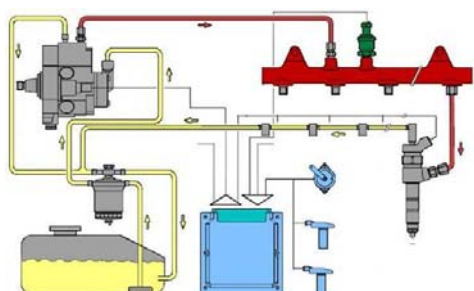


DIAGNOSTIC MANUAL (EMS)



Vlx/Sle/Lx



MAN-00057



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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

Over view of the vehicle communication network

Brief Specification- Engine.

Note on Engine Stop-Start (Micro Hybrid)

Recommended trouble shooting procedure

IQA code

Warranty & Other Information

EMS ECU Programming /Flashing

Reprogramming procedure

List of DTC codes

DTC Codes.

Actuator Tests

Symptom Based Diagnosis

Conformity Check / Resistance Values.

Analog Based Immobilizer (Applicable to Scorpio Vlx non-refresh models only)

Release Notes

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.

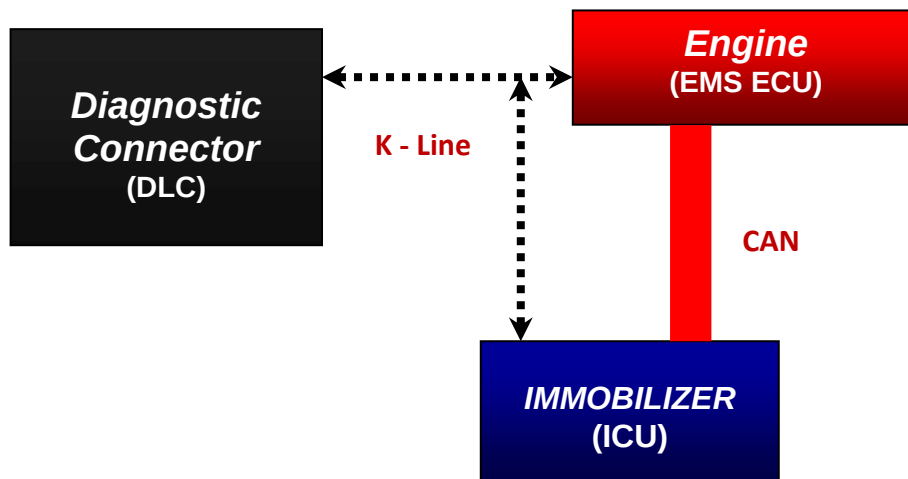
There are certain complaints for which no DTC codes are generated. The trouble shooting procedure for the same is covered in the Symptom based Diagnosis.

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

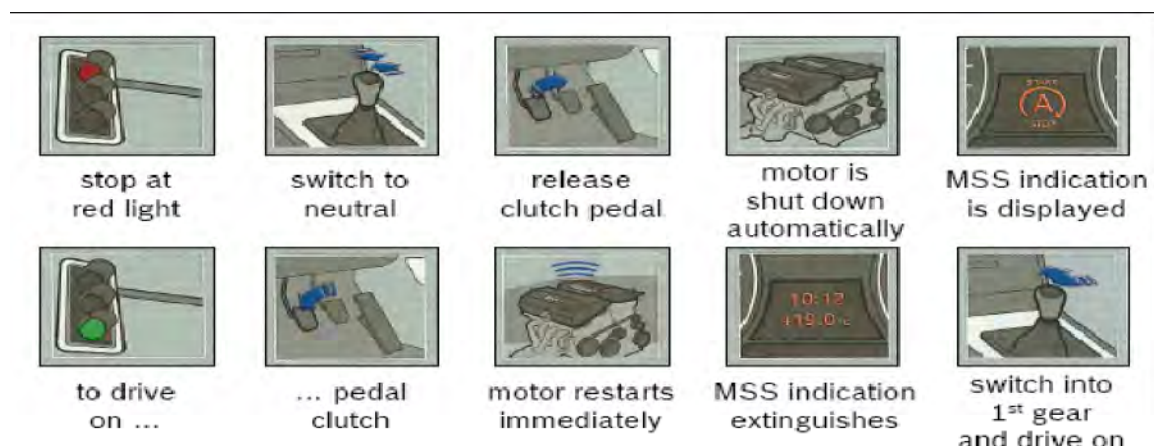
Note on Engine Stop-Start System

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.

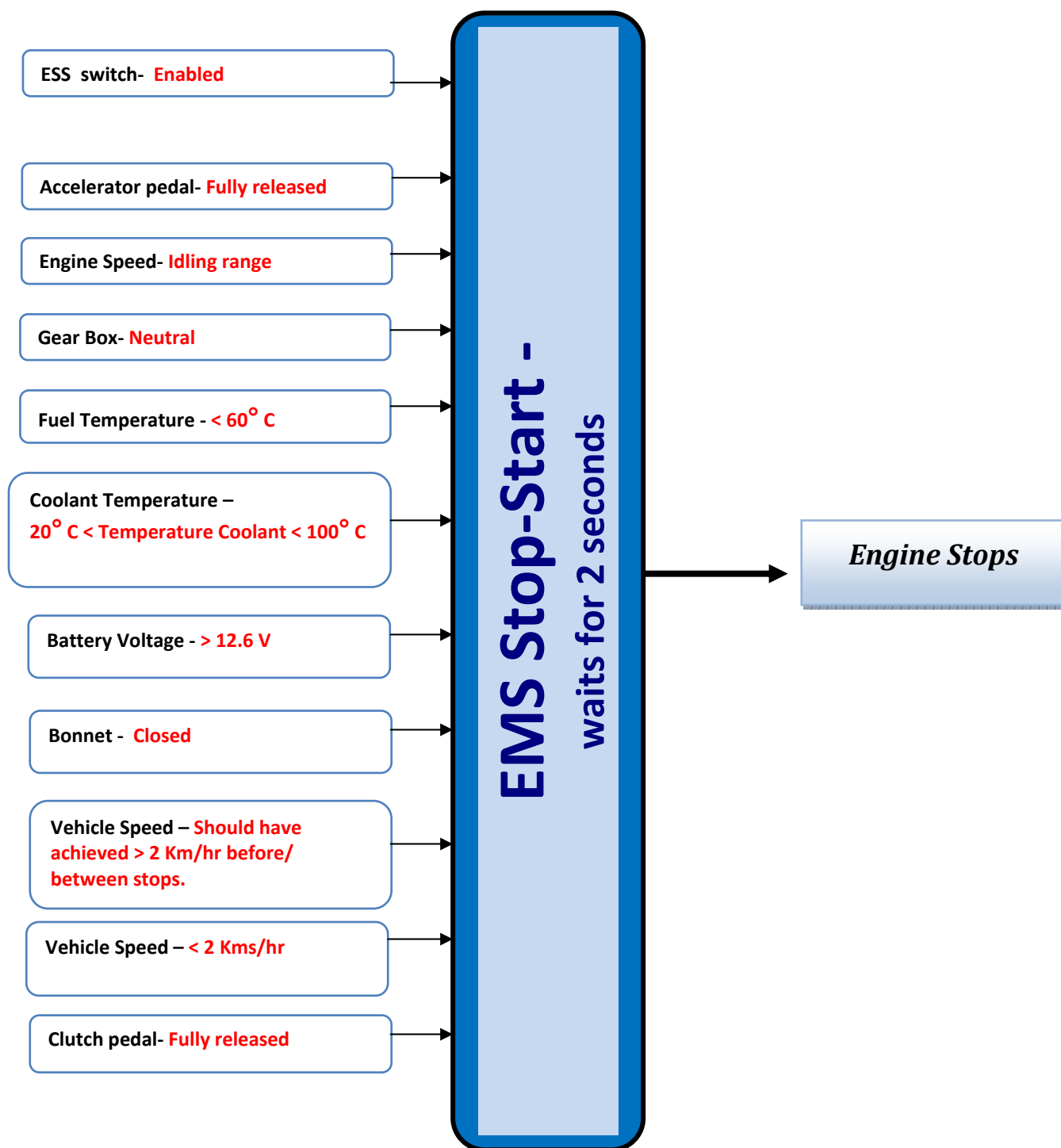


The block diagram of how the ESS functions is given in the next page.

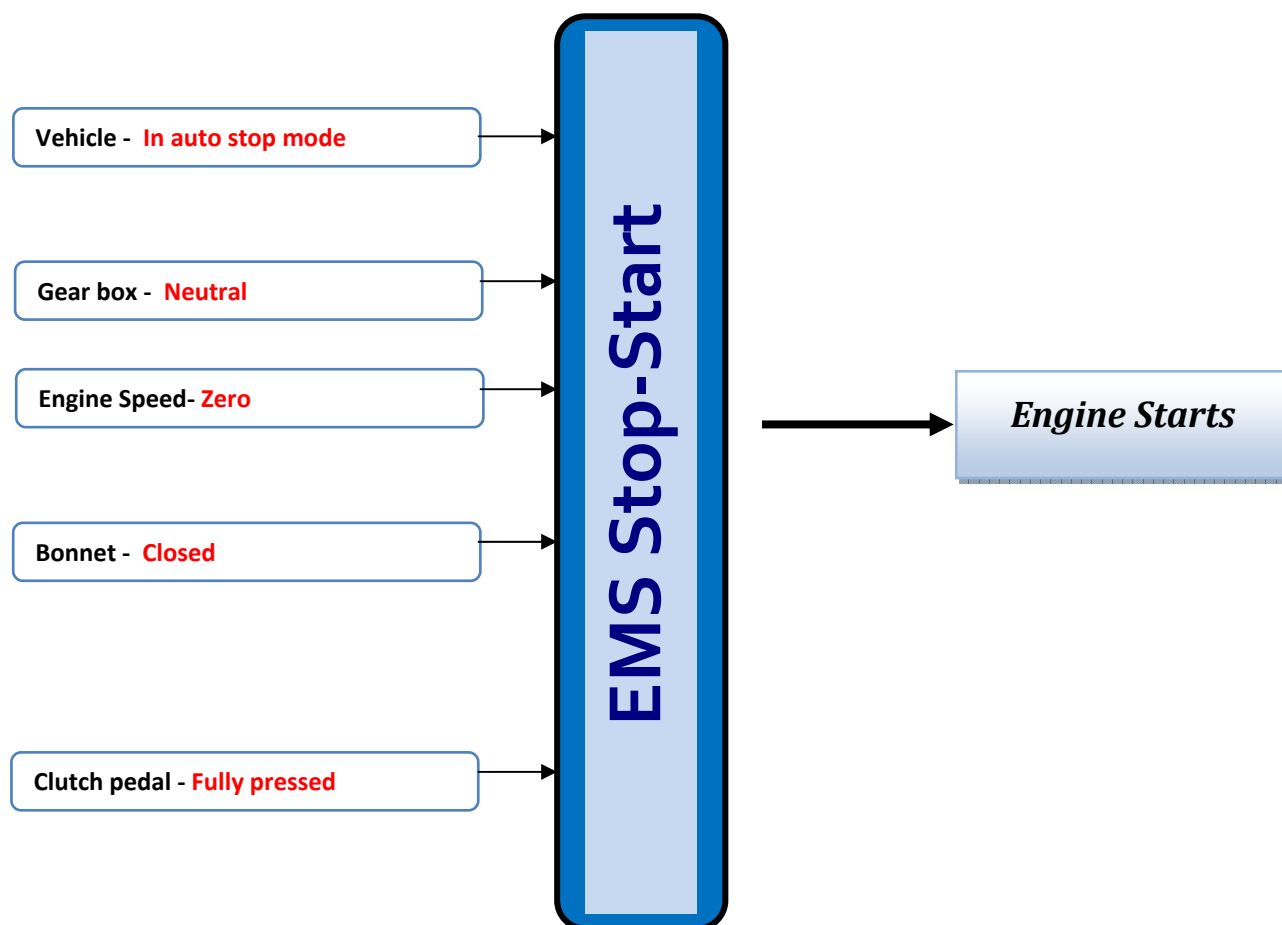
ESS is controlled from the EMS ECU. If any of the sensors malfunction then the ESS is disabled and an error code generated.

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



I/O of ESS

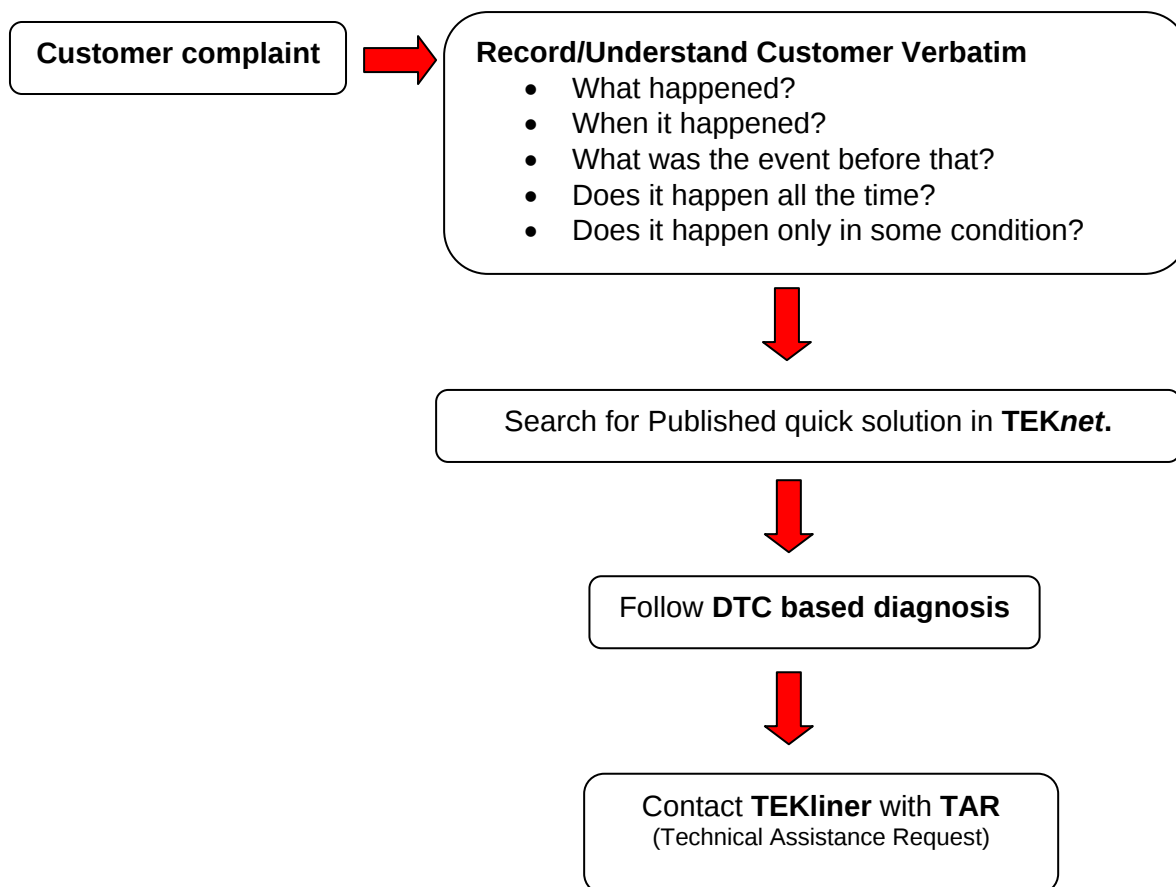


Note:

- 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



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 WHEN YOU REPLACE AN INJECTOR, ECU or ENGINE.

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.

0315CM0031N ECU WITHOUT ETK

C39**

****** 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 Vlx (Refresh) TBI ESS MT - BS III	V76	EDC16C39	1037397155	Will be released through a TSB
Scorpio Vlx (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 Vlx (Non-Refresh) TBI MT BS III	V71	EDC16C39	1037397090	1037397127
Scorpio Vlx (Non-Refresh) TBI AT BS III	V75	EDC16C39	1037397150	Will be released through a TSB
Scorpio Vlx (Non-Refresh) AT BS III	V64	EDC16C39	1037392587	1037392587
Scorpio Vlx (Non-Refresh) MT BS III	V52	EDC16C39	1037392417	1037392417
Scorpio Vls (Non-Refresh) MT BS III	V52	EDC16C39	1037392423	1037392423

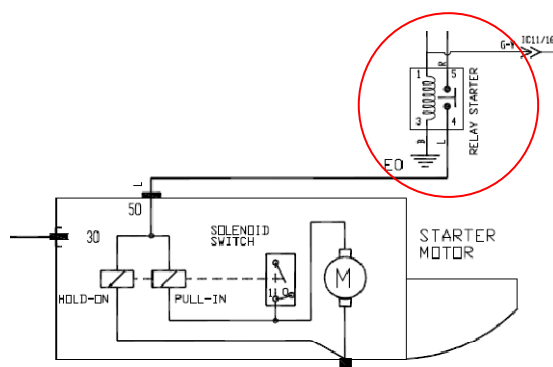
TBI – Transponder Based Immobiliser
ESS – Engine Stop-Start
MT – Manual transmission
AT – Automatic Transmission
BS III – Emission Level Bharat Stage 3
BS IV – Emission Level Bharat stage 4

Notes –

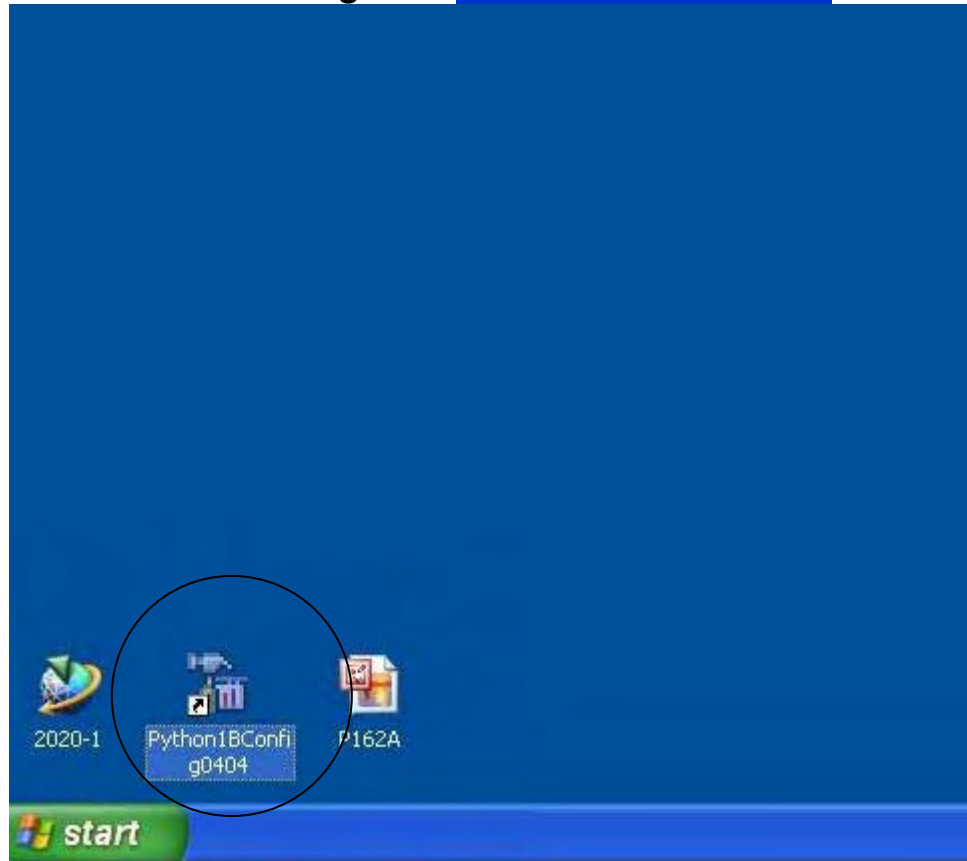
1. Ensure that there is no communication breakdown once the flashing begins. Check Python connections are secure.
2. Ensure that the SMART tester has -
 - Enough battery reserve/Connected to AC power
 - Screen saver/Battery saver mode turned off,
 - Vehicle's ignition is ON
 - Battery terminals connected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

RE-PROGRAMMING PROCEDURE

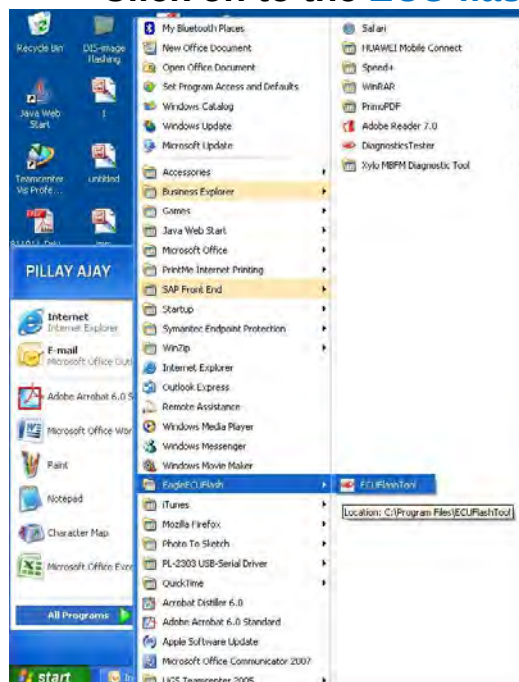
Caution while flashing on vehicles with ESS feature: Before switching ON the ignition with a blank ECU for start of flashing, ensure that the starter relay is disconnected. This is a safety precaution.

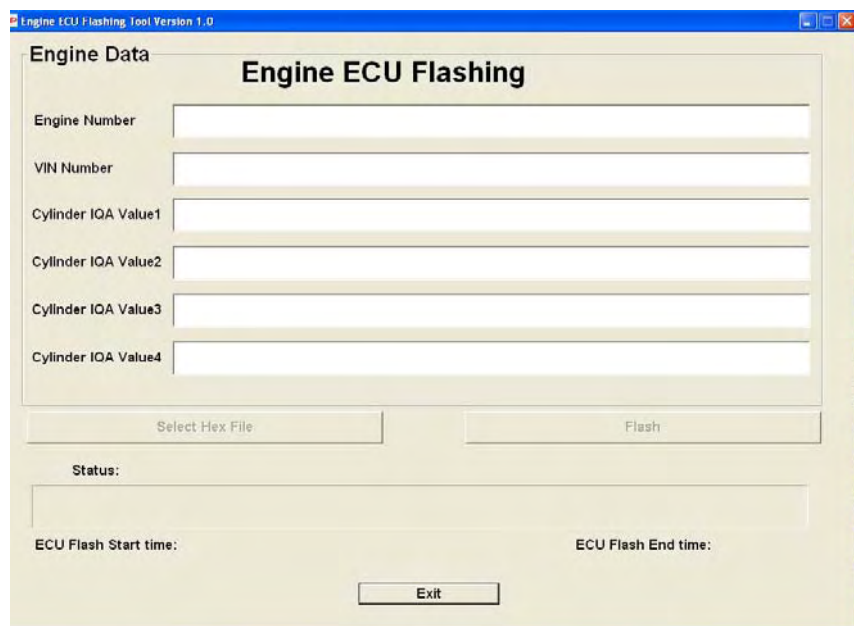


- Connect using the “[Python1BConfig0404](#)”.

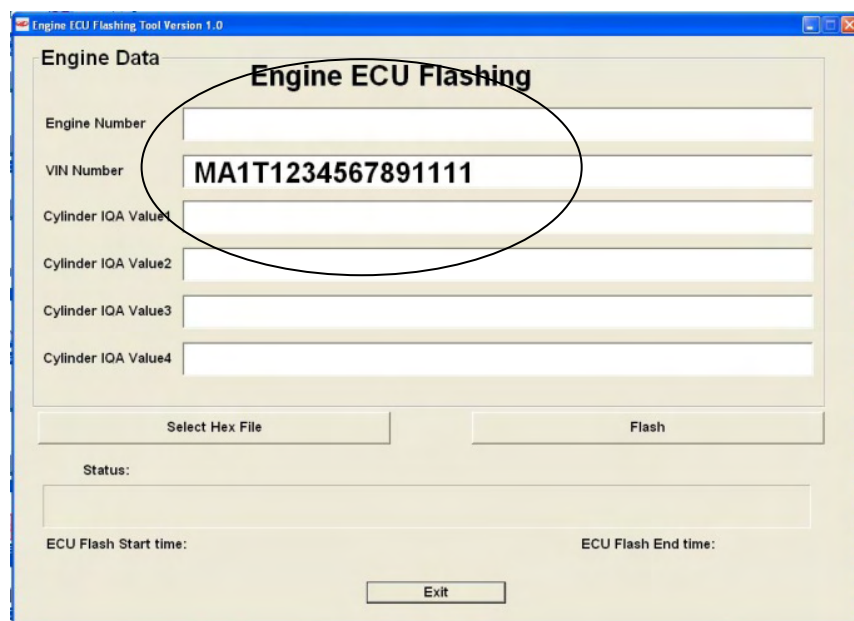


- Click on to the [ECU flash tool](#)

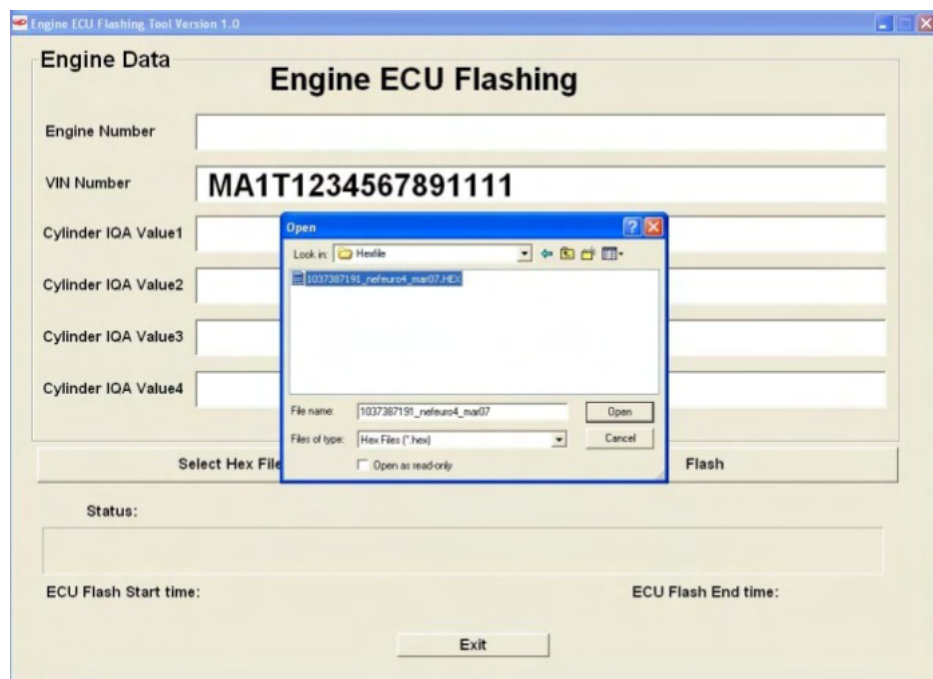




- Write the correct 17 digit VIN



- 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

Index

Group	Code	Label	Page No
<u>APP1</u>	P-0123	Voltage above upper limit	23
	P-0122	Voltage below lower limit.	
	P-1120	Plausibility with APP2 violated.	
<u>APP2</u>	P-0223	Voltage above upper limit	28
	P-0222	Voltage below lower limit.	
	P-1220	Plausibility with APP1 violated	
	P-1221	Accelerator Pedal signal not plausible with brake	
<u>BPA</u>	P-1604	Short circuit Battery	33
	P-1605	Short circuit Ground	
	P-1606	No Load	
	P-1607	Excess Temperature	
<u>BPS</u>	P-235	Boost pressure sensor- Voltage above upper limit	40
	P-236	Boost pressure sensor- Voltage below lower limit	
	P-1236	Boost pressure sensor not plausible with atmospheric pressure sensor.	
<u>Camshaft</u>	P-0340	No camshaft signal	45
	P-0341	Wrong camshaft signal	
<u>Crankshaft</u>	P-0335	No crankshaft signal	48
	P-0336	Wrong crankshaft signal	
<u>Air Flow</u>	P-0103	Voltage above upper Limit	51
	P-0102	Voltage below lower Limit	
<u>Air temperature</u>	P-0113	Voltage above upper limit.	57
	P-0112	Voltage below lower limit.	
<u>Rail Pressure</u>	P-0193	Voltage above upper limit.	61
	P-0192	Voltage below lower limit.	
<u>Rail pressure deviation</u>	P-1192	Maximum positive Rail pressure deviation exceeded	65
	P-1193	Maximum positive Rail pressure deviation exceeded concerning the set flow value	
	P 1194	Maximum negative rail pressure deviation with metering unit on lower limit is exceeded.	68
	P-1195	Minimum rail pressure exceeded.	69
<u>K Line</u>	No communication with Diagnostic		70

<u>EGR</u>	P-0406	Short Circuit Battery	72
	P-0405	Short Circuit Ground	
	P-0403	No Load	
	P-0404	Excess Temperature	
<u>Error path of offset</u>	P-1340	Offset between camshaft and crankshaft	75
<u>Fuel Temperature Sensor</u>	P-0182	Voltage above upper limit	79
	P-0183	Voltage below lower limit	
<u>Metering Unit</u>	P-1252	Short Circuit to Battery	83
	P-1253	Short Circuit to Ground	
	P-1250	No Load	
	P-1251	Excess Temperature	
<u>Main relay</u>	P-121A	Main relay does not open in time	87
	P-121B	Main relay opens too early	
<u>Cruise</u>	P-0577	SRC MAX error for analog signal	90
	P-0576	SRC MIN error for analog signal	
	P-0575	Plausibility error for analog signal	
<u>Battery</u>	P-0563	Voltage above upper limit	95
	P-0562	Voltage below lower limit.	
<u>Brake Switch</u>	P-1792	Brake signal is defective	96
	P-1791	Brake signals not plausible	
<u>Clutch Switch</u>	P-0704	Clutch signal is not plausible	99
<u>Coolant Temp Sensor(CTS)</u>	P-0118	Voltage above upper limit	102
	P-0117	Voltage below lower limit	
<u>CTS absolute & dynamic test</u>	P-2558	Minimum Temperature not reached within time limit.	106
	P-1126	Minimum temperature or temperature raise no reached within time limit	
<u>Overheat lamp</u>	P-165E	Short Circuit to Battery	108
	P-165F	Short Circuit to Battery	
	P-1660	No Load	
	P-1661	Excess Temperature	

<u>Atm pressure sensor</u>	P-0108	Voltage above upper limit	111
	P-0107	Voltage below lower limit	
<u>Injector Energizing Time</u>	P1623	Below lower limit of energising time- Injector # 1	112
	P1625	Below lower limit of energising time- Injector # 2	
	P161F	Below lower limit of energising time- Injector # 3	
	P1621	Below lower limit of energising time- Injector # 4	
<u>Communication monitoring</u>	P-162A	Communication error of CJ940	113
<u>Controller & TPU Monitoring</u>	P-1659	Deviation between TPU and system time	114
<u>ECU Monitoring</u>	P-1638	Set, if error-counter of Watchdog or controller are not plausible or the system must shut down	115
<u>EEPROM Monitoring</u>	P-162B	EEPROM: error during last read operation	116
	P-162C	EEPROM: error during last write operation	
	P-162D	EEPROM: default value used	
<u>Tachometer Signal</u>	P-160C	Short Circuit to Battery	117
	P-160D	Short Circuit to Ground	
	P-160E	No Load	
<u>Coolant temperature output</u>	P-1608	Short circuit to battery	120
	P-1609	Short circuit to ground	
	P-160A	No load	
	P-160B	Excess temperature	
<u>Air condition</u>	P-1530	Short circuit to battery	123
	P-1531	Short circuit to ground	
	P-1532	No load	
	P-1533	Excess temperature	

<u>Injector Power Stage</u>	P-1210	Chip-specific errors : CY33X internal reset / clock loss / under voltage	125
	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	
<u>Monitoring communication</u>	P-1664	The fault path contains the supervision of the SPI-Handler Set, if SPI-communication failed	126
<u>Power stage Monitoring</u>	P-1641	Test of redundant shut off paths during initialization: Watch dog switch off path defect	127
	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	
<u>Power Stage Voltage Monitoring</u>	P-1631	(Hardware) CJ940 upper limit: internal supply voltage upper limit (Hardware)	128
	P-1632	CJ940 lower limit: internal supply voltage lower limit	

<u>Sensor Supply Monitoring 1</u>	<u>P-1644</u>	Voltage above upper limit	129
	<u>P-1645</u>	Voltage below lower limit	
<u>Sensor Supply Monitoring 2</u>	<u>P-1646</u>	Voltage above upper limit	132
	<u>P-1647</u>	Voltage below lower limit	
<u>System Lamp</u>	<u>P-1654</u>	Short Circuit to Battery	135
	<u>P-1655</u>	Short Circuit to Battery	
	<u>P-1656</u>	No Load	
	<u>P-1657</u>	Excess Temperature	
<u>Terminal 15 (Ignition Switch)</u>	<u>P-1658</u>	No Terminal T15 signals detected	137
<u>Vehicle Speed</u>	<u>P-0503</u>	Exceeding of the maximum vehicle speed	139
	<u>P-0500</u>	HW signal for vehicle speed not valid	
	<u>P-0501</u>	Vehicle speed not plausible with injection mass and engine speed	
<u>Glow Control (if applicable)</u>	<u>P-1387</u>	Short Circuit to Battery	141
	<u>P-1388</u>	Short Circuit to Ground	
	<u>P-1389</u>	No Load	
	<u>P-1390</u>	Excess temperature	
<u>Immobiliser Codes</u>	<u>P-0513</u>	Invalid key error	144
	<u>P1832</u>	Communication wire may open	145
	<u>P-183A</u>	Signature Mismatch	148
	<u>P-183B</u>	EMS is locked.	150
	<u>P-183E</u>	EEPROM error	152
<u>Fault path bank1-specific errors -> stop engine</u>	<u>P-201</u>	Injector bank 1: short circuit	153
	<u>P-1201</u>	Injector bank 1: short circuit on Low Side to ground	
	<u>P-1203</u>	Injector bank 1 specific error depending on application	
	<u>P-1204</u>	Injector bank 1 not-classifiable error	
<u>Fault path bank1-specific warning -> stop engine</u>	<u>P-1205</u>	Injector bank 1specific warning : depending on application	154
	<u>P-1206</u>	Injector bank 1specific warning : depending on application	
	<u>P-1207</u>	Injector bank 1specific warning open load	
	<u>P-1208</u>	Injector bank 1specific warning depending on application	

<u>Pressure control Regulation (VGT control)</u>	P-1400	AirCtl permanent positive governor deviation: Positive governor deviation above limit	155
	P-1401	AirCtl permanent negative governor deviation: negative governor deviation below limit	155
<u>CAN error</u>	P-1705	Main Clutch CAN signal error	157
<u>Transmission clutch signal-CAN</u>	P-0704	Main Clutch signal not Plausible error	158
<u>TCU error</u>	P-0302	TCU error state	159
<u>EMS ECU Mute Error</u>	P-0073	EMS ECU in confirmed Mute error	160
<u>CAN Vehicle speed not valid</u>	P-1827	CAN signal for Vehicle speed not valid	161
Gear Neutral Switch	P-1704	Gear Neutral signal is not plausible	163
	P-168E	Gear Neutral signal is not plausible in Standstill Condition	166
Starter Power stage	P-170D	Short Circuit Battery	169
	P-170E	Short Circuit to Ground	172
	P-1710	Excess Temperature	171
Gear Neutral Switch Relay	P-1712	No Load	173
	P-1714	GNS Relay Sticking	176
Redundant Clutch Switch	P-170A	Clutch signal is not plausible	180
Stop Lamp Power Stage	P-1AE9	Short Circuit Battery	183
	P-1AEA	Short Circuit to Ground	184
	P-1AEB	No Load	185
	P-1AEC	Excess Temperature	187
T 50 (Ignition Switch)	P-1715	Terminal 50 Always pressed.	188

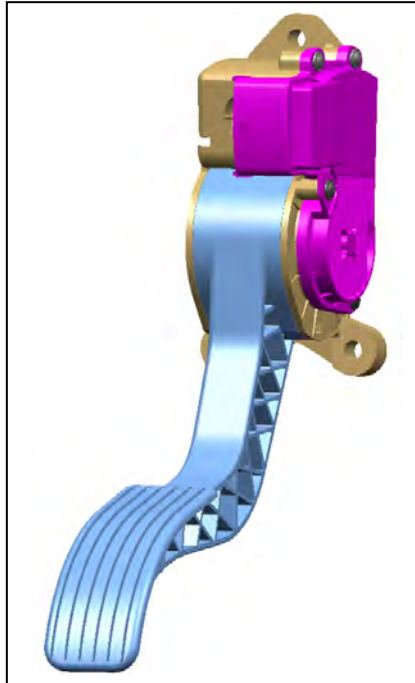
Group	Code	Label	Page No
Actuator Test	Home Screen for Actuator		189
	ACT # 1	System lamp Actuator test	190
	ACT # 2	Coolant Overheat Lamp	192
	ACT # 3	Air Conditioning	193
	ACT # 4	EGR	194
	ACT # 5	Boost Pressure Actuator (BPA)	195
Symptom Based Diagnosis	SBD #1	Vehicle not starting & no error codes	196
	SBD # 2	Vehicle not starting also may get P1192/1193	198

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

Group	Code	Label	Page No
	P-1828	Immobilizer communication wire open or short	205
	P-1829	Immobilizer communication wire short to ground.	207
	P-182A	Immobilizer signal in error zone	211
	P-182B	ECU is locked completely	213
	P-182C	Immobilizer controller has not received correct pattern (RF signal)	215

Accelerator Pedal Module 1

P-0123
P-0122
P-1120



P-0123
P-0122
P-1120

Accelerator Pedal Module 1

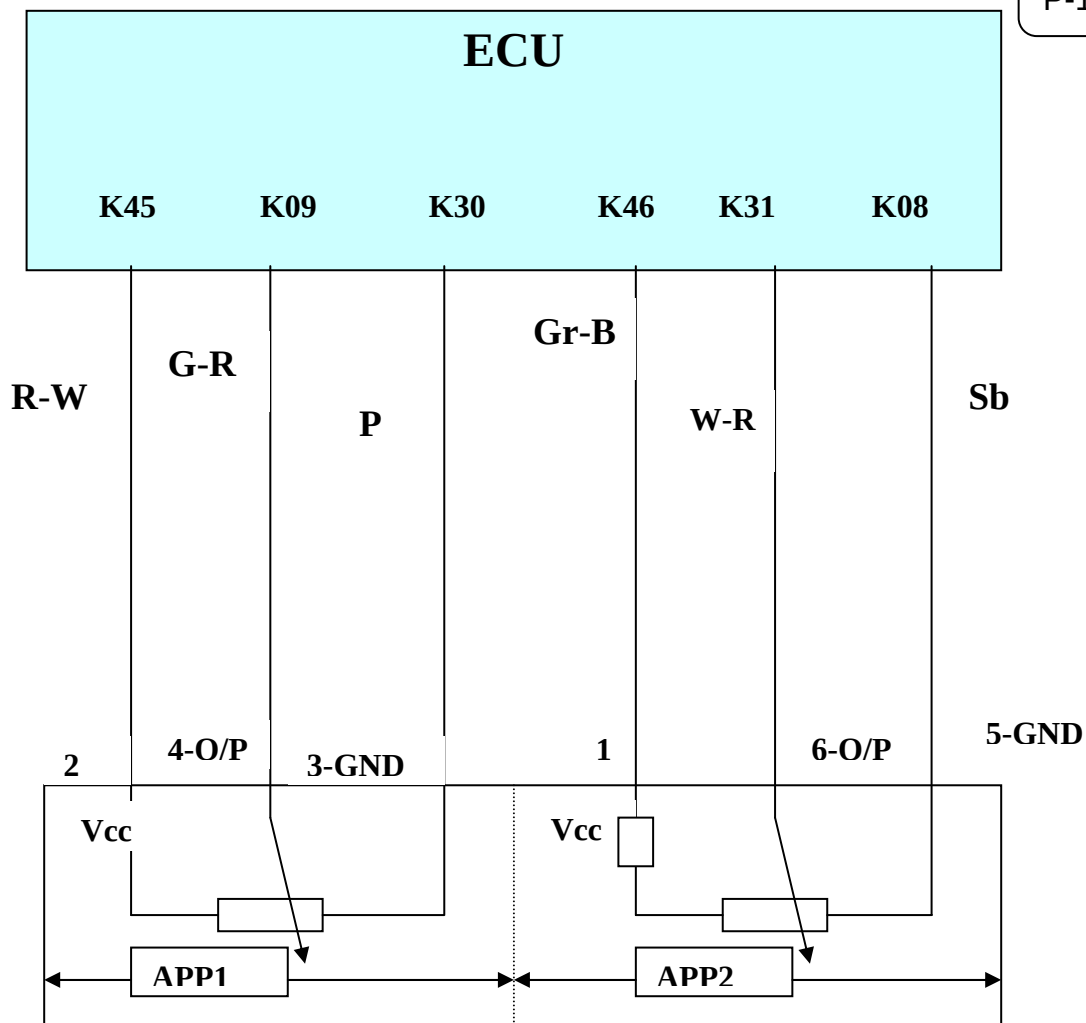
Description:

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.

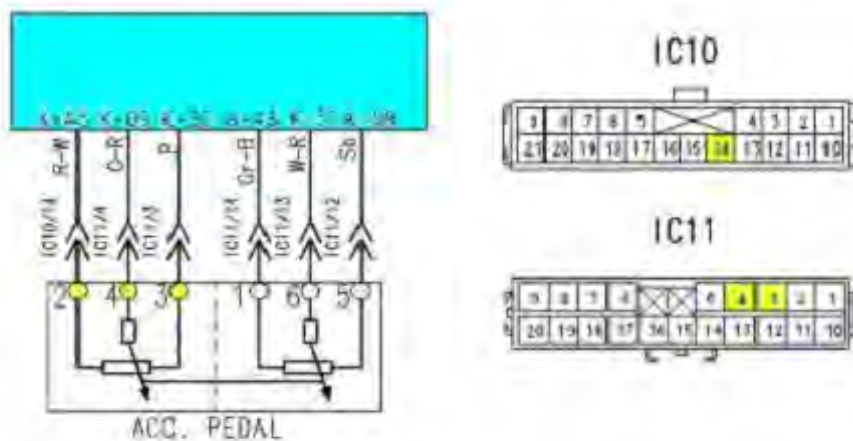
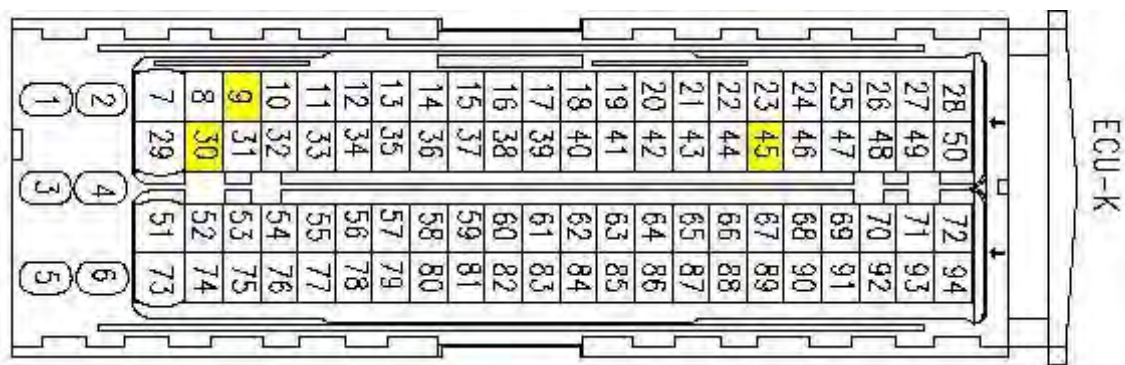
DTC	Diagnostic item
P-0123	Voltage above upper limit
P-0122	Voltage below lower limit.
P-1120	Plausibility with APP2 violated.

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.

