PE13-033 HYUNDAI-KIA

1/14/2014

ATTACHMENT A

ATTACHMENT A

Field Report Files

HYUNDAI

FSE Report

Created by Baldassarre, Paul on 05/01/2012.
Submitted by Baldassarre, Paul on 05/08/2012.
Finalized by Baldassarre, Paul on 05/08/2012.

* **Required Fields**

FSE Number	FS2012050000025	**CA Case #***	X999999
Dealer Code*	[CA293] HARDIN HYUNDAI	**Tech. Case #***	3651725
Model	[BH] Genesis Sedan 2009-20xx MY	**Assistance Type**	Diagnostic Assistance
Year	2009	**FSE Name***	Paul Baldassarre
VIN*	KMHGC46E29U[redacted]	**Part Name**	HECU
Mileage	30,059	**Part Number**	1
Prod. Date	07/01/2008	**Engine Code**	3.8L V6 Lambda II
Customer Complaint*		**Symptom Code**	
Severity Code	10 - Loss of primary function performance	**Diag Code#**	
Priority	High	**TREAD Cat.**	Service brake system
Target Date	05/01/2012	**Days Open**	8 Day
Latest Incident Date	//		
Comment			
Subject*	2009 BH Brake Pedal Goes to Floor		

Additional VIN List

VIN No	Model Code	Model Year	Prod.Date	Mileage

Previous FSE Report

FSE No	VIN No	Model Code	Model Year	Dealer	FSE

Condition

Brake pedal goes to floor

Attachment : 20120522154337618_HMA01809_EIMS _uD074_uB808_uC784 Master to _uBC15_uC218_uC9C4CJ.xlsx

Vehicle History

Warranty History:

VIN : KMHGC46E29U Genesis (BH) 2009 Total Claims: 11

Dealer: _____ Claim No: ______ R/O No: ______

A	Delr	Claim#	R/O No	VR	C/T	R/O Date	Mileage	OP Code	Paid Date	Sts
_	CA293	043117	043117	00	W	12/20/2011	26,178	84790R00	12/20/2011	A
_	CA293	023907	023907	00	W	6/28/2010	15,222	81310R0R	6/29/2010	A
_	CA293	018809	018809	01	W	12/03/2009	10,375	52933R00	12/07/2009	A
_	CA293	018809	018809	00	W	12/03/2009	679	52933R00		R
_	CA293	15585A	015585	01	W	7/23/2009	8,058	91789NTT	7/27/2009	A
_	CA293	15585A	015585	00	W	7/23/2009	8,058	91789NTT		R
_	CA293	15585B	015585	00	R	7/23/2009	8,058	90B010R0	7/24/2009	A
_	CA293	15585C	015585	01	R	7/23/2009	8,058	80B025R2	7/28/2009	A
_	CA293	15585C	015585	00	R	7/23/2009	8,058	80B025R0		R
_	CA310	OLDJUL	008937	00	I	7/10/2008	7	PREDELIV		R
_	CA293	PDI999	008937	00	I	7/05/2008	7	PREDELIV	7/14/2008	A

Root Cause Analysis

Confirmed brake pedal drops to floor

Scanned all systems for DTC - Found CAN and TPMS Codes in "History"

Erased DTC's

Tech advised they had ordered a Brake Master Cyl

Next day the dealer called and advised that after master cyl replacement the same condition exists

Author advised dealer to replace HECU

Corrective Action

Replaced HECU

Reason(s) vehicle was not previously repaired

Did this action resolve condition?	YES
Condition verified by personal inspection of company employee?	YES
Were Photos Taken?	NO
Parts Inspected?	YES
Parts Sent?	NO

Following people were notified via e-mail:

ATTACHMENT A

Field Report Files

HYUNDAI

FSE Report

Created by Smith, Suszann on 02/28/2013.
Finalized by Baldassarre, Paul on 03/11/2013.

* Required Fields

FSE Number	FS2013020000422	**CA Case #***	X999999
Dealer Code*	[CA325] TUSTIN HYUNDAI	**Tech. Case #***	5309817
Model	[BH] Genesis Sedan 2009-20xx MY	**Assistance Type**	Diagnostic Assistance
Year	2009	**FSE Name***	Baldassarre, Paul
VIN*	KMHGC46E89U[redacted]	**Part Name**	HYDRAULIC MODULE ASSY
Mileage	38,061	**Part Number**	589203M0A5
Prod. Date	11/06/2008	**Engine Code**	3.8L V6 Lambda II
Customer Complaint*	Brakes (not enough stopping power)	**Symptom Code**	BRAKE - CONCERN OTHER
Severity Code	1- No effect	**Diag Code#**	
Priority	High	**TREAD Cat.**	Service brake system
Target Date		**Days Open**	11 Day
Latest Incident Date	//		

Comment Brake pedal travels to floor. Per Tech line: repalced master cylinder. Did not fix problem. Told to repalce module. Now brake light and abs light is on and will clear or reset.

Subject* VDAR - 2009 [BH] Genesis Sedan No Communication After HECU Replacement

Additional VIN List

VIN No	Model Code	Model Year	Prod.Date	Mileage

Previous FSE Report

FSE No	VIN No	Model Code	Model Year	Dealer	FSE

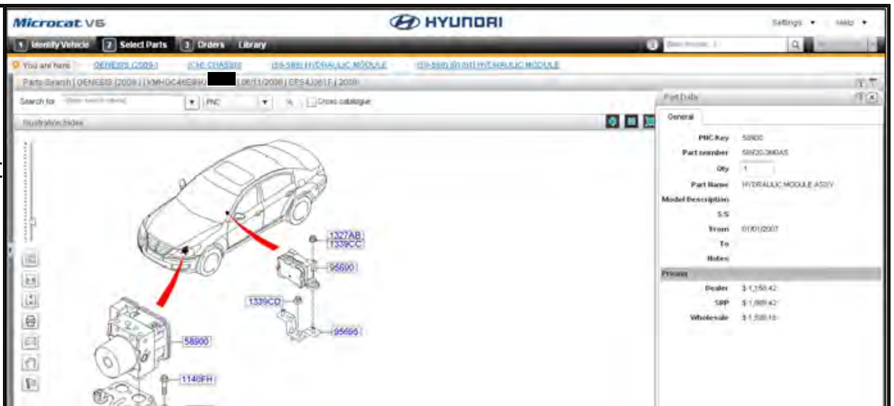
Condition Dealer replaced HECU w/ 589203N3A5 and now can't communicate with ESC

Vehicle History

Dealer Code	Claim Number	Repair Order	Repair Date	Repair Mileage	Operation Description
CA325	102681	010268	20111008	25055	[96710R00] SWITCH-STEERING REMOTE CONTROL (ALL)
CA325	086591	008659	20110915	24530	[96300R00] RADIO ASSY
CA317	050609	866990	20090324	12	[90B010R0]

Root Cause Analysis See below

Dealer had another BH Genesis in for the same repair (HECU Replacement) and the dealer was using the same P/N on both vehicles. This vehicle was NOT the same year or engine type and once they realized that, and the correct p/n was used, (58920-3M0A5) the vehicle got repaired.

Microcat shows correct P/N	

Attachment：20130311155831429_HMA00630.jpg

Corrective Action	Replaced HECU
Reason(s) vehicle was not previously repaired	Parts SNAFU
Did this action resolve condition?	YES
Condition verified by personal inspection of company employee?	YES
Were Photos Taken?	NO
Parts Inspected?	YES
Parts Sent?	NO

Following people were notified via e-mail:

Baldassarre, Paul(pbaldassarre@hmausa.com); Bompiani, Tim(TBompiani@hmausa.com); Brandt, Rolf(RBrandt@hmausa.com); Cattelino, Brian(BCattelino@hmausa.com); Felix, Nicole (Nfelix@hmausa.com); Hu, Chris(CHu@hmausa.com); Morales-Rodriguez, Enrique(EMorales-Rodriguez@hmausa.com); Pizarro, Randy(RPizarro@hmausa.com); Prasad, Andy(APrasad@hmausa.com); Rivera, Omar(ORivera@hmausa.com); Smith, Suszann(SSmith@hmausa.com); Snyder, Jason(JSnyder@hmausa.com); Tiberio, Vincent(VTiberio@hmausa.com); Vu, Thai(tvu@hmausa.com);

ATTACHMENT A

Field Report Files

HYUNDAI

FSE Report

Created by Smith, Suszann on 02/26/2013.
Finalized by Baldassarre, Paul on 03/28/2013.

* Required Fields

FSE Number	FS2013020000386	**CA Case #***	X999999
Dealer Code*	[CA325] TUSTIN HYUNDAI	**Tech. Case #***	5159143
Model	[BH] Genesis Sedan 2009-20xx MY	**Assistance Type**	Diagnostic Assistance
Year	2010	**FSE Name***	Baldassarre, Paul
VIN*	KMHGC4DF0AU[redacted]	**Part Name**	HYDRAULIC MODULE ASSY
Mileage	44,011	**Part Number**	589203N3A0
Prod. Date	07/31/2009	**Engine Code**	4.6L V8 Tau
Customer Complaint*	Brakes (not enough stopping power)	**Symptom Code**	BRAKE - NO PEDAL
Severity Code	1- No effect	**Diag Code#**	
Priority	High	**TREAD Cat.**	Service brake system
Target Date		**Days Open**	30 Day
Latest Incident Date	03/28/2013		

Comment Customer states that brake pedal will go to the floor. Repalced brake master and module per Tech line. Now brake lights and abs lights are on and will not communicate and cannot turn off lights. Replaced a few modules and still no luck. Brian and Pual have been out but vehicle is still not repaired.

Subject* VDAR - 2010 [BH] Genesis Sedan HECU replacement

Additional VIN List

VIN No	Model Code	Model Year	Prod.Date	Mileage

Previous FSE Report

FSE No	VIN No	Model Code	Model Year	Dealer	FSE

Condition After HECU Replacement there is No Communicaation w/ ESC

Vehicle History

Dealer Code	Claim Number	Repair Order	Repair Date	Repair Mileage	Operation Description
CA310	010931	010931	20091228	9	[90B059R1] NAV MAP/HEADUNIT/UTA UPDATE
OR523	931003	072253	20091027	0	[90B051R0]

Root Cause Analysis See below

- HECU P/N 589203N3A0 supercedes to 589203N3A5
- After trying 3 of the superceded P/N with no success, it seemed the supercession was incorrect
- Contact was made with engineering who subsiquently contacted MOBIS

This is an excerpt from the email sent


You forwarded this message on 2/18/2013 12:22 PM.
From: Baldassarre, Paul [HMA]
To: Hu, Chris [HMA]
Cc:
Subject: RE: HECU P/N Change

Chris,

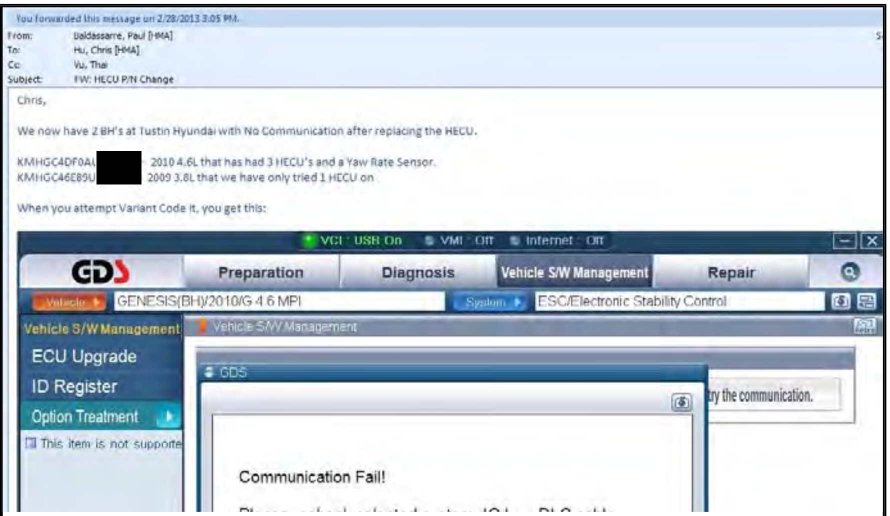
I haven't heard anything on this; have you?

P.

From: Baldassarre, Paul [HMA]
Sent: Friday, February 01, 2013 3:41 PM
To: Hu, Chris [HMA]; 이태석 책임연구원
Subject: RE: HECU P/N Change

Here are some photos that might help:

This is the screen shot I sent w/ VIN's


You forwarded this message on 2/28/2013 3:05 PM.
From: Baldassarre, Paul [HMA]
To: Hu, Chris [HMA]
Cc: Vu, Thai
Subject: FW: HECU P/N Change

Chris,

We now have 2 BH's at Tustin Hyundai with No Communication after replacing the HECU.

KMHGC4DF0A[redacted] 2010 4.6L that has had 3 HECU's and a Yaw Rate Sensor.
KMHGC46E89U[redacted] 2009 3.8L that we have only tried 1 HECU on

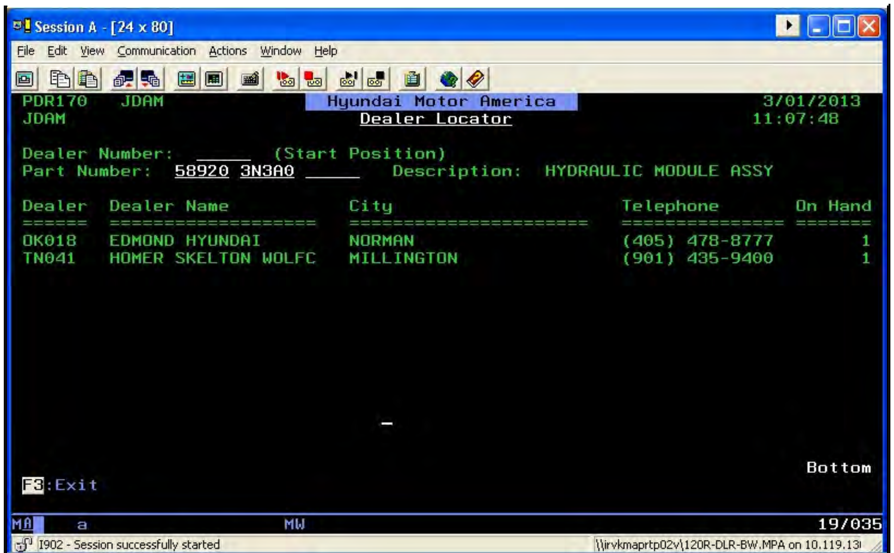
When you attempt Variant Code it, you get this:

Fast forward a couple of weeks; with help from parts (JD) a HECU with the original p/n was found in dlr stock in another state

Dealer obtained one of those units and installed it into the car; still no communication

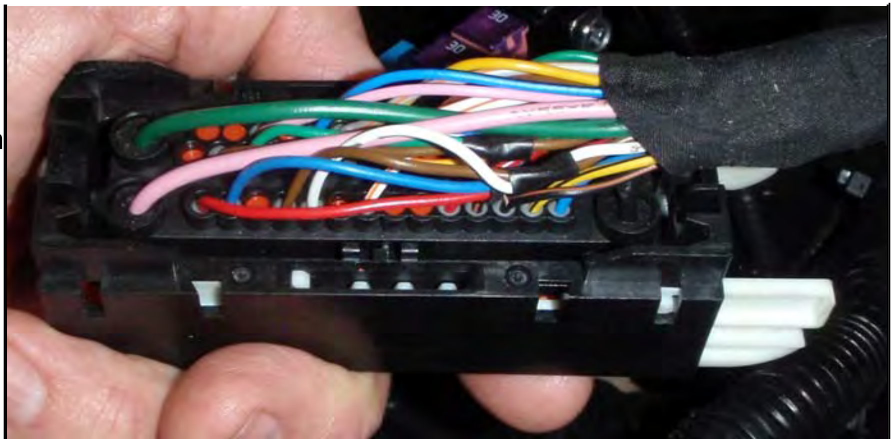
FTE advised the dealer to replace the Engine Harness

I sent the HATCI Note to parts and was given information on 2 dealer's

that have the part on their shelf	

UPDATE 2/26/2013:
New harness not yet installed so FTE decided to focus on HECU (E15) Connector
Pin tension were tested on all connector terminals in E15
Cap and Latch removed so that can wires could be checked to make certain they were locked into conector
While cap and latching mechanism were off I slid the latching bars out and plugged the E15 connector into the HECU = Communication returned!!
Upon further inspection I found that the latching bars (see photo) were not in their proper position when the latch was in its installed position.
After properly 'timing' the latching bars (white) to the latch (orange) in their proper position the condition was fixed.

• This photo shows the E15 connector with the latch (orange) and latching bars (white) in the 'installed' position. Latching bars should be flush with the body of the connector on the right side of photo.	
• Once the cap and latch were removed and the latching	

bars set in their proper position the communication issue was resolved	

Corrective Action See below

After multiple HECU replacements and hours upon hours of FSE and FTE involvement the issue was resolved by removing the E15 latching mechanism and putting it in its proper position

Reason(s) vehicle was not previously repaired

The latching mechanism of the E15 Connector got out of position when the HECU was initially replaced and from there the case when off a cliff.

Did this action resolve condition?	YES
Condition verified by personal inspection of company employee?	YES
Were Photos Taken?	YES
Parts Inspected?	YES
Parts Sent?	NO

Following people were notified via e-mail:

Baldassarre, Paul(pbaldassarre@hmausa.com); Bompiani, Tim(TBompiani@hmausa.com); Brandt, Rolf(RBrandt@hmausa.com); Cattelino, Brian(BCattelino@hmausa.com); Dam, Josh(joshdam@hmausa.com); Hu, Chris(CHu@hmausa.com); Morales-Rodriguez, Enrique(EMorales-Rodriguez@hmausa.com); Pizarro, Randy(RPizarro@hmausa.com); Prasad, Andy(APrasad@hmausa.com); Rivera, Omar(ORivera@hmausa.com); Smith, Suszann(SSmith@hmausa.com); Snyder, Jason(JSnyder@hmausa.com); Tiberio, Vincent(VTiberio@hmausa.com); Vu, Thai(tvu@hmausa.com);

ATTACHMENT A

Field Report Files

HYUNDAI

FSE Report

Created by LaFleur, Roger on 03/18/2013.
Finalized by LaFleur, Roger on 03/18/2013.

* Required Fields

FSE Number	FS2013030000254	**CA Case #***	X999999
Dealer Code*	[NH013] Hyundai Of Keene	**Tech. Case #***	5371863
Model	[BH] Genesis Sedan 2009-20xx MY	**Assistance Type**	Diagnostic Assistance
Year	2012	**FSE Name***	LaFleur, Roger
VIN*	KMHGC4DF6CU[redacted]	**Part Name**	
Mileage	10,410	**Part Number**	
Prod. Date	11/24/2011	**Engine Code**	4.6L V8 Tau
Customer Complaint*	Brake pedal feels mushy/soft	**Symptom Code**	BRAKE - FADE, BRAKE - LOW PEDAL
Severity Code	10 - Loss of primary function performance	**Diag Code#**	
Priority	High	**TREAD Cat.**	Service brake system
Target Date		**Days Open**	1 Day
Latest Incident Date	//		
Comment			
Subject*	2012 [BH] Genesis Sedan TL6 Campaign		

Additional VIN List

VIN No	Model Code	Model Year	Prod.Date	Mileage

Previous FSE Report

FSE No	VIN No	Model Code	Model Year	Dealer	FSE

Condition Customer came into the dealer to have TL6 Campaign performed.

After the dealer performed the TL6 brake fluid change they noticed the pedal didnt feel as hard as it should so they performed the TL6 again with no sucess.

Dealer called tech line and they suggested replacing the HECU assy so the dealer did with no sucess.

Dealer called FSE and they said that the brake pedal felt good at first touch but then the pedal would slowly go down to the floor.

Dealer also noticed the only two wheels had good braking power.

FSE recommended replacing the master cylinder and the brake pedal was now excellant.

Dealer took the master cylinder piston out and found on seal was folded over causing this issue.

Vehicle History

Root Cause Analysis The master cylinder piston had a seal that was folded over causing a soft pedal and only two wheels had brakes that worked.

Master cylinder piston and seals.	

The seal shown here is folded over and caused a leak by and low pedal.	

Attachment : 20130318171043193_HMA02633.jpg , 20130318171043193_HMA02633.jpg

Corrective Action	Dealer replaced the master cylinder and bleed brakes. Now vehicle is operating as desinged.
Reason(s) vehicle was not previously repaired	This was the first repair attempt.

Did this action resolve condition?	YES
Condition verified by personal inspection of company employee?	NO
Were Photos Taken?	YES
Parts Inspected?	YES
Parts Sent?	NO

Following people were notified via e-mail:

Hu, Chris(CHu@hmausa.com); LaFleur, Roger(RLafleur@hmausa.com); Lock, Alan(ALock@hmausa.com); Morales-Rodriguez, Enrique(EMorales-Rodriguez@hmausa.com); Pizarro, Randy(RPizarro@hmausa.com); Prasad, Andy(APrasad@hmausa.com); Rivera, Omar(ORivera@hmausa.com); Vu, Thai (tvu@hmausa.com);

ATTACHMENT A

Field Report Files

HYUNDAI

FSE Report

Created by Anderson III, Art on 05/29/2012.
Submitted by Anderson III, Art on 06/01/2012.
Finalized by Anderson III, Art on 06/01/2012.

*** Required Fields**

FSE Number	FS2012050000117	**CA Case #***	X999999
Dealer Code*	[MD035] PRESTON HYUNDAI	**Tech. Case #***	4830032
Model	[VI] Equus 2011-20xx MY	**Assistance Type**	IQS
Year	2012	**FSE Name***	Arthur Anderson
VIN*	KMHGH4JH3CU[redacted]	**Part Name**	
Mileage	515	**Part Number**	N/A
Prod. Date	02/28/2012	**Engine Code**	5.0L V8 Tau
Customer Complaint*		**Symptom Code**	
Severity Code	7 - Reduced primary function performance	**Diag Code#**	[C1354] TPMS Low Frequency Initiator (LFI) R/Right Circuit - Open/Short. , [C1360] ESP IRREVERSIBLE ERROR
Priority	Medium	**TREAD Cat.**	Service brake system
Target Date	05/29/2012	**Days Open**	4 Day
Latest Incident Date	//		
Comment			
Subject*	2012 VI Equus low brake pedal		

Additional VIN List

VIN No	Model Code	Model Year	Prod.Date	Mileage

Previous FSE Report

FSE No	VIN No	Model Code	Model Year	Dealer	FSE

Condition

Customer states the brake pedal went to the floor.

Vehicle is a in-stock vehicle that the dealer principle family member was going to purchase. While she was driving she stated the brake pedal went to the floor 4 times but if she released the pedal and re-applied the brake it braked normally.

Technician inspected vehicle and found brakes to be operating normally. The technician test drove the vehicle 200 miles with no concerns The DPSM test drove vehicle and had no concerns. The FSE was requested to inspect the vehicle.

The FSE inspected and test drove the vehicle 20 miles and no issues were experienced.

Vehicle History

Dealer Code	Claim Number	Repair Order	Repair Date	Repair Mileage	Operation Description
MD035	30637A	030637	05/10/2012	256	HYDRAULIC MODULE ASSY
MD035	30579A	030579	05/07/2012	1	PRE-DELIVERY INSPECTION/SERVICE

Root Cause Analysis

No issue found

Corrective Action

None taken

Reason(s) vehicle was not previously repaired	
Did this action resolve condition?	NO
Condition verified by personal inspection of company employee?	NO
Were Photos Taken?	NO
Parts Inspected?	NO
Parts Sent?	NO

Following people were notified via e-mail:

ATTACHMENT B

Hyundai 13V-489 Owner Letter

Hyundai Motor America
10550 Talbert Avenue
P.O. Box 20839
Fountain Valley, CA 92728-9937

HYUNDAI
NEW THINKING.
NEW POSSIBILITIES.

NHTSA Campaign Number: 13V-489

00000084

IMPORTANT SAFETY RECALL

This notice applies to your vehicle, KMHGC4DD5CU[redacted]

Dear Hyundai Genesis owner:

This notice is sent to you in accordance with the requirements of the National Traffic and Motor Vehicle Safety Act. Hyundai has decided that a defect which relates to motor vehicle safety exists in certain 2009 through 2012 model year Hyundai Genesis sedan vehicles that were produced beginning on April 30, 2008 through March 28, 2012. Our records indicate that your vehicle falls within this production date range.

What is the problem?

- Hyundai has determined the affected vehicles may contain brake fluid that does not sufficiently inhibit corrosion in the zinc plating on the service brake system's Hydraulic Electronic Control Unit (HECU) module. Corrosion may lead to a gel buildup on the module's valves affecting the valve's operation, resulting in low/soft brake pedal with reduced brake effectiveness, which may increase the risk of a vehicle crash.

What will Hyundai do?

- Hyundai will diagnose the brake system and, if necessary, replace the brake system's HECU module, flush the brake system and change the brake fluid with fluid containing additional corrosion inhibitor additive. This procedure will be performed at no charge to you. The actual time required to perform the procedure will depend on the dealer's work load; therefore, we recommend scheduling a service appointment to minimize inconvenience.

What should you do?

- For more information regarding this Recall Campaign, including a link to make a service appointment, please visit:

  www.HyundaiUSA.com/Campaign114

- Input your 17 digit Vehicle Identification Number to verify that your vehicle qualifies for this Recall Campaign. Input your zip code and a list of the five closest dealers will appear. Click on "Schedule Service" for your preferred dealer.

- There are three options to make an appointment to have this campaign completed on your vehicle:

  1. If you have a MyHyundai account, please log into your account, select the "Service" tab, and schedule service for your vehicle.
     a. Click on "Repair" and select "Genesis Brake Fluid Recall Campaign"
     b. In the "Repair Service" box, type "CAMP114" and click on "OK"
     c. Follow additional instructions to complete scheduling your appointment

2. If you do not have a MyHyundai account, please visit hyundaiusa.com, click on "Find a Dealer" and input your zip code. When your preferred dealer appears, click on "Schedule Service" under their address.

    a. If you have a user name and password for online scheduling with your preferred dealer:
        i. Enter your user name and password, click on "Log In"
        ii. Then click on "Repair" and select "Genesis Brake Fluid Recall Campaign"
        iii. In the "Repair Service" box, type "CAMP114" and click on "OK"
        iv. Follow the additional instructions to complete scheduling your appointment

    b. If you do not have a user name and password for online scheduling:
        i. Complete the information under "new customer"- Model / Year / Trim / Driving Conditions (if applicable)
        ii. Click on "Repair" and select "Genesis Brake Fluid Recall Campaign"
        iii. In the "Repair Service" box, type "CAMP114" and click on "OK"
        iv. Follow the additional instructions to complete scheduling your appointment

3. If your preferred dealer does not have a link to schedule service online or you are unable to make an appointment online, call your Hyundai dealer to schedule an appointment.

What if you have other questions?

- If you have any difficulty having this repair performed, we recommend that you call the Hyundai Customer Care Center at 1-855-671-3059. If you are still not satisfied that we have remedied this situation without charge, and within a reasonable amount of time, you may wish to write to the Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE, Washington, D.C. 20590, or call their toll-free Vehicle Safety Hotline at 1-888-327-4236 (TTY: 1-800-424-9153), or go to http://www.safercar.gov.

Reimbursement Notification

- Hyundai has a program for reimbursement of owners of 2009 through 2012 model year Hyundai Genesis sedans who paid to have the Hydraulic Electronic Control Unit module replaced after October 28, 2012 and prior to receiving this recall notification letter.

- To obtain information about reimbursement from Hyundai, please call the Hyundai Customer Care Center at 1-855-671-3059. Ask about reimbursement information for campaign 114.

If you are a vehicle lessor, Federal law requires that any vehicle lessor receiving this recall notice must forward a copy of this notice to the lessee within ten days.

We urge your prompt attention to this important safety matter.

Hyundai Motor America

ATTACHMENT B

03-05-2013 Dealer Communication

//ALL 03/05/2013 to 04/30/2013
TO: Hyundai Dealership General Managers, Sales Managers, Service Managers, Parts Managers, and Warranty Administrators
FROM: Hyundai Motor America
DATE: March 05, 2013
SUBJECT: **Revised Service Campaign TL6** – Equus/Genesis Brake Fluid Replacement (TSB# 13-01-006)

Effective March 05, 2013, 2009-12 Genesis Sedan has been added to service campaign TL6 (Brake Fluid Replacement).

In order to identify only those vehicles affected by service campaign TL6, it will be necessary to access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS before starting the replacement. The "Warranty Vehicle Information" screen will identify affected vehicles with an open service campaign TL6.

A listing of DEALER STOCK AND RETAILED VEHICLES is also located on **WEBDCS**, **SERVICE** tab, select **INFORMATION**, and select: **UNCOMPLETED CAMPAIGN VIN LIST – DEALER STOCK OR RETAILED**.

TSB #13-01-006 with the addition of the Genesis Sedan will be available on HMAservice.com on March 05, 2013. It contains instructions on performing the service and submitting the campaign claim.

It is IMPORTANT TO SUBMIT A CAMPAIGN CLAIM FOR EACH VEHICLE SERVICED so your dealership can be compensated for your work and Hyundai can maintain accurate records of campaign completions.

LEGAL LIABILITY NOTICE: You are required to keep confidential any and all information and documents provided to you by Hyundai Motor America in the conduct of carrying out work for this recall. Hyundai Motor America dealers may use owner information provided for the campaign only for the purpose of conducting and performing this service campaign, and for no other purpose.

Hyundai appreciates your cooperation and support. Questions may be directed to your District Parts and Service Manager or Warranty HELPREP line at 1-877-446-2922.

HYUNDAI MOTOR AMERICA

ATTACHMENT B

03-22-2013 Dealer Communication

//ALL 03/22/2013 to 04/29/2013
TO: Hyundai Dealership General Managers, Sales Managers, Service Managers, Parts Managers, and Warranty Administrators
FROM: Hyundai Motor America
DATE: March 22, 2013
SUBJECT: Revised: **Service Campaign TL6 – Equus, Genesis Sedan Brake Fluid Replacement – TSB# 13-01-006-1 – Revised Sublet Amount**

Effective March 22, 2013, Hyundai Motor America is increasing the brake fluid sublet amount to $23.40 for Service Campaign TL6 – Equus and Genesis Sedan brake fluid replacement.

In order to identify only those vehicles affected by Service Campaign TL6, it will be necessary to access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS before starting the repair. The "Warranty Vehicle Information" screen will identify affected vehicles with an open Service Campaign TL6.

A listing of DEALER STOCK AND RETAILED VEHICLES is also located on WEBDCS, SERVICE tab, select INFORMATION, and select: UNCOMPLETED CAMPAIGN VIN LIST – DEALER STOCK OR RETAILED.

TSB #13-01-006-1 for Service Campaign TL6 is available on HMAservice.com as of March 22, 2013. It contains instructions on performing the service and submitting the service campaign claim.

It is IMPORTANT TO SUBMIT A CAMPAIGN CLAIM FOR EACH VEHICLE SERVICED so your dealership can be compensated for your work and Hyundai can maintain accurate records of campaign completions.

LEGAL LIABILITY NOTICE: You are required to keep confidential any and all information and documents provided to you by Hyundai Motor America in the conduct of carrying out work for this Service Campaign. Hyundai Motor America dealers may use owner information provided for the campaign only for the purpose of conducting and performing this service campaign, and for no other purpose.

Hyundai appreciates your cooperation and support. Questions may be directed to your District Parts and Service Manager or Warranty HELPREP line at 1-877-446-2922.

HYUNDAI MOTOR AMERICA

ATTACHMENT B

05-29-2013 Dealer Communication

//ALL 05/29/2013 to 06/28/2013
TO: Hyundai Dealership General Managers, Sales Managers, Service Managers, Parts Managers, and Warranty Administrators
FROM: Hyundai Motor America
DATE: May 28, 2013
SUBJECT: **Revised: Service Campaign TL6 – Equus, Genesis Sedan Brake Fluid Replacement – TSB# 13-01-006-2 – Removed Sublet Amount**

Effective May 28, 2013, Hyundai Motor America is removing the $23.40 sublet amount and placing the DOT 4 brake fluid part number as the replacement part for Service Campaign TL6 – Equus and Genesis Sedan brake fluid replacement.

In order to identify only those vehicles affected by Service Campaign TL6, it will be necessary to access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS before starting the repair. The "Warranty Vehicle Information" screen will identify affected vehicles with an open Service Campaign TL6.

A listing of DEALER STOCK AND RETAILED VEHICLES is also located on WEBDCS, SERVICE tab, select INFORMATION, and select: UNCOMPLETED CAMPAIGN VIN LIST – DEALER STOCK OR RETAILED.

Supersede TSB #13-01-006-2 for Service Campaign TL6 is available on HMAservice.com as of May 28, 2013. It contains instructions on performing the service and submitting the service campaign claim.

It is IMPORTANT TO SUBMIT A CAMPAIGN CLAIM FOR EACH VEHICLE SERVICED so your dealership can be compensated for your work and Hyundai can maintain accurate records of campaign completions.

LEGAL LIABILITY NOTICE: You are required to keep confidential any and all information and documents provided to you by Hyundai Motor America in the conduct of carrying out work for this Service Campaign. Hyundai Motor America dealers may use owner information provided for the campaign only for the purpose of conducting and performing this service campaign, and for no other purpose.

Hyundai appreciates your cooperation and support. Questions may be directed to your District Parts and Service Manager or Warranty HELPREP line at 1-877-446-2922.

HYUNDAI MOTOR AMERICA

ATTACHMENT B

09-17-2012 Dealer Communication

//ALL 09/17/2012 to 10/26/2012

TO: Hyundai Dealership General Managers, Sales Managers, Service Managers, Parts Managers, and Warranty Administrators

FROM: Hyundai Motor America

DATE: 09/17/12

SUBJECT: Service Campaign TL6 – 2011-12 Equus Brake Fluid Replacement (TSB# 12-01-026)

Hyundai Motor America is conducting a Service Campaign to replace the brake fluid on certain 2011-12 Model Year Equus vehicles. Service Campaign TL6 provides a procedure to replace the brake fluid.

In order to identify only those vehicles affected by Service Campaign TL6, it will be necessary to access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS before starting the repair. The "Warranty Vehicle Information" screen will identify affected vehicles with an open Service Campaign TL6.

A listing of VEHICLES is also located on **WEBDCS**, **SERVICE** tab, select **INFORMATION**, and select **UNCOMPLETED CAMPAIGN VIN LISTING – RETAILED or DEALER STOCK.**

TSB #12-01-026 is available on Hyundai's Service Website as of September 17, 2012. It contains instructions on performing the service and submitting the campaign claim.

An initial supply of brake fluid started shipping on September 14, 2012 to all affected dealers. Additional brake fluid can be ordered following the normal parts ordering procedure.

It is IMPORTANT TO SUBMIT A CAMPAIGN CLAIM FOR EACH VEHICLE SERVICED so your dealership can be compensated for your work and Hyundai can maintain accurate records of campaign completions.

LEGAL LIABILITY NOTICE: You are required to keep confidential any and all information and documents provided to you by Hyundai Motor America in the conduct of carrying out work for this service campaign. Hyundai Motor America dealers may use owner information provided for the campaign only for the purpose of conducting and performing this service campaign, and for no other purpose.

Hyundai appreciates your cooperation and support. Questions may be directed to your District Parts and Service Manager or Warranty HELPREP line at 1-877-446-2922.

HYUNDAI MOTOR AMERICA

ATTACHMENT B

12-20-2013 Dealer Communication

//ALL 12/20/2013 to 01/31/2014
TO: Hyundai Dealership General Managers, Sales Managers, Service Managers, Parts Managers, and Warranty Administrators
FROM: Hyundai Motor America
DATE: December 20, 2013
SUBJECT: **Service Campaign TL6** – BH Genesis Sedan Brake Fluid Replacement (TSB# 13-01-006-2)

Effective December 20, 2013, service campaign TL6 (Brake Fluid Replacement) will no longer apply to Genesis sedans. Recall 114 describes the procedure to inspect (and if necessary replace) the Hydraulic Electronic Control Unit(HECU) and replace the brake fluid on certain Genesis sedan vehicles.

In order to identify those Genesis VINs affected by Recall 114, it will be necessary to access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS before starting the procedure. The "Warranty Vehicle Information" screen will identify affected vehicles with an open Recall 114.

Recall 114 TSB #13-01-052 will be available on HMAservice.com on December 20, 2013. It contains instructions on performing the service and submitting the recall claim.

It is IMPORTANT TO SUBMIT A CAMPAIGN CLAIM FOR EACH VEHICLE SERVICED so your dealership can be compensated for your work and Hyundai can maintain accurate records of campaign completions.

LEGAL LIABILITY NOTICE: You are required to keep confidential any and all information and documents provided to you by Hyundai Motor America in the conduct of carrying out work for this recall. Hyundai Motor America dealers may use owner information provided for the campaign only for the purpose of conducting and performing this service campaign, and for no other purpose.

Hyundai appreciates your cooperation and support. Questions may be directed to your District Parts and Service Manager or Warranty HELPREP line at 1-877-446-2922.

HYUNDAI MOTOR AMERICA

ATTACHMENT B

Hyundai 13V-489 Dealer Communication

TO: Hyundai Dealership General Managers, Sales Managers, Service Managers, Parts Managers, and Warranty Administrators
FROM: Hyundai Motor America
DATE: December 20, 2013
SUBJECT: **Recall Campaign 114 – 2009 – 2012 MY Genesis Sedan HECU Inspection and Brake Fluid Replacement TSB# 13-01-052**

Hyundai Motor America is conducting Recall Campaign 114 for the Hydraulic Electronic Control Unit (HECU) inspection and Brake Fluid Replacement on certain 2009 – 2012 model year Hyundai Genesis vehicles, produced beginning on April 30, 2008 through March 28, 2012.

Technical Service Bulletin #13-01-052 provides a procedure for the inspection of the HECU and Brake Fluid Replacement.

In order to identify only those vehicles affected by Recall Campaign 114, it will be necessary to access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS before starting the repair. The "Warranty Vehicle Information" screen will identify affected vehicles with an open Recall Campaign 114.

A listing of VEHICLES is also located on **WEBDCS**, **SERVICE** tab, select **INFORMATION**, and select **UNCOMPLETED CAMPAIGN VIN LISTING – RETAILED**.

TSB #13-01-052 will be available on Hyundai's Service Website on December 20, 2013. It contains instructions on performing the service and submitting the recall claim.

Upon completion of the HECU inspection and if a replacement HECU is required it can be ordered from your Facing PDC by providing an applicable Recall Campaign 114 VIN.

Customer notification letters will be mailed on December 24, 2013.

It is IMPORTANT TO SUBMIT A RECALL CAMPAIGN CLAIM FOR EACH VEHICLE SERVICED so your dealership can be compensated for your work and Hyundai can maintain accurate records of campaign completions.

LEGAL LIABILITY NOTICE: You are required to keep confidential any and all information and documents provided to you by Hyundai Motor America in the conduct of carrying out work for this recall campaign. Hyundai Motor America dealers may use owner information provided for the campaign only for the purpose of conducting and performing this recall campaign, and for no other purpose.

Hyundai appreciates your cooperation and support. Questions may be directed to your District Parts and Service Manager or Warranty HELPREP line at 1-877-446-2922.

HYUNDAI MOTOR AMERICA

ATTACHMENT B

12-01-026 Technical Bulletin

Technical Service Bulletin	GROUP	NUMBER
	CAMPAIGN	12-01-026
	DATE	MODEL(S)
	SEPTEMBER 2012	VI EQUUS

SUBJECT: VI EQUUS BRAKE FLUID REPLACEMENT (SERVICE CAMPAIGN TL6)

★ IMPORTANT

***** Dealer Stock and Retail Vehicles *****

Dealers must perform this Service Campaign on all affected vehicles prior to customer retail delivery and whenever an affected vehicle is in the shop for any maintenance or repair.

When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: This bulletin describes the procedure to replace the brake fluid for some Equus (VI) vehicles.

Applicable Vehicles:
VI Equus produced from SOP to March 16, 2012

Parts Information:

PART NAME	FIGURE	BEFORE	AFTER	QTY
DOT4 Brake Fluid		00232-19033	00232-19053	About 1.8L is required per vehicle. (Five 12 fl. oz. bottles per vehicle).

Warranty Information:

OP CODE	OPERATION	OP TIME
20C022R0	Brake Fluid Replacement	0.7 M/H

NOTE: Submit Claim on Campaign Claim Entry Screen
NOTE: $16.70 will be automatically reimbursed via the sublet amount on the campaign claim for the brake fluid.

Service Procedure: Replace Brake Fluid

1. Remove the driver's side cover in the engine bay by unfastening the 3 retaining clips.

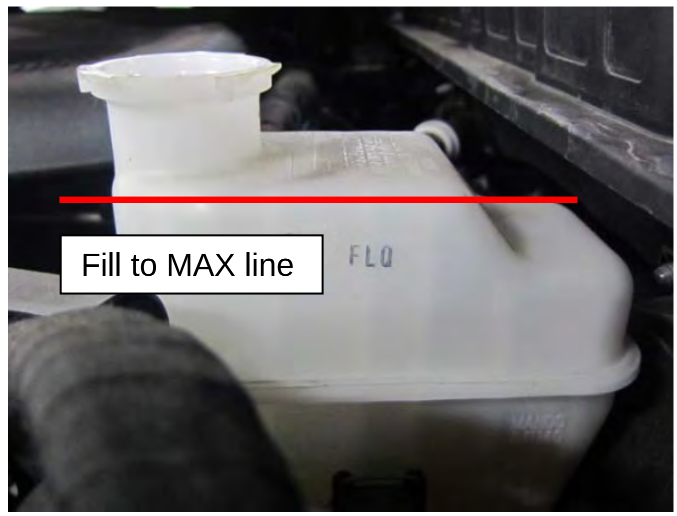
2. Locate the brake master cylinder, remove the cap, and remove the filter.

3. Remove as much of the brake fluid as possible using a vacuum pump or similar tool.

4. Fill the reservoir to the MAX line using DOT4 brake fluid.

   Reinstall the filter and master cylinder cap.

> **★ NOTE**
>
> If any brake fluid is spilled, immediately clean the spill by generously flushing water over the area.



5. Lift the vehicle on a hoist and remove the hub covers from all four wheels. Remove all lug nuts and wheels.

> **★ NOTE**
>
> **Tightening torque:**
> **24.5~29.4.m (2.5~3 kgf.m, 18.1~21.7 lb-ft)**

6. ***Start at the RIGHT REAR brake assembly.***

Connect one end of a bleeding line to the bleeder screw nipple, and the place the other end in a container to catch brake fluid as it is released.

Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

7. Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

While holding the brake pedal down, open the bleeder to release brake fluid. After fluid is released, close the bleeder, and release pressure from the brake pedal.

★ IMPORTANT

DO NOT release the brake pedal until after the bleeder screw is fully closed.

★ NOTE

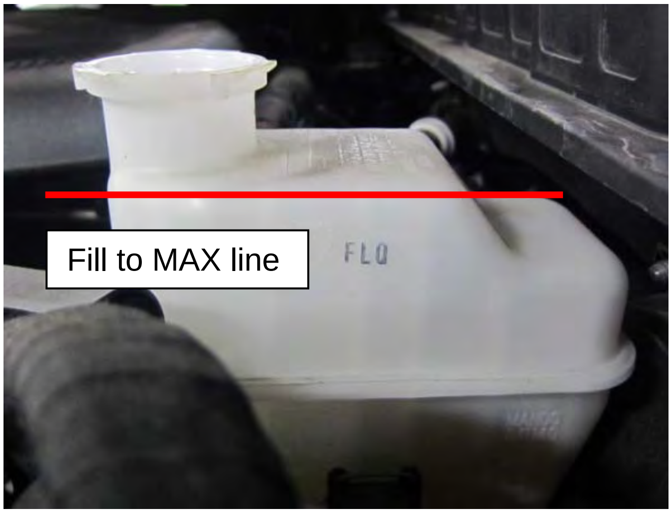
Bleeder screw tightening torque: 6.9~12.7 Nm (0.7~1.3 kgf.m, 5.1~9.4 lb-ft)

8. Repeat steps 6-7 until the level of brake fluid in the reservoir drops from MAX to MIN.

★ NOTE

DO NOT allow the fluid level to drop below the MIN line. If the level drops below MIN at any time during this procedure, it is required to start the bleeding process over, starting from the RIGHT REAR brake assembly.

9. Refill the reservoir to the MAX line using DOT 4 brake fluid.



10. ***Move to the FRONT LEFT wheel.***

Repeat the process described in steps 6-9.

> *** NOTE**
>
> Some models may have a fixed-type front caliper which has 2 bleeders (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

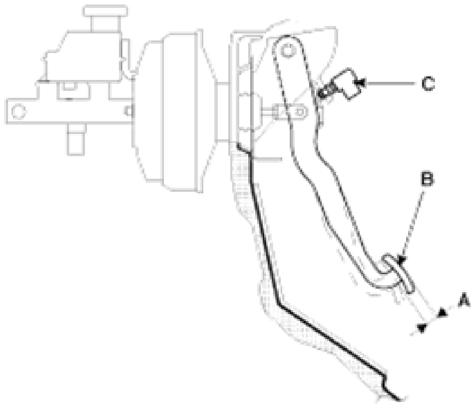
11. ***Repeat steps 6-9 at the REAR LEFT wheel, then the FRONT RIGHT wheel.***

12. Check the brake pedal free play by depressing the pedal.

Brake pedal free play specification: 3~8mm.

If the amount of play is over specification, bleeding should be performed again.

If the amount of play is within specification, continue to Service Procedure: HECU Valve Flush Using GDS.



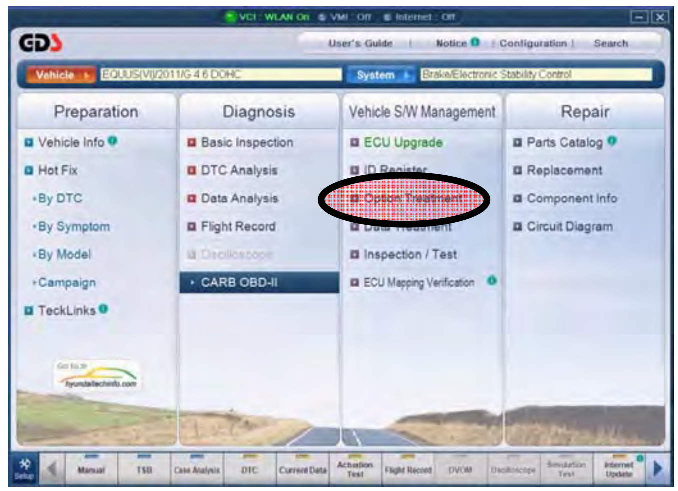
Service Procedure: HECU Valve Flush Using GDS

1. Connect GDS VCI to DLC connector.
   Connect VCI to GDS using USB cable.

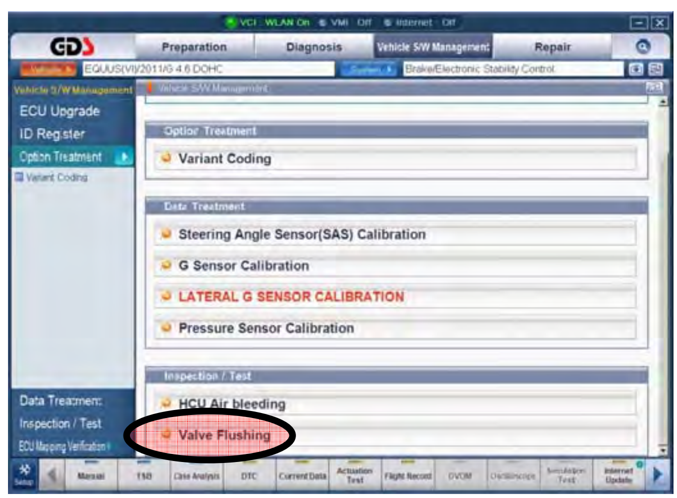
   Start the engine and verify that all electrical systems turn off (no electrical load).
   Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

> **✱ NOTE**
>
> Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

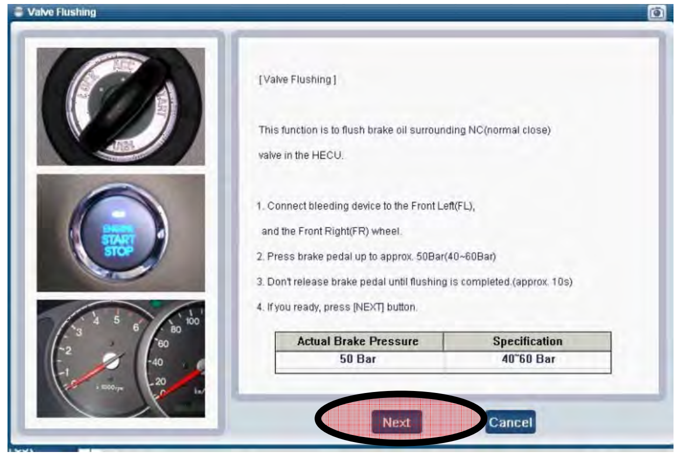
2. Select "Option Treatment" under the Vehicle S/W Management tab.



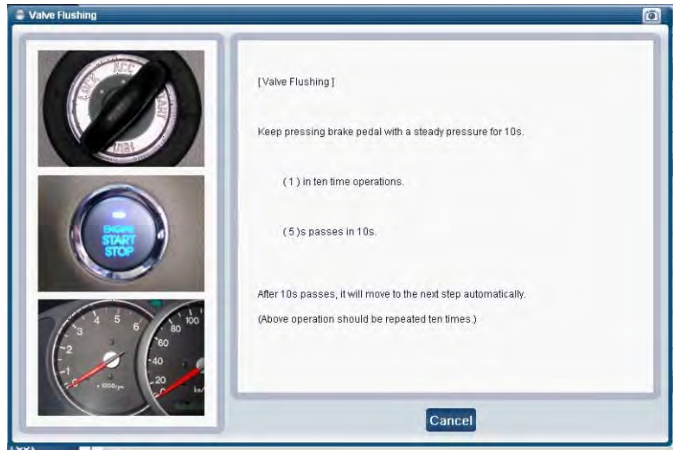
3. Select "Valve Flushing."



4. As directed by the GDS, press and hold the brake pedal to maintain about 50 bar of brake pressure. Press “NEXT” while holding pressure.



5. The HECU motor will operate and the brake pedal will pulsate for 10 seconds. Maintain holding brake pressure during this time.

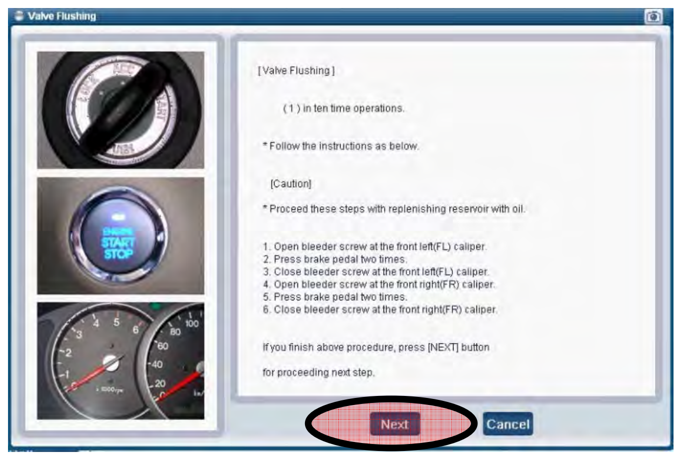


6. Bleed front brake assemblies:

Start with the front left brakes.

Press the brake pedal twice and hold. With a bleeding line attached, open the bleeder screw to bleed the line.

Repeat for the front right brakes, then press “NEXT.”



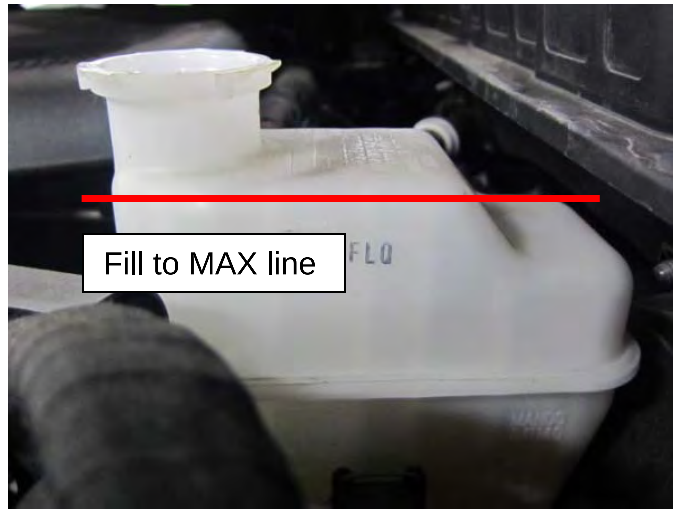
7. Repeat steps 5 and 6 for a total of 10 HECU valve flushing operations. GDS menu screen will count number of iterations.

✱ NOTE

Monitor the level of brake fluid in the master cylinder reservoir. If the fluid drops close to the MIN line, refill to MAX.

After the 10th flushing, the procedure is completed.

8. Refill the brake fluid in the master cylinder reservoir to the MAX line.



ATTACHMENT B

12-01-026-1 Technical Bulletin

Technical Service Bulletin	GROUP **CAMPAIGN**	NUMBER **12-01-026-1**
	DATE **SEPTEMBER 2012**	MODEL(S) **VI EQUUS**

SUBJECT: VI EQUUS BRAKE FLUID REPLACEMENT (SERVICE CAMPAIGN TL6)

This TSB supersedes 12-01-026 to update tightening torque specifications (page 3, step #5)

★ IMPORTANT

***** Dealer Stock and Retail Vehicles *****

Dealers must perform this Service Campaign on all affected vehicles prior to customer retail delivery and whenever an affected vehicle is in the shop for any maintenance or repair.

When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: This bulletin describes the procedure to replace the brake fluid for some Equus (VI) vehicles.

Applicable Vehicles:
VI Equus produced from SOP to March 16, 2012

Parts Information:

PART NAME	FIGURE	BEFORE	AFTER	QTY
DOT4 Brake Fluid		00232-19033	00232-19053	About 1.8L is required per vehicle. (Five 12 fl. oz. bottles per vehicle).

Circulate To: General Manager, Service Manager, Parts Manager, Warranty Manager, Service Advisors, Technicians, Body Shop Manager, Fleet Repair

Warranty Information:

OP CODE	OPERATION	OP TIME
20C022R0	Brake Fluid Replacement	0.7 M/H

NOTE: Submit Claim on Campaign Claim Entry Screen
NOTE: $16.70 will be automatically reimbursed via the sublet amount on the campaign claim for the brake fluid.

Service Procedure: Replace Brake Fluid

1. Remove the driver's side cover in the engine bay by unfastening the 3 retaining clips.

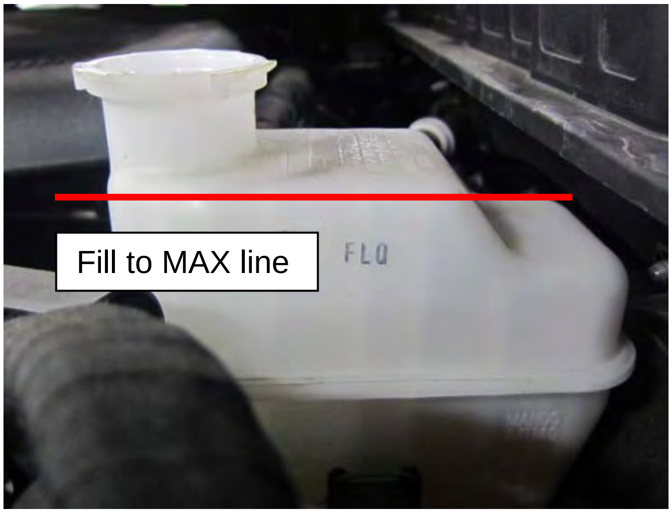
2. Locate the brake master cylinder, remove the cap, and remove the filter.

3. Remove as much of the brake fluid as possible using a vacuum pump or similar tool.

4. Fill the reservoir to the MAX line using DOT4 brake fluid.

   Reinstall the filter and master cylinder cap.

> **★ NOTE**
>
> If any brake fluid is spilled, immediately clean the spill by generously flushing water over the area.



5. Lift the vehicle on a hoist and remove the hub covers from all four wheels. Remove all lug nuts and wheels.

> **★ NOTE**
>
> **Tightening torque:**
> **90~110 N.m (9~11 kgf.m, 65~80 lb-ft)**

6. ***Start at the RIGHT REAR brake assembly.***

Connect one end of a bleeding line to the bleeder screw nipple, and the place the other end in a container to catch brake fluid as it is released.

Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

7. Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

While holding the brake pedal down, open the bleeder to release brake fluid. After fluid is released, close the bleeder, and release pressure from the brake pedal.

★ IMPORTANT

DO NOT release the brake pedal until after the bleeder screw is fully closed.

★ NOTE

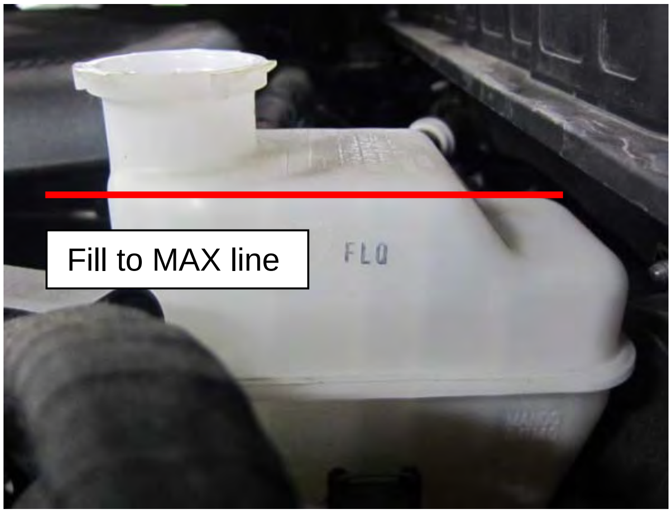
Bleeder screw tightening torque: 6.9~12.7 Nm (0.7~1.3 kgf.m, 5.1~9.4 lb-ft)

8. Repeat steps 6-7 until the level of brake fluid in the reservoir drops from MAX to MIN.

★ NOTE

DO NOT allow the fluid level to drop below the MIN line. If the level drops below MIN at any time during this procedure, it is required to start the bleeding process over, starting from the RIGHT REAR brake assembly.

9. Refill the reservoir to the MAX line using DOT 4 brake fluid.



10. ***Move to the FRONT LEFT wheel.***

Repeat the process described in steps 6-9.

> **✱ NOTE**
>
> Some models may have a fixed-type front caliper which has 2 bleeders (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

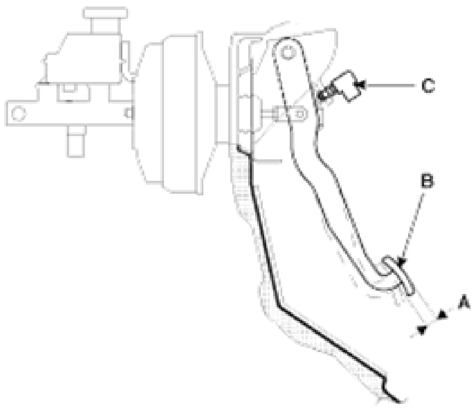
11. ***Repeat steps 6-9 at the REAR LEFT wheel, then the FRONT RIGHT wheel.***

12. Check the brake pedal free play by depressing the pedal.

Brake pedal free play specification: 3~8mm.

If the amount of play is over specification, bleeding should be performed again.

If the amount of play is within specification, continue to Service Procedure: HECU Valve Flush Using GDS.



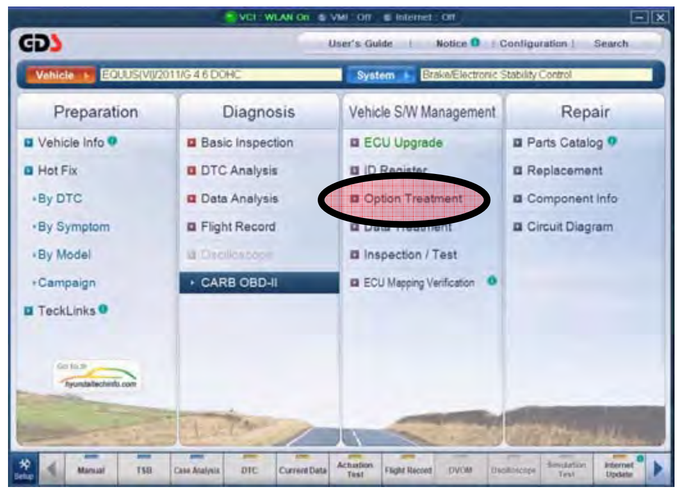
Service Procedure: HECU Valve Flush Using GDS

1. Connect GDS VCI to DLC connector.
Connect VCI to GDS using USB cable.

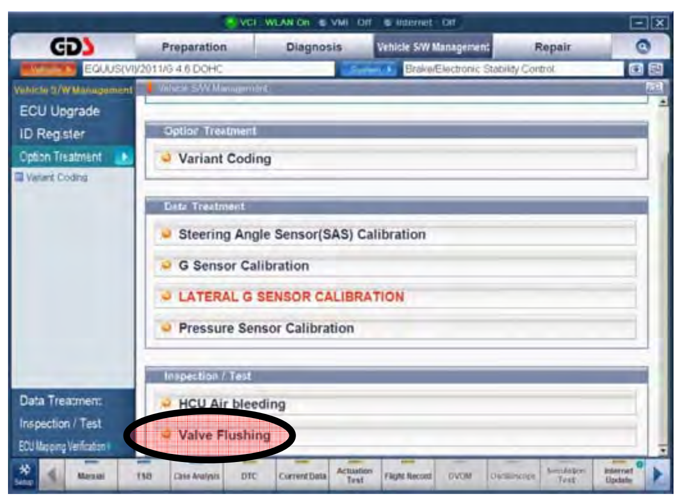
Start the engine and verify that all electrical systems turn off (no electrical load).
Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

> **✱ NOTE**
>
> Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

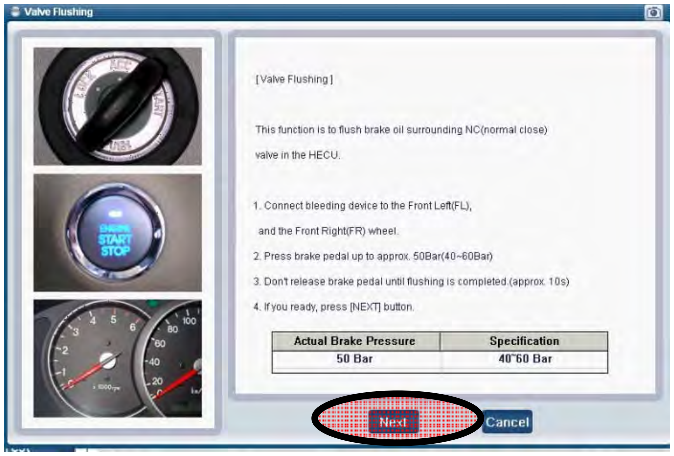
2. Select "Option Treatment" under the Vehicle S/W Management tab.



