Mahindra
Rise.

BS6

DIAGNOSTIC MANUAL

OBDI – Page No. 04 to 402

OBDII – Page No. 403to 448

1. General Information

The most basic check that must be made by the technician is to check the status of **Check Engine Lamp (CEL)**, **Malfunction Indication Lamp (MIL)** and other critical tell-tale lamps. If any of these critical lamps have illuminated (blinking or continuously ON), the fault needs to be identified using the dedicated MTBD BSVI Diagnostic Tool, understand root cause, troubleshoot the fault by making use of the information provided in the subsequent diagnostic manual.

Note: For analysing and troubleshooting fault codes in BSVI vehicles, only BSVI Diagnostic Manual & Tool is to be referred and not BSIV.

Driver Information System (DIS) Cluster: Critical Tell-Tale Lamps

Item	Description
1	NOx Malfunction Lamp (Add on Tell Tale in BS6)
2	DPF Regeneration Lamp (Add on Tell Tale in BS6)
3	Check Engine Lamp
4	Malfunction Indication Lamp (MIL)
5	Low AdBlue Level Indication Lamp

NOx Malfunction Lamp

DPF Regeneration Lamp

Driver Information System Cluster (DIS) – Active Tell-Tale Lamps

Note:

1. **Tell Tale LED's for RPM (In Tachometer) & DPF regeneration lamps are in tricolor: Green, Amber & Red**
2. **With reference to odometer reading, whenever the ECU & DIS cluster are connected, by default the highest odometer reading among the two will be displayed in the cluster.**
3. **ECU Odometer reading cannot be edited.**

2. ENGINE MANAGEMENT (EMS)

2.1 Overview

The EMS (Engine Management System) is responsible for controlling the amount of fuel being injected and for adjusting the injection timing. Optimum functioning of the EMS assures maximum engine power, with the lowest amount of exhaust emissions and the lowest fuel consumption.

EMS system is subdivided into:

1. Sensors

Detects the engine operating conditions and the driver's demand. They convert physical variables into electrical signals.

2. Electronic Control Unit (ECU)

Processes the information received from the sensors. It controls the electrical output signals to the actuators. It also provides interfaces with other systems like diagnostics tool, ABS, etc.

3. Actuators

Converts the electrical signal from the ECU to control physical variables such as changing injection rate and timing using Injectors and Inlet Metering Valve

4. Torque Limitation

This is a situation where the vehicle's maximum torque is limited up to a specific percentage.

5. Speed Limiting Mode

This is a situation where the vehicle torque is reduced such that the vehicle speed does not increase beyond a specific speed.

6. Engine Speed / RPM Limiting Mode:

This is a situation where the engine RPM is limited up to a certain value.

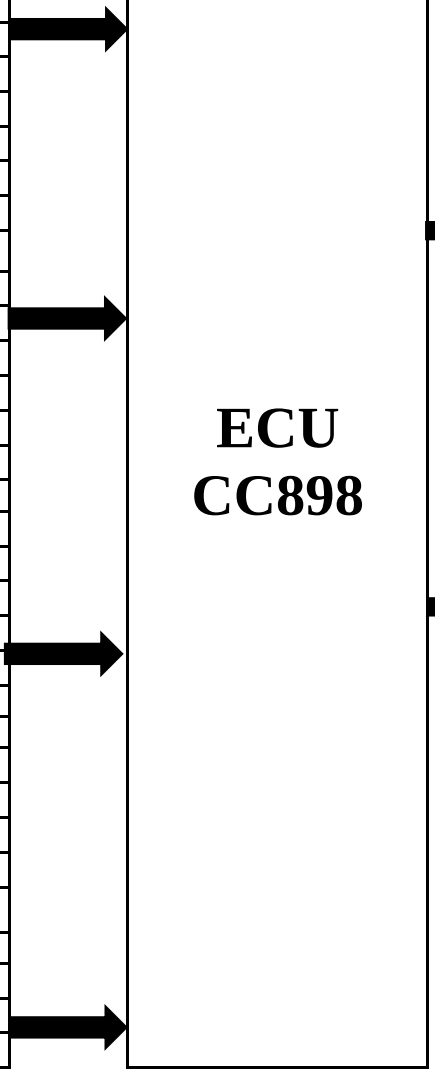
7. Driving Cycle

Start the engine by turning the ignition switch and let the engine run for a few seconds. Then turn it OFF. This is considered a single driving cycle. Even if the engine runs for 3 seconds or 3 hrs. after cranking the engine, it is considered a single driving cycle. In BSVI vehicles if the CEL / MIL / Fault codes are to be cleared from the DIS Cluster without clearing from ECU memory, then the engine must be given a maximum of 4 driving cycles.

8. CEL & MIL Normal Condition: When the engine is operating / running, the CEL & MIL will be off.

SENSORS

- Crank Shaft Position Sensor
- Cam Phase Sensor
- Coolant Temperature Sensor
- Oil Pressure Sensor
- Boost Pressure & Temperature Sensor
- Rail Pressure Sensor
- EV Fan Speed Sensor
- TEGR Temperature Sensor
- Exhaust Throttle Valve Position Sensor
- EGR Valve Position Sensor
- Accelerator Pedal Sensor
- Brake Switch
- Clutch Switch
- Exhaust Brake Switch
- Multi-Mode Switches -Light/Heavy/Turbo
- A/C Request Switch
- A/C Pressure Switch
- DPF Regeneration Switch
- DPF Regeneration Inhibit Switch
- Barometric Sensor
- HFM Sensor
- T21: Temperature Sensor (Intercooler)
- T0: Temperature Sensor (Chassis)
- Water in Fuel Sensor
- Neutral Switch
- Vehicle Speed Sensor
- NOx Sensor – Upstream
- T4: Temperature Sensor (DOC Inlet)
- T5: Temperature Sensor (DOC Outlet)
- Differential Pressure Sensor (Delta P)
- T6: Temperature Sensor (DPF Outlet)
- NOx Sensor - Downstream
- Ad Blue Header unit – Level, Temperature, Quality Sensor
- Ad Blue Supply Module Pressure Sensor
- Fuel Float Unit (Fuel Level Sensor)



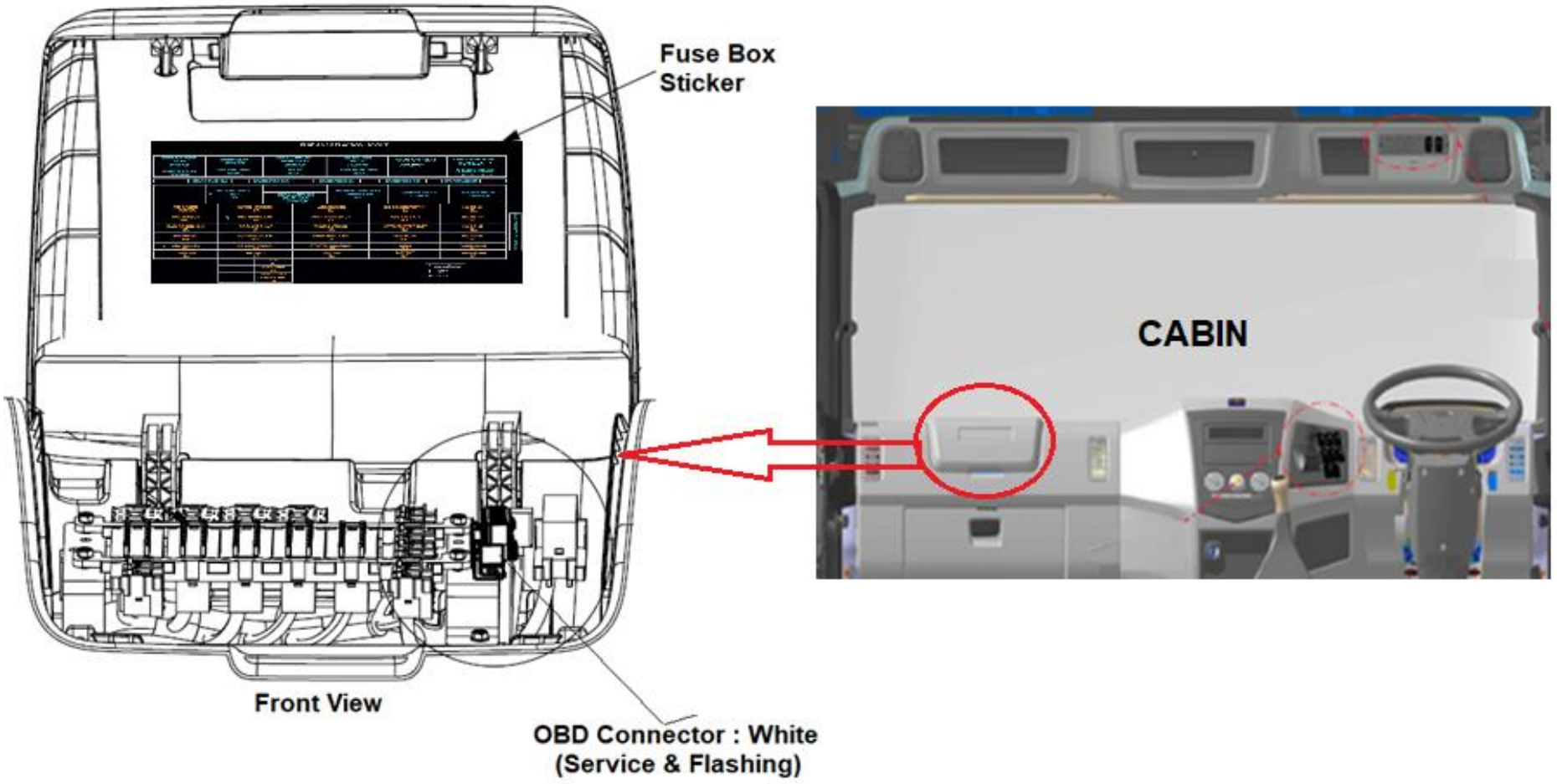
ACTUATORS

- Inlet Metering Unit
- Fuel Injector
- EGR Valve - Solenoid
- EV Fan Solenoid
- Water in Fuel Lamp
- Tachometer, Speedometer, Temperature Gauge
- Check Lamp
- MIL
- NOx Malfunction Lamp
- Ad Blue Warning Lamp & Ad Blue Level Indication
- Fuel Gauge, Oil Pressure Gauge, Odometer reading
- DPF Regeneration Lamp
- Multi-Mode Switch LED'S – Light, Heavy, Turbo
- Exhaust Brake Indication
- Gear Position Indication
- Starter Relay
- Diagnostic Outlet
- A.C Control Relay
- Exhaust Throttle Valve – Solenoid
- Supply Module Pump
- Dosing Module (Ad Blue Injector)
- Coolant Pump Relay
- Supply Module Reverting Valve

2.2 MTBD Guidelines for Diagnostic Troubleshooting

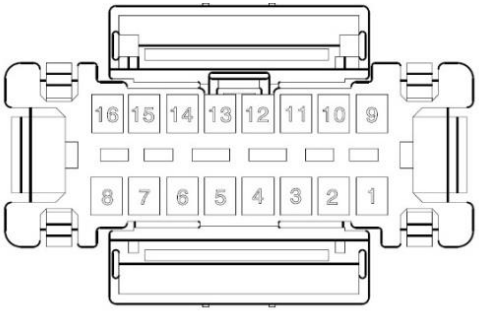
The most basic check that must be made by the technician is to check the status of **Check Engine Lamp (CEL)**, **Malfunction Indication Lamp (MIL)** and other critical tell-tale lamps. If any of these critical lamps have illuminated (i.e either blinking or continuously ON) during engine operating condition, then the fault needs to be analysed using the dedicated MTBD BSVI Diagnostic Tool 3.4.1

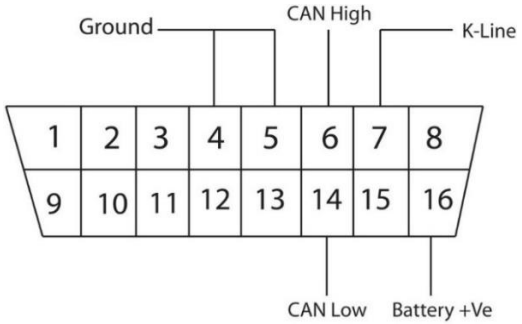
2.2.1 EMS Diagnostics Connector



White Connector: This is a 16-pin D-type connector provided to carry out:

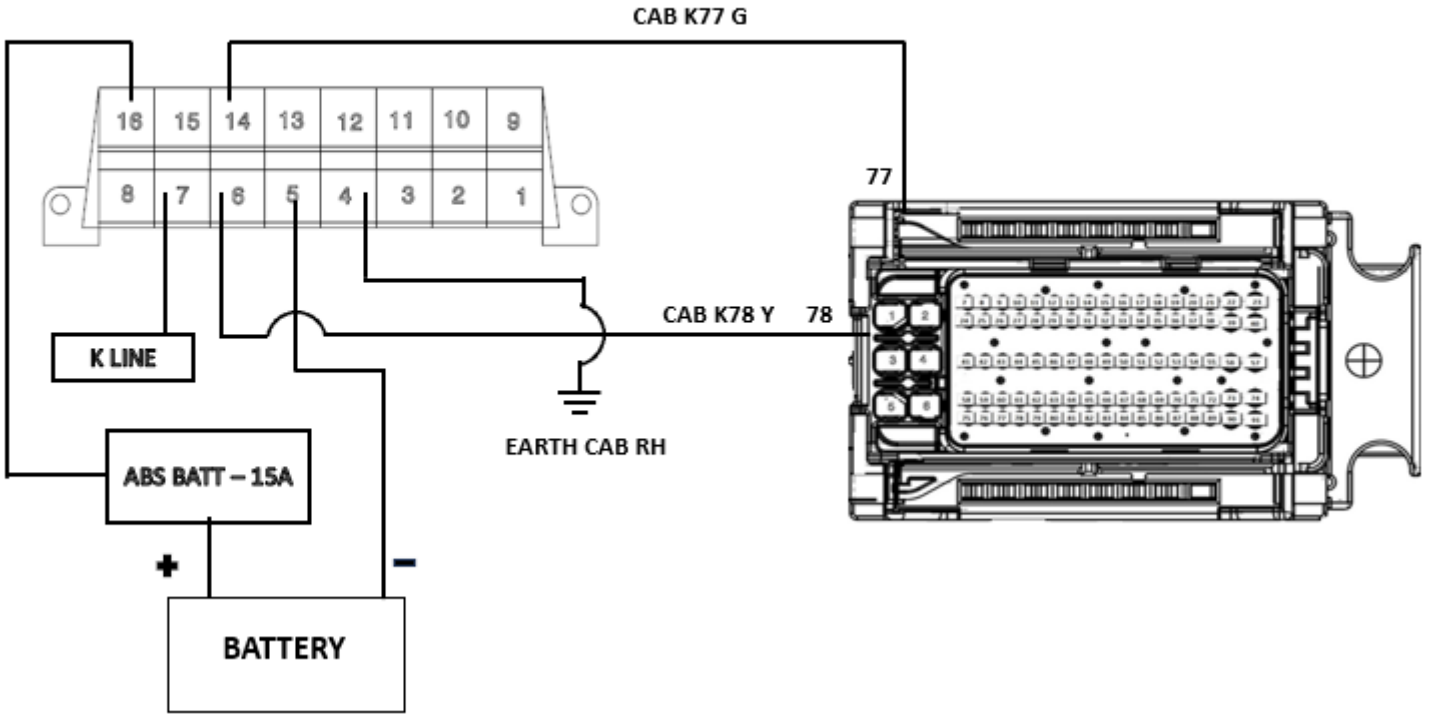
1. **Service Functions:** For trouble shooting & erasing of fault codes stored in the ECU memory, live data monitoring, Service functions like Speed Limit & PRV count / time writing, Fuel Injector IQA values writing etc)
2. **Flashing Functions:** Flashing of the ECU with the required dataset. Diagnostics tool / tester with the mating connector can be plugged in to this 16-pin connector.





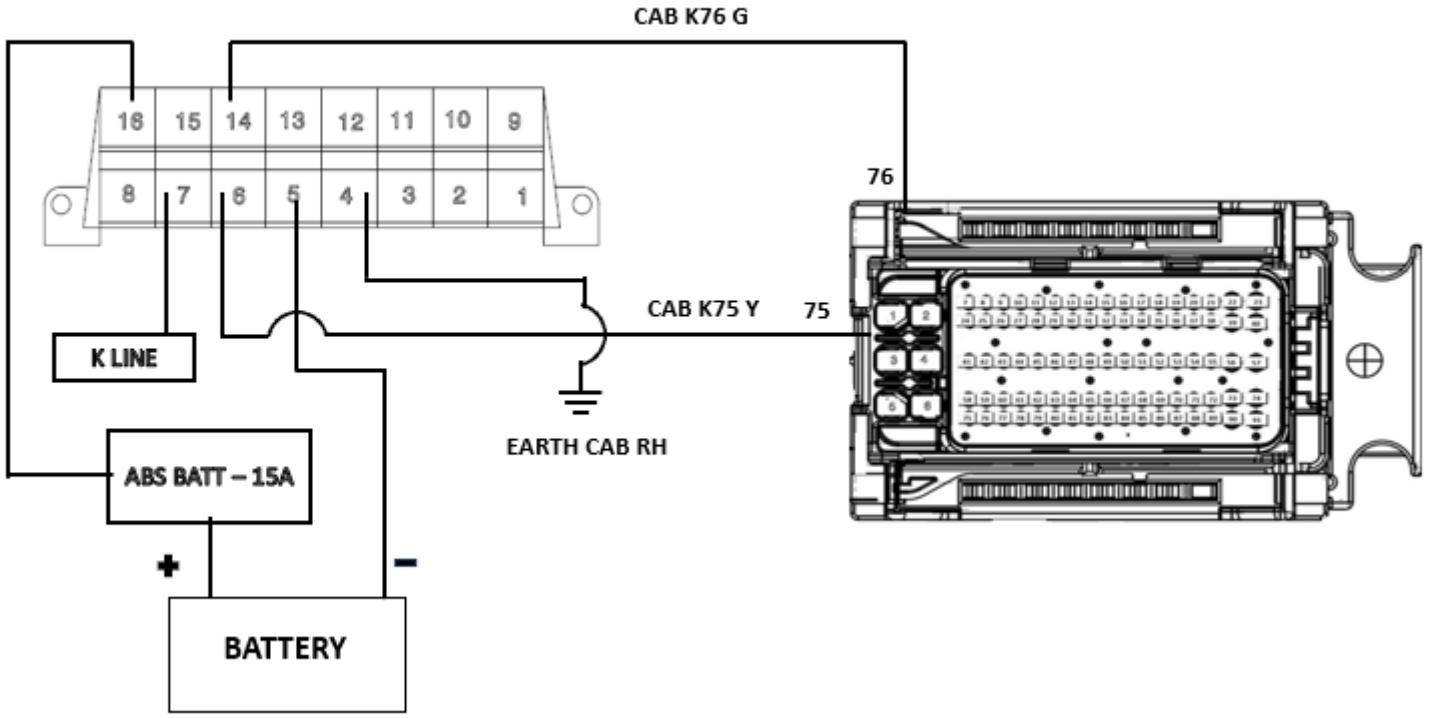
Black Connector: This is a 16 pin D-type connector is provided for Service functions for diagnosing fault codes pertaining to ABS ECU only. Diagnostics tool / tester with the mating connector can be plugged in to this 16-pin connector.

DIAGNOSTIC CONNECTOR SERVICE



CAUTION
Always ensure that the diagnostic connector is covered with cap when not in use.

DIAGNOSTIC CONNECTOR ABS ECU



3. BSVI DIAGNOSTIC TOOL

3.1 Garuda Diagnostic Tool (GARUDA II)

Garuda tool is used to communicate with the vehicle's Electronic Control Unit (ECU). It is used to connect the ECU with the diagnostic software to display the vehicle live parameters, fault codes and to clear them / write them as per requirement wherever applicable and to reprogram (flash) the ECU and DIS Cluster with corresponding Data sets.

- **USB:** USB light will glow, when it is connected to the computer successfully.
- **Link Status:** Link Status will blink when the computer is communicating with the ECU through the Garuda tool.
- **Power:** Power will glow when the Garuda tool is connected to the vehicle's OBD connector.

NOTE
• *If the "USB" LED lamp does not glow, it indicates a probable issue with the Garuda drivers installed in the computer or a loose connection in the Garuda connector.* • *If the "Power" LED lamp does not glow, it indicates a probable loose connection to the Garuda tool or no supply in the vehicle's OBD connector.*

3.2 Diagnostic Software

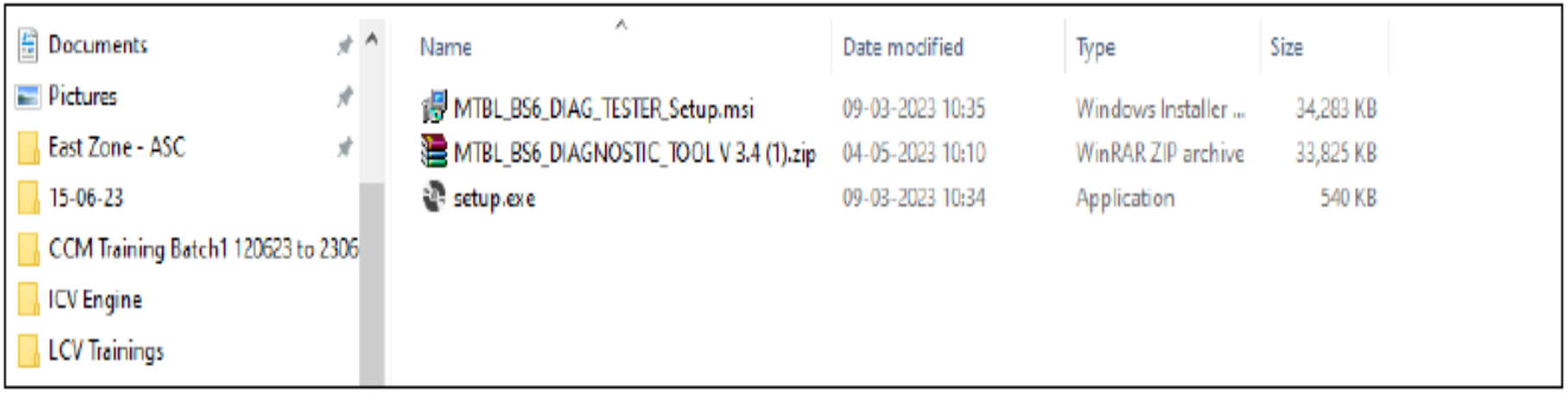
3.2.1 Operating system & Interface device compatibility requirement

- Interface Device: **Garuda II** only (**Garuda I** is not compatible for BS6 application). Note that Garuda II drivers need to be updated accordingly.
- Operating System: Windows 7 or above (32 bit or 64 bit) with **"Administrative Rights"** enabled in the system.
- Recommended System Configuration: Intel i3 processor or above, 4GB RAM or above.
- The diagnostic software set up file needs to be saved in **D or E** Drive in the system.

