ABOUT THE EMS* DIAGNOSTIC MANUAL

*Engine Management System

The EMS(Engine Management System) diagnostic manual outlines the detailed procedures to troubleshoot complaints related to the Common Rail Diesel Engine and its controller (EMS ECU) fitted on **Scorpio Vlx/Sle/Lx (Refresh)** vehicle. Procedures to treat each DTC retrieved from the EMS ECU is given in a step by step , trouble-shooting tree structure.

This manual covers –

- EMS ECU re-programming/Re-flashing procedures, including micro-hybrid related parameters.

- Trouble shooting and diagnosis of DTCs (Defect Trouble Codes)

- Actuator tests

- Symptom Based diagnosis

The EMS ECU is linked to Engine immobilizer ECU(ICU) system and hence it is recommended that only trained CoTEKs carryout re-programming operations in the system, if required.

This Diagnostic manual supersedes all earlier manuals vis-a-viz MAN-00029, MAN-00030 and MAN-00038. For issues related to non-Transponder based immobilizer (Mahindra Secure) systems, refer to the section "Analog Based Immobilizer" in the manual MAN-00057.

> **In spite of our best efforts to make the manual error-free, a few errors could have inadvertently crept in. If you identify errors, functional or typographical , please inform your TEKline or pillay.ajay@mahindra.com. Suggestions to improve the manual and make it more user-friendly are also welcome.**

Contents

How to Use this manual

If the DTC code is known, then go to the Index of DTC code, and click on the group under which the DTC appears. The codes/groups are hyperlinked to the respective trouble shooting chart/pages.

The following is the structure of the Diagnostic Manual –

- Sketch/Photo of the sensor/actuator involved
- Brief description about the sensor/Actuator and its functions
- Possible defect codes related to that sensor/actuator
- Normal/Abnormal operating conditions of the sensor/actuator, possible causes and vehicle/engine reactions
- Related circuit diagram, connectors and wiring plans
- Trouble shooting process

Always use the diagnostic manual along with the vehicle's wiring manual **(MAN-00058).**

The Diagnostic tester has the ability to test certain actuators.

For GEN3 Immobilizer related errors, the DTCs in the Engine EMS and along with that the DTCs in the Immobilizer ECU(ICU) need to be analyzed together. Refer to the Diagnostic Manual (Immobilizer) – **MAN-00056** for details. The possible causes and corrective action are to be taken based on the combination of the codes.

There are certain complaints for which no DTC codes are generated. The trouble shooting procedure for the same is covered in the Symptom based Diagnosis.

The Micro-hybrid (Engine Stop-Start) is variant specific and will not be available in all models. At present, the micro-hybrid feature is available only in the Vlx variant. Introduction of this feature in other variants will be communicated through TSB.

Note :

Prior to introduction of transponder based immobilizer , Scorpio Vlx vehicles sold between Dec 2007 and March 2009, had Analog immobilizer linked to the Security system and EMS ECU. The details of trouble shooting of this system are appended under the chapter "Analog based immobilizer". Use the corresponding wiring manual, MAN-00028, while trouble-shooting.

Overview of the in-vehicle communication network
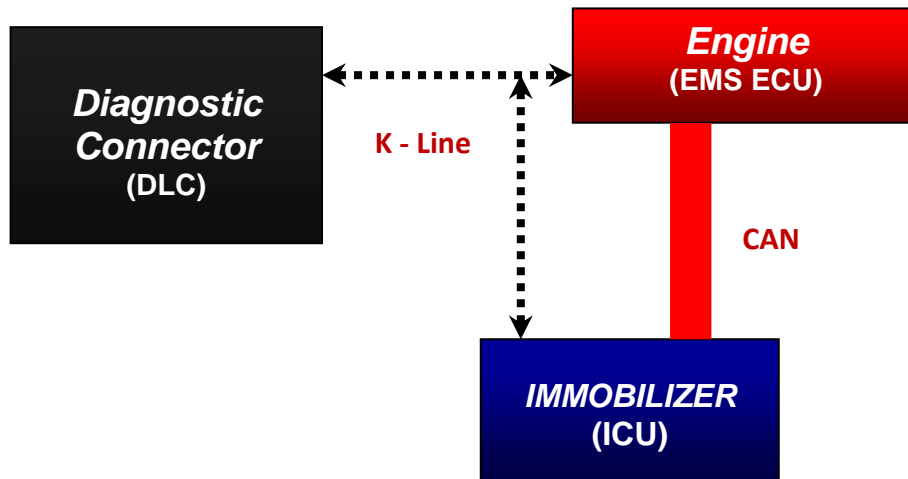
M Hawk Engine Brief Data (2.2L- BS III/BS IV)

Bore   : 85 mm
Stroke   : 96 mm
Power   - Max 86.7 kW BHP @ 3800
Torque   -Max 277 Nm@1800
Firing Order   1-3-4-2
Type Of ECU   : Bosch EDC 16C39

Note on Engine Stop-Start System

The Engine Stop-Start System (ESS) is a feature which automatically switches off the engine, when certain conditions are met.

Once the engine has switched off due to ESS, it can be restarted by pressing the clutch pedal.

ESS switch needs to be switched ON to activate the system.

With ESS switch ON, below schematic representation explains the ESS functionality.
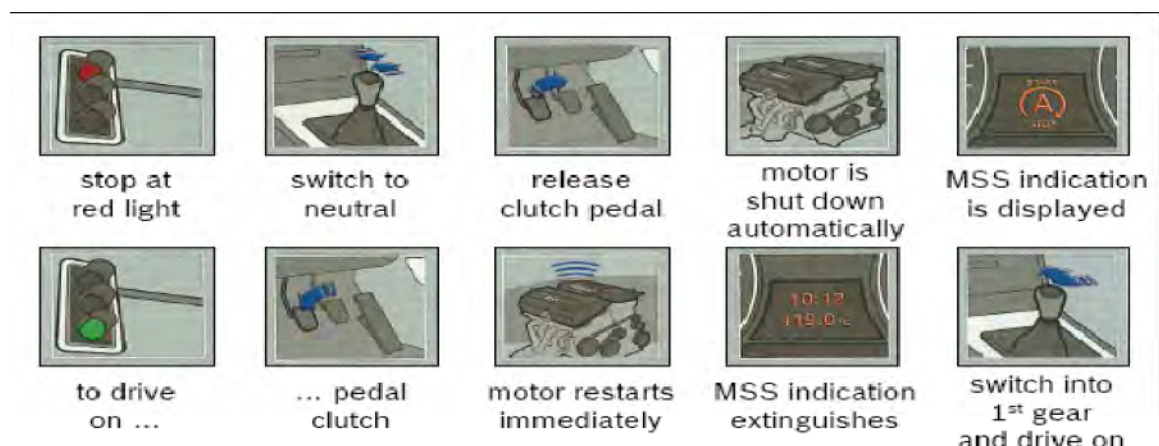
The block diagram of how the ESS functions is given in the next page.

ESS is controlled from the EMS ECU. If any of the sensors malfunction then the ESS is disabled and an error code generated.

For details of each sensor electrical function refer the section on brief description, associated with the relevant Defect Trouble Code (DTC).

I/O of ESS

ESS switch- **Enabled**

Accelerator pedal- **Fully released**

Engine Speed- **Idling range**

Gear Box- **Neutral**

Fuel Temperature - **< 60° C**

Coolant Temperature –
20° C < Temperature Coolant < 100° C

Battery Voltage - **> 12.6 V**

Bonnet - **Closed**

Vehicle Speed – **Should have achieved > 2 Km/hr before/ between stops.**

Vehicle Speed – **< 2 Kms/hr**

Clutch pedal- **Fully released**

EMS Stop-Start - waits for 2 seconds

Engine Stops

I/O of ESS

Vehicle - **In auto stop mode**

Gear box - **Neutral**

Engine Speed- **Zero**

Bonnet - **Closed**

Clutch pedal - **Fully pressed**

EMS Stop-Start

Engine Starts

Note:

1) If the feature selection switch is reset (From ON – OFF – ON) when vehicle is in auto stop mode, then clutch start will not be possible but key crank would be possible.
2) If Bonnet is opened when the vehicle is in auto-stop mode, clutch start would be disabled and only key crank would be possible.

However under both the above conditions, auto stop / start would be possible if all required conditions for auto-stop are met again.

Recommended Trouble Shooting Process

Customer complaint	➡	**Record/Understand Customer Verbatim** • What happened? • When it happened? • What was the event before that? • Does it happen all the time? • Does it happen only in some condition?

⬇

Search for Published quick solution in **TEK*net*.**

⬇

Follow **DTC based diagnosis**

⬇

Contact **TEKliner** with **TAR**
(Technical Assistance Request)
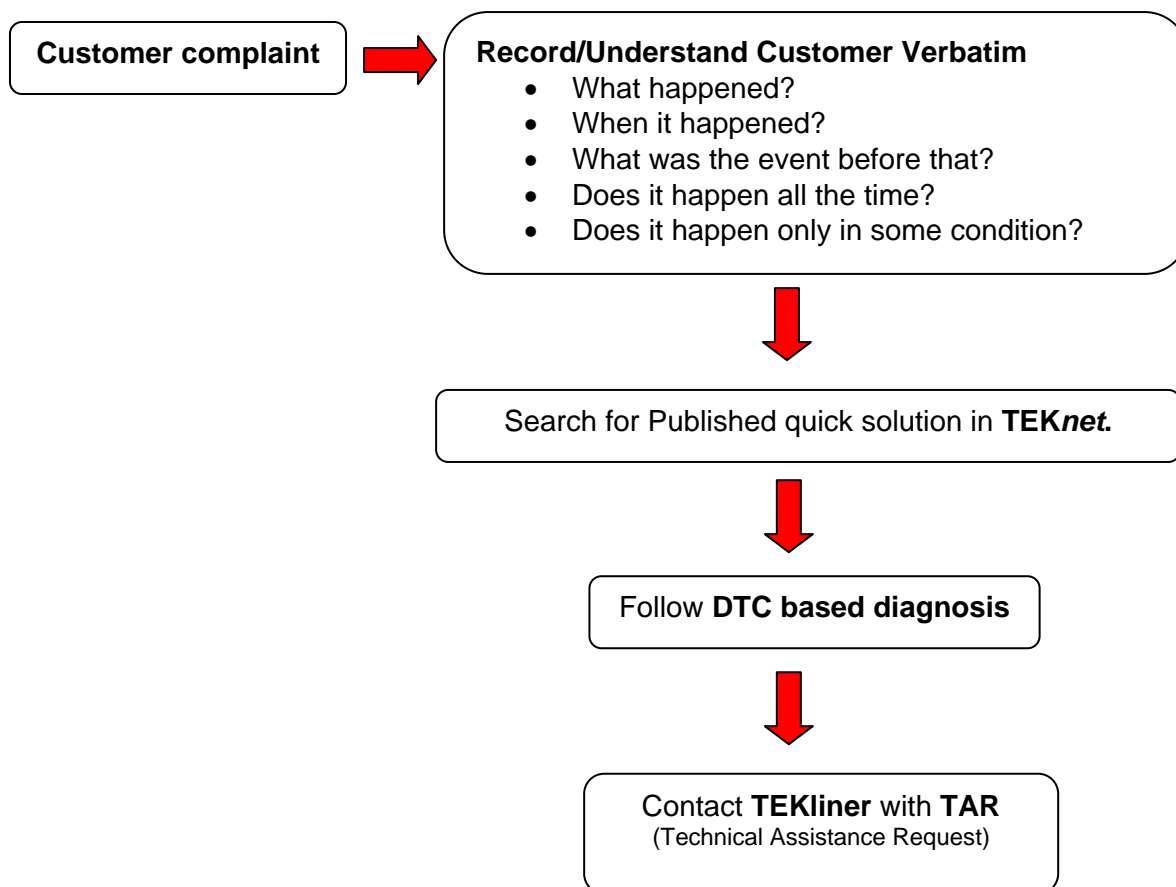
IQA/IMA Code Programming

An ECU controlled engine needs precise metering of fuel. Due to manufacturing tolerances, each injector deviates slightly from its idealized behavior. Thus, each injector has a correction factor, which is engraved on top of it, in the form of a 7-character alphanumeric code. This is known as an IQA code/IMA code. For optimal performance of the engine, the ECU needs to know the IQA code/IMA code of each injector. This information is programmed into the ECU when the vehicle is manufactured. However, if you need to replace an injector(s), then the IQA code/IMA code for that new injector has to be updated in the ECU.

As a first step, you need to select the cylinder number of the injector being replaced. After the cylinder number is selected by clicking on the check-button next to the number, the IQA code/IMA code should be entered in the box provided.

Click the button to the right of the text box. If the Injector code is valid and accepted by the ECU, a message is displayed, indicating that the operation is performed successfully.

A message "Invalid IQA code" will be displayed , if an incorrect IQA/IMA code is keyed in. IQA codes are case sensitive.

Programming IQA codes is an extremely important activity. In order to ensure that the correct code has been entered and that it has been entered in the correct cylinder, SMART tester allows you to verify the codes that you have entered.

Select an injector, and click the button below the "Verify" line in figure. The IQA codes present in the ECU will be read back and displayed in the text box before this button. It is recommended that you carry out the verification activity whenever you change an IQA code.

PLEASE ENSURE TO PROGRAM IQA/IMA CODES <u>WHEN YOU REPLACE AN INJECTOR, ECU or ENGINE</u>.

The following are the fonts of the alphanumeric characters of the IQA/IMA code, as etched on the injectors.

0123456789

ABCDEFGHIJKLM
NOPQRSTUVWXYZ

Warranty & Other Information

All failures/complaints encountered on EMS ECU and/or ICU controllers need to be reported through a Common Rail Failure Report (CrFR)/Service Complaint Report (SCR).

Replacement of any of the EMS ECU or ICU controller requires approval of the TEKline. Ensure that a TAR is raised[#] in the TEKnet website for approval, attaching the CrFR/SCR. While raising a warranty claim, the TAR no should be quoted on the warranty claim.

Only a trained and certified CoTEK can raise a TAR (in TEKnet website)

EMS ECU Programming/Flashing

The EMS ECU required to be flashed in the following conditions –

BLANK ECU

1. Procure blank EMS ECU from spare part dept.

<p style="text-align:center">0315CM0031N ECU WITHOUT ETK C39**</p>

** Check for the correct/latest part no in parts catalogue/Technical Service Bulletins.

2. Flash the EMS ECU dataset with a **latest dataset** as per TSB or at the advice of TEKline.

REFLASHING AN EXISTING ECU

1. Flash the EMS ECU with the correct/latest dataset(Field dataset). The matrix of the vehicles and the related latest dataset will be released through TSB - if in doubt ask the TEKline.
2. Wrong dataset flashing may result in vehicle not starting and can lead to EMS ECU failure.
3. **If a different version dataset is used on Micro Hybrid (ESS) enabled vehicles, the Starter Motor will engage continuously, when the ignition is switched ON.**

| Model	Software Version	ECU Type	Plant Dataset ID	Field Dataset ID
Scorpio VIx (Refresh) **TBI ESS MT - BS III**	**V76**	**EDC16C39**	**1037397155**	**Will be released through a TSB**
Scorpio VIx (Refresh) **TBI ESS MT BS IV**	**V76**	**EDC16C39**	**1037397191**	**Will be released through a TSB**
Scorpio Sle/Lx (Refresh) **TBI MT BS III**	**V71**	**EDC16C39**	**1037397093**	**1037397128**
Scorpio VIx (Non-Refresh) **TBI MT BS III**	**V71**	**EDC16C39**	**1037397090**	**1037397127**
Scorpio VIx (Non-Refresh) **TBI AT BS III**	**V75**	**EDC16C39**	**1037397150**	**Will be released through a TSB**
Scorpio VIx (Non-Refresh) **AT BS III**	**V64**	**EDC16C39**	**1037392587**	**1037392587**
Scorpio VIx (Non-Refresh) **MT BS III**	**V52**	**EDC16C39**	**1037392417**	**1037392417**
Scorpio VIs (Non-Refresh) **MT BS III**	**V52**	**EDC16C39**	**1037392423**	**1037392423**

TBI – Transponder Based Immobiliser
ESS – Engine Stop-Start
MT – Manual transmission
AT – Automatic Transmission
BS III – Emission Level Bharat Stage 3
**BS IV – Emission Level Bharat stage 4**

Notes –

1. Ensure that the there is no communication breakdown once the flashing begins. Check Python connections are secure.
2. Ensure that the SMART tester has -
   - Enough battery reserve/Connected to AC power
   - Screen saver/Battery saver mode turned off,
   - Vehicle's ignition is ON
   - Battery terminals connected securely.
   - Battery earth connection is good.
3. Never touch the ECU pins by hand/finger.
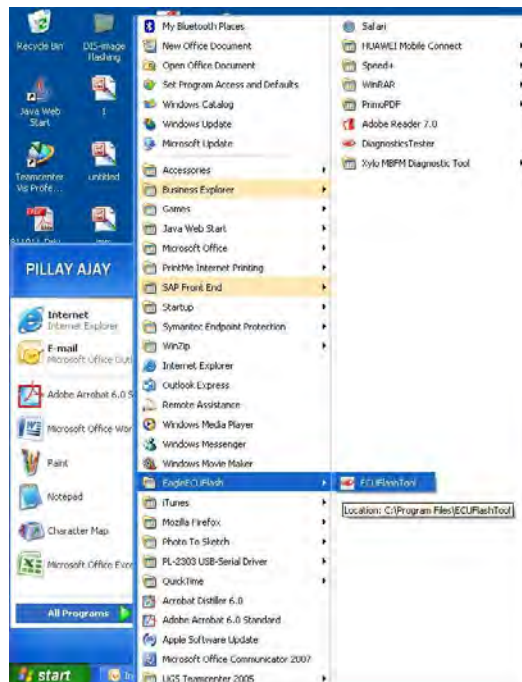
RE-PROGRAMMING PROCEDURE

Caution while flashing on vehicles with ESS feature: Before switching ON the ignition with a blank ECU for start of flashing, ensure that the starter relay is disconnected. This is a safety precaution.
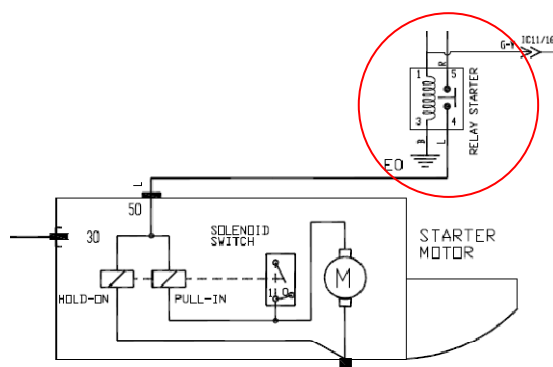
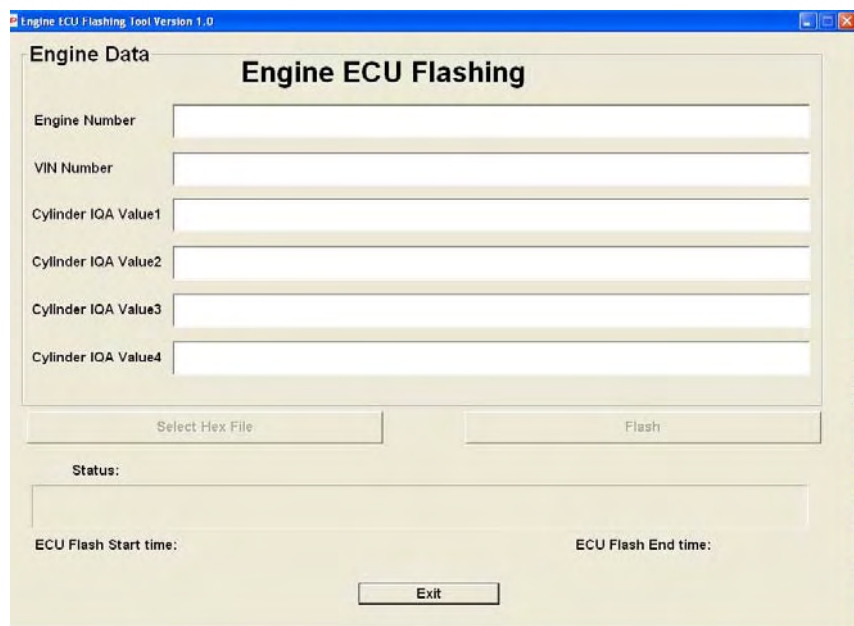- **Connect using the "Python1BConfig0404".**
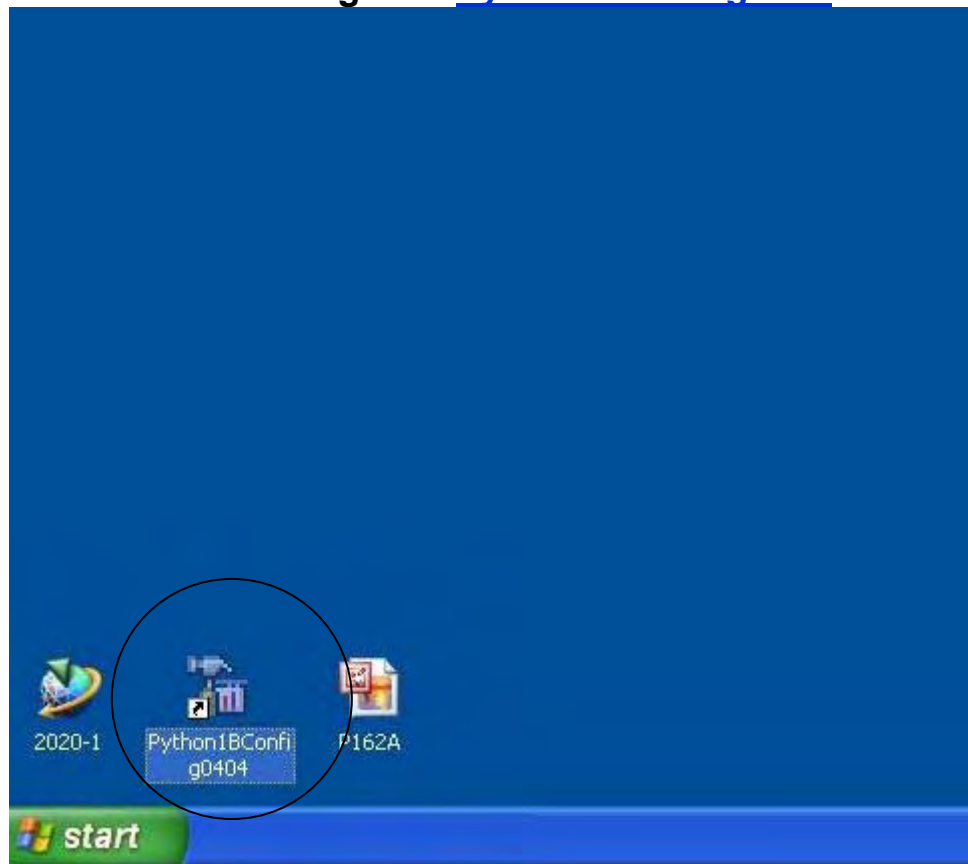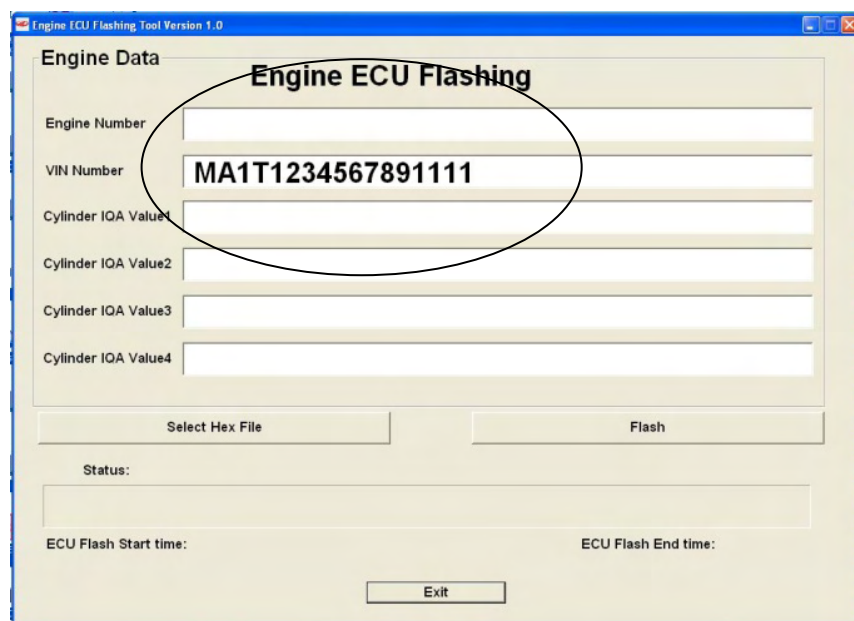
- **Click on to the ECU flash tool**

- **Write the correct 17 digit VIN**

- **Click on "Select Hex File"** **(Refer to latest TSB)**
- **Select the applicable dataset and click "open"**
- **Click "Flash"**
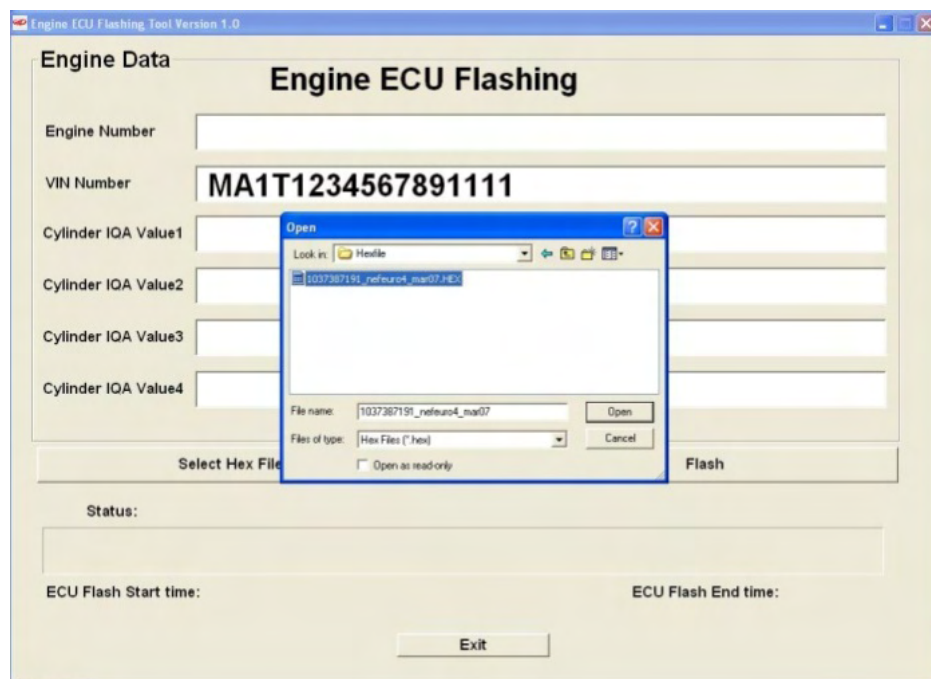
- **After completion of flashing , switch OFF the ignition for 1 minute and switch it ON**
- **Learn the EMS with Immobilizer ECU (ICU) – Refer to diagnostic manual (immobilizer).**
- **Refit the starter relay – if it has been removed for vehicle with ESS**

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For Analog Immobilizer Code (Applicable for Scorpio VLX without Transponder Based Immobilizer, sold between Dec 2007 to March 2009)

Accelerator Pedal Module 1

P-0123
P-0122
P-1120
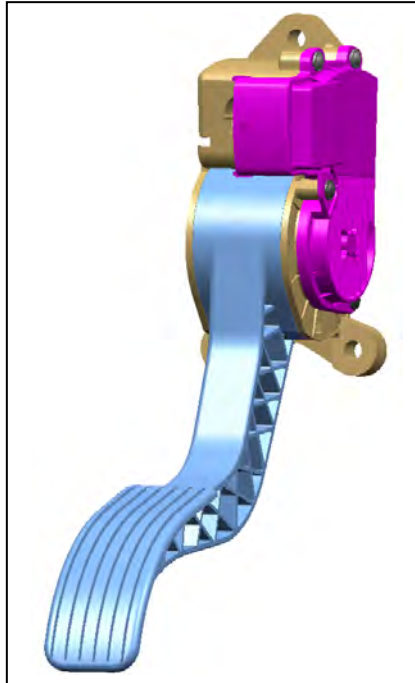
P-0123
P-0122
P-1120

Accelerator Pedal Module 1

Description:

The Accelerator pedal module (APM) mounts in place of accelerator pedal and is connected to the ECU by wires. The APM sensor is a variable resistor (potentiometer) whose resistance changes according to the pedal position. ECU applies a reference voltage to the APM sensor and then measures the voltage that is present on the APM sensor signal circuit. The ECU uses the APM sensor signal for further calculation of fuelling & other engine operational parameters.

DTC	Diagnostic item
P-0123	Voltage above upper limit
P-0122	Voltage below lower limit.
P-1120	Plausibility with APP2 violated.

DTC detection condition	Probable cause
Normal Operation • The Accelerator pedal module (APM) outputs a voltage, which is proportional to the Position of accelerator pedal. • The ECU checks whether the voltage output by the Accelerator pedal module is within a specified range. In addition, it checks that the voltage output does not become too large while the engine is in idling. **Proper Performance** Sensor output voltage has continued to between 0 to 5V, varying accelerator pedal position. **Malfunction; out-of-range** • With the changing Accelerator pedal position, the sensor output voltage has continued to be 5V or 0V. **Reaction:** • The engine speed not varying with changing accelerator pedal position. (Constant 1200 rpm) • The system lamp is continuously on.	• Open or shorted Accelerator pedal module circuits, loose or wrongs connections. • Accelerator pedal module failed or maladjusted.

P-0123
P-0122
P-1120

ECU

K45　　K09　　K30　　K46　K31　　K08

R-W　　G-R

Gr-B

P

W-R

Sb

2　　4-O/P　3-GND　　1　　6-O/P　　5-GND

Vcc　　　　　　　Vcc

APP1　　　　　APP2

P-0123
P-0122
P-1120

ECU-K

IC10

IC11

ACC. PEDAL

ENGINE

E1

E10

Test Procedure APP1 –

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify either P0123 or P122 or P1120 are present.

- Turn Ignition switch OFF & disconnect Accelerator Pedal connector.
- Turn the Ignition ON & measure voltage between terminal 2 & terminal 3 of the APP1 (from the APP1 connector side.)
- It should be 5 ± 0.3 V
- Is it?
-

P-0123
P-0122
P-1120

Yes	No

Turn Ignition OFF	
Measure the continuity between terminal K09 in ECU and Terminal 4 of connector	Measure the continuity between K45 & 2 (Voltage) K30 and 3 (ground)
Continuity is OK? (resistance below 1 Ω)	Repair the damaged line/ connection
	Clear code
	Verify that the complaint has been eliminated.

Yes	No

Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place.	Repair the damaged line/ connection
Clear the codes	Clear code
Does the problem persist?	Verify that the complaint has been eliminated.

Yes	No
Check the APP 1 resistance in both the state 0% & 100%	
Is it within the specifications	

P-0123
P-0122
P-1120

Yes	No
Clear the code.	Replace the Accelerator pedal Module
Verify that the complaint has been eliminated.	

Accelerator Pedal (APP2)
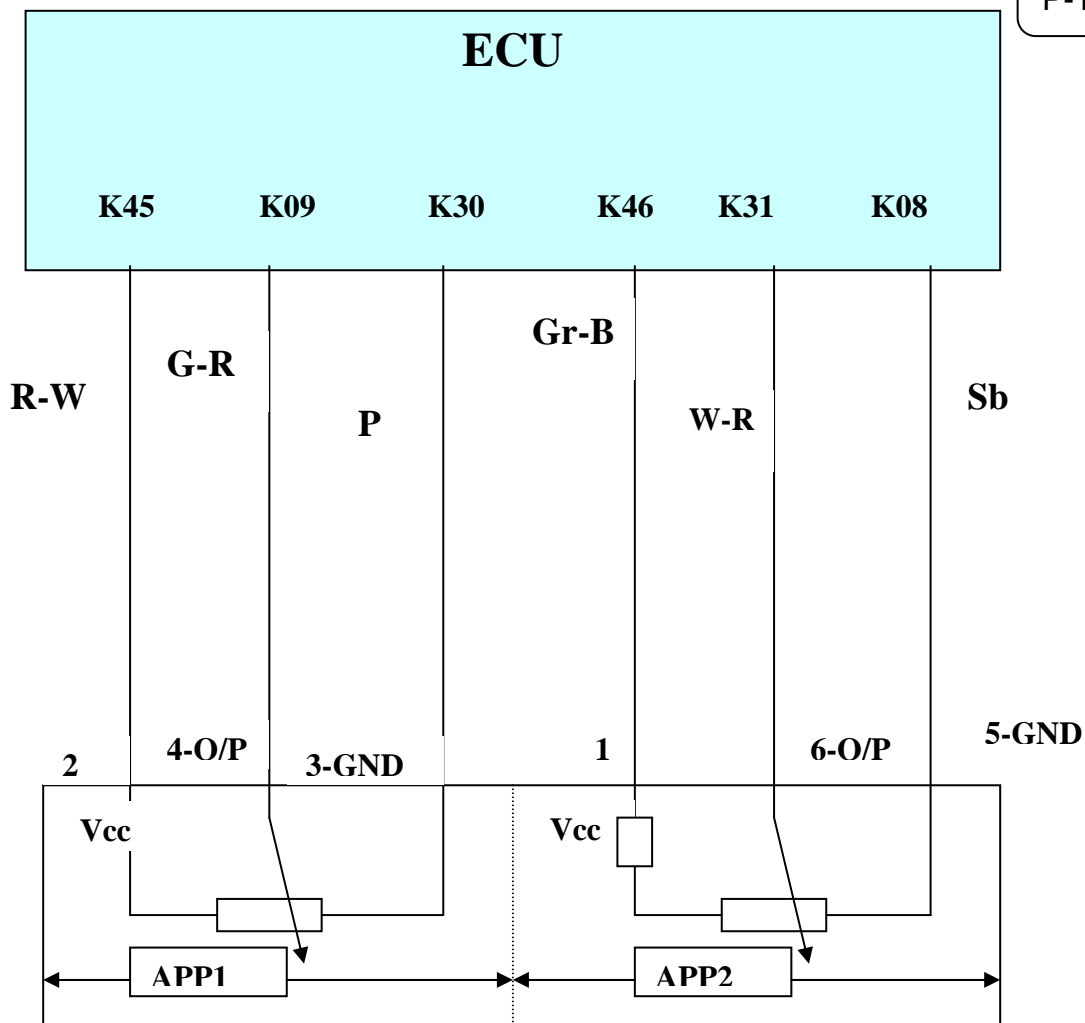
P-0223
P-0222
P-1220
P-1221

Description:

The Accelerator pedal module (APM) mounts in place of accelerator pedal and is connected to the ECU by wires. The APM sensor is a variable resistor (potentiometer) whose resistance changes according to the pedal position. ECU applies a reference voltage to the APM sensor and then measures the voltage that is present on the APM sensor signal circuit. The ECU uses the APM sensor signal for further calculation of fuelling & other engine operational parameters.

DTC	Diagnostic item
P-0223	Voltage above upper limit
P-0222	Voltage below lower limit.
P-1220	Plausibility with APP1 violated
P-1221	Accelerator Pedal signal not plausible with brake

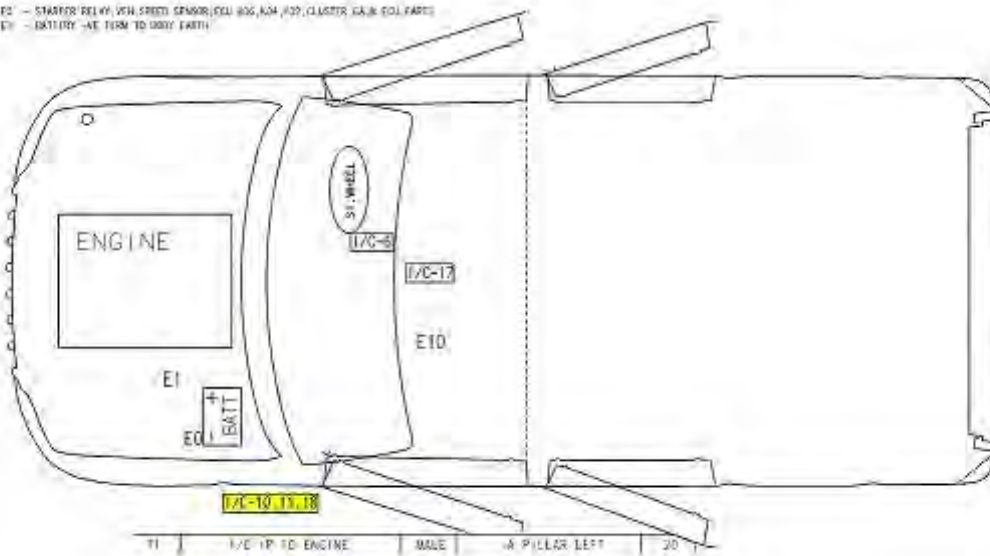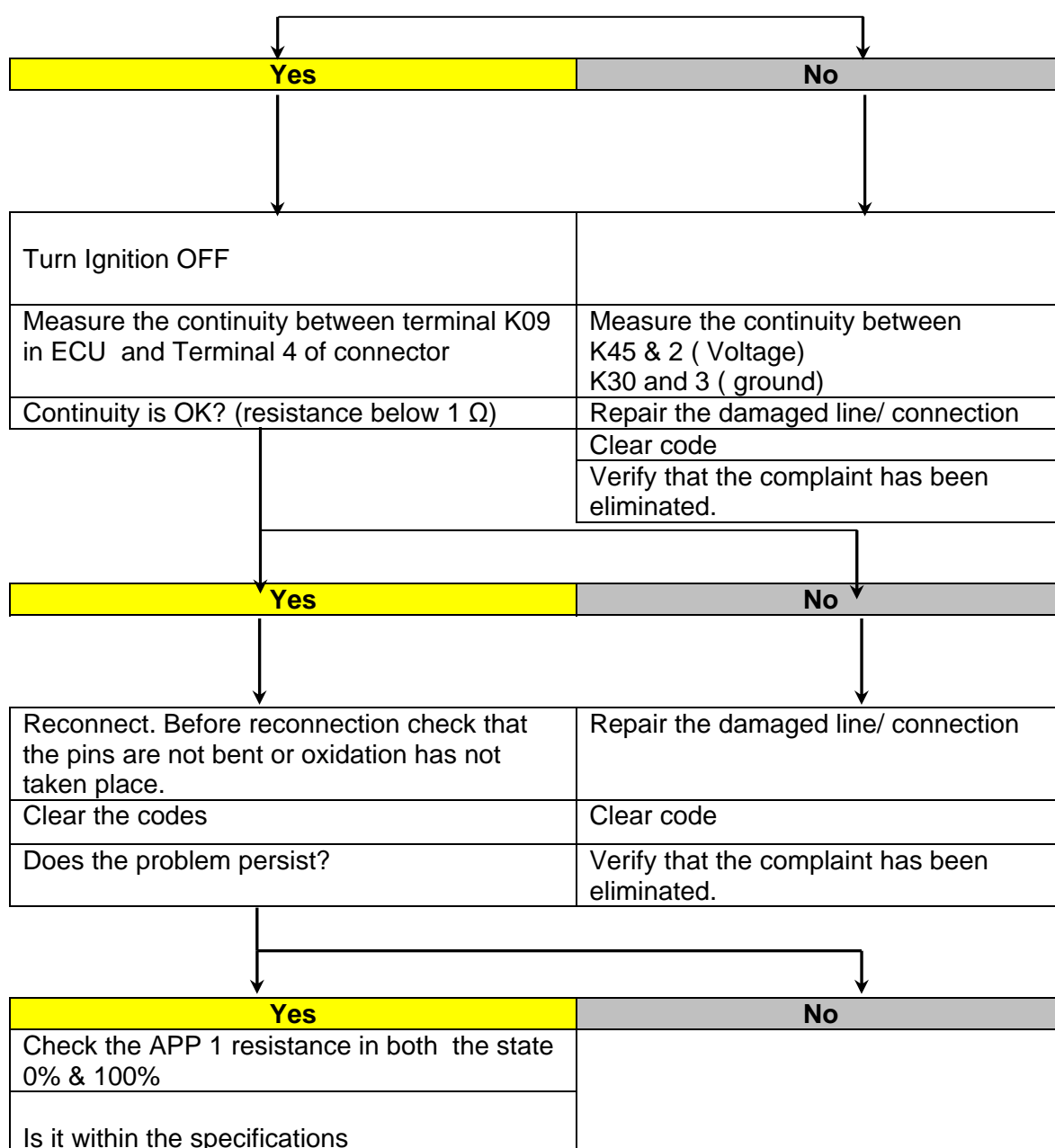| DTC detection condition	Probable cause
Proper Performance Sensor output voltage has continued to between 0 to 2.5V, with varying accelerator pedal position. **Malfunction; out-of-range** • With the fully pressed Accelerator pedal module, the sensor output voltage has continued to be 2.5V or 0 for 4 sec. **Reaction** • The engine speed not varying with changing accelerator pedal position. (Constant 1200 rpm) • The system lamp is continuously on.	• Open or shorted Accelerator pedal module circuits, loose or wrong connections. • Accelerator pedal module failed or maladjusted.

P-0223
P-0222
P-1220
P-1221

ECU

K45   K09   K30   K46   K31   K08

G-R   Gr-B

R-W   P   W-R   Sb

2   4-O/P   3-GND   1   6-O/P   5-GND

Vcc   Vcc

APP1   APP2

ECU-K

IC11

ACC. PEDAL
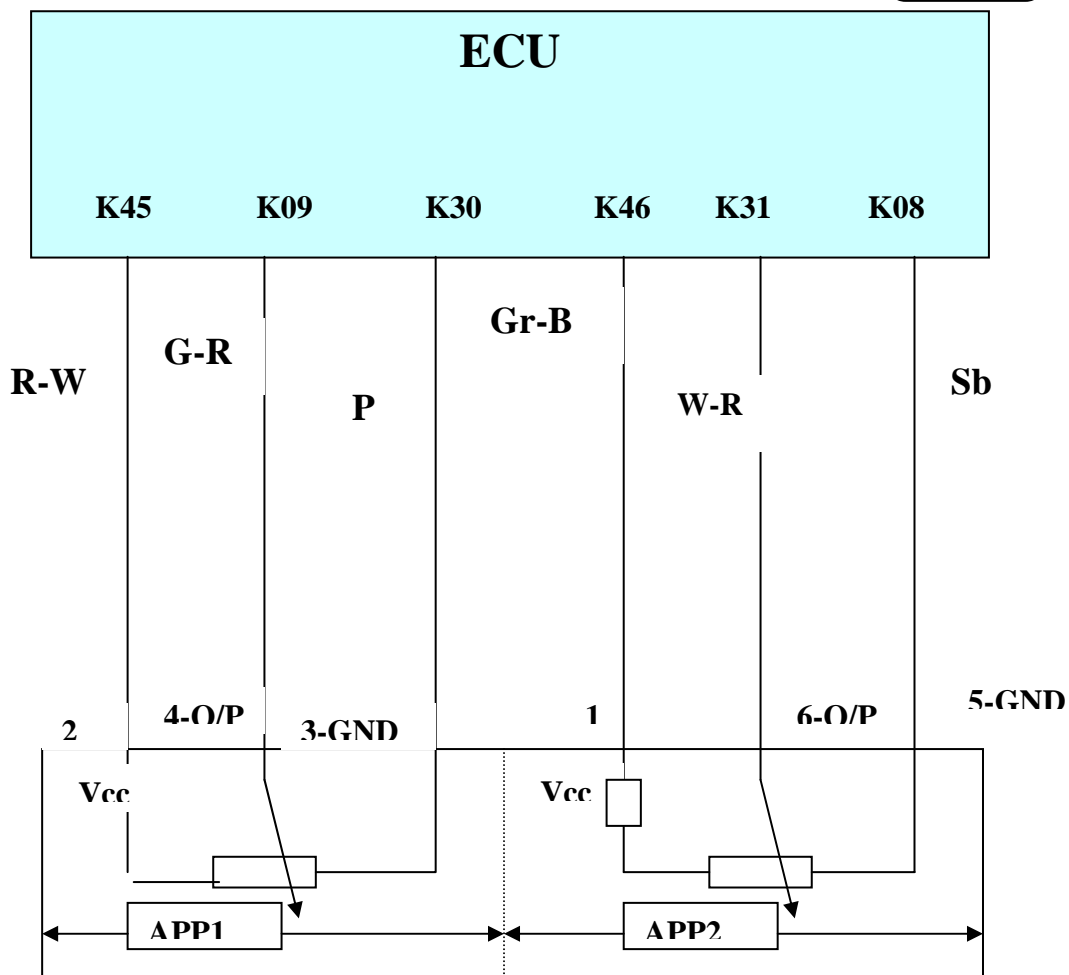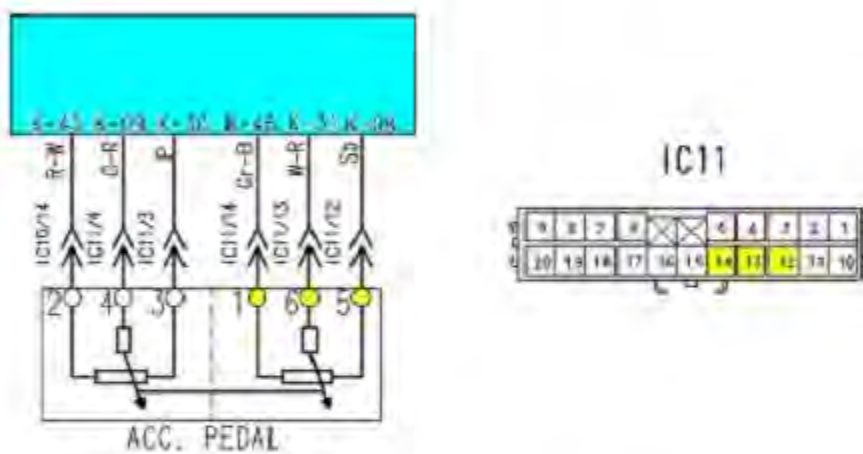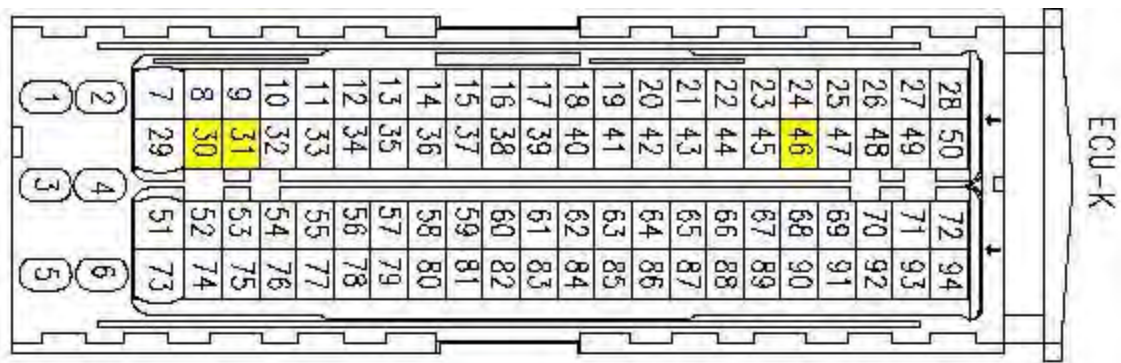
Test Procedure APP2 –

| P-0223 |
| P-0222 |
| P-1220 |
| P-1221 |

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0223/P0222/P1220 / or P1221 is present.

- Turn Ignition switches OFF & disconnect Accelerator pedal connector.
- Turn the Ignition ON & measure voltage between terminal 2 & terminal 3 of the APP2 (from the APP2 connector side.)

- It should be 2.5 ± 0.15 V
- Is it?

Yes	No

Turn Ignition OFF	
Measure the continuity between terminal K31 in ECU and Terminal 6 of connector.	Measure the continuity between K46 & 1 (Voltage) K08 and 5 (ground)
Continuity is OK? (resistance below 1 Ω)	Repair the damaged line/ connection.
	Clear code
	Verify that the complaint has been eliminated.

Yes	No
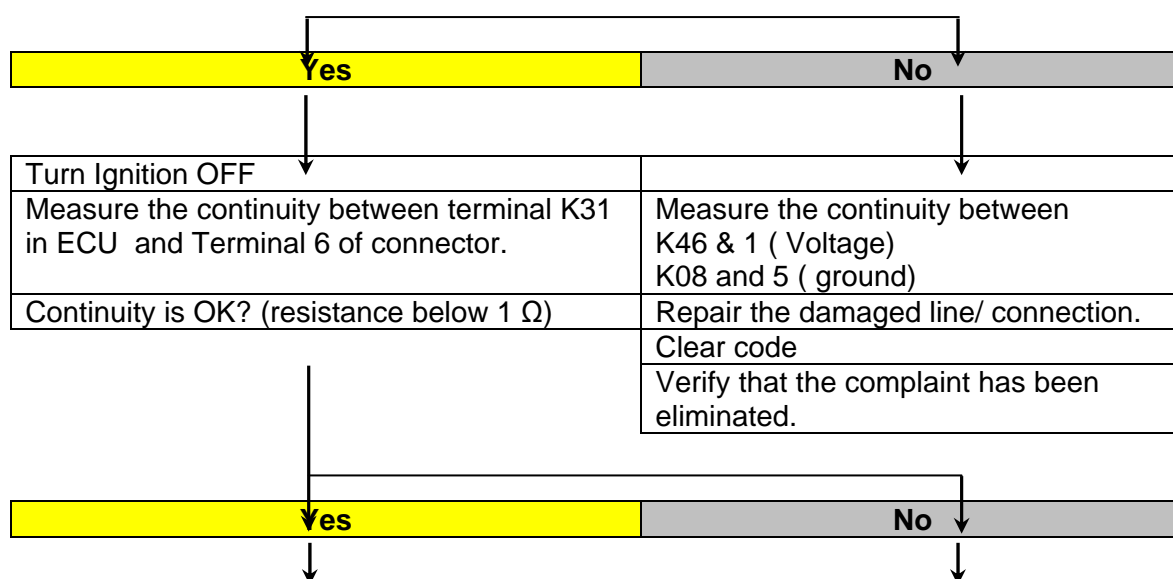
P-0223
P-0222
P-1220
P-1221

Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place.	Repair the damaged line/ connection.
Clear the codes.	Clear code.
Does the problem persist?	Verify that the complaint has been eliminated.

Yes	No
Check the APP 2 resistance in both the state 0% & 100%	
Is it within the specifications	

Yes	No
	Replace the Accelerator pedal Module
Clear code.	
Verify that the complaint has been eliminated.	

