

EA02-027

FORD 8/5/03

LETTER TO ODI

APPENDIX A

5 BOXES

BOX 5 OF 5

PART 4 OF 4

From: Williams, Les (LHW.)
Sent: Tuesday, March 05, 2002 9:25 AM
To: Altoonian, Don (D.J.); Amenda, Harry (H.F.); Badgley, Joel (J.K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Glas, Stuart (S.); Gokhale, Renuka (R.V.); Hansen, George (G.C.); Harr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald (E-mail); Jones, Andy; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Lintaco, Steven (S.); Linda, Peter (P.A.); Liu, Jane (J.); Luehrsen, Eric (E.A.); Marck, Edmond (E.C.); Matasa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tom; Morishima, Shigeki (S.); Naveed Khan; Nematollahi, Sonya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Orman, James (J.W.); Powell, Cary; Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aiden (A.P.); Rothwaller, Daniel (D.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shiraiishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hirochi (H.); Vecchio, Anne Marie (A.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Les (LHW.); Williamson, David (D.E.); Yeung, Lem (.)
Subject: U204 Stall Meeting moved to 2-3 PM on Thursdays

Hello Team:

My last day on this assignment is 3/15/02. The Stalls meetings have been moved to 2-3 PM EST on Thursdays. Muriel Sanders will be taking over the stalls issue after I am departed. Thanks!

Regards,
Les Williams
For More, Count on Les
U204 3.0L Powertrain Calibration
Truck Engine Engineering, Suite 1AE20
Phone: (313)33-72503
Fax: (313) 32-31786

Subject: Updated: Update: U204 Phantom Stall Meeting
Location: TEE Conference Rm 2

Start: Thu 1/17/2002 2:00 PM
End: Thu 1/17/2002 3:00 PM
Show Time As: Tentative

Recurrence: Weekly
Recurrence Pattern: every Thursday from 2:00 PM to 3:00 PM

Meeting Status: Not yet responded

Required Attendees: Williams, Lee (LHW.); Altonian, Don (D.J.); Amanda, Harry (H.F.); Badgley, Joel (J.K.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diaz, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Gilas, Stuart (S.); Gokhale, Renuka (R.V.); Hansen, George (G.C.); Han, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald (E-mail); Jones, Andy; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Luehrsen, Eric (E.A.); Marck, Edmond (E.C.); Matosa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tom; Morishima, Shigeki (S.); Naveed Khan; Nematollahi, Sonya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Orman, James (J.W.); Powell, Cary; Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Rothweiler, Daniel (D.); Sanders, Murtel (M.S.); Shah, Kiran (K.C.); Shirahsi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhea (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Vecchio, Anne Marie (A.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Lee (LHW.); Williamson, David (D.E.); Young, Lam (.)

Optional Attendees: Klostermann, Eric (E.); Williamson, David (D.E.)

Dial in: 1-866-250-3175 or Fordnet: 9-1-954-1163
International Participants # 1 (630) 827-6733
Passcode: 7354080#

From: Williams, Les (LHW.)
Sent: Monday, March 04, 2002 5:39 PM
To: Freeland, Mark (M.)
Subject: RE: Mark Freeland

:-)

—Original Message—

From: Freeland, Mark (M.)
Sent: Monday, March 04, 2002 5:35 PM
To: Williams, Les (LHW.)
Subject: RE: Mark Freeland

OK,

Will bring my warranty story on Focus showing correlation between dPFE replacements and Stalls warranty.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Williams, Les (LHW.)
Sent: Monday, March 04, 2002 6:33 PM
To: Freeland, Mark (M.)
Subject: RE: Mark Freeland

verbal and answer questions will be great! Maybe bring in a few graphs showing the spike in data during the past summers with dPFes.

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

From: Freeland, Mark (M.)
Sent: Monday, March 04, 2002 5:30 PM
To: Williams, Les (LHW.)
Subject: RE: Mark Freeland

Les,

Thanks for the directions.

What do I need to be prepared with for Thursday? Or am I just there to give a verbal and answer questions?

Thanks

Mark

From: Williams, Les (LHW.)
Sent: Monday, March 04, 2002 4:05 PM
To: Freeland, Mark (M.)
Cc: Sanders, Muriel (M.S.)
Subject: RE: Mark Freeland



TEE Bldg
Directions.doc

I get that question a lot!
:-)

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

From: Freeland, Mark (M.)
Sent: Monday, March 04, 2002 3:59 PM
To: Williams, Les (LHW.)
Subject: RE: Mark Freeland

Thanks Les,

I have a place holder in my Outlook.

Can you send directions for the TEE bldg. I'm not sure where it is at.

Regards

Mark Freeland

Directions to TEE Bldg:

From PDC:

1. Go South on Oakwood.
2. Go past M-39.
3. Keep going... soon you will travel under I-94.
4. As soon as you go under I-94, make an immediate left onto Enterprise Drive (sign will not be easy to spot).
5. Continue Straight on Enterprise Drive for 300 yds.
6. Make a right into the Truck Engine Engineering Bldg (TEE), and go thru front door and call my cell phone or desk phone cell= 248-390-0150 Desk= X72503

TEE bldg is VERY small, it is on the Southside of I94 and it is to the west of Allen Park Test Labs (APTL), APTL is MUCH bigger than TEE.

Thanks.

From: Williams, Les (LHW.)
Sent: Monday, March 04, 2002 11:27 AM
To: Fraeland, Mark (M.)
Cc: Altoonian, Don (D.J.)
Subject: RE: Mark Freeland

Hello Mark:

The meeting is slated to be from 2-3 PM this Thursday at TEE. More info will be out in the next couple of days, I just wanted to give you an early quick email notice. THANK YOU FOR YOUR ASSISTANCE.

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

From: Altoonian, Don (D.J.)
Sent: Tuesday, February 26, 2002 3:06 PM
To: Williams, Les (LHW.)
Subject: RE: Mark Freeland

Les, no next Thursday the 7th, can you send him an agenda and you great map on how to find you.

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

From: Williams, Les (LHW.)
Sent: Tuesday, February 26, 2002 12:00 PM
To: Altoonian, Don (D.J.)
Subject: Mark Freeland

Sure Don! Does he want to come THIS Thursday the 28th?

Regards,

Les Williams

For More, Count on Les

U204 3.0L Powertrain Calibration

Truck Engine Engineering, Suite 1A820

Phone: (313)33-72503

Fax: (313) 32-31786

From: Williamson, Richard (E.)
Sent: Tuesday, December 03, 2002 3:28 PM
To: Freeland, Mark (M.)
Subject: RE: DPFE Sensor stalls

Mark,

I personally talked to the shop foreman. He was assigned the vehicle after the first tech couldn't fix it. He stated that he let the vehicle idle in his stall and eventually the vehicle would stall. He would try to start it and the vehicle would not start and there was no check engine light on the dash. He would unplug the DPFE and cycle the key, the MIL would be on and the vehicle would start. He repeated this twice and then replaced the part. He has promised to ship me the part and I will bring it to you. If I haven't received the part by the end of the week I will call him back.

Rick

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

From: Freeland, Mark (M.)
Sent: Tuesday, December 03, 2002 10:33 AM
To: Gates, Freeman (F.C.); Maurer, James (J.B.); McCoy, James (J.D.)
Cc: Kobwicki, Allan (A.J.); Altes, Sheran (S.A.); O'Neill, Jim (J.D.); Crawley, Ian (I.A.); Williamson, Richard (E.); Jefford, Bob (R.D.)
Subject: RE: DPFE Sensor stalls

For info:

I just looked up the vehicle in AWS. It was also in for stalls on 9/9/02 and had the ignition coils replaced, the PCM replaced and one injector replaced on that visit.

Tech. Comments: EXSTENCIVE TIME R R TRIM PANLES TO OPEN AND INSPECT WIRRING HARNESS.REPLACE ALL EIGHT COIL PACKS PER HOTLINE.

Customer Comments: CUSTOMER STATES VECH WANTS TO STALL OUT AT STOPS

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

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

From: Gates, Freeman (F.C.)
Sent: Tuesday, December 03, 2002 10:29 AM
To: Freeland, Mark (M.); Maurer, James (J.B.); McCoy, James (J.D.)
Cc: Kobwicki, Allan (A.J.); Altes, Sheran (S.A.); O'Neill, Jim (J.D.); Crawley, Ian (I.A.); Williamson, Richard (E.); Jefford, Bob (R.D.)
Subject: RE: DPFE Sensor stalls

This vehicle will have the ESM. This sounds like it may even be an EVR concern i.e. vacuum on EGR valve continually. We have seen this on some EVR applications if the filter is not installed correctly or contamination exists on the disc (internal to EVR). We have seen this at least 1 time this year. When you disconnect the DPFE, you also disconnect, EVR and MAP sensor through the common connector.

EA02-027-G 22634

Thanks Mark/Richard.

Anyway the answer is YES , we want the part !

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

From: Freeland, Mark (M.)
Sent: Tuesday, December 03, 2002 10:14 AM
To: Gates, Freeman (F.C.); Maurer, James (J.B.); McCoy, James (J.D.)
Cc: Kobwicki, Alan (A.); Alles, Sheran (S.A.); O'Neill, Jim (J.D.)
Subject: FW: DPFE Sensor stalls
Importance: High

Freeman, Jim & Jim,

Please read the attached from Rick Williamson of ECI. I will ask Rick to obtain the part if he can.

A couple of questions:

- 1) Which dPFE sensor will this vehicle have, Kavlico TM, Motorola Dash Mount or Siemens (Kavlico) ECM?
- 2) What current draw does it take to shut down a 2003 MY Town Car?

Regards

Mark Freeland

6-Sigma Black Belt
 Engine Research Department
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 Dearborn, MI 48121-2053 USA
 email: mfreela1@ford.com
 Tel: (313) 594-7645

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

From: Williamson, Richard (E.)
Sent: Wednesday, November 27, 2002 7:57 AM
To: Freeland, Mark (M.)
Subject: DPFE Sensor stalls
Importance: High

Hi Mark,
 How have you been?
 Are you still interested in the DPFE sensor?
 I have a CQIS report that you might be interested in:

CSQI002	CQIS Indicator Summary	11/27/02 07:50:39	
==>			1 of 1
Rpt#: 2KTAC415 EDSR --or-- Q 200200039171 Rpt: 11/21/2002 Odom: 3,439 M			
Rvwd: File: Folder: Atchmnts: 0 Print Smy/Disp Detail(P/D):			
Vehicle: 2003 TOWN CAR,EXEC ,SEDAN 1LNHM81W73Y626638 Bld: 07/29/2002			
Engine: 4.6L ROM B Calb: Trans: Axle: A/C:			
Dealer Id: 08910 Columbia Ford Lincoln-Mercury Ph#: (860) 228-2886			
State: Connecticut City: Columbia Orig/Caller: PAUL DANIELUK			
Symptom: 6 07 6 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP			
Addl Sym: St: CCRG/EPRC: S Rvwd: A Dt: 11/25/2002			
Fix: Y Caus. Comp: EGR ASSEMBLY - RPL Condition Code:			

Region Code: 11 Region Name: Boston -11

CONCER VEHICLE STALLS WHILE DRIVING SOMETIMES, SOMETIMES IT RESTARTS AND

SOMETIMES IT WON'T CRANK AFTER IT STALLS.
TECH/C NGS SELF TEST NO CODES, WHEN CAR WON'T CRANK YOU LOSE COMMUNICATION
WITH PCM, THEFT LIGHT DOES NOT PROVE OUT WHEN KEY IS TURNED ON,
UNPLUGGED DPFE AND CONCERN IS CORRECTED. REPLACED SHORTED DPFE ERG
VALVE ASSEMBLY AND RETEST.

I am going to try and get the part back, let me know if you would like it

Take care,

RICK WILLIAMSON
Product Concern Analyst
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

From: Williamson, Richard (E.)
Sent: Wednesday, November 27, 2002 7:57 AM
To: Freeland, Mark (M.)
Subject: DPFE Sensor stalls

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Mark,
How have you been?
Are you still interested in the DPFE sensor?
I have a CQIS report that you might be interested in:

CSQI002 CQIS Indicator Summary 11/27/02 07:50:39 1 of 1
=> _____
Rpt#: 2KTAC415 EDSR --or-- Q 200200039171 Rpt: 11/21/2002 Odom: 3,439 M
Rvw: File: Folder: Attachmnts: 0 Print Smy/Disp Detail(P/D):
Vehicle: 2003 TOWN CAR,EXEC ,SEDAN 1LNHM81W73Y62663B Bld: 07/29/2002
Engine: 4.6L ROM B Calb: Trans: Axle: A/C:
Dealer Id: 08910 Columbia Ford Lincoln-Mercury Ph#: (860) 228-2886
State: Connecticut City: Columbia Orig/Callr: PAUL DANIELUK
Symptom: 8 07 8 93 DRVABL,STALL/QUITS,AT CRUISE,ALL ENGINE TEMP
Addl Sym: St: CCRG/EPRC: S Rvw: A Dt: 11/25/2002
Fix: Y Caus. Comp: EGR ASSEMBLY -- RPL Condition Code:

Region Code: 11 Region Name: Boston -11

CONCER VEHICLE STALLS WHILE DRIVING SOMETIMES, SOMETIMES IT RESTARTS AND
SOMETIMES IT WON'T CRANK AFTER IT STALLS.
TECH/C NGS SELF TEST NO CODES, WHEN CAR WON'T CRANK YOU LOSE COMMUNICATION
WITH PCM, THEFT LIGHT DOES NOT PROVE OUT WHEN KEY IS TURNED ON,
UNPLUGGED DPFE AND CONCERN IS CORRECTED. REPLACED SHORTED DPFE ERG
VALVE ASSEMBLY AND RETEST.

I am going to try and get the part back, let me know if you would like it

Take care,

RICK WILLIAMSON
Product Concern Analyst
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

From: Williamson, Richard (E.)
Sent: Wednesday, June 05, 2002 9:27 AM
To: Freeland, Mark (M.)
Subject: DPFE

Hi Mark,

Got your phone message yesterday, but was out of the office. I am searching through my DPFE's now for the correct dates. The FQE are still sending me all DPFE's. That "tap" is turning off now and I will send out the "special request" for all dates after 2A07B.

2A07B

1st number =Year (2002)

A = January

07=actual date

B= Shift

Is this cotrrect??

I am looking through my stock now for latest dates and will let you know if I find any new ones.

Regards,

RICK WILLIAMSON

Product Concern Analyst-Powertrain

Enhanced Concern Identification

313-248-6348

rwill110@ford.com

From: Williamson, Richard (E.)
Sent: Wednesday, May 15, 2002 7:03 AM
To: Fraeland, Mark (M.)
Subject: RE: Vin Numbers from RO numbers

Mark,

I am sorry - we have tried everything to come up with those two RO numbers with no success. There are two possibilities:

- 1 - The RO's are not yet in the AWS system (too new)
- 2 - These were "cash" jobs and no AWS or PEARS reports exist.

I have instructed the FQE's that we cannot accept any more parts of any kind with out documentation. I know that is of little consequence to you now, but it is the best that I can do.

I have about 60 more dPFE sensor's (ALL with VIN's or documentation) that I will drop off at your desk this morning.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

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

From: Fraeland, Mark (M.)
Sent: Monday, May 13, 2002 6:37 PM
To: Williamson, Richard (E.)
Cc: Maurer, James (J.B.); Gales, Fraeman (F.C.); Plante, Paul (P.G.); Aldns, Mary (M.)
Subject: Vin Numbers from RO numbers

Rick,

There are two additional parts from the group which you supplied without VIN numbers which we are planning to send to an outside lab for analysis. It is very important to us to get the vehicle history associated with both of these parts.

Could you please make every effort to identify the VIN numbers from the RO numbers given below.

SRL ID No: SRL547 RO: 87581
SRL ID No: SRL614 RO: 3815309

SRL614 is particularly important as it is one of the improved parts which was manufactured after 1/7/2002. It may be from a second repair, from a low mileage failure on a new vehicle or from a pre delivery failure. It exhibits one of the symptoms of a high current draw.

Thanks for you're assistance.

Regards

Mark Fraeland

ER02-027-G 22641

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Williamson, Richard (E.)
Sent: Tuesday, May 07, 2002 2:40 PM
To: Freeland, Mark (M.)
Subject: RE: 85581

Importance: High

Mark,

I looked for a copy of the recall on the TSO website....it is too new to list.

There is an 800 # for the help desk and I am sure that they will forward you a copy (they are very helpful).

1-800-325-5621

Regards,

Rick Williamson

Product Concern Analyst-Powertrain

Enhanced Concern Identification

313-248-8348

rwill110@ford.com <<mailto:rwill110@ford.com>>

PS

You should give Bob Merrell a call sometime(82027)...he just bought his 10th "vintage" automobile - this time a 1963 Impala SS with a 327!!!! He is acting like a proud papa!

R

---Original Message---

From: Freeland, Mark (M.)
Sent: Monday, May 06, 2002 5:34 PM
To: Williamson, Richard (E.)
Subject: RE: 85581

Thanks for the info.

This was a great lead as it has led me to 02S33B, a safety recall for sealing of an electrical connector.

Where can I get the low down on the safety recall?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt

Engine Research Department

ER02-827-G 22643

Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Williamson, Richard (E.)
Sent: Monday, May 06, 2002 10:46 AM
To: Freeland, Mark (M.)
Cc: Bliss, Gerry (G.)
Subject: 85581
Importance: High

Hi Mark,
Michael Storms found one of your two dPFE sensors - 85581
VIN# 2FMZA51491BA02859
AWS CLAIM: 6378567
Gaudin Ford, Nevada
This came from our Nevada FQE - Brain Cox

No luck on the second VIN - we have exhausted all worldly efforts - we may think of something in a different dimension???????? but we will probably not find that VIN.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

From: Williamson, Richard (E.)
Sent: Monday, May 06, 2002 10:46 AM
To: Freeland, Mark (M.)
Cc: Bissl, Gerry (G.)
Subject: 85581

Importance: High

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Mark,
Michael Storms found one of your two dPFE sensors - 85581
VIN# 2FMZA51491BA02859
AWS CLAIM: 6378567
Gaudin Ford, Nevada
This came from our Nevada FQE - Brain Cox

No luck on the second VIN - we have exhausted all worldly efforts - we may think of something in a different dimension??????? but we will probably not find that VIN.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
913-248-6348
rwill110@ford.com

EP02-027-G Z2845

From: Williamson, Richard (E.)
Sent: Monday, May 06, 2002 6:38 AM
To: Freeland, Mark (M.)
Subject: RE: VIN numbers from RO numbers.

I talked to the other analysts - no one at ECI has any knowledge of this occurrence

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

From: Freeland, Mark (M.)
Sent: Friday, May 03, 2002 11:20 AM
To: Williamson, Richard (E.)
Subject: RE: VIN numbers from RO numbers.

Thanks for the update, I do appreciate you're efforts.

I just got a new clue! Do you know anything about shorts between 12 V & 5 Vref caused by a connector to the break switch? Report came from Mazda on a Tribute in Canada.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: Williamson, Richard (E.)
Sent: Friday, May 03, 2002 10:04 AM
To: Freeland, Mark (M.)
Cc: Storms, Michael (M.); Bliss, Garry (G.)
Subject: RE: VIN numbers from RO numbers.
Importance: High

Hi Mark,

I have not been able to find either of those two hot VINS you need, even after several hours of looking. Michael Storms has an idea that he will try on Monday (AWS is down today). Hang in there - we should have an answer for you then!

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

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

From: Freeland, Mark (M.)

ER02-027-G 22646

Sent: Wednesday, May 01, 2002 2:51 PM
To: Williamson, Richard (E.)
Subject: RE: VIN numbers from RO numbers.

Thanks Rick, but it's the specific test results from this part, not just the date that makes it so important.

Also, from this morning's tests there is another SUPER HOT one. Even hotter than the first, as it was built after the V Transient Improvements went into production. The number from the box was 3815308, the sensor's date of manufacture is 1/21/2002. Another golden egg if we can locate the VIN number.

Thanks for all your help and dead sensors.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mrfreel1@ford.com
Tel.: (313) 594-7645

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

From: Williamson, Richard (E.)
Sent: Tuesday, April 30, 2002 6:50 AM
To: Freeland, Mark (M.)
Subject: RE: VIN numbers from RO numbers.

Mark,

John Domka is in training all week (he is the guy who promised quick action on the VIN's). I have a bunch more DPFE's - can I find a similar date for you or do you want me to bring them over??

I will still try and find a way to get the VIN's

Rick

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

From: Freeland, Mark (M.)
Sent: Monday, April 29, 2002 6:15 PM
To: Williamson, Richard (E.)
Subject: VIN numbers from RO numbers.

Rick,

What is the best way for us to handle getting VINs for the specific parts of interest in the ones you sent? Should I ship you an excel workbook with the RO numbers and have you send it back with the VIN's filled in?

There is one that I am in a hurry to get, that is for RO number 85581

Can you get your person find me the VIN for this one ASAP.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt

ERR2-027-G 22647

Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mrfela1@ford.com
Tel.: (313) 594-7645

From: Williamson, Richard (E.)
Sent: Friday, May 03, 2002 10:04 AM
To: Freeland, Mark (M.)
Cc: Storms, Michael (M.); Blisal, Gerry (G.)
Subject: RE: VIN numbers from RO numbers.

Importance: High

Hi Mark,

I have not been able to find either of those two hot VINS you need, even after several hours of looking. Michael Storms has an idea that he will try on Monday (AWS is down today). Hang in there - we should have an answer for you then!

Regards,

RICK WILLIAMSON

Product Concern Analyst-Powertrain

Enhanced Concern Identification

313-248-6348

rwill110@ford.com

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

From: Freeland, Mark (M.)
Sent: Wednesday, May 01, 2002 2:51 PM
To: Williamson, Richard (E.)
Subject: RE: VIN numbers from RO numbers.

Thanks Rick, but it's the specific test results from this part, not just the date that makes it so important.

Also, from this mornings tests there is another SUPER HOT one. Even hotter than the first, as it was built after the V Transient Improvements went into production. The number from the box was 3615309, the sensor's date of manufacture is 1/21/2002. Another golden egg if we can locate the VIN number.

Thanks for all you're help and dead sensors.

Regards

Mark Freeland

6-Sigma Black Belt

Engine Research Department

Ford Research Laboratory

P.O. Box 2053

MD 2629 - SRL - Room 1517

Dearborn, MI 48121-2053 USA

email: mfreela1@ford.com

Tel.: (313) 594-7645

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

From: Williamson, Richard (E.)
Sent: Tuesday, April 30, 2002 6:50 AM
To: Freeland, Mark (M.)
Subject: RE: VIN numbers from RO numbers.

Mark,

John Dornka is in training all week (he is the guy who promised quick action on the VIN's). I have a bunch more DPFE's - can I find a similar date for you or do you want me to bring them over??

ER02-027-0 22540

I will still try and find a way to get the VIN's
Rick

—Original Message—

From: Freeland, Mark (M.)
Sent: Monday, April 29, 2002 6:15 PM
To: Williamson, Richard (E.)
Subject: VIN numbers from RO numbers.

Rick,

What is the best way for us to handle getting VINs for the specific parts of interest in the ones you sent?
Should I ship you a excel workbook with the RO numbers and have you send it back with the VIN's filled in?

There is one that I am in a hurry to get, that is for RO number 85581

Can you get you're person find me the VIN for this one ASAP.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Williamson, Richard (E.)
Sent: Wednesday, May 01, 2002 7:37 AM
To: Lovelace, Maria (M.E.); Domka, John (J.J.)
Cc: Freeland, Mark (M.)
Subject: RE: VIN Numbers

Maria,

When John gave me the boxes of DPFE sensors without VIN's he offered to pull the VIN's when they were needed. That is why I contacted him directly - due to his offer.

One of the DPFE's that he handed in turned out to be a "golden nugget" and is in high demand right now. I spent about an hour trying to find a VIN for this RO and will probably spend another hour trying to find it today. Without the VIN and VIN history the part is not as valuable.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6948
rwill110@ford.com

---Original Message---

From: Lovelace, Maria (M.E.)
Sent: Wednesday, May 01, 2002 7:22 AM
To: Domka, John (J.J.); Williamson, Richard (E.)
Cc: Freeland, Mark (M.)
Subject: RE: VIN Numbers

Rick

what is it that you need from the FQEs? Please go through me when you are requesting information from them.

As I know where they are and their workload. Thanks

---Original Message---

From: Domka, John (J.J.)
Sent: Tuesday, April 30, 2002 10:14 PM
To: Williamson, Richard (E.)
Cc: Lovelace, Maria (M.E.)
Subject: RE: VIN Numbers

No problem, but it will have to wait until late next week. I am in new model training this week and heading down to Lexington Ky Monday, for a couple of days.

---Original Message---

From: Williamson, Richard (E.)
Sent: Tuesday, April 30, 2002 6:44 AM
To: Domka, John (J.J.)
Subject: FW: VIN Numbers
Importance: High

John,
Here are some more:

---Original Message---

From: Freeland, Mark (M.)
Sent: Monday, April 29, 2002 6:28 PM

ERR2-827-G 22651

To: Williamson, Richard (E.)
Subject: VIN Numbers

Rick,

Here is the list of parts which I need Vin numbers for so far.

Can you're guy help? Thanks << File: RO numbers requiring VINs.xls >>

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Williamson, Richard (E.)
Sent: Tuesday, April 30, 2002 6:50 AM
To: Freeland, Mark (M.)
Subject: RE: VIN numbers from RO numbers.

Mark,

John Domka is in training all week (he is the guy who promised quick action on the VIN's). I have a bunch more DPFE's - can I find a similar date for you or do you want me to bring them over??

I will still try and find a way to get the VIN's

Rick

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

From: Freeland, Mark (M.)
Sent: Monday, April 29, 2002 6:15 PM
To: Williamson, Richard (E.)
Subject: VIN numbers from RO numbers.

Rick,

What is the best way for us to handle getting VINs for the specific parts of interest in the ones you sent? Should I ship you a excel workbook with the RO numbers and have you send it back with the VIN's filled in?

There is one that I am in a hurry to get, that is for RO number 85561

Can you get you're person find me the VIN for this one ASAP.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

ER82-027-G 22853

From: Williamson, Richard (E.)
Sent: Wednesday, March 20, 2002 10:16 AM
To: Awad, Mahmoud (M.I.); Plants, Paul (P.G.)
Cc: Freeland, Mark (M.); Bluel, Gerry (G.)
Subject: AWS Claims List 9J460 and Accidents

Hi Mahmoud!

As requested I have searched my AWS files for accidents caused by the dPFE sensor. I could not find any reports that alleged that the dPFE caused an accident or that the vehicle was in an accident due to the stalling or no start condition etc that the vehicle was in due to dPFE failure.

All my files are on Excel. I used the word search function of Excel to look for "accident" in any of the text of the several thousand reports of the five selected vehicles lines(2.0L Escape; 3.0L Escape; 4.6L F-150; 3.0L DT Taurus; and 2.0L Z-Tech Focus).

Any questions or comments please feel free to contact me.

Regards,

RICK WILLIAMSON
Product Concern Analyst-Powertrain
Enhanced Concern Identification
313-248-6348
rwill110@ford.com

From: Woods, Dennis (D.G.)
Sent: Tuesday, September 10, 2002 2:02 PM
To: Drbn Pool Lot, QMP (.); Koszewnik, John (J.J.)
Cc: Freeland, Mark (M.); McCoy, James (J.D.); King, Sandra (S.M.); O'Neal, Jim (J.D.)
Subject: RE: Pool Vehicle

I approve this request. Thanks.

Regards,

Dennis G. Woods

Superintendent

R&E Vehicle Service Center

Ofc: 313-32-20323, Fax:313-24-82051

"Customer is the Key"

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

From: Toukhanian, Christopher (.) On Behalf Of Drbn Pool Lot, QMP (.)
Sent: Tuesday, September 10, 2002 1:59 PM
To: Koszewnik, John (J.J.)
Cc: Freeland, Mark (M.); McCoy, James (J.D.); King, Sandra (S.M.); O'Neal, Jim (J.D.); Woods, Dennis (D.G.)
Subject: RE: Pool Vehicle

You will have to ask Dennis Woods to approve before we can supply you with a replacement. Usually, we can only provide a pool vehicle for a management lease vehicle that is being repaired, not evaluated by an engineering dept.

Thanks
Chris

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

From: Koszewnik, John (J.J.)
Sent: Tuesday, September 10, 2002 1:54 PM
To: Drbn Pool Lot, QMP (.)
Cc: Freeland, Mark (M.); McCoy, James (J.D.); King, Sandra (S.M.); O'Neal, Jim (J.D.)
Subject: RE: Pool Vehicle

By copy of this note, I'm approving Mark Freeland's use of a pool car for the period shown below. Thanks in advance.

John Koszewnik

Chief Engineer
V-Engine Engineering
Ph. 32-28973
Fx. 24-86057
jkoszewn@ford.com

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

From: O'Neal, Jim (J.D.)
Sent: Tuesday, September 10, 2002 1:12 PM
To: Koszewnik, John (J.J.); King, Sandra (S.M.)
Cc: Freeland, Mark (M.); McCoy, James (J.D.)
Subject: RE: Pool Vehicle

ER82-827-G 22783

John - Please forward the below note to Dbnpool@ford.com this afternoon. Thanks.
Sandra - can you follow up with John's admin (I think her name is Jan) to make sure this happens.

I approve Mark Freeland's use of a pool car while his lease car is being evaluated for Delta PFE EGR sensor issues. He will need a pool car from Sept 11th at 2PM to Sept 13th at 4PM. Thanks

J. D. O'Neill

Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-8839

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

From: Mack, Ed (E.T.)
Sent: Tuesday, September 10, 2002 9:27 AM
To: McCoy, James (J.D.)
Cc: O'Neill, Jim (J.D.); Freeland, Mark (M.)
Subject: RE: Pool Vehicle

Yes, with LL4 approval. Send to Dbnpool@ford.com

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

From: McCoy, James (J.D.)
Sent: Tuesday, September 10, 2002 9:26 AM
To: Mack, Ed (E.T.)
Cc: O'Neill, Jim (J.D.); Freeland, Mark (M.)
Subject: RW: Pool Vehicle

Ed, Can you provide an answer our question listed below?

Thanks. Jjm.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

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

From: Tokarczyk, Jim (J.J.)
Sent: Tuesday, September 10, 2002 9:02 AM
To: McCoy, James (J.D.)
Subject: RE: Pool Vehicle

Need to contact Ed Mack in Vehicle Programs (he controls the pool vehicles).

Thank You

Jim Tokarczyk

Product Development Vehicle Control
phone x76943, fax 23311
QMP 408

Vehicle Services WEB Sites

<http://www.darborn.ford.com/ftp/PPPBV/VehicleControl/vehiclecontrol.html>

ERE2-827-G 22784

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

From: McCoy, James (J.D.)
Sent: Tuesday, September 10, 2002 9:00 AM
To: Tokarczyk, Jim (J.J.)
Cc: O'Neal, Jim (J.D.); Freeland, Mark (M.)
Subject: Pool Vehicle

Jim,

We are currently working on a warranty issue and have a vehicle which is exhibiting concerns and needs to be investigated. The vehicle we need to test is a lease vehicle that belongs to an employee, Mark Freeland, here at Ford. Mark has volunteered his vehicle for testing which will take about a week.

Would it be possible to provide a pool vehicle for Mark's use while we test his vehicle? Could you let me know if this is something we can do?

Thanks Jim.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

From: Young, Lem (.)
Sent: Friday, August 02, 2002 2:55 PM
To: Freeland, Mark (M.)
Subject: RE: Spark Plug Issues

Bill Goodwin is the one who identified it.

Basically, we recently found a U204 engine stall issue which was resolved with spark plug replacement. The stall followed the plugs. It has been found in the past on J16 Mazda MPV (another Duratec) that low resistance spark plugs can cause a stall. Analysis on the plugs from this U204 engine stall had plugs measuring low resistance in the range seen on J16. We are planning on providing Bob Dalbo some low resistance plugs to try and understand how many bad plugs can cause a stall and in which locations.

Here is what he sent me. I think you will find Bill much more knowledgeable on this subject.



RE: Spark plugs
returned under...

W. Lem Young
Ford Motor Company
U204 Duratec Engine Systems Supervisor
Work 313-32-23844
Pager 313-795-2777
Fax 313-584-7323

---Original Message---

From: Freeland, Mark (M.)
Sent: Friday, August 02, 2002 10:34 AM
To: Young, Lem (.)
Subject: Spark Plug Issues

Lem,

I am a 6 Sigma BB in FRL working on a stalls issue. I heard from the Escape stalls team that you are working on a spark plug issue, which may have some connection to the project I am working on.

Would you be prepared to meet with me and fill me in on the details of the spark plug issue?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

EA02-027-G 22706

From: Goodwin, William (W.R.)
Sent: Tuesday, July 23, 2002 1:54 PM
To: Dalbo, Bob (R.J.); Yeung, Lam (.)
Cc: Sanders, Muriel (M.S.); 'Eden Weston (E-mail)'; Elwell, Fred (F.); Power, James (J.H.); Fournelle, Gilbert (G.)
Subject: RE: Spark plugs returned under 14D-16-1



Spark Plug
Resistance_Ex.xls

J16L was experiencing stalls that went away when LVR failure parts were removed.

Attached is a file from the J16L Issue.

Regards,

Bill Goodwin

Product Design Engineer, Ignition Systems
V Engine Engineering, Ford Motor Company
Tel: 313 337-8578 Fax: 313 380-4084
email: wgoodwin@ford.com
textpage mellio:3137960571@alphapage.airtouch.com

---Original Message---

From: Dalbo, Bob (R.J.)
Sent: Tuesday, July 23, 2002 1:49 PM
To: Goodwin, William (W.R.); Yeung, Lam (.)
Cc: Sanders, Muriel (M.S.); 'Eden Weston (E-mail)'; Elwell, Fred (F.); Power, James (J.H.); Gilbert Fournelle
Subject: RE: Spark plugs returned under 14D-16-1

Bill,

What does this Low Voltage Resistance failure mean in the context of causing a vehicle to stall?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31788
Pager: (313) 795-2859 Email: rdalbo@ford.com

---Original Message---

From: Goodwin, William (W.R.)
Sent: Tuesday, July 23, 2002 12:56 PM
To: Yeung, Lam (.); Dalbo, Bob (R.J.)
Cc: Eden Weston (E-mail); Elwell, Fred (F.); Power, James (J.H.)
Subject: Spark plugs returned under 14D-16-1
Importance: High

I have measured spark plugs returned from Japan. Two of the spark plugs have Low Voltage Resistance (LVR) failure issues. The typical specification is 2-20K ohm with a typical value of 2-10 Kohms on these spark plugs. One spark plug is 130 ohms the other is 790 Ohms. Please consider these measurements needing confirmation. My equipment is not calibrated, but I am I want to ensure that Honeywell confirms these values. It has been known that spark plugs with low resistance can create PCM reset conditions on the J16L program (Mazda MPV).

The reference number is #14D-16-1 Mileage 22,806 Engine Serial # 740684086

I will be sending on the spark plugs for analysis to Honeywell to attempt to determine the cause of the LVR

failures.

Regards,

Bill Goodwin

Product Design Engineer, Ignition Systems

V Engine Engineering, Ford Motor Company

Tel: 313 337-9579 Fax: 313 390-4084

email: wgoodwin@ford.com

textpage mailto:3137980571@alphapage.airtouch.com

From: Zanini-Fisher, Margherita (M.)
Sent: Thursday, January 02, 2003 1:58 PM
To: Freeland, Mark (M.)
Subject: DPFE recall

Hello Mark,

Happy new year!

I believe you have moved from the first to the second or third floor, but I do not know where. I was looking for information on whether a recall was ever issued for the Kavlico DPFE and/or whether the dealers were told to just replace sensors manufactured before a certain date when doing other service on vehicle lines with a high percentage of faulty sensors.

I just got a draft report from a colleague I have worked with last year on the MAS project who has done a statistical analysis to demonstrate how snapshots of 50-60 secs of vehicle data (EGRVR and DPFE, mainly) can be automatically analyzed to identify a faulty sensor. Although the data were collected because of last year Mobile Assets Systems Project, I see that Dave calls this piece of work a "6-sigma" project. Anyway, nothing urgent, but I thought I may just try to see you and catch up with some late news.

Regards,

Margherita Zanini

Advanced Diagnostics
Powertrain Controls R&D Dept
SRL - MD2036 - Rm 3011-Y
Phone: 313-337-1097 Fax: 313-248-5167

From: Zanini-Fisher, Margherita (M.)
Sent: Monday, June 17, 2002 8:53 PM
To: Freeland, Mark (M.)
Subject: P0401

Mark,

My Focus VIN is 1FAFP38311W275628 Prod date 3/12/01 at Wayne

The DPFE is stuck in range at $-1.80V$ (between $1.79V$ to $1.84V$). EGREV goes as high as 90% (including revving up in park, which surprises me a little bit because I thought in park EGR would not be enabled). I can definitely feel the hesitation accelerating from part-throttle condition.

I'll put the VDR on sometime tomorrow, but if the sensor is fried, the data will be not very exciting because they will show that EGR is requested, the duty cycle maxes out, and the sensor is steady as a rock. I was hoping to find a sensor that "wanders" around and then gets stuck. I'll check again if on a few restarts I will always get $1.8V$ (I have the NGS plugged in now), but I am not holding my breath. I am tied up morning and early afternoon: maybe we can talk after John Gerlack's farewell.

Margherita

From: Zanini-Fisher, Margherita (M.)
Sent: Monday, June 17, 2002 9:54 AM
To: Freeland, Mark (M.)
Subject: RE: I have a P401 code in my own Focus

Mark,

I know very well that you are working on this. I did try to join your 8D session, but I am really over my head with too many things so there is no point for me to participate in it.
I cannot give you the sensor but I can tell you when I'll bring the vehicle (it is my lease car) for repair. Now I am going to erase the code and record when the DTC and the MIL come on again. If the sensor is bad, the data will not be very interesting: it just will record no EGR. If, however, the sensor was fried because of something else in the vehicle, then, it would be interesting to keep the VDR on for a while to see if/when the problem reappears. Can you tell me how to know whether the sensor is a Kavlico or a Mototrola? I understand that in the Focus, there is a substantial problem with noise in the wiring. I do not recall if the noise spike fries the sensor or the PCM. Call me this morning if you can.

Margherita

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

From: Freeland, Mark (M.)
Sent: Friday, June 14, 2002 2:04 PM
To: Zanini-Fisher, Margherita (M.)
Subject: FW: I have a P401 code in my own Focus!

Margherita,

Hi,

You probably didn't know that I am the BB working the dPFE sensor issue, but if you would like to drop by I will fill you in on the details. I would like to have the sensor from your car, and the VIN number and mileage. (Tim Potter and George Mz's wife have also had failures on their Focus).

I can give you a replacement sensor which will not be capable of stalling your vehicle, the current one could leave you stranded.

Also, Ed has been back working on this one with me!

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

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

From: Dossell, James (J.M.)
Sent: Friday, June 14, 2002 12:34 PM
To: Freeland, Mark (M.)
Subject: FW: I have a P401 code in my own Focus!

ERG2-027-G Z2711

Thought you might be interested

—Original Message—

From: Zanini-Fisher, Margherita (M)
Sent: Friday, June 14, 2002 12:23 PM
To: Rachedi, Shane (S.H.); Bardelski, David (D.); Kado, Mark (S.)
Cc: James, John (J.V.); Doodell, James (J.M.); Marko, Ken (K.A.)
Subject: I have a P401 code in my own Focus!

I just turned on a MIL. My first ever. what an excitement! It is the usual EGR Insufficient flow code (P410) that we have seen so many warranty returns about. I understand that the FOCUS is especially bad because the sensor is sensitive to noise in the wiring system and either latches up or can even create a short that fries the PCM. Interesting enough, yesterday driving back home, I thought the vehicle was misfiring. Now, EGR does effect combustion stability, so it can be interesting to take a look at the vehicle behavior.

Would you like to give me a VDR? I could try to retrofit the I3000 from the Explorer, but I could capture the problem a lot faster with your system. I would like first to take a baseline, then erase the code, then drive around to set the DTC and then set the MIL. Or please suggest other procedures. I have a good idea of when the EGR monitor runs from the previous work done on the rolls. Pls let me know.

Margherita

Margherita Zanini

Advanced Diagnostics
Powertrain Controls R&D Dept
SRL - MD2036 - Rm 3011-Y
Phone: 313-337-1097 Fax: 313-248-5167

From: Plante, Paul (P.G.)
Sent: Wednesday, March 20, 2002 3:04 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlco TM dPFE Sensor UPAD Root Cause Investigation

I have other commitments that morning, thanks for the invite. I suspect I am up on most of this already. Hopefully you can give this to Kavlco and outside experts that will be added shortly to help us.

Note, the John Koszewnik review is also Friday 1:00-2:00 PM in JK CR next to his office. Please attend, this is an important pre review to 14D Monday at 5:00 PM which you should also attend. OK?

Thanks again for your continuing efforts and expertise on gaining resolution to the DPFE. You are the single most important figure in the Root Cause analysis!

From: Nuno, Elena (E.S.) on behalf of Helms, Jeffrey (J.H.)
Sent: Wednesday, March 20, 2002 3:01 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

Jeff has another meeting during this time, therefore he will be unable to attend.

From: Bauer, David (D.R.)
Sent: Wednesday, March 20, 2002 2:58 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

Mark,
I won't be able to attend as I will be out of town.
I will catch up to you on Monday to see if there is anyway I can help.
Dave

From: Plants, Paul (P.G.)
Sent: Wednesday, March 20, 2002 3:04 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

I have other commitments that morning, thanks for the invite. I suspect I am up on most of this already. Hopefully you can give this to Kavlico and outside experts that will be added shortly to help us.

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Sent: Wednesday, March 20, 2002 3:01 PM
To: Frelund, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

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From: Bauer, David (D.R.)
Sent: Wednesday, March 20, 2002 2:58 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

Mark,

I won't be able to attend as I will be out of town.

I will catch up to you on Monday to see if there is anyway I can help.

Dave

ER02-027-G 22718

From: Akins, Mary (M.)
Sent: Thursday, March 21, 2002 3:55 PM
To: Frøeland, Mark (M.)
Subject: Tentative: Kevico TM dPFE Sensor UPAD Root Cause Investigation

Mark, I will try to make the meeting. I would like to get a feel for the direction this group will take.

Mary Akins

From: Gonzalez, Lebyz (L.)
Sent: Thursday, March 21, 2002 10:56 AM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: Holubka, Joe (J.W.)
Sent: Thursday, March 21, 2002 9:14 AM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

ERG2-827-G 22721

From: Potter, Timothy (T.J.)
Sent: Thursday, March 21, 2002 8:53 AM
To: Freeland, Mark (M.)
Subject: Accepted: Kevlco TM dPFE Sensor UPAD Root Cause Investigation

From: Zanini-Fisher, Margherita (M.)
Sent: Wednesday, March 20, 2002 10:48 PM
To: Freedland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

Mark,

I would like to attend but I may have to be at POEE part of the morning.

Is Ed acting a consultant for PCSE? I thought there was an 8D team in place for this problem, but I only see Freeman on the list. Are you going to address only the IC part of the problem?

From: Dankon, William (W.T.)
Sent: Wednesday, March 20, 2002 3:51 PM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: Visser, Jaco (J.H.)
Sent: Wednesday, March 20, 2002 3:23 PM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

Mark,

I have another meeting from 9:00-10:00, but I'll try to come at 9:00 (otherwise at 10:00).

From: Simko, Steven (S.J.)
Sent: Wednesday, March 20, 2002 3:18 PM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: King, Sandra (S.M.) on behalf of O'Neill, Jim (J.D.)
Sent: Wednesday, March 20, 2002 3:15 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

J. O'Neill will be off site and will be unable to attend this meeting.

From: Carter, Roscoe (R.O.)
Sent: Wednesday, March 20, 2002 3:14 PM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: Stephan, Craig (C.H.)
Sent: Wednesday, March 20, 2002 3:14 PM
To: Freeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: Plants, Paul (P.G.)
Sent: Wednesday, March 20, 2002 3:04 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

I have other commitments that morning, thanks for the invite. I suspect I am up on most of this already. Hopefully you can give this to Kavlico and outside experts that will be added shortly to help us.

Note, the John Koszewnik review is also Friday 1:00-2:00 PM in JK CR next to his office. Please attend, this is an important pre review to 14D Monday at 5:00 PM which you should also attend. OK?

Thanks again for your continuing efforts and expertise on gaining resolution to the DPFE. You are the single most important figure in the Root Cause analysis!

From: Nuno, Elena (E.S.) on behalf of Helms, Jeffrey (J.H.)
Sent: Wednesday, March 20, 2002 3:01 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavico TM dPFE Sensor UPAD Root Cause Investigation

Jeff has another meeting during this time, therefore he will be unable to attend.

EP02-027-G 22731

From: Harris, Stephen (S.J.)
Sent: Wednesday, March 20, 2002 3:01 PM
To: Freeland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: Bauer, David (D.R.)
Sent: Wednesday, March 20, 2002 2:58 PM
To: Frestland, Mark (M.)
Subject: Declined: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

Mark,
I won't be able to attend as I will be out of town.
I will catch up to you on Monday to see if there is anyway I can help.
Dave

From: Uy, Dairene (D.)
Sent: Wednesday, March 20, 2002 2:57 PM
To: Freeland, Mark (M.)
Subject: Accepted: Kevlco TM dPFE Sensor UPAD Root Cause Investigation

From: Drews, Andy (A.R.)
Sent: Wednesday, March 20, 2002 2:57 PM
To: Fraeland, Mark (M.)
Subject: Accepted: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

From: Hass, Kenneth (K.C.)
Sent: Wednesday, March 20, 2002 2:58 PM
To: Freeland, Mark (M.)
Subject: Out of Office AutoReply: Kavlico TM dPFE Sensor UPAD Root Cause Investigation

I will be out of the office until Friday, March 22, 2002. I will be checking email occasionally, but if you need an immediate response to any matter of concern to the Ford Research Laboratory's Physical & Environmental Sciences Dept., please contact my administrative assistant, Mary Johnson (313/322-7007, mjohns64@ford.com).

From: Uy, Dairana (D.)
Sent: Monday, March 11, 2002 6:01 PM
To: Freeland, Mark (M.)
Subject: Accepted: Meeting with Kavlico to review SRL work on UPAD

From: Maurer, Andrea (A.M.)
Sent: Wednesday, April 10, 2002 2:27 PM
To: Freeland, Mark (M.)
Subject: RE: Proposed data to be gathered on all parts sent to outside labs

Mark,

I think this was sent to me in error.

Andrea Maurer
Safety Engineer
Ford Livonia Transmission
Phone: 734/523-4037
Fax: 734/523-5986
amaurer@ford.com

—Original Message—

From: Freeland, Mark (M.)
Sent: Wednesday, April 10, 2002 1:46 PM
To: Maurer, Andrea (A.M.); Plante, Paul (P.G.); Gates, Freeman (F.C.); Verner, Carol (C.J.); Hargas, Jon (.)
Cc: Potter, Timothy (T.J.)
Subject: Proposed data to be gathered on all parts sent to outside labs

Please see the attached document for my initial proposal of the minimum data which should be collected for each part sent to an outside lab before any tear down analysis is conducted.

If you have any additional suggestions then please let me know and I will add this to the document.

Thanks

<< File: Outside Lab Initial Characterization.doc >>

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Akins, Mary (M.)
Sent: Tuesday, March 05, 2002 3:45 PM
To: Chang, Doug (D.K.); Losh, Rick (R.D.)
Cc: Eller, Michael (M.R.); Kloeb, James Todd (J.T.); Everett, Warren (W.L.); Losh, Rick (R.D.); Intravala, Joseph (J.S.); Bush, Mark (M.P.); Maurer, James (J.B.); Riendeau, Gerard (G.D.)
Subject: RE: DPFE Failure

Doug,
I received the second St. Thomas sensor today. I am shipping it out tonight to Kavlico for delivery tomorrow.

The first sensor is a saturated low failure. We are continuing our failure analysis to find the root cause. Jim Maurer is following the testing progress.

I will update you with information on the second return when I receive feedback, probably Friday of this week.

---Original Message---

From: Chang, Doug (D.K.)
Sent: Monday, March 04, 2002 8:41 AM
To: Losh, Rick (R.D.)
Cc: Eller, Michael (M.R.); Kloeb, James Todd (J.T.); Akins, Mary (M.); Everett, Warren (W.L.); Losh, Rick (R.D.); Intravala, Joseph (J.S.); Bush, Mark (M.P.)
Subject: RE: DPFE Failure

Good morning Rick,
Could you send me the BD for the failed DPFE with Romeo's containment action, please? I'm worry about more in second part I sent to Kavlico. Because, the part failed at EOL test, however, not in NGS, as shown in the note below. If the failure happening at the border line of the spec or intermittent, it will give us more problem. Thanks.

Regards,
Doug K. Chang
Resident Engineer, Powertrain Operations
PVT Office, P.O. Box 2005
St. Thomas, Ontario, Canada N5P 3W1
Tel. 519-637-5375, FordNet-782-5375, Fax, 519-637-5461

---Original Message---

From: Chang, Doug (D.K.)
Sent: Friday, March 01, 2002 5:10 PM
To: Akins, Mary (M.)
Cc: Eller, Michael (M.R.); Everett, Warren (W.L.); Losh, Rick (R.D.); Kloeb, James Todd (J.T.); Intravala, Joseph (J.S.); Bush, Mark (M.P.)
Subject: RE: DPFE Failure

Mary,
Have you received the second part yet? If you haven't received the part, please call Santana Logistics. The part was expedited direct to you via Santana truck# 2503.

Please send me the full report for the first part. Thanks.

Regards,
Doug K. Chang
Resident Engineer, Powertrain Operations
PVT Office, P.O. Box 2005
St. Thomas, Ontario, Canada N5P 3W1
Tel. 519-637-5375, FordNet-782-5375, Fax, 519-637-5461

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

From: Akins, Mary (M.)
Sent: Thursday, February 28, 2002 4:46 PM
To: Chang, Doug (D.K.)
Subject: RE: DPFE Failure

Doug,

The part is a failed sensor. I am hoping to get a full report today. If I get the report before I leave tonight I will forward it to you, otherwise it will be tomorrow morning.

Regards,
Mary Akins

Ford phone: (313) 248-1989
Ford fax: (313) 845-3169
makins@ford.com
makinwork@aol.com
Cell Phone/Messages: (810) 942-9606
Kavlico phone: (248) 263-8757

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

From: Chang, Doug (D.K.)
Sent: Thursday, February 28, 2002 4:34 PM
To: Akins, Mary (M.)
Subject: RE: DPFE Failure

Mary,
What's the result of the part I sent to California?

Regards,
Doug K. Chang
Resident Engineer, Powertrain Operations
PVT Office, P.O. Box 2005
St. Thomas, Ontario, Canada N5P 3W1
Tel. 519-637-5375, FordNet-782-5375, Fax.519-637-5461

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

From: Akins, Mary (M.)
Sent: Thursday, February 28, 2002 4:22 PM
To: Chang, Doug (D.K.); Kaput, Barb (B.J.)
Cc: Elser, Michael (M.R.); Losh, Rick (R.D.); Davis, Arnetta (A.J.); Helm, Burk (B.); Galante, Chris (C.R.)
Subject: RE: DPFE Failure
Importance: High

Doug,
Please overnight the sensor to my Southfield office. I will forward it to Kavlico.

Attn: Mary Akins
Kavlico Corporation
26525 American Dr.
Southfield, MI 48034
(248) 263-8753

Thanks.
Mary Akins

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

From: Chang, Doug (D.K.)
Sent: Thursday, February 28, 2002 8:47 AM
To: Kaput, Barb (B.J.)
Cc: Elser, Michael (M.R.); Akins, Mary (M.); Losh, Rick (R.D.); Davis, Arnetta (A.J.); Helm, Burk (B.)
Subject: RE: DPFE Failure

ERR2-827-G 22762

STAP has another DPFE failure last night. However, ABA test shows different from last failure. Details are as follow:

- ESN 31054741 failed EOL test last night with a same code we had last week, p5491.
- Replaced the DPFE passed the EOL test
- Installed defective DPFE on known good vehicle, and the vehicle failed EOL test with a same code.
- However, NGS did not show any failure code.
- Replaced the defective DPFE sensor with known good DPFE, and the vehicle passed the EOL test.

In OBDII, more emphasized on hardware failure or contamination for the code p1408 than sensor itself. However, failure following the defective DPFE sensor. Please help.

I don't know why, but expediting takes so long to cross the border. Please let me know how and where you want me to send this part. Thanks.

Regards,
Doug K. Chang
Resident Engineer, Powertrain Operations
PVT Office, P.O. Box 2005
St. Thomas, Ontario, Canada N5P 3W1
Tel. 519-637-5375, FordNet-782-5375, Fax 519-637-5461

---Original Message---

From: Akins, Mary (M.)
Sent: Wednesday, February 20, 2002 2:37 PM
To: Chang, Doug (D.K.)
Cc: Eler, Michael (M.R.)
Subject: EOL Failure From St. Thomas
Importance: High

Doug,
Please ship the EOL failure to this address:

Kavlico Corporation
14501 Los Angeles Ave.
Moorpark, CA 93021
Attn: Terry Tamashiro
(805) 825-2000

Regards,
Mary Akins

Ford phone: (313) 248-1989
Ford fax: (313) 845-3169
makins@ford.com
makinwork@aol.com
Cell Phone/Messages: (810) 942-9606
Kavlico phone: (248) 263-8757

From: Akolkar, Shrikant (S.V.)
Sent: Monday, October 14, 2002 1:36 PM
To: Duncan, Jack (J.L.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Verner, Carol (C.J.); Robinson, John (J.W.)
Subject: 4 Hour shut down

Jack,

As per our conversation today, I am confirming by email so that others involved would be aware of the change. Even after running over 600 cycles on more than 3 sensors, we haven't encountered any failure yet. Though we have hourly shut down, it appears that it's not adequate to cause condensation. The 24hours x 5 or 7day & the warm weather may have caused the sensor to run dry. I suggest 4 hour shut down every midnight shift with immediate effect. Thanks.

With Regards,

SHRI Akolkar
sakolkar@ford.com Ph: (313) 594-1908 Fax: (313) 390-1229
Ford Motor Co. POEE AQ077 P.O.Box 2053 MD#36
Dearborn MI 48124 U.S.A.

From: Akolkar, Shrikant (S.V.)
Sent: Thursday, October 03, 2002 10:27 AM
To: Freeland, Mark (M.)
Cc: Verner, Carol (C.J.); Maurer, James (J.B.); Gates, Freeman (F.C.); Bersie, Anita (A.); Robinson, John (J.W.)
Subject: RE: Failed part from Roush

Thanks Mark for digging into the database.

That makes one fact clear that we haven't seen any failure yet at Roush or MPG after running 100 to 200 cycles (~hours) in tests. But I feel we should continue up to 500 cycles on few sensors. I have some ideas to make test more severe. Jim, do you want me to set up meeting to review the test results so far & discuss the test severity issue?

—Original Message—

From: Freeland, Mark (M.)
Sent: Wednesday, October 02, 2002 1:39 PM
To: Akolkar, Shrikant (S.V.)
Cc: Verner, Carol (C.J.); Maurer, James (J.B.)
Subject: Failed part from Roush

Shri,

The part you showed me in the lab today which has the RML number 8798-011 inscribed on the case was a Lima Engine Plant Warranty Return which was logged into Kavlico's data base on 4/25/2001. It was working when it was tested at Kavlico then.

I guess it had an intermittent fault before you put it onto the test, so not surprisingly it has shown up as a failure.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Akolkar, Shrikant (S.V.)
Sent: Monday, September 23, 2002 1:06 PM
To: Bersie, Anita (A.)
Cc: Maurer, James (J.B.); Gatas, Freeman (F.C.); Fabien, Phil (P.A.)
Subject: RE: DPFE Data

Anita,

Your plots look good. They should help us to flag out sensor failure like on DPFE 1 when it started acting at 27 engine hours. I suggest one more plot with engine torque & fuel rate to monitor if the engine is functioning correctly during the test & flag out any problem if engine starts misbehaving by torque or fuel rate change.

Pl. keep on monitoring data every day & provide us plots when failure occurs or every 100 cycles & at the end of 500 cycles.

Good job.

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

From: Bersie, Anita (A.)
Sent: Thursday, September 19, 2002 10:53 AM
To: Akolkar, Shrikant (S.V.)
Subject: DPFE Data

Shri,

I left some data charts on your desk that I came up with from the data ROUSH is sending. This is current through the data posted yesterday. I have not yet gotten to the data added on today. I am still working out some issues with the format of data from Roush, but am able to pull most of it together right now.

As far as the engine backfiring goes, I would like to get to the bottom of the problem and figure out why we are backfiring. But I also don't want to hold up our testing. Phil Fabien has said he is not too concerned about the backfire if it is happening on such an infrequent basis, and we can get more parts for the engine if we run into a problem. I would prefer to continue to use the RCON so we can monitor agr_des and agr_act. I have asked Don to try another RCON first before completely eliminating the RCON from our set up. Hopefully we can resolve this soon.

Please let me know what you think of the data format. If I'm not at my desk today, I will most likely be at the Dyno lab, so just send me an e-mail. I will be out of the office tomorrow on vacation, but back on Monday. Thanks.

Anita Bersie

Ford Motor Company
2.5/3.0L Duratec Engine Development
phone: (313) 594-3993
e-mail: abersie@ford.com

From: Akolkar, Shrikant (S.V.)
Sent: Friday, August 30, 2002 11:52 AM
To: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: FW: Focus Test Status

FYI

—Original Message—

From: Duncan, Jack (J.L.)
Sent: Friday, August 30, 2002 10:02 AM
To: Akolkar, Shrikant (S.V.)
Subject: Focus Test Status

Hello Shri,

We have replaced the M1 sensor with M2, and are 14 cycles into that test. We are running this weekend, so by Tuesday we should be getting close to completion.

I have sent the 100 cycle scope data (both 105 and 65 mph) for the M1 sensor to Jim McCoy. Later today I will send you the Campbell data for the M2 testing. We did change the sampling rate to 1 sample/minute, so there will be considerably less data.

Jack Duncan		jduncan1@ford.com
MI Proving Ground		
74240 Fisher Rd		(586) 75-28563 (w)
Romeo, MI 48065		(586) 75-28683 (f)

Subject: FW: Final inspection & prep of 3.0L engine
Location: Roush-Don Thering

Start: Mon 8/26/2002 9:30 AM
End: Mon 8/26/2002 12:00 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Required Attendees: Akolkar, Shrikant (S.V.); Maurer, James (J.B.); Pandolfi, Pate (P.G.)

FYI

—Original Appointment—

From: Akolkar, Shrikant (S.V.)
Sent: Friday, August 23, 2002 10:45 AM
To: Akolkar, Shrikant (S.V.); McCoy, James (J.D.); Bersis, Anita (A.); Petty, Neal (N.E.); dither@roushind.com
Subject: Final inspection & prep of 3.0L engine
When: Monday, August 26, 2002 9:30 AM-12:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Roush-Don Thering

Purpose:

- Inspect prepped engine before development & check break-in data
- RCON connection
- Connect all 4 sensors to voltage & current measurements
- Pressure test-electrical test thermocoupled & other 3 sensors
- Run initial cycle
- Determine data collection & transfer to Ford

I will get the car. We will start from my desk at 9:30am. Anita/Neal, pl. let me know if any of you would like to come for data & line up decisions. I need to take Jim McCoy there for electrical decisions.

From: Duncan, Jack (J.L.)
Sent: Wednesday, October 30, 2002 10:12 AM
To: Freeland, Mark (M.); McCoy, James (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc: Verner, Carol (C.J.)
Subject: RE: MPG Focus Testing

VIN 1FAPP36381W115569
Installation date 17-Sept-2002
Installation odometer 33417
Removal date 23-Oct-2002
Removal odometer 45682

Jack Duncan		jlduncan1@ford.com
MI Proving Ground		
74240 Fisher Rd		(586) 75-28563 (w)
Romeo, MI 48065		(586) 75-28683 (f)

—Original Message—

From: Freeland, Mark (M.)
Sent: Wednesday, October 30, 2002 9:59 AM
To: McCoy, James (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc: Duncan, Jack (J.L.); Verner, Carol (C.J.)
Subject: RE: MPG Focus Testing

Carol Verner and I examined the M6 sensor which failed on this vehicle yesterday.

The observed symptoms were:

The output was saturated low.

The power to ground impedance was unstable.

The ref. die has a dark discoloration of the gold on the Vro, the Hpos and the Hneg bond pads.

The H1 die had a large bubble (about 80% of the die area) at the interface between the surface of the die and the potting gel, this is consistent with the die having passed a large current for a short period of time.

I understand that the oscilloscope never triggered, but I have to report that I believe that this part experienced a short duration, high current event.

The unstable Iref data from the data logger may be a significant clue and should be looked at again.

Jack,

Can you give me the VIN number, the ODO and date at which the M6 part was installed and the ODO and date at the time it was removed, for my records.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053

EA82-827-G 24237

MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mtfreelal@ford.com
Tel.: (313) 594-7645

—Original Message—

From: McCoy, James (J.D.)
Sent: Thursday, October 24, 2002 1:53 PM
To: Maurer, James (J.B.); Freeland, Mark (M.); Gates, Freeman (F.C.)
Cc: Duncan, Jack (J.L.)
Subject: MPG Focus Testing

<< File: m6cyc4551.xls >>

Data sent by Jack Duncan on the Focus from MPG.

Chart shows VREF, DPFE out, and VREF current with reference to the DPFE failure.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoysl@ford.com

From: FGates3319@aol.com
Sent: Tuesday, April 23, 2002 9:05 PM
To: joneall@ford.com; jjohnson@ford.com
Cc: pwhitejo@ford.com; fgates@ford.com; jmaurer@ford.com
Subject: Fwd: PV Thermal Shock Failure



PV Thermal Shock
Failure

It appears that the sensors did see some cycles at 150C

From: FGates3319@aol.com
Sent: Monday, April 15, 2002 10:23 PM
To: joneall@ford.com; jjohnson@ford.com
Cc: jmaurer@ford.com; fgatees@ford.com
Subject: Fwd: Dalsa PV Qualification Update



Dalsa PV
Qualification Update
FYI...

From: Ayers, Don [DAyers@kavlico.com]
Sent: Monday, April 15, 2002 7:57 PM
To: Freeman Gates (E-mail 2)
Cc: White-Johnson, Patrice (P.); Ray, Randy; Tameshiro, Terry; Clifford, Mark; Park, Kyong
Subject: Dalsa PV Qualification Update

Freeman -

Here's the information you requested:

1. The 27 parts that were piggybacking on the ESM thermal shock test have completed 132 cycles. Testing at room temperature showed no failures. They will be tested at cold and hot overnight. Data should be available sometime tomorrow morning.
2. Failure analysis of Thermal Shock Failure, #84
 - a. Analysis of components on the hybrid showed no anomalies.
 - b. Comments were made regarding the solder fillets. We are looking into that claim with engineering and production.
 - c. Higher resistance was picked up measuring along a trace on the hybrid which may indicate a thick film problem. This is also being looked into.
3. All ESM parts passed the thermal shock test.

Thanks,
Don

From: Freeland, Mark (M.)
Sent: Friday, November 08, 2002 9:27 AM
To: O'Neill, Jim (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc: Kotwicki, Allan (A.J.); Alles, Sheren (S.A.)
Subject: High TCR Resistors

Al Kotwicki has identified a potential source for high TCR resistors.
Can you please pass this information on to Dr. Kyong Park:

K-tronics, Inc.
P.O. Box 4398
Bisbee,
AZ 85603

Tel. (520) 432-5388

Sales Representative:
James J. Majewski
Tel (317) 894-1414 and (248) 305-7123
email: jjmajewski@electronicreps.com
Internet: <http://www.electronicreps.com>

K-tronics advertise:

SM Series wire wound resistors Type SMH, power rating 0.5 W, Std. resistances 0.1 - 400 ohms, Tolerance 0.1% to 5%.

Any of our standard resistors can be specified with a special TCR, They have a selection of TCRs to choose from, one of interest is -55 deg. C to 25 deg. C +3700 +/-300, 25 deg. C to 125 deg. C +3900 +/-300.

Package size is 0.21 long, 0.13 wide and 0.11 high.

Thanks Al

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Wednesday, October 30, 2002 9:59 AM
To: McCoy, James (J.D.); Maurer, James (J.B.); Gates, Freeman (F.C.)
Cc: Duncan, Jack (J.L.); Verner, Carol (C.J.)
Subject: RE: MPG Focus Testing

Carol Verner and I examined the M6 sensor which failed on this vehicle yesterday.

The observed symptoms were:

The output was saturated low.

The power to ground impedance was unstable.

The ref. die has a dark discoloration of the gold on the Vro, the Hpos and the Hneg bond pads.

The HI die had a large bubble (about 90% of the die area) at the interface between the surface of the die and the potting gel, this is consistent with the die having passed a large current for a short period of time.

I understand that the oscilloscope never triggered, but I have to report that I believe that this part experienced a short duration, high current event.

The unstable Iref data from the data logger may be a significant clue and should be looked at again.

Jack,

Can you give me the VIN number, the ODO and date at which the M6 part was installed and the ODO and data at the time it was removed, for my records.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: McCoy, James (J.D.)
Sent: Thursday, October 24, 2002 1:53 PM
To: Maurer, James (J.B.); Freeland, Mark (M.); Gates, Freeman (F.C.)
Cc: Duncan, Jack (J.L.)
Subject: MPG Focus Testing

<< File: m6cyc4551.xls >>

Data sent by Jack Duncan on the Focus from MPG.

Chart shows VREF, DPFE cut, and VREF current with reference to the DPFE failure.

EA02-027-G 24312

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering

Hardware Control Interface Group

V-Engine Engineering

POEB - MD#69 - Rm. D142 - Cube DF186

Phone (313) 33-79690 / Fax (313) 39-04084

E-Mail: jmccoy1@ford.com

EA82-827-G 24313

From: Freeland, Mark (M.)
Sent: Tuesday, October 22, 2002 10:28 AM
To: Maurer, James (J.B.); Alles, Sheran (S.A.); McCoy, James (J.D.)
Cc: Kotwicki, Allan (A.J.); Gates, Freeman (F.C.); O'Neil, Jim (J.D.); Elwell, Fred (F.); Power, James (J.H.); Boran, Lisa (L.T.)
Subject: Effect of changing the spark plugs on the Mountaineer

Jim,

As you know Fred Elwell and Jim Power replaced the spark plugs on my lease Mountaineer yesterday. They confirmed that the "bad" plug still had a resistance of less than 200 ohms, (I think the number they measured was 194 ohms for #4 plug).

The result on my drive evaluation last night was as follows:

The maximum Peak to Peak amplitude of the HF noise on Vref (as measured by the instrumentation set up) during accelerations reduced from 41 volts to 17 volts. This was a tremendous reduction.

I can no longer find the micro latch events which I have been recording with my instrument pick ups located between the filter and the unprotected dPFE (i.e. C2, C5 & Z1 removed from a 2001 MY sensor).

We should discuss the possibility of replacing spark plugs as part of the fix package. Perhaps there is some simple tool which could be used to identify if a vehicle has noisy plugs without removing the plugs? Does anyone know of such a tool, perhaps an RF "sniffer"?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

Structured Inventive Thinking at work

From: Freeland, Mark (M.)
Sent: Wednesday, June 19, 2002 3:56 PM
To: Maurer, James (J.B.)
Cc: Awad, Mahmoud (M.I.); Jenda, Jon (J.M.); Plante, Paul (P.G.); Kyong Park (E-mail); Akine, Mary (M.); Dionisi, Anthony (A.J.); Roasl, Roberto (R.A.); Lovelaca, Marla (M.E.); Williamson, Richard (E.)
Subject: FQE Field returns

I have just finished testing and inspecting the three field returns from Tony Dionisi. The results are as follows:

VIN 3FAFP31381R119440, Stalled, towed in

SRL730, 9/8/2000 part. Confirmed high current failure, still drawing a very high current. (700 mA @ 1.29 Volts). This part will still cause a no crank/no start. I believe this part to have been latched and cooked at high temperature for some considerable time based on the visual symptoms observed and on the current electrical characteristics. Probably caused by a transient on Vref relative to Signal Return.

VIN 1FAFP55U61A28848, Check engine light, P0401

SRL731, 3/21/2002 part. TNI at room temperature, no visual clues. Recommend returning to Kavlico for three temperature parametric testing.

VIN 1FMZU73E82ZC24188, Customer said MIL, dealer said no MIL no codes but dPFE out of spec during road test.

SRL731, 2/2/2002 part. TNI at room temperature, no visual clues. Recommend returning to Kavlico for three temperature parametric testing.

Let's discuss next steps at 14 D meeting tomorrow.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, April 12, 2002 12:18 PM
To: Chen, Smith S N (S.)
Cc: Maurer, James (J.B.)
Subject: RE: DPFE EGR Part Concern

Smith,

Thanks for the clarification. Please send the PCM when you can. Jim Maurer is working on the replacement PCM which we will send to you.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7845

—Original Message—

From: schen16 [mailto:schen16@ford.com]
Sent: Thursday, April 11, 2002 8:28 PM
To: Freeland, Mark (M.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Plante, Paul (P.G.)
Subject: Re: DPFE EGR Part Concern

Mark:

Thank you for your information, the defeat EGR part was shipped to you this time, but not included the PCM, as I mentioned we still not get this car back so far, so we will ship PCM to you as it is available, sorry to confuse you.

EP82-827-G 25348

Regards,

— Original Message —

From: "Freeland, Mark (M.)" <mfreela1@ford.com>

To: "Chen, Smith S N (S.)" <schen16@ford.com>

Cc: "Maurer, James (J.B.)" <jmaurer@ford.com>; "Gates, Freeman (F.C.)" <fgates@ford.com>; "McCoy, James (J.D.)" <jmccoy1@ford.com>; "Plante, Paul (P.G.)" <pplante@ford.com>

Sent: Thursday, April 11, 2002 9:30 PM

Subject: RE: DPFE EGR Part Concern

> Smith,

> Thanks for the info and shipping the PCM. I have asked Jim Maurer to
> look into getting you a replacement PCM.

> I do not know if you are aware of the improved dPFE sensor which went
> into production on January 7th, 2002. If not here are the details.

>

> There is a known failure mode that we have been referring to a "V
> Transient". With this failure the sensor goes into a high current draw
> situation, where the current draw can be anywhere in the range 200 -
> 1,700 mA. It is believed to be a SCR latch caused by some unknown
> transient voltage spike hitting the sensor output and/or the sensor Vref
> line. The improved transient voltage protection to the dPFE sensor
> went into production at Kavlico on January 7th 2002. It incorporates an
> added 10 ohm current limiting resistor on the 5 V input (Vref line) and
> two 30 ohm series resistors and a diode to ground on the sensor output
> line. This improved sensor will prevent the sensor from ever drawing a
> current greater than 500 mA for any failure mode. For the Escape (and I
> presume also for the Tribute) it takes a current of 1,500 mA to pull the
> PCM 5 V low enough to stall the engine.

>

> So a good fix to prevent dPFE induced stalls and/or no starts is to
> replace the dPFE sensor with one which has a manufacturing date code of
> greater than or equal to 2A07B. Please pass this information on to
> those who need to know.

>

ERG2-027-0 25341

> We are still working to identify the source of the transient voltage
> spikes which cause the sensor to go into the SCR latch. This is why we
> are so interested in examining the PCM from your problem vehicle.

>

> Many thanks for your help in obtaining the PCM from the problem
> vehicle.

>

> Regards

>

> Mark Freeland

>

>> 6-Sigma Black Belt
>> Engine Research Department
>> Ford Research Laboratory
>> P.O. Box 2053
>> MD 2829 - SRL - Room 1517
>> Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7845

>

>

> —Original Message—

> From: schen16 [mailto:schen16@ford.com]
> Sent: Thursday, April 11, 2002 3:10 AM
> To: Freeland, Mark (M.); Chang C.K
> Subject: Fw: DPFE EGR Part Concern

>

>

> Mark:

> Please be advised that the part was ready and will be sent through "DHL"
> shipment, the shipping no is "2642010453" .

>

> Regards,

> — Original Message —

> From: "schen16" <schen16@ford.com>
> To: "Freeland, Mark (M.)" <mfreela1@ford.com>
> Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao, Jack (J.)"

FA02-827-G 25342

> <jjao@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>; "Maurer, James
> (J.B.)" <jmaurer@ford.com>
> Sent: Thursday, April 11, 2002 3:03 PM
> Subject: Re: DPFE EGR Part Concern

>
>

>> Mark:

>> Attached file please find the information that responded from our ACSG
>> people, this vehicle was "Tribute 2.0L" imported car, however, I can't
>> get
>> this car so far but the PCM parts No. shall be "YL8Z-12A650-TG".
>> The Lot # of this EGR part is "1F19B", Mr. C.K.Chang will mail this
>> part

>> to

>> you ASAP .

>>

>> Regards,

>> — Original Message —

>> From: "Freeland, Mark (M.)" <mfreela1@ford.com>

>> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Kwon, Soon (S.K.)"

>> <skwon@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>;

>> "Freeland,

>> Mark

>> (M.)" <mfreela1@ford.com>

>> Cc: "Huang, M (M.T.)" <mhuang3@ford.com>; "Freeland, Mark (M.)"

>> <mfreela1@ford.com>; "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao,

>> Jack

>> (J.)" <jjao@ford.com>

>> Sent: Tuesday, April 09, 2002 9:57 PM

>> Subject: RE: DPFE EGR Part Concern

>>

>>

>>> Smith,

>>>

>>> This is great news. Can you also tell me if the original DPFE

>>> sensor is

>>> still with the vehicle, if so it would be very helpful to get that

> back

>>> also. We can provide a replacement for the dPFE sensor.

>>> I will need additional information on the vehicle to obtain a

>>> replacement PCM.

>>> Can you please provide me with the VIN number, Build date, Specific

>>> Vehicle description (i.e. 2.0L Zetec Focus, 2001 MY etc.) and if

>>> possible also the part number and any other available information

> from

>>> the label on the current PCM.

>>>

>>> Also, can you please provide me with the complete service history or

> the

>>> vehicle.

>>>

>>> My shipping address is:

>>> SRL Room 1517/MD 2629

>>> 2101 Village Road

>>> Dearborn, MI 48121-2053

>>>

>>> Jim,

>>>

>>> Do you have any idea if we can obtain a replacement PCM for an

> overseas

>>> application locally? Any thoughts, please let me know.

>>>

>>>

>>> Regards

>>>

>>> Mark Freeland

>>>

>>>> 6-Sigma Black Belt

>>>> Engine Research Department

>>>> Ford Research Laboratory

>>>> P.O. Box 2053

>>>> MD 2629 - SRL - Room 1517

>>>> Dearborn, MI 48121-2053 USA

>>>> email: mfreela1@ford.com

EP82-827-G 25344

>>> Tel.: (313) 594-7645

>>>

>>>

>>> —Original Message—

>>> From: schen16 [mailto:schen16@ford.com]

>>> Sent: Monday, April 08, 2002 10:51 PM

>>> To: Kwon, Soon (S.K.); Maurer, James (J.B.); Freeland, Mark (M.)

>>> Cc: Huang M. T.; Freeland, Mark (M.); Gates, Freeman (F.C.); Jao,

> Jack

>>> (J.)

>>> Subject: Re: DPFE EGR Part Concern

>>>

>>>

>>> Mark:

>>> It is possible to get the PCM from the concern vehicle, due to our

>>> company

>>> decided to buy back this vehicle to solve the customer's big

> concern,

>>> however, we will send PCM to you if you can provide a new one for

>>> replacement. Please also show your detailed address, I can mail to

> you

>>> when

>>> it is available.

>>>

>>> Regards,

>>>

>>> — Original Message —

>>> From: "Freeland, Mark (M.)" <mfreela1@ford.com>

>>> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Maurer, James (J.B.)

> "

>>> <jmaurer@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>

>>> Cc: "Jao, Jack (J.)" <jao@ford.com>; "Gates, Freeman (F.C.)"

>>> <fgates@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>

>>> Sent: Monday, April 08, 2002 9:42 PM

>>> Subject: RE: DPFE EGR Part Concern

>>>

>>>

ER02-027-G 25345

>>>> Smith,
>>>> Would it be possible to obtain the PCM from the subject vehicle as
>>> there
>>>> Is a possibility that a defect in the PCM was the trigger which
> caused
>>>> the dPFE sensor to go into the high current mode and become
> shorted?

>>>>

>>>> Regards

>>>>

>>>> Mark Freeland

>>>>

>>>>> 6-Sigma Black Belt

>>>>> Engine Research Department

>>>>> Ford Research Laboratory

>>>>> P.O. Box 2053

>>>>> MD 2629 - SRL - Room 1517

>>>>> Dearborn, MI 48121-2053 USA

>>>> email: mfreela1@ford.com

>>>> Tel.: (313) 594-7645

>>>>

>>>>

>>>> -----Original Message-----

>>>> From: schen16 [mailto:schen16@ford.com]

>>>> Sent: Wednesday, April 03, 2002 12:11 AM

>>>> To: Maurer, James (J.B.); Kwon, Soon (S.K.)

>>>> Cc: Jack Jao; Gates, Freeman (F.C.); Freeland, Mark (M.)

>>>> Subject: Re: DPFE EGR Part Concern

>>>>

>>>>

>>>> Jim:

>>>> Please find the attached file for the measuring data of the defeat

>>> DPFE

>>>> EGR

>>>> part, this case was happened when the customer was driving in city

>>> with

>>>> 40kph cruising, the engine stalled suddenly without any warning

>>> signals,
>>>> after that the ODO indicator showed "-----" and can not restart
>>>> engine,
>>>> this vehicle was buy in Sept, 2001, the accumulated mllage was
> 7034KM
>>>> only.
>>>> It causes the customer very big concern and our S& M people do
> their
>>>> best to
>>>> try to explain and calm down customer's emotion.
>>>> As your mail, do you have any experience for engine stall? and the
>>>> improved
>>>> parts can prevent this engine stall? what actions shall be taken?
>>>> Any queries of this case you want to understand please let me
> know.
>>>>
>>>> Regards,
>>>> --- Original Message ---
>>>> From: "Maurer, James (J.B.)" <jmaurer@ford.com>
>>>> To: "Chen, Smith S N (S.)" <schen16@ford.com>
>>>> Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Freeland, Mark
> (M.)"
>>>> <mfreela1@ford.com>
>>>> Sent: Tuesday, April 02, 2002 11:27 PM
>>>> Subject: FW: DPFE EGR Part Concern
>>>>
>>>>
>>>>> Mr. Chen,
>>>>>
>>>>> Your attached files did not come through to me, so I don't know
> the
>>>>> specifics for your vehicle.
>>>>>
>>>>> One of the failure modes of the sensor is that it may short and
> draw
>>>> a
>>>>> high current from the PCM (engine control module). When this

> > > happens,
> > > > the voltage that is supplied to the microprocessor inside the
> PCM is
> > > > not
> > > > sufficient to keep the PCM operating. When the microprocessor
> is
> > > not
> > > > running, there are no signals to the fuel injectors, ignition
> coils,
> > > > and
> > > > other components required to keep the engine running.
> > > >
> > > > The circuit inside the sensor was changed to eliminate this
> issue.
> > > A
> > > > resistor was added to limit the amount of current the sensor
> would
> > > > draw
> > > > when it shorted, and another resistor and diode were added to
> > > > eliminate
> > > > electrical noise issues that could potentially cause the short
> to
> > > > occur.
> > > > The new part was released on concern C11286321. Production
> began
> > > > January 7, 2002.
> > > >
> > > > I am interested in knowing the details about why a customer
> would
> > > sue
> > > > over this issue. Does the customer want you to buy back the
> vehicle
> > > > if
> > > > it cannot be fixed? The latest level part should take care of
> the
> > > > issue.
> > > >

>>>>

>>>> Regards,

>>>> Jim Maurer

>>>> James B. Maurer

>>>> V-Engine 6-Sigma Team Leader

>>>> Fuel Metering Dept. V Engine Engineering

>>>> Phone (313) 390-3672, Fax (313) 390-4084

>>>> Text Page: (313) 795-5219

>>>> Email: jmaurer@Ford.com

>>>>

>>>> -----Original Message-----

>>>> From: Owens, Karen (K.E.)

>>>> Sent: Tuesday, April 02, 2002 9:58 AM

>>>> To: Chen, Smith S N (S.)

>>>> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Freeland, Mark

> (M.)

>>>> Subject: RE: DPFE EGR Part Concern

>>>>

>>>>

>>>> Mr., Chen:

>>>> I am no longer working on this matter, James Maurer (JMAURER) is

> the

>>>> new

>>>> team leader. I am forwarding your note to him.

>>>>

>>>> Jim:

>>>> Please respond to Mr. Chen. Thank you.

>>>>

>>>>

>>>> Change is Good. Proactivity is Better!

>>>> Karen E. Owens

>>>> Supervisor

>>>> Modular V8/V10 Engine Systems

>>>> (off) 313.845.5770

>>>> (fax) 313.390.1229

>>>>

>>>> -----Original Message-----

EA82-827-G 25348

>>>> From: schen16 [mailto:schen16@ford.com]
>>>> Sent: Wednesday, March 27, 2002 3:25 AM
>>>> To: Owens, Karen (K.E.)
>>>> Cc: Jack Jao
>>>> Subject: DPFE EGR Part Concern
>>>>
>>>>
>>>> Miss Owens:
>>>> How are you, we recently have a special case that DPFE EGR part
>>>> malfunction and causing engine stalled w/o any warning during
>>> driving,
>>>> this customer is proposed to sue to company if we can not
> provide a
>>>> reasonable reason. Attached file please find the failure mode 2
>>> which
>>>> is
>>>> causing engine stall immediately during drive, the failure mode
> 1
>>>> which
>>>> is other defeat parts data, and we also show the new parts and
> dura.
>>>> test part. Please give us a special effort to explain this
> concern.
>>>> Your quick response will be requested and appreciated.
>>

From: Freeland, Mark (M.)
Sent: Thursday, April 11, 2002 9:31 AM
To: Chen, Smith S N (S.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Plante, Paul (P.G.)
Subject: RE: DPFE EGR Part Concern

Smith,

Thanks for the info and shipping the PCM. A have asked Jim Maurer to look into getting you a replacement PCM.

I do not know if you are aware of the improved dPFE sensor which went into production on January 7th, 2002. If not here are the details.

There is a known failure mode that we have been referring to a "V Transient". With this failure the sensor goes into a high current draw situation, where the current draw can be anywhere in the range 200 - 1,700 mA. It is believed to be a SCR latch caused by some unknown transient voltage spike hitting the sensor output and/or the sensor Vref line. The improved transient voltage protection to the dPFE sensor went into production at Kavlico on January 7th 2002. It incorporates an added 10 ohm current limiting resistor on the 5 V input (Vref line) and two 30 ohm series resistors and a diode to ground on the sensor output line. This improved sensor will prevent the sensor from ever drawing a current greater than 500 mA for any failure mode. For the Escape (and I presume also for the Tribute) it takes a current of 1,500 mA to pull the PCM 5 V low enough to stall the engine.

So a good fix to prevent dPFE induced stalls and/or no starts is to replace the dPFE sensor with one which has a manufacturing date cod of greater than or equal to 2A07B. Please pass this information on to those who need to know.

We are still working to identify the source of the transient voltage spikes which cause the sensor to go into the SCR latch. This is why we are so interested in examining the PCM from you're problem vehicle.

Many thanks for you're help in obtaining the PCM from the problem vehicle.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory

EA02-027-6 25354

> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

—Original Message—

From: schen16 [mailto:schen16@ford.com]
Sent: Thursday, April 11, 2002 3:10 AM
To: Freeland, Mark (M.); Chang C.K
Subject: Fw: DPFE EGR Part Concern

Mark:

Please be advised that the part was ready and will sent through "DHL" shipment, the shipping no is "2642010453" .

Regards,

— Original Message —

From: "schen16" <schen16@ford.com>
To: "Freeland, Mark (M.)" <mfreela1@ford.com>
Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao, Jack (J.)" <jjao@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>
Sent: Thursday, April 11, 2002 3:03 PM
Subject: Re: DPFE EGR Part Concern

> Mark:

> Attached file please find the information that responded from our ACSG
> people, this vehicle was "Tribute 2.0L" imported car, however, I can't get
> this car so far but the PCM parts No. shall be "YL8Z-12A650-TG".
> The Lot # of this EGR part is "1F19B", Mr. C.K.Chang will mail this part
to
> you ASAP .
>

> Regards,
> — Original Message —
> From: "Freeland, Mark (M.)" <mfreela1@ford.com>
> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Kwon, Soon (S.K.)"
> <skwon@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>; "Freeland,
Mark
> (M.)" <mfreela1@ford.com>
> Cc: "Huang, M (M.T.)" <mhuang3@ford.com>; "Freeland, Mark (M.)"
> <mfreela1@ford.com>; "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao, Jack
> (J.)" <jjao@ford.com>
> Sent: Tuesday, April 09, 2002 9:57 PM
> Subject: RE: DPFE EGR Part Concern
>
>
>> Smith,
>>
>> This is great news. Can you also tell me if the original dPFE sensor is
>> still with the vehicle, if so it would be very helpful to get that back
>> also. We can provide a replacement for the dPFE sensor.
>> I will need additional information on the vehicle to obtain a
>> replacement PCM.
>> Can you please provide me with the VIN number, Build date, Specific
>> Vehicle description (i.e. 2.0L Zetec Focus, 2001 MY etc.) and if
>> possible also the part number and any other available information from
>> the label on the current PCM.
>>
>> Also, can you please provide me with the complete service history on the
>> vehicle.
>>
>> My shipping address is:
>> SRL Room 1517/MD 2629
>> 2101 Village Road
>> Dearborn, MI 48121-2053
>>
>> Jim,
>>
>> Do you have any idea if we can obtain a replacement PCM for an overseas

>> application locally? Any thoughts, please let me know.

>>

>>

>> Regards

>>

>> Mark Freeland

>>

>>> 6-Sigma Black Belt

>>> Engine Research Department

>>> Ford Research Laboratory

>>> P.O. Box 2053

>>> MD 2829 - SRL - Room 1517

>>> Dearborn, MI 48121-2053 USA

>> email: mfreela1@ford.com

>> Tel.: (313) 594-7645

>>

>>

>> ~~Original Message~~

>> From: schen16 [mailto:schen16@ford.com]

>> Sent: Monday, April 08, 2002 10:51 PM

>> To: Kwon, Soon (S.K.); Maurer, James (J.B.); Freeland, Mark (M.)

>> Cc: Huang M. T.; Freeland, Mark (M.); Gates, Freeman (F.C.); Jao, Jack

>> (J.)

>> Subject: Re: DPFE EGR Part Concern

>>

>>

>> Mark:

>> It is possible to get the PCM from the concern vehicle, due to our

>> company

>> decided to buy back this vehicle to solve the customer's big concern,

>> however, we will send PCM to you if you can provide a new one for

>> replacement. Please also show your detailed address, I can mail to you

>> when

>> it is available.

>>

>> Regards,

>>

>> — Original Message —

>> From: "Freeland, Mark (M.)" <mfreela1@ford.com>
>> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Maurer, James (J.B.)"
>> <jmaurer@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>
>> Cc: "Jao, Jack (J.)" <jjao@ford.com>; "Gates, Freeman (F.C.)"
>> <fgates@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>
>> Sent: Monday, April 08, 2002 9:42 PM
>> Subject: RE: DPFE EGR Part Concern

>>

>>

>>> Smith,

>>> Would it be possible to obtain the PCM from the subject vehicle as
>> there

>>> is a possibility that a defect in the PCM was the trigger which caused
>>> the dPFE sensor to go into the high current mode and become shorted?

>>>

>>> Regards

>>>

>>> Mark Freeland

>>>

>>>> 6-Sigma Black Belt

>>>> Engine Research Department

>>>> Ford Research Laboratory

>>>> P.O. Box 2053

>>>> MD 2629 - SRL - Room 1517

>>>> Dearborn, MI 48121-2053 USA

>>> email: mfreela1@ford.com

>>> Tel.: (313) 594-7645

>>>

>>>

>>> —Original Message—

>>> From: schen16 [mailto:schen16@ford.com]
>>> Sent: Wednesday, April 03, 2002 12:11 AM
>>> To: Maurer, James (J.B.); Kwon, Soon (S.K.)
>>> Cc: Jack Jao; Gates, Freeman (F.C.); Freeland, Mark (M.)
>>> Subject: Re: DPFE EGR Part Concern

>>>

ERG2-027-G 25358

> > >

> > > Jim:

> > > Please find the attached file for the measuring data of the defeat

> > > DPFE

> > > EGR

> > > part, this case was happened when the customer was driving in city

> > > with

> > > 40kph cruising, the engine stalled suddenly without any warning

> > > signals,

> > > after that the ODO indicator showed "—" and can not restart

> > > engine,

> > > this vehicle was buy in Sept, 2001, the accumulated mileage was 7034KM

> > > only.

> > > it causes the customer very big concern and our S& M people do their

> > > best to

> > > try to explain and calm down customer's emotion.

> > > As your mail, do you have any experience for engine stall? and the

> > > improved

> > > parts can prevent this engine stall? what actions shall be taken?

> > > Any queries of this case you want to understand please let me know.

> > >

> > > Regards,

> > > — Original Message —

> > > From: "Maurer, James (J.B.)" <jmaurer@ford.com>

> > > To: "Chen, Smith S N (S.)" <schen16@ford.com>

> > > Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Freeland, Mark (M.)"

> > > <mfreela1@ford.com>

> > > Sent: Tuesday, April 02, 2002 11:27 PM

> > > Subject: FW: DPFE EGR Part Concern

> > >

> > >

> > > > Mr. Chen,

> > > >

> > > > Your attached files did not come through to me, so I don't know the

> > > > specifics for your vehicle.

> > > >

> > > > One of the failure modes of the sensor is that it may short and draw

> > a
> > > high current from the PCM (engine control module). When this
> > happens,
> > > the voltage that is supplied to the microprocessor inside the PCM is
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> > > sufficient to keep the PCM operating. When the microprocessor is
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> > > running, there are no signals to the fuel injectors, ignition coils,
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> > > The circuit inside the sensor was changed to eliminate this issue.
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> > eliminate
> > > electrical noise issues that could potentially cause the short to
> > occur.
> > > The new part was released on concern C11285321. Production began
> > > January 7, 2002.
> > >
> > > I am interested in knowing the details about why a customer would
> > sue
> > > over this issue. Does the customer want you to buy back the vehicle
> > if
> > > it cannot be fixed? The latest level part should take care of the
> > > issue.
> > >
> > >
> > > Regards,
> > > Jim Maurer
> > > James B. Maurer
> > > V-Engine 6-Sigma Team Leader
> > > Fuel Metering Dept. V Engine Engineering
> > > Phone (313) 390-3672, Fax (313) 390-4084
> > > Text Page: (313) 795-5219

>>>> Email: jmaurer@Ford.com

>>>>

>>>> —Original Message—

>>>> From: Owens, Karen (K.E.)

>>>> Sent: Tuesday, April 02, 2002 9:58 AM

>>>> To: Chen, Smith S N (S.)

>>>> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Frøeland, Mark (M.)

>>>> Subject: RE: DPFE EGR Part Concern

>>>>

>>>>

>>>> Mr., Chen:

>>>> I am no longer working on this matter, James Maurer (JMAURER) is the

>>>> new

>>>> team leader. I am forwarding your note to him.

>>>>

>>>> Jim:

>>>> Please respond to Mr. Chen. Thank you.

>>>>

>>>>

>>>> Change Is Good. Proactivity Is Better!

>>>> Karen E. Owens

>>>> Supervisor

>>>> Modular V8/V10 Engine Systems

>>>> (off) 313.845.5770

>>>> (fax) 313.390.1229

>>>>

>>>> —Original Message—

>>>> From: schen16 [mailto:schen16@ford.com]

>>>> Sent: Wednesday, March 27, 2002 3:25 AM

>>>> To: Owens, Karen (K.E.)

>>>> Cc: Jack Jao

>>>> Subject: DPFE EGR Part Concern

>>>>

>>>>

>>>> Miss Owens:

>>>> How are you, we recently have a special case that DPFE EGR part

>>>> malfunction and causing engine stalled w/o any warning during

> > driving.
> > > this customer is proposed to sue to company if we can not provide a
> > > reasonable reason. Attached file please find the failure mode 2
> > which
> > > is
> > > causing engine stall immediately during drive, the failure mode 1
> > > which
> > > is other defeat parts data, and we also show the new parts and dura.
> > > test part. Please give us a special effort to explain this concern.
> > > Your quick response will be requested and appreciated.
>

From: Freeland, Mark (M.)
Sent: Tuesday, September 26, 2001 12:21 PM
To: Owens, Karen (K.E.)
Subject: FW: Temperature Tests on Modified TMDP Sensors

Karen

Info from Mark Clifford on the 10 ohm resistor evaluations to date.
Looks good.

Regards

Mark Freeland

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

From: Mark Clifford [mailto:MClifford@kavlico.com]
Sent: Tuesday, September 25, 2001 11:30 AM
To: Mark Freeland (E-mail)
Subject: Temperature Tests on Modified TMDP Sensors

Mark,

The tests on ten (10) TMDP units were conducted with a 10 Ohm series resistor to examine whether the temperature performance would be impaired by the proposed change. Roger Houston reviewed the data and forwarded it to Don Ayers yesterday morning. Don will put out the "official" information for everyone. "Unofficially", the resistor appears to have had had no significant affect on the overall temperature performance of the TMDP units. The worst case change in power supply current with pressure and temperature conditions was 1.25 mA which should create a 12.5 mV change in output. Based on this data, adding the resistor should present no problems. I know that hundreds of new TMDP hybrid devices were in assembly a couple days ago. They should be built, in units, and trimmed by the end of this week. This should give us a good sample and information on the modification.

Kavlico selected an 0805 thick-film chip resistor for the 10 Ohms. This should create the input transient immunity protection margin that we desire. It should also act like a fuse and make the device fail to a safe condition if the sensor unit for some reason tried to draw excessive current.

I saw a list of EMI tests recommended by your EMI expert yesterday. Roger is at an EMI training seminar today and he'll look at it tomorrow.

Best Regards,

Mark Clifford

From: Gagnier, Troy (T.A.)
Sent: Wednesday, August 01, 2001 8:46 AM
To: Maurer, James (J.B.)
Cc: Sass, Ronald (R.S.)
Subject: 2001 MY D186 VDR recordings

Here's the data.. Triggered on IEGR..



2001D1863_0L.cn0 2001D1863_0L.cn1 2001D1863_0L.cn2

Regards,
Troy Gagnier
OBDII Field Feedback
R&VT- Cape- Diagnostic Systems (T326)
(Phone) 313-337-1463 / (Fax) 313- 323-6743
Cube EG146, POEE, MD #26
(Email) tgagnier@ford.com

From: Gates, Freeman (F.C.)
Sent: Tuesday, November 19, 2002 3:37 PM
To: O'Neill, Jim (J.D.)
Cc: Maurer, James (J.B.)
Subject: FW: dPFE sensors 2-10 and M-6

Jim,
Kyong is partially correct, there was high frequency noise on the supply line, however the magnitude observed by Jim Maurer, Kyong Park, EDP personnel and myself was only 1 volt maximum. Definitely not the "very large and very fast" transient described in the preceding communication.

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Tuesday, November 19, 2002 2:50 PM
To: Gates, Freeman (F.C.)
Cc: Maurer, James (J.B.); O'Neill, Jim (J.D.); McDaniel, Scott; Tackman, Bruce; Hubbard, Rick
Subject: RE: dPFE sensors 2-10 and M-6

Freeman,

We examined those two returns from you.

My understanding is that M-6 is returned from a Focus buy back car, and as it had the typical symptoms of many field returns. Knowing many field returns had transient voltage related failures, we paid our attention more to the other unit, 2-10.

This 2-10 was reportedly operated on a regulated power supply and was failed at 72 hours of testing with exhaust condensate. The high die of the part has a large bubble, and some sign that is similar to the result of transient voltage issue.

During our visit to the EDP laboratory, we have observed that very large and very fast transient noise riding on input (supply) line and the sensor output line. We (I and EDP personal) had witnessed these noise at the point of use by the sensors. The lab had monitored outputs and inputs once per 10 minutes. The frequency of the measurements may not be sufficient to catch the fast transients.

I strongly believe that those reported drifts of the outputs from sensors were affected by these transient voltages.

Kyong

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

From: Gates, Freeman (F.C.) [mailto:fgates@ford.com]
Sent: Monday, November 04, 2002 2:47 PM
To: Park, Kyong
Cc: Maurer, James (J.B.); O'Neill, Jim (J.D.)
Subject: FW: dPFE sensors 2-10 and M-6

> -----Original Message-----

> **From:** Uy, Dairene (D.)

EA82-827-8 28582

> Sent: Friday, November 01, 2002 5:45 PM
> To: Gates, Freeman (F.C.)
> Subject: dPFE sensors 2-10 and M-6

> Freeman,

> I told you yesterday that I would give you a write-up of my visual observations. I am attaching a file of these observations. Unfortunately, I don't have pictures because I used the microscope that I could not save pictures with.

> However, I am also attaching some pictures that Mark Freeland had taken of these sensors previously. The point of my attaching these pictures is to say that I did not see these when I looked at the sensors. When you mentioned that Mark had observed these bubbles, I had contacted him to inquire about what he saw. (This was before you said you were taking back the sensors.) He sent me some information today and showed me what he had seen. I was really amazed at the bubbles he had seen, because I definitely did not see them. I really don't think I could have missed them!!! I guess the potting gel and the die underwent some changes during the few days he and I made our observations. It seems like the potting gel "heals" itself over time.

> A word about SRL1094 Hi die 00.jpg - Mark's pictures shows clear areas of the gel. What I observed was an almost continuous "crust" of deposits on the surface.

> A word about SRL1098 ref die 02.jpg - I did not see the discoloration of the gold pad.

> > <<Visible examination of failed dPFE sensors.doc>> > > <<SRL1094 HI die 00.JPG>> > > <<SRL1094 HI die 01.JPG>> > > <<SRL1098 Ref die 02.JPG>> > > <<SRL1098 HI die 00.JPG>>

> Regards,
> Dairene

> _____
> Dairene Uy
> Physical and Environmental Sciences Department
> Ford Research Laboratory
> Mail Drop 3083/SRL, PO Box 2053
> Dearborn, MI 48121

> Phone: 313-594-1649
> Fax: 313-322-7044
> Email: duy@ford.com

From: Goebel, Ken (K.M.)
Sent: Friday, November 08, 2002 4:26 PM
To: Kaercher, Don (D.F.); Shore, John (J.); Maurer, James (J.B.); O'Neill, Jim (J.D.); Muter, Doreen (D.J.); Douglass, Jim (J.B.); Tokarsky, Michael (M.); DSC-2 Conf Room J (10); Kirschke, Kevin (K.E.); Plants, Paul (P.G.); Souchock, Peter (P.D.); Masura, Gordon (G.P.); Goering, Kimberly (K.L.)
Subject: dPFE Contingency Action Team Meeting

Info and commitments from today's 1:00 conference call:

- PS&L currently has 420K parts on hand, with commitments for another 400K by 12/31/02.
- Improved sensor due to go into production 1/03 at Kavlico.
- PS&L to hold current service part inventory and to investigate potential for delaying/converting committed orders to 1/03 level parts.
- Perform cost/benefit analysis to assess the benefits of going to the 1/03 level sensor over the current level sensor, weighed against the costs/risks of scrapping existing service stock. (J. Maurer/D. Kaercher)
- Quantify magnitude of non-warranty repairs thru comparison between AWS claims and part sales (D. Muter/D. Kaercher)
- Assess performance improvement of current level sensor over earlier versions thru AWS analysis. (D. Muter)

Next meeting will be held the week of 11/18, with regular monthly meetings scheduled thereafter. (K. Goebel)

In attendance:

K. Kirschke
P. Souchock
J. Douglass
D. Kaercher
J. Maurer
D. Muter
K. Goebel

Regards,
Ken Goebel
Program Manager, Recall & Service Programs, FCSD
Ph. 313-33-72791, FAX 313-84-51024, DSC2, Rm. 803
kgoebel@ford.com

From: Hargas, Jon (.)
Sent: Thursday, June 13, 2002 10:15 AM
To: 'Ed Sickafus'; Uy, Dairene (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

Ed,

I believe Dairene was comparing Raman spectra from their archive of previous standards. In their archive they had tests of heating $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, aluminum nitrate nonahydrate, from room temperature to 600C, and Dairene showed me that the spectrum started changing at 100C, and the sample did not rehydrate at room temperature. Perhaps that heating test was not done in high humidity.

The area of aluminum nitrate nonahydrate that Dairene found in a bond pad area is small, and the UV laser alters the sample with time. If and when I stick that into the SEM, or Steve Simko uses Auger, there may be little nonahydrate left for comparison, even if it is metastable in the vacuum.

Roc's testing on the gel and die attach adhesive show that decomposition and color changes can start to occur at about 300C, if memory serves me correctly, and Kyong has temperature probe data showing latched parts get up to 250C, or so. This is enough to start decomposing the aluminum nitrate nonahydrate in a latch up. Perhaps the area Dairene found was able to rehydrate on cooling or in storage.

It would solve some points of curiosity if I could examine a sample of aluminum nitrate nonahydrate in the TRM and see if it transforms to an aluminum hydrate or oxide, but that would be using a higher beam energy than I used in the SEM. I don't think it's worth doing at this time. Auger could determine whether the aluminum nitrate nonahydrate decomposes in vacuum to a nitrate or oxide product, but can't detect hydrogen, any more than I can.

Jon

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

From: Ed Sickafus [mailto:ntelleck@ic.net]
Sent: Wednesday, June 12, 2002 9:24 PM
To: Uy, Dairene (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

There are various ambient vapor conditions for investigating thermal decomposition of a hydrate. A vacuum is one. Another is a high temperature, high humidity ambient. Shouldn't the decomposition processes and results differ?

Ed

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

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Tuesday, June 11, 2002 12:25 PM
To: Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed

ER82-827-G 26941

Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: RE: Discrepancy between Auger and Raman results

Before we jump to any conclusions, I just want to mention that I have taken a lot more spectra of both ref and hi dies (+ gel) that Lebzy prepared. I have not finished looking at all my data yet, but I have seen aluminum nitrate again, though NOT all the mudcracked/chickenpox areas showed aluminum nitrate.

I agree with Jon when he says that Al nitrate nonahydrate decomposes at higher temperature. We have Raman spectra of this compound being heated from room temperature up to 600C and back to room temp again, and the spectrum had already started changing at 100C.

Dairene

> -----Original Message-----

> From: Hargas, Jon (.)
> Sent: Tuesday, June 11, 2002 11:50 AM
> To: Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)';
Simko, Steven (S.J.); Uy, Dairene (D.)
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
'kpark@kavlico.com'; 'bdavies@kavlico.com'
> Subject: Discrepancy between Auger and Raman results

> Dairene's Raman results are exciting, and give an insight into the initial compounds that form in PAD or UPAD.

> Steve Simko found no nitrogen in the samples he looked at except the passivation. He suggested electron beam damage as a cause if the nitrate existed. EDX in SEM is not very sensitive to nitrogen, and I would have to compare an aluminum nitrate standard to whatever unknown I was looking at before drawing conclusions on any spectra I have stored before claiming there was a nitrate present.

> The enthalpy of formation or Gibbs Free Energies for aluminum nitrate or aluminum nitrate nonahydrate are not listed in the CRC, but aluminum hydrates (Al₂O₃.H₂O or Al₂O₃.3H₂O) have a higher free energy of formation than aluminum oxide (of course their formation will depend on the partial pressure of water and temperature). Other tables mention Al(NO₃)₃ decomposes, but not the temperature, and that Al(NO₃)₃.9H₂O decomposes at 135 degrees Centigrade.

> I wonder if in further latch up and heating in high current events may convert any aluminum nitrate formed to aluminum hydrate. Perhaps aluminum nitrate or aluminum nitrate nonahydrate forms in the presence of exhaust condensate.

> Jon

> -----Original Message-----

> From: Gates, Freeman (F.C.)
> Sent: Tuesday, June 11, 2002 9:15 AM
> To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);

'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hangas, Jon (.); Gates, Freeman (F.C.)

> Subject: RE: New Raman results

>

> Mark,

>

> As per our conversation last night (6/10/02), my research did show the following:

>

> Aluminium Hydroxide + Nitric Acid (exhaust) -----> Aluminium Nitrate + Water

>

> ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

>

> So perhaps Analytical Solutions was not completely off base on their, they just did not account for the subsequent reaction in the exhaust environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

>

> Thanks

>

> -----Original Message-----

> From: Freeland, Mark (M.)

> Sent: Friday, June 07, 2002 4:53 PM

> To: Ed Sickafus (E-mail)

> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)

> Subject: FW: New Raman results

>

> Ed,

>

> New information of the residue material left after the Al is transformed. We should discuss this next week.

>

> Regards

>

> Mark Freeland

>

> 6-Sigma Black Belt

> Engine Research Department

> Ford Research Laboratory

> P.O. Box 2053

> MD 2629 - SRL - Room 1517

> Dearborn, MI 48121-2053 USA

> email: mfreelal@ford.com

> Tel.: (313) 594-7645

>

> -----Original Message-----

> From: Freeland, Mark (M.)

> Sent: Friday, June 07, 2002 4:35 PM

> To: Kyong Park (E-mail); Brady Davies (E-mail); Hangas, Jon (.)

> Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)

> Subject: New Raman results

>

> Dairene and Lebzy has been working with a UPAD sample which was mechanically depotted, and saw no chemistry.>

> Today she examined the residue under a bond pad using a UV laser, and compared the spectra to samples of Al Hydroxide and Al Nitrate that she had also measured with the equipment.

> The results indicate that the residue is Al Nitrate, and not Al Hydroxide, as previously suggested by Analytical Solutions.

> I will share the spectra with you on Monday when I arrive. (I only have

paper copies at this time).

>
> Also, it was interesting to note that after the mechanical depotting, the residue did not have the mud cracked appearance as previously observed.

>
> The sample used for this work was SRL647, from the data base.

>
> Regards

>
> Mark Freeland

>
> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
> email: mfreel1@ford.com
> Tel.: (313) 594-7645
>

From: Herr, Mike (M.S.)
Sent: Wednesday, May 28, 2002 1:45 PM
To: Akolkar, Shrikant (S.V.)
Cc: Maurer, James (J.B.); Fabien, Phil (P.A.)
Subject: RE: DPFE sensor/EGR During DCDC Tests

Shrikant,

Answers to your questions:

EGR is functional and DPFE is electrically connected during all DCDC testing, but the lowest RPM for that test is pk tq RPM - 500. That's pretty high for most engines (>3000 rpm) and we typically don't run EGR there. I'm looking at the cycle right now. At most 15% of the test time is spent with EGR functioning. And that's the only durability test we currently have where the EGR will be functioning.

All engine controls are driven by PCM but we can bring in an RCON or ATI and run the engine from that if needed.

It would be possible to get DPFE sensors that have finished testing. All engines are sent to EMDO for teardown. You can try to grab them before leaving Dyno, or get them at EMDO after teardown. If you are intested only in 3.0L U204, we'll have to get with Phil Fabien.

Some info for you on DPFE failures at Dyno. If they occur during durability testing (doubtful since we don't exercise them) we would never know about it because we have no way of monitoring DPFE function in durability rooms. We have had a history of DPFE failures in development rooms. On past programs I can remember not being able to control EGR and changing DPFE to re-gain control. The failures were blamed on moisture accumulation in the DPFE. We were told this would not occur in vehicles since they would spend more time not running than a Dyno motor and would have time for the water to drain. So we need to check with the 3.0L U204 development engineer(s) to find out if they had any DPFE failures during development. There is no other way because part failures in development rooms are not tracked.

We understand that we don't catch EGR-related failures on Dyno so we are developing new tests that will prevent things like the Kavlico DPFE from slipping through in the future.

1. **Dynamic Cycling Test** - designed to cycle the VCT mechanism, it will also cycle the EGR system
2. **Intake Sludging Test** - based on a real customer drive cycle that sludges the intake manifold and throttle. EGR will function at the speeds/loads run here.
3. **WRT test** - a wear test but it includes simulated city driving and frigid temperatures
4. **New Engine Systems Test** - there is a BlackBelt project to get rid of the DCDC and replace it with a test that will actually cycle the EGR and other components.

It would be great if one of those test cycles would fail the DPFE. I will support your efforts as best I can. Maybe we need to set-up a meeting, including someone from Phil Fabien's group (I don't recall who develops U204 over there).

Mike Herr

Engine Durability Technical Specialist
✉ mham@ford.com
☎ (313) 33-71909 (voice and fax)
V-Engine Engineering - Ford Motor Company

—Original Message—

From: Akolkar, Shrikant (S.V.)
Sent: Tuesday, May 28, 2002 5:15 PM
To: Herr, Mike (M.S.)
Cc: Maurer, James (J.B.)

ENG2-027-G 20006

Subject DPFE sensor/EGR During DCDC Tests

Mike,

When we run DCDC/Cologne durability tests do we have EGR functional? If yes, then is it controlled by Rcon or PCM-DPFE sensor? Is DPFE sensor fully electrically connected all the time? Is it possible to get hands on Kevlico sensors that have completed DCDC tests?

Some background info copied from other memo is as below-

We intend to set up one 3.0L engine at dyno & one Focus vehicle chassis tests to determine if we can duplicate field failures of Kevlico DPFE sensor. Focus & 3.0L DOHC Escape have highest warranty. Most current dyno DVPR test don't have EGR functioning & that's why we can't find any dyno history of failures for DPFE sensor. We need to develop new test by cycling EGR & sensor output.

Same Kevlico sensor goes on all car/truck lines & its a huge warranty/recall possibility issue right now. The team consists of dozen or two members & 4 black belts with Jim Maurer as a leader. I am one of the black belts working with him. I need complete 1 or 2 engines suitable to run on dyno with harnesses, PCM etc. They can be any old engines that have finished other tests & not required any more.

I appreciate any help we can from you in this efforts. Pl. let me know asap. Thanks.

With Regards,

SHRIKANT Akolkar

sakolkar@ford.com Ph:(313) 594-1908 Fax: (313) 390-1229

Ford Motor Co. POEE AQ077 P.O.Box 2053 MD#36

Dearborn MI 48124 U.S.A.

From: Hoshino, Jun (J.)
Sent: Wednesday, April 10, 2002 9:38 PM
To: Jao, Jack (J.); Kanai, Shinji (S.); King, Robert (R.F.); Spangler, David (D.R.); Shelton, Randy (R.); Maurer, James (J.B.); Chang, Chia Kai (C.); Kwon, Soon (S.K.); Dalbo, Bob (R.J.); Huck, Dave (D.E.); Sanders, Muriel (M.S.); Kuhnd, Noel (N.); McGee, Brett (B.L.); Tsai, C (C.Y.)
Subject: RE: U204 DPFE. cause the engine stall unexpective

Thank you Jack.

All, here is production date of concerned DPFE sensor.
1F19B = June 19, 2001

Jun Hoshino
RHD Escape/Maverick FCSD PVT Program Manager
PVT & Field Support, Vehicle Service & Programs
Hiroshima Japan Tel: 81-82-287-4603 Fax: 81-82-287-5220

—Original Message—

From: jjao [mailto:jjao@ford.com]
Sent: Thursday, April 11, 2002 10:10 AM
To: Hoshino, Jun (J.)
Subject: Re: U204 DPFE. cause the engine stall unexpective

Dear Hoshino:

The defect part lot No.# 1F19B./Jack Jao

--- Original Message ---

寄件者: "Hoshino, Jun (J.)" <jhoshino@ford.com>
收件者: "Tsai, C (C.Y.)" <ctsai@ford.com>
副本: "Kanai, Shinji (S.)" <skanai@mazdausa.com>; "King, Robert (R.F.)" <rking9@ford.com>; "Jao, Jack (J.)" <jjao@ford.com>; "Li, Charles (C.S.)" <cl3@ford.com>; "Spangler, David (D.R.)" <dspangle@ford.com>; "Shelton, Randy (R.)" <rshelton@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>; "Chang, Chia Kai (C.)" <cchang9@ford.com>; "Kwon, Soon (S.K.)"

EA02-027-G 28872

<skwon@ford.com>; "Dalbo, Bob (R.J.)" <rdalbo@ford.com>; "Huck, Dave (D.E.)" <dhuck@ford.com>; "Sanders, Muriel (M.S.)" <msander6@ford.com>; "Kuhnd, Noel (N.)" <nkuhnd@ford.com>; "McGee, Brett (B.L.)" <brmcgee@ford.com>

傳送日期: 2002年4月10日

主旨: RE: U204 DPFE. cause the engine stall unexpective

> Thank you Jack,
> Would you also provide the information of the defective DPFE before you
> send it to Mark.
> We need Lot#(built date) of DPFE (such as "1M15B", 1=2001, M=December,
> 15=15th), it indicates back of the DPFE sensor body.

>
> Jun Hoshino
> RHD Escape/Maverick FCSD PVT Program Manager
> PVT & Field Support, Vehicle Service & Programs
> Hiroshima Japan Tel: 81-82-287-4603 Fax: 81-82-287-5220

>
> —Original Message—
> From: McGee, Brett (B.L.)
> Sent: Wednesday, April 10, 2002 7:36 PM
> To: Tsai, C (C.Y.)
> Cc: Kanal, Shinji (S.); King, Robert (R.F.); Jao, Jack (J.); Li, Charles
> (C.S.); Spangler, David (D.R.); Shelton, Randy (R.); Maurer, James
> (J.B.); Chang, Chia Kai (C.); Kwon, Soon (S.K.); Dalbo, Bob (R.J.);
> Huck, Dave (D.E.); Sanders, Muriel (M.S.); Hoshino, Jun (J.); Kuhnd,
> Noel (N.)
> Subject: RE: U204 DPFE. cause the engine stall unexpective

>
>
> Jack, thank you for the additional information – is it possible to get
> the DPFE and the PCM from "case 2" sent to Mark Frøeland at the
> following address?:

>
> Mark Frøeland
>
> Telephone: 1-313-594-7645

ENG2-027-G 28873

>
> SRL Room 1517/ MD 2629
>
> 2101 Village Rd
>
> Dearborn, MI 48121-2053
>
>
> Brett McGee
> Ford Resident Engineer - Hofu Assembly Plant
> e-mail: bmcgee@ford.com
> Telephone: 011-81-82-287-1095
> Fax: 011-81-82-287-5399
>
> —Original Message—
> From: ctsai [mailto:ctsai@ford.com]
> Sent: Wednesday, April 10, 2002 8:57 PM
> To: Hoshino, Jun (J.); Kuhnd, Noel (N.)
> Cc: McGee, Brett (B.L.); Kanai, Shinji (S.); King, Robert (R.F.)
> Subject: Re: U204 DPFE. cause the engine stall unexpective
>
>
> Jun,
> Just let me separate the issues into 2 portion:
> (1) High defective rate of DPFE in the field, usually with DTC P0401
> orP1401.
> The dealers replaced another new one. That had been in SAQ
> process.
> (2) For this case :
> a. The first case of engine stall due to defective DPFE.
> b. VIN:5F2CUO8B81KM71661
> Prod. July,2001. Sale: Sep. 24,2001.
> Stall occurred on Mar. 01, 2002, 6997km.
> Before the case, the car had no problem (back to the dealer
> for 1000 & 5000KM
> regular maintalnence only.)
> c. When the car picked back to the dealer:

- > 1. can't start again.
- > 2. can't communicate with WDS.
- > 3. replacing another PCM (from anothe same model car),can't communicate with WDS.
- > 4. with original PCM, communicate with WDS by using " Manual Entry" function of WDS.
- > 5. WDS showed DTC : B1681/B1401/U1262
- > 6. diagnoze the DTCs with " Probe test" function of WDS, everything seemed OK.
- > 7. because the connector of DPFE was disconnected in "Probe test", the technician tried to start again after the test, the car started, then found the DPFE was disconnected.
- > 8. try several times, all the same, when the connector was connected, can't start. when disconnecting, can start again.
- > 9. change another new DPFE, the problem was disappeared.
- >
- > Noel,
- > The DPFE concern is in SAQ process, if you need some other information, please tell me.
- > Later, I'll tell you some other issues of our job.
- >
- >
- > C. Y. (Jack) Tsai
- > Technical Support Engineer,
- > SE, ACSG, FLH.
- > e-mail: ctsai@ford.com <<mailto:ctsai@ford.com>>
- > fax: 886-3-4634164
- >
- > If you want to know more of field quality and service technical information,
- > please access the shared files in the PC : ctsai /D:
- >
- > — Original Message —
- > From: Hoshino, Jun <<mailto:jhoshino@ford.com>> (J.)
- > To: Tsai, C (C.Y.) <<mailto:ctsai@ford.com>>

> Cc: Kuhnd, Noel (N.) <mailto:nkuhnd@ford.com> ; McGee, Brett (B.L.)
> <mailto:bmcgee@ford.com> ; Kanai, Shinji <mailto:skanai@mazdausa.com>
> (S.) ; King, Robert <mailto:rking9@ford.com> (R.F.)
> Sent: Monday, April 08, 2002 4:01 PM
> Subject: RE: U204 DPFE. cause the engine stall unexpective

>
>

> Jack,
> Would you please respond question below COB tomorrow?

>

> Jun Hoshino
> RHD Escape/Maverick FCSD PVT Program Manager
> PVT & Field Support, Vehicle Service & Programs
> Hiroshima Japan Tel: 81-82-287-4603 Fax: 81-82-287-5220

>

>

>

> —Original Message—

> From: Hoshino, Jun (J.)
> Sent: Friday, April 05, 2002 12:54 PM
> To: Tsai, C (C.Y.)
> Cc: Kuhnd, Noel (N.); McGee, Brett (B.L.); Kanai, Shinji (S.); King,
> Robert (R.F.)
> Subject: RE: U204 DPFE. cause the engine stall unexpective

>

>

> Jack,
> I am Jun Hoshino, Hofu/Hiroshima FCSD PVT rep. for Escape.

>

> KCAP PVT and Dearborn engineering need further information for one of
> engine stalling vehicle (caused by DPFE) in Taiwan.

>

> Would you provide us the information?

>

> Requested information are;

> 1. VIN

> 2. Production date

- > 3. Mileage
- > 4. Lot#(built date) of DPFE (such as "1M15". 1=2001, M=December, 15=15th)
- > 5. Whether white dot is existing around lot# of DPFE

>

> Regards,

>

> Jun Hoshino

> RHD Escape/Maverick FCSD PVT Program Manager

> PVT & Field Support, Vehicle Service & Programs

> Hiroshima Japan Tel: 81-82-287-4603 Fax: 81-82-287-5220

>

>

>

> —Original Message—

> From: Kuhnd, Noel (N.)

> Sent: Wednesday, April 03, 2002 8:37 AM

> To: Tsai, C (C.Y.)

> Cc: Hoshino, Jun (J.)

> Subject: FW: U204 DPFE. cause the engine stall unexpective

>

>

> Hi Jack,

> Further to my earlier note regarding suggestion from Taiwan PVT of a
> possible field action the Hofu FCSD/PVT representative has made further
> enquires on this issue. Please keep the regional office informed.

>

> Jack Jao may seek your assistance in responding to the following
> enquires from our Hofu PVT representative, this matter may become
> urgent.

>

> Regards

> Noel Kuhnd

> Regional Service Specialist

> Asia Pacific Operations

> Ford Customer Service Division

> Phone 61 3 9359 8006

> Mobile 61 0413 272 455

>

>

>

> ---Original Message---

> From: Hoshino, Jun (J.)

> Sent: Wednesday, 3 April 2002 9:18 AM

> To: Jao, Jack (J.)

> Cc: McGee, Brett (B.L.); Kuhnd, Noel (N.)

> Subject: RE: U204 DPFE. cause the engine stall unexpective.

> Urgently..Urgently..

>

>

> Jack, Would you provide us following information?

>

> 1. How many vehicles had MIL problem regarding DPFE sensor (such as DTC
> P0401)?

> 2. How many vehicles stalled? According to your last note, one case in
> Taiwan. Right?

> 3. How dealers fixed customer's vehicles? All vehicles were replaced
> DPFE sensor? Do you have recurrence case?

> 4. How many units were sold in Taiwan?

>

> If you are not the correct person to get this kind of information,
> please forward this note the correct person.

>

> Jun Hoshino

> RHD Escape/Maverick FCSD PVT Program Manager

> PVT & Field Support, Vehicle Service & Programs

> Hiroshima Japan Tel: 81-82-287-4603 Fax: 81-82-287-5220

>

>

>

> ---Original Message---

> From: Jao [mailto:jao@ford.com <mailto:jao@ford.com>]

> Sent: Tuesday, April 02, 2002 1:35 PM

> To: McGee, Brett (B.L.)

ERG2-827-G 28878

> Cc: Hoshino, Jun (J.)
> Subject: Re: U204 DPFE. cause the engine stall unexpective.
> Urgently..Urgently..
>
>
> One case only so far, and replace to new EGR sensor is Okay! We kept the
>
> defect part in hand, detailed investigation is required. Thank!

> — Original Message —

> 寄件者: "McGee, Brett (B.L.)" <bmcgee@ford.com>
> 收件者: "Jao, Jack (J.)" <jjao@ford.com>
> 副本: "Hoshino, Jun (J.)" <jhoshino@ford.com>
> 傳送日期: 2002年4月2日
> 主旨: RE: U204 DPFE. cause the engine stall unexpective.
> Urgently..Urgently..

>
>
> Jack, regarding the short of the DPFE sensor, how many confirmed cases
> do you have?

>
> Have all been resolved by replacing the DPFE sensor?

>
> Brett McGee
> Ford Resident Engineer - Hofu Assembly Plant
> e-mail: bmcgee@ford.com
> Telephone: 011-81-82-287-1095
> Fax: 011-81-82-287-5399

> -----Original Message-----

> From: Spangler, David (D.R.)
> Sent: Tuesday, April 02, 2002 11:55 AM
> To: Jao, Jack (J.); McGee, Brett (B.L.)
> Subject: RE: U204 DPFE. cause the engine stall unexpective.
> Urgently..Urgently..

>
> Jack:
>
> I'm going to pass this along to Brett McGee. As our RHD PVT Resident
> Engineer, it's his responsibility to know the answers to all your
> questions.
>
> Brett?
>
> David R. Spangler
> RHD Escape / Maverick Project Manager, Hiroshima Japan
> dspangle@ford.com; Voice: 81 82 287-1096; Fax: 81 82 287-5399
>
>
> -----Original Message-----
> From: JJao [mailto:JJao@ford.com <mailto:JJao@ford.com>]
> Sent: Tuesday, April 02, 2002 11:30 AM
> To: dspangle@ford.com
> Subject: Fw: U204 DPFE. cause the engine stall unexpective.
> Urgently..Urgently..
>
>
> Hello David: My name is Jack Jao, is responsible for the vehicle testing
>
> In
> Taiwan Ford Lio Ho Mo., we are facing the field challenge about the EGR
> sensor.
>
> The EGR sensor shorting cause the engine stall, the Taiwan Government in
>
> Consumer Protection Bureau is handling the issue, we recognized it might
>
> be
> potential recall issue if Ford Lio Ho can not have reasonable
> explanation.
>
> My questions:

From: Johnson, Joe (J.H.)
Sent: Tuesday, September 17, 2002 1:52 PM
To: King II, Lamar (L.L.); Maurer, James (J.B.)
Subject: FW: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

FYI

Joe Johnson

Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 89
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

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

From: Lizotte, Brian (B.W.)
Sent: Tuesday, September 17, 2002 1:45 PM
To: MacDonald, George (G.F.); Surti, P. J. (P.J.); Shopp, James (J.J.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); Stump, Steven (S.M.); Dhaliwal, Dave (D.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

Actually, Ken Thomas who works for Mike Giordano and Ryan Morrison actually did the SSM.



FW: SSM
11-2002 Focus Zetec

Brian W. Lizotte

14 Engine Programs
POEE, MD#88
313-390-4868
313-337-5808(Fax)
313-684-8501(Pager)
blizotte@ford.com

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

From: MacDonald, George (G.F.)
Sent: Tuesday, September 17, 2002 1:28 PM
To: Surti, P. J. (P.J.); Shopp, James (J.J.); Lizotte, Brian (B.W.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Pepitone, Gil (J.); Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); Stump, Steven (S.M.); Dhaliwal, Dave (D.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Subject: RE: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

PJ,

One additional comment. . .At WSAP, with the help of Gil Pepitone, we discovered a routing issue that creates a touch condition of the EVR vacuum hose to the EGR. This melts the hose, creates a vacuum leak & a p0401 insufficient EGR flow MIL code. In looking at the data (Zetec only concern) and our past DPFE history, dealers are swapping out good Motorola sensors. This accounts for a good portion of the latest DPFE warranty for vehicles with the Motorola DPFE's.

Brian Lizotte's group is working on a message to the field highlighting this special cause.

Brian, Jim,
Any comment on the status of the message on EVR hose routing issue?

George F. MacDonald

Wayne Stamping & Assembly Plant - Powertrain Resident Engineer
Phone: 734-48-70198
Mobile: 734-730-8174
Textpager: 313-795-7888 <mailto:3137957969@alphapage.airtouch.com>
gmacdona@ford.com

---Original Message---

From: Surti, P. J. (P.J.)
Sent: Tuesday, September 17, 2002 10:53 AM
To: Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); MacDonald, George (G.F.); Stump, Steven (S.M.); Dhaliwal, Dave (D.S.); Malkoy, Gene (E.E.); Thomas, Ken (K.C.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peplona, Gil (G.); Surti, P. J. (P.J.)
Subject: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

Hello Joe - I know you are not involved with Focus EGR system, but the attached CQIS report concern can happen to other vehicle lines too. We have seen this concern in past, but I like to know what to advise the techs. in this type of case. The DPFE was replaced due to the inside electronics issue more than year ago. So, the current sensor is better design sensor. But the vehicle came back due to water in the sensor. If this sensor would have been dried and cleaned, it probably would have worked. Although, due to the bad reputation of the sensor, the techs., just replace them. And this is happening on other applications too. One of the biggest MIL concerns at dealerships is the DPFE sensor MIL. And unfortunately, the concern repeats again.. It seems that this past big concern does not seem to go away. Any advice/suggestion on such repeat repairs will be appreciated. Thanks...

CSQI002 CQIS Indicator Summary 09/17/02 10:29:24

==>

1 of 1

Rpt#: 2IQIV001 PTOFSE Rpt: 09/17/2002 Odom: 36,598 M
Rvw: File: Folder: Images: 0 Print Smy/Disp Detail(P/D):
Vehicle: 2001 FOCUS,ZX3 ,COUPE 3FAFP31341R108239 Bld: 09/07/2000
Engine: 2.0L ZTECH Calb: Trans: MTX-75 E Axle: FWD 3.82 A/C: YES
Dealer Id: 05517 Sunset Ford Ph#: (714) 372-4520
State: California City: Westminster Orig/Callr: P. J. SURTI
Symptom: 6 98 2 00 DRVABL,INDICATOR,CHECK ENGINE,OTHER-CODE NA
Addl Sym: St CCRG/EPRC: Rvw: Dt:
Fix Caus. Comp: SENSOR ASY EGR PR VL -- RPL Condition Code: 42
PSURTI (714) 982-3227 FAX: MIL? Y ABA? Symp V? Survey? N
EO: EC: Prt St: 0
ER: CB: Intmit? N

CONCER CHECK ENGINE LIGHT STAYS ON.

REPAIR HOOKED UP WDS AND RAN EEC SELF TEST. RETRIEVED THE KOEO-C DTC P0401.
RAN DCL DISPLAY. MONITORED THE EGR SYSTEM. DPFE SENSOR WAS READING 0.1 VOLT WITH KOEO AND ALSO WHILE RUNNING AT IDLE. AS PER PREVIOUS EXPERIENCE, THE TECH. REMOVED THE DPFE SENSOR AND FOUND WATER IN THE SENSOR. THE SENSOR HAD BEEN REPLACED ABOUT ONE YEAR AGO. AND NOW IT WAS ACTING UP AGAIN DUE TO WATER IN THE SENSOR. THE TECH. REPLACED THE SENSOR. THE MIL CONCERN IS RESOLVED AFTER THE REPAIR.

P. J. Surti

Powertrain EQS
T. No. (714) 982-3227

ERR2-827-0 27822

Fax No. (714) 982-4448

EA02-027-G 27023

From: Giordano, Mike (M.A.)
Sent: Tuesday, August 20, 2002 3:49 PM
To: Lizotte, Brian (B.W.)
Subject: FW: SSM 2001-2002 Focus Zetec P0401 (FCSD Global Template v1.0 Request for Input)

Brian,
Ryan combined several messages with the ISM to draft this SSM for DPFE

Mike Giordano
Focus Powertrain Quality
32-20925

"If you plan to fail, it will be easy to accomplish your goals !"

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

From: jmorri40@ford.com [mailto:jmorri40@ford.com]
Sent: Tuesday, August 20, 2002 2:33 PM
To: mgiordal@ford.com
Subject: SSM 2001-2002 Focus Zetec P0401 (FCSD Global Template v1.0 Request for input)

"(Begin automated email)

PRIVILEGED AND CONFIDENTIAL
Confidential Information - Do Not Distribute
*** DRAFT ***

This message is being sent on behalf of jmorri40 to jmorri40@ford.com, vcolatru@ford.com, kthomas1@ford.com, mgiordal@ford.com for purposes of email compatibility.
You are requested to provide input to the author of this message. Forward/send any comments to the author of this message only.

Comments:

The intent of the message is to provide the updated DPFE part #, and the 02 DPFE hose info to dealers, and to consolidate messages 14977, 15278, 02-06-015. and 02-08-034 into one message.

Author: jmorri40
Request Type: SSM
Title (subject): 2001-2002 Focus Zetec P0401
Applications:
{application 1} 2001-2002 Focus 2.0L Zetech

Activity Code: 053 FOCUS (NA)
QSF/Non-QSF Status: Non-QSF Item (system generated tracking number)
Tracking Number:
Is this a publication specs concern? No
Does this request supersede an active TSB/SSM/ISM? Yes
TSB/SSM/ISM to supersede: 02-06-015 15278 14977
Message Type: Final
Other applicable articles: 02-08-034
Date Repair was Verified: 11/20/2001 2:00:00 PM
Repair Verified by CDSID: kthomas1
Repair Verification: repair verified by engineering, new style DPFE reduces repeat repairs.

Are Parts Required? Yes
Are Illustrations Required? No
Contact information for additional illustrations:
CDSID:
Name:
Phone:
Illustration notes:

Is Calibration CD required? No
Calibrations:
Has a White Paper or Certification Wire been sent to VEE? N/A
Date White Paper or Certification Wire sent to VEE: 12:00:00 AM
Have you completed a part request for the calibrations listed? N/A
Do you have access to a vehicle for time study? N/A
Contact for vehicle CDSID: Trustmarks that apply: Ford
Article Distribution: NA: Canada, Mexico, United States
OASIS Service Codes: 690000 698298
Causal Basic Part # or Finis Code:
Issue/Cause TSB or SSM Text:
SOME 2001-2002 FOCUS EQUIPPED WITH A 2.0L ZETEC engine and a small tube mounted DPFE sensor MAY EXHIBIT A DIAGNOSTIC TROUBLE CODE (DTC) P0401 OR OTHER DPFE RELATED DTC'S. ADDITIONAL SYMPTOMS MAY INCLUDE NO START, NO COMMUNICATION WITH PCM, AND/OR ODOMETER READS ALL DASHES THIS MAY BE CAUSED BY A DPFE SENSOR SHORTING V-REF. If these codes and/or symptoms are pinpointed to the DPFE sensor then replace it WITH NORMAL SERVICE STOCK PART NUMBER 2F1Z-9J460-AA. Some 2002 Focus equipped with a 2.0L Zetec and a large bulkhead mounted DPFE may exhibit these DTC's as well. verify DPFE hose routing and integrity (the hoses may be damaged by the exhaust if misrouted), before condemning this style sensor.

Repair Action TSB:

Service Procedure TSB:

WERS Concern Number, Date Released in WERS

OSF single agenda date/program FRC date: 12:00:00 AM

Parts:

Special instructions/remarks:

Repairs Per 1000 Vehicles: 300

Year(s) of Vehicles: One Year Old

Criticality of Fix: Dependability perceived affected

Repair quantity needed as estimated by engineers: 55000

Is geographic location significant? No

If Yes, Vehicle Populations:

United States: 565750

Ford of Canada: 60740

Association: 0

Ford of Mexico: 35190

Europe: 0

Direct: 0

Asia/Pacific: 0

South America: 0

WDMO: 0

Aston Martin: 0

Mazda: 0

Ford: 661680
Mercury: 0
Jaguar: 0
Think: 0
Land Rover: 0
Volvo: 0
Lincoln: 0
Nissan: 0
VW: 0

SSM Number:

ECM Number:

Last act taken (as of 20-Aug-2002, 2:33:27 PM): Send for engineering input

(End automated email)"

From: Johnson, Joe (J.H.)
Sent: Tuesday, September 17, 2002 12:08 PM
To: Surti, P. J. (P.J.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); MacDonald, George (G.F.); Stump, Steven (S.M.); Dhallwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peppitone, Gil (J.); Maurer, James (J.B.)
Subject: RE: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

P.J., thanks for the note.

The "water" in the sensor is expected since it is a by-product of combustion; however, it isn't water, but an acidic solution (the water is just a carrier). We believe the acid then migrates through the gel and in time attacks the sensor electronics if they are not properly protected. In the case of the Focus, we believe the failure rate is also exacerbated by poor grounding on that car (Zetec only).

The correct action is to replace the sensor, but I would also suggest that the grounds be checked (I think there are about two dozen of them and I am not sure which are the most critical).

Joe Johnson

Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 89
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

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

From: Surti, P. J. (P.J.)
Sent: Tuesday, September 17, 2002 10:53 AM
To: Johnson, Joe (J.H.); Gates, Freeman (F.C.); Whitworth, Rudy (A.R.); Giordano, Mike (M.A.); MacDonald, George (G.F.); Stump, Steven (S.M.); Dhallwal, Dave (B.S.); Malloy, Gene (E.E.); Thomas, Ken (K.C.)
Cc: DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peppitone, Gil (J.); Surti, P. J. (P.J.)
Subject: REPEAT REPAIRS OF DPFE SENSOR FOR MILCONCERN

Hello Joe - I know you are not involved with Focus EGR system, but the attached CQIS report concern can happen to other vehicle lines too. We have seen this concern in past, but I like to know what to advise the techs. In this type of case, the DPFE was replaced due to the inside electronics issue more than year ago. So, the current sensor is better design sensor. But the vehicle came back due to water in the sensor. If this sensor would have been dried and cleaned, it probably would have worked. Although, due to the bad reputation of the sensor, the techs., just replace them. And this is happening on other applications too. One of the biggest MIL concerns at dealerships is the DPFE sensor MIL. And unfortunately, the concern repeats again.. It seems that this past big concern does not seem to go away. Any advice/suggestion on such repeat repairs will be appreciated. Thanks...

Rpt#: 2IQIV001 PTOFSE Rpt: 09/17/2002 Odom: 36,598 M
 Rvw: File: Folder: Images: 0 Print Smy/Disp Detail(P/D):
 Vehicle: 2001 FOCUS,ZX3 ,COUPE 3FAFP31341R108239 Bld: 09/07/2000
 Engine: 2.0L ZTECH Calb: Trans: MTX-75 E Axle: FWD 3.82 A/C: YES
 Dealer Id: 05517 Sunset Ford Ph#: (714) 372-4520
 State: California City: Westminster Orig/Caller: P. J. SURTI
 Symptom: 6 98 2 00 DRVABL,INDICATOR,CHECK ENGINE,OTHER-CODE NA
 Addl Sym: St: CCRG/EPRC: Rvw: Dt:
 Fix: Caus. Comp: SENSOR ASY EGR PR VL - RPL Condition Code: 42
 PSURTI (714) 962-3227 FAX: MIL? Y ABA? Symp V? Survey? N
 EO: EC: Pri St: O
 ER: CB: Inrmit? N

CONCER CHECK ENGINE LIGHT STAYS ON.

REPAIR HOOKED UP WDS AND RAN EEC SELF TEST. RETRIEVED THE KOEO-C DTC P0401.
 RAN DCL DISPLAY. MONITORED THE EGR SYSTEM. DPFE SENSOR WAS READING
 0.1 VOLT WITH KOEO AND ALSO WHILE RUNNING AT IDLE. AS PER PREVIOUS
 EXPERIENCE, THE TECH. REMOVED THE DPFE SENSOR AND FOUND WATER IN
 THE SENSOR. THE SENSOR HAD BEEN REPLACED ABOUT ONE YEAR AGO. AND
 NOW IT WAS ACTING UP AGAIN DUE TO WATER IN THE SENSOR. THE TECH.
 REPLACED THE SENSOR. THE MIL CONCERN IS RESOLVED AFTER THE REPAIR.

P. J. Surti

Powertrain FGS

T. No. (714) 862-3227

Fax No. (714) 962-4448

From: Johnson, Joe (J.H.)
Sent: Monday, June 24, 2002 11:58 AM
To: Surti, P. J. (P.J.); Gates, Freeman (F.C.); Bansek, Catherine (C.K.); Freeland, Mark (M.); Maurer, James (J.B.); Jensen, Ted (T.E.)
Cc: Giordano, Mike (M.A.); Dhaliwal, Dave (B.S.); MacDonald, George (G.F.); Malloy, Gene (E.E.); DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peppone, Gil (J.)
Subject: RE: STRANGE CASE OF 2001 FOCUS STALL

P.J., yes, when a sensor (DPFE, transmission and maybe others) on the V-Ref line fails, the vehicle will stall and not re-start. I believe the field was alerted to this some time ago (see



DPFE Field Failures
Short to V...

attached note).

Please send the sensor to me. Thanks.

Joe Johnson

Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 69
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

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

From: Surti, P. J. (P.J.)
Sent: Monday, June 24, 2002 11:24 AM
To: Johnson, Joe (J.H.); Gates, Freeman (F.C.); Bansek, Catherine (C.K.); Freeland, Mark (M.); Maurer, James (J.B.); Jensen, Ted (T.E.)
Cc: Giordano, Mike (M.A.); Dhaliwal, Dave (B.S.); MacDonald, George (G.F.); Malloy, Gene (E.E.); DiAngelo, Renaldo (R.); Noteboom, Jim (J.E.); Peppone, Gil (J.); Surti, P. J. (P.J.)
Subject: STRANGE CASE OF 2001 FOCUS STALL

Hello Joe - Pl. see attched CQIS report on 2001 Focus. The high incidence of DPFE quality is known concern and we have talked about it several times in past. But this DPFE failure mode is little strange, shorting Vref to ground and its effect of stalling on the road. Also, the inoperative Odometer display was an interesting part of the failure mode. It took some time to diagnose and finding the root cause due to the lack of communication with PCM and not being able to retrieve the DTCs. If you like to receive this sensor back for further test analysis, I can ship it wherever you like me to do so. So, Pl. let me know. Thanks...

CSQI002

CQIS Indicator Summary

06/24/02 10:43:43

==>

1 of 1

Rpt#: 2FX14001 PTOFSE Rpt: 06/24/2002 Odom: 11,600 M
Rvwd: File: _ Folder: _ Images: 0 Print Smy/Disp Detail(P/D): _
Vehicle: 2001 FOCUS,SE ,SEDAN 1FAHP34341W110512 Bld: 09/12/2000
Engine: 2.0L ZTECH Calb: 1AK1AZ0A Trans: FN 4SPD Axle: FWD 3.904 A/C: YES
Dealer Id: 05517 SUNSET FORD Ph#: (714) 372-4520
State: California City: Westminster Orig/Caller: P. J. SURTI
Symptom: 6 03 3 93 DRVABL,CRANKS/NO STAR,START ENG TEMP ,ALL ENGINE TEMP
Addl Sym: St: CCRG/EPRC: _ Rvwd: Dt:

EP02-027-0 27829

Fix: Caus. Comp: SENSOR ASY EGR PR VL - RPL Condition Code: 42
PSURTI (714) 962-3227 FAX: MIL? N ABA? Symp V? Survey? N
EO: EC: Prt St: O
ER: CB: Intrim? N

CONCER VEHICLE QUIT WHILE DRIVING AND WON'T RESTART.

REPAIR THE VEHICLE QUIT WHILE IDLING IN PARK AND WON'T RESTART. CHECKED THE BATTERY AND STARTING SYSTEM. EVERYTHING WAS O'K. HOOKED UP WDS. BUT THERE WAS NO COMMUNICATION WITH PCM AND COULDN'T RUN EEC SELF TEST. ALSO, THE TECH. NOTICED THAT THE ODOMETER DISPLAY ON THE INSTRUMENT CLUSTER WAS INOPERATIVE. RAN PINPOINT TEST FOR EEC SYSTEM. FOUND DPFE SENSOR VREF CKT. SHORTED TO GROUND. REPLACED THE DPFE SENSOR. THE VEHICLE STARTED AFTER THE REPAIR. THE ODOMETER DISPLAY ALSO STARTED TO WORK FINE AFTER THE REPAIR.

P. J. Smith

Powertrain PQE

T. No. (714) 962-3227

Fax No. (714) 962-4448

From: Katie (Catherine) Connaughton [Kconnaughton@msxi.com]
Sent: Monday, December 09, 2002 10:13 AM
To: cverner@ford.com
Cc: jmaurer@ford.com; mduke@ford.com; Mpoggi@retlif.com
Subject: RE: NOTIFICATION OF ORDER PLACEMENT

Hello -

Per Retlif, the PO was emailed 10:15 am EST 12/9/02 to mpoggi@retlif.com

I did confirm their mailing address, and we did have the correct address when it was mailed 9/12/02, so I am assuming it was misplaced on the part of Retlif.

Thanks.

Katie (Catherine) Connaughton
MSX Buyer
28333 Telegraph Road
Suite 575
Southfield, MI 48034
Phone: 248-304-7707
Fax: 248-304-7738
kconnaughton@msxi.com

>>> "Verner, Carol (C.J.)" <cverner@ford.com> 12/06/02 02:48PM >>>
Katie,

We need you assistance with the status of this PO to Retlif Testing Labs. Within the next couple of weeks, I will want Retlif to begin engineering testing of some components. I spoke with Retlif this afternoon and they inform me that they are not aware of this PO and as a result they will not put us into their schedule unless they have a confirmed PO. I am interpreting from this email that both Ford and MSX/ADTEAM PO have been assigned. Can MSX/ADTEAM please contact Mr. Richard Reitz (631) 731-1500 (x28) and confirm this PO with him. They need to know how to bill for their services at test completion.

If you have any questions, please respond back vial Reply All.

Thank you
Carol Verner
313-390-7180

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

From: Katie (Catherine) Connaughton [mailto:Kconnaughton@msxi.com]
Sent: Thursday, September 12, 2002 1:40 PM
To: CVERNER@ford.com
Subject: NOTIFICATION OF ORDER PLACEMENT

Hello!

The following is a confirmation of the purchase order issued by MSX/ADTEAM on behalf of Ford Motor Company or its affiliates:

Ford P.N. Number: A-AT-RL02186767
MSX/ADTEAM PO #: 00200 2020
Estimate Amount: \$50,000.
PO Date: 9/12/2002
Supplier: RETLIF TESTING LABORATORIES

Order History:

RQ Initiated at Ford: 8/6/2002
PN Received by MSX/ADTEAM: 8/29/2002
Purchase Order Released to Supplier: 9/12/2002

THIS IS NOT A REQUEST FOR PAYMENT APPROVAL

* To help expedite your orders in the future, please provide as much of

the following information as possible to MSX/ADTEAM at the time of order initiation:

- Supplier name & address included in the description or clause sections of the order
- Any supporting documentation with PN# referenced (T&C's, shipping instructions)
- All orders over \$10,000 will require a quote and single source letter faxed to (248) 304-7738.
- We request suppliers send an invoice copy to the Ford Requester for informational purposes.

Next Step:

- The above mentioned order has been issued to the supplier. They may now send invoices to MSX Accounts Payable after performing work specified on this order.
- Upon receipt of the supplier's original invoice and your verification of services rendered or material received, MSX ADTEAM will make payment according to the purchase order payment terms.

***** MSX ADTEAM Website Address: TBD

***** CPARS assistance/training is available by contacting the helpdesk at (313) 317-4957.

From: King II, Lamar (L.L.)
Sent: Friday, September 13, 2002 7:40 AM
To: Grandas, Joseph (J.M.); Crawley, Ian (I.A.)
Cc: Gates, Freeman (F.C.); Maurer, James (J.B.); Johnson, Joe (J.H.); O'Neill, Jim (J.D.)
Subject: FW: Failure Analysis of 8 recent returns

Appears we should have some new 8Ds coming our way soon.

A PASSION FOR "CUSTOMER SATISFACTION"

Lamar L. King II
Supervisor- I4 & SMALL V6 EGR SYSTEMS
Fuel Metering, Emissions and Ignition Systems Engineering, VRS Engine Engrg.
Phone (313) 594-1633 Fax (313) 390-4084
LKingI@ford.com Text/ Page (313) 795-5332

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

From: Nydam Ken [mailto:Ken.Nydam@at.siemens.ca]
Sent: Friday, September 13, 2002 7:18 AM
To: 'lkingI@ford.com'
Subject: FW: Failure Analysis of 6 recent returns

Hi Lamar,
update on the latest samples sent to Kavlico.

Ken Nydam
Technology Manager
Siemens VDO Automotive Ltd.
Phone: (519) 436-3613
Fax: (519) 436-3836
mailto:ken.nydam@siemens.com

The message is intended only for the use of the intended recipient(s). It is confidential and may also be privileged and/or exempt from disclosure under applicable law. If you are not the intended recipient(s), you are hereby notified that any review, retransmission, conversion to hard copy, copying, circulation or other use of this message is strictly prohibited and may be illegal. If you are not the intended recipient(s), or have received this message in error, please notify the sender immediately by return E-mail and delete this message.

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

From: Ayers, Don [mailto:DAyers@kavlico.com]
Sent: Thursday, September 12, 2002 8:34 PM
To: Hueniken Peter; Nydam Ken
Cc: Gandaria, Enrique; Tamashiro, Terry; Bugaj, Barry; makins@ford.com
Subject: Failure Analysis of 6 recent returns

Peter and Ken,

Here's a summary of the 6 parts we received on Wednesday:

RML	PART NO	CUST PART NO	DATE CODE	CUST SERIAL NO	UPDATE
-----	---------	--------------	-----------	----------------	--------

87283A-001 P604-9746 388934 0L17B RA31024 ALUMINUM WIRE
FATIGUE
87283A-002 P604-9746 388934 1F01B RA31017 Map Die output wire
(6) Looks to be EOS. Needs engineering confirmation
87283A-003 P604-9746 389114 2E20B RA31030-1 SHORTED 4
CAP ARRAY (C2C)
87283A-004 P604-9746 389114 2E21B RA31030-2 SHORTED 4
CAP ARRAY (C2B)
87283A-005 P604-9746 389114 2F14B RA31022-2 Unknown at
this time. Analysis needs to be continued
87283A-006 P604-9746 389114 2D25B RA31022-6 TNI. Power
up/ power down test still needs to be performed when time is available.

4 of 6 have had root cause identified. One of the rest appears to be EOS
and the other is still being analyzed.

Regards,
Don

From: McCarty, Bill (W.D.)
Sent: Wednesday, September 04, 2002 7:52 AM
To: Akolkar, Shrikant (S.V.); Edson, Sharon (P.)
Cc: 'tsweeringen@kavlico.com'; Akins, Mary (M.); Maurer, James (J.B.)
Subject: RE: Kavlico DPFE Sensors 2F1E-9J460-AB

Sharon sourced the proto-types, per an RPS. Please see the detailed information below. There is another RPS for the same part number that is awaiting sourcing, but since Sharon originally processed the RPS and priced the proto-type parts, there is no need since the order that she processed would be a blanket P.O. for this part number.

WIPS G01X DK ATP Overview 02/09/04 R1362132

User : GH76 MCCARTY, BILL Page : 01

Enquiry : GENERAL ENQUIRY Buyer Code : GH15
Part : 2F1E 9J460 AB ATP/Status : VQ6405 COMPLETE
Pt Name B : DPFE ATP Causal : NEW PART
Eng Level : RPS 30L KB21 TOOLNG 020502 RFQ Return : 020531 ILVS : N
Superseded : Estimate : N Target: NO
Prod Lines : 30L ATP Recvd : 020502 Rolled: R
Comm Code : E490 EMISSION COMPONENTS Drwg Aff : NO Proto : YES
Wkly CPV : Old : 0 Program ID : RC RFQ Remark :
New : 1 UoM : EA

S Supplier	RFQ	Work Item	Status	Estimate
_ K046D KAVLICO CORP	020510	PROTOTYPE PIECE PRINTED	020510	
_ K046D KAVLICO CORP	020510	PRODUCTION PIECE SOURCE ONLY	020510	NOT RQSTD

WIPS G61X BW Purchase Order Details 02/09/04 R1362132
MSG-0740 PURCHASE ORDER/AMENDMENT PREVIOUSLY PRINTED (N)
User : GH76 MCCARTY, BILL Page : 1

Part Number : 2F1E 9J460 AB ATP : VQ6405
Part Name : DPFE
Eng Level : RPS 30L KB21 020502 TOOLNG Rmks/Non Std : NO NO
Min Run : 0
Supplier : K046D KAVLICO CORP Ctry Orig/Con: US N
Economics : (L) 020101 (M) 020101 (O) 020101 Belgium/Verif: N N
Auto Matrix : KGM: Ind:

CF/PO/Issue : D INITIAL 01 020510

T Nat Pl % Price USD UOM Effect End Pay Del Pkg MWST Link IRI

D FUS ** 100 9.65000 EA 020101 031231 8 C A S N

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

From: Akolkar, Shrikant (S.V.)
Sent: Friday, August 23, 2002 12:39 PM
To: Edison, Sharon (P.)
Cc: McCarty, Bill (W.D.); 'tsweARINGen@kavlico.com'; Akins, Mary (M.); Maurer, James (J.B.)
Subject: RE: Kavlico DPFE Sensors 2F1E-9J460-AB

Sharon;

My RPS couldn't have been sourced in May 2002. I issued paper RPS on 6/19/02 for 24 Kavlico sensors part# 2F1E-9J460-AB. I am faxing you the RPS for your follow-up. Pl. give us the PO# immed so that Mary Akins of Kavlico will provide help to get parts soon.

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

From: Edison, Sharon (P.)
Sent: Friday, August 23, 2002 11:34 AM
To: Akolkar, Shrikant (S.V.)
Cc: McCarty, Bill (W.D.); 'tsweARINGen@kavlico.com'; Akins, Mary (M.); Maurer, James (J.B.)
Subject: RE: Kavlico DPFE Sensors 2F1E-9J460-AB

Prototypes were sourced in May, 2002...

Thank you

Sharon P. Edison

Powertrain Purchasing
(313) 390-3512 office
(313) 248-9206 fax
sedison@ford.com

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

From: Akolkar, Shrikant (S.V.)
Sent: Thursday, August 22, 2002 4:47 PM
To: Edison, Sharon (P.)
Cc: McCarty, Bill (W.D.); Akolkar, Shrikant (S.V.); 'tsweARINGen@kavlico.com'; Akins, Mary (M.); Maurer, James (J.B.)
Subject: FW: Kavlico DPFE Sensors 2F1E-9J460-AB

Sharon,

I issued this RPS about couple of months ago as an urgent engineering requirement for test. I got all other things ready now at MPG & dyno lab but have no sensors to test. Can you pl. process the order immed & explain when parts will be available for test. Pl. forward this message to those who are responsible for actions. Thanks.

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

From: Akins, Mary (M.)
Sent: Tuesday, August 20, 2002 1:23 PM
To: Edison, Sharon (P.)
Cc: McCarty, Bill (W.D.); Akolkar, Shrikant (S.V.); 'tsweARINGen@kavlico.com'; Akins, Mary (M.)
Subject: RE: Kavlico DPFE Sensors 2F1E-9J460-AB

Sharon,

Do you have a PO number for this order? Kavlico still is not seeing the order. Shri Akolkar has been waiting patiently for the parts to put on test. Please advise what to do.

Regards,
Mary Akins

EA82-027-G 27090

Ford phone: (313) 248-1989

Ford fax: (313) 845-3169
makins@ford.com
makins@kavlico.com
Cell Phone/Messages: (586) 942-9606
Kavlico phone: (248) 263-8757

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

From: Akins, Mary (M.)
Sent: Wednesday, August 14, 2002 2:22 PM
To: Edison, Sharon (P.)
Subject: RE: Kavlico DPFE Sensors 2F1E-90460-AB

Production.

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

From: Edison, Sharon (P.)
Sent: Wednesday, August 14, 2002 2:16 PM
To: Akins, Mary (M.)
Subject: RE: Kavlico DPFE Sensors 2F1E-90460-AB

Is this for prototypa or production?

Thank you

Sharon P. Edison

Powertrain Purchasing

(313) 390-3512 office

(313) 248-9206 fax

sedison@ford.com

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

From: Akins, Mary (M.)
Sent: Wednesday, August 14, 2002 2:02 PM
To: Edison, Sharon (P.)
Subject: RE: Kavlico DPFE Sensors 2F1E-90460-AB

We have been waiting to see a PO for the 24 pieces for at least two weeks. The parts are needed for testing but we don't want to ship unless we have a PO. Bill McCarty says you are the one with info on the PO.

Can you help us?

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

From: Edison, Sharon (P.)
Sent: Wednesday, August 14, 2002 1:59 PM
To: Akins, Mary (M.)
Subject: RE: Kavlico DPFE Sensors 2F1E-90460-AB

What is the issue?

Thank you

Sharon P. Edison

Powertrain Purchasing

(313) 390-3512 office

(313) 248-9206 fax

sedison@ford.com

---Original Message---

From: Akins, Mary (M.)
Sent: Wednesday, August 14, 2002 1:57 PM
To: Edison, Sharon (P.)
Cc: McCarty, Bill (W.D.)
Subject: Kavlico DPFE Sensors 2F1E-9J460-AB
Importance: High

Sharon,

Bill McCarty instructed Terry Swearingen of Kavlico to contact you regarding a PO# for 24 DPFE sensors, part number 2F1E-9J460-AB. Terry has tried to contact you several time regarding this issue and is now asking that I try to get a hold of you regarding this order.

If you have any questions or need more information please contact myself at the number listed in my signature below, or Terry Swearingen at (805)523-2000 ext. 2225.

Regards,
Mary Akins

Ford phone: (313) 248-1989
Ford fax: (313) 845-3169
makins@ford.com
makins@kavlico.com
Cell Phone/Messages: (586) 942-9606
Kavlico phone: (248) 263-8757

From: McCoy, James (J.D.)
Sent: Thursday, September 26, 2002 2:43 PM
To: Freeland, Mark (M.); Akolkar, Shrikant (S.V.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Duncan, Jack (J.L.)
Subject: RE: Iref spikes-MPG Focus MZ4 sensor

This is the same issue we have discussed in the past. I understand that the steady state current is 7-8mA, but the spikes that are being seen in the trace look to be the same current spikes that have been seen since day one. Lets look back at the early data that was collected on the Focus which showed an increase in the current during tip in/drive away. These increases in current were directly related to the ignition breakdown event. We know that. Once again, without using the term "could be related", where is the evidence that shows this noise contributes to the demise of the dPFE sensor?

I do not believe the statement that the "the dPFE current is not normal" is correct. As long as we have an inductive ignition system we will have noise. The only way to totally eliminate the ignition noise is not to start the vehicle. And as long as there is noise, you will see it conducted and coupled in the harness. The methods you use to measure the noise will also impact the perceived amount of noise on any given circuit. We have even tried to show how noise is coupled into instrumentation by providing scope traces of the noise with the signal wire shorted to ground. No one ever even commented on it. Duration of this current should also be addressed, but again, we have discussed this 20-50nS pulse to no conclusion.

When attempting to design a component, external noise variables that can't be changed need to be taken into account to make the component robust against such noise.

Sensors are failing. That doesn't "Define the problem". That is the end result of a problem. Define the problem. Measure and collect data. Analyze the data. The only problem here is we have data that we analyze but we don't know what the true definition of the problem is. It may be current spikes, it may be di/dt, it may be we need a stand alone VREF, it may be plugs, it may be grounds, it may be a combination of sensors, it may be a connector, it may be the harness, it may be the PCM, it may be pressure, it may be contamination, it may be heat, or it may be the sensor.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering

Hardware Control Interface Group

V-Engine Engineering

POEE - MD#69 - Rm. D142 - Cube DF186

Phone (313) 33-79690 / Fax (313) 39-04084

E-Mail: jmcocoy1@ford.com

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

From: Freeland, Mark (M.)
Sent: Thursday, September 26, 2002 1:48 PM
To: Akolkar, Shrikant (S.V.); McCoy, James (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Duncan, Jack (J.L.)
Subject: RE: Iref spikes-MPG Focus MZ4 sensor

All,

No the reported dPFE current is not normal. I ref should be quite steady at about 7 - 8 mA with a slight drop of up to about 1.2 mA as the dP increases toward 100 inches. It is also a weak function of die temperature, which changes only slowly. The slope of the temperature response is about 0.0277 mA per deg. C. If the reported current is real, there is something significant going on.

EA02-027-G 27142

I would suggest returning the vehicle to Dearborn, so that the EE folks can sus it out in a location where they have access to all the right gear. I would be happy to help out if you like.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Akolkar, Shrikant (S.V.)
Sent: Thursday, September 26, 2002 1:11 PM
To: McCoy, James (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Duncan, Jack (J.L.); Freeland, Mark (M.)
Subject: FW: Iref spikes-MPG Focus M24 sensor

Jim,

Where are buddy? You didn't call or respond. I need your opinion on continuous current fluctuations I am seeing all the time. This ~20ma fluctuation is normal, only on Focus, harmful for sensor? Pl. comment. Pl. ignore Ref pressure plot here. I had axis error. When EGR flows, HI-REF pressure is about ~4"Hg.

Mark, your comments?

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

From: Akolkar, Shrikant (S.V.)
Sent: Wednesday, September 18, 2002 9:56 AM
To: Duncan, Jack (J.L.); McCoy, James (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Iref spikes-MPG Focus M24 sensor

Jack/Jim,

Iref is dark blue line with spikes from beginning to end. Can you check wiring, connection etc. Jim McCoy, can you suggest remedy or is it how sensor is behaving? I am looking at this sensor data from beginning & other sensors data. I will let you know.

<< OLE Object: Microsoft Excel Chart >>

With Regards,
Shrikant Akolkar
sakolkar@ford.com Ph:(313) 594-1908, Fax:390-1229
Ford Motor Co. POEB Buldg. AQ077
21500, Oakwood Blvd. P.O.Box 2053, MD#36
Dearborn, MI 48124 U.S.A.

From: McCoy, James (J.D.)
Sent: Monday, June 10, 2002 1:52 PM
To: Poma, Amy (A.)
Cc: McCoy, James (J.D.); Zamora, Melissa Iefret (M.I.); Maurer, James (J.B.)
Subject: RE: 2001 Tribute

The starting test mileage is 19208.

Tektronix Scope 784A
Pearson Current Ring 2877

CH 1 = DPFE Output (volts)
CH 2 = VREF (volts)
CH 3 = VREF (current)

Driver: Krzyska/McCoy/Kazmer

Configuration is Complex due to scope/trigger configuration and method of data collection.

The trigger configuration is as follows:

Type= Pulse
Class= Width
Source= CH3
Polarity= Positive
Level= 250mA
Pulse Limits= Lower 10uS/Upper 1.0S

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

---Original Message---

From: Poma, Amy (A.)
Sent: Monday, June 10, 2002 8:28 AM
To: McCoy, James (J.D.)
Subject: RE: 2001 Tribute

Thanks for the info. Can you please provide:

Test Equipment, (i.e.)

Tektronix 754C, etc. like you did for vehicle #1? To clarify, the data below is complex instrumentation info, correct? If so you had given me other "configuration" info for #1 which was CH1=N/A, CH2 = V signal out @ dPFE sensor, etc. I'm trying to standardize the spreadsheet and have the same info for each car.:

Test Equipment

ER02-827-G 27154

Configuration
Driver
Mileage at test start
Weekly mileage
Simple/Complex Instrumentation (list specifics)

Let me know when you can, thanks.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CQ-156
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

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

From: McCoy, James (J.D.)
Sent: Friday, June 07, 2002 3:43 PM
To: Poma, Amy (A.)
Cc: Maurer, James (J.B.)
Subject: 2001 Tribute

Amy, The Tribute is on the road being tested. The test configuration would be considered complex. The starting test mileage is 19206. The trigger configuration is as follows:

Type= Pulse
Class= Width
Source= CH3
Polarity= Positive
Level= 250mA
Pulse Limits= Lower 10uS/Upper 1.0S

Regards,
Jim McCoy
Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

From: Naushad Hossain [NHossain@kavlico.com]
Sent: Monday, July 23, 2001 2:37 PM
To: jmaurer@ford.com
Cc: Kyong Park; Bob Welka; Mary Akins
Subject: FW: Latest Data for All Returns



Blackbelt Freeland
All Data pa...

Jim:

Attached please find the data. Please let me know if you cannot open the file.

Regards,
Naushad

> -----Original Message-----
> From: Don Ayers
> Sent: Tuesday, July 17, 2001 1:29 PM
> To: Mark Freeland (E-mail)
> Cc: Naushad Hossain
> Subject: Latest Data for All Returns
>
> <<Blackbelt Freeland All Data past 2-15-00 to 7-01.zip>>

From: Nehasil, Linda (L.F.)
Sent: Thursday, January 03, 2002 5:11 PM
To: Owens, Karen (K.E.)
Cc: Dakhilallah, Hassan (H.A.); Nehasil, Linda (L.F.)
Subject: RE: PT Quality Steering Team Meeting

Thanks for the information Karen. With regard to our PTQRT meeting on Tuesday, January 8th, will there be any info. from the 14D that you can share with us at that time? We have you on the agenda for report out on the status of the 14D. If not, when do you think you can present in the PTQRT? thanks!

Quality comes first....
Linda F. Nehasil
Explorer Powertrain Quality
32-38671

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

From: Owens, Karen (K.E.)
Sent: Thursday, January 03, 2002 4:56 PM
To: Nehasil, Linda (L.F.)
Cc: Dakhilallah, Hassan (H.A.)
Subject: RE: PT Quality Steering Team Meeting

Linda, we have been working on a corporate 14D that should answer all of your questions. We have reviewed it with our Chief Engineer and he had advised us to make some modifications as we are working with two other divisions within the 14D before presenting it to all of Ford. However, for your information, the variable cost and tooling for pressure die latch up and alignment of diffusion mask is \$0 to Ford Motor. The unprotected area damage resolution is still in the developmental stages and no tooling or variable cost numbers have been shared. Once that information is available, you will need to obtain it from our purchasing group and at that time I will be able to direct to the appropriate person since things are somewhat dynamic at the beginning of this year. Please advise if there if I can be of further assistance. Thank you.

Change is Good. Proactivity is Better!

Karen E. Owens

Supervisor

4.0L Engine Systems

(off) 313.845.5770

(fax) 313.390.2513

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

From: Nehasil, Linda (L.F.)
Sent: Thursday, November 29, 2001 9:33 AM
To: Owens, Karen (K.E.)
Cc: Dakhilallah, Hassan (H.A.)
Subject: FW: PT Quality Steering Team Meeting

Hi Karen, I work for Hassan Dakhilallah in the Explorer PTQRT and I am working on an assignment to complete a roadmap of issues we are following that will go into production next year. One of these is the Kavlico sensor updates. On my roadmap I have listed the corrective actions that have not been implemented as yet per the 8D summary you sent out. (actions 1, 2 and 3 a and b) What I need is the variable cost and tooling impact of these actions. Is this information available? If so, can you provide it or tell me who to contact. Thanks alot, I need this info. as soon as possible.

Quality comes first....
Linda F. Nehasil
Explorer Powertrain Quality
32-38671

EA82-027-G 27313

---Original Message---

From: Dakhlallah, Hassan (H.A.)
Sent: Tuesday, November 13, 2001 10:51 AM
To: Sloan, Burt (B.E.); Nehasil, Linda (L.F.); Adams, Kerry (K.N.); Boyk, Greg (G.J.)
Subject: FW: PT Quality Steering Team Meeting

Info. On DPFE Issue Resolution Status.

---Original Message---

From: Owens, Karen (K.E.)
Sent: Monday, November 12, 2001 9:21 AM
To: Tracy, Lynn (L.J.); Grewal, Bill (B.S.); Fascetti, Bob (R.J.); McCliment, Bob (R.S.); Preston, Carla Trad (C.T.); Miller, Cary (C.D.); Freese, Charles (C.E.); Hollister, Dave (D.); Schuetzler, Dennis (D.E.); Brewer, Gary (G.L.); Mazzella, Gary (G.R.); Hansen, George (G.C.); Schmidt, Gregory (G.A.); Lowman, Harold (H.R.); Dakhlallah, Hassan (H.A.); Conroy, Jerry (J.R.); Klarr, Jerry (G.T.); Zhou, Jianhua (J.); Van Gilder I, Jim (J.); Rashidi, Karim (K.K.); Layden, Kevin (K.E.); Neutgens, Kurt (K.J.); Hoffman, Michael (M.V.); Guys, Philip (P.R.); Bess, Raynard (R.); Patel, Sam (S.N.); Corbett, Sandra (S.M.); Ward, Sheila (S.A.); Judge, Surinder (S.S.)
Subject: RE: PT Quality Steering Team Meeting

Team, this is the latest report regarding the Kavlico dPFE sensor.

<< File: Kavlico TMDPFE Update.doc >>

Change is Good. Proactivity is Better!

Karen E. Owens

Supervisor

4.0L Engine Systems

(off) 313.845.5770

(fax) 313.390.2513

---Original Appointment---

From: Tracy, Lynn (L.J.)
Sent: Monday, November 12, 2001 8:55 AM
To: Bill Grewal; Bob Fascetti; Bob McCliment; Carla Trad Preston; Cary Miller; Charles Freese; Dave Hollister; Dennis Schuetzler; Gary Brewer; Gary Mazzella; George Hansen; Gregory Schmidt; Harold Lowman; Hassan Dakhlallah; Jerry Conroy; Jerry Klarr; Jianhua Zhou; Jim Vangilder; Karen Owens; Karim Rashidi; Kevin Layden; Kurt Neutgens; Michael Hoffman; Philip Guys; Raynard Bess; Sam Patel; Sandra Corbett; Sheila Ward; Surinder Judge
Subject: PT Quality Steering Team Meeting
When: Occurs every 2 week(s) on Monday effective 11/26/01 until 12/10/01 from 4:00 PM to 5:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: PDC 1GB55

From: Nleean, Christian (C.A.)
Sent: Friday, March 08, 2002 3:06 PM
To: Maurer, James (J.B.); McCarty, Bill (W.D.)
Cc: O'Neall, Jim (J.D.); Pinkerton, Donna (D.)
Subject: RE: Kavlico Releases and Capacity to support a service campaign

Jim,

Please forward this information to Barry Bugai. I do not have his e-mail address.

Based on conversations with John Shore it appears these parts will "self-campaign". This means the failure rate is so high that the parts will completely turn-over without a recall campaign.

The monthly requirements are as follows:

YF1E 8J460 AD	36,000
YM2A 8J460 AB	10,000

Please let me know how Kavlico plans on supporting these numbers.

Chris Nielsen
Buyer, Electrical/Electronics
Ford Customer Service Division
Phone: 734 266-9886
Fax: 734 523-5672

---Original Message---

From: Maurer, James (J.B.)
Sent: Friday, March 08, 2002 11:48 AM
To: McCarty, Bill (W.D.); Nielsen, Christian (C.A.)
Cc: O'Neall, Jim (J.D.)
Subject: Kavlico Releases and Capacity to support a service campaign

Bill and Chris,

The 14D team for Kavlico sensor issues is considering a recall of some of the DPFE sensors. As part of the investigation, we need to determine if Kavlico has sufficient capacity to support remaining tube mounted DPFE releases, ESM volumes, normal service volume, as well as a campaign.

Bill,

Can you supply projected Kavlico tube mount sensor volumes and ESM volumes to Kavlico through the end of the year?

This would include the reduction in Kavlico volume based on the introduction of Motorola.

Chris,

Can you supply projected service requirements for Kavlico based on how many parts are being sold now?

Please supply the information to Barry Bugai in the Kavlico sales office and he will determine what extra capacity is available for campaign parts.

Regards,

Jim Maurer

James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084

EA02-827-G 27318

Text Page: (313) 795-5219
Email: jmaurer@Ford.com

From: Kaput, Barb (B.J.)
Sent: Wednesday, March 13, 2002 9:19 AM
To: Chang, Doug (D.K.)
Cc: Galante, Chris (C.R.); Eller, Michael (M.R.); Losh, Rick (R.D.)
Subject: RE: Powertrain Daily Claims

Doug, I have no idea. As you know this is a supplier that historically has been difficult to get data out of. I've assigned Chris Galante to the team, because I was not getting data on a regular basis and felt exposed to huge risk. The two STAP returns were received at Kavlico, but failure mode is TBD with TBD timing. We'll keep pushing. We know of 3 failure modes that Kavlico has been assuring us accounted for close to 100% of the failure modes, but the two STAP returns at first glance don't fit any of the three. We'll continue pushing.

Barb Kaput

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

From: Chang, Doug (D.K.)
Sent: Tuesday, March 12, 2002 6:46 PM
To: Kaput, Barb (B.J.)
Cc: Eller, Michael (M.R.); Losh, Rick (R.D.)
Subject: FW: Powertrain Daily Claims

Barb,
Any idea what's going on? We had 5 claims on 3/6, and 2 claims on 3/7.

Regards,
Doug K. Chang
Resident Engineer, Powertrain Operations
PVT Office, P.O. Box 2005
St. Thomas, Ontario, Canada N5P 3W1
Tel. 519-637-5375, FordNet-782-5375, Fax.519-637-5461

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

From: Duncan, Melanie (M.)
Sent: Tuesday, March 12, 2002 10:59 AM
To: Ahn, Wan Ho (W.); Bertone, Carmen (C.P.); Chang, Doug (D.K.); Draper, Jeanine (J.S.); Duncan, Melanie (M.); Hein, Burk (B.); Jackson, Mike (M.); Koski, Jeffrey (J.A.); McCarter, Wayne (W.D.); Petroeanu, Dan (D.)
Cc: Byk, Edward (E.F.); 'jcheval3@vision.com'
Subject: Powertrain Daily Claims

Summary of claims for load date 3/8/02:

6 NPF
1 Engagement clunk
3 DPFE sensor replaced (BD 1/28/02, 2/12/02)
1 Replace transceiver/ screw through wire
1 Stall - replace air bypass valve
1. Replace hego sensor
1 Replace VMV
1 Replace fuel gauge (open circ)
1 Loose gas cap
10 Belt toss
1 Lower rad clamp loose
1 Adjust shift indicator
2 Loose cooler lines
1 Loose torque converter nuts

ER82-827-G 27848

- 1 OD button broken (BD 2/22/02)
- 1 Replace transmission
- 3 Replace battery
- 1 Replace engine - leak?
- 1 Head gasket leak
- 1 Exhaust rattle
- 1 Loose heater hose
- 1 Tighten rear end mounts
- 1 Reprogram key
- 1 Repair starter circuit
- 1 Stall - headlight switch shorted
- 1 Replace fuel pump
- 1 Wire repair C140
- 1 Poor connection @ hego
- 1 Replace COP
- 1 Fix #2 spark plug wiring
- 1 Replace ignition lock cylinder
- 1 Loose torque centre bolt
- 1 Replace starter motor

Should you require further details on any of these claims please contact me.

Melanie Duncan
PTSE Quality Analyst
Powertrain Systems Engineering

Tel: 519-637-5421
Fx: 519-637-5461

From: O'Neall, Jim (J.D.)
Sent: Thursday, December 05, 2002 11:58 AM
To: 'jpark@kavlico.com'
Cc: Maurer, James (J.B.)
Subject: FW: Kavlico Layouts for the Filter Rev 2.0

Please see Mark Frøeland's request below. He needs some parts and some specific drawings.