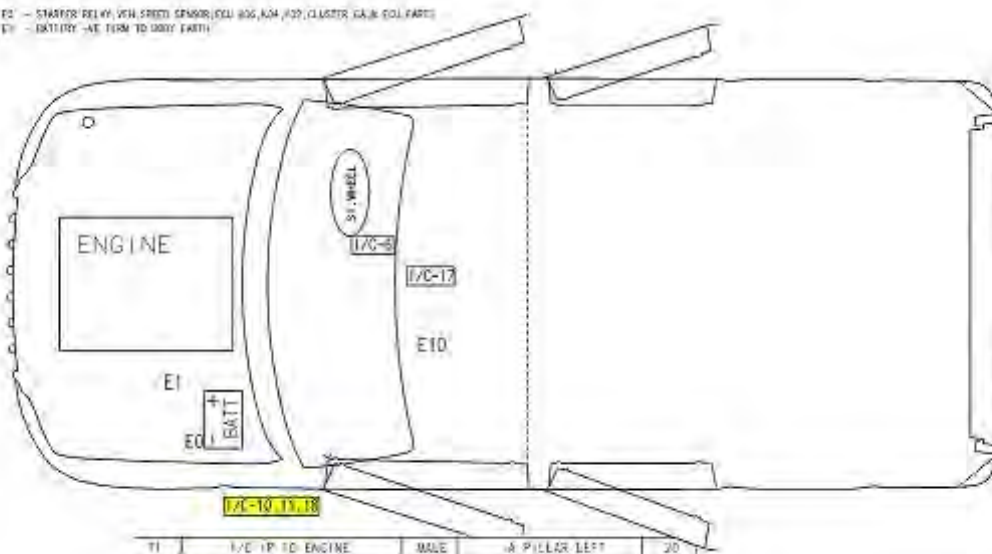
P-0123
 P-0122
 P-1120



P-0123
P-0122
P-1120



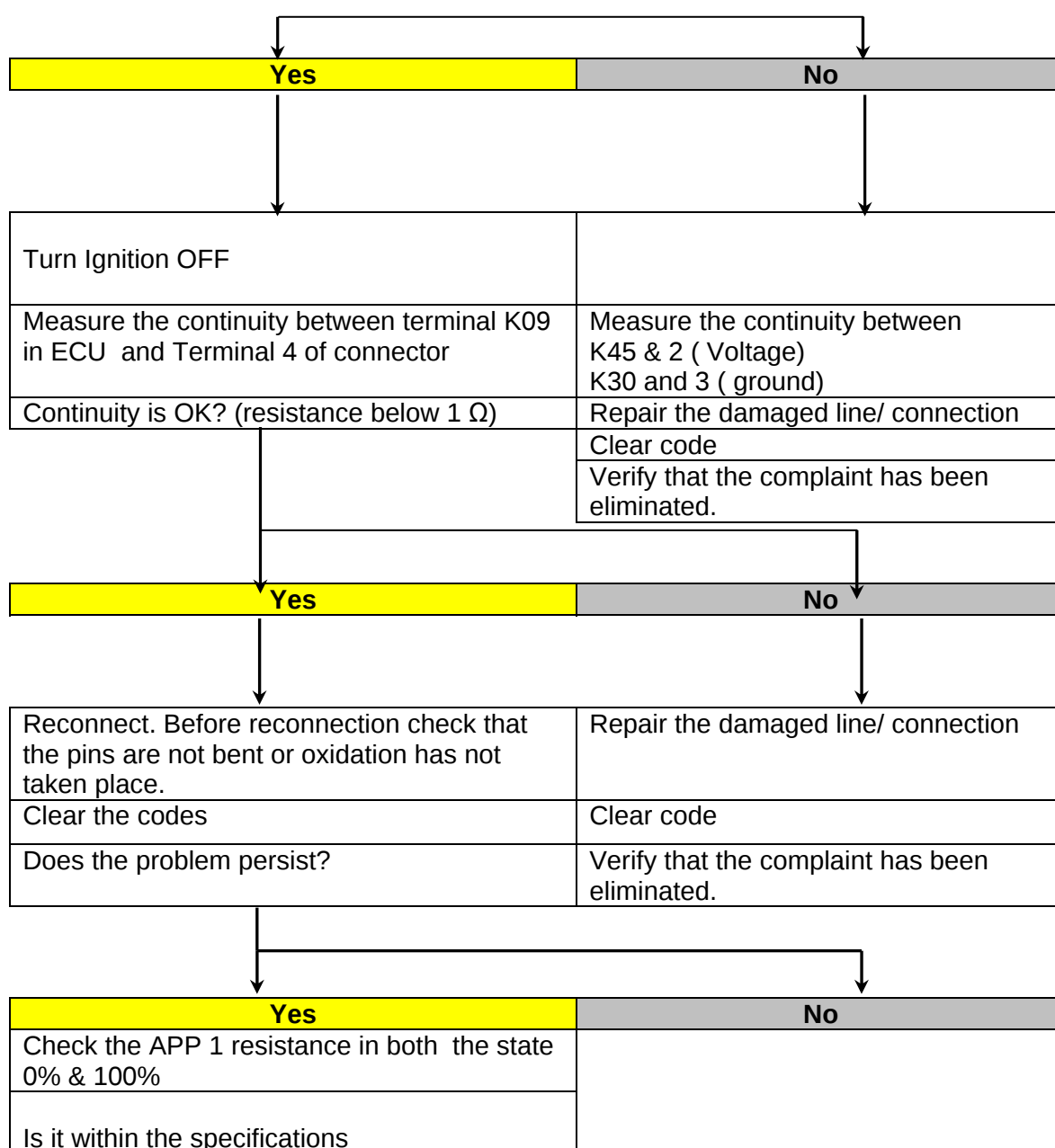
EC — STARTER RELAY, VEH. SPEED SENSOR, ECU B26, A24, A27, CLUSTER GAUGE SOL. PARTS
EY — BATTERY —VE TERM TO BODY EARTH



Test Procedure APP1 –

P-0123
 P-0122
 P-1120

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
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

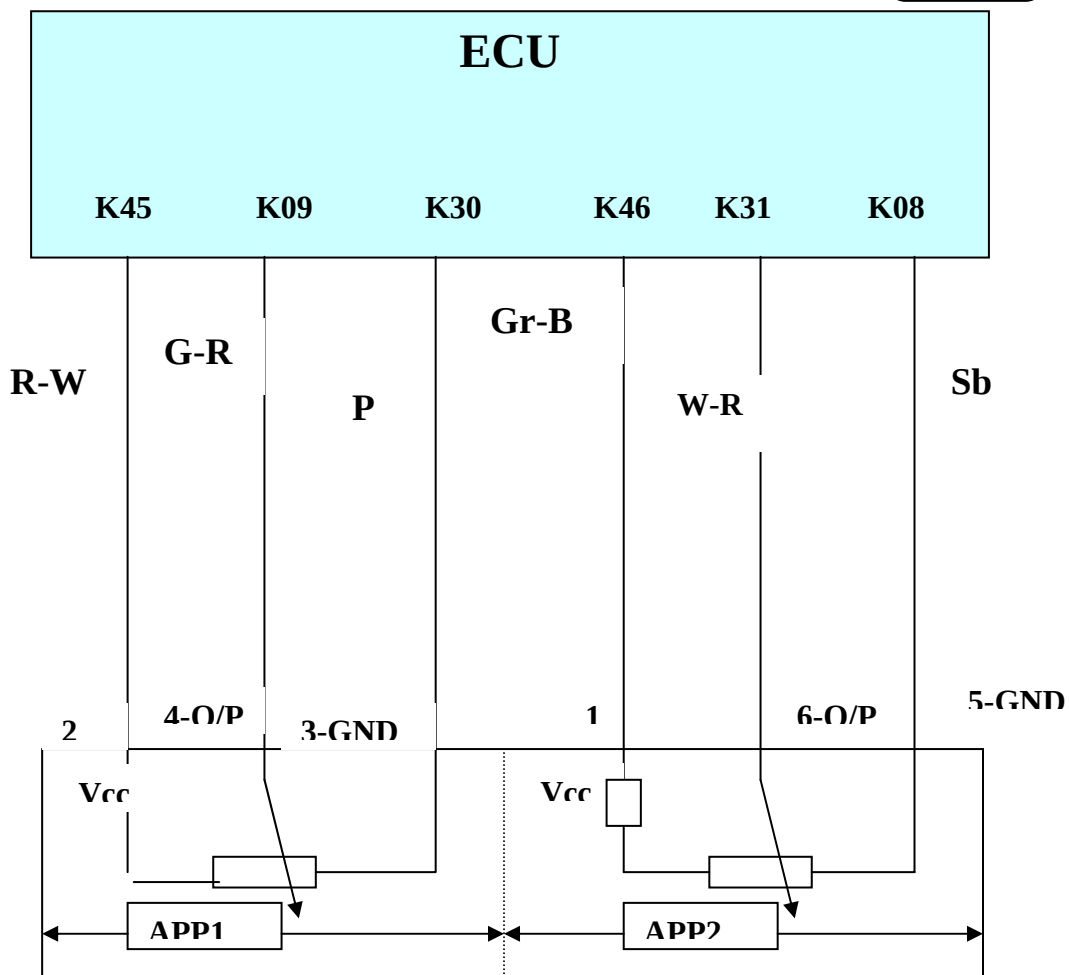
Description:

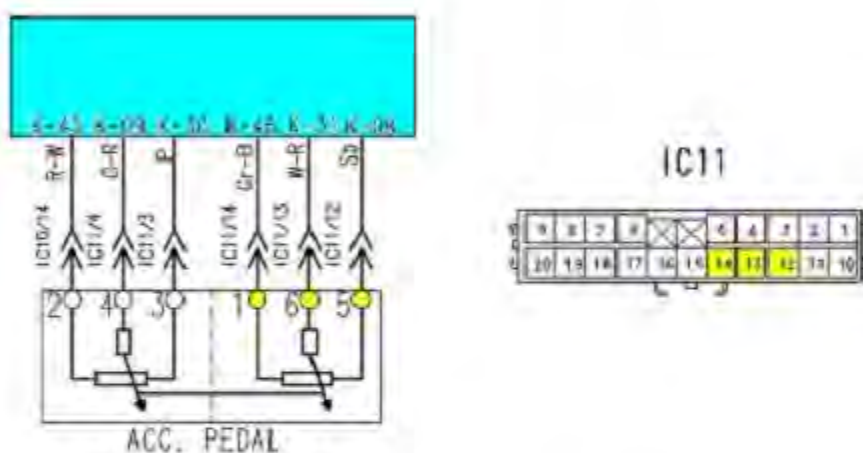
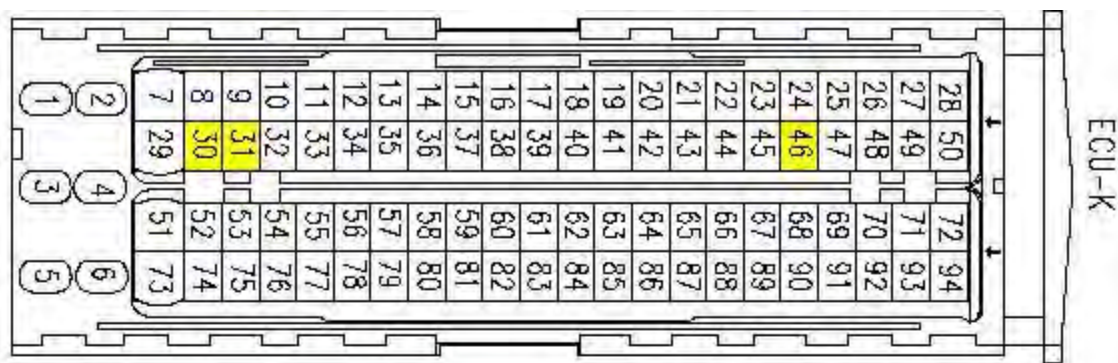
The Accelerator pedal module (APM) mounts in place of accelerator pedal and is connected to the ECU by wires. The APM sensor is a variable resistor (potentiometer) whose resistance changes according to the pedal position. ECU applies a reference voltage to the APM sensor and then measures the voltage 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

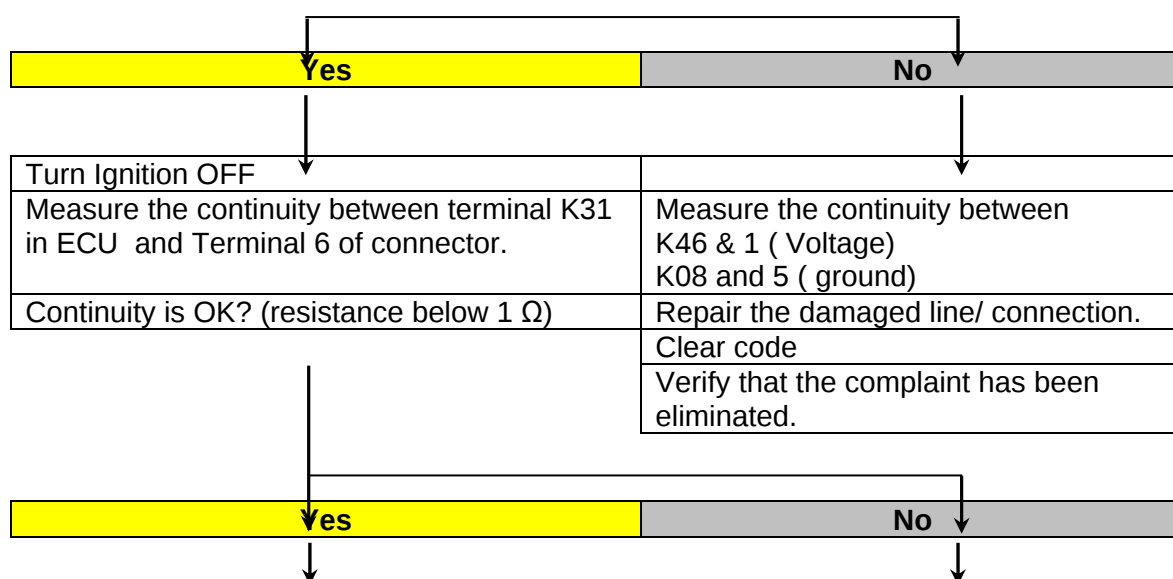




Test Procedure APP2 –

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?



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

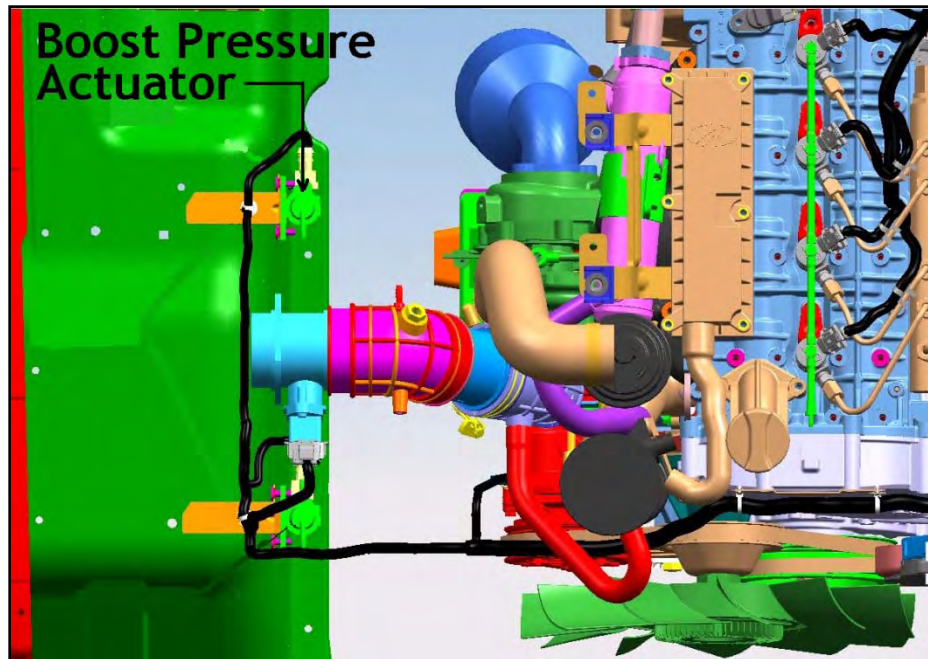
Reconnect. Before reconnection check that the pins are not bent or oxidation has not taken place.	Repair the damaged line/ connection.
Clear the codes.	Clear code.
Does the problem persist?	Verify that the complaint has been eliminated.

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.

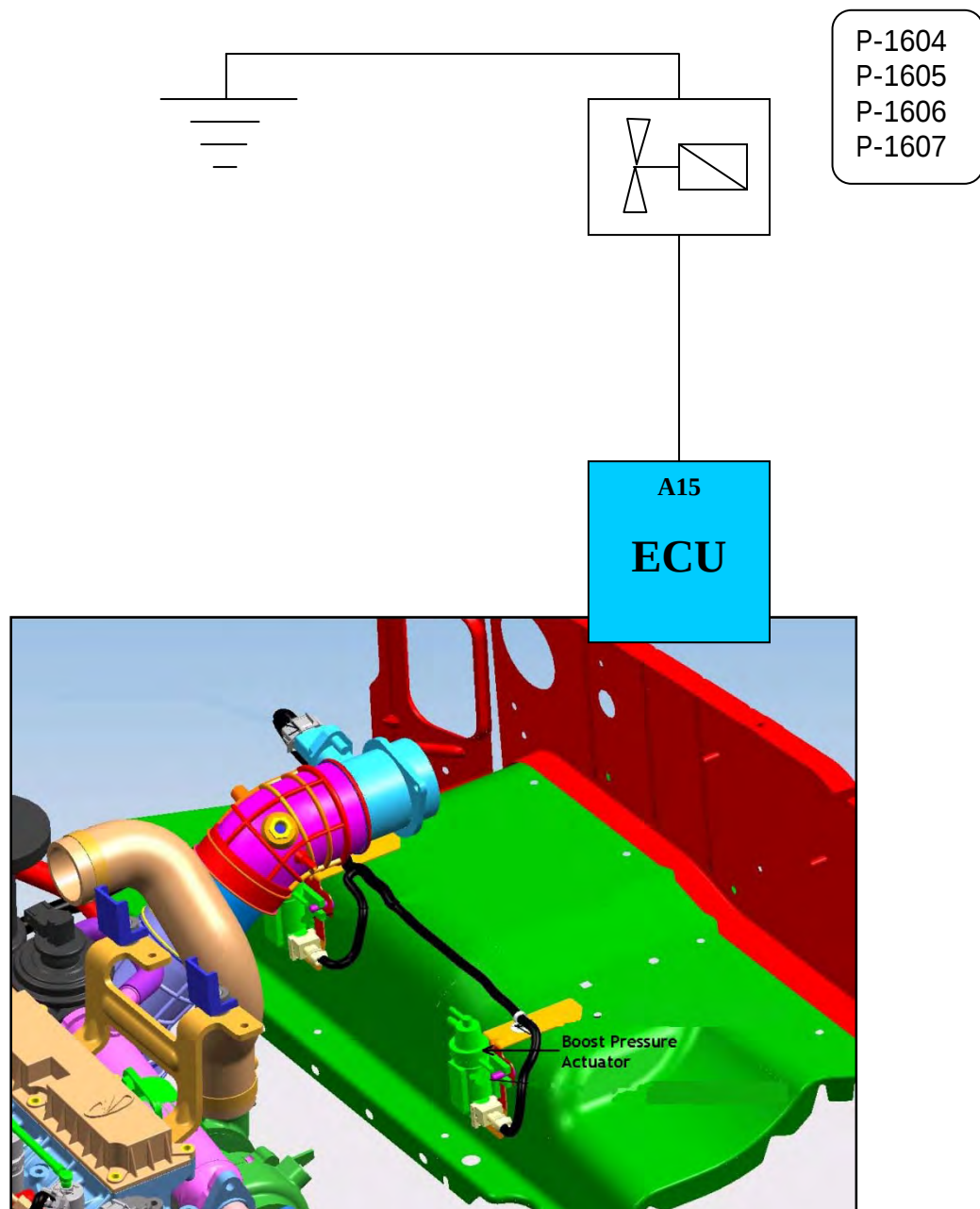
P-1604
 P-1605
 P-1606
 P-1607

Hint:

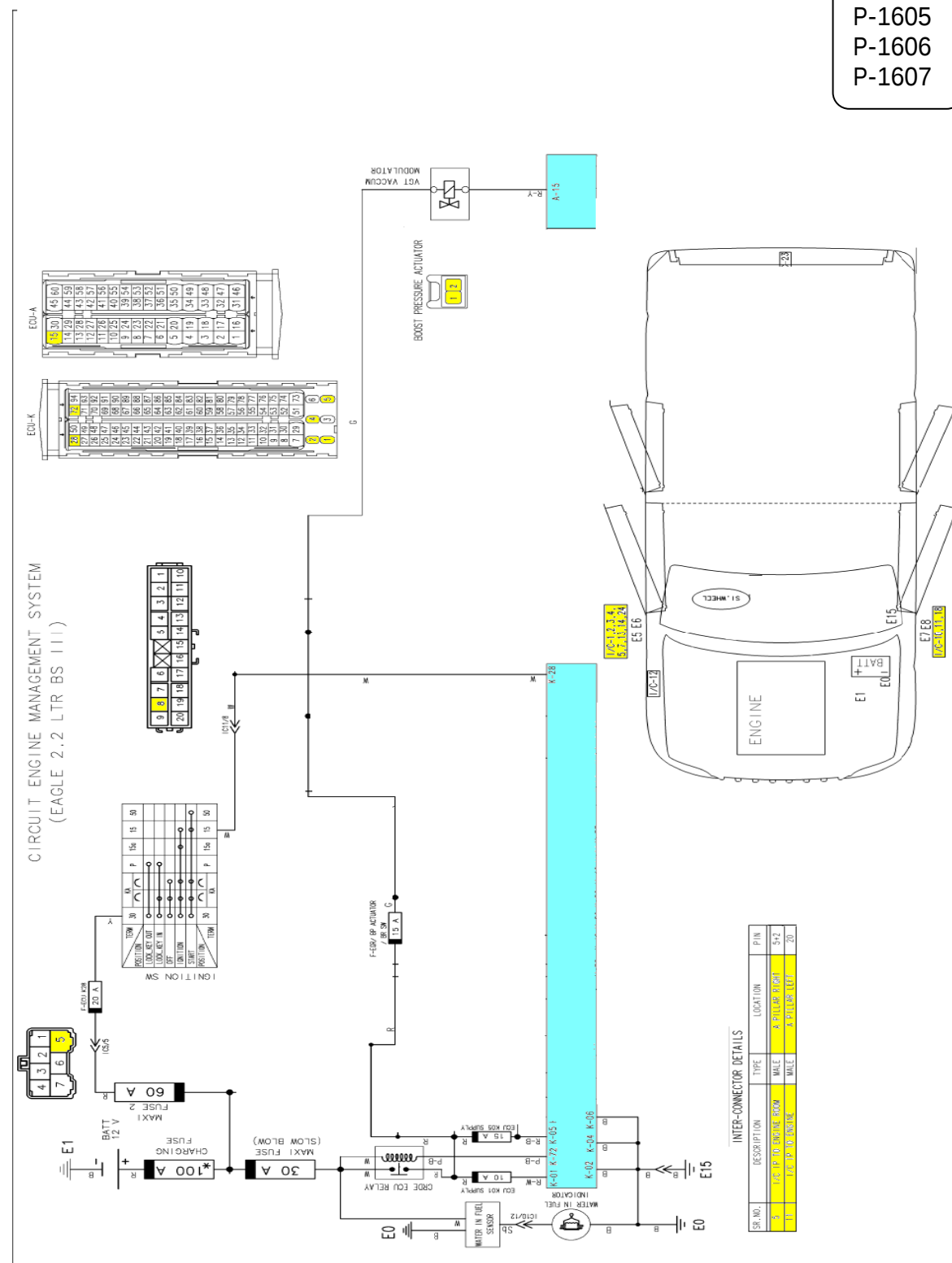
Short circuit to battery and excess temperature errors can be detected only when the power stage is switched on.

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)		Possible Causes • Short circuit to battery or ground. • Excess temperature • No load.
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		



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



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

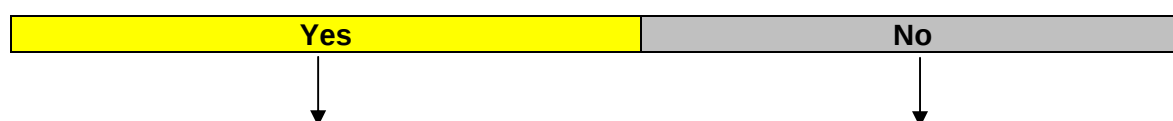
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P1604/P1605/P1606/P1607 is present.

For Defect Codes P 1605 & P1606 –

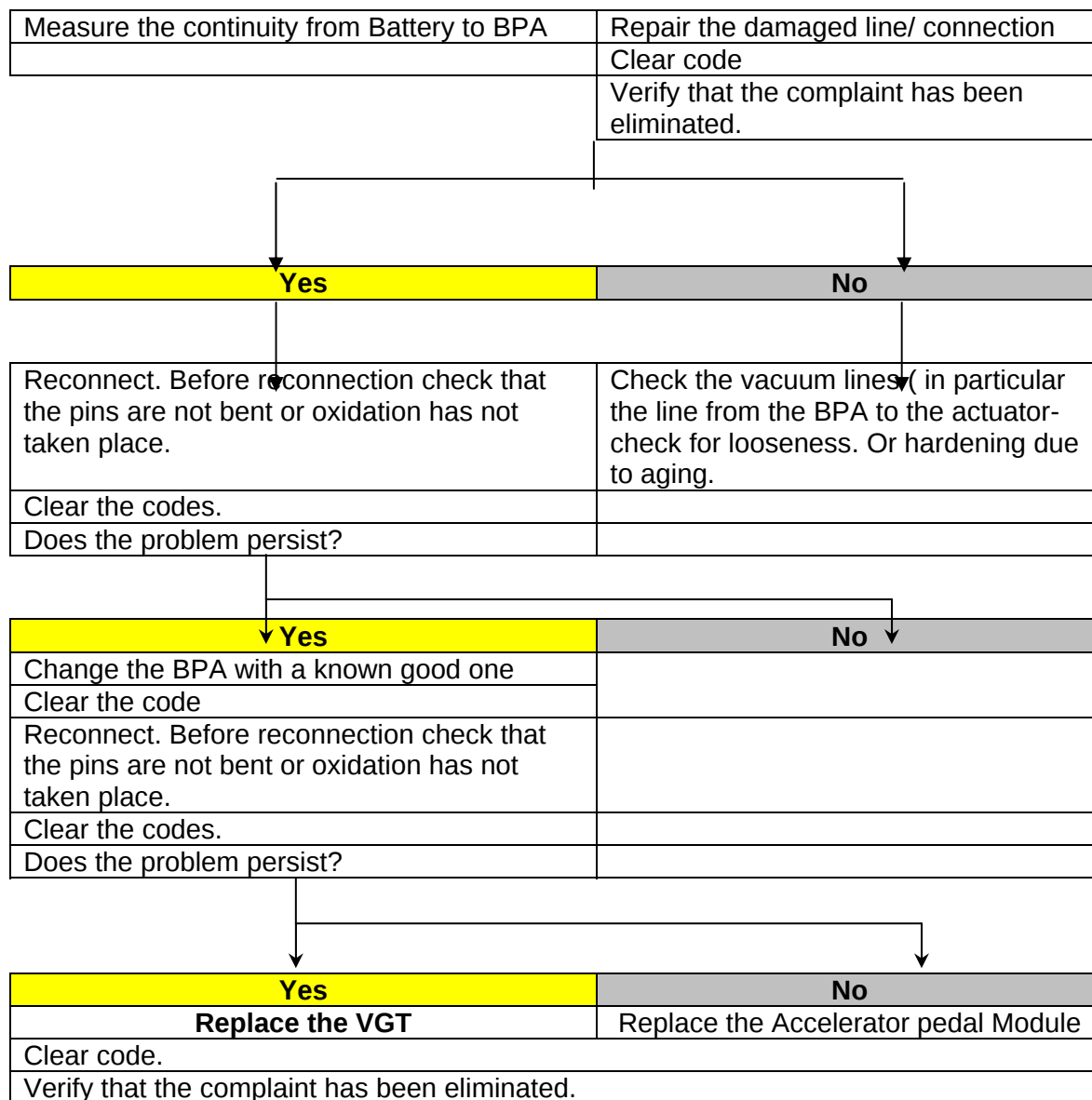
- Turn Ignition switches OFF & disconnect BPA connector.
- Turn the Ignition ON & measure voltage between terminal 2 & terminal 3 of the APP2 (from the APP2 connector side.)
- It should be 4.5 ± 0.15 V
- Is it?

Check the continuity from BPA to A15

Is it OK ?



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

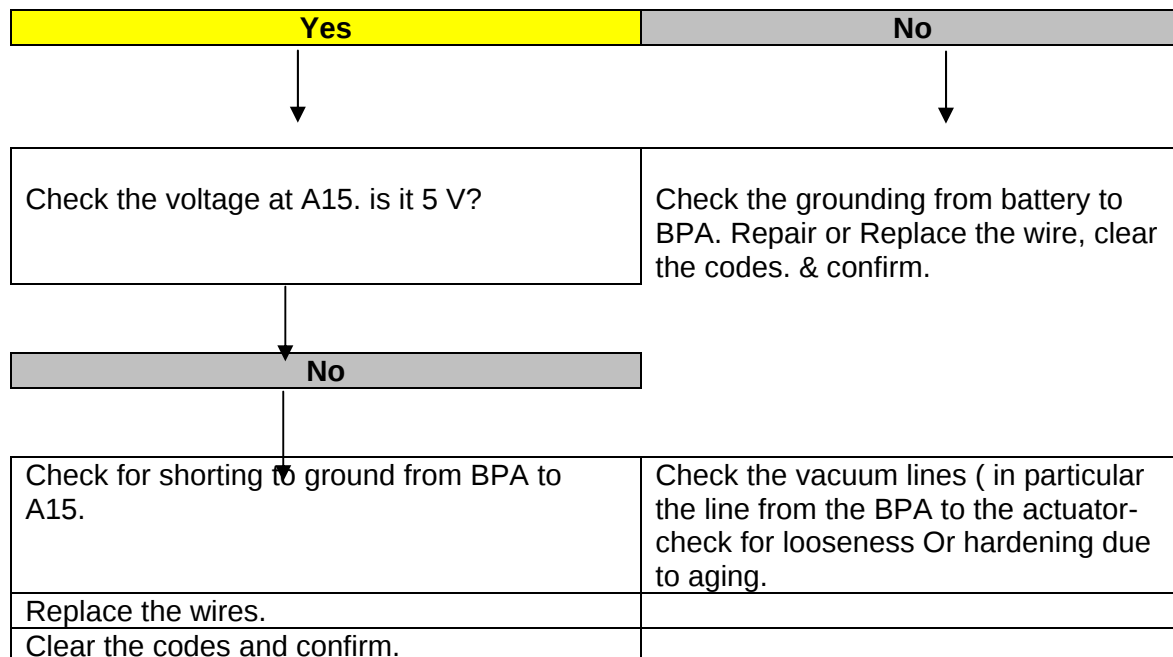


For Defect Codes P 1604 & P1607 -

- 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 ?



Boost Pressure Sensor

P-235
P-236
P-1236

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.

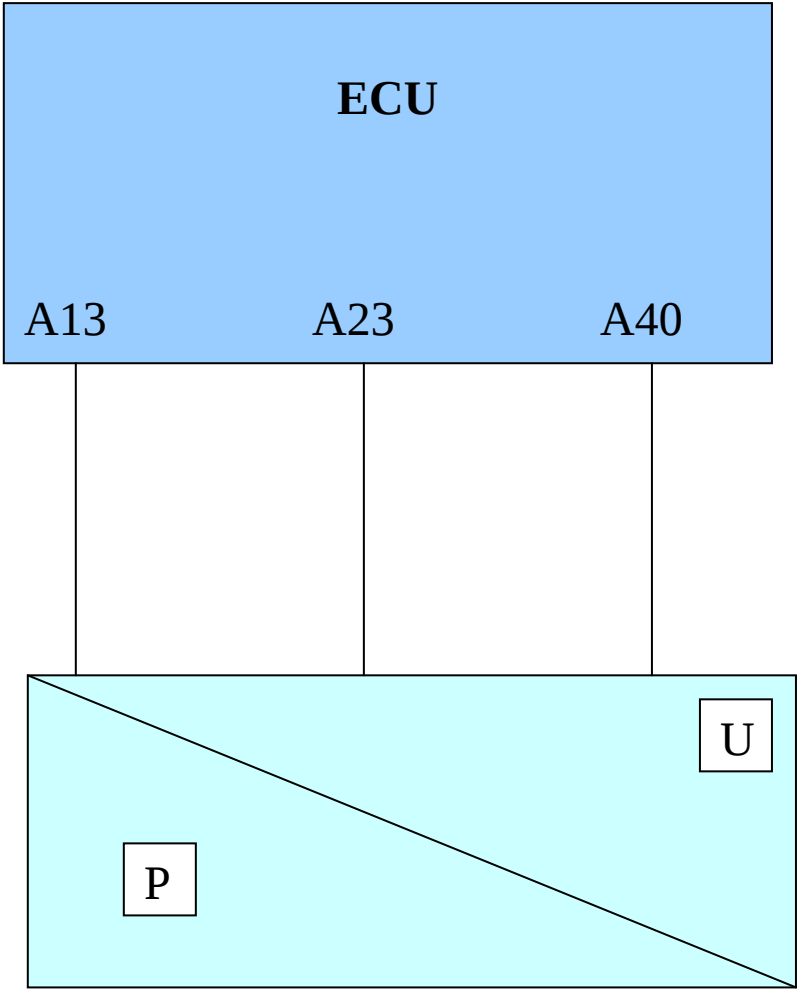
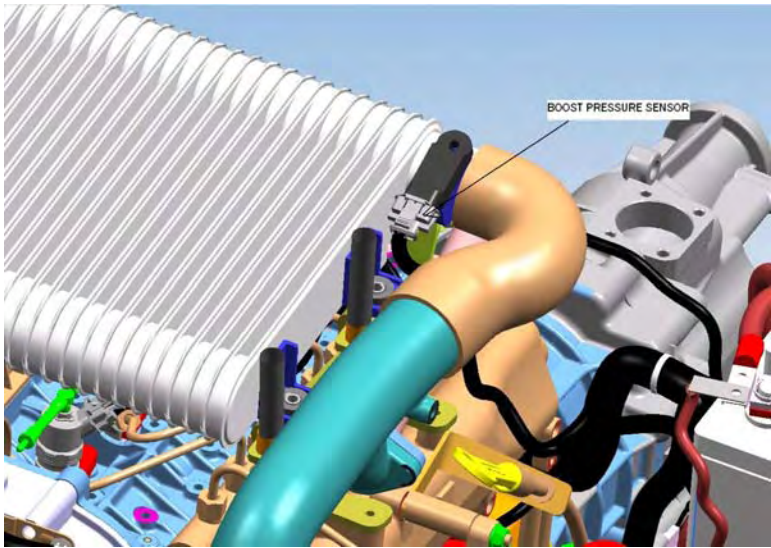
DTC	Diagnostic item
P-235	Boost pressure sensor- Voltage above upper limit
P-236	Boost pressure sensor- Voltage below lower limit
P-1236	Boost pressure sensor not plausible with atmospheric pressure sensor.

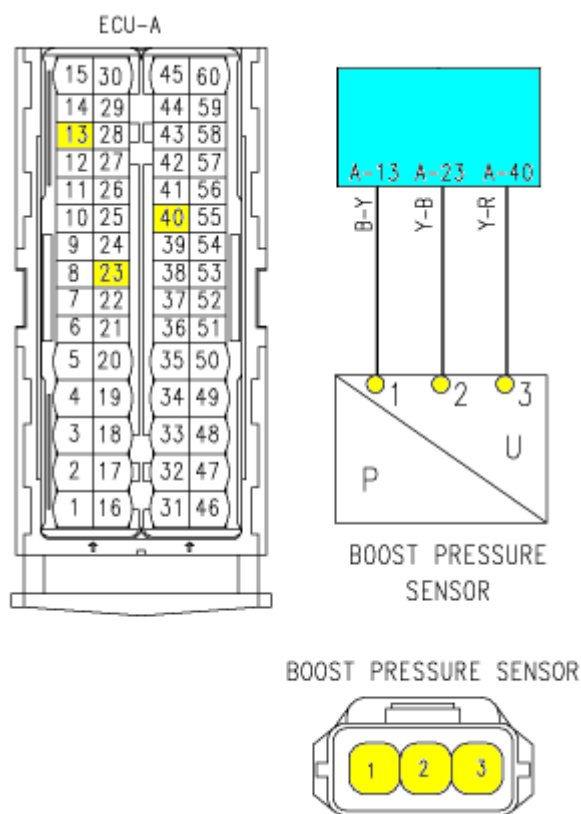
DTC detection condition	Probable cause
Proper Performance The ECU monitors the Boost pressure Malfunction; out-of-range - Monitors the pressure build up or decrease. - Also monitors the plausibility with the atmospheric pressure sensor Reaction - System Check lamp is ON - Engine torque is limited. -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

- P-235

P-236

P-1236





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

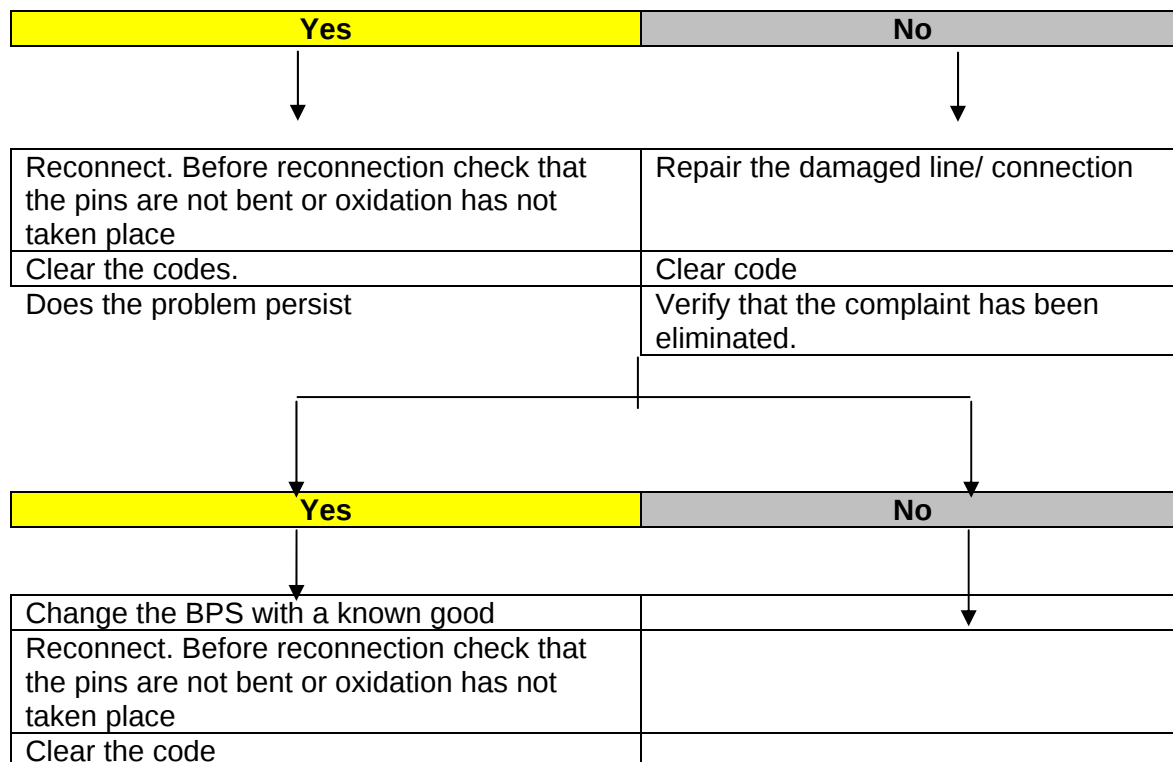
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P235/P236/P1236 is present.

- 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

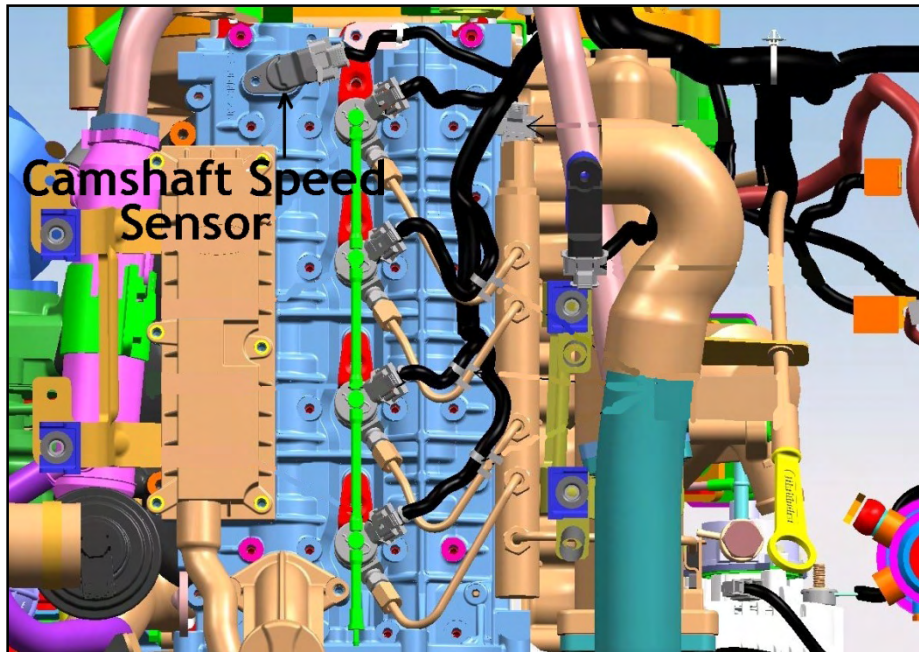
Is it OK ?

P-235
 P-236
 P-1236



Camshaft Speed Sensor

P-0340
P-0341



Camshaft speed sensor

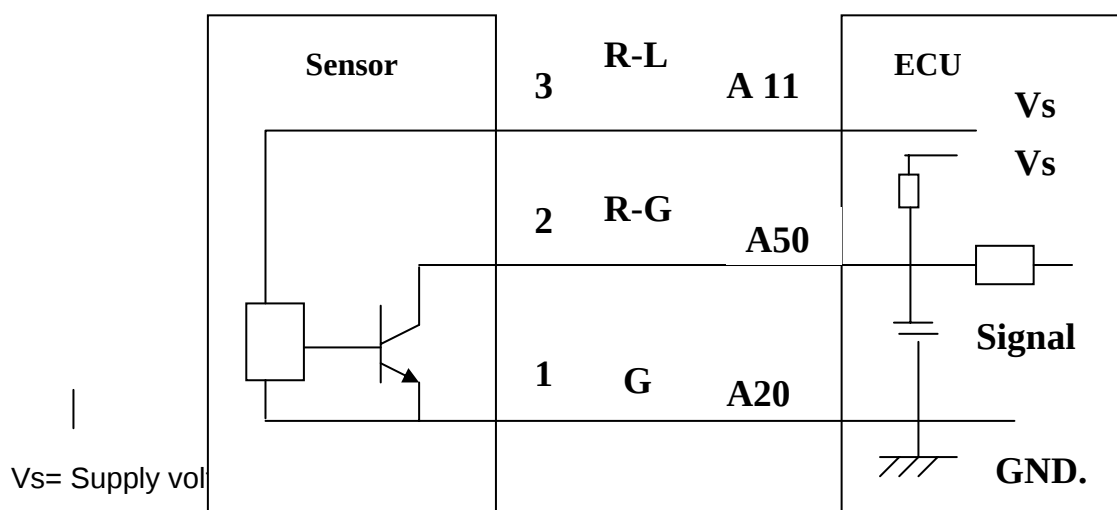
P-0340
 P-0341

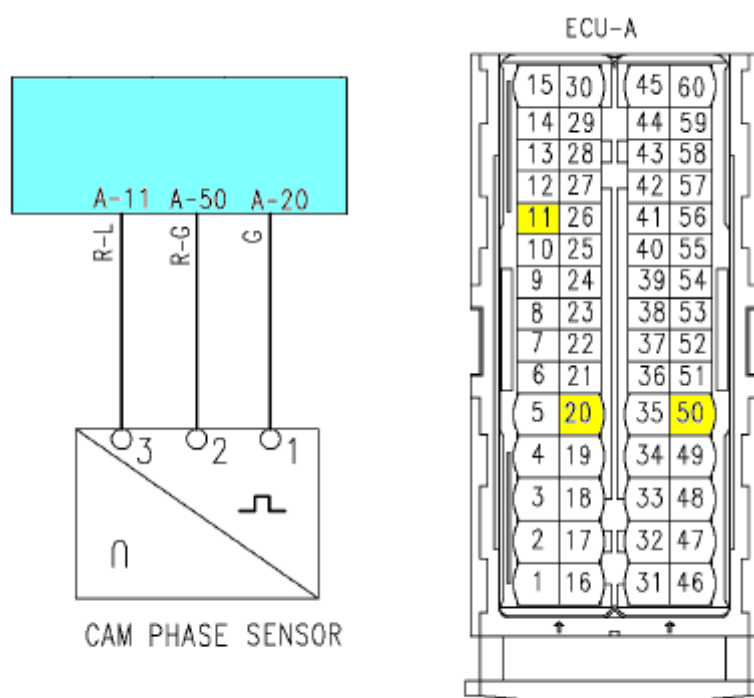
DTC	Diagnostic item
P-0340	No camshaft signal
P-0341	Wrong camshaft signal

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.





P-0340
 P-0341

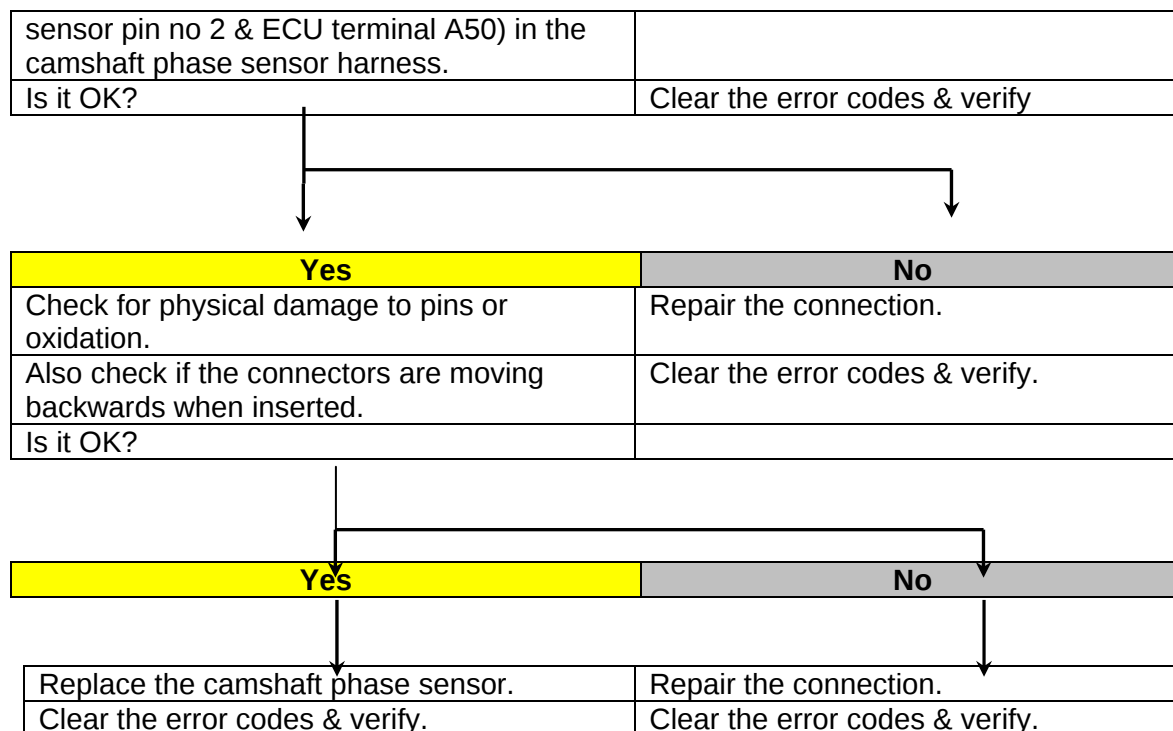
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0340 or P0341 are present.

- 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
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
-----	----

Measure the continuity of signal (between	Repair the connection.
---	------------------------



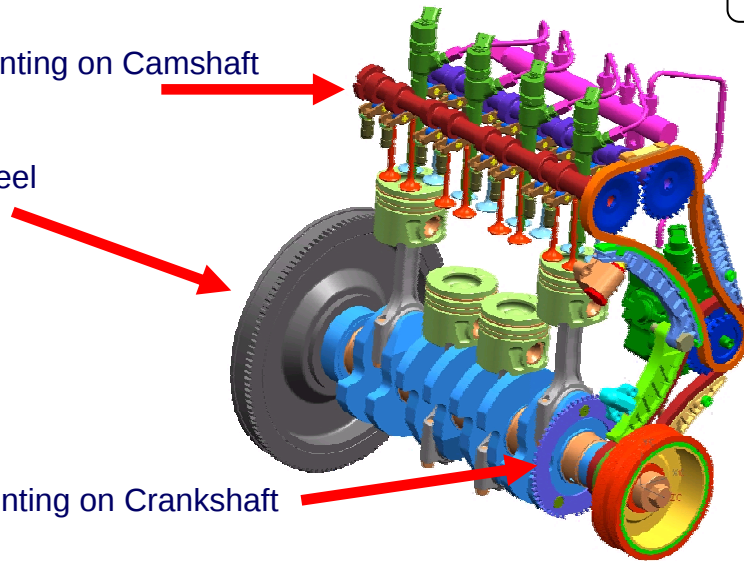
Crankshaft sensor

P-0335
P-0336

Phase Sensor Mounting on Camshaft

Single Mass Flywheel

Speed Sensor Mounting on Crankshaft



Crankshaft Sensor

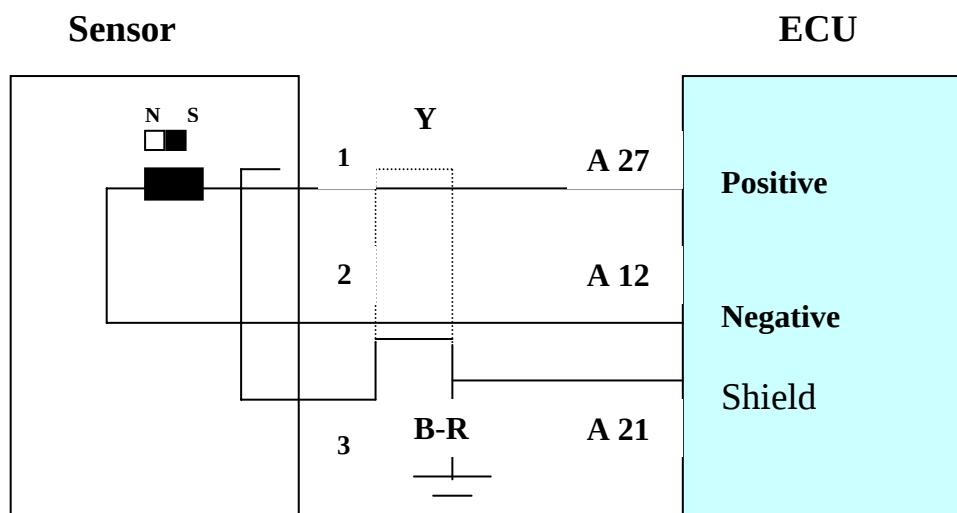
P-0335
 P-0336

Description - 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.

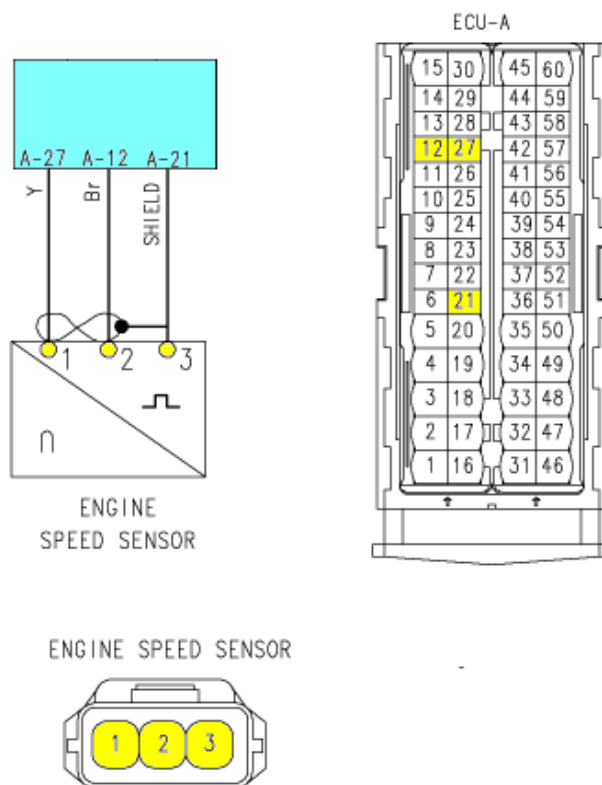
DTC	Diagnostic item
P-0335	No crankshaft signal
P-0336	Wrong crankshaft signal

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)



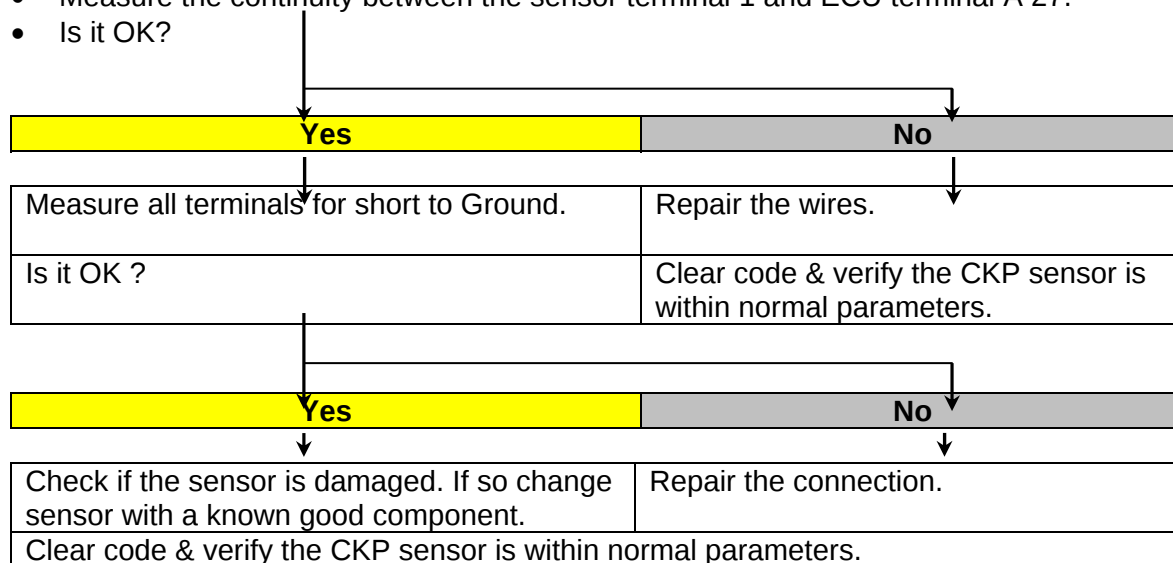
P-0335
 P-0336



Test Procedure ISS

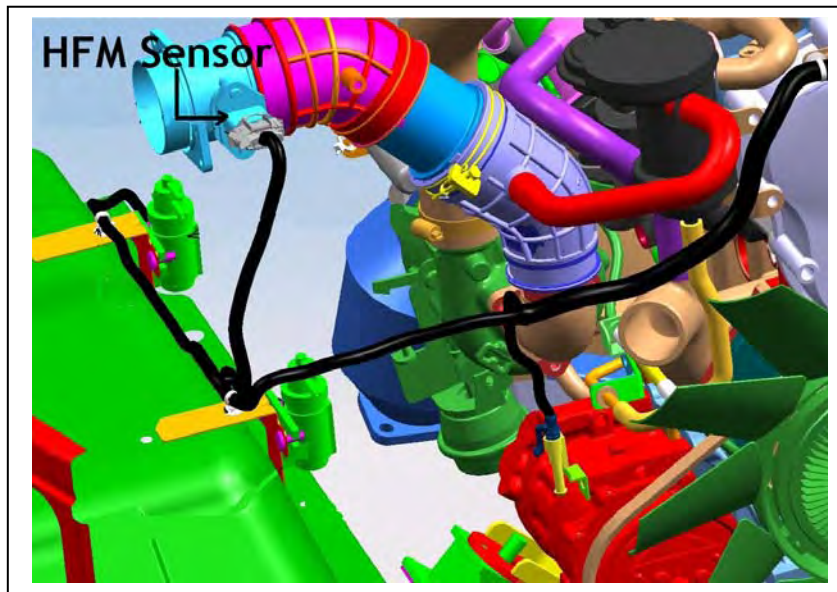
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0335 or P0336 are present. Please verify while cranking the engine.