Boost Pressure Actuator

P-1604
P-1605
P-1606
P-1607
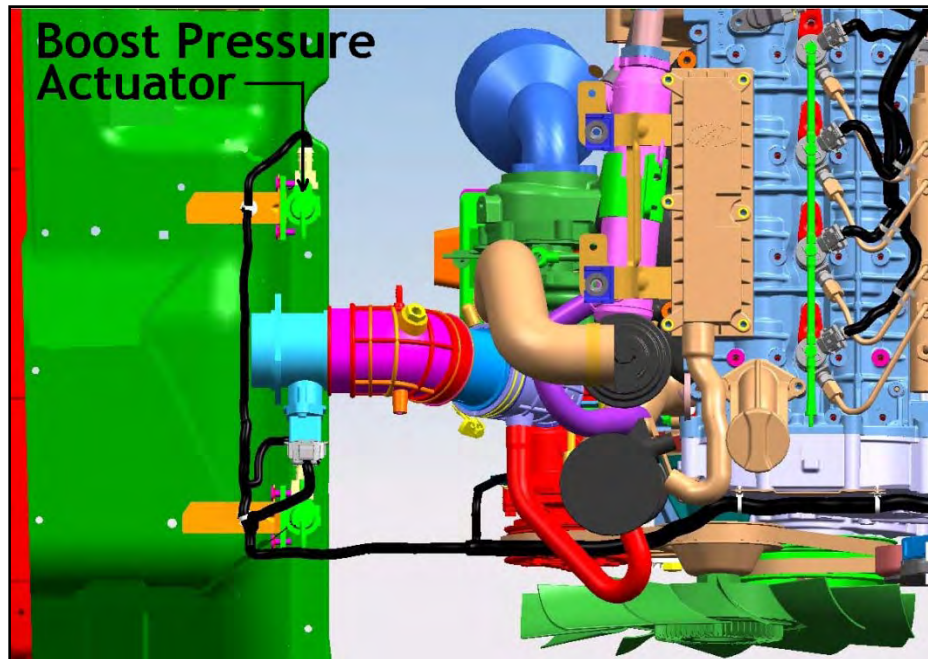
Description –

In normal operation and during an actuator test, the PWM power stage of ECU is tested for short circuit to battery voltage, short circuit to ground, open circuit and excess temperature. Once the errors are confirmed, the power stage is switched off.
The BPA in turn controls the Variable vanes operation through vacuum.

P-1604
P-1605
P-1606
P-1607

Hint:
Short circuit to battery and excess temperature errors can be detected only when the power stage is switched on.
Short circuit to ground and no load errors can be detected only when the power stage is switched off.

DTC	Diagnostic item	
P-1604	Short circuit Battery	
P-1605	Short circuit Ground	
P-1606	No Load	
P-1607	Excess Temperature	
DTC detection condition		**Probable cause**
Proper Performance The ECU monitors the Boost pressure actuator (modulator) during the normal operation as well as during actuator test) **Malfunction; out-of-range** • With the fully pressed Accelerator pedal module, the sensor output voltage has continued to be 2.5V or 0 for 4 sec. **Reaction** • Torque will be reduced • EGR is switched off. • System Check lamp is ON		**Possible Causes** • Short circuit to battery or ground. • Excess temperature • No load.

P-1604
P-1605
P-1606
P-1607

A15

ECU

Boost Pressure
Actuator

Diagnostic Manual (EMS)
Scorpio Vlx, Sle, Lx (Refresh)

MAN-00057-36

March 2009/Rev 3

P-1604
P-1605
P-1606
P-1607

CIRCUIT ENGINE MANAGEMENT SYSTEM
(EAGLE 2.2 LTR BS III)

INTER-CONNECTOR DETAILS

SR. NO.	DESCRIPTION	TYPE	LOCATION	PIN
5	I/C IP TO ENGINE ROOM	MALE	A PILLAR RIGHT	5+2
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20
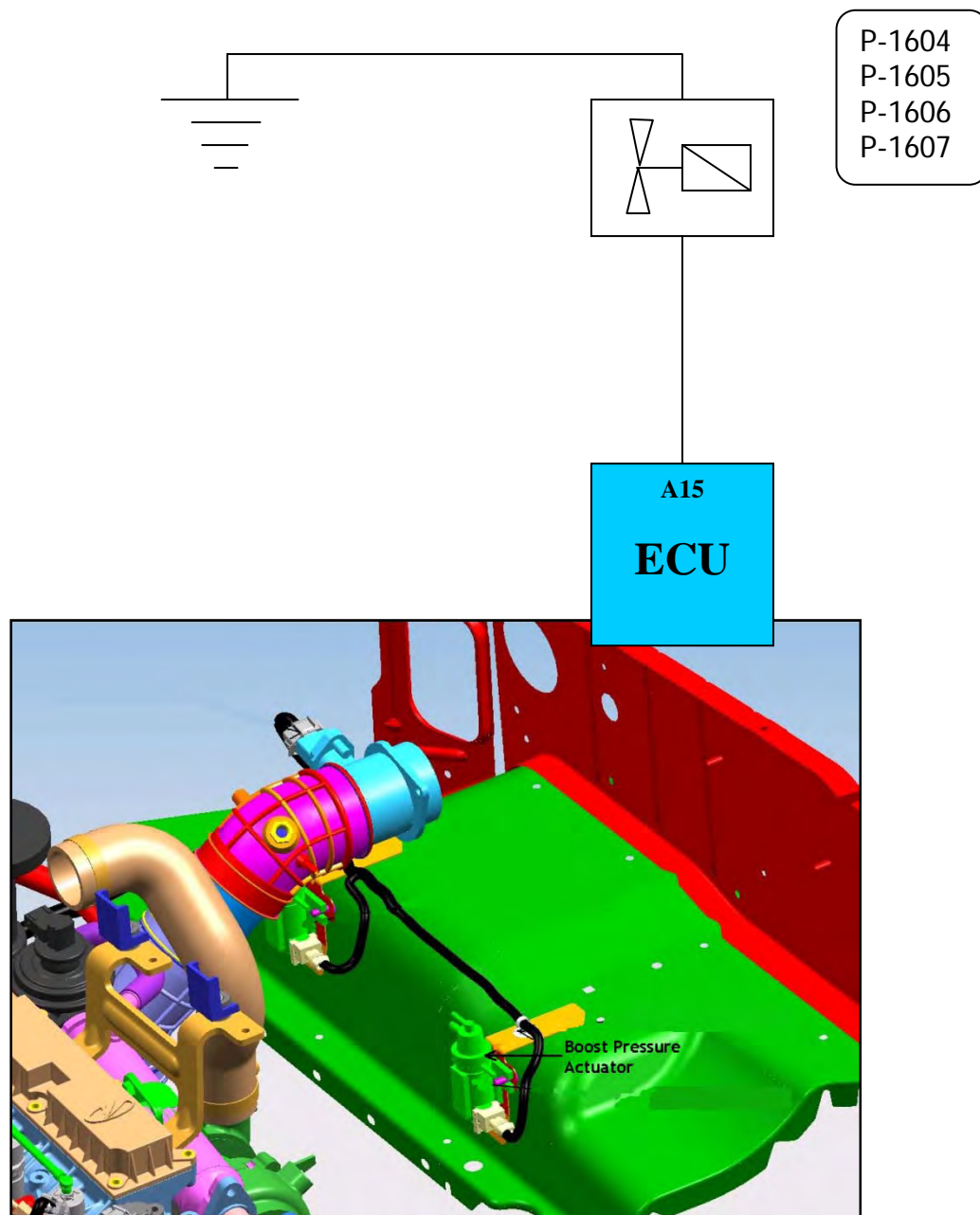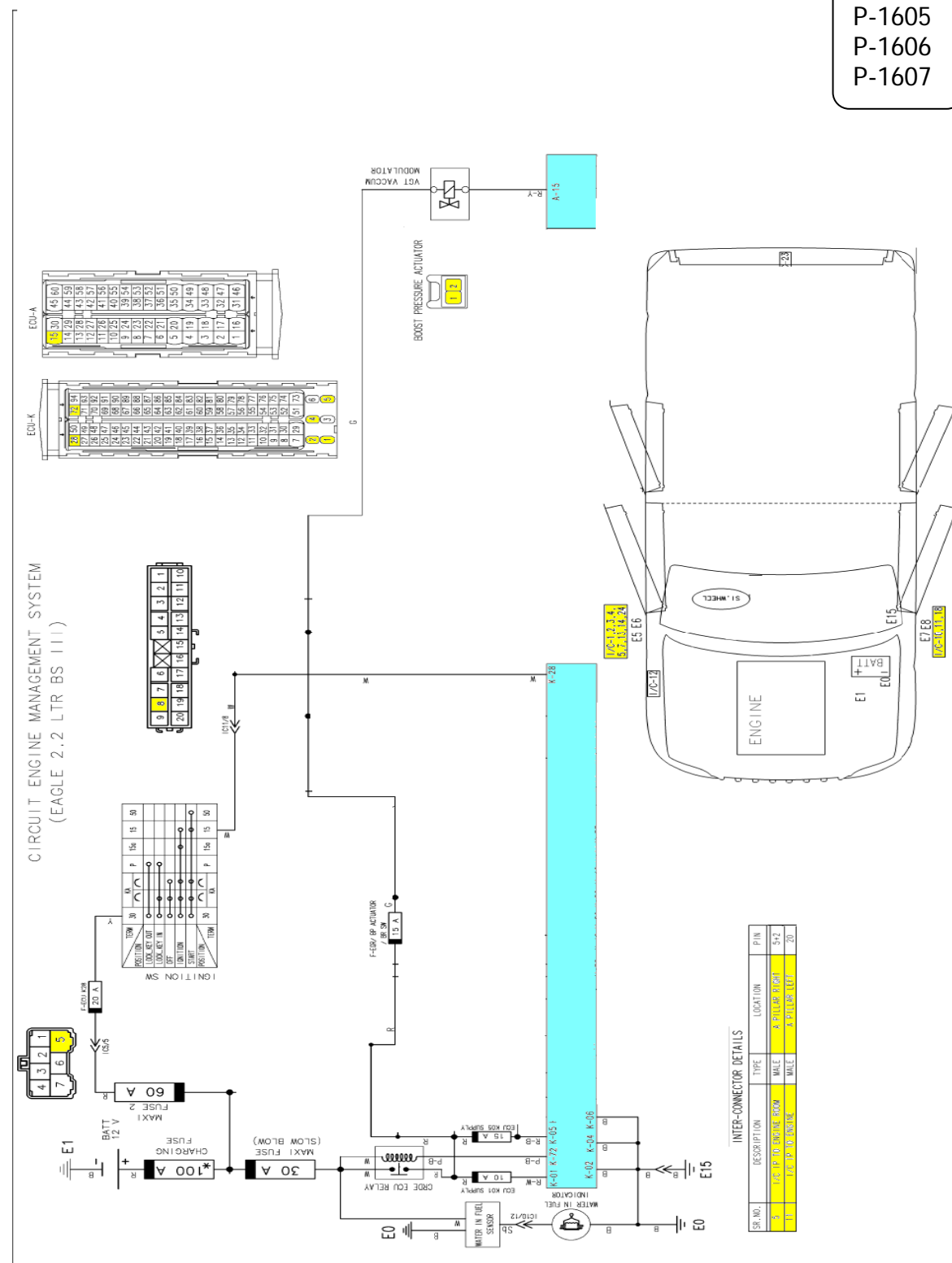
P-1604
P-1605
P-1606
P-1607

The BPA can give errors due to the following causes:

1. Error present in modulator and reported by ECU.
2. There is vacuum leak in the system. Thus when the x amount of boost but the actual amount is y. The BPA will supply more vacuum to the VGT so that the vanes open further and boost is increased. If however the VGT movement is not proportional to the demand, then after a limit, the complaint will be registered as an error.
3. If the boost pressure is not proportional to the expected performance as the VGT is not able to respond to the changes then the ECU will register is as an error of the BPA.

We suggest that the diagnostic procedure has to be   1 ⟶ 2 ⟶   3

Test Procedure BPA

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P1604/P1605/P1606/P1607 is present.

For Defect Codes P 1605 & P1606 –

- Turn Ignition switches OFF & disconnect BPA connector.
- Turn the Ignition ON & measure voltage between terminal 2 & terminal 3 of the APP2 (from the APP2 connector side.)
- It should be 4.5 ± 0.15 V
- Is it?

Check the continuity from BPA to A15

Is it OK ?

Yes	No
↓	↓

P-1604
P-1605
P-1606
P-1607

Measure the continuity from Battery to BPA	Repair the damaged line/ connection
	Clear code
	Verify that the complaint has been eliminated.

Yes	**No**
Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place.	Check the vacuum lines(in particular the line from the BPA to the actuator- check for looseness. Or hardening due to aging.
Clear the codes.	
Does the problem persist?	

Yes	**No**
Change the BPA with a known good one	
Clear the code	
Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place.	
Clear the codes.	
Does the problem persist?	

Yes	**No**
Replace the VGT	Replace the Accelerator pedal Module
Clear code.	
Verify that the complaint has been eliminated.	

For Defect Codes P 1604 & P1607 -

- Turn Ignition switches ON & connect BPA connector.
- Turn the Ignition ON & measure voltage coming to the BPA it should 5 V.
- Is it?

P-1604
P-1605
P-1606
P-1607

Is it OK ?

Yes	No
Check the voltage at A15. is it 5 V?	Check the grounding from battery to BPA. Repair or Replace the wire, clear the codes. & confirm.

No	
Check for shorting to ground from BPA to A15.	Check the vacuum lines (in particular the line from the BPA to the actuator- check for looseness Or hardening due to aging.
Replace the wires.	
Clear the codes and confirm.	

P-235
P-236
P-1236

Boost Pressure Sensor

Description:
The boost pressure signal is monitored. This signal is used as a feedback for the control of the VGT and also for the EGR.
The boost pressure sensor is mounted on the outlet of the intercooler.

DTC	Diagnostic item
P-235	Boost pressure sensor- Voltage above upper limit
P-236	Boost pressure sensor- Voltage below lower limit
P-1236	Boost pressure sensor not plausible with atmospheric pressure sensor.

DTC detection condition	Probable cause
Proper Performance The ECU monitors the Boost pressure **Malfunction; out-of-range** • Monitors the pressure build up or decrease. • Also monitors the plausibility with the atmospheric pressure sensor **Reaction** • System Check lamp is ON • Engine torque is limited. • Air mass – default values taken	**Possible Causes** • Short circuit to battery or ground. • No load. • Defective sensor

P-235
P-236
P-1236

BOOST PRESSURE SENSOR

ECU

A13   A23   A40

U

P
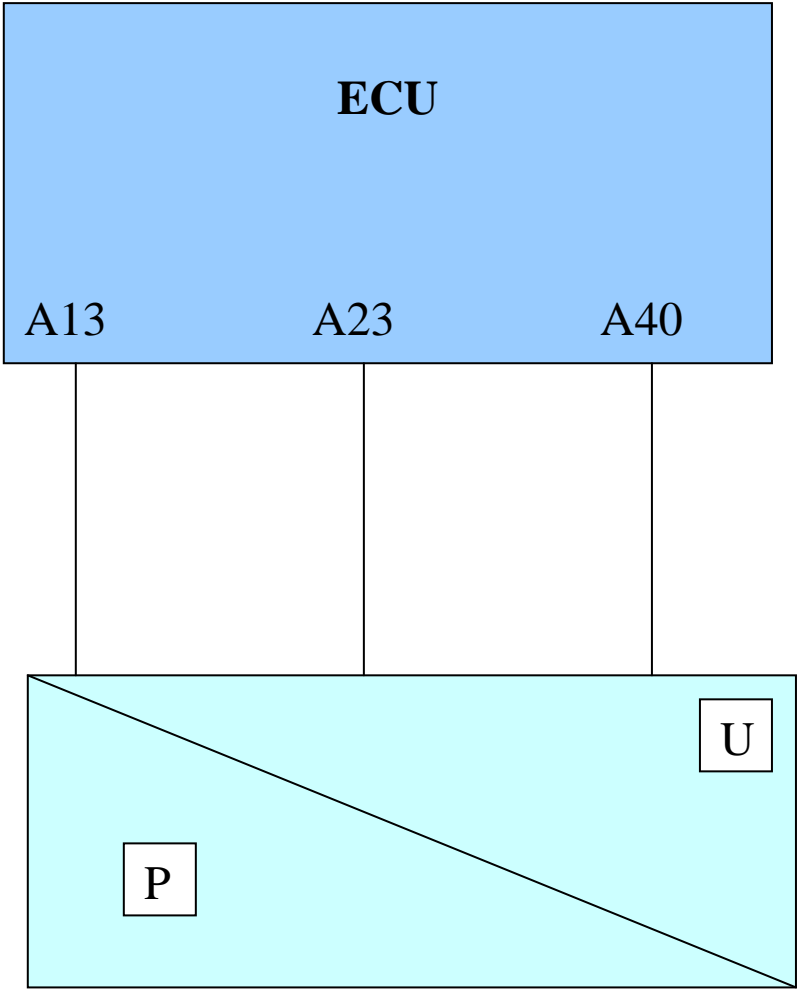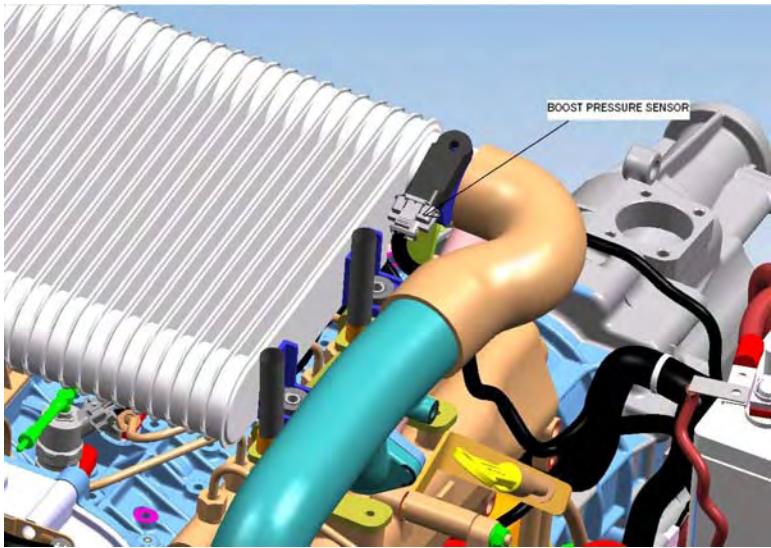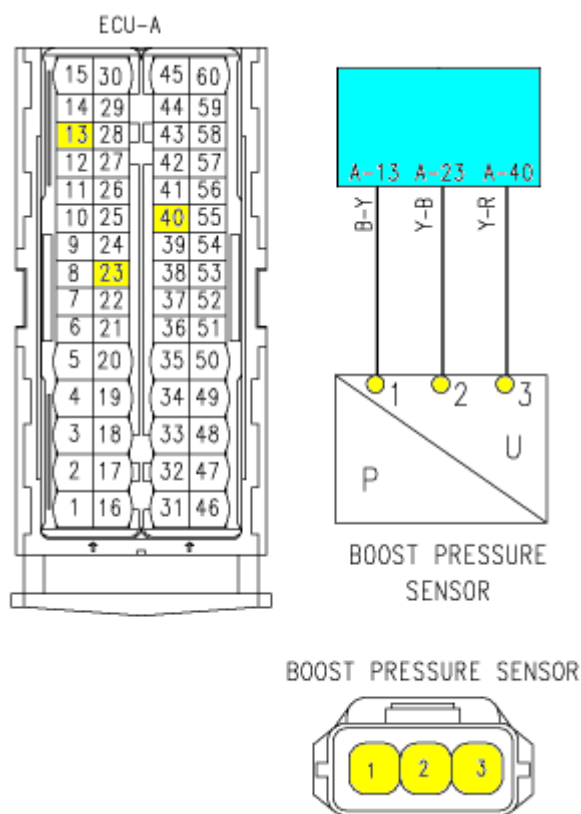
P-235
P-236
P-1236

The BPS can give errors due to the following causes:

There is vacuum leak in the system.
1. If the boost pressure is not proportional to the expected performance as the VGT is not able to respond to the changes then the ECU will register is as an error of the BPA.

Test Procedure BPA

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P235/P236/P1236 is present.

- Turn Ignition switches OFF & disconnect BPA connector.
- Turn the Ignition ON & measure voltage between terminal 2 & terminal 3 of the APP2 (from the APP2 connector side.)
- It should be 4.5 ± 0.15 V
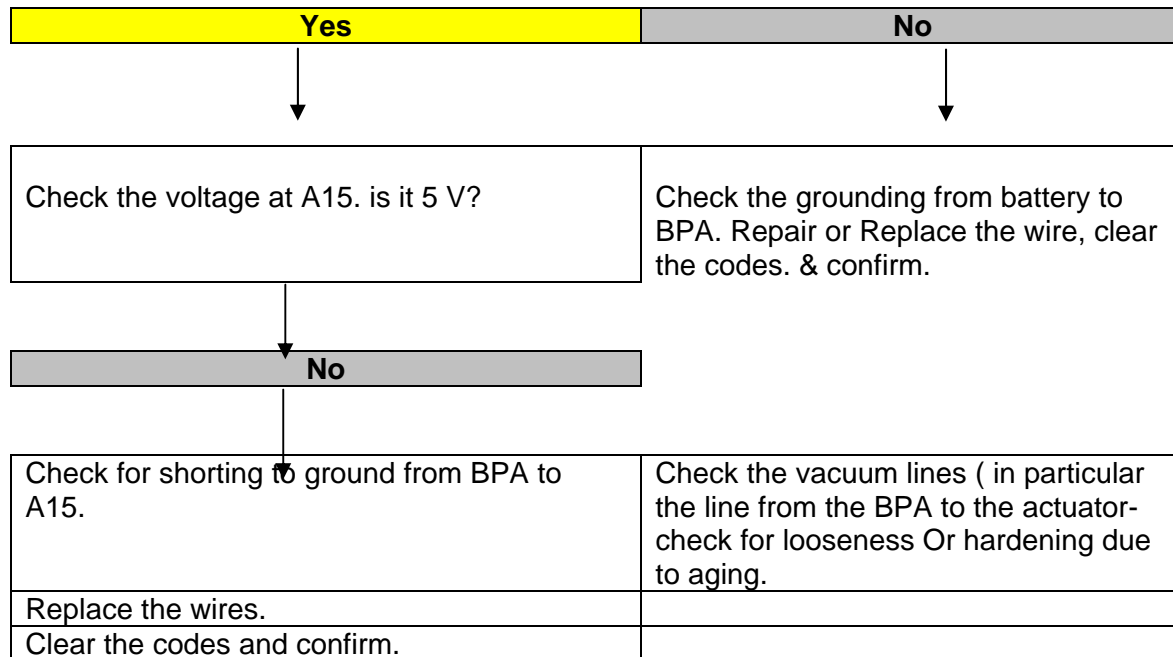- Is it?

Check the continuity from BPS to A13 to 1, A23- 2; A40-3

Is it OK ?

P-235
P-236
P-1236

Yes	**No**
Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place	Repair the damaged line/ connection
Clear the codes.	Clear code
Does the problem persist	Verify that the complaint has been eliminated.

Yes	**No**
Change the BPS with a known good	
Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place	
Clear the code	

Camshaft Speed Sensor
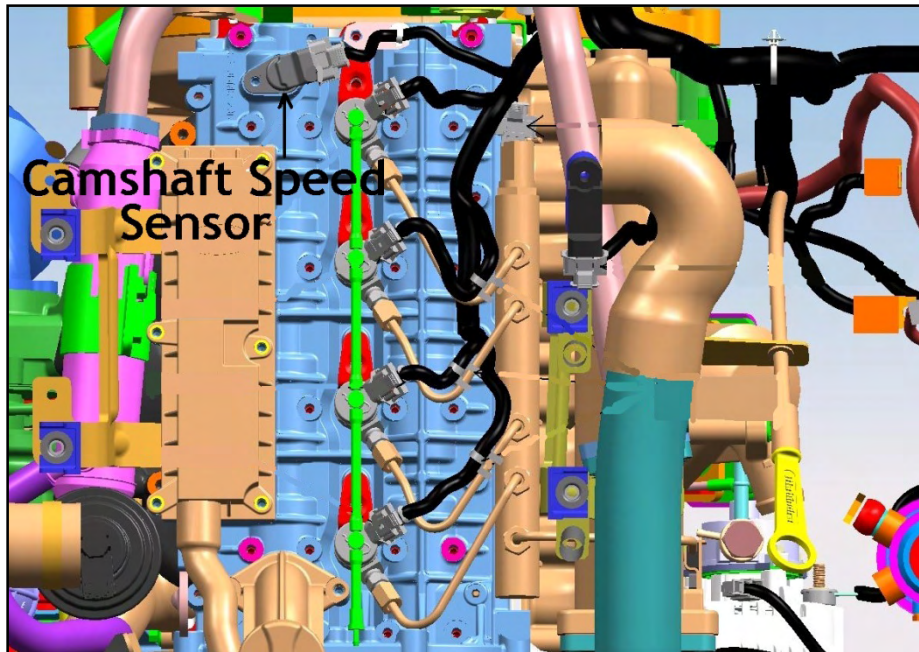
P-0340
P-0341

Camshaft speed sensor

<div>
P-0340
P-0341
</div>

DTC	Diagnostic item
P-0340	No camshaft signal
P-0341	Wrong camshaft signal

Description

The Hall effect camshaft position sensor senses the Top dead center (TDC) point of the # 1 cylinder in the compression stroke. Which allows the ECU to determine when to start the injection.

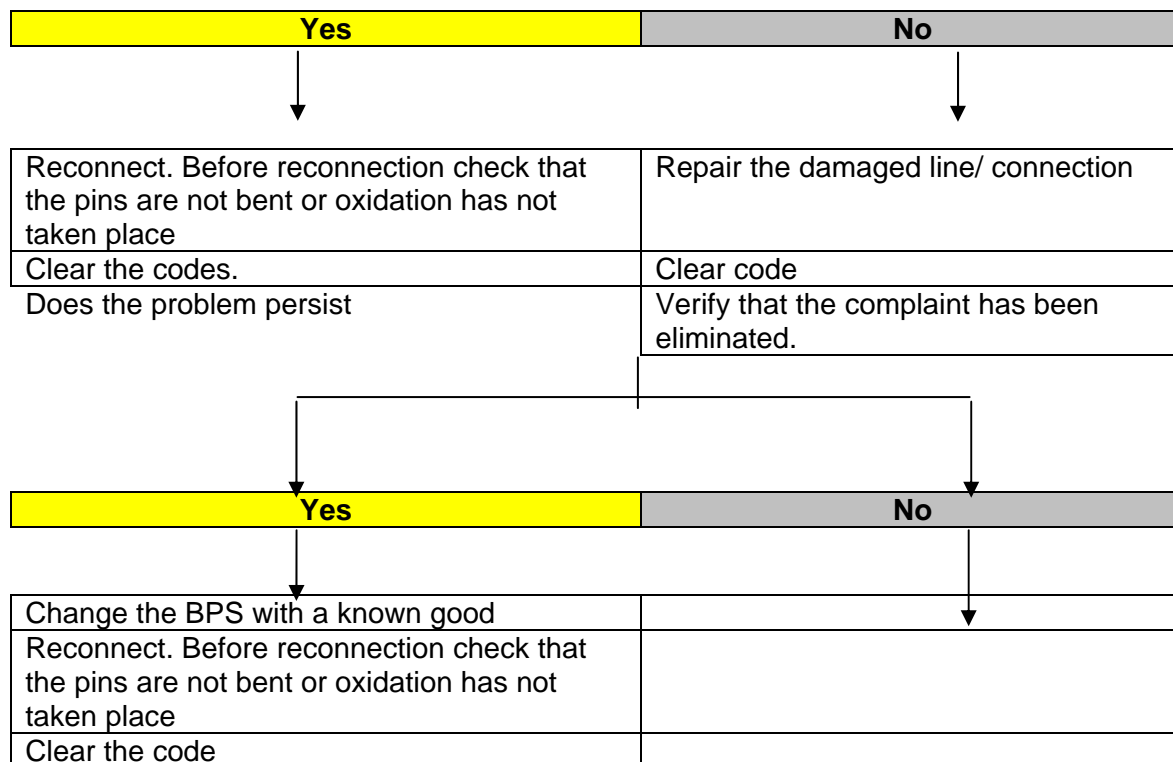| DTC detection condition	Probable cause
Normal Operation • When the **engine is running**, the Camshaft Position sensor outputs a pulse signal. • The ECU checks whether the pulse signal is input. **Malfunction** • Normal signal pattern has not been input for cylinder identification from the camshaft position sensor signal for 4 sec. (Engine should be cranked to check this error). **Reaction** • Engine will not start • System lamp will be continuously on.	• Open or shorted camshaft position sensor circuit, loose or wrong connection. • Camshaft Position sensor malfunction.
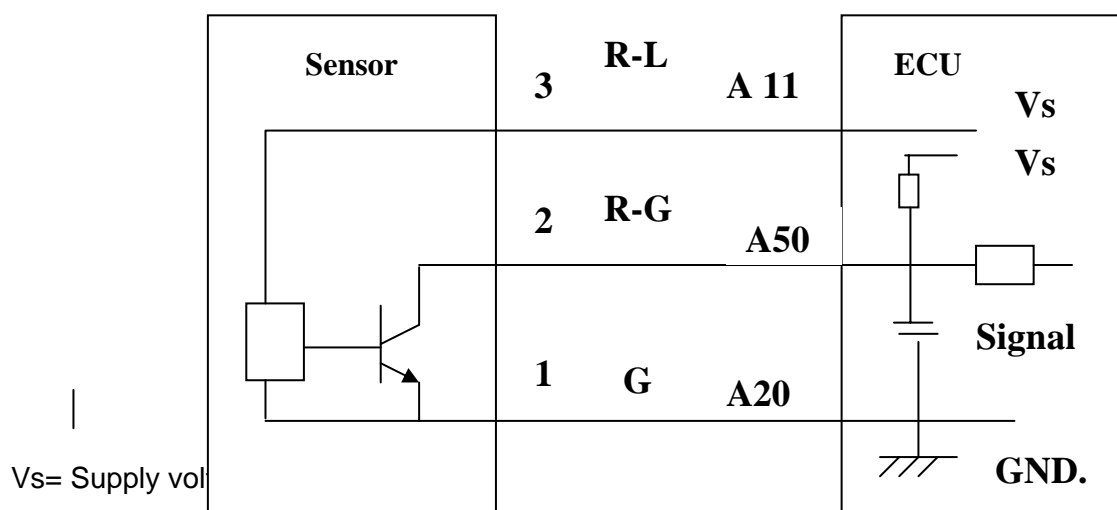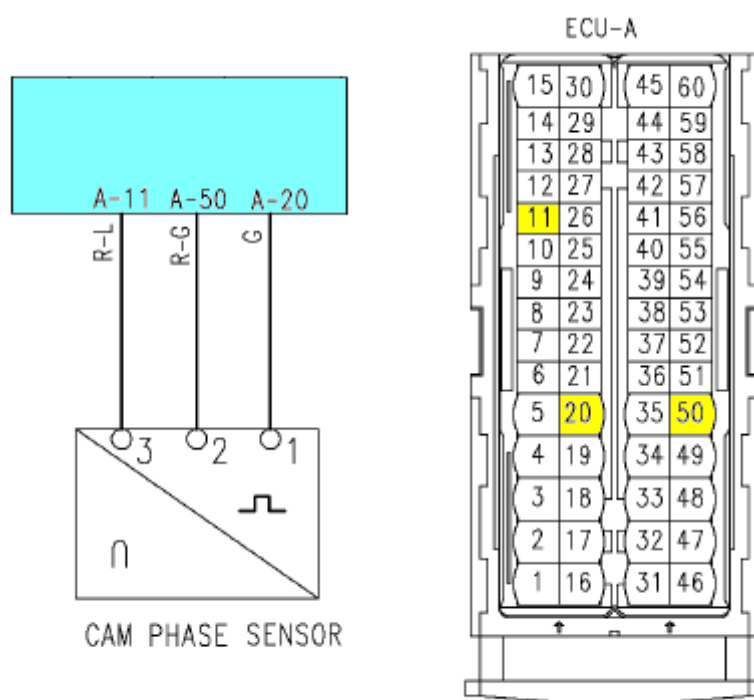
Vs= Supply vol

ECU-A

P-0340
P-0341

CAM PHASE SENSOR

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0340 or P0341 are present.

- Switch off the Ignition.
- Disconnect the camshaft sensor connector.
- Turn ON the Ignition.
- Measure the voltage between the pins in the camshaft connector - Pin No. 3 &1.
- It should be 5 ± 0.3 Volts
- Is it?

Yes	No

Yes	No
Turn the Ignition OFF	Repair the wires A 11 to Pin No.3 &A 20 to Pin No. 1.
Disconnect ECU connector A.	Clear the error codes & verify.
Measure the continuity of Ground (between sensor pin no 1 & ECU terminal A20) in the camshaft phase sensor harness.	
Is it OK?	

Yes	No

Yes	No
Measure the continuity of signal (between	Repair the connection.

sensor pin no 2 & ECU terminal A50) in the camshaft phase sensor harness.	
Is it OK?	Clear the error codes & verify

Yes	**No**
Check for physical damage to pins or oxidation.	Repair the connection.
Also check if the connectors are moving backwards when inserted.	Clear the error codes & verify.
Is it OK?	

Yes	**No**
Replace the camshaft phase sensor.	Repair the connection.
Clear the error codes & verify.	Clear the error codes & verify.

Crankshaft sensor

P-0335
P-0336

Phase Sensor Mounting on Camshaft

Single Mass Flywheel

Speed Sensor Mounting on Crankshaft
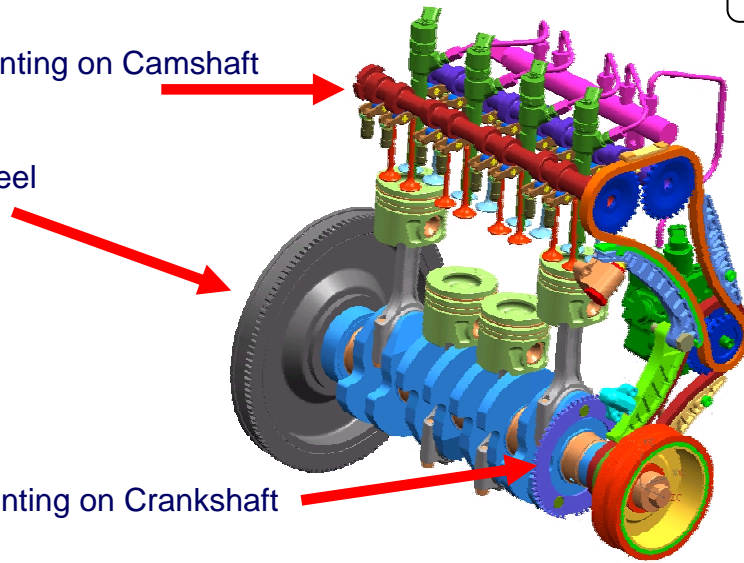
Crankshaft Sensor

P-0335
P-0336

<u>Description</u> - In order that the ECU can control the engine at all the position of the crankshaft must be known so that the cylinder in compression and the timing of the next fuel injection can be calculated. The CKP is an inductive pulse generator, which scans protrusions on the flywheel. Two teeth are missing, and this gap is situated at 90° before TDC.

DTC	Diagnostic item
P-0335	No crankshaft signal
P-0336	Wrong crankshaft signal

DTC detection condition	Probable cause
Background • When the engine is running, the Crankshaft Position sensor outputs a pulse signal. • The ECU checks whether the pulse signal is input while the engine is cranking. **Normal Operating condition** • Engine is being cranked. **Malfunction** • Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal for 4 sec. • No synchronization between crankshaft & camshaft signal. **Reaction** • System lamp continuously on. • Engine will not start. • If engine is running & this fault occurs, engine will stop immediately.	• Open, shorted or wrong connection crankshaft position sensor circuit. • Failed or damaged crankshaft position sensor.

ISS (Incremental speed sensor/ Crankshaft speed sensor)

Sensor   **ECU**

P-0335
P-0336

ECU-A

ENGINE
SPEED SENSOR

ENGINE SPEED SENSOR
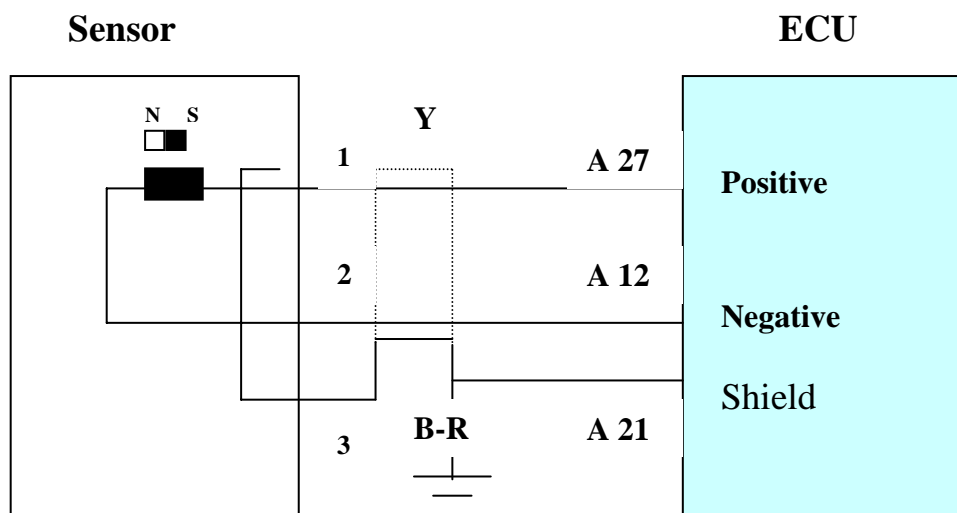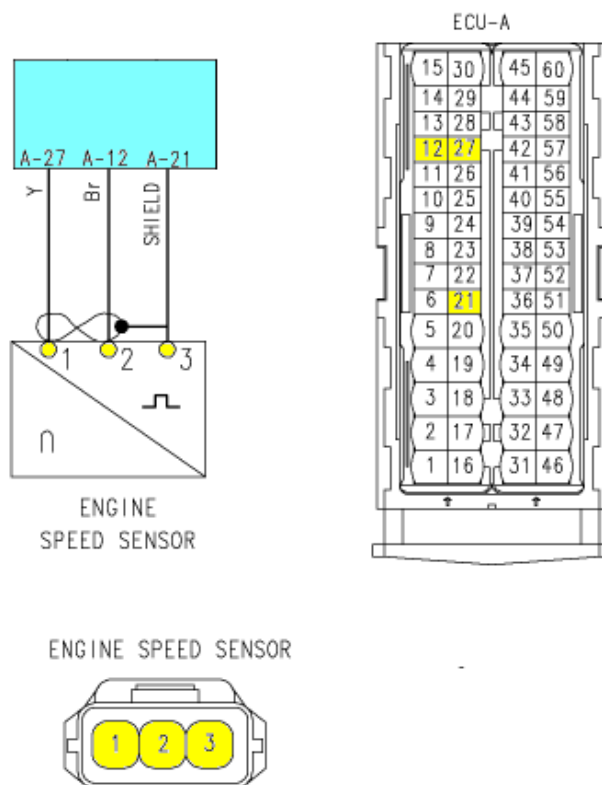
Test Procedure ISS
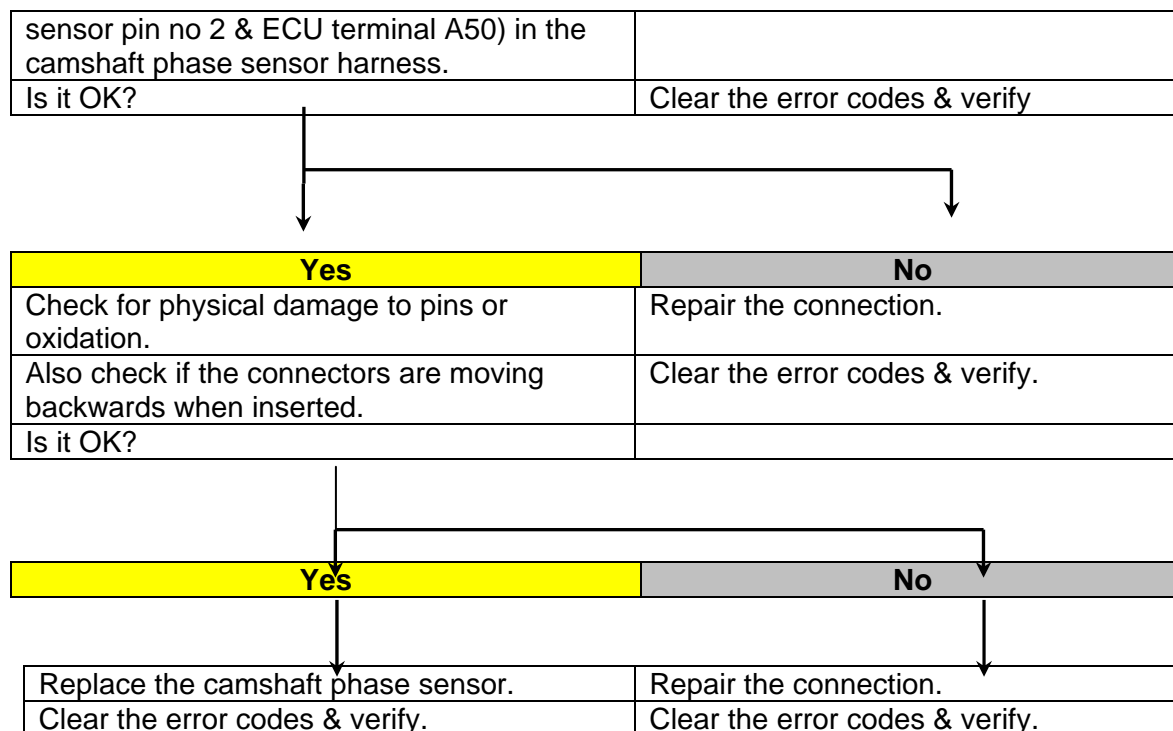
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0335 or P0336 are present. Please verify while cranking the engine.

- Turn the Ignition switch OFF.
- Disconnect the crankshaft position sensor connector and also the connector at ECU.
- Measure the continuity between the sensor terminal 1 and ECU terminal A 27.
- Is it OK?

Yes	No
Measure all terminals for short to Ground.	Repair the wires.
Is it OK ?	Clear code & verify the CKP sensor is within normal parameters.

Yes	No
Check if the sensor is damaged. If so change sensor with a known good component.	Repair the connection.
Clear code & verify the CKP sensor is within normal parameters.	

Air Flow

P-0103
P-0102

Air Flow

P-0103
P-0102

Description -

Mass air flow rate is measured by detection of heat transfer from a hot film probe because the change of the mass air flow rate causes change in the amount of heat being transferred from the hot film probe surface to the air flow. The airflow sensor generates a pulse so it repeatedly opens and closes between the 5V voltage supplied from the engine control module. This results in the change of the temperature of the hot film probe and in the change of resistance.

DTC	Diagnostic item
P-0103	Voltage above upper Limit
P-0102	Voltage below lower Limit

DTC detection condition	Probable cause
Normal Operation • The HFM sensor outputs a voltage, which corresponds to the intake airflow. • The ECU checks whether this voltage is within a specified range. **Normal Operating Requirements** • Ignition switch: ON • Malfunction lamp: OFF after 2 Sec • Battery voltage is 8V-16V or more. **Malfunction** • The sensor output voltage has continued to be 5V or higher. • The sensor output voltage has continued to be 0.5V or lower. **Reactions:** • System lamp will continuously blink. Engine will continue to run with default air flow (depending on Speed & Fuelling)	• Open or shorted HFM sensor circuit, loose or wrong connections. • Failed HFM sensor.

P-0103
P-0102

AIR MASS SENSOR-HFM

ECU-A
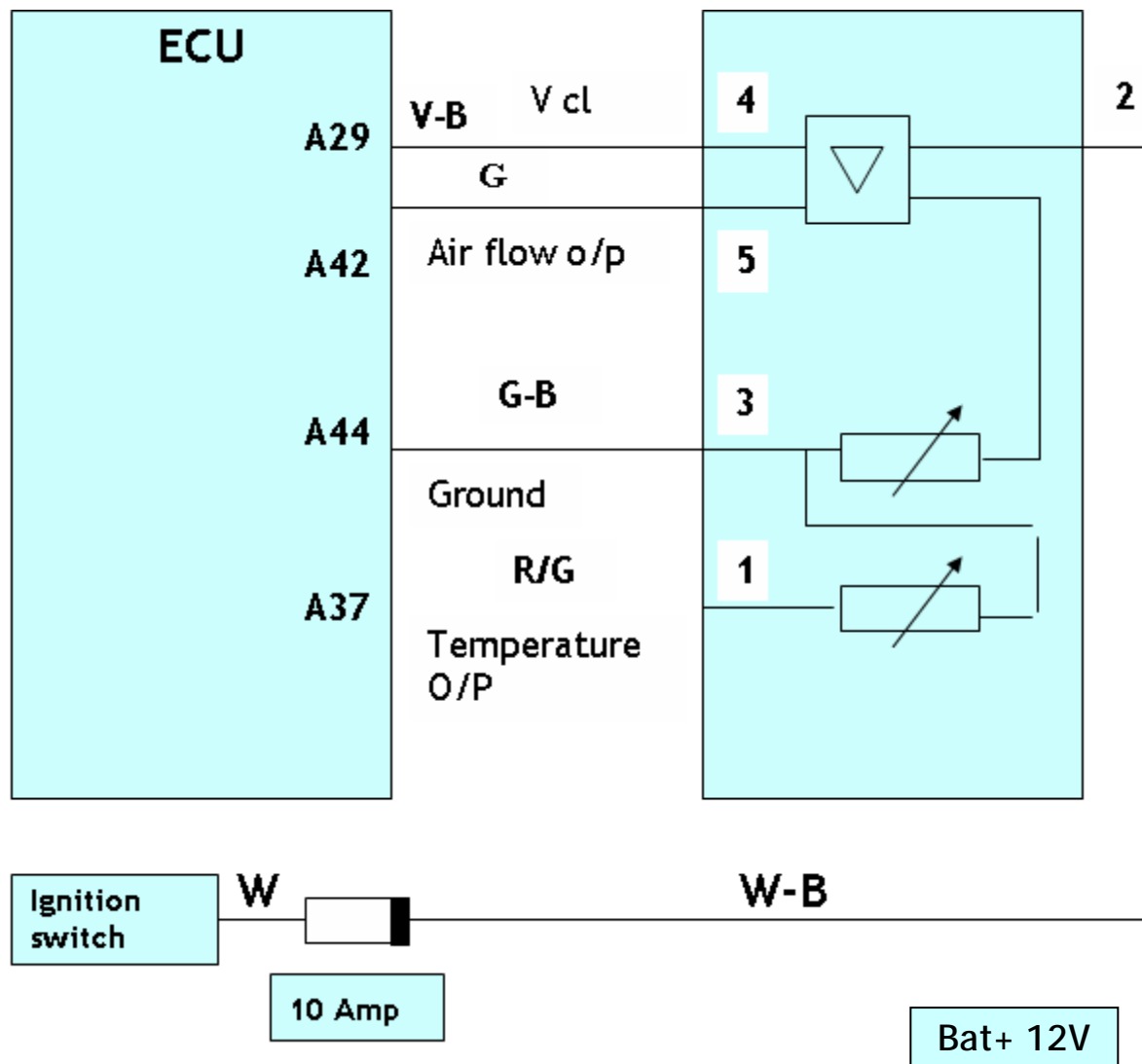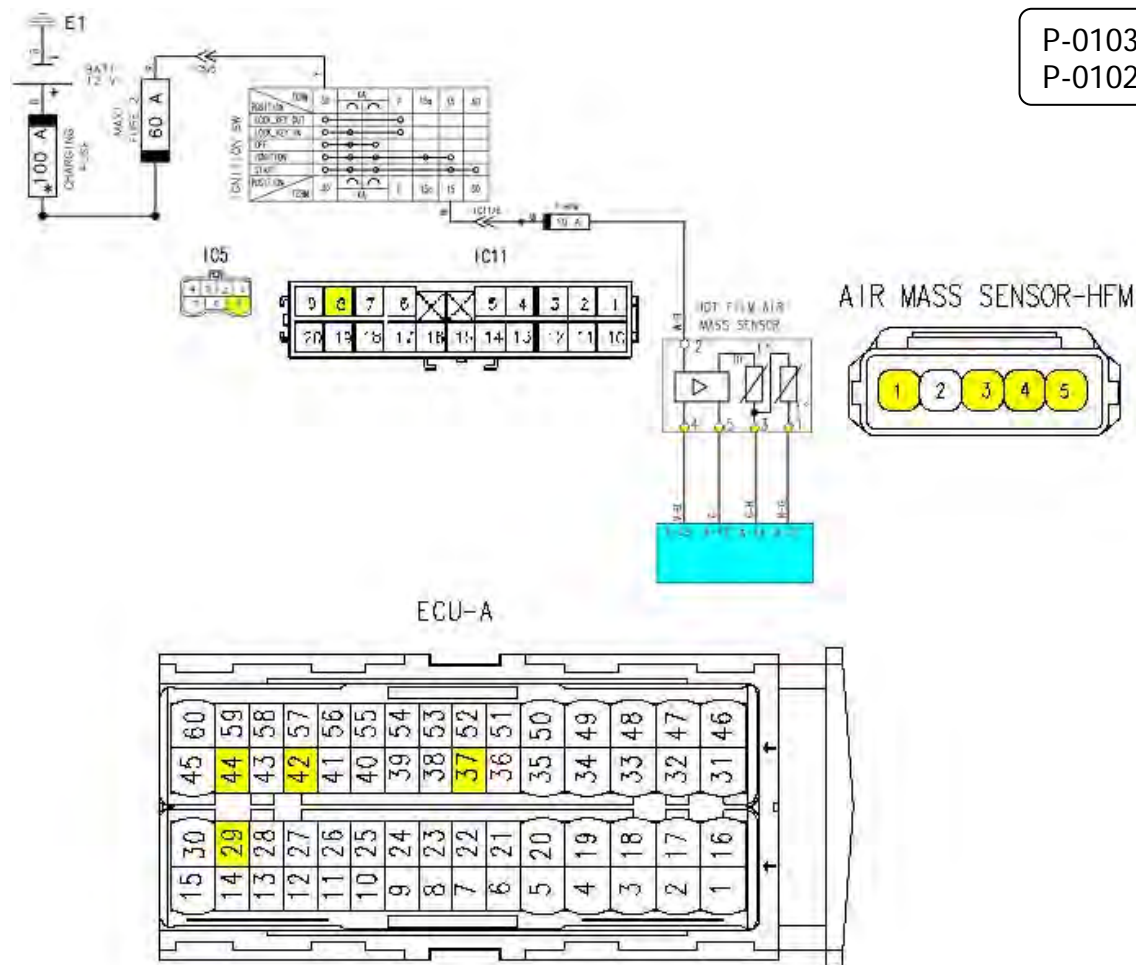
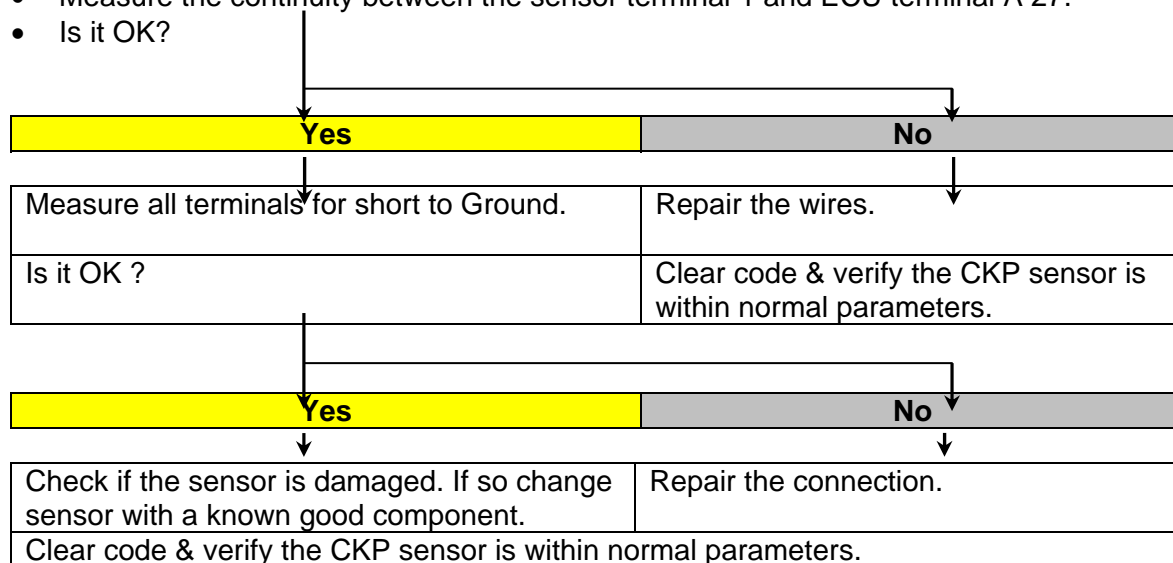**Test Procedure HFM**
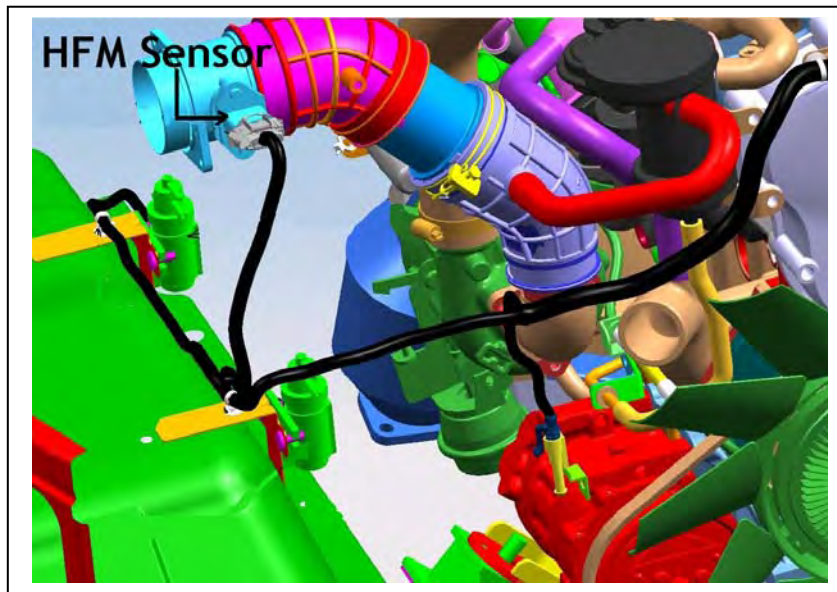
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0103 or P0102 are present.