J. D. O'Neall

Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

---Original Message---

From: Frøeland, Mark (M.)
Sent: Thursday, December 05, 2002 11:01 AM
To: O'Neall, Jim (J.D.); Tracz, Jarek (J.A.)
Cc: Gates, Freeman (F.C.); Maurer, James (J.B.); Alles, Sheran (S.A.); Kotwicki, Allan (A.J.)
Subject: Kavlico Layouts for the Filter Rev 2.0

Jarek,

Thank you for taking the time yesterday to discuss the layout and circuit design with me. Attached are the bitmap files showing the Vref (5 volt) and the Vout (Signal to the PCM) tracks. I am still working on trying to decipher the ground paths.

The first concern that I have and wish to document is that the Kavlico's version of the schematic shows the locations of the C5 and Z1 swapped, and the locations of C2 and D1 swapped, when compared to the schematic that I provided. Although, as far as a Net List is concerned the circuits are equivalent, they will behave differently at high frequency. Kavlico's proposed layout is implemented like their schematic (not our schematic) as far as C5 and Z1 are concerned. Kavlico's proposed layout is not implemented like their nor our schematic as far as C2 and D1 are concerned. I am sure that you will cover these two points in greater detail in your review of the layout.

Jim O'Neall,

As Freeman is out of town, could you please pass on the following request to Dr. Park:

- 1) When can we set up a meeting to discuss the details of the layout with Kavlico? I would like to do this soon.
- 2) Please provide two additional drawings electronically (B&W .bmp or .tif would be best). One to show ONLY the first conductor layer and the outline of the substrate. The second to show ONLY the second conductor and the outline of the substrate. This is needed as the layout drawings received are difficult to follow because there are multiple layers shown on the same drawings (i.e. conductor and insulator).

Also, I am still waiting for connectors to build additional prototype bread boards for Freeman (for the corner testing). Could you ask Kavlico if they could supply me with 6 or more loom side connectors with short pig tails (I only need them to be 2 or 3 inches long, but will cut if they supply longer).

Thank you.

PS The drawings will follow separately in two emails as they are too big for this one email.

Regards

EA02-027-G 27325

Mark Freeland

**6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645**

From: O'Neill, Jim (J.D.)
Sent: Thursday, December 05, 2002 6:17 AM
To: Nielsen, Christian (C.A.)
Cc: Samouelian, Al (A.L.); Johnson, Joe (J.H.); King II, Lamar (L.L.); Maurer, James (J.B.)
Subject: FW: TMDPFE Sourcing Commitment Letter Draft to Motorola

Importance: High

I forwarded you a meeting notice on Dec 11th, CR 229, QMP, set up by Al Samouelian, that is going to discuss "DPFE/ESM Chip Sourcing". I would encourage you to attend this meeting before finalizing your response to Motorola. There could be some issues around too many programs at Motorola and we may have to recommend that we switch our decision and go to Honeywell for your service parts. Besides this meeting we have a high level meeting with Motorola on Dec 18th as well.

J. D. O'Neill
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

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

From: Vadnais Jeffrey-G15043 [mailto:Jeffrey.Vadnais@motorola.com]
Sent: Wednesday, December 04, 2002 6:36 PM
To: 'Chris Nielsen (E-mail)'
Cc: Defreese Jeff-G10068; Veluz Janice-G10092; Wagner Dave-GUSR135; Sievers Kirk-GUSR134; Joe Johnson (E-mail); Karl Kloup (E-mail); Jim O'Neill (E-mail)
Subject: RE: TMDPFE Sourcing Commitment Letter Draft to Motorola
Importance: High

Chris,

I am just following up my phone call to your earlier. I was wondering what the next steps are to move forward for the sourcing commitment on the TMDPFE sensor program?

Please let me know the status so I can advise the Ford EGR team.

Thanks,

Jeff Vadnais

> -----Original Message-----

> **From:** Vadnais Jeffrey-G15043
> **Sent:** Tuesday, November 19, 2002 4:26 PM
> **To:** Chris Nielsen (E-mail)
> **Cc:** Defreese Jeff-G10068; Veluz Janice-G10092; Wagner Dave-GUSR135;
> Sievers Kirk-GUSR134
> **Subject:** TMDPFE Sourcing Commitment Letter Draft to Motorola
> **Importance:** High

>

> Chris,

>

> As we discussed in our meeting with Joe Johnson on Monday November 18,
> 2002, here is the letter draft Motorola would require for sourcing

> commitment from Ford for the TMDPFE sensor program.
>
> << File: FCSD TMDPFE Sourcing Comm Ltr Draft REV A.doc >>
>
> I have taken the liberty to insert our engineering estimates and
> assumptions that Motorola has been provided thus far from Ford for this
> opportunity, along with the 3 key items discussed at our meeting with Joe.
>
> Please review and if you have any questions, please feel free to contact
> me at the numbers noted below.
>
> Thanks,
>
> Jeffrey S. Vadnais
> Account Executive - Sensors
> m
> Automotive Communications and Electronics Systems Group
> Phone: (248) 324-9429
> Fax: (248) 324-9472
> Pager: (888)794-5529
> Email: Jeffrey.Vadnais@Motorola.com
>

From: O'Neill, Jim (J.D.)
Sent: Wednesday, December 04, 2002 6:48 AM
To: Kaercher, Don (D.F.)
Cc: Meurer, James (J.B.); Nialen, Christian (C.A.)
Subject: FW: Results of D. Szczupak Meeting on 12-2-02 - Golden Sensors

Don - are you OK with the out come of Dave Szczupak's meeting In regards to the DPFE service parts? The way I see it is that we need to project how many service parts we will need from Kavlico if in fact we make the robustness changes. If there are very few parts to be made, Kavlico will resist. I rec'd your note that a recall for Japan was to be around 141K parts (from our viewpoint we question whether this will happen - I don't know details but will pursue). Will this change your estimated 50K per month prediction for this sensor? I can update my one pager cost-benefit analysis but it won't change anything unless we update the 50K/month prediction. It would be good if we could have this by tomorrow PM.

I am setting up a conference call for both of us, John Koszewnik, and Kavlico sometime tomorrow afternoon to have further discussion. As soon as it is confirmed we will inform you. John Koszewnik did send Kavlico the agreement that we will pay the engineering development costs for the robustness actions.

J. D. O'Neill

Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

—Original Message—

From: O'Neill, Jim (J.D.)
Sent: Monday, December 02, 2002 3:04 PM
To: Wellman, Jeffrey (J.W.); Koszewnik, John (J.J.); Kapp, Dan (Daniel R.)
Cc: Danes, Adam (A.V.); Meurer, James (J.B.); Johnson, Joe (J.H.); Fsadri, Frank (F.); Liimatta, Gary (G.D.); Kaercher, Don (D.F.); Myles, Sonia (S.I.)
Subject: Results of D. Szczupak Meeting on 12-2-02 - Golden Sensors

We, V-Engine, had a couple of assignments as a result of this meeting with Dave this PM:

- Dave wants to go back to J. Padilla to review our plan to pull ahead the resourcing of the Kavlico sensor in ESM after we get back from our Xmas break. (J. Johnson - pull the plan together)
- Dave wants to see an accelerated plan of migrating to Denso for IAC after Xmas, by application. (Liimatta/Danes - pull the plan together)
- Concerning the Kavlico DPFE service inventory, Dave wants to use existing inventory, go ahead with the robustness improvement validation and evaluate if in fact this sensor is more robust. If it is, make the changes and then fulfill any remaining service volume with the improved parts. If it is not, don't make the changes and again fulfill any remaining service volume with the existing design. (D. Kaercher/J. O'Neill)
- Please note that all of the golden sensors will be reviewed for robust sourcing strategies based upon the SCT approach. Each sensor will be scheduled into a Friday D. Kapp review during the next few weeks/months.

J. D. O'Neill

Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

From: O'Neill, Jim (J.D.)
Sent: Tuesday, September 10, 2002 1:20 PM
To: Maurer, James (J.B.); McCoy, James (J.D.); Verner, Carol (C.J.); Alles, Sheran (S.A.); Gatas, Freeman (F.C.); 'KPark@kavlico.com'
Cc: O'Neill, Jim (J.D.)
Subject: FW: Audio Conference this Friday & TMDP Data from Las Vegas Fleet



Las Vegas DP
Sample #99.rtf



Las Vegas DPFE
Sensors.rtf

Kyong is sending in the latest data from the Vegas fleet vehicle analysis. Kyong - thanks for the quick response.

J. D. O'Neill
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Tuesday, September 10, 2002 12:32 PM
To: O'Neill, Jim (J.D.)
Cc: Tackman, Bruce; Hubbard, Rick
Subject: RE: Audio Conference this Friday & TMDP Data from Las Vegas Fleet

Jim,

I will try to make myself available for your telephone conference on coming Friday.

We have shipped one out of three units taken from Las Vegas to you for your review. The unit is #99, which has almost normal readings, but the TVS has a slight sign of over-heating. I have attached below all the available data so far. We will keep you posted with more data later as soon as those data are available.

We are experiencing some difficulties due the extreme heavy deposits of carbon like materials inside the chimney area.

Yours,
Kyong

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

From: O'Neill, Jim (J.D.) [mailto:joneall@ford.com]
Sent: Tuesday, September 10, 2002 5:42 AM
To: Park, Kyong
Cc: O'Neill, Jim (J.D.)
Subject: Audio Conference this Friday

We would like to have an audio conference this Friday at 10:00AM Pacific coast Time for about one hour. Is this a good time for you? Agenda will be sent shortly but will be around final recommendation for robustness changes, testing requirements, and the associated feasibility, cost and timing.

ER02-027-G 27386

J. D. O'Neill
Manager, Fuel Metering, Emissions, and Ignition Dept
V-Engine Engineering, Ford Motor Company
joneall@ford.com, 313-322-6839

From: Owens, Karen (K.E.)
Sent: Thursday, January 03, 2002 5:31 PM
To: Nehasil, Linda (L.F.)
Subject: RE: PT Quality Steering Team Meeting

Linda, the one pager will have additional information that should be helpful. The plan is for us to have technical paper available before the month's end. We will forward the 14D once it has been approved and we are scheduling team meetings that will facilitate call-ins in the near future.

Change is Good. Proactivity is Better!

Karen E. Owens

***Supervisor
4.0L Engine Systems
(off) 313.845.5770
(fax) 313.390.2513***

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

From: Nehasil, Linda (L.F.)
Sent: Thursday, January 03, 2002 5:11 PM
To: Owens, Karen (K.E.)
Cc: Dakhlallah, Hassan (H.A.); Nehasil, Linda (L.F.)
Subject: RE: PT Quality Steering Team Meeting

Thanks for the information Karen. With regard to our PTQRT meeting on Tuesday, January 8th, will there be any info. from the 14D that you can share with us at that time? We have you on the agenda for report out on the status of the 14D. If not, when do you think you can present in the PTQRT? thanks!

Quality comes first....

Linda F. Nehasil
Explorer Powertrain Quality
32-38671

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

From: Owens, Karen (K.E.)
Sent: Thursday, January 03, 2002 4:56 PM
To: Nehasil, Linda (L.F.)
Cc: Dakhlallah, Hassan (H.A.)
Subject: RE: PT Quality Steering Team Meeting

Linda, we have been working on a corporate 14D that should answer all of your questions. We have reviewed it with our Chief Engineer and he had advised us to make some modifications as we are working with two other divisions within the 14D before presenting it to all of Ford. However, for your information, the variable cost and tooling for pressure die latch up and alignment of diffusion mask is \$0 to Ford Motor. The unprotected area damage resolution is still in the developmental stages and no tooling or variable cost numbers have been shared. Once that information is available, you will need to obtain it from our purchasing group and at that time I will be able to direct to the appropriate person since things are somewhat dynamic at the beginning of this year. Please advise if there is further assistance. Thank you.

Change is Good. Proactivity is Better!

Karen E. Owens

***Supervisor
4.0L Engine Systems
(off) 313.845.5770
(fax) 313.390.2513***

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

From: Nehasil, Linda (L.F.)
Sent: Thursday, November 29, 2001 9:33 AM
To: Owens, Karen (K.E.)
Cc: Dakhilallah, Hassan (H.A.)
Subject: FW: PT Quality Steering Team Meeting

Hi Karen, I work for Hassan Dakhilallah in the Explorer PTQRT and I am working on an assignment to complete a roadmap of issues we are following that will go into production next year. One of these is the Kavlico sensor updates. On my roadmap I have listed the corrective actions that have not been implemented as yet per the 8D summary you sent out. (actions 1, 2 and 3 a and b) What I need is the variable cost and tooling impact of these actions. Is this information available? If so, can you provide it or tell me who to contact. Thanks alot, I need this info. as soon as possible.

Quality comes first....
Linda F. Nehasil
Explorer Powertrain Quality
32-38671

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

From: Dakhilallah, Hassan (H.A.)
Sent: Tuesday, November 13, 2001 10:51 AM
To: Sloan, Burt (B.E.); Nehasil, Linda (L.F.); Adams, Kerry (K.N.); Boyk, Greg (G.J.)
Subject: FW: PT Quality Steering Team Meeting

Info. On DPFE Issue Resolution Status.

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

From: Owens, Karen (K.E.)
Sent: Monday, November 12, 2001 9:21 AM
To: Tracy, Lynn (L.J.); Grewal, Bill (B.S.); Fascetti, Bob (R.J.); McCliment, Bob (R.S.); Preston, Carla Traci (C.T.); Miller, Cary (C.D.); Freese, Charles (C.E.); Hollister, Dave (D.); Schuetzler, Dennis (D.E.); Brewer, Gary (G.L.); Mazzella, Gary (G.R.); Hansen, George (G.C.); Schmidt, Gregory (G.A.); Lowman, Harold (H.R.); Dakhilallah, Hassan (H.A.); Conroy, Jerry (J.R.); Klarr, Jerry (G.T.); Zhou, Jianhua (J.); Van Gilder I, Jim (J.); Rashidi, Karim (K.K.); Layden, Kevin (K.E.); Neutgens, Kurt (K.J.); Hoffman, Michael (M.V.); Guys, Philip (P.R.); Bess, Raynard (R.); Patal, Sam (S.N.); Corbett, Sandra (S.M.); Ward, Sheila (S.A.); Judge, Surinder (S.S.)
Subject: RE: PT Quality Steering Team Meeting

Team, this is the latest report regarding the Kavlico dPFE sensor.

<< File: Kavlico TMDPFE Update.doc >>

Change is Good. Proactivity is Better!
Karen E. Owens
Supervisor
4.0L Engine Systems
(off) 313.845.5770
(fax) 313.390.2513

-----Original Appointment-----

From: Tracy, Lynn (L.J.)
Sent: Monday, November 12, 2001 8:55 AM
To: Bill Grewal; Bob Fascetti; Bob McCliment; Carla Traci Preston; Cary Miller; Charles Freese; Dave Hollister; Dennis Schuetzler; Gary Brewer; Gary Mazzella; George Hansen; Gregory Schmidt; Harold Lowman; Hassan Dakhilallah; Jerry Conroy; Jerry Klarr; Jianhua Zhou; Jim Vangilder; Karen Owens; Karim Rashidi; Kevin Layden; Kurt Neutgens; Michael Hoffman; Phillip Guys; Raynard Bess; Sam Patal; Sandra Corbett; Sheila Ward; Surinder Judge
Subject: PT Quality Steering Team Meeting
When: Occurs every 2 week(s) on Monday effective 11/26/01 until 12/19/01 from 4:00 PM to 5:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: PDC 1G855

From: Park, Kyong [KPark@kavlico.com]
Sent: Tuesday, June 11, 2002 4:13 PM
To: MIKE STRIZICH; Park, Kyong; 'Poma, Amy (A.)'
Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com; mawad@ford.com; fgates@ford.com; Davies, Brady; Tackman, Bruce
Subject: RE: PDFE FA report

Dear Mike,
During our Ford-Kavlico meeting today, the following question was raised.

Question:

Have you looked at the part, SRL411? If you have not, could you look

at the part to see if there is any sign of transient voltage exposure?

Please, look at the die attachment material. It is known that the die

attachment changes its color from cream (normal), brown(250C 15 min)

to Black(320C 15 min) depending on the temperature it is exposed to.

Please, let us know.

Thank you.

Kyong

> -----Original Message-----

> From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]

> Sent: Thursday, June 06, 2002 12:04 PM

> To: 'Park, Kyong'; 'Poma, Amy (A.)'

> Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;

> mawad@ford.com; fgates@ford.com; 'Davies, Brady'; 'Tackman, Bruce'

> Subject: RE: PDFE FA report

>

> Dr. Park,

> Please find the attached "cleaned up version" of the first report that addressed your questions. In regard to the corrosion of the metallization,

> I

> did not understand what further explanation you were looking for. I do have

> several technical articles describing the corrosion of aluminum, and

> associated by-products. One major question that I think needs to be

> answered

> is "does the latch-up accelerate the corrosion conditions at the die level",

> and is the corrosion a secondary effect of the overheating of the die. In

> other words, does the gel "outgas" or "free-up" fluorine at elevated

> temperatures. The gel changes states (etches slower or not at all during

> removal) where a high power dissipation occurred (overstress states). The gel manufacturer may be able to answer these questions.

> I sent the addendum report for a second time about 1 hour ago. Please let me

> know if you received.

>

> Thanks you,

> Mike

>

> -----Original Message-----

> From: Park, Kyong [mailto:KPark@kavlico.com]

> Sent: Thursday, June 06, 2002 9:30 AM

EA02-027-G 27715

> To: Poma, Amy (A.); metriz@analyticalsol.com
> Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> mawad@ford.com; fgates@ford.com; Davies, Brady; Tackman, Bruce
> Subject: RE: PDFE FA report

> Analytical Solutions:

> Dear Mike,
> I have not received the expected report you mentioned last Monday, nor I
> have not received anything from you
> since I sent you my e-mail with a few comments and questions. I wonder if
> I
> have a system problem, or
> you have not send anything yet.

> I appreciate you if you let me know one way or the other before 10 AM
> Pacific Daylight Saving Time.
> Yours,
> Kyong

> > -----Original Message-----
> > From: Poma, Amy (A.) [SMTP:apoma2@ford.com]
> > Sent: Thursday, June 06, 2002 6:29 AM
> > To: 'Park, Kyong'
> > Subject: RE: PDFE FA report

> > Kyong,
> > Have you received the 2nd report from Analytical Solutions yet? We
> > wanted
> > to discuss it at today's 1:00pm mtg. Please advise. Thanks.

> > Amy Poma
> > V-Engine Engineering-Project Mgmt.
> > POEE Building, FMEI Cube CQ-156
> > phone-313-390-8849, fax: 313-390-4084
> > apoma2@ford.com

> > -----Original Message-----
> > From: Park, Kyong [mailto:KPark@kavlico.com]
> > Sent: Tuesday, June 04, 2002 6:49 PM
> > To: MIKE STRIZICH
> > Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> > fgates@ford.com; mawad@ford.com; apoma2@ford.com; Akins, Mary; Davies,
> > Brady; Tackman, Bruce
> > Subject: RE: PDFE FA report

> > Dear Mike,
> > During today's our meeting, a few comments and a couple of questions
> > were
> > raised in regards to your report, and I like to pass them on to you.

> > Comments:
> > On page 2, the Quantity Received in the table is not correct: 7
> > field returns, number of good parts from Ford, in addition,

> > unpopulated ceramic hybrids and virgin dies from Kavlico.
> >
> > On page 8, under the heading of High Current Failures, Iout=100 mV,
> > and so on: Iout = 100 mA or Vout = 100 mV? needs
> > clarifications. I understand S/N SRL547 and S/N SRL401 are not 'High
> > Current
> > Failures', needs verification.
> >
> > The heading, 'Transient Failures (Vehicle Failures-pass
> > spec.):', the heading may not be correct. Ford's suggestion is
> > 'Others', needs verifications.
> >
> > Questions:
> > On page 15, the picture of a Oscilloscope screen: Is it I - V
> > traces? What are the settings for scope, X-scale and Y-scale
> > unit/division? What does it mean by ICC - 400 mA? Is this input current?
> > What does it mean by "Output current - 25 mA" ? How are
> > these two
> > traces connected?
> >
> > On page 18, the paper reported the result of HCl experiments on the
> > creation of Aluminum Hydroxide gel. A question was
> > raised about how this phenomena relates to the similar observations
> > obtained
> > from the field returns. We hope that your future
> > report provides some discussions on this issue, if you could.
> >
> > Overall, at least I think, your report had demonstrated an excellent
> > professionalism.
> > Yours,
> > Kyong

> > > -----Original Message-----

> > > From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> > > Sent: Monday, June 03, 2002 8:35 AM
> > > To: 'Park, Kyong'
> > > Subject: RE: PDFE FA report

> > > Kyong,
> > > Should be done by Wed this week. I am sure there will be a lot of
> > > questions
> > > generated by the current report. Just have people email me relative to
> > > the
> > > questions, and I will get them into a report addendum.
> > > Regards,
> > > Mike

> > > -----Original Message-----

> > > From: Park, Kyong [mailto:KPark@kavlico.com]
> > > Sent: Monday, June 03, 2002 9:10 AM
> > > To: mstriz@analyticalsol.com; jmaurer@ford.com; pplante@ford.com;
> > > mfreelal@ford.com; fgates@ford.com; apoma2@ford.com; mawad@ford.com;
> > > Davies, Brady; Akins, Mary
> > > Cc: Tackman, Bruce; Hubbard, Rick
> > > Subject: FW: PDFE FA report

> > > Dear Mike,
> > > I am distributing your report to the concerned people, and I like to
> ask
> > > when we should expect your report on next phase analysis?
> > > Thank you very much for your report.
> > > Yours,
> > > Kyong

> > > > -----Original Message-----

> > > > From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> > > > Sent: Sunday, June 02, 2002 8:42 AM
> > > > To: 'Park, Kyong'
> > > > Cc: "Kevin Berger"; Clifton Aldridge
> > > > Subject: PDFE FA report

> > > > Dear Mr. Park,
> > > > Please find the attached failure analysis report for your review. An
> > > > addendum with mainly photos showing damage on remaining samples will
> > > > follow
> > > > shortly. Please pass along to FORD participants and Brady.
> > > > I look forward to your feedback, and hope we can continue to service
> > > your
> > > > failure analysis needs.
> > > > Regards,
> > > > Michael Strizich

> > > > -----Original Message-----

> > > > From: Park, Kyong [mailto:KPark@kavlico.com]
> > > > Sent: Friday, May 31, 2002 8:34 AM
> > > > To: mstriz@analyticalsol.com
> > > > Subject: Report & Passcode

> > > > Dear Mike,
> > > > Hello.
> > > > I am not rushing you, but I am just wondering whether I should
> expect
> > to
> > > receive any report from you today. Ford people asked about a
> passcode
> > to
> > > your data base, the passcode that you had mentioned about during our
> > > visit
> > > to your company.
> > > > Please, let me know.
> > > > Thank you.
> > > > Kyong <<02F686PRELIM.pdf>>
> > > > << File: 02F686PRELIM.pdf >>

From: Park, Kyong [KPark@kavlico.com]
Sent: Tuesday, June 11, 2002 12:35 PM
To: Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.); Uy, Dairene (D.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neal, Jim (J.D.); Park, Kyong; Davies, Brady; mstriz@analyticalsol.com
Subject: RE: Discrepancy between Auger and Raman results

Jon,

I still think the corrosion initiator is HF and agree that Al HydroperOxide, and Al Nitrate are the Al corrosion byproducts. All of these materials would not be generated without the high temperature and with the protection by the gel's initial good condition.

Without the HF, the passivation layer protects the device with the help of the gel, without the high temperature, NOx from the exhaust, even as it might turned into H2NO3, will not attack the device, that we had tested in the laboratory test, and would create Al Nitrate.

Without the high temperature, which is caused by the electric "Latch up", if you are able to create corrosion of Al and other degradation of materials, all these fine details may be significant, yet the importance of HF will be still valid.

We have the results of "Latch up" with uncontrolled currents and various liquids for two weeks. Most parts had lost gel turned into black, the device dies were not attacked very much.

The on-and-off 'slow cooking' due to the intermittence of the electrical latch up in the vehicles may also play very important, the gel may hold those HF created by the degradation of the die attachment and from the gel itself, and provides the essential time for these gas to attack the die, otherwise, the gas will be evaporated before it can attack the die.

Yours,
Kyong

> -----Original Message-----

> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Tuesday, June 11, 2002 8:50 AM
> To: Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)';
> Simko, Steven (S.J.); Uy, Dairene (D.)
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neall, Jim (J.D.);
> 'kpark@kavlico.com'; 'bdavies@kavlico.com'
> Subject: Discrepancy between Auger and Raman results

> Dairene's Raman results are exciting, and give an insight into the initial
> compounds that form in PAD or UPAD.

> Steve Simko found no nitrogen in the samples he looked at except the
> passivation. He suggested electron beam damage as a cause if the nitrate
> existed. EDX in SEM is not very sensitive to nitrogen, and I would have
> to compare an aluminum nitrate standard to whatever unknown I was looking
> at before drawing conclusions on any spectra I have stored before claiming
> there was a nitrate present.

> The enthalpy of formation or Gibbs Free Energies for aluminum nitrate or

> aluminum nitrate nonahydrate are not listed in the CRC, but aluminum
> hydrates (Al₂O₃.H₂O or Al₂O₃.3H₂O) have a higher free energy of formation
> than aluminum oxide (of course their formation will depend on the partial
> pressure of water and temperature). Other tables mention Al(NO₃)₃
> decomposes, but not the temperature, and that Al(NO₃)₃.9H₂O decomposes at
> 135 degrees Centigrade.
>
> I wonder if in further latch up and heating in high current events may
> convert any aluminum nitrate formed to aluminum hydrate. Perhaps aluminum
> nitrate or aluminum nitrate nonahydrate forms in the presence of exhaust
> condensate.

> Jon

> > -----Original Message-----

> > From: Gates, Freeman (F.C.)
> > Sent: Tuesday, June 11, 2002 9:15 AM
> > To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
> > Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
> > 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hansas, Jon (.); Gates,
> > Freeman (F.C.)
> > Subject: RE: New Raman results

> > Mark,

> > As per our conversation last night(6/10/02), my research did show the
> > following:

> > Aluminium Hydroxide + Nitric Acid (exhaust) -----> Aluminium Nitrate +
> > Water

> > ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

> > So perhaps Analytical Solutions was not completely off base on their,
> > they just did not account for the subsequent reaction in the exhaust
> > environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

> > Thanks

> > -----Original Message-----

> > From: Freeland, Mark (M.)
> > Sent: Friday, June 07, 2002 4:53 PM
> > To: Ed Sickafus (E-mail)
> > Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
> > Subject: FW: New Raman results

> > Ed,

> > New information of the residue material left after the Al is
> > transformed. We should discuss this next week.

> > Regards

> > Mark Freeland

> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory

> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> > email: mfreelal@ford.com
> > Tel.: (313) 594-7645

> > -----Original Message-----

> > From: Freeland, Mark (M.)
> > Sent: Friday, June 07, 2002 4:35 PM
> > To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
> > Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
> > Subject: New Raman results

> > Dairene and Lebzy has been working with a UPAD sample which was
> > mechanically depotted, and saw no chemistry.
> > Today she examined the residue under a bond pad using a UV laser, and
> > compared the spectra to samples of Al Hydroxide and Al Nitrate that she
> > had also measured with the equipment.
> > The results indicate that the residue is Al Nitrate, and not Al
> > Hydroxide, as previously suggested by Analytical Solutions.
> > I will share the spectra with you on Monday when I arrive. (I only have
> > paper copies at this time).

> > Also, it was interesting to note that after the mechanical depotting,
> > the residue did not have the mud cracked appearance as previously
> > observed.

> > The sample used for this work was SRL647, from the data base.

> > Regards

> > Mark Freeland

> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory
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> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> > email: mfreelal@ford.com
> > Tel.: (313) 594-7645

From: Park, Kyong [KPark@kawico.com]
Sent: Monday, June 10, 2002 5:54 PM
To: MIKE STRIZICH
Cc: pplante@ford.com; mfreela1@ford.com; apoma2@ford.com; mawad@ford.com;
jmaurer@ford.com; fgates@ford.com; Davies, Brady; Akina, Mary; bblackman@ford.com;
Hubbard, Rick
Subject: RE: PDFE FA report

Dear Mike,

Mr. Mark Freeland of Ford is visiting with us today, and we tried to call you just to find out that you were not available. We have some questions we like you to look into:

1. Your HCl tests to create corrosion and to draw a conclusion of Al HydroperOxide residue: The picture appears to be that the surface does not have Au metalization. Is it true? If so, how did you remove the gold and the corrosion was not the result of the Au removal process?

What was the concentration of HCl (pH value)?

2. Al HydroperOxide gel: Ford Scientific Research Laboratory think the residue is Al nitrate (Al (NO3)3) as a result of Raman spectroscopy analysis. Ford also said that they did not use any chemicals to remove the gel. (They used only Q-tips to remove the gel.) If you have any left over field returns you have not yet worked on, could you remove the gel mechanically, and also remove mechanically (or pull) the wire bond. After remove those materials, please pick corroded area and identify/verify what the residue element(s) is (or are)? If you do not have any field return left to work on, please, let me know. I will ask Ford send you more.

Please, let us know what you could do.
Thank you again.
Yours,
Kyong

> -----Original Message-----

> From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> Sent: Thursday, June 06, 2002 12:04 PM
> To: 'Park, Kyong'; 'Poma, Amy (A.)'
> Cc: jmaurer@ford.com; pplante@ford.com; mfreela1@ford.com;
> mawad@ford.com; fgates@ford.com; 'Davies, Brady'; 'Tackman, Bruce'
> Subject: RE: PDFE FA report
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> Dr. Park,
> Please find the attached "cleaned up version" of the first report that
> addressed your questions. In regard to the corrosion of the metallization,
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> did not understand what further explanation you were looking for. I do
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EM02-027-G 27722

> associated by-products. One major question that I think needs to be
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> temperatures. The gel changes states (etches slower or not at all during
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> gel manufacturer may be able to answer these questions.
> I sent the addendum report for a second time about 1 hour ago. Please let
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>
> Thanks you,
> Mike

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> From: Park, Kyong [mailto:KPark@kavlico.com]
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> To: Poma, Amy (A.); mstriz@analyticalsol.com
> Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> nawad@ford.com; fgates@ford.com; Davies, Brady; Tackman, Bruce
> Subject: RE: PDFE FA report

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> Analytical Solutions:

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> you have not send anything yet.

> I appreciate you if you let me know one way or the other before 10 AM
> Pacific Daylight Saving Time.

> Yours,
> Kyong

> > -----Original Message-----

> > From: Poma, Amy (A.) [SMTP:apoma2@ford.com]
> > Sent: Thursday, June 06, 2002 6:29 AM
> > To: 'Park, Kyong'
> > Subject: RE: PDFE FA report

> > Kyong,

> > Have you received the 2nd report from Analytical Solutions yet? We
> > wanted
> > to discuss it at today's 1:00pm mtg. Please advise. Thanks.

> > Amy Poma
> > V-Engine Engineering-Project Mgmt.
> > POEE Building, FMEI Cube CQ-156
> > phone-313-390-8849, fax: 313-390-4084
> > apoma2@ford.com

> >

EA02-027-G 27723

> > -----Original Message-----

> > From: Park, Kyong [mailto:KPark@kavlico.com]

> > Sent: Tuesday, June 04, 2002 6:49 PM

> > To: MIKE STRIZICH

> > Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;

> > fgates@ford.com; mawad@ford.com; apoma2@ford.com; Akins, Mary; Davies,

> > Brady; Tackman, Bruce

> > Subject: RE: PDFE FA report

> >

> >

> >

> > Dear Mike,

> > During today's our meeting, a few comments and a couple of questions
> > were

> > raised in regards to your report, and I like to pass them on to you.

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> > Comments:

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> > field returns, number of good parts from Ford, in addition,

> > unpopulated ceramic hybrids and virgin dies from Kavlico.

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> > and so on: Iout = 100 mA or Vout = 100 mV? needs

> > clarifications. I understand S/N SRL547 and S/N SRL401 are not 'High

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> > traces? What are the settings for scope, X-scale and Y-scale

> > unit/division? What does it mean by ICC - 400 mA? Is this input current?

> > What does it mean by "Output current - 25 mA" ? How are

> > these two

> > traces connected?

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> > creation of Aluminum Hydroxide gel. A question was

> > raised about how this phenomena relates to the similar observations

> > obtained

> > from the field returns. We hope that your future

> > report provides some discussions on this issue, if you could.

> >

> > Overall, at least I think, your report had demonstrated an excellent

> > professionalism.

> > Yours,

> > Kyong

> >

> >

> >

> >

> > > -----Original Message-----

> > > From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]

> > > Sent: Monday, June 03, 2002 8:35 AM

> > > To: 'Park, Kyong'

> > > Subject: RE: PDFE FA report

> > >

ERR2-027-G 2772A

> > > Kyong,
> > > Should be done by Wed this week. I am sure there will be a lot of
> > > questions
> > > generated by the current report. Just have people email me relative to
> > > the
> > > questions, and I will get them into a report addendum.
> > > Regards,
> > > Mike

> > > -----Original Message-----

> > > From: Park, Kyong [mailto:KPark@kavlico.com]
> > > Sent: Monday, June 03, 2002 9:10 AM
> > > To: mstriz@analyticalsol.com; jmaurer@ford.com; pplante@ford.com;
> > > mfreelal@ford.com; fgates@ford.com; apoma2@ford.com; mawad@ford.com;
> > > Davies, Brady; Akins, Mary
> > > Cc: Tackman, Bruce; Hubbard, Rick
> > > Subject: FW: PDFE FA report

> > > Dear Mike,
> > > I am distributing your report to the concerned people, and I like to
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> > > when we should expect your report on next phase analysis?
> > > Thank you very much for your report.
> > > Yours,
> > > Kyong

> > > -----Original Message-----

> > > From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> > > Sent: Sunday, June 02, 2002 8:42 AM
> > > To: 'Park, Kyong'
> > > Cc: "Kevin Berger"; Clifton Aldridge
> > > Subject: PDFE FA report

> > > Dear Mr. Park,
> > > Please find the attached failure analysis report for your review. An
> > > addendum with mainly photos showing damage on remaining samples will
> > > follow
> > > shortly. Please pass along to FORD participants and Brady.
> > > I look forward to your feedback, and hope we can continue to service
> > > your
> > > failure analysis needs.
> > > Regards,
> > > Michael Strizich

> > > -----Original Message-----

> > > From: Park, Kyong [mailto:KPark@kavlico.com]
> > > Sent: Friday, May 31, 2002 8:34 AM
> > > To: mstriz@analyticalsol.com
> > > Subject: Report & Passcode

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> > > I am not rushing you, but I am just wondering whether I should
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From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, June 06, 2002 8:33 PM
To: MIKE STRIZICH
Cc: pplante@ford.com; mfree1@ford.com; jmaurer@ford.com; mawad@ford.com;
fgates@ford.com; apoma2@ford.com; Davies, Brady; Akins, Mary; Tackman, Bruce; Ray,
Randy; Ayers, Don
Subject: RE: PDFE FA report

Analytical Solutions:

Dear Mr. Strizich;
I thank you for your report and your explanation for Al HydroOxide, I will pass them to the concerned people.
Yes, I received your previous transmission of the second report, which I distributed already.
I am not sure yet if there is any question or comment until I review your papers, and discuss with other people in Tuesday's meeting-- all I can do now is to express our appreciation for your work.
We will get back to you soon.
Yours.
Kyong

Ford & Kavlico:

Team,
Please, review the attached report from Mr. Mike Strizich of Analytical Solutions below, we will discuss your question or comment at the next meeting, if any.
Thank you.
Kyong

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> Sent: Thursday, June 06, 2002 12:04 PM
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Questions:

On page 15, the picture of a Oscilloscope screen: Is it I - V traces? What are the settings for scope, X-scale and Y-scale unit/division? What does it mean by ICC - 400 mA? Is this input current? What does it mean by "Output current - 25 mA" ? How are these two traces connected?

On page 18, the paper reported the result of HCl experiments on the creation of Aluminum Hydroxide gel. A question was raised about how this phenomena relates to the similar observations obtained from the field returns. We hope that your future report provides some discussions on this issue, if you could.

Overall, at least I think, your report had demonstrated an excellent professionalism.

Yours,
Kyong

> -----Original Message-----

> From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> Sent: Monday, June 03, 2002 8:35 AM
> To: 'Park, Kyong'
> Subject: RE: PDFE FA report

>

> Kyong,
> Should be done by Wed this week. I am sure there will be a lot of
> questions
> generated by the current report. Just have people email me relative to the
> questions, and I will get them into a report addendum.

> Regards,
> Mike

> -----Original Message-----

> From: Park, Kyong [mailto:KPark@kavlico.com]
> Sent: Monday, June 03, 2002 9:10 AM
> To: mstriz@analyticalsol.com; jmaurer@ford.com; pplante@ford.com;
> mfreelal@ford.com; fgates@ford.com; apoma2@ford.com; mawad@ford.com;
> Davies, Brady; Akins, Mary
> Cc: Tackman, Bruce; Hubbard, Rick
> Subject: FW: PDFE FA report

> Dear Mike,
> I am distributing your report to the concerned people, and I like to ask
> when we should expect your report on next phase analysis?
> Thank you very much for your report.
> Yours,
> Kyong

> > -----Original Message-----

> > From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> > Sent: Sunday, June 02, 2002 8:42 AM
> > To: 'Park, Kyong'
> > Cc: "Kevin Berger"; Clifton Aldridge
> > Subject: PDFE FA report

> > Dear Mr. Park,
> > Please find the attached failure analysis report for your review. An
> > addendum with mainly photos showing damage on remaining samples will
> > follow
> > shortly. Please pass along to FORD participants and Brady.
> > I look forward to your feedback, and hope we can continue to service
> > your
> > failure analysis needs.
> > Regards,
> > Michael Strizich

> > -----Original Message-----

> > From: Park, Kyong [mailto:KPark@kavlico.com]
> > Sent: Friday, May 31, 2002 8:34 AM
> > To: mstriz@analyticalsol.com
> > Subject: Report & Passcode

> > Dear Mike,
> > Hello.
> > I am not rushing you, but I am just wondering whether I should expect to
> > receive any report from you today. Ford people asked about a passcode to
> > your data base, the passcode that you had mentioned about during our
> > visit
> > to your company.
> > Please, let me know.
> > Thank you.
> > Kyong <<02F686PRELIM.pdf>>

From: Park, Kyong [KPark@kavllco.com]
Sent: Thursday, May 30, 2002 10:12 AM
To: Maurer, James (J.B.); Gates, Freeman (F.C.); Freeland, Mark (M.); Plante, Paul (P.G.); Poma, Amy (A.); Davies, Brady; Akins, Mary
Cc: Tackman, Bruce; Hubbard, Rick
Subject: FW: Analytical Solutions Work Plan



Fwd Progress
Report.rtf

For your records, I sent my response to Mr. Michael Strizich of Analytical Solutions for his work plan, which I have distributed already. If any comments, please let me know.
Kyong M. Park

> -----Original Message-----
> From: Park, Kyong
> Sent: Tuesday, May 28, 2002 2:39 PM
> To: 'mstriz@analyticalsol.com'
> Cc: Tackman, Bruce; Davies, Brady
> Subject: FW: Analytical Solutions Work Plan

>
>
> Dear Mike,
> As you can see, I distributed your plan to the participants of our regular meeting for their comments.
> Unless we have significant suggestion(s) to revise your work plan during the discussion in our meeting this Thursday,
> I think personally, you devised a fair and an excellent work plan. I am looking forward to receiving an intermediate, or the final report of your findings.
>
> If anything you need from us to expedite your analysis, please let me know.
> Thank you for the plan.
> Kyong

> -----Original Message-----
> From: Park, Kyong
> Sent: Tuesday, May 28, 2002 2:18 PM
> To: 'Maurer, James (J.B.)'; Gates, Freeman (F.C.); Freeland, Mark (M.); Plante, Paul (P.G.); Poma, Amy (A.); Davies, Brady
> Cc: Tackman, Bruce; Hubbard, Rick
> Subject: Analytical Solutions Work Plan

>
>
> To All;
>
> I have received the work plan from Mr. Michael Strizich of Analytical Solutions, and here I attached the plan below for your review.
> We will discuss your concerns or comments at the next 14D telephone conference if any.
> Truly,
> Kyong
>

ER02-027-G 27743

> Kyong M. Park, D.Sc.
> Vice President, R&D
> Kavlico, a Solectron Company
> 14501 Los Angeles Avenue
> Moorpark, CA 93021
> Tel.: 805/523-2000; e-Mail: kpark@kavlico.com
>
>
> <<Fwd Progress Report.rtf>>
>
>

Park, Kyong
From: Kyong M. Park [k_park@man.com]
Sent: Tuesday, May 28, 2002 12:18 PM
To: kpark@kavlico.com
Subject: Fwd: Progress Report

Message Flag: Follow up
Flag Status: Flagged

>From: "MIKE STRIZICH" <mstriz@analyticalsol.com>
>To: "kpark@kavlico.com" <k_park@msn.com>
>Subject: Progress Report
>Date: Tue, 28 May 2002 11:44:52 -0600
>

>Mr. Park,
>Please review the following analysis steps proposed. We have already
>started
>the analysis last week on these two (2) parts. If there is a problem with
>the proposed steps, please let us know ASAP.
>Regards,
>Michael Strizich, ASI

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Progress report.doc

<http://www.hotmail.com>

From: Plante, Paul (P.G.)
Sent: Monday, June 10, 2002 4:39 PM
To: 'Park, Kyong'; Maurer, James (J.B.)
Subject: RE: PDFE FA report

It is different than a 14D meeting. We will be looking for strategic issues as discussed by upper management as opposed to engineering details. Jim O'Neill, Jim Maurer, Freeman, Bill McCarty and myself discussed an agenda this morning. We have a proposed list of Ford attendees we can share with you.

Jim Maurer, can you add this to Tuesday 14D meeting agenda for discussion please.

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Friday, June 07, 2002 4:54 PM
To: Plante, Paul (P.G.)
Cc: Tackman, Bruce
Subject: RE: PDFE FA report

Paul,
Would this meeting be different from 14D we are having regularly? Is there any special reason to have the meeting here at Kavlico?
I am raising these questions to figure out what we need to prepare and select the people to attend.
Kyong

> -----Original Message-----

> From: Plante, Paul (P.G.) [SMTP:pplante@ford.com]
> Sent: Friday, June 07, 2002 12:44 PM
> To: 'Park, Kyong'
> Subject: RE: PDFE FA report

>
> We will discuss agenda and attendees at a future Tuesday/Thursday meeting.
> The Ford team will input, and I would ask Kavlico to think about who
> should attend, and agenda items also. After this preliminary work, I think
> Jim O'Neill and Bruce should talk. OK?

> -----Original Message-----

> From: Park, Kyong [mailto:KPark@kavlico.com]
> Sent: Friday, June 07, 2002 1:58 PM
> To: Plante, Paul (P.G.)
> Cc: Tackman, Bruce
> Subject: RE: PDFE FA report

>
>
> Paul,
> I thank you for you e-mail, and I informed Mr. Bruce Tackman that Mr. John
> Koszewnik likes to have a meeting here on around July 11, 2002. Mr.
> Tackman
> said Mr. Koszewnik is more than welcome to visit Kavlico. However, Mr.
> Tackman likes to know the nature of discussions and who will accompany Mr.
> Koszewnik.
> I think, perhaps, it might be better that Mr. Jim O'Neill call Mr. Tackman
> directly to work out a plan for the meeting.
> Yours,
> Kyong

>
> > -----Original Message-----
> > From: Plante, Paul (P.G.) [SMTP:pplante@ford.com]
> > Sent: Friday, June 07, 2002 6:24 AM
> > To: 'Park, Kyong'
> > Subject: RE: PDFE FA report
> >
> > Kyong, thanks. Also I have few comments to make to you personally on your
> > efforts to correct this issue. I think you, Brady and the technical
> > Kavlico team are doing an excellent job trying to correct this concern.
> > My
> > personal belief is that issues need to be addressed by all affected
> > parties including V Engine, Body Wiring and Kavlico. I have recently
> > personally set up the Monday Ford review meeting for vehicle concerns to
> > try and get this aspect resolved, and will continue to press that forum
> > for results. I intend to keep a completely open mind as to root causes
> > of
> > this issue, and I believe a number of other Ford people feel the same.
> > Thanks again for your cooperation. I think John Koszewnik's request to
> > personally meet with Kavilco in California is an indication of his
> > willingness to have our two companies work together. Thanks again for
> > your
> > continued personal support!

> >
> > -----Original Message-----
> > From: Park, Kyong [mailto:KPark@kavlico.com]
> > Sent: Thursday, June 06, 2002 8:33 PM
> > To: MIKE STRIZICH
> > Cc: pplante@ford.com; mfreelal@ford.com; jmaurer@ford.com;
> > mawad@ford.com; fgates@ford.com; apoma2@ford.com; Davies, Brady; Akins,
> > Mary; Tackman, Bruce; Ray, Randy; Ayers, Don
> > Subject: RE: PDFE FA report
> >
> >

> > Analytical Solutions:

> >
> > Dear Mr. Strizich;
> > I thank you for your report and your explanation for Al HydroOxide, I
> > will
> > pass them to the concerned people.
> > Yes, I received your previous transmission of the second report, which I
> > distributed already.
> > I am not sure yet if there is any question or comment until I review
> > your
> > papers, and discuss with other people
> > in Tuesday's meeting-- all I can do now is to express our appreciation
> > for
> > your work.
> > We will get back to you soon.
> > Yours,
> > Kyong

> >
> > Ford & Kavlico:

> >
> > Team,
> > Please, review the attached report from Mr. Mike Strizich of Analytical
> > Solutions below, we will discuss your
> > question or comment at the next meeting, if any.
> > Thank you.

> > Kyong

> >
> >
> >

> > > -----Original Message-----

> > > From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> > > Sent: Thursday, June 06, 2002 12:04 PM
> > > To: 'Park, Kyong'; 'Poma, Amy (A.)'
> > > Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> > > mawad@ford.com; fgates@ford.com; 'Davies, Brady'; 'Tackman, Bruce'
> > > Subject: RE: PDFE FA report

> > >
> > > Dr. Park,
> > > Please find the attached "cleaned up version" of the first report that
> > > addressed your questions. In regard to the corrosion of the
> > > metallization,

> > > I
> > > did not understand what further explanation you were looking for. I do
> > > have
> > > several technical articles describing the corrosion of aluminum, and
> > > associated by-products. One major question that I think needs to be
> > > answered
> > > is "does the latch-up accelerate the corrosion conditions at the die
> > > level",
> > > and is the corrosion a secondary effect of the overheating of the die.

> > > In
> > > other words, does the gel "outgas" or "free-up" fluorine at elevated
> > > temperatures. The gel changes states (etches slower or not at all
> > > during

> > > removal) where a high power dissipation occurred (overstress states).
> > > The

> > > gel manufacturer may be able to answer these questions.
> > > I sent the addendum report for a second time about 1 hour ago. Please
> > > let
> > > me
> > > know if you received.

> > >
> > > Thanks you,
> > > Mike

> > >

> > > -----Original Message-----

> > > From: Park, Kyong [mailto:KPark@kavlico.com]
> > > Sent: Thursday, June 06, 2002 9:30 AM
> > > To: Poma, Amy (A.); mstriz@analyticalsol.com
> > > Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> > > mawad@ford.com; fgates@ford.com; Davies, Brady; Tackman, Bruce
> > > Subject: RE: PDFE FA report

> > >

> > >

> > > Analytical Solutions:

> > >

> > > Dear Mike,

> > > I have not received the expected report you mentioned last Monday, nor
> > > H

> > > have not received anything from you
> > > since I sent you my e-mail with a few comments and questions. I
> > > wonder

> > > if

> > > I

> > > have a system problem, or

ERB2-827-G 27767

> > > you have not send anything yet.
> > >
> > > I appreciate you if you let me know one way or the other before 10 AM
> > > Pacific Daylight Saving Time.
> > > Yours,
> > > Kyong
> > >
> > >
> > > -----Original Message-----
> > > From: Poma, Amy (A.) [SMTP:apoma2@ford.com]
> > > Sent: Thursday, June 06, 2002 6:29 AM
> > > To: 'Park, Kyong'
> > > Subject: RE: PDFE FA report
> > >
> > > > Kyong,
> > > >
> > > > Have you received the 2nd report from Analytical Solutions yet? We
> > > > wanted
> > > > to discuss it at today's 1:00pm mtg. Please advise. Thanks.
> > > >
> > > > Amy Poma
> > > > V-Engine Engineering-Project Mgmt.
> > > > POEE Building, FMEI Cuba CQ-156
> > > > phone-313-390-8849, fax: 313-390-4084
> > > > apoma2@ford.com
> > > >
> > > >
> > > > -----Original Message-----
> > > > From: Park, Kyong [mailto:KPark@kavlico.com]
> > > > Sent: Tuesday, June 04, 2002 6:49 PM
> > > > To: MIKE STRIZICH
> > > > Cc: jmaurer@ford.com; pplante@ford.com; mfreela1@ford.com;
> > > > fgates@ford.com; mawada@ford.com; apoma2@ford.com; Akins, Mary;
> > > > Davies,
> > > > Brady; Tackman, Bruce
> > > > Subject: RE: PDFE FA report
> > > >
> > > >
> > > >
> > > > Dear Mike,
> > > > During today's our meeting, a few comments and a couple of questions
> > > > were
> > > > raised in regards to your report, and I like to pass them on to you.
> > > >
> > > > Comments:
> > > > On page 2, the Quantity Received in the table is not
> > > > correct: 7
> > > > field returns, number of good parts from Ford, in addition,
> > > > unpopulated ceramic hybrids and virgin dies from Kavlico.
> > > >
> > > > On page 8, under the heading of High Current Failures,
> > > > Iout=100 mV,
> > > > and so on: Iout = 100 mA or Vout = 100 mV? needs
> > > > clarifications. I understand S/N SRL547 and S/N SRL401 are not 'High
> > > > Current
> > > > Failures', needs verification.
> > > >
> > > > The heading, 'Transient Failures (Vehicle
> > > > Failures-pass
> > > > spec.):', the heading may not be correct. Ford's suggestion is

From: Plante, Paul (P.G.)
Sent: Wednesday, March 20, 2002 1:48 PM
To: Awad, Mahmoud (M.I.); Maurer, James (J.B.)
Subject: RE: Failure Symptom Pareto

We need to add a line that says overall MIL is 98% (i.e. 98% of the time the MIL tells the customer that the sensor is defective and is therefore self-capaingning. Since it normally will happen within warranty that is also good news to the customer and recall not required)

---Original Message---

From: Awad, Mahmoud (M.I.)
Sent: Wednesday, March 20, 2002 12:59 PM
To: Maurer, James (J.B.); Plante, Paul (P.G.)
Cc: Panaretos, Christine (C.M.)
Subject: Failure Symptom Pareto

Jim,

This is what I got in terms of the Pareto Symptom. I would suggest to use the following verblage on the 14 D under 1a:

Customer may experience any or all of the following symptoms:

- 1) Check engine light only (MIL): (64% - 90%)
- 2) Hesitation/ Surges:
 - With MIL (1-14%)
 - Without MIL (0.3-1%)
- 3) Stalls with restart, stalls with no crank and no start, and No crank & no start:
 - With MIL (0.9 - 5.1%)
 - Without MIL (1- 1.6%)

Note: Due to the wide spectrum of applications and months of productions, percentages varied between a lower and upper values given above. See praetor attachment.

<< File: DPFE Symptom Pareto.doc >>

Best Regards

Mahmoud Awad

Reliability Implementation Engineer

FMEI Department Support

Phone: (313) 24-83869

e-mail: mawad@ford.com

From: Sapick, Gregory (G.)
Sent: Thursday, August 02, 2001 12:49 PM
To: Maurer, James (J.B.)
Cc: Crawley, Ian (I.A.)
Subject: RE: White DPFE #9

James,

The RCON was triggered by the high IEGR condition which you set as 993. So to answer your question, the value of IEGR was 993. You can see this clearly in the plots that I gave Ian. Note that the files are taken with 2000 data points before the triggering event, and at a sample rate of .01 sec. With this information you should be able to find exact where on the plots the rcon triggered. If you have any other questions feel free to contact me....

Greg Sapick

Ford Motor Company

PD-R&VT-CAPE-PCSE

Calibration Development


Taurus/Sable 4V-2V-FFV

POEE Building, Cube BC186

Phone:(313) 24-81219 Fax:(313) 323-6743

Pager:(313) 851-4771 Or Text Page <mailto:3138514771@alphapage.airtouch.com>

Email: <mailto:gsapick@ford.com>

 **Go Blue!**

---Original Message---

From: Crawley, Ian (I.A.)
Sent: Thursday, August 02, 2001 12:42 PM
To: Sapick, Gregory (G.)
Subject: FW: White DPFE #9

Greg,

Here are the revised triggers.

---Original Message---

From: Maurer, James (J.B.)
Sent: Thursday, August 02, 2001 12:35 PM
To: Crawley, Ian (I.A.)
Subject: RE: White DPFE #9

Ian,

I revised the triggers for the parameters in the other vehicles that have VDRs.

The new triggers are set on EPTBAR rather than IEGR and will trigger the VDR when EPTBAR is less than 80 counts or above 1013 counts. The new limits were set because pressure pulsations in the EGR tube can cause the pressure sensor signal to be lower than expected with the value of IEGR and EPTBAR being less than EPTZER. Also, some sensors can saturate high at 4.95 volts, so the upper limit was raised too.

I still have VDR triggers set for the P0401 and P0402 fault timers at 3.0 seconds.

There is also a trigger on CODES_COUNT.

It would be interesting to know what the value of IEGR was when the RCON triggered.

Regards,

Jim Maurer

James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3872, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

---Original Message---

From: Crawley, Ian (I.A.)
Sent: Wednesday, August 01, 2001 5:24 PM
To: Maurer, James (J.B.); Ogozali, Jim (J.C.); Gates, Freeman (F.C.)
Subject: FW: White DPFE #9

FYI. We may be discussing this at our Friday section meeting, if you are interested. I have asked Greg Sapick for the hard copy plots for the information located in the attached files. Let me know if you have any questions or feedback.

---Original Message---

From: Sapick, Gregory (G.)
Sent: Wednesday, August 01, 2001 10:04 AM
To: Crawley, Ian (I.A.)
Subject: White DPFE #9

Ian,

3 files were collected yesterday due to excessive ieqr. Note that I altered the fault times for 401 and 402 to set codes in only 3 seconds. There were no counts on the fault timers. Enjoy!

Let me know if you want me to move on the next sensor or what....

Thanks!

<< File: DPFE.ZIP >>

Greg Sapick

Ford Motor Company

PD-R&VT-CAPE-PCSE

Calibration Development

Taurus/Sable 4V-2V-FFV

POEE Building, Cube BC186

Phone:(313) 24-81219 Fax:(313) 323-6743

Page:(313) 851-4771 Or Text Page <mailto:3138514771@alphapage.airtouch.com>

Email: <mailto:gsapick@ford.com>



Go Blue!

From: Sass, Ronald (R.S.)
Sent: Monday, July 30, 2001 1:06 PM
To: Maurer, James (J.B.)
Subject: EGR data

Jim, I think we should use EPTBAR > 1003 counts to alleviate this transient condition. EPTBAR would give us some filtering action, and 1003 would be the absolute max the sensor should read.

Ron Sass
R&VT-CAPE-Diagnostic Systems--
OBD-II Field Feedback
Ph: (313) 337-6850 /Fax: (313) 323-6743
POEE bldg. Cube: EG-153 MD #25
email: RSass@Ford.com

From: Sass, Ronald (R.S.)
Sent: Monday, July 30, 2001 9:43 AM
To: Maurer, James (J.B.)
Cc: Bensek, Catherine (C.K.); Ogozaly, Jim (J.C.)
Subject: FW: 566W724 IEGR = 995

Jim, I am forwarding some DPFE data we captured from one of the TNI sensors we installed on our Focus. It shows an IEGR spike occurring at about 1000 counts when the EGRDC was commanded to about 60%. It's just a spike mind you and may be characteristic on transients, but may also be a precursor. I am wondering if it might be better to trigger off of EPTBAR to allow for some filtering?

--- Original Message ---

From: Gagnier, Troy (T.A.)
Sent: Monday, July 30, 2001 8:44 AM
To: Sass, Ronald (R.S.)
Cc: Gagnier, Troy (T.A.)
Subject: 566W724 IEGR = 995

Ron,

I have enclosed the VDR data file from 566W724. The vehicle information needed is as follows:
2001 MY Focus 2.0L Manual Transmission
566W724 Tag #
Vin: 1FAHP36331W100003
Approx. Mileage 16,200 fault occurred
Date fault occurred 7/28/2001
You have the data on when and mileage the DPFE was installed.
This should be all the info you need to put the occurrence in the database.



566W724.cvt0

Regards,
Troy Gagnier
OBDI Field Feedback
R&VT- Cape-Diagnostic Systems (T326)
(Phone) 313-337-1463 / (Fax) 313- 323-6743
Cube EG146, POEE, MD #25
(Email) tgagnier@ford.com

From: schen16 [schen16@ford.com]
Sent: Thursday, April 11, 2002 8:28 PM
To: Freeland, Mark (M.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Plante, Paul (P.G.)
Subject: Re: DPFE EGR Part Concern

Mark:

Thank you for your information, the defeat EGR part was shipped to you this time, but not included the PCM, as I mentioned we still not get this car back so far, so we will ship PCM to you as it is available, sorry to confuse you.

Regards,

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

From: "Freeland, Mark (M.)" <mfreela1@ford.com>
To: "Chen, Smith S N (S.)" <schan16@ford.com>
Cc: "Maurer, James (J.B.)" <jmaurer@ford.com>; "Gates, Freeman (F.C.)" <fgates@ford.com>; "McCoy, James (J.D.)" <jmccoy1@ford.com>; "Plante, Paul (P.G.)" <pplante@ford.com>
Sent: Thursday, April 11, 2002 9:30 PM
Subject: RE: DPFE EGR Part Concern

> Smith,
> Thanks for the info and shipping the PCM. I have asked Jim Maurer to
> look into getting you a replacement PCM.
> I do not know if you are aware of the improved dPFE sensor which went
> into production on January 7th, 2002. If not here are the details.
>
> There is a known failure mode that we have been referring to a "V
> Transient". With this failure the sensor goes into a high current draw
> situation, where the current draw can be anywhere in the range 200 -
> 1,700 mA. It is believed to be a SCR latch caused by some unknown
> transient voltage spike hitting the sensor output and/or the sensor Vref
> line. The improved transient voltage protection to the dPFE sensor
> went into production at Kavlico on January 7th 2002. It incorporates an
> added 10 ohm current limiting resistor on the 5 V input (Vref line) and
> two 30 ohm series resistors and a diode to ground on the sensor output

> line. This improved sensor will prevent the sensor from ever drawing a
> current greater than 500 mA for any failure mode. For the Escape (and I
> presume also for the Tribute) it takes a current of 1,500 mA to pull the
> PCM 5 V low enough to stall the engine.

>

> So a good fix to prevent dPFE induced stalls and/or no starts is to
> replace the dPFE sensor with one which has a manufacturing date code of
> greater than or equal to 2A07B. Please pass this information on to
> those who need to know.

>

> We are still working to identify the source of the transient voltage
> spikes which cause the sensor to go into the SCR latch. This is why we
> are so interested in examining the PCM from you're problem vehicle.

>

> Many thanks for you're help in obtaining the PCM from the problem
> vehicle.

>

> Regards

>

> Mark Freeland

>

>> 6-Sigma Black Belt

>> Engine Research Department

>> Ford Research Laboratory

>> P.O. Box 2053

>> MD 2629 - SRL - Room 1517

>> Dearborn, MI 48121-2053 USA

> email: mfreela1@ford.com

> Tel.: (313) 594-7645

>

>

> ---Original Message---

> From: schen16 [mailto:schen16@ford.com]

> Sent: Thursday, April 11, 2002 3:10 AM

> To: Freeland, Mark (M.); Chang C.K

> Subject: Fw: DPFE EGR Part Concern

>

>

> Mark:

> Please be advised that the part was ready and will sent through "DHL"

> shipment, the shipping no is "2642010453" .

>

> Regards,

> --- Original Message ---

> From: "schen18" <schen18@ford.com>

> To: "Freeland, Mark (M.)" <mfreela1@ford.com>

> Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao, Jack (J.)"

> <jjao@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>; "Maurer, James

> (J.B.)" <jmaurer@ford.com>

> Sent: Thursday, April 11, 2002 3:03 PM

> Subject: Re: DPFE EGR Part Concern

>

>

>> Mark:

>> Attached file please find the information that responded from our ACSG

>> people, this vehicle was "Tribute 2.0L" imported car, however, I can't

> get

>> this car so far but the PCM parts No. shall be "YL8Z-12A650-TG".

>> The Lot # of this EGR part is "1F19B", Mr. C.K.Chang will mail this

> part

> to

>> you ASAP .

>>

>> Regards,

>> --- Original Message ---

>> From: "Freeland, Mark (M.)" <mfreela1@ford.com>

>> To: "Chen, Smilh S N (S.)" <schen18@ford.com>; "Kwon, Soon (S.K.)"

>> <skwon@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>;

> "Freeland,

> Mark

>> (M.)" <mfreela1@ford.com>

>> Cc: "Huang, M (M.T.)" <mhuang3@ford.com>; "Freeland, Mark (M.)"

>> <mfreela1@ford.com>; "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao,

> Jack

> > (J.)" <jiao@ford.com>
> > Sent: Tuesday, April 09, 2002 9:57 PM
> > Subject: RE: DPFE EGR Part Concern
> >
> >
> > > Smith,
> > >
> > > This is great news. Can you also tell me if the original dPFE
> > sensor is
> > > still with the vehicle, if so it would be very helpful to get that
> > back
> > > also. We can provide a replacement for the dPFE sensor.
> > > I will need additional information on the vehicle to obtain a
> > > replacement PCM.
> > > Can you please provide me with the VIN number, Build date, Specific
> > > Vehicle description (i.e. 2.0L Zetec Focus, 2001 MY etc.) and if
> > > possible also the part number and any other available information
> > from
> > > the label on the current PCM.
> > >
> > > Also, can you please provide me with the complete service history on
> > the
> > > vehicle.
> > >
> > > My shipping address is:
> > > SRL Room 1517/MD 2629
> > > 2101 Village Road
> > > Dearborn, MI 48121-2053
> > >
> > > Jim,
> > >
> > > Do you have any idea if we can obtain a replacement PCM for an
> > overseas
> > > application locally? Any thoughts, please let me know.
> > >
> > >
> > > Regards

> > >

> > > Mark Freeland

> > >

> > > > 6-Sigma Black Belt

> > > > Engine Research Department

> > > > Ford Research Laboratory

> > > > P.O. Box 2053

> > > > MD 2629 - SRL - Room 1517

> > > > Dearborn, MI 48121-2053 USA

> > > email: mfreela1@ford.com

> > > Tel.: (313) 594-7645

> > >

> > >

> > > ---Original Message---

> > > From: schen16 [mailto:schen16@ford.com]

> > > Sent: Monday, April 08, 2002 10:51 PM

> > > To: Kwon, Soon (S.K.); Maurer, James (J.B.); Freeland, Mark (M.)

> > > Cc: Huang M. T.; Freeland, Mark (M.); Gates, Freeman (F.C.); Jao,

> Jack

> > > (J.)

> > > Subject: Re: DPFE EGR Part Concern

> > >

> > >

> > > Mark:

> > > It is possible to get the PCM from the concern vehicle, due to our

> > > company

> > > decided to buy back this vehicle to solve the customer's big

> concern,

> > > however, we will send PCM to you if you can provide a new one for

> > > replacement. Please also show your detailed address, I can mail to

> you

> > > when

> > > it is available.

> > >

> > > Regards,

> > >

> > > --- Original Message ---

>>> From: "Freeland, Mark (M.)" <mfreela1@ford.com>
>>> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Maurer, James (J.B.)"
>>>
>>> <jmaurer@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>
>>> Cc: "Jao, Jack (J.)" <jjao@ford.com>; "Gates, Freeman (F.C.)"
>>> <fgates@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>
>>> Sent: Monday, April 08, 2002 8:42 PM
>>> Subject: RE: DPFE EGR Part Concern

>>>
>>>
>>>> Smith,
>>>> Would it be possible to obtain the PCM from the subject vehicle as
>>>> there
>>>> is a possiblilty that a defect in the PCM was the trigger which
>>>> caused
>>>> the dPFE sensor to go into the high current mode and become
>>>> shorted?

>>>>
>>>> Regards

>>>>
>>>> Mark Freeland

>>>>
>>>>> 6-Sigma Black Belt
>>>>> Engine Research Department
>>>>> Ford Research Laboratory
>>>>> P.O. Box 2053
>>>>> MD 2629 - SRL - Room 1517
>>>>> Dearborn, MI 48121-2053 USA
>>>>> email: mfreela1@ford.com
>>>>> Tel.: (313) 594-7645

>>>>
>>>>

>>>> -----Original Message-----

>>>>> From: schen16 [mailto:schen16@ford.com]
>>>>> Sent: Wednesday, April 03, 2002 12:11 AM
>>>>> To: Maurer, James (J.B.); Kwon, Soon (S.K.)
>>>>> Cc: Jack Jao; Gates, Freeman (F.C.); Freeland, Mark (M.)

>>> Subject: Re: DPFE EGR Part Concern
>>>
>>>
>>> Jim:
>>> Please find the attached file for the measuring data of the defeat
>>> DPFE
>>> EGR
>>> part, this case was happened when the customer was driving in city
>>> with
>>> 40kph cruising, the engine stalled suddenly without any warning
>>> signals,
>>> after that the ODO indicator showed "—" and can not restart
>>> engine,
>>> this vehicle was buy in Sept, 2001, the accumulated mileage was
> 7034KM
>>> only.
>>> It causes the customer very big concern and our S&M people do
> their
>>> best to
>>> try to explain and calm down customer's emotion.
>>> As your mail, do you have any experience for engine stall? and the
>>> improved
>>> parts can prevent this engine stall? what actions shall be taken?
>>> Any queries of this case you want to understand please let me
> know.
>>>
>>> Regards,
>>> --- Original Message ---
>>> From: "Maurer, James (J.B.)" <jmaurer@ford.com>
>>> To: "Chen, Smith S N (S.)" <schen16@ford.com>
>>> Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Freeland, Mark
> (M.)"
>>> <mfreela1@ford.com>
>>> Sent: Tuesday, April 02, 2002 11:27 PM
>>> Subject: FW: DPFE EGR Part Concern
>>>
>>>

>>>> Mr. Chen,
>>>>
>>>> Your attached files did not come through to me, so I don't know
> the
>>>> specifics for your vehicle.
>>>>
>>>> One of the failure modes of the sensor is that it may short and
> draw
>>> a
>>>> high current from the PCM (engine control module). When this
>>> happens,
>>>> the voltage that is supplied to the microprocessor inside the
> PCM is
>>>> not
>>>> sufficient to keep the PCM operating. When the microprocessor
> is
>>> not
>>>> running, there are no signals to the fuel injectors, ignition
> coils,
>>>> and
>>>> other components required to keep the engine running.
>>>>
>>>> The circuit inside the sensor was changed to eliminate this
> issue.
>>> A
>>>> resistor was added to limit the amount of current the sensor
> would
>>>> draw
>>>> when it shorted, and another resistor and diode were added to
>>>> eliminate
>>>> electrical noise issues that could potentially cause the short
> to
>>>> occur.
>>>> The new part was released on concern C11288321. Production
> began
>>>> January 7, 2002.
>>>>

>>>> I am interested in knowing the details about why a customer
> would
>>> sue
>>>> over this issue. Does the customer want you to buy back the
> vehicle
>>>> if
>>>> it cannot be fixed? The latest level part should take care of
> the
>>>> issue.

>>>>
>>>>

>>>> Regards,
>>>> Jim Maurer
>>>> James B. Maurer
>>>> V-Engine & Sigma Team Leader
>>>> Fuel Metering Dept. V Engine Engineering
>>>> Phone (313) 390-3672, Fax (313) 390-4084
>>>> Text Page: (313) 795-5219
>>>> Email: jmaurer@Ford.com

>>>>

>>>> —Original Message—

>>>> From: Owens, Karen (K.E.)
>>>> Sent: Tuesday, April 02, 2002 9:58 AM
>>>> To: Chen, Smith S N (S.)
>>>> Cc: Maurer, James (J.B.); Gatas, Freeman (F.C.); Freeland, Mark
> (M.)

>>>> Subject: RE: DPFE EGR Part Concern

>>>>

>>>>

>>>> Mr., Chen:

>>>> I am no longer working on this matter, James Maurer (JMAURER) is
> the

>>>> new

>>>> team leader. I am forwarding your note to him.

>>>>

>>>> Jim:

>>>> Please respond to Mr. Chen. Thank you.

>>>>

>>>>

>>>> Change Is Good. Proactivity Is Better!

>>>> Karen E. Owens

>>>> Supervisor

>>>> Modular V8/V10 Engine Systems

>>>> (off) 313.845.5770

>>>> (fax) 313.390.1229

>>>>

>>>> —Original Message—

>>>> From: schen16 [mailto:schen16@ford.com]

>>>> Sent: Wednesday, March 27, 2002 3:25 AM

>>>> To: Owens, Karen (K.E.)

>>>> Cc: Jack Jao

>>>> Subject: DPFE EGR Part Concern

>>>>

>>>>

>>>> Miss Owens:

>>>> How are you, we recently have a special case that DPFE EGR part

>>>> malfunction and causing engine stalled w/o any warning during

>>> driving,

>>>> this customer is proposed to sue to company if we can not

> provide a

>>>> reasonable reason. Attached file please find the failure mode 2

>>> which

>>>> is

>>>> causing engine stall immediately during drive, the failure mode

> 1

>>>> which

>>>> is other defeat parts data, and we also show the new parts and

> data.

>>>> test part. Please give us a special effort to explain this

> concern.

>>>> Your quick response will be requested and appreciated.

>>

From: schen16 [schen16@ford.com]
Sent: Thursday, April 11, 2002 3:03 AM
To: Freeland, Mark (M.)
Cc: Gates, Freeman (F.C.); Jao, Jack (J.); Kwon, Soon (S.K.); Maurer, James (J.B.)
Subject: Re: DPFE EGR Part Concern



Fw: U204 DPFE
cause the engl... Mark:

Attached file please find the information that responded from our ACSG people, this vehicle was "Tribute 2.0L" imported car, however, I can't get this car so far but the PCM parts No. shall be "YL8Z-12A650-TG". The Lot # of this EGR part is "1F19B", Mr. C.K.Chang will mail this part to you ASAP .

Regards,

--- Original Message ---

From: "Freeland, Mark (M.)" <mfreela1@ford.com>
To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>; "Maurer, James (J.B.)" <jmaurer@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>
Cc: "Huang, M (M.T.)" <mhuang3@ford.com>; "Freeland, Mark (M.)" <mfreela1@ford.com>; "Gates, Freeman (F.C.)" <fgates@ford.com>; "Jao, Jack (J.)" <jjao@ford.com>
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> still with the vehicle, if so it would be very helpful to get that back
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EA02-027-G 27981

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> Regards
>
> Mark Freeland
>
>> 6-Sigma Black Belt
>> Engine Research Department
>> Ford Research Laboratory
>> P.O. Box 2053
>> MD 2629 - SRL - Room 1517
>> Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7645
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> From: schen16 [mailto:schen16@ford.com]
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> To: Kwon, Soon (S.K.); Maurer, James (J.B.); Freeland, Mark (M.)
> Cc: Huang M. T.; Freeland, Mark (M.); Gates, Freeman (F.C.); Jao, Jack
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> Subject: Re: DPFE EGR Part Concern

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> — Original Message —

> From: "Freeland, Mark (M.)" <mfreela1@ford.com>

> To: "Chen, Smith S N (S.)" <schen16@ford.com>; "Maurer, James (J.B.)"

> <jmaurer@ford.com>; "Kwon, Soon (S.K.)" <skwon@ford.com>

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>>> 6-Sigma Black Belt

>>> Engine Research Department

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>>> P.O. Box 2053

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>> — Original Message —

>> From: "Maurer, James (J.B.)" <jmaurer@ford.com>

>> To: "Chen, Smith S N (S.)" <schen16@ford.com>
>> Cc: "Gates, Freeman (F.C.)" <fgates@ford.com>; "Freeland, Mark (M.)"
>> <mfreela1@ford.com>
>> Sent: Tuesday, April 02, 2002 11:27 PM
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> > > Jim Maurer
> > > James B. Maurer
> > > V-Engine 6-Sigma Team Leader
> > > Fuel Metering Dept. V Engine Engineering
> > > Phone (313) 390-3672, Fax (313) 390-4084
> > > Text Page: (313) 795-5219
> > > Email: jmaurer@Ford.com
> > >
> > > -----Original Message-----
> > > From: Owens, Karen (K.E.)
> > > Sent: Tuesday, April 02, 2002 9:58 AM
> > > To: Chen, Smith S N (S.)
> > > Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Freeland, Mark (M.)
> > > Subject: RE: DPFE EGR Part Concern
> > >
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> > > Mr., Chen:
> > > I am no longer working on this matter, James Maurer (JMAURER) is the
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> > > Modular V8/V10 Engine Systems
> > > (off) 313.845.5770

> > > (fax) 313.390.1229

> > >

> > > —Original Message—

> > > From: schen16 [mailto:schen16@ford.com]

> > > Sent: Wednesday, March 27, 2002 3:25 AM

> > > To: Owens, Karen (K.E.)

> > > Cc: Jack Jao

> > > Subject: DPFE EGR Part Concern

> > >

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> > > How are you, we recently have a special case that DPFE EGR part
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> > > is

> > > causing engine stall immediately during drive, the failure mode 1
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> > > is other defeat parts data, and we also show the new parts and dura.

> > > test part. Please give us a special effort to explain this concern.

> > > Your quick response will be requested and appreciated.

From: Verner, Carol (C.J.)
Sent: Monday, November 25, 2002 8:31 AM
To: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: RE: Roush & MPG Key Life Testing Update

Jim,

The Focus at MPG should be reaching the 500 cycles by this week. I am going to forward a note to Jack telling him to stop testing @ 500 cycles.

Carol

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

From: Maurer, James (J.B.)
Sent: Thursday, November 21, 2002 9:34 AM
To: Verner, Carol (C.J.); Gates, Freeman (F.C.)
Subject: RE: Roush & MPG Key Life Testing Update

Carol & Freeman,

I am in favor of continuing the tests till there is 500 cycles on the MPG sensor, and continuing the test at Roush for another couple of weeks. At the end of a few more weeks, we will probably have more failures on the test at EDP and then that can become the screening test we will use.

It would be good to get another failure at MPG with the scope set to trigger on the vehicle when a "transient" occurs. What do you think about putting a low value resistor in series with the sensor line (1 ohm) and monitoring current similar to the EDP test?

Regards,

Jim Maurer

James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

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

From: Verner, Carol (C.J.)
Sent: Thursday, November 21, 2002 9:24 AM
To: Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Roush & MPG Key Life Testing Update

As of this morning, the sensor on the Focus at MPG has 354 cycles on it. The last time a failure occurred from the same production build datecode was after 455 cycles.

At Roush, the highest cycles tested so far is 225.

Do we want to continue testing after we have achieved the 500 cycles per sensor which is what Shrl set up the test to evaluate?

Carol

From: Verner, Carol (C.J.)
Sent: Wednesday, October 30, 2002 11:12 AM
To: Donald Thering JR'; Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Roush Data (Graphs) 10/29/02 and 10/30/02



Graphs Max Cycles
102902 and 1...

All,

FYI regarding how the sensors are performing on the Roush test.

Carol

From: Verner, Carol (C.J.)
Sent: Tuesday, September 10, 2002 3:30 PM
To: O'Neall, Jim (J.D.); Maurer, James (J.B.)
Subject: dPFE Fleet Measurements: Florida

Jim,

I spoke with both fleets this afternoon about taking measurement on the dpfe sensors on their vehicles. Both said it is was okay for me to come down and make the measurements however.

* **Mears Transportation: Orlando, Florida** needs at least one weeks notice to establish a schedule to make this happen. They lease their vehicles out to independent contractors who operate the vehicles anytime during the day so they has to set up a time for them to come in for service. Mears will get back to me tomorrow AM and let me know the days and times. They anticipate the earliest I can start is next Tuesday 9/17/02.

* Whenever the vehicle is in for service, Mears pays the driver for down time at a rate of \$10/hr. We will need to reimburse them for the downtime.

* They are testing 25 non-paralyene coated sensors for us. I told the we would like to have the all the vehicles out of operation for a maximum of 1 hr.

- **NCH Healthcare: Naples, FL:** Needs a day to work out a schedule. They uses the cars to make deliveries to medical facilities and they provide this service on a 24 hour basis. Some are also used by the Sales Department. NCH said they would get back to me tomorrow with details.

Carol

From: Verner, Carol (C.J.)
Sent: Friday, August 30, 2002 11:15 AM
To: Maurer, James (J.B.)
Subject: FW: Focus: AM Noise & "Runs out of Gas at 1/3 tank."

Importance: High

Jim,

A note Jerry Minifield shared with me today while we were discussing my EMC test plan for the Kavilco dPFE sensor. FYI!

Carol

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

From: Minifield, Jeremiah (J.R.)
Sent: Friday, August 30, 2002 9:27 AM
To: Kardos, Nancy (N.J.); Verner, Carol (C.J.)
Subject: FW: Focus: AM Noise & "Runs out of Gas at 1/3 tank."
Importance: High

FYI. See comments about the "PFE" sensor below.

Grace and Peace,
J. R. Minifield (jminif@ford.com)
EMC Section, Bldg 5, Cube 2D102,
Ph: 313-32-36583, Fax: 313-39-05327

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

From: Weltman, Lester (L.H.)
Sent: Thursday, August 29, 2002 8:41 AM
To: Garrett, Bill (W.G.)
Cc: Minifield, Jeremiah (J.R.); Swick, Curt (C.); Gatt, Mark (M.V.); Tengler, Dave (D.R.); Cheatham, Sandy (S.M.); Clayton, Chris (C.N.)
Subject: RE: Focus: AM Noise & "Runs out of Gas at 1/3 tank."
Importance: High

Dealer's analysis (after the tech drove other Focus' on their lot) was "they all are the same"... Check with EMC (T. Hermann, Jerry Minifield). Powertrain went across the board with new PFE supplier (Kavilco).. New PFE we tested on '01 SN95 FAILED our EMC testing & we (thought) we stopped them from implementing....

Another thing that might be elevating TGW's in Audio & other electrical products, is an apparent change in "Warranty Policy". Dealers are CHARGING customers to perform diagnostics if no warrantable problem is found. They wanted to charge me \$72 to tell me that my radio is "normal" *. Especially on leased vehicles, this discourages people from getting items repaired. But, makes them more likely to raise the issue as a TGW & negatively impact their future purchase decisions. (The shuttle driver I had, yesterday, raised the same complaint when she wanted her Dealer to fix inoperative power door locks....)

P.S. Audio is scheduled to present at 9/12 LMPDQR (Lincoln Mercury Product Development Quality Review; previously "Customer Satisfaction Steering Team"). Can you help Dave Tengler (Mark Gatt) prepare to show:

- Cascade & Reconciliation status of previously violated "Audio" SDS requirements you previously showed as main causes of quality issues your team's working on.
- Deviations for all affected Lincoln Mercury applications.
- Status of "prevent recurrence" actions, i.e.
 - how to prevent PFE sensor that causes EMI issues from getting into production.
 - improved DVM's for consistent Pass/Fail criteria (* Focus' AM noise is significantly worse than level

we shut DAP down for on '01 SN95 Launch.)

Lester Weltman

Quality & Reliability Supervisor,
Lincoln Mercury, Electrical
RC III Mail Drop: LM-301 Cube: 22P32
Phone/Fax: (313) 248-2499
lweltman@ford.com <<mailto:lweltman@ford.com>>
Text Pager: (313) 684-7119

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

From: Garrett, Bill (W.G.)
Sent: Wednesday, August 28, 2002 6:41 PM
To: Creathem, Sandy (S.M.)
Cc: Weltman, Lester (L.H.)
Subject: FW: Focus: AM Noise & "Runs out of Gas at 1/3 tank."

Sandy,
FYI. Any clues on the AM noise issue?

Regards,

Bill Garrett, Supervisor
Multimedia Quality & Value Engineering
RVT - E/E Systems Engineering - Multimedia Dept.
Bldg. #5, Rm. 2E004, MD 5016
313-845-1470 pg 734-431-1171 FAX 313-621-4426

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

From: Weltman, Lester (L.H.)
Sent: Wednesday, August 28, 2002 8:48 AM
To: Swick, Curt (C.); bpurvis@visteon.com; Fike, Barbara (B.G.); Garrett, Bill (W.G.); Hermann, Thomas (T.J.)
Subject: Focus: AM Noise & "Runs out of Gas at 1/3 tank."

fyi, Fairlane Ford (Michigan Ave. between Greenfield & Schaefer) is working on my 2001 Focus, today. If interested, contact the Service Manager: Jim Harris on (313) 846-5000. The vehicle's "claim check/tag" number is 3329. (VIN: 1FAFP34341W110789)

The stall problem happens after a long cloverleaf turn (i.e. I-94 exit to Telegraph South). So far, all the cloverleafs it's stalled on were clockwise. Last time, it would NOT re-start until I pumped in 8 gallons.

AM noise has been a major issue on 800 & 950 since they changed the PFE sensor. Note in attached that they've had Cross vehicle issues with the re-sourced PFE supplier (Kavlico). (I wonder if this is the same "cheaper" supplier that Powertrain tried to use on '01 Mustang, that we rejected for excess EMI???)

<< File: top25 doc.doc >>

Lester Weltman

Quality & Reliability Supervisor,
Lincoln Mercury, Electrical
RC III Mail Drop: LM-301 Cube: 22P32
Phone/Fax: (313) 248-2499
lweltman@ford.com <<mailto:lweltman@ford.com>>
Text Pager: (313) 684-7119

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

From: Swick, Curt (C.)

ERG2-827-G 28113

Sent: Wednesday, August 07, 2002 12:14 PM
To: 'bpurvis@visteon.com'; Fike, Barbara (B.G.)
Cc: Weltman, Lester (L.H.)
Subject: FW: Focus: "Runs out of Gas at 1/3 tank."

Bruce, Barb
do you guys want to look at this vehicle. is this the fuel pump issue?
thanks

Curt Swick
N.A. Focus EESE Supervisor
PVT/OPD/Launch
Phone: 734.467.0694, Alternate 313.390.1035
Pager: cswick

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

From: Weltman, Lester (L.H.)
Sent: Wednesday, August 07, 2002 12:07 PM
To: Swick, Curt (C.); Srinivasan, Madhu (M.)
Subject: Focus: "Runs out of Gas at 1/3 tank."

Before I bring my '01 Focus to the Dealer, do you know if PVT is interested in seeing my Focus that stalls/out of gas with at least 4 gals left in tank & 1/3 reading on Fuel Gauge? This has been a recent, but consistent issue. John LoPorto & Dean Nowicki had to push my car to the gas station across Telegraph road when, all of a sudden, at 1/3 tank / 220 miles on trip odo, it just died & refused to re-start, until I put 8 gals in (Full tank: 2 clicks).

The only issues I've seen in the past that cause similar symptoms, are "ballooning tanks" that caused the pick-up tube to "suck air" before the measurable fuel was used up.

Lester Weltman
Quality & Reliability Supervisor,
Lincoln Mercury, Electrical
RC III Mail Drop: LM-301 Cube: 22P32
Phone/Fax: (313) 248-2499
lweltman@ford.com <<mailto:lweltman@ford.com>>
Text Pager: (313) 684-7119

From: Verner, Carol (C.J.)
Sent: Friday, January 04, 2002 3:16 PM
To: Peters, Ed (E.W.); Hammer, Richard (R.M.); Kamph III, John (J.G.); Owens, Karen (K.E.)
Cc: Muter, Doreen (D.J.); Dible, Ken (K.M.); Parker, Jimmy (J.D.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Ed,

Bear with me here.

Based on John K's note, I am concluding that Atlanta may be building vehicles today with engines that have either a Motorola and Kavlico sensor on it if they recieved a shipment with EBD's prior to 12/10/01. **At this time I am asking the question is it possible to purge LEP's warehouse of all engines with the Kavlico sensor on them and get these engines to the plants as soon as possible.** The reason for my concern is that for every day we build vehicles with this mix we have to recall that entire day of production just to make sure we get those vehicles with the Kavlico sensor on them for both plants. As I understand it we do not track the VIN & ESNs as the vehicle is built. What I am hoping for is we may be able to do it get a clean build date from the B&A's stating when all the engines with Kavlico sensors were installed in vehicles.

Can you send back a response to the question in bold print?

Carol

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

From: Peters, Ed (E.W.)
Sent: Friday, January 04, 2002 2:08 PM
To: Verner, Carol (C.J.); Hammer, Richard (R.M.); Kamph III, John (J.G.)
Cc: Muter, Doreen (D.J.); Dible, Ken (K.M.); Parker, Jimmy (J.D.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

To confirm: LEP changed to the new sensor on the first engine at the wire harness installation station on 12/10/01. The first "handful" of engines would have had a 12/7/01 engine build date (label with date goes on upstream of the wire harness). All engines with a 12/10/01 or later engine build date definitely have the Motorola sensor.

Regards,

Ed Peters

3.DL Resident Engineer - Lima Engine Plant
Ford Motor Company, PTO, V Engine Engineering
Ford Dialnet: 9-1-226-7076, Pager (419) 226-7297 x1019

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

From: Kamph III, John (J.G.)
Sent: Friday, January 04, 2002 1:42 PM
To: Verner, Carol (C.J.); Hammer, Richard (R.M.)
Cc: Dible, Ken (K.M.); Peters, Ed (E.W.); Parker, Jimmy (J.D.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

It appears Lima did have a clean date of 12/10/2001. However, due to the pipeline we just unloaded another box car with 12/04/2001 engines which is the Kavlico sensor. All engines @ CAP built after 12/10 do have the new style DPFE.

John G. Kamph III

Powertrain Resident Engineer Chicago Assembly Plant
Ford Net 9-1-686-7330, Outside 773-646-7330

EA02-027-G 28260

Fax Ford Net 9-1-686-7377, Outside 773-646-7377

When you build quality you never need an excuse

—Original Message—

From: Kamph III, John (J.G.)
Sent: Friday, January 04, 2002 11:52 AM
To: Verner, Carol (C.J.); Hammer, Richard (R.M.)
Cc: Dible, Ken (K.M.); Peters, Ed (E.W.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Carol, not so easy of a question. I am still producing vehicles with Kavlico sensors (just walked the engine line). I am still receiving engines from Lima with the old sensor. It would have been easier if Lima would have purged all old stock and then I would have a clean cut-off. So your answer is not available yet nor will it be clean.

John G. Kamph III

Powertrain Resident Engineer Chicago Assembly Plant
Ford Net 9-1-686-7330, Outside 773-646-7330
Fax Ford Net 9-1-686-7377, Outside 773-646-7377

When you build quality you never need an excuse

—Original Message—

From: Verner, Carol (C.J.)
Sent: Friday, January 04, 2002 11:47 AM
To: Kamph III, John (J.G.); Hammer, Richard (R.M.)
Subject: FW: 2000 through 2002 Kavlico TM DPFE Sensor

Good Afternoon John & Rich,

Attached are a series of emails but the last one from Doreen is the reason for my sending you this email. I am part of a 14D team working on the possible recall of the titled Kavlico TM-dPFE sensor. As Doreen notes, the 3.0L Vulcan Taurus/Sable engine for 2002 used both the Kavlico and Motorola sensor. Can each of you provide me with the number of vehicles which have the Kavlico sensor on them?

The reason for my request is I have to identify how many vehicles we need to go get. We want to make sure we get all of them and only the ones with the Kavlico sensor.

If you have any questions, pls reply back by email, text pager (cverner) or call 313-390-7180.

Thank you for your support
Carol

—Original Message—

From: Muter, Doreen (D.J.)
Sent: Friday, January 04, 2002 8:24 AM
To: Verner, Carol (C.J.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Sorry for the typo, I have a cast on my left hand and my typing is suffering. The correct name is John Kamph III e-mail (Kamph III, John (J.G.))

Doreen J. Muter
Recall & Service Programs—FCSD
Diagnostic Service Center II, Cube 793
Phone #:313-248-9391
dmuter@ford.com

EP02-027-G 2A207

---Original Message---

From: Verner, Carol (C.J.)
Sent: Thursday, January 03, 2002 4:08 PM
To: Muter, Doreen (D.J.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Doreen,

Do you have an email address for John Jamph III? I could not find him in Outlook.

Thank you

---Original Message---

From: Muter, Doreen (D.J.)
Sent: Thursday, January 03, 2002 3:12 PM
To: Verner, Carol (C.J.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Carol, the resident engineers at the Taurus/Sable plants should be able to give you the number of vehicles affected by the Kavlico sensor.

John Jamph III --- Chicago
Richard Hammer --- Atlanta

Doreen J. Muter
Recall & Service Programs--FCSD
Diagnostic Service Center II, Cube 793
Phone #:313-248-0391
dmuter@ford.com

---Original Message---

From: Verner, Carol (C.J.)
Sent: Thursday, January 03, 2002 12:36 PM
To: Muter, Doreen (D.J.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Hello Doreen,

I am a member of the 14D team responsible for tracking vehicles affected by the Kavlico sensor. Please see my comments in blue in your attached note.

Thanks
Carol (x07180), text pager overner

---Original Message---

From: Freeland, Mark (M.)
Sent: Wednesday, January 02, 2002 9:35 AM
To: Verner, Carol (C.J.)
Cc: Owens, Karen (K.E.); Plante, Paul (P.G.)
Subject: FW: 2000 through 2002 Kavlico TM DPFE Sensor

Carroll,

See below, a correction to the list of applications is required.

Thanks

Happy new year!

Regards

EA02-027-G 28288

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Johnson, Joe (J.H.)
Sent: Wednesday, January 02, 2002 7:28 AM
To: Freeland, Mark (M.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Doreen is correct.

Joe Johnson

Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 69
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292
Fax: (313) 390-4084
e-mail: jjohnson@ford.com

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

From: Freeland, Mark (M.)
Sent: Thursday, December 20, 2001 1:18 PM
To: Benzek, Catherine (C.K.); Johnson, Joe (J.H.)
Cc: Owens, Karen (K.E.); Varnar, Carol (C.I.); Planka, Paul (P.G.); Atkins, Mary (M.); Gabas, Freeman (F.C.)
Subject: FW: 2000 through 2002 Kavlico TM DPFE Sensor

Joe or Cathy,

What sensor type is used on the 2001 MY 3.0L Vulcan Ranger?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Muter, Doreen (D.J.)
Sent: Thursday, December 20, 2001 12:41 PM
To: Owens, Karen (K.E.); Freeland, Mark (M.); Akins, Mary (M.)
Cc: Manta, Paul (P.G.); Verner, Carol (C.J.); Muter, Doreen (D.J.); Bandoska, Pete (P.F.); Merder, Julie (J.A.)
Subject: 2000 through 2002 Kavlico TM DPFE Sensor

Karen, Mark, and Mary, I am the product concern analyst at FCSO assigned to the Kavlico DPFE Sensor concern. The 2001 and 2002 Ranger equipped with the 3.0L Vulcan engine is listed as affected vehicles on the 14D. After preliminary investigation, it was determined that the 2001 and 2002 3.0L Vulcan engine is not affected by the Kavlico DPFE sensor. The 2001 3.0LRanger is not tube mounted and the 2002 3.0L Ranger does not have an EGR system. Would you please remove these vehicles from the 14D. I will be removing this vehicle from the list for 2001 & 2002. The 3.0L Vulcan Taurus/Sable switched to a Motorola sensor in early December 2001. I will forward the date when I get it. Are you able to determine how many vehicles have the Kavlico sensor on them prior to switching to Motorola? Based on the conversion to Motorola, I am interpeting that the 2002 3.0L Vulcan Taurus/Sable should not be on the list as well. Is my interpetation correct? Any questions please call.

Doreen J. Muter
Recall & Service Programs—FCSO
Diagnostic Service Center II, Cube 793
Phone #:313-248-9391
dmuter@ford.com

From: Verner, Carol (C.J.)
Sent: Wednesday, January 02, 2002 11:45 AM
To: Freeland, Mark (M.)
Cc: Owens, Karen (K.E.); Plants, Paul (P.G.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Mark,

i will make the correction on the vehicles application list.

Carol

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

From: Freeland, Mark (M.)
Sent: Wednesday, January 02, 2002 9:35 AM
To: Verner, Carol (C.J.)
Cc: Owens, Karen (K.E.); Plants, Paul (P.G.)
Subject: FW: 2000 through 2002 Kavlico TM DPFE Sensor

Carroll,

See below, a correction to the list of applications is required.

Thanks

Happy new year!

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfree1a1@ford.com
Tel.: (313) 594-7645

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

From: Johnson, Joe (J.H.)
Sent: Wednesday, January 02, 2002 7:28 AM
To: Freeland, Mark (M.)
Subject: RE: 2000 through 2002 Kavlico TM DPFE Sensor

Doreen is correct.

Joe Johnson

Supervisor, EGR Systems, FMEI Dept
V-Engine Engineering, Powertrain Operations
POEE Bldg, Mail Drop 69
21500 Oakwood Blvd
Dearborn, Mich 48124-4091

Ph: (313) 845-8292

EA02-027-G 28211

Fax: (313) 390-4084
e-mail: jjohnson@ford.com

---Original Message---

From: Freeland, Mark (M.)
Sent: Thursday, December 20, 2001 1:18 PM
To: Bansek, Catherine (C.K.); Johnson, Joe (J.H.)
Cc: Owens, Karen (K.E.); Verner, Carol (C.J.); Plante, Paul (P.G.); Aldine, Mary (M.); Gates, Freeman (F.C.)
Subject: FW: 2000 through 2002 Kavlico TM DPFE Sensor

Joe or Cathy,

What sensor type is used on the 2001 MY 3.0L Vulcan Ranger?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

---Original Message---

From: Muter, Doreen (D.J.)
Sent: Thursday, December 20, 2001 12:41 PM
To: Owens, Karen (K.E.); Freeland, Mark (M.); Aldine, Mary (M.)
Cc: Plante, Paul (P.G.); Verner, Carol (C.J.); Muter, Doreen (D.J.); Sandoske, Pete (P.F.); Mercier, Julie (J.A.)
Subject: 2000 through 2002 Kavlico TM DPFE Sensor

Karen, Mark, and Mary, I am the product concern analyst at FCSD assigned to the Kavlico DPFE Sensor concern. The 2001 and 2002 Ranger equipped with the 3.0L Vulcan engine is listed as affected vehicles on the 14D. After preliminary investigation, it was determined that the 2001 and 2002 3.0L Vulcan engine is not affected by the Kavlico DPFE sensor. The 2001 3.0LRanger is not tube mounted and the 2002 3.0L Ranger does not have an EGR system. Would you please remove these vehicles from the 14D. The 3.0L Vulcan Taurus/Sable switched to a Motorola sensor in early December 2001. I will forward the date when I get it. Any questions please call.

Doreen J. Muter
Recall & Service Programs--FCSD
Diagnostic Service Center II, Cube 793
Phone #:313-248-9391
dmuter@ford.com

From: Williams, Lea (LHW.)
Sent: Wednesday, February 20, 2002 12:06 PM
To: Atoonjan, Don (D.J.); Amenda, Harry (H.F.); Badgley, Joel (J.K.); Bauer, Scott (S.C.); Bhojwan, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Glee, Stuart (S.); Gokhale, Renuka (R.V.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hurley, Robert (R.E.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); John McDonald (E-mail); Jones, Andy; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Klostermann, Eric (E.); Kwon, Soon (S.K.); Limilaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Luehrsen, Eric (E.A.); Marck, Edmond (E.C.); Matosa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); Morgan, Tom; Morishima, Shigeki (S.); Naveed Khan; Nematollahi, Sorya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Orman, James (J.W.); Powell, Cary; Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aiden (A.P.); Rothweiler, Daniel (D.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stigenbauer, Jeffrey (J.R.); Suarez, Rhas (R.); Sullivan, Jamie (J.P.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Vecchio, Anna Marie (A.); Wakenell, Ray (R.A.); Williams, Lea (LHW.); Williamson, David (D.E.); Yeung, Lem (.)
Cc: Hermann, Thomas (T.J.); Diez, Timothy (T.P.)
Subject: Meeting Minutes: EMC PSW Results for current production Kavlico DPFE

Meeting Minutes

Attendees:

Bob Dalbo (U204 V8 Calibration Supervisor)
Gilbert Fournelle (U204 V8 Calibration)
Lea Williams (U204 Calibration)
Tom Hermann (EMC Supervisor)
Tim Diaz (EMC)

On Friday February 15, 2002 EMC PSW test data for current production Kavlico DPFE sensor was reviewed. Thomas Hermann has independently investigated the behavior of this sensor. Based on his investigations and this data, he concluded that the current production Kavlico DPFE sensor should not contribute to U204 stalling in the field due to RFI and coupled noise from the wiring harness.

Regards,
Lea Williams
For More, Count on Lea
U204 3.0L Powertrain Calibration
Truck Engine Engineering, Suite 1AE20
Phone: (313)33-72503
Fax: (313) 32-31786

20010619 Vref short drive report.txt

<HTML>Subj:
 FW: Defective DPFE<FONT COLOR="#000000" BACK="#ffffff"
style="BACKGROUND-COLOR: #ffffff" SIZE=3 PFSIZE=10 FAMILY="SANSSERIF" FACE="Arial"
LANG="0">

Date: 6/19/01 7:50:18 AM Eastern Daylight Time

From: trozema@ford.com (Rozema, Thomas (T.M.))

To: mfsopwith@cs.com

<FONT COLOR="#000000" BACK="#ffffff" style="BACKGROUND-COLOR: #ffffff"
SIZE=2 PFSIZE=10 FAMILY="SANSSERIF" FACE="Arial" LANG="0">

Some good info.....

Thomas Rozema

Ford Motor Company

RVT\PTSE Engineering

Wayne Assembly Plant

trozema@ford.com

Phone:734-641-5831

Text Pager:734-267-5262

> -----Original Message-----

> From: Thomas, Ken (K.C.)

> Sent: Tuesday, June 19, 2001 7:35 AM

> To: Grant, Kathleen, Kathy (K.A.)

> Cc: Whitworth, Rudy (A.R.); Colatruglio, Vince (V.E.); Montini, Matthew (M.J.);
Rozema, Thomas (T.M.)

> Subject: Defective DPFE

>

> Hi Kathy, I have a defective DPFE from the field that was replaced for a no start
and code P0401. When I put it on a vehicle yesterday morning I found the drivability
poor from too much EGR and after 10 -15 miles of city driving a code P0401 was set.
But at no time did it not start.

>

> I drove the vehicle home last night, this morning after about 7 miles (@50mph) I
stopped for a intersection and upon turning the corner the vehicle quit. I coasted
to the shoulder and tried to restart with no luck. The odo displayed all dashes, I
then opened the hood and disconnected the sensor and the vehicle started. When I got
to work there were two codes P0401 and P1401.

>

> What if anything would you like to do with this sensor? Before we give it to the
supplier!

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SIZE=2 PFSIZE=10 FAMILY="SANSSERIF" FACE="Arial" LANG="0">

----- Headers -----

Return-Path: <mfraela1@ford.com>

Received: from rly-ye04.mx.aol.com (rly-ye04.mail.aol.com [172.18.151.201]) by
air-ye05.mail.aol.com (v79.20) with ESMTp id MAILINYE58-0619075018; Tue, 19 Jun 2001
07:50:18 -0400

Received: from dymwsm14.mailwatch.com (dymwsm14.mailwatch.com [204.253.83.38]) by
rly-ye04.mx.aol.com (v79.20) with ESMTp id MAILRELAYINYE48-0619075015; Tue, 19 Jun
2001 07:50:15 -0400

Received: from mwsc0204.mw4.mailwatch.com (mwsc0204.mw4.mailwatch.com
[204.253.83.134])

by dymwsm14.mailwatch.com (8.11.0/8.11.0) with ESMTp id f5JbnPK19920

for <mfsopwith@cs.com>; Tue, 19 Jun 2001 07:49:51 -0400

Received: from mail pickup service by mwsc0204.mw4.mailwatch.com with Microsoft
SMTPSVC;

Tue, 19 Jun 2001 07:50:32 -0400

Received: from 204.253.83.34 ([204.253.83.34]) by MWSC0204 with SMTP id
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Received: from eccmfw3.ford.com (mailfw3.ford.com [136.1.1.28]) by
dymwsm12.mailwatch.com (8.11.0/8.11.0) with ESMTp id f5JBoHx10431 for

Page 1

20010619 vref short drive report.txt
<mfsopwith@cs.com>; Tue, 19 Jun 2001 07:50:17 -0400

Message-Id: <200106191150.f5JBoHx10431@dymwsm12.mailwatch.com>

Received: by mailfw3.ford.com id HAA22950 (InterLock SMTP Gateway 4.2 for
mfsopwith@cs.com); Tue, 19 Jun 2001 07:55:53 -0400 (EDT)

Received: by mailfw3.ford.com (Internal Mail Agent-1); Tue, 19 Jun 2001 07:55:53
-0400 (EDT)

Received: by mailfw3.ford.com (Internal Mail Agent-0); Tue, 19 Jun 2001 07:55:53
-0400 (EDT)

From: "Rozema, Thomas (T.M.)" <trozema@ford.com>

To: mfsopwith@cs.com

Subject: FW: Defective DPFE

Date: Tue, 19 Jun 2001 07:50:02 -0400

MIME-Version: 1.0

X-Mailer: Internet Mail Service (5.5.2654.52)

Content-Type: text/plain; charset="iso-8859-1"

HOP-COUNT: 1

X-MAILWATCH-INSTANCEID: 010200048ad7b28a-f700-499e-b905-2c3867bbda16

X-OriginalArrivalTime: 19 Jun 2001 11:50:32.0138 (UTC)
FILETIME=[0B2982AD:01C0F8B6]

</HTML>

From: Plante, Paul (P.G.)
Sent: Tuesday, March 19, 2002 8:29 AM
To: Perry, Brian (B.J.)
Cc: Plante, Paul (P.G.); Maurer, James (J.B.); Gates, Freeman (F.C.); Freeland, Mark (M.)
Subject: RE: Revised Agenda for 3/14 Kavlico Technical Offsite
Can you coordinate answer with Rudy Whitworth, MIL Affinity team leader, and Gary Danoff, EGR MIL strategy (presenter at first DPFE Offsite). Should we say in 14D that the PCM is does NOT affect this issue?

---Original Message---

From: Perry, Brian (B.J.)
Sent: Tuesday, March 19, 2002 12:35 AM
To: Plante, Paul (P.G.)
Subject: RE: Revised Agenda for 3/14 Kavlico Technical Offsite

I gave Chris my comments for all points either 3/5 or 3/12, can't remember which. I don't really see them in the document she just sent out.

High level of what I believe I told her;
Issue: Vehicle stall
Cause: PCM power supply brought down by VREF short causes PCM to reset
Corrective Action: None in PCM
Resolution: Implement buffered VREF in Power PC applications (2003-2005)

Issue: Noise spikes on VREF line
Corrective Action: DPFE sensor made more robust to voltage spike transients. Not sure if we have enough data to implement wire routing changes or providing ground paths for fuel rails
Cause: No evidence source is PCM. Induced noise from harnesses and possibly static charge build up on fuel rail. Evidence of noise spikes exist, no confirmation data on source.

Brian J. Perry

Supervisor - C170, U231 & Outsourced Control Systems
GCE-PCSE-Powertrain Electronic Applications
Phone/Fax: (313) 39-04170
Cube AP-062 POEE MailDrop 75

---Original Message---

From: Plante, Paul (P.G.)
Sent: Friday, March 15, 2002 7:27 AM
To: Perry, Brian (B.J.)
Subject: RE: Revised Agenda for 3/14 Kavlico Technical Offsite

The 14D will be presented Monday 3/25/02. Pre Review w/ John Koszewnik is 3/22 Friday. I need you to summarize the root cause and possible corrective actions associated with the PCM by Monday COB to add to paper. OK?? Thanks for Thursday offsite support!

---Original Message---

From: Perry, Brian (B.J.)
Sent: Wednesday, March 13, 2002 4:34 PM
To: Panaretos, Christine (C.M.)
Cc: Atkins, Mary (M.); Akolkar, Shrikant (S.V.); Altes, Sheran (S.A.); Awad, Mahmoud (M.I.); Ayars, Don;

Danes, Adam (A.V.); Freeland, Mark (M.); Gates, Freeman (F.C.); Jahshan, John; Janda, Jon (J.M.); Maurer, James (J.B.); Nielsen, Christian (C.A.); O'Neill, Jim (J.D.); Plante, Paul (P.G.); Rossi, Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Smythe, Joseph (J.M.); Verner, Carol (C.J.)

Subject: RE: Revised Agenda for 3/14 Kavlico Technical Offsite

I was originally only planning to support the AM session due to another critical system issue mtg I have in the afternoon. This was going to work since the fishbone and Is/Is not was during the AM. I don't feel that I am of any benefit for the UPAD and corrosion analysis.

I am not sure that I can support the is/ Is not and fishbone discussions in the afternoon with this revised agenda. I will try to rebalance my schedule to support the afternoon, but I cannot confirm.

Brian J. Perry

Supervisor - C170, U231 & Outsourced Control Systems

GCE-PCSE-Powertrain Electronic Applications

Phone/Fax: (313) 39-04170

Cube AP-062 POEE MailDrop 75

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

From: Panaretos, Christina (C.M.)
Sent: Wednesday, March 13, 2002 1:01 PM
To: Adams, Mary (M.); Alkofar, Shrikant (S.V.); Alles, Sheran (S.A.); Awad, Mahmoud (M.I.); Ayers, Don; Danes, Adam (A.V.); Freeland, Mark (M.); Gates, Freeman (F.C.); Jahshan, John; Janda, Jon (J.M.); Maurer, James (J.B.); Nielsen, Christian (C.A.); O'Neill, Jim (J.D.); Panaretos, Christina (C.M.); Perry, Brian (B.J.); Plante, Paul (P.G.); Rossi, Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Smythe, Joseph (J.M.); Verner, Carol (C.J.)
Subject: Revised Agenda for 3/14 Kavlico Technical Offsite

Attached please find the revised agenda for the offsite meeting tomorrow. As a reminder, this will be held at the Fairlane Training and Development Center, Room 145, South building. Lunch will no longer be provided, but the cafeteria will be open if you would like to purchase one. There will be an In-focus projector available for presentation purposes.

If you have any questions, please feel free to contact me. See you tomorrow at 8:30!

<< File: Kavlico dPFE Tech Offsite Agenda_031402.doc >>

Chris Panaretos

Project Manager, Project Solutions, LLC.

Ford POEE, Components "B"

(313) 24-89337

Fax: (313) 32-29265

From: Aklns, Mary (M.)
Sent: Tuesday, March 19, 2002 12:20 PM
To: Freeland, Mark (M.)
Cc: Barry Bugaj (E-mail); Gary Beason (E-mail)
Subject: Review of Kavlico TM-DP Sensor
Mark,

Kavlico gives you approval to review the Kavlico TM-DP sensor issues with Dr. Ed Sickafus, ex-Ford employee. It is understood that you will be reviewing Kavlico confidential information as covered by the confidentiality agreement of April 15, 2001, assignment #2336 between Kavlico and Ford.

Regards,
Mary Aklns

Ford phone: (313) 248-1989
Ford fax: (313) 845-3169
maklns@ford.com
maklnwork@aol.com
Cell Phone/Messages: (810) 942-9606
Kavlico phone: (248) 263-8757

From: Akins, Mary (M.)
Sent: Tuesday, March 19, 2002 12:20 PM
To: Freeland, Mark (M.)
Cc: Barry Bugaj (E-mail); Gary Beason (E-mail)
Subject: Review of Kavlico TM-DP Sensor
Mark,

Kavlico gives you approval to review the Kavlico TM-DP sensor issues with Dr. Ed Sickafus, ex-Ford employee. It is understood that you will be reviewing Kavlico confidential information as covered by the confidentiality agreement of April 15, 2001, assignment #2338 between Kavlico and Ford.

Regards,
Mary Akins

Ford phone: (313) 248-1989
Ford fax: (313) 845-3169
makins@ford.com
makinwork@aol.com
Cell Phone/Messages: (810) 942-9606
Kavlico phone: (248) 263-8757

From: Hargas, Jon (.)
Sent: Tuesday, January 29, 2002 6:34 PM
To: 'kpark@kavlico.com'; Freeland, Mark (M.)
Subject: Freon

Kyong,

Mark told me you asked about the Freon.

The Freon I use is 1,1,2-Trichloro-1,2,2-trifluoroethane from Fisher Scientific (www.fishersci.com). The catalogue number is T178-4. The link below should pull up the page for this chemical.

<https://www1.fishersci.com/catalogs/chemgroup.jsp;jsessionid=5fad%3A3c572fbb%3A1f928637e77f?catalogParamId=6473196&catalogParamType=CG&catalogParamView=normal>

Regards,
Jon Hargas
Ford Motor Co.

Tweezer Experiment.txt

From: Naushad Hossain [NHossain@kavlico.com]
Sent: Wednesday, September 05, 2001 7:13 PM
To: mfree1a1@ford.com
Subject: Tweezer Experiment

Mark:

Following are the photographs of the tweezer experiment. I don't think any of these isotropic etch pits are the result of the tweezer. Wafer # 15 was touched by the tweezer at the center and wafer # 21 was not touched by the tweezer at all. Should you have any questions, please let me know.

Regards,
Naushad

<<4F23651.1.doc>>

> -----Original Message-----

> From: David Lopez
> Sent: Friday, August 31, 2001 2:34 PM
> To: Naushad Hossain
> Subject: FW: KOH Etch experiment

>

>

>

> -----Original Message-----

> From: Wafer Fab2
> Sent: Thursday, August 30, 2001 6:57 AM
> To: David Lopez
> Subject: KOH Etch experiment

>

> <<4F23651.1-15(KOH etch)1.5X.JPG>> <<4F23651.1-15(KOH
> etch)1.5X.Numar.C.JPG>> <<4F23651.1-15(KOH etch)1.5XB.JPG>>
> <<4F23651.1-15(KOH etch)5X.Numar.A.JPG>> <<4F23651.1-15(KOH
> etch)5X.Numar.B.JPG>> <<4F23651.1-21(KOH etch)5X.Numar.JPG>>

PolySwitch Surface-mount Resettable Devices

More than ten years ago, Raychem Circuit Protection introduced the SMD product family, and polymeric PTC devices quickly became the computer industry standard for keyboard, mouse, and disk drive protection. In 1996, Raychem Circuit Protection advanced the technology, reducing the size and cost of surface-mount resettable devices with the introduction of its miniSMD product series. The recent additions to the surface-mount family include the nanoSMD series, which reduces the size to a 3216mm (1206mil) foot print, one-third the size of the popular miniSMD series.



Benefits:

- Smaller size saves board space and cost
- Many product choices give engineers more design flexibility
- Compatible with high-volume electronics assembly
- Assists in meeting regulatory requirements
- Higher voltage ratings allow use in new applications

Features:

- Broadest range of resettable devices available in the industry
- Current ratings from 0.05 to 3A
- Voltage ratings from 6V computer and electronic applications to 60V (600V Telecom)
- Agency recognition: UL, CSA, TUV
- Small footprint
- Fast time-to-trip
- Low resistance

Applications:

- Computer motherboards
- Modems
- USB hub, ports and peripherals
- IEEE1384 ports
- Digital cameras
- Disk drives
- CD-ROMs
- Game machines
- Battery packs
- Phones
- Fax machines
- Analog and digital line cards
- Printers
- PDAs
- Chargers

Products in this section are grouped by:

Product Dimensions, Product Series, Bold Current

Selection Guide for Surface-mount Devices**Step 1. Determine the circuit's operating parameters.**

Fill in the following information about the circuit:

Maximum ambient operating temperature _____

Normal operating current _____

Maximum operating voltage
(i.e. miniSMDC014 is 60V_{DC} max.) _____

Maximum interrupt current _____

Step 2. Select the PolySwitch device that will accommodate the circuit's maximum ambient temperature and normal operating current.

Look across the top of Table S2 to find the temperature that most closely matches the circuit's maximum operating temperature. Look down that column to find the value equal to or greater than the circuit's normal operating current. Now look to the far left of that row to find the part number for the PolySwitch surface mount device that will best accommodate the circuit. Devices in this section are grouped by device dimensions, so your operating-current requirement may be found in more than one grouping.

The thermal derating curves located in Figure S1 are the normalized representations of the data in Table S2.

Step 3. Compare the selected device's maximum electrical ratings with the circuit's maximum operating voltage and interrupt current.

Look down the first column of Table S3 to find the part number you selected in Step 2. Look to the right in that row to find the device's maximum operating voltage (V_{MAX}) and maximum interrupt current (I_{MAX}). Ensure that V_{MAX} and I_{MAX} are greater than or equal to the circuit's maximum operating voltage and maximum interrupt current.



Step 4. Determine time-to-trip.

Time-to-trip is the amount of time it takes for a device to switch to a high-resistance state once a fault current has been applied across the device. Identifying the PolySwitch device's time-to-trip is important in order to provide the desired protection capabilities. If the device you choose trips too fast, undesired or nuisance tripping will occur. If the device trips too slowly, the components being protected may be damaged before the device switches to a high-resistance state.

Figures S11-S18 show the typical time-to-trip at 20°C for each of the PolySwitch devices.

If the PolySwitch device's time-to-trip is too fast or too slow for the circuit, go back to Step 2 and choose an alternate device.

Step 5. Verify ambient operating conditions.

Ensure that your application's minimum and maximum ambient temperatures are within the operating temperature of -40°C to 85°C (-40°C to 125°C for SMDH160).

Step 6. Verify the PolySwitch device dimensions.

Using dimensions in Table S4, compare the dimensions of the PolySwitch device you selected with the application's space considerations.

4

Protection Application Selection Table for Surface-mount Devices

The table below lists PolySwitch devices typically used in these applications.

Specifications for the suggested device part numbers can be found in this section.

Once a part has been selected, the user should evaluate and test each product for the intended application.

Protection Application	Additional Comments	Overcurrent Overvoltage	PolySwitch Resettable Devices—Key Selection Criteria		
			Small Size	Low Resistance	Fast Therm-40-41ps (Temperature Protection)
AC adapter input power	use w/ Zener & triac		SMD250	SMD258	SMD200
Battery pack protection			nanoSMD160	miniSMDC250	miniSMDC180
Charger protection			nanoSMDM060	miniSMDM110P16	nanoSMDM075
CPU/IC protection			nanoSMDM100	nanoSMDC150	nanoSMDM075
Data acquisition/sensor			microSMD006	—	microSMD006
DC input/output power	50V 57.2V		nanoSMDM075	nanoSMDC150	nanoSMDM050
DDC			miniSMDC075	miniSMDM110P16	miniSMDC075
Device Bay system	DB12, DB20 DB32		nanoSMDM075	nanoSMDM100	nanoSMDM050
Ethernet/Lan			miniSMDC200	miniSMDC280	miniSMDC200
Fan			miniSMDC250	SMD300	miniSMDC200
IEEE-1394	power provider alt. power provider self-powered		nanoSMDM060	miniSMDM110P16	nanoSMDM075
LCD inverter			microSMD035	microSMD050	microSMD035
LCD screen power			SMD150F33	SMD185	SMD100/33
LNB (Low Noise Block)			SMD185	SMD185	SMD150/33
Motor	50V 513.2V		SMD185	SMD185	SMD150/33
PS/2 mouse/keyboard			nanoSMDM060	miniSMDM110P16	nanoSMDM075
Signal - data communication			nanoSMDM050	nanoSMDM050	microSMD035
SCSI			SMD075	SMD075	SMD050
Smart card reader			SMD030-2018	SMD075	SMD050
Telecom - modem	UL1850	OC OV	nanoSMDM100	nanoSMDC160	nanoSMDM075
	ITU-T K.21	OC OV	microSMD010	microSMD036	microSMD006
	Digital line	OC OV	TS800-170 TVB270SA or SC*	TS250-130 TVB270SA or SC*	TS800-170 TVB270SA or SC*
Telecom - PBX	UL1850	OC OV	TS250, TSV250 TVB270SA*	TS250, TSV250-130 TVB270SA*	TS250-130-R8 TVB270SA*
	Subscriber	OC	TS600-200-RA TVB270SA or SC*	TS600-200-RA TVB270SA or SC*	TS600-170 TVB270SA or SC*
Telecom - line card	Telecordia GR-1089	OC OV	miniSMDC014 TVB270SC*	miniSMDC014 TVB270SC*	miniSMDC014 TVB270SC*
	ITU-T K.20	OC OV	TS800-200-RA-B-0.6 TVB270SC*	T800-200-RA-B-0.6 TVB270SC*	TS600-200-RA-B-0.6 TVB270SC*
Intelligent protection	Telecordia GR1089		TS250, TSV250 TVB270SA*	TS250-130-RA TVB270SA*	TS250 TVB270SA*
Temperature sensor	CPU		TSL250-080	SMD030-2018	TSL250-080
USB	Individual Port		nanoSMDM050	nanoSMDM075	nanoSMDM050
	2 port ganged		nanoSMDM075	nanoSMDM100	nanoSMDM050
	3 port ganged		nanoSMDC150	miniSMDC150	miniSMDC125
	4 port ganged		miniSMDC200	miniSMDM200	miniSMDC200

*Refer to the Biller Hytelco printed section for more information.

This list is not exhaustive. Raychem Circuit Protection welcomes our customers' input for additional application ideas for PolySwitch Resettable devices.

Table B1. Product Series: Size, Current Rating, Voltage Rating/Typical Resistance for Surface-mount Devices

	nanoSMD nanoSMD	microSMD	miniSMD miniSMD	microSMD	SMD	SMD	miniSMD	TS208 TS1280 TSV208	TS800
Size (mm) (mil)	3216 (1206)	3225 (1210)	4532 (1812)	6050 (2018)	7656 (2820)	8763 (3425)	11560 (4420)	*	*
Hold Current (A)	—	—	—	—	—	—	—	—	—
0.05	—	30V _{DC} /2.6Ω	—	—	—	—	—	—	—
0.08	—	—	—	—	—	—	—	80V/12.5Ω	—
0.13	—	—	—	—	—	—	—	80V/6.0-8.0Ω	—
0.14	—	—	80V _{DC} /1.0Ω	—	—	—	—	—	—
0.17	—	—	—	—	—	—	—	—	60V/11.0Ω
0.18	—	—	—	—	—	—	—	—	—
0.20	—	—	30V _{DC} /1.4Ω	—	—	—	—	—	60V/6.6Ω
0.30	—	—	—	60V _{DC} /1.4Ω	60V _{DC} /3.0Ω	—	—	—	—
0.36	—	8V _{DC} /0.61Ω	—	—	—	—	—	—	—
0.50	8V _{DC} /0.40Ω	12.2V _{DC} /1.55Ω	16V _{DC} /0.80Ω	—	60V _{DC} /0.87Ω	—	—	—	—
0.75	8V _{DC} /0.20Ω	8V _{DC} /0.28Ω	13.2V _{DC} /0.29Ω	—	30V _{DC} /0.67Ω	—	—	—	—
			24V _{DC} /0.27Ω						
1.00	8V _{DC} /0.15Ω	—	—	16V _{DC} /0.25Ω	30V _{DC} /0.10Ω	—	—	—	—
					30V _{DC} /0.27Ω				
1.70	—	8V _{DC} /0.14Ω	8V _{DC} /0.12Ω	—	—	—	—	—	—
			8V _{DC} /0.14Ω						
			16V _{DC} /0.12Ω						
1.25	—	—	8V _{DC} /0.09Ω	—	16V _{DC} /0.18Ω	—	—	—	—
1.50	8V _{DC} /0.08Ω	8V _{DC} /0.07Ω	8V _{DC} /0.07Ω	15V _{DC} /0.13Ω	—	15V _{DC} /0.18Ω	—	—	—
						33V _{DC} /0.15Ω			
1.80	—	—	8V _{DC} /0.08Ω	—	—	16V _{DC} /0.10Ω	—	—	—
1.85	—	—	—	—	—	33V _{DC} /0.12Ω	—	—	—
1.90	—	—	—	—	—	—	16V _{DC} /0.06Ω	—	—
2.00	—	—	8V _{DC} /0.06Ω	8V _{DC} /0.07Ω	—	15V _{DC} /0.08Ω	—	—	—
			8V _{DC} /0.04Ω						
2.50	—	—	—	—	—	15V _{DC} /0.05Ω	—	—	—
2.60	—	—	8V _{DC} /0.03Ω	—	8V _{DC} /0.05Ω	—	—	—	—
			8V _{DC} /0.03Ω						
3.00	—	—	—	—	8V _{DC} /0.013Ω	—	—	—	—

*Refer to Telecommunications and Networking section for dimensional voltage for these parts is RMS max.

Table 82. Thermal Derating for Surface-mount Devices (Hold Current (A) at Ambient Temperature (°C))

Part Number	Maximum Ambient Temperature										
	-40°C	-20°C	0°C	25°C	40°C	60°C	80°C	90°C	100°C	125°C	150°C
nanoSMD Size 3218 mm/1206 mils											
nanoSMDM012	0.18	0.17	0.16	0.13	0.11	0.10	0.09	0.08	0.07	0.07	—
nanoSMDM016	0.24	0.22	0.18	0.17	0.14	0.13	0.10	0.09	0.08	0.08	—
nanoSMDM050	0.78	0.68	0.58	0.52	0.44	0.40	0.35	0.32	0.28	0.28	—
nanoSMDM060F*	0.78	0.68	0.59	0.52	0.44	0.40	0.35	0.32	0.28	0.28	—
nanoSMDM075	1.11	1.00	0.86	0.78	0.67	0.61	0.52	0.50	0.44	0.42	—
nanoSMDM075F*	1.11	1.00	0.85	0.78	0.67	0.61	0.52	0.50	0.44	0.42	—
nanoSMDM100	1.48	1.34	1.15	1.04	0.88	0.81	0.70	0.68	0.58	0.55	—
nanoSMDM100F*	1.48	1.34	1.15	1.04	0.88	0.81	0.70	0.68	0.58	0.55	—
nanoSMDC150	2.25	1.88	1.77	1.56	1.34	1.23	1.10	1.01	0.90	0.84	—
microSMD Size 3236 mm/1218 mils											
microSMD005	0.08	0.07	0.06	0.05	0.048	0.04	0.04	0.03	0.03	0.02	—
microSMD010	0.15	0.13	0.12	0.10	0.10	0.08	0.08	0.07	0.06	0.05	—
microSMD035	0.51	0.46	0.40	0.34	0.30	0.27	0.24	0.22	0.19	0.18	—
microSMD050	0.78	0.68	0.68	0.476	0.42	0.38	0.36	0.29	0.25	0.23	—
microSMD075	1.10	0.97	0.88	0.72	0.64	0.58	0.56	0.47	0.42	0.39	—
microSMD110	1.80	1.42	1.25	1.06	0.94	0.86	0.80	0.70	0.62	0.58	—
microSMD150	2.30	2.02	1.75	1.43	1.24	1.11	1.00	0.85	0.72	0.65	—
miniSMD Size 4638 mm/1812 mils											
miniSMD0014	0.23	0.20	0.17	0.13	0.11	0.10	0.09	0.07	0.06	0.05	—
miniSMD020	0.30	0.27									—
miniSMD050	0.58	0.57									—
miniSMD075	1.10	0.99									—
miniSMDM015	1.11	1.00	0.81	0.78	0.67	0.61	0.49	0.47	0.45	0.42	—
miniSMDM016/24	1.11	1.00	0.85	0.78	0.67	0.61	0.62	0.50	0.44	0.42	—
miniSMDC110	1.60	1.46	1.28	1.065	0.82	0.83	0.71	0.66	0.57	0.52	—
miniSMDM110	1.58	1.43	1.20	1.14	0.88	0.82	0.77	0.73	0.70	0.66	—
miniSMDM110F16	1.61	1.46	1.25	1.14	0.88	0.90	0.78	0.74	0.68	0.62	—
miniSMDM110F16*	1.61	1.46	1.25	1.14	0.88	0.90	0.78	0.74	0.68	0.62	—
miniSMDC125	2.00	1.60	1.47	1.17	1.03	0.92	0.80	0.69	0.68	0.63	—
miniSMDC150	2.30	2.05	1.77	1.44	1.23	1.08	0.95	0.82	0.68	0.61	—
miniSMDC160F*	2.50	2.10	1.88	1.53	1.31	1.18	1.10	0.94	0.79	0.70	—
miniSMDM180	2.32	2.10	1.80	1.68	1.43	1.32	1.14	1.10	0.88	0.83	—
miniSMDM160F*	2.32	2.10	1.80	1.68	1.43	1.32	1.14	1.10	0.89	0.83	—
miniSMDC200	2.80	2.44	2.22	1.98	1.78	1.57	1.50	1.45	1.34	1.29	—
miniSMDM200	2.88	2.61	2.25	2.07	1.80	1.86	1.46	1.38	1.26	1.19	—
miniSMDM200F*	2.88	2.61	2.25	2.07	1.80	1.86	1.46	1.38	1.26	1.19	—
miniSMDC260	3.40	3.16	2.86	2.54	2.32	2.18	2.00	1.90	1.76	1.69	—
miniSMDM280	3.70	3.36	2.90	2.68	2.35	2.18	1.90	1.84	1.67	1.69	—
miniSMDM280F*	3.70	3.38	2.90	2.68	2.35	2.18	1.90	1.84	1.67	1.69	—
miniSMD-E Size 11568 mm/4420 mils											
miniSMD-E180	3.18	2.74	2.20	1.74	1.48	1.27	1.10	0.80	0.50	0.35	—

*: lead-free device

Table B2. Thermal Derating for Surface-mount Devices [Hold Current (A) at Ambient Temperature (°C)]
continued

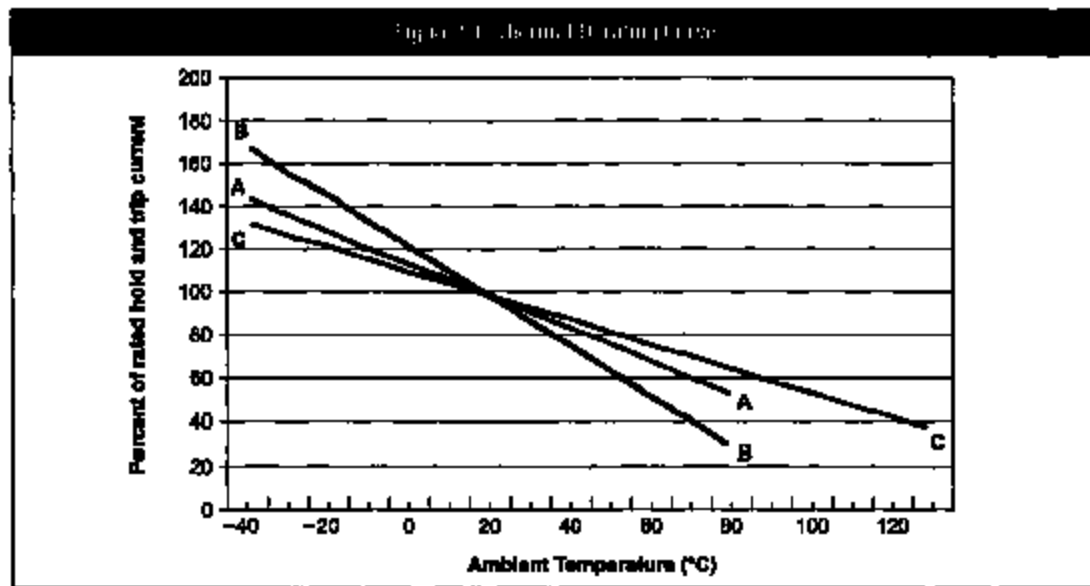
Part Number	Maximum Ambient Temperature											
	-40°C	-20°C	0°C	25°C	40°C	50°C	60°C	70°C	80°C	90°C	125°C	
SMD010												
Size 3080 mm/2018 mils												
SMD020-2018	0.45	0.42	0.36	0.28	0.24	0.21	0.17	0.15	0.12	0.10	—	
SMD100-2018	1.59	1.48	1.20	1.03	0.84	0.65	0.72	0.60	0.51	0.57	—	
SMD150-2018	2.21	1.97	1.70	1.42	1.26	1.15	1.00	0.91	0.78	0.73	—	
SMD200-2018	2.61	2.34	2.27	1.93	1.73	1.59	1.46	1.32	1.19	1.12	—	
SMD												
Size 7568 mm/2820 mils												
SMD030	0.44	0.39	0.32	0.28	0.25	0.23	0.19	0.18	0.17	0.16	—	
SMD050	0.73	0.65	0.55	0.47	0.43	0.39	0.33	0.31	0.28	0.26	—	
SMD075	1.11	0.99	0.84	0.71	0.63	0.57	0.49	0.46	0.38	0.36	—	
SMD100	1.59	1.43	1.30	1.03	0.94	0.86	0.72	0.69	0.61	0.67	—	
SMD100/33	1.48	1.35	1.20	1.08	0.99	0.91	0.83	0.79	0.73	0.69	—	
SMD125	1.89	1.69	1.50	1.21	1.04	0.93	0.85	0.71	0.61	0.58	—	
SMD250 and SMD250-RB	3.82	3.41	2.90	2.46	2.18	1.89	1.70	1.58	1.36	1.28	—	
SMD300	4.13	3.75	3.30	2.87	2.62	2.43	2.25	2.00	1.87	1.78	—	
SMD2												
Size 8763 mm/3423 mils												
SV									0.70	0.63	—	
SV									0.70	0.63	—	
SV									1.06	1.01	0.64	
SV									1.08	1.00	—	
SV									0.99	0.91	—	
SV									1.28	1.18	—	
Telecom Surface-mount												
TS1250-080	0.125	0.110	0.065	0.090	0.077	0.065	0.067	0.051	0.044	0.037	0.033	—
TS250-130	0.200	0.182	0.130	0.130	0.124	0.104	0.091	0.078	0.062	0.062	0.045	—
TSV250-130	0.200	0.182	0.130	0.130	0.124	0.104	0.091	0.078	0.062	0.062	0.046	—
TS600-170	0.260	0.250	0.230	0.200	0.193	0.180	0.170	0.159	0.094	0.077	0.070	—
TS600-200-RA	0.310	0.275	0.230	0.200	0.193	0.165	0.147	0.128	0.110	0.091	0.083	—

Thermal Derating Curves for Surface-mount Devices*

A = nanoSMD/microSMD/miniSMD & SMD

B = miniSMDE190

C = SMDH100



*Refer to Telecom and Networking section for thermal derating of Telecom parts.

4

Table 83. Electrical Characteristics for Surface-mount Devices at 20°C

Part Number	L ₁ (A)	L ₂ (A)	V _{nom} (V _{DC})	I _{nom} (A)	P _{nom} (W)	Max. Trip-to-Trip		R _{nom} Ω	R _{trip} Ω	R _{1ms} Ω	Figures for Dimensions	
						(A)	(A)					
nanoSMD Size 2216 mm/1285 mils												
nanoSMDM012	†	0.125	0.29	30	10	0.4	1.0	0.20	1.50	4.8	6.000	S2
nanoSMDM015	†	0.16	0.37	30	10	0.4	1.0	0.30	1.20	3.6	4.500	S2
nanoSMDM050	†	0.50	1.00	6	40	0.4	8.0	0.10	0.15	0.400	0.700	S2
nanoSMDM090F*	†	0.90	1.00	6	40	0.4	8.0	0.10	0.15	0.400	0.700	S2
nanoSMDM075	†	0.75	1.50	6	40	0.4	8.0	0.20	0.10	0.200	0.280	S2
nanoSMDM075F*	†	0.75	1.50	6	40	0.4	8.0	0.20	0.10	0.200	0.280	S2
nanoSMDM100	†	1.00	1.90	6	40	0.4	8.0	0.30	0.06	0.150	0.210	S2
nanoSMDM100F*	†	1.00	1.90	6	40	0.4	8.0	0.30	0.06	0.150	0.210	S2
nanoSMDC150	†	1.50	3.00	6	40	0.6	8.0	1.00	0.04	0.080	0.110	S3
microSMD Size 3226 mm/1218 mils												
microSMD005		0.06	0.15	30	10	0.6	0.25	1.5	3.80	26.00	60.000	S4
microSMD010		0.10	0.25	30	10	0.6	0.5	1.0	2.1	8.0	15.000	S3
microSMD045		0.35	0.75	6	40	0.6	8.0	0.2	0.32	0.81	1.300	S3
microSMD060		0.60	1.00	13.2	40	0.6	6.0	0.1	0.25	0.55	0.900	S3
microSMD075		0.75	1.60	6	40	0.6	8.0	0.1	0.11	0.29	0.400	S3
microSMD110		1.10	2.20	6	40	0.6	5.0	1.0	0.07	0.14	0.210	S3
microSMD150		1.5	3.0	6	40	0.6	5.0	5.0	0.04	0.07	0.110	S3
miniSMD Size 4032 mm/1612 mils												
miniSMDC014		0.14	0.34	80	10	0.6	1.5	0.15	1.500	1.500	8.000	S3
miniSMDC020		0.20	0.48	30	10	0.6	8.0	0.02	0.800	2.800	3.300	S3
miniSMDC050		0.50	1.00	15	40	0.6	8.0	0.15	0.150	0.800	1.000	S3
miniSMDC075		0.75	1.50	13.2	40	0.6	8.0	0.20	0.110	0.280	0.450	S3
miniSMDM075	†	0.75	1.50	13.2	40	0.5	8.0	0.20	0.100	0.230	0.290	S2
miniSMDM075/24	†	0.75	1.50	24	40	0.6	8.0	0.30	0.090	0.200	0.280	S6
miniSMDC110		1.10	2.20	6	40	0.6	8.0	0.30	0.040	0.120	0.210	S3
miniSMDM110	†	1.10	2.00	6	40	0.5	8.0	0.30	0.080	0.140	0.180	S2
miniSMDM110/18	†	1.10	1.85	18	40	0.6	8.0	0.50	0.060	0.120	0.180	S6
miniSMDM110F16*	†	1.10	1.95	16	40	0.6	8.0	0.50	0.060	0.120	0.180	S6
miniSMDC125		1.25	2.60	6	40	0.8	8.0	0.40	0.050	0.080	0.140	S3
miniSMDC150		1.50	3.00	6	40	0.6	8.0	0.50	0.040	0.070	0.110	S3
miniSMDC160F*		1.60	3.65	8	40	0.6	8.0	1.00	0.030	0.078	0.100	S3
miniSMDM180	†	1.80	2.80	8	40	0.6	8.0	2.00	0.033	0.065	0.089	S6
miniSMDM180F*	†	1.80	2.80	8	40	0.6	8.0	2.00	0.033	0.068	0.089	S6
miniSMDC200		2.00	4.00	6	40	0.6	8.0	5.00	0.020	0.050	0.070	S3
miniSMDM200	†	2.00	3.50	8	40	0.6	8.0	3.00	0.020	0.040	0.080	S5
miniSMDM200F*	†	2.00	3.60	8	40	0.6	8.0	3.00	0.020	0.040	0.080	S5
miniSMDC250		2.50	5.00	6	40	0.6	8.0	15.00	0.015	0.035	0.047	S3
miniSMDM280	†	2.80	4.65	6	40	0.6	8.0	6.00	0.010	0.030	0.043	S5
miniSMDM280F*	†	2.60	4.65	6	40	0.6	8.0	6.00	0.010	0.030	0.043	S5
miniSMDE Size 9180 mm/4489 mils												
miniSMDE180		1.80	3.80	18	100	1.4	10	2.0	0.024	0.066	0.08	S3

†: lead-free device †: Electrical characteristics determined at 25°C.

Table 53. Electrical Characteristics for Surface-mount Devices continued

Part Number	I _N (A)	I _T (A)	V _{max} (V _{DC})	I _{max} (A)	P _{max} (W)	Max. Time-to-Trip		R _{max} (Ω)	R _{TP} (Ω)	R _{max} (Ω)	Figures for Dimensions
						(μ)	(s)				
midSMD											
Size 6060 mm/2018 mils											
SMD030-2018	0.30	0.80	60	20	0.7	1.5	1.5	0.500	1.40	2.300	S6
SMD100-2018	1.10	2.20	15	40	1.2	8.0	0.5	0.100	0.25	0.400	S6
SMD150-2018	1.50	3.00	15	40	1.4	8.0	1.0	0.070	0.13	0.180	S6
SMD200-2018	2.00	4.20	6	40	1.4	8.0	3.0	0.048	0.07	0.100	S6
SMD											
Size 7666 mm/2980 mils											
SMD030	0.30	0.80	60	10	1.5	1.5	3.0	1.200	1.00	4.800	S7
SMD050	0.50	1.00	60	10	1.5	2.5	4.0	0.350	0.87	1.400	S7
SMD075	0.75	1.50	30	40	1.5	8.0	0.3	0.350	0.87	1.000	S7
SMD100	1.10	2.20	30	40	1.5	8.0	0.5	0.120	0.30	0.480	S7
SMD100/33	1.10	2.20	33	40	1.5	8.0	0.5	0.120	0.27	0.410	S7
SMD125	1.25	2.50	15	40	1.5	8.0	2.0	0.070	0.16	0.250	S7
SMD200	2.00	4.20	6	40	1.5	8.0	20.0	0.026	0.05	0.076	S7
SMD200-R8	2.00	5.00	6	40	1.5	5.0	60.0	0.030	0.056	0.075	S7
SMD300	3.00	6.00	6	40	1.3	8.0	35.0	0.015	0.033	0.048	S7
SMD2											
Size 8783 mm/3426 mils											
SMD150	1.50	3.00	15	40	1.7	8.0	5.0	0.060	0.16	0.250	S7
SMD160/83	1.60	3.00	33	40	1.7	8.0	5.0	0.060	0.15	0.230	S7
SMD160	1.60	3.20	16	70	2.1	8.0	15.0	0.060	0.10	0.150	S7
SMD166	1.60	3.00	33	40	1.2	8.0	5.0	0.065	0.12	0.156***	S7
SMD200	2.00	4.00	15	40	1.7	8.0	12.0	0.060	0.08	0.125	S7
SMD250	2.60	5.00	15	40	1.7	8.0	25.0	0.035	0.06	0.086	S7
Telecom Surface-mount*											
TSL250-080	0.08	0.18	250**	3.0	1.0	1.0	1.8	5.0	11.0	20.0***	S7
TS260-130	0.13	0.26	260**	3.0	3.0	1.8	2.5	8.5	12.0	20.0	S8
			860	1.1							
TSV250-130	0.13	0.26	250**	3.0	3.0	1.8	3.0	4.0	7.0	12.0***	S10
TS800-170	0.17	0.40	800**	3.0	2.5	1.8	21.0	4.0	9.0	18.0	S8
TS800-200-8A	0.20	0.40	800**	3.0	2.5	1.8	21.0	4.0	7.5	13.5	S8

*These products are intended for telecom applications. Time-to-trip is typical, please see Telecom and Networking section for details.

**RMS max. voltage.

***R_{max} is measured one hour post-trip or 24 hours post-reflow at 20°C.

I_N = Hold current; maximum current device will pass without interruption in 50°C still air.

I_T = Trip current; minimum current that will switch the device from low resistance to high resistance in 20°C still air.

V_{max} = Maximum voltage device can withstand without damage at rated current.

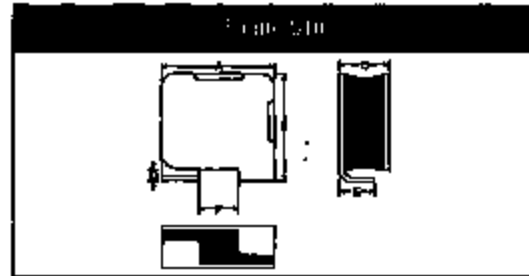
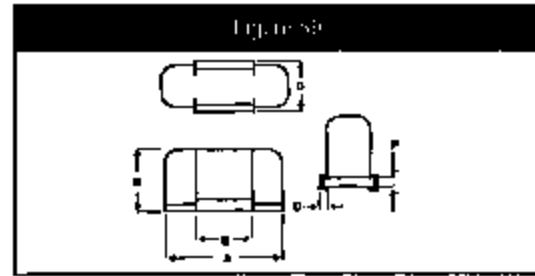
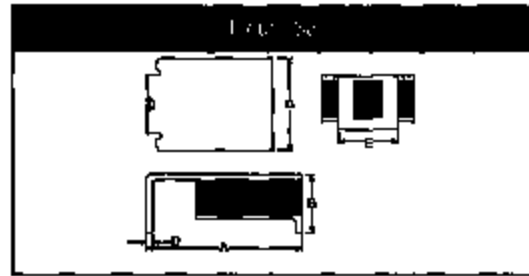
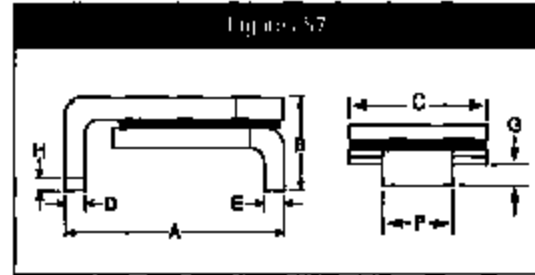
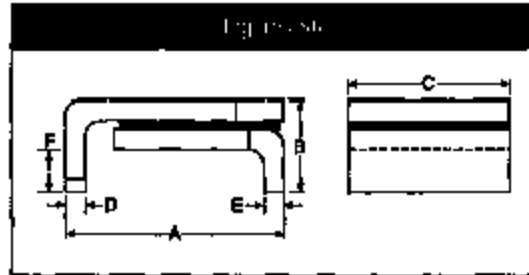
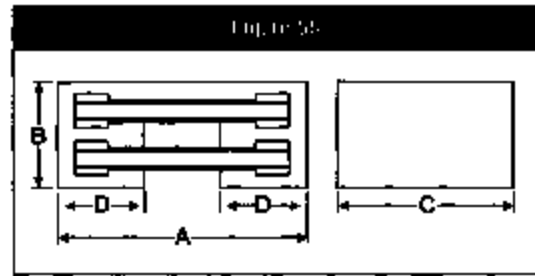
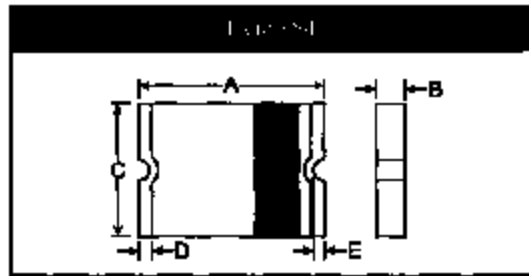
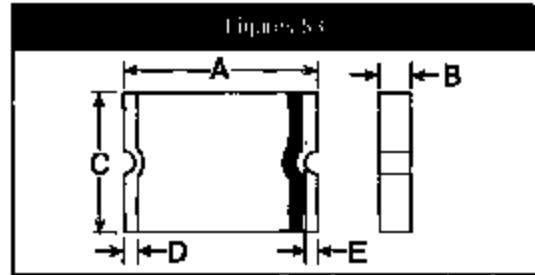
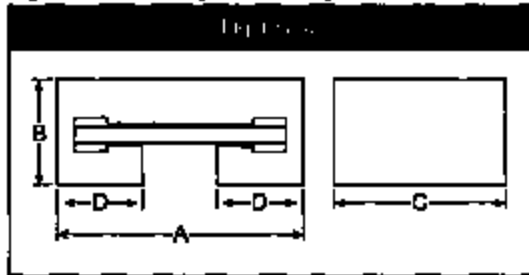
I_{max} = Maximum fault current device can withstand without damage at rated voltage.

P_D = Power dissipated from device when in the tripped state in 20°C still air.

R_{max} is measured one hour post-reflow.

R_{TP} = Typical resistance of device as supplied at 20°C unless otherwise specified.

Figures S2-S10. Physical Description for Dimensions for Surface-mount Devices



Resistor Circuit Protection

PolySwitch Surface-mount Resettable Devices 193

4

Table 84. Dimensions for Surface-mount Devices in Millimeters (Inches)

Part Number	Dimension A		Dimension B		Dimension C		Dimension D		Dimension E		Dimension F		Dimension G		Dimension H Dr. Figure	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
nanoSMD																
nanoSMDM012	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM015	2.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM050	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM050F	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM075	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM075F	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM100	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDM100F	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								52
nanoSMDC150	3.0 (0.118)	3.4 (0.134)	0.85 (0.033)	1.4 (0.055)	1.37 (0.054)	1.8 (0.071)	0.25 (0.010)					0.127 (0.005)				53
microSMD																
microSMD005	3.00 (0.118)	3.43 (0.135)	0.90 (0.010)	0.85 (0.034)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.008)				54
microSMD010	3.00 (0.118)	3.43 (0.135)	0.90 (0.010)	0.85 (0.034)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.008)				54
microSMD035	3.00 (0.118)	3.43 (0.135)	0.95 (0.010)	0.82 (0.029)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.010)				53
microSMD050	3.00 (0.118)	3.43 (0.135)	0.95 (0.010)	0.82 (0.029)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.010)				53
microSMD075	3.00 (0.118)	3.43 (0.135)	0.95 (0.010)	0.82 (0.029)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.010)				53
microSMD110	3.00 (0.118)	3.43 (0.135)	0.95 (0.010)	0.82 (0.029)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.010)				53
microSMD150	3.00 (0.118)	3.43 (0.135)	0.95 (0.010)	0.82 (0.029)	2.35 (0.092)	2.80 (0.110)	0.30 (0.010)					0.25 (0.010)				53
miniSMD																
miniSMDC014	4.37 (0.172)	4.73 (0.186)	0.85 (0.025)	0.80 (0.030)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)					0.25 (0.010)	0.50 (0.020)			53
miniSMD020	4.37 (0.172)	4.73 (0.186)	0.85 (0.025)	0.80 (0.030)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)					0.25 (0.010)	0.50 (0.020)			53
miniSMD050	4.37 (0.172)	4.73 (0.186)	0.85 (0.016)	0.82 (0.025)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)					0.25 (0.010)	0.50 (0.020)			53
miniSMD075	4.37 (0.172)	4.73 (0.186)	0.85 (0.015)	0.82 (0.029)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)					0.25 (0.010)	0.50 (0.020)			53
miniSMD075	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMD075/24	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMDC110	4.37 (0.172)	4.73 (0.186)	0.85 (0.015)	0.82 (0.029)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)					0.25 (0.010)	0.50 (0.020)			53
miniSMDM110	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMDM110F16	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMDM110F18	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMDC125	4.37 (0.172)	4.73 (0.186)	0.85 (0.011)	0.80 (0.018)	3.07 (0.121)	3.41 (0.134)	0.25 (0.010)					0.25 (0.008)	0.50 (0.020)			53
miniSMDC150	4.37 (0.172)	4.73 (0.186)	0.85 (0.011)	0.80 (0.018)	3.07 (0.121)	3.41 (0.134)	0.25 (0.010)					0.25 (0.008)	0.50 (0.020)			53
miniSMDC150F	4.37 (0.172)	4.73 (0.186)	0.85 (0.011)	0.80 (0.018)	3.07 (0.121)	3.41 (0.134)	0.25 (0.010)					0.25 (0.008)	0.50 (0.020)			53
miniSMDM180	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMDM180F	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMDC200	4.37 (0.172)	4.73 (0.186)	0.61 (0.024)	1.22 (0.048)	2.87 (0.121)	3.41 (0.134)	0.25 (0.012)					0.25 (0.010)				53

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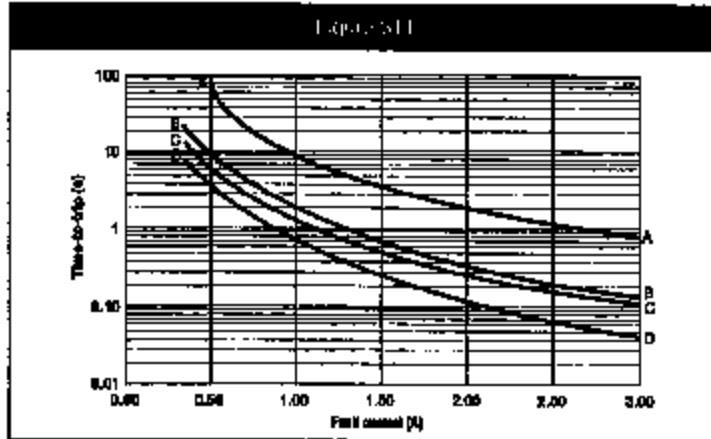
Table 54. Dimensions for Surface-mount Devices in Millimeters (Inches) continued

Part Number	Dimensions												Figures			
	A		B		C		D		E		F			G		H
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.	
miniSMD, overhead																
miniSMD200	4.36 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								55
miniSMD200F	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								56
miniSMD280	4.37 (0.172)	4.73 (0.186)	0.78 (0.030)	1.26 (0.050)	2.07 (0.121)	2.41 (0.134)	0.30 (0.012)		0.25 (0.010)							53
miniSMD280D	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								55
miniSMD280F	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								55
miniSMD																
miniSMD100	11.31 (0.438)	11.51 (0.453)	0.33 (0.013)	0.53 (0.021)	4.83 (0.189)	5.33 (0.210)	0.51 (0.020)	1.02 (0.040)								53
SMD																
SMD050-2018	4.72 (0.186)	5.44 (0.214)		1.79 (0.070)	4.22 (0.166)	4.68 (0.184)	0.25 (0.010)	0.38 (0.014)	0.25 (0.010)	0.38 (0.014)	0.30 (0.012)	0.46 (0.018)				58
SMD100-2018	4.72 (0.186)	5.44 (0.214)		1.52 (0.060)	4.22 (0.166)	4.63 (0.184)	0.25 (0.010)	0.38 (0.014)	0.25 (0.010)	0.38 (0.014)	0.30 (0.012)	0.45 (0.018)				56
SMD150-2018	4.72 (0.186)	5.44 (0.214)		1.52 (0.060)	4.22 (0.166)	4.63 (0.184)	0.25 (0.010)	0.38 (0.014)	0.25 (0.010)	0.38 (0.014)	0.30 (0.012)	0.46 (0.018)				58
SMD200-2018	4.72 (0.186)	5.44 (0.214)		1.52 (0.060)	4.22 (0.166)	4.63 (0.184)	0.25 (0.010)	0.38 (0.014)	0.25 (0.010)	0.38 (0.014)	0.30 (0.012)	0.45 (0.018)				56
SMD																
SMD030	6.73 (0.265)	7.98 (0.314)		3.18 (0.125)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.68 (0.027)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD060	6.73 (0.265)	7.98 (0.314)		3.18 (0.125)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.68 (0.027)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD075	6.73 (0.265)	7.98 (0.314)		3.18 (0.125)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.68 (0.027)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD100	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.68 (0.027)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD100/33	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD125	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD200	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD280-08	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.68 (0.027)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD300	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.18)	5.44 (0.214)	0.55 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.18 (0.086)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD																
SMD150	8.08 (0.318)	8.40 (0.330)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.88 (0.153)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD150/33	8.08 (0.318)	8.40 (0.330)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.88 (0.153)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD180	8.08 (0.318)	8.40 (0.330)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.88 (0.153)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD185	8.08 (0.318)	8.40 (0.330)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.88 (0.153)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD200	8.08 (0.318)	8.40 (0.330)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.88 (0.153)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
SMD250	8.08 (0.318)	8.40 (0.330)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.88 (0.153)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	57
Telecom, surface-mount																
TS129-080	6.7 (0.265)	7.9 (0.310)	2.7 (0.11)	3.7 (0.145)	4.8 (0.18)	5.3 (0.21)	0.50 (0.020)	0.38 (0.015)	0.30 (0.012)	0.3 (0.012)	2.5 (0.100)	3.1 (0.120)				
TS250-130	8.5 (0.335)	8.4 (0.330)		3.4 (0.135)		7.4 (0.290)	0.3 (0.011)			3.8 (0.150)						
TS250-130	8.1 (0.319)			5.6 (0.220)		3.2 (0.126)	0.55 (0.022)			1.8 (0.070)	1.6 (0.063)	2.31 (0.091)				
TS800-170	18.2 (0.720)	19.4 (0.765)	11.6 (0.456)	12.3 (0.486)	7.21 (0.282)	8.3 (0.325)	1.81 (0.071)	2.4 (0.095)	0.8 (0.031)	10.4 (0.410)	1.5 (0.060)	2.3 (0.090)				
TS900-170	18.2 (0.720)	16.4 (0.646)	11.5 (0.453)	12.3 (0.486)	7.21 (0.282)	8.3 (0.325)	1.81 (0.071)	2.4 (0.095)	0.8 (0.031)	10.4 (0.410)	1.5 (0.060)	2.3 (0.090)				

Figures S11-S18. Typical Time-to-trip Curves at 20°C for Surface-mount Devices

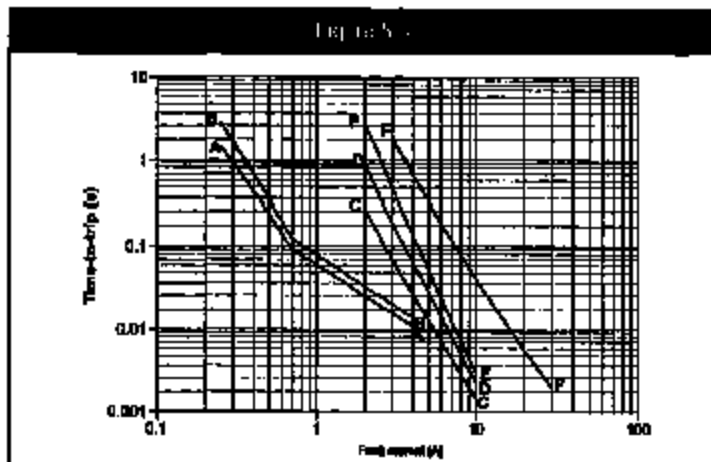
Telecom and Networking Devices

- A = TS600-170/TS600-200
- B = TS250-130
- C = TSV250-130
- D = TSL250-060



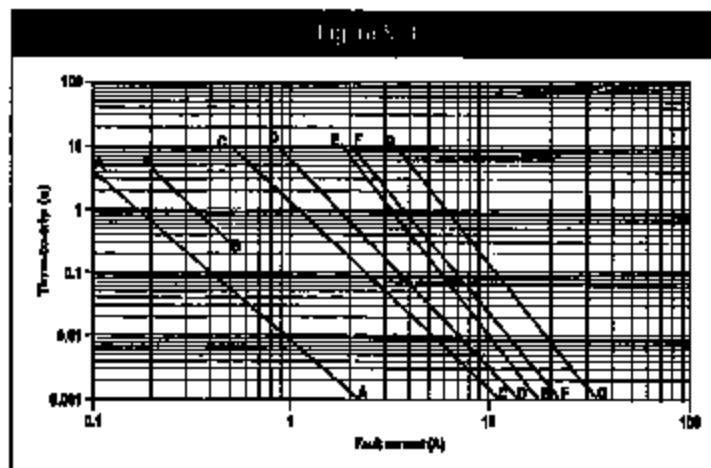
nanoSMD (data at 25°C)

- A = nanoSMDM012
- B = nanoSMDM016
- C = nanoSMDM050, nanoSMDM050F
- D = nanoSMDM075, nanoSMDM075F
- E = nanoSMDM100, nanoSMDM100F
- F = nanoSMDM150



microSMD

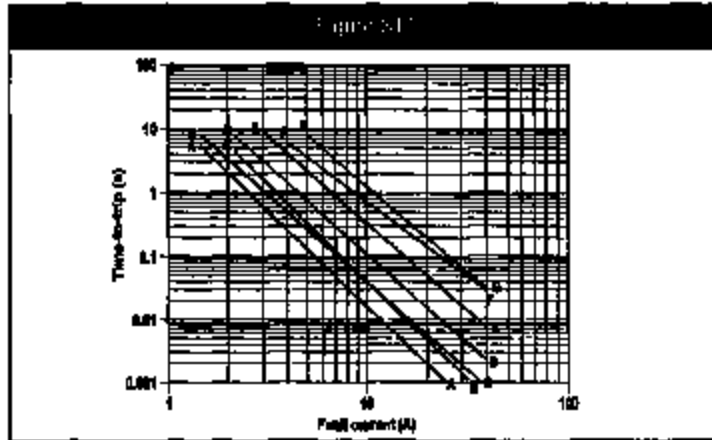
- A = microSMD005
- B = microSMD010
- C = microSMD035
- D = microSMD050
- E = microSMD075
- F = microSMD110
- G = microSMD150



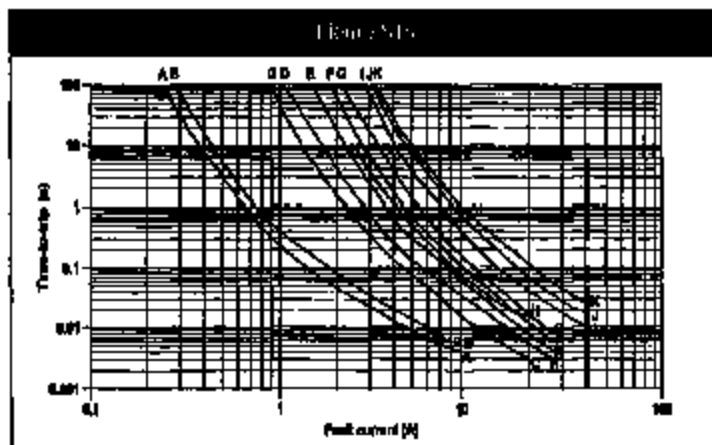
4

Figures S11-S18. Typical Time-to-trip Curves at 20°C for Surface-mount Devices *continued*miniSMDM (data at 25°C)

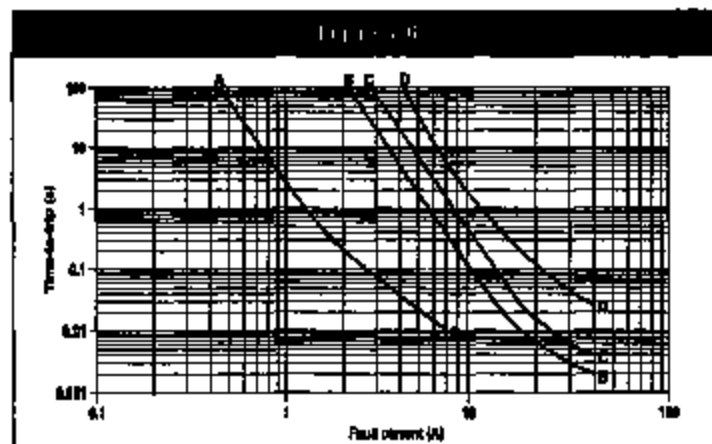
- A = miniSMDM075
- B = miniSMDM075/24
- C = miniSMDM110
- D = miniSMDM110/16,
miniSMDM110F/16
- E = miniSMDM160,
miniSMDM160F
- F = miniSMDM200,
miniSMDM200F
- G = miniSMDM280,
miniSMDM280F

miniSMDC and miniSMDE

- A = miniSMDC014
- B = miniSMDC020
- C = miniSMDC050
- D = miniSMDC075
- E = miniSMDC110
- F = miniSMDC125
- G = miniSMDC160
- H = miniSMDC160F
- I = miniSMDC200
- J = miniSMDE190
- K = miniSMDC280

midSMD

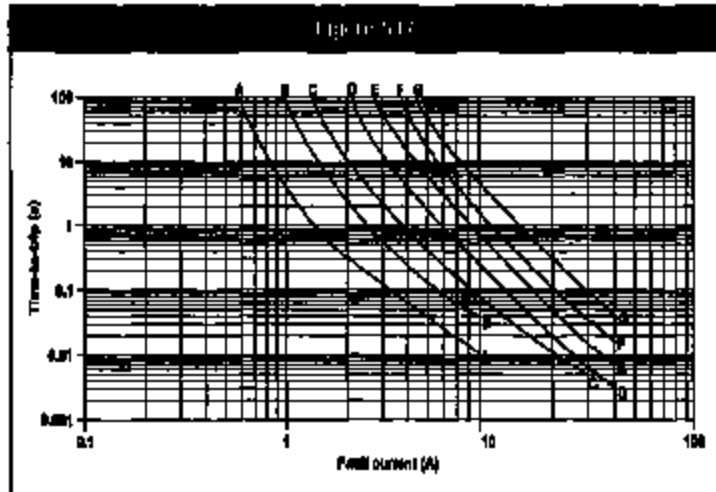
- A = SMD030-2018
- B = SMD100-2018
- C = SMD150-2018
- D = SMD200-2018



Figures S11–S18. Typical Time-to-Trip Curves at 20°C for Surface-mount Devices

SMD

- A = SMD030
- B = SMD050
- C = SMD075
- D = SMD100 and 100/33
- E = SMD125
- F = SMD260 and SMD260RB
- G = SMD300



SMD2

- A = SMD150 and 150/33
- B = SMDH180
- C = SMD185
- D = SMD200
- E = SMD260

4

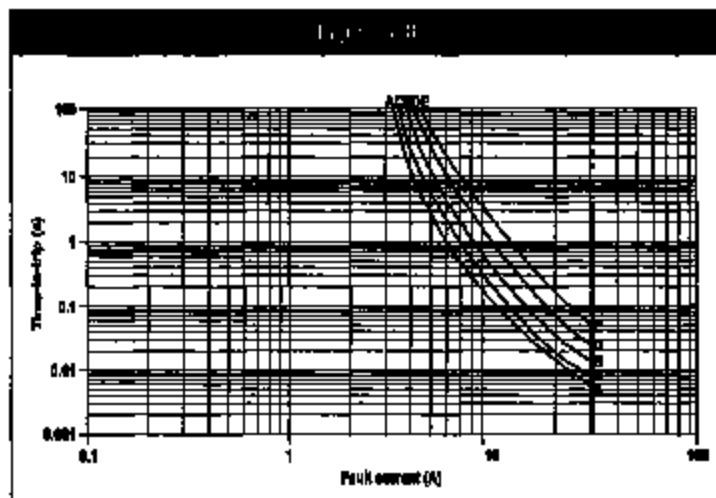


Table 53. Physical Characteristics and Environmental Specifications for Surface-mount Devices
 Operating temperature range -40°C to 85°C, -40°C to 125°C for SMDH160

Physical Characteristics			
Terminal pad material	Solder-plated copper for nanoSMDC, microSMD, and miniSMDC series Gold plating for nanoSMDM, and miniSMDM series 99% Au for SMD series		
Soldering characteristics	ANSI/J-STD-002 Category 3 for nanoSMDC, nanoSMDM, microSMD, miniSMDC, and miniSMDM series ANSI/J-STD-002 Category 1 for SMD series		
Solder (not withstand)	per IEC-STD 68-2-20, Test Td, Section 5, Method 1A		
Flammability resistance	per IEC 6095-2-2 Needle Flame Test for 30 sec.		
Recommended storage conditions	40°C max, 70% R.H. max; devices may not meet specified ratings if storage conditions are exceeded.		
Environmental Specifications			
Test	Test Method	Conditions	Resistance Change
Passive aging	Raychem P5300, Section 5.3.2	60°C, 1000 hours	±3% typical
		85°C, 1000 hours	±5% typical
Humidity aging	Raychem P5300, Section 5.3.1	85°C, 85% RH, 100 hours	±1.2% typical
Thermal shock	MIL-STD-883C, Method 107G	85°C, -40°C (20 times)	-33% typical
		125°C, -65°C (10 times)	-33% typical
Vibration	MIL-STD-883C	per MIL-STD-883C	No change
Solvent resistance	Raychem P5300, Section 5.1.2	Freon	No change
		Tetrachloroethane	No change
		Hydrocarbons	No change

Agency Recognition for Surface-mount Devices*

UL	File # E74888 for all surface-mount devices
CSA	File # CA78166 for SMD/miniSMDC/miniSMDM/microSMD/nanoSMDC/nanoSMDM series
TUV	Certificate # R8872048 for microSMD/miniSMDC/miniSMDM series
	Certificate # R2172061 for nanoSMDM/nanoSMDC series
	Certificate # R8872049 for SMD series

*Refer to Telecom and Networking section for agency recognition on Telecom and Networking Surface Mount Devices

Table 96. Packaging and Marking Information for Surface-mount Devices

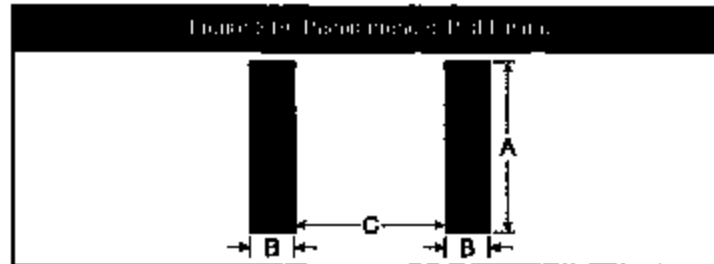
Part Number	Type & Reel Quantity	Standard Package	Part Marking	Recommended Pad Layout Figures (in.)			Agency Recognition
				Dimension A (Nom.)	Dimension B (Nom.)	Dimension C (Nom.)	
nanoSMD							
nanoSMDM012	3,000	15,000	012	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM016	3,000	15,000	016	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM050	3,000	15,000	050	1.80 (0.071)	1.00 (0.039)	1.6 (0.059)	UL, CSA, TÜV
nanoSMDM050F	3,000	15,000	05F	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM075	3,000	15,000	075	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM075F	3,000	15,000	07F	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM100	3,000	15,000	100	1.80 (0.071)	1.00 (0.039)	1.6 (0.059)	UL, CSA, TÜV
nanoSMDM100F	3,000	15,000	10F	1.80 (0.071)	1.00 (0.039)	1.6 (0.059)	UL, CSA, TÜV
nanoSMDJ150	3,000	15,000	J	1.60 (0.063)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD							
microSMD005	4,000	20,000	05	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD010	4,000	20,000	10	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD035	4,000	20,000	3	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD050	4,000	20,000	50	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD075	4,000	20,000	75	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD110	4,000	20,000	11	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD150	4,000	20,000	15	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
miniSMD							
miniSMD0014	2,000	10,000	14	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMD0020	2,000	10,000	2	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, TÜV
miniSMD0050	2,000	10,000	5	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMD0075	2,000	10,000	7	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM075	3,000	15,000	075	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM075Z4	3,000	15,000	075Z4	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDJ10	2,000	10,000	1	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM110	3,000	15,000	110	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM110F18	3,000	15,000	110F18	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM110F18	3,000	15,000	110F	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDJ125	2,000	10,000	12	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDJ150	2,000	10,000	16	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDJ160F	2,000	10,000	16	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM160	3,000	15,000	160	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM160F	3,000	15,000	160F	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDJ200	2,000	10,000	20	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM200	3,000	15,000	200	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM200F	3,000	15,000	200F	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDJ250	1,500	7,500	25	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM250	3,000	15,000	250	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM250F	3,000	15,000	250F	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMD							
SMD090-2018	4,000	20,000	A09	4.5 (0.18)	1.60 (0.063)	3.4 (0.134)	UL
SMD100-2018	4,000	20,000	A10	4.5 (0.18)	1.60 (0.063)	3.4 (0.134)	UL, CSA, TÜV
SMD150-2018	4,000	20,000	A15	4.6 (0.18)	1.60 (0.063)	3.4 (0.134)	UL, CSA, TÜV
SMD200-2018	4,000	20,000	A20	4.6 (0.18)	1.60 (0.063)	3.4 (0.134)	UL, CSA, TÜV
SMD							
SMD030	2,000	10,000	030	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD050	2,000	10,000	050	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD075	2,000	10,000	075	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD100	2,000	10,000	100	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV

Table 86. Packaging and Marking Information for Surface-mount Devices *continued*

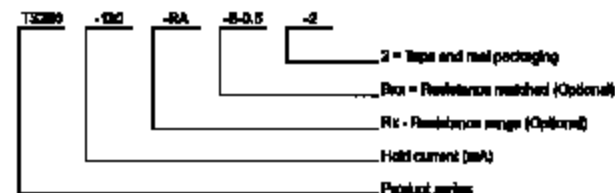
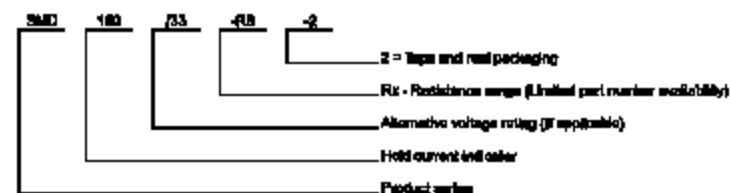
Part Number	Tape & Reel Quantity	Standard Package	Part Marking	Recommended Pad Layout Figures (mm (in.))			Agency Recognition
				Dimension A (Nom.)	Dimension B (Nom.)	Dimension C (Nom.)	
SMD <i>continued</i>							
SMD100/33	2,000	10,000	103	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD125	2,000	10,000	125	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD250	2,000	10,000	255	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD250-RA	2,000	10,000	255	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD300	2,000	10,000	340	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD2							
SMD150	1,500	7,500	150	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD150/33	1,500	7,500	150	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMDH150	1,500	7,500	150	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD185	1,500	7,500	185	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD200	1,500	7,500	200	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD250	1,500	7,500	250	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
miniSMD							
miniSMD190	6,000	20,000	18	4.75 (0.187)	1.45 (0.057)	6.57 (0.257)	UL, CSA, TÜV
Telecom Surface-mount							
TSL250-080	1,500	7,500	T08	3.8 (0.14)	1.8 (0.07)	6.5 (0.25)	UL, CSA, TÜV
TS250-130	1,500	7,500	T13	4.6 (0.18)	1.8 (0.07)	6.1 (0.24)	UL, CSA, TÜV
TSV250-130	1,200	6,000	T13V				UL, CSA, TÜV
TS600-170	300	900	T20	6.81 (0.268)	3.30 (0.130)	3.35 (0.132)	UL, CSA
TS600-250-RA	300	900	T20	6.81 (0.268)	3.30 (0.130)	3.36 (0.132)	UL, CSA

*For TSV250-130 pad layout, see Telecom and Networking Section

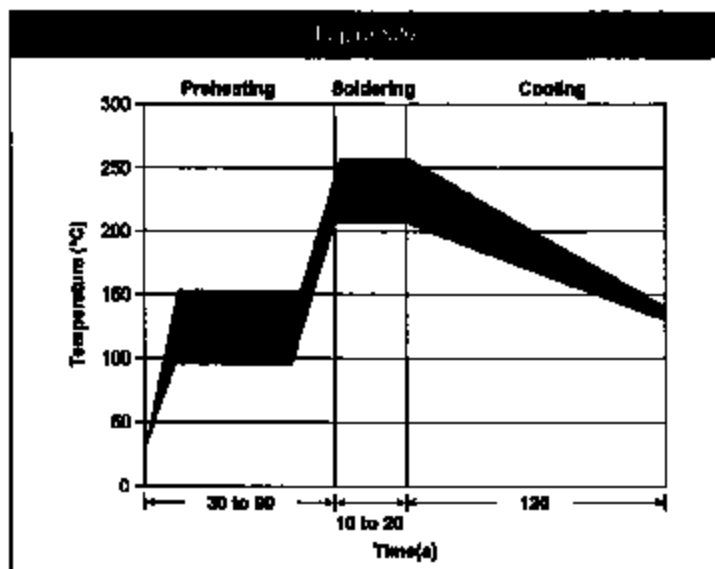
Figure 2-19. Pad dimensions: Pad Layout



Part Numbering System



Solder Reflow and Rework Recommendations for Surface-mount Devices



4

Caution:

- If reflow temperatures exceed the recommended profile, devices may not meet the performance specifications.