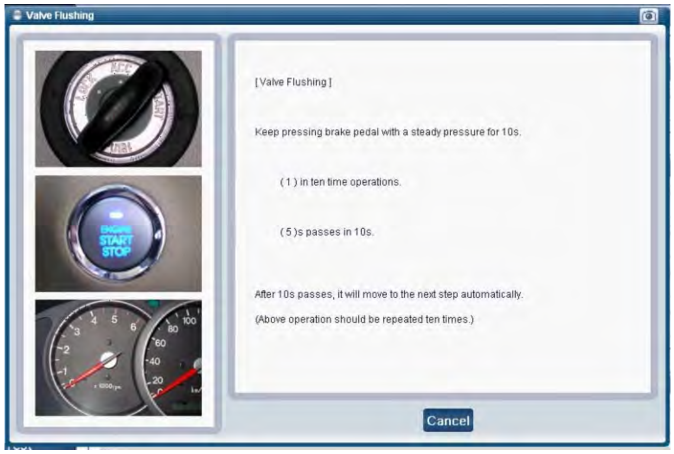
3. Select "Valve Flushing."



4. As directed by the GDS, press and hold the brake pedal to maintain about 50 bar of brake pressure. Press “NEXT” while holding pressure.



5. The HECU motor will operate and the brake pedal will pulsate for 10 seconds. Maintain holding brake pressure during this time.

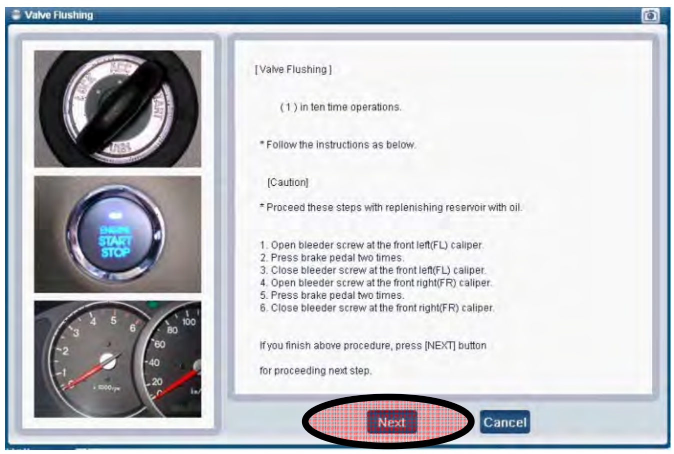


6. Bleed front brake assemblies:

   Start with the front left brakes.

   Press the brake pedal twice and hold. With a bleeding line attached, open the bleeder screw to bleed the line.

   Repeat for the front right brakes, then press “NEXT.”

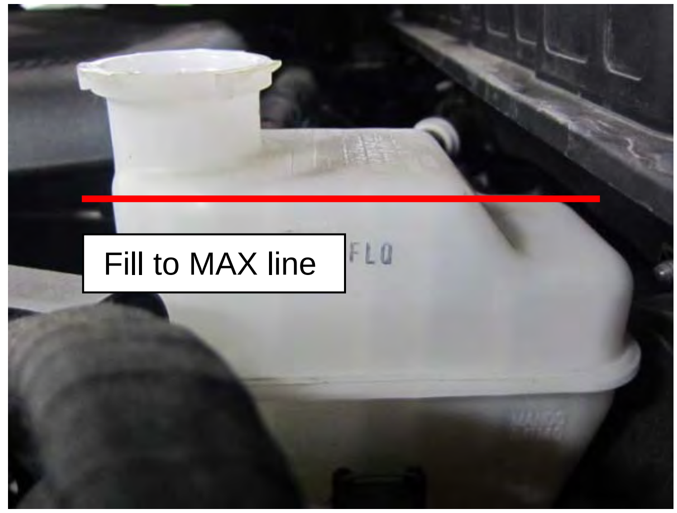


7. Repeat steps 5 and 6 for a total of 10 HECU valve flushing operations. GDS menu screen will count number of iterations.

> **✱ NOTE**
>
> Monitor the level of brake fluid in the master cylinder reservoir. If the fluid drops close to the MIN line, refill to MAX.

After the 10th flushing, the procedure is completed.

8. Refill the brake fluid in the master cylinder reservoir to the MAX line.



ATTACHMENT B

13-01-006 Technical Bulletin

HYUNDAI NEW THINKING. NEW POSSIBILITIES. **Technical Service Bulletin**	GROUP **CAMPAIGN**	NUMBER **13-01-006**
	DATE **MARCH 2013**	MODEL(S) **VI EQUUS BH GENESIS**

SUBJECT: VI EQUUS, BH GENESIS SEDAN BRAKE FLUID REPLACEMENT (SERVICE CAMPAIGN TL6)

This TSB supersedes 12-01-026-1 to add BH Genesis vehicles to the applicable vehicles.

*** IMPORTANT**

***** Dealer Stock and Retail Vehicles *****

Dealers must perform this Service Campaign on all affected vehicles prior to customer retail delivery and whenever an affected vehicle is in the shop for any maintenance or repair.

When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: This bulletin describes the procedure to replace the brake fluid for some Equus (VI) and Genesis sedan (BH) vehicles.

Applicable Vehicles:
VI Equus produced from July 13, 2010 to March 16, 2012
BH Genesis sedan produced from April 30, 2008 to March 28, 2012

Parts Information:

PART NAME	FIGURE	BEFORE	AFTER	QTY
DOT4 Brake Fluid		00232-19033	00232-19053	About 1.8L is required per vehicle. (Five 12 fl. oz. bottles per vehicle).

Circulate To: General Manager, Service Manager, Parts Manager, Warranty Manager, Service Advisors, Technicians, Body Shop Manager, Fleet Repair

Warranty Information:

OP CODE	OPERATION	OP TIME
20C022R0	Brake Fluid Replacement	0.7 M/H

NOTE: Submit Claim on Campaign Claim Entry Screen
NOTE: $16.70 will be automatically reimbursed via the sublet amount on the campaign claim for the brake fluid.

Service Procedure: Replace Brake Fluid

1. If equipped, remove the driver's side cover in the engine bay by unfastening the 3 retaining clips.

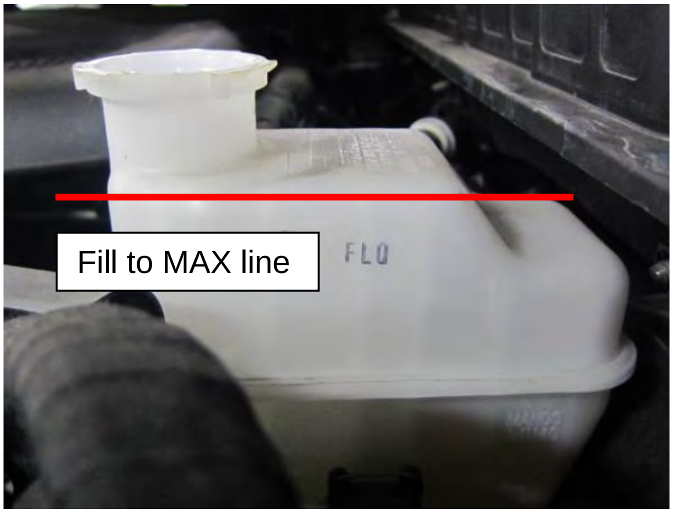
2. Locate the brake master cylinder, remove the cap, and remove the filter.

3. Remove as much of the brake fluid as possible using a vacuum pump or similar tool.

4. Fill the reservoir to the MAX line using DOT4 brake fluid.

   Reinstall the filter and master cylinder cap.

> **★ NOTE**
>
> If any brake fluid is spilled, immediately clean the spill by generously flushing water over the area.



5. Lift the vehicle on a hoist and remove the hub covers from all four wheels. Remove all lug nuts and wheels.

> **★ NOTE**
>
> **Tightening torque:**
> **90~110 N.m (9~11 kgf.m, 65~80 lb-ft)**

6. ***Start at the RIGHT REAR brake assembly.***

Connect one end of a bleeding line to the bleeder screw nipple, and then place the other end in a container to catch brake fluid as it is released.

Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

7. Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

While holding the brake pedal down, open the bleeder to release brake fluid. After fluid is released, close the bleeder, and release pressure from the brake pedal.

*** IMPORTANT**

DO NOT release the brake pedal until after the bleeder screw is fully closed.

*** NOTE**

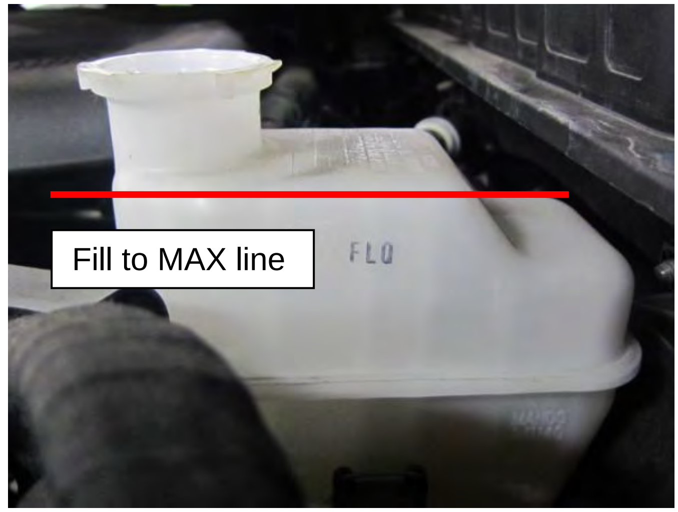
Bleeder screw tightening torque: 6.9~12.7 Nm (0.7~1.3 kgf.m, 5.1~9.4 lb-ft)

8. Repeat steps 6-7 until the level of brake fluid in the reservoir drops from MAX to MIN.

*** NOTE**

DO NOT allow the fluid level to drop below the MIN line. If the level drops below MIN at any time during this procedure, it is required to start the bleeding process over, starting from the RIGHT REAR brake assembly.

9. Refill the reservoir to the MAX line using DOT 4 brake fluid.



10. ***Move to the FRONT LEFT wheel.***

    Repeat the process described in steps 6-9.

    *** NOTE**

    Some models may have 2 bleeder screws (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

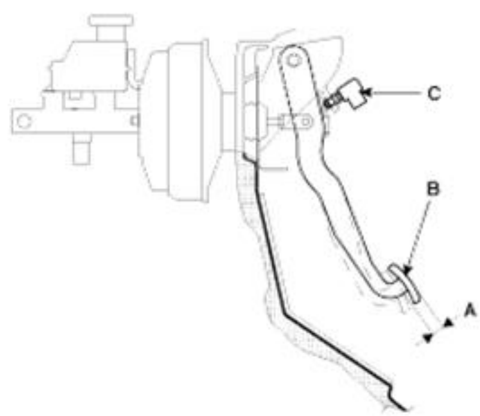
11. ***Repeat steps 6-9 at the REAR LEFT wheel, then the FRONT RIGHT wheel.***

12. Check the brake pedal free play by depressing the pedal.

    Brake pedal free play specification: 3~8mm.

    If the amount of play is over specification, bleeding should be performed again.

    If the amount of play is within specification, continue to Service Procedure: HECU Valve Flush Using GDS.



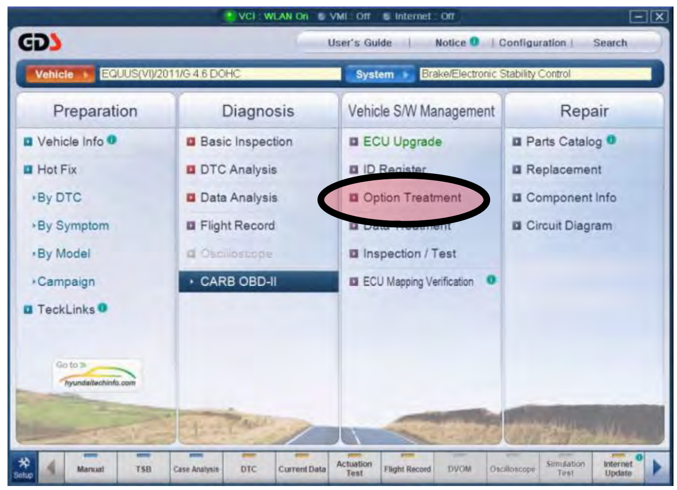
Service Procedure: HECU Valve Flush Using GDS

1. Connect GDS VCI to DLC connector.
   Connect VCI to GDS using USB cable.

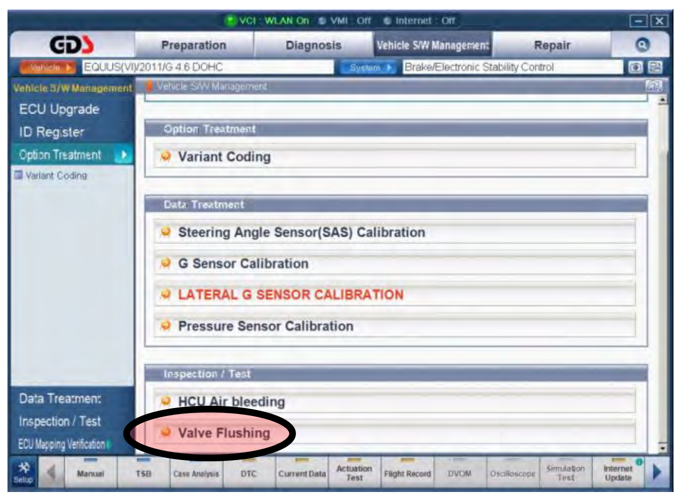
   Start the engine and verify that all electrical systems turn off (no electrical load).
   Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

> *** NOTE**
>
> Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

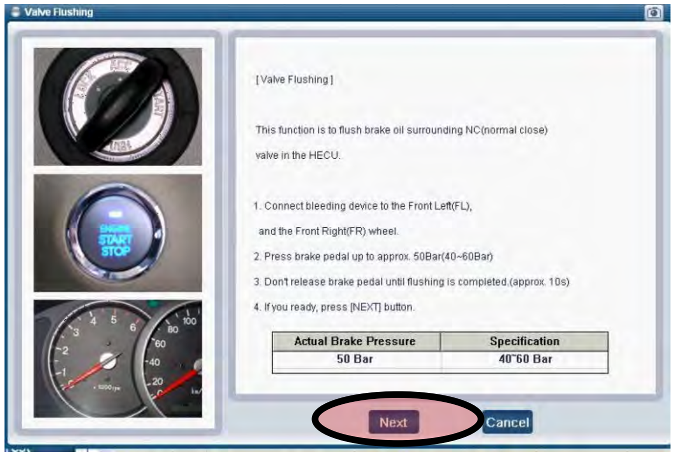
2. Select "Option Treatment" under the Vehicle S/W Management tab.



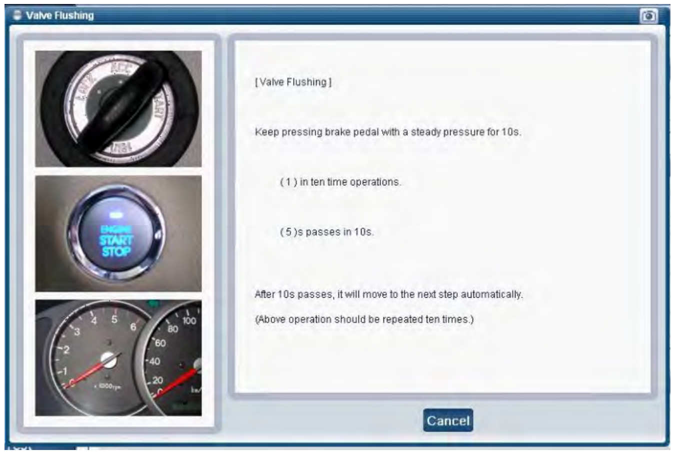
3. Select "Valve Flushing."



4. As directed by the GDS, press and hold the brake pedal to maintain about 50 bar (725 psi) of brake pressure. Press “NEXT” while holding pressure.



5. The HECU motor will operate and the brake pedal will pulsate for 10 seconds. Maintain holding brake pressure during this time.

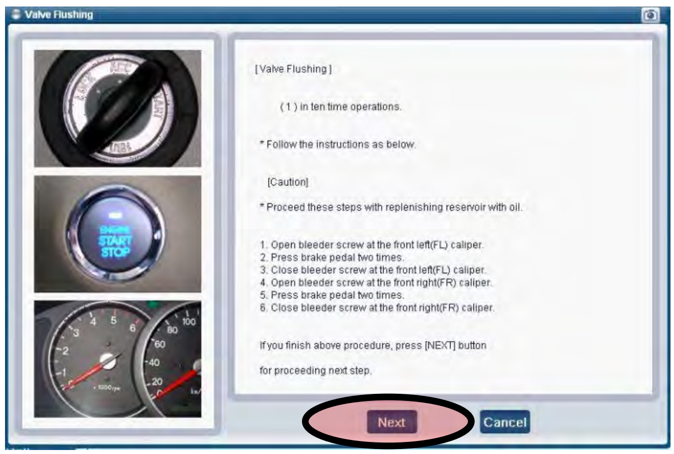


6. Bleed front brake assemblies:

   Start with the front left brakes.

   Press the brake pedal twice and hold. With a bleeding line attached, open the bleeder screw to bleed the line.

   Repeat for the front right brakes, then press “NEXT.”



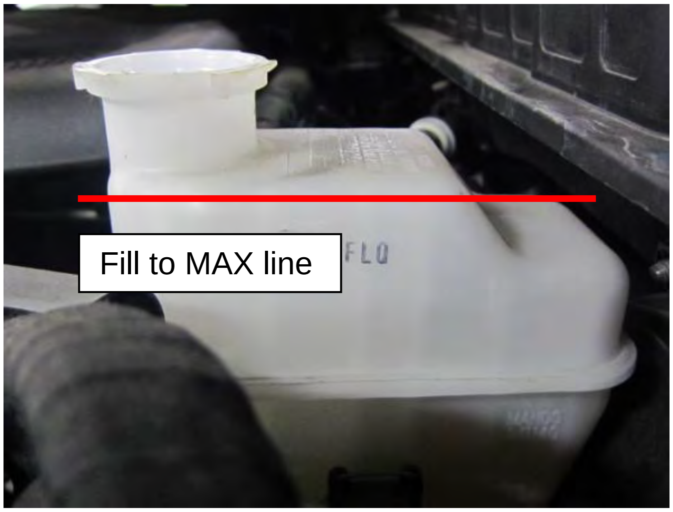
7. Repeat steps 5 and 6 for a total of 10 HECU valve flushing operations. GDS menu screen will count number of iterations.

   ✱ NOTE

   Monitor the level of brake fluid in the master cylinder reservoir. If the fluid drops close to the MIN line, refill to MAX.

   After the 10th flushing, the procedure is completed.

8. Refill the brake fluid in the master cylinder reservoir to the MAX line.



ATTACHMENT B

13-01-006-1 Technical Bulletin

Technical Service Bulletin	GROUP	NUMBER
	CAMPAIGN	**13-01-006-1**
	DATE	MODEL(S)
	MARCH 2013	**VI EQUUS** **BH GENESIS**

SUBJECT: VI EQUUS, BH GENESIS SEDAN BRAKE FLUID REPLACEMENT (SERVICE CAMPAIGN TL6)

This TSB supersedes 13-01-006 to update sublet amount.

*** IMPORTANT**

***** Dealer Stock and Retail Vehicles *****

Dealers must perform this Service Campaign on all affected vehicles prior to customer retail delivery and whenever an affected vehicle is in the shop for any maintenance or repair.

When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: This bulletin describes the procedure to replace the brake fluid for some Equus (VI) and Genesis sedan (BH) vehicles.

Applicable Vehicles:
VI Equus produced from July 13, 2010 to March 16, 2012
BH Genesis sedan produced from April 30, 2008 to March 28, 2012

Parts Information:

PART NAME	FIGURE	BEFORE	AFTER	QTY
DOT4 Brake Fluid		00232-19033	00232-19053	About 1.8L is required per vehicle. (Five 12 fl. oz. bottles per vehicle).

Circulate To: General Manager, Service Manager, Parts Manager, Warranty Manager, Service Advisors, Technicians, Body Shop Manager, Fleet Repair

Warranty Information:

OP CODE	OPERATION	OP TIME
20C022R0	Brake Fluid Replacement	0.7 M/H

NOTE: Submit Claim on Campaign Claim Entry Screen
NOTE: $23.40 will be automatically reimbursed via the sublet amount on the campaign claim for the brake fluid.

Service Procedure: Replace Brake Fluid

1. If equipped, remove the driver's side cover in the engine bay by unfastening the 3 retaining clips.

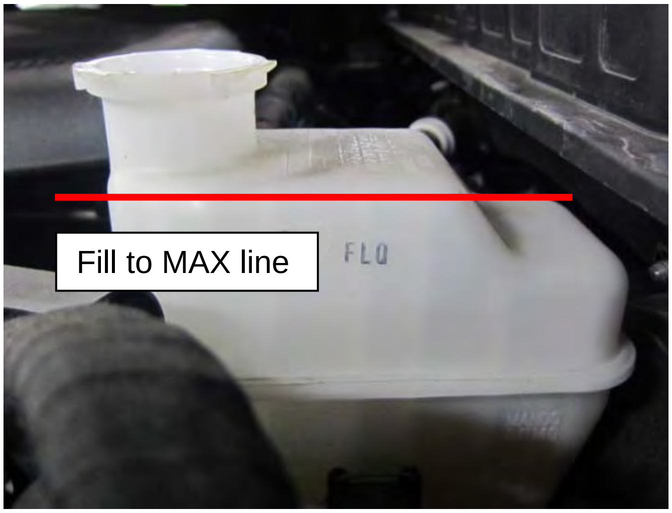
2. Locate the brake master cylinder, remove the cap, and remove the filter.

3. Remove as much of the brake fluid as possible using a vacuum pump or similar tool.

4. Fill the reservoir to the MAX line using DOT4 brake fluid.

   Reinstall the filter and master cylinder cap.

> **★ NOTE**
>
> If any brake fluid is spilled, immediately clean the spill by generously flushing water over the area.



5. Lift the vehicle on a hoist and remove the hub covers from all four wheels. Remove all lug nuts and wheels.

> **★ NOTE**
>
> **Tightening torque:**
> **90~110 N.m (9~11 kgf.m, 65~80 lb-ft)**

6. ***Start at the RIGHT REAR brake assembly.***

   Connect one end of a bleeding line to the bleeder screw nipple, and then place the other end in a container to catch brake fluid as it is released.

   Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

7. Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

   While holding the brake pedal down, open the bleeder to release brake fluid. After fluid is released, close the bleeder, and release pressure from the brake pedal.

✱ IMPORTANT

DO NOT release the brake pedal until after the bleeder screw is fully closed.

✱ NOTE

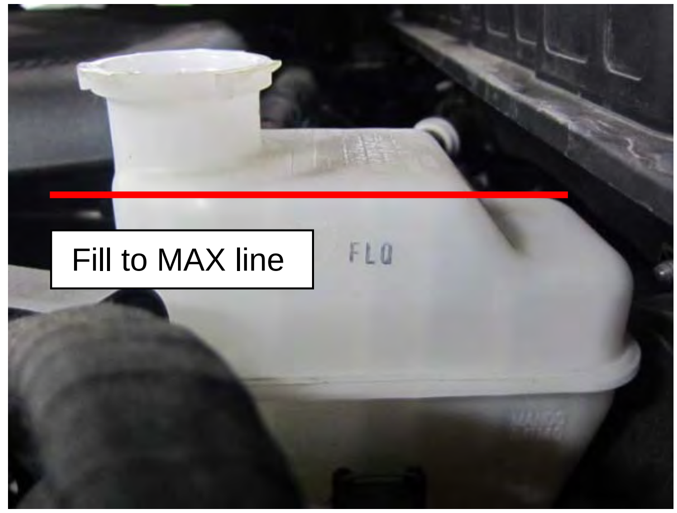
Bleeder screw tightening torque: 6.9~12.7 Nm (0.7~1.3 kgf.m, 5.1~9.4 lb-ft)

8. Repeat steps 6-7 until the level of brake fluid in the reservoir drops from MAX to MIN.

✱ NOTE

DO NOT allow the fluid level to drop below the MIN line. If the level drops below MIN at any time during this procedure, it is required to start the bleeding process over, starting from the RIGHT REAR brake assembly.

9. Refill the reservoir to the MAX line using DOT 4 brake fluid.



10. ***Move to the FRONT LEFT wheel.***

    Repeat the process described in steps 6-9.

    *** NOTE**

    Some models may have 2 bleeder screws (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

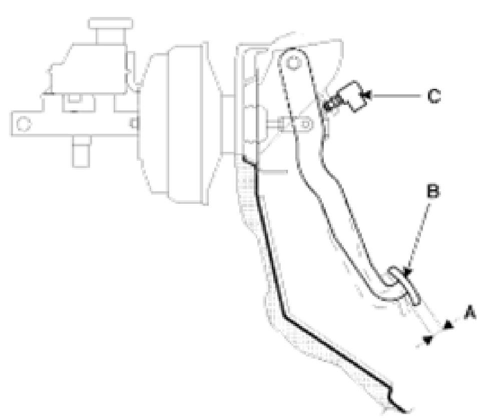
11. ***Repeat steps 6-9 at the REAR LEFT wheel, then the FRONT RIGHT wheel.***

12. Check the brake pedal free play by depressing the pedal.

    Brake pedal free play specification: 3~8mm.

    If the amount of play is over specification, bleeding should be performed again.

    If the amount of play is within specification, continue to Service Procedure: HECU Valve Flush Using GDS.



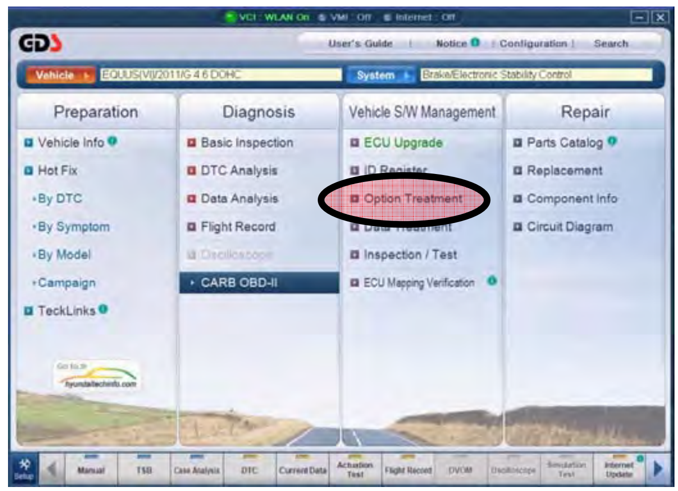
Service Procedure: HECU Valve Flush Using GDS

1. Connect GDS VCI to DLC connector.
Connect VCI to GDS using USB cable.

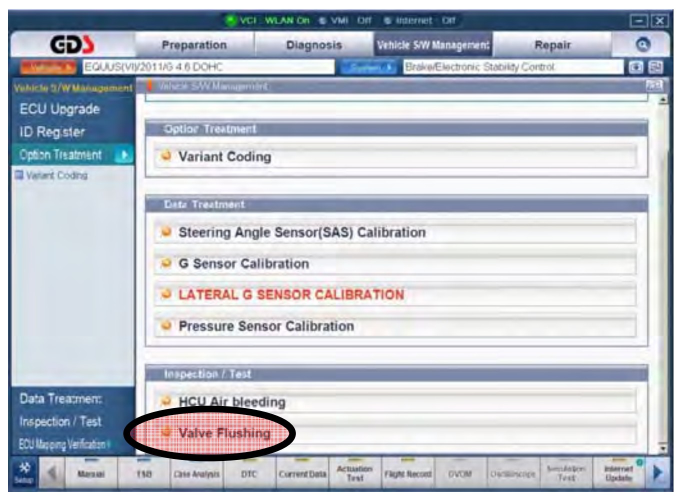
Start the engine and verify that all electrical systems turn off (no electrical load).
Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

> **★ NOTE**
>
> Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

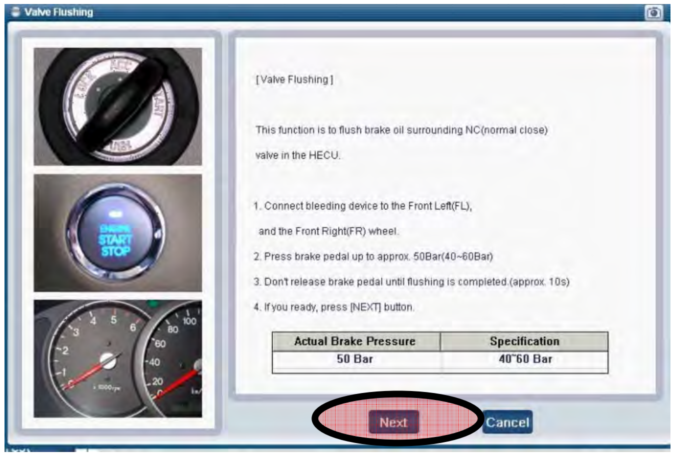
2. Select "Option Treatment" under the Vehicle S/W Management tab.



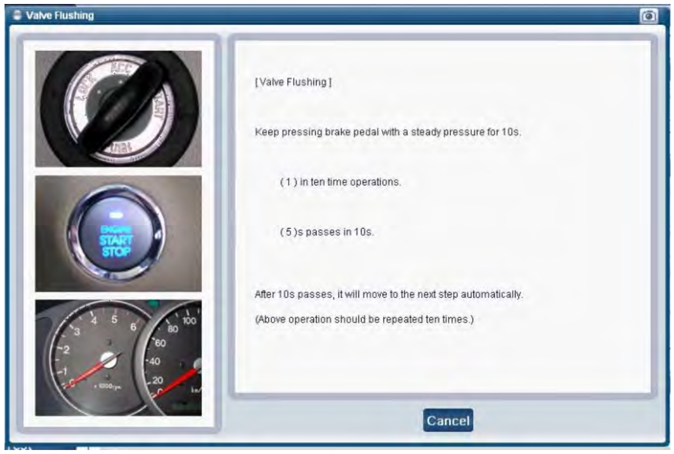
3. Select "Valve Flushing."



4. As directed by the GDS, press and hold the brake pedal to maintain about 50 bar (725 psi) of brake pressure. Press “NEXT” while holding pressure.



5. The HECU motor will operate and the brake pedal will pulsate for 10 seconds. Maintain holding brake pressure during this time.

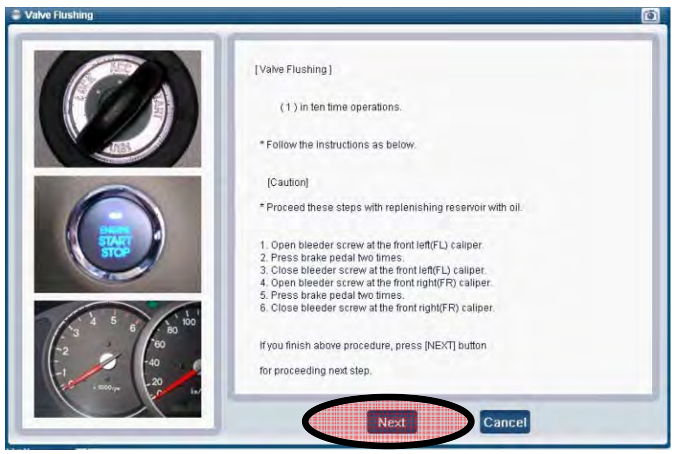


6. Bleed front brake assemblies:

Start with the front left brakes.

Press the brake pedal twice and hold. With a bleeding line attached, open the bleeder screw to bleed the line.

Repeat for the front right brakes, then press “NEXT.”



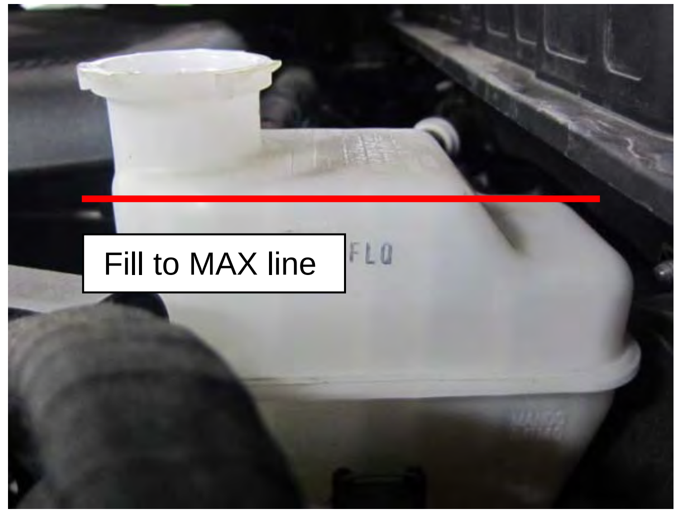
7. Repeat steps 5 and 6 for a total of 10 HECU valve flushing operations. GDS menu screen will count number of iterations.

✱ NOTE

Monitor the level of brake fluid in the master cylinder reservoir. If the fluid drops close to the MIN line, refill to MAX.

After the 10th flushing, the procedure is completed.

8. Refill the brake fluid in the master cylinder reservoir to the MAX line.



ATTACHMENT B

13-01-006-2 Technical Bulletin

HYUNDAI NEW THINKING. NEW POSSIBILITIES. **Technical Service Bulletin**	GROUP **CAMPAIGN**	NUMBER **13-01-006-2**
	DATE **MAY 2013**	MODEL(S) **VI EQUUS** **BH GENESIS**

SUBJECT: VI EQUUS, BH GENESIS SEDAN BRAKE FLUID REPLACEMENT (SERVICE CAMPAIGN TL6)

This TSB supersedes 13-01-006-1 to remove sublet amount, and reimburse part number 00232-19053 in the replaced parts field.

⁎ IMPORTANT

***** Dealer Stock and Retail Vehicles *****

Dealers must perform this Service Campaign on all affected vehicles prior to customer retail delivery and whenever an affected vehicle is in the shop for any maintenance or repair.

When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: This bulletin describes the procedure to replace the brake fluid for some Equus (VI) and Genesis sedan (BH) vehicles.

Applicable Vehicles:
VI Equus produced from July 13, 2010 to March 16, 2012
BH Genesis sedan produced from April 30, 2008 to March 28, 2012

Parts Information:

PART NAME	FIGURE	BEFORE	AFTER	QTY
DOT4 Brake Fluid		00232-19033	00232-19053	About 1.8L is required per vehicle. (Five 12 fl. oz. bottles per vehicle).

Circulate To: General Manager, Service Manager, Parts Manager, Warranty Manager, Service Advisors, Technicians, Body Shop Manager, Fleet Repair

Warranty Information:

OP CODE	OPERATION	OP TIME
20C022R0	Brake Fluid Replacement	0.7 M/H

NOTE: Submit Claim on Campaign Claim Entry Screen
NOTE: Part number 00232-19053 will be reimbursed along with appropriate dealer parts mark-up in the replaced parts field.

Service Procedure: Replace Brake Fluid

1. If equipped, remove the driver's side cover in the engine bay by unfastening the 3 retaining clips.

2. Locate the brake master cylinder, remove the cap, and remove the filter.

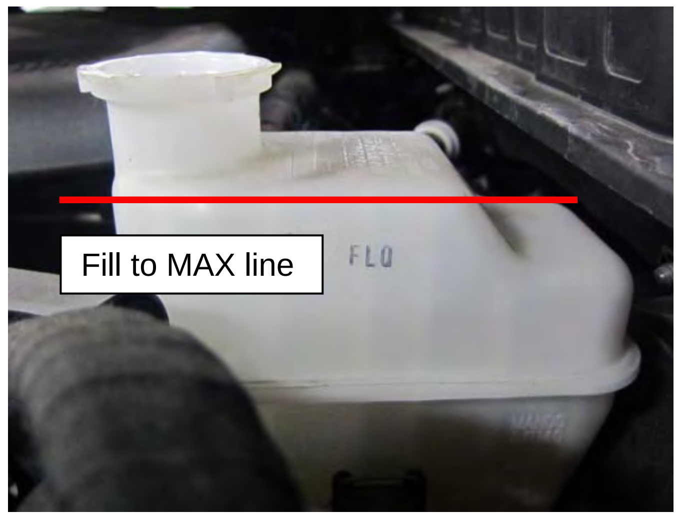
3. Remove as much of the brake fluid as possible using a vacuum pump or similar tool.

4. Fill the reservoir to the MAX line using DOT4 brake fluid.

   Reinstall the filter and master cylinder cap.

★ NOTE

If any brake fluid is spilled, immediately clean the spill by generously flushing water over the area.



5. Lift the vehicle on a hoist and remove the hub covers from all four wheels. Remove all lug nuts and wheels.

★ NOTE

Tightening torque:
90~110 N.m (9~11 kgf.m, 65~80 lb-ft)

6. ***Start at the RIGHT REAR brake assembly.***

   Connect one end of a bleeding line to the bleeder screw nipple, and then place the other end in a container to catch brake fluid as it is released.

   Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

7. Pump the brake pedal 3 times and hold the pedal down, to pressurize the system.

   While holding the brake pedal down, open the bleeder to release brake fluid. After fluid is released, close the bleeder, and release pressure from the brake pedal.

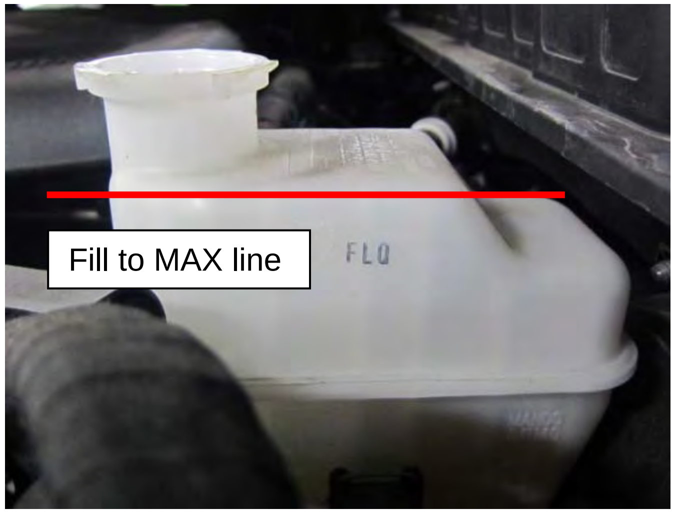
> *** IMPORTANT**
>
> DO NOT release the brake pedal until after the bleeder screw is fully closed.

> *** NOTE**
>
> **Bleeder screw tightening torque: 6.9~12.7 Nm (0.7~1.3 kgf.m, 5.1~9.4 lb-ft)**

8. Repeat steps 6-7 until the level of brake fluid in the reservoir drops from MAX to MIN.

> *** NOTE**
>
> DO NOT allow the fluid level to drop below the MIN line. If the level drops below MIN at any time during this procedure, it is required to start the bleeding process over, starting from the RIGHT REAR brake assembly.

9. Refill the reservoir to the MAX line using DOT 4 brake fluid.



10. ***Move to the FRONT LEFT wheel.***

Repeat the process described in steps 6-9.

*** NOTE**

Some models may have 2 bleeder screws (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

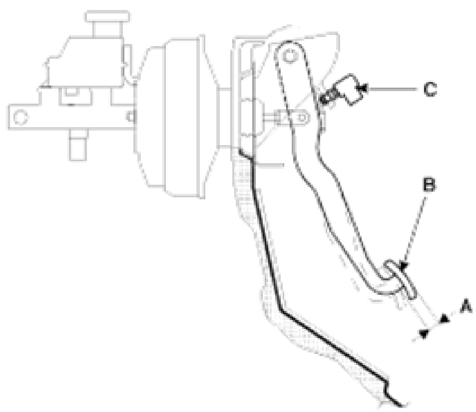
11. ***Repeat steps 6-9 at the REAR LEFT wheel, then the FRONT RIGHT wheel.***

12. Check the brake pedal free play by depressing the pedal.

Brake pedal free play specification: 3~8mm.

If the amount of play is over specification, bleeding should be performed again.

If the amount of play is within specification, continue to Service Procedure: HECU Valve Flush Using GDS.



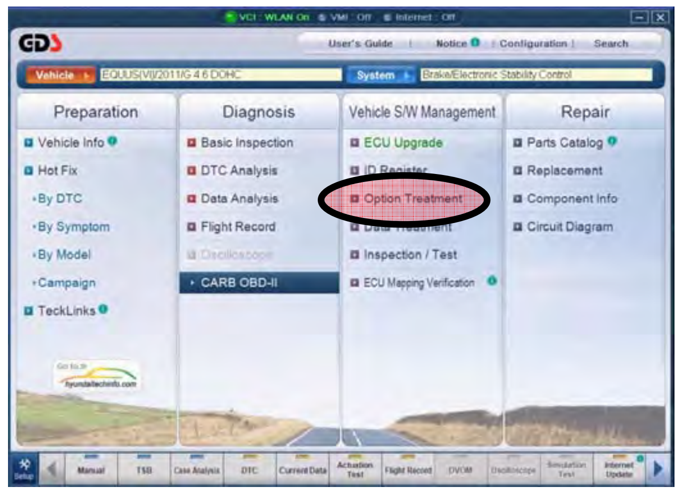
Service Procedure: HECU Valve Flush Using GDS

1. Connect GDS VCI to DLC connector.
   Connect VCI to GDS using USB cable.

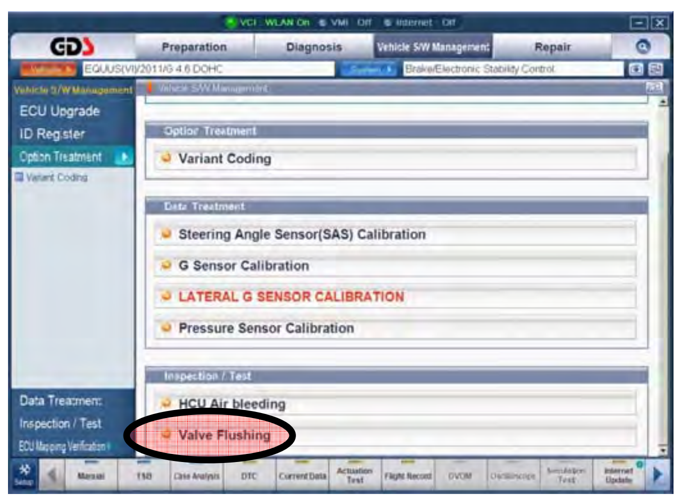
   Start the engine and verify that all electrical systems turn off (no electrical load).
   Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

   > **✱ NOTE**
   >
   > Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

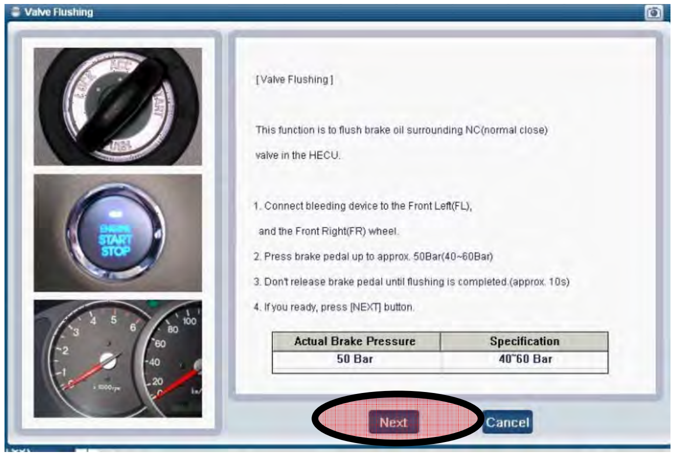
2. Select "Option Treatment" under the Vehicle S/W Management tab.



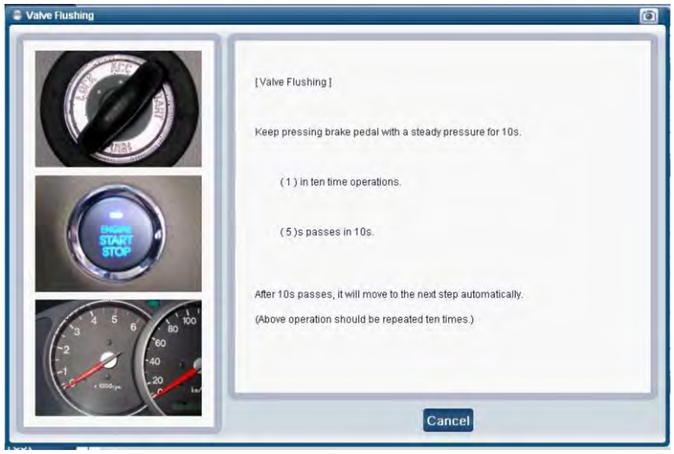
3. Select "Valve Flushing."



4. As directed by the GDS, press and hold the brake pedal to maintain about 50 bar (725 psi) of brake pressure. Press "NEXT" while holding pressure.



5. The HECU motor will operate and the brake pedal will pulsate for 10 seconds. Maintain holding brake pressure during this time.

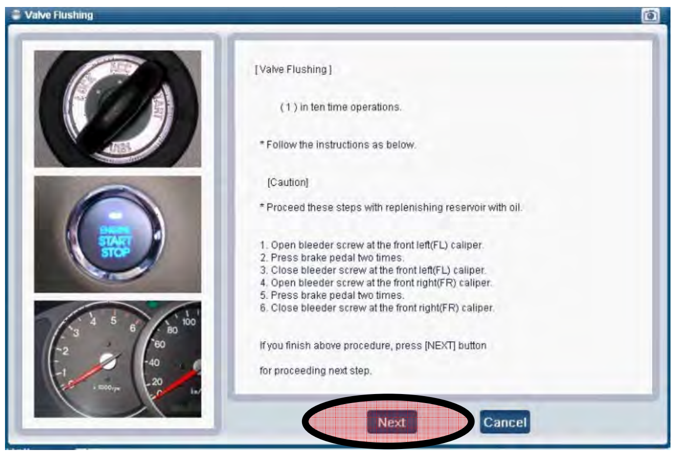


6. Bleed front brake assemblies:

   Start with the front left brakes.

   Press the brake pedal twice and hold. With a bleeding line attached, open the bleeder screw to bleed the line.

   Repeat for the front right brakes, then press "NEXT."

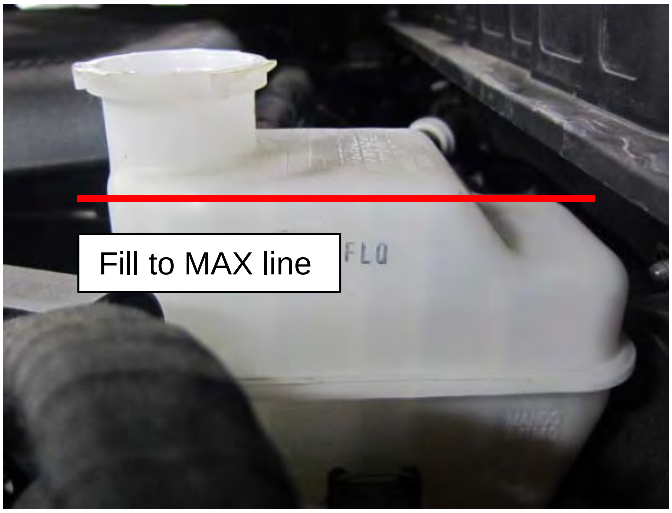


7. Repeat steps 5 and 6 for a total of 10 HECU valve flushing operations. GDS menu screen will count number of iterations.

> **★ NOTE**
>
> Monitor the level of brake fluid in the master cylinder reservoir. If the fluid drops close to the MIN line, refill to MAX.

   After the 10th flushing, the procedure is completed.

8. Refill the brake fluid in the master cylinder reservoir to the MAX line.



ATTACHMENT B

Hyundai 13V-489 Technical Bulletin

HYUNDAI NEW THINKING. NEW POSSIBILITIES. **Technical Service Bulletin**	GROUP **CAMPAIGN**	NUMBER **13-01-052**	
	DATE **DECEMBER 2013**	MODEL(S) **GENESIS SEDAN (BH)**	

SUBJECT: BH GENESIS SEDAN HECU INSPECTION AND BRAKE FLUID REPLACEMENT (RECALL 114)

★ IMPORTANT

***** RETAIL VEHICLES ONLY *****

Dealers must perform this Recall Campaign whenever an affected vehicle is in the shop for any maintenance or repair.

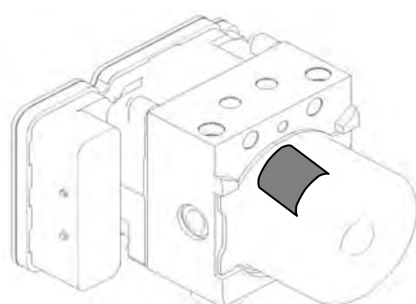
When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: This bulletin describes the procedure to:

1) Inspect (and if necessary, replace) the Hydraulic Electronic Control Unit (HECU)
2) Replace the brake fluid on certain Genesis sedan (BH) vehicles.

Applicable Vehicles:
Certain Genesis sedan (BH) vehicles produced beginning on April 30, 2008 through March 28, 2012.

Parts Information:

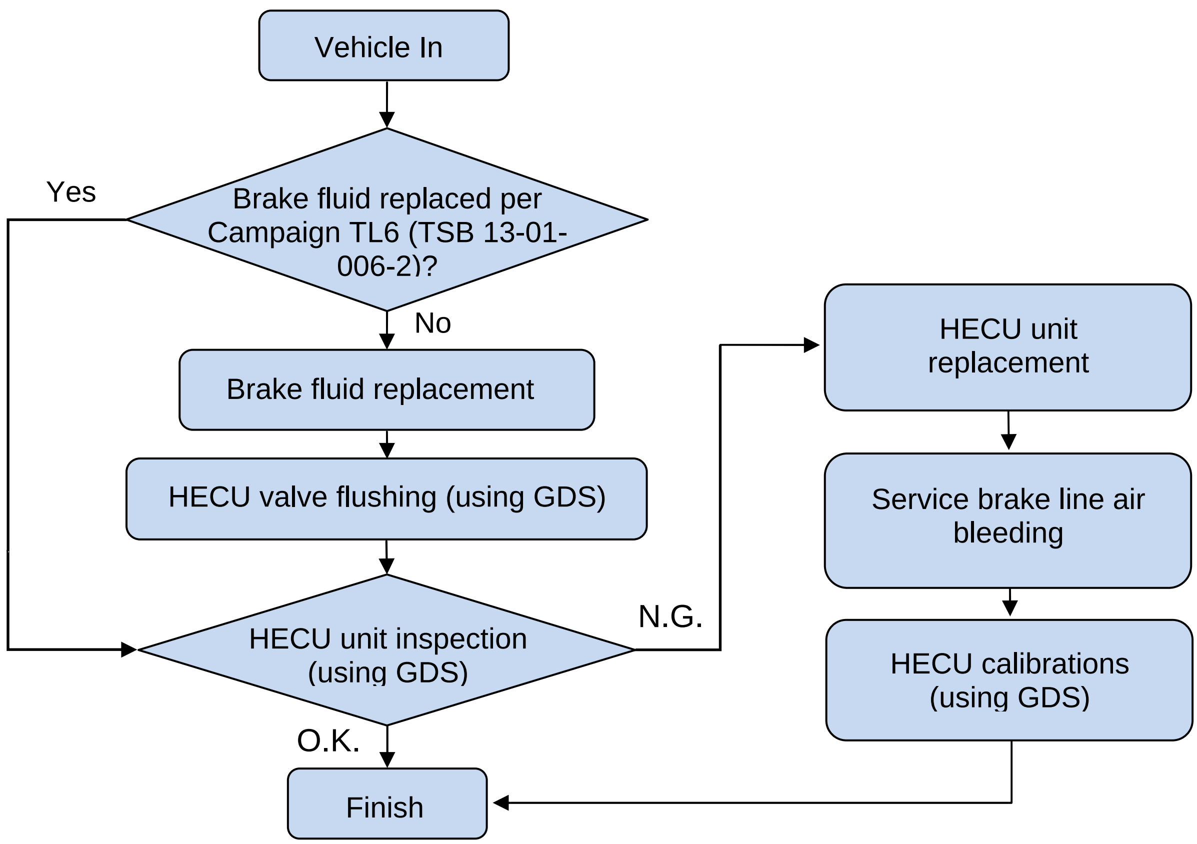
PART NAME	PICTURE	PART NUMBER	REMARKS
HECU		58920-3M050-QQH	6AT Without EPB and SCC
		58920-3N300-QQH	6AT With EPB and SCC
		58920-3M060-QQH	8AT Without EPB and SCC
		58920-3M360-QQH	8AT With EPB and SCC
DOT 4 Brake Fluid		00232-19053	Approximately 1.8L is required per vehicle (five 12 fl. oz. bottles).

Warranty Information:

OP CODE	OPERATION	OP TIME
31C072R0	HECU INSPECTION AND REPLACEMENT, BRAKE FLUID REPLACEMENT	3.0 M/H
31C072R1	HECU INSPECTION AND BRAKE FLUID REPLACEMENT	1.0 M/H
31C072R2	HECU INSPECTION AND REPLACEMENT	2.3 M/H
31C072R3	HECU INSPECTION	0.3 M/H

NOTE: Submit Claim on Campaign Claim Entry Screen
NOTE: Part number 00232-19053 will be reimbursed along with appropriate dealer parts mark-up in the replaced parts field.

SERVICE PROCEDURE OVERVIEW



Service Procedure: Brake Fluid Replacement and Service Brake Line Air Bleeding

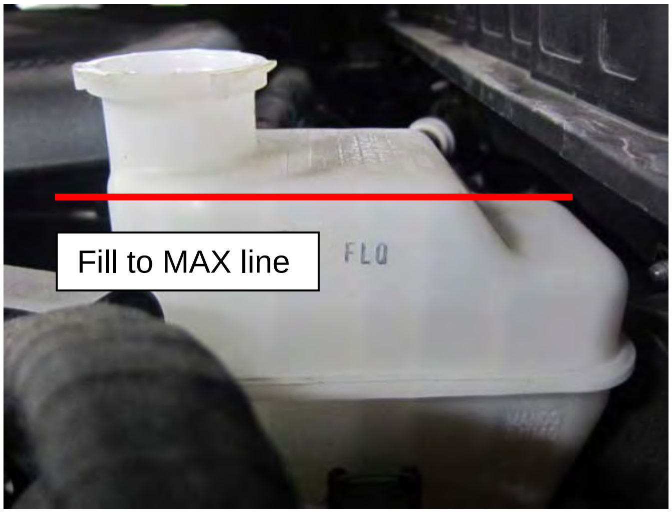
1. Locate the brake master cylinder, remove the cap, and remove the filter.

2. Remove as much of the brake fluid as possible using a vacuum pump or similar tool.

3. Fill the reservoir to the MAX line using DOT4 brake fluid.

   Reinstall the filter and master cylinder cap.

   > **★ NOTE**
   >
   > If any brake fluid is spilled, immediately clean the spill by generously flushing water over the area.



4. Lift the vehicle on a hoist and remove the hub covers from all four wheels. Remove all lug nuts and wheels.

✱ NOTE

Tightening torque:
90~110 N.m (9~11 kgf.m, 65~80 lb-ft)

5. ***Start at the RIGHT REAR brake assembly.***

Connect one end of a bleeding line to the bleeder screw nipple, and then place the other end in a container to collect brake fluid as it is released.

6. Pump the brake pedal 3 times and then hold the pedal down to pressurize the system.

While holding the brake pedal down, open the bleeder to release brake fluid. After fluid is released, close the bleeder, and release pressure from the brake pedal.

✱ IMPORTANT

DO NOT release the brake pedal until after the bleeder screw is fully closed.

✱ NOTE

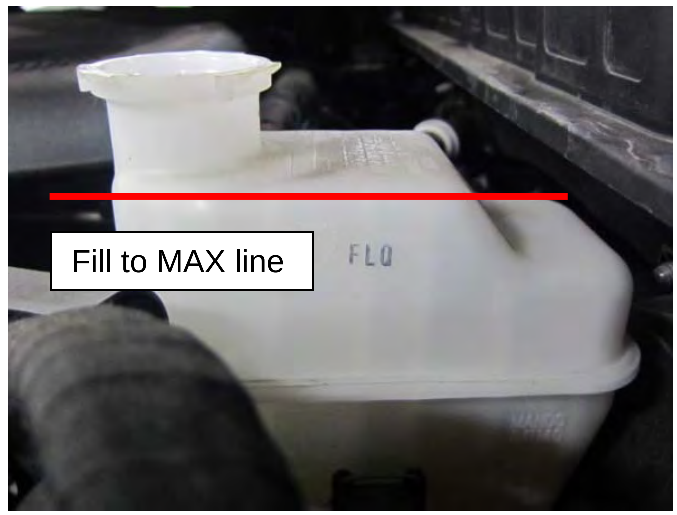
Bleeder screw tightening torque:
6.9~12.7 Nm (0.7~1.3 kgf.m, 5.1~9.4 lb-ft)

7. Repeat step 6 until the level of brake fluid in the reservoir drops from MAX to MIN.

*** NOTE**

DO NOT allow the fluid level to drop below the MIN line. If the level drops below MIN at any time during this procedure, it is required to start the bleeding process over, starting from the RIGHT REAR brake assembly.

8. Refill the reservoir to the MAX line using DOT 4 brake fluid.



9. ***Move to the FRONT LEFT wheel.***

Repeat the process described in steps 5-8.

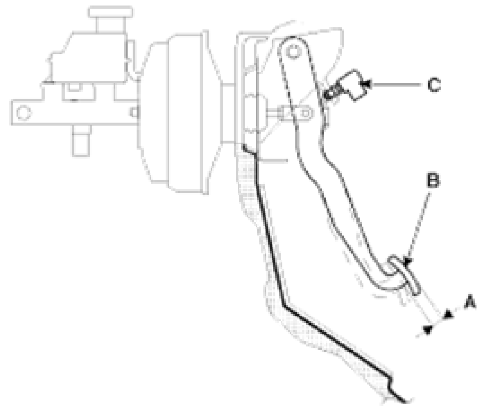
*** NOTE**

Some models may have 2 bleeder screws (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

10. ***Repeat steps 5-8 at the REAR LEFT wheel, then the FRONT RIGHT wheel.***

11. Check the brake pedal free play by depressing the pedal.

    Brake pedal free play specification: 3~8mm (0.1 to 0.3").

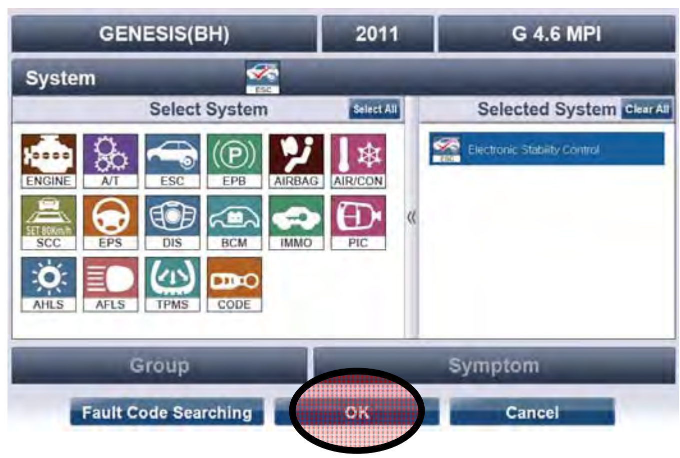


> **✱ NOTE**
>
> If the amount of play is over specification, line bleeding should be performed again.
>
> If the amount of play is within specification, continue to **Service Procedure: HECU Valve Flushing.**

Service Procedure: HECU Valve Flushing

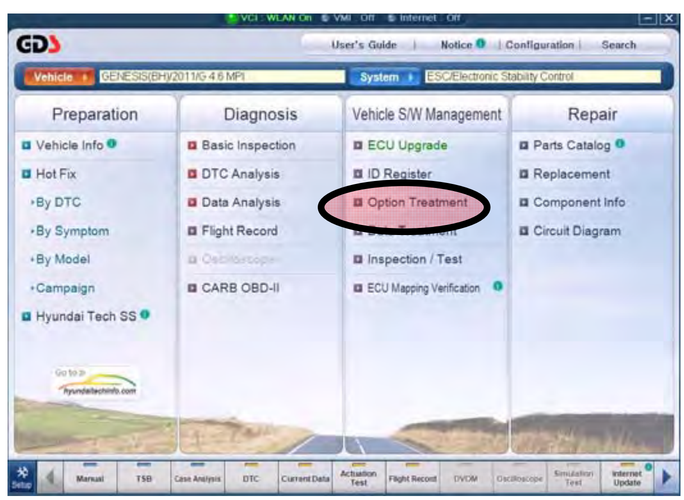
1. Connect GDS VCI to DLC connector. Connect VCI to GDS using USB cable.

   Start the engine and verify that all electrical systems are turned off (no electrical load). Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

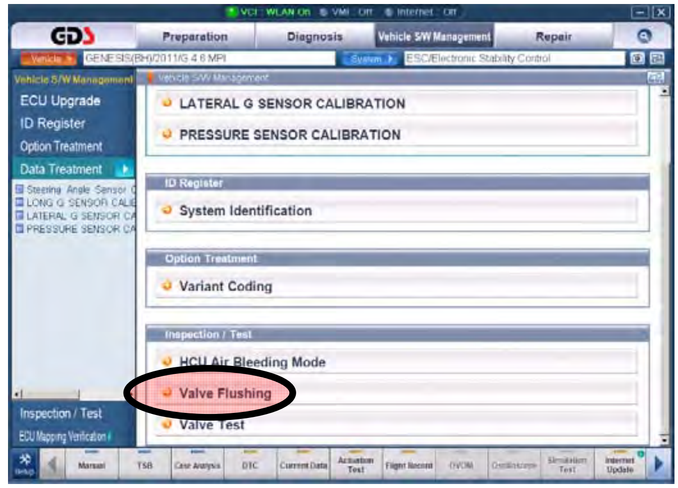


> **✱ NOTE**
>
> Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

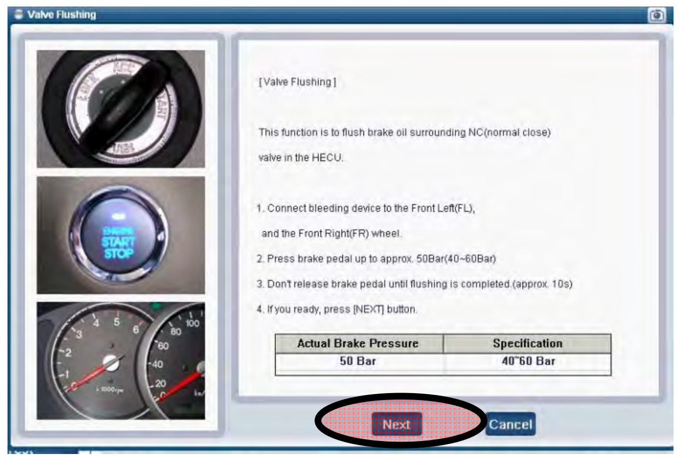
2. Select "Option Treatment" under the Vehicle S/W Management tab.



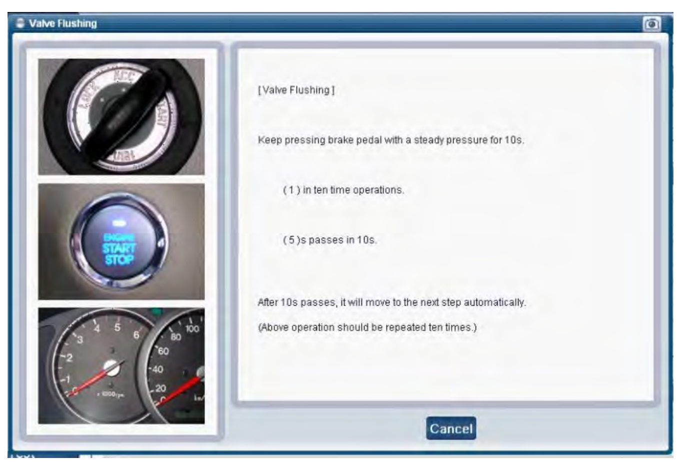
3. Select "Valve Flushing."