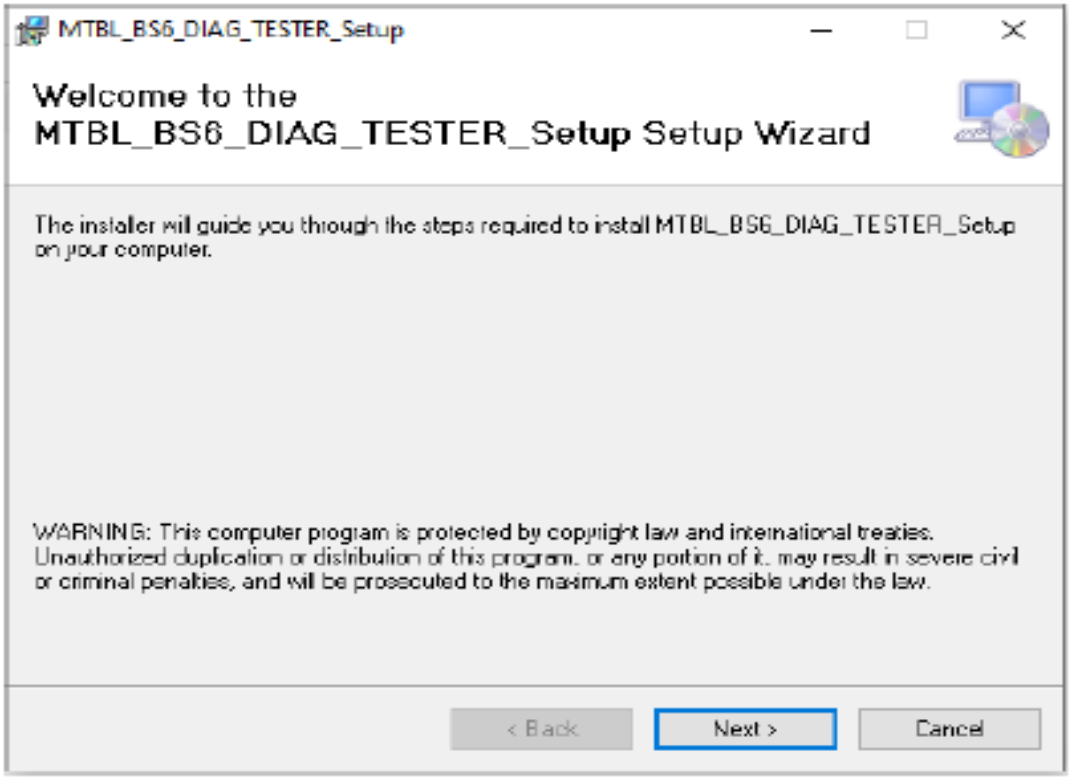
3.2.2 Diagnostic Software Operating Guidelines

Set Up File Installation Procedure:

Download the set-up file **"MTBD_** BS6_DIAG_TESTER_SETUP" (.exe/ Application file which is highlighted below with brown border) in **D or E** Drive and double click on the same.

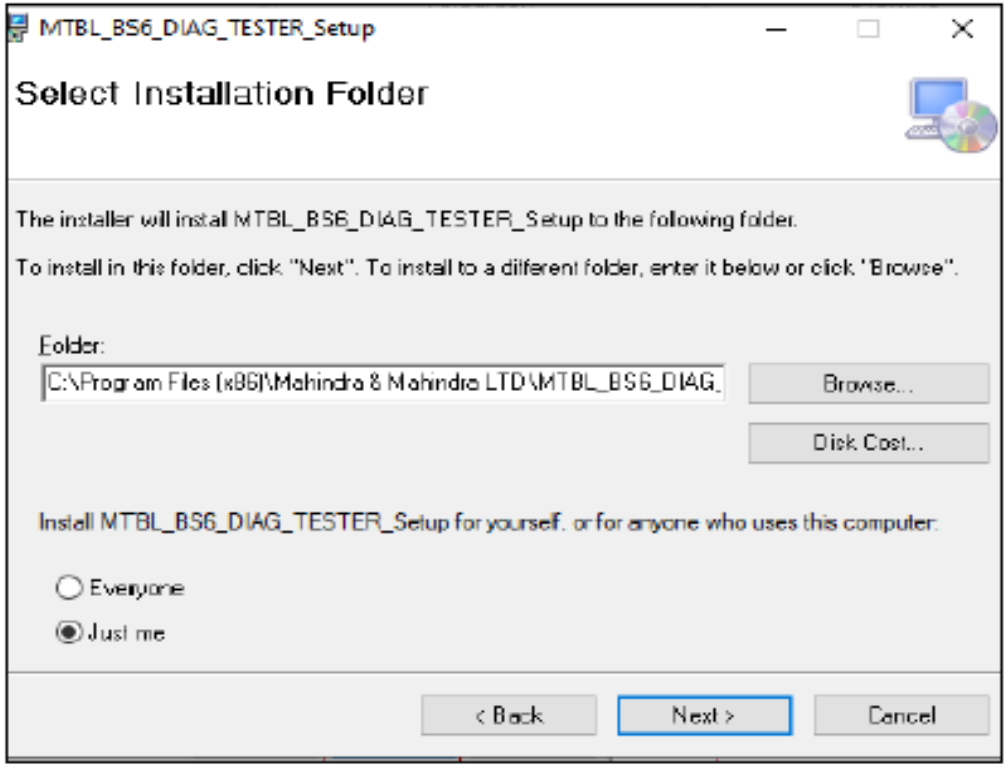


Once double clicked on the application file, below dialog box appears on screen. Click on **“Next”**

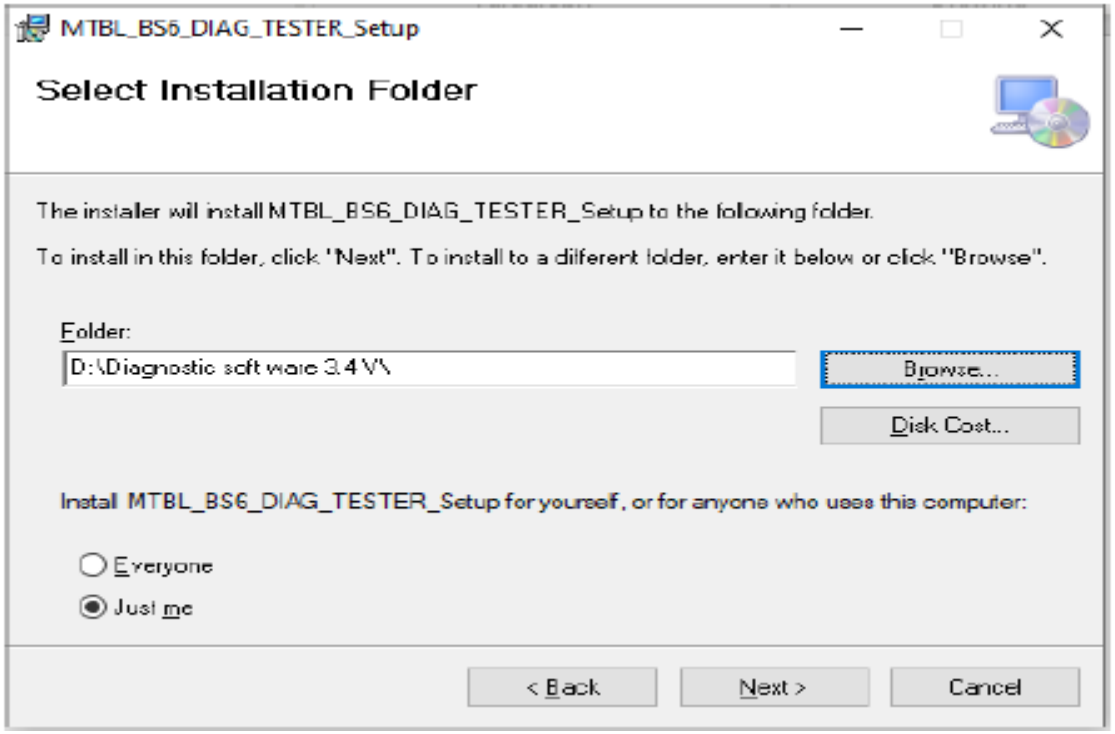


Click on “**Next**” button to proceed.

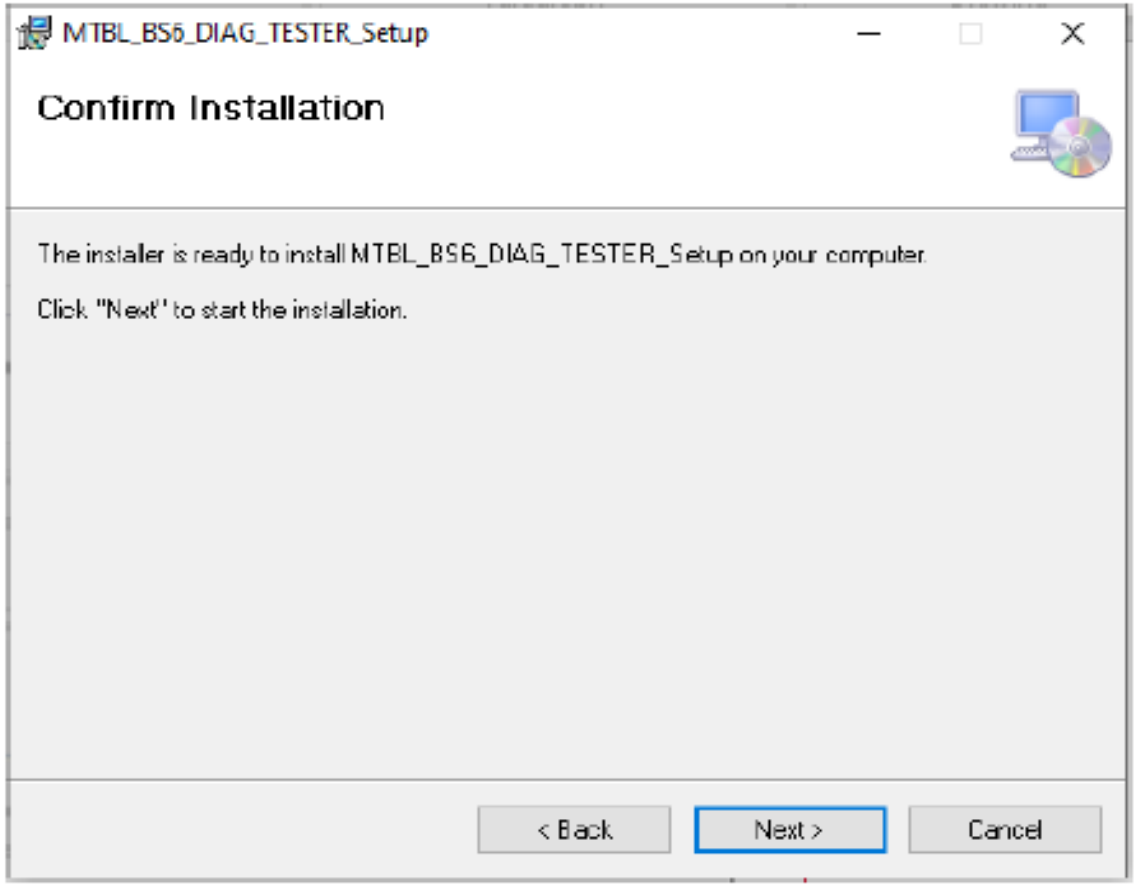
Note: Need to change the path from “c”’ to the folder where the diagnostic software is saved.



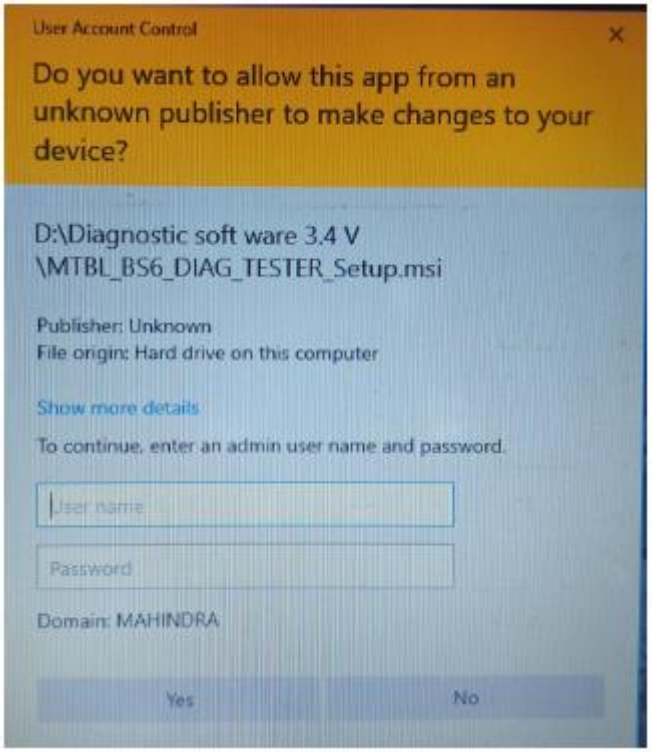
Click “**Next**” to proceed installation.
Wait for a few minutes until the installation is completed.



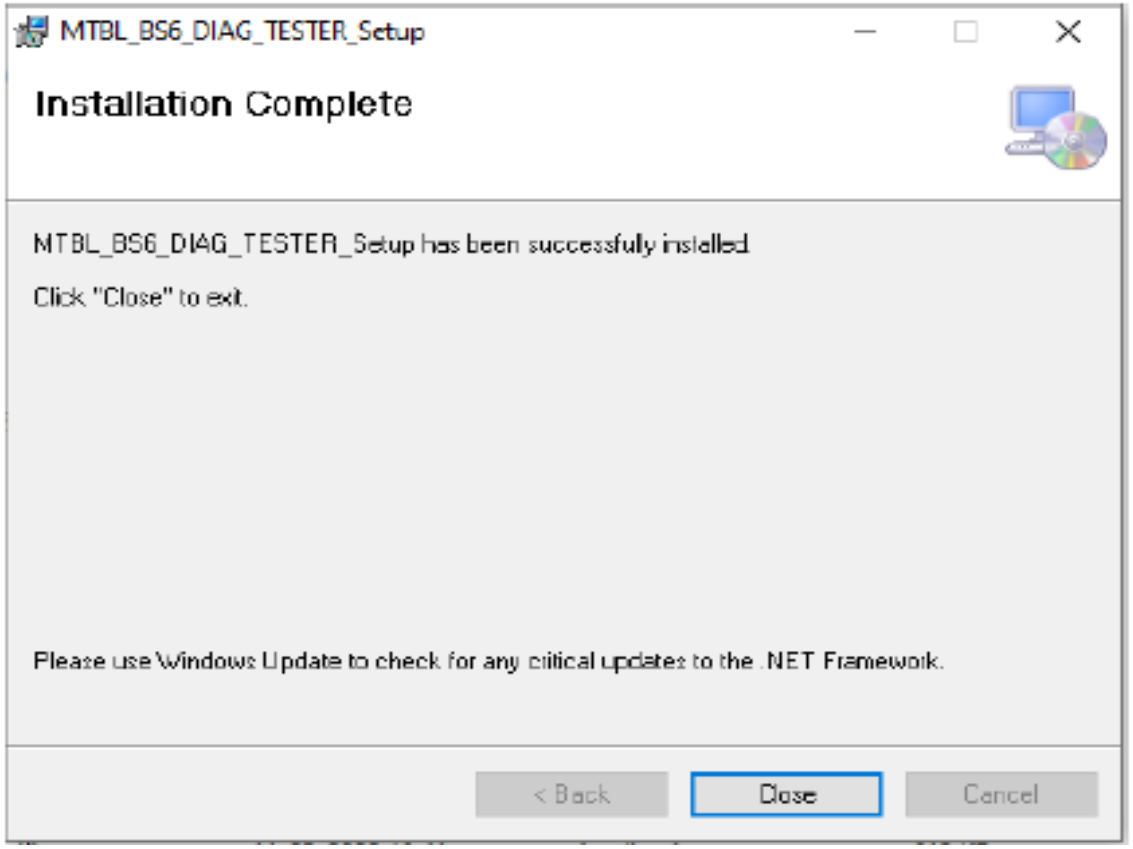
Click on “**Next**” button to proceed.



Need to enter Username & Password and click “Yes’’



Once installation is complete; **Finish** button appears on screen. Click **“Finish”** button to proceed.



Desktop shortcut will be created as shown below.

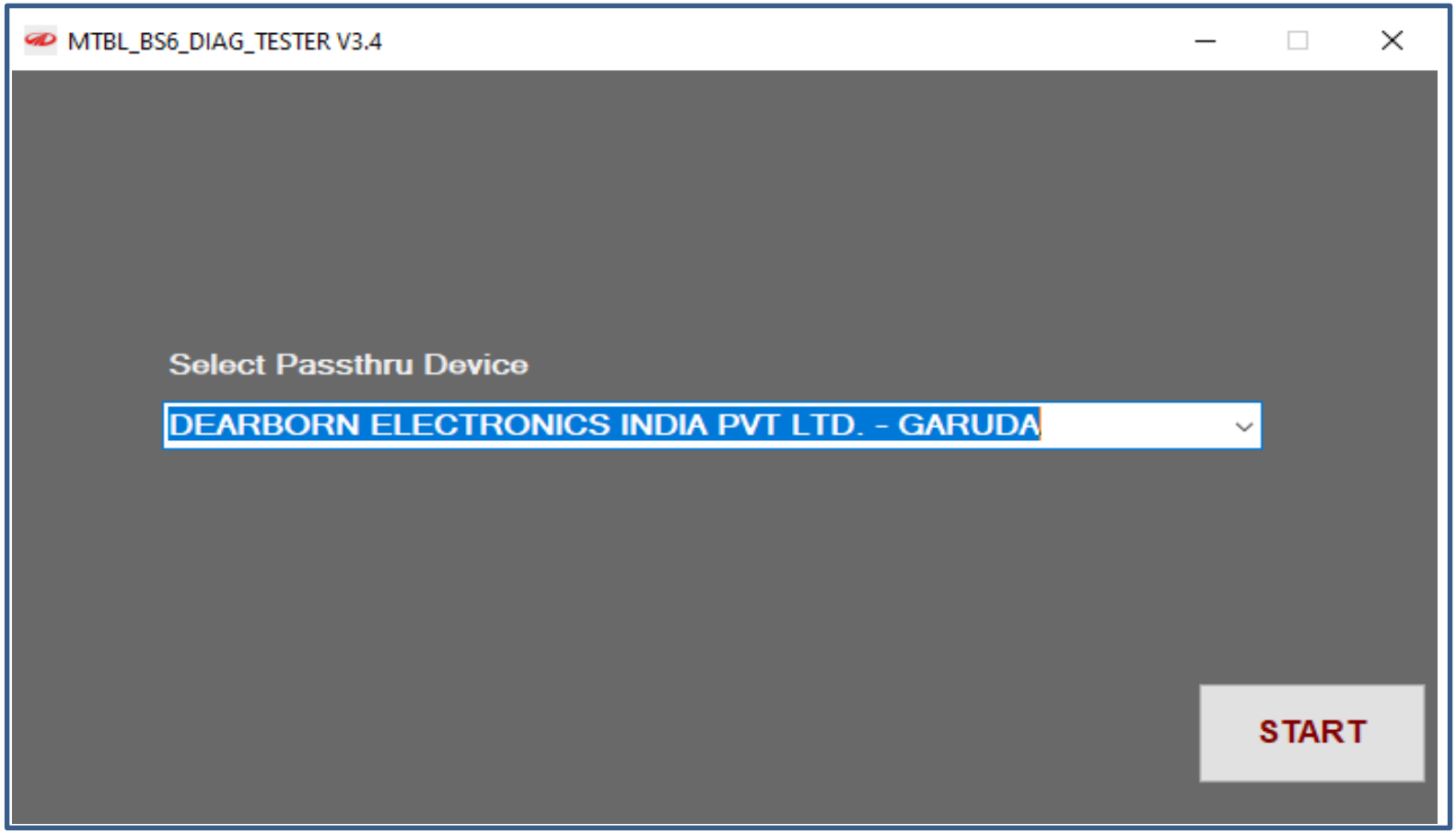
Note: For Diagnostic Tool Configuring Procedure please connect the Garuda II with white connector.

Diagnostic Tool Configuring Procedure:

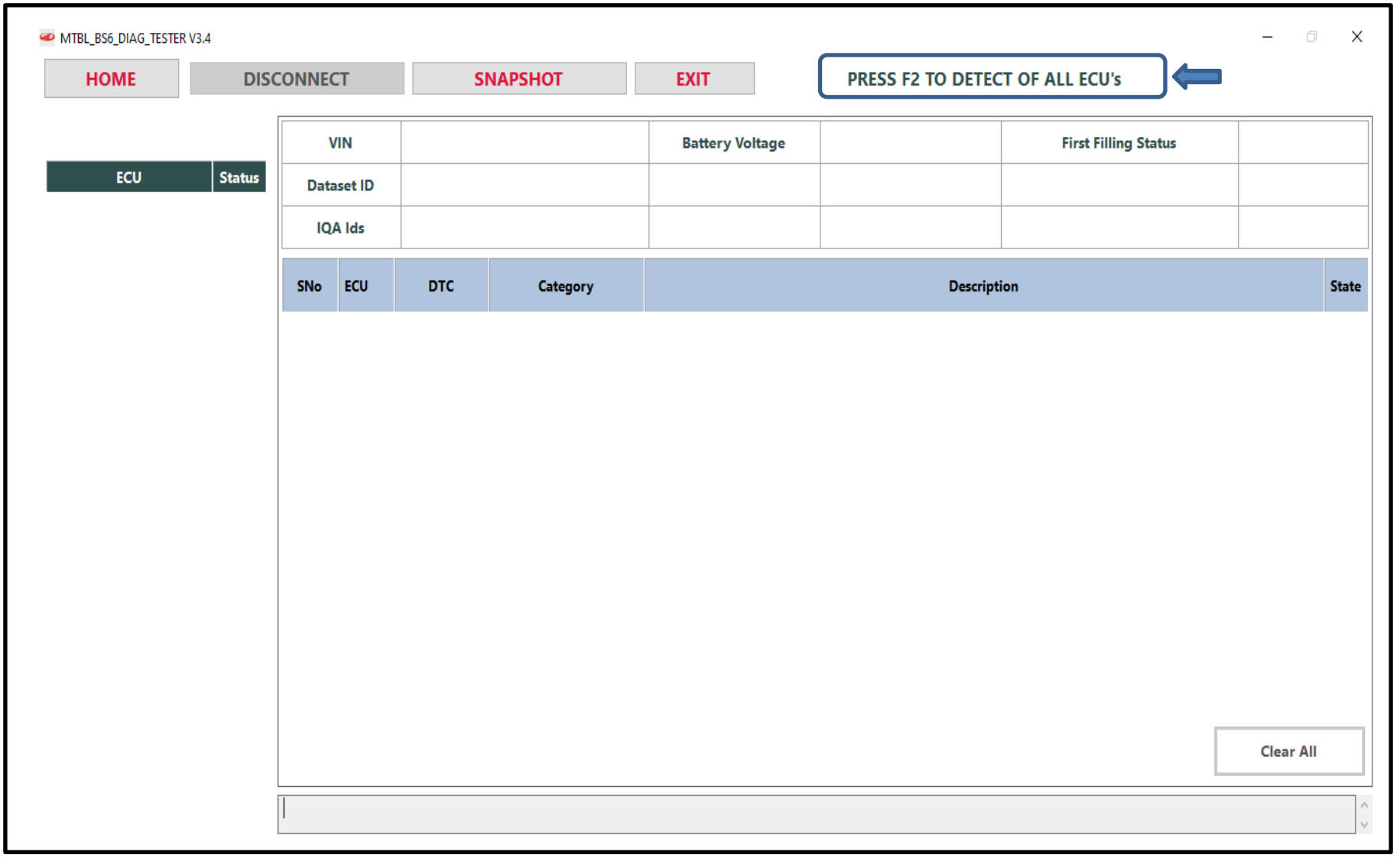
Double click on MTBL_BS6_DIAG_TESTER v3.4.1 desktop Icon to open diagnostic tool software.