Turn the ignition OFF
Disconnect HFM sensor.
Turn the Ignition ON
Measure the voltage at the connector between terminal 3 & 4.
It should be 5 ± 0.3 Volts
Is it

Yes	No

P-0103
P-0102
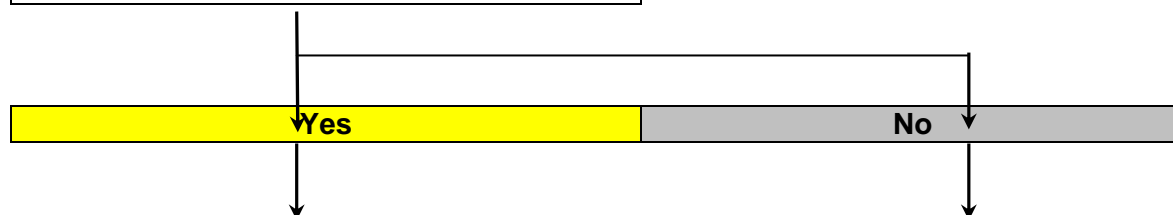
Check the output voltage (with engine running)	Check fuses
Signal voltage within the range	Check continuity between the A29 & 4 (voltage) Check continuity between A44 & 3 (Ground)
Is it?	Repair the open wire.
	Clear codes and verify that the HFM signal ratio is within limit.

Yes	**No**

Switch off the Ignition	
Check the connectors if the pins are bent or having oxidation.	Check the continuity between the A42 & 5 (Signal)
Clear codes & verify if the codes are eliminated.	Rectify
	Clear codes and verify that the HFM signal ratio is within limit.

No

Check the resistance of the HFM sensor (between 5 & 3) it should be between 5.119 to 5.892 KOhms
If not OK. Replace the HFM sensor.
Clear codes & verify that the error has been removed.

Air Temperature

P-0113
P-0112
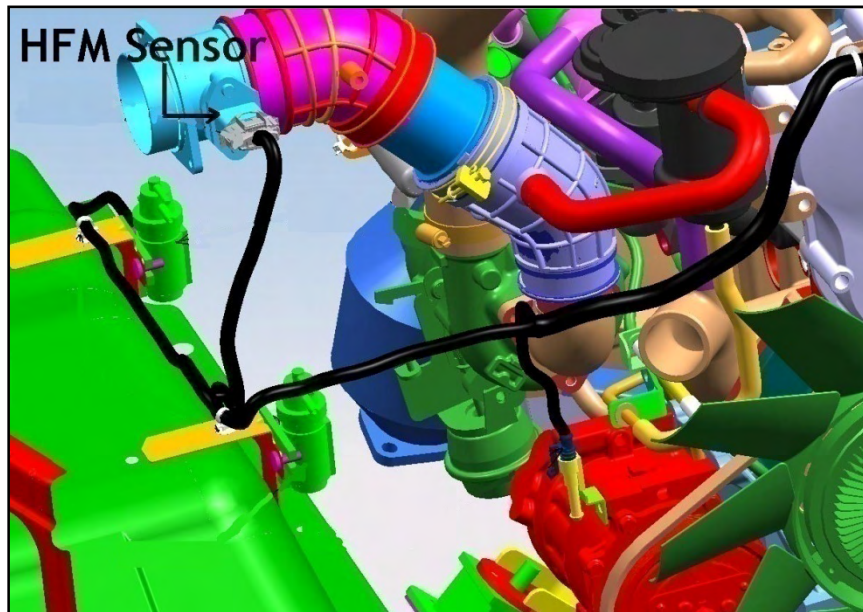
Air Temperature

P-0113
P-0112

DTC	Diagnostic item
P-0113	Voltage above upper limit.
P-0112	Voltage below lower limit.

Description: The function acquires the raw voltage of the induction air temperature. The raw value is linearised and monitored for compliance with the signal range.
The sensor is mounted in HFM.

DTC detection condition	Probable cause
Normal Operation • The HFM temperature sensor outputs a voltage, which corresponds to the temperature of intake airflow. • The ECU checks whether this voltage is within a specified range. **Normal Operating Requirements** • Ignition switch: ON • Malfunction lamp: OFF after 2 Sec • Battery voltage is 8V –16 V. **Malfunction** • The sensor output voltage has continued to be 5V or higher. • The sensor output voltage has continued to be 0.2 V or lower. **Reactions** • Engine will run with default air temp of 20 Degrees Centigrade • System lamp status for this error is off.	• Open or shorted HFM temperature sensor circuit, loose or wrong connections. • Failed HFM temperature sensor.

P-0113
P-0112

ECU

A29   **V-B**   V cl   **4**   **2**

A42   **G**   **5**

Air flow o/p

A44   **G-B**   **3**

Ground

A37   **R/G**   **1**

Temperature O/P

Ignition switch

10 Amp

Bat+ 12V

P-0113
P-0112

CIRCUIT ENGINE MANAGEMENT SYSTEM
(EAGLE 2.2 LTR BS III)
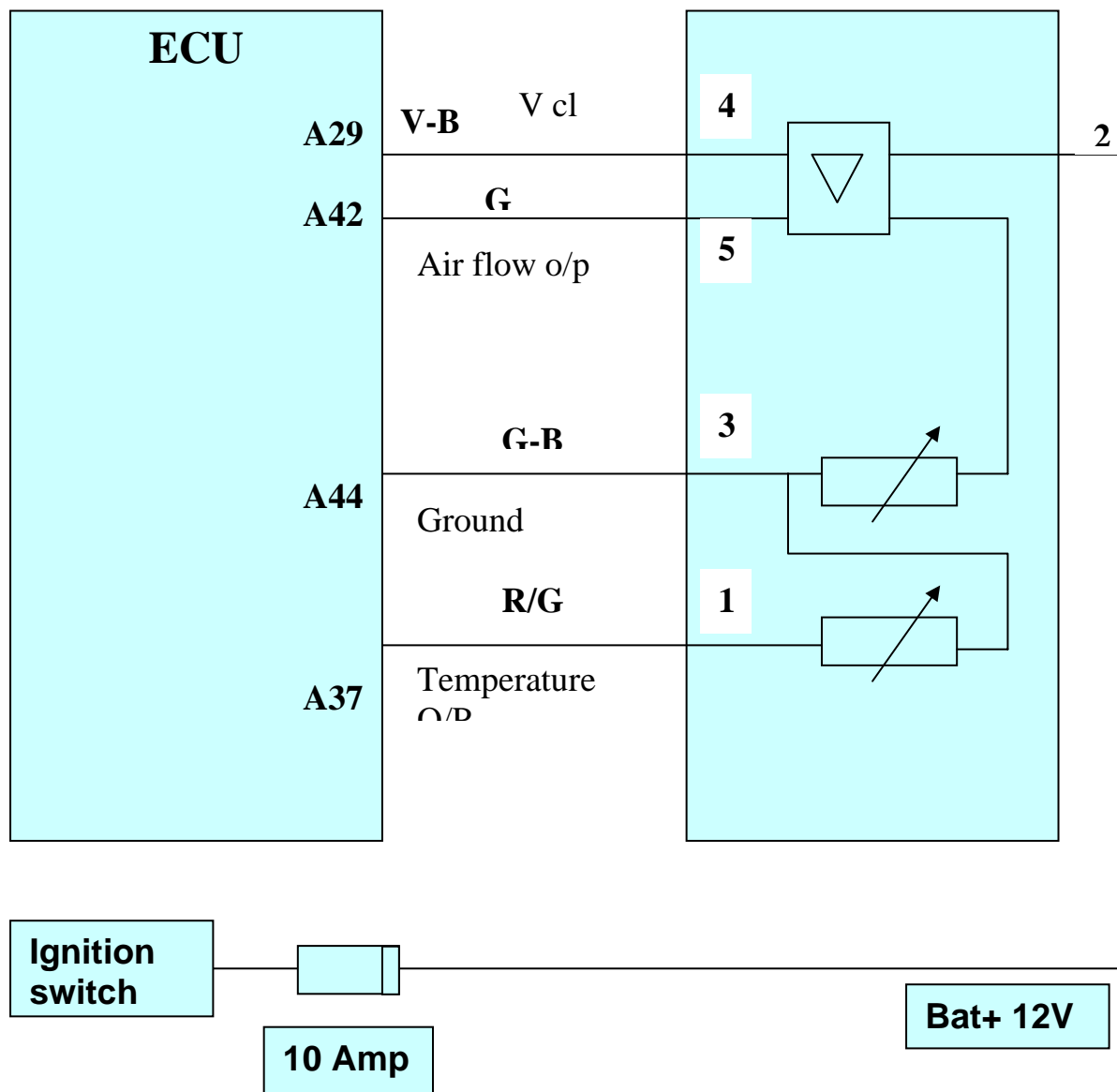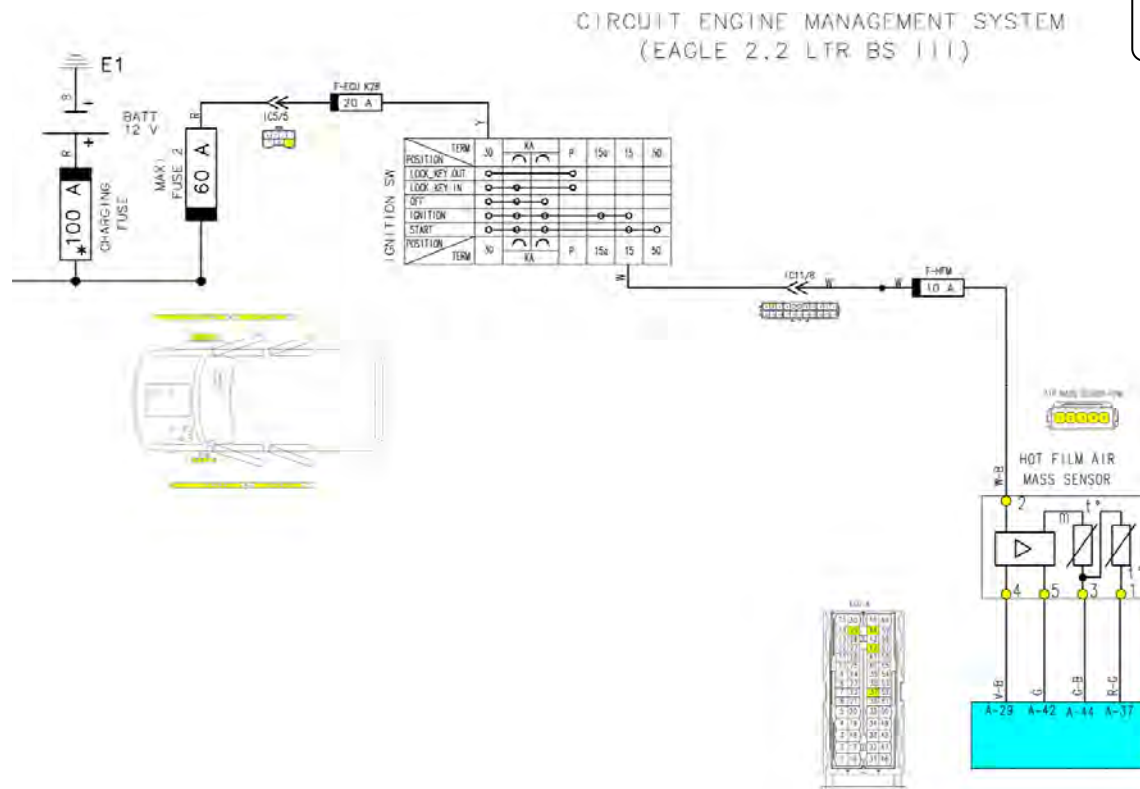
Test Procedure AFTSCD –

Codes: P0112, P0113

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0113 or P0112 are present.

Turn the ignition OFF
Disconnect HFM sensor Connector.
Turn the Ignition ON
Measure the voltage between the Terminal 3 & 4 of HFM Sensor Connector.
It should be 5 ± 0.3 Volts
Is it

Yes	No

Check fuses
Check continuity between the A29 & 4 (voltage)
Check continuity between A44 & 3 (Ground)
Repair the open wire.
Clear codes and verify that error has been eliminated.

P-0113
P-0112

Measure the continuity between A44 & 3 (ground)
- Is it?

Yes	No

Check the continuity between the A37 & 1 (output signal)	Rectify
	Clear codes & verify.

Yes	No

Replace the HFM sensor	Rectify
Clear codes & verify.	

P-0193
P-0192

Rail Pressure Sensor

DTC	Diagnostic item
P-0193	**V**oltage above upper limit.
P-0192	**V**oltage below lower limit.

DTC detection condition	Probable cause
Normal operation • When ignition is ON rail pressure sensor getting supply from ECU. • ECU reads the rail pressure in terms of voltage. • Engine is starting properly. • Building pressure in rail. **Malfunction** • Rail pressure output voltage is below **Reaction** • When ignition is ON system lamp is glowing. Engine is not starting & error is set in ECU Error memory.	• Open, shorted or wrong connection of rail pressure sensor circuit. • Rail pressure sensor failed.

P-0193
P-0192
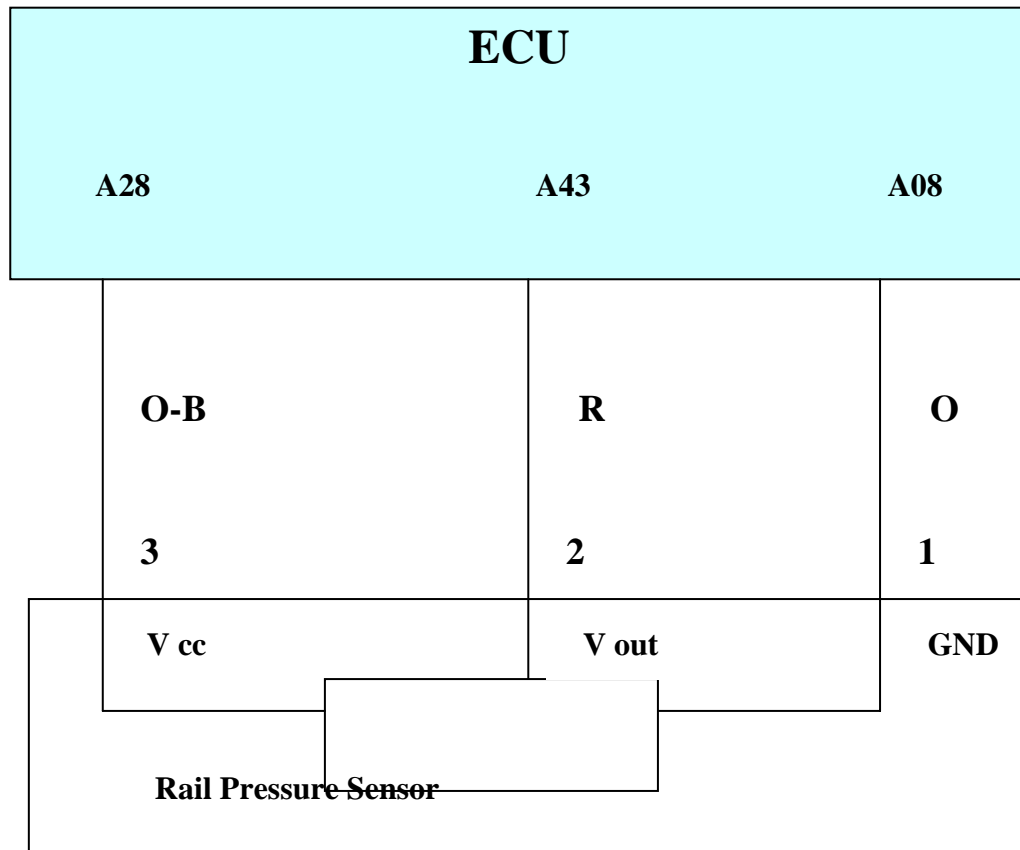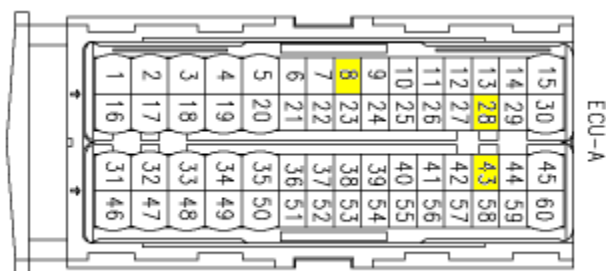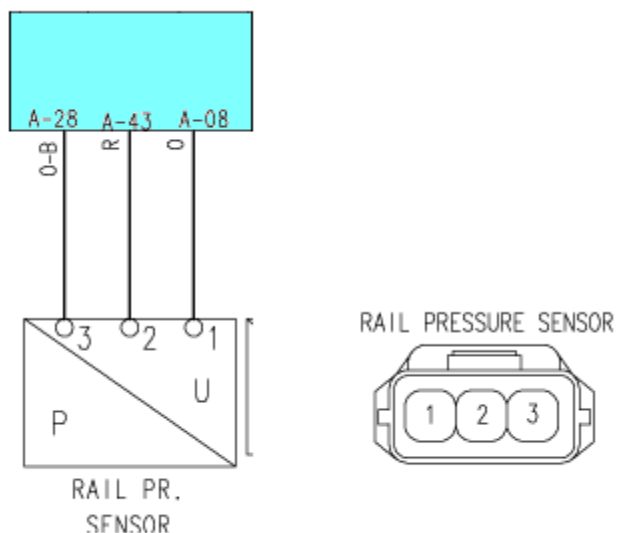
ECU

A28   A43   A08

O-B   R   O

3   2   1

V cc   V out   GND

Rail Pressure Sensor

P-0193
P-0192

RAIL PRESSURE SENSOR

RAIL PR. SENSOR

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P-0193 or P-0192 is present.

- Switch off the Ignition
- Disconnect the rail pressure sensor connector.
- Turn ON the Ignition.
- Measure the voltage between the supply and the ground of the Rail pressure sensor (Pin no 1 & 3 of the RPS connector).
- It should be 5 ± 0.3 Volts
- Is it?

Yes	No
Check the continuity between the ECU terminal A28 & pin no 3 of the RPS. Continuity between the ECU terminal A43 & pin no 2 of the RPS.	Repair the wire.

P-0193
P-0192

Is it OK?	Clear the error codes & verify.

Yes	**No**

Connect the rail pressure sensor connector to sensor.	Repair the wire. (Check for pins contamination)
Switch ON the Ignition.	Clear the error codes & verify.
Check the output of the RPS (Should be in range of 500 to 700 mVolts.	
Is it?	

Yes	**No**

Change the engine speed and check the corresponding increase in RPS value.	Rail pressure sensor has failed.
(This can be done using the live data in the 'Smart Tester')	Change the Rail assembly (RPS is not recommended to service separately)
Is there a change in the RPS.	Clear codes & verify

Yes	**No**

Clear codes & verify.	Replace rail.
	Clear codes & verify.

Rail Pressure Deviation

P-1192
P-1193

DTC	Diagnostic item
P-1192	Maximum positive Rail pressure deviation exceeded
P-1193	Maximum positive Rail pressure deviation exceeded concerning the set flow value

DTC detection condition	Probable cause
Proper Performance The ECU compares the rail pressure monitored through the RPS against the expected pressure generated due to HPP (Based on MPROP position and the engine RPM and other parameters) **Malfunction; out-of-range** • If the deviation is more then error is generated. **Reaction** • Engine will be switched OFF • Engine can not be started • System Check lamp is ON	**Possible Causes** • Defective fuel tank cap (improper breathing) • Fuel filter • Filter assembly • Tank strainer choked. • Injector stuck in open condition • M-Prop valve stuck

P-1192
P-1193
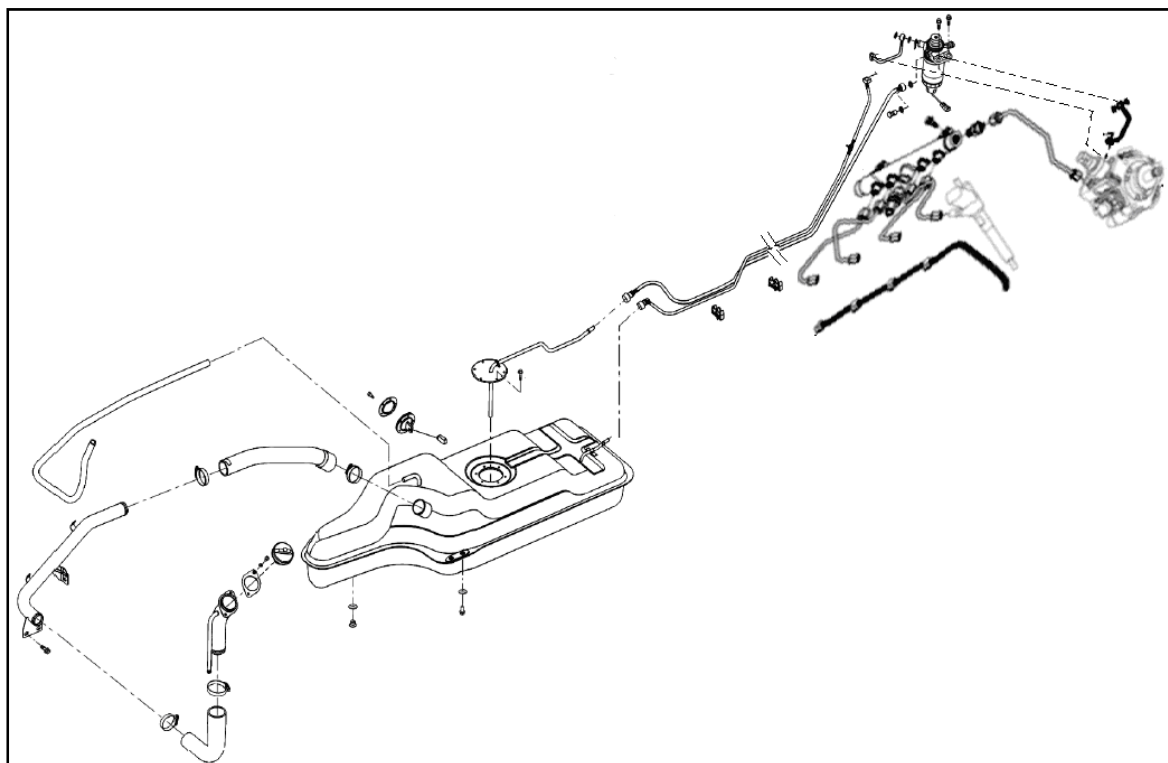
Test Procedure Rail Pressure Deviation -

1. Connect the 'Smart Tester' to diagnostic connector.
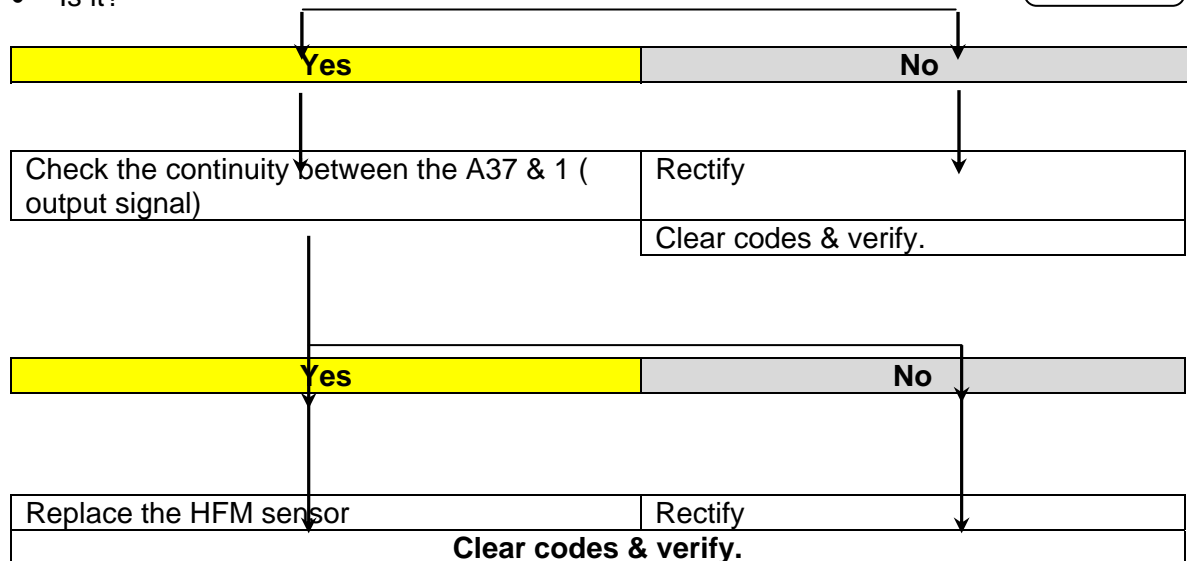2. Turn Ignition Switch ON.
3. Verify that either P1192/1193 is present.

P-1192
P-1193

Complaint < 2000 Kms. after filter change.

Yes

No

Air lock-do bleeding

OK

Change Filter & bleed

No

Change Filter assembly along with copper washer

Not OK

Clean tank strainer & fuel line

OK

Do bleeding at rail in the 4th cylinder injector nut as well as 2nd & 3rd

OK

Change Injector

Not OK

Check injector overflow

OK

Change HPP

Metering valve can be getting stuck

Hint: Try bleeding after removal of the fuel tank cap.

If that works, the cap is defective, change it.

Not OK

Change Rail & sensor

OK

Rail Pressure Deviation

P-1194

DTC	Diagnostic item
P-1194	Maximum negative rail pressure deviation with metering unit on lower limit is exceeded.

DTC detection condition	Probable cause

Proper Performance
 	
The negative pressure deviation is within the limit
 	
Malfunction; out-of-range
The error is reported if the negative rail pressure deviation is more then the specified in the map and at the same time the flow rate is also less
 	
Reaction
   *   The fuelling is controlled
   *   System Check lamp is ON
	Possible Causes
	
	Metering unit is stuck in open position,
	
	Metering unit without power due to electrical error.

Rail Pressure Deviation

P-1195

DTC	Diagnostic item
P-1195	Minimum rail pressure exceeded.

DTC detection condition	Probable cause
Proper Performance The rail pressure is within the limit. **Malfunction; out-of-range** If the rail pressure falls below engine speed threshold Then the error is generated. . **Reaction** * System Check lamp is ON	**Possible Causes** **Possible causes in low pressure system :** Pressure before gear pump too low, gear pump output too low due to (filter clogged up, leak on low pressure side),. **Leakage in the high pressure section due to :-** injection nozzle stuck in open position, worn high pressure pump, worn injector, leaking pressure limiting valve

Diagnostic tester does not
get connected

K line: Diagnostic connector

The diagnostic tester does not get connected.
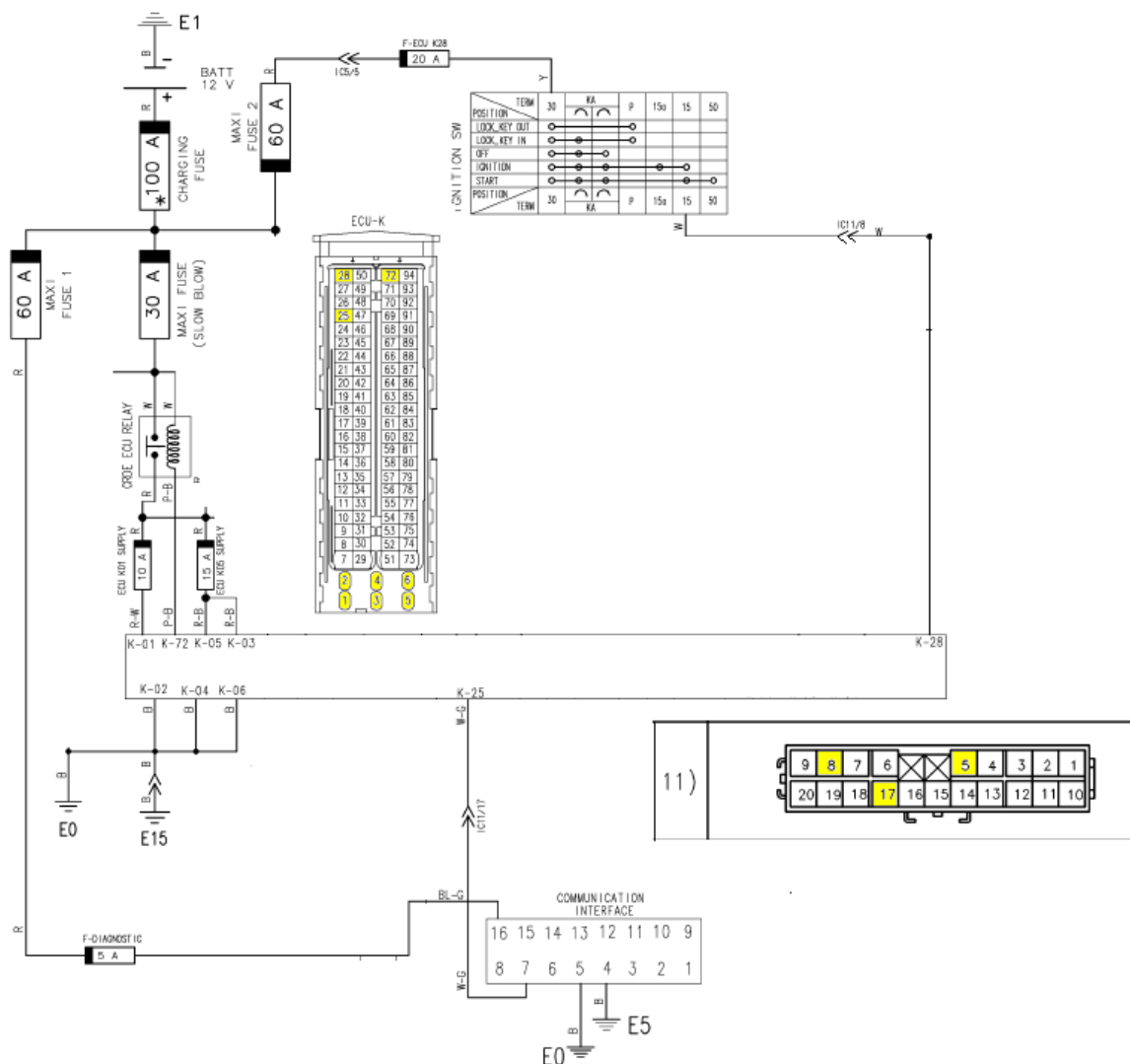
INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

Connect the 'Smart Tester' to the Diagnostic Connector.
Turn the Ignition ON.
Check for the connection on the 'Smart Tester'.
Is it OK?

> Diagnostic tester does not get connected

No	Yes
Remove the smart tester from the connector.	Diagnostic connector is OK.
Switch on the Ignition.	
Check the voltage of the pin no 4/5 & 7 of the connector (It should show 12 Volts when Ignition is ON and show 0 Volts when Ignition is switched OFF.	
Is it OK?	

No	Yes
Check connectivity between K25 and diagnostic connector pin no 7.	Check the voltage between the connector pins10 & pin 4/5. It should show 12 V continuously.
If is not OK, then repair.	If it is not showing , repair the connection.
Check the voltage.	Otherwise it indicates less/poor/intermittent contact.
Is it OK.	Repair

Yes	No
Connect smart tester & confirm.	Diagnostic hardware is faulty.
	Change the hardware.

EGR power stage

| P-0406 |
| P-0405 |
| P-0403 |
| P-0404 |

Description
A pulse-width-modulated signal is output for the Exhaust Gas Recirculation actuator control. Converting the air control output into duty cycle carries this out. The possible defects are short circuit to battery, ground & no load.

DTC	Diagnostic item
P-0406	Short Circuit Battery
P-0405	Short Circuit Ground
P-0403	No Load
P-0404	Excess Temperature

DTC detection condition	Probable cause
Background * The ECU checks current flows in the EGR solenoid drive circuit when the solenoid is ON and OFF. Range of check, set conditions. * When the EGR solenoid is turned OFF, no surge voltage is detected. **Normal operation** • When engine is running per the EGR mapping. • System lamp off after 2 sec. **Malfunction** • EGR valve will remain open in case of short circuit to ground fault & remain closed for other fault conditions. **Reaction** • System lamp will blink in case of short circuit to ground condition i.e.P0405.For all other fault condition (related to EGR) lamp will be OFF. • Emission will affect.	* Open or shorted EGR solenoid circuit, loose or wrong connection. * EGR solenoid failed * EGR control vacuum is too low

P-0406
P-0405
P-0403
P-0404

EAGLE 2.2 LTR BS III
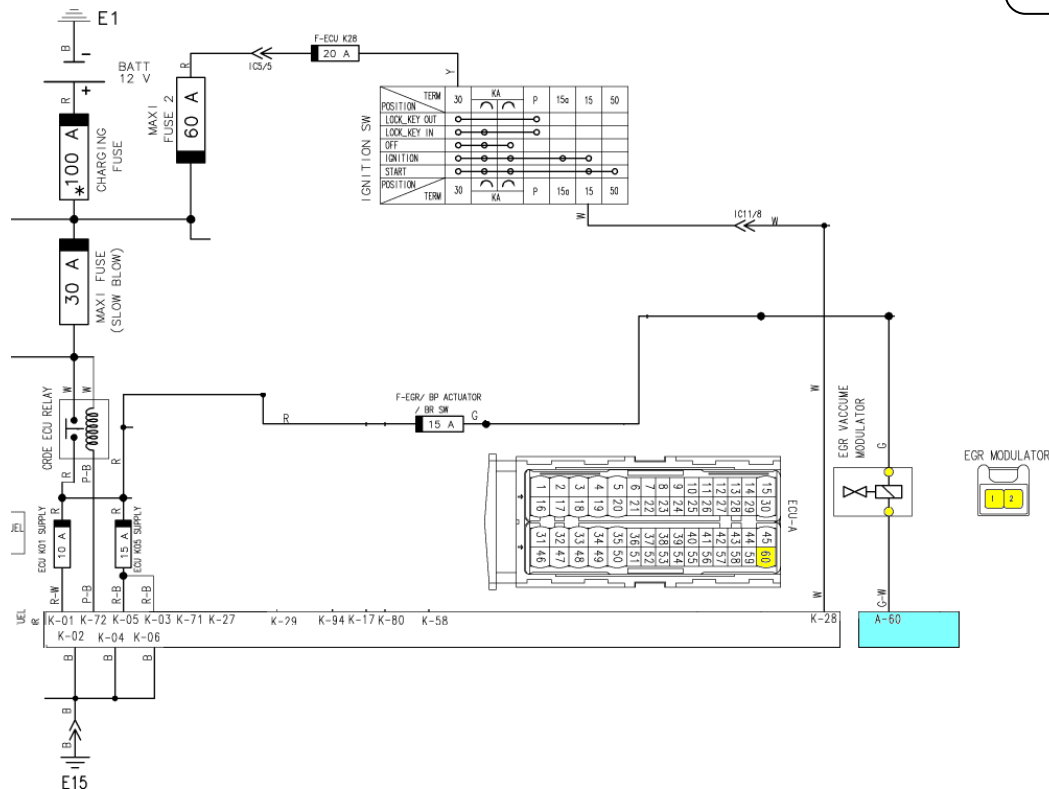
*- Twisted pair

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0406 or P0405 or P0403 or P0404 are present.

- Disconnect the EGR control solenoid valve connector.
- Turn Ignition ON
- Check the voltage between Ground & EGR control solenoid, valve harness connector terminal. Battery voltage should be present.
- It should be 12 V when Ignition ON.
- Is it?

Yes	No
Turn Ignition OFF.	Verify that the 15 Amp fuse is OK (same fuse is also used for brake & clutch switch).
Disconnect the EGR control solenoid.	Repair open or short to Ground on wire

P-0406
P-0405
P-0403
P-0404

	between ECU control relay & EGR control solenoid valve.
Disconnect the ECU connector.	Clear codes & verify.
Check the continuity of the EGR connector with ECU terminal A 60.	
Is it OK?	

Yes	**No**
Are the connectors OK (check for bent pins or oxidation).	Rectify the wiring.
	Clear codes & verify.

Yes	**No**
Replace EGR solenoid with known good components.	Rectify the wiring harness.
Clear codes & verify EGR solenoid is within limits.	
If problem persist, replace EGR.	

Note – The Modulator for EGR is Black in colour.

P-1340

Error path of offset between camshaft and crankshaft

DTC	Diagnostic item
P-1340	Offset between camshaft and crankshaft

DTC detection condition	Probable cause
Normal operation * Engine is being cranked & started. **Malfunction** * Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 4 sec. * No synchronization between crankshaft & camshaft signal. **Reaction** * Engine is not being cranked. * System lamp will continuously ON.	• Mounting of phase sensor, speed sensor or flywheel is loose. • Manufacturing defect. • Sensors faulty or damaged.

Segment Speed Sensor (camshaft sensor)

P-1340
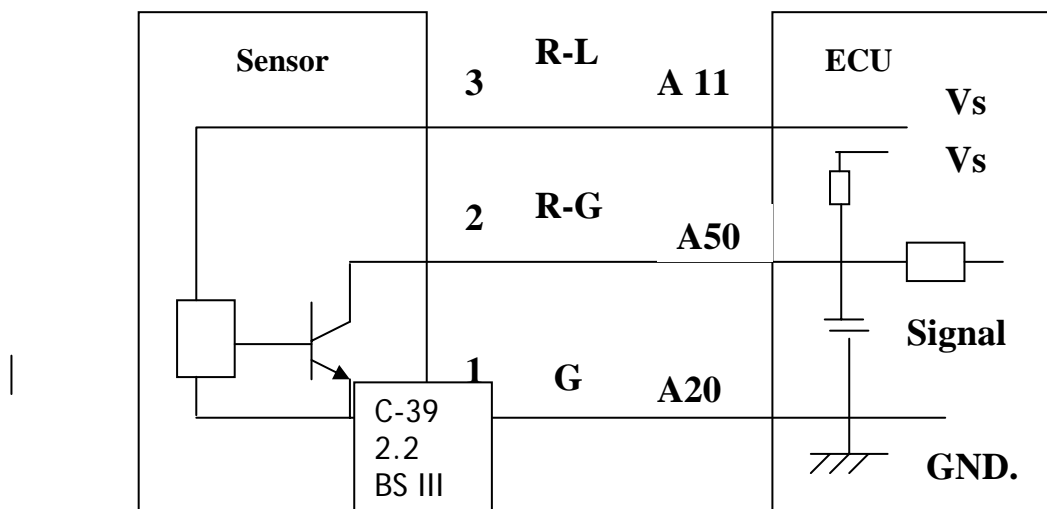
Vs= Supply voltage- 5V
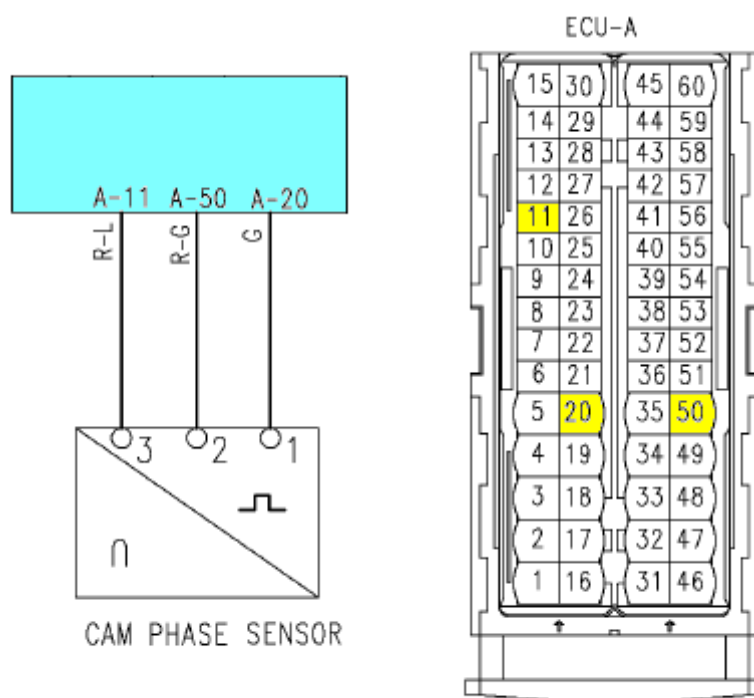
CAM PHASE SENSOR

ECU-A

P-1340

ISS (Incremental speed sensor/ Crankshaft speed sensor)

Sensor   **ECU**

N   S

Y

1   A 27   Positive

2   A 12   Negative

                                     Shield

3   B-R   A 21

ECU-A

A-27 A-12 A-21

Y   Br   SHIELD

1   2   3

ENGINE
SPEED SENSOR
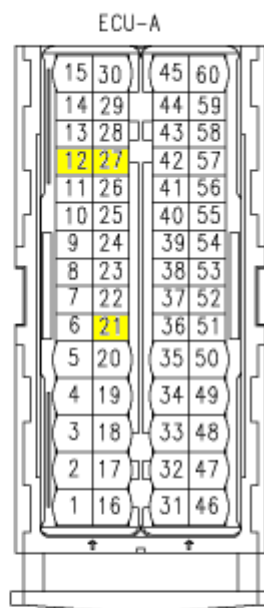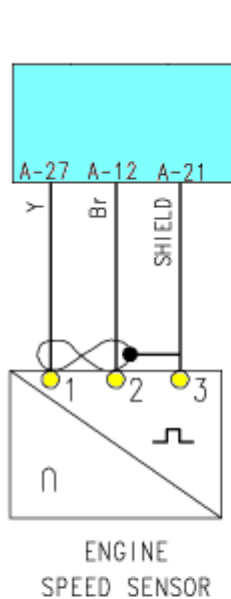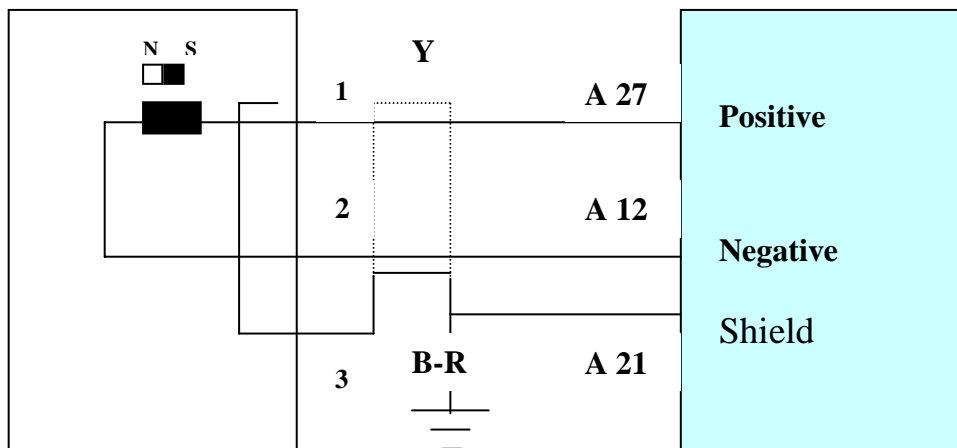
ENGINE SPEED SENSOR

1 2 3
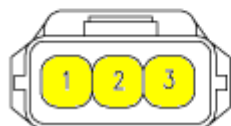
1. Connect the 'Smart Tester' to diagnostic connector
2. Turn Ignition Switch ON.
3. Verify that P1340 is present.

P-1340

Turn the Ignition OFF.
Disconnect the camshaft & also the crankshaft sensors.

Yes	**No**
Check the sensor mounting of crank shaft speed sensor.	Correct the mounting.
Check the wiring harness continuity between the cam sensor to ECU & also the crankshaft speed sensor to ECU.	Clear codes & verify that the signal is within limit.
Flywheel mounting is OK.	
Check the phase sensor for any nicks.	

Yes	**No**
Check for any manufacturing defects.	Correct the mounting.
Clear codes & verify that the signal is within limit.	Clear codes & verify that the signal is within limit.
If it is not in limit, change the corresponding sensor.	

Fuel Temperature Sensor

P-0182
P-0183

Fuel Temperature Sensor

P-0182
P-0183

Description –

Fuel temperature sensor acquires the raw value of the fuel temperature. The raw value is linearised and monitored for compliance with the signal range. The sensor is a NTC type

DTC	Diagnostic item
P-0182	Voltage above upper limit
P-0183	**Voltage below lower limit**

DTC detection condition	Probable cause
Background * The fuel temperature sensor converts the engine fuel temperature to a voltage and outputs it. * The ECU checks whether the voltage is within a specified range. **Malfunction; out-of-range** * Sensor output voltage has continued to be 5V or higher for 4 sec. * Sensor output voltage has continued to be 0.1V or lower for 4 sec. **Reaction** * System lamp will blink continuously. * Engine will run with default fuel temp of 20 Deg C.	• Open or shorted Engine fuel temperature sensor circuit, loose or wrong connection • Fuel temperature sensor failed.

P-0182
P-0183

FUEL TEMP. SENSOR

FUEL TEMP. SENSOR

ECU-A
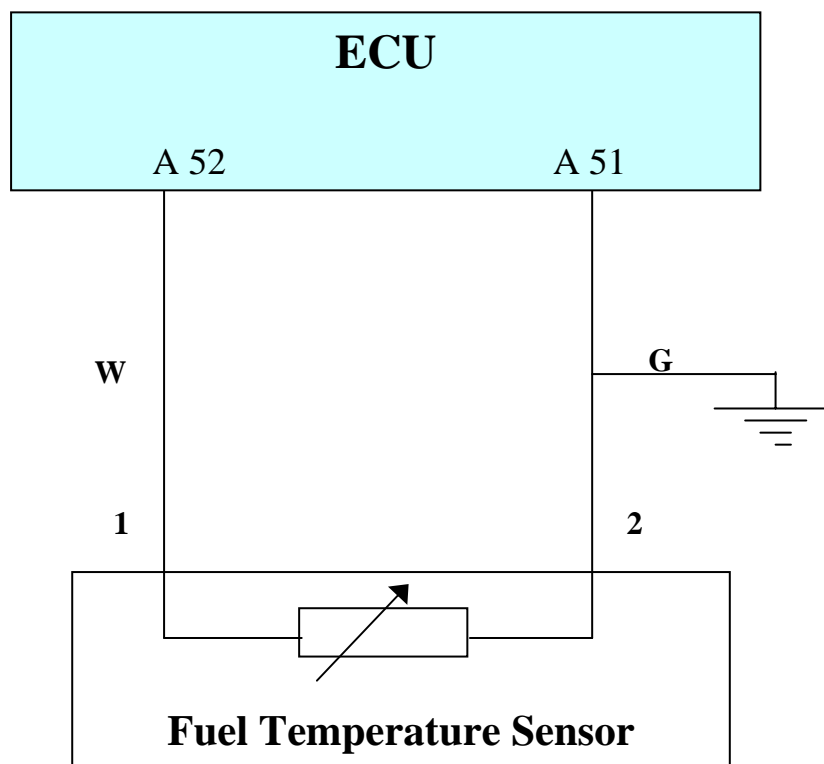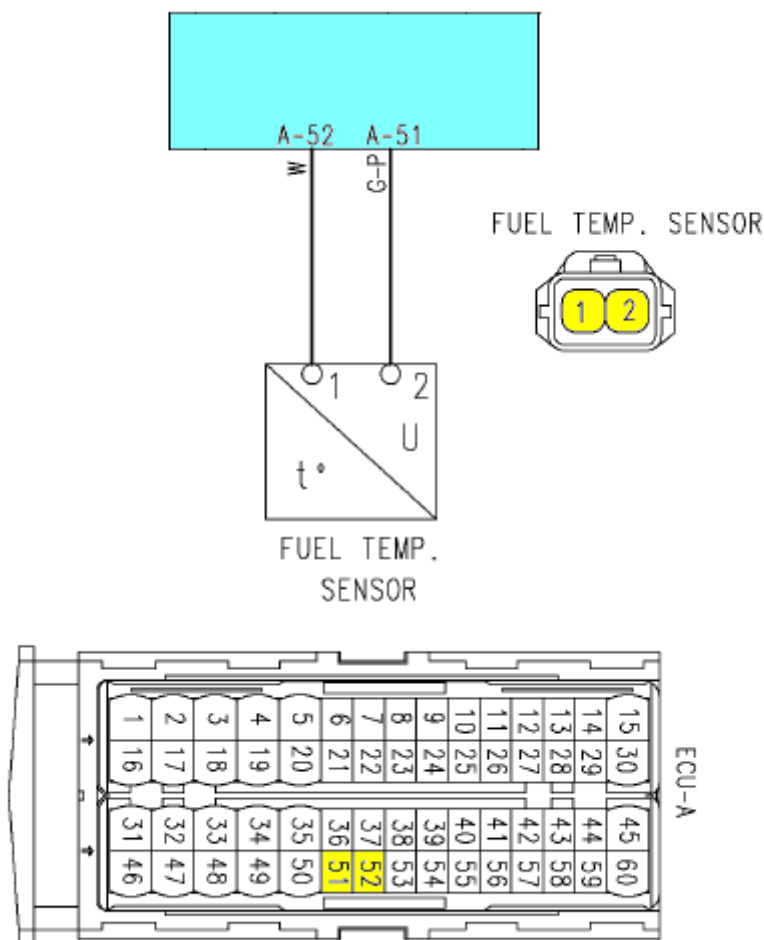
Test Procedure Fuel Temperature Sensor –

Codes: P-0182, P-0183

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn the Ignition Switch ON.
3. Verify that either P0182 or P0183 are present.