- 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?



Air Flow

P-0103
P-0102



Air Flow

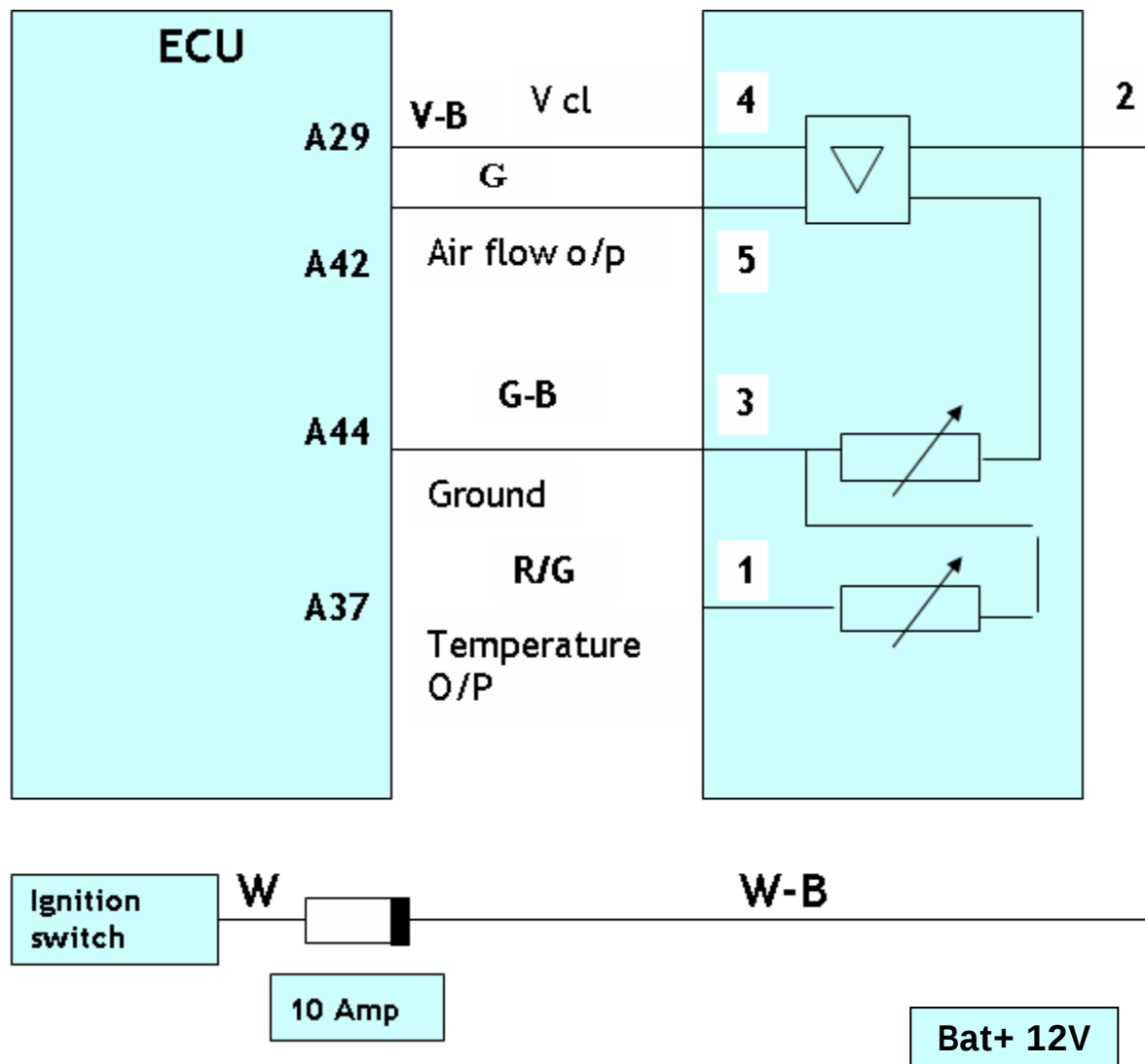
P-0103
P-0102

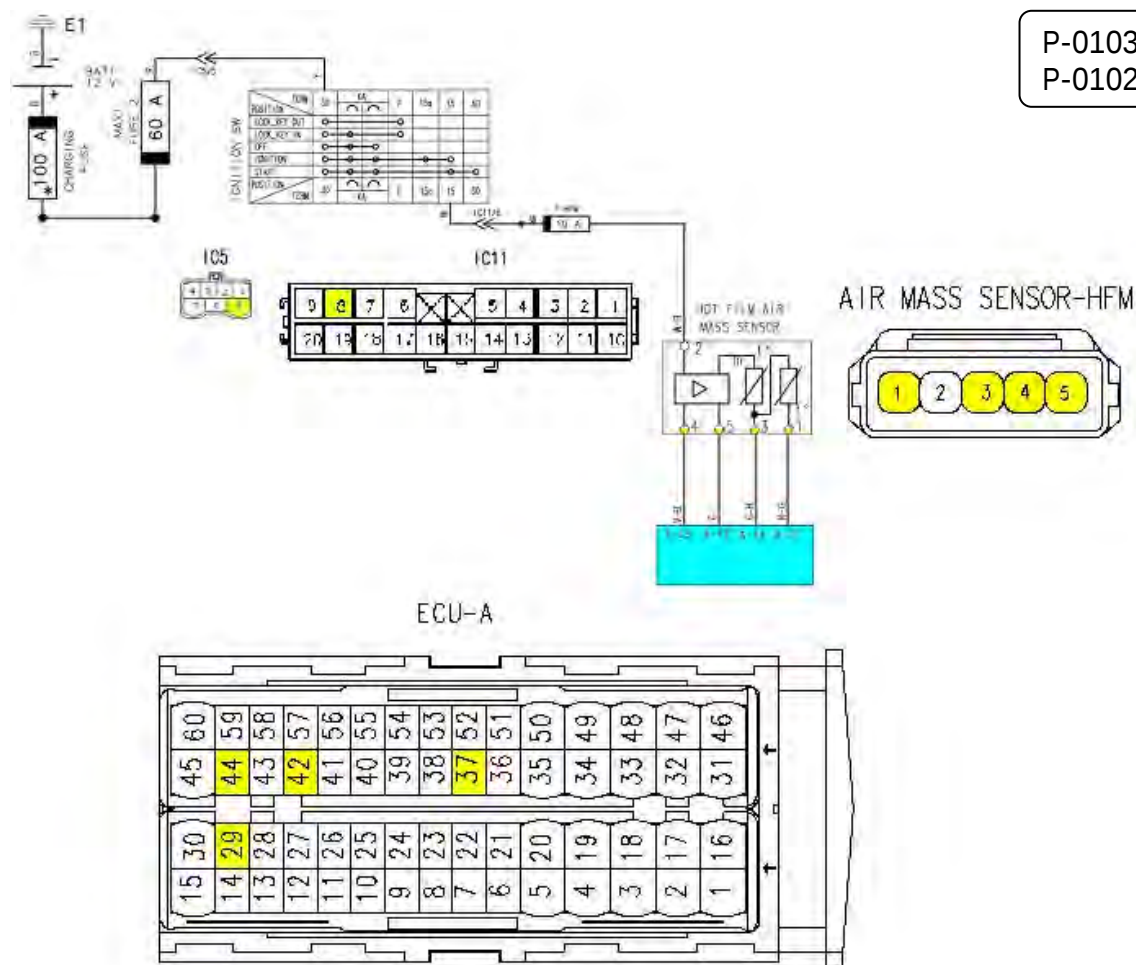
Description -

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.



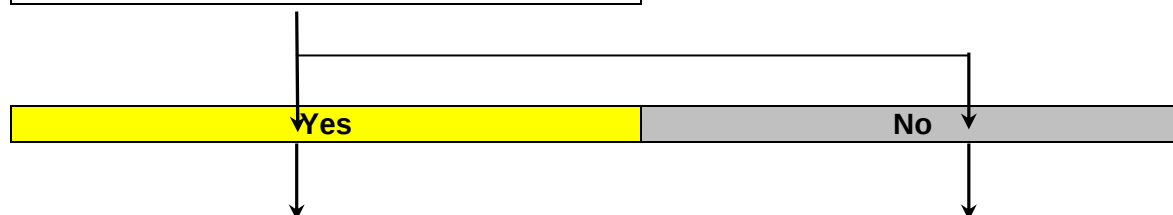


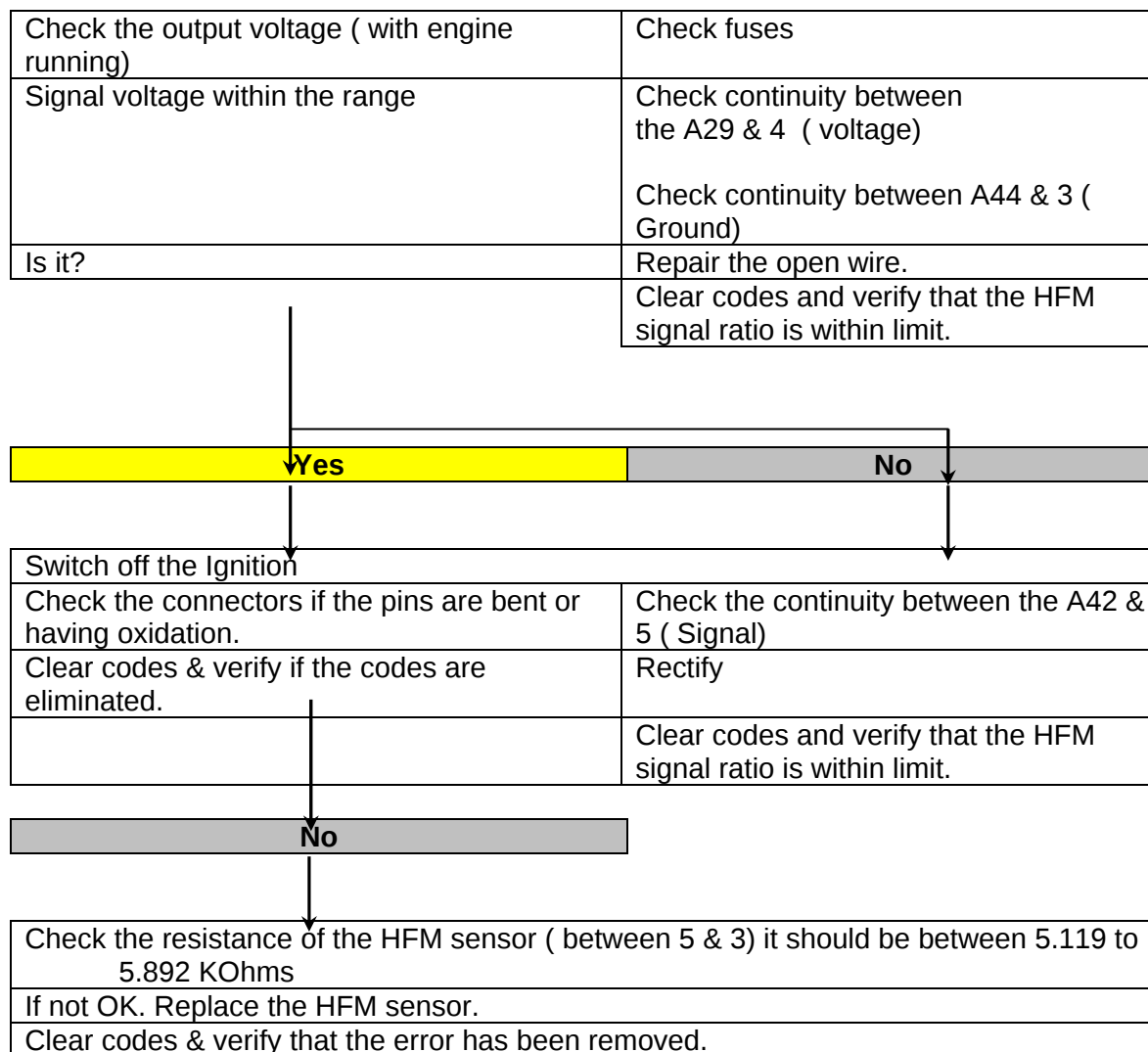
P-0103
P-0102

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.

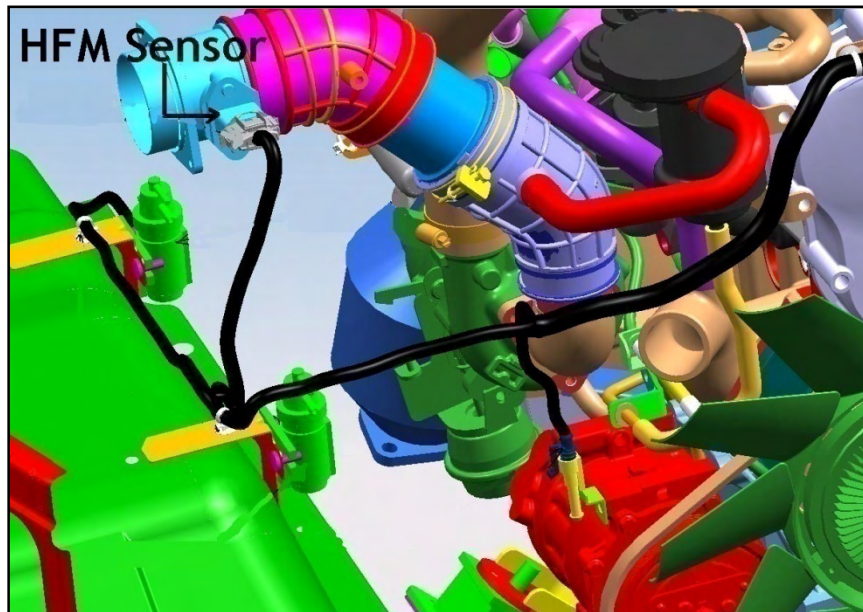
Turn the ignition OFF
Disconnect HFM sensor.
Turn the Ignition ON
Measure the voltage at the connector between terminal 3 & 4.
It should be 5 ± 0.3 Volts
Is it





Air Temperature

P-0113
P-0112



Air Temperature

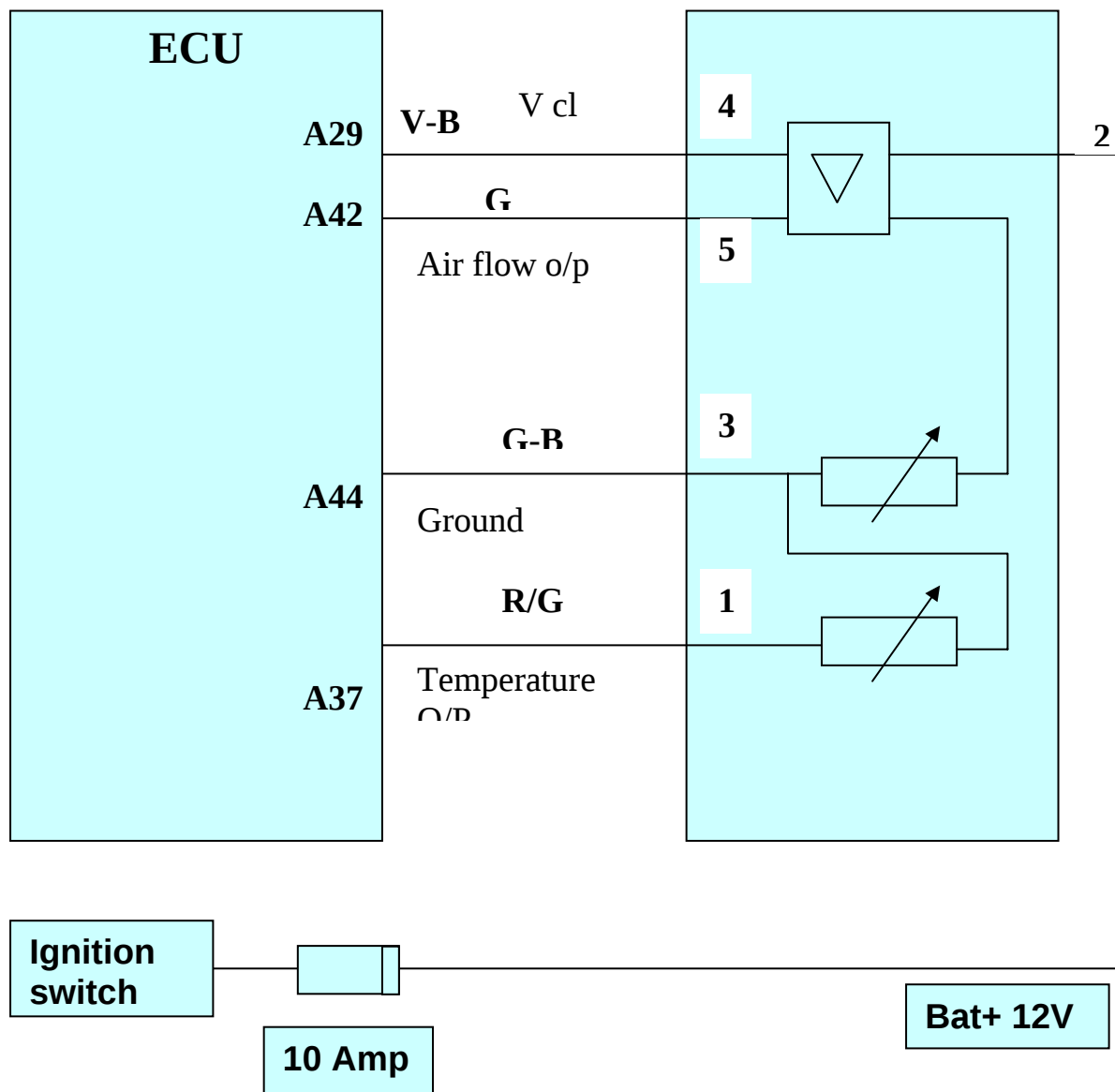
P-0113
P-0112

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

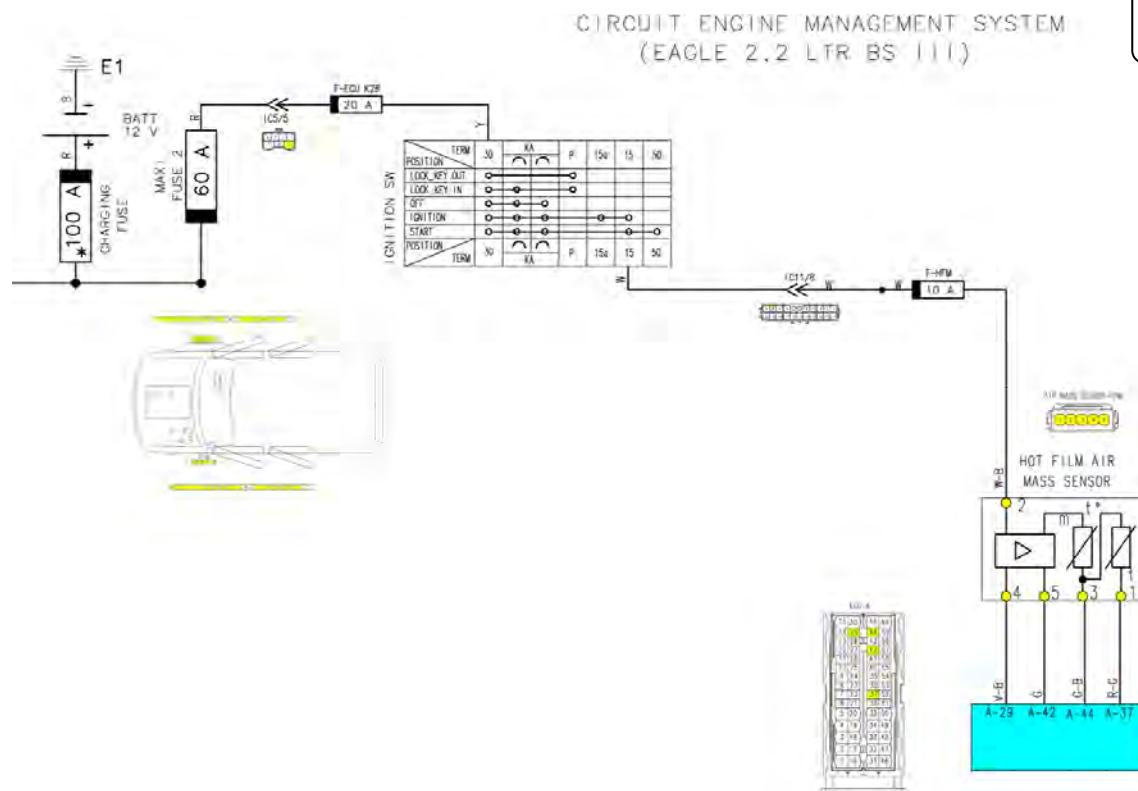
Description: The function acquires the raw voltage of the induction air temperature. The raw value is linearised and monitored for compliance with the signal range.
The sensor is mounted in HFM.

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



P-0113
P-0112



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.

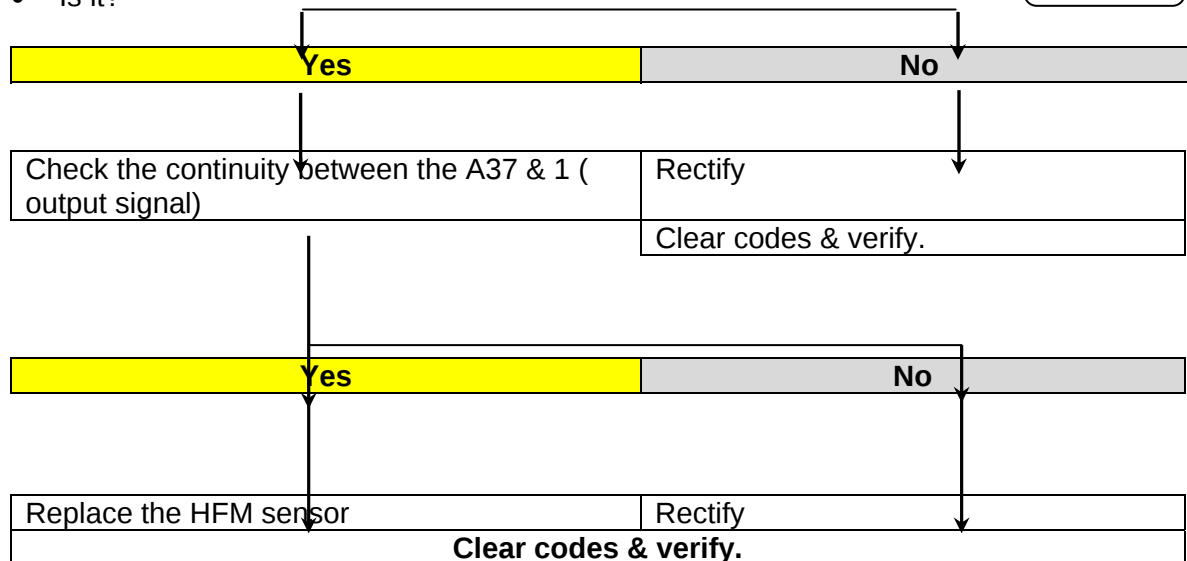
Turn the ignition OFF
Disconnect HFM sensor Connector.
Turn the Ignition ON
Measure the voltage between the Terminal 3 & 4 of HFM Sensor Connector.
It should be 5 ± 0.3 Volts
Is it

Yes	No					
	<table><tr><td>Check fuses</td></tr><tr><td>Check continuity between the A29 & 4 (voltage)</td></tr><tr><td>Check continuity between A44 & 3 (Ground)</td></tr><tr><td>Repair the open wire.</td></tr><tr><td>Clear codes and verify that error has been eliminated.</td></tr></table>	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.
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.						

Measure the continuity between A44 & 3 (ground)

- Is it?

P-0113
 P-0112

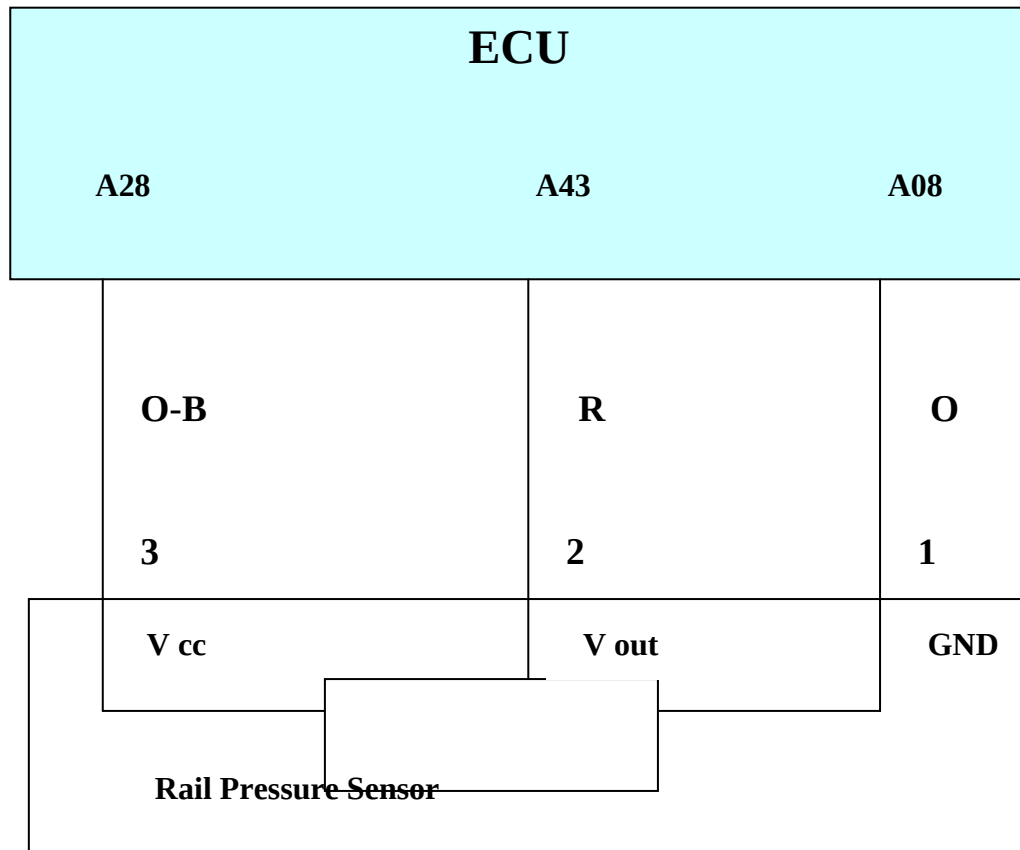


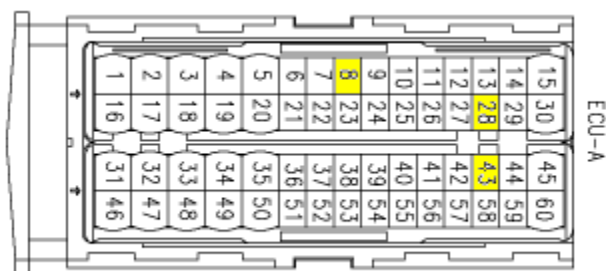
Rail Pressure Sensor

DTC	Diagnostic item
P-0193	Voltage above upper limit.
P-0192	Voltage below lower limit.

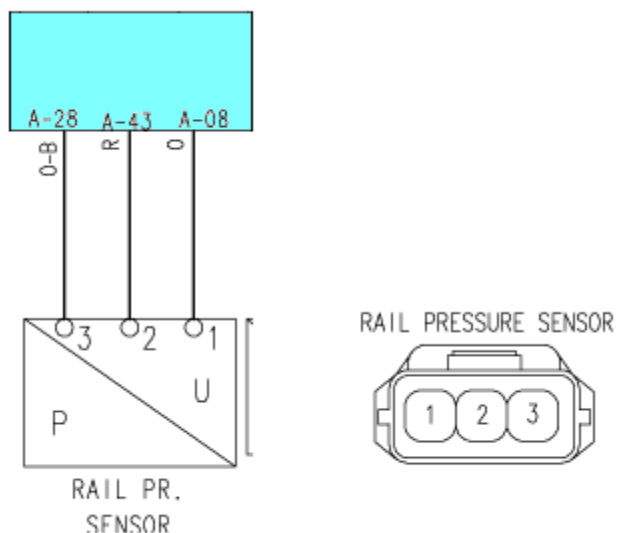
DTC detection condition	Probable cause
Normal operation • When ignition is ON rail pressure sensor getting supply from ECU. • ECU reads the rail pressure in terms of voltage. • Engine is starting properly. • Building pressure in rail. Malfunction • Rail pressure output voltage is below Reaction • When 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

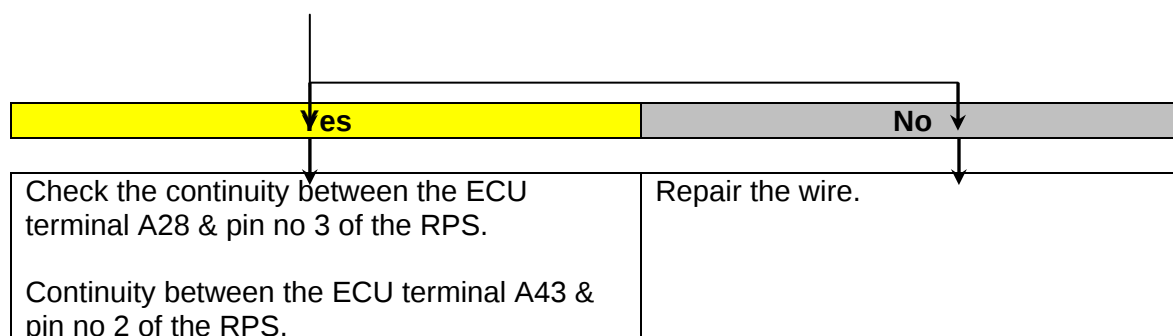


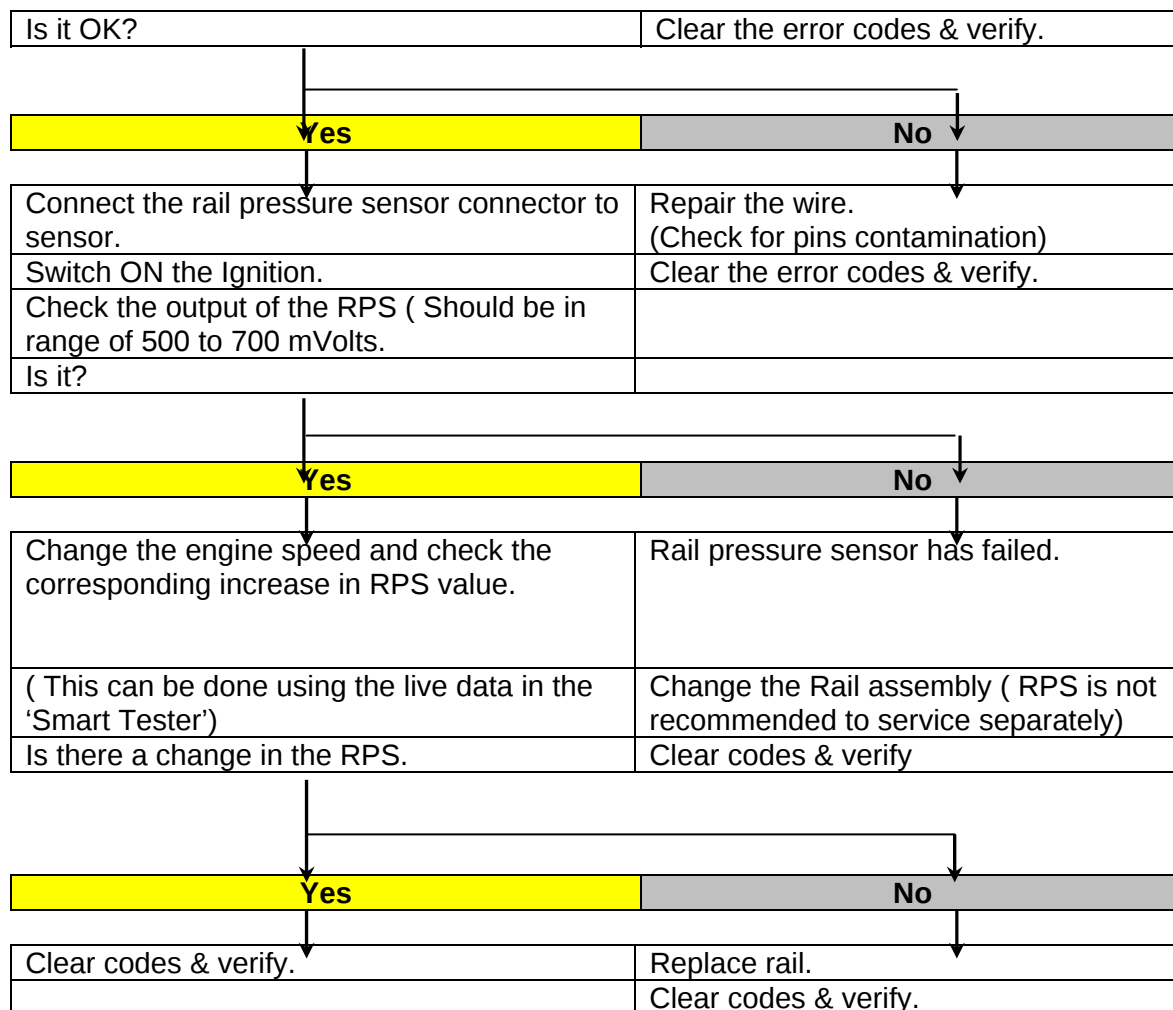


P-0193
P-0192



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?





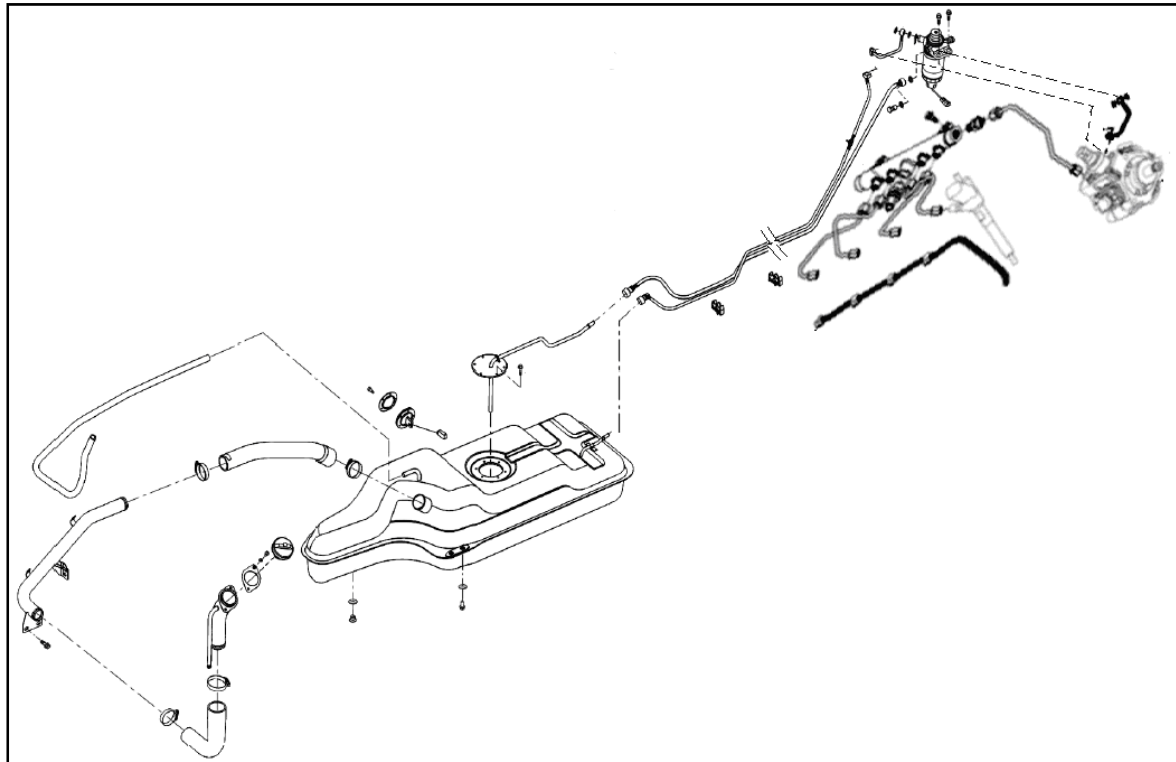
Rail Pressure Deviation

P-1192
 P-1193

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

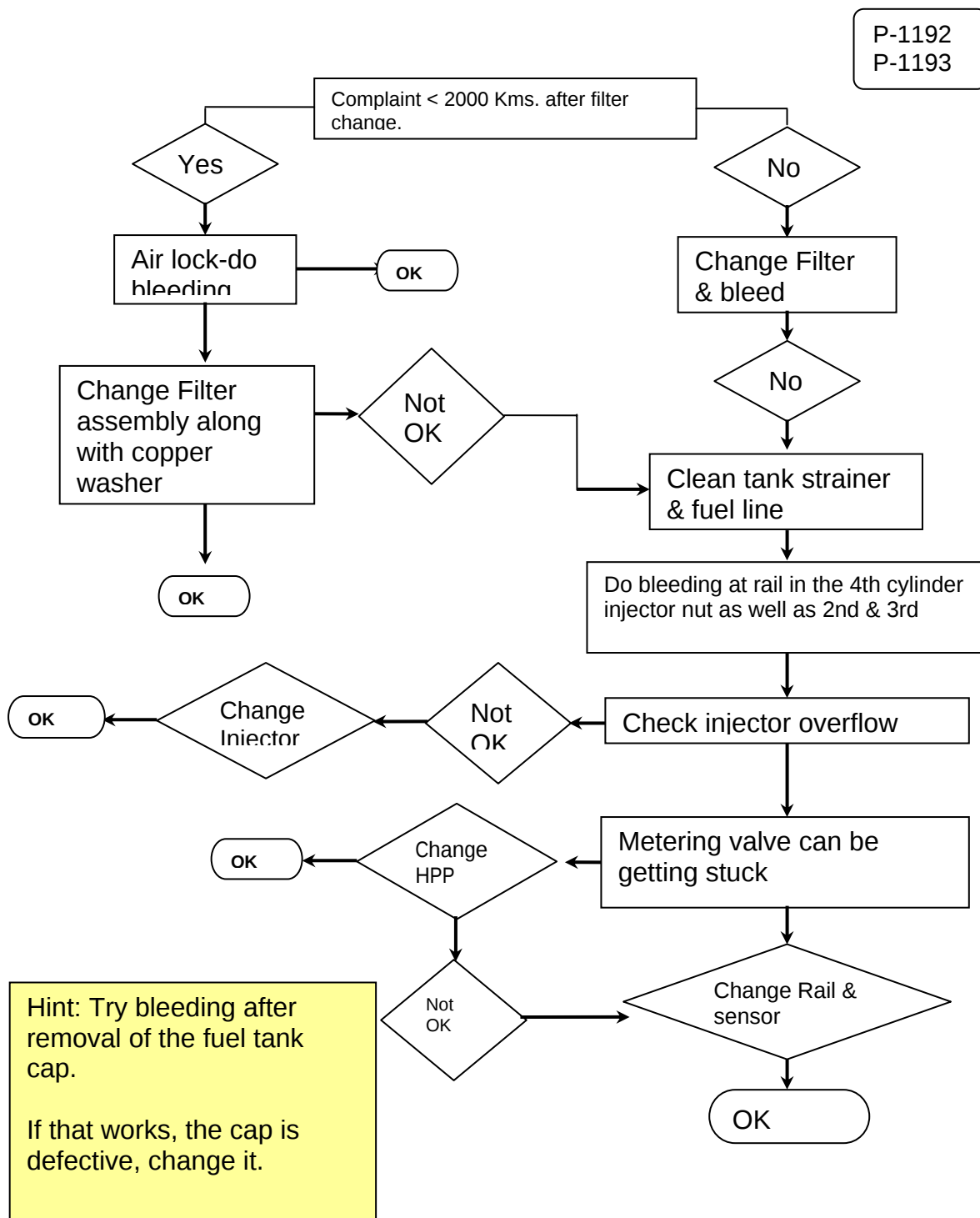
DTC detection condition	Probable cause
Proper Performance The ECU compares the rail pressure monitored through the RPS against the expected pressure generated due to HPP (Based on MPROP position and the engine RPM and other parameters) Malfunction; out-of-range - If the deviation is more then error is 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.



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

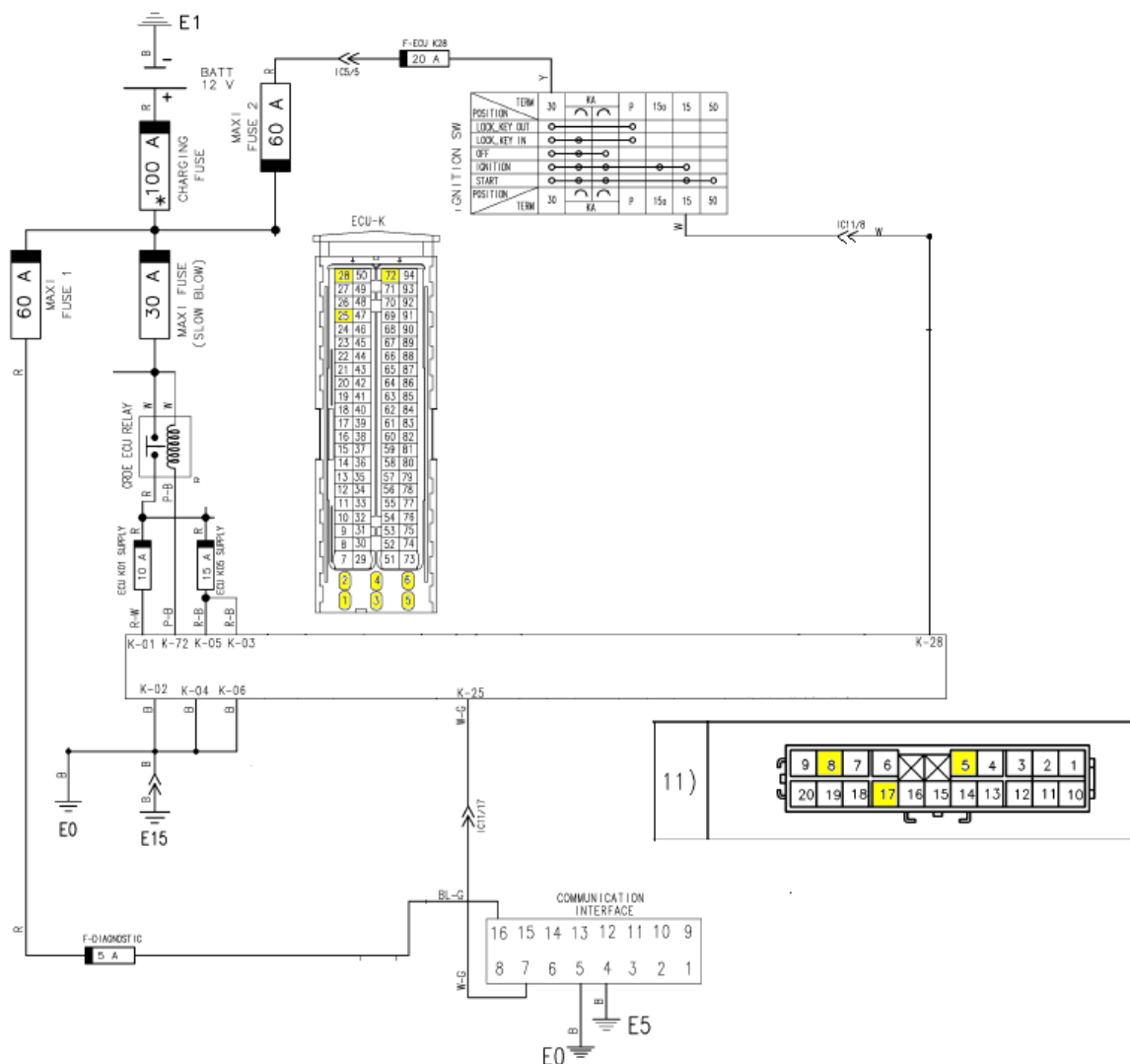
DTC	Diagnostic item
P-1195	Minimum rail pressure exceeded.

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.

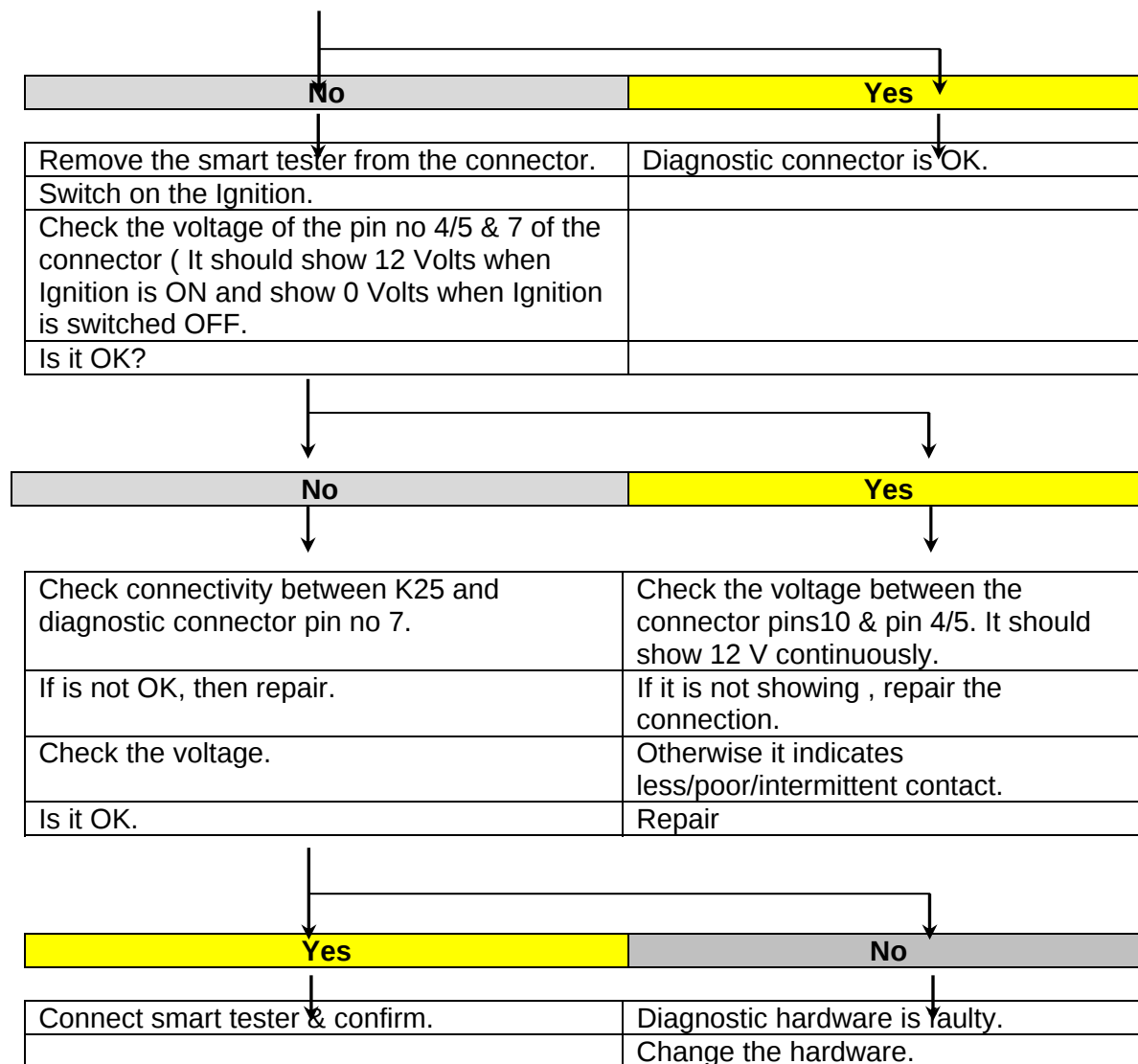


INTER-CONNECTOR DETAILS

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



EGR power stage

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.