Solder Reflow

- Recommended reflow methods: IR, Vapor phase, and hot air oven.
- The following product series are not designed to be wave soldered to circuit boards:
 - nanoSMDM
 - miniSMDM
 - midSMD
 - SMD
 - SMD2
 - TS
- The following product series are designed to be wave soldered to circuit boards:
 - nanoSMDC
 - microSMD
 - miniSMDC, miniSMDE
- Recommended maximum paste thickness for the microSMD, miniSMDC, and miniSMDE devices is 0.25 mm (10 mils).
- Devices can be cleaned using standard methods and solvents.

Rework

- Use standard industry practices for the nanoSMDC, nanoSMDM, microSMD, miniSMDC, miniSMDM, and miniSMDE devices.
- For SMD and midSMD series and all TS devices rework should be confined to removal of the installed product and replacement with a fresh device.

Table S7. Tape and Reel Specifications for Surface-mount Devices (In Millimeters)

	miniSMDC nanoSMDCM	microSMD	miniSMDC miniSMDCM	miniSMDE100	miniSMD	SMD	SMDZ
	EIA 481-1	EIA 481-1	EIA 481-1	EIA 481-2	EIA 481-2	EIA 481-2	EIA 481-2
W	6.0 ± 0.30	6.0 ± 0.30	12.0 ± 0.30	24.0 ± 0.30	16.0 ± 0.30	16.0 ± 0.30	16.0 ± 0.30
P ₀	4.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10	4.0 ± 0.10
P ₁	4.0 ± 0.10	4.0 ± 0.10	8.0 ± 0.10	8.0 ± 0.10	8.0 ± 0.10	8.0 ± 0.10	12.0 ± 0.10
P ₂	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.10	2.0 ± 0.10	2.0 ± 0.10	2.0 ± 0.10
A ₀	Table S7a	2.85 ± 0.10	Table S7b	5.70 ± 0.10	5.11 ± 0.15	5.6 ± 0.23	6.9 ± 0.23
B ₀	Table S7a	3.98 ± 0.10	Table S7b	11.80 ± 0.10	5.6 ± 0.23	6.1 ± 0.15	9.6 ± 0.15
B ₁ max.	4.35	4.35	8.2**	20.1	12.1	12.1	12.1
D ₀	1.5 ± 0.10/-0.00	1.5 ± 0.10/-0.00	1.5 ± 0.10/-0.00	1.5 ± 0.10/-0.00	1.5 ± 0.10/-0.00	1.5 ± 0.10/-0.00	1.5 ± 0.10/-0.00
F	3.5 ± 0.05	3.5 ± 0.05	5.5 ± 0.05	11.5 ± 0.10	7.5 ± 0.10	7.5 ± 0.10	7.5 ± 0.10
E ₁	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10
E ₂ min.	8.25	6.25	10.25	22.25	14.25	14.25	14.25
T max.	0.6	0.6	0.6	0.6	0.6	0.6	0.6
T ₂ max.	0.1	0.1	0.1	0.1	0.1	0.1	0.1
K ₀	Table S7a	0.60 ± 0.10*	Table S7b	0.95 ± 0.10	1.8 ± 0.15	3.2 ± 0.15	3.4 ± 0.15
Leader min.	360***	360	360***	400	400	400	400
Trailer min.	160***	160	160***	180	160	160	160

*1.1±0.05 for microSMD100

**5.1 for miniSMDCM

***200 for nanoSMDCM, miniSMDCM

Table S7a

	miniSMDC100	nanoSMDCM
A ₀	2.3 ± 0.10	1.86 ± 0.10
B ₀	3.5 ± 0.10	3.5 ± 0.10
K ₀	1.45 ± 0.10	1.4 ± 0.10

Table S7b

	miniSMDC	miniSMDC200	miniSMDCM
A ₀	3.5 ± 0.23	3.7 ± 0.10	3.6 ± 0.23
B ₀	5.1 ± 0.15	4.9 ± 0.10	5.1 ± 0.15
K ₀	0.9 ± 0.15	1.4 ± 0.10	2.3 ± 0.15

Table S7c. Reel Dimensions for Surface-mount Devices

	miniSMDC nanoSMDCM	microSMD	miniSMDC	miniSMDCM	miniSMDE100	miniSMD	SMD	SMDZ
A max.	185	185	185	340	609	609	609	609
N min.	50	50	50	50	50	50	50	50
W ₁	8.5 ± 1.5/-0.00	8.4 ± 1.5/-0.00	12.4 ± 2.0/-0.00	12.4 ± 2.0/-0.00	24.4 ± 2.0/-0.00	16.4 ± 2.0/-0.00	16.4 ± 2.0/-0.00	16.4 ± 2.0/-0.00
W ₂ max.	14.4	14.4	18.4	18.4	30.4	22.4	22.4	22.4

Figure S21. Electrical Component Dimensions.

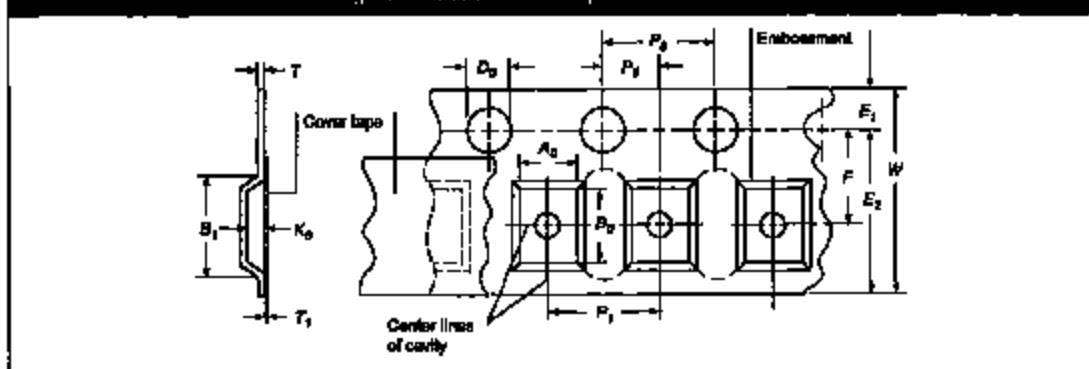
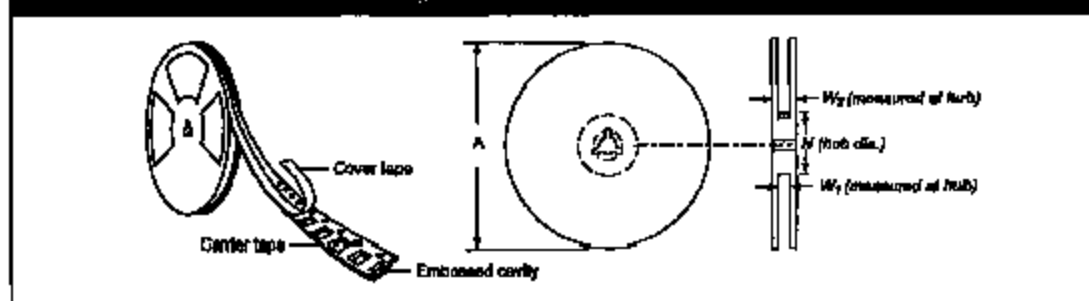


Figure S22. Floor Dimensions.



4

Latest Information

- Please visit us at www.circuitprotection.com or contact your local representative for the latest information.
- The information in this data package contains some preliminary information. Raychem Circuit Protection, a division of Tyco Electronics, reserves the right to change any of the specifications without notice. In addition, Tyco Electronics reserves the right to make changes—without notification to Buyer—to materials or processing that do not affect compliance with any applicable specification.

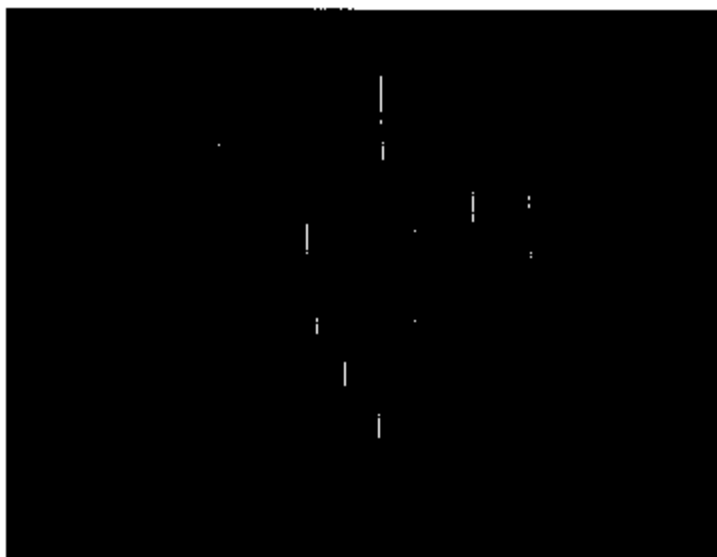


WARNING:

- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- The devices are intended for protection against occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- Contamination of the PPTC material with certain silicon based oils or some aggressive solvents can adversely impact the performance of the devices.
- Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal, and mechanical procedures for electronic components.
- Operation in circuits with a large inductance can generate a circuit voltage ($L di/dt$) above the rated voltage of the PolySwitch resettable devices.

PolySwitch Automotive Resettable Devices

Raychem has provided PPTC resettable devices in the automotive industry for over fifteen years. Until recently, the products sold by Raychem to this industry were either custom products (TD and Chip series devices) or our standard commercial versions of PPTC resettable devices. With the advent of QS-9000 and our continued involvement in the automotive industry, we were asked to develop automotive-specific versions of our PPTC resettable devices. The result of that work is the four device series (AHS, ASMD, AHR and AGR) featured in this section. These products are qualified and sold under our PS400 specification which is derived from AEC-Q200, the standard for electronic components used in the automotive industry. The key difference of these products is the rigorous additional testing these devices have successfully passed to meet the demanding environmental conditions that can be found in automotive applications, and the addition of new specification values which characterize the products' performance after being subjected to these specified environmental and electrical stress conditions.



4

Benefits:

- Many product choices give engineers more design flexibility
- Compatible with high volume electronics assembly
- Assists in meeting regulatory requirements
- Higher voltage ratings allow use in new applications

Features:

- Wide range of resettable devices for the automotive industry
- Current ratings from 0.3A to 14A
- Voltage ratings from 15V to 80V
- Meets automotive industry standards
- Fast time-to-trip
- Low resistance

Applications:

- Automotive motors
- Junction boxes
- Lamp protection
- Power outlet protection
- CD changer

Devices in this section are grouped by:

Term Factor, Product Series, Hold Current

Step 1. Determine the circuit's operating parameters.

Fill in the following information about the circuit:

Maximum ambient operating temperature _____

Normal operating current _____

Maximum operating voltage
(i.e. AGR400 is 16V_{MAX}) _____

Maximum Interrupt current _____

Step 2. Select the PolySwitch device that will accommodate the circuit's maximum ambient temperature and normal operating current.

Look across the top of Table A2 to find the temperature that most closely matches the circuit's maximum operating temperature. Look down that column to find the value equal to or greater than the circuit's normal operating current. Now look to the far left of that row to find the part number for the PolySwitch device that will best accommodate the circuit. Devices in this section are grouped by form factor, therefore your operating current requirement may be found in more than one product grouping.

The thermal derating curves located in Figures A1 and A2 are the normalized representations of the data in Table A2.

Step 3. Compare the selected device's maximum electrical ratings with the circuit's maximum operating voltage and maximum interrupt current.

Look down the first column of Table A3 to find the part number you selected in Step 2. Look to the right in that row to find the device's maximum operating voltage (V_{MAX}) and maximum interrupt current (I_{MAX}). Ensure that V_{MAX} and I_{MAX} are greater than or equal to the circuit's maximum operating voltage and maximum interrupt current.



Step 4. Determine time-to-trip.

Time-to-trip is the amount of time it takes for a device to switch to a high-resistance state once a fault current has been applied across the device. Identifying the PolySwitch device's time-to-trip is important in order to provide the desired protection capabilities. If the device you choose trips too fast, undesired or nuisance tripping will occur. If the device trips too slowly, the components being protected may be damaged before the device switches to a high-resistance state.

Refer to the typical time-to-trip curves for each of the PolySwitch devices found in Figures A8-A11.

If the PolySwitch device's time-to-trip is too fast or too slow for the circuit, go back to Step 2 and choose an alternate device.

Step 5. Verify ambient operating conditions.

Ensure that your application's minimum and maximum ambient temperatures are within the operating temperature of -40°C to 85°C (-40°C to 125°C for AHR, AHS series devices).

4

Step 6. Verify the PolySwitch device dimensions.

Using dimensions in Table A4, compare the dimensions of the PolySwitch device you selected with the application's space considerations.

Table A1. Product Series – Current Rating, Voltage Rating/Typical Resistance for Automotive Devices

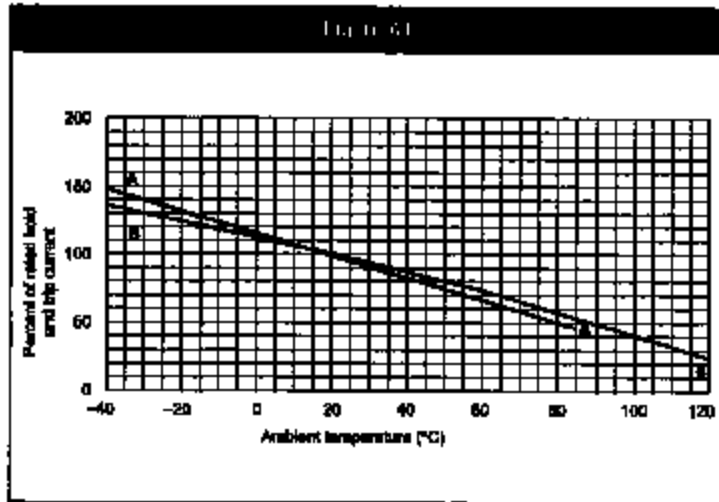
Voltage Rating	APR	APR	AHS	ASMD		
	70V	10V	10V	15V	30V	80V
Hold Current (A)						
0.30	—	—	—	—	—	0.23Ω
0.50	—	—	—	—	—	0.90Ω
0.75	—	—	—	—	0.90Ω	—
0.90	—	—	0.26Ω	—	—	—
1.00	—	—	—	—	0.30Ω	—
1.25	—	—	—	0.16Ω	—	—
1.50	—	—	—	0.16Ω	—	—
1.80	—	—	0.10Ω	—	—	—
2.00	—	—	—	0.09Ω	—	—
2.50	—	—	—	0.08Ω	—	—
4.00	0.030Ω	—	—	—	—	—
4.50	—	0.028Ω	—	—	—	—
5.00	0.020Ω	—	—	—	—	—
6.00	0.015Ω	0.018Ω	—	—	—	—
6.50	—	0.014Ω	—	—	—	—
7.00	0.011Ω	—	—	—	—	—
7.50	—	0.012Ω	—	—	—	—
8.00	0.0098Ω	—	—	—	—	—
9.00	0.0070Ω	—	—	—	—	—
10.00	0.0056Ω	0.0063Ω	—	—	—	—
11.00	0.0050Ω	—	—	—	—	—
12.00	0.0046Ω	—	—	—	—	—
13.00	—	0.0050Ω	—	—	—	—
14.00	0.0040Ω	—	—	—	—	—

Table A2. Thermal Derating for Automotive Devices [Hold Current (A) at Ambient Temperature (°C)]

Part Number	Maximum Ambient Temperature										
	-40°C	-20°C	0°C	20°C	40°C	50°C	60°C	70°C	85°C	125°C	
AGL											
10V—Loaded											
AGR400	5.9	5.3	4.8	4.1	3.5	3.2	2.8	2.6	1.9	—	
AGR500	7.3	6.8	6.0	5.2	4.4	4.0	3.6	3.1	2.4	—	
AGR600	8.8	8.0	7.2	6.2	5.2	4.8	4.2	3.8	2.8	—	
AGR700	10.3	9.3	8.4	7.3	6.2	5.8	5.0	4.4	3.3	—	
AGR800	11.7	10.7	9.6	8.3	6.9	6.4	5.6	5.1	3.7	—	
AGR900	13.2	11.9	10.7	9.4	7.9	7.2	6.4	5.8	4.2	—	
AGR1000	14.7	13.3	12.0	10.3	8.7	8.0	7.0	6.3	4.7	—	
AGR1100	16.1	14.6	13.1	11.6	9.7	8.8	7.8	6.9	5.2	—	
AGR1200	17.6	16.0	14.4	12.4	10.4	9.5	8.4	7.6	5.8	—	
AGR1400	20.6	19.7	18.8	14.6	12.1	11.2	9.8	8.9	6.5	—	
AHL (High Temperature)											
10V—Loaded											
AHR460	6.1	5.8	5.1	4.8	4.0	3.6	3.3	3.0	2.6	1.1	
AHR600	8.2	7.6	6.8	6.2	5.3	4.9	4.4	4.0	3.3	1.6	
AHR660	8.8	8.1	7.4	6.7	5.7	5.3	4.8	4.3	3.6	1.6	
AHR760	10.2	9.4	8.6	7.7	6.6	6.1	5.6	5.0	4.1	1.9	
AHR1000	13.6	12.5	11.4	10.3	8.8	8.1	7.4	6.8	5.6	2.5	
AHR1300	17.7	16.3	14.8	13.4	11.4	10.5	9.6	8.6	7.2	3.3	
AHS (High Temperature)											
30V—Surface-mount											
AHS080-2018	1.20	1.04	0.90	0.80	0.68	0.62	0.50	0.53	0.46	0.26	
AHS160	2.40	2.10	1.80	1.60	1.36	1.25	1.20	1.01	0.92	0.52	
ASMD											
18-AHV—Surface-mount											
ASMD030	0.36	0.31	0.27	0.23	0.19	0.17	0.15	0.13	0.11	—	
ASMD050	0.59	0.53	0.46	0.39	0.33	0.29	0.26	0.23	0.18	—	
ASMD075	0.91	0.81	0.71	0.60	0.60	0.45	0.40	0.35	0.28	—	
ASMD100	1.37	1.22	1.06	0.90	0.76	0.69	0.60	0.52	0.41	—	
ASMD125	1.58	1.48	1.23	1.04	0.87	0.78	0.70	0.60	0.48	—	
ASMD160	1.93	1.79	1.60	1.27	1.07	0.95	0.86	0.74	0.66	—	
ASMD200	2.63	2.34	2.04	1.73	1.46	1.30	1.16	1.00	0.80	—	
ASMD260	3.60	2.86	2.32	1.87	1.85	1.48	1.32	1.14	0.81	—	

Figures A1-A2. Thermal Derating Curves for Automotive Devices

A = AGR
B = AHR



4 A = ASMD
B = AHS

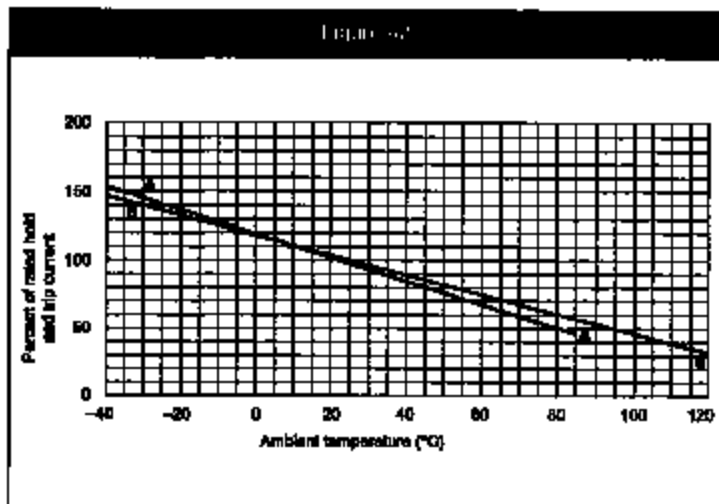


Table A3. Electrical Characteristics for Automotive Devices

Part Number	I_H (A) Φ	I_H (A) Φ	I_T (A)	V_{MAX} (V _{DC})	I_{MAX} (A)	P_D TYP (mW)	Max. Time-to-trip		R_{MIN} (Ω)	R_{1MAX} (Ω)	R_{2MAX} (Ω)	Figures for Dimensions
	R_{1MAX}	R_{2MAX}					(s)	(s)				
AGR												
18V-Loaded												
AGR400	4.0	3.0	7.5	16	100	2.5	20	2.0	0.0196	0.061	0.066	A3, A6, A7
AGR500	5.0	4.3	9.4	16	100	2.7	25	2.5	0.0140	0.034	0.048	A3, A6, A7
AGR600	6.0	5.3	10.7	16	100	2.8	30	3.5	0.0096	0.029	0.032	A3, A6, A7
AGR700	7.0	6.6	13.2	16	100	3.0	35	4.0	0.0066	0.020	0.022	A3, A6, A7
AGR800	8.0	7.8	15.0	16	100	3.2	40	5.5	0.0049	0.0175	0.0181	A3, A6, A7
AGR900	9.0	8.6	18.5	16	100	3.4	45	8.0	0.0041	0.0136	0.0140	A3, A6, A7
AGR1000	10.0	9.5	18.6	16	100	3.6	50	7.0	0.0034	0.0102	0.0106	A3, A6, A7
AGR1100	11.0	10.5	20.3	16	100	3.7	55	7.5	0.0033	0.0089	0.0093	A3, A6, A7
AGR1200	12.0	11.5	22.1	16	100	4.2	60	8.0	0.0030	0.0086	0.0091	A3, A6, A7
AGR1400	14.0	13.0	27.3	16	100	4.6	70	8.0	0.0022	0.0064	0.0067	A3, A6, A7
AHR												
18V-Loaded (High Temperature)												
AHR450	4.5	4.5	8.7	16	100	3.8	22.5	4.0	0.0170	0.054	0.064	A3, A6, A7
AHR600	6.0	6.0	12.0	16	100	4.1	30.0	6.5	0.0100	0.032	0.032	A3, A6, A7
AHR650	6.5	6.5	18.7	16	100	4.3	32.5	7.0	0.0090	0.026	0.026	A3, A6, A7
AHR750	7.5	7.5	14.8	16	100	4.5	37.5	8.0	0.0074	0.022	0.022	A3, A6, A7
AHR1000	10.0	10.0	20.5	16	100	5.3	50	10.5	0.0051	0.015	0.015	A3, A6, A7
AHR1300	13.0	13.0	27.0	16	100	6.9	65	15.0	0.0034	0.010	0.010	A3, A6, A7
AHS												
18V-Surface-mount (High Temperature)												
AHS090-2018	0.90	0.90	2.00	16	70	1.6	4.0	9.0	0.130	0.560	0.560	A4
AHS160	1.60	1.60	3.20	16	70	2.1	8.0	15.0	0.050	0.160	0.160	A6
ASMD												
16-60V-Surface-mount												
ASMD030	0.23	0.23	0.59	80	10	1.1	1.15	12.0	0.88	4.800	4.800	A5
ASMD050	0.39	0.39	0.85	80	10	1.1	1.95	20.0	0.28	1.400	1.400	A5
ASMD075	0.60	0.60	1.49	30	40	1.1	3.00	20.0	0.28	1.000	1.000	A5
ASMD100	0.90	0.90	2.15	30	40	1.1	4.50	20.0	0.038	0.480	0.480	A5
ASMD125	1.04	1.04	2.45	15	40	1.1	5.20	20.0	0.067	0.250	0.250	A5
ASMD150	1.27	1.27	2.85	15	40	1.2	6.35	25.0	0.049	0.250	0.250	A5
ASMD200	1.73	1.73	3.83	15	40	1.2	8.65	30.0	0.06	0.120	0.120	A5
ASMD260	1.97	1.97	5.00	16	40	1.2	9.85	30.0	0.085	0.085	0.085	A5

Notes:

I_H = Hold current: maximum current device will pass without interruption in 25°C unless otherwise specified (25°C for ASMD).

I_T = Trip current: minimum current that will switch the device from low resistance to high resistance in 25°C still air unless otherwise specified.

V_{MAX} = Maximum voltage device can withstand without damage at rated current.

I_{MAX} = Maximum (surge) current device can withstand without damage at rated voltage.

P_D = Power dissipated from device when in the tripped state in 25°C still air unless otherwise specified.

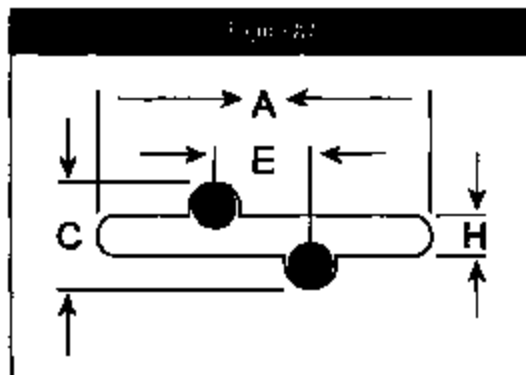
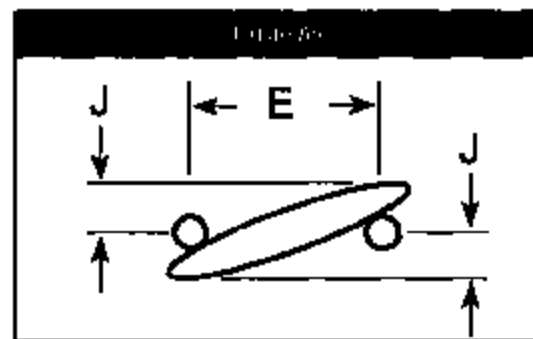
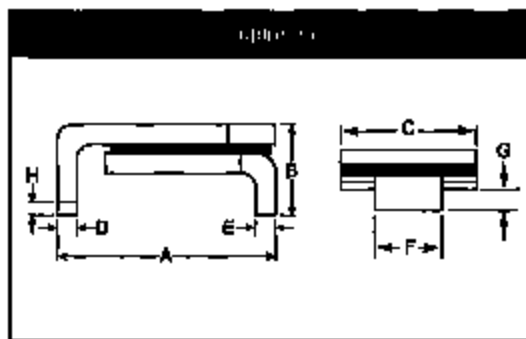
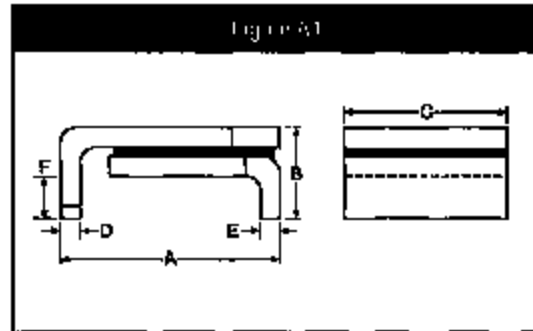
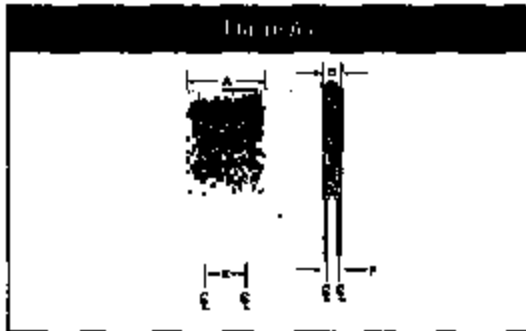
R_{1MAX} = Maximum resistance of device when measured one hour post reflow (surface-mount device) or one hour post trip (radial loaded device) at 25°C unless otherwise specified.

R_{MIN} = Minimum functional resistance of device after being subjected to the stresses described in PS400 at 25°C unless otherwise specified.

R_{2MAX} = Maximum functional resistance of device after being subjected to the stresses described in PS400 at 25°C unless otherwise specified.

R_{MIN} = Minimum resistance of device as supplied at 25°C unless otherwise specified.

Figures A3–A7. Physical Description for Dimensions for Automotive Devices



4

Table A4. Dimensions for Automotive Devices in Millimeters (Inches)

Part Number	Dimensions										Figure	
	A	B	C	D	E	F	G	H	I			
	Min.	Max.	Min.	Max.	Min.	Max.	Typ.	Min.	Max.	Typ.	Min.	
AGR												
10V—Loaded												
AGR400	5.8 (0.35)	14.7 (0.58)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.15)	3.96 (0.120)	1.24 (0.048)	1.4 (0.06)		A3, A6, A7
AGR500	10.4 (0.41)	15.6 (0.61)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	3.94 (0.135)	1.24 (0.048)	1.6 (0.06)		A3, A6, A7
AGR600	10.7 (0.42)	18.4 (0.73)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	4.07 (0.160)	1.24 (0.048)	1.6 (0.06)		A3, A6, A7
AGR700	11.2 (0.44)	21.0 (0.78)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	4.48 (0.177)	1.24 (0.048)	1.7 (0.07)		A3, A6, A7
AGR800	12.7 (0.50)	22.2 (0.88)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	5.08 (0.200)	1.24 (0.048)	1.8 (0.07)		A3, A6, A7
AGR900	14.0 (0.55)	23.0 (0.91)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	5.69 (0.224)	1.24 (0.048)	2.0 (0.08)		A3, A6, A7
AGR1000	16.51 (0.65)	25.7 (1.01)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	6.96 (0.274)	1.24 (0.048)	2.0 (0.08)		A3, A6, A7
AGR1100	17.5 (0.69)	26.5 (1.04)	3.0 (0.12)	7.6 (0.3)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	7.47 (0.294)	1.24 (0.048)	2.4 (0.09)		A3, A6, A7
AGR1200	17.6 (0.69)	26.8 (1.14)	3.5 (0.14)	7.6 (0.3)	4.4 (0.37)	10.8 (0.43)	1.4 (0.06)	4.83 (0.190)	1.45 (0.057)	1.5 (0.06)		A3, A6, A7
AGR1400	23.5 (0.925)	28.7 (1.13)	3.5 (0.14)	7.6 (0.3)	4.4 (0.37)	10.8 (0.43)	1.4 (0.06)	7.82 (0.308)	1.45 (0.057)	1.9 (0.07)		A3, A6, A7
AHR (High Temperature)												
10V—Loaded												
AHR450	10.4 (0.41)	15.6 (0.61)	3.0 (0.12)	7.6 (0.30)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	3.94 (0.156)	1.24 (0.048)	1.6 (0.06)		A3, A6, A7
AHR500	11.2 (0.44)	21.0 (0.73)	3.0 (0.12)	7.6 (0.30)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	4.48 (0.177)	1.24 (0.048)	1.7 (0.067)		A3, A6, A7
AHR650	12.7 (0.50)	22.2 (0.88)	3.0 (0.12)	7.6 (0.30)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	5.08 (0.200)	1.24 (0.048)	1.8 (0.07)		A3, A6, A7
AHR750	14.0 (0.55)	23.0 (0.93)	3.0 (0.14)	7.6 (0.30)	4.3 (0.17)	6.8 (0.23)	1.2 (0.06)	5.69 (0.224)	1.24 (0.048)	2.0 (0.08)		A3, A6, A7
AHR1000	17.5 (0.69)	26.5 (1.04)	3.0 (0.12)	7.6 (0.30)	4.4 (0.37)	10.8 (0.43)	1.2 (0.06)	7.47 (0.294)	1.24 (0.048)	1.5 (0.06)		A3, A6, A7
AHR1300	23.5 (0.925)	28.7 (1.13)	3.5 (0.14)	7.6 (0.30)	4.4 (0.37)	10.8 (0.43)	1.4 (0.06)	7.82 (0.308)	1.45 (0.057)	1.9 (0.08)		A3, A6, A7

Table A4. Dimensions for Automotive Devices in Millimeters (Inches) continued

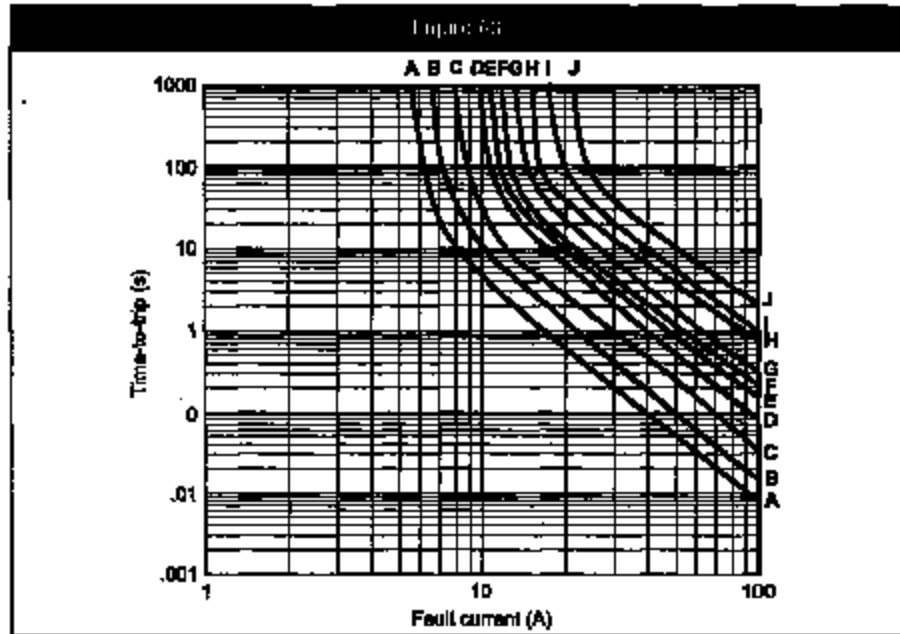
Part Number	Dimension																Figure
	A		B		C		D		E		F		G		H		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
AIS (High Temperature)																	
18V—Surface-mount																	
AIS000-2018	4.72 (0.186)	5.44 (0.214)	—	1.62 (0.064)	4.22 (0.166)	4.83 (0.190)	0.25 (0.010)	0.36 (0.014)	0.26 (0.010)	0.36 (0.014)	—	—	—	—	0.30 (0.012)	0.48 (0.019)	A4
AIS160	8.00 (0.315)	9.80 (0.374)	—	3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.68 (0.022)	0.71 (0.028)	0.66 (0.022)	0.71 (0.028)	3.68 (0.145)	3.84 (0.166)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD																	
18-60V—Surface-mount																	
ASMD030	6.73 (0.265)	7.98 (0.314)	—	3.18 (0.125)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD050	6.73 (0.265)	7.98 (0.314)	—	3.18 (0.125)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD076	6.73 (0.265)	7.98 (0.314)	—	3.18 (0.125)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD108	6.73 (0.265)	7.98 (0.314)	—	3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.66 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD121	6.73 (0.265)	7.98 (0.314)	—	3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD160	8.00 (0.315)	9.80 (0.374)	—	3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.84 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD200	8.00 (0.315)	9.80 (0.374)	—	3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.84 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5
ASMD280	8.00 (0.315)	9.80 (0.374)	—	3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.84 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	—	A5

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Figures A9-A11. Typical Time-to-Trip at 25°C for Automotive Devices

AGR

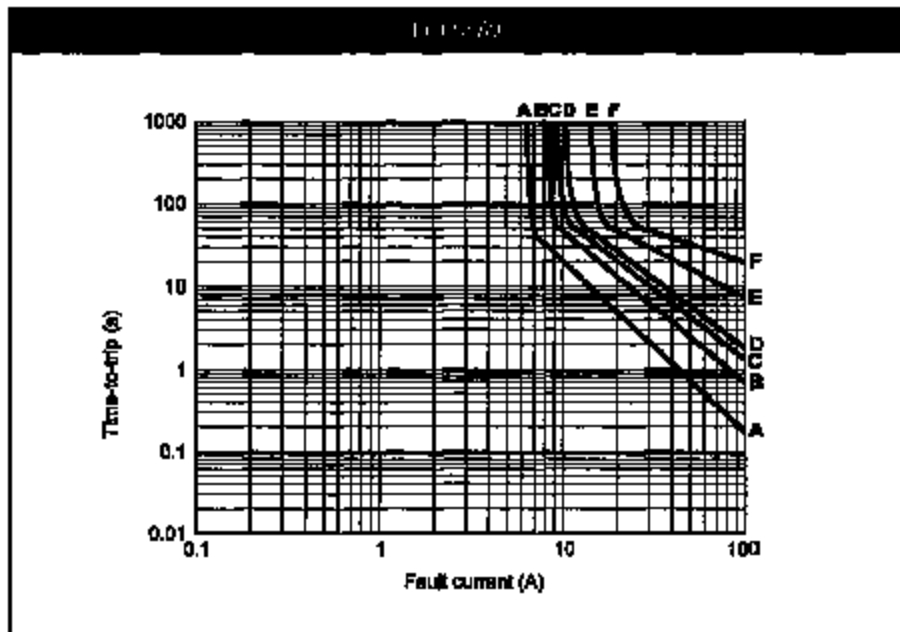
- A = AGR400
- B = AGR600
- C = AGR800
- D = AGR1000
- E = AGR1200
- F = AGR1400
- G = AGR1600
- H = AGR1800
- I = AGR2000
- J = AGR2400



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AHR

- A = AHR460
- B = AHR600
- C = AHR850
- D = AHR1000
- E = AHR1300
- F = AHR1600

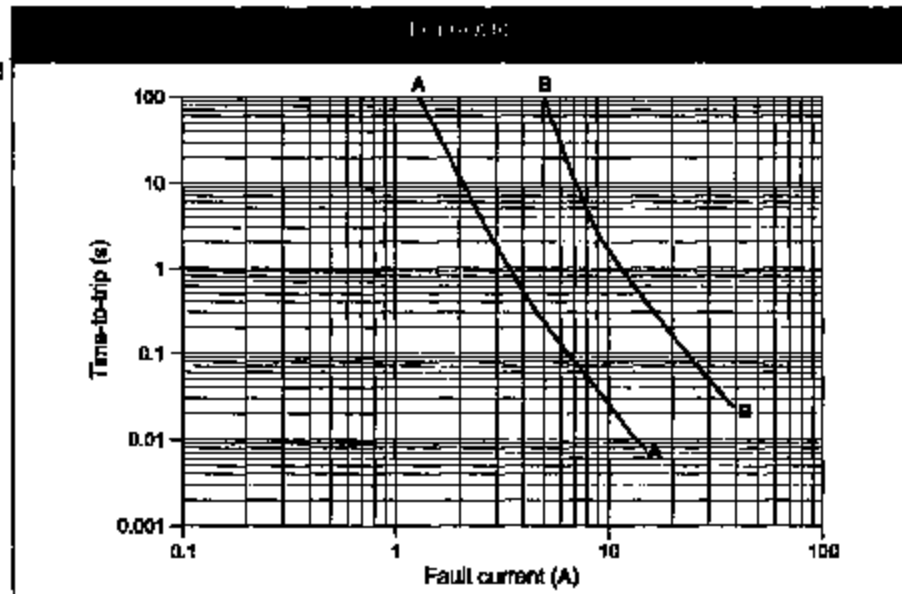


Figures A8–A11. Typical Time-to-trip at 25°C for Automotive Devices *continued*

AHS

A = AHS080-2018

B = AHS160



4

ASMD

A = ASMD030

B = ASMD050

C = ASMD075

D = ASMD100

E = ASMD125

F = ASMD160

G = ASMD200

H = ASMD260

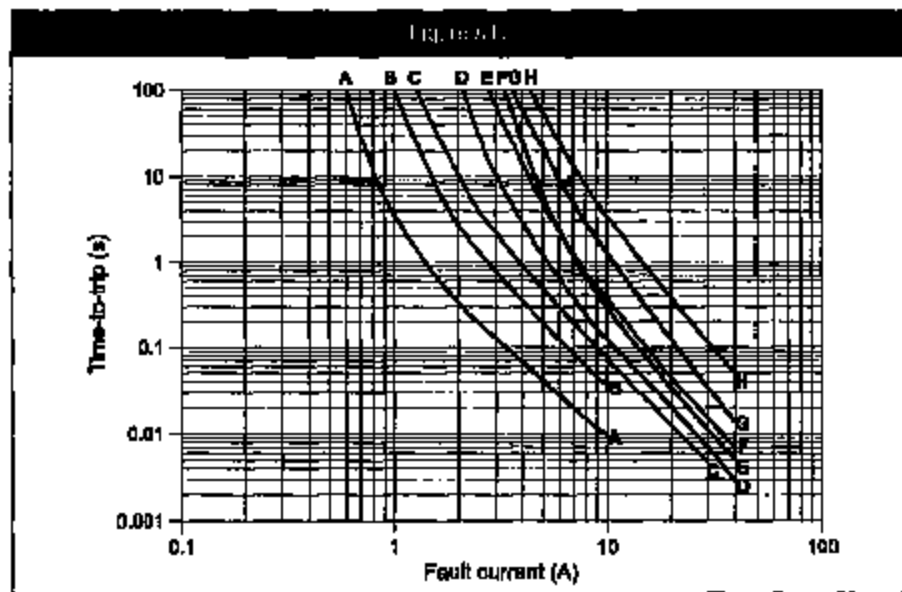


Table A5. Physical Characteristics and Environmental Specifications for Automotive Devices

AGR		
Physical characteristics		
Lead material	AGR400 to AGR1000: Tin/Lead Plated Copper, 0.62mm ² (20AWG) ± 0.8 mm/0.032in AGR1200 to AGR1400: Tin/Lead Plated Copper, 0.62mm ² (18AWG) ± 1.0mm/0.040in	
Soldering characteristics	Solderability per ANS/J-STD-002 Category 3	
Solder heat withstand	AGR400: per IEC68-2-20 Test Tb, method 1a, condition a: can withstand 5 seconds at 260°C ± 5°C AGR500-AGR1400: per IEC68-2-20 Test Tb, method 1a, condition b: can withstand 10 seconds at 260°C ± 5°C	
Insulating material	Cured, flame-retardant epoxy polymer: meets UL 94V-0	
See P5400 for other physical characteristics		
*Devices are not designed to be placed through a reflow process.		
Environmental specifications		
Test	Conditions	Resistance Change
Passive aging	70°C, 1000 hours 85°C, 1000 hours	±5% ±5%
Humidity aging	85°C, 85% RH, 1000 hours	±5%
Thermal shock	85°C, -40°C (10 times)	±5%
Solvent resistance	MIL-STD-202, Method 210F	No change
See P5400 for other environmental specifications		

AHR		
Physical characteristics		
Lead material	AHR450 to AHR1000: Tin/lead-plated Copper 0.62mm ² (20 AWG), ± 0.81mm/0.032in AHR1300: Tin lead-plated copper 0.62mm ² (18AWG), ± 1.0mm/0.040 in	
Soldering characteristics	Solderability per ANS/J-STD 002 Category 3	
Solder heat withstand	per IEC 68-2-20, Test Tb, Method 1a, condition b; can withstand 10 seconds at 280°C ± 5°C	
Insulating material	Cured, flame-retardant epoxy polymer: meets UL 94V-0 requirements	
See P5400 for other physical specifications		
*Devices are not designed to be placed through a reflow process.		
Environmental specifications		
Test	Conditions	Resistance Change
Passive aging	70°C, 1000 hours 85°C, 1000 hours	±5% ±5%
Humidity aging	85°C, 85% RH, 1000 hours	±5%
Thermal shock	125°C, -40°C (10 times)	±5%
Solvent resistance	MIL-STD-202, Method 210F	No change
See P5400 for other environmental specifications		

Table A3. Physical Characteristics and Environmental Specifications for Automotive Devices *continued*

ASMD

Physical characteristics

Terminal pad material	98%+ Tin-plated brass
Soldering characteristics	Solderability per ANSI-J-STD-002 Category 1
Solder heat withstand	per IEC-STD 68-2-20, Test Tb, Section 5, Method 1A
Flammability resistance	per IEC 695-2-2 Needle flame test for 20 seconds
Recommended storage conditions	40°C max, 70% RH max; devices may not meet specified ratings if storage conditions are exceeded

See PS-400 for other physical characteristics

Environmental specifications

Test	Conditions	Resistance Change
Passive aging	80°C, 1000 hours	±3% typical
	85°C, 1000 hours	±5% typical
Humidity aging	85°C, 85% RH, 100 hours	±1.2% typical
Thermal shock	85°C, -40°C (20 times)	-33% typical
	125°C, -55°C (10 times)	-33% typical
Solvent resistance	Freon	No change
	Trichloroethane	No change
	Hydrocarbons	No change

See PS-400 for other environmental specifications

ANS

Physical characteristics

Lead material	Tin-plated brass to MIL-T-10727B
Soldering characteristics	Solderability per ANSI-J-STD-002 Category 1
Solder heat withstand	per IEC-STD 68-2-20, Test Tb, Section 5, Method 1A
Flammability	per IEC 695-2-2 Needle flame test for 20 seconds

See PS-400 for other physical characteristics

Environmental specifications

Test	Conditions	Resistance Change
Passive aging	70°C, 1000 hours	±3% Typical
	85°C, 1000 hours	±5% Typical
Humidity aging	85°C, 85% RH, 1000 hours	±1.2% Typical
Thermal shock	125°C, -40°C (20 times)	-33% Typical
Solvent resistance	Freon	No change
	Trichloroethane	No change
	Hydrocarbons	No change

See PS-400 for other environmental specifications

4

Table A6. Packaging and Marking Information for Radial-lead Automotive Devices

Part Number	Bag Quantity	Tape & Reel Quantity	Antenna Pack Quantity	Standard Package Quantity	Part Marking	Agency Recognition
AGR Lowest						
AGR400	500	—	—	10,000	G4	*
AGR400-2	—	2,500	—	12,500	G4	*
AGR400-AP	—	—	2,000	10,000	G4	*
AGR500	500	—	—	10,000	G5	*
AGR500-2	—	2,000	—	10,000	G5	*
AGR500-AP	—	—	2,000	10,000	G5	*
AGR600	500	—	—	10,000	G6	*
AGR600-2	—	2,000	—	10,000	G6	*
AGR600-AP	—	—	2,000	10,000	G6	*
AGR700	500	—	—	10,000	G7	*
AGR700-S	—	1,500	—	7,500	G7	*
AGR700-AP	—	—	1,500	7,500	G7	*
AGR800	500	—	—	10,000	G8	*
AGR800-2	—	1,000	—	5,000	G8	*
AGR800-AP	—	—	1,000	5,000	G8	*
AGR900	500	—	—	10,000	G8	*
AGR900-2	—	1,000	—	5,000	G8	*
AGR900-AP	—	—	1,000	5,000	G8	*
AGR1000	250	—	—	5,000	G10	*
AGR1000-2	—	1,000	—	5,000	G10	*
AGR1000-AP	—	—	1,000	5,000	G10	*
AGR1100	250	—	—	5,000	G11	*
AGR1100-2	—	1,000	—	5,000	G11	*
AGR1100-AP	—	—	1,000	5,000	G11	*
AGR1200	250	—	—	5,000	G12	*
AGR1200-2	—	1,000	—	5,000	G12	*
AGR1200-AP	—	—	1,000	5,000	G12	*
AGR1400	250	—	—	5,000	G14	*
AGR1400-2	—	1,000	—	5,000	G14	*
AGR1400-AP	—	—	1,000	5,000	G14	*

*These devices have been designed for use in automotive applications. For commercial alternatives in these product series please see the Radial-lead or Surface-mount section of this Databook.

Table A6. Packaging and Marking Information for Radial-leaded Automotive Devices *continued*

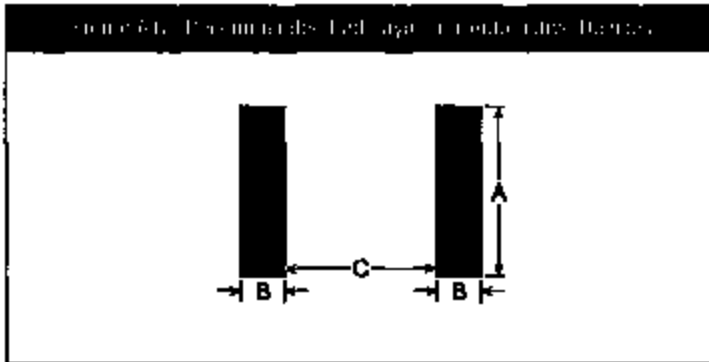
Part Number	Bag Quantity	Tape & Reel Quantity	Auto Pack Quantity	Standard Package Quantity	Part Marking	Agency Recognition
AHE (High Temperature Lead)						
AHR450	500	—	—	10,000	H4.5	*
AHR450-2	—	1,500	—	7,500	H4.5	*
AHR450-AP	—	—	1,500	7,500	H4.5	*
AHR500	600	—	—	10,000	H5	*
AHR500-2	—	1,500	—	7,500	H5	*
AHR500-AP	—	—	1,500	7,500	H5	*
AHR550	600	—	—	10,000	H5.5	*
AHR550-2	—	1,500	—	7,500	H5.5	*
AHR550-AP	—	—	1,500	7,500	H5.5	*
AHR750	500	—	—	10,000	H7.5	*
AHR750-2	—	1,000	—	5,000	H7.5	*
AHR750-AP	—	—	1,000	5,000	H7.5	*
AHR1000	250	—	—	5,000	H10	*
AHR1000-2	—	1,000	—	5,000	H10	*
AHR1000-AP	—	—	1,000	5,000	H10	*
AHR1300	250	—	—	5,000	H13	*
AHR1300-2	—	1,000	—	5,000	H13	*
AHR1300-AP	—	—	1,000	5,000	H13	*

Table A7. Packaging and Marking Information for Surface-mount Automotive Devices

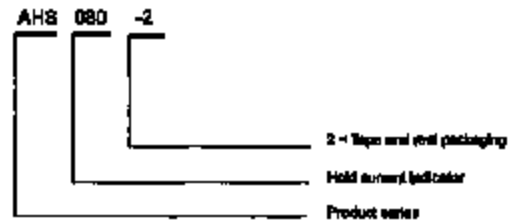
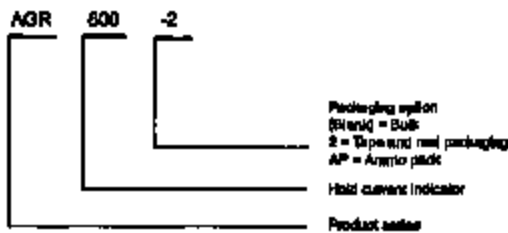
Part Number	Tape & Reel Quantity	Standard Package Quantity	Part Marking	Recommended Pad Layouts (mm (in) See Figure A12)			Agency Recognition
				Dimension A (mm (in))	Dimension B (mm)	Dimension C (mm)	
AHS (High Temperature)							
AHS080-2018	4,000	20,000	H08	4.6 (0.18)	1.5 (0.06)	3.4 (0.134)	*
AHS180	1,500	7,500	180	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	*
ASMD							
ASMD030	2,000	10,000	030	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	*
ASMD050	2,000	10,000	050	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	*
ASMD076	2,000	10,000	076	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	*
ASMD100	2,000	10,000	100	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	*
ASMD125	2,000	10,000	125	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	*
ASMD150	1,500	7,500	150	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	*
ASMD200	1,500	7,500	200	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	*
ASMD250	1,500	7,500	250	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	*

*These devices have been designed for use in automotive applications. For commercial alternatives to these product series please see the Radial-leaded or Surface-mount section of this Databook.

Figure 64. Dimensions Labeling Automotive Devices



Part Numbering System for Automotive Devices



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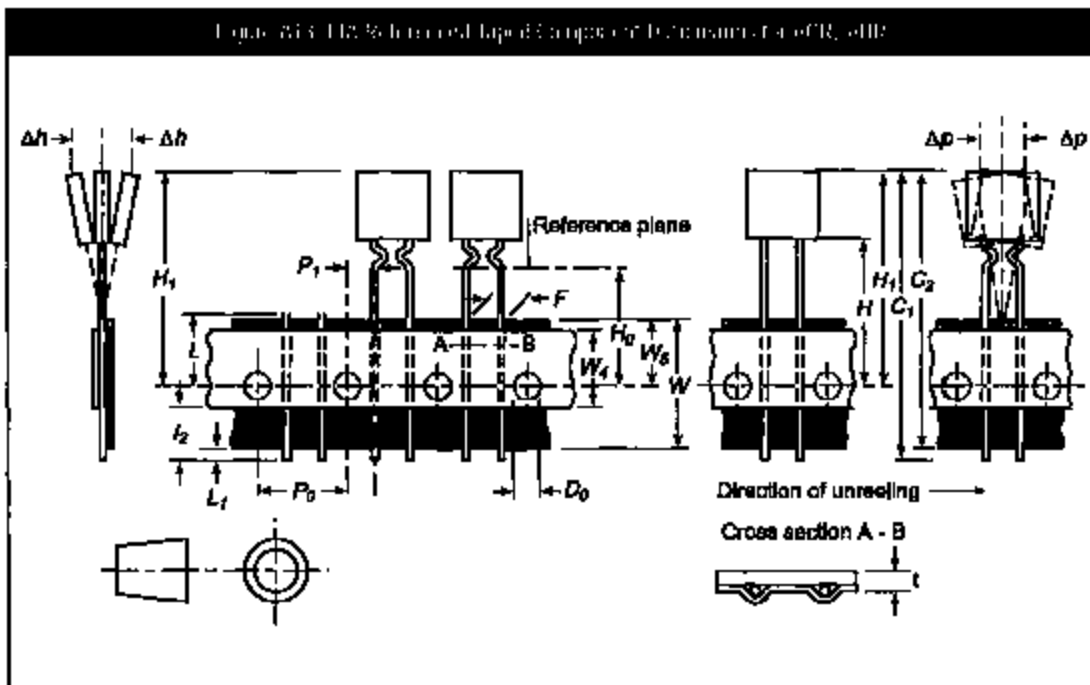
Table A8. Tape and Reel Specifications for Automotive Devices

AGR and AHR devices are available in tape and reel packaging per EIA488-B/IEC288-2 and EIA 481-2 standards. See Figures A13 and A14 for details.

Description	ER Mark	Dimensions (mm)	Tolerance
Carrier tape width	W	16.0	-0.5/+1.0
Hold down tape width	W _h	11.0	Minimum
Top distance between tape edges	W _t	3.0	Maximum
Sprocket hole position	W _s	9.0	-0.5/+0.75
Sprocket hole diameter	D _s	4.0	±0.2
Abscissa to plane	H _h	16.0	±0.5
Abscissa to top AGR600 to AGR800 & AHR450	H _i	32.2	Maximum
Abscissa to top AGR700 to AGR1400 & AHR600 to AHR1300*	H _h	45.0	Maximum
Overall width w/lead protrusion AGR400 to AGR600 & AHR450	C _i	43.2	Maximum
Overall width w/lead protrusion AGR700 to AGR1400 & AHR600 to AHR1300	C _i	55.0	Maximum
Overall width w/o lead protrusion AGR400 to AGR600 & AHR450	C _i	42.5	Maximum
Overall width w/o lead protrusion AGR700 to AGR1400 & AHR600 to AHR1300	C _i	64.0	Maximum
Lead protrusion	L _i	1.0	Maximum
Protrusion of cut-out	L	11.0	Maximum
Protrusion beyond hold-down tape	l ₂	Not specified	—
Sprocket hole pitch	P _s	12.7	±0.3
Device pitch AGR400 to AGR700, AHR450 to AHR600	—	12.7	±0.5
Device pitch AGR800 to AGR1400, AHR650 to AHR1300	—	25.4	±0.8
Pitch tolerance	—	20 consec.	±0.1
Tape thickness	t	0.9	Maximum
Overall tape and lead thickness AGR400 to AGR1100, AHR450 to AHR1000*	t ₁	2.0	Maximum
Overall tape and lead thickness AGR1200 to AGR1400, AHR1300*	t ₁	2.3	Maximum
Splice sprocket hole alignment	—	0	±0.3
Body lateral deviation	D _h	0	±1.0
Body tape plane deviation	D _p	0	±1.3
Ordnance to adjacent component lead AGR400 to AGR1100, AHR450 to AHR750	P ₁	3.81	±0.7
Ordnance to adjacent component lead AGR1200 to AGR1400, AHR1000 to AHR1300	P ₁	7.62	±0.7
Lead spacing AGR400 to AGR1100, AHR450 to AHR750*	F	5.08	±0.75/-0.5
Lead spacing AGR1200 to AGR1400, AHR1000 to AHR1300*	F	10.2	±0.75/-0.5
Reel width AGR400 to AGR600 & AHR450	w _r	56.0	Maximum
Reel width AGR700 to AGR1400, AHR600 to AHR1300*	w _r	63.5	Maximum
Reel diameter	φ	370.0	Maximum
Space between flanges less device*	w ₁	4.75	±3.25
Arbor hole diameter	φ	25.0	±12.0
Core diameter*	φ	91.0	Maximum
Box	—	64/372/352	Maximum
Consecutive missing pieces	—	None	—
Empty pieces per reel	—	0.1%	Maximum

* Differs from EIA specification.

Figure 20-113. Schematic diagram of a component of a CR, 600



4

Figure 20-114. Schematic diagram of a component of a CR, 600

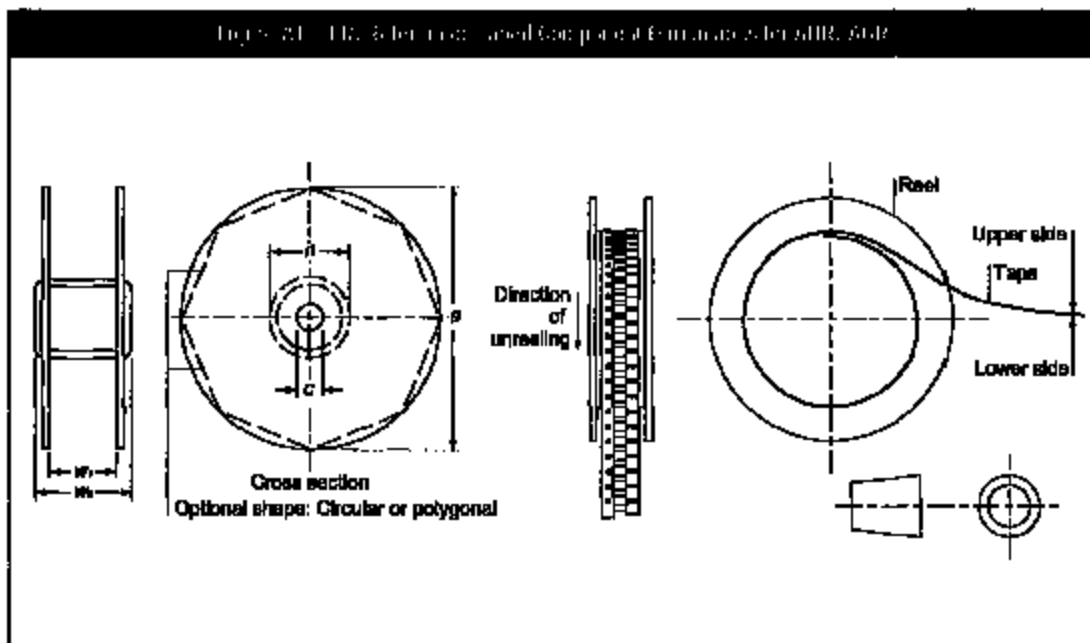


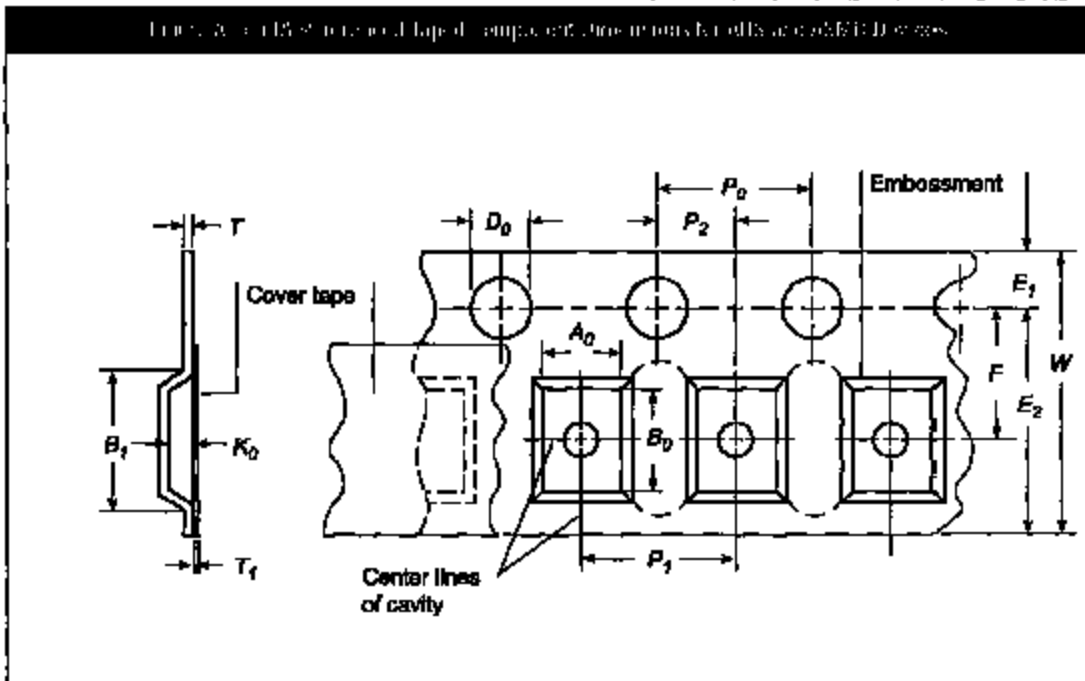
Table A8. Tape and Reel Specifications for Automotive Devices continued

AHS and ASMD devices are available in tape and reel packaging per EIA 488-2 standards. See Figures A15 and A16 for details.

Description	EN Mark	Dimension (mm)	Tolerance
Carrier tape width	W	16.0	± 0.3
Sprocket hole pitch	Pe	4.0	± 0.10
Embossed cavity pitch (ASMD030 to ASMD126 & AHS080)	Pi	8.0	± 0.10
Embossed cavity pitch (ASMD160 to ASMD250 & AHS160)	Pi	12.0	± 0.10
Offset to embossed cavity center	Pe	2.0	± 0.10
Embossed cavity length (inside) (AHS080)	Aa	5.11	± 0.15
Embossed cavity length (inside) (ASMD030 to ASMD126 & AHS160)	Aa	5.6	± 0.28
Embossed cavity length (inside) (ASMD160 to ASMD250)	Aa	8.9	± 0.23
Embossed cavity width (inside) (AHS080)	Ba	5.6	± 0.23
Embossed cavity width (inside) (ASMD030 to ASMD126)	Ba	8.1	± 0.15
Embossed cavity width (inside) (ASMD160 to ASMD250)	Ba	8.6	± 0.15
Embossed cavity length (outside)	Bb min.	12.1	—
Sprocket hole diameter	De	1.5	+ 0.1, -0
Offset to embossed cavity center	F	7.5	± 0.10
Sprocket hole location	Ei	1.75	± 0.10
Sprocket hole location (across embossed cavity)	Ez min.	14.25	—
Carrier tape thickness	T max.	0.5	—
Cover tape thickness	T1 max.	0.1	—
AHS080	Ka	1.8	± 0.15
ASMD100, ASMD126	Ka	3.2	± 0.15
ASMD150 to 250	Ka	3.4	± 0.15
Embossed cavity depth (inside)	Ka	—	± 0.15
Leader min.	—	400	—
Trailer min.	—	180	—
Reel diameter	A min.	800	—
Cone diameter	N min.	50	—
Reel width measured at inside hub	W1	16.4	+ 2.0, -0
Reel width measured at outside hub	W2 MAX.	22.4	—

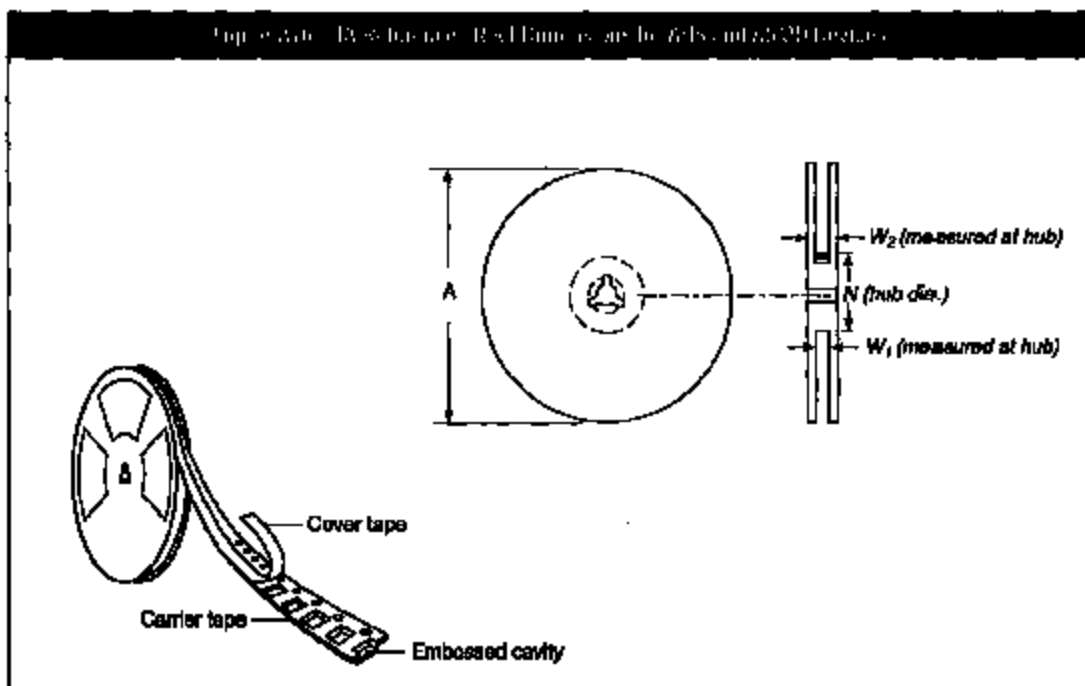
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Figure 20. Embossed metal tape component, three inductor coils and 25331 device.



4

Figure 21. Resistor tape component, as for 25331 device.



Latest Information

- Please visit us at www.circuitprotection.com or contact your local representative for the latest information.
- The information in this Databook contains some preliminary information. Raychem Circuit Protection, a division of Tyco Electronics reserves the right to change any of the specifications without notice. In addition, Tyco Electronics reserves the right to make changes—without notification to Buyer—to materials or processing that do not affect compliance with any applicable specification.



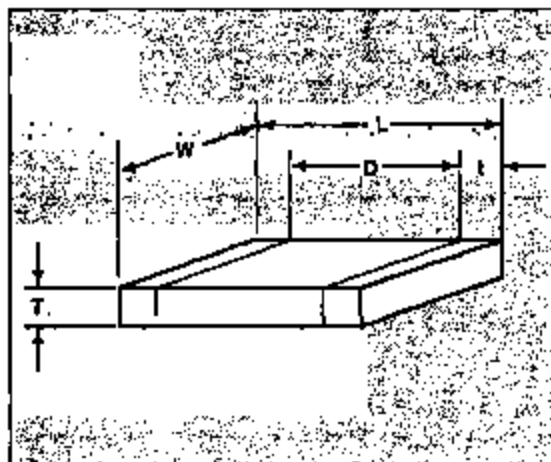
WARNING:

- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- The devices are intended for protection against occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- Contamination of the PPTC material with certain silicon based oils or some aggressive solvents can adversely impact the performance of the devices.
- Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal, and mechanical procedures for electronic components.
- Operation in circuit with a large inductance can generate a circuit voltage ($L \frac{di}{dt}$) above the rated voltage of the PolySwitch resettable device.

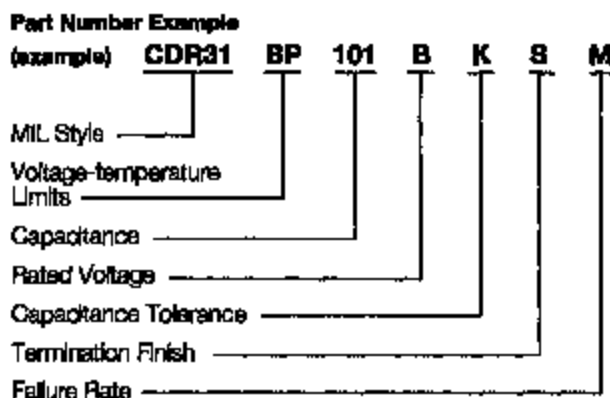
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MIL-PRF-55681/Chips

Part Number Example
CDR31 thru CDR35



MILITARY DESIGNATION PER MIL-PRF-55681



MIL Style: CDR31, CDR32, CDR33, CDR34, CDR35

Voltage Temperature Limits:

BP = 0 ± 30 ppm/°C without voltage; 0 ± 30 ppm/°C with rated voltage from -55°C to +125°C

BX = $\pm 15\%$ without voltage; $+15 - 25\%$ with rated voltage from -55°C to +125°C

Capacitance: Two digit figures followed by multiplier (number of zeros to be added) e.g., 101 = 100 pF

Rated Voltage: A = 50V, B = 100V

Capacitance Tolerance: C $\pm .25$ pF, D $\pm .5$ pF, F $\pm 1\%$
J $\pm 5\%$, K $\pm 10\%$, M $\pm 20\%$

Termination Finish:

M = Palladium Silver
N = Silver Nickel Gold
S = Solder-coated

U = Base Metallization/Barrier Metal/Solder Coated*
W = Base Metallization/Barrier Metal/Tinned (Tin or Tin/Lead Alloy)

*Solder shall have a melting point of 200°C or less.

Failure Rate Level: M = 1.0%, P = .1%, R = .01%, S = .001%

Packaging: Bulk is standard packaging. Tape and reel per RS481 is available upon request.

CROSS REFERENCE: AVX/MIL-PRF-55681/CDR31 THRU CDR35

Per MIL-PRF-55681 (Metric Size)	AVX Style	Length (L) (mm)	Width (W) (mm)	Thickness (T)		Termination Band (B)	
				Max. (mm)	Min. (mm)	Max. (mm)	Min. (mm)
CDR31	0805	2.00	1.25	1.3	.50	.70	.30
CDR32	1206	3.20	1.60	1.3	—	.70	.30
CDR33	1210	3.20	2.50	1.5	—	.70	.30
CDR34	1812	4.50	3.20	1.5	—	.70	.30
CDR35	1825	4.50	6.40	1.5	—	.70	.30



MIL-PRF-55681/Chips



Military Part Number Identification CDR31

CDR31 to MIL-PRF-55681/7

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 0805/CDR31 (BP)				
CDR31BP1R0B--	1.0	B,C	BP	100
CDR31BP1R1B--	1.1	B,C	BP	100
CDR31BP1R2B--	1.2	B,C	BP	100
CDR31BP1R3B--	1.5	B,C	BP	100
CDR31BP1R5B--	1.8	B,C	BP	100
CDR31BP1R6B--	1.8	B,C	BP	100
CDR31BP1R8B--	1.8	B,C	BP	100
CDR31BP2R0B--	2.0	B,C	BP	100
CDR31BP2R2B--	2.2	B,C	BP	100
CDR31BP2R4B--	2.4	B,C	BP	100
CDR31BP2R7B--	2.7	B,C,D	BP	100
CDR31BP3R0B--	3.0	B,C,D	BP	100
CDR31BP3R3B--	3.3	B,C,D	BP	100
CDR31BP3R6B--	3.6	B,C,D	BP	100
CDR31BP3R9B--	3.9	B,C,D	BP	100
CDR31BP4R3B--	4.3	B,C,D	BP	100
CDR31BP4R7B--	4.7	B,C,D	BP	100
CDR31BP5R1B--	5.1	B,C,D	BP	100
CDR31BP5R6B--	5.6	B,C,D	BP	100
CDR31BP5R2B--	6.2	B,C,D	BP	100
CDR31BP6R8B--	6.8	B,C,D	BP	100
CDR31BP7R8B--	7.5	B,C,D	BP	100
CDR31BP8R2B--	8.2	B,C,D	BP	100
CDR31BP9R1B--	9.1	B,C,D	BP	100
CDR31BP100B--	10	F,J,K	BP	100
CDR31BP110B--	11	F,J,K	BP	100
CDR31BP120B--	12	F,J,K	BP	100
CDR31BP130B--	13	F,J,K	BP	100
CDR31BP150B--	15	F,J,K	BP	100
CDR31BP160B--	16	F,J,K	BP	100
CDR31BP180B--	18	F,J,K	BP	100
CDR31BP200B--	20	F,J,K	BP	100
CDR31BP220B--	22	F,J,K	BP	100
CDR31BP240B--	24	F,J,K	BP	100
CDR31BP270B--	27	F,J,K	BP	100
CDR31BP300B--	30	F,J,K	BP	100
CDR31BP330B--	33	F,J,K	BP	100
CDR31BP360B--	36	F,J,K	BP	100
CDR31BP390B--	39	F,J,K	BP	100
CDR31BP430B--	43	F,J,K	BP	100
CDR31BP470B--	47	F,J,K	BP	100
CDR31BP510B--	51	F,J,K	BP	100
CDR31BP560B--	56	F,J,K	BP	100
CDR31BP620B--	62	F,J,K	BP	100
CDR31BP680B--	68	F,J,K	BP	100
CDR31BP750B--	75	F,J,K	BP	100
CDR31BP820B--	82	F,J,K	BP	100
CDR31BP910B--	91	F,J,K	BP	100

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 0805/CDR31 (BP) cont'd				
CDR31BP101B--	100	F,J,K	BP	100
CDR31BP111B--	110	F,J,K	BP	100
CDR31BP121B--	120	F,J,K	BP	100
CDR31BP131B--	130	F,J,K	BP	100
CDR31BP151B--	150	F,J,K	BP	100
CDR31BP161B--	160	F,J,K	BP	100
CDR31BP181B--	180	F,J,K	BP	100
CDR31BP201B--	200	F,J,K	BP	100
CDR31BP221B--	220	F,J,K	BP	100
CDR31BP241B--	240	F,J,K	BP	100
CDR31BP271B--	270	F,J,K	BP	100
CDR31BP301B--	300	F,J,K	BP	100
CDR31BP331B--	330	F,J,K	BP	100
CDR31BP361B--	360	F,J,K	BP	100
CDR31BP391B--	390	F,J,K	BP	100
CDR31BP431B--	430	F,J,K	BP	100
CDR31BP471B--	470	F,J,K	BP	100
CDR31BP511A--	510	F,J,K	BP	50
CDR31BP561A--	560	F,J,K	BP	50
CDR31BP621A--	620	F,J,K	BP	50
CDR31BP681A--	680	F,J,K	BP	50

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 0805/CDR31 (BK)				
CDR31BK471B--	470	K,M	BK	100
CDR31BK681B--	680	K,M	BK	100
CDR31BK821B--	820	K,M	BK	100
CDR31BK102B--	1,000	K,M	BK	100
CDR31BK122B--	1,200	K,M	BK	100
CDR31BK152B--	1,500	K,M	BK	100
CDR31BK182B--	1,800	K,M	BK	100
CDR31BK222B--	2,200	K,M	BK	100
CDR31BK272B--	2,700	K,M	BK	100
CDR31BK332B--	3,300	K,M	BK	100
CDR31BK392B--	3,900	K,M	BK	100
CDR31BK472B--	4,700	K,M	BK	100
CDR31BK562A--	5,600	K,M	BK	50
CDR31BK682A--	6,800	K,M	BK	50
CDR31BK822A--	8,200	K,M	BK	50
CDR31BK103A--	10,000	K,M	BK	50
CDR31BK123A--	12,000	K,M	BK	50
CDR31BK153A--	15,000	K,M	BK	50
CDR31BK183A--	18,000	K,M	BK	50

- Add appropriate failure rate
- Add appropriate termination finish
- Capacitance Tolerance

- Add appropriate failure rate
- Add appropriate termination finish
- Capacitance Tolerance

1/ The complete part number will include additional symbols to indicate capacitance tolerance, termination and failure rate level.

MIL-PRF-55681/Chips



Military Part Number Identification CDR32

CDR32 to MIL-PRF-55681/6

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 1206/CDR32 (BP)				
CDR32BP1R0B	1.0	B,C	BP	100
CDR32BP1R1B	1.1	B,C	BP	100
CDR32BP1R2B	1.2	B,C	BP	100
CDR32BP1R3B	1.3	B,C	BP	100
CDR32BP1R5B	1.5	B,C	BP	100
CDR32BP1R6B	1.6	B,C	BP	100
CDR32BP1R8B	1.8	B,C	BP	100
CDR32BP2R0B	2.0	B,C	BP	100
CDR32BP2R2B	2.2	B,C	BP	100
CDR32BP2R4B	2.4	B,C	BP	100
CDR32BP2R7B	2.7	B,C,D	BP	100
CDR32BP3R0B	3.0	B,C,D	BP	100
CDR32BP3R3B	3.3	B,C,D	BP	100
CDR32BP3R6B	3.6	B,C,D	BP	100
CDR32BP3R9B	3.9	B,C,D	BP	100
CDR32BP4R3B	4.3	B,C,D	BP	100
CDR32BP4R7B	4.7	B,C,D	BP	100
CDR32BP5R1B	6.1	B,C,D	BP	100
CDR32BP5R6B	5.6	B,C,D	BP	100
CDR32BP6R2B	6.2	B,C,D	BP	100
CDR32BP6R8B	6.8	B,C,D	BP	100
CDR32BP7R5B	7.5	B,C,D	BP	100
CDR32BP8R2B	8.2	B,C,D	BP	100
CDR32BP9R1B	9.1	B,C,D	BP	100
CDR32BP10B	10	F,J,K	BP	100
CDR32BP11B	11	F,J,K	BP	100
CDR32BP12B	12	F,J,K	BP	100
CDR32BP13B	13	F,J,K	BP	100
CDR32BP15B	15	F,J,K	BP	100
CDR32BP16B	16	F,J,K	BP	100
CDR32BP18B	18	F,J,K	BP	100
CDR32BP20B	20	F,J,K	BP	100
CDR32BP22B	22	F,J,K	BP	100
CDR32BP24B	24	F,J,K	BP	100
CDR32BP27B	27	F,J,K	BP	100
CDR32BP30B	30	F,J,K	BP	100
CDR32BP33B	33	F,J,K	BP	100
CDR32BP36B	36	F,J,K	BP	100
CDR32BP43B	43	F,J,K	BP	100
CDR32BP47B	47	F,J,K	BP	100
CDR32BP51B	51	F,J,K	BP	100
CDR32BP56B	56	F,J,K	BP	100
CDR32BP62B	62	F,J,K	BP	100
CDR32BP68B	68	F,J,K	BP	100
CDR32BP75B	75	F,J,K	BP	100
CDR32BP82B	82	F,J,K	BP	100
CDR32BP91B	91	F,J,K	BP	100

- Add appropriate failure rate
- Add appropriate termination limits
- Capacitance Tolerance

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 1206/CDR32 (BP) cont'd				
CDR32BP101B	100	F,J,K	BP	100
CDR32BP111B	110	F,J,K	BP	100
CDR32BP121B	120	F,J,K	BP	100
CDR32BP131B	130	F,J,K	BP	100
CDR32BP161B	160	F,J,K	BP	100
CDR32BP161B	160	F,J,K	BP	100
CDR32BP181B	180	F,J,K	BP	100
CDR32BP201B	200	F,J,K	BP	100
CDR32BP221B	220	F,J,K	BP	100
CDR32BP241B	240	F,J,K	BP	100
CDR32BP271B	270	F,J,K	BP	100
CDR32BP301B	300	F,J,K	BP	100
CDR32BP331B	330	F,J,K	BP	100
CDR32BP361B	360	F,J,K	BP	100
CDR32BP391B	390	F,J,K	BP	100
CDR32BP431B	430	F,J,K	BP	100
CDR32BP471B	470	F,J,K	BP	100
CDR32BP511B	510	F,J,K	BP	100
CDR32BP561B	560	F,J,K	BP	100
CDR32BP621B	620	F,J,K	BP	100
CDR32BP681B	680	F,J,K	BP	100
CDR32BP751B	750	F,J,K	BP	100
CDR32BP821B	820	F,J,K	BP	100
CDR32BP911B	910	F,J,K	BP	100
CDR32BP102B	1,000	F,J,K	BP	100
CDR32BP112A	1,100	F,J,K	BP	50
CDR32BP122A	1,200	F,J,K	BP	50
CDR32BP132A	1,300	F,J,K	BP	50
CDR32BP152A	1,500	F,J,K	BP	50
CDR32BP162A	1,600	F,J,K	BP	50
CDR32BP182A	1,800	F,J,K	BP	50
CDR32BP202A	2,000	F,J,K	BP	50
CDR32BP222A	2,200	F,J,K	BP	50

AVX Style 1206/CDR32 (BK)

CDR32BK472B	4,700	K,M	BK	100
CDR32BK682B	6,800	K,M	BK	100
CDR32BK822B	8,200	K,M	BK	100
CDR32BK102B	10,000	K,M	BK	100
CDR32BK123B	12,000	K,M	BK	100
CDR32BK153B	15,000	K,M	BK	100
CDR32BK183A	18,000	K,M	BK	50
CDR32BK223A	22,000	K,M	BK	50
CDR32BK273A	27,000	K,M	BK	50
CDR32BK333A	33,000	K,M	BK	50
CDR32BK393A	39,000	K,M	BK	50

- Add appropriate failure rate
- Add appropriate termination limits
- Capacitance Tolerance

1/ The complete part number will include additional symbols to indicate capacitance tolerance, termination and failure rate level.



MIL-PRF-55681/Chips



Military Part Number Identification CDR33/34/35

CDR33/34/35 to MIL-PRF-55681/9/10/11

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 1210/CDR33 (BP)				
CDR33BP102B	1,000	F,J,K	BP	100
CDR33BP112B	1,100	F,J,K	BP	100
CDR33BP122B	1,200	F,J,K	BP	100
CDR33BP132B	1,300	F,J,K	BP	100
CDR33BP152B	1,500	F,J,K	BP	100
CDR33BP182B	1,800	F,J,K	BP	100
CDR33BP222B	2,200	F,J,K	BP	100
CDR33BP272B	2,700	F,J,K	BP	100
CDR33BP332B	3,300	F,J,K	BP	100
CDR33BP472B	4,700	F,J,K	BP	100
CDR33BP622B	6,200	F,J,K	BP	100
CDR33BP822B	8,200	F,J,K	BP	100
CDR33BP104A	10,000	F,J,K	BP	100
CDR33BP124A	12,000	F,J,K	BP	100
CDR33BP154A	15,000	F,J,K	BP	100
CDR33BP184A	18,000	F,J,K	BP	100
CDR33BP224A	22,000	F,J,K	BP	100
CDR33BP274A	27,000	F,J,K	BP	100
CDR33BP334A	33,000	F,J,K	BP	100
CDR33BP474A	47,000	F,J,K	BP	100
CDR33BP624A	62,000	F,J,K	BP	100
CDR33BP824A	82,000	F,J,K	BP	100
CDR33BP104A	100,000	F,J,K	BP	100
AVX Style 1210/CDR33 (BX)				
CDR33BX153B	15,000	K,M	BX	100
CDR33BX183B	18,000	K,M	BX	100
CDR33BX223B	22,000	K,M	BX	100
CDR33BX273B	27,000	K,M	BX	100
CDR33BX333A	33,000	K,M	BX	50
CDR33BX473A	47,000	K,M	BX	50
CDR33BX623A	62,000	K,M	BX	50
CDR33BX823A	82,000	K,M	BX	50
CDR33BX104A	100,000	K,M	BX	50
AVX Style 1812/CDR34 (BP)				
CDR34BP222B	2,200	F,J,K	BP	100
CDR34BP242B	2,400	F,J,K	BP	100
CDR34BP272B	2,700	F,J,K	BP	100
CDR34BP302B	3,000	F,J,K	BP	100
CDR34BP332B	3,300	F,J,K	BP	100
CDR34BP362B	3,600	F,J,K	BP	100
CDR34BP392B	3,900	F,J,K	BP	100
CDR34BP432B	4,300	F,J,K	BP	100
CDR34BP472B	4,700	F,J,K	BP	100
CDR34BP512A	5,100	F,J,K	BP	50
CDR34BP622A	6,200	F,J,K	BP	50
CDR34BP722A	7,200	F,J,K	BP	50
CDR34BP822A	8,200	F,J,K	BP	50
CDR34BP912A	9,100	F,J,K	BP	50
CDR34BP103A	10,000	F,J,K	BP	50

Add appropriate failure rate
 Add appropriate termination finish
 Capacitance Tolerance

Military Type Designation 1/	Capacitance in pF	Capacitance tolerance	Rated temperature and voltage-temperature limits	WVDC
AVX Style 1812/CDR34 (BX)				
CDR34BX273B	27,000	K,M	BX	100
CDR34BX333B	33,000	K,M	BX	100
CDR34BX393B	39,000	K,M	BX	100
CDR34BX473B	47,000	K,M	BX	100
CDR34BX563B	56,000	K,M	BX	100
CDR34BX104A	100,000	K,M	BX	50
CDR34BX124A	120,000	K,M	BX	50
CDR34BX154A	150,000	K,M	BX	50
CDR34BX184A	180,000	K,M	BX	50
AVX Style 1825/CDR35 (BP)				
CDR35BP472B	4,700	F,J,K	BP	100
CDR35BP512B	5,100	F,J,K	BP	100
CDR35BP562B	5,600	F,J,K	BP	100
CDR35BP622B	6,200	F,J,K	BP	100
CDR35BP682B	6,800	F,J,K	BP	100
CDR35BP752B	7,500	F,J,K	BP	100
CDR35BP822B	8,200	F,J,K	BP	100
CDR35BP912B	9,100	F,J,K	BP	100
CDR35BP104B	10,000	F,J,K	BP	100
CDR35BP113A	11,000	F,J,K	BP	50
CDR35BP123A	12,000	F,J,K	BP	50
CDR35BP133A	13,000	F,J,K	BP	50
CDR35BP153A	15,000	F,J,K	BP	50
CDR35BP163A	16,000	F,J,K	BP	50
CDR35BP183A	18,000	F,J,K	BP	50
CDR35BP203A	20,000	F,J,K	BP	50
CDR35BP223A	22,000	F,J,K	BP	50
AVX Style 1825/CDR35 (BX)				
CDR35BX623B	62,000	K,M	BX	100
CDR35BX683B	68,000	K,M	BX	100
CDR35BX753B	75,000	K,M	BX	100
CDR35BX104B	100,000	K,M	BX	100
CDR35BX124B	120,000	K,M	BX	100
CDR35BX154B	150,000	K,M	BX	100
CDR35BX184A	180,000	K,M	BX	50
CDR35BX224A	220,000	K,M	BX	50
CDR35BX274A	270,000	K,M	BX	50
CDR35BX334A	330,000	K,M	BX	50
CDR35BX394A	390,000	K,M	BX	50
CDR35BX474A	470,000	K,M	BX	50

Add appropriate failure rate
 Add appropriate termination finish
 Capacitance Tolerance

1/ The complete part number will include additional symbols to indicate capacitance tolerance, termination and failure rate level.



Packaging of Chip Components

Automatic Insertion Packaging

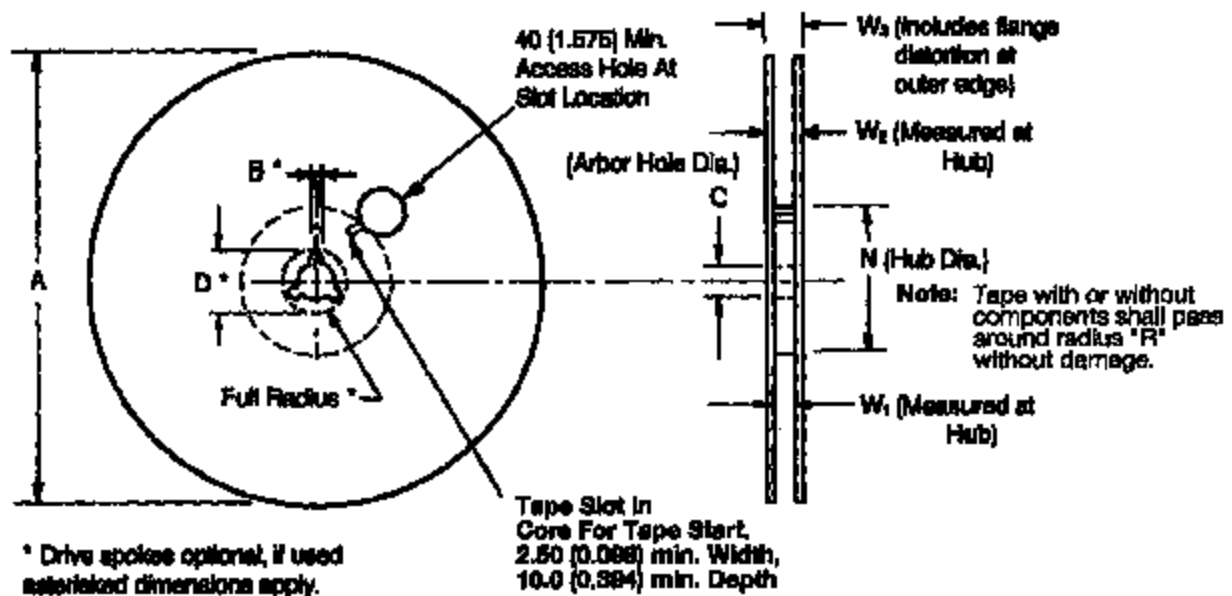


TAPE & REEL QUANTITIES

All tape and reel specifications are in compliance with RS481.

	6mm	12mm	
Paper or Embossed Carrier	0812, 0508, 0806, 1208, 1210		
Embossed Only	0306	1808	1812, 1825, 2220, 2225
Paper Only	0201, 0402, 0803		
Qty. per Reel/7" Reel	2,000, 3,000 or 4,000, 10,000, 15,000 Contact factory for exact quantity	3,000	500, 1,000 Contact factory for exact quantity
Qty. per Reel/13" Reel	5,000, 10,000, 50,000 Contact factory for exact quantity	10,000	4,000

REEL DIMENSIONS



Tape Size ⁽¹⁾	A Max.	B* Min.	C	D* Min.	N Min.	W ₁	W ₂ Max.	W ₃
6mm						8.40 ±0.10 (0.331 ±0.004)	14.4 (0.567)	7.50 Min. (0.311) 10.9 Max. (0.429)
12mm	330 (12.992)	1.5 (0.059)	13.0 ±0.1 (0.512 ±0.004)	21.2 (0.795)	50.0 (1.969)		18.4 (0.724)	11.9 Min. (0.469) 15.4 Max. (0.607)

Metric dimensions will govern.

English measurements rounded and for reference only.

(1) For tape sizes 16mm and 24mm (used with chip size 3040) consult EIA RS-481 latest revision.

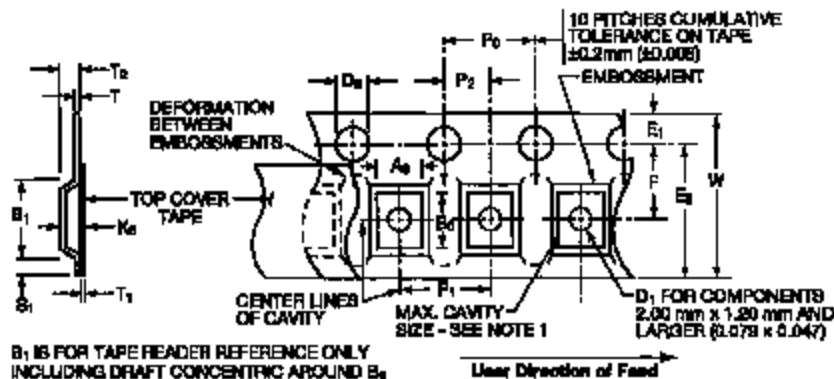


ERR2-827-0 39590

Embossed Carrier Configuration



8 & 12mm Tape Only



8 & 12mm Embossed Tape Metric Dimensions Will Govern

CONSTANT DIMENSIONS

Tape Size	D_0	E	F_0	F_1	S_1 Min.	T Max.	T_1
8mm and 12mm	1.50 ± 0.05 (0.059 ± 0.002)	1.75 ± 0.10 (0.069 ± 0.004)	4.0 ± 0.10 (0.157 ± 0.004)	2.0 ± 0.05 (0.079 ± 0.002)	0.50 (0.024)	0.60 (0.024)	0.10 (0.004) Max.

VARIABLE DIMENSIONS

Tape Size	S_1 Max.	D_1 Min.	E_2 Min.	F	F_1	F Min.	T_2	W Max.	A_0, E_0, K_0
8mm	4.95 (0.171)	1.00 (0.039)	6.25 (0.248)	3.50 ± 0.05 (0.138 ± 0.002)	4.00 ± 0.10 (0.157 ± 0.004)	25.0 (0.984)	2.50 Max. (0.098)	9.30 (0.327)	See Note 1
12mm	8.20 (0.323)	1.50 (0.059)	10.25 (0.404)	5.50 ± 0.05 (0.217 ± 0.002)	4.00 ± 0.10 (0.157 ± 0.004)	30.0 (1.181)	6.50 Max. (0.256)	12.3 (0.484)	See Note 1
8mm 1/2 Pitch	4.35 (0.171)	1.00 (0.039)	6.25 (0.248)	3.50 ± 0.05 (0.138 ± 0.002)	2.00 ± 0.10 (0.079 ± 0.004)	25.0 (0.984)	2.50 Max. (0.098)	9.30 (0.327)	See Note 1
12mm Double Pitch	8.20 (0.323)	1.50 (0.059)	10.25 (0.404)	5.50 ± 0.05 (0.217 ± 0.002)	4.00 ± 0.10 (0.157 ± 0.004)	30.0 (1.181)	6.50 Max. (0.256)	12.3 (0.484)	See Note 1

NOTES

1. The cavity defined by A_0 , E_0 , and K_0 shall be configured to provide the following:

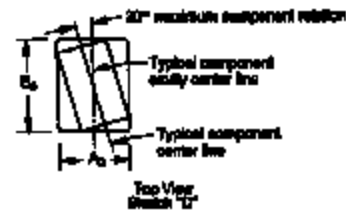
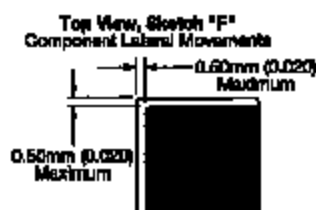
- a) Surround the component with sufficient clearance such that:
 - (1) the component does not protrude beyond the seating plane of the cover tape.
 - (2) the component can be removed from the cavity in a vertical direction without mechanical restriction, after the cover tape has been removed.
 - (3) rotation of the component is limited to 20° maximum (see Sketches D & E).
 - (4) lateral movement of the component is restricted to 0.50mm maximum (see Sketch F).

2. Tape with or without components shall pass around radius "R" without damage.

3. Bar code labeling (if required) shall be on the side of the reel opposite the round spacial holes. Refer to BM-506.

4. E_2 dimension is a reference dimension for tape leader clearance only.

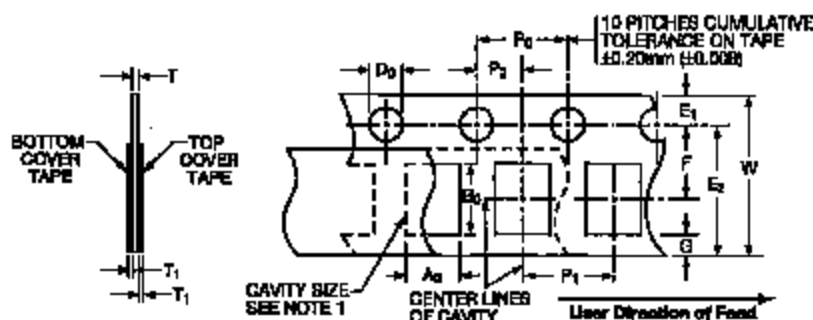
6. $F_0 = 2.0$ mm, the tape may not properly index in all tape feeders.



Paper Carrier Configuration



8 & 12mm Tape Only



8 & 12mm Paper Tape Metric Dimensions Will Govern

CONSTANT DIMENSIONS

Tape Size	D_0	E	P_0	P_1	T_1	G. Min.	R Min.
8mm and 12mm	1.50 ± 0.05 (0.059 ± 0.002)	1.75 ± 0.10 (0.069 ± 0.004)	4.00 ± 0.10 (0.157 ± 0.004)	2.00 ± 0.05 (0.079 ± 0.002)	0.10 (0.004) Max.	0.75 (0.030) Min.	25.0 (0.984) See Note 2 Min.

VARIABLE DIMENSIONS

Tape Size	R_1 See Note 4	E_2 Min.	F	W	A_0, B_0	T
8mm	1.25 ± 0.10 (0.049 ± 0.004)	5.25 (0.207)	3.50 ± 0.05 (0.138 ± 0.002)	6.00 ± 0.30 (0.315 ± 0.012)	See Note 1	1.10mm (0.043) Max. for Paper Base Tape and 1.60mm (0.063) Max. for Non-Paper Base Compositions
12mm	4.00 ± 0.10 (0.157 ± 0.004)	10.25 (0.404)	5.50 ± 0.05 (0.217 ± 0.002)	12.0 ± 0.30 (0.472 ± 0.012)		
8mm 1/2-Pitch	2.00 ± 0.05 (0.079 ± 0.002)	5.25 (0.207)	3.50 ± 0.05 (0.138 ± 0.002)			
12mm Double Pitch	5.00 ± 0.10 (0.315 ± 0.004)	10.25 (0.404)	5.50 ± 0.05 (0.217 ± 0.002)	12.0 ± 0.30 (0.472 ± 0.012)		

NOTES

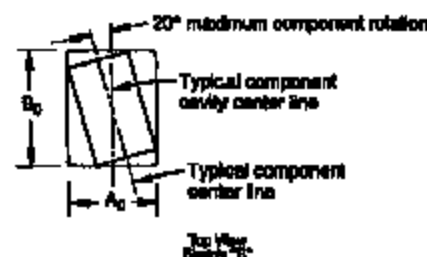
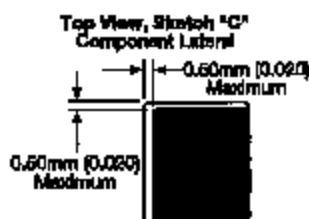
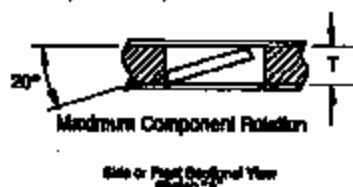
1. The cavity defined by A_0 , B_0 , and T shall be configured to provide sufficient clearance surrounding the component so that:

- the component does not protrude beyond either surface of the carrier tape;
- the component can be removed from the cavity in a vertical direction without mechanical restriction after the top cover tape has been removed;
- rotation of the component is limited to 20° maximum (see Sketches A & B);
- lateral movement of the component is restricted to 0.6mm maximum (see Sketch C).

2. Tape with or without components shall pass around radius "R" without damage.

3. Bar code labeling (if required) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-568.

4. If $P_1 = 2.0mm$, the tape may not properly index in all tape feeders.



Bar Code Labeling Standard

AVX bar code labeling is available and follows latest version of EIA-568



EA82-827-G 3852

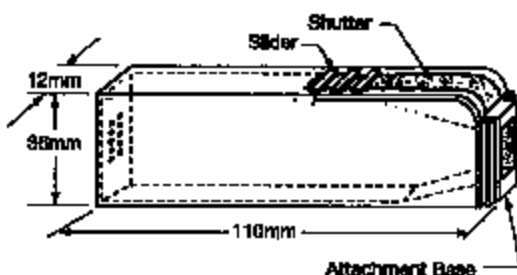
Bulk Case Packaging



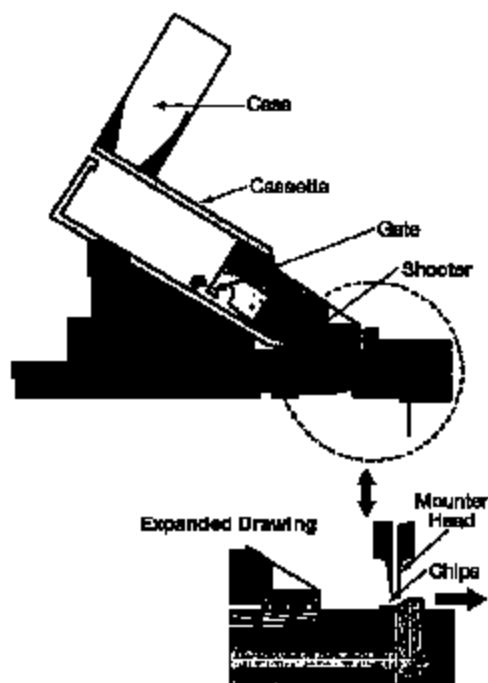
BENEFITS

- Easier handling
- Smaller packaging volume
(1/20 of T/R packaging)
- Easier inventory control
- Flexibility
- Recyclable

CASE DIMENSIONS



BULK FEEDER



CASE QUANTITIES

Part Size	0402	0603	0805	1206
Qty. (pos / cassette)	80,000	16,000	10,000 (T=.023") 8,000 (T=.031") 8,000 (T=.043")	6,000 (T=.023") 4,000 (T=.032") 3,000 (T=.044")

Basic Capacitor Formulas



I. Capacitance (farads)

English: $C = \frac{.224 \text{ K.A.}}{T_p}$

Metric: $C = \frac{.0884 \text{ K.A.}}{T_p}$

II. Energy stored in capacitors (Joules, watt - sec)

$E = \frac{1}{2} CV^2$

III. Linear charge of a capacitor (Amperes)

$I = C \frac{dV}{dt}$

IV. Total impedance of a capacitor (ohms)

$Z = \sqrt{R_C^2 + (X_C - X_L)^2}$

V. Capacitive Reactance (ohms)

$X_C = \frac{1}{2 \pi fC}$

VI. Inductive Reactance (ohms)

$X_L = 2 \pi fL$

VII. Phase Angles:

Ideal Capacitors: Current leads voltage 90°

Ideal Inductors: Current lags voltage 90°

Ideal Resistors: Current in phase with voltage

VIII. Dissipation Factor (%)

$D.F. = \tan \delta \text{ (loss angle)} = \frac{E.S.R.}{X_C} = (2 \pi fC) (E.S.R.)$

IX. Power Factor (%)

P.F. = Sine δ (loss angle) = Cos ϕ (phase angle)

P.F. = (when less than 10%) = DF

X. Quality Factor (dimensionless)

$Q = \text{Cotan } \delta \text{ (loss angle)} = \frac{1}{D.F.}$

XI. Equivalent Series Resistance (ohms)

$E.S.R. = (D.F.) (X_C) = (D.F.) / (2 \pi fC)$

XII. Power Loss (watts)

$\text{Power Loss} = (2 \pi fCV^2) (D.F.)$

XIII. KVA (Kilowatts)

$KVA = 2 \pi fCV^2 \times 10^{-3}$

XIV. Temperature Characteristic (ppm/°C)

$T.C. = \frac{C_1 - C_2}{C_2 (T_1 - 25)} \times 10^6$

XV. Cap Drift (%)

$C.D. = \frac{C_1 - C_2}{C_1} \times 100$

XVI. Reliability of Ceramic Capacitors

$\frac{L_0}{L_1} = \left(\frac{V_1}{V_2} \right)^X \left(\frac{T_1}{T_2} \right)^Y$

XVII. Capacitors in Series (current the same)

Any Number: $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_N}$

Two: $C_T = \frac{C_1 C_2}{C_1 + C_2}$

XVIII. Capacitors in Parallel (voltage the same)

$C_T = C_1 + C_2 + \dots + C_N$

XIX. Aging Rate

$A.R. = \% \Delta C / \text{decade of time}$

XX. Decibels

$db = 20 \log \frac{V_1}{V_2}$

METRIC PREFIXES

SYMBOLS

Pico	$\times 10^{-12}$
Nano	$\times 10^{-9}$
Micro	$\times 10^{-6}$
Milli	$\times 10^{-3}$
Deci	$\times 10^{-1}$
Deca	$\times 10^1$
Kilo	$\times 10^3$
Mega	$\times 10^6$
Giga	$\times 10^9$
Tera	$\times 10^{12}$

K = Dielectric Constant	f = frequency	L _t = Test life
A = Area	L = Inductance	V _t = Test voltage
T _d = Dielectric thickness	δ = Loss angle	V _o = Operating voltage
V = Voltage	ϕ = Phase angle	T ₁ = Test temperature
t = time	X & Y = exponent effect of voltage and temp.	T ₂ = Operating temperature
R _s = Series Resistance	L _o = Operating life	

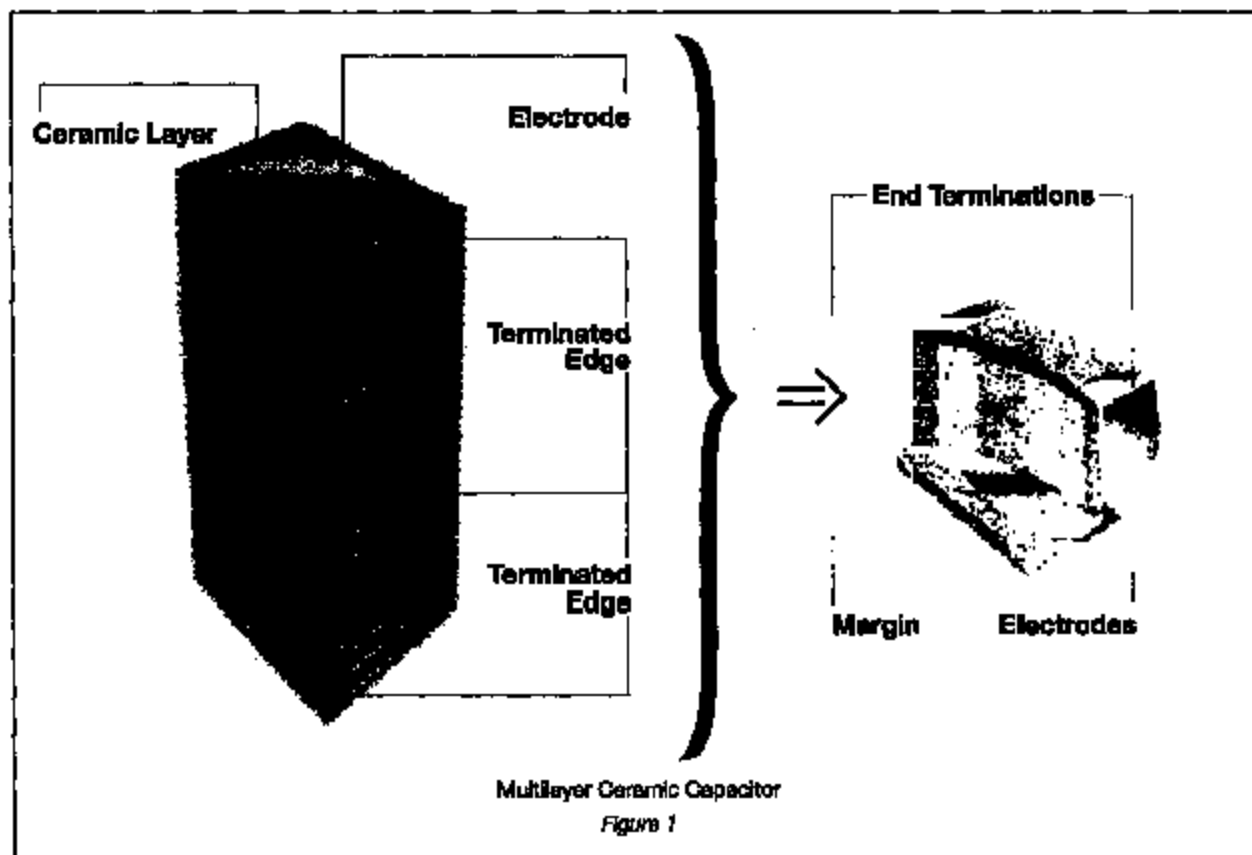


General Description



Basic Construction – A multilayer ceramic (MLC) capacitor is a monolithic block of ceramic containing two sets of offset, interleaved planar electrodes that extend to two opposite surfaces of the ceramic dielectric. This simple

structure requires a considerable amount of sophistication, both in material and manufacture, to produce it in the quality and quantities needed in today's electronic equipment.



Formulations – Multilayer ceramic capacitors are available in both Class 1 and Class 2 formulations. Temperature compensating formulations are Class 1 and temperature stable and general application formulations are classified as Class 2.

Class 1 – Class 1 capacitors or temperature compensating capacitors are usually made from mixtures of titanates where barium titanate is normally not a major part of the mix. They have predictable temperature coefficients and in general, do not have an aging characteristic. Thus they are the most stable capacitor available. The most popular Class 1 multilayer ceramic capacitors are COG (NP0) temperature compensating capacitors (negative-positive 0 ppm/°C).

Class 2 – EIA Class 2 capacitors typically are based on the chemistry of barium titanate and provide a wide range of capacitance values and temperature stability. The most commonly used Class 2 dielectrics are X7R and Y5V. The X7R provides intermediate capacitance values which vary only $\pm 15\%$ over the temperature range of -55°C to 125°C . It finds applications where stability over a wide temperature range is required.

The Y5V provides the highest capacitance values and is used in applications where limited temperature changes are expected. The capacitance value for Y5V can vary from 22% to -82% over the -30°C to 85°C temperature range. The Z5U dielectric is between X7R and Y6V in both stability and capacitance range.

All Class 2 capacitors vary in capacitance value under the influence of temperature, operating voltage (both AC and DC), and frequency. For additional information on performance changes with operating conditions, consult AVX's software, SpiCap.

General Description



Table 1: EIA and MIL Temperature Stable and General Application Codes

EIA CODE	
Percent Capacity Change Over Temperature Range	
RS198	Temperature Range
X7	-55°C to +125°C
X5	-55°C to +85°C
Y5	-30°C to +85°C
Z5	+10°C to +85°C
Code	Percent Capacity Change
D	±3.3%
E	±4.7%
F	±7.0%
G	±10%
H	±15%
J	±22%
K	+22%, -33%
L	+22%, -56%
M	+22%, -82%

EXAMPLE - A capacitor is desired with the capacitance value at 25°C to increase no more than 7.0% or decrease no more than 7.0% from -30°C to +85°C. EIA Code will be Y5F.

MIL CODE		
Symbol	Temperature Range	
A	-55°C to +85°C	
B	-55°C to +125°C	
C	-55°C to +160°C	
Symbol	Cap. Change Zero Volts	Cap. Change Rated Volts
R	+15%, -15%	+15%, -40%
W	+22%, -56%	+22%, -88%
X	+18%, -15%	+18%, -25%
Y	+30%, -70%	+30%, -80%
Z	+20%, -20%	+20%, -30%

Temperature characteristic is specified by combining range and change symbols, for example BR or AW. Specifications also shown indicate the characteristics applicable to a given style of capacitor.

In specifying capacitance change with temperature for Class 2 materials, EIA expresses the capacitance change over an operating temperature range by a 3 symbol code. The first symbol represents the cold temperature end of the temperature range, the second represents the upper limit of the operating temperature range and the third symbol represents the capacitance change allowed over the operating temperature range. Table 1 provides a detailed explanation of the EIA system.

Effects of Voltage - Variations in voltage have little effect on Class 1 dielectric but does affect the capacitance and dissipation factor of Class 2 dielectrics. The application of DC voltage reduces both the capacitance and dissipation factor while the application of an AC voltage within a reasonable range tends to increase both capacitance and dissipation factor readings. If a high enough AC voltage is applied, eventually it will reduce capacitance just as a DC voltage will. Figure 2 shows the effects of AC voltage.

Cap. Change vs. A.C. Volts X7R

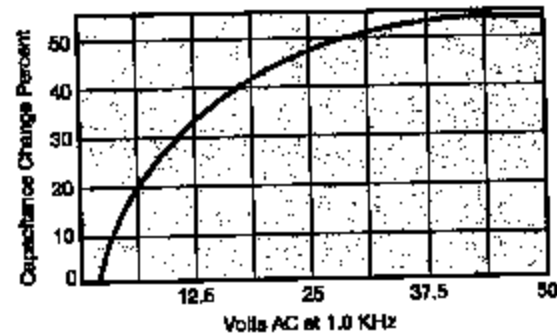


Figure 2

Capacitor specifications specify the AC voltage at which to measure (normally 0.5 or 1 VAC) and application of the wrong voltage can cause spurious readings. Figure 3 gives the voltage coefficient of dissipation factor for various AC voltages at 1 kilohertz. Applications of different frequencies will affect the percentage changes versus voltages.

D.F. vs. A.C. Measurement Volts X7R

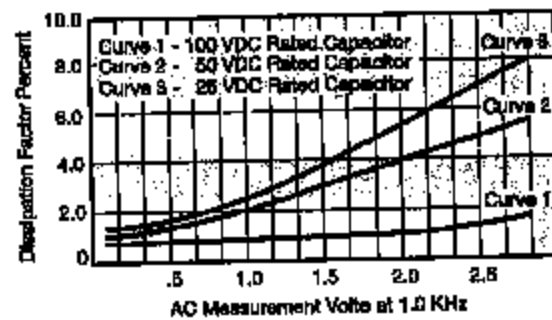


Figure 3

Typical effect of the application of DC voltage is shown in Figure 4. The voltage coefficient is more pronounced for higher K dielectrics. These figures are shown for room temperature conditions. The combination characteristic known as voltage temperature limits which shows the effects of rated voltage over the operating temperature range is shown in Figure 5 for the military BX characteristic.



**Typical Cap. Change vs. D.C. Volts
X7R**

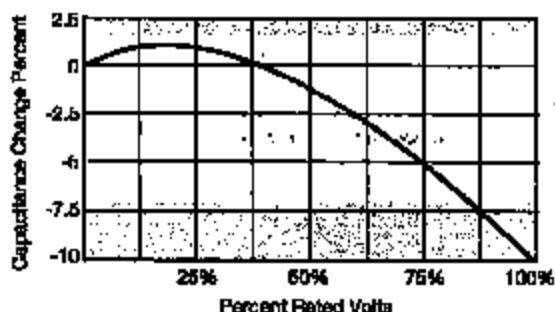


Figure 4

**Typical Cap. Change vs. Temperature
X7R**

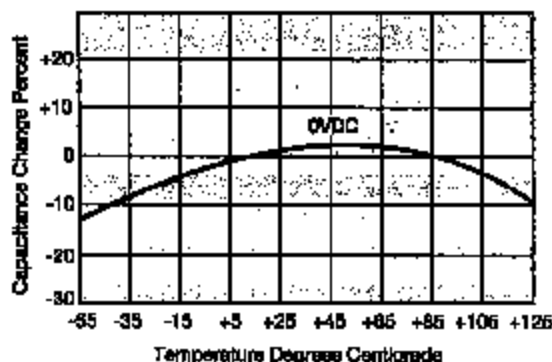


Figure 5

Effects of Time – Class 2 ceramic capacitors change capacitance and dissipation factor with time as well as temperature, voltage and frequency. This change with time is known as aging. Aging is caused by a gradual re-alignment of the crystalline structure of the ceramic and produces an exponential loss in capacitance and decrease in dissipation factor versus time. A typical curve of aging rate for semi-stable ceramics is shown in Figure 6.

If a Class 2 ceramic capacitor that has been sitting on the shelf for a period of time, is heated above its curie point, (125°C for 4 hours or 150°C for ½ hour will suffice) the part will de-age and return to its initial capacitance and dissipation factor readings. Because the capacitance changes rapidly, immediately after de-aging, the basic capacitance measurements are normally referred to a time period sometime after the de-aging process. Various manufacturers use different time bases but the most popular one is one day or twenty-four hours after "last heat." Change in the aging curve can be caused by the application of voltage and other stresses. The possible changes in capacitance due to de-aging by heating the unit explain why capacitance changes are allowed after test, such as temperature cycling, moisture resistance, etc., in MIL specs. The application of high voltages such as dielectric withstanding voltages also

tends to de-age capacitors and is why re-reading of capacitance after 12 or 24 hours is allowed in military specifications after dielectric strength tests have been performed.

**Typical Curve of Aging Rate
X7R**

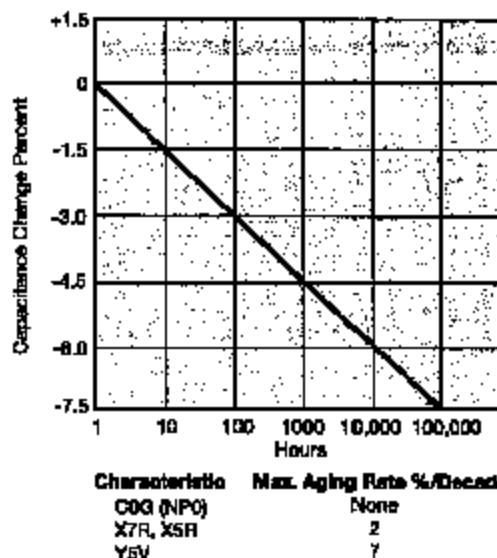
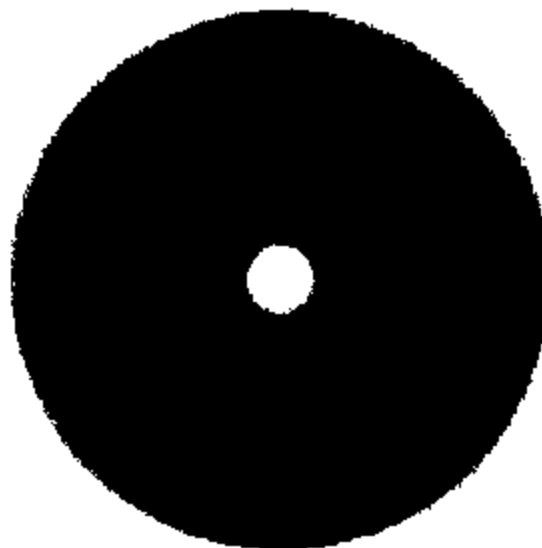


Figure 6

Effects of Frequency – Frequency affects capacitance and impedance characteristics of capacitors. This effect is much more pronounced in high dielectric constant ceramic formulation that is low K formulations. AVX's SpiCap software generates impedance, ESR, series inductance, series resonant frequency and capacitance all as functions of frequency, temperature and DC bias for standard chip sizes and styles. It is available free from AVX and can be downloaded for free from AVX website: www.avxcorp.com.



General Description



Effects of Mechanical Stress – High "K" dielectric ceramic capacitors exhibit some low level piezoelectric reactions under mechanical stress. As a general statement, the piezoelectric output is higher, the higher the dielectric constant of the ceramic. It is desirable to investigate this effect before using high "K" dielectrics as coupling capacitors in extremely low level applications.

Reliability – Historically ceramic capacitors have been one of the most reliable types of capacitors in use today. The approximate formula for the reliability of a ceramic capacitor is:

$$\frac{L_o}{L_t} = \left(\frac{V_t}{V_o}\right)^X \left(\frac{T_t}{T_o}\right)^Y$$

where

L_o = operating life T_t = test temperature and
 L_t = test life T_o = operating temperature
 V_t = test voltage in °C
 V_o = operating voltage X, Y = see text

Historically for ceramic capacitors exponent X has been considered as 3. The exponent Y for temperature effects typically tends to run about 6.

A capacitor is a component which is capable of storing electrical energy. It consists of two conductive plates (electrodes) separated by insulating material which is called the dielectric. A typical formula for determining capacitance is:

$$C = \frac{.224 KA}{t}$$

C = capacitance (picofarads)
 K = dielectric constant (vacuum = 1)
 A = area in square inches
 t = separation between the plates in inches (thickness of dielectric)
 $.224$ = conversion constant (Q884 for metric system in cm)

Capacitance – The standard unit of capacitance is the farad. A capacitor has a capacitance of 1 farad when 1 coulomb charges it to 1 volt. One farad is a very large unit and most capacitors have values in the micro (10^{-6}), nano (10^{-9}) or pico (10^{-12}) farad level.

Dielectric Constant – In the formula for capacitance given above the dielectric constant of a vacuum is arbitrarily chosen as the number 1. Dielectric constants of other materials are then compared to the dielectric constant of a vacuum.

Dielectric Thickness – Capacitance is indirectly proportional to the separation between electrodes. Lower voltage requirements mean thinner dielectrics and greater capacitance per volume.

Area – Capacitance is directly proportional to the area of the electrodes. Since the other variables in the equation are usually set by the performance desired, area is the easiest parameter to modify to obtain a specific capacitance within a material group.

Energy Stored – The energy which can be stored in a capacitor is given by the formula:

$$E = \frac{1}{2} CV^2$$

E = energy in joules (watts-sec)
 V = applied voltage
 C = capacitance in farads

Potential Change – A capacitor is a reactive component which reacts against a change in potential across it. This is shown by the equation for the linear charge of a capacitor:

$$I_{max} = C \frac{dV}{dt}$$

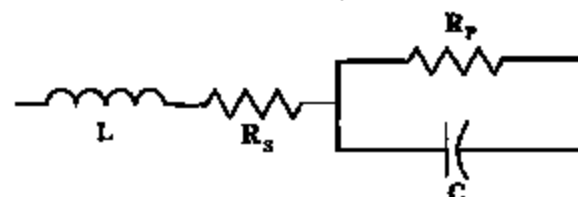
where

I = Current
 C = Capacitance
 dV/dt = Slope of voltage transition across capacitor

Thus an infinite current would be required to instantly change the potential across a capacitor. The amount of current a capacitor can "sink" is determined by the above equation.

Equivalent Circuit – A capacitor, as a practical device, exhibits not only capacitance but also resistance and inductance. A simplified schematic for the equivalent circuit is:

C = Capacitance L = Inductance
 R_s = Series Resistance R_p = Parallel Resistance



Reactance – Since the insulation resistance (R_p) is normally very high, the total impedance of a capacitor is:

$$Z = \sqrt{R_s^2 + (X_c - X_L)^2}$$

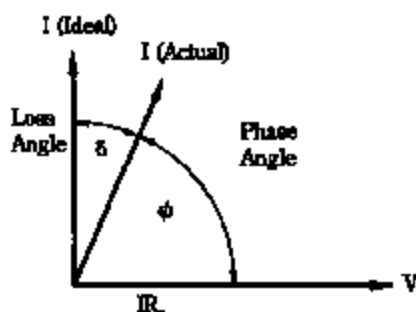
where

Z = Total Impedance
 R_s = Series Resistance
 X_c = Capacitive Reactance = $\frac{1}{2\pi fC}$
 X_L = Inductive Reactance = $2\pi fL$

The variation of a capacitor's impedance with frequency determines its effectiveness in many applications.

Phase Angle – Power Factor and Dissipation Factor are often confused since they are both measures of the loss in a capacitor under AC application and are often almost identical in value. In a "perfect" capacitor the current in the capacitor will lead the voltage by 90°.





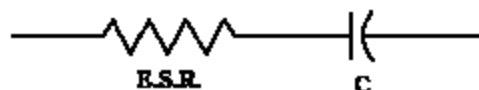
In practice the current leads the voltage by some other phase angle due to the series resistance R_s . The complement of this angle is called the loss angle and:

$$\text{Power Factor (P.F.)} = \cos \phi \text{ or } \sin \delta$$

$$\text{Dissipation Factor (D.F.)} = \tan \delta$$

for small values of δ the tan and sine are essentially equal which has led to the common interchangeability of the two terms in the industry.

Equivalent Series Resistance - The term E.S.R. or Equivalent Series Resistance combines all losses both series and parallel in a capacitor at a given frequency so that the equivalent circuit is reduced to a simple R-C series connection.



Dissipation Factor - The DF/PF of a capacitor tells what percent of the apparent power input will turn to heat in the capacitor.

$$\text{Dissipation Factor} = \frac{\text{E.S.R.}}{X_c} = (2 \pi f C) (\text{E.S.R.})$$

The watts loss are:

$$\text{Watts loss} = (2 \pi f C V^2) (\text{D.F.})$$

Very low values of dissipation factor are expressed as their reciprocal for convenience. These are called the "Q" or Quality factor of capacitors.

Parasitic Inductance - The parasitic inductance of capacitors is becoming more and more important in the decoupling of today's high speed digital systems. The relationship between the inductance and the ripple voltage induced on the DC voltage line can be seen from the simple inductance equation:

$$V = L \frac{di}{dt}$$

The $\frac{di}{dt}$ seen in current microprocessors can be as high as 0.3 A/ns, and up to 10A/ns. At 0.3 A/ns, 100pH of parasitic inductance can cause a voltage spike of 30mV. While this does not sound very drastic, with the V_{cc} for microprocessors decreasing at the current rate, this can be a fairly large percentage.

Another important, often overlooked, reason for knowing the parasitic inductance is the calculation of the resonant frequency. This can be important for high frequency, bypass capacitors, as the resonant point will give the most signal attenuation. The resonant frequency is calculated from the simple equation:

$$f_{res} = \frac{1}{2\pi\sqrt{LC}}$$

Insulation Resistance - Insulation Resistance is the resistance measured across the terminals of a capacitor and consists principally of the parallel resistance R_p shown in the equivalent circuit. As capacitance values and hence the area of dielectric increases, the I.R. decreases and hence the product ($C \times IR$ or RC) is often specified in ohm farads or more commonly megohm-microfarads. Leakage current is determined by dividing the rated voltage by IR (Ohm's Law).

Dielectric Strength - Dielectric Strength is an expression of the ability of a material to withstand an electrical stress. Although dielectric strength is ordinarily expressed in volts, it is actually dependent on the thickness of the dielectric and thus is also more generically a function of volts/mil.

Dielectric Absorption - A capacitor does not discharge instantaneously upon application of a short circuit, but drains gradually after the capacitance proper has been discharged. It is common practice to measure the dielectric absorption by determining the "reappearing voltage" which appears across a capacitor at some point in time after it has been fully discharged under short circuit conditions.

Corona - Corona is the ionization of air or other vapors which causes them to conduct current. It is especially prevalent in high voltage units but can occur with low voltages as well where high voltage gradients occur. The energy discharged degrades the performance of the capacitor and can in time cause catastrophic failures.

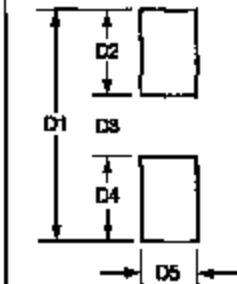
Surface Mounting Guide



MLC Chip Capacitors

REFLOW SOLDERING

Case Size	D1	D2	D3	D4	D5
0402	1.70 (0.07)	0.60 (0.02)	0.60 (0.02)	0.60 (0.02)	0.50 (0.02)
0603	2.30 (0.09)	0.60 (0.03)	0.70 (0.03)	0.80 (0.03)	0.75 (0.03)
0805	3.00 (0.12)	1.00 (0.04)	1.00 (0.04)	1.00 (0.04)	1.25 (0.05)
1206	4.00 (0.16)	1.00 (0.04)	2.00 (0.09)	1.00 (0.04)	1.60 (0.06)
1210	4.00 (0.16)	1.00 (0.04)	2.00 (0.09)	1.00 (0.04)	2.50 (0.10)
1608	5.60 (0.22)	1.00 (0.04)	3.60 (0.14)	1.00 (0.04)	2.00 (0.06)
1612	5.60 (0.22)	1.00 (0.04)	3.60 (0.14)	1.00 (0.04)	3.00 (0.12)
1825	5.60 (0.22)	1.00 (0.04)	3.60 (0.14)	1.00 (0.04)	6.35 (0.25)
2220	6.60 (0.26)	1.00 (0.04)	4.60 (0.18)	1.00 (0.04)	5.00 (0.20)
2225	6.60 (0.26)	1.00 (0.04)	4.60 (0.18)	1.00 (0.04)	6.35 (0.25)



Dimensions in millimeters (inches)

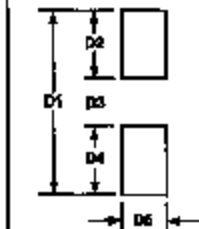
Component Pad Design

Component pads should be designed to achieve good solder fillets and minimize component movement during reflow soldering. Pad designs are given below for the most common sizes of multilayer ceramic capacitors for both wave and reflow soldering. The basis of these designs is:

- Pad width equal to component width. It is permissible to decrease this to as low as 85% of component width but it is not advisable to go below this.
- Pad overlap 0.5mm beneath component.
- Pad extension 0.5mm beyond components for reflow and 1.0mm for wave soldering.

WAVE SOLDERING

Case Size	D1	D2	D3	D4	D5
0603	3.10 (0.12)	1.20 (0.05)	0.70 (0.03)	1.20 (0.05)	0.75 (0.03)
0805	4.00 (0.15)	1.50 (0.06)	1.00 (0.04)	1.50 (0.06)	1.25 (0.05)
1206	5.00 (0.19)	1.50 (0.06)	2.00 (0.09)	1.50 (0.06)	1.60 (0.06)
1210	5.00 (0.19)	1.50 (0.06)	2.00 (0.09)	1.50 (0.06)	2.50 (0.10)



Dimensions in millimeters (inches)

Component Spacing

For wave soldering components, must be spaced sufficiently far apart to avoid bridging or shadowing (inability of solder to penetrate properly into small spaces). This is less important for reflow soldering but sufficient space must be allowed to enable rework should it be required.

Preheat & Soldering

The rate of preheat should not exceed 4°C/second to prevent thermal shock. A better maximum figure is about 2°C/second.

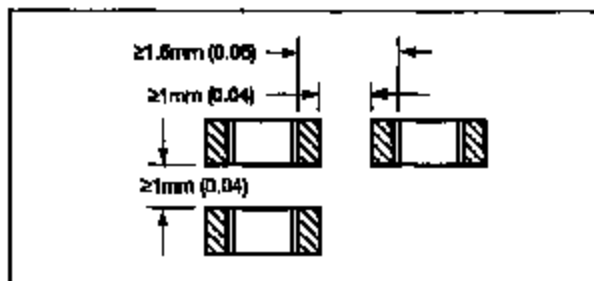
For capacitors size 1206 and below, with a maximum thickness of 1.25mm, it is generally permissible to allow a temperature differential from preheat to soldering of 150°C. In all other cases this differential should not exceed 100°C.

For further specific application or process advice, please consult AVX.

Cleaning

Care should be taken to ensure that the capacitors are thoroughly cleaned of flux residues especially the space beneath the capacitor. Such residues may otherwise become conductive and effectively offer a low resistance bypass to the capacitor.

Ultrasonic cleaning is permissible, the recommended conditions being 8 Watts/litre at 20-45 KHz, with a process cycle of 2 minutes vapor rinse, 2 minutes immersion in the ultrasonic solvent bath and finally 2 minutes vapor rinse.



Surface Mounting Guide



MLC Chip Capacitors

APPLICATION NOTES

Storage

Good solderability is maintained for at least twelve months, provided the components are stored in their "as received" packaging at less than 40°C and 70% RH.

Solderability

Terminations to be well soldered after immersion in a 60/40 tin/lead solder bath at $235 \pm 5^\circ\text{C}$ for 2 ± 1 seconds.

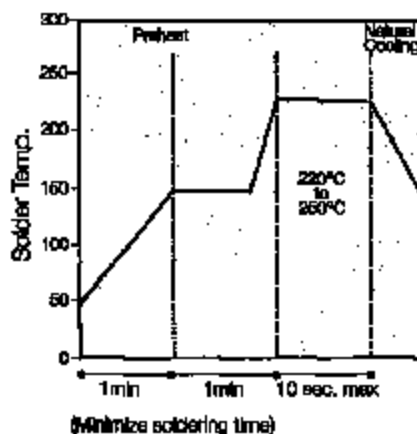
Leaching

Terminations will resist leaching for at least the immersion times and conditions shown below.

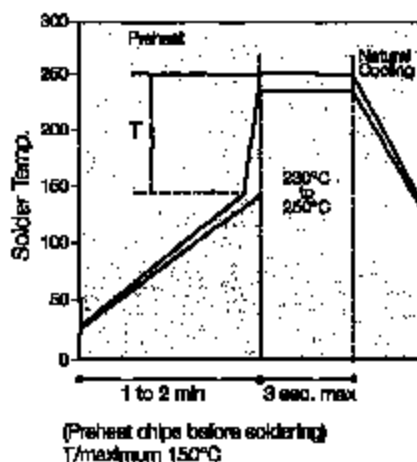
Termination Type	Solder Tin/Lead/Silver	Solder Temp. °C	Immersion Time Seconds
Nickel Barrier	60/40/0	230 ± 5	30 ± 1

Recommended Soldering Profiles

Reflow



Wave



General

Surface mounting chip multilayer ceramic capacitors are designed for soldering to printed circuit boards or other substrates. The construction of the components is such that they will withstand the time/temperature profiles used in both wave and reflow soldering methods.

Handling

Chip multilayer ceramic capacitors should be handled with care to avoid damage or contamination from perspiration and skin oils. The use of tweezers or vacuum pick ups is strongly recommended for individual components. Bulk handling should ensure that abrasion and mechanical shock are minimized. Taped and reeled components provides the ideal medium for direct presentation to the placement machine. Any mechanical shock should be minimized during handling chip multilayer ceramic capacitors.

Preheat

It is important to avoid the possibility of thermal shock during soldering and carefully controlled preheat is therefore required. The rate of preheat should not exceed $4^\circ\text{C}/\text{second}$ and a target figure $2^\circ\text{C}/\text{second}$ is recommended. Although an 80°C to 120°C temperature differential is preferred, recent developments allow a temperature differential between the component surface and the soldering temperature of 150°C (Maximum) for capacitors of 1210 size and below with a maximum thickness of 1.25mm. The user is cautioned that the risk of thermal shock increases as chip size or temperature differential increases.

Soldering

Mildly activated rosin fluxes are preferred. The minimum amount of solder to give a good joint should be used. Excessive solder can lead to damage from the stresses caused by the difference in coefficients of expansion between solder, chip and substrate. AVX terminations are suitable for all wave and reflow soldering systems, if hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

Cooling

Natural cooling in air is preferred, as this minimizes stresses within the soldered joint. When forced air cooling is used, cooling rate should not exceed $4^\circ\text{C}/\text{second}$. Quenching is not recommended but if used, maximum temperature differentials should be observed according to the preheat conditions above.

Cleaning

Flux residues may be hygroscopic or acidic and must be removed. AVX MLC capacitors are acceptable for use with all of the solvents described in the specifications MIL-STD-202 and EIA-RS-198. Alcohol based solvents are acceptable and properly controlled water cleaning systems are also acceptable. Many other solvents have been proven successful, and most solvents that are acceptable to other components on circuit assemblies are equally acceptable for use with ceramic capacitors.

Surface Mounting Guide



MLC Chip Capacitors

POST SOLDER HANDLING

Once SMD components are soldered to the board, any bending or flexure of the PCB applies stresses to the soldered joints of the components. For leaded devices, the stresses are absorbed by the compliancy of the metal leads and generally don't result in problems unless the stress is large enough to fracture the soldered connection.

Ceramic capacitors are more susceptible to such stress because they don't have compliant leads and are brittle in nature. The most frequent failure mode is low DC resistance or short circuit. The second failure mode is significant loss of capacitance due to severing of contact between sets of the internal electrodes.

Cracks caused by mechanical flexure are very easily identified and generally take one of the following two general forms:



Type A:
Angled crack between bottom of device to top of solder joint.



Type B:
Fracture from top of device to bottom of device.

Mechanical cracks are often hidden underneath the termination and are difficult to see externally. However, if one end termination falls off during the removal process from PCB, this is one indication that the cause of failure was excessive mechanical stress due to board warping.

COMMON CAUSES OF MECHANICAL CRACKING

The most common source for mechanical stress is board depanelization equipment, such as manual breakapart, v-cutters and shear presses. Improperly aligned or dull cutters may cause torquing of the PCB resulting in flex stresses being transmitted to components near the board edge. Another common source of flexural stress is contact during parametric testing when test points are probed. If the PCB is allowed to flex during the test cycle, nearby ceramic capacitors may be broken.

A third common source is board to board connections at vertical connectors where cables or other PCBs are connected to the PCB. If the board is not supported during the plug/unplug cycle, it may flex and cause damage to nearby components.

Special care should also be taken when handling large (>6" on a side) PCBs since they more easily flex or warp than smaller boards.

REWORKING OF MLCs

Thermal shock is common in MLCs that are manually attached or reworked with a soldering iron. AVX strongly recommends that any reworking of MLCs be done with hot air reflow rather than soldering irons. It is practically impossible to cause any thermal shock in ceramic capacitors when using hot air reflow.

However direct contact by the soldering iron tip often causes thermal cracks that may fail at a later date. If rework by soldering iron is absolutely necessary, it is recommended that the wattage of the iron be less than 30 watts and the tip temperature be <300°C. Rework should be performed by applying the solder iron tip to the pad and not directly contacting any part of the ceramic capacitor.

Surface Mounting Guide



MLC Chip Capacitors



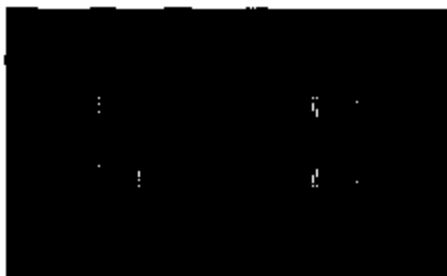
Preferred Method - No Direct Part Contact



Poor Method - Direct Contact with Part

PCB BOARD DESIGN

To avoid many of the handling problems, AVX recommends that MLCs be located at least .2" away from nearest edge of board. However when this is not possible, AVX recommends that the panel be routed along the cut line, adjacent to where the MLC is located.



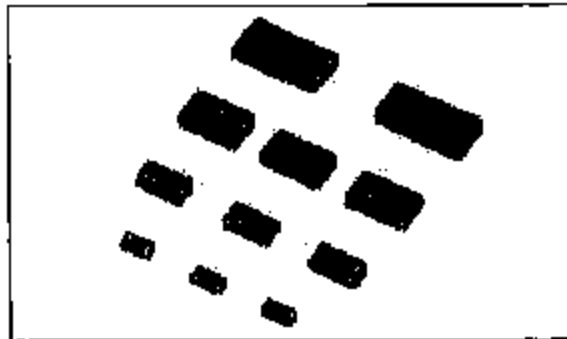
No Stress Relief for MLCs



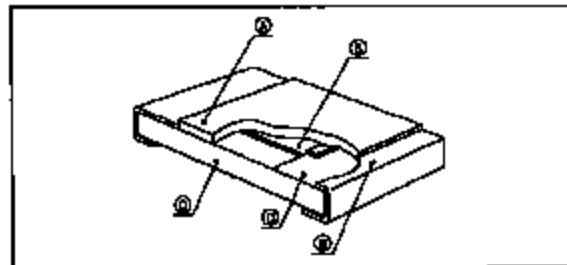
Routed Cut Line Relieves Stress on MLC

Thick Film Chip Resistors

CR, CJ Series

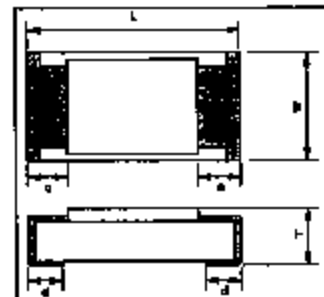


STRUCTURE AND MATERIAL



Code	Structure	Material
A	Coating	Glass or Epoxy
B	Resistor	R ₂ O ₅ Resistor (The same material of termination for chip jumper)
C	Substrate	95% Alumina
D	Termination	Silver
E	Plating	(Ni, Sn, Pb) Plating

DIMENSIONS



	CR03, CR03 (0301)	CR05, CJ05 (0402)	CR10, CJ10 (0603)	CR21, CJ21 (0805)	CR32, CJ32 (1206)
W	0.30±0.03 (0.012±0.001)	0.50±0.05 (0.020±0.002)	0.80±0.10 (0.031±0.004)	1.25±0.15 (0.050±0.006)	1.55±0.15 (0.061±0.006)
L	0.80±0.03	1.00±0.05	1.60±0.10	2.00±0.10 (0.080±0.004)	3.10±0.10 (0.122±0.004)
a	0.005±0.004	0.005±0.004	0.010±0.008	0.35±0.20 (0.014±0.009)	0.45±0.20 (0.018±0.009)
d	0.15±0.05 (0.006±0.002)	0.20±0.10 (0.008±0.004)	0.25±0.10 (0.008±0.004)	0.40±0.20 (0.016±0.009)	0.45±0.20 (0.018±0.009)
T	0.23±0.05 (0.009±0.002)	0.35±0.05 (0.014±0.002)	0.45±0.10 (0.020±0.004)	0.55±0.10 (0.022±0.004)	0.55±0.10 (0.022±0.004)

SPECIFICATIONS

Series	CR03 (0301)	CR05 (0402)	CR10 (0603)	CR21 (0805)	CR32 (1206)
Rated Power	0.360 (1/20) W	0.625 (1/16) W	0.10 (1/10) W	0.125 (1/8) W	0.25 (1/4) W
Max. Working Voltage	15V	50V	50V	100V	200V
Resistance Tolerance	J = ±5%	F = ±1% J = ±5%	D = ±0.5% F = ±1% J = ±5%	D = ±0.5% F = ±1% J = ±5%	D = ±0.5% F = ±1% J = ±5%
Resistance Value Range	10Ω to 1MΩ	10Ω to 1MΩ : F 1.0Ω to 10MΩ : J	10Ω to 1MΩ : D 10Ω to 1MΩ : F 1.0Ω to 10MΩ : J	10Ω to 1MΩ : D 10Ω to 1MΩ : F 1.0Ω to 10MΩ : J	10Ω to 1MΩ : D 10Ω to 1MΩ : F 1.0Ω to 10MΩ : J
Working Temperature	-55 to +125°C	-55 to +125°C	-55 to +125°C	-55 to +125°C	-55 to +125°C

FEATURES

- Low Noise
- Nickel Barrier Terminations

APPLICATION

- General Purpose

HOW TO ORDER

CR 05 - 472 J - H

Packaging

- T = 7" Reel/Punched Paper Tape (5,000 pcs/reel) except CR05
- H = 7" Reel/Punched Paper Tape (10,000 pcs/reel, 2mm pitch taping) CR03 and CR05
- D = 10" Reel/Punched Paper Tape (10,000 pcs/reel) CR32, CR21, CR10

Resistance Tolerance

- D = ±0.5% J = ±5%
- F = ±1% Blank = Chip Jumper

Resistance Value (3 digits or 4 digits)

Example: 2 significant figures and 1 multiplier
R indicator decimal or values <100
Chip Jumper = 000

Size (EIA)

- 03 = 0301 21 = 0805
- 05 = 0402 32 = 1206
- 10 = 0603

Series

- CR = Resistor
- CJ = Jumper

Thick Film Chip Resistors



CR, CJ Series

SPECIFICATIONS

CJ Series

Part Number	CJ03	CJ05, CJ10, CJ21 (0402, 0603, 0805 Type)	CJ32 (1906 Type)
Rated Current	0.5A (70°C)	1A (70°C)	2A (70°C)
Resistivity	50mΩ max.	50mΩ max.	50mΩ max.
Working Temperature	-55 to +125°C	-55 to +125°C	-55 to +125°C

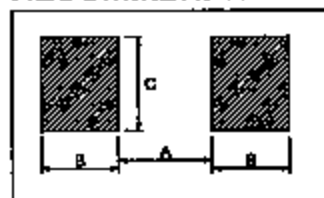
HOW TO CALCULATE RATED VOLTAGE

$$E = \sqrt{P \cdot R}$$

- E = Rated Voltage (V)
- P = Rated Power (W)
- R = Standard Resistance Value (Ω)

Rated voltage should be lower than max. working voltage.

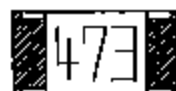
RECOMMENDED LAND PATTERN



MLA Size	0801	0402	0603	0805	1906
A	0.25 (0.010)	0.60 (0.020)	0.80 (0.031)	1.00 (0.039)	2.00 (0.078)
B	0.225 (0.009)	0.40 (0.016)	0.70 (0.028)	0.90 (0.035)	0.80 (0.031)
C	0.20 (0.008)	0.50 (0.020)	0.60 (0.024)	1.20 (0.047)	1.20 (0.047)

MARKING

Marking available as follows:
 Series: CR32, CJ32, CR21, CJ21, CR10, CJ10
 3 digit indication
 Example: 473=47x10³ = 47000 Ω = 47 kΩ
 0 = 0 Ω (Jumper)
 100 = 10 Ω
 102 = 1 kΩ
 105 = 1 MΩ



Series: CR03, CJ03, CR05 and CJ05 - No marking
 Note: On CR32 4 digit marking is standard for ±1% and ±0.5% tolerances.

STANDARD RESISTANCE VALUE

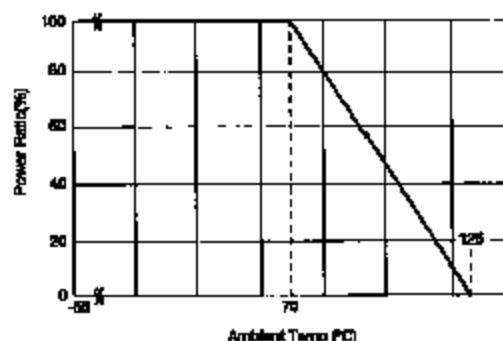
1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2
2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1
5.6	6.2	6.8	7.5	8.2	9.1			

For ±1% and ±5% Tolerance

10.0	10.2	10.5	10.7	11.0	11.3	11.5	11.8	12.1	12.4
12.7	13.0	13.3	13.7	14.0	14.3	14.7	15.0	15.4	15.8
16.2	16.5	16.9	17.4	17.8	18.2	18.7	19.1	19.6	20.0
20.5	21.0	21.5	22.1	22.6	23.2	23.7	24.3	24.9	25.5
26.1	26.7	27.4	28.0	28.7	29.4	30.1	30.9	31.6	32.4
33.2	34.0	34.8	35.7	36.6	37.4	38.3	39.2	40.2	41.2
42.2	43.2	44.2	45.3	46.4	47.5	48.7	49.9	51.1	52.3
53.6	54.9	56.2	57.6	59.0	60.4	61.9	63.4	64.9	66.5
68.1	69.8	71.3	73.2	75.0	76.8	78.7	80.6	82.6	84.6
86.8	88.7	90.6	93.1	95.3	97.8				

DERATING CURVE

Rated power should be reduced as below when temperature become higher.
 Under high temperature, power derated as follows:



TEMPERATURE CHARACTERISTICS

Resistance (Ω)	TCR (ppm/°C)
D, F	-100 to +100
105 R ≤ 1M	
↓	
R < 10	-100 to +600
105 R ≤ 1M	-200 to +200
1M < R	-500 to +300

KYOCERA

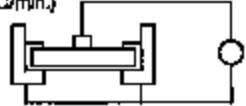
EA82-827-0 38565

Chip Resistor Arrays



CR, CJ, CRA, CRB, CRC Series - Test Conditions

ELECTRICAL CHARACTERISTICS

Item	Standard		Test Conditions															
	Resistor	Jumper	Resistor	Jumper														
DC Resistance	Within tolerance		Within tolerance															
Temperature Characteristics	<table border="1"> <thead> <tr> <th>Resistance (Ω)</th> <th>TOR (ppm/°C)</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>±100 ±R1</td> </tr> <tr> <td>100</td> <td>±100 ±R1</td> </tr> <tr> <td>1000</td> <td>±100 ±R1</td> </tr> <tr> <td>10000</td> <td>±100 ±R1</td> </tr> <tr> <td>100000</td> <td>±100 ±R1</td> </tr> <tr> <td>1000000</td> <td>±100 ±R1</td> </tr> </tbody> </table>		Resistance (Ω)	TOR (ppm/°C)	10	±100 ±R1	100	±100 ±R1	1000	±100 ±R1	10000	±100 ±R1	100000	±100 ±R1	1000000	±100 ±R1	Part 1000000000, 25, 125°C 3-4 H, 10, 100, 1000, 10000 3-4 H, 10, 100, 1000, 10000 10000, 100000, 1000000 10000, 100000, 1000000 10000, 100000, 1000000 T ₁ = 25°C T ₂ = 125°C R ₁ = T ₁ Resistance at (Ω) R ₂ = T ₂ Resistance at (Ω)	
Resistance (Ω)	TOR (ppm/°C)																	
10	±100 ±R1																	
100	±100 ±R1																	
1000	±100 ±R1																	
10000	±100 ±R1																	
100000	±100 ±R1																	
1000000	±100 ±R1																	
Short-time Overload	ΔR/R	±2.0%+0.10Ω max. of the initial value	50mΩ max.	(1) Apply 2.0 x rated voltage for 6 sec. (2.5 x rated voltage for Arrays) (2) Wait 30 minutes (3) Measure resistance CR03 = 30V max. CR05 = 50V max. CR10 = 100V max. CR21 = 200V max. CR32 = 400V max. CRA3A, CRB3A, CRC3A = 100V max.														
	Visual	No evidence of mechanical damage intermittent overload																
Intermittent Overload	ΔR/R	±5%+0.1Ω max. of the initial value	50mΩ max.	(1) Perform 10,000 voltage cycles as follows: ON (2.0 x rated voltage, 2.5 x for Arrays) 1 sec. OFF 25 sec. (2) Stabilization time 30 min. without loading (3) Measure resistance CR03 = 30V max. CR05 = 50V max. CR10 = 100V max. CR21 = 200V max. CR32 = 400V max. CRA, CRB, CRC = 100V max.														
	Visual	No evidence of mechanical damage																
Dielectric Withstanding Voltage	No evidence of mechanical damage		Apply 500 VAC for 1 min. (CR10 300 VAC) (CR05, CRA3A, CRB3A, CRC3A 300 VAC/1 sec. CR03 50 VAC/min.)															
Insulation Resistance	<ul style="list-style-type: none"> CR03, CJ03 = 10¹⁰ min. CR05, CJ05 = 10¹⁰ min. CR10, CJ10 = 10¹⁰ min. CR21, CJ21 = 10¹⁰ min. CR32, CJ32 = 10¹⁰ min. CRA3A, CRB3A, CRC3A = 10¹⁰ min. 		Apply 500V DC (CR05, CRA3A, CRB3A, CRC3A 100V DC CR03 50 VDC) 															

Chip Resistor Arrays

CR, CJ, CRA, CRB, CRC Series - Test Conditions

MECHANICAL CHARACTERISTICS

Item	Standard		Test Conditions	
	Resistor	Jumper	Resistor	Jumper
Terminal Strength	$\Delta R/R$	$\pm(1\%+0.05\Omega)$ max. of the initial value	50m Ω max.	Apply the load as shown. Measure resistance during load application.
	Visual	No evidence of mechanical damage after testing		
Soldering Heat Resistance	$\Delta R/R$	$\pm(1\%+0.05\Omega)$ max. of the initial value	50m Ω max.	Immerse in molten solder at 260 \pm 5°C for 10 \pm 1 sec. Stabilize component at room temperature for 1 hr. Measure resistance.
	Visual	No evidence of cracking		
Solderability		Coverage 100% each terminal on pin		Immerse in Solder Flux for 2 \pm 0.5 sec. and in 60/40 solder at 286 \pm 6°C for 2 \pm 0.5 sec.
Anti-Vibration Test	$\Delta R/R$	$\pm(1\%+0.1\Omega)$ max. of the initial value	50m Ω max.	2 Hz max. X, Y and Z axis. (TTL 6 hrs.) 10 to 56 Hz max. 0.1 mm. at 1.5mm amplitude.
	Visual	No evidence of mechanical damage		
Solvent Resistance	$\Delta R/R$	$\pm(1\%+0.05\Omega)$ max. of the initial value	50m Ω max.	Immerse in diethyl sebacate at 20°C to 25°C for 3 \pm 0.5 sec. Stabilize component at room temperature for 30 min. Measure value.
	Visual	No evidence of mechanical damage		

ENVIRONMENTAL CHARACTERISTICS

Item	Standard		Test Conditions	
	Resistor	Jumper	Resistor	Jumper
Temperature Cycle	$\Delta R/R$	$\pm(1\%+0.05\Omega)$ max. of the initial value	50m Ω max.	(1) Run 6 cycles as follows: -55 \pm 3°C for 30 min. 125 \pm 3°C for 30 min. Room temp. for 10-15 min. (2) Stabilize component at room temperature for 1 hr. then measure value.
	Visual	No evidence of mechanical damage		
Low Temperature Storage	$\Delta R/R$	$\pm(2\%+0.1\Omega)$ max. of the initial value	50m Ω max.	(1) Dwell in -55°C chamber without loading for 1000 $\frac{1}{2}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.
	Visual	No evidence of mechanical damage		
High Temperature Storage	$\Delta R/R$	$\pm(2\%+0.1\Omega)$ max. of the initial value	50m Ω max.	(1) Dwell in 125°C chamber without loading for 1000 $\frac{1}{2}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.
	Visual	No evidence of mechanical damage		
Moisture Resistance	$\Delta R/R$	$\pm(3\%+0.1\Omega)$ max. of the initial value	50m Ω max.	(1) Dwell in temp.: 65°C RH:90 to 95% RH chamber without loading for 1000 $\frac{1}{2}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.
	Visual	No evidence of mechanical damage		
Life Test	$\Delta R/R$	$\pm(3\%+0.1\Omega)$ max. of the initial value	50m Ω max.	(1) Temp.: 70 \pm 3°C. Voltage (rated voltage) on 90 min. off 30 min. Duration: 1000 $\frac{1}{2}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.
	Visual	No evidence of mechanical damage		
Loading Life in Moisture	$\Delta R/R$	$\pm(3\%+0.1\Omega)$ max. of the initial value	50m Ω max.	(1) Temp.: 40 \pm 2°C RH: 90-95% Voltage Cycle on 90 min. (rated voltage) off 30 min. Duration: 1000 $\frac{1}{2}$ hrs. (2) Stabilize component at room temperature for 1 hr. then measure value.
	Visual	No evidence of mechanical damage		

Packaging of Chip Component

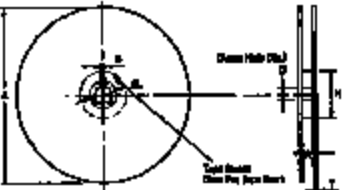


Automatic Insertion Packaging

TAPE AND REEL

REEL DIMENSIONS

millimeters (inches)



Tape Size	A Max.	B Min.	C	D Min.	N Min.	W	T Max.
178	(7)	1.00	13.0±0.50	20.2	50	10.0±1.60	2.50
8mm	250	(0.039)	(0.512±0.020)	(0.799)	(1.969)	(0.394±0.064)	(0.098)

Metric dimensions will govern.
English measurements rounded and for reference only.

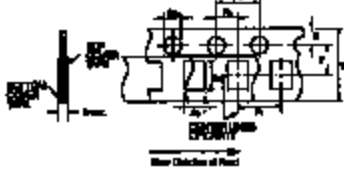
millimeters (inches)

PUNCHED TAPE CONFIGURATION 8MM TAPE ONLY

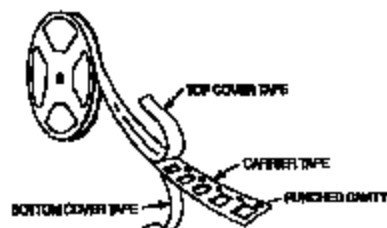
Tape Size	D ₀	E	F ₁	F ₂	W	F
8mm	14.0 ±0.05 (0.551 ±0.002)	1.75±0.04 (0.069±0.002)	4.0±0.10 (0.157±0.004)	2.00±0.06 (0.079±0.002)	8.00±0.20 (0.315±0.008)	3.80±0.06 (0.149±0.002)

VARIABLE DIMENSIONS

Style	F ₁	A ₀	B ₀	T max.
CR/C/J08	2.20±0.10 (0.087±0.004)	1.85±0.10 (0.073±0.004)	1.18±0.10 (0.046±0.004)	0.80 (0.031)
CR/C/J06	4.00±0.10 (0.157±0.004)	1.10±0.20 (0.043±0.008)	1.90±0.20 (0.075±0.008)	1.10 (0.043)
CR/C/JPR10	2.50±0.10 (0.098±0.004)	1.55±0.20 (0.061±0.008)	2.40±0.20 (0.094±0.008)	
CR/C/JPR21	4.00±0.10 (0.157±0.004)	2.00±0.20 (0.079±0.008)	3.60±0.20 (0.142±0.008)	
CR/C/JPR22		1.90±0.20 (0.075±0.008)	1.80±0.20 (0.071±0.008)	
CRB1A		2.00±0.20 (0.079±0.008)	3.60±0.20 (0.142±0.008)	
CRB2A CRB3A CRB4A	2.00±0.10 (0.079±0.004)	1.26±0.20 (0.049±0.008)	2.50±0.20 (0.098±0.008)	
CRB5A				



PUNCHED CARRIER

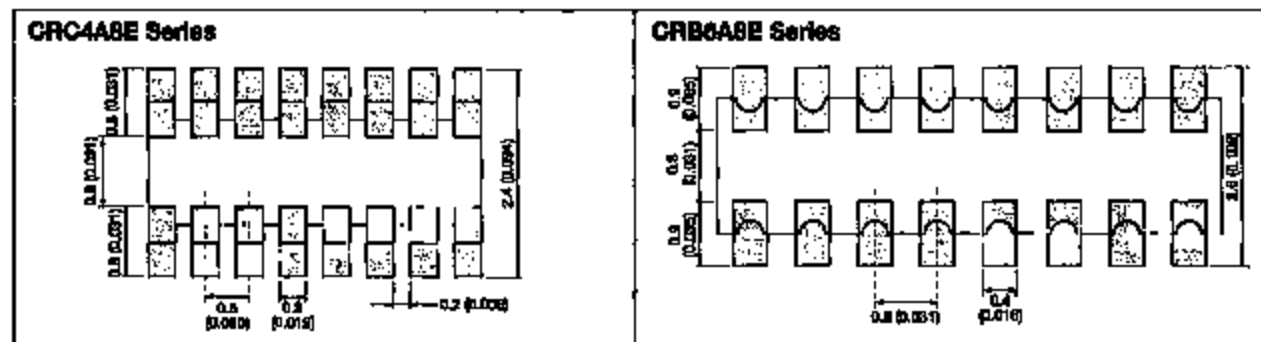
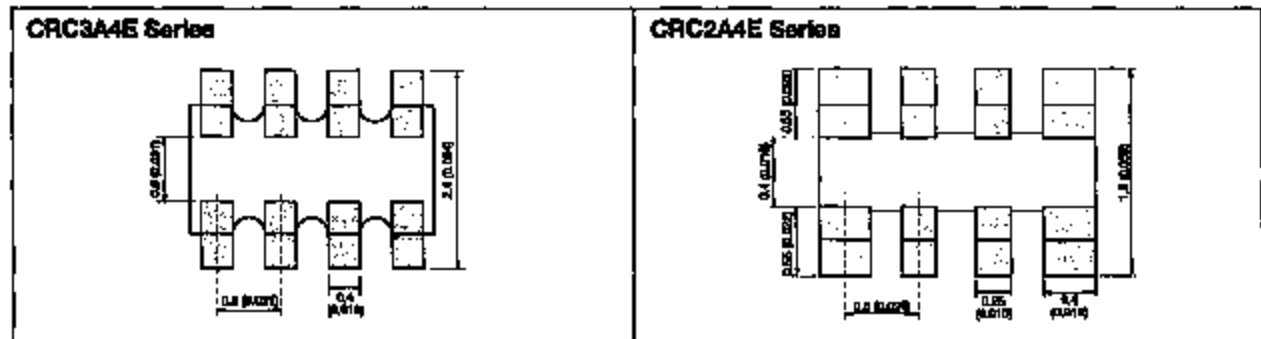
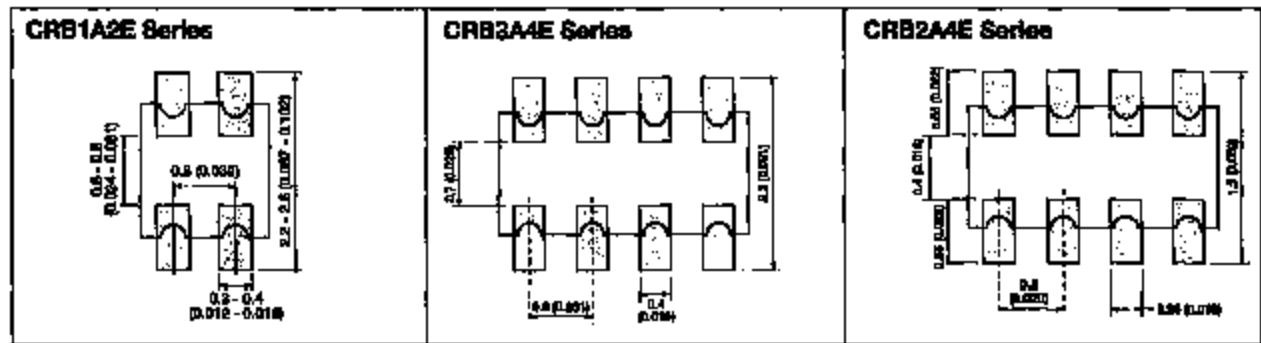
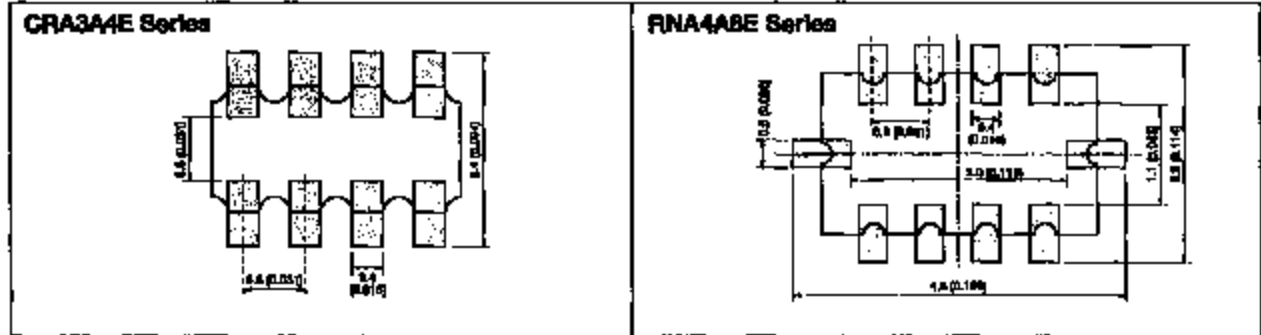


Recommended Land Patterns



RECOMMENDED LAND PATTERNS IS REFERRED THE FOLLOWING FOR EXAMPLE

millimeters (inches)



Chip Resistor and Array Kits



SAMPLE KIT PART NUMBERS

Part Number	Description
CRJ-E6-KIT	0805, 1208, 5% parts 829 100 pcs. per value (approx.)
CR08-E12-KIT	0402, 5% parts 63 values 100 pcs. per value
CR10J-E12-KIT	0803, 5% parts 63 values 100 pcs. per value (approx.)
CR21J-E12-KIT	0806, 5% parts 63 values 100 pcs. per value (approx.)
CR33J-E12-KIT	1208, 5% parts 63 values 100 pcs. per value (approx.)
CR08F-E24-KIT	0402, 1% parts 63 values 100 pcs. per value
CR10F-E24-KIT	0803, 1% parts 63 values 100 pcs. per value
CR-ARRAY-E6-KIT	Arrays, Various styles, CRA, CRB, CRC, RFA, 5% 13 values per style (approx.) 20 pcs. per value

TAJ, THJ & TPS Marking

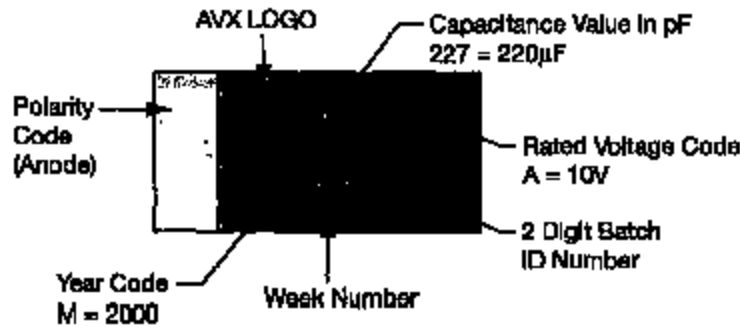


For TAJ & TPS & THJ, the positive end of body has visible readable polarity marking as shown in the diagram. Bodies are marked by indelible laser marking on top surface with capacitance value, voltage and date of manufacture and batch ID number. R case is an exception due to the small size in which only the voltage and capacitance values are printed.

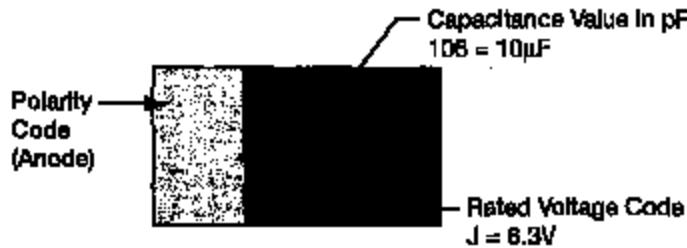
Year	Year Code
1999	L
2000	M
2001	N
2002	P

Voltage Code	Rated Voltage at 85°C
F	2
G	4
J	6.3
A	10
C	16
D	20
E	25
V	35
T	50

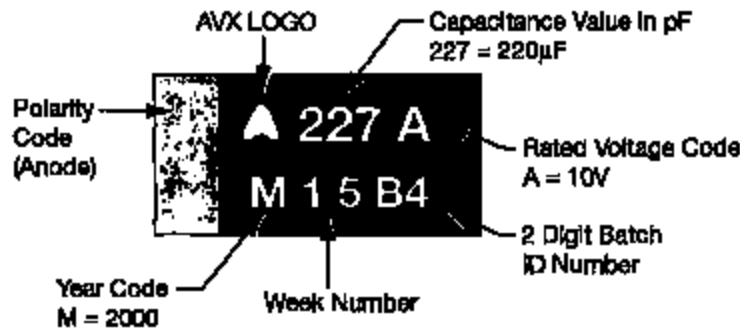
TAJ & TPS - A, B, C, D, E, S, T, V, W, Y AND X CASE:



TAJ - R CASE:



THJ - A, B, C, D AND E CASE:



Technical Summary and Application Guidelines



INTRODUCTION

Tantalum capacitors are manufactured from a powder of pure tantalum metal. The typical particle size is between 2 and 10 μm .

Figure below shows typical powders. Note the very great difference in particle size between the powder CVs.



4000 μFV

20000 μFV

60000 μFV

Figure 1.

The powder is compressed under high pressure around a Tantalum wire (known as the Riser Wire) to form a "pellet". The riser wire is the anode connection to the capacitor.

This is subsequently vacuum sintered at high temperature (typically 1400 - 1600°C). This helps to drive off any impurities within the powder by migration to the surface.

During sintering the powder becomes a sponge like structure with all the particles interconnected in a huge lattice.

This structure is of high mechanical strength and density, but is also highly porous giving a large internal surface area (see Figure 2).

The larger the surface area the larger the capacitance. Thus high CV (capacitance/voltage product) powders, which have a low average particle size, are used for low voltage, high capacitance parts.

By choosing which powder is used to produce each capacitance/voltage rating the surface area can be controlled.

The following example uses a 220 μF 10V capacitor to illustrate the point.

$$C = \frac{\epsilon_0 \epsilon_r A}{d}$$

where ϵ_0 is the dielectric constant of free space
(8.855 $\times 10^{-12}$ Farads/m)

ϵ_r is the relative dielectric constant for Tantalum Pentoxide (27)

d is the dielectric thickness in meters

C is the capacitance in Farads

and A is the surface area in meters

Rearranging this equation gives:

$$A = \frac{Cd}{\epsilon_0 \epsilon_r}$$

thus for a 220 μF 10V capacitor the surface area is 650 square centimeters, or nearly twice the size of this page.

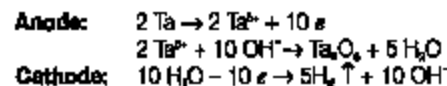
The dielectric is then formed over all the tantalum surfaces by the electrochemical process of anodization. To achieve this, the "pellet" is dipped into a very weak solution of phosphoric acid.

The dielectric thickness is controlled by the voltage applied during the forming process. Initially the power supply is kept in a constant current mode until the correct thickness of dielectric has been reached (that is the voltage reaches the "forming voltage"), it then switches to constant voltage mode and the current decays to close to zero.



Figure 2. Sintered Tantalum

The chemical equations describing the process are as follows:



The oxide forms on the surface of the Tantalum but it also grows into the metal. For each unit of oxide two thirds grows out and one third grows in. It is for this reason that there is a limit on the maximum voltage rating of Tantalum capacitors with present technology powders (see Figure 3).

The dielectric operates under high electrical stress. Consider a 220 μF 10V part:

$$\begin{aligned} \text{Formation voltage} &= \text{Formation Ratio} \times \text{Working Voltage} \\ &= 3.6 \times 10 \\ &= 36 \text{ Volts} \end{aligned}$$



Technical Summary and Application Guidelines



The pentoxide (Ta_2O_5) dielectric grows at a rate of 1.7×10^4 m/V

Dielectric thickness (d) = $35 \times 1.7 \times 10^4$
= 0.06 μ m

Electric Field strength = Working Voltage / d
= 187 KV/mm



Figure 3. Dielectric Layer

The next stage is the production of the cathode plate. This is achieved by pyrolysis of Manganese Nitrate into Manganese Dioxide.

The "pellet" is dipped into an aqueous solution of nitrate and then baked in an oven at approximately 250°C to produce the dioxide coat. The chemical equation is:



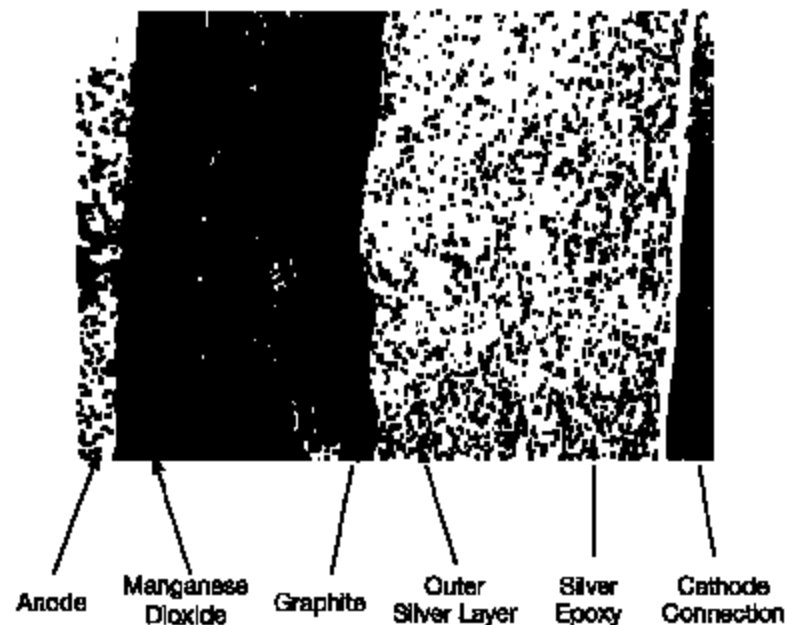
Figure 4. Manganese Dioxide Layer

This process is repeated several times through varying specific densities of nitrate to build up a thick coat over all internal and external surfaces of the "pellet", as shown in Figure 4.

The "pellet" is then dipped into graphite and silver to provide a good connection to the Manganese Dioxide cathode plate. Electrical contact is established by deposition of carbon onto the surface of the cathode. The carbon is then coated with a conductive material to facilitate connection to the cathode termination (see Figure 5). Packaging is carried out to meet individual specifications and customer requirements. This manufacturing technique is adhered to for the whole range of AVX tantalum capacitors, which can be sub-divided into four basic groups: Chip / Resin dipped / Rectangular boxed / Axial.

Further information on the production of Tantalum Capacitors can be obtained from the technical paper "Basic Tantalum Technology", by John Gill, available from your local AVX representative.

Figure 5.



Technical Summary and Application Guidelines



SECTION 1 ELECTRICAL CHARACTERISTICS AND EXPLANATION OF TERMS

1.1 CAPACITANCE

1.1.1 Rated capacitance (C_R)

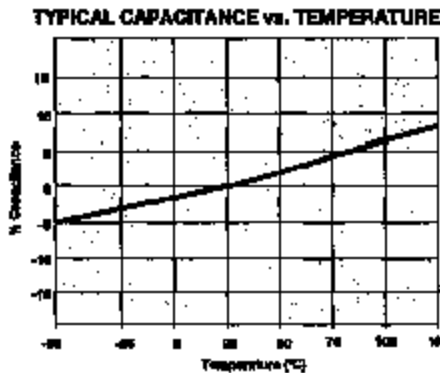
This is the nominal rated capacitance. For tantalum capacitors it is measured as the capacitance of the equivalent series circuit at 20°C using a measuring bridge supplied by a 0.5Vpk-pk 120Hz sinusoidal signal, free of harmonics with a maximum bias of 2.2Vd.c.