Press F2 key for VCI Selection

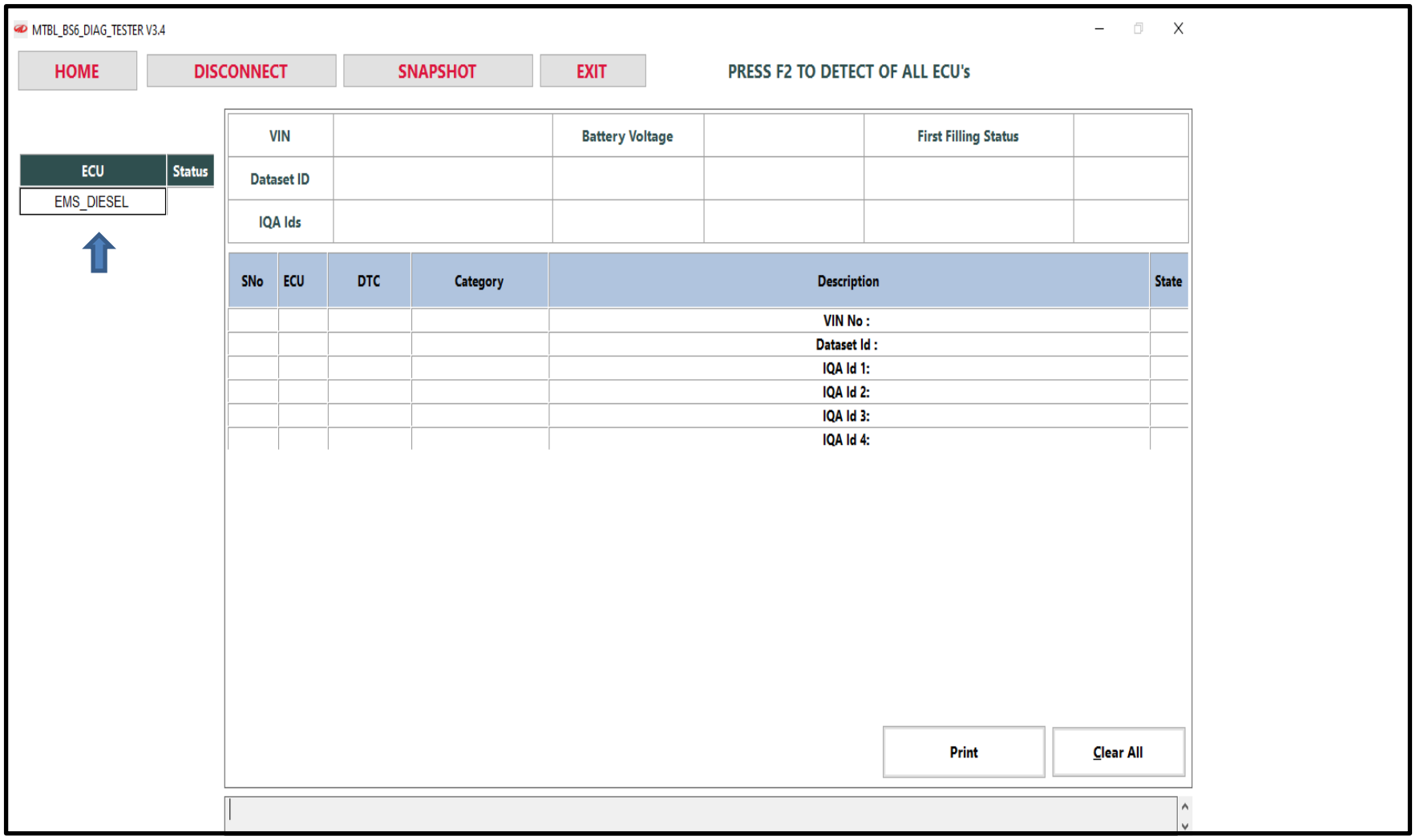
Select the pass-through device DEARBORN ELECTRONICS INDIA PVT LTD.— GARUDA from the drop-down list and click on START.



Press F2 key to detect ECU.

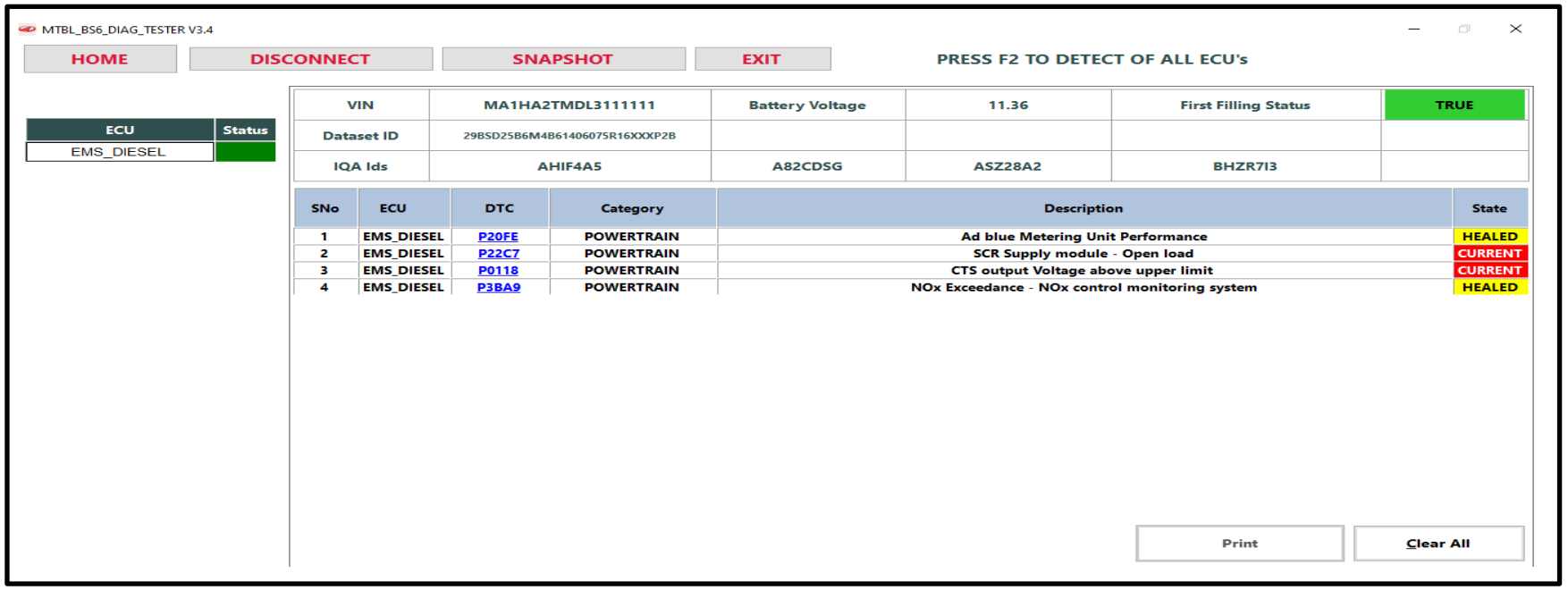


Select EMS_DIESEL option.



Once ECU connected; tool is ready to operate.

Home Screen



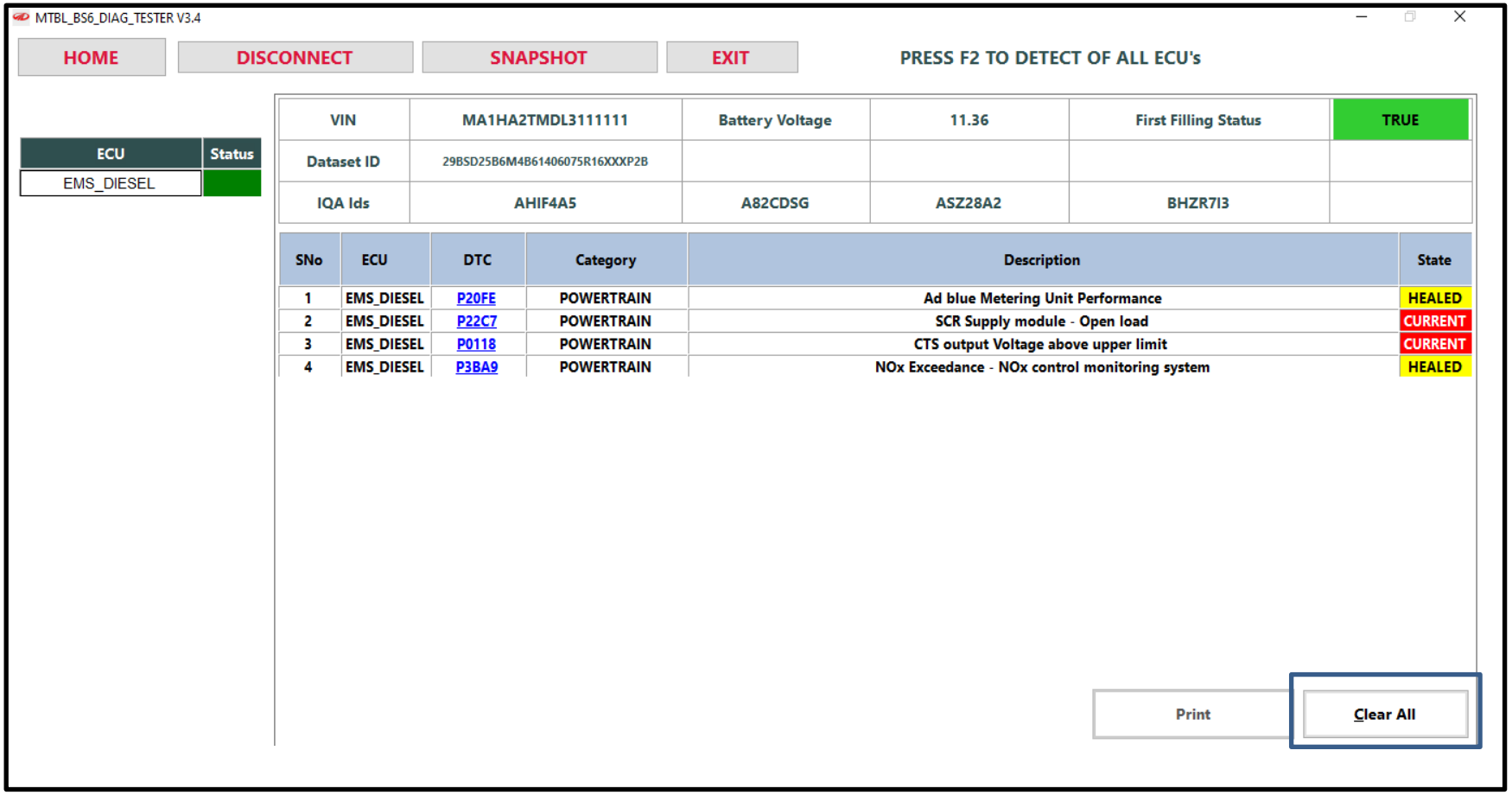
Note

The home page is mainly for end-of-line users to check vehicle status and take a print.

1. On the home page, it shows complete vehicle details.

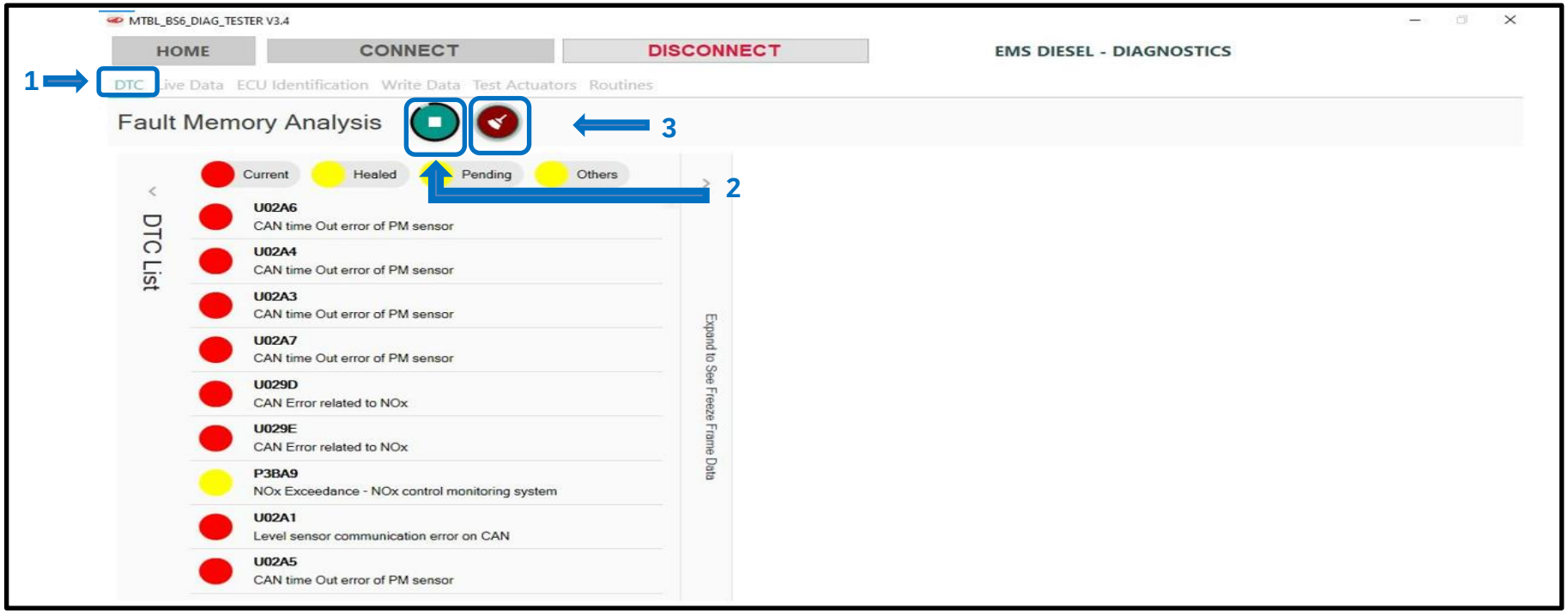
- Vehicle identification number (VIN)
- Dataset ID
- Injector IQA code
- Battery voltage status:12V/ 24V
- First filling status TRUE/FALSE of the AdBlue tank (D25 & D35Ds)
- Page Snapshot

If a DTC is present, it will be displayed on the home page, and you can clear it from the options provided below once the issue has been resolved.



To access the ECU Diagnostic page, select **EMS_DIESEL**. When the ECU EMS_DIESEL Status is connected, the colour green appears, and when it is disconnected, the colour red appears.

DTC Reading



1. Click on **DTC** to diagnose the vehicle or to check the fault codes, errors, or DTC from the vehicle.

2. Click on Auto Refresh DTC's (the play button) to start tracing the fault codes or errors from the vehicle (this process of tracing out the error will last until the circle around the Auto Refresh DTC's or play button rotates).

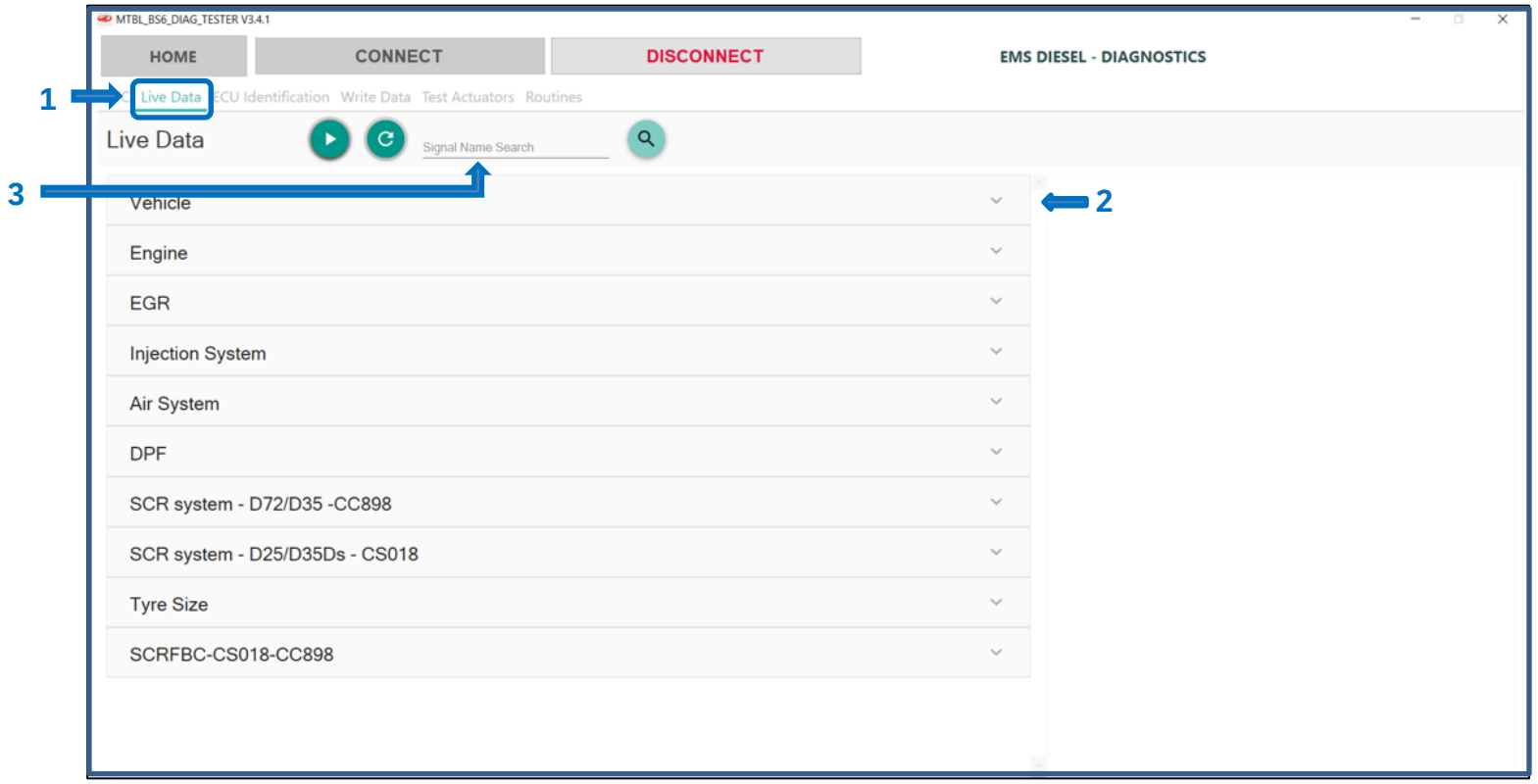
3. Click on to clear the fault codes from the vehicle.