4. As directed by the GDS, press and hold the brake pedal to maintain about 50 bar (725 psi) of brake pressure. Press "NEXT" while holding pressure.



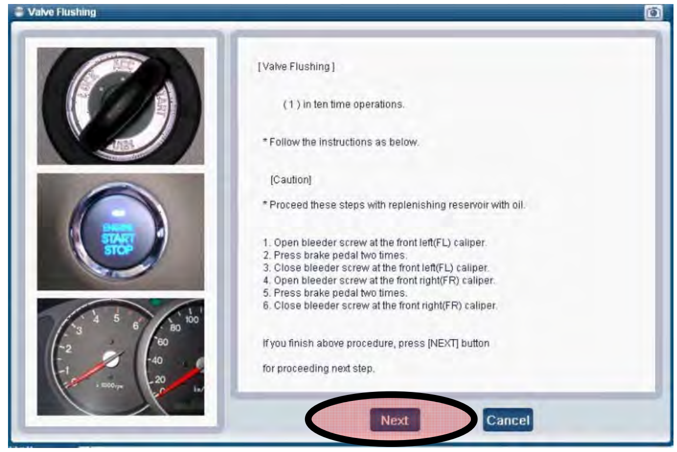
5. The HECU motor will operate and the brake pedal will pulsate for 10 seconds. Maintain holding brake pressure during this time.



6. Bleed front brake assemblies:

Start with the front left brakes.

Press the brake pedal twice and hold. With a bleeding line attached, open the bleeder screw to bleed the line.



✱ NOTE

Some models may have 2 bleeder screws (one inside, one outside). For these models, bleed the outside first (until the fluid level is halfway between MAX and MIN) then move to the inside bleeder (until the fluid is down to MIN).

Repeat for the front right brakes, then press “NEXT.”

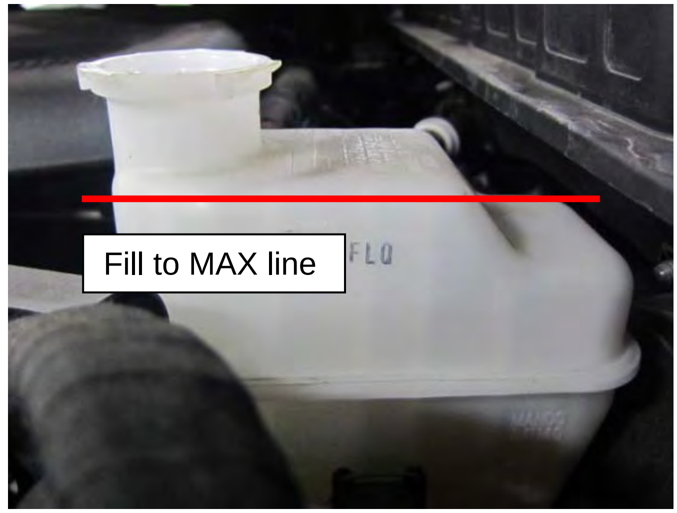
7. Repeat steps 5 and 6 for a total of 10 HECU valve flushing operations. GDS menu screen will count number of iterations.

✱ NOTE

Monitor the level of brake fluid in the master cylinder reservoir. If the fluid drops close to the MIN line, refill to MAX.

After the 10th flushing, the procedure is completed.

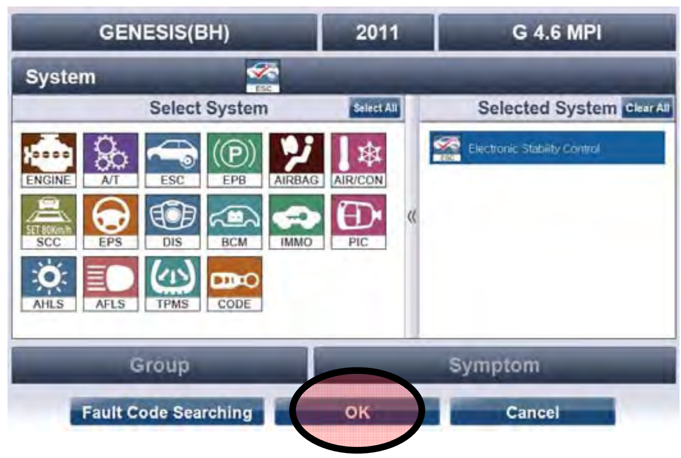
8. Refill the brake fluid in the master cylinder reservoir to the MAX line.



Service Procedure: HECU Unit Inspection

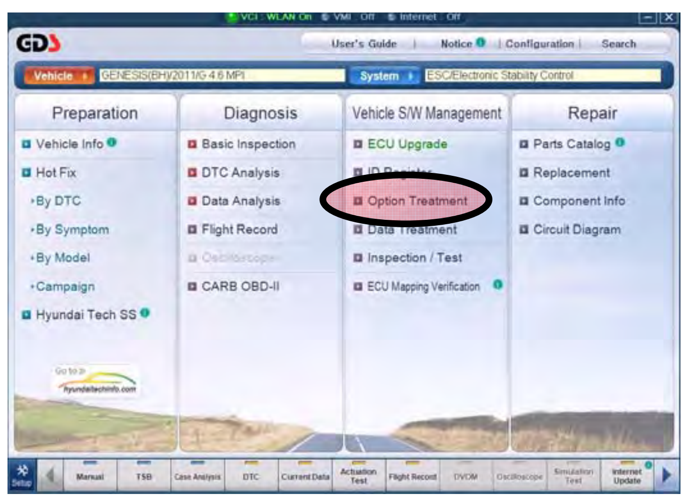
1. Connect GDS VCI to DLC connector. Connect VCI to GDS using USB cable.

   Start the engine and verify that all electrical systems are turned off (no electrical load). Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

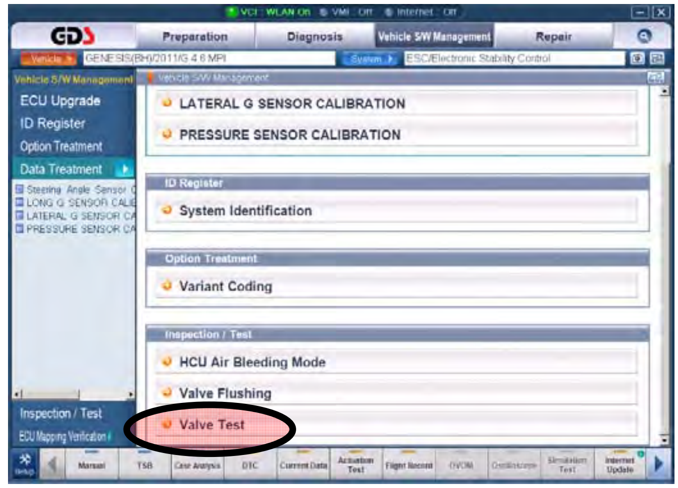


> **✱ NOTE**
>
> Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

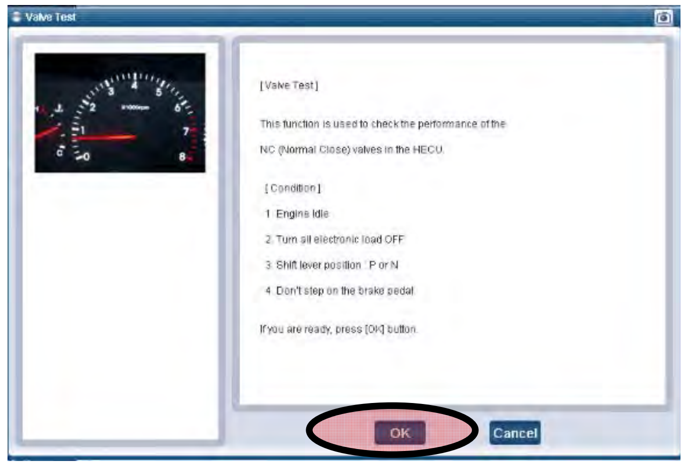
2. Select "Option Treatment" under the Vehicle S/W Management tab.



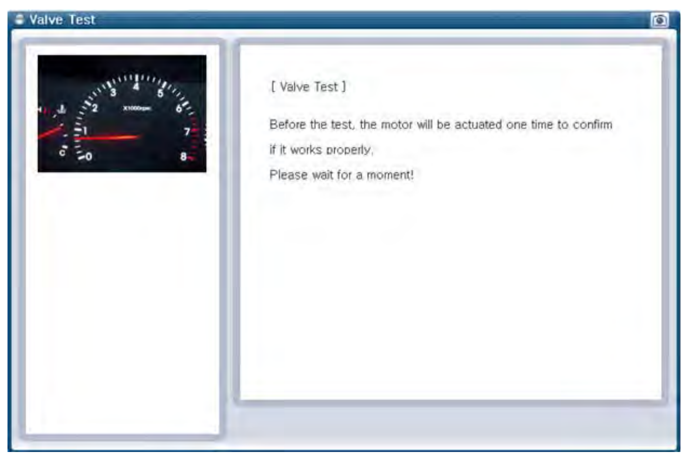
3. Select "Valve Test."



4. Check the vehicle conditions (engine idling, all electronic loads are OFF, shifter in P or N, foot off the brake pedal) and then click "OK."

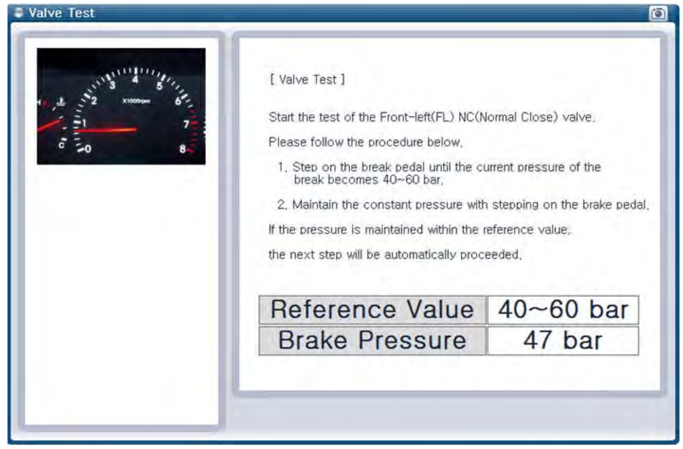


5. Wait for the motor test, which is performed automatically.



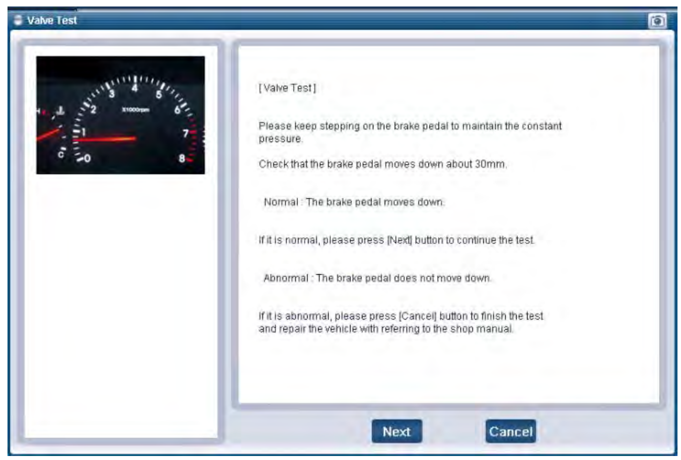
6. The valve test begins with the front left NC (normally closed) valve.

   Step on the brake pedal until the indicated pressure of the brake becomes 40 ~ 60 bar and then maintain the pressure.



7. While maintaining foot pressure on the brake pedal, check that pedal moves down approximately 30mm (1.18”):

   - <u>Pedal moves down</u>: Continue with the HECU inspection (step 8) by clicking “Next.”
   - <u>Pedal does not move down</u>: Click “Cancel” to end the inspection procedure, then replace the HECU according to the applicable shop manual procedures.



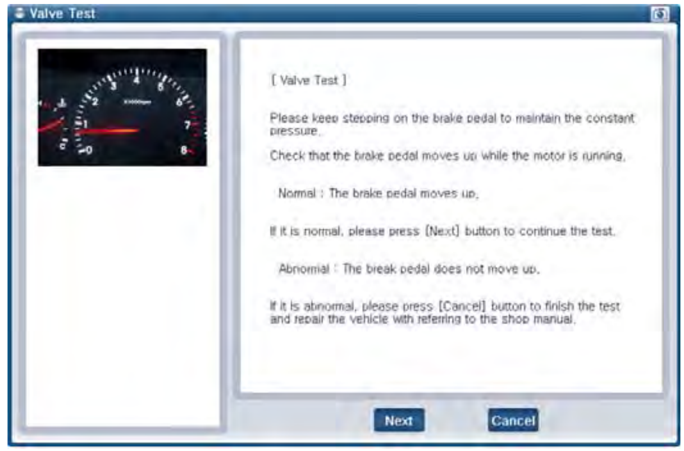
★ IMPORTANT

After HECU replacement, bleed any air from the brake lines at all four calipers in the correct order, then perform the calibration procedures on page 13.

8. While maintaining foot pressure on the brake pedal, check that pedal comes back up:

    - <u>Pedal comes back up</u>: Continue with the HECU inspection (step 9) by clicking "Next."

    - <u>Pedal does not come back up</u>: Click "Cancel" to end the inspection procedure, then replace the HECU according to the applicable shop manual procedures.

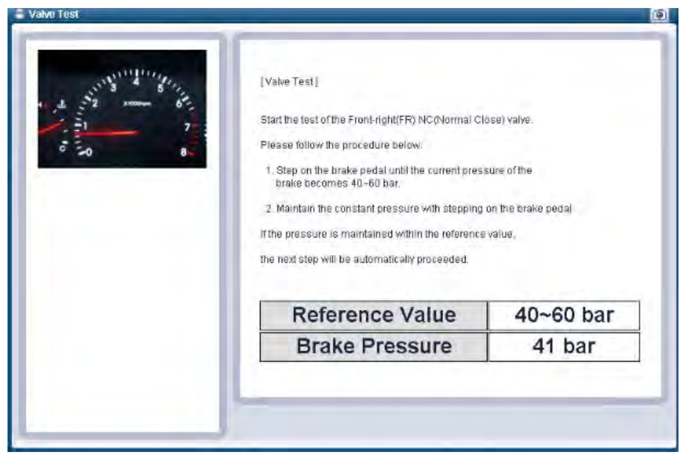


✱ IMPORTANT

After HECU replacement, bleed any air from the brake lines at all four calipers in the correct order, then perform the calibration procedures on page 13.

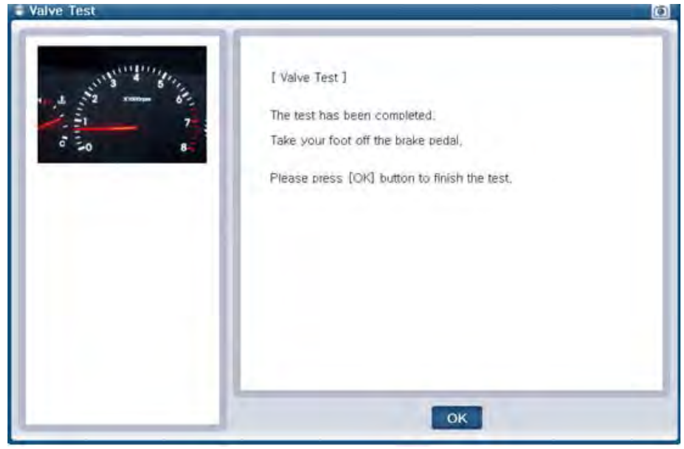
9. The valve test continues with the front right NC (normally closed) valve.

    Repeat steps 6-8 for the front right valve, then move onto the rear left, and rear right valves using the same procedures as directed by the GDS.



10. After all four valves are tested, the test is complete. Press the "OK" button to finish:

- If all valves tested OK: The service procedure is completed.
- If any valve did not pass the test: Replace the HECU according to the applicable shop manual procedures.



★ IMPORTANT

After HECU replacement, bleed any air from the brake lines at all four calipers in the correct order, then perform the calibration procedures on page 13.

Service Procedure: Calibrations Following HECU Replacement

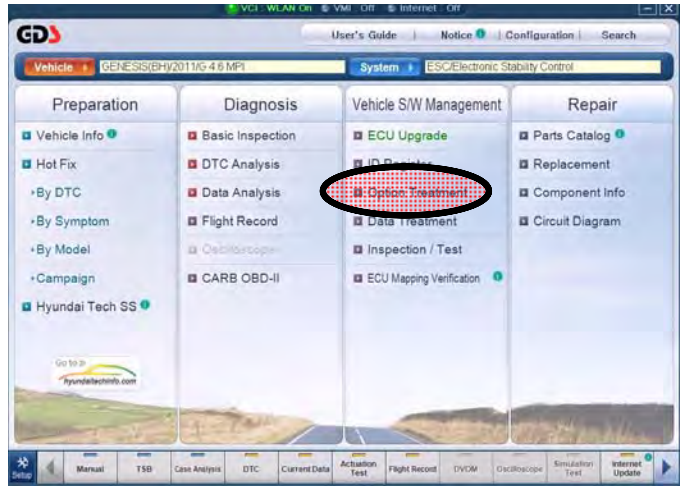
1. Connect GDS VCI to DLC connector. Connect VCI to GDS using USB cable.

   Start the engine and verify that all electrical systems are turned off (no electrical load). Select model and ESC (Electronic Stability Control) system, then press "OK" button on the screen.

★ NOTE

Keep engine idling during this procedure to aid in maintaining adequate brake pressure.

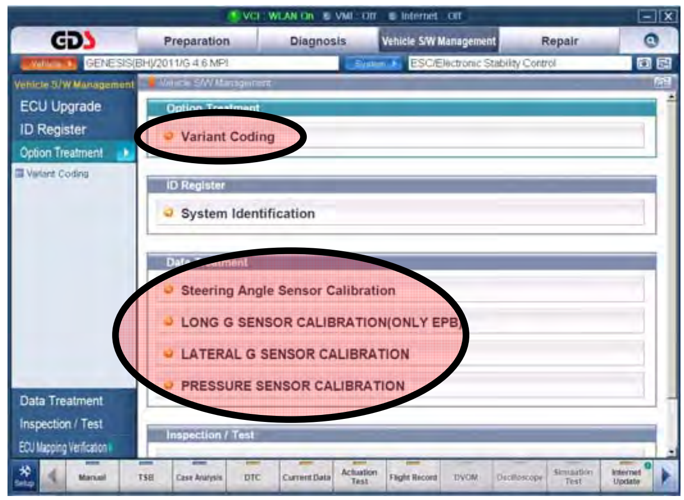
2. Select "Option Treatment" under the Vehicle S/W Management tab.



3. After HECU replacement, it is required to perform 5 calibrations:

   - Variant Coding
   - Steering Angle Sensor Calibration
   - Long G Sensor Calibration (ONLY EPB)
   - Lateral G Sensor Calibration
   - Pressure Sensor Calibration

   Perform these by clicking on each one, and following the GDS instructions.



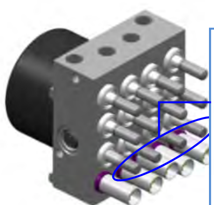
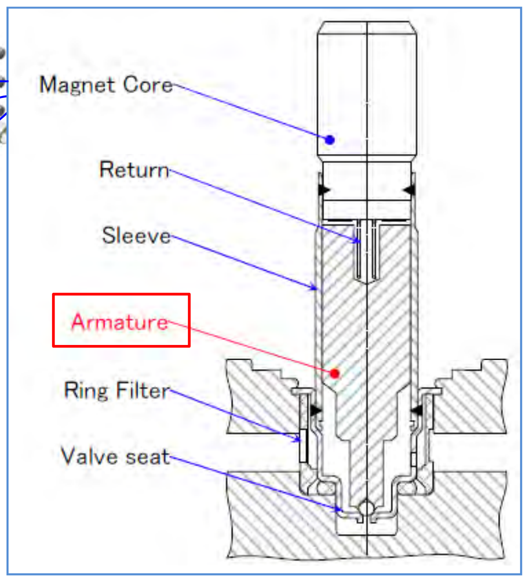
ATTACHMENT C

10-1. HECU Part History

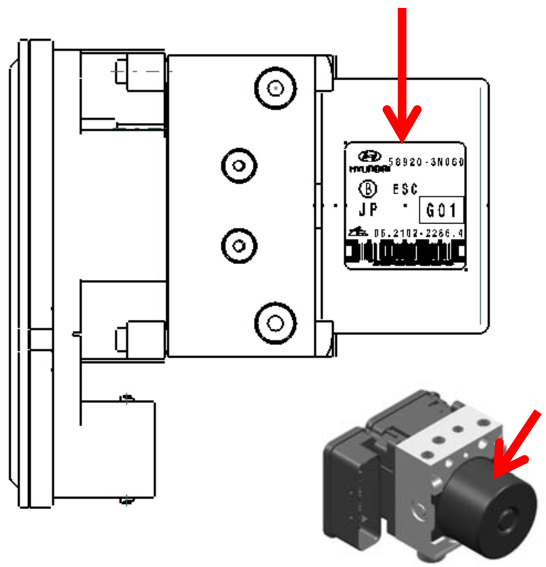
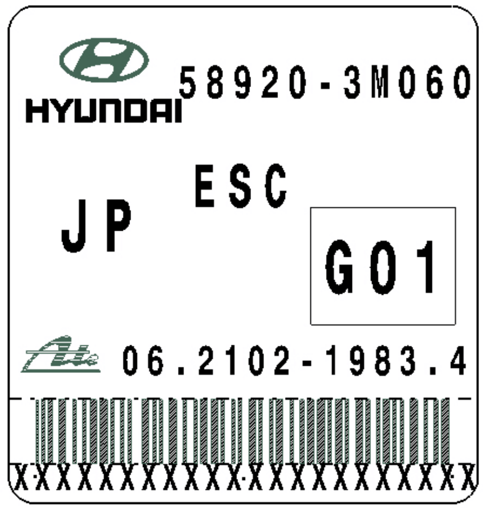
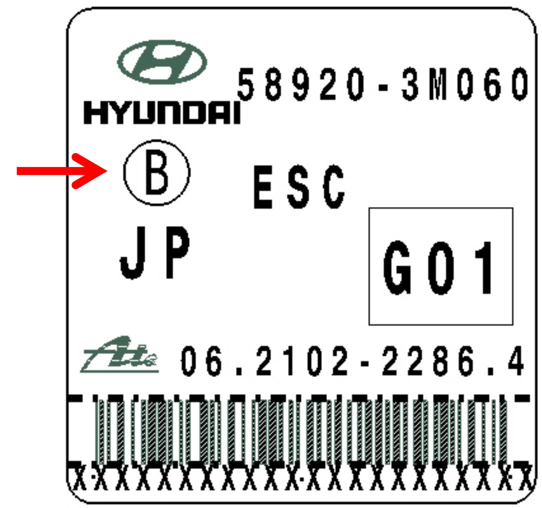
HECU Part revision history

Summary

- **Finish** treatment of NC valve's **Armature** was changed
  (HMC's plant vehicle production date : 2012.03.29)
  ※ There was no change of Part No for HECU Assy, but added mark B on the label ☞ *#see next page*
  HECU's Internal parts were not indicated in HMC's Drawing as well as out of HMC's engineering control scope (Supplier's scope of control)

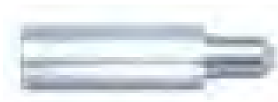
Detail item	Before	After
 HECU  NC Valve	• Zinc Coating  	• Black Oxide Coating (supplier : '2012.03.12~)  

HECU label

<table>
<tr><th></th><th>Before</th><th>After</th></tr>
<tr>
<td>Label location
</td>
<td>Armature finish : Zinc coating

</td>
<td>Armature finish : Black Oxide

</td>
</tr>
</table>

Comparison Data of HMC's ESC HECU Supplier

Comparison armature (Continental) with other supplier (MANDO & MOBIS)

Supplier	Material	Finish treatment	Armature shape
Continental	SUM24L	Zinc coating → Black Oxide coating	
MANDO	SUM24L	Black Oxide coating	
MOBIS	SCM415	No finish (Inhibit oil)	

ATTACHMENT D

12-1. Part Information

12. Part Information

BH ESC ('08.4/1 ~ '11.3/27)

HMC Product P/No	Service P/No	
✓ **58920-3M050** (include 58920-3M000)	✓ **58920-3M0A5 (include 58920-3M0A0)**	6AT ,MPI
✓ **58920-3N200**	✓ **58920-3N2A0**	6AT, MPI, with EPB
✓ **58920-3N300**	✓ **58920-3N3A0**	6AT, MPI, with EPB + SCC

BH ESC ('11.3/28~ , 8AT AND GDI)

HMC Product P/No	Service P/No	
✓ **58920-3M060**	✓ **58920-3M0A6**	8AT, MPI & GDI,
✓ **58920-3M260**	✓ **58920-3M2A6**	8AT, MPI & GDI, with EPB
✓ **58920-3M360**	✓ **58920-3M3A6**	8AT, MPI & GDI, with EPB + SCC

HYUNDAI MOTOR GROUP

12. Supplier Information

1) Supplier's name : Continental Automotive Corporation

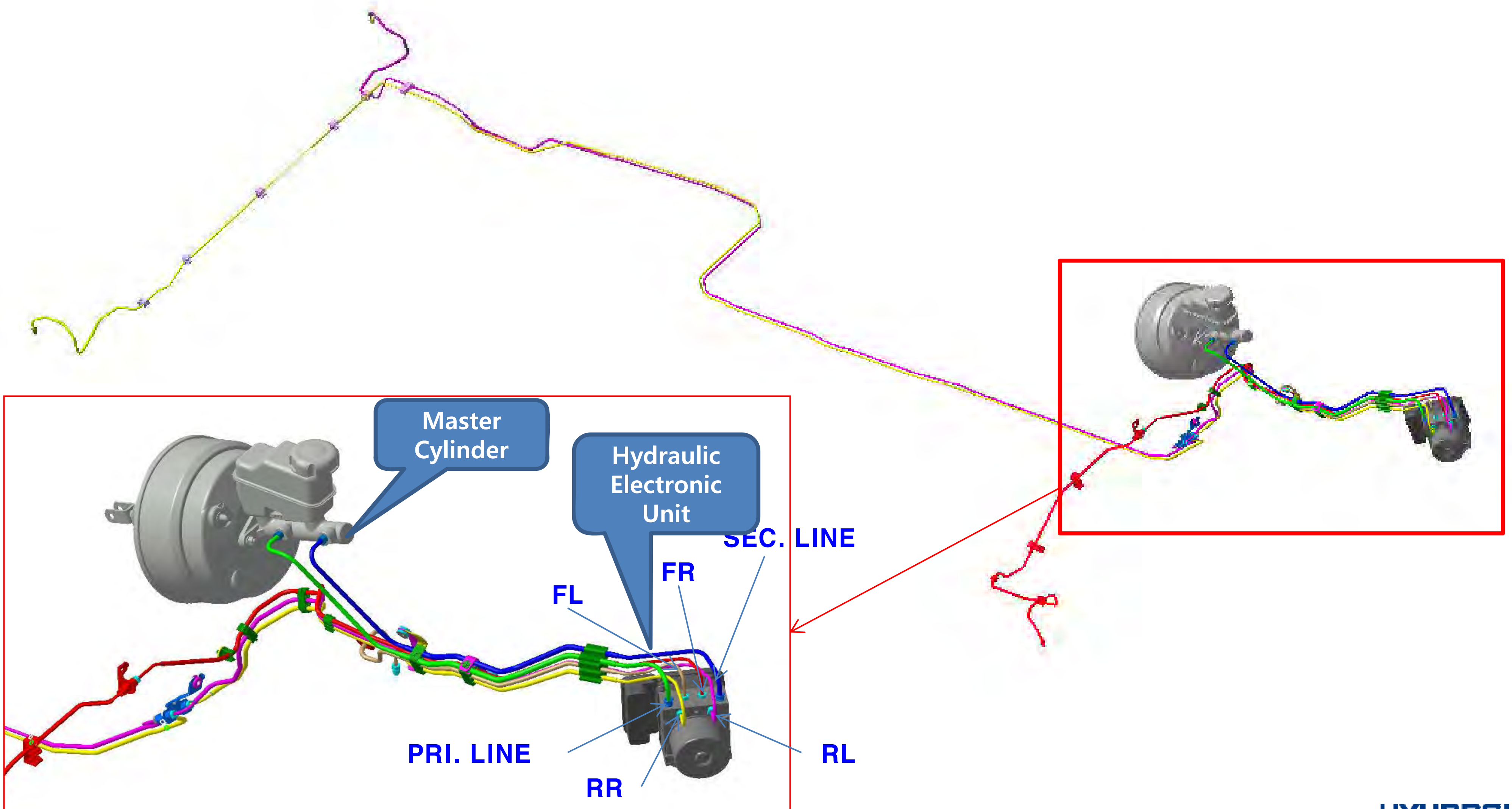
2) Address: 7F Solid Space Bldg, 220 Pangyoyeok-ro,
Bundang-gu, Seongnam-si, Gyeonggi-do 463-400,
Korea

3) Contact person: Taeseung Song
Head of Customer Quality
Continental Automotive Corp. Korea
Continental Chassis & Safety Division
Phone: +82.31.697.3902

ATTACHMENT E

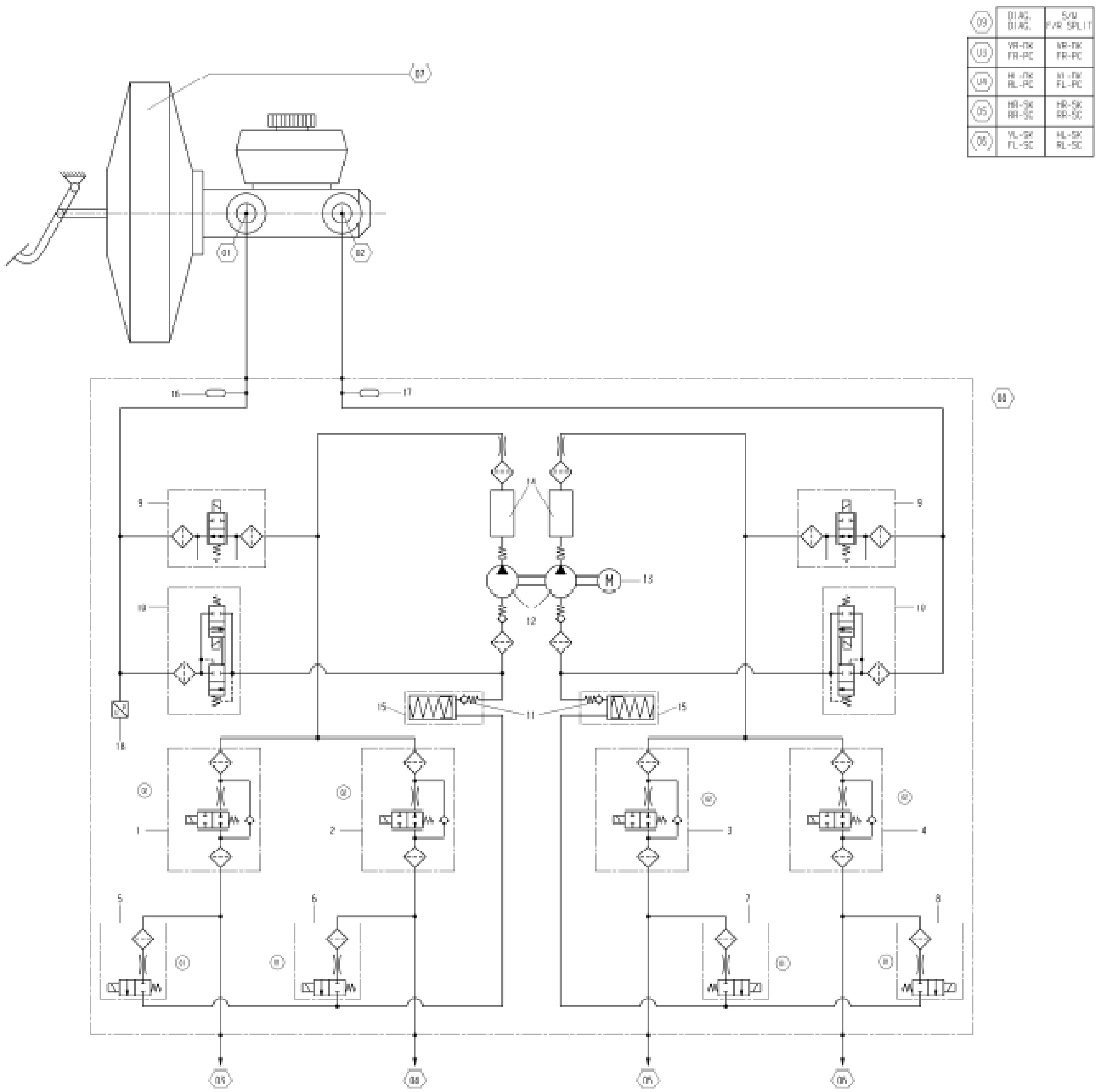
13-1. Brake and HECU Information

Brake System Hydraulic Line



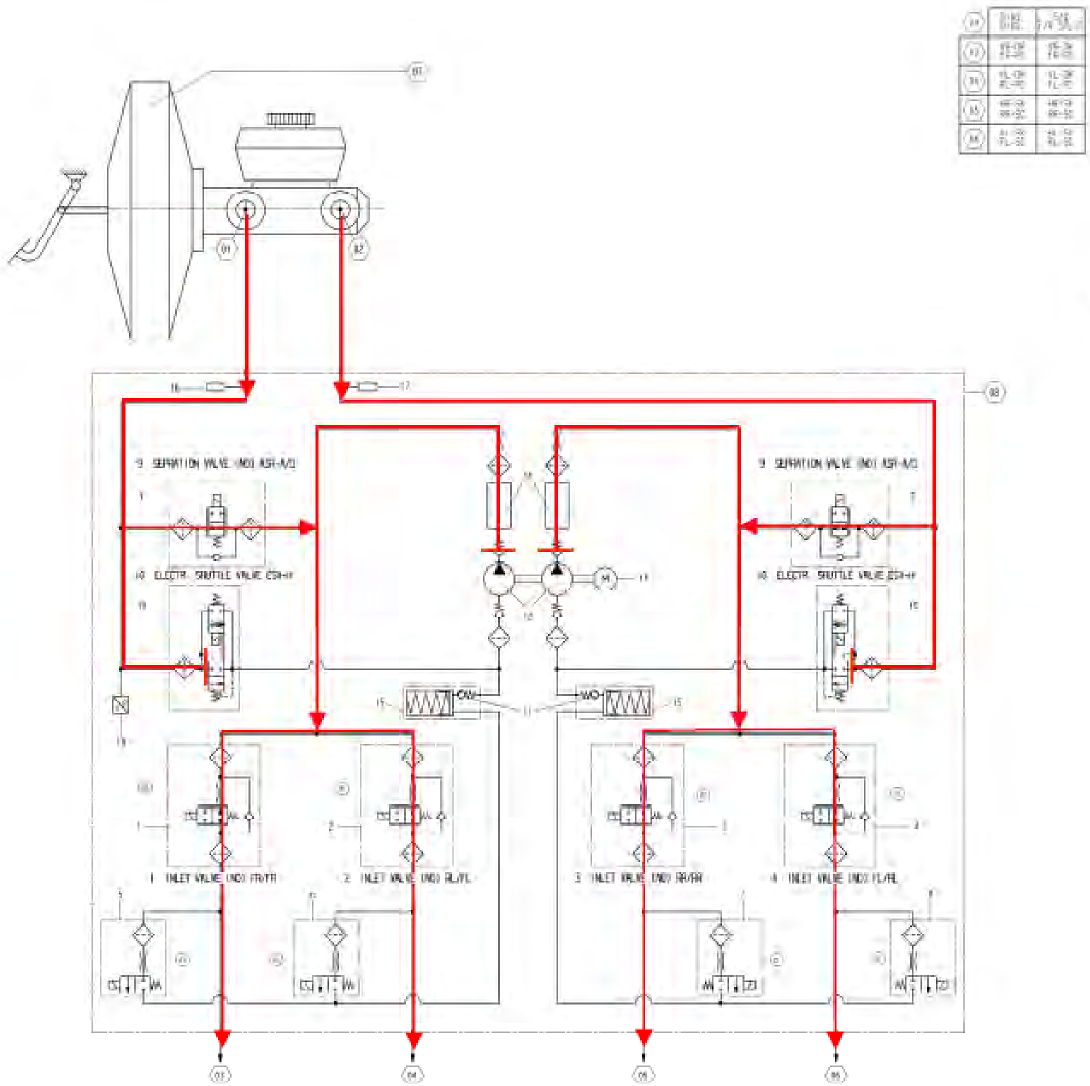
HYUNDAI MOTOR GROUP

Brake Hydraulic flow Diagram (BH, MK25E model)



01	PRIMARY CIRCUIT
02	SECONDARY CIRCUIT
03	CONNECTION SEE LIST
04	CONNECTION SEE LIST
05	CONNECTION SEE LIST
06	CONNECTION SEE LIST
07	ACTUATION UNIT CPL.
08	HCU CPL. 1 INLET VALVE (NO) FR/FR 2 INLET VALVE (NO) RL/FL 3 INLET VALVE (NO) RR/RR 4 INLET VALVE (NO) FL/RL 5 OUTLET VALVE (NC) FR/FR 6 OUTLET VALVE (NC) RL/FL 7 OUTLET VALVE (NC) RR/RR 8 OUTLET VALVE (NC) FL/RL 9 SEPRATION VALVE (NO) ASR-A/D 10 ELECTR. SHUTTLE VALVE ESV-H 11 CHECK VALVE 12 DUAL CIRCUIT HYDRAULIC PUMP 13 D.C. MOTOR 14 DAMPENING CHAMBER 15 LOW PRESSURE ACCUMULATOR 16 PULSATION DAMPER P. C. 17 PULSATION DAMPER S. C. 18 PRESSURE SENSOR
09	HYDRAULIKPORT CONNECTION LIST

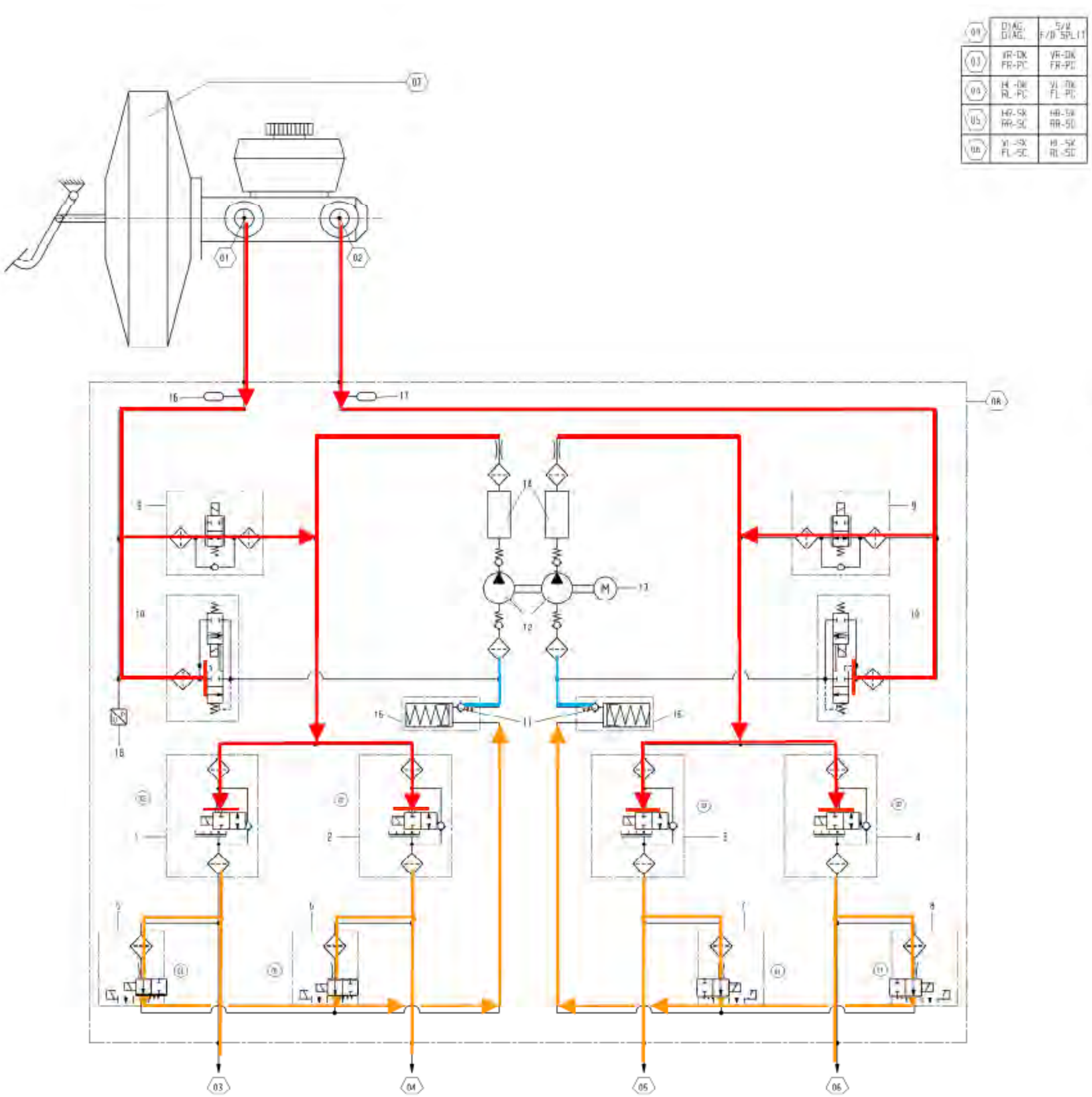
Brake Hydraulic flow Diagram - Normal Braking mode



TMC pressure (Master Cylinder)

1) Normal braking, NO & NC valves in standard mode

Brake Hydraulic flow Diagram – ABS Braking mode



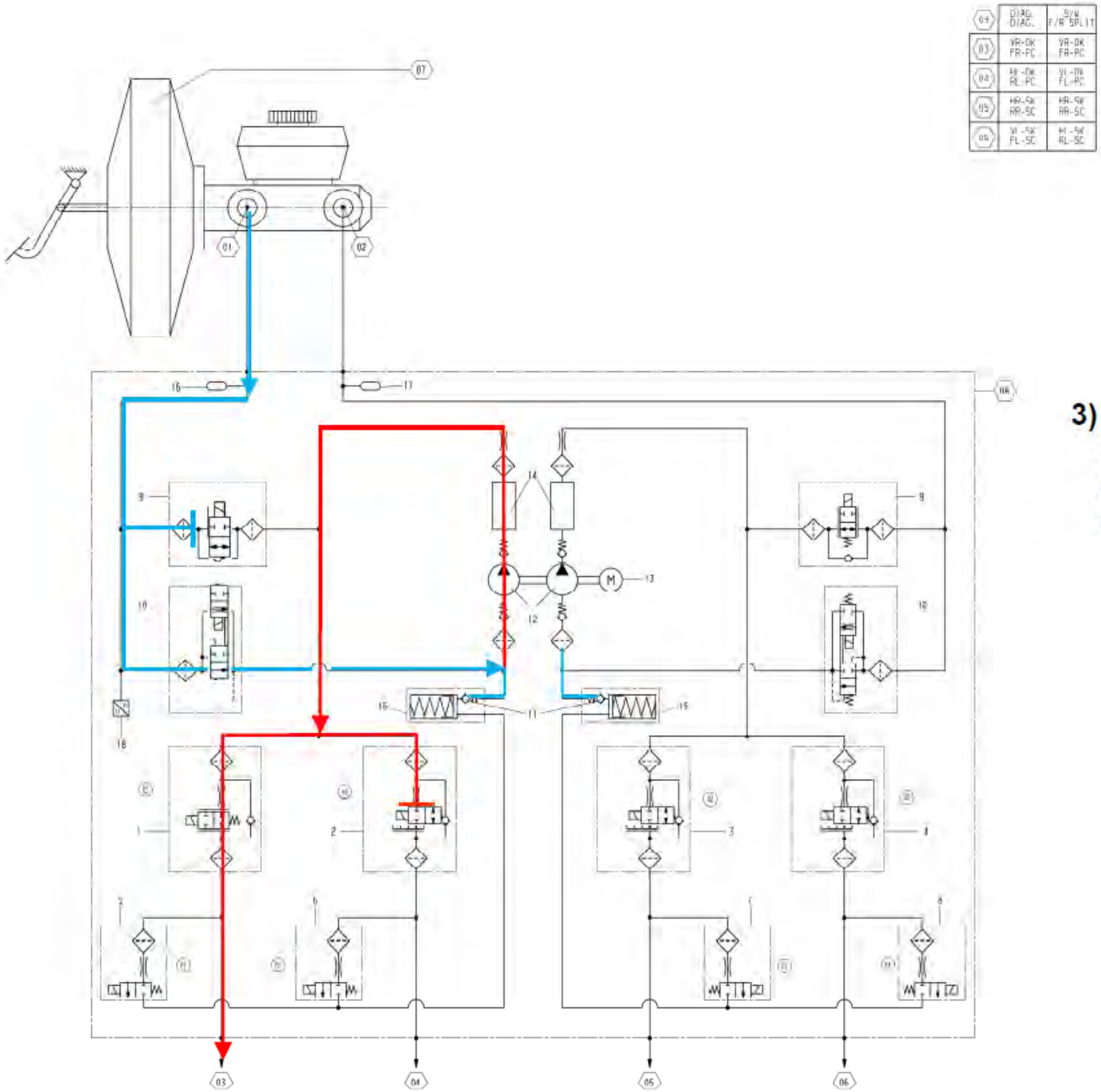
TMC pressure (Master Cylinder)

ABS regulated pressure

LPA pressure (Low Pressure Accumulator)

2) ABS braking, NO (closed state), NC (open state)

Brake Hydraulic flow Diagram – ESC Braking mode

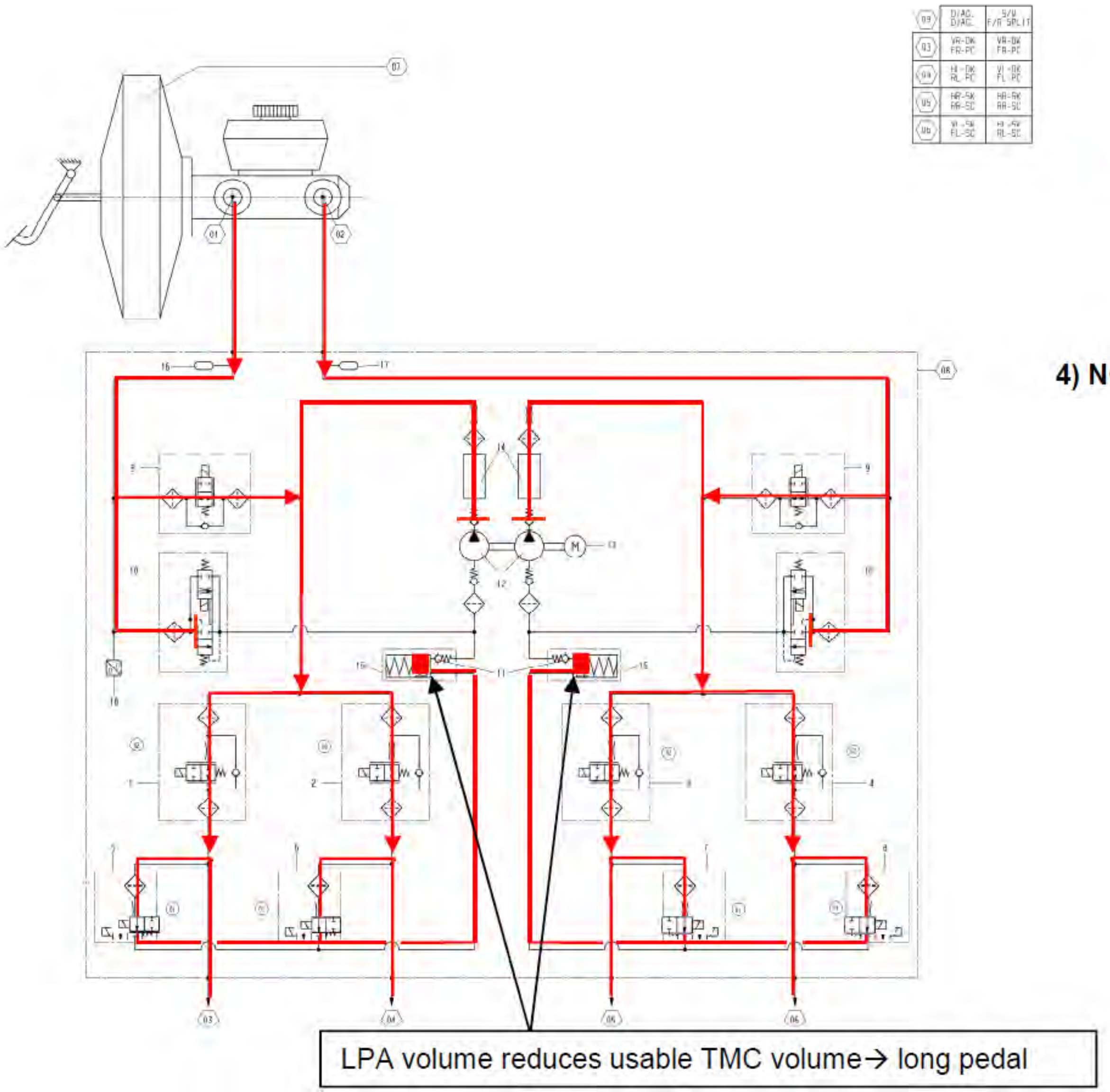


TMC pressure (Master Cylinder)

LPA pressure (Low Pressure Accumulator)

3) ESC braking (one wheel pressure build up shown)
NO & NC valves in standard mode
NO Separation valve (closed state),
NC Electr. shutter valve (open state)

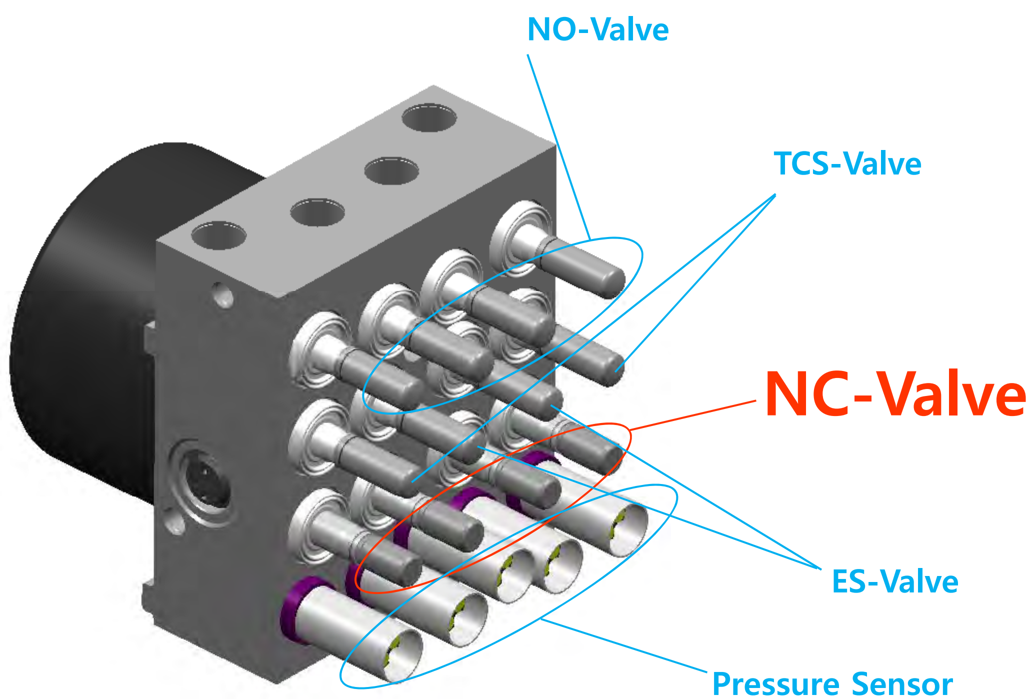
Brake Hydraulic flow Diagram – NC valve failure mode

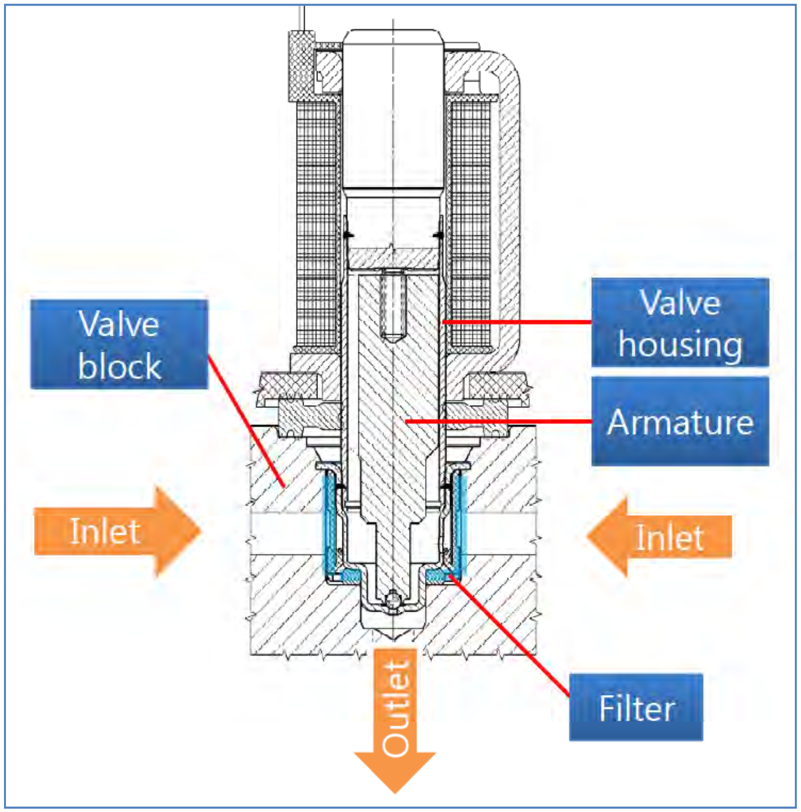


TMC pressure (Master Cylinder)

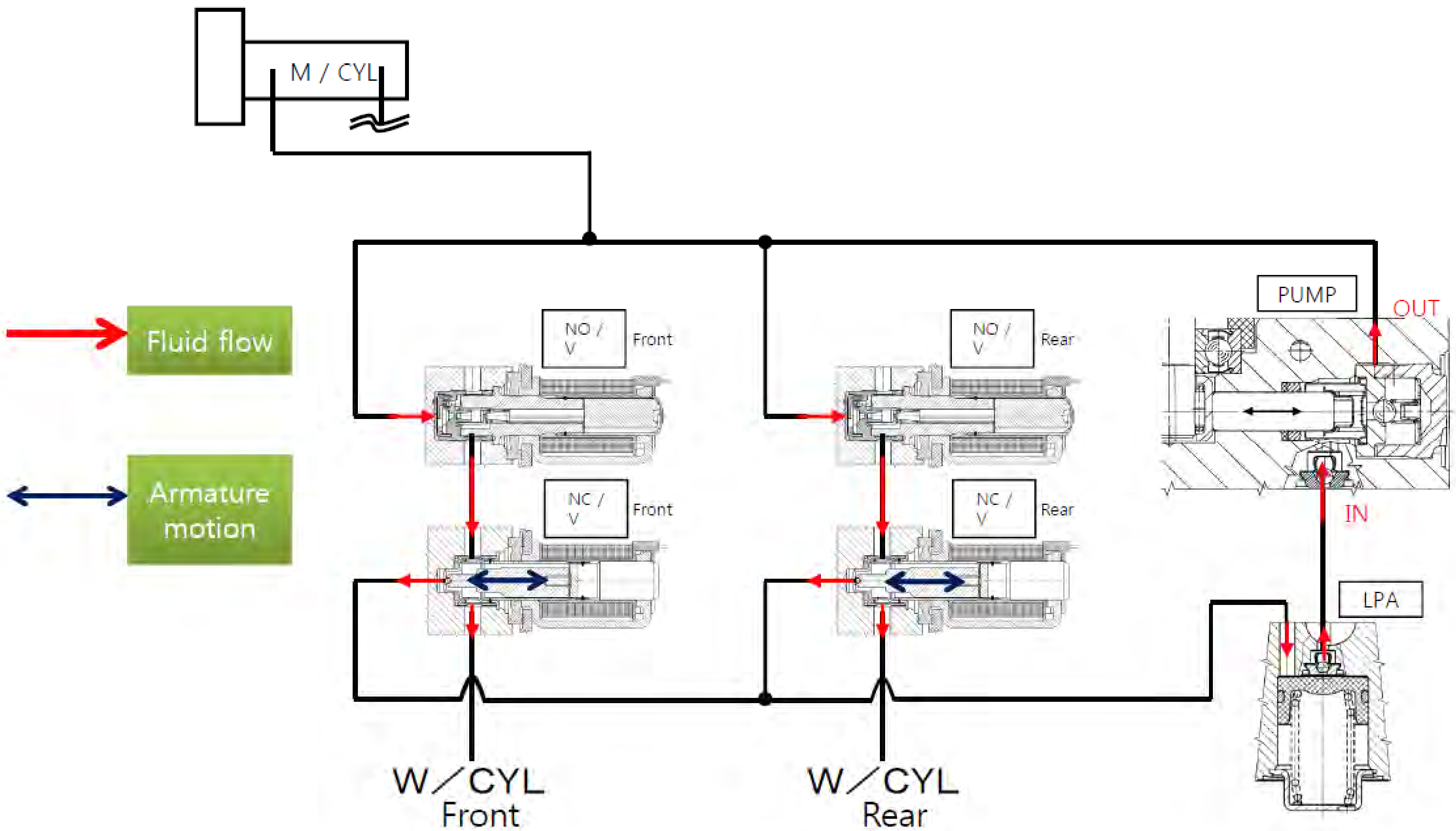
4) NO valve (open state) & <u>NC valves defect (open state)</u>

Detailed information for NC valve



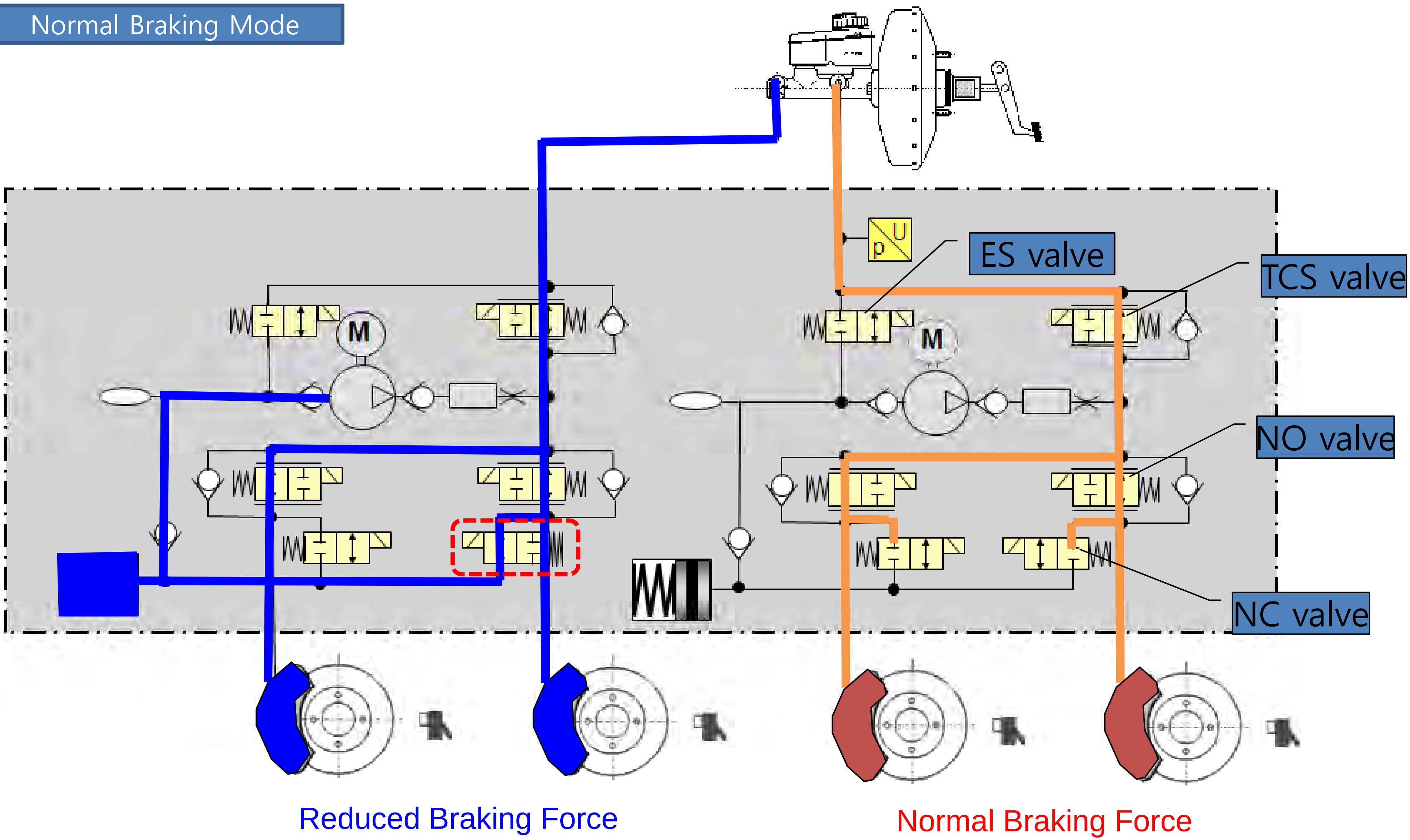


Brake Hydraulic flow Diagram & NC valve armature motion



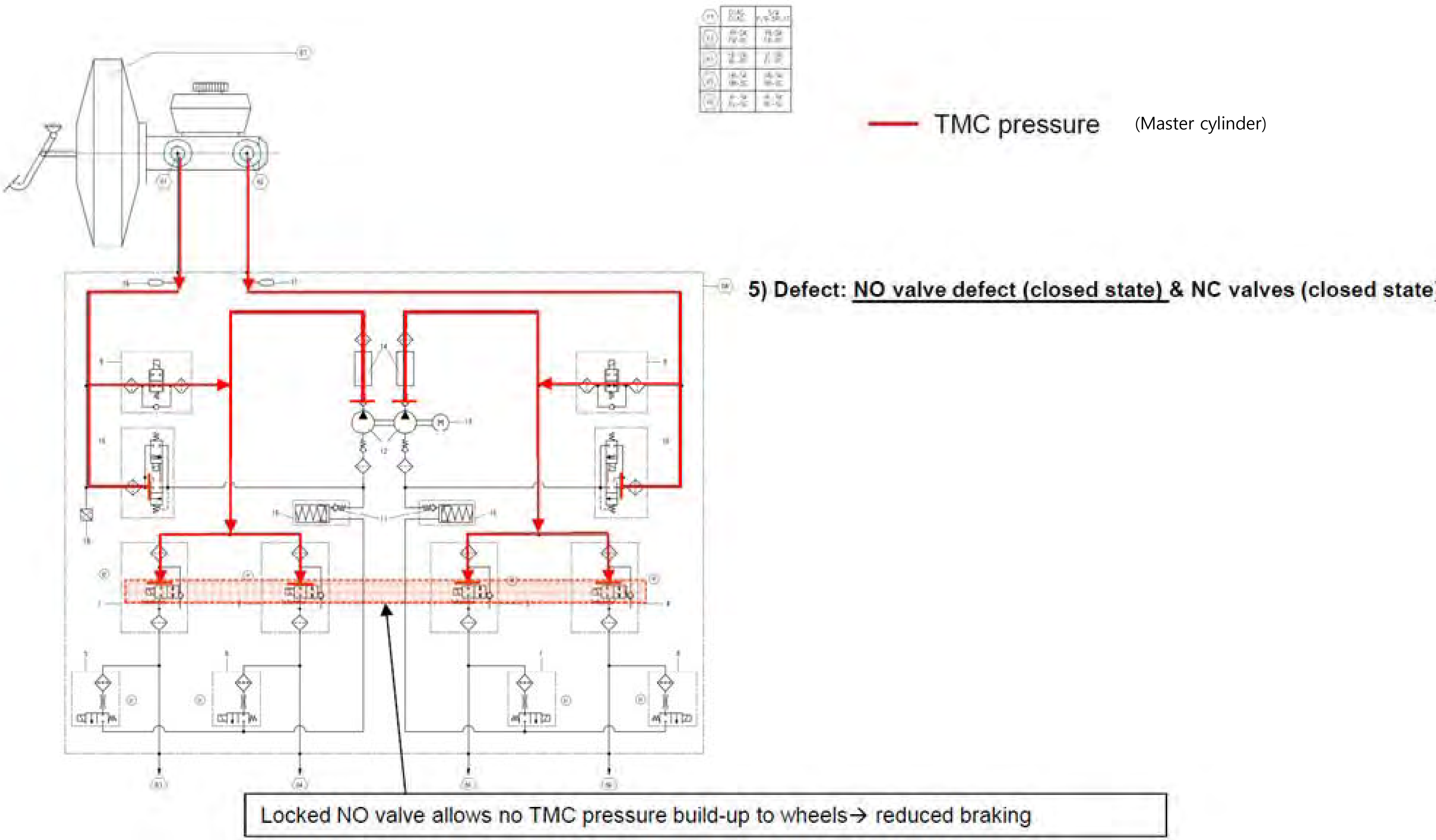
Brake Hydraulic flow Diagram – Comparison NC valve failure mode with normal condition

Normal Braking Mode



HYUNDAI MOTOR GROUP

Brake Hydraulic flow Diagram – NO valve failure mode



ATTACHMENT E

13-2. ESC Description

Description of ESC

Optimum driving safety now has a name: ESC, the Electronic Stability Control.