- Turn the Ignition OFF.
- Disconnect the FTS connector.
- Turn the Ignition ON and check the voltage between FTS' signal terminal 1 and ground.
- It should be 5 V ± 0.3 when Ignition ON
- Is it?
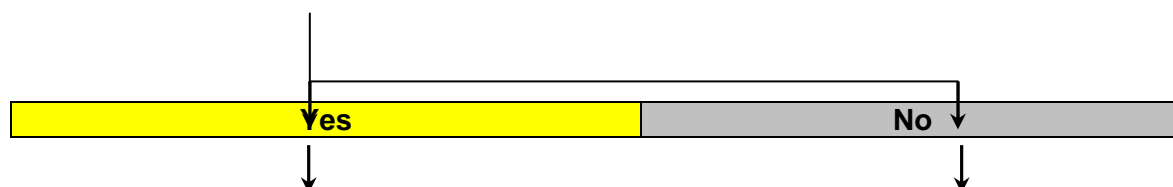
Yes **No**

P-0182
P-0183

Turn the Ignition OFF.	Open or short between FTS signal terminal 1 and ECU.
Measure continuity between A 52 of ECU & connector terminal 1.	Repair as necessary.
Measure continuity between A 51 of ECU & connector terminal 2.	
Is it OK ?	

Yes	**No**

Connect FTS connector.	Open or short between FTS signal terminal 1 and ECU.
Turn Ignition ON.	Repair as necessary.
Check the voltage of FTS (at A51 & A52)	
Is it as per specification ?	

Yes	**No**

Poor terminal contact due to oxidation , bent or misplaced terminal.	Temporarily install a known good FTS and check for proper operation.
Repair as necessary.	If problem is corrected, replace FTS.

- Return vehicle to original condition. Clear all DTC.
- Verify by driving vehicle with "Smart Tester" connected and monitor for error codes.

P-1252
P-1253
P-1250
P-1251

Metering unit pump -Power stage

DTC	Diagnostic item
P-1252	Short Circuit to Battery
P-1253	Short Circuit to Ground
P-1250	No Load
P-1251	Excess Temperature

DTC detection condition	Probable cause
Normal operation • When ignition is ON pump is getting supply from ECU. • Engine is starting properly. **Malfunction** • When ignition is ON pump is not getting PWM signal from ECU. **Reaction** • Engine is not starting & error is recorded in ECU error memory. • Fuel output is not available from pump. • System lamp will remain ON.	• Open, shorted or wrong connection of pump circuit.

P-1252
P-1253
P-1250
P-1251

High Pressure Pump (with fuel metering unit)
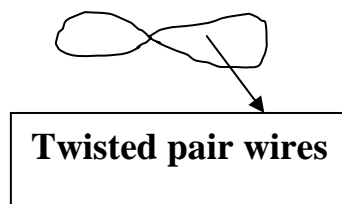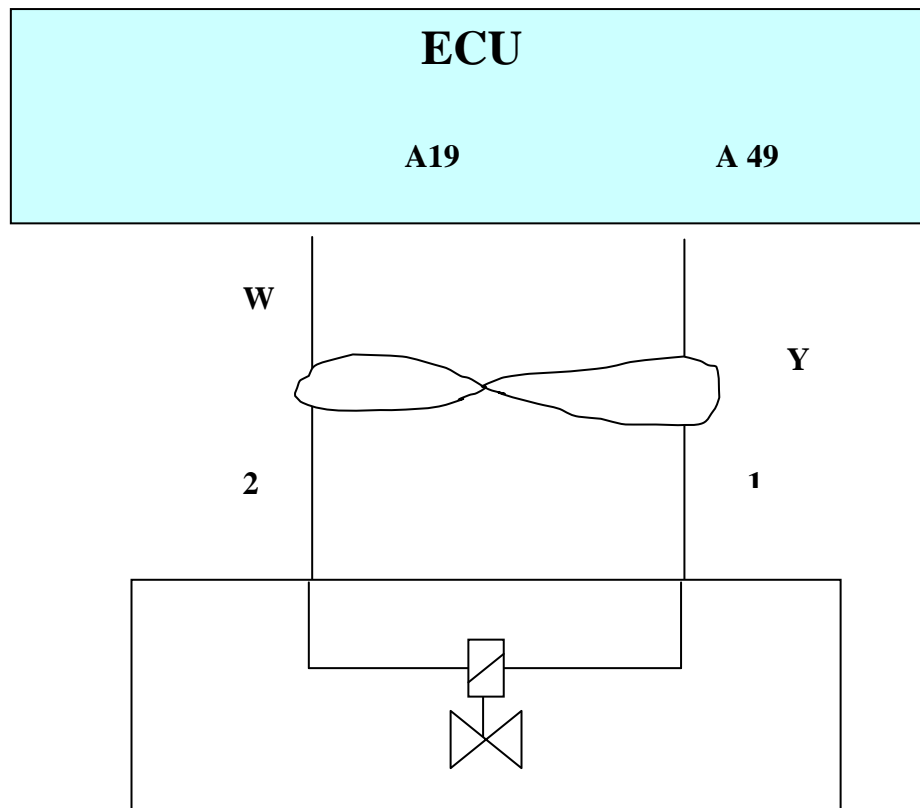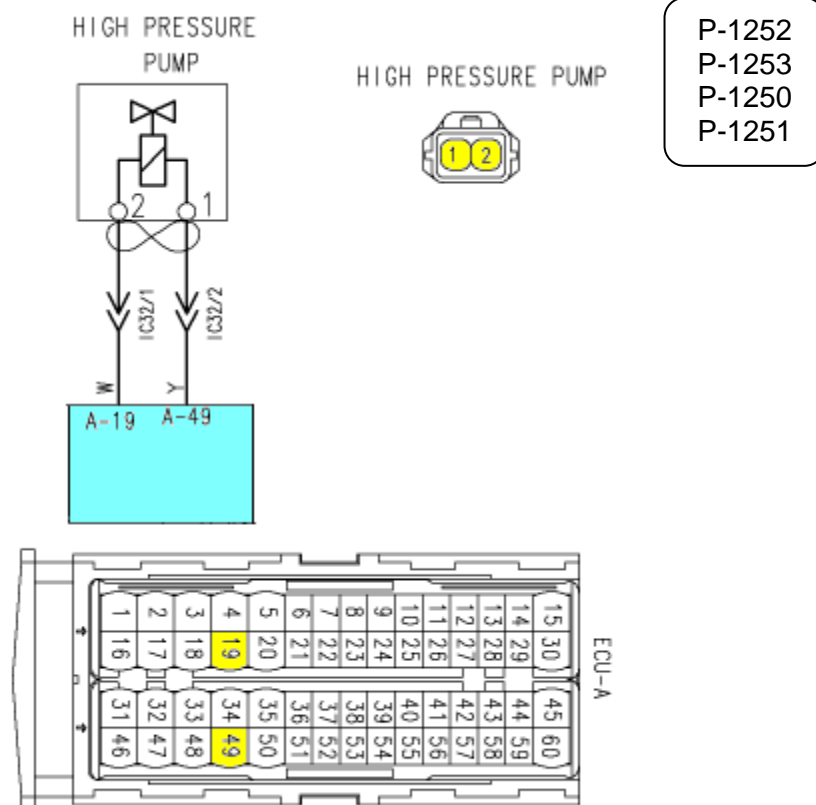
Twisted pair wires

HIGH PRESSURE PUMP

HIGH PRESSURE PUMP

P-1252
P-1253
P-1250
P-1251

ECU-A

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P-1252 or P-1253 or P-1250 or P-1251 is present.

- Check the connections to the pump.
- Check that the connections are connected correctly; and that it is not connected in reverse way.
- Disconnect the pump and ECU connectors.
- Check the continuity between the ECU terminal A19 and pump terminal 2.
- Check the continuity between the ACY terminal A49 with pump terminal 1.
- Is it OK?

Yes	No
Check the continuity of ECU connector terminal A49 and A19 with Battery +ve and Ground.	Check for terminal contamination. Repair the connection.
Is it OK?	Clear codes and verify that the error

P-1252
P-1253
P-1250
P-1251

	has been eliminated.

No	**Yes**
Error observed due to loose/ intermittent connection.	There is a possibility of short circuit of battery to ground.
Ensure that the connections are proper.	Repair the connections.
Clear codes and verify the error.	Clear codes & verify.

Hint: The Error Code P 1251 can also be generated if there is leakage in the HPP adaptor.

Main relay

<div style="float:right; border:1px solid black">
P-121A
P-121B
</div>

DTC	Diagnostic item
P-121A	Main relay does not open in time
P-121B	Main relay opens too early

DTC detection condition	Probable cause
Normal operation • While cranking engine will start properly. **Malfunction** • Supply will not come to ECU input. **Reaction** • Engine will not start. • No communication with smart tester. • System check lamp will be on.	• Open, shorted or wrong connection of main relay. • Main relay fuse is blown. • Relay is not working

P-121A
P-121B

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
5	I/C IP TO ENGINE ROOM	MALE	A PILLAR RIGHT	5+2
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

INTER-CONNECTOR DETAILS
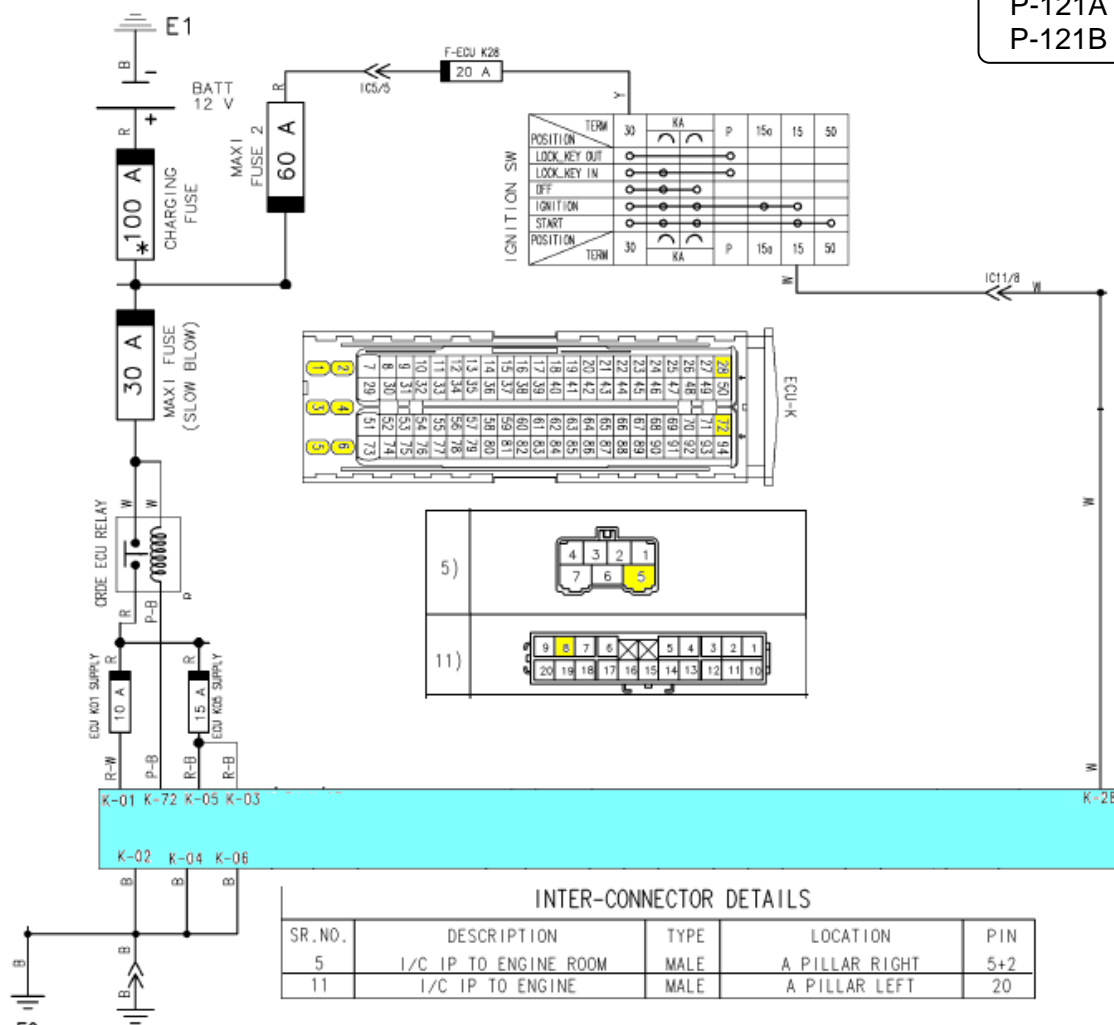
Engine not cranking – 'Smart Tester' not responding.

Turn the Ignition OFF.
Check battery voltage. It should be greater than 8 Volts.
Check the 30 Amp fuse.

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P121A or P121B is present.

- Ensure that the main relay is inserted properly in the connector
- Remove relay.
- Check the relay externally.
- Give 12 Volts to terminal 86 and Ground the terminal 85.
- A clicking sound should be heard.
- If the sound is not heard, replace the relay.
- Check if 12 Volts is available at terminal 30, 86 & 85.
- With respect to ground, terminal 87 should show 0 Volts.
- Is it OK?

P-121A
P-121B

Yes	No
Switch ON the Ignition.	Check the wiring harness.
Measure the voltage at terminal K72 of ECU or terminal 85 of the relay.	Repair the main relay connections (check the 30 Amp fuse)
Is it showing 0 Volts ?	Clear codes & verify that the main relay is working properly.

Yes	No
Measure the voltage at ECU terminal K05/K01. Or at terminal 87 of the relay.	Check that the terminal K 28 of ECU is showing 12 Volts. If not repair the connection.
It should show 12 Volts.	

Yes	No
Clear codes and verify that the main relay is working properly.	Replace the relay with a known good component.
	Clear codes and verify that the main relay is working properly.

P-0577
P-0576
P-0575

Cruise Control

DTC	Diagnostic item
P-0577	SRC MAX error for analog signal
P-0576	SRC MIN error for analog signal
P-0575	Plausibility error for analog signal

DTC detection condition	Probable cause
Normal operation • When vehicle is running, no clutch & brake is pressed, by pressing cruise control switch vehicle will go into cruise mode. • Pressing resume key; vehicle will set the previous set speed. • Pressing set + or Set - vehicle speed can be adjusted. • Pressing OFF switch, vehicle will come out of cruise mode. • It will be operational in 2nd /3rd /4th & 5th Gear. • Clutch signal & brake switch signal are ok. • Engine RPM is > 1200 **Malfunction** • By pressing any of the cruise control switch vehicle will not go into cruise mode. • Vehicle will not respond to set +, Set -, OFF or resume switch when vehicle is in cruise mode.	* Open, shorted or wrong connection of cruise control circuit. * Brake or clutch error is set into ECU. • Switches are not responding or faulty. • Engine RPM less than 1200.

P-0577
P-0576
P-0575
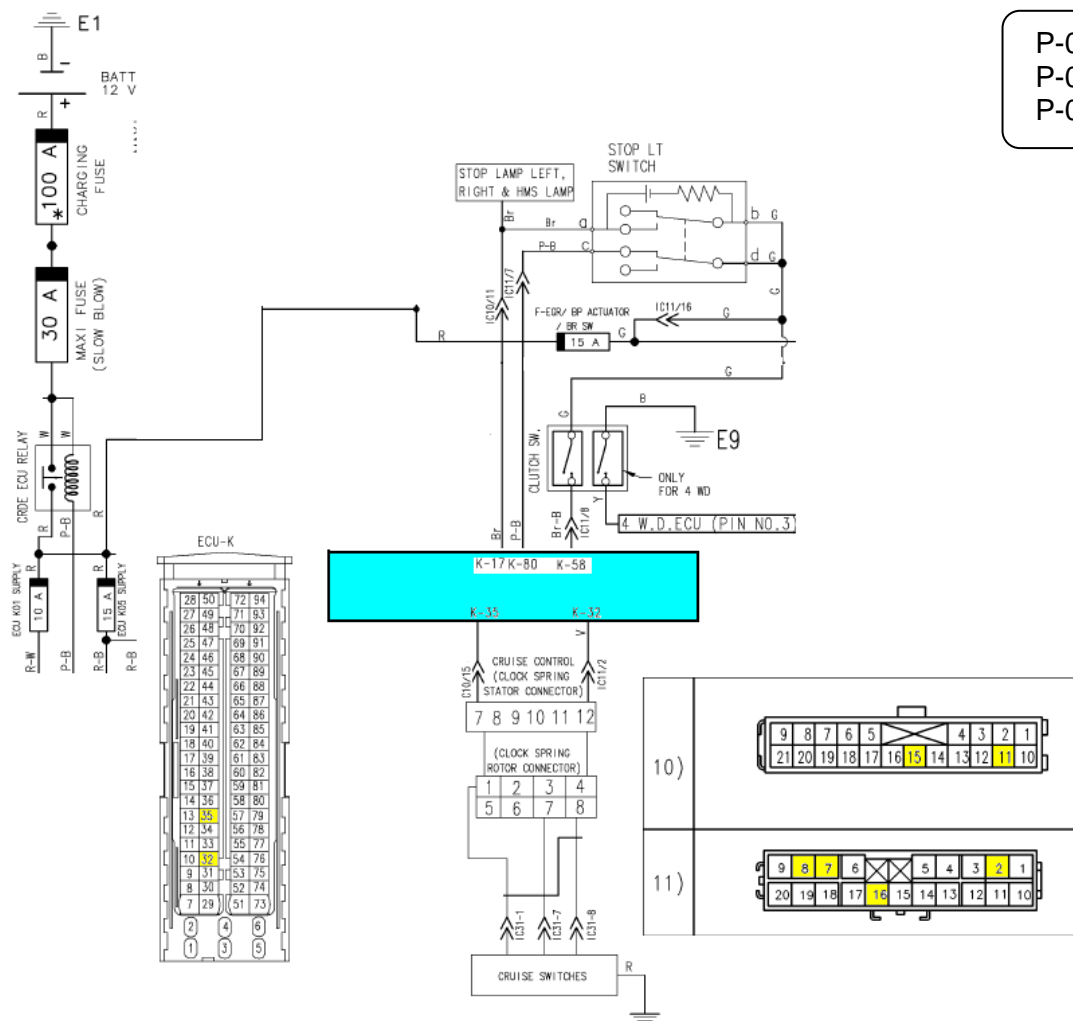
ECU

K35   **K32**   **K80**   **K17**

K58

W-B   V   P-B   Br   Br-B

Redunda nt brake switch

On/off

On/O

Set -

Set +

Coast/Resu

Clutch

Main brake switch

C-39 2.2 BS III

Coast / Reset

15A

15

Batte

Batte

Cruise control activator

P-0577
P-0576
P-0575

INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

P-0577
P-0576
P-0575

Connect the 'Smart Tester' to diagnostic connector.
1. Turn the Ignition Switch ON.
2. Verify that either P0577 or P0576 or P0575 is present.

- Turn the Ignition OFF/ON to measure the Voltages.
- Check the resistances across all the switches when they are activated

Parameter	Resistance	Voltage
No key pressed	4.323 K Ώ	4.35 V
ON/OFF	150 Ώ	0.9823 V
Coast/Reset	1.63 K Ώ	3.61 V
Set +	810 Ώ	2.845 V
Set -	420 K Ώ	2.035 V

Do the switch show the above value?

Yes	No

Switch ON the Ignition.	Switches are faulty.
Check if there is any error of the brake & clutch switch set. Clear them.	Replace the switch with a new good part.
Is there any other error present?	Clear codes & verify.

Yes	No

Diagnose the error & clear it.	Check the connection of ECU terminals K 35 & K32 and the cruise control switch connections.
Clear codes & verify that the cruise control is functioning properly.	
Is it OK?	

Yes	No

Check for any short or intermittent connections.	Repair the connections.
Repair it.	Clear codes & verify that the cruise control is working properly.
Clear codes & verify that the cruise control is working properly.	

Battery

P-0563
P-0562
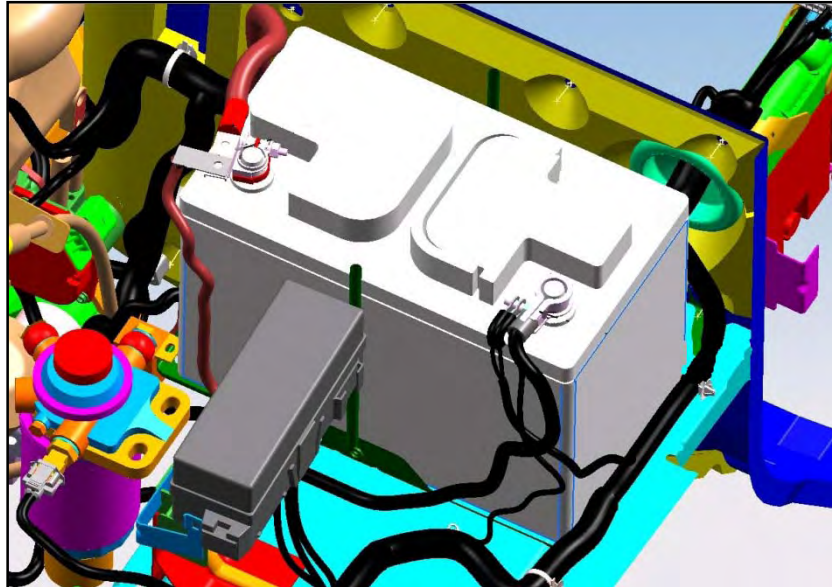
Battery

P-0563
P-0562

Description:

The system voltage has to guarantee to perform diagnosis functions. The Electronic Control Unit (ECU) monitors battery voltage. If this code is set, the System Lamp is off.

DTC	Diagnostic item
P-0563	Voltage above upper limit
P-0562	Voltage below lower limit.

DTC detection condition	Probable cause
Detecting Condition * Battery voltage <8 V Enable Condition - No main relay failure * Battery voltage > 16V Enable Condition - No main relay failure	• Charging system not working. • Wiring harness to ECU faulty.

Test Procedure Battery –

- Check charging system.
- Check charging system (including battery) for proper operation.
- Refer the charging system section in the Electrical.
- Charging system OK. (Voltage during cranking should be at least 9 volts)

Yes	No
Check the ECU, problem procedure.	Repair or replace.
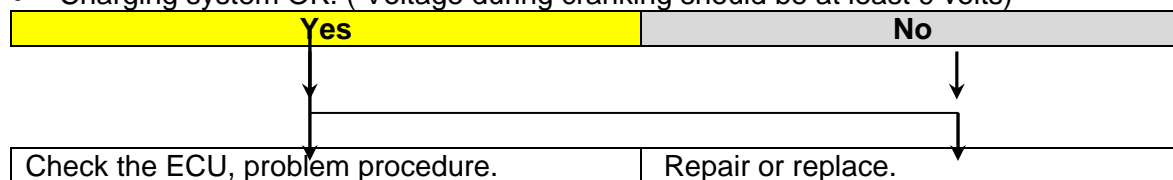
Brake Switch

| P-1792 |
| P-1791 |

Description:

The function acquires and processes the information via the brake contact and the redundant brake contact. The status message of the brake position is the output.

DTC	Diagnostic item
P-1792	**Brake signal is defective**
P-1791	Brake signals not plausible

DTC detection condition	Probable cause
Principle * The brake switch outputs a voltage, which corresponds to the brake position. * The ECU checks whether this voltage is within a specified range (0 or 12V). **Normal Operation** * Ignition switch: ON * System lamp: OFF after 2 Sec * Battery voltage is 8V –16V. **Malfunction** * The sensor output voltage has continued to be 0V in spite of brake pedal being pressed/not pressed * The sensor output voltage has continued to 12V in spite of brake pedal being pressed/not pressed * Main or redundant switch is not working. **Reaction** * System lamp will be off. Cruise control will not work.	• Open, shorted, loose or wrong connections of brake switch Wiring. • Brake switch damage or faulty • Brake switch failed or maladjusted. .

P-1792
P-1791

CIRCUIT ENGINE MANAGEMENT SYSTEM
(EAGLE 2.2 LTR BS III)
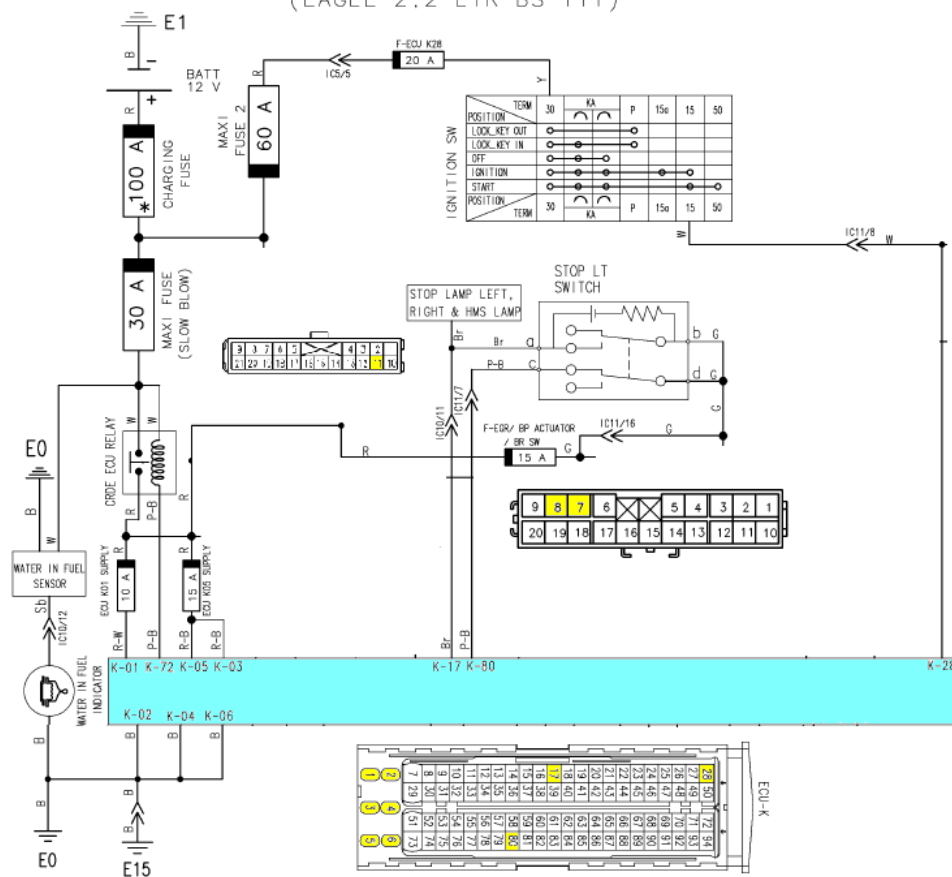
INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

Test Procedure Brake switch --

P-1792
P-1791

Codes: P-01792, P-1791

1. Connect the 'Smart Tester' to diagnostic connector
2. Turn Ignition Switch ON
3. Verify that either P1791 or P1792 are present.
   Disconnect the brake switch connector.
- Turn Ignition ON and check the supply voltage to brake switch two point connector.
- It should be 12 V when Ignition ON
- Is it?

Yes	No
Turn the Ignition OFF.	Check the 15 Amp fuse after the main relay.
Connect the brake switch connector.	Check the supply to K01 & K05. (Fuses of K01 & K05)
Check the voltage at K80 of ECU input pin when the brake is in released position. When the brake pedal is pressed then it should be checked at K17.	Repair connections as necessary.
It should be 12 V. Is it?	Clear codes & verify.

Yes	No
Replace the brake switch with known good component.	Turn Ignition OFF
Check for error.	Remove brake switch connection & check continuity between terminal K17 & K80 to brake switch connector.
Clear the error memory.	Is it OK?

No	Yes
Repair the connection as necessary.	Replace the brake switch with known good component
Clear the error and verify.	

Clutch Switch – (With MT)

P-0704

DTC	Diagnostic item
P-0704	Clutch signal is not plausible

Description

The clutch signal is acquired as a hardware signal. The signal is checked for plausibility using gear information. Error is detected, if there is a valid gear change without the clutch being pressed during the time that elapsed since the last gear change.

DTC detection condition	Probable cause
Normal Operation * The clutch switch outputs a voltage, which corresponds to the clutch position. * The ECU checks whether this voltage is within a specified range (0 or 12V). **Normal Operating Requirements:** * Ignition switch: ON * Malfunction lamp: OFF after 2 Sec * Battery voltage is 8V –16V. **Malfunction** * The sensor output voltage has continued to be 0V in spite of clutch pedal being pressed/not pressed. * The sensor output voltage has continued to 12V in spite of clutch pedal being pressed/not pressed. **Reaction:** * System lamp will be off. * Cruise control will not work.	• Open, shorted, loose or wrong connections of brake switch Wiring. • Clutch switch failed or maladjusted. • Clutch switch damage or faulty.

15 Amp

Br-B

4

R

G

4

K58

Clutch switch (normally closed)

ECU

P-0704

EAGLE 2.2 LTR BS III

INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
5	I/C IP TO ENGINE ROOM	MALE	A PILLAR RIGHT	5+2
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20
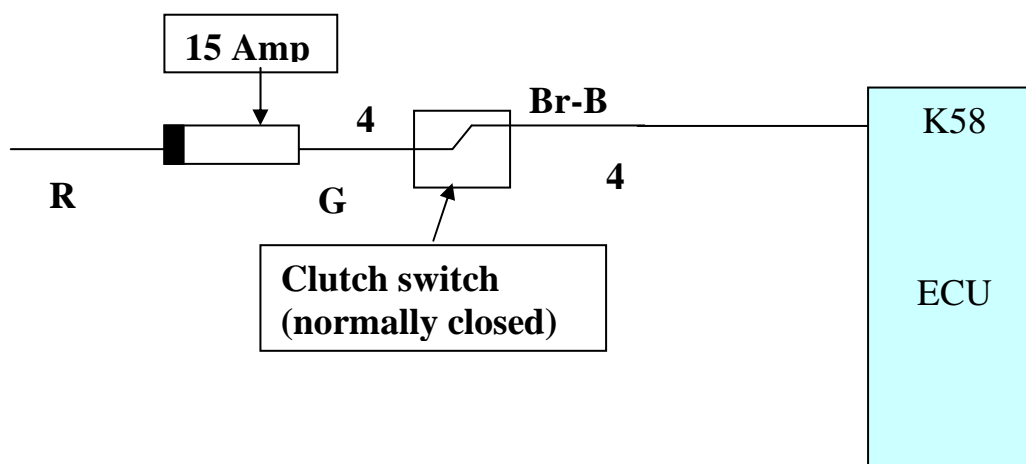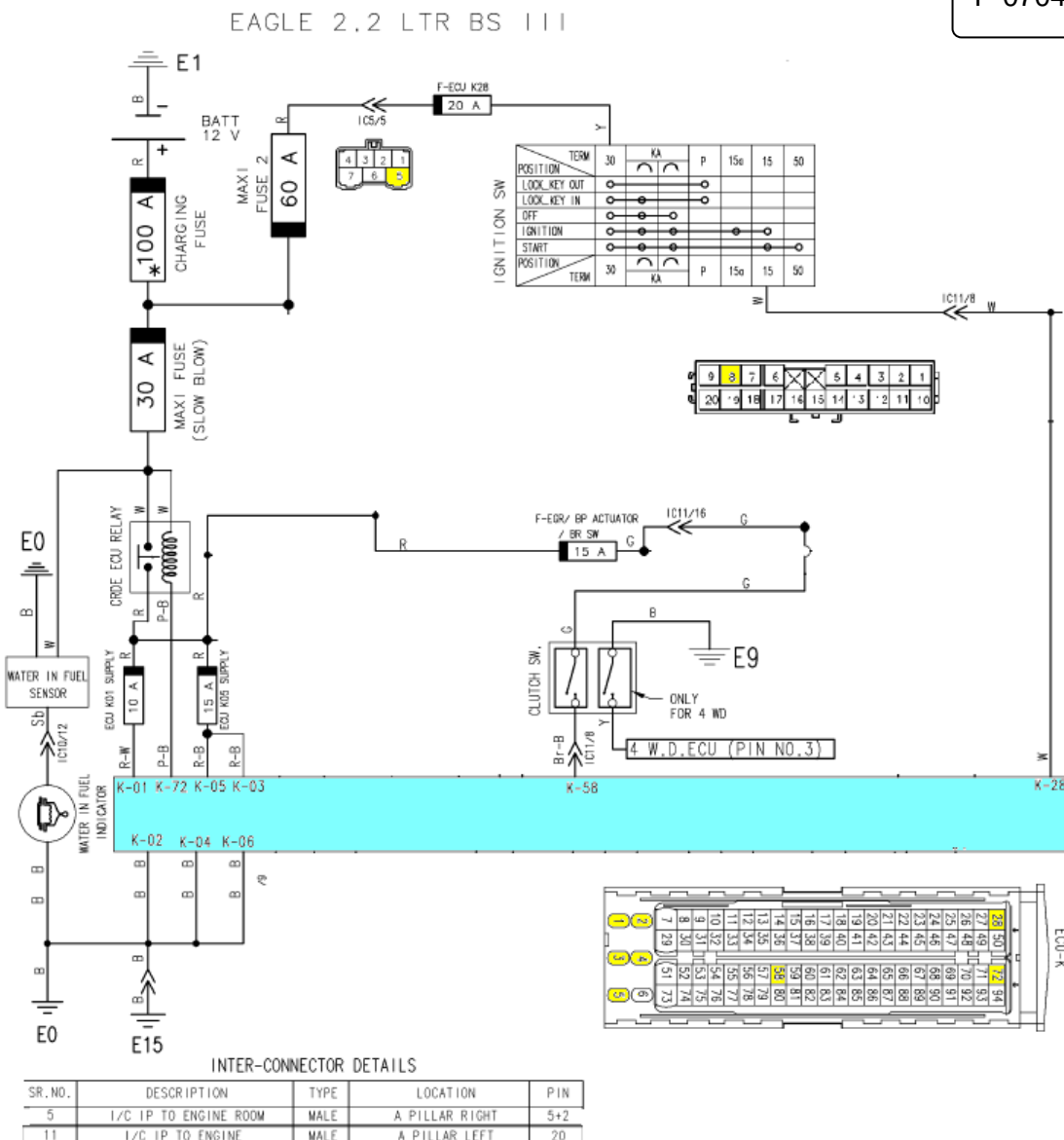
Test Procedure Clutch switch –

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that error P 0704 is present.

Verify that no error related to vehicle speed (vehicle speed sensor related) is present. If present, first attend to those complaints then verify if the error P 0704 is present and then proceed.
Disconnect clutch switch connector.
Turn the ignition ON.
Check supply voltage to clutch switch on connector.
It should be 12 V, when Ignition is ON. Is it?

P-0704

Yes	No
Turn Ignition OFF.	Check the 15 Amp fuse after the main relay (this fuse also controls EGR & Brake switch).
Connect the clutch switch connector.	Check the supply to K01 & K05.
Check the voltage at K 58 of the ECU pin, when the clutch is in released condition.	Repair the connections as necessary.
It should be 12 V.	Clear codes & verify.
Is it ?	

Yes	No
Clear the codes & verify.	Turn Ignition OFF.
If the problem persist, replace with a known good clutch switch.	Remove clutch switch connection & check continuity between terminal K58 with clutch switch connector.
Clear the codes & verify.	Is it OK?

No	Yes
Repair the connection as necessary.	Replace the clutch switch with known good component.
Clear the error memory & verify	

Coolant Temperature Sensor

Coolant Temperature Sensor

P-0118
P-0117

Description: The Water temperature sensor (WTF) is located in the coolant pipe of the cylinder head. The WTF sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes.(NTC resistor) When the coolant temperature is low, the sensor resistance is high; when the coolant temperature is high, the sensor resistance is low. The ECU checks WTF voltage and uses the information to help smoothen the engine operation.

DTC	Diagnostic item
P-0118	Voltage above upper limit
P-0117	Voltage below lower limit

DTC detection condition	Probable cause
Background * The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it. * The ECU checks whether the voltage is within a specified range. In addition, it checks that the engine coolant temperature (signal) does not drop while the engine is warming up. **Malfunction; out-of-range** * Sensor output voltage has continued to be 5V or higher for 4 sec. * Sensor output voltage has continued to be 0.1V or lower for 4 sec. Reaction: * System lamp will be on. Engine will continue to run with water temperature of 120 deg C.	* Open or shorted Engine Coolant Temperature sensor circuit, or loose or wrong connection * Engine Coolant Temperature sensor failed.

ECU

A 58   A41

P-0118
P-0117

W-R

G-R

1   2

Coolant Temperature Sensor

ECU-A

A-58   A-41

W-R   G-R

1   2

U

t°

COOLENT
TEMP.SENSOR

COOLENT TEMP SENSOR

1   2
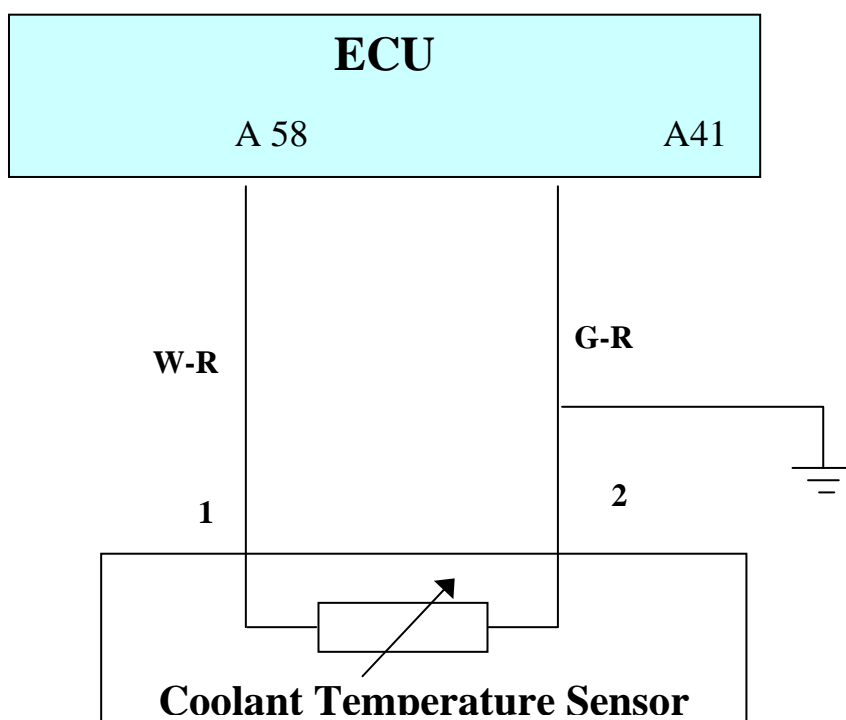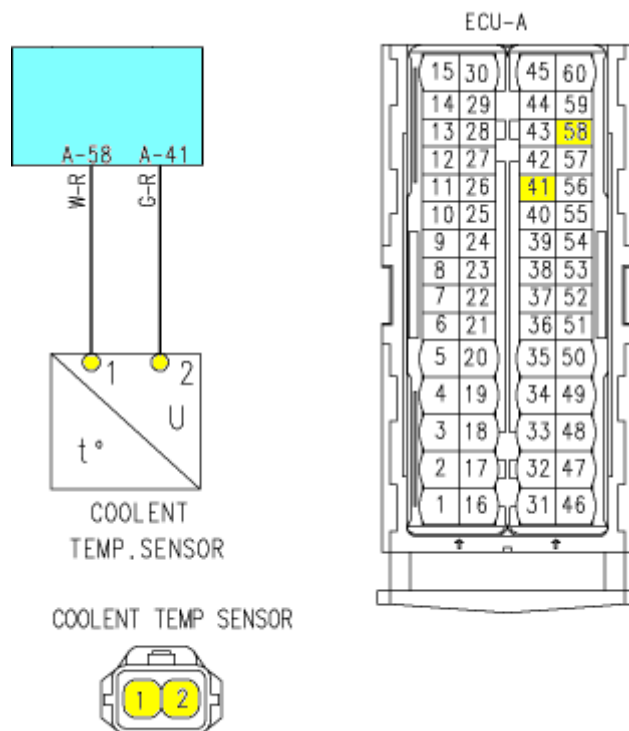
Test Procedure Coolant Temperature Sensor --

1. Connect the 'Smart Tester' to diagnostic connector
2. Turn Ignition Switch ON

P-0118
P-0117

*   Verify DTC P0118 or P0117 are present.
*   Turn the Ignition OFF
*   Disconnect the CTS connector.
*   Turn Ignition ON and check the voltage between 'CTS' signal terminal 1 and ground.
*   It should be 5 V when Ignition ON
*   Is it?

Yes	No

Yes	No
Turn the Ignition OFF	Open or short between CTS signal terminal 1 and ECU
Measure continuity between A 58 of ECU & connector terminal 1	Repair as necessary.
Measure continuity between A 41 of ECU & connector terminal 2	
Is it OK	

Yes	No

Yes	No
Connect CTS connector	Open or short between CTS signal terminal 1 and ECU
Turn Ignition ON	Repair as necessary.
Check the voltage of CTS	
Is it as per specification	

Yes	No

Yes	No
Poor terminal contact due to oxidation, bent or misplaced terminal	Temporarily install a known good CTS and check for proper operation.
Repair as necessary	If problem is corrected, replace CTS.

*   Return vehicle to original condition. Clear all DTC.
*   Verify by driving vehicle with "Insight" connected and monitor for error codes.
*

Coolant temperature sensor absolute & dynamic test

P-2558
P-1126

Description - When the engine is switched ON then the ECU detects the temperature. After that when the engine runs then the temperature output on a time frame is detected and compared against predetermined slope.

DTC	Diagnostic item
P-2558 P-1126	Minimum Temperature not reached within time limit. Minimum temperature or temperature raise no reached within time limit

DTC detection condition	Probable cause
Proper Performance The coolant temperature rises to a specified temperature within a specific time period. It also compares the rate of rise with a defined rate of rise **Malfunction; out-of-range** The coolant temperature do not rise enough within a specific time period, • The coolant temperature do not reach a warmed-up fuel control temperature within a specific time period. **Reaction** System check lamp : OFF	• Defective temperature sensor. • Thermostat stuck in open condition • Thermostat removed.

Test Procedure -

P-2558
P-1126

```
                    ┌──────────────────────┐
                    │ Remove the connector of │
                    │ the temperature sensor  │
                    └──────────────────────┘
```

Not Ok

Replace the temperature sensor

Fit a new good thermostat

Check if the thermostat present

Not Present

Present

Check if thermostat opening is OK

Not Ok

Replace

OK
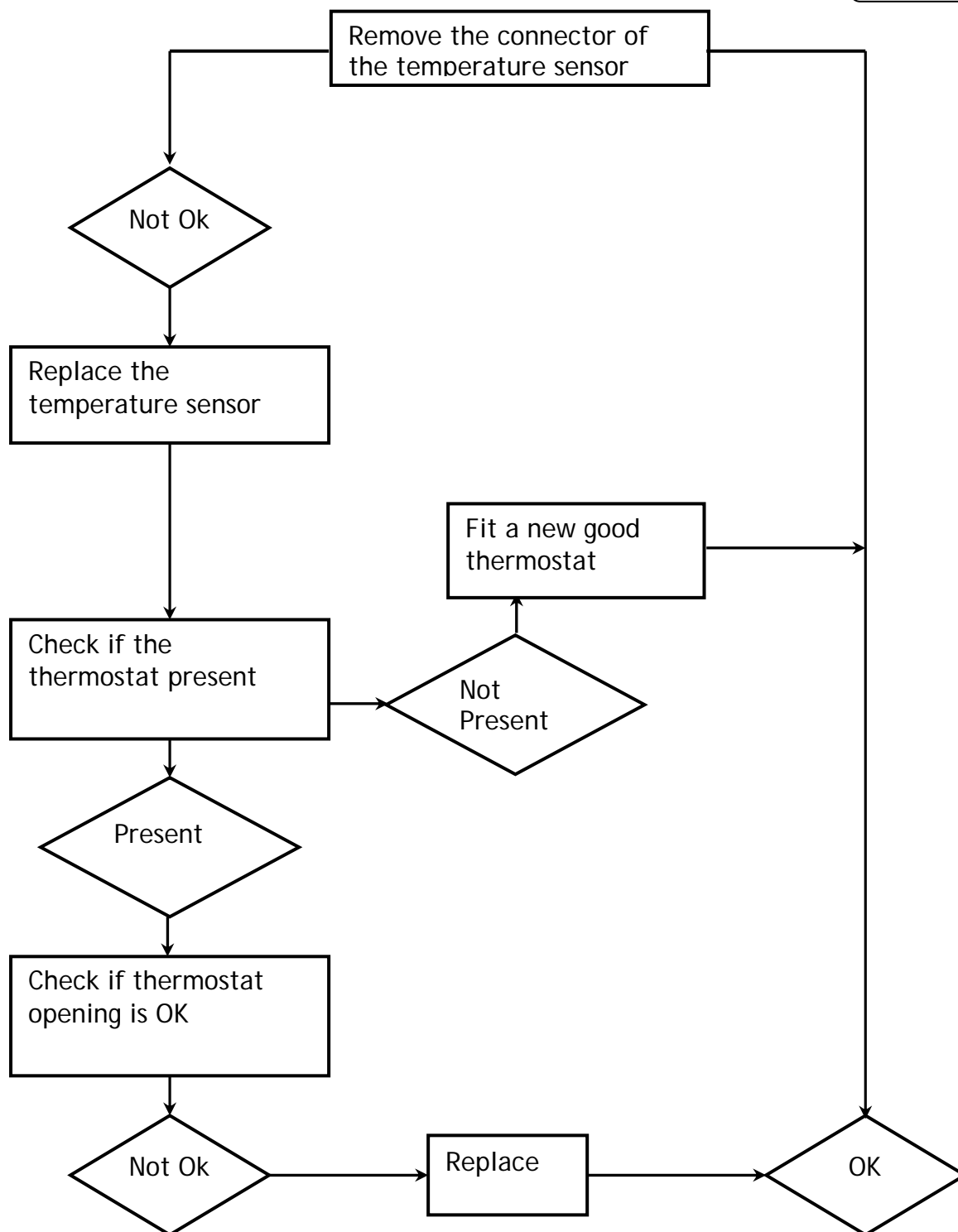
P-165E
P-165F
P-1660
P-1661

Coolant overheat Lamp - power stage

DTC	Diagnostic item
P-165E	Short Circuit to Battery
P-165F	Short Circuit to Battery
P-1660	No Load
P-1661	Excess Temperature

DTC detection condition	Probable cause
Normal operation • When ignition is ON coolant overheat lamp will be ON & OFF after 2 sec. • When coolant temperature crosses the set value lamp will glow. Malfunction • Coolant overheat lamp will not respond, during the lamp test. • Show wrong display.	• Open short circuit to battery or ground. • Wrong connection for coolant overheats lamp circuit.
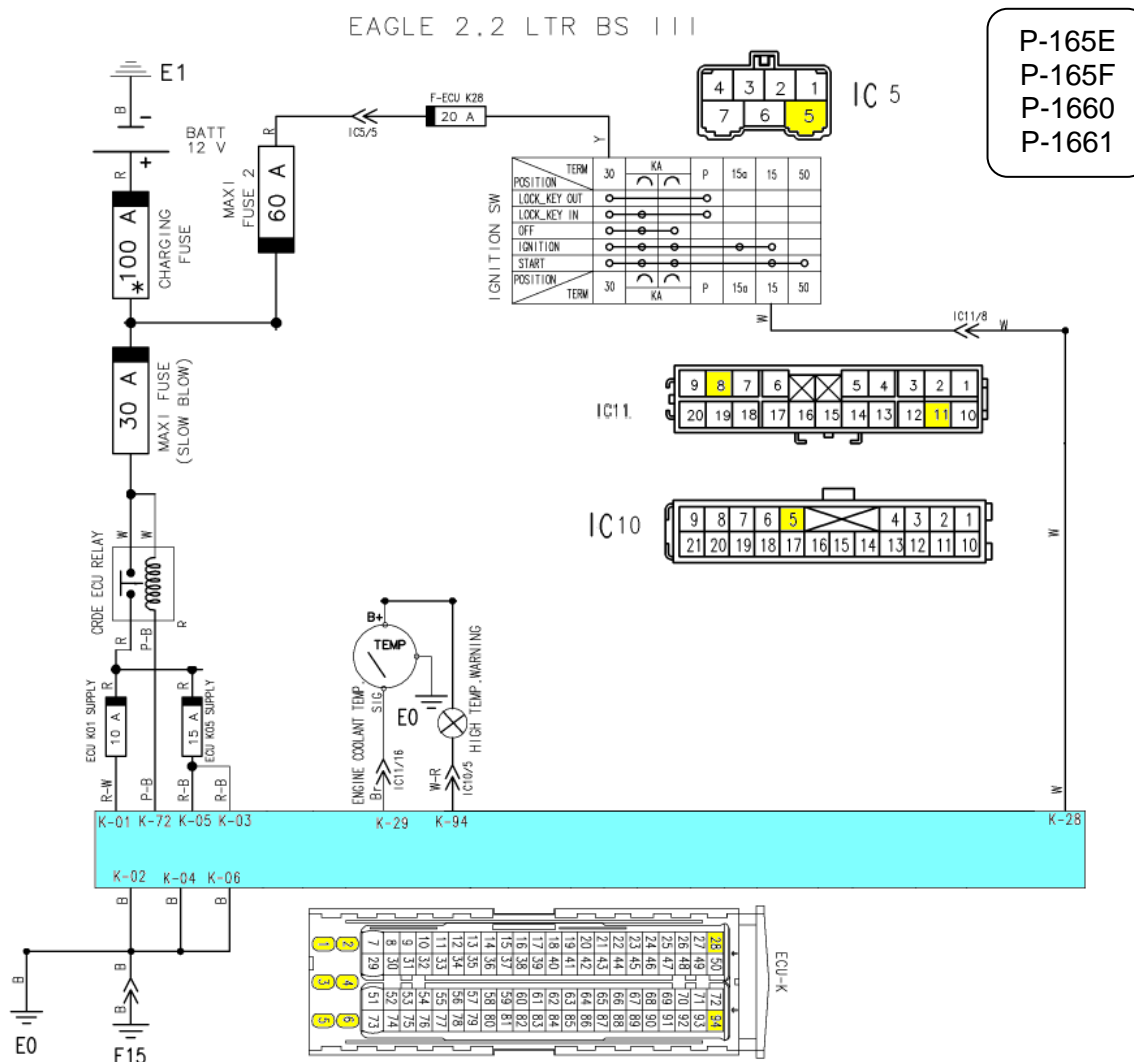
EAGLE 2.2 LTR BS III

P-165E
P-165F
P-1660
P-1661

INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
5	I/C IP TO ENGINE ROOM	MALE	A PILLAR RIGHT	5+2
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

Connect the 'Smart Tester' to diagnostic connector.
1. Turn Ignition Switch ON.
2. Verify that either P1660 or P1661 or P165E or P165F is present.

> P-165E
> P-165F
> P-1660
> P-1661

- Switch off the Ignition
- Check the connection to the coolant overheat lamp.
- Go to the Actuator Test # ACT 1. If the lamp is working as per the command then the lamp & connections are OK.
- If not working then:-
- Check the continuity between ECU terminal K94 with overheat lamp.
- Is it OK?