Note

Errors Active

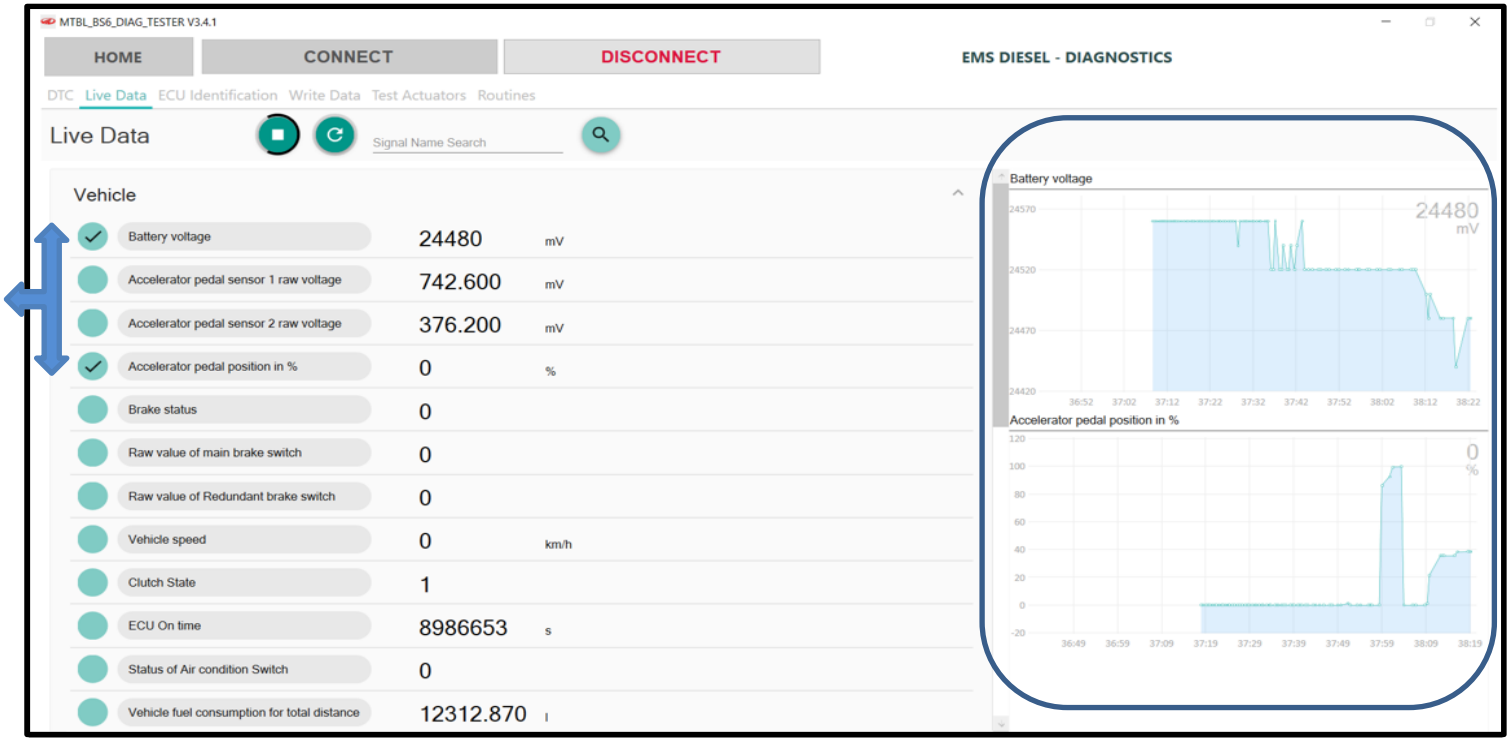
Errors History

Live Data



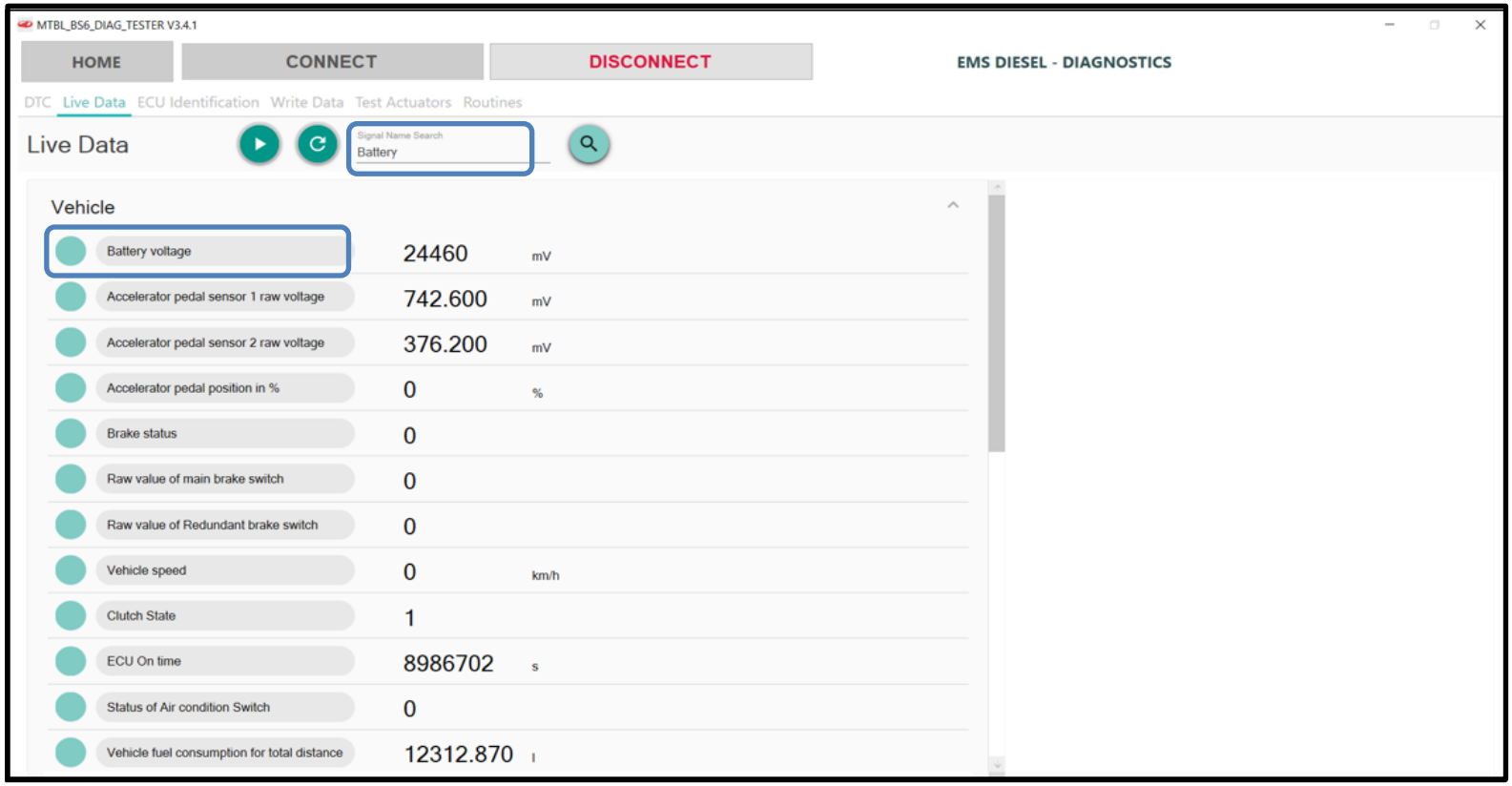
1. Click on **Live Data** to monitor or check the live parameters of the vehicle.
2. Select the group accordingly.
3. Click on the play button to start the visualization of live data.

4. Select the parameter for a graphical representation of the respective parameter.

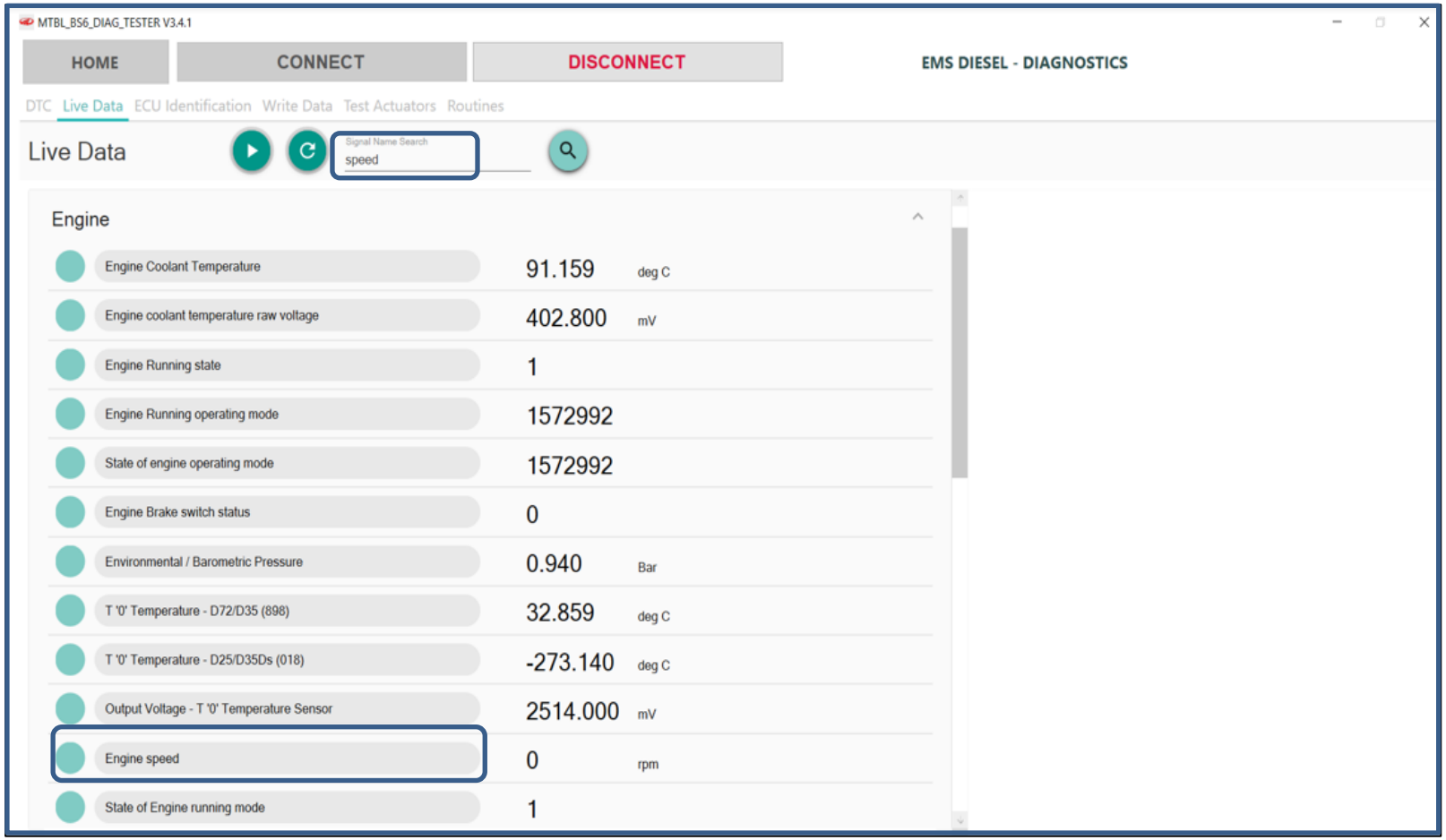


Click on **Signal Name Search** and enter the parameter name and click on the search button, this will take you to the respective group of parameters.

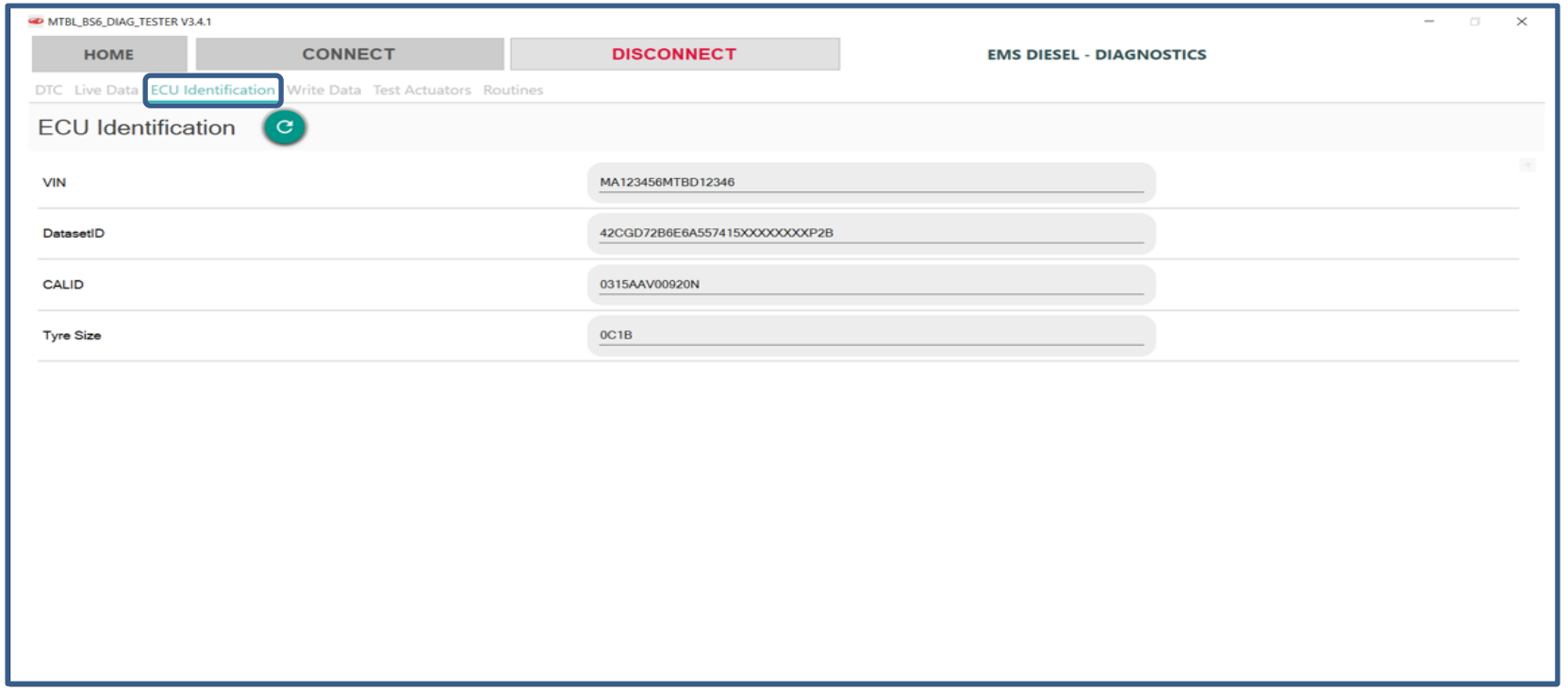
- **Example: Battery**.



- **Example: Engine Speed.**



ECU Identification



Dataset Nomenclature for reference:

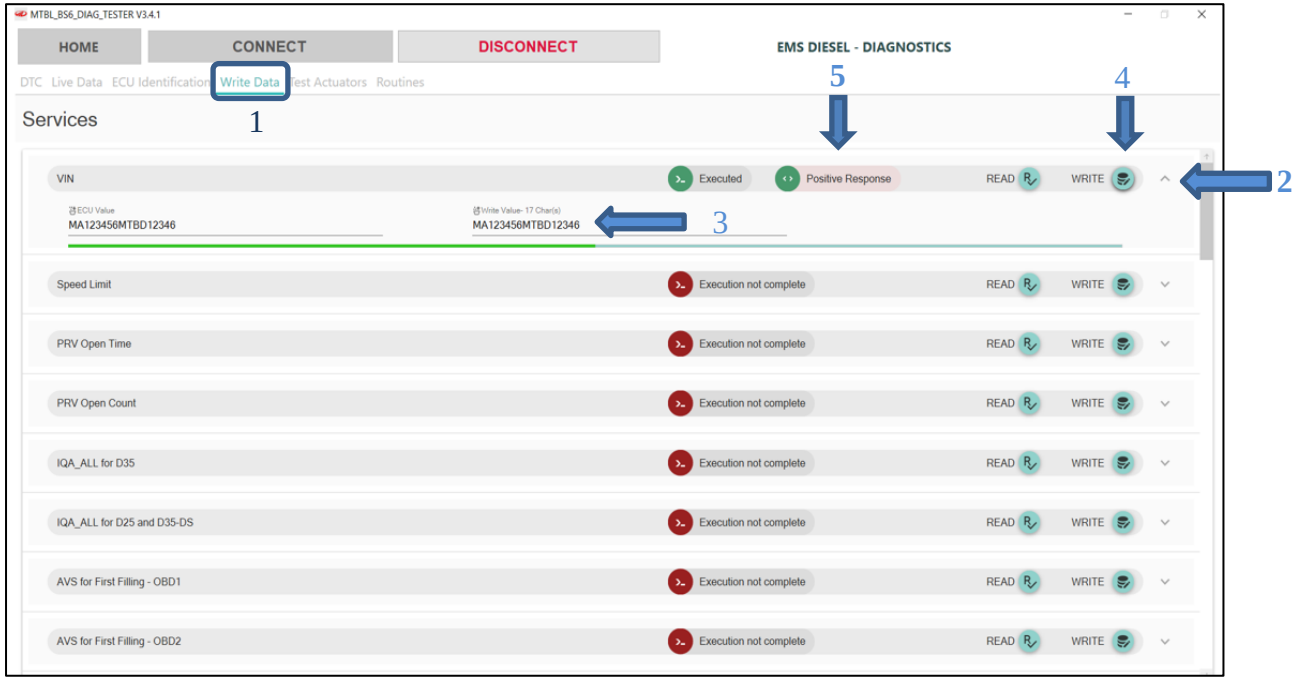
Dataset ID	42CGD72BS6E6A557415XXXXXXXXP2B

42	CG	D72	B6	E6A	557	415	XXXXXXP2B
Tonnage	Application cargo	Engine	Emission	Transmission	Rear axle Ratio	Fuel tank	Data set Revision

Note: The dataset for vehicles equipped with Endurance Brake is different.

Write Data

VIN



1. Write the VIN in the following cases:

- A new or fresh ECU is updated on the vehicle.
- On the vehicle, another (vehicle) ECU was updated. • Select the "write data" functionality from the tool.

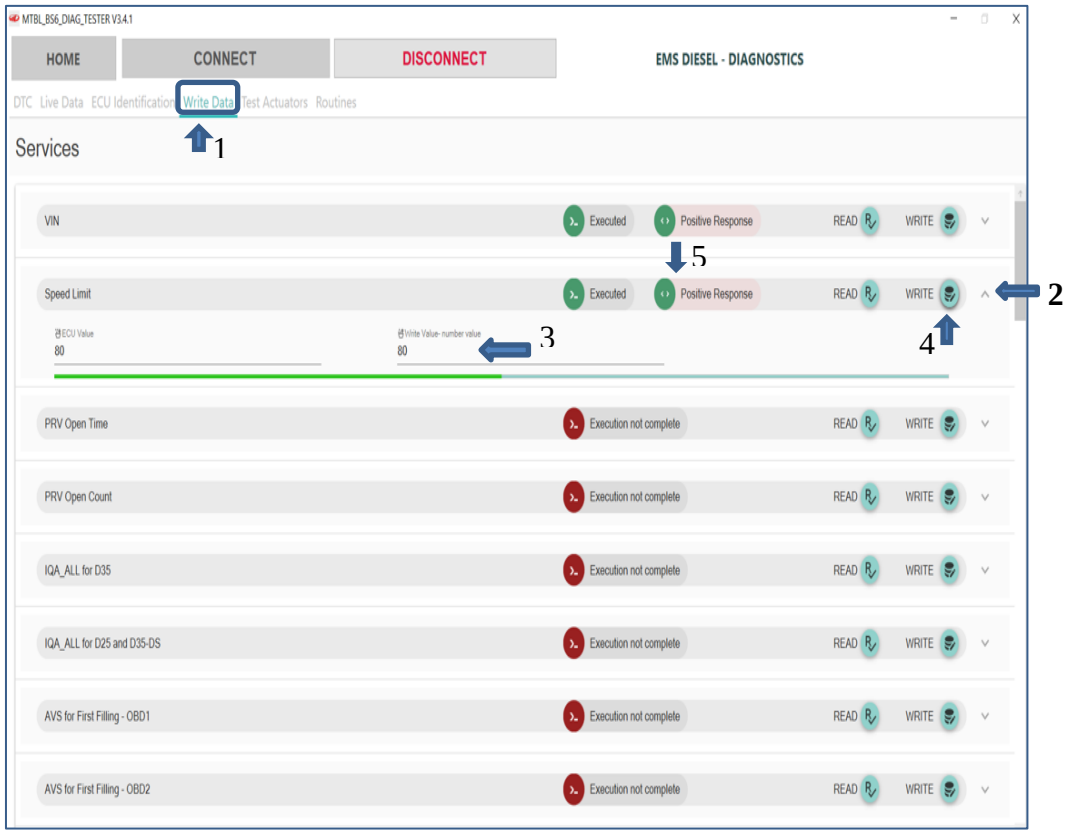
2. To do so, follow the below-mentioned procedure

- Select the **“write data”** functionally from the tool.
- Click on the drop-down arrow from **VIN**.
- Write the 17-digit VIN in the window.
- Click on the **"write"** button.

- **Positive response** will be received once VIN is successfully executed, and then written VIN will display in the ECU value window (read window).

Write Data

Speed Limit



1.Write the SPEED LIMIT in the following cases:

- A new or fresh ECU is updated on the vehicle.
- On the vehicle, another (vehicle) ECU was updated.

2. To do so, follow the below-mentioned procedure:

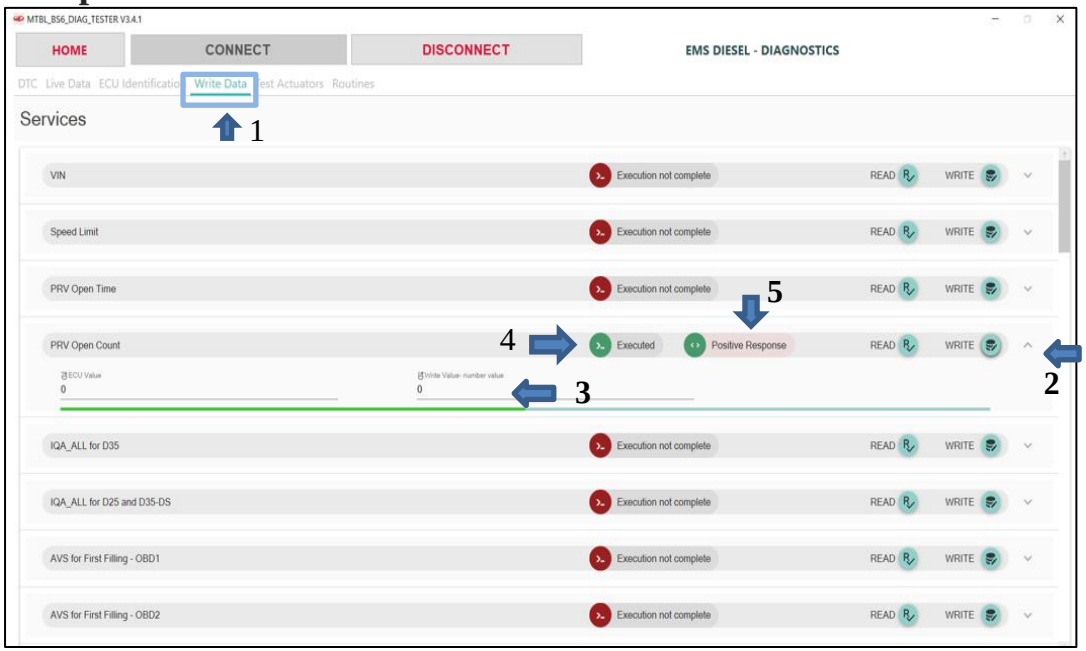
- Click on the **Write Data** functionality from the tool,
- Click on the drop-down arrow from **Speed Limit.**
- Click on the write window and write the desired speed limit (refer to the speed limit matrix for reference).
- Click on the **write button.**
- A **positive response** will be received once Speed Limit is successfully executed, and Speed Limit will also be displayed in the ECU value window (read window).

Note

- Turn off the key and wait for the ECU to turn completely off.
- After turning off the ECU, turn it back on and press the Read button. Speed in the ECU value window should be the same as entered in the written window.
- Refer to the speed limit matrix to set the desired speed limit with respect to the variant and its application.