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

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

ECU-A

15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	52
6	21	36	51
5	20	35	50
4	19	34	49
3	18	33	48
2	17	32	47
1	16	31	46

ECU-B

15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	52
6	21	36	51
5	20	35	50
4	19	34	49
3	18	33	48
2	17	32	47
1	16	31	46

ECU-C

15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	52
6	21	36	51
5	20	35	50
4	19	34	49
3	18	33	48
2	17	32	47
1	16	31	46

ECU-D

15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	52
6	21	36	51
5	20	35	50
4	19	34	49
3	18	33	48
2	17	32	47
1	16	31	46

ECU-E

15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	52
6	21	36	51
5	20	35	50
4	19	34	49
3	18	33	48
2	17	32	47
1	16	31	46

ECU-F

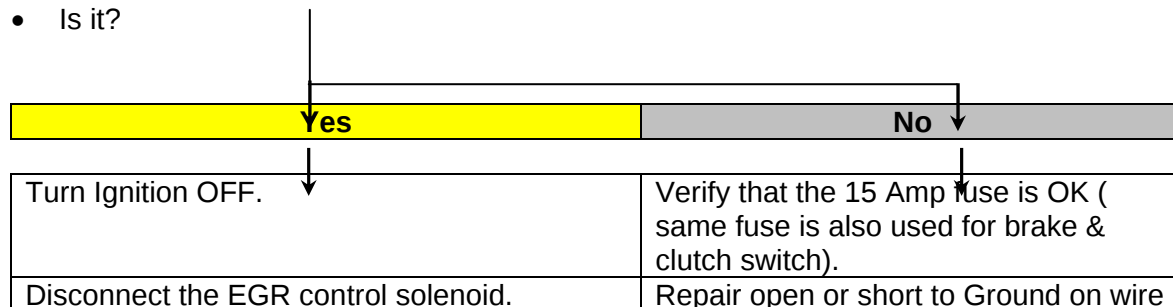
15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	52
6	21	36	51
5	20	35	50
4	19	34	49
3	18	33	48
2	17	32	47
1	16	31	46

ECU-G

15	30	45	60
14	29	44	59
13	28	43	58
12	27	42	57
11	26	41	56
10	25	40	55
9	24	39	54
8	23	38	53
7	22	37	

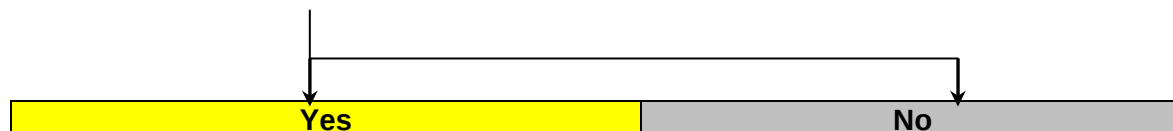
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that either P0406 or P0405 or P0403 or P0404 are present.

- 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? |

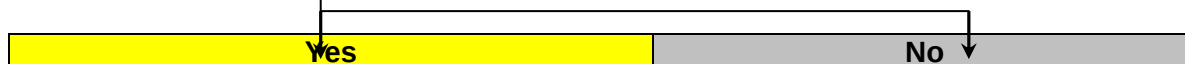


P-0406
P-0405
P-0403
P-0404

	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?	



Are the connectors OK (check for bent pins or oxidation).	Rectify the wiring.
	Clear codes & verify.



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.

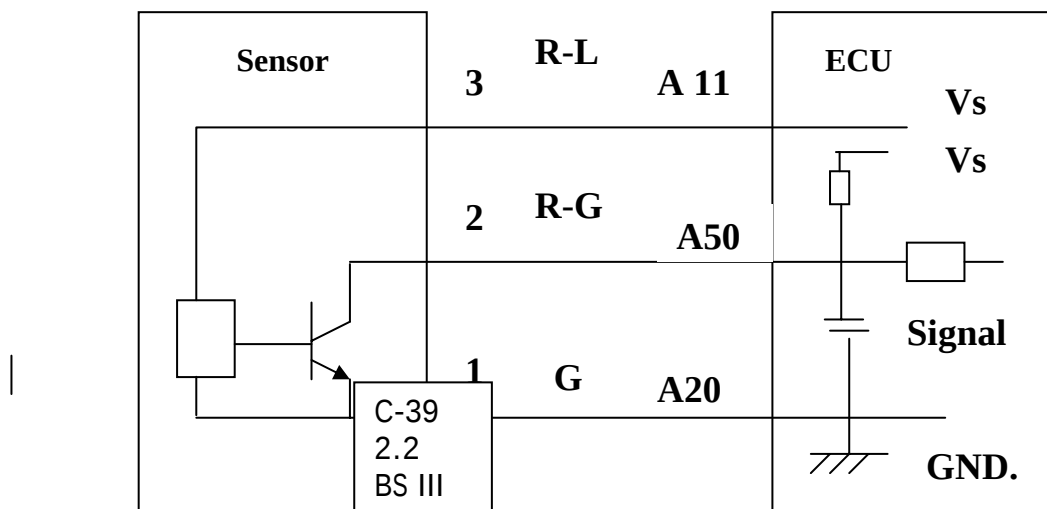
Error path of offset between camshaft and crankshaft

DTC	Diagnostic item
P-1340	Offset between camshaft and crankshaft

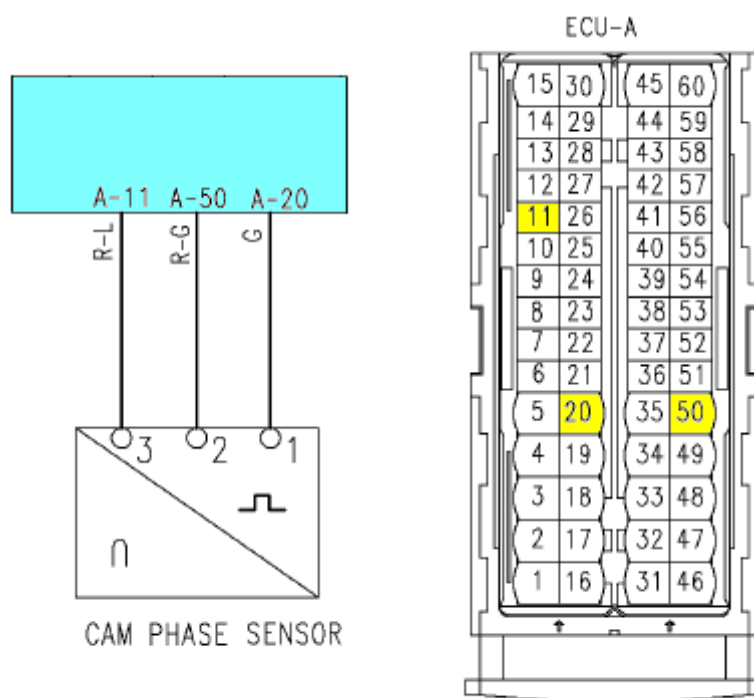
DTC detection condition	Probable cause
Normal operation * Engine is being cranked & started. Malfunction * Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 4 sec. * No synchronization between crankshaft & 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

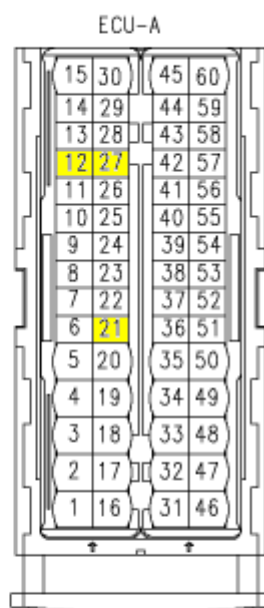
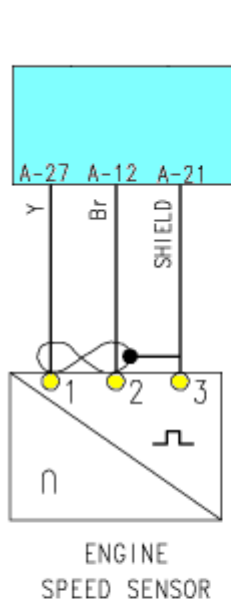
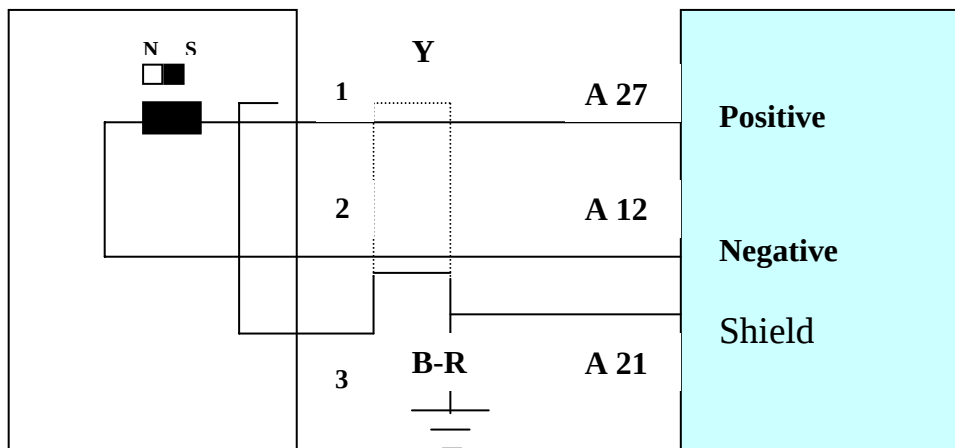


P-1340

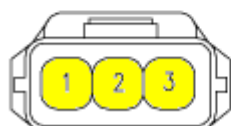
ISS (Incremental speed sensor/ Crankshaft speed sensor)

Sensor

ECU



ENGINE SPEED SENSOR



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

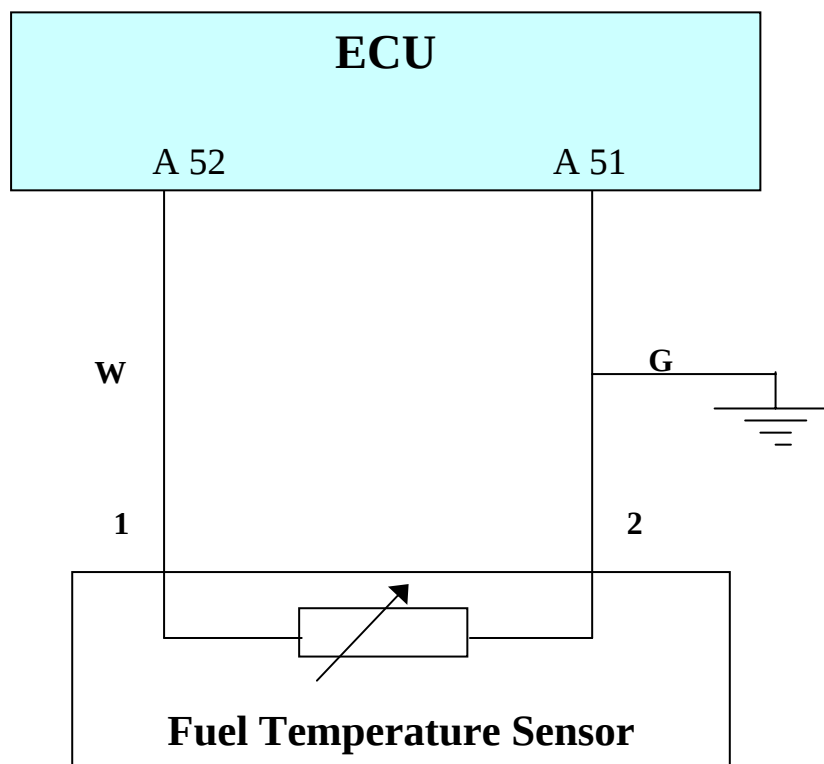
P-0182
 P-0183

Description –

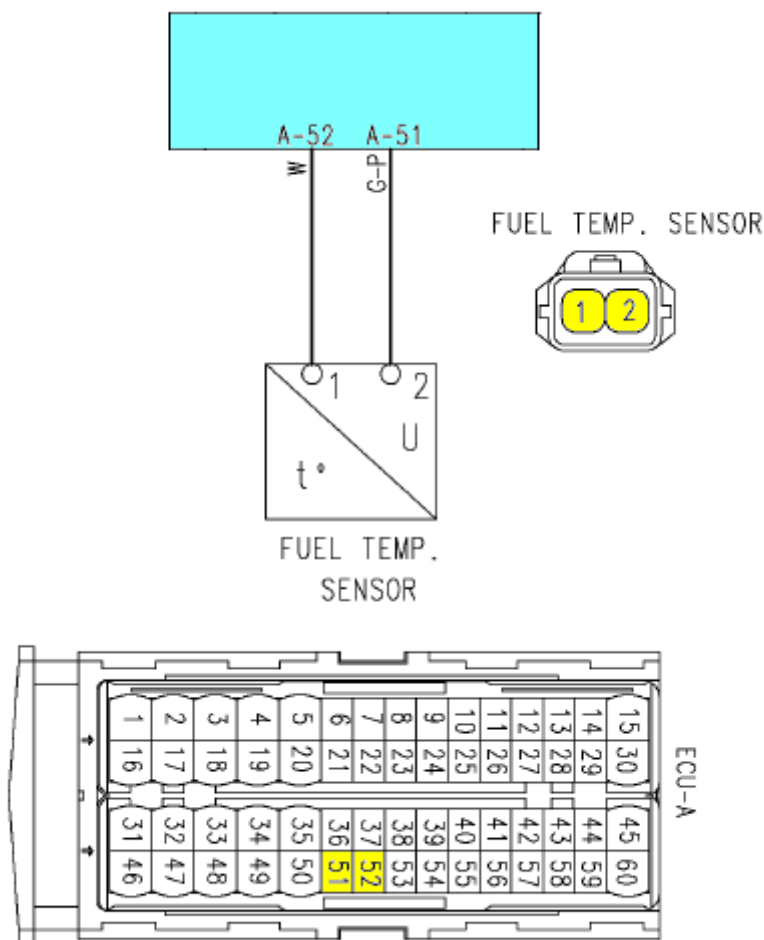
Fuel temperature sensor acquires the raw value of the fuel temperature. The raw value is linearised and monitored for compliance with the signal range. The sensor is a NTC type

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

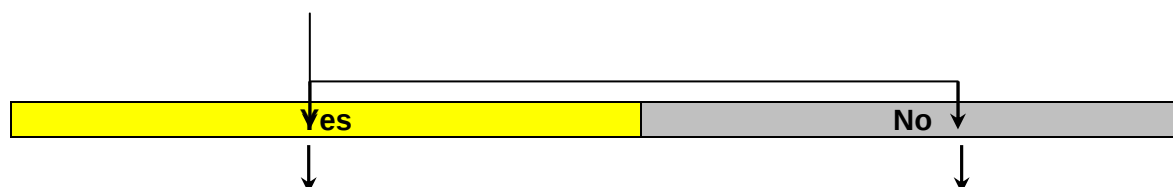


Test Procedure Fuel Temperature Sensor –

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 $\pm$ 0.3 when Ignition ON
- Is it?



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

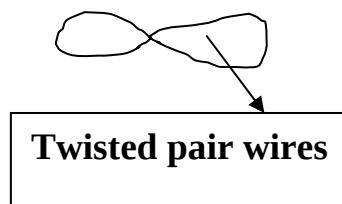
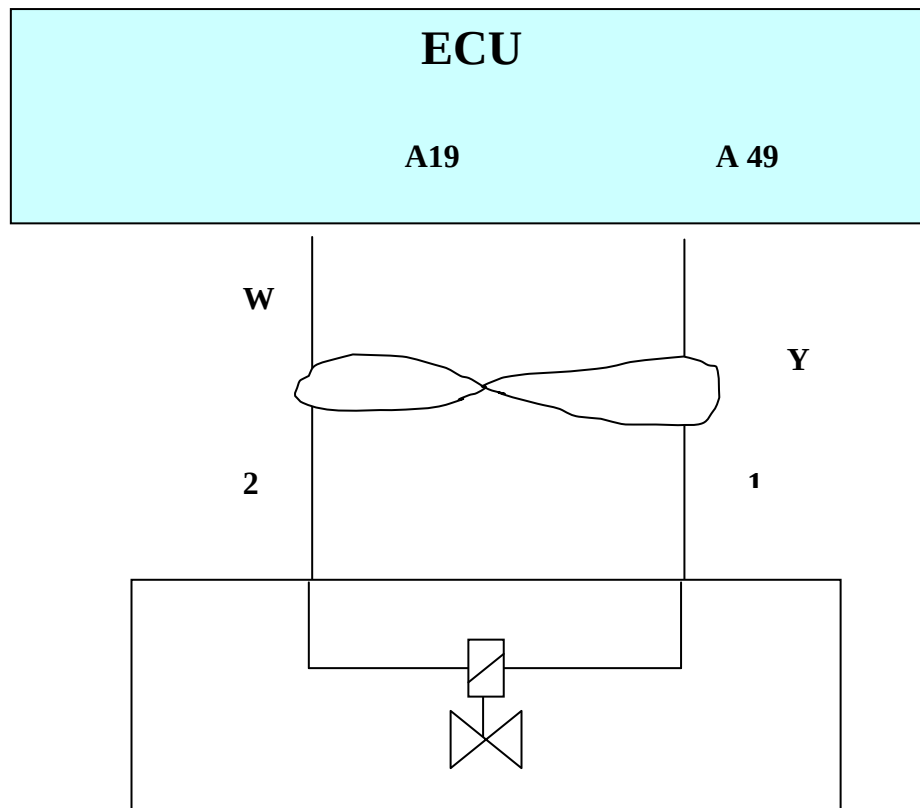
Metering unit pump -Power stage

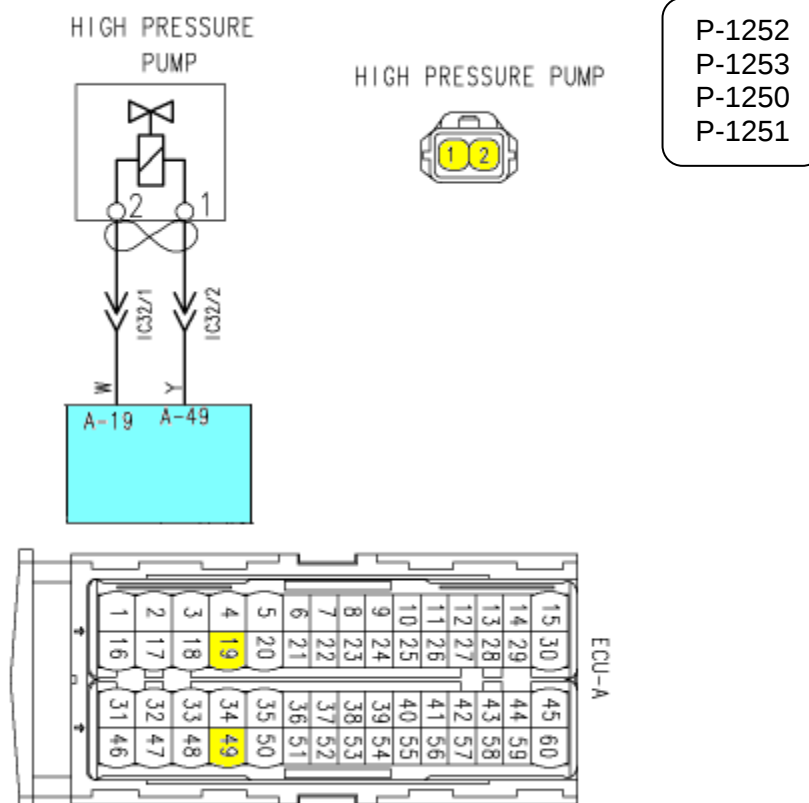
DTC	Diagnostic item
P-1252	Short Circuit to Battery
P-1253	Short Circuit to Ground
P-1250	No Load
P-1251	Excess Temperature

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.

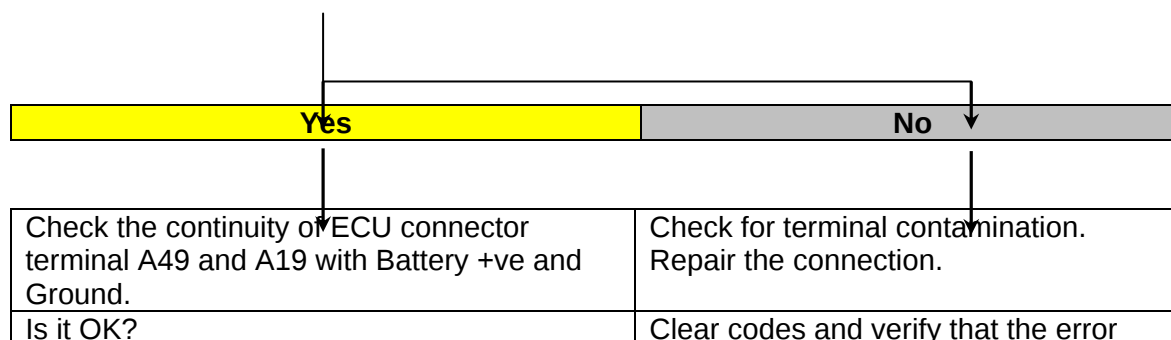
P-1252
P-1253
P-1250
P-1251

High Pressure Pump (with fuel metering unit)

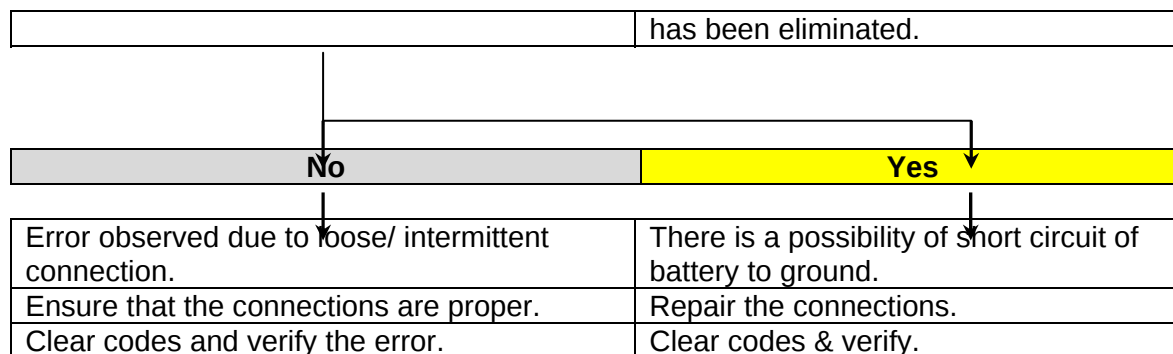




1. Connect the 'Smart Tester' to diagnostic connector.
 2. Turn Ignition Switch ON.
 3. Verify that either P-1252 or P-1253 or P-1250 or P-1251 is present.
- Check the connections to the pump.
 - Check that the connections are connected correctly; and that it is not connected in reverse way.
 - Disconnect 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?



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



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

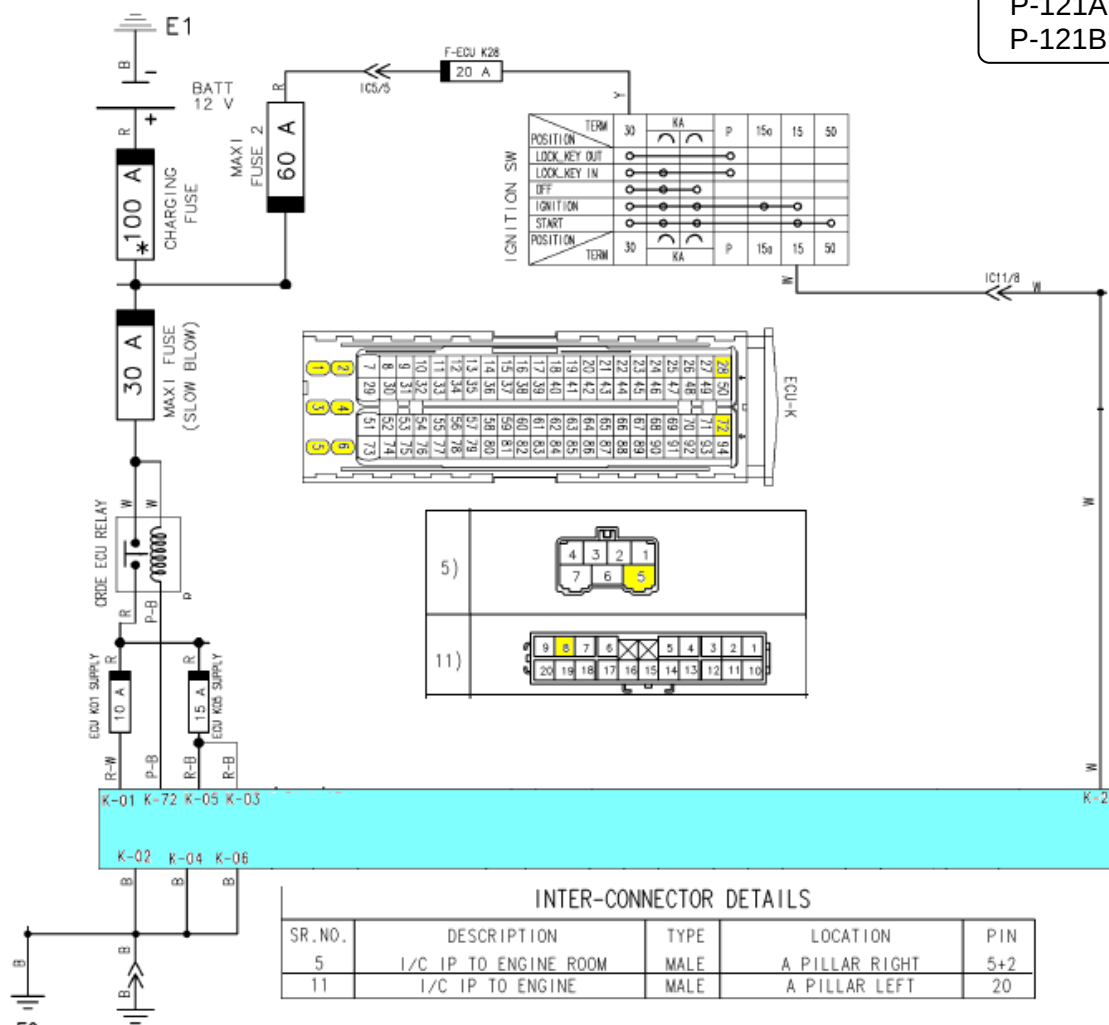
Main relay

P-121A
P-121B

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



Engine not cranking – ‘Smart Tester’ not responding.

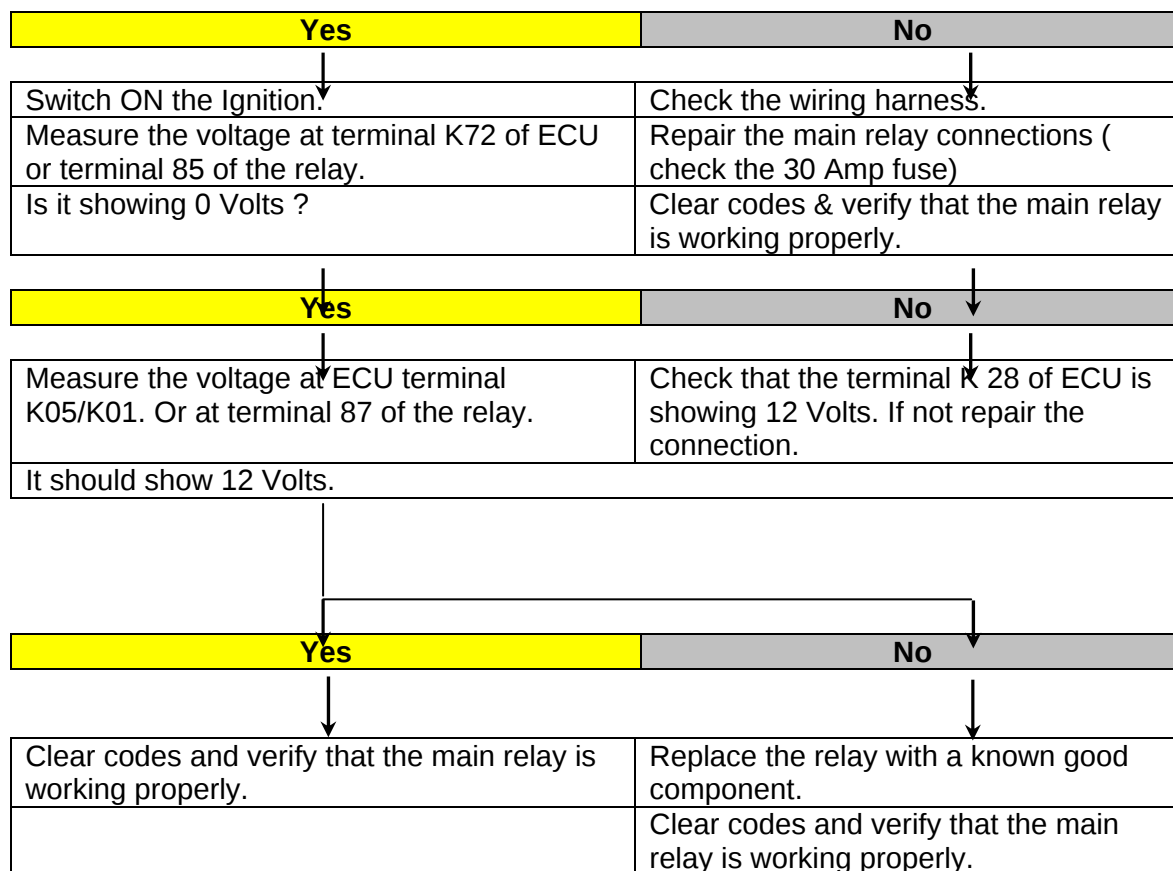
Turn the Ignition OFF.

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?



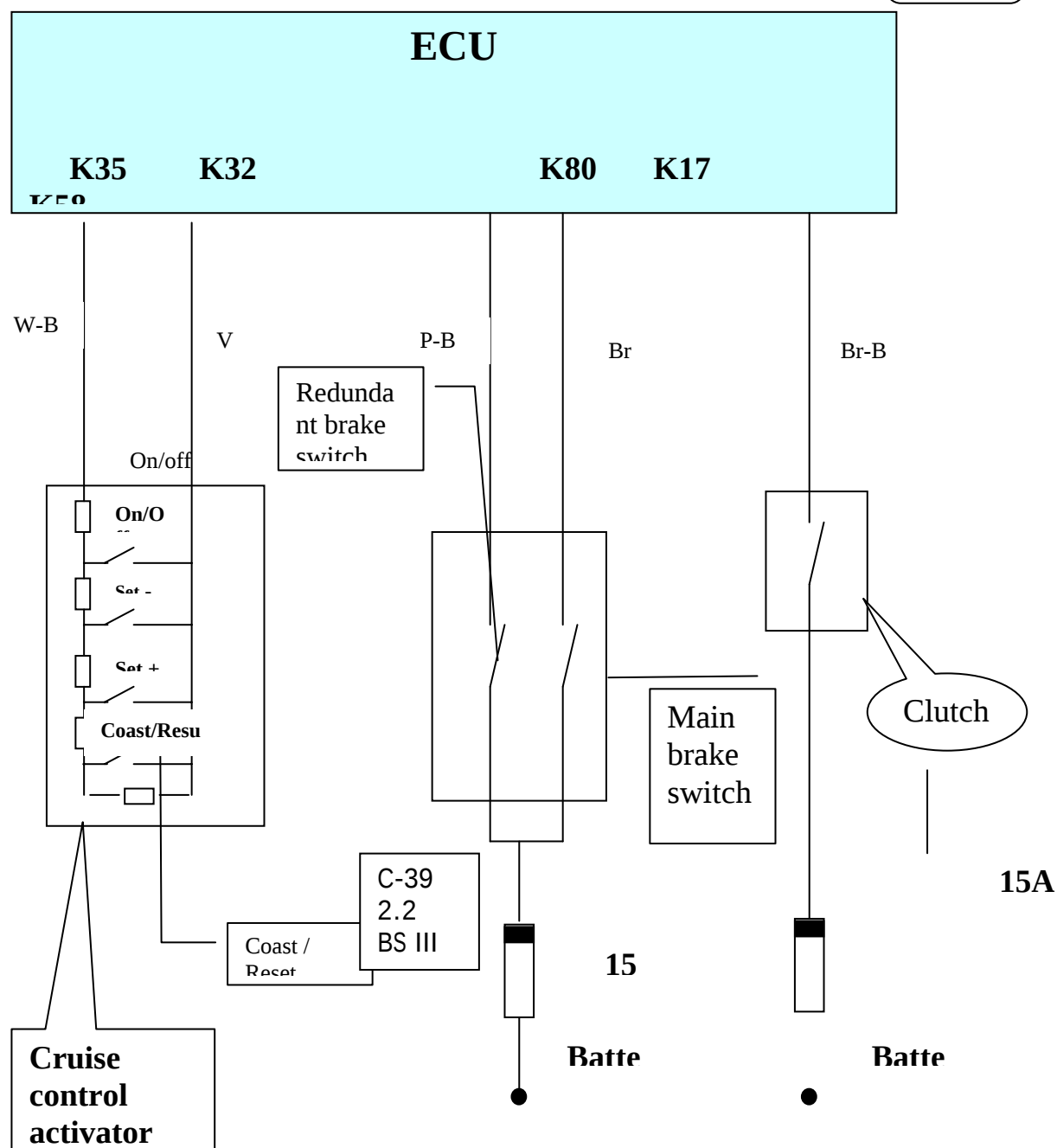
P-0577
P-0576
P-0575

Cruise Control

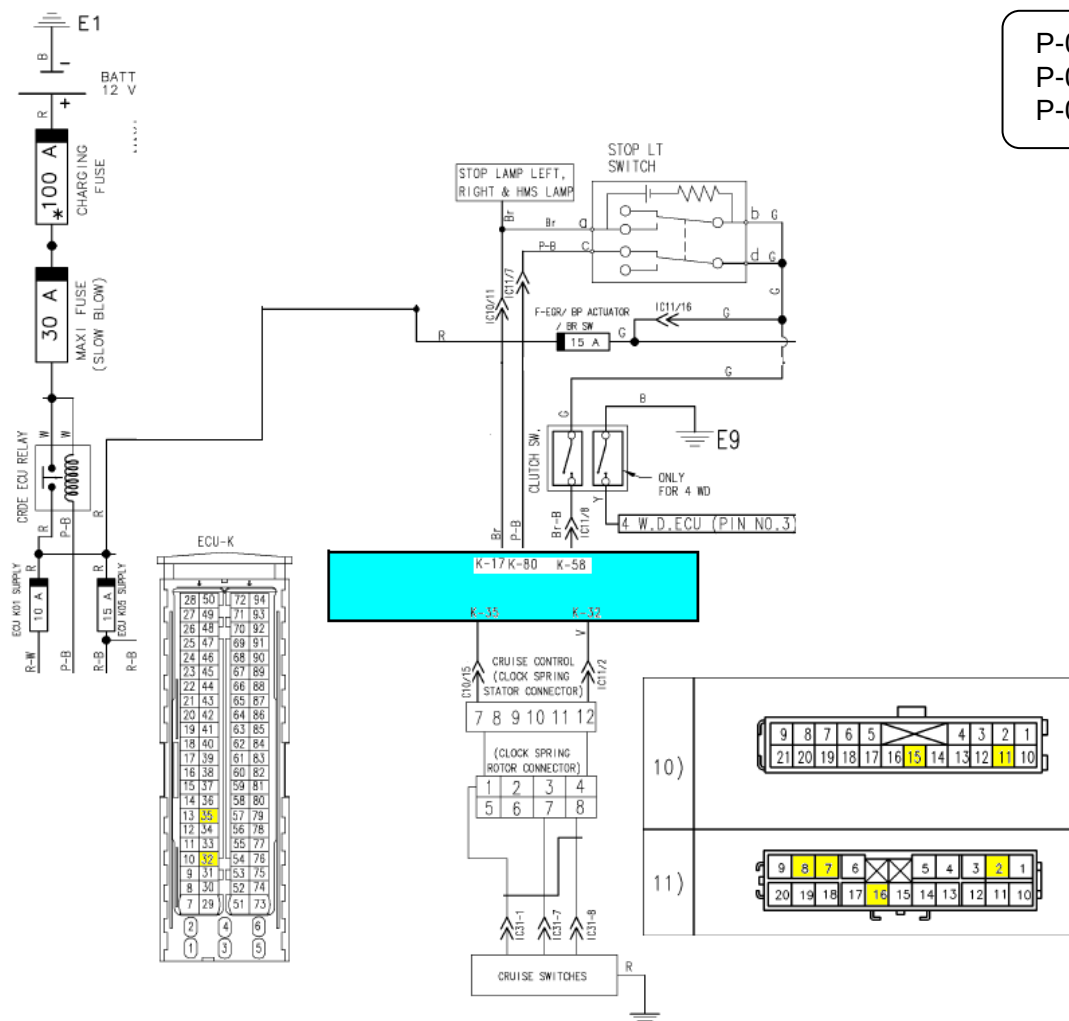
DTC	Diagnostic item
P-0577	SRC MAX error for analog signal
P-0576	SRC MIN error for analog signal
P-0575	Plausibility error for analog signal

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



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 Ω	4.35 V
ON/OFF	150 Ω	0.9823 V
Coast/Reset	1.63 K Ω	3.61 V
Set +	810 Ω	2.845 V
Set -	420 K Ω	2.035 V

Do the switch show the above value?

Yes	No
------------	-----------

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

Yes	No
------------	-----------

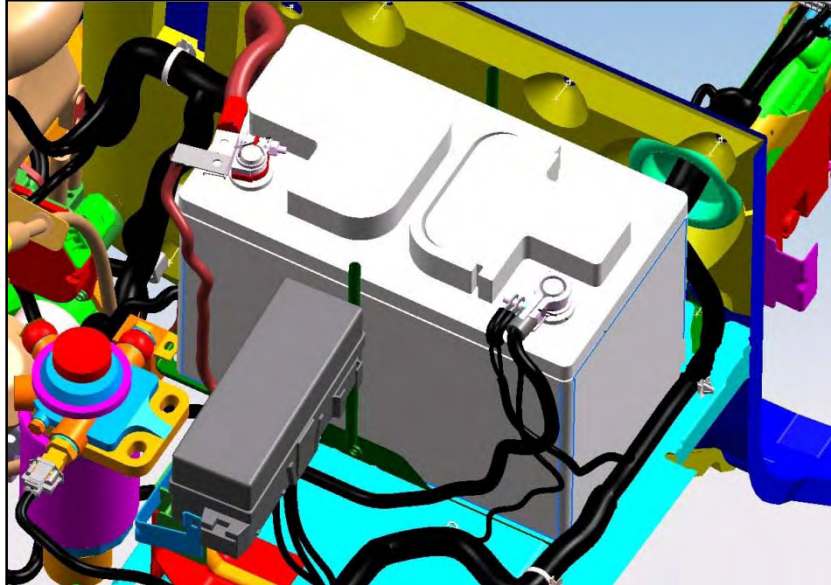
Diagnose the error & clear it.	Check the connection of ECU terminals K 35 & K32 and the cruise control switch connections.
Clear codes & verify that the cruise control is functioning properly.	
Is it OK?	

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:

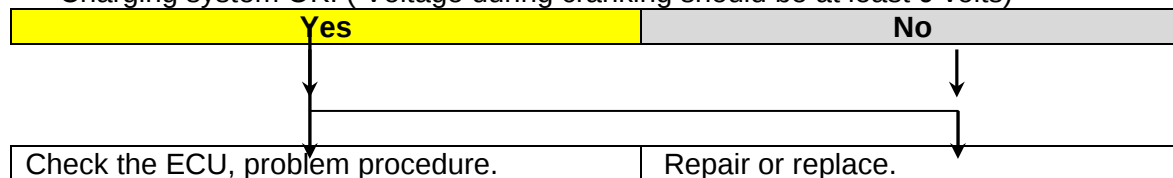
The system voltage has to guarantee to perform diagnosis functions. The Electronic Control Unit (ECU) monitors battery voltage. If this code is set, the System Lamp is off.

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)



Brake Switch

P-1792
P-1791

Description:

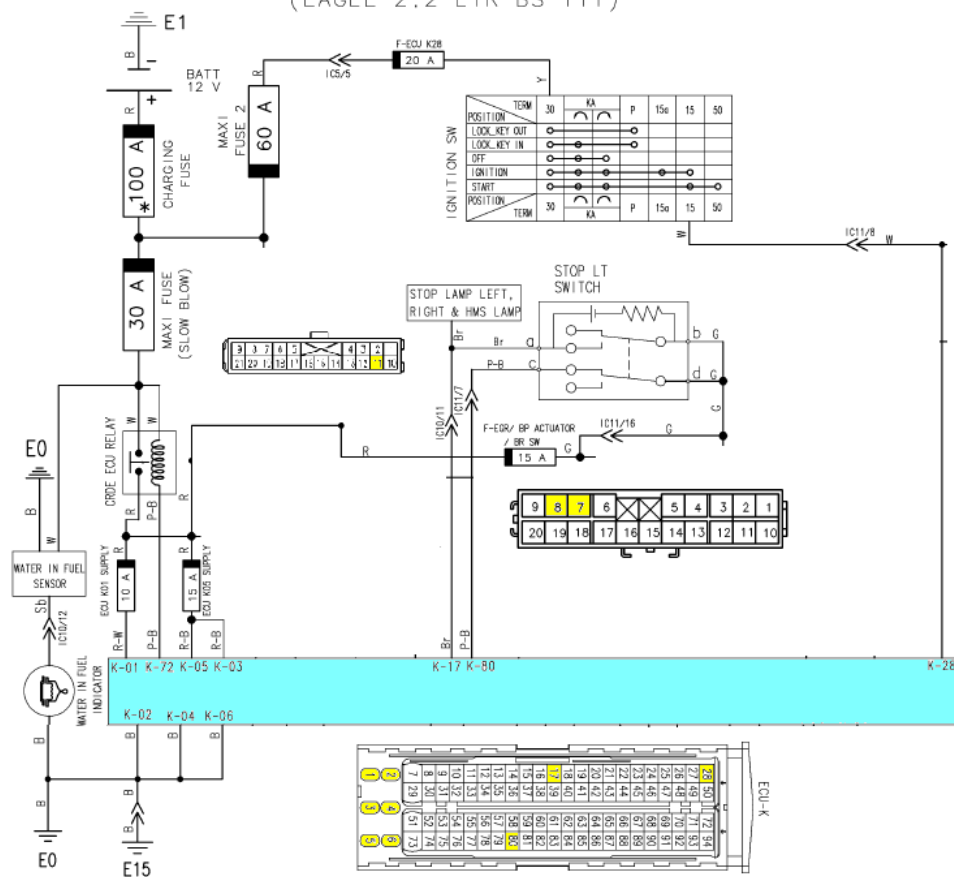
The function acquires and processes the information via the brake contact and the redundant brake contact. The status message of the brake position is the output.

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.

CIRCUIT ENGINE MANAGEMENT SYSTEM
(EAGLE 2.2 LTR BS III)

P-1792
P-1791



INTER-CONNECTOR DETAILS

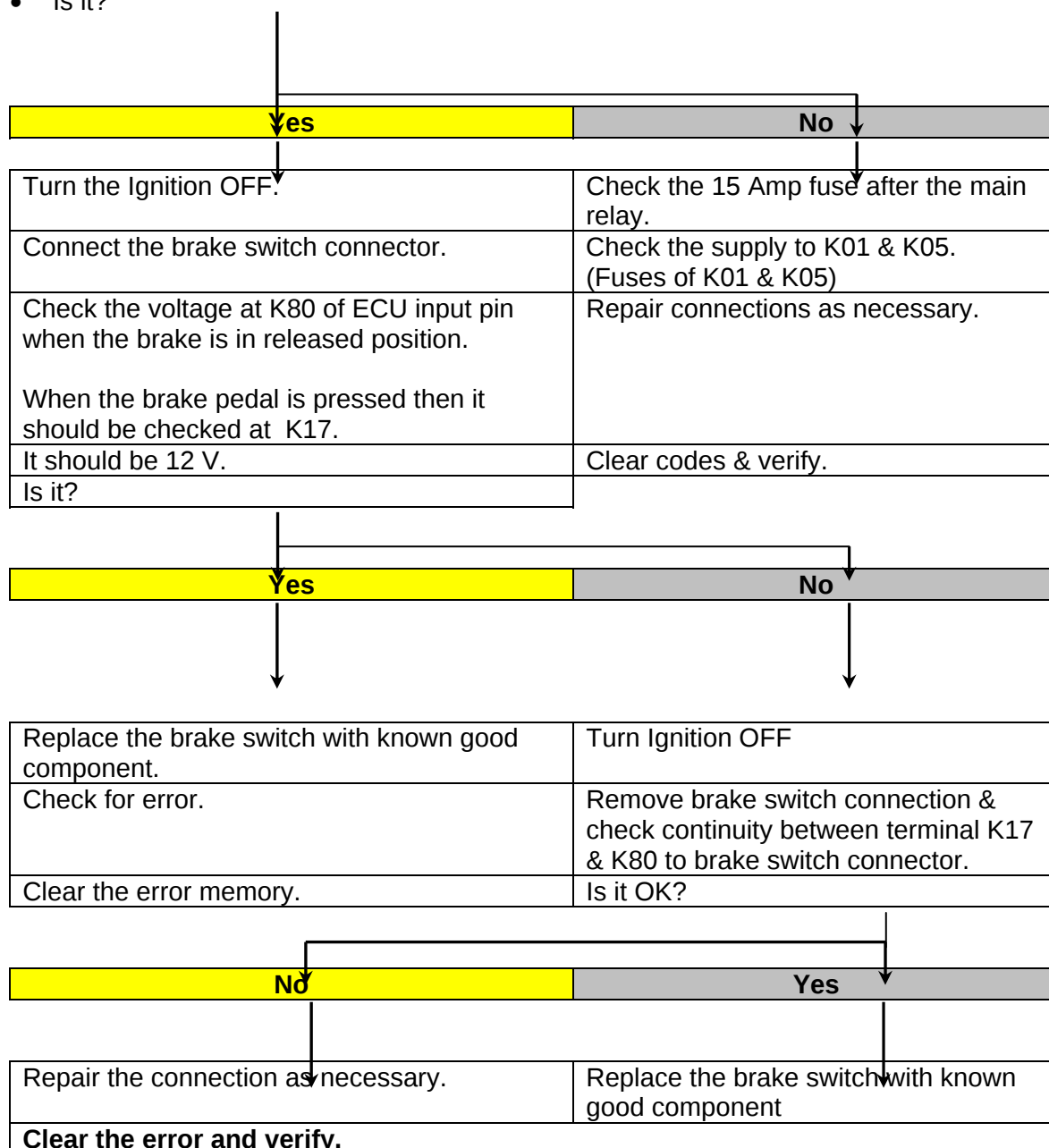
SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

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?