1.1.2 Capacitance tolerance.

This is the permissible variation of the actual value of the capacitance from the rated value. For additional reading, please consult the AVX technical publication "Capacitance Tolerances for Solid Tantalum Capacitors".

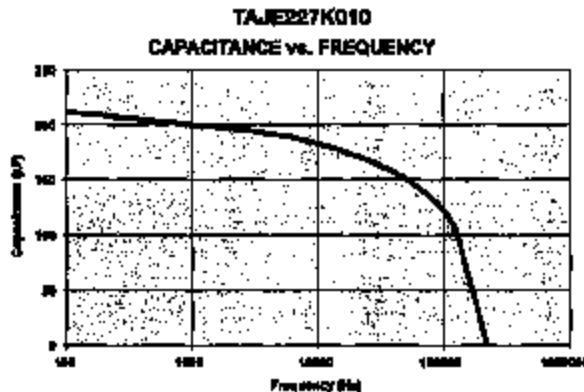
1.1.3 Temperature dependence of capacitance.

The capacitance of a tantalum capacitor varies with temperature. This variation itself is dependant to a small extent on the rated voltage and capacitor size.



1.1.4 Frequency dependence of the capacitance.

The effective capacitance decreases as frequency increases. Beyond 100KHz the capacitance continues to drop until resonance is reached (typically between 0.5 - 5MHz depending on the rating). Beyond the resonant frequency the device becomes inductive.



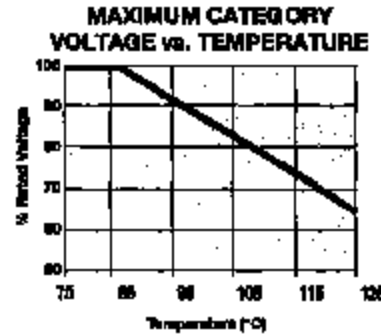
1.2 VOLTAGE

1.2.1 Rated d.c. voltage (V_R)

This is the rated d.c. voltage for continuous operation at 85°C.

1.2.2 Category voltage (V_C)

This is the maximum voltage that may be applied continuously to a capacitor. It is equal to the rated voltage up to +85°C, beyond which it is subject to a linear derating, to 2/3 V_R at 125°C.



1.2.3 Surge voltage (V_S)

This is the highest voltage that may be applied to a capacitor for short periods of time in circuits with minimum series resistance of 1Kohm. The surge voltage may be applied up to 10 times in an hour for periods of up to 30 seconds at a time. The surge voltage must not be used as a parameter in the design of circuits in which, in the normal course of operation, the capacitor is periodically charged and discharged.

55°C		125°C	
Rated Voltage (Vdc)	Surge Voltage (Vdc)	Category Voltage (Vdc)	Surge Voltage (Vdc)
4	5.2	2.7	3.2
6.3	8	4	6
10	13	7.0	8
16	20	10	12
25	26	13	16
25	32	17	20
35	48	25	28
50	65	35	40

1.2.4 Effect of surges

The solid Tantalum capacitor has a limited ability to withstand voltage and current surges. This is in common with all other electrolytic capacitors and is due to the fact that they operate under very high electrical stress across the dielectric. For example a 25 volt capacitor has an Electrical Field of 147 KV/mm when operated at rated voltage.



Technical Summary and Application Guidelines

AVX

It is important to ensure that the voltage across the terminals of the capacitor never exceeds the specified surge voltage rating.

Solid tantalum capacitors have a self healing ability provided by the Manganese Dioxide semiconducting layer used as the negative plate. However, this is limited in low impedance applications.

In the case of low impedance circuits, the capacitor is likely to be stressed by current surges. Derating the capacitor by 50% or more increases the reliability of the component. (See Figure 2 page 45). The "AVX Recommended Derating Table" (page 46) summarizes voltage rating for use on common voltage rails, in low impedance applications.

In circuits which undergo rapid charge or discharge a protective resistor of 1Ω/V is recommended. If this is impossible, a derating factor of up to 70% should be used.

In such situations a higher voltage may be needed than is available as a single capacitor. A series combination should be used to increase the working voltage of the equivalent capacitor. For example two 22μF 25V parts in series is equivalent to one 11μF 50V part. For further details refer to J.A. Gill's paper "Investigation into the effects of connecting Tantalum capacitors in series", available from AVX offices worldwide.

NOTE:

While testing a circuit (e.g. at ICT or functional) it is likely that the capacitors will be subjected to large voltage and current transients, which will not be seen in normal use. These conditions should be borne in mind when considering the capacitor's rated voltage for use. These can be controlled by ensuring a correct test resistance is used.

1.2.6 Reverse voltage and Non-Polar operation.

The values quoted are the maximum levels of reverse voltage which should appear on the capacitors at any time. These limits are based on the assumption that the capacitors are polarized in the correct direction for the majority of their working life. They are intended to cover short term reversals of polarity such as those occurring during switching transients or during a minor portion of an impressed waveform. Continuous application of reverse voltage without normal polarization will result in a degradation of leakage current. In conditions under which continuous application of a reverse voltage could occur two similar capacitors should be used in a back-to-back configuration with the negative terminations connected together. Under most conditions this combination will have a capacitance one half of the nominal capacitance of either capacitor. Under conditions of isolated pulses or during the first few cycles, the capacitance may approach the full nominal value.

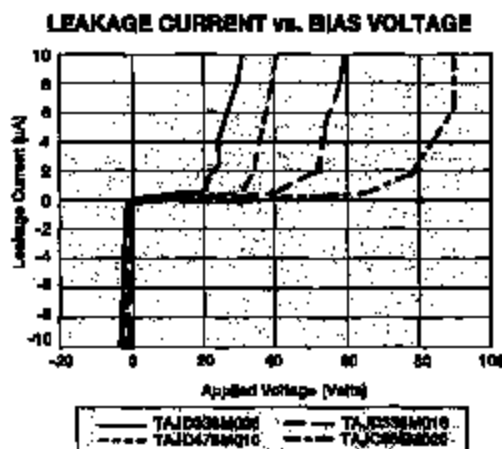
The reverse voltage ratings are designed to cover exceptional conditions of small level excursions into incorrect polarity. The values quoted are not intended to cover continuous reverse operation.

The peak reverse voltage applied to the capacitor must not exceed:

10% of the rated d.c. working voltage to a maximum of 1.0v at 25°C

3% of the rated d.c. working voltage to a maximum of 0.5v at 85°C

1% of the category d.c. working voltage to a maximum of 0.1v at 125°C



1.2.6 Superimposed A.C. Voltage (r.m.s.) - Ripple Voltage.

This is the maximum r.m.s. alternating voltage; superimposed on a d.c. voltage, that may be applied to a capacitor. The sum of the d.c. voltage and peak value of the superimposed a.c. voltage must not exceed the category voltage, Vc.

Full details are given in Section 2.

1.2.7 Forming voltage.

This is the voltage at which the anode oxide is formed. The thickness of this oxide layer is proportional to the formation voltage for a tantalum capacitor and is a factor in setting the rated voltage.

1.3 DISSIPATION FACTOR AND TANGENT OF LOSS ANGLE (TAN δ)

1.3.1 Dissipation factor (D.F.).

Dissipation factor is the measurement of the tangent of the loss angle (tan δ) expressed as a percentage. The measurement of DF is carried out using a measuring bridge which supplies a 0.5Vpk-pk 120Hz sinusoidal signal, free of harmonics with a maximum bias of 2.2Vdc. The value of DF is temperature and frequency dependent.

Note: For surface mounted products the maximum allowed DF values are indicated in the ratings table and it is important to note that these are the limits met by the component AFTER soldering onto the substrate.

Technical Summary and Application Guidelines

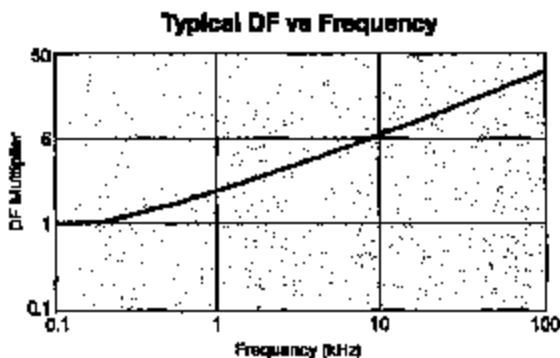


1.3.2 Tangent of Loss Angle (tan δ).

This is a measurement of the energy loss in the capacitor. It is expressed as tan δ and is the power loss of the capacitor divided by its reactive power at a sinusoidal voltage of specified frequency. Terms also used are power factor, loss factor and dielectric loss. Cos (90 - δ) is the true power factor. The measurement of tan δ is carried out using a measuring bridge which supplies a 0.5Vpk-pk 120Hz sinusoidal signal, free of harmonics with a maximum bias of 2.2Vdc.

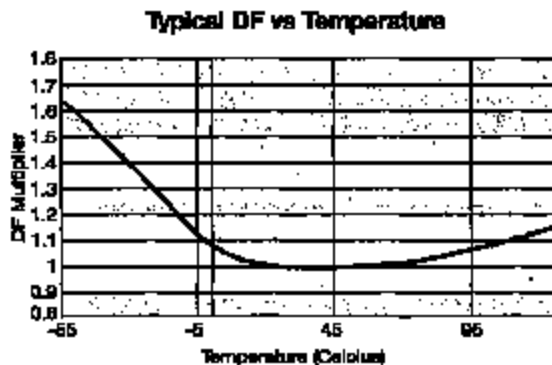
1.3.3 Frequency dependence of Dissipation Factor.

Dissipation Factor increases with frequency as shown in the typical curves:



1.3.4 Temperature dependence of Dissipation Factor.

Dissipation factor varies with temperature as the typical curves show. For maximum limits please refer to ratings tables.



1.4 IMPEDANCE, (Z) AND EQUIVALENT SERIES RESISTANCE (ESR)

1.4.1 Impedance, Z.

This is the ratio of voltage to current at a specified frequency. Three factors contribute to the impedance of a tantalum capacitor; the resistance of the semiconductor layer; the capacitance value and the inductance of the electrodes and leads.

At high frequencies the inductance of the leads becomes a limiting factor. The temperature and frequency behavior of these three factors of impedance determine the behavior

of the Impedance Z. The impedance is measured at 20°C and 100kHz.

1.4.2 Equivalent Series Resistance, ESR.

Resistance losses occur in all practical forms of capacitors. These are made up from several different mechanisms, including resistance in components and contacts, viscous forces within the dielectric and defects producing bypass current paths. To express the effect of these losses they are considered as the ESR of the capacitor. The ESR is frequency dependent and can be found by using the relationship:

$$ESR = \frac{\tan \delta}{2\pi fC}$$

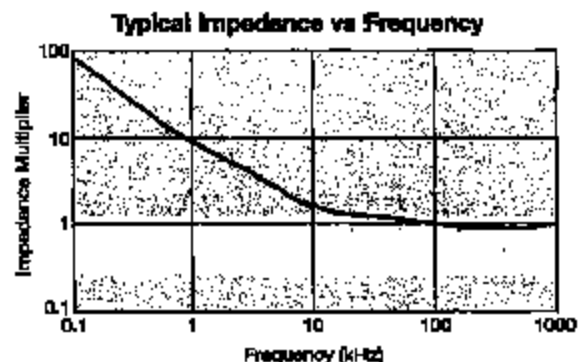
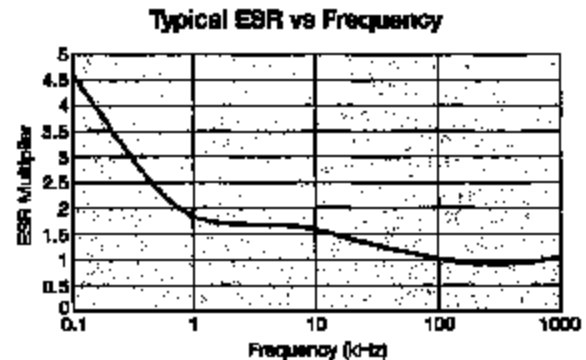
Where f is the frequency in Hz, and C is the capacitance in farads.

The ESR is measured at 20°C and 100kHz.

ESR is one of the contributing factors to impedance, and at high frequencies (100kHz and above) it becomes the dominant factor. Thus ESR and impedance become almost identical, impedance being only marginally higher.

1.4.3 Frequency dependence of Impedance and ESR.

ESR and impedance both increase with decreasing frequency. At lower frequencies the values diverge as the extra contributions to impedance (due to the reactance of the capacitor) become more significant. Beyond 1MHz (and beyond the resonant point of the capacitor) impedance again increases due to the inductance of the capacitor.



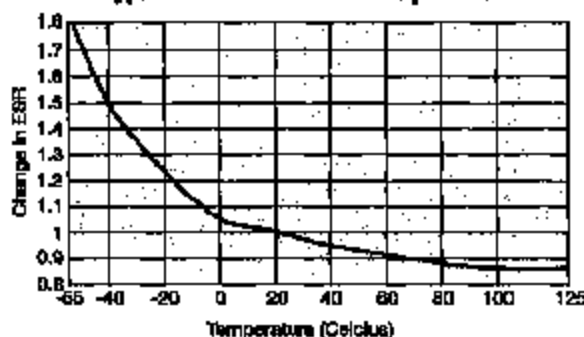
Technical Summary and Application Guidelines



1.4.4 Temperature dependence of the Impedance and ESR.

At 100kHz, Impedance and ESR behave identically and decrease with increasing temperature as the typical curves show.

Typical 100kHz ESR vs Temperature



1.5 D.C. LEAKAGE CURRENT

1.5.1 Leakage current.

The leakage current is dependent on the voltage applied, the elapsed time since the voltage was applied and the component temperature. It is measured at +20°C with the rated voltage applied. A protective resistance of 1000Ω is connected in series with the capacitor in the measuring circuit. Three to five minutes after application of the rated voltage the leakage current must not exceed the maximum values indicated in the ratings table. These are based on the formulas 0.01CV or 0.5μA (whichever is the greater).

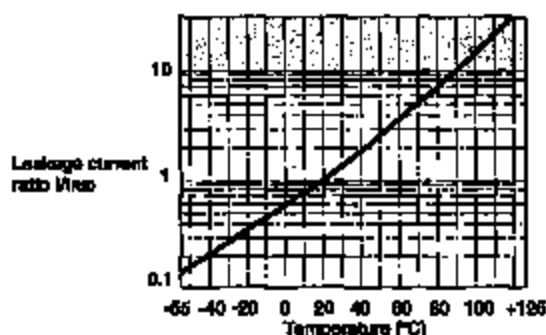
Reforming of tantalum capacitors is unnecessary even after prolonged storage periods without the application of voltage.

1.5.2 Temperature dependence of the leakage current.

The leakage current increases with higher temperatures, typical values are shown in the graph. For operation between 65°C and 125°C, the maximum working voltage must be derated and can be found from the following formula.

$$V_{max} = \left(1 - \frac{T - 65}{125}\right) \times V_R \text{ volts, where } T \text{ is the required operating temperature.}$$

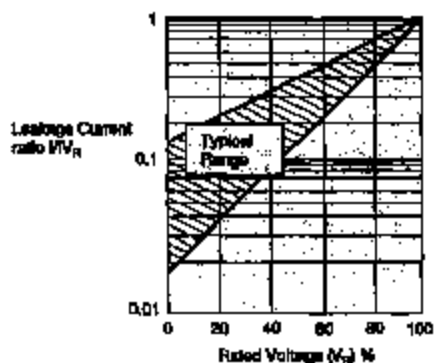
LEAKAGE CURRENT vs. TEMPERATURE



1.5.3 Voltage dependence of the leakage current.

The leakage current drops rapidly below the value corresponding to the rated voltage V_R when reduced voltages are applied. The effect of voltage derating on the leakage current is shown in the graph. This will also give a significant increase in the reliability for any application. See Section 3.1 for details.

LEAKAGE CURRENT vs. RATED VOLTAGE



For additional information on Leakage Current, please consult the AVX technical publication "Analysis of Solid Tantalum Capacitor Leakage Current" by R. W. Franklin.

1.5.4 Ripple current.

The maximum ripple current allowed is derived from the power dissipation limits for a given temperature rise above ambient temperature (please refer to Section 2).

Technical Summary and Application Guidelines



SECTION 2

A.C. OPERATION, RIPPLE VOLTAGE AND RIPPLE CURRENT

2.1 RIPPLE RATINGS (A.C.)

In an a.c. application heat is generated within the capacitor by both the a.c. component of the signal (which will depend upon the signal form, amplitude and frequency), and by the d.c. leakage. For practical purposes the second factor is insignificant. The actual power dissipated in the capacitor is calculated using the formula:

$$P = I^2 R$$

and rearranged to $I = \sqrt{\frac{P}{R}}$ (Eq. 1)

and substituting

$$P = \frac{E^2 R}{Z^2}$$

- where
- I = rms ripple current, amperes
 - R = equivalent series resistance, ohms
 - E = rms ripple voltage, volts
 - P = power dissipated, watts
 - Z = impedance, ohms, at frequency under consideration

Maximum a.c. ripple voltage (E_{max}).

From the previous equation:

$$E_{max} = Z \sqrt{\frac{P}{R}} \text{(Eq. 2)}$$

Where P is the maximum permissible power dissipated as listed for the product under consideration (see tables). However care must be taken to ensure that:

1. The d.c. working voltage of the capacitor must not be exceeded by the sum of the positive peak of the applied a.c. voltage and the d.c. bias voltage.
2. The sum of the applied d.c. bias voltage and the negative peak of the a.c. voltage must not allow a voltage reversal in excess of the "Reverse Voltage".

Historical ripple calculations.

Previous ripple current and voltage values were calculated using an empirically derived power dissipation required to give a 10°C rise of the capacitor's body temperature from room temperature, usually in free air. These values are shown in Table I. Equation 1 then allows the maximum ripple current to be established, and Equation 2, the maximum ripple voltage. But as has been shown in the AVX article on thermal management by I. Salisbury, the thermal conductivity of a Tantalum chip capacitor varies considerably depending upon how it is mounted.

Table I: Power Dissipation Ratings (In Free Air)

TAJ/TPS/CWR11/THJ
Series Molded Chip

Case size	Max. power dissipation (W)
A	0.075
B	0.085
C	0.110
D	0.150
E	0.165
R	0.095
S	0.085
T	0.080
V	0.250
W	0.090
Y	0.185

TAZ/CWR09
Series Molded Chip

Case size	Max. power dissipation (W)
A	0.050
B	0.070
C	0.075
D	0.090
E	0.090
F	0.100
G	0.125
H	0.160

TAJ/TPS/CWR11/THJ
TAZ/CWR09
Series Molded Chip

Temperature correction factor for ripple current	
Temp. °C	Factor
+25	1.0
+55	0.95
+85	0.90
+125	0.40

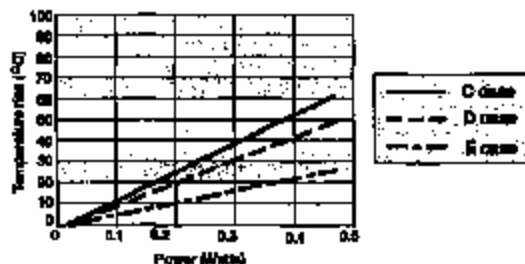


Technical Summary and Application Guidelines



A piece of equipment was designed which would pass sine and square wave currents of varying amplitudes through a biased capacitor. The temperature rise seen on the body of the capacitor was then measured using an infra-red probe. This ensured that there was no heat loss through any thermocouple attached to the capacitor's surface.

Results for the C, D and E case sizes



Several capacitors were tested and the combined results are shown above. All these capacitors were measured on FR4 board, with no other heatsinking. The ripple was supplied at various frequencies from 1KHz to 1MHz.

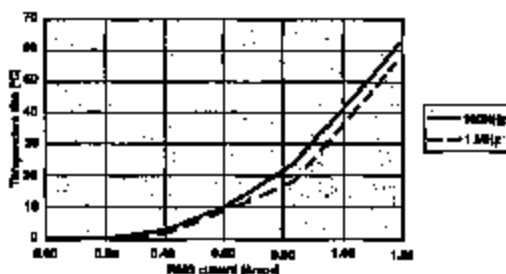
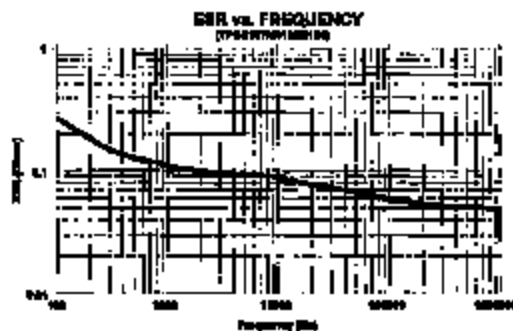
As can be seen in the figure above, the average P_{max} value for the C case capacitors was 0.11 Watts. This is the same as that quoted in Table I.

The D case capacitors gave an average P_{max} value 0.125 Watts. This is lower than the value quoted in the Table I by 0.025 Watts.

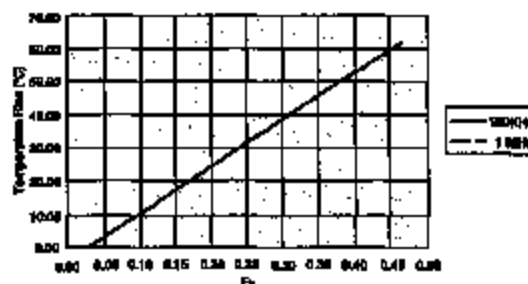
The E case capacitors gave an average P_{max} of 0.200 Watts which was much higher than the 0.165 Watts from Table I.

If a typical capacitor's ESR with frequency is considered, e.g. figure below, it can be seen that there is variation. Thus for a set ripple current, the amount of power to be dissipated by the capacitor will vary with frequency. This is clearly shown in figure in top of next column, which shows that the surface temperature of the unit rises less for a given value of ripple current at 1MHz than at 100KHz.

The graph below shows a typical ESR variation with frequency. Typical ripple current versus temperature rise for 100KHz and 1MHz sine wave inputs.



If I^2R is then plotted it can be seen that the two lines are in fact coincident, as shown in figure below.



Example

A Tantalum capacitor is being used in a filtering application, where it will be required to handle a 2 Amp peak-to-peak, 200KHz square wave current.

A square wave is the sum of an infinite series of sine waves at all the odd harmonics of the square waves fundamental frequency. The equation which relates is:

$$I_{square} = I_{pk} \sin(2\pi f) + I_{pk} \sin(6\pi f) + I_{pk} \sin(10\pi f) + I_{pk} \sin(14\pi f) + \dots$$

Thus the special components are:

Frequency	Peak-to-peak current (Amps)	RMS current (Amps)
200 KHz	2.000	0.707
600 KHz	0.667	0.236
1 MHz	0.400	0.141
1.4 MHz	0.286	0.101

Let us assume the capacitor is a TA1D686M006 Typical ESR measurements would yield.

Frequency	Typical ESR (Ohms)	Power (Watts) $I_{rms}^2 \times ESR$
200 KHz	0.120	0.060
600 KHz	0.115	0.036
1 MHz	0.080	0.009
1.4 MHz	0.100	0.001

Thus the total power dissipation would be 0.069 Watts.

From the D case results shown in figure top of previous column, it can be seen that this power would cause the capacitor's surface temperature to rise by about 6°C. For additional information, please refer to the AVX technical publication "Ripple Rating of Tantalum Chip Capacitors" by R.W. Franklin.

Technical Summary and Application Guidelines



2.2 Thermal Management

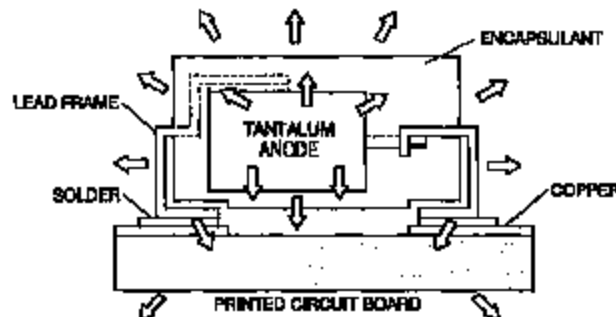
The heat generated inside a tantalum capacitor in a.c. operation comes from the power dissipation due to ripple current. It is equal to I^2R , where I is the rms value of the current at a given frequency, and R is the ESR at the same frequency with an additional contribution due to the leakage current. The heat will be transferred from the outer surface by conduction. How efficiently it is transferred from this point is dependent on the thermal management of the board.

The power dissipation ratings given in Section 2.1 are based on free-air calculations. These ratings can be approached if efficient heat sinking and/or forced cooling is used.

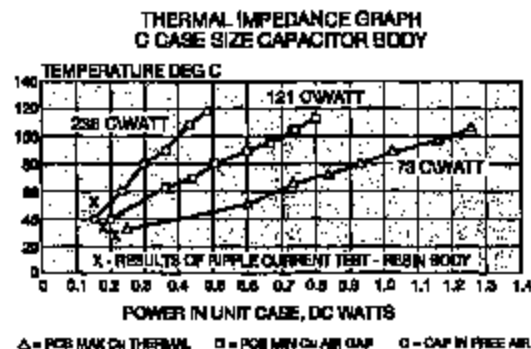
In practice, in a high density assembly with no specific thermal management, the power dissipation required to give a 10°C rise above ambient may be up to a factor of 10 less. In these cases, the actual capacitor temperature should be established (either by thermocouple probe or infra-red scanner) and if it is seen to be above this limit it may be necessary to specify a lower ESR part or a higher voltage rating.

Please contact application engineering for details or contact the AVX technical publication entitled "Thermal Management of Surface Mounted Tantalum Capacitors" by Ian Salisbury.

Thermal Dissipation from the Mounted Chip



Thermal Impedance Graph with Ripple Current



Technical Summary and Application Guidelines

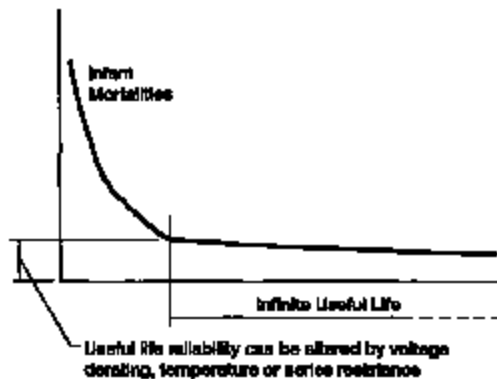


SECTION 3 RELIABILITY AND CALCULATION OF FAILURE RATE

3.1 STEADY-STATE

Tantalum Dielectric has essentially no wear out mechanism and in certain circumstances is capable of limited self healing. However, random failures can occur in operation. The failure rate of Tantalum capacitors will decrease with time and not increase as with other electrolytic capacitors and other electronic components.

Figure 1. Tantalum Reliability Curve



The useful life reliability of the Tantalum capacitor is affected by three factors. The equation from which the failure rate can be calculated is:

$$F = F_U \times F_T \times F_R \times F_B$$

where F_U is a correction factor due to operating voltage/voltage derating

F_T is a correction factor due to operating temperature

F_R is a correction factor due to circuit series resistance

F_B is the basic failure rate level. For standard Tantalum product this is 1%/1000 hours

Base failure rate.

Standard tantalum product conforms to Level M reliability (i.e., 1%/1000 hrs.) at rated voltage, rated temperature, and 0.1Ω/volt circuit impedance. This is known as the base failure rate, F_B , which is used for calculating operating reliability. The effect of varying the operating conditions on failure rate is shown on this page.

Operating voltage/voltage derating.

If a capacitor with a higher voltage rating than the maximum line voltage is used, then the operating reliability will be improved. This is known as voltage derating.

The graph, Figure 2a, shows the relationship between voltage derating (the ratio between applied and rated voltage) and the failure rate. The graph gives the correction factor F_U for any operating voltage.

Figure 2a. Correction factor to failure rate F for voltage derating of a typical component (90% con. level).

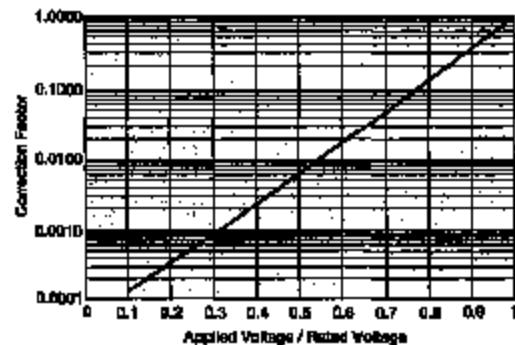


Figure 2b. Give our recommendation for voltage derating to be used in typical applications.

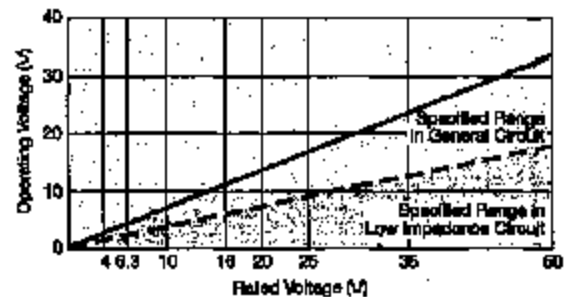
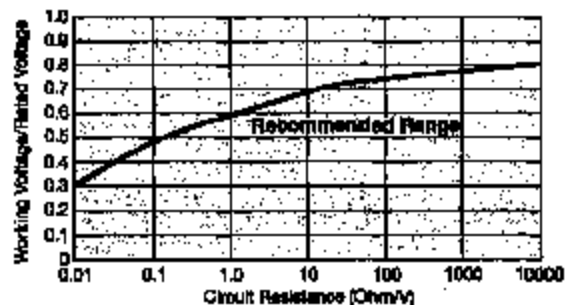


Figure 2c. Gives voltage derating recommendations as a function of circuit impedance.



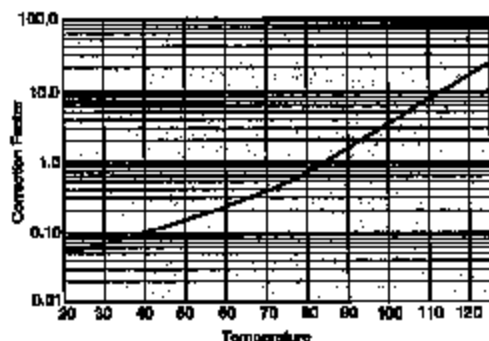
Technical Summary and Application Guidelines



Operating Temperature.

If the operating temperature is below the rated temperature for the capacitor then the operating reliability will be improved as shown in Figure 3. This graph gives a correction factor FT for any temperature of operation.

Figure 3: Correction factor to failure rate F for ambient temperature T for typical component (50% con. level).



Circuit Impedance.

All solid tantalum capacitors require current limiting resistance to protect the dielectric from surges. A series resistor is recommended for this purpose. A lower circuit impedance may cause an increase in failure rate, especially at temperatures higher than 20°C. An inductive low impedance circuit may apply voltage surges to the capacitor and similarly a non-inductive circuit may apply current surges to the capacitor, causing localized over-heating and failure. The recommended impedance is 1 Ω per volt. Where this is not feasible, equivalent voltage derating should be used [See MIL HANDBOOK 217E]. The graph, Figure 4, shows the correction factor, FR, for increasing series resistance.

Figure 4: Correction factor to failure rate F for series resistance R on basic failure rate FB for a typical component (50% con. level).

Circuit resistance - ohms/volt	FR
3.0	0.07
2.0	0.1
1.0	0.2
0.8	0.3
0.6	0.4
0.4	0.6
0.2	0.8
0.1	1.0

For circuit impedances below 0.1 ohms per volt, or for any mission critical application, circuit protection should be considered. An ideal solution would be to employ an AVX SMT thin-film fuse in series.

Example calculation

Consider a 12 volt power line. The designer needs about 10µF of capacitance to act as a decoupling capacitor near a video bandwidth amplifier. Thus the circuit impedance will be limited only by the output impedance of the board's power unit and the track resistance. Let us assume it to be about 2 Ohms minimum, i.e. 0.167 Ohms/Volt. The operating temperature range is -25°C to +85°C. If a 10µF 16 Volt capacitor was designed in the operating failure rate would be as follows.

- FT = 1.0 @ 85°C
- FR = 0.85 @ 0.167 Ohms/Volt
- FU = 0.08 @ applied voltage/rated voltage = 75%
- FB = 1%/1000 hours, basic failure rate level

Thus $F = 1.0 \times 0.85 \times 0.08 \times 1 = 0.068\%/1000 \text{ Hours}$

If the capacitor was changed for a 20 volt capacitor, the operating failure rate will change as shown.

- $$FU = 0.018 \text{ @ applied voltage/rated voltage} = 60\%$$
- $$F = 1.0 \times 0.85 \times 0.018 \times 1 = 0.0153\%/1000 \text{ Hours}$$

3.2 Dynamic.

As stated in Section 1.2.4, the solid Tantalum capacitor has a limited ability to withstand voltage and current surges. Such current surges can cause a capacitor to fail. The expected failure rate cannot be calculated by a simple formula as in the case of steady-state reliability. The two parameters under the control of the circuit design engineer known to reduce the incidence of failures are derating and series resistance.

The table below summarizes the results of trials carried out at AVX with a piece of equipment which has very low series resistance with no voltage derating applied. That is the capacitor was tested at its rated voltage.

Results of production scale derating experiment

Capacitance and Voltage	Number of units tested	50% derating applied	No derating applied
47µF 16V	1,647,667	0.03%	1.1%
100µF 10V	632,876	0.01%	0.6%
22µF 25V	2,255,258	0.05%	0.9%

As can clearly be seen from the results of this experiment, the more derating applied by the user, the less likely the probability of a surge failure occurring.

It must be remembered that these results were derived from a highly accelerated surge test machine, and failure rates in the low ppm are more likely with the end customer.

A commonly held misconception is that the leakage current of a Tantalum capacitor can predict the number of failures which will be seen on a surge screen. This can be disproved by the results of an experiment carried out at AVX on 47µF 10V surface mount capacitors with different leakage currents. The results are summarized in the table on the following page.



Technical Summary and Application Guidelines



Leakage current vs number of surge failures

	Number tested	Number failed surge
Standard leakage range 0.1 μ A to 1 μ A	10,000	26
Over Catalog limit 5 μ A to 50 μ A	10,000	26
Classified Short-Circuit 60 μ A to 500 μ A	10,000	25

Again, it must be remembered that these results were derived from a highly accelerated surge test machine, and failure rates in the low ppm are more likely with the end customer.

AVX recommended derating table

Voltage Rail	Working Cap Voltage
3.3	6.3
5	10
10	20
12	25
15	35
24	Series Combinations (11)

SECTION 4 APPLICATION GUIDELINES FOR TANTALUM CAPACITORS

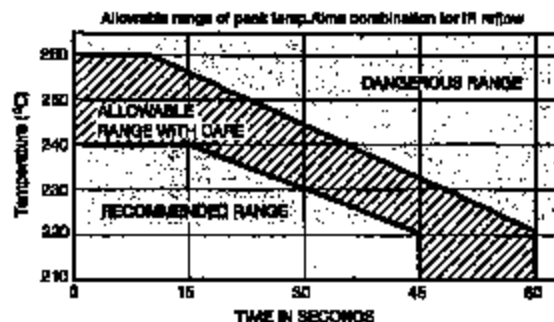
So there is an order improvement in the capacitors steady-state reliability.

Soldering Conditions and Board Attachment

The soldering temperature and time should be the minimum for a good connection.

A suitable combination for wavesoldering is 230 - 250°C for 3 - 5 seconds.

For vapor phase or infra-red reflow soldering the profile below shows allowable and dangerous time/temperature combinations. The profile refers to the peak reflow tempera-



Under the CECC 00 802 International Specification, AVX Tantalum capacitors are a Class A component.

The capacitors can therefore be subjected to one IR reflow, one wave solder and one soldering iron cycle.

For further details on surge in Tantalum capacitors refer to J.A. Gill's paper "Surge in solid Tantalum capacitors", available from AVX offices worldwide.

An added bonus of increasing the derating applied in a circuit, to improve the ability of the capacitor to withstand surge conditions, is that the steady-state reliability is improved by up to an order. Consider the example of a 6.3 volt capacitor being used on a 5 volt rail.

The steady-state reliability of a Tantalum capacitor is affected by three parameters; temperature, series resistance and voltage derating. Assume 40°C operation and 0.1 Ohms/Volt series resistance.

The capacitors reliability will therefore be:

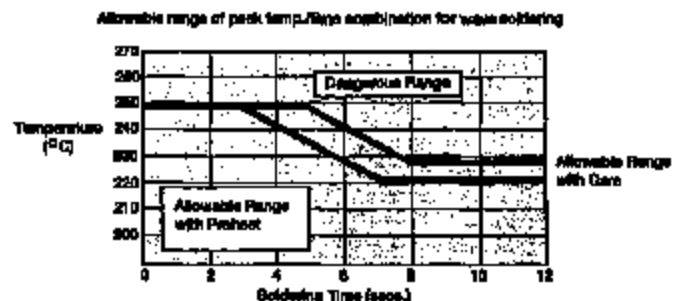
$$\begin{aligned} \text{Failure rate} &= F_U \times F_T \times F_R \times 1\%/1000 \text{ hours} \\ &= 0.15 \times 0.1 \times 1 \times 1\%/1000 \text{ hours} \\ &= 0.015\%/1000 \text{ hours} \end{aligned}$$

If a 10 volt capacitor was used instead, the new scaling factor would be 0.008, thus the steady-state reliability would be:

$$\begin{aligned} \text{Failure rate} &= F_U \times F_T \times F_R \times 1\%/1000 \text{ hours} \\ &= 0.008 \times 0.1 \times 1 \times 1\%/1000 \text{ hours} \\ &= 6 \times 10^{-4} \%/1000 \text{ hours} \end{aligned}$$

ture and is designed to ensure that the temperature of the internal construction of the capacitor does not exceed 220°C. Preheat conditions vary according to the reflow system used, maximum time and temperature would be 10 minutes at 150°C. Small parametric shifts may be noted immediately after reflow, components should be allowed to stabilize at room temperature prior to electrical testing.

Both TAJ and TAZ series are designed for reflow and wave soldering operations. In addition TAZ is available with gold terminations compatible with conductive epoxy or gold wire bonding for hybrid assemblies.



If more aggressive mounting techniques are to be used please consult AVX Tantalum for guidance.

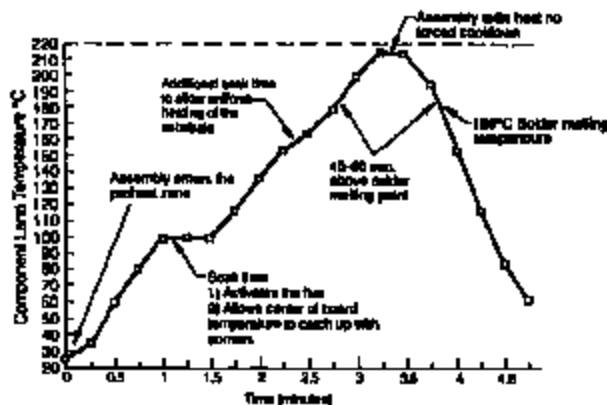
Technical Summary and Application Guidelines



SECTION 4 APPLICATION GUIDELINES FOR TANTALUM CAPACITORS

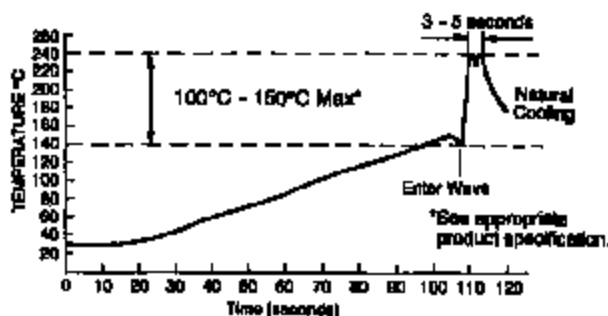
Recommended soldering profiles for surface mounting of tantalum capacitors is provided in figure below.

IR REFLOW



Recommended Ramp Rate Less than 2°C/sec.

WAVE SOLDERING



LEAD FREE PROGRAM

AVX will implement a change to the termination finish on its TAJ, THJ and TPS series surface mount tantalum capacitors effective January 1, 2001.

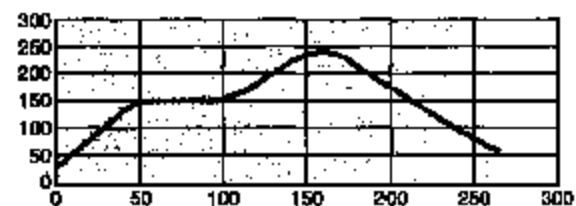
After that date all products manufactured will utilize lead free terminations.

The termination is compatible with the following lead free solder pastes: SnCu, SnCuAg and SnCuAgBi.

It is also compatible with existing SnPb solder pastes / systems in use today.

The recommended IR reflow profile is shown below.

LEAD FREE REFLOW PROFILE



- Pre-heating: 150 ±15C / 60-90s
- Max. Peak Gradient 2.5C/s
- Peak Temperature: 240 ±5C
- Time at >230C: 40s Max.

The following should be noted by customers changing from lead based systems to the new lead free pastes.

- a) The visual standards used for evaluation of solder joints will need to be modified as lead free joints are not as bright as with tin-lead pastes and the fillet may not be as large.
- b) Resin color may darken slightly due to the increase in temperature required for the new pastes.
- c) Lead free solder pastes do not allow the same self alignment as lead containing systems. Standard mounting pads are acceptable, but machine set up may need to be modified.

Technical Summary and Application Guidelines



SECTION 5 MECHANICAL AND THERMAL PROPERTIES OF CAPACITORS

5.1 Acceleration

98.1m/s² (10g)

5.2 Vibration Severity

10 to 2000Hz, 0.75mm of 98.1m/s² (10g)

5.3 Shock

Trapezoidal Pulse, 98.1m/s² for 6ms.

5.4 Adhesion to Substrate

IEC 384-3, minimum of 5N.

5.5 Resistance to Substrate Bending

The component has compliant leads which reduces the risk of stress on the capacitor due to substrate bending.

5.6 Soldering Conditions

Dip soldering is permissible provided the solder bath temperature is $\leq 270^{\circ}\text{C}$, the solder time < 3 seconds and the circuit board thickness $\geq 1.0\text{mm}$.

5.7 Installation Instructions

The upper temperature limit (maximum capacitor surface temperature) must not be exceeded even under the most unfavorable conditions when the capacitor is installed. This must be considered particularly when it is positioned near components which radiate heat strongly (e.g. valves and power transistors). Furthermore, care must be taken, when bending the wires, that the bending forces do not strain the capacitor housing.

5.8 Installation Position

No restriction.

5.9 Soldering Instructions

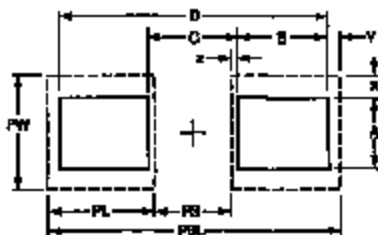
Fluxes containing acids must not be used.

5.9.1 Guidelines for Surface Mount Footprints

Component footprint and reflow pad design for AVX capacitors.

The component footprint is defined as the maximum board area taken up by the terminators. The footprint dimensions are given by A, B, C and D in the diagram, which corresponds to W_{max}, A_{max}, S_{min} and L_{max} for the component. The footprint is symmetric about the center line.

The dimensions x, y and z should be kept to a minimum to reduce rotational tendencies while allowing for visual inspection of the component and its solder fillet.



Dimensions PS (Pad Separation) and PW (Pad Width) are calculated using dimensions x and z. Dimension y may vary, depending on whether reflow or wave soldering is to be performed.

For reflow soldering, dimensions PL (Pad Length), PW (Pad Width), and PSL (Pad Set Length) have been calculated. For wave soldering the pad width (PW) is reduced to less than the termination width to minimize the amount of solder pick up while ensuring that a good joint can be produced.

NOTE: These recommendations (also in compliance with EIA) are guidelines only. With care and control, smaller footprints may be considered for reflow soldering.

Nominal footprint and pad dimensions for each case size are given in the following tables:

PAD DIMENSIONS: millimeters (inches)

CASE		PSL	PL	PS	PW	PWw
TAJ	A	4.0 (0.157)	1.4 (0.054)	1.2 (0.047)	1.8 (0.071)	0.9 (0.035)
	B	4.8 (0.187)	1.4 (0.054)	1.2 (0.047)	2.8 (0.110)	1.8 (0.069)
TPS	C	6.5 (0.255)	2.0 (0.078)	2.5 (0.098)	2.8 (0.110)	1.4 (0.055)
	D	9.0 (0.315)	2.0 (0.078)	2.5 (0.098)	3.0 (0.118)	1.7 (0.068)
TAZ	E	8.0 (0.315)	2.0 (0.078)	4.0 (0.157)	3.0 (0.118)	1.7 (0.068)
	F	2.7 (0.106)	1.0 (0.039)	1.0 (0.039)	1.8 (0.071)	0.8 (0.031)
THJ	G	4.0 (0.157)	1.4 (0.054)	1.0 (0.039)	1.8 (0.071)	0.8 (0.031)
	H	4.0 (0.157)	1.4 (0.054)	1.0 (0.039)	2.8 (0.110)	0.8 (0.031)
THS	I	6.5 (0.255)	2.0 (0.078)	2.5 (0.098)	2.8 (0.110)	1.8 (0.069)
	J	8.0 (0.315)	2.0 (0.078)	4.0 (0.157)	3.0 (0.118)	1.7 (0.068)
TAL	K	2.4 (0.098)	0.7 (0.027)	0.8 (0.031)	1.0 (0.039)	-
	L	3.0 (0.120)	0.7 (0.027)	1.8 (0.069)	1.5 (0.059)	-
TAM	M	3.8 (0.150)	1.4 (0.054)	0.8 (0.031)	2.5 (0.098)	1.0 (0.039)
	N	4.8 (0.178)	1.4 (0.054)	1.8 (0.069)	2.5 (0.098)	1.0 (0.039)
TAN	O	4.5 (0.178)	1.4 (0.054)	1.8 (0.069)	3.8 (0.150)	2.0 (0.079)
	P	6.8 (0.228)	1.4 (0.054)	3.0 (0.118)	3.8 (0.150)	2.2 (0.086)
TAP	Q	6.8 (0.248)	1.4 (0.054)	3.8 (0.150)	4.5 (0.178)	2.8 (0.110)
	R	7.4 (0.288)	1.8 (0.074)	8.7 (0.343)	4.0 (0.157)	2.4 (0.098)
TAS	S	8.0 (0.313)	1.8 (0.074)	4.2 (0.165)	6.0 (0.197)	3.4 (0.133)

5.10 PCB Cleaning

Ta chip capacitors are compatible with most PCB board cleaning systems.

If aqueous cleaning is performed, parts must be allowed to dry prior to test. In the event ultrasonics are used power levels should be less than 10 watts per/litre, and care must be taken to avoid vibrational nodes in the cleaning bath.

SECTION 6 EPOXY FLAMMABILITY

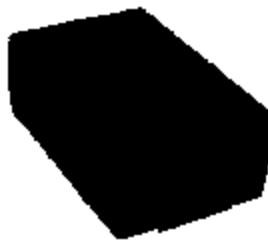
EPOXY	UL RATING	OXYGEN INDEX
TAJ	UL94 V-0	35%
TPS	UL94 V-0	35%
TAZ	UL94 V-0	35%
THJ	UL94 V-0	35%

SECTION 7 QUALIFICATION APPROVAL STATUS

DESCRIPTION	STYLE	SPECIFICATION
Surface mount capacitors	TAJ	CECC 30801 - 005 Issue 2 CECC 30801 - 011 Issue 1 MIL-C-55365/8 (CWR11)
	TAZ	MIL-C-55365/4 (CWR09)

TPS Series

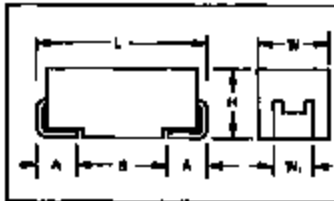
Low ESR



The TPS surface mount products have inherently low ESR (equivalent series resistance) and are capable of higher ripple current handling, producing lower ripple voltages, less power and heat dissipation than standard product for the most efficient use of circuit power. TPS has been designed, manufactured, and

preconditioned for optimum performance in typical power supply applications. By combining the latest improvements in tantalum powder technology, improved manufacturing processes, and application specific preconditioning tests, AVX is able to provide a technologically superior alternative to the standard range.

CASE DIMENSIONS: millimeters (inches)



For part marking see pages 12 & 50

Code	ISA Code	Le±0.2 (0.008)	W±0.2 (0.008) -0.1 (0.004)	H±0.0 (0.005) -0.1 (0.004)	W,±0.2 (0.008)	A±0.3 (0.012) -0.2 (0.008)	S min.
A	3216	3.2 (0.126)	1.8 (0.063)	1.8 (0.063)	1.2 (0.047)	0.8 (0.031)	1.1 (0.043)
B	3626	3.6 (0.138)	2.8 (0.110)	1.9 (0.075)	2.2 (0.087)	0.8 (0.031)	1.4 (0.055)
C	6032	6.0 (0.236)	3.2 (0.126)	2.6 (0.102)	2.2 (0.087)	1.3 (0.051)	2.9 (0.114)
D	7843	7.3 (0.287)	4.3 (0.169)	2.9 (0.114)	2.4 (0.094)	1.3 (0.051)	4.4 (0.173)
E	7843H	7.3 (0.287)	4.3 (0.169)	4.1 (0.162)	2.4 (0.094)	1.3 (0.051)	4.4 (0.173)
V	7361	7.3 (0.287)	6.1 (0.240)	3.45 ±0.3 (0.136±0.012)	3.1 (0.120)	1.4 (0.055)	4.4 (0.173)
W*	6032L	6.0 (0.236)	3.2 (0.126)	1.5 (0.059) max.	2.2 (0.087)	1.3 (0.051)	2.9 (0.114)
Y**	7843L	7.3 (0.287)	4.3 (0.169)	2.0 (0.079) max.	2.4 (0.094)	1.3 (0.051)	4.4 (0.173)

W₁ dimension applies to the termination width for A dimensional case, only.
 * Low Profile Version of C Case (max. height 1.6mm)
 ** Low Profile Version of D Case (max. height 2mm)

HOW TO ORDER

TPS
Type

C
Case Size
See table above

107
Capacitor Code
pF codes: last two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)

M
Tolerance
K=±10%
M=±20%

010
Rated DC Voltage
006=6.3Vdc
010=10Vdc
016=16Vdc
020=20Vdc
025=25Vdc
035=35Vdc
050=50Vdc

R
Packaging
See Tape and Reel Packaging
R=7" T/R
S=13" T/R
(see page 46)

100
Maximum ESR in Milliohms
See note below

NOTE: The ISA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalog limit post mounting.

TECHNICAL SPECIFICATIONS

Technical Data:		All technical data relate to an ambient temperature of +25°C							
Capacitance Range:		1.0µF to 470µF							
Capacitance Tolerance:		±10%; ±20%							
Rated Voltage (V _R)	≤ +85°C:	6.3	10	16	20	25	35	50	
Category Voltage (V _C)	≤ +125°C:	4	7	10	13	17	23	33	
Surge Voltage (V _S)	≤ +85°C:	8	13	20	25	32	46	65	
Surge Voltage (V _S)	≤ +125°C:	5	8	12	16	20	28	40	
Temperature Range:		-55°C to +125°C							
Environmental Classification:		66/125/58 (IEC 68-2)							
Reliability:		1% per 1000 hours at 85°C with 0.1Ω/V series impedance, 60% confidence level							



EA02-827-G 39586

TPS Series



Low ESR

CAPACITANCE AND RATED VOLTAGE, V_R (VOLTAGE CODE) RANGE (LETTER DENOTES CASE SIZE)

Capacitance		Rated voltage (V_R) to 85°C							
μF	Code	4V (G)	6.3V (J)	10V (A)	16V (C)	20V (D)	25V (E)	35V (V)	50V (T)
1	105							A(3000) B(2000)	C(2500)
1.5	166						A(3000) B(1800)	B(2500)	C(1500-2000)
2.2	226			A(1800)	A(3600) A(1800)	A(3000)	B(2600)	B(2000) C(1000)	D(1200)
3.3	335				A(3600)	A(2500) B(1300)	B(2000)	C(700)	D(600)
4.7	475			A(1400)	A(2000) B(800-1600)	A(1800)	B(1500)	B(1500) C(600)	D(300-700)
6.8	685		A(1800)	A(1800)	B(1200)	B(1000) C(700)	C(600-700)	D(500)	D(500-600)
10	106		A(1500) F(1000-3000)	A(900-1800)	B(800) C(500) W(800)	B(1000) C(600-700)	C(300-500)	D(125-300) E(200)	E(400-500)
15	156		A(1500)	A(1000)	B(500)	C(400-450)	C(300) D(100-300)	C(450) D(100-300)	
22	226		A(800) B(600)	B(500-700)	B(600) C(300-875) W(500)	C(150-400) D(300)	D(100-300)	D(125-400) E(200-300)	
33	336		A(600) B(600)	W(350) B(425-650) C(150-600)	C(225-300) W(175-600) Y(300-400)	D(200)	D(100-300) E(175-300)	D(200-300)	
47	476	A(500)	B(250-500) C(300)	B(500-650) C(350) D(100) W(150-250)	C(350) W(80-200) Y(250)	D(100-200) E(125-250)	D(150-250) E(100-125)	E(200-250)	
68	686		B(500) C(150-200) W(125-250)	C(200-300) D(100-150) Y(100-200)	C(200) D(70-150) Y(200-250)	D(70-300) E(125-150)	E(125-200) V(95-200)		
100	107		B(400) C(75-150) Y(100)	C(75-200) D(50-150) E(125) Y(100-200)	D(60-150) E(100-150) Y(100-200)	E(150-200) V(80-200)			
150	157		C(150-250) D(50-125)	D(50-100) Y(100-200)	D(125-150)				
220	227	D(50-100)	C(125-250) D(50-125) E(100) Y(100-150)	D(60-150) E(50-150) Y(150-200)	E(100-150) V(50-150)				
330	337	D(45-100)	D(45-100) E(100-150)	D(100-150) E(50-150) V(60-100)					
470	477	D(45-100) E(100)	D(100-200) E(45-200) V(55-100)	E(45-200) V(60-100)					
680	687	D(100) E(40-100)	E(45-100) V(35-50)						
1000	108	V(35-50)							

For TPS series and the case sizes C, D and E the ESR limits are printed on capacitor side in the following format:

Txxx - where xxx is ESR limit in milliohms. T100 represents max. ESR of 100 milliohms.

NOTE: The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalog limit post assembly.

ESR limits quoted in brackets are in milliohms

red = new released



TPS Series



Low ESR

RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance (µF)	Rated Voltage (Voltage Code)	DGL (µA) Max.	DF % Max.	ESR Max. (mΩ) @100kHz	100kHz Ripple Current (Amp) Ratings		
							25°C	85°C	125°C
Voltage/Code							4 volt @ 85°C (2.5 volt @ 125°C) / G		
TPSE887*004#0100	E	880	4	27.2	14	100	1.284	1.158	0.613
Voltage/Code							6.3 volt @ 85°C (4 volt @ 125°C) / J		
TPSA687*008#*900	A	6.8	6.3	0.5	8	1800	0.204	0.184	0.082
TPSA108*008#1500	A	10	6.3	0.6	8	1500	0.224	0.200	0.089
TPSA158*008#1500	A	15	6.3	0.9	8	1500	0.224	0.200	0.089
TPSA228*008#0900	A	22	6.3	1.4	8	900	0.289	0.260	0.115
TPSE228*008#0800	B	22	6.3	1.4	6	800	0.375	0.339	0.151
TPSA336*006#0650	A	33	6.3	2.1	8	600	0.353	0.318	0.141
TPSE336*008#0600	B	33	6.3	2.1	6	600	0.376	0.337	0.151
TPSW336*006#0400	W	33	6.3	2.1	8	400	0.474	0.427	0.190
TPSD478*008#0500	B	47	6.3	3.0	6	500	0.412	0.371	0.166
TPSC476*008#0300	C	47	6.3	3.0	6	300	0.606	0.545	0.242
TPSB688*008#0500	B	68	6.3	4.3	6	500	0.412	0.371	0.166
TPSC688*008#0200	C	68	6.3	4.3	6	200	0.742	0.667	0.297
TPSC688*008#0150	C	68	6.3	4.3	6	150	0.856	0.780	0.343
TPSW688*008#0250	W	68	6.3	4.6	8	250	0.903	0.840	0.340
TPSC107*008#0150	C	100	6.3	6.8	6	180	0.856	0.780	0.343
TPBC157*008#0250	C	150	6.3	9.5	6	280	0.953	0.867	0.365
TPSC157*008#0150	C	150	6.3	9.5	6	150	0.958	0.771	0.343
TPSD157*008#0125	D	150	6.3	9.5	6	125	1.096	0.980	0.438
TPSC227*008#0250	C	220	6.3	13.8	10	250	0.883	0.807	0.366
TPSC227*008#0125	C	220	6.3	13.8	10	125	0.938	0.844	0.375
TPSC227*008#0100	D	220	6.3	13.8	8	100	1.125	1.102	0.490
TPSE227*008#0100	E	220	6.3	13.8	8	100	1.295	1.156	0.514
TPSD337*008#0100	D	330	6.3	20.8	8	100	1.125	1.102	0.490
TPSE337*008#0100	E	330	6.3	20.8	8	150	1.049	0.936	0.425
TPSD477*008#0100	D	470	6.3	29.8	12	200	0.958	0.779	0.346
TPSE477*008#0100	E	470	6.3	29.8	12	100	1.225	1.102	0.490
TPSD477*008#0060	D	470	6.3	29.8	10	60	1.817	1.635	0.727
TPSV477*008#0100	V	470	6.3	29.8	10	100	1.681	1.414	0.662
TPSV477*008#0065	V	470	6.3	29.8	10	65	2.132	1.907	0.853
Voltage Code							10 volt @ 85°C (6.3 volt @ 125°C) / A		
TPSA478*010#1400	A	4.7	10	0.5	8	1800	0.204	0.184	0.082
TPSA688*010#1800	A	6.8	10	0.5	8	1400	0.231	0.208	0.089
TPSA108*010#1800	A	10	10	0.7	8	1800	0.204	0.184	0.082
TPSA158*010#1000	A	15	10	1.0	8	1000	0.274	0.249	0.110
TPSB228*010#0700	B	22	10	2.2	8	700	0.348	0.312	0.139
TPSB228*010#0500	D	22	10	2.2	6	500	0.418	0.371	0.165
TPSB336*010#0650	B	33	10	3.3	6	650	0.392	0.355	0.145
TPSB336*010#0500	B	33	10	3.3	6	500	0.412	0.371	0.155
TPSC336*010#0500	C	33	10	3.3	6	500	0.489	0.420	0.188
TPSC336*010#0375	C	38	10	3.3	6	375	0.542	0.484	0.217
TPSW336*010#0380	W	33	10	3.3	8	350	0.507	0.456	0.203
TPSB478*010#0800	B	47	10	4.7	8	800	0.362	0.325	0.146
TPSB478*010#0500	B	47	10	4.7	6	600	0.412	0.371	0.165
TPSC478*010#0350	C	47	10	4.7	6	350	0.561	0.501	0.224
TPSD688*010#0150	D	68	10	6.8	6	150	1.000	0.930	0.400
TPSD688*010#0100	D	68	10	6.8	6	100	1.225	1.102	0.490
TPSW688*010#0200	W	68	10	6.8	8	200	0.791	0.712	0.316
TPSW688*010#0150	Y	68	10	6.8	8	150	0.913	0.821	0.368
TPSC107*010#0200	C	100	10	10.0	8	200	0.742	0.667	0.297
TPSC107*010#0160	C	100	10	10.0	6	160	0.856	0.771	0.343
TPSC107*010#0100	C	100	10	10.0	6	100	1.049	0.944	0.420
TPSD107*010#0080	D	100	10	10.0	6	80	1.369	1.235	0.548
TPSD107*010#0065	D	100	10	10.0	6	65	1.519	1.367	0.597

TPS Series

Low ESR



RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance μ F	Rated Voltage (Voltage Code)	DCL (uA) Max.	DF % Max.	ESR Max. (m Ω) @100kHz	100kHz Ripple Current (Amp) Ratings		
							25°C	85°C	125°C
10 volt @ 85°C (8.3 volt @ 125°C) / A									
TPSY107*010#0200	Y	100	10	10.0	6	250	0.701	0.712	0.316
TPSY107*010#0150	Y	100	10	10.0	6	180	0.813	0.822	0.366
TPSD157*010#0150	D	150	10	15.0	6	150	1.000	0.900	0.400
TPSD157*010#0100	D	150	10	15.0	6	100	1.225	1.035	0.480
TPSY157*010#0200	Y	150	10	15.0	6	200	0.791	0.712	0.316
TPSY157*010#0150	Y	150	10	15.0	6	150	0.919	0.822	0.366
TPSD227*010#0150	D	220	10	22.0	6	150	1.000	0.900	0.400
TPSD227*010#0100	D	220	10	22.0	6	100	1.225	1.102	0.480
TPSE227*010#0100	E	220	10	22.0	6	100	1.285	1.149	0.514
TPSD337*010#0150	D	330	10	33.0	6	150	1.000	0.900	0.400
TPSD337*010#0100	D	330	10	33.0	6	100	1.225	1.102	0.480
TPSE337*010#0100	E	330	10	33.0	6	100	1.285	1.149	0.514
TPSV337*010#0060	V	330	10	33.0	10	80	1.668	1.483	0.653
TPSV337*010#0100	V	330	10	33.0	10	100	1.581	1.414	0.632
TPSV337*010#0060	V	330	10	33.0	10	80	2.041	1.826	0.819
TPSE477*010#0100	E	470	10	47.0	10	100	1.285	1.149	0.574
TPSE477*010#0080	E	470	10	47.0	10	80	1.659	1.492	0.663
TPSV477*010#0100	V	470	10	47.0	10	100	1.661	1.423	0.632
TPSV477*010#0060	V	470	10	47.0	10	60	2.041	1.826	0.819
16 volt @ 85°C (10 volt @ 125°C) / C									
TPSA226*016#3500	A	2.2	16	0.5	6	3500	0.148	0.131	0.059
TPSA336*016#3500	A	3.3	16	0.5	6	3500	0.148	0.131	0.059
TPSA476*016#2000	A	4.7	16	0.8	6	2000	0.184	0.174	0.077
TPSC666*016#1200	S	6.6	16	1.1	6	1200	0.266	0.240	0.108
TPSB106*016#0800	B	10	16	1.6	6	800	0.366	0.293	0.130
TPSW106*016#0800	W	10	16	1.6	6	600	0.367	0.349	0.156
TPSB166*016#0800	B	16	16	2.4	6	800	0.326	0.292	0.130
TPSE226*016#0800	B	22	16	3.5	6	600	0.376	0.336	0.150
TPSC226*016#0975	C	22	16	3.5	6	375	0.542	0.484	0.217
TPSC336*016#0300	C	33	16	5.3	6	300	0.506	0.546	0.242
TPSW336*016#0500	W	33	16	5.3	6	600	0.424	0.381	0.169
TPSW336*016#0400	W	33	16	5.3	6	400	0.474	0.427	0.189
TPSC476*016#0350	C	47	16	7.5	6	350	0.561	0.501	0.224
TPSD476*016#0200	D	47	16	7.5	6	200	0.866	0.776	0.348
TPSD476*016#0150	D	47	16	7.5	6	150	1.000	0.884	0.400
TPSC666*016#0200	C	66	16	10.9	6	200	0.741	0.667	0.298
TPSD666*016#0150	D	66	16	10.8	6	150	1.000	0.884	0.400
TPSY666*016#0250	Y	66	16	10.8	6	250	0.707	0.636	0.263
TPSY666*016#0200	Y	66	16	10.8	6	200	0.791	0.712	0.316
TPSD107*016#0180	D	100	16	16.0	6	150	1.000	0.884	0.400
TPSD107*016#0150	D	100	16	16.0	6	125	1.066	0.960	0.438
TPSD107*016#0100	D	100	16	16.0	6	100	1.225	1.049	0.420
TPSE107*016#0125	E	100	16	16.0	6	125	1.149	1.026	0.480
TPSE107*016#0100	E	100	16	16.0	6	100	1.285	1.149	0.514
TPSD157*016#0150	D	150	16	24.0	6	150	1.000	0.900	0.400
TPSD157*016#0125	D	150	16	24.0	6	125	1.066	0.960	0.438
TPSE227*016#0150	E	220	16	35.2	10	150	1.049	0.944	0.420
TPSE227*016#0100	E	220	16	35.2	10	100	1.285	1.156	0.514
TPSV227*016#0150	V	220	16	35.2	8	150	1.290	1.182	0.518
TPSV227*016#0075	V	220	16	33.2	8	75	1.625	1.493	0.730
20 volt @ 85°C (13 volt @ 125°C) / D									
TPSA225*020#3000	A	2.2	20	0.5	6	3000	0.156	0.149	0.063
TPSA335*020#2500	A	3.3	20	0.7	6	2500	0.173	0.158	0.069
TPSA475*020#1800	A	4.7	20	0.9	6	1800	0.204	0.183	0.082
TPSC665*020#0700	C	6.6	20	1.4	6	700	0.366	0.367	0.159
TPSB105*020#1000	B	10	20	2.0	6	1000	0.282	0.281	0.117
TPSC105*020#0700	C	10	20	2.0	6	700	0.386	0.357	0.159
TPSC156*020#0450	C	15	20	3.0	6	480	0.464	0.442	0.186
TPSC226*020#0450	C	22	20	4.8	6	400	0.524	0.472	0.210
TPSD226*020#0300	D	22	20	4.8	6	300	0.707	0.636	0.263
TPSD336*020#0200	D	33	20	6.0	6	200	0.866	0.776	0.348
TPSD476*020#0200	D	47	20	8.4	6	200	0.886	0.779	0.348
TPSE476*020#0250	E	47	20	8.4	6	250	0.812	0.781	0.325



TPS Series

Low ESR



RATINGS & PART NUMBER REFERENCE

AVX Part No.	Case Size	Capacitance μ F	Rated Voltage (Voltage Code)	DCL (uA) Max.	DF % Max.	ESR Max. (m Ω) @100kHz	100kHz Ripple Current (Amp) Ratings		
							25°C	55°C	125°C
20 volt @ 85°C (13 volt @ 125°C) / D									
	E	47	20	8.4	6	150	1.049	0.938	0.420
	D	47	20	8.4	6	125	1.149	1.034	0.460
	D	68	20	13.6	6	300	0.707	0.636	0.263
TPSE686*020*0200	E	68	20	13.6	6	200	0.868	0.779	0.346
TPSE686*020*0200	E	88	20	13.6	6	200	0.908	0.817	0.363
TPSE686*020*0150	E	88	20	13.6	6	150	1.049	0.938	0.420
TPSE686*020*0125	E	88	20	13.6	6	125	1.149	1.028	0.460
TPSE107M020*0200	E	100	20	20.0	6	200	0.908	0.817	0.363
TPSE107M020*0150	E	100	20	20.0	6	150	1.049	0.944	0.420
TPSV107*020*0200	V	100	20	20.0	6	200	1.15	1.006	0.467
TPSV107*020*0085	V	100	20	20.0	6	85	1.74	1.543	0.666
25 volt @ 85°C (16 volt @ 125°C) / E									
	A	1.6	25	0.4	6	3000	0.158	0.141	0.063
	B	2.2	25	0.6	6	2500	0.184	0.166	0.074
TPSE306*025*2000	B	3.3	25	0.8	6	2000	0.206	0.186	0.082
TPSE476*025*1500	B	4.7	25	1.2	6	1500	0.298	0.219	0.086
TPSC686*025*0700	C	6.8	25	1.7	6	700	0.596	0.557	0.169
TPSC686*025*0600	C	6.8	25	1.7	6	600	0.428	0.386	0.171
TPSC106*025*0600	C	10	25	2.8	6	500	0.489	0.420	0.166
TPSD156*025*0360	D	15	25	3.8	6	300	0.707	0.636	0.263
	D	22	25	5.5	6	200	0.868	0.775	0.346
	D	33	25	8.3	6	300	0.707	0.636	0.263
	E	33	25	8.3	6	300	0.742	0.663	0.267
	F	33	25	8.3	6	200	0.908	0.812	0.363
	F	33	25	8.3	6	175	0.871	0.786	0.306
	D	47	25	8.3	6	250	0.775	0.697	0.310
TPSE686M025*0200	E	68	25	17.0	6	200	0.908	0.817	0.363
TPSE686M025*0125	E	68	25	17.0	6	125	1.149	1.034	0.460
TPSV686*025*0150	V	68	25	17.0	6	150	1.291	1.162	0.616
TPSV686*025*0085	V	68	25	17.0	6	85	1.622	1.480	0.648
35 volt @ 85°C (23 volt @ 125°C) / V									
TPSA106*035*3000	A	1.0	35	0.5	4	3000	0.158	0.142	0.063
TPSB105*035*2000	B	1.0	35	0.5	4	2000	0.206	0.186	0.082
TPSB155*035*2500	B	1.5	35	0.5	6	2500	0.184	0.166	0.074
TPSC225*035*2000	B	2.2	35	0.8	6	2000	0.206	0.186	0.082
TPSC335*035*0700	C	3.3	35	1.2	6	700	0.398	0.357	0.169
TPSD475*035*0600	C	4.7	35	1.6	6	600	0.428	0.383	0.171
TPSD685*035*0500	D	6.8	35	2.4	6	500	0.548	0.493	0.219
TPSD106*035*0300	D	10	35	3.5	6	300	0.707	0.632	0.263
	E	10	35	3.5	6	200	0.908	0.817	0.363
	C	15	35	5.3	6	450	0.494	0.446	0.166
	C	15	35	5.3	6	300	0.707	0.632	0.263
	E	22	35	7.7	6	400	0.812	0.548	0.246
	E	22	35	7.7	6	300	0.742	0.663	0.267
	E	22	35	7.7	6	200	0.908	0.812	0.363
TPSE335V*035*0300	D	33	35	11.6	6	300	0.767	0.636	0.263
TPSE475M035*0250	E	47	35	18.5	6	250	0.612	0.731	0.346
TPSE475M035*0200	E	47	35	18.5	6	200	0.831	0.817	0.363
50 volt @ 85°C (33 volt @ 125°C) / T									
TPSD475*050*0700	D	4.7	50	2.4	6	700	0.483	0.417	0.166
TPSD685*030*0600	D	6.8	50	3.4	6	600	0.530	0.450	0.200

All technical data relates to an ambient temperature of +25°C measured at 120Hz, 0.5V RMS unless otherwise stated.

* Insert K for $\pm 10\%$ and M for $\pm 20\%$
 † Insert R for 7" reel and S for 13" reel

NOTE: AVX reserves the right to supply a higher voltage rating or tighter tolerance part in the same case size, to the same reliability standards.



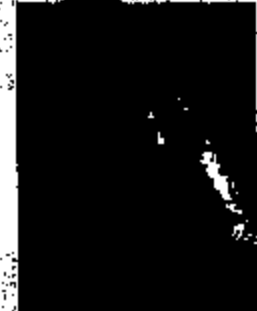


Introduction

AVX Tantalum



APPLICATIONS

		
2-16 Volt Low ESR Low Profile Case 0603 available Low Failure Rate High Volumetric Efficiency Temperature Stability Stable over Time	50 Volt @ 85°C 33 Volt @ 125°C Automotive Range High Reliability Temperature Stability QS9000 Approved Up to 150°C	2-35 Volt Low ESR Low Profile Case 0603 available Low Failure Rate High Volumetric Efficiency Temperature Stability Stable over Time

QUALITY STATEMENTS

AVX's focus is CUSTOMER satisfaction - customer satisfaction in the broadest sense; product quality, technical support, product availability and all at a competitive price.

In pursuance of the established goals of our corporate wide QV2000 program, it is the stated objective of AVX Tantalum to supply our customers with a world class service in the manufacturing and supplying of electronic components which will result in an adequate return on investment.

This world class service shall be defined as consistently supplying product and services of the highest quality and reliability.

This should encompass, but not be restricted to all aspects of the customer supply chain.

In addition any new or changed products, processes or services will be qualified to established standards of quality and reliability.

The objectives and guidelines listed above shall be achieved by the following codes of practice:

1. Continual objective evaluation of customer needs and expectations for the future and the leverage of all AVX resources to meet this challenge.

2. By continually fostering and promoting culture of continuous improvement through ongoing training and empowered participation of employees at all levels of the company.

3. By Continuous Process Improvement using sound engineering principles to enhance existing equipment, material and processes. This includes the application of the science of S.P.C. focused on improving the Process Capability Index, Cpk.

All AVX Tantalum manufacturing locations are approved to ISO9001/ISO9002 and QS9000 - Automotive Quality System Requirements.

Introduction



AVX Tantalum

AVX Palgnton is the Divisional Headquarters for the Tantalum division which has manufacturing locations in Palgnton in the UK, Biddeford in Maine, USA, Juarez in Mexico, Lanskroun in the Czech Republic and El Salvador.

The Division takes its name from the raw material used to make its main products, Tantalum Capacitors. Tantalum is

an element extracted from ores found alongside tin and niobium deposits; the major sources of supply are Canada, Brazil and Australasia.

So for high volume tantalum capacitors with leading edge technology call us first - **AVX your global partner.**

TECHNOLOGY TRENDS

The amount of capacitance possible in a tantalum capacitor is directly related to the type of tantalum powder used to manufacture the anode.

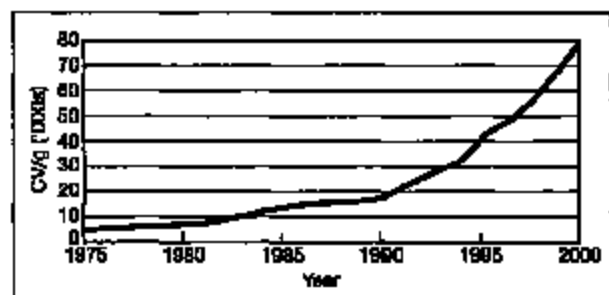
The graph following shows how the (capacitance) x (voltage) per gram (CV/g) has steadily increased over time, thus allowing the production of larger and larger capacitances with the same physical volume. CV/g is the measure used to define the volumetric efficiency of a powder; a high CV/g means a higher capacitance from the same volume.

These improvements in the powder have been achieved through close development with the material suppliers.

AVX Tantalum is committed to driving the available technology forwards as is clearly identified by the new TACmicrochip technology and the standard codes under development.

If you have any specific requirements, please contact your local AVX sales office for details on how AVX Tantalum can assist you in addressing your future requirements.

Tantalum Powder CV/gm



WORKING WITH THE CUSTOMER - ONE STOP SHOPPING

In line with our desire to become the number one supplier in the world for passive and interconnection components, AVX is constantly looking forward and innovating.

It is not good enough to market the best products; the customer must have access to a service system which suits their needs and benefits their business.

The AVX 'one stop shopping' concept is already beneficial in meeting the needs of major OEMs while worldwide partnerships with only the premier division of distributors aids the smaller user.

Helping to market the breadth and depth of our electronic component line card and support our customers are a dedicated team of commercial sales people, applications engineers and product marketing managers. Their qualifica-

tions are hopefully always appropriate to your commercial need, but as higher levels of technical expertise are required, access directly to the appropriate department is seamless and transparent.

Total quality starts and finishes with our customer service, and where cost and quality are perceived as given quantities the AVX service invariably has us selected as the preferred supplier.

Facilities are equipped with instant worldwide computer and telecommunication links connected to every sales and production site worldwide. That ensures that our customers delivery requirements are constantly met wherever in the world they may be.



Technical Summary and Application Guidelines



INTRODUCTION

Tantalum capacitors are manufactured from a powder of pure tantalum metal. The typical particle size is between 2 and 10 μm .

Figure below shows typical powders. Note the very great difference in particle size between the powder CVs.



4000 μFV

20000 μFV

50000 μFV

Figure 1.

The powder is compressed under high pressure around a Tantalum wire (known as the Riser Wire) to form a "pellet". The riser wire is the anode connection to the capacitor.

This is subsequently vacuum sintered at high temperature (typically 1400 - 1800°C). This helps to drive off any impurities within the powder by migration to the surface.

During sintering the powder becomes a sponge like structure with all the particles interconnected in a huge lattice.

This structure is of high mechanical strength and density, but is also highly porous giving a large internal surface area (see Figure 2).

The larger the surface area the larger the capacitance. Thus high CV (capacitance/voltage product) powders, which have a low average particle size, are used for low voltage, high capacitance parts.

By choosing which powder is used to produce each capacitance/voltage rating the surface area can be controlled.

The following example uses a 220 μF 10V capacitor to illustrate the point.

$$C = \frac{\epsilon_0 \epsilon_r A}{d}$$

where ϵ_0 is the dielectric constant of free space (8.855 $\times 10^{-12}$ Farads/m)

ϵ_r is the relative dielectric constant for Tantalum Pentoxide (27)

d is the dielectric thickness in meters

C is the capacitance in Farads

and A is the surface area in meters

Rearranging this equation gives:

$$A = \frac{Cd}{\epsilon_0 \epsilon_r}$$

thus for a 220 μF 10V capacitor the surface area is 550 square centimeters, or nearly twice the size of this page.

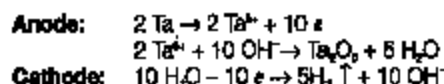
The dielectric is then formed over all the tantalum surfaces by the electrochemical process of anodization. To achieve this, the "pellet" is dipped into a very weak solution of phosphoric acid.

The dielectric thickness is controlled by the voltage applied during the forming process. Initially the power supply is kept in a constant current mode until the correct thickness of dielectric has been reached (that is the voltage reaches the "forming voltage"), it then switches to constant voltage mode and the current decays to close to zero.



Figure 2. Sintered Tantalum

The chemical equations describing the process are as follows:



The oxide forms on the surface of the Tantalum but it also grows into the metal. For each unit of oxide two thirds grows out and one third grows in. It is for this reason that there is a limit on the maximum voltage rating of Tantalum capacitors with present technology powders (see Figure 3).

The dielectric operates under high electrical stress. Consider a 220 μF 10V part:

$$\begin{aligned} \text{Formation voltage} &= \text{Formation Ratio} \times \text{Working Voltage} \\ &= 3.5 \times 10 \\ &= 35 \text{ Volts} \end{aligned}$$

Technical Summary and Application Guidelines



The pentoxide (Ta_2O_5) dielectric grows at a rate of 1.7×10^4 m/V

Dielectric thickness (d) = $35 \times 1.7 \times 10^4$
= $0.06 \mu\text{m}$

Electric Field strength = Working Voltage / d
= 167 KV/mm



Figure 3. Dielectric Layer

The next stage is the production of the cathode plate. This is achieved by pyrolysis of Manganese Nitrate into Manganese Dioxide.

The "pellet" is dipped into an aqueous solution of nitrate and then baked in an oven at approximately 250°C to produce the dioxide coat. The chemical equation is:



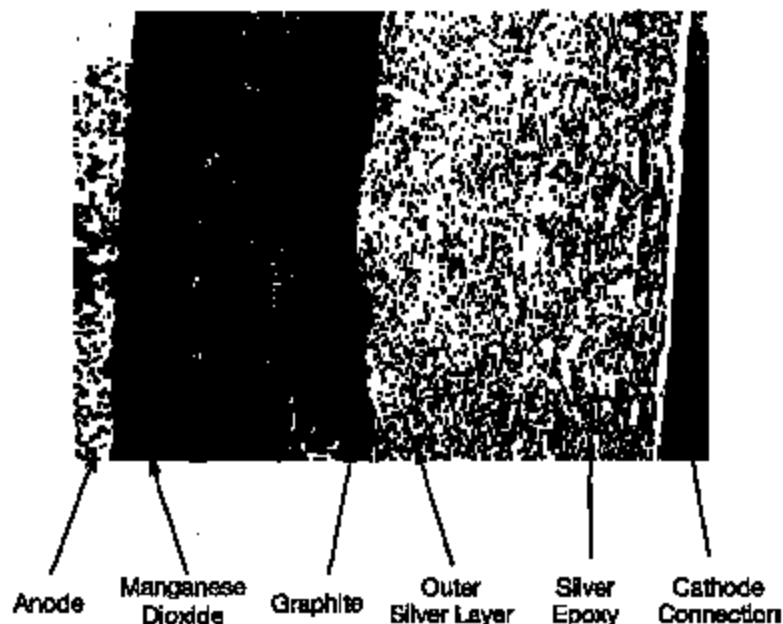
Figure 4. Manganese Dioxide Layer

This process is repeated several times through varying specific densities of nitrate to build up a thick coat over all internal and external surfaces of the "pellet", as shown in Figure 4.

The "pellet" is then dipped into graphite and silver to provide a good connection to the Manganese Dioxide cathode plate. Electrical contact is established by deposition of carbon onto the surface of the cathode. The carbon is then coated with a conductive material to facilitate connection to the cathode termination (see Figure 5). Packaging is carried out to meet individual specifications and customer requirements. This manufacturing technique is adhered to for the whole range of AVX tantalum capacitors, which can be sub-divided into four basic groups: Chip / Resin dipped / Rectangular boxed / Axial.

Further information on the production of Tantalum Capacitors can be obtained from the technical paper "Basic Tantalum Technology", by John Gill, available from your local AVX representative.

Figure 5.



Technical Summary and Application Guidelines



SECTION 1

ELECTRICAL CHARACTERISTICS AND EXPLANATION OF TERMS

1.1 CAPACITANCE

1.1.1 Rated capacitance (C_R).

This is the nominal rated capacitance. For tantalum capacitors it is measured as the capacitance of the equivalent series circuit at 20°C using a measuring bridge supplied by a 0.5Vpk-pk 120Hz sinusoidal signal, free of harmonics with a maximum bias of 2.2Vd.c.

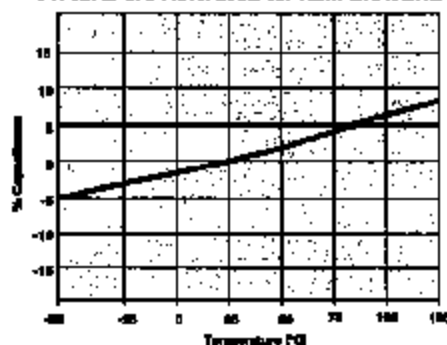
1.1.2 Capacitance tolerance.

This is the permissible variation of the actual value of the capacitance from the rated value. For additional reading, please consult the AVX technical publication "Capacitance Tolerances for Solid Tantalum Capacitors".

1.1.3 Temperature dependence of capacitance.

The capacitance of a tantalum capacitor varies with temperature. This variation itself is dependent to a small extent on the rated voltage and capacitor size.

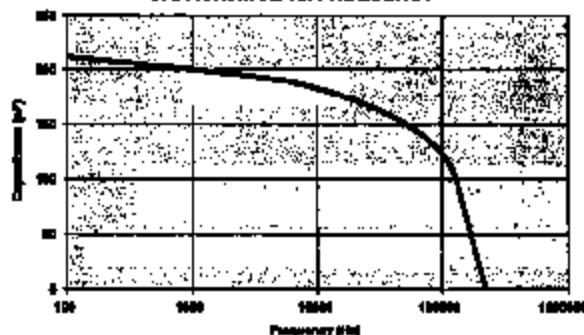
TYPICAL CAPACITANCE vs. TEMPERATURE



1.1.4 Frequency dependence of the capacitance.

The effective capacitance decreases as frequency increases. Beyond 100kHz the capacitance continues to drop until resonance is reached (typically between 0.5 - 5MHz depending on the rating). Beyond the resonant frequency the device becomes inductive.

TAJE227K010
CAPACITANCE vs. FREQUENCY



1.2 VOLTAGE

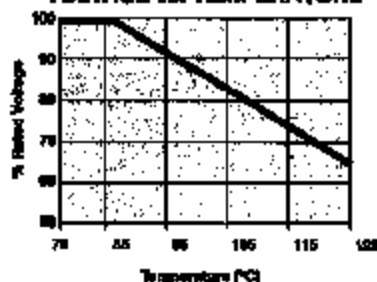
1.2.1 Rated d.c. voltage (V_R)

This is the rated d.c. voltage for continuous operation at 85°C.

1.2.2 Category voltage (V_C)

This is the maximum voltage that may be applied continuously to a capacitor. It is equal to the rated voltage up to +85°C, beyond which it is subject to a linear derating, to 2/3 V_R at 125°C.

MAXIMUM CATEGORY VOLTAGE vs. TEMPERATURE



1.2.3 Surge voltage (V_S)

This is the highest voltage that may be applied to a capacitor for short periods of time in circuits with minimum series resistance of 1Kohm. The surge voltage may be applied up to 10 times in an hour for periods of up to 30 seconds at a time. The surge voltage must not be used as a parameter in the design of circuits in which, in the normal course of operation, the capacitor is periodically charged and discharged.

85°C		125°C	
Rated Voltage (Vdc.)	Surge Voltage (Vdc.)	Category Voltage (Vdc.)	Surge Voltage (Vdc.)
4	5.2	2.7	3.2
6.3	8	4	6
10	13	7.0	8
16	20	10	12
20	28	13	16
25	32	17	20
35	46	25	28
50	65	33	40

1.2.4 Effect of surges

The solid Tantalum capacitor has a limited ability to withstand voltage and current surges. This is in common with all other electrolytic capacitors and is due to the fact that they operate under very high electrical stress across the dielectric. For example a 25 volt capacitor has an Electrical Field of 147 KV/mm when operated at rated voltage.



Technical Summary and Application Guidelines

AVX

It is important to ensure that the voltage across the terminals of the capacitor never exceeds the specified surge voltage rating.

Solid tantalum capacitors have a self healing ability provided by the Manganese Dioxide semiconducting layer used as the negative plate. However, this is limited in low impedance applications.

In the case of low impedance circuits, the capacitor is likely to be stressed by current surges. Derating the capacitor by 50% or more increases the reliability of the component. (See Figure 2 page 45). The "AVX Recommended Derating Table" (page 46) summarizes voltage rating for use on common voltage rails, in low impedance applications.

In circuits which undergo rapid charge or discharge a protective resistor of 1 Ω /V is recommended. If this is impossible, a derating factor of up to 70% should be used.

In such situations a higher voltage may be needed than is available as a single capacitor. A series combination should be used to increase the working voltage of the equivalent capacitor: For example two 22 μ F 25V parts in series is equivalent to one 11 μ F 50V part. For further details refer to J.A. Gill's paper "Investigation into the effects of connecting Tantalum capacitors in series", available from AVX offices worldwide.

NOTE:

While testing a circuit (e.g. at ICT or functional) it is likely that the capacitors will be subjected to large voltage and current transients, which will not be seen in normal use. These conditions should be borne in mind when considering the capacitor's rated voltage for use. These can be controlled by ensuring a correct test resistance is used.

1.2.5 Reverse voltage and Non-Polar operation.

The values quoted are the maximum levels of reverse voltage which should appear on the capacitors at any time. These limits are based on the assumption that the capacitors are polarized in the correct direction for the majority of their working life. They are intended to cover short term reversals of polarity such as those occurring during switching transients of during a minor portion of an impressed waveform. Continuous application of reverse voltage without normal polarization will result in a degradation of leakage current. In conditions under which continuous application of a reverse voltage could occur two similar capacitors should be used in a back-to-back configuration with the negative terminations connected together. Under most conditions this combination will have a capacitance one half of the nominal capacitance of either capacitor. Under conditions of isolated pulses or during the first few cycles, the capacitance may approach the full nominal value.

The reverse voltage ratings are designed to cover exceptional conditions of small level excursions into incorrect polarity. The values quoted are not intended to cover continuous reverse operation.

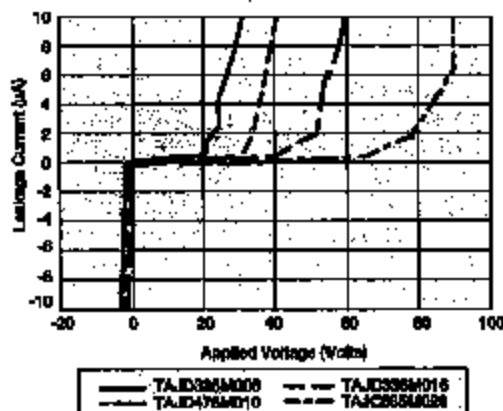
The peak reverse voltage applied to the capacitor must not exceed:

10% of the rated d.c. working voltage to a maximum of 1.0v at 25°C

3% of the rated d.c. working voltage to a maximum of 0.5v at 85°C

1% of the category d.c. working voltage to a maximum of 0.1v at 125°C

LEAKAGE CURRENT vs. BIAS VOLTAGE



1.2.6 Superimposed A.C. Voltage (V.r.m.s.) - Ripple Voltage.

This is the maximum r.m.s. alternating voltage; superimposed on a d.c. voltage, that may be applied to a capacitor. The sum of the d.c. voltage and peak value of the superimposed a.c. voltage must not exceed the category voltage, V_c .

Full details are given in Section 2.

1.2.7 Forming voltage.

This is the voltage at which the anode oxide is formed. The thickness of this oxide layer is proportional to the formation voltage for a tantalum capacitor and is a factor in setting the rated voltage.

1.3 DISSIPATION FACTOR AND TANGENT OF LOSS ANGLE (TAN δ)

1.3.1 Dissipation factor (D.F.).

Dissipation factor is the measurement of the tangent of the loss angle ($\tan \delta$) expressed as a percentage. The measurement of DF is carried out using a measuring bridge which supplies a 0.5Vpk-pk 120Hz sinusoidal signal, free of harmonics with a maximum bias of 2.2Vdc. The value of DF is temperature and frequency dependent.

Note: For surface mounted products the maximum allowed DF values are indicated in the ratings table and it is important to note that these are the limits met by the component AFTER soldering onto the substrate.

Technical Summary and Application Guidelines



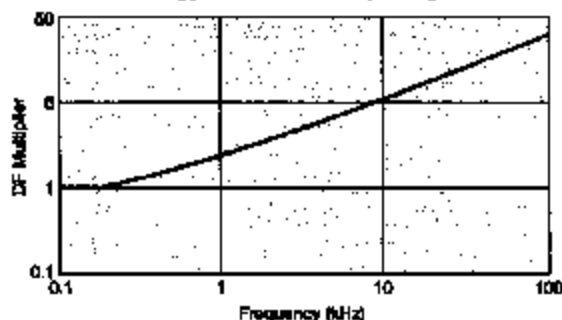
1.3.2 Tangent of Loss Angle (tan δ).

This is a measurement of the energy loss in the capacitor. It is expressed as tan δ and is the power loss of the capacitor divided by its reactive power at a sinusoidal voltage of specified frequency. Terms also used are power factor, loss factor and dielectric loss. Cos (90 - δ) is the true power factor. The measurement of tan δ is carried out using a measuring bridge which supplies a 0.5Vpk-pk 120Hz sinusoidal signal, free of harmonics with a maximum bias of 2.2Vdc.

1.3.3 Frequency dependence of Dissipation Factor.

Dissipation Factor increases with frequency as shown in the typical curves:

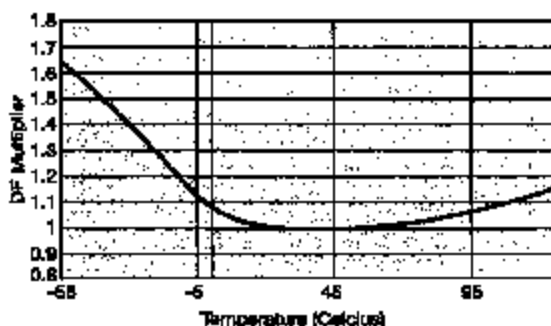
Typical DF vs Frequency



1.3.4 Temperature dependence of Dissipation Factor.

Dissipation factor varies with temperature as the typical curves show. For maximum limits please refer to ratings tables.

Typical DF vs Temperature



1.4 IMPEDANCE, (Z) AND EQUIVALENT SERIES RESISTANCE (ESR)

1.4.1 Impedance, Z.

This is the ratio of voltage to current at a specified frequency. Three factors contribute to the impedance of a tantalum capacitor; the resistance of the semiconductor layer; the capacitance value and the inductance of the electrodes and leads.

At high frequencies the inductance of the leads becomes a limiting factor. The temperature and frequency behavior of these three factors of impedance determine the behavior

of the impedance Z. The impedance is measured at 20°C and 100kHz.

1.4.2 Equivalent Series Resistance, ESR.

Resistance losses occur in all practical forms of capacitors. These are made up from several different mechanisms, including resistance in components and contacts, viscous forces within the dielectric and defects producing bypass current paths. To express the effect of these losses they are considered as the ESR of the capacitor. The ESR is frequency dependent and can be found by using the relationship;

$$ESR = \frac{\tan \delta}{2\pi f C}$$

Where f is the frequency in Hz, and C is the capacitance in farads.

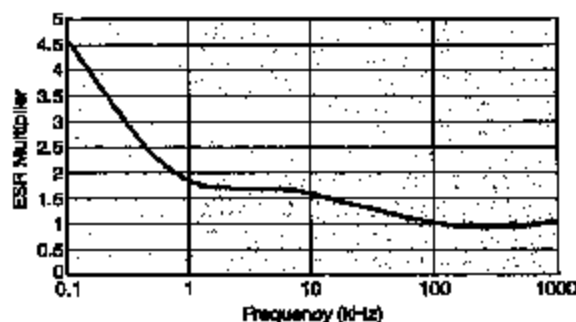
The ESR is measured at 20°C and 100kHz.

ESR is one of the contributing factors to impedance, and at high frequencies (100kHz and above) it becomes the dominant factor. Thus ESR and impedance become almost identical, impedance being only marginally higher.

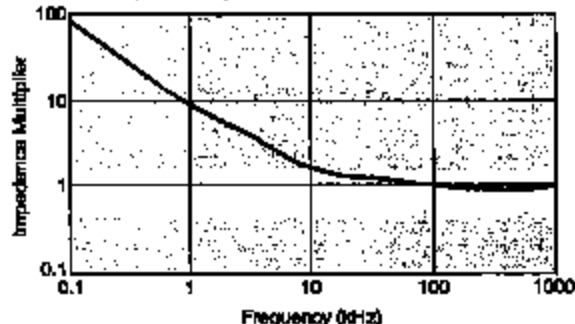
1.4.3 Frequency dependence of Impedance and ESR.

ESR and impedance both increase with decreasing frequency. At lower frequencies the values diverge as the extra contributions to impedance (due to the reactance of the capacitor) become more significant. Beyond 1MHz (and beyond the resonant point of the capacitor) impedance again increases due to the inductance of the capacitor.

Typical ESR vs Frequency



Typical Impedance vs Frequency



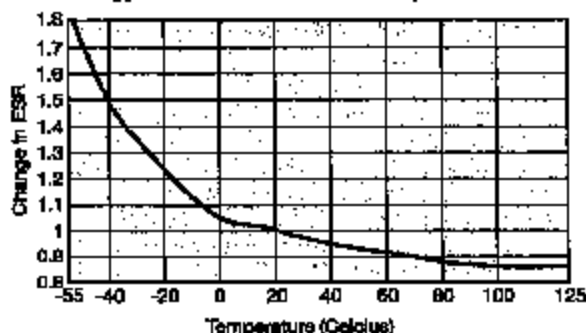
Technical Summary and Application Guidelines



1.4 Temperature dependence of the Impedance and ESR.

At 100kHz, impedance and ESR behave identically and decrease with increasing temperature as the typical curves show.

Typical 100kHz ESR vs Temperature



1.5 D.C. LEAKAGE CURRENT

1.5.1 Leakage current.

The leakage current is dependent on the voltage applied, the elapsed time since the voltage was applied and the component temperature. It is measured at +20°C with the rated voltage applied. A protective resistance of 1000Ω is connected in series with the capacitor in the measuring circuit. Three to five minutes after application of the rated voltage the leakage current must not exceed the maximum values indicated in the ratings table. These are based on the formulae 0.01CV or 0.5μA (whichever is the greater).

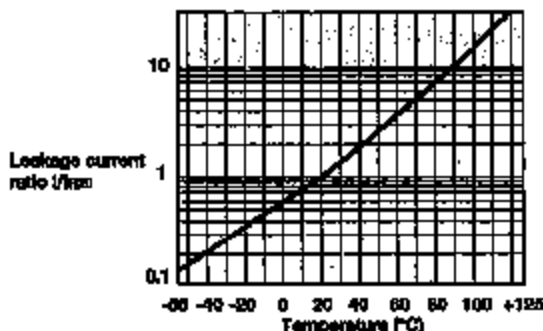
Reforming of tantalum capacitors is unnecessary even after prolonged storage periods without the application of voltage.

1.5.2 Temperature dependence of the leakage current.

The leakage current increases with higher temperatures, typical values are shown in the graph. For operation between 85°C and 125°C, the maximum working voltage must be derated and can be found from the following formula.

$$V_{max} = \left(1 - \frac{T - 85}{125}\right) \times V_R \text{ volts, where } T \text{ is the required operating temperature.}$$

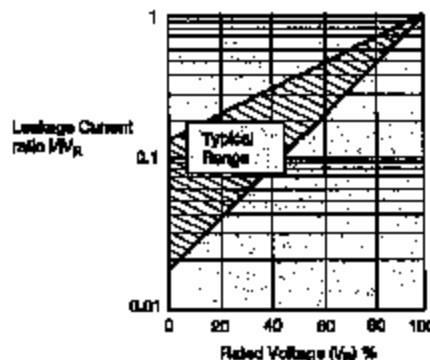
LEAKAGE CURRENT vs. TEMPERATURE



1.5.3 Voltage dependence of the leakage current.

The leakage current drops rapidly below the value corresponding to the rated voltage V_R when reduced voltages are applied. The effect of voltage derating on the leakage current is shown in the graph. This will also give a significant increase in the reliability for any application. See Section 3.1 for details.

LEAKAGE CURRENT vs. RATED VOLTAGE



For additional information on Leakage Current, please consult the AVX technical publication "Analysis of Solid Tantalum Capacitor Leakage Current" by R. W. Franklin.

1.5.4 Ripple current.

The maximum ripple current allowed is derived from the power dissipation limits for a given temperature rise above ambient temperature (please refer to Section 2).

Technical Summary and Application Guidelines



SECTION 2

A.C. OPERATION, RIPPLE VOLTAGE AND RIPPLE CURRENT

2.1 RIPPLE RATINGS (A.C.)

In an a.c. application heat is generated within the capacitor by both the a.c. component of the signal (which will depend upon the signal form, amplitude and frequency), and by the d.c. leakage. For practical purposes the second factor is insignificant. The actual power dissipated in the capacitor is calculated using the formula:

$$P = I^2 R$$

and rearranged to $I = \sqrt{\frac{P}{R}}$ (Eq. 1)

and substituting

$$P = \frac{E^2 R}{Z^2}$$

where I = rms ripple current, amperes
 R = equivalent series resistance, ohms
 E = rms ripple voltage, volts
 P = power dissipated, watts
 Z = impedance, ohms, at frequency under consideration

Maximum a.c. ripple voltage (E_{max}).

From the previous equation:

$$E_{max} = Z \sqrt{\frac{P}{R}} \text{(Eq. 2)}$$

Where P is the maximum permissible power dissipated as listed for the product under consideration (see tables). However care must be taken to ensure that:

1. The d.c. working voltage of the capacitor must not be exceeded by the sum of the positive peak of the applied a.c. voltage and the d.c. bias voltage.
2. The sum of the applied d.c. bias voltage and the negative peak of the a.c. voltage must not allow a voltage reversal in excess of the "Reverse Voltage".

Historical ripple calculations.

Previous ripple current and voltage values were calculated using an empirically derived power dissipation required to give a 10°C rise of the capacitors body temperature from room temperature, usually in free air. These values are shown in Table I. Equation 1 then allows the maximum ripple current to be established, and Equation 2, the maximum ripple voltage. But as has been shown in the AVX article on thermal management by I. Salisbury, the thermal conductivity of a Tantalum chip capacitor varies considerably depending upon how it is mounted.

Table I: Power Dissipation Ratings (In Free Air)

TAJ/TPS/GWR11/THJ
Series Molded Chip

Case size	Max. power dissipation (W)
A	0.075
B	0.090
C	0.110
D	0.150
E	0.180
F	0.255
S	0.265
T	0.280
V	0.280
W	0.290
Y	0.185

TAZ/GWR09
Series Molded Chip

Case size	Max. power dissipation (W)
A	0.050
B	0.070
C	0.075
D	0.090
E	0.090
F	0.100
G	0.125
H	0.150

TAJ/TPS/GWR11/THJ
TAZ/GWR09
Series Molded Chip

Temperature correction factor for ripple current	
Temp. °C	Factor
+25	1.0
+35	0.95
+45	0.90
+125	0.40

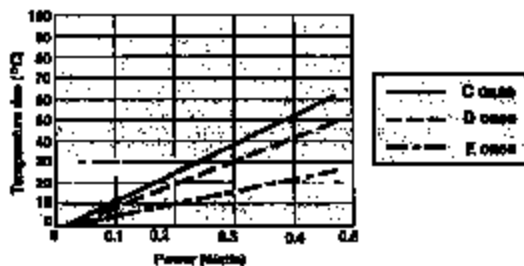


Technical Summary and Application Guidelines



A piece of equipment was designed which would pass sine and square wave currents of varying amplitudes through a biased capacitor. The temperature rise seen on the body for the capacitor was then measured using an infra-red probe. This ensured that there was no heat loss through any thermocouple attached to the capacitor's surface.

Results for the C, D and E case sizes



Several capacitors were tested and the combined results are shown above. All these capacitors were measured on FR4 board, with no other heatsinking. The ripple was supplied at various frequencies from 1KHz to 1MHz.

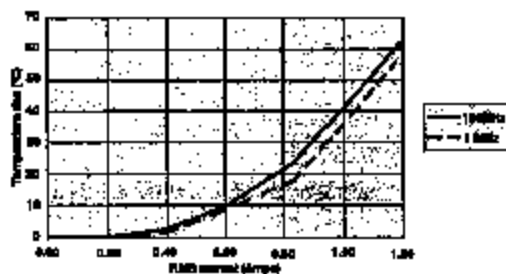
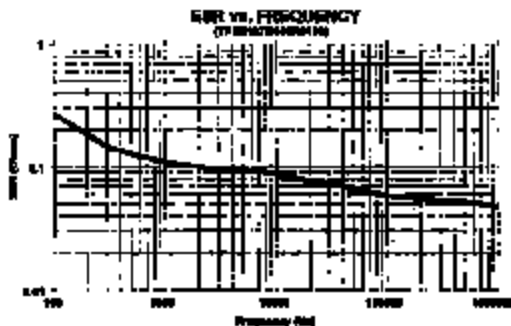
As can be seen in the figure above, the average P_{max} value for the C case capacitors was 0.11 Watts. This is the same as that quoted in Table I.

The D case capacitors gave an average P_{max} value 0.125 Watts. This is lower than the value quoted in the Table I by 0.025 Watts.

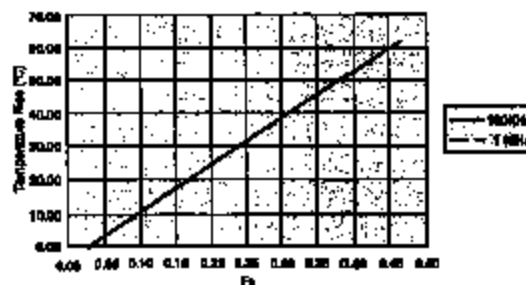
The E case capacitors gave an average P_{max} of 0.200 Watts which was much higher than the 0.165 Watts from Table I.

If a typical capacitor's ESR with frequency is considered, e.g. figure below, it can be seen that there is variation. Thus for a set ripple current, the amount of power to be dissipated by the capacitor will vary with frequency. This is clearly shown in figure in top of next column, which shows that the surface temperature of the unit rises less for a given value of ripple current at 1MHz than at 100KHz.

The graph below shows a typical ESR variation with frequency. Typical ripple current versus temperature rise for 100KHz and 1MHz sine wave inputs.



If P_R is then plotted it can be seen that the two lines are in fact coincident, as shown in figure below.



Example

A Tantalum capacitor is being used in a filtering application, where it will be required to handle a 2 Amp peak-to-peak, 200KHz square wave current.

A square wave is the sum of an infinite series of sine waves at all the odd harmonics of the square wave's fundamental frequency. The equation which relates is:

$$i_{total} = i_m \sin(2\pi f) + \frac{1}{3} i_m \sin(6\pi f) + \frac{1}{5} i_m \sin(10\pi f) + \frac{1}{7} i_m \sin(14\pi f) + \dots$$

Thus the special components are:

Frequency	Peak-to-peak current (Amps)	RMS current (Amps)
200 KHz	2.000	0.707
600 KHz	0.667	0.236
1 MHz	0.400	0.141
* 1 MHz	0.286	0.101

Let us assume the capacitor is a TA1D688M008

Typical ESR measurements would yield.

Frequency	Typical ESR (Ohms)	Power (Watts) $i_{rms}^2 \times ESR$
200 KHz	0.125	0.060
600 KHz	0.115	0.028
1 MHz	0.091	0.012
* 1 MHz	0.110	0.001

Thus the total power dissipation would be 0.069 Watts.

From the D case results shown in figure top of previous column, it can be seen that this power would cause the capacitor's surface temperature to rise by about 5°C. For additional information, please refer to the AVX technical publication "Ripple Rating of Tantalum Chip Capacitors" by R.W. Franklin.

Technical Summary and Application Guidelines



2.2 Thermal Management

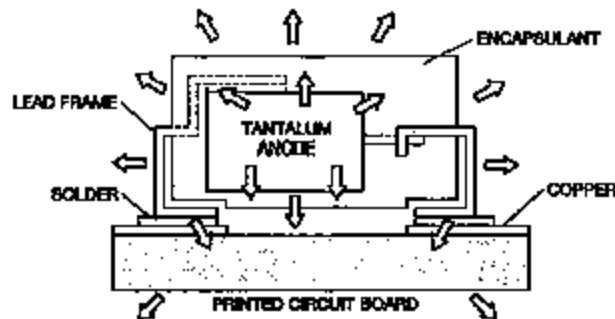
The heat generated inside a tantalum capacitor in a.c. operation comes from the power dissipation due to ripple current. It is equal to I^2R , where I is the rms value of the current at a given frequency, and R is the ESR at the same frequency with an additional contribution due to the leakage current. The heat will be transferred from the outer surface by conduction. How efficiently it is transferred from this point is dependent on the thermal management of the board.

The power dissipation ratings given in Section 2.1 are based on free-air calculations. These ratings can be approached if efficient heat sinking and/or forced cooling is used.

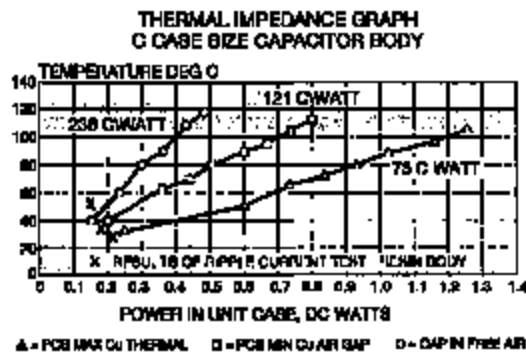
In practice, in a high density assembly with no specific thermal management, the power dissipation required to give a 10°C rise above ambient may be up to a factor of 10 less. In these cases, the actual capacitor temperature should be established (either by thermocouple probe or infra-red scanner) and if it is seen to be above this limit it may be necessary to specify a lower ESR part or a higher voltage rating.

Please contact application engineering for details or contact the AVX technical publication entitled "Thermal Management of Surface Mounted Tantalum Capacitors" by Ian Salisbury.

Thermal Dissipation from the Mounted Chip



Thermal Impedance Graph with Ripple Current



Technical Summary and Application Guidelines

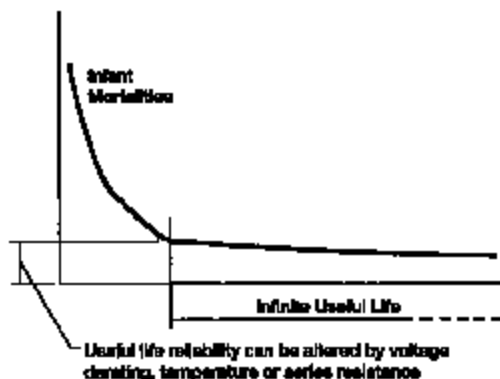


SECTION 3 RELIABILITY AND CALCULATION OF FAILURE RATE

3.1 STEADY-STATE

Tantalum Dielectric has essentially no wear out mechanism and in certain circumstances is capable of limited self healing. However, random failures can occur in operation. The failure rate of Tantalum capacitors will decrease with time and not increase as with other electrolytic capacitors and other electronic components.

Figure 1. Tantalum Reliability Curve



The useful life reliability of the Tantalum capacitor is affected by three factors. The equation from which the failure rate can be calculated is:

$$F = F_U \times F_T \times F_R \times F_B$$

where F_U is a correction factor due to operating voltage/voltage derating
 F_T is a correction factor due to operating temperature
 F_R is a correction factor due to circuit series resistance
 F_B is the basic failure rate level. For standard Tantalum product this is 1%/1000 hours

Base failure rate.

Standard tantalum product conforms to Level M reliability (i.e., 1%/1000 hrs.) at rated voltage, rated temperature, and 0.1Ω/volt circuit impedance. This is known as the base failure rate, F_B , which is used for calculating operating reliability. The effect of varying the operating conditions on failure rate is shown on this page.

Operating voltage/voltage derating.

If a capacitor with a higher voltage rating than the maximum line voltage is used, then the operating reliability will be improved. This is known as voltage derating.

The graph, Figure 2a, shows the relationship between voltage derating (the ratio between applied and rated voltage) and the failure rate. The graph gives the correction factor F_U for any operating voltage.

Figure 2a. Correction factor to failure rate F for voltage derating of a typical component (50% con. level).

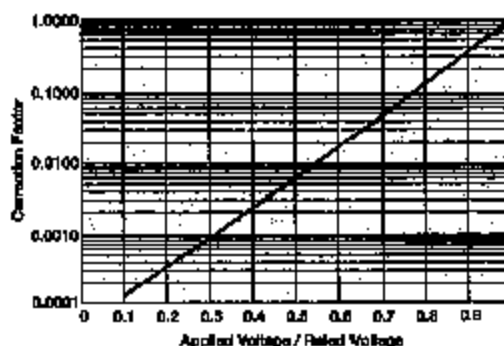


Figure 2b. Gives our recommendation for voltage derating to be used in typical applications.

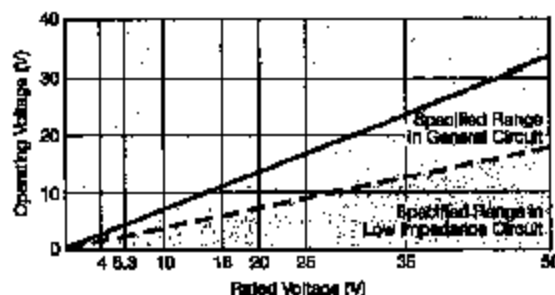
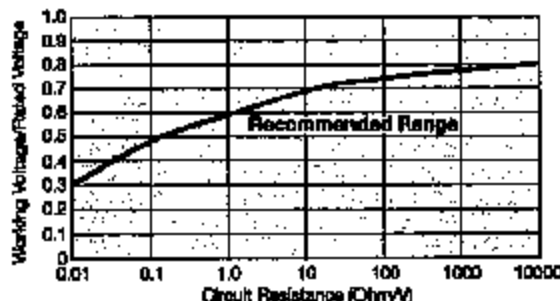


Figure 2c. Gives voltage derating recommendations as a function of circuit impedance.



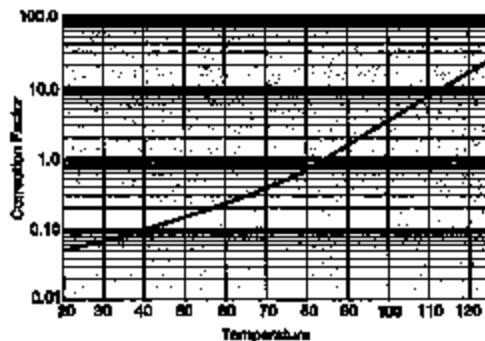
Technical Summary and Application Guidelines



Operating Temperature.

If the operating temperature is below the rated temperature for the capacitor then the operating reliability will be improved as shown in Figure 3. This graph gives a correction factor FT for any temperature of operation.

Figure 3: Correction factor to failure rate F for ambient temperature T for typical component (60% con. level).



Circuit Impedance.

All solid tantalum capacitors require current limiting resistance to protect the dielectric from surges. A series resistor is recommended for this purpose. A lower circuit impedance may cause an increase in failure rate, especially at temperatures higher than 20°C. An inductive low impedance circuit may apply voltage surges to the capacitor and similarly a non-inductive circuit may apply current surges to the capacitor, causing localized over-heating and failure. The recommended impedance is 1 Ω per volt. Where this is not feasible, equivalent voltage derating should be used (See MIL HANDBOOK 217E). The graph, Figure 4, shows the correction factor, FR, for increasing series resistance.

Figure 4. Correction factor to failure rate F for series resistance R on basic failure rate FB for a typical component (60% con. level).

Circuit resistance ohms/volt	FR
3.0	0.07
2.0	0.1
1.0	0.2
0.8	0.3
0.6	0.4
0.4	0.6
0.2	0.8
0.1	1.0

For circuit impedances below 0.1 ohms per volt, or for any mission critical application, circuit protection should be considered. An ideal solution would be to employ an AVX SMT thin-film fuse in series.

Example calculation

Consider a 12 volt power line. The designer needs about 10µF of capacitance to act as a decoupling capacitor near a video bandwidth amplifier. Thus the circuit impedance will be limited only by the output impedance of the board's power unit and the track resistance. Let us assume it to be about 2 Ohms minimum, i.e. 0.167 Ohms/Volt. The operating temperature range is -25°C to +85°C. If a 10µF 16 Volt capacitor was designed in the operating failure rate would be as follows.

- FT = 1.0 @ 85°C
- FR = 0.85 @ 0.167 Ohms/Volt
- FU = 0.08 @ applied voltage/rated voltage = 75%
- FB = 1%/1000 hours, basic failure rate level

Thus $F = 1.0 \times 0.85 \times 0.08 \times 1 = 0.068\%/1000 \text{ Hours}$

If the capacitor was changed for a 20 volt capacitor, the operating failure rate will change as shown.

$$FU = 0.018 \text{ @ applied voltage/rated voltage} = 60\%$$

$$F = 1.0 \times 0.85 \times 0.018 \times 1 = 0.0153\%/1000 \text{ Hours}$$

3.2 Dynamic.

As stated in Section 1.2.4, the solid Tantalum capacitor has a limited ability to withstand voltage and current surges. Such current surges can cause a capacitor to fail. The expected failure rate cannot be calculated by a simple formula as in the case of steady-state reliability. The two parameters under the control of the circuit design engineer known to reduce the incidence of failures are derating and series resistance.

The table below summarizes the results of trials carried out at AVX with a piece of equipment which has very low series resistance with no voltage derating applied. That is the capacitor was tested at its rated voltage.

Results of production scale derating experiment

Capacitance and Voltage	Number of units tested	50% derating applied	No derating applied
10µF 16V	1000	0	0
10µF 20V	1000	0	0
10µF 25V	1000	0	0
10µF 32V	1000	0	0
10µF 40V	1000	0	0
10µF 50V	1000	0	0
10µF 63V	1000	0	0
10µF 80V	1000	0	0
10µF 100V	1000	0	0

As can clearly be seen from the results of this experiment, the more derating applied by the user, the less likely the probability of a surge failure occurring.

It must be remembered that these results were derived from a highly accelerated surge test machine, and failure rates in the low ppm are more likely with the end customer.

A commonly held misconception is that the leakage current of a Tantalum capacitor can predict the number of failures which will be seen on a surge screen. This can be disproved by the results of an experiment carried out at AVX on 47µF 10V surface mount capacitors with different leakage currents. The results are summarized in the table on the following page.

Technical Summary and Application Guidelines



Leakage current vs number of surge failures

	Number tested	Number failed surges
Standard leakage range 0.1 μ A to 1 μ A	10,000	25
Over Catalog limit 5 μ A to 50 μ A	10,000	25
Classified Short Circuit 50 μ A to 500 μ A	10,000	25

Again, it must be remembered that these results were derived from a highly accelerated surge test machine, and failure rates in the low ppm are more likely with the end customer.

AVX recommended derating table

Voltage Rail	Working Cap Voltage
3.3	6.3
5	10
10	20
12	25
15	36
≥ 24	Series Combinations (11)

SECTION 4 APPLICATION GUIDELINES FOR TANTALUM CAPACITORS

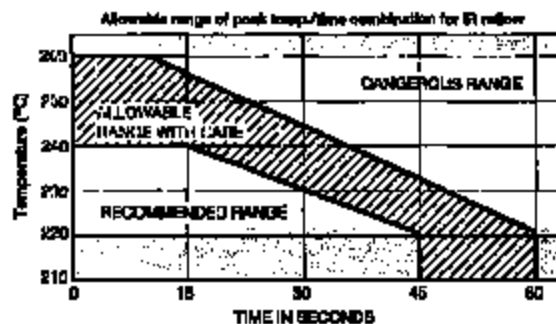
So there is an order improvement in the capacitors steady-state reliability.

Soldering Conditions and Board Attachment.

The soldering temperature and time should be the minimum for a good connection.

A suitable combination for wavesoldering is 230 - 250°C for 3 - 5 seconds.

For vapor phase or infra-red reflow soldering the profile below shows allowable and dangerous time/temperature combinations. The profile refers to the peak reflow tempera-



Under the CECC 00 802 International Specification, AVX Tantalum capacitors are a Class A component.

The capacitors can therefore be subjected to one IR reflow, one wave solder and one soldering iron cycle.

For further details on surge in Tantalum capacitors refer to J.A. Gill's paper "Surge in solid Tantalum capacitors", available from AVX offices worldwide.

An added bonus of increasing the derating applied in a circuit, to improve the ability of the capacitor to withstand surge conditions, is that the steady-state reliability is improved by up to an order. Consider the example of a 6.3 volt capacitor being used on a 5 volt rail.

The steady-state reliability of a Tantalum capacitor is affected by three parameters; temperature, series resistance and voltage derating. Assume 40°C operation and 0.1 Ohms/volt series resistance.

The capacitors reliability will therefore be:

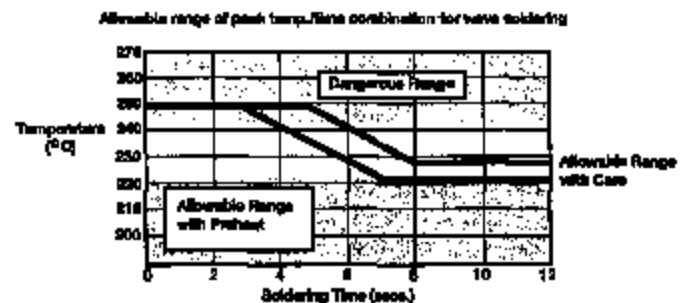
$$\begin{aligned} \text{Failure rate} &= F_U \times F_T \times F_R \times 1\%/1000 \text{ hours} \\ &= 0.15 \times 0.1 \times 1 \times 1\%/1000 \text{ hours} \\ &= 0.015\%/1000 \text{ hours} \end{aligned}$$

If a 10 volt capacitor was used instead, the new scaling factor would be 0.006, thus the steady-state reliability would be:

$$\begin{aligned} \text{Failure rate} &= F_U \times F_T \times F_R \times 1\%/1000 \text{ hours} \\ &= 0.006 \times 0.1 \times 1 \times 1\%/1000 \text{ hours} \\ &= 6 \times 10^{-4} \%/1000 \text{ hours} \end{aligned}$$

ture and is designed to ensure that the temperature of the internal construction of the capacitor does not exceed 220°C. Preheat conditions vary according to the reflow system used, maximum time and temperature would be 10 minutes at 150°C. Small parametric shifts may be noted immediately after reflow, components should be allowed to stabilize at room temperature prior to electrical testing.

Both TAJ and TAZ series are designed for reflow and wave soldering operations. In addition TAZ is available with gold terminations compatible with conductive epoxy or gold wire bonding for hybrid assemblies.



If more aggressive mounting techniques are to be used please consult AVX Tantalum for guidance.

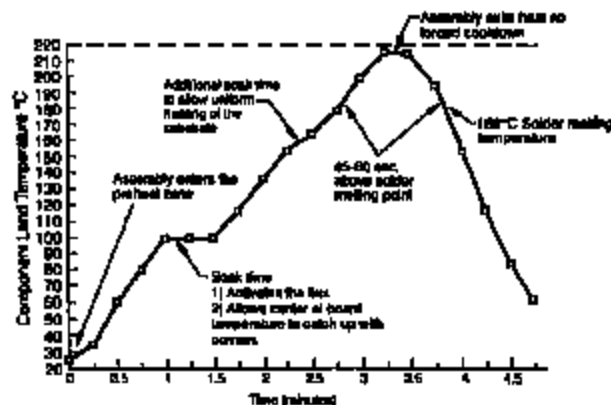
Technical Summary and Application Guidelines



SECTION 4 APPLICATION GUIDELINES FOR TANTALUM CAPACITORS

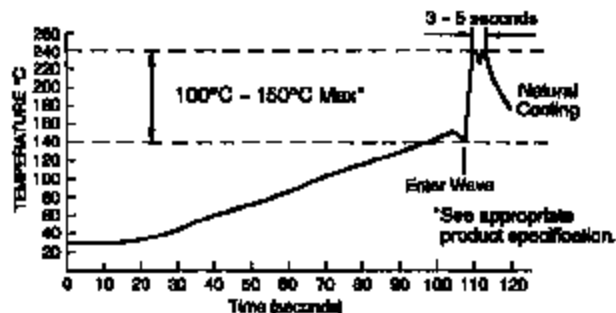
Recommended soldering profiles for surface mounting of tantalum capacitors is provided in figure below.

IR REFLOW



Recommended Ramp Rate Less than 2°C/sec.

WAVE SOLDERING



LEAD FREE PROGRAM

AVX will implement a change to the termination finish on its TAJ, THJ and TPS series surface mount tantalum capacitors effective January 1, 2001.

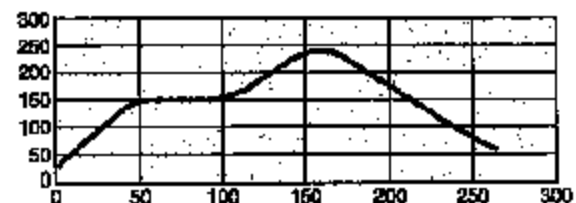
After that date all products manufactured will utilize lead free terminations.

The termination is compatible with the following lead free solder pastes; SnCu, SnCuAg and SnCuAgBi.

It is also compatible with existing SnPb solder pastes / systems in use today.

The recommended IR reflow profile is shown below.

LEAD FREE REFLOW PROFILE



- Pre-heating: 150 ±15C / 60-90s
- Max. Peak Gradient 2.5C/s
- Peak Temperature: 240 ±5C
- Time at >230C: 40s Max.

The following should be noted by customers changing from lead based systems to the new lead free pastes.

- a) The visual standards used for evaluation of solder joints will need to be modified as lead free joints are not as bright as with tin-lead pastes and the fillet may not be as large.
- b) Resin color may darken slightly due to the increase in temperature required for the new pastes.
- c) Lead free solder pastes do not allow the same self alignment as lead containing systems. Standard mounting pads are acceptable, but machine set up may need to be modified.



Technical Summary and Application Guidelines



SECTION 5 MECHANICAL AND THERMAL PROPERTIES OF CAPACITORS

5.1 Acceleration

98.1m/s² (10g)

5.2 Vibration Severity

10 to 2000Hz, 0.76mm of 98.1m/s² (10g)

5.3 Shock

Trapezoidal Pulse, 98.1m/s² for 6ms.

5.4 Adhesion to Substrate

IEC 384-3, minimum of 5N.

5.5 Resistance to Substrate Bending

The component has compliant leads which reduces the risk of stress on the capacitor due to substrate bending.

5.6 Soldering Conditions

Dip soldering is permissible provided the solder bath temperature is $\leq 270^{\circ}\text{C}$, the solder time < 3 seconds and the circuit board thickness $\geq 1.0\text{mm}$.

5.7 Installation Instructions

The upper temperature limit (maximum capacitor surface temperature) must not be exceeded even under the most unfavorable conditions when the capacitor is installed. This must be considered particularly when it is positioned near components which radiate heat strongly (e.g. valves and power transistors). Furthermore, care must be taken, when bending the wires, that the bending forces do not strain the capacitor housing.

5.8 Installation Position

No restriction.

5.9 Soldering Instructions

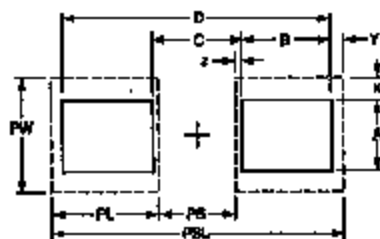
Fluxes containing acids must not be used.

5.9.1 Guidelines for Surface Mount Footprints

Component footprint and reflow pad design for AVX capacitors.

The component footprint is defined as the maximum board area taken up by the terminators. The footprint dimensions are given by A, B, C and D in the diagram, which corresponds to W, max, A max, S min, and L max, for the component. The footprint is symmetric about the center lines.

The dimensions x, y and z should be kept to a minimum to reduce rotational tendencies while allowing for visual inspection of the component and its solder fillet.



Dimensions PS (Pad Separation) and PW (Pad Width) are calculated using dimensions x and z. Dimension y may vary, depending on whether reflow or wave soldering is to be performed.

For reflow soldering, dimensions PL (Pad Length), PW (Pad Width), and PSL (Pad Set Length) have been calculated. For wave soldering the pad width (PWW) is reduced to less than the termination width to minimize the amount of solder pick up while ensuring that a good joint can be produced.

NOTE: These recommendations (also in compliance with EIA) are guidelines only. With care and control, smaller footprints may be considered for reflow soldering.

Nominal footprint and pad dimensions for each case size are given in the following tables:

PAD DIMENSIONS: millimeters (inches)

CASE	PBL	PL	PS	PW	PWW	
TAJ	A	4.0 (0.157)	1.4 (0.054)	1.2 (0.047)	1.8 (0.071)	0.9 (0.035)
	B	4.0 (0.157)	1.4 (0.054)	1.2 (0.047)	2.8 (0.110)	1.8 (0.069)
	C	8.0 (0.315)	2.0 (0.079)	2.6 (0.099)	2.8 (0.110)	1.8 (0.069)
	D	8.0 (0.315)	2.0 (0.079)	4.0 (0.157)	3.0 (0.118)	1.7 (0.068)
	E	8.0 (0.315)	2.0 (0.079)	3.7 (0.146)	3.7 (0.146)	1.7 (0.068)
	F	8.0 (0.315)	2.0 (0.079)	4.0 (0.157)	3.0 (0.118)	1.7 (0.068)
	G	2.7 (0.106)	1.0 (0.040)	1.0 (0.040)	1.8 (0.070)	0.8 (0.031)
	H	4.0 (0.157)	1.4 (0.054)	1.0 (0.040)	1.8 (0.070)	0.8 (0.031)
TPS	I	4.0 (0.157)	1.4 (0.054)	1.0 (0.040)	2.8 (0.110)	0.8 (0.031)
	J	8.0 (0.315)	2.0 (0.079)	2.8 (0.099)	2.8 (0.110)	1.8 (0.069)
	K	8.0 (0.315)	2.0 (0.079)	4.0 (0.157)	3.0 (0.118)	1.7 (0.068)
	L	2.4 (0.094)	0.7 (0.027)	0.9 (0.035)	1.0 (0.039)	-
	M	8.0 (0.315)	2.0 (0.079)	0.7 (0.027)	1.8 (0.070)	1.0 (0.039)
	N	8.0 (0.315)	2.0 (0.079)	0.9 (0.035)	2.8 (0.110)	1.0 (0.039)
	O	4.6 (0.179)	1.4 (0.054)	1.8 (0.070)	2.6 (0.099)	1.0 (0.039)
	P	4.6 (0.179)	1.4 (0.054)	1.8 (0.070)	3.6 (0.142)	2.0 (0.079)
TAZ	Q	8.0 (0.315)	1.4 (0.054)	3.0 (0.120)	3.6 (0.142)	2.2 (0.085)
	R	8.0 (0.315)	1.4 (0.054)	3.8 (0.149)	4.8 (0.189)	3.0 (0.118)
	S	7.4 (0.291)	1.8 (0.071)	3.7 (0.146)	4.0 (0.157)	2.4 (0.093)
	T	8.0 (0.315)	1.9 (0.074)	4.2 (0.165)	6.0 (0.236)	3.4 (0.133)
	U	8.0 (0.315)	1.9 (0.074)	4.2 (0.165)	6.0 (0.236)	3.4 (0.133)
	V	8.0 (0.315)	1.9 (0.074)	4.2 (0.165)	6.0 (0.236)	3.4 (0.133)
	W	8.0 (0.315)	1.9 (0.074)	4.2 (0.165)	6.0 (0.236)	3.4 (0.133)
	X	8.0 (0.315)	1.9 (0.074)	4.2 (0.165)	6.0 (0.236)	3.4 (0.133)

5.10 PCB Cleaning

Ta chip capacitors are compatible with most PCB board cleaning systems.

If aqueous cleaning is performed, parts must be allowed to dry prior to test. In the event ultrasonics are used power levels should be less than 10 watts per/litre, and care must be taken to avoid vibrational nodes in the cleaning bath.

SECTION 6 EPOXY FLAMMABILITY

EPOXY	UL RATING	OXYGEN INDEX
TAJ	UL94 V-0	35%
TPS	UL94 V-0	35%
TAZ	UL94 V-0	35%
THJ	UL94 V-0	35%

SECTION 7 QUALIFICATION APPROVAL STATUS

DESCRIPTION	STYLE	SPECIFICATION
Surface mount capacitors	TAJ	CERD 50601 - 006 Issue 2 CERD 50601 - 011 Issue 1 MIL-C-55365/8 (CWR11)
	TAZ	MIL-C-85365/4 (CWR09)

TAJ, TPS, THJ & TAC Series



Tape and Reel Packaging

Tape and reel packaging for automatic component placement.
Please enter required Suffix on order. Bulk packaging is not available.

TAJ, TPS AND TAC TAPING SUFFIX TABLE

Case Size reference	Tape width mm	P mm	Suffix (R) reel		Suffix (S) reel	
			Suffix	Qty.	Suffix	Qty.
A	8	4	R	2000	S	5000
B	8	4	R	2000	S	5000
C	12	8	R	800	S	3000
D	12	8	R	500	S	2500
E	12	8	R	400	S	1500
V	12	8	R	400	S	1500
R	8	4	R	2500	S	10000
S	8	4	R	2500	S	10000
T	8	4	R	2500	S	10000
W	12	8	R	1000	S	5000
Y	12	8	R	1000	S	4000
X	12	8	R	1000	S	5000
TACR	8	4	X	500	R	2500
TACL	8	4	X	500	R	3500

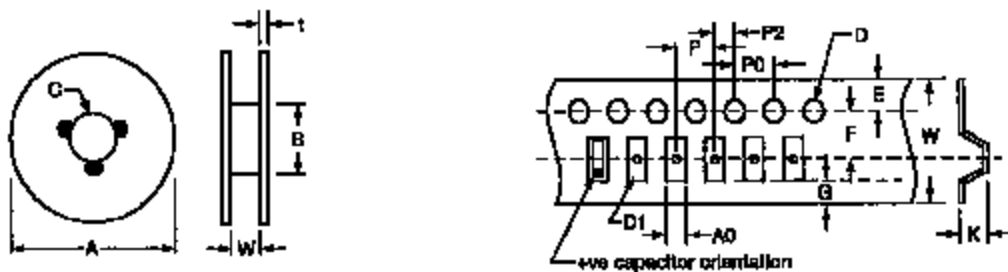
TAPE SPECIFICATION

Tape dimensions comply to EIA 481-1
Dimensions A₀ and B₀ of the pocket and the tape thickness, K, are dependent on the component size.
Tape materials do not affect component solderability during storage. Carrier Tape Thickness <0.4mm.

PLASTIC TAPE DIMENSIONS

Code	A ₀	B ₀	K	W	E	F	G	P	P2	P ₀	D	D1
A	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
B	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
C	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
D	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
E	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
V	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
R	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
S	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
T	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
W	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
Y	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
X	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
TACR	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
TACL	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02

Code	A ₀	B ₀	K	W	E	F	G	P	P2	P ₀	D	D1
A	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
B	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
C	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
D	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
E	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
V	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
R	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
S	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
T	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
W	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
Y	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
X	2.14±0.02	2.27±0.02	0.5±0.01	12±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
TACR	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02
TACL	1.14±0.02	1.27±0.02	0.5±0.01	8±0.1	1.2±0.02	2.5±0.02	3.2±0.02	4.0±0.02	2.0±0.02	2.0±0.02	2.2±0.02	1.2±0.02



REEL DIMENSIONS

Code	Tape	A	B	C	W	t
R	12mm	160±2.0	50 min	13±0.6	12.4±1.5,-0	1.6±0.6
R	8mm	180±2.0	50 min	13±0.6	8.4±1.8,-0	1.6±0.6
S	12mm	330±2.0	80 min	13±0.6	12.4±1.5,-0	1.6±0.6
S	8mm	330±2.0	50 min	13±0.6	8.4±1.8,-0	1.6±0.6
X	8mm	100±2.0		13±0.6	8.4±1.8,-0	1.6±0.6

Cover Tape Dimensions

Thickness: 75±25µm
Width of tape:
5.5mm + 0.2mm (8mm tape)
9.5mm + 0.2mm (12mm tape)



TAJ, THJ & TPS Marking

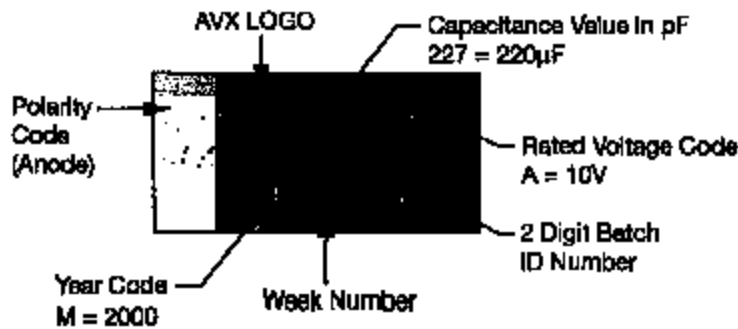


For TAJ & TPS & THJ, the positive end of body has visible readable polarity marking as shown in the diagram. Bodies are marked by indelible laser marking on top surface with capacitance value, voltage and date of manufacture and batch ID number. R case is an exception due to the small size in which only the voltage and capacitance values are printed.

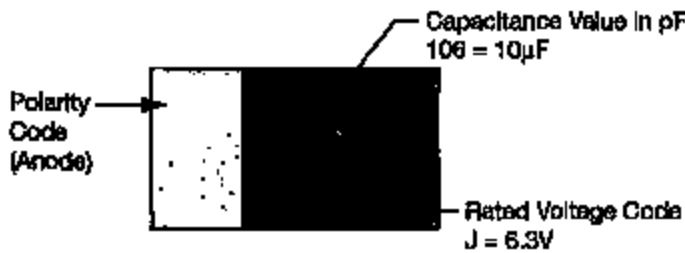
Year	Year Code
1999	L
2000	M
2001	N
2002	P

Voltage Code	Rated Voltage at 85°C
F	2
G	4
J	6.3
A	10
C	16
D	20
E	25
V	35
T	50

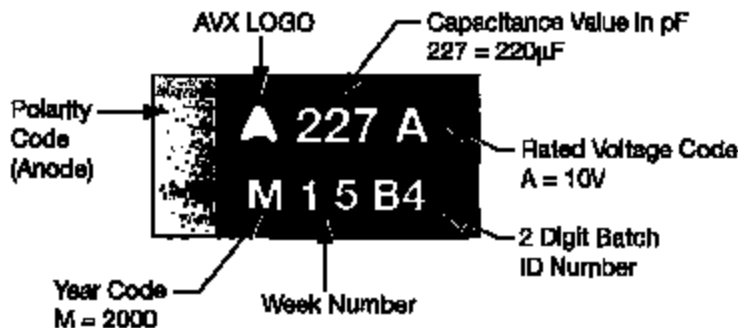
TAJ & TPS - A, B, C, D, E, S, T, V, W, Y AND X CASE:



TAJ - R CASE:



THJ - A, B, C, D AND E CASE:



TAZ, CWR09, CWR11 Series



Tape and Reel Packaging

Solid Tantalum Chip TAZ Tape and reel packaging for automatic component placement.
Please enter required Suffix on order. Bulk packaging is standard.

TAZ TAPING SUFFIX TABLE

Case Size reference	Tape width mm	P mm	7" (180mm) reel Suffix	Qty.	12" reel (300mm) reel Suffix	Qty.
A	8	4	R	2500	G	8000
B	12	4	R	2500	S	8000
D	12	4	R	2500	G	8000
E	12	4	R	2500	S	8000
F	12	8	R	1000	S	3000
G	12	8	R	500	S	2500
H	12	8	R	500	S	2500

Total Tape Thickness — K max	
Case size reference	Millimeters (inches) DIM
A	2.0 (0.078)
B	4.0 (0.157)
D	4.0 (0.157)
E	4.0 (0.157)
F	4.0 (0.157)
G	4.0 (0.157)
H	4.0 (0.157)

Code	8mm Tape		12mm Tape	
P*	4±0.1 or 8±0.1	(0.157±0.004) (0.315±0.004)	4±0.1 or 8±0.1	(0.157±0.004) (0.315±0.004)
G	0.75 min	(0.03 min)	0.75 min	(0.03 min)
F	3.5±0.05	(0.138±0.002)	5.5±0.05	(0.22±0.002)
E	1.75±0.1	(0.069±0.004)	1.75±0.1	(0.069±0.004)
W	8±0.3	(0.315±0.012)	12±0.3	(0.472±0.012)
Pe	2±0.05	(0.079±0.002)	2±0.05	(0.079±0.002)
Pe	4±0.1	(0.167±0.004)	4±0.1	(0.167±0.004)
D	1.5±0.1 +0	(0.059±0.004) (-0)	1.5±0.1 -0	(0.059±0.004) (-0)
D1	1.0 min	(0.039 min)	1.5 min	(0.059 min)

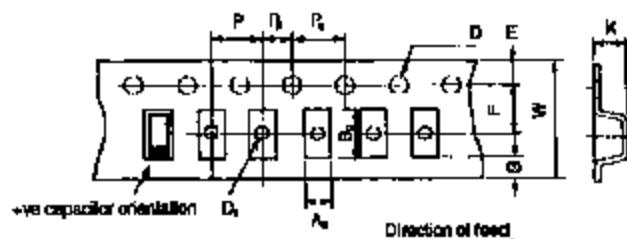
*See taping suffix tables for actual P dimension (component pitch).

TAPE SPECIFICATION

Tape dimensions comply to EIA RS 481 A
Dimensions A_0 and B_0 of the pocket and the tape thickness, K, are dependent on the component size.

Tape materials do not affect component solderability during storage.

Carrier Tape Thickness <0.4mm



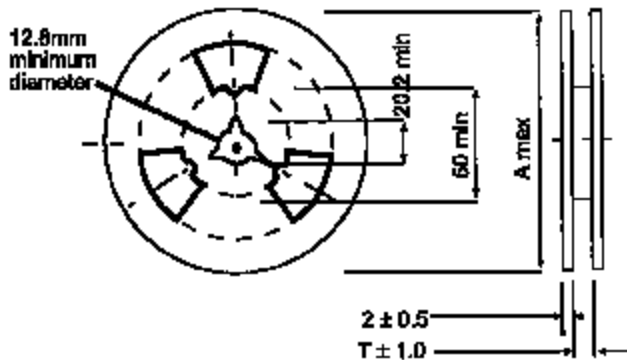
ERR2-827-Q 38889

TAZ, CWR09, CWR11 Series

Tape and Reel Packaging



PLASTIC TAPE REEL DIMENSIONS



Standard Dimensions mm

T: 9.5mm (8mm tape)
13.0mm (12mm tape)

A: See page 48

Cover Tape Dimensions

Thickness: 75±25µ
Width of tape:
5.5mm + 0.2mm (8mm tape)
9.5mm + 0.2mm (12mm tape)

Waffle Packaging - 2" x 2" hard plastic waffle trays. To order Waffle packaging use a "W" in part numbers packaging position.

Case Size	Maximum Quantity Per Waffle
TAZ A	160
TAZ B	112
TAZ D	88
TAZ E	80
TAZ F	48
TAZ G	50
TAZ H	28
CWR11 A	96
CWR11 B	72
CWR11 C	54
CWR11 D	28



NOTE: Orientation of parts in waffle packs varies by case size.

Product Safety Information Sheet



Material Data and Handling

This should be read in conjunction with the Product Data Sheet. Failure to observe the ratings and the information on this sheet may result in a safety hazard.

1. Material Content

Solid tantalum capacitors do not contain liquid hazardous materials.

The operating section contains:

Tantalum	Graphite/carbon
Tantalum oxide	Conducting paint/resins
Manganese dioxide	Fluoropolymers (not TAC)

The encapsulation contains:

TAA - solder, metal case, solder coated terminal wires, glass seal and plastic sleeve

TAC - epoxy molding compound, tin coated terminal pads

TAJ - epoxy molding compound, solder coated terminal pads

TAP - solder, solder coated terminal wires, epoxy dipped resin

THJ - epoxy molding compound, solder coated terminal pads

TPS - epoxy molding compound, solder coated terminal pads

The epoxy resins may contain Antimony trioxide and Bromine compounds as fire retardants. The capacitors do not contain PBB or PBBO/PBBE. The solder alloys may contain lead.

2. Physical Form

These capacitors are physically small and are either rectangular with solderable terminal pads, or cylindrical or bead shaped with solderable terminal wires.

3. Intrinsic Properties

Operating

Solid tantalum capacitors are polarized devices and operate satisfactorily in the correct d.c. mode. They will withstand a limited application of reverse voltage as stated in the data sheets. However, a reverse application of the rated voltage will result in early short circuit failure and may result in fire or explosion. Consequential failure of other associated components in the circuit e.g. diodes, transformers, etc. may also occur. When operated in the correct polarity, a long period of satisfactory operation will be obtained but failure may occur for any of the following reasons:

- normal failure rate
- temperature too high
- surge voltage exceeded
- ripple rating exceeded
- reverse voltage exceeded

If this failure mode is a short circuit, the previous conditions apply. If the adjacent circuit impedance is low, voltage or current surges may exceed the power handling capability of the capacitor. For this reason capacitors in circuits of below 3Q/V should be derated by 50% and precautions taken to prevent reverse voltage spikes. Where capacitors may be subjected to fast switched, low impedance source voltages, the manufacturers advice should be sought to determine the most suitable capacitors for such applications.

Non-operating

Solid tantalum capacitors contain no liquids or noxious gases to leak out. However, cracking or damage to the encapsulation may lead to premature failure due to ingress of material such as cleaning fluids or to stresses transmitted to the tantalum anode.

4. Fire Characteristics

Primary

Any component subject to abnormal power dissipation may

- self ignite
- become red hot
- break open or explode emitting flaming or red hot material, solid, molten or gaseous.

Fumes from burning components will vary in composition depending on the temperature, and should be considered to be hazardous, although fumes from a single component in a well ventilated area are unlikely to cause problems.

Secondary

Induced ignition may occur from an adjacent burning or red hot component. Epoxy resins used in the manufacture of capacitors give off noxious fumes when burning as stated above. Wherever possible, capacitors comply with the following: BS EN 60066

UL 492,80A/280

LOI (ASTM D2953-70) as stated in the data sheets.

5. Storage

Solid tantalum capacitors exhibit a very low random failure rate after long periods of storage and apart from this there are no known modes of failure under normal storage conditions. All capacitors will withstand any environmental conditions within their ratings for the periods given in the detail specifications. Storage for longer periods under high humidity conditions may affect the leakage current of resin protected capacitors. Solderability of solder coated surfaces may be affected by storage of excess of one year under high temperatures (>40°C) or humidity (>80%RH).

6. Disposal

Incineration of epoxy coated capacitors will cause emission of noxious fumes and metal cased capacitors may explode due to build up of internal gas pressure. Disposal by any other means normally involves no special hazards. Large quantities may have salvage value.

7. Unsafe Use

Most failures are of a passive nature and do not represent a safety hazard. A hazard may, however, arise if this failure causes a dangerous malfunction of the equipment in which the capacitor is employed. Circuits should be designed to fail safe under the normal modes of failure. The usual failure mode is an increase in leakage current or short circuit. Other possible modes are decrease of capacitance, increase in dissipation factor (and impedance) or an open-circuit. Operations outside the ratings quoted in the data sheets represents unsafe use.

8. Handling

Careless handling of the cut terminal leads could result in scratches and/or skin punctures. Hands should be washed after handling solder coated terminals before eating or smoking, to avoid ingestion of lead. Capacitors must be kept out of the reach of small children. Care must be taken to discharge capacitors before handling as capacitors may retain a residual charge even after equipment in which they are being used has been switched off. Sparks from the discharge could ignite a flammable vapor.



Product Safety Information Sheet



Environmental Information

AVX has always sought to minimize the environmental impact of its manufacturing operations and of its tantalum capacitors supplied to customers throughout the world.

We have a policy of preventing and minimizing waste streams during manufacture, and recycling materials wherever possible. We actively avoid or minimize environmentally hazardous materials in our production processes.

1. Material Content

For customers wishing to assess the environmental impact of AVX's capacitors contained in waste electrical and electronic equipment, the following information is provided:

Surface mount tantalum capacitors contain:

- Tantalum and Tantalum oxide
- Manganese dioxide
- Carbon/graphite
- Silver
- Nickel-iron alloy or Copper alloy depending on design (consult factory for details)
- Tin-lead alloy plating
- Polymers including fluorinated polymers
- Epoxy resin encapsulant

The encapsulant is made fire retardant to UL 94 V-0 by the inclusion of inert mineral filler, antimony trioxide and an organic bromine compound.

2. AVX capacitors do not contain any Poly Brominated Biphenyl (PBB) or PBBE/PBBO.

The approximate content of some materials is given in the table below:

Case Size	Typical Weight mg	Lead %	Antimony Trioxide %	Organic Bromine Compound %
A	25	0.18	1.7	2.5
B	85	0.11	1.4	2.1
C	137	0.04	2.3	3.4
D	330	0.023	1.5	2.2
E	480	0.017	1.2	1.8

The specific weight of other materials contained in the various case sizes is available on written request.

The component packing tape is either recyclable Polycarbonate or PVC (depending on case size), and the sealing tape is a laminate of halogen-free polymers. The reels are recyclable polystyrene, and marked with the recycling symbol. The reels are over-packed in recyclable fiber board boxes. None of the packing contains heavy metals.

3. Future Proposals

Lead

TAJ, TPS and THJ series supplied today are electroplated over the terminal contact area with 90:10 tin:lead alloy. Although the lead comprises much less than 0.2% of the component weight, TAC series currently have lead free (100% tin) terminations. Parts will be converted to 100% tin in 2001.

4. Fire Retardants

Currently the only known way of supplying a fire retardant encapsulant which meets all our performance requirements, is to incorporate antimony trioxide and an organic bromine compound. These materials are commonly used in many plastic items in the home and industry. We expect to be able to offer an alternative fire retardant encapsulant, free of these materials, by 2004. A combustible encapsulant free of these materials could be supplied today, but AVX believes that the health and safety benefits of using these materials to provide fire retardancy during the life of the product, far outweigh the possible risks to the environment and human health.

5. Nickel alloy

It is intended that all case sizes will be made with a high copper alloy termination. Some case sizes are supplied now with this termination, and other sizes may be available. Please contact AVX if you prefer this.

6. Recycling

Surface mount tantalum capacitors have a very long service life with no known wear-out mechanism, and a low failure rate. However, parts contained in equipment which is of no further use will have some residual value mainly because of the tantalum metal contained. This can be recovered and recycled by specialist companies. The silver and nickel or copper alloy will also have some value. Please contact AVX if you require assistance with the disposal of parts. Packaging can be recycled as described above.

7. Disposal

Surface mount tantalum capacitors do not contain any liquids and no part of the device is normally soluble in water at neutral pH values. Incineration will cause the emission of noxious fumes and is not recommended except by specialists. Land fill may be considered for disposal, bearing in mind the small lead content.

Some commonly asked questions regarding Tantalum Capacitors:

Question: If I use several tantalum capacitors in serial/parallel combinations, how can I ensure equal current and voltage sharing?

Answer: Connecting two or more capacitors in series and parallel combinations allows almost any value and rating to be constructed for use in an application. For example, a capacitance of more than 80 μ F is required in a circuit for stable operation. The working voltage rail is 24 volts dc with a superimposed ripple of 1.5 volts at 120 Hz.

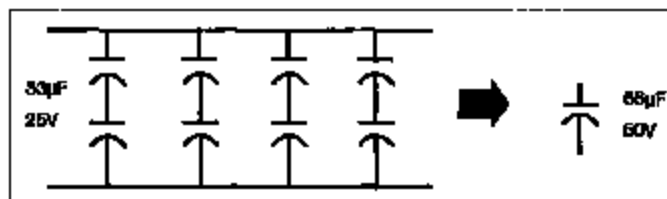
The maximum voltage seen by the capacitor is $V_{dc} + V_{ac} = 25.5V$

Applying the 50% derating rule tells us that a 50V capacitor is required.

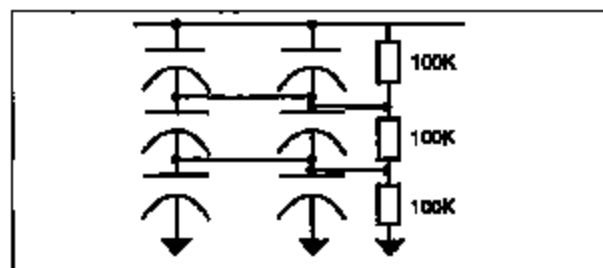
Connecting two 25V rated capacitors in series will give the required capacitance voltage rating, but the



effective capacitance will be halved, so for greater than 80 μ F, four such series combinations are required, as shown.



In order to ensure reliable operation, the capacitors should be connected as shown below to allow current sharing of the ac noise and ripple signals. This prevents any one capacitor heating more than its neighbors and thus being the weak link in the chain.



The two resistors are used to ensure that the leakage currents of the capacitors does not affect the circuit reliability, by ensuring that all the capacitors have half the working voltage across them.

Question: What are the advantages of tantalum over other capacitor technologies?

Answer:

1. Tantalum capacitors have high volumetric efficiency.
2. Electrical performance over temperature is very stable.
3. They have a wide operating temperature range -55 degrees C to +125 degrees C.
4. They have better frequency characteristics than aluminum electrolytics.
5. No wear out mechanism. Because of their construction, solid tantalum capacitors do not degrade in performance or reliability over time.

Question: How does TPS differ from your standard product?

Answer: TPS has been designed from the initial anode production stages for power supply applications. Special manufacturing processes provide the most robust capacitor dielectric by maximizing the volumetric efficiency of the package. After manufacturing, parts are conditioned by being subjected to elevated temperature overvoltage burn in applied for a minimum of two hours. Parts are monitored on a 100% basis for their direct current leakage performance at elevated temperatures. Parts are then subjected to a low impedance current surge. This current surge is performed on a 100% basis with each capacitor individually monitored. At this stage, the capacitor undergoes 100% test for capacitance, Dissipation Factor, leakage current, and 100 KHz ESR to TPS requirements.

Question: If the part is rated as a 25 volt part and you have current surged it, why can't I use it at 25 volts in a low impedance circuit?

Answer: The high volumetric efficiency obtained using tantalum technology is accomplished by using an extremely thin film of tantalum pentoxide as the dielectric. Even an application of the relatively low voltage of 25 volts will produce a large field strength as seen by the dielectric. As a result of this, derating has a significant impact on reliability as described under the reliability section. The following example uses a 22 microfarad capacitor rated at 25 volts to illustrate the point. The equation for determining the amount of surface area for a capacitor is as follows:

$$C = (E) (E_s) (A) / d$$

$$A = (C) (d) / (E_s)(E)$$

$$A = (22 \times 10^{-9}) (170 \times 10^{-9}) / (8.85 \times 10^{-12}) (27)$$

$$A = 0.015 \text{ square meters (150 square centimeters)}$$

Where

- C = Capacitance in farads
- A = Dielectric (Electrode) Surface Area (m²)
- d = Dielectric thickness (Space between dielectric) (m)
- E = Dielectric constant (27 for tantalum)
- E_s = Dielectric Constant relative to a vacuum (8.855 x 10⁻¹² Farads x m⁻¹)

To compute the field voltage potential felt by the dielectric we use the following logic.

$$\begin{aligned} \text{Dielectric formation potential} &= \text{Formation Ratio} \times \\ &\quad \text{Working Voltage} \\ &= 4 \times 25 \\ \text{Formation Potential} &= 100 \text{ volts} \\ \text{Dielectric (Ta}_2\text{O}_5\text{) Thickness (d) is } &1.7 \times 10^{-8} \text{ Meters Per Volt} \\ d &= 0.17 \mu \text{ meters} \\ \text{Electric Field Strength} &= \text{Working Voltage} / d \\ &= (25 / 0.17 \mu \text{ meters}) \\ &= 147 \text{ Kilovolts per} \\ &\quad \text{millimeter} \\ &= 147 \text{ Megavolts} \\ &\quad \text{per meter} \end{aligned}$$

No matter how pure the raw tantalum powder or the precision of processing, there will always be impurity sites in the dielectric. We attempt to stress these sites in the factory with overvoltage surges, and elevated temperature burn in so that components will fail in the factory and not in your product. Unfortunately, within this large area of tantalum pentoxide, impurity sites will exist in all capacitors. To minimize the possibility of providing enough activation energy for these impurity sites to turn from an amorphous state to a crystalline state that will conduct energy, series resistance and derating is recommended. By reducing the electric field within the anode at these sites, the tantalum capacitor has increased reliability. Tantalums differ from other electrolytics in that charge transients are carried by electronic conduction rather than absorption of ions.

Question: What negative transients can Solid Tantalum Capacitors operate under?

Answer: The reverse voltage ratings are designed to cover exceptional conditions of small level excursions into incorrect polarity. The values quoted are not intended to cover continuous reverse operation. The peak reverse voltage applied to the capacitor must not exceed:

- 10% of rated DC working voltage to a maximum of 1 volt at 25°C.
- 3% of rated DC working voltage to a maximum of 0.5 volt at 85°C.
- 1% of category DC working voltage to a maximum of 0.1 volt at 125°C.

Question: I have read that manufacturers recommend a series resistance of 0.1 ohm per working volt. You suggest we use 1 ohm per volt in a low impedance circuit. Why?

Answer: We are talking about two very different sets of circuit conditions for those recommendations. The 0.1 ohm per volt recommendation is for steady-state conditions. This level of resistance is used as a basis for the series resistance variable in a 1% / 1000 hours 60% confidence level reference. This is what steady-state life tests are based on. The 1 ohm per volt is recommended for dynamic conditions which include current in-rush applications such as inputs to power supply circuits. In many power supply topologies where the di/dt through the capacitor(s) is limited, (such as most implementations of buck (current mode), forward converter, and flyback), the requirement for series resistance is decreased.

Question: How long is the shelf life for a tantalum capacitor?

Answer: Solid tantalum capacitors have no limitation on shelf life. The dielectric is stable and no reformation is required. The only factors that affect future performance of the capacitors would be high humidity conditions and extreme storage temperatures. Solderability of solder coated surfaces may be affected by storage in excess of one year under temperatures greater than 40°C or humidities greater than 80% relative humidity. Terminations should be checked for solderability in the event an oxidation develops on the solder plating.

Question: Do you recommend the use of tantalum capacitors on the input side of DC-DC converters?

Answer: No. Typically the input side of a converter is fed from the voltage sources which are not regulated and are of nominally low impedance. Examples would be Nickel-Metal-Hydroxide batteries, Nickel-Cadmium batteries, etc., whose internal resistance is typically in the low milliohm range.

One example of Engine quit.txt

From: Shinji Kanai [kanai.sh@sv.mazda.co.jp]
Sent: Wednesday, June 19, 2002 10:05 AM
To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Aynessazian, Kam (K.)'; 'Badgley, Joel (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn, Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John (J.)'; 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra (S.M.)'; 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)'; 'Diez, Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)'; 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka (R.V.)'; 'Grewal, Bill (B.S.)'; 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George (G.J.)'; 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa, Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones, Andy'; 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert (R.F.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)'; 'Linfaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)'; 'Mandziuk, Roger (R.S.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John (J.)'; 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry (L.)'; 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)'; 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie'; 'Noteboom, Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price, Martin (M.)'; 'Raquetpau, Alden (A.P.)'; 'Shah, Kiran (K.C.)'; 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey (J.R.)'; 'Suarez, Rhae (R.)'; 'Takasawa, Keith (K.D.)'; 'Takubo, Hiroichi (H.)'; 'Veenstra, Tim (T.W.)'; 'Wakenell, Ray (R.A.)'; 'Wettach, Bill (B.)'; 'Williams, Les (L.H.W.)'; 'Yeung, Lem (.)'
subject: One example of Engine quit

My lease vehicle 2002MY Tribute experienced engine quit last night.

4F2YU08172KM28336 Build 12/11/2001, Retail 1/11/2002
Mileage: 7360 miles Event: 6/18/2002

After 25 minutes Freeway driving, I exited and stopped traffic signal.
About 30 sec. later I started moving to left turn and stopped at traffic signal again about 50m later.
About 30 sec. later I started moving 20m and right turn.
Then I gave throttle accelerating vehicle up to 35 MPH - 40MPH at slight up hill about 200m.
Then road switched down hill, I released throttle. Usually vehicle slight increase speed up to 45MPH about 200m.
I applied throttle gently after changing road up hill. Few seconds later I realized that vehicle kept down speed and three warning lamp illuminated about 40MPH.
I did not calm enough.
I turned key to start position, but engine did not start because shifter was stayed D range.
I cycled key OFF and ON again, all warning lamp illuminated about 25MPH.
I applied brake to reduce speed and turned vehicle to left.
I shifted N range and cranked. Small gear noise (starter engagement ?) was heard but Engine started normally about 10 MPH.

I remember engine rpm dropped twice on this vehicle during last 6 month.
Possibly engine rpm drop might happen more than two, but I recognized twice.
One is same location same direction, another one was opposite direction almost same location.
No ECM like building or equipment near there, as far as I know.
This is my first V6-4WD model. Previous Tribute was I4-4WD.
I will bring this vehicle to dealer for usual scheduled (7,500 miles) maintenance this week.
I will ask dealer to reflash PCM calibration and continue to monitor.

If you have any question or comment, please feel free to contact to me.

One example of Engine quit.txt

Shinji Kanai
Manager, Tribute Plant QA
Mazda North American Operations

Ford Kansas City Assembly Plant
Plant Vehicle Team
8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
Local Text Pager: 9135677156@alphapage.airtouch.com



U.S. Department
of Transportation
National Highway
Traffic Safety
Administration

ODI RESUME

IDENTIFICATION: PE01- 043 **DATE OPENED:** 7 Dec 2001
SUBJECT: Engine Stalling
PROMPTED BY: Consumer complaints, IE01-051
PRINCIPLE ENGINEER: Ali Motamedamin

MANUFACTURER: Ford Motor Company/Mazda North America
MODEL(S): Escape/Tribute equipped with the 3.0 L Duratec V6 Engine
MODEL YEAR(S): 2001-2002
VEHICLE POPULATION: 193,000 (Escape), 75,000 (Tribute) for 2001, 2002 unknown.

PROBLEM DESCRIPTION: The complaints allege that the engine stalls without warning while driving.

FAILURE REPORT SUMMARY

	Ford Escape/Mazda Tribute (ODI)	Ford Escape/Mazda Tribute (MFR)	TOTAL
COMPLAINTS:	49/51	N/A	100
CRASHES:	0/0	N/A	0
INJ CRASHES:	0/0	N/A	0
# INJURIES:	0/0	N/A	0
FAT CRASHES:	0/0	N/A	0
#FATALS:	0/0	N/A	0
OTHER	3/1	N/A	4

DESCRIPTION OF OTHER: VOQ reports submitted subsequent to original complaint reports and alleging a subsequent stalling event.

ACTION: A Preliminary Investigation (PE) has been opened

ENGINEER: Ali Motamedamin **DIV CHR:** Ali Motamedamin **OFC DIR:** [Signature]
DATE: 12/12/01 **DATE:** 12/15/01 **DATE:** 12/7/01

SUMMARY: ODI has received forty-nine (49) reports on the Ford Escape and fifty-one (51) reports on the Mazda Tribute alleging that the engine would stall out without warning while driving. Sixty-three (63) of the one hundred (100) vehicles have had repair attempts more than once. Reported repairs include replacing the following components: Electronic Engine Control (EEC) Power Relay for the Programmable Control Module (PCM), Fuel Pump, Exhaust Gas Recirculation (EGR) Valve, and Ignition Starter Switch. One attempt at reprogramming the PCM was also made. In addition, many of the reports indicate that dealers have not been consistently successful in correcting the stalling problem.

There are no Technical Service Bulletins or recalls issued regarding this subject on these vehicles.

12/10/01
SD

RE One example of Engine quit.txt

From: Dalbo, Bob (R.J.)
Sent: Wednesday, June 19, 2002 10:58 AM
To: Kanai, Shinji (S.); Sanders, Muriel (M.S.); Altoonian, Don (D.J.); Aynessazian, Kam (K.); 'Badgley, Joel (J.K.)'; Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); 'Cary Powell'; Chick, John (J.); Chih, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); Rothweiler, Daniel (D.); De Pena, Juan (J.E.); Diez, Timothy (T.P.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Grewal, Bill (B.S.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Ichikawa, Jiyunichiro (J.); Jensen, Ted (T.E.); 'John McDonald'; 'Jones, Andy'; Jordan, Donald (D.E.); Kanai, Shinji (S.); King, Robert (R.F.); Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Limtiaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Mandziuk, Roger (R.S.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); 'Morgan, Tom'; Morishima, Shigeki (S.); 'Naveed Khan'; Nematollahi, Sonya (S.); 'Nikolai, Bernie'; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Alden (A.P.); Shah, Kiran (K.C.); Shiraishi, Masaru (M.); Stilgenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Keith (K.D.); Takubo, Hiroichi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Wettach, Bill (B.); Williams, Les (LHW.); Yeung, Lem (.)
Subject: RE: One example of Engine quit

Kanai-san,
This is the exact problem we have been working on. If your dealer services your vehicle per the TSB and ISM we have released, we believe your issue should be resolved.

Mr. Limtiaco,
Can you please help ensure Kanai-san's vehicle is properly serviced?

Bob Dalbo
3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31786
Pager: (313) 795-2859 Email: rdalbo@ford.com

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

From: Shinji Kanai [mailto:kanai.sh@sv.mazda.co.jp]
Sent: Wednesday, June 19, 2002 10:05 AM
To: 'Sanders, Muriel (M.S.)'; 'Altoonian, Don (D.J.)'; 'Aynessazian, Kam (K.)'; 'Badgley, Joel (J.K.)'; 'Bauer, Scott (S.C.)'; 'Bhojwani, Kamal (K.)'; 'Blackburn, Thomas (T.J.)'; 'Bogema, John (P.)'; 'Cary Powell'; 'Chick, John (J.)'; 'Chih, Ming-Niu (M.N.)'; 'Chin, Darrel (D.)'; 'Corbett, Sandra (S.M.)'; 'Dalbo, Bob (R.J.)'; 'Dan Rothweiler'; 'De Pena, Juan (J.E.)'; 'Diez, Timothy (T.P.)'; 'Fascetti, Bob (R.J.)'; 'Fournelle, Gilbert (G.)'; 'Freeland, Mark (M.)'; 'Giles, Stuart (S.)'; 'Gokhale, Renuka (R.V.)'; 'Grewal, Bill (B.S.)'; 'Grimes, Jeff (J.R.)'; 'Hansen, George (G.C.)'; 'Herr, George (G.J.)'; 'Hofman, Michael (M.V.)'; 'Holmes, Jeffrey (J.R.)'; 'Ichikawa, Jiyunichiro (J.)'; 'Jensen, Ted (T.E.)'; 'John McDonald'; 'Jones, Andy'; 'Jordan, Donald (D.E.)'; 'Kanai, Shinji (S.)'; 'King, Robert (R.F.)'; 'Kosko, Jeff (J.R.)'; 'Kwon, Soon (S.K.)'; 'Limtiaco, Steven (S.)'; 'Linde, Peter (P.A.)'; 'Liu, Jane (J.)'; 'Mandziuk, Roger (R.S.)'; 'Marck, Edmond (E.C.)'; 'Matesa, John (J.)'; 'Maurer, James (J.B.)'; 'Mazzella, Gary (G.R.)'; 'Mooney, Larry (L.)'; 'Moorhouse, Scott (S.R.)'; 'Morgan, Tom'; 'Morishima, Shigeki (S.)'; 'Naveed Khan'; 'Nematollahi, Sonya (S.)'; 'Nikolai, Bernie'; 'Noteboom, Jim (J.E.)'; 'Ortman, James (J.W.)'; 'Powers, Ken (K.W.)'; 'Price, Martin (M.)'; 'Raquepau, Alden (A.P.)';

Page 1

RE One example of Engine quit.txt
'Shah, Kiran (K.C.)'; 'Shiraishi, Masaru (M.)'; 'Stilgenbauer, Jeffrey (J.R.)'; 'Suarez, Rhae (R.)'; 'Takasawa, Keith (K.D.)'; 'Takubo, Hiroichi (H.)'; 'Veenstra, Tim (T.W.)'; 'Wakenell, Ray (R.A.)'; 'Wattach, Bill (B.)'; 'Williams, Les (LHW.)'; 'Yeung, Lem (.)'
subject: One example of Engine quit

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Then road switched down hill, I released throttle. usually vehicle slight increase speed up to 45MPH about 200m.
I applied throttle gently after changing road up hill. Few seconds later I realized that vehicle kept down speed and three warning lamp illuminated about 40MPH.
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I will bring this vehicle to dealer for usual scheduled (7,500 miles) maintenance this week.
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If you have any question or comment, please feel free to contact to me.