ESC recognizes critical driving conditions, such as panic reactions in dangerous situations, and stabilizes the vehicle by wheel-individual braking and engine control intervention.

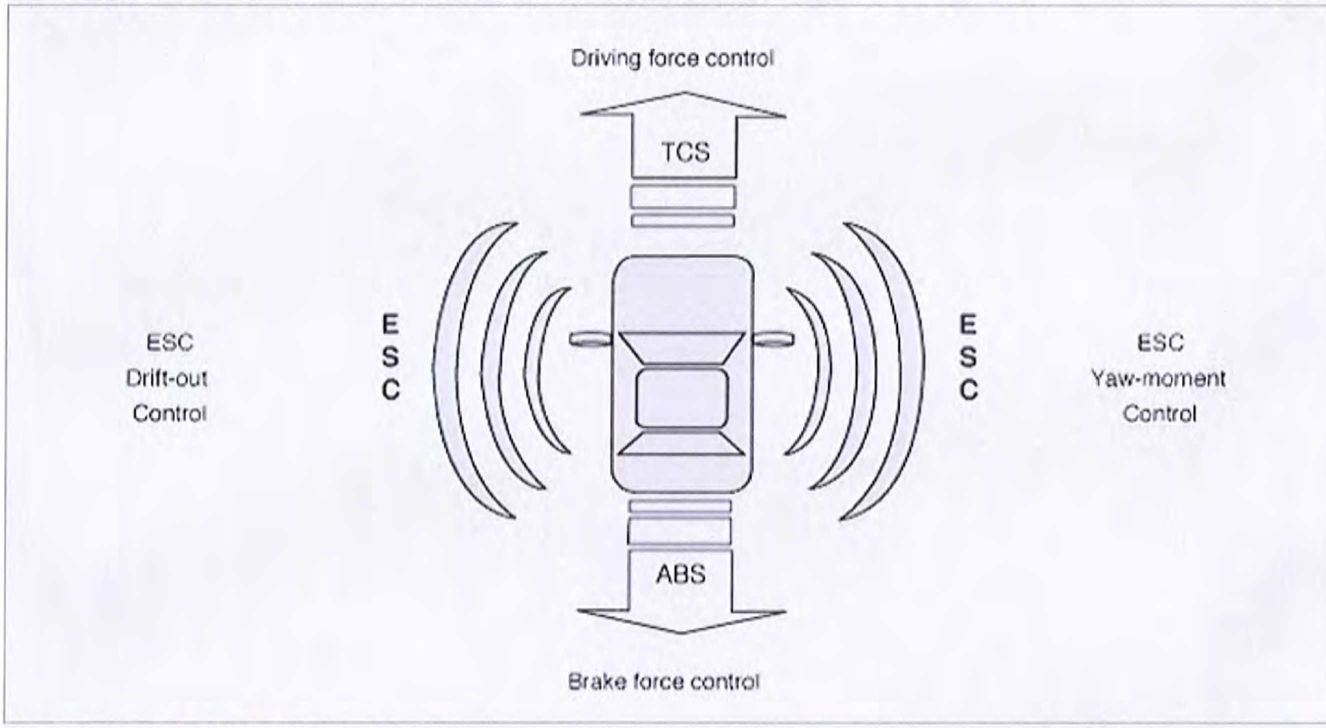
ESC adds a further function known as Active Yaw Control (AYC) to the ABS, TCS, EBD and EDC functions. Whereas the ABS/TCS function controls wheel slip during braking and acceleration and, thus, mainly intervenes in the longitudinal dynamics of the vehicle, active yaw control stabilizes the vehicle about its vertical axis.

This is achieved by wheel individual brake intervention and adaptation of the momentary engine torque with no need for any action to be taken by the driver.

ESC essentially consists of three assemblies: the sensors, the electronic control unit and the actuators.

The stability control feature works under all driving and operating conditions. Under certain driving conditions, the ABS/TCS function can be activated simultaneously with the ESC function in response to a command by the driver.

In the event of a failure of the stability control function, the basic safety function, ABS, is still maintained.



Description of ESC Control

ESC system includes ABS/EBD, TCS and AYC function.

ABS/EBD function The ECU changes the active sensor signal (current shift) coming from the four wheel sensors to the square wave.

By using the input of above signals, the ECU calculates the vehicle speed and the acceleration & deceleration of the four wheels.

And, the ECU judges whether the ABS/EBD should be actuated or not.

TCS function prevents the wheel slip of drive direction by adding the brake pressure and engine torque reduction via CAN communication.

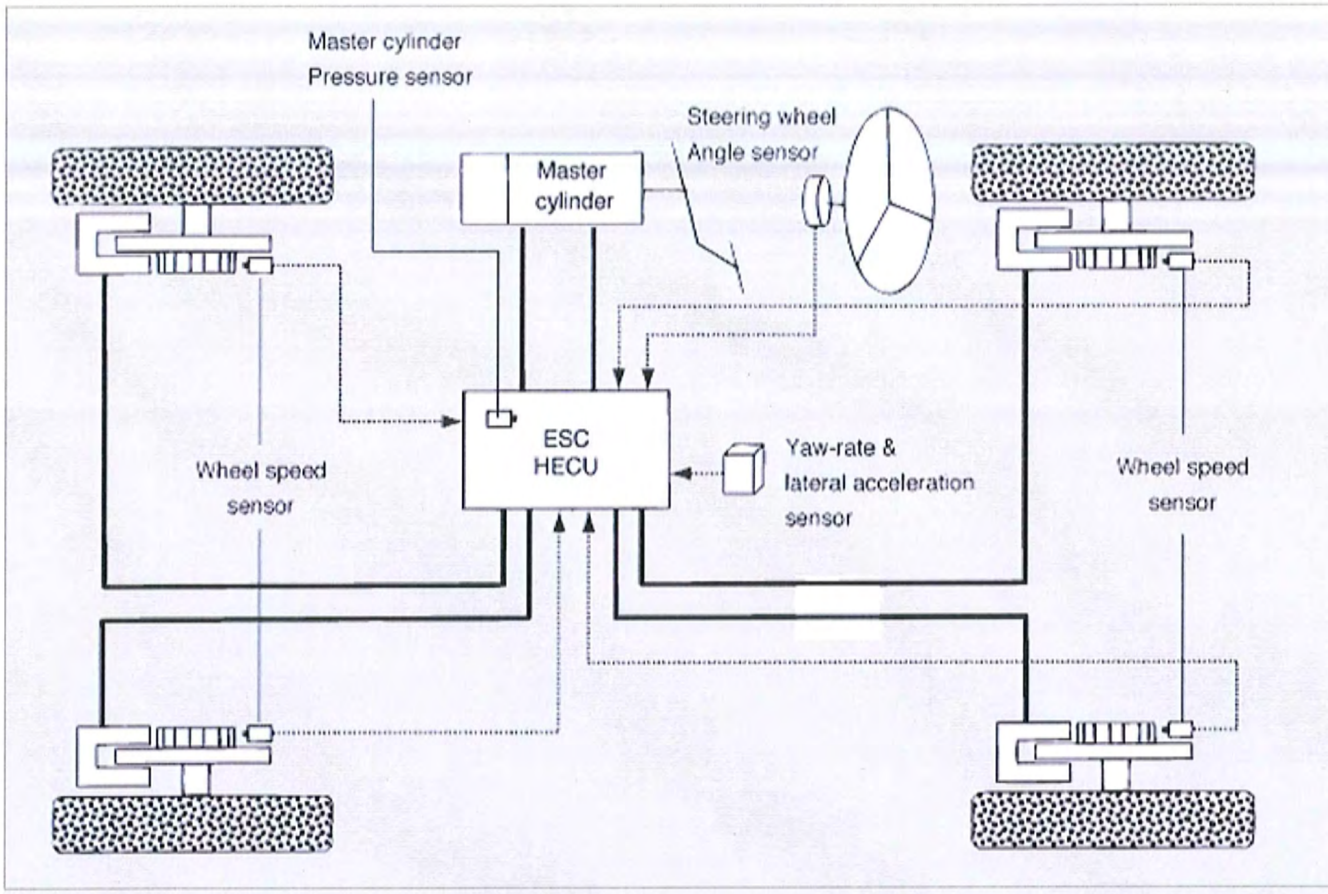
TCS function uses the wheel speed sensor signal to determine the wheel slip as far as ABS function.

AYC function prevents unstable maneuver of the vehicle. To determine the vehicle maneuver, AYC function uses the maneuver sensor signals(Yaw Rate Sensor, Lateral Acceleration Sensor, Steering Wheel Angle Sensor).

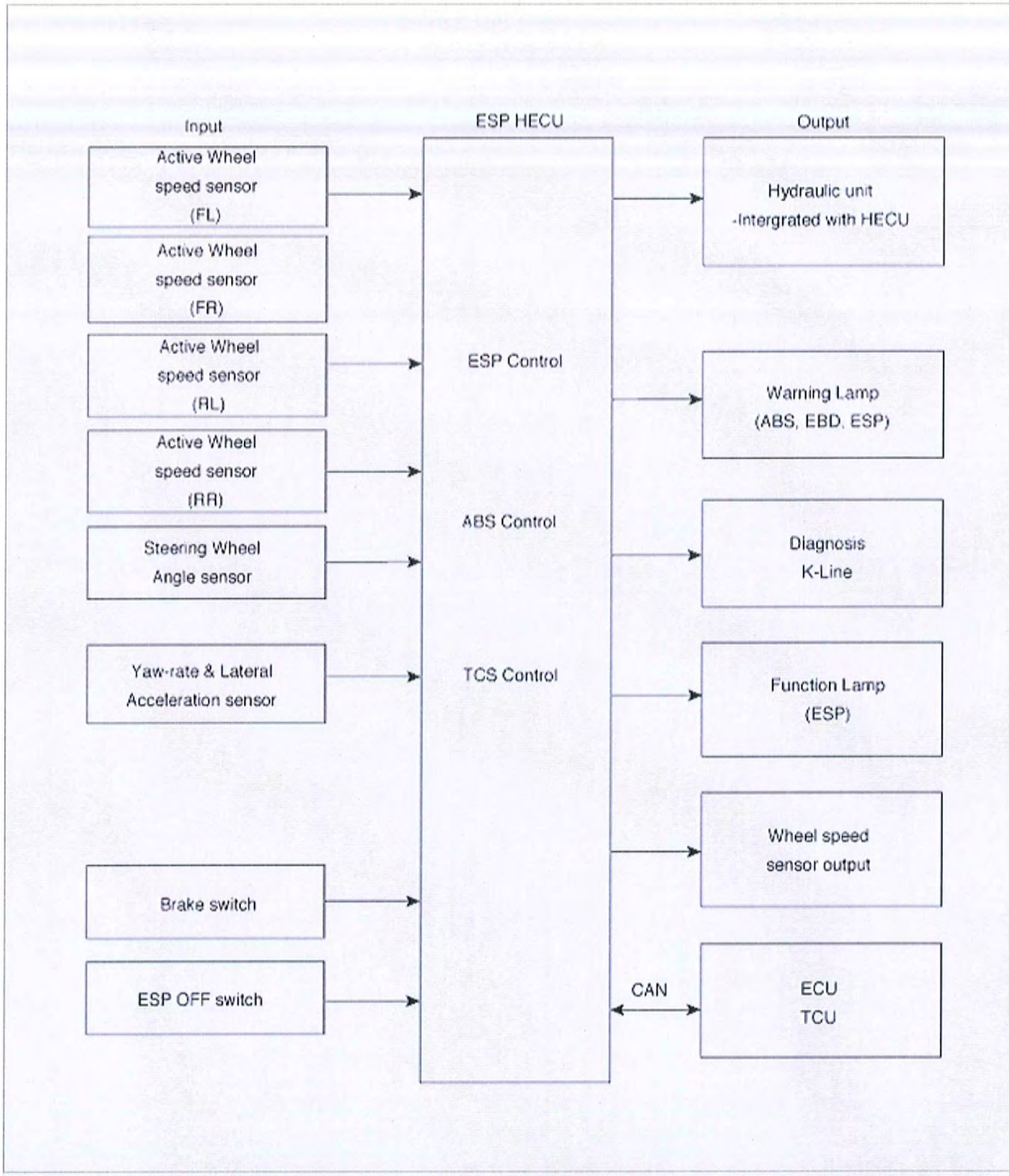
If vehicle maneuver is unstable (Over Steer or Under Steer), AYC function applies the brake pressure on certain wheel, and send engine torque reduction signal by CAN.

After the key-on, the ECU continually diagnoses the system failure. (Self-diagnosis)

If the system failure is detected, the ECU informs driver of the system failure through the BRAKE/ABS/ESC warning lamp. (fail-safe warning)

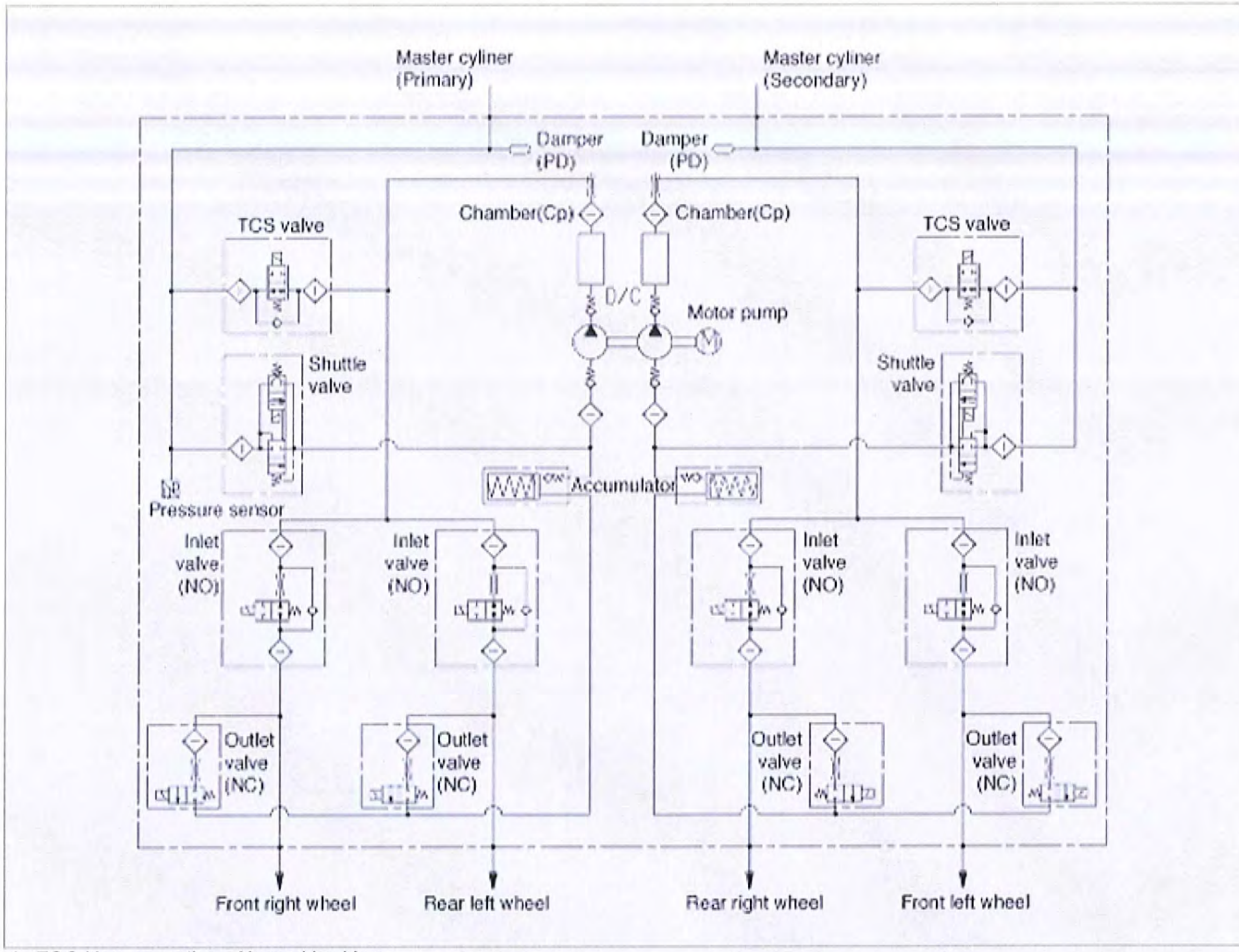


Input and Output Diagram



ESC Operation Mode

ESC Hydraulic System Diagram



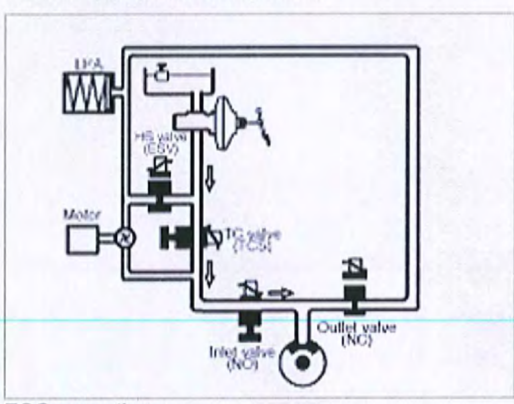
1. ESC Non-operation : Normal braking.

Solenoid valve	Continuity	Valve	Motor pump	TC Valve
IN (NO)	OFF	OPEN	OFF	OFF
OUT (NC)	OFF	CLOSE		

Operation

In this position, the inlet valve and the TCS valve are open, the electrically operated shuttle valve and the outlet valve are closed.

*ESV: Electric reversing valve.

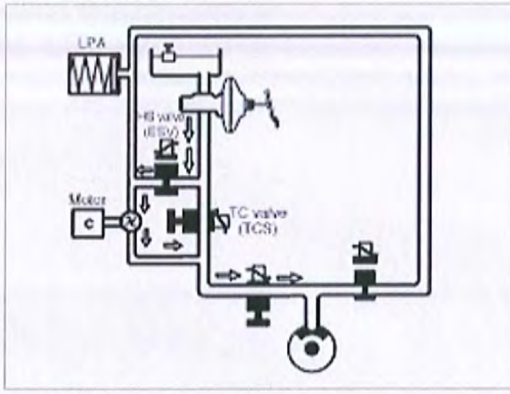


2. ESC operation

Solenoid valve		Continuity	Valve	Motor pump	TC Valve
Under steering (Only inside of rear wheel)	IN(NO)	OFF	OPEN	ON	ON
	OUT(NC)	OFF	CLOSE		
Over steering (Only outside of front wheel)	IN(NO)	OFF	OPEN		
	OUT(NC)	OFF	CLOSE		

Operation

The on/off booster builds up a pressure of approx. 10 bar in order to enable the ESC pump to suck brake fluid at low temperatures. In this position, the inlet valve is driven in a pulsed cycle. The TCS valve is closed. The outlet valve remains closed. The electrically operated shuttle valve is opened. The hydraulic pressure is led to the wheel brakes which are to be applied for a brief period of time.

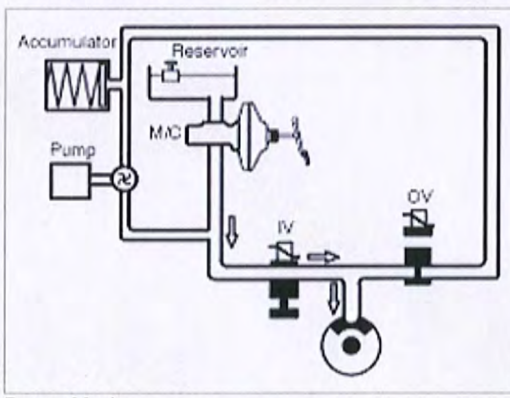


ABS Operation Mode

1. Normal Braking

Solenoid valve	State	Valve	Passage
Inlet valve (NO)	OFF	OPEN	Master cylinder⇔Wheel cylinder
Outlet valve (NC)	OFF	CLOSE	Wheel cylinder⇔Reservoir

When braking, the hydraulic pressure in the TMC is increased. The pressure reaches the wheel brake via the current less open inlet valve IV. The current less closed outlet valve OV is closed. For the sake of simplicity the diagram is limited to only the solenoid valve pair of one brake circuit. The wheel speed is reduced as the brake pressure increases, in the extreme case until the wheel locks.

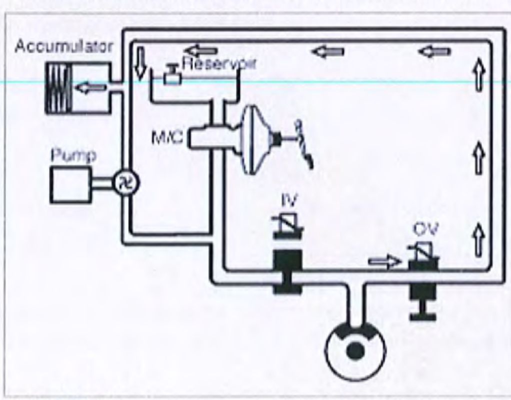


2. Dump Mode

Solenoid	State	Valve	Passage
Inlet valve (NO)	ON	CLOSE	Master cylinder⇔Wheel cylinder
Outlet valve (NC)	ON	OPEN	Wheel cylinder⇔Reservoir

If the wheel speed decreases, there is still a tendency to lock; the brake pressure on the corresponding wheel must be reduced accordingly. For this, the outlet valve OV is opened, the inlet valve IV remains closed.

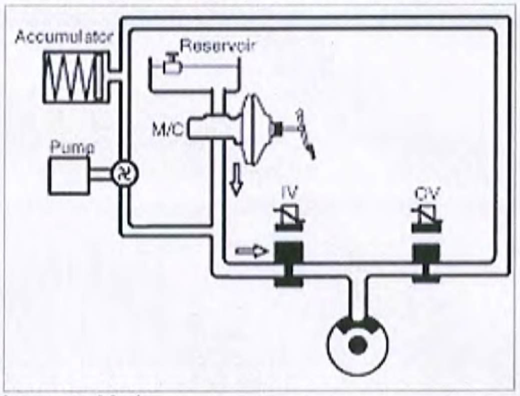
The brake pressure to the low-pressure accumulator is reduced. The wheel in danger of locking gains speed again.



3. Hold Mode

Solenoid	State	Valve	Passage
Inlet valve (NO)	ON	CLOSE	Master cylinder⇔Wheel cylinder
Outlet valve (NC)	OFF	CLOSE	Wheel cylinder⇔Reservoir

When a wheel (or several) tends to lock the inlet valve IV is first closed to avoid a further increase in brake pressure. The outlet valve OV remains closed: the brake pressure is kept constant.



4. Increase Mode

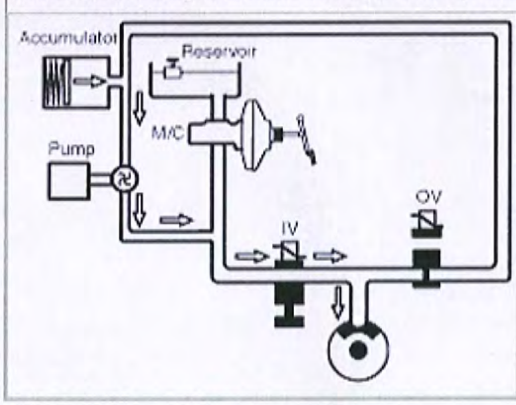
Solenoid	State	Valve	Passage
Inlet valve (NO)	OFF	OPEN	Master cylinder⇔Wheel cylinder
Outlet valve (NC)	OFF	CLOSE	Wheel cylinder⇔Reservoir

For optimum brake from the certain wheel acceleration a brake pressure increase is necessary. For this, the inlet valve IV is opened and the outlet valve OV is closed. The pump of the unit starts to run and aspirates the necessary quantity of fluid from the Low-pressure accumulator, in order to produce the necessary brake pressure for the pressure increase phase in seconds.

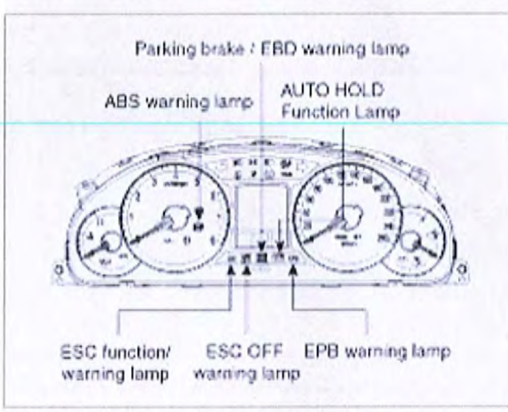
With an increase in the brake pressure the wheel speed is reduced. These control phases are repeated until the ABS control unit no longer detects any tendency of the wheels to lock.

NOTICE

During ABS control function, the brake pedal only moves in accordance with the volume requirement of the wheels. Because of a sudden change in friction coefficient this pedal movement may increase slightly.



ABS Warning Lamp Module



ABS Warning Lamp Module

The active ABS warning lamp module indicates the self test and failure status of the ABS.
The ABS warning lamp shall be on:

- During the initialization phase after IGN ON.
  (Continuously 3 seconds).
- In the event of inhibition of ABS functions by failure.
- During diagnostic mode.
- When the ECU Connector is separated from ECU.

EBD/Parking Brake Warning Lamp Module

The active EBD warning lamp module indicates the self test and failure status of the EBD. However, in case the Parking Brake Switch is turned on, the EBD warning lamp is always turned on regardless of EBD functions.
The EBD warning lamp shall be on:

- During the initialization phase after IGN ON.
  (Continuously 3 seconds).
- When the Parking Brake Switch is ON or brake fluid level is low.
- When the EBD function is out of order.
- During diagnostic mode.
- When the ECU Connector is separated from ECU.

ESC Warning Lamp (ESC System)

The ESC warning lamp indicates the self test and failure status of the ESC.
The ESC warning lamp is turned on under the following conditions:

- During the initialization phase after IGN ON.
  (Continuously 3 seconds).
- In the event of inhibition of ESC functions by failure.
- During diagnostic mode.

ESC Function Lamp (ESC System)

The ESC function lamp indicates the self-test and operating status of the ESC.
The ESC Function lamp operates under the following conditions:

- During the initialization phase after IGN ON.
  (Continuously 3 seconds).
- When the ESC control is operating. (Blinking - 2Hz)

ESC ON/OFF Switch (ESC System)

The ESC On/Off Switch shall be used to toggle the ESC function between On/Off states based upon driver input.
The On/Off switch shall be a normally open, momentary contact switch. Closed contacts switch the circuit to ignition.
Initial status of the ESC function is on and switch toggle the state.

AUTO HOLD Function Lamp (EPB System)

The AUTO HOLD function lamp indicates the operating status of the ESP.
The ESP Function lamp operates under the following conditions:

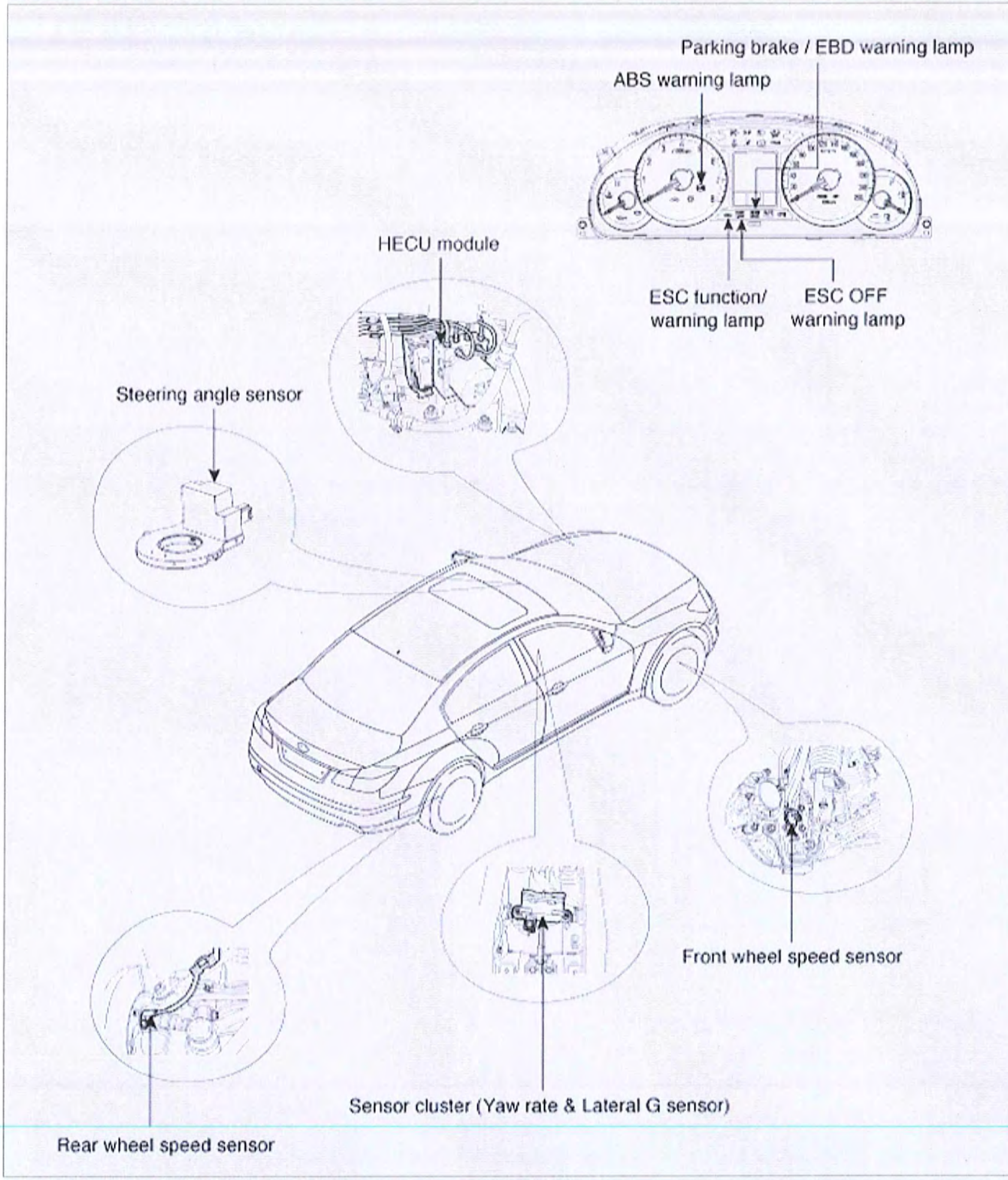
- the initialization phase after IGN ON.
  (Continuously 3 seconds).
- The lamp is turned on when a driver put the AUTO HOLD switch.

EPB Warning Lamp (EPB System)

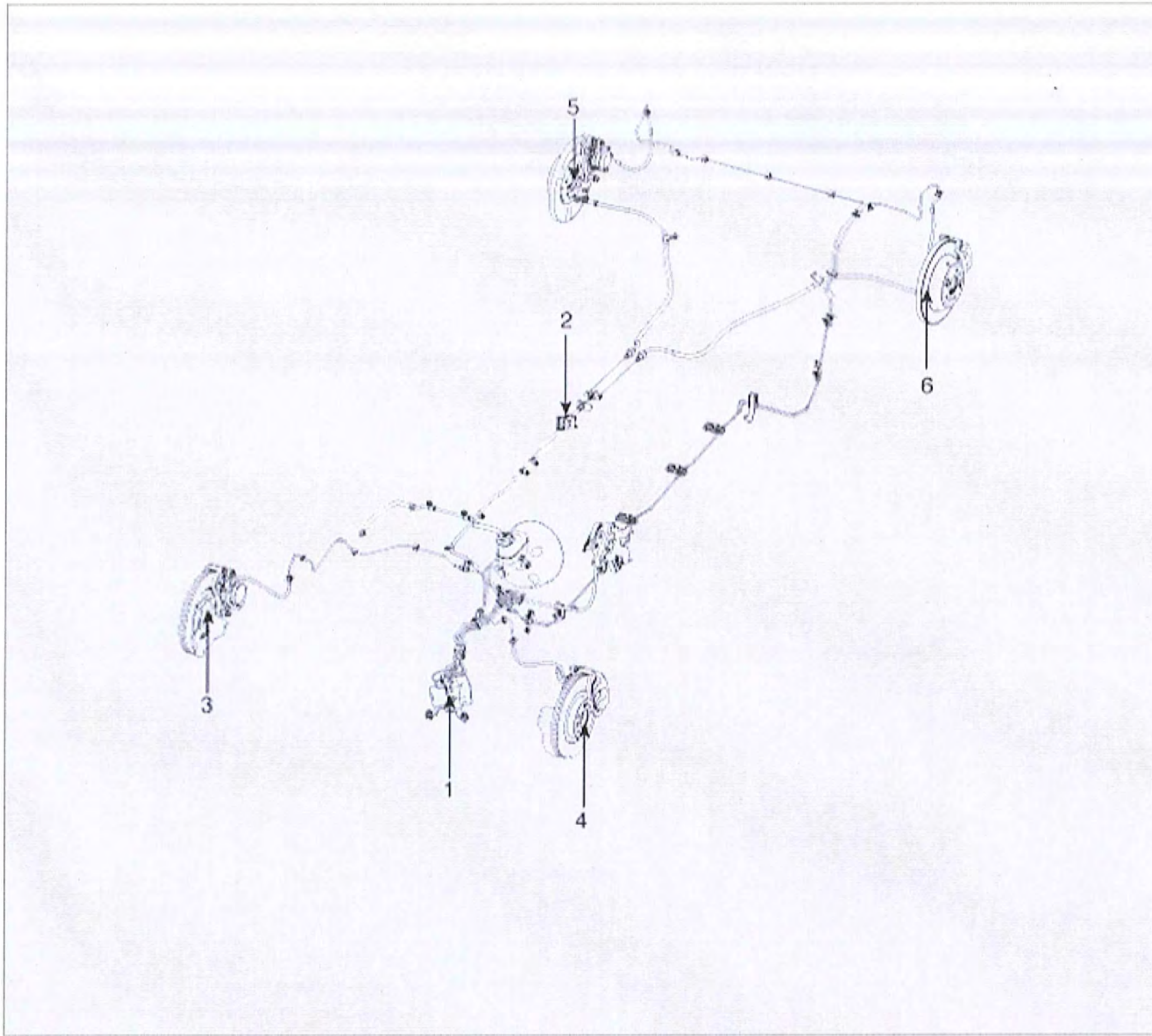
The EPB warning lamp indicates the self-test and failure status of the EPB.
The EPB warning lamp shall be on:

- During the initialization phase after IGN ON.
  (Continuously 3 seconds).
- In the event of inhibition of EPB functions by failure.

Components (1)

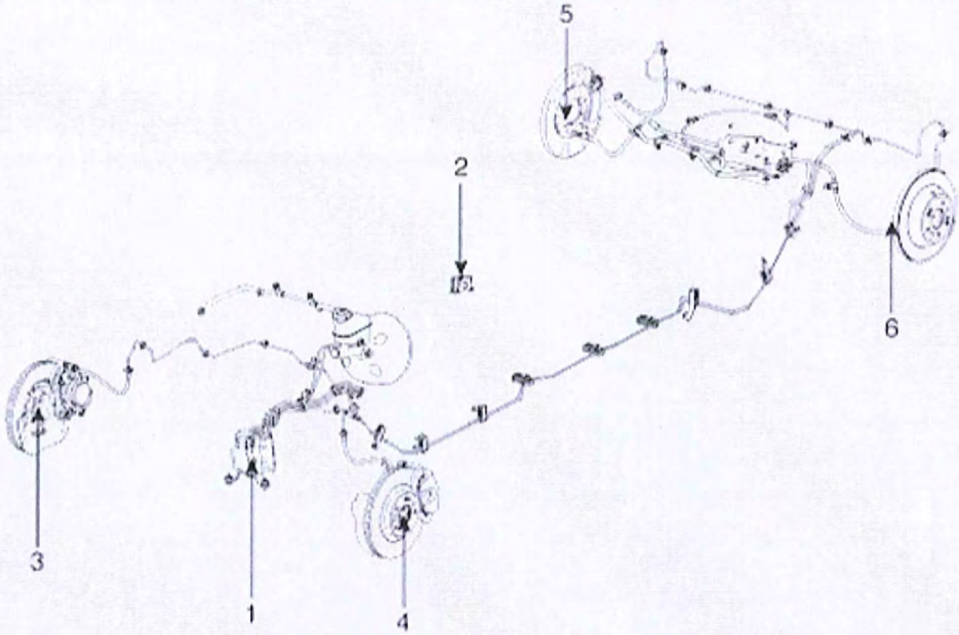


Components (2)



1. ESC control module (HECU)	4.Front left wheel speed sensor
2. Sensor cluster (Yaw rate & Lateral G sensor)	5. Rear right wheel speed sensor
3. Front right wheel speed sensor	6. Rear left wheel speed sensor

Components (3)



1. ESP control module (HECU)	4. Front left wheel speed sensor
2. Sensor cluster (Yaw rate & Lateral G sensor)	5. Rear right wheel speed sensor
3. Front right wheel speed sensor	6. Rear left wheel speed sensor

ATTACHMENT F

14-1. Genesis _FMVSS_135_report

MOTOR VEHICLE SAFETY STANDARD 135

HYDRAULIC BRAKE SYSTEM TEST

ON HYUNDAI [BH]

CONDUCTED BY :

VEHICLE EVALUATION

OBJECTIVE TEST GROUP

HYUNDAI•KIA AMERICA TECHNICAL CENTER INC.

DATE : 02-26-08 ~ 03-06-08

HATCI

CATEGORY	
Planning	
Research	
Investigation	
Test	●
Business Trip	
Training	
Quality	
Benchmarking	
Regulation	●
Technical	
Certification	●
Other	

BH Lamda FMVSS 135 Brake Test

SECTOR	
Proposal	
Information	●

Report Number
2008-VE-OTD-012

DISTRIBUTION	
Engineering Design	
Powertrain	
Vehicle Evaluation	●
Planning	
Others:	

Engineer	Section Mgr	Department Mgr / Chief Coordinator	President
William Manosh	John DePaul Doug Bookman	B. I. Park	Chung Kook Park

COMMENTS

March 6, 2008

Vehicle Evaluation

Hyundai · Kia America Technical Center

TABLE OF CONTENTS

Symbols for Brake Components

4 - 4 Wheel
X - Skid
L - Left
R - Right
R - Rear
F - Front
B - Both
INT or INIT - Initial Part of Stop
MID - Middle of Stop
END - End of Stop

G - Groan
SQ - Squeal
SQK - Squeak
PO - Pinchout
P - Pull
R - Shudder

DL - Deceleration (State FPSPS)
PF - Pedal on Floor
SCP - Shoe Scrape
RB - Rubber Banding
0 - Odor
NOX - No Skid
INCIP - Incipient Skid

EXAMPLE

″ BFMID ″ = Both front wheel lockup occurred at approximately middle of stop

″ LFX ″ = Front left skid

″ RFX ″ = Front right skid

DATA SHEET 1
VEHICLE INFORMATION

MAKE/MODEL/BODY STYLE:
MODEL YEAR: 2009 ; MANUFACTURE DATE: n/a
Report No.: TR_2008-VE-OTD-012 ; VIN: KMHGE46EP7U[redacted]
GVWR: 2253 kg ; WHEELBASE: 2935 mm
GAWR FRONT: 1032 kg ; GAWR REAR: 1221 kg

FOR BUSES ONLY -
CHASSIS MFR.: n/a
SERIAL NO.: n/a ; NO. OF SEATS: n/a
MANUFACTURER DATE: n/a

ENGINE TYPE: ICE V-6 ; DISPLACEMENT: 3.8 L
ENGINE HORSEPOWER: n/a ; IDLE SPEED: n/a
TRANSMISSION TYPE: 6 speed Auto ; NO. OF AXLES: 2

ELECTRIC VEHICLE: n/a ; HYBRID VEHICLE: n/a

TIRE SIZE: P215/60R17 ; TYPE: SP Sport 5000M M+S
TIRE MANUFACTURER: Dunlop
RECOMMENDED PRESS. AT GVWR: FRONT - 227.5 kPa: REAR - 227.5 kPa

BRAKES - FRONT: DRUM ______ DISC X
BRAKES - REAR: DRUM ______ DISC X

BRAKE ACTUATION - Describe Hydraulic Circuit Split: Diagonal Split

FOUNDATION BRAKES:
HYDRAULIC X ; ELECTRIC ______ ; SPLIT ______

ELECTRICALLY-ACTUATED SERVICE BRAKES: YES ___ NO X

ELECTRIC TRANSMISSION OF SERVICE BRAKE CONTROL SIGNAL: YES ___ NO X

REGENERATIVE BRAKING SYSTEM (RBS): YES ___ NO X

RBS PART OF SERVICE BRAKE SYSTEM: YES ___ NO _X_

BRAKE POWER UNIT: ___Hydraulic; _X_ Vacuum; ___Other _______

BRAKE POWER ASSIST UNIT: YES ____ NO _X_

BRAKE POWER UNIT WITH ACCUMULATOR: No

BRAKE POWER ASSIST OR POWER UNIT WITH BACKUP: No

VARIABLE PROPORTIONING SYSTEM: Yes EBD

ANTISKID DEVICE: _Y_ MFR- Continental Teves

DIRECTLY CONTROLLED WHEELS: 4 channel

PARKING MECHANISM: Electric Park Brake with DIH

DESCRIBE- Direct pull cable DIH

BRAKE MASTER CYLINDER DIAMETER: 25.4 mm

BRAKE PEDAL RATIO: 2.98:1

FRONT BRAKE COMPONENT MATERIALS AND CONSTRUCTION:

FOR DRUM BRAKES				FOR DISC BRAKES			
	MATERIAL		CONSTRUCTION		MATERIAL		CONSTRUCTION
	Cast Iron		Cast		Cast Iron	x	Integral Cast
	Steel		Composite		Steel		2-Piece
	Bi-Metallic		Centrifused		Bi-metallic	x	Vented
			Pressed				Unvented

FRONT BRAKE DIAMETER: Inside - 204 mm ; Outside - 320 mm

FRONT DISC BRAKE THICKNESS (include vent): 28 mm

FRONT DRUM BRAKE SHOE CAGE DIA.: Left - n/a ; Right - n/a
DIAMETER RESET TO: Left - n/a ; Right - n/a

FRONT BRAKE COMPONENT DIMENSIONS AND LINING CODE/COLOR:

	FOR DRUM BRAKES		FOR DISC BRAKES	
WIDTH	Primary	n/a	Inboard	61.0 mm
	Secondary	n/a	Outboard	61.1 mm
LENGHTH	Primary	n/a	Inboard	138.0 mm
	Secondary	n/a	Outboard	138.0 mm
THICKNESS	Primary	n/a	Inboard	10.0 mm
	Secondary	n/a	Outboard	10.0 mm
CODE/COLOR	Primary	n/a	Inboard	KBP 3092H/Black
	Secondary	n/a	Outboard	KBP 3092H/Black

* Primary/Secondary may be leading/trailing or other

HYDRAULIC PISTON DIAMETER: 63.5 mm

DRUM BRAKE WHEEL CYLINDER - n/a
DISC BRAKE CALIPER - single piston sliding

REAR BRAKE COMPONENT MATERIALS AND CONSTRUCTION:

FOR DRUM BRAKES				FOR DISC BRAKES			
	MATERIAL		CONSTRUCTION		MATERIAL		CONSTRUCTION
	Cast Iron		Cast		Cast Iron	x	Integral Cast
	Steel		Composite		Steel		2-Piece
	Bi-Metallic		Centrifused		Bi-metallic		Vented
			Pressed			x	Unvented

REAR BRAKE DIAMETER: Inside - 222.0 mm ; Outside - 314.0 mm

REAR DISC BRAKE THICKNESS (including vent): 13 mm

REAR DRUM BRAKE SHOE CAGE DIA.: Left - n/a ; Right - n/a

DIAMETER RESET TO: Left - n/a ; Right - n/a

REAR BRAKE COMPONENT DIMENSIONS AND LINING CODE/COLOR:

	FOR DRUM BRAKES		FOR DISC BRAKES	
WIDTH	Primary	n/a	Inboard	44.0 mm
	Secondary	n/a	Outboard	44.0 mm
LENGHTH	Primary	n/a	Inboard	100.6mm
	Secondary	n/a	Outboard	100.6 mm
THICKNESS	Primary	n/a	Inboard	10.0 mm
	Secondary	n/a	Outboard	10.0 mm
CODE/COLOR	Primary	n/a	Inboard	SBK 5713A/Green
	Secondary	n/a	Outboard	SBK 5713A/Green

* Primary/Secondary may be leading/trailing or other

HYDRAULIC PISTON DIAMETER: 43.0 mm

DRUM BRAKE WHEEL CYLINDER - n/a

DISC BRAKE CALIPER - single piston sliding

OTHER COMPONENT INFORMATION:

Friction-type Parking Brake - ____ Hand Operated

____ Foot Operated

Nonservice Brake Type Parking Brake - x Hand Operated

____ Foot Operated

ELECTRIC BRAKES INFORMATION: Electric actuated cable pull park brake

DATA SHEET 2
SUMMARY OF TESTING

VEHICLE: KMHGE46EP7U[redacted]

Report No.: TR_2008-VE-OTD-012

DATE: 3/5/2008

TEST	loading condition	speed	Min Pedal Force (N)	Max Pedal Force (N)	Stopping Distance Requirement (m)	After ramp up, Min. pedal force remains above specified value	Max Pedal Force (N)	Stopping Distance (m)	Pass Fail (Y/N)	Pass Margin %
		SPECIFICATION AND LIMIT				TEST RESULTS -SHORTEST STOP (in compliance is one stop meets requirement)				
Vehicle Maximum Speed	LLVW	n/a	n/a			n/a			n/a	n/a
Burnish	GVWR	n/a	n/a			n/a			n/a	n/a
Wheel Lockup Sequence w/o ABS	GVWR	n/a			Lockup of front wheels prior to rear	n/a			n/a	n/a
Wheel Lockup Sequence w/o ABS	LLVW					n/a			n/a	n/a
Adhesion Utilization w/o ABS	LLVW	n/a			adhesion utilization curve below specifed	n/a			n/a	n/a
Adhesion Utilization w/o ABS	GVWR					n/a			n/a	n/a
Cold Effectiveness	GVWR	100	65	500	70	223	487	45.7	Y	34.68%
High Speed Effectiveness	GVWR	160.0	65	500	187.5	234	469	107.5	Y	42.69%
Stops with Engine Off	GVWR	100	65	500	70	264	453	42.9	Y	38.73%
Cold Effectiveness	LLVW	100	65	500	70	208	493	42.0	Y	40.03%
High Speed Effectiveness	LLVW	160.0	65	500	187.5	197	464	103.5	Y	44.80%
Failed Antilock	LLVW	100	65	500	85	98	179	45.6	Y	46.32%
Failed Proportioning Valve	LLVW	100	65	500	110	79	124	52.0	Y	52.74%
Failed Hydraulic Circuit #1	LLVW	100	65	500	168	288	492	83.6	Y	50.24%
Failed Hydraulic Circuit #2	LLVW	100	65	500	168	290	497	86.0	Y	48.82%
Failed Hydraulic Circuit #1	GVWR	100	65	500	168	240	476	82.4	Y	50.95%
Failed Hydraulic Circuit #2	GVWR	100	65	500	168	306	493	94.6	Y	43.70%
Failed Antilock	GVWR	100	65	500	85	149	288	46.1	Y	45.78%
Failed Proportioning Valve	GVWR	100	65	500	110	100	161	52.8	Y	52.03%
Power Brake Unit Failure	GVWR	100	65	500	168	336	499	140.9	Y	16.13%
Parking Brake - Uphill	GVWR	n/a	n/a	380	n/a	n/a	0	n/a	Y	24.00%
Parking Brake - Downhill	GVWR	n/a	n/a	380	n/a	n/a	0	n/a	Y	24.00%
Heating Snubs	GVWR	120	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hot Performance Stop #1	GVWR	100	65	375 avg	70.0	n/a	AVG 324	48.7	Y	30.41%
Hot Performance Stop #2	GVWR	100	65	500	89	n/a	497	49.5	Y	44.38%
Recovery Performance Stop #1	GVWR	100	65	AVG	≥ 24.0	n/a	AVG 238	43.1	Y	n/a
Recovery Performance Stop #2	GVWR	100	65	375	≤ 51.4	n/a	AVG 299	43.8	Y	n/a
Final Inspection-Brake Integrity	OK					OK			Y	n/a
Final Inspection- Reservoirs									Y	n/a

Comments: Park Brake section run on different vehicle in Korea due to unavailability of 20% grade at US facility.

* NOTE: May be additional requirements for Electric Vehicles or vehicles utilizing electrically-actuated brakes, electric brake signal, and RBS.

DATA SHEET 3
VEHICLE WEIGHT

VEHICLE: KMHGE46EP7U[redacted] ; Report No.: TR_2008-VE-OTD-012 DATE: 2/26/2008

TIRE PRESSURE (Cold): Front - 227.5 kPa Rear - 227.5 kPa

ODOMETER READING: Start - 8237 mi Finish - 8790 mi

SCALE(S) USED: Rice Lake Weighing Systems S/N 1464900089 calibrated 2/22/2008

NOTE: GVWR, LLVW and axle weights to be measured within +0% and -1%.

GVWR/GAWR INFORMATION

GVWR - 2253 kg GAWR Front = 1032 kg and GAWR Rear = 1221 kg

UNLOADED VEHICLE WEIGHT **(UVW)**:

Left Front - 472.5 kg Left Rear - 449 kg

Right Front - 472.5 kg Right Rear - 449 kg

Total Front - 945 kg Total Rear - 898 kg

TOTAL **UVW** - 1843 kg

Front Axle Load % = Total Front/TOTAL **UVW** = 51.3%

Rear Axle Load % = Total Rear/TOTAL **UVW** = 48.7%

LIGHT LOADED VEHICLE WEIGHT **(LLVW)**:

Note 1: LLVW = UVW + 400lb (181 kg)

Note 2: Weight distributed in front passenger seat area

Note 3: Neight axle load at LLVW less then at UVW; ballast as required

Left Front - 514 kg Left Rear - 497.5 kg

Right Front - 514 kg Right Rear - 497.5 kg

(Continued on next page)

Total Front - 1028 kg Total Rear - 995 kg

TOTAL **LLVW** - 2023 kg

Front Axle Load % = Total Front/TOTAL **LLVW** = 50.8%

Rear Axle Load % = Total Rear/TOTAL **LLVW** = 49.2%

ACTUAL TEST LLVW:

Left Front - 525.5 kg Left Rear - 500 kg

Right Front - 505 kg Right Rear - 494.5 kg

Total Front - 1030.5 kg Total Rear - 994.5 kg

TOTAL ACTUAL TEST LLVW - 2025.0 kg

Front Axle Load % = Total Front/TOTAL ACTUAL TEST LLVW = 50.9% %

Rear Axle Load % = Total Rear/TOTAL ACTUAL TEST LLVW = 49.1% %

FULLY LOADED VEHICLE WEIGHT **(GVWR)**:

Note 1: Vehicle loaded so axle loads proportional to GAWR shown previously

Note 2: But no axle weight to be less then at LLVW

Note 3: If weight on any axle at LLVW exceeds the axle's proportional share of the GVWR, the load required to reach GVWR is placed so that the weight on that axle remains the same as at LLVW. Neither axle load at LLVW **LESS THAN** at UDW.

Left Front - 537 kg Left Rear - 621 kg

Right Front - 500 kg Right Rear - 602.5 kg

Total Front - 1037.0 kg Total Rear - 1223.5 kg

FULLY LOADED VEHICLE WEIGHT (GVWR) - 2260.5 kg

Front Axle Load % = Total Front / FULLY LOADED VEH. WT. (GVWR) = 45.9%

Rear Axle Load % = Total Rear / FULLY LOADED VEH. WT. (GVWR) = 54.1%

Comments:

TECHNICIAN: William Manosh ; QUALITY ASSURANCE: n/a

DATE: 3/6/2008

DATA SHEET 4
MAXIMUM SPEED

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	N/A
TEMP.:	N/A	WIND VELOCITY:	N/A	ROAD PFC:	N/A
ODOMETER START:	N/A	ODOMETER FINISH:	N/A		

TEST WEIGHT: Total = n/a kg; Front = n/a kg; Rear = n/a kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

Establish vehicle maximum speed

VEHICLE LOAD: LLVW
GEAR: Drive
PEDAL FORCE: Not applicable
TEST SPEED: Maximum attainable from a standing start in 3.2km.
IBT: Not applicable
DECEL RATE: Not applicable
WHEEL LOCKUP: Not applicable
INTERVAL: Not applicable

Ballast vehicle to LLVW

Accelerate at a maximum rate from a standing start for a distance of 3.2km on a level surface.

Repeat in opposite direction.

Record speed attained in each direction and use the average of the two runs.

	DIRECTION	MAX. SPEED (km/h)		Time 0-100 km/h
		Visual	Recorded	
Run No. 1	n/a	n/a	n/a	n/a
Run No. 2	n/a	n/a	n/a	n/a

Average = n/a km/h

Comments: Test section not run, vehicle maximum speed known to require all high speed stops from 160 kph
Tested by: n/a Date: n/a

DATA SHEET 5
BURNISH

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	2/28/2008 @ 9:00 AM
TEMP.:	13º C	WIND VELOCITY:	1.42 m/s	ROAD PFC:	N/A
ODOMETER START:	8251 mi	ODOMETER FINISH:	8490 mi		

TEST WEIGHT:	Total = 2260.5 kg;	Front = 1037.0 kg;	Rear = 1223.5 kg
TARGET WEIGHT:	Total = 2253 kg;	Front = 1032 kg;	Rear = 1221 kg

VEHICLE LOAD: GVWR

GEAR: Drive

PEDAL FORCE: Adjust as necessary to maintain constant decel rate.

TEST SPEED: 80 km/h to 0

IBT: ≤100ºC (Record temperatures 0.32 km before stop)

DECEL RATE: 3.0 m/s²

WHEEL LOCKUP: None longer than 0.1 seconds at speeds > 15 km/h.

INTERVAL: The interval from the start of one service brake application to the start of the next is either the time necessary to reduce the IBT to 100ºC or less, or the distance of 2 km, whichever occurs first.

Comments:

BURNISH

RECORDED DATA

STOP NO.	Initial Speed (KM/H)	initial brake temperature (C) (Secondary Shoe or Hottest Pad)				MAX PEDAL FORCE (N)	AVERAGE PEDAL FORCE (N)	AVERAGE SUSTAINED DECELERATION (m/s²)	COMMENTS
		LF	RF	LR	RR				
1	79.8	36	32	33	29	55	43	2.5	-
10	80.1	96	91	143	123	43	32	2.5	-
20	79.7	90	88	147	126	46	39	2.7	-
30	80.1	89	89	140	127	40	32	2.7	-
40	79.7	90	88	138	130	37	31	2.6	-
50	79.8	91	88	140	133	41	31	2.7	-
60	79.9	90	87	141	133	51	37	3.0	Break
70	79.9	95	93	134	119	43	32	2.8	-
80	80.0	93	91	147	129	38	30	2.7	-
90	80.0	94	90	146	135	39	31	2.8	-
100	79.9	95	91	144	137	36	31	2.7	lunch stop 102
110	79.9	108	107	110	107	46	42	2.6	-
120	80.0	99	94	143	130	37	32	2.7	-
130	79.8	97	92	147	136	54	36	2.8	-
140	80.2	99	95	149	138	43	36	2.7	-
150	80.2	98	94	134	125	41	32	2.6	-
160	80.1	102	96	140	132	36	31	2.6	-
170	79.9	98	93	141	127	38	33	2.6	-
180	80.1	100	95	145	128	41	31	2.6	-
190	79.6	101	95	143	128	50	40	2.5	Cruise control fault
200	77.9	99	92	143	128	54	36	2.8	-

Comments: Cruise control fault appeared to increase pedal force to deceleration slightly.

Driver: [redacted] Date: 2/28/2007

Brake Adjustment (Post Burnish)

Adjust to manufacturer's published recommended practice

Record method used: n/a

Adjusted by: n/a Date: n/a

DATA SHEET 6
14.2 WHEEL LOCK SEQUENCE @ GVWR (S7.2)

VEHICLE:	KMHGE46EP7 [redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	n/a
TEMP.:	n/a	WIND VELOCITY:	n/a	ROAD PFC:	n/a
ODOMETER START:	n/a	ODOMETER FINISH:	n/a		

TEST WEIGHT: Total = n/a kg; Front = n/a kg; Rear = n/a kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S7.2 Wheel Lockup Sequence:
NOTE: Wheel lockup sequence is **NOT** an S135 compliance requirement for ABS equipped vehicles.

NOTE: Vehicles that lock their front axle simultaneously or at lower deceleration rates than their rear axle need not be tested to the torque wheel

S7.2.2 Vehicle Conditions:

A. Vehicle load: GVWR

B. Trasmission Positoin: Neutral

S7.2.3 Test Conditions and Procedures

IBT: ≥65ºC, ≤100ºC

TEST SPEEDS:
65 km/h for braking ratio ≤.50, 100 km/h for braking ratio >.50

PEDAL FORCE:
Is increased at a linear rate such that the first axle lockup occurs no less than 0.5 second and no more than 1.5 seconds after the initial application of the pedal.

The pedal is released when the second axle locks, or when the pedal force reaches 1kN (225 lbs), or 0.1 seconds after first axle lockup, whichever occurs first.

WHEEL LOCKUP:
Only wheel lockups above a vehicle speed of 15 km/h are considered in determining the results of this test.

TEST SURFACES:
Each loading condition on two different test surfaces, resulting in a braking ratio of between 0.15 and 0.80.

TEST PROCEDURE:
Each test surface, three runs meeting pedal and time for wheel lockup requirements. Six (6) runs allowed to obtain 3 valid runs.

S7.2.4 PERFORMANCE REQUIREMENTS:

Meets test requirements on all test surfaces.

All 3 valid runs on each test surface result in front axle locking before or simultaneously with rear axle.

An EV with RBS that is part of the service brake system shall meet the performance requirements over the entire normal operating range of the RBS. If the RBS contribution to braking varies according to vehicle speed, deceleration, etc. then the worst case must be determined i.e. where RBS provides limited braking, and the test conducted at this condition at a minimum.

Comments: Test section not run, ABS equiped vehicle

WHEEL LOCK SEQUENCE @ GVWR

RECORDED DATA

Stop No.	IBT Front/Rear	Braking Ratio	Initial Vehicle Speed	Pedal Force Rate (N/Sec)	Vehicle Deceleration & Pedal Force @ Time of each Wheel at Lockup				RESULT Front/Rear Lockup
					LF	RF	LR	RR	
Test Surface PFC_______									
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
Test Surface PFC 0.9									
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-

Data indicates compliance: YES N/a NO ______

Comments: Test section not run, ABS equiped vehicle

Driver: N/A Observer: N/A

Date: N/A

DATA SHEET 7
14.3 WHEEL LOCK SEQUENCE @ LLVW (S7.2)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	n/a
TEMP.:	n/a	WIND VELOCITY:	n/a	ROAD PFC:	n/a
ODOMETER START:	n/a	ODOMETER FINISH:	n/a		

TEST WEIGHT: Total = n/a kg; Front = n/a kg; Rear = n/a kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

REPEAT 14.2 WITH VEHICLE LOAD AT LLVW

WHEEL LOCK SEQUENCE @ LLVW

RECORDED DATA

Stop No.	IBT Front/Rear	Braking Ratio	Initial Vehicle Speed	Pedal Force Rate (N/Sec)	Vehicle Deceleration & Pedal Force @ Time of each Wheel at Lockup				RESULT Front/Rear Lockup
					LF	RF	LR	RR	
Test Surface PFC__n/a_____									
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
Test Surface PFC___n/a____									
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-

Data indicates compliance: YES n/a NO n/a
Comments: Test section not run, ABS equipped vehicle.
Driver: n/a Observer: n/a

Date: n/a

DATA SHEET 8
14.5 ADHESION UTILIZATION (TORQUE WHEEL) @ LLVW (S7.4)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	n/a
TEMP.:	n/a	WIND VELOCITY:	n/a	ROAD PFC:	n/a
ODOMETER START:	n/a	ODOMETER FINISH:	n/a		

TEST WEIGHT: Total = n/a kg; Front = n/a kg; Rear = n/a kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

S7.4 Adhesion Utilization (Torque Wheel Method)
NOTE: Adhesion Utilization results are not an FMVSS 135 compliance requirement for ABS equipped vehicles.

S7.4.2 Vehicle Conditions:

A. Vehicle load: LLVW

B. Trasmission Positoin: In Neutral

C. Tires:
For this test, a separate set of tires, identical to those used for all other sections of this test, may be mounted on torque wheels and used to complete this portion of test.

S7.4.3 Test Conditions and Procedures:

IBT: ≥65ºC, ≤100ºC

TEST SPEEDS: 100 km/h and 50 km/h

PEDAL FORCE:
100 km/h test speed -
Ramp apply between 100 and 150 N/sec apply rate until the first axle locks or a max. of 1000 N pedal force is reached, whichever occurs first.

50 km/h test speed -
Ramp apply between 100 and 200 N/sec apply rate until the first axle locks or a max. of 1000 N pedal force is reached, whichever occurs first.