Clutch Switch – (With MT)

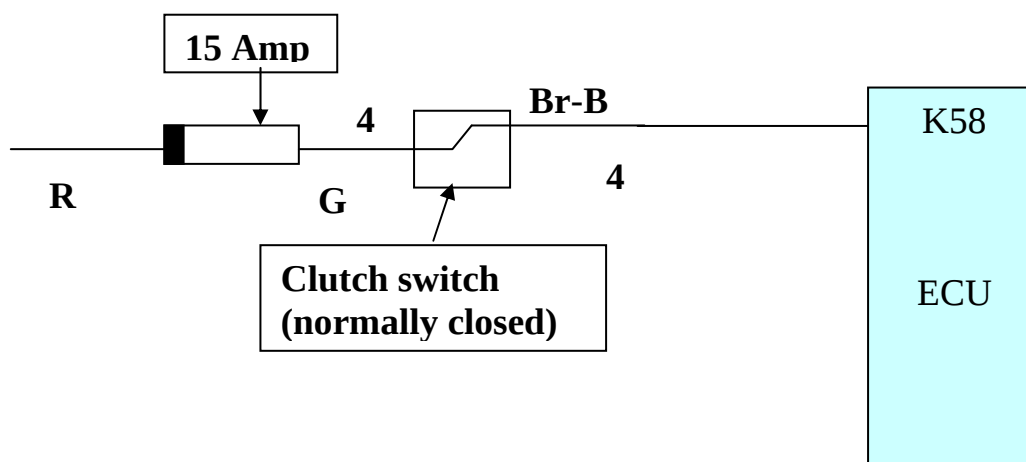
P-0704

DTC	Diagnostic item
P-0704	Clutch signal is not plausible

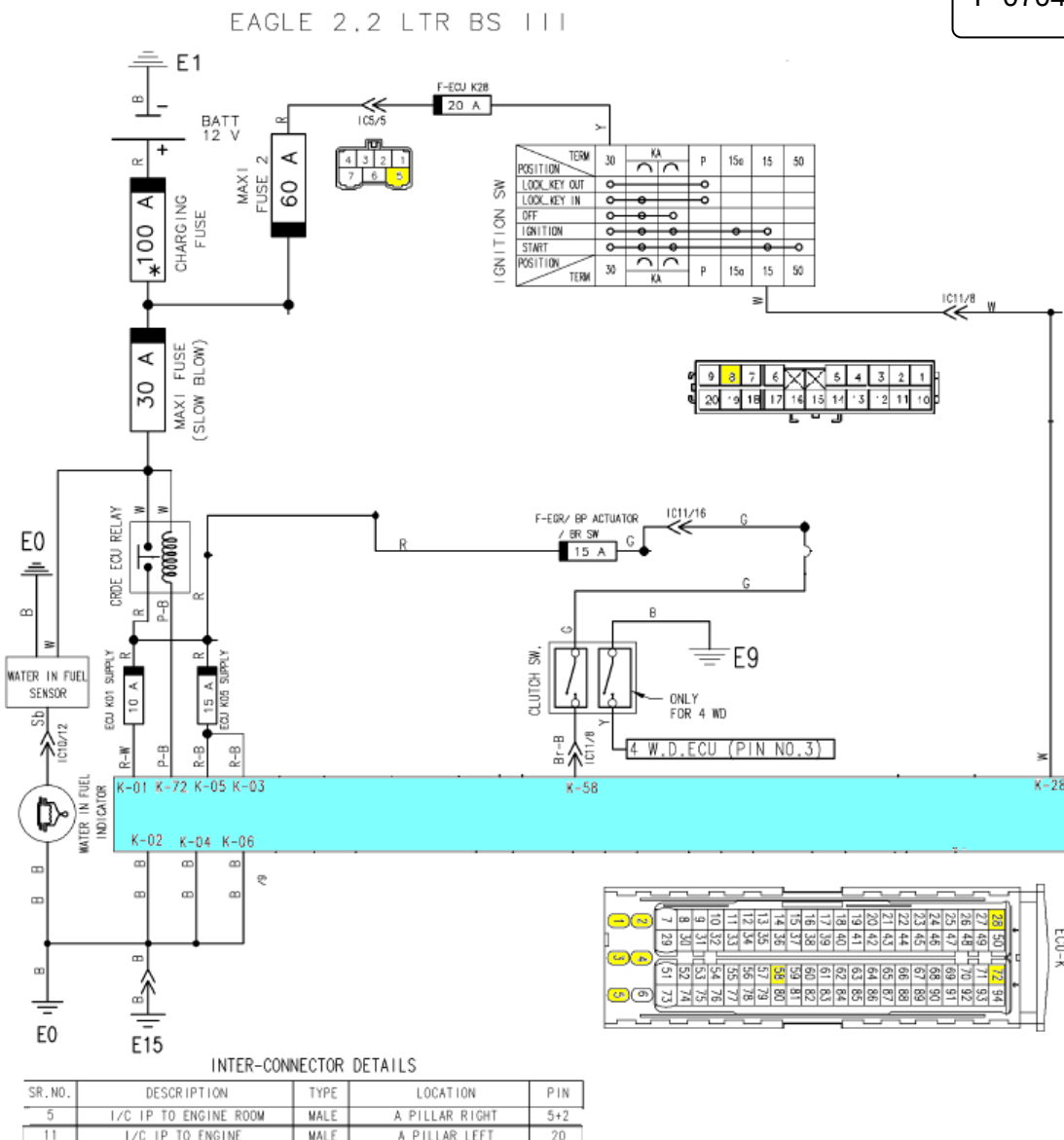
Description

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.



P-0704



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.

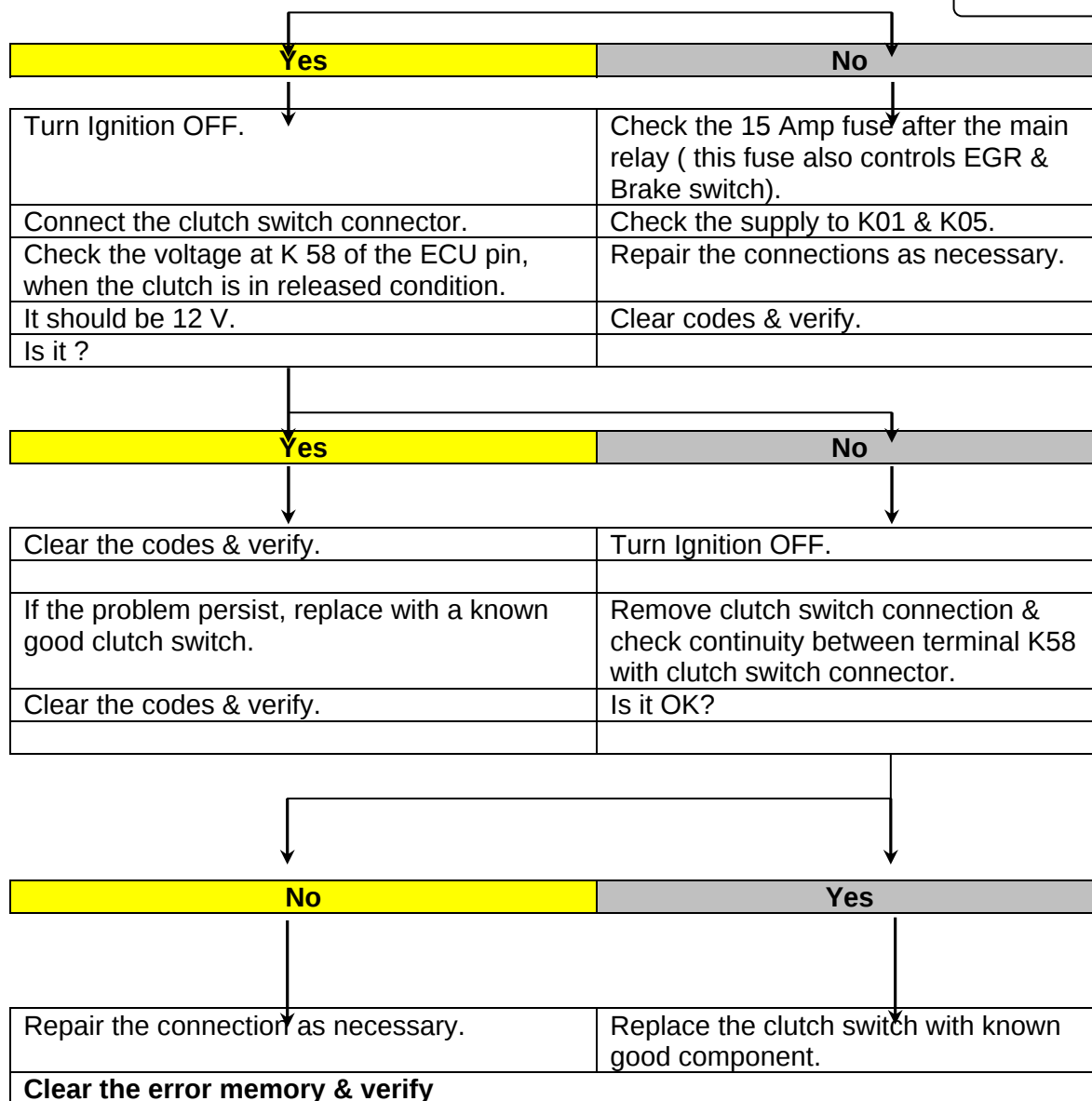
Disconnect clutch switch connector.

Turn the ignition ON.

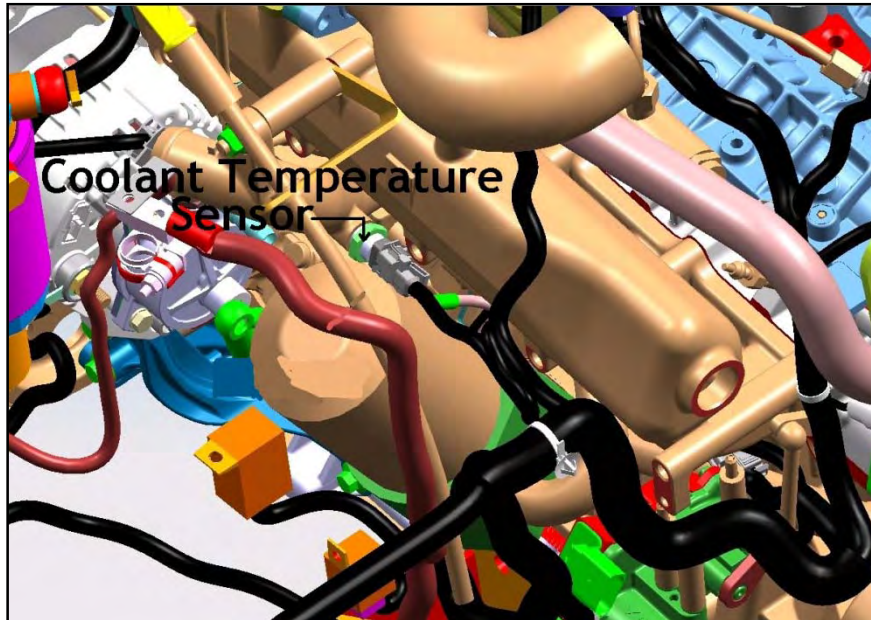
Check supply voltage to clutch switch on connector.

It should be 12 V, when Ignition is ON. Is it?

P-0704



Coolant Temperature Sensor



Coolant Temperature Sensor

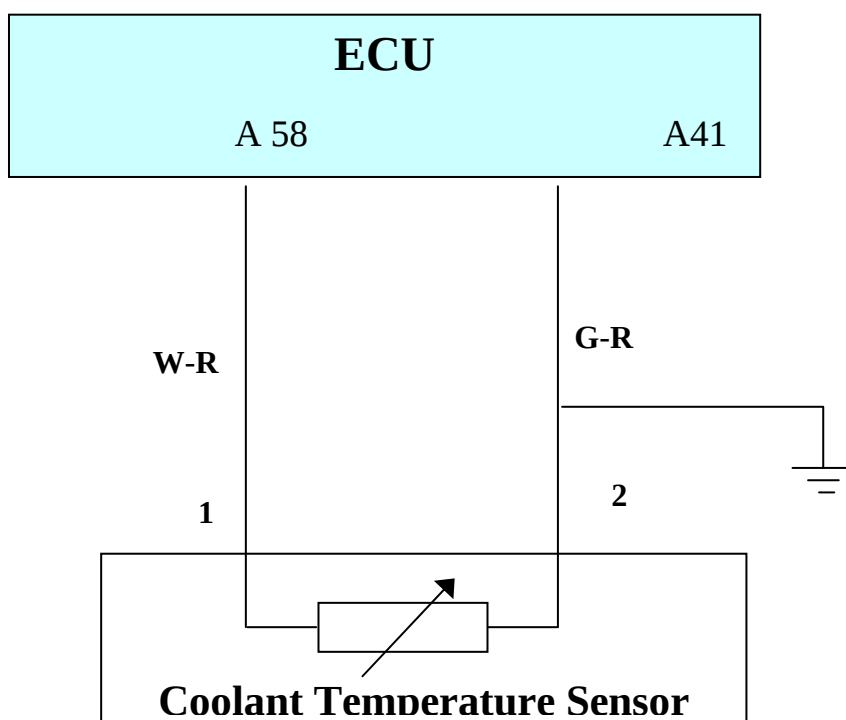
P-0118

P-0117

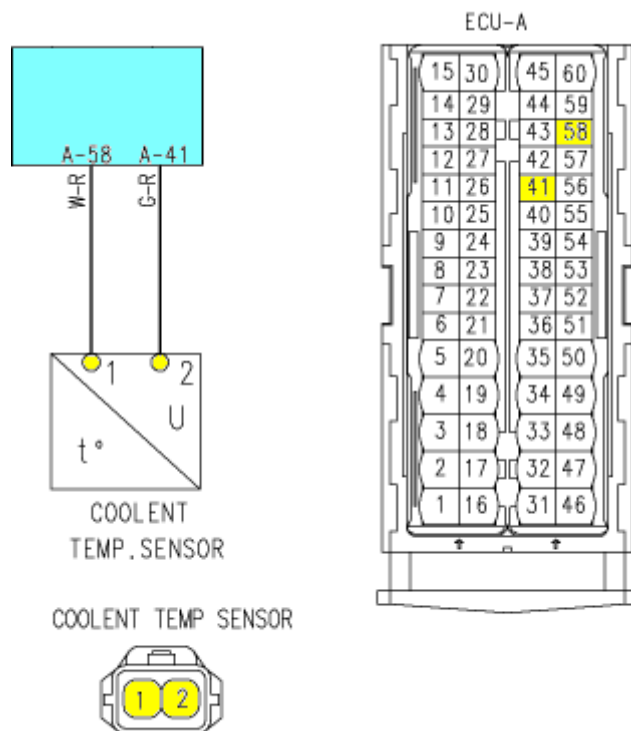
Description: The Water temperature sensor (WTF) is located in the coolant pipe of the cylinder head. The WTF sensor is a variable resistor whose resistance changes as the temperature of the engine coolant flowing past the sensor changes.(NTC resistor) When the coolant temperature is low, the sensor resistance 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.



P-0118
 P-0117

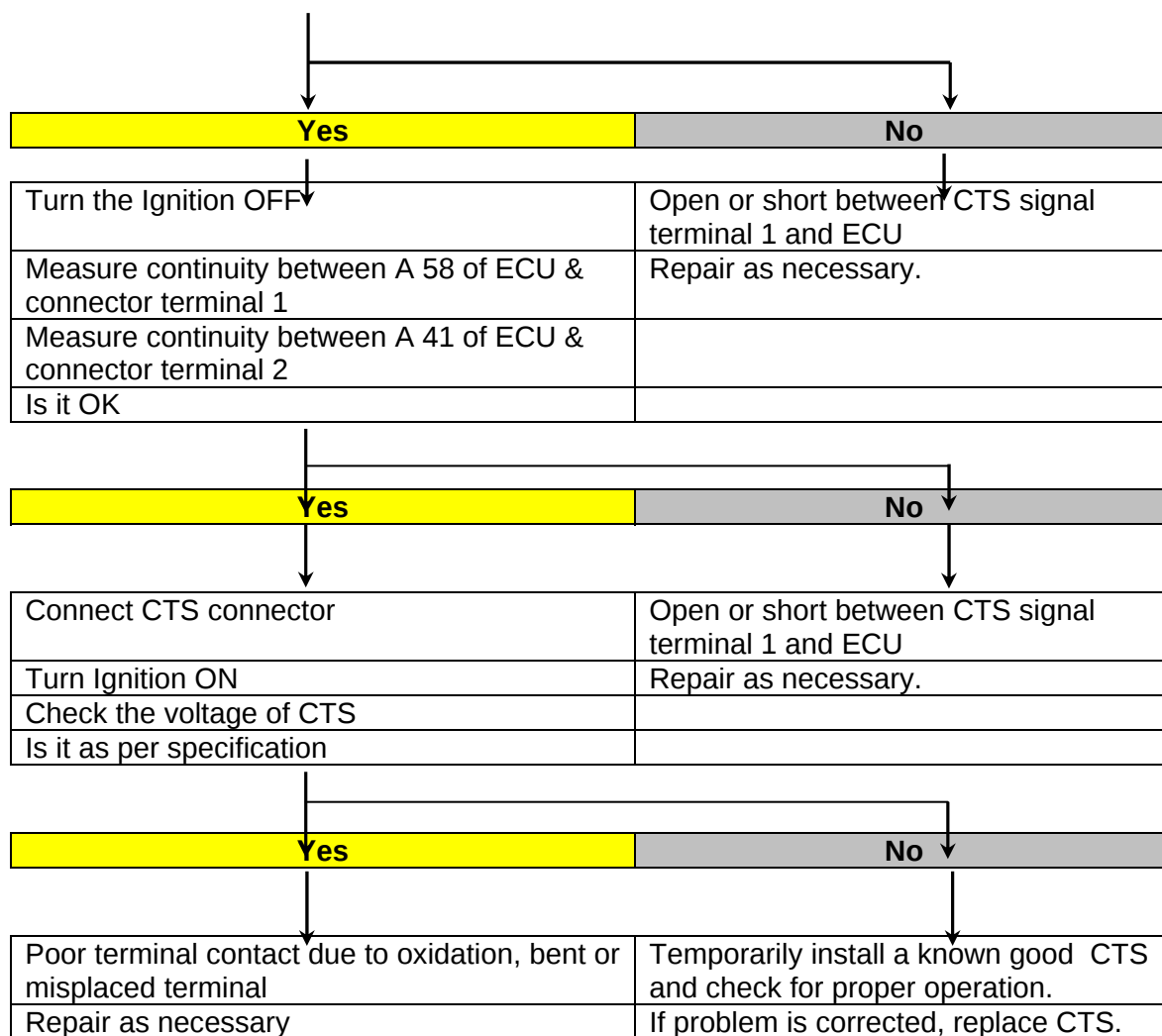


Test Procedure Coolant Temperature Sensor --

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?



- 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

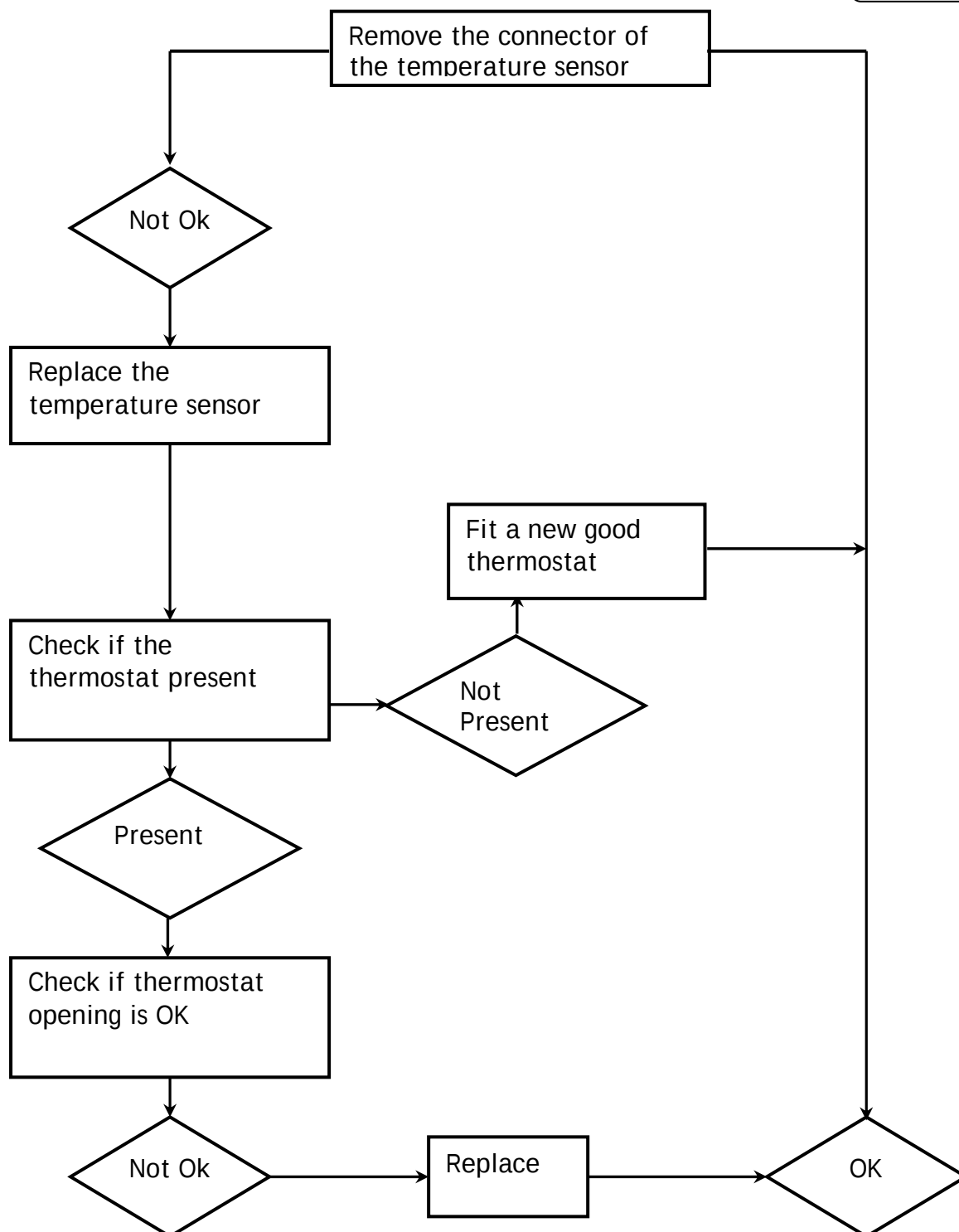
Description - When the engine is switched ON then the ECU detects the temperature. After that when the engine runs then the temperature output on a time frame is detected and compared against predetermined slope.

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

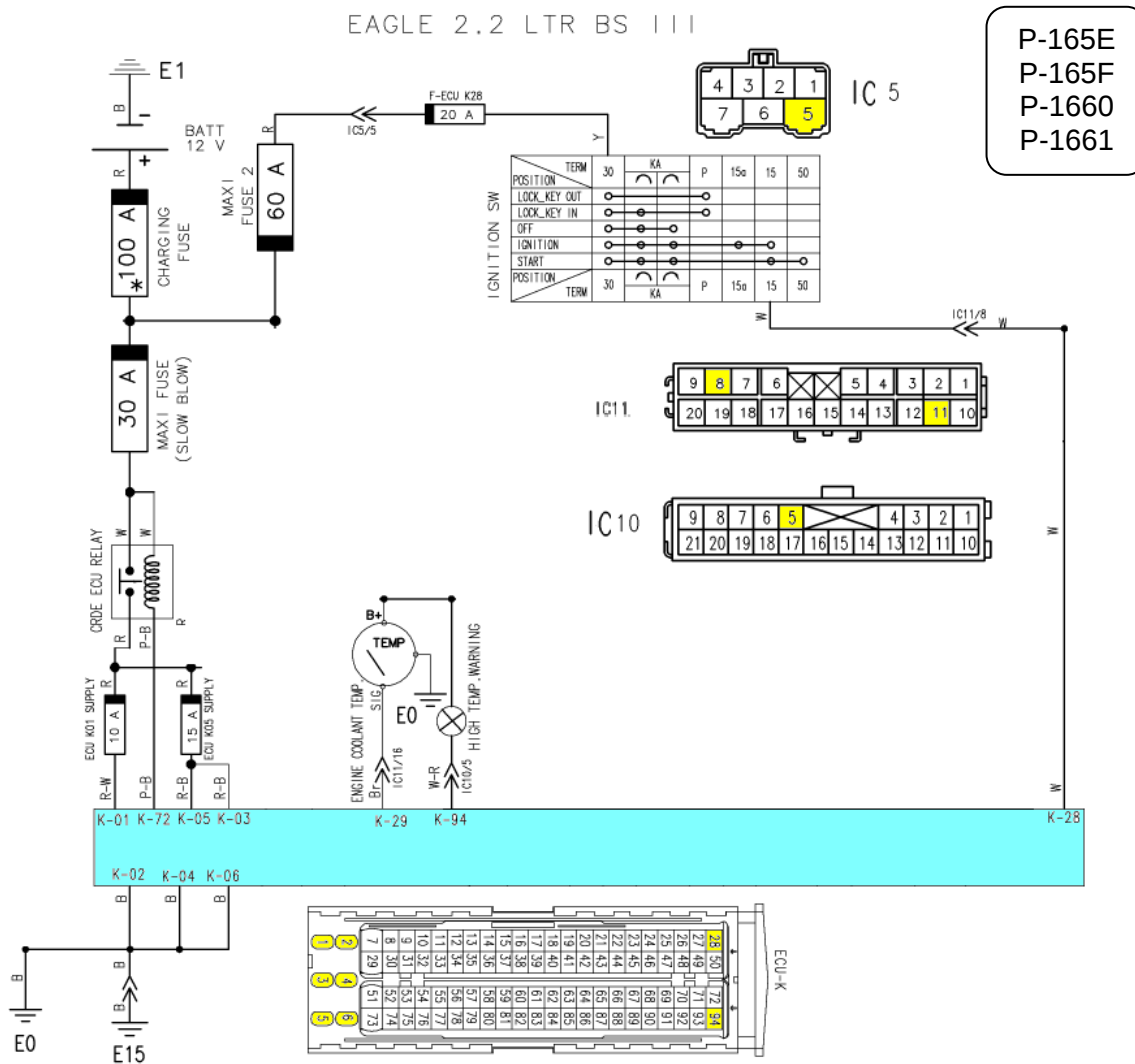


P-165E
P-165F
P-1660
P-1661

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.



INTER-CONNECTOR DETAILS

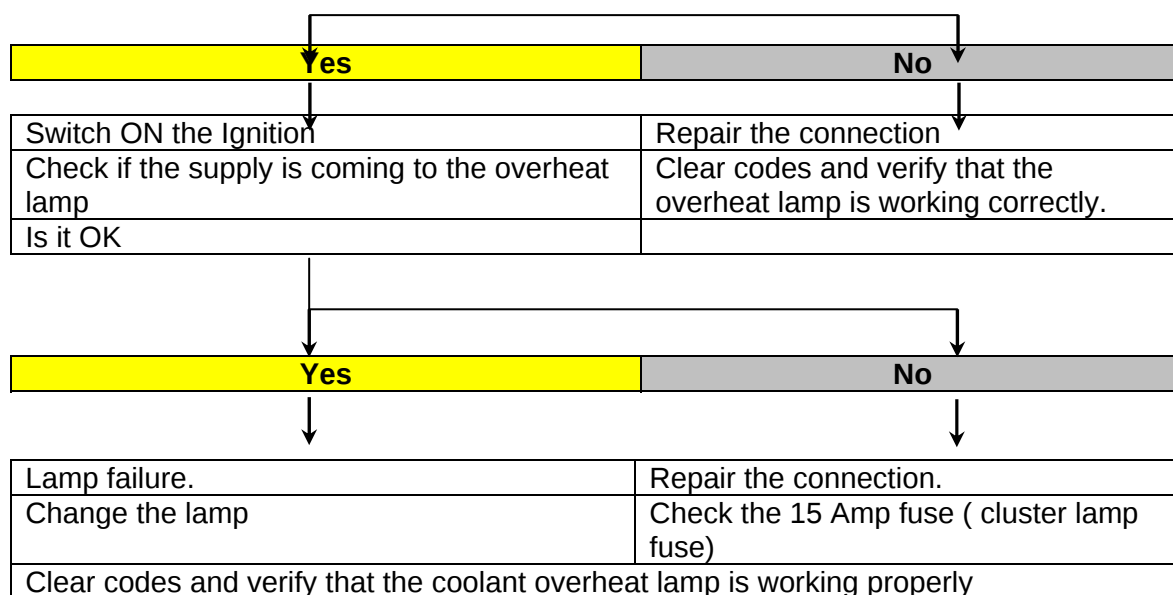
SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
5	I/C IP TO ENGINE ROOM	MALE	A PILLAR RIGHT	5+2
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

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 overhear 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 overhear lamp.
- Is it OK?



Atmospheric pressure sensor

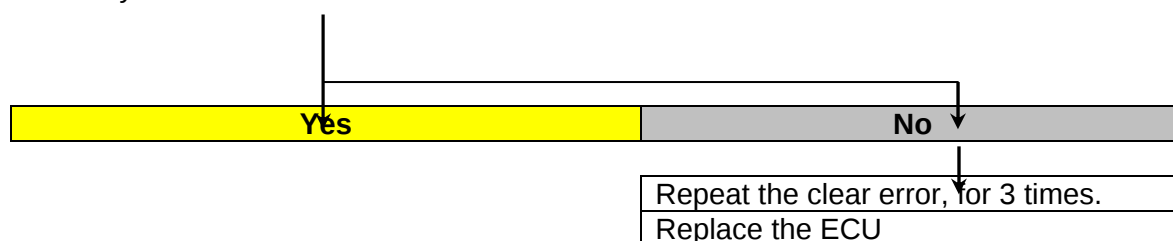
P-0108
 P-0107

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.



Injector Energising time

P1623
P1625
P161F
P1621

Description: Controller not able to control power stage

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

Reaction: The System Check lamp will be Off.

Vehicle speed may drop.

Test Procedure –

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.

Controller and TPU Monitoring

P-1659

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.

ECU Monitoring

P-1638

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:

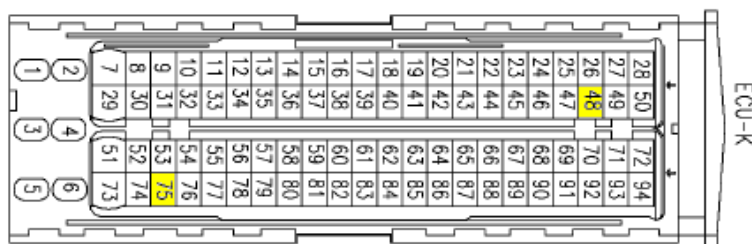
1. Switch ON Ignition.
2. Using 'Smart Tester', clear the ECU faults.
3. Switch OFF Ignition key and wait for 2 minutes.
4. Switch ON Ignition.
5. Using smart tester check whether any of the above mentioned fault is present.
6. If fault is still present, switch OFF ignition.
7. Replace the ECU with a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

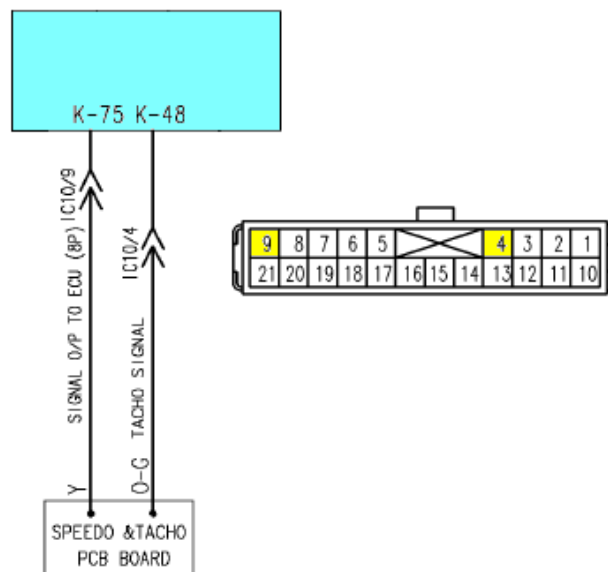
Error path for the Tachometer signal

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 - No impact on vehicle performance. Only engine speed indication on dash panel can not be seen. - Cruise control will not work.	* Open, shorted or wrong connection of tachometer circuit.



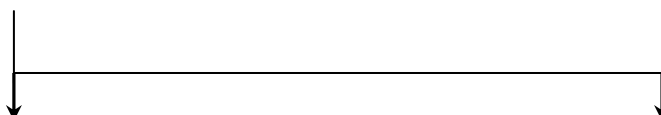
P-160C
P-160D
P-160E



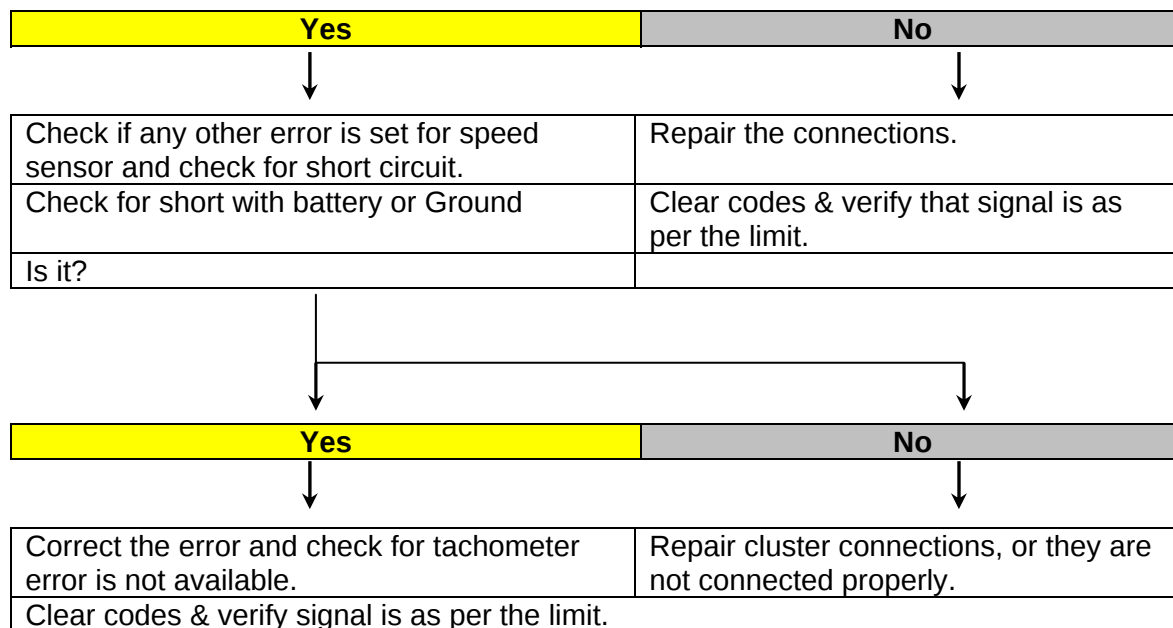
INTER-CONNECTOR DETAILS

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



Error path of coolant temperature output

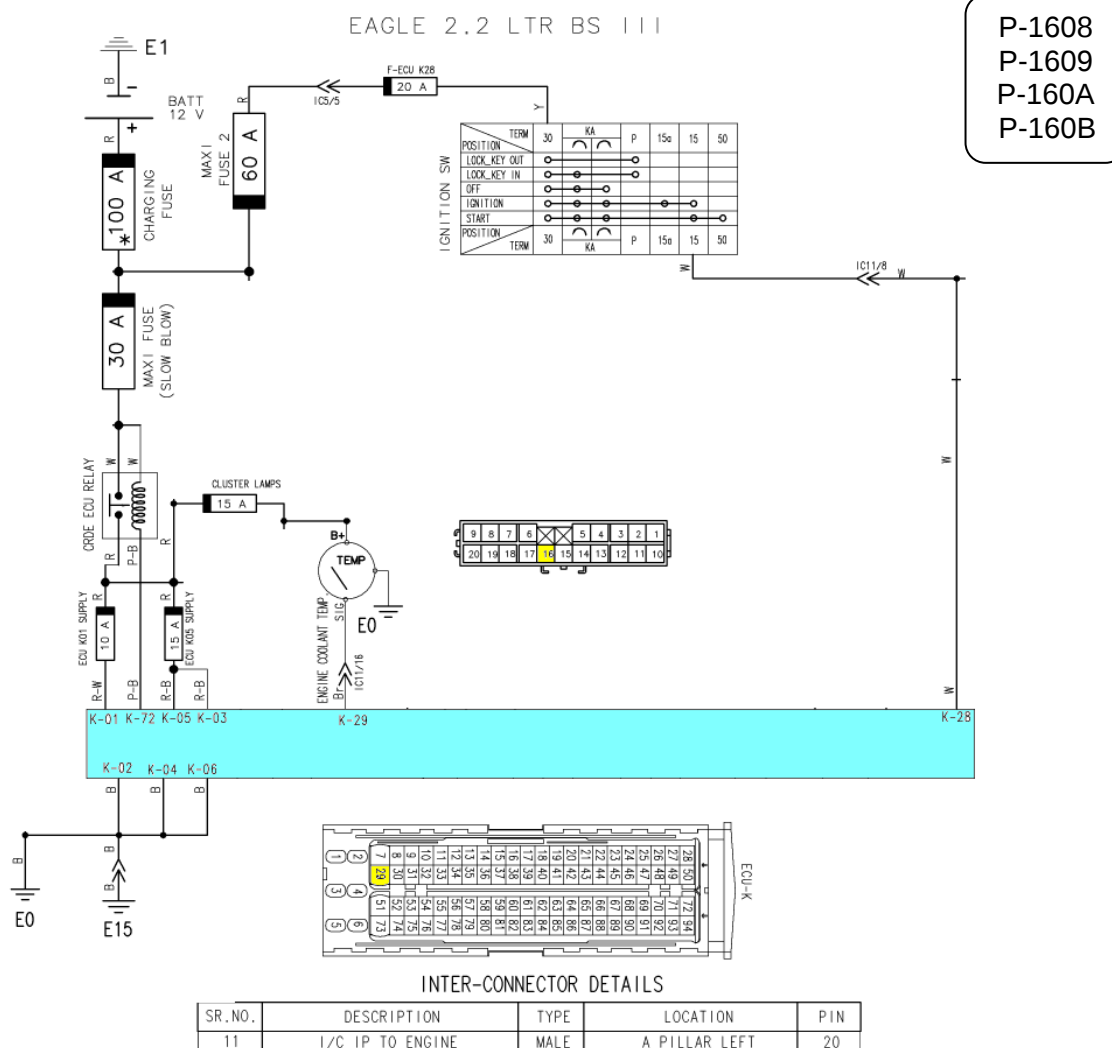
P-1608
P-1609
P-160A
P-160B

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.

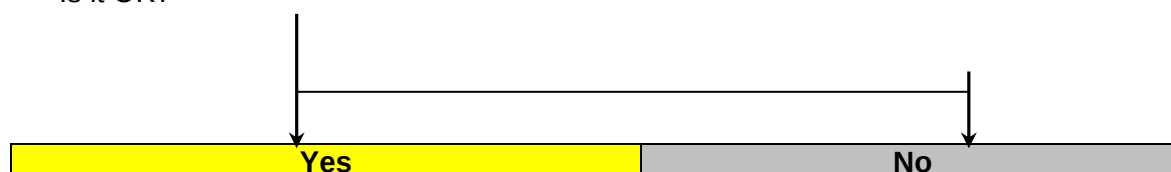


Test Procedure Coolant temperature output --

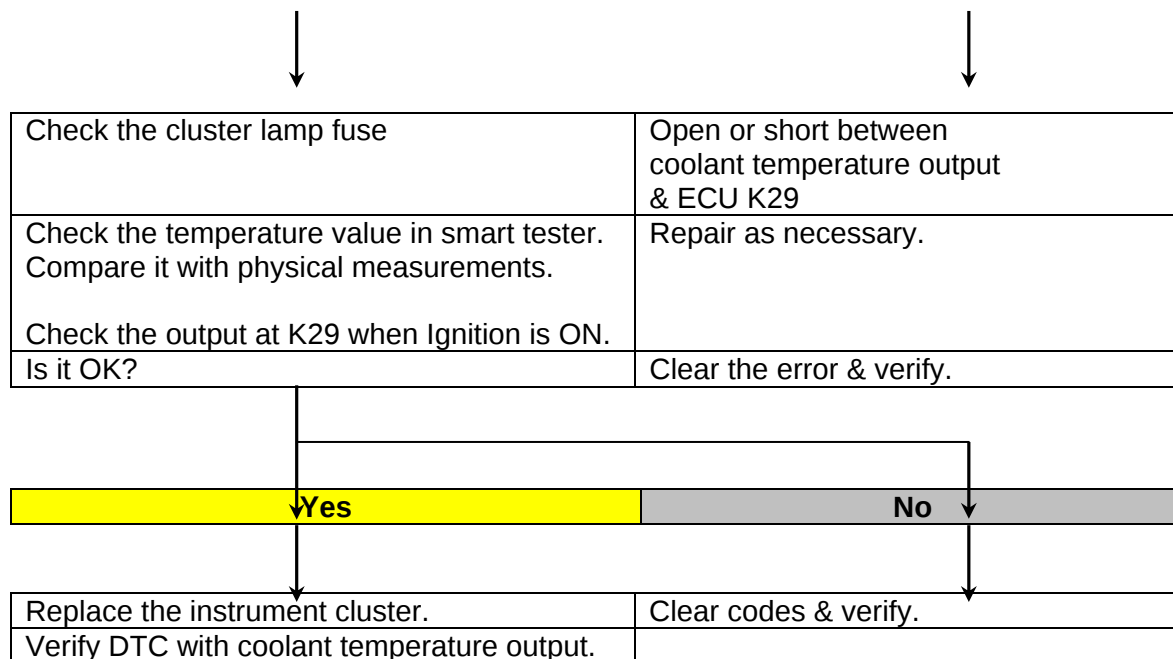
1. Connect the 'Smart Tester' to diagnostic connector.
2. Turn Ignition Switch ON.
3. Verify that the either of the error codes P1608 or P1609 or P160A or P160B is present.

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?



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



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.

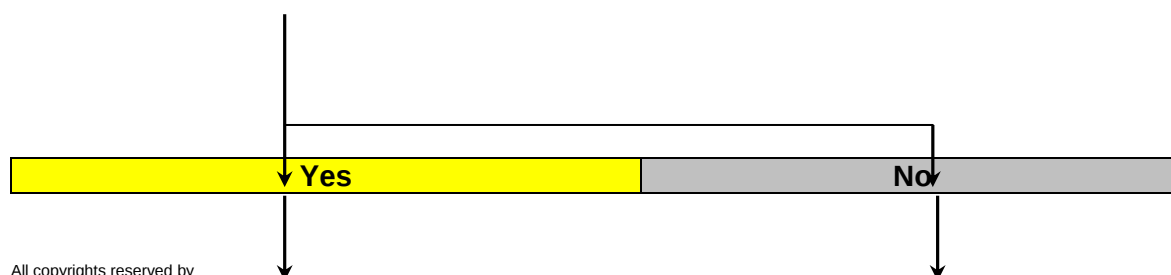
DTC	Diagnostic item
P-1530	Short circuit to battery
P-1531	Short circuit to ground
P-1532	No load
P-1533	Excess temperature

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.

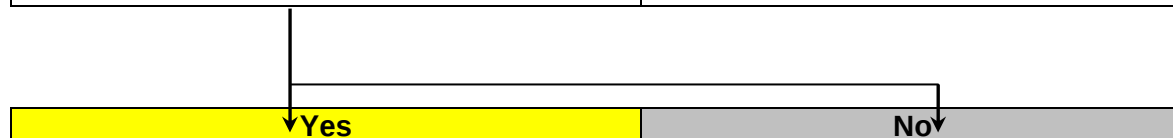
Connect the 'Smart Tester' to diagnostic connector.

1. Turn the Ignition Switch ON.
2. Verify that either P1530 or P1531 or P1532 or P1533 are present.

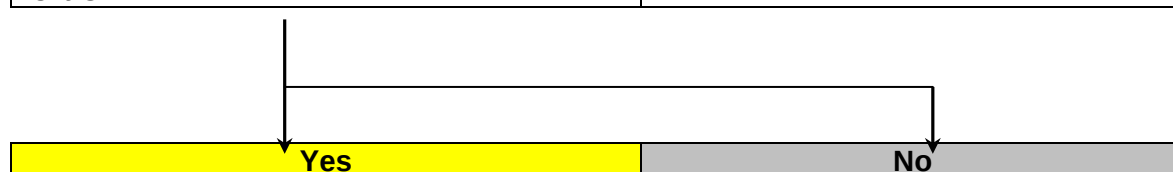
- Check that all the AC connections are fitted.
- Check the AC charging.
- Check that the AC & compressor relay both are functioning properly
- Is it OK?



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 ?	



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.	Repair the connections.
Also check the voltage between K70 & ground.	
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 ?	



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.

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 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.

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.

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.

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.

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
P-1632	(Hardware) CJ940 lower limit: internal supply voltage lower limit

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.

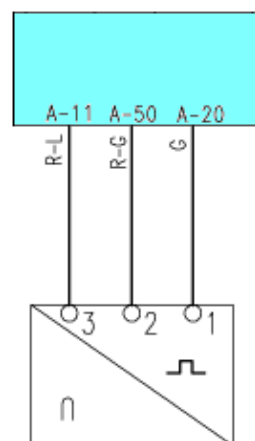
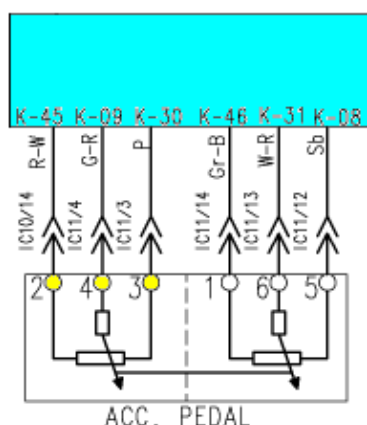
P-1644
P-1645

Sensor supply monitoring 1

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

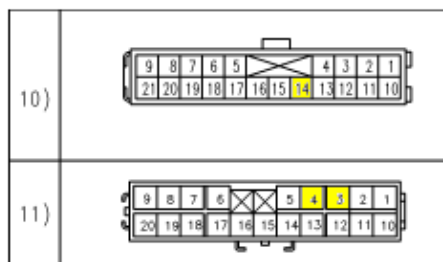
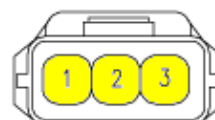
DTC detection condition	Probable cause
Normal Operation The ECU monitors the supply voltage to camshaft phase sensor, and accelerator pedal (APP1) Malfunction The voltages are beyond the range. Reactions System lamp status for this error is ON.	

P-1644
P-1645



CAM PHASE SENSOR

CAM PHASE SENSOR



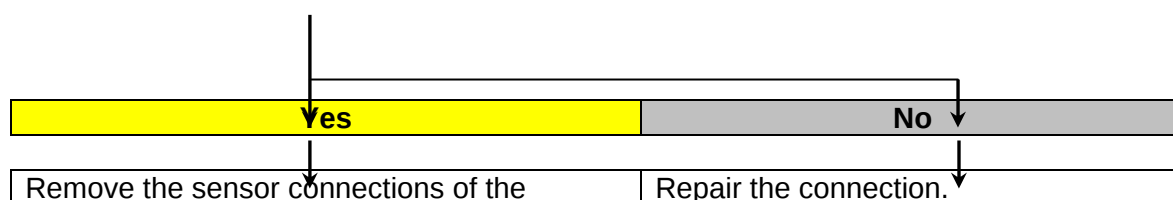
INTER-CONNECTOR DETAILS

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.

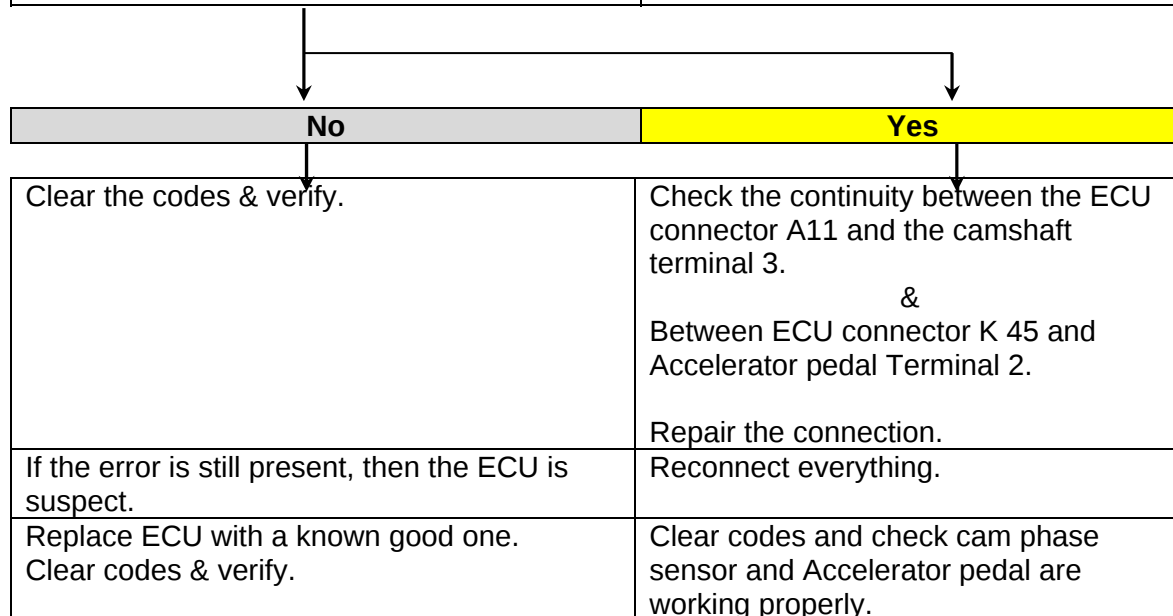
1. Turn Ignition Switch ON.
2. Verify that either P-1644 or P-1645 is present.

- 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?