Shinji Kanai
Manager, Tribute Plant QA
Mazda North American Operations

Ford Kansas City Assembly Plant
Plant Vehicle Team
8121 N.E. Hwy. 69, Claycomo, MO 64119 USA
Tel: 816-459-1623/ Fax: -1726/ e-mail: kanai.sh@sv.mazda.co.jp
Local Text Pager: 9135677156@alphapage.airtouch.com

FOCUS STALLS

ODI No	Manufacturer	2001MY Model Yr	Model	Vin	Failure Date	Letter Date	Accident	Injured	Fault	Fte
558274	FORD MOTOR COMPANY	2001	FOCUS	1FAPP3P51W132742		28-Jan-01			0 INOPERATIVE	
883188	FORD MOTOR COMPANY	2001	FOCUS	1FAPP35331W182481	8-Mar-01	15-Mar-01	N		0 INOPERATIVE	N
882388	FORD MOTOR COMPANY	2001	FOCUS	1FAPP36301W137615		10-Jul-01	N		0 DESIGN	N
893041	FORD MOTOR COMPANY	2001	FOCUS			17-Jul-01	N		ERRATIC OPERATION 0 POOR PERFORMANCE	N
760571	FORD MOTOR COMPANY	2001	FOCUS	3FAPP31301R110389	14-Jul-01	18-Aug-01			ERRATIC OPERATION 0 POOR PERFORMANCE	N
896653	FORD MOTOR COMPANY	2001	FOCUS	1FAPP34PX1W329191	1-Aug-01	18-Sep-01	N		0 INOPERATIVE	N

763188 FORD MOTOR COMPANY 2001 FOCUS 1FAHP36361W118437

13-Oct-01

ERRATIC OPERATION/POOR
0 PERFORMANCE

897932 FORD MOTOR COMPANY 2001 FOCUS 1FAFP34321W272985

12-May-01 15-Oct-01 N

ERRATIC OPERATION/POOR
0 PERFORMANCE

N

756151 FORD MOTOR COMPANY 2001 FOCUS 3FAFP313X1R202158

10-Feb-02 12-Feb-02

ERRATIC OPERATION/POOR
0 PERFORMANCE

N

892376 FORD MOTOR COMPANY 2001 FOCUS 1FAFP36301W137815

1-Mar-01 10-Jul-01 N

0 INOPERATIVE

N

745387	FORD MOTOR COMPANY	2001 FOCUS 1FAFP31381W283002	29-May-01	4-Jun-01	DESIGN	N
742541	FORD MOTOR COMPANY	2001 FOCUS 3FAFP31381R129285	1-Mar-01	16-Mar-01	ERRATIC OPERATION OF DOOR PERFORMANCE	N
892376	FORD MOTOR COMPANY	2001 FOCUS 1FAFP36301W187815	1-Mar-01	10-Jul-01	BURNED OVERHEATED BURNT OUT MELTED	N
753409	FORD MOTOR COMPANY	2001 FOCUS 3FAFP31381R199153	10-Oct-01	19-Oct-01	STALLS	N

2002MY

Zero Reports

Part Name	City	State	Miles	Summary
ENGINE	POMONA	NY	0	ENGINE EXPERIENCING SEVERAL PROBLEMS. VEHICLE IS STALLING AND THEN NOT STARTING. OIL IS LEAKING. THE ENGINE RAGES AND VEHICLE RUNS HARD. *SLC
ENGINE	BANGOR	PA	800	ON TWO OCCASIONS VEHICLE HAD CUT OFF WHILE PARKED AND IDLING. DEALER WAS NOTIFIED, AND INFORMED CONSUMER THAT IT WAS DUE TO ENGINE BEING BROKEN IN. *AK *SLC
ENGINE	ST AUGUSTE	FL	4500	WHILE TRAVELING AT HIGHWAY SPEEDS VEHICLE WOULD SUDDENLY STALL OUT FOR NO REASON IN THE MIDDLE OF TRAFFIC. PROBLEM OF STALLING COULD HAPPEN WHILE AT A STOP LIGHT OR SIGN WHENEVER TRYING TO RESTART VEHICLE IT WOULD BE FLOODED, NOT ABLE TO RESTART AFTER 24 HRS. LATER. PROBLEM WAS INTERMITTENT. VEHICLE HAS BEEN TOWED 7 TIMES AFTER STALLING AT DEALERSHIP MECHANIC COULD NOT LOCATE CAUSE OF STALLING WAS EVEN TEST DRIVEN. BUT STALLING DID NOT OCCUR. *AK
ENGINE	BAKERSFIELD	CA	0	WHILE DRIVING 60MPH AT NIGHT LOST ALL POWER. CURRENTLY VEHICLE ACTS AS THOUGH IT IS OUT OF GAS. VEHICLE WILL JUST STOP RUNNING WITH NO PRIOR WARNING. PLEASE ADVISE VIN. *AK
ENGINE	FORT LAUDERDALE	FL	4500	ENGINE STALLS WHILE DRIVING FIRST TIME AT 35 MPH AND SECOND TIME AT 70 MPH. DEALER CAN FIND NOTHING WRONG.
ENGINE	CONCORD	NC	7400	VEHICLE WOULD SHUTDOWN WITHOUT WARNING WHILE DRIVING. VEHICLE BEEN TO DEALER SHOP ON THREE OCCASIONS AND STILL UNABLE TO RESOLVE PROBLEM. FEEL FREE TO PROVIDE ANY FURTHER INFORMATION ON THIS MATTER. *AK

ENGINE

SANTA CRUZ CA

SUDDEN ENGINE STALL WHILE DRIVING AT 65 MPH. UNABLE TO RESTART CAR FOR 6 MINUTES. THEN CAR STARTED AND I HAVE HAD NO RECURRENCE OF PROBLEM. DEALER WAS UNABLE TO FIND CAUSE. *AK

ENGINE

REMINGTON VA

WHEN COMING TO A STOP OR SLOWING DOWN VEHICLE WILL STALL. CONSUMER LOSES ALL POWER. CONTACTED DEALER BUT NO RESULT. *AK

ENGINE

DAHLONEGA GA

MY CAR BEGAN HAVING PROBLEMS AT 21,000 MILES. I HAVE HAD IT 8 MONTHS AND IT HAS BROKEN DOWN 6 TIMES. THE CAR DIES WHILE DRIVING POSING A SERIOUS RISK OF CRASH, INJURY AND DEATH. THE DEFECT REMAINS UNRESOLVED. THERE IS NO WARNING THAT THE CAR IS ABOUT TO GO DEAD OTHER THAN SPUTTERING THEN DEAD. THE CAR HAS AN ERRATIC IDLE, DIES WHILE DRIVING AT ANY SPEED, DIES IN PARK, DIES AT STOP SIGNS AND AT RED LIGHTS. I HAVE FILED FORMAL COMPLAINTS TO MY DEALER PRIOR TO FILING HERE. NO ONE WILL HELP ME OR TAKE ME SERIOUSLY. PUT IT LIKE THIS: THE CAR CAN EITHER BE REPURCHASED AND FORD LOSE \$17,000 OR ME AND MY CHILD GET KILLED AND MY HUSBAND SUE FORD FOR MILLIONS AND HE WOULD WIN. I HAVE A SMALL CHILD AND I DON'T WANT HER TO BE HARMED OR MYSELF OR OTHER MOTORIST FOR THAT MATTER. I HAVE HAD MY CAR REPAIRED FOUR TIMES AND THIS TIME MAKES THE FIFTH. I FEAR FOR MY SAFETY AND WILL NO LONGER DRIVE THE CAR. I AM CURRENTLY PURSUING ACTION UNDER THE 'LEMON LAW' RIGHTS. I HAVE READ OTHER COMPLAINTS WITH CARS JUST LIKE MINE. MY HEART DROPPED WHEN I SAW SO MANY OTHER 8700 PEOPLE HAVING THE SAME PROBLEM AS ME AND SAW THAT THEIR

FUEL FUEL PUMP

ST. AUGUSTINE FL

ENGINE FLOODS AND STALLS AT IDLE OR IN MOTION. EMISSIONS LIGHT COMES ON WHEN IT STALLS. OWNERS MANUAL STATES IF EMISSION LIGHT COMES ON IT INDICATES THAT CATALYTIC CONVERTER IS HOT AND CAN CAUSE A FIRE. VEHICLE DOESN'T START BACK UP ONCE IT STALLS SO IT HAS TO BE TOWED. THERE IS A GASOLINE SMELL BEFORE IT STALLS. DEALER HAS TRIED TO REMEDY PROBLEM 5 TIMES. DEALER HAS ACKNOWLEDGED OTHER VEHICLES WITH SAME PROBLEM. DEALER REMOVED FUEL PUMP DRAINED IT AND CLEANED IT. DEALER HOOKED A COMPUTER TO VEHICLE SO CODE WOULD SHOW HOW TO REPAIR 5000. *AK

ENGINE	OCEANO	CA	2293	<p>WAIT IN THE ENGINE TECHNICIAN COULD NOT FIND ANY MECHANICAL REASON FOR IT TO GET IN THERE! NEED A BRAND NEW ENGINE WARRANTY WILL NOT COVER IT! ESTIMATE IS \$4000. *AK</p>
FUEL THROTTLE LINKAGES ACCELERA TOR RIGID	NAPLES	FL	5847	<p>A/C VALVE REPLACED 2 TIMES CAR SAME. THROTTLE CABLE REPLACED 1 INTERMITTENT PROBLEMSD STILL. THEY TOLD ME THIS IS THE WAY IT IS. ITS DANGEROUS? LIGHT COMES ON WHEN IT STALLS. OWNERS MANUAL STATES IF EMISSION LIGHT COMES ON IT INDICATES THAT CATALYTIC CONVERTER IS HOT AND CAN CAUSE A FIRE. VEHICLE DOESNT START BACK UP ONCE IT STALLS. IT HAS TO BE TOWED. THERE IS A GASOLINE SMELL BEFORE IT STALLS. DEALER HAS TRIED TO REMEDY PROBLEM 6 TIMES. DEALER HAS ACKNOWLEDGED OF OTHER VEHICLES WITH SAME PROBLEM. DEALER REMOVED FUEL PUMP DRAINED IT AND CLEANED IT. DEALER HOOKED A COMPT. TER TO VEHICLE SO CODE WOULD SHOW HOW TO REPAIR</p>
EXHAUST SYSTEM CATALYTIC CONVERTER SYSTEM	ST. AUGUST	FL	5009	
FUEL FUEL INJECTION SYSTEM	FALLBROOK	CA	29003	<p>WHEN FUEL TANK REGISTERS 1/4 TANK OR LESSO CAR LOSES ACCELERATION AFTER CLIMBING A 6-8% GRADE WITH A CURVE. CAR CONTINUES TO RUMBLE BUT ONLY AT IDLE SPEED. CAR WILL LOSE ALL POWER AFTER 10-15 SECONDS. *AK</p>

OCI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident	Injured	Fault	File	Part Name	Qty	State	Miles	Summary	
2001MY																
108	808616	FORD MOTOR COMPANY	2001	F180	ADD	25-Apr-01	4-Dec-01			0 ERRATIC OPERATION/POOR PERFORMANCE	ENGINE		HOT SPRINGS	AR	11000	
108	808620	FORD MOTOR COMPANY	2001	F150	1FTRW081W91KD80886	23-Mar-01	6-Dec-01			0 ERRATIC OPERATION/POOR PERFORMANCE	ENGINE		EAST BANGOR	PA	23000	
120	744228	FORD MOTOR COMPANY	2001	F180	1FTZP17231NA79233	17-Apr-01	18-Apr-01			0 INOPERATIVE	ENGINE	N	MILFORD	CT	4800	

2002MY Zero reports

ENR2-027-0 48838

VEHICLE STALLED AT ANY SPEED WHEN APPLYING BRAKES. VEHICLE TAKEN TO DEALER 8 TIMES. REPROGRAMMED COMPUTERD BUT THAT DID NOT REMEDY THE PROBLEM. FORD WAS AWARE OF PROBLEM BUT HAD NO SOLUTION. *AK
ENGINE STALLS INTERMITTENTLY DURING NORMAL OPERATION WHILE TRAVELING AT ANY SPEED. DEALERSHIP HAS BEEN UNABLE TO REPRODUCE PROBLEM AND IDENTIFY THE CAUSE. PLEASE PROVIDE ANY ADDITIONAL INFORMATION /
WHILE TRAVELING ON THE INTERSTATE AT APPROX. 80 MPH. THE ENGINE SHUT OFF AND THE DASHBOARD GAUGES AND ODOMETER WENT BLANK. I WAS NOT ABLE TO RESTART THE ENGINE AND THE VEHICLE HAD TO BE TOWED FROM THE TRAVEL.

2002-027-G 40020

ODI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident	Injured
2001MY								
885788	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04121KE78268	31-Mar-01	12-Apr-01	N	0
743710	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03141KF42807	2-Apr-01	8-Apr-01		0
743853	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04111KB02817	12-Apr-01	12-Apr-01		0
886311	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04191KA73138	30-Apr-01	15-May-01	N	0
754817	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03121KA88889	16-Nov-01	16-Nov-01		0
754861	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03121KA88889		27-Nov-01		0
880438	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04131KD82807		15-Jun-01	N	0
748630	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04131KE81258	9-Nov-00	6-Jun-01		0
748727	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KA88828	8-Jun-01	12-Jun-01		0
881780	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KB8100	1-Jun-01	2-Jul-01	N	0
747822	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04101KB91888	28-Jun-01	30-Jun-01		0
748329	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04141KB81818		12-Jul-01		0
748474	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KB81574	9-Jul-01	15-Jul-01		0
748837	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU03181KE84746	14-Jun-01	17-Jul-01		0
748708	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KF70888		3-Aug-01		0
748472	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04111KF93556		30-Jul-01		0
748888	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04111KB81789		2-Aug-01		0
748826	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU041151KB7008	2-Aug-01	4-Aug-01		0
884180	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KF17895	15-Jun-01	13-Aug-01	N	0
750043	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KB90277		8-Aug-01		0
750043	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KB90277		8-Aug-01		0
582227	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03191KB14182	15-Jul-01	24-Jul-01		0
752015	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KF57116	7-Sep-01	10-Sep-01		1
752210	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KA79177	17-Jun-01	15-Sep-01		0
752283	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04101KF34888	16-Sep-01	16-Sep-01		0
752411	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KF84151	10-Aug-01	20-Sep-01		0
752507	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03101KC58528	22-Sep-01	24-Sep-01		0
887180	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04131KE83821	15-Aug-01	2-Oct-01	N	0
752594	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04131KE88821	25-Sep-01	28-Sep-01		0
887332	FORD MOTOR COMPANY	2001	ESCAPE	PLEASE FILL IN	1-Sep-01	4-Oct-01	N	0
887585	FORD MOTOR COMPANY	2001	ESCAPE	FILL IN	4-Oct-01	10-Oct-01	N	0
752748	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03181KB58212	24-Sep-01	30-Sep-01		0
753077	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KA78177	4-Oct-01	10-Oct-01		0
753080	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04171KF08803	10-Oct-01	10-Oct-01		0
583128	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KF57116	7-Sep-01	18-Sep-01		0
753134	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KE77858	1-Mar-01	12-Oct-01		0
783274	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04111KE97913	15-Sep-01	18-Oct-01		0
753386	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KD82828	22-Sep-00	18-Oct-01		0
888454	FORD MOTOR COMPANY	2001	ESCAPE	ADD	24-Oct-01	30-Oct-01	N	0
888482	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KB88220	28-Sep-01	30-Oct-01	N	0
888890	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KA73486	2-Nov-01	2-Nov-01	N	0
753877	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KA34477	22-Aug-01	30-Oct-01		0
754478	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04181KA34477	7-Nov-01	13-Nov-01		0
753879	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU03132KA81782	27-Oct-01	1-Nov-01		0
754122	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04191KF82703	2-Nov-01	5-Nov-01		0
583778	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KF57116		23-Oct-01		0
583720	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KF57116		15-Oct-01		0
754873	FORD MOTOR COMPANY	2001	ESCAPE		16-Nov-01	19-Nov-01		0
754827	FORD MOTOR COMPANY	2001	ESCAPE		26-Oct-01	28-Nov-01		0
888880	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04101KB70817	24-Sep-01	29-Nov-01		0
755139	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KD97839	2-Nov-00	30-Nov-01		0
755205	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04181KB13718	28-Nov-01	3-Dec-01		0
8008561	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04111KA88501	8-Dec-01	11-Dec-01	Y	0
755440	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU041X1KE98042	22-Oct-01	8-Dec-01		0
755582	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04171KC58738	10-Dec-01	12-Dec-01		0

755988 FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04121KB05584		24-Dec-01	0
758032 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04111KA88682	29-Dec-01	14-Jan-02	0
757141 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU03171KA18836	30-Mar-01	21-Jan-02	0
8003168 FORD MOTOR COMPANY	2001 ESCAPE	FILL IN PLEASE	27-Nov-01	30-Jan-02	0
8003280 FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04181KB73303	29-Jan-02	30-Jan-02	0
757646 FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04181KB73303	29-Jan-01	30-Jan-02	0
757611 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU01181KB08270	31-Jan-02	31-Jan-02	0
757612 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04191KC57752	16-Oct-01	31-Jan-02	0
757627 FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04181KD88688	30-Jan-02	1-Feb-02	0
757631 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04121KB28137	2-Dec-01	1-Feb-02	0
748036 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04121KF70886	23-Jul-01	24-Jul-01	0
753280 FORD MOTOR COMPANY	2001 ESCAPE	1FMCU03111KB27041	9-Oct-01	16-Oct-01	0
8003381 FORD MOTOR COMPANY	2001 ESCAPE	VIN NOT AVAILABLE	28-Jan-02	1-Feb-02	0
754752 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU02111KA81081	18-Nov-01	20-Nov-01	0
753601 FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04181KE70576		24-Oct-01	0
2002NY					
753177 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU04182KA37955	12-Oct-01	13-Oct-01	0
886553 FORD MOTOR COMPANY	2002 ESCAPE	NOT AVAILABLE	9-Oct-01	31-Oct-01 N	0
754987 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU03162KB20522	26-Nov-01	27-Nov-01	0
788267 FORD MOTOR COMPANY	2002 ESCAPE	1FMGLU03132KA83539	11-Nov-01	4-Dec-01	0
889883 FORD MOTOR COMPANY	2002 ESCAPE	PLEASE FILL IN	18-Nov-01	7-Dec-01	0
755370 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU03132KA38387	25-Nov-01	6-Dec-01	0
765608 FORD MOTOR COMPANY	2002 ESCAPE	1FMGLU04182KA14185	18-Oct-01	11-Dec-01	0
755540 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU03172KB14978	11-Dec-01	12-Dec-01	0
755546 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU031X2KB37867	10-Dec-01	12-Dec-01	0
755734 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU04182KA28212	14-Dec-01	17-Dec-01	0
758274 FORD MOTOR COMPANY	2002 ESCAPE	1FMCU04192KA46555	1-Jan-02	1-Jan-02	0
758653 FORD MOTOR COMPANY	2002 ESCAPE	1FMCU04182KA46556	1-Jan-02	10-Jan-02	0
758737 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU04132KA48240	11-Jan-02	12-Jan-02	0
584018 FORD MOTOR COMPANY	2002 ESCAPE	1FMCU03132KA83539	11-Nov-01	17-Jan-02	0
8003484 FORD MOTOR COMPANY	2002 ESCAPE	N/A	1-Jan-02	4-Feb-02	0
8003567 FORD MOTOR COMPANY	2002 ESCAPE	FILL IN PLEASE	5-Jan-02	5-Feb-02	0
757808 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU041X2KA25801	20-Oct-01	5-Feb-02	0
757761 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU04132KA06426		4-Feb-02	0
788232 FORD MOTOR COMPANY	2002 ESCAPE	1FMCU04142KB53185	26-Jan-02	14-Feb-02	0
758412 FORD MOTOR COMPANY	2002 ESCAPE	1FMYU04182KC01092	12-Feb-02	18-Feb-02	0

Fault	Fire	Part Name	City	State	Miles
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	CHARLEROI	PA	11000
INOPERATIVE	N	ENGINE	TALLAHASSEE	FL	2120
INOPERATIVE	N	ENGINE	CHESTERFIELD	MO	350
DESIGN	N	ENGINE	COAL TOWNSHIP	PA	2000
INOPERATIVE	N	ENGINE	AUSTIN	TX	8180
INOPERATIVE		ENGINE	AUSTIN	TX	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	LITTLE FERRY	NJ	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	COCHRANVILLE	PA	626
INOPERATIVE	N	ENGINE	KNOXVILLE	TN	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	UTICA	PA	2
INOPERATIVE	N	ENGINE	KING OF PRUSSIA	PA	117
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	STUARTS DRAFT	VA	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	WAVERLY	NY	1540
DESIGN	N	ENGINE	DALLAS	TX	15100
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	SCHUYLKILL HAVEN	PA	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	CAMP HILL	PA	0
INOPERATIVE	N	ENGINE	OAKHAM	MA	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	WAPWALLOPEN	PA	5200
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	RENSSELAER	NY	5107
INOPERATIVE		ENGINE	CHESTERFIELD	MO	0
INOPERATIVE		ENGINE	CHESTERFIELD	MO	0
INOPERATIVE	N	ENGINE	MIAMI	FL	0
INOPERATIVE	N	ENGINE	RALEIGH	NC	11224
DESIGN	N	ENGINE	GREER	SC	2400
DESIGN	N	ENGINE	OMAHA	NE	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	STEVENS	PA	8100
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	MACON	GA	445
INOPERATIVE	N	ENGINE	THORNTON	PA	5400
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	THORNTON	PA	5400
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	UNION CITY	PA	10400
DESIGN	N	ENGINE	DANVERS	MA	6500
INOPERATIVE	N	ENGINE	CHARLOTTE	NC	5700
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	GREER	SC	5200
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	BORDENTOWN	NJ	7307
INOPERATIVE	N	ENGINE	RALEIGH	NC	11245
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	NORRISTOWN	PA	10000
INOPERATIVE	N	ENGINE	WEST GROVE	PA	12500
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	MARTINSVILLE	NJ	200
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	TRUSSVILLE	AL	30000
INOPERATIVE	N	ENGINE	CINCINNATI	OH	11000
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	WESCHESTER	OH	11
DESIGN	N	ENGINE	STRONGBVILLE	OH	7000
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	STRONGBVILLE	OH	9400
LOCKS UP□STICKS□GRABS	N	ENGINE	WHITING	VT	803
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	OKLAHOMA CITY	OK	13000
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	RALEIGH	NC	0
STALLS	N	ENGINE	RALEIGH	NC	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	PICKENS	SC	5900
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	NAUGATUCK	CT	8000
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	OMAHA	NE	34900
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	MUKLTYO	WA	2230
DESIGN	N	ENGINE	PICKENS	SC	6250
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	LONG VALLEY	NJ	9000
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	SUWANEE	GA	8100
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	BURBANK	CA	2800

ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	PHILADELPHIA	PA	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	SNOQUALMIE	WA	15231
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	HOOVER	AL	2700
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	MASSILLON	OH	4000
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	BRENTWOOD	CA	1500
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	BRENTWOOD	CA	500
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	GULFPORT	MS	14277
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	HEWITT	NJ	1900
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	BAYVILLE	NY	18795
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	ELIZABETH	PA	5000
		FUEL:FUEL INJECTION SYSTEM			
FLOODS□LEAKS	N	SYSTEM	SCHUYLKILL HAVEN	PA	6138
		FUEL:FUEL INJECTION:IDLE SPEED CONTROL UNIT			
ERRATIC OPERATION□POOR PERFORMANCE	N	UNIT	LOUISVILLE	KY	6300
		FUEL:FUEL INJECTION:OTHER PARTS			
ERRATIC OPERATION□POOR PERFORMANCE		R PARTS	DACULA	GA	12100
		FUEL:THROTTLE LINKAGES AND CONTROL			
ENGINE RUNAWAY□SUDDEN ACCELERATION(5-83)	N	CONTROL	KENT	WA	11000
		FUEL:THROTTLE LINKAGES AND CONTROL:SOLENOID:VALVES:SWITCH:BRACKET			
ERRATIC OPERATION□POOR PERFORMANCE	N	TC:BRACKET	HARBORCREEK	PA	0
LOCKS UP□STICKS□GRABS	N	ENGINE	MILFORD	CT	351
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	CHARLOTTE	NC	190
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	PARMA	OH	164
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	MCLEAN	VA	2000
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	LEE'S SUMMIT	MO	2300
LOCKS UP□STICKS□GRABS DESIGN	N	ENGINE	JACKSONVILLE	IL	1821
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	SKY	NC	2000
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	SAN DIEGO	CA	1600
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	RIVER EDGE	NJ	27
INOPERATIVE	N	ENGINE	OAKTON	VA	5450
LOCKS UP□STICKS□GRABS	N	ENGINE	WOODBIDGE	VA	2950
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	WOODBIDGE	VA	2950
STALLS	N	ENGINE	ALBRIGHTSVILLE	PA	6900
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	MCLEAN	VA	2000
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	STOCKBRIDGE	GA	1100
ERRATIC OPERATION□POOR PERFORMANCE		ENGINE	AUBURN	WA	1500
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	CHAGRIN FALLS	OH	300
ERRATIC OPERATION□POOR PERFORMANCE DESIGN	N	ENGINE	DOBSON	NC	0
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	COLUMBIA STATION	OH	500
ERRATIC OPERATION□POOR PERFORMANCE	N	ENGINE	PITTSBURGH	PA	832

Summary

BRAKE LIGHT CAME ON DASHBOARD. ALSO VEHICLE JUST SHUTDOWN WITHOUT PRIOR WARNING. WHEN CONSUMER APP ENGINE SHUT OFF WHILE DRIVING DOWN A HILL HAS HAPPENED TO ME FOUR TIMES THIS WEEK. CAUSES LOSS OF POWER-A DRIVING DOWN A BUSY STREET DOWN A SLIGHT GRADE ABOUT 45 MPH THE CAR SUDDENTLY DIED. I HAD TO PULL OVER WHILE DRIVING AT 45MPH SUDDENLY VEHICLE STALLED OUT FOR NO REASON IN MIDDLE OF TRAFFIC. THIS WAS SECOND TIME VEHICLE STALLED WITHOUT WARNING WHILE DRIVING @~30MPH. THIS HAS HAPPENED SEVERAL OTHER TIMES ON THE ROAD VEHICLE STALLED AGAIN. THIS IS 4TH TIME VEHICLE HAS STALLED WHILE DRIVING. VEHICLE HAS ALREADY BEEN IN FOR REPAIR WHILE DRIVING AT ANY SPEED VEHICLE COMPLETELY SHUTDOWN WITHOUT WARNING CAUSING LOSS OF POWER BRAKES TOTAL AND COMPLETE LOSS OF POWER AND ALL ELECTRICAL SYSTEM WHILE CAR IS BEING OPERATED ON BUSY ROADS WHILE DRIVING AT ABOUT 35-40 MPH THE ENGINE JUST QUITS. ONCE I COME TO A ROLLING STOP I HAVE TO TURN THE CAR WHILE DRIVING DOWN HILL VEHICLE STALLED WITHOUT PRIOR WARNING CAUSING LOSS OF ALL POWER STEERING AND BRAKES WHILE DRIVING 35-40 MPH ON LEVEL ROAD ENGINE SHUTDOWN; POWER STEERING LOST POWER ASSIST BRAKING LOST; 3 DRIVING 45-50 MPH WHEN ENGINE JUST SHUT DOWN. HAD ALL LOSS OF POWER INCLUDING STEERING AND BRAKES. COASTING ENGINE SHUT OFF WHILE DRIVING DOWN A HILL WITHOUT PRIOR WARNING. LOSS OF POWER STEERING AND POWER BRAKES OUR CAR SPORADICALLY STALLS WHEN COASTING TO A STOP CHANGING GEARS FROM DRIVE TO REVERSE AND WHEN GOING DOWN A HILL AT APPROXIMATELY 30 MPH - ENGINE AND OIL LIGHT WENT ON. LOSS OF POWER AND CAR DID NOT APPEAR PREVIOUSLY REPORTED AS #748806. VEHICLE CONTINUES TO STALL OR ALMOST STALL AT STOP SIGNS OR IN SLOW MOVING TRAFFIC. ENGINE HAS SHUT OFF 3 TIMES WHILE DRIVING SINCE CAR BOUGHT 6 WEEKS AGO. ALWAYS ON HILLY CURVEY ROADS. OVER A PERIOD OF 2 MONTHS THE CAR LOST ALL POWER DURING THE AM DRIVE TO WORK. THIS OCCURRED ON THREE SEPARATE OCCASIONS WHILE DRIVING ENGINE STALLED AND OIL LIGHT ILLUMINATED. CONSUMER CHECKED OIL LEVEL AND IT WAS AT THE NORMAL LEVEL. VEHICLE STALLED WHILE TRAVELING 35 MPH TWO SEPARATE TIMES. CAN'T FIND PROBLEM. *AK

STALLED WHILE TRAVELING 38 MPH TWO SEPARATE TIMES. CAN'T FIND PROBLEM. *AK

WHILE DRIVING VEHICLE STALLED WHICH WAS THEN TOWED TO DEALERSHIP. CONSUMER WAS THEN INFORMED THAT THE SUV WAS PURCHASED NEW IN MID-DECEMBER 2000. ON 6/7/01 I WAS SLOWING DOWN ON A DOWNHILL SLOPE TO MAKE A RIGHT TURN. ENGINE HAS STALLED ON 3 SEPARATE OCCASIONS (MID-JUNE MID-JULY EARLY SEP) WHILE TRAVELING. ENGINE HAS STALLED FOUR TIMES IN BUSY TRAFFIC IN THE PAST TEN MONTHS. DEALER CANNOT DUPLICATE PROBLEM. *AK

ON 2 OCCASIONS ENGINE SHUT OFF WHILE COASTING AT 35MPH. *AK

WHILE COASTING DOWN SLIGHT GRADE AT 35 MPH ENGINE SHUTS OFF WITH NO WARNING STOPPED ON SIDE OF ROAD (RAMP) VEHICLE HAS STALLED TWICE; ONCE AT 30 MPH AND SECOND TIME AT 45 MPH. DEALER FOUND NO PROBLEM FIRST TIME: 1) ON TWO OCCASIONS THE CAR'S ENGINE SHUT OFF WHILE IN TRAFFIC. I TOOK THE CAR BACK TO THE DEALER AFTER BOTH OCCASIONS INTERMITTENTLY VEHICLE WOULD STALL WHILE DRIVING AT ANY SPEED. THEN VEHICLE WOULD RESTART. VEHICLE BEEN IN SHOP TWICE. ENGINE WOULD STALL WHILE DRIVING AT 30MPH. WOULD HAVE NO WARNING OF ANY PROBLEMS. HAD LOST POWER BRAKES OVER A PERIOD OF FOUR MONTHS MY FORD ESCAPE HAS LOST ALL POWER WHILE DRIVING IN THE AM TO WORK. IT WAS VERY DANGEROUS. ENGINE STALLS WHILE TRAVELING. OCCURRED ONCE EACH IN JUNE JULY SEPT AND OCT. PRESUMED ELECTRICAL SHORT. VEHICLE STALLS/BUCKS WHILE DRIVING. *AK

WHILE DRIVING ON A DOWNHILL SLOPE THE VEHICLE SUDDENLY SHUT DOWN CAUSING LOSS OF POWER STEERING AND BRAKES. THE DRIVER WAS DRIVING AROUND 40MPH AND CAR HAS STALLED THREE TIMES ON ME NOW WITH LOSS OF STEERING AND BRAKES. MOST OF THE TIMES WHILE DRIVING VEHICLE COMPLETELY DIES. LOST ALL STEERING AND POWER TO THE VEHICLE WHILE DRIVING 46 MPH. THE LAST TIME MY VEHICLE STALLS AT SPEEDS BETWEEN 40 AND 45 MPH GOING DOWNHILL. IT STARTS RIGHT UP AND THE ON-BOARD COMPUTER LIGHTS ARE ON. VEHICLE STALLED WHILE DRIVING 40 MPH. DEALER COULD NOT FIND CAUSE. *AK

ON FOUR OCCASIONS VEHICLE EXPERIENCED ENGINE STALLING WHILE DRIVING AT 35 MPH OR LOWER SPEED. VEHICLE TAKE OFF WHILE TRAVELING AT 25MPH CONSUMER SLOWED DOWN AND WHEN TRYING TO SPEED UP VEHICLE STARTED TO LOSE POWER. ENGINE STALLED WHILE GOING DOWNHILL. POWER BRAKES AND STEERING WENT OUT SO VERY HARD TO CONTROL ON AN INCLINE. VEHICLE STALLED WHILE ON A SLIGHT INCLINE. POWER STEERING AND BRAKES LOST POWER. SECOND TIME IT HAS HAPPENED WHILE DRIVING DOWN THE INTERSTATE AT AROUND 70 MPH. THE VEHICLE MADE A CLUNKING NOISE AND THE ENGINE STOPPED. THE ENGINE ON MY FORD ESCAPE STALLED WHILE ACCELERATING ON THE ON-RAMP TO ENTER A HIGHWAY. GOING APPROXIMATELY 45 MPH. THE ENGINE LIGHT COMES ON DUE TO UNKNOWN ENGINE PROBLEM AND THE VEHICLE HAD BEEN AT DEALER FOUR TIMES. CONSUMER STATES THAT THE VEHICLE SHUTS ITSELF OFF WITHOUT WARNING CAUSING THE STEERING COLUMN TO LOCK. I AM AFRAID TO DRIVE IT. MY FORD ESCAPE HAS STALLED 3 TIMES IN THE LAST 7 MONTHS. I AM TO THE POINT WHERE I AM AFRAID TO DRIVE IT. *AK

TWICE THE STALL ALMOST CAUSED AN ACCIDENT. DUE TO LOSS OF POWER BRAKES WE ALMOST RE-ENDED THE CAR IN AN Ongoing PROBLEM WITH ENGINE STALLING WHILE TRAVELING 30 OR MORE MPH. VEHICLE BEEN IN DEALER SHOP ON THREE OCCASIONS. CAR STALLED HAS DONE SO TWICE SINCE. *AK

ENGINE STALLED LOSING ALL POWER WHILE DRIVING DOWN ROAD. THIS HAS OCCURRED 4 TIMES. VEHICLE HAS BEEN WAITING IN SHOP SINCE. WHILE DRIVING 30 MPH VEHICLE STALLED/LOST POWER STEERING AND BRAKING ABILITY. CONSUMER USED PARK BRAKE TO STOP. I BOUGHT MY VEHICLE NEW ON 08/18/01 AS A DEMO W/ 6600 MILES. ON 10/22/01 MY VEHICLE STALLED FOR NO REASON ON A DOWNHILL GRADE. WILL BRING IT IN FOR SERVICE. MANY SI

VERY DANGEROUS STALLING AT HIGH SPEED. LOSS OF CONTROL. FORD UNABLE TO FIX. *AK
MY OBSERVATION OF WHEN IT OCCURS IS USUALLY WHEN GOING 60 MPH FOR A NUMBER OF MILES. MAKE A TURN THEN GO
THE ENGINE STALLED AGAIN IN SEPTEMBER OF 2001. I WAS GOING APPROXIMATELY 25MPH WHEN IT STALLED AND HAD TO P
ENGINE STALLED WHILE DRIVING APPROXIMATELY 25 TO 40 MPH ON 27-NOV-2001 AND 27-JAN-2002. DEALERSHIP EXAMINED
VEHICLE STALLS INTERMITTENTLY DEALER HAS BEEN CONTACTED BUT IS UNABLE TO LOCATE SOURCE OF PROBLEM. PLEASE
VEHICLE EXPERIENCES INTERMITTENT ENGINE QUIT CONDITION (STALLS) WITHOUT WARNING. VEHICLE RESTARTS IMMEDIATE
CAR WILL NOT START APPROXIMATELY 6 TIMES AND STALLED WHILE DRIVING ONE TIME. BRAKES LOCKED TWO TIMES. STALLING
STALLING OCCURS WITHOUT WARNING. HAS OCCURRED ON A BRIDGE. I MUST COAST ACROSS BRIDGE. PULL OVER AND R
ON WED. EVENING JAN. 30 2002 AT 6:30 PM I WAS DRIVING MY 2001 FORD ESCAPE HOME FROM THE HICKSVILLE RAILROAD S
SEVERAL INCIDENTS OF VEHICLE STALLING WHILE DRIVING: 1ST INCIDENT OCCURRED WHEN ROUNDING A BEND AND GOING I

TRAVELING AT APPROXIMATELY 35MPH -CAR DID NOT SHUT OFF BUT LOST STEERING AND BRAKES. FROM TIME TO TIME TIM

WHEN DRIVING OR IDLING. MY 2001 FORD ESCAPE HAS STALLED 7 TIMES IN THE PAST THREE WEEKS. THE AUTO HAS ONLY 1

AT HIGHWAY SPEED VEHICLES SUDDENLY DIED. DRIVER LOST BRAKES AND STEERING CONTROL. DRIVER COASTED TO SIDE

VEHICLE STALLED FOUR TIMES AT SPEEDS RANGING FROM 10-40 MPH. LOST POWER STEERING AND BRAKES. VERY UNNERVII

THERE HAVE BEEN MULTIPLE TIMES WHEN PULLING OUT OF A STREET THAT THE CAR COMES TO A STOP; THE RPM'S DIE OFF

VEHICLE STOPPED RUNNING WHILE AT SPEED ON THE ROAD. DEALER DIAGNOSED PROBLEM AS A SEIZED ENGINE. THE 3.0 L
VEHICLE WAS GOING 45MPH AND STALLED WITHOUT WARNING. CONSUMER HAD ONLY OWNED VEHICLE FOR 4 DAYS. DEALER
2002 ESCAPE STALLED WHILE COASTING 35-40 MPH DOWN-HILL. ENGINE, BATTERY AND OIL LIGHTS ILLUMINATED ON DASH. I
NO SUMMARY LISTED FOR ABOVE VEHICLE. *AK

ON TWO OCCASIONS ENGINE STALLED WHILE DRIVING DOWN HILL. DEALER HAS NOT BEEN ABLE TO DUPLICATE THE PROBL
WHILE ATTEMPTING TO PASS A CAR ON THE INTERSTATE. ENGINE DIED. THICK WHITE SMOKE ENGULFED THE BACK WINDOW
ENGINE CUT OFF WHILE TRAVELING 40-45 MPH. LOSS OF POWER STEERING AND POWER BRAKES. DASH LIGHTS ILLUMINATED
ENGINE STALLED WHILE DRIVING DOWNHILL. WAS EITHER BRAKING OR DECELERATING BY LETTING UP ON GAS. CHECK ENGI
BRAND NEW 2002 FORD ESCAPE XLT AUTOMATIC 4X2 STALLED 5 TIMES DRIVING IT HOME FROM THE DEALER AFTER BUYING IT
2002 FORD ESCAPE XLT HAS NOW STALLED THREE TIMES RESULTING IN LOSS OF STEERING AND BRAKES—HAVING INVESTIG
VEHICLE SUDDENLY AND UNEXPECTEDLY LOST POWER AND ENGINE FAILED WHILE OPERATING ON MAJOR WASHINGTON D.C
ENGINE FAILED WHILE TRAVELING AT 60 MPH (IN CRUISE CONTROL) ON INTERSTATE HIGHWAY. DEALER DIAGNOSED PROBLE
WHILE DRIVING ENGINE SHUT DOWN. COULD NOT RESTART. ENGINE WOULD TURN BUT NOT START. TOWED TO DEALER. C
WHILE DRIVING AND WITHOUT WARNING. VEHICLE STALLS. CONSUMER HAS TAKEN VEHICLE TO DEALER AND IS CURRENTLY
WHILE DRIVING AT 45-50 MPH. VEHICLE WILL AUTOMATICALLY SHUT OFF. ALL LIGHTS WENT OUT; HOWEVER, LIGHTS ON D
WHILE DRIVING APPROXIMATELY 40 MPH. VEHICLE STALLED UNEXPECTEDLY, CAUSING A LOSS OF POWER ASSISTED BRAKE
ON THREE OCCASIONS ABOUT TWO MONTHS APART. STARTING IN OCT 2001 MY FORD ESCAPE STALLED WHILE DRIVING. IT H
AT 40 MPH THE ENGINE STALLED OUT. I HAD TO PULL OFF THE ROAD AND RE START THE ENGINE. LOSS OF POWER TO MAJOR
I WAS DRIVING @ ABOUT 40 MPH ON SAT 1-28-2002 WHEN THE ENGINE STOPPED AND THE DASH LIGHTS FOR THE ENGINE AND
ENGINE STALLED WHILE GOING DOWN HILL DUE TO LOW RPM AFTER ACCELERATION STOPPED AND FOOT TAKEN OFF OF THE

LIED BRAKES PEDAL WAS NORMAL. SHE TOOK VEHICLE TO DEALERSHIP. MECHANIC TOLD HER SHE NEEDED ASSISTED BRAKES AND STEERING. VEHICLE PUT IN DEALER SHOP ON 4/8/2001. NO REPAIRS MADE BECAUSE DEALER TOOK VEHICLE TO THE SIDE OF THE ROAD. I WAITED A COUPLE OF MINUTES AND IT RESTARTED. THERE WAS NO INDICATION OF ME IT HAS HAPPENED. WAS AT A STOP SIGN WHEN STALLING FIRST TIME. *AK *JB
1. DEALER HAS PERFORMED REPAIRS 3 OTHER TIMES AS FOLLOWS: VISIT 1 - CHANGED FUEL PUMP RELAY □ VISIT 2 - VISIT 3 TIMES WITHOUT ANY SUCCESSFUL FIX. TRAVELLING ~30MPH □ NO A/C □ STALLED WITHOUT WARNING. LOST A/C □ AND STEERING CONTROL □ NEARLY CAUSING A COLLISION. DEALER REPLACED ENGINE WHICH HAS NOT CORRECTED

PROBLEM OFF AND RESTART IT. THIS IS THE SECOND TIME THIS HAS HAPPENED. *AK
DRIVING ABILITY. CONSUMER HAS CONTACTED DEALER □ DEALER NOT WILLING TO PROVIDE ANY ASSISTANCE. *AK
1. OCCURRENCES SAME SITUATION □ SAME ROAD & APPROXIMATE LOCATION AND TIME OF DAY; THIS IS THE SECOND TIME I DROVE TO EDGE OF ROAD □ PLACED GEAR IN PARK AND SAT FOR A FEW MINUTES AND TRIED TO RESTART. WAS SUCCESSFUL □ PULLED OVER AND SHUT CAR OFF. WHEN I RESTARTED IT IT SEEMED TO WORK OK □ TOOK IT TO THE GARAGE AND TRIED TO DRIVE OVER ANY SMALL BUMP IN THE ROAD. WE'VE TAKEN IT TO THE DEALER FOR REPAIR BUT THEY CLAIM THAT CAR IS NOT GETTING ANY GAS. CAR KEPT RUNNING. *AK

TRAFFIC. HAS BEEN TO AN AUTHORIZED DEALER TWICE NOW TO NO AVAIL. IS CURRENTLY AT DEALER FOR THE SECOND TIME. DRIVING 35-40 MPH □ COASTING AND BRAKING LIGHTLY. CHECK ENGINE LIGHT COMES ON. POWER STEERING AND BRAKES STOP WORKING SEPARATE OCCASIONS □ ALMOST EXACTLY 7 MILES FROM MY HOME. GOING 20-30 MILES PER HOUR DURING EACH OCCASION. *SLC

THE PROBLEM COULD NOT BE DUPLICATED. *YD
WAS TAKING A RIGHT TURN WHEN THE SUV SHUT ITSELF OFF AND THE STEERING COLUMN LOCKED UP. IT HAD 1/3 TANK OF GAS. WAS TRAVELLING AT 45 MPH; ORIGINAL DEALER COULD PROVIDE NO SOLUTION; CURRENTLY BEING EVALUATED AT 2ND LOCATION.

REQUIRE GREAT EFFORT TO STEER AND BRAKE □ WAS ALMOST REAR-ENDED BY FOLLOWING VEHICLES. PUT CAR IN PARK □ SECOND TIME DEALER REPROGRAMMED COMPUTER. *AK
1. OCCURRENCES. THE DEALER WAS NICE ENOUGH TO LOOK AT THE CAR RIGHT AWAY ON BOTH OCCASIONS. THE FIRST TIME I DROVE TO DEALER □ AND THEY COULD NOT DUPLICATE PROBLEM. FEEL FREE TO PROVIDE ANY FURTHER INFORMATION. POWER STEERING AND BRAKES HAD TO USE EMERGENCY BRAKES TO STOP VEHICLE. HAD HAPPENED ONCE BEFORE. WILL BE VERY DIFFICULT TO HANDLE THE CAR WHEN IT LOST ALL POWER BECAUSE OF THE LOSS OF POWER STEERING. THE CAR COASTS TO ROADSIDE □ COME TO COMPLETE STOP □ PUT IN PARK □ TURN KEY AND TAKE OFF AGAIN. LAST INCIDENT

DRIVER WAS ABLE TO RESTART THE VEHICLE □ THE DEALER REPLACED A VALVE WHICH CONTROLLED AIR FLOW □ THIS HAPPENED RECENTLY ON 10/11/2001. FORD SAYS THEY DON'T KNOW WHAT IS WRONG. *AK
THIS HAS HAPPENED 4 TIMES NOW AND HAS BEEN SEEN AT THE DEALER TWICE. THE DEALER IS UNABLE TO FIND ANOTHER SOLUTION □ COMPUTER DOESN'T STORE ANY INFORMATION. I TOOK IT TO A DEALER FOR REPAIRS 8 TIMES WITH THIS PROBLEM □

DRIVE TO DEALER SHOP □ AND INFORMED CONSUMER THAT THEY WERE UNABLE TO DUPLICATE THE PROBLEM. *AK *YD
POWER. *AK

ON AN INCLINE. SEEMS TO BE A COMMON PROBLEM WITH THE EXACT SAME SITUATIONS WITH THIS VEHICLE. THIS HAS HAPPENED WITHIN A FEW MONTHS. VERY DANGEROUS AND COULD CAUSE A BAD ACCIDENT. TAKING TO DEALER SOON AFTER. THIS ALL HAPPENED WITHIN 30 SECONDS. I WAS ABLE TO COAST OVER TO THE SIDE OF THE ROAD WITHOUT WITHOUT LOST SPEED. I HAVE NOW DISCOVERED THIS IS A COMMON PROBLEM WITH FORD ESCAPE □ AND HOPE THE PROBLEM IS FIXED. *YH

UP □ AND THE CHECK ENGINE LIGHT TO ILLUMINATED □ DEALER REPAIRED THE AIR VALVE □ AFTER LEAVING REPAIR

SHUT OFF FRONT OF US THE FIRST TIME □ AND THE SECOND TIME WE NEARLY WENT OFF THE ROAD INTO SOMEONES YEAR. THIS HAS HAPPENED ON SEVERAL OCCASIONS □ AND COULD NOT DUPLICATE OR CORRECT THE PROBLEM. FEEL FREE TO PROVIDE ANY FURTHER INFORMATION.

WORKED ON BY DEALER TO ATTEMPT TO SOLVE THIS PROBLEM ALL 4 TIMES. CAR MUST BE PULLED OFF OF ROAD (IF IT STALLS) □ STOP VEHICLE. ALSO □ ON DECEMBER 7 2001 AT 30 MPH VEHICLE STALLED AGAIN □ CONSUMER UNABLE TO STOP VEHICLE □ MY WAY TO WORK. I WAS GOING SLIGHTLY DOWNHILL (NOT THAT STEEP OF A HILL) AT APPROX 35MPH. I LOST CONTROL OF THE CAR □ SIMILAR STALL EVENTS HAVE BEEN REPORTED BY ESCAPE OWNERS ON INTERNET SITES SUCH AS [HTTP://WWW.ESCAPEOWNERS.COM](http://www.escapeowners.com)

DOWNHILL WITH THE HEATER ON FULL-SPEED. ABOUT HALFWAY DOWN THE HILL THE IGNITION NOCKS OUT AND I HAD TO PULL THE EMERGENCY BRAKE TO GET THE VEHICLE TO STOP. THE VEHICLE WENT SIDEWAYS AND THE VEHICLE BECAME UNCONTROLLABLE. I WAS UNABLE TO DETERMINE A CAUSE FOR THE PROBLEM. VEHICLE HAS NOT BEEN REPAIRED. PLEASE PROVIDE FURTHER DETAILS.*AK

IMMEDIATELY AFTER EACH INCIDENT. FOUR SUCH INSTANCES HAVE OCCURRED SINCE THE CAR WAS PURCHASED 7 MONTHS AGO. THE CHECK ENGINE LIGHT AND BRAKE LIGHTS COME ON EVERY TIME I STOP TO RESTART THE CAR. *AK

WHILE DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 2ND OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 3RD OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 4TH OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE.

WHEN THERE IS A GAS ODOR COMING FROM AIR VENTS. ALSO IN THE MORNING VEHICLE HESITATES WHEN PULLING AWAY FROM A STOP. PLEASE PROVIDE FURTHER DETAILS.*AK

8600 MILES. I FIRST TOOK IT TO THE FORD SERVICE SHOP WHO REPLACED THE AIR FLOW VALVE AND THE IDLE AIR VALVE. THE PROBLEM CONTINUED. I TOOK THE VEHICLE TO ANOTHER FORD SERVICE SHOP WHO REPLACED THE RELAY SYSTEM. ONE MONTH LATER THE PROBLEM RE-OCURRED. PLEASE PROVIDE FURTHER DETAILS.*AK

WHILE DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 2ND OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 3RD OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 4TH OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE.

THE PROBLEM RE-OCURRED AND SEEMS TO POSE A DANGEROUS THREAT. APPEARS FORD HAS NO FIX OR SOLUTION YET.*AK

WHILE DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 2ND OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 3RD OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE; 4TH OCCURRENCE WHEN DRIVING AT 60 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. I WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE.

THE V8 ENGINE IS GOING TO BE REPLACED. VEHICLE ONLY HAD 331 MILES ON IT. *AK

THE DEALER COULDN'T FIND A CAUSE BUT KEPT IT TO INSPECT FURTHER AND GAVE CONSUMER A LOANER VEHICLE. *AK
LOSS OF POWER STEERING AND BRAKES. VEHICLE STARTED UP IMMEDIATELY AFTER PLACING IN 'PARK' POSITION. PLEASE PROVIDE FURTHER DETAILS.*AK

PLEASE PROVIDE ADDITIONAL INFORMATION.*AK

SMOKE FROM THE EXHAUST. WAS MOMENTARILY UNABLE TO SEE ANYTHING IN BACK ON THE CAR. I LOST ALL POWER STEERING AND BRAKES. LUCKILY NO OTHER TRAFFIC WAS ON THE ROAD. I PUT THE VEHICLE IN 'PARK' AND IT STARTED RIGHT UP. DEALER REPAIRED AIRBAG AND POSSIBLY OIL LIGHTS CAME ON. POWER STEERING AND BRAKES FAILED. WAS ABLE TO PULL OFF ROAD. LOST POWER STEERING AND POWER BRAKES AT OVER 35 MPH. DEALER DOES NOT KNOW WHAT THE SOLUTION IS. I HAD THIS VEHICLE ON MY OWN I'VE FOUND SEVERAL OTHER IDENTICAL CASES. FORD NEEDS TO FIND OUT WHAT IS GOING ON. INTERSTATE. VEHICLE COULD NOT BE RESTARTED ALTHOUGH AMPLE POWER APPEARS TO BE AVAILABLE FOR START. ENGINE SEIZED. FAILURE WAS SUDDEN AND WITHOUT WARNING. *AK

DEALER INVESTIGATED PROBLEM. THEY DETERMINED THAT ONE OR MORE INTERNAL PARTS HAVE FAILED. NEW PARTS ARE BEING WAITING FOR A NEW PART THAT MAY NOT CORRECT THE PROBLEM. *SLC

THE CHECK ENGINE LIGHT CAME ON. CONTACTED DEALER AND DEALER COULD NOT FIND THE CAUSE. *AK

LOSS OF POWER STEERING. DEALERSHIP EXAMINED VEHICLE AND REPLACED AN UNKNOWN RELAY TO REMEDY THE PROBLEM. I HAD BEEN TO THE DEALER THE FIRST AND THIRD TIME. THE MOST RECENT BEING 2/4/02. A 'FIX' HAS BEEN MADE. I'VE HAD TO REPLACE SEVERAL COMPONENTS. IF I HAD BEEN 100 FEET FURTHER DOWN THE ROAD A MAJOR ACCIDENT WOULD HAVE OCCURRED. OIL CAME ON. I COASTED TO A STOP AND TURNED OFF THE HEATER, RADIO, AND IGNITION AND PUT THE CAR IN NEUTRAL. LOST POWER STEERING AND POWER BRAKES AFTER STALL. STARTED RIGHT BACK UP IN NEUTRAL. PLEASE PROVIDE FURTHER DETAILS.*AK

.MASTER CYLINDER. *AK
ER COULD NOT DUPLICATE THE PROBLEM IN THE SHOP.
ANY PROBLEM PRIOR TO THIS.*AK

2 - CHANGED ECM MODULE RELAY VISIT 3 - REPLACED FUEL
ALL POWER AND BRAKING. FORD (VIA CUSTOMER RESPON
CTED THE PROBLEM. PLEASE GIVE ANY FURTHER DETAILS. *AK

CONSUMER STATES ANOTHER DEALER REPAIRED VEHICLE BY
D VEHICLE TO WHICH THIS HAS HAPPENED; DEALER HAS VEHIC
CESSFUL AT RESTARTING WITH NO PROBLEM. THIS IS THE
THEY SAID IT WAS RUNNING VERY HOT.CALLED FORD AND THEY
THEYRE NOT ABLE TO REPLICATE THE PROBLEM. IT'S BEEN TO

THIRD TIME. (TIRE CLICKING REPORTED UNDER #74880
AKES GO. HAVE TO MUSCLE CAR TO ROADSIDE. TURNING OFF
CURRENCE. CAR JUST LOSES ALL POWER AS WELL AS BRAKES

*GAS. I SHIFTED THE AUTOMATIC INTO PARK I TURNED THE
AL DEALER; SEEKING GUARANTEED RESOLUTION; REPLACE

3 IN 'PARK' AND RESTARTED W/O ANY PROBLEM (NO ENGINE STUMBS

ST TIME THE TOLD ME THAT FORD WAS AWARE OF THE PRO
I.*AK

TAKING VEHICLE TO DEALERSHIP.*AK
E FIRST OCCURRENCE HAPPENED FIVE DAYS AFTER I PURCHAS
INT WAS SHORTLY AFTER EXITING INTERSTATE HIGHWAY - I CA

IE NEXT DAY THIS PROBLEM OCCURED AGAIN WHEN GOING UP A SEMI

YTHING AT ALL WRONG WITH THE VEHICLE III ALL FOU
BUT THEY DONT SEEM TO BE ABLE TO DUPLICATE THE PR

*SLC

I ALTHOUGH THEY CLAIM TO NEVER HAVE HEARD ANYTHING LIKE
* INCIDENT. THE PROBLEM WAS A SEIZED ENGINE AND FORD
MANUFACTURER WILL TAKE STEPS TO CORRECT IT. IT CAN BE A

I SHOP VEHICLE SHUTS OFF AGAIN AND THE ENTIRE DASHBOARD

- ACROSS DOUBLE YELLOW LINE ON A BACKROAD - BECAUSE OF
NFORMATION OR DETAILS CONCERNING THIS MATTER.*AK

* POSSIBLE) AND RESTARTED. THE LAST TIME THIS O
TOP VEHICLE DUE TO NO BRAKING ABILITY AND REARENDED
POWER & MY CHECK ENGINE OIL & BATTERY LIGHT
XCAPE-CENTRAL.COM. THIS IS A SAFETY ISSUE. PLEASE ORDE

I MUST PULL OVER AND RESTART THE ENGINE. THIS HAS HAPPENED
BEHIND BARELY AVOIDED HITTING ME. THE DEALERSHIP AGAIN
WAS EXAMINED FOR SECOND INCIDENT. PLEASE PROVIDE

THIS INFO. VEHICLE TAKEN TO FORD AFTER EACH OCCURRENCE.

KIND. FORTUNATELY I WAS ABLE TO GET OFF TO THE SIDE OF THE
ROAD ON SLIGHT GRADE WAS NOT ABLE TO PULL OFF ROAD AND

DRIVE OUT FROM A STOP SIGN. CAR WAS TOWED TO LOCAL FORD

DEALERSHIP BUT THIS DID NOT SOLVE THE PROBLEM.

PROBLEM OCCURRED. DEALER STATED IT WAS THE PROCESSOR. PLEASE

ADVISE ME FOR THE GAS TO WORK. THIS IS SCARY SINCE I AM USING

THE DEALERSHIP TESTED VEHICLE AND FOUND NOTHING OUT

RE: STEERING AND POWER BRAKES. I WAS ABLE TO MAKE IT
OFF THE ROAD AND STOP VEHICLE WITH HAND BRAKE. SHIF
T INTO THE PROBLEM IS AT ALL. *AK
IT IS CAUSING THESE FAILURES AND RECALL THESE VEHICLE
ELECTRICAL DEMANDS. VEHICLE TOWED TO OWNERS HOME.

ENGINE TO BE INSTALLED. *AK

PROBLEM. AFTER THE SERVICE WAS PERFORMED, ENGINE STALLED
DUE TO 90 DEGREE TURN. SELLING DEALER HAS BEEN CONTACTED
IN PARK. CAR STARTED AGAIN BUT I WAS CONCERNED THAT
PROBLEM WILL RE-OCUR. *AK

ODI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident
2001NY		ESCAPE 2.0L					
201	687242	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU01B91KBB4850	16-Jul-01	2-Oct-01
77	887352	FORD MOTOR COMPANY	2001	ESCAPE	1FMJLD1BX1KEB4068	1-May-01	3-May-01

2002MY - zero reports

Injured	Fault	File	Part Name	City	State	Miles	Summary
N	0	STALLS	N	ENGINE	OAKLAND	CA	1800
N	0	INOPERATIVE	N	ENGINE	LEBANON	OH	5400

WHILE ACCELERATING TO 65 MPH, VEHICLE WILL STALL UNEXPECTEDLY IN TRAFFIC. DEALERSHIP HAS BEEN IN POSSESSION OF VEHICLE. TIRES MAKE A HUMMING NOISE. CONSUMER FEELS THAT THEY MAY BE LEAVING GROUND LIKE HYDROPLANING. AND AT 65 MPH VEHICLE

VEHICLE FOR TWO WEEKS. DEALER PERFORMED EXTENSIVE ROAD TESTING AND WAS ONLY ABLE TO VERIFY STALLING CONCERN
VEHICLE WOBBLES. VEHICLE IS NOT STABLE AT HIGH SPEEDS WITH WINDOW DOWN. *AK THE VEHICLE HESITATES WHEN A/C UI

IN ONCED STILL UNABLE TO DETERMINE CA
NIT IS IN OPERATION AND A/C MAKE

Item No	ODI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident
2000 MY								
881784		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5221YA158865	4-May-00	11-May-00	N 0
882553		FORD MOTOR COMPANY	2000	TAURUS		4-May-00	25-May-00	N 0
863348		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5221YA158865	1-Jun-00	9-Jun-00	N 0
867722		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5228YA168895		14-Aug-00	N 0
725845		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5328YA161078		24-Jul-00	N 0
725722		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5681YA2B3354	2-Aug-00	5-Aug-00	N 0
868450		FORD MOTOR COMPANY	2000	TAURUS		20-Aug-00	23-Aug-00	N 0
870410		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5220YG164374	1-Sep-00	13-Sep-00	Y 1
558871		FORD MOTOR COMPANY	2000	TAURUS	1FAPP53U9YA150752		26-Oct-00	N 0
538871		FORD MOTOR COMPANY	2000	TAURUS	1FAPP53U9YA150752		26-Oct-00	N 0
741621		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5328YA198718	16-Feb-01	27-Feb-01	N 0
889007		FORD MOTOR COMPANY	2000	TAURUS	1FAPP55U1YA158115	2-Apr-01	16-Apr-01	N 0
889179		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5327YA158573	1-May-00	25-May-01	N 0
880649		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5BU7YA128404		19-Jun-01	N 0
747120		FORD MOTOR COMPANY	2000	TAURUS		15-Jun-01	20-Jun-01	N 0
883305		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5322YA245538	1-Jun-00	8-Aug-01	N 0
883887		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5225YG161148	23-Mar-00	7-Aug-01	N 0
884388		FORD MOTOR COMPANY	2000	TAURUS			15-Aug-01	N 0
884383		FORD MOTOR COMPANY	2000	TAURUS	1FAFT5520YG134884	1-Jul-01	15-Aug-01	N 0
750508		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5B25YA143128		15-Aug-01	N 0
885108		FORD MOTOR COMPANY	2000	TAURUS	N/A	4-Aug-01	24-Aug-01	N 0
8003620		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5225YG181148	21-Jul-01	20-Aug-01	N 0
886888		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5522YA190134	18-Aug-00	28-Sep-01	N 0
563518		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5525YG170733	6-Jun-01	2-Oct-01	N 0
583258		FORD MOTOR COMPANY	2000	TAURUS	1FAPP5328YG198030	24-Oct-00	25-Sep-01	N 0
888839		FORD MOTOR COMPANY	2000	TAURUS	1FALP5687YA21A153	1-Nov-01	8-Nov-01	N 0
755013		FORD MOTOR COMPANY	2000	TAURUS	1FAPP55S7YG280405		28-Nov-01	N 0

2001MY Zero Reports

2002 MY Zero reports

Injured	Fault	Fire	Part Name	City	State
DESIGN	N		ENGINE FT BRAGG	NC	0
INOPERATIVE	N		ENGINE CHARLOTTE	NC	0
INOPERATIVE	N		ENGINE FORT BRAGG	NC	840
DESIGN	N		ENGINE LAS VEGAS	NV	1500
ERRATIC OPERATION			ENGINE ELIZABETH	NJ	0
STALLS	N		ENGINE JACKSONVILLE	FL	35
DESIGN	N		ENGINE FAIRLAWN	NJ	4400
ERRATIC OPERATION			ENGINE PLACERVILLE	CA	7510
INOPERATIVE			ENGINE LAKE CHARLES	LA	0
INOPERATIVE			ENGINE LAKE CHARLES	LA	0
ERRATIC OPERATION			ENGINE DEVON	PA	10400
ERRATIC OPERATION			ENGINE HARVEY	IL	26000
ERRATIC OPERATION			ENGINE MARIETTA	GA	12700
ERRATIC OPERATION			ENGINE ANNAPOLIS	MD	0
DESIGN	N		ENGINE MINNEAPOLIS	MN	1000
DESIGN	N		ENGINE WYOMING	DE	15000
ERRATIC OPERATION			ENGINE WEST ALLIN	WI	0
INOPERATIVE	N		ENGINE BIRMINGHAM	AL	0
ERRATIC OPERATION			ENGINE WEBSTER	NY	50
INOPERATIVE			ENGINE MENTOR	OH	0
ERRATIC OPERATION			ENGINE PAWTUCKET	RI	23
UNKNOWN	N		ENGINE WEST ALLIS	WI	18500
STALLS	N		ENGINE DACULA	GA	0
INOPERATIVE	N		ENGINE GREENBRIER	TN	22392
ERRATIC OPERATION			ENGINE CURTIS BAY	MD	18866
ERRATIC OPERATION			ENGINE CONLEY	GA	68000
NOISY	N		ENGINE VIENNA	VA	0

Miles

CONSUMER BOUGHT VEHICLE BRAND NEW. VEHICLE STALLED ANYWHERE WITHOUT PRIOR WARNING. ALSO ENGINE CHECK LIGHT CAME ON THE DASHBOARD. CONS WHILE DRIVING DOWN THE ROAD VEHICLE WILL SHUT OFF IN THE MIDDLE OF THE ROAD. TOOK VEHICLE TO DEALER AND THEY REPLACED BURNED OUT STARTER. BUT WHILE DRIVING ABOUT 40 MPH VEHICLE STALLED WITHOUT PRIOR WARNING. COULD NOT RESTART VEHICLE AND THEN VEHICLE HAD TO BE TOWED. OWNER HAD CONF VEHICLE WILL SUDDENLY STALL WHILE IN MOTION. CONSUMER MUST QUICKLY PULL OVER AND TRY TO RESTART VEHICLE. DEALER CLAIMED THAT HE COULD NOT DUP BEING A BRAND NEW CAR AND TWO STALLING INCIDENTS ON THE ROAD. I FEEL I SHOULD GET A NEW CAR. *AK

2000 TAURUS WITH DURATEC ENGINE HAS A 'COMPLETE' ENGINE SHUTDOWN AT 35 MPH. WHEN THE 'COMPLETE' ENGINE SHUTDOWN OCCURRED, I LOST CONTROL OF TI WHILE DRIVING CAR STARTS TO BUCK A LITTLE AND THEN MOTOR SHUTS DOWN. WHEN THIS HAPPENS, CONSUMER LOSES BRAKES/STEERING AND EVERYTHING JUS CONSUMER WAS TRAVELING ABOUT 25MPH ON A SIDE STREET WHILE IT WAS RAINING AT THAT EVENING. SHE WAS GOING DOWN A MOUNTAIN HILL AND VEHICLE STALLI WHILE DRIVING 70 MPH IN HEAVY TRAFFIC THE VEHICLE STALLED. DRIVER WAS ABLE TO PULL OVER TO THE SHOULDER SAFELY. AFTER A FEW MINUTES THE VEHICLE S' WHILE DRIVING 70 MPH IN HEAVY TRAFFIC THE VEHICLE STALLED. DRIVER WAS ABLE TO PULL OVER TO THE SHOULDER SAFELY. AFTER A FEW MINUTES THE VEHICLE S' WHEN ACCELERATING ONTO INTERSTATE HIGHWAY THE ENGINE MOMENTARILY CUT OUT. THE BATTERY LIGHT FLASHED ON THEN OFF & THE CHECK ENGINE LIGHT CAME WHILE DRIVING 20-30 MPH. VEHICLE STALLED WITHOUT PRIOR NOTICE. DEALER COULD NOT FIND A PROBLEM. *AK THE VEHICLE WENT IN REVERSE FROM DRIVE WHILE WHILE TRAVELING UNDER 40 MPH AND APPLYING OR TAPPING BRAKES AND THEN REAPPLYING ACCELERATOR. ENGINE WILL BEGIN TO RUMBLE AND CAUSE VIBRATIO WHILE DRIVING AT 50 MPH. VEHICLE COMPLETELY SHUTDOWN WITHOUT WARNING. CAUSE UNKNOWN. NO INJURIES OR COLLISION OCCURRED. DEALER CANNOT IDENTIF LOW COOLANT LIGHT CAME ON BUT CAR DID NOT OVERHEAT BUT ANTIFREEZE DID LEAK OUT OF HEATER BLOCK. TOOK CAR TO DEALER... HEATER BLOCK THREADED I VEHICLE HAS STALLED 7 TIMES AT ANY SPEED/ ANY TIME TAKEN TO DEALER 6 TIMES. DEALER UNABLE TO REMEDY SITUATION. *AK

WHILE DRIVING VEHICLE CONSUMER STATES IT JUST STALLED WITHOUT WARNING AND LOST ALL POWER. WAITED ABOUT 15 TO 20 MINUTES VEHICLE RESTARTED. CONTI WHILE TRAVELING AT NORMAL SPEED AND WITHOUT ANY INDICATION VEHICLE STALLED. AFTER SITTING FOR ONE HOUR, VEHICLE RESTARTED. PLEASE PROVIDE FURTHI VEHICLE WOULD STALL WHILE CONSUMER WAS TRAVELING ON EXPRESSWAY. BUT VEHICLE WOULD RESTART EVERY TIME. PROBLEM WAS INTERMITTENT. *AK

ON JULY 29, 2001, WHILE DRIVING AT 50 MPH ON A COUNTRY ROAD, THE CAR DIED. THE DASH LIGHT JUST CAME ON AND THE JUST QUIT RUNNING IN THE MIDDLE OF THE WHEN DRIVING ON HIGHWAY AT 60-65 MPH AND WITHOUT ANY WARNING. VEHICLE SUDDENLY STALLED, CAUSING LOSS OF ALL POWER. CONSUMER PULLED OFF TO THE HAD TROUBLE WITH CAR STALLING AT 1200 MILES. ALSO VEHICLE WOULD HESITATE CONSTANTLY WHEN HITTING THE GAS. WANTS TO CUT OFF. HAS STALLED SEVERAL WHILE TRAVELING AT 55 MPH AND WITHOUT ANY INDICATION VEHICLE STALLED. CONSUMER PULLED OVER AND RESTARTED VEHICLE. IT RETURNED TO NORMAL TI THE VEHICLE SUDDENLY STALLS WHILE DRIVING AND WITHOUT WARNING. THIS PROBLEM HAS OCCURED ON FOUR DIFFERENT OCCASIONS. THE DEALER HAS REPLACED CONSUMER STATES ENGINE IDLE WILL GO TO 800 TO 1000 RPMs AT TIMES WHILE IDLING IN GEAR. DEALER UNABLE TO DUPLICATE THE PROBLEM. *JB

WHILE DRIVING 25-30 MPH VEHICLE STALLED. VEHICLE NOT TAKEN TO DEALER YET. *AK

THERE WERE TWO INCIDENTS WHERE WHILE DRIVING AT LOW SPEED (10MPH) ABS LIGHT TURNED ON AND ENGINE MADE VERY STRONG NOISE. AFTER STOPPING AND MC

Summary

CUSTOMER TOOK VEHICLE TO THE DEALERSHIP. *AK
CANT DUPLICATE THE PROBLEM. *AK
DISCUSS WITH DEALER OVER A REPLACEMENT VEHICLE AND PAYMENT OF REPAIRS. *AK *MIL
INDICATE DEFECTED BUT DEFECT KEEPS OCCURRING. *AK

THE VEHICLE. I MANAGED TO STOP THE VEHICLE IN THE ROAD. THIS WAS A 'LIFE THREATENING' EXPERIENCE AS I DIRECTED T
IT SHUTS DOWN.*AK
STARTED WITHOUT PRIOR WARNING. VEHICLE STARTED TO SLIDE TO LEFT INTO THE CROSS LANE. SHE APPLIED BRAKES AND THEN
STARTED AGAIN. *CJ
STARTED AGAIN. *CJ
ON & STAYED ON ALL THE WAY HOME. DEALER CHECKED IT OUT AND FOUND NO PROBLEM. IT HAS OPERATED PERFECTLY EVER SINCE. DE
STOPPED AT SIGNAL. *YH
IN IN VEHICLE FOR A COUPLE SECONDS AND THEN SHUTDOWN. ENGINE CHECK LIGHT WILL COME ON. THIS ALSO OCCURRED WHI
FY CAUSE. PLEASE GIVE ANY FURTHER DETAILS. *AK
INCORRECTLY TO ENGINE. NOW TOLD I NEED A WHOLE NEW ENGINE! (I HAVE ONLY HAD CAR FOR A MONTH)

CONTACTED DEALER AND DEALER COULD NOT FIND CAUSE. *AK
FOR INFORMATION. *AK

ON ROAD. NO INDICATION CAME FROM THE CAR OTHER THAN JUST STOPPED RUNNING. IT DIDN'T HESITATE BULK OR ANYTHIN
SIDE OF ROAD. PLEASE PROVIDE ANY FURTHER DETAILS. *AK
TIMES AT ONE TIME VEHICLE JUST LURGE FORWARD. ON 7/21/00 WHILE DRIVING 80-85 MPH IN HEAVY TRAFFIC VEHICLE JU
RAVEL. DEALER WAS CONTACTED AND COULD NOT FIND PROBLEM. PLEASE PROVIDE FURTHER INFORMATION. *AK
ON CERTAIN PARTS BUT THE PROBLEM REOCCURS. NUM

WHEN SHIFTING TO NEUTRAL IN ORDER TO TURN OFF THE ENGINE THE ENGINE MADE EVEN A LOUDER SQUEAKING NOISE. AFTER TURNING OFF

**DPFE Sensor Vehicle Issues Meeting, Monday 5/20/02 1:00-3:00 p.m.
POEE, E103A (pillar L10)**

Attendees:	Paul Plante	Mahmoud Awad	Mary Akins
	Amy Poma	Freeman Gates	John Jahshan
	Jim Maurer	Jon Janda	Mark Freeland
	Jim McCoy	Sheran Alles	Carol Verner
	Robert Rossi	Shri Akolkar	

Meeting Objective: This is an issues resolution meeting. The objective being to address vehicle issues, decide if it is an IS/IS NOT Root Cause, with a delegation of assignments/collection of data to further discuss and bring to conclusion.

Assignments:

- **Paul Plante** – contact EESE chief engineering and establish the support required from that office for this team.
- **Shri Akolkar** – Powertrain applications – get pressure, pulsation and temperature information. John to get with Freeman to define what requirements are necessary for the test and to make sure the vehicles being used are the same. Proposed vehicles are:
 - 4.6L SOHC F-Series
 - 4.6L SOHC Econoline
 - 4.2L OHV F-Series
 - 4.2L OHV Econoline

Freeman Gates-Determine if exhaust gas at the sensor contains acids. Run test on vehicle with sensor fitted with litmus paper (from K. Park).

- **Jim McCoy-leader** – Study non-standard sensor current and voltage for the "best of the best" to the "worst of the worst" vehicles.
 - 4.0L 2002 Explorer-need to establish month of production for low warranty condition. (best)
 - 2.0L Alan Ford Zetec Focus (worst) original PCM. Paul will check with Marty on car status.

Need to collectively test a variety of different concepts that cause transient noise: Transient noise coming out of V-ref to be checked: (C=connections, G=grounds). C270B, C270C, C270D, C110, C133, G300, G100, G104, G105 and G101.

Concepts decided for discussion of 20 minutes each at next week's May 20th meeting:

1. J1-PCM solder
2. C-90 connector intermittent
3. Cigarette lighter does not work or fuse blows indicating electrical short in harness
4. Alternator
5. Escape-brake pedal switch connector.

The next meeting is scheduled for Monday, May 20, 2002 in conference room E103A. Please bring 13 copies of your issues to present and discuss. If you are unable to attend but would like to call it, please contact me in advance and I will obtain a conference call phone for the room. Apoma2@ford.com.

From: Poma, Amy (A.)
Sent: Tuesday, July 30, 2002 8:41 AM
To: Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auiler, Jim (J.E.); Awad, Mahmoud (M.I.); Ayers, Don; Bandoke, Pete (P.F.); Bansek, Catherine (C.K.); Bersuder, Lee (L.C.); Bissi, Gerry (G.); Bronni, Mark (M.J.); Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.); Douglass, Jim (J.B.); Freelant, Mark (M.); Galante, Chris (C.R.); Gates, Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hargas, Jon (.); Jahshan, John; Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerezi, Karen (K.J.); Kozewnik, John (J.J.); Kunde, Olf (O.); Masura, Gordon (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.); Nielsen, Christian (C.A.); O'Neill, Jim (J.D.); Oswald, Greg (G.G.); Park, Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.); Poma, Amy; Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Reddy, Srikanth; Rossi, Roberto (R.A.); Schleding, Kurt (K.J.); Shore, John (J.); Tamashiro, Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); Williamson, Richard (E.)
Subject: August 1, 2002 1:00-3:00 Ford/Kavlico mtg. CANCELLED
Please be advised that the Thursday August 1, 2002 1:00-3:00 call in meeting is cancelled. You will be notified when the next meeting will be scheduled.

*Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com*

DPFE Sensor Meeting Agenda

Thursday 2/7/02

#	Name	Time	Description
1	C. Panaretos	5	Fax handouts to Kavlico
2	All	5	Introductions
3	Rudy Whitworth	5	Rudy Whitworth, MIL Affinity team, (Gary Danhoff-offsite)
4	Mark Freeland	5	Should we have a rep from Focus stalls team on DPFE team?
5	Paul Plante	5	Proposed Tech Review Thursday 2/28/02
6	Mark/Mahmoud	5	Pareto of failure symptoms-Leader and approach
7	Mark/Mahmoud	10	Data Mining and Analysis update
8	Terry Tamashiro	10	Field returns analysis at Kavlico & DV/PV test plan
9	Freeman	15	Metalization damage, sensor technology and durability information
10	Paul	5	Offsite follow up assignments-Add answers to agenda next week
11	T. Green	20	Documents Discovery-Escape Tribute Stalls NHTSA Inquiry
12	All	5	Open Issues/Assignments List
13	All	5	Walk Ins
14	All	5	Next meeting agenda
		105	Total Minutes (120 available)

Note: Bench test working group meeting Thursday, 3:00PM; Vehicle test team meeting Friday, 11:00.

Tuesday 2/12/02

A	S. Alles/R. Rossi	20	Wiring Harness noise concerns update, OA work plan, and conclusions
B	All	15	Offsite follow up assignments answers
C	Kyong Park	10	Component bench test results: Low failure rate

Near Future Meeting Agenda

A	Basem El-Haik	Data Mining and approach discussion
B	Bob Jentz	Kavlico improved sensor test results from Focus (Carol)
C	Freeman/Mark	Team Expert help-Additional heads requirement
D	Plante	Fishbone Diagram and Is-Is Not
E	Don Ayers	Kavlico service parts availability (Match to John Shore FCSD parts requir.)

pgp/dpfe meet
2/6/2002

**Issues Resolution Meeting Agenda
Monday, May 20, 2002
POEE CR E103A**

- | | |
|--|-------------------|
| 1. J1-PCM solder | 20 minutes |
| 2. C-90 connector intermittent | 20 minutes |
| 3. Cigarette lighter does not work or fuse
Blows indicating electrical short in harness | 20 minutes |
| 4. Alternator | 20 minutes |
| 5. Escape-brake pedal switch connector | 20 minutes |
| 6. New topics/walkins | 20 minutes |
| 7. Kavlico's request to acquire car for testing | 20 minutes |

**Issues Resolution Meeting Agenda
Monday, May 20, 2002
POEE CR E103A**

- | | |
|--|-------------------|
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| 4. Alternator | 20 minutes |
| 5. Escape-brake pedal switch connector | 20 minutes |
| 6. New topics/walkins | 20 minutes |

**DPFE Sensor Vehicle Issues Meeting, Monday 5/20/02 1:00-3:00 p.m.
POEE, E103A (pillar L10)**

Attendees:

Paul Plante	Mahmoud Awad	Mary Akins
Amy Poma	Freeman Gates	John Jahshan
Jim Maurer	Jon Janda	Mark Freeland
Jim McCoy	Sheran Alles-no	Carol Vernor-no
Robert Rossi-no		

Meeting Objective: This is an issues resolution meeting. The objective being to address vehicle issues, decide if it is an IS/IS NOT Root Cause, with a delegation of assignments/collection of data to further discuss and bring to conclusion.

Assignments:

- **Paul Plante** – contact EESE chief engineering and establish the support required from that office for this team.
- **John Jahshan/Freeman Gates** – Powertrain applications – get pressure, pulsation and temperature information. John to get with Freeman to define what requirements are necessary for the test and to make sure the vehicles being used are the same. Proposed vehicles are:
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 - 4.2L OHV Econoline
- **Jim McCoy-leader** – Study non-standard sensor current and voltage for the "best of the best" to the "worst of the worst" vehicles.
 - 4.0L 2002 Explorer-need to establish month of production for low warranty condition. (best)
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Need to collectively test a variety of different concepts that cause transient noise:
Transient noise coming out of V-ref to be checked: (C=connections, G=grounds).
C270B, C270C, C270D, C110, C133, G300, G100, G104, G105 and G101.

Concepts decided for discussion of 20 minutes each at next week's May 20th meeting:

1. J1-PCM solder
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3. Cigarette lighter does not work or fuse blows indicating electrical short in harness
4. Alternator
5. Escape-brake pedal switch connector.

The next meeting is scheduled for Monday, May 20, 2002 in conference room E103A. Please bring 13 copies of your issues to present and discuss. If you are unable to attend but would like to call it, please contact me in advance and I will obtain a conference call phone for the room.
Apoma2@ford.com.

Kavlico TM dPFB Sensor
Technical Offsite Meeting
FTDC – Room
March 14, 2002
8:30-5:00

Agenda

Discussion of UPAD – Results from FRL	<i>Mark Freeland</i>	1 hour
Break		10 minutes
Summary of Investigations to Date: Corrosion Analysis	<i>Freeman Gates</i>	1 hour
Analysis from Kavlico Returns	<i>Loay Saliaeh, Mahmoud Awad</i>	.5 hour
Discussion of Outside help and Management Support	<i>Jim O'Neill</i>	.5 hour
Break for Lunch – FTDC Cafeteria		50 minutes
Is/Is Not and Fishbone	<i>Shri Akolkar, Jon Janda, Team</i>	1.5 hours
Break		10 minutes
Cause/Effect Analysis	<i>Team</i>	2.5 hours
Final Summary		.5 hours

Kavlico TM dPFE Sensor
Technical Offsite Meeting
FTDC – Room
March 14, 2002
8:30-5:00

Agenda

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Break		10 minutes
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Analysis from Kavlico Returns	<i>Loay Sataieh, Mahmoud Awad</i>	.5 hour
Discussion of Outside help and Management Support	<i>Jim O'Neill</i>	.5 hour
Break for Lunch – FTDC Cafeteria		50 minutes
Is/Is Not and Fishbone	<i>Shri Akolkar, Jon Janda, Team</i>	1.5 hours
Break		10 minutes
Cause/Effect Analysis	<i>Team</i>	2.5 hours
Final Summary		.5 hours

Kavlico dPFE Sensor
Technical Offsite
February 1, 2002
8:00 – 5:00
FTDC – Room 161 South

Attendees: Mary Akins, Sheran Alles, Mahmoud Awad, Don Ayers (Kavlico), Brady Davies (Kavlico), Mark Freeland, Freeman Gates, Jon Hargas, Jim O'Neill, Chris Panarstus, Kyong Park (Kavlico), Anup Patel, Brian Perry, Paul Plante, Kurt Schieding, Carol Verner, Loay Salhiq (Student), Barry Bugaj (Kavlico), Gary Danhoff, Jim Maurer.

Introductions: 8:15-8:30

1. BGR System Overview - Freeman Gates 8:30-9:00
 - Assignment: Does vehicle temperature information of silicon exist for applications with high dPFE warranty? (R. Rossi)

2. Conventional dPFE EGR Sensor – Gary Danhoff 9:00-9:40
 - Assignment: Provide team with pictures of each functional failure mode. (Mark Freeland)
 - Assignment: File compare for 21 vehicles 2001 MY calibration assoc. w/issue for voltage trip values. (Gary Danhoff)
 - Assignment: Provide team with a pareto of the AWS EGR codes for the "5" applications – 2001 MY. (Gary Danhoff)

Break: 9:40 – 10:00

3. PCM Discussion - Anup Patel, Brian Perry 10:00 – 10:40
 - Assignment: For all 21 applications: Identify PCM part number and current draw required, incremental to normal, to put PCM into reset. Include standard deviation (5 platforms to study: measurement on 5 and best vehicles, start with Focus). Collect data on power spike, then do more in depth analysis. (Brian Perry, Anup Patel)
 - Parking Lot: Shecan give more detail with regard to wiring to PCM at Thursday's meeting (next week).

3. Sensor Overview – Don Ayers 10:40 - 12:00
 - Assignment: Identify date of change from extended gold one to extended gold two design. (Brady Davies)
 - Assignment: Give Mahmoud Awad exact dates for Kavlico changes. (Don Ayers)

Lunch Break 12-1:00

3. Sensor Overview – Don Ayers (continued) 1:00 – 2:20
 - Assignment: Compare failure mechanism of the current production acid tested parts vs. warranty UPAD parts. (Brady Davies)
 - Assignment: Provide Mark Freeland 6 parts with corrosion from pre-An parts. (Brady Davies)
 - Parking Lot: Paralyne coating: Root cause determination

Break: 2:20-2:30

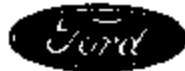
4. Warranty Summary – Taurus: Mahmoud Awad 2:30 – 2:45
- by application and Focus: Mark Froeland 2:45 – 3:05
5. Technical Presentation – Mark Froeland 3:05 – 3:35
Transient Voltage
UPAD
6. Technical Presentation – John Hargus 3:45 – 4:15
UAD
- Freeman asked if he could replicate the testing that he has done.
7. Wrap-up 4:15-4:30;

Notes: Presenters need to send out copies of all presentations to Chris. Before sending documents, please mark 'confidential'. Paul Plante asked that if you want a copy of everything, to e-mail CPANARET.

Freeman added that the objectives of the technical presentations were met; focus of core team should be to cover UPAD root cause and bench and vehicles. Keep in mind that Kavlico is switching suppliers from SMI to Zarlink.

Assignment: Provide DV Plan for new Tier-2 Supplier (Mary Atkins). Need reliability engineer dedicated from Ford to work with Mary.

Will continue discussions at Tuesday/Thursday meetings.



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: **Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: February 12, 2002
Time: 1-2:30 p.m.
Location: POBE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): February 14, 2002, DI-196, 1-3:00 p.m.
 February 19, 2002, DI-196, 1-2:30 p.m.
Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#

Core Team Participants

<u>Black Belt</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>RESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Atkins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Joe Smytha
	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
<u>Team Leader</u>		Chris Panaretos			
Jim Maurer		Paul Plante		<u>PCSE</u>	
		Carol Verner		Ken Arnold	
				Brian Perry	

Meeting Agenda - 2/12/02

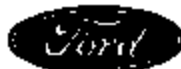
<u>Order of Agenda Items</u>	<u>Cont. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Proposed I. Koszewnik Review 2/22/02 and Tech Review 2/28/02	I1, A4	Paul Plante	5 minutes
3. Component bench test results: Low failure rate	I5, A6	Kyong Park	10 minutes
4. Field returns analysis at Kavlico	I3, A3	Terry Tamashiro	10 minutes
5. DV/PV Test Plan, Bench and Fleet Vehicles		Mahmoud Awad / Terry Tamashiro	10 minutes
6. Wiring Harness Noise concerns, OA work plan and conclusions	I2, A6	S. Alles/R. Rossi	15 minutes
7. Metalization damage by sensor manufacturing and technology	I3, A8	Freeman Gates	10 minutes
8. Pareto of failure symptoms - Leader and approach		Paul Plante / Mahmoud Awad	5 minutes
9. Open Issues / Assignments List		Chris Panaretos	5 minutes
10. Walk-in's		All	10 minutes
11. Next Meeting (2/14/02) Agenda Items		All	5 minutes

Proposed Next Meeting Agenda 2/14/02

<u>Proposed Next Meeting Agenda 2/14/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>
Data Mining and Analysis Update	Mahmoud Awad / Mark Freeland	10 minutes
Offsite Follow-up assignments	Paul Plante / Jim Maurer	20 minutes
Align all Kavlico actions with R/1000 Stack Charts	Mahmoud Awad / Don Ayers	10 minutes

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to CPANARBT (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: February 14, 2002
Time: 1-3:00 p.m.
Location: POEB, DI-196 (FMBI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): February 19, 2002, DI-196, 1-2:30 p.m.
 February 21, 2002, DI-196, 1-3:00 p.m.
Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#

Core Team Participants

Black Belt	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alies	Joe Smythe
	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Team Leader		Chris Pararetos			
Jim Maurer		Paul Plants		PCSE	
		Carol Verner		Ken Arnold	
				Brian Perry	

Meeting Agenda - 2/14/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Open Issues and Assignments	High	All	30 minutes
3. Data Mining and Analysis Update		Mahmoud Awad, Mark Freeland	20 minutes
4. Align all Kavlico actions with R/1000 Stack Charts		Mahmoud Awad / Don Ayers	10 minutes
5. Pareto of failure symptoms - Approach to look at warranty data		Mahmoud Awad	15 minutes
6. Walk-in's		All	20 minutes
7. Next Meeting (2/14/02) Agenda Items		All	10 minutes

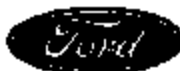
<u>Proposed Next Meeting Agenda 2/19/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
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 Please be on time as we have a full agenda

ER02-827-G 48515

Jim Maurer/ep: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: March 5, 2002
 Time: 1-2:30 p.m.
 Location: POEB, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): March 7, 2002, DI-196, 1-3:00 p.m.
 March 12, 2002, DI-196, 1-2:30 p.m.
 March 14, 2002, Technical Offsite #2
 Conference Call-in: 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Number(s): Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	BESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Joe Snythe
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 3/05/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Analysis of data from Kavlico returns	I1, A1	Loay Salaieh	20 minutes
3. Update on obtaining fleet vehicles from buy-back lists/discussion of car requirements for testing	I6, A3 & I10, A6	Carol Verner	10 minutes
4. Pressure/voltage data for Zarlink and SMI sensors	I12, A4	Kavlico	5 minutes
5. Update on Vehicle Electrical Testing	I6, A1 & I12, A6	R. Rossi	20 minutes
6. Offsite Assignments (from 2/1 Technical Offsite)	Various	C. Panaretos	10 minutes
7. Agenda for 2-Day Technical Review (3/14 Offsite)		All	10 minutes
8. Walk-ins		All	5 minutes
9. Next meeting (3/5) agenda		All	5 minutes

<u>Proposed Next Meeting Agenda 3/7/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>
Overlay of Kavlico and Ford changes on stack chart	Mahmoud Awad	10 minutes

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: March 7, 2002
Time: 1-3:00 p.m.
Location: POBE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): March 12, 2002, DI-196, 1-2:30 p.m.
 March 14, 2002, Technical Offsite #2
Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Froeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Joe Smythe
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 3/7/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Overlay of Kavlico and Ford changes on stack chart	I6, A2	Mahmoud Awad	20 minutes
3. Update from Kavlico on part RML8760-184; Full report/matrix update of teardown analysis	E, A1, A4	Terry Tamashiro	20 minutes
4. Status on Norfolk and St. Thomas returns	E, A3	Terry Tamashiro	10 minutes
5. Comparison report of UPAD to Acid Test	I5, A6	Kyong Park	10 minutes
6. Update on Vehicle Electrical Testing	I6, A1 & I12, A6	R. Rossi	20 minutes
7. Kavlico service part capacity/Motorola coordination	I16, all	All	10 minutes
8. Agenda for 2-Day Technical Review (3/14 Offsite) - Revise	I3, A7	All	10 minutes
9. Walk-in's		All	10 minutes
10. Next meeting (3/12) agenda		All	5 minutes

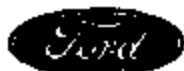
<u>Proposed Next Meeting Agenda 3/12/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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EP02-027-G 40518

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor
Meeting Logistics	
Subject:	Kavlico TM dPFE Sensor Core Team
Date:	March 12, 2002
Time:	1-2:30 p.m.
Location:	POER, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	March 14, 2002, Technical Office #2
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574

Core Team Participants					
Black Belts	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Freeland	Mary Atkins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Joe Smythe
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

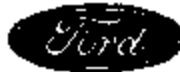
Meeting Agenda - 3/12/02				
Order of Agenda Items	Corr. Issue #	Person(s) Responsible	Time Allocated	
1. Introductions		All	5 minutes	
2. Kavlico needs to verify what Pirana-etch does to aluminum.		Kyong Park	10 minutes	
3. Status on Norfolk and St. Thomas returns.		Terry T	10 minutes	
4. Complete teardown analysis for five platforms including Focus		Terry T	10 minutes	
5. Capacity for service.		Chris Nielsen	10 minutes	
6. Update on Vehicle Electrical Testing	I6, A1 & I12, A6	R. Rossi	20 minutes	
7. Compare failure mechanism of the current production acid tested parts vs. warranty UPAD parts.		Kyong Park	15 minutes	
8. Affect of the gold process on warranty		Kyong Park	15 minutes	
9. Update on fleet vehicles		Carol Verner	10 minutes	
10. Walk-in's		All	10 minutes	
11. Next meeting (3/19) agenda		All	5 minutes	

Proposed Next Meeting Agenda 3/19/02	Person(s) Responsible	Time Estimated

Notes

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Jim Maurer/op: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: **Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: March 21, 2002
 Time: 1-2:30 p.m.
 Location: POEE, DI-196 (FMEI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): March 25, 2002, Technical Review (CCRG)
 March 26, 2002, Core Team Meeting
 March 28, 2002, Core Team Meeting
 Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	ERSE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Joe Smythe
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 3/21/02

<u>Order of Agenda Items</u>	<u>Corr. 14D #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Update from FCSD (Julie Marcer)	1, c	Carol Verner	10 minutes
3. Supporting Documents to Explain Root Cause (P-Diag, Is/Is Not, Cause/Effect)	2, a	Jon Janda, Shri Akolkar	10 minutes
4. Transient Voltage Test Results	3, a	Mark Freeland	20 minutes
5. AWS Results / Additional Graphs	3, d	Mahmoud Awad	10 minutes
6. SRBA number and date from Kavlico	4, a	Mary Akins	5 minutes
7. Body Electric Actions - Findings to Date	4, a	Robert Rossi	15 minutes
8. Acid Test Results: Overview document in pareto or spreadsheet format	5, ii	Kyong Park Terry Tamahiro	15 minutes
9. Comment from Kavlico on capacity issue	10	Barry Bugaj	10 minutes
10. New Financial Figures based on Carol's findings	12	Jim Maurer	5 minutes
11. Finalize presentation to Technical Review		All	15 minutes

<u>Proposed Next Meeting Agenda 3/26/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: March 26, 2002
 Time: 1-2:30 p.m.
 Location: POEE, DI-196 (FMRI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): March 28, 2002, Core Team Meeting
 April 2, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Bolts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESE</u>	<u>Purchasing</u>
Mark Froeland	Mary Akins	Jim O'Neal	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jim Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Veruer		Ken Arnold	
Jim Maurer				Brian Perry	

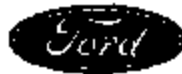
Meeting Agenda - 3/26/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Results / Comments from Technical Review	11, A4	Jim Maurer , Paul Plante	10 minutes
3. Discussion of Outside Sources to use for analysis	15, A5	Jim Maurer	10 minutes
4. Update from BESE on testing / establish date when findings available.	Various	R. Rossi, S. Alles	20 minutes
5. Review of High-Priority open issues	Various	All	15 minutes
6. Walk-in's		All	15 minutes
7. Next Agenda Items / Discussion		All	10 minutes

<u>Proposed Next Meeting Agenda 3/28/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: March 28, 2002
 Time: 1-2:30 p.m.
 Location: POEB, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): April 4, 2002, Core Team Meeting

Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	ESSE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sharan Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Percy	

Meeting Agenda - 3/28/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Results / Comments from Technical Review	11, A4	Paul Plante	10 minutes
3. Discussion w/Kavlico of Outside Sources to use for analysis	15, A5	Jim Maurer	10 minutes
4. Discussion of PCM J1 Connector warranty issues	13, A5	John Jahshan	10 minutes
5. Update on obtaining Fleet Vehicles	16, A4	Carol Verner	10 minutes
6. Review of High-Priority open issues	Various	All	25 minutes
7. Walk-in's		All	15 minutes
8. Next Agenda Items / Discussion		All	10 minutes

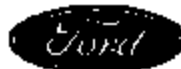
<u>Proposed Next Meeting Agenda 4/4/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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ER82-827-G 40522

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: April 9, 2002
Time: 1-2:30 p.m.
Location: FOEE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): April 11, 2002, Core Team Meeting
 April 16, 2002

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belt	Kavlico	V-Engine	Quality Office	EESB	Purchasing
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nilsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plants		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 4/9/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Service Part Volume Projections - Kit vs. One part	I16, A2	John Shore	10 minutes
3. Update on Wiring Harness Root Causes / Findings	various	Sheran Alles, Robert Rossi	15 minutes
4. STA Update	I20	Patrice White-Johnson	10 minutes
5. Update on FRI Scientific Evaluation - progress to date	I3, A2	Mark Freeland	10 minutes
6. GQRS Data on 21 platforms - Status	I3, A9	Jon Janda, Mahmoud Awad	10 minutes
7. Outside Lab - Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Freeman Gates	10 minutes
8. Update on Body and Assembly plant failures	I3, A3	Terry Tamashiro	10 minutes
9. Walk-ins		All	10 minutes
10. Next Meeting Agenda Items		All	10 minutes

<u>Proposed Next Meeting Agenda 4/11/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>
PCM solder crack issue (J1 connector) & current draw to stall the vehicle	John Jasha	10 minutes

Notes

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E982-827-0 48523

Jim Maurer/cp: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Date: April 16, 2002
Time: 1-2:30 p.m.
Location: POEB, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): April 18, 2002, Core Team Meeting
 April 23, 2002

Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESB</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

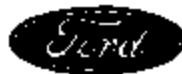
Meeting Agenda - 4/16/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Update on Body and Assembly plant failures	I3, A3	Terry Tamashiro	10 minutes
3. Update on Wiring Harness Root Causes / findings	I3, A4	Sheran Alles, Robert Rossi	15 minutes
4. PCM solder crack issue (J1 connector) & current draw to stall the vehicle	I3, A5	John Jabshan, Brian Perry	15 minutes
5. Outside Lab - Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Freeman Gates	15 minutes
6. Walk-ins		All	20 minutes
7. Next Meeting Agenda Items		All	10 minutes

<u>Proposed Next Meeting Agenda 4/18/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor
<u>Meeting Logistics</u>	
Subject:	Kavlico TM dPFE Sensor Core Team
Dates:	April 18, 2002
Time:	1-3:00 p.m.
Location:	POEE, DI-196 (FMEI War Room)
Called By:	Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s):	April 23, 2002, Core Team Meeting April 25, 2002
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574

<u>Core Team Participants</u>					
<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Allen	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Papanicolaou			Patrice White-Johnson
		Paul Plants		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

<u>Meeting Agenda -4/18/02</u>			
<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Update on Body and Assembly plant failures	I3, A3	Terry Tamashiro	10 minutes
3. Update on Wiring Harness Root Causes / findings	I3, A4	Sheran Allen, Robert Rossi	15 minutes
4. Update on FRL testing / evaluation of UPAD parts	I3, A2	Mark Freeland	15 minutes
5. Investigation of Stalls - Update on Pareto, Parser Report data	I3, A9	Mahmoud Awad, Mary Akins	15 minutes
6. Outside Lab - Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Jim Maurer	15 minutes
7. Update on analyzing acid tested parts vs. warranty UPAD parts	I5, A6	Freeman Gates	10 minutes
8. Status of Concern to commonize parts	I16, A2	Jon Janda	5 minutes
9. Status of Supplier order for field service parts	I16, A4	Bill McCarty	5 minutes
10. Walk-ins		All	15 minutes
11. Next Meeting Agenda Items		All	10 minutes

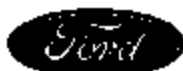
<u>Proposed Next Meeting Agenda 4/23/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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E982-827-G 40325

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Date: June 18, 2002
Time: 1-2:30 p.m.
Location: POEE, D1-196 (FMBI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): June 20, 2002, Core Team Meeting
June 25, 2002, Core Team Meeting

Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
Kavlico Fax: 805-523-7125

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESB</u>	<u>Purchasing</u>
Mark Fraeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielson
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jan Janda	Kyong Park	Amy Poma			Patrice White-Johnson
		Paul Plants		<u>PCSE</u>	
<u>Team Leader</u>	<u>Visteon</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahahan			Brian Perry	

Meeting Agenda - 6/13/02

<u>Order of Agenda Items</u>	<u>Cont. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Update/review of repeat repairs data	I6, A9	Mahmoud Awad	15 minutes
2. Management Review at Kavlico-tentative date of visit/ begin Draft agenda.		Jim O'Neill, Jim Maurer	5 minutes
3. STA update. Transition of Patrice's function.	I5, A10	Patrice White-Johnson	10 minutes
4. Update test plan for dynamometer-schematic & diagram.		Freeman Gates	10 minutes
5. Walk Ins		All	

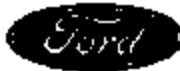
<u>Proposed Next Meeting Agenda 6/13/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
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Please be on time as we have a full agenda

EA82-827-G 48526

Jim Maurer/ep: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: April 25, 2002
 Time: 1-3:00 p.m.
 Location: POBE, DI-196 (FMEI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): April 30, 2002, Core Team Meeting
 May 2, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belt</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>RRSE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akina	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jan Janda		Chris Panaretos			Patrice White-
		Paul Plante		<u>PCSE</u>	Johnson
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 4/25/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Update on Body and Assembly plant failures	I3, A3	Don Ayers, Mark Freeland	10 minutes
3. PCM updates on how much current it takes to stall vehicle	I3, A5	Brian Perry	10 minutes
4. Outside Lab - Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Jim Maurer	10 minutes
5. Update on "In Process" acid tested parts	I5, A6	Freeman Gates	10 minutes
6. Update on installing "lab induced" failed sensors in vehicles	I6, A1	Jim Maurer (Larry Stutz)	10 minutes
7. Update on obtaining high-mileage parts for FRL analysis	I6, A6	Jim Maurer (John Firu)	10 minutes
8. Update on obtaining buy-back vehicles and parts for testing	I6, A5	John Firu	10 minutes
9. Update on PV Failures	I12, A10	Patrice White- Johnson	10 minutes
10. Status of Supplier order for field service parts	I16, A4	Bill McCarty	5 minutes
11. Walk-ins		All	10 minutes
12. Next Meeting Agenda Items		All	5 minutes

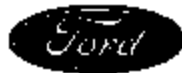
<u>Proposed Next Meeting Agenda 4/30/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda

EA82-827-G 48527

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: April 30, 2002
 Time: 1-2:30 p.m.
 Location: POBE, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): May 2, 2002, Core Team Meeting
 May 7, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESB</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Allen	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patricia White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda -4/30/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. FRL Update of UPAD	13, A2	Mark Freeland	15 minutes
3. Update on Body and Assembly plant failures	13, A3	Don Ayers	10 minutes
4. PCM update: Voltage drop between v-out and signal return	13, A5	Brian Perry, John Jabshan	10 minutes
5. Outside Lab / Non disclosure agreement - status	15, A5	Bill McCarty	5 minutes
6. Update on "In Process" acid tested parts; Discussion of chemical analysis of gel.	15, A6, A8	Kyong Park, Mark Freeland	15 minutes
7. Update on obtaining vehicles and high-mileage parts for FRL analysis	16, A5, A6	Jim Maurer (John Firu)	10 minutes
8. Walk-ins		All	10 minutes
9. Next Meeting Agenda Items		All	5 minutes

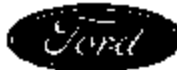
<u>Proposed Next Meeting Agenda 5/2/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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 Please be on time as we have a full agenda

E002-B27-G 40328

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: May 7, 2002
 Time: 1-2:30 p.m.
 Location: POBE, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): May 9, 2002, Core Team Meeting
 May 14, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESH</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

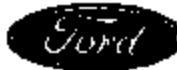
Meeting Agenda - 5/7/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. FRI Update of UPAD	I3, A2	Mark Freeland	15 minutes
3. Update on Body and Assembly plant failures	I3, A3	Don Ayers	10 minutes
4. Sensor Failure Mode	I1, A6	Shri Akolkar	10 minutes
5. Outside Lab / Non disclosure agreement - status	I5, A5	Bill McCarty	5 minutes
6. Update on "In Process" acid tested parts; Discussion of chemical analysis of gel.	I5, A6, A8	Jim Maurer, Mark Freeland	15 minutes
7. Update from May 2, Stalls meeting		Paul Plante	15 minutes
8. Walk-ins		All	10 minutes
9. Next Meeting Agenda Items		All	5 minutes

<u>Proposed Next Meeting Agenda 5/9/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: May 7, 2002
 Time: 1-2:30 p.m.
 Location: POBE, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader; (313) 39-03672
 Next Meeting (s): May 9, 2002, Core Team Meeting
 May 14, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	ERSE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Fresman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

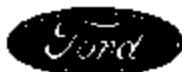
Meeting Agenda -4/30/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	
2. FRL Update of UPAD-discussion of chemical analysis of gel.	I3, A2	Mark Freeland	15 minutes
3. Update on Body and Assembly plant failures	I3, A3	Don Ayers	10 minutes
4. Sensor Failure Mode	I1, A6	Shri Akolkar	10 minutes
5. Outside Lab / Non disclosure agreement - status	I5, A5	Bill McCarty, Jim Maurer	20 minutes
6. Update on "In Process" acid tested parts.	I5, A6, A8	Jim Maurer, Mark Freeland	15 minutes
7. Update from May 2, Stalla meeting		Paul Plante	15 minutes
8. Walk-ins		All	10 minutes
9. Next Meeting Agenda Items		All	5 minutes

<u>Proposed Next Meeting Agenda 5/2/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: May 9, 2002
 Time: 1-2:30 p.m.
 Location: POEE, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): May 14, 2002, Core Team Meeting
 May 16, 2002, Core Team Meeting

Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESB</u>	<u>Purchasing</u>
Mark Freeland	Mary Atkins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Parry	

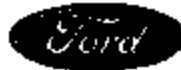
Meeting Agenda - 5/9/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Review and discuss proposed Workplan		Jim Maurer	30 minutes
3. Update on Body and Assembly plant failures	I3, A10	Don Ayers	10 minutes
4. Update on "In Process" acid tested parts.	I3, A3	Jim Maurer, Mark Freeland	15 minutes
5. Update from May 2, Stalls meeting	I5, A6	Paul Plante	15 minutes
6. Walk-ins		All	10 minutes
7. Next Meeting Agenda Items		All	5 minutes

<u>Proposed Next Meeting Agenda 5/14/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: May 14, 2002
 Time: 1-2:30 p.m.
 Location: POER, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): May 16, 2002, Core Team Meeting
 May 21, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Hopping</u>	<u>Quality Office</u>	<u>RESB</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Fredman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>	<u>Vistcon</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Petry	

Meeting Agenda - 5/14/02

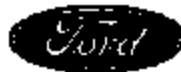
<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Review and discuss updated Workplan	I3, A10	Jim Maurer	20 minutes
3. Update on Body and Assembly plant failures-Norfolk	I3, A3	Don Ayers	10 minutes
4. Outside consultant's participation at Analytical Solutions	I5, A5	Bill McCarty	10 minutes
5. Effect of Scientific Coating process change to warranty.	I3	Kyong Park	15 minutes
6. Update from May 13 Monday 1-3:00 pm Issues meeting		Paul Plante	15 minutes
7. Update on Warranty Claims	I6, A4	Mary Akins	5 minutes
8. Walk-In		All	5 minutes

Proposed Next Meeting Agenda 5/16/02

<u>Proposed Next Meeting Agenda 5/16/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: May 16, 2002
Time: 1-2:30 p.m.
Location: POEB, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): May 16, 2002, Core Team Meeting
 May 21, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>Y-Engine</u>	<u>Quality Office</u>	<u>BESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>	<u>Vistcon</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jabahn			Brian Perry	

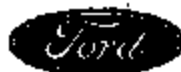
Meeting Agenda - 5/16/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Outside consultant's participation at Analytical Solutions	I5, A5	Bill McCarty	10 minutes
2. Update on Body and Assembly plant failures at Norfolk	I3, A3	Don Ayers	10 minutes
3. Update from May 13, 1-3:00 p.m. Issues Resolution Mtg.		Paul Plante	10 minutes
4. Supplier Technical Asst. (STA) weekly update		Patrice White-Johnson	10 minutes
5. Kavlico/Ford travel to Analytical Solutions Status		Jim Maurer	10 minutes
6. Walk-ins		All	20 minutes

<u>Proposed Next Meeting Agenda 5/21/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: May 23, 2002
Time: 1-2:30 p.m.
Location: POEE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): May 28, 2002, Core Team Meeting
 May 30, 2002, Core Team Meeting
Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Atkins	Jim O'Neal	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>	<u>Visteon</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda -5/16/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Update on Kavlico/Ford May 20, 2002 mtg. W/ Analytical Sol.		Jim Maurer, Mark Freeland, Freeman Gates	20 minutes
2. Update on Body and Assembly plant failures at Norfolk	13, A3	Don Ayers	10 minutes
3. STA weekly update.		Patrice White-Johnson	5 minutes
4. Post transient voltage parts-what to do w/parts once inspected.		Mark Freeland	10 minutes
5. Stalls assignment update re: status of vehicle testing		Jim McCoy	10 minutes
6. Update from May 20 Issues Resolution mtg.		Jon Janda	10 minutes
7. Walk-ins		All	20 minutes

Proposed Next Meeting Agenda 5/28/02

Person(s) Responsible

Time Estimated

<u>Proposed Next Meeting Agenda 5/28/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to spoma2 (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda

ER02-027-G 48534

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: May 28, 2002
Time: 1-2:30 p.m.
Location: POEB, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): May 30, 2002, Core Team Meeting
 June 4, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	BESE	Purchasing
Mark Freeland	Mary Atkins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Chris Panaretos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader	Visteon	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 5/28/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Update on Analytical Solutions Workplan since May 20 visit.	15, A5	Kyong Park	10 minutes
2. Update on Body and Assembly plant failures at Norfolk.	13, A3	Don Ayers	10 minutes
3. STA weekly update.		Patrice White-Johnson	10 minutes
4. Vehicle testing update/status if differential input to signal needed.	16, A7	Jim McCoy, Sheran Alles	15 minutes
5. Walkins		All	20 minutes

<u>Proposed Next Meeting Agenda 5/28/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
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 Please be on time as we have a full agenda

EP82-027-G 48535

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and Implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: May 30, 2002
 Time: 1-2:30 p.m.
 Location: POEE, DI-196 (PMEI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): June 4, 2002, Core Team Meeting
 June 6, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	BESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Chris Panarotos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader	Visteon	Carol Verner		Ken Arnold	
Jim Maurer	John Jabshan			Brian Perry	

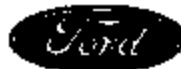
Meeting Agenda -6/6/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Review and discuss Analytical Solutions Workplan.	I5, A5	All	15 minutes
2. Update on Body and Assembly plant failures at Norfolk.	I3, A3	Don Ayers	10 minutes
3. Acid test update.	I5, A6	Kyong Park	15 minutes
4. Status on gel testing.	I5, A8	Mark Freeland	10 minutes
5. Vehicle testing update.	I6, A7	Jim McCoy/Army	5 minutes
6. Water test on department test cars		Jim Maurer	5 minutes
7. Walk ins		All	15 minutes

<u>Proposed Next Meeting Agenda 6/11/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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 Please be on time as we have a full agenda



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: June 6, 2002
Time: 1-2:30 p.m.
Location: POEE, DI-196 (FMBI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): June 11, 2002, Core Team Meeting
 June 13, 2002, Core Team Meeting

Conferences Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Atkins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Amy Poma			Patrice White-Johnson
		Paul Plante		<u>PCSB</u>	
<u>Team Leader</u>	<u>Visteon</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 6/6/02

<u>Order of Agenda Items</u>	<u>Curr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Team discussion of questions from review of 2 nd AS report. Mike S. to call in for 6/11 mtg.	15, A5	All	15 minutes
2. Update on Norfolk and St. Thomas parts	13, A3	Don Ayers	10 minutes
3. Report out of Issues Resolution 6/10 mtg.		Jon Janda	15 minutes
4. STA update-Patrice/Walid to call in from Kavlico	15, A10	Patrice White-Johnson	10 minutes
5. Instrumentation/electrical testing of vehicles update.	16, A7	Jim McCoy	10 minutes
6. Walk ins		All	10 minutes

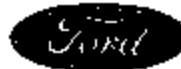
<u>Proposed Next Meeting Agenda 6/11/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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ER02-027-G 48537

Jim Maurer/cp: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: June 4, 2002
Time: 1-2:30 p.m.
Location: POER, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): June 6, 2002, Core Team Meeting
 June 11, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	BESB	Purchasing
Mark Freeland	Mary Atkins	Jim O'Neill	Mahmoud Awad	Sheran Alies	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Amy Poma			Patrice White-Johnson
		Paul Plante		FCSE	
Team Leader	Visteon	Carol Verner		Ken Arnold	
Jim Maurer	John Jabshan			Brian Perry	

Meeting Agenda - 6/4/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Discussion of Questions, team is to ask Mike Strizich of Analytical Solutions at Thursday mtg. (Mary A. to arrange for Mike to call in for 6/6 mtg.)	IS, A5	All	15 minutes
2. Update on Norfolk and St. Thomas parts.	IS, A3	Don Ayers	10 minutes
3. Update on decomposition testing.	IS, A8	Mark Freeland	10 minutes
4. Report out of Issues Resolution 6/3 mtg. (Thursday report out/set Monday Agenda format we will be following).		J. Janda not attending/Paul Plante	10 minutes
5. STA update		Patrice White-Johnson	10 minutes
6. Walk ins		All	10 minutes

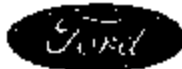
<u>Proposed Next Meeting Agenda 6/11/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
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EA02-027-G 48538

Jim Maurer/ep: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: April 23, 2002
 Time: 1-2:30 p.m.
 Location: POEE, DI-196 (FMEI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): April 25, 2002, Core Team Meeting
 April 30, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Paascode: 6881436#
 Kavlico Fax: 803-531-6574

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	EESB	Purchasing
Mark Freeland	Mary Akins	Jim O'Neal	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

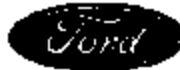
Meeting Agenda - 4/23/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Update on Body and Assembly plant failures	I3, A3	Don Ayers, Mark Freeland	10 minutes
3. Correlation of wiring and dPFE Warranty	I3, A4	Robert Rossi, Mahmoud Awad	10 minutes
4. Update on FRL testing / evaluation of UPAD parts	I3, A2	Mark Freeland	10 minutes
5. Investigation of Stalls - Update on Pareto	I3, A9	Mahmoud Awad	10 minutes
6. Outside Lab - Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Jim Maurer	10 minutes
7. Update on analyzing acid tested parts	I5, A6	Freeman Gates	10 minutes
8. Update on obtaining buy-back vehicles for testing	I10, A6	John Firu	5 minutes
9. Status of Supplier order for field service parts	I16, A4	Bill McCarty	5 minutes
10. Walk-ins		All	10 minutes
11. Next Meeting Agenda Items		All	5 minutes

<u>Proposed Next Meeting Agenda 4/25/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFB Sensor

Meeting Logistics

Subject: Kavlico TM dPFB Sensor Core Team
Date: June 11, 2002
Time: 1-2:30 p.m.
Location: POBE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): June 13, 2002, Core Team Meeting
 June 18, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engines</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Atkins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Andy Poma			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>	<u>Vistron</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 6/11/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Team discussion of questions from review of 2 nd AS report. Mike S. to call in for 6/13 mtg.	IS, A5	All	15 minutes
2. Update on Norfolk and St. Thomas parts.	IS, A3	Don Ayers	10 minutes
3. Ford visit to Kavlico - discuss mid July dates/draft Agenda		All	15 minutes
4. STA update	IS, A10	Patrice White-Johnson	10 minutes
5. Walk Ins		All	20 minutes

<u>Proposed Next Meeting Agenda 6/13/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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E982-827-G 48540

Jim Maurer/cp: 6/30/2003
Kavlico dPFB Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: June 13, 2002
 Time: 1-2:30 p.m.
 Location: POBE, DI-196 (FMBI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): June 18, 2002, Core Team Meeting
 June 20, 2002, Core Team Meeting

Conferences Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

Black Belt	Kavlico	V-Engine	Quality Office	EESE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Amy Poma			Patrice White-Johnson
		Paul Plante		PCSE	
Team Leader	Visteon	Carol Verner		Ken Arnold	
Jim Maurer	John Jahahan			Brian Perry	

Meeting Agenda -6/13/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Update on Norfolk and St. Thomas parts	13, A3	Don Ayers	10 minutes
2. Issues Resolution Report out	13, A12	Jon Janda	20 minutes
3. Parser Data	15, A11	Mary Akins	10 minutes
4. Update repeat repairs data	16, A9	Mahmoud Awad	15 minutes
5. Instrumentation/Settings and update on test vehicles	16, A7	Jim McCoy	15 minutes
6. STA update	15, A10	Patrice White-Johnson	10 minutes
7. Ford visit to Kavlico-tentative date/agenda update		Jim O'Neall	10 minutes
8. Walk Ins		All	15 minutes

<u>Proposed Next Meeting Agenda 6/13/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: June 18, 2002
 Time: 1-2:30 p.m.
 Location: POEE, DI-196 (FMEI War Room)
 Called By: Jim Maurer, Team Leader; (313) 39-03672
 Next Meeting (s): June 20, 2002, Core Team Meeting
 June 25, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-523-7125

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>ERSE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sharan Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyung Park	Amy Poma			Patrice White-Johnson
		Paul Plante		<u>PCSB</u>	
<u>Team Leader</u>	<u>Visitor</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

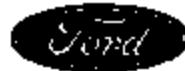
Meeting Agenda - 6/13/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Update/review of repeat repairs data	16, A9	Mahmoud Awad	15 minutes
2. Management Review at Kavlico-tentative date of visit/ begin Draft agenda.		Jim O'Neill, Jim Maurer	5 minutes
3. STA update. Transition of Patrice's function.	15, A10	Patrice White-Johnson	10 minutes
4. Update -test plan for dynamometer-schematic & diagram.		Freeman Gates	10 minutes
5. Walk Ins		All	

<u>Proposed Next Meeting Agenda 6/13/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Date: June 20, 2002
Time: 1-3:00 p.m.
Location: POEE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): June 25, 2002, Core Team Meeting
 June 27, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-523-7125

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Amy Poma			Patrice White-
		Paul Plants		<u>PCSE</u>	Johnson
<u>Team Leader</u>	<u>Visteon</u>	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 6/20/02

<u>Order of Agenda Items</u>	<u>Cont. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Continued review/discussion of Repeat Repairs Data	I6, A9	Mahmoud Awad	30 minutes
2. Plan for use of outside lab for Nitric Acid Test and High Temperature Test- in process.	I5, A8	Freeman Gates	20 minutes
3. Accelerated Exhaust Condensate Exposure test on vehicle.	I5, I6, A10	Mark Freeland	10 minutes
4. Update on Norfolk and St. Thomas parts.	I3, A3	Don Ayers	10 minutes
5. Update for test plan for dynamometer -schematic & diagram		Freeman Gates	10 minutes
6. Issues Resolution report out.		Jon Janda	10 minutes
7. Management Review at Kavlico -travel dates/agenda		Jim O'Neill	10 minutes
8. Walk Ins		All	10 minutes

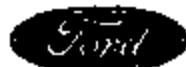
<u>Proposed Next Meeting Agenda 6/25/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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EAB2-827-G 48543

Jim Maurer/cp: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: June 25, 2002
 Time: 1-3:00 p.m.
 Location: FOEB, DI-196 (FMEI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): June 27, 2002, Core Team Meeting
 July 2, 2002, Core Team Meeting

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-523-7125

Core Team Participants

Black Belts	Kavlico	V-Engine	Quality Office	BBSE	Purchasing
Mark Freeland	Mary Akins	Jim O'Neall	Mahmoud Awad	Sheran Ailes	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Ross	Bill McCarty
Jon Janda	Kyong Park	Amy Pours			Shri Reddy
		Paul Plante		PCSE	
Team Leader	Yisjeon	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 6/28/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Analytical Solutions 3 rd report on 2-heat temperature tested parts.		Kyong Park/All	30 minutes
2. Management Review dates/agenda		Jim O'Neall	5 minutes
3. Test vehicle status/update.		Jim McCoy	15 minutes
4. Accelerated Exhaust Condensate Exposure test on vehicle results.		Mark Freeland	20 minutes
5. Nitric Acid and High Temperature test update.		Freeman Gates	20 minutes
6. Walk Ins		All	

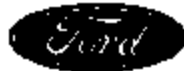
<u>Proposed Next Meeting Agenda 6/27/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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ER02-027-G 48544

Jim Maurer/cp: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: June 27, 2002
Time: 1-3:00 p.m.
Location: POBB, DI-196 (FMBI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): June 2, 2002, Core Team Meeting
 July 9, 2002, Core Team Meeting

Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-523-7125

Core Team Participants

Black Belts	Kavlico	V-Enginc	Quality Office	RESE	Purchasing
Mark Froeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielson
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Arny Poma			Shri Reddy
		Paul Plante		PCSE	
Team Leader	Visteon	Carol Verner		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 6/27/02

<u>Order of Agenda Items</u>	<u>Cont. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Continued discussions of 6/15 Analytical Sol. Ltr. M. Froeland's feedback from 6/26 Sci Lab mtg.		Mark Froeland/All	20 minutes
2. Parser Data update		Mary Akins	5 minutes
3. Vehicle instrumentation/test status		Jim McCoy	5 minutes
4. Test plan for Norfolk DP field return part.		Brady Davies	5 minutes
5. Walk Ins		All	30 minutes

<u>Proposed Next Meeting Agenda 6/27/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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ENG2-827-G 48545

Jim Maurer/cp: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPPE Sensor

Meeting Logistics

Subject: Kavlico TM dPPE Sensor Core Team
Dates: July 18, 2002
Time: 1-3:00 p.m.
Location: POBE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): July 25, 2002

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-523-7125

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>FESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Amy Poma			Shri Reddy
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>	<u>Visteon</u>	Carol Veruer		Ken Arnold	
Jim Maurer	John Jahshan			Brian Perry	

Meeting Agenda - 7/18/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Raman spectroscopy results from SRL.	I3, A13	Dairene Uy	20 minutes
2. Ongoing vehicle testing updates.	I6, A7	Jim McCoy	10 minutes
3. Issues Resolution July 15 mtg. Overview		Jon Janda	10 minutes
4. Kavlico's Agenda items for future meeting-when data will be available regarding:		All	5 minutes
- Status of sensor w/Parylene Coating for fleet testing			
- Kavlico visit w/Ford for onsite 14D mtg. In August			
5. Kavlico's report out on Motorola returns		Kyong Park	10 minutes
6. Kavlico's report out on Escape 2001.		Kyong Park	10 minutes
7. Walk In		All	

<u>Proposed Next Meeting Agenda 7/25/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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E682-827-G 48546

Jim Maurer/cp: 6/30/2003
 Kavlico dPPE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: To Achieve Vehicle Issues Resolution by addressing vehicle issues leading to decision if IS/IS NOT Root Cause with delegation of assignments and collection of data to bring to conclusion

<u>Meeting Logistics</u>	
Subject:	Kaylico TM dPFE Sensor Vehicle Issues Resolution.
Date:	July 22, 2002
Time:	1-3:00 p.m.
Location:	POER, conference rm.B103A, (pillar L10)
Called By:	Jon Janda, Team Leader 24(8-2589)
Next Meeting (s):	July 29, 2002, Core Team Meeting
Conference Call-In Number(s):	

<u>Core Team Participants</u>					
<u>Black Belts</u>	<u>Kaylico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESE</u>	
Mark Freeland	Mary Akins	Jim Maurer	Mahmoud Awad	Sheran Alles	
Shri Akolkar		Freeman Gates		Robert Rossi	
Jim McCoy		Amy Poma			
		Paul Plante			
<u>Team Leader</u>	<u>Visteon</u>	<u>Carol Verner</u>			
Jon Janda	John Jabshan				

<u>Meeting Agenda - 7/22/02</u>		
<u>Order of Agenda Items</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Best/Worse exhaust pressure and temperature update.	Shri Akolkar	15 minutes
2. Quality report update.	Mahmoud Awad	15 minutes
3. Zero resistance spark plug test.	Sheran Alles	10 minutes
4. Electrical data update	Robert Rossi	15 minutes
5. Walk Ins	All	

<u>Other Open Issues for Discussion</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: **Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: July 25, 2002
Time: 1-3:00 p.m.
Location: POER, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): August 1, 2002

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-523-7125

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>Y-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akina	Jim O'Neill	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda	Kyong Park	Anty Poma			Shri Reddy
<u>Team Leader</u>	<u>Visteon</u>	<u>PCSE</u>			
Jim Maurer	John Jahshan	Carol Verner		Ken Arnold	
				Brian Parry	

Meeting Agenda - 7/25/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Ramon spectroscopy conclusions.		Dairene Uy	15 minutes
2. Analytical Solutions Failure Analysis report questions (July 18 email from Paul Plant to Kyong, Sheran and Ed Sickafus.		Sheran Alles	15 minutes
3. Confirm Kavlico's visit to Ford tentative dates 8/8-8/9.		All	5 minutes
4. Issues Resolution overview.		Jon Janda	10 minutes
5. Vehicle Testing updates.	16, A7	Jim McCoy	10 minutes
6. Parylene Coating for fleet testing update		Carol Verner	15 minutes
7. Walk Ins		All	

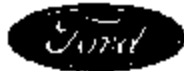
<u>Proposed Next Meeting Agenda 7/25/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to apoma2 (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda

EA02-027-G 40540

Jim Maurer/op: 6/30/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: To Achieve Vehicle Issues Resolution by addressing vehicle issues leading to decision if IS/IS NOT Root Cause with delegation of assignments and collection of data to bring to conclusion

Meeting Logistics	
Subject:	Kavlico TM dPFE Sensor Vehicle Issues Resolution.
Dates:	July 29, 2002
Time:	1-3:00 p.m.
Location:	POEH, conference rm.B103A, (pillar L10)
Called By:	Jon Janda, Team Leader 24(8-2589)
Next Meeting (s):	August 5, 2002, Core Team Meeting
Conference Call-In Number(s):	

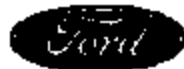
Core Team Participants				
<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>BESE</u>
Mark Freeland	Mary Atkins	Jim Maurer	Mahmoud Awad	Sheran Altes
Shri Akolkar		Freeman Gates		Robert Rossi
Jim McCoy		Andy Porra		
		Paul Plante		
<u>Team Leader</u>	<u>Viateon</u>	<u>Carol Verner</u>		
Jon Janda	John Jahahan			

Meeting Agenda - 7/29/02		
Order of Agenda Items	Person(s) Responsible	Time Allocated
1. EGR pressure and temperature @ zero flow.	Shri Akolkar	15 minutes
2. Definition of latch.	All	20 minutes
3. Quantifying a latch condition.	All	20 minutes
4. Escape brake light switch & cigarette lighter wiring harness 1 pg. Document.	Robert Rossi	10 minutes
5. 14D Team meetings-structure/status - follow up from Koszewnik mtg.	Jim Maurer	15 minutes
6. Walk Ins.	All	

Other Open Issues for Discussion	Person(s) Responsible	Time Estimated

EA82-027-G 40549

Jim Maurer/ep: 6/30/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective:	Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor				
<u>Meeting Logistics</u>					
Subject:	Kavlico TM dPFE Sensor Core Team				
Date:	April 4, 2002				
Time:	1-2:30 p.m.				
Location:	PORE, DI-196 (FMBI War Room)				
Called By:	Jim Maurer, Team Leader: (313) 39-03672				
Next Meeting (s):	April 9, 2002, Core Team Meeting April 11, 2002, Core Team Meeting				
Conference Call-in Number(s):	9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436# Kavlico Fax: 805-531-6574				
<u>Core Team Participants</u>					
<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>ERSE</u>	<u>Purchasing</u>
Mark Freeland	Mary Atkins	Jim O'Neal	Mahmoud Awad	Sheran Alles	Chris Nielsen
Shri Akolkar	Don Ayers	Freeman Gates		Robert Rossi	Bill McCarty
Jon Janda		Chris Panaretos			Patrice White-Johnson
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Kou Arnold	
Jim Maurer				Brian Perry	
<u>Meeting Agenda - 4/04/02</u>					
<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>		
1. Introductions		All	5 minutes		
2. VOQ data update & EPRC paper		Paul Plante	10 minutes		
3. Results of Analysis of outstanding Plant returns	I3, A3	Terry Tamaahiro	10 minutes		
4. Update on Wiring Harness Root Causes / findings	various	Sheran Alles, Robert Rossi	15 minutes		
5. Investigation of Stalls - Status	I3, A9	Jon Janda, Mahmoud Awad	15 minutes		
6. Outside Lab - Non disclosure agreement, work plan, objectives	I5, A5	Kyong Park Freeman Gates	10 minutes		
7. Results of "in process testing" of current production vs. warranty UPAD parts.	I5, A6	Kyong Park	15 minutes		
8. One pager on MRB wafer usage for production		Freeman Gates	10 minutes		
9. Walk-ins		All	10 minutes		
10. Next Meeting Agenda Items		All	10 minutes		
<u>Proposed Next Meeting Agenda 4/09/02</u>					
	<u>Person(s) Responsible</u>	<u>Time Estimated</u>			
Service part volume projections	John Shere	10			
PCM solder crack issue & current draw to stall the vehicle	John Joshan	10			
<u>Notes</u>					
Bring handouts (paper copies) for all presentations					
Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)					
Please be on time as we have a full agenda					

E002-027-6 40550

Jim Maurer/cp: 6/30/2003
Kavlico dPFE Sensor Core Team

Kavlico TM dPFK Sensor Meeting Minutes
January 29, 2002
1-2:30 p.m.
POEE, DI-196 (FMBI War Room)

Meeting Minutes

Attendees: Mary Akins, Sheran Allen, Mahmoud Awad, Mark Freeland, Freeman Gates, John Koszewnik (1st ½ hour), Chris Nielsen, Jim O'Neill, Karen Owens, Chris Panaretos, Brian Perry, Paul Plante, Kurt Schieding, John Shore, Carol Verner; **Kavlico teleconference attendees:** Terry Tamashiro, Brady Davis, Kyong Park.

1. **Introductions:** Don Ayers will be coming to the offsite on Thursday. 805-523-7125 (Kavlico FAX).
2. **Agenda Review**
3. **Production and Field Service parts capacity update:** Kavlico update: Waiting for Randy Ray (Kavlico). Did not attend, and did not cover this issue. Barry Bugaj will bring information to next team meeting (2/5). ISSUE #16, ACTION #3.
4. **Kavlico Sensor D&R Responsibility:** Kavlico does have design and release responsibility – Mary Akins. Still need a Ford design and release engineer to work with Mary. Freeman Gates added that historically, the CPMT leaders have been responsible for FSS responsibility. WERS concerns initiated by FSS, but did not absolve anyone from FMEL from other responsibilities. Karen Owens is Ford FMEL contact for Kavlico. Joe Johnson not involved with Kavlico. Kathy Reaume is contact for WERS concerns. ISSUE #18, ACTION #2.
5. **Data Mining and analysis:** Mahmoud Awad: Student identified to help Mark: Still need Jim O'Neali's help (request to Karen Owens). CPARS help – Karen will see Freeman. ISSUE #8, ACTION #8.
6. **Field Returns Analysis at Kavlico:** Terry Tamashiro: Flow chart and analysis (Mary handed out). Identified parts they have; asked for parts with different mileage. Matrix shows how many parts of each category. Oct 2000-haven't physically located yet. Updated June 01 vehicle build date parts into matrix. F150 with build date of 10/2000, might be problem with matching VIN nos. w/engins for 4.6L F150's. Mary to pull VIN nos. from list to get data. Still questionable whether we can get parts for testing. By next Tuesday, Kavlico should know what they have tested and in house. Mary Akins responsible. Take office: die inspection (step 10 in handout) technical findings (Freeman Gates will get with Terry Tamashiro for clarification). Review on individual basis to step 16 for all parts. Most parts have already been done through step 6. Kavlico (Terry Tamashiro) will break up spreadsheet with what steps they are on with each part. 48 parts from 6/01. Will have by Thursday (2/7). Give us estimated timing at next report out. ISSUE #1, ACTION #3.
7. **Wiring Harness Noise Concerns:** Sheran Allen. Presented handout, faxed to Kavlico. Need to send last weeks presentation to Kavlico via e-mail. Identify if there is coupling around the circuitry. Can have primary noise together with secondary. See next steps in handout (p.2). Freeman Gates added: In addition to the work Sheran did, got real data on 23 harnesses; measured capacitance between all wires relative to output signal; worst case was around 260 pc. ISSUE #3, ACTION #5.
8. **Technical Offsite – finalize agenda:** 1st 3 hours: Technical presentations. Last 5 hours: Cause and effect diagrams (Fishbone – Paul Plante, ISIS Not – Kurt Schieding). Kavlico scheduled to depart Detroit at 7:00 on Thursday. Will change travel arrangements due to predicted weather conditions. Add Don Ayers name to list of attendees. E-mail Freeman's Presentation to Kavlico on Wednesday. ISSUE #3, ACTION #8.
9. **STA Trip/Overview:** Joe Smythe not here: will give update by 2/1 to team. ISSUE #5, ACTION #5.

Kavlico dPFB Sensor Meeting Minutes
February 5, 2002
1-2:30 p.m.
POBE, CR DI-196 (FMBI War Room)

Attendees: Brady Davies, Kyong Park, Don Ayers (Kavlico). Mahmoud Awad, Mark Freeland, Freeman Gates, John Jahahan, Jim Maurer (new team leader, replacing Karen Owens), Doreen Muter, Jim O'Neall, Chris Panaretos, Brian Perry, Paul Plante, Kurt Schieding, Joe Smythe, Carol Verner, Rick Williamson (FCSD).

Agenda: Paul distributed his agenda, which included items for the next two meetings.

Shared Drive/Web Access: Offsite documents are currently on the shared drive: POE00004\proj\kavlico. They should be only on Web – and only available to core team members. Non-core team members will not have access. Decision was made to use only the website, not shared drive. Kavlico needs access to the website also. Chris will look into the restrictions and verify with Tamara DiCicco. Only non-confidential documents will be posted.

Assignment: Send all non-confidential documents to Dave Tyler for upload to web page; notify team (including Kavlico) of web address. Send core team the path of how to access the website. (Chris Panaretos)
The team should send confidential document requests to Paul Plante or Jim Maurer.

EPRC Review – Paul Plante: If this issue goes to a recall, the EPRC committee will coordinate periodic reviews. Paul will walk thru one page, technical summary, list of issues. Will review with the core team periodically in team meetings. Tech reviews will also be addressed.

STA Trip to Kavlico - Joe Smythe: See attached paper ("Agenda: 1/23/2002 – 1/25/2002"). He will be following up on "action items". Next follow-up visit will be first week in March. Will be working with Kavlico, Mark Freeland, Carol Verner. Keep action items separate for now, if there is any significant, then add to open issues.

Fleet Test Plan – Mahmoud Awad: His recommendation is to test at least 45 vehicles from same platform (to build level of confidence: homogeneous). Put in different environment conditions. Test paralyne sensor. Originally 5 platforms chosen to take closer look at (highest warranty). UPAD, Mask Misalignment, V-Transient failure modes (increase sample size across different platforms). Take offline to discuss DV testing. **Assignment:** Put together one-pager of where we are today and what issues need to be addressed. Need to have an audio conference w/Kavlico to discuss. Arrange for Friday at 11:00. (Mahmoud Awad) **Attendees:** Paul Plante, Freeman Gates, Jim Maurer, Mahmoud Awad, Brady Davies, Kyong Park, Don Ayers.

Data Mining – Rick Williamson (FCSD): Technicians having hard time identifying sensor problems. Ran AWS claims w/different parameters. Distributed 'dPFB – 9J460 CCC-Overview' Spreadsheet. 75% were replaced after original repair. Kavlico asked if we could map return data to corrective actions? Use 'Focus' first: Go to PVT – Wayne assembly plant; get them to identify electrical noise issues Carol can bring to "Focus" PVT. **Assignment:** Provide a clean cutoff date for significant actions that reduced warranty (things that changed in the sensor) to identify in AWS. Take changes that PVT has incorporated, overlay in stack charts. (Carol Verner)

Emission Compliance – Freeman Gates: Changing part numbers was discussed. Need analysis from Kavlico on parts that are currently being run. Paul will put on agenda for Thursday.

Next Agenda (preliminary):

Sensor Technology Durability Information (was Metalization damage) – move to Thursday (Freeman).

Field Returns Analysis at Kavlico – Mary Akins

Wiring Harness Noise concerns update

Documents Discovery – Escape Tribute Stalk NHTSA Inquiry

Kavlico dPFB Sensor Meeting Minutes
February 12, 2002
1-2:30 p.m.
POBB, CR DI-196 (FMEI War Room)

Attendees: Brady Davies, Kyong Park, Terry Tamashiro, Don Ayers (Kavlico). Mary Akins, Sheran Alles, Ken Arnold, Mahmoud Awad, Freeman Gates, John Jahshan, Jim Maurer, Chris Panaretos, Brian Parry, Paul Plants, Robert Rossi, Carol Vernor, Mike Pickett (Engine Systems).

Proposed J. Koszewuk Review 2/22/02 and Tech Review 2/28/02—Paul Plants: The 14D will be used as the key document for the tech review. Paul will meet with Jim Maurer and Freeman Gates to update in preparation for this. We will also refer to the "open issues deck" that Chris Panaretos has been working on. **Assignment:** Chris Panaretos will send an updated issues deck to the team, including Kavlico, when changes are received. The team is to get changes to Chris by noon on Friday, 2/15/02.

Component bench test results: Low failure rate—Kyong Park (Kavlico): Kavlico was asked to give test results based on Jim Maurer and Freeman Gates discussion of in-process containment and bond pad corrosion. Looking for signs of corrosion and what is the accept/reject criteria. Tests to date at Kavlico indicate no evidence of corrosion w/gel. They have been shipping tested out UPAD wafers to Freeman for inspection. Freeman needs to know when change/issues occurred at SMI. Need to know all changes with respective dates to overlay on stack chart and see where Kavlico actions align with our data. **Assignment:** Kavlico to provide revised test procedures, discuss with Freeman offline. Freeman to set up meeting. Mahmoud Awad to send Kavlico copy of meeting discussion of Fleet Test Plan.

Field returns analysis at Kavlico—Terry Tamashiro (Kavlico): Terry walked through the "Visual Inspection Plan at the end of Fleet Tests" flow chart and "14D Ford TMDP Investigation". **Assignment:** Kavlico should be completed with testing up through step 13 (Submit to S Lab) by 2/22/02. He will report out on his findings at that time. Mary Akins to provide AWS reports to Kavlico today or tomorrow.

DV/PV Test Plan, Bench and Fleet Vehicles—Mahmoud Awad, Terry Tamashiro: A mini-meeting already took place this week to talk about the test plan; Mahmoud provided minutes. Another meeting will be held later this week based on bench test plan that Freeman Gates and Jim Maurer worked on with Kavlico. **Assignment:** The team will summarize their findings at next Tuesday's team meeting (2/19/02).

Wiring Harness Noise concerns, OA work plan and conclusions—Sheran Alles, Robert Rossi: Mark Froeland and Robert Rossi met as follow-up to offsite. Took vehicle measurements, tried duplicate test— not able to see any differences. Conclusion: Noise not of sufficient energy to cause damage to parts. Still question of high frequency. **Assignment:** Still need to look at Escape and other vehicles w/warranty returns. Test parts for transient duration to latch-up sensor and compare to Kavlico tests. Robert Rossi will generate a work plan and send to critical team members (including Kavlico); get agreement on the plan; come up with results and conclusions based on the plan. Will be completed in 2 weeks. Will have workplan by 2/19; findings by 2/26.

Next Agenda (preliminary):

Open Issues / Assignments List Updates - All

Data Mining and Analysis Update - Mahmoud Awad, Mark Froeland

Align all Kavlico actions with R/1000 Stack Charts - Mahmoud Awad, Don Ayers

Pareto of Failure Symptoms - Approach to look at warranty data - Mahmoud Awad

2000-2002 Kavlico TM dPFE Sensor
Team Roster by Organization/Department

Kavlico TM dPFE Sensor								
Team Roster								
* Denotes Core Team Member								
LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
*Gates	Freeman	313-32-24807	V-Engine	FMEI Tech Spec./Technical Lead	Ford	POEE	fgates@ford.com	313-39-0-4084
*Owens	Karan	313-84-65770	V-Engine	FMEI Supervisor	Ford	POEE	kowens@ford.com	313-845-5770
*Panaretos	Chris	313-24-89337	V-Engine	Proj. Mgt. Analyst	Proj. Solution	POEE	cpanaret@ford.com	313-322-9285
*Plante	Paul	313-84-54138	V-Engine	Campaign Manager	Ford	POEE	pplante@ford.com	
*Verner	Carol	313-39-07180	V-Engine	FMEI Engineer	Ford	POEE	cverner@ford.com	313-39-0-4084
Albrecht	Gunther	313-32-23153	V-Engine	Service Engineer	Ford	POEE	galbrecht@ford.com	313-621-4367
Baneak	Catherine	313-32-38101	V-Engine	FMEI CPMT Eng./WERS concerns	Ford	POEE	cbaneak2@ford.com	313-39-0-4084
Johnson	Joe	313-84-58292	V-Engine	FMEI Section Supv.	Ford	POEE	jjohnson@ford.com	313-39-0-4084
Kerezi	Karen	313-20-63387	V-Engine	FMEI AWS Analyst	Ford	POEE	kkerezi@ford.com	313-845-3169
O'Neal	Jim		V-Engine	FMEI Dept. Mgr.	Ford	POEE	joneal@ford.com	313-39-0-4084
*Awad	Mahmoud	734-58-25816	Quality Office	Reliability Engineer/ Field Data Leader	Ford	ATNPC	mawad@ford.com	313-39-0-2315
*Schleding	Kurt	313-32-25448	Quality Office	Reliability Supervisor	Ford	POEE	kschled1@ford.com	313-39-0-2314
*Smythe	Joe	313-62-12995	Purchasing	STA Engineer (Leader)	Ford	PTE	jsmythe@ford.com	313-337-2804
McCarty	Bill	313-59-41031	Purchasing	Production Buyer	Ford	Purchasing	wmccart1@ford.com	313-584-4875
Nielsen	Chris	734-28-69888	Purchasing	Service Buyer	Ford	FCSD	cnlense4@ford.com	
White-Johnson	Patrice	313-39-04408	Purchasing	STA Site Manager	Ford	AVTS	pwhitej@ford.com	313-339-2804
Aular	Jim	313-32-38783	PTSE	Chief Engineer	Ford	POEE	jaular@ford.com	
Kepp	Dan	313-33-76554	PTSE	AVT Chief Engineer	Ford	POEE	dkepp1@ford.com	
Bronni	Mark	313-24-84509	Motorola	On-Site Rep.	Motorola	POEE	mbronni@ford.com	313-39-0-4084
*Akins	Mary	313-24-81989	Kavlico	On-Site Rep.	Kavlico	POEE	makins@ford.com	313-39-0-4084
*Ayers	Don	805-523-2000	Kavlico	Program Manager/Technical Leader	Kavlico	CA	dayers@kavlico.com	805-523-8475
Davies	Brady	805-523-2000	Kavlico	Director MEMS Technology	Kavlico	CA	bdavies@kavlico.com	805-523-7125
Park	Kyong	805-523-2000	Kavlico	VP Research and Dev't	Kavlico	CA	kpark@kavlico.com	805-523-7125
Tamashiro	Terry	805-523-2000	Kavlico	Warranty Analysis	Kavlico	CA	ttamashiro@kavlico.com	805-523-7125
*Freeland	Mark	313-59-47845	FRL	6-Sigma Black Belt	Ford	FRL	mfreela1@ford.com	313-621-0348
Giordano	Mike	313-32-20925	Focus	C&P Supervisor	Ford	VPC	mgiorda1@ford.com	
Kunde	Olaf	313-20-65930	Focus	PT Focus Program Mgr.	Ford	VPC	okunde1@ford.com	313-248-2526
Popoff	Dan	313-24-88803	Focus	C&P Quality Eng (Leader)	Ford	VPC	dpopoff@ford.com	

2000-2002 Kavlico TM dPFE Sensor
 Team Roster by Organization/Department

Kavlico TM dPFE Sensor								
Team Roster								
* Denotes Core Team Member								
LAST NAME	FIRST NAME	PHONE NO.	ORG./Dept.	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
Balint	Gary	313-33-72790	FCSD	Recall Program Manager	Ford	DSCII	gbalint@ford.com	
Bersuder	Lee	313-84-50881	FCSD	FQE Supervisor	Ford	TWCTDR	lbersude@ford.com	
Bliss	Gerry	313-24-88280	FCSD	ECI Supervisor	Ford	TWCTDR	obliss@ford.com	
Shore	John	734-28-89789	FCSD	PS&L Recall Mgr.	Ford	FCSD	jshore@ford.com	734-288-1166
Williamson	Rick	313-24-86348	FCSD	ECI Prod.Con.Anal.	Ford	FCSD	rwill10@ford.com	
Masura	Gordon	313-32-29662	EPRC	Leader	Ford	FPB4	gmasura@ford.com	
Goswalt	Greg	313-39-01160	EPRC	Critical Con. Mgr.	Ford	FCSD	ggoswalt@ford.com	313-594-7470
Rossi	Roberto	313-84-51438	EESE	Wiring CPS	Ford	Bldg. #1	ross11@ford.com	
Wilson	Cary	313-39-02652	EESE	Chief Engineer	Ford	AVTS	cwilso32@ford.com	

ERR-827-5 48743

created: 12/11/01
revised: 6/30/2003

2000-2002 Kavlico TM dPFE Sensor
Attendance List

Meeting Date: 12/18/01

Please:								
- Initial the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If your name is not on this list, please write it in at the bottom including the appropriate detail.								
* Denotes Core Team Member								
Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	*Akins	Mary	313-24-81889	On-Site Rep.	Kavlico	POEE	makins@ford.com	313-39-0-4084
	Albrecht	Gunther	313-32-23153	Service Engineer	Ford	POEE	galbrech@ford.com	313-821-4367
	Auller	Jim	313-32-38783	Chief Engineer	Ford	POEE	jauller@ford.com	
	*Awad	Mahmoud	734-58-25815	Reliability Engineer/ Field Data Leader	Ford	ATNPC	maawad@ford.com	313-39-0-2315
	*Ayers	Don	805-523-2000	Program Manager/Technical Leader	Kavlico	CA	dayers@kavlico.com	805-523-8475
	Balfnt	Gary	313-33-72790		Ford	DSCII	gbalfnt@ford.com	
	Bansek	Catherine	313-32-38101	FMEI CPMT Eng./WERs concerns	Ford	POEE	cbansek2@ford.com	313-39-0-4084
	Bersuder	Lee	313-84-50881	FQE Supervisor	Ford	TWCTDR	lbersude@ford.com	
	Bissel	Garry	313-24-86280	ECI Supervisor	Ford	TWCTDR	gbissel@ford.com	
	Bronni	Mark	313-24-84508	On-Site Rep.	Motorola	POEE	mbronni@ford.com	313-39-0-4084
	Davies	Brady	805-523-2000	Director MEMS Technology	Kavlico	CA	bdavies@kavlico.com	805-523-7125
	*Freeland	Mark	313-59-47845	8-Sigma Black Belt	Ford	FRL	mfreela1@ford.com	313-821-0348
	*Gates	Freeman	313-32-24807	FMEI Tech Spec./Technical Lead	Ford	POEE	fgates@ford.com	313-39-0-4084
	Giordano	Mike	313-32-20925	C&P Supervisor	Ford	VPC	mgiorda1@ford.com	
	Johnson	Joe	313-84-58282	FMEI Section Supv.	Ford	POEE	jjohnson@ford.com	313-39-0-4084
	Kapp	Den	313-33-78554	AVT Chief Engineer	Ford	POEE	dkapp1@ford.com	
	Kerezi	Karen	313-20-63387	FMEI AWS Analyst	Ford	POEE	kkerezi@ford.com	313-845-3169
	Kunde	Olaf	313-20-85930	PT Focus Program Mgr.	Ford	VPC	okunde1@ford.com	313-248-2528
	Masura	Gordon	313-32-29882	Leader	Ford	FPB4	gmasura@ford.com	
	McCarty	Bill	313-59-41031	Production Buyer	Ford	Purchasing	wmccart1@ford.com	313-594-4875
	Nielsen	Chris	734-28-69886	Service Buyer	Ford	FCSD	cniese4@ford.com	
	O'Neill	Jim		FMEI Dept. Mgr.	Ford	POEE	joneil@ford.com	313-39-0-4084
	Oswalt	Greg	313-39-01180	Critical Con. Mgr.	Ford	FCSD	goswalt@ford.com	313-594-7470
	*Owens	Karen	313-84-55770	FMEI Supervisor	Ford	POEE	kowens@ford.com	313-845-5770
	*Panaretos	Chris	313-24-89337	Proj. Mgt. Analyst	Project Solutions	POEE	cpanaret@ford.com	313-322-9265
	Park	Kyong	805-523-2000	VP Research and Dev't	Kavlico	CA	kpark@kavlico.com	805-523-7125

ENR2-827-6 4/17/04

created: 12/11/01
 revised: 6/30/2003

2000-2002 Kavlico TM dPFE Sensor
 Attendance List

Meeting Date: 12/18/01

Please:								
- Initial the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If your name is not on this list, please write it in at the bottom including the appropriate detail.								
* Denotes Core Team Member								
Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	*Plante	Paul	313-84-54138	Campaign Manager	Ford	POEE	polante@ford.com	
	Popoff	Den	313-24-88803	C&P Quality Eng (Leader)	Ford	VPC	dpopoff@ford.com	
	Rossi	Roberto	313-84-51436	Wiring CPS	Ford	Bldg. #1	rrossi1@ford.com	
	*Schleding	Kurt	313-32-25449	Reliability Supervisor	Ford	POEE	kchedi@ford.com	313-39-0-2314
	Shore	John	734-26-69759	PS&L Recall Mgr.	Ford	FCSD	jshore@ford.com	734-266-1166
	*Smythe	Joe	313-62-12665	STA Engineer (Leader)	Ford	PTE	jsmythe@ford.com	313-337-2604
	Tomashiro	Terry	805-523-2000	Warranty Analysis	Kavlico	CA	ttamashiro@kavlico.com	805-523-7125
	*Verner	Carol	313-39-07180	FMEI Engineer	Ford	POEE	cverner@ford.com	313-39-0-4084
	White-Johnson	Patrice	313-38-04409	STA Site Manager	Ford	AVTS	pwhitej@ford.com	313-339-2804
	Williamson	Rick	313-24-86348	ECl Prod.Con.Anal	Ford	FCSD	rwill110@ford.com	
	Wilson	Cary	313-39-02652	Chief Engineer	Ford	AVTS	cwilso32@ford.com	

EM82-827-6 48748

Kavlico TM dPFE Sensor
14D Core Team Meeting
Tuesday, December 18, 2001
Time: 1-3:00 p.m.
Conf. Room: POEE, CF087

Attendees: Mary Akins, Mahmoud Awad, Mark Freeland, Freeman Gates, Chris Panaretos, Paul Plants, Carol Verner

Meeting Minutes

1. **Finalize Technical Interfaces with Kavlico - Mary Akins:** Tie in Don Ayers on Tuesday's and Thursday's. He is aware of the workload and coordination efforts. Can he drop DCX? Mark asked, Mary to find out. Agenda for 1st Thursday back: same item.
2. **Review Warranty / Stack Chart, Mahmoud Awad:** Another trend. Focus (Zetec); more serious problem, more than Escape. Taurus consistent bet. June/July. F150 also reviewed. Escape 3.0L and Focus Zetec seeing trend: Phase lag – goes directly to vehicle plant for install. Others go to Engine plant. Same part. Mark needs interpretation of data for July, compare to March/April. Mary will communicate to Don Ayers. Production problems in that timeframe. Need by 1/3 meeting. Kavlico should look at returned parts over shutdown, to get to root cause. They need access to AWS to look up vehicle info. Mary will see if they can travel here the week of 1/3. Mark will show them what needs to be done. Paul will contact Gary Balint to give access to AWS or assign person to work with Kavlico. Pick sampling of 5 platforms, rather than go through all vehicle parts – Paul's suggestion to help Kavlico. Then, can get help from FSCD, Warranty Analysts (rather than get access to AWS). Mark would prefer to educate them on the sensor. 700 parts for Focus. Mary needs number of statistical repairs (50-100 per application). Then, decide when we want the parts. Can isolate 5 platforms, total parts, by mop, to do over Christmas. Mary at least needs access to AWS for analysis. Freeman will see Karen Kerezi to help Mary. Comparison and judgments need to be done. Karen needs to pull data, Mary needs to make analysis and comparison. Report of problem needs to be stapled with the part and sent to Kavlico. Mahmoud figured minimum number to analyze (5 platforms x30). Paul's suggestion: Mahmoud should pick the m.o.p.'s applicable (minimum number that can give information), then assignment should go to Mary and Karen. Kavlico should take all the parts they have (by months of production) over Christmas to analyze. Mark asked, is MIS not included? If not, it should be. AWS is vehicle. Need m.o.p on sensor. Request to Karen's supervisor and cc: Jim O'Neill for her to be assigned to this. Freeman will meet with Jim on 12/19 to discuss. Kavlico can analyze over the holiday, this does not need to be done by then. But, we do need the answer of help by Friday. Mary needs to send a report every time she sends sensors. Carol, Mary, Cathy Bansek to look into AWS data mining. Pull Vin, vehicle build history, technicians comments, if relevant, print. Who at Kavlico will make technical decision on these parts? Put on agenda for next meeting. **Outcome is changes to sensor, wiring, PCM – What is Root Cause (#2 of 14D). Pareto data based on total parts of m.o.p. at Kavlico. Statistical analysis needs to be done. Mahmoud and company**

to review. Freeman added we have to get a representative part that is clean, with mileage, that did not fail. Freeman to work up a proposal. Add all to open issues.

3. Review Open Issues and Action Items: Did not have time to review in meeting, but asked that everyone review and give Chris Panaretos updates.
4. Walk-ins / Additional Issues:

Meeting with Dan Kapp, 12/17/01: Freeman gave overview:

- Education (Jim Auiler, F. Fsadni, Dan Kapp attended – C.E. level)
- Warranty Issues were discussed: Troy Fisher – reports to John Carnago (DPFE Sensor by project)
- PCM and Wiring issues; general opinion was sensor needs to be more robust.
- Meeting will continue on Wednesday at 10:00 (AA140)
- Concentrate on 1-pager, 14D, Mahmoud's findings, and PTSE assignments at next meeting (concern of Paul's)
- Carol will take and distribute open issues to meeting on 12/19 (filter out by Wiring Harness issues: PTSE and EBSE). Paul will discuss responsibilities with them.
- Freeman concerned with wiring: trying to get data on 25 pc. Sample of harness to look at variation in production. Put request through systems engineering (4.6L); trying to do the same for Lear. Look at Root Cause investigation. Also need for ESM launch.
- Schedule Bob Dalbo on agenda in January (Paul will find out when available and detail he will bring).

Preliminary Agenda for 1/3: Will be held in War Room, DI186 (FMEI department).

1. Technical interfaces from Kavlico.... Don Ayers (audio)
2. Kavlico review of returned parts.....Mary Akins
3. Tie AWS data to Kavlico parts (continue discussion from 12/18).....All
4. Walk-ins / Additional issues

From: Akins, Mary (M.)
Sent: Tuesday, March 19, 2002 12:20 PM
To: Freeland, Mark (M.)
Cc: Barry Bugaj (E-mail); Gary Beason (E-mail)
Subject: Review of Kavlico TM-DP Sensor
Mark,

Kavlico gives you approval to review the Kavlico TM-DP sensor issues with Dr. Ed Sickafus, ex-Ford employee. It is understood that you will be reviewing Kavlico confidential information as covered by the confidentiality agreement of April 15, 2001, assignment #2336 between Kavlico and Ford.

Regards,
Mary Akins

Ford phone: (313) 248-1989
Ford fax: (313) 845-3169
makins@ford.com
makinwork@aol.com
Cell Phone/Messages: (810) 942-9606
Kavlico phone: (248) 263-8757

George.txt

<HTML>Subj:
 summary August 24<FONT COLOR="#000000" BACK="#ffffff"
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LANG="0">

Date: 8/24/01 4:20:15 PM Eastern Daylight Time

From: gmozurke@ford.com (Mozurkewich, George (G.))

To: mfreela1@ford.com (Freeland, Mark (M.))

CC: tpotter1@ford.com (Potter, Timothy (T.J.)), mfsopwith@cs.com
(mfsopwith@cs.com)

File: summary_August_24.doc (22016 bytes)

DL Time (52000 bps): < 1 minute

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Attached is a brief summary of experiments Tim and I performed today.

We tested two TNI sensors with positive pulses on the power line. We were able to reversibly induce double latch, which would stall a Zetec Focus but not prevent restart.

We tested two more TNI sensors with negative pulses on the signal-out line. We were able to reversibly induce single latch, but not double latch, conditions. We were also able to permanently fail the sensors, although not in a condition that would cause either stall or failure to restart.

-George

George Mozurkewich

Ford Motor Company Research Lab

(313) 845-5038

</XMP><FONT COLOR="#0f0f0f" BACK="#ffffff" style="BACKGROUND-COLOR: #ffffffe"
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by dymwsm05.mailwatch.com (8.11.0/8.11.0) with SMTP id f70KK5921289

for <mfsopwith@cs.com>; Fri, 24 Aug 2001 16:20:05 -0400

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Page 1

ER02-027-0 41492

George.txt

-0400 (EDT)

From: "Mozurkewich, George (G.)" <gmozurke@ford.com>

To: "Freeland, Mark (M.)" <mfreela1@ford.com>

Cc: "Potter, Timothy (T.J.)" <tpotter1@ford.com>,

"mfsopwith@cs.com" <mfsopwith@cs.com>

Subject: summary August 24

Date: Fri, 24 Aug 2001 16:19:53 -0400

MIME-Version: 1.0

X-Mailer: Internet Mail Service (5.5.2654.52)

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Guidelines.txt

<HTML>Subj: FW: Wiring Guideline wrt Ignition System
 Date: 8/27/01 3:24:56 PM Eastern Daylight Time
 From: mfreel1@ford.com (Freeland, Mark (M.))
 To: mfsopwith@cs.com

>

> -----
> From: Whitworth, Rudy (A.R.)
> Sent: Monday, August 27, 2001 3:24:43 PM
> To: Freeland, Mark (M.)
> Subject: FW: Wiring Guideline wrt Ignition System
> Auto forwarded by a Rule
>

Rudy Whitworth
PTSE Resident Engineer - Wayne Assembly Plant
Phone 734-467-2024
Fax 734-467-0489
E-mail AMHITWOR

-----Original Message-----
From: Pascany, Ken (K.M.)
Sent: Monday, August 27, 2001 2:54 PM
To: Whitworth, Rudy (A.R.)
Subject: FW: Wiring Guideline wrt Ignition System

Rudy,

Here is the web page from which you may search the SETk database...

<http://www.dearborn4.ford.com/setk/> <<http://www.dearborn4.ford.com/setk/>>

-----Original Message-----
From: Pascany, Ken (K.M.)
Sent: Monday, August 27, 2001 2:45 PM
To: Whitworth, Rudy (A.R.); Freeland, Mark (M.)
Subject: Wiring Guideline wrt Ignition System

Rudy,

Attached is the requirement that you phoned about. Let me know if you have additional questions.

Regards,

Ken Pascany, kpascany@ford.com <mailto:kpascany@ford.com>
Voice fax: 313-248-4669
P/T Electronic Applications
POEE Building, Mail Drop 75, BH177
21500 Oakwood Boulevard
Dearborn, MI 48124-4091

Guidelines.txt

Voice, fax: 313-248-4669

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Dearborn, MI 48124-4091</DIV> <DIV> </DIV></BLOCKQUOTE><FONT
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air-xb02.mail.aol.com (v80.17) with SMTP id MAILINXB28-0827152456; Mon, 27 Aug 2001
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by dymwsm06.mailwatch.com (8.11.0/8.11.0) with SMTP id f7RJO1F21481

for <mfsopwith@cs.com>; Mon, 27 Aug 2001 15:24:47 -0400

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dymwsm09.mailwatch.com (8.11.0/8.11.0) with SMTP id f7RJOk910116 for
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-0400 (EDT)

Received: by mailfw6.ford.com (Internal Mail Agent-0); Mon, 27 Aug 2001 15:23:00
-0400 (EDT)

From: "Freeland, Mark (M.)" <mfree1a@ford.com>

To: mfsopwith@cs.com

Subject: FW: Wiring Guideline wrt Ignition System

Date: Mon, 27 Aug 2001 15:24:43 -0400

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</HTML>

Kavlico dPFE Sensor
Technical Office
February 1, 2002
8:00 - 5:00
FTDC - Room 161 South

Attendees: Mary Akins, Sheran Allas, Mahmoud Awad, Don Ayers (Kavlico), Brady Davies (Kavlico), Mark Freeland, Freeman Gates, Jon Hargas, Jim O'Neill, Chris Panaretos, Kyong Park (Kavlico), Anup Patel, Brian Perry, Paul Plants, Kurt Schieding, Carol Verner, Louy Salhish (Student), Barry Bugaj (Kavlico), Gary Danhoff, Jim Maurer.

Introductions: 8:15-8:30

1. EGR System Overview - Freeman Gates 8:30-9:00
 - Assignment: Does vehicle temperature information of silicon exist for applications with high dPFE warranty? (R. Ross)
2. Conventional dPFE BGR Sensor - Gary Danhoff 9:00-9:40
 - Assignment: Provide team with pictures of each functional failure mode. (Mark Freeland)
 - Assignment: File compare for 21 vehicles 2001 MY calibration assoc. w/leak for voltage trip values. (Gary Danhoff)
 - Assignment: Provide team with a pareto of the AWS EGR codes for the "S" applications - 2001 MY. (Gary Danhoff)

Break: 9:40 - 10:00

3. PCM Discussion - Anup Patel, Brian Perry 10:00 - 10:40
 - Assignment: For all 21 applications: Identify PCM part number and current draw required, incremental to normal, to put PCM into reset. Include standard deviation (5 platforms to study: measurement on 5 and best vehicles, start with Focus). Collect data on power spikes, then do more in depth analysis. (Brian Perry, Anup Patel)
 - Parking Lot: Sheran give more detail with regard to wiring to PCM at Thursday's meeting (next week).

3. Sensor Overview - Don Ayers 10:40 - 12:00

- Assignment: Identify date of change from extended gold one to extended gold two design. (Brady Davies)
- Assignment: Give Mahmoud Awad exact dates for Kavlico changes. (Don Ayers)

Lunch Break 12-1:00

3. Sensor Overview - Don Ayers (continued) 1:00 - 2:20
 - Assignment: Compare failure mechanism of the current production acid tested parts vs. warranty UPAD parts. (Brady Davies)
 - Assignment: Provide Mark Freeland 6 parts with corrosion from pre-Au parts. (Brady Davies)
 - Parking Lot: Paralyne coating: Root cause determination

Break: 2:20-2:30

4. Warranty Summary – Taurus: Mahmoud Awad 2:30 – 2:45
- by application and Focus: Mark Freeland 2:45 – 3:05

5. Technical Presentation – Mark Freeland 3:05 – 3:35

Transient Voltage
UPAD

6. Technical Presentation -- John Hansas 3:45 – 4:15

UAD
- Freeman asked if he could replicate the testing that he has done.

7. Wrap-up 4:15-4:30:

Notes: Presenters need to send out copies of all presentations to Chris. Before sending documents, please mark 'confidential'. Paul Plante asked that if you want a copy of everything, to e-mail CPANARET.

Freeman added that the objectives of the technical presentations were met, focus of core team should be to cover UPAD root cause and bench and vehicles. Keep in mind that Kavlico is switching suppliers from SMI to Zarlink.

Assignment: Provide DV Plan for new Tier-2 Supplier (Mary Akins). Need reliability engineer dedicated from Ford to work with Mary.

Will continue discussions at Tuesday/Thursday meetings.

Powertrain Meeting Minutes 8/22/01

ECATS – The daily and weekly trends are currently remaining at or near 90%. There are no newcomers to the top failures list:

- 1) Download Entry Failure – Software Issue
- 2) Unable to Read ECS – Software
- 3) A/C Switch not on
- 4) Rough Idle
- 5) Key Not On Failure – Dead Batteries and Battery Cable routing issues

VFG 4243 – The top pre-delivery issue in the field for NO START is dead batteries. Team feels we can reduce these failures by implementing a previously completed Black Belt Project.

- o The minimum battery voltage to ship a vehicle is 12.5.
- o Vehicles are currently losing .3 volts from area of connection to EOL.
- o Nearly all of WSAP vehicles were at or near the 12.5-volt minimum when checked on Wednesday.
- o Team would like to institute the 4 Best Practices that resulted from the BB Project by Anne Wicks.
- o Team has requested a WSAP Green Belt to institute best practices.

Starter – Bolt Operation

One of the top issues for Starter replacements is mounting bolts loose, missing and/or cross-threaded.

Team feels this is a result of the starter installation being a two-person/two step process. Currently, one person hand starts the bolts and about 3 operations later, another person torques the bolts. Team feels that switching to one person starting and torquing the bolts. Also, incorporation of a DC nut-runner would better contain this issue.

Alternator – Currently the team has received only 49 alternators from warranty. Of those 49, 57% were TNFs, 15% were burnt battery terminals and 10% had high regulatory screws. Team has made a request to FCSD to receive more alternators. Currently, the majority of returned alternators are sent to remanufacturing. YPSI to respond to this item on 9/19/01 – J. Chigas/Ypsi

Electrical Grounds – Ground screw strip-outs noted in-system this week in multiple ground positions. Screw manufacturer has been contacted. Control points have been instituted in the body shop. Some investigation has possibly linked grounds to the DPFE short to V-Ref issue. More investigation needs to be done.

Rough Idle Update – Data taken from the field and compared to EOL data shows 90% of the vehicles which failed in the field had passed the EOL testing.

VFG 49 Overview – Currently the top early warranty part for engine noise is lifters on SP1 engines. The team is looking for a 3rd party group to analyze the returned parts.

VRT Team Meeting – Plant has had 6 wrong transmission builds in the last month. Team needs a scanner verification incorporated on the engine line – M. Majzoub/D. Torosian.

Agenda for 9/5/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 Push/Pull Electrical Connections
 VFG 42/43 Start/Stall Top Issue
 P0455 - Gross EVAP Leak
 IAC - 9F715
 Starter
 Fuel Pump
 Clipsless Clamps Update

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 M. Majzoub
 R. Wilkins/M. Giordano
 B. Tobis
 K. Conyee/Vendor
 J. Chigas/K. Singh
 J. Schnakder
 H. Lee

Agenda for 9/12/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 New 1 and 3 MIS Data
 Pedal Box Switches
 Auto Trans Detent
 Manual Trans - Diff. To Shift
 VFG 41 - Top Issue
 VFG 44 - Overview and Top Issue
 VFG 48 - Top Issue
 VFG 49 - Top Issue

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 D. Oboza
 C. Swick/A. D'Agostino
 H. Lee
 I. Odum/E. Moses/H. Lee
 M. Majzoub
 G. MacDonald
 J. Centilvre
 B. Mihora

Agenda for 9/19/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 P0705 - TRS
 Taillight Grounds
 Spark Plugs/Wires
 Alternator Update
 VFG 47 - Difficult to Shift
 E29 - Overview

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 J. Rezaee
 J. Rezaee/S. King/L. Marsec
 P. Cvetkovski
 J. Chigas/Ypai
 I. Odum/E. Moses
 G. MacDonald

Agenda for 9/19/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 Starter Update
 Battery Green Belt Project
 Rough Idle Update
 P0455 - Gross EVAP Leak
 D50 - Other Engine Trouble

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 B. Gilmour
 TBD
 C. Trombetta
 B. Tobis
 J. Brooks

From: Bansek, Catherine (C.K.)
Sent: Thursday, November 29, 2001 2:32 PM
To: 'dayers@kevlco.com'
Cc: Akins, Mary (M.); Smytha, Joseph (J.M.); Owens, Karen (K.E.); Gates, Freeman (F.C.); Verner, Carol (C.J.); Freeland, Mark (M.)
Subject: New DPFE part numbers

Don,

As per our conversation, I understand that these new part numbers (pulled for the platinum part) have NOT been shipped out to Ford.

Previous	New
YF1E-9J460-AD	2F1E-9J460-AA
YM2A-9J460-AB	YM2A-9J460-AC
YF1E-9J433-AG	2F1E-9J433-AA
YM2A-9J433-AB	YM2A-9J433-AC
1L3E-9J433-BC	2L3E-9J433-AA
1L6E-9J433-AB	TBD

If this is the case, these same numbers can be used for the pressure die latch up change.

If you have any questions, let me know.

C.K. Bansek

cbansek2@ford.com

Fax: 313-390-4084

Phone: 313-323-8101

Product Design Engineer, EGR Valve

V-Engine Engineering, Ford Motor Company

Text Pager: [cbansek2 \(313-796-5245\)](tel:3137965245)

[3137965245@alphapage.airtouch.com](tel:3137965245)

From: Carter, Roscoe (R.O.)
Sent: Thursday, May 02, 2002 11:38 AM
To: Ausherman, Julie (J.S.)
Cc: Wallace, Anna (A.); Freeland, Mark (M.)
Subject: RE: Work Task Number for Central Labs charged to Dept #J071
This is the work task # to be used in place of XMY30 on LAB # 20889 and 20871.
Thanks for your assistance one and all. ROCarter

---Original Message---

From: Ausherman, Julie (J.S.)
Sent: Thursday, May 02, 2002 10:27 AM
To: Carter, Roscoe (R.O.)
Cc: Wallace, Anna (A.); Freeland, Mark (M.); Ausherman, Julie (J.S.)
Subject: RE: Work Task Number for Central Labs charged to Dept #J071

I have created work task number AJ71A for use with Polymer Characterization.
WHMSWORQ's will be updated this weekend.

If you have any questions or problems, please don't hesitate to call.

Best Regards,
Julie Ausherman
Financial Analyst
Ford Research Laboratory
Phone: 313-390-7392
Fax: 313-845-7307

---Original Message---

From: Carter, Roscoe (R.O.)
Sent: Thursday, April 25, 2002 10:24 AM
To: Ausherman, Julie (J.S.)
Cc: Wallace, Anna (A.); Freeland, Mark (M.)
Subject: Work Task Number for Central Labs charged to Dept #J071

Julie,

Please forward the Work task number for the work at Central labs on to Anna Wallace at the above e-mail address as soon as it is available. This is for the Polymer Characterization of the delta PFE sensors (four units total). Thank!!

Roscoe "ROC" Carter
Ford Research Lab
Physical and Environmental Sciences Department
Lubricant Science and ATF Analysis Group Leader

2000-2002 Kavlico TM dPFE Sensor
Core Team Roster

Please:								
- Initial the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If your name is not on this list, please write it in at the bottom including the appropriate detail.								
Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	Akins	Mary	313-24-81989	Kavlico Rep.	Kavlico	POEE	maldns@ford.com	313-39-4084
	Awad	Mahmoud	734-68-25815	Reliability Engineer	Ford		mawad@ford.com	313-39-2315
	Ayers	Don	805-623-2000	Kavlico Program Manag	Kavlico	CA	dayers@kavlico.com	805-523-6475
	Freeland	Mark	313-59-47645	B-Sigma Black Belt	Ford	FRL	mfreela1@ford.com	313-621-0346
	Gates	Freeman	313-32-24807	FMEI Tech Spec.	Ford	POEE	fgates@ford.com	313-39-4084
	Owens	Karen	313-84-55770	FMEI Supervisor	Ford	POEE	kowens@ford.com	313-845-5770
	Panaretos	Chris	313-24-89337	Proj. Mgt. Analyst	Project Solutions	POEE	cranaret@ford.com	313-322-8265
	Plante	Paul	313-84-54138	Campaign Manager	Ford	POEE	oplante@ford.com	313-39-2513
	Schleding	Kurt	313-32-25449	Reliability Supervisor	Ford	POEE	kachied1@ford.com	313-39-2314
	Smythe	Joe	313-62-12985	STA Engineer (Leader)	Ford		jsmythe1@ford.com	313-337-2604
	Verner	Carol	313-39-07180	FMEI Engineer	Ford	POEE	cverner@ford.com	313-39-4084

EM02-027-6 41532

2000-2002 Kavlico TM dPFE Sensor
Roster

Please:

- Initial the box to the left of your name to indicate your attendance.
- Make any corrections to the detail associated with your name.
- If your name is not on this list, please write it in at the bottom including the appropriate detail.

Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	Aldns	Mary	313-24-87989	Kavlico On-Site Rep.	Kavlico	POEE	mekins@ford.com	313-39-04084
	Albrecht	Gunther	313-52-23159	V-Engine Svc. Eng.	Ford	POEE	galbrech@ford.com	313-52-14367
	Aulier	Jim	313-32-38763	PTSE Chief Engineer	Ford	POEE	jeulier@ford.com	
	Awad	Mahmoud	734-58-35815	Reliability Engineer/ Field Data Leader	Ford	ATNPC	mawad@ford.com	313-39-02315
	Ayers	Don	805-523-2000	Kavlico Program Manager/Technical Leader	Kavlico	CA	dayers@kavlico.com	805-523-8475
	Balint	Gary	313-33-72780	FCSD	Ford	DSCII	gbalint@ford.com	
	Bansek	Catherine	313-32-38101	FMEI CPMT Eng./WERs concerns	Ford	POEE	cbansek2@ford.com	313-39-04084
	Bissi	Gerry	313-24-86280	FCSD ECI Supervisor	Ford	TWCTDR	gbissi@ford.com	
	Bronni	Mark	313-24-84509	Motorola Rep.	Motorola	POEE	mbronni@ford.com	313-39-04084
	Bersuder	Lee	313-84-50881	FCSD FQE Supervisor	Ford	TWCTDR	lbersude@ford.com	
	Davies	Brady	805-523-2000	Director MEMS Technology	Kavlico	CA	bdavies@kavlico.com	805-523-7125
	Freeland	Mark	313-59-47845	6-Sigma Black Belt	Ford	FRL	mfreela1@ford.com	313-82-10348
	Gates	Freeman	313-32-24807	FMEI Tech Spec./Technical Lead	Ford	POEE	fgates@ford.com	313-39-04084
	Giordano	Mike	313-32-20925	Focus C&P Supervisor	Ford	VPC	mgiorda1@ford.com	
	Johnson	Joe	313-84-58292	FMEI Section Supv.	Ford	POEE	ljohnson@ford.com	313-39-04084
	Kapp	Dan	313-33-75554	PTSE AVT Chief Engineer	Ford	POEE	dkapp1@ford.com	
	Kerazi	Karan	313-20-63387	FMEI AWS Analyst	Ford	POEE	kkerazi@ford.com	313-84-53159
	Kunde	Claf	313-20-85930	PT Focus Program Mgr.	Ford	VPC	okunde1@ford.com	313-24-82528
	Masura	Gordon	313-32-29662	EPRC Leader	Ford	FPB4	gmasura@ford.com	
	McCarty	Bill	313-59-41031	Production Buyer	Ford	Purchasing	wmccart1@ford.com	313-59-44875
	Nielsen	Chris	734-28-69886	Service Buyer	Ford	FCSD	cnielse4@ford.com	
	O'Neill	Jim		FMEI Dept. Mgr.	Ford	POEE	loneall@ford.com	313-39-04084
	Oswalt	Grag	313-39-01160	Critical Con. Mgr.	Ford	FCSD	gswalt@ford.com	313-59-47470
	Owens	Karen	313-84-55770	FMEI Supervisor	Ford	POEE	kowens@ford.com	313-84-55770
	Panaretos	Chris	313-24-89337	Proj. Mgt. Analyst	Project Solutions	POEE	cpanaret@ford.com	313-32-28265
	Park	Kyong	805-523-2000	VP Research and Dev't	Kavlico	CA	kpark@kavlico.com	805-523-7125
	Plante	Paul	313-84-54138	Campaign Manager	Ford	POEE	pplante@ford.com	

E002-027-G 41533

created: 12/11/01
 revised: 7/1/2003

2000-2002 Kavlico TM dPFE Sensor
 Roster

7/1/2003

Please:								
- Initial the box to the left of your name to indicate your attendance.								
- Make any corrections to the detail associated with your name.								
- If your name is not on this list, please write it in at the bottom including the appropriate detail.								
Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	Popoff	Dan	313-24-88603	Focus C&P Quality Eng (Leader)	Ford	VPC	dpopoff@ford.com	
	Ross	Roberto	313-84-51438	EESE Wiring CPS	Ford	Bldg. #1	rross11@ford.com	
	Schieding	Kurt	313-32-25449	Reliability Supervisor	Ford	POEE	kschiedi@ford.com	313-39-02914
	Shore	John	734-26-69789	PS&L Recall Mgr.	Ford	FCSD	jshore@ford.com	734-26-81188
	Smythe	Joe	313-82-12985	STA Engineer (Leader)	Ford	PTE	jsmythe@ford.com	313-33-72804
	Verner	Carol	313-38-07180	FMEI Engineer	Ford	POEE	cverner@ford.com	313-39-04084
	White-Johnson	Patrice	313-39-04409	STA Site Manager	Ford	AVTS	pwhitejo@ford.com	313-33-82804
	Williamson	Rick	313-24-86348	ECI Prod.Con.Anal.	Ford	FCSD	rwill110@ford.com	
	Wilson	Cary	313-39-02662	EE&E Chief Engineer	Ford	AVTS	cwilso32@ford.com	

EM02-027-G 41534

From: Akins, Mary (M.)
Sent: Monday, June 04, 2001 1:35 PM
To: MacDonald, George (G.F.)
Cc: Rozema, Thomas (T.M.); Freeland, Mark (M.); Gates, Freeman (F.C.); Groom, Reginald (R.); Johnson, Joseph (J.H.); Juntunen, John (J.M.); Maurer, James (J.B.); Trombetta, Christopher (C.B.); Whitworth, Rudy (A.R.)
Subject: RE: ANOTHER DPFE FAILURE TODAY!!

George,
I have contacted Kavlico to see if we have any May 21, 2001 bullt sensors on hand. We do not.