COOLING:

Between brake applications, drive at speeds up to 100 km/h until IBT is reached.

NUMBER OF RUNS:

5 Stops from 50 km/h and 5 stops from 100 km/h, alternating between speeds after each stop.

TEST SURFACE: PFC of at least 0.9

DATA TO BE ROCORDED:

Vehicle speed Pedal Force
Wheel Velocity Deceleration
Brake Torque at each wheel, and hydraulic line pressure in each brake circuit (at least one front wheel and one rear wheel downstream of the proportioning valve).

Sampling Rate:
10 HZ on temperature channels - 100 HZ on all other channels

Performance Criteria – Data below line as shown in figure 2 on page 36. For an EV with RBS, meets requirement over entire range of RBS operation.

RECORDED DATA

STOP NO.	SPEED (km/h)		Maximum Pedal Force (N)	Wheel Velocity at Lockup (km/h)				Max. Decel (m/s²)	Rate of Apply (N/s)	Brake Trque at each wheel	Brake Line Press. In each braek circuit	Comments
	Target	Actual		LF	RF	LR	RR					
1	100	-	-	-	-	-	-	-	-	-	-	-
2	50	-	-	-	-	-	-	-	-	-	-	-
3	100	-	-	-	-	-	-	-	-	-	-	-
4	50	-	-	-	-	-	-	-	-	-	-	-
5	100	-	-	-	-	-	-	-	-	-	-	-
6	50	-	-	-	-	-	-	-	-	-	-	-
7	100	-	-	-	-	-	-	-	-	-	-	-
8	50	-	-	-	-	-	-	-	-	-	-	-
9	100	-	-	-	-	-	-	-	-	-	-	-
10	50	-	-	-	-	-	-	-	-	-	-	-

Data indicates compliance: YES n/a NO n/a
Comments: Test section not run, ABS equipped vehicle.

Driver: n/a Observer: n/a
Date: n/a

DATA SHEET 9
14.6 ADHESION UTILIZATION (TORQUE WHEEL) @ GVWR (S7.4)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	n/a
TEMP.:	n/a	WIND VELOCITY:	n/a	ROAD PFC:	n/a
ODOMETER START:	n/a	ODOMETER FINISH:	n/a		

TEST WEIGHT: Total = n/a kg; Front = n/a kg; Rear = n/a kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

REPEAT 14.5 WITH VEHICLE LOAD AT GVWR

RECORDED DATA

STOP NO.	SPEED (km/h)		Maximum Pedal Force (N)	Wheel Velocity at Lockup (km/h)				Max. Decel (m/s²)	Rate of Apply (N/s)	Brake Trque at each wheel	Brake Line Press. In each braek circuit	Comments
	Target	Actual		LF	RF	LR	RR					
1	100	-	-	-	-	-	-	-	-	-	-	-
2	50	-	-	-	-	-	-	-	-	-	-	-
3	100	-	-	-	-	-	-	-	-	-	-	-
4	50	-	-	-	-	-	-	-	-	-	-	-
5	100	-	-	-	-	-	-	-	-	-	-	-
6	50	-	-	-	-	-	-	-	-	-	-	-
7	100	-	-	-	-	-	-	-	-	-	-	-
8	50	-	-	-	-	-	-	-	-	-	-	-
9	100	-	-	-	-	-	-	-	-	-	-	-
10	50	-	-	-	-	-	-	-	-	-	-	-

Data indicates compliance: YES n/a NO n/a
Comments: Test section not run, ABS equipped vehicle.

Driver: n/a Observer: n/a
Date: n/a

DATA SHEET 10
14.7 COLD EFFECTIVENESS @ GVWR (S7.5)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	2/29/2008 @ 10:20 AM
TEMP.:	20.0º C	WIND VELOCITY:	3.28 m/s	ROAD PFC:	0.9
ODOMETER START:	8490 mi	ODOMETER FINISH:	8518 mi		

TEST WEIGHT: Total = 2260.5 kg; Front = 1037.0 kg; Rear = 1223.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S.7.5.1 Vehicle conditions:

A. Vehicle Load: GVWR

B. Transmission Position: Neutral

S.7.5.2 Test Conditions and Procedures

NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 100 km/h

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 6 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s

S.7.5.3 Performance Requirements

Sc for hot performance stop = 45.725 m

Avg. PF for hot performance stop = 375 N

*STOPPING DISTANCE: ≤70 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.4	78	74	46.0	235	578	438	10.7	8.3	N	Y	45.6	N
2	100.3	71	98	46.0	223	487	375	11.0	8.2	N	Y	45.7	Y
3	100.2	51	99	47.2	218	488	397	10.8	8.1	N	Y	47.0	Y
4	100.3	58	100	47.7	229	461	348	10.7	8.2	N	Y	47.4	Y
5	100.3	48	99	46.9	206	491	382	10.9	8.2	N	Y	46.6	Y
6	100.1	44	93	46.9	264	516	427	11.0	8.2	N	Y	46.8	N

$S \leq 0.10V + 0.0060V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES x NO ____
Comments: N/A

Driver: [redacted] Observer: N/A
Date: 2/29/2008

DATA SHEET 11
14.8 HIGH SPEED EFFECTIVENESS @ GVWR (S7.6)
(Not required if vehicle maximum speed is ≤125 km/h)

VEHICLE:	KMHGE46EP7 U0[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	2/29/2008 @ 11:10 AM
TEMP.:	24º C	WIND VELOCITY:	2.11 m/s	ROAD PFC:	0.9
ODOMETER START:	8515 mi	ODOMETER FINISH:	8555 mi		

TEST WEIGHT: Total = 2260.5 kg; Front = 1037.0 kg; Rear = 1223.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1216 kg

S.7.6.1 Vehicle conditions:

A. Vehicle Load: GVWR

B. Transmission Position: In Drive

S.7.6.2 Test Conditions and Procedures

NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 80 % of vehicle maximum speed but not greater than 160 km/h

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 6 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s

S.7.6.3 Performance Requirements

STOPPING DISTANCE: $S \le 0.10V + 0.0067V^2$

Calculated distance = 187.52 m

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	159.8	69	98	113.7	264	491	431	10.6	8.8	N	Y	114.0	Y
2	159.7	49	100	109.8	203	530	439	10.8	9.1	N	Y	110.2	N
3	159.7	72	100	108.1	166	809	474	10.8	9.2	N	Y	108.5	N
4	159.2	87	91	106.4	234	469	390	11.0	9.2	N	Y	107.5	Y
5	159.1	98	80	107.5	241	513	408	10.9	9.2	N	Y	108.7	N
6	159.7	61	99	110.1	213	487	392	11.3	9.1	N	Y	110.5	Y

Data indicates compliance: YES X NO ______
Comments: N/A

Driver: [redacted] Observer: n/a
Date: 2/29/2008

DATA SHEET 12
14.9 STOPS WITH ENGINE OFF @ GVWR (S7.7)

VEHICLE:	KMHGE46EP7 [redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/3/2008 @ 10:15 AM
TEMP.:	12º C	WIND VELOCITY:	4.8 m/s	ROAD PFC:	0.9
ODOMETER START:	8557 mi	ODOMETER FINISH:	8593 mi		

TEST WEIGHT: Total = 2260.5 kg; Front = 1037.0 kg; Rear = 1223.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S.7.7.1 General Information
This test is for vehicles equipped with one or more brake power or assist units.

S.7.7.2 Vehicle conditions:

A. Vehicle Load: GVWR

B. Transmission Position: In Neutral

C. Vehicle Engine: Off (not running)

D. Ignition Key Position:
May be returned to "on" position after turning engine off.

S.7.7.3 Test Conditions and Procedures

NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

NOTE: All system reservoirs (brake power and / or assist units) are fully charged and the vehicle's engine is off (not running) at the beginning of each stop.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 100 kph

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 6 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s

S.7.7.4 Performance Requirements:

*STOPPING DISTANCE: ≤70 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	101.2	57	87	47.5	98	494	295	10.7	7.8	Y	Y	46.4	N
2	102.0	32	72	45.8	197	532	387	11.4	8.4	N	Y	44.0	N
3	100.6	68	91	43.9	214	492	383	11.2	8.6	N	Y	43.4	Y
4	100.8	85	100	43.9	252	471	380	11.2	8.6	N	Y	43.2	Y
5	99.9	67	99	41.9	246	508	423	11.6	8.7	N	Y	42.0	N
6	99.9	79	98	42.8	264	453	374	11.4	8.5	N	Y	42.9	Y

$S \leq 0.10V + 0.0060V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

For EV – describe method used to disable electric power to the vehicle propulsion motor(s) if applicable:____n/a___________

Data indicates compliance: YES ___x___ NO _______
Comments: Stop 1 ABS not initialized. Other stops were run with charged booster disconnected from intake manifold. Vehicle would restart engine when ignition switched back to run.
Driver: [redacted] Observer: n/a
Date: 3/3/2008

DATA SHEET 13
14.10 COLD EFFECTIVENESS @ LLVW (S7.5)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/3/2008 @ 1:30 PM
TEMP.:	15.8º C	WIND VELOCITY:	3.5 m/s	ROAD PFC:	0.9
ODOMETER START:	8595 mi	ODOMETER FINISH:	8608 mi		

TEST WEIGHT: Total = 2025 kg; Front = 1030.5 kg; Rear = 994.5 kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

REPEAT 14.7 WITH VEHICLE AT LLVW

S.7.5.3 Performance Requirements:

*STOPPING DISTANCE: ≤70 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.8	63	69	43.9	245	517	411	11.2	8.7	N	Y	43.2	N
2	100.7	90	90	45.2	204	462	358	11	8.5	N	Y	44.6	Y
3	100.2	83	98	42.7	227	454	373	11.5	8.7	N	Y	42.5	Y
4	100.2	47	96	43.2	232	509	423	11.4	8.7	N	Y	43.0	N
5	100.5	73	98	42.4	208	493	404	11.4	8.7	N	Y	42.0	Y
6	100.4	69	87	42.7	225	577	462	11.2	8.7	N	Y	42.4	N

$S \le 0.10V + 0.0060V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ______
Comments: N/A

Driver: [redacted] Observer: n/a
Date: 3/3/2008

DATA SHEET 14
14.11 HIGH SPEED EFFECTIVENESS @ LLVW (S7.6)
(Not required if vehicle maximum speed is ≤125 km/h)

VEHICLE:	KMHGE46EP7 [redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/3/2008 @ 2:02 PM
TEMP.:	16.5º C	WIND VELOCITY:	1.7 m/s	ROAD PFC:	0.9
ODOMETER START:	8608 mi	ODOMETER FINISH:	8625 mi		

TEST WEIGHT: Total = 2025 kg; Front = 1030.5 kg; Rear = 994.5 kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

REPEAT 14.8 WITH VEHICLE AT LLVW

S.7.6.3 Performance Requirements

STOPPING DISTANCE: $S \leq 0.10V + 0.0067V^2$

Calculated distance = 187.52 m

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	160.0	87	91	107.6	240	492	428	11.3	9.3	N	Y	107.6	Y
2	159.6	97	98	103	197	464	393	11.3	9.5	N	Y	103.5	Y
3	159.8	68	78	106.4	240	503	447	11	9.2	N	Y	106.7	N
4	159.4	93	96	102.1	187	514	423	11.4	9.5	N	Y	102.9	N
5	159.3	99	74	102.7	203	483	390	11.6	9.4	N	Y	103.6	Y
6	159.6	65	100	104.7	259	481	414	11.4	9.4	N	Y	105.2	Y

Data indicates compliance: YES x NO ______
Comments: N/A

Driver: [redacted] Observer: n/a
Date: 3/3/2008

DATA SHEET 15
14.12 ANTILOCK FUNCTIONAL FAILURE @ LLVW (S7.8)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/3/2008 @ 3:00 PM
TEMP.:	17.2° C	WIND VELOCITY:	2.4 m/s	ROAD PFC:	0.9
ODOMETER START:	8625 mi	ODOMETER FINISH:	8640 mi		

TEST WEIGHT: Total = 2025 kg; Front = 1030.5 kg; Rear = 994.5 kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

S.7.8.1 Vehicle conditions:

A. Vehicle Load: LLVW

B. Transmission Position: In Neutral

S.7.8.2 Test Conditions and Procedures

NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 100 km/h

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 6 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s

FAILURE SIMULATION:

A. Disconnect the functional power source, or any electrical connector that creates a functional failure.

Record method used to induce failure: Removed ESP-1 30 amp fuse

B. Brake system indicator light activated? YES ______ NO X

C. Restore the system to normal at the completion of this test.
NOTE: If more than one antilock brake subsystem is provided, repeat test for each subsystem.

S.7.8.3 Performance Requirements:

*STOPPING DISTANCE: ≤85 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.4	88	99	47.2	76	164	135	10.8	8.5	N	Y	46.8	Y
2	100.3	71	99	45.9	98	179	143	11.2	8.4	N	Y	45.6	Y
3	100.3	68	98	47.3	104	183	151	11.3	8.3	N	Y	47.0	Y
4	100.3	83	95	50.9	90	142	125	10.1	7.9	N	Y	50.6	Y
5	100.3	70	99	46.8	105	169	140	11	8.5	N	Y	46.5	Y
6	100.5	59	96	47.7	108	229	163	10.9	8.2	Y	Y	47.2	N

$S \leq 0.10V + 0.0075V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO _______
Comments: Amber ABS and ESC telltales illuminated.

Driver: [redacted] Observer: n/a
Date: 3/3/2008

DATA SHEET 16

14.13 Variable Brake Proportioning System Functional Failure @ LLVW(S7.9)

VEHICLE:	KMHGE46EP7 [redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/3/2008 @ 3:35PM
TEMP.:	16.0º C	WIND VELOCITY:	1.27 m/s	ROAD PFC:	0.9
ODOMETER START:	8640 mi	ODOMETER FINISH:	8647 mi		

TEST WEIGHT: Total = 2025 kg; Front = 1030.5 kg; Rear = 994.5 kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

Is vehicle equipped with variable proportioning? Yes x No ____

If "No", skip this section and continue to section S7.10.1

S.7.9.1 Vehicle Conditions

A. Vehicle Load: LLVW

B. Transmission Position: In Neutral

S.7.9.2 Test Conditions and Procedures:

NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 100 km/h

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 6 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s

FAILURE SIMULATION:

A. Disconnect the functional power source or mechanical linkage to render the variable brake proportioning system inoperative.

Record method used to induce failure: Removed ESP-1 and ESP-2 30 amp fuses

B. Brake system indicator light activated? YES X NO ____

C. Restore the system to normal at the completion of this test.
NOTE: If more than one antilock brake subsystem is provided, repeat test for each subsystem.

S.7.9.3 Performance Requirements:

*STOPPING DISTANCE: ≤110 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.3	62	90	51.7	54	152	111	9.6	7.5	Y	Y	51.4	N
2	100.5	58	97	55.0	57	157	102	9.6	7.2	Y	Y	54.5	N
3	100.4	76	99	52.4	79	124	110	9.2	7.6	N	Y	52.0	Y
4	100.3	62	99	50.4	80	147	118	9.8	7.3	Y	Y	50.1	N
5	100.4	47	69	55.3	71	129	111	8.9	7.4	Y	Y	54.9	N
6	100.2	74	95	52.3	86	120	106	8.9	7.4	N	Y	52.1	Y

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ____
Comments: Red brake light and amber ABS and ESC lights illuminated.

Driver: [redacted] Observer: n/a
Date: 3/3/2008

DATA SHEET 17
14.14 HYDRAULIC CIRCUIT FAILURE # 1 @ LLVW (S7.10) & FAILED ELECTRICALLY TRANSMITTED SIGNAL & FAILED RBS

VEHICLE:	KMHGE46EP7 [redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 9:15 AM
TEMP.:	12.8º C	WIND VELOCITY:	0.6 m/s	ROAD PFC:	0.9
ODOMETER START:	8647 mi	ODOMETER FINISH:	8662 mi		

TEST WEIGHT: Total = 2025 kg; Front = 1030.5 kg; Rear = 994.5 kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

S.7.10 Hydraulic Circuit Failure CIRCUIT NO. 1
Or Failed Brake Signal or Failed RBS

S.7.10.1 General Information: This test is for vehicles manufactured with a split service brake system. It is also for failed electric brake signal and **failed RBS.**

S.7.10.2 Vehicle Conditions:

A. Vehicle Load: LLVW

B. Transmission Position: In Neutral

S.7.10.3 Test Conditions and Procedures:
NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 100 km/h

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 4 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s
FAILURE SIMULATION (for hydraulic circuit, electronic brake signal, failed RBS):

Method of simulating failure: Dump valve at master cylinder and shorted fluid level sensor

System Portion Failed: LF + RR Failed

Determine the control force pressure level (differential pressure between intact and failed subsystem) or fluid level drop, necessary to activate the brake warning indicator.

A. Differential pressure to activate light: N/A ,or

B. Fluid level required to activate light: 279.7 mL below full
Make stops after the brake warning indicator has been activated.

C. For failed electric brake signal or failed RBS, warning indicators activated: n/a

D. Restore the system to normal at the completion of this test.

S.7.10.4 Performance Requirements:

*STOPPING DISTANCE: ≤168 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.4	64	74	84.5	170	510	380	5.7	4.7	N	Y	83.8	N
2	100.3	40	88	84.6	106	458	370	5.8	4.7	N	Y	84.1	Y
3	100.6	39	93	84.9	305	497	445	5.6	4.7	N	Y	83.9	Y
4	100.3	40	97	84.1	288	492	440	5.6	4.7	N	Y	83.6	Y

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO
Comments: LF + RR circuit failed, red brake light illuminated.

Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 18
14.14 HYDRAULIC CIRCUIT FAILURE # 2 @ LLVW (S7.10)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 10:00 AM
TEMP.:	14.5º C	WIND VELOCITY:	0.8 m/s	ROAD PFC:	0.9
ODOMETER START:	8667 mi	ODOMETER FINISH:	8685 mi		

TEST WEIGHT: Total = 2025 kg; Front = 1030.5 kg; Rear = 994.5 kg
TARGET WEIGHT: Total = 2023 kg; Front = 1028 kg; Rear = 995 kg

REPEAT 14.14 With Hydraulic Circuit #2 Failure

S.7.10.4 Performance Requirements:

*STOPPING DISTANCE: ≤168 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.3	59	72	86.5	290	497	426	5.9	4.6	N	Y	86.0	Y
2	99.9	68	99	87.8	286	534	433	6.0	4.3	N	Y	88.0	N
3	100.4	47	94	88.4	242	437	353	5.9	4.5	N	Y	87.7	Y
4	100.4	44	90	98.1	253	455	392	5.7	4.1	N	Y	97.3	Y

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ______
Comments: RF and LR circuit failed, red brake light and yellow ESC light illuminated.

Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 19
14.15 HYDRAULIC CIRCUIT FAILURE #1 @ GVWR (S7.10) & FAILED ELECTRICALLY TRANSMITTED SIGNAL & FAILED RBS

VEHICLE:	KMHGE46EP7U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 1:15 AM
TEMP.:	19.7° C	WIND VELOCITY:	2.5 m/s	ROAD PFC:	0.9
ODOMETER START:	8712 mi	ODOMETER FINISH:	8726 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

REPEAT 14.14 With Hydraulic Circuit #1 Failure @ GVWR

S.7.10.4 Performance Requirements:

*STOPPING DISTANCE: ≤168 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.5	68	73	85.3	285	429	370	5.6	4.7	N	Y	84.5	Y
2	100.3	69	96	82.9	240	476	398	5.8	4.7	N	Y	82.4	Y
3	100.3	80	95	82.2	342	504	459	5.8	4.7	N	Y	81.7	N
4	100.4	63	100	87.5	356	497	465	5.5	4.6	N	Y	86.8	Y

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ______
Comments: RF and LR circuit failed, red brake light and yellow ESC light illuminated.

Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 20
14.15 HYDRAULIC CIRCUIT FAILURE # 2 @ GVWR (S7.10)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 10:48 AM
TEMP.:	16º C	WIND VELOCITY:	0.9 m/s	ROAD PFC:	0.9
ODOMETER START:	8687 mi	ODOMETER FINISH:	8709 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

REPEAT 14.14 With Hydraulic Circuit #2 Failure @ GVWR

S.7.10.4 Performance Requirements:

*STOPPING DISTANCE: ≤168 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.5	61	76	99.6	235	520	408	5.6	4	N	Y	98.6	N
2	100.8	49	99	96.1	306	493	379	5.6	4.1	N	Y	94.6	Y
3	100.1	65	98	99.7	284	503	399	5.4	3.9	N	Y	99.5	N
4	100.5	96	98	105.0	276	449	449	5.4	3.8	N	Y	104.0	Y

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ________
Comments: LF + RR circuit failed, red brake light illuminated.

Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 21
14.16 ANTILOCK FUNCTIONAL FAILURE @ GVWR (S7.8)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 2:00 PM
TEMP.:	20.6º C	WIND VELOCITY:	4.6 m/s	ROAD PFC:	0.9
ODOMETER START:	8728 mi	ODOMETER FINISH:	8742 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

REPEAT 14.12 WITH VEHICLE AT GVWR

S.7.8.3 Performance Requirements:

*STOPPING DISTANCE: ≤85 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.5	64	77	48.1	192	413	300	10.9	8.1	Y	Y	47.6	N
2	99.5	65	100	47.1	189	319	262	11	8.2	N	Y	47.6	Y
3	100.4	61	98	45.6	136	278	203	10.6	8.6	Y	Y	45.2	N
4	99.8	67	98	45.9	149	288	212	11	8.3	N	Y	46.1	Y
5	100.1	77	97	46.7	159	267	220	10.9	8.5	Y	Y	46.6	N
6	100.3	66	97	46.1	160	258	223	10.9	8.5	Y	Y	45.8	N

$S \leq 0.10V + 0.0075V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO _______
Comments: Yellow ABS and ESC lights illuminated. Pulled ESP-1 fuse.

Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 22
14.17 Variable Brake Proportioning System Functional Failure @ GVWR(S7.9)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 2:50PM
TEMP.:	22.5º C	WIND VELOCITY:	8.5 m/s @ 320º	ROAD PFC:	0.9
ODOMETER START:	8742 mi	ODOMETER FINISH:	8748 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

Repeat 14.13 with vehicle at GVWR

S.7.9.3 Performance Requirements:

*STOPPING DISTANCE: ≤110 m from 100 km/h speed

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	99.6	57	91	54.0	109	189	157	10.4	7.9	N	Y	54.4	Y
2	100.4	79	96	47.4	90	241	160	10.4	8.3	Y	Y	47.0	N
3	100.6	57	98	50.2	108	216	162	10.5	7.9	Y	Y	49.6	N
4	100.5	78	98	53.3	100	161	138	10.2	7.6	N	Y	52.8	Y
5	100.5	54	95	49.8	85	250	167	10.2	7.9	Y	Y	49.3	N
6	100.5	76	94	49.1	94	181	147	10.3	8.1	Y	Y	48.6	N

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ____
Comments: Yellow ABS and ESC lights illuminated. Pulled ESP-1 and ESP-2 fuses.
Ran stops with tail wind.
Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 23
14.18 Power Brake Unit or Brake Power Assist Unit Inoperative @ GVWR (System Depleted) (S7.11) ***& Electrical failure in the electrically-actuated service brakes***

VEHICLE:	KMHGE46EP7 [redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/4/2008 @ 3:30 PM
TEMP.:	21.1º C	WIND VELOCITY:	7.9 m/s @ 307º	ROAD PFC:	0.9
ODOMETER START:	8748 mi	ODOMETER FINISH:	8764 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S.7.11.1 General Information:

This test is for vehicles equipped with one or more brake power units or brake power assist units. *It is also for electrical failure in the electrically-actuated service brakes.*

S.7.11.2 Vehicle Conditions:

A. Vehicle Load: GVWR

B. Transmission Position: In Neutral

S.7.11.3 Test Conditions and Procedures:
NOTE: STOP IN SHORTEST DISTANCE ACHIEVABLE (BEST EFFORT) ON ALL STOPS.

IBT: ≥65ºC, ≤100ºC

TEST SPEED: 100 km/h

PEDAL FORCE: 65 N minimum to 500 N maximum

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

NUMBER OF RUNS: 6 stops

TEST SURFACE: PFC of 0.9

WIND SPEED: Not greater than 5 m/s

FAILURE SIMULATION:
Disconnect the primary source of power or *fail electrically-actuated service brakes.*

(Deplete all reserve power capability.)

Method of rendering inoperative Removed vacuum hose and check valve from booster.

Restore the system to normal at the completion of this test. Repeat test for other power unit if vehicle has more than one.

S.7.11.4 Performance Requirements:

*STOPPING DISTANCE: ≤168 m

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Stopping Distance (m)	Pedal Force (N)			Vehicle Decel. (m/s^2)		Wheel Lockup	Stay in Lane	Corrected Stopping Distance (m) (speed and PFC)	Pass Y/N
		Front	Rear		Min.	Max.	Avg.	Max.	Avg.				
1	100.1	68	90	144.6	260	506	471	3.4	2.9	N	Y	144.3	N
2	100.4	90	100	129.2	440	526	486	3.5	3.2	N	Y	128.2	N
3	100.6	97	87	142.6	336	499	475	3.5	3.0	N	Y	140.9	Y
4	100.5	68	91	145.2	344	505	478	3.5	2.9	N	Y	143.8	N
5	100.5	90	90	136.4	412	502	477	3.5	3.0	N	Y	135.0	N
6	100.6	68	99	148.5	392	486	467	3.4	2.8	N	Y	146.7	Y

$S \leq 0.10V + 0.0100V^2$ (Stopping Distance formula for vehicles with top speed of <100 km/h)

Data indicates compliance: YES X NO ______
Comments: Ran stops with tail wind.

Driver: [redacted] Observer: n/a
Date: 3/4/2008

DATA SHEET 24
14.19 PARKING BRAKE @ GVWR (S7.12)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	n/a
TEMP.:	n/a	WIND VELOCITY:	n/a	ROAD PFC:	0.9
ODOMETER START:	n/a	ODOMETER FINISH:	n/a		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

Parking Brake: Hand Control? _____ Foot Control? _____ Electrically-Actuated? _____

S.7.12.1 Vehicle Conditoins:

A. Vehicle Load: GVWR

B. Transmission Position: In Neutral

C. Parking Brake Burnish:

For vehicles with parking brake systems not utilizing the service brake friction elements, the friction elements of such systems are to be burnished prior to parking brake tests according to the manufacturer's published recommendations as furnished to the purchaser. If no recommendations are furnished, test the system in an un-burnished condition. If recommendations are furnished, record method used.___________n/a_______________________________________

S.7.12.2 Test Conditions and Procedures:

A. Parking brake systems utilizing service brake friction materials.

IBT: ≤100°C
(No additional burnishing or artificial heating prior to the start of the parking brake test is allowed).

B. Parking brake systems utilizing non-service brake friction materials.

IBT: Ambient Temperature
(No additional burnishing or artificial heating prior to the start of the parking brake test is allowed).

PEDAL FORCE:

Hand control: ≤400 N

Foot control: ≤500 N

Drive onto 20% grade. Apply service brake just enough to hold vehicle stationary, and shift to Neutral. Apply park brake to force of ≤ 400 N hand control and ≤ 500 N foot control.

Release service brake; If vehicle remains stationary, start the measurement of time. Terminate after 5 minutes. If vehicle is not held stationary, reapply service brake just enough to hold vehicle on the grade. Reapply the specified force to parking lever or pedal (without releasing ratchet mechanism).

Release service brake. If vehicle still doesn't hold, repeat application. If vehicle is not held stationary for 5 minutes after two re-applications, check with engineer for further instructions. Repeat test in the opposite direction.

Did parking brake indicator operate each time the parking brake was applied?

Yes ______ No______

S.7.12.3 Performance Requirements:

The parking brake must hold the vehicle stationary in both directions for 5 minutes.

Comments: **Section was not run due to no 20% grade facility available.**

RECORDED DATA

		20% Grade - Uphill			20% Grade - Downhill		
		Initial Apply	1st Reapply	2nd Reapply	Initial Apply	1st Reapply	2nd Reapply
Service Brake Force to Hold Vehicle Stationary (N)		-	-	-	-	-	-
Parking Brake Force Applied (N)		-	-	-	-	-	-
Number of Clicks (Optional)		-	-	-	-	-	-
Vehicle Stationary for 5 minutes?		-	-	-	-	-	-
Initial Brake Temperature (°C)	Left	-	-	-	-	-	-
	Right	-	-	-	-	-	-
	Average	-	-	-	-	-	-

Data indicates compliance: YES - NO -
Comments:

Driver: - Observer: -
Date: -

DATA SHEET 24
15.19 PARKING BRAKE @ GVWR (S7.12)

VEHICLE:	BH	NHTSA NUMBER:	TR_2008-VE-OTD-0	DATE:	2/22/2008
TEMP.:	8 ℃	WIND VELOCITY:	2 m/s	ROAD PFC:	0.9
ODOMETER START:	2309	ODOMETER FINISH:	2311		

Test Weight: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

Parking Brake: Hand Control? NO Foot Control? YES

S7.12.1 Vehicle Conditions:

A. Vehicle Load: GVWR

B. Transmission Position: In Neutral

NOTE: For vehicle with parking brake systems not utilizing the service brake function elements, the friction elements of such systems are to be burnished prior to parking brake tests acording to the manufacturer's published recommendations as furnished to the purchaser. If no recommendations are furnished, test the system in an unburnished condition. If recommendations are furnished, record method used. Drive the vehicle 500M with speed of 60KPH while parking brake pedal is operated with 15kgf (2~3notches)

S7.10.3 Test Conditions and Procedures:

A. Parking brake systems utilizing service brake friction materials.

IBT: <100℃
(No additional burnishing or artificial heating prior to the start of the parking brake test is allowed).

B. Parking brake systems utilizing non-service brake friction materials.

IBT: Ambient Temperature
(No additional burnishing or artificial heating prior to the start of the parking brake test is allowed).

PEDAL FORCE:

Hand Control: <400 N

Foot Control: <500 N

Drive onto 20% grade. Apply service brake just enough to hold vehicle stationary. and shift to Neutral. Apply park brake to force of 400 N hand control and < 500 N foot control.

Release service brake; if vehicle remains stationary, start the measurement of time. Terminate after 5 minutes. If vehicle is not held stationary, reapply service brake just enough to hold vehicle on the grade. Reapply the specified force to parking lever or pedal (without releasing rachet mechanism).

Release service brake; if vehicle still doesn't hold, repeat application. If vehicle is not held stationary for 5 minutes after two re-applications, check with engineer for further instructions. Repeat test in the oposite direction.

Did parking brake indicator operate each time the parking brake was applied?

Yes ○ No ____

S7.10.4 Performance Requirements:

The parking brake must hold the vehicle stationary in both directions for 5 minutes.

Comments:

(65/82)

VISUAL DATA

		20% Grade - Uphill			20% Grade - Downhill		
		Initial Apply	1st Reapply	2nd Reapply	Initial Apply	1st Reapply	2nd Reapply
Service Brake Force to Hold Vehicle Stationary (N)		109			81		
Parking Brake Force Applied (N)		380			380		
Number of Clicks (Optional)							
Vehicle Stationary for 5 minutes?		YES			YES		
Initial Brake Temperature (℃)	Left	23			21		
	Right	22			21		
	Average	22			21		

RECORDED DATA

		20% Grade - Uphill			20% Grade - Downhill		
		Initial Apply	1st Reapply	2nd Reapply	Initial Apply	1st Reapply	2nd Reapply
Service Brake Force to Hold Vehicle Stationary (N)		109			81		
Parking Brake Force Applied (N)		380			380		
Initial Brake Temperature (℃)	Left	23			21		
	Right	22			21		
	Average	22			21		

COMPLIANCE: YES ○ NO ____

Comments: Section was run on different vehicle in Korea. Section included in test report to maintain single source of information.

Driver: J.H MA Observer: D.H KANG

Date: 2/22/2008

DATA SHEET 25
14.20 HEATING SNUBS @ GVWR (S7.13)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/5/2008 @ 8:25 AM
TEMP.:	12º C	WIND VELOCITY:	4.4 m/s	ROAD PFC:	0.9
ODOMETER START:	8767 mi	ODOMETER FINISH:	8790 mi		

TEST WEIGHT:	Total =	2259 kg;	Front =	1034.5 kg;	Rear =	1224.5 kg
TARGET WEIGHT:	Total =	2253 kg;	Front =	1032 kg;	Rear =	1221 kg

IBT: ≥ 55ºC, ≤65ºC.

Establish IBT before the first brake application. IBT before subsequent snubs are those occurring at the distance intervals.

TRANSMISSION POSITION: In gear

NUMBER OF SNUBS: 15

TEST SPEEDS:
The initial speed for each snub is 120 km/h or 80% of Vmax, whichever is slower. Each snub is terminated at one-half the initial speed.

DECELERATION RATE:
Maintain a constant deceleration rate of 3.0 m/s². Attain the specified deceleration within one second and maintain it for the remainder of the snub.

PEDAL FORCE:
Adjust as necessary to maintain the specified constant deceleration rate.

TIME INTERVAL:
Maintain an interval of 45 seconds between the start of brake applications (snubs).

NOTE 1: Accelerate as rapidly as possible to the initial test speed immediately after each snub.

NOTE 2: Immediately after the 15th snub, accelerate to 100 km/h and commence the hot performance test.

RECORDED DATA

NOTE: Modify as needed according to feasibility and instrumentation.

Snub No.	Max. Decel. Rate (m/s²)	Avg. Decel. Rate (m/s²)	Time Interval	Max. Pedal Force (N)	Avg. Pedal Force (N)	Brake Lining Temp. C				Speed (km/h)	Comments
						LF	RF	LR	RR		
1	4.0	2.4	0	67.9	29.4	61	60	68	57	121.0	-
2	3.5	2.4	45	43.2	23.5	88	88	98	84	122.3	-
3	3.2	2.3	45	51.0	32.3	118	120	129	113	124.3	-
4	3.4	2.2	45	49.3	31.9	145	149	158	143	118.9	-
5	3.1	2.1	45	44.9	31.6	163	169	181	167	124.1	-
6	3.1	2.3	45	55.1	35.7	181	188	202	188	118.7	-
7	3.2	2.3	45	45.1	27.9	191	197	216	202	119.4	-
8	3.4	2.3	45	46.2	24.5	199	203	227	214	121.1	-
9	3.3	2.2	45	45.2	24.2	205	205	238	227	123.6	-
10	3.2	2.2	45	62.5	39.4	213	210	248	240	125.2	-
11	3.1	2.2	45	64.2	42.2	222	217	261	254	123.3	-
12	3.7	2.2	45	68.3	35.5	229	223	275	266	123.0	-
13	3.2	2.2	45	61.3	41.1	234	230	286	275	122.1	-
14	3.1	2.2	45	58.6	38.0	234	234	293	281	120.0	-
15	3.5	2.2	45	59.6	30.5	231	234	297	285	119.9	-

Data indicates compliance: YES ___X___ NO _______
Comments: N/A

Driver: [redacted] Observer: N/A
Date: 3/5/2008

DATA SHEET 26
14.21 HOT PERFORMANCE @ GVWR (S7.14)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/5/2008 @ 8:25 AM
TEMP.:	12º C	WIND VELOCITY:	4.4 m/s	ROAD PFC:	0.9
ODOMETER START:	8767 mi	ODOMETER FINISH:	8790 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S.7.14 Hot Performance: GVWR

IBT: Temperature achieved at completion of heating snubs.

TRANSMISSION POSITION: In neutral

NUMBER OF RUNS: 2 stops

TEST SPEEDS: 100 km/h (62.1 mph). If vehicle is incapable of attaining 100 km/h, it is tested at the same speeds used for the cold effectiveness test.

PEDAL FORCE:

Stop No. 1: Average pedal force not greater than the average pedal force recorded during the shortest GVWR cold effectiveness stop.

AVG. Pedal force from cold effectiveness stop: 375 N

NOTE: To insure Average Pedal Force is not GREATER THAN the Average Pedal Force on shortest GVWR cold effectiveness stop, driver can observe instrument panel mounted real time pedal force gauge and maintain a force lower than the average value which must NOT be exceeded.

Stop No. 2: <500 N (112.4 lbs.)

WHEEL LOCKUP: No lockup of any wheel for longer than 0.1 seconds at speeds greater than 15 km/h

Relative and Absolute Performance Requirements:

A. For the **1st** hot stop, the stopping distance must be less than or equal to a calculated distance which is based on 60 percent of the deceleration actually achieved on the shortest GVWR cold effectiveness stop. The following equations shall be used in calculating the performance requirement.

$$Dc = 0.0386V^2 / (Sc - 0.10V)$$

$$S = 0.10V + (0.0386V^2 / 0.60Dc)$$, where —

Sc = actual stopping distance measured on the shortest cold effectiveness stop at GVWR (m/s)

V = cold effectiveness test speed (km/h)

Dc = the average deceleration actually achieved during the shortest cold effectiveness stop at GVWR (m/s²)

S = stopping distance.

B. In addition to the requirement above, the stopping distance for **at least one** of the two hot stops must be $S \leq 89$ m (292 ft.) from a test speed of 100 km/h or, for reduced test speed $S \leq 0.10V + 0.0079V^2$. The results of the second stop may not be used to meet the requirements of the first stop.

NOTE 1: Accelerate as rapidly as possible to the initial test speed immediately after each stop.

NOTE 2: Immediately after the hot performance stops, drive 1.5 km at 50 km/h before the first cooling stop.

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Actual Stopping Distance (m)	Corrected Stopping Distance (m)	Pedal Force (N)		Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane	Pass Req. 1 Y/N	Pass Req. 2 Y/N
		Front	Rear			Max.	Avg.	Max.	Avg.				
1	100.3	242	299	48.7	48.7	427	324	9.5	7.1	N	Y	Y	Y
2	100.4	256	316	49.5	49.5	497	431	9.5	7	N	Y		Y

Data indicates compliance: YES X NO

Comments: N/A

Driver: [redacted] Observer: n/a

Date: 3/5/2008

DATA SHEET 27
14.22 BRAKE COOLING @ GVWR (S7.15)

VEHICLE:	KMHGE46EP7 U[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/5/2008 @ 8:25 AM
TEMP.:	12º C	WIND VELOCITY:	4.4 m/s	ROAD PFC:	0.9
ODOMETER START:	8767 mi	ODOMETER FINISH:	8790 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S.7.15 Brake Cooling Stops: GVWR

IBT: Temperature achieved at completion of hot performance.

TRANSMISSION POSITION: In gear

NUMBER OF RUNS: 4 stops

TEST SPEEDS: 50 km/h (31.1 mph)

PEDAL FORCE:
Adjust as necessary to maintain specified constant deceleration rate

DECELERATION RATE:
Maintain a constant deceleration rate of 3.0 m/s²

WHEEL LOCKUP:
No lockup of any wheel for longer than 0.1 seconds at speeds > 15 km/h

NOTE 1: Immediately after the hot performance stops, drive 1.5 km at 50 km/h before the first cooling stop.

NOTE 2: For the first through third cooling stops, immediately accelerate at the maximum rate to 50 km/h. Maintain that speed until beginning the next stop at a distance of 1.5 km from the beginning of the previous stop.

NOTE 3: Immediately after the fourth stop, accelerate at the maximum rate to 100 km/h. Maintain that speed until beginning the recovery performance stops at a distance of 1.5 km after the beginning of the fourth cooling stop.

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Interval (km)	Pedal Force (N)		Vehicle Decel. (m/s²)		Wheel Lockup	Stay in Lane
		Front	Rear		Max.	Avg.	Max.	Avg.		
1	51.8	230	290	0	57.4	28.6	3.9	2.2	N	Y
2	52.7	179	241	1.5	54.4	28.6	3.8	2.4	N	Y
3	52.7	152	217	1.5	62.6	27.5	4.0	2.3	N	Y
4	50.8	130	194	1.5	43.8	34.7	3.4	2.1	N	Y

Data indicates compliance: YES x NO ____
Comments: N/A

Driver: [redacted] Observer: n/a
Date: 3/5/2008

DATA SHEET 28
14.23 Recovery Performance @ GVWR (S7.16)

VEHICLE:	KMHGE46E P7[redacted]	Report No.:	TR_2008-VE-OTD-012	DATE:	3/5/2008 @ 8:25 AM
TEMP.:	12º C	WIND VELOCITY:	4.4 m/s	ROAD PFC:	0.9
ODOMETER START:	8767 mi	ODOMETER FINISH:	8790 mi		

TEST WEIGHT: Total = 2259 kg; Front = 1034.5 kg; Rear = 1224.5 kg
TARGET WEIGHT: Total = 2253 kg; Front = 1032 kg; Rear = 1221 kg

S.7.16 Recovery Performance. GVWR

NOTE: The recovery performance test is conducted immediately after completion of the brake cooling stops.

IBT: Temperature achieved at completion of cooling stops.

TRANSMISSION POSITION: In neutral.

NUMBER OF RUNS: 2 Stops

TEST SPEED:
100km/h (62.1 mph). If vehicle is incapable of attaining 100 km/h, it is tested at the same speeds used for the cold effectiveness test.

PEDAL FORCE:
Average pedal force not greater than the average pedal force recorded during the shortest GVWR cold effectiveness stop.

AVG. Pedal force from cold effectiveness stop: 375 N

WHEEL LOCKUP:
No lockup of any wheel for longer than 0.1 seconds allowed at speeds greater than 15 km/h.

Immediately after the 4th cooling stop, accelerate at the maximum rate to 100 km/h. Maintain that speed until beginning the 1st recovery performance stop at a distance of 1.5 km after the beginning of the 4th cooling stop.

Immediately after completion of the 1st recovery performance stop, accelerate as rapidly as possible to the specified test speed and conduct the 2nd recovery performance stop.

Performance Requirements: The stopping distance S for **at least one** of the two stops must be within the following limits:

$S - 0.10V \geq (0.0386 V^2 / 1.50Dc)$, and

$S - 0.10V \leq (0.0386 V^2 / 0.70Dc)$, where —

V = cold effectiveness test speed (km/h)

Dc = average deceleration actually achieved during the shortest cold effectiveness stop at GVWR (m/s^2).

RECORDED DATA

Stop No.	Test Speed (km/h)	Initial Brake Temp. (℃)		Actual Stopping Distance (m)	Corrected Stopping Distance (m)	Pedal Force (N)		Vehicle Decel. (m/s^2)		Wheel Lockup	Stay in Lane	Pass Y/N
		Front	Rear			Max.	Avg.	Max.	Avg.			
1	99.5	131	194	42.7	43.1	328	238	11.7	7.7	N	Y	Y
2	100.2	147	208	43.9	43.8	394	299	11.4	7.7	N	Y	Y

Data indicates compliance: YES X NO ______
Comments: N/A

Driver: [redacted] Observer: n/a
Date: 3/5/2008

DATA SHEET 29 (Part 1 of 6)
14.24 TEST COMPLETION INSPECTION (S7.17)

VEHICLE: KMHGE46EP7U[redacted] Report No.: TR_2008-VE-OTD-012 ; DATE: 3/6/2008

TEMPERATURE: n/a ºC; WIND VELOCITY & DIRECTION: n/a
TEST COMPLETION INSPECTION REQUIREMENTS:

No detachment or fracture of any components such as brake springs, brake shoe, or disc pads facing. All mechanical components shall be intact and functional. Friction facing tearout shall not exceed 10% of the lining on any single frictional element. No visible brake fluid or lubricant on the friction surface of the brake. No leakage at any system reservoir cover, seal, or filler opening.

BRAKE SYSTEM INTEGRITY (S5.6) (S7.17):

Friction Material condition: Primary/Inner		Friction Material condition: Secondary/Outer	
LF	OK	LF	OK
RF	OK	RF	Lt Glaze
LR	Lt Glaze	LR	Lt Glaze
RR	Lt Glaze	RR	Lt Glaze
DRUM (OR ROTOR) CONDITION:		BRAKE FLUID/LUBRICANT INSIDE BRAKES:	
LF	Heavy Transfer, Lt Ringing	LF	None
RF	Heavy Transfer, Lt Ringing	RF	None
LR	Heavy Transfer, Lt Ringing	LR	None
RR	Heavy Transfer, Lt Ringing	RR	None
HYDRAULIC COMPONENT CONDITION:		MECHANICAL COMPONENT CONDITION:	
LF	OK	Brk/Ped	OK
RF	OK	Pow/Brk	OK
LR	OK	Stop/Lamp	OK
RR	OK	Linkage	OK
M/CYL	OK	Other	n/a

Data indicates compliance: YES X NO ____ No Requirements ____
Comments:

Driver: [redacted] Observer: n/a

RECORDED DATA PROCESSED BY: William Manosh DATE: 3/6/2008

DATA SHEET 29 (Part 2 of 6)
14.24 TEST COMPLETION INSPECTION (S7.17)

EQUIPMENT REQUIREMENTS (S5)

Service Brake System (S5.1):

Vehicle equipped with a service brake system acting on all wheels? YES __X__ NO ____

Wear Adjustment (S5.1.1):

Service Brakes are compensated for wear by means of a system of automatic adjustment?

YES __X__ NO ____

Describe: Caliper seal groove

Wear Status (S5.1.2):

Wear status of service brakes is indicated by:

(A) Acoustic or optical device? YES __X__ NO ____

Describe: Squealer on leading edge of inboard pad

(B) Visual check outside or under vehicle? YES __X__ NO ____

Describe: caliper windows and park brake inspection hole

Regenerative Brake System (S5.1.3):

(A) EV with RBS, RBS is part of the service brake system if automatically activated , there is no means to deactivate, and functions in all transmission positions.

No RBS YES ____ NO ____

(B) If equipped with ABS and RBS that is part of the service brake system, ABS controls RBS.

No RBS YES ____ NO ____

DATA SHEET 29 (Part 3 of 6)

Parking Brake System (S5.2):

Vehicle equipped with a parking brake system of a friction type with solely mechanical means to retain engagement:

YES X NO ____

Controls (S5.3):

(A) Service brakes activated by means of a foot control?
YES X NO ____

(B) Parking brake control is independent of the service brake control?
YES X NO ____

(C) Parking brake control is hand or foot operated?
YES X NO ____

(D) ABS, if equipped, cannot be manually disabled?
YES X NO ____

Data indicates compliance: YES X NO ____
Comments:

Tested By: William Manosh Date: 3/6/2008

DATA SHEET 29 (Part 4 of 6)
14.24 TEST COMPLETION INSPECTION (S7.17)

VEHICLE: KMHGE46EP7U[redacted]

DATE: 3/6/2008

MASTER CYLINDER RESERVOIR:

Date:	10/22/2007	Requirements:	Pass	Fail
Master Cylinder Piston Displacement(S5.4.2) [If Common Reservoir Supply - continued from previous page]				
Fluid displaced by three strokes of master cylinder piston for Primary (Subsystem No. 1)	25 mL	Individual partial compartments of reservoir shall each at a minimum have a fluid capacity equal to at least the volume displaced by the master cylinder piston servicing the subsystem during a full stroke of the piston. **NOTE:** Procedure uses three strokes to ensure an accurate measurement.	X	
Fluid displaced by three strokes of master cylinder piston for Secondary (Subsystem No. 2)	26 mL		X	
Fluid displaced per stroke, Primary	8.3 mL		X	
Fluid displaced per stroke, Secondary	8.6 mL		X	
Fluid available in partial compartment Subsystem No. 1	105.3 mL		X	
Fluid available in partial compartment Subsystem No. 2	74.7 mL		X	
Brake Power Unit Reservoir (S5.4.2)				
Volume displaced in charging system piston or accumulator to normal operating pressure plus wheel cylinder or caliper piston displacement.	N/A	Shall have a capacity at least equal to fluid displacement required to charge the system pistons on accumulators to normal operating pressure plus displacement when wheel cylinders or caliper pistons move from new lining to full worn condition as above.	N/A	N/A

Reservoir Labeling (S5.4.3)				
Exact copy of reservoir label: WARNING, CLEAN FILLER CAP BEFORE REMOVING. USE ONLY DOT 3 OR 4 BRAKE FLUID FROM A SEALED CONTAINER.		Label shall read: "Warning, clean filler cap before removing; use only * fluid from a sealed container". * Fluid type specified in 49 CFR 571.116	x	
Measure letter height 3.5 mm		Letters shall be at least 3.2mm/ 0.125" high		
Describe label attachment method and location. Raised lettering molded into cap		Lettering shall be permanently affixed, engraved or embossed and located so as to be visible by direct view either on or within 100mm/3.94 inches of the brake fluid reservoir filler plug or cap.	x	
Does the lettering contrast with the background?	No	If label is not engraved or embossed, letters shall be of a color that contrasts with the background	x	

DATA SHEET 29 (Part 5 of 6)
14.24 TEST COMPLETION INSPECTION (S7.17)

VEHICLE: KMHGE46EP7U[redacted] ; DATE: 3/6/2008

BRAKE SYSTEM WARNING INDICATOR (S5.5)

Condition	Answer	Requirements:	Pass	Fail
Brake Systems Indicator Lamp Function Check (S5.5.2) (Bulb and systems check)				
Describe location of brake indicator lamp:	Low center	Shall be in front, and in clear view, of driver.	X	
Does lamp light with ignition (start) switch at ON/RUN?	Yes	Automatic activation when ignition switch is “on” when engine not running, or ignition between “on” and “start” if is manufacturer check position- OR -single manual action by driver	X	
Does lamp light with ignition between ON and Start?				
Brake check description in owner’s manual?	not evaluated	Manufacturer shall explain the brake check function test procedure in the owner’s manual.	Not availaible	
Brake System Warning Indicator ACTIVATION (S5.5.1) DURATION (S5.5.3) FUNCTION (S5.5.4) FLUID LEVEL INDICATION (S5.4.4)				

Condition	Light on	Requirements:	Pass	Fail
A. In event of hydraulic leak (1) On or before appearance of pressure differential of 218 psi (split system) value ______	No	When ignition (Start) switch is ON, lamp must light whenever (A), (B), (C), (D), (E), (F), or (G) occurs. IN addition, if service brake system is not a split system, audible warning must be activated when any condition in (A) exists. Visual warning indicator for non-split systems must be flashing.		
(2) If any reservoir compartment falls below either “safe” level or 25% of capacity, whichever is greater. Values _________ml or cc	Yes		X	
(3) On or before supply pressure to brake power unit falls to 50% value_________	N/A			
B. Electrical functional failure in an antilock or variable brake proportioning system.	Yes			
C. Application of the parking brake.	Yes			
D. Brake lining wear-out if optical warning	N/A			
E. For a vehicle with electrically-actuated service brakes, failure of the source of electric power to the brakes, or diminution of state of charge of the batteries.	N/A			
F. For a vehicle with electric transmission of the service brake control signal, failure of a brake control circuit.	N/A			
G. For an EV with RBS that is part of the service brake system, failure of RBS	N/A		X	
Must have Audiable alarm if not split system and a condition in (a) above exists?	N/A			
If Condition (a)(1) above exists, and light does not activate, then fluid reservoir must be **transparent** for fluid check without need for reservoir to be opened? (S5.4.4)	N/A			
Indicator lamps remain activated as long as conditoin exists - ignition 'on", and engine on or off? ____ (**S5.5.3 DURATION**)	YES			
Visual warning - continuous or flashing? ___	CONT			
Audiable warning - continuous or flashing? ___	N/A			

DATA SHEET 29 (Part 6 of 6)
14.24 TEST COMPLETION INSPECTION (S7.17)

VEHICLE: KMHGE46EP[redacted] ; DATE: 3/6/2008

BRAKE SYSTEM WARNING INDICATOR LABELING (S5.5.5)

CONDITION AND REQUIREMENT	ANSWER NOTE: Standard requires that the answer to questions be YES	PASS	FAIL
Are visual indicators legible to driver in daylight and nighttime conditions when activated?	Yes	X	
Are visual indicator words 3.2mm (.125") high minimum? Record Height__4mm____________	Yes	X	
Visual indicator words and background contrasting colors, one of which is red. Record colors______________RED________________________	Yes	X	
If split system is there one brake indicator? If yes does it say the word “Brake”?	Yes	X	
If not split system, is there a separate indicator for loss of fluid or fluid pressure? Does this indicator say “Stop-Brake Failure” ? Are the letters block and not less than 6.4mm (.25") in height? Record letter height____	N/A		
If separate indicator for: 1. Low brake fluid per S5.5.1(a)(1), does indicator say “Brake Fluid”? NOTE: not required for mineral oil system Record wording____	N/A		
2. Gross pressure loss per S5.5.1(a)(2), does indicator say “Brake Pressure”? Record wording _____________________________	N/A		
3. Electrical functional failure in antilock or variable proportioning system per S5.5.1(b), letters and background contrasting colors one of which is yellow? Record colors _____Yellow_____________	Yes		
Does indicator say “Antilock” or “ABS” or “Brake Proportioning”? Record wording___________________ABS______________________	Yes		
4. Parking brake per S5.5.1(c), does indicator say “Park” or “Parking Brake”? Record wording ___________________________	N/A		
5. Brake lining wear-out per S5.5.1(d), does indicator say “Brake Wear”? Record wording____	N/A		
6. If separate indicator for RBS, the letters and background shall be of contrasting colors, one of which is yellow. The indicator shall be labeled “RBS”. RBS failure in a system which is part of the service brake system may also be indicated by a yellow lamp that also indicates “ABS” failure and displays the symbol “ABS/RBS.” Record wording _____________	N/A		
7. For any other function? If yes, Record_____ESC OFF, EPB	Yes	X	

Data indicates compliance: YES __X__ NO ______

Comments:

Technician: William Manosh Date: 3/6/2008

DATA SHEET 30
CALCULATION OF MINIMUM RESERVOIR VOLUME REQUIREMENTS

BRAKE		LINING		
LOCATION	TYPE	DESCRIPTION	MINIMUM THICKNESS	THICKNESS TO FULLY WARN (1) in.
Left Front	Drum	Leading X	Pretest 0.677 in	0.394 in
		Primary	Post Test 0.662 in	
		Outboard X	) 0.015 in	
	Disc X	Trailing	Pretest 0.685 in	0.394 in
		Secondary	Post Test 0.670	
		Inboard X	) 0.015	
LINING CLEARANCE:	Diametral (2) - N/A	Inboard - 0	Outboard - 0	
WHEEL CYLINDER DIAMETER (3) - N/A		CALIPER PISTON DIAMETER (3) - 63.5 mm		
SHOE CAGE DIAMETER (4) _______: CENTER POINT OF BRAKE ASSY TO CENTER POINT OF W.C.				
Right Rear	Drum	Leading X	Pretest 0.615 in	0.394 in
		Primary	Post Test 0.587 in	
		Outboard X	) 0.028 in	
	Disc X	Trailing	Pretest 0.614 in	0.394 in
		Secondary	Post Test 0.593 in	
		Outboard X	) 0.021 in	
LINING CLEARANCE:	Diametral (2) - N/A	Inboard - 0	Outboard - 0	
WHEEL CYLINDER DIAMETER (3) -		CALIPER PISTON DIAMETER (3) - 43mm		
SHOE CAGE DIAMETER (4) _______: CENTER POINT OF BRAKE ASSY TO CENTER POINT OF W.C.				
SUBSYSTEM 1 CONSISTS OF:	LF X	LR	RF	RR X
SUBSYSTEM 2 CONSISTS OF:	LF	LR X	RF X	RR
(1) MFRS RECOMMENDATIONS - REAR - FRONT -				
(2) DRUM BRAKES, MEASURED AT HORIZONTAL CENTERLINE				
(3) MFRS DATA				
(4) RESET POSITION				

DATA SHEET 31
(SAMPLE)

BRAKE		LINING		
LOCATION	TYPE	DESCRIPTION	MINIMUM THICKNESS	THICKNESS TO FULLY WARN (1) in.
Left Front	Drum	Leading	Pretest - 0.425	0.324
		Primary	Post Test - 0.403	
		Inboard -X	) - 0.022	
	Disc - X	Trailing	Pretest - 0.393	0.3
		Secondary	Post Test - 0.380	
		Outboard -X	) - 0.013	
LINING CLEARANCE:	Diametral (2) - N/A	Inboard - 0	Outboard - 0	
WHEEL CYLINDER DIAMETER (3) - N/A		CALIPER PISTON DIAMETER (3) - 2.38"		
SHOE CAGE DIAMETER (4) - N/A : CENTER POINT OF BRAKE ASSY TO CENTER POINT OF W.C. - N/A				
Right Rear	Drum - X	Leading - X	Pretest - 0.206	0.122
		Primary	Post Test - 0.20	
		Inboard	) - 0.006	
	Disc	Trailing - X	Pretest - 0.238	0.179
		Secondary	Post Test - 0.231	
		Outboard	) - 0.007	
LINING CLEARANCE:	Diametral (2) - 0.030"	Inboard - N/A	Outboard - N/A	
WHEEL CYLINDER DIAMETER (3) - 0.750"		CALIPER PISTON DIAMETER (3) - N/A		
SHOE CAGE DIAMETER (4) - 9.45" : CENTER POINT OF BRAKE ASSY TO CENTER POINT OF W.C. - 3"				
SUBSYSTEM 1 CONSISTS OF:	LF - X	LR	RF - X	RR
SUBSYSTEM 2 CONSISTS OF:	LF	LR - X	RF	RR - X
(1) MFRS RECOMMENDATIONS - REAR - TOP OF RIVIT HEADS FRONT - 1/32 INCH				
(2) DRUM BRAKES, MEASURED AT HORIZONTAL CENTERLINE				
(3) MFRS DATA				
(4) RESET POSITION				

Minimum Reservoir Calculation

Front caliper diameter	**63.5mm**
Front lining thickness to fully worn	**10mm**

Rear caliper diameter	**43mm**
Rear lining thickness to fully worn	**10mm**

Front caliper fluid displacement to fully worn linings
(10mm+10mm)x3.14x(63.5^2)/4=63.3mL

Front axle fluid displacement to fully worn linings
63.3mlx2calipers=126.6mL

Rear caliper fluid displacement to fully worn linings
(10mm+10mm)x3.14x(43^2)/4=29.03mL

Rear axle fluid displacement to fully worn linings
29.03mlx2calipers=58.06mL

Total system fluid displacement to fully worn linings
126.6mL+58.06mL=184.66mL

Total reservoir volume **488.7mL**

488.7mL>184.66mL Pass requirement

APPENDIX 1

Procedure and Example for Determining Master Cylinder Volume Requirement

The procedure followed for determining the minimum volume requirements is outlined in the example shown below. The required data is taken from Table 1A-1.