Write Data

PRV Open Count

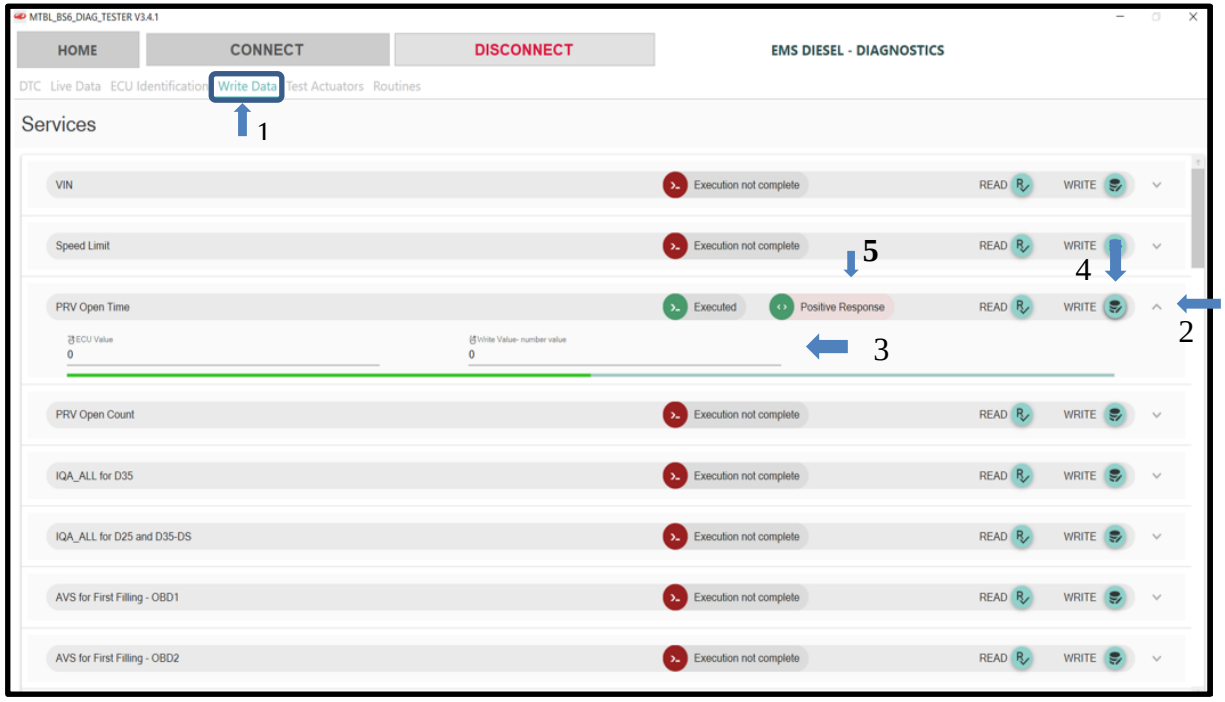


WRITE DATA - PRV Open Count:

- Click on **WRITE DATA** functionality from tool.
- Click on drop down arrow from **PRV Open Count**.
- Click on **WRITE** window and enter '**0**' (**zero**).
- Click on **WRITE** button.
- Once **PRV Open Count** is successfully written, the user will receive a "**Executed"** and a "**Positive Response**" message in the tool at which point, "**0**" (**zero**) value will display in **ECU Value** window.
- To confirm the PRV value in ECU, go to the **Live Data** Functionality, select the drop-down option for injection system group and check the value in **PRV OPEN COUNT**. the value must be 0"value, the write process was not successful and need to executed again and confirm.
- Clear the DTC as per the SOP.

Write Data

PRV Open Time



WRITE DATA - PRV Open Time:

- Click on **WRITE DATA** functionality from tool.
- Click on drop down arrow from **PRV Open Time**.
- Click on **WRITE** window and enter '**0**' (**zero**).
- Click on **WRITE** button.
- Once **PRV Open Time** is successfully written, the user will receive a "**Executed"** and a "**Positive Response**" message in the tool at which point, "**0**" (**zero**) value will display in **ECU Value** window.
- To confirm the PRV value in ECU, go to the **Live Data** Functionality, select the drop-down option for injection system group and check the value in **PRV OPEN Time**. the value must be 0"value, the write process was not successful and need to executed again and confirm.
- Clear the DTC as per the SOP.

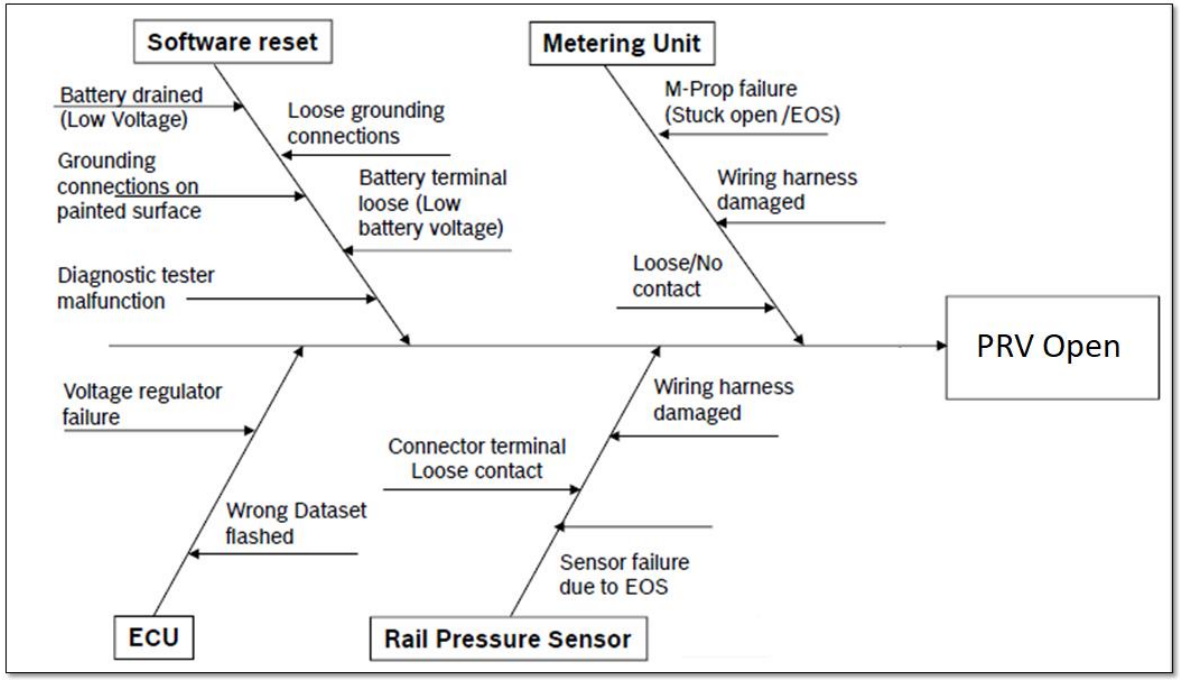
PRV OPEN COUNT / Time must be reset only if the value (ECU Value) crosses the threshold value of: **Time = 300 minutes / Count = 50 counts** respectively.

- To determine the root cause of the PRV opening use the fishbone diagram.
- The Common Rail Assembly need to inspected / tested at Bosch service Centre for its performance. If the rail assembly is found ok and re- used or if found faulty and replaced with new one, the PRV Values w.r.t time & count needs to be rest to "0" as per the above-mentioned Procedure. PRV reset to "0" also to be done whenever Common Rail assembly is replaced with a new one.

Points to be checked in case of PRV errors:

HCV / ICV / LCV BSVI - PRV (Pressure Relief Valve) CHECK SHEET				
	ERROR CODE DETAILS: P018F / P0095 / P0096 / P0194 / P0091 / P0097 / P1110	Mention code with Description		
	Nos of PRV Counts & Time:			
	Basic Checks	OK / Not OK	Field Observations	Remarks / Photos
A	Battery voltage low			
B	Fuel level low / Air lock			
C	Fuel filter chock / Strainer blockage			
D	Adulterated fuel / fuel line pinch			
E	Fuel leak from Fuel lines / High pressure pipes / filter / HPP Banjo / Injector / common rail etc			
	Loose connections / Improper fitments verification: -			
a	Check & Rectify - Battery terminal / Cut off switch connection & Cleaning			
b	Check & Rectify - Maxi fuse / Cabin & Chassis earth connection / ECU A&K connector / earth wire connections			
c	Check & Rectify - Starter terminal / Alternator terminal / HPP or Common rail connectors			
d	Check & Rectify - Injectors connectors loose (for all vehicles) & Injector IQA Value matching with Injector cylinder nos. (**Applicable for ICV & LCV Only**)			
e	Check & Rectify - Battery terminal / Cut off switch connection & Cleaning			
	Continuity / short / ground / terminal back out / Cavity Verification: -			
1	Check & Replace / rectify - Wiring harness rubbing / sleeve damages / wire cut / Wire burnt etc			
2	Check & Replace or rectify - Specific to HPP / Injector / Common rail connectors continuity / short / ground / voltage etc			
3	Check & Replace - Rail pressure sensor / HPP inlet metering valve & Injector function etc			
4	Check & Replace - ECU software & Hardware function			
	Other check points :-			
I	Check & Replace - Fuel filter hand primer Function			
II	Check & Flash ECU dataset version			
√	You can upload relevant photos against specific point for better clarity			
√	Any other observation apart from the above point, please mention in remark column at bottom side			
√	Enclosed Fish Bone Diagram			

Cause – Effect Diagram for PRV Opening



DPF Service Regeneration:

1.Before performing DPF Service Regeneration, below mentioned conditions need to be met, failing which the Regeneration process will not be initiated.

S No.	Precondition	Range
1	Ignition Key	ON
2	Vehicle Speed	0 km/hr
3	Engine RPM	Idle RPM
4	Engine Coolant Temperature	Above 75°C
5	Accelerator Pedal Position	0%
6	DTC's	No other DTC's present apart from the ones related to DPF /
7	Gear Position	Neutral (N)
8	Exhaust Brake Switch & DPF Inhibit Switch PTO (If	OFF
9	Parking Brake	ON (Parking Brake Tell Tale Lamp in Cluster should ON)
10	Soot Mass in the DPF Filter	D72: (0 to 125.00) grams

- [The PTO needs to be in disengaged condition before carrying out the regeneration process.

Note: To perform DPF Parked Regeneration, all the above conditions are same, except the below mentioned points:

1. To initiate Parked Regeneration, the user needs to press the DPF Regeneration switch for 5 seconds & release.
2. Soot Load (Grams) & Delta P threshold values are different for Parked Regeneration.

Check Sheet for Diagnosis & Root Cause Analysis for High Soot Mass related DTC's (P2461/P24A4/P24A5/P244B):

Customer Name -	**Chassis no -**	**Application -**
Dealer location -	**Engine no -**	
Model -	**Kms/hrs covered -**	

Note: Irrespective of any observations in the vehicle, all the below mentioned checkpoints have to be checked without fail

Sr. No.	Description / Check List	System	How	Specification	Details / SOP if Required
1	Check for DTC's w.r.t ATS, Air intake & fuel system	All	Diagnostic tester	No DTC w.r.t ATS, Air intake & fuel system	1. Refer the Diagnostic manual for troubleshooting of respective DTC's **Note: If Primary DTC's are not present, proceed with inspection of below mentioned checkpoints to identify the root cause**
2	Check for dataset	EMS	Diagnostic tester	As per vehicle model	Ensure the latest dataset present in the ECU
3	Inhibit switch condition	Electricals	Visual	Inhibit switch should be in OFF Condition	Refer Tech alert- **MTB/Service/21-22/01**
4	Inhibit switch usage history in iMAXX	Electricals	iMAXX	Inhibit switch value should display "0"	1.Go to OBD data in iMAXX and select period of last 15 days from the date of error code reported 2.Enter PID - 3703 (**Diesel particulate filter active regeneration inhibited due to inhibit switch**) & check the switch usage (Refer Tech alert- **MTB/Service/21-22/01)**

5	Live data value of Delta P	Exhaust	Diagnostic tester	Values should be less than - D25- High Idle - 35mbar D35 DS- High Idle - 50mbar D35- High Idle - 50mbar D72- High Idle- 80mbar	Check Delta P value through Live data of Diagnostic tester tool (Parameter:"**Delta P pressure value across DPF**") Note: Value to be checked at High Idle after 10 secs
6	Live data value of Soot	Exhaust	Diagnostic tester	Fault code triggers, if soot value exceeds below value D25- 35g D35 DS- 32g D35 - 46g D72 - 65g	Check Soot value through Live data of Diagnostic tester tool (Parameter: "**Soot mass in the particulate filter**")
7	For- T4 , T5 & T6 sensors a. DTC's b. Any interchange of harness connectors	Exhaust	a. Diagnostic tester b. Visual	a. No DTC's present b. No interchange of T4 , T5 & T6 connectors on sensors	a. If DTC's is present, refer diagnostic manual for rectification b. Visually inspect if the wiring harness connectors of T4,T5 & T6 sensors are connected to the intended sensor and correct as required (Refer -**MTBD/SER/TA/20-21/09**)
8	Injector electrical connection a. DTC's b. Injector electrical connector c. Terminals below tappet cover-HCV	Electricals	a. Diagnostic tester b. Visual c. Visual	a. No DTC's present b. No loose or open circuit c. No loose or open circuit	a. If DTC's is present, refer diagnostic manual for rectification b. Check for any loose connection on injector electrical connector c. Check for any loose connection on injector terminals below tappet cover- HCV
9	Perform actuator test	Engine	Diagnostic tester	Write value & Read value should approximately match each other	1. Perform actuator tests through diagnostic tool. **- (Refer Diagnostic manual V2)** **2. If the value displayed in the read window is not matching within +/-5% of Write value, then carryout troubleshooting & rectification of complaint by referring to diagnostic manual** 3.Capture the Screenshot of Read and Write value after execution for attaching in SCR, as required Note :If DTC'S w.r.t any of the following actuators (Turbo------) is
a	Perform Turbocharger actuator test (Applicable only for D25/D35/D35DS)				
b	Perform EGR actuator test (Applicable for all engine platforms)				

c	Perform ITV/ETV actuator test (ITV Applicable for D25/D35/D35DS Engine) (ETV Applicable for D72 Engine)				triggered , then perform actuator test for that particular component first & then followed by rest of the actuator tests
10	Air filter Condition	Air Intake	Visual	No clog or puncture/damage	1. Check whether Air filter clog indicator tell-tale is ON in cluster or was displayed some time back 2. Remove the Air filter element and physically check for puncture/damage using the electric bulb 3. Replace if required
11	Modifications to Intake/Exhaust layout	Intake/Exhaust	Visual	No modifications	Check for any modification done in intake and exhaust layout
12	Leakages in air intake system as per below points	Air Intake	Visual	No leakage	
	a. Air Filter to HFM Inlet Hose				1. If any hose clamp is found loose, punctured or damaged -Check & rectify / replace as required. Note: For Identifying leakages, start the engine & and check leakages through any of the joints.
	b. HFM Duct Outlet to Turbocharger Inlet				
	c. Turbocharger Outlet to Intercooler Inlet				
	d. CCV (Closed crankcase ventilation) connection to Intake (Applicable to D25/D35/D35DS engine)				
	e. Intercooler Outlet Hose to Intake Manifold				
13	Orientation of HFM Duct (Applicable for D72 engine)	Air intake	Visual	HFM Duct Orientation as per SOP	Refer TSB - MTB/TSB/21-22/04

14	Condition of HFM Duct	Air intake	Visual	No Deformation/ Collapse of HFM Duct	If HFM duct observed to be deform / collapse or Mesh damage, Check & rectify as required
15	Condition of EGR pipe	Engine	Visual	No damage / cracks / leakages	Check any damage or cracks or Leakages in EGR pipe.
16	Check for leakages from the following gasket joints 1.EGR 2.Turbocharger 3. Exhaust manifold 4.ATS	Exhaust	Visual / Feel / Listen	No leakage	Start the engine & check for any leakages
17	Delta P sensor hoses & pipes condition	Exhaust	Visual	No kink in hoses & No blockages in pipe	1. Visually inspect whether both differential pressure sensor hoses are connected or not, rectify as required. 2. Check delta p lines for any blockage. Blow air (1 – 4 bar) in pipe and see if any particles or moisture is getting removed and path is having full flow of air (Check without sensor) 3. Check sensor both ports visually, for any moisture or blockage. Gentle blow (without pressurized air) can be used for removal of blockage. **Note**: Don't use any tool for insertion inside sensor.
18	Turbocharger free play & Oil throw from turbo compressor side, if any	Engine	Visual	1.No blade erosion/damage 2.No excessive shaft play	Check & Rectify / Replace as required Note: Presence of minor Oil traces is allowable in intake system after turbocharger.
19	Intercooler Fins condition	Intake	Visual	No fins damage or leakage	Check for fins condition, if found damaged - Replace as required
20	Check for any DTC related to Fuel system (P0085/ P0086/ P0087/ P0088/ P0093/ P0094)	Fuel	Diagnostic tester	No restriction in Low pressure circuit / Leakage in High pressure circuit	Refer the Diagnostic manual for troubleshooting

21	Injector back leak Quantity	Engine	Visual	No excess back leak	1.Start the engine and collect the fuel for one minute at idling speed at each injector in a container 2.Volume of fuel collected in all injectors should be similar Replace the injector in which the back leak qty. is found abnormal high
22	Electric Feed Pump (In tank suction pump) functioning (Applicable only for D25 & D35DS Engine)	Fuel / Electrical	Visual / Feel	Electric Pump should operate after the ignition is switched ON	1. To confirm, remove the return line (pipe) from Fuel Tank Unit (Float Unit) & switch on the ignition. 2. There should be continuous Fuel Flow (without interruptions, bubbles etc.) & no presence of foreign particles - rust etc. 3. If found abnormal, Check & Replace affected wiring / pump as required
23	Quality of fuel in fuel tank	Fuel	Visual	No contamination / foreign particles in fuel tank	1.Check visually for any abnormality and contamination i.e - Fuel mix with Kerosene, Bleaching powder & Bio fuel usage- If found contaminated, empty and refill with genuine Fuel (Refer Tech alert - **MTBD/SER/TA/21-22/07**) 2.Drain the fuel from fuel tank by loosening the drain plug and check for fuel contamination (Kerosine, Bio Fuel etc.) / presence or sediments. Clean the fuel tank if required.
24	Fuel tank strainer (Applicable only for D72 & D35 Engine)	Fuel	Visual	No clogging / damage	1. Check the strainer for choking/blockages. If found abnormal, replace it accordingly
25	Water separator cum fuel filter	Fuel	Visual	No excessive accumulation of water in fuel	1. Check whether Water in Fuel tell-tale is ON in cluster. If ON, drain water and confirm 2. Check whether the water in fuel sensor coupler is connected to sensor or not. If found disconnected, reconnect the coupler to sensor & check whether telltale ON in cluster. If ON, drain water and confirm 3. Replace water separator and confirm
26	Fuel filter- D72 & D35	Fuel	Visual	Filter should not be choked	If found choked, replace Fuel filter and confirm

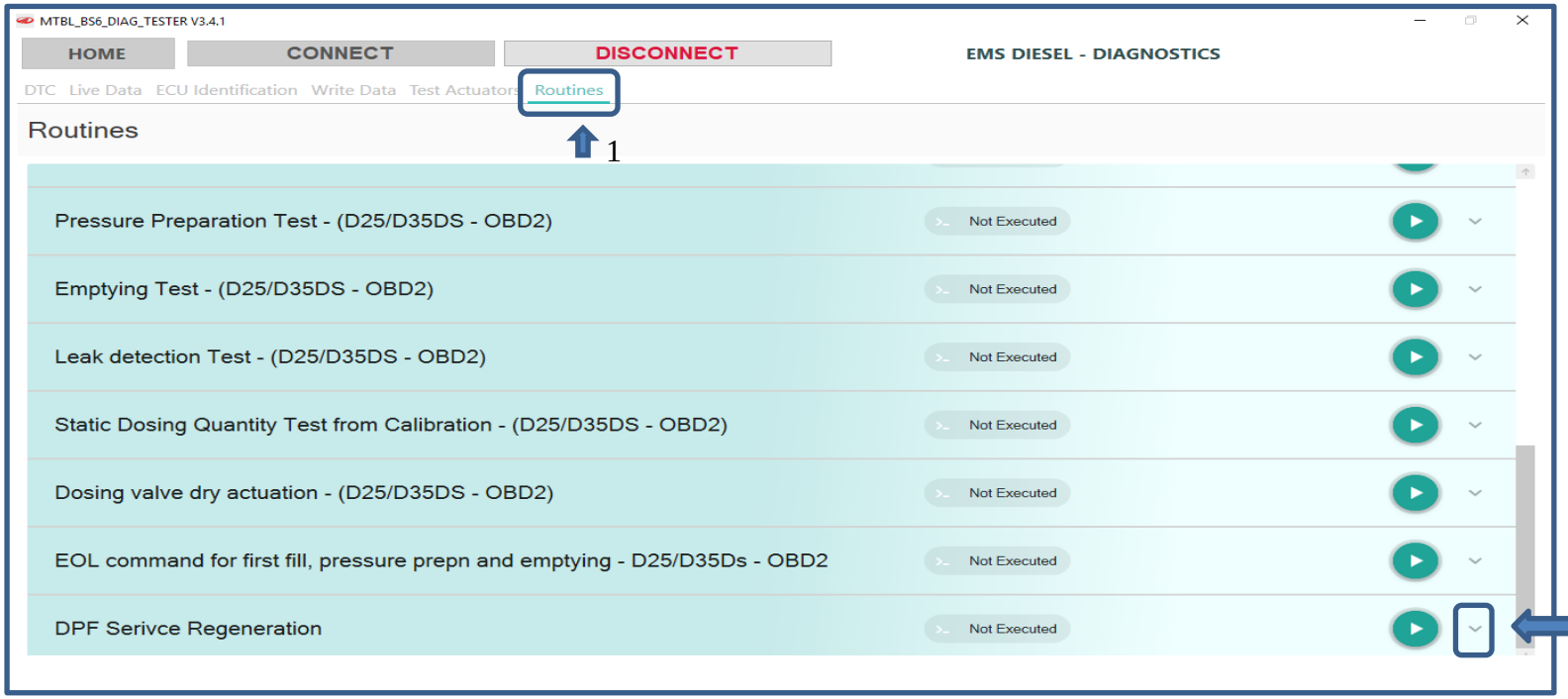
27	a. Engine oil consumption b. Oil change record / history b. Excessive blow by-HCV	Engine	a. Service history b. Service history c. Visual	a. No excess oil consumption b. No deviation in oil change interval c. No excessive blow by-Visual	a. Check the service history for frequent oil top-ups b. Check Oil change history in DMS c. Warm the engine up to optimum operating temperature & check visually for any signs of blow by through breather tube
28	Black smoke	Exhaust	Visual	No excessive black smoke	1. By disconnecting the flex pipe (In D72 & D35) 2. By disconnecting the DOC (In D25, D35DS) 3. If found excess, then diagnose the root cause for the same and rectify accordingly
29	Condition of Engine Oil	Engine	Visual	No presence of metal particles / contamination in oil	1. Drain the Engine oil and check for the presence of metal particles or oil contamination 2. If metal particles are present / if oil is contaminated, diagnose the root cause for the same and rectify accordingly
30	Tappet clearance- D72 & D25	Engine	Feeler gauge	As per specifications	Check tappet clearance & adjust, if required
31	DPF condition	Exhaust	Visual	1.No cracks 2.No Physical impact or damage 3.No Excess soot	1. Remove the DPF and check for any cracks 2. Check DPF externally for any physical impact or damage 3.Refer DPF cleaning SOP which is provided in diagnostic manual
32	DOC condition	Exhaust	Visual	No impact/damage	1. Check DOC externally for any physical impact or damage 2. Check for any restriction before DOC (check for presence of foreign material)
Check Sheet - Post rectification of complaint (After performing regeneration-Park/Service)					
1	Live data value of Delta P	Exhaust	Diagnostic tester	Values should be less than - D25- High Idle - 35mbar. D35 DS- High Idle - 50mbar D35-High Idle - 50mbar	Check Delta P value through Live data of Diagnostic tester tool (Parameter: **"Delta P pressure value across DPF**") **Note: Value to be checked at High Idle rpm. Note the reading after the engine running in high idle for 10 secs**