We are checking our daily/weekly logs to see if we can see any anomalies. I will ship the sensors to Kavlico as soon as I receive them, probably Tues. June 5th. Kavlico will receive them on Wed., June 6th and start analysis. As I receive feedback on the sensors I will forward it on to you.

Regards,

Mary Akins
Kavlico Corp.
Ford Phone: 313.248.1989
Ford Fax: 313.845.3169
makins@ford.com
makins@kavlico.com
messages/pager 248.848.9670

-----Original Message-----
From: MacDonald, George (G.F.)
Sent: Monday, June 04, 2001 12:32 PM
To: Akins, Mary (M.)
Cc: Rozema, Thomas (T.M.); Freeland, Mark (M.); Gates, Freeman (F.C.); Groom, Reginald (R.); Johnson, Joseph (J.H.); Juntunen, John (J.M.); Maurer, James (J.B.); Trombetta, Christopher (C.B.); Whitworth, Rudy (A.R.)
Subject: RE: ANOTHER DPFE FAILURE TODAY!!
Importance: High

Mary,
What can you do to immediately ensure we no longer build with this buid date? Can you set up a sort prior to coming to WSAP?? Please expedite analysis. . .

George F. MacDonald
PTO Resident Engineer - Wayne Assembly Plant
Phone: 734-46-70196
Textpager: 313-795-7969 <mailto:3137957969@alphapage.airtouch.com>
gmcdona@ford.com

-----Original Message-----
From: Rozema, Thomas (T.M.)
Sent: Monday, June 04, 2001 12:15 PM
To: Akins, Mary (M.); Freeland, Mark (M.); Gates, Freeman (F.C.); Groom, Reginald (R.); Johnson, Joseph (J.H.); Juntunen, John (J.M.); MacDonald, George (G.F.); Maurer, James (J.B.); Trombetta, Christopher (C.B.); Whitworth, Rudy (A.R.)
Subject: FW: ANOTHER DPFE FAILURE TODAY!!
Importance: High

ER8Z-827-8 42339

We had another failure today at the EOL.

The failure code that was presented on eCATS was EGR003 (IEGR Low When EGRDC OFF). Rotation number 6010 with last six of VIN#338630 for those of you with access to eCATS.

The build date of the sensor is May 21, 2001. I took the sensor and hooked it up to my bench test. The corresponding voltage was 0.13V. Both static and with vacuum applied.

Mary is coming to pick up the parts today at 2:00 to get them tested. This is the second one in two days we have caught here at EOL. Both failed parts have had the same build date! I will let you know on results of test.

I have attached to specs. for the first failure for those of you who were not included in the first email, for others sorry to repeat.

Thomas Rozema

Ford Motor Company
RVTPTSE Engineering
Wayne Assembly Plant
trozema@ford.com
Phone:734-641-5831
Text Pager:734-267-5262

---Original Message---

From: Rozema, Thomas (T.M.)
Sent: Friday, June 01, 2001 3:13 PM
To: Freedland, Mark (M.); Alkins, Mary (M.); Juntunen, John (J.M.); Groom, Reginald (R.); Gates, Freeman (F.C.); Maurer, James (J.B.); MacDonald, George (G.F.); Whitworth, Rudy (A.R.); Trombetta, Christopher (C.B.)
Subject: DPFE FAILURE TODAY!!
Importance: High

All,

We had a end of line failure today with root cause being a faulty DPFE sensor.

The sensor build date was May 21, 2001. For those of you with access to Ecats the last six digits on the VIN are 329852, vehicle rotation 8742.

The failure given on the test was EGR005, this is EGR on time exceeded. The DPFE was removed and replaced and problem was cleared up. I have tested the faulty DPFE using a volt meter and it is at 4.98 Volts in a static position and when vacuum is applied it does not change correspondingly, it simply stays at 4.98 V.

**After analyzing eCATS data the vehicle failed 6 consecutive static PCM tests. The parameters out of the range were noticed to be:
HO2 Low = .8838 w/upper limit 0.45**

RP_ACLD_2P_FINAL = .4565 w/lower limit 0.459
EGR_ON_TIME = 3.047 w/limit 3 seconds.

Please advise on who to send the part to. MARY, or MARK?

Thanks,

Thomas Rozema

Ford Motor Company
RV/TPTSE Engineering
Wayne Assembly Plant
trozema@ford.com
Phone:734-641-5831
Text Pager:734-267-6262

E082-827-G 42341

From: Rossi, Roberto (R.A.)
Sent: Friday, March 22, 2002 12:33 PM
To: Freeland, Mark (M.)
Cc: Plants, Paul (P.G.); Maurer, James (J.B.); Awad, Mahmoud (M.I.)
Subject: RE: Special Service Message 14747 for short in connector to PCM

Here is the text of SSM 14747.

CSQI702 CQIS Technical Service Detail 03/22/02 12:30:58

==>

Next/Previous Article (N/P): _ Article #: SSM 14747 Date: 03/14/2001

Symptom:

Year Vt Fm VI Mdl Trans Engine Calib Axle

Criteria:

FOLLOW NORM DIAG FOR (FPDM), CONNS, HARNESS, ETC...
SOME 2000/2001 FOCUS MAY EXHIBIT A CHECK ENGINE LIGHT ON WITH
DIAGNOSTIC
TROUBLE CODE P1233, P1235, P1237 (FUEL PUMP DRIVER MODULE). THIS MAY
ALSO BE
ACCOMPANIED BY A LOSS/LACK OF POWER OR CRANK NO START WITH A LOSS
OF FUEL
PRESSURE. THIS MAY BE CAUSED BY THE FPDM CONNECTIONS, CIRCUIT.
FIRST FOLLOW
NORMAL PC/ED DIAGNOSIS. SPECIFIC FPDM AREAS TO CHECK ARE; AN
IMPROPERLY SEATED
CONNECTOR, A TIGHT OR CHAFFED HARNESS OR GROUND (G54) BEING
LOOSE. CHECK THE
BATTERY JUNCTION BOX (BJB) FOR A LOOSE CONNECTION OR PIN PUSH
OUTS. VERIFY
THAT THE CONNECTIONS AT THE TRANSMISSION HOUSING (C95/C96) ARE
PROPERLY SEATED
AND THE HARNESS IS NOT CHAFFED AGAINST THE TRANSMISSION. ALSO
CHECK FOR A
POSSIBLE PINCHED WIRING HARNESS UNDER THE RIGHT FRONT DOOR SCUFF
PLATE AREA.

Robert Rossi
Electrical/Electronic Systems Campaign Prevention Specialist
North American Car Lifestyle Vehicles
Phone/Fax: 84-51438

---Original Message---

From: Freeland, Mark (M.)
Sent: Thursday, March 21, 2002 6:05 PM
To: Rossi, Roberto (R.A.)
Cc: Plants, Paul (P.G.); Maurer, James (J.B.); Awad, Mahmoud (M.I.)
Subject: Special Service Message 14747 for short in connector to PCM

Roberto,

Can you please find out the details of Special Service Letter 14747 for short in

connector to PCM. (see attached .pdf).

I found it referred to in a GQRS report for a 2.0L Zetec Focus VIN # 1FAHP38391W107129, Build date 9/9/2000, which has been in several times for no start, died while driving, and other concerns. This vehicle had a dPFE replaced on 1/25/2002.

Thanks

Mark Freeland

<< File: 1FAHP38391W107129.pdf >>

From: Mozurkewich, George (G.)
Sent: Tuesday, August 20, 2002 8:37 AM
To: Freeland, Mark (M.)
Cc: Potter, Timothy (T.J.)
Subject: Focus electrical problems

Regarding electrical problems on the Focus: "The problems customers had before aren't there anymore," said Cvetkovski. Surprise! See:
http://www.fcw.ford.com/art_display.cfm?article_id=12135.

George Mozurkewich
Ford Motor Company Research Lab
Physical and Environmental Sciences Dept.
(313) 845-5038

From: Freeland, Mark (M.)
Sent: Thursday, August 01, 2002 12:54 PM
To: McCoy, James (J.D.)
Cc: Potter, Timothy (T.J.)
Subject: UPS

Jim,

I understand that the UPS's were all shipped directly to you, and that at least 5 have arrived. Can you please let me have one of them so that I can install it in the Mountaineer.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Tuesday, July 30, 2002 4:58 PM
To: Hargas, Jon (.); Uy, Dairene (D.)
Cc: Potter, Timothy (T.J.)
Subject: RE: Elwood Focus sensor

Jon & Dairene,

I have assigned a SRL tracking number of SRL931 to this part. If you have the part could you please inscribe this number on the part and associate all records with this number. I have noted the info that I have in the master log, but please advise me of any info & findings you have on the part.

When you are done then the remains should be stored in a plastic bag clearly labeled with the tracking number and deposited in the 900 series box in my office.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Hargas, Jon (.)
Sent: Friday, July 19, 2002 1:25 PM
To: Freeland, Mark (M.); Uy, Dairene (D.)
Subject: Elwood Focus sensor

Mark,

Tim Potter got a sensor from Kevin Elwood's Focus. It has some clear bubbles by the base of the wire bonds. Dairene wrote down the mileage.

The date stamp on the sensor is 1K19B. I have not assigned it an SRL number. There are images in the Kavlico directory on the optical lab computer.

Jon

From: Hargas, Jon (.)
Sent: Thursday, July 18, 2002 5:48 PM
To: Potter, Timothy (T.J.)
Subject: FW: Used good sensor for Raman

Tim,

Dairene needs a good used sensor to Raman on. I think it would be better to do it fresh off the car, condensate and all, so that she has the best chance at detecting whether anything is dissolved in the gel. Carol Verner suggested that you might not be squeamish about trading sensors out of your Focus. Would you be able to do it if Carol gives you a replacement?

Jon Hargas
x31088

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

From: Verner, Carol (C.J.)
Sent: Thursday, July 18, 2002 5:23 PM
To: Hargas, Jon (.)
Subject: RE: Used good sensor for Raman

Jon,

Ask Tim Potter if he is willing to take the sensor off his Focus. If so, I can give him a replacement. If you have a dpfe on your vehicle are you willing to take it off and use for the test.

Let me know.
Carol

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

From: Hargas, Jon (.)
Sent: Thursday, July 18, 2002 5:08 PM
To: Verner, Carol (C.J.); Uy, Dairene (D.)
Cc: Friesland, Mark (M.); Akina, Mary (M.); 'Kyong Park (E-mail)' (E-mail)
Subject: Used good sensor for Raman

Carol,

Dairene Uy presented data on her Raman analysis at today's meeting. It was requested that she look at a used sensor that was still good to see if there was anything in the exhaust gas that was dissolved in the gel. It would be desirable to have the results reported next week, but Mark is in Ireland and he's our normal source for parts.

Do you have any good used parts? I think it would actually be more appropriate to take a sensor off a vehicle and give it to her, condensate and all. There's a better chance that a more volatile chemical will be present in a sensor directly off a vehicle than one sitting in a parts bin for months. We have to break the case open for Dairene to do Raman, so a replacement would have to be available.

Jon Hargas
Materials Science Dept.
x31088

From: Freeland, Mark (M.)
Sent: Wednesday, June 18, 2002 4:21 PM
To: Alles, Sheran (S.A.); Rossi, Roberto (R.A.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); Gates, Freeman (F.C.); McCoy, James (J.D.); Potter, Timothy (T.J.)
Subject: It did it again 5 mins ago

Guys,

We may be in luck tomorrow, as my Mountaineer did it again five minutes ago, with new wiring and a different meter.

Roberto, I totally redid the wiring for my monitor on the dPFE today. Just incase the strange event on Monday and two strange events yesterday were caused by an instrumentation wiring issue.

Sheran, As discussed earlier today, we need to get together in the morning and get the good scope from the Focus into my mountaineer. Please call me as arranged on my cell phone between 8:30 and 9:15 in the morning.

Tim, Thanks for you're help today in preparing the new wiring loom for the dPFE monitor in my Mountaineer, and for installing the regulators in the test box for the latched sensors. Works good.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Tuesday, June 18, 2002 5:51 PM
To: Potter, Timothy (T.J.)
Subject: RE: Oscilloscope

Thanks Tim,

I will try and get the one from the Focus for the weekend, if EESE are not driving the vehicle.

See you in the morning.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Potter, Timothy (T.J.)
Sent: Tuesday, June 18, 2002 2:49 PM
To: Freeland, Mark (M.)
Subject: Oscilloscope

Mark,

The Tektronix scope I borrowed is in use by it's owner. I called Electro-Rent and all of their TDK 3054's are rented. They do have a TDS3014 which is a 100MHz scope. The scope rents for \$378/mo plus \$48/mo for the battery pack. If you want that call Arvid at Electro-Rent at (800) 688-1111 then dial 8 and 3169. They can get it here in a day or two normally.

Tim

From: Jahshan, John (J.H.) [jjahshan@visteon.com]
Sent: Friday, May 17, 2002 7:48 AM
To: 'Potter, Timothy (T.J.)'
Subject: RE: Active Current Probe for Buy Back Focus

Hi Tim,

I am currently using a Fluke 199. Do you want me to bring the vehicle over this morning?

John H. Jahshan
POER Resident Engineer
PCM Applications
jjahshan@visteon.com
Phone & Fax: (313) 722-1638 or (313) 390-4854
Pager: (313) 795-8068
<http://www.myairmail.com/>
"WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE RIGHT"

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

From: Potter, Timothy (T.J.) [mailto:tpotter1@ford.com]
Sent: Thursday, May 16, 2002 9:28 AM
To: 'Jahshan, John (J.H.)'
Subject: RE: Active Current Probe for Buy Back Focus

John,

The DC-DC converters have arrived. I will install it in the box and place the box in the car. What are you going to use for a oscilloscope?

Tim Potter

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

From: Jahshan, John (J.H.) [mailto:jjahshan@visteon.com]
Sent: Monday, May 13, 2002 8:03 AM
To: 'Freeland, Mark (M.)'; 'Potter, Timothy (T.J.)'
Subject: RE: Active Current Probe for Buy Back Focus

Hi Tim,

When do you have time to instrument the Vref at the DPFE on the MT Focus?

John H. Jahshan
POER Resident Engineer
PCM Applications
jjahshan@visteon.com
Phone & Fax: (313) 722-1638 or (313) 390-4854
Pager: (313) 795-8068
<http://www.myairmail.com/>
"WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE RIGHT"

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

From: Jahshan, John (J.H.)
Sent: Wednesday, May 08, 2002 3:26 PM
To: 'Freeland, Mark (M.)'; Potter, Timothy (T.J.)
Subject: RE: Active Current Probe for Buy Back Focus

Hi Mark,

Ken has found a probe but we do not have an amp for it. Do you have an amp?
I currently have the NT 4 door Focus instrumented for Vref at the PCM only.

Hi Tim,

I would like to get the Vref signal at the DPFE sensor instrumented. When can you help me out on this?

John H. Jahshan
POEE Resident Engineer
PCM Applications
jjahshan@visteon.com
Phone & Fax: (313) 722-1638 or (313) 390-4854
Pager: (313) 795-8068
<http://www.myairmail.com/>
"WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE RIGHT"

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

From: Freeland, Mark (M.) [mailto:mfresl1@ford.com]
Sent: Wednesday, May 08, 2002 10:34 AM
To: John Jahshan (E-mail)
Cc: Potter, Timothy (T.J.)
Subject: Active Current Probe for Buy Back Focus

John,

I still want to take you up on you're offer of an active current probe for the Buy Back Focus I we are driving at SRL. When do you think we could have it?

Tim,

When John gives us the probe, will the existing DC to AC converter handle an extra box? Would you please install it? Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department

> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Thursday, May 16, 2002 6:55 PM
To: McCoy, James (J.D.); Potter, Timothy (T.J.); Rossi, Roberto (R.A.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.)
Subject: RE: Resistor current measurement

Jim,

We would make up a little box using a sensor housing with a fly lead coming out the other side to a sensor connector, then the signal wires would come out the side and be fed back through the door. This would give a minimal impact to the vehicle wiring (the reliability of one added connector in series, and the V drop across the 1 ohm. (This I would consider negligible as the V Transient improved device has 10 ohms added at the same point).

So, if you have no other concerns I am going to have Tim proceed with my lease vehicle, and I hope others will follow and have their vehicles instrumented also. The more that do, the better the chance of finding the event.

Roberto, does anyone in you're organization want to have their vehicle instrumented also?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: McCoy, James (J.D.)
Sent: Thursday, May 16, 2002 1:43 PM
To: Freeland, Mark (M.); Potter, Timothy (T.J.)
Cc: Maurer, James (J.B.)
Subject: Resistor current measurement

Hi Mark. Got your message this morning about using a 1 ohm resistor in the VREF line to calculate the DPFE current. As long as you are looking for a latch/hold condition, the response of the voltmeter would be adequate and you're right that this would be an inexpensive and effective way to monitor for a fault without a scope. The only draw back would be the test is intrusive in that you would have to break into the VREF line to add the resistor.

|

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmccoy1@ford.com

From: McCoy, James (J.D.)
Sent: Thursday, May 16, 2002 9:26 AM
To: Potter, Timothy (T.J.)
Subject: RE: Oscilloscope

Thanks Tim, I'll call him today and see what they can do for us.

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmc coy1@ford.com

---Original Message---

From: Potter, Timothy (T.J.)
Sent: Thursday, May 16, 2002 9:20 AM
To: McCoy, James (J.D.)
Subject: RE: Oscilloscope

Yes, I talked to Tony Seccia, the Account Manager from Yokogawa and they rent or lease the oscilloscopes. He is the representative I bought my scope from and would also be happy to sell a scope. His office phone is (248) 553-8700 ext. 25, and his cell phone is (248) 761-2086.

Tim Potter

---Original Message---

From: McCoy, James (J.D.)
Sent: Thursday, May 16, 2002 9:06 AM
To: Potter, Timothy (T.J.); Maurer, James (J.B.)
Subject: RE: Oscilloscope

The Tek scopes we use (700 series) can be configured to capture waveforms in a PCX file format. These files can be viewed in practically any "picture" type viewer or can be inserted into a Word document. The scopes have 3.5 floppy's standard and can also be fitted with Zip drives for additional storage. I have attached a sample of the waveforms collected on the Tek scope. I would rather use the Yokogawa's simply for the size alone, but Electro Rent does not offer them. The rental charge for the three Tek scopes for 60 days is \$12,600.00. Anyone know where to rent a Yokogawa???

<< File: sample.doc >>

Regards,

Jim McCoy

Fuel Metering, Emissions & Ignition Systems Engineering
Hardware Control Interface Group
V-Engine Engineering
POEE - MD#69 - Rm. D142 - Cube DF186
Phone (313) 33-79690 / Fax (313) 39-04084
E-Mail: jmc coy1@ford.com

---Original Message---

From: Potter, Timothy (T.J.)
Sent: Thursday, May 16, 2002 8:44 AM
To: Maurer, James (J.B.); McCoy, James (J.D.)
Subject: Oscilloscope

Jim & Jim,

We need to think how we are going to use these oscilloscopes. If you are going to want to pull traces off the scope and look at them on your desk or print them for meetings, the Tektronix may not be the best choice. I have been working with the software they provide and it does not do the job nearly as well as Yokogawa's Waveform Viewer. They have a program which will convert the whole file into a spreadsheet format, but many of the traces we capture are too large for any spreadsheet program to read.

The Yokogawa Waveform Viewer allows one to zoom in on the section of interest and then save that section as a comma delimited file to be read by some other plotting program. The Yokogawa 1740 also has a Zip drive which can hold more traces, but transferring data via Zip disk means the person wanting the traces must have access to a zip drive from which to read out the traces.

Let me know if you want to discuss this further. I prefer to discuss via email because I can research my answers for any questions you might have.

Tim Potter.

From: Freeland, Mark (M.)
Sent: Monday, May 13, 2002 10:12 AM
To: Potter, Timothy (T.J.)
Subject: RE: Yokogawa Current Probe - follow up

Tim,

I don't need too much accuracy at the normal current level, so the 2 mA resolution should be just fine. Please proceed.

If we can borrow the evaluation unit while the paperwork goes through that would be great.

Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: Potter, Timothy (T.J.)
Sent: Monday, May 13, 2002 7:24 AM
To: Freeland, Mark (M.)
Subject: FW: Yokogawa Current Probe - follow up

Mark,

The Yokogawa current probe is marginal, but cheaper. Look at the specs below and let me know what you think. I will likely be in Monroe today.

Tim.

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

From: Tony.Seccia@yca.com [mailto:Tony.Seccia@yca.com]
Sent: Friday, May 10, 2002 4:14 PM
To: tpotter1@ford.com
Subject: Yokogawa Current Probe - follow up

Tim,

For use with your DL1740 Digital Scope to measure in the mA range, we have the following:

Model 700937 - DC to 50MHz current probe, 15A max range.

Cost: \$1,795.00 each

Note: as your DL1740 has the /P4 probe power option, you can power the probe directly from the scope and you will not require any additional power supplies.

On your scope you can set the following:

Input: DC coupling, 1Mohm input impedance
Range: 2mV / div (which gives you 20mA / div current readings)
Probe: 1:1 ratio

Variable: you can change, this will let you zoom up to 10x, so you can see 2mA per division.

Answer to your question:

Yes - you should be able to read in the mA range. Either directly with 20mA per division setting or by zooming in the variable on the channel range.

I have a 700937 current probe in our office if you would like to evaluate before you buy.

Please let me know, thanks!

Tony Seccia
Account Manager
Yokogawa Corporation of America
Test & Measurement Division
Suite A-1
27250 Haggerty Road
Farmington Hills, MI 48331
Phone: 248-553-8700
Fax: 248-553-8881
Cell: 248-761-2086
Email: tony.seccia@us.yokogawa.com
www.yokogawa.com/tm
www.yca.com

You're invited....Basic Networking in Instrumentation
A seminar brought to you by Yokogawa
May 21, 2002
Hilton Inn - Southfield

Learn more about Networks, Ethernet, and connecting your lab instrumentation. RSVP via email or to request additional information.

From: Altes, Sheran (S.A.)
Sent: Friday, May 10, 2002 12:51 PM
To: Altes, Sheran (S.A.); Plante, Paul (P.G.); McCoy, James (J.D.); Potter, Timothy (T.J.); Maurer, James (J.B.); Fraeland, Mark (M.)
Cc: Lawla, Jim (J.); King, Daniel (D.M.)
Subject: RE: Re: Flight data recorder

According to Jim Lawla, the GTM uses an Infineon C167CS-32FM (16MHz), and so is limited by the ADC of the micro. It does have the auto-scan feature with no software intervention for data capture (less overhead). So I did a simple calculation to find the A/D conversion time which will be the sum of the sample time(to charge cap), conversion time and A-to-D time.

$T_{cpu} = 1/f = 62.5\text{ns}$
Bus Clock freq=16MHz/2, $T_{bc}=125\text{ ns.}$ (bus clock time)
Sampling time = $16 * T_{bc} = 2\text{ us.}$ (per spec)
Conversion time = $40 * T_{bc} = 5\text{ us.}$
A-to-D time = $2 * T_{cpu} = 125\text{ ns.}$

Total ADC time = 7.125 us
Not considering aliasing issues where we would like to sample much faster.

This would therefore make the GTM unuseable for our application, for transients. We would need the scopes...sorry.

Regards
-Sheran

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

From: King, Daniel (D.M.)
Sent: Wednesday, May 08, 2002 1:45 PM
To: Altes, Sheran (S.A.)
Subject: RE: Re: Flight data recorder

Sheran - There are trade-offs to be made in deciding this. The recorder is constrained more by the amount of data that needs to be captured than by acquisition rate. You should contact Bob Crawford for more details. (734) 453-8817.

Thanks!
Dan King Phone: (313) 337-2844
Ford Motor Company Fax: (313) 323-2923
EESE - Body E/E Subsystems

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

From: Altes, Sheran (S.A.)
Sent: Wednesday, May 08, 2002 10:39 AM
To: King, Daniel (D.M.); Plante, Paul (P.G.); McCoy, James (J.D.); Potter, Timothy (T.J.); Maurer, James (J.B.)
Cc: Altes, Sheran (S.A.)
Subject: Re: Flight data recorder

We have previously used a flight data recorder (standalone module based off the PCM architecture with I/O and SCP recording capabilities and remote data access) for capturing spikes that have eluded us. The module is made by Ford but is now supported by Jim Crawford and his company. After discussions with Tim Potter, we could use this on some Ford employee Focus vehicles in a transparent manner than a bulky scope. Dan King used Crawford's services when we worked on a previous issue. One thing we should be certain about is the acquisition rate. Since we would be only using about 3 channels, this should be excellent. Dan, could you get us the specs for this flight recorder, especially the sample rates, etc.

Thanks
Regards

-Sheran

From: Poma, Amy (A.)
Sent: Friday, May 10, 2002 12:21 PM
To: Maurer, James (J.B.); McCoy, James (J.D.); Plante, Paul (P.G.); Potter, Timothy (T.J.); Alles, Sheran (S.A.)
Cc: Poma, Amy (A.)
Subject: Electrical Testing on Vehicles 5/8/02 meeting notes

All-

Attached please find notes taken from the May 8 meeting as referenced above.



Kavira.doc-electric
altesting ...

*Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CQ-156
phone 313-390-8849, fax: 313-390-4084
apoma2@ford.com*

Kavlico

May 8, 2002

Electrical Testing on Vehicles

Attendees Jim Maurer
 Jim McCoy
 Paul Plante
 Tim Potter
 Sheran Alles
 Amy Poma

Meeting Notes

Questions addressed:

- What kind of instrumentation should we use to test?
- Do we need other scopes to test?
- How do we set up test cars to capture noise?
- Is there better equipment to capture signal and put in memory than use of a scope? No.

Instrumentation/Scopes:

- Jim McCoy will see, good opportunity to obtain additional equipment. Jim McCoy has access to (3) Techtronic scopes but need hefty power supply. Problem is powering them (too big). Has (1) inverter and can get (2) out of Ypsilanti but it's going to really tax the system.
- In this case we need a fast scope. Decided inverter and scope only way we know how.
- Probes-make short ground path.

Set up test cars to capture noise.

- Monitoring current on V ref, that's where latch up is.
- 2 sensor test: measure the one sensor that's actually connected and monitor the other sensor, the robust one. Both of the sensors would be on the Y-tube. Put battery pack in car to run scope so inverter can provide 110 volts.
- Decided we want to measure what are triggers for current and voltage.
70 Volts -- 80 milliamps, monitor V-ref and signal lines/threshold on milliamps.
- Assignment-need to get temperature data on the 21 car lines affected by the sensor.
- List of test equipment needed:
 - We have instrumentation
 - 4 cars -- 2 here, 2 coming
 - 5 sets of everything
 - 1 additional scope -- J. McCoy
 - Need to identify drivers of test cars

From: Freeland, Mark (M.)
Sent: Wednesday, May 08, 2002 3:49 PM
To: 'Jahshan, John (J.H.); Freeland, Mark (M.); Potter, Timothy (T.J.)'
Subject: RE: Active Current Probe for Buy Back Focus

Tim,
Am I correct in assuming we don't have an amplifier for an active current probe?

Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

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

From: Jahshan, John (J.H.) [<mailto:jjahshan@visteon.com>]
Sent: Wednesday, May 08, 2002 3:26 PM
To: 'Freeland, Mark (M.)'; Potter, Timothy (T.J.)
Subject: RE: Active Current Probe for Buy Back Focus

Hi Mark,

Ken has found a probe but we do not have an amp for it. Do you have an amp?

I currently have the MT 4 door Focus instrumented for Vref at the PCM only.

Hi Tim,

I would like to get the Vref signal at the DPFE sensor instrumented. When can you help me out on this?

John H. Jahshan
POEE Resident Engineer
PCM Applications
jjahshan@visteon.com
Phone & Fax: (313) 722-1638 or (313) 390-4854
Pager: (313) 795-8068
<http://www.myairmail.com/>
"WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE RIGHT"

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

From: Freeland, Mark (M.) [<mailto:mfreel1@ford.com>]

Sent: Wednesday, May 08, 2002 10:34 AM
To: John Jahshan (E-mail)
Cc: Potter, Timothy (T.J.)
Subject: Active Current Probe for Buy Back Focus

John,

I still want to take you up on you're offer of an active current probe for the Buy Back Focus I we are driving at SRL. When do you think we could have it?

Tim,

When John gives us the probe, will the existing DC to AC converter handle an extra box? Would you please install it? Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Alles, Sheran (S.A.)
Sent: Wednesday, May 08, 2002 10:38 AM
To: King, Daniel (D.M.); Plante, Paul (P.G.); McCoy, James (J.D.); Potter, Timothy (T.J.); Maurer, James (J.B.)
Cc: Alles, Sheran (S.A.)
Subject: Re: Flight data recorder

We have previously used a flight data recorder (standalone module based off the PCM architecture with I/O and SCP recording capabilities and remote data access) for capturing spikes that have eluded us. The module is made by Ford but is now supported by Jim Crawford and his company. After discussions with Tim Potter, we could use this on some Ford employee Focus vehicles in a transparent manner than a bulky scope. Dan King used Crawford's services when we worked on a previous issue. One thing we should be certain about is the acquisition rate. Since we would be only using about 3 channels, this should be excellent. Dan, could you get us the specs for this flight recorder, especially the sample rates, etc.

Thanks
Regards
-Sheran

From: Freeland, Mark (M.)
Sent: Wednesday, May 08, 2002 10:34 AM
To: John Jahshan (E-mail)
Cc: Potter, Timothy (T.J.)
Subject: Active Current Probe for Buy Back Focus

John,

I still want to take you up on you're offer of an active current probe for the Buy Back Focus I we are driving at SRL. When do you think we could have it?

Tim,

When John gives us the probe, will the existing DC to AC converter handle an extra box? Would you please install it? Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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Ford Research Laboratory
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Monday, April 29, 2002 11:25 AM
To: Gates, Freeman (F.C.); Maurer, James (J.B.); Plante, Paul (P.G.); Rossi, Roberto (R.A.)
Cc: Mozurkewich, George (G.); Potter, Timothy (T.J.)
Subject: No Start Car at SRL

Freeman et al.

We have a new mystery.

Last October George Mozurkewich's wife had a dPFE failure on her 2.0L Zetec Focus, VIN 1FAPP38301W196354. We replaced the sensor with one of the prototype V Transient hardened sensors, Sn. SRL123.

Yesterday her car would not crank or start for her. After several attempts to start the car, George unplugged the dPFE sensor and the car started.

This morning Tim & I bench tested the sensor removed from the car. It appeared from the results to behave normally, and had normal current draw and impedances. We then deliberately latched the sensor on the bench. The maximum latched current we drew was 238 mA, which by itself is not sufficient to stop the PCM from functioning normally.

Using a Star tester we checked for PCM Codes, and only found a P1401 code. (This would be expected as George drove the car for several drive cycles with the dPFE sensor unplugged).

The above scenario would suggest one possibility is the following:

- 1) the dPFE had something to do with the car not starting, possibly by drawing up to 238 mA.
- 2) something else was drawing a high also from the Vref line such that the combined current was in excess of 690 mA, but less than 928 mA.
- 3) when George unplugged the dPFE sensor the total current draw from the Vref fell to below 690mA and so the car could be started.

Question:

Is it possible to latch the Fuel Rail Pressure Sensor and/or the Fuel Tank Vapor Pressure Sensor such that either or both sensors draw a high current?

Can you suggest any alternate reasons why the car did not start, but then did after the dPFE was unplugged?

In the mean time, until we decide what else to look at, Tim Potter is going to install a new production V Transient Improved part in the car.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517

Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Reichenbach, Ronald (R.W.)
Sent: Monday, April 29, 2002 9:57 AM
To: Potter, Timothy (T.J.)
Subject: FW: IPATS with Wipe Keys

Tim,
Sorry for the delay, I've been out since Wednesday.

The guy in the note below, David Treharne, should be able to help you. I've been told that he is a knowledgeable PATS expert. I hope this helps.
-Ron Reichenbach

Message from Ted Coultate:

There is no easy way to determine if a strategy has Wipe keys save the following:

1. Try it.
2. Look at the software version and read if it is a development version of IPATS. If so, it has wipe keys. If not, the system has only NGS related key clearing.

Regards,
David Treharne
E/E Security Technical Specialist (313)845-4718 -fax 323-2823
Internet: dtreharn@ford.com Room: MD 5030 Bldg 5, Desk 1E069

From: Freeland, Mark (M.)
Sent: Monday, April 29, 2002 9:22 AM
To: Verner, Carol (C.J.)
Cc: Potter, Timothy (T.J.)
Subject: Registration & Insurance papers for the Automatic Buy Back Focus.

Carol,

There is no paperwork (registration and proof of insurance) in the glove box of the two door automatic buy back Focus, VIN 3FAFP313X1R108133 .

Could you please pass this on to you're car coordinator and ask him to obtain copies of these documents for the vehicle. Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Corcoran, Bill (W.C.)
Sent: Thursday, April 25, 2002 1:55 PM
To: Potter, Timothy (T.J.)
Subject: pats

<http://www.merkefnich.ford.com/~avtease/security/pats/index.htm>

Bill Corcoran
Focus Powertrain Development
ph 313-845-4972 fax 313-323-2847

From: Freeland, Mark (M.)
Sent: Wednesday, April 24, 2002 11:04 AM
To: Potter, Timothy (T.J.)
Subject: FW:

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: Jahshan, John (J.H.) [mailto:jjahshan@visteon.com]
Sent: Wednesday, April 24, 2002 7:51 AM
To: 'Freeland, Mark (M.)'
Subject: RE:

Hi Mark,

You hit the date code on the head. Nice interoperation.

John H. Jahshan
POEE Resident Engineer
PCM Applications
jjahshan@visteon.com
Phone & Fax: (313) 722-1638 or (313) 390-4854
Pager: (313) 795-8068
<http://www.myaairmail.com/>
"WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE RIGHT"

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

From: Freeland, Mark (M.) [mailto:mfreelal@ford.com]
Sent: Tuesday, April 23, 2002 6:08 PM
To: 'jjahshan@visteon.com'
Subject:

Sorry for the delay in getting the PCM date code to you, but it is 0H23E which I interoperate as meaning 8/23/2000. Not sure about the E.

<<SRL185 Label.TIF>>
See the picture for the label on the connector.

Please call me if there is anything else you need to know.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Tuesday, April 16, 2002 9:44 AM
To: Potter, Timothy (T.J.)
Cc: Ales, Sheran (S.A.); McCoy, James (J.D.); Gates, Freeman (F.C.); Maurer, James (J.B.); Plante, Paul (P.G.); Mozurkewich, George (G.); Rossi, Roberto (R.A.)
Subject: Buy Back Focus

Tim,

Could you please obtain the two buy back Focuses, Sheran has the Auto and Jim McCoy has the stick shift. Please install our instrumentation package into the Auto, (using a the second current pickup and gray box if you like, so as not to tear out everything from the stick shift, but use our good scope in the Auto).

Then, once you are satisfied that the instrumentation is functioning correctly, install the EEC V (PCM) test number SRL185 that was removed from the Alan Ford customer vehicle with the short circuit sensor in the Auto.

I will give you the test sensor (8/2000 warranty return) and reference sensor (Post 1/7/2002 V Transient Improved) for the vehicle when you collect the PCM from me.

We will drive that PCM for a while to see if there are any unusual transient voltages on the Vref line.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Kushniruk, Jason (J.K.)
Sent: Tuesday, February 12, 2002 1:53 PM
To: Akins, Mary (M.); Markland, Sherman (S.A.)
Cc: Potter, Timothy (T.J.); Gates, Freeman (F.C.); Maurer, James (J.B.); Bansek, Catherine (C.K.); Johnson, Joe (J.H.); Verner, Carol (C.J.); 'Don Ayers (E-mail)'; 'Al Montoya (E-mail)'
Subject: RE: DPFE Fault Data

Mary, Sherman has the part - Sherm, please see attached.

Jason K. Kushniruk, P.Eng.
Manufacturing Engineer
Incoming Quality Supervisor
Ford Essex Engine Plant
1 Quality Way, Windsor, Ontario, Canada, N9A6X3
Bus / Cell (519)944-8537
Fax(519)944-9236

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

From: Akins, Mary (M.)
Sent: Tuesday, February 12, 2002 10:43 AM
To: Kushniruk, Jason (J.K.)
Cc: Potter, Timothy (T.J.); Gates, Freeman (F.C.); Maurer, James (J.B.); Bansek, Catherine (C.K.); Johnson, Joe (J.H.); Verner, Carol (C.J.); 'Don Ayers (E-mail)'; 'Al Montoya (E-mail)'
Subject: FW: DPFE Fault Data
Importance: High

Jason,

There are people here at Ford who would like to do some testing on the sensor before it is sent to California. Could you send the part to my Southfield office and I will deliver it to the appropriate people here at Ford.

ADDRESS:
Kavlico Corporation
26525 American Drive
Southfield, MI 48034
(248) 263-8700
Attn: Mary Akins

Thanks,
Mary Akins

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

From: Freeland, Mark (M.)
Sent: Friday, February 08, 2002 10:01 AM
To: Bansek, Catherine (C.K.); Akins, Mary (M.); Verner, Carol (C.J.)
Cc: Johnson, Joe (J.H.); Maurer, James (J.B.); Potter, Timothy (T.J.); Gates, Freeman (F.C.)
Subject: RE: DPFE Fault Data

Cathy/Freeman,

I assume from the date code that this is one of the new and improved sensors? I think we should take a look at it before sending it to CA.

I will be out of the office all next week, however Tim Potter (SRL, Physics and Environmental Research) could bench test the device and at least get a preliminary data set which may give some indication as to what is going on. Can you get the part to him please. After that I would suggest it be given to Mary to get back to CA for tear down.

Mary,

Can you give this one the special treatment, with a report back (with data) each day on it's status. As this is the first post change failure report this one needs special treatment.

Tim,

When Mary gets this one, could you please give it the standard bench treatment. (Do not apply any transient voltages, and limit the bench supply to less than 50 mA just to make sure we do not change it's state.)

Jim,

Do you agree?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Akins, Mary (M.)
Sent: Tuesday, February 12, 2002 10:48 AM
To: Potter, Timothy (T.J.)
Subject: RE: Failed sensor.

Tim,

Essex Engine Plant received the part today. They are going to do some hot testing and then I requested they send it to me. I should receive it within the next 4-5 days.

I will let you know when I receive it.

Regards,

Mary Akins

Kavlico Corp.

Ford Phone: 313.248.1989

Ford Fax: 313.845.3169

makins@ford.com

makins@kavlico.com

messages/pager 248.848.9670

---Original Message---

From: Potter, Timothy (T.J.)
Sent: Tuesday, February 12, 2002 8:36 AM
To: Akins, Mary (M.)
Subject: Failed sensor.

Mary,

Am I correct in assuming you will let me know when you get the failed sensor in? As soon as I get the sensor, I will make our standard measurements and give it back to you to forward to California.

Tim Potter.

From: Akins, Mary (M.)
Sent: Tuesday, February 12, 2002 10:43 AM
To: Kushniruk, Jason (J.K.)
Cc: Potter, Timothy (T.J.); Gates, Freeman (F.C.); Maurer, James (J.B.); Bansek, Catherine (C.K.); Johnson, Joe (J.H.); Verner, Carol (C.J.); 'Don Ayers (E-mail)'; 'Al Montoya (E-mail)'
Subject: FW: DPFE Fault Data
Importance: High

Jason,

There are people here at Ford who would like to do some testing on the sensor before it is sent to California. Could you send the part to my Southfield office and I will deliver it to the appropriate people here at Ford.

ADDRESS:
Kavlico Corporation
28525 American Drive
Southfield, MI 48034
(248) 263-8700
Attn: Mary Akins

Thanks,
Mary Akins

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

From: Freeland, Mark (M.)
Sent: Friday, February 08, 2002 10:01 AM
To: Bansek, Catherine (C.K.); Akins, Mary (M.); Verner, Carol (C.J.)
Cc: Johnson, Joe (J.H.); Maurer, James (J.B.); Potter, Timothy (T.J.); Gates, Freeman (F.C.)
Subject: RE: DPFE Fault Data

Cathy/Freeman,

I assume from the date code that this is one of the new and improved sensors? I think we should take a look at it before sending it to CA.

I will be out of the office all next week, however Tim Potter (SRU, Physics and Environmental Research) could bench test the device and at least get a preliminary data set which may give some indication as to what is going on. Can you get the part to him please. After that I would suggest it be given to Mary to get back to CA for tear down.

Mary,

Can you give this one the special treatment, with a report back (with data) each day on it's status. As this is the first post change failure report this one needs special treatment.

Tim,

When Mary gets this one, could you please give it the standard bench treatment. (Do not apply any transient voltages, and limit the bench supply to less than 50 mA just to make sure we do not change it's state.)

Jim,

Do you agree?

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Physics Department
Ford Research Laboratory
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MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, February 08, 2002 10:01 AM
To: Bensek, Catherine (C.K.); Akins, Mary (M.); Verner, Carol (C.J.)
Cc: Johnson, Joe (J.H.); Maurer, James (J.B.); Polter, Timothy (T.J.); Gatsis, Freeman (F.C.)
Subject: RE: DPFE Fault Data

Cathy/Freeman,

I assume from the date code that this is one of the new and improved sensors? I think we should take a look at it before sending it to CA.

I will be out of the office all next week, however Tim Potter (SRL, Physics and Environmental Research) could bench test the device and at least get a preliminary data set which may give some indication as to what is going on. Can you get the part to him please. After that I would suggest it be given to Mary to get back to CA for tear down.

Mary,

Can you give this one the special treatment, with a report back (with data) each day on it's status. As this is the first post change failure report this one needs special treatment.

Tim,

When Mary gets this one, could you please give it the standard bench treatment. (Do not apply any transient voltages, and limit the bench supply to less than 50 mA just to make sure we do not change it's state.)

Jim,

Do you agree?

Thanks

Regards

Mark Freeland

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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Panaretos, Christine (C.M.)
Sent: Wednesday, February 06, 2002 12:17 PM
To: Freeland, Mark (M.); Plante, Paul (P.G.); Maurer, James (J.B.)
Cc: Verner, Carol (C.J.); Popoff, Daniel (D.M.); Donald Ayers (E-mail); Brady Davies (E-mail); Gates, Freeman (F.C.); Hargas, Jon (.); Smythe, Joseph (J.M.); Thomas, Ken (K.C.); Kyong Park (E-mail); Awad, Mahmoud (M.I.); Giordano, Mike (M.A.); Williamson, Richard (E.); Alles, Sheran (S.A.); Potter, Timothy (T.J.)
Subject: RE: Failed DPFE

Done. The evidence book is on my desk.

Chris Panaretos

Project Manager, Project Solutions, LLC.
Ford POEE, Components "B"
(313) 24-89337
Fax: (313) 32-29265

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

From: Freeland, Mark (M.)
Sent: Wednesday, February 06, 2002 12:13 PM
To: Panaretos, Christine (C.M.); Plante, Paul (P.G.); Maurer, James (J.B.)
Cc: Verner, Carol (C.J.); Popoff, Daniel (D.M.); Donald Ayers (E-mail); Brady Davies (E-mail); Gates, Freeman (F.C.); Hargas, Jon (.); Smythe, Joseph (J.M.); Thomas, Ken (K.C.); Kyong Park (E-mail); Awad, Mahmoud (M.I.); Giordano, Mike (M.A.); Williamson, Richard (E.); Alles, Sheran (S.A.); Potter, Timothy (T.J.)
Subject: FW: Failed DPFE

Christina/Paul

Please add this stall event record to the evidence book.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Physics Department
Ford Research Laboratory
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MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreefal@ford.com
Tel.: (313) 594-7645

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

From: Thomas, Ken (K.C.)
Sent: Wednesday, February 06, 2002 11:38 AM
To: Freeland, Mark (M.)
Subject: Failed DPFE

On or about October 24th I was given a returned failed DPFE from the field. I installed this part on one of my 2002 1PP vehicles (578WB45). After installing it on the vehicle I proceeded to evaluate it for drivability and any service codes. On the first trip out I could tell that in its state of failure the EEC was commanding full EGR flow though the system, due to heavy surge at road load speeds. On my drive home at the end of the day the "check engine" light came on (P0401) Insufficient EGR flow.

The next morning after I drove about 7 miles at about 40-50 mph I came to a stop. I immediately did a quick accel (traffic) and the vehicle quit so I coasted off to the side of the road. After putting the selector in neutral I tried to do a restart but got nothing. The odo was all dashes and a no crank condition was observed. I got out of the vehicle and opened the hood and disconnected the DPFE, the vehicle would then crank and start. The vehicle was driven into work with the sensor disconnected.

Since that day the vehicle has been returned to the original production part and no reoccurrences have been noted.

That part was supplied to the OBD group along with a vehicle only to have no repeats, from there it went to Kavlico.

From: Alka, Sheran (S.A.)
Sent: Wednesday, January 16, 2002 9:08 AM
To: Potter, Timothy (T.J.)
Subject: RE: What has been happening?

Hi Tim,

No, I have no scope reboot problems. Are you running your scope off the internal battery or external inverter? As you know on crank, the battery voltage drops to about 7V which may be upsetting the inverter. Maybe your battery is at a low state of charge. I will call you to discuss.

As to the noise, they still seem rather small and the internal sensor caps should take care of it. However, we have been questioning the process issues at Kavlico which seems questionable.

Regards
-Sheran

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

From: Potter, Timothy (T.J.)
Sent: Wednesday, January 16, 2002 8:09 AM
To: Alka, Sheran (S.A.)
Subject: What has been happening?

Sheran,

What has been happening with the dying sensor problem? Have you captured any interesting events on the Kentucky car?

I try to have the Yokogawa scope booted up and ready to capture a trace when I turn the key on before each start up. While cranking the engine to start, I have had the oscilloscope go off and reboot several times in the New York Focus. Have you seen that in the Kentucky car? Do you understand why that might happen? Is it something we should worry about? It seems like it is happening more frequently lately.

Tim

From: Freeland, Mark (M.)
Sent: Friday, December 07, 2001 11:37 AM
To: Plante, Paul (P.G.); Owens, Karen (K.E.); Verner, Carol (C.J.); Popoff, Daniel (D.M.); Giordano, Mike (M.A.); Akins, Mary (M.); Hermann, Thomas (T.J.); Allee, Sheran (S.A.); Potter, Timothy (T.J.); Thomas, Ken (K.C.)
Cc: Gates, Freeman (F.C.); Kunde, Olaf (O.); Whitworth, Rudy (A.R.)
Subject: Pleased off customer

Team,

I just had a call from Freeman regarding a 2.0L Zetec Focus that he had been notified of at Lasco Ford, Fenton, MI.

The customer is pleased off and wants Ford to buy the car back.

The VIN number is 3FAFP31371R136214, please look it's history up in the AWS at <http://www.quality.ford.com/aws/aws/jlu1/reports.html>

(Change the MY to 2001 and type in the VIN number then click on submit.)

9/5/01 No Crank No Start

9/13/01 Headlights won't come on

9/20/01 Left turn signal does not work

10/3/01 Towed in, will not start (but started when it got to the dealership)

11/29/01 Check engine light on, (dPFE failed)

11/30/01 Customer said "Service had ignition switch"

12/7/01 The car is back at the dealership again (no data in AWS yet)

This vehicle might be the golden egg. We should get our hands on it and do a deep dive. Please coordinate your involvement through Freeman, he is trying to obtain the vehicle.

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
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MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Tuesday, December 04, 2001 1:08 PM
To: Monthl, Matthew (M.J.); Potter, Timothy (T.J.)
Subject: RE: 1W12055

Matt,

The mileage on the NY Focus was 18,222 when we got it and was 19,628 yesterday.

Hope that is all you needed to know.

Regards

Mark Freeland

> 6-Sigma Black Belt Candidate
> Physics Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 3028 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

From: Alles, Sheran (S.A.)
Sent: Monday, November 19, 2001 10:02 PM
To: Potter, Timothy (T.J.)
Subject: RE: DPFE testing

Hi Tim,

Have you experienced any stalls ? I have a few more ideas which I would like to try.

- 1)The PCM monitors VREF, I am curious at what VREF voltage and duration will the PCM register a fault (stall).
- 2)I want to try the intermittent gnd with a larger external cap. This would provide larger voltage spikes.

If possible could you bring the vehicle say 9:30am.

Regards
-Sheran

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

From: Potter, Timothy (T.J.)
To: Alles, Sheran (S.A.)
Sent: 11/15/01 7:20 AM
Subject: RE: DPFE testing

Sheran,

I have asked Mark to bring me the keys to the vehicle as soon as he comes in with it. I will call you when I have the keys. If I don't get an answer, I will await your call before bringing it over to you. I will probably be working in the Lab at phone number: 31296.

Tim

> -----Original Message-----

>From: Alles, Sheran (S.A.)
>Sent: Wednesday, November 14, 2001 12:11 PM
>To: Potter, Timothy (T.J.)
>Cc: Hermann, Thomas (T.J.)
>Subject: DPFE testing

>

>Hi Tim,

>

>Could you please drop the vehicle tomorrow morning. I plan to do some
>testing emulating loose connections at the DPFE connector. It is in a
>relative hot location, so could have thermal and vibration cycling. For
>example, intermittent GND, VREF, as this could make the spikes more
>aggressive, or the voltage difference to cause a latch-up may be
>smaller.

>

>Regards
>-Sheran

From: Alles, Sheran (S.A.)
Sent: Thursday, November 15, 2001 9:43 AM
To: Potter, Timothy (T.J.)
Subject: RE: DPFE testing

Hi Tim,

When you have the vehicle please page me 888-333-1039 or you could use the text-page feature from the Ford web "sales"

Regards
-Sheran

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

From: Potter, Timothy (T.J.)
Sent: Thursday, November 15, 2001 7:20 AM
To: Alles, Sheran (S.A.)
Subject: RE: DPFE testing

Sheran,

I have asked Mark to bring me the keys to the vehicle as soon as he comes in with it. I will call you when I have the keys. If I don't get an answer, I will await your call before bringing it over to you. I will probably be working in the Lab at phone number: 31296.

Tim

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

From: Alles, Sheran (S.A.)
Sent: Wednesday, November 14, 2001 12:11 PM
To: Potter, Timothy (T.J.)
Cc: Hermann, Thomas (T.J.)
Subject: DPFE testing

Hi Tim,

Could you please drop the vehicle tomorrow morning. I plan to do some testing emulating loose connections at the DPFE connector. It is in a relative hot location, so could have thermal and vibration cycling. For example, intermittent GND, VREF, as this could make the spikes more aggressive, or the voltage difference to cause a latch-up may be smaller.

Regards
-Sheran

From: Freeland, Mark (M.)
Sent: Wednesday, November 14, 2001 10:18 AM
To: Popoff, Daniel (D.M.); Potter, Timothy (T.J.); Thomas, Ken (K.C.); Owens, Karen (K.E.);
Giordano, Mike (M.A.); Akins, Mary (M.)
Cc: Hermann, Thomas (T.J.); Gates, Freeman (F.C.); Johnson, Joe (J.H.); Kunde, Olaf (O.)
Subject: Buy Back 2.0L Zetec Focus stall event

The following event occurred this morning:

VIN: 1FAPP34371W120555
Date: 11/14/2001
Time: 8:05 am
Driver: Mark Freeland

Mileage: 18,864

During the cold start the data acquisition system triggered (on step change in current) and recorded a transient voltage spike, step change in current and output voltage of the dPFE sensor. The magnitude of the signals will be known later this morning when the data file is retrieved from the system. Then engine was still running at this time.

After saving the data file to hard drive I was pulling out of the drive way when the engine stopped. There was no additional trigger of the data acquisition system. After key off and key on the engine restarted without problem.

More information will follow when we have the data plotted.

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mrfreela1@ford.com
Tel.: (313) 594-7645

From: Alles, Sheran (S.A.)
Sent: Tuesday, November 13, 2001 2:41 PM
To: Potter, Timothy (T.J.)
Subject: RE: DPFE Noise Measurements

Hi Tim,

Did more tests with different harness orientations but the spikes are in the order of 10ns., there are some negative spikes which I can now explain from the harness capacitive coupling. I would like to discuss the exact failure modes that you were able to induce in the lab and the order of the spikes that you injected. You could come over and pick up the vehicle, and maybe drop it over tomorrow morning.

Regards
-Sheran

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

From: Potter, Timothy (T.J.)
Sent: Tuesday, November 13, 2001 7:34 AM
To: Alles, Sheran (S.A.)
Subject: RE: DPFE Noise Measurements

Thanks Sheran,

I appreciate being kept informed.

Tim.

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

From: Alles, Sheran (S.A.)
Sent: Monday, November 12, 2001 4:59 PM
To: Potter, Timothy (T.J.)
Subject: RE: DPFE Noise Measurements

Hi Tim,

Had some negative spikes but of a very short duration-today was more of a learning phase. Tomorrow we plan to re-route the DPFE wires around the ignition wires to see if we could get a failure/aggravate the spikes. Will keep in touch,

Regards
-Sheran

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

From: Alles, Sheran (S.A.)
Sent: Monday, November 12, 2001 9:16 AM
To: Potter, Timothy (T.J.)
Cc: Hermann, Thomas (T.J.); Freeland, Mark (M.)
Subject: DPFE Noise Measurements

Hi Tim,

If you could drop the vehicle this afternoon, say 1:15pm at Bldg 5 garage, we could do some of the noise measurements we discussed last week.

Regards

-Sheran

Textpage: salles

pager: 888-332-1039

From: Alles, Sheran (S.A.)
Sent: Monday, November 12, 2001 4:59 PM
To: Potter, Timothy (T.J.)
Subject: RE: DPFE Noise Measurements

Hi Tim,

Had some negative spikes but of a very short duration-today was more of a learning phase. Tomorrow we plan to re-route the DPFE wires around the ignition wires to see if we could get a failure/aggravate the spikes. Will keep in touch.

Regards
-Sheran

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

From: Alles, Sheran (S.A.)
Sent: Monday, November 12, 2001 9:16 AM
To: Potter, Timothy (T.J.)
Cc: Hermann, Thomas (T.J.); Preeland, Mark (M.)
Subject: DPFE Noise Measurements

Hi Tim,

If you could drop the vehicle this afternoon, say 1:15pm at Bldg 5 garage, we could do some of the noise measurements we discussed last week.

Regards
-Sheran
Textpage: salles
pager: 888-332-1039

From: Alas, Sheran (S.A.)
Sent: Monday, November 12, 2001 9:16 AM
To: Potter, Timothy (T.J.)
Cc: Hermann, Thomas (T.J.); Frøland, Mark (M.)
Subject: DPFE Noise Measurements

Hi Tim,

If you could drop the vehicle this afternoon, say 1:15pm at Bldg 5 garage, we could do some of the noise measurements we discussed last week.

Regards

-Sheran

Textpage: salles

pager: 888-332-1039

From: Freeland, Mark (M.)
Sent: Friday, November 02, 2001 1:15 PM
To: Potter, Timothy (T.J.)
Subject: VIN look up

<http://www.quality.ford.com/aws/>
Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel: (313) 594-7645

From: Throop, MJ (M.J.)
Sent: Wednesday, October 31, 2001 8:55 AM
To: Potter, Timothy (T.J.)
Subject: Vehicle Instrumentation Contact

Tim,

Steve Budry (sbudry) is the X-Car garage vehicle Instrumentation contact I mentioned yesterday.
Regards, MJ

From: Freeland, Mark (M.)
Sent: Wednesday, October 24, 2001 2:58 PM
To: Davis, Craig (L.C.); Helms, Jeffrey (J.H.)
Cc: Potter, Timothy (T.J.); Mozurkewich, George (G.)
Subject: FW: Focus Owners Only (OOT)

Craig/Jeff

Here is a copy of the internal memo which went out this morning, to try and locate one of the problem vehicles for the dPFE sensor problem. It is being sent out in small groups of department numbers, if needed it will eventually go to all SE MI.

There have been 8 responses (one promising) within the first two hours.

Regards

Mark Freeland

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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Wilkins, Robert (R.M.)
Sent: Wednesday, October 24, 2001 12:01 PM
To: Freeland, Mark (M.)
Subject: Focus Owners Only (OOT)

The Focus Quality and Reliability Team is in the process of collecting information from Focus owners about a No Crank/No Start concern. If you own or lease a Model Year 2001 or 2002 Focus with 2.0L Zetec engine and have experienced a No Crank/No Start concern exhibiting the following conditions:

* Engine stalls then will not crank or start

and at the same time

* Odometer/trip meter displays all dashes

please contact Mark Freeland cds MFREELA1 (313) 594-7645. Thank you for your time and assistance in our data collection effort.

*****Please do not respond to Rwilkin3

From: Freeland, Mark (M.)
Sent: Monday, August 20, 2001 3:10 PM
To: Potter, Timothy (T.J.); Mozurkewich, George (G.)
Cc: Akins, Mary (M.)
Subject: Contact Info

Mark Freeland Cell Phone (248)842-1080 Email while away is as normal mfreela1@ford.com
Mary Akins (Kavlico Resident) (313) 248-1989 makins@ford.com
Kavlico In CA (805) 523-2000 Have me paged if you want me (the time is 3 hours earlier
there than here)

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physios Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Monday, August 20, 2001 11:15 AM
To: Mozurkewich, George (G.); Potter, Timothy (T.J.); Rossi, Roberto (R.A.)
Subject: Contact Info

Roberto Rossi rross1@ford.com (313) 845-1436
Rudy Whitworth rwhitwor@ford.com (734) 487-2024 WAP Supervisor Powertrain PVT
Thomas Rozema trozema@ford.com (734) 641-5831 WAP Engineer Powertrain PVT
Bill Hardy whardy@visteon.com (313) 755-2852 EEC Power Supply
Tom Gwozdek tgwozdek@ford.com (313) 248-7872 G1 Ground Issue 6 Sigma Black Belt

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
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MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, August 17, 2001 1:58 PM
To: Potter, Timothy (T.J.); Mozurkewich, George (G.)
Subject: FW: 2001MY 2.0L Zetec Focus Vref noise

Tim & George,

This is Bill Hardy's (Visteon) reply to looking at our data. He has also suggested if we need a Ford person with experience in the type of thing we are looking for, we could contact Roberto Rossi (rrossil, Tel: 845-1436). I will try and get a hold of him today, but I give you his number in case I cant get a hold of him.

Regards

Mark Freeland

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

From: Hardy, Bill (W.R.) [mailto:whardy@visteon.com]
Sent: Friday, August 17, 2001 10:50 AM
To: 'Freeland, Mark (M.)'
Subject: RE: 2001MY 2.0L Zetec Focus Vref noise

Mark,

I took a look at the traces you have sent, and have a few comments.

First, I can't say I have ever observed any noise of that type on the 5V line of a PCM. Most noise observed on the PCM would typically be in the 1usec to 10usec and higher range, and would be on the order of several hundred millivolts.

Second, I don't think the noise you are seeing on these lines is actually there. For example, the amplitude and pulse width of the noise is such that the current that would be induced by the dv/dt would be great enough to destroy the PCM. Typically when you see noise of that frequency, what you are picking up is noise being radiated into the test instrumentation ground lead. I'm not sure what equipment was used, and where the signal and ground references were connected at, but you may want to consider making a differential measurement if possible. The fact that you observe noise when the horn is blown supports a radiated mechanism as well. Loads such as horns that are controlled by relays are big EMI radiators as there is ionization around the relay contacts as they open/close. You would need to look at the vehicle wiring diagrams to be sure, but the horn circuit should be pretty well isolated from the PCM circuits, on both the ground and supply sides. Of course, if the horn did share some common impedance on either the supply or ground side, you could get some conducted noise into the PCM, but due to the wiring inductance and capacitance in the PCM, it would be of a much lower frequency and amplitude.

I don't have a whole bunch of experience of making noise measurements at the vehicle level. I do know that when we are measuring noise at the PCM level, if we are unable to make a differential measurement, we must be very careful where we ground the instrument, keeping the ground lead as short as possible, and making sure we do not form a physical loop between the ground lead and the signal probe.

As far as the power supplies go between the Focus and Explorer, the numbers you got for external resistance to ground that causes the PCM to shut down are consistent with those designs. The difference you have observed is primarily due to the fact the PCMs for these two vehicles have entirely different power supply designs, and different internal 5V loading.

I hope this helps.

Regards,

Bill Hardy
PCM Core Electrical Design
Electronics Product Line Department
Visteon Energy Management Systems
E130 VEMA (313) 75-52952
mailto:whardy@visteon.com

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

From: Freeland, Mark (M.) [mailto:mfreela1@ford.com]
Sent: Thursday, August 16, 2001 10:30 AM
To: 'whardy@visteon.com'
Cc: Potter, Timothy (T.J.); Mozurkewich, George (G.); Kyong Park (E-mail); Naushad Hossain (E-mail)
Subject: 2001MY 2.0L Zetec Focus Vref noise

Bill,

The attached document contains the traces of the high frequency noise signals on the DPF8 power and signal lines which we discussed on Tuesday. I thought you would like to take a look at the traces, incase it would give you any additional clues. Please let me know what you think. <<Noise signals recorded on Tim Potter.doc>>

Regards

Mark Freeland

> 6-Sigma Black Belt Candidate
> Physics Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 3028 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Mozurkewich, George (G.)
Sent: Thursday, August 16, 2001 2:36 PM
To: Potter, Timothy (T.J.)
Subject: info from Mark

Tim,
Info from Mark:

One sensor on your desk, marked "Mark Freeland for Tim Potter," is the good one for your personal Focus.

Several sensors on your chair (three before "clean" date and three after) are to be added to the "bucket of parts."

This statement is correct: By pulsing the sensor output line, Kyoung Park was able to latch up only one die, the one connected to the output line via the feedback resistor. Mark's hypothesis, therefore, is that a voltage spike on the +5V line is required to kill both dies.

-George

From: Davis, Craig (L.C.)
Sent: Friday, July 20, 2001 2:58 PM
To: Mozurkewich, George (G.); Potter, Timothy (T.J.); Lowe-Ma, Charlotte (C.K.); Ginder, John (J.M.); Wolvanton, Christopher (C.); Gebremariam, Samuel (S.)
Cc: Johnson, Mary (M.K.)
Subject: Green belt project

I will set up a meeting next week with Catherine Bansek to see if we can get started on this project with EGR DPFE sensor, which Mark Freeland tells me is a big problem. Several of you will be in training so I'll try to work around that.

Craig

For the 2.0L Zetec Focus, 2001 MY we need to understand the following:

- 1) Are there any switching spikes/Load dumps on either the Vref (5 volt's from the EEC to the sensor), or on the Signal wire from the sensor to the EEC relative to the Sensor's ground wire. (Pay particular attention to anything that the PATS system and A/C system might be doing). Oscilloscope traces of anything found would be good.
- 2) What is the variability in the V I curve for the Vref from the EEC IV. (use a decade box across the Vref & Ground instead of the DPFE sensor and a series shunt in the Vref line and measure current and voltage for different resistances, between say 5 ohms and 15 ohms, using small steps of say 0.1 ohms around the knee of the curve.)

This study could be done on a number of new vehicles at WAP, contact there who will arrange access to vehicles is Thomas Rosema. And possibly any cars which turn up with a shorted sensor (talk to Catherine Bansek on this one).

The powertrain person who should be a part of this exercise is Catherine Bansek.

L. Craig Davis
Manager, Physics Dept.
Ford Research Lab
MD 3028 SRL
Ford Motor Co.
Dearborn, MI 48121-2053
Phone: 313-322-7008
Fax: 313-322-7044
Email: LDAVIS7@ford.com

L

From: Freeland, Mark (M.)
Sent: Friday, November 01, 2002 9:07 AM
To: Uy, Dairene (D.)
Subject: FW: Data from today's testing of the failed parts

Dairene,

You are right, they did not apparently want us to talk! Here is my data on the parts in question.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

---Original Message---

From: Freeland, Mark (M.)
Sent: Tuesday, October 29, 2002 5:36 PM
To: Verner, Carol (C.);
Maurer, James (J.B.); Gates, Freeman (F.C.)
Subject: Data from today's testing of the failed parts

Carol,

Attached is the test data from today's testing. The photographs you already have on CD, they can not be emailed as they are so large.

In summary:

The 2-10 (edp) part and the M6 (MPG) part from the Focus both have large vapor bubbles over the HI die, which suggests that the die may have been in a high current state for long enough to cause the gel to decompose at the interface to the die. There is no visible sign of UPAD on either part. However, there is brown discoloration of the Vro, Hpos and Hneg bond pads on the reference die of the MPG part.

The three Roush parts all have leaking seals in the HI port. The one which we dismantled seems to have a swollen, softened seal ring in the HI port. This could either be from chemical damage or thermal damage to the polymer in the seal. Further analysis of the seal is recommended. There was insufficient leakage for hot exhaust gas to "melt" the housing, or the exhaust gas which did leak was already cooled sufficiently so that it would not be capable of melting the housing. There was sufficient leak to deposit carbon over the entire inside of the sensor housing.



Failure reports from
SRL test...

Regards

Mark Freeland

6-Sigma Black Belt

Engine Research Department
Ford Research Laboratory
P.O. Box 2053
Ward 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Uy, Dairene (D.)
Sent: Friday, August 23, 2002 9:41 AM
To: Frøland, Mark (M.); Gates, Freeman (F.C.); 'Park, Kyong'
Subject: a little update on SRL332

I just wanted to share a small observation on the ref die of SRL 332, which is the die I heated up to 320C in Argon/H2O.

The wire bonds easily fell off when Mark tried to remove the potting gel. Also, some of the bond pads showed strong silicon peaks at the center of the pad, indicating that the gold and aluminum have been removed. This was also the case with the Kavlico sample treated with sulfuric acid: wire bonds fell off upon ultrasonic cleaning and silicon is seen in the center of the bond pad.

Dairene

Dairene Uy
Physical and Environmental Sciences Department
Ford Research Laboratory
Mail Drop 3083/SRL, PO Box 2053
Dearborn, MI 48121

Phone: 313-594-1649
Fax: 313-322-7044
Email: duy@ford.com

From: Freeland, Mark (M.)
Sent: Thursday, August 08, 2002 11:32 AM
To: Kyong Park (E-mail); Hangaas, Jon (.); Gates, Freeman (F.C.); Maurer, James (J.B.)
Cc: Simko, Steven (S.J.); Uy, Dairene (D.); Carter, Roscoe (R.O.); Akins, Mary (M.)
Subject: SRL308 Lab test results

Steve Simko's work on the Auger has shown that the anomaly which I created on sensor sample SRL308 by driving for 1,674 miles in the SCR Latched state is quite different from the UPAD and PAD.

Steve's work on SRL308 has shown the following:

- 1) There is a thin layer of oxidized Aluminum on the surface above the gold (where the gold appears discolored).
- 2) The gold layer has inter-granular separations (looks like the loose head of a cauliflower) in the raised regions.
- 3) The "Al" layer under the raised regions are up to twice as thick as the base "Al" layer should be.
- 4) There is a lot of Au diffused through out the Al under the raised regions.
- 5) There is some voiding in the "Al" layer mostly near the BPSG interface, but this is relatively little compared with the increase in the thickness in the mounds.
- 6) No Oxygen was detected in the "Al" layer below the TiW.

From this result we have concluded that the UPAD and PAD symptom is most likely not caused by continuous high currents running through the die. Work will continue at SRL to try and identify the actual mechanism by which UPAD and PAD are created.

If you wish to see Steve's data we can set up a meeting to review it in detail.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Thursday, August 08, 2002 10:49 AM
To: Akins, Mary (M.)
Cc: Uy, Dairene (D.); Kyong Park (E-mail); Gates, Freeman (F.C.)
Subject: Sample dPFE with Zarlink die

Mary,

Could you please supply me with a new (never seen a vehicle exhaust system) sensor with Zarlink (Dalsa) die. Dairene is going to use the die for an experiment to attempt to create corrosion in the lab.

Thank you

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Park, Kyong [KPark@kavlico.com]
Sent: Friday, August 02, 2002 4:56 PM
To: Uy, Dairene (D.)
Subject: RE: QMI 536 MSDS

Dairene,

I am NOT worrying, but the statement of the MSDS about the word 'use' means 'to apply on a product'. i.e., "when people apply this die attachment material, they should apply under '35 degree Celsius" (before curing). It also said the polymer (as properly cured) will be stable up to 150 degree Celsius. So, it would be all right that the polymer can be exposed to up to 150 degree Celsius. (It would not be decomposed under low temperature.)

I just wanted to bring this to your attention.
KYONG

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

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Friday, August 02, 2002 12:48 PM
To: Park, Kyong
Cc: Freeland, Mark (M.); Hargas, Jon (.)
Subject: RE: QMI 536 MSDS

Don't worry, Kyung. I haven't said anything, and Mark and Jon have not either. I will probably call you sometime next week because I would like to know more about it.

Dairene

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Friday, August 02, 2002 1:47 PM
To: Uy, Dairene (D.)
Subject: RE: QMI 536 MSDS

Dairene,

You were interested in the statement of 'use at < 35 degree Celsius', I hope you don't misunderstand before you make a public statement.

If you have a question on it, I think I can help you.

Kyong
Tel: 805 623-2000 x2243.

From: Park, Kyong [KPark@kavlico.com]
Sent: Friday, August 02, 2002 1:47 PM
To: Uy, Dairene (D.)
Subject: RE: QMI 536 MSDS

Dairene,

You were interested in the statement of 'use at < 35 degree Celsius'. I hope you don't misunderstand before you make a public statement.

If you have a question on it, I think I can help you.

Kyong
Tel: 805 523-2000 x2243.

From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, August 01, 2002 12:35 PM
To: Uy, Dalrene (D.)
Subject: RE: QMI 536 MSDS

In the previous e-mail of mine to you, I had some typo and incomplete sentence, so corrected below. Please, forgive me for mistake.

Dalrene,
Mark had experimented heating to burning the die attachment material. And an outside lab, SEAL in Los Angeles area did similar testing for us. I think the lab test will prove quickly that the decomposition of the material occurs at what temperature and produces what kind of materials.

The nitrate you have observed is, by definition, the element of nitric acid, or the ester of Nitric acid. You need or allow the transition phase from NOx to HNO3, and I am not sure whether you be able to see nitrate right away by just heating the fresh sensor. However, we consider circumstances involved and if we recognize the important fact that decomposition of the material creates unwanted by-products which can eventually attack the other materials, would matter. So, how you set up the experiment and what you look for or how you interpret the result is important.

Yes, you also asked about the gel. The gel dis-Integrates at lower temperature than that for the die attachment. At around 280 to 290 degree C. It produces F radicals as I was reported, but not HF nor NOx.
Good luck to you and I would appreciate you if you let me know with what you find.
Thanks.
Kyong

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

From: Uy, Dalrene (D.) [mailto:duy@ford.com]
Sent: Thursday, August 01, 2002 8:35 AM
To: Park, Kyong
Subject: RE: QMI 536 MSDS

Kyong,

Well, I will be doing the heating experiments on the fresh sensors tomorrow or next week, and I hope to prove that the decomposition comes from heating and thus decomposition of the die attach, and not from the exhaust gas. We'll see. By the way, you mentioned in your email that the gel on top of the die (Sifel) has similar issues. Do you mean by this that it produces both HF and NOx upon decomposition?

Dalrene

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Tuesday, July 30, 2002 2:19 PM
To: Uy, Dalrene (D.)
Subject: RE: QMI 536 MSDS

Yes, these points I tried to make a few people at Ford aware, but either my communication skill is terrible or my message is ignored intentionally. The gel that goes on the top of the die has similar issues.
Thank you for your comment.
Kyong

ER02-027-G 65437

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

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Monday, July 29, 2002 8:10 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.); Freeland, Mark (M.)
Cc: Park, Kyong
Subject: RE: QMI 536 MSDS

Thanks for the MSDS of the die attach. It is very interesting to note that:

- a) there is "irritant evolution" at temperatures greater than 300C,
- b) recommended use conditions are at < 35C,
- c) among the combustion and decomposition products are HF and NOx.

Dairene

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

From: Hargas, Jon (.)
Sent: Monday, July 29, 2002 10:48 AM
To: Uy, Dairene (D.); Carter, Roscoe (R.O.)
Cc: 'Kyong Park (E-mail)' (E-mail)
Subject: FW: QMI 536 MSDS

Hi Dairene, Roc,
Kyong Park from Kavlico wanted to distribute the latest MSDS for the die attach adhesive.
Jon

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Saturday, July 27, 2002 1:35 PM
To: jhargas@ford.com
Subject: FW: QMI 536 MSDS

Dear Jon,
I received the e-file of Loctite QMI 536 MSDS that we use as die attachment. Ma. Uy may want to have a copy this file. Would you please, forward a copy of it? I do NOT have her address.
Thanks.
Kyong

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

From: Melanie.donovan@loctite.com [mailto:Melanie.donovan@loctite.com]
Sent: Friday, July 26, 2002 4:38 PM
To: Park, Kyong
Subject: QMI 536 MSDS

Mr. Park,

Attached find the latest revision of our MSDS for QMI 536.

Best Regards,

Melanie Donovan
Quality Assurance Administrator
Henkel Loctite
Phone: 858-695-1718 x 853
Fax: 858-695-0951

From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, August 01, 2002 12:04 PM
To: Uy, Dairene (D.)
Subject: RE: QMI 536 MSDS

Dairene,

Mark had experimented heating to burning the die attachment material. And an outside lab, SEAL in Los Angeles area did similar testing for us. I think the lab test will prove quickly that the decomposition of the material occurs at what temperature and produces what kind of materials.

The nitrate you have observed is, by definition, the element of nitric acid. You need or allow the transition phase from NOx to H2NO3, and I am not sure whether you be able to see nitrate right away by just heating the fresh sensor. However, we consider circumstances involved and if we recognize the important fact that decomposition of the material creates unwanted by-products which can eventually attack the other materials. So, how you set up the experiment and what you look for or how you interpret the result is important.

Yes, you also asked about the gel. The gel dis-integrates at lower temperature than that for the die attachment. At around 280 to 290 degree C. It produces F radicals as I was reported, but not HF nor NOx.

Good luck to you and I would appreciate you if you let me know with what you find.

Thanks.

Kyong

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

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Thursday, August 01, 2002 8:35 AM
To: Park, Kyong
Subject: RE: QMI 536 MSDS

Kyong,

Well, I will be doing the heating experiments on the fresh sensors tomorrow or next week, and I hope to prove that the decomposition comes from heating and thus decomposition of the die attach, and not from the exhaust gas. We'll see. By the way, you mentioned in your email that the gel on top of the die (Sifel) has similar issues. Do you mean by this that it produces both HF and NOx upon decomposition?

Dairene

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Tuesday, July 30, 2002 2:19 PM
To: Uy, Dairene (D.)
Subject: RE: QMI 536 MSDS

Yes, these points I tried to make a few people at Ford aware, but either my communication skill is terrible or my message is ignored intentionally. The gel that goes on the top of the die has similar issues.

Thank you for your comment.

Kyong

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

ER02-027-G 05440

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Monday, July 29, 2002 8:10 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.); Freeland, Mark (M.)
Cc: Park, Kyong
Subject: RE: QMI 536 MSDS

Thanks for the MSDS of the die attach. It is very interesting to note that:

- a) there is "irritant evolution" at temperatures greater than 300C,
- b) recommended use conditions are at < 35C,
- c) among the combustion and decomposition products are HF and NOx.

Dairene

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

From: Hargas, Jon (.)
Sent: Monday, July 29, 2002 10:48 AM
To: Uy, Dairene (D.); Carter, Roscoe (R.O.)
Cc: 'Kyong Park (E-mail)' (E-mail)
Subject: FW: QMI 536 MSDS

Hi Dairene, Roc,
Kyong Park from Kavlico wanted to distribute the latest MSDS for the die attach adhesive.
Jon

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Saturday, July 27, 2002 1:35 PM
To: jhargas@ford.com
Subject: FW: QMI 536 MSDS

Dear Jon,
I received the e-file of Loctite QMI 536 MSDS that we use as die attachment. Ms. Uy may want to have a copy this file. Would you please, forward a copy of it? I do NOT have her address.
Thanks.
Kyong

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

From: Melanie.donovan@loctite.com [mailto:Melanie.donovan@loctite.com]
Sent: Friday, July 26, 2002 4:38 PM
To: Park, Kyong
Subject: QMI 536 MSDS

Mr. Park,

Attached find the latest revision of our MSDS for QMI 536.

Best Regards,

EA82-827-G 65441

Melanie Donovan
Quality Assurance Administrator
Henkel Loctite
Phone: 858-695-1716 x 653
Fax: 858-695-0951

From: Freeland, Mark (M.)
Sent: Tuesday, July 30, 2002 4:58 PM
To: Hargas, Jon (.); Uy, Dairene (D.)
Cc: Potter, Timothy (T.J.)
Subject: RE: Elwood Focus sensor

Jon & Dairene,

I have assigned a SRL tracking number of SRL931 to this part. If you have the part could you please inscribe this number on the part and associate all records with this number. I have noted the info that I have in the master log, but please advise me of any info & findings you have on the part.

When you are done then the remains should be stored in a plastic bag clearly labeled with the tracking number and deposited in the 900 series box in my office.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

---Original Message---

From: Hargas, Jon (.)
Sent: Friday, July 19, 2002 1:25 PM
To: Freeland, Mark (M.); Uy, Dairene (D.)
Subject: Elwood Focus sensor

Mark,

Tim Potter got a sensor from Kevin Elwood's Focus. It has some clear bubbles by the base of the wire bonds. Dairene wrote down the mileage.

The date stamp on the sensor is 1K19B. I have not assigned it an SRL number. There are images in the Kavlico directory on the optical lab computer.

Jon

From: Verner, Carol (C.J.)
Sent: Tuesday, July 30, 2002 4:38 PM
To: Uy, Dairene (D.)
Subject: DPFE Sensors & Exhaust Gas Condensate

Dairene,

I did not drop off the dpfe sensors yet because Freeman Gates asked me to give you a sample of exhaust gas condensate from a Dynamometer tested engine. He would like for you to perform a quantitative analysis on a sample. He said that this is in reference to a report from Denso where the question came up regarding the content of Nitrogen and Sulfur in the condensate. I have a rather large sample. I do not have any clean jars to transfer a small amount to without fear of contaminating the sample.

Please let me know a good time to stop by. Hopefully you have a clean lab jar we can transfer the liquid to.

Carol
x07180

From: Park, Kyong [KPark@kavilco.com]
Sent: Tuesday, July 30, 2002 2:19 PM
To: Uy, Dalrene (D.)
Subject: RE: QMI 536 MSDS

Yes, these points I tried to make a few people at Ford aware, but either my communication skill is terrible or my message is ignored intentionally. The gal that goes on the top of the die has similar issues.
Thank you for your comment.
Kyong

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

From: Uy, Dalrene (D.) [mailto:duy@ford.com]
Sent: Monday, July 29, 2002 8:10 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.); Freeland, Mark (M.)
Cc: Park, Kyong
Subject: RE: QMI 536 MSDS

Thanks for the MSDS of the die attach. It is very interesting to note that:

- a) there is "irritant evolution" at temperatures greater than 300C,
- b) recommended use conditions are at < 35C,
- c) among the combustion and decomposition products are HF and NOx.

Dalrene

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

From: Hargas, Jon (.)
Sent: Monday, July 29, 2002 10:48 AM
To: Uy, Dalrene (D.); Carter, Roscoe (R.O.)
Cc: 'Kyong Park (E-mail)' (E-mail)
Subject: FW: QMI 536 MSDS

Hi Dalrene, Roc,
Kyong Park from Kavilco wanted to distribute the latest MSDS for the die attach adhesive.
Jon

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

From: Park, Kyong [mailto:KPark@kavilco.com]
Sent: Saturday, July 27, 2002 1:35 PM
To: jhargas@ford.com
Subject: FW: QMI 536 MSDS

Dear Jon,
I received the e-file of Loctite QMI 536 MSDS that we use as die attachment. Ms. Uy may want to have a copy this file. Would you please, forward a copy of it? I do NOT have her address.
Thanks.
Kyong

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

ER02-827-G 85448

From: Melanie.donovan@loctite.com [mailto:Melanie.donovan@loctite.com]
Sent: Friday, July 26, 2002 4:38 PM
To: Park, Kyong
Subject: QMI 536 MSDS

Mr. Park,

Attached find the latest revision of our MSDS for QMI 536.

Best Regards,

Melanie Donovan
Quality Assurance Administrator
Henkel Loctite
Phone: 858-695-1716 x 653
Fax: 858-695-0951

From: Hargas, Jon (.)
Sent: Friday, July 19, 2002 4:58 PM
To: Uy, Dairena (D.)
Subject: FW: resend

Dairena,

This is the last relevant email in my search for Sickafus's name.
Jon

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

From: Freeland, Mark (M.)
Sent: Wednesday, March 27, 2002 2:06 PM
To: Hargas, Jon (.)
Subject: FW: resend

Jon,

more thoughts from Ed. Do you think the cold N might work, my daughters had fun watching cold N explode pop bottles lat time we went to COSI!

Mark

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

From: Ed Sickafus (mailto:ntelleck@ic.net)
Sent: Tuesday, March 26, 2002 12:51 PM
To: Freeland, Mark (M.)
Subject: RE: resend

Mark, my cell phone number is (313) 318-3299. It's not always on though, sometimes I forget to turn it on, and sometimes I just don't because I'm not expecting any calls. Tomorrow, I'll be driving all day to Pennsylvania, so I'll probably keep it on in case you have any news or ideas -- could make the drive more interesting.

I have a suggestion to try for lifting off the gold to reveal aluminum. Pour liquid nitrogen into a small beaker until it stops its violent bubbling; i.e., when it pretty cold and you can see clear liquid nitrogen in the beaker. Then drop a couple of die into the liquid nitrogen. I'd pick at least one die from the wafer's periphery. The sudden cooling will produce intralayer stresses between the films, and between films and die, as a result of their different thermal expansion. This most probably will flake off some shards of thin films. Whether it will successfully separate the films remains to be seen -- the purpose of the experiment. If it works, as I hope, the AL will not be distorted; i.e., broken into pieces, but may be warped, which is OK. If the AL is not separated from the Au, but they come off together, that's fine. One can look at one side and then the other.

I also recommend having Roc or Joe dip die into the gel, when you get some, to see if any reaction occurs w/ the aluminum. Also see when and if bubbles occur.

If bubbles occur only as a result of heating the gel, and not from chemical reaction w/ the die, then they become a postmortem flag for die having been heated. So it will be useful to heat some gel on a hot plate w/ a thermocouple and determine at what temperature bubbles occur (do it w/ and w/o die present in the hot gel).

Bear in mind that the amount of gaseous bubbles generated on heating may relate to the degree, if any, of pre-outgasing of the gel before its application in the package.

I look forward to meeting w/ you again to pursue these and other ideas.

ER02-027-G 65454

I'll be home Monday evening, next.
Have a great holiday, Ed.

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

From: Freeland, Mark (M.) [mailto:mfreelal@ford.com]
Sent: Tuesday, March 26, 2002 11:20 AM
To: 'Ed Sickafus'
Cc: Hangas, Jon (.)
Subject: RE: resend

Ed,

I am thinking that we should keep the books open for a few weeks. I would like to have you back for another day (or two) after the Easter break, Partially to cover flushing out recommendations as you suggested, and also to spend some more time looking at parts with you. I will be out from 3/28 returning 4/8, so there will be no conflict with you're Easter plans. If you need to contact me while I am away I will have my cell phone with me (248) 842-1080. It may not work in the Grand Canyon, but hopefully will work some of the time!

Before you come back I want to have the attorneys resolve the transfer of Kavlico confidential information to you so that I can give you answers to all you're questions.

One thing which came out of Friday's meeting was a suggestion from Andy Drews to use ID imaging to try and see flaws in the Al under the Au without removing the Au first. He found a reference for IBM using such a technique to look at the Al layer from the back side through the Si! He is following up on trying to recreate the technique here. I will keep you posted on this one.

Regards

Mark Freeland

From: Hengas, Jon (.)
Sent: Friday, July 19, 2002 4:41 PM
To: Uy, Dairene (D.)
Subject: Ed's emails

Dairene,
Here are 2 emails which came from Ed directly which did not include you in the distribution list.

Jon



Comments on
Thursday last meet...



comments on
tasting

From: Hargas, Jon (.)
Sent: Friday, July 19, 2002 1:25 PM
To: Freeland, Mark (M.); Uy, Dalrene (D.)
Subject: Elwood Focus sensor

Mark,

Tim Potter got a sensor from Kevin Elwood's Focus. It has some clear bubbles by the base of the wire bonds. Dalrene wrote down the mileage.

The date stamp on the sensor is 1K19B. I have not assigned it an SRL number. There are images in the Kavico directory on the optical lab computer.

Jon

From: Verner, Carol (C.J.)
Sent: Thursday, July 18, 2002 5:48 PM
To: Hargas, Jon (.); Uy, Dairene (D.)
Subject: RE: Used good sensor for Raman

Dairene,

I am working on getting a sensor for you. If you get the sensor by Monday, noon will that be enough time for you to perform the necessary analysis?

Carol
x07180

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

From: Hargas, Jon (.)
Sent: Thursday, July 18, 2002 5:06 PM
To: Verner, Carol (C.J.); Uy, Dairene (D.)
Cc: Freeland, Mark (M.); Akins, Mary (M.); 'Kyong Park (E-mail)' (E-mail)
Subject: Used good sensor for Raman

Carol,

Dairene Uy presented data on her Raman analysis at today's meeting. It was requested that she look at a used sensor that was still good to see if there was anything in the exhaust gas that was dissolved in the gel. It would be desirable to have the results reported next week, but Mark is in Ireland and he's our normal source for parts.

Do you have any good used parts? I think it would actually be more appropriate to take a sensor off a vehicle and give it to her, condensate and all. There's a better chance that a more volatile chemical will be present in a sensor directly off a vehicle than one sitting in a parts bin for months. We have to break the case open for Dairene to do Raman, so a replacement would have to be available.

Jon Hargas
Materials Science Dept.
x31068

From: Hargas, Jon (.)
Sent: Thursday, July 18, 2002 5:08 PM
To: Verner, Carol (C.J.); Uy, Dairene (D.)
Cc: Freeland, Mark (M.); Akins, Mary (M.); 'Kyong Park (E-mail) ' (E-mail)
Subject: Used good sensor for Raman

Carol,

Dairene Uy presented data on her Raman analysis at today's meeting. It was requested that she look at a used sensor that was still good to see if there was anything in the exhaust gas that was dissolved in the gel. It would be desirable to have the results reported next week, but Mark is in Ireland and he's our normal source for parts.

Do you have any good used parts? I think it would actually be more appropriate to take a sensor off a vehicle and give it to her, condensate and all. There's a better chance that a more volatile chemical will be present in a sensor directly off a vehicle than one sitting in a parts bin for months. We have to break the case open for Dairene to do Raman, so a replacement would have to be available.

Jon Hargas
Materials Science Dept.
x31088

From: Poma, Amy (A.)
Sent: Wednesday, July 17, 2002 9:11 AM
To: Uy, Dairene (D.)
Subject: July 18th 1:00 dPFE Sensor mtg.

Dairene,

This is to confirm that you will be on tomorrow's Agenda to discuss your Raman Spectroscopy results at the Ford/Kavlico dPFE Sensor 140 mtg. Please advise how much time you need on the Agenda. I'll be in the lobby just before 1:00 to meet you and take you to the meeting.

Amy Poma
V-Engine Engineering-Project Mgmt.
POEE Building, FMEI Cube CO162
phone-313-390-8849, fax: 313-390-4084
apoma2@ford.com

From: Carter, Roscoe (R.O.)
Sent: Friday, July 12, 2002 9:51 AM
To: Uy, Dairene (D.); Hargas, Jon (.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED!

Dairene,

The gel in the chimneys does contain a silicone copolymer but you are like correct that some cross contamination can inadvertently occur. ROC

---Original Message---

From: Uy, Dairene (D.)
Sent: Friday, July 12, 2002 9:36 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED!

The silicone I found is polymethylsiloxane, which is the gel material outside the chimneys.

The gel covering the sensor dies is a perfluoropolyether.

I guess there was some contamination of the two gels when Jon was removing them and the chimney.

| ---Original Message---

From: Hargas, Jon (.)
Sent: Thursday, July 11, 2002 6:46 PM
To: Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.); Uy, Dairene (D.)
Subject: silicone

Roc,

Dairene found some silicones in Raman. It might be best for you to discuss with her your findings about the gel and what is produced when it is overheated.

The gel over the hybrid is different than the gel over the die.

There may be some possibility of cross contamination of the gels.

To get the gel off the scalpel I was using I did have to wipe it onto the nitrile gloves on my hand. I don't know if the nitrile has silicone.

I don't think I have any silicones in the area that I removed the gel. I have vacuum grease and diffusion pump oil in the room, but don't use them on that bench.

Jon

From: Uy, Dairene (D.)
Sent: Friday, July 12, 2002 9:36 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED

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Cc: Freeland, Mark (M.); Uy, Dairene (D.)
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Jon

From: Hargas, Jon (.)
Sent: Thursday, July 11, 2002 8:46 PM
To: Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.); Uy, Dairene (D.)
Subject: silicone

Rec,

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Jon

From: Uy, Dairena (D.)
Sent: Thursday, July 11, 2002 2:48 PM
To: Frøeland, Mark (M.)
Subject: nitrate

Mark,

I'm looking at my fourth bubble-within-the-gel now, and finally I see a small nitrate peak.

Dairena

Dairena Uy
Physical and Environmental Sciences Department
Ford Research Laboratory
Mail Drop 3083/SRL, PO Box 2053
Dearborn, MI 48121

Phone: 313-594-1649
Fax: 313-322-7044
Email: duy@ford.com

From: Hargas, Jon (.)
Sent: Monday, July 01, 2002 1:08 PM
To: Gonzalez, Lebzy (L.)
Cc: Uy, Dairane (D.); Freeland, Mark (M.)
Subject: No microtomy needed on SRL326 Ref

Lebzy,

All the wire bonds fell off while ultrasonically cleaning SRL326 Ref die. Microtomy will not be needed on this part. But there might not be much left for Dairane to look at. The Ref die had cooked its gel and die attach adhesive.

Since the HI die in the sensor still had gel and nearly normal die attach color, it may not have run latched. It's possible for only one of the two die in a sensor to be latched. I'll try to look at it optically to see if it's worth microtoming this one for Dairane to look at.

Jon

From: Uy, Dairene (D.)
Sent: Thursday, June 06, 2002 5:00 PM
To: Gonzalez, Lebzy (L.)
Subject: RE: Microtomed dies (low mag OM photos)

Lebzy,

I was thinking - I think I might try to take more Raman spectra of those mudcracks. We have another laser I can use, and there's a tiny chance I'll see something different. Can I stop by sometime tomorrow to get them from you? I can just pick them up from your office if you put them on the edge of your desk.

Thanks.

Dairene

---Original Message---

From: Gonzalez, Lebzy (L.)
Sent: Thursday, June 06, 2002 12:06 PM
To: Uy, Dairene (D.); Freeland, Mark (M.)
Subject: Microtomed dies (low mag OM photos)

<< File: ref_die.jpg >>

<< File: hi_die.jpg >>

From: Uy, Dalrene (D.)
Sent: Thursday, June 08, 2002 4:58 PM
To: Freeland, Mark (M.)
Subject: mudcracks

Mark,

I have taken several Raman spectra of the mudcracks in both dies and I mostly see very strong peaks belonging to silicon. I believe there may be the nitrate peak again there as well, but I have yet to print out the spectra. I will stop by your office tomorrow morning with some spectra as well as the report you made for this sensor, which I have with me right now.

If we suspect some other aluminum compound, it may be that the layers are so thin that I cannot see them using Raman. Or if it is just aluminum oxide, I may have some difficulty as well.

You know what - I have returned the dies to Lebzky but maybe I'll have another go, using our UV laser this time. There's a tiny chance I'll see something different. I'll ask Lebzky for the dies back.

Dalrene

Dalrene Uy
Physical and Environmental Sciences Department
Ford Research Laboratory
Mail Drop 3083/SRL, PO Box 2053
Dearborn, MI 48121

Phone: 313-594-1649
Fax: 313-322-7044
Email: duy@ford.com

From: Carter, Roscoe (R.O.)
Sent: Tuesday, May 21, 2002 12:06 PM
To: Uy, Dairane (D.)
Subject: Nitrate in gel

Dairane,

I have just been sent an MSDS for the die adhesive and it can produce NOx upon decomposition. Temp of decomposition at present unknown but we are working on it.

ROC

From: Freeland, Mark (M.)
Sent: Wednesday, March 20, 2002 3:58 PM
To: Uy, Dairene (D.)
Subject: FW: more on UPAD

Dairene,

No we do not know if there are fully functional sensors with bubbles. We do not get fully functional sensors to inspect. However, I would suspect that the bubble occurs before the sensor actually fails, therefore I would predict that the answer is probably YES.

Regards

Mark Freeland

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

From: Uy, Dairene (D.)
Sent: Wednesday, March 13, 2002 6:32 PM
To: Freeland, Mark (M.)
Subject: more on UPAD

Mark,

I never looked at a bubble from Type 2 UPAD. I should look at one. If I also see nitrate in that bubble, maybe these bubbles are unrelated to sensor failure. Do we know if there are bubbles on fully functional sensors?

I'll talk to you more when you get back. I have a meeting at lunchtime and in the afternoon so I don't think I will go to your gathering, but if you want an elaboration of my previous email or want some "technical support" and none of us (steve, jon) are there, please do call and I will see if I can make it there.

Dairene

Dairene Uy
Physical and Environmental Sciences Department
Ford Research Laboratory
Mail Drop 3083/SRL, PO Box 2053
Dearborn, MI 48121

Phone: 313-594-1648
Fax: 313-322-7044
Email: duy@ford.com

From: Freeland, Mark (M.)
Sent: Monday, March 11, 2002 11:59 AM
To: Uy, Dairene (D.)
Subject: RE: raman 2-pager, jpeg files

Dairene,

Thank you for your report. I will integrate it into the master document.

I did not manage to get your friend on the phone, but did do some research on Electromigration. It is a mechanism which shifts the metal to a new site nearby the place where it is depleted from. This is quite different from what we have, where material is "removed" (but not redeposit nearby) and material is "transformed". But, thanks for the lead. Let me know if you have any further thoughts.

I will let you know of the meeting time when I have it confirmed.

Thanks

Mark

From: Freeland, Mark (M.)
Sent: Monday, March 04, 2002 5:28 PM
To: Uy, Dairene (D.)
Subject: RE:

Thanks for the Etch web site info. Very interesting.

I have a new thought, a specific question.

What does:

Piranha

- > > Excellent oxidant; removes most organic residues.
5 parts H_2SO_4
1 part H_2O_2
- > > **Note:** Always add peroxide to sulfuric acid, never vice versa! This is a self-heating solution.

do to an exposed thin film (about 1 micron) of Al, and how fast?

I don't know what the process temperature is, but I would assume room temp. for the question.

Piranha is typically used to strip photo resist after the normal etch steps have been completed.

Thanks

Mark

From: Uy, Dairene (D.)
Sent: Friday, December 14, 2001 11:32 AM
To: Kotwicki, Allan (A.J.)
Subject: formate and acetate

Al,

Just want to let you know that formic and acetic acids are weak acids compared to say, hydrochloric or nitric. A strong acid will *dissociate* in water to release the H⁺ ion, e.g. HCl (hydrochloric acid) becomes H⁺ + Cl⁻. In a dilute solution of acetic acid (HCH₃COO) at room temperature, only a few % of the molecules will dissociate.

Dairene

FW Ford FA a .txt

From: Brady Davies [BDavies@kavlico.com]
Sent: Monday, February 11, 2002 8:54 PM
To: Mark Freeland (E-mail)
Cc: Kyong Park
Subject: FW: Ford FA

> -----Original Message-----

> From: Rick Palermo
> Sent: Monday, February 11, 2002 5:16 PM
> To: Brady Davies
> Cc: Jay Caffee; Calin Miclaus
> Subject: RE: Ford FA

> I EDX'd two pads: VDD and Vout. The results are large amounts of Si, and
> O, with smaller amounts of P and C. The energy level where Al should
> show up if present shows only back ground noise, or no Al present. The
> results were virtually identical for VDD and Vout. Rick

> <<Edge die1 VDD.doc>> <<Edge die1 Vout.doc>>

> -----
> From: Brady Davies
> Sent: Monday, February 11, 2002 16:49
> To: Rick Palermo
> Cc: Jay Caffee; Calin Miclaus
> Subject: RE: Ford FA

> Rick,
> Can you verify the presence or absence of Aluminum on the edge die bond
> pads?
> Brady

> -----Original Message-----

> From: Calin Miclaus
> Sent: Monday, February 11, 2002 11:53 AM
> To: Brady Davies
> Cc: Jay Caffee
> Subject: Ford FA

> Brady,

> attached are the SEM photos that Rick took. The edge die EDX shows the
> absence of Au on the bonding pad and its presence (lighter areas) in the
> vicinity of the pad.

> In the case of the center "good" die the gold is present on the pad
> (confirmed by EDX) and absent near, as it should be. The Au looks a bit
> rough and a few Si nodules are also present.

> I will be out this afternoon, but I will instruct Rick to save this
> samples should you need more work done on them. Calin

> << File: edge die 1.jpg >> << File: center die pad.jpg >> << File:
> center die 1.jpg >> << File: edge die pad.jpg >> << File: edge die pad
> 10K.jpg >>

FW Ford FA.txt

From: Brady Davies [BDavies@kavlico.com]
Sent: Monday, February 11, 2002 8:53 PM
To: Mark Freeland (E-mail)
Cc: Kyong Park
Subject: FW: Ford FA

Mark,

This email, and one to follow, detail some of our findings related to your concerns about edge die in lot 21084. This wafer is 21084-23. This email and the one to follow specifically address your concerns regarding Al on the edge die. Our EDX and visual analysis did not find Al on edge die from this wafer. I did see at least one edge die bond pad that showed barely discernable probe marks (like shadows), but no Al. We also did not see areas of missing gold. As far as unused die concentrated in two locations, this is a fairly common occurrence.

Brady

> -----Original Message-----

> From: Calin Miclaus
> Sent: Monday, February 11, 2002 11:53 AM
> To: Brady Davies
> Cc: Jay Caffee
> Subject: Ford FA

>
> Brady,

> attached are the SEM photos that Rick took. The edge die EDX shows the
> absence of Au on the bonding pad and its presence (lighter areas) in the
> vicinity of the pad.

> In the case of the center "good" die the gold is present on the pad
> (confirmed by EDX) and absent near, as it should be. The Au looks a bit
> rough and a few Si nodules are also present.

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>
>

> <<edge die 1.jpg>> <<center die pad.jpg>> <<center die 1.jpg>> <<edge
> die pad.jpg>> <<edge die pad 10K.jpg>>

20010619 Vref short drive report.txt

<HTML>Subj:
 FW: Defective DPFE<FONT COLOR="#000000" BACK="#ffffff"
style="BACKGROUND-COLOR: #ffffff" SIZE=3 PTSIZE=10 FAMILY="SANSSERIF" FACE="Arial"
LANG="0">

Date: 6/19/01 7:50:18 AM Eastern Daylight Time

From: trozema@ford.com (Rozema, Thomas (T.M.))

To: mfsopwith@cs.com

<FONT COLOR="#000000" BACK="#ffffff" style="BACKGROUND-COLOR: #ffffff"
SIZE=2 PTSIZE=10 FAMILY="SANSSERIF" FACE="Arial" LANG="0">

Some good info.....

Thomas Rozema

Ford Motor Company

RVT\PTSE Engineering

Wayne Assembly Plant

trozema@ford.com

Phone:734-641-5831

Text Pager:734-267-5262

> -----Original Message-----

> From: Thomas, Ken (K.C.)

> Sent: Tuesday, June 19, 2001 7:35 AM

> To: Grant, Kathleen,Kathy (K.A.)

> Cc: Whitworth, Rudy (A.R.); Colatruglio, vince (V.E.); Montini, Matthew (M.J.);
Rozema, Thomas (T.M.)

> Subject: Defective DPFE

>

> Hi Kathy, I have a defective DPFE from the field that was replaced for a no start
and code P0401. When I put it on a vehicle yesterday morning I found the drivability
poor from to much EGR and after 10 -15 miles of city driving a code P0401 was set.
But at no time did it not start.

>

> I drove the vehicle home last night, this morning after about 7 miles (@50mph) I
stopped for a intersection and upon turning the corner the vehicle quit. I coasted
to the shoulder and tried to restart with no luck. The odo displayed all dashes, I
then opened the hood and disconnected the sensor and the vehicle started. When I got
to work there were two codes P0401 and P1401.

>

> What if anything would you like to do with this sensor? Before we give it to the
supplier!

</XMP><FONT COLOR="#0f0f0f" BACK="#ffffff" style="BACKGROUND-COLOR: #ffffff"
SIZE=2 PTSIZE=10 FAMILY="SANSSERIF" FACE="Arial" LANG="0">

----- Headers -----

Return-Path: <mfree1a1@ford.com>

Received: from rly-ye04.mx.aol.com (rly-ye04.mail.aol.com [172.18.151.201]) by
air-ye05.mail.aol.com (v79.20) with ESMTTP id MAILINYE58-0619075018; Tue, 19 Jun 2001
07:50:18 -0400

Received: from dymwsm14.mailwatch.com (dymwsm14.mailwatch.com [204.253.83.38]) by
rly-ye04.mx.aol.com (v79.20) with ESMTTP id MAILRELAYINYE48-0619075015; Tue, 19 Jun
2001 07:50:15 -0400

Received: from mwsc0204.mw4.mailwatch.com (mwsc0204.mw4.mailwatch.com
[204.253.83.134])

by dymwsm14.mailwatch.com (8.11.0/8.11.0) with ESMTTP id f5JBnpk19920

for <mfsopwith@cs.com>; Tue, 19 Jun 2001 07:49:51 -0400

Received: from mail pickup service by mwsc0204.mw4.mailwatch.com with microsoft
SMTPSVC;

Tue, 19 Jun 2001 07:50:32 -0400

Received: from 204.253.83.34 ([204.253.83.34]) by MWSC0204 with SMTP id
000200048ad7b28a-f700-499e-b905-2c3867bbda16; Tue, 19 Jun 2001 07:50:32 -0500

Received: from eccmfw3.ford.com (mailfw3.ford.com [136.1.1.28]) by
dymwsm12.mailwatch.com (8.11.0/8.11.0) with ESMTTP id f5JBOHX10431 for
Page 1

20010619 Vref short drive report.txt
<mfsopwith@cs.com>; Tue, 19 Jun 2001 07:50:17 -0400

Message-Id: <200106191150.f5JBoHx10431@dynamsm12.mailwatch.com>

Received: by mailfw3.ford.com id HAA22950 (InterLock SMTP Gateway 4.2 for
mfsopwith@cs.com); Tue, 19 Jun 2001 07:55:53 -0400 (EDT)

Received: by mailfw3.ford.com (Internal Mail Agent-1); Tue, 19 Jun 2001 07:55:53
-0400 (EDT)

Received: by mailfw3.ford.com (Internal Mail Agent-0); Tue, 19 Jun 2001 07:55:53
-0400 (EDT)

From: "Rozema, Thomas (T.M.)" <trozema@ford.com>

To: mfsopwith@cs.com

Subject: FW: Defective DPFE

Date: Tue, 19 Jun 2001 07:50:02 -0400

MIME-Version: 1.0

X-Mailer: Internet Mail service (5.5.2654.52)

Content-Type: text/plain; charset="iso-8859-1"

HOP-COUNT: 1

X-MAILWATCH-INSTANCEID: 010200048ad7b28a-f700-499e-b905-2c3867bbda16

X-OriginalArrivalTime: 19 Jun 2001 11:50:32.0138 (UTC)
FILENAME=[082982A0:01C0F8B6]

</HTML>

From: Williamson, David (D.E.)
Sent: Monday, April 09, 2001 1:35 PM
To: Plattenberger, Karl (K.J.); Akins, Mary (M.); Ogozaly, Jim (J.C.); Garrett, Bruce (B.); 'bbugaj@kavlico.com'; Corbett, Sandra (S.M.); Maurer, James (J.B.); Freeland, Mark (M.); Johnson, Joseph (J.H.)
Cc: Sveticas, Ed (E.); Kwon, Soon (S.K.); Wineland, Richard (R.J.); Moorhouse, Scott (S.R.)
Subject: 4/6/01 DPFE Minutes
Attendees: Mary Akins (Kavlico), Barry Bugaj (Kavlico), Sandra Corbett, Jim Maurer, Jim Ogozaly, Karl Plattenberger

We met to go over questions Bruce Garrett had forwarded concerning DPFE sensor. Beyond the mask alignment correction, a Six Sigma team project will begin soon, headed by Jim Maurer & Mark Freeland.

Agenda

- * Process Poke-Yoke Info (To be reviewed by 6-Sigma Team. Suggestion was to add to existing Kavlico documentation all process poke-yoke including visual aids, operator training logs, etc.)
- * Change in type of parts analyzed 90/10 or 80/20 field to process (Bruce, please clarify this question and this will be added to 6-Sigma Team investigation)
- * Field data and KCAP data on failures (Mary Akins for field data) (KCAP is not experiencing failures post 11/20 alignment tolerance change. Failures appear on vehicles with at least a few thousand miles on them.)
- * 8D status on various failures (6-Sigma Investigation)
- * DV/PV results (Johnson) Suggestion is for DV/PV to be updated to prevent future problems via 6-Sigma Team
- * Design changes made as result of P-diagram No – design changes resulted from failures in the field. Kavlico will update FMEA's & other related quality data).
- * Discussion of instances where what were thought to be good parts that failed & vice versa 6-Sigma Team Investigation

Discussion of future actions to improve quality/need for 6-Sigma Project (Team) Jim Maurer, please forward me date when meetings will begin and please included myself & Bruce Garrett on invitation list.

David E. Williamson

Ford Escape/Mazda Tribute P/T OPD

Phone: 313 248 2488
Pager: 313 795 1419
Email: DWILLI29@FORD.COM

EA02-027-G 75899

From: Hargas, Jon (.)
Sent: Tuesday, January 29, 2002 6:34 PM
To: 'kpark@kavlico.com'; Freeland, Mark (M.)
Subject: Freon

Kyong,

Mark told me you asked about the Freon.

The Freon I use is 1,1,2-Trichloro-1,2,2-trifluoroethane from Fisher Scientific (www.fishersci.com). The catalogue number is T178-4. The link below should pull up the page for this chemical.

<https://www1.fishersci.com/catalogs/chemgroup.jsp?sessionId=5fad%3A3c572fbb%3A1f926537e77f?catalogParamId=6473196&catalogParamType=CG&catalogParamView=normal>

Regards,
Jon Hargas
Ford Motor Co.

EA02-027-G 75707



U.S. Department
of Transportation
National Highway
Traffic Safety
Administration

ODI RESUME

IDENTIFICATION: PR01- 043 DATE OPENED: 7 Dec 2001

SUBJECT: Engine Stalling

PROMPTED BY: Consumer complaints, PR01-051

PRINCIPLE ENGINEER: Ali Motamedani

MANUFACTURER: Ford Motor Company/Mazda North America

MODEL(S): Escape/Tribute equipped with the 3.0 L Duratec V6 Engine

MODEL YEAR(S): 2001-2002

VEHICLE POPULATION: 195,000 (Escape), 75,000 (Tribute) for 2001, 2002 unknown.

PROBLEM DESCRIPTION: The complainant alleges that the engine stalls without warning while driving.

FAILURE REPORT SUMMARY

	Ford Escape/Mazda Tribute (ODI)	Ford Escape/Mazda Tribute (NHTSA)	TOTAL
COMPLAINTS:	49/51	N/A	100
CRASHES:	0/0	N/A	0
INJ CRASHES:	0/0	N/A	0
# INJURIES:	0/0	N/A	0
FAT CRASHES:	0/0	N/A	0
# FATALS:	0/0	N/A	0
OTHER:	3/1	N/A	4

DESCRIPTION OF OTHER: VOQ reports submitted subsequent to original complaint reports and alleging a subsequent stalling event.

ACTION: A Preliminary Evaluation (PE) has been opened

ENGINEER: Ali Motamedani
DATE: 12/12/01

DIV CHF: Ali Motamedani
DATE: 12/12/01

OPC DIR: [Signature]
DATE: 12/7/01

SUMMARY: ODI has received forty-nine (49) reports on the Ford Escape and fifty-one (51) reports on the Mazda Tribute alleging that the engine would stall out without warning while driving. Sixty-three (63) of the one hundred (100) vehicles have had repair attempts more than once. Reported repairs include replacing the following components: Electronic Engine Control (EEC) Power Relay for the Programmable Control Module (PCM), Fuel Pump, Exhaust Gas Recirculation (EGR) Valve, and Ignition Starter Switch. One attempt at reprogramming the PCM was also made. In addition, many of the reports indicate that dealers have not been consistently successful in correcting the stalling problem.

There are no Technical Service Bulletins or recalls issued regarding this subject on these vehicles.

12/12/01
30

EA02-027-G 75750

FOCUS STALLS

DEZ No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident	Injured	FAIR	File Part Name	City	State	Miles	Summary	
89224	FORD MOTOR COMPANY	2001	FOCUS	1FAFP28P91W12742	29-Jul-01		0		INOPERATIVE	ENGINE	FIDENZA	NY	0	ENGINE VEHICLE DIE 0 VEH- DIE IN MAY NOT WAS 200 "SLC"	ENGINE STARTING AND IT OFF WAS R THAT IT I SA "AK"
89218	FORD MOTOR COMPANY	2001	FOCUS	1FAFP28P91W12741	18-Jul-01	18-Jul-01	N		INOPERATIVE	ENGINE	BANGOR	PA	200	WHILE TRAVELING AT HIGHWAY SPEEDS VEHICLE WOULD SUDDENLY STALL OUT FOR NO REASON IN THE MIDDLE OF TRAFFIC. PROBLEM OF STALLING COULD HAPPEN WHILE AT A STOP LIGHT OR BEEN WHENEVER TRYING TO RESTART VEHICLE IT WOULD BE PROCEEDED. NOT ABLE TO RESTART AFTER 10-15 MIN. LATER. PROBLEM WAS INTERMITTENT. VEHICLE WAS BEEN TOWED 7 TIMES AFTER STALLING. AT DEALERSHIP MECHANIC COULD NOT LOCATE CAUSE OF STALLING. WAS EVENTUALLY DRIVEN AWAY 4000	
89283	FORD MOTOR COMPANY	2001	FOCUS	1FAFP28P91W12742	10-Aug-01		R		DESIGN	ENGINE	ST AUGUSTINE	FL	4000	STALLING DID NOT OCCUR AT ALL WHILE DRIVING BEHIND AT NIGHT LOST ALL POWER. CURRENTLY VEHICLE ACTS AS THOUGH IT IS OUT OF GAS. VEHICLE WILL JUST STOP RUNNING WITH NO PRIOR WARNING. PLEASE ADD 0 VEH "AK"	
89841	FORD MOTOR COMPANY	2001	FOCUS		17-Jul-01		N		ERRATIC OPERATION POOR PERFORMANCE	ENGINE	BAKERSFIELD	CA	0	ENGINE STALLS WHILE DRIVING FIRST TIME AT 28 MPH AND SECOND TIME AT 70 MPH. DEALER CAN 4000 FIND NOTHING WRONG.	
79071	FORD MOTOR COMPANY	2001	FOCUS	2FAFP28P91R13289	14-Jul-01	19-Aug-01			ERRATIC OPERATION POOR PERFORMANCE	ENGINE	FORT LAUDERDALE	FL	4000	VEHICLE WOULD SHUTDOWN WITHOUT WARNING WHILE DRIVING. VEHICLE BEEN TO DEALER SHOP ON THREE OCCASIONS AND STILL UNABLE TO RESOLVE PROBLEM. NEED PARTS TO PROVIDE ANY 7400 FURTHER INFORMATION ON THIS MATTER. "AK"	
89233	FORD MOTOR COMPANY	2001	FOCUS	1FAFP28P91W12741	1-Aug-01	19-Sep-01	M		INOPERATIVE	ENGINE	CONCORD	NC	7400	SUDDEN ENGINE STALL WHILE DRIVING AT 60 MPH. UNABLE TO RESTART CAR FOR 15 MINUTES. THEN CAR STARTED AND HAVE HAD NO RECURRENCE OF PROBLEM. DEALER WAS UNABLE TO FIND 0 CAUSE "AK"	
79218	FORD MOTOR COMPANY	2001	FOCUS	2FAFP28P91R13287	15-Oct-01				ERRATIC OPERATION POOR PERFORMANCE	ENGINE	SANTA CRUZ	CA	0	WHEN COMING TO A STOP OR BLOWING DOWN VEHICLE WILL STALL. CONSUMER LOSES ALL POWER. CONTACTED DEALER BUT NO 8 RESULT "AK"	
89282	FORD MOTOR COMPANY	2001	FOCUS	2FAFP28P91W12742	10-Jul-01	18-Oct-01	N		ERRATIC OPERATION POOR PERFORMANCE	ENGINE	REINCTOR	VA	8		

EA02-027-G 75758

CSX No	Manufacturer	Model Yr Model	Vin	Policy Cms Letter Date Accident Injury Part	File Part Name	City	State	Miles	Description				
251151	FORD MOTOR COMPANY	2001	FOCUS	9FAFP21812000000000	20-Feb-01 10-Feb-01		FLORIDA	2700	<p>EROMATIC OPERATION POOR</p> <p>D PERFORMANCE</p> <p>N ENGINE</p>	DANLONCA	FL	2700	<p>STARTS AT IDLE OR IN</p> <p>SHUT COMES ON WHEN IT</p> <p>WAS STATED IF EMISSION</p> <p>INDICATED THAT CATALYTIC</p> <p>CONVERTER CAUSED A FIRE</p> <p>IT BACK UP ONCE IT</p> <p>STARTED. THERE IS A</p> <p>PROBLEM WITH THE ENGINE</p> <p>HAS ACKNOWLEDGED OF OTHER VEHICLES WITH</p> <p>SAME PROBLEM. DEALER REPAIRED FUEL PUMP</p> <p>DRAGGED IT AND CLEANED IT. DEALER HOOKED A</p> <p>CODE WHICH WOULD SHOW</p> <p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p>
252276	FORD MOTOR COMPANY	2001	FOCUS	9FAFP21812000000000	14-Mar-01 10-Mar-01		FLORIDA	5000	<p>D INFORMATION</p> <p>M FUEL-FUEL PUMP</p> <td>ST. AUGUSTINE</td> <td>FL</td> <td>5000</td> <td> <p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p> </td>	ST. AUGUSTINE	FL	5000	<p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p>
262347	FORD MOTOR COMPANY	2001	FOCUS	9FAFP21812000000000	20-Mar-01 4-Mar-01		FLORIDA	2200	<p>D DESIGN</p> <p>N ENGINE</p> <td>OCEANO</td> <td>FL</td> <td>2200</td> <td> <p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p> </td>	OCEANO	FL	2200	<p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p>
262348	FORD MOTOR COMPANY	2001	FOCUS	9FAFP21812000000000	13-Mar-01 10-Mar-01		FLORIDA	2900	<p>EROMATIC OPERATION POOR</p> <p>D PERFORMANCE</p> <p>E FUEL-THROTTLE LINKAGE/ACCELERATOR</p> <td></td> <td>FL</td> <td>2900</td> <td> <p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p> </td>		FL	2900	<p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p>
802376	FORD MOTOR COMPANY	2001	FOCUS	9FAFP21812000000000	14-Mar-01 10-Mar-01		FLORIDA	2600	<p>EXCESSIVE OVERHEATING REPORT</p> <p>D OUT-LET</p> <p>N EXHAUST SYSTEM/CATALYTIC CONVERTER/ADJUSTING</p> <td></td> <td>FL</td> <td>2600</td> <td> <p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p> </td>		FL	2600	<p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p>
785446	FORD MOTOR COMPANY	2001	FOCUS	9FAFP21812000000000	10-Oct-01 13-Oct-01		FLORIDA	2600	<p>D STALLS</p> <p>N FUEL/FUEL INJECTION SYSTEM</p> <td>HALLSBOURNE</td> <td>FL</td> <td>2600</td> <td> <p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p> </td>	HALLSBOURNE	FL	2600	<p>TECHNICIAN COULD NOT</p> <p>FIND A REASON FOR IT TO GET IN</p> <p>THE ENGINE. A BRAND NEW ENGINE</p> <p>WAS ORDERED. ESTIMATE IS</p> <p>2200.00. VALVE REPLACED. FUEL CON. SAME.</p> <p>THROTTLE CARBURETOR ACID INTERMITTENT</p> <p>PROBLEMS STILL. THEY TOLD ME THIS IS THE</p> <p>BEST WAY IT IS TO BE DRIVEN.</p>

EA02-027-G 75759

CR# No.	Reference Number	Model Yr - Model	Vin	Failure Date	Last Date	Accident	Injured	Fault	For	Part Name	Qty	State	Miles	Summary		
500704														VEHICLE STALLED AT ANY SPEED WHEN APPLYING THROTTLE. VEHICLE TAKEN TO DEALER 3 TIMES. REPROGRAMMED COMPUTER BUT THAT DID NOT REMEDY THE PROBLEM. FORD WAS AWARE OF PROBLEM BUT HAD NO SOLUTION.		
806818	FORD MOTOR COMPANY	2001 F150	ADD	25-Nov-01	4-Dec-01			0	ERRATIC OPERATION	POOR PERFORMANCE	ENGINE	HOT SPRINGS	AR	11000	VEHICLE STALLED AT ANY SPEED WHEN APPLYING THROTTLE. VEHICLE TAKEN TO DEALER 3 TIMES. REPROGRAMMED COMPUTER BUT THAT DID NOT REMEDY THE PROBLEM. FORD WAS AWARE OF PROBLEM BUT HAD NO SOLUTION.	
855580	FORD MOTOR COMPANY	2001 F150	1FTEDW9WY1K080895	25-Sep-01	8-Oct-01			0	ERRATIC OPERATION	POOR PERFORMANCE	ENGINE	EAST SANGOR	PA	23000	ENGINE STALLS INTERMITTENTLY DURING NORMAL OPERATION WHILE TRAVELING AT ANY SPEED. DEALERSHIP HAS BEEN UNABLE TO REPRODUCE PROBLEM AND IDENTIFY THE CAUSE. PLEASE PROVIDE ANY ADDITIONAL INFORMATION / DOCUMENTATION. *AK WHILE TRAVELING ON THE INTERSTATE AT APPROX 80 MPH THE ENGINE SHUT OFF AND THE DASHBOARD GAGES AND ODOMETER WENT BLANK. I WAS NOT ABLE TO RESTART THE ENGINE AND THE VEHICLE HAD TO BE TOWED FROM THE TRAVEL LANE OF THE HIGHWAY. THE FORD DEALER THAT THE VEHICLE WAS TOWED TO STEVENS FORD IN MILFORD CT CLAIMS THAT THERE IS A OPEN WIRE IN THE DASHBOARD WIRING.	
744226	FORD MOTOR COMPANY	2001 F150	1FTZP17Z31NA76203	17-Apr-01	18-Apr-01			0	INOPERATIVE		N	ENGINE	MILFORD	CT	4500	ENGINE STALLS INTERMITTENTLY DURING NORMAL OPERATION WHILE TRAVELING AT ANY SPEED. DEALERSHIP HAS BEEN UNABLE TO REPRODUCE PROBLEM AND IDENTIFY THE CAUSE. PLEASE PROVIDE ANY ADDITIONAL INFORMATION / DOCUMENTATION. *AK WHILE TRAVELING ON THE INTERSTATE AT APPROX 80 MPH THE ENGINE SHUT OFF AND THE DASHBOARD GAGES AND ODOMETER WENT BLANK. I WAS NOT ABLE TO RESTART THE ENGINE AND THE VEHICLE HAD TO BE TOWED FROM THE TRAVEL LANE OF THE HIGHWAY. THE FORD DEALER THAT THE VEHICLE WAS TOWED TO STEVENS FORD IN MILFORD CT CLAIMS THAT THERE IS A OPEN WIRE IN THE DASHBOARD WIRING.
200204			Zero reports													

EA02-027-G 75760

CR# No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident	Injured	FAULT	Fin Part Name	City	State	Miles	Summary
2001MY														
863789	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04121K67826	31-Mar-01	12-Apr-01	N		ERRATIC OPERATION POOR PERFORMANCE	ENGINE	CHARLESTON	PA	11000	<p>BRAKE LIGHT CAME ON DASHBOARD. ALSO VEHICLE JUST SHUTDOWN WITHOUT PRIOR WARNING. WHEN CONSUMER APPLIED BRAKES PEDAL WAS NORMAL. SHE TOOK VEHICLE TO DEALERSHIP. MECHANIC TOLD HER SHE NEEDED A MASTER CYLINDER. *AK</p> <p>ENGINE SHUT OFF WHILE DRIVING DOWN A HILL HAS HAPPENED TO ME FOUR TIMES THIS WEEK. CAUSED LOSS OF POWER-ASSISTED BRAKES AND STEERING. VEHICLE PUT IN DEALER SHOP ON 4/22/01. NO REPAIRS MADE BECAUSE DEALER COULD NOT DUPLICATE THE PROBLEM IN THE SHOP.</p>
742710	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03141K62800	2-Apr-01	8-Apr-01			INOPERATIVE	ENGINE	TALLAHASSEE	FL	2120	<p>DRIVING DOWN A BUSHY STREET DOWN A SLIGHT GRADE ABOUT 48 MPH THE CAR SUDDENTLY DIED. I HAD TO PULL OVER TO THE SIDE OF THE ROAD. I WAITED A COUPLE OF MINUTES AND IT RESTARTED. THERE WAS NO INDICATION OF ANY PROBLEM PRIOR TO THIS *AK</p>
742983	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04111K60281	12-Apr-01	12-Apr-01			INOPERATIVE	ENGINE	CHESTERFIELD	MO	350	<p>WHILE DRIVING AT 45MPH SUDDENLY VEHICLE STALLED OUT FOR NO REASON IN MIDDLE OF TRAFFIC. THIS WAS SECOND TIME IT HAS HAPPENED. WAS AT A STOP SIGN WHEN STALLING FIRST</p>
888311	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04191K67819	10-Apr-01	15-May-01	N		DESIGN	ENGINE	COAL TOWNSHIP	PA	2000	<p>THIS *AK *AL</p> <p>VEHICLE STALLED WITHOUT WARNING WHILE DRIVING @ 30MPH. THIS HAS HAPPENED SEVERAL OTHER TIMES ON THE ROAD. DEALER HAS PERFORMED REPAIRS 3 OTHER TIMES AS FOLLOWS: VISIT 1 - CHANGED FUEL PUMP RELAY VISIT 2 - CHANGED ECM MODULE RELAY VISIT 3 - REPLACED FUEL</p>
744617	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03121K68896	16-Nov-01	16-Nov-01			INOPERATIVE	ENGINE	AUSTIN	TX	8180	<p>VEHICLE STALLED AGAIN. THIS IS 4TH TIME VEHICLE HAS STALLED WHILE DRIVING. VEHICLE HAS ALREADY BEEN IN FOR REPAIR 3 TIMES WITHOUT ANY SUCCESSFUL FIX. TRAVELLING 30MPH NO A/C STALLED WITHOUT WARNING. LOST ALL POWER AND BRAKING. FORD DONT GIVE CUSTOMER RESPON</p>
754921	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU03121K68889		27-Nov-01			INOPERATIVE	ENGINE	AUSTIN	TX		<p>WHILE DRIVING AT ANY SPEED VEHICLE COMPLETELY SHUTDOWN WITHOUT WARNING CAUSING LOSS OF POWER BRAKES AND STEERING CONTROL. NEARLY CAUSING A COLLISION. DEALER REPLACED ENGINE WHICH HAS NOT CORRECTED THE PROBLEM. PLEASE GIVE ME ANY FURTHER DETAILS. *AK</p>
862428	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04131K68807		15-Jul-01	N		ERRATIC OPERATION POOR PERFORMANCE	ENGINE	LITTLE FERRY	NJ		<p>TOTAL AND COMPLETE LOSS OF POWER AND ALL ELECTRICAL SYSTEM WHILE CAR IS BEING OPERATED ON BUSY ROADS</p>
748630	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04131K68126	2-Nov-90	6-Jul-01			ERRATIC OPERATION POOR PERFORMANCE	ENGINE	COCHRANVILLE	PA	828	<p>WHILE DRIVING AT ABOUT 30-40 MPH THE ENGINE JUST QUITS. ONCE I COME TO A ROLLING STOP I HAVE TO TURN THE CAR OFF AND RESTART IT. THIS IS THE SECOND TIME THIS HAS HAPPENED. *AK</p>
748727	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04191K68886	6-Jun-01	12-Jun-01			INOPERATIVE	ENGINE	KNOXVILLE	TN		<p>D. HAPPENED *AK</p>

EA02-027-G 75761

DOT No.	Manufacturer	Model Yr/Model	Vin	Follow Date	Letter Date	Accident	Injured	Fault	Prp Part Name	City	State	Miles	Summary	
881739	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU041851925108	1-Nov-01	2-MAR-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE		UTICA PA 3	WHILE DRIVING DOWN HILL VEHICLE STALLED WITHOUT PRIOR WARNING CAUSING LOSS OF ALL POWER STEERING AND BRAKING ABILITY. CONSUMER HAS CONTACTED DEALER. DEALER NOT WILLING TO PROVIDE ANY ASSISTANCE. AK CONSUMER STATES ANOTHER DEALER REPAIRED VEHICLE BY
747822	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04101K89198	28-Jun-01	30-Jun-01			0	INOPERATIVE	N	ENGINE		KING OF PRUSSIA PA 117	WHILE DRIVING 35-40 MPH ON LEVEL ROAD ENGINE SHUTDOWN, POWER STEERING LOST, POWER ASSIST BRAKING LOST. 3 0 OCCURRENCES SAME SITUATION SAME ROAD & APPROXIMATE LOCATION AND TIME OF DAY; THIS IS THE SECOND VEHICLE TO WHICH THIS HAS HAPPENED; DEALER HAS VEHIC
748829	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04111K891915		12-MAR-01			0	ERRATIC OPERATION POOR PERFORMANCE		ENGINE		STUARTS DRAFT VA 0	PROBLEM. THIS IS THE
748174	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04121K89187	9-JUN-01	15-JUN-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE		WAVERLY NY 1649	ENGINE SHUT OFF WHILE DRIVING DOWN A HILL WITHOUT PRIOR WARNING LOSS OF POWER STEERING AND POWER BRAKES. PULLED OVER AND SHUT CAR OFF. WHEN I RESTARTED IT IT SEEMED TO WORK OK. TOOK IT TO THE GARAGE AND THEY SAID IT WAS RUNNING VERY HOT. CALLED FORD AND THEY
748837	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU03211K89174	14-JUN-01	17-JUN-01			0	DESIGN	N	ENGINE		DALLAS TX 15120	OUR CAR SPORADICALLY STALLS WHEN COASTING TO A STOP. CHANGING GEARS FROM DRIVE TO REVERSE AND WHEN GOING OVER ANY SMALL BUMP IN THE ROAD. WE'VE TAKEN IT TO THE DEALER FOR REPAIR BUT THEY CLAIM THAT THEY'RE NOT ABLE TO REPLICATE THE PROBLEM. IT'S BEEN TO
748708	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04021K892099		3-Aug-01			0	ERRATIC OPERATION POOR PERFORMANCE		ENGINE		SCHUYLKILL HAVEN PA 0	DRIVE DOWN A HILL AT APPROXIMATELY 30 MPH - ENGINE AND OIL LIGHT WENT ON. LOSS OF POWER AND CAR DID NOT APPEAR TO BE GETTING ANY GAS. CAR
748672	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04111K893558		30-MAR-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE		CAMP HILL PA 0	VEHICLE CONTINUES TO STALL OR ALMOST STALL AT STOP OR IN SLOW MOVING TRAFFIC. HAS BEEN TO AN AUTHORIZED DEALER TWICE NOW TO NO AVAIL. IS CURRENTLY AT DEALER FOR THE THIRD TIME. (TIRE CLICKING
748888	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04111K891789		2-Aug-01			0	INOPERATIVE	N	ENGINE		ORSHAN MA 0	ENGINE HAS SHUT OFF 3 TIMES WHILE DRIVING SINCE CAR BOUGHT & WORKS AFD. ALWAYS ON HILLY CURVEY ROADS. DRIVING 35-40 MPH COASTING AND BRAKING LIGHTLY. CHECK ENGINE LIGHT COMES ON, POWER STEERING AND BRAKES GO. HAVE TO MUSCLE CAR TO

EA02-027-G 75762

Order No.	Manufacturer	Model Yr	Model	Vin	Failure Date	Last Date	Assistant	Report	Fig#	File Part Name	City	State	Mile	Summary		
748525	FORD MOTOR COMPANY	2001	ESCAPE	1FMFU041181K810C	2-Aug-01	4-Aug-01		0		ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	WAPWALLOPEN	PA	5200	OVER A PERIOD OF 2 MONTHS THE CAR LOST ALL POWER DURING THE AMORIVE TO WORK THIS OCCURRED ON THREE SEPARATE OCCASIONS ALMOST EXACTLY 7 MILES FROM MY HOME GOING 30-35 MILES PER HOUR DURING EACH OCCURRENCE CAR JUST LOSTES ALL POWER AS WELL AS BRAKES
894180	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K7179J	18-Jun-01	18-Aug-01	N	0		ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	RENSSELAER	NY	6187	WHILE DRIVING ENGINE STALLED AND OIL LIGHT ILLUMINATED CONSUMER CHECKED OIL LEVEL AND IT WAS AT THE NORMAL LEVEL. S/C
750043	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K820277		8-Aug-01		0		INOPERATIVE		ENGINE	CHESTERFIELD	MD	0	STALLED WHILE TRAVELING 35 MPH TWO SEPARATE TIMES. CANT FIND PROBLEM.
750043	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K820277		8-Aug-01		0		INOPERATIVE		ENGINE	CHESTERFIELD	MD	0	STALLED WHILE TRAVELING 35 MPH TWO SEPARATE TIMES. CANT FIND PROBLEM.
852227	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K8141B	18-Jul-01	24-Jul-01		0		INOPERATIVE	M	ENGINE	SEAM	FL	0	WHILE DRIVING VEHICLE STALLED WHICH WAS THEN TOWED TO DEALERSHIP. CONSUMER WAS THEN INFORMED THAT THE PROBLEM COULD NOT BE DUPLICATED TO
752018	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4121K057131	7-Sep-01	10-Sep-01		1		INOPERATIVE	N	ENGINE	RALEIGH	NC	11224	THE SUV WAS PURCHASED NEW IN MID-DECEMBER 2000. ON 07/07 I WAS SLOWING DOWN ON A DOWNHILL SLOPE TO MAKE A RIGHT TURN WHEN THE SUV SHUT ITSELF OFF AND THE STEERING COLUMN LOCKED UP. IT HAD 1/2 TANK OF GAS. I SHIFTED THE AUTOMATIC INTO PARK, TURNED THE
752210	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K8141B	17-Jun-01	16-Sep-01		0		DESIGN	N	ENGINE	GREER	SC	2480	8 MILES OLD VEH, 4700 MILES; ENGINE HAS STALLED ON 3 SEPARATE OCCASIONS (MID-JUN, MID-JUL, EARLY SEP) WHILE TRAVELING AT 45 MPH; ORIGINAL DEALER COULD PROVIDE NO SOLUTION; CURRENTLY BEING EVALUATED AT 2ND LOCAL DEALER; SEEKING GUARANTEED RESOLUTION; REPLACE
752285	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4101K03402	15-Sep-01	18-Sep-01		0		DESIGN	N	ENGINE	OHAMA	NE	0	ENGINE HAS STALLED FOUR TIMES IN BUSY TRAFFIC IN THE PAST TEN MONTHS. DEALER CANNOT DUPLICATE PROBLEM. OK
753411	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K04619	18-Aug-01	20-Sep-01		0		ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	STEVENS	PA	3100	ON 2 OCCASIONS ENGINE SHUT OFF WHILE COASTING AT 35MPH. OK WHILE COASTING DOWN SLIGHT GRADE AT 35 MPH ENGINE SHUTS OFF WITH NO WARNING STOPPED ON SIDE OF ROAD (REQUIRED GREAT EFFORT TO STEER AND BRAKE) WAS ALMOST REAR-ENDED BY FOLLOWING VEHICLES. PUT CAR IN PARK AND RESTARTED W/O ANY
753857	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4181K03862	22-Sep-01	24-Sep-01		0		ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	MAON	GA	445	PROBLEM IN ENGINE. 80UNB. VEHICLE HAS STALLED TWICE ONCE AT 30 MPH AND SECOND TIME AT 45 MPH. DEALER FOUND NO PROBLEM FIRST TIME SECOND TIME DEALER REPROGRAMMED COMPUTER. OK
887180	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4121K815282	16-Aug-01	2-Oct-01	N	0		INOPERATIVE	N	ENGINE	THORNTON	PA	5400	1) ON TWO OCCASIONS THE CAR'S ENGINE SHUT OFF WHILE IN TRAFFIC. I TOOK THE CAR BACK TO THE DEALER AFTER BOTH INCIDENTS. THE DEALER WAS NICE ENOUGH TO LOOK AT THE CAR RIGHT AWAY ON BOTH OCCASIONS. THE FIRST TIME THE TOLD ME THAT FORD WAS AWARE OF THE PRO
702094	FORD MOTOR COMPANY	2001	ESCAPE	1FMFLD4131K81882	25-Sep-01	28-Sep-01		0		ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	THORNTON	PA	6400	AWARE OF THE PRO

OCI No	Manufacturer	Model Yr.	Model	Via	Failure Date	Letter Date	Accident Involved	Failure	Prob. Part Name	City	State	Summary
697332	FORD MOTOR COMPANY	2001	ESCAPE	PLEASE FILL IN	1-Sep-01	4-Oct-01	N	ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	UNION CITY	PA	10400 INTERMITTENTLY VEHICLE WOULD STALL WHILE DRIVING AT ANY SPEED. THEN VEHICLE WOULD RESTART. VEHICLE BEEN TO DEALER AND THEY COULD NOT DUPLICATE. PROBLEM FEEL FREE TO PROVIDE ANY FURTHER INFORMATION. *AK
697334	FORD MOTOR COMPANY	2001	ESCAPE	FILL IN	4-Oct-01	10-Oct-01	N	DESIGN	N ENGINE	DRIVERS	MA	5300 ENGINE WOULD STALL WHILE DRIVING AT 35MPH. WOULD HAVE NO WARNING OF ANY PROBLEMS. HAD LOST POWER BRAKES AND STEERING. HAD TO USE EMERGENCY BRAKES TO STOP VEHICLE. HAD HAPPENED ONCE BEFORE. WILL BE TAKING VEHICLE TO DEALERSHIP. *AK
732749	FORD MOTOR COMPANY	2001	ESCAPE	1FACU03181N8621	24-Sep-01	30-Sep-01	0	INOPERATIVE	N ENGINE	CHARLOTTE	NC	9700 OVER A PERIOD OF FOUR MONTHS MY FORD ESCAPE HAS LOST ALL POWER WHILE DRIVING IN THE AM TO WORK. IT WAS VERY DIFFICULT TO HANDLE THE CAR WHEN IT LOST ALL POWER BECAUSE OF THE LOSS OF POWER STEERING. THE FIRST OCCURRENCE HAPPENED FIVE DAYS AFTER I PURCHASED
753077	FORD MOTOR COMPANY	2001	ESCAPE	1FACU04181KA7917	4-Oct-01	10-Oct-01	0	ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	GREEN	SC	8200 ENGINE STALLS WHILE TRAVELING. OCCURRED ONCE EACH IN JUNE JULY SEPT AND OCT. PRESUMED ELECTRICAL SHORT. COAST TO ROADSIDE COME TO COMPLETE STOP PUT IN PARK TURN KEY AND TAKE OFF AGAIN. LAST INCIDENT WAS SHORTLY AFTER EXITING INTERSTATE HIGHWAY - I 84
753080	FORD MOTOR COMPANY	2001	ESCAPE	1FACU04171KF0990	10-Oct-01	10-Oct-01	0	ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	BORDENTOWN	NJ	7387 *AK VEHICLE STALL BY BLOCK WHILE DRIVING.
853128	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04121KF6711	7-Sep-01	18-Sep-01	0	INOPERATIVE	N ENGINE	RALIEGH	NC	11245 WHILE DRIVING ON A DOWNHILL SLOPE THE VEHICLE SUDDENLY SHUT DOWN CAUSING LOSS OF POWER STEERING THE DRIVER WAS ABLE TO RESTART THE VEHICLE THE DEALER REPLACED A VALVE WHICH CONTROLLED AIR FLOW THE NEXT DAY THE PROBLEM OCCURED AGAIN WHEN GOING UP A HILL
753134	FORD MOTOR COMPANY	2001	ESCAPE	1FACU04181KE7785	1-Jan-01	12-Oct-01	0	ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	NORRISTOWN	PA	10000 DRIVING AROUND 40MPH AND CAR HAS STALLED THREE TIMES ON HILL NOW WITH LOSS OF STEERING AND BRAKES MOST RECENTLY ON 10/11/2001. FORD SAYS THEY DONT KNOW WHAT IS WRONG. *AK
753274	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04111KE7791	16-Sep-01	16-Oct-01	0	INOPERATIVE	N ENGINE	WEST GROVE	PA	12600 WHILE DRIVING VEHICLE COMPLETELY DIES. LOST ALL STEERING AND POWER TO THE VEHICLE WHILE DRIVING 45 MPH. THIS HAS HAPPENED 4 TIMES NOW AND HAS BEEN SEEN AT THE DEALER TWICE. THE DEALER IS UNABLE TO FIND ANYTHING AT ALL WRONG WITH THE VEHICLE. ALL PCU
753285	FORD MOTOR COMPANY	2001	ESCAPE	1FMYU04151K09282	22-Sep-00	18-Oct-01	0	ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	MARTINSVILLE	NJ	200 MY VEHICLE STALLS AT SPEEDS BETWEEN 40 AND 45 MPH GOING DOWNHILL. IT STARTS RIGHT UP AND THE ON-BOARD COMPUTER DOESNT STORE ANY INFORMATION. I TOOK IT TO A DEALER FOR REPAIRS 6 TIMES WITH THIS PROBLEM BUT THEY DONT SEEM TO BE ABLE TO DUPLICATE THE PR
88454	FORD MOTOR COMPANY	2001	ESCAPE	ATD	24-Oct-01	30-Oct-01	N	ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	TRUBEVILLE	AL	30000 VEHICLE STALLED WHILE DRIVING 40 MPH. DEALER COULD NOT FIND CAUSE. *AK

COI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Repair Date	Accident	Injured Party	Prob. Part Name	Qty	State	Miles	Summary
759452	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U041B1K8062E	25-Sep-01	20-Oct-01	N		D INOPERATIVE	N	OH	11000	ON FOUR OCCASIONS VEHICLE EXPERIENCED ENGINE STALLING WHILE DRIVING AT 25 MPH OR LOWER SPEED. VEHICLE TAKEN TO DEALER SHOP AND INFORMED CONSUMER THAT THEY WERE UNABLE TO DUPLICATE THE PROBLEM. *AK *SLC
80880	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U041B1K734	2-Nov-01	2-Nov-01	N		D ERRATIC OPERATION POOR PERFORMANCE	N	OH	11	WHILE TRAVELING AT 20MPH CONSUMER SLOWED DOWN AND WHEN TRYING TO SPEED UP VEHICLE STARTED TO LOSE POWER. *AK
753777	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U041B1K2447	22-Aug-01	20-Oct-01			D DESIGN	N	OH	7000	ENGINE STALLED WHILE GOING DOWNHILL. POWER BRAKES AND STEERING WENT OUT SO VERY HARD TO CONTROL ON AN INCLINE. SEEMS TO BE A COMMON PROBLEM WITH THE EXACT SAME SITUATIONS WITH THIS VEHICLE. VEHICLE STALLED WHILE ON A SLIGHT INCLINE. POWER STEERING AND BRAKES LOST POWER. SECOND TIME IT HAS HAPPENED WITHIN A FEW MONTHS. VERY DANGEROUS AND COULD CAUSE A BAD ACCIDENT. TAKING TO DEALER SOON ALTHOUGH THEY CLAIM TO NEVER HAVE HEARD ANYTHING LIKE
754478	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U041B1K2447	7-Nov-01	13-Nov-01			D ERRATIC OPERATION POOR PERFORMANCE	N	OH	9400	WHILE DRIVING DOWN THE INTERSTATE AT AROUND 20 MPH THE VEHICLE MADE A CLUNKING NOISE AND THE ENGINE STOPPED. THIS ALL HAPPENED WITHIN 30 SECONDS. I WAS ABLE TO COAST OVER TO THE SIDE OF THE ROAD WITHOUT INCIDENT. THE PROBLEM WAS A SEIZED ENGINE. *AK AND FORD
753878	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U041B1K6175	27-Oct-01	1-Nov-01			D LOCKS UP STICKS GRASS	N	VT	800	THE ENGINE ON MY FORD ESCAPE STALLED WHILE ACCELERATING ON THE ON-RAMP TO ENTER A HIGHWAY GOING APPROXIMATELY 60 MPH. I HAVE NOW DISCOVERED THIS IS A COMMON PROBLEM WITH FORD ESCAPES AND HOPE THE MANUFACTURER WILL TAKE STEPS TO CORRECT IT. IT CAN BE A THE ENGINE LIGHT COMES ON DUE TO UNKNOWN ENGINE PROBLEM AND THE VEHICLE HAD BEEN AT DEALER FOUR TIMES. *YH
754222	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U041B1K6870	2-Nov-01	8-Nov-01			D ERRATIC OPERATION POOR PERFORMANCE	N	OK	13000	CONSUMER STATES THAT THE VEHICLE SHUTS ITSELF OFF WITHOUT WARNING CAUSING THE STEERING COLUMN TO LOCK UP AND THE CHECK ENGINE LIGHT TO ILLUMINATE. DEALER REPAIRED THE AIR VALVE. AFTER LEAVING REPAIR SHOP VEHICLE SHUTS OFF AGAIN AND THE ENTIRE DASHBOARD
863778	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U0421K97118		23-Dec-01			D ERRATIC OPERATION POOR PERFORMANCE	N	NC		MY FORD ESCAPE HAS STALLED 3 TIMES IN THE LAST 7 MONTHS. I AM TO THE POINT WHERE I AM AFRAID TO DRIVE IT. *AK
863720	FORD MOTOR COMPANY	2001	ESCAPE	1FM3U0421K97118		15-Oct-01			D STALLS	N	NC		TWICE THIS STALL ALMOST CAUSED AN ACCIDENT. DUE TO LOSS OF POWER BRAKES WE ALMOST REBANDERED THE CAR IN FRONT OF US THE FIRST TIME AND THE SECOND TIME WE NEARLY WENT OFF THE ROAD INTO SOMEONES YARD - ACROSS DOUBLE YELLOW LINE ON A
754873	FORD MOTOR COMPANY	2001	ESCAPE		16-Nov-01	16-Nov-01			D ERRATIC OPERATION POOR PERFORMANCE	N	SC	5800	TWICE THIS STALL ALMOST CAUSED AN ACCIDENT. DUE TO LOSS OF POWER BRAKES WE ALMOST REBANDERED THE CAR IN FRONT OF US THE FIRST TIME AND THE SECOND TIME WE NEARLY WENT OFF THE ROAD INTO SOMEONES YARD - ACROSS DOUBLE YELLOW LINE ON A
754827	FORD MOTOR COMPANY	2001	ESCAPE		26-Oct-01	26-Nov-01			D ERRATIC OPERATION POOR PERFORMANCE	N	CT	8000	BACKROAD - BECAUSE OF

QDI No.	Manufacturer	Model Yr.	Model	Vin	Failure Date	Lease Date	Accident	Injured	First	Frq.	Prod Name	City	State	Miles	Summary		
68880	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04101R07081	24-Sep-01	20-Nov-01			0	ERRATIC OPERATION	POOR PERFORMANCE	ENGINE	OMAHA	NE	3400	CONDION PROBLEM WITH ENGINE STALLING WHILE TRAVELING 30 ON MORE MPH. VEHICLE BEEN IN DEALER SHOP ON THREE OCCASIONS AND COULD NOT DUPLICATE OR CORRECT THE PROBLEM. PLEASE FREE TO PROVIDE ANY FURTHER INFORMATION OR DETAILS CONCERNING THIS MATTER. THANK	
735138	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04191K02795	2-Nov-00	20-Apr-01			0	ERRATIC OPERATION	POOR PERFORMANCE	N	ENGINE	MERILETO	WA	2250	CAR STALLED HAS DONE SO TWICE WHILE DRIVING DOWN ROAD. THIS HAS OCCURRED 4 TIMES. VEHICLE HAS BEEN WORKED ON BY DEALER TO ATTEMPT TO SOLVE THIS PROBLEM ALL 4 TIMES. CAR MUST BE PULLED OFF OF ROAD IF (POSSIBLE) AND RESTARTED. THE LAST TIME THIS O.
76204	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04161K01371	25-Nov-01	3-Dec-01			0	DESIGN		N	ENGINE	PICKENS	SC	650	WHILE DRIVING 30 MPH VEHICLE STALLED LOST POWER STEERING AND BRAKING ABILITY. CONSUMER USED PARK BRAKE TO STOP VEHICLE. ALSO ON DECEMBER 7 2001 AT 30 MPH VEHICLE STALLED AGAIN. CONSUMER UNABLE TO STOP VEHICLE DUE TO NO BRAKING ABILITY AND REARENDED.
800381	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04111K0850	5-Dec-01	11-Dec-01	Y		0	ERRATIC OPERATION	POOR PERFORMANCE	ENGINE	LONG VALLEY	NY	800	I BROUGHT MY VEHICLE NEW 000N 08/18/01 AS A DEMO W/ 6500 MILES. ON 10/22/01 MY VEHICLE STALLED FOR NO REASON ON MY WAY TO WORK. I WAS GOING SLOWLY DOWNHILL (NOT THAT STEEP OF A HILL) AT APPROX 35MPH. I LOST POWER & MY CHECK ENGINE OIL & BATTERY LIGHT.	
75548	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU041X1K0804	22-Oct-01	8-Dec-01			0	ERRATIC OPERATION	POOR PERFORMANCE	N	ENGINE	SUMANTE	GA	8100	VEHICLE STALLED WITHOUT WARNING WHILE DOING 30MPH ON A DOWNHILL GRADE. WILL BRING IT IN FOR SERVICE. MANY SIMILAR STALL EVENTS HAVE BEEN REPORTED BY ESCAPE OWNERS ON INTERNET SITES SUCH AS HTTP://WWW.ESCAPECENTRAL.COM . THIS IS A SAFETY ISSUE. PLEASE OREG.
75992	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04171K02673	10-Dec-01	10-Dec-01			0	ERRATIC OPERATION	POOR PERFORMANCE	N	ENGINE	EVERANK	CA	2000	VERY DANGEROUS STALLING AT HIGH SPEED. LOSS OF CONTROL. FORD UNABLE TO FIX. THANK
75993	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04121K08884	24-Dec-01				0	ERRATIC OPERATION	POOR PERFORMANCE	N	ENGINE	PHILADELPHIA	PA		MY OBSERVATION OF WHEN IT OCCURS IS USUALLY WHEN GOING 30 MPH FOR A NUMBER OF MILES. MAKE A TURN THEN GO DOWNHILL WITH THE HEATER ON FULL SPEED. ABOUT HALFWAY DOWN THE HILL THE IGNITION ROCKS OUT AND I MUST PULL OVER AND RESTART THE ENGINE. THIS HAS HAP
76602	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04111K0858	20-Dec-01	14-Jan-02			0	DESIGN		N	ENGINE	SHOQUALLE	WA	13231	THE ENGINE STALLED AGAIN IN SEPTEMBER OF 2001. I WAS GOING APPROXIMATELY 25MPH WHEN IT STALLED AND HAD TO PULL THE EMERGENCY BRAKE TO GET THE VEHICLE TO STOP. THE VEHICLE WENT SIDEWAYS AND THE VEHICLE BEING BARELY AVOIDED HITTING ME. THE DEALERSHIP
757141	FORD MOTOR COMPANY	2001	ESCAPE	1FMUJ03171K01893	30-Nov-01	21-Jan-02			0	ERRATIC OPERATION	POOR PERFORMANCE	N	ENGINE	HOOVER	AL	2700	ENGINE STALLED WHILE DRIVING APPROXIMATELY 25 TO 40 MPH ON 27-JUN-2002. DEALERSHIP EXAMINED VEHICLE FOR FIRST INCIDENT AND WAS UNABLE TO DETERMINE A CAUSE FOR PROBLEM. VEHICLE HAS NOT BEEN EXAMINED FOR 4000 SECOND INCIDENT. PLEASE ADVISE
8003186	FORD MOTOR COMPANY	2001	ESCAPE	1FMCU04111K0850	27-Nov-01	28-Jan-02			0	ERRATIC OPERATION	POOR PERFORMANCE	ENGINE	MARSHALL	OH	4000	SECOND INCIDENT. PLEASE ADVISE	

CCF No.	Manufacturer	Model Yr./Model	Vin	Failure Date	Last Date	Ambient (Injured) Fault	Part Name	City	State	Miles	Summary
8003230	FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04181K87330	26-Jan-02	30-Jan-02	D ERATIC OPERATION POOR PERFORMANCE	ENGINE	BRENTWOOD	CA	1800	VEHICLE STALLS INTERMITTENTLY. DEALER HAS BEEN CONTACTED BUT IS UNABLE TO LOCATE SOURCE OF PROBLEM. PLEASE PROVIDE FURTHER DETAILS. *AK
767648	FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04181K87330	29-Jan-01	30-Jan-02	D ERATIC OPERATION POOR PERFORMANCE	N ENGINE	BRENTWOOD	CA	800	VEHICLE EXPERIENC ENGINE SHUT CONDIT WITHOUT WARNING. IMMEDIATELY AFTER STARTS M.T. FOUR SUCH INSTANCES HAVE OCCURRED SINCE THE CAR WAS PURCHASED 7 MONTHS AGO. VEHICLE TAKEN TO FORD AFTER EACH OCCURRENCE.
767611	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU01181K80827	31-Jan-02	31-Jan-02	D DESIGN	N ENGINE	QUILBERT	MS	14277	CAR WILL NOT START APPROXIMATELY 8 TIMES AND STALLED WHILE DRIVING ONE TIME. BRAKES LOCKED TWO TIMES STEERING WHEEL LOCKS EVERY TIME ALL LIGHTS ON THE DASH COME ON. *AK
767612	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04181K85775	16-Oct-01	31-Jan-02	D ERATIC OPERATION POOR PERFORMANCE	N ENGINE	HEWITT	NJ	1800	STALLING OCCURS WITHOUT WARNING. HAS OCCURRED ON A BRIDGE. I MUST COAST ACROSS BRIDGE. PULL OVER AND RESTART THE CAR. *AK
767627	FORD MOTOR COMPANY	2001 ESCAPE	1FMCU04181K82889	30-Jan-02	1-Feb-02	D DESIGN	N ENGINE	RAYVILLE	NY	18758	ON WED. EVENING JAN. 30 2002 AT 8:00 PM I WAS DRIVING MY 2001 FORD ESCAPE HOME FROM THE NICKSVILLE RAILROAD STATION WHILE DRIVING AT 80 MPH ON ROUTE 108 THE VEHICLE TURNED ITSELF OFF WITH NO WARNING OF ANY KIND. FORTUNATELY I WAS ABLE TO GET OFF TO THE
767631	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04121K82813	2-Dec-01	1-Feb-02	D DESIGN	N ENGINE	ELIZABETH	PA	8000	SEVERAL INCIDENTS OF VEHICLE STALLING WHILE DRIVING. 1ST INCIDENT OCCURRED WHEN ROUNDING A BEND AND GOING DOWN A SLIGHT GRADE. WAS ABLE TO PULL OFF ROAD AND RESTART VEHICLE. 2ND OCCURRENCE WHEN DRIVING DOWN SLIGHT GRADE. WAS NOT ABLE TO PULL OFF ROAD AND
748298	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU04181K82829	26-Jul-01	26-Jul-01	D FLOODS LEAKS	N FUEL/FUEL INJECTION	BYE BERRY KILL HAVEN	PA	6138	TRAVELING AT APPROXIMATELY 28MPH - CAR DID NOT SHUT OFF BUT LOST STEERING AND BRAKES. FROM TIME TO TIME THERE IS A GAS ODOR COMING FROM AIR VENTS. ALSO IN THE MORNING VEHICLE HEATERS WHEN PULLING OUT FROM A STOP SIGN. CAR WAS TOWED TO LOCAL FOR
766890	FORD MOTOR COMPANY	2001 ESCAPE	1FMCU03111K82705	8-Dec-01	16-Dec-01	D ERATIC OPERATION POOR PERFORMANCE	N FUEL/FUEL INJECTION	INDIAN LOUISVILLE	NY	8000	WHEN DRIVING OR IDLING MY 2001 FORD ESCAPE HAS STALLED 7 TIMES IN THE PAST THREE WEEKS. THE AUTO HAS ONLY 8000 MILES. I FIRST TOOK IT TO THE FORD SERVICE SHOP WHO REPLACED THE AIR FLOW VALVE AND THE IDLE REGULATOR BUT THIS DID NOT SOLVE THE PROBLEM.
8003361	FORD MOTOR COMPANY	2001 ESCAPE	VIN NOT AVAILABLE	25-Jan-02	1-Feb-02	D ERATIC OPERATION POOR PERFORMANCE	FUEL/FUEL INJECTION	STY DACULA	GA	12100	AT HIGHWAY SPEED VEHICLES SUDDENLY DIED. DRIVER LOST BRAKES AND STEERING CONTROL. DRIVER COASTED TO SIDE OF ROAD. TOOK VEHICLE TO DEALER AND THEY REPLACED RELAY SYSTEM ONE MONTH LATER. PROBLEM REOCCURRED. DEALER STATED IT WAS THE PROCESEEN. PLEASE
764752	FORD MOTOR COMPANY	2001 ESCAPE	1FMYU02111K81108	18-Nov-01	20-Nov-01	D ENGINE RUNAWAY SLODDEN ACCELERATIONS	N FUEL/THROTTLE LINKAGE	KENT	WA	11000	VEHICLE STALLED FOUR TIMES AT SPEEDS RANGING FROM 10-40 MPH. LOST POWER STEERING AND BRAKES. VERY UNNerving AND SEEMS TO POSE A DANGEROUS THREAT. APPEARS FORD HAS NO FIX OR SOLUTION YET. *AK

CR No	Manufacturer	Model Yr	Model	VIN	Failure Date	Last Date	Accident	Injured	Part	Part Name	City	State	Mile	Summary
749601	FORD MOTOR COMPANY	2001	ESCAPE	1FMYL04181KE20578	24-Oct-01				0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE		<p>THRE HAVE BEEN MULTIPLE TIMES WHEN PULLING OUT OF A STREET THAT THE CAR COMES TO A STOP. THE RPM'S DIE OFF AND PRESSING THE GAS DOES NOTHING. LETTING OFF THE GAS SOMETIMES HELPS BUT IT JUST TAKES A SECOND FOR THE GAS TO WORK. THIS IS SCARY SINCE I</p> <p>PULB-THROTTLE LINKAGES AND CONTROL SOLENOID VALVE SWITCH BRACKET</p> <p>HARBORCREER PA 01AH LB</p>
753177	FORD MOTOR COMPANY	2002	ESCAPE	1FMYL04182KA3795	12-Oct-01	13-Oct-01			0	LOCKS UP STICKS BRAES	N	ENGINE	331	<p>VEHICLE STOPPED RUNNING WHILE AT SPEED ON THE ROAD. DEALER DIAGNOSED PROBLEM AS A SEIZED ENGINE. THE 3.0 L V6 ENGINE IS GOING TO BE REPLACED. VEHICLE ONLY HAD 331 MILES ON IT. *AK</p>
896659	FORD MOTOR COMPANY	2002	ESCAPE	NOT AVAILABLE	9-Oct-01	31-Oct-01	N		0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	100	<p>VEHICLE WAS GOING 45MPH AND STALLED WITHOUT WARNING. CONSUMER HAD ONLY OWNED VEHICLE FOR 4 DAYS. DEALER COULDN'T FIND A CAUSE BUT KEPT IT TO INSPECT FURTHER AND GAVE CONSUMER A LOANER VEHICLE. *AK</p>
754987	FORD MOTOR COMPANY	2002	ESCAPE	1FMYL03182NB2562	26-Nov-01	27-Nov-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	184	<p>2002 ESCAPE STALLED WHILE COASTING 35-40 MPH DOWN HILL. ENGINE BATTERY AND OIL LIGHTS ILLUMINATED ON DASH. LOSS OF POWER STEERING AND BRAKES. VEHICLE STARTED UP IMMEDIATELY AFTER PLACING IN 'PARK' POSITION. DEALERSHIP TESTED VEHICLE AND FOUND NOTHING DU</p>
756287	FORD MOTOR COMPANY	2002	ESCAPE	1FMYL03182KA4363	11-Nov-01	4-Dec-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	2000	<p>NO SUMMARY LISTED FOR ABOVE VEHICLE. *AK</p>
899663	FORD MOTOR COMPANY	2002	ESCAPE	PLEASE FILL IN	19-Nov-01	7-Dec-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	2000	<p>ON TWO OCCASIONS ENGINE STALLED WHILE DRIVING DOWN HILL. DEALER HAS NOT BEEN ABLE TO DUPLICATE THE PROBLEM. PLEASE PROVIDE ADDITIONAL INFORMATION. *AK</p>
755570	FORD MOTOR COMPANY	2002	ESCAPE	1FMYL03182KA3836	23-Nov-01	8-Dec-01			0	LOCKS UP STICKS BRAES	N	ENGINE	1821	<p>WHILE ATTEMPTING TO PASS A CAR ON THE INTERSTATE. ENGINE DIED. THICK WHITE SMOKE ENGLTFED THE BACK WINDOW FROM THE EXHAUST. WAS MOMENTARILY UNABLE TO SEE ANYTHING IN BACK ON THE CAR. I LOST ALL POWER STEERING AND POWER BRAKES. I WAS ABLE TO MAKE IT</p>
755526	FORD MOTOR COMPANY	2002	ESCAPE	1FMYL04182KA1418	18-Oct-01	11-Dec-01			0	DESIGN	N	ENGINE	2000	<p>ENGINE CUT OFF WHILE TRAVELING 40-45 MPH. LOSS OF POWER STEERING AND POWER BRAKES. DASH LIGHTS ILLUMINATED. LUCKILY NO OTHER TRAFFIC WAS ON THE ROAD. I PUT THE VEHICLE IN 'PARK' AND IT STARTED RIGHT UP. DEALER HAS NO EXPLANATION FOR LOSS OF POWER BUT SEV</p>
755540	FORD MOTOR COMPANY	2002	ESCAPE	1FMYL03182KA1487	11-Dec-01	12-Dec-01			0	ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	1800	<p>ENGINE STALLED WHILE DRIVING DOWN HILL. WAS EITHER BRAKING OR DECELERATING BY LETTING UP ON GAS. CHECK ENGINE AIRBAG AND POSSIBLY OIL LIGHTS CAME ON. POWER STEERING AND BRAKES FAILED. WAS ABLE TO PULL OFF THE ROAD AND STOP VEHICLE WITH HAND BRAKE. SHE</p>

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QDI No.	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Receipt	Injured	Fault	Prob. Part Name	City	State	Mile	Summary
756546	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04128KA3785	10-Dec-01	12-Dec-01			D ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	RIVER EDGE	NJ	27	BRAND NEW 2002 FORD ESCAPE XLT AUTOMATIC 402 STALLED 8 TIMES DRIVING IT HOME FROM THE DEALER AFTER BUYING IT. LOST POWER STEERING AND BRAKE WRENDS AT OVER 35 MPH. DEALER DOES NOT KNOW WHAT THE SOLUTION TO THE PROBLEM IS AT ALL. "AK"
756784	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04128KA2821	14-Dec-01	17-Dec-01			D DESIGN	N ENGINE	OAKTON	VA	8400	2002 FORD ESCAPE XLT HAS NOW STALLED THREE TIMES RESULTING IN LOSS OF STEERING AND BRAKES-- HAVING INVESTIGATED THIS VEHICLE ON MY OWN IVE FOUND SEVERAL OTHER IDENTICAL CASES. FORD NEEDS TO FIND OUT WHAT IS CAUSING THESE FAILURES AND RECALL THESE VEHICLE
756274	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04128KA4585	1-Jan-02	1-Jan-02			D INOPERATIVE	N ENGINE	WOODBRIDGE	VA	2850	VEHICLE SUDDENLY AND UNEXPECTEDLY LOST POWER AND ENGINE FAILED WHILE OPERATING ON MAJOR WASHINGTON D.C. INTERSTATE. VEHICLE COULD NOT BE RESTARTED ALTHOUGH AMPLE POWER APPEARS TO BE AVAILABLE FOR ELECTRICAL DEMANDS. VEHICLE TOWED TO OWNERS HOME.
756923	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04128KA488M	1-Jan-02	10-Jan-02			D LOCKS UP STICKS GRABS	N ENGINE	WOODBRIDGE	VA	2980	ENGINE FAILED WHILE TRAVELING AT 60 MPH (IN CRUISE CONTROL) ON INTERSTATE HIGHWAY. DEALER DIAGNOSED PROBLEM AS SEIZED ENGINE. FAILURE WAS SUDDEN AND WITHOUT WARNING. "AK"
756737	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04128KA4884	11-Jan-02	12-Jan-02			D ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	ALBRIGHTSVILLE	PA	9800	WHILE DRIVING ENGINE SHUT DOWN COULD NOT RESTART. ENGINE WOULD TURN BUT NOT START. TOWED TO DEALER. DEALER INVESTIGATED PROBLEM. THEY DETERMINED THAT ONE OR MORE INTERNAL PARTS HAVE FAILED. NEW ENGINE TO BE INSTALLED. "AK"
554018	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU03132KA88MS	11-Nov-01	17-Jan-02			D STALLE	N ENGINE	MCLEAN	VA	2000	WHILE DRIVING AND WITHOUT WARNING VEHICLE STALLS. CONSUMER HAS TAKEN VEHICLE TO DEALER AND IS CURRENTLY WAITING FOR A NEW PART THAT MAY NOT CORRECT THE PROBLEM. "SLC"
8003484	FORD MOTOR COMPANY	2002	ESCAPE	N/A	1-Jul-02	4-Feb-02			D ERRATIC OPERATION POOR PERFORMANCE	ENGINE	STOCKBRIDGE	GA	1100	WHILE DRIVING AT 45-50 MPH VEHICLE WILL AUTOMATICALLY SHUT OFF ALL LIGHTS WENT OUT; HOWEVER LIGHTS ON DASHBOARD CAME ON, CONTACTED DEALER AND DEALER COULD FIND THE CAUSE. "AK"
8003897	FORD MOTOR COMPANY	2002	ESCAPE	FILL IN PLEASE	5-Jan-02	5-Feb-02			D ERRATIC OPERATION POOR PERFORMANCE	ENGINE	ALBURN	VA	1800	WHILE DRIVING APPROXIMATELY 40 MPH VEHICLE STALLED UNEXPECTEDLY CAUSING A LOSS OF POWER ASSISTED BRAKES AND STEERING. DEALERSHIP EXAMINED VEHICLE AND REPLACED AN UNKNOWN RELAY TO REMEDY THE PROBLEM. AFTER THE SERVICE WAS PERFORMED ENGINE STALLED.
757201	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04128KA2580	20-Oct-01	5-Feb-02			D ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	CHAIRMAN FALLS	OH	300	ON THREE OCCASIONS ABOUT TWO MONTHS APART STARTING IN OCT 2001 MY FORD ESCAPE STALLED WHILE DRIVING. IT HAS BEEN TO THE DEALER THE FIRST AND THIRD TIME. THE MOST RECENT BEING 2M/02. A "PO" HAS BEEN MADE BUT WHETHER THAT TAKES CARE OF THE PROBLEM REMA

DOI No.	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Code	Accident	Injured	Fault	Eng. Part Name	City	State	Map	Summary
757701	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04132KAD8A28	4-Feb-02				D ERRATIC OPERATION POOR PERFORMANCE	ENGINE	DOBSON	NC		AT 48 MPH THE ENGINE STALLED OUT. I HAD TO PULL OFF THE ROAD AND RE-START THE ENGINE. LOSS OF POWER TO MAJOR COMPONENTS. IF I HAD SEEN 100 FEET FURTHER DOWN THE ROAD A MAJOR ACCIDENT WOULD HAVE OCCURRED DUE TO 90 DEGREE TURN. SELLING DEALER HAS BEEN CONVI
786232	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04142KB0318	25-Jan-02	14-Feb-02			D DESIGN	N ENGINE	COLLIERIA STATION	OH	000	I WAS DRIVING @ ABOUT 40 MPH ON SAT 1-28-2002 WHEN THE ENGINE STOPPED AND THE DASH LIGHTS FOR THE ENGINE AND OIL CAME ON. I COASTED TO A STOP AND TURNED OFF THE HEATER, RADIO, AND IGNITION AND PUT THE CAR IN PARK. IT STARTED AGAIN BUT I WAS CONCERNED
758412	FORD MOTOR COMPANY	2002	ESCAPE	1FMYU04182K02109	12-Feb-02	18-Feb-02			D ERRATIC OPERATION POOR PERFORMANCE	N ENGINE	PITTSBURGH	PA	852	ENGINE STALLED WHILE GOING DOWN HILL DUE TO LOW RPM AFTER ACCELERATION STOPPED AND FOOT TAKEN OFF OF THE GAS PEDAL. LOSS OF POWER STEERING AND POWER BRAKES AFTER STALL. STARTED RIGHT BACK UP IN NEUTRAL GEAR

EA02-027-G 75770

CDI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Letter Date	Accident	Injured	Fault	File Part Name	City	State	Miles	Summary
2001MY		ESCAPE 2.0L												WHILE ACCELERATING TO 65 MPH VEHICLE WILL STALL UNEXPECTEDLY IN TRAFFIC. DEALERSHIP HAS BEEN IN POSSESSION OF VEHICLE FOR TWO WEEKS. DEALER PERFORMED EXTENSIVE ROAD TESTING AND WAS ONLY ABLE TO VERIFY STALLING CONCERN ONCE. STILL UNABLE TO DETERMINE CA.
887242	FORD MOTOR COMPANY	2001	ESCAPE	1FM1YUD1B91KBM4830	15-Jul-01	2-Oct-01	N		0 STALLS	N ENGINE	DAKLAND	CA	1600	
887352	FORD MOTOR COMPANY	2001	ESCAPE	1FM1JUC1B91KBM4050	1-May-01	3-May-01	N		0 INOPERATIVE	N ENGINE	LEBANON	OH	5400	TIRES MAKE A HUMMING NOISE. CONSUMER FEELS THAT THEY MAY BE LEAVING GROUND LIKE HYDROPLANING. AND AT 68 MPH VEHICLE WOBLES. VEHICLE IS NOT STABLE AT HIGH SPEEDS WITH WINDOW DOWN. *AK THE VEHICLE HERBITATES WHEN A/C UNIT IS IN OPERATION AND A/C MAKE
2002MY - zero reports														

EA02-027-G 75771

ODI No	Manufacturer	Model/Yr	Model	VIN	Failure Date	Repair Date	Accident	Injured	Part	City	State	Mileage	Summary
2000 NY													
861754	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	4-Nov-00	11-Nov-00	N		0 DESIGN	FT BRAGG	NC		CONSUMER BOUGHT VEHICLE BRAND NEW. VEHICLE STALLED ANYWHERE WITHOUT PRIOR WARNING. ALSO ENGINE CHECK LIGHT CAME ON THE DASHBOARD. CONSUMER TOOK VEHICLE TO THE DEALER SHIP. *AK
862503	FORD MOTOR COMPANY	2000	TAURUS		4-May-00	25-May-00	N		0 INOPERATIVE	CHARLOTTE	NC		WHILE DRIVING DOWN THE ROAD VEHICLE WILL SHUT OFF IN THE MIDDLE OF THE ROAD. TOOK VEHICLE TO DEALER AND THEY REPLACED BURNED OUT STARTER BUT CANT DUPLICATE THE PROBLEM. *AK
863349	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	1-Jul-00	6-Jun-00	N		0 INOPERATIVE	FORT BRAGG	NC	840	WHILE DRIVING ABOUT 40 MPH VEHICLE STALLED WITHOUT PRIOR WARNING. COULD NOT RESTART VEHICLE AND THEN VEHICLE HAD TO BE TOWED. OWNER HAD CONFLICT WITH DEALER OVER A REPLACEMENT VEHICLE AND PAYMENT OF REPAIRS. *AK *AL
867722	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885		14-Aug-00	N		0 DESIGN	LAS VEGAS	NV	1500	VEHICLE WILL SUDDEENLY STALL WHILE IN MOTION. CONSUMER MUST QUICKLY PULL OVER AND TRY TO RESTART VEHICLE. DEALER CLAIMED THAT HE COULD NOT DUPLICATE DEFECT BUT DEFECT KEEPS OCCURRING. *AK
736245	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885		24-Jul-00			0 ERRATIC OPERATION POOR PERFORMANCE	ELIZABETH	NJ		BEING A BRAND NEW CAR AND TWO STALLING INCIDENTS ON THE ROAD. I FEEL I SHOULD GET A NEW CAR. *AK
738722	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	2-Aug-00	5-Aug-00			0 STALLS	JACKSONVILLE	FL	35	2000 TAURUS WITH DURATEC ENGINE HAS A COMPLETE ENGINE SHUTDOWN AT 30 MPH. WHEN THE COMPLETE ENGINE SHUTDOWN OCCURRED I LOST CONTROL OF THE VEHICLE. I MANAGED TO STOP THE VEHICLE IN THE ROAD. THIS WAS A LIFE THREATENING EXPERIENCE AS I DIRECTED Y
868460	FORD MOTOR COMPANY	2000	TAURUS		20-Aug-00	23-Aug-00	N		0 DESIGN	PARLAWN	NJ	4400	WHILE DRIVING CAR STARTS TO BUCK A LITTLE AND THEN MOTOR SHUTS DOWN. WHEN THIS HAPPENS CONSUMER LOSTS BRAKES/STEERING AND EVERYTHING JUST SHUTS DOWN. *AK
870410	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	1-Sep-00	12-Sep-00	Y		1 ERRATIC OPERATION POOR PERFORMANCE	PLACERVILLE	CA	7610	CONSUMER WAS TRAVELING ABOUT 20MPH ON A SIDE STREET WHILE IT WAS RAINING AT THAT EVENING. SHE WAS GOING DOWN A MOUNTAIN HILL AND VEHICLE STALLED WITHOUT PRIOR WARNING. VEHICLE STARTED TO SLIDE TO LEFT INTO THE CROSS LANE. SHE APPLIED BRAKES AND THEN
566871	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885		26-Oct-00			0 INOPERATIVE	LAKE CHARLES	LA		WHILE DRIVING 70 MPH IN HEAVY TRAFFIC THE VEHICLE STALLED. DRIVER WAS ABLE TO PULL OVER TO THE SHOULDER SAFELY. AFTER A FEW MINUTES THE VEHICLE STARTED AGAIN. *CJ
566871	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885		26-Oct-00			0 INOPERATIVE	LAKE CHARLES	LA		WHILE DRIVING 70 MPH IN HEAVY TRAFFIC THE VEHICLE STALLED. DRIVER WAS ABLE TO PULL OVER TO THE SHOULDER SAFELY. AFTER A FEW MINUTES THE VEHICLE STARTED AGAIN. *CJ
741621	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	18-Feb-01	27-Feb-01			0 ERRATIC OPERATION POOR PERFORMANCE	DEVON	PA	10400	WHEN ACCELERATING ONTO INTERSTATE HIGHWAY THE ENGINE MOMENTARILY CUT OUT. THE BATTERY LIGHT FLASHED ON THEN OFF & THE CHECK ENGINE LIGHT CAME ON & STAYED ON ALL THE WAY HOME. DEALER CHECKED IT OUT AND FOUND NO PROBLEM. HAS OPERATED PERFECTLY EVER SINCE.
865507	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	2-Apr-01	16-Apr-01	N		0 ERRATIC OPERATION POOR PERFORMANCE	HARVEY	IL	28000	WHILE DRIVING 20-30 MPH VEHICLE STALLED WITHOUT PRIOR NOTICE. DEALER COULD NOT FIND A PROBLEM. *AK THE VEHICLE WENT IN REVERSE FROM DRIVE WHILE STOPPED AT SIGNAL. *YH
868179	FORD MOTOR COMPANY	2000	TAURUS	1FAFP8221YA159885	1-Nov-00	23-Nov-00	N		0 ERRATIC OPERATION POOR PERFORMANCE	MAURETTA	GA	12700	WHILE TRAVELING UNDER 40 MPH AND APPLYING OR TAPPING BRAKES AND THEN REAPPLYING ACCELERATOR ENGINE WILL BEGIN TO RUMBLE AND CAUSE VIBRATION IN VEHICLE FOR A COUPLE SECONDS AND THEN SHUTDOWN. ENGINE CHECK LIGHT WILL COME ON. THIS ALSO OCCURRED TWX

Occ No	Manufacturer	Model Yr/Model	Vin	File Date	Letter Date	Accident	Initial	Part	File Part Name	City	State	Miles	Summary		
690649	FORD MOTOR COMPANY	2000 TAURUS	1FAFP38U76A128404	19-Jun-01	N				ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	ANNAPOLIS MD	0	74K WHILE DRIVING AT 60 MPH VEHICLE COMPLETELY SHUT/DOWN WITHOUT WARNING. CAUSE UNKNOWN. NO INJURIES OR COLLISION OCCURRED. DEALER CANNOT IDENTIFY CAUSE. PLEASE GIVE ANY FURTHER DETAILS.	
747128	FORD MOTOR COMPANY	2000 TAURUS		15-Jun-01	20-Jun-01				D/DESIGN	N	ENGINE	MINNEAPOLIS MN	1000		LOW COOLANT LIGHT CAME ON BUT CAR DID NOT OVERHEAT BUT ANTIFREEZE DID LEAK OUT OF HEATER BLOCK. TOOK CAR TO DEALER. HEATER BLOCK THREADED INCORRECTLY TO ENGINE. NOW TOLD I NEED A WHOLE NEW ENGINE. I HAVE ONLY HAD CAR FOR A MONTH.
888826	FORD MOTOR COMPANY	2000 TAURUS	1FAFP32Z2Y6348826	1-Jul-01	9-Aug-01	N			D/DESIGN	N	ENGINE	WYOMING DE	18000		VEHICLE HAS STALLED 7 TIMES AT ANY SPEED/ANY TIME TAKEN TO DEALER 8 TIMES. DEALER UNABLE TO REMEDY SITUATION. *AK
882827	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6161146	23-Mar-00	7-Aug-01	N			ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	WEST ALLIN TN	0	74K WHILE DRIVING VEHICLE CONSUMER STATED IT JUST STALLED WITHOUT WARNING AND LOST ALL POWER. WAITED ABOUT 15 TO 20 MINUTES VEHICLE RESTARTED. CONTACTED DEALER AND DEALER COULD NOT FIND CAUSE. *AK	
894368	FORD MOTOR COMPANY	2000 TAURUS		13-Aug-01	N				INOPERATIVE	N	ENGINE	BIRMINGHAM AL	0	74K WHILE TRAVELING AT NORMAL SPEED AND WITHOUT ANY INDICATION VEHICLE STALLED. AFTER SITTING FOR ONE HOUR VEHICLE RESTARTED. PLEASE PROVIDE FURTHER INFORMATION. *AK	
864383	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6184834	1-Jul-01	16-Aug-01	N			ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	WEBSTER NY	50		VEHICLE WOULD STALL WHILE CONSUMER WAS TRAVELING ON EXPRESSWAY. BUT VEHICLE WOULD RESTART EVERY TIME. PROBLEM WAS INTERMITTENT. *AK ON JULY 25 2001 WHILE DRIVING AT 85 MPH ON A COUNTRY ROAD THE CAR DIED. THE DASH LIGHT JUST CAME ON AND THE CAR JUST QUIT RUNNING IN THE MIDDLE OF THE ROAD. NO INDICATION CAME FROM THE CAR OTHER THAN JUST STOPPED RUNNING. IT DIDNT HESITATE BULK
790508	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6143128	15-Mar-01					INOPERATIVE		ENGINE	MENTOR OH	0	74K WHEN DRIVING ON HIGHWAY AT 60-65 MPH AND WITHOUT ANY WARNING VEHICLE SUDDENLY STALLED CAUSING LOSS OF ALL POWER. CONSUMER PULLED OFF TO THE SIDE OF ROAD. PLEASE PROVIDE ANY FURTHER DETAILS.	
888109	FORD MOTOR COMPANY	2000 TAURUS	N/A	4-Aug-01	24-Aug-01	N			ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	PAWLETTSCT RI	20	74K HAD TROUBLE WITH CAR STALLING AT 1200 MILES. ALSO VEHICLE WOULD HESITATE CONSTANTLY WHEN HITTING THE GAS. WANTS TO CUT OFF. HAS STALLED SEVERAL TIMES AT ONE TIME VEHICLE JUST LUNGE FORWARD ON 72/100 WHILE DRIVING 80-85 MPH IN HEAVY TRAFFIC	
8003820	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6161146	21-Jul-01	28-Aug-01	N			UNKNOWN	N	ENGINE	WESTALLS WI	1800	74K VEHICLE STALL	
888888	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6180134	18-Aug-01	28-Sep-01	N			STALLS	N	ENGINE	Dacula GA	0	74K WHILE TRAVELING AT 85 MPH AND WITHOUT ANY INDICATION VEHICLE STALLED. CONSUMER PULLED OVER AND RESTARTED VEHICLE. IT RETURNED TO NORMAL TRAVEL. DEALER WAS CONTACTED. COULD NOT FIND PROBLEM. PLEASE PROVIDE FURTHER INFORMATION. *AK THE VEHICLE SUDDENLY STALLS WHILE DRIVING AND WITHOUT WARNING. THIS PROBLEM HAS OCCURED ON FOUR DIFFERENT OCCASIONS. THE DEALER HAS REPLACED CERTAIN PARTS BUT THE PROBLEM REOCCURE.	
883616	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6170738	6-Jun-01	3-Oct-01				INOPERATIVE	N	ENGINE	GREENBERG TN	2200	74K CONSUMER STATES ENGINE ISNT WILL GO TO 100 TO 150 RPM'S AT TIMES WHILE IDLING IN GEAR. DEALER UNABLE TO DUPLICATE THE PROBLEM. *AK	
888264	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y6198030	24-Oct-00	25-Sep-01				ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	CUSTER BAY MD	1885	74K WHILE DRIVING 25-30 MPH VEHICLE STALLED. VEHICLE NOT TAKEN TO DEALER YET. *AK	
888938	FORD MOTOR COMPANY	2000 TAURUS	1FAFP52Z2Y61A1153	14-Nov-01	8-Nov-01	N			ERRATIC OPERATION POOR PERFORMANCE	N	ENGINE	CONLEY GA	8900	74K THERE WERE TWO INCIDENTS WHERE WHILE DRIVING AT LOW SPEED (10MPH) ABS LIGHT TURNED ON AND ENGINE MADE VERY STRONG NOISE. AFTER STOPPING AND MOVING TO NEUTRAL IN ORDER TO TURN OFF THE ENGINE THE ENGINE MADE EVEN A LOUDER ROUBAKING NOISE. AFTER TURNING OFF	
788013	FORD MOTOR COMPANY	2000 TAURUS	1FAFP5657Y6288488	28-Nov-01					NOISE	N	ENGINE	VIENNA VA	0	74K TURNING OFF	

DOI No	Manufacturer	Model Yr	Model	Vin	Failure Date	Last Date	Accident Involved	Fixed	Fine	Part Name	City	Scope	Miles	Summary
2001887	Zero Reports													
2001887	Zero Reports													

Development Of An Etchant For Selectively Etching TiWN_x In The Presence of Electroplated 95%Pb-5%Sn solder

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Abstract

Shrinking die sizes and increasing I/O density is motivating the push towards flip chip packages. A flip chip interconnection system with a under bump metallurgy stack containing sputtered TiWN_x/sputtered Cu/electroplated Cu stud/electroplated 95%Pb-5%Sn was developed. An important step in the above process is the selective etching of the sputtered Cu bus layer and the TiWN_x barrier layer, in the presence of the Pb-Sn solder. The Cu bus layer was selectively etched using commercial etchants. However, no commercial etchants were available for selectively etching the TiWN_x layer. H₂O₂-NH₄OH based etching systems, popularly known as Standard Clean-1 cleaning solutions, have been extensively used to clean silicon wafers in front end wafer fabrication where only trace metal contamination exists. Since metals like lead, copper, titanium, tin and tungsten catalyze the heterogeneous decomposition of the peroxide, the unstable H₂O₂-NH₄OH based etching systems are rarely used to etch metal films. In this paper the development of a H₂O₂-NH₄OH based etchant to selectively etch the sputtered TiWN_x films in the presence of electroplated 95%Pb-5%Sn solder bumps is discussed. A 2³ full factorial experiment with mid point was conducted to establish the etchant composition, as well as process temperature, that give satisfactory responses with respect to etch time, permissible undercut of the Cu stud (caused by the NH₄OH), and acceptable bump shape after reflow. Statistical analysis was used to understand the significant factors influencing the etch rate and undercut. An etchant containing 6% by volume of 30% H₂O₂ and 0.75 % by volume of 30%-NH₄OH operated at a temperature of 37°C was found to give satisfactory results.