Yes	**No**
Switch ON the Ignition	Repair the connection
Check if the supply is coming to the overheat lamp	Clear codes and verify that the overheat lamp is working correctly.
Is it OK	

Yes	**No**
Lamp failure.	Repair the connection.
Change the lamp	Check the 15 Amp fuse (cluster lamp fuse)
Clear codes and verify that the coolant overheat lamp is working properly	

Atmospheric pressure sensor

P-0108
P-0107

DTC	Diagnostic item
P-0108	Voltage above upper limit
P-0107	Voltage below lower limit

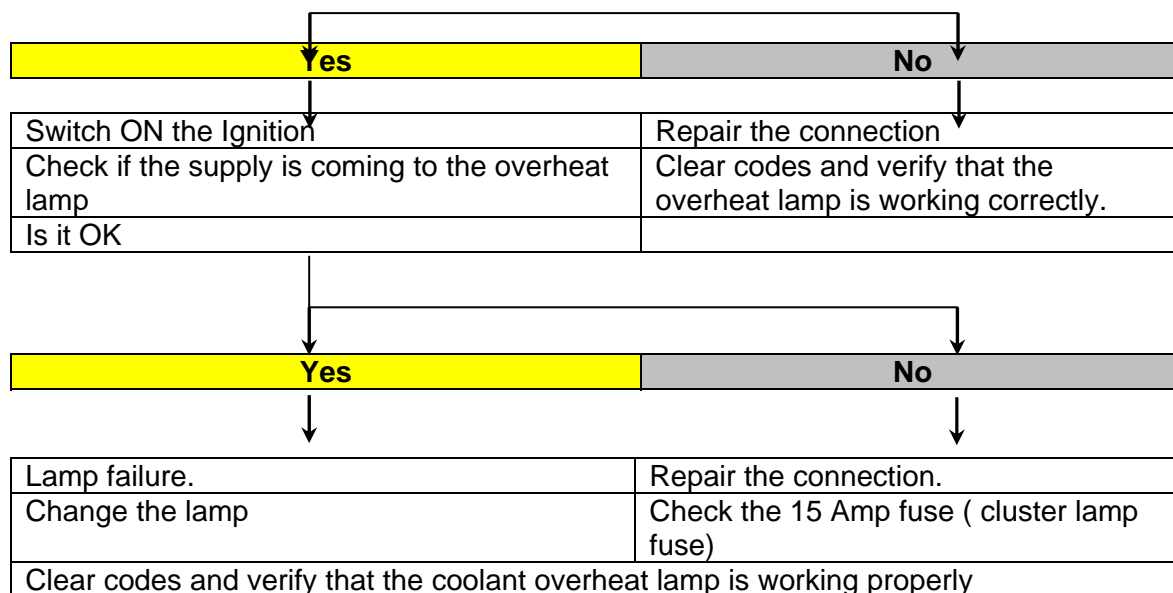| DTC detection condition	Probable cause
Normal Operation * The atmospheric pressure sensor outputs a voltage, which corresponds to atmospheric pressure. **Normal Operation** * Ignition switch: ON * Malfunction lamp: OFF after 2 Sec * Battery voltage is 8V to 12V. * No error reported in error memory. **Malfunction** * The sensor output voltage has continued to be 5V or higher. * The sensor output voltage has continued to be 0V or lower. **Reaction** 1. System lamp will blink. 2. Engine will run with default atmospheric Pressure of 800hPa	• Failed atmospheric pressure sensor.

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0108 or P0107 is present.

• Check the battery voltage.
• Clear the error codes.
• Verify if the error has been cleared.

Yes	No

Repeat the clear error, for 3 times.
Replace the ECU

| P1623 |
| P1625 |
| P161F |
| P1621 |
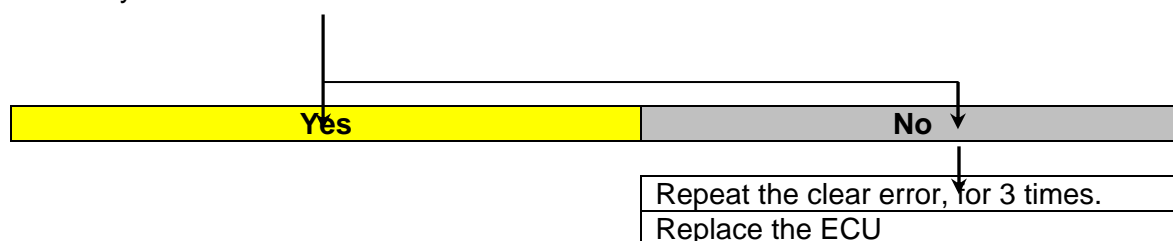
Injector Energising time

Description: Controller not able to control power stage

DTC	Diagnostic item
P1623	Below lower limit of enegising time- Injector # 1
P1625	Below lower limit of enegising time- Injector # 2
P161F	Below lower limit of enegising time- Injector # 3
P1621	Below lower limit of enegising time- Injector # 4

Reaction: The System Check lamp will be Off.

Vehicle speed may drop.

<u>Test Procedure</u> –

1. Pl. confirm IMA (IQA) codes are flashed.
2. Confirm no fuel leakage in low & high pressure circuit.(including the injector backflow test)
3. Check the continuity for the high & low sides.
4. Confirm battery voltage is above 10V.
5. Ensure fuel filter is not clogged. (Service interval followed as per schedule)
6. Check with swapping Injector.
7. If still error persists change the injector.

Communication Monitoring

P-162A

Description: Communication between controller and power stage inside the ECU is not OK

DTC	Diagnostic item
P-162A	Communication error of CJ940

Reaction: The System Check lamp will be continuously ON.

Test Procedure:

1. Switch ON Ignition
2. Using smart tester, clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

P-1659

Controller and TPU Monitoring

Description: Controller and Time processing unit out of sync.

DTC	Diagnostic item
P-1659	Deviation between TPU and system time

Reaction: The System Check lamp will be continuously ON.

Test Procedure:

1. Switch ON Ignition
2. Using smart tester, clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

P-1638

ECU Monitoring

Description: Monitoring module inside ECU reports a defect.

DTC	Diagnostic item
P-1638	Set, if error-counter of Watchdog or controller are not plausible or the system must shut down

Reaction: The System Check lamp will be continuously ON.

Engine will shut down.

Test Procedure:

1. Switch ON Ignition.
2. Using 'Smart Tester', clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

EEPROM Monitoring

P-162B
P-162C
P-162D

Description: EEPROM storage device inside ECU is not OK

DTC	Diagnostic item
P-162B	EEPROM: error during last read operation
P-162C	EEPROM: error during last write operation
P-162D	EEPROM: default value used

Reaction: The System Check lamp will be continuously ON.

Test Procedure:

1. Switch ON Ignition.
2. Using 'Smart Tester', clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

P-160C
P-160D
P-160E

Error path for the Tachometer signal

DTC	Diagnostic item
P-160C	Short Circuit to Battery
P-160D	Short Circuit to Ground
P-160E	No Load

DTC detection condition	Probable cause
Normal operation • When ignition is ON system lamp will be switch OFF after 2sec. • When engine is running it will show corresponding engine speed on dash panel. Malfunction • When engine is running it wouldn't show corresponding engine speed on dash panel. Reaction 3. No impact on vehicle performance. Only engine speed indication on dash panel can not be seen. 4. Cruise control will not work.	* Open, shorted or wrong connection of tachometer circuit.
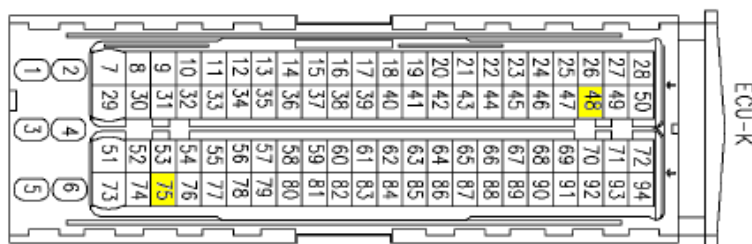
P-160C
P-160D
P-160E
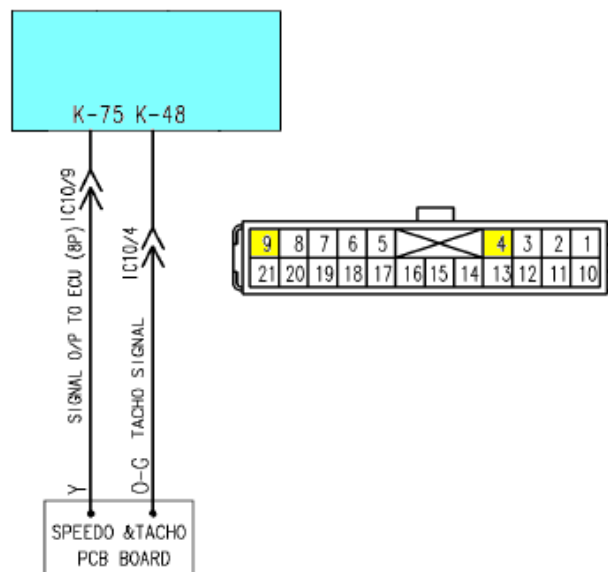
INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P160C or P160D or P160E is present.

- Turn the Ignition OFF.
- Disconnect the tachometer connector from the cluster connections.
- Check the continuity between the ECU connector terminal K48 and cluster tachometer connections.

- Is it OK?

P-160C
P-160D
P-160E

Yes	**No**
Check if any other error is set for speed sensor and check for short circuit.	Repair the connections.
Check for short with battery or Ground	Clear codes & verify that signal is as per the limit.
Is it?	

Yes	**No**
Correct the error and check for tachometer error is not available.	Repair cluster connections, or they are not connected properly.
Clear codes & verify signal is as per the limit.	

P-1608
P-1609
P-160A
P-160B

Error path of coolant temperature output

Description
The component driver for the coolant temperature outputs the variable as a PWM signal to the power stage. (Output on the cluster) In normal operation, the PWM power stage is tested for short circuit to battery, to ground, open circuit and excess temperature.

DTC	Diagnostic item
P-1608	Short circuit to battery
P-1609	Short circuit to ground
P-160A	No load
P-160B	Excess temperature

DTC detection condition	Probable cause
Normal Operation * The coolant temperature output voltage, which is given to the cluster from ECU as an output. * The ECU checks whether this voltage is within a specified range (0 or 5V). **Normal Operating Conditions** * Ignition switch: ON * System lamp: OFF after 2 Sec **Malfunction** • No indication of water temperature on the instrument cluster.	* Open or shorted Engine Coolant Temperature output sensor circuit, or loose or wrong connection.

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P-1608
P-1609
P-160A
P-160B

INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20
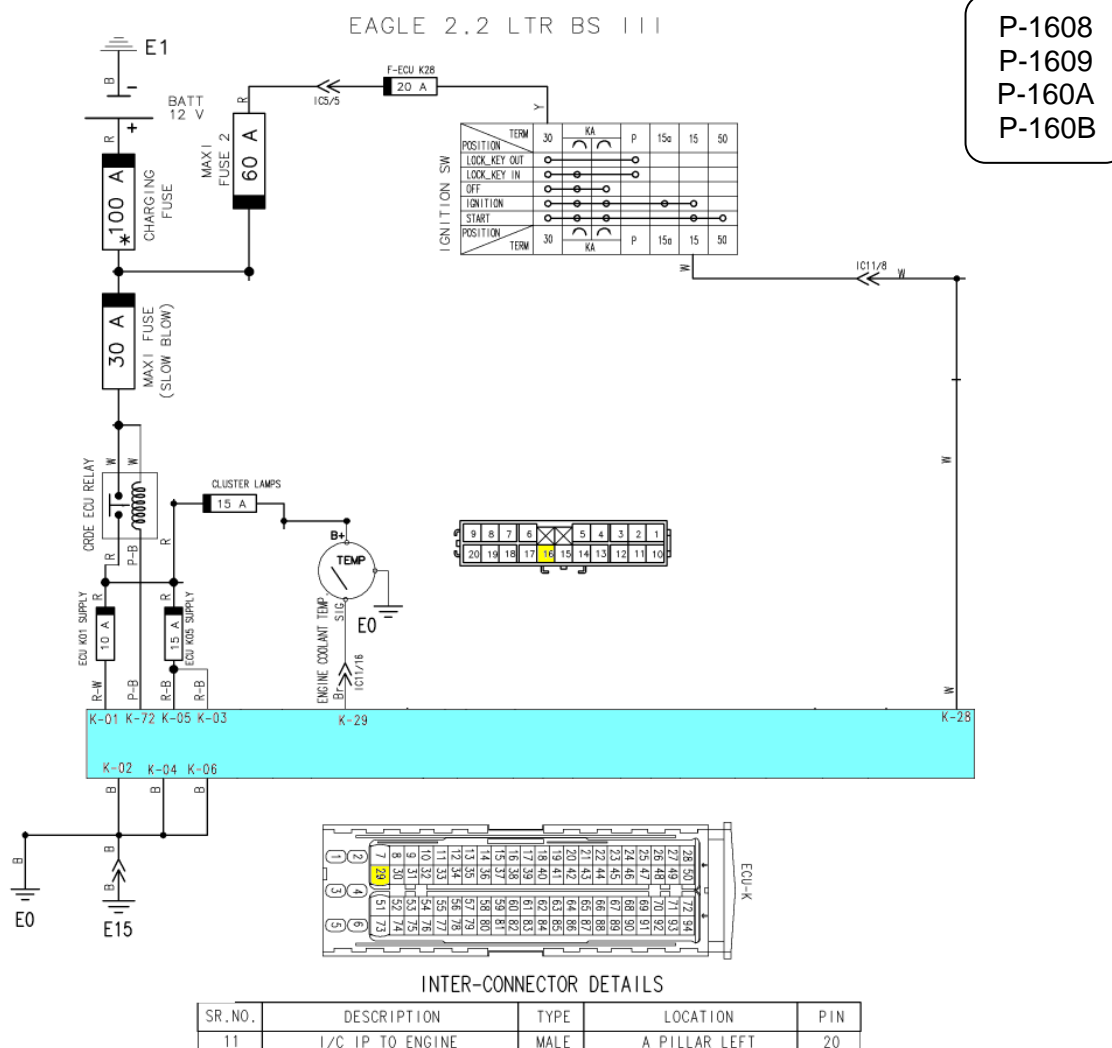
Test Procedure Coolant temperature output --

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that the either of the error codes P1608 or P1609 or P160A or P160B is present.

Turn the Ignition OFF.

- Remove the cluster connections of the coolant temperature indicator.
- Check the continuity between coolant temperature output connector with K29 of the ECU.
- Is it OK?

Yes	No

P-1608
P-1609
P-160A
P-160B

Check the cluster lamp fuse	Open or short between coolant temperature output & ECU K29
Check the temperature value in smart tester. Compare it with physical measurements. Check the output at K29 when Ignition is ON.	Repair as necessary.
Is it OK?	Clear the error & verify.

Yes	**No**
Replace the instrument cluster.	Clear codes & verify.
Verify DTC with coolant temperature output.	
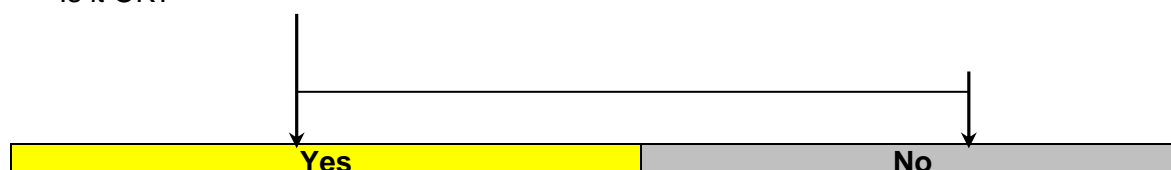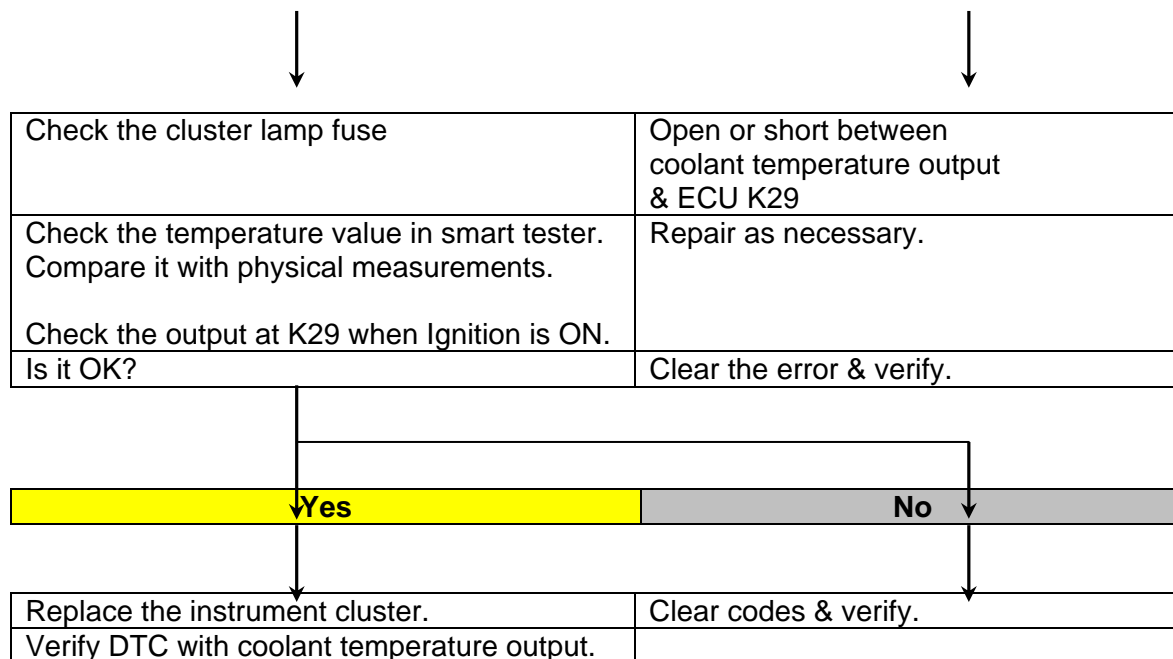
P-1530
P-1531
P-1532
P-1533

Fault path of air condition power stage

Description –

The A/C compressor routes the A/C compressor control signal to the digital power stage output. The power stage is monitored. An error such as short circuit, open circuit or excess temperature, occurring at the power stage is reported.
The function routes the control signal for the A/C compressor to the power stage.

DTC	Diagnostic item
P-1530	Short circuit to battery
P-1531	Short circuit to ground
P-1532	No load
P-1533	Excess temperature

| DTC detection condition	Probable cause for malfunction
Normal Operation * AC relay is OFF when the AC switch & blower switch is OFF. * The ECU checks whether AC switch is ON then it will try to switch ON the AC relay provided blower is ON. * When AC relay is energized then it will switch ON the AC compressor. **Normal Operation** * Ignition switch: ON * Engine is ON * System lamp: OFF after 2Sec * Battery voltage is 8V –16V. * AC switch & blower switches are ON. **Malfunction** * ECU not recognizing 12V when AC switch is ON. * ECU output to AC relay has continued to 0.5V or more. **Reaction** * System lamp will blink continuously. * AC will not work.	• No AC gas available. • AC relay is not working. • Open or shorted AC circuits, loose or wrong connections. • Compressor is not working • ECU AC circuit faulty.

Connect the 'Smart Tester' to diagnostic connector.
1. Turn the Ignition Switch ON.
2. Verify that either P1530 or P1531 or P1532 or P1533 are present.

• Check that all the AC connections are fitted.
• Check the AC charging.
• Check that the AC & compressor relay both are functioning properly
• Is it OK?

Yes	No

P-1530
P-1531
P-1532
P-1533
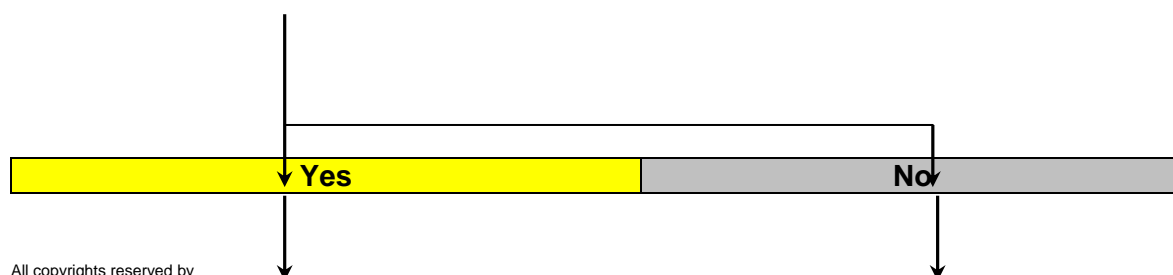
Turn the Ignition OFF.	If needed change the relay & repair the connections.
Measure continuity between K54 and AC switch & AC relay.	Clear codes & verify.
Measure continuity between K 70 & ECU relay.	
Is it OK ?	

Yes	**No**
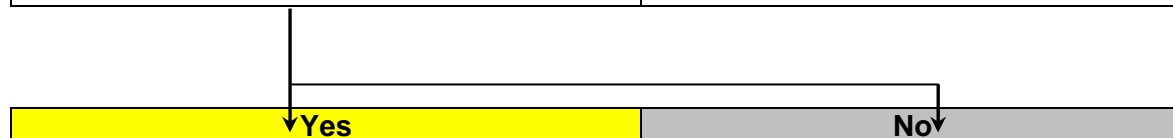
Switch ON the Ignition.	Check the fuses (15 Amp AC fuse)
Switch ON the AC switch.	If required , replace it.
Check the voltage between the ECU terminal K54 & Ground. Also check the voltage between K70 & ground.	Repair the connections.
At K70- Gnd. It should be 0 Volts when in OFF condition and 12 Volts when in ON condition.	Clear codes & verify that AC is working properly.
Switch on the blower.	
Check the voltage between K 70 & ground. It should show 0 Voltage.	
Is it OK ?	

Yes	**No**
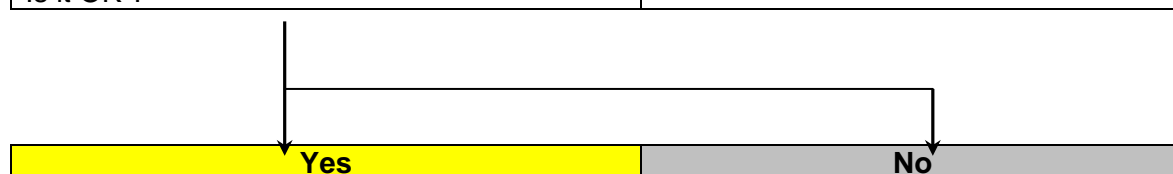
Check AC compressor connections & supply.	Repair the connections as per the circuit diagram.
Clear codes & verify AC is working.	Clear codes & verify AC is working properly.

P-1210
P-1211
P-1212
P-1213
P-1214
P-1215
P-1216
P-1217

Injector power stage- chip specific errors

Description:

Injector power stage inside ECU defective

DTC	Diagnostic item
P-1210	Chip-specific errors : CY33X internal reset / clock loss / under voltage
P-1211	Chip-specific errors: CY33X is unlocked / CY33X init error
P-1212	Chip-specific errors:CY33X is in Test mode
P-1213	Chip-specific errors: CY33X SPI communication error /checksum/read back
P-1214	Chip-specific errors ->CY33X internal parity error
P-1215	Chip-specific errors ->CY33X internal program flow error
P-1216	Chip-specific errors ->CY33X check of inv. YSEL during ON failed
P-1217	Chip-specific errors ->CY33X ON timeout for at least 1 cylinder

Reaction: The System Check lamp will be continuously ON.
Engine stops.

<u>Test Procedure</u> –

1. Switch ON Ignition.
2. Using 'Smart Tester' clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using diagnostic tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.

8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

Monitoring module communication Monitoring

P-1664

Description: Communication failure with monitoring module.

DTC	Diagnostic item
P-1664	The fault path contains the supervision of the SPI-Handler Set, if SPI-communication failed

Reaction: The System Check lamp will be continuously ON.

<u>Test Procedure</u> –

1. Switch ON Ignition.
2. Using 'Smart Tester', clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

P-1641
P-1642
P-1643

Power Stage Monitoring

Description: Controller not able to control power stage

DTC	Diagnostic item
P-1641	Test of redundant shut off paths during initialization: Watch dog switch off path defect
P-1642	Test of redundant shut off paths during initialization: Voltage monitoring upper limit shut off path defect
P-1643	Test of redundant shut off paths during initialization: Voltage monitoring lower limit shut off path defect

Reaction: The System Check lamp will be continuously ON.

<u>Test Procedure</u> –

1. Switch ON Ignition.
2. Using 'Smart Tester', clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

Power stage voltage Monitoring

P-1631
P-1632

Description: Over / Under voltage to power stage detected

DTC	Diagnostic item
P-1631	(Hardware) CJ940 upper limit: internal supply voltage upper limit
	(Hardware) CJ940 lower limit: internal supply voltage lower limit
P-1632	

Reaction: The System Check lamp will be continuously ON.

<u>Test Procedure</u> –

1. Switch ON Ignition.
2. Using 'Smart Tester', clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a new one and repeat steps 4 & 5.
8. If fault is not present in the new ECU, then the old ECU is defective and has to be sent back to M&M.

Sensor supply monitoring 1

P-1644
P-1645

DTC	Diagnostic item
P-1644	Voltage above upper limit
P-1645	Voltage below lower limit

DTC detection condition	Probable cause
Normal Operation The ECU monitors the supply voltage to camshaft phase sensor, and accelerator pedal (APP1) **Malfunction** The voltages are beyond the range. **Reactions** System lamp status for this error is ON.	

P-1644
P-1645

ACC. PEDAL
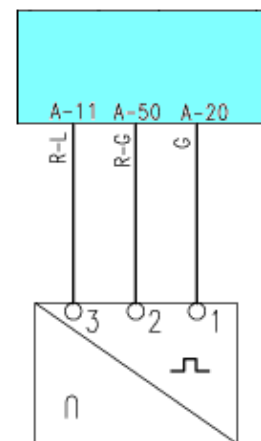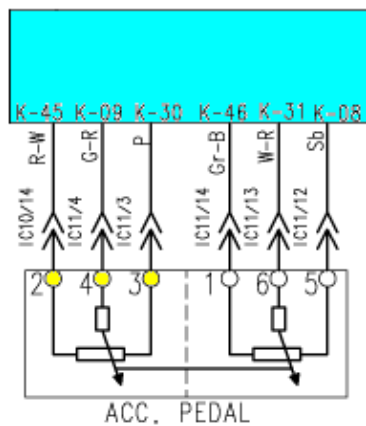
CAM PHASE SENSOR

CAM PHASE SENSOR
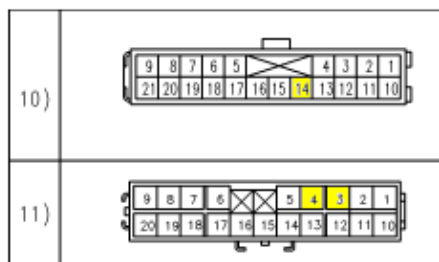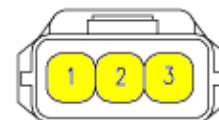
ECU-K

ECU-A

10)

11)

INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

Connect the 'Smart Tester' to diagnostic connector.
1. Turn Ignition Switch ON.
2. Verify that either P-1644 or P-1645 is present.

- This is related to the cam shaft sensor supply & also APP1 supply voltage.
- Check the connection of the cam shaft sensor supply & accelerator pedal connector.
- Is it OK?

Yes	No
Remove the sensor connections of the	Repair the connection.
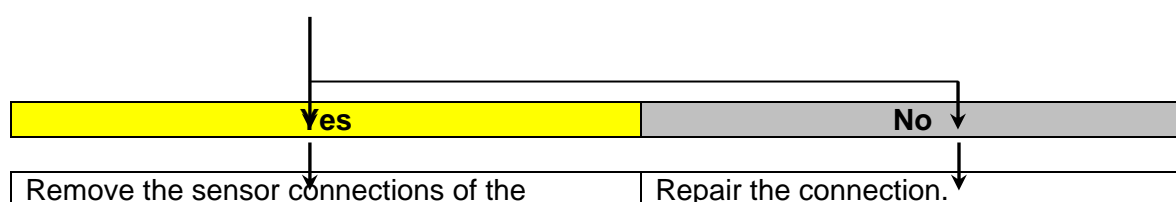
		P-1644 P-1645
camshaft sensor & the Accelerator pedal.		
Clear the error.	Clear codes and verify.	
If the error heals then the problem may be due to poor connection.		
Does it heal?		

No	**Yes**
Clear the codes & verify.	Check the continuity between the ECU connector A11 and the camshaft terminal 3. & Between ECU connector K 45 and Accelerator pedal Terminal 2. Repair the connection.
If the error is still present, then the ECU is suspect.	Reconnect everything.
Replace ECU with a known good one. Clear codes & verify.	Clear codes and check cam phase sensor and Accelerator pedal are working properly.

P-1646
P-1647

Sensor supply monitoring 2

DTC	Diagnostic item
P-1646	Voltage above upper limit
P-1647	Voltage below lower limit

DTC detection condition	Probable cause
Normal Operation The ECU monitors the supply voltage to Rail pressure sensor, HFM and accelerator pedal (APP 2) **Malfunction** The voltages are beyond the range. **Reactions** System lamp status for this error is ON.	

P-1646
P-1647

ACC. PEDAL

RAIL PR. SENSOR

RAIL PRESSURE SENSOR

ECU-K

ECU-A

INTER-CONNECTOR DETAILS

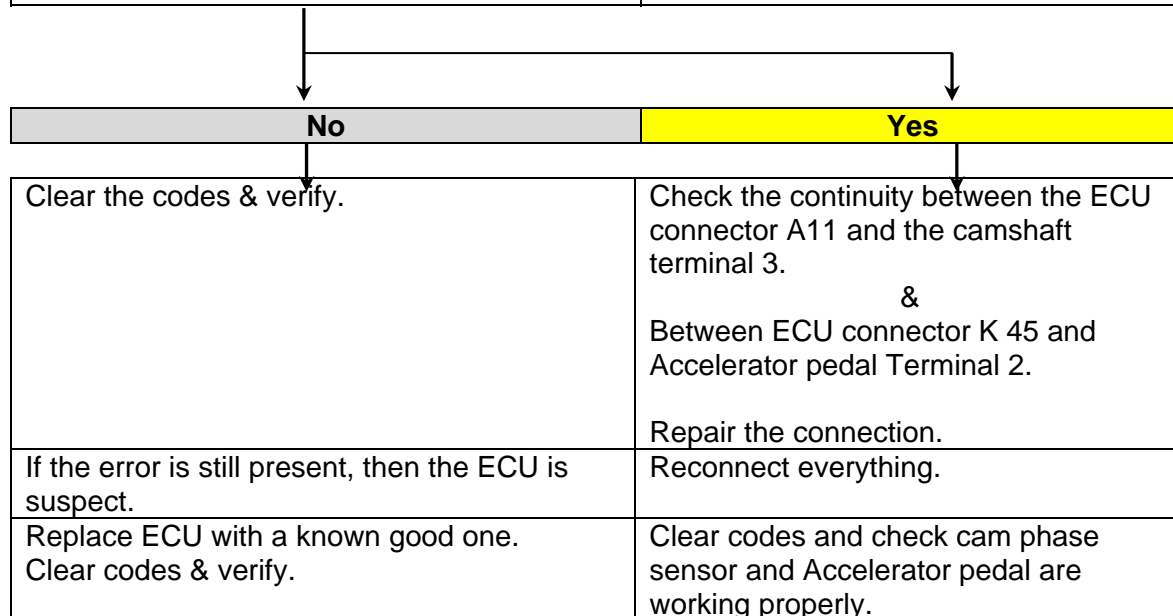| SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20
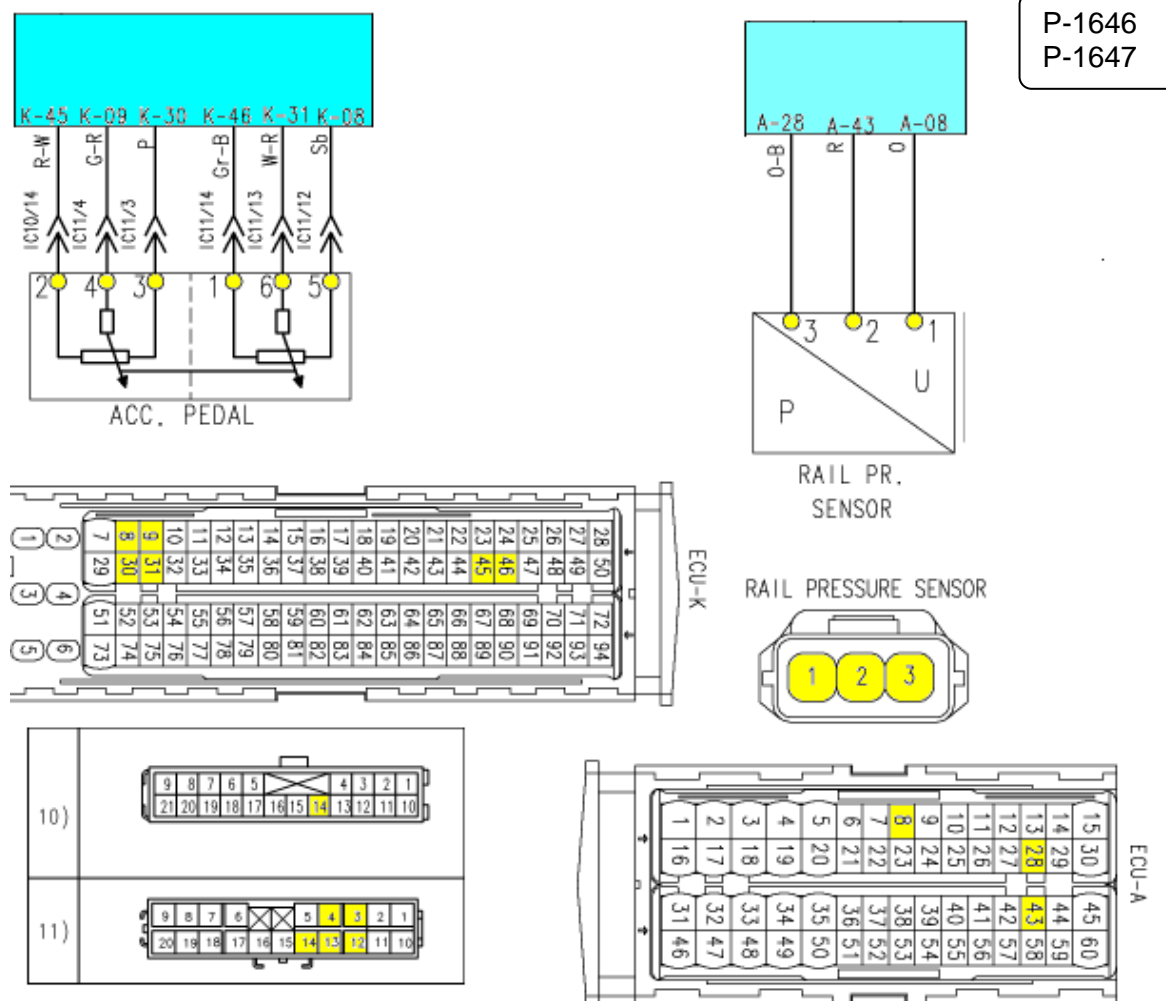
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P-1646 or P-1647 is present.
- This is related to the rail pressure sensor, HFM and APP2 supply voltage.
- Check the connection of the rail pressure sensor, HFM & accelerator pedal connector.
- Is it OK?

Yes	**No**
Remove the sensor connections of the Rail pressure sensor , HFM & the Accelerator pedal	Repair the connection
Clear the error	Clear codes and verify.

P-1646
P-1647

If the error heals then the problem may be due to poor connection.	
Does it heal?	

No	**Yes**
Clear the codes & verify.	Check the continuity between the ECU connector A 29 and the HFM terminal 4. Check the continuity between the Rail pressure connector terminal 3 and terminal A14 of the ECU Check the continuity of between terminal 1 of the Accelerator pedal (APP2) and K 46 of the ECU. Repair the connection.
If the error is still present, then the ECU is suspect.	Reconnect everything.
Replace ECU with a known good one. Clear codes & verify.	Clear codes and verify.

System lamp -Power Stage fault status

DTC	Diagnostic item
P-1654	Short Circuit to Battery
P-1655	Short Circuit to Battery
P-1656	No Load
P-1657	Excess Temperature

DTC detection condition	Probable cause
Normal Operation • When Ignition is switched ON the system lamp will glow ON for 2 sec. • It will switch OFF if no error is set. Malfunction • When ignition is switched ON the system lamp does not glow ON.	• Open, shorted or wrong connection of system lamp circuit.

INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
5	I/C IP TO ENGINE ROOM	MALE	A PILLAR RIGHT	5+2
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20
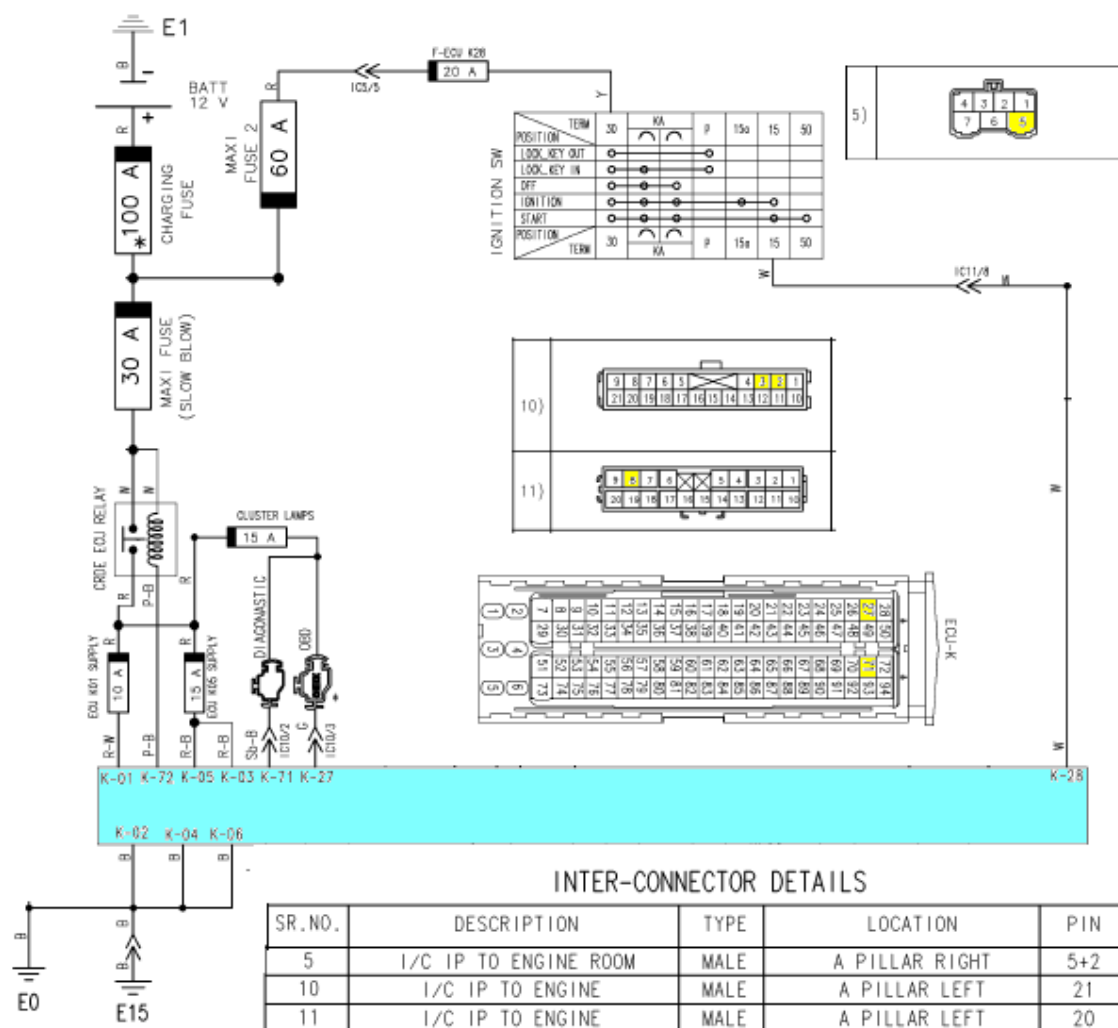
P-1654
P-1655
P-1656
P-1657

1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON
3. Verify that either P1654 or P1655 or P1666 or P1667 is present.

Go to the Actuator Test # ACT 2. If the system check lamp works with the actuator test then the system check lamp, wiring & ECU are OK.

If not working then:

- Switch off the Ignition
- Disconnect the camshaft sensor connector.
- The connections to the system lamp.
- Check the continuity between the ECU terminal K71 with system lamp
- Is it OK?

Yes	No
Turn the Ignition OFF	Check the fuse.
Disconnect ECU connector A	Repair the wire.
Measure the continuity of Ground (between sensor pin no 1 & ECU terminal A20) in the camshaft phase sensor harness.	Clear the error codes & verify
Is it OK?	

Yes	No
Lamp failure	Repair the connection.
Replace lamp	Clear codes and verify that the system lamp is working properly.
Clear codes and verify that the system lamp is working properly.	

Terminal 15 (Ignition)- contains plausibility error [Sig] of T15

DTC	Diagnostic item
P-1658	No Terminal T15 signals detected

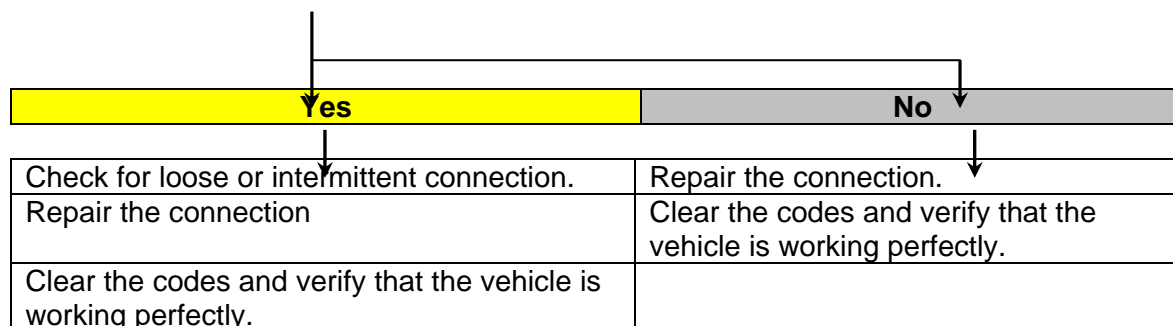| DTC detection condition	Probable cause
Normal operation • When ignition is ON relay coil will get energized. • Engine being started. Malfunction • When ignition is ON supply is not coming to ECU. • Main relay coil will not get energized. • Engine will not start.	• Open, shorted or wrong connection of T15 circuit.

Connect the 'Smart Tester' to diagnostic connector.
1. Turn Ignition Switch ON.
2. Verify that P-1658 is present.

P-1658

- Check that the main relay is getting energized.
- To check that the relay is getting energized, hear for the clicking sound from the main relay when the Ignition is switched ON.
- Is it OK ?

Yes	No
Turn the Ignition OFF.	Follow the Main relay fault finding procedure.
Measure the continuity of the wire between the K28 terminal of the ECU and the Ignition switch (Terminal 15).	Clear the error codes & verify.
Is it OK?	

Yes	No
Check for loose or intermittent connection.	Repair the connection.
Repair the connection	Clear the codes and verify that the vehicle is working perfectly.
Clear the codes and verify that the vehicle is working perfectly.	

P-0503
P-0500
P-0501

Vehicle speed sensing

DTC	Diagnostic item
P-0503	Exceeding of the maximum vehicle speed
P-0500	HW signal for vehicle speed not valid
P-0501	Vehicle speed not plausible with injection mass and engine speed

DTC detection condition	Probable cause
Normal Operation * The vehicle speed sensor outputs a pulse signal while the vehicle is driven. * The ECU checks whether the pulse signal is present. **Malfunction** * Sensor output voltage has not changed (No pulse signal) for 4 sec.	• Failed vehicle speed sensor. • Open shorted vehicle-speed sensor circuit, loose or wrong connection.
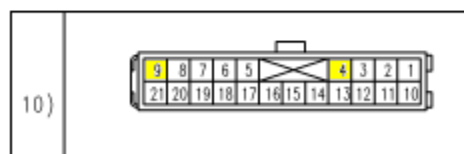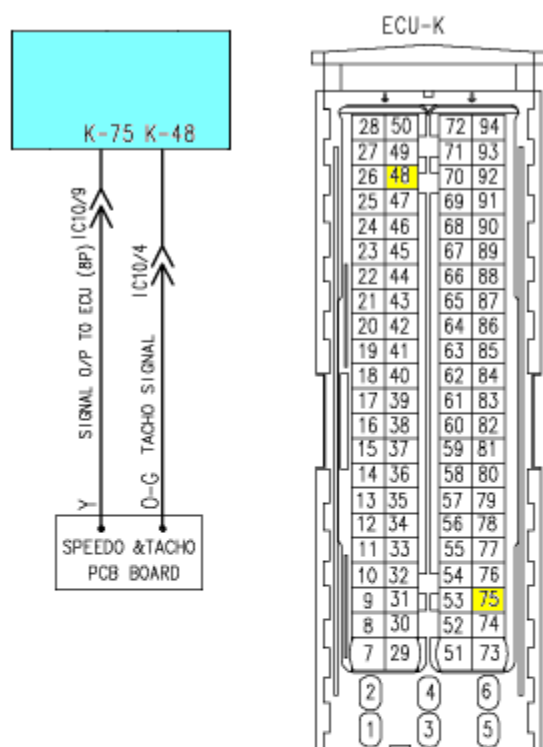
INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21

1. Connect the 'Smart Tester' to diagnostic connector
2. Turn Ignition Switch ON
3. Verify that either P0503 or P0500 or P0501 is present.

P-0503
P-0500
P-0501

- Drive the vehicle.
- Does the speedometer show the correct value? (Compare the values of speedometer with the value visible in the "'Smart Tester'"- use the live data tab in 'Smart Tester'.)
- Is it OK?

Yes	No

Turn the Ignition OFF.	Repair the cable (from the pin no 1 to pin no 5 of the instrument cluster socket- C24).
Inspect the interface between the VSS and the speedometer gear in the Gearbox.	Clear the error codes & verify.
Is it OK?	

Yes	No

Disconnect VSS	Repair the interface between he speedometer & the VSS
Disconnect ECU connector	Clear codes & verify that VSS signal is within limit.
Measure the continuity between the ECU terminal K75 and sensor terminal 3	
Is it OK?	

Yes	No

Check the open circuit between the sensor Ground & positive supply	Repair the wire between VSS connector & ECU terminal
Is it OK	Clear codes & verify that VSS signal is within limit.

Yes	No

Verify that the ECU connections are OK	Repair short circuit to Ground or another circuit in wire between VSS harness connector
If OK replace VSS with a known good VSS	Clear codes and verify that the VSS signal is within range.
Clear codes and verify that the VSS signal is within range.	
If problem persist- replace ECU	

P-1387
P-1388
P-1389
P-1390

Glow control relay actuator (If Applicable)

DTC	Diagnostic item
P-1387	Short Circuit to Battery
P-1388	Short Circuit to Ground
P-1389	No Load
P-1390	Excess temperature

DTC detection condition	Probable cause
Normal operation • When ignition is ON after 2 seconds the system lamp will switch OFF. • When Ignition is ON glow relay will switch ON & switch OFF after 10 sec. (If temp. is lesser than 0 Degree Centigrade) • Glow relay will get energized as per the logic in the ECU. Malfunction • When ignition is ON system lamp will be ON. • Relay will not get energized as per ECU logic.	* Open, shorted or wrong connection of glow circuit. * Fuse is blown. * Relay is not working.

P-1387
P-1388
P-1389
P-1390
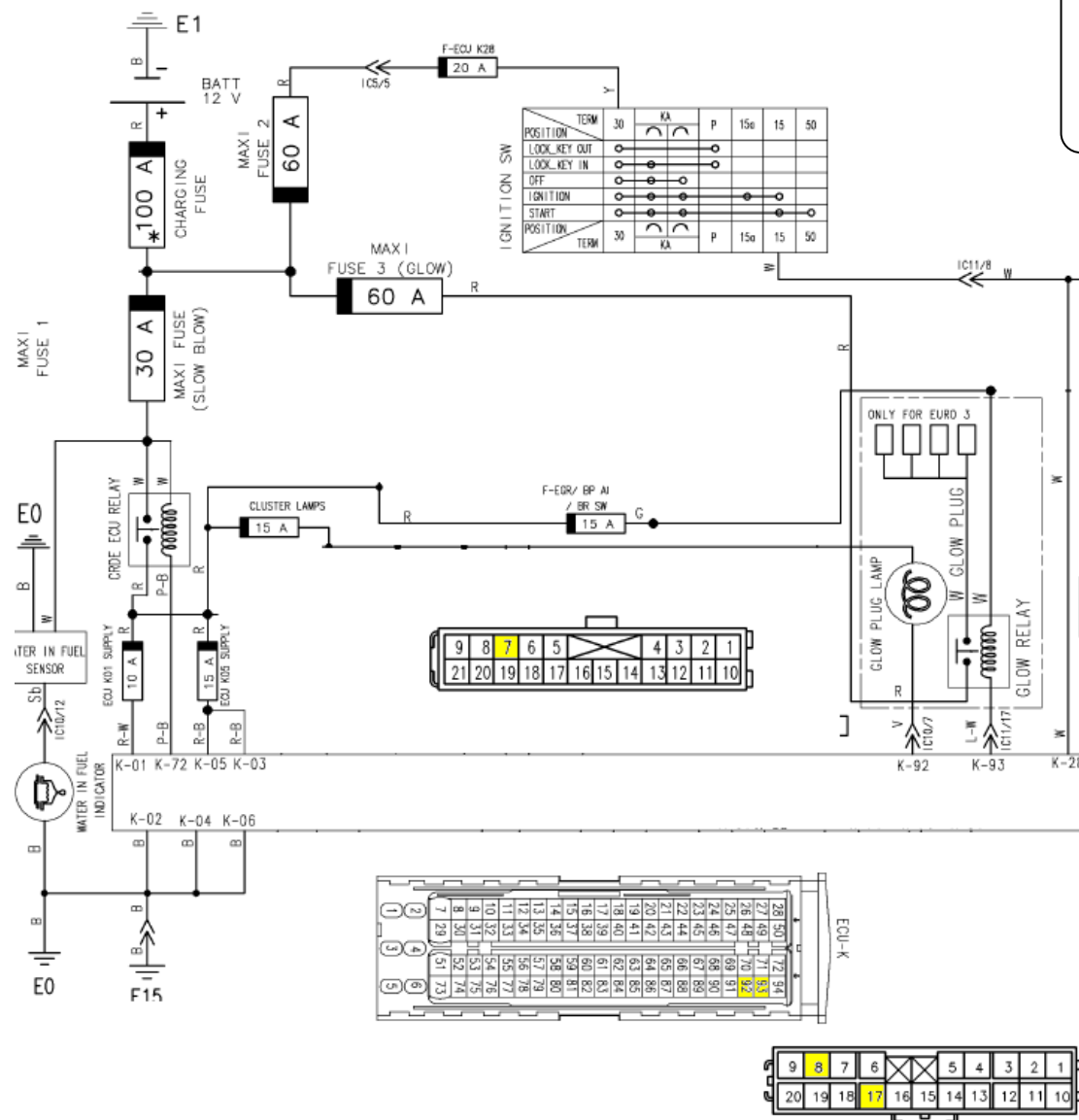
INTER-CONNECTOR DETAILS

SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

Test Procedure –

1. Connect the 'Smart Sensor' to diagnostic connector.
2. Turn Ignition Switch ON
3. Verify that either P-1888 or P-1889 or P-1890 or P1887 is present.
- Check the 15 Amp fuses. If defective, replace.
- Check when the Ignition ON the Glow lamp is ON (Check lamp check: the system lamp & the overheat lamp should come On for 2 seconds and then go off)
- If not On then check lamp & replace.
- Check the insertion of glow plug & glow relays.

P-1387
P-1388
P-1389
P-1390

- Is it OK?

Yes	**No**

Check the contuinity between the ECU terminal K 93 and terminal 85 of the relay.	Repair the terminal of the glow plug & relay.
When the supply is ON the supply is coming to terminal 86 & 30 of the relay.	Clear codes & verify that the glow plugs are working properly.
Check the 60 Amp fuse, if faulty, replace fuse.	