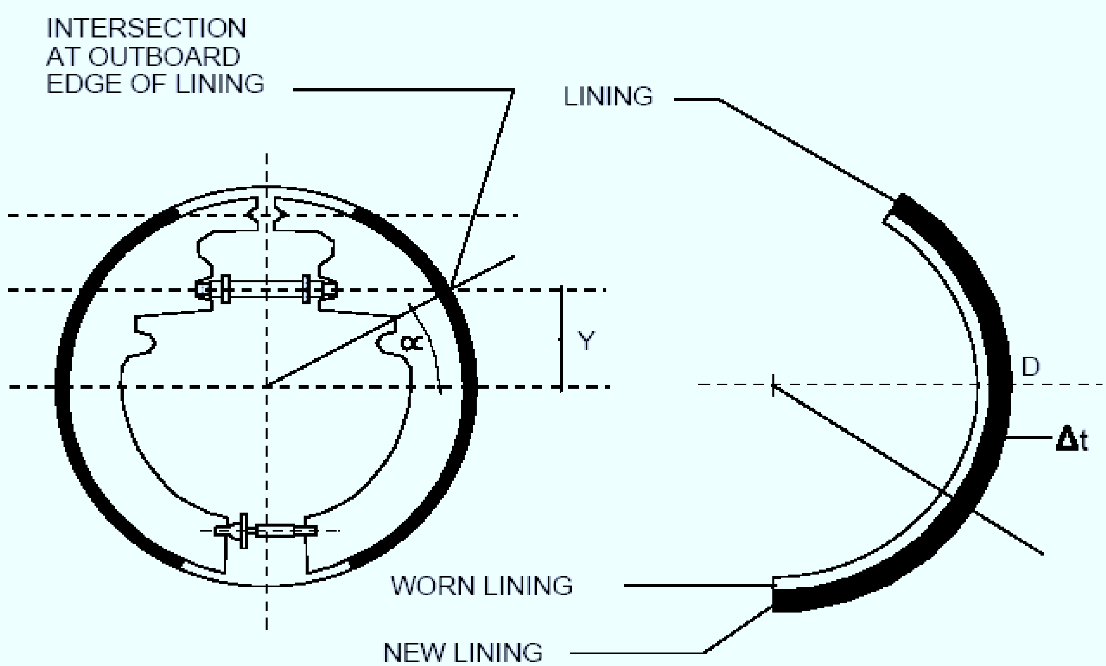


FIGURE 1A

DRUM BRAKES

Volume Required, Vr = [(2C + Δ ts + Δ tp)/cos ∝] x A x NWC, where –

Vr =	Volume required per wheel
C =	Manufacturer's recommended drum-to-lining clearance
Δ tp =	Change in thickness of primary lining
Δ ts =	Change in thickness of secondary lining
Y =	Center point of wheel cylinder to center point of brake assembly
A =	Cross sectional area of the wheel cylinder bore
NWC =	Number of wheel cylinders serviced by the reservoir in question
∝ =	Sin-1(2Y/D)
D =	Cage diameter

APPENDIX ....Continued

DISC BRAKES

Volume Required, Vv = (Δ ti + Δ tic + Δ to + toc) x [Π (D²)]/4, where –

Vv =	Volume required per wheel
Δt =	Change in thickness (average)
i =	inboard
o =	Outboard
D =	Caliper cylinder diameter
c =	Average clearance

Using the above equations, the volume requirements for Subsystem No. 1 (LF, RR) and Subsystem No. 2 (LF, RF) were calculated as shown below:

Drum Brakes (rear):

Vr =	(2C + Δ tp + Δ s x 1)/cos ∝
C =	0.025 in.
Δ tp =	0.122 in.
Δ ts =	0.179 in.
D =	9.45 in.
∝ =	Sin-1 (2 x 3)/9.45 = 39.4°; cos ∝ = 0.772
A =	Π x (0.75)² = 0.44 in.²
Vr =	[(2 x 0.025 x 0.179 + 0.122)/0.772] x 0.44
Vr =	0.13 in.³ (2.1 ml)

Disc Brakes (front):

Vr = (Δ ti + Δ to + tic + toc) x (Π D²)/4
Δ ti = 0.324 in.
Δ to = 0.300 in.
tic = toc = 0
D = 2.38 in.
Vr = (0 + 0.324 + 0.300)[(Π x 2.38²)/4]
Vr = 2.77 in.³ (45.0 ml)

For System 1 (LF, RR)

Vr1 = 2.77 in.³ + 0.13 in.³
Vr1 = 2.90 in.³ (47.1 ml)

For System 2 (LR, RF)

Vr2 = Vr1 = 2.90 in.³ (47.1 ml)

TOTAL VOLUME REQUIRED = Vt = 5.8 in.³ (94.3 ml)

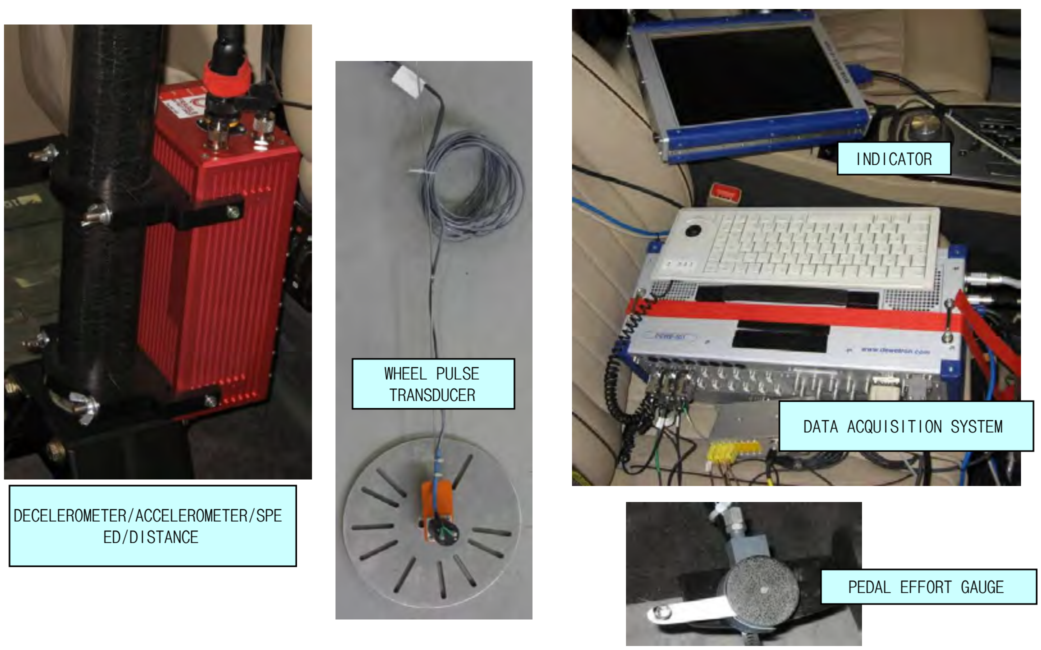
3/4 FRONTAL VIEW FROM RIGHT SIDE OF VEHICLE(at GVWR)

3/4 REAR VIEW FROM RIGHT SIDE OF VEHICLE(at GVWR)

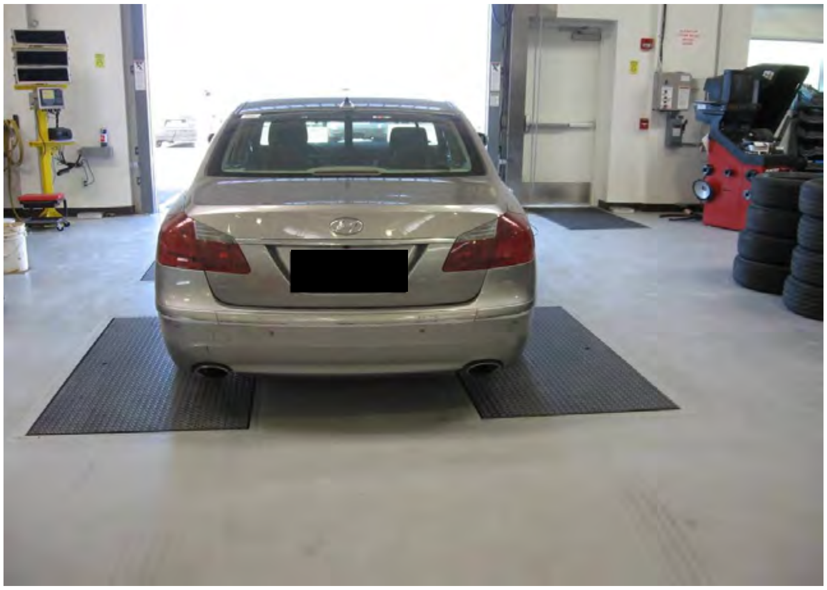
THERMOCOUPLE INSTALLATION OF LEFT FRONT

THERMOCOUPLE INSTALLATION OF LEFT REAR

TEST INSTRUMENTATION IN VEHICLE

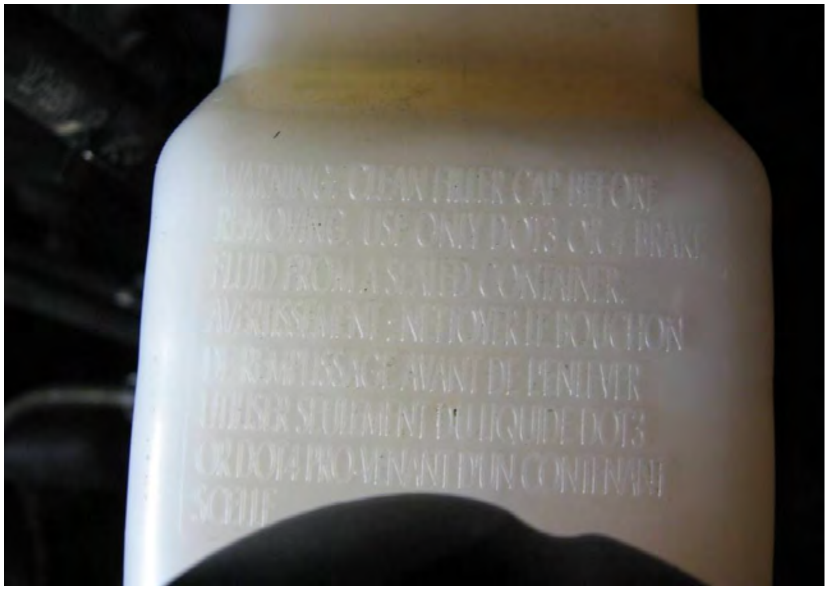


PHOTOS OF ALL TEST INSTRUMENTATION USED IN CONDUCTING THIS TEST



VEHICLE BEING WEIGHTED

LOCATION OF BALLAST IN VEHICLE

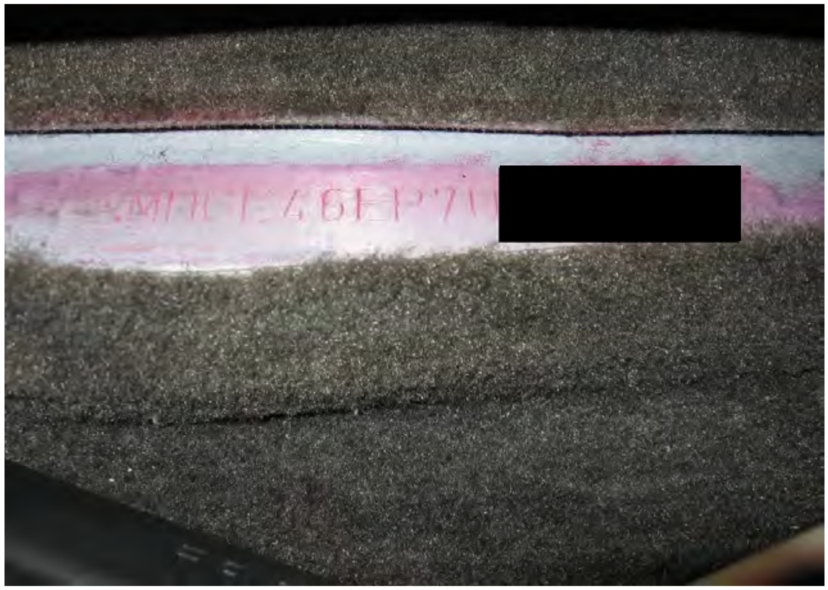


BRAKE FLUID RESERVOIR LABEL

CLOSE UP OF ANY FAILURES

BRAKE SYSTEM INDICATOR LAMPS

TEST TRACK DIMENSIONED LAY-OUT



VEHICLE CERTIFICATION LABEL

Pre-production vehicle with no tire label information

VEHICLE'S TIRE INFORMATION LABEL

ATTACHMENT F

14-2. Genesis FMVSS 126 ESC Test Reports_

___ Research ✓ Test ___ Analysis ___ General	TECHNICAL REPORT FOR CERTIFICATION FMVSS 126 ESC Test Reports for 09MY GENESIS(BH) model	Page 1 of 7 Report No.: THLK-BH08- Date: 2008. 4. 17 Dept: Chassis&Safety Control Development Team

Prepared	Checked	Approved	Distribution	
4/18	4/18	4/18	(1) Quality Strategy Team (2) Certification & Regulation Team (3) Chassis & Powertrain Engineering Team 2	(4) Chassis & Safety Control Design Team (5) Electronic Evaluation Development Team

DATA SHEETS

DATA SUMMARY SHEET

VEHICLE MAKE/MODEL/BODY STYLE:

TEST REPORT NO.: THLK-BH08- VIN: KMHGC46E371[redacted]

VEHICLE TYPE: BH F1#28(τ4.6)

TEST DEPT.: Chassis&Safety Control Development Team

REQUIREMENTS	PASS/FAIL
ESC Malfunction Telltale – Location, Labeling and Bulb Check* (Data Sheet 3) *Requirements effective on and after September 1, 2011	
Telltale meets the requirements for mounting, symbol or text, color and check of lamp function. (F126, S5.3.1, S5.3.2, S5.3.4 and S5.3.5, S5.3.6)	PASS
ESC Malfunction Warning (Data Sheet 8) Warning is provided to driver after malfunction occurrence. (F126. S5.3.3, S5.3.9)	PASS
Malfunction telltale stayed illuminated as long as malfunction existed and must extinguished after malfunction was corrected. (F126, S5.3.3, S5.3.7)	PASS

DATA SHEET 3 (Sheet 1 of 4)

ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS – Location, Labeling and Bulb Check (Effective on and after September 1, 2011)

VEHICLE MAKE/MODEL/BODY STYLE: BH F1#28(τ4.6)

VEHICLE NHTSA NO. ____-____ TEST DATE: 2008. 4. 17

ESC Malfunction Telltale

Malfunction Telltale Location : inside of the instrument cluster

Telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

___✓___Yes ________ No (fail) If no, explain:______________________________

Telltale is part of a common space? __________Yes ______✓______No

Malfunction Telltale symbol or abbreviation required by FMVSS No. 101.

Or **ESC** _________Vehicle uses this symbol

____✓____Vehicles uses this abbreviation

Note any words or additional symbols used.

____

____

"ESC OFF" Telltale (if provided)

"ESC OFF" Telltale Location : inside of the instrument cluster

"ESC OFF" telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

____✓____Yes _________No (fail) If no, explain:_______________________

Telltale is part of a common space? ______Yes ____✓____No

DATA SHEET 3 (Sheet 2 of 4)

ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

“ESC OFF” Telltale symbol or abbreviation required by FMVSS No. 101.

Or **ESC OFF**

____________Vehicle uses this symbol

_____✓_____Vehicle uses this abbreviation

Note any words or additional symbols used.

____

____

Malfunction Telltale Lamp Function:

Identify position of ignition locking system when malfunction telltale illuminates.

☐ OFF/LOCK ☐ Between OFF/LOCK and ON/RUN

☑ ON/RUN ☐ Between ON/RUN and Start

Is telltale yellow in color? _____✓_____Yes _____________No (fail)

Time telltale remains illuminated _____3_____seconds

Note: If telltale is part of common space, it is not required to illuminate during this check of lamp function.

Starter Interlock:

Does vehicle have any starter, transmission or other interlocks that affect operation of the Malfunction telltale lamp check functions? ________Yes _____✓_____No

If yes, describe the interlock feature:

____

____

DATA SHEET 3 (Sheet 3 of 4)

ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

"ESC OFF" Telltale Lamp Function:

Identify position of ignition locking system when "ESC OFF" telltale illuminates.

☐ OFF/LOCK ☐ Between OFF/LOCK and ON/RUN

☑ ON/RUN ☐ Between ON/RUN and Start

Is telltale yellow in color? ____✓____Yes _________No (fail)

Time telltale remains illuminated upon <u>only activation of the ESC off control</u>

The check of "ESC Off" lamp function when the ignition locking system is turned to the "On" ("Run") position is expected to apply. (April, 2009)

Note: If telltale is part of common space, it is not required to illuminate during the check of lamp function.

ESC OFF Control Operational Check:

Is the vehicle equipped with a control whose sole purpose is to deactivate the ESC system?

____✓____Yes _________ No

"ESC OFF" Control identification symbol or abbreviation required by FMVSS No. 101.

Or **ESC OFF**

_____________Vehicle uses this symbol

______✓______Vehicle uses this abbreviation

Note any words or additional symbols used.

____

____

DATA SHEET 3 (Sheet 4 of 4)

ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

Does the “ESC Off” telltale illuminate upon activation of the ESC off control?

____✓____Yes ________No (fail)

Does the “ESC Off” telltale extinguish when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?

____✓____Yes ________No (fail)

If no, describe the off control function:

____

____

RECORDED BY: H.CHOI DATE: 2008. 4. 18

APPROVED BY: K.S.PARK DATE: 2008. 4. 18

DATA SHEET 8

MALFUNCTION WARNING TEST

VEHICLE MAKE/MODEL/BODY STYLE: BH F1#28(τ4.6)

VEHICLE NHTSA NO. ______-______ TEST DATE: 2008. 4. 17

CHECK MALFUNCTION TELLTALE BULB CHECK FUNCTION:

Before simulating an ESC system malfunction activate the vehicle ignition locking system and verify telltale illuminates for the bulb check and then extinguishes.

__✓__Yes _____No

Describe telltale label (until 9/1/2011, can be ABS telltale) : “ESC”

METHOD OF MALFUNCTION SIMULATION:

Describe method of malfunction simulation:

(1) wheel speed sensor line disconnection(FL, FR, RL, RR severally)

(2) steering angle sensor power and signal line disconnection

(3) yaw rate & lateral G sensor power and signal line disconnection

(4) ESC unit power line disconnection(Motor B+, Valve B+, Ignition)

MALFUNCTION TELLTALE ILLUMINATION:

Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes __✓__Yes ______No

Time for telltale to illuminate after ignition system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

Illuminate promptly (vehicle speed of 0mph) __✓__Pass ______Fail

Cycle ignition locking system and start the vehicle’s engine. Verify that the malfunction telltale illuminates and stays illuminated. __✓__Yes _______No

After the ESC system is restored to normal operation verify that the telltale does not remain illuminated. __✓__Yes _______NO

DATA INDICATES COMPLIANCE: PASS/FAIL PASS

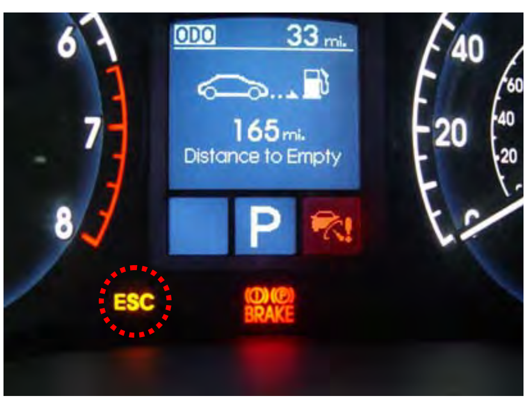
REMARKS:

RECORDED BY: H.CHOI DATE: 2008. 4. 18

APPROVED BY: K.S.PARK DATE: 2008. 4. 18

APPENDING

❑ ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

Lamp Snapshot	**Remark**
	1. The check of "ESC" lamp function when the ignition locking system is turned to the "On" ("Run") position - About 3 seconds 2. The check of "ESC Off" lamp function is expected to apply. (April, 2009)
	1. Does the "ESC Off" telltale illuminate upon activation of the ESC off control 2. "ESC Off" telltale extinguish when the ignition is cycled from "On" ("Run") to "Lock" or "Off" and then back again to the "On" ("Run") position
	1. Malfunction telltale stayed illuminated as long as malfunction existed and extinguished after malfunction was corrected

ATTACHMENT F

14-3. Genesis FMVSS126 Test

CATEGORY	
Planning	
Research	
Investigation	
Test	●
Business Trip	
Training	
Quality	
Benchmarking	
Regulation	
Technical	
Certification	
Other	

BH Lambda FMVSS 126 Test

SECTOR	
Proposal	
Information	●

Report Number
TR_2008-VE-OTD-056

DISTRIBUTION	
Engineering Design	
Powertrain	
Vehicle Evaluation	●
Planning	
Others:	

Engineer	Section Mgr / Department Mgr	Department Mgr / Chief Coordinator	President
Melanie Kykal	John DePaul / Doug Bridgman /signed/	B.I. Park	Chung Kook Park

COMMENTS

06/10/2008

Vehicle Evaluation, Chassis/Brake

Hyundai·Kia America Technical Center

Executive Summary

Purpose	•Confirm compliance with the Federal Motor Vehicle Safety Standard (FMVSS) No. 126 (NHTSA ESC Spin Out Test) of the BH Lambda on 18” and 17” Dunlop tires
Scope	•Meet the test requirements from NHTSA: ESC Spin Out Test: - Lateral displacement: vehicle must be able to have at least 1.83m lateral displacement at 1.07 sec. after initiation of steering input - Spin: Criterion 1: The yaw rate at 1 second after completion of steer (T0+1) must not exceed 35% of the maximum yaw rate (T0) and Criterion 2: The yaw rate at 1.75 seconds after completion of steer (T0+1.75) must not exceed 20% of the maximum yaw rate
Analysis	•The BH Lambda was tested on 18” and 17” Dunlop tires in the ESC Spin Out Test. •The vehicle meets the ESC spin out test criteria on all tires. •The yaw rate criterion is fulfilled during the test. •The vehicle makes the lateral displacement criterion (at least 1.83m) without issue. •The testing showed consistent results.
Conclusions / Recommendations	•The BH Lambda meets the test requirements in all test conditions. •The overall ESC performance is acceptable
Future Action	•No future action necessary.

Vehicle Specification BH Lambda

Test Vehicle
BH Lambda, 3.8l V6 Automatic transmission, EPB VIN: KMHGC46E17U[redacted] M1 vehicle

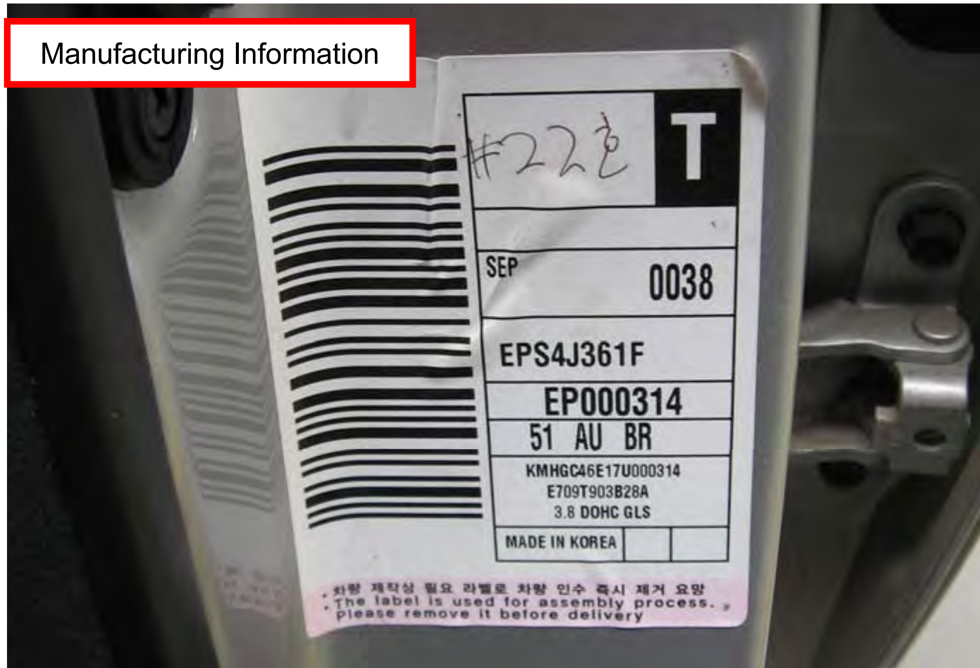
Vehicle Test Weight

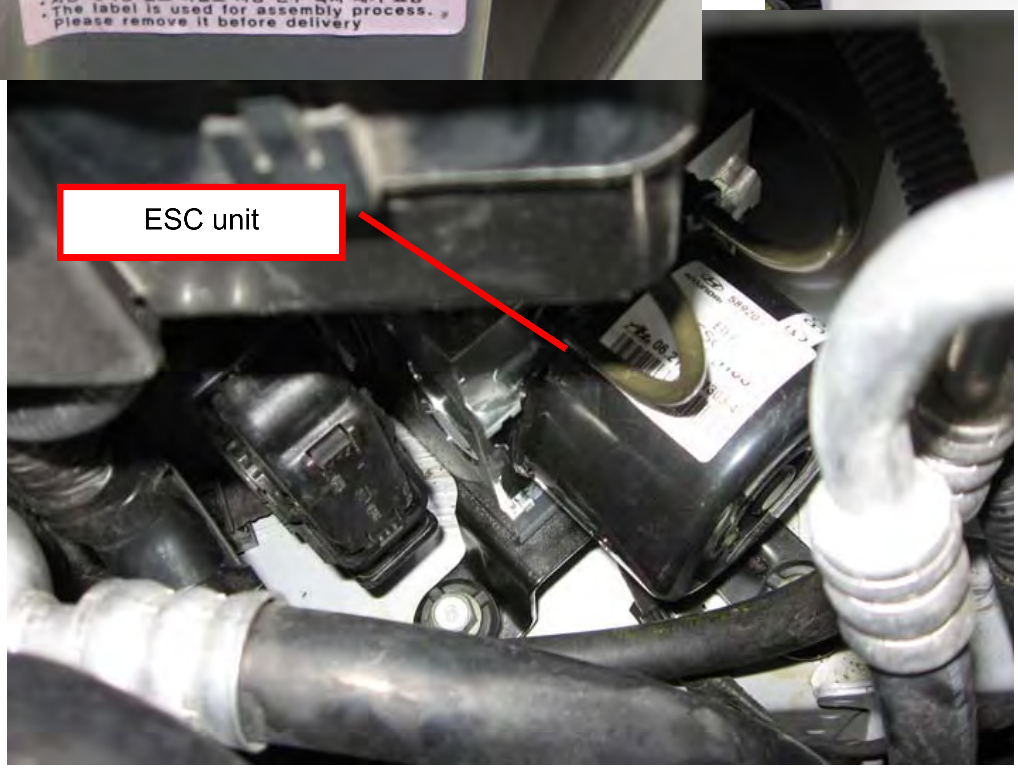
	Kilograms	Pounds
Front	992.5	2188
Rear	931.2	2053
Total	1923.7	4241

Vehicle Setup

Springs	Bars	Shocks	Tires	Tested ESC version
Front 4.2kgf/mm Rear 5.1kgf/mm	Front 25mm Rear 17mm	Front F62 Rear R107	Dunlop SP Sport 5000M P225/55 R17 95H M+S Dunlop SP Sport 5000M P235/50 R18 97V M+S Tire pressure: 33 psi	6I_RAI00036.elf

Vehicle Specification BH Lambda





Vehicle Specification BH Lambda

Data Summary Sheet

VEHICLE MAKE/MODLE/BODY STYLE:	Hyundai Genesis Sedan		
VEHICLE NHTSA NO.:	n/a	VIN	KMHGC46E17U[redacted]
VEHICLE TYPE:	Luxury Sedan	DATE OF MANUFACTURE	n/a
LABORATORY:	California Proving Ground		

	PASS/FAIL
Vehicle Lateral Stability	Pass
Yaw Rate Ratio at 1 second after COS is less then 35% of peak value (S126, S5.2.1)	Pass
Yaw Rate Ratio at 1.75 second after COS is less then 20% of peak value (S126, S5.2.2)	Pass
Vehicle responsiveness	Pass
Lateral displacement at 1.07 seconds after BOS is at least 1.83m (6 feet) for vehicle with a GVWR of 3500kg (7.716 lbs.) or less, and 1.52m (5 feet) for vehicle with a GVWR greater then 3500kg (7.716 lbs.) (S126 S5.2.3)	Pass

Test Vehicle Inspection and Test Preparation

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan				
TEST REPORT NUMBER:	TR_2008-VE-OTD-056	TEST DATE:	06/05/2008		
VIN:	KMHGC46E17U[redacted]	MANUFACTURE DATE:	n/a		
GVWR (kg.):	n/a	FRONT GAWR (kg.):	n/a	REAR GAWR (kg.):	n/a
ODOMETER READING START OF TEST:	10138	Miles			

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABLEING:			
Front Axle:	P235/50 R18, P225/55 R17	Rear Axle:	P235/50 R18, P225/55 R17

DESIGNATED TIRE SIZE(S) ON VEHICLE:		
From Tire Sidewall	Front Axle	Rear Axle
Manufacturer and Model	Dunlop SP Sport 5000M	Dunlop SP Sport 5000M
Tire Size Designation	P235/50 R18 97V M+S, P225/55 R17 95H M+S	P235/50 R18 97V M+S, P225/55 R17 95H M+S
Are installed tire sizes same as labeled tire sizes? If no, contact COTR for further guidance.	___X__YES _____NO	

DRIVETRAIN CONFIGURATION:			
	Front Wheel Drive (FWD)	X	Rear Wheel Drive (RWD)
	Four Wheel Drive (4WD)		All Wheel Drive (AWD)

VEHICLE STABILITY SYSTEMS (Check applicable technologies):					
X	ESC	X	Traction Control	X	Roll Stability Control
	Active Suspension		Electronic Throttle Control		Active Steering
X	ABS				
List other systems:	Electronic Parking Brake				

ESC System Hardware and Operational Characteristics

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan		
NHTSA No.:	n/a	TEST DATE:	06/05/2008

ESC SYSTEM IDENTIFICATION:			
Manufacturer/Model:	Continental Teves ESC MK25E1, 6I_RAI00036.elf		
ESC SYSTEM HARDWARE (Check applicable hardware):			
X	Electronic Control Unit	X	Hydraulic Control Unit
X	Wheel Speed Sensors	X	Steering Angle Sensor
X	Yaw Rate Sensor	X	Lateral Acceleration Sensor
List other components:	Longitudinal Acceleration Sensor		

Vehicle and Test Track Data

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan		
NHTSA No.:	n/a	TEST DATE:	06/05/2008

Test Track Requirements:			
Test Surface Slope (0-1%):	0.2-0.5%	Peak Friction Coefficient (0.9):	0.8

Full Fluid Levels:	Fuel:	Full	Coolant:	Full	Other Fluids:	Full

Tire Pressures				
Required;	Front Axle (kpa)	227.5	Rear Axle (kpa)	227.5
Actual;	LF (kpa)	227.5	RF (kpa)	227.5
	LR (kpa)	227.5	RR (kpa)	227.5

Vehicle and Test Track Data (continued)

VEHICLE WEIGHTS					
GAWR Front:	n/a	GAWR Rear	n/a		
Unloaded Vehicle Weight (UVW)					
Front Axle (kg)	913.1	LF (kg)	462.2	RF (kg)	450.9
Rear Axle (kg)	842.3	LR (kg)	422.3	RR (kg)	420.0
Total UVW (kg)	1755.4				
UVW with Outriggers					
Calculated baseline Weight (UVW+73 kg)	n/a				
Outrigger size required (“light”, “standard”, “heavy”)	n/a				
Front Axle (kg)	n/a	LF (kg)	n/a	RF (kg)	n/a
Rear Axle (kg)	n/a	LR (kg)	n/a	RR (kg)	n/a
Total UVW with outriggers (kg)	n/a				
Loaded Vehicle Weight					
Front Axle (kg)	992.5	LF (kg)	499.4	RF (kg)	493.1
Rear Axle (kg)	931.2	LR (kg)	469.5	RR (kg)	461.8
Total Vehicle Weight (kg)	1923.7				

Center of Gravity	Point of reference location	Center of Rear axle
X-distance (longitudinal) (cm)	151.7	
Y-distance (lateral) (cm)	-0.6	
Sensor Location with Respect to CG.	Inertial Sensing System	
X-distance (longitudinal) (cm)	-51.4	
Y-distance (lateral) (cm)	0.6	

Slowly Increasing Steer (SIS) Maneuver

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan		
Tire Manufacturer/Model/Size:	Dunlop SP Sport 5000M P235/50 R18 97V M+S		
NHTSA No.:	n/a	TEST DATE:	06/05/2008

Measured Cold Tire Pressures (kpa)			
LF (kpa)	227.5	RF (kpa)	227.5
LR (kpa)	227.5	RR (kpa)	227.5
Wind Speed (m/s), (10 m/s max for passenger cars, 5 m/s max for MPVs and trucks)	4.24		
Ambient Temperature (C) (7 to 40 deg C, 45 to 104 deg F)	28.0		

Steering Wheel Angle at Corrected 0.3g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (max 5min between runs)	Steering wheel Angle to nearest 0.1 degree
1	Left	1:36pm	33.2
2	Left	1:37pm	34.1
3	Left	1:38pm	34.0
4	Right	1:39pm	28.5
5	Right	1:40pm	28.6
6	Right	1:41pm	29.3
		Average Overall Steering Wheel Angle (deg):	**31.28**

Vehicle Lateral Stability and Responsiveness

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan		
Tire Manufacturer/Model/Size:	Dunlop SP Sport 5000M P235/50 R18 97V M+S		
NHTSA No.:	n/a	TEST DATE:	06/05/2008

	Yes	No
Tire Conditioning Completed	X	
ESC system is enabled	X	
On track calibration checks have been completed	X	
Overall Steering Wheel Angle (deg)	**31.28**	

Vehicle Lateral Stability and Responsiveness

Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction										
Run #	Clock time (5min max between runs	Commanded Steering Angle (deg)		Yaw Rates (deg/sec)			YYR at 1.0sec after COS (<35%)		YYR at 1.75sec after COS (<20%)	
		Scalar	Angle	Peak	@ 1.0sec	@1.75sec	%	Pass/fail	%	Pass/fail
1	2:34pm	1.5	46.9	13.46	-0.01	0.12	-0.09	Pass	0.93	Pass
2	2:35pm	2.0	62.6	18.19	0.24	0.58	1.30	Pass	3.20	Pass
3	2:36pm	2.5	78.2	22.04	0.07	0.08	0.33	Pass	0.38	Pass
4	2:37pm	3.0	93.8	26.06	0.16	0.36	0.60	Pass	1.39	Pass
5	2:38pm	3.5	109.5	30.76	1.30	-0.02	4.21	Pass	-0.06	Pass
6	2:39pm	4.0	125.1	36.66	0.10	0.09	0.27	Pass	0.25	Pass
7	2:40pm	4.5	140.8	40.98	-0.15	0.02	-0.37	Pass	0.04	Pass
8	2:41pm	5.0	156.4	46.33	-0.27	0.06	-0.57	Pass	0.13	Pass
9	2:42pm	5.5	172.0	51.55	-0.10	-0.09	-0.19	Pass	-0.17	Pass
10	2:43pm	6.0	187.7	56.58	0.29	0.00	0.51	Pass	-0.01	Pass
11	2:44pm	6.5	203.3	61.06	1.19	-0.10	1.96	Pass	-0.16	Pass
12	2:45pm	7.0	219.0	64.34	-3.28	-0.26	-5.11	Pass	-0.41	Pass
13	2:46pm	7.5	234.6	66.80	-4.26	-0.24	-6.37	Pass	-0.36	Pass
14	2:47pm	8.0	250.2	70.49	4.68	0.21	6.64	Pass	0.30	Pass
15	2:48pm	8.5	265.9	74.43	7.48	1.11	10.05	Pass	1.49	Pass
16	2:49pm	9.0	270.0	76.86	9.67	-1.21	12.58	Pass	-1.57	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5*$\delta^{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated 6.5*$\delta^{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If 6.5*$\delta^{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5*$\delta^{0.3\ g,\ overall}$ without exceeding the 270 degree steering wheel angle. If the highest calculated multiple of 0.5*$\delta^{0.3\ g,\ overall}$ falls within the range of 260 - 270 degrees the final maneuver should be conducted at that angle, otherwise, the final maneuver should be conducted at the 270 degree steering wheel angle.

Vehicle Lateral Stability and Responsiveness

Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction										
Run #	Clock time (5min max between runs)	Commanded Steering Angle (deg)		Yaw Rates (deg/sec)			YYR at 1.0sec after COS (<35%)		YYR at 1.75sec after COS (<20%)	
		Scalar	Angle	Peak	@ 1.0sec	@1.75sec	%	Pass/fail	%	Pass/fail
1	2:49pm	1.5	46.9	-12.74	0.56	0.53	-4.42	Pass	-4.15	Pass
2	2:50pm	2.0	62.6	-17.40	0.60	0.62	-3.47	Pass	-3.59	Pass
3	2:51pm	2.5	78.2	-21.66	0.52	0.65	-2.40	Pass	-2.98	Pass
4	2:52pm	3.0	93.8	-26.13	0.66	0.59	-2.52	Pass	-2.26	Pass
5	2:53pm	3.5	109.5	-30.72	0.57	0.58	-1.85	Pass	-1.90	Pass
6	2:54pm	4.0	125.1	-36.08	0.69	0.60	-1.91	Pass	-1.67	Pass
7	2:55pm	4.5	140.8	-40.50	0.50	0.60	-1.24	Pass	-1.48	Pass
8	2:56pm	5.0	156.4	-46.55	0.80	0.50	-1.71	Pass	-1.08	Pass
9	2:57pm	5.5	172.0	-51.54	0.96	0.81	-1.86	Pass	-1.57	Pass
10	2:58pm	6.0	187.7	-56.31	0.93	0.92	-1.65	Pass	-1.63	Pass
11	2:59pm	6.5	203.3	-59.93	-0.10	0.95	0.17	Pass	-1.58	Pass
12	3:00pm	7.0	219.0	-62.66	0.10	0.90	-0.15	Pass	-1.44	Pass
13	3:01pm	7.5	234.6	-63.75	0.56	1.06	-0.87	Pass	-1.66	Pass
14	3:02pm	8.0	250.2	-67.69	0.60	1.00	-0.89	Pass	-1.48	Pass
15	3:03pm	8.5	265.9	-73.91	-6.31	-0.02	8.54	Pass	0.03	Pass
16	3:04pm	9.0	270.0	-74.88	-6.15	0.47	8.21	Pass	-0.62	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta_{0.3\ g,\ overall}$ or 270 degrees is utilized, whichever is greater provided the calculated $6.5*\delta_{0.3\ g,\ overall}$ is less than or equal to 300 degrees. If $6.5*\delta_{0.3\ g,\ overall}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta_{0.3\ g,\ overall}$ without exceeding the 270 degree steering wheel angle. If the highest calculated multiple of $0.5*\delta_{0.3\ g,\ overall}$ falls within the range of 260 - 270 degrees the final maneuver should be conducted at that angle, otherwise, the final maneuver should be conducted at the 270 degree steering wheel angle.

Vehicle Lateral Stability and Responsiveness

During execution of the sine with dwell maneuvers were any of the following events observed?	Yes	No
Rim-to-pavement contact		X
Tire debeading		X
Loss of pavement contact of vehicle tires		X
Did the test driver experience any vehicle loss of control or spinout?		X

Vehicle Lateral Stability and Responsiveness

Responsiveness – Lateral Displacement							
Run #	Initial steer direction	Commanded Steering Wheel Angle		Lateral Acceleration @ 1.07 after BOS		Calculated Lateral Displacement	
		Scalar	Angle (deg)	Measured	Corrected	Distance (m)	Pass/fail
1	Left	1.5	46.9	4.18	4.18	1.32	Pass
2	Left	2.0	62.6	5.31	5.31	1.86	Pass
3	Left	2.5	78.2	5.64	5.64	2.05	Pass
4	Left	3.0	93.8	6.45	6.45	2.25	Pass
5	Left	3.5	109.5	6.86	6.86	2.69	Pass
6	Left	4.0	125.1	6.35	6.35	2.87	Pass
7	Left	4.5	140.8	6.24	6.24	3.04	Pass
8	Left	5.0	156.4	4.97	4.97	3.17	Pass
9	Left	5.5	172.0	3.50	3.50	3.24	Pass
10	Left	6.0	187.7	0.99	0.99	3.27	Pass
11	Left	6.5	203.3	0.93	0.93	3.22	Pass
12	Left	7.0	219.0	1.21	1.21	3.28	Pass
13	Left	7.5	234.6	2.54	2.54	3.37	Pass
14	Left	8.0	250.2	1.41	1.41	3.38	Pass
15	Left	8.5	265.9	1.68	1.68	3.48	Pass
16	Left	9.0	270.0	1.22	1.22	3.38	Pass

1.Measured Lateral Accelerations are corrected for sensor location CG offset and vehicle body roll.
2. For passenger cars lateral displacement should be > 1.83 m (6 ft); For MPVs and trucks lateral displacement should be > 1.52 m (5ft).

Vehicle Lateral Stability and Responsiveness

Responsiveness – Lateral Displacement							
Run #	Initial steer direction	Commanded Steering Wheel Angle		Lateral Acceleration @ 1.07 after BOS		Calculated Lateral Displacement	
		Scalar	Angle (deg)	Measured	Corrected	Distance (m)	Pass/fail
1	Right	1.5	46.9	-3.16	-3.16	1.65	Pass
2	Right	2.0	62.6	-4.21	-4.21	1.70	Pass
3	Right	2.5	78.2	-4.98	-4.98	2.14	Pass
4	Right	3.0	93.8	-5.27	-5.27	2.42	Pass
5	Right	3.5	109.5	-5.44	-5.44	2.87	Pass
6	Right	4.0	125.1	-4.74	-4.74	2.93	Pass
7	Right	4.5	140.8	-3.81	-3.81	3.07	Pass
8	Right	5.0	156.4	-3.67	-3.67	3.24	Pass
9	Right	5.5	172.0	-1.28	-1.28	3.51	Pass
10	Right	6.0	187.7	0.58	0.58	3.57	Pass
11	Right	6.5	203.3	1.41	1.41	3.63	Pass
12	Right	7.0	219.0	0.72	0.72	3.51	Pass
13	Right	7.5	234.6	1.26	1.26	3.61	Pass
14	Right	8.0	250.2	2.32	2.32	3.75	Pass
15	Right	8.5	265.9	-0.31	-0.31	3.60	Pass
16	Right	9.0	270.0	0.38	0.38	3.56	Pass

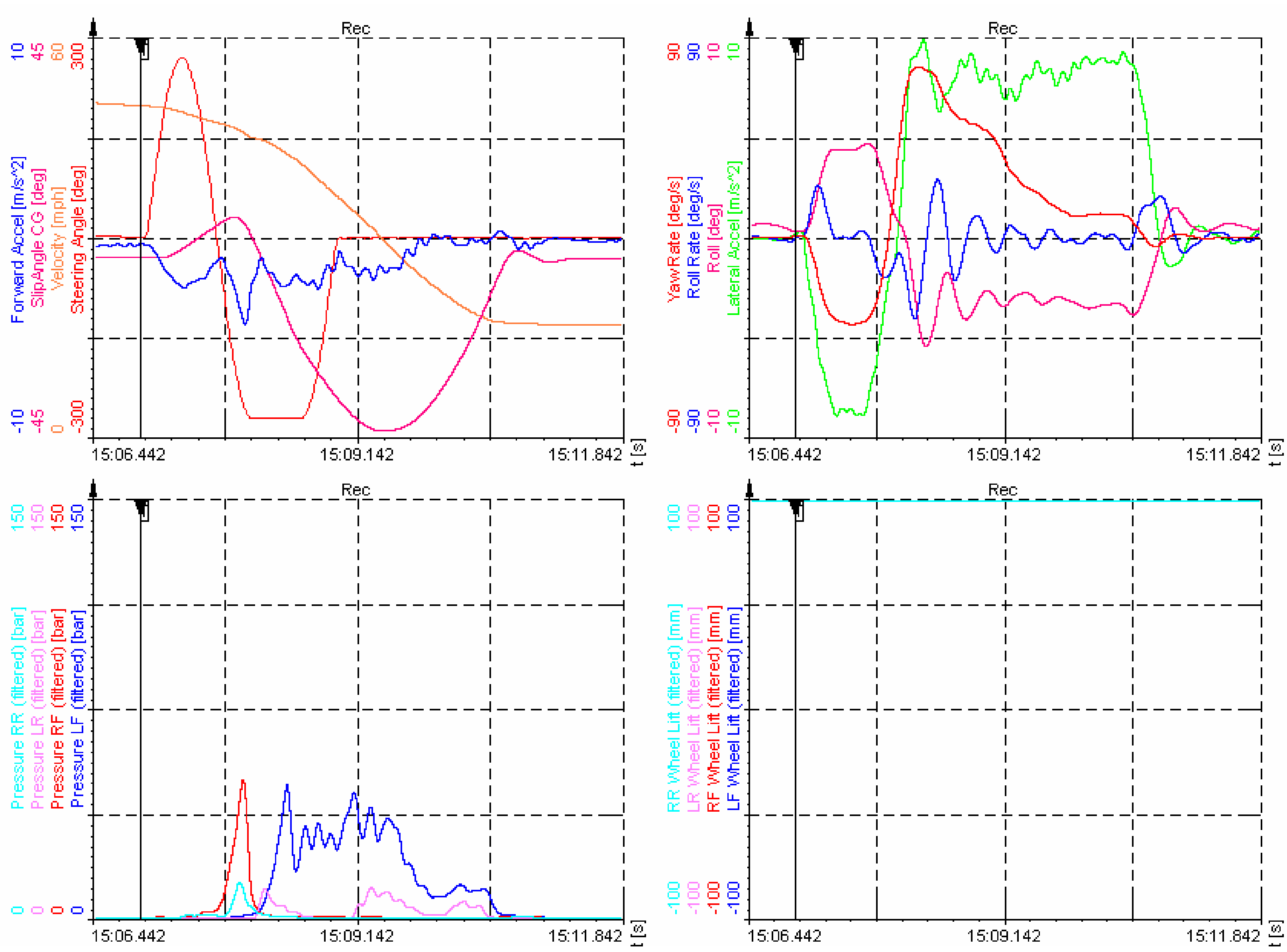
1.Measured Lateral Accelerations are corrected for sensor location CG offset and vehicle body roll.
2. For passenger cars lateral displacement should be > 1.83 m (6 ft); For MPVs and trucks lateral displacement should be > 1.52 m (5ft).

Vehicle Lateral Stability and Responsiveness

DATA INDICATES COMPLIANCE (PASS/FAIL):	Pass		
REMARKS:			
RECORDED BY:	Melanie Kykal	DATE:	06/10/2008

Detailed Test Result

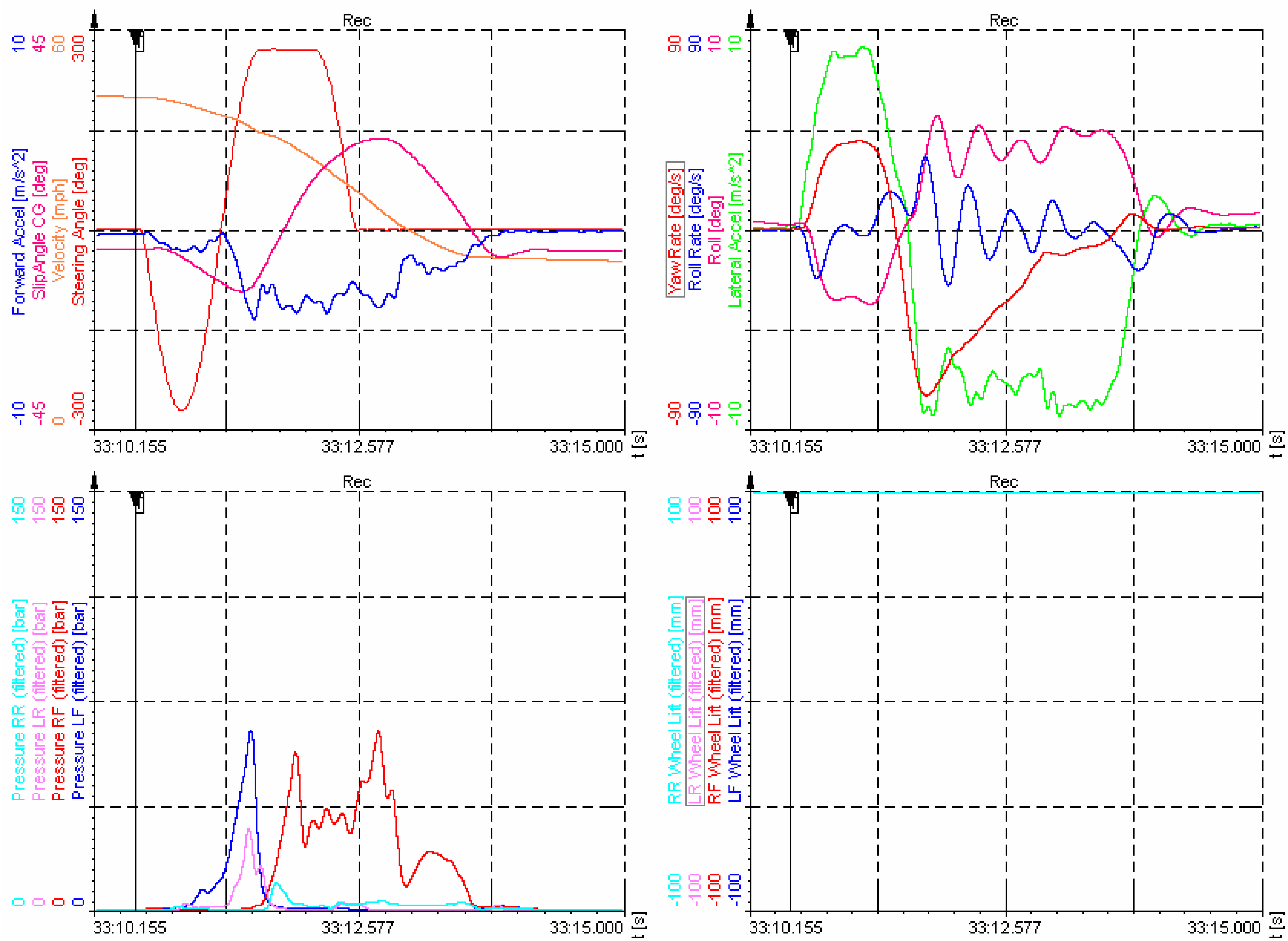
- **ESC Spin Out Test BH Lambda, 18in Dunlop**
  Run: 50.0 mph, 270deg, left turn first, test passed



HYUNDAI·KIA MOTORS

Detailed Test Result

- **ESC Spin Out Test BH Lambda, 18in Dunlop**
  Run: 50.0 mph, 270deg, right turn first, test passed



Slowly Increasing Steer (SIS) Maneuver

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan		
Tire Manufacturer/Model/Size:	Dunlop SP Sport 5000M P225/55 R17 95H M+S		
NHTSA No.:	n/a	TEST DATE:	06/05/2008

Measured Cold Tire Pressures (kpa)			
LF (kpa)	227.5	RF (kpa)	227.5
LR (kpa)	227.5	RR (kpa)	227.5
Wind Speed (m/s), (10 m/s max for passenger cars, 5 m/s max for MPVs and trucks)	2.82		
Ambient Temperature (C) (7 to 40 deg C, 45 to 104 deg F)	23.0		

Steering Wheel Angle at Corrected 0.3g Lateral Acceleration:

Maneuver #	Initial Steer Direction	Time Clock (max 5min between runs)	Steering wheel Angle to nearest 0.1 degree
1	Left	9:43am	31.6
2	Left	9:44am	32.9
3	Left	9:45am	33.3
4	Right	9:46am	30.7
5	Right	9:47am	30.7
6	Right	9:48am	30.2
Average Overall Steering Wheel Angle (deg):			**31.56**

Vehicle Lateral Stability and Responsiveness

VEHICLE MAKE/MODEL/BODY STYLE:	Hyundai Genesis Sedan		
Tire Manufacturer/Model/Size:	Dunlop SP Sport 5000M P225/55 R17 95H M+S		
NHTSA No.:	n/a	TEST DATE:	06/05/2008

	Yes	No
Tire Conditioning Completed	X	
ESC system is enabled	X	
On track calibration checks have been completed	X	
Overall Steering Wheel Angle (deg)	**31.56**	

Vehicle Lateral Stability and Responsiveness

Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction										
Run #	Clock time (5min max between runs	Commanded Steering Angle (deg)		Yaw Rates (deg/sec)			YYR at 1.0sec after COS (<35%)		YYR at 1.75sec after COS (<20%)	
		Scalar	Angle	Peak	@ 1.0sec	@1.75sec	%	Pass/fail	%	Pass/fail
1	10:17am	1.5	47.3	13.73	-0.14	-0.13	-1.01	Pass	-0.97	Pass
2	10:18am	2.0	63.1	18.80	-0.28	-0.20	-1.48	Pass	-1.07	Pass
3	10:19am	2.5	78.9	24.29	-0.32	-0.21	-1.30	Pass	-0.87	Pass
4	10:20am	3.0	94.7	27.85	-0.29	-0.43	-1.04	Pass	-1.54	Pass
5	10:21am	3.5	110.5	35.04	19.18	-2.99	54.74	Pass	-8.55	Pass
6	10:22am	4.0	126.2	38.73	-0.24	-0.11	-0.63	Pass	-0.28	Pass
7	10:23am	4.5	142.0	44.64	0.38	-0.19	0.84	Pass	-0.44	Pass
8	10:24am	5.0	157.8	48.66	0.75	-0.30	1.55	Pass	-0.62	Pass
9	10:25am	5.5	173.6	53.86	0.17	-0.35	0.32	Pass	-0.64	Pass
10	10:26am	6.0	189.4	57.52	0.58	-0.40	1.01	Pass	-0.70	Pass
11	10:27am	6.5	205.1	61.04	-0.04	-0.44	-0.06	Pass	-0.72	Pass
12	10:28am	7.0	220.9	64.98	-5.78	-0.65	-8.89	Pass	-1.01	Pass
13	10:29am	7.5	236.7	68.63	-1.56	-0.48	-2.27	Pass	-0.70	Pass
14	10:30am	8.0	252.5	71.45	5.85	0.18	8.18	Pass	0.26	Pass
15	10:31am	8.5	268.3	76.64	7.09	0.46	9.25	Pass	0.60	Pass
16	10:32am	9.0	270.0	77.92	11.78	-4.02	15.11	Pass	-5.16	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta^{0.3\text{ g, overall}}$ or 270 degrees is utilized, whichever is greater provided the calculated $6.5*\delta^{0.3\text{ g, overall}}$ is less than or equal to 300 degrees. If $6.5*\delta^{0.3\text{ g, overall}}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta^{0.3\text{ g, overall}}$ without exceeding the 270 degree steering wheel angle. If the highest calculated multiple of $0.5*\delta^{0.3\text{ g, overall}}$ falls within the range of 260 - 270 degrees the final maneuver should be conducted at that angle, otherwise, the final maneuver should be conducted at the 270 degree steering wheel angle.

Vehicle Lateral Stability and Responsiveness

Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction										
Run #	Clock time (5min max between runs	Commanded Steering Angle (deg)		Yaw Rates (deg/sec)			YYR at 1.0sec after COS (<35%)		YYR at 1.75sec after COS (<20%)	
		Scalar	Angle	Peak	@ 1.0sec	@1.75sec	%	Pass/fail	%	Pass/fail
1	10:33am	1.5	47.3	-14.10	0.09	-0.02	-0.61	Pass	0.12	Pass
2	10:34am	2.0	63.1	-19.89	-0.18	-0.20	0.90	Pass	1.01	Pass
3	10:35am	2.5	78.9	-23.72	0.17	0.25	-0.71	Pass	-1.07	Pass
4	10:36am	3.0	94.7	-28.59	0.27	0.31	-0.93	Pass	-1.10	Pass
5	10:37am	3.5	110.5	-33.57	0.13	0.00	-0.39	Pass	0.00	Pass
6	10:38am	4.0	126.2	-38.43	0.16	-0.04	-0.40	Pass	0.09	Pass
7	10:39am	4.5	142.0	-42.84	0.14	0.10	-0.33	Pass	-0.22	Pass
8	10:40am	5.0	157.8	-49.03	0.25	0.21	-0.50	Pass	-0.42	Pass
9	10:41am	5.5	173.6	-54.29	0.34	0.15	-0.63	Pass	-0.28	Pass
10	10:42am	6.0	189.4	-58.80	-0.29	0.45	0.49	Pass	-0.76	Pass
11	10:43am	6.5	205.1	-61.81	0.55	0.45	-0.89	Pass	-0.73	Pass
12	10:44am	7.0	220.9	-64.02	0.43	0.45	-0.67	Pass	-0.70	Pass
13	10:45am	7.5	236.7	-67.52	5.05	0.65	-7.48	Pass	-0.96	Pass
14	10:46am	8.0	252.5	-70.74	3.39	0.83	-4.80	Pass	-1.18	Pass
15	10:47am	8.5	268.3	-74.40	0.99	0.98	-1.33	Pass	-1.31	Pass
16	10:48am	9.0	270.0	-73.91	-3.17	0.52	4.29	Pass	-0.70	Pass

Maneuver execution should continue until a steering wheel angle magnitude factor of $6.5*\delta^{0.3\text{ g, overall}}$ or 270 degrees is utilized, whichever is greater provided the calculated $6.5*\delta^{0.3\text{ g, overall}}$ is less than or equal to 300 degrees. If $6.5*\delta^{0.3\text{ g, overall}}$ is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of $0.5*\delta^{0.3\text{ g, overall}}$ without exceeding the 270 degree steering wheel angle. If the highest calculated multiple of $0.5*\delta^{0.3\text{ g, overall}}$ falls within the range of 260 - 270 degrees the final maneuver should be conducted at that angle, otherwise, the final maneuver should be conducted at the 270 degree steering wheel angle.

Vehicle Lateral Stability and Responsiveness

During execution of the sine with dwell maneuvers were any of the following events observed?	Yes	No
Rim-to-pavement contact		X
Tire debeading		X
Loss of pavement contact of vehicle tires		X
Did the test driver experience any vehicle loss of control or spinout?		X

Vehicle Lateral Stability and Responsiveness

Responsiveness – Lateral Displacement							
Run #	Initial steer direction	Commanded Steering Wheel Angle		Lateral Acceleration @ 1.07 after BOS		Calculated Lateral Displacement	
		Scalar	Angle (deg)	Measured	Corrected	Distance (m)	Pass/fail
1	Left	1.5	47.3	3.73	3.73	1.50	Pass
2	Left	2.0	63.1	4.44	4.44	1.79	Pass
3	Left	2.5	78.9	4.92	4.92	2.00	Pass
4	Left	3.0	94.7	5.24	5.24	2.40	Pass
5	Left	3.5	110.5	5.71	5.71	2.68	Pass
6	Left	4.0	126.2	3.76	3.76	2.85	Pass
7	Left	4.5	142.0	1.70	1.70	2.92	Pass
8	Left	5.0	157.8	0.17	0.17	3.10	Pass
9	Left	5.5	173.6	-0.60	-0.60	3.17	Pass
10	Left	6.0	189.4	-2.60	-2.60	3.32	Pass
11	Left	6.5	205.1	-2.90	-2.90	3.27	Pass
12	Left	7.0	220.9	-1.19	-1.19	3.32	Pass
13	Left	7.5	236.7	-2.12	-2.12	3.40	Pass
14	Left	8.0	252.5	-0.71	-0.71	3.30	Pass
15	Left	8.5	268.3	-0.87	-0.87	3.35	Pass
16	Left	9.0	270.0	-0.71	-0.71	3.32	Pass

1.Measured Lateral Accelerations are corrected for sensor location CG offset and vehicle body roll.
2. For passenger cars lateral displacement should be > 1.83 m (6 ft); For MPVs and trucks lateral displacement should be > 1.52 m (5ft).

Vehicle Lateral Stability and Responsiveness

Responsiveness – Lateral Displacement							
Run #	Initial steer direction	Commanded Steering Wheel Angle		Lateral Acceleration @ 1.07 after BOS		Calculated Lateral Displacement	
		Scalar	Angle (deg)	Measured	Corrected	Distance (m)	Pass/fail
1	Right	1.5	47.3	-3.20	-3.20	1.45	Pass
2	Right	2.0	63.1	-3.72	-3.72	1.57	Pass
3	Right	2.5	78.9	-4.41	-4.41	1.96	Pass
4	Right	3.0	94.7	-4.09	-4.09	2.41	Pass
5	Right	3.5	110.5	-4.22	-4.22	2.56	Pass
6	Right	4.0	126.2	-3.50	-3.50	2.73	Pass
7	Right	4.5	142.0	-2.50	-2.50	3.08	Pass
8	Right	5.0	157.8	-0.68	-0.68	3.14	Pass
9	Right	5.5	173.6	0.55	0.55	3.37	Pass
10	Right	6.0	189.4	1.54	1.54	3.40	Pass
11	Right	6.5	205.1	2.14	2.14	3.37	Pass
12	Right	7.0	220.9	2.43	2.43	3.50	Pass
13	Right	7.5	236.7	2.41	2.41	3.62	Pass
14	Right	8.0	252.5	3.12	3.12	3.76	Pass
15	Right	8.5	268.3	3.27	3.27	3.63	Pass
16	Right	9.0	270.0	2.19	2.19	3.73	Pass

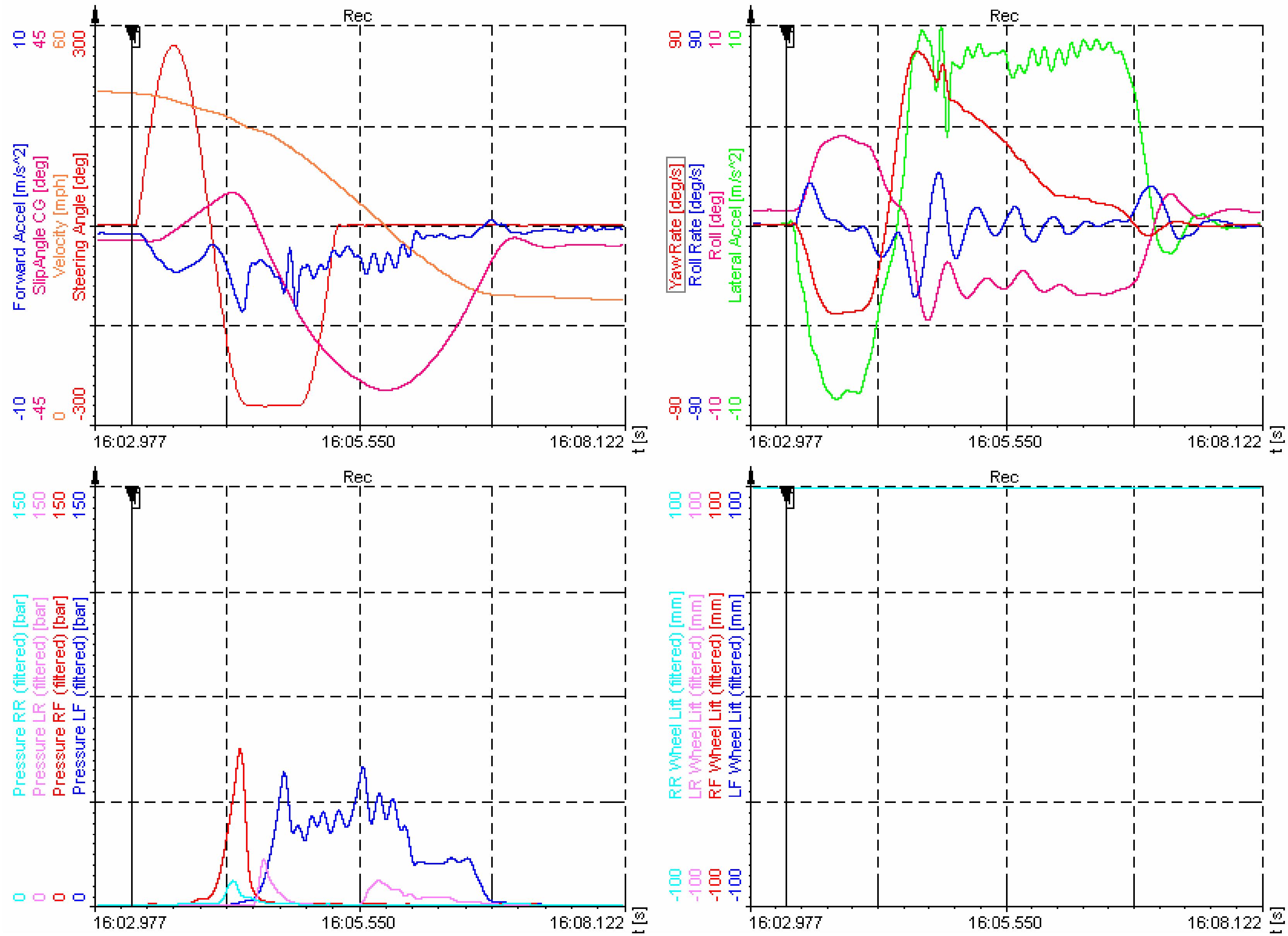
1.Measured Lateral Accelerations are corrected for sensor location CG offset and vehicle body roll.
2. For passenger cars lateral displacement should be > 1.83 m (6 ft); For MPVs and trucks lateral displacement should be > 1.52 m (5ft).