P-1644
 P-1645

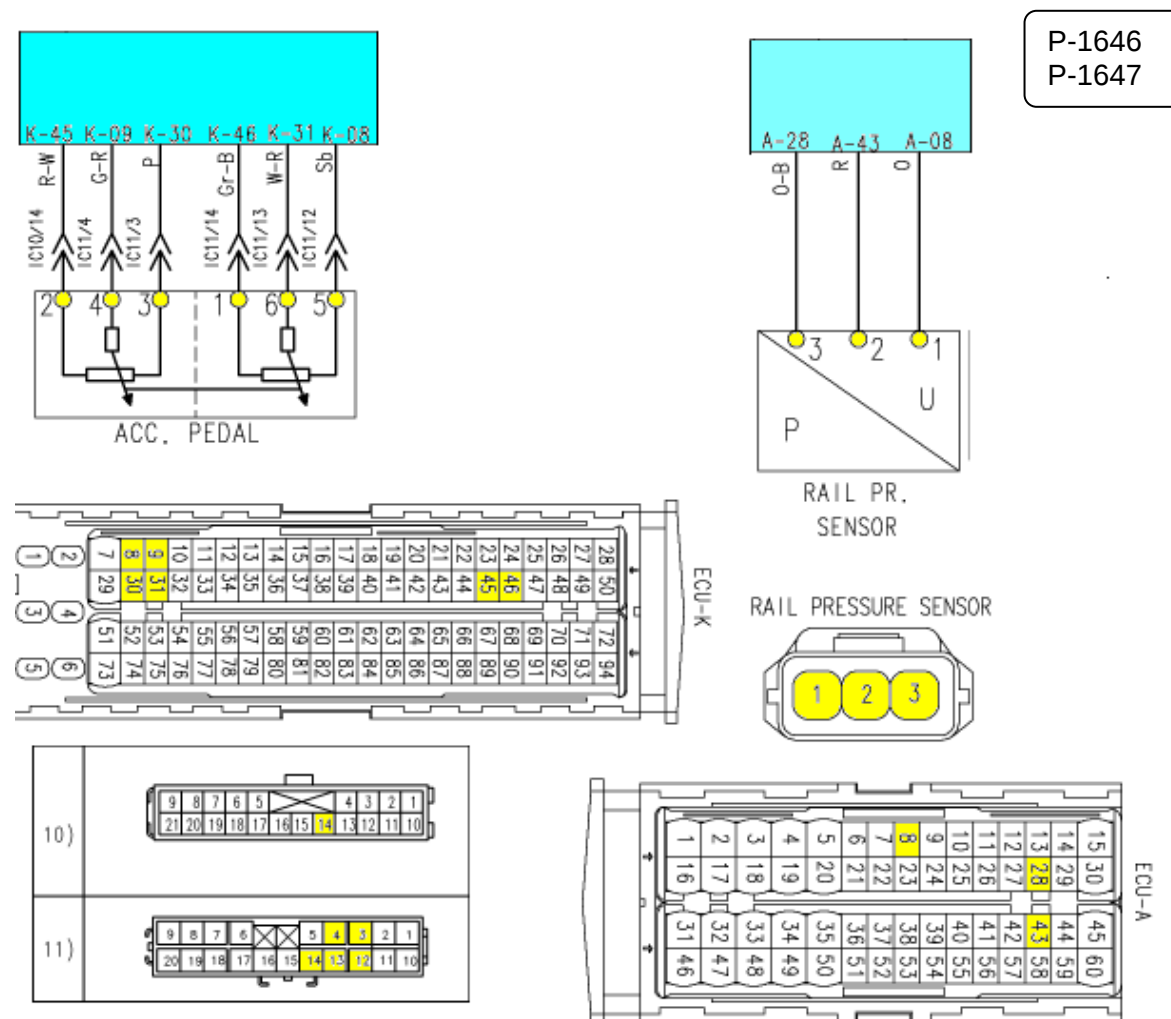
camshaft sensor & the Accelerator pedal.	
Clear the error.	Clear codes and verify.
If the error heals then the problem may be due to poor connection.	
Does it heal?	



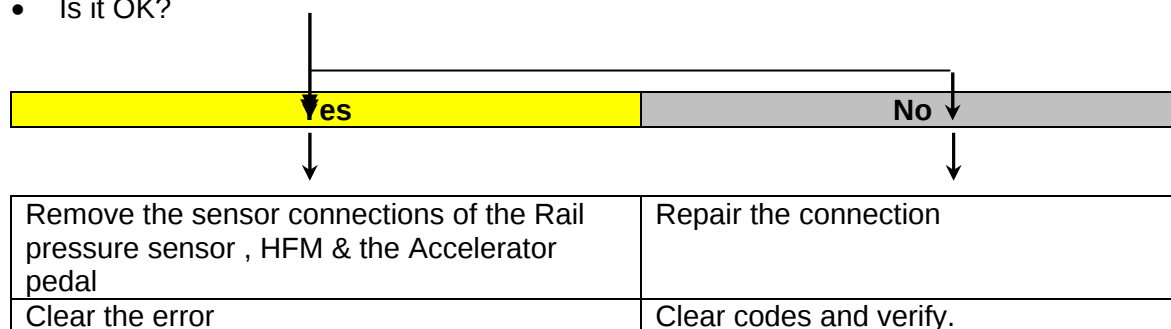
Sensor supply monitoring 2

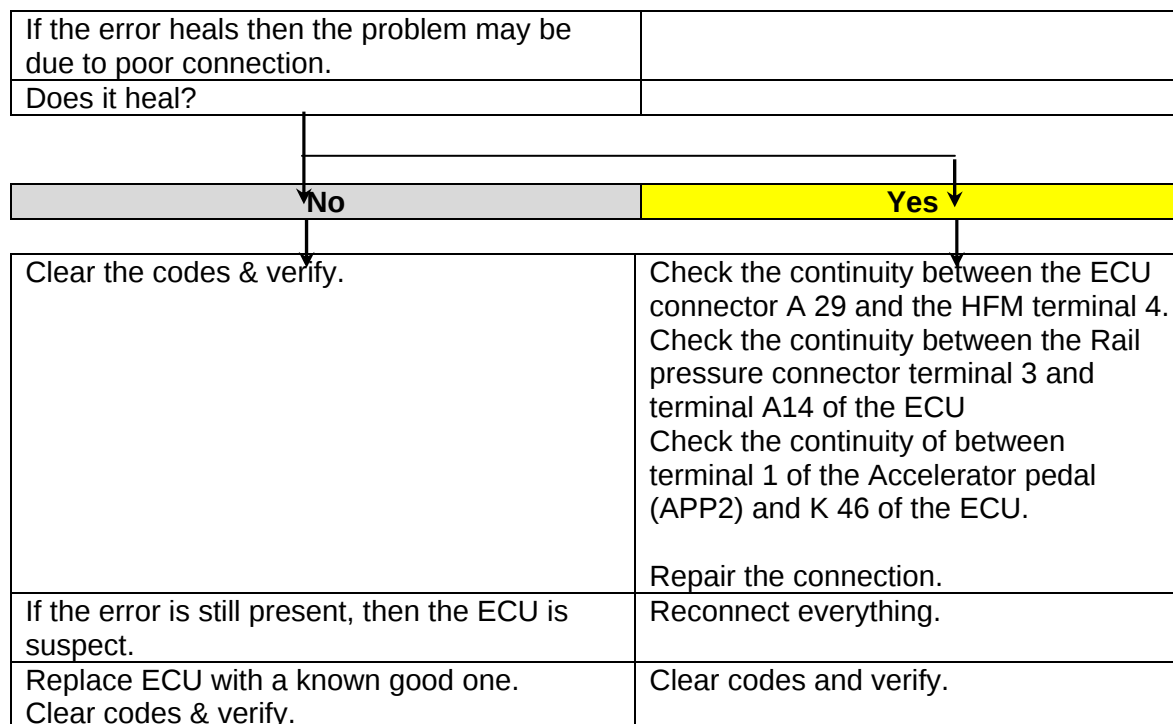
DTC	Diagnostic item
P-1646	Voltage above upper limit
P-1647	Voltage below lower limit

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.	



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?



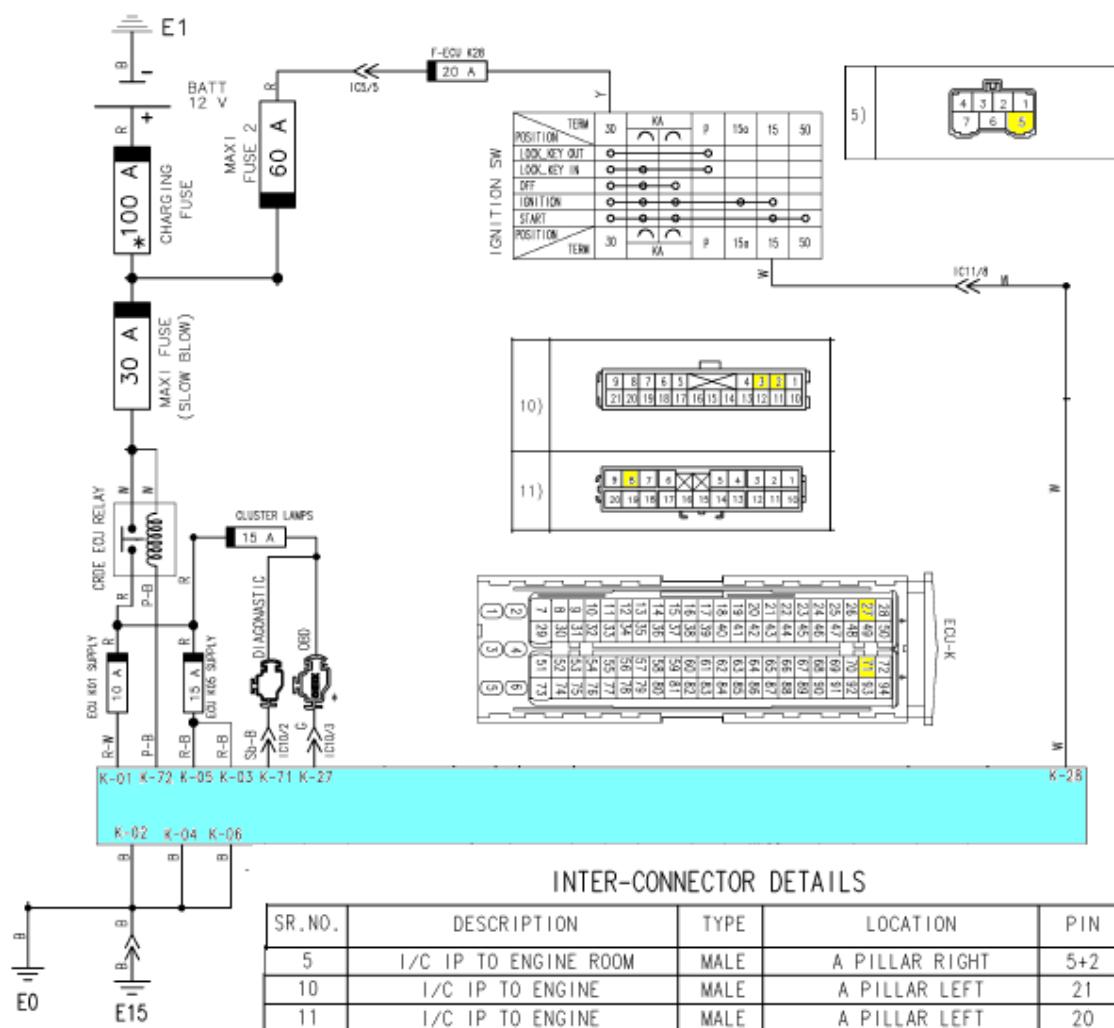


P-1654
P-1655
P-1656
P-1657

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.



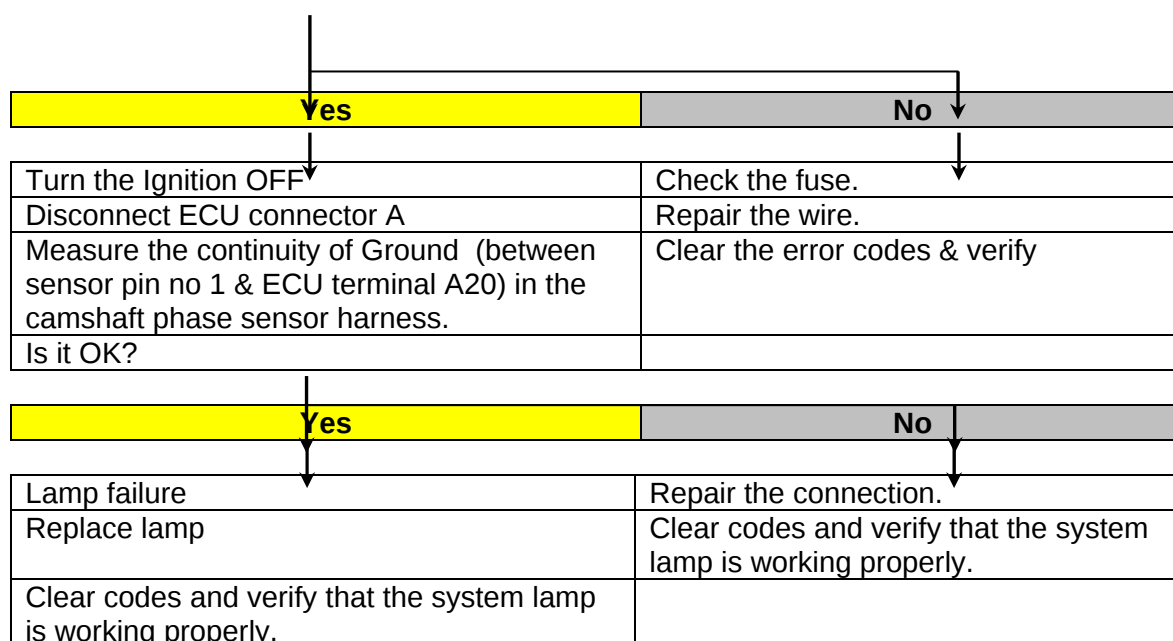
P-1654
P-1655
P-1656
P-1657

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?



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

P-1658

DTC	Diagnostic item
P-1658	No Terminal T15 signals detected

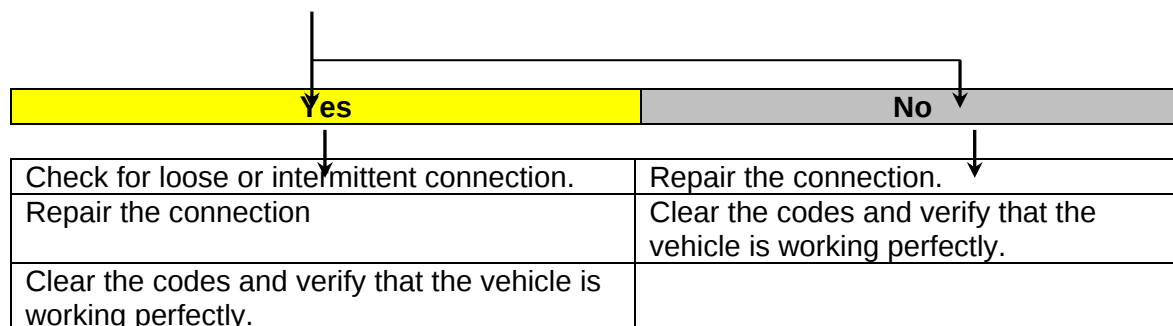
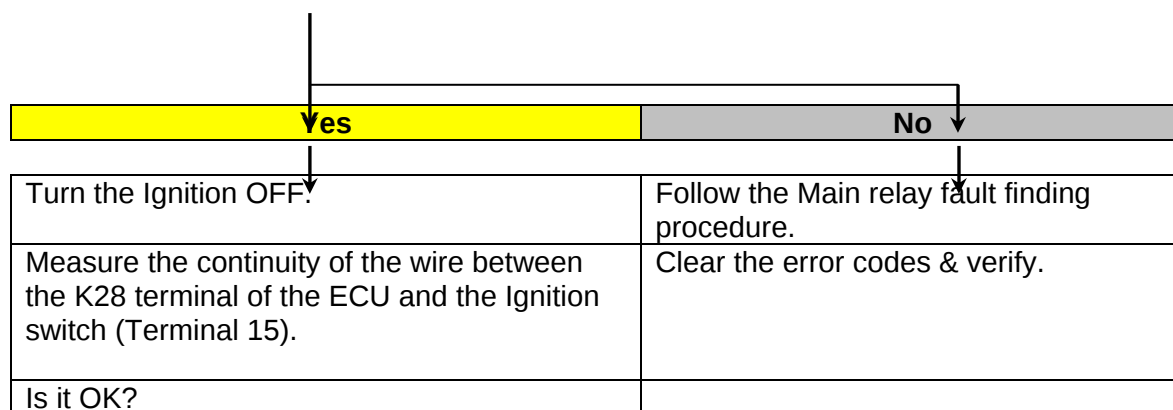
DTC detection condition	Probable cause
Normal operation • When ignition is ON relay coil will get energized. • Engine being started. Malfunction • When ignition is ON supply is not coming to ECU. • Main relay coil will not get energized. • Engine will not start.	• Open, shorted or wrong connection of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

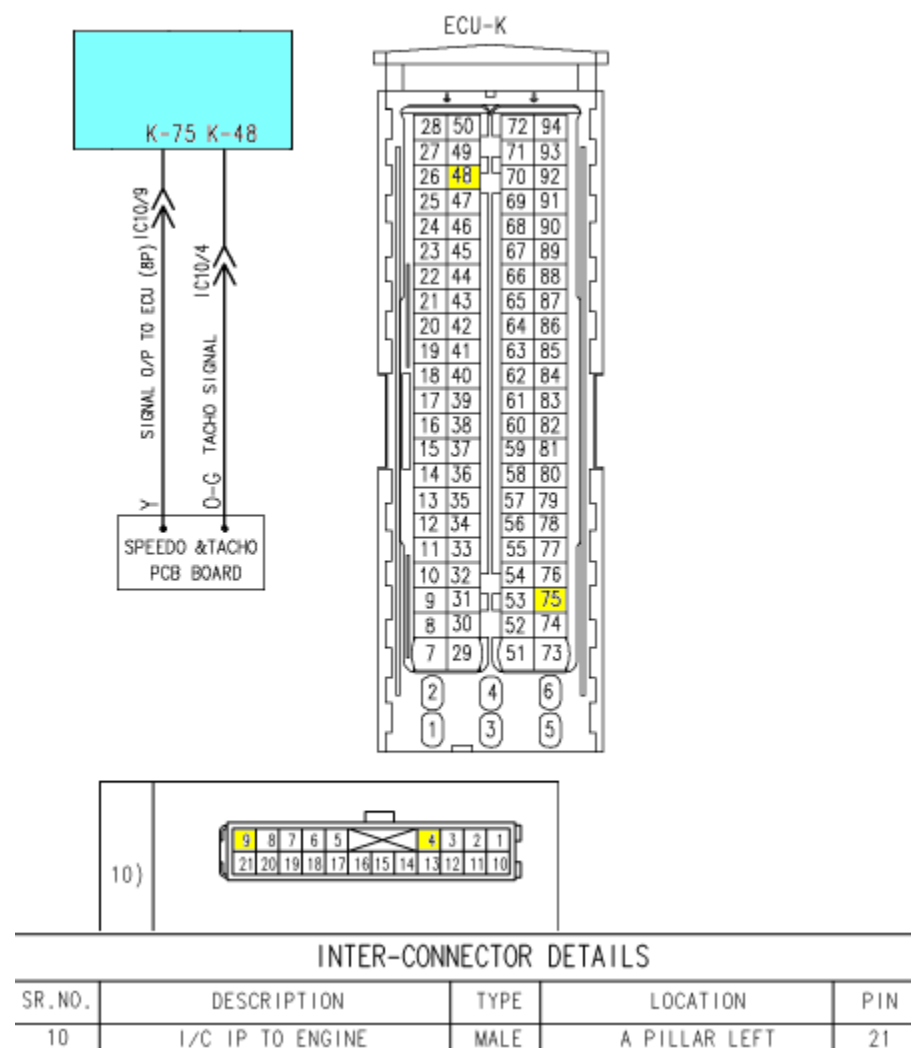


P-0503
 P-0500
 P-0501

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.



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

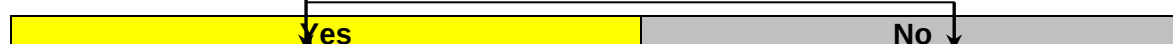
- Drive the vehicle.
- Does the speedometer show the correct value? (Compare the values of speedometer with the value visible in the "Smart Tester"- use the live data tab in 'Smart Tester'.)
- Is it OK?



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?	



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?	



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.



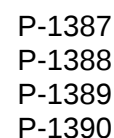
Verify that the ECU connections are OK	Repair short circuit to Ground or another circuit in wire between VSS harness connector
If OK replace VSS with a known good VSS	Clear codes and verify that the VSS signal is within range.
Clear codes and verify that the VSS signal is within range.	
If problem persist-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

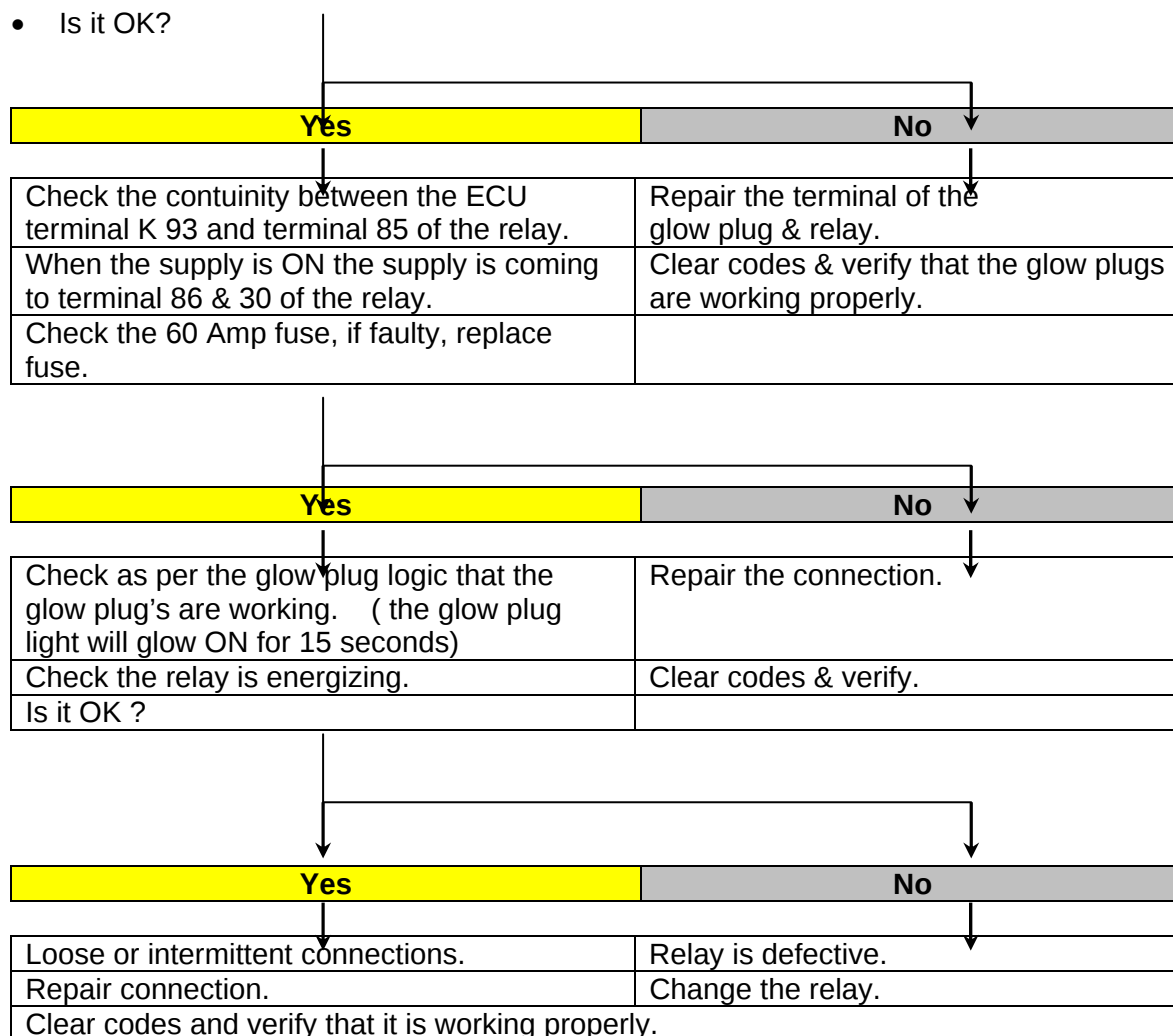


SR.NO.	DESCRIPTION	TYPE	LOCATION	PIN
10	I/C IP TO ENGINE	MALE	A PILLAR LEFT	21
11	I/C IP TO ENGINE	MALE	A PILLAR LEFT	20

1. Connect the 'Smart 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?



Immobilizer

P-0513

DTC	Diagnostic item
P-0513	Invalid Key error

+ Immobilizer code

DTC	Diagnostic item
90A0	Key is rejected by Immobiliser 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

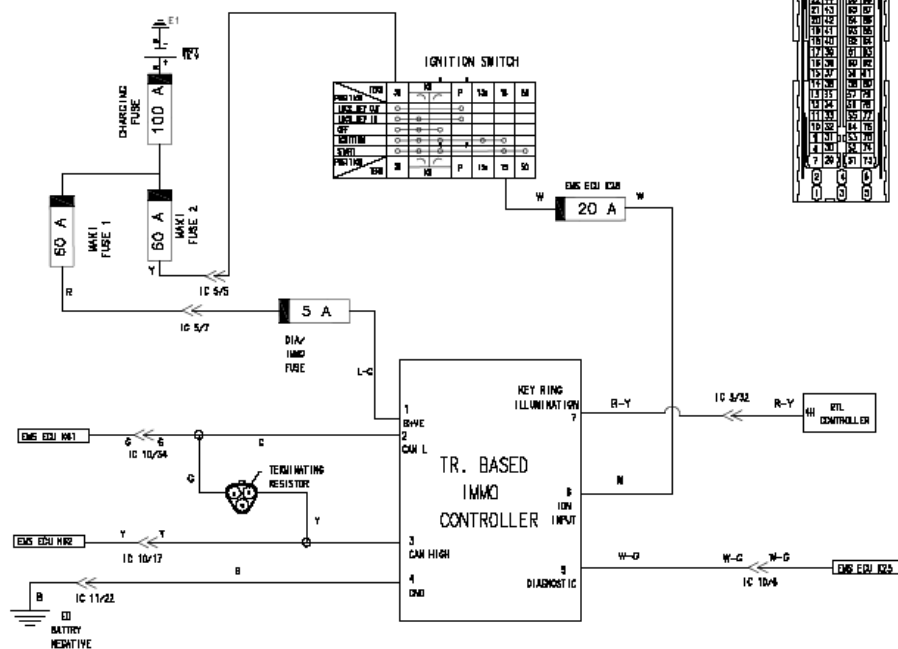
Corrective Action:

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

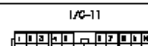
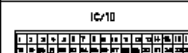
If more than one error is found in EMS please follow the priority of the errors during. Here below the errors are listed in the priority error.

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

	EQU-K															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
D	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
E	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
F	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
G	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
H	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
I	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
J	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
K	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
L	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
M	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
N	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
O	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
P	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256



FRONT VIEW OF THE CONNECTORS



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:

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

P-183A

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:

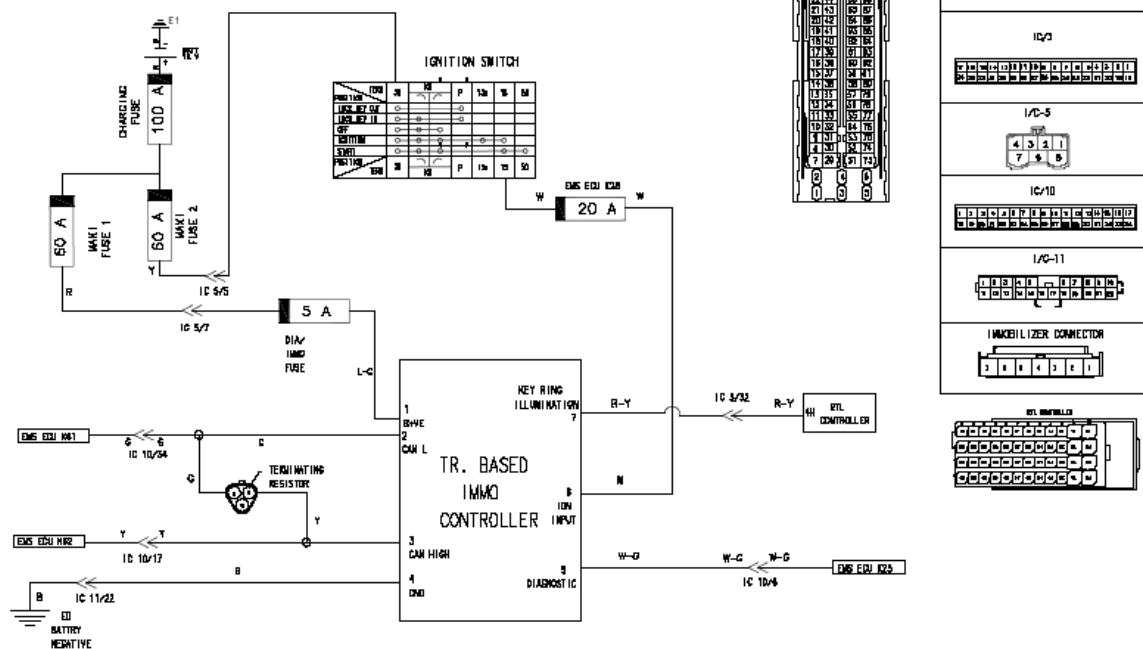
Check the CAN wiring – if it is correct.
Perform ICU- EMS learning.
Clear all errors in both EMS and ICU

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

P-183B

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

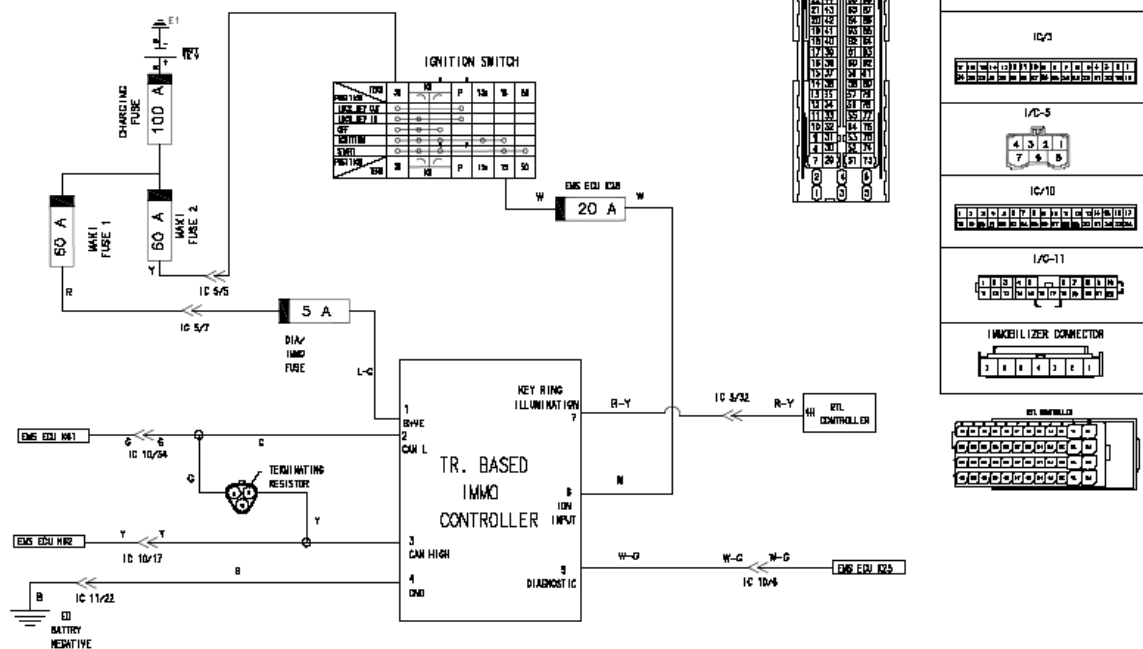
DTC	Diagnostic item
90A2	No response from EMS ECU after signature mismatch

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)**



Immobilizer

P-183E

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

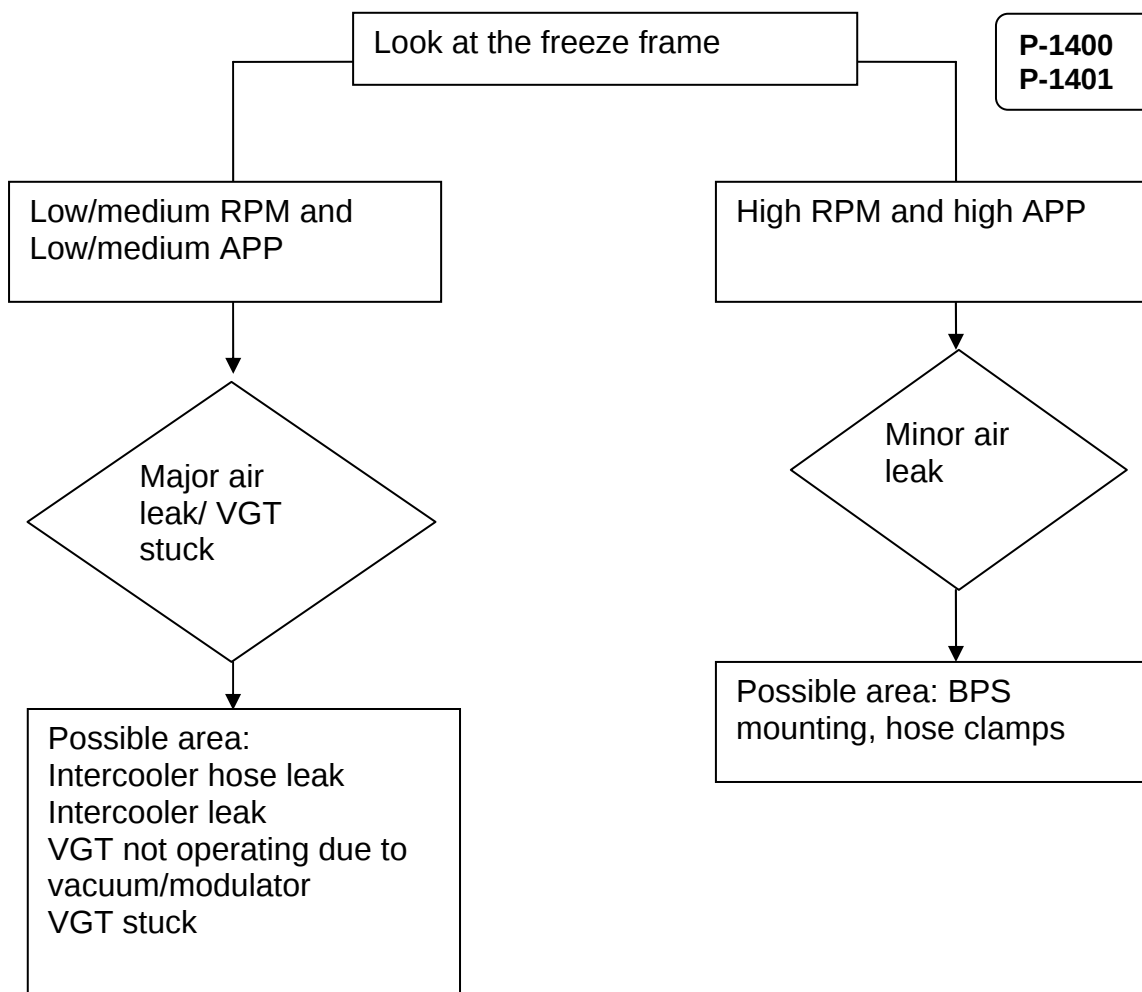
DTC	Diagnostic item
P-1205	Injector bank 1specific warning : depending on application
P-1206	Injector bank 1specific warning : depending on application
P-1207	Injector bank 1specific warning open load
P-1208	Injector bank 1specific warning depending on application

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.

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



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 Plausibility Error

P-1704

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 confirmed Mute error

P-0073

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

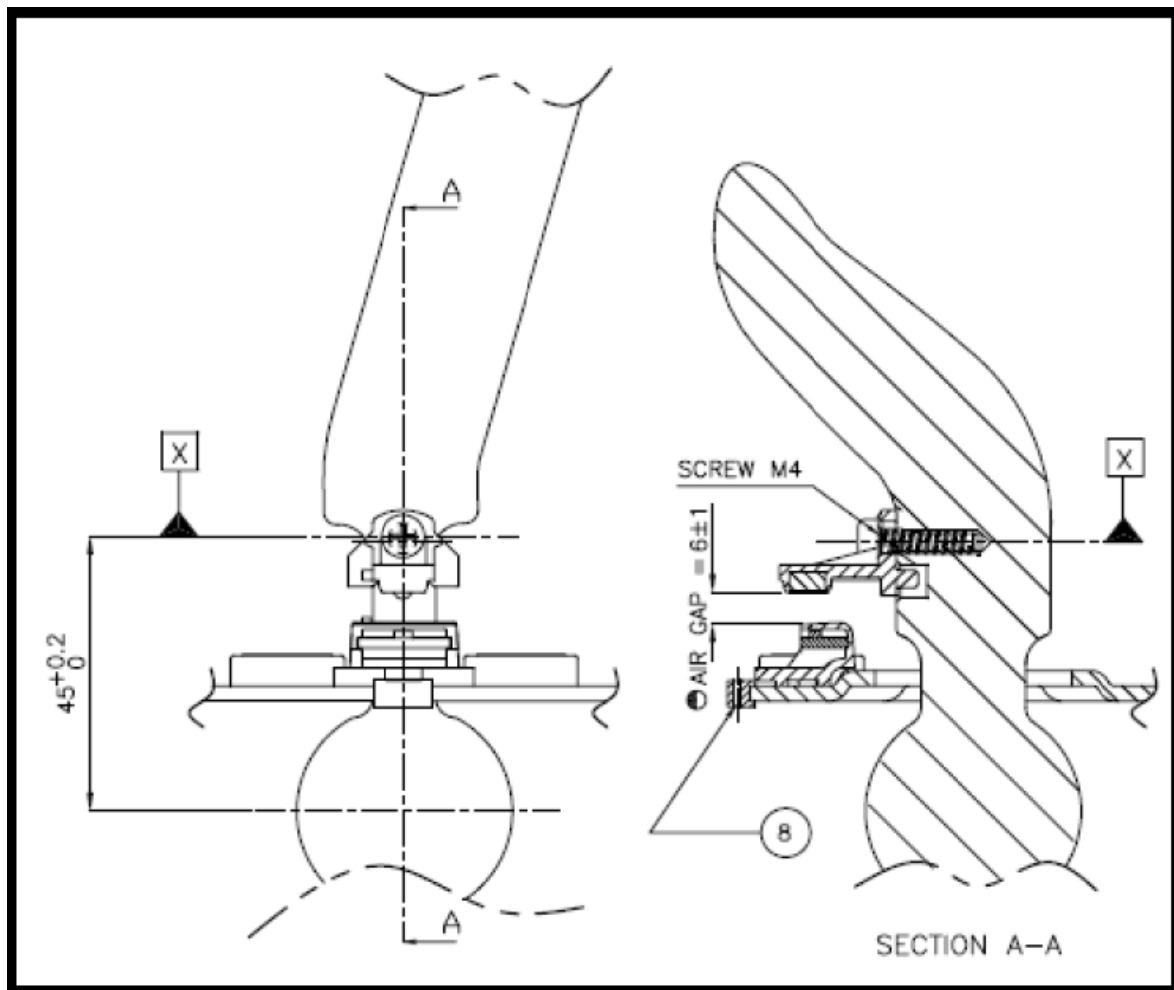
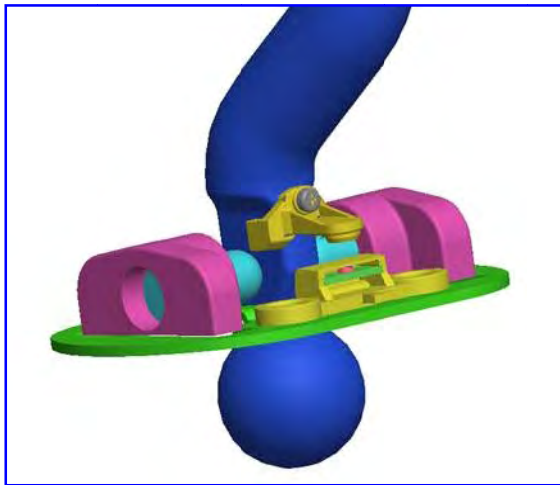
P-1827

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



3 D and the installation view of the Gear Neutral Switch

Gear Neutral Switch

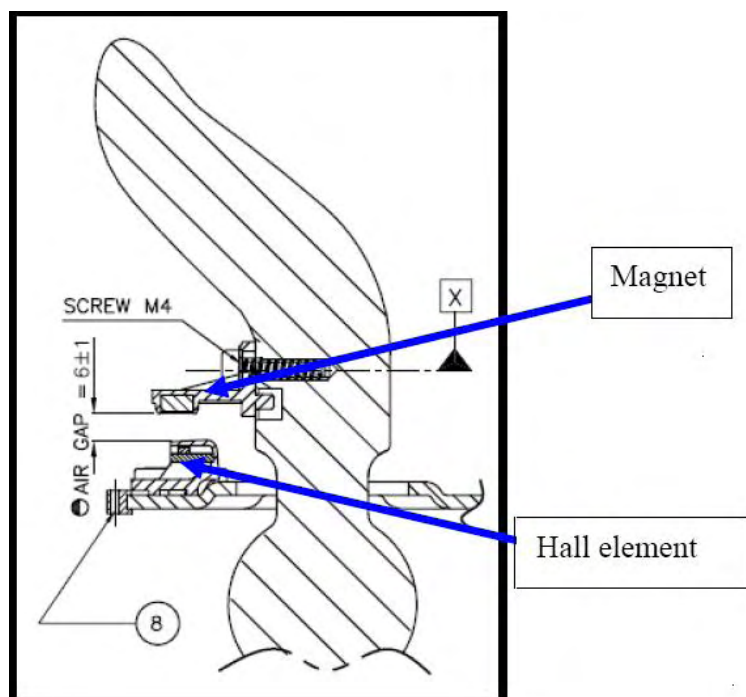
P-1704

Description:

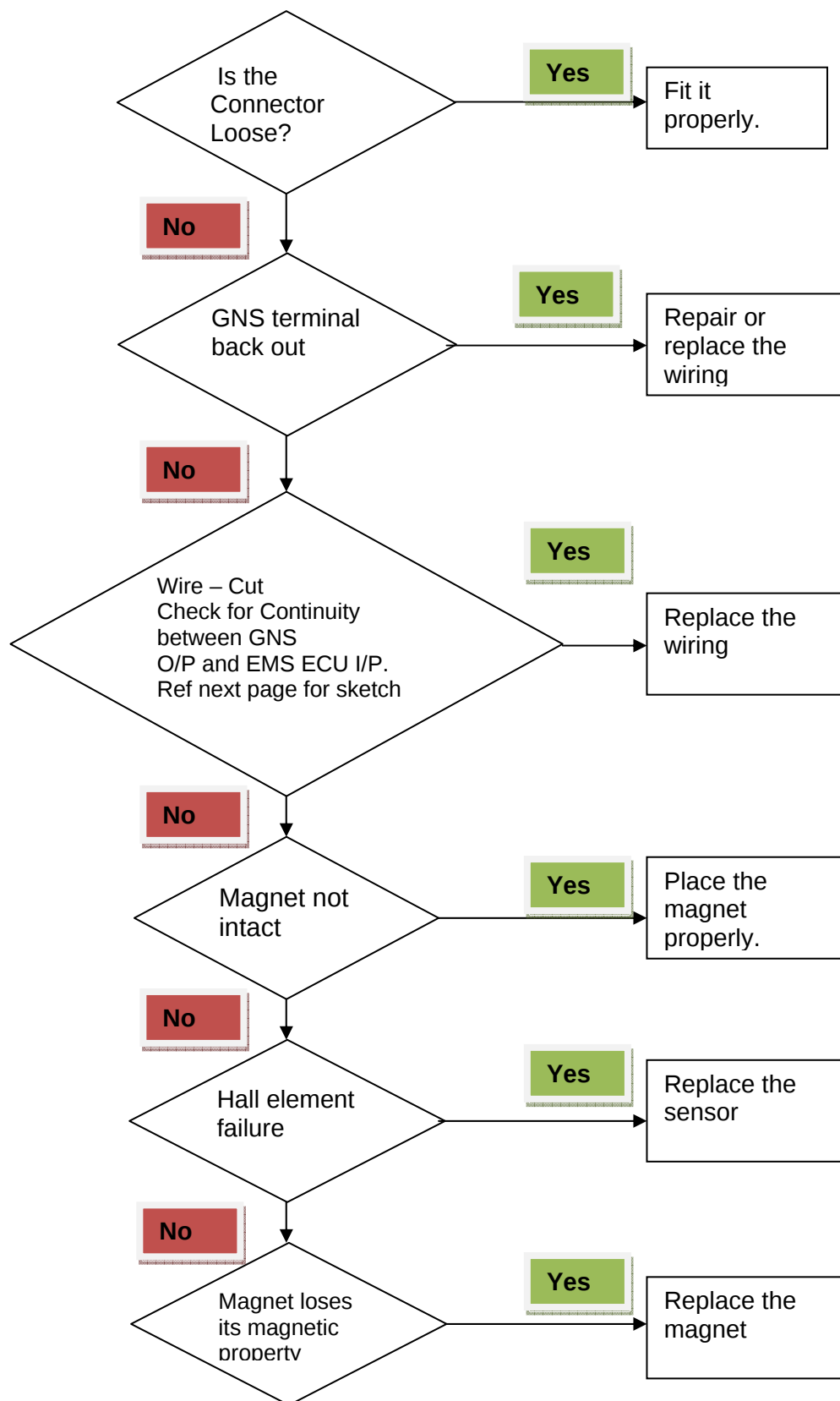
The gear neutral switch is a hall effect based sensor, mounted on the gear shift selector. The gap between sensor and magnet shall be 6 ± 1 mm. This gap has to be maintained within the specification to ensure the proper function of gear neutral sensor.