Yes	**No**

Check as per the glow plug logic that the glow plug's are working. (the glow plug light will glow ON for 15 seconds)	Repair the connection.
Check the relay is energizing.	Clear codes & verify.
Is it OK ?	

Yes	**No**

Loose or intermittent connections.	Relay is defective.
Repair connection.	Change the relay.
Clear codes and verify that it is working properly.	

Immobilizer

P-0513

DTC	Diagnostic item
P-0513	Invalid Key error

+ *Immobilizer code*

DTC	Diagnostic item
90A0	Key is rejected by Immobilser ECU

Vehicle behaviour: Engine does not start, check lamp will blink/ON

Probable Cause:

Invalid key error.
Key is rejected by Immobiliser ECU

Corrective Action:
Replace the key.
Perform the transponder learning
Clear error at both EMS ECU and Immobiliser ECU
Inform the customer about the theft attempt.

+ *Immobilizer code*

DTC	Diagnostic item
90A1	Invalid Transponder password is found.

Probable Cause:

Somebody duplicated the mechanical key and tried starting the vehicle.
Theft attempt is made

Corrective Action:
Clear the errors at EMS and ICU
Alert the customer.

If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

EMS Errors	Priority
P0513	1
P183A	2
P0633	3
P183E	4
P183B	5
P1832	6

Immobilizer

P-1832

DTC	Diagnostic item
P-1832	Immobilized condition

+ Immobilizer code

DTC	Diagnostic item
90A3	No EMS ACK after the signature response

Vehicle behaviour: Engine does not start, check lamp will blink/ON

Probable Cause:

Immobilizer circuit is faulty
Immobiliser ECU is not working properly.
Transponder is not working/faulty
EMS is flashed with wrong dataset

Corrective Action:
Check the Immobilizer circuit.
Clear error at both EMS ECU and Immobiliser ECU
Inform the customer about the theft attempt.
If wrong dataset- flash the correct dataset.

+ Immobilizer code

DTC	Diagnostic item
90A4	Mismatch in checksum 1
90A5	Mismatch in Checksum 2
90A6	Mismatch in Checksum 3

Probable Cause:

EMS is responding in wrong manner
Invalid immobiliser
ICU-EMS not learned

Corrective Action:
Replace immobiliser ECU
Perform transponder learning
Perform ICU- EMS learning
Clear all errors in both EMS and ICU

If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

EMS Errors	Priority
P0513	1
P183A	2
P0633	3
P183E	4
P183B	5
P1832	6

IMMOBILIZER CIRCUIT
(SCORPIO REFRESH)

Immobilizer

DTC	Diagnostic item
P-1832	Immobilized condition

+ Immobilizer code

DTC	Diagnostic item
90A3	No EMS ACK after the signature response

Vehicle behaviour: Engine does not start, check lamp will blink/ON

Probable Cause:

No EMS Ack after the signature mismatch
Theft attempt is made.

Corrective Action:

Clear all errors in both EMS and ICU

If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

EMS Errors	Priority
P0513	1
P183A	2
P0633	3
P183E	4
P183B	5
P1832	6

Immobilizer

<div style="border:1px solid">P-183A</div>

DTC	Diagnostic item
P-183A	Signature Mismatch

+ *Immobilizer code*

DTC	Diagnostic item
90A3	No EMS ACK after the signature response

Vehicle behaviour: Engine does not start, check lamp will blink/ON

Probable Cause:

Invalid immobilizer/EMS.
Signature mismatch.

Corrective Action:

Check the CAN wiring – if it is correct.
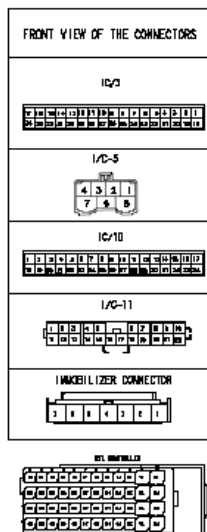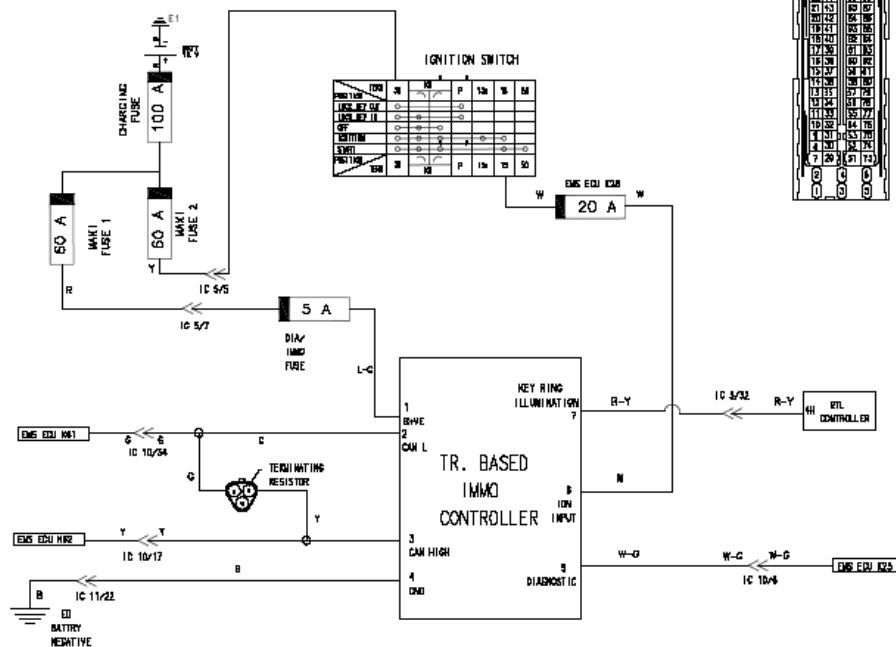Perform ICU- EMS learning.
Clear all errors in both EMS and ICU

If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

EMS Errors	Priority
P0513	1
P183A	2
P0633	3
P183E	4
P183B	5
P1832	6

P-183A

IMMOBILIZER CIRCUIT
〈SCORPIO REFRESH〉

Immobilizer

<div style="float:right">**P-183B**</div>

DTC	Diagnostic item
P-183B	EMS is locked

+ Immobilizer code

DTC	Diagnostic item
90A4	Mismatch in checksum 1
90A5	Mismatch in Checksum 2
90A6	Mismatch in Checksum 3

Vehicle behaviour: Engine does not start, check lamp will blink/ON

Probable Cause:
- Invalid immobilizer.
- CAN wiring related problem.
- EMS is locked.
- No EMS ACK from EMS.

Corrective Action:
- Check the CAN wiring – if it is correct- replace immobiliser.
- Perform transponder learning.
- Perform ICU – EMS learning.
- Clear all errors in both ICU & EMS.

+ Immobilizer code

DTC	Diagnostic item
90A2	No response from EMS ECU after signature mismatch

If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

EMS Errors	Priority
P0513	1
P183A	2
P0633	3
P183E	4
P183B	5
P1832	6

P-183B

IMMOBILIZER CIRCUIT
(SCORPIO REFRESH)
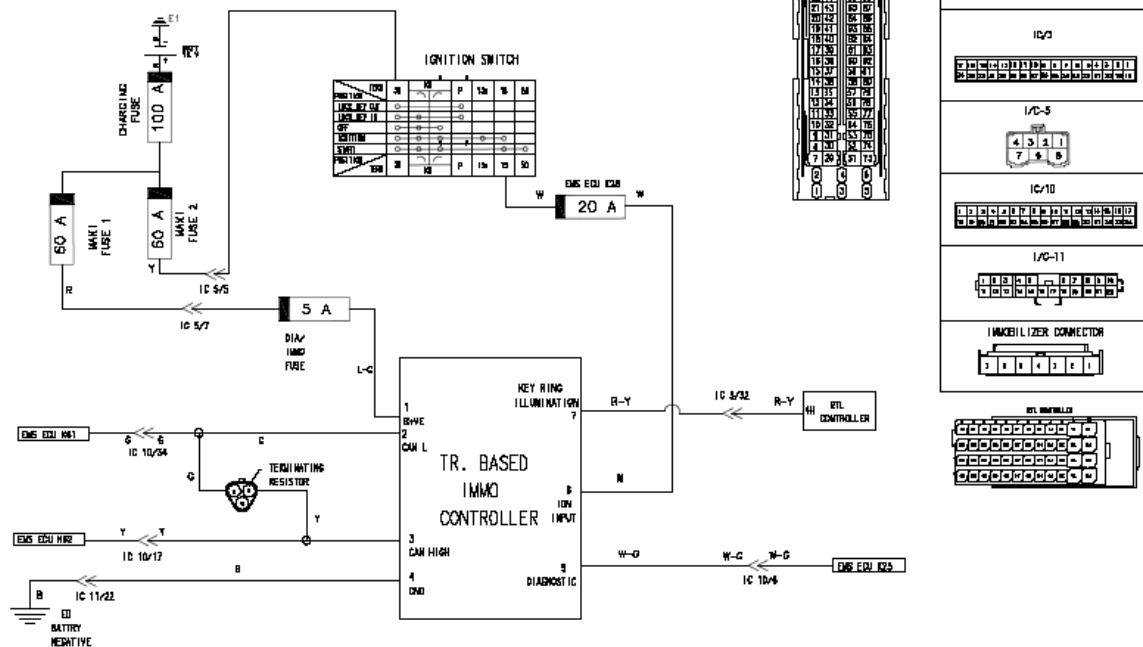
P-183E

Immobilizer

DTC	Diagnostic item
P-183E	EEPROM ERROR

Probable Cause:

EMS is flashed with different dataset
EMS is faulty.

Corrective Action:
Flash it with the correct the dataset.
Replace the EMS
Perform the ICU- EMS learning.
Clear all the errors in the EMS and ICU.

If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

EMS Errors	Priority
P0513	1
P183A	2
P0633	3
P183E	4
P183B	5
P1832	6

P-201
P-1201
P-1203
P-1204

Fault path bank1-specific errors -> stop engine

DTC	Diagnostic item
P-201	Injector bank 1: short circuit
P-1201	Injector bank 1: short circuit on Low Side to ground
P-1203	Injector bank 1 specific error depending on application
P-1204	Injector bank 1 not-classifiable error

DTC detection condition	Probable cause
Proper Performance The rail pressure is within limit **Malfunction; out-of-range** If rail pressure exceeds the limits specified in the map then the error is generated **Reaction** • The Engine is switched off. • System check lamp is ON	**Possible Causes** 201- general short circuit of the injector cable 1201- short circuit on low side to ground cable

P-1205
P-1206
P-1207
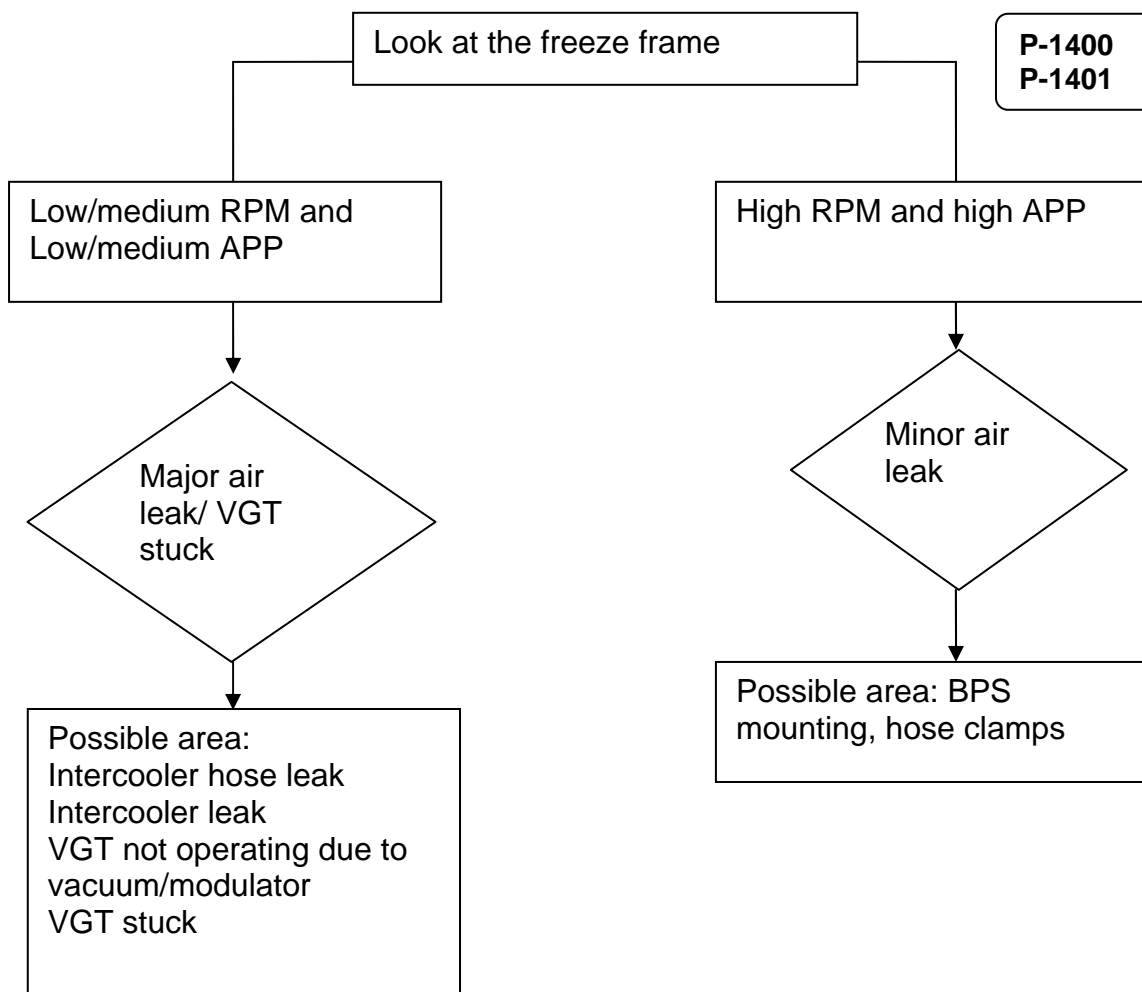P-1208

Fault path bank1-specific warning -> stop engine

DTC	Diagnostic item
P-1205	Injector bank 1specific warning : depending on application
P-1206	Injector bank 1specific warning : depending on application
P-1207	Injector bank 1specific warning open load
P-1208	Injector bank 1specific warning depending on application

DTC detection condition	Probable cause
Proper Performance The rail pressure is within limit **Malfunction; out-of-range** If rail pressure exceeds the limits specified in the map then the error is generated **Reaction** • The Engine is switched off. • System check lamp is ON	**Possible Causes** Open load.

P-1400
P-1401

Air Control Governor Deviation

DTC	Diagnostic item
P-1400	AirCtl permanent positive governor deviation: Positive governor deviation above limit
P-1401	AirCtl permanent negative governor deviation: negative governor deviation below limit

DTC detection condition	Probable cause
Normal operation * ECU monitors the boost pressure and maintains as per the set value by controlling the VGT. **Malfunction** * The boost pressure value is going beyond the limits which can be compensated by the VGT **Reaction** * If Error present/healed then * Check lamp is ON. * EGR is off * Torque is limited- poor drivability.	Air leak between TC and inlet manifold VGT stuck in open or closed condition. Vacuum leak between modulator to VGT. VGT modulator defective Vacuum supply to VGT modulator intermittent Intercooler leak BPS mounting loose

```
                    ┌─────────────────────────────────┐      ┌─────────┐
                    │   Look at the freeze frame      │      │ P-1400  │
                    └─────────────────────────────────┘      │ P-1401  │
                                                             └─────────┘
```

Low/medium RPM and Low/medium APP	High RPM and high APP

Major air leak/ VGT stuck

Minor air leak

Possible area:
Intercooler hose leak
Intercooler leak
VGT not operating due to vacuum/modulator
VGT stuck

Possible area: BPS mounting, hose clamps

CAN Signal Error

P-1705

DTC	Diagnostic item
P-1705	Main Clutch CAN signal error

DTC detection condition	Probable cause
Normal operation * ECU monitors the CAN network **Malfunction** * No signal received over the CAN network **Reaction** * Malfunction Indication lamp (MIL) is **Off**. * The TCU will go into a limp home mode * Cruise control will not work	Open circuit in Can network

CAN Signal Plausiblity Error

<div style="border:1px solid black; display:inline-block; padding:4px">P-1704</div>

DTC	Diagnostic item
P-0704	Main Clutch signal not Plausible error

DTC detection condition	Probable cause

Normal operation
   * ECU monitors the CAN network
 	
Malfunction
   * The signal is not plausible
 	
Reaction
* Malfunction indication lamp is **Off**.
* The TCU will go into a limp home mode
* Cruise control will not work
	Can Hi and Can Low shorted?

TCU Error State

P-0302

DTC	Diagnostic item
P-0302	TCU error state

DTC detection condition	Probable cause
Normal operation **Malfunction** **Reaction** * Malfunction indication lamp is **ON**. * The TCU will go into a limp home mode	Can Hi and Can Low shorted ?

EMS ECU confimed Mute error

DTC	Diagnostic item
P-0073	EMS ECU in confirmed Mute error

DTC detection condition	Probable cause
Normal operation **Malfunction** **Reaction** * Malfunction indication lamp is **ON**.	

CAN signal for vehicle speed not valid

P-1827

DTC	Diagnostic item
P-1827	CAN signal for Vehicle speed not valid

DTC detection condition	Probable cause

Normal operation
 	
Malfunction
 	
Reaction
*   Malfunction indication lamp is **OFF**.
   *   AC is switched off
   *   After run test is disabled.
   * ECU programming cannot be done.	

Gear Neutral Switch

P-1704
P-168E

SCREW M4

AIR GAP = 6±1

45$^{+0.2}_{0}$

8

SECTION A-A
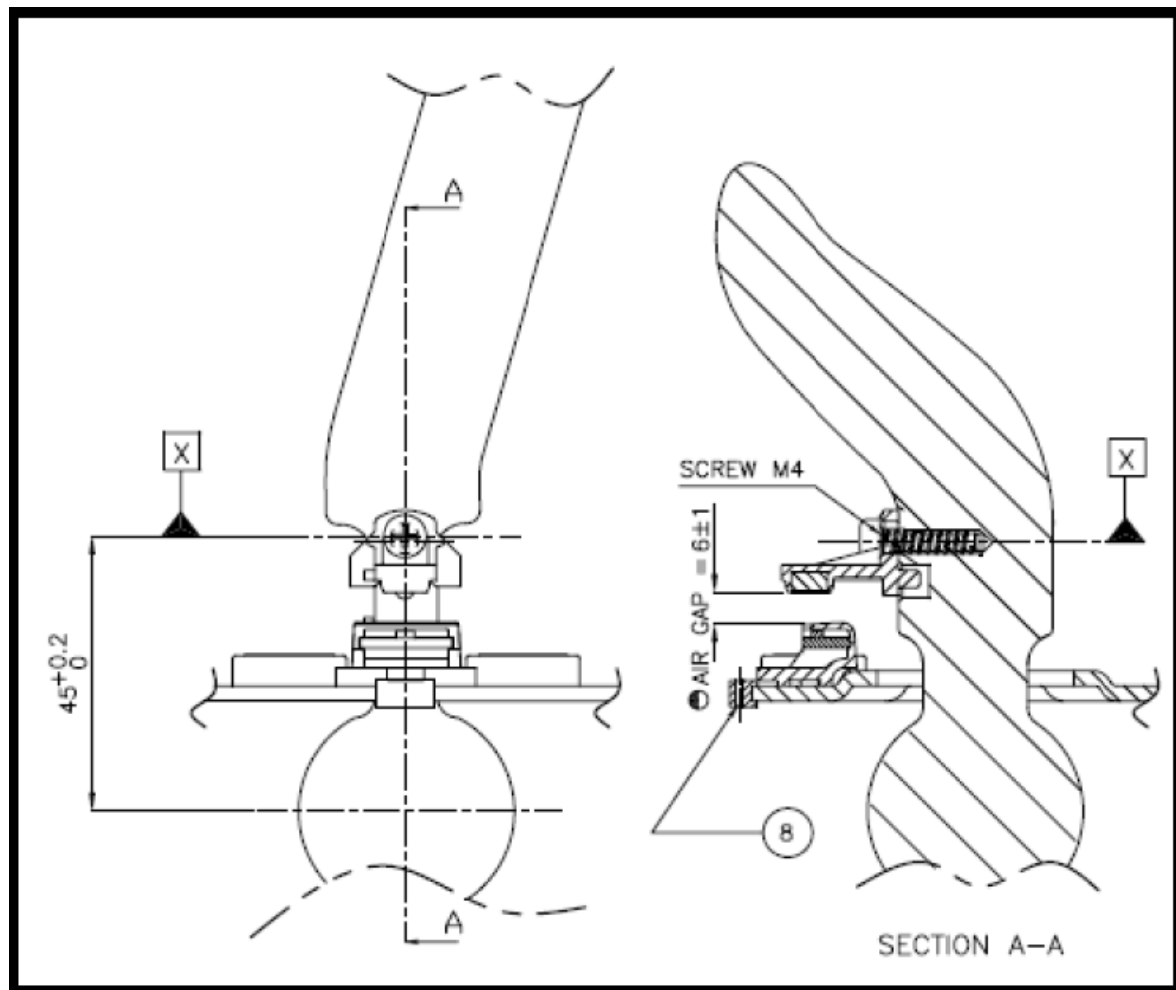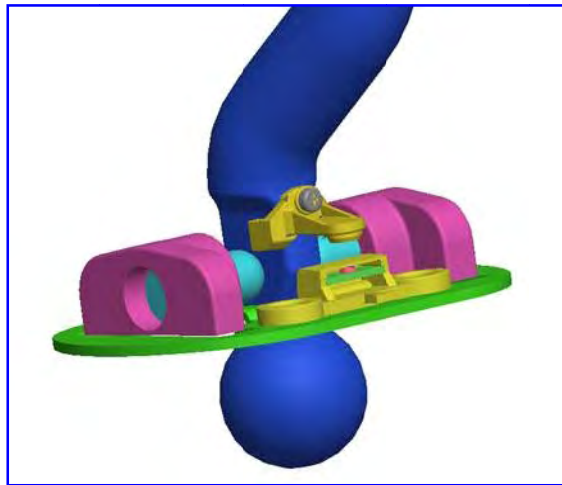
3 D and the installation view of the Gear Neutral Switch
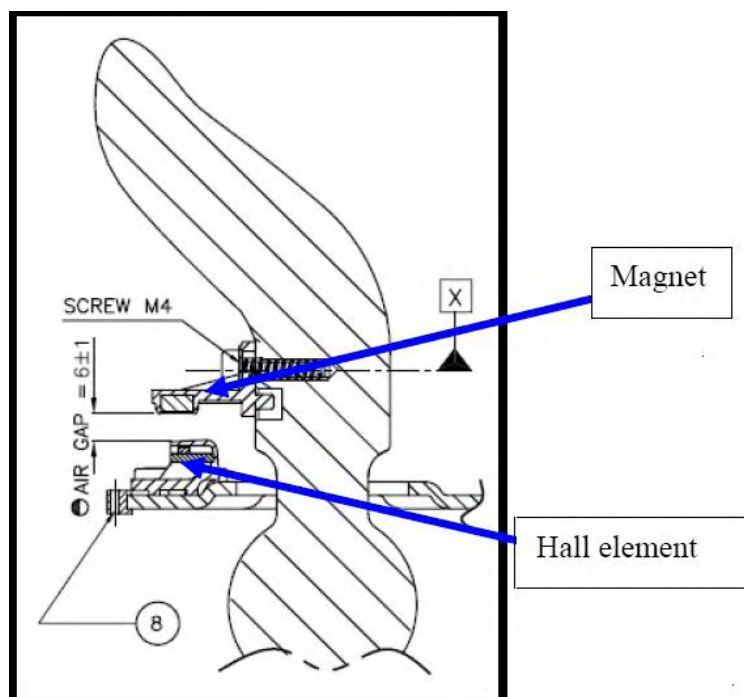
Gear Neutral Switch

P-1704

Description:

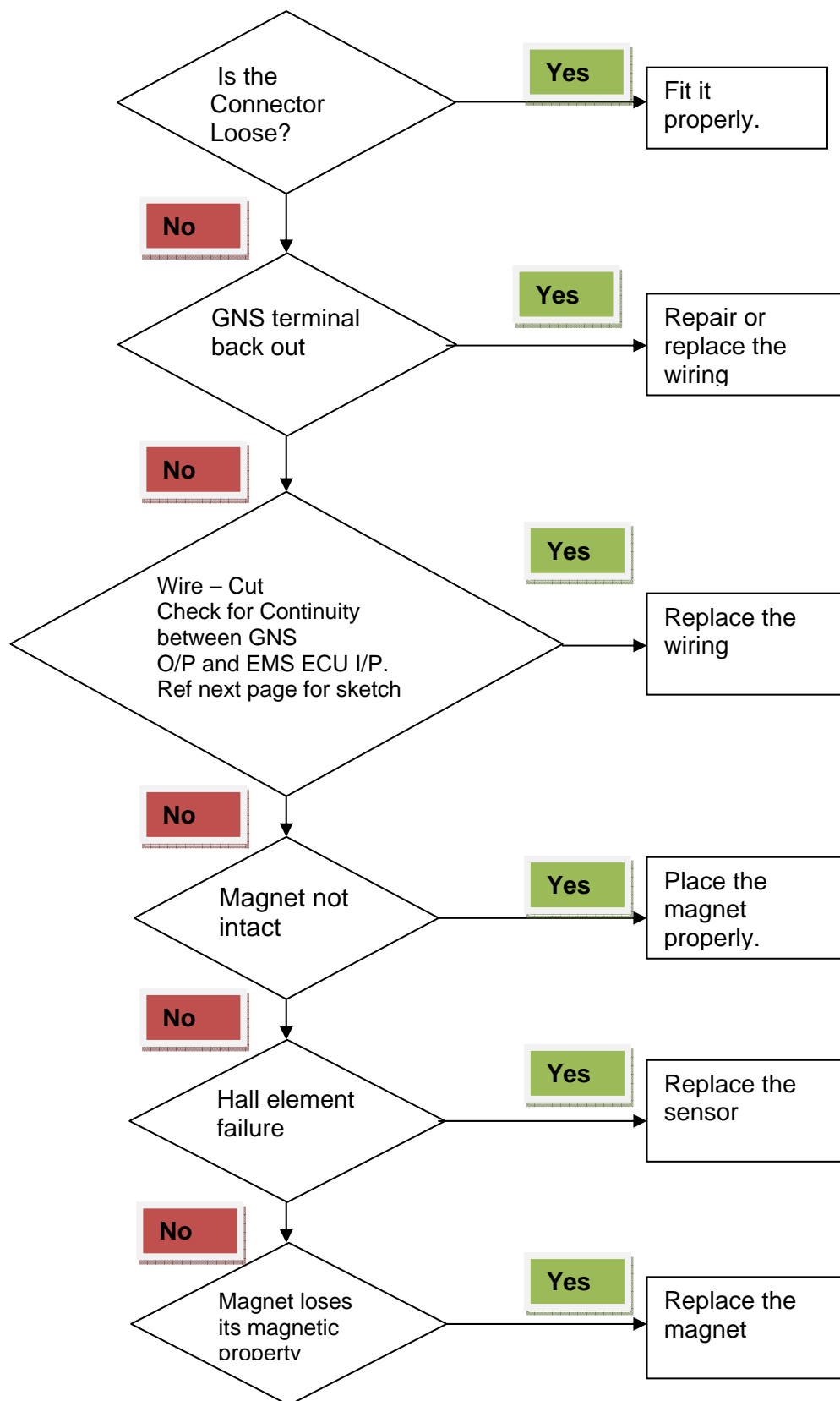The gear neutral switch is a hall effect based sensor, mounted on the gear shift selector. The gap between sensor and magnet shall be 6±1mm. This gap has to be maintained within the specification to ensure the proper function of gear neutral sensor.

DTC	Diagnostic item
P-1704	Gear Neutral signal is not plausible

DTC detection condition	Probable cause
Normal operation The ECU monitors the vehicle speed and gear ratio. During each gear change it monitors if the neutral is detected. **Malfunction** When ECU detects gear change but no neutral position then it takes it as an error **Reaction** * Check lamp does not glow, error is registered. * The Engine Start Stop system will not work.. * Gets healed if GNS status change (Neutral) is detected for 3 consecutive gear shifts in that particular driving cycle.	Gear Neutral Switch (GNS)defective/wrong signal

P-1704

Is the Connector Loose? → **Yes** → Fit it properly.

No

GNS terminal back out → **Yes** → Repair or replace the wiring

No

Wire – Cut
Check for Continuity between GNS
O/P and EMS ECU I/P.
Ref next page for sketch → **Yes** → Replace the wiring

No

Magnet not intact → **Yes** → Place the magnet properly.

No

Hall element failure → **Yes** → Replace the sensor

No

Magnet loses its magnetic property → **Yes** → Replace the magnet

Wire Cut

P-1704

ECU-K

K-53   K-52

B-□

G-W   IC10/29

IC10/22   R

VEHICLE SPEED SENSOR   1 2 3

GEAR NEUTRAL SENSOR   1 3 2

L-Y   IC10/7

E14

GEAR NEUTRAL SENSOR
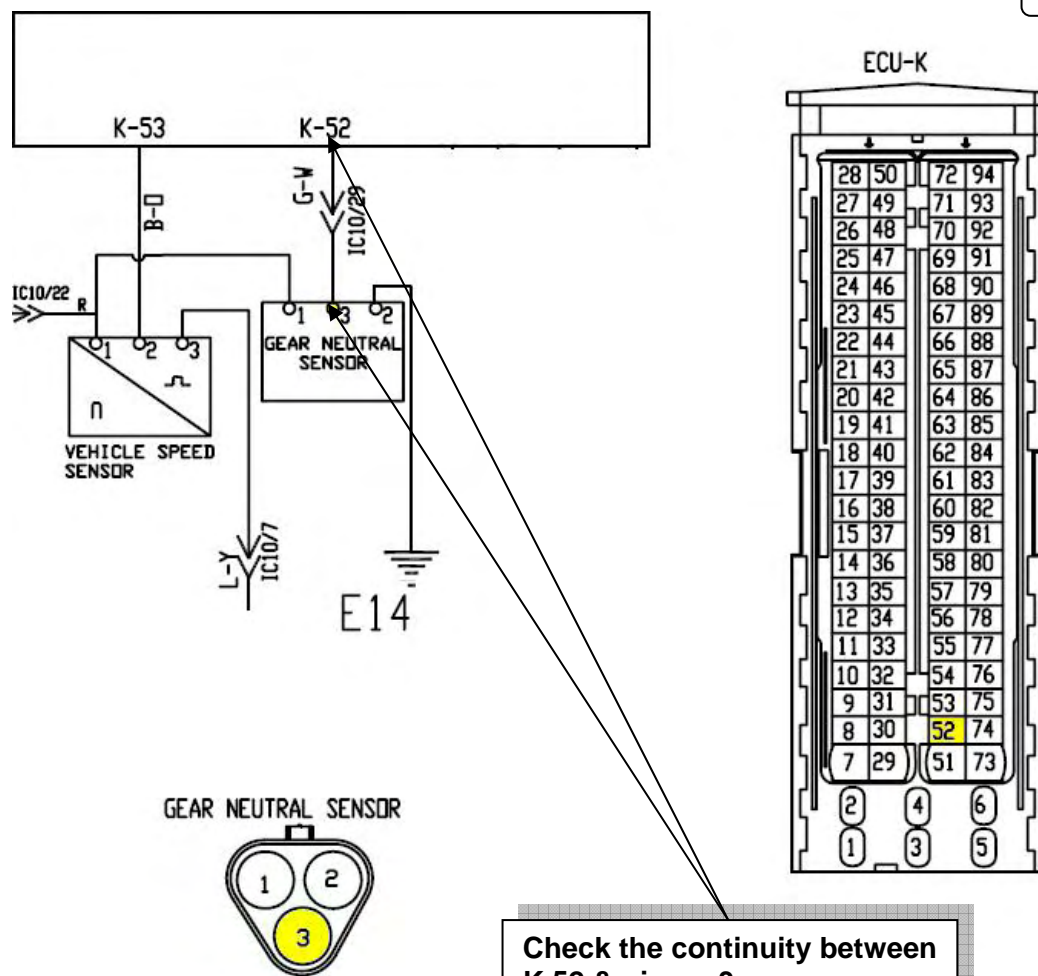
1 2
3

Check the continuity between K 52 & pin no 3
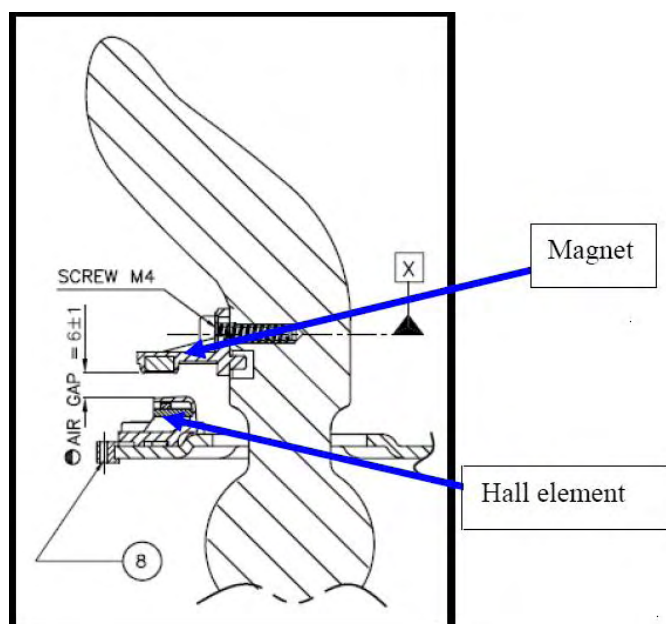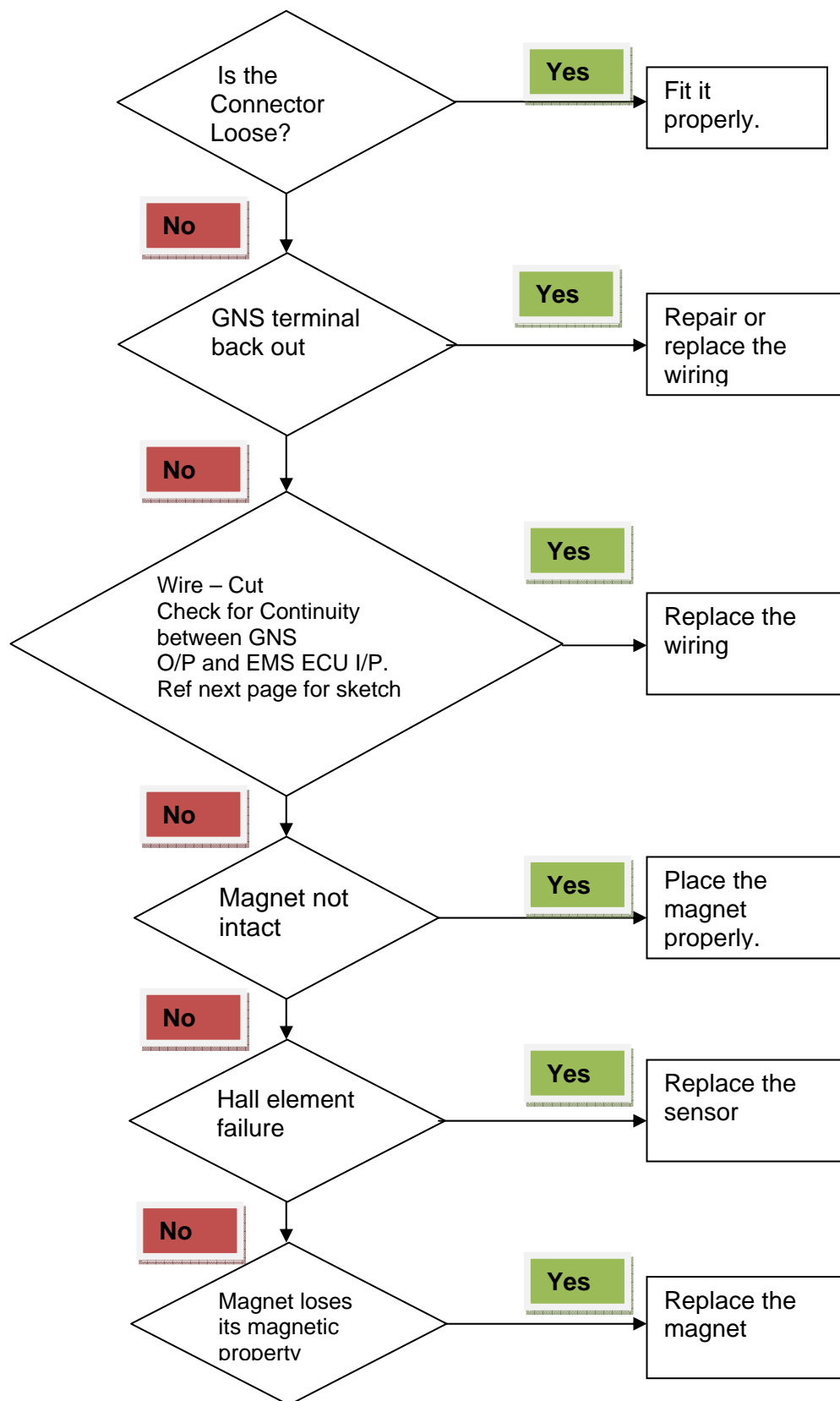
P-168E

Gear Neutral Switch

Description:

The gear neutral switch is a Hall Effect based sensor, mounted on the gear shift selector. The gap between sensor and magnet shall be 6±1mm. This gap has to be maintained within the specification to ensure the proper function of gear neutral sensor.

DTC	Diagnostic item
P-168E	Gear Neutral signal is not plausible in Standstill Condition

DTC detection condition	Probable cause
Normal operation The ECU monitors the vehicle speed, accelerator and clutch and gear. If the accelerator is pressed and vehicle is not moving and clutch is not pressed then it indicates that the vehicle is in neutral **Malfunction** During this condition if the gear switch shows that the gear is engaged, then this error is registered. **Reaction** * Check lamp does not glow, error is registered * Start Stop will not function. **Healing :** Condition for healing : When Neutral is detected this error is healed immediately **Note** : If this error happens and when in signal if gear neutral is detected with all other stop conditions then this error is healed and the vehicle will stop due to start stop system	1.GNS 2. Clutch 10% & 90% switches

P-168E

Is the Connector Loose? — **Yes** → Fit it properly.

No ↓

GNS terminal back out — **Yes** → Repair or replace the wiring

No ↓

Wire – Cut Check for Continuity between GNS O/P and EMS ECU I/P. Ref next page for sketch — **Yes** → Replace the wiring

No ↓

Magnet not intact — **Yes** → Place the magnet properly.

No ↓

Hall element failure — **Yes** → Replace the sensor

No ↓

Magnet loses its magnetic property — **Yes** → Replace the magnet

Wire Cut

ECU-K
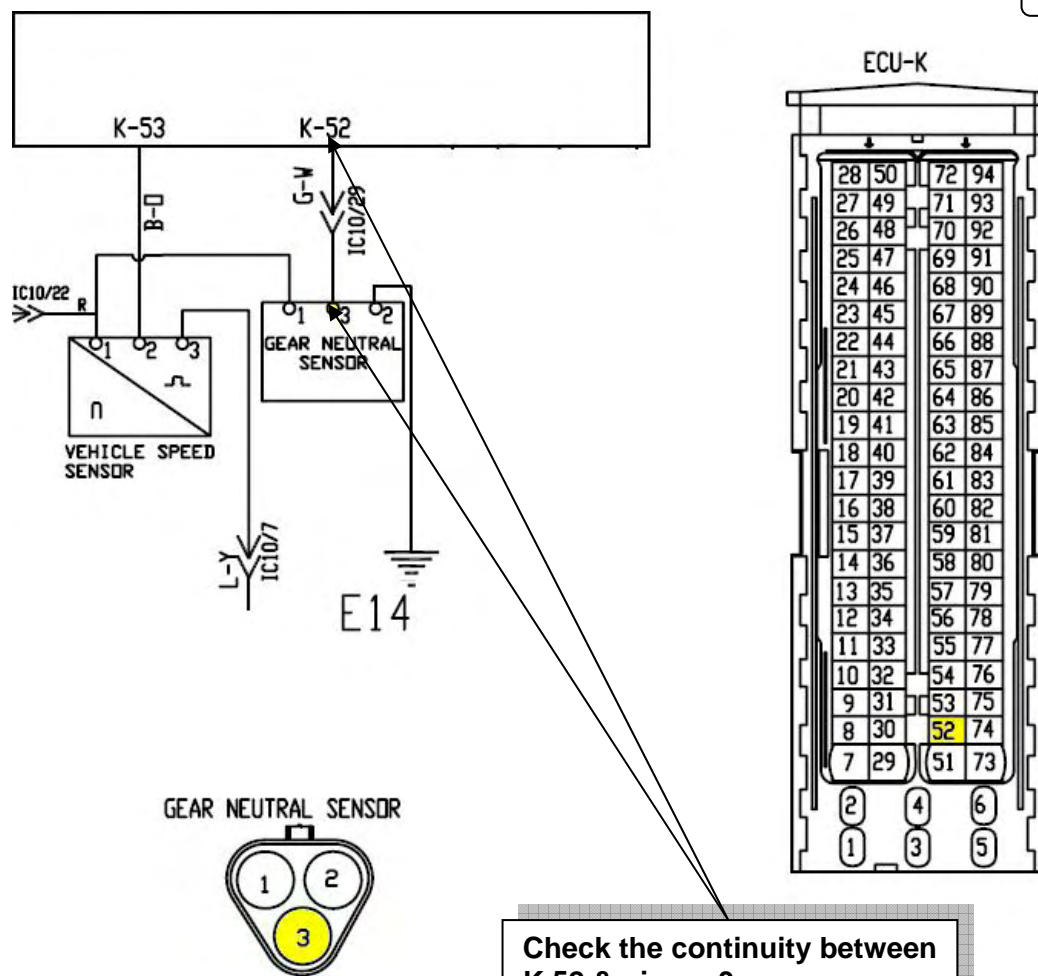
GEAR NEUTRAL SENSOR

Check the continuity between K 52 & pin no 3

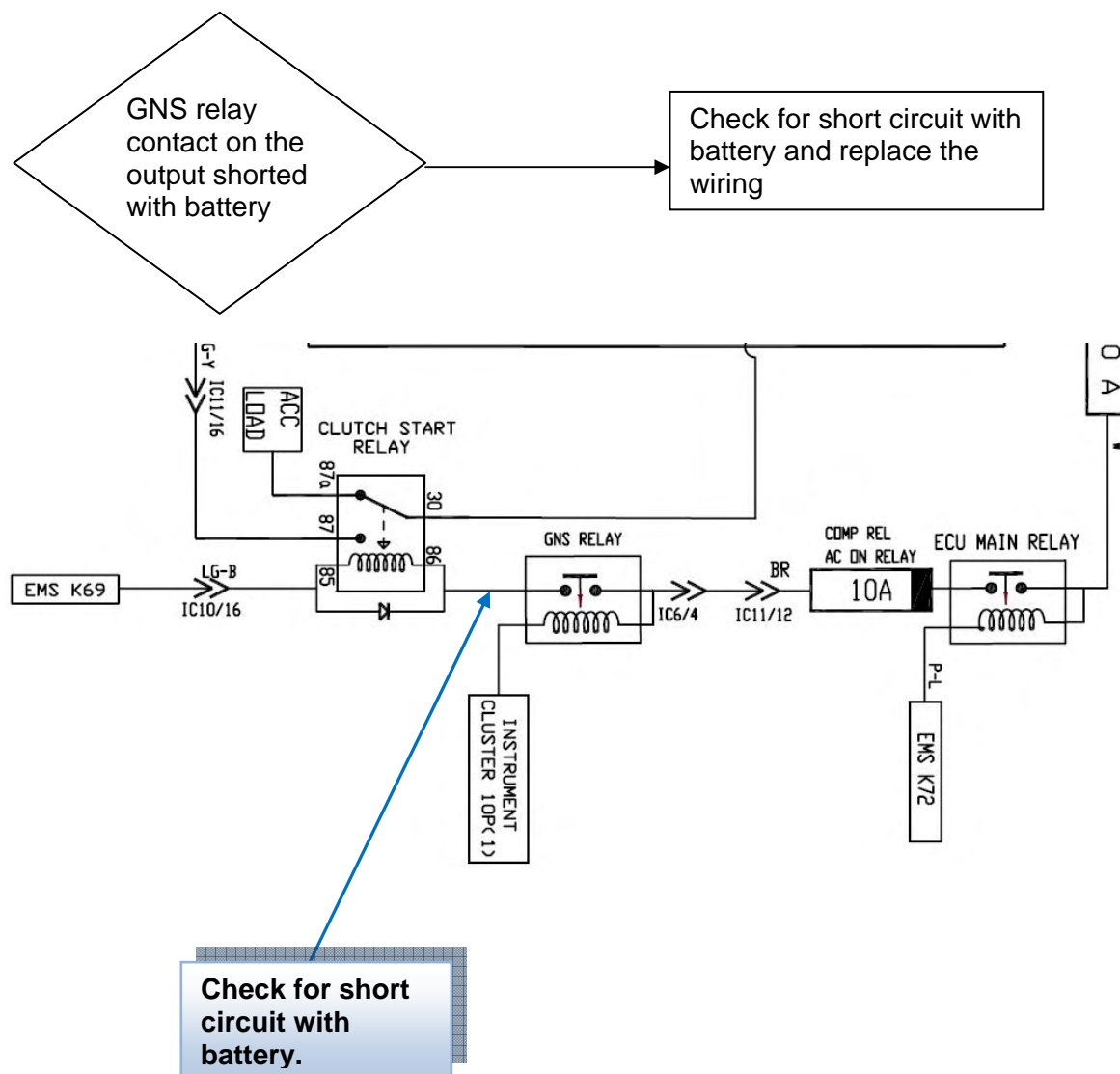## Starter Power Stage

P-170D
P-170E
P-1710

Description:

The ECU has a power stage which controls the starter actuation when the ESS
Is ON. It also monitors the power stage.

DTC	Diagnostic item
P-170D	Short Circuit Battery
P-170E	Short Circuit to Ground
P-1710	Excess Temperature

DTC detection condition	Probable cause
Normal operation **Power stage functioning OK** **Malfunction** **Reaction** * Check lamp does not glow * The Engine Start Stop system will not work..	

Diagnostic for P 170 D- short circuit to Battery

| P-170D |

Diamond: GNS relay contact on the output shorted with battery → Box: Check for short circuit with battery and replace the wiring

Callout: **Check for short circuit with battery.**

Circuit labels: G-Y, IC11/16, ACC LOAD, CLUTCH START RELAY, 87a, 87, 30, 85, 86, EMS K69, LG-B, IC10/16, GNS RELAY, INSTRUMENT CLUSTER 10P(1), IC6/4, BR, IC11/12, COMP REL AC ON RELAY, 10A, ECU MAIN RELAY, P-L, EMS K72, O A W

Note : This error will be registered only if the ESS is enabled.

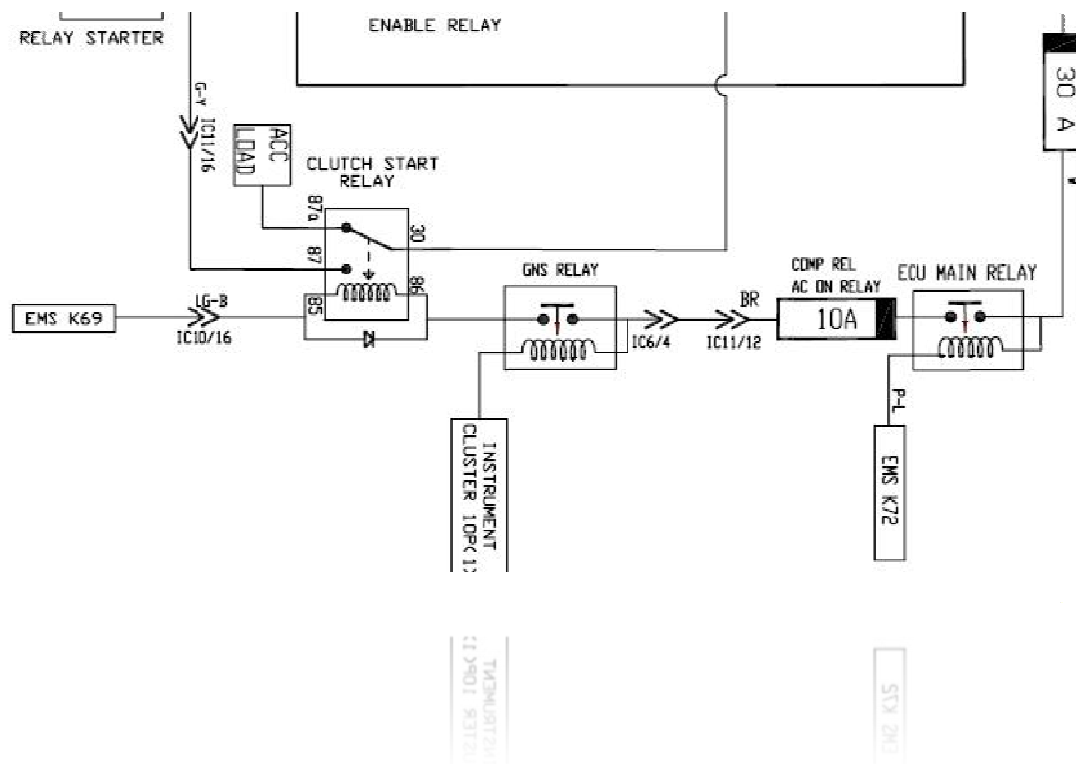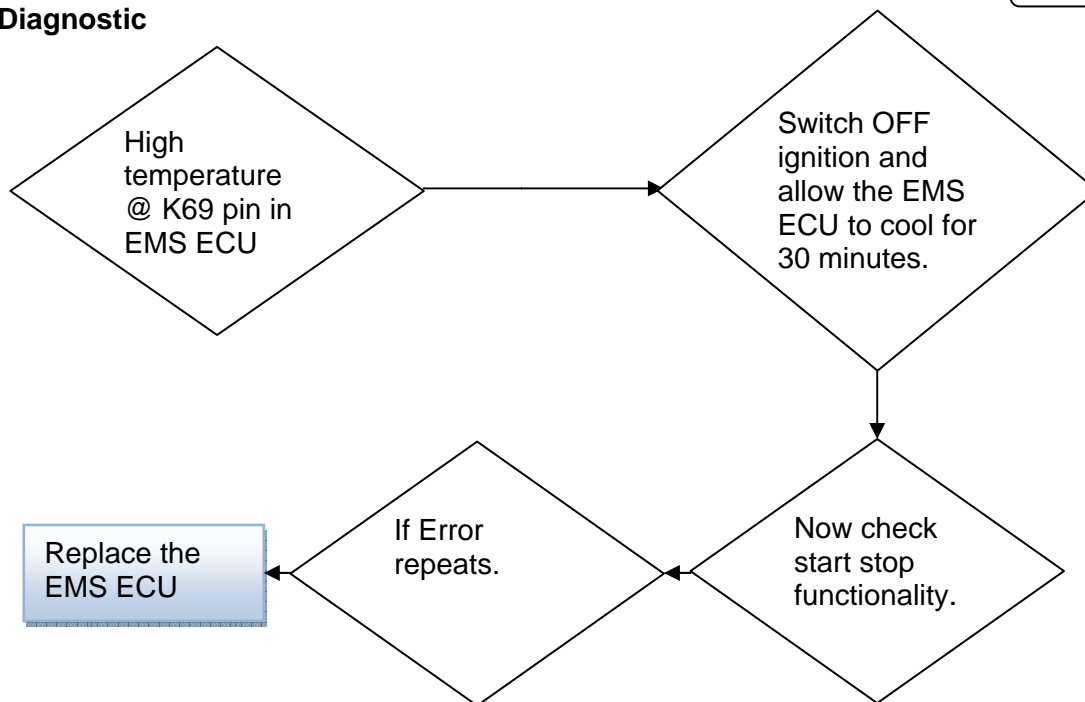This is connected through EMS ECU Main relay.
The main relay after ignition off will be held for 40 seconds after which it will be released.
Even after this, if the above shown line is found connected (Shorted) directly to Batt. then this error will get registered.