				D72-High Idle- 80mbar	
2	Live data value of Soot	Exhaust	Diagnostic tester	Value should be less than 10g	Check Soot value through Live data of Diagnostic tester tool (Parameter: "**Soot mass in the particulate filter**")
3	Live value of Air mass flow	Intake	Diagnostic tester	Values should be in the range of - (Kg/hr) **D25** Low Idle- 30 to 40 High Idle- 270 to 300 **D35** Low Idle- 40 to 60 High Idle- 200 to 300 **D35 DS** Low Idle- 40 to 50 High Idle- 270 to 300 **D72** Low Idle- 130 to 140 High Idle- 740 to 850	Check Air mass flow value through Live data of Diagnostic tester tool (Parameter: "**Air mass flow**") **Note: Value to be checked at High Idle rpm. Note the reading after the engine running in high idle for 10 secs**

Follow below mentioned procedure to perform DPF Service Regeneration: -

1. Click on **Routines** functionality from tool.

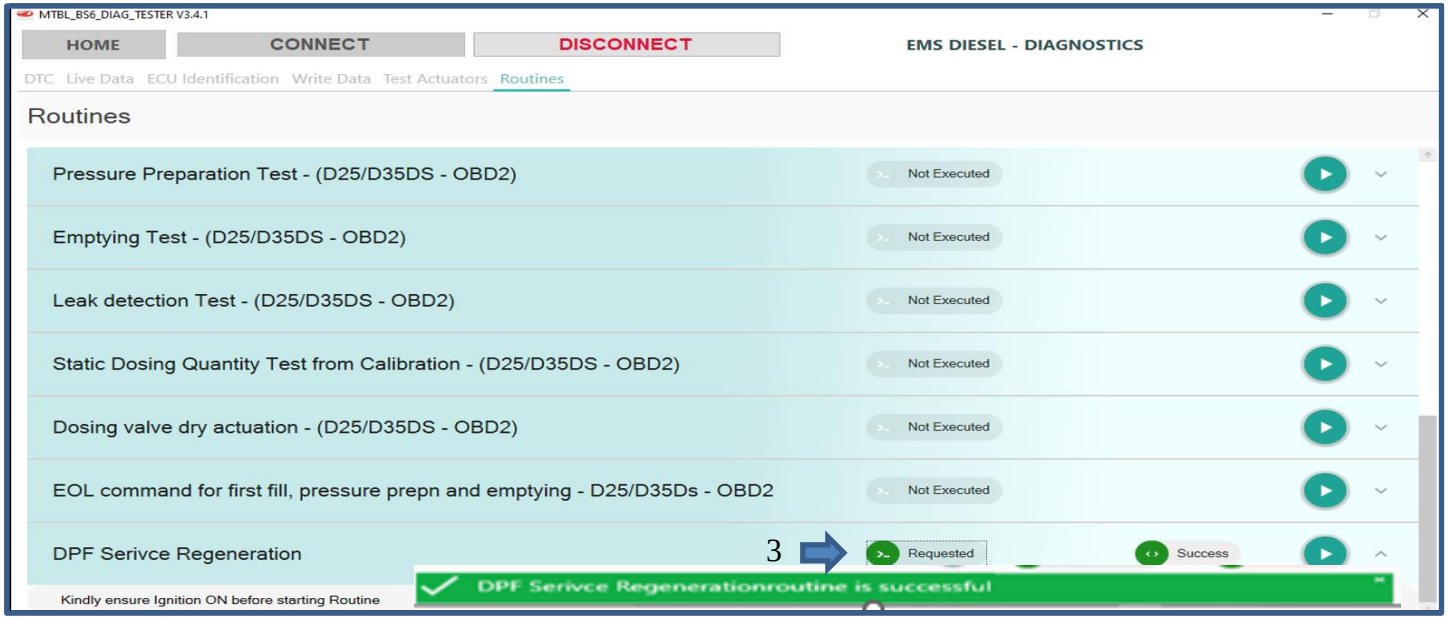
2. Click on **drop down** arrow from "**DPF Service Regeneration**".



3. Click on drop down arrow from status bar.

4. Click on **Execute button**  and wait till the process of execution.

5. Once the Regeneration completed successfully, notification will pop as "**DPF Service Regeneration routine is successful**".



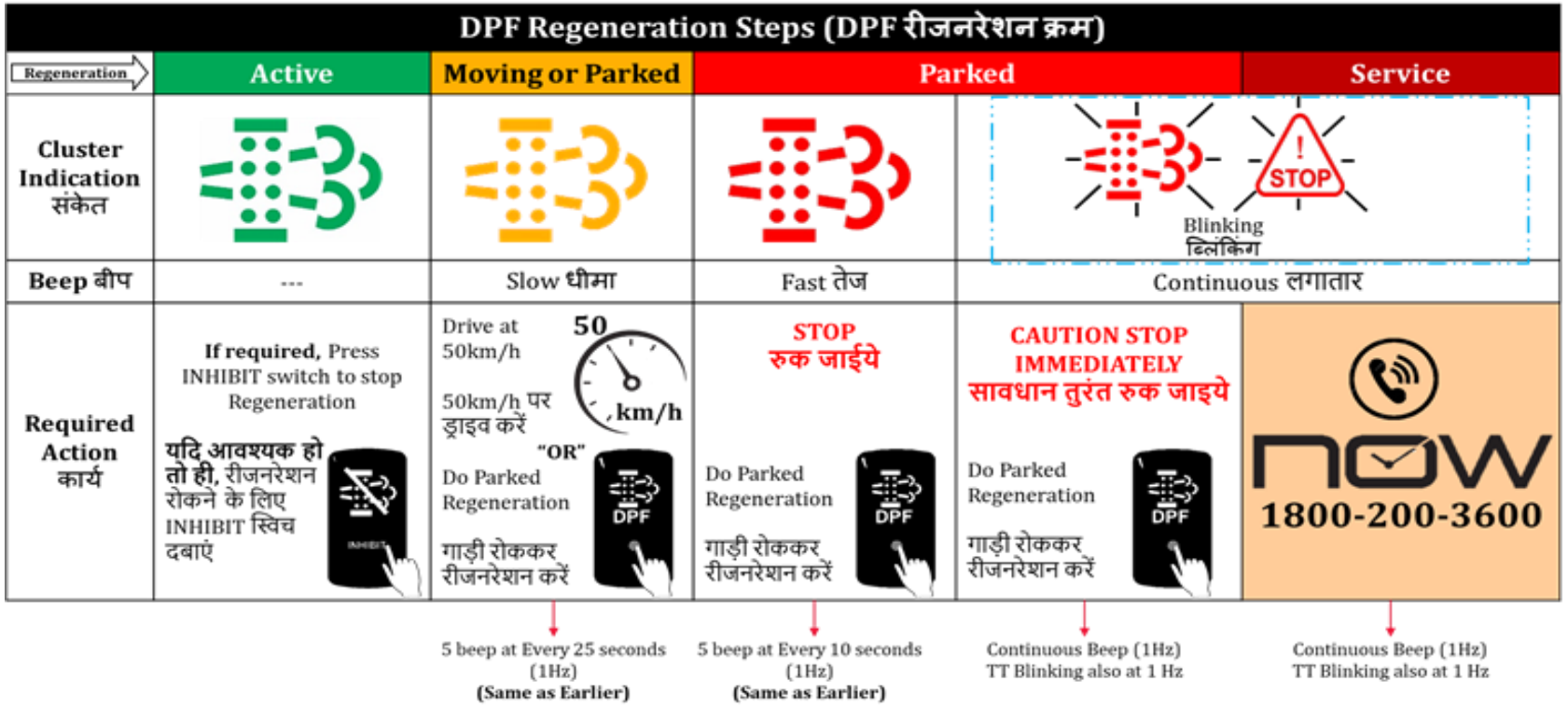
Note: If Service regeneration is not initiated, then the notification will come accordingly, at which time, user need to check the following:

a. Preconditions are maintained and then perform the test once again.

b. The Soot Mass / Delta P Value have crossed the maximum threshold. In this case, we need to follow the Soot Mass Reset SOP to complete the regeneration process.

WRITE DATA – Soot Mass Reset

The following DTC's are associated with soot loading in DPF: P24A5, P24A4, P244B, P2461. The DPF Regeneration Tell Tale in cluster is a tri-colored LED which is triggered at different levels of soot loading in DPF. The sequence will be Green, followed by Amber & then Red as given in the image below:



Note:

- Once the DTC P24A5 is triggered, the Torque limitation mode is induced in the vehicle. Parked regeneration needs to be triggered immediately using DPF Regeneration Switch in Cabin.
- If further soot builds up triggering the DTC P24A4, then perform parked regeneration. If Parked regeneration is not initiated, then Service regeneration needs to be performed using Diagnostic tool. At this time, if soot accumulation builds further, then along with previously induced Torque limitation mode, Creep mode will also be induced (wherein the vehicle cannot be driven above 20 Kmph) leading to triggering of DTC's P2461/ P244B.

- If the Soot mass in DPF exceeds the following limits, then Service Regeneration will not happen directly.

D72- 130 Grams.

In such a situation, the soot needs to be cleaned first by removing the DPF to bring the soot mass within the threshold limits. Only after this, the user can perform Service Regeneration through Diagnostic Tool. Follow below Procedure / SOP to clean the DPF if soot mass collected is above the threshold limits.

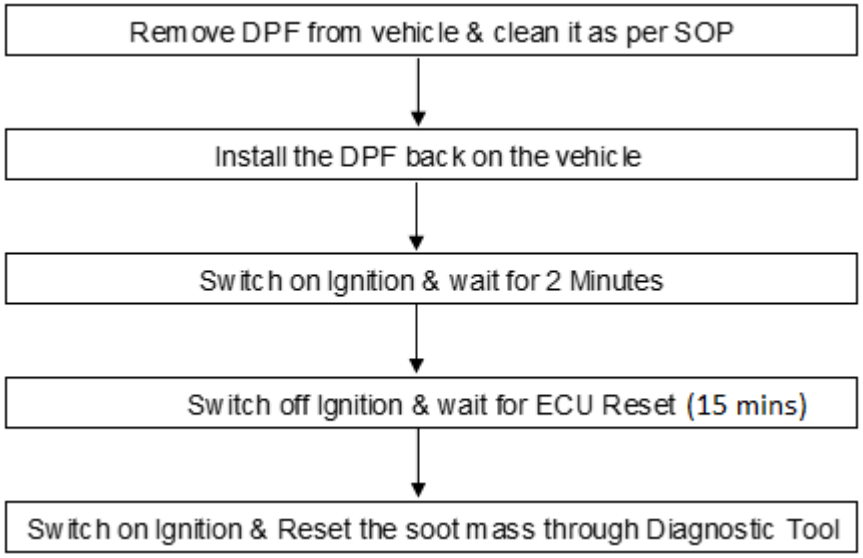
DPF Cleaning Procedure / SOP:

Before initiating the DPF cleaning procedure, note down the value of Soot (grams) & Delta P Value (@Full RPM – Held for a min of 10 secs)

Facility, Tools & Safety Gear required for DPF Cleaning:

Heat Resistance Gloves	Safety Goggles	Pneumatic Air Gun	Safety Shoes	Mask
				

- Closed container / environment for soot collection during cleaning.
- Approximately 3 Bar Pneumatic / Air Supply (Air supplied should be free from Dust, dirt, rust, water, oil etc).
- Weigh Machine with 1 gram Least Count.



DPF Soot cleaning procedure:

a) Wait for the ATS temperature to cool down and then remove ATS cover.

b) Carefully disconnect Delta P Sensor pipe connections, T6 Temperature Sensor and its respective wiring harness connections.

c) Dust / Mud accumulated on DPF to be cleaned carefully.

d) DPF images need to be captured before removal from vehicle. Keep these images in record.

e) DPF needs to be removed as per the below mentioned steps:

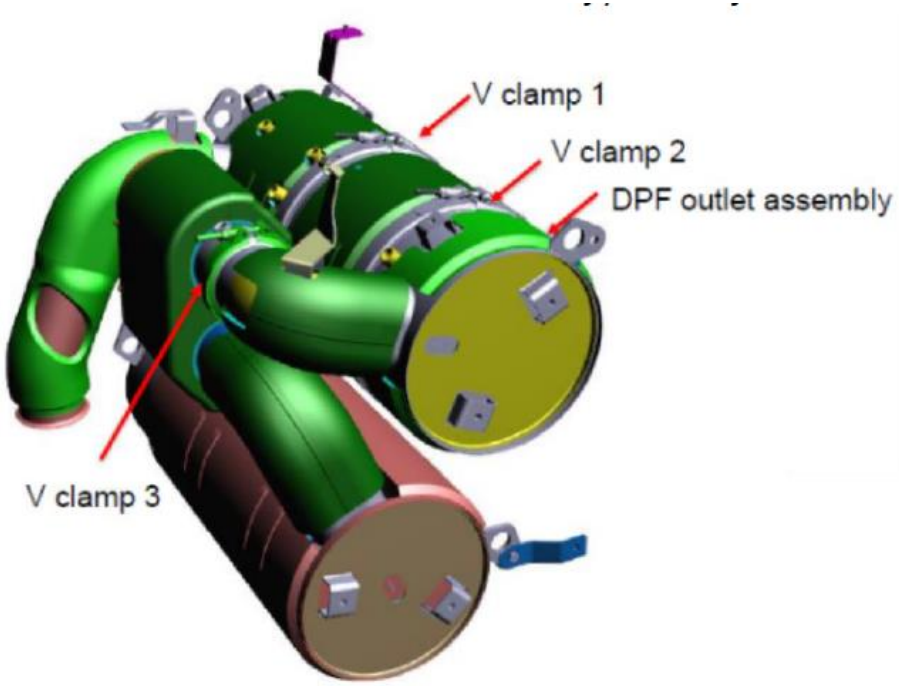
Step 1: Remove V Clamp 3

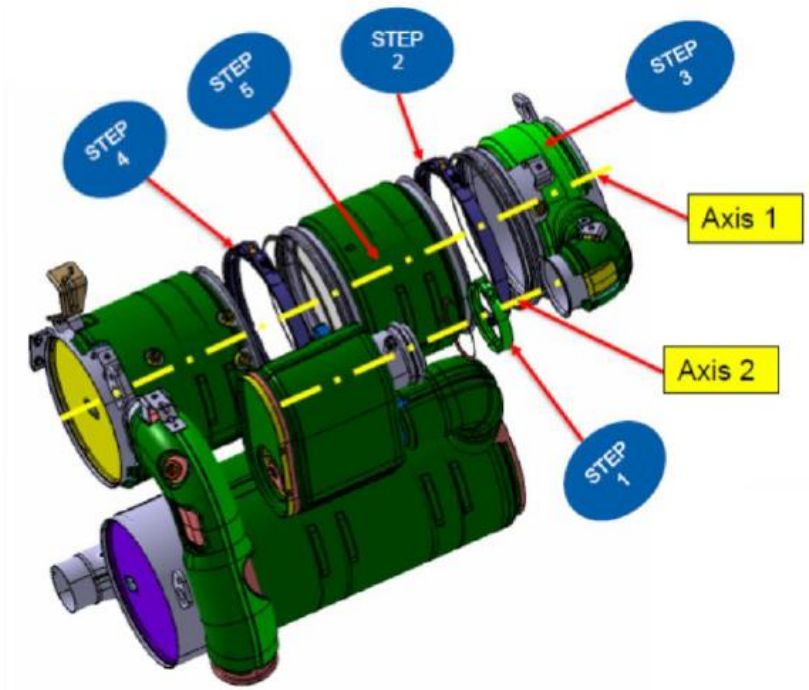
Step 2: Remove V Clamp 2

Step 3: Take out DPF outlet assembly axially along Axis 1 & Axis 2 direction as shown below.

Step 4: Remove V Clamp 1

Step 5: Take out DPF axially along Axis 1 direction.



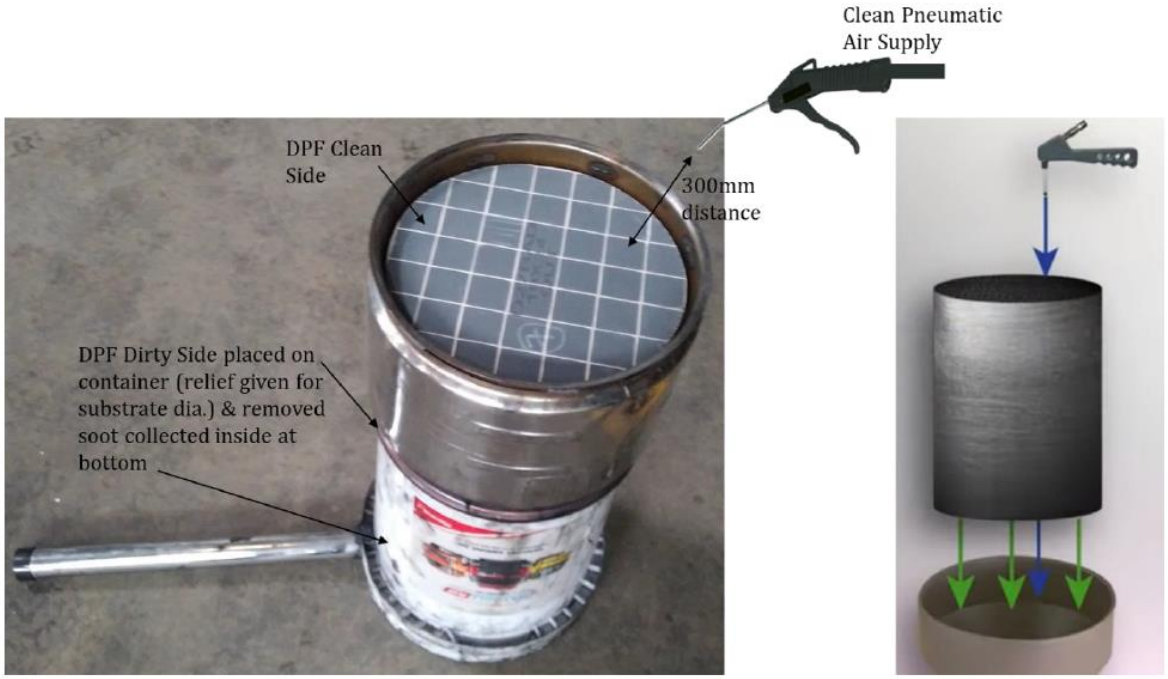


f) After removing the DPF, cover the open ends of DOC & Ad Blue Mixer with a clean cover to avoid foreign material entry.

g) Before beginning the process of soot cleaning in DPF, the images of both clean side (DPF outlet side) & dirty side (DPF inlet side) need to be captured and kept in records.

h) Inspect the DPF for internal & external damage. If the DPF is found damaged, then the DPF must be compulsorily replaced and not cleaned.

i) The DPF needs to be cleaned in a closed environment so that the soot is not released into the environment effecting the health of the operator and others. Proper ventilation is to be provided along with necessary gears like masks, goggles etc so that the cleaning process does not affect the operator and others health. The image below shows how a DPF can be cleaned in a closed environment.



j) To begin the process of DPF soot cleaning, we need a pneumatic supply at approximately 3 bar presure. The air supplied needs to be free from dust, dirt, rust, water, oil etc. The air is to be blown using an air gun, holding it at around 300 mm distance with the blow direction being from clean side (DPF outlet side) to dirty side (DPF inlet side), as shown in the image above. The pneumatic air flow must be given to the entire DPF substrate circumference (not concentrating on individual channels) to avoid damage to the plug and to efficiently clean the accumulated soot.