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

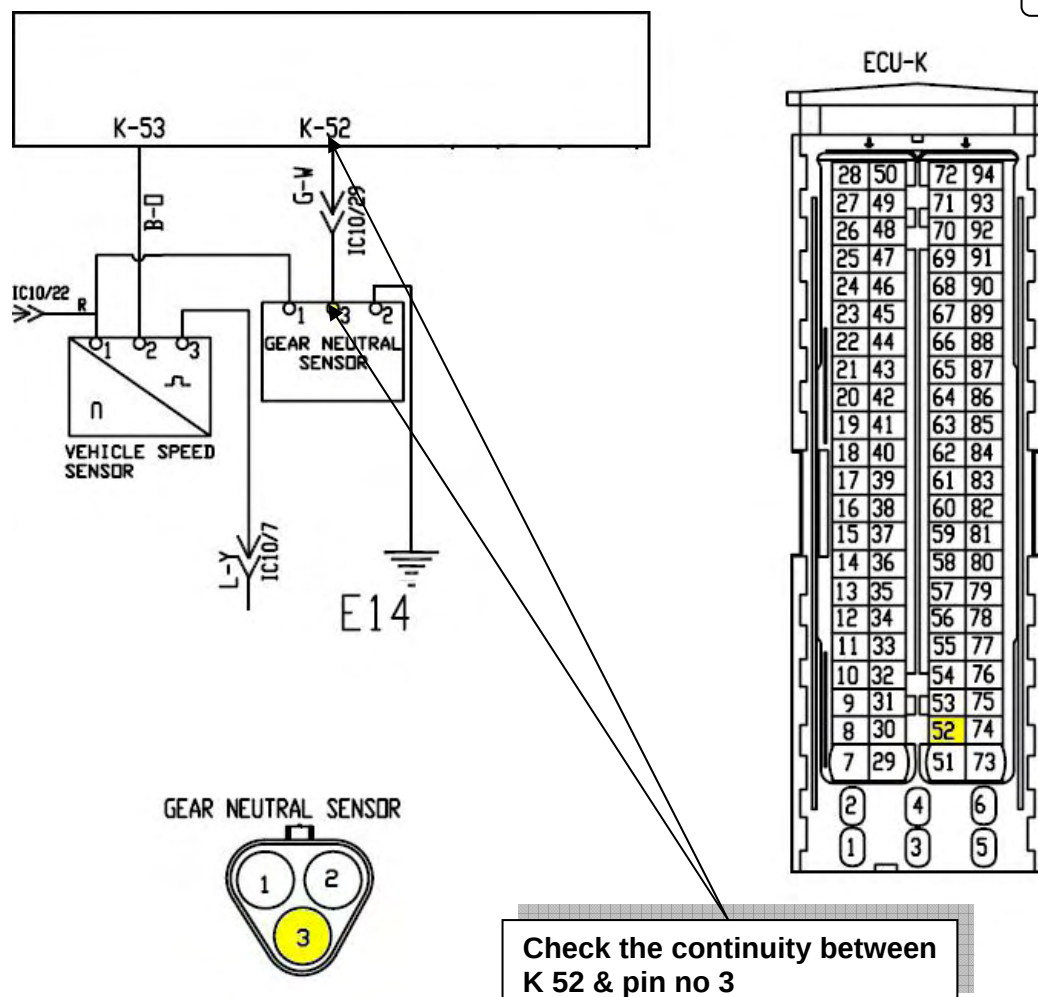


P-1704



Wire Cut

P-1704



Gear Neutral Switch

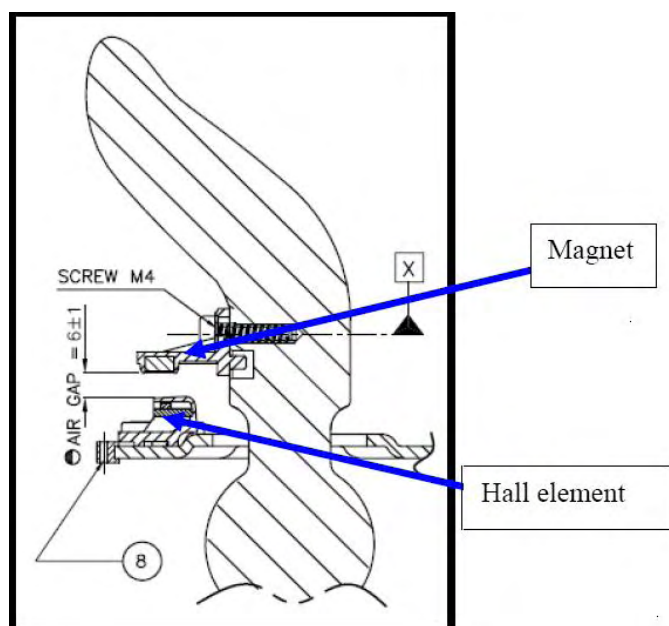
P-168E

Description:

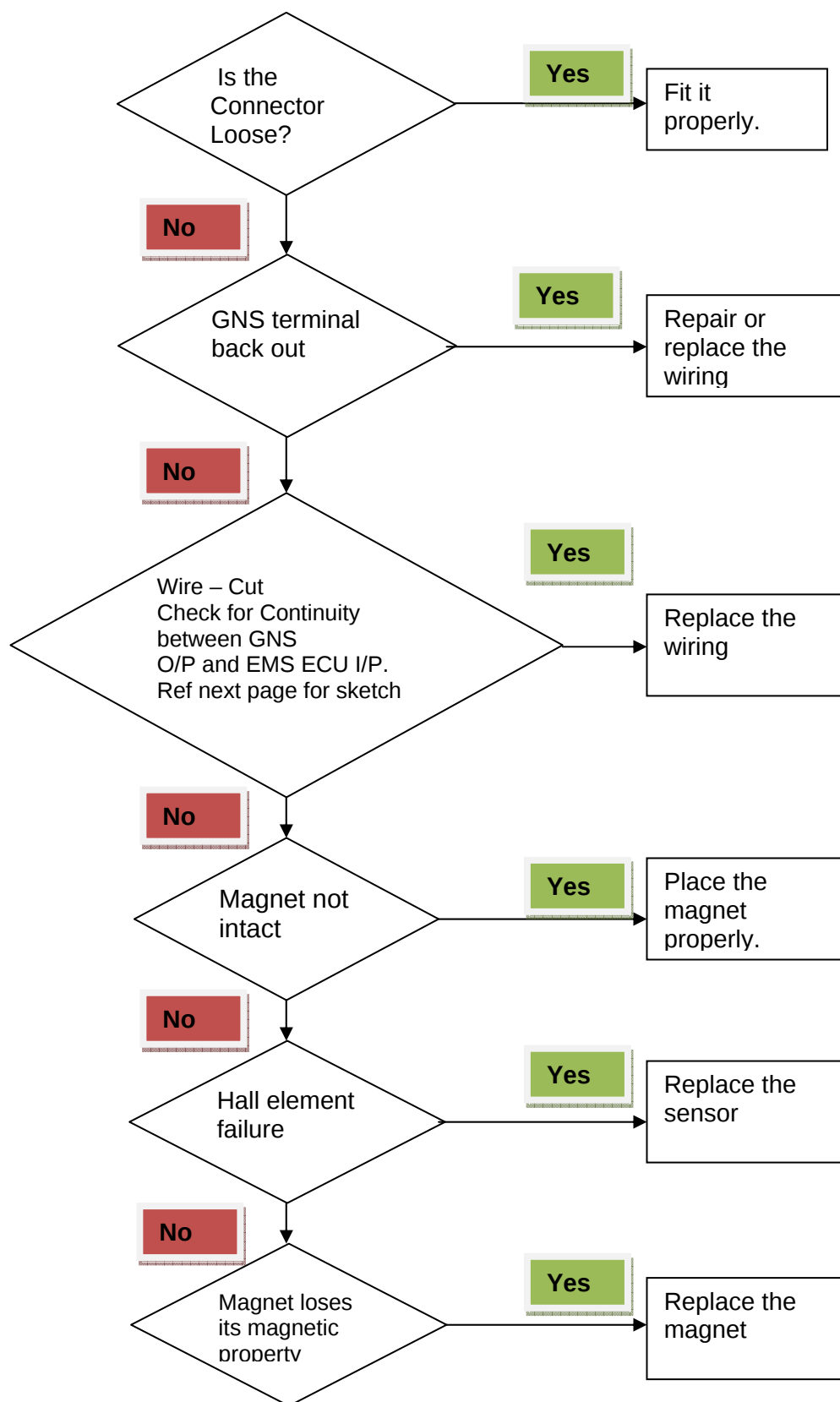
The gear neutral switch is a Hall Effect based sensor, mounted on the gear shift selector. The gap between sensor and magnet shall be 6 ± 1 mm. This gap has to be maintained within the specification to ensure the proper function of gear neutral sensor.

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

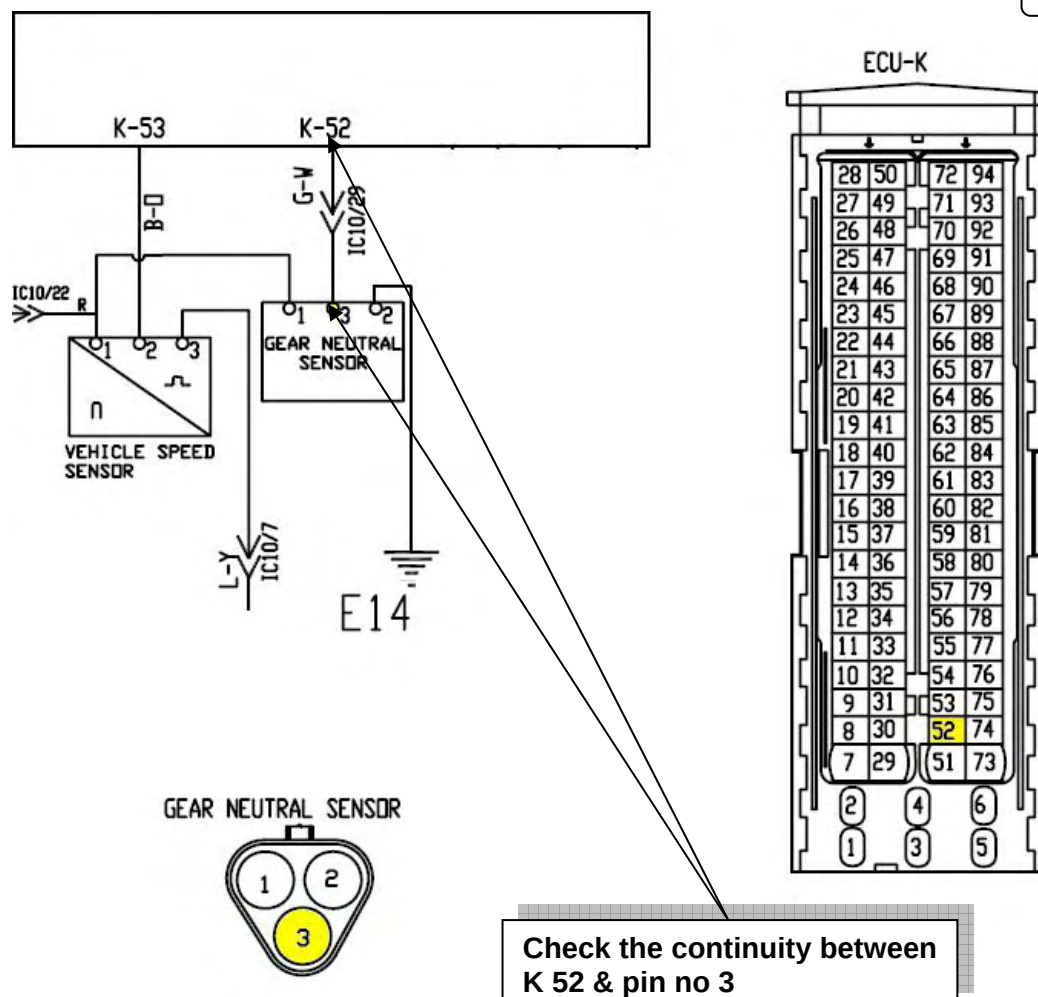


P-168E



Wire Cut

P-168E



Starter Power Stage

P-170D
P-170E
P-1710

Description:

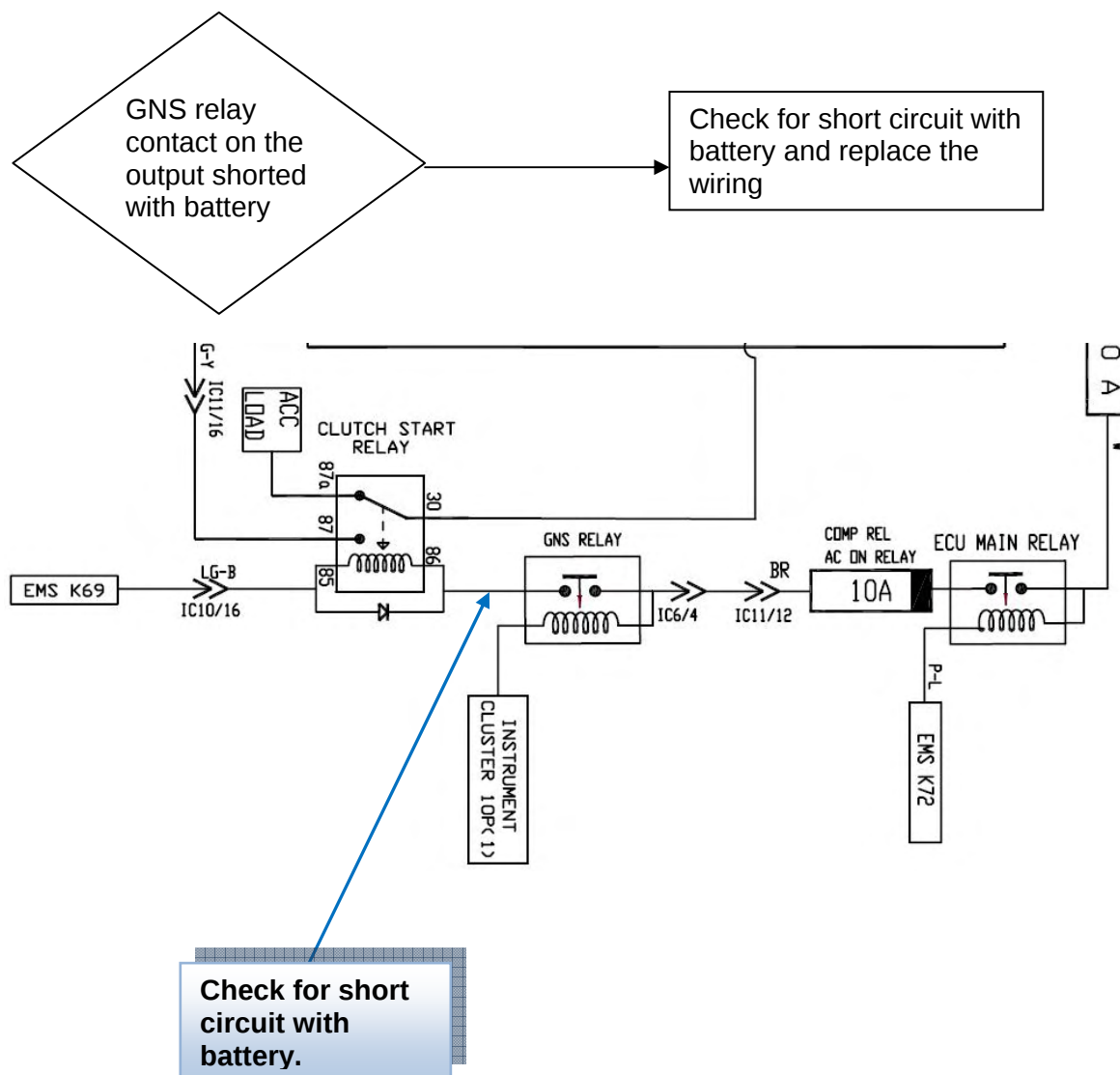
The ECU has a power stage which controls the starter actuation when the ESS is ON. It also monitors the power stage.

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



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

This is connected through EMS ECU Main relay.

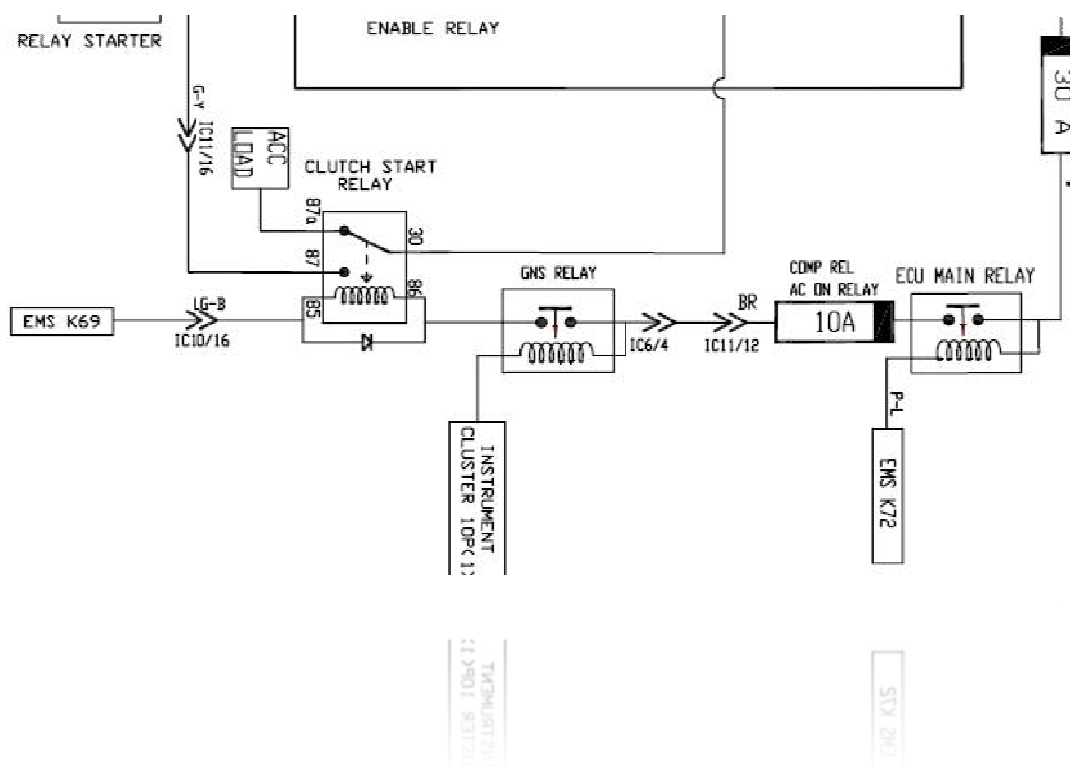
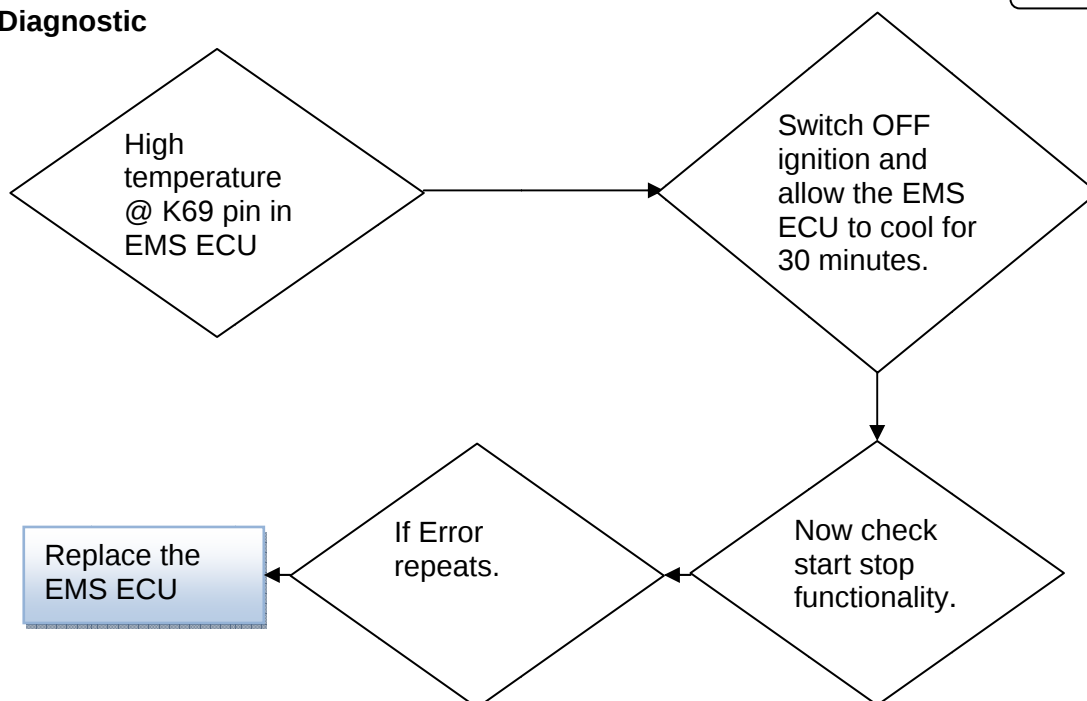
The main relay after ignition off will be held for 40 seconds after which it will be released. Even after this, if the above shown line is found connected (Shorted) directly to Batt. then this error will get registered.

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 temperature

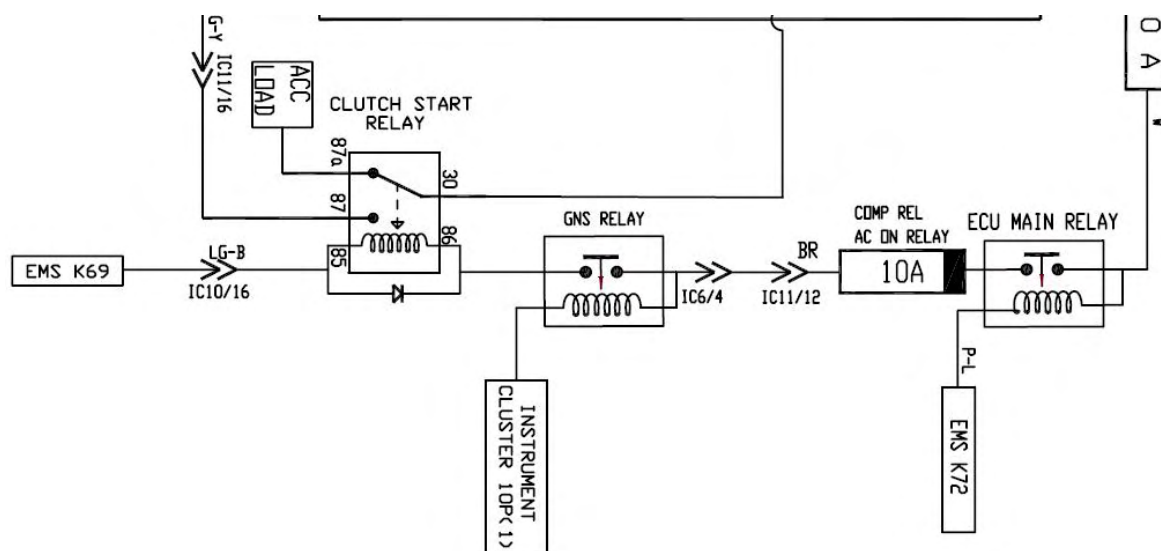
P-1710

Diagnostic



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- replace the wiring.

Gear Neutral Switch Relay

P-1712

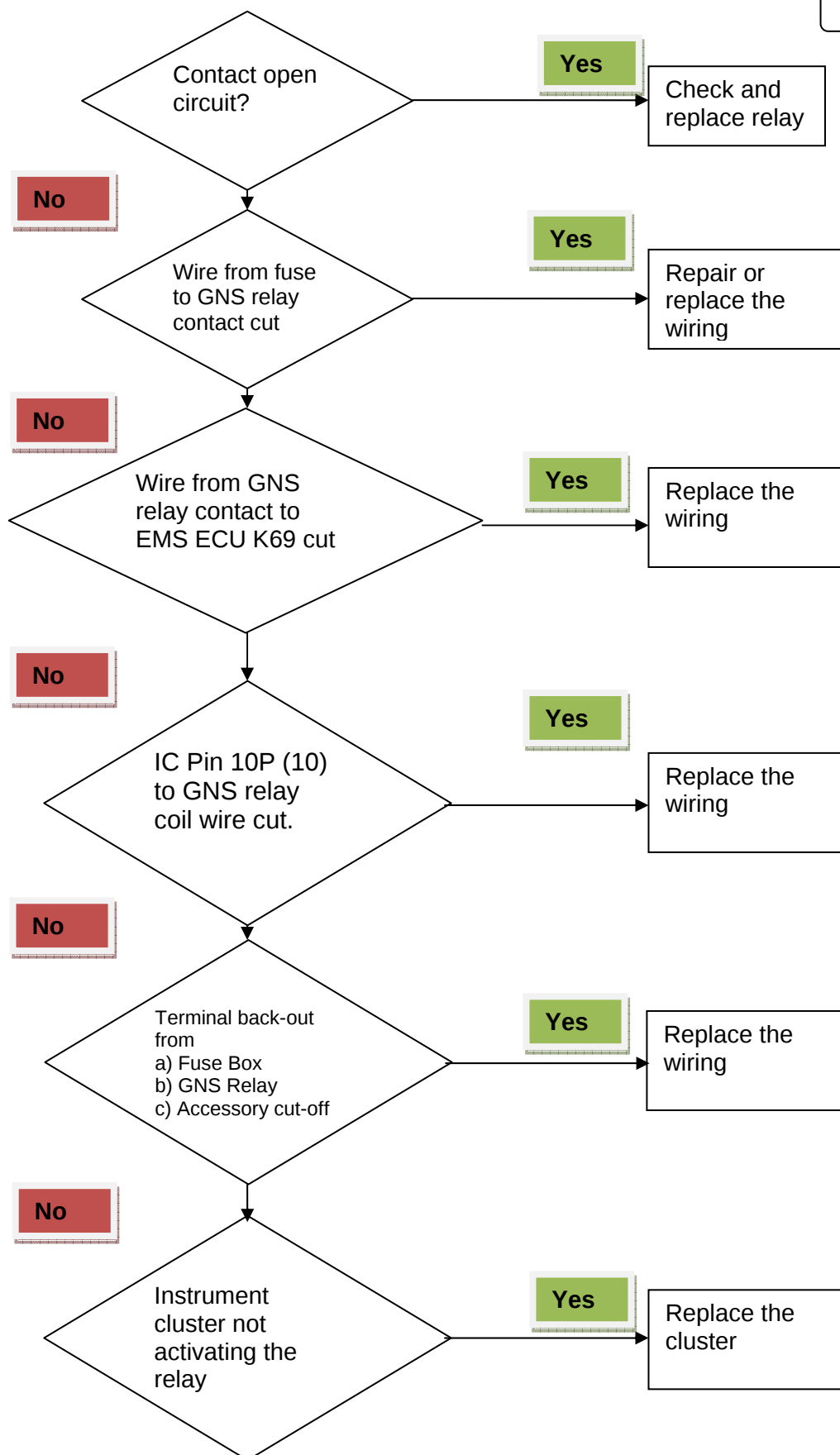
Description:

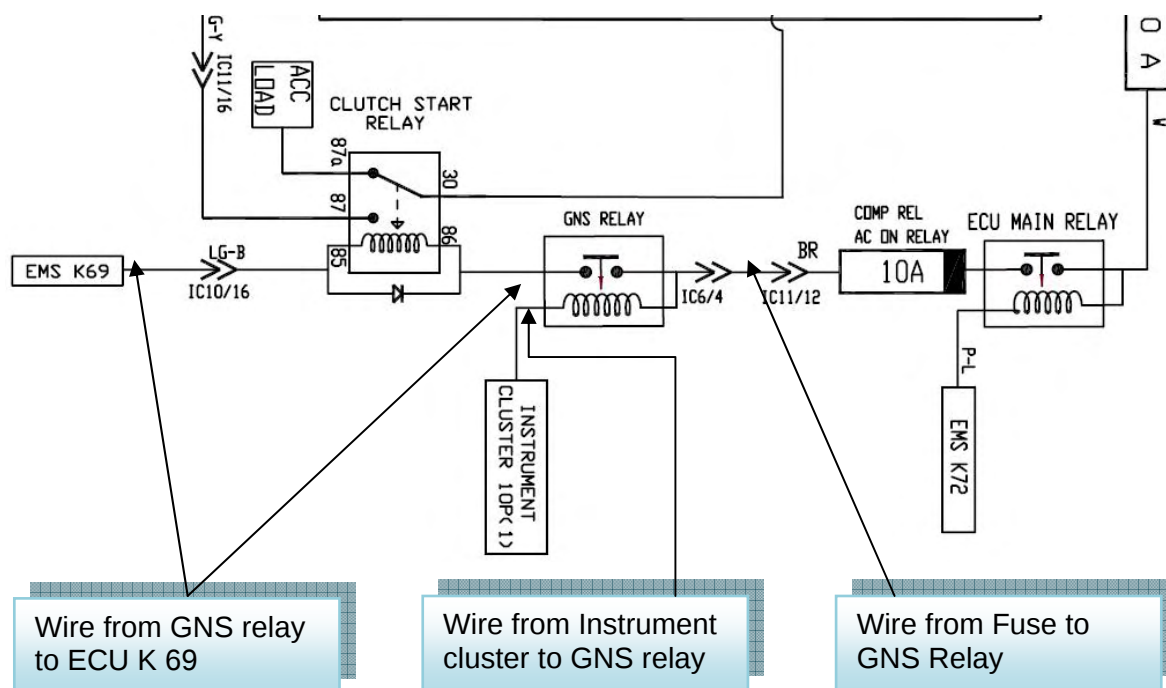
The gear neutral switch relay has to close when the gear is in neutral. When the gear is engaged then relay has to open

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





Gear Neutral Switch Relay

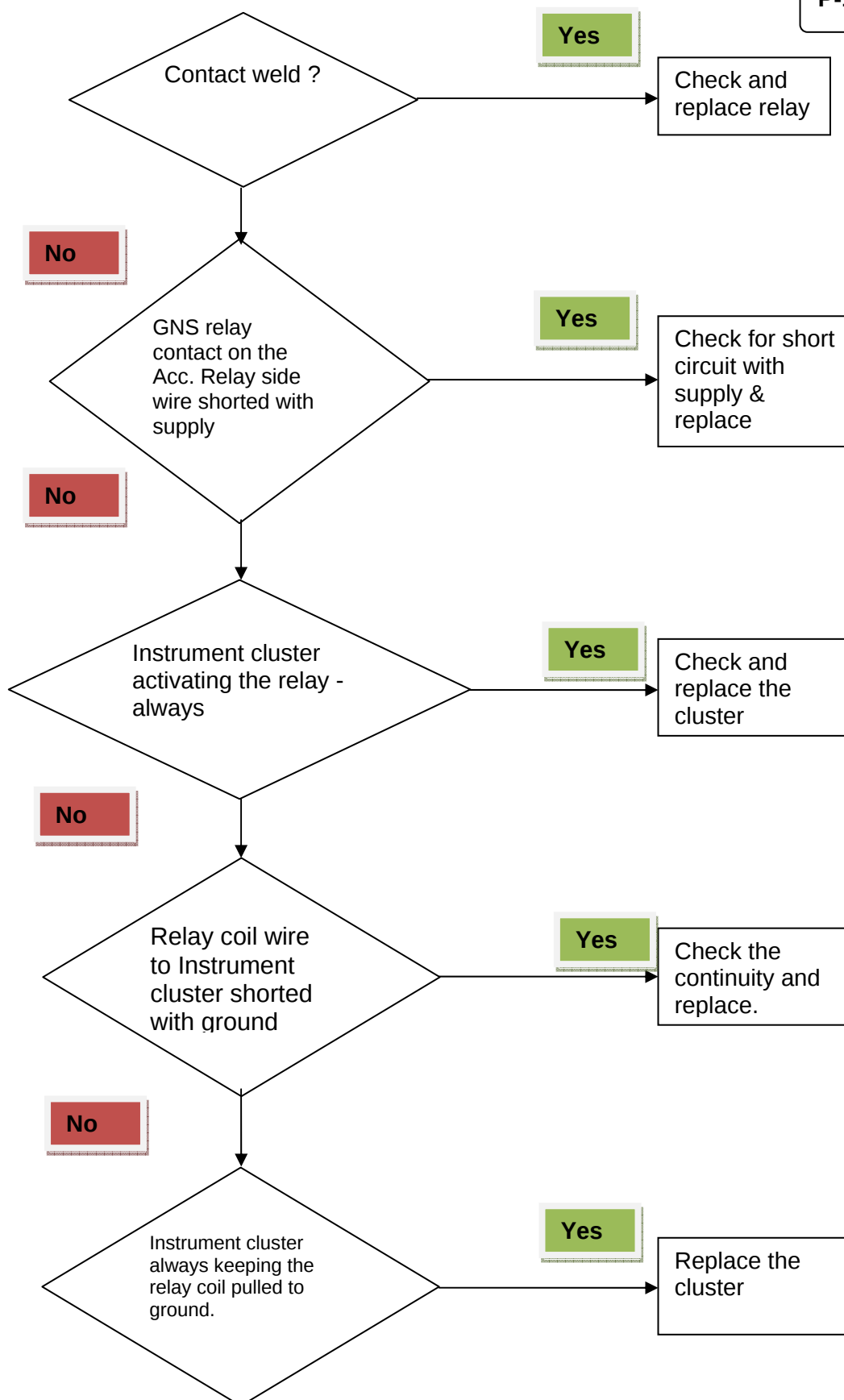
P-1714

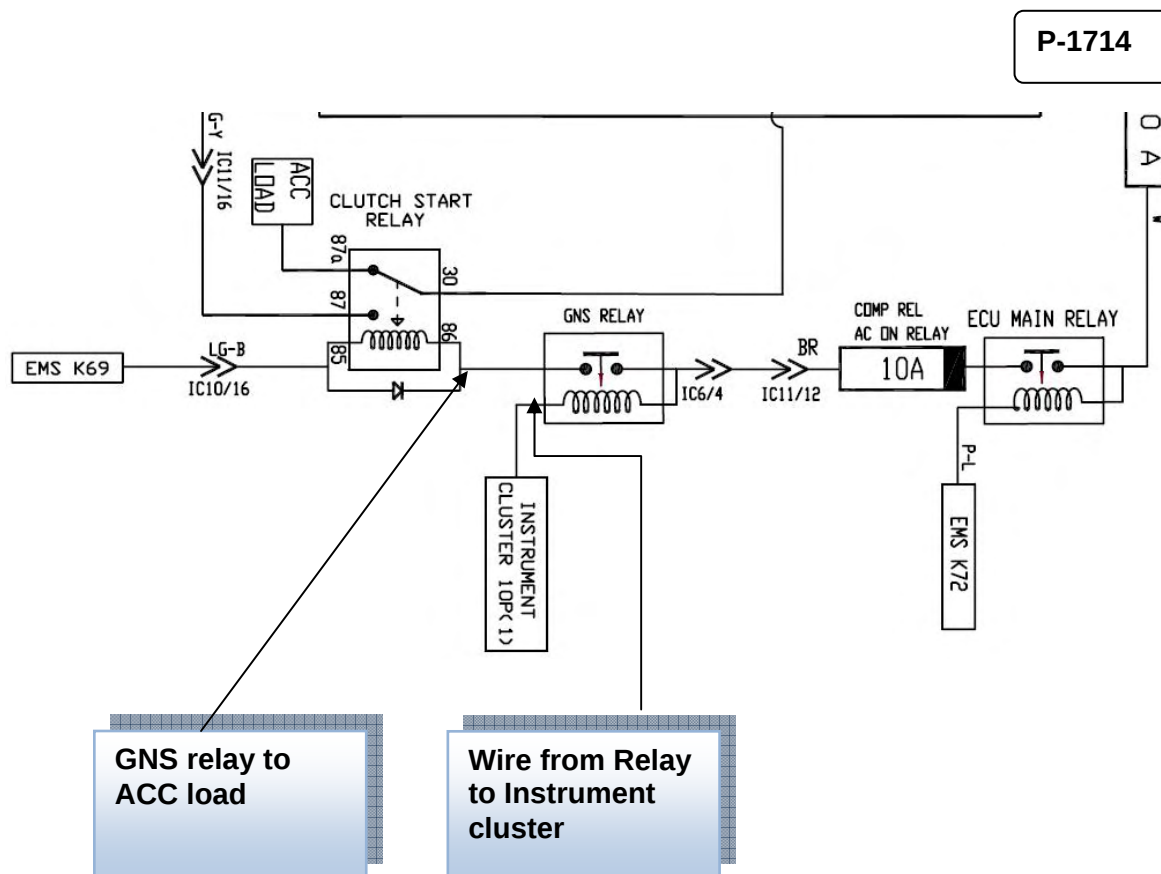
The gear neutral switch relay has to close when the gear is in neutral. When the gear is engaged then relay has to open

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

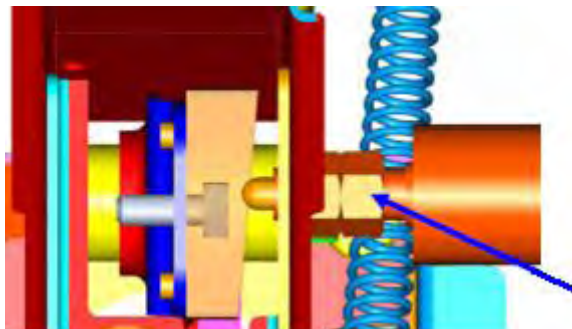
P-1714





Redundant Clutch Switch

P-170A



Nut for removing the
clutch switch

Redundant Clutch Switch

P-170A

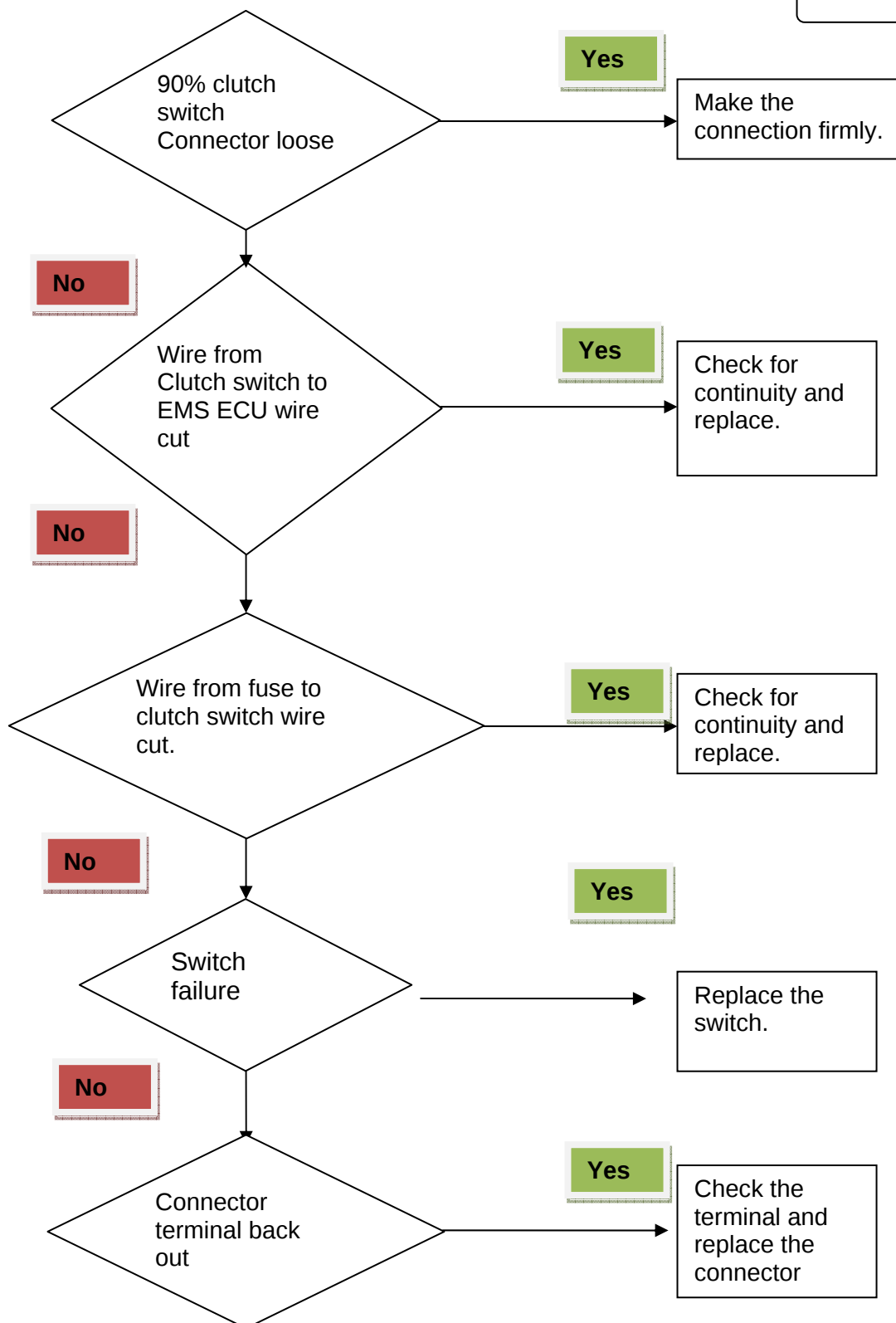
Description

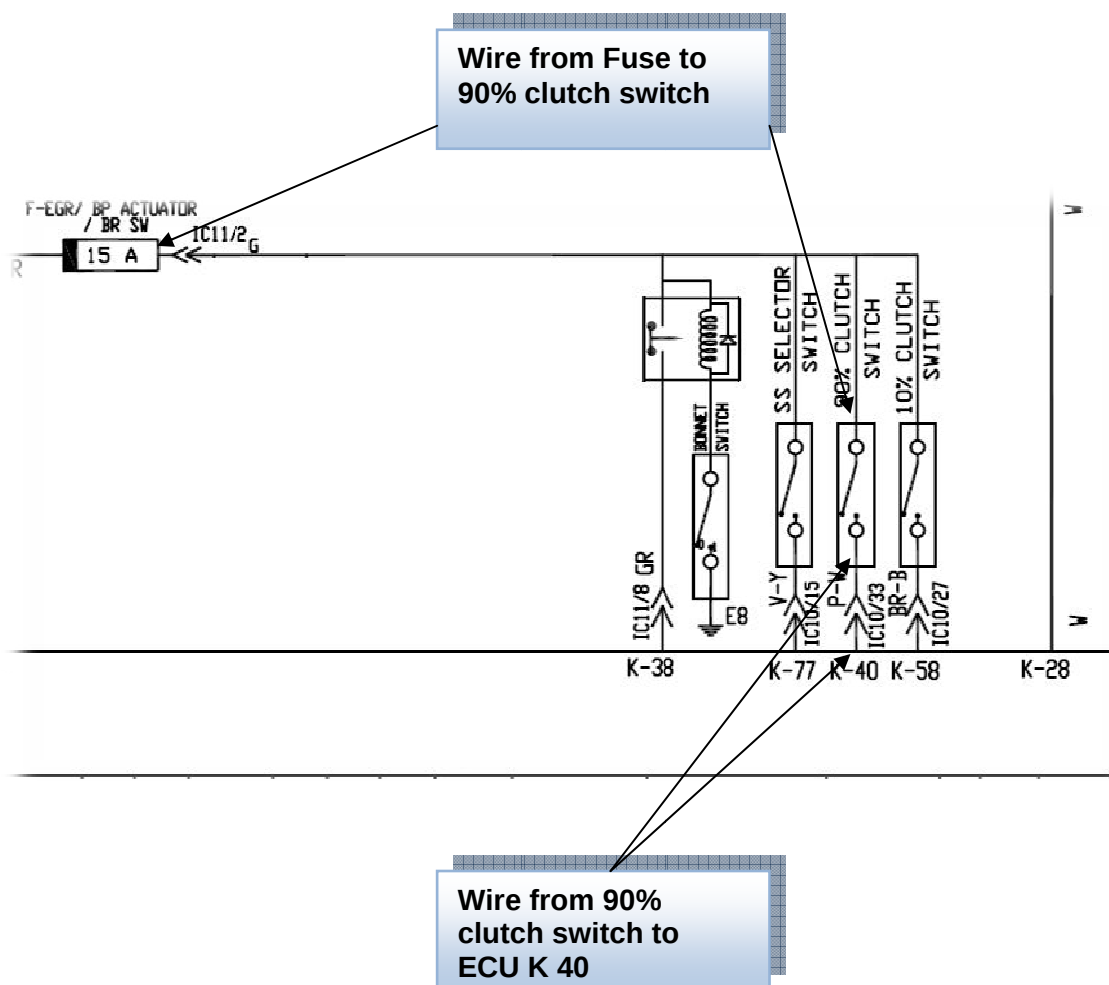
The ECU monitors the signal from the normal clutch switch- which is at 10% of the pedal travel and also the redundant clutch switch (which is at 90% clutch pedal travel)

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





Lamp Power Stage

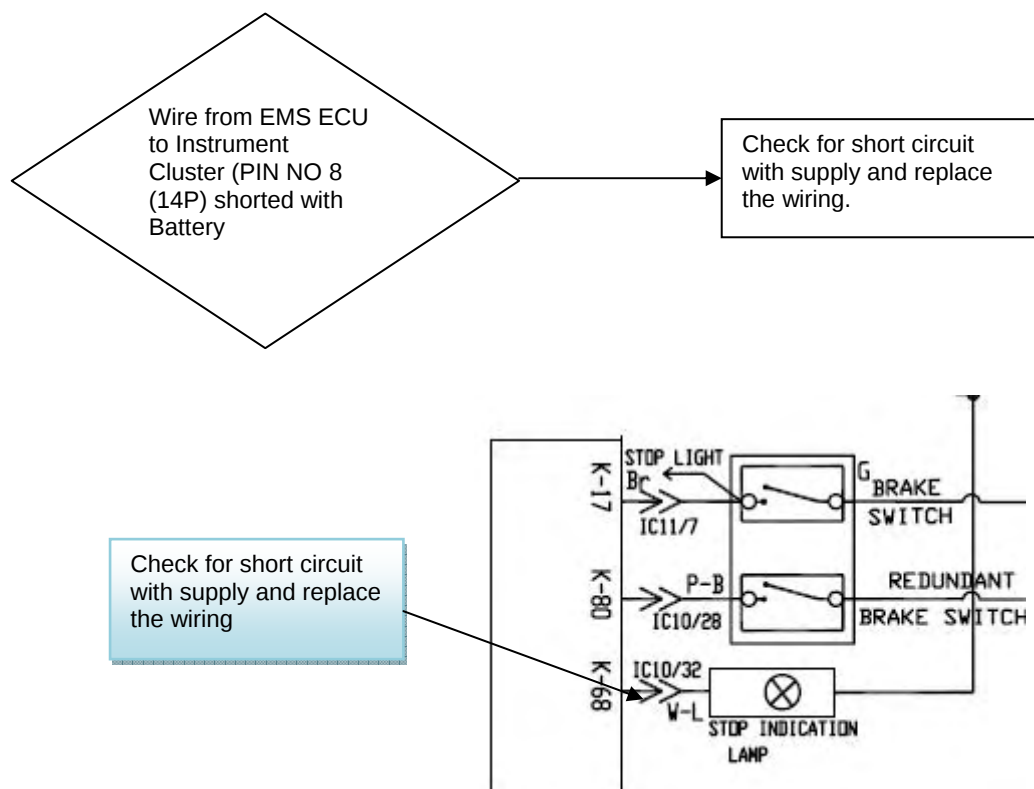
P- 1AE9

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.



Lamp Power Stage

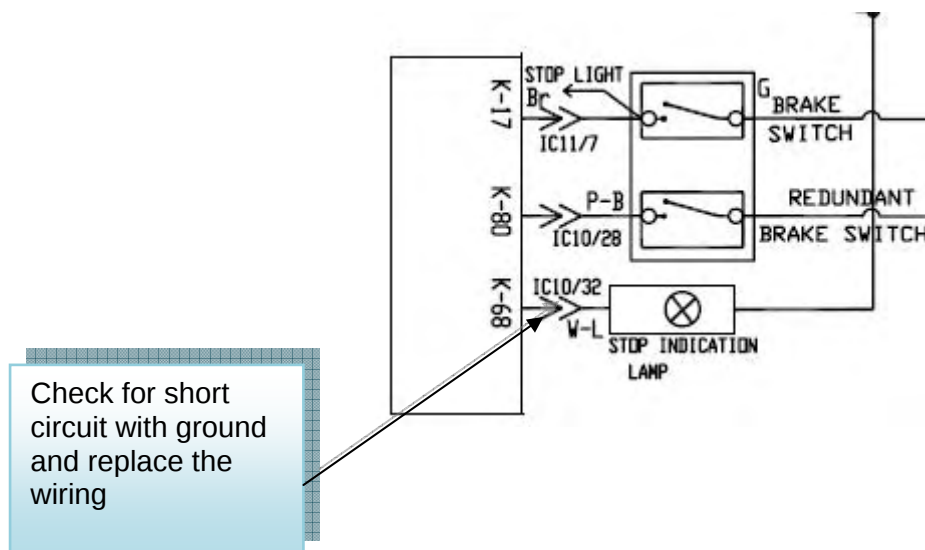
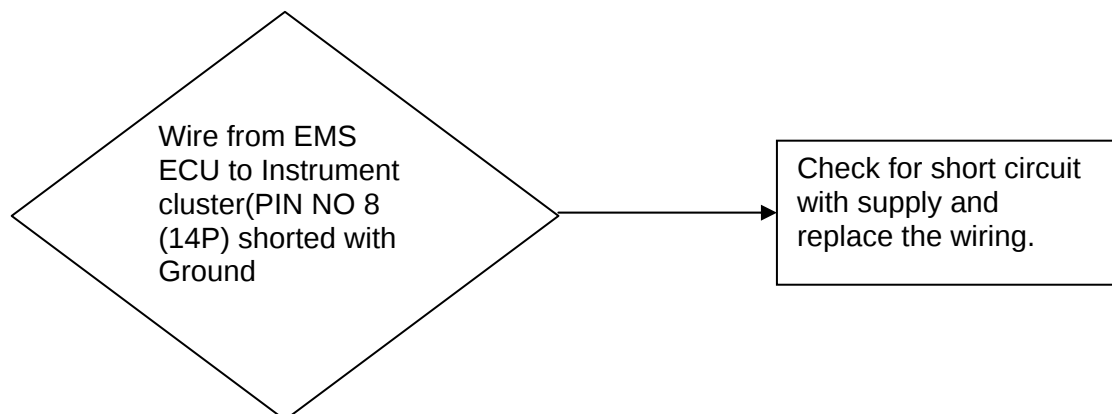
P- 1AEA

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.