So, while checking, T15 must be switched off and you must wait for EMS ECU to be reset and then check continuity of this line with direct battery.
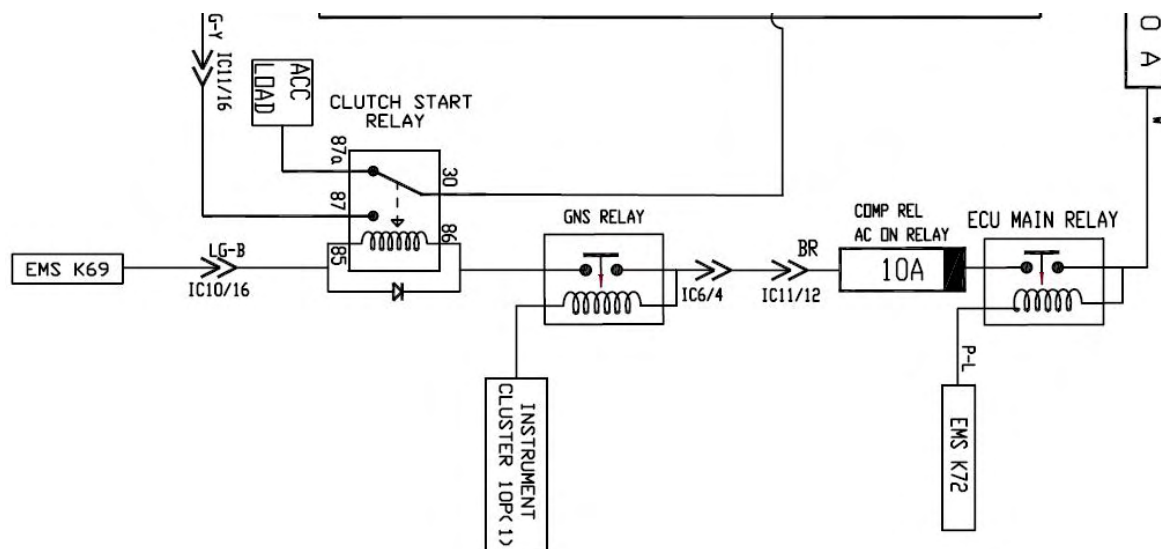
P-1710. Starter power stage – excess temprature

| P-1710 |

Diagnostic

High temperature @ K69 pin in EMS ECU

Switch OFF ignition and allow the EMS ECU to cool for 30 minutes.

Replace the EMS ECU

If Error repeats.

Now check start stop functionality.

Note : This error will be registered only if the ESS is enabled.

P-170E	Short Circuit to Ground

P 170E is registered when any of the wires are short to ground- replce the wiring.
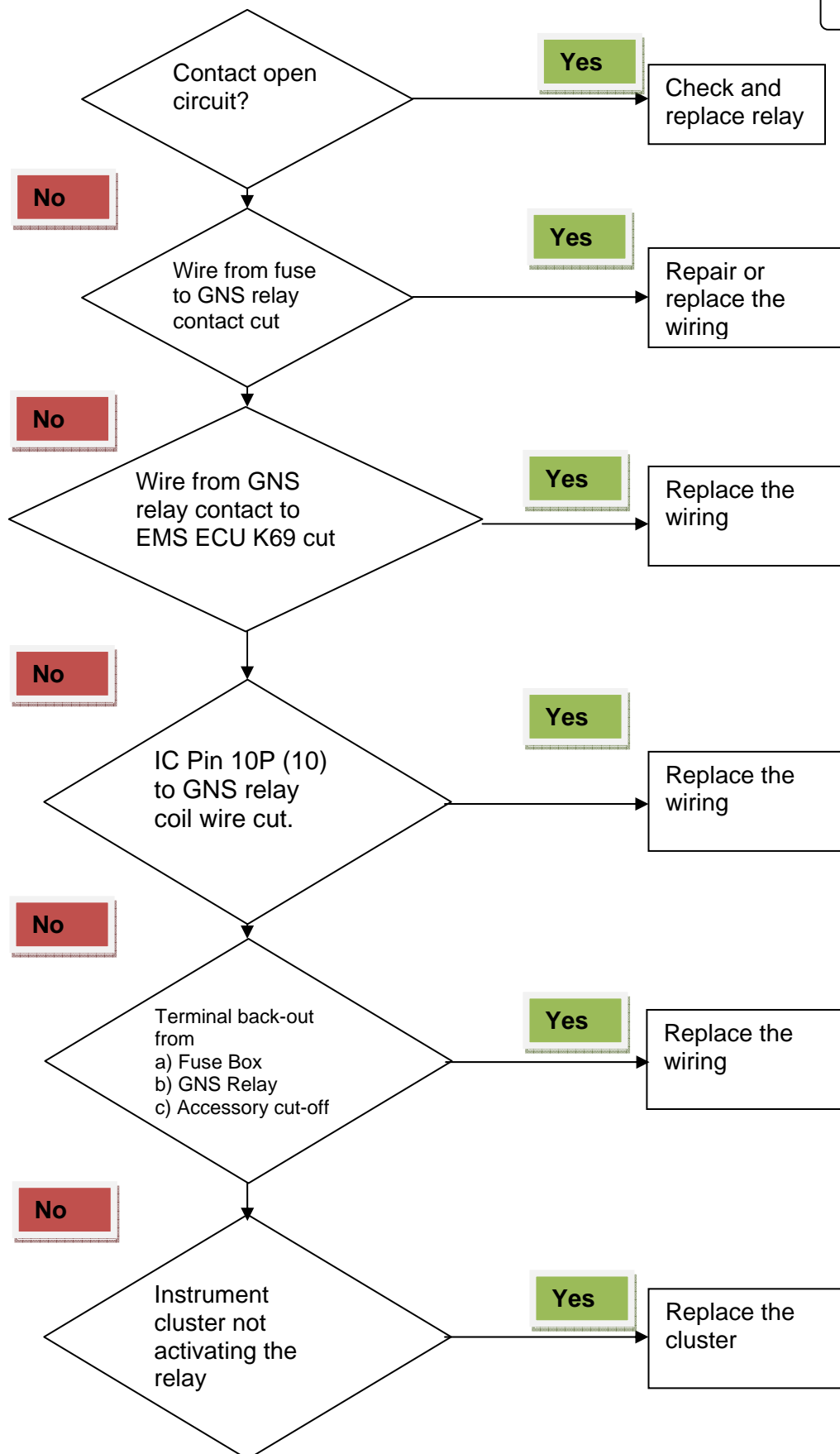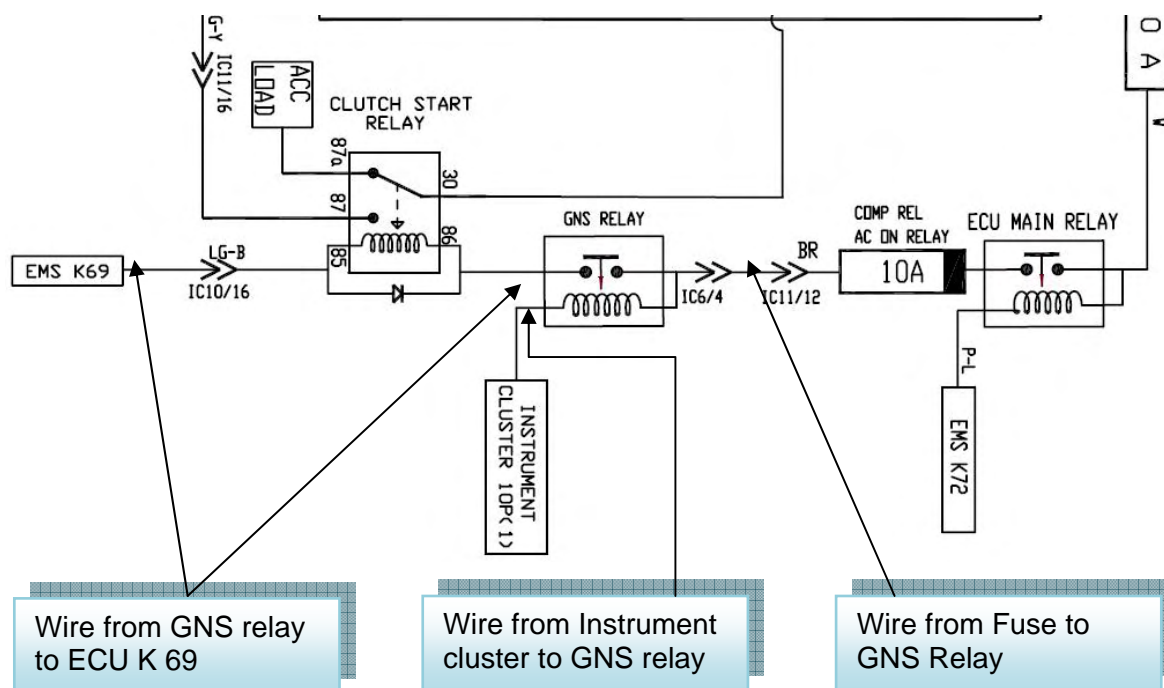
Gear Neutral Switch Relay

P-1712

Description:

The gear neutral switch relay has to close when the gear is in neutral. When the gear is engaged then relay has to open

DTC	Diagnostic item
P- 1712	No Load

DTC detection condition	Probable cause
Normal operation The ECU monitors the vehicle speed, gear position and the signal from the gear neutral switch and Pin No K69. This error is detected by monitoring Pin No K69 along with Gear Neutral switch. Whenever there is a gear change, then the status of relay (by monitoring the K69 pin) also should change. If it changes then relay is diagnosed to be fine. **Malfunction** If the signal is always open i.e. the gear switch always shows the gear engaged then this code is registered. **Reaction** *　Check lamp does not glow, error is registered. *　ESS is disabled and will not work.	1. Relay 2. Wiring 3. Instrument cluster.

P-1712

Contact open circuit? — **Yes** → Check and replace relay

No

Wire from fuse to GNS relay contact cut — **Yes** → Repair or replace the wiring

No

Wire from GNS relay contact to EMS ECU K69 cut — **Yes** → Replace the wiring

No

IC Pin 10P (10) to GNS relay coil wire cut. — **Yes** → Replace the wiring

No

Terminal back-out from
a) Fuse Box
b) GNS Relay
c) Accessory cut-off — **Yes** → Replace the wiring

No

Instrument cluster not activating the relay — **Yes** → Replace the cluster

Wire from GNS relay to ECU K 69

Wire from Instrument cluster to GNS relay

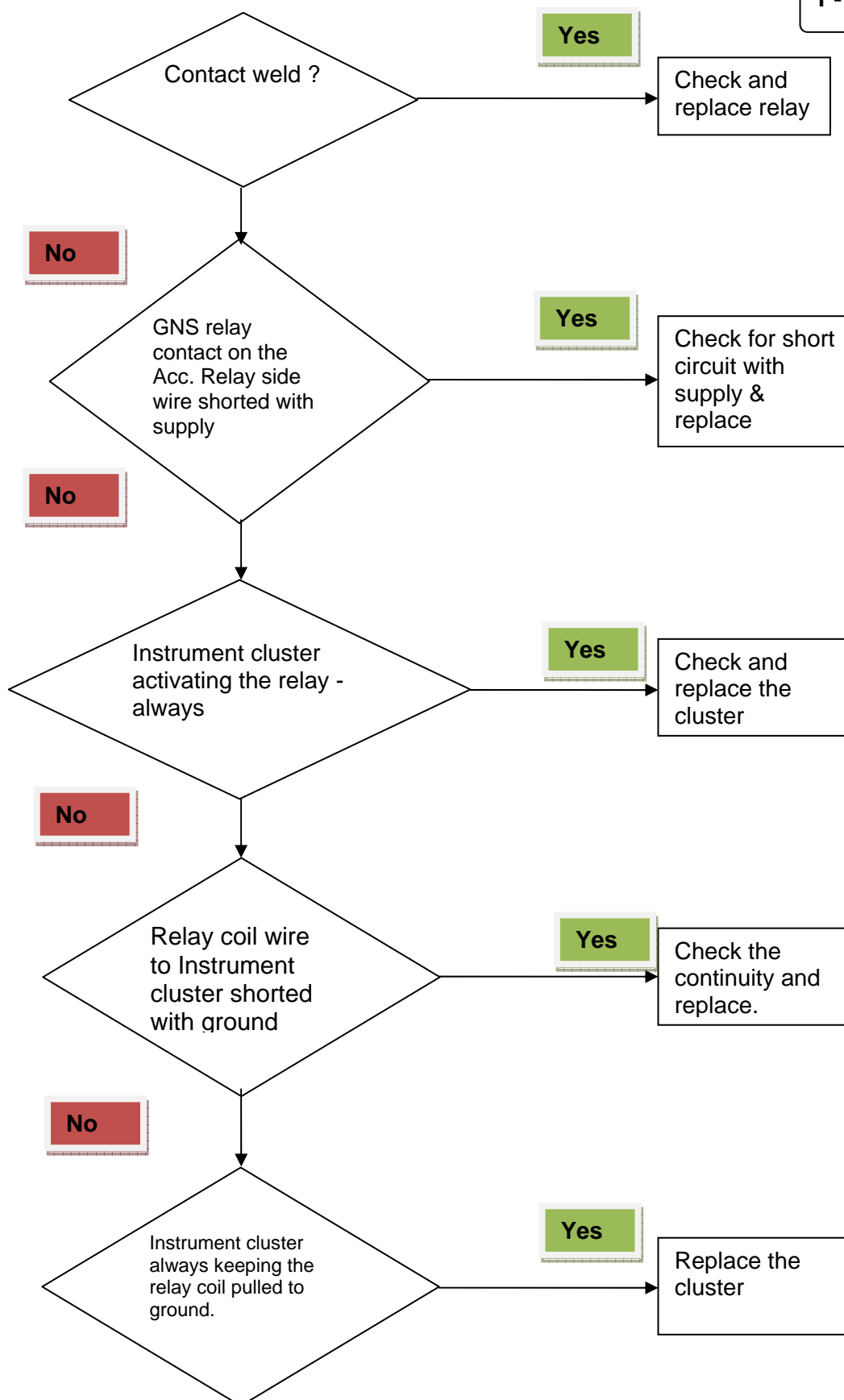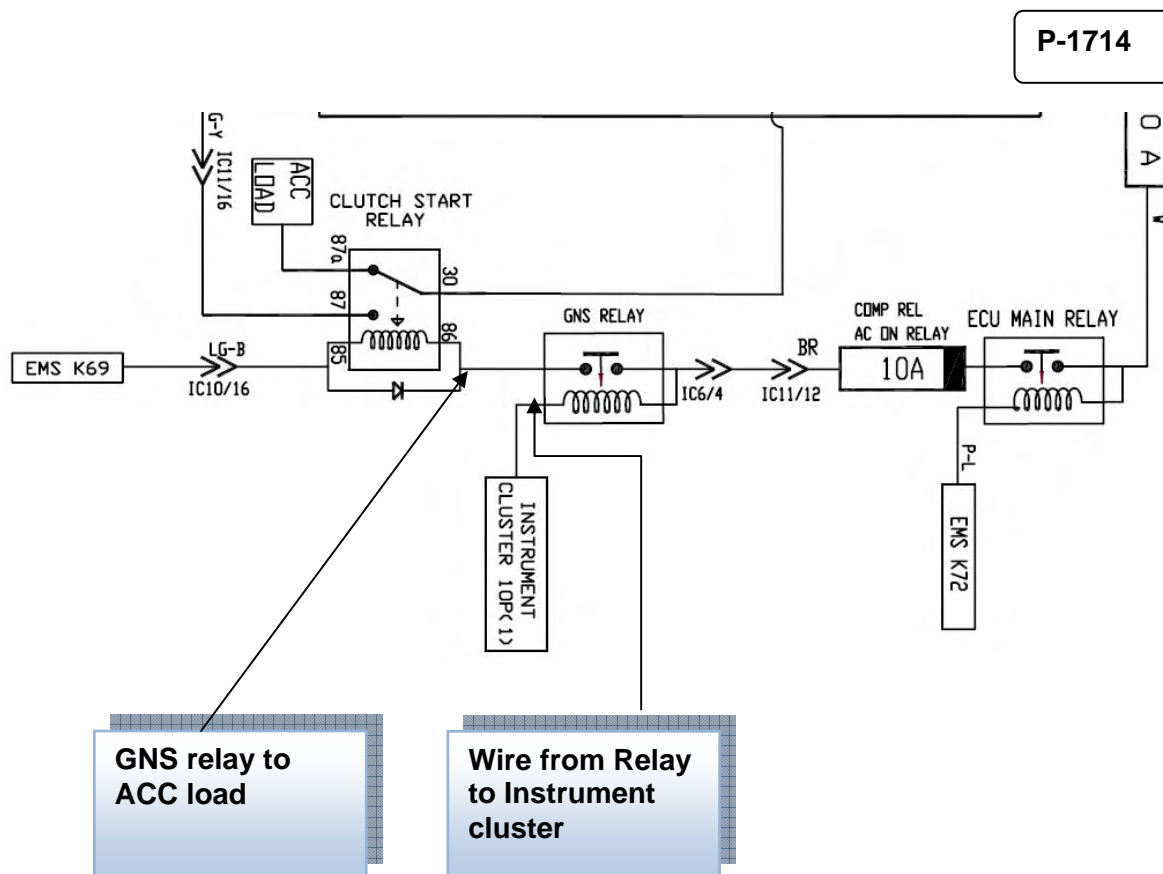Wire from Fuse to GNS Relay

Gear Neutral Switch Relay

P-1714

The gear neutral switch relay has to close when the gear is in neutral. When the gear is engaged then relay has to open

DTC	Diagnostic item
P- 1714	GNS relay sticking.

DTC detection condition	Probable cause
Normal operation The ECU monitors the vehicle speed, gear position and the signal from the gear neutral switch and Pin No K69. This error is detected by monitoring Pin No K69 along with Gear Neutral switch. Whenever there is a gear change, then the status of relay (by monitoring the K69 pin) also should change. If it changes then relay is diagnosed to be fine. **Malfunction** If the signal is always closed i.e. the gear switch always shows the gear lever is in neutral then this code is registered. **Reaction** * Check lamp does not glow, error is registered. * ESS is disabled and will not work.	a) Relay b) Wiring c) Instrument cluster

P-1714

Contact weld ?

Yes → Check and replace relay

No

GNS relay contact on the Acc. Relay side wire shorted with supply

Yes → Check for short circuit with supply & replace

No

Instrument cluster activating the relay - always

Yes → Check and replace the cluster

No

Relay coil wire to Instrument cluster shorted with ground

Yes → Check the continuity and replace.

No

Instrument cluster always keeping the relay coil pulled to ground.

Yes → Replace the cluster

P-1714

GNS relay to ACC load

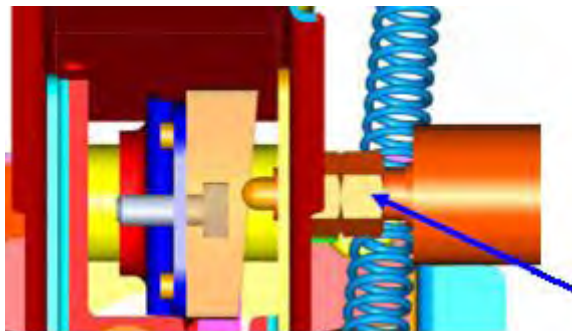**Wire from Relay to Instrument cluster**

Redundant Clutch Switch

P-170A

Nut for removing the clutch switch
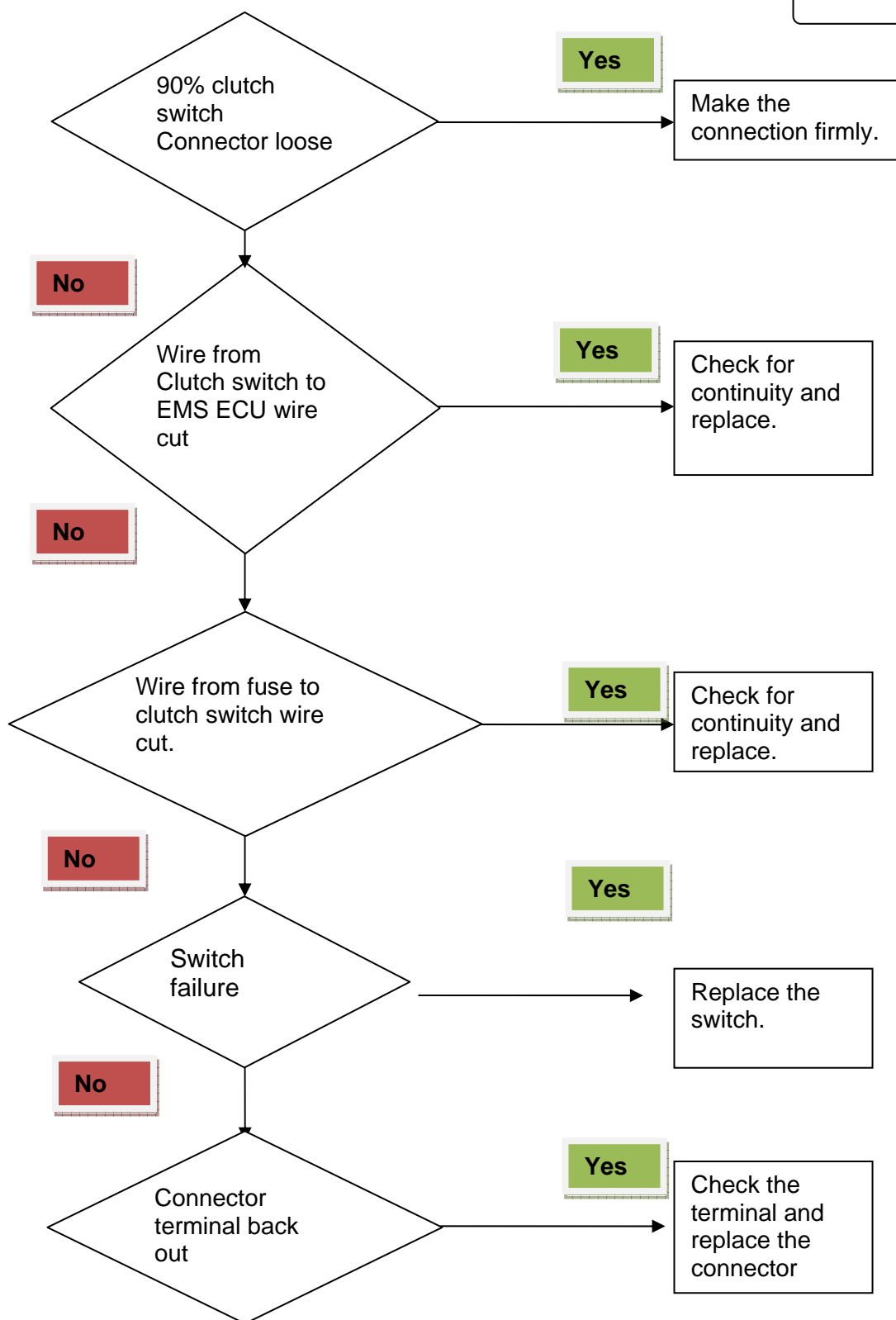
Redundant Clutch Switch
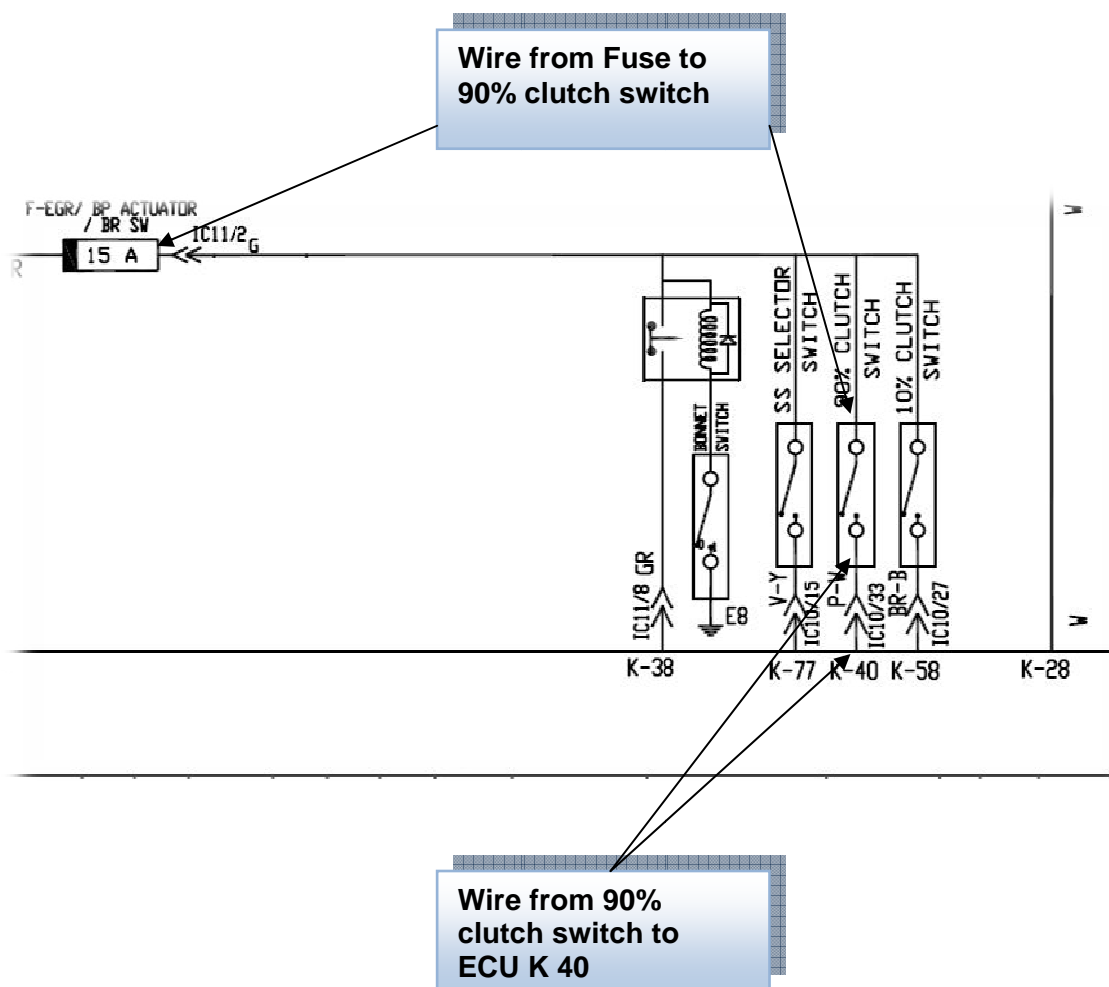
P-170A

Description

The ECU monitors the signal from the normal clutch switch- which is at 10% of the pedal travel and also the redundant clutch switch (which is at 90% clutch pedal travel)

DTC	Diagnostic item
P-170A	Clutch signal is not plausible

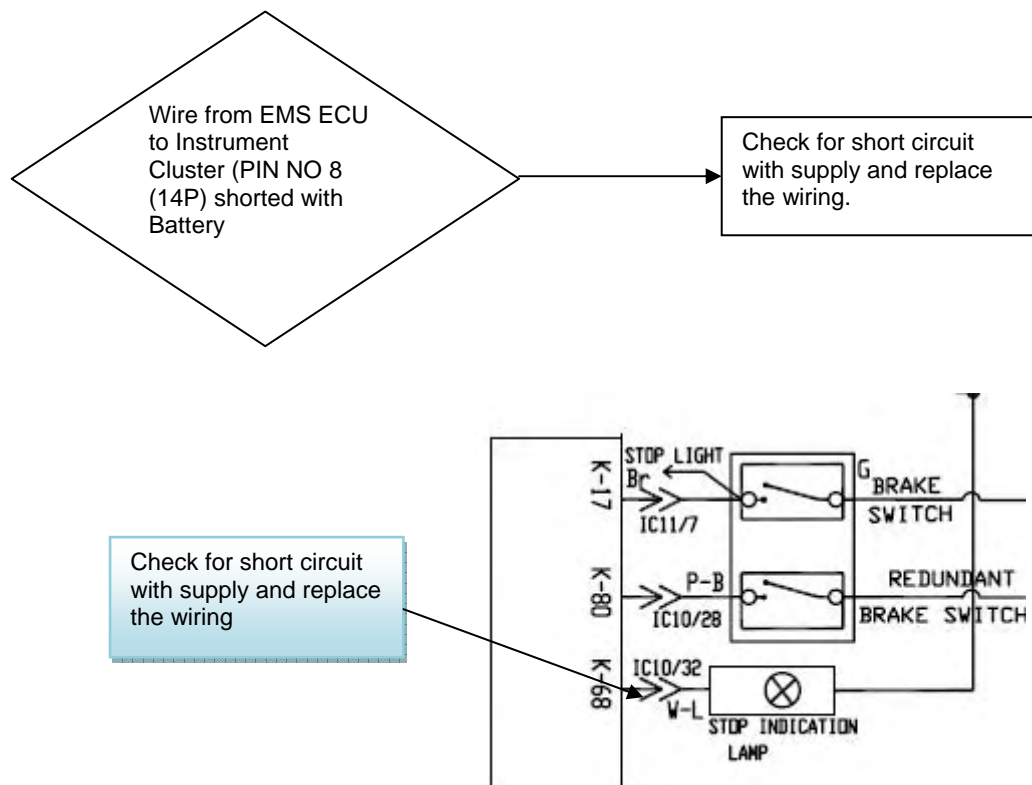| DTC detection condition	Probable cause
Normal operation In normal operation the signal from the 10% switch will come before the 90% switch. **Malfunction** If the signal from the 10% switch has not come but the 90% switch has come then it is considered as a plausibility error. **Reaction** * Check lamp does not glow, error is registered. * ESS is disabled and will not work.	a) 90% clutch switch b) Wiring.

P-170A

90% clutch switch Connector loose

Yes → Make the connection firmly.

No

Wire from Clutch switch to EMS ECU wire cut

Yes → Check for continuity and replace.

No

Wire from fuse to clutch switch wire cut.

Yes → Check for continuity and replace.

No

Yes

Switch failure → Replace the switch.

No

Connector terminal back out

Yes → Check the terminal and replace the connector

Wire from Fuse to 90% clutch switch

F-EGR/ BP ACTUATOR
/ BR SW   IC11/2 G

15 A

R

SS SELECTOR SWITCH

90% CLUTCH SWITCH

10% CLUTCH SWITCH

BONNET SWITCH

IC11/8 GR

E8

V-Y
IC10/15

P-W
IC10/33

BR-B
IC10/27

K-38   K-77 K-40 K-58   K-28

Wire from 90% clutch switch to ECU K 40

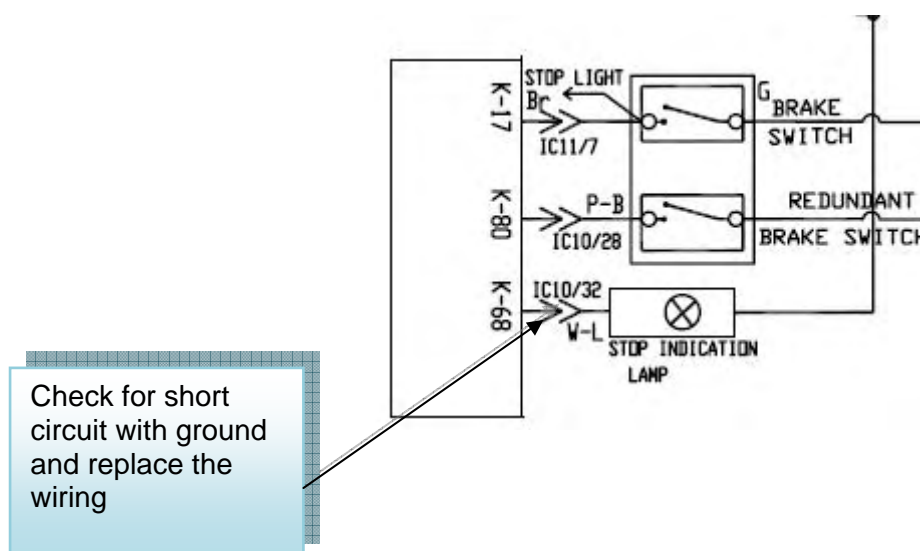## Lamp Power Stage

<div style="border:1px solid;">P- 1AE9</div>

Description

The stop lamp of the ESS is driven by the ECU's power stage.
The output stage is monitored and checked for errors.

DTC	Diagnostic item
P-1AE9	Short Circuit Battery

DTC detection condition	Probable cause
Normal operation Stop lamp is powered through the ECU Main relay. The lamp is driven by pulling the other end of lamp to ground by EMS ECU stop lamp power stage. 40 seconds after ignition is switched off, the ECU main relay contacts open. When the ignition is ON (Or till Main relay contacts are closed) Pin K68 sees +12V..So the pin K68 should be showing open circuit after the main relay contacts open. **Malfunction** If it does not show open circuit, it only means that the power supply for lamps is short directly to battery. **Reaction** * Check lamp does not glow, error is registered. * .	Wiring short.

Wire from EMS ECU to Instrument Cluster (PIN NO 8 (14P) shorted with Battery → Check for short circuit with supply and replace the wiring.

Check for short circuit with supply and replace the wiring

Lamp Power Stage

P- 1AEA

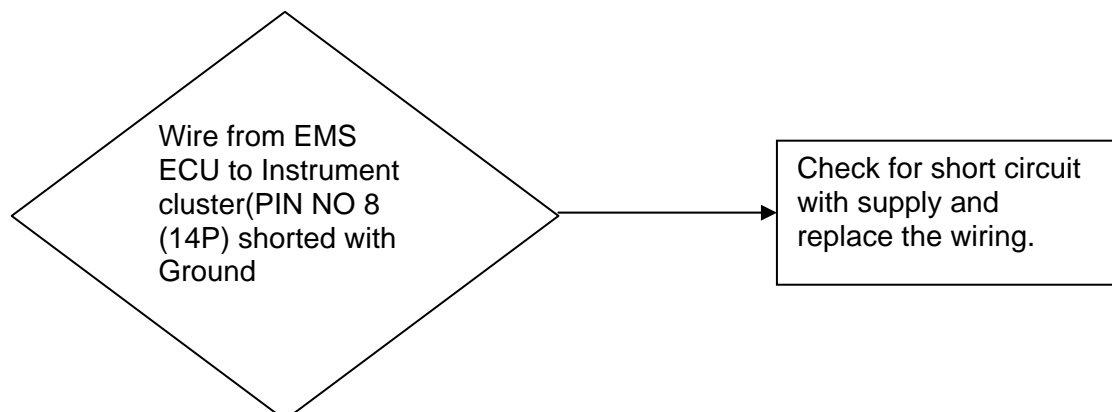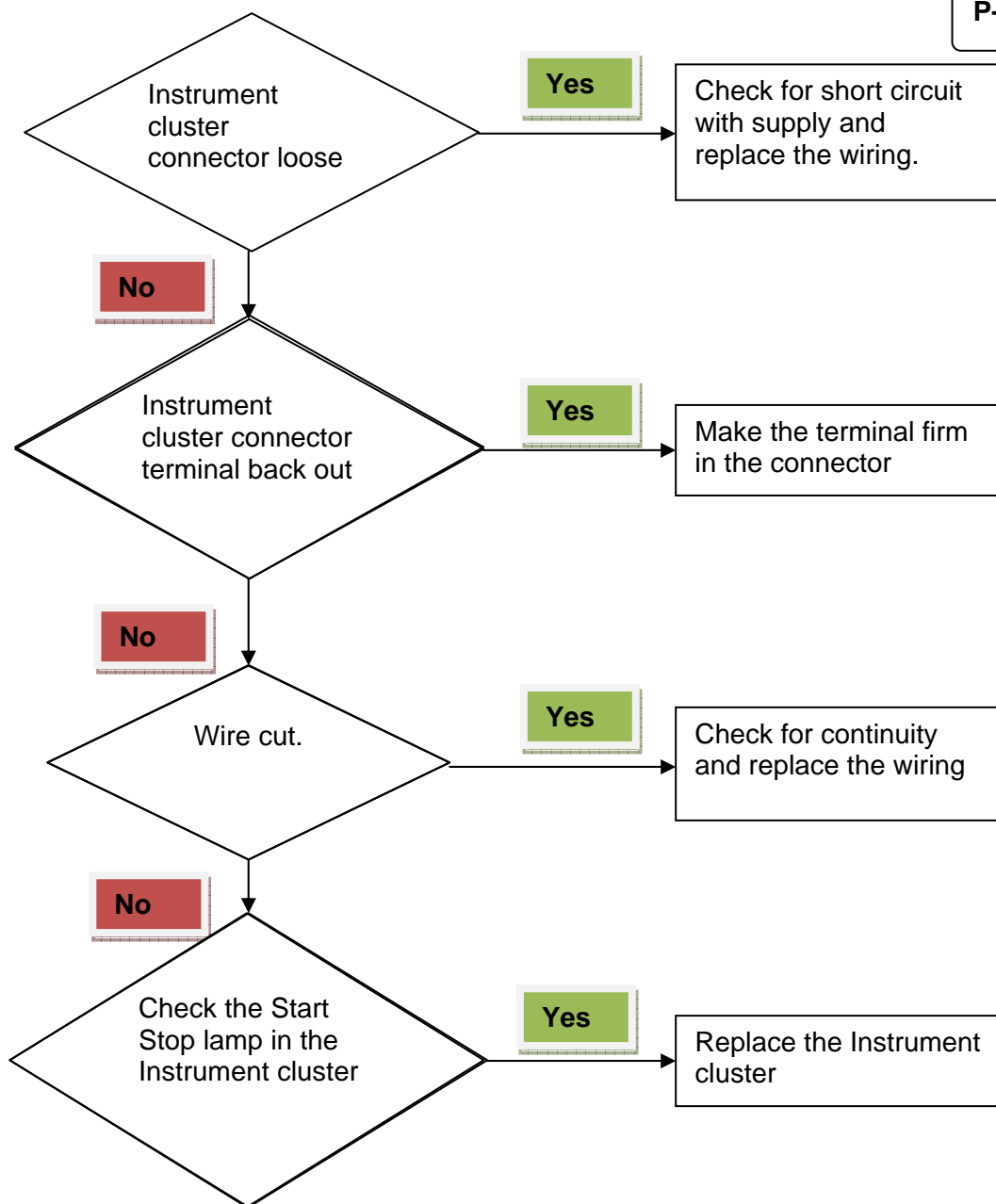### Description

The stop lamp of the ESS is driven by the ECU's power stage.
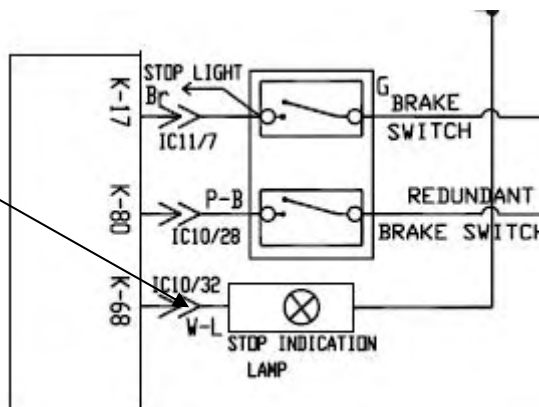The output stage is monitored and checked for errors.

DTC	Diagnostic item
P-1AEA	Short Circuit to Ground

DTC detection condition	Probable cause
Normal operation When the power stage is switched off then it does not detect a short to Ground **Malfunction** When it detects a short **Reaction** * Check lamp does not glow, error is registered. * .	Wiring short.

Wire from EMS ECU to Instrument cluster(PIN NO 8 (14P) shorted with Ground → Check for short circuit with supply and replace the wiring.

Check for short circuit with ground and replace the wiring

STOP LIGHT
K-17 Br IC11/7
G BRAKE SWITCH

K-80 P-B IC10/28
REDUNDANT BRAKE SWITCH

K-68 IC10/32 W-L
STOP INDICATION LAMP

Lamp Power Stage

| P- 1AEB |

Description

The stop lamp of the ESS is driven by the ECU's power stage.
The output stage is monitored and checked for errors.

DTC	Diagnostic item
P-1AEB	No Load

DTC detection condition	Probable cause
Normal operation When Ignition is ON and the power stage is switched off, then at Pin K68 point EMS ECU monitoring of lamp power stage will be seeing a +12V. When power stage is switched ON then monitoring will see a ground at K68 pin. **Malfunction** When the power stage is switched OFF and ignition is ON, if +12V is not detected at Input to pin K68 (i.e, no load is detected) this error is logged **Reaction** * Check lamp does not glow, error is registered. * .	Open circuit Instrument cluster Loose connector Pin Backout

P- 1AEB

```
┌─────────────────┐
│   Instrument    │──── Yes ────→  Check for short circuit
│   cluster       │                with supply and
│ connector loose │                replace the wiring.
└─────────────────┘
        │
       No
        │
┌─────────────────┐
│   Instrument    │──── Yes ────→  Make the terminal firm
│ cluster connector│                in the connector
│ terminal back out│
└─────────────────┘
        │
       No
        │
┌─────────────────┐
│   Wire cut.     │──── Yes ────→  Check for continuity
│                 │                and replace the wiring
└─────────────────┘
        │
       No
        │
┌─────────────────┐
│  Check the Start │──── Yes ────→  Replace the Instrument
│  Stop lamp in the│                cluster
│ Instrument cluster│
└─────────────────┘
```

Wire from EMS ECU to IC Pin 8(14P)

STOP LIGHT
K-17 Br IC11/7 → G BRAKE SWITCH

K-80 P-B IC10/28 → REDUNDANT BRAKE SWITCH

K-68 IC10/32 W-L → STOP INDICATION LAMP

Lamp Power Stage

P- 1AEC

Description

The stop lamp of the ESS is driven by the ECU's power stage.
The output stage is monitored and checked for errors.

DTC	Diagnostic item
P-1AEC	Excess temperature

DTC detection condition	Probable cause
Normal operation The temperature of the power stage is monitored and is within range **Malfunction** When it detects that there is excess temperature **Reaction** * Check lamp does not glow, error is registered. * .	ECU

High temperature @ K68 in EMS ECU → Replace ECU
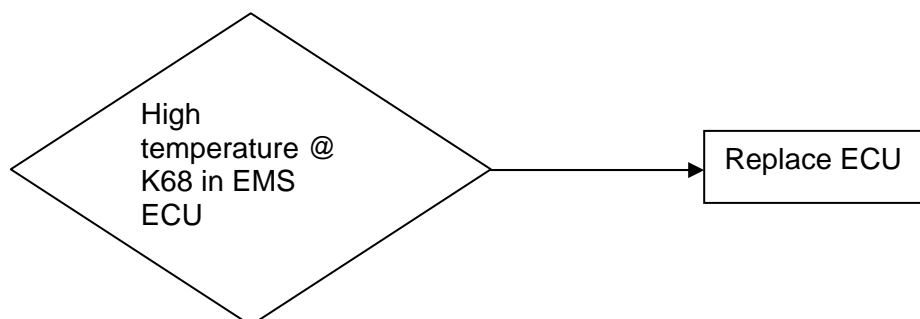
T 50 (Igniation Switch) Always pressed ON

P- 1715

Description

The signal from the igniaton switch (for cranking) is monitored for duration

DTC	Diagnostic item
P-1715	T50 Always pressed ON

DTC detection condition	Probable cause
Normal operation The time duration of the signal is within normal **Malfunction** When the cranking signal is detected beyond the range then it is assigned as the T50 is pressed ON. **Reaction** * Check lamp does not glow, error is registered. * .	Wiring Ignition switch

```
        ┌───────────────┐
        │  T50 input    │   Yes     Check the wiring for short circuit
        │  shorted to   │──────────▶  with supply and replace the
        │  Supply       │             wiring harness.
        └───────┬───────┘
                │ No
                ▼
        ┌───────────────┐
        │ Ignition key  │           Replace the ignition key.
        │ problem.      │──────────▶
        └───────────────┘
```
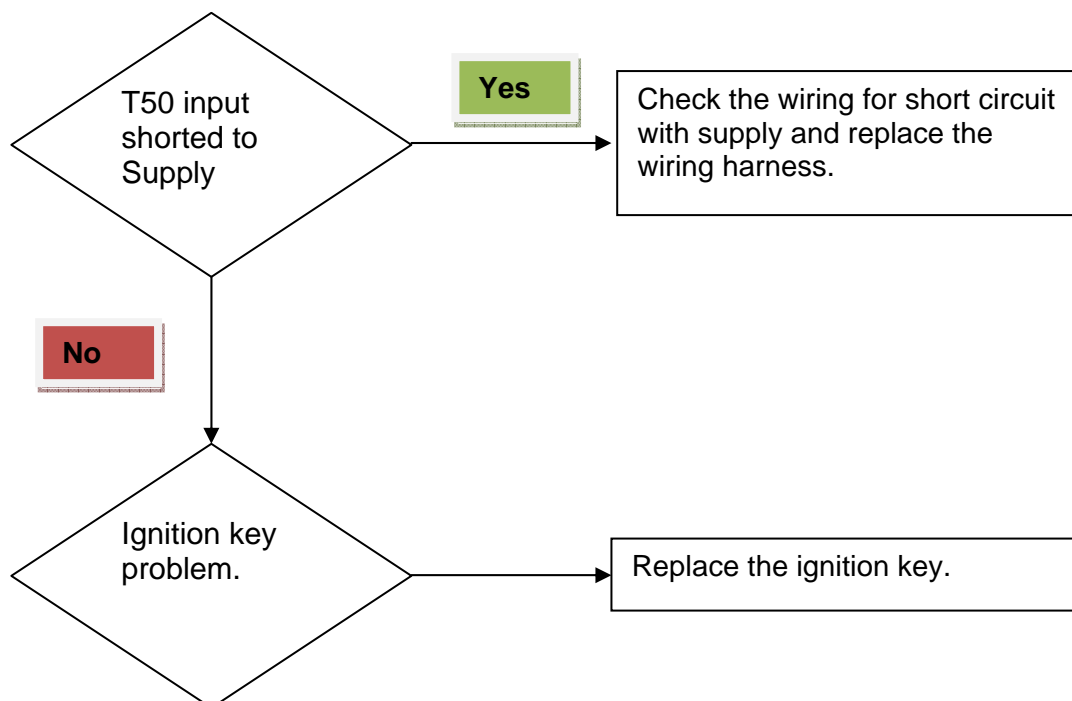
Actuator Tests

Home screen for the Actuator test
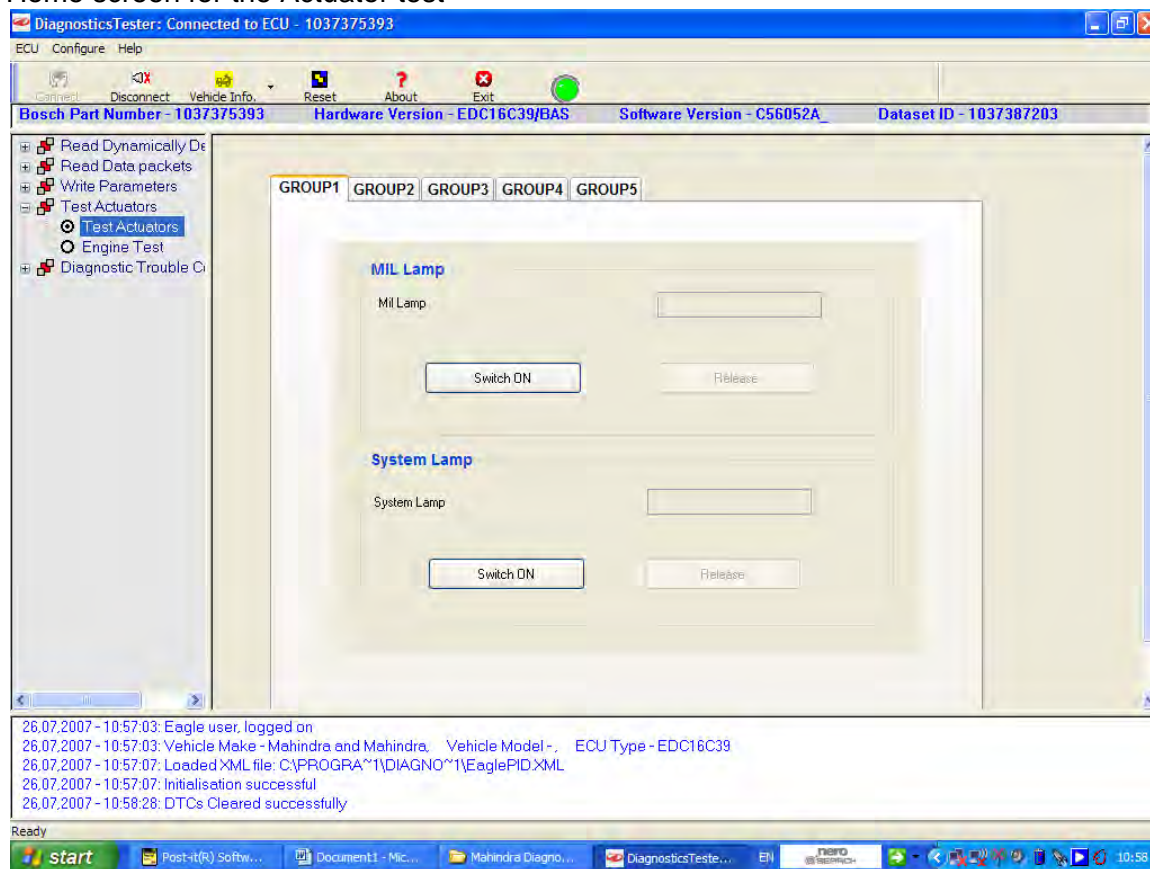
ACT # 1 - System Lamp

Test condition: Ignition ON

Actuate: Click on the System Lamp ON.