Note: Do not clean the DPF with any other medium other than pneumatic.

k) After cleaning the DPF, mount the DPF on the ATS in the exact reverse way in which it was removed for cleaning

Note: <u>Replace DPF Gaskets with a new one during fitment.</u>

l) Switch on the ignition and wait for 5 minutes.

m) Switch off the ignition and wait for a minimum of 15 minutes for ECU to reset.

n) Switch on the ignition again and reset the soot mass in the ECU by following the below procedure:

i. Click on **WRITE DATA** functionality from tool,

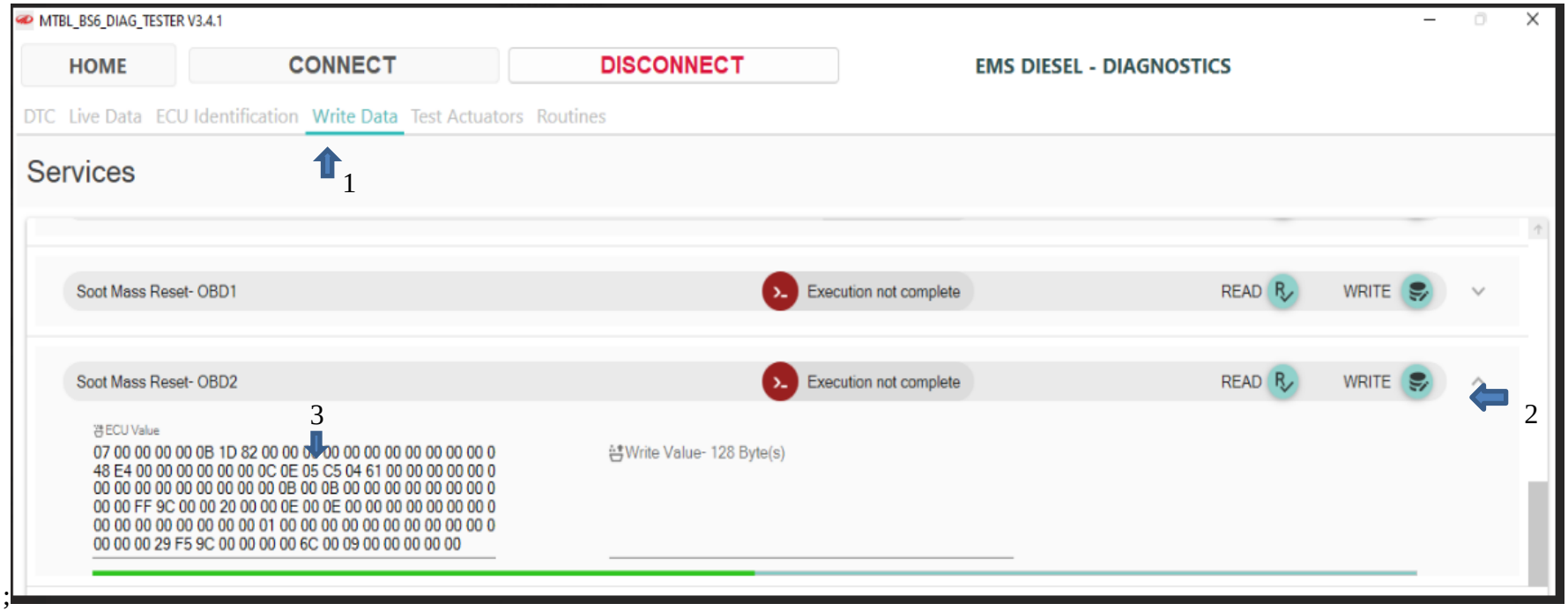
ii. Click on drop down arrow from **Soot Mass Reset**.

iii. Do right click on **ECU Value** window and copy the entire data as it is.

iv. Paste it in **WRITE** window & replace first two-digit data by deleting "**07"** and entering "**13"** in place of it.

v. Click on **WRITE** button.

vi. Once **Soot Mass Values** are successfully written, the user will receive an "**Executed"** & a "**Positive Response**" message in tool. Note that, at this point, value in **ECU Value** window will still display as **07** only. The entered value of 13 will not display in the ECU Value window, which is normal.



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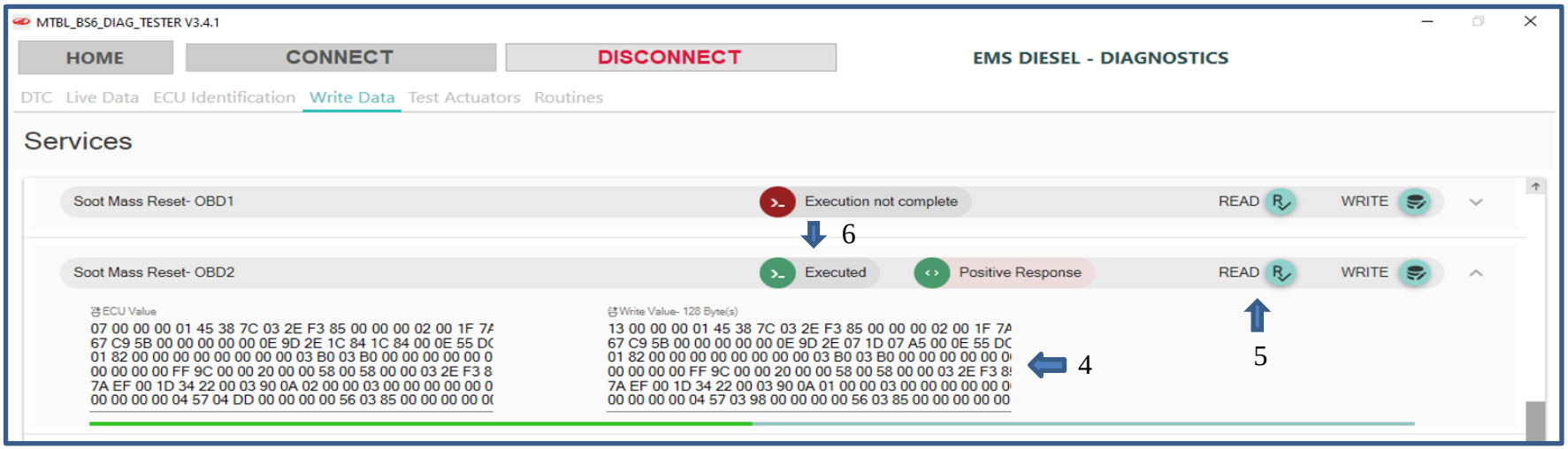
Note

- **For the Soot mass reset for OBD1 and OBD2, different TAB's are provided (refer above picture). Use the correct TAB for updating the values.**



vii. Switch off ignition and wait for a minimum of 15 minutes for ECU to shut off completely.

viii. To confirm the same, go to **DPF** group under **LIVE DATA** functionality and check the **Soot Mass in the Particulate Filter.** This value would have changed from the previously stored value (which was noted at the beginning of the process) & will be set to a default value (default value varies from platform to platform) as per the ECU logic & now will be within the threshold values / limits of Service Regeneration.

ix. Perform **Service Regeneration** through Diagnostic Tool & Clear the DTC's.

Note: Performing Service Regeneration by doing only Soot mass reset without pneumatically cleaning the DPF may lead to DPF failures.

Note:

1. The above method of DPF cleaning will principally remain same for D35, D25 & D35 DS platforms, except that their ATS layouts are different (In-Line type) as compared to D72 (Switch Back type)
2. The soot mass reset procedure is to be carried out only if the soot values are above the threshold limit during which time, the DPF needs to be removed, cleaned & service regeneration is performed to clean the DPF.
3. The Soot Mass reset process is applicable for vehicles in which the ECU is with Rev C Dataset & above.
4. Do not perform the "Soot Mass Reset" unnecessarily if the soot mass values are below the threshold values. If the soot mass values are below the threshold, then perform either Parked regeneration or Service Regeneration directly.

Ad Blue Quality Reset (D72) - Applicable for D72 & D35 vehicles OBD I only (DNOx 2.2 System).

Ad Blue quality reset needs to be done when the following fault code is triggered due to filling of non-genuine / contaminated ad blue.

Fault Codes Triggered: P1BA9 / P2BA9.

Follow the below mentioned SOP to reset ad blue quality.

- Note down the Dataset ID in the vehicle through diagnostic tool from ECU Identification option in diagnostic tool.
- Drain non-genuine / contaminated ad blue from the tank.
- Flush the tank completely and refill fresh ad blue in the tank – Fresh Ad Blue level should be more than 50% in the tank.
- Ignition should be in “ON” condition (0 RPM / Engine Shut Off)
- Ad Blue Tank Temperature should be between 0 Deg Cel to 60 Deg Cel.
- Ad Blue Header Unit Quality Sensor should not be kept open to atmosphere & should be completely immersed in Ad Blue
- Flash the following dataset:
    1. D72 OBD I Vehicle: D72-ADBLUE-QUALITY-RESETXXXXX (P1981V80 _TSW1_ D72_BSVI_AVS_Function_Adble reset_compleate_1_hex)
- Do not switch off the ignition & Wait in Ignition ON condition for 10 mins.
- Switch of the ignition & wait in ignition OFF condition for 5 mins.
- Verify AdBlue quality value in live Data (SCR System –D72-CC898.)
- Clear the DTC & flash the latest revision of Engine & vehicle dataset as per the OBD-1 model applicability.

Actuator Tests:

Actuator test is performed to verify whether the actuator is functioning as required. Once the actuator test is triggered by the user, the actuator is actuated as per the user demand entered by the user. The component under test will give an output which can be compared with the user input to verify whether the actuator is performing as required or not. The list of actuator tests that can be performed using the diagnostic tool are listed below. These tests need to be performed based on the fault code triggered with respect to any actuator for which the test functions are made available in the tool. Whenever any fault code / P-code is triggered with respect to any actuator, before performing the actuator test directly, it needs to be verified whether there is any fault with respect to the wiring harness for that actuator. If the wiring is ok, then the user can proceed to perform actuator tests for verification of root cause. The table also provides information on the Actuator Test applicability matrix and Actuator Test Range to be entered by user for performing the actuator test. The user has to enter the test value (Note: Test value to be entered should be within the range as highlighted in the Write Window in the table below) in the Write Window using the BSVI diagnostic tool and accordingly the Read Window should display the actual test result, which should be approximately equal to the value entered by user in the Write Window. If the Actuator or its corresponding wiring harness is faulty, then, Read Window will not display any value, in which case the Actuator or its Wiring Harness, whiche1ver is found faulty, needs to be replaced.

Actuator Test Applicability Matrix		**Test Range**	
Test Name	**D72**	**Write Window (User Input)**	**Read Window (ECU Output)**
Intake Throttle Valve Actuator	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Intake Throttle Valve Actuator Duty Cycle	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Intake Throttle Valve Actuator Learning	NO	1	0 to 1
EGR Valve Actuator	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
EGR Valve Actuator Duty Cycle	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
EGR Valve Actuator Learning	YES	1	0 to 1
Turbocharger Actuator	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%

Turbocharger Duty Cycle	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Turbocharger Valve Actuator Learning	NO	1	0 to 1
Fan Actuator	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Fan Duty Cycle	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
AC Compressor Actuator	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
AC Compressor Duty Cycle	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Exhaust Throttle Valve Actuator (D35)	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Exhaust Throttle Valve Actuator Duty Cycle (D35)	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Exhaust Throttle Valve Actuator (D72)	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Exhaust Throttle Valve Actuator Duty Cycle (D72)	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Exhaust Throttle Valve Actuator Learning	YES	1	0 to 1
AdBlue Pump Motor Actuator (D72/D35)	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
AdBlue Pump Reverting Valve Actuator (D72/D35)	YES	1	1
AdBlue Dosing Valve Actuator	YES	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
AdBlue Pump Motor Actuator (D25/D35 DS)	NO	5% to 20%	Value should be approximately equal to the percentage mentioned in the write window.
AdBlue Backflow Pump Actuator (D25/D35 DS)	NO	30%, 60%, 90%	Value should be approx. equal to the % value mentioned in the write window with a tolerance of +/- 2%
Fuel Feed Pump Actuator	NO	1	1

Note:

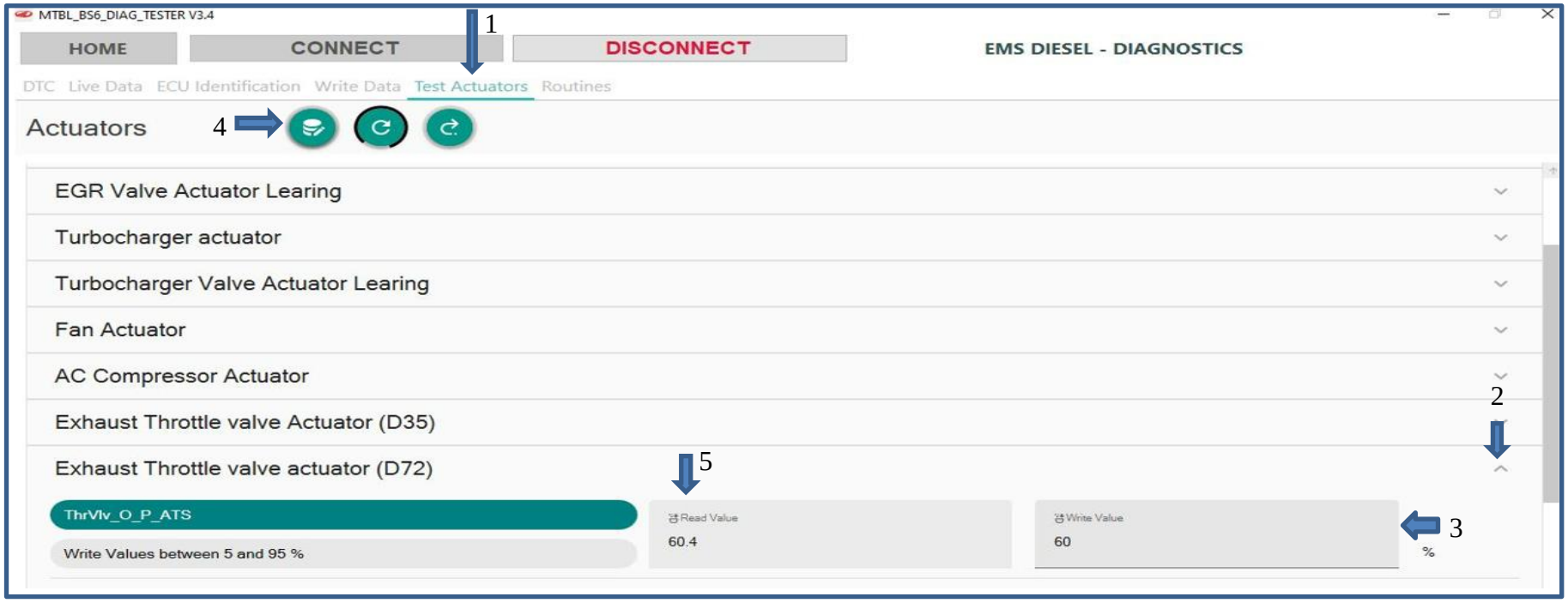
1. The Actuator test needs to be performed before replacement of the faulty component to confirm the failure and after the replacement of the component for confirmation of complaint rectification. The actuator test will ensure whether the electrical circuit of the component under test is functioning or not.
2. At the end of / later part of the actuator test, the ECU may display higher / lower values in read window. These values are to be neglected. Only the value displayed in the Read Window immediately after executing the actuator test is to be considered.
3. When the Actuator Test is executed, a Green Color rectangular tab appears at the bottom of the tool window. This tab indicates that the test execution command given by the user is received by ECU. It is not to be confused to conclude the results of the actuator test assuming that the Green Color indicates that the actuator under test is ok. The actuator condition can be concluded only by comparing the values mentioned in Write & Read windows.

   Sample Actuator Test procedure w.r.t "**Exhaust Throttle Valve**" is given below for reference. For all other actuator tests, the user needs to follow the same procedure after selecting the required Actuator option.

Exhaust Throttle Valve Actuator:

1. Click on **Actuators** functionality from Tool.
2. Click on **drop side arrow** of **Exhaust valve Actuator.**
3. Click on **Write window (Write Value)** and enter actuator demand of 30%, 60%, 90%.
4. Click on **Adjust temporarily** button**.**

5.If the actuator is working as per requirement, then the written actuator demand will reflect In ECU window (Read Value) for a few seconds, which should be approximately equal to written value.



Actuator Learning:

Actuator Learning must be performed after replacement of the following components:

1. ETV (D72)
2. EGR (D72)

Follow below mentioned procedure to test Throttle Valve Actuator Learning: -

1. Switch Off the Ignition & wait for 5 mins for ECU to reset.
2. Switch On the Ignition & connect the Diagnostic Tool and click on Actuator functionality.
3. Click on drop side arrow of Actuator Learning (e.g., Throttle Valve Actuator Learning).
4. Click on Write window and enter actuator demand range of 1.

5. Click on Adjust temporarily  button.

6. Written actuator demand will reflect In ECU window for few seconds which should be approximately equal to written actuator demand.

7. After Written demand is displayed in read / ECU window, give 2 driving cycles. When performing driving cycles, raise the engine RPM up to 1500 for a few seconds & bring to idling. Maintain 30 second time interval between the 2 driving cycles.

ROUTINES:

Routine Tests are applicable for DNOx system only. They are needed to be performed under the following conditions:

1. Whenever the ECU is faulty & needs to be replaced.
2. Whenever any component of DNOx system is faulty & needs to be replaced.
3. Whenever any fault code analysis involves a check point pertaining to components of DNOx system.

Note:

1. Whenever any fault code / P-code is triggered with respect to any component of DNOx system, before performing the Routine test, it needs to be verified whether there is any fault with respect to the wiring harness for that component. If the wiring is ok, then the user can proceed to perform routine tests for verification of root cause. The Routine test will have to be performed before replacement of the faulty component to confirm the failure and after the replacement of the component for confirmation of complaint rectification.

2. Before performing the Routine Tests, the following conditions need to be met, failing which the Routine Test result will not be successful.

Sr No.	Preconditions to be met for Routine Test	Range (ECU: CC898 - D72)
1	Ignition Key	ON
2	Vehicle Speed	0 km/hrs.
3	Engine Speed	0 rpm
4	Catalyst Temperature (T6)	T6 Less than 80°C
5	AdBlue Tank Temperature	Min. 0°C to Max. 50°C
6	AdBlue Level	More than 50% (Can be referred from Cluster bar graph)
7	Battery Voltage	D72 Above 20V
8	AVS (Adjustment Value Services) for First Filling	**Not Applicable**

Note:

1.Some of the Routine tests will require the Dosing Module to spray Ad Blue multiple times during the course of the tests, due to which, before beginning any Routine tests, the "**Dosing Module needs to be unmounted from its seating & kept open to atmosphere, with its spray tip facing away from ATS & DNOx components".** Note that the Ad Blue connections, Coolant connections (in DNOx 2.2) & Electrical connections should not be removed. After completion of Routine functions, the Dosing Module gasket needs to be replaced during installation. Note that if the Dosing Module is not unmounted before performing the Routine test, then the Ad blue sprayed will get accumulated in the Mixer Unit & SCR which may lead to problems with ATS / DNOx system.

2.When performing Routine Tests, a particular sequence needs to be followed. The Routine Test applicability matrix with respect to platform along with the corresponding sequence in which they need to be performed is mentioned in the table below.

3.Routine Test for **DNOx 2.2**: A single sequence needs to be followed if any of the components of the DNOx system & / ECU are replaced.

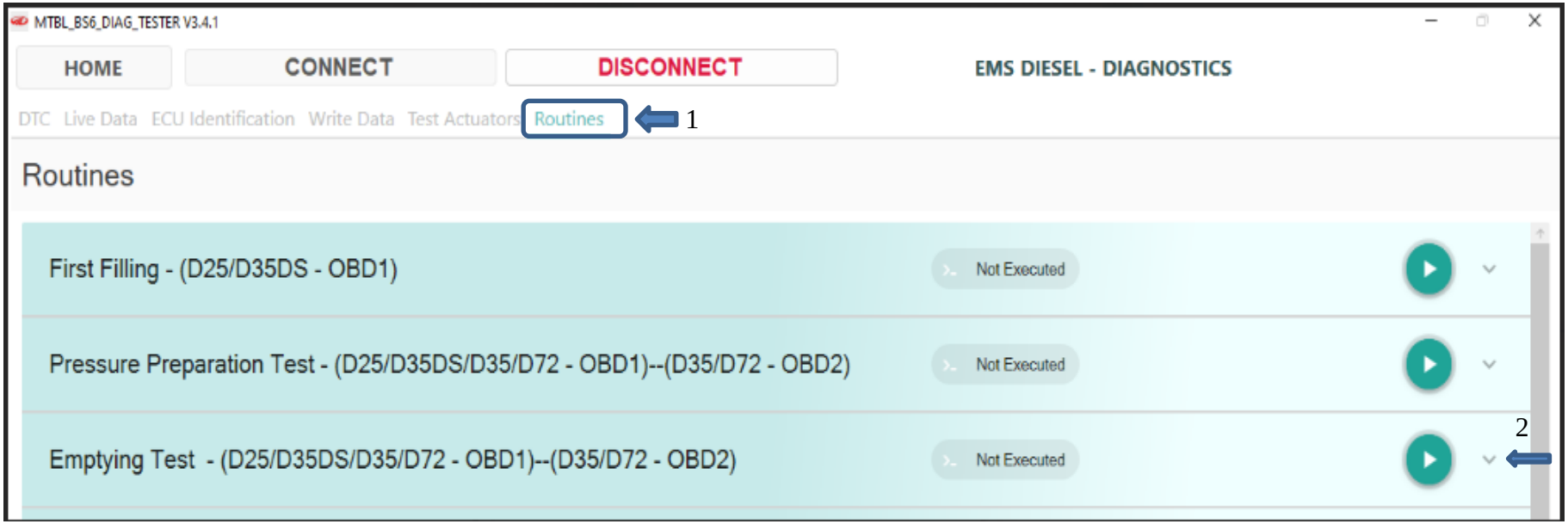
Routine Test Name	Test Function	Platform Applicability with Routine Sequence of Execution
		DNOx 2.2 (D72)
		To be carried out after replacing any of DNOx system components & ECU
First Filling	To activate new supply pump	N. A
Pressure Preparation Test	To check whether the desired pressure is built up by supply module	1
Emptying Test	To empty AdBlue lines	4
Leak Detection Test	To check leakage in AdBlue lines	5
Backflow Pump Test	To check working of Backflow Pump	N. A
Static Dosing Quantity Test from Calibration	To check whether the AdBlue is Dosing as per desired manner	2
Spray Test	To check AdBlue Dosing unit	3
Dosing Valve Dry Actuation	To check AdBlue Dosing unit	N. A
EOL command combining First Filling, Pressure Preparation & Emptying Test	N. A	N. A

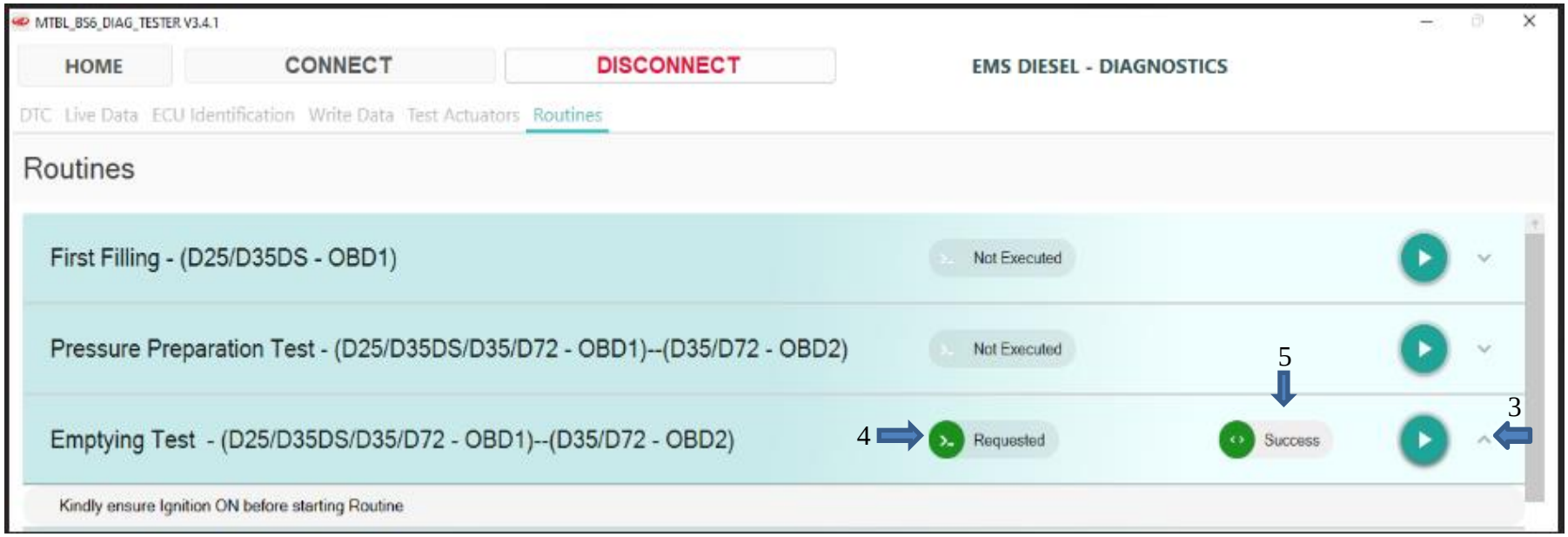
Sample Routine Test procedure w.r.t “**Emptying Test**” is given below for reference. For all other Routine functions, the user needs to follow the same procedure after selecting the required Routine option.