Vehicle Lateral Stability and Responsiveness

DATA INDICATES COMPLIANCE (PASS/FAIL):	Pass		
REMARKS:			
RECORDED BY:	Melanie Kykal	DATE:	06/10/2008

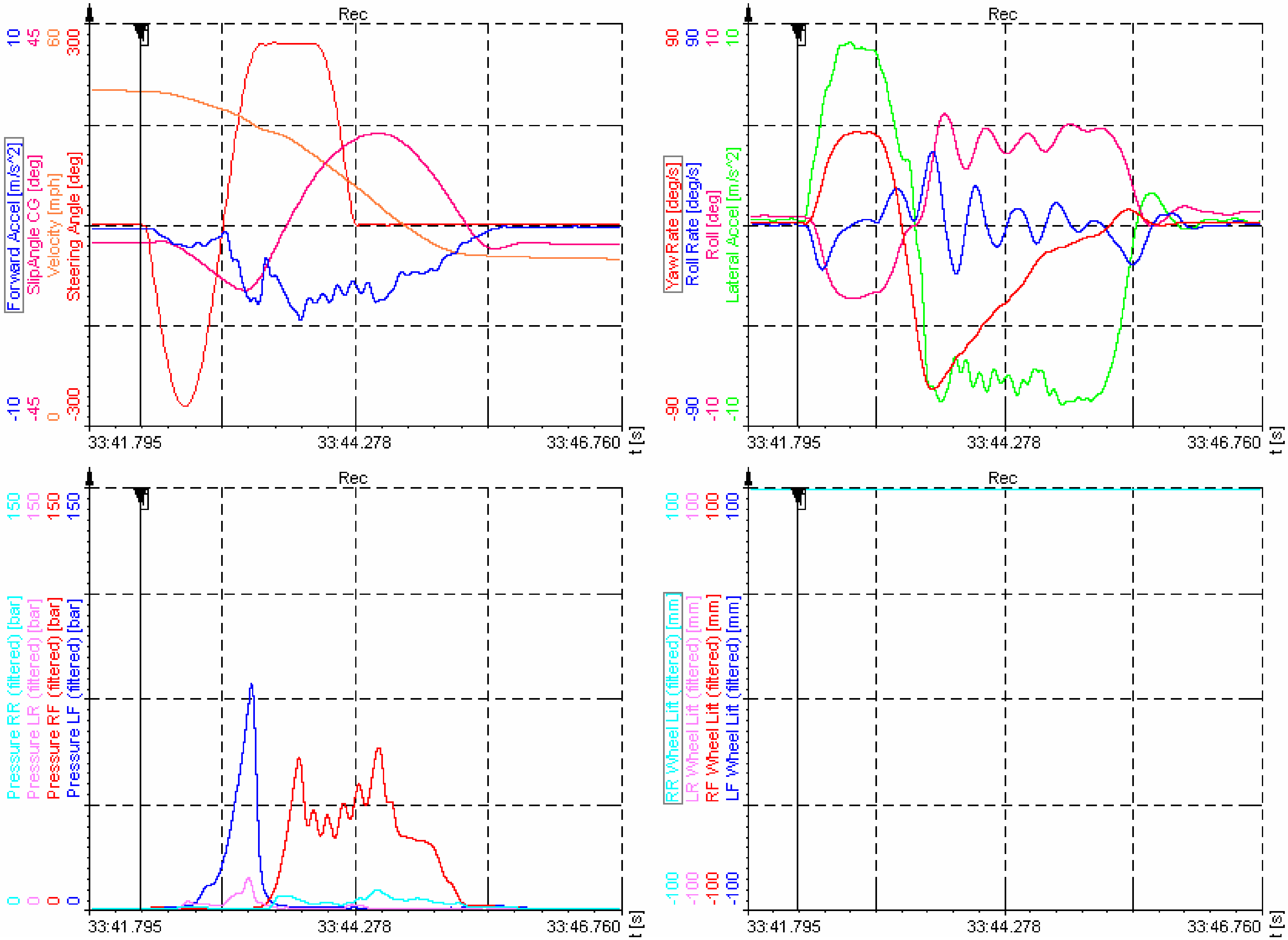
Detailed Test Result

- **ESC Spin Out Test BH Lambda, 17in Dunlop**
  Run: 50.0 mph, 270deg, left turn first, test passed



Detailed Test Result

- **ESC Spin Out Test BH Lambda, 17in Dunlop**
  Run: 50.0 mph, 270deg, right turn first, test passed



ATTACHMENT F

14-4. HECU field parts analysis 201202

Genesis HECU Field Return Parts Analysis

HMC Quality Assurance Department

February, 2012

BH HECU field parts investigation

2012.2.7

NO	Product date	Repair Date	Period (Month)	Mileage (Km)	Phenomenon	NC valve armature	Result
1	2008-04-08	2012-01-11	46	105,457	Insufficient Braking		No Corrosion
2	2008-04-20	2012-01-12	45	70,902	Malfunction ESC		No Corrosion
3	2008-04-17	2012-01-16	46	76,011	Spongy pedal		Corrosion
4	2008-04-10	2012-01-27	46	92,629	Malfunction ESC		Corrosion & Gel adhesion
5	2008-05-13	2012-01-30	45	64,994	Malfunction ESC		No Corrosion

BH HECU field defective parts investigation

2012.2.8

NO	Product date	Repair Date	Period (Month)	Mileage (Km)	Phenomenon	NC valve armature	Result
6	2008-04-27	2012-01-11	42	61,619	Malfunction ESC		No Corrosion
7	2008-04-06	2012-01-13	46	78,675	Malfunction ESC		No Corrosion
8	2008-02-27	2012-01-25	48	40,090	Malfunction ESC		Corrosion
9	2008-04-25	2012-01-13	45	140,642	Spongy pedal		Corrosion & Gel adhesion

ATTACHMENT F

14-4.1. HECU field parts analysis 201209

Genesis HECU Field Return Parts Analysis

HMC Quality Assurance Department

September, 2012

BH HECU field parts analysis

2012.9.10

NO	Product date	Repair Date	Period (Month)	Mileage (Km)	Phenomenon	NC valve armature	Result
1	2008-10-23	2012-08-29	46	89,341	Malfunction ESC		No Corrosion
2	2008-12-19	2012-08-04	42	73,541	Spongy pedal		No Corrosion
3	2008-07-09	2012-06-19	44	65,530	Spongy pedal		Corrosion

ATTACHMENT F

14-5. Incident HECU Vehicle Evaluation 20120207

Genesis Vehicle Evaluation Test

with incident HECU

2012. 2. 7

HMC Brake Performance Development Team

Genesis Vehicle Evaluation Test with incident HECU

1. Summary
   1-1. Symptom
   - "Spongy" pedal in normal/hard braking condition

   1-2. Cause
   - Corrosion of armature lead to malfunction of NC Valve (NC Valve's position open).

2. Information of parts & evaluation contents

   2-1. Incident parts (HECU) vehicle information - originally installed in production unit

VIN	Product Date	Customer's comment
KMHGE41EP8U[redacted]	2008-05-05	Spongy pedal

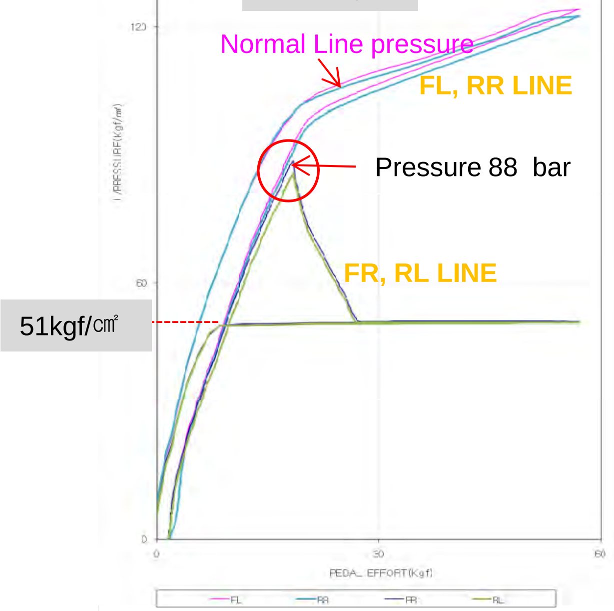
   2-2.Evaluation category: Static / Dynamic Braking performance (pedal effort & stroke), Stopping Distance, Braking Stability

3. Test Result : Equipped with incident part, Braking performance inferior to normal condition
   Stopping distance was increased 4m (still within of FMVSS135 requirement).

Parameter		Normal part	Incident part	HMC's developing Target
Leakage of Hydraulic line		Not found	Leakage occurred (FR/RL of hydraulic line)	
DYNAMIC Braking efficiency (100 kph)	0.3 g (decel)	3.9kgf/35.2mm (pedal effort/stroke)	4.4kgf/37.9mm (pedal effort/stroke)	8 kgf ↓ / 43 mm ↓ (pedal effort/stroke)
	0.6 g (decel)	7.3 kgf/44.4mm (pedal effort/stroke)	7.7kgf/50.0mm (pedal effort/stroke)	15 kgf ↓ / 58 mm ↓ (pedal effort/stroke)
Stopping Distance (100 kph , 1 UP)		43.5m	47.5m (4m ↑)	44 m ↓
STABILITY (140 kph)		Normal	Slight pulling occurred when ABS activated	

Detailed data of Vehicle Test

<Leakage>

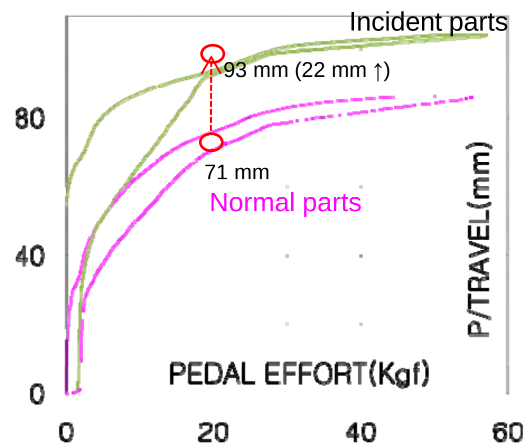


1. Normal brake line condition: As pedal effort increased, hydraulic line pressure also increased

2. Incident part brake line : FR/RL line pressure increase less than normal part; initially increased and then decreased indicating valve leakage in line's NC valve

- Incident part line pressure
  CUT IN 88 kgf/cm²
  Final 51 kgf/cm²

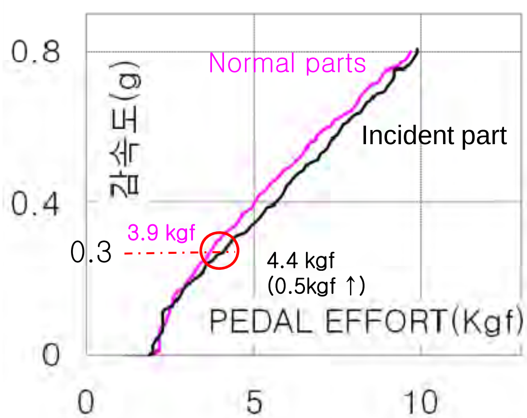
< Brake Pedal stroke at Static vehicle condition>

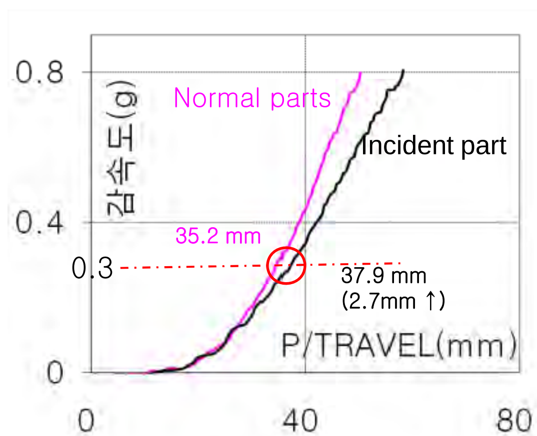


Incident part result: As pedal effort increased, pedal stroke was increased 22mm in comparison with normal part (at 20 kgf)

<DYNAMIC braking performance - 100KPH stop >

Deceleration





Equipped with incident part, results showed decreased deceleration efficiency compared to normal part.

※ Test result to approach 0.3 g deceleration
Pedal effort : 0.5 kgf increased
Pedal stroke: 2.7 mm increased

ATTACHMENT F

14-6. Brake Fluid investigation result 20120106

ESC Brake Fluid Analysis

2012. 1. 6

MATERIALS TECHNOLOGY & ANALYSIS TEAM

ESC Brake Fluid Analysis

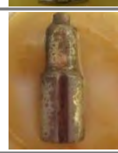
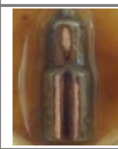
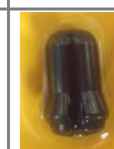
STATUS

■ The test of Brake fluid/armature according to the test method Parts supplier (Continental) presented

1) Test method : Immerse armature of 2/3 in brake fluid on petri dish and leave it at 120℃ for 288hr.

2) Result



Parts Maker		Continental									MOBIS	MANDO
		NC valve (before ball calking)				NCvalve (after ball calking)				NOvalve	NCvalve	NCvalve
Brake Fluid Maker		KUKDONG (DOT3)	KUKDONG (DOT4)	SHELL (DOT4)	DONG-A (DOT4)	KUKDONG (DOT3)	KUKDONG (DOT4)	SHELL (DOT4)	DONG-A (DOT4)	KUKDONG(DOT3)	KUKDONG (DOT3)	KUKDONG (DOT3)
Immersion time hr	72											
	216											
	288											
note		corrosion (216hr)	All clear	All clear	corrosion (72hr)	corrosion (216hr)	All clear	All clear	corrosion (72hr)	corrosion (216hr)	All clear	All clear

3) Conclusion

1) While MOBIS and MANDO armatures don't show any corrosion with HMC factory filling brake fluid (KUKDONG DOT3), Continental's show corrosion from 216hr.

2) There's no difference on performance grade (DOT3, DOT4) for anti corrosion.
But, continental armatures do not corrode with KUKDONG DOT4, SHELL DOT4.

ESC Brake Fluid Analysis

STATUS

■ Corrosion test with Campaign A/S fluid according to Continental's test method.

1) Test method : ① Immerse armature part of 2/3 in factory filling brake fluid (DOT-3) on petri dish.

② Replace DOT-3 with DOT-4 (improved anti corrosion) at the fixed time.

※ DOT3/DOT4 : Product of KUKDONG, satisfied HMC spec.

2) Result

-		Replacement time	48hr	96hr	144hr	192hr	240hr	288hr
No replacement		-	No corrosion	No corrosion	No corrosion	Corrosion	Corrosion	Corrosion
Replace with A/S fluid (DOT4)		48hr	No corrosion	No corrosion	No corrosion	No corrosion	No corrosion	No corrosion
		96hr	No corrosion	No corrosion	No corrosion	No corrosion	No corrosion	No corrosion
		144hr	No corrosion	No corrosion	No corrosion	No corrosion	No corrosio	No corrosion
		192hr	No corrosion	No corrosion	No corrosion	Corrosion	Not Progress	Not Progress
		240hr	No corrosion	No corrosion	No corrosion	Corrosion	Corrosion	Not Progress

3) Conclusion

- HMC factory filling brake fluid(DOT3), corrosion observed at 192 hr.
- Replacing the brake fluid(DOT4) either before or after corrosion arrests further corrosion.

ESC Brake Fluid Analysis

STATUS

■ Difference between HMC's spec and international standard(FMVSS no.116).

1) The spec of HMC was established based on FMVSS no.116

2) The difference of between HMC spec and FMVSS no.116

① Test specimen for corrosion test : HMC spec has the corrosion test of Zinced Iron, but FMVSS don't.

② HMC spec requires two more tests such as Copper Solubility, Parts Corrosion test

Refer to the attached: Appendix A.

ESC Brake Fluid Analysis

STATUS

■ The review of zinc plating armature

1) Salt spray test result (ASTM B 117)

- After calking(inserting ball in armature),thickness of armature gets thinner and corrode quickly.
- Comparing between Continental and domestic products (domestic 3㎛, continental before calking), corrosion quality of continental is poor.

	Continental		Domestic manufactured			note
	Before calking	After calking	3㎛	5㎛	8㎛	
Zinc coating Thickness ㎛	3.7~4.6	2.4~3.2	3.6~4.9	5.7~7.3	11.6~12.2	· After galvanized, treat with chromate · When ball calking, thickness of plating gets thinner about 1.3~1.4㎛.
Corrosion Start Time hr	48 	24 	72 	192 	240 all clear 	

2) The test result according to the test method Continental presented

- Test method and criteria : Immerse armature part of 2/3 in brake fluid , leave at 120℃ during 288hr.
  It shouldn't show any corrosion.
- Result : There's no corrosion with domestic zinc plating armature.

Continental manufactured		3㎛	5㎛	8㎛
218 hr 	corrosion 288hr 	288hr all clear 	← 	← 

<test image>

3) Conclusion : Quality of domestic produced zinc plating is better than Continental production.

Appendix A

Brake Fluid Investigation

DOT-3 specification (1/4)

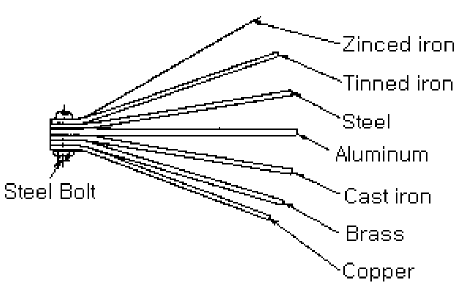
<table>
<tr><th colspan="3">Item</th><th>Unit</th><th>Requirement</th><th>Test Method</th></tr>
<tr><td colspan="3">ERBP</td><td>℃</td><td>Min. 230</td><td>6.1 of FMVSS No.116</td></tr>
<tr><td colspan="3">Wet EPRB</td><td>℃</td><td>Min. 145</td><td>6.2 of FMVSS No.116</td></tr>
<tr><td colspan="3">Flash Point</td><td>℃</td><td>Min. 82</td><td>JIS K 2265</td></tr>
<tr><td rowspan="2">Kinematic Viscosity</td><td colspan="2">100℃</td><td>cSt</td><td>Min. 1.5</td><td rowspan="2">6.3 of FMVSS No.116.</td></tr>
<tr><td colspan="2">40℃</td><td>cSt</td><td>Max. 1500</td></tr>
<tr><td colspan="3">pH</td><td></td><td>7.0 ~ 11.5</td><td>6.4 of FMVSS No.116.</td></tr>
<tr><td rowspan="2">Stability</td><td colspan="2">High-Temperature Stability</td><td></td><td>ERBP change Max. [3 + 0.05 (ERBP – 22)] ℃</td><td rowspan="2">6.5 of FMVSS No.116</td></tr>
<tr><td colspan="2">Chemical Stability</td><td></td><td>ERBP change Max. [2 + 0.05 (ERBP – 225)] ℃</td></tr>
<tr><td rowspan="4">Rubber Swell (70±2h×70℃)</td><td>Base diameter Change</td><td>Rubber Cup</td><td>%</td><td>0.5 ~ 4.0</td><td rowspan="8">6.12 of FMVSS No.116</td></tr>
<tr><td>Volume Change</td><td>EPDM Specimen</td><td>%</td><td>0 ~ 10</td></tr>
<tr><td>Hardness Change</td><td rowspan="2">Rubber Cup & EPDM Specimen</td><td>IRHD</td><td>0 ~ - 10</td></tr>
<tr><td>Appearance</td><td>-</td><td>No disintegration as evidenced by Stickiness, blisters or sloughing.</td></tr>
<tr><td rowspan="4">Rubber Swell (70±2h×120℃)</td><td>Base diameter Change</td><td>Rubber Cup</td><td>%</td><td>0.5 ~ 4.0</td></tr>
<tr><td>Volume Change</td><td>EPDM Specimen</td><td>%</td><td>0 ~ 10</td></tr>
<tr><td>Hardness Change</td><td rowspan="2">Rubber Cup & EPDM Specimen</td><td>IRHD</td><td>0 ~ - 5</td></tr>
<tr><td>Appearance</td><td>-</td><td>No disintegration as evidenced by Stickiness, blisters or sloughing.</td></tr>
<tr><td colspan="3">Water content</td><td>wt%</td><td>Max. 0.15</td><td>ASTM D 1123</td></tr>
<tr><td colspan="3">Hazardous Substances</td><td>-</td><td>Each Material must meet the requirements of MS201-02</td><td>MS 201-02</td></tr>
</table>

DOT-3 specification (2/4)

Item		Unit	Requirement	Test Method
Fluidity and appearance at Low Temperature	-40 ± 2 ℃ × 144 ±4.0 h		No sledging, sedimentation, crystallization or stratification. Air bubble flow times to travel to the top of fluids upon inversion of the sample bottle : max. 10 sec Shall regain its original appearance and fluidity when warmed to room temperature.	6.7 of FMVSS No.116
	-50 ± 2 ℃ × 6 ± 0.2 h			
Evaporation 100 ± 2 ℃	Loss by Evaporation	wt%	Max. 80	6.8 of FMVSS No.116
	Condition of the Residue		No precipitate that remains gritty or abrasive when rubbed with the fingertip	
	Pour Point of Residue		Below – 5 ℃	
Water Tolerance	-40 ±2 ℃ × 120 ±2 h		No sludge, sedimentation, crystallization or stratification. Air bubble flow times to travel to the top of fluids upon inversion of the centrifuge tube: Max. 10 sec If cloudiness has developed, the wet fluid shall regain its original clarity and fluidity when warmed to room temperature.	6.9 of FMVSS No.116
	60 ±2 ℃ × 24 ±2 h	vol%	The fluid shall show no stratification. sedimentation after centrifuging: Max. 0.05	
Compatibility	-40 ±2 ℃ × 120 ±2 h		No sludge, sedimentation, crystallization or stratification.	6.10 of FMVSS No.116
	60 ±2 ℃ × 24 ±2 h	vol%	Sedimentation after centrifuging: Max. 0.05	
Resistance to Oxidation		㎎/㎠	The metal test strips outside the areas of contact with the tinfoil shall not exhibit pitting or etching to an extent discernible without magnification and gummy deposit. Aluminum weight change : ± 0.05 Cast iron weight change : ± 0.2	6.11 of FMVSS No.116

DOT-3 specification (3/4)

Item			Unit	Requirement	Test Method
Corrosion 100±2℃ 120±2h	Weight Change	Zinced Iron	mg/cm^2	± 0.2	6.6 of FMVSS No.116
		Tinned Iron		± 0.1	
		Steel		± 0.2	
		Aluminum		± 0.1	
		Cast Iron		± 0.2	
		Brass		± 0.2	
		Copper		± 0.2	
	Appearance of Test Strip Surface at the end of test			Excluding the area of contact, the metal test strips shall not show pitting or etching to an extent discernable without magnification.	
	Condition of Fluids at the end of test			No jelling at 23 ± 5 ℃ No crystalline deposits shall form or adhere to either the glass jar walls or the surface of the metal strips. Sedimentation : Max. 0.20 vol%, PH : 7.0 ~ 11.5	
	Condition of Rubber cups at the end of test			No disintegration, as evidenced by blisters or sloughing, Hardness decrease: max. 15 IRHD Base diameter increase : max. 4.0 %	



ITEMS	TEST STRIPS
Zinced Iron	Zinced iron strips - 0.3mm thick SPCC strip with a 8 micron thick electro-plate zinc coat and colored chromate
Tinned Iron	SPTH of JIS G 3303 (Tinplate and black plate)
Steel	Class of JIS G 3141 (Cold Rolled Carbon Steel Sheets and Strips)
Aluminum	A2024P of JIS G 4000 (Aluminum and aluminum Alloy Sheets and Strips)
Cast Iron	Class 3 (FC20) of JIS G 5501 (Gray Iron Casting)
Brass	C2080P of JIS H 3100 (Copper and Copper Alloy Sheets, Plates and Strips)
Copper	C1100P of JIS H 3100 (Copper and Copper Alloy Sheets, Plates and Strips)

DOT-3 specification (4/4)

Item		Unit	Requirement	Test Method
Stroking Properties	Condition of Metal Parts	-	No pitting or etching to an extent discernible without magnification.	6.13 of FMVSS No.116
	Diameter change of Cylinder or Piston	㎜	Max. 0.13	
	Hardness change	IRHD	Max. 15	
	Appearance	-	No stickiness, scuffing, blisters, cracking, chipping or other change in shape from its original appearance.	
	Base Diameter Change	%	Max. 3	
	Lip Diameter change	%	Max. 65, in average	
	Loss of fluid	-	Max. 36 ㎖ during by any period of 24,000 strokes	
	Operating condition of the Cylinder end Piston	-	Not freeze or funtion improperly throughout the test.	
	The total loss of fluid during the 100 Strokes at the end of the test	㎖	Max. 36	
	Condition of the Fluids at the end of the test	-	No formation of gels.	
	Sedimentation at the end of test	vol %	Max. 1.5	
	Condition of inside area of Cylinder	-	Shall be free of deposits that are abrasive or that can't be removed when rubbed moderately with a nonabrasive cloth wetted with ethanol.	

DOT-3 specification (FMVSS N0.116)

Item		Unit	Requirement	Test Method
Copper Solubility 100±2℃ × 168 h	Copper Solubility	wt%	Max. 0.01	Appendix 1
	Condition of Cups	-	No cracking, pitting, remarkable hardness decrease or other harmful defects.	
Part Corrosion 100±2℃× 40±2㎏/㎠×100,000 Strokes	Condition of Metal	-	No pitting, etching, copper coating or other harmful defects to extent discernible without magnification	Appendix 2
	Condition of Metal part	-	No sticking, blisters, scuffing, cracking, pitting, remarkable hardness decrease or other harmful defects.	
	Condition of Fluids	-	No gels, sludge or other harmful defects.	

Appendix 1

◎Copper Solubility

-Test Apparatus

(1) Apparatus Assemble the apparatus as shown in Fig -1.
(2) Container : Use a 500 ㎖, glass tall beaker with glass interface.
(3) Condenser : Use a coiled type condenser (minimum 500 ㎜ long).
(4) Aerator tube : Use a gas – dispersion tube, porosity size G3 and dispersion length about 15㎜, tube outside diameter about 8㎜ and length about 100 ㎜
(5) Thermometer : Use a liquid – in – brass thermometer graduated at 1 ℃
(6) Heater : The heater shall consist of a heating plate and oil bath, which, as a unit, is capable of maintaining the solution automatically at 100 ± 2 ℃ for 168 consecutive hours.
(7) Dry Air Blower : The dry air blower shall be capable of feeding each container with dry air at 100 ± 10 ㎖/min.
(8) Copper Strip : Use class 1 of JIS H 3103. Use a 500 ㎠ strip for each container.
Polish the strip with AA or CC 320. Wash the strip with ethanol and dry.
Maintain the strip in desiccators at room temperature for a minimum of 1 hour.
(9) Rubber Cups : For each one container, use 10 rubber cups specified by HMC and KMC.
Otherwise, use rubber cups specified in paragraph 6.6.3 (b) of FMVSS No.116.

- Test Procedure

Fill the apparatuses assembled as shown in Fig 2. with 300 ㎖ fluid. Attach a heater unit to the apparatus. Maintain the fluid at 100 ± 2 ℃ for 168 h, by feeding the container with dry air through a feeder tube. At the completion of heating, measure the weight of copper dissolved in the fluid by weight analysis or an equivalent method.

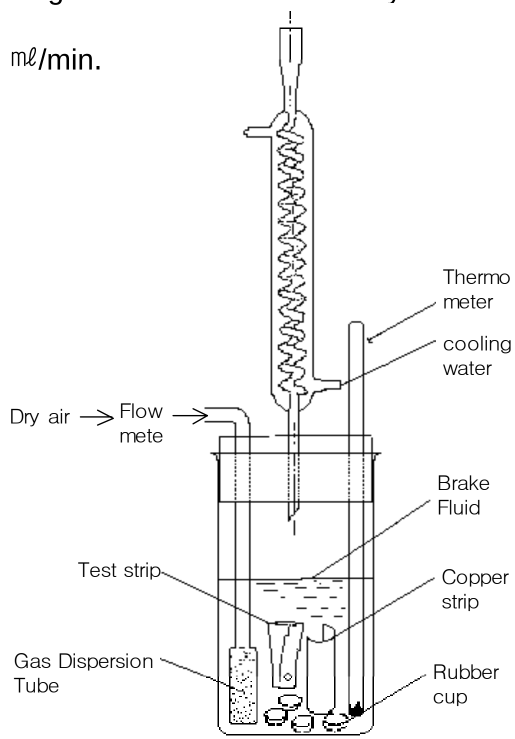


Fig-1. Test Apparatus for Copper

Appendix 2

◎Parts Corrosion

-Test Parts

Adequate test parts for at least one complete motor vehicle brake hydraulic system shall be prepared. These parts shall be the master cylinder, caliper, wheel cylinders, tube, hoses, and valves specified by HMC and KMC.

-Test Apparatus

A Test apparatus shall be set up using Fig -2 as a guide. The arrangement of the brake test line shall conform to vehicles test designed by HMC

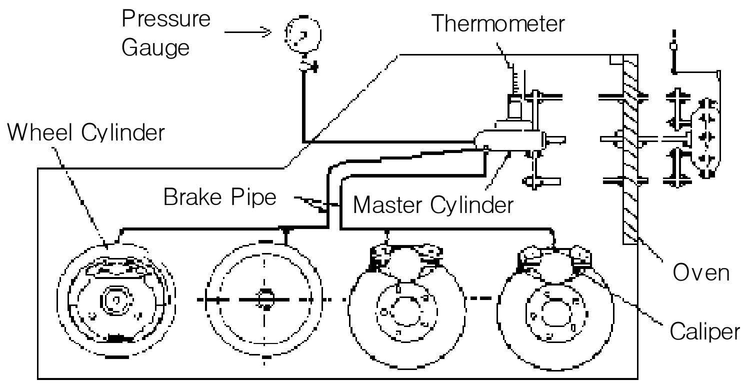


Fig-2. Test Apparatus for Part Corrosion

ITEMS		CONDITONS
Test Fluids		Copper solution fluid subsequence to test in accordance with . 3.16 + 10 % of water
Temperature, Time		100±5 ℃ × 10,000 strode → R.T.X 14 h × 10 cycle
Max, Pressure		40 ± 2 ㎏/㎠
Strokes/hour		1,000 ± 100/h
Piston Strokes	Caliper	1 ± 0.2 ㎜ (One side)
	Wheel Cylinder	2± 0.2 ㎜ (One side)
Piston Stroke as related to Pressure of Fluid		Conform to paragraph 6.13 of FMVSS No. 116 (Motor Vehicle Brake Fluids).

Table-1

-Test Condition

Tests shall be performed in the same condition as shown in Table-5. If the test condition is agreed with the inspection department of HMC and KMC, conform to the following. Note: Temperature shall be reached within 2 hours. Then, perform test.Table-1

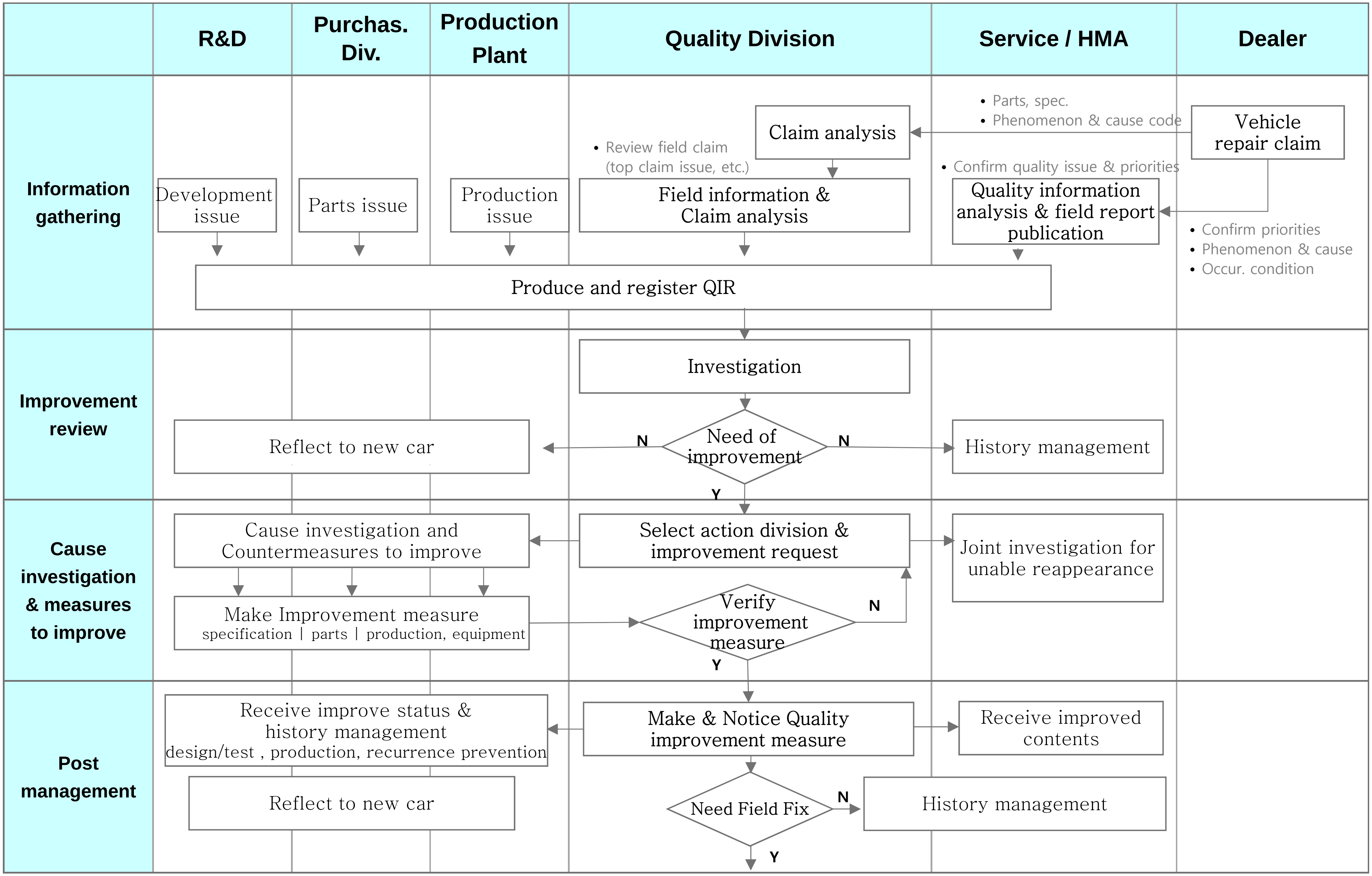
- Test Procedure

Wash each part with ethanol and dry. Assemble test parts using the test fluid as a lubricant. Attach each Assembled part to the part corrosion apparatus. Fill with test fluid. Remove air by operating air bleeding air-bleeding valve. Test after the target temperature is achieved.

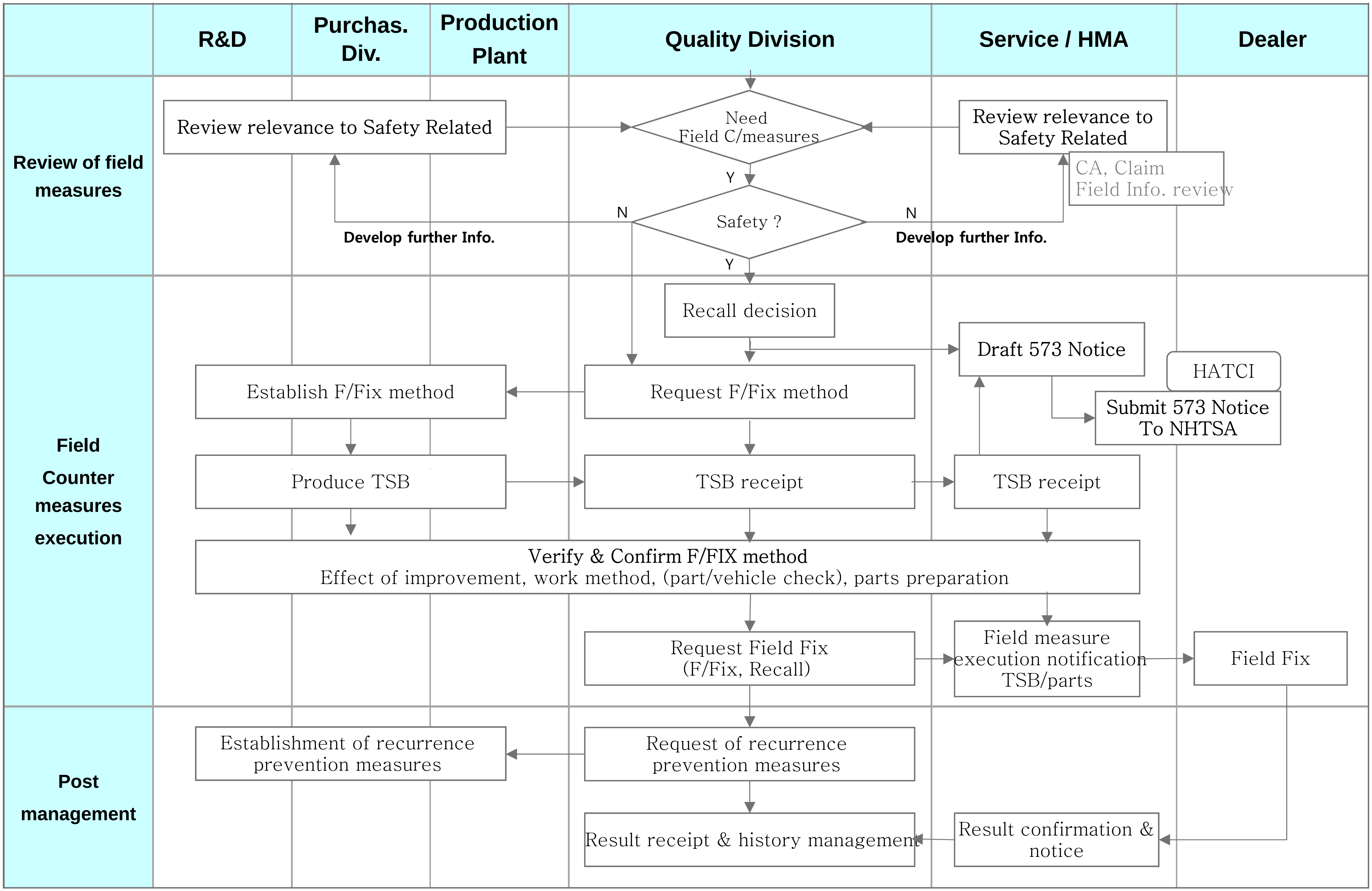
ATTACHMENT G

15-1. Quality Improve Process Flow Charts

Process - 1) Activities of quality information management



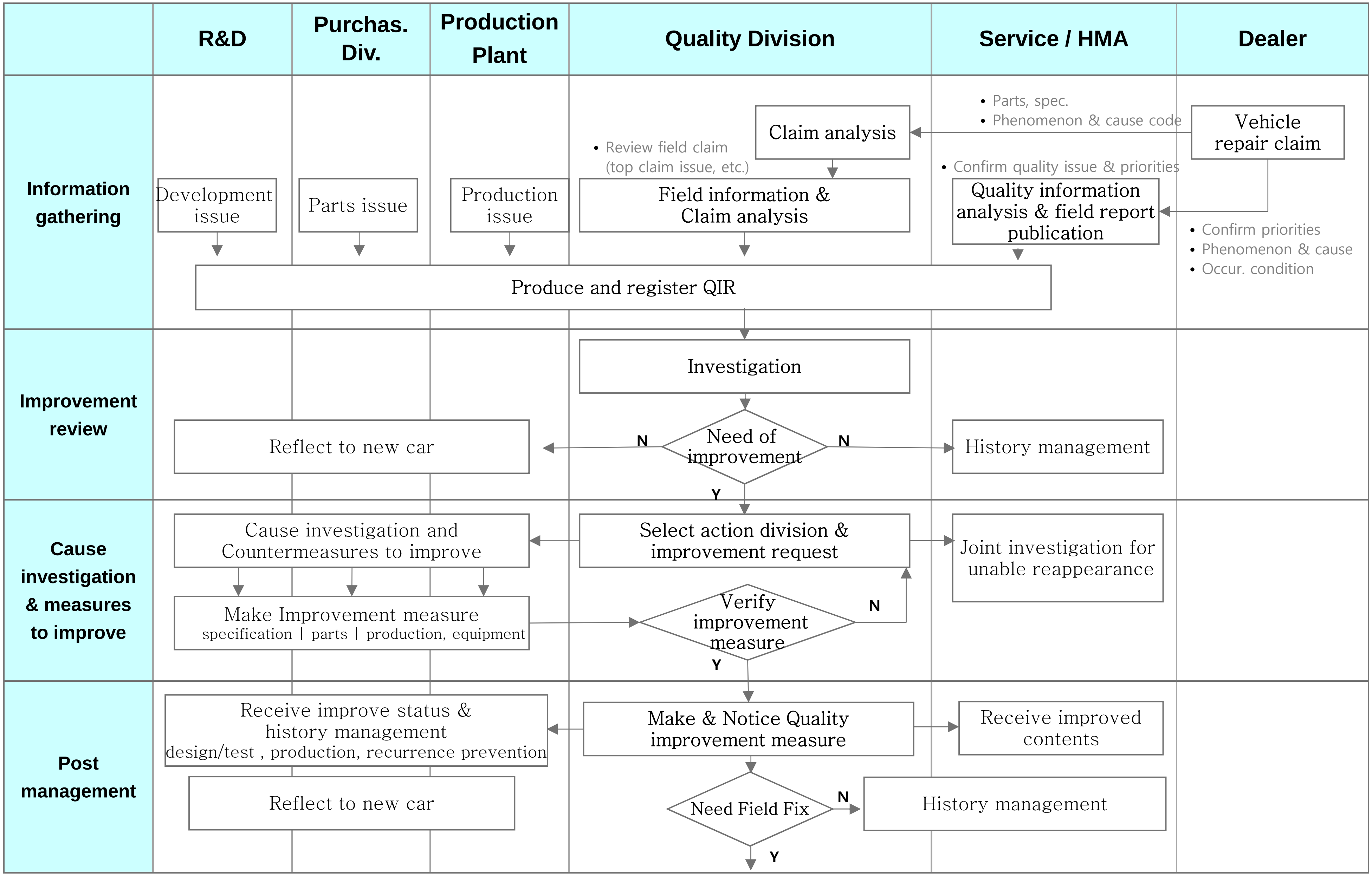
Process - 2) Activities of field measure establishing



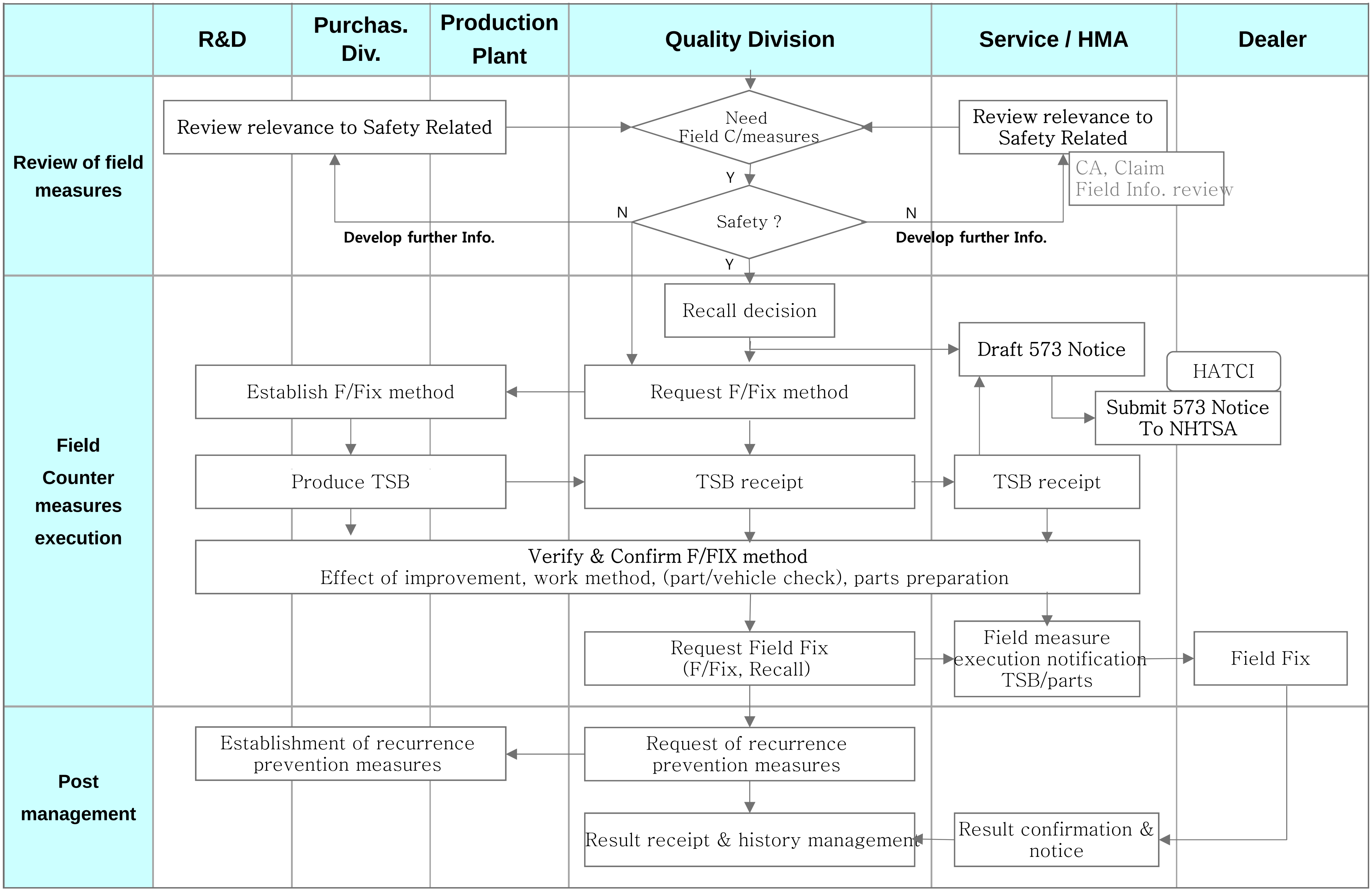
ATTACHMENT G

15-1.Recall Process Flow Charts

Recall Process - 1) Activities of quality information management



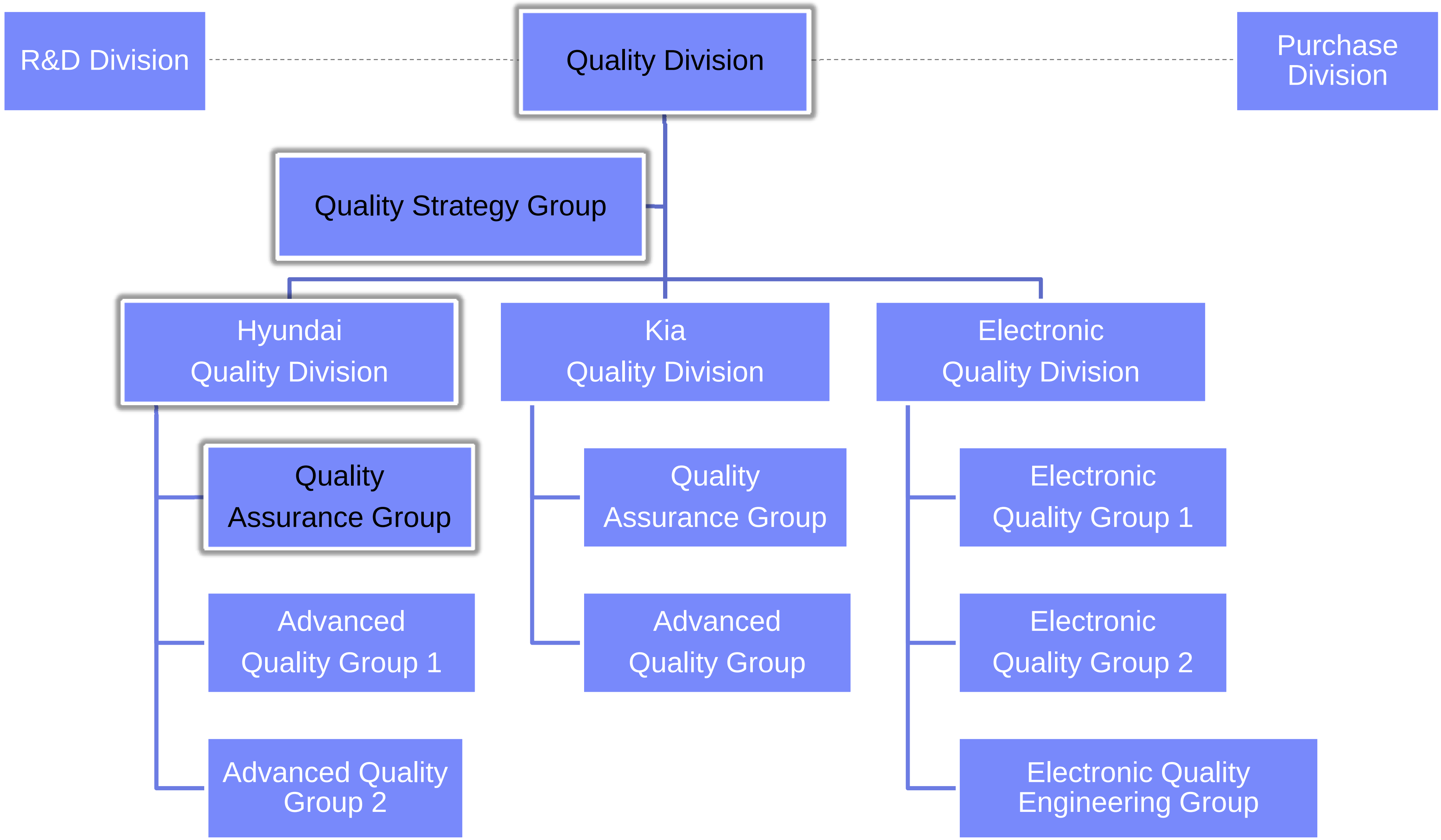
Recall Process - 2) Activities of field measure establishing



ATTACHMENT G

15-2. Organization_Quality_R&D_Purchase

Organizational Chart



ATTACHMENT G

15-2. 15-3.QIR, QIS Template

QIR

W/Claim | Save | Issu

Distributor		Report No.		Date	2013-12-31
QIR Type		Priority		Req Number	
Reporter	LEE JUYONG	Tel		E-mail	paul@hyundai.com

Vehicle Information

Model		Vehicle ID No.		Repair Date	
Mileage		No.of Vehicles Affected		Delievery Date	
Fuel Type		Displacement		Production Date	
Engine Number		Engine Type		Engine Model	
T/M Number		T/M Type		T/M Model	
MI code					

Part Information

Causal Part No		Part Name		Part Supplier	
Defective Part	Available / Unavailable / Already Sent			Part Lot No.	

Problem Occurrence Condition — Multy Input

Nature Code		Cause Code	
Occurrence		Weather Condition	
Time Period		Driving Phase	
Speed Range		Road Condition	
Location		Etc.	

Subject	
Description	1. Introduction (Reason for reporting) 2. Detailed Symptom & Condition (Driving condition/ Vehicle condition/ Road condition) 3. Investigation result & Possible cause (Supporting material) 4. Corrective action & Result 5. Comments
Attachment	Attach

Additional Vin List

SEQ	Vehicle ID No.	Mileage	Engine No.	T/M No.	Repair Date	Delievery Date	Prod Date

Defective Part

Request QA Date	Request QA Charger	Request Date	Request Name	Receive Date	Receive Name	Send Date(TS)	Send Name	B/L No

Additional information

Request QA Date	Request QA Charger	Request Date	Request Name	Receive Date	Receive Name	Send Date(TS)	Send Name

QIR Rating	QIR Rate Comment

QIS Rating	QIS Rate Comment

QIRF + − NEW

QIS + − NEW

Comment + − NEW

To	Egypt		
Attn	Mr. Esmat El-Araby		
CC	Michael Samir	Date	2013-12-31
From	LEE JUYONG / Hyundai Motor Company	QIR Issue Date	2013-12-23
Subject	Hard to move shift lever.		
Report No.	D03AB2013122301	Model	Elantra(MD)
Status			
TSB No.		Claim Monitoring	Y N
Attachment	Attach		

Improvement Status

Condition			
Cause			
Countermeasure			
Effective Date		Vehicle ID No.	
Field Fix Method			

Comments

image Attach

QIS Evaluation

Very Poor		Poor		Normal		Good		Excellent	Perfect
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

ATTACHMENT G

15-4.Report Template_one page

Title

		C/measure Developer	
		Supplier	

Problem Description	Before	After

Symptom & Cause	Countermeasure – Assy Line	Countermeasure – Field Fix
Description	Description	Description

A/S interchangeable		Cost change	
Part # Change		Responsible	

ATTACHMENT G

15-5.Report Template_Full

Title

Date

Quality Division

Title

Car / Model

1. Symptom

Lay-Out

■ Problem Description

■ Country

■ Claim

Supplier	
Responsibility	

2. Cause

■ Description (picture, drawing)	■ Description (explanation)

3. Countermeasure – assembly line

Before		After
Description (picture, drawing)		Description (picture, drawing)
Improvement Description		
Verification		

4. Countermeasure – Field Fix

F/Fix Method	
Affected Range	
Affected Volume	
Cost estimate	

5. Prevent Recurrence (option)

Responsible Div.	Description	Date

ATTACHMENT G

15-6.Report_Full Campaign 201203

BH/VI ESC Module Spongy brake pedal

2012. 03

Hyundai Quality Division

Spongy brake pedal

BH/VI

1. Symptom

Lay-Out

■ Problem Description

· Soft/Spongy brake pedal feeling when operating brake pedal

- The NC Valves which should be closed in a normal braking stay stick and open, it causes spongy brake pedal feeling.

■ Country

· Korea

■ Claims

· BH : 0.06% (62 cases/ 111,900 units)

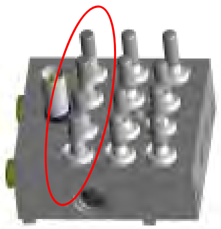
· VI : 0.03% (16 cases/ 47,800 units)

Supplier	Continental Automotive Corp.
Responsibility	Purchasing / R&D

2. Cause (Possible)

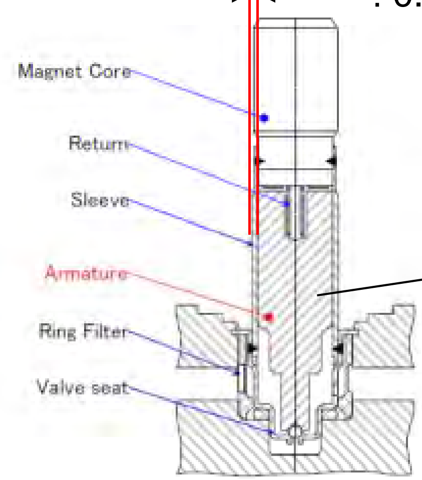
NC Valve

<ESC module>



<Block ASS'Y>

gap (Sleeve and Armature)
: 0.08mm



<NC Valve ASS'Y>

▣ NC armatures in valve sleeves of ESC module may stick open by corrosion

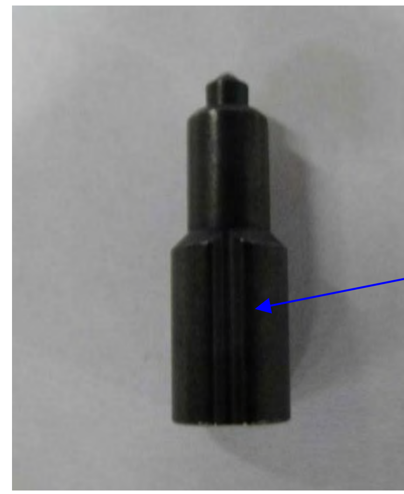
① A chemical reaction between NC valve and Brake Fluid causes Zinc plating corrosion
② The NC Valve may stick and causes brake oil pressure to decrease
③ Spongy feeling when operating brake pedal

※ The reason of Zinc plating
- Corrosion proof of valve before putting in Brake Fluid
- Zinc Plating (Seiko, CHINA) → Module Assembling (Continental, Japan)
  → Module delivery and BF Injection to vehicles : 1 ~ 3 months required

※ The treatment method of NC armatures surface

Manufacture	surface treatment	Results
MANDO	Black-oxide coating	No corrosion
MOBIS (BOSCH)	No plating (rust-preventing oil application)	

3. Countermeasure – assembly line

Before	After
▣ Surface treatment : Zinc Plating  Zinc Plating	▣ Surface treatment : Black-oxide coating  Black-oxide coating

Improvement Description	▶ Change the surface treatment of NC valve : 12. 3.16 - Zinc Plating → Black-oxide coating
Verification	▶ No Corrosion with Petri test method - Soaking Black-oxide coating armatures in BF DOT3 for 288 hours - Proven with other black-oxide coated HECU (MANDO product)

4. Countermeasure – Field Fix

F/Fix Method	• Premium Service • Brake Fluid Replacement (DOT3 → DOT4)
Affected Range	• SOP ~ ’12.3.16 (Korea) - BH : ‘07. Dec ~ - VI : ‘09. Feb ~
Affected Volume	• 159,700 (BH : 111,900 VI : 47,800)

ATTACHMENT G

15-7.Report_Full Recall 201310

BH Genesis Spongy brake pedal

2013. 10.

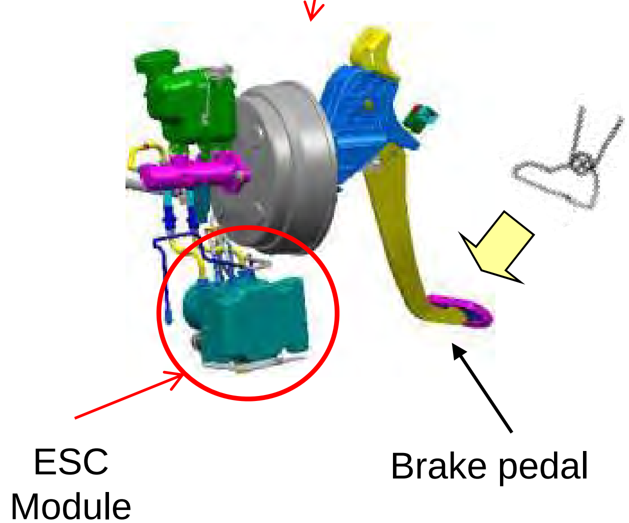
Hyundai Quality Division

Spongy brake pedal

BH Genesis

1. Symptom

Lay-Out



■ **Problem Description**

· Soft/Spongy brake pedal feeling when operating brake pedal

- Internal Valve of ESC module can be corroded

■ **Country**

· Multiple

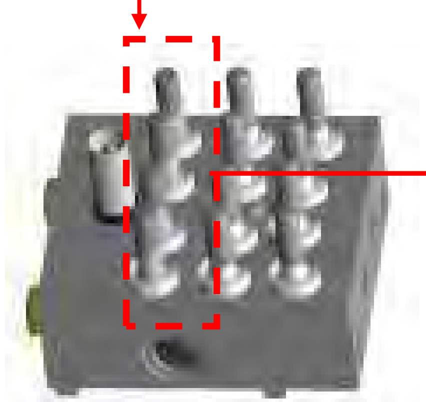
■ **Claims**

· ~1,700 HECU units replaced in USA

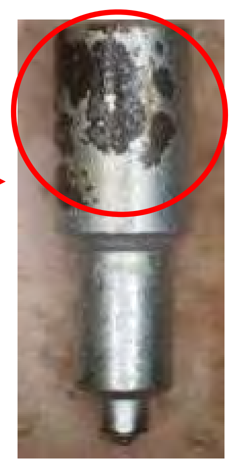
Supplier	Continental Automotive Corp.
Responsibility	Purchasing / R&D

2. Cause

<ESC Module>



NC Valve



Zinc plating corrosion

■ NC armatures in valve sleeves of ESC module may stick open by corrosion

① A chemical reaction between NC valve and Brake Fluid causes Zinc plating corrosion

② The NC Valve may stick and causes brake oil pressure to decrease

③ Spongy feeling when operating brake pedal

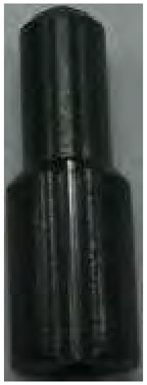
※ The reason of Zinc plating

- Corrosion proof of valve before putting in Brake Fluid
- Zinc Plating (Seiko, CHINA) → Module Assembling (Continental, Japan)
  → Module delivery and BF Injection to vehicles : 1 ~ 3 months required

※ The treatment method of NC armatures surface

<table>
<tr><th>Manufacture</th><th>surface treatment</th><th>Results</th></tr>
<tr><td>MANDO</td><td>Black-oxide coating</td><td rowspan="2">No corrosion</td></tr>
<tr><td>MOBIS
(BOSCH)</td><td>No plating
(rust-preventing oil application)</td></tr>
</table>

3. Countermeasure – assembly line

Before	After
▣ Surface treatment : Zinc Plating 	▣ Surface treatment : Black-oxide coating 

Improvement Description	▪ Change the surface treatment of NC valve : 12. 3.16 - Zinc Plating → Black-oxide coating
Verification	▪ No Corrosion with Petri test method - Soaking Black-oxide coating armatures in BF DOT3 for 288 hours

4. Countermeasure – Field Fix

F/Fix Method	• Recall Campaign • Brake Fluid Replacement (DOT3 → DOT4) - Replace ESC module if necessary
Affected Range	• SOP ('07.Dec) ~ '12. 3.16
Affected Volume	• 64,952 units - S. Korea 9,100 units, N. America 46,649 units, China 1,547 units, General 7,656 units

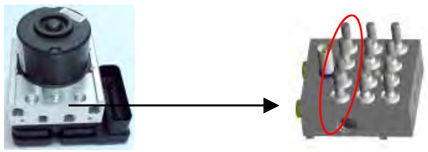
ATTACHMENT G

15-8. One Page Report

BH/VI Spongy brake pedal

C/measure Developer	Purchasing
Supplier	Continental

Problem Description



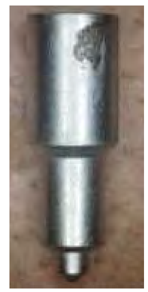
ESC module (MK25E)

NC Valve

Armature

Before

▣ Surface treatment : Zinc Plating



After

▣ Under study

Manufacture	surface treatment
MANDO	Black-oxide coating
MOBIS	No plating (rust-preventing oil)

Symptom & Cause

▣ Symptom : Soft/Spongy brake pedal feeling when operating brake pedal

▣ Cause : NC armatures in valve sleeves of ESC module may stick open by corrosion

▣ Region : Domestic

Countermeasure – Assy Line

▣ Under study

Countermeasure – Field Fix

▣ Under study

A/S interchangeable	-	Cost change	-
Part # Change	-	Responsible	Purchasing

ATTACHMENT H

16-1. Brake manufacturer & Brake Fluid information

KUKDONG CROWN DOT-3

KUKDONG
KUKDONG JEYEN CO.,LTD.

COMPANY PROFILE

- **COMPANY NAME** : KUKDONG JEYEN CO.LTD.
- **C.E.O.** : Jae-uk Park
- **ESTABLISHMENT** : May. 1973
- **ANNUAL TURNOVER (2012):** 63,342 million (KRW)
- **EMPLOYEE** : 54
- **COMPANY STRUCTURE** : 5 Dep. 13 teams,

  China Branch, India Branch, Europe Branch (Slovakia)
- **ANNUAL TURNOVER (2012):** 63,342 million (KRW)
- **ADDRESS**
  - Head Office / Factory: #1173-4 Wonjeong-ri Poseung-eup Pyeongtaek-si

    Gyeonggi-do Korea
  - R&D Center : #1499 Seonbuk-dong Kangseo-gu, Busan Korea
- **COMPANY CERTIFICATIONS**
  - "TS16949" SYSTEM Certified (May. 2007)
  - "TOP COMPANY OF TECHNOLOGY" Designated by SMBA (Jan. 1999)
  - "Venture Company" Designated by SMBA (May.1998)

COMPANY STRUCTURE

KUKDONG

Chunil Cargo Transportation

MOTHER COMPANY

Chunil Motor Freight Co.,Ltd

C&S international Logistics Co.,Ltd

Chunil Car Service Co.,Ltd

Chunil I&C Co.,Ltd

극동제연(주)

KUKDONG JEYEN Co.,Ltd

Technical Cooperation

극동중앙연구소
KUKDONG R&D CENTER

NTG
NTG KOREA CO.,LTD

[Chunil Head Office - Busan]

[Kukdongjeyen Head Office - PyeongTaek]

[NTG-KOREA Head Office - Haman]

BUSINESS NETWORK

WORLDWIDE NETWORK

LOCAL NETWORK

KUKDONG EURO. S.R.O

Sladovnicka22, 917 01 Trnava, Slovak Republic
TEL: +421 - 33 - 293 - 3190, FAX: +421 - 33 - 593 – 3064

SHANGHAI KUKDONG JEYEN. CO., LTD

Room 704, Ouyin Building No 1369, Wuzhong Road, Shanghai, China
TEL: +86 - 21 - 5156 - 6145, FAX: +86 - 21 - 5156 - 6147

KUKDONG COOLANT INDIA CO. PVT LTD

1st FLR, PLOT No.3, Sai Lakhshmi nagar Bangalore, Main Road, Sriperambudur, Chennai, India
TEL: +91 - 44 - 2716 - 2556, FAX: +91 - 44 - 2716 - 2515

본사 공장

경기도 평택시 포승읍 원정리 1173-4
TEL: 031-680-0505
FAX. 031-680-0507

서울영업사무소

경기도 시흥시 조남동 283번지
TEL: 031-716-3963
FAX: 031-794-3986

기술연구소

부산광역시 강서구 성북동 1499
(주) 씨앤에스 국제물류센터
TEL: 051-204-0505
FAX: 051-204-0577

BRAKE FLUID

KUKDONG

- Autos Chemical Product

CROWN

DOT-3 Grade
DOT-4 Grade

- Certified FMVSS 116.
- Supply to Hyundai Motors, Kia Motors, Renault-Nissan Alliance(RSM), GM Korea, Etc.