Expected Result: The system lamp in the cluster will come ON

ACT#1
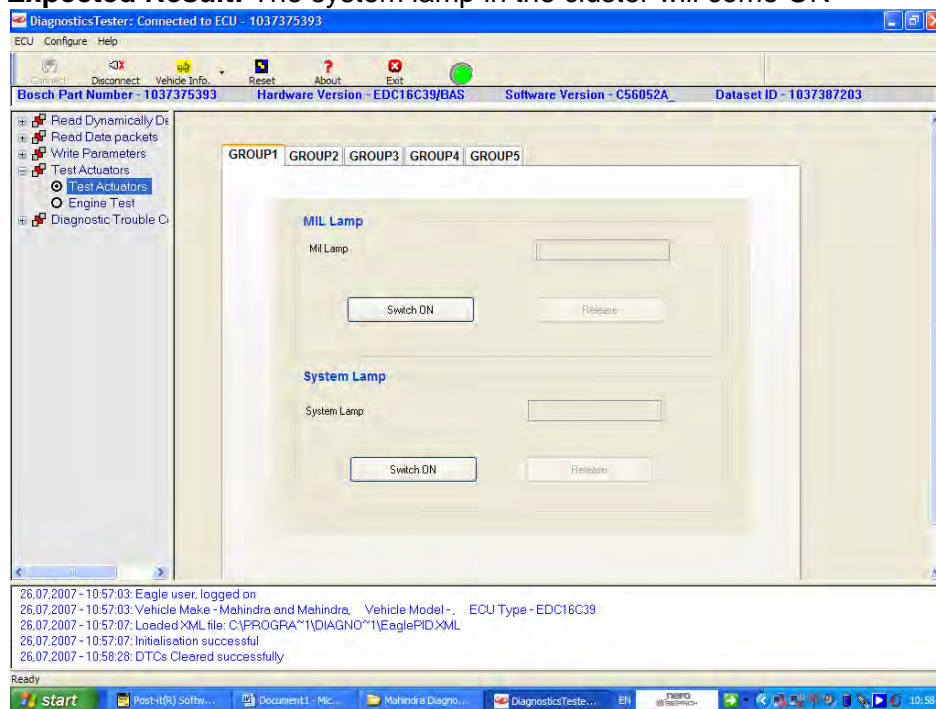
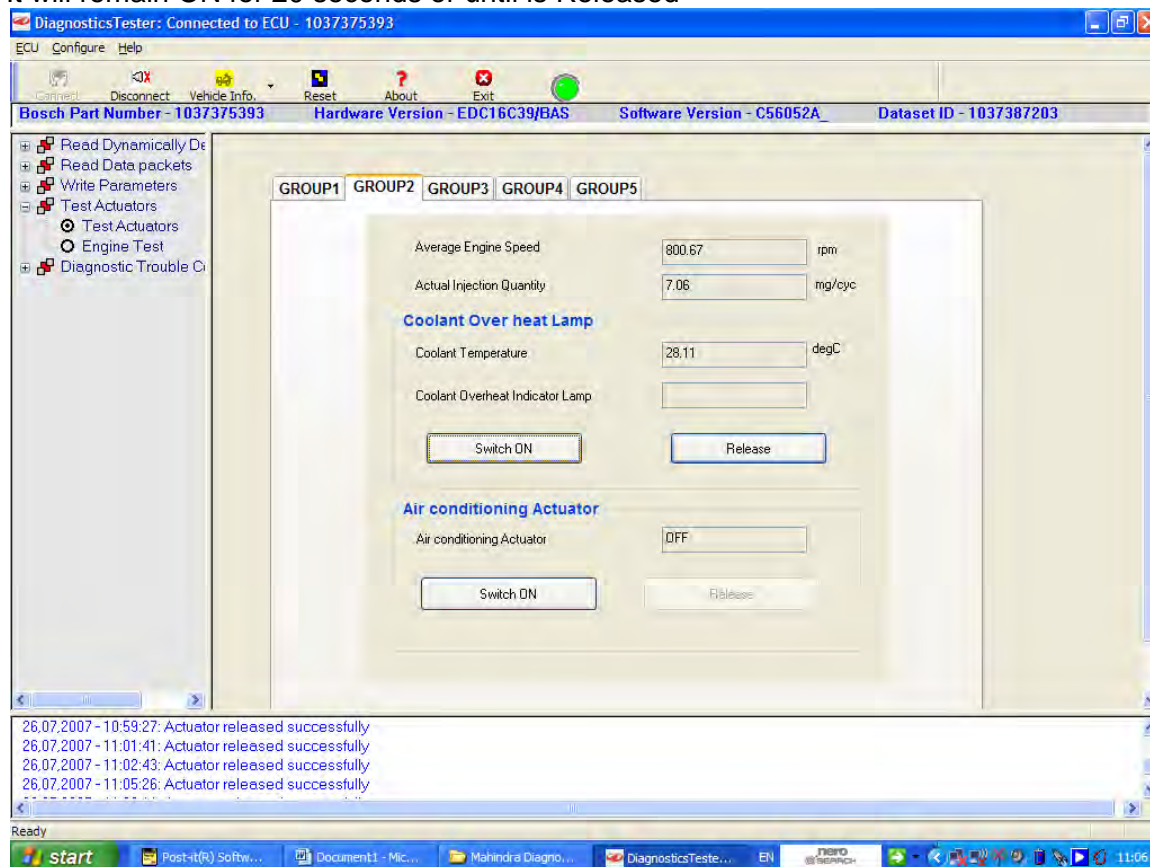Click on the release to release the lamp
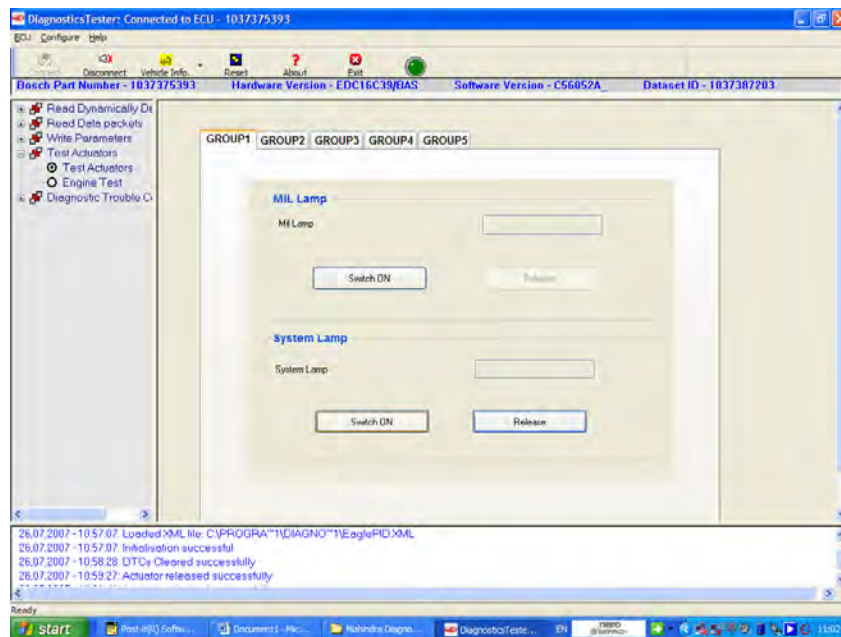
ACT#2

ACT # 2– Coolant Overheat Lamp Test

Test condition: Engine Running

Actuate: Click the switch ON.

Expected Result: The coolant overheat lamp at the end of the temperature scale will light up.

It will remain ON for 20 seconds or until is Released

ACT # 3– Air Conditioning Actuator

> **ACT#3**

Test condition: Engine at Idle or With Ignition ON

Actuate

Expected result: The air condition actuator will become ON, you can hear the compressor engage

Note: This actuator does not get released automatically. You have to manually release
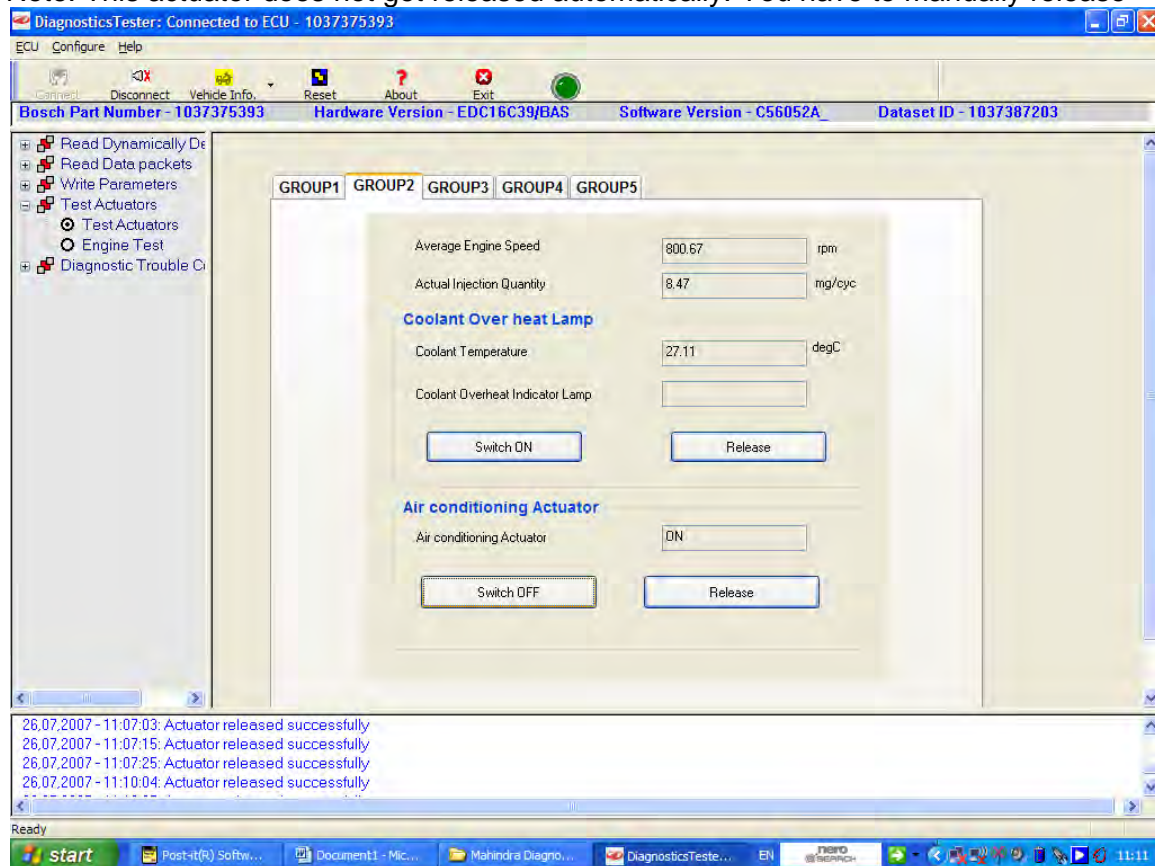
ACT #4– EGR Actuator

ACT#4

Test condition:

Engine Running at Idle
Note the quantity of the injection and the air mass.
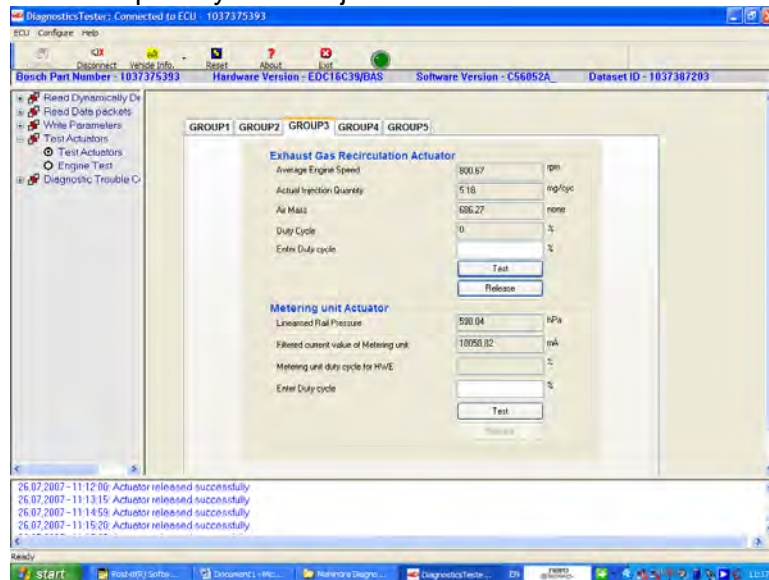
Action: Put EGR quantity >80%. In the Enter duty cycle. Actuate

Expected result: The actual duty cycle will change.

The air mass quantity and the injection quantity should change. The value are very small Air mass by around 4 and fuel quantity change of around 0.47.

Note: If not released manually, the system will automatically release the entered duty cycle after 30 seconds

ACT #5– Boost Pressure Actuator (BPA) Test

ACT#5

Test Condition: Engine running – at idle
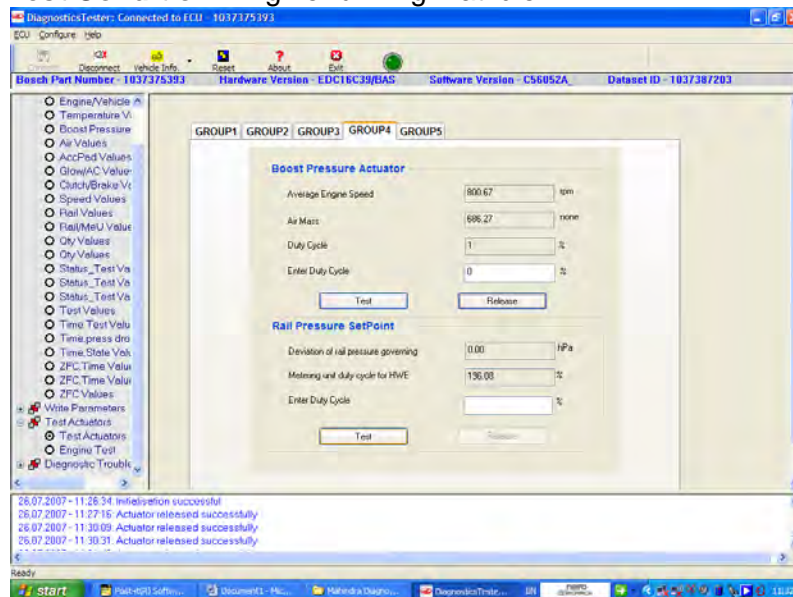
Enter duty cycle – between 0 to 100%. Click on Test

Expected result : There is a change in Engine RPM and also the air mass quantity changes. The engine noise change is also clearly audible

Disabled Actuator Test:

> ➢ Rail Pressure set Point
> ➢ Metering Unit Actuator
> ➢ Glow Lamp & Glow relay

Symptom Based Diagngosis – SBD # 1

SBD#1

Complaint - Engine not starting
Error codes - No error codes.

Look in Data Packet Group – Rail/Meu Values- Serial no 6 – Information for trouble in starting of the engine.

Note the value.
Convert it into binary.
See the bit positon and look at the table below

Bit position of	Conditions to be met	Implication	Look at this area
0	The engine speed is above the minimum threshold, but the Pressure built up in the rail is not sufficient.	Problem in low pressure circuit or HPP	LPC including injector back leak, copper washers. HPP to be changed in last step.
1	There is sufficient pressure in the rail but the engine speed is below the minimum threshold	Cranking RPM less	4. Battery 5. Starter 6. Engine partial seizure
2	There is sufficient pressure build-up in the rail and the engine speed is above the minimum threshold, but a problem has arisen with the engine synchronisation	Synchronisation issue	Look at the synchorisination label and follow the chart in the next page.
3	There is a reversible shut-off request . The application constant determines which shut-off conditions are to be taken into account.	Look at the table to find the reason	Please contact tekliner/ tekhub.

4	There is an irreversible shut-off request	Please contact tekliner/ tekhub.		SBD#1

Synchronisation state
Code Description

0   INIT: Basic initialization of state machine
1   RECOVER: Resetting the counters

2   TIMEOUT: Engine stops or error case in which all engine speed sensors of system are defective

3   INTERIMS: Additional asynchronous interrupts which is generated when engine position is detected based on the time condition of system.

4   WAIT_INC: Plausibility test is done on the events of the redundant sensor system w/o the mail sensor system delivering events. Interrupts are generated with min. system freq.

5   PHASE_FREQ_CHK: Plausibility test is done on the events of the redundant sensor system w/o the mail sensor system delivering events. Interrupts are generated with max. system freq.

8   PHASE_PLAUS_CHK: Plausibility test is done on the events of the redundant sensor system w/o the main system delivering events.

16   POLLING: The overall system behaves frq. Synchronous & waits for further events to determine the phases.

32   WAIT_PHASE: Waits for the unique positioning by the phase system.

33   VERIFY A unique positioning of the system has occurred. A plausibility test is run on all sensor systems wrt each other in their status & angle info.

34   RESYNC_OVERFLOW: No unique position was found
35   RESYNC_OFFSET

48

64   POST: The system wait until there is a complete engine stop.

128   VERIFY_BACKUP

129   BACK UP

130   START_BACKUP

131   WAIT_BACKUP: Engine has decelerated. Metering unit no longer be activated.

Symptom Based Diagngosis – SBD # 2. Injector Back leak

SBD#2

Applicable to
Scorpio CRDe 2.2, Xylo 2.49

DTC code
• None (Will happen when injectors stuck close) • P1193/P1192 (Will happen when injectors are stuck open)

Engine Status
• Can not be started

State of Starting System Code	Synchronization status Code
• 1	• Jumps from 3 to 48

Tools required for Doing the test
• 4 Test tubes with graduations, (capacity 30 to 75 ml) • 4 no rubber tube of 310 mm (Recommend part number 9350042680 - Engine–Tube Connection Injection Pump)

SBD#2

Caution - The ID of the tube is important; hence please use this part number.

Blow air around the injectors to remove the dust.

Remove injector overflow connector holder clips from all the four injectors.

Remove injector overflow connections from all the four injectors.
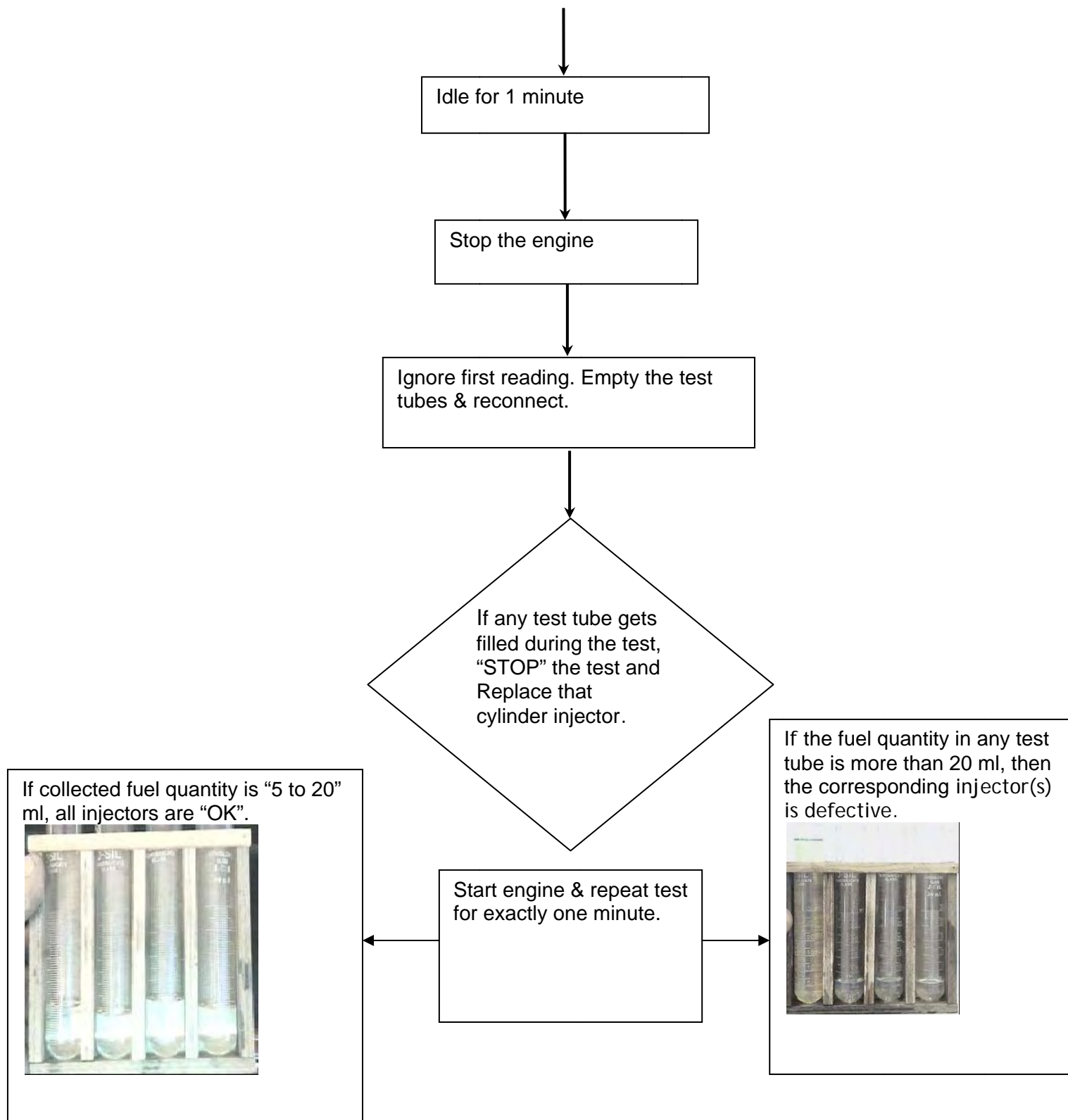Do not remove overflow tube connection from the fuel return line 'T' joint

Insert injector overflow pipe firmly in Each Injector.

Over flow pipe inserted in the injector.

Start Engine.

Insert the pipes open end in to the test tubes as shown in photograph).

Idle for 1 minute

Stop the engine

Ignore first reading. Empty the test tubes & reconnect.

If any test tube gets filled during the test, "STOP" the test and Replace that cylinder injector.

If the fuel quantity in any test tube is more than 20 ml, then the corresponding injector(s) is defective.

If collected fuel quantity is "5 to 20" ml, all injectors are "OK".

Start engine & repeat test for exactly one minute.

The root cause for the injectors stuck open or close is the presence of water in the fuel or poor fuel quality.

Investigate & advice the customer accordingly to avoid repeat failure.

In case of water – please advise the customer how to drain water when the indicator comes ON.

If it is suspected due to poor fuel quality- please advise accordingly.

Conformity Check

Coolant temperature Sensor/ Fuel Temperature sensor

Temperature	Resistance Min kΩ	Resistance Max kΩ
10	8.244	10.661
20	2.262	2.76
80	0.304	0.342
100	0.178	0.196

Accelerator pedal

	Poti 1	Poti 2
Accelerator pedal:- 0%	2.160KOhm,	2.672KOhm
Accelerator pedal :-100%	1.321KOhm	2.112KOhm
Poti 1	1.2 **kΩ ± 0.4**	1.7 **kΩ ± 0.4**

HFM (Air flow)

Air flow	R Min(Kohm)	R Max (Kohm)
-10	7.942	9.3
0	5.119	5.892
30	1.573	1.752
60	0.565	0.654
90	0.238	0.285
100	0.184	0.222

Injector Solenoid coil

Nominal value: 0.255 Ohm
Min: 0.215 Ohm,
Max: 0.295 Ohm
Measured at 20-70 degrees centigrade.

MPROP coil resistance

Between Minimum: 2.60 Ohm & **Maximum:** 3.15 Ohm
Measured at 20 degrees centigrade.

ANALOG BASED IMMOBILIZER
(SCORPIO VLX)
SOLD BETWEEN DEC 2007 AND MAR2009

Overview of the in-vehicle communication network-with analog Immobilizer
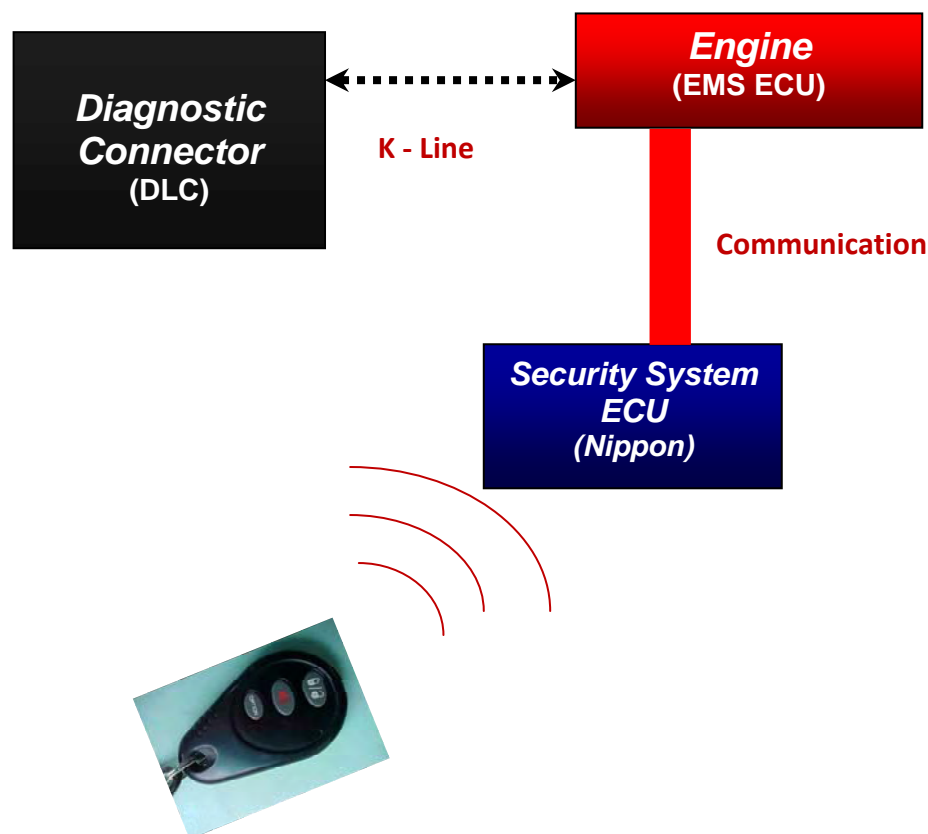
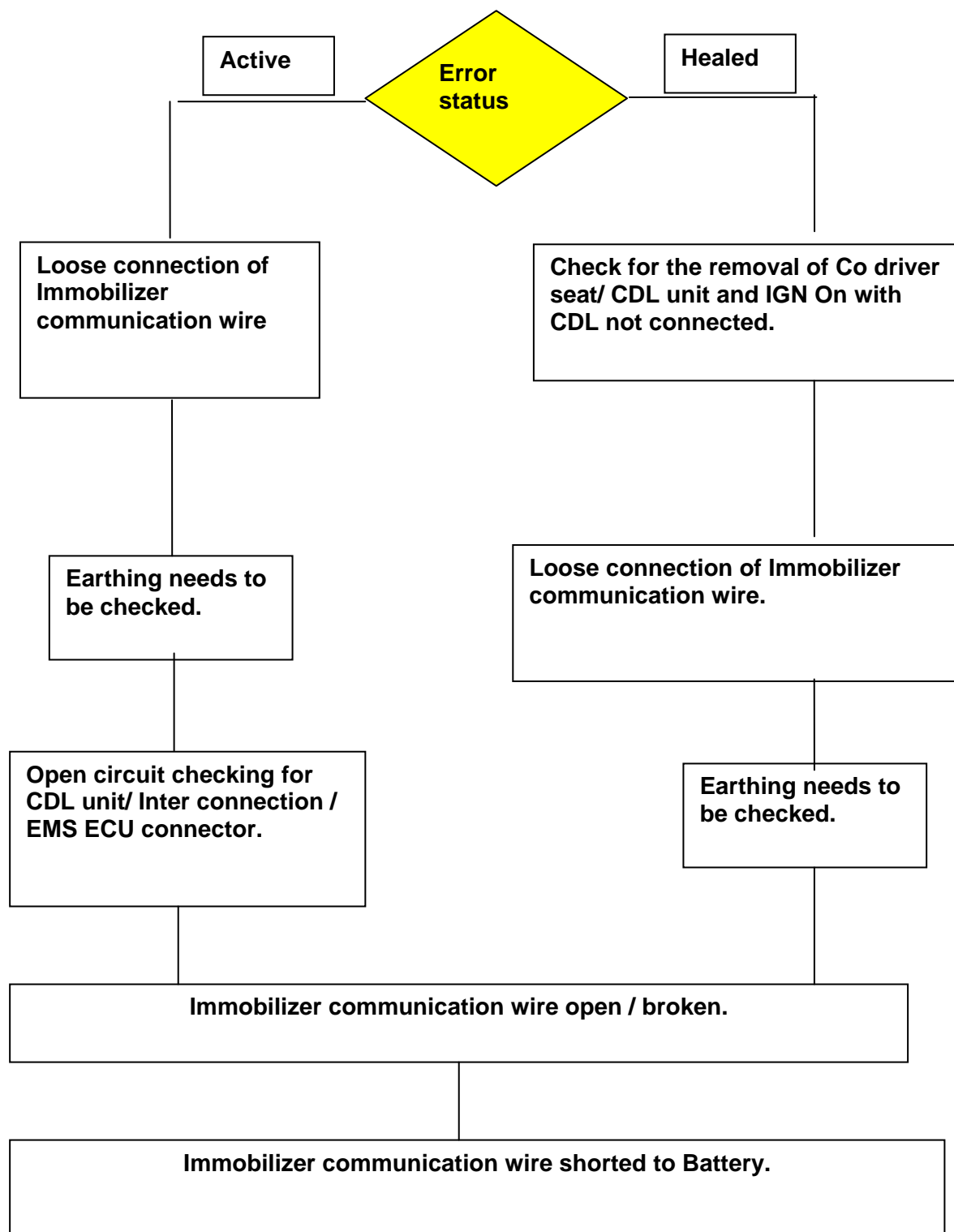**Note on Function of Analog based immobilizer –**

1. In the Analog immobilizer , the immobilizer function will become active , only if the vehicle is locked using the remote.
2. Using the mechanical key to lock the vehicle **will not activate** the immobilizer function.
3. The customer should be educated to change the PIN code of the immobilizer unit (Refer to relevant TSB)

Immobilizer communication wire open or shorted to Vbatt+

P-1828

DTC	Diagnostic item
P-1828	Immobilizer communication wire open or short

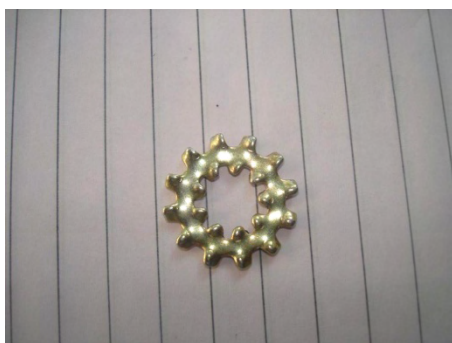| DTC detection condition	Probable cause

Normal operation
• ECU receives signal from RKE, as authentic and allows the engine to crank.
 	
Malfunction
• Correct signal not received
 	
Reaction
• If Error present and active then
    • Check lamp is ON.
    • Engine will not start
 	
• If Error is healed but recorded in ECU then
    • Check lamp is ON
    • Engine will start.
	• Open circuit
	• Improper earthing

Active

Error status

Healed

Loose connection of Immobilizer communication wire

Check for the removal of Co driver seat/ CDL unit and IGN On with CDL not connected.

Earthing needs to be checked.

Loose connection of Immobilizer communication wire.

Open circuit checking for CDL unit/ Inter connection / EMS ECU connector.

Earthing needs to be checked.

Immobilizer communication wire open / broken.

Immobilizer communication wire shorted to Battery.

Checking the earthing :

Main earth near the battery on the LH fender.
Check for the star washer's presence.
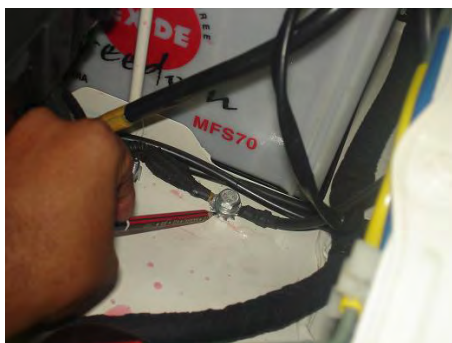
P-1828

Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-
   A. If the washer is not there please add.
   B. If reversed- correct the orientation.
   C. If flattened- change.

Checking the connectors:

DESCRIPTION	LOCATION	IC No	PINS	M/F
IP to ENGINE	A-PILLAR LEFT	10	21	M
IP to FLOOR	A-PILLAR RIGHT	26	20	F
FLOOR to CDL	BELOW CO-DRIVER SEAT	27	21	M
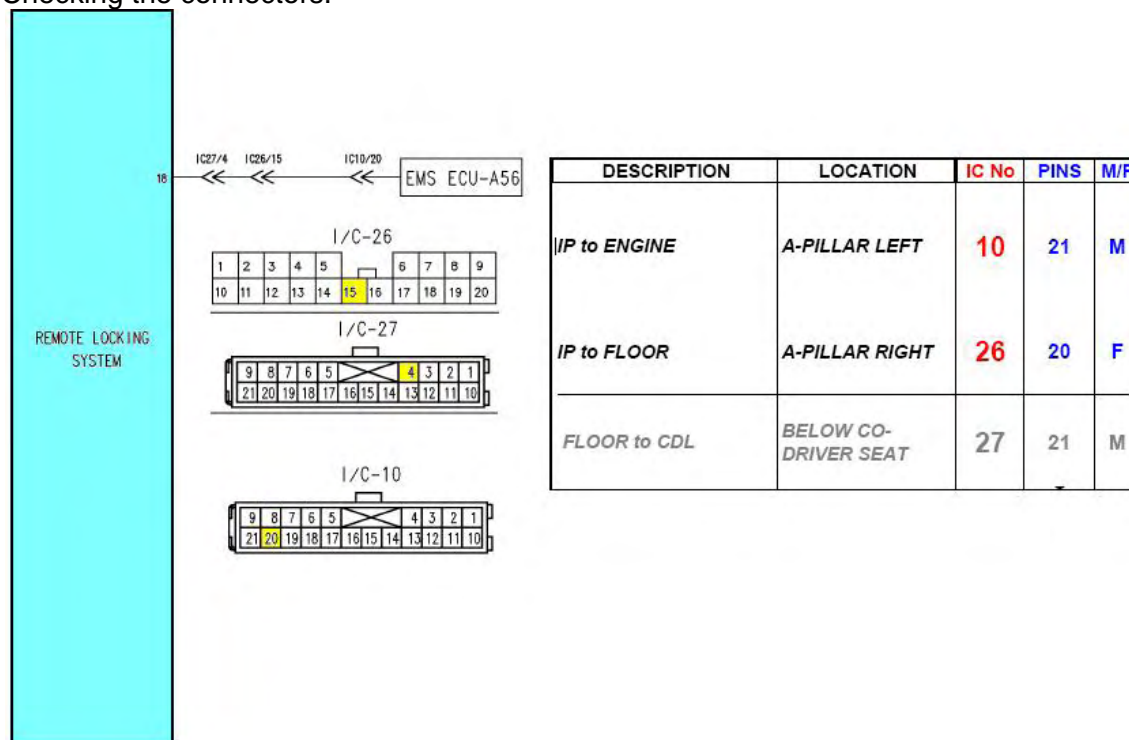
Immobilizer communication wire open or shorted to ground.

P-1829

DTC	Diagnostic item
P-1829	Immobilizer communication wire short to ground.

DTC detection condition	Probable cause

Normal operation
• ECU receives signal from RKE, as authentic and allows the engine to crank.
 	
Malfunction
• Correct signal not received
 	
Reaction
• If Error present and active then
    • Check lamp is ON.
    • Engine will not start
 	
• If Error is healed but recorded in ECU then
    • Check lamp is ON
    • Engine will start.
	• Immobilizer communication wire short to ground.
	• Improper earthing

Probable Causes:

P-1829

```
          Error
       Active/Healed
```

Immobilizer communication wire
shorted to Ground point.

Earthing needs to be checked.
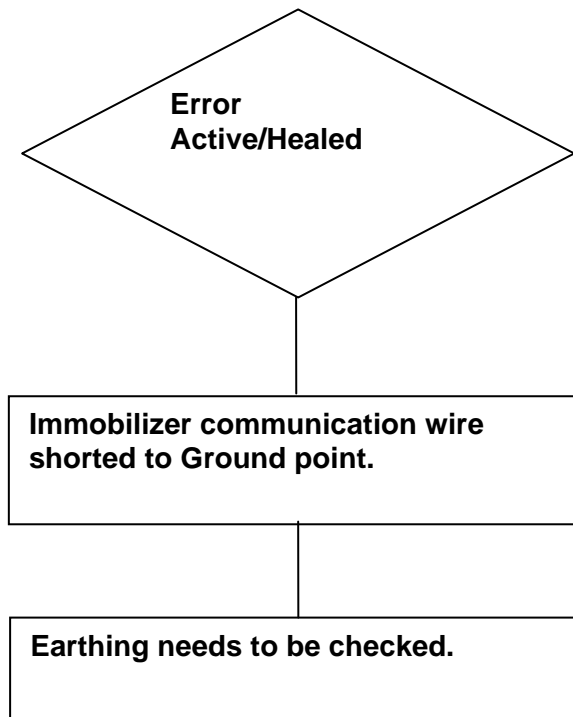
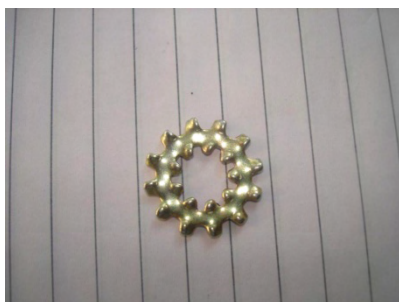**Checking the earthing :**

P-1829

Main earth near the battery on the LH fender.
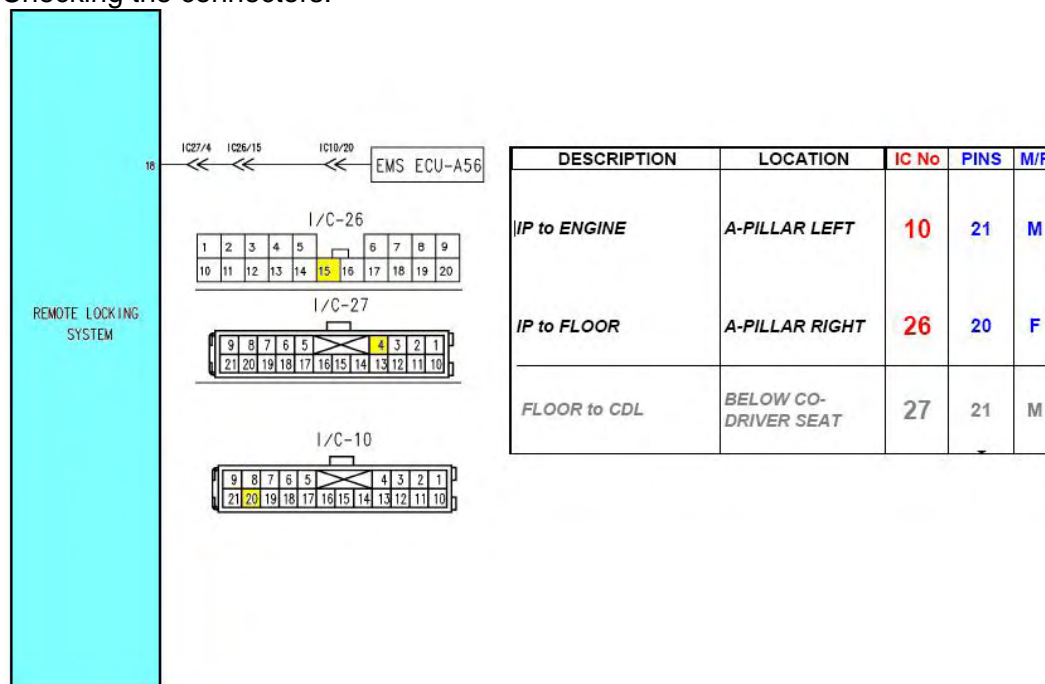Check for the star washer's presence.

Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-
   D. If the washer is not there please add.
   E. If reversed- correct the orientation.
   F. If flattened- change.

Checking the connectors:

DESCRIPTION	LOCATION	IC No	PINS	M/F
IP to ENGINE	A-PILLAR LEFT	10	21	M
IP to FLOOR	A-PILLAR RIGHT	26	20	F
FLOOR to CDL	BELOW CO-DRIVER SEAT	27	21	M

Immobilizer signal in error zone

P-182A

DTC	Diagnostic item
P-182A	Immobilizer signal in error zone

DTC detection condition	Probable cause

Normal operation
• ECU receives signal from RKE, as authentic and allows the engine to crank.
 	
Malfunction
• Correct signal not received
 	
Reaction
• If Error present and active then
    • Check lamp is ON.
    • Engine will not start
 	
• If Error is healed but recorded in ECU then
    • Check lamp is ON
• Engine will start after 3 Ignition ON.(To understand the coorelation of theft attempt and ECU locking a table is given below.
	• Improper Earthing / Grounding.
	• Loose Connection of the any connectors (from CDL to EMS ECU)
	• Poor Battery / poor starting system / multiple cranking.

Number of theft attempts	No. of Ignition cycles required to start the engine
1	1+1
2	2+1
3	ECU is locked

Possible causes

A. Improper Earthing / Grounding.
B. Loose Connection of the any connectors (from CDL to EMS ECU)
C. Poor Battery / poor starting system / multiple cranking.

Probable causes:

1. Both A & C
2. A alone
3. Both B & C
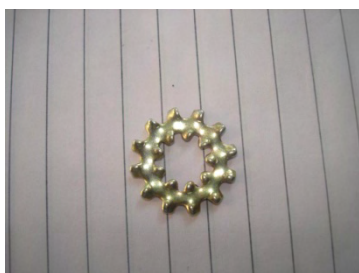4. B alone

Checking the earthing :

P-182A

Main earth near the battery on the LH fender.
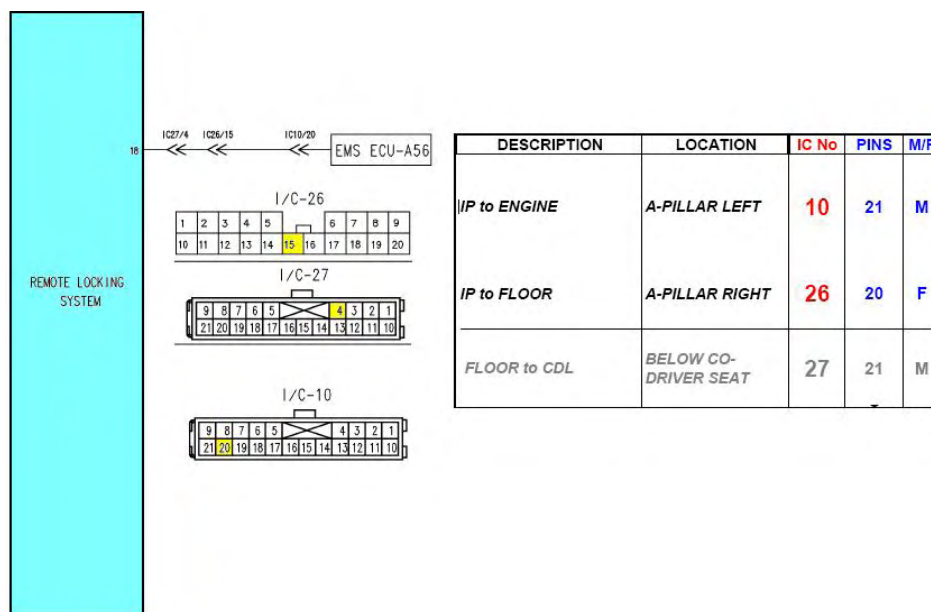Check for the star washer's presence.

Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-
   G. If the washer is not there please add.
   H. If reversed- correct the orientation.
   I.   If flattened- change.

Checking the connectors:

DESCRIPTION	LOCATION	IC No	PINS	M/F
IP to ENGINE	*A-PILLAR LEFT*	10	21	M
IP to FLOOR	*A-PILLAR RIGHT*	26	20	F
FLOOR to CDL	*BELOW CO-DRIVER SEAT*	27	21	M

Immobilizer signal in error zone

P-182B

DTC	Diagnostic item
P-182B	ECU is locked completely

DTC detection condition	Probable cause

Normal operation
• ECU receives signal from RKE, as authentic and allows the engine to crank.
 	
Malfunction
• Wrong signal received continuously hence the ECU is locked. (P182A with multiple crank/Ignition ON)
 	
Reaction
• If Error present/healed then
    • Check lamp is ON.
    • Engine will not start
	• Improper Earthing / Grounding.
	• Loose Connection of the any connectors (from CDL to EMS ECU)
	• Poor Battery / poor starting system / multiple cranking.
	• Wrong signal received continuously.

Possible causes

This error will only occur if P182A happens multiple times.

A. Improper Earthing / Grounding.
B. Loose Connection of the any connectors (from CDL to EMS ECU)
C. Poor Battery / poor starting system / multiple cranking.

Probable causes:

1.   Both A & C
2.   A alone
3.   Both B & C
4.   B alone
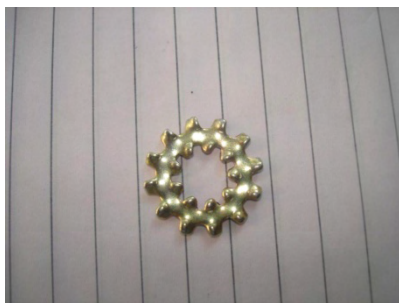
Checking the earthing :

Main earth near the battery on the LH fender.
Check for the star washer's presence.

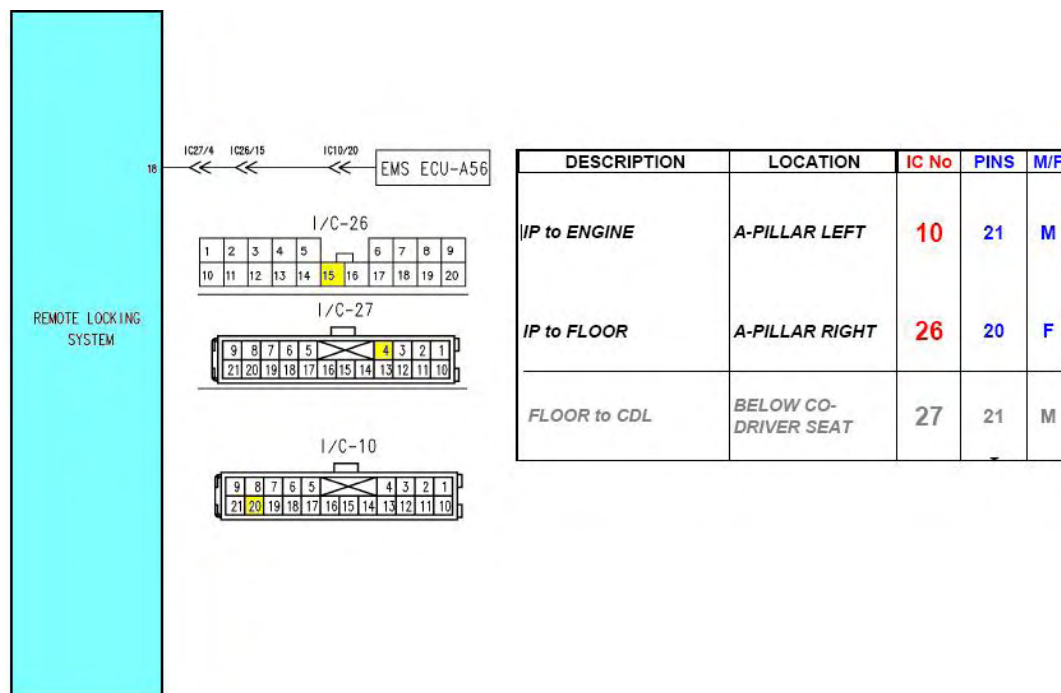
Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-

J. If the washer is not there please add.
K. If reversed- correct the orientation.
L. If flattened- change.

Checking the connectors:

DESCRIPTION	LOCATION	IC No	PINS	M/F
IP to ENGINE	A-PILLAR LEFT	10	21	M
IP to FLOOR	A-PILLAR RIGHT	26	20	F
FLOOR to CDL	BELOW CO-DRIVER SEAT	27	21	M

Immobilizer controller has not received correct pattern (RF signal)

Immobilizer signal in error zone

P-182C

DTC	Diagnostic item
P-182C	Immobilizer controller has not received correct pattern (RF signal)

DTC detection condition	Probable cause
Normal operation • ECU receives signal from RKE, as authentic and allows the engine to crank. **Malfunction** • This error is lodged when the vehicle has been locked/ armed by the security system and has not received the correct pattern of the remote signal before an attempt to start the engine was made. **Reaction** • If Error present/healed then • Check lamp is ON. • Engine will start •	• Mechanical Key used for unlocking the vehicle / RKE Remote NOT used for unlocking the vehicle & IGN ON. Loose Connection of the any connectors (from CDL to EMS ECU) • RKE Remote NOT working properly/Remote battery low. • Theft attempt

Note: The healing will occur if after hearing the remote siren the correct remote key is pressed and the security system validates it. .

Possible causes and the probability:

Active

Error status

Healed

Mechanical Key used for unlocking the vehicle / RKE Remote NOT used for unlocking the vehicle & IGN ON

RKE Remote NOT working properly/Remote battery low.

Theft attempt with the vehicle
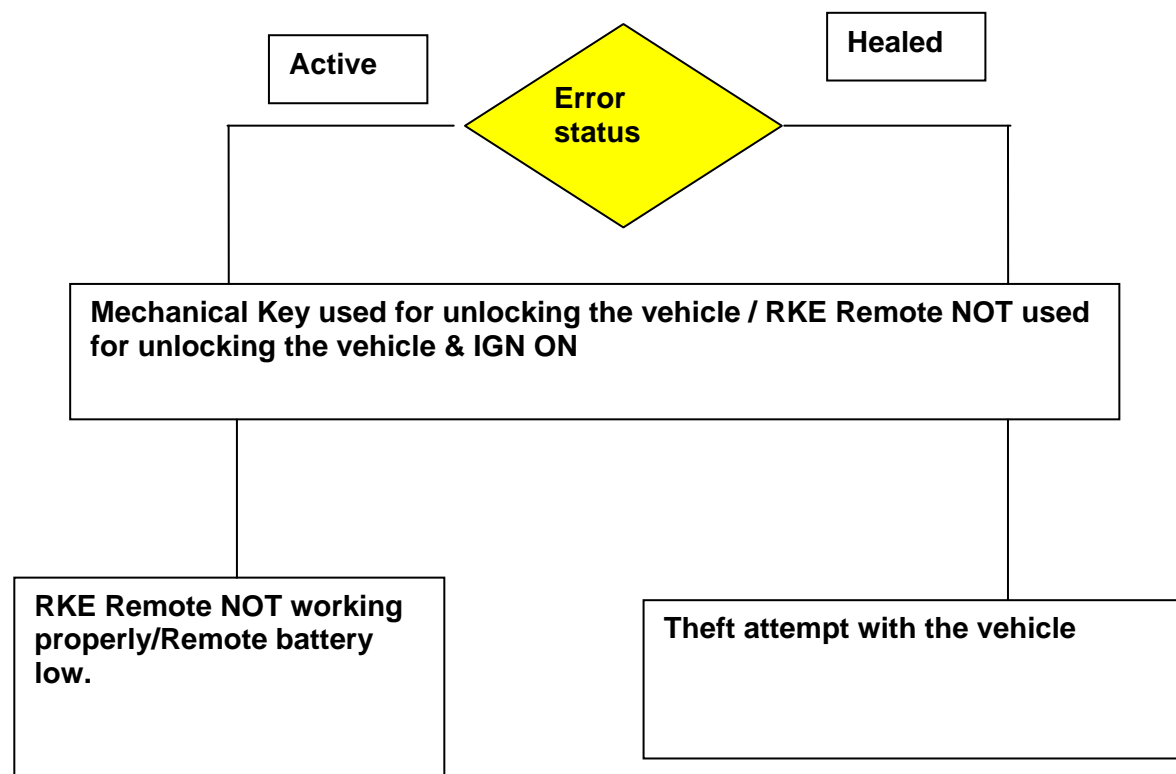
Release Notes

This manual supersedes the following earlier versions

MAN -00029, Rev 1   : 2.2 L + non transponder based immobilser. EDC 16C39

MAN -00038 , Rev 2 : Revision 1 + AT

Changes incorporated in MAN -00057 , Rev 3 *(EDC 16C39, AT, + TBI, ESS)*

In BPA and BPS the voltage mentioned was 2.5, corrected to 4.5 V

Added DTC details : 1194,1195;P-201;P-1201;P-1203;P-1204;P-1205;P-1206;P-1207;P-1208;

ESS related errors
P-1704;P-168E;P-170D;P-170E;P-170F;P-1710;P-1712;P-1714;P-170A;P-1AE9;P-1AEA;P-1AEB;P-1AEC;P-1715

Corrected the code no for Glow plug controller relay.