1. Click on **Routines** functionality from tool,
2. Click on **drop down** arrow from “**Emptying Test”**
3. Click on drop down arrow from status bar.
4. Click on **Execute button** and wait till the process of execution is completed.
5. Once the test is completed successfully, notification will pop as “**Emptying test routine is successful**”.

Note:

If the routine function test **fails**, then the notification will come accordingly, at which time, user need to check whether all the preconditions are maintained and then perform the test once again.




MTBL_BS6_DIAG_TESTER V3.4.1
HOME
CONNECT
DISCONNECT
EMS DIESEL - DIAGNOSTICS
DTC Live Data ECU Identification Write Data Test Actuators Routines
Routines
First Filling - (D25/D35DS - OBD1)
Not Executed
Pressure Preparation Test - (D25/D35DS/D35/D72 - OBD1)--(D35/D72 - OBD2)
Not Executed
Emptying Test - (D25/D35DS/D35/D72 - OBD1)--(D35/D72 - OBD2)
Requested
Success
Kindly ensure Ignition ON before starting Routine
3
4
5

Note:

1.During Routine Test, If the Status indicates "**Failed"**, then it is possible that the component/system under test may be faulty.

2.When performing the Routine – **"Spray Test"**, which tells the Spray Pattern of Ad Blue, the user needs to hold the Dosing Module in front of the Blotting Paper and check the Spray Pattern and decide whether the Dosing Module is ok or faulty. If the Spray Pattern is not as per desired, then it indicates that the spray holes in the Dosing Module are blocked and accordingly the Dosing Module needs to be replaced. Sample image given below will assist in differentiating between an acceptable & faulty spray pattern.

DNOx 2.2 (6 Holes)

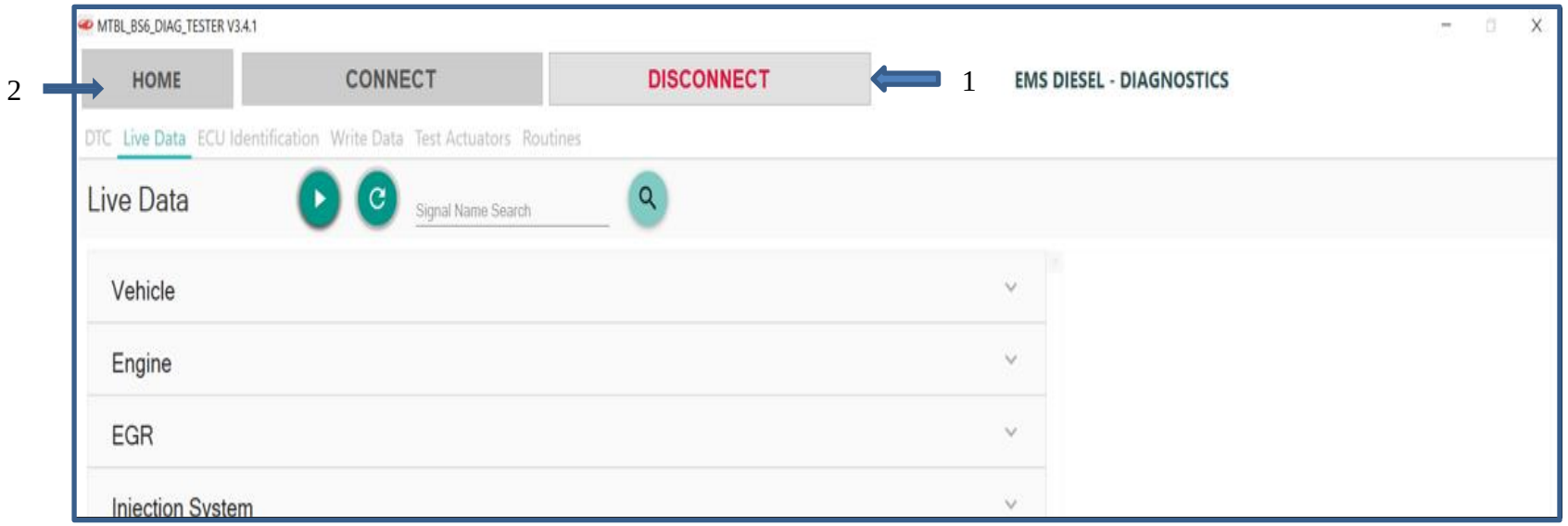
3. For DNOx **2.2** System – The Dosing Module has **6** holes.
4. If a component under diagnosis is a part of both Actuator Test & Routine Test, then both the tests need to be performed before & after replacement of the component accordingly.
5. The quantity of Ad Blue that is required to be Dosed / Sprayed when the: **"Static Dosing Quantity Test from Calibration"** routine function is executed are as follows:

- **DNOx 2.2: (180 to 220) ml**

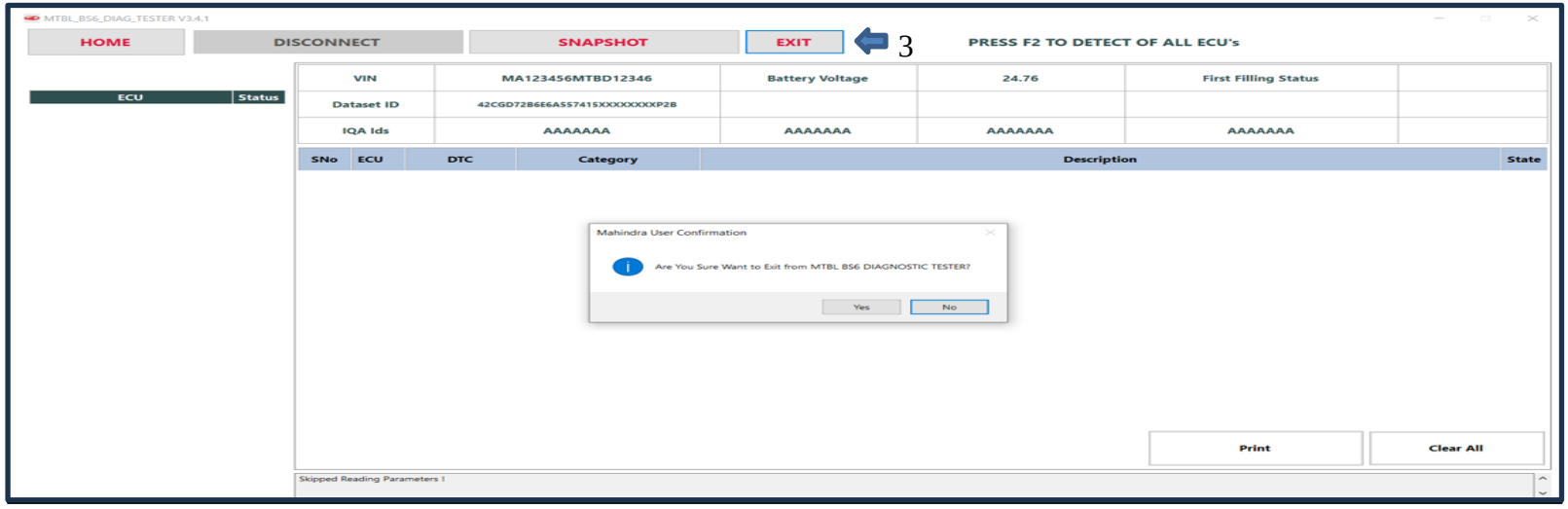
The user needs to collect the ad blue sprayed during this test in a measuring cup / jar / container & note the same. Replace Dosing Module / Faulty component if the collected values are not matching the above specified values and reconfirm. The collected ad blue then needs to be discarded.

Exiting the Diagnostic Software:

1.Click on Disconnect to Close ECU Connection. Then select Home option.



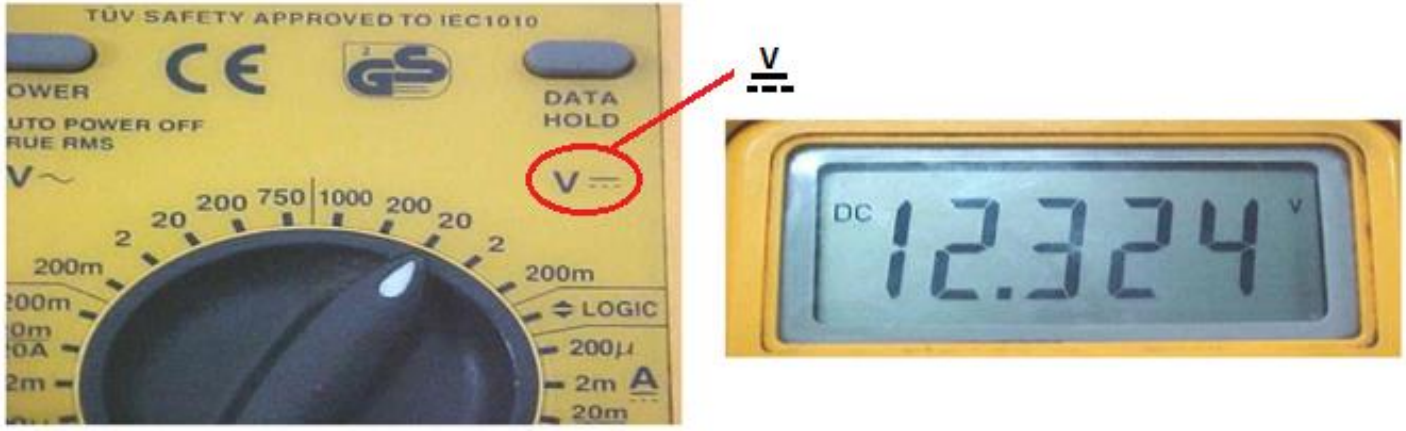
2.Click on Exit and Yes to close the software.

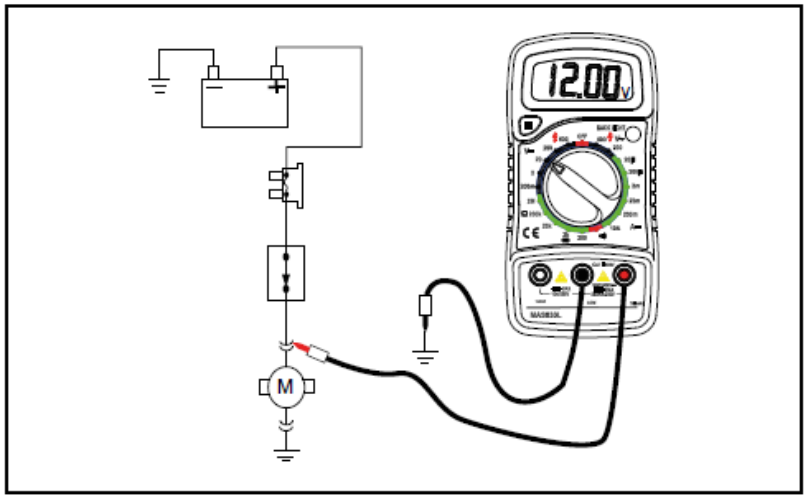


3.3 Multimeter or Continuity Tester – Tool for Diagnosis

1. Voltage checking and resistance checking Voltage.

- Voltage is the electrical force that moves electrons through a conductor.
- The Unit of Voltage is Volt. It is expressed by the letter “V”.
- Keep the knob position in the DC volt range. The selected voltage should be higher than the voltage of the power source checked. Voltage value will appear on screen.



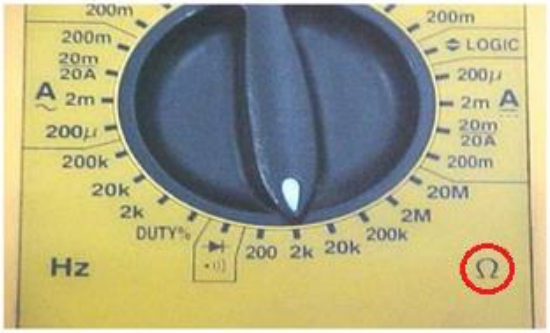


TESTING OF VOLTAGE POTENTIAL

- Connect the ground lead of a voltmeter to a body ground or battery ground
- Connect the other lead of voltmeter to selected test point. The vehicle ignition may need to be turned ON to check voltage.

2. Resistance

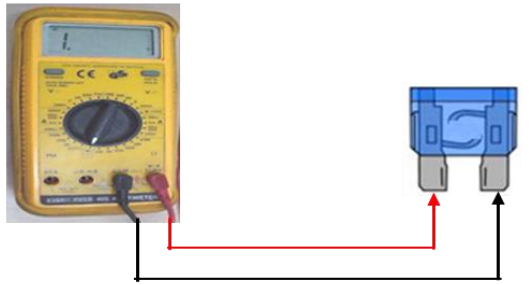
- Resistance is the force that reduces or stops flow of electrons. It opposes voltage.
- The Unit of Resistance is Ω (Ohms). It is expressed by the letter "R".
- Keep the knob position in the higher range of the resistance value of the component to be checked. Resistance value will appear on screen.



NOTE
1. MTBD recommends usage of digital multimeter
2.While checking wiring, resistance, Sensor/Actuator/ECU connectors should be disconnected.

3. Fuses

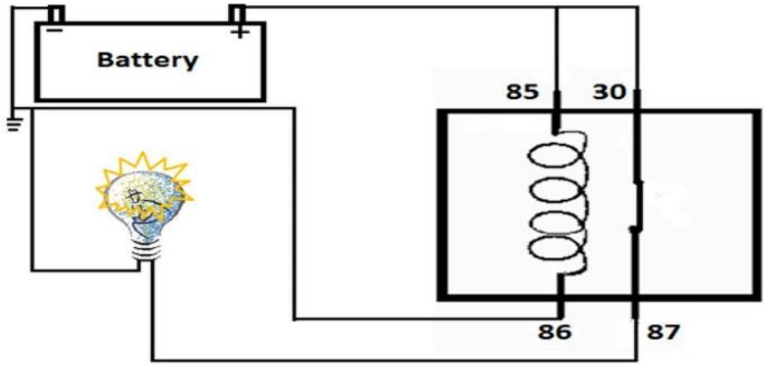
Buzzer “ON” – Fuse OK



Buzzer “OFF” – Fuse NOT OK / BLOWN

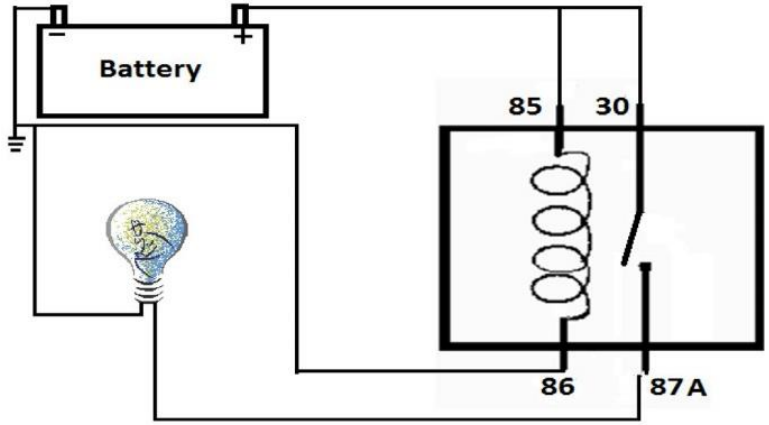
4. Relays

4 Pin Normally Open Relay Checking:



After making the electrical connections for testing the relay, if the bulb glows, then the relay is OK; else the relay is faulty and needs to be replaced.

4 Pin Normally Closed Relay Checking:

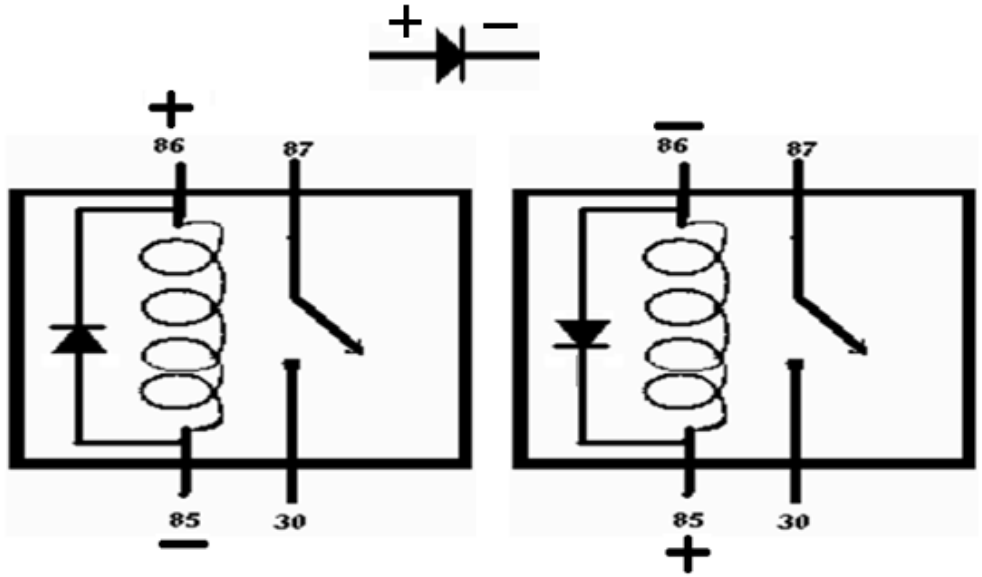


After making the electrical connections for testing the relay, if the bulb does not glow, the relay is OK. Since it is a normally closed relay, the bulb will glow after removing the relay coil supply i.e., supply at pin no. 85. If the above conditions do not meet, the relay is faulty and needs to be replaced.

Relay with De-spike diode:

- Some relays have in-built diode across pin no 85 & 86 to save the system from surge voltage. When relay is switched off a surge voltage is produced. Sensitive components like ECU may get affected due to high surge voltage.
- Surge voltage which is produced when relay is off will pass through the diode instead of going into the circuit because diode has zero resistance in forward direction.
- When checking a relay with de-spike diode, the connection must be made based on the diode polarity.

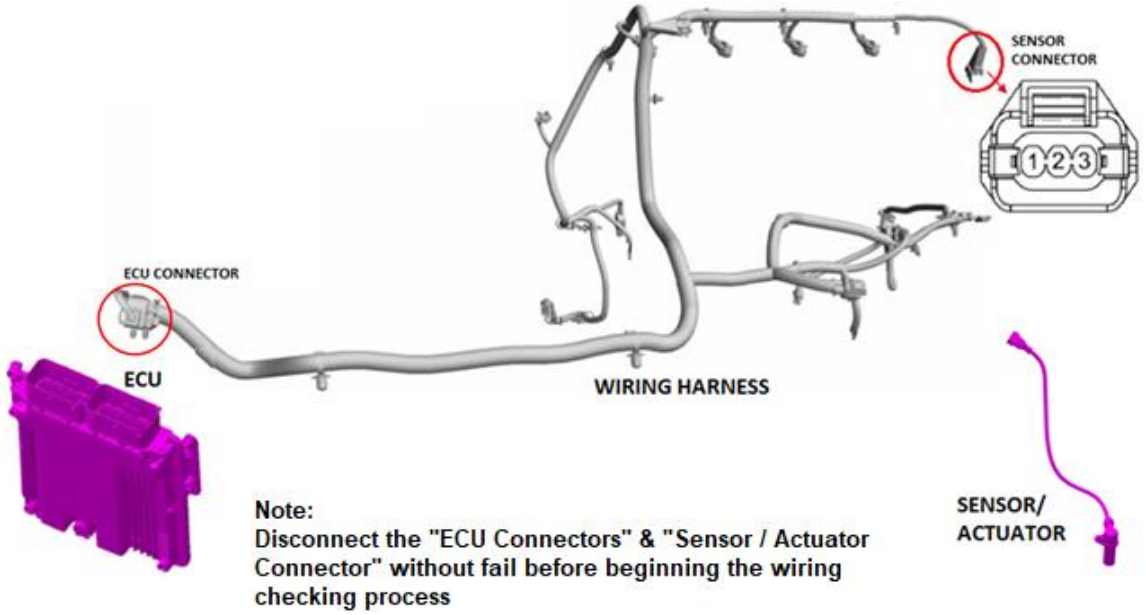
Note: In case of replacement of a relay with de-spie diode, the new relay should also be of de-spike type. Do not use a relay without diode as a replacement.



3.3.1 Possible Faults with Wiring Harness

- **Physical damage** (Sensor/Actuator Pin Back out, Expanded, Fouling, Burnt etc.)
- **Open Circuit** (Open circuit test is also known as continuity test which is measured between 2 ends of a wiring along its length)
- **Ground Circuit** (Ground circuit test is checking continuity of wiring with any ground point. It is also known as short to ground)
- **Short Circuit** (Short circuit test is checking continuity of one wire with a different wire / with battery positive. It is also known as short to battery)

How to Trace Faults (Sample)



Sequential steps to follow during wiring checking:

1. Before performing inspection / checking on wiring, always **Switch off** the **Ignition Switch**, **disconnect** the **ECU connectors** & **Sensor / Actuator connector**, after which the wiring harness needs to be inspected for complaints.

2.Check whether the Sensor / Actuator connector is properly seated on the sensor / actuator.

3.Check for physical damages, loose connection, fouling, burning, water entry, oxidation/corrosion of pins, routing of harness, wiring insulation damages

4.Check for pin back out, connector pin damages, connector pin expanded, loosely seated wire in connector, broken wire, damaged wire by carrying out physical inspection of the sensor / actuator connector. Refer sample images below for understanding the connector related complaints.