Check for short circuit with ground and replace the wiring

Lamp Power Stage

P- 1AEB

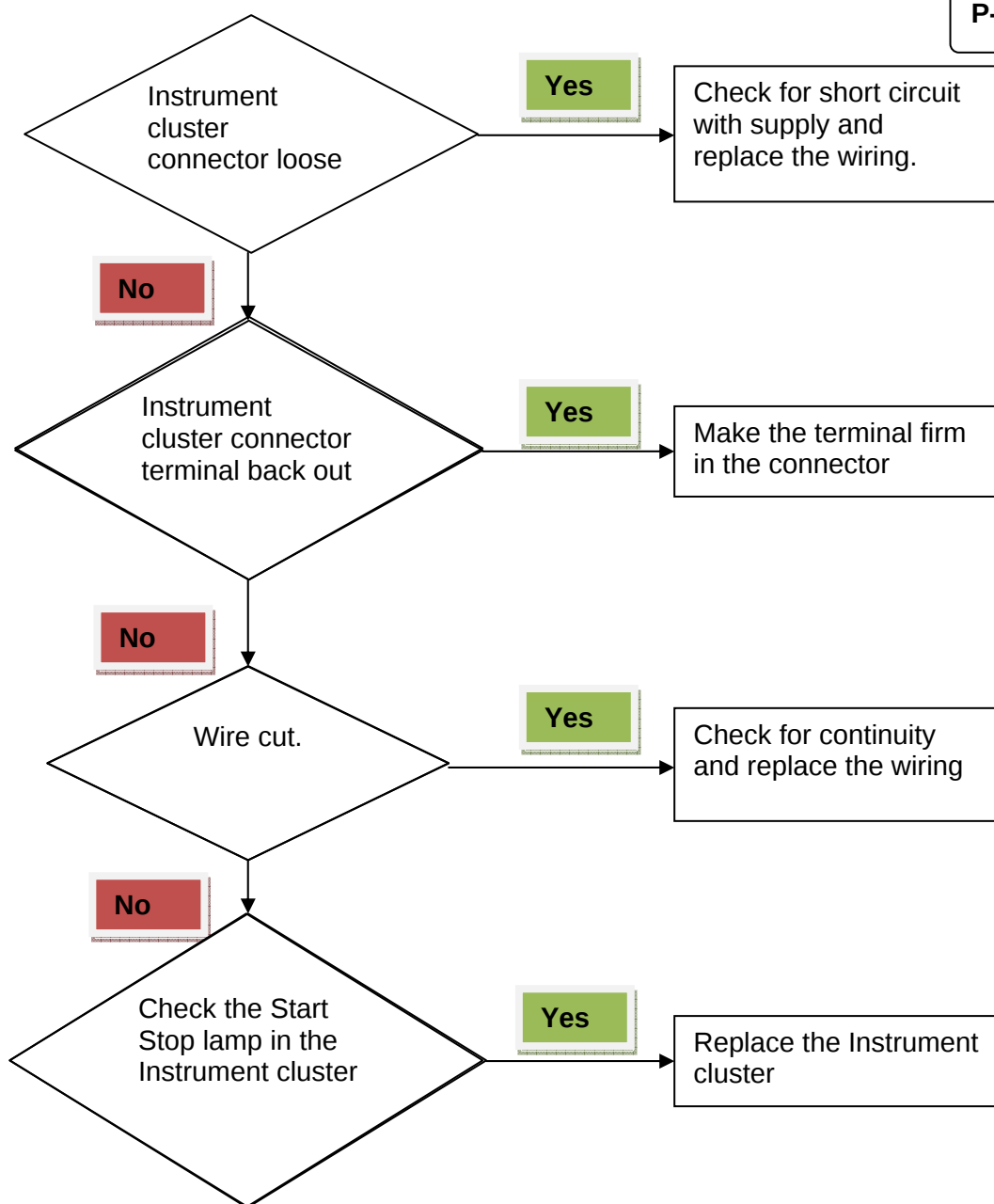
Description

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

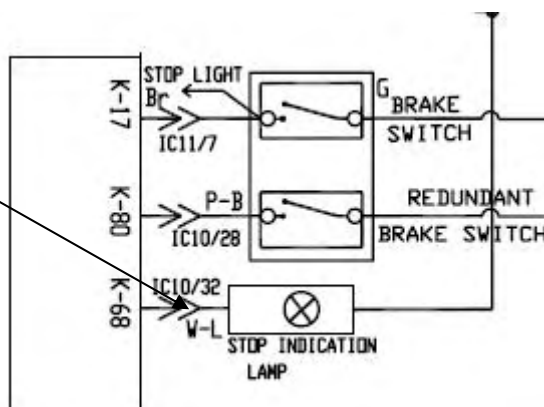
DTC	Diagnostic item
P-1AEB	No Load

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



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



Lamp Power Stage

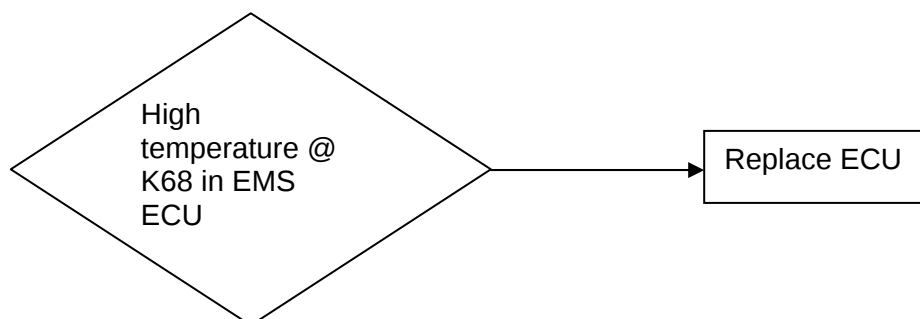
P- 1AEC

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



T 50 (Igniation Switch) Always pressed ON

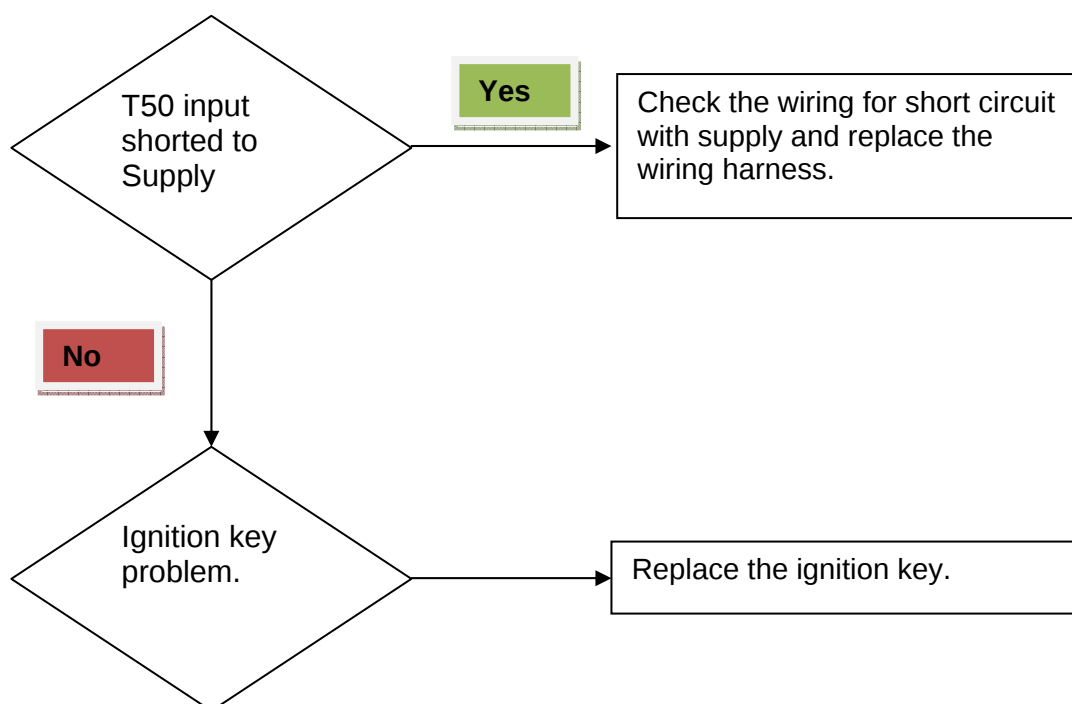
P- 1715

Description

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

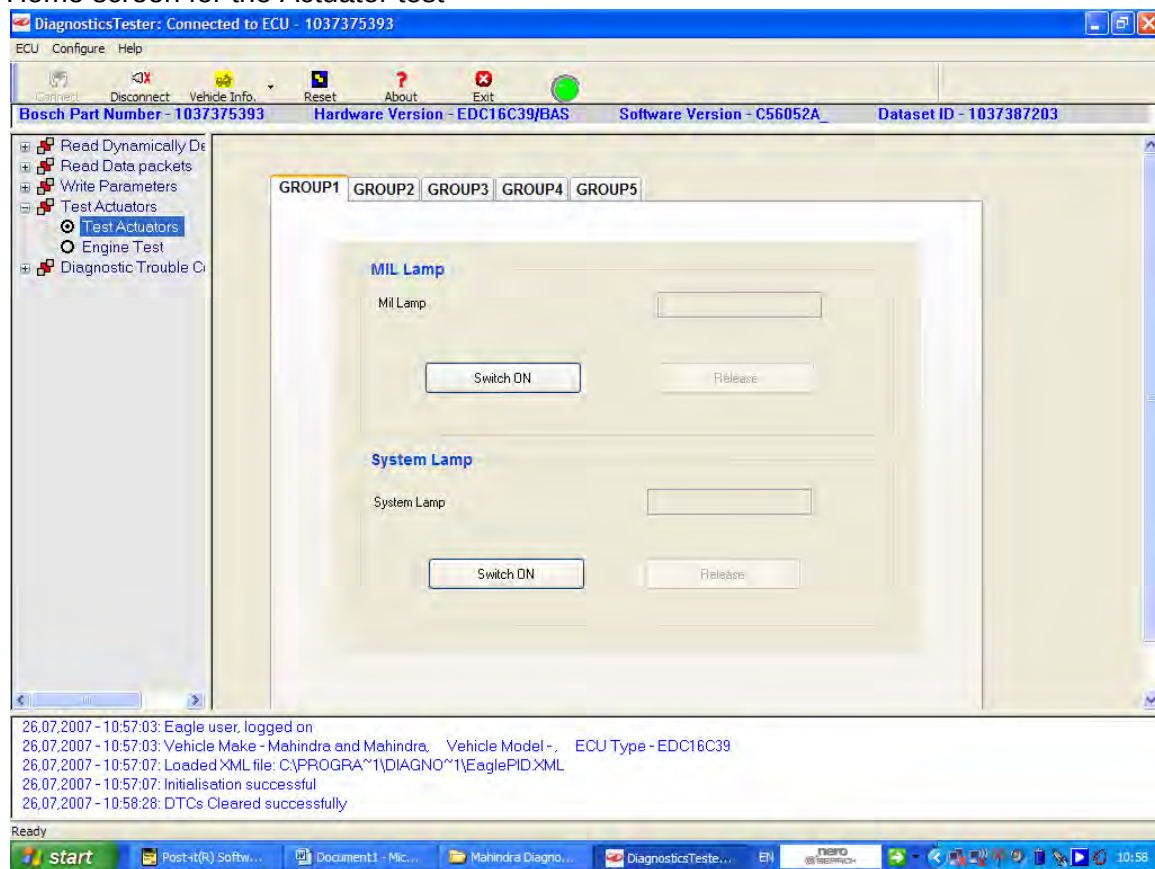
DTC	Diagnostic item
P-1715	T50 Always pressed ON

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



Actuator Tests

Home screen for the Actuator test



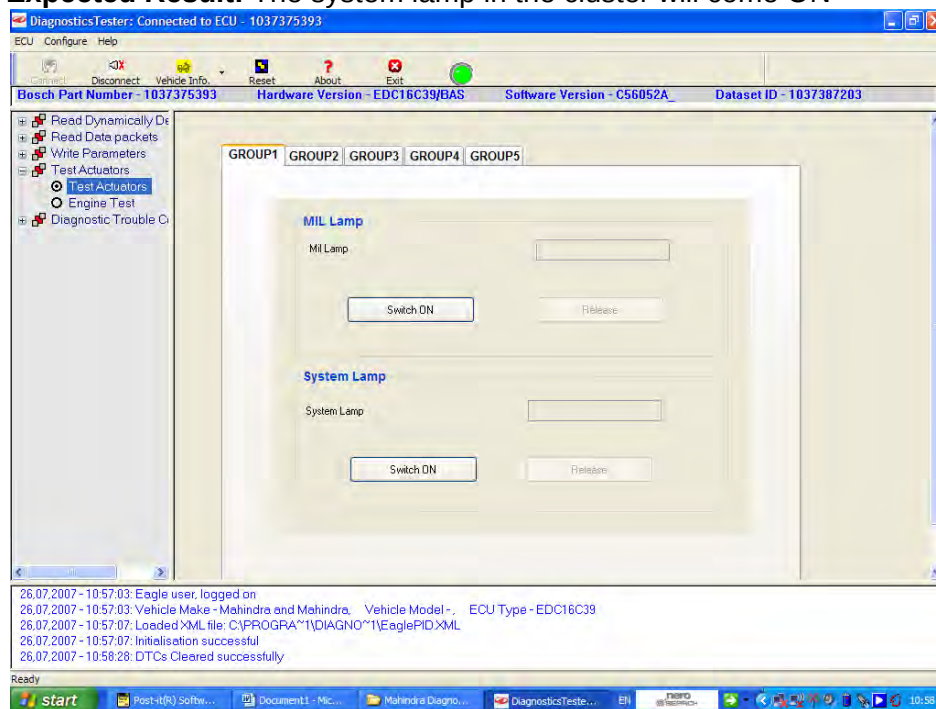
ACT # 1 - System Lamp

ACT#1

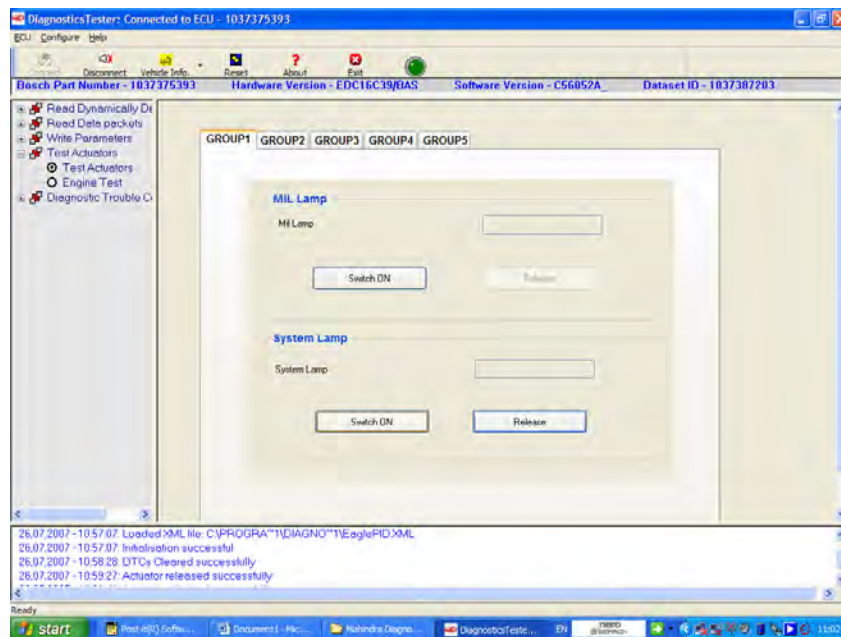
Test condition: Ignition ON

Actuate: Click on the System Lamp ON.

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



Click on the release to release the lamp



ACT#2

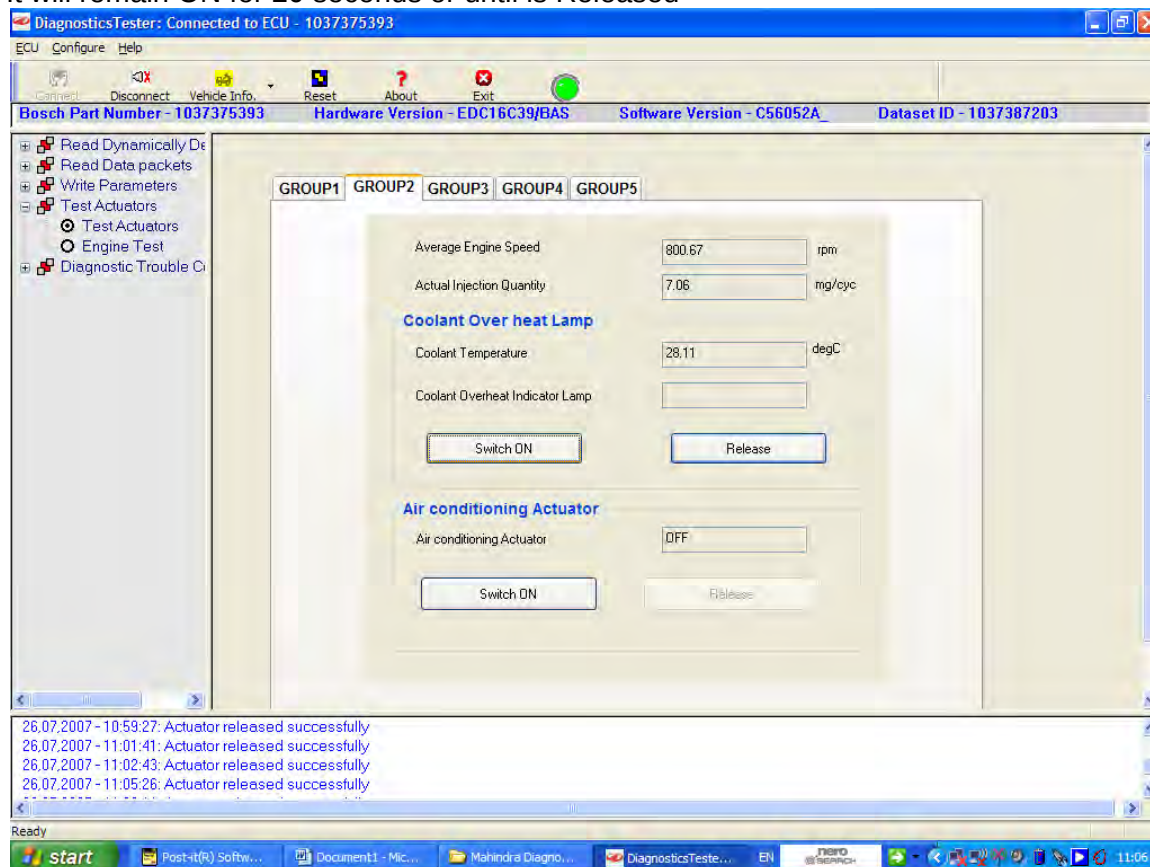
ACT # 2– Coolant Overheat Lamp Test

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

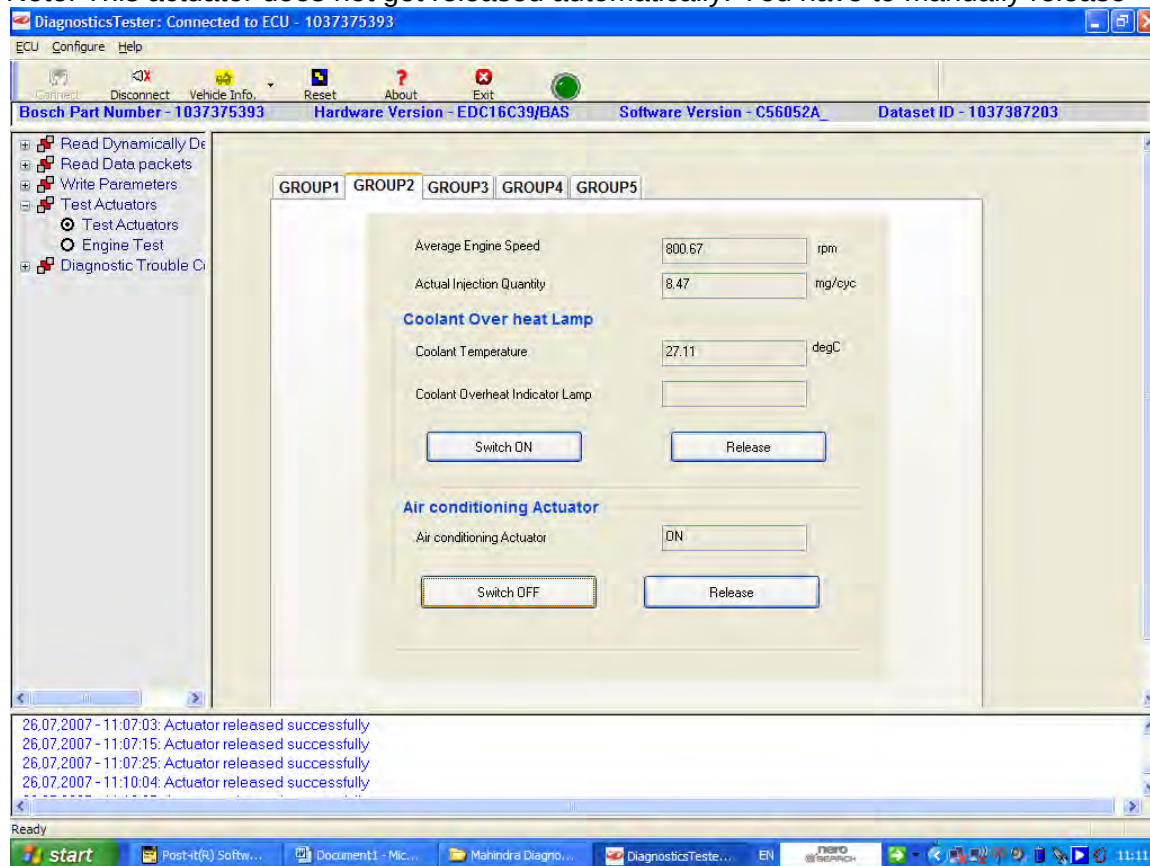
ACT # 3– Air Conditioning Actuator

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



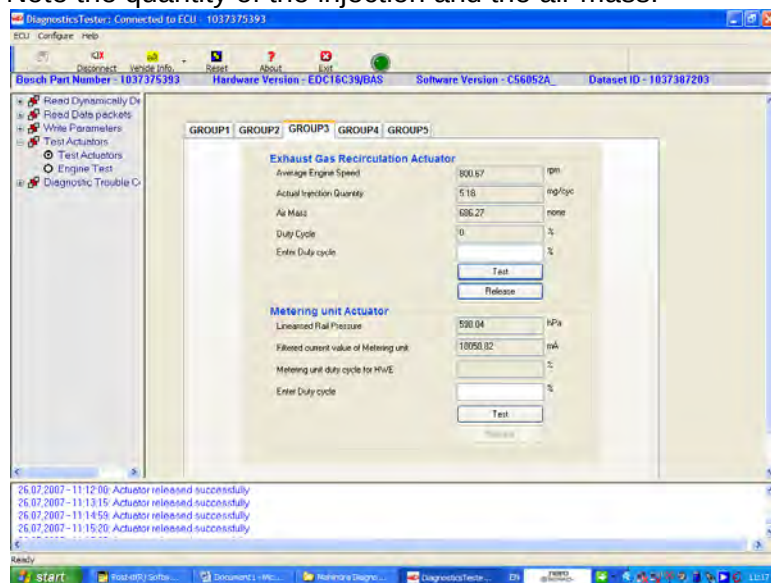
ACT #4– EGR Actuator

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.

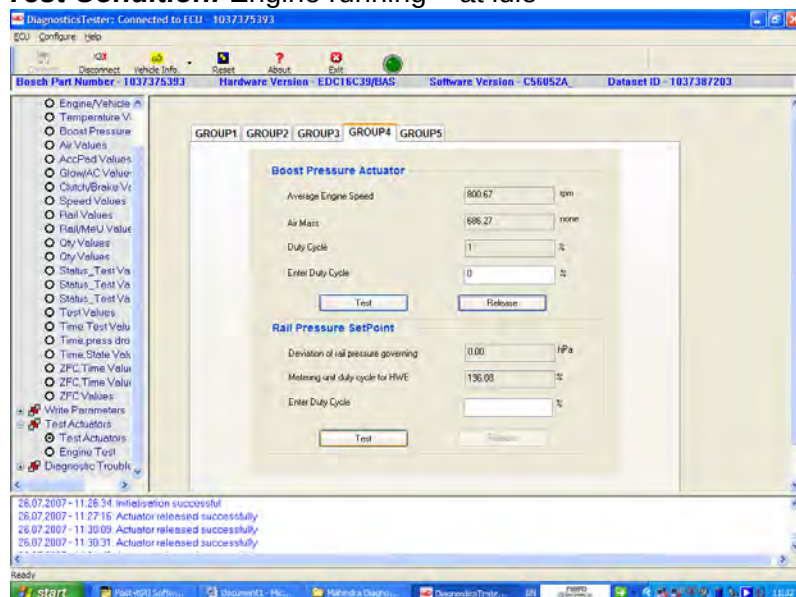
The air mass quantity and the injection quantity should change. The value are very small
Air mass by around 4 and fuel quantity change of around 0.47.

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 Diagnosis – 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 position 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 synchronisation 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
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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 Diagnosis – 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

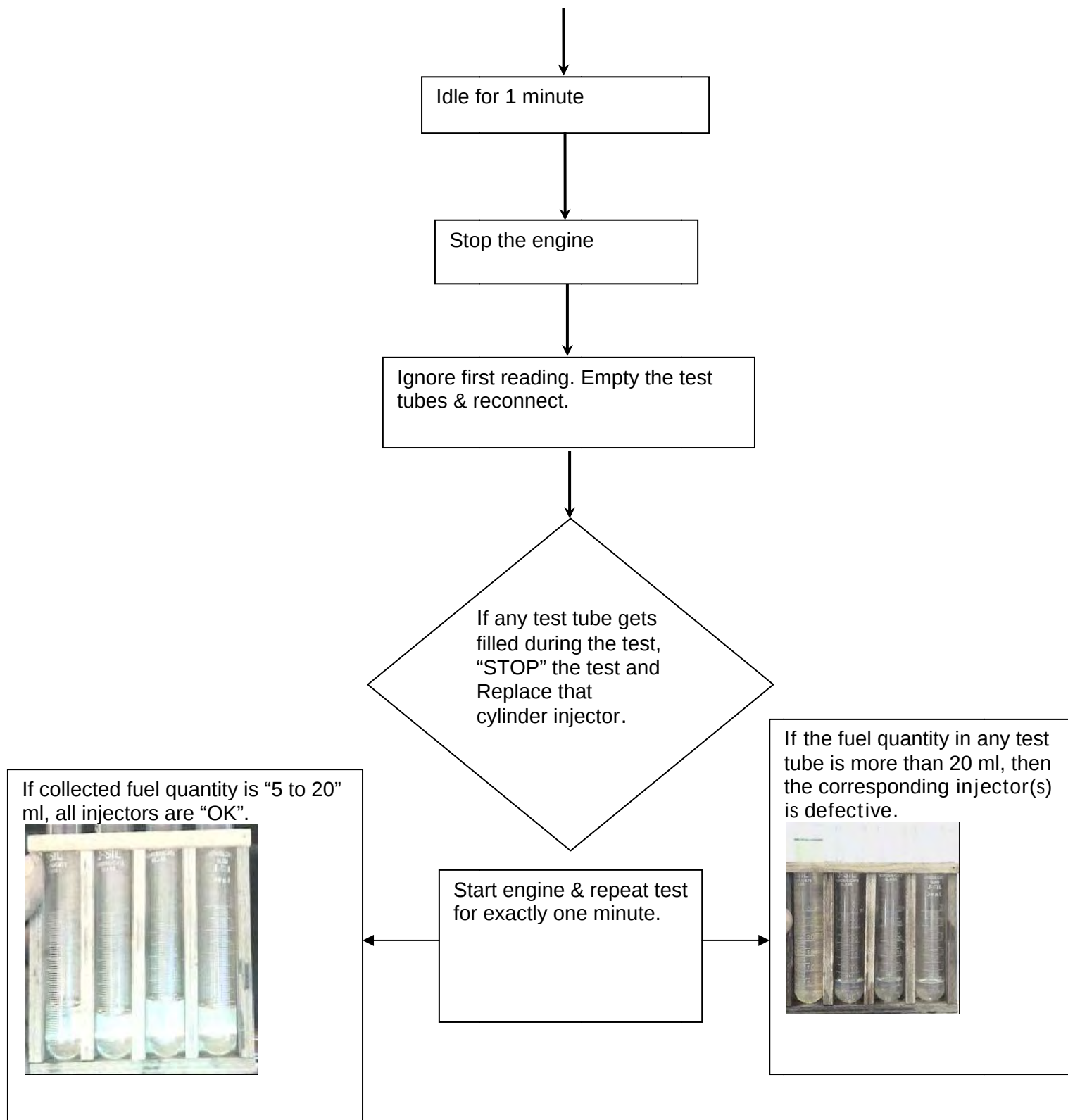
Insert injector overflow pipe firmly in Each Injector.



Over flow pipe inserted in the injector.

Start Engine.

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



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

Investigate & advise 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.

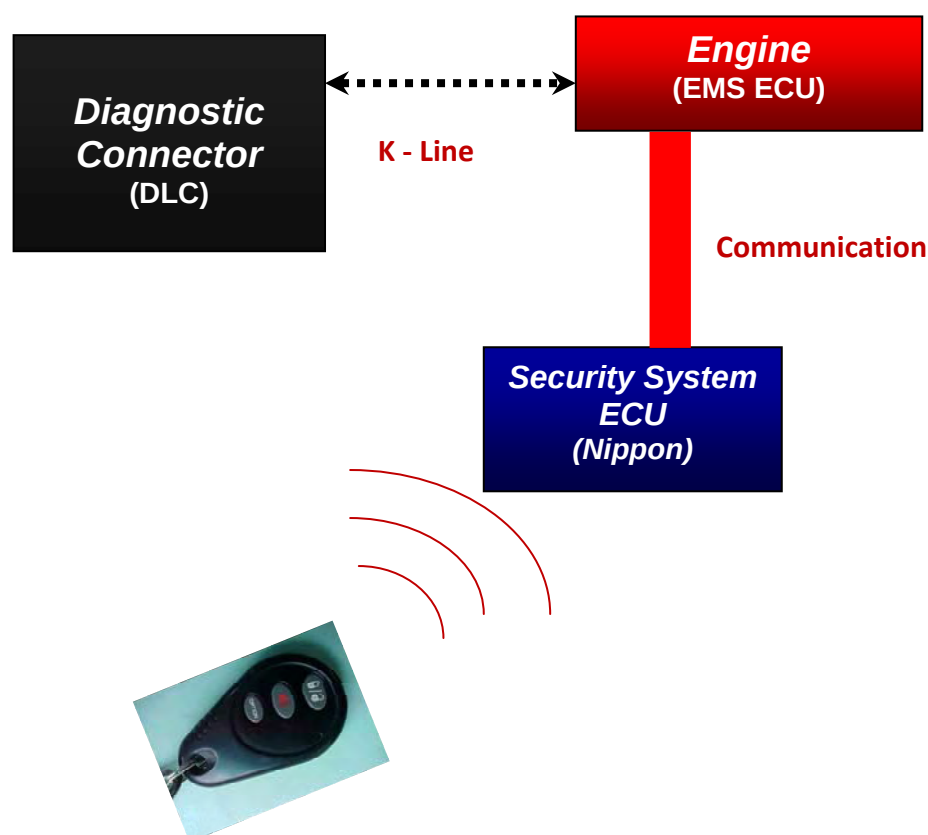
MPROP coil resistance

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 –

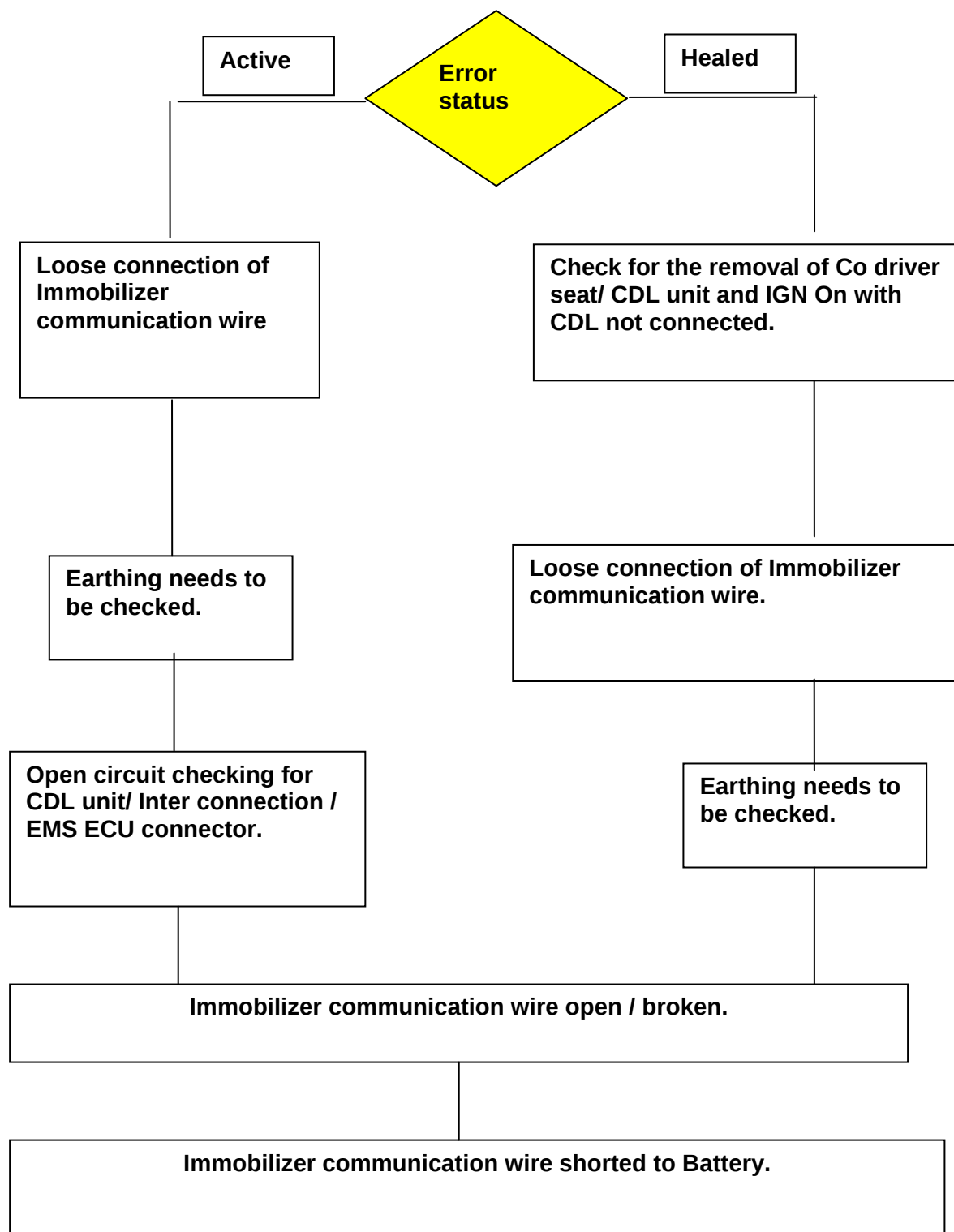
1. In the Analog immobilizer , the immobilizer function will become active , only if the vehicle is locked using the remote.
2. Using the mechanical key to lock the vehicle **will not activate** the immobilizer function.
3. The customer should be educated to change the PIN code of the immobilizer unit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

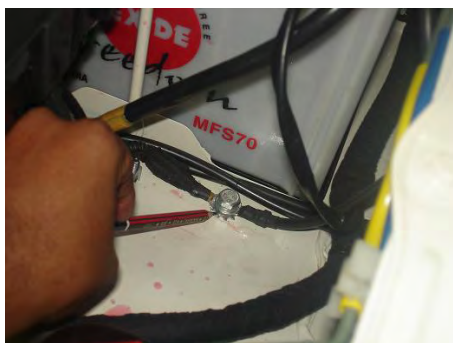
DTC detection condition	Probable cause
Normal operation - ECU receives signal from RKE, as authentic and allows the engine to crank. Malfunction - Correct signal not received Reaction - If Error present and active then - Check lamp is ON. - Engine will not start - If Error is healed but recorded in ECU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



Checking the earthing :

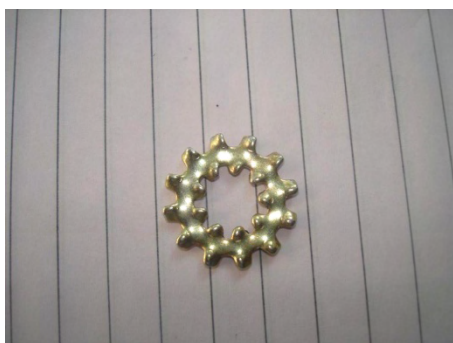
Main earth near the battery on the LH fender.
 Check for the star washer's presence.

P-1828

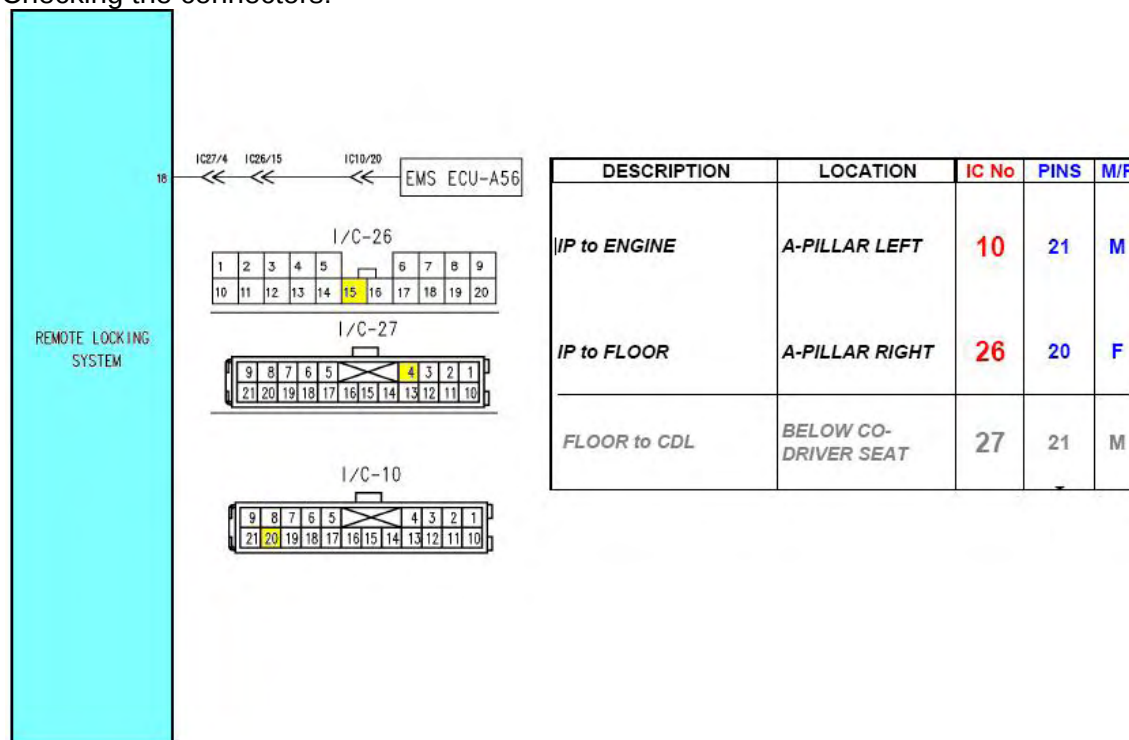


Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-

- A. If the washer is not there please add.
- B. If reversed- correct the orientation.
- C. If flattened- change.



Checking the connectors:



Immobilizer communication wire open or shorted to ground.

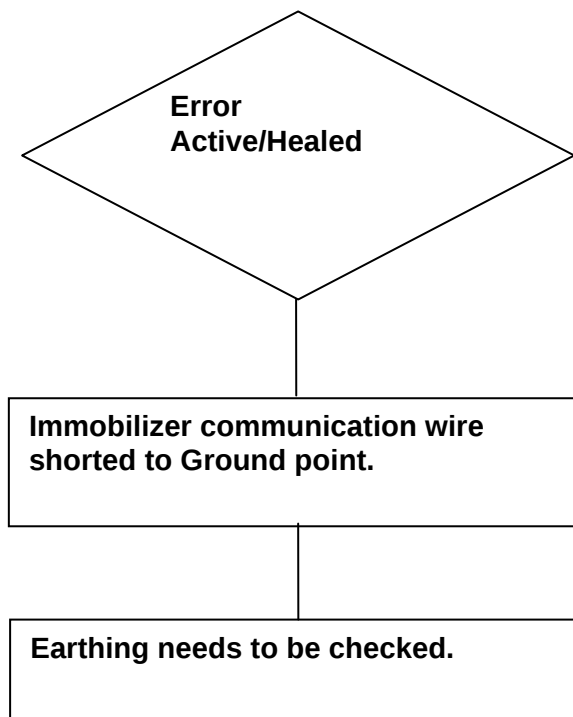
P-1829

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



Checking the earthing :

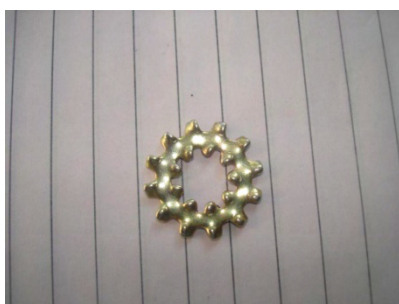
P-1829

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

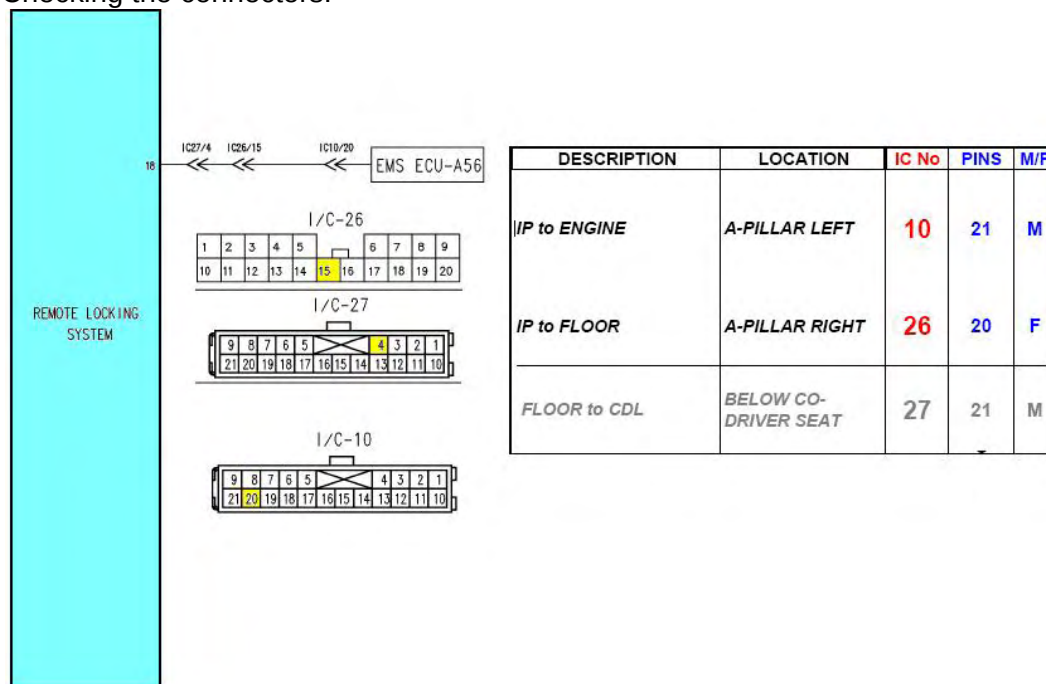


Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-

- D. If the washer is not there please add.
- E. If reversed- correct the orientation.
- F. If flattened- change.



Checking the connectors:



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 :

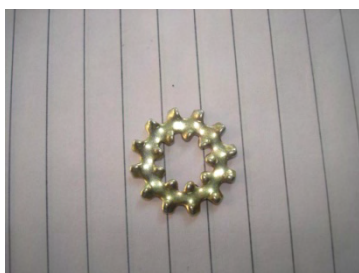
P-182A

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

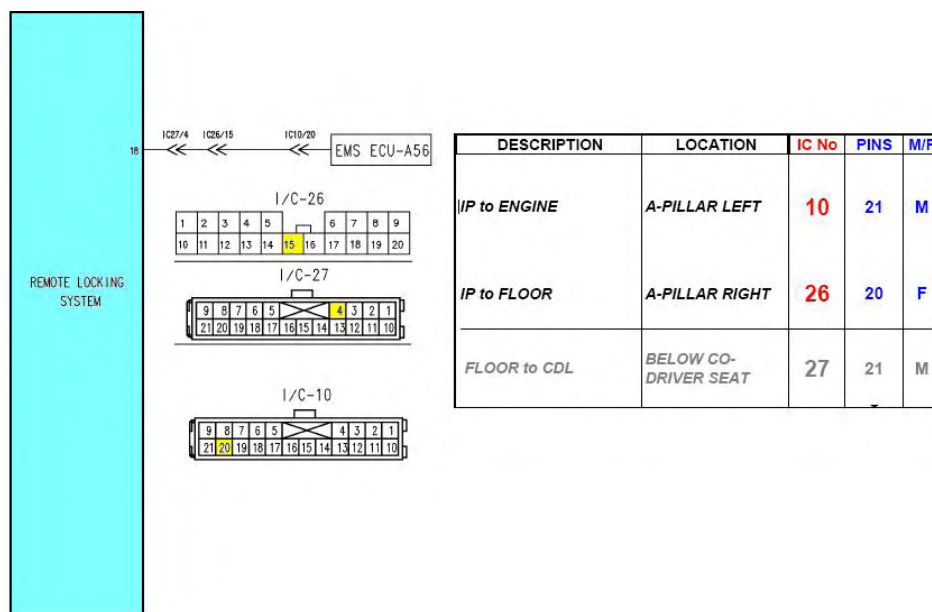


Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-

- G. If the washer is not there please add.
- H. If reversed- correct the orientation.
- I. If flattened- change.



Checking the connectors:



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 :

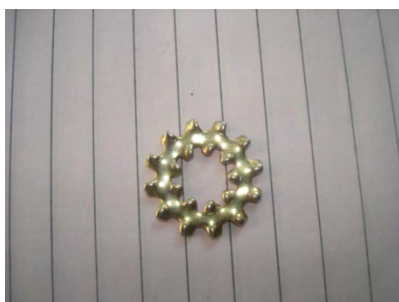
P-182B

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

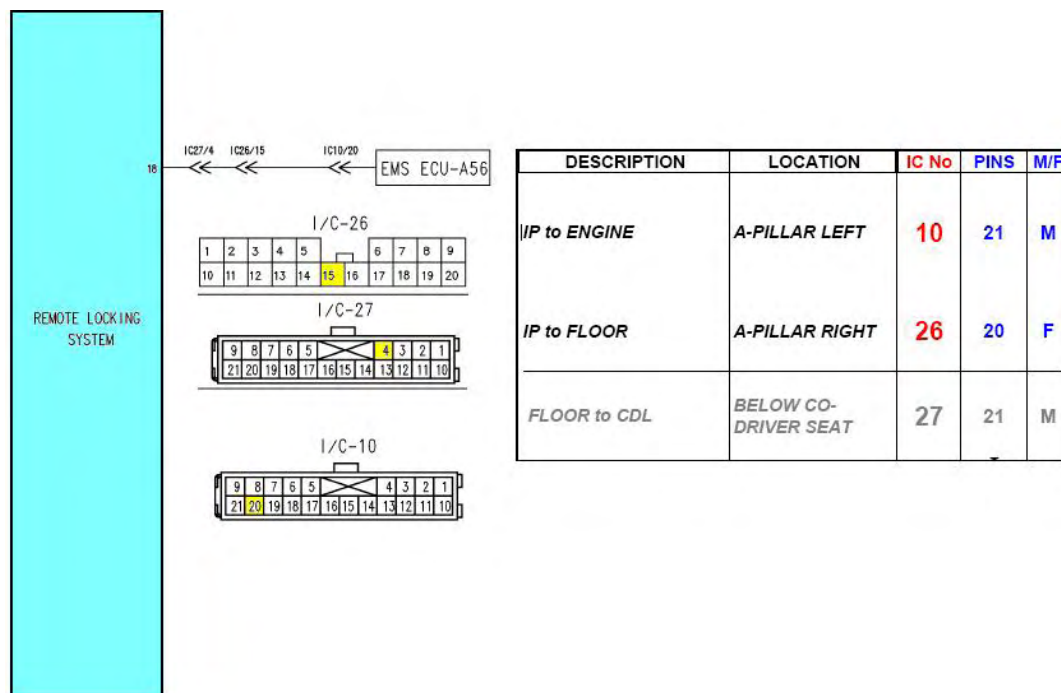


Remove the washer – ensure that the cutting edge is facing downwards. This will ensure that the paint is removed and proper earthing takes place.-

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



Checking the connectors:



Immobilizer controller has not received correct pattern (RF signal)

Immobilizer signal in error zone

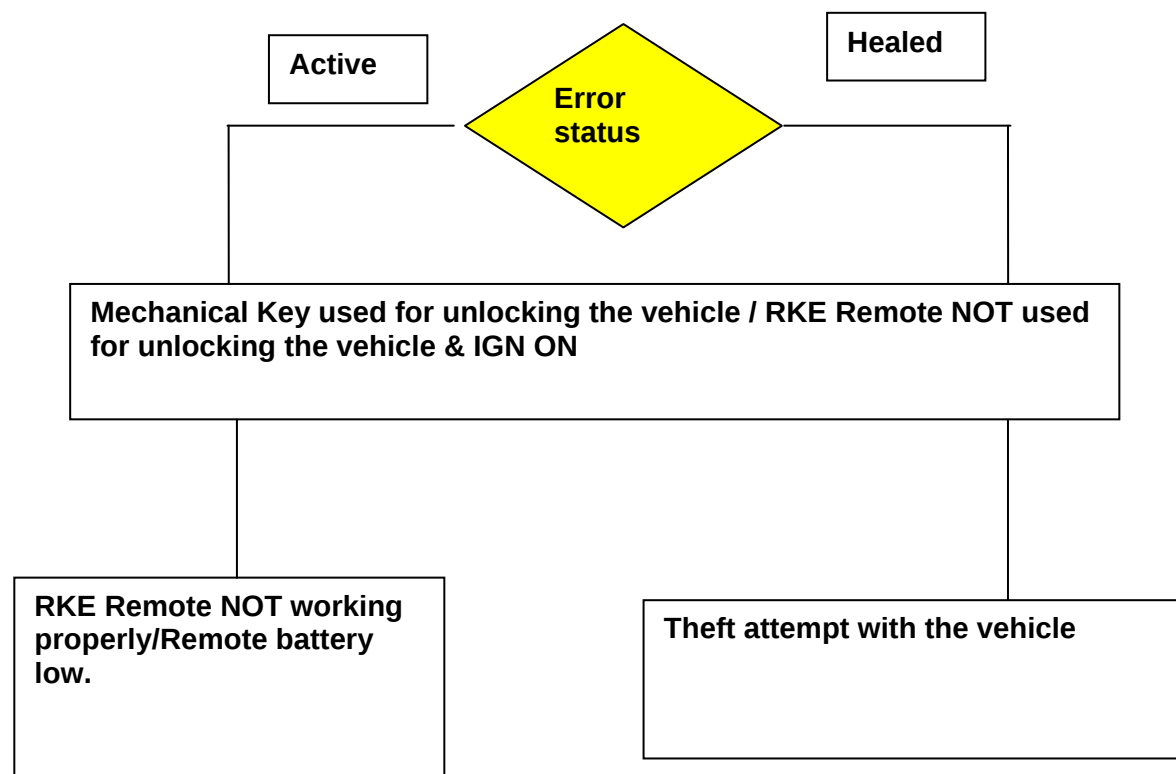
P-182C

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:



Release Notes

This manual supersedes the following earlier versions

MAN -00029, Rev 1 : 2.2 L + non transponder based immobiliser. 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.