Source: Google search on "Etchant TiWN_x" ; http://www.ecic.net/advance_program/abstracts2000/s22p1.html

EA02-027-G 75888

Etching Metal Films

Wet Chemical Etching

(all ratios are by volume unless noted otherwise)

Ag, Al, Au, Cr, Cu, Ni, Sb

- Aluminum
 - "metal etch" (3:3:1:1 H₃PO₄:HNO₃:CH₃COOH:H₂O) 8.7 $\mu\text{m}/\text{min}$ @RT "metal etch" (3:3:1:1 H₃PO₄:HNO₃:CH₃COOH:H₂O)<4min/micron@40C
 - "Al fine line etch 1" (4:1:4:1 H₃PO₄:HNO₃:CH₃COOH:H₂O) 30min/micron
 - "Al fine line etch 2" (1:2 HCl:H₂O)
 - "Al fast etch" (17:1:3 H₃PO₄:HNO₃:CH₃COOH:H₂O) ~5 min/micron
- Antimony
 - "metal etch" (3:3:1:1 H₃PO₄:HNO₃:CH₃COOH:H₂O) <<3min/1000A@50C
- Chromium
 - "Cyanate CR-7a" (Perchloric based) 7 min/micron (24A/s new)
 - "Cr acid etch" (1:1 HCl:glycerine) 12min/micron after depassivation
 - "Cr base etch" (1:3 [50gNaOH+100mlH₂O]:[30g K₃Fe(CN)₆+100mlH₂O]) 1hr/micron
- Gold
 - "Aqua Regia" (3:1 HCl:HNO₃) ~1.5 seconds/micron
 - "Au mask etch" (10g KI, 2.5g I₂, 100ml H₂O) 1min/micron
- Copper
 - 150g Sodium persulfate:1000ml H₂O ~20s/micron @ 45C
Use only as a last step outside of the microengineering lab. When free of Fe, this solution is selective for Cu against Ni (added iron salts will cause Ni corrosion)
- Nickel
 - "metal etch" (3:3:1:1 H₃PO₄:HNO₃:CH₃COOH:H₂O) ~15min/micron@RT with air exposure every 15 seconds
- Silver
 - "dilute metal etch" (3:3:23:1 H₃PO₄:HNO₃:CH₃COOH:H₂O) ~10min/100A "silver base etch" (1:1:4 NH₄OH:H₂O₂:CH₃OH) .36micron/min resist ok but rinse rapidly after etching

Titanium etch 2" (1:9 HF:H₂O) 5s/micron@32C

Dry Etching

...under construction...

"Armin Kuebelbeck", memis-co@ISI.EDU There are several different Aluminium etchants know. Most of them are based on Phosphoric Acid 85%(about 60 to 90 parts per volume) and Nitric Acid 70% (about 2 to 10 parts per volume). Sometimes people add Acetic Acid (about 10-30 parts per volume) for better wetting behaviour and lower viscosity. Metek Corporation has about 10 different Aluminium etchants.

Source: Google search on "Etching Metal Films";
<http://thayer.dartmouth.edu/microengineering/processing/etching/metal.etch.html>

EA02-027-G 75889

Metal Etchants

Metal		Etchant	Ratio
Aluminum		H ₂ O/HF	1:1
		HCl/HNO ₃ /HF	1:1:1
Antimony		H ₂ O/HF/HNO ₃	1:1:1
		H ₂ O/HF/HNO ₃	90:1:10
Bismuth		H ₂ O/HCl	10:1
Chromium		H ₂ O/H ₂ O ₂	3:1
Cobalt		H ₂ O/HNO ₃	1:1
		HCl/H ₂ O ₂	3:1
Copper		H ₂ O/HNO ₃	1:5
Gold	Hot	HCl/HNO ₃	3:1
Hafnium		H ₂ O/HF/H ₂ O ₂	20:1:1
Indium	Hot	HCl/HNO ₃	3:1
Iridium	Hot	HCl/HNO ₃	3:1
Iron		H ₂ O/HCl	1:1
		H ₂ O/HNO ₃	1:1
Lead		Acetic/H ₂ O ₂	1:1
Magnesium	Hot	H ₂ O/NaOH	10:1 by weight
	followed by	H ₂ O/CrO ₃	5:1 by weight
Molybdenum		HCl/H ₂ O ₂	1:1
Nickel		HNO ₃ /Acetic/Acetone	1:1:1
		HF/HNO ₃	1:1
Niobium		HF/HNO ₃	1:1
Palladium	Hot	HCl/HNO ₃	3:1
Platinum	Hot	HCl/HNO ₃	3:1
Rhenium	Hot	HCl/HNO ₃	3:1
Rhodium	Hot	HCl/HNO ₃	3:1
Ruthenium	Hot	HCl/HNO ₃	3:1
Silver		HNO ₃ /H ₂ O	1:1
Tantalum		HF/HNO ₃	1:1
Tin		HF/HCl	1:1
		HF/HNO ₃	1:1
Titanium		HF/H ₂ O	1:1
		H ₂ O/HF/HNO ₃	50:1:1
		H ₂ O/HF/H ₂ O ₂	20:1:1
Tungsten		HF/HNO ₃	1:1
Vanadium		H ₂ O/HNO ₃	1:1
		HF/HNO ₃	1:1
Zirconium		H ₂ O/HF/HNO ₃	50:1:1
		H ₂ O/HF/H ₂ O ₂	20:1:1

TM-DPFE SREA Summary

Updated 7/11/2003

SREA No.	Product	Title/Description	Process or Design	Date Sent to Ford Or Detroit	Date Submitted To Ford	Date Approved By Ford Eng.	Clean Date (approx)
379461	TMDP	Add Fingers to Wire Bond Mach.; Eliminate Locfits Adhesive Under Hybrid	P/D	19-May-99	21-May-99	16-Jul-99	7/16/1999
379462	TMDP	Dielectric Glass Change; Hybrid Circuit Card	P	9-Nov-99	11-Nov-99	23-Nov-99	12/1/1999
379463	TMDP	Hose Install. Machines; Assy. Loop No. 1	P	12-Nov-99	15-Nov-99	23-Nov-99	11/24/1999
379464	TMDP	Datacon Pick And Place Machine No.2 Gold Wire Bonder (Palomar CBT 8000)	P	17-Dec-99	4-Jan-00	Lost see 379481	
379465	TMDP	Move Die Fab. Equipment	P	7-Jan-00	11-Jan-00	14-Jan-00	1/17/2000
379466	TMDP	Laser Trim Machines 2, 3 and 4	P	1-Mar-00	6-Mar-00	11-Jul-00	7/12/2000
379467	TMDP	Gold Wire Bonder T3190	P	19-Jan-00	24-Jan-00	28-Apr-00	4/30/2000
379468	TMDP	Gold Wire Bonder T3190	P	7-Feb-00	11-Feb-00	28-Apr-00	5/3/2000
379472	TMDP	Encapsulant Dispense, Piston Pump	P	17-Apr-00	24-Apr-00	11-Jul-00	7/12/2000
379476	TMDP	Datacon 2230 Chimney Attach	P	19-May-00	25-May-00	7-Sep-00	8/12/2000
379477	TMDP	Chng. Value Of C8 to Reduce Pwr. Up Time	O	21-Jun-00	28-Jun-00	28-Jun-00	6/28/2000
379478	TMDP	Add HF Wash To Remove Ionic Contam.	P	23-Jun-00	27-Jun-00	5-Jul-00	7/12/2000
379479	TMDP	Hose Bowl Feeders, New Data Code	P	28-Jun-00	30-Jun-00	7-Sep-00	9/7/2000
379480	TMDP	Eich	P	11-Jul-00	12-Jul-00	7-Sep-00	7/14/2000
379481	TMDP	Qualification TMDP Line #2	P	1-Sep-00	2-Sep-00	7-Sep-00	8/12/2000
379482	TMDP	Resubmittal of 379484	P	1-Sep-00	2-Sep-00	7-Sep-00	8/12/2000
379483	TMDP	Specification Change - Drift / -20°C	P	2-Aug-00	2-Aug-00	3-Aug-00	8/5/2000
379484	TMDP	Recovery of Water Edge Die	P				
379488	TMDP	Introduce Prober #3	P	1-Nov-00	2-Nov-00	6-Dec-00	12/12/2000
379490	TMDP	Introduce Hose Bowl Feeders Line #2	P	22-Nov-00	23-Nov-00	6-Dec-00	12/6/2000
379491	TMDP	Introduce Teflon Coated Hoses	D	12-Nov-00	14-Nov-00	8-Jan-01	1/30/2001
379494	TMDP	Introduce Platinum Metallization	D/P	16-Feb-01	16-Feb-01	On Hold	
379495	TMDP	Add High Saturation Limits to EOL	P	15-Jun-01	16-Jun-01	20-Jul-01	7/20/2001
379498	TMDP	Tighten Limits at Probe	P	11-Jul-01	12-Jul-01	13-Jul-01	7/20/2001
379498	TMDP	Fix Latchup Issue with SMC	D	15-Aug-01	17-Aug-01	21-Nov-01	1/4/2002
379501	TMDP	Change Hyb Solder Paste Supplier	P	9-Oct-01	11-Oct-01	27-Nov-01	12/5/2001
379502	TMDP	Qualification of Zinink Waters	P	est 25-Mar-02			

EA02-027-G 75900

KOH & TMAH Etch Research:

<http://www.design.caltech.edu/Research/MEMS/Pictures/rate.KOH.txt>

Anisotropic 2D etch rate diagram:

Common etchants such as EDP, KOH, and TMAH have 2D etch rate diagrams in the (100) plane similar to this one. Note that each etchant has different 3D behavior. In addition, behavior changes with wafer orientation; a (110) wafer has six fold symmetry rather than 4-fold. The two dimensional etch rate pattern is a projection of the three dimensional etch rate diagram onto the wafer plane.

In the figure, the slowest planes are the (111) family, the fastest are usually the (311) family and the (110) and/or (100) families are intermediate.

To park chang min <iampcm@kuc08.korea.ac.kr>, mems-co@ISLE.EDU

From Kirthi Roberts <kroberts@sfu.ca>

Date Sun, 14 Mar 1999 19:14:01 -0800

Organization SFU-Engineering

References <9903150054.AA24931@k2.isi.edu>

Sender pabacha@cs.sfu.ca

park chang min wrote:

- >
- > Hello, mems.
- > I want to know etch rate of SiO2 etch rate using etchant Buffered HF (
- > 6:1).(BOE)
- > And I want to know that the etch rate of SiO2 using etchant KOH(20:80)
- > H2O, too.
- > Please let me know as soon as possible.
- > Sincerely yours.
- >
- >

EA02-027-G 75908

Hello,

With BOE the etch rate of SiO₂ is about 1 micron/minute.

Kirithi

--

Kirithi Roberts
School of Engineering Science
Simon Fraser University
Vancouver
Canada

e-mail : kroberts@sfu.ca
URL: <http://www.sfu.ca/~kroberts>

To [park chang min <ismncom@kuce08.korea.ac.kr>](mailto:ismncom@kuce08.korea.ac.kr), mams-cc@ISI.EDU
From Armit Shiwalkar <amits@cc.itb.ac.id>
Date Mon, 15 Mar 1999 17:56:45 +0530 (IST)
In-Reply-To <9903150054.AA24931@k2.isi.edu>

> Hello, mams.
> I want to know etch rate of SiO₂ etch rate using etchant Buffered HF (
> 6:1).(BOE)

800 to 1000 A per minutes depending on depth and aspect ratio, as per if the reaction becomes diffusion limited.

> And I want to know that the etch rate of SiO₂ using etchant KOH(20:80)
> H₂O, too.

I can tell you that it is definitely lesser than 400 A /minute as I had once determined the parameters but do not remember it. Refer to Runyan's book "Principles of Micromachining", or to S.K.Ghandhi " VLSI fabrication principles using GaAs and Si". The rate is largely dependent on

temperature but does not exceed 400 A/min under any circumstance for this concentration ratio.

> *Please let me know as soon as possible.*
> *Sincerely yours.*

You are welcome
Good luck.
Amit Shiwalkar

To iampcm@knucc08.korea.ac.kr, mama-cc@ISI.EDU

From Andrzej Prochaska <A.Prochas@ee.gub.ac.uk>

Date Tue, 16 Mar 1999 12:23:12 GMT

Etch rate of SiO₂ in Buffered HF is about 960A/min.
Etch rate of SiO₂ in 1:10 HF is about 360A/min
Etch rate of SiO₂ in KOH depends on temperature and solution contents. I don't know what is the etch rate in 20:80 solution, but in 40:60 solution at 80C the etch rate is about 55A/min.

Best regards,

Andrzej Prochaska

http://mitghnar.spd.louisville.edu/lutz/resources/tables/Wet_Etch_Table.html

EA02-027-G 75908

Data In the following Table are from "Etch Rates for Micromachining Processing" by K. Williams and R. Muller

(Journal of MEMS, Vol. 5, No. 4, Dec 1996)

Wet Etch Rates for Micromachining and IC Processing (Å/min)																	
The top etch rate was measured by the authors with fresh solutions, etc. The center and bottom values are the low and high etch rates observed by the authors and others in our lab under less carefully controlled conditions.																	
ETCHANT EQUIPMENT CONDITIONS	TARGET MATERIAL	MATERIAL															
		SC Si <100>	Poly n+	Poly not doped	Wet Ox	Dry Ox	LTO not doped	PSG not annealed	PSG annealed	Stoic Nitride	Low Stress Nitride	Alum 2% SI	Spot Tung	Sput Ti	Sput Ti/W	OCG B20PR	Olin Hunt PR
Concentrated HF (49%) Wet Sink Room Temperature	Silicon oxides	-	0	-	23k 18k 23k	F	>14k	F	36k	140	52 30 52	42 0 42	<50	F	-	PO	PO
10:1 HF Wet Sink Room Temp	Silicon oxides	-	7	0	230	230	340	15k	4700	11	3	2500 2500 12k	0	11k	<70	0	0
25:1 HF Wet Sink	Silicon oxides	-	0	0	97	95	150	W	1500	6	1	W	0	-	-	0	0

Room Temp																	
5:1 BHF Wet Sink Room Temp	Silicon oxides	-	9	2	1000 900 1080	1000	1200	6800	4400 3500 4400	9	4	1400	<20 0.25 20	F	1000	0	0
Phosphoric Acid (85%) Heated Bath with Reflux 160°C	Silicon nitrides	-	7	-	0.7	0.8	<1	37	24 9 24	28 28 42	19 19 42	9800	-	-	-	550	390
Silicon Etchant (126 HNO ₃ :60 H ₂ :5 NH ₄ F) Wet Sink Room Temp	Silicon	1500	3100	1000	87	W	110	4000	1700	2	3	4000	130	3000	-	0	0
KOH (1 KOH: 2 H ₂ O by weight) Heated Stirred Bath 80°C	<100>Silicon	14k	>10k	F	77 41 77	-	94	W	380	0	0	F	0	-	-	F	F
Aluminum Etchant Type A	Aluminum																

EA02-027-G 75910

(15 H ₃ PO ₄ :1 HNO ₃ :1 HAc:2H ₂ O) Heated Bath 50°C		-	<10	<9	0	0	0	-	<10	0	2	6600	-	0	-	0	0
												2600					
												6600					
Titanium Etchant (20 H ₂ O:1H ₂ O ₂ O:1 HF) Wet Sink Room Temp	Titanium	-	12	-	120	W	W	W	2100	8	4	W	0	8800	-	0	0
												0					
												<10					
H ₂ O ₂ (30%) Wet Sink Room Temp	Tungsten	-	0	0	0	0	0	0	0	0	0	<20	190	0	60	<2	0
													190		60		
													1000		150		
Piranha (-50 H ₂ SO ₄ :1 H ₂ O ₂) Heated Bath 120°C	Cleaning off metals and organics	-	0	0	0	0	0	-	0	0	0	1800	-	2400	-	F	F
Acetone	Photoresist	-	0	0	0	0	0	-	0	0	0	0	-	0	-	>44k	>39k

Wet Sink															
Room Temp															

Notation: - = test not performed; W = Not performed, but known to Work (100 A/min); F = not performed, but known to be Fast (10 kA/min); P = some of film Peeled during etch or when rinsed; A = film was visibly Attached and roughened.

Etch areas are all of a 4-inch wafer for the transparent films and half of the wafer for single-crystal silicon and the metals.

Etch rates will vary with temperature and prior use of solution, area of exposure of film, other materials present (e.g., photoresist), film impurities and microstructure, etc. Some variation should be expected.

Etching Recipes

Recipes

Process	Author	Comments

Etch Rates:

Cr	AZ351/AZ400	(05/26/99) Udo Lang
	KOH <ul style="list-style-type: none">• Relatively low selectivity between Si and oxide.• High selectivity between Si and nitride.• Selectivity depends on T.• Verify solution concentration before use.	

Si (100-wafer)	2.2 um/h 9 55	45%, 30 deg 45%, 50 45%, 80	
Si (110-wafer)	3.3 um/h 13.6 85	45%, 30 deg 45%, 50 45%, 80	Very rough surface
Si (100-wafer)	3.3 um/h 13 83	25%, 30 deg 25%, 50 25%, 80	

Au	Au Etchant EDP High selectivity between Si and oxide etching with oxide as a mask (through holes) Very fast	~ 700 A/min		
		~ 60 nm/h	1.0 deg C	Yael Hansin
Al	20:3:77 (Acetic acid: Nitric acid: Phosphoric acid)	~1 um/h	T > 35 deg C	Joel Reiter
SiO2	BOE	0.05 um/min	(10:1)	
Nitride	BOE	200 nm/hour	(10:1)	Yael Hansin

<http://library.northernlight.com/FN19991215040840134.html?cb=0&sc=0#doc>

Title: Deep etching key to the MEMS/MST revolution.

Summary: The use of silicon etching techniques is integral to the development of silicon-based MEMS/MST. The versatility of MEMS/MST allows various applications in industries such as chemical gas sensor, tire pressure sensor, glucose sensor and in drug delivery systems.

Source: R & D
Date: 07/1998
Price: \$2.95
Document Size: Medium (3 to 7 pages)
Document ID: FN19991215040840134
Subject(s): Microelectronics--Research; Miniaturization (Electronics)--Research; Silicon--Usage; Semiconductors--Etching
Microelectronics; Circuit miniaturization; Semiconductors
Citation Information: (ISSN: 0746-9179), Vol. v40 No. n8 Pg. p38
Author(s): Prashant Gadil
Copyright Holder: 1998, Cahners Publishing Company
Document Type: Article

Money Back Guarantee If you buy an article and you are not satisfied with it, let us know and we will refund your money. Please press the "Money Back Guarantee" link for additional information about this policy.

What is the Special Collection? The Special Collection is a unique combination of premium data representing over 7,100 journals, books, magazines, databases and newswires not easily found on the World Wide Web. Not only is most of the data completely unavailable on the Internet, the collection and breadth of information offered in one place is unique to Northern Light.

<http://www.eng.lastate.edu/~carma/mems/desi.html>

(2) Etch Rate Modeling In MEMS Design, T.J. Hubbard and E.K. Antonsson:

Abstract:

This paper presents an etch rate model for determining the full three dimensional behavior of an etchant from experimentally determined etch rates of four principle planes: (100), (110), & (311). The etch rate for an arbitrary plane is expressed in terms of the measured planes. The model shows excellent agreement with both experimental measurements and values reported in the literature. A high quality 3D model of etch rates, such as the one reported here, is required for MEMS CAD or etch simulators to be able to accurately predict etched shapes.

2) T.J. Hubbard and E.K. Antonsson, "Etch Rate Modeling In MEMS Design", IEEE/ASME Journal of Microelectromechanical Systems, 1995, pp. 1-23. (To be published).

<http://www.nsn.edu/readme room/books/micro/>

Microelectromechanical Systems

Advanced Materials and Fabrication Methods

Committee on Advanced Materials
and Fabrication Methods for
Microelectromechanical Systems

National Materials Advisory Board

Commission on Engineering and Technical Systems

EA02-027-G 75916

National Research Council

- Notice
- Committee
- Acknowledgments
- Preface
- Contents
- Executive Summary

NMAB-483
NATIONAL ACADEMY PRESS
Washington, D.C. 1997

EA02-027-G 75917

Silicon as a Mechanical Material - A Summary

About this document

The following text is derived of the well-known paper of K.Petersen, "Silicon as a Mechanical Material", where he describes the most important mechanical properties of silicon, and shows several ways on using silicon as a working material, including etching, micromachining, and other techniques, as well as the problems that arise from the fact that silicon, primarily developed for the semiconductor industry, has to fulfill very different tasks when used due to its mechanical rather than its electrical properties.

The original paper also describes many examples of the MEMS field in order to show its possibilities as well as its limitations, and to discuss some of the information that is given in the first three chapters in detail. These examples are *not* described here, lecture of the original paper is therefore required and highly recommended, since the today more than 15-year-old paper can still be viewed as one of the most important introductory and comparative papers written to this subject so far.

Silicon as a Mechanical Material (A Summary), by Kurt E. Petersen

Source: K.E. Petersen "Silicon as a Mechanical Material", *Proceedings of the IEEE*, Vol. 70, No.5, May 1982
<http://www.fuji-ric.co.jp/crab/electric/semicon/microcad/part/part4.html>

MICROCAD

MEMS CAD System for 3D Anisotropic-Etching Simulation

●Etching Rate Database

The etching rates measured by Micromachining Working Group are included in the etching rate database for KOH solution and TMAH. Etch rate data can be modified by the MICROCAD users who want to adjust parameters according to their own etching conditions. Furthermore, users can input etch rates measured themselves into the database. The pictures showed below are etching rate distributions interpolated by MICROCAD.

<http://www.personal.dundee.ac.uk/~rpketch/lecture.htm>

Paper printed

<http://www.el.utwente.nl/tt/projects/wetchem/>

Fundamentals and simulation of wet-chemical etching techniques for the fabrication of 3-dimensional structures in silicon:

Anisotropic wet-chemical etching of silicon

<http://tima-cmp.imag.fr/tima/mcs/tech/tech.html>

Anisotropic etchants

The KOH is a commonly used etchant. KOH solutions are the most widely used due to good etched surfaces and low toxicity but compatibility with CMOS processes is not good enough. The advantage of this etchant is its high etch-rate of silicon dioxide. Usually a PECVD silicon nitride is used as a masking layer protected the included integrated circuits of the design. The TMAH is IC-compatible, non toxic, has a very good anisotropic etching characteristic. The disadvantage of this solution is the high undercutting ratios which can be reduced by the addition of IPA (isopropyl alcohol). An anisotropic etching service with 10% TMAH solution is available at IBS (Ion Beam Service, Aix en provence). CMP uses this service for its bulk micromachining post process. Another etchant for compatible bulk micromachining is the EDP. But this solution presents the disadvantage to be toxic so not easy to handle. Furthermore some problems of compatibility with AMS technology, and specially aluminium pads, occurs. XeF₂ is a white solid which sublimates at room temperature with a vapor pressure of roughly 4 Torr. The etch is performed in vapor

EA02-027-G 75919

phase, at room temperature, with no external energy sources, at between 1 and 4 Torr. Under these conditions, the etch is nearly isotropic and leaves a surface roughness of several microns. XeF2 is extremely selective to aluminum, photoresist, silicon dioxide and silicon nitride.

The table below gives the characteristics of these etchants :

Etchant	Suitable masking	Characteristics
EDP	SiO ₂ , SiN, Au, Ag, Cr, Ta	Toxic
TMAH (+ IPA)	SiO ₂ , SiN	-
KOH	SiN, Cr, Au	-
Hydrazine	SiO ₂ , SiN, Metals	Toxic & explosive
XeF ₂	Photoresist, Al, Au, SiO ₂ , Si ₃ N ₄ , NiTi	Gas (no adhesion force)



**Ford/Kavlico EGR Delta Pressure Sensor Element
6 Sigma Project #3618**

5/21 – 5/22/2001 Working Level meeting at Kavlico, Moorpark CA

Tasks to be accomplished:

Team Members:

Define initial team structure, rolls & responsibilities

6 Sigma Define Phase:

**Develop Problem Statement
Identify Project Scope
Identify Customers Critical To Quality Characteristic
Develop a "High Level" process map
Estimate the Customer Satisfaction and Cost of Poor Quality impact
Identify the key process output variable (KPOV), the big Y
Create a project time line**

6 Sigma Measure Phase:

**Brainstorm key process input variables (KPIVs), the Xs
Develop a data collection plan
Review measurement system capability data
 develop a plan to augment as necessary
Review current process FMEA
If possible establish baseline metric (DPMO/Sigma Level) for current process
Set project objective/stretch objective in terms of improvement to metric**

Wrap up:

Formalize work plan and establish timing for next meeting

EA02-027-G 75833

Kavlico DPFE Sensor:

Notes from 6/19 – 6/27 meetings

Warranty Analysis:

Delivered one Vref shorted part from Wayne. 17991 miles on vehicle, at least the second repair on this vehicle. Three parts which were previously analyzed as TNI were given back to Kavlico. These three parts had high Vsat. One of them had a Vsat which starts high and then drifts to within spec after about 7 seconds. Kavlico tested these three parts and confirmed Ford's observations.

One field return was delivered with a defective ultrasonic weld, and another which had the high port tube melted. The possible connection between these two was discussed.

One plant return from Lima was delivered with a high frequency oscillation on the output voltage.

One plant return from Lima was delivered with a output offset which was slightly out of range high.

I requested that Don Ayres add sup Peratos with more detailed explanation of the failure mode and causes to each of the failure mode categories.

I discussed the possibility of the Silicon Nitride being thin or displaced around the bond pads as being the possible cause of the unprotected area damage. A plan was established to use the optical profilometer to try and measure the step size and location of the Silicon Nitride around the bond pad on some failed parts.

EA02-027-G 75934

No Start/Stall Problem Driver's Comments

From: Thomas, Ken (K.C.)
Sent: Tuesday, June 19, 2001 7:35 AM
To: Grant, Kathleen, Kathy (K.A.)
Cc: Whitworth, Rudy (A.R.); Colatruglio, Vince (V.E.); Montini, Matthew (M.J.); Rozema, Thomas (T.M.)
Subject: Defective DPFE

Hi Kathy, I have a defective DPFE from the field that was replaced for a no start and code P0401. When I put it on a vehicle yesterday morning I found the drivability poor from too much EGR and after 10 -15 miles of city driving a code P0401 was set. But at no time did it not start.

I drove the vehicle home last night, this morning after about 7 miles (@60mph) I stopped for a intersection and upon turning the corner the vehicle quit. I coasted to the shoulder and tried to restart with no luck. The odo displayed all dashes, I then opened the hood and disconnected the sensor and the vehicle started. When I got to work there were two codes P0401 and P1401.

What if anything would you like to do with this sensor? Before we give it to the supplier!

FORD MOTOR COMPANY

FACSIMILE TRANSMITTAL SHEET

TO: Brady Davies	FROM: Mark Freeland
FAX NUMBER: (805) 523-7125	DATE: July 11, 2003
COMPANY: Kavlico	TOTAL NO. OF PAGES INCLUDING COVER: 4
PHONE NUMBER: (805) 523-2000	SENDER'S REFERENCE NUMBER:
RE: Confidential Disclosure Agreement	YOUR REFERENCE NUMBER:

URGENT FOR REVIEW PLEASE COMMENT PLEASE REPLY PLEASE RECYCLE

NOTES/COMMENTS:

Brady,

Attached is the draft of the Ford Confidential Disclosure agreement, which I am directed to propose to you. Please review it with your people and let me know if it is acceptable to you.

Regards

Mark Freeland

EA02-027-G 75960

George.txt

<HTML>Subj:
 summary August 24<FONT COLOR="#000000" BACK="#ffffff"
style="BACKGROUND-COLOR: #ffffff" SIZE=3 PTSIZE=10 FAMILY="SANSSERIF" FACE="Arial"
LANG="0">

Date: 8/24/01 4:20:15 PM Eastern Daylight Time

From: gmozurke@ford.com (Mozurkewich, George (G.))

To: mfreel1@ford.com (Freeland, Mark (M.))

CC: tpotter1@ford.com (Potter, Timothy (T.J.)), mfsopwith@cs.com
('mfsopwith@cs.com')

File: summary_August_24.doc (22016 bytes)

DL Time (52000 bps): < 1 minute

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<FONT COLOR="#000000" BACK="#ffffff" style="BACKGROUND-COLOR: #ffffff"
SIZE=3 PTSIZE=10 FAMILY="SANSSERIF" FACE="Arial" LANG="0">Mark,

Attached is a brief summary of experiments Tim and I performed today.

We tested two TNI sensors with positive pulses on the power line. We were able to
reversibly induce double latch, which would stall a Zetec Focus but not prevent
restart.

We tested two more TNI sensors with negative pulses on the signal-out line. We
were able to reversibly induce single latch, but not double latch, conditions. We
were also able to permanently fail the sensors, although not in a condition that
would cause either stall or failure to restart.

-George

George Mozurkewich

Ford Motor Company Research Lab

(313) 845-5038

</XMP><FONT COLOR="#0f0f0f" BACK="#ffffff" style="BACKGROUND-COLOR: #ffffff"
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16:20:15 -0400

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Fri, 24 Aug 2001 16:20:41 -0400

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-0400 (EDT)

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Page 1

EA02-027-G 75987

George.txt

-0400 (EDT)

From: "Mozurkewich, George (G.)" <gmozurke@ford.com>

To: "Freeland, Mark (M.)" <mfreelai@ford.com>

Cc: "Potter, Timothy (T.J.)" <tpotter1@ford.com>,

"mfsopwith@cs.com" <mfsopwith@cs.com>

Subject: summary August 24

Date: Fri, 24 Aug 2001 16:19:53 -0400

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Date: 8/27/01 3:24:56 PM Eastern Daylight Time

From: mfreel1@ford.com (Freeland, Mark (M.))

To: mfsopwith@cs.com

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> -----

> From: Whitworth, Rudy (A.R.)

> Sent: Monday, August 27, 2001 3:24:43 PM

> To: Freeland, Mark (M.)

> Subject: FW: Wiring Guideline wrt Ignition System

> Auto forwarded by a Rule

>

Rudy Whitworth

PTSE Resident Engineer - Wayne Assembly Plant

Phone 734-467-2024

Fax 734-467-0489

E-mail AWHITWOR

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

From: Pascany, Ken (K.M.)

Sent: Monday, August 27, 2001 2:54 PM

To: Whitworth, Rudy (A.R.)

Subject: FW: Wiring Guideline wrt Ignition System

Rudy,

Here is the web page from which you may search the SETk database...

<http://www.dearborn4.ford.com/setk/> <<http://www.dearborn4.ford.com/setk/>>

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

From: Pascany, Ken (K.M.)

Sent: Monday, August 27, 2001 2:45 PM

To: Whitworth, Rudy (A.R.); Freeland, Mark (M.)

Subject: Wiring Guideline wrt Ignition System

Rudy,

Attached is the requirement that you phoned about. Let me know if you have
additional questions.

Regards,

Ken Pascany, kpascany@ford.com <mailto:kpascany@ford.com>

Voice, fax: 313-248-4669

P/T Electronic Applications

POEE Building, Mail Drop 75, BH177

21500 Oakwood Boulevard

Dearborn, MI 48124-4091

Guidelines.txt

Voice, fax: 313-248-4669

P/T Electronic Applications</DIV> <DIV>POEE Building, Mail Drop 75, BH177</DIV>
<DIV>21500 Oakwood Boulevard

Dearborn, MI 48124-4091</DIV> <DIV> </DIV></BLOCKQUOTE><FONT
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Return-Path: <mfreela1@ford.com>

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air-xb02.mail.aol.com (v80.17) with ESMTMP id MAILINXB28-0827152456; Mon, 27 Aug 2001
15:24:56 -0400

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2001 15:24:48 -0400

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[204.253.83.131])

by dymwsm06.mailwatch.com (8.11.0/8.11.0) with ESMTMP id f7RJ01F21481

for <mfsopwith@cs.com>; Mon, 27 Aug 2001 15:24:47 -0400

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Mon, 27 Aug 2001 15:25:23 -0400

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Received: from eccmfw6.ford.com (mailfw6.ford.com [136.1.1.30]) by
dymwsm09.mailwatch.com (8.11.0/8.11.0) with ESMTMP id f7RJ0k910116 for
<mfsopwith@cs.com>; Mon, 27 Aug 2001 15:24:46 -0400

Message-Id: <200108271924.f7RJ0k910116@dymwsm09.mailwatch.com>

Received: by mailfw6.ford.com id PAA13883 (InterLock SMTP Gateway 4.2 for
mfsopwith@cs.com); Mon, 27 Aug 2001 15:23:00 -0400 (EDT)

Received: by mailfw6.ford.com (Internal Mail Agent-1); Mon, 27 Aug 2001 15:23:00
-0400 (EDT)

Received: by mailfw6.ford.com (Internal Mail Agent-0); Mon, 27 Aug 2001 15:23:00
-0400 (EDT)

From: "Freeland, Mark (M.)" <mfreela1@ford.com>

To: mfsopwith@cs.com

Subject: FW: Wiring Guideline wrt Ignition System

Date: Mon, 27 Aug 2001 15:24:43 -0400

MIME-Version: 1.0

X-Mailer: Internet Mail Service (5.5.2654.52)

Content-Type: multipart/alternative;
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HOP-COUNT: 1

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X-OriginalArrivalTime: 27 Aug 2001 19:25:23.0975 (UTC)
FILETIME=[04DE1970:01c12f2e]

</HTML>

Hypothesis of how 9 ct Gold die are formed:

Facts:

The phenomenon is observed for individual die and also for groups of die.

9 ct Gold die have, when viewed in a two dimensional plane, certain characteristic dark lines in areas on the bond plane and normally have normal looking diaphragms.

9 ct Gold die have been observed with half of the diaphragm missing.

After KOH etch square pits have been observed in the handle wafer.

After TMAH etch and before BOE oxide strip die have been observed with the Epi Si missing over the CMOS circuit area.

After BOE oxide strip on SOITEC wafer more 9 ct Gold die have been observed than were observed on the same wafer before BOE oxide strip.

Cracked flaps have been observed before the BOE etch on the SOITEC wafer. This has been observed both before BOE etch and after the Masking oxidation.

9 ct Gold die occur on other MEMS pressure sensor designs which use a similar process, and was occurring as early as 1997.

Hypothesis requiring disproof:

9 ct die always have at least a partial diaphragm.

Kavlico dPFE Sensor
Technical Offsite
February 1, 2002
8:00 – 5:00
FTDC – Room 161 South

Attendees: Mary Akins, Sheran Alles, Mahmoud Awad, Don Ayers (Kavlico), Brady Davies (Kavlico), Mark Freeland, Freeman Gates, Jon Hargas, Jim O'Neall, Chris Panaretos, Kyong Park (Kavlico), Anup Patel, Brian Perry, Paul Plante, Kurt Schieding, Carol Verner, Loay Salbiach (Student), Barry Bugaj (Kavlico), Gary Danhoff, Jim Maurer.

Introductions: 8:15-8:30

1. EGR System Overview - Freeman Gates 8:30-9:00
 - Assignment: Does vehicle temperature information of silicon exist for applications with high dPFE warranty? (R. Rossi)
2. Conventional dPFE EGR Sensor – Gary Danhoff 9:00-9:40
 - Assignment: Provide team with pictures of each functional failure mode. (Mark Freeland)
 - Assignment: File compare for 21 vehicles 2001 MY calibration assoc. w/issue for voltage trip values. (Gary Danhoff)
 - Assignment: Provide team with a pareto of the AWS EGR codes for the "5" applications – 2001 MY. (Gary Danhoff)

Break: 9:40 – 10:00

3. PCM Discussion - Anup Patel, Brian Perry 10:00 – 10:40
 - Assignment: For all 21 applications: Identify PCM part number and current draw required, incremental to normal, to put PCM into reset. Include standard deviation (5 platforms to study: measurement on 5 and best vehicles, start with Focus). Collect data on power spike, then do more in depth analysis. (Brian Perry, Anup Patel)
 - Parking Lot: Sheran give more detail with regard to wiring to PCM at Thursday's meeting (next week).

3. Sensor Overview – Don Ayers 10:40 - 12:00

- Assignment: Identify date of change from extended gold one to extended gold two design. (Brady Davies)
- Assignment: Give Mahmoud Awad exact dates for Kavlico changes. (Don Ayers)

Lunch Break 12-1:00

3. Sensor Overview – Don Ayers (continued) 1:00 – 2:20
 - Assignment: Compare failure mechanism of the current production acid tested parts vs. warranty UPAD parts. (Brady Davies)
 - Assignment: Provide Mark Freeland 6 parts with corrosion from pre-Aa parts. (Brady Davies)
 - Parking Lot: Paralys coating: Root cause determination

Break: 2:20-2:30

EA02-027-G 76993

4. Warranty Summary – Taurus: Mahmoud Awad 2:30 – 2:45
- by application and Focus: Mark Freeland 2:45 – 3:05

5. Technical Presentation – Mark Freeland 3:05 – 3:35

Transient Voltage
UPAD

6. Technical Presentation – John Hargas 3:45 – 4:15

LAD

- Freeman asked if he could replicate the testing that he has done.

7. Wrap-up 4:15-4:30:

Notes: Presenters need to send out copies of all presentations to Chris. Before sending documents, please mark 'confidential'. Paul Plante asked that if you want a copy of everything, to e-mail CPANARET.

Freeman added that the objectives of the technical presentations were met; focus of core team should be to cover UPAD root cause and bench and vehicles. Keep in mind that Kavlico is switching suppliers from SMI to Zartlink.

Assignment: Provide DV Plan for new Tier-2 Supplier (Mary Akus). Need reliability engineer dedicated from Ford to work with Mary.

Will continue discussions at Tuesday/Thursday meetings.

EA02-027-G 75994

Powertrain Meeting Minutes 8/22/01

ECATS – The daily and weekly trends are currently remaining at or near 90%. There are no newcomers to the top failures list:

- 1) Download Entry Failure – Software issue
- 2) Unable to Read ECS – Software
- 3) A/C Switch not on
- 4) Rough Idle
- 5) Key Not On Failure – Dead Batteries and Battery Cable routing issues

VFG 42/43 – The top pre-delivery issue in the field for NO START is dead batteries. Team feels we can reduce these failures by implementing a previously completed Black Belt Project.

- o The minimum battery voltage to ship a vehicle is 12.5.
- o Vehicles are currently losing .3 volts from area of connection to EOL.
- o Nearly all of WSAP vehicles were at or near the 12.5-volt minimum when checked on Wednesday.
- o Team would like to institute the 4 Best Practices that resulted from the BB Project by Anne Wicks.
- o Team has requested a WSAP Green Belt to institute best practices.

Starter – Bolt Operation

One of the top issues for Starter replacements is mounting bolts loose, missing and/or cross-threaded. Team feels this is a result of the starter installation being a two-person/two step process. Currently, one-person hand starts the bolts and about 3 operations later, another person torques the bolts. Team feels that switching to one person starting and torquing the bolts. Also, incorporation of a DC nut-runner would better contain this issue.

Alternator – Currently the team has received only 49 alternators from warranty. Of those 49, 67% were TMI's, 15% were burnt battery terminals and 10% had high regulatory screws. Team has made a request to FCSD to receive more alternators. Currently, the majority of returned alternators are sent to remanufacturing. YPSI to respond to this item on 9/18/01 – J. Chigas/Ypsi

Electrical Grounds – Ground screw strip-outs noted in-system this week in multiple ground positions. Screw manufacturer has been contacted. Control points have been instituted in the body shop. Some investigation has possibly linked grounds to the DPFE short to V-Ref issue. More investigation needs to be done.

Rough Idle Update – Data taken from the field and compared to EOL data shows 90% of the vehicles which failed in the field had passed the EOL testing.

VFG 49 Overview – Currently the top early warranty part for engine noise is lifters on SPI engines. The team is looking for a 3rd party group to analyze the returned parts.

VRT Team Meeting – Plant has had 6 wrong transmission builds in the last month. Team needs a scanner verification incorporated on the engine line – M. Majzoub/D. Torosian.

Agenda for 9/5/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 Push/Pull Electrical Connections
 VFG 42/43 Start/Start Top Issue
 P0455 – Gross EVAP Leak
 IAC – 9F715
 Starter
 Fuel Pump
 Clipless Clamps Update

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 M. Majzoub
 R. Wilkins/M. Giordano
 B. Tobis
 K. Coryea/Vendor
 J. Chigas/K. Singh
 J. Schneider
 H. Lee

Agenda for 9/12/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 New 1 and 3 MIS Data
 Pedal Box Switches
 Auto Trans Delent
 Manual Trans – Diff. To Shift
 VFG 41 – Top Issue
 VFG 44 – Overview and Top Issue
 VFG 48 – Top Issue
 VFG 49 – Top Issue

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 D. Oboza
 C. Swick/A. D'Agostino
 H. Lee
 I. Odum/E. Moses/H. Lee
 M. Majzoub
 G. MacDonald
 J. Centivre
 B. Mihora

Agenda for 9/19/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 P0705 – TRS
 Talllight Grounds
 Spark Plugs/Wires
 Alternator Update
 VFG 47 – Difficult to Shift
 E29 – Overview

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 J. Razae
 J. Razae/S. King/L. Marsac
 P. Cvetkovski
 J. Chigas/Ypsi
 I. Odum/E. Moses
 G. MacDonald

Agenda for 9/19/01

Containment Review
 ECATS
 Top ECATS (TBD)
 Top ECATS MIL
 Starter Update
 Battery Green Belt Project
 Rough Idle Update
 P0455 – Gross EVAP Leak
 D50 – Other Engine Trouble

Kinnie/Rollin
 Kinnie/Rollin
 Kinnie/Rollins/Majzoub/Poirier
 Oboza/Singley/August
 B. Gilmour
 TBD
 C. Trombetta
 B. Tobis
 J. Brooks

From: Bansek, Catherine (C.K.)
Sent: Thursday, November 29, 2001 2:32 PM
To: 'dayers@kavlico.com'
Cc: Akins, Mary (M.); Smythe, Joseph (J.M.); Owens, Karen (K.E.); Gates, Freeman (F.C.); Verner, Carol (C.J.); Freeland, Mark (M.)
Subject: New DPFE part numbers

Don,

As per our conversation, I understand that these new part numbers (pulled for the platinum part) have NOT been shipped out to Ford.

Previous	New
YF1E-9J460-AD	2F1E-9J460-AA
YM2A-9J480-AB	YM2A-9J480-AC
YF1E-9J433-AG	2F1E-9J433-AA
YM2A-9J433-AB	YM2A-9J433-AC
1L3E-9J433-BC	2L3E-9J433-AA
1L5E-9J433-AB	TBD

If this is the case, these same numbers can be used for the pressure die latch up change.

If you have any questions, let me know.

C. K. Bansek
cbansek2@ford.com
Fax: 313-390-4084
Phone: 313-323-8101
Product Design Engineer, EGR Valve
V-Engine Engineering, Ford Motor Company
Text Pager: cbansek2 (313-796-6245)
3137966245@alphapage.qltouch.com

EA02-027-G 75999

created: 12/11/01
revised: 7/11/2003

2000-2002 Kavlico TM dPFE Sensor
Roster

7/11/2003

Please:

- Initial the box to the left of your name to indicate your attendance.
- Make any corrections to the detail associated with your name.
- If your name is not on this list, please write it in at the bottom including the appropriate detail.

Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	Akins	Mary	313-24-81989	Kavlico On-Site Rep.	Kavlico	POEE	makins@ford.com	313-39-04084
	Albrecht	Gurthar	313-32-23153	V-Engine Svc. Eng.	Ford	POEE	galbrech@ford.com	313-62-14367
	Auller	Jim	313-32-38763	PTSE Chief Engineer	Ford	POEE	jauller@ford.com	
	Awad	Mahmoud	734-58-35815	Reliability Engineer/ Field Data Leader	Ford	ATNPC	mawad@ford.com	313-39-02315
	Ayers	Don	805-523-2000	Kavlico Program Manager/Technical Leader	Kavlico	CA	dayers@kavlico.com	805-523-8475
	Balint	Gary	313-33-72790	FCSD	Ford	DSCII	gbalint@ford.com	
	Bansak	Catherine	313-32-38101	FMEI CPMT Eng./WERs concerns	Ford	POEE	cbansak2@ford.com	313-39-04084
	Bissi	Gerry	313-24-86280	FCSD ECI Supervisor	Ford	TWCTDR	gbissi@ford.com	
	Bronni	Mark	313-24-84509	Motorola Rep.	Motorola	POEE	mbronni@ford.com	313-39-04084
	Bersuder	Lee	313-84-50881	FCSD FQE Supervisor	Ford	TWCTDR	lbersude@ford.com	
	Davies	Brady	805-523-2000	Director MEMS Technology	Kavlico	CA	bdavies@kavlico.com	805-523-7126
	Freeland	Mark	313-69-47645	B-Sigma Black Belt	Ford	FRL	mfreela1@ford.com	313-62-10346
	Gates	Freeman	313-32-24807	FMEI Tech Spec./Technical Lead	Ford	POEE	fgates@ford.com	313-39-04084
	Giordano	Mike	313-32-20925	Focus C&P Supervisor	Ford	VPC	mgiorda1@ford.com	
	Johnson	Joe	313-84-58282	FMEI Section Supv.	Ford	POEE	jjohnson@ford.com	313-39-04084
	Kapp	Dan	313-33-78554	PTSE AVT Chief Engineer	Ford	POEE	dkapp1@ford.com	
	Kerazi	Karen	313-20-83387	FMEI AWS Analyst	Ford	POEE	kkerazi@ford.com	313-84-53169
	Kunde	Olaf	313-20-85830	PT Focus Program Mgr.	Ford	VPC	okunde1@ford.com	313-24-82528
	Masura	Gordon	313-32-29862	EPRC Leader	Ford	FPB4	gmasura@ford.com	
	McCarty	Bill	313-59-41031	Production Buyer	Ford	Purchasing	wmccart1@ford.com	313-59-44875
	Nielsen	Chris	734-28-69886	Service Buyer	Ford	FCSD	cnelsen4@ford.com	
	O'Neill	Jim		FMEI Dept. Mgr.	Ford	POEE	joneill@ford.com	313-39-04084
	Oswalt	Greg	313-39-01180	Critical Con. Mgr.	Ford	FCSD	gooswalt@ford.com	313-59-47470
	Owens	Karen	313-84-55770	FMEI Supervisor	Ford	POEE	kowens@ford.com	313-84-55770
	Panaretos	Chris	313-24-89337	Proj. Mgt. Analyst	Project Solutions	POEE	cpanaret@ford.com	313-32-29265
	Park	Kyong	805-523-2000	VP Research and Dev't	Kavlico	CA	kpark@kavlico.com	805-523-7125
	Plante	Paul	313-84-54138	Campaign Manager	Ford	POEE	pplante@ford.com	

created: 12/11/01
 revised: 7/11/2003

**2000-2002 Kavlico TM dPFE Sensor
 Roster**

7/11/2003

Please:

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Initial for attendance	LAST NAME	FIRST NAME	PHONE NUMBER	TITLE/FUNCTION	COMPANY	LOCATION	E-MAIL	FAX NUMBER
	Popoff	Dan	313-24-88003	Focus C&P Quality Eng (Leader)	Ford	VPC	dpopoff@ford.com	
	Rossi	Roberto	313-84-51438	EESE Wiring CPS	Ford	Bldg. #1	rross1@ford.com	
	Schleding	Kurt	313-32-25449	Reliability Supervisor	Ford	POEE	kschled@ford.com	313-39-02314
	Shore	John	734-26-89789	PS&L Recall Mgr.	Ford	FCSD	jshore@ford.com	734-26-61186
	Smythe	Joe	313-82-12995	STA Engineer (Leader)	Ford	PTE	jsmythe@ford.com	313-33-72804
	Verner	Carol	313-39-07180	FMEI Engineer	Ford	POEE	cverner@ford.com	313-39-04064
	White-Johnson	Patrice	313-39-04409	STA Site Manager	Ford	AVTS	pwhitej@ford.com	313-33-82804
	Williamson	Rick	313-24-88348	ECI Prod.Con.Anal.	Ford	FCSD	rwill10@ford.com	
	Wilson	Cary	313-39-02652	EESE Chief Engineer	Ford	AVTS	cwilso32@ford.com	

created: 12/11/01
revised: 7/11/2003

2000-2002 Kavlico TM dPFE Sensor
Core Team Roster

Meeting Date: 12/14/01

- Please:**
- Initial the box to the left of your name to indicate your attendance.
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	Akins	Mary	313-24-81989	Kavlico Rep.	Kavlico	POEE	makins@ford.com	313-39-4084
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	Ayers	Don	805-523-2000	Kavlico Program Manag	Kavlico	CA	dayers@kavlico.com	805-523-8475
	Freeland	Mark	313-59-47645	6-Sigma Black Belt	Ford	FRL	mfreela1@ford.com	313-621-0346
	Gates	Freeman	313-32-24807	FMEI Tech Spec.	Ford	POEE	fgates@ford.com	313-39-4084
	Owens	Karen	313-84-55770	FMEI Supervisor	Ford	POEE	kowens@ford.com	313-845-5770
	Panaretos	Chris	313-24-88337	Proj. Mgt. Analyst	Project Solutions	POEE	cpanaret@ford.com	313-322-9265
	Plante	Paul	313-84-54138	Campaign Manager	Ford	POEE	pplante@ford.com	313-39-2513
	Schieding	Kurt	313-32-25448	Reliability Supervisor	Ford	POEE	kschiedi@ford.com	313-39-2314
	Smythe	Joe	313-82-12895	STA Engineer (Leader)	Ford		jsmythe1@ford.com	313-337-2804
	Verner	Carol	313-39-07180	FMEI Engineer	Ford	POEE	cverner@ford.com	313-39-4084

DPFE Sensor Meeting Agenda

Thursday 2/7/02

<u>#</u>	<u>Name</u>	<u>Time</u>	<u>Description</u>
1	C. Panaretos	5	Fax handouts to Kavlico
2	All	5	Introductions
3	Rudy Whitworth	5	Rudy Whitworth, MIL Affinity team, (Gary Danhoff-offsite)
4	Mark Freeland	5	Should we have a rep from Focus stalls team on DPFE team?
5	Paul Plante	5	Proposed Tech Review Thursday 2/28/02
6	Mark/Mahmoud	5	Pareto of failure symptoms-Leader and approach
7	Mark/Mahmoud	10	Data Mining and Analysis update
8	Terry Tamashiro	10	Field returns analysis at Kavlico & DV/PV test plan
9	Freeman	15	Metalization damage, sensor technology and durability information
10	Paul	5	Offsite follow up assignments-Add answers to agenda next week
11	T. Green	20	Documents Discovery-Escape Tribute Stalls NHTSA Inquiry
12	All	5	Open Issues/Assignments List
13	All	5	Walk Ins
14	All	5	Next meeting agenda
		105	Total Minutes (120 available)

Note: Bench test working group meeting Thursday, 3:00PM; Vehicle test team meeting Friday, 11:00.

Tuesday 2/12/02

A	S. Allas/R. Rossi	20	Wiring Harness noise concerns update, OA work plan, and conclusions
B	All	15	Offsite follow up assignments answers
C	Kyang Park	10	Component bench test results: Low failure rate

Near Future Meeting Agenda

A	Basem El-Haik	Data Mining and approach discussion
B	Bob Jentz	Kavlico Improved sensor test results from Focus (Carol)
C	Freeman/Mark	Team Expert help-Additional heads requirement
D	Plante	Fishbone Diagram and Is-Is Not
E	Don Ayers	Kavlico service parts availability (Match to John Shore FCSD parts requir.)

pgp/dpfemeet
2/8/2002

EA02-027-G 76154

Kavlico TM dPPE Sensor
Technical Offsite Meeting
FTDC – Room
March 14, 2002
8:30-5:00

Agenda

Discussion of UPAD – Results from FRL	<i>Mark Freeland</i>	1 hour
Break		10 minutes
Summary of Investigations to Date: Corrosion Analysis	<i>Freeman Gates</i>	1 hour
Analysis from Kavlico Returns	<i>Loay Saliach, Mahmoud Awad</i>	.5 hour
Discussion of Outside help and Management Support	<i>Jim O'Neill</i>	.5 hour
Break for Lunch – FTDC Cafeteria		50 minutes
Is/Is Not and Fishbone	<i>Shri Akolkar, Jon Janda, Team</i>	1.5 hours
Break		10 minutes
Cause/Effect Analysis	<i>Team</i>	2.5 hours
Final Summary		.5 hours

EA02-027-G 76157

Kavlico dPFE Sensor
Technical Offsite
February 1, 2002
8:00 – 5:00
FTDC – Room 161 South

Attendees: Mary Atkins, Sheran Alles, Mahmoud Awad, Don Ayers (Kavlico), Brady Davies (Kavlico), Mark Freeland, Freeman Gates, Jon Hargas, Jim O'Neal, Chris Panaretos, Kyong Park (Kavlico), Anup Patel, Brian Perry, Paul Plante, Kurt Schieding, Carol Verner, Loay Sallieh (Student), Barry Bugaj (Kavlico), Gary Danhoff, Jim Maurer.

Introductions: 8:15-8:30

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2. Conventional dPFE EGR Sensor – Gary Danhoff 9:00-9:40
 - Assignment: Provide team with pictures of each functional failure mode. (Mark Freeland)
 - Assignment: File compare for 21 vehicles 2001 MY calibration assoc. w/issue for voltage trip values. (Gary Danhoff)
 - Assignment: Provide team with a pareto of the AWS EGR codes for the "5" applications – 2001 MY. (Gary Danhoff)

Break: 9:40 – 10:00

3. PCM Discussion - Anup Patel, Brian Perry 10:00 – 10:40
 - Assignment: For all 21 applications: Identify PCM part number and current draw required, incremental to normal, to put PCM into reset. Include standard deviation (5 platforms to study: measurement on 5 and best vehicles, start with Focus). Collect data on power spike, then do more in depth analysis. (Brian Perry, Anup Patel)
 - Parking Lot: Sheran give more detail with regard to wiring to PCM at Thursday's meeting (next week).

3. Sensor Overview – Don Ayers 10:40 - 12:00
 - Assignment: Identify date of change from extended gold one to extended gold two design. (Brady Davies)
 - Assignment: Give Mahmoud Awad exact dates for Kavlico changes. (Don Ayers)

Lunch Break 12-1:00

3. Sensor Overview – Don Ayers (continued) 1:00 – 2:20
 - Assignment: Compare failure mechanism of the current production acid tested parts vs. warranty UPAD parts. (Brady Davies)
 - Assignment: Provide Mark Freeland 6 parts with corrosion from pre-Au parts. (Brady Davies)
 - Parking Lot: Paralyne coating: Root cause determination

Break: 2:20-2:30

EA02-027-G 76158

4. Warranty Summary – Taurus: Mahmoud Awad 2:30 – 2:45
- by application and Focus: Mark Freeland 2:45 – 3:05
5. Technical Presentation – Mark Freeland 3:05 – 3:35
Transient Voltage
UPAD
6. Technical Presentation - John Hargas 3:45 – 4:15
UAD
- Freeman asked if he could replicate the testing that he has done.
7. Wrap-up 4:15-4:30:

Notes: Presenters need to send out copies of all presentations to Chris. Before sending documents, please mark 'confidential'. Paul Plante asked that if you want a copy of everything, to e-mail CPANARET.

Freeman added that the objectives of the technical presentations were met; focus of core team should be to cover UPAD root cause and bench and vehicles. Keep in mind that Kaylico is switching suppliers from SMI to Zarlink.

Assignment: Provide DV Plan for new Tier-2 Supplier (Mary Akins). Need reliability engineer dedicated from Ford to work with Mary.

Will continue discussions at Tuesday/Thursday meetings.



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: February 12, 2002
Time: 1-2:30 p.m.
Location: POEE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): February 14, 2002, DI-196, 1-3:00 p.m.
 February 19, 2002, DI-196, 1-2:30 p.m.
Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#

Core Team Participants

<u>Black Belt</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins Don Ayers	Jim O'Neill Freeman Gates	Mahmoud Awad Kurt Schieding	Sheran Alles Robert Rossi	Joe Smythe Chris Nielsen
<u>Team Leader</u>		Chris Panaretos			
Jim Maurer		Paul Plante Carol Verner		<u>PCSE</u> Ken Arnold Brian Perry	

Meeting Agenda - 2/12/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Proposed J. Koszewnik Review 2/22/02 and Tech Review 2/28/02	11, A4	Paul Plante	5 minutes
3. Component bench test results: Low failure rate	15, A6	Kyong Park	10 minutes
4. Field returns analysis at Kavlico	13, A3	Terry Tamashiro	10 minutes
5. DV/PV Test Plan, Bench and Fleet Vehicles		Mahmoud Awad / Terry Tamashiro	10 minutes
6. Wiring Harness Noise concerns, OA work plan and conclusions	12, A6	S. Alles/R. Rossi	15 minutes
7. Metalization damage by sensor manufacturing and technology	13, A8	Freeman Gates	10 minutes
8. Pareto of failure symptoms - Leader and approach		Paul Plante / Mahmoud Awad	5 minutes
9. Open Issues / Assignments List		Chris Panaretos	5 minutes
10. Walk-in's		All	10 minutes
11. Next Meeting (2/14/02) Agenda Items		All	5 minutes

Proposed Next Meeting Agenda 2/14/02

	<u>Person(s) Responsible</u>	<u>Time Estimated</u>
Data Mining and Analysis Update	Mahmoud Awad / Mark Freeland	10 minutes
Offsite Follow-up assignments	Paul Plante / Jim Maurer	20 minutes
Align all Kavlico actions with R/1000 Stack Charts	Mahmoud Awad / Don Ayers	10 minutes

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda

EA02-027-G 76160

Jim Maurer/cp: 7/13/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: February 14, 2002
Time: 1-3:00 p.m.
Location: POBE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): February 19, 2002, DI-196, 1-2:30 p.m.
 February 21, 2002, DI-196, 1-3:00 p.m.
Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#

Core Team Participants

<u>Black Belt</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>ESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins Don Ayers	Jim O'Neall Freeman Gates	Mahmoud Awad Kurt Schieding	Sheran Alles Robert Rossi	Joe Strybe Chris Nielsen
<u>Team Leader</u>		Chris Panaretos			
Jim Maurer		Paul Plante Carol Verner		<u>PCSE</u> Ken Arnold Brian Perry	

Meeting Agenda - 2/14/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Open Issues and Assignments	High	All	30 minutes
3. Data Mining and Analysis Update		Mahmoud Awad, Mark Freeland	20 minutes
4. Align all Kavlico actions with R/1000 Stack Charts		Mahmoud Awad / Don Ayers	10 minutes
5. Pareto of failure symptoms - Approach to look at warranty data		Mahmoud Awad	15 minutes
6. Walk-in's		All	20 minutes
7. Next Meeting (2/14/02) Agenda Items		All	10 minutes

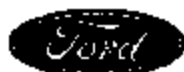
<u>Proposed Next Meeting Agenda 2/19/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda

EA02-027-G 78181

Jim Maurer/cp: 7/13/2003
Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: **Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor**

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: March 5, 2002
Time: 1-2:30 p.m.
Location: POEE, DI-196 (PMBI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): March 7, 2002, DI-196, 1-3:00 p.m.
 March 12, 2002, DI-196, 1-2:30 p.m.
 March 14, 2002, Technical Offsite #2
Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Proeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Altes	Joe Smythe
Shri Akolkar	Don Ayers	Froeman Gates	Kurt Schieding	Robert Rossi	Chris Nielson
Jon Janda		Chris Panaretos			
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 3/05/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Analysis of data from Kavlico returns	I1, A1	Loay Salaich	20 minutes
3. Update on obtaining fleet vehicles from buy-back lists/discussion of car requirements for testing	I6, A3 & I10, A6	Carol Verner	10 minutes
4. Pressure/voltage data for Zarlink and SMI sensors	I12, A4	Kavlico	5 minutes
5. Update on Vehicle Electrical Testing	I6, A1 & I12, A6	R. Rossi	20 minutes
6. Offsite Assignments (from 2/1 Technical Offsite)	Various	C. Panaretos	10 minutes
7. Agenda for 2-Day Technical Review (3/14 Offsite)		All	10 minutes
8. Walk-in's		All	5 minutes
9. Next meeting (3/5) agenda		All	5 minutes

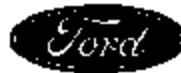
<u>Proposed Next Meeting Agenda 3/7/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>
Overlay of Kavlico and Ford changes on stack chart	Mahmoud Awad	10 minutes

Notes

Bring handouts (paper copies) for all presentations
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 Please be on time as we have a full agenda

EA02-027-G 78182

Jim Maurer/cp: 7/13/2003
 Kavlico dPFE Sensor Core Team



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
Dates: March 7, 2002
Time: 1-3:00 p.m.
Location: POEE, DI-196 (FMEI War Room)
Called By: Jim Maurer, Team Leader: (313) 39-03672
Next Meeting (s): March 12, 2002, DI-196, 1-2:30 p.m.
 March 14, 2002, Technical Offsite #2

Conference Call-in Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESE</u>	<u>Purchasing</u>
Mark Freeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Alles	Joe Smythe
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schieding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda - 3/7/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Overlay of Kavlico and Ford changes on stack chart	16, A2	Mahmoud Awad	20 minutes
3. Update from Kavlico on part RML8760-184; Full report/matrix update of teardown analysis	13, A1, A4	Terry Tamashiro	20 minutes
4. Status on Norfolk and St. Thomas returns	13, A3	Terry Tamashiro	10 minutes
5. Comparison report of UPAD to Acid Test	15, A6	Kyong Park	10 minutes
6. Update on Vehicle Electrical Testing	16, A1 & 112, A6	R. Rossi	20 minutes
7. Kavlico service part capacity/Motorola coordination	116, all	All	10 minutes
8. Agenda for 2-Day Technical Review (3/14 Offsite) -- Revise	13, A7	All	10 minutes
9. Walk-in's		All	10 minutes
10. Next meeting (3/12) agenda		All	5 minutes

<u>Proposed Next Meeting Agenda 3/12/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

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 Please be on time as we have a full agenda



MEETING ANNOUNCEMENT / WORKING TEAM MEETING

Objective: Establish and implement corrective and containment actions for Kavlico TM dPFE Sensor

Meeting Logistics

Subject: Kavlico TM dPFE Sensor Core Team
 Dates: March 12, 2002
 Time: 1-2:30 p.m.
 Location: POEE, D1-196 (FMEI War Room)
 Called By: Jim Maurer, Team Leader: (313) 39-03672
 Next Meeting (s): March 14, 2002, Technical Office #2

Conference Call-In Number(s): 9-1-954-1149 (inside Ford); 847-619-6158 (outside) Passcode: 6881436#
 Kavlico Fax: 805-531-6574

Core Team Participants

<u>Black Belts</u>	<u>Kavlico</u>	<u>V-Engine</u>	<u>Quality Office</u>	<u>EESI</u>	<u>Purchasing</u>
Mark Froeland	Mary Akins	Jim O'Neill	Mahmoud Awad	Sheran Allec	Joe Smytho
Shri Akolkar	Don Ayers	Freeman Gates	Kurt Schioding	Robert Rossi	Chris Nielsen
Jon Janda		Chris Panaretos			
		Paul Plante		<u>PCSE</u>	
<u>Team Leader</u>		Carol Verner		Ken Arnold	
Jim Maurer				Brian Perry	

Meeting Agenda -- 3/12/02

<u>Order of Agenda Items</u>	<u>Corr. Issue #</u>	<u>Person(s) Responsible</u>	<u>Time Allocated</u>
1. Introductions		All	5 minutes
2. Kavlico needs to verify what Pirana-etch does to aluminum.		Kyong Park	10 minutes
3. Status on Norfolk and St. Thomas returns.		Terry T	10 minutes
4. Complete teardown analysis for five platforms including Focus		Terry T	10 minutes
5. Capacity for service.		Chris Nielsen	10 minutes
6. Update on Vehicle Electrical Testing	I6, A1 & I12, A6	R. Rossi	20 minutes
7. Compare failure mechanism of the current production acid tested parts vs. warranty UPAD parts.		Kyong Park	15 minutes
8. Affect of the gold process on warranty		Kyong Park	15 minutes
9. Update on fleet vehicles		Carol Verner	10 minutes
10. Walk-in's		All	10 minutes
11. Next meeting (3/19) agenda		All	5 minutes

<u>Proposed Next Meeting Agenda 3/19/02</u>	<u>Person(s) Responsible</u>	<u>Time Estimated</u>

Notes

Bring handouts (paper copies) for all presentations
 Provide electronic copies of presentations to CPANARET (no later than 1 hour prior to the meeting)
 Please be on time as we have a full agenda

Kavlico TM dPFE Sensor Meeting Minutes

January 29, 2002

1-2:30 p.m.

POBE, DI-196 (FMEI War Room)

Meeting Minutes

Attendees: Mary Akins, Sheran Alles, Mahmoud Awad, Mark Freeland, Freeman Gates, John Koszownik (1st ½ hour), Chris Nielsen, Jim O'Neal, Karen Owens, Chris Panaretos, Brian Perry, Paul Plante, Kurt Schieding, John Shore, Carol Verner; **Kavlico teleconference attendees:** Terry Tamashiro, Brady Davies, Kyong Park.

1. **Introductions:** Don Ayers will be coming to the offsite on Thursday. 805-523-7125 (Kavlico FAX).
2. **Agenda Review**
3. **Production and Field Service parts capacity update:** Kavlico update: Waiting for Randy Ray (Kavlico). Did not attend, and did not cover this issue. Barry Bugaj will bring information to next team meeting (2/5). **ISSUE #16, ACTION #3.**
4. **Kavlico Sensor D&R Responsibility:** Kavlico does have design and release responsibility – Mary Akins. Still need a Ford design and release engineer to work with Mary. Freeman Gates added that historically, the CPMT leaders have been responsible for FSS responsibility. WERS concerns initiated by FSS, but did not absolve anyone from FMEI from other responsibilities. Karen Owens is Ford FMEI contact for Kavlico. Joe Johnson not involved with Kavlico. Kathy Reaume is contact for WERS concerns. **ISSUE #18, ACTION #2.**
5. **Data Mining and analysis:** Mahmoud Awad: Student identified to help Mark: Still need Jim O'Neal's help (request to Karen Owens). CPARS help – Karen will see Froeman. **ISSUE #8, ACTION #8.**
6. **Field Returns Analysis at Kavlico:** Terry Tamashiro: Flow chart and analysis (Mary handed out). Identified parts they have; asked for parts with different mileage. Matrix shows how many parts of each category. Oct 2000-haven't physically located yet. Updated June 01 vehicle build date parts into matrix. F150 with build date of 10/2000, might be problem with matching VIN nos. w/engine for 4.6L F150's. Mary to pull VIN nos. from list to get data. Still questionable whether we can get parts for testing. By next Tuesday, Kavlico should know what they have tested and in house. Mary Akins responsible. Take offline: die inspection (step 10 in handout) technical findings (Freeman Gates will get with Terry Tamashiro for clarification). Review on individual basis to step 16 for all parts. Most parts have already been done through step 6. **Kavlico (Terry Tamashiro) will break up spreadsheet with what stops they are on with each part. 40 parts from 6/01. Will have by Thursday (2/7). Give us estimated timing at next report out. ISSUE #1, ACTION #3.**
7. **Wiring Harness Noise Concerns:** Sheran Alles. Presented handout, faxed to Kavlico. Need to send last weeks presentation to Kavlico via e-mail. Identify if there is coupling around the circuitry. Can have primary noise together with secondary. See next steps in handout (p.2). Freeman Gates added: In addition to the work Sheran did, got real data on 23 harnesses; measured capacitance between all wires relative to output signal; worst case was around 260 pc. **ISSUE #3, ACTION #5.**
8. **Technical Offsite – finalize agenda: 1st 3 hours: Technical presentations. Last 5 hours: Cause and effect diagrams (Fishbone – Paul Plante, IS/IS Not – Kurt Schieding). Kavlico scheduled to depart Detroit at 7:00 on Thursday. Will change travel arrangements due to predicted weather conditions. Add Don Ayers name to list of attendees. E-mail Freeman's Presentation to Kavlico on Wednesday. **ISSUE #3, ACTION #8.****
9. **STA Trip/Overview:** Joe Snythe not here: will give update by 2/1 to team. **ISSUE #5, ACTION #5.**

EA02-027-G 76167

Kavlico dPFE Sensor Meeting Minutes
February 5, 2002
1-2:30 p.m.
POEE, CR DI-196 (FMEI War Room)

Attendees: Brady Davies, Kyong Park, Don Ayers (Kavlico). Mahmoud Awad, Mark Freeland, Freeman Gates, John Jahshan, Jim Maurer (new team leader, replacing Karen Owens), Doreen Muter, Jim O'Neill, Chris Panaretos, Brian Perry, Paul Plante, Kurt Schieding, Joe Smythe, Carol Verner, Rick Williamson (FCSD).

Agenda: Paul distributed his agenda, which included items for the next two meetings.

Shared Drive/Web Access: Offsite documents are currently on the shared drive: POE00004\proj\kavlico. They should be only on Web – and only available to core team members. Non-core team members will not have access. Decision was made to use only the website, not shared drive. Kavlico needs access to the website also. Chris will look into the restrictions and verify with Tamara DiCicco. Only non-confidential documents will be posted.

Assignment: Send all non-confidential documents to Dave Tyler for upload to web page; notify team (including Kavlico) of web address. Send core team the path of how to access the website. (Chris Panaretos)
The team should send confidential document requests to Paul Plante or Jim Maurer.

EPRC Review – Paul Plante: If this issue goes to a recall, the EPRC committee will coordinate periodic reviews. Paul will walk thru one page, technical summary, list of issues. Will review with the core team periodically in team meetings. Tech reviews will also be addressed.

STA Trip to Kavlico - Joe Smythe: See attached paper ("Agenda: 1/23/2002 - 1/25/2002"). He will be following up on "action items". Next follow-up visit will be first week in March. Will be working with Kavlico, Mark Freeland, Carol Verner. Keep action items separate for now, if there is any significant, then add to open issues.

Fleet Test Plan – Mahmoud Awad: His recommendation is to test at least 45 vehicles from same platform (to build level of confidence: homogeneous). Put in different environment conditions. Test paralyse sensor. Originally 5 platforms chosen to take closer look at (highest warranty). UPAD, Mask Misalignment, V-Transient failure modes (increase sample size across different platforms). Take offline to discuss DV testing. **Assignment:** Put together one-pager of where we are today and what issues need to be addressed. Need to have an audio conference w/Kavlico to discuss. Arrange for Friday at 11:00. (Mahmoud Awad) Attendees: Paul Plante, Freeman Gates, Jim Maurer, Mahmoud Awad, Brady Davies, Kyong Park, Don Ayers.

Data Mining – Rick Williamson (FCSD): Technicians having hard time identifying sensor problems. Ran AWS claims w/different parameters. Distributed 'dPFE – 9J460 CCC-Overview' Spreadsheet. 75% were replaced after original repair. Kavlico asked if we could map return data to corrective actions? Use 'Focus' first: Go to PVT – Wayne assembly plant; get them to identify electrical noise issues Carol can bring to "Focus" PVT. **Assignment:** Provide a clean cutoff date for significant actions that reduced warranty (things that changed in the sensor) to identify in AWS. Take changes that PVT has incorporated, overlay in stack charts. (Carol Verner)

Emission Compliance – Freeman Gates: Changing part numbers was discussed. Need analysis from Kavlico on parts that are currently being run. Paul will put on agenda for Thursday.

Next Agenda (preliminary):

Sensor Technology Durability Information (was Metalization damage) – move to Thursday (Freeman).

Field Returns Analysis at Kavlico – Mary Akins

Wiring Harness Noise concerns update

Documents Discovery – Escape Tribute Stalls NHTSA Inquiry

EA02-027-G 76168

Kavlico dPFE Sensor Meeting Minutes
February 12, 2002
1-2:30 p.m.
POEE, CR DI-196 (FMEI War Room)

Attendees: Brady Davica, Kyong Park, Terry Tamashiro, Don Ayers (Kavlico). Mary Akins, Sheran Alles, Ken Arnold, Mahmoud Awad, Freeman Gates, John Jahshan, Jim Maurer, Chris Panaretos, Brian Perry, Paul Plante, Robert Rossi, Carol Verner, Mike Pickott (Engine Systems).

Proposed J. Koszewnik Review 2/22/02 and Tech Review 2/28/02- Paul Plante: The 14D will be used as the key document for the tech review. Paul will meet with Jim Maurer and Freeman Gates to update in preparation for this. We will also refer to the "open issues deck" that Chris Panaretos has been working on. **Assignment:** Chris Panaretos will send an updated issues deck to the team, including Kavlico, when changes are received. The team is to get changes to Chris by noon on Friday, 2/15/02.

Component bench test results: Low failure rate - Kyong Park (Kavlico): Kavlico was asked to give test results based on Jim Maurer and Freeman Gates discussion of in-process containment and bond pad corrosion. Looking for signs of corrosion and what is the accept/reject criteria. Tests to date at Kavlico indicate no evidence of corrosion w/gel. They have been shipping tested out UPAD wafers to Freeman for inspection. Freeman needs to know when change/issues occurred at SMI. Need to know all changes with respective dates to overlay on stack chart and see where Kavlico actions align with our data. **Assignment:** Kavlico to provide revised test procedures, discuss with Freeman offline. Freeman to set up meeting. Mahmoud Awad to send Kavlico copy of meeting discussion of Fleet Test Plan.

Field returns analysis at Kavlico - Terry Tamashiro (Kavlico): Terry walked through the "Visual Inspection Plan at the end of Fleet Tests" flow chart and "14D Ford TMDP Investigation". **Assignment:** Kavlico should be completed with testing up through step 13 (Submit to S Lab) by 2/22/02. He will report out on his findings at that time. Mary Akins to provide AWS reports to Kavlico today or tomorrow.

DV/PV Test Plan, Bench and Fleet Vehicles - Mahmoud Awad, Terry Tamashiro: A mini-meeting already took place this week to talk about the test plan; Mahmoud provided minutes. Another meeting will be held later this week based on bench test plan that Freeman Gates and Jim Maurer worked on with Kavlico. **Assignment:** The team will summarize their findings at next Tuesday's team meeting (2/19/02).

Wiring Harness Noise concerns, OA work plan and conclusions - Sheran Alles, Robert Rossi: Mark Freeland and Robert Rossi met as follow-up to offsite. Took vehicle measurements, tried duplicate test - not able to see any differences. **Conclusion:** Noise not of sufficient energy to cause damage to parts. Still question of high frequency. **Assignment:** Still need to look at Escape and other vehicles w/warranty returns. Test parts for transient duration to latch-up sensor and compare to Kavlico tests. Robert Rossi will generate a work plan and send to critical team members (including Kavlico); get agreement on the plan; come up with results and conclusions based on the plan. Will be completed in 2 weeks. Will have workplan by 2/19; findings by 2/26.

Next Agenda (preliminary):

Open Issues / Assignments List Updates - All

Data Mining and Analysis Update - Mahmoud Awad, Mark Freeland

Align all Kavlico actions with R/1000 Stack Charts - Mahmoud Awad, Don Ayers

Pareto of Failure Symptoms - Approach to look at warranty data - Mahmoud Awad

EA02-027-G 78169

Message Sent!

EA02-027-G 76210

FIG 11

EA02-027-G 76211

From: Freeland, Mark (M.)
Sent: Thursday, November 07, 2002 10:28 AM
To: Limtiaco, Steven (S.); Freeland, Mark (M.); Fournelle, Gilbert (G.); Goodwin, William (W.R.); Power, James (J.H.); Jensen, Ted (T.E.); Pletta, Shari Finn (S.F.); O'Neill, Jim (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Hargas, Jon (.); Elwel, Fred (F.)
Subject: RE: Mazda Tribute Buy Back Stallers, Spark Plug Resistance

All,

According to Fred Elwel:

"Our records indicate that we PPAP'd the Nickel plated shell (AGSF32NM) 6/25/01 and shipped in production quantities to CEP beginning in early September, 2001."

Based on the vehicle build dates of the two vehicles with the plated plugs, (11/13/01 and 4/19/02) and the lack of any service record of plug changes, I conclude that all the plugs that Steve returned to me were original equipment for the vehicles from which they were removed.

The majority of the plugs have been given to the Spark Plug group so that they can work with Honeywell to look into the issue of their low resistances. I have retained six of the plugs for bench testing the dPFE for susceptibility to the RF noise generated by the plugs.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Steven Limtiaco [mailto:SLimtiac@mazdausa.com]
Sent: Thursday, October 31, 2002 5:57 PM
To: 'Freeland, Mark (M.)'; Fournelle, Gilbert (G.); Goodwin, William (W.R.); Power, James (J.H.); Steven Limtiaco; Jensen, Ted (T.E.); Pletta, Shari Finn (S.F.); O'Neill, Jim (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Hargas, Jon (.)
Subject: RE: Mazda Tribute Buy Back Stallers, Spark Plug Resistance

Mark,

Attached is the information requested. Production dates are now included. Also, notes were added regarding SRL1102/SRL1107 vehicle repair history (no spark plugs were claimed for either vehicle).

EP02-027-G 76683

Steve Limtiaco
Mazda North American Operations
Tribute Product Support
949-442-6514 (phone)
949-442-6599 (fax)
e-mail: slimtiac@mazdausa.com

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

From: Freeland, Mark (M.) [mailto:mfreel1@ford.com]
Sent: Thursday, October 31, 2002 7:38 AM
To: Fournelle, Gilbert (G.); Goodwin, William (W.R.); Power, James (J.H.);
Limtiaco, Steven (S.); Jensen, Ted (T.E.); Pletta, Shari Finn (S.F.);
O'Neill, Jim (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.);
Hansas, Jon (.)
Subject: Mazda Tribute Buy Back Stallers, Spark Plug Resistance

Yesterday I received the 10 randomly selected sets of spark plugs and dPFE sensors from the 2001 MY 3.0L Mazda Tribute Staller Buy Back pool of vehicles. Thanks Steve.

I measured the cold plug noise suppression resistance of each plug. The results are illustrated in the graph below.

<<...OLE_Obj...>>

The raw data and other information I have on each vehicle is in the attached workbook. Items of note are:

- 1) the Lower Spec. Limit for the resistance is 2,000 ohms.
- 2) SRL1102 and SRL1107 plugs bodies are plates, the others are black oxide. Do we know if these two had the OEM plugs or were they previously serviced?
- 3) I do not know the vehicle build dates, so I can not verify, but I suspect that four or more of these vehicles had previously had their dPFE sensor changed. Steve, can you fill in the Vehicle Build Dates in the work book and return it to me so that I can verify if the dPFE's were the original equipment or not.
- 4) 20 out of 60 plugs were out of specification on the low side.
- 5) 13 out of the 60 plugs have resistances less than 1,000 ohms.

It seems that a very high percentage of these vehicles have low resistance spark plugs. It is highly likely that the increased level of RF noise generated by these plugs will influence other systems in the vehicles adversely, and may be a contributing cause for the stalls.

I plan to turn the majority of these <<Mazda Plug Resistances.xls>> plugs over to Sheri Finn Pletta for further analysis.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com

ER82-827-G 76864

Tel.: (313) 594-7645

EA02-027-G 70885

From: Steven Limtiaco [SLimtiac@mazdausa.com]
Sent: Thursday, October 31, 2002 5:57 PM
To: Freeland, Mark (M.); Fournelle, Gilbert (G.); Goodwin, William (W.R.); Power, James (J.H.); Steven Limtiaco; Jensen, Ted (T.E.); Pletta, Shari Finn (S.F.); O'Neill, Jim (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Hargas, Jon (.)
Subject: RE: Mazda Tribute Buy Back Stallers, Spark Plug Resistance



Mazda Plug
Resistances.xls

Mark,

Attached is the information requested. Production dates are now included. Also, notes were added regarding SRL1102/SRL1107 vehicle repair history (no spark plugs were claimed for either vehicle).

Steve Limtiaco
Mazda North American Operations
Tribute Product Support
949-442-6514 (phone)
949-442-6599 (fax)
e-mail: slimtiac@mazdausa.com

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

From: Freeland, Mark (M.) [mailto:mfreelal@ford.com]
Sent: Thursday, October 31, 2002 7:38 AM
To: Fournelle, Gilbert (G.); Goodwin, William (W.R.); Power, James (J.H.); Limtiaco, Steven (S.); Jensen, Ted (T.E.); Pletta, Shari Finn (S.F.); O'Neill, Jim (J.D.)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); McCoy, James (J.D.); Hargas, Jon (.)
Subject: Mazda Tribute Buy Back Stallers, Spark Plug Resistance

Yesterday I received the 10 randomly selected sets of spark plugs and dPFE sensors from the 2001 MY 3.0L Mazda Tribute Staller Buy Back pool of vehicles. Thanks Steve.

I measured the cold plug noise suppression resistance of each plug. The results are illustrated in the graph below.

<<...OLE_Obj...>>

The raw data and other information I have on each vehicle is in the attached workbook. Items of note are:

- 1) the Lower Spec. Limit for the resistance is 2,000 ohms.
- 2) SRL1102 and SRL1107 plugs bodies are plates, the others are black oxide. Do we know if these two had the OEM plugs or were they previously serviced?
- 3) I do not know the vehicle build dates, so I can not verify, but I suspect that four or more of these vehicles had previously had their dPFE sensor changed. Steve, can you fill in the Vehicle Build Dates in the work book and return it to me so that I can verify if the dPFE's were the original equipment or not.
- 4) 20 out of 60 plugs were out of specification on the low side.
- 5) 13 out of the 60 plugs have resistances less than 1,000 ohms.

It seems that a very high percentage of these vehicles have low resistance

spark plugs. It is highly likely that the increased level of RF noise generated by these plugs will influence other systems in the vehicles adversely, and may be a contributing cause for the stalls.

I plan to turn the majority of these <<Mazda Plug Resistances.xls>> plugs over to Sheri Finn Fletta for further analysis.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Akolkar, Shrikant (S.V.)
Sent: Thursday, September 19, 2002 7:01 PM
To: Maurer, James (J.B.); O'Neill, Jim (J.D.)
Cc: Gates, Freeman (F.C.); Freeland, Mark (M.); Hargas, Jon (.)
Subject: FW: Windstar Sensor #99

Jim & Jim;

Thanks to Mark & John for prompt help they provided today for ele testing & gel removal.

- Sensor is electrically dead/out of spec. Vout is low & Impedence are completely beyond limits
- Gel surface & tubes had layer of carbon over 1 mm thick implying poorly performing engine. Mark has photos. Ultrasonic alcohol cleaning did not removal the carbon. It had to be mechanically removed which probably damaged bond pad wires
- I am leaving die photos & ele report on Jim Maurer's desk. There is no obvious visible damage. Some bubble anomalies are visible on REF die.

—Original Message—

From: Freeland, Mark (M.)
Sent: Thursday, September 19, 2002 3:07 PM
To: O'Neill, Jim (J.D.)
Cc: Akolkar, Shrikant (S.V.)
Subject: Windstar Sensor #99

Jim,

Please forward me all info you have regarding the sensor Shri brought me to test this afternoon. I would like to make sure the document I send you is clear and concise.

Can you provide the following:

VIN #

Mileage accumulated on the sensor.

Date the sensor was removed.

Were there any stored codes in the PCM, all codes are of interest, not just the dPFE codes?

What is the full repair history for this vehicle from the date the sensor was installed until the date it was removed? I suspect that the engine has a misfire history, of some sort.

Do we have Kavlico's parametric test data for the part.

Thanks

Regards

Mark Freeland

6-Sigma Black Bolt
Engine Research Department
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email: mfreela1@ford.com
Tel.: (313) 594-7645

EA02-827-G 76688

From: Freeland, Mark (M.)
Sent: Tuesday, September 10, 2002 11:58 AM
To: Hargas, Jon (.)
Subject: FW: Spark plug resistance checks

Spark plug person

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Elwell, Fred (F.)
Sent: Wednesday, September 04, 2002 4:03 PM
To: Freeland, Mark (M.)
Cc: McCoy, James (J.D.); Power, James (J.H.)
Subject: RE: Spark plug resistance checks

Mark,

We will be visiting Essex Engine plant tomorrow morning. If you can leave the vehicle here on Friday, I should be able to measure the plugs sometime during the day.

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

From: Freeland, Mark (M.)
Sent: Tuesday, September 03, 2002 12:38 PM
To: Elwell, Fred (F.)
Cc: McCoy, James (J.D.)
Subject: FW: Spark plug resistance checks

Fred,

When would be a good time for you to check out the plugs on the Mountaineer? If you would like I could come over to your garage tomorrow morning or afternoon. If it will only take an hour I will stay with you, or if a lot longer then I can leave the vehicle with you and borrow wheels from Jim McCoy.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com

EA82-827-G 78889

Tel.: (313) 594-7645

—Original Message—

From: Ewell, Fred (F.)
Sent: Thursday, August 29, 2002 2:15 PM
To: Freeland, Mark (M.)
Cc: Power, James (J.H.)
Subject: Spark plug resistance checks

I was unable to pry Jim McCoy away from the vehicle long enough to get the plugs removed and checked for resistance. Please make arrangements with Jim Power and/or me next week after the labor day holiday. Have a good weekend.

ER02-027-G 75590

From: Freeland, Mark (M.)
Sent: Friday, August 30, 2002 1:48 PM
To: Hargas, Jon (.)
Subject: SRL test data base



All Data SRL Test
Data.xls

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, August 16, 2002 1:42 PM
To: Hargas, Jon (.)
Subject: RE: cleaning 30 mile part

Jon,
I had a good look at the part after Shri left. My opinion is that someone stuck a drill down the port, thus it might be a big waste of time. What do you think?

Regards

Mark Freeland

6-Sigma Black Belt
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email: mfreela1@ford.com
Tel.: (313) 594-7645

---Original Message---

From: Hargas, Jon (.)
Sent: Thursday, August 15, 2002 6:07 PM
To: Freeland, Mark (M.)
Subject: cleaning 30 mile part

Mark,
If you want to preserve the wire bonds on the 30-mile part that failed on the drive up to MPG, you'll need to get some Dynasolve. Of course this will eat the aluminum.

I don't think it's feasible to soak in freon and scrub around the wire bonds, they're too likely to break.

Jon

From: Freeland, Mark (M.)
Sent: Thursday, August 08, 2002 11:32 AM
To: Kyong Park (E-mail); Hargas, Jon (.); Gates, Freeman (F.C.); Maurer, James (J.B.)
Cc: Simko, Steven (S.J.); Uy, Dalrene (D.); Carter, Roscoe (R.O.); Akins, Mary (M.)
Subject: SRL308 Lab test results

Steve Simko's work on the Auger has shown that the anomaly which I created on sensor sample SRL308 by driving for 1,674 miles in the SCR Latched state is quite different from the UPAD and PAD.

Steve's work on SRL308 has shown the following:

- 1) There is a thin layer of oxidized Aluminum on the surface above the gold (where the gold appears discolored).
- 2) The gold layer has inter-granular separations (looks like the loose head of a cauliflower) in the raised regions.
- 3) The "Al" layer under the raised regions are up to twice as thick as the base "Al" layer should be.
- 4) There is a lot of Au diffused through out the Al under the raised regions.
- 5) There is some voiding in the "Al" layer mostly near the BPSG interface, but this is relatively little compared with the increase in the thickness in the mounds.
- 6) No Oxygen was detected in the "Al" layer below the TIW.

From this result we have concluded that the UPAD and PAD symptom is most likely not caused by continuous high currents running through the die. Work will continue at SRL to try and identify the actual mechanism by which UPAD and PAD are created.

If you wish to see Steve's data we can set up a meeting to review it in detail.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Uy, Dairene (D.)
Sent: Friday, August 02, 2002 3:48 PM
To: Park, Kyong'
Cc: Freeland, Mark (M.); Hengea, Jon (.)
Subject: RE: QMI 536 MSDS

Don't worry, Kyong. I haven't said anything, and Mark and Jon have not either. I will probably call you sometime next week because I would like to know more about it.

Dairene

—Original Message—

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Friday, August 02, 2002 1:47 PM
To: Uy, Dairene (D.)
Subject: RE: QMI 536 MSDS

Dairene,

You were interested in the statement of 'use at < 35 degree Celsius', I hope you don't misunderstand before you make a public statement.

If you have a question on it, I think I can help you.

Kyong
Tel: 805 523-2000 x2243.

From: Freeland, Mark (M.)
Sent: Thursday, August 01, 2002 10:08 AM
To: Uy, Dalrene (D.); Simko, Steven (S.J.)
Cc: Gates, Freeman (F.C.); Maurer, James (J.B.); Hargas, Jon (.); Planta, Paul (P.G.); Kyong Park (E-mail)
Subject: Bond Pad Corrosion created by running a dPFE on vehicle in the latched condition

Dalrene,

Attached is a photograph of the Vo pad of the HI die of SRL308, the part which I created corrosion on by running it in vehicle in the latched condition.

Jon Hargas has removed the potting gel with his usual Freon process. You can see that there are "blisters" of a residue material above the surface of the gold. Jon and I have decided that we should take a final attempt to identify this material with Raman before Steve Simko removes the gold in the Auger.

I will bring the part to you this morning. Could you please see if you can identify what the material in the blisters is.

Steve,

After Dalrene has finished could you please remove the gold and the TiW layers and examine the Al conductor on the Vro, Vbuf and Vout pads of this die. Please record any anomalies you observe on each of these three



SRL308 HI die 5
20020730.jpg



SRL308 HI die 5a
20020730.jpg

pads, in each layer,

before removing the layer.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
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From: Freeland, Mark (M.)
Sent: Tuesday, July 30, 2002 4:58 PM
To: Hargas, Jon (.); Uy, Dairene (D.)
Cc: Potter, Timothy (T.J.)
Subject: RE: Elwood Focus sensor

Jon & Dairene,
I have assigned a SRL tracking number of SRL931 to this part. If you have the part could you please inscribe this number on the part and associate all records with this number. I have noted the info that I have in the master log, but please advise me of any info & findings you have on the part.
When you are done then the remains should be stored in a plastic bag clearly labeled with the tracking number and deposited in the 900 series box in my office.

Thanks

Regards

Mark Freeland

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—Original message—

From: Hargas, Jon (.)
Sent: Friday, July 19, 2002 1:25 PM
To: Freeland, Mark (M.); Uy, Dairene (D.)
Subject: Elwood Focus sensor

Mark,
Tim Potter got a sensor from Kevin Elwood's Focus. It has some clear bubbles by the base of the wire bonds. Dairene wrote down the mileage.

The date stamp on the sensor is 1K19B. I have not assigned it an SRL number. There are images in the Kavlico directory on the optical lab computer.

Jon

EA02-021-G 77596

From: Park, Kyong [KPark@kavlico.com]
Sent: Tuesday, July 30, 2002 2:20 PM
To: Hargas, Jon (.)
Subject: RE: QMI 536 MSDS

Thank you very much.
Kyong

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

From: Hargas, Jon (.) [mailto:jhargas@ford.com]
Sent: Monday, July 29, 2002 7:48 AM
To: Uy, Dairene (D.); Carter, Roscoe (R.O.)
Cc: Park, Kyong
Subject: FW: QMI 536 MSDS

Hi Dairene, Roc,
Kyong Park from Kavlico wanted to distribute the latest MSDS for the die attach adhesive.
Jon

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Saturday, July 27, 2002 1:35 PM
To: jhargas@ford.com
Subject: FW: QMI 536 MSDS

Dear Jon,
I received the e-file of Loctite QMI 536 MSDS that we use as die attachment. Ms. Uy may want to have a copy this file.
Would you please, forward a copy of it? I do NOT have her address.
Thanks.
Kyong

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

From: Melanie.donovan@loctite.com [mailto:Melanie.donovan@loctite.com]
Sent: Friday, July 26, 2002 4:38 PM
To: Park, Kyong
Subject: QMI 536 MSDS

Mr. Park,

Attached find the latest revision of our MSDS for QMI 536.

Best Regards,

Melanie Donovan
Quality Assurance Administrator
Henkel Loctite
Phone: 858-695-1716 x 653
Fax: 858-695-0951

ER02-027-G 77507

From: Uy, Dairene (D.)
Sent: Monday, July 29, 2002 11:10 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.); Freland, Mark (M.)
Cc: 'Kyong Park (E-mail)' (E-mail)
Subject: RE: QMI 536 MSDS

Thanks for the MSDS of the die attach. It is very interesting to note that:

- a) there is "irritant evolution" at temperatures greater than 300C,
- b) recommended use conditions are at < 35C,
- c) among the combustion and decomposition products are HF and NOx.

Dairene

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

From: Hargas, Jon (.)
Sent: Monday, July 29, 2002 10:48 AM
To: Uy, Dairene (D.); Carter, Roscoe (R.O.)
Cc: 'Kyong Park (E-mail)' (E-mail)
Subject: FW: QMI 536 MSDS

Hi Dairene, Roc,

Kyong Park from Kavlico wanted to distribute the latest MSDS for the die attach adhesive.
Jon

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Saturday, July 27, 2002 1:35 PM
To: jhargas@ford.com
Subject: FW: QMI 536 MSDS

Dear Jon,

I received the e-file of Loctite QMI 536 MSDS that we use as die attachment. Ms. Uy may want to have a copy this file. Would you please, forward a copy of it? I do NOT have her address.

Thanks.

Kyong

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

From: Melanie.donovan@loctite.com [mailto:Melanie.donovan@loctite.com]
Sent: Friday, July 26, 2002 4:38 PM
To: Park, Kyong
Subject: QMI 536 MSDS

Mr. Park,

Attached find the latest revision of our MSDS for QMI 536.

EA82-027-G 77388

Best Regards,

Melanie Donovan
Quality Assurance Administrator
Henkel Loctite
Phone: 858-896-1716 x 863
Fax: 858-896-0961

Karbousky Sr., Robert (R.J.)

From: Park, Kyong [KPark@kavlico.com]
Sent: Saturday, July 27, 2002 1:35 PM
To: jhanges@ford.com
Subject: FW: QMI 536 MSDS
Follow Up Flag: Follow up
Flag Status: Flagged

Dear Jon,
I received the e-file of Loctite QMI 536 MSDS that we use as die attachment. Ms. Uy may want to have a copy this file. Would you please, forward a copy of it? I do NOT have her address.
Thanks.
Kyong

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

From: Melanie.donovan@loctite.com [mailto:Melanie.donovan@loctite.com]
Sent: Friday, July 26, 2002 4:38 PM
To: Park, Kyong
Subject: QMI 536 MSDS

Mr. Park,

Attached find the latest revision of our MSDS for QMI 536.

Best Regards,

Melanie Donovan
Quality Assurance Administrator
Henkel Loctite
Phone: 858-695-1716 x 658
Fax: 858-695-0951

EA92-827-G 77888

7/18/2003



Material Safety Data Sheet

IDENTIFICATION

Product Number: QMI 536

Product Name: Organic Die Attach

Synonyms: Non-Conductive Thermoset Adhesive

INGREDIENT DISCLOSURE

CAS number	Name	%	Potential Hazard
9002-84-0	Proprietary Filler	≤ 50	Irritant evolution at temperatures greater than 300°C (572°F)
none	Proprietary Bismaleimide	≤ 50	polymerization
none	Proprietary Polymer	≤ 20	polymerization

TSCA Status: The product is a mixture and therefore listing on the TSCA registry is not required. Each of these ingredients are listed, or covered by a low volume exemption under section 5(h) (4).

PHYSICAL AND CHEMICAL PROPERTIES

Vapor Pressure: N/E

Density g/ml: 1.26

Water Solubility: Insoluble

Boiling Pt °C: N/A

Vapor Pressure: Negligible

Polymerization Temp: 150°C

Physical State, Appearance and Odor: A viscous white paste with mild odor.

FIRE AND EXPLOSION HAZARD DATA

Flash Point °F: > 200 °F

Extinguishing Media: carbon dioxide, dry chemical, water fog

Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing to prevent inhalation or contact of combustion products.

Unusual Fire and Explosion Hazards: Hazardous polymerization will not occur.

Product Number: QMI 536

Product Name: Organic Die Attach

REACTIVITY DATA

Material is stable under normal storage and recommended use conditions (-40°C, and < 35°C, respectively)

Incompatibilities: Strong Oxidizers, acids, and bases.

Hazardous Combustion or Decomposition Products: CO₂, CO, HF, NO_x, hydrocarbons from Incomplete combustion.

TOXICITY AND HEALTH HAZARD DATA

Potential Routes of entry: Ingestion, skin and eye exposure.

Is material listed in National Toxicology Program, Third Annual Report on Carcinogens? No

Has the material been found to be a potential carcinogen by the International Agency for Research on Cancer? No

Acute Effects: May cause eye and skin irritation on contact. Inhalation of fumes evolved during the product's cure may irritate the respiratory tract. Ingestion may cause irritation to the gastrointestinal tract.

To the best of our knowledge, the chemical, physical and toxicological properties of this material have not been thoroughly investigated.

First Aid:

Inhalation - Remove to fresh air and consult a physician. If not breathing give artificial respiration. If breathing is difficult give oxygen. Call a physician.

Eyes - Flush with water for at least 15 minutes and contact a physician.

Skin - Remove contaminated clothing as needed. Wash affected area with soap and water.

Ingestion - Drink large quantities of water. Do not induce vomiting. Contact a physician. Never give liquids to an unconscious person.

Product Number: QMI 536

Product Name: Organic Die Attach

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Protective equipment: Safety glasses and chemical resistant gloves.

Handling protocols: Good personal hygiene must be maintained. Do not allow eating, smoking, or drinking in storage or use areas. Avoid ingestion and contact with skin and eyes. Use product in a well ventilated area.

Storage conditions: Store at -40°C until required for use.

SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:

Small spills: Wipe up spilled material and package in storage drums for disposal.

Large spills: Shovel material in to storage drums for disposal.

Waste disposal method: Destructive Incineration in a permitted facility is the preferred method of disposal. Observe all federal, state and local laws.

TRANSPORT INFORMATION

DOT/IATA Proper shipping Name	Not Regulated
DOT/IATA Packing Group	Not Regulated
DOT/IATA Label	Not Regulated
DOT/IATA UN Number	Not Regulated

REGULATORY INFORMATION

This product contains a toxic chemical(s) subject to the reporting requirements of SARA 313 (40CFR372).

OTHER INFORMATION

The information contained herein relates only to the specific material identified. Loctite Corporation believes that such information is accurate and reliable as of the date of this material safety data sheet, but no representation, guarantee or warranty, express or implied, is made as to the accuracy, reliability, or completeness of the information. Loctite Corporation urges persons receiving this information to make their own determination as to the information's suitability and completeness for their particular application.

Latest Revision By Bill Wood, Dated 04/08/02

Loctite Corporation
9938 Via Pasar, San Diego, CA 92126
Phone: (858) 695-1716 fax: (858) 695-0951

 Loctite Corporation

From: Kevin R.J. Ellwood [kellwood@ford.com]
Sent: Friday, July 19, 2002 2:17 PM
To: Mark Freeland (MFREELA1)
Cc: Jon Hanges (JHANGAS)
Subject: VIN number for my Focus

Hi Guys,

I was told that you need my VIN number. Here it is:

1FAFP34362W147490

cu
Kevin

Kevin R.J. Ellwood
Materials Science Dept.
Scientific Research Lab
Dearborn, MI 48121-2153 MD3182

Phone: (313) 322-5535
Fax: (313) 323-1129

From: Uy, Dairene (D.)
Sent: Friday, July 19, 2002 8:50 AM
To: Verner, Carol (C.J.); Hargas, Jon (.)
Subject: RE: Used good sensor for Raman

Carol,

I just got one this morning. We took one off somebody's Focus and put another one in. Thank you.

Jon,

Can I ask you to depot the sample for me when you have time? I will be in the lab looking at it in the meantime.

Dairene

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

From: Verner, Carol (C.J.)
Sent: Thursday, July 18, 2002 5:48 PM
To: Hargas, Jon (.); Uy, Dairene (D.)
Subject: RE: Used good sensor for Raman

Dairene,

I am working on getting a sensor for you. If you get the sensor by Monday, noon will that be enough time for you to perform the necessary analysis?

Carol
x07180

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

From: Hargas, Jon (.)
Sent: Thursday, July 18, 2002 5:08 PM
To: Verner, Carol (C.J.); Uy, Dairene (D.)
Cc: Freeland, Mark (M.); Akins, Mary (M.); 'Kyong Park (E-mail)' (E-mail)
Subject: Used good sensor for Raman

Carol,

Dairene Uy presented data on her Raman analysis at today's meeting. It was requested that she look at a used sensor that was still good to see if there was anything in the exhaust gas that was dissolved in the gel. It would be desirable to have the results reported next week, but Mark is in Ireland and he's our normal source for parts.

Do you have any good used parts? I think it would actually be more appropriate to take a sensor off a vehicle and give it to her, condensate and all. There's a better chance that a more volatile chemical will be present in a sensor directly off a vehicle than one sitting in a parts bin for months. We have to break the case open for Dairene to do Raman, so a replacement would have to be available.

Jon Hargas
Materials Science Dept.
x31088

EA02-027-G 77885

From: Potter, Timothy (T.J.)
Sent: Friday, July 19, 2002 8:09 AM
To: Hanges, Jon (.)
Subject: RE: Used good sensor for Raman

Yes. If you need it right away I will need a ride to my apartment to get the sensor. That brings up another issue, my car does not get driven much. You might want a sensor from a car that was driven some distance to get to work. Otherwise I could bring in a sensor Monday.

Tim

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

From: Hanges, Jon (.)
Sent: Thursday, July 18, 2002 5:48 PM
To: Potter, Timothy (T.J.)
Subject: FW: Used good sensor for Raman

Tim,

Dalrene needs a good used sensor to Raman on. I think it would be better to do it fresh off the car, condensate and all, so that she has the best chance at detecting whether anything is dissolved in the gel. Carol Verner suggested that you might not be squeamish about trading sensors out of your Focus. Would you be able to do it if Carol gives you a replacement?

Jon Hanges
x31068

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

From: Verner, Carol (C.J.)
Sent: Thursday, July 18, 2002 5:23 PM
To: Hanges, Jon (.)
Subject: RE: Used good sensor for Raman

Jon,

Ask Tim Potter if he is willing to take the sensor off his Focus. If so, I can give him a replacement. If you have a dpfe on your vehicle are you willing to take it off and use for the test.

Let me know.
Carol

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

From: Hanges, Jon (.)
Sent: Thursday, July 18, 2002 5:08 PM
To: Verner, Carol (C.J.); Uy, Dalrene (D.)
Cc: Freeland, Mark (M.); Aldns, Mary (M.); 'Kyong Park (E-mail)' (E-mail)
Subject: Used good sensor for Raman

Carol,

Dalrene Uy presented data on her Raman analysis at today's meeting. It was requested that she look at a used sensor that was still good to see if there was anything in the exhaust gas that was dissolved in the gel. It would be desirable to have the results reported next week, but Mark is in Ireland and he's our normal source for parts.

Do you have any good used parts? I think it would actually be more appropriate to take a sensor off a vehicle and give it to her, condensate and all. There's a better chance that a more volatile chemical will be present in a sensor directly off a vehicle than one sitting in a parts bin for months. We have to break the case open for Dalrene to do Raman, so a replacement would have to be available.

Jon Hanges

BAR2-827-G 77608

Materials Science Dept.
x31068

EM2-827-G 77887

From: Uy, Dairene (D.)
Sent: Thursday, July 18, 2002 6:03 PM
To: Hargas, Jon (.)
Subject: RE: Analytical solutions`

thanks, Jon.
dairene

---Original Message---

From: Hargas, Jon (.)
Sent: Thursday, July 18, 2002 4:50 PM
To: Uy, Dairene (D.)
Subject: Analytical solutions`

<< File: 686_add1.pdf >> << File: 02F686PRELIM.pdf >> << File: corrosion notes.doc >> Dairene,
Here are the three reports from analytical solutions.
Jon

From: Freeland, Mark (M.)
Sent: Friday, July 12, 2002 10:45 AM
To: Hargas, Jon (.)
Subject: RE: 308

Thanks for the status Jon.

Next week can you get with Steve and explain what needs done with it. Hopefully he can get it finished by the time I get back from vacation.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

—Original Message—

From: Hargas, Jon (.)
Sent: Thursday, July 11, 2002 6:50 PM
To: Freeland, Mark (M.)
Subject: 308

Mark,
Dalrene gave me 308, the part you latched and drove, and it's on the bench in my sample prep area in case you need to look at it.
Jon

E682-827-G 77612

From: Uy, Dalrene (D.)
Sent: Friday, July 12, 2002 10:06 AM
To: Carter, Roscoe (R.O.); Hargas, Jon (.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED!

Thanks, Roc. I didn't know that the gel in the chimneys had a silicone copolymer. Anyhow, the silicone I found within the perfluoropolyether was in the form of "flat" bubbles, and their spectra exactly matched the spectrum of the gel outside the chimneys, which is an exact match for polydimethylsiloxane. (I realize I forgot to put the "di" in polydimethylsiloxane in my previous email.)

Dalrene

---Original Message---

From: Carter, Roscoe (R.O.)
Sent: Friday, July 12, 2002 9:51 AM
To: Uy, Dalrene (D.); Hargas, Jon (.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED!

Dalrene,

The gel in the chimneys does contain a silicone copolymer but you are like correct that some cross contamination can inadvertently occur. ROC

---Original Message---

From: Uy, Dalrene (D.)
Sent: Friday, July 12, 2002 9:36 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED!

The silicone I found is polymethylsiloxane, which is the gel material outside the chimneys.

The gel covering the sensor dies is a perfluoropolyether.

I guess there was some contamination of the two gels when Jon was removing them and the chimney.

! ---Original Message---

From: Hargas, Jon (.)
Sent: Thursday, July 11, 2002 5:46 PM
To: Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.); Uy, Dalrene (D.)
Subject: silicone

Roc,

Dalrene found some silicones in Raman. It might be best for you to discuss with her your findings about the gel and what is produced when it is overheated.

The gel over the hybrid is different than the gel over the die.

There may be some possibility of cross contamination of the gels.

To get the gel off the scalpel I was using I did have to wipe it onto the nitrile gloves on my hand. I don't know if the nitrile has silicone.

EP02-027-G 77613

I don't think I have any silicones in the area that I removed the gel. I have vacuum grease and diffusion pump oil in hte room, but don't use them on that bench.
Jon

From: Carter, Roscoe (R.O.)
Sent: Friday, July 12, 2002 9:51 AM
To: Uy, Dalrene (D.); Hargas, Jon (.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED

Dalrene,

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

From: Uy, Dalrene (D.)
Sent: Friday, July 12, 2002 9:36 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED

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| -----Original Message-----

From: Hargas, Jon (.)
Sent: Thursday, July 11, 2002 6:46 PM
To: Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.); Uy, Dalrene (D.)
Subject: silicone

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Jon

From: Uy, Dairene (D.)
Sent: Friday, July 12, 2002 9:36 AM
To: Hargas, Jon (.); Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.)
Subject: RE: silicone -IDENTIFIED

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I guess there was some contamination of the two gels when Jon was removing them and the chimney.

! —Original Message—

From: Hargas, Jon (.)
Sent: Thursday, July 11, 2002 6:46 PM
To: Carter, Roscoe (R.O.)
Cc: Freeland, Mark (M.); Uy, Dairene (D.)
Subject: silicone

Roc,

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The gel over the hybrid is different than the gel over the die.

There may be some possibility of cross contamination of the gels.

To get the gel off the scalpel I was using I did have to wipe it onto the nitrile gloves on my hand. I don't know if the nitrile has silicone.

I don't think I have any silicones in the area that I removed the gel. I have vacuum grease and diffusion pump oil in the room, but don't use them on that bench.

Jon

EA02-827-G 77616

From: Freeland, Mark (M.)
Sent: Thursday, July 11, 2002 9:47 AM
To: Kyong Park (E-mail); Gates, Freeman (F.C.)
Cc: Hanges, Jon (.); Carter, Roscoe (R.O.)
Subject: Exhaust Gas Condensate Acidity

I measured the condensate in the tubes of the dPFE on my Mountaineer this morning with high resolution paper (thanks Jon or Rosco, not sure which one left me the present last night). The value I observed was 4.5.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, June 28, 2002 4:35 PM
To: Kyong Park (E-mail)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); Gates, Freeman (F.C.); Hargas, Jon (.); Jeff Helms (E-mail)
Subject: FW: FREELAND, MARK

Kyong,

As discussed I am planning to visit Kavlico on Tuesday all day and Wednesday morning to review our attempts to create UPAD and to review results from vehicle testing on the Mountaineer and the Yellow cab.
Attached is my flight plan.

Please call when you have a chance.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: PNR-american express [mailto:pnr-notification@itn.net]
Sent: Friday, June 28, 2002 4:23 PM
Subject: FREELAND, MARK

TRAVEL BOOKING CONFIRMATION

Your company's Travel Department has requested this Message be sent each time you book travel for company business. If you wish to change that arrangement please contact your Travel Department.

CRS Record Locator # 7YX6X2
Airline Record Locator #1 UA-RBHMZ4

Name(s) of people traveling:
Passenger #1: MARK FREELAND
Meal: standard

Fare Details: DTT UA X/DEN UA BUR 254.66UA X/DEN UA DTT 254.65US\$509.31 END UA ZPDTWDEMBURDEN XT10.00AY16.50XF DTW4.5DEN4.5BUR 3DEN4.5

Baggage Allowance: 2 pieces

ITINERARY

Flight/Equip.: United Airlines 1905 Boeing 737-300
Depart: Detroit (DTW)/Monday July 1 6:05 pm
Arrive: Denver (DEN)/Monday July 1 7:09 pm
Stops: non-stop Miles:1123
Class: Coach

Flight/Equip.: United Airlines 1285 Boeing 737-500
Depart: Denver (DEN)/Monday July 1 8:00 pm
Arrive: Burbank (BUR)/Monday July 1 9:19 pm
Stops: non-stop Miles:850
Class: Coach

Flight/Equip.: United Airlines 706 Boeing 737-500
Depart: Burbank (BUR)/Wednesday July 3 2:33 pm
Arrive: Denver (DEN)/Wednesday July 3 5:48 pm
Stops: non-stop Miles:850
Class: Coach

Flight/Equip.: United Airlines 378 Airbus A319
Depart: Denver (DEN)/Wednesday July 3 6:35 pm
Arrive: Detroit (DTW)/Wednesday July 3 11:17 pm
Stops: non-stop Miles:1123
Class: Coach

Total Airfare (including taxes) USD 586.00
Flight segments must be ticketed by close of business on July 1.

AGENCY INFORMATION

Agency: American Express
Dearborn, MI

BILLING INFORMATION

Name: Mark Freeland
Address: 2101 Village Road
Mail Stop: Rm 1517 MD 2629
Dearborn, MI 48124
Country: USA
Day Phone: 1-313-5947645
Home Phone: 1-248-426-0799
Email: MFREELA1@ford.com

PAYMENT INFORMATION

Visa Number: ON FILE
Expires: ON FILE

SPECIAL REQUESTS

HAVE A GREAT TRIP!

From: Davies, Brady [BDavies@kavlico.com]
Sent: Tuesday, June 25, 2002 11:43 AM
To: Poma, Amy (A.); Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auller, Jim (J.E.); Awad, Mahmoud (M.I.); Ayers, Don; Bandoake, Pete (P.F.); Bansek, Catherine (C.K.); Bersuder, Lee (L.C.); Bissl, Gerry (G.); Bronni, Mark (M.J.); Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.); Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates, Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hargas, Jon (.); Jahshan, John; Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerazi, Karen (K.J.); Koszewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.); Nielsen, Christian (C.A.); O'Neill, Jim (J.D.); Oswald, Greg (G.G.); Park, Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.); Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Reddy, Srikanth; Rossel, Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro, Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); Williamson, Richard (E.)
Subject: RE: June 25, 2002 Kavlico Agenda and Issues Deck



Norfolk DP Sensor
Failure Anal...

Attached is the test plan for the Norfolk DP field return part.

Brady

<<Norfolk DP Sensor Failure Analysis Test Plan.xls>>

> -----Original Message-----

> **From:** Poma, Amy (A.) [SMTP:apoma2@ford.com]
> **Sent:** Tuesday, June 25, 2002 5:44 AM
> **To:** Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter
> (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auller, Jim (J.E.);
> Awad, Mahmoud (M.I.); Ayers, Don; Bandoake, Pete (P.F.); Bansek, Catherine
> (C.K.); Bersuder, Lee (L.C.); Bissl, Gerry (G.); Bronni, Mark (M.J.);
> Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.);
> Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates,
> Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hargas, Jon
> (.); Jahshan, John; Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerazi, Karen
> (K.J.); Koszewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon (G.P.);
> Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.); Nielsen,
> Christian (C.A.); O'Neill, Jim (J.D.); Oswald, Greg (G.G.); Park, Kyong;
> Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.); Poma, Amy;
> Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Reddy, Srikanth; Rossi,
> Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro,
> Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); Williamson, Richard
> (E.)
> **Subject:** June 25, 2002 Kavlico Agenda and Issues Deck

> Team-

> Attached is the Agenda and Issues deck for our 1:00 p.m. meeting today.
> The following people are on today's agenda, please advise if you have any
> additions or changes, thanks.

> KYONG PARK - ALL
> JIM MCCOY
> MARK FREELAND
> FREEMAN GATES
> JIM O'NEALL

ER02-027-G 77681

> <<Kavlico Meeting Agenda_062502.doc>>
>
> <<Rpt_IssuesStatus062502.pdf>>
>
>
>
> Amy Poma
> V-Engine Engineering-Project Mgmt.
> POEE Building, FMEI Cube CO162
> phone-313-390-8849, fax: 313-390-4084
> apoma2@ford.com
> << File: Kavlico Meeting Agenda_062502.doc >> << File:
> Rpt_IssuesStatus062502.pdf >>

Norfolk DP Sensor Failure Analysis

Task	Completion Date
QA Testing of DP sensor at temperature and pressure.	Complete
Electrical characterization performed by Roger Houston (indicates erratic Reference die)	Complete
Visual through gel inspection of HI and Reference die (one location on HI die suspect, but Indeterminate).	Complete
Chimneys removed and traces cut by Analysis Lab.	Complete
Ship to Analytical Solutions	06/24/02
Review electrical test data performed at Kavlico.	06/26/02
External visual inspection to document received module.	06/26/02
Electrical testing to verify electrical failure mode.	06/27/02
Visual inspection of Dice.	06/27/02
Remove silicone gel covering the top surface of the die, and inspect the unprotected and protected damage areas using optical microscope and SEM. SEM inspection to include Backscattered electron imaging, and X-ray elemental analysis.	06/28/02
Perform first tier failure location (Liquid Crystal analysis) to locate general location of the electrical short on the top surface of the die.	07/01/02
Perform Light emission analysis, or EBIC analysis for second tier failure isolation to a particular transistor or diffusion location.	07/02/02
Chemical Unlayering as needed to remove oxide and metal layers to document the physical failure mechanism.	07/03/02
Determine root failure mechanism.	07/03/02

From: Freeland, Mark (M.)
Sent: Wednesday, June 19, 2002 1:55 PM
To: Maurer, James (J.B.)
Cc: Rossi, Roberto (R.A.); Plante, Paul (P.G.); Gates, Freeman (F.C.); Hargas, Jon (.)
Subject: RE: Duplication of Field Failures

Jim,

One of the H2SO4 with latch may be similar to the field PAD bubble, but not identical as the overlying gel has gone. I have yet to get the Raman done on one of these parts to confirm. One of the HCL parts with latch was similar to the 8 mile part from the 3.8L Mustang that failed two sensors on the same day. The CD with the photographs Jon & I took last week of the Add Test parts arrived as I am righting this note. I will have it copied for you to inspect the pictures yourself.

Other than that we have not seen UPAD, area 20 UPAD, confirmed PAD, MC Ctr bubbles, or Blistering of the gel at the die interface from Laboratory generated experiments.

What we do know how to create in the lab is:

- Fused Wire bonds,
- Bubbles around wire bonds,
- Large circular bubbles over the die,
- Brain like bubbles, (Jon & Shri's description)
- Discolored die attach,
- Saturated Low output,
- Saturated High output,
- Erratic output,
- No slope output,
- Low input impedance,
- High Input Impedance,
- Abnormal output impedance,
- Low Current Draw,
- High Current Draw,
- TNI after High Current Events.

Note the common necessary condition for the lab generated examples of each of these symptoms is a high current event.

I know that you will only be convinced if we know how to create each and every symptom that we get back from the field. Therefore, one of my objectives is to demonstrate in contrived experiments, how to generate each of the symptoms observed in the field returns.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

—Original Message—

EA02-027-G 77687

From: Maurer, James (J.B.)
Sent: Wednesday, June 19, 2002 12:52 PM
To: Freeland, Mark (M.)
Subject: Duplication of Field Failures

Mark,

Yesterday, I got the impression that you did not think we had a test to duplicate the field failures. I talked to Jon Janda about what the results of Kyong's acid and latch up test were and he stated that the test did duplicate the failures that we had seen in the field. (Latched up with acid)

Do you agree?

Regards,

Jim Maurer

James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

From: Uy, Dairene (D.)
Sent: Friday, June 14, 2002 11:18 AM
To: Hargas, Jon (.); 'Ed Sickafus'; Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.)
Subject: Raman results - aluminum hydroxide

I believe I have found an area underneath the wire bond (not midcracked/chicken poxed) with aluminum hydroxide. Mark, this is on Bout of the hi die.

Also, there is a peak in the Raman spectrum of the gel that can belong to a nitrite (NO₂⁻) or NO₂. The peak had always been there, but I never paid attention to it since the gel is a complex compound and the peak can be due to something else.

Dairene

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

From: Hargas, Jon (.)
Sent: Thursday, June 13, 2002 10:15 AM
To: 'Ed Sickafus'; Uy, Dairene (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

Ed,

I believe Dairene was comparing Raman spectra from their archive of previous standards. In their archive they had tests of heating Al(NO₃)₃·9H₂O, aluminum nitrate nonahydrate, from room temperature to 600C, and Dairene showed me that the spectrum started changing at 100C, and the sample did not rehydrate at room temperature. Perhaps that heating test was not done in high humidity.

The area of aluminum nitrate nonahydrate that Dairene found in a bond pad area is small, and the UV laser alters the sample with time. If and when I stick that into the SEM, or Steve Simko uses Auger, there may be little nonahydrate left for comparison, even if it is metastable in the vacuum.

Roc's testing on the gel and die attach adhesive show that decomposition and color changes can start to occur at about 300C, if memory serves me correctly, and Kyong has temperature probe data showing latched parts get up to 250C, or so. This is enough to start decomposing the aluminum nitrate nonahydrate in a latch up. Perhaps the area Dairene found was able to rehydrate on cooling or in storage.

It would solve some points of curiosity if I could examine a sample of aluminum nitrate nonahydrate in the TEM and see if it transforms to an aluminum hydrate or oxide, but that would be using a higher beam energy than I used in the SEM. I don't think it's worth doing at this time. Auger could determine whether the aluminum nitrate nonahydrate decomposes in vacuum to a nitrate or oxide product, but can't detect hydrogen, any more than I can.

Jon

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

EP02-027-G 77669

From: Ed Sickafus [mailto:ntelleck@ic.net]
Sent: Wednesday, June 12, 2002 9:24 PM
To: Uy, Dairene (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

There are various ambient vapor conditions for investigating thermal decomposition of a hydrate. A vacuum is one. Another is a high temperature, high humidity ambient. Shouldn't the decomposition processes and results differ?

Ed

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

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Tuesday, June 11, 2002 12:25 PM
To: Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: RE: Discrepancy between Auger and Raman results

Before we jump to any conclusions, I just want to mention that I have taken a lot more spectra of both ref and hi dies (+ gel) that Lebzy prepared. I have not finished looking at all my data yet, but I have seen aluminum nitrate again, though NOT all the mudcracked/chickenpox areas showed aluminum nitrate.

I agree with Jon when he says that Al nitrate nonahydrate decomposes at higher temperature. We have Raman spectra of this compound being heated from room temperature up to 600C and back to room temp again, and the spectrum had already started changing at 100C.

Dairene

> -----Original Message-----

> From: Hargas, Jon (.)
> Sent: Tuesday, June 11, 2002 11:50 AM
> To: Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.); Uy, Dairene (D.)
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
> Subject: Discrepancy between Auger and Raman results
>
> Dairene's Raman results are exciting, and give an insight into the initial compounds that form in PAD or UPAD.
>
> Steve Simko found no nitrogen in the samples he looked at except the passivation. He suggested electron beam damage as a cause if the nitrate existed. EDX in SEM is not very sensitive to nitrogen, and I would have to compare an aluminum nitrate standard to whatever unknown I was looking at before drawing conclusions on any spectra I have stored before claiming there was a nitrate present.
>
> The enthalpy of formation or Gibbs Free Energies for aluminum nitrate or aluminum nitrate nonahydrate are not listed in the CRC, but aluminum hydrates (Al₂O₃.H₂O or Al₂O₃.3H₂O) have a higher free energy of formation

than aluminum oxide (of course their formation will depend on the partial pressure of water and temperature). Other tables mention $Al(NO_3)_3$ decomposes, but not the temperature, and that $Al(NO_3)_3 \cdot 9H_2O$ decomposes at 135 degrees Centigrade.

>
> I wonder if in further latch up and heating in high current events may convert any aluminum nitrate formed to aluminum hydrate. Perhaps aluminum nitrate or aluminum nitrate nonahydrate forms in the presence of exhaust condensate.

>
> Jon

> -----Original Message-----

> From: Gates, Freeman (F.C.)
> Sent: Tuesday, June 11, 2002 9:15 AM
> To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hargas, Jon (.); Gates, Freeman (F.C.)
> Subject: RE: New Raman results

> Mark,

> As per our conversation last night (6/10/02), my research did show the following:

> Aluminium Hydroxide + Nitric Acid (exhaust) -----> Aluminium Nitrate + Water

> ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

> So perhaps Analytical Solutions was not completely off base on their, they just did not account for the subsequent reaction in the exhaust environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

> Thanks

> -----Original Message-----

> From: Freeland, Mark (M.)
> Sent: Friday, June 07, 2002 4:53 PM
> To: Ed Sickafus (E-mail)
> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
> Subject: FW: New Raman results

> Ed,

> New information of the residue material left after the Al is transformed. We should discuss this next week.

> Regards

> Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517

EA02-027-G 77571

> Dearborn, MI 48121-2053 USA
> email: mfreelal@ford.com
> Tel.: (313) 594-7645

> -----Original Message-----

> From: Freeland, Mark (M.)
> Sent: Friday, June 07, 2002 4:35 PM
> To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
> Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
> Subject: New Raman results

> Dairene and Lebzy has been working with a UPAD sample which was
mechanically depotted, and saw no chemistry.>
> Today she examined the residue under a bond pad using a UV laser, and
compared the spectra to samples of Al Hydroxide and Al Nitrate that she had
also measured with the equipment.
> The results indicate that the residue is Al Nitrate, and not Al Hydroxide,
as previously suggested by Analytical Solutions.
> I will share the spectra with you on Monday when I arrive. (I only have
paper copies at this time).

> Also, it was interesting to note that after the mechanical depotting, the
residue did not have the mud cracked appearance as previously observed.

> The sample used for this work was SRL647, from the data base.

> Regards

> Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
> email: mfreelal@ford.com
> Tel.: (313) 594-7645

From: Uy, Dairene (D.)
Sent: Thursday, June 13, 2002 12:40 PM
To: Hangas, Jon (.); 'Ed Sickafus'; Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plants, Paul (P.G.); O'Neal, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: Raman data on aluminum nitrate nonahydrate - for those interested

As I mentioned, we have heating data on aluminum nitrate nonahydrate. Below is a summary of our observations:

We took data on 2 samples in Nov. 2000.

Sample 1:

Room temperature, 350C, 600C, room temperature again. The final room temperature spectra were taken the day the sample was heated, and again 3 days later.

Sample 2:

Room temperature, 100C, 200C, 300C, 400C, 500C, 600C, room temp - all on the same day.

Raman observations:

Spectrum starts to change at 100C. 200C is also different. Spectra at 300C, 400C, 500C, 600C are identical. Room temp spectrum after heating is similar to 300-600C spectra.

Room temperature spectra taken one hour after cooling from 600C and spectra taken 3 days later were identical. The sample was left inside the cell. The cell had two 1/8" diameter openings left open.

The changed spectra did not resemble Raman spectra of aluminum hydroxide or aluminum oxide (gamma-alumina).

Visible observations:

Sample is composed of transparent crystals initially, which turn opaque upon heating. Appearance ranged from "milky white" to "like slightly toasted marshmallows" to "chalky-white" to "brownish around the edges". The cooled sample still had the chalky appearance 3 days later.

Dairene

---Original Message---

From: Hangas, Jon (.)
Sent: Thursday, June 13, 2002 10:15 AM
To: 'Ed Sickafus'; Uy, Dairene (D.); Hangas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plants, Paul (P.G.); O'Neal, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

Ed,

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The area of aluminum nitrate nonahydrate that Dairene found in a bond pad area is small, and the UV laser alters the sample with time. If and when I stick that into the SEM, or Steve Simko uses Auger, there may be little nonahydrate left for comparison, even if it is metastable in the vacuum.

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Jon

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

From: Ed Sickafus [mailto:ntellect@ic.net]
Sent: Wednesday, June 12, 2002 9:24 PM
To: Uy, Dairene (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kperk@kavilco.com; bdavies@kavilco.com
Subject: RE: Discrepancy between Auger and Raman results

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Ed

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From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Tuesday, June 11, 2002 12:25 PM
To: Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kperk@kavilco.com; bdavies@kavilco.com
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I agree with Jon when he says that Al nitrate nonahydrate decomposes at higher temperature. We have Raman spectra of this compound being heated from room temperature up to 800C and back to room temp again, and the spectrum had already started changing at 100C.

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> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kperk@kavilco.com; bdavies@kavilco.com
> Subject: Discrepancy between Auger and Raman results
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ER82-827-G 77674

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> I wonder if in further latch up and heating in high current events may convert any aluminum nitrate formed to aluminum hydrate. Perhaps aluminum nitrate or aluminum nitrate nonahydrate forms in the presence of exhaust condensate.

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> Jon

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> From: Gates, Freeman (F.C.)
> Sent: Tuesday, June 11, 2002 9:15 AM
> To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hargas, Jon (.); Gates, Freeman (F.C.)
> Subject: RE: New Raman results

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> Mark,

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> As per our conversation last night(6/10/02), my research did show the following:

>
> Aluminium Hydroxide + Nitric Acid (exhaust) \longrightarrow Aluminium Nitrate + Water

>
> ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

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> So perhaps Analytical Solutions was not completely off base on their, they just did not account for the subsequent reaction in the exhaust environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

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> Thanks

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> ---Original Message---

> From: Freeland, Mark (M.)
> Sent: Friday, June 07, 2002 4:53 PM
> To: Ed Sickafus (E-mail)
> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
> Subject: FW: New Raman results

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> Ed,

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> New information of the residue material left after the Al is transformed. We should discuss this next week.

>
> Regards

>
> Mark Freeland

>
> 6-Sigma Black Belt

EA82-827-G 71878

> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7645

> —Original Message—

> From: Freeland, Mark (M.)
> Sent: Friday, June 07, 2002 4:35 PM
> To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
> Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
> Subject: New Raman results

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mechanically depotted, and saw no chemistry.>
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as previously suggested by Analytical Solutions.
> I will share the spectra with you on Monday when I arrive. (I only have
paper copies at this time).

> Also, it was interesting to note that after the mechanical depotting, the
residue did not have the mud cracked appearance as previously observed.

> The sample used for this work was SRL647, from the data base.

> Regards

> Mark Freeland

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> Engine Research Department
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> email: mfreela1@ford.com
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From: Uy, Dairne (D.)
Sent: Thursday, June 13, 2002 11:41 AM
To: Hargas, Jon (.); 'Ed Sickafus'; Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: RE: Discrepancy between Auger and Raman results

1. Our heating tests were done in air. The chamber is not vacuum tight, but no gases were being flowed over the sample either. The tests were done in Nov. 2000.
2. I have found 4 different bond pads on the 2 dies that showed the nitrate. Also, a bubble by Vdd, ref die, showed the nitrate as well.
3. The data we have on aluminum nitrate nonahydrate was taken over a period of a few days. We have observations on what the sample looked like while heating, cooling, etc. (Am still looking over the data.)
4. The nonahydrate did not decompose to an oxide or hydroxide under our reaction conditions.

—Original Message—

From: Hargas, Jon (.)
Sent: Thursday, June 13, 2002 10:15 AM
To: 'Ed Sickafus'; Uy, Dairne (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

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Sent: Wednesday, June 12, 2002 9:24 PM
To: Uy, Dairne (D.); Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)

ER02-021-G 77577

Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

There are various ambient vapor conditions for investigating thermal decomposition of a hydrate. A vacuum is one. Another is a high temperature, high humidity ambient. Shouldn't the decomposition processes and results differ?

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From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Tuesday, June 11, 2002 12:25 PM
To: Hanges, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
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Subject: RE: Discrepancy between Auger and Raman results

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> Subject: Discrepancy between Auger and Raman results
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EA02-027-G 77678

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> To: Ed Sickafus (E-mail)
> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Planta, Paul (P.G.)
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> Mark Freeland
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> 6-Sigma Black Belt
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> 6-Sigma Black Belt

> Engine Research Department

> Ford Research Laboratory

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ERG2-027-G 77581

Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
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> Sent: Friday, June 07, 2002 4:53 PM

> To: Ed Sickafus (E-mail)

> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)

> Subject: FW: New Raman results

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> Mark Freeland

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> Engine Research Department

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> P.O. Box 2053

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> Dearborn, MI 48121-2053 USA

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> To: Kyong Park (E-mail); Brady Davies (E-mail); Hangas, Jon (.)

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From: Freeland, Mark (M.)
Sent: Thursday, June 13, 2002 10:04 AM
To: Ed Slickafus (E-mail)
Cc: Uy, Dalrana (D.); Hengse, Jon (.)
Subject: FW: PDFE FA report

Ed,

Info on debate regarding Al nitrate vs. Al hydroxide. Kavlico have requested AS to confirm our findings.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
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-----Original Message-----

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Monday, June 10, 2002 5:54 PM
To: MIKE STRIZICH
Cc: pplante@ford.com; mfreel1@ford.com; apoma2@ford.com;
mawad@ford.com; jmaurer@ford.com; fgates@ford.com; Davies, Brady; Akins, Mary; btackman@ford.com; Hubbard, Rick
Subject: RE: PDFE FA report

Dear Mike,

Mr. Mark Freeland of Ford is visiting with us today, and we tried to call you just to find out that you were not available.
We have some questions we like you to look into:

1. Your HCl tests to create corrosion and to draw a conclusion of Al HydroperOxide residue: The picture appears to be that the surface does not have Au metalization. Is it true? If so, how did you remove the gold and the corrosion was not the result of the Au removal process?

What was the concentration of HCl(pH value)?

2. Al HydroperOxide gel: Ford Scientific Research Laboratory think the residue is Al nitrate (Al (NO3)3) as a result of Raman spectroscopy analysis. Ford also said that they did not use any chemicals to remove the gel. (They used only Q-tips to remove the gel.) If you have any left over field returns you have not yet worked on, could you remove the gel mechanically, and also remove mechanically (or pull) the wire bond.

ERR2-027-G 77685

After remove those materials, please pick corroded area and identify/verify what the residue element(s) is (or are)? If you do not have any field return left to work on, please, let me know. I will ask Ford send you more.

Please, let us know what you could do.
Thank you again.
Yours,
Kyong

> -----Original Message-----
> From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
> Sent: Thursday, June 06, 2002 12:04 PM
> To: 'Park, Kyong'; 'Poma, Amy (A.)'
> Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> mawad@ford.com; fgates@ford.com; 'Davies, Brady'; 'Tackman, Bruce'
> Subject: RE: PDFE FA report
>
> Dr. Park,
> Please find the attached "cleaned up version" of the first report that
> addressed your questions. In regard to the corrosion of the metallization,
> I
> did not understand what further explanation you were looking for. I do
> have
> several technical articles describing the corrosion of aluminum, and
> associated by-products. One major question that I think needs to be
> answered
> is "does the latch-up accelerate the corrosion conditions at the die
> level",
> and is the corrosion a secondary effect of the overheating of the die. In
> other words, does the gel "outgas" or "free-up" fluorine at elevated
> temperatures. The gel changes states (etches slower or not at all during
> removal) where a high power dissipation occurred (overstress states). The
> gel manufacturer may be able to answer these questions.
> I sent the addendum report for a second time about 1 hour ago. Please let
> me
> know if you received.
>
> Thanks you,
> Mike

> -----Original Message-----
> From: Park, Kyong [mailto:KPark@kavlico.com]
> Sent: Thursday, June 06, 2002 9:30 AM
> To: Poma, Amy (A.); mstriz@analyticalsol.com
> Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> mawad@ford.com; fgates@ford.com; Davies, Brady; Tackman, Bruce
> Subject: RE: PDFE FA report
>
>
> Analytical Solutions:
>
> Dear Mike,
> I have not received the expected report you mentioned last Monday, nor I
> have not received anything from you
> since I sent you my e-mail with a few comments and questions. I wonder if
> I

> have a system problem, or
> you have not send anything yet.

> I appreciate you if you let me know one way or the other before 10 AM
> Pacific Daylight Saving Time.

> Yours,
> Kyong

> > -----Original Message-----

> > From: Poma, Amy (A.) [SMTP:apoma2@ford.com]
> > Sent: Thursday, June 06, 2002 6:29 AM
> > To: 'Park, Kyong'
> > Subject: RE: PDFE FA report

> > Kyong,

> > Have you received the 2nd report from Analytical Solutions yet? We
> > wanted
> > to discuss it at today's 1:00pm mtg. Please advise. Thanks.

> > Amy Poma
> > V-Engine Engineering-Project Mgmt.
> > POKE Building, FMEI Cube CQ-156
> > phone-313-390-8849, fax: 313-390-4084
> > apoma2@ford.com

> > -----Original Message-----

> > From: Park, Kyong [mailto:KPark@kavlico.com]
> > Sent: Tuesday, June 04, 2002 5:49 PM
> > To: MIKE STRIZICH
> > Cc: jmaurer@ford.com; pplante@ford.com; mfreelal@ford.com;
> > fgates@ford.com; nawad@ford.com; apoma2@ford.com; Akins, Mary; Davies,
> > Brady; Tackman, Bruce
> > Subject: RE: PDFE FA report

> > Dear Mike,
> > During today's our meeting, a few comments and a couple of questions
> > were
> > raised in regards to your report, and I like to pass them on to you.

> > Comments:

> > On page 2, the Quantity Received in the table is not correct: 7
> > field returns, number of good parts from Ford, in addition,
> > unpopulated ceramic hybrids and virgin dies from Kavlico.

> > On page 8, under the heading of High Current Failures, Iout=100 mV,
> > and so on: Iout = 100 mA or Vout = 100 mV? needs
> > clarifications. I understand S/N SRL547 and S/N SRL401 are not 'High
> > Current
> > Failures', needs verification.

> > The heading, 'Transient Failures (Vehicle Failures-pass
> > spec.):', the heading may not be correct. Ford's suggestion is
> > 'Others', needs verifications.

> > Questions:

ERR2-627-G 77687

>> On page 15, the picture of a Oscilloscope screen: Is it I - V
>> traces? What are the settings for scope, X-scale and Y-scale
>> unit/division? What does it mean by ICC - 400 mA? Is this input current?
>> What does it mean by "Output current - 25 mA" ? How are
>> these two
>> traces connected?

>> On page 18, the paper reported the result of HCl experiments on the
>> creation of Aluminum Hydroxide gel. A question was
>> raised about how this phenomena relates to the similar observations
>> obtained
>> from the field returns. We hope that your future
>> report provides some discussions on this issue, if you could.

>> Overall, at least I think, your report had demonstrated an excellent
>> professionalism.

>> Yours,
>> Kyong

>>> -----Original Message-----

>>> From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
>>> Sent: Monday, June 03, 2002 9:35 AM
>>> To: 'Park, Kyong'
>>> Subject: RE: PDEF FA report

>>> Kyong,
>>> Should be done by Wed this week. I am sure there will be a lot of
>>> questions
>>> generated by the current report. Just have people email me relative to
>>> the
>>> questions, and I will get them into a report addendum.
>>> Regards,
>>> Mike

>>> -----Original Message-----

>>> From: Park, Kyong [mailto:KPark@kavlico.com]
>>> Sent: Monday, June 03, 2002 9:10 AM
>>> To: mstriz@analyticalsol.com; jmaurer@ford.com; pplante@ford.com;
>>> mfreelal@ford.com; fgates@ford.com; apoma2@ford.com; mawad@ford.com;
>>> Davies, Brady; Akins, Mary
>>> Cc: Tackman, Bruce; Hubbard, Rick
>>> Subject: FW: PDEF FA report

>>> Dear Mike,
>>> I am distributing your report to the concerned people, and I like to
>> ask
>>> when we should expect your report on next phase analysis?
>>> Thank you very much for your report.
>>> Yours,
>>> Kyong

>>> -----Original Message-----

>>> From: MIKE STRIZICH [SMTP:mstriz@analyticalsol.com]
>>> Sent: Sunday, June 02, 2002 8:42 AM
>>> To: 'Park, Kyong'
>>> Cc: "Kevin Berger"; Clifton Aldridge

EA02-027-G 77588

> > > > Subject: PDFX FA report

> > > >

> > > >

> > > > Dear Mr. Park,

> > > > Please find the attached failure analysis report for your review. An
> > > > addendum with mainly photos showing damage on remaining samples will
> > > > follow

> > > > shortly. Please pass along to FORD participants and Brady.

> > > > I look forward to your feedback, and hope we can continue to service
> > > > your

> > > > failure analysis needs.

> > > > Regards,

> > > > Michael Strizich

> > > >

> > > > -----Original Message-----

> > > > From: Park, Kyong [mailto:KPark@kavlico.com]

> > > > Sent: Friday, May 31, 2002 8:34 AM

> > > > To: mstriz@analyticalsol.com

> > > > Subject: Report & Passcode

> > > >

> > > >

> > > > Dear Mike,

> > > > Hello.

> > > > I am not rushing you, but I am just wondering whether I should
> expect

> > to

> > > > receive any report from you today. Ford people asked about a

> passcode

> > to

> > > > your data base, the passcode that you had mentioned about during our
> > > > visit

> > > > to your company.

> > > > Please, let me know.

> > > > Thank you.

> > > > Kyong <<02F686PRELIM.pdf>>

> > > > << File: 02F686PRELIM.pdf >>

From: Ed Sickafus [ntelleck@ic.net]
Sent: Wednesday, June 12, 2002 9:24 PM
To: Uy, Dairene (D.); Hangas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); kpark@kavlico.com; bdavies@kavlico.com
Subject: RE: Discrepancy between Auger and Raman results

There are various ambient vapor conditions for investigating thermal decomposition of a hydrate. A vacuum is one. Another is a high temperature, high humidity ambient. Shouldn't the decomposition processes and results differ?

Ed

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

From: Uy, Dairene (D.) [mailto:duy@ford.com]
Sent: Tuesday, June 11, 2002 12:25 PM
To: Hangas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: RE: Discrepancy between Auger and Raman results

Before we jump to any conclusions, I just want to mention that I have taken a lot more spectra of both ref and hi dies (+ gel) that Lebzy prepared. I have not finished looking at all my data yet, but I have seen aluminum nitrate again, though NOT all the mudcracked/chickenpox areas showed aluminum nitrate.

I agree with Jon when he says that Al nitrate nonahydrate decomposes at higher temperature. We have Raman spectra of this compound being heated from room temperature up to 600C and back to room temp again, and the spectrum had already started changing at 100C.

Dairene

> -----Original Message-----

> **From:** Hangas, Jon (.)
> **Sent:** Tuesday, June 11, 2002 11:50 AM
> **To:** Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.); Uy, Dairene (D.)
> **Cc:** Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
> **Subject:** Discrepancy between Auger and Raman results
>
> Dairene's Raman results are exciting, and give an insight into the initial compounds that form in PAD or UPAD.
>
> Steve Simko found no nitrogen in the samples he looked at except the passivation. He suggested electron beam damage as a cause if the nitrate existed. EDX in SEM is not very sensitive to nitrogen, and I would have to compare an aluminum nitrate standard to whatever unknown I was looking at before drawing conclusions on any spectra I have stored before claiming there was a nitrate present.
>
> The enthalpy of formation or Gibbs Free Energies for aluminum nitrate or aluminum nitrate nonahydrate are not listed in the CRC, but aluminum

hydrates ($\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ or $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$) have a higher free energy of formation than aluminum oxide (of course their formation will depend on the partial pressure of water and temperature). Other tables mention $\text{Al}(\text{NO}_3)_3$ decomposes, but not the temperature, and that $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ decomposes at 135 degrees Centigrade.

>
> I wonder if in further latch up and heating in high current events may convert any aluminum nitrate formed to aluminum hydrate. Perhaps aluminum nitrate or aluminum nitrate nonahydrate forms in the presence of exhaust condensate.

>
> Jon

>
>
>
>
> -----Original Message-----
> From: Gates, Freeman (F.C.)
> Sent: Tuesday, June 11, 2002 9:15 AM
> To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
> 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hangan, Jon (.); Gates, Freeman
> (F.C.)
> Subject: RE: New Raman results

>
> Mark,
>
> As per our conversation last night (6/10/02), my research did show the following:

>
> Aluminium Hydroxide + Nitric Acid (exhaust) -----> Aluminium Nitrate +
Water

>
> ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

>
> So perhaps Analytical Solutions was not completely off base on their, they just did not account for the subsequent reaction in the exhaust environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

>
> Thanks

>
> -----Original Message-----
> From: Freeland, Mark (M.)
> Sent: Friday, June 07, 2002 4:53 PM
> To: Ed Sickafus (E-mail)
> Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
> Subject: FW: New Raman results

>
> Ed,
>
> New information of the residue material left after the Al is transformed. We should discuss this next week.

>
> Regards

>
> Mark Freeland

>
> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053

> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
> email: mfreelal@ford.com
> Tel.: (313) 594-7645

> -----Original Message-----

> From: Freeland, Mark (M.)
> Sent: Friday, June 07, 2002 4:35 PM
> To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
> Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
> Subject: New Raman results

> Dairene and Lebzy has been working with a UPAD sample which was mechanically depotted, and saw no chemistry.>
> Today she examined the residue under a bond pad using a UV laser, and compared the spectra to samples of Al Hydroxide and Al Nitrate that she had also measured with the equipment.
> The results indicate that the residue is Al Nitrate, and not Al Hydroxide, as previously suggested by Analytical Solutions.
> I will share the spectra with you on Monday when I arrive. (I only have paper copies at this time).

> Also, it was interesting to note that after the mechanical depotting, the residue did not have the mud cracked appearance as previously observed.

> The sample used for this work was SRL647, from the data base.

> Regards

> Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
> email: mfreelal@ford.com
> Tel.: (313) 594-7645

From: Park, Kyong [KPark@kavlico.com]
Sent: Tuesday, June 11, 2002 12:35 PM
To: Hanges, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); Ed Sickafus (E-mail); Simko, Steven (S.J.); Uy, Dairene (D.)
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); Park, Kyong; Davies, Brady; matriz@analyticalsol.com
Subject: RE: Discrepancy between Auger and Raman results

Jon,

I still think the corrosion initiator is HF and agree that Al HydroperOxide, and Al Nitrate are the Al corrosion byproducts. All of these materials would not be generated without the high temperature and with the protection by the gel's initial good condition.

Without the HF, the passivation layer protects the device with the help of the gel, without the high temperature, NOx from the exhaust, even as it might turned into H2NO3, will not attack the device, that we had tested in the laboratory test, and would create Al Nitrate.

Without the high temperature, which is caused by the electric "Latch up", if you are able to create corrosion of Al and other degradation of materials, all these fine details may be significant, yet the importance of HF will be still valid.

We have the results of "Latch up" with uncontrolled currents and various liquids for two weeks. Most parts had lost gel turned into black, the device dies were not attacked very much.

The on-and-off 'slow cooking' due to the intermittence of the electrical latch up in the vehicles may also play very important, the gel may hold those HF created by the degradation of the die attachment and from the gel itself, and provides the essential time for these gas to attack the die, otherwise, the gas will be evaporated before it can attack the die.

Yours,
Kyong

> -----Original Message-----

> From: Hanges, Jon (.) [SMTP:jhangas@ford.com]
> Sent: Tuesday, June 11, 2002 8:50 AM
> To: Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)';
> Simko, Steven (S.J.); Uy, Dairene (D.)
> Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
> 'kpark@kavlico.com'; 'bdavies@kavlico.com'
> Subject: Discrepancy between Auger and Raman results
>
> Dairene's Raman results are exciting, and give an insight into the initial
> compounds that form in PAD or UPAD.
>
> Steve Simko found no nitrogen in the samples he looked at except the
> passivation. He suggested electron beam damage as a cause if the nitrate
> existed. EDX in SEM is not very sensitive to nitrogen, and I would have
> to compare an aluminum nitrate standard to whatever unknown I was looking
> at before drawing conclusions on any spectra I have stored before claiming
> there was a nitrate present.
>
> The enthalpy of formation or Gibbs Free Energies for aluminum nitrate or

> aluminum nitrate nonahydrate are not listed in the CRC, but aluminum
> hydrates (Al₂O₃.H₂O or Al₂O₃.3H₂O) have a higher free energy of formation
> than aluminum oxide (of course their formation will depend on the partial
> pressure of water and temperature). Other tables mention Al(NO₃)₃
> decomposes, but not the temperature, and that Al(NO₃)₃.9H₂O decomposes at
> 135 degrees Centigrade.

>
> I wonder if in further latch up and heating in high current events may
> convert any aluminum nitrate formed to aluminum hydrate. Perhaps aluminum
> nitrate or aluminum nitrate nonahydrate forms in the presence of exhaust
> condensate.

>
> Jon

> > -----Original Message-----

> > From: Gates, Freeman (F.C.)
> > Sent: Tuesday, June 11, 2002 9:15 AM
> > To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
> > Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.);
> > 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hargas, Jon (.); Gates,
> > Freeman (F.C.)
> > Subject: RE: New Raman results

> > Mark,

> > As per our conversation last night (6/10/02), my research did show the
> following:

> > Aluminium Hydroxide + Nitric Acid (exhaust) -----> Aluminium Nitrate +
> Water

> > ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

> > So perhaps Analytical Solutions was not completely off base on their,
> they just did not account for the subsequent reaction in the exhaust
> environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

> > Thanks

> > -----Original Message-----

> > From: Freeland, Mark (M.)
> > Sent: Friday, June 07, 2002 4:53 PM
> > To: Ed Sickafus (E-mail)
> > Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
> > Subject: FW: New Raman results

> > Ed,

> > New information of the residue material left after the Al is
> transformed. We should discuss this next week.

> > Regards

> > Mark Freeland

> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory

EA82-827-G 77884

> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> > email: mfreelal@ford.com
> > Tel.: (313) 594-7645

> > -----Original Message-----

> > From: Freeland, Mark (M.)
> > Sent: Friday, June 07, 2002 4:35 PM
> > To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
> > Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
> > Subject: New Raman results

> > Dairene and Lebzy has been working with a UPAD sample which was
> mechanically depotted, and saw no chemistry.
> > Today she examined the residue under a bond pad using a UV laser, and
> compared the spectra to samples of Al Hydroxide and Al Nitrate that she
> had also measured with the equipment.
> > The results indicate that the residue is Al Nitrate, and not Al
> Hydroxide, as previously suggested by Analytical Solutions.
> > I will share the spectra with you on Monday when I arrive. (I only have
> paper copies at this time).

> > Also, it was interesting to note that after the mechanical depotting,
> the residue did not have the mud cracked appearance as previously
> observed.

> > The sample used for this work was SRL647, from the data base.

> > Regards

> > Mark Freeland

> > 6-Sigma Black Belt
> > Engine Research Department
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> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
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> > email: mfreelal@ford.com
> > Tel.: (313) 594-7645

From: Uy, Dalrene (D.)
Sent: Tuesday, June 11, 2002 12:25 PM
To: Hargas, Jon (.); Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.)
Cc: Maurer, James (J.B.); Pianta, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: RE: Discrepancy between Auger and Raman results

Before we jump to any conclusions, I just want to mention that I have taken a lot more spectra of both ref and hi dies (+ gel) that Lebzy prepared. I have not finished looking at all my data yet, but I have seen aluminum nitrate again, though NOT all the mudcracked/chickenpox areas showed aluminum nitrate.

I agree with Jon when he says that Al nitrate nonahydrate decomposes at higher temperature. We have Raman spectra of this compound being heated from room temperature up to 600C and back to room temp again, and the spectrum had already started changing at 100C.

Dalrene

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Sent: Tuesday, June 11, 2002 11:50 AM
To: Gates, Freeman (F.C.); Freeland, Mark (M.); 'Ed Sickafus (E-mail)'; Simko, Steven (S.J.); Uy, Dalrene (D.)
Cc: Maurer, James (J.B.); Pianta, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'
Subject: Discrepancy between Auger and Raman results

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To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
Cc: Maurer, James (J.B.); Pianta, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hargas, Jon (.); Gates, Freeman (F.C.)
Subject: RE: New Raman results

Mark,

As per our conversation last night(6/10/02), my research did show the following:

ER82-627-G 77896

Aluminium Hydroxide + Nitric Acid (exhaust) \longrightarrow Aluminium Nitrate + Water

ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

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Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
Subject: FW: New Raman results

Ed,

New information of the residue material left after the Al is transformed. We should discuss this next week.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

---Original Message---

From: Freeland, Mark (M.)
Sent: Friday, June 07, 2002 4:35 PM
To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
Subject: New Raman results

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Also, it was interesting to note that after the mechanical depotting, the residue did not have the mud cracked appearance as previously observed.

The sample used for this work was SRL647, from the data base.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory

2002-027-G 71697

P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

ERG2-027-G 77698

From: Gates, Freeman (F.C.)
Sent: Tuesday, June 11, 2002 9:16 AM
To: Freeland, Mark (M.); 'Ed Sickafus (E-mail)'
Cc: Maurer, James (J.B.); Plante, Paul (P.G.); O'Neill, Jim (J.D.); 'kpark@kavlico.com'; 'bdavies@kavlico.com'; Hargas, Jon (.); Gates, Freeman (F.C.)
Subject: RE: New Raman results

Mark,

As per our conversation last night(6/10/02), my research did show the following:

Aluminium Hydroxide + Nitric Acid (exhaust) —> Aluminium Nitrate + Water

ref. www.wpbschoolhouse.btinternet.co.uk/index.htm

So perhaps Analytical Solutions was not completely off base on their, they just did not account for the subsequent reaction in the exhaust environment that transforms Aluminium Hydroxide to Aluminium Nitrate.

Thanks

—Original Message—

From: Freeland, Mark (M.)
Sent: Friday, June 07, 2002 4:53 PM
To: Ed Sickafus (E-mail)
Cc: Maurer, James (J.B.); Gates, Freeman (F.C.); Plante, Paul (P.G.)
Subject: FW: New Raman results

Ed,

New information of the residue material left after the Al is transformed. We should discuss this next week.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

—Original Message—

From: Freeland, Mark (M.)
Sent: Friday, June 07, 2002 4:35 PM
To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
Cc: Uy, Dairene (D.); Gonzalez, Lebzy (L.)
Subject: New Raman results

Dairene and Lebzy has been working with a UPAD sample which was mechanically depotted, and saw no chemistry.

Today she examined the residue under a bond pad using a UV laser, and compared the spectra to samples of Al Hydroxide and Al Nitrate that she had also measured with the equipment.

The results indicate that the residue is Al Nitrate, and not Al Hydroxide, as previously suggested by Analytical Solutions.

I will share the spectra with you on Monday when I arrive. (I only have paper copies at this time).

Also, it was interesting to note that after the mechanical depotting, the residue did not have the mud cracked appearance as previously observed.

The sample used for this work was SRL047, from the data base.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, June 07, 2002 4:35 PM
To: Kyong Park (E-mail); Brady Davies (E-mail); Hargas, Jon (.)
Cc: Uy, Dalrene (D.); Gonzalez, Lebzy (L.)
Subject: New Raman results

Dalrene and Lebzy has been working with a UPAD sample which was mechanically depotted, and saw no chemistry.

Today she examined the residue under a bond ped using a UV laser, and compared the spectra to samples of Al Hydroxide and Al Nitrate that she had also measured with the equipment.

The results indicate that the residue is Al Nitrate, and not Al Hydroxide, as previously suggested by Analytical Solutions.

I will share the spectra with you on Monday when I arrive. (I only have paper copies at this time).

Also, it was interesting to note that after the mechanical depotting, the residue did not have the mud cracked appearance as previously observed.

The sample used for this work was SRL647, from the data base.

Regards

Mark Freeland

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Ford Research Laboratory
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MD 2629 - SRL - Room 1517
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Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, June 07, 2002 2:57 PM
To: Hargas, Jon (.)
Subject: FW: Microtomed dies (low mag OM photos)

Jon,

Need to discuss with you, the mud is not cracked!
Part preparation was mechanical only, no chemical depotting. Please also see Dlirene for her spectra from the mud. Then can you call me at Kavlico to discuss.

Hope the North Sea was good to you, and the Guinness wasn't too bad either!!!!

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

---Original Message---

From: Gonzalez, Labzy (L.)
Sent: Thursday, June 06, 2002 12:06 PM
To: Uy, Dalrene (D.); Freeland, Mark (M.)
Subject: Microtomed dies (low mag OM photos)

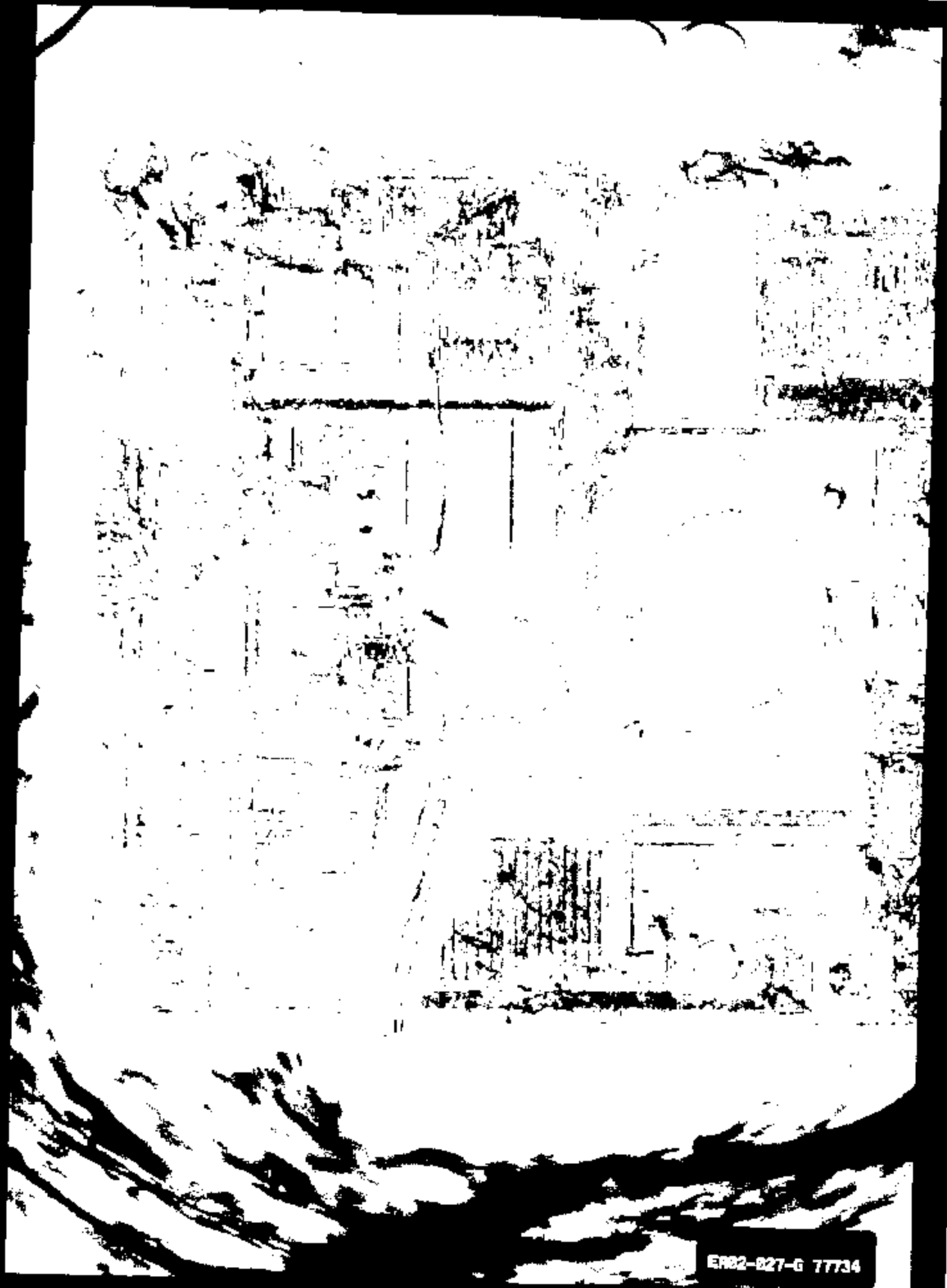


ref_die.jpg

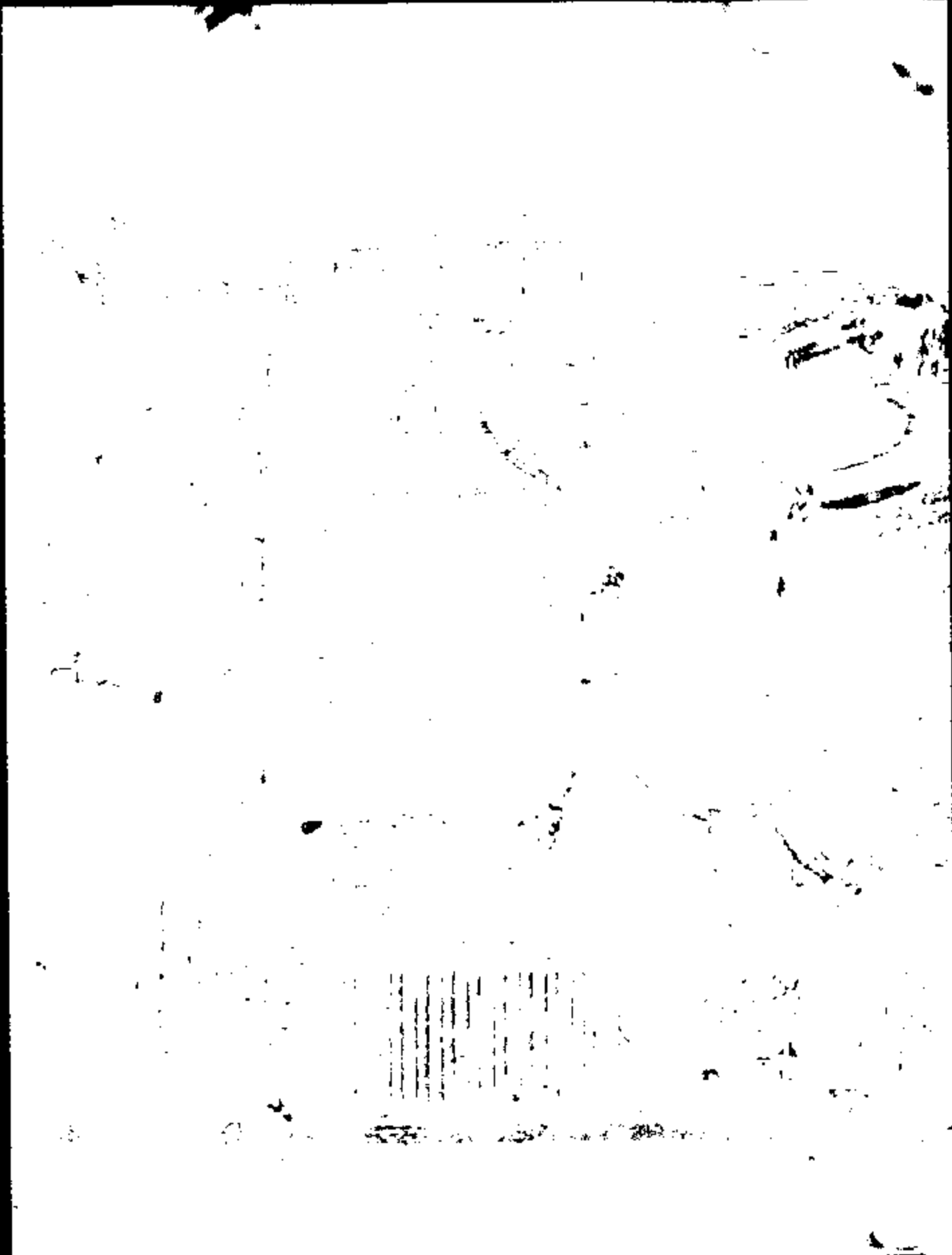


n_die.jpg

ER02-027-G TTT33



ER02-027-G 77734



8982-827-6 7736

From: Freeland, Mark (M.)
Sent: Wednesday, June 05, 2002 10:45 AM
To: Janda, Jon (J.M.); Kyong Park (E-mail); Brady Davies (E-mail)
Cc: Jeff Helms (E-mail); Plants, Paul (P.G.); Maurer, James (J.B.); Hargas, Jon (.); Gates, Freeman (F.C.); Bryant, Bruce (B.D.); Kotwicki, Allen (A.J.)
Subject: FW: American Express Itinerary

Attached is my itinerary for next weeks visit to Kavlico.

The focus of my trip is to review the parts from the High Current Acid, H2O2 and HO2 tests conducted to date and to plan next steps in the quest to recreate all of the field failure symptoms with lab tests.