HYUNDAI
Drive your way

KIA MOTORS
The Power to Surprise™

HYUNDAI MOBIS

SAMSUNG
RENAULT SAMSUNG MOTORS

GM KOREA

Crown B-303

- Supply Brake Fluid to Hyundai Motors

ITEMS			REQUIREMENTS MS517-06 DOT-3	B-303
pH			7.0 ~ 11.5	9.10
B.P (℃)			230 min	250
Wet B.P (℃)			145min	150
Viscosity (cst) at -40℃			1500 max	1100
Water Content (wt%)			0.15 max	0.06
Fluid and appearance at Low Temperature	-40℃ 144h	appearance	No sedimentation, No Stratification	Pass
		Time for bubble to travel to top	10 sec max	2
	-50℃ 6h	appearance	No sedimentation, No Stratification	Pass
		Time for bubble to travel to top	10 sec max	3

ATTACHMENT I

17-1. Recall Scope_Validation

Genesis – Scope of Recall Campaign

Scope

- Applicable vehicle production date : **From Genesis job1 ~ 2012.03.28**
  - ▶ **Finish** treatment of NC valve's **Armature** was changed (zinc coating → black oxide coating)
    (HMC's start of vehicle production date : 2012.03.29)

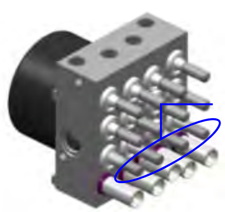
★ The condition was related to Armature's Zinc coating and specific Brake fluid's chemical effect, thus, after changing finish (to Black oxide) no valve corrosion will occur.

1) HMC's other HECU supplier (MANDO) applied black oxide coating – no reports of this issue. ☞ *see appendix1*

2) During our investigation(reproducing test), we found only zinc coating of armature reacted with specific brake fluid (Kuk-dong,DOT3) and made yellow gel(corrosion) ☞ *see appendix2*

Vehicle Production date

#job1('08.4.1)~ *'12.3.29~*



HECU

Zinc Coating

'< Armature >

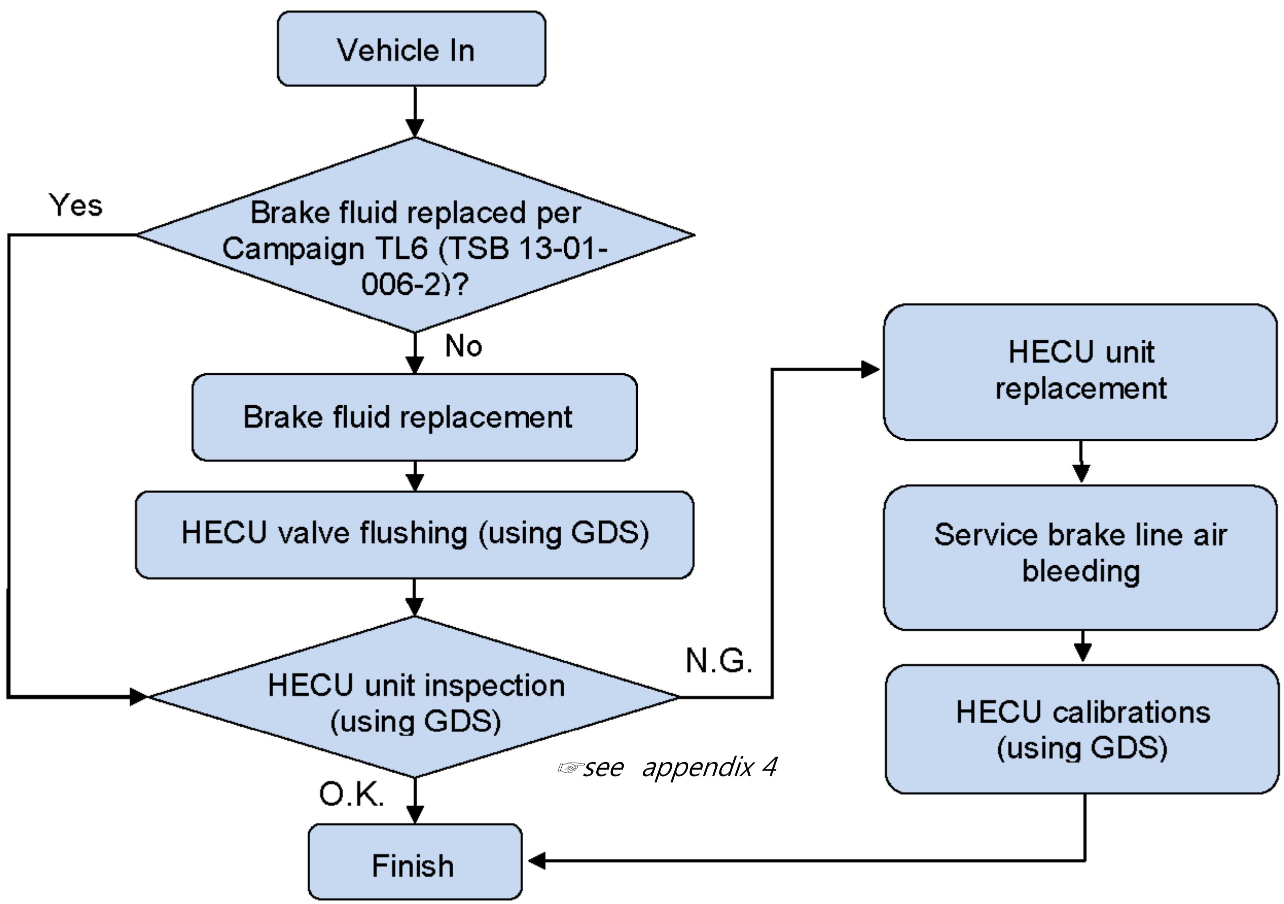
Black Oxide

'< Armature >

HYUNDAI MOTOR GROUP

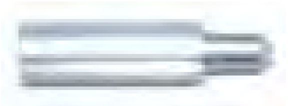
Genesis – Recall Service Procedure

Procedure



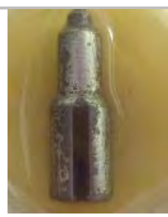
Appendix 1- Other HECU supplier's finish of armature

Comparison armature (Continental) with HMC's other supplier (MANDO & MOBIS)

Supplier	Material	Finish treatment	Armature shape
Continental	SUM24L	Zinc coating → Black Oxide coating	
MANDO	SUM24L	Black Oxide coating	
MOBIS	SCM415	No finish (Apply Inhibit oil)	

Appendix 2- Reproduce Test Result

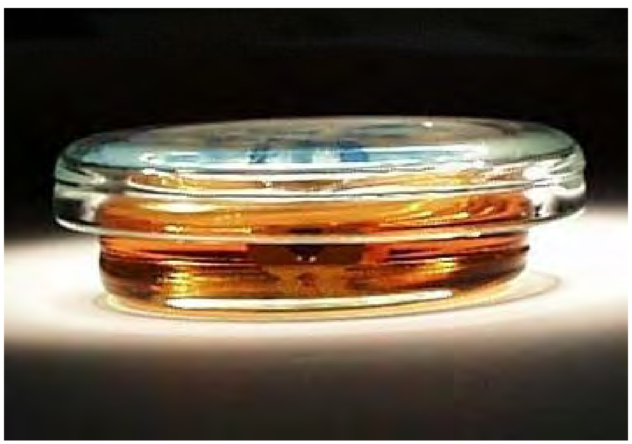
※ **Test procedure: Petri dish test mode (Continental's Test Procedure)** ☞ *see appendix3*

Supplier		**Continental**				**MOBIS**	**MANDO**
Parts		**Armature (NC valve)**				**Armature (NC valve)**	**Armature (NC valve)**
Brake Fluid		**Kuk-Dong (DOT3)**	**Kuk-Dong (DOT4)**	**Shell (DOT4)**	**Dong-A (DOT4)**	**Kuk-Dong (DOT3)**	**Kuk-Dong (DOT3)**
Hours	72						
	216						
	288						
	Result	corrosion (216hr)	OK	OK	corrosion (72hr)	OK	OK

※ HMC's Plant filling Brake fluid: Kuk-Dong DOT3

Appendix 3- Reproduction Test Method: Brake Fluid Thermo-Oxidative Stability Test Setup

Put a zinc plated NC valve steel armature into a petri dish with a nominal diameter of 4 cm (real diameter: 3.4 cm)



Remark:

The rim of the petri dish is not completely regular, thus allowing oxygen to enter the dish between lid and rim of petri dish

Pour 3 ml of brake fluid over the armature. The armature is not completely covered but soaked

Close the lid.

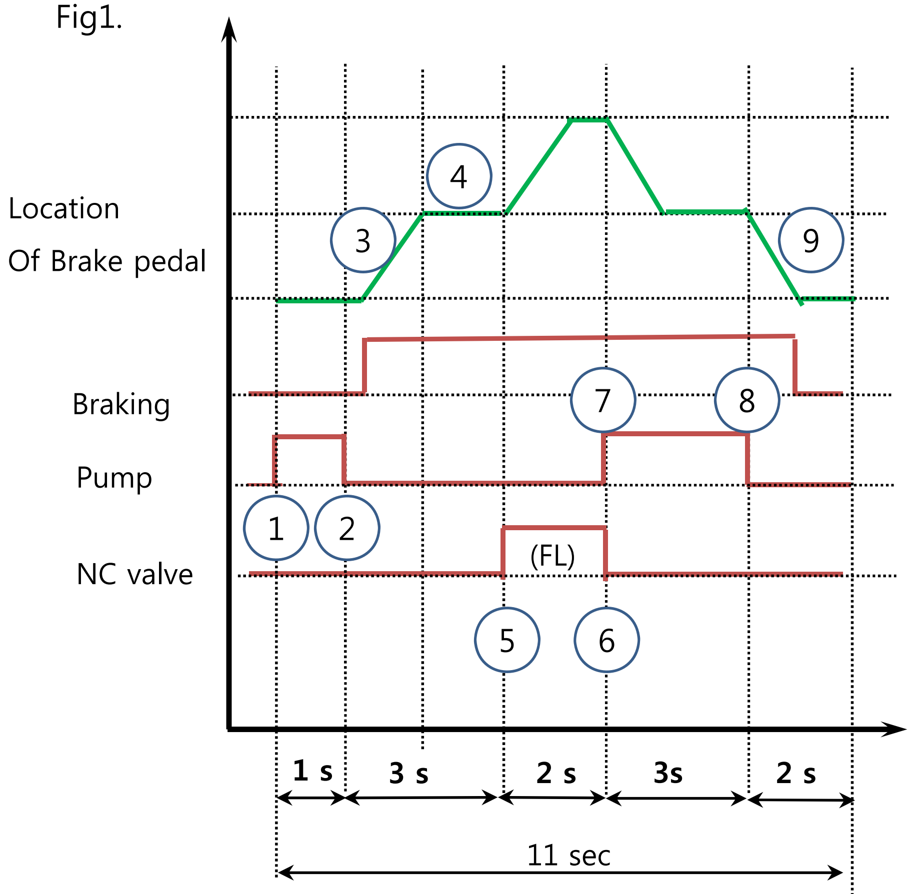
Storage conditions

- Put covered dishes on a metal tablet for easier handling
-Store tablet with covered dishes in a medium position within an oven without a fan(natural convection; temperature gradient will be higher than in a vented oven, oven itype s much more suitable to prevent brake fluid evaporation).
- Jacket heating type of oven
- Temperature: 120°C
- Test duratiion 72hours (3days) ~ 288hours (12days)
- Control storage temperature by a glass thermometer with a silicone oil-filled flask near the petri dishes

Picture of opened convection oven with petri dishes and thermometer-equipped silicone oil flask ((metal tablet is omitted for clarity)

Appendix 4- Service Procedure for Verifying HECU Valve function

Fig1.



Summary

Operating NC valve→ Moved Pedal location about 30mm to floor
Operation Pump → Returned Pedal to initial location

"NG" : During test step 8, technician determines one of 2 cases.
1. Brake pedal doesn't go down after open NC valve
2. Brake pedal doesn't return after pumping process

As shown Fig1. indicated Front Left (FL).
Checking FR, RL, RR with same process.

Step 1, 2
Operate pump for 1 sec to empty brake fluid in LPA

Step 3
Pressing brake pedal to raise brake line pressure
- Increase brake pressure up to 50±10 bar

Step4
- Maintain Brake pressure during test.

Step 5, 6
Open (operate) NC valve for 2 seconds ("FL" at Fig1)
→ Move Pedal about 30mm to floor

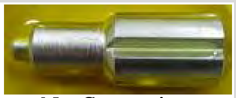
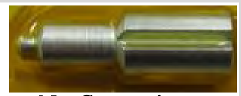
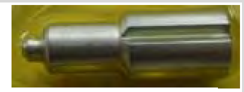
Step 7, 8
Close NC Valve and Operate Pump for 3seconds.
Return Brake pedal to original position.

Step 9
Remove foot from brake pedal.

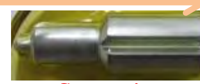
Appendix 5- Validation Test of Changing Brake fluid for Field Fix

Test Result 1. – with DOT3 (KukDong)

※ Test procedure: Petri dish test mode

Time	~48hr	~96hr	~144hr	~192hr	~240hr	~288hr
Photos	 No Corrosion	 No Corrosion	 No Corrosion	 Occurred Corrosion	 more serious corrosion	 more serious corrosion

Test Result2. – Changed Brake fluid DOT3 → DOT4 (KukDong) according to each case

Brake Fluid Changed Time	~48hr	~96hr	~144hr	~192hr	~240hr	~288hr
Photos	DOT3 →  No Corrosion	DOT4 →  No Corrosion	 No Corrosion	 No Corrosion	 No Corrosion	 No Corrosion
	DOT3 →  No Corrosion	 No Corrosion	DOT4 →  No Corrosion	 No Corrosion	 No Corrosion	 No Corrosion
	DOT3 →  No Corrosion	 No Corrosion	 No Corrosion	DOT4 →  No Corrosion	 No Corrosion	 No Corrosion
	DOT3 →  No Corrosion	 No Corrosion	 No Corrosion	 Corrosion	DOT4 →  No addl corrosion	 No addl corrosion
	DOT3 →  No Corrosion	 No Corrosion	 No Corrosion	 Corrosion	 More corrosion	DOT4 →  No addl corrosion

ATTACHMENT J

18-1. Field Actions for Other Markets

18. Field Action Summary

Date	Field Action	Country	Remarks
2012. Mar.	Premium Service for Genesis(BH) and Equus(VI) - Replace brake fluid	Korea only	
2012. Sep.	Service campaign for Equus(VI) - Replace brake fluid	USA, Canada	
2013. Mar.	Service campaign for Genesis(BH) - Replace brake fluid	USA, Canada	
2013. Aug.	Service campaign for Genesis(BH) and Equus(VI) - Replace brake fluid	Worldwide	
2013. Oct. 29th	Recall campaign for Genesis(BH)	USA, Canada Puerto Rico	
2013. Oct. 31st	Recall campaign for Genesis(BH)	Korea	
2013. Nov. 1st	Recall campaign for Genesis(BH)	China	
2013. Dec. 30th	Recall campaign for Genesis(BH)	Brazil	

18. Field Action Summary

No.	Country	Vehicle Volume	BH	VI	Action	Date of action	Claim rate
1	South Korea	159,634	111,857	47,777	Premium Service	23.Mar.2012	BH : 0.06% (62 cases) VI : 0.03% (16 cases)
2	Brazil	154	76	78	NOT launched	16.Aug.2013	BH : 0% VI : 0%
3	Canada	3,943	3,709	234	Service campaign	VI : 30.Sep.2012 BH : 26.Feb.2013	BH : 0.05%(2 cases) VI : 0%
4	Iran	2,091	2,006	85	Service campaign	16.Aug.2013	BH : 0.3% (6 cases) VI : 0%
5	Saudi Arabia	1,907	1,640	267	Service campaign	16.Aug.2013	BH : 0.2% (4 cases) VI : 0.37% (1 case)
6	China	2,771	1,595	1,176	NOT launched	16.Aug.2013	BH : 0.06% (1 case) VI : 0.%
7	U.A.E	1,196	1,088	108	Service campaign	16.Aug.2013	BH : 0.18% (2 cases) VI : 0%
8	Syria	577	529	48	Service campaign	16.Aug.2013	BH : 0% VI : 0%
9	Kuwait	505	414	91	Service campaign	16.Aug.2013	BH : 0.97% (4 cases) VI : 1.0% (1 case)
10	Jordan	456	408	48	Service campaign	16.Aug.2013	BH : 0% VI : 0%
11	Oman	408	385	23	Service campaign	16.Aug.2013	BH : 0% VI : 0%
12	Russia	637	254	383	Service campaign	16.Aug.2013	BH : 0% VI : 0%
13	Azerbaijan	176	135	41	Service campaign	16.Aug.2013	BH : 0% VI : 0%

18. Field Action Summary – Federalized territories

No.	Country	Vehicle Volume	BH	VI	Action	date of action	Failure rate
1	Saipan	4	4	-	Service campaign	16.Aug.2013	BH : 0%
2	Guam	53	45	8	Service campaign	16.Aug.2013	BH : 0% VI : 0%
3	PUERTO RICO	25	25	-	Service campaign	16.Aug.2013	BH : 0%

18. Field Action Summary – Countries with <100 vehicles sold

Countries	Vehicle Volume	BH	VI	Action	date of action
81	1,042	780	262	Service campaign	16.Aug.2013

ATTACHMENT L

19-12. Kukdong Jeyen Amature Corrosion Test (20120104)

ABS Module Amature Corrosion Test Report(Petri dishes)

2012년 01월 04일

Kukdong Jeyen 공업(주) Institute of Technology

1. Summary

- BH/VI's ABS Module Armature Corrosion test

2. Test Items

① Brake Fluids

- Kukdong Jeyen DOT-3 Brake Fluid, Kukdong Jeyen Brake Fluid(Class6 grade), Shell Brake Fluid(Class6 grade), Dong-A DOT-4 Brake Fluid

Kukdong Jeyen DOT-3 Brake Fluid	Kukdong Jeyen Brake Fluid (Class6 grade)	Shell Brake Fluid (Class6 grade)	Dong-A DOT-4 Brake Fluid
			

- Brake Fluids in the market

: BOSCH DOT-4 Brake Fluid, VALVOLINE DOT-4 Brake Fluid, CASTROL DOT-4 Brake Fluid

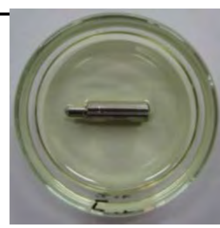
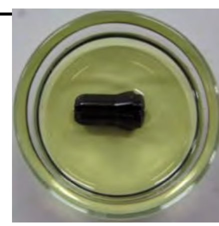
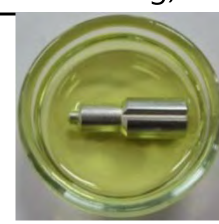
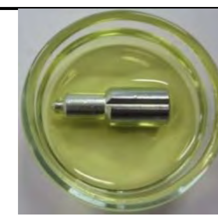
BOSCH DOT-4 Brake Fluid	VALVOLINE DOT-4 Brake Fluid	CASTROL DOT-4 Brake Fluid
		

② Armature

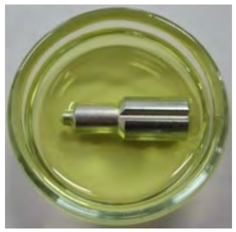
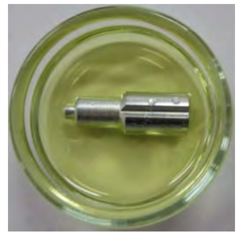
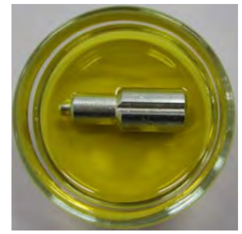
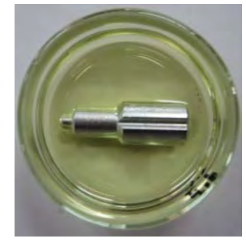
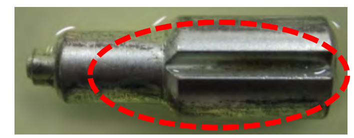
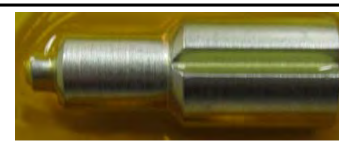
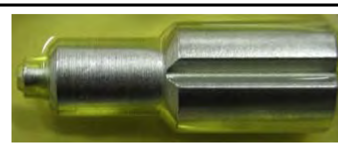
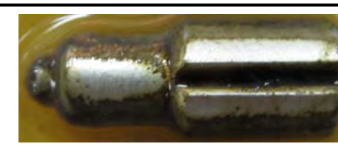
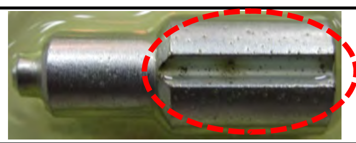
- Mobis, Mando, CONTI (before Calking), CONTI (After Calking)

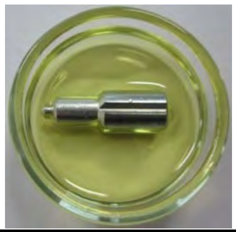
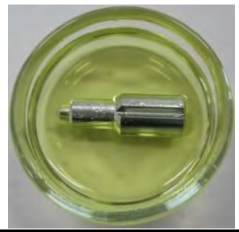
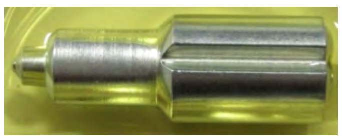
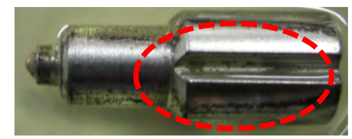
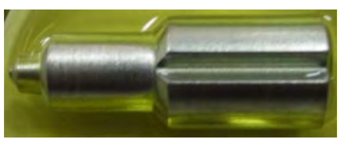
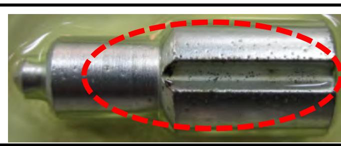
TYPE	Mobis	Mando	CONTI(before Calking)	CONTI(After Calking)
ARMATURE				

3. Test Mode – CONTI's test method

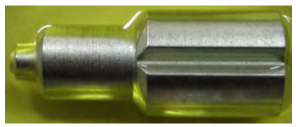
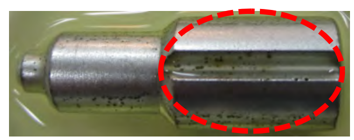
	Mobis	Mando	CONTI(before Calking)	CONTI(After Calking)
ARMATURE PHOTOS				
Brake Fluid (ml)	1.5ml	3ml	3ml	3ml
Temperature	120℃ in oven			
Remark	1/3 of Armature was exposed to the air in Brake Fluid			

4. Photos after testing

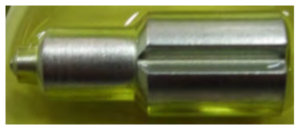
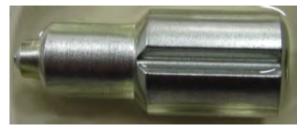
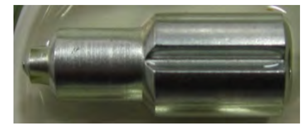
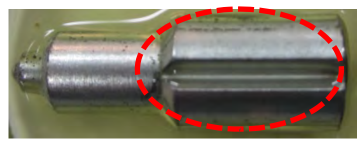
Elapsed days (Time to progression)	CONTI (before Calking) Armature			
	Kukdong Jeyen DOT-3 Brake Fluid	Kukdong Jeyen Brake Fluid (Class6 grade)	Shell Brake Fluid (Class6 grade)	Dong-A DOT-4 Brake Fluid
Beginning of the experiment				
2 days (48h)				
4 days (96h)				
7 days (168h)				
10 days (240h)				
12 days (288h)				
Remark	Fine Pitting occurrence in the exposed area to air after 10 days		Fluid discolor after 7 days (Dark brown)	Corrosion occurrence in boundary interface after 2 days

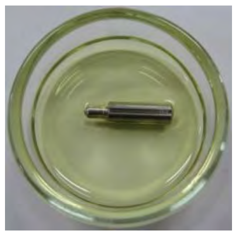
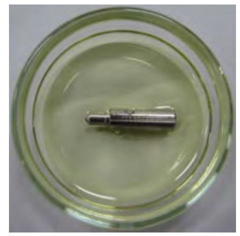
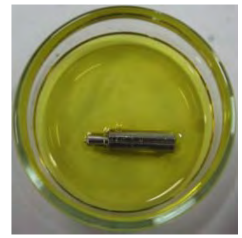
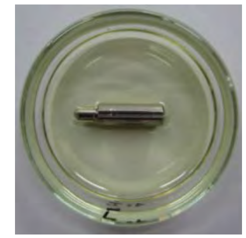
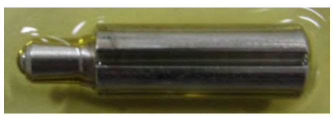
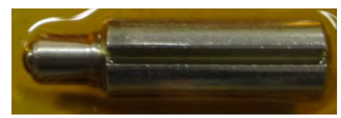
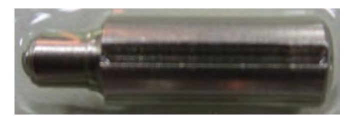
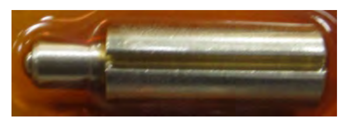
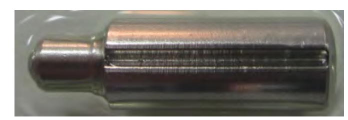
Elapsed days (Time to progression)	CONTI (After Calking) Armature			
	Kukdong Jeyen DOT-3 Brake Fluid	Kukdong Jeyen Brake Fluid (Class6 grade)	Shell Brake Fluid (Class6 grade)	Dong-A DOT-4 Brake Fluid
Beginning of the experiment				
2 days (48h)				
4 days (96h)				
7 days (168h)				
10 days (240h)				
120 days (288h)				
Remark	Fine Pitting occurrence in the exposed area to air after 10 days		Fluid discolor after 7 days (Dark brown)	Corrosion occurrence in boundary interface after 2 days

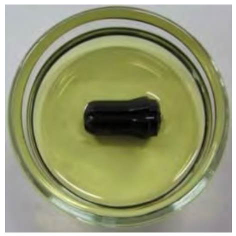
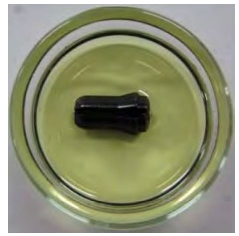
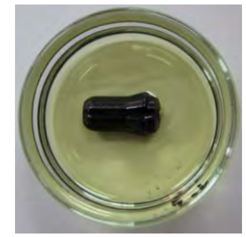
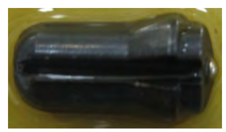
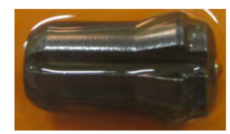
▶ Brake Fluid in the market

Elapsed days (Time to progression)	CONTI (before Calking) Armature		
	BOSCH DOT-4 Brake Fluid	VALVOLINE DOT-4 Brake Fluid	CASTROL DOT-4 Brake Fluid
2 days (48h)			
5 days (120h)			
7 days (168h)			
10 days (240h)			
Remark		5 days Pitting occurrence	

▶ Brake Fluid in the market

Elapsed days (Time to progression)	CONTI (After Calking) Armature		
	BOSCH DOT-4 Brake Fluid	VALVOLINE DOT-4 Brake Fluid	CASTROL DOT-4 Brake Fluid
2 days (48h)			
5 days (120h)			
7 days (168h)			
10 days (240h)			
Remark		5 days Pitting occurrence	

Elapsed days (Time to progression)	Mobis Armature			
	Kukdong Jeyen DOT-3 Brake Fluid	Kukdong Jeyen Brake Fluid (Class6 grade)	Shell Brake Fluid (Class6 grade)	Dong-A DOT-4 Brake Fluid
Beginning of the experiment				
2 days (48h)				
4 days (96h)				
7 days (168h)				
10 days (240h)				
Remark	Nothing significant	Nothing significant	Nothing significant	Nothing significant

Elapsed days (Time to progression)	Mando Armature			
	Kukdong Jeyen DOT-3 Brake Fluid	Kukdong Jeyen Brake Fluid (Class6 grade)	Shell Brake Fluid (Class6 grade)	Dong-A DOT-4 Brake Fluid
Beginning of the experiment				
2 days (48h)				
4 days (96h)				
7 days (168h)				
10 days (240h)				
Remark	Nothing significant	Nothing significant	Nothing significant	Nothing significant

ATTACHMENT K

19-1. Continental Letter (20111026)

Qualität und Umwelt Konzern

Mr.Dong In Son
Director
Overseas Parts Procurement Group
Hyundai Motor Company & Kia Motors Corporation

Karlheinz Haupt
Leiter Qualität und Umwelt Konzern,
Qualität Automotive
Telefon: +49 69 7603-4030
Telefax: +49 69 7603-3862
karlheinz.haupt
@continental-corporation.com

Frankfurt Oct.26, 2011

Customer information regarding brake fluids

Dear Mr.Son,

In the framework of our product monitoring obligations, we have unfortunately determined by a single incident in Asia that brake fluids are offered and used on the worldwide market latterly that may lead due to their specific chemical composition to a chemical attack of the zinc-based surface protection that is typically used to protect brake parts.

This is aggravated by the fact that these brake fluids bear a DOT designation. The DOT3 and DOT4 specifications of the US safety standard FMVSS116 of NHTSA do not, however, require the brake fluids for such a classification to be tested for a chemical reaction with the surface protection of brake parts as mentioned above. In the case of brake fluids designated as DOT that are offered in the market, it can therefore not be determined, based on this designation, whether or not these brake fluids have a chemically aggressive effect on the surface protection that is used.

According to this perception, we urgently recommend that you release and apply only brake fluids that in appropriate testing have proven not to chemically attack or damage the surface protection of the parts. We are willing to support you concerning this matter within our means also by laboratory examination.

Best regards

K. Haupt

Karlheinz Haupt

ATTACHMENT K

Public 19-11 Brake Fluids test reports

19-10. Continental Brake Fluids test report (120111).pdf
and19-11. Continental Brake Fluids test report_update (120315).pdf
submitted to the Office of Chief Counsel with a request for confidential treatment

ATTACHMENT K

Public 19-10 Brake Fluids test reports

19-10. Continental Brake Fluids test report (120111).pdf
and19-11. Continental Brake Fluids test report_update (120315).pdf
submitted to the Office of Chief Counsel with a request for confidential treatment

ATTACHMENT K

Public 19-2 Continental Corrosion report (20111026)

MK25E ESC

Valve Corrosion by Reaction of Unstable Brake Fluid and Zinc Plating

Oct. 26, 2011

Central Quality

Continental Automotive Corporation

1. Customer information

Customer information regarding brake fluids

In the framework of our product monitoring obligations, we have unfortunately determined that brake fluids are offered and used on the worldwide market latterly that may lead due to their specific chemical composition to a chemical attack of the zinc-based surface protection that is typically used to protect brake parts.

This is aggravated by the fact that these brake fluids bear a DOT designation. The US safety standard FMVSS116 of NHTSA as well as the latest revisions of the standard SAE J1703* do not, however, require the brake fluids for such a DOT classification to be tested for a chemical reaction with the surface protection of brake parts as mentioned above.

*In the October 2000 revision of SAE J1703 the zinc strip was removed from the corrosion test procedure.

In the case of brake fluids designated as DOT that are offered in the market, it can therefore not be determined, based on this designation, whether or not these brake fluids have a chemically aggressive effect on the surface protection that is used.

According to this perception, we urgently recommend that you release and apply only brake fluids that in appropriate testing have proven not to chemically attack or damage the surface protection of the parts. We are willing to support you concerning this matter within our means also by laboratory examination.

2. Mechanism

Mechanism

Unstable Brake fluid → Organic acids generated → Corrosion & GEL → NC stuck open

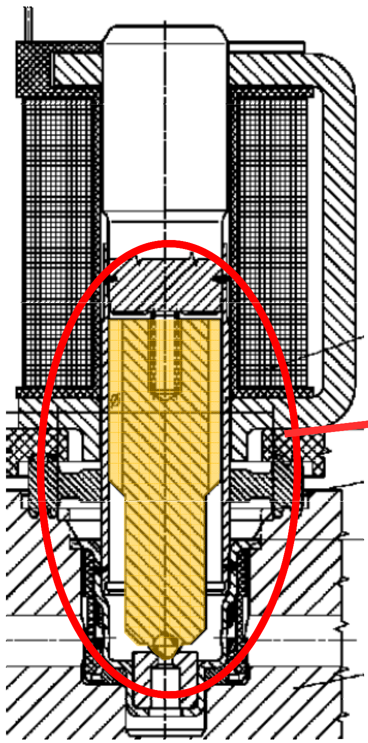
Thermo-oxidative degradation

Chemical reaction with Zn plating

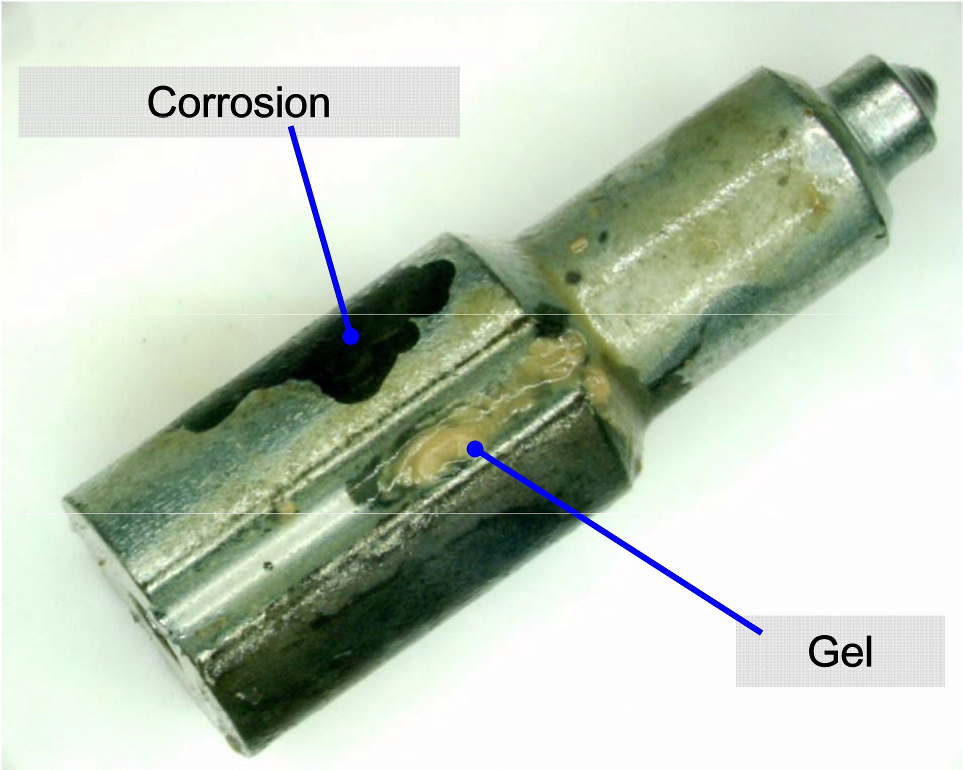
- Unstable BF (Brake Fluid) is used in field.
- Due to thermal-oxidative decomposition, unstable and aged BF generates organic acids which may be aggressive to metals.
- Organic acids may attack Zn plating, then corrosion and gel are generated.
- NC armatures in valve sleeves may stick by corrosion and gel accumulated when they are activated to open → NC valve internal leakage

3. Phenomena – Return Part NC Valve Armature Corrosion & Gel

- After disassembling field claim parts, it was found that corrosion and gel were on NC valve armatures keeping the NC valves open.

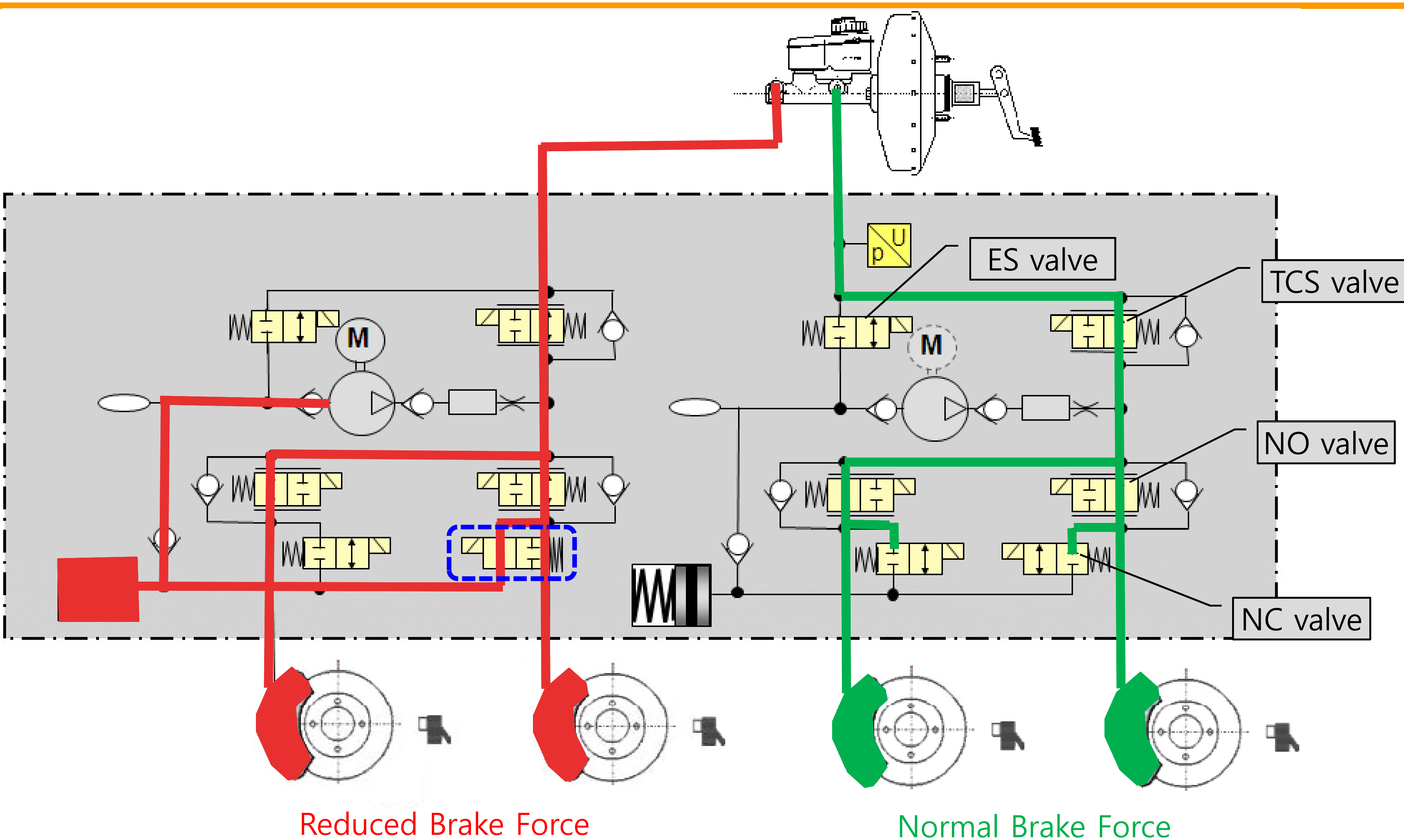


NC 밸브



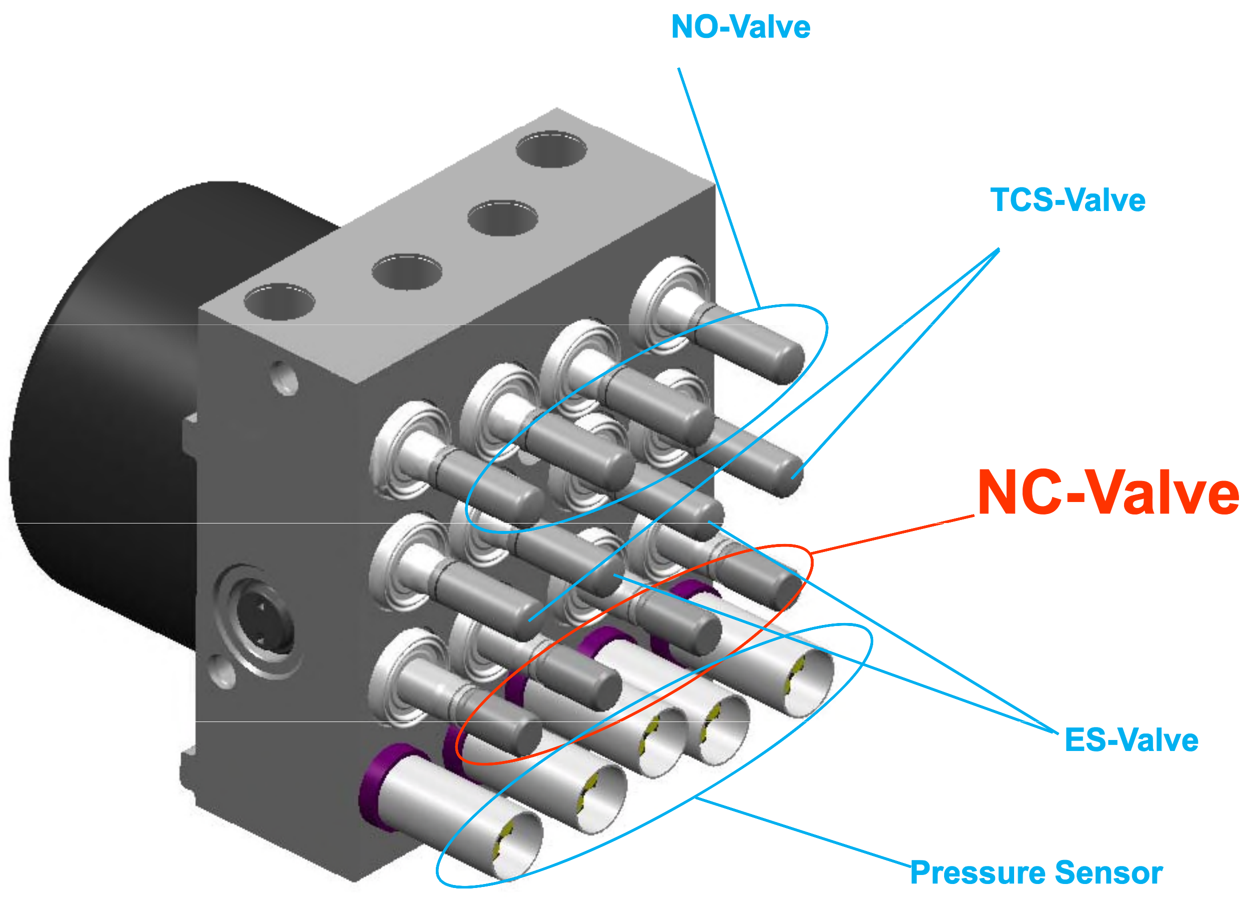
NC armature

3. Phenomena - Brake Force Reduction Due to NC Valve Stuck Open



SIXTH PAGE SUBMITTED TO THE OFFICE OF CHIEF COUNSEL
WITH A REQUEST FOR CONFIDENTIAL TREATMENT

4. Background Info - NC Valve Location



ATTACHMENT K

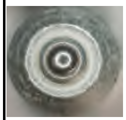
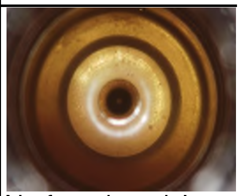
Public 19-3 Continental 8-DO report (20111027)

First two pages submitted to Office of Chief Counsel with request for confidential treatment

Redacted

4-4. Tear-down inspection for NC valve

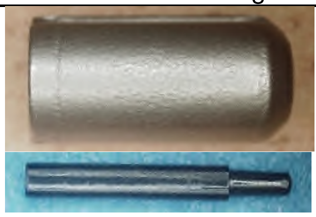
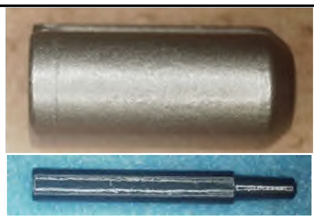
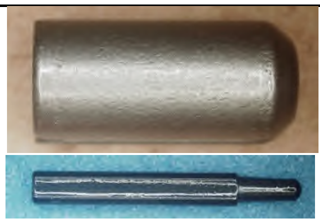
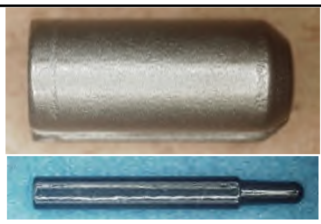
* BF remains

	Armature	Top side	Valve Seat
FL	 Corrosion on the surface	 no found damage/ corrosion	 No found particle contamination/damage
FR	 Corrosion on the surface	 no found damage/ corrosion	 No found particle contamination/damage
RL	 Corrosion on the surface	 no found damage/ corrosion	 No found particle contamination/damage
RR	 Corrosion on the surface	 no found damage/ corrosion	 Confirmed gel in BF. No damage.

[redacted]

Redacted

4-5. Tear-down inspection for NO valve

	Armature/ Plunger	Valve Seat
FL	 No corrosion/Damage	 No contamination/Damange
FR	 No corrosion/Damage	 No contamination/Damange
RL	 No corrosion/Damage	 No contamination/Damange
RR	 No corrosion/Damage	 No contamination/Damange

[redacted]

Analysis Result ☐ **TF** ☐ **NTF** ☐ **Not responsibility of Continental**

5.Corrective action(s)

6.Verification

7.Recurrence prevention

Items & Application ☐Appl. ☐N/Appl.	Resp. Dept.	Date Plan/Actual		Resp. Dept.	Date Plan/Actual
☐P-FMEA			☐Drawing		
☐Control Plan			☐Specification		
☐Work Instruction			☐Others ( )		

8.Congratulations to the Team

ATTACHMENT K

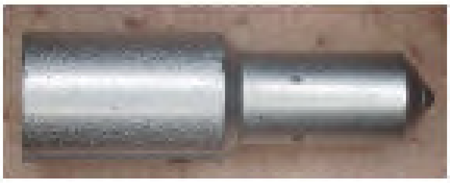
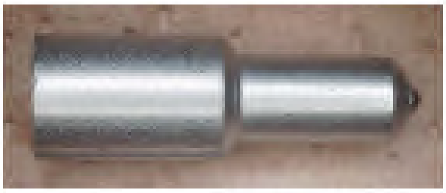
Public 19-4 Continental 8-DO report (20111207)

Page submitted to the Office of Chief Counsel with a request for confidential treatment

Redacted

4-2. Tear-down Inspection for NC valves

The zinc plating of every of the NC armatures showed distinct dark areas of corrosion accompanied by gelatineous corrosion products.

	Armature	
FL		
FR		
RL		
RR		

[redacted]

Analysis Result	☐ TF	☐ NTF	☑ Not responsibility of Continental

5.Corrective action(s) N/A	**6.Verification** N/A

7.Recurrence prevention
N/A

Items & Application ☑ Appl. ☐ N/Appl.	Resp. Dept.	Date Plan/Actual		Resp. Dept.	Date Plan/Actual
☐ P-FMEA			☐ Drawing		
☐ Control Plan			☐ Specification		
☐ Work Instruction			☐ Others ( )		

8.Congratulations to the Team

Best regards

ATTACHMENT K

Public 19-5 Continental 8-DO report (20111207)

Page submitted to Office of Chief Counsel with request for confidential treatment

Redacted

4-2. Tear-down inspection for NC valves

The zinc plating of every of the NC armatures showed distinct dark areas of corrosion accompanied by gelatineous corrosion products.

[redacted]

Analysis Result ☐ TF ☐ NTF ☑ Not responsibility of Continental

5.Corrective action(s)	6.Verification
N/A	N/A

7.Recurrence prevention

N/A

Items & Application ☑ Appl. ☐ N/Appl.	Resp. Dept.	Date Plan/Actual		Resp. Dept.	Date Plan/Actual
☐ P-FMEA			☐ Drawing		
☐ Control Plan			☐ Specification		
☐ Work Instruction			☐ Others ( )		

8.Congratulations to the Team

Best regards

ATTACHMENT K

Public 19-6 Continental 8-DO report (20111213)

Page submitted to Office of Chief Counsel with request for confidential treatment

Redacted

4-2. Tear-down inspection for NC valves

The zinc plating of every of the NC armatures showed distinct dark areas of corrosion accompanied by gelatineous corrosion products.

[redacted]

Analysis Result ☐ TF ☐ NTF ☑ Not responsibility of Continental					

5.Corrective action(s)
N/A

6.Verification
N/A

7.Recurrence prevention
N/A

Items & Application ☑ Appl. ☐ N/Appl.	Resp. Dept.	Date Plan/Actual		Resp. Dept.	Date Plan/Actual
☐ P-FMEA			☐ Drawing		
☐ Control Plan			☐ Specification		
☐ Work Instruction			☐ Others ( )		

8.Congratulations to the Team

Best regards

ATTACHMENT K

Public 19-7 Continental Petri test method (20110912)

Brake Fluid Thermo-Oxidative Stability
Test Setup

Two pages submitted to the Office of Chief Counsel with a request for confidential treatment

ATTACHMENT K

Public 19-7 Continental Petri test method (20111209)

Brake Fluid Thermo-Oxidative Stability
Test Setup

Two pages submitted to the Office of Chief Counsel with a request for confidential treatment

ATTACHMENT K

Public 19-8 Continental Zinc Galvanizing (20111218)

How did Continental end up with Zn-plating as surface treatment of MK25E normally closed valves?

2011-12-18

Continental

The second through fifth pages have been submitted to the Office of Chief Counsel with a request for confidential treatment

HKMC requested information – Armature production process and period

	process	company / transportation method	plant location	duration
1	Armature machining	SII	China	
2	Armature surface treatment by Zn plating	SII	China	4 days
3	100% inspection and others	SII	China	7 days
4	Transporation from SII China to SII JP	SII: China to Japan by Air		3 days
5	Final inspection/ Packing and stocks	SII	Japan	5 days
6	Shipping to CAC	SII to CAC	Japan	1 days
7	Ball caulking in armature and valve assembly	Continental	Hamakita / Japan	2-3days
8	HECU assembly	Continental	Hamakita / Japan	3-4days
9	HECU stock	Continental	Hamakita / Japan	*1
10	Transportation	sea freight		2 weeks

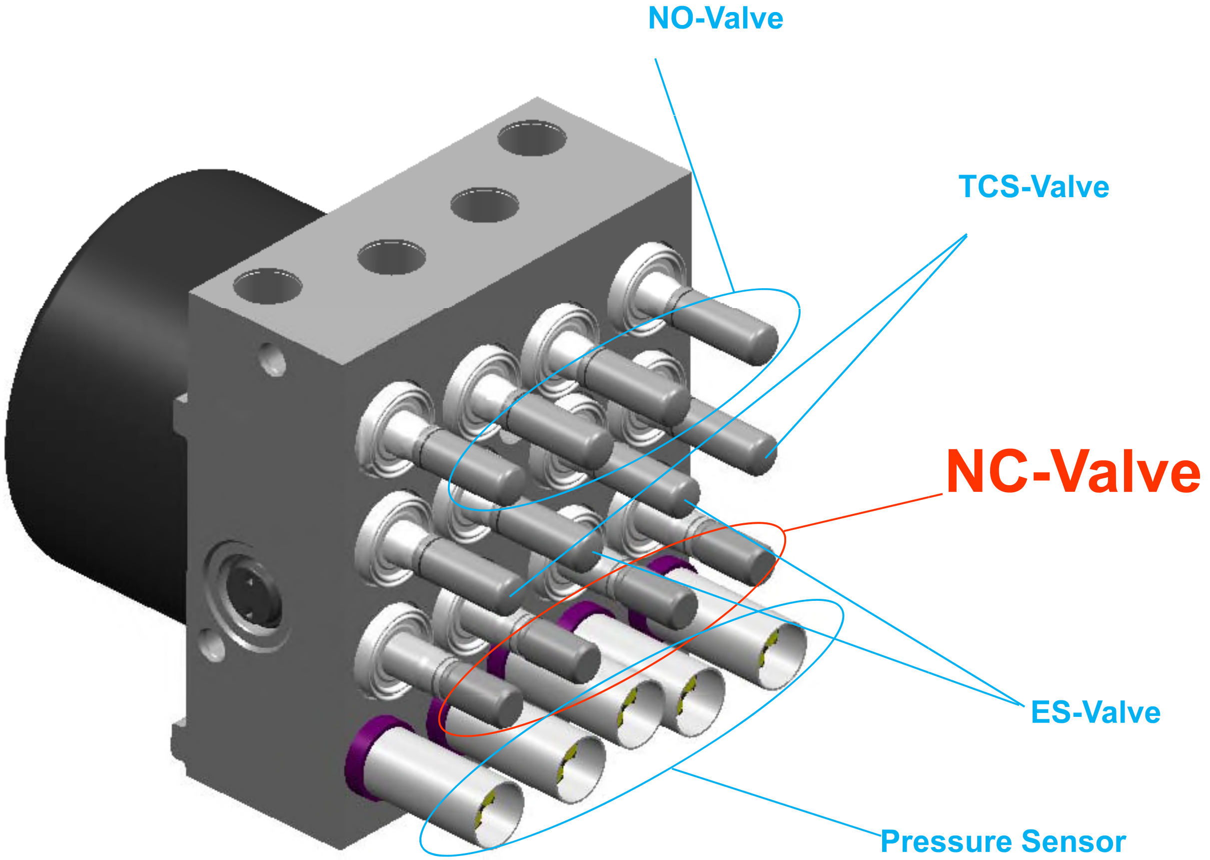
*1. depends on customer order.

HKMC requested information – What about the oil applied to armature?

- Anti-corrosive or oil is not applied to armature
- Anti-corrosive paper is used for packaging for transport, storage

The eighth and ninth pages have been submitted to the Office of Chief Counsel with a request for confidential treatment

HKMC requested information - NC valve location



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ATTACHMENT K

Public 19-9 Continental report (20120615)

Unstable Brake Fluid

Hyundai Motor Company

15th of June 2012

Continental

Unstable Brake Fluid

Visit at Ulsan 15th of June

HYUNDAI

- Invitation to Ulsan
- Technical Investigation Result
- Types of Corrosion
- Countermeasure or alternative Valve Design
- Brake Fluid Stability Test & Stability Chart
- Responsibility

Invitation

- In April 2012 Continental was asked to provide a responsibility chart to Hyundai
- Continental could not comply because Continental is not the brake fluid manufacturer
- In April CAC-Korea attended a meeting at Ulsan on the 17^{th}
- Mr. Gihoon Lee sends an e-mail to Mr. Dieter Driendl on the 3^{rd} of May insisting to invite a German Manager
- Continental internally discusses to reassure Hyundai appreciation for our valued business relation, accepting the invitation to exchange information in a F2F-Meeting in Ulsan
- Meeting scheduled for the 15^{th} of June

Technical Investigation Result

Field Case with Corrosion & Gel

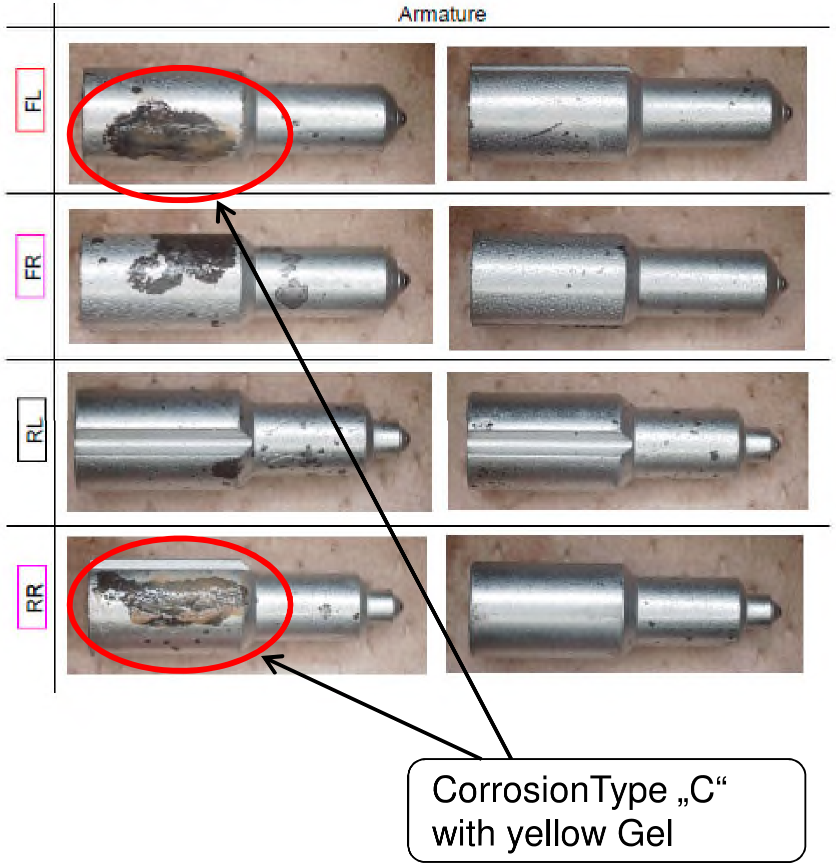
Redacted

Unstable Brake Fluid
Technical Investigation Field

[redacted]

4-2. Tear-down inspection for NC valves

The zinc plating of every of the NC armatures showed distinct dark areas of corrosion accompanied by gelatineous corrosion products.



Types of Corrosion

Observation by Central Laboratory Frankfurt

Redacted

Unstable Brake Fluid
Types of Corrosion

- Continental was able to observe 4 main types of corrosion until today

- Continental Central Laboratory classified these 4 types into "**A, B, C & D**"
  - **A** -> a beginning state of black spot corrosion, valve function not affected
  - **B** -> a copper inhibitor complex, showing white gel formed outside the hydraulic valve block, most likely inside the brake pipes, and transported by the brake fluid
  - **C** -> a zinc corrosion, showing yellow gel formed by degraded brake fluid allowing acids to attack metal surfaces e.g. zinc
  - **D** -> a significant amount of colourless gel formed by external contamination everywhere inside the brake system. A rare phenomenon seldom observed

- Type C has been observed during analysis with Hyundai MK25E units from the field
- Type C corrosion was observed by Continental on vehicles with build dates starting from Y2007 (initial brake system filling). Before Y2007 no Type C corrosion was observed.

Redacted

Unstable Brake Fluid

Types of Corrosion

Image of Armature	Image of Sleeve	Results of electrical/ hydraulic check	Dark spots found	Gel or deposit corrosion products detected	Yellow gel corrosion products detected	Zinc corrosion by degraded brake fluid probable	Type of Corrosion	Evaluation
		OK	Yes	No	No	No	A	No zinc corrosion products. No indication of zinc attack by degraded brake fluid.
		OK	Yes	Yes	No	No	B	No zinc corrosion products. No indication of zinc attack by degraded brake fluid.
		OK	Yes	Yes	Yes	Yes	C	Zinc corrosion products caused by degraded brake fluid. Valve function not affected.
		OK	Yes	Yes	Yes	Yes	C	Zinc corrosion products caused by degraded brake fluid. Valve function not affected.
		NOK	Yes	Yes	Yes	Yes	C	Zinc corrosion products caused by degraded brake fluid. Valve function affected.
		NOK	Yes	Yes	Yes	Yes	C	Zinc corrosion products caused by degraded brake fluid. Valve function affected.
		NOK	Yes	Yes	No	No	D	No zinc corrosion products. No indication of zinc attack by degraded brake fluid. Valve function affected.

Countermeasure or

Alternative Valve Design

Unstable Brake Fluid
Countermeasure or Alternative Valve Design

HYUNDAI

- Immediate & Permanent Countermeasure eliminating the root cause
  - Change to stable Brake Fluid at Production
  - Specify stable Brake Fluid for Dealership and Aftermarket
  - Declare specified Brake Fluid at reservoir and vehicle manual
    (e.g. Type of Fuel/Engine Oil)
  - Involve the Brake Fluid Manufacturer as Specialist
  - Contact external Laboratory for determination of Fluid Character

- Black Oxide coated NC-Valves
  - More Robust against acids from degraded Brake Fluids
  - Corrosion protection during storage (dry delivery & shelf life) less effective than zinc

Brake Fluid Stability Test

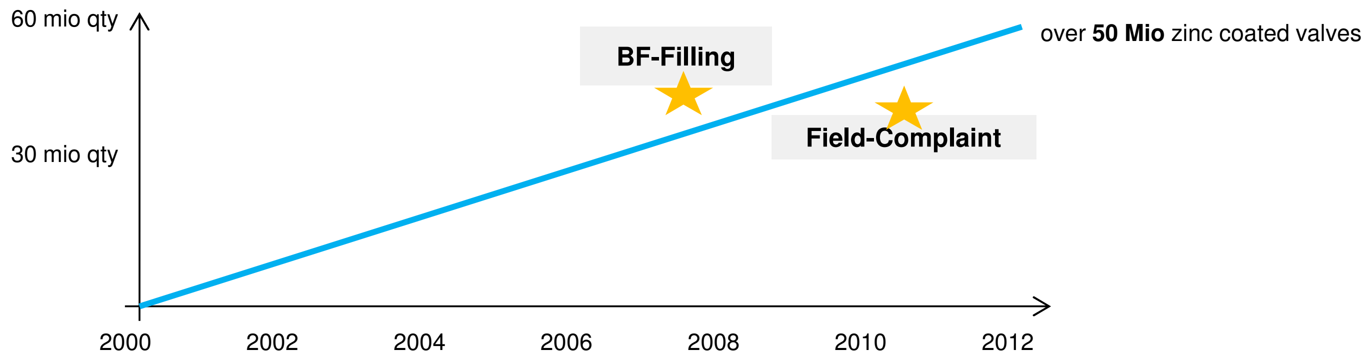
&

Stability Chart

Twelfth and thirteenth pages submitted to the Office of Chief Counsel with a request for confidential treatment

Responsibility

Unstable Brake Fluid
Responsibility



- Continental has manufactured over 50 Mio zinc coated valves and sold ww
- Zinc coatings at Brake System Components represent a high end preservation and are State of the Art
- First Field Claims reported in Y2010 traced back to oldest BF filling reported in Y2007
- No corrosion type "C" Claims reported between Y2000 – Y2010
- Claim related Fluids were found as products of certain BF manufacturers in Korea and Japan

Unstable Brake Fluid
Responsibility

- Continental understands no involvement in the responsibility for unexpected Fluid effects
- Continental supports the OEM Hyundai Motor Company actively and in partnership
- The responsibility for compatibility between the OEM chosen brake fluid and any brake system component is with the vehicle manufacturer
- Unstable Brake Fluids are also attacking metals in general not only zinc coatings
- Internationally distributed unstable Brake Fluids are harming the reputation of the ww Automotive Industry

Unstable Brake Fluid
Responsibility

HYUNDAI

- Unstable Brake Fluids increasingly offered in the market are also leading other OEM to the conclusion that standards like FMVSS 116 and SAE J1703/04 have not developed in parallel with requirements of modern brake systems, not being “State of the Art” any longer.
- Other OEM are declaring their own Brake Fluid standard in compliance to the Brake System Design
- Unstable Brake Fluids are subject of Discussion at the “2012 SAE Brake Fluid Colloquium” in San Diego US this September

Chassis & Safety Division