I would propose that I plan to be at the plant at 8:30 am to give you time to take care of you're email etc.. Jon will let us know by tomorrow morning if he will be joining me.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: eschindo [mailto:amexusa@mindspring.com]
Sent: Wednesday, June 05, 2002 11:34 AM
To: mfreela1@ford.com
Subject: American Express Itinerary

ITINERARY

PAGE NO. 1
PNR: 1P-2LRAGS

FREELAND/MARK-FORD MOTOR CO
PSGR 1-313-5947645
ETKT EMAIL

NAME : FREELAND/MARK

CO	DATE	CITY-AIRPORT	TIME	FLIGHT NBR/CLASS	ST SERV/AMNT
A SU	09JUN	LV DETROIT/METRO	605P	UNITED	1905M OK
		AR DENVER	709P		0STOP 737
		UA CONFO *XJTHDQ			
		SEAT	11-B	**RESERVED**	

EN02-027-0 71787

FREELAND/MARK

A SU 09JUN LV DENVER 800P UNITED 1285M OK
 AR BURBANK 919P OSTOP 737
 UA CONFO *KJTHDQ

UA1285-SEAT ASSIGNMENT IS AIRPORT CHECK IN

C SU 09JUN HERTZ CONFO-B8432744615
 HOLLYWOOD-BURBANK-TERMINAL PICKUP-09JUN SUN/2119
 BURBANK CALIFORNIA RETURN-12JUN WED/0616
 PHONE-818-569-3570
 RATE-(QUOTED) USD 52.50 DAILY UNLIMITED MILEAGE
 EXTRA HOUR CHARGE 27.00 UNLIMITED MILEAGE
 APPROX TTL USD170.49 INC TAX-OTH CHGS
 1 INTERMEDIATE CAR
 CORPORATE ID-25501

H SU 09JUN HYATT WESTLAKE PLAZA CHECK IN- 09JUN SUN/300PM
 880 S WESTLAKE VILLAGE BLVD CHECK OUT-11JUN TUE/1200PM
 WESTLAKE VILLAGE CA 91361 GUARANTEED TO CREDIT CARD-VI
 PHONE-805-557-1234
 FAX-805-379-9392
 CONFO-HY0021502555
 RATE GUARANTEED-USD
 PREFERRED RATE GUESTROOM
 RATE INFO-EFF 09JUN02 185.00
 CANCEL ROOMTS-CANCEL 24 HOURS PRIOR TO ARRIVAL
 PERSONS INCLUDED IN RATE-1 CORPORATE ID-CR12642
 NSRM

H TU 11JUN HILTON BURBANK AIRPORT CHECK IN- 11JUN TUE/1500
 2500 HOLLYWOOD WAY CHECK OUT-12JUN WED/1200
 BURBANK CALIFORNIA 91505 GUARANTEED TO CREDIT CARD-VI
 PHONE-818 843-6000 FREE SHUTTLE SERVICE
 FAX-818 842-9720
 CONFO-3145442668NSCONF
 RATE GUARANTEED-USD
 AMERICAN EXPRESS TRAVEL

CO	DATE	CITY-AIRPORT	TIME	FLIGHT NBR/CLASS	ST SERV/AMNT
H TU	11JUN	HILTON BURBANK AIRPORT			CONTINUED
		RATE INFO-159.00			
		CANCEL RQMTS-BY 0000 11JUN2002 LOCAL PROPERTY TIME			
		1 NIGHT STAY			
		PERSONS INCLUDED IN RATE-1		CORPORATE ID-N0002690	
		NSRM			
A WE	12JUN	LV BURBANK	616A	UNITED	574M OK SNACK
		AR DENVER	925A		OSTOP 737
		UA CONFO *XJTHDQ			
			SEAT	11-B **RESERVED**	
				FREELAND/MARK	
A WE	12JUN	LV DENVER	1005A	UNITED	1406M OK
		AR DETROIT/METRO	240P		OSTOP 757
		UA CONFO *XJTHDQ			
		UA1406 SEAT ASSIGNMENT AIRPORT CHECK IN			

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 ACCEPTED FARE WITHIN TRAVEL POLICY OF \$586.00
 DIRECTORY HOTEL NOT APPLICABLE

 FORM OF PAYMENT IS VISA.
 YOUR UNITED TICKET NUMBER IS 1531025050.

HAVE A PLEASANT TRIP

*****KEEP TO USE FOR EXPENSE REPORT*****

From: Freeland, Mark (M.)
Sent: Friday, May 31, 2002 2:31 PM
To: Maurer, James (J.B.); O'Neill, Jim (J.D.)
Cc: Galas, Freeman (F.C.); Plante, Paul (P.G.); Hargas, Jon (.); Kyong Park (E-mail); McCarty, Bill (W.D.)
Subject: Review of Kavlico H2O, H2O2 and Acid test parts

Jim & Jim,

I would like to propose that we review the results (i.e. the physical symptoms, under a microscope and in the SEM) from Kavlico's current series of testing, with Kavlico. To that end I think that I need to be go to Moorpark so that I can look down the microscope with their people and discuss the observations with them.

Thus, I plan to take a trip to Moorpark, departing 6/8 and returning 6/12/2002.

Could you please submit a request to have this trip approved.

Thanks

Do you think anyone else should also come with me?

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Friday, May 31, 2002 1:51 PM
To: Carter, Roecos (R.O.)
Cc: Hanges, Jon (.)
Subject: Die Attach

Kyong suggests the easiest test would be to take die on substrates (ie sensors) and push the die off, as opposed to creating lap shear samples. We could remove the substrate from housing, and heat one to 300 deg C in an oven, and not heat the other. Then measure the force to shear the die of the substrate. We would get two data points per sensor tested.

The official test for the shear strength of the adhesive is TM558 and/or MS t.b.d. (Kyong to advise).

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
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Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Park, Kyong [KPark@kavlico.com]
Sent: Wednesday, May 29, 2002 12:15 PM
To: Freeland, Mark (M.); Kyong Park (E-mail); Robert Weikal (E-mail); Akins, Mary (M.)
Cc: Brady Davies (E-mail); Maurer, James (J.B.); Plante, Paul (P.G.); Gates, Freeman (F.C.);
Hansas, Jon (.); Tackman, Bruce
Subject: RE: Wafer Carcasses Returned to Kavlico

Mark,
Thank you.
I will acknowledge receiving them to you when they arrive here.
Kyong

> -----Original Message-----
> From: Freeland, Mark (M.) [SMTP:mfreelal@ford.com]
> Sent: Wednesday, May 29, 2002 8:43 AM
> To: Kyong Park (E-mail); Robert Weikal (E-mail); Akins, Mary (M.)
> Cc: Brady Davies (E-mail); Maurer, James (J.B.); Plante, Paul (P.G.);
> Gates, Freeman (F.C.); Hansas, Jon (.)
> Subject: Wafer Carcasses Returned to Kavlico
>
> Kyong,
>
> Per your request, and in accordance with the terms of our
> confidentiality agreement, I am returning all of the wafer Carcasses which
> I have in my possession to Kavlico.
> The attached spreadsheet contains the inventory of the material I had in
> my possession and the wafer carcasses which I am returning. There is one
> wafer, no. 2033925, which is unaccounted for. I have not been able to
> locate this wafer. When I do I will return it also.
>
> Please note that there are also 13 loose die on various mounts also
> included in the package.
>
> The material will be delivered to Mary Akins this afternoon, and she will
> ship it back to Bob Weikal's attention at Moorpark.
>
> If you wish the material to be received by an alternate designee, then
> please let Mary know. I have specified Bob, as he is the official conduit
> for all confidential material, per the agreement.
>
> Thank you for the opportunity to study the material which I have had since
> January this year.
>
> Regards
>
> Mark Freeland <<Wafers Returned to Kavlico 20020529.xls>>
>
> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory
> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> email: mfreelal@ford.com
> Tel.: (313) 594-7645
> << File: Wafers Returned to Kavlico 20020529.xls >>

From: Freeland, Mark (M.)
Sent: Wednesday, May 29, 2002 11:43 AM
To: Kyong Park (E-mail); Robert Weikal (E-mail); Akins, Mary (M.)
Cc: Brady Davies (E-mail); Maurer, James (J.B.); Plante, Paul (P.G.); Gatas, Freeman (F.C.); Hargas, Jon (.)
Subject: Wafer Carcasses Returned to Kavlico

Kyong,

Per your request, and in accordance with the terms of our confidentiality agreement, I am returning all of the wafer carcasses which I have in my possession to Kavlico.

The attached spreadsheet contains the inventory of the material I had in my possession and the wafer carcasses which I am returning. There is one wafer, no. 2033825, which is unaccounted for. I have not been able to locate this wafer. When I do I will return it also.

Please note that there are also 13 loose die on various mounts also included in the package.

The material will be delivered to Mary Akins this afternoon, and she will ship it back to Bob Weikal's attention at Moorpark.

If you wish the material to be received by an alternate designee, then please let Mary know. I have specified Bob, as he is the official conduit for all confidential material, per the agreement.

Thank you for the opportunity to study the material which I have had since January this year.

Regards



Wafers Returned to
Kavlico 200...

Mark Freeland

6-Sigma Black Belt
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Dearborn, MI 48121-2053 USA
email: rufreel1@ford.com
Tel.: (313) 594-7645

Kavlico TM dPFE Sensor:

Wafer Log

Wafer ID	MRB	Probe Date	Probe Yield or Lowest yield (Amb & Ho) good die	Tape Date	Tunnel De	Wafer M. Perc	Wafer Returned to Kavlico
1393403				#####		X	5/29/2002
1503311				12/4/1999		X	5/29/2002
2004304		5/15/2000	518	Not Taped		X	5/29/2002
2033601		6/7/2000	911	6/8/2000		X	5/29/2002
2033604				#####		X	5/29/2002
2033605		6/7/2000	1077	6/8/2000		X	5/29/2002
2033606	mrB: HF process	6/21/2000	1072	6/22/2000	L3-Jun 29,	X	5/29/2002
2033607		6/7/2000	1137	6/8/2000		X	5/29/2002
2033608		6/8/2000	1140	6/8/2000		X	5/29/2002
2033611	mrB: HF process	6/21/2000	1101	6/22/2000	L3-Jun 29	X	5/29/2002
2033612	mrB: IR & HF Process	7/26/2000	1123	7/28/2000	L4-Jun 27,	X	5/29/2002
2033613	mrB: IR & HF Process	7/26/2000	1188	7/26/2000	L4-Aug 1,	X	5/29/2002
2033614	mrB: IR & HF Process	7/26/2000	1061	7/26/2000	L5-Jul 31	X	5/29/2002
2033616		6/8/2000	1020	6/8/2000		X	5/29/2002
2033617		6/8/2000	1124	6/8/2000		X	5/29/2002
2033618	mrB: IR & HF Process	7/26/2000	1206	7/26/2000	L5-Aug 1,	X	5/29/2002
2033620	mrB: IR & HF Process	7/26/2000	1210	7/26/2000	L4-Jul 28	X	5/29/2002
2033621		6/8/2000	1080	6/8/2000		X	5/29/2002
2033622		6/8/2000	1101	6/8/2000		X	5/29/2002
2033623		6/8/2000	1095	6/8/2000		X	5/29/2002
2033624	mrB4	7/26/2000	1145	7/26/2000		X	5/29/2002
2033625		6/8/2000	1113	6/8/2000		X	5/29/2002
2033914		6/9/2000	743	#####		X	5/29/2002
2033916		6/9/2000	6	1/25/2002		X	5/29/2002
2033923		6/19/2000	14	1/25/2002		X	5/29/2002
2033925	mrB: IR & HF Process	7/26/2000	1205		L2-Jul 28,	X	Can not locate this wafer
2034109	mrB: IR & HF Process	7/24/2000	926	7/24/2000	L3-Jul 28,	X	5/29/2002
2041906				7/7/2000		X	5/29/2002
2043305				#####		X	5/29/2002
2044508				#####		X	5/29/2002
2044512				#####	#####	X	5/29/2002
2044518				#####		X	5/29/2002
2044521				#####	#####	X	5/29/2002
2044524				#####	#####	X	5/29/2002
2044525				#####		X	5/29/2002
2044607				8/9/2000	#####	X	5/29/2002
2044621				#####		X	5/29/2002
2044622				#####	#####	X	5/29/2002

Wafer ID	MRB	Probe Date	Probe Yield or Lowest yield (Amb & Hot) good die	Tape Date	Tunnel Date	Wafer at Ford	Wafer Returned to Kaylco
2044807				#####		X	5/29/2002
2044823				#####		X	5/29/2002
2056206				#####		X	5/29/2002
2056805				#####	#####	X	5/29/2002
2057001				#####		X	5/29/2002
2057016				#####		X	5/29/2002
2057105				#####		X	5/29/2002
2058601				#####		X	5/29/2002
2058605				#####		X	5/29/2002
2058606				#####		X	5/29/2002
2058607				#####		X	5/29/2002
2058608				#####		X	5/29/2002
2058609				#####		X	5/29/2002
2058611				#####		X	5/29/2002
2058615				#####		X	5/29/2002
2058617				#####		X	5/29/2002
2058618				#####	#####	X	5/29/2002
2058619				#####		X	5/29/2002
2058621				#####		X	5/29/2002
2058624				#####	#####	X	5/29/2002
2058625				#####		X	5/29/2002
2075024				#####		X	5/29/2002
2103606				#####	#####	X	5/29/2002
2103924				#####		X	5/29/2002
2108402		#####	#####	#####		X	5/29/2002
2108403				#####		X	5/29/2002
2108405				#####		X	5/29/2002
2108410				#####	#####	X	5/29/2002
2108421				#####		X	5/29/2002
2108425				#####		X	5/29/2002
2109014				9/5/2000	9/6/2000	X	5/29/2002
2206006				#####		X	5/29/2002
2206101		#####	912	#####		X	5/29/2002
2206103				#####		X	5/29/2002
2206104				#####	#####	X	5/29/2002
2206105				#####		X	5/29/2002
2206106				#####	#####	X	5/29/2002
2206107				#####	#####	X	5/29/2002

Wafer ID	MRB	Probe Date	Probe Yield or Lowest yield (Amb & Hot) good die	Type Date	Tunnel Date	Wafer at Park	Wafer Returned to Kavlico
2206109				#####		X	5/29/2002
2206110				#####		X	5/29/2002
2206111				#####		X	5/29/2002
2206119				#####	#####	X	5/29/2002
2278225				#####		X	5/29/2002
2322805						X	5/29/2002
2337623						X	5/29/2002
2341002				#####		X	5/29/2002
2341913						X	5/29/2002
2413102				2/2/2002		X	5/29/2002
2413519				2/3/2002		X	5/29/2002
2502008				#####	#####	X	5/29/2002
2502025				#####		X	5/29/2002

From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, May 23, 2002 5:00 PM
To: Hargas, Jon (.)
Subject: RE: Sample is on it's way.

Jon,
Looking forward.
Thank you again.
Kyong

> -----Original Message-----

> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Thursday, May 23, 2002 1:43 PM
> To: 'Park, Kyong'; Freeland, Mark (M.)
> Subject: Sample is on it's way.

>
> Kyong,
> I just put the sample 8946-065 Ref for FIB analysis by our Airborne
> Express
> drop. You should get it Tuesday.
> Jon

> -----Original Message-----

> From: Park, Kyong [mailto:KPark@kavlico.com]
> Sent: Wednesday, May 22, 2002 4:04 PM
> To: Hargas, Jon (.)
> Cc: Davies, Brady; mfreelal@ford.com
> Subject: RE: Gold/passivation interfacial failure

>
> Jon,
> Please, send me the part.
> As in contrary to the previous under-estimation, now we know that the gel
> does provide very good protection to the die. Remember that I could not
> make
> the sensors fail in the acid test until the sensors brought to high
> temperature by latched-up. What this means is that even if there might be
> a
> crack in the bond pad in begin with, HF or any other chemicals did not
> attack because there were none--the gel stopped them. At high
> temperature,
> however, either the gel produces F or HF, or it becomes degraded so that
> it
> allows them to come in. However, I think the gel or the die attachment
> material released F or HF. Then the cycle of damage starts!
>
> Someone at the meeting argued that what we have is gaseous HF, not liquid,
> so that it would not attack. What do you think? I think they are equally
> reactive. Only the etch rate may be different due to the difference in
> concentricity's.
> Kyong

> -----Original Message-----

> > From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> > Sent: Wednesday, May 22, 2002 12:23 PM
> > To: 'kpark@kavlico.com'

> > Subject: Gold/passivation interfacial failure
> >
> > Kyong,
> > Please note that sample 8946-065 Ref has not been cross sectioned. It
> > is
> > the die that had larger than normal wire bonds and warped edges at
> > certain
> > points of the bond pads above the point where the conductor, covered by
> > passivation, goes under the bond pad. The warped edge to me means that
> > material was getting out. I had suspicions that initial failure of the
> > interface could be due to thermal expansion. Perhaps ultrasonic bonding
> > could have damaged the interface slightly, and it was just that the area
> > over the conductor had a shorter exit path than the other sides of the
> > bond pad. I didn't see any signs of microcracking of the passivation.
> >
> > But in light of the possible release of HF at high temperature by
> > materials around the die, there could be some possibility of capillary
> > action between the edge of the bond and the passivation causing HF to
> > breach a path to the conductor.
> >
> > I've been asking for FIB work to be done on this sample.
> >
> > If none of the samples Analytical Solutions has show similar features,
> > I'd
> > be glad to send this sample to you so you can have them do FIB on it. I
> > think it would be important to see if there's loss of passivation
> > thickness due to HF in the region of curled bond pad edge.
> >
> > I guess you have to talk to the owner to find out he has FIB access at
> > Scandia. When I called the person who answered asked around a little
> > bit
> > and then said no.
> >
> > Regards,
> > Jon
> >
> >

From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, May 23, 2002 4:59 PM
To: Hargas, Jon (.)
Subject: RE: TGA

Jon,
Thank you.
Kyong

> -----Original Message-----
> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Thursday, May 23, 2002 12:20 PM
> To: 'kpark@kavlico.com'
> Subject: TGA
>
> Kyong,
> I forwarded the TGA analysis to Roc Carter, Cynthia Flanigan, and Mark (to
> make sure he gets a copy).
> Jon

From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, May 23, 2002 1:02 PM
To: Hargas, Jon (.)
Subject: RE: HF

Jon,
I do not either.
I had to argue with him for a few seconds, but I do not want to bring up his name.
Thank you for you understanding.
Kyong

P.S.
I wonder how sick Mark is. Please, give him my cheers if you have a chance.
Hope that he gets better soon.

> -----Original Message-----
> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Thursday, May 23, 2002 9:14 AM
> To: 'kpark@kavlico.com'
> Cc: Freeland, Mark (M.)
> Subject: HF
>
> Kyong,
> I don't understand the logic someone used in your meetings at Analytical
> Solutions that because HF is gaseous (boiling point about 20C I think)
> that
> it would not attack. I was only aware of He, Ne Ar, Kr, Xe, and Rn as
> being
> inert gases.
> Carbon monoxide is a gas, and it's used in case hardening steels.
> SiF4 is listed in the thermodynamic tables as being a gas and having a
> high
> enthalpy of formation than Si3N4 (at 298K).
> Browsing through the thermodynamic tables gives me the impression that if
> you give HF a chance to contact the passivation and something's going to
> happen.
>
> The kinetics of the reactions with Si, Si3N4, and Al, and the byproducts
> might change as temperature increases and the regime is changed from one
> of
> acidic liquid condensate when the engine is cold to gaseous compounds
> including HF in a bubble in the gel when the gel is breaking down at high
> temperature. Gas molecules might take a little longer to adsorb onto a
> surface and react than water-borne molecules, and may require dissociation
> of the HF on the surface to react, but I suspect that's only going to slow
> the kinetics slightly.
>
>
> Jon

From: Park, Kyong [KPark@kavlico.com]
Sent: Wednesday, May 22, 2002 4:04 PM
To: Hargas, Jon (.)
Cc: Davies, Brady; mfreeia1@ford.com
Subject: RE: Gold/passivation interfacial failure

Jon,

Please, send me the part.

As in contrary to the previous under-estimation, now we know that the gel does provide very good protection to the die. Remember that I could not make the sensors fail in the acid test until the sensors brought to high temperature by latched-up. What this means is that even if there might be a crack in the bond pad in begin with, HF or any other chemicals did not attack because there were none--the gel stopped them. At high temperature, however, either the gel produces F or HF, or it becomes degraded so that it allows them to come in. However, I think the gel or the die attachment material released F or HF. Then the cycle of damage starts!

Someone at the meeting argued that what we have is gaseous HF, not liquid, so that it would not attack. What do you think? I think they are equally reactive. Only the etch rate may be different due to the difference in concentricity's.

Kyong

> -----Original Message-----

> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Wednesday, May 22, 2002 12:23 PM
> To: 'kpark@kavlico.com'
> Subject: Gold/passivation interfacial failure

>

> Kyong,

> Please note that sample 8946-065 Ref has not been cross sectioned. It is
> the die that had larger than normal wire bonds and warped edges at certain
> points of the bond pads above the point where the conductor, covered by
> passivation, goes under the bond pad. The warped edge to me means that
> material was getting out. I had suspicions that initial failure of the
> interface could be due to thermal expansion. Perhaps ultrasonic bonding
> could have damaged the interface slightly, and it was just that the area
> over the conductor had a shorter exit path than the other sides of the
> bond pad. I didn't see any signs of microcracking of the passivation.

>

> But in light of the possible release of HF at high temperature by
> materials around the die, there could be some possibility of capillary
> action between the edge of the bond and the passivation causing HF to
> breach a path to the conductor.

>

> I've been asking for FIB work to be done on this sample.

>

> If none of the samples Analytical Solutions has show similar features, I'd
> be glad to send this sample to you so you can have them do FIB on it. I
> think it would be important to see if there's loss of passivation
> thickness due to HF in the region of curled bond pad edge.

>

> I guess you have to talk to the owner to find out he has FIB access at
> Scandia. When I called the person who answered asked around a little bit
> and then said no.

>
> Regards,
> Jon
>
>

From: Park, Kyong [KPark@kavlico.com]
Sent: Wednesday, May 22, 2002 2:46 PM
To: Hangan, Jon (.)
Cc: mfrsela1@ford.com; Davies, Brady
Subject: RE: hydrogen peroxide

Dear Jon,

I do not remember exactly who made comment on Aluminum Hydrogen peroxide, I think it was Michael Strizich, the owner of Analytical Solutions. When Mark was showing the pictures you took on UPAD, he claimed that Hydrogen-peroxide did it. Later we had more discussion about the same subject, and I remember that someone said there is hardly any Oxygen in the exhaust gas. Then someone, I think it was Ed, theorized that the moisture goes into the gel accumulates acid ions and then attacks the surface of die. As you know by now, the experiments do not support those theories.

In my mind, F plays very important roll. F with H creates HF and it attacks passivation to create openings first. Without this openings, the surface of the die seems to be fairly robust. As we know now, the gel needs 280 degree Celsius to be unstable. The die attachment needs higher temperature to start degrading-450 degree C. We also know that some die get hotter than the others. I think that's why we see some die has more corrossions than the others as each sees different temperatures.

We also discussed hillocks and Al whiskers. We commented in the meeting, that we had NOT seen large and unusual hillocks on new parts, and Michael S. commented that the picture of hillocks he saw from the pictures Mark presented are normal. Michael S told that hillocks and whiskers grow rapidly at around 300 degree C with electrical current.

I 'FedEx's out a CD to Mark yesterday, it should be there by now. The CD that I burned, contains all the photos my engineer took from the latched-up plus Acid tests, and the photos of hydrogen-peroxide experiments. The previous e-mail transmission had only photos from even number sensors. You are welcomed to look at a couple of these parts to see if these parts created UPAD. By re-examining those photos, #6 and #10 may developed some interesting damage. These each die still has the gel on top of it and they are never exposed to any additional chemical including the gel remover. You may be interested in knowing how different these dies from the field returns.

Please, let me know.

Kyong

> -----Original Message-----

> From: Hangan, Jon (.) [SMTP:jhangan@ford.com]
> Sent: Wednesday, May 22, 2002 10:44 AM
> To: 'Park, Kyong'
> Cc: Freeland, Mark (M.); Simko, Steven (S.J.)
> Subject: RE: hydrogen peroxide

>

> Kyong,

> Since I was not in on the discussions at Analytical Solutions, I might
> have missed something.

>

> I had assumed that Mark was interested in aluminum hydroxide formation in
> UPAD as evidence that some moisture was getting through the gel during

> use.
>
> After thinking a little more about it, I think H2O2 has no chance of
> getting in contact with the aluminum anyway during the TiW etch unless
> there's been photoresist failure or is used in MRB (and I thought only
> Dynasolve and HF were used for that). Defects resulting from photoresist
> failure should be picked up by August.
>
> Pirhanna etch may attack Al because it contains an acid to break up any
> native oxide and the peroxide to oxidize the metal. The KOH in Dynasolve
> will also attack Al. These are used in photoresist strip. But we have to
> hypothesize that there are breaks in the gold for that to happen. What
> little reading I've done about hillock growth suggests that it is a creep
> related phenomenon to relieve thermal stresses. I suppose the hillocks
> are grown at some step during the deposition of the passivation. From
> scratched hillocks it appears the gold and TiW would lie conformally on
> top. So long as the temperature the Al sees then is well above the
> temperature during the gold deposition and subsequent processing and
> normal service temperature in the vehicle, then I would assume further
> creep will be minimal if it occurs at all. And I've given you information
> on our MRB results.
>
> This morning in sample SRL612 Steve Simko found an area of oxidized
> aluminum (or perhaps hydrate) a few microns in diameter in the Hpos pad,
> consistent with PAD. He didn't take a before-sputtering picture to see if
> a hillock was there, but during sputtering there was a mound of TiW
> adjacent to the oxidized aluminum. He interprets this as consistent with
> the core of a hillock. This was near where he was sputtering away to
> expose area 20 damage where he found oxidized aluminum in semicircular
> pockets. Since this was classified as a V-transient Stage 3 part, it
> probably saw temperatures higher than 120C according to your thermocouple
> work. I assume creep and thermal expansion related phenomena could be
> possible then.
>
> Mark is not in today. He's sick and may be out a couple of days.
>
> Jon Hargas
> Ford Research Lab.
> 313-323-1068
>
>
> -----Original Message-----
> From: Park, Kyong [mailto:KPark@kavlico.com]
> Sent: Tuesday, May 21, 2002 7:09 PM
> To: Hargas, Jon (.)
> Cc: Davies, Brady; McDaniel, Scott
> Subject: RE: hydrogen peroxide
>
>
> Dear Jon,
> Possible.
> I think the most important fact is that HO could not attack it.
> Thank you for your comments.
> Kyong
>
> > -----Original Message-----
> > From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> > Sent: Tuesday, May 21, 2002 12:21 PM
> > To: 'Park, Kyong'
> > Cc: Freeland, Mark (M.)

> > Subject: RE: hydrogen peroxide
> >
> > Kyong,
> > Interesting results. I assume they were done at the same temperature as
> > the TiW etch.
> > So is hydrogen peroxide stopped by a native oxide layer?
> > If no native oxide layer exists on aluminum, does peroxide quickly make
> > one and then cease all etching (at least for the short time of
> processing
> > the wafers)? A two nanometer native oxide layer would be hard to
> detect.
> >
> > In the MRB wafer results I found some pores in scratches in the gold
> layer
> > that had aluminum detectable within them. I assumed they were the cores
> > of scratched hillocks that had been etched in the second MRB recovery.
> > Steve Simko used Auger to sputter away this area and found no
> significant
> > oxide. Other scratched hillocks had the Al core level with the surface
> of
> > the scratch, so I had assumed those occurred in the second probing after
> > the MRB recovery etch.
> >
> > It would seem that it didn't take much of an oxide layer to stop the
> > reaction in the MRB wafer.
> >
> > I believe broken hillocks are possible, but I wonder if there is a
> > statistically significant number of scratched hillocks that are not
> > covered by the wire bond on any wafer?
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> > I'm still interested in trying to see an "in-situ" latching and high
> > current experiment done without gel either in vacuum in the SEM or an
> > inert atmosphere (argon) or inert liquid (fluorinert). The residue gel
> > leaves behind makes microscopy difficult. Fluorinert or flowing argon
> > might be best to simulate conduction of heat away, if no break down of
> the
> > fluorinert occurs at the temperatures the surface of the die would see.
> > The purpose would be to be to see if the thermal stresses produced any
> > microcracking in the gold, additional hillock growth breaking the gold
> > layer on the hillock, etc. Exposure to chemicals or oxygen would be a
> > final step to show initiation of oxidation (which might be necessary if
> > defects produced at first were too small to be seen by routine SEM
> > examination). What can I say, these are the types of experiments
> > microscopists like to think of.
> >
> > Jon
> >
> >
> > -----Original Message-----
> > From: Park, Kyong [mailto:KPark@kavlico.com]
> > Sent: Tuesday, May 21, 2002 12:46 PM
> > To: Hargas, Jon (.)
> > Co: mfreelal@ford.com
> > Subject: RE: Raman may detect hydroxide
> >
> >
> > FYI
> >
> > <<Hydrogen peroxide etch test on aluminum wafer..rtf>>
> >

> > > -----Original Message-----
> > > From: Hangaas, Jon (.) [SMTP:jhangaas@ford.com]
> > > Sent: Tuesday, May 21, 2002 8:54 AM
> > > To: Brady Davies (E-mail); 'Kyong Park (E-mail) ' (E-mail);
> > > Freeland,
> > > Mark (M.); Gates, Freeman (F.C.); Maurer, James (J.B.); Plante, Paul
> > > (P.G.)
> > > Subject: Raman may detect hydroxide
> > >
> > > Mark,
> > > I've asked around and Raman may be able to detect aluminum hydroxide.
> > > Dairene is willing to look at a sample, and Lebzy is willing to
> > > microtome
> > > one to expose fresh area.
> > >
> > > Every other analytical technique would have problems detecting
> > > hydrogen
> > > or
> > > hydroxides.
> > >
> > > Roc thinks that the hydroxide would dehydrate in SEM or Auger, and
> > > that
> > > could be what causes the mudcracked texture. He suggested using an
> > > environmental SEM, one that can have a partial atmosphere of water and
> > > air
> > > in the sample chamber of around 2 torr. The only purpose of the
> > > experiment would be to see if the layer is continuous when observation
> > > starts with a partial pressure of water vapor in the sample chamber,
> > > and
> > > then mudcracks as the sample chamber is brought down to normal SEM
> > > operational pressures of around 10^{-6} torr.
> > >
> > >
> > > Jon

From: Carter, Roscoe (R.O.)
Sent: Wednesday, May 22, 2002 2:04 PM
To: Hargas, Jon (.)
Subject: Quantum Materials, Inc.



536.doc

ER02-027-G 77837

Material Safety Data Sheet

IDENTIFICATION

Product Number: QMI 536

Product Name: Organic Die Attach

Synonyms: Non-Conductive Thermoset Adhesive

INGREDIENT DISCLOSURE

CAS number	Name	%	Potential Hazard
9002-84-0	Proprietary Filler	≤ 50	irritant evolution at temperatures greater than 300°C (572°F)
none	Proprietary Bismaleimide	≤ 50	polymerization
none	Proprietary Polymer	≤ 20	polymerization

TSCA Status: The product is a mixture and therefore listing on the TSCA registry is not required. Each of these ingredients are listed, or covered by a low volume exemption under section 5(h) (4).

PHYSICAL AND CHEMICAL PROPERTIES

Vapor Pressure: N/E

Density g/ml: 1.26

Water Solubility: Insoluble

Boiling Pt °C: N/A

Vapor Pressure: Negligible

Polymerization Temp: 150°C

Physical State, Appearance and Odor: A viscous white paste with mild odor.

FIRE AND EXPLOSION HAZARD DATA

Flash Point °F: > 200 °F

Extinguishing Media: carbon dioxide, dry chemical, water fog

Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing to prevent inhalation or contact of combustion products.

Unusual Fire and Explosion Hazards: Hazardous polymerization will not occur.

Product Number: QMI 536

Product Name: Organic Die Attach

REACTIVITY DATA

Material is stable under normal storage and recommended use conditions (-40°C, and < 35°C, respectively)

Incompatibilities: Strong Oxidizers, acids, and bases.

Hazardous Combustion or Decomposition Products: CO₂, CO, HF, NO_x, hydrocarbons from incomplete combustion.

TOXICITY AND HEALTH HAZARD DATA

Potential Routes of entry: Ingestion, skin and eye exposure.

Is material listed in National Toxicology Program, Third Annual Report on Carcinogens? No

Has the material been found to be a potential carcinogen by the International Agency for Research on Cancer? No

Acute Effects: May cause eye and skin irritation on contact. Inhalation of fumes evolved during the product's cure may irritate the respiratory tract. Ingestion may cause irritation to the gastrointestinal tract.

To the best of our knowledge, the chemical, physical and toxicological properties of this material have not been thoroughly investigated.

First Aid:

Inhalation - Remove to fresh air and consult a physician. If not breathing give artificial respiration. If breathing is difficult give oxygen. Call a physician.

Eyes - Flush with water for at least 15 minutes and contact a physician.

Skin - Remove contaminated clothing as needed. Wash affected area with soap and water.

Ingestion - Drink large quantities of water. Do not induce vomiting. Contact a physician. Never give liquids to an unconscious person.

Product Number: QMI 536

Product Name: Organic Die Attach

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Protective equipment: Safety glasses and chemical resistant gloves.

Handling protocols: Good personal hygiene must be maintained. Do not allow eating, smoking, or drinking in storage or use areas. Avoid ingestion and contact with skin and eyes. Use product in a well ventilated area.

Storage conditions: Store at -40°C until required for use.

SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:

Small spills: Wipe up spilled material and package in storage drums for disposal.

Large spills: Shovel material in to storage drums for disposal.

Waste disposal method: Destructive incineration in a permitted facility is the preferred method of disposal. Observe all federal, state and local laws.

TRANSPORT INFORMATION

DOT/IATA Proper shipping Name Not Regulated

DOT/IATA Packing Group Not Regulated

DOT/IATA Label Not Regulated

DOT/IATA UN Number Not Regulated

REGULATORY INFORMATION

This product contains a toxic chemical(s) subject to the reporting requirements of SARA 313 (40CFR372).

OTHER INFORMATION

The information contained herein relates only to the specific material identified. Loctite Corporation believes that such information is accurate and reliable as of the date of this material safety data sheet, but no representation, guarantee or warranty, express or implied, is made as to the accuracy, reliability, or completeness of the information. Loctite Corporation urges persons receiving this information to make their own determination as to the information's suitability and completeness for their particular application.

Latest Revision By Bill Wood, Dated 04/08/02

Loctite Corporation
9938 Via Pasar, San Diego, CA 92126
Phone: (858) 695-1716 fax: (858) 695-0951

A Henkel Company

From: Park, Kyong [KPark@kav/co.com]
Sent: Tuesday, May 21, 2002 7:09 PM
To: Hargas, Jon (.)
Cc: Davies, Brady; McDaniel, Scott
Subject: RE: hydrogen peroxide

Dear Jon,
Possible.

I think the most important fact is that HO could not attack it.
Thank you for your comments.
Kyong

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> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Tuesday, May 21, 2002 12:21 PM
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> Jon

>
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> Sent: Tuesday, May 21, 2002 12:46 PM
> To: Hargas, Jon (.)
> Cc: mfrealal@ford.com
> Subject: RE: Raman may detect hydroxide
>
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> FYI
>
> <<Hydrogen peroxide etch test on aluminum wafer..rtf>>
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> > From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> > Sent: Tuesday, May 21, 2002 8:54 AM
> > To: Brady Davies (E-mail); 'Kyong Park (E-mail) ' (E-mail); Freeland,
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> > then mudcracks as the sample chamber is brought down to normal SEM
> > operational pressures of around 10^{-6} torr.
> >
> >
> > Jon

From: Park, Kyong [KPark@kavlico.com]
Sent: Tuesday, May 21, 2002 10:52 AM
To: Jahshan, John (J.H.); Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auller, Jim (J.E.); Awad, Mahmoud (M.I.); Ayers, Don; Bandoske, Pete (P.F.); Bansek, Catherine (C.K.); Bersuder, Lee (L.C.); Bissi, Gerry (G.); Bronni, Mark (M.J.); Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.); Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates, Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hargas, Jon (.); Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerezi, Karen (K.J.); Koszewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.); Nielsen, Christian (C.A.); O'Neall, Jim (J.D.); Oswalt, Greg (G.G.); Park, Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.); Poma, Amy (A.); Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Rossi, Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro, Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); White-Johnson, Patrice (P.); Williamson, Richard (E.)
Cc: Tackman, Bruce; Hubbard, Rick; Davies, Brady
Subject: RE: Hussein Bina's Focus failed it's DPFE again

Very easy to blame DPFE!
Kavlico is very interested in this car. Please, ship to Kavlico. Kavlico likes to work on this car.

> -----Original Message-----
> From: Jahshan, John (J.H.) [SMTP:jjahshan@vistec.com]
> Sent: Monday, May 20, 2002 7:30 AM
> To: Akins, Mary (M.); Akolkar, Shrikant (S.V.); Albrecht, Guenter
> (G.K.); Alles, Sheran (S.A.); Arnold, Kenneth (K.M.); Auller, Jim (J.E.);
> Awad, Mahmoud (M.I.); Ayers, Don; Bandoske, Pete (P.F.); Bansek, Catherine
> (C.K.); Bersuder, Lee (L.C.); Bissi, Gerry (G.); Bronni, Mark (M.J.);
> Bugaj, Barry; Danes, Adam (A.V.); Davies, Brady; Deeb, Joe (J.S.);
> Douglass, Jim (J.B.); Freeland, Mark (M.); Galante, Chris (C.R.); Gates,
> Freeman (F.C.); Giordano, Mike (M.A.); Godlewski, Ed (E.V.); Hargas, Jon
> (.); Jahshan, John (J.H.); Janda, Jon (J.M.); Johnson, Joe (J.H.); Kerezi,
> Karen (K.J.); Koszewnik, John (J.J.); Kunde, Olaf (O.); Masura, Gordon
> (G.P.); Maurer, James (J.B.); McCarty, Bill (W.D.); Muter, Doreen (D.J.);
> Nielsen, Christian (C.A.); O'Neall, Jim (J.D.); Oswalt, Greg (G.G.); Park,
> Kyong; Pascany, Ken (K.M.); Perry, Brian (B.J.); Plante, Paul (P.G.);
> Poma, Amy (A.); Popoff, Daniel (D.M.); Raquepau, Alden (A.P.); Rossi,
> Roberto (R.A.); Schieding, Kurt (K.J.); Shore, John (J.); Tamashiro,
> Terry; Trujillo, Thomas (T.G.); Verner, Carol (C.J.); White-Johnson,
> Patrice (P.); Williamson, Richard (E.)
> Subject: FW: Hussein Bina's Focus failed it's DPFE again
>
> Any interest in this vehicle?
>
> John H. Jahshan
> POEE Resident Engineer
> PCM Applications
> jjahshan@vistec.com
> Phone & Fax: (313) 722-1638 or (313) 390-4854
> Pager: (313) 795-8068
> <http://www.myaimail.com/>
> "WHETHER YOU BELIEVE YOU CAN DO SOMETHING OR YOU BELIEVE YOU CAN'T, YOU'RE
> RIGHT"
>
>
>
> -----Original Message-----

> From: Matysiewicz, Edwin (E.J.) [mailto:ematysie@ford.com]
> Sent: Monday, May 20, 2002 9:58 AM
> To: Grant, Kathleen, Kathy (K.A.)
> Cc: Perry, Brian (B.J.); Sebold, Lynn (L.A.); 'jjahshan@visteon.com';
> Huck, Dave (D.E.); Stump, Steven (S.M.)
> Subject: Hussein Bina's Focus failed it's DPFE again
>
>
> Kathy
>
> I just went out into the parking lot, dumped codes, and got a P401 code on
> Hussein's 2001 Zetec Focus.
>
> His DPFE is stuck at 0.11 VDC all the time.
>
> This is his second DPFE failure on his car.
>
> Ed

From: Cartar, Roscoe (R.O.)
Sent: Monday, May 20, 2002 8:48 AM
To: Fraeland, Mark (M.)
Cc: Simko, Steven (S.J.); Hargas, Jon (.)
Subject: What is happening to the Al?

Mark,

I hope you are checking your e-mail . Steve S. and I chatted briefly after we left you and the group on Fri. We have kicked around and looked up a number of possible scenarios for the Al metal in the tracks and where it might have gotten off to. We still do not have story that makes any sense to us even given the chemistry of gel or adhesive break down. (AlBr₃ or AlI₃ would vaporize but not AlF₃.) Volatile compounds with Al are hard to come by and the only residues we see are oxides. Soluble compounds are more abundant but even then we think some form of residual would likely be present and none has been found. We are not comfortable with any feeling I may have left that the Al loss can be explained away with the information at hand. ROC

From: Park, Kyong [KPark@kavlico.com]
Sent: Thursday, May 16, 2002 12:32 PM
To: Hargas, Jon (.); Davies, Brady; Ayers, Don; Park, Kyong; Akins, Mary (M.); Simko, Steven (S.J.); Freeland, Mark (M.); Gates, Freeman (F.C.); Maurer, James (J.B.); Plante, Paul (P.G.)
Subject: RE: Area 20 cross section

John,
Thank you for sharing your work and data.
Could you explain more about the history of the samples?
Yours,
Kyong

> -----Original Message-----
> From: Hargas, Jon (.) [SMTP:jhargas@ford.com]
> Sent: Thursday, May 16, 2002 9:06 AM
> To: Brady Davies (E-mail); Don Ayers (E-mail); 'Kyong Park (E-mail) '
> (E-mail); Akins, Mary (M.); Simko, Steven (S.J.); Freeland, Mark (M.);
> Gates, Freeman (F.C.); Maurer, James (J.B.); Plante, Paul (P.G.)
> Subject: Area 20 cross section
>
> <<SRL612 pore in Al layer area 20.jpg>> <<SRL612 some AlOx in pore
> SP10.TIF>> Attached are an image and spectrum showing loss of Al
> conductor in Area 20 of SRL612 Ref. Some aluminum oxide appears to be
> present in the pore. There are many pores along the conductor.
>
> The cross section of the sample was prepared by tripod polishing. Flakes
> of gold are visible in many of the pores. I would assume those are
> polishing debris, but for polishing debris they're oddly shaped...
>
> Steve Simko will do Auger next week on the H1 die to sputter Au off area
> 20 and observe the extent of damage in plan view. This will have fewer
> specimen preparation artefacts.
>
> Jon Hargas
> Ford Research Lab.
> 313-323-1068 << File: SRL612 pore in Al layer area 20.jpg >> << File:
> SRL612 some AlOx in pore SP10.TIF >>

Subject: Preparation for dPFE trip to Analytical Solutions
Location: SRL Conf Room 1347 (10)

Start: Fri 5/17/2002 1:30 PM
End: Fri 5/17/2002 4:00 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Required Attendees: Freeland, Mark (M.); Maurer, James (J.B.); Carter, Roscoe (R.O.); Hargas, Jon (.); Ed Sickafus (E-mail); Gates, Freeman (F.C.)
Optional Attendees: Simler, Steven (S.K.); Uy, Dalrene (D.)

To update Ed with all new information from FRL and Powertrain

From: Freeland, Mark (M.)
Sent: Thursday, May 16, 2002 9:18 AM
To: Hargas, Jon (.); Simko, Steven (S.J.)
Subject: RE: SRL612

Thanks Jon,

I understand the limitations of you're sectioning. Contrary to popular belief the help around here is pretty good!

Steve,

It's up to you next week.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Hargas, Jon (.)
Sent: Wednesday, May 15, 2002 6:03 PM
To: Freeland, Mark (M.); Simko, Steven (S.J.)
Subject: SRL612

The second attempt at sectioning the part was showed that there's alumina in the pits in the aluminum layer, but some also contain gold flakes suggestive of polishing debris. Hence the need for Auger.
Jon

From: Freeland, Mark (M.)
Sent: Wednesday, May 15, 2002 11:32 AM
To: Carter, Roscoe (R.O.)
Cc: Hargas, Jon (.)
Subject: FW: poor die cement

ROC,

The glue is on the way. Can you handle from here when I give you the glue?

Thanks

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Wednesday, May 15, 2002 11:09 AM
To: Freeland, Mark (M.)
Subject: RE: poor die cement

Mark,

The material you requested will be on the way to you today.
The material is Loctite's QMI 536, and we do cure it here at 150 degree C
for 30 min., I was told.
Good Luck!
Kyong

> -----Original Message-----

> **From:** Freeland, Mark (M.) [SMTP:mfreelal@ford.com]
> **Sent:** Wednesday, May 15, 2002 6:08 AM
> **To:** 'Kyong Park (E-mail)'
> **Cc:** Hargas, Jon (.); Flanigan, Cynthia (C.M.); Carter, Roscoe (R.O.)
> **Subject:** RE: poor die cement

>
> Kyong,

>
> Could you please send me a small sample of the die attach material, info
> on the cure cycle and any available data sheets, MSDS etc. We will get
> the testing done here.

>
> The shipping method you used for the other Gel worked fine!

>
> Thanks

>
> Regards
>
> Mark Freeland
>
> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory
> > P.O. Box 2053
> > MD 2629 - SRL - Room 1517
> > Dearborn, MI 48121-2053 USA
> email: mfreela1@ford.com
> Tel.: (313) 594-7645
>
>
> -----Original Message-----
> From: Carter, Roscoe (R.O.)
> Sent: Wednesday, May 15, 2002 8:14 AM
> To: Freeland, Mark (M.)
> Cc: Hargas, Jon (.); 'Kyong Park (E-mail)'; Flanigan, Cynthia (C.M.)
> Subject: RE: poor die cement
>
>
> Mark, Jon, and Dr. Park
> I think the FRL Material Science Dept. folks would be able to set up
> a tensile test for new and aged die adhesive material. Cynthia Flanigan
> and Debbie Mielewski is where I would start. We would need some of the
> material (fresh and info on the cure conditions) to start with but the
> testing should be straight forward. - Now when I say that it always seems
> to be the curse of the arrogant that things are never so easy as they
> should be.
> Roscoe "ROC" Carter
> Ford Research Lab
> Physical and Environmental Sciences Department
> Lubricant Science and ATF Analysis Group Leader
>
> -----Original Message-----
> From: Freeland, Mark (M.)
> Sent: Tuesday, May 14, 2002 5:07 PM
> To: Carter, Roscoe (R.O.)
> Cc: Hargas, Jon (.); Kyong Park (E-mail)
> Subject: FW: poor die cement
>
>
> Roc,
>
> Any suggestions as to how we would best evaluate the die attach adhesive
> for mechanical properties after heating to the 300 - 400 deg C range?
>
> I would appreciate you're thoughts.
>
> Thanks
>
> Regards
>
> Mark Freeland
>
> > 6-Sigma Black Belt
> > Engine Research Department
> > Ford Research Laboratory

> > P.O. Box 2053
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> > Dearborn, MI 48121-2053 USA
> email: mfreelal@ford.com
> Tel.: (313) 594-7645

> -----Original Message-----

> From: Park, Kyong [mailto:KPark@kavlico.com]
> Sent: Tuesday, May 14, 2002 1:12 PM
> To: Freeland, Mark (M.); Hargas, Jon (.); Park, Kyong
> Cc: Gates, Freeman (F.C.)
> Subject: RE: poor die cement

> Dear Mark,
> I would not doubt at that high excessive temperature, the materials
> designed
> to use at lower temperature would not survive or be degraded. I could you
> send you the die attachment material if you want to see at what
> temperature
> the material becomes weakened.
> Initially, I thought about this, but I did not pursue this issue further
> because the important point is whether the sensor has to be operated at
> those temperatures.

> Kyong

> > -----Original Message-----

> > From: Freeland, Mark (M.) [SMTP:mfreelal@ford.com]
> > Sent: Tuesday, May 14, 2002 9:04 AM
> > To: Hargas, Jon (.); Kyong Park (E-mail)
> > Cc: Gates, Freeman (F.C.)
> > Subject: RE: poor die cement

> > Jon,

> > Good observation. I have seen this before. It is possible, but hard to
> > prove without being at Moorpark, that the heating of the die to 300 -
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> > 20 bubbles on both die. He is sectioning the part to inspect the
> > condition of the periphery conductor track.

> > Regards

> > Mark Freeland

> > > 6-Sigma Black Belt
> > > Engine Research Department
> > > Ford Research Laboratory
> > > P.O. Box 2053
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> > > Dearborn, MI 48121-2053 USA
> > email: mfreela1@ford.com
> > Tel.: (313) 594-7645

> > > -----Original Message-----
> > > From: Hargas, Jon (.)
> > > Sent: Monday, May 13, 2002 7:11 PM
> > > To: Freeland, Mark (M.)
> > > Subject: poor die cement

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From: Freeland, Mark (M.)
Sent: Wednesday, May 15, 2002 9:08 AM
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Cc: Hargas, Jon (.); Flanigan, Cynthia (C.M.); Carter, Roscoe (R.O.)
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Sent: Wednesday, May 15, 2002 8:14 AM
To: Freeland, Mark (M.)
Cc: Hargas, Jon (.); 'Kyong Park (E-mail)'; Flanigan, Cynthia (C.M.)
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Mark, Jon, and Dr. Park

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Roscoe "ROC" Carter
Ford Research Lab
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From: Freeland, Mark (M.)
Sent: Tuesday, May 14, 2002 5:07 PM
To: Carter, Roscoe (R.O.)
Cc: Hargas, Jon (.); Kyong Park (E-mail)
Subject: FW: poor die cement

Roc,

Any suggestions as to how we would best evaluate the die attach adhesive for mechanical properties after heating to the 300 - 400 deg C range?

I would appreciate you're thoughts.

Thanks

Regards

Mark Freeland

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> Engine Research Department
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From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Tuesday, May 14, 2002 1:12 PM
To: Freeland, Mark (M.); Hargas, Jon (.); Park, Kyong
Cc: Gates, Freeman (F.C.)
Subject: RE: poor die cement

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Initially, I thought about this, but I did not pursue this issue further because the important point is whether the sensor has to be operated at those temperatures.

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> Subject: RE: poor die cement

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> email: mfreela1@ford.com

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> > -----Original Message-----

> > From: Hargas, Jon (.)

> > Sent: Monday, May 13, 2002 7:11 PM

> > To: Freeland, Mark (M.)

> > Subject: poor die cement

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ERR2-827-G TT8T3

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Kyong,

Do you have any ideas on how we could confirm that excess current flowing through a die will result in a degraded die attach bond strength?

The part Jon is working with is a sample which had a severe case of Area 20 bubbles on both die. He is sectioning the part to inspect the condition of the periphery conductor track.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
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P.O. Box 2053
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Jon

Subject: Review inspection/electrical test results & Selection of dPFE sensors for the outside lab
Location: SRL Conf Room 1529 (10)

Start: Fri 5/10/2002 3:00 PM
End: Fri 5/10/2002 4:30 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Required Attendees: Freeland, Mark (M.); Janda, Jon (J.M.); Akolkar, Shrikant (S.V.); Verner, Carol (C.J.)
Optional Attendees: Maurer, James (J.B.); Plante, Paul (P.G.); Gates, Freeman (F.C.); Hargas, Jon (.)

From: Freeland, Mark (M.)
Sent: Wednesday, May 08, 2002 12:56 PM
To: Carter, Roscoe (R.O.); Hargas, Jon (.)
Subject: FW: fyl



HCl Spin
Reaction.PDF

Jon & Roscoe,

Kyong probably meant this for all the scientific folks. I haven't read it yet, might get round to it tonight after kids go to bed.

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

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

From: Park, Kyong [mailto:KPark@kavlico.com]
Sent: Wednesday, May 08, 2002 12:28 PM
To: Davies, Brady; Spivak, Alex; McDaniel, Scott; Caffee, Jay; McDaniel, Scott; mfreela1@ford.com
Subject: fyl

I came cross a very interesting a research article, and I attached here. I thought you might be interested in reading this paper.

Kyong

<<HCl Spin Reaction.PDF>>

Theoretical Study of the Validity of the Born-Oppenheimer Approximation in the $\text{Cl} + \text{H}_2 \rightarrow \text{HCl} + \text{H}$ Reaction

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 Hans-Joachim Werner^{2*}

Reactivity of the excited spin-orbit state of Cl with H_2 to yield ground-state HCl products is forbidden by the Born-Oppenheimer (BO) approximation. We used new ab initio potential energy surfaces and exact quantum scattering calculations to explore the extent of electronic nonadiabaticity in this reaction. In direct contrast to recent experiments, we predict that the BO-allowed reaction of the ground spin-orbit state will be much more efficient than the BO-forbidden reaction of the excited spin-orbit state. Also, Coriolis coupling opens up an electronically nonadiabatic inelastic channel, which competes substantially with reaction.

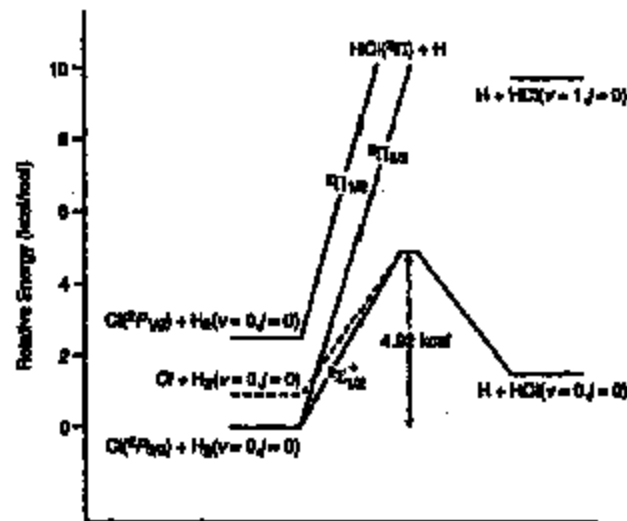
The kinetics of the $\text{Cl} + \text{H}_2$ reaction has been the object of study for more than a century (1, 2). The reaction has played an important role in the development of transition state theory, has provided verification of the kinetic isotope effect, and is the paradigm for the reaction of Cl with hydrocarbons, which is of importance in many atmospheric environments. Recently, molecular beam techniques have been used to yield information on this reaction at well-defined collision energies (2-6). Quasi-classical trajectory and precise quantum scattering investigations have been reported (7-16) on several potential energy surfaces (PESs) (17, 18). All previous theoretical work has been based on the approximation that only a single PES governs the reaction and that the open-shell character of the Cl atom plays no role in the dynamics.

The approach of molecular hydrogen to an atom in a 2P electronic state splits the degeneracy of this state, giving rise to three PESs (18-21). Of these only the lowest, which corresponds to the lower state of A' symmetry in C_2 geometry (Σ symmetry in collinear geometry), correlates with the electronic ground state of the products [$\text{H} + \text{HCl}(^2\Sigma^+)$]. The PESs of the two other states (the higher state of A' symmetry and the unique state of A'' symmetry) correlate with HCl products in the $^2\Pi$ electronic state, which is considerably higher in energy (22) (Fig. 1).

The excited spin-orbit (SO) state of the Cl

atom ($^2P_{1/2}$), which lies 180 cm^{-1} (2.32 kcal/mol) above the ground SO state ($^2P_{3/2}$), does not correlate adiabatically with the electronic ground state of the reaction products. Thus, if the reaction were to proceed adiabatically on a single PES, as would be predicted by the Born-Oppenheimer (BO) approximation, then the excited SO state would not react (24, 25). For the chemically similar $\text{F} + \text{H}_2$ reaction, both theory (21) and experiment (26, 27) agree that the reactivity of the excited SO state is, at most, 10% of that of the ground state. The $\text{Cl} + \text{H}_2$ reaction differs in two respects: (i) the spin-orbit splitting is more than a factor of 2 greater (23) and (ii) the barrier height is much higher. The larger SO splitting suggests that the breakdown in the BO approximation would be less important in the $\text{Cl} + \text{H}_2$ reaction. However, because the

Fig. 1. Schematic plot of the energetics of the $\text{Cl} + \text{H}_2$ reaction. The relative reactant energies, the position of the barrier, and the position of the indicated HCl product channels are drawn to scale. All energies include zero-point corrections; those for the barrier were determined from the constants published by Bian and Werner (table I of (18)). Linear-molecule Σ and Π state labels are used, which is appropriate for a collinear transition state. The dashed line indicates the schematic reaction profile for single-surface calculations based on the BW2 PES, in which the SO Hamiltonian is not included.



internal SO energy might help to overcome the higher barrier, nonadiabaticity might be more important in $\text{Cl} + \text{H}_2$.

In recent molecular beam experiments, Liu and co-workers (4-6) used two different Cl atom sources to characterize the reactivity of the two SO states of the Cl atom. Except at the lowest collision energies, they conclude that the excited SO state has a substantially larger reactive cross section. This result is surprising, because the body of prior experimental work indicates that BO-allowed (adiabatically allowed) pathways always dominate (25, 28).

This breakdown in the BO approximation inferred by Liu and co-workers (4-6) demands further theoretical investigation. Two questions must be answered: (i) How large is the reactivity of the adiabatically forbidden channel [$\text{Cl}(^2P_{1/2}) + \text{H}_2$], and (ii) how well can the reactivity of the adiabatically allowed channel [$\text{Cl}(^2P_{3/2}) + \text{H}_2$] be predicted by standard scattering calculations (7-16), based on a single PES in which nonadiabatic effects are of necessity neglected. We used exact quantum scattering calculations to answer these questions.

We first need accurate PESs for the three electronic states mentioned above. For the subsequent scattering calculations, it is necessary to transform the two states of A' symmetry into an electronically diabatic basis, in which the orientation of the missing 3p electron on the Cl atom remains unchanged in the body frame (21). Capecchi and Werner (29) have carried out internally contracted, multireference, configuration-interaction calculations (30, 31) of these PESs and the SO coupling matrix elements. Transformation into the diabatic basis results in four PESs. Capecchi and Werner subsequently developed multiparameter global fits (29) to these

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PESs and to the two SO coupling functions (21). Their calculations extend the earlier work of Bian and Werner (18), which was limited to the lowest electronically adiabatic ClH_2 PES.

In the $\text{Cl} + \text{H}_2$ arrangement, there are six electronic states. These correspond to the three spatial orientations of the $3p$ hole on the Cl atom and the two possible spin-projection quantum numbers. In each $\text{H} + \text{HCl}$ product arrangement, we neglect the high-lying Π states of HCl (22). In general, outside the reactant arrangement, the description of the $\text{Cl} + \text{H}_2$ system is unchanged from the original BW2 fit (18), which was limited to the lowest electronically adiabatic PES.

If the sum of the electronic interaction Hamiltonian plus the SO coupling in the 6×6 electronic basis is diagonalized at each value of the coordinates, the lowest root will define what we will call the fully (electronic + SO) adiabatic Capoenchi-Werner (CWad) PES and corresponds to the reactive PES illustrated schematically in Fig. 1. This PES differs from the BW2 PES (18), which is obtained by diagonalizing only the electrostatic Hamiltonian, without inclusion of the SO Hamiltonian.

The SO Hamiltonian couples the reactive PES ($^2\Sigma_{1/2}$ in linear geometry) with the two repulsive PESs ($^2\Pi_{3/2}$ and $^2\Pi_{1/2}$ in linear geometry). Because the latter are so much higher in energy at the barrier, inclusion of the SO coupling has a negligible effect at the barrier. However, inclusion of the SO coupling in the asymptotic reactant region lowers

the lowest adiabatic PES by $\sim 1/3$ the SO splitting of the Cl atom. Thus, when compared to the BW2 PES, the barrier to reaction on the CWad PES is ~ 0.34 kcal/mol higher (18, 21, 32–34).

In addition to the electrostatic and SO Hamiltonians, it is also necessary to determine matrix elements of the orbital angular momentum of the triatomic system: $L^2 = (J - l - s - j)^2$, where J is the total angular momentum, j is the rotational angular momentum of the diatomic moiety, and l and s are the electronic orbital and spin angular momenta (21).

With the required ClH_2 PESs in the diabatic basis, it is possible to carry out complete quantum scattering calculations. We draw from the formalism presented by Schatz on the $\text{Cl} + \text{HCl}$ exchange reaction (37) and use the algorithms and computer program developed over the past decade by Manolopoulos and co-workers (35, 36), extended, as we have described previously (21), to treat abstraction reactions involving an atom in a 2P electronic state. The choice of integration parameters was identical to those adopted in the single-state studies of the $\text{Cl} + \text{H}_2$ reaction (18).

We obtain, at each value of the total angular momentum J , probabilities for transition from a given initial state to any particular final state of either the reactants (an inelastic collision) or products (a reactive collision). By summing the latter over all accessible product states and averaging over the rotational ($2j + 1$) and electronic ($2j_e + 1$) degeneracy of the initial state ($j_e = 3/2$ or $1/2$),

one extracts a total probability for reaction.

In Fig. 2 we compare, at the lowest value of the total angular momentum ($J = 0.5$), the calculated total probabilities for reaction of H_2 in $v = 0, j = 0$ (the lowest rotational level of *para*- H_2). The multistate results, determined with the full set of diabatic PESs, are compared in Fig. 2 with the $J = 0$ transition probabilities, as predicted by single-state calculations on the CWad PES. In the latter calculation, both the SO and electronic-orbital angular momenta of the Cl atom were neglected, as in any standard single-state treatment of a triatomic reaction (13, 14, 35, 36). The reaction probabilities are plotted as a function of collision energy, which is the fundamental dynamical variable in a molecular beam experiment. Thermal rate constants could then be obtained by integration over a Maxwellian distribution of collision velocities, although an equally valid expression involves integration over the total (collision + internal) energy of the "cumulative reaction probability" (32).

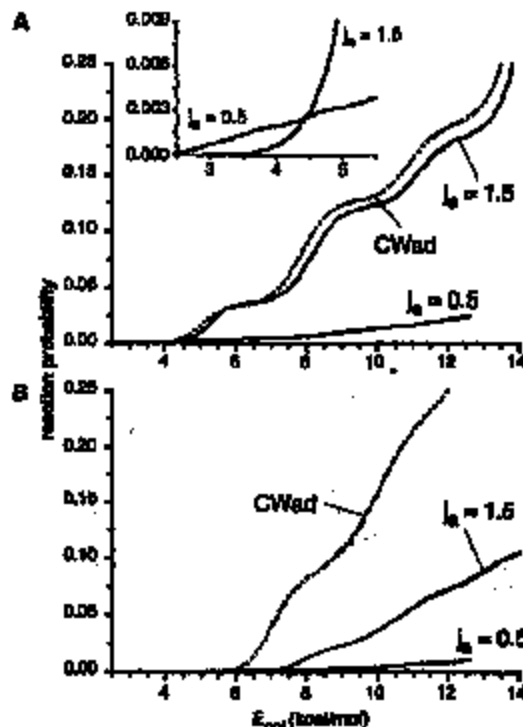
In the multistate treatment, four states correlate with the ground-state reactants $\text{Cl}(^2P_{3/2}) + \text{H}_2$; namely, as seen in Fig. 1, $\Sigma_{1/2}$ and $\Pi_{3/2,2}$. Of these, the Π states are repulsive, within the BO approximation, so that, to zeroth order, only 50% of the reactants will approach on a PES that leads to reaction. However, in the single-state calculations, one assumes that all (100%) of the reactants will approach on the reactive PES. To take into account this fundamental difference, previous investigators (21, 37) have divided the single-state results by a factor of 2 to compare with the cross sections and probabilities for reaction out of the $j_e = 3/2$ level of a 2P atom obtained from multistate calculations.

The probability for (adiabatically forbidden) reaction out of the excited ($j_e = 1/2$) SO state of Cl is much smaller than the probability for the adiabatically allowed reaction of the ground SO state. Only at collision energies below the zero-point corrected barrier to reaction [$E_{\text{coll}} < 4.93$ kcal/mol (Fig. 1)] does the adiabatically forbidden channel start to dominate, because the threshold for reaction of the excited SO state is 2.52 kcal/mol lower.

We also observe that the reaction probabilities predicted by single-state calculations on the fully adiabatic CWad PES agree very well with the multistate probabilities for the adiabatically allowed channel. As discussed above, the single-state probabilities have been divided by 2. Because the excited Π states are very high in energy in the region of the barrier, the topology of the barrier, which controls the flux from reactants to products, is virtually identical in the multistate and single-state calculations.

The pronounced staircase-like structure in the reaction probability out of the lower (adi-

Fig. 2. (A) Probabilities for reaction of Cl in the $j_e = 3/2$ ($^2P_{3/2}$) and $j_e = 1/2$ ($^2P_{1/2}$) SO states with H_2 ($v = 0, j = 0$) for $J = 0.5$. The abscissa is the collision energy. Also shown are reaction probabilities determined from single-state calculations based on the fully adiabatic (CWad) PESs for $J = 0$ but divided by a factor of 2. (Inset) The low-energy behavior of the multistate probabilities. (B) Similar reaction probabilities, but for $J = 17.5$.



abatically allowed) SO state corresponds to the successive opening of additional vibrational states at the barrier.

The lower panel of Fig. 2 displays similar reactive transition probabilities, but for $J = 17.5$. Again, the CWad probabilities have been divided by 2. At this higher angular momentum, the centrifugal barrier has increased. Consequently, the threshold for reaction occurs at a higher collision energy. At $J = 17.5$, the multistate reactions are now substantially smaller than those predicted by the single-state CWad calculations, even after division by 2. Similar comparisons at other values of J reveal that as J increases, the multistate reaction probabilities become increasingly smaller than the comparable single-state probabilities. Because the discrepancy grows roughly linearly with J , Coriolis coupling would seem to be responsible.

In the single-state calculations, only three outcomes of a collision are possible: (i) elastic scattering, (ii) inelastic scattering on the reactive PES, or (iii) reactive scattering. In the multistate calculations, additional inelastic channels are present for collisions of Cl in its ground SO state with H_2 , namely (Fig. 1) (iv) elastic and inelastic scattering on the repulsive ($^1\Pi_{1/2}$) PES; (v) inelastic scattering from the ($^2\Sigma_{1/2}^+$) PES to the ($^1\Pi_{1/2}$) PES, which will be accompanied by SO excitation of the Cl atom without reaction; and (vi) inelastic scattering from the reactive ($^2\Sigma_{1/2}^+$) PES back to the $^1\Pi_{1/2}$ PES. The last process will yield Cl in its ground SO state, accompanied by rotational and/or vibrational excitation of the H_2 . At low J , these additional inelastic channels do not seem to deplete the reactive scattering, because the single- and multistate reaction probabilities shown in Fig. 2A are virtually identical. However, a difference between the single-state and multistate probabilities for reaction of Cl($^2\Sigma_{1/2}^+$) does emerge as J increases (Fig. 2B). It is the inelastic channels that are responsible for this difference.

We find that the sum of the reactive and inelastic transition probabilities as predicted by the multistate calculations at $J = 0.5$ and 17.5 agrees very closely with a similar sum, but divided by a factor of 2, of the inelastic and reactive probabilities predicted by the single-state CWad calculations at $J = 0$ and 17. Because this agreement is obtained by dividing the single-state results by a factor of 2, we conclude that incoming flux on the repulsive $^1\Pi_{1/2}$ PES (Fig. 1) has an insignificant probability of either reaction (as discussed above) or inelastic scattering.

Because at higher J the inelastic (inelastic + reactive) probabilities agree whereas the reactive probabilities are significantly lower for the multistate (as compared to the single-state) calculations (Fig. 2), we conclude that, at higher J , the multistate inelastic probabilities must exceed those predicted by the sin-

gle-state calculations. This is indeed the case, as illustrated in Fig. 3.

At low energy, below the barrier in reactive, the multistate calculations at $J = 17.5$ reveal a pronounced oscillatory structure. This structure is the manifestation of quantum interference between trajectories that undergo an inelastic transition from the less repulsive $^2\Sigma_{1/2}^+$ PES to the more repulsive $^1\Pi_{1/2}$ PES when the system passes through the zone of strong nonadiabatic coupling as the atoms approach and then again as they recede, having bounced off the barrier to reaction (35).

As the collision energy rises above the barrier, the inelastic probabilities predicted by the CWad single-state calculations remain relatively independent of J . However, the multistate inelastic transition probabilities show a pronounced increase. This is a consequence of the presence of an additional electronic channel(s), not present in the single-state calculations.

In a linear molecule, the non-BO coupling between $^2\Sigma_{1/2}^+$ and $^1\Pi_{1/2}$ states is due to "J-uncoupling" (39), which arises from the J -1 term in expansion of the L^2 operator. Further investigation shows that the J -dependent enhancement of the inelastic probabilities in the multistate calculations can be attributed predominantly to rovibrational excitation of the H_2 molecule without excitation of the Cl atom and hence corresponds (Fig. 1) to transitions from the $^2\Sigma_{1/2}^+$ to the $^1\Pi_{1/2}$ PESs.

Integral cross sections are proportional to

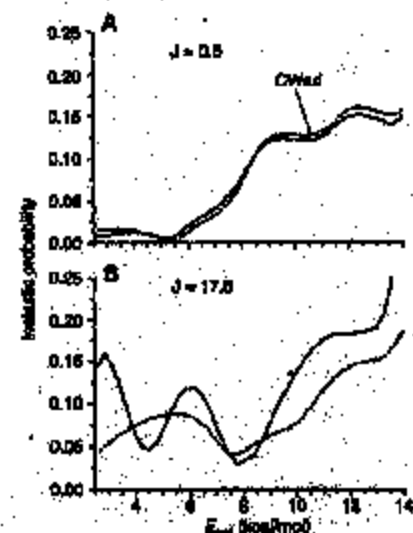


Fig. 3. (A) Speed curve indicates the inelastic transition probabilities for Cl($j = 3/2$) + $H_2(v = 0)$ for $J = 0.5$, summed over all energetically accessible final states. The abscissa is the collision energy. Dashed curve indicates a similar sum, but divided by 2, of inelastic transition probabilities from single-state calculations on the CWad PES for $J = 0$. The abscissa is the collision energy. (B) Similar plot of the inelastic transition probabilities but for $J = 17.5$ ($J = 17$ for the CWad calculations).

the sum over J of the transition probabilities weighted by $(2J + 1)(2I)$, is general, as the collision energy increases, successively greater values of J contribute. Because the multistate reaction probabilities are increasingly depressed at higher J (compared to the single-state probabilities), we expect that the increase of the multistate reactive cross sections with increasing collision energy will be smaller than the prediction from single-state calculations on the CWad PES. This is indeed the case, as shown in Fig. 4.

In the experiments of Lin and co-workers (4-6), only the lowest three ($J = 0, 1,$ and 2) rotational levels of H_2 are present in the beam. By weighting the cross sections of each J level by the experimental populations of these levels, we can obtain reactive cross sections appropriate to the experiments with $p-H_2$ or $s-H_2$ (Fig. 5).

We observe, similarly to the transition probabilities, that the cross section for the adiabatically forbidden reaction of Cl in its excited SO state is small in comparison with that for reaction of the ground SO state, which is adiabatically allowed. Only at very low collision energy, where the adiabatically allowed reaction is throttled off by the large barrier, does the adiabatically forbidden reaction begin to dominate. This is a consequence of the greater internal energy of the excited SO state, which does, albeit inefficiently, allow the barrier to be surmounted. Figure 5 is qualitatively similar to our earlier predictions of the relative reactivity of the two SO states of the F atom (27).

Because the statistical degeneracy of the ground SO state of Cl is twice as large as that of the excited state, which is not taken into ac-

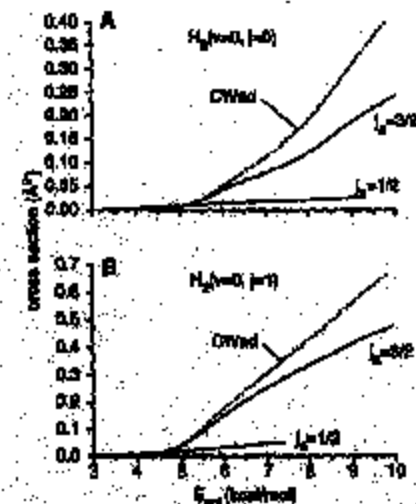


Fig. 4. Integral cross sections for reaction of Cl with $H_2(v = 0, j = 0)$ (A) and $H_2(v = 0, j = 1)$ (B). Solid lines are predictions of single-state calculations based on the fully adiabatic (CWad) PES, divided by a factor of 2.

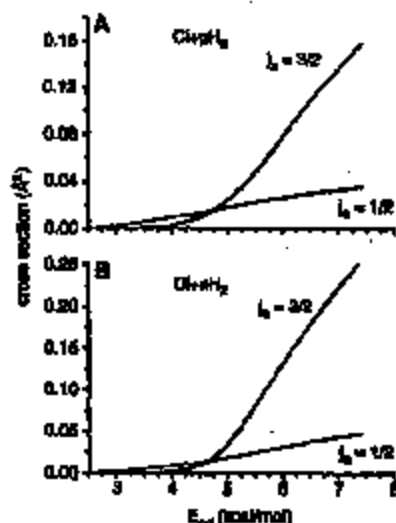


Fig. 5. (A) Integral cross sections for reaction of Cl in its ground ($j_s = 3/2$) and excited ($j_s = 1/2$) SO state with $p\text{-H}_2$. (B) Similar integral cross sections for reaction with $m\text{-H}_2$. The relative rotational state populations of the $j = 0, 1$ and 2 H_2 rotational levels were taken from (4–6).

count in Fig. 5, the observed reactivity of the excited SO state will be a factor of 2 less than predicted by Fig. 5.

We predict, fully in agreement with the body of available experimental evidence on other reactions (23, 28), that the adiabatically allowed $[Cl(2P_{3/2}) + H_2]$ reaction will dominate the adiabatically forbidden reaction $[Cl(2P_{1/2}) + H_2]$, except for collision energies below 5 kcal/mol. This prediction is in direct contrast with the recent work of Liu and co-workers (4–6). This disagreement is one of the major currently unsolved problems in the dynamics of elementary chemical reactions.

Although we predict the reactivity of the adiabatically forbidden channel to be small, we conclude that the breakdown in the BO approximation nevertheless plays an important role in the $Cl + H_2$ reaction. The coupling between the electronic-orbital angular momentum and the overall orbital motion of the reactants opens up a nonadiabatic channel that competes with reaction. The predicted reactive cross sections are smaller than those calculated from more traditional treatments, in which these nonadiabatic molecular processes are not taken into account.

We have shown that nonadiabatic processes influence the $Cl + H_2$ reaction dynamics in subtle and as yet not fully understood ways. In the *ab initio* calculations of Capocchi and Werner, the nonreactive II states were characterized only in the reactant arrangement, when these states lie relatively close in energy to the reactive Σ state. It may be that additional electronic couplings in (or inside) the reaction barrier underlie the discrepancy with Liu's experiments. The need for further studies, both theoretical and experimental, is clear.

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Dynamic Aggregation of Chiral Spinners

Bartosz A. Grzybowski* and George M. Whitesides*

An object spinning at the surface of a liquid creates a chiral vortex. If the spinning object is itself chiral, its shape modifies the characteristics of the vortex; interactions between that vortex and other vortices then depend on the chirality of the objects that produce them. This paper describes the aggregation of millimeter-sized, chiral magnetized plates floating at a liquid-air interface and rotating under the influence of a rotating external magnetic field. This external field confines all the plates at densities that cause the vortices they generate to interact strongly. For one set of plates investigated, plates of one chirality attract one another, and plates of the other chirality repel other plates of both chiralities.

The properties and interactions of chiral molecules are a central concern in chemistry, with applications in chromatographic separations, asymmetric catalysis, and medicinal chemistry (1, 2). Chiral interactions between molecules are conceptually well understood

(3, 4). Interactions between chiral objects larger than molecules are, however, less well explored or exploited. Here, we describe a study of the interactions between millimeter-scale vortices generated in a fluid by the rotation of chiral objects floating at the surface of that fluid. This system has the characteristics that it is dynamic (5–10)—that is, the interacting objects (the vortices) exist only when there is a flux of energy into the system—and that both the vortices and the objects that generate them are macroscopic. The system consists of magnetically doped

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From: Freeland, Mark (M.)
Sent: Monday, May 06, 2002 8:12 PM
To: Hargas, Jon (.)
Subject: RE: Letter of proposed work from Accurel

Jon,

Sorry for taking so long to reply. I have a large backlog of email that I am wading through.

This looks good, only issue, the parts for the Latched emission microscopy work will be packaged, not unpackaged.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
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Tel.: (313) 594-7645

---Original Message---

From: Hargas, Jon (.)
Sent: Friday, April 19, 2002 8:41 PM
To: Freeland, Mark (M.)
Subject: Letter of proposed work from Accurel

Mark,

Would you be able to proofread this and offer your comments?

Jon

The team leader of the project I'm on would like a letter outlining the course of action and the anticipated costs of the initial work so that a purchase order can be written. Ammending the order for additional work should be easy.

The sensors I am dealing with are silicon-based pressure sensors, with two die per package. Each die is 2mm by 2mm. Most are entirely covered by gold except where the bond pads are electrically isolated. In the package they are covered with a few millimeters of fluororubber gel to protect them from the corrosive effects of automotive exhaust gas. I remove fluororubber with trichlorotrifluoroethane and some mechanical persuasion, but have been told Fluorinert has similar abilities. One of our chemists has used tetrahydrofuran, xylene, or toluene to remove different fluororubbers.

I will be sending:

- 4 unpackaged sensors with 2 silicon-base pressure sensing die each.
- 6 die I have already examined by SEM to have FIB cross sections cut.

I anticipate the work flow will be:

- 1) Electrical testing of a circuit board modification to determine whether an MOV circuit modification for high

frequency voltage transients meets specification.

2) Emission microscopy for latch-up location on four sensors, each containing two die. One of these sensors does not have extended gold on the surface. All others are of a vintage with gold on the surface and may need to be dismantled and viewed from the back side. If fluororubber absorbs infrared, then die will have to be cleaned. A couple of unused die from a wafer carcass without extended gold may be obtained to make an unused sensor, if Accurel has wire bonding capability. Consultation on further analytical techniques that may help diagnose latch-up damage and preventative measures is desired.

3) One day SEM time should be budgeted prior to FIB analysis to examine for potential areas of interest of the die Accurel depackages.

4) FIB for SEM analysis of 8 sensor die, probing on average an estimated 10 areas with trenches cut 10-20 microns long. Area of interest is typically 1 micron gold, 1 micron of passivation, 1 micron of aluminum conductor, and underlying glass. The goal in these probing cuts is to cross section examining hillocks, delamination, or oxidation of the aluminum conductor.

5) FIB for SEM of 3 of these die will cross section part of the gold wire bond/ aluminum conductor interface. The sections may go into wire bond as deep as 50 microns.

From: Freeland, Mark (M.)
Sent: Wednesday, May 01, 2002 2:17 PM
To: Akins, Mary (M.); Maurer, James (J.B.)
Cc: Terry Tamashiro (E-mail); Kyong Park (E-mail); Plante, Paul (P.G.); Hargas, Jon (.)
Subject: RE: St. Thomas RML# 9138-001

Mary,

Thanks for forwarding. I already had this photo as Terry sent it to me a while back.

Jon Hargas & I are both of the opinion that this apparent surface scratch in the gold overlaying two of the conductor traces is probably not the cause of the part not functioning correctly. The only way to be sure would be to section the part at this location. We do not have the ability to do that here, but it could be done at one of the outside labs with a FIB.

Jim,

What do you want to do from here on the St. Thomas plant return?

Regards

Mark Freeland

> 6-Sigma Black Belt
> Engine Research Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 2629 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: Akins, Mary (M.)
Sent: Thursday, April 18, 2002 3:59 PM
To: Freeland, Mark (M.)
Subject: FW: St. Thomas RML# 9138-001

Mark,

Here is the photo you are waiting for.

Mary

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

From: Tamashiro, Terry [mailto:TTamashiro@kavlico.com]
Sent: Monday, April 15, 2002 4:44 PM
To: Akins, Mary
Subject: St. Thomas

Mary,

This was the SEM photo of the second St. Thomas return (part that was sent to you).

According to the S-Lab, they felt that this was the most likely culprit of the failure. The failure mode was designated Die Damaged. I told Mark that

ER02-027-G 71902

I'd get him this photo.

<<9138-001-1-ref-wilbur.jpg>>

Thanks,

Terry Tamashiro

Kavlico, a Solectron Company

Telephone: 805-523-2000 ext. 2469

Fax: 805-523-8475

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From: Maurer, James (J.B.)
Sent: Monday, April 22, 2002 9:03 AM
To: Hargas, Jon (.)
Subject: RE: Legal status with outside labs

The meeting did not happen on Friday, but was scheduled again for this morning. I expect to hear results by lunchtime, so I'll let you know then.

Regards,

Jim Maurer

James B. Maurer
V-Engine 6-Sigma Team Leader
Fuel Metering Dept. V Engine Engineering
Phone (313) 390-3672, Fax (313) 390-4084
Text Page: (313) 795-5219
Email: jmaurer@Ford.com

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

From: Hargas, Jon (.)
Sent: Friday, April 19, 2002 5:46 PM
To: Maurer, James (J.B.)
Cc: Pienta, Paul (P.G.); Gates, Freeman (F.C.); O'Neal, Jim (J.D.)
Subject: Legal status with outside labs

Jim,

What is the legal status of the work I'm interested in doing with Accurel after the FGTI and Purchasing meeting yesterday?

Will I be restricted to doing work on warranty return parts only, or will I be able to do work on Zarlink/Dalse parts and wafer carcasses?

Regards,
Jon Hargas
x31068

From: Ed Sickafus [intellect@ic.net]
Sent: Sunday, April 21, 2002 1:04 PM
To: Jon Hargas; Mark Freeland; James Maurer; Paul Plante
Subject: comments on testing



21Apr02.doc

Please see attached Word file. Ed

E982-827-G 77812

NTELLECK, LLC

Creative Thinking

April 21, 2002

To: Paul Plante (pplante@ford.com), James Maurer (jmaurer@ford.com),
Mark Preetand (mfreelal@ford.com, Jon Hargas (jhargas@ford.com)

Subject: Testing and Analytical Solutions, Inc.

The analyticalsol.com website is very informative. They appear to have capabilities appropriate for our current needs. However, it may require an effort on our part to identify and apportion needed testing in some appropriate manner.

Analytical Solutions, Inc. offer three types of failure analysis capability:

1. Failure analysis (FA): "... the device under investigation is carefully analyzed to establish a link between the electrical failure mode reported by the customer to a physical failure mechanism on the device ..."
2. Destructive physical analysis (DPA): "... is performed to evaluate the quality of construction of a particular lot of electronic devices ..."
3. Construction analysis (CA): "... to evaluate the process design and if any inherent reliability problems are present."

It doesn't appear that their FA is what we think of as FMEA (see below).

Analytical Solutions, Inc. has the following analytical tools: Optical Microscopy (IR not indicated), X-radiography, In-SEM probing, E-Beam Techniques including Electron Beam Induced Current and Voltage Contrast imaging (static and dynamic), Electrical Characterization, Micro-Probing, Precision Cross-Sectioning, Chemical Etching including Selective wet/dry etching. These tools, plus CMOS device experience, should prove very fruitful in aiding our analyses.

I. Electrical failure mode: we have devices, which upon laboratory testing show a "high-current state" without destroying the devices. These are of two types: devices removed from field service and devices overstressed in the laboratory. Since these are CMOS devices, it is plausible that the high-current state may arise from a parasitic SCR condition. It is also possible, but not yet determined, that the high-current state is root cause of field failures.

II. Independent laboratory testing is needed to determine whether the high-current state is an SCR condition or if other causes exist on a device: probe-test equipment can probably do this type of analysis.

1. If it is an SCR condition this raises at least three possible causes,
 - a. overstressing* of the device with high voltage (V),
 - b. overstressing* of the device with high rate of voltage rise (dV/dt),
 - c. overstressing* of the device with the sequence of voltages applied to the device (V₁ ... V_n). (* Overstressing refers to field conditions and the

response of a device to these conditions. Device capability, vis-à-vis field conditions, relates to performance specifications, circuit design, fabrication, and manufacturing variability.)

- d. An independent laboratory may have CMOS experience indicating that other SCR causes are plausible [temperature, vibration (erratic make/break contacts), corrosion, irradiation, etc.].
2. If it is determined that no SCR condition is present then physical examination of high-current devices is needed. Imaging methods would be an appropriate starting point; imaging of non-activated devices, and imaging of devices held in a high-current state. The device's gold over-layer presents a problem because of possible damage to underlying structure during its removal. It will be of interest to see how an independent laboratory will propose to remove it or make images with it in place. Optical microscopies in the visible band and in the infrared are likely candidates for these imaging exercises. If Au and other passivation layers can be removed, scanning electron microscopy can be used to examine for physical defects.
3. If examination of images produces no clues then other overstress parameters may need to be simulated (temperature, vibration, etc.).

III. If an SCR-condition, along with particular overstress parameters (V , dV/dt , $V_a \dots V_n$, other), is determined to be root cause then an FMEA should be executed to determine relationships between these SCR-conditions and "engine-light on". I should think the supplier would want to do a similar analysis relative to the circuit design and the fabrication process as relates to a high-current state. An independent laboratory might be able to do an FMEA relating the high-current state to design and/or processes issues if given the supporting design/process fundamentals.

If an SCR-condition is determined, along with its overstress parameters, it may then be possible to estimate the probable frequency of such conditions as relate to design/fabrication variances and field application variances.

IV. If corrosion becomes suspect, with/without an SCR-condition, then gel analysis is one bit of information of interest. This might be available from the device supplier and/or the gel manufacturer. Interpretation of the data may need the above FMEA results.

From the information presented in Analytical Systems, Inc. website, it appears that they are capable of a large portion of the measurements suggested above.

Bd Sickafus, PhD, PD
President
Ntalleck, LLC
PO Box 193
Grosse Ile, MI 48138
Phone: (734) 676-3594
Email: Ntalleck@ic.net

Subject: Kavlico dPPE UPAD research
Location: SRL Conf Room 1347 (10)

Start: Tue 4/9/2002 11:00 AM
End: Tue 4/9/2002 12:30 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Required Attendees: Freeland, Mark (M.); Hargas, Jon (.); Simko, Steven (S.J.)

From: Carter, Roscoe (R.O.)
Sent: Friday, April 05, 2002 8:11 AM
To: Hargas, Jon (.)
Subject: RE: solvent for gel

Yes that and toluene or xylene. ROC

—Original Message—

From: Hargas, Jon (.)
Sent: Thursday, April 04, 2002 6:18 PM
To: Carter, Roscoe (R.O.)
Subject: solvent for gel

Roc,
Was that tetrahydrofuran you told me was one of the solvents you would try to remove the fluororubber?
Jon

From: Freeland, Mark (M.)
Sent: Wednesday, March 27, 2002 2:08 PM
To: Hanges, Jon (.)
Subject: FW: resend

Jon,

more thoughts from Ed. Do you think the cold N might work, my daughters had fun watching cold N explode pop bottles lat time we went to COSI!

Mark

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

From: Ed Sickafus [mailto:ntelleck@ic.net]
Sent: Tuesday, March 26, 2002 12:51 PM
To: Freeland, Mark (M.)
Subject: RE: resend

Mark, my cell phone number is (313) 318-3299. It's not always on though, sometimes I forget to turn it on, and sometimes I just don't because I'm not expecting any calls. Tomorrow, I'll be driving all day to Pennsylvania, so I'll probably keep it on in case you have any news or ideas -- could make the drive more interesting.

I have a suggestion to try for lifting off the gold to reveal aluminum. Pour liquid nitrogen into a small beaker until it stops its violent bubbling; i.e., when it pretty cold and you can see clear liquid nitrogen in the beaker. Then drop a couple of die into the liquid nitrogen. I'd pick at least one die from the wafer's periphery. The sudden cooling will produce intralayer stresses between the films, and between films and die, as a result of their different thermal expansion. This most probably will flake off some shards of thin films. Whether it will successfully separate the films remains to be seen -- the purpose of the experiment. If it works, as I hope, the AL will not be distorted; i.e., broken into pieces, but may be warped, which is OK. If the AL is not separated from the Au, but they come off together, that's fine. One can look at one side and then the other.

I also recommend having Rod or Joe dip die into the gel, when you get some, to see if any reaction occurs w/ the aluminum. Also see when and if bubbles occur.

If bubbles occur only as a result of heating the gel, and not from chemical reaction w/ the die, then they become a postmortem flag for die having been heated. So it will be useful to heat some gel on a hot plate w/ a thermocouple and determine at what temperature bubbles occur (do it w/ and w/o die present in the hot gel).

Bear in mind that the amount of gaseous bubbles generated on heating may relate to the degree, if any, of pre-outgassing of the gel before its application in the package.

I look forward to meeting w/ you again to pursue these and other ideas. I'll be home Monday evening, next. Have a great holiday, Ed.

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

ENR2-827-G 77925

From: Freeland, Mark (M.) [mailto:mfreela1@ford.com]
Sent: Tuesday, March 26, 2002 11:20 AM
To: 'Ed Sickafus'
Cc: Hargas, Jon (.)
Subject: RE: resend

Ed,

I am thinking that we should keep the books open for a few weeks. I would like to have you back for another day (or two) after the Easter break. Partially to cover flushing out recommendations as you suggested, and also to spend some more time looking at parts with you. I will be out from 3/28 returning 4/8, so there will be no conflict with you're Easter plans. If you need to contact me while I am away I will have my cell phone with me (248) 842-1080. It may not work in the Grand Canyon, but hopefully will work some of the time!

Before you come back I want to have the attorneys resolve the transfer of Kavlico confidential information to you so that I can give you answers to all you're questions.

One thing which came out of Friday's meeting was a suggestion from Andy Drews to use ID imaging to try and see flaws in the Al under the Au without removing the Au first. He found a reference for IBM using such a technique to look at the Al layer from the back side through the Si! He is following up on trying to recreate the technique here. I will keep you posted on this one.

Regards

Mark Freeland

From: Freeland, Mark (M.)
Sent: Tuesday, March 26, 2002 11:20 AM
To: 'Ed Sickafus'
Cc: Hargas, Jon (.)
Subject: RE: resand

Ed,

I am thinking that we should keep the books open for a few weeks. I would like to have you back for another day (or two) after the Easter break. Partially to cover flushing out recommendations as you suggested, and also to spend some more time looking at parts with you. I will be out from 3/28 returning 4/8, so there will be no conflict with you're Easter plans. If you need to contact me while I am away I will have my cell phone with me (248) 842-1080. It may not work in the Grand Canyon, but hopefully will work some of the time!

Before you come back I want to have the attorneys resolve the transfer of Kavlico confidential information to you so that I can give you answers to all you're questions.

One thing which came out of Friday's meeting was a suggestion from Andy Drews to use ID imaging to try and see flaws in the Al under the Au without removing the Au first. He found a reference for IBM using such a technique to look at the Al layer from the back side through the Si. He is following up on trying to recreate the technique here. I will keep you posted on this one.

Regards

Mark Freeland

From: Freeland, Mark (M.)
Sent: Monday, March 25, 2002 10:58 AM
To: Akins, Mary (M.); Grant Hellker (E-mail)
Cc: Holubka, Joe (J.W.); Simko, Steven (S.J.); Hargas, Jon (.)
Subject: Sample of potting gel

Mary/Grant,

Could you please get me a sample of the uncured potting gel from the chimneys. We want to do some experiments with it regarding it's effect on AI conductor traces.

About 50 cc or so would be good.

Also, please provide me with the "procedure" for using it (i.e. the normal process parameters which are relevant to using and curing the gel).

Thanks

Mark Freeland

From: Helms, Jeffrey (J.H.)
Sent: Tuesday, March 19, 2002 1:11 PM
To: Hargas, Jon (.)
Cc: Hass, Kenneth (K.C.)
Subject: RE: Another Kavlico trip

Jon,

OK. Please coordinate with Mark and Steve to see who needs to go.

Jeffrey H. Helms, Manager
Materials Science Department
Ford Research Laboratory
Ph: (313)337-1098
Fax: (313)845-0100

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

From: Hargas, Jon (.)
Sent: Tuesday, March 19, 2002 1:10 PM
To: Helms, Jeffrey (J.H.)
Subject: Another Kavlico trip

Jeff,

Mark may be going out to Kavlico at the request of Brady Davies in the near future to present our analytical results to their scientists and engineers. Mark would like either Steve Simko or myself to go along to explain the analytical details. The earliest possible day was Friday, but that may be unfeasible. Jim O'Neall would pick up the tab.

Jon Hargas

From: Freeland, Mark (M.)
Sent: Monday, March 11, 2002 4:30 PM
To: Hargas, Jon (.)
Subject: FW: Sifel 807 biproducts during curing

Jon, Let's ask this again of Brady on Wednesday.

Mark

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

From: Heliker, Grant [mailto:GHeliker@kavlico.com]
Sent: Monday, March 11, 2002 1:04 PM
To: Freeland, Mark (M.)
Subject: RE: Sifel 807 biproducts during curing

I asked -- nothing at all is given off according to my sources here.

> -----Original Message-----

> **From:** Freeland, Mark (M.) [SMTP:mfreelal@ford.com]
> **Sent:** Monday, March 11, 2002 8:46 AM
> **To:** Grant Heliker (E-mail)
> **Cc:** Brady Davies (E-mail); Kyong Park (E-mail); Hargas, Jon (.)
> **Subject:** FW: Sifel 807 biproducts during curing

>

> Grant,

>

> Could you please research what is given off during the cure cycle for the
> chimney potting gel. We are looking into the possibility that if there
> were a path to the Al through the Au & TiW, could the potting cause damage
> to the Al.

>

> Thanks

>

> Mark

>

> -----Original Message-----

> **From:** Hargas, Jon (.)
> **Sent:** Monday, March 11, 2002 10:46 AM
> **To:** Freeland, Mark (M.)
> **Subject:** FW: Sifel 807 biproducts during curing

>

>

> Mark,

> I think we're going to have to ask Kavlico whether acetic acid, etc., is
> given off during cure.

> I left a voice message with the new sales rep, but we'll see if I get a
> response.

> Regards,

> Jon

> -----Original Message-----

> **From:** jheitler [mailto:jheitler@msn.com]
> **Sent:** Monday, March 11, 2002 7:35 AM
> **To:** 'Hargas, Jon (.)'
> **Subject:** RE: Sifel 807 biproducts during curing

>

>

> Dear Mr. Hansas,

>

> Mark is no longer with Shin-Etsu. Your new Sales Rep. is Steve Craig. He
> handles North Penn, Tech. Ctr., etc.

>

> To answer your question, there are no other hydrocarbon solvents in
> Sifel807A/B except for that small amount of toluene which is the carrier
> for the catalyst necessary to cure the gel.

>

> You can find Steve Craig at 330-630-9860 X202.

>

> Best regards

>

> John Heitler

>

>

> -----Original Message-----

> From: Hansas, Jon (.) [mailto:jhansas@ford.com]

> Sent: Friday, March 08, 2002 7:45 PM

> To: 'Neuber, Mark'

> Subject: Sivel 807 biproducts during curing

>

>

>

> Mark,

> Does Sivel 807 give off any biproducts other than hydrocarbon
> solvents during curing, similar to acetic acid given off when RTV cures?

>

> I realize there is some toluene in one component according to the
> MSDS sheet, and I'm not concerned with pH neutral solvents.

>

> Regards,

> Jon Hansas

> Materials Science Dept.

> Ford Motor Co.

> 313-323-1068

>

From: Freeland, Mark (M.)
Sent: Monday, March 11, 2002 11:46 AM
To: Grant Hellker (E-mail)
Cc: Brady Davies (E-mail); Kyong Park (E-mail); Hargas, Jon (.)
Subject: FW: Sifel 807 biproducts during curing

Grant,

Could you please research what is given off during the cure cycle for the chimney potting gel. We are looking into the possibility that if there were a path to the Al through the Au & TiW, could the potting cause damage to the Al.

Thanks

Mark

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

From: Hargas, Jon (.)
Sent: Monday, March 11, 2002 10:46 AM
To: Freeland, Mark (M.)
Subject: FW: Sifel 807 biproducts during curing

Mark,

I think we're going to have to ask Kavlico whether acetic acid, etc., is given off during cure. I left a voice message with the new sales rep, but we'll see if I get a response.

Regards,
Jon

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

From: jheitler [mailto:jheitler@msh.com]
Sent: Monday, March 11, 2002 7:35 AM
To: 'Hargas, Jon (.)'
Subject: RE: Sifel 807 biproducts during curing

Dear Mr. Hargas,

Mark is no longer with Shin-Etsu. Your new Sales Rep. is Steve Craig. He handles North Penn, Tech. Ctr., etc.

To answer your question, there are no other hydrocarbon solvents in Sifel807A/B except for that small amount of toluene which is the carrier for the catalyst necessary to cure the gel.

You can find Steve Craig at 330-830-8880 X202.

Best regards

John Heitler

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

From: Hargas, Jon (.) [mailto:jhargas@ford.com]
Sent: Friday, March 08, 2002 7:45 PM
To: 'Neuber, Mark'
Subject: Sifel 807 biproducts during curing

EA82-627-G 77946

Mark,

Does Sifel 807 give off any byproducts other than hydrocarbon solvents during curing, similar to acetic acid given off when RTV cures?

I realize there is some toluene in one component according to the MSDS sheet, and I'm not concerned with pH neutral solvents.

Regards,
Jon Hanges
Materials Science Dept.
Ford Motor Co.
313-323-1068

From: jheiter [jheiter@man.com]
Sent: Monday, March 11, 2002 7:35 AM
To: 'Hargas, Jon (.)'
Subject: RE: Sivel 807 b/products during curing

Dear Mr. Hargas,

Mark is no longer with Shin-Etsu. Your new Sales Rep. is Steve Craig. He handles North Penn, Tech. Ctr., etc.

To answer your question, there are no other hydrocarbon solvents in Sivel807A/B except for that small amount of toluene which is the carrier for the catalyst necessary to cure the gel.

You can find Steve Craig at 330-630-9860 X202.

Best regards

John Heiter

—Original Message—

From: Hargas, Jon (.) [mailto:jhargas@ford.com]
Sent: Friday, March 08, 2002 7:45 PM
To: 'Neuber, Mark'
Subject: Sivel 807 b/products during curing

Mark,

Does Sivel 807 give off any b/products other than hydrocarbon solvents during curing, similar to acetic acid given off when RTV cures?

I realize there is some toluene in one component according to the MSDS sheet, and I'm not concerned with pH neutral solvents.

Regards,
Jon Hargas
Materials Science Dept.
Ford Motor Co.
313-329-1068

EX02-027-G 71048

From: Freeland, Mark (M.)
Sent: Monday, March 04, 2002 2:50 PM
To: Terry Tamashiro (E-mail)
Cc: Hargas, Jon (.); Simko, Steven (S.J.); Maurer, James (J.B.); Gatas, Freeman (F.C.); Plante, Paul (P.G.)
Subject: Low mileage UPAD part

Terry,

I would like to have one or two of the very low mileage UPAD parts for Auger analysis.

Specifically, there is one in the data base RML No. 8760-184 which was one of two sensors replaced on a 3.8L Mustang for the complaint of Stalling at 8 miles. The vehicle had not been delivered to the customer at the time the sensor was replaced.

Another part which would be of interest if you can locate it, would be RML 8900-080, which came from a Focus with 54 miles.

Regards

Mark Freeland

6-Sigma Black Belt
Engine Research Department
Ford Research Laboratory
P.O. Box 2053
MD 2629 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Simko, Steven (S.J.)
Sent: Friday, February 22, 2002 8:23 AM
To: Hargas, Jon (.)
Subject: RE: 036 Ref

Jon,

I just looked at 036 HI in the optical microscope. The features that were were seeing yesterday in the unprotected area are DEFINITELY due to grain structure in the Al. Other areas with aluminum are visible on the chip and they show the same structure that we saw in the unprotected area. Different crystal faces of aluminum sputter at different rates. With the extensive sputtering that was done on this specimen, the different sputter rates translate into the topography differences we observed.

Best Regards,

Steve

From: Simko, Steven (S.J.)
Sent: Tuesday, February 12, 2002 10:48 AM
To: Hargas, Jon (,)
Subject: FIB Lab

Jon,

Check out the attached web site. This company does excellent work, primarily in surface analysis, with an emphasis on secondary ion mass spectrometry (SIMS). I looked at their web site and they do perform FIB work. <http://www.cea.com/>

Steve

From: Freeland, Mark (M.)
Sent: Tuesday, January 29, 2002 4:17 PM
To: Grant Heliker (E-mail)
Cc: Brady Davies (E-mail); Kyong Park (E-mail); Terry Tamashiro (E-mail); Akins, Mary (M.); Hargas, Jon (.)
Subject: FW: Steam Exposure Test

Grant,

I just received the two steam tested wafers from Mary. They are wafer numbers 4f22061-01 and 4f21084-02. Could you please get me the probe test data for these wafers, both hot and cold, and if they are MRB (I don't think they are) then the first test as well as the second test data.

Thanks
Regards

Mark Freeland

> 6-Sigma Black Belt
> Physics Department
> Ford Research Laboratory
> P.O. Box 2053
> MD 3028 - SRL - Room 1517
> Dearborn, MI 48121-2053 USA
email: mfreelal@ford.com
Tel.: (313) 594-7645

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

From: Terry Tamashiro [mailto:TTamashiro@kavlico.com]
Sent: Tuesday, January 29, 2002 12:17 PM
To: Freeland, Mark (M.)
Subject: RE: Steam Exposure Test

I'm not sure what the wafer number or die numbers are. All of the information is on the wafer picture maps. The wafer number is identified on the picture maps. The dies are numbered on the picture maps and on the individual photos. The photos were printed out to show before and after exposures.

> -----Original Message-----

> **From:** Freeland, Mark (M.) [SMTP:mfreelal@ford.com]
> **Sent:** Tuesday, January 29, 2002 9:05 AM
> **To:** 'Terry Tamashiro'; Freeland, Mark (M.)
> **Subject:** RE: Steam Exposure Test

>
> Terry, what are the wafer numbers and die numbers for the die you
> selected?
>
> Thanks
>
> Mark

From: Freeland, Mark (M.)
Sent: Friday, January 25, 2002 12:47 PM
To: Brady Davies (E-mail); Kyong Park (E-mail)
Cc: Hanges, Jon (.)
Subject: Pictures from the Scrap Wafer I was examining last night.

Here are the pictures in a more usable format. Let's discuss further at you're convenience.



Clue 1.ppt

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

ER82-827-G 78450

From: Freeland, Mark (M.)
Sent: Friday, January 18, 2002 4:57 PM
To: Hargas, Jon (.)
Subject: FW: Auger of corroded aluminum

Jon,

Thanks for following up on the OJ (sorry Auger).

If it works, do you think there is anything to be gained from looking at one of the four field return parts, or would the weld bead obscure the beam and prevent Steve from seeing what's going on in the Al layer?

Mark

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

From: Hargas, Jon (.)
Sent: Friday, January 18, 2002 4:11 PM
To: Freeland, Mark (M.)
Subject: Auger of corroded aluminum

Mark,

Steve Simko expressed an interest in doing Auger on the aluminum of an oxidized bond pad. He can sputter through the gold and detect O and N in the presence of Al. His beam size is about 50nm. He'd like a control sample, so I'll try to select one that's one of the better samples we took as a control.

Jon

From: Freeland, Mark (M.)
Sent: Wednesday, January 09, 2002 4:16 PM
To: 'Randy Ray (E-mail)'; 'Donald Ayers (E-mail)'
Cc: Aklns, Mary (M.); Hargas, Jon (.)
Subject: RE: Which wafers to dig out for us

Randy & Don,

In addition I would like to see the carcasses from 11/27/2000, 12/1/2000, 3/9/2001, 6/19/2001 & 6/25/2001, based on the data Mary sent this morning.

I will also probably want to see the probe data for some of the wafers from the dates. I assume Grant will be able to help me with that when he returns from SMI on Monday.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mffreel1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Wednesday, January 09, 2002 4:03 PM
To: Randy Ray (E-mail); Donald Ayers (E-mail)
Cc: Akins, Mary (M.); Hargas, Jon (.)
Subject: Which wafers to dig out for us

Randy & Don,

Please have available for Jon & I all wafer carcasses which were or may have been used to produce sensors with the European Part Number with EOL date coded of 8/11/00, 8/17/00, 8/22/00, 8/24/00, 9/1/00, 9/7/00, 9/19/00, 11/22/00 & 1/19/01.

I will also be looking for additional dates in July 2001 after I have looked at the data Mary sent me this morning.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Neuber, Mark [mneuber@shinetaua.com]
Sent: Friday, December 07, 2001 5:50 PM
To: Hengas, Jon (.)
Subject: RE: Fluorinert

Jon,

Thank you very much for your comments...I'm glad Mike Boneaver and I have been able to meet your expectations. I will doublecheck with Japan on the Fluorinert 5080 ~ I checked the email we rec'd from Japan and it wasn't a typo on my part anyway...I'll make sure it wasn't one on their end.

I personally deal with a lot of the guys at Kavlico. If you want me to contact them regarding this, just supply me a name and I'll be happy to follow up. (I have no idea why they wouldn't know this material is a fluoroelastomer and not a silicone!)

As mentioned, I should be close to my office for the rest of the year...I'm definitely tired of travelling - it's not too fun since Sept. 11.

Regards,
Mark Neuber
Sales Manager
Shin-Etsu Silicones of America
605-866-0988

> -----Original Message-----

> From: Hengas, Jon (.) [mailto:lhengas@ford.com]

> Sent: Thursday, December 06, 2001 11:05 AM

> To: 'Mark Neuber (E-mail)'

> Subject: Fluorinert

>

>

> Mark,

> Thanks a lot for your phone calls.

>

> I have forwarded your name and the information you gave me to

> the people at Kavlico who manufacture and are also debugging

> this same sensor. I believe they were not aware that the

> Sifel was a fluoroelastomer, because the Dynasol 711 they

> were using was designed for silicone removal.

>

> I have been able to remove the Sifel with some Freon CFC-113,

> and as you said it would need some prodding. I use a Q-tip.

> But the surface is robust enough that the Q-tip doesn't cause

> any damage. The results are quite satisfactory, better than

> the Dynasol results.

>

> I do have one question. Fluorinert PF-5080 is listed on 3M's

> web site (in a very obscure and hard to find location) as a

> heat transfer fluid. One or two others in the 50xx series

> are listed as solvents, PF-5060 and PF-5070. Could you

> double check that there wasn't a typo? Is 5080 the best

> fluorinert solvent for Sifel 807?

>

> I realize that the 5080 might be multipurpose (just optimized

EP82-027-G 78458

- > more for heat transfer than the other formulations), and
- > that it may have the ability to soften Sifel better because
- > of the type of fluorine compounds it contains.
- >
- > Also, I must complement you and Mike Bonsaver for your
- > helpfulness, and your company for your web site. I was
- > fairly quickly able to find that the Sifel was a
- > Fluoroelastomer, and figured out that Freon might work. It
- > took much longer to find PF-6080 on the 3M web site, because
- > it seems the specialty division's chemicals aren't seen by
- > 3M's search engine. I tried calling, talked to a
- > receptionist who could confirm that the chemical did exist,
- > and gave me a couple of 1-800 numbers to call. You call
- > those and if you don't know the extension of anyone there you
- > get a message saying "We're sorry you're having problems... .
- > Goodbye."
- >
- > Thanks for your help.
- > Jon Hargas
- > Ford Motor Co.
- > 313-323-1088
- >

From: Freeland, Mark (M.)
Sent: Thursday, December 06, 2001 7:02 PM
To: Hargas, Jon (.)
Subject: FW: Process Map

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

From: Don Ayers [mailto:DAyers@kavlico.com]
Sent: Thursday, December 06, 2001 5:01 PM
To: Freeland, Mark (M.)
Cc: Akins, Mary (M.); Brady Davies; Hargas, Jon (.)
Subject: RE: Process Map

Mark -

The process run cards for the gold fab process, in addition to MSDS' for the chemicals used, have been Fedex'd to Mary.

Thanks.
Don

> -----Original Message-----

> **From:** Freeland, Mark (M.) [SMTP:mfreela1@ford.com]
> **Sent:** Wednesday, December 05, 2001 12:41 PM
> **To:** Donald Ayers (E-mail)
> **Cc:** Akins, Mary (M.); Brady Davies (E-mail); Hargas, Jon (.)
> **Subject:** Process Map

>

> Don,

>

> Could you please provide me with a detailed process map for the Gold Room
> processes.

>

> Thanks

>

> Regards

>

> Mark Freeland

>

> > 6-Sigma Black Belt Candidate

> > Physics Department

> > Ford Research Laboratory

> > P.O. Box 2053

> > MD 3028 - SRL - Room 1517

> > Dearborn, MI 48121-2053 USA

> email: mfreela1@ford.com

> Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Thursday, December 06, 2001 6:07 PM
To: Gates, Freeman (F.C.); Hargas, Jon (.)
Subject: FW: UAD Evaluation Test Plan Status

Freeman & Jon

I asked Kavlico yesterday for a daily status report on the UPAD work plan progress. Here is a copy of the first report.

Regards

Mark

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

From: Jay Caffee [mailto:JCaffee@kavlico.com]
Sent: Thursday, December 06, 2001 5:13 PM
To: Mary Akina; Mark Freeland
Cc: Brady Davies; Kyong Park; Don Ayers; Mark Miller
Subject: UAD Evaluation Test Plan Status

We have completed inspection of 28 wafers (consisting of 14 wafer lots) from Sept. & Oct. of '00. No UAD damage could be detected on these wafers. We have located wafers from 12 lots manufactured in Aug. of '00, we are in the process of visually inspecting these wafers at this time and will have the results by the end of the day tomorrow.

Jay Caffee

From: Freeland, Mark (M.)
Sent: Thursday, December 06, 2001 9:33 AM
To: Hargas, Jon (.)
Subject: FW: more SEM of 242

Jon,

I understand. That sounds like a good idea. Can you keep track of where each section you photograph is in a planer view as you walk down into the part. That way we can "map" the damage and anything we find at the Passivation to Conductor (or void) interface.

I will come back late in the afternoon after the 14D meeting at POEE. (probably after 5:00)

Thanks

Mark

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

From: Hargas, Jon (.)
Sent: Wednesday, December 05, 2001 7:59 PM
To: Freeland, Mark (M.)
Subject: more SEM of 242

Mark,

I just got done doing some SEM of 242. Hout has some undercut areas on the gold pad, but the registration of the pad looks good, with good sidewalks.

When I section it, I might want to do so from a corner, rather than parallel to a given side. That way I might be able to see what's going on with 2 sides of the pad at once.

Jon

From: Freeland, Mark (M.)
Sent: Wednesday, December 05, 2001 3:41 PM
To: Donald Ayers (E-mail)
Cc: Akhs, Mary (M.); Brady Davies (E-mail); Hargas, Jon (.)
Subject: Process Map

Don,

Could you please provide me with a detailed process map for the Gold Room processes.

Thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreel1@ford.com
Tel.: (313) 594-7645

From: Mike Bonsaver [MBonsaver@MicroSi.com]
Sent: Wednesday, November 28, 2001 12:24 PM
To: 'jhangas@ford.com'
Cc: Mark Neuber (E-mail)
Subject: SIFEL 807 MSDS



SIFEL 807A-XX.doc SIFEL 807B-XX.doc

Dear John;

It was nice talking to you today; Here are the MSDS sheets for SIFEL 807A and B.

Mark Neuber is the gentleman at Shin-Etsu Silicones of America who would handle your needs.
His number is (505) 856-0988.

I'll also send your request for a solvent to our team in Japan, and will get back to you as soon as I have an answer.

Thx

Mike <<SIFEL 807A-XX.doc>> <<SIFEL 807B-XX.doc>>

ERR2-827-G 78494

Shin-Etsu MicroSi

MATERIAL SAFETY DATA SHEET

This MSDS is compatible with ISO 11014-1:1994 and conforms to ANSI standard Z39.1-1993.

Section 1: Chemical Product and Company Identification

CHEMICAL SUPPLIER COMPANY NAME	EMERGENCY TELEPHONE
Shin-Etsu MicroSi, Inc.	Chemtree 24 hr.s, USA: (800) 424-9300
10028 South 51 st Street	Shin-Etsu MicroSi Information: (480) 893-8898
Phoenix, AZ 85044	Contact: Shin-Etsu MicroSi, Inc.
Phone (480) 893-8898	Shin-Etsu Silicones of America,
Fax: (480) 893-8637	Information: (330) 630-9860

MANUFACTURER'S NAME:	Shin-Etsu Chemical Co. Ltd.
ADDRESS:	6-1, 2-Chrome, Ohtemachi, Chiyodaku, Tokyo, Japan
TELEPHONE NUMBER:	03-3246-5345 Tokyo, Japan

DATE PREPARED:	10/14/1996
DATE REVIEWED, BY:	10/26/1999, LTSN

PRODUCT NAMES:	SIFEL 807A
CHEMICAL NAME:	Liquid Fluororubber
CHEMICAL FAMILY:	Perfluoropolyether Mixture
FORMULA:	Mixture

Section 2: Composition, Information on Ingredients

PRODUCT COMPOSITION	wi. %	ACGIH TLV	OSHA PEL	UNITS	CAS NO.
Perfluoropolyether Mixture	100	Not Established	Not Established	Not Applicable	Mixture

Some items on this MSDS may be designated as trade secrets. Beside requests for disclosure of trade secret information to medical personnel must be made in accordance with the provisions contained in 29 CFR 1910.1200 11-13.

HAZARDOUS COMPONENTS: None

Section 3: Hazards Identification

HAZARD CLASSIFICATION: Not classified as hazardous based on IMO and DOT.

FIRE AND EXPLOSION:

Not considered flammable or combustible, but this substance will burn if involved in a fire.

POTENTIAL HEALTH EFFECTS

SKIN CONTACT: May cause slight skin irritation, but no significant effect.

EYE CONTACT: May cause slight eye irritation.

INGESTION: No information is available.

INHALATION:

Not applicable. Be aware that toxic and corrosive fluorine-compounds may be liberated during processing above 200 °C, or in fire conditions, or from smoking cigarettes or tobacco products contaminated with this product.

ERG2-027-G 78405

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Section 4: First Aid Measures

SKIN CONTACT:

Immediately remove liquid from skin with dry cloth or towel and wash exposed area with soap and water.

EYE CONTACT:

Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

INGESTION:

If swallowed, wash out mouth with water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

INHALATION:

Not applicable. Be aware, if decomposition products are inhaled, remove to fresh air. If victim is not breathing give artificial respiration, preferably mouth-to-mouth. Get medical attention immediately.

Section 5: Fire-fighting Measures

FLASH POINT: Not Applicable

FLAMMABLE LIMITS IN AIR (% by vol): Lower: Not Measured, Upper: Not Measured

EXTINGUISHING MEDIA: Foam, Dry Chemical, or Carbon Dioxide

SPECIAL FIREFIGHTING PROCEDURES:

Wear appropriate protective equipment, including NIOSH-approved respirator. Work from the upwind side of the fire. Use suitable extinguishing agents. If possible, move the container to a safe area. If it cannot be removed from fire danger, protect it from destruction then cool container and vicinity by spraying with water. If ignited and it cannot be extinguished easily, evacuate the area and call your emergency responders.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

When heating above 200 °C, or in fire conditions, harmful decomposition products may be formed, including hydrogen fluoride, carbonyl fluoride, carbon monoxide, and low molecular weight fluorocarbons. Do not inhale decomposition products. Disperse harmful atmospheres by ventilating with air.

Section 6: Accidental Release Measures

ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Wear proper protective equipment and warn unnecessary people away. Eliminate all sources of ignition and ventilate area. Contain or dike the spill or leak. Take up spilled material with rag or cardboard. Place in a chemical waste container for later disposal. Prevent spills from entering sewers or watercourses.

DISPOSAL METHOD:

Disposal should be made in accordance with Federal, State and local regulations. Incineration is recommended.

Section 7: Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Store upright in a cool, dry place.

Keep container closed when not in use.

Keep away from heat, sparks, flame, direct sunlight and other possible sources of ignition.

Wear proper protective equipment when handling this material.

Avoid contact with skin, eyes or clothing. Avoid prolonged or repeated skin contact.

Wash hands and face after handling this material.

Do not smoke cigarettes which have come in contact with this material.

Keep out of reach of children.

Follow all regulations in pertaining to this material in your country.

INFORMATION ON EMPTIED CONTAINER

EA82-027-0 78496

Do not reuse this container
Keep empty container away from heat, sparks, flame, direct sunlight and other possible sources of ignition.
Do not puncture or cut this container, and do not weld on or near this container.
Dispose of this container according to local, state, and federal laws in your country.

Section 8: Exposure Controls/Personal Protection

EXPOSURE GUIDELINES

ACGIH TLV-TWA: Not Established
ACGIH STEL: Not Established
OSHA PEL: Not Established

VENTILATION:

Good general, mechanical, room ventilation is recommended but not required.

SPECIAL VENTILATION CONTROLS:

If processing conditions heat this chemical to >200 °C, this chemical must be processed inside totally enclosed equipment, or used it with local exhaust ventilation at points where vapors can be released into the workspace air.

RESPIRATORY PROTECTION:

Use only NIOSH approved respirator if required by your process.

PROTECTIVE GLOVES: Plastic Film

EYE PROTECTION: Chemical Goggles, Safety Glasses, Faceshield

PROTECTIVE CLOTHING:

Wear suitable protective clothing to prevent skin contact.

OTHER EQUIPMENT:

Make safety shower, eyewash stations and handwashing equipment available in the work area.

WORK/HYGIENE PRACTICES:

Avoid contact with eyes and prolonged or repeated skin contact. Wash hands and face after handling.

Section 9: Physical and Chemical Properties

BOILING POINT:	Not Applicable
VAPOR PRESSURE(@25 °C):	Negligible
VAPOR DENSITY(AIR=1):	Not Applicable
SPECIFIC GRAVITY(@25 °C):	1.82
MELTING POINT:	Not Applicable
EVAPORATION RATE(BUTYL ACETATE = 1):	Negligible
SOLUBILITY IN WATER:	Not Soluble
APPEARANCE - COLOR:	Transparent, Colorless to Light Yellow
PHYSICAL STATE:	Fluid
ODOR:	Slight Odor

Section 10: Stability and Reactivity

STABILITY: Stable

CONDITIONS TO AVOID: Heating above 200°C.

INCOMPATIBILITY (MATERIALS TO AVOID): None

HAZARDOUS DECOMPOSITION PRODUCTS:

When heating above 200 °C, or in fire conditions, harmful decomposition products may be formed, including hydrogen fluoride, carbonyl fluoride, carbon monoxide, and low molecular weight fluorocarbons.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11: Toxicological Information

SKIN IRRITATION: No Data is Available

ERG2-827-G 78497

EYE IRRITATION: No Data is Available
ACUTE TOXICITY (LD50): No Data is Available
ACUTE TOXICITY (LC50): No Data is Available
CHRONIC TOXICITY: No Data is Available
CARCINOGENICITY
NTP: Not Listed
IARC: Not Listed
OSHA REGULATED: Not Listed
OTHER INFORMATION: None

Section 12: Ecological Information

BIODEGRADATION: No information is available.
BIOACCUMULATION: No information is available.
AQUATIC TOXICITY: No information is available.
OTHER INFORMATION: None

Section 13: Disposal Considerations

Can be burned in a chemical incinerator equipped with an afterburner and scrubber. Do not dispose of the emptied container unlawfully. Observe all federal, state, and local laws in your country.

Section 14: Transport Information (per 49 CFR 172.101)

UN NO.: Not Regulated
IMO CLASSIFICATION AND CLASS,
and DOT HAZARD CLASS: Not Regulated
DOT LABELS: None
PLACARD: None
PACKAGING GROUP: Not Regulated
DOT PROPER SHIPPING NAME,
and EXPORT SHIPPING NAME: None
TECHNICAL SHIPPING NAME: None
MARINE POLLUTANT: Not Regulated

DOT REPORTABLE QUANTITY (49 CFR 172.101, APP.) and
CERCLA REPORTABLE QUANTITY (40 CFR PART 302, TABLE 302.4)
HAZARDOUS SUBSTANCE(S) NAME / (CAS NO.), CONTENT(S) AND RQ: None

Section 15: Regulatory Information

TOXIC SUBSTANCES CONTROL ACT (TSCA) STATUS:

Some components in this product are not listed in the TSCA inventory. Components in this product should be used in compliance with low volume exemptions (LVE) under TSCA. Under the TSCA LVE rules, this product is in compliance with rules, regulations and/or orders of TSCA.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA) TITLE III SECTION 313 SUPPLIER NOTIFICATION:

This regulation requires submission of annual reports of toxic chemical(s) that appear in section 313 of the Emergency Planning and Community Right To Know Act of 1986 and 40 CFR 372. This information must be included in all MSDS's that are copied and distributed for the material. The toxic chemicals contained in this product are: None

CALIFORNIA PROPOSITION 65:

This regulation requires a warning for California Proposition 65 chemical(s) under the statute. The California Proposition 65 Chemical(s) contained in this product are: None

Section 16: Other Information

FOR INDUSTRIAL USE ONLY:

This material safety data sheet is offered solely for your information, consideration and investigation. The data described in this MSDS consist of data on literature, our acquisitional data, and analogical inference by data of similar chemical substances or products. Shin-Etsu Chemical Co. Ltd. provides no warranties, either expressed or implied, and assumes no responsibility for the accuracy or completeness of the data contained herein. Final determination of the suitability of any material is the sole responsibility of the user.

ADDITIONAL INFORMATION:

The information contained within this MSDS is released in good faith and believed to be accurate. No agent of Shin-Etsu Chemical Co., Ltd's, and its subsidiaries, are authorized vary any MSDS data, and its agents disclaim all liability for any action taken or foregone on reliance upon such data. Conditions of use are beyond Shin-Etsu Chemical Co., Ltd's, and its subsidiaries control and therefor the users are responsible to verify this data under their own particular purposes and they alone assume all risks of their use, handling, disposal and reliance upon the information provided herein. This information applies only to the product designated above and does not necessarily apply to its use in combination with other materials, products, chemical compounds, structures or processes.

ERG2-827-6 78499

Shin-Etsu MicroSi

MATERIAL SAFETY DATA SHEET

This MSDS is compatible with ISO 15094 - 1:1994 and conforms to ANSI Standard Z396.1 - 1983.

Section 1: Chemical Product and Company Identification

CHEMICAL SUPPLIER COMPANY NAME	EMERGENCY TELEPHONE
Shin-Etsu MicroSi, Inc.	Chemtrec 24 hrs, USA: (800) 424-9300
10028 South 51 st Street	Shin-Etsu MicroSi Information: (480) 893-8898
Phoenix, AZ 85044	Contact: Shin-Etsu MicroSi, Inc.
Phone (480) 893-8898	Shin-Etsu Silicones of America,
Fax: (480) 893-8637	Information: (330) 630-9860

MANUFACTURER'S NAME:	Shin-Etsu Chemical Co. Ltd.
ADDRESS:	6-1, 2-Chrome, Ohtemachi, Chiyodaku, Tokyo, Japan
TELEPHONE NUMBER:	03-3246-5345 Tokyo, Japan

DATE PREPARED:	10/14/1996
DATE REVIEWED, BY:	10/26/1999, LTSN

PRODUCT NAMES:	SIFEL 807B
CHEMICAL NAME:	Liquid Fluororubber
CHEMICAL FAMILY:	Perfluoropolyether Mixture
FORMULA:	Mixture

Section 2: Composition, Information on Ingredients

PRODUCT COMPOSITION	wt. %	ACGIH TLV	OSHA PEL	UNITS	CAS NO.
Perfluoropolyether Mixture	100	Not Established	Not Established	Not Applicable	Mixture

Some items on this MSDS may be designated as trade secrets. Bonafide requests for disclosure of trade secret information to medical personnel must be made in accordance with the provisions contained in 29 CFR 1910.1200 f 1-13.

HAZARDOUS COMPONENTS:

This product contains ca. 0.1% toluene, CAS No. 108-88-3. Toluene is listed as a Group 3 carcinogen by the International Agency for Research on Cancer (IARC). According to IARC definition, Group 3 identifies the agent (mixture, or exposure circumstance) as unclassifiable as to carcinogenicity to humans. Toluene is not listed as a carcinogen by the National Toxicological Program (NTP), nor is it regulated as a carcinogen by the Occupational Safety and Health Administration (OSHA).

Section 3: Hazards Identification

HAZARD CLASSIFICATION: Not classified as hazardous based on IMO and DOT.

FIRE AND EXPLOSION:

Not considered flammable or combustible, but this substance will burn if involved in a fire.
Contact with acidic, basic or oxidizing materials generates flammable and explosive hydrogen gas.

POTENTIAL HEALTH EFFECTS

SKIN CONTACT:	May cause slight skin irritation, but no significant effect.
EYE CONTACT:	May cause slight eye irritation.
INGESTION:	No information is available.

ER02-827-G 78508

INHALATION:

Not applicable. Be aware that toxic and corrosive fluorine-compounds may be liberated during processing above 200 °C, or in fire conditions, or from smoking cigarettes or tobacco products contaminated with this product.

Section 4: First Aid Measures

SKIN CONTACT:

Immediately remove liquid from skin with dry cloth or towel and wash exposed area with soap and water.

EYE CONTACT:

Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

INGESTION:

If swallowed, wash out mouth with water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

INHALATION:

Not applicable. Be aware, if decomposition products are inhaled, remove to fresh air. If victim is not breathing give artificial respiration, preferably mouth-to-mouth. Get medical attention immediately.

Section 5: Fire-fighting Measures

FLASH POINT: Not Applicable

FLAMMABLE LIMITS IN AIR (% by vol): Lower: Not Measured, Upper: Not Measured

EXTINGUISHING MEDIA: Foam, Dry Chemical, or Carbon Dioxide

SPECIAL FIREFIGHTING PROCEDURES:

Wear appropriate protective equipment, including NIOSH-approved respirator. Work from the upwind side of the fire. Use suitable extinguishing agents. If possible, move the container to a safe area. If it cannot be removed from fire danger, protect it from destruction then cool container and vicinity by spraying with water. If ignited and it cannot be extinguished easily, evacuate the area and call your emergency responders.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Contact with acidic, basic or oxidizing materials generates flammable and explosive hydrogen gas. When heating above 200 °C, or in fire conditions, harmful decomposition products may be formed, including hydrogen fluoride, carbonyl fluoride, carbon monoxide, and low molecular weight fluorocarbons. Do not inhale decomposition products. Disperse harmful atmospheres by ventilating with air.

Section 6: Accidental Release Measures

ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Wear proper protective equipment and warn unnecessary people away. Eliminate all sources of ignition and ventilate area. Contain or dike the spill or leak. Take up spilled material with rag or cardboard. Place in a chemical waste container for later disposal. Avoid contacting spilled material with acids, bases, or oxidizing materials to prevent generation of hydrogen gas. Prevent spills from entering sewers or watercourses.

DISPOSAL METHOD:

Disposal should be made in accordance with Federal, State and local regulations. Incineration is recommended.

Section 7: Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Store upright in a cool, dry place.
Keep container closed when not in use.

ER02-027-G 70501

Keep away from heat, sparks, flame, direct sunlight and other possible sources of ignition.
Avoid contact with acidic, basic or oxidizing materials.
Wear proper protective equipment when handling this material.
Avoid contact with skin, eyes or clothing. Avoid prolonged or repeated skin contact.
Wash hands and face after handling this material.
Do not smoke cigarettes which have come in contact with this material.
Keep out of reach of children.
Follow all regulations in pertaining to this material in your country.

INFORMATION ON EMPTIED CONTAINER

Do not reuse this container
Keep empty container away from heat, sparks, flame, direct sunlight and other possible sources of ignition.
Do not puncture or cut this container, and do not weld on or near this container.
Dispose of this container according to local, state, and federal laws in your country.

Section 8: Exposure Controls/Personal Protection

EXPOSURE GUIDELINES

ACGIH TLV-TWA: Not Established
ACGIH STEL: Not Established
OSHA PEL: Not Established

VENTILATION:

Good general, mechanical, room ventilation is recommended but not required.

SPECIAL VENTILATION CONTROLS:

If processing conditions heat this chemical to >200 °C, this chemical must be processed inside totally enclosed equipment, or used it with local exhaust ventilation at points where vapors can be released into the workspace air.

RESPIRATORY PROTECTION:

Use only NIOSH approved respirator if required by your process.

PROTECTIVE GLOVES: Plastic Film

EYE PROTECTION: Chemical Goggles, Safety Glasses, Faceshield

PROTECTIVE CLOTHING:

Wear suitable protective clothing to prevent skin contact.

OTHER EQUIPMENT:

Make safety shower, eyewash stations and handwashing equipment available in the work area.

WORK/HYGIENE PRACTICES:

Avoid contact with eyes and prolonged or repeated skin contact. Wash hands and face after handling.

Section 9: Physical and Chemical Properties

BOILING POINT:	Not Applicable
VAPOR PRESSURE(@25 °C):	Negligible
VAPOR DENSITY(AIR=1):	Not Applicable
SPECIFIC GRAVITY(@25 °C):	1.73
MELTING POINT:	Not Applicable
EVAPORATION RATE(BUTYL ACETATE = 1):	Negligible
SOLUBILITY IN WATER:	Not Soluble
APPEARANCE - COLOR:	Transparent, Colorless to Light Yellow
PHYSICAL STATE:	Fluid
ODOR:	Slight Odor

Section 10: Stability and Reactivity

STABILITY:

Unstable, but please be aware, this product will not vigorously polymerize, decompose, or condense, nor will it become self-reactive under conditions of shock, pressure, or heightened temperature.

CONDITIONS TO AVOID:

Contact with acidic, basic or oxidizing materials, or heating above 200°C.

INCOMPATIBILITY (MATERIALS TO AVOID): Acidic, Basic or Oxidizing Materials

HAZARDOUS DECOMPOSITION PRODUCTS:

Flammable hydrogen gas is generated when this material comes in contact with incompatible materials. When heating above 200 °C, or in fire conditions, harmful decomposition products may be formed, including hydrogen fluoride, carbonyl fluoride, carbon monoxide, and low molecular weight fluorocarbons.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11: Toxicological Information

SKIN IRRITATION: No Data is Available

EYE IRRITATION: No Data is Available

ACUTE TOXICITY (LD50): No Data is Available

ACUTE TOXICITY (LC50): No Data is Available

CHRONIC TOXICITY: No Data is Available

CARCINOGENICITY

NTP: Not listed

IARC:

One component in this mixture, Toluene, CAS No. 108-88-3, in concentration ca. 0.1%, is listed as Group 3: The agent (mixture, or exposure circumstance) is unclassifiable as to carcinogenicity to humans.

OSHA REGULATED: Not listed

OTHER INFORMATION: None

Section 12: Ecological Information

BIODEGRADATION: No information is available.

BIOACCUMULATION: No information is available.

AQUATIC TOXICITY: No information is available.

OTHER INFORMATION: None

Section 13: Disposal Considerations

Can be burned in a chemical incinerator equipped with an afterburner and scrubber. Do not dispose of the emptied container unlawfully. Observe all federal, state, and local laws in your country.

Section 14: Transport Information (per 49 CFR 172.101)

UN NO.: Not Regulated

**IMO CLASSIFICATION AND CLASS,
and DOT HAZARD CLASS:** Not Regulated

DOT LABELS: None

PLACARD: None

PACKAGING GROUP: Not Regulated

**DOT PROPER SHIPPING NAME,
and EXPORT SHIPPING NAME:** None

TECHNICAL SHIPPING NAME: None

MARINE POLLUTANT: Not Regulated

**DOT REPORTABLE QUANTITY (49 CFR 172.101, APP.) and
CERCLA REPORTABLE QUANTITY (40 CFR PART 302, TABLE 302.4)**

EA82-827-0 78583

HAZARDOUS SUBSTANCE(S) NAME / (CAS NO.), CONTENT(S) AND RQ:

Toluene(108-88-3), ca. 0.1%, 1000 Lbs (454 Kg)

This mixture contains ca. 0.1% toluene. The CERCLA RQ for that component is 1000 lbs.

Section 15: Regulatory Information

TOXIC SUBSTANCES CONTROL ACT (TSCA) STATUS:

Some components in this product are not listed in the TSCA inventory. Components in this product should be used in compliance with low volume exemptions (LVE) under TSCA. Under the TSCA LVE rules, this product is in compliance with rules, regulations and/or orders of TSCA.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA) TITLE III

SECTION 313 SUPPLIER NOTIFICATION:

This regulation requires submission of annual reports of toxic chemical(s) that appear in section 313 of the Emergency Planning and Community Right To Know Act of 1986 and 40 CFR 372.

This information must be included in all MSDS's that are copied and distributed for the material. The toxic chemicals contained in this product are: Toluene, CAS No. 108-88-3, in mixture at a concentration of ca. 0.1%. This concentration is considered *de minimis* for SARA 313 Title III (EPCRA), per EPA 754-K-99-001 pp. II-15, and therefore is not reportable under this regulation.

CALIFORNIA PROPOSITION 65:

This regulation requires a warning for California Proposition 65 chemical(s) under the statute. The California Proposition 65 Chemical(s) contained in this product are: Toluene, CAS No. 108-88-3, ca. 0.1%.

Section 16: Other Information

FOR INDUSTRIAL USE ONLY:

This material safety data sheet is offered solely for your information, consideration and investigation. The data described in this MSDS consist of data on literature, our acquisitional data, and analogical inference by data of similar chemical substances or products. Shin-Etsu Chemical Co. Ltd. provides no warranties, either expressed or implied, and assumes no responsibility for the accuracy or completeness of the data contained herein. Final determination of the suitability of any material is the sole responsibility of the user.

ADDITIONAL INFORMATION:

The information contained within this MSDS is released in good faith and believed to be accurate. No agent of Shin-Etsu Chemical Co., Ltd'a, and its subsidiaries, are authorized vary any MSDS data, and its agents disclaim all liability for any action taken or foregone on reliance upon such data. Conditions of use are beyond Shin-Etsu Chemical Co., Ltd'a, and its subsidiaries control and therefor the users are responsible to verify this data under their own particular purposes and they alone assume all risks of their use, handling, disposal and reliance upon the information provided herein. This information applies only to the product designated above and does not necessarily apply to its use in combination with other materials, products, chemical compounds, structures or processes.

From: Grant Heliker [GHeliker@kavico.com]
Sent: Wednesday, November 28, 2001 11:33 AM
To: Freeland, Mark (M.); Grant Heliker
Cc: Hargas, Jon (.)
Subject: RE: Potting Gel

Sorry, I left just a touch early yesterday and missed this request. The answer is:

We use two substances in the chimney. One is an underfill; it serves to attach the chimney and fills in space around the die, but is not present on top of the die. This is a "Sifel 610".

The second is the potting gel that does go on top of the die, and serves to protect the die from the environment. This is a "Sifel 807". It is a two part gel that is mixed shortly before being applied.

Hope this is in time to be of some use,
-grant

> -----Original Message-----

> From: Freeland, Mark (M.) [SMTP:mfreelal@ford.com]
> Sent: Tuesday, November 27, 2001 4:06 PM
> To: Grant Heliker (E-mail)
> Cc: Hargas, Jon (.); Kyong Park (E-mail)
> Subject: Potting Gel

>

> Grant,

>

> Could you please let me and "jhargas@ford.com" know what the name and
> product designation is for the potting gel used in the chimney over the
> die is.

>

> We would like this information to be available in the morning if that is
> possible.

>

> Many thanks

>

> Regards

>

> Mark Freeland

>

> > 6-Sigma Black Belt Candidate

> > Physics Department

> > Ford Research Laboratory

> > P.O. Box 2053

> > MD 3028 - SRL - Room 1517

> > Dearborn, MI 48121-2053 USA

> email: mfreelal@ford.com

> Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Tuesday, November 27, 2001 7:08 PM
To: Grant Holker (E-mail)
Cc: Hargas, Jon (.); Kyong Park (E-mail)
Subject: Potting Gel

Grant,

Could you please let me and "jhargas@ford.com" know what the name and product designation is for the potting gel used in the chimney over the die is.

We would like this information to be available in the morning if that is possible.

Many thanks

Regards

Mark Freeland

6-Sigma Black Belt Candidate
Physics Department
Ford Research Laboratory
P.O. Box 2053
MD 3028 - SRL - Room 1517
Dearborn, MI 48121-2053 USA
email: mfreela1@ford.com
Tel.: (313) 594-7645

From: Freeland, Mark (M.)
Sent: Monday, November 19, 2001 9:53 AM
To: Hargas, Jon (.)
Subject: RE: Unprotected Area Damage Investigation:

Thanks Jon,

Are you sure they were ridges, not valleys in the TiW. My perception were that they were places where the TiW had separated exposing the overlying gold during the wire bonding operation?

Hope you are having a good vacation. See you on Monday week.

Regards

Mark

From: Freeland, Mark (M.)
Sent: Monday, November 12, 2001 4:32 PM
To: Hanges, Jon (.)
Subject: FW: MSDS for dynasolve 711



ricks.jpg

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

From: Rick Palermo [mailto:RPalermo@kavlico.com]
Sent: Monday, November 12, 2001 2:15 PM
To: Freeland, Mark (M.)
Subject: MSDS for dynasolve 711

This will help to explain the potassium you saw during analysis. One of the components is KOH. I also understand you suggested to Don that I shouldn't smoke Teflon anymore. I agree since I don't smoke anything anymore (except maybe a fine cigar every now and then). After reading this MSDS I'm no better off breathing this stuff than smoking Teflon. Hope this is some help for you. Rick

<<ricks.jpg>>



UNITED STATES DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION

MEMORANDUM FOR THE DIRECTOR
SUBJECT: [Illegible]

DATE: [Illegible]

TO: [Illegible]

FROM: [Illegible]

RE: [Illegible]

1

STATISTICAL SUMMARY DATA SHEET

UNITED STATES DEPARTMENT OF COMMERCE	OFFICE OF ECONOMIC ANALYSIS
INDUSTRY	MANUFACTURING
PRODUCT	IRON AND STEEL
PERIOD	1962-1963

Annual report, showing, for each of the 50 States, District of Columbia, Puerto Rico, and Alaska, the following information:

State	1962	1963
Alabama	100	100
Alaska	100	100
Arizona	100	100
Arkansas	100	100
California	100	100
Colorado	100	100
Connecticut	100	100
Delaware	100	100
District of Columbia	100	100
Florida	100	100
Georgia	100	100
Idaho	100	100
Illinois	100	100
Indiana	100	100
Iowa	100	100
Kansas	100	100
Kentucky	100	100
Louisiana	100	100
Maine	100	100
Maryland	100	100
Massachusetts	100	100
Michigan	100	100
Minnesota	100	100
Mississippi	100	100
Missouri	100	100
Montana	100	100
Nebraska	100	100
Nevada	100	100
New Hampshire	100	100
New Jersey	100	100
New Mexico	100	100
New York	100	100
North Carolina	100	100
North Dakota	100	100
Ohio	100	100
Oklahoma	100	100
Oregon	100	100
Pennsylvania	100	100
Rhode Island	100	100
South Carolina	100	100
South Dakota	100	100
Tennessee	100	100
Texas	100	100
Utah	100	100
Vermont	100	100
Virginia	100	100
Washington	100	100
West Virginia	100	100
Wisconsin	100	100
Wyoming	100	100
Total	100	100

Source: Bureau of Economic Analysis, U.S. Department of Commerce, Statistical Summary of the Iron and Steel Industry, 1962-1963.

Notes: 1. Figures are based on the best available data. 2. Figures are preliminary estimates.

3. Figures are based on the best available data. 4. Figures are preliminary estimates.

5. Figures are based on the best available data. 6. Figures are preliminary estimates.

7. Figures are based on the best available data. 8. Figures are preliminary estimates.

9. Figures are based on the best available data. 10. Figures are preliminary estimates.

From: Corbett, Sandra (S.M.)
Sent: Tuesday, December 10, 2002 10:16 AM
To: Aitorian, Don (D.J.); Dalbo, Bob (R.J.)
Cc: Fournelle, Gilbert (G.); Fascetti, Bob (R.J.)
Subject: FW: Stall CQIS after 9/11

Don,

Can you give the dealer a call and run the VIN on this CQIS call. Doesn't sound like our typical stalls but need to be sure since this is past our clean date.

Sandy Corbett

Escape Powertrain PMT & QRT

Phone/Fax: (313)59-44351

Product Development Center 2H-E66

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

From: Suarez, Rhea (R.)
Sent: Tuesday, December 10, 2002 10:13 AM
To: Corbett, Sandra (S.M.)
Subject: Stall CQIS after 9/11

Rpt#: 2KLF008 NHL Rpt: 11/12/2002 Odom: 94 M
Rvwd: Y File: _ Folder: 02012236 2 Attachments: 0 Print Srvy/Disp Detail(P/D): _
Vehicle: 2003 ESCAPE 4X2,XLT ,MPV 1FMYU03103K832739 Bld: 10/29/2002
Engine: 3.0L DUR Calb: 3M11A30A Trans: CD4E E Axle: 3800F2.73C A/C:
Dealer Id: 01521 Friendly Ford, Inc. Ph#: (630) 924-8686
State: Illinois City: Roseville Orig/Caller: SEAN KELLETT
Symptom: 6 07 4 93 DRVABL,STALL/QUITS,AT IDLE,ALL ENGINE TEMP
Addl Sym: STALLS AT IDLE St: CCRG/EPRC: _ Rvwd: Dt:
Fix: Caus. Comp: - Condition Code:
Hotliner: CPERRITO Phone: 313 317-4487 Regn Cd: 41 Chicago - 41
Engineering: Phone: TAR:
Dfr Contact: Phone: Title Cde: T
REPAIR TECH STATES THAT VEHICLE WILL STALL AT IDLE. CUST ALLEGES IT ALSO
WILL STALL AT CRUISE. NO CODES. LATEST CALIB. TECH STATES THAT HE
NOTICES THAT CYL START TO MISS AND ALSO THAT IT FEELS AS IF IGN JUST
SHUTS OFF. ALSO STATES THAT HEGOS GO RICH AFTER STALL.
RECOMM ADVISED TECH TO MONITOR RPM PID FOR GLITCHES, DROPPING OUT, ETC. IF
SO THEN MONITOR CKP CKT, OVERLAY CKT AND/OR REPLACE CKP AS NEEDED.
ALSO ADVISED TO MONITOR FRP AND FOR COMM WITH NGS/WDS AT TIME OF
CONCERN.

From: Dalbo, Bob (R.J.)
Sent: Monday, October 07, 2002 5:12 PM
To: Grzincic, Karen (K.M.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: RE: PCM service information in WERS

Karen/Maggie,

The parts in question are in concern C11402381 (2003 MY) and notices (?) E11404407-000/001, according to Robin Peters' emergency release meeting plans.

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31788
Pager: (313) 785-2858 Email: rdalbo@ford.com

---Original Message---

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 3:46 PM
To: Dalbo, Bob (R.J.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: FW: PCM service information in WERS

Bob and/or Terry ... What is this all about? Is there an issue with a past release or is this something pending? What is the concern/notice number?

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

---Original Message---

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 1:48 PM
To: Grzincic, Karen (K.M.)
Subject: RE: PCM service information in WERS

Here is the parts request that keeps being sent back to me. All the way at the bottom.

<< Message: RE: 97-4373 R3 TSB dh - DRIVEABILITY - INTERMITTENT ENGINE QUIT OR (FCSD Global Template v1.0 WORK Notification) >>

The first time Terry Suetterlin needed info. The second time I talked to him and he said you would know what was needed. Something about tying the old calibration info to the new parts in one of the screens. I believe the WERS concern is C11390580. You can verify that with the part numbers in the second attachment. That is the actual TSB and parts request template.

<< Message: 97-4373 R3 TSB Escape 3.0L - Reprogram/Repl PCM driveability Che (FCSD Global Template v1.0 Request for Input) >>

Please let me know if you have more question.

Thanks!!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 1:39 PM
To: Suarez, Rhae (R.)
Cc: Krohn, Maggie (M.M.)
Subject: RE: PCM service information in WERS

I know of no issues. Does this pertain to a certain notice, or can you provide part numbers, or anything to go on???

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-8743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 12:53 PM
To: Grzincic, Karen (K.M.)
Subject: RE: PCM service information in WERS

Karen,

I got your name from Terry Suetterlin last week. I believe you were copied on an email about the same concern.

Engineering told me they were going to contact you or Terry to help them identify the missing information in the WERS release. I don't total understand what is required in the WERS but whatever it is, our parts group will not sign off on the Parts Request until the missing info is addressed.

Please let me know if you need more info on this subject.

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 12:48 PM
To: Krohn, Maggie (M.M.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.); Suarez, Rhae (R.); Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Suetterlin, Terry (T.D.)
Subject: RE: PCM service information in WERS

I assume this is something you're working on?

Karen M. Grzindc
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhoe (R.)
Sent: Monday, October 07, 2002 12:38 PM
To: Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Grzindc, Karen (K.M.); Suetterlin, Terry (T.D.)
Cc: Lawler, Dave (D.A.); Fentze, Sam (S.J.); Jaster, Daniel (D.C.)
Subject: PCM service information in WERS

I am checking to see if all the WERS information for the service PCMs, has been done so I can re-submit the Parts Request for the Stall concern? Until this is complete, the Parts group cannot sign off on this to get the PCMs parts available and to release the Stall TSB. We are also planning to release a SSM with the calibration information and this will also need a parts request sign off.

Please let me know if any assistance is needed to get this completed.

Thanks!

Rhoe M. Suarez

Rhoe Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DBC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-6242
Fax: 313-33-78337
Email: rsuarez3@ford.com

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 12:38 PM
To: Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Grzincic, Karen (K.M.); Suetterlin, Terry (T.D.)
Co: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.)
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Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
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DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-8242
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Email: rsuarez8@ford.com

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TEL: 313-322-4593
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E-MAIL: kgrzinc1@ford.com

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Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 648) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-799-6242
Fax: 313-33-78337
Email: rsuarez8@ford.com

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 3:46 PM
To: Dalbo, Bob (R.J.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: FW: PCM service information in WERS

Bob and/or Terry ... What is this all about? Is there an issue with a past release or is this something pending? What is the concern/notice number?

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com


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- DRIVE...

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97-4373 R3 TSB
Escape 3.0L - R...

Please let me know if you have more question.

Thanks!!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 648) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-766-6242
Fax: 313-33-78337
Email: rsuarezR@ford.com

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Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
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To: Grzincic, Karen (K.M.)
Subject: RE: PCM service information in WERS

Karen,

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Engineering told me they were going to contact you or Terry to help them identify the missing information in the WERS release. I don't total understand what is required in the WERS but whatever it is, our parts group will not sign off on the Parts Request until the missing info is addressed.

Please let me know if you need more info on this subject.

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 648) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-798-8242
Fax: 313-33-78397
Email: rsuarez8@ford.com

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

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 12:48 PM
To: Krohn, Maggie (M.M.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.); Suarez, Rhae (R.); Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Suetterlin, Terry (T.D.)
Subject: RE: PCM service information in WERS

I assume this is something you're working on?

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
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Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.)
Subject: PCM service information in WERS

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Please let me know if any assistance is needed to get this completed.

Thanks!

Rhac M. Suarez

Rhac Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
OSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 9:49 AM
To: Fournelle, Gilbert (G.); Dalbo, Bob (R.J.)
Cc: Lawler, Dave (D.A.)
Subject: PCM wers input

Gilbert/Bob,

Has the PCM WERS info been completed? I need to know. Until that is completed I can not re-submit the TSB parts request back in. It was returned to me last week because of the missing info.

Please let me know as soon as it is completed.

Thanks!
Rhae

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 8:23 AM
To: Ferrise, Sam (S.J.)
Subject: RE: PCM numbers

Thanks Sam!

—Original Message—

From: Ferrise, Sam (S.J.)
Sent: Friday, October 11, 2002 9:22 AM
To: Suarez, Rhae (R.); Suelterlin, Terry (T.D.)
Cc: Jaster, Daniel (D.C.)
Subject: RE: PCM numbers

Rhae: SF is not released in WERS. The others are in WERS with no Service Part No.'s yet assigned. I believe Dan Jaster was working on these.

Terry: I believe Dan Jaster was working on these with you, and he is out of the office today. Please advise if there is a problem in establishing Service Part No.'s for FC, HC & JC. Thanks.

Regards,
Sam Ferrise, QSF Parts Specialist
Ford Customer Service Division
CDS ID: sferrise Ph: 734-523-3184
E-Mail: sferrise@ford.com

—Original Message—

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 8:19 AM
To: Ferrise, Sam (S.J.)
Subject: PCM numbers

I don't know why I can never figure this out. Can you tell me if I am doing something wrong or do these part numbers not have service numbers assigned to them. If that is the case, why not??

3L8A 12A650 FC
3L8A 12A650 HC
3L8A 12A650 JC
3L8A 12A650 SF

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-6242
Fax: 313-33-78337
Email: rsuarez8@ford.com

From: Dalbo, Bob (R.J.)
Sent: Friday, October 11, 2002 10:17 AM
To: Suarez, Rhae (R.); Lawler, Dave (D.A.)
Cc: Fournelle, Gilbert (G.); John Bogema
Subject: RE: PCM wers input

Dave/Rhae:

What does PCM WERS info completed mean? We need concern numbers and screen details in order to help.

Who returned the TSB?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84847 Fax: (313) 32-31788
Pager: (313) 795-2859 Email: rdalbo@ford.com

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

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 9:49 AM
To: Fournelle, Gilbert (G.); Dalbo, Bob (R.J.)
Cc: Lawler, Dave (D.A.)
Subject: PCM wers input

Gilbert/Bob,

Has the PCM WERS info been completed? I need to know. Until that is completed I can not re-submit the TSB parts request back in. It was returned to me last week because of the missing info.

Please let me know as soon as it is completed.

Thanks!
Rhae

From: Dalbo, Bob (R.J.)
Sent: Friday, October 11, 2002 10:18 AM
To: Gilbert Fournelle; John Bogema
Subject: FW: PCM numbers

Bob Dalbo

J.D. Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31788
Pager: (313) 795-2859 Email: rdalbo@ford.com

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

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 9:23 AM
To: Ferrise, Sam (S.J.)
Subject: RE: PCM numbers

Thanks Sam!

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

From: Ferrise, Sam (S.J.)
Sent: Friday, October 11, 2002 9:22 AM
To: Suarez, Rhae (R.); Susterlin, Terry (T.D.)
Cc: Jaster, Daniel (D.C.)
Subject: RE: PCM numbers

Rhae: SF is not released in WERS. The others are in WERS with no Service Part No.'s yet assigned. I believe Dan Jaster was working on these.

Terry: I believe Dan Jaster was working on these with you, and he is out of the office today. Please advise if there is a problem in establishing Service Part No.'s for FC, HC & JC. Thanks.

Regards,
Sam Ferrise, QSF Parts Specialist
Ford Customer Service Division
CDS ID: sferrise Ph: 734-523-3184
E-Mail: sferrise@ford.com

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

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 8:19 AM
To: Ferrise, Sam (S.J.)
Subject: PCM numbers

I don't know why I can never figure this out. Can you tell me if I am doing something wrong or do these part numbers not have service numbers assigned to them. If that is the case, why not??

3L8A 12A650 FC
3L8A 12A650 HC
3L8A 12A650 JC
3L8A 12A650 SF

Thanks!

Rhac M. Suarez

Rhac Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1900 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-6242
Fax: 313-33-78337
Email: rsuarez8@ford.com

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 10:25 AM
To: Dalbo, Bob (R.J.); Lawler, Dave (D.A.)
Cc: Fournelle, Gilbert (G.); Bogema, John (P.); Suetterlin, Terry (T.D.); Grzincic, Karen (K.M.)
Subject: RE: PCM wers Input

The parts guys returned the TSB (parts Request section only) to me for more info.

The PCM calibration service people need more info. Something is missing in the WERS that released the calibrations. I emailed about this a few weeks ago and a few times. This is the one where the release person was suppose to contact Terry Suetterlin and Karen Grzincic. I hope this rings a bell because I don't know how to describe what is needed. Terry told me a few things but not being familiar with WERS I was sort of lost.

Gilbert did mention in the stall meeting yesterday that the release person was going to or did talk to Karen but it appears that the work has not been completed yet.

Reminder: until the parts are signed off (keep in mind we still have IAC part concerns) the TSB will not be released.

Thanks!
Rhae

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

From: Dalbo, Bob (R.J.)
Sent: Friday, October 11, 2002 10:17 AM
To: Suarez, Rhae (R.); Lawler, Dave (D.A.)
Cc: Fournelle, Gilbert (G.); John Bogema
Subject: RE: PCM wers Input

Dave/Rhae:

What does PCM WERS info completed mean? We need concern numbers and screen details in order to help.

Who returned the TSB?

Bob Dalbo

3.0L Calibration Supervisor
Outfitters Calibration, NAT
Phone: (313) 24-84947 Fax: (313) 32-31788
Pager: (313) 785-2859 Email: rdalbo@ford.com

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Sent: Friday, October 11, 2002 9:49 AM
To: Fournelle, Gilbert (G.); Dalbo, Bob (R.J.)
Cc: Lawler, Dave (D.A.)
Subject: PCM wers Input

Gilbert/Bob,

Has the PCM WERS info been completed? I need to know. Until that is completed I can not re-submit the TSB parts request back in. It was returned to me last week because of the missing info.

Please let me know as soon as it is completed.

Thanks!

From: Krohn, Maggie (M.M.)
Sent: Friday, October 11, 2002 11:00 AM
To: Bogema, John (P.)
Cc: Suarez, Rhae (R.); Suetterlin, Terry (T.D.); Grzincic, Karen (K.M.); Dalbo, Bob (R.J.)
Subject: RE: PCM service information in WERS

John,

I have spoke with Karen this morning and she nor I can figure out what the service issues related to these notices are. Can someone please state the issues and what exactly the problem is we are trying to resolve.

Thank you,

Maggie Krohn

PCM Engineering Change Specialist

84-199 POEE

(313) 32-31808 Fax: (313) 323-6743

E-Mail mkrohn@ford.com

---Original Message---

From: Dalbo, Bob (R.J.)
Sent: Monday, October 07, 2002 5:12 PM
To: Grzincic, Karen (K.M.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: RE: PCM service information in WERS

Karen/Maggie,

The parts in question are in concern C11402381 (2003 MY) and notices (?) E11404407-000/001, according to Robin Peters' emergency release meeting plans.

Bob Dalbo

3.0L Calibration Supervisor

Outfitters Calibration, NAT

Phone: (313) 24-84947 Fax: (313) 32-31786

Pager: (313) 795-2858 Email: rdalbo@ford.com

---Original Message---

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 3:46 PM
To: Dalbo, Bob (R.J.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: FW: PCM service information in WERS

Bob and/or Terry ... What is this all about? Is there an issue with a past release or is this something pending? What is the concern/notice number?

Karen M. Grzincic

PCM Engineering Change Specialist

TEL: 313-322-4593

FAX: 313-323-6743

E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 1:48 PM
To: Grzinc, Karen (K.M.)
Subject: RE: PCM service information in WERS

Here is the parts request that keeps being sent back to me. All the way at the bottom.

<< Message: RE: 97-4373 R3 TSB dri - DRIVEABILITY - INTERMITTENT ENGINE QUIT OR (FCSD Global Template v1.0 WORK Notification) >>

The first time Terry Suetterlin needed info. The second time I talked to him and he said you would know what was needed. Something about tying the old calibration info to the new parts in one of the screens. I believe the WERS concern is C11390580. You can verify that with the part numbers in the second attachment. That is the actual TSB and parts request template.

<< Message: 97-4373 R3 TSB Escape 3.0L - Reprogram/Repl PCM driveability Che (FCSD Global Template v1.0 Request for Input) >>

Please let me know if you have more question.

Thanks!!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tibuta / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23844 Pager: 313-796-6242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Grzinc, Karen (K.M.)
Sent: Monday, October 07, 2002 1:39 PM
To: Suarez, Rhae (R.)
Cc: Krohn, Maggie (M.M.)
Subject: RE: PCM service information in WERS

I know of no issues. Does this pertain to a certain notice, or can you provide part numbers, or anything to go on???

Karen M. Grzinc
PCM Engineering Change Specialist
TEL: 313-322-4598
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 12:53 PM
To: Grzinc, Karen (K.M.)
Subject: RE: PCM service information in WERS

Karen,

I got your name from Terry Suetterlin last week. I believe you were copied on an email about the same concern.

Engineering told me they were going to contact you or Terry to help them identify the missing information in the

WERS release. I don't total understand what is required in the WERS but whatever it is, our parts group will not sign off on the Parts Request until the missing info is addressed.

Please let me know if you need more info on this subject.

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-798-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 12:46 PM
To: Krohn, Maggie (M.M.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.); Suarez, Rhae (R.); Dalbo, Bob (R.I.); Fournelle, Gilbert (G.); Suetterlin, Terry (T.D.)
Subject: RE: PCM service information in WERS

I assume this is something you're working on?

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-8743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 12:38 PM
To: Dalbo, Bob (R.I.); Fournelle, Gilbert (G.); Grzincic, Karen (K.M.); Suetterlin, Terry (T.D.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.)
Subject: PCM service information in WERS

I am checking to see if all the WERS information for the service PCMs, has been done so I can re-submit the Parts Request for the Stall concern? Until this is complete, the Parts group cannot sign off on this to get the PCMs parts available and to release the Stall TSB. We are also planning to release a SSM with the calibration information and this will also need a parts request sign off.

Please let me know if any assistance is needed to get this completed.

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-798-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

From: Suetterlin, Terry (T.D.)
Sent: Friday, October 11, 2002 11:04 AM
To: Krohn, Maggie (M.M.); Bogema, John (P.)
Cc: Suarez, Rhae (R.); Grzincic, Karen (K.M.); Dalbo, Bob (R.J.)
Subject: RE: PCM service information in WERS

This is a problem on the FCSD end, Dan Jaster needs to correct the format in which he supplies the information to us.

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

From: Krohn, Maggie (M.M.)
Sent: Friday, October 11, 2002 11:00 AM
To: Bogema, John (P.)
Cc: Suarez, Rhae (R.); Suetterlin, Terry (T.D.); Grzincic, Karen (K.M.); Dalbo, Bob (R.J.)
Subject: RE: PCM service information in WERS

John,

I have spoke with Karen this morning and she nor I can figure out what the service issues related to these notices are. Can someone please state the issues and what exactly the problem is we are trying to resolve.

Thank you,

Maggie Krohn

PCM Engineering Change Specialist

84-199 POSE

(313) 32-31808 Fax: (313) 323-6743

E-Mail mkrohn@ford.com

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

From: Dalbo, Bob (R.J.)
Sent: Monday, October 07, 2002 5:12 PM
To: Grzincic, Karen (K.M.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: RE: PCM service information in WERS

Karen/Maggie,

The parts in question are in concern C11402381 (2003 MY) and notices (?) E11404407-000/001, according to Robin Peters' emergency release meeting plans.

Bob Dalbo

3.0L Calibration Supervisor

Outfitters Calibration, NAT

Phone: (313) 24-84947 Fax: (313) 32-31788

Pager: (313) 795-2859 Email: rdalbo@ford.com

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

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 3:46 PM
To: Dalbo, Bob (R.J.); Suetterlin, Terry (T.D.)

Co: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
Subject: FW: PCM service information in WERS

Bob and/or Terry ... What is this all about? Is there an issue with a past release or is this something pending? What is the concern/notice number?

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 1:48 PM
To: Grzincic, Karen (K.M.)
Subject: RE: PCM service information in WERS

Here is the parts request that keeps being sent back to me. All the way at the bottom.

<< Message: RE: 97-4373 R3 TSB d#1 - DRIVEABILITY - INTERMITTENT ENGINE QUIT OR (FCSD Global Template v1.0 WORK Notification) >>

The first time Terry Seutter/in needed info. The second time I talked to him and he said you would know what was needed. Something about tying the old calibration info to the new parts in one of the screens. I believe the WERS concern is C11390580. You can verify that with the part numbers in the second attachment. That is the actual TSB and parts request template.

<< Message: 97-4373 R3 TSB Escape 3.0L - Reprogram/Repl PCM driveability Che (FCSD Global Template v1.0 Request for Input) >>

Please let me know if you have more question.

Thanks!!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-708-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 1:39 PM
To: Suarez, Rhae (R.)
Co: Krohn, Maggie (M.M.)
Subject: RE: PCM service information in WERS

I know of no issues. Does this pertain to a certain notice, or can you provide part numbers, or anything to go on???

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 12:53 PM
To: Grzinc, Karen (K.M.)
Subject: RE: PCM service information in WERS

Karen,

I got your name from Terry Suetterlin last week. I believe you were copied on an email about the same concern.

Engineering told me they were going to contact you or Terry to help them identify the missing information in the WERS release. I don't total understand what is required in the WERS but whatever it is, our parts group will not sign off on the Parts Request until the missing info is addressed.

Please let me know if you need more info on this subject.

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-796-6242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Grzinc, Karen (K.M.)
Sent: Monday, October 07, 2002 12:48 PM
To: Krohn, Maggie (M.M.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.); Suarez, Rhae (R.); Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Suetterlin, Terry (T.D.)
Subject: RE: PCM service information in WERS

I assume this is something you're working on?

Karen M. Grzinc
PCM Engineering Change Specialist
TEL: 313-322-4693
FAX: 313-323-6743
E-MAIL: kgrzino1@ford.com

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

From: Suarez, Rhae (R.)
Sent: Monday, October 07, 2002 12:38 PM
To: Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Grzinc, Karen (K.M.); Suetterlin, Terry (T.D.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.)
Subject: PCM service information in WERS

I am checking to see if all the WERS information for the service PCMs, has been done so I can re-submit the Parts Request for the Stall concern? Until this is complete, the Parts group cannot sign off on this to get the PCMs parts available and to release the Stall TSB. We are also planning to release a SSM with the calibration information and this will also need a parts request sign off.

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PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23844 Pager: 313-798-8242
Fax: 313-33-78337
Email: rsuarez6@ford.com

From: Suarez, Rhae (R.)
Sent: Friday, October 11, 2002 12:50 PM
To: Suetterlin, Terry (T.D.); Krohn, Maggie (M.M.); Bogema, John (P.)
Cc: Grzincic, Karen (K.M.); Dalbo, Bob (R.J.); Ferrise, Sam (S.J.); Jaster, Daniel (D.C.); Lawler, Dave (D.A.)
Subject: RE: PCM service information in WERS

Terry,

I don't think I understand what the issue is. When we last spoke I thought the concern had something to do with one of the WERS screens.

If the issue has something to do with the Parts Request please take a look at the attached email. It is the template that gets sent out when the TSB draft and parts request are submitted into the system. Is there a way you can mark up what you need to see? Please let me know. We would like to get this portion of the TSB completed ASAP.



97-4373 R3 TSB
Escape 3.0L - R...

Thanks!

Rhae M. Suarez

Rhae Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23544 Pager: 313-766-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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

From: Suetterlin, Terry (T.D.)
Sent: Friday, October 11, 2002 11:04 AM
To: Krohn, Maggie (M.M.); Bogema, John (P.)
Cc: Suarez, Rhae (R.); Grzincic, Karen (K.M.); Dalbo, Bob (R.J.)
Subject: RE: PCM service information in WERS

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Sent: Friday, October 11, 2002 11:00 AM
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Cc: Suarez, Rhae (R.); Suetterlin, Terry (T.D.); Grzincic, Karen (K.M.); Dalbo, Bob (R.J.)
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Maggie Krohn

PCM Engineering Change Specialist

89-199 POEE

(313) 32-31808 Fax: (313) 323-6743

E-Mail mkrohn@ford.com

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Bob Dalbo

3.01. Calibration Supervisor

Outfitters Calibration, NAT

Phone: (313) 24-84947 Fax: (313) 32-31786

Pager: (313) 795-2859 Email: *rdalbo@ford.com*

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Sent: Monday, October 07, 2002 3:46 PM
To: Dalbo, Bob (R.J.); Suetterlin, Terry (T.D.)
Cc: Krohn, Maggie (M.M.); Suarez, Rhae (R.)
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Karen M. Grzincic

PCM Engineering Change Specialist

TEL: 313-322-4593

FAX: 313-323-6749

E-MAIL: *kgrzinc1@ford.com*

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To: Grzincic, Karen (K.M.)
Subject: RE: PCM service information in WERS

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and parts request template.

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Rhas M. Suarez

Rhas Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-798-8242
Fax: 313-33-78337
Email: rsuarez8@ford.com

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PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-8743
E-MAIL: kgrzino1@ford.com

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Sent: Monday, October 07, 2002 12:53 PM
To: Grzincic, Karen (K.M.)
Subject: RE: PCM service information in WERS

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Rhas M. Suarez

Rhas Michael Suarez
Product Concern Engineer - Escape / Tribute / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-798-8242

Fax: 313-33-78337
Email: msuarez8@ford.com

---Original Message---

From: Grzincic, Karen (K.M.)
Sent: Monday, October 07, 2002 12:48 PM
To: Krohn, Maggie (M.M.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jester, Daniel (D.C.); Suarez, Rhae (R.); Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Suetzerlin, Terry (T.D.)
Subject: RE: PCM service information in WERS

I assume this is something you're working on?

Karen M. Grzincic
PCM Engineering Change Specialist
TEL: 313-322-4593
FAX: 313-323-6743
E-MAIL: kgrzinc1@ford.com

---Original Message---

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Sent: Monday, October 07, 2002 12:38 PM
To: Dalbo, Bob (R.J.); Fournelle, Gilbert (G.); Grzincic, Karen (K.M.); Suetzerlin, Terry (T.D.)
Cc: Lawler, Dave (D.A.); Ferrise, Sam (S.J.); Jester, Daniel (D.C.)
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Rhae Michael Suarez
Product Concern Engineer - Escape / Tributs / Maverick
PVT & Field Support / FCSD
DSC II (room 548) / 1800 Fairlane Dr. / Allen Park, MI 48101
Phone: 313-32-23344 Pager: 313-798-6242
Fax: 313-33-78337
Email: msuarez8@ford.com

Subject: U204 phantom stall meeting
Location: TEE CR-1

Start: Thu 9/5/2002 2:00 PM
End: Thu 9/5/2002 3:00 PM
Show Time As: Tentative

Recurrence: Weekly
Recurrence Pattern: every Thursday from 2:00 PM to 3:00 PM

Meeting Status: Not yet responded

Required Attendees: Fournelle, Gilbert (G.); Altonian, Don (D.J.); Bauer, Scott (S.C.); Bhojwani, Kamal (K.); Blackburn, Thomas (T.J.); Bogema, John (P.); Cary Powell (E-mail); Chick, John (J.); Chin, Ming-Niu (M.N.); Chin, Darrel (D.); Corbett, Sandra (S.M.); Dalbo, Bob (R.J.); De Pena, Juan (J.E.); Diaz, Timothy (T.P.); Duvall, Allen (A.W.); Fascetti, Bob (R.J.); Fournelle, Gilbert (G.); Freeland, Mark (M.); Giles, Stuart (S.); Gokhale, Renuka (R.V.); Goodwin, William (W.R.); Grewal, Bill (B.B.); Grimes, Jeff (J.R.); Hansen, George (G.C.); Herr, George (G.J.); Hofman, Michael (M.V.); Holmes, Jeffrey (J.R.); Hoshino, Jun (J.); Ichikawa, Jyunichiro (J.); Jansen, Ted (T.E.); Jones, Andy; Jordan, Donald (D.E.); Kanai, Shinji (S.); Khan, Naveed; Kosko, Jeff (J.R.); Kwon, Soon (S.K.); Lawler, Dave (D.A.); Le, Dzong (D.H.); Lintlaco, Steven (S.); Linde, Peter (P.A.); Liu, Jane (J.); Marck, Edmond (E.C.); Matesa, John (J.); Maurer, James (J.B.); Mazzella, Gary (G.R.); McDonald, John; McGee, Brett (B.L.); Mooney, Larry (L.); Moorhouse, Scott (S.R.); TMORGA43 was deleted 20021116; Morishima, Shigeaki (S.); Nematollahi, Sorya (S.); Nikolai, Bernie; Noteboom, Jim (J.E.); Ortman, James (J.W.); Powers, Ken (K.W.); Price, Martin (M.); Raquepau, Aldon (A.P.); Rothweiler, Daniel (D.); Sanders, Muriel (M.S.); Shah, Kiran (K.C.); Shirahshi, Masaru (M.); Stigenbauer, Jeffrey (J.R.); Suarez, Rhae (R.); Takasawa, Kalth (K.D.); Takubo, Hirochi (H.); Veenstra, Tim (T.W.); Wakenell, Ray (R.A.); Weitach, Bill (B.); Williams, Lee (LHW.)

toll free: 1-866-227-7015
Ford net: 854-1206
International: 1-630-693-6145

pass code: 8402370#

BEGINNING OF CONTACT
06/10/2002

VOICE OF THE CUSTOMER TRACKING SYSTEM

09.17.27

ION: 72 SAN FRANCISCO INFORMATION ISSUE CASE NBR: 0667941162
1FMJU04112KB97371 ZONE: A2 OPENED: 06/04/2002
ENGINE: 1 VEH TYPE: T CLOSED: 06/04/2002

LAST NAME: [REDACTED] FIRST NAME: [REDACTED] STATUS: CLOSED
TITLE: [REDACTED] MI: [REDACTED]
ADDRESS: [REDACTED]
CITY: HILO STATE: HI ZIP: [REDACTED]
HOME PHONE: [REDACTED]
MODEL YEAR: 2002 MODEL: ESCAPE XLT 4X4
MILEAGE: 2006
DEALER NAME: ORCHID ISLE AUTO CE SALES CODE: F72414 P & A: 07761
REASON CODE: 1708 PRODUCT - NEGATIVE FEEDBACK
SYMPTOMS:

ORIGIN: CAC108 - US INQUIRY CASE BASE COMMUNICATION: PHONE
ACTION: 823 - ADVISE CUSTOMER THE FEEDBACK HAS BEEN DOCUMENTED
DOCUMENT: ANALYST: CKENT CATHY KENT

DATE: 06/04/2002 TIME: 14.10.18 :
ACTION DATA/COMMENTS:

CUSTOMER SAYS: SAYS VEHICLE KEEPS STALLING SAYS THIS IS THE SECOND TIME VEHICLE IS AT DLR FOR THIS CONCERN SAYS SHE OWNED A 2001 ESCAPE THAT WAS DOING THE SAME THING AND TRADED IT IN BECAUSE OF THE PROBLEM SAYS WANTS FORD TO REPLACE THIS VEHICLE AS SHE FEELS IT IS UNSAFE SAYS IF FORD WILL NOT BUY VEHICLE BACK THEN SHE WILL HAVE TO MAIL DSB APPLICATION SHE HAS PER CUSTOMER, DEALER SAYS: (JOE HANLEY) SAYS CONTACT FORD CRC CAC ADVISED: ADVISE CUSTOMER INFORMATION HAS BEEN DOCUMENTED OUR GOAL IS TO HAVE THE VEH REPAIRED WITHIN FORD SPECIFICATION AND IF CUST WANTS TO TRADE OUT OF VEH THIS NEEDS TO BE ADDRESSED AT THE FORD DLRSHIP AS FORD IS UNABLE TO INTERVENE IN SALES ISSUES INFERENCE CASE ID: 867

BEGINNING OF CONTACT
08/10/2002

VOICE OF THE CUSTOMER TRACKING SYSTEM

09.17.27

ION: 47 CINCINNATI INFORMATION ISSUE CASE NBR: 1664633441
V... 1FMCU04182KB22338 ZONE: E1 OPENED: 03/12/2002
ENGINE: 1 VEH TYPE: T CLOSED: 03/12/2002

LAST NAME: [REDACTED] FIRST NAME: [REDACTED] STATUS: CLOSED
TITLE: [REDACTED] MI: [REDACTED]
ADDRESS: [REDACTED] STATE: KY ZIP: [REDACTED]
CITY: RICHMOND
HOME PHONE: [REDACTED]
MODEL YEAR: 2002 MODEL: ESCAPE XLT 4X4
MILEAGE: 3000
DEALER NAME: COMMONWEALTH FLM IN SALES CODE: F47108 P & A: 01034
REASON CODE: 1708 PRODUCT - NEGATIVE FEEDBACK
SYMPTOMS:

ORIGIN: CAC108 - US INQUIRY CASE BASE COMMUNICATION: PHONE
ACTION: 623 - ADVISE CUSTOMER THE FEEDBACK HAS BEEN DOCUMENTED
DOCUMENT: ANALYST: MCARIBON MATHEW CARIBONI

DATE: 03/12/2002 TIME: 16.06.43:
ACTION DATA/COMMENTS:

CUSTOMER SAYS: -VEH WAS GOING 45 MILES/HR AND THE ENGINE S
HUT OFF COMPLETELY -SHE LOST CONTROL OF THE VEH AS THE POWE
R STEERING WAS GONE -VEH HAS BEEN TO THE DLRSHIP -THERE WA
S A NOTICE SENT OUT TO THE DLRSHIP REGARDING A SENSOR THAT N
EEDED REPLACEMENT -CUST CALLED THE ATTORNEY GENERAL -VEH D
OES NOT HAVE ANY CONCERNS -DOES NOT FEEL THE VEH IS SAFE =
CUST NO LONGER WANTS THE VEH PER CUSTOMER, DEALER SAYS: N
ONE CAC ADVISED: ADVISE CUSTOMER INFORMATION HAS BEEN DOCU
MENTED INFERENCE CASE ID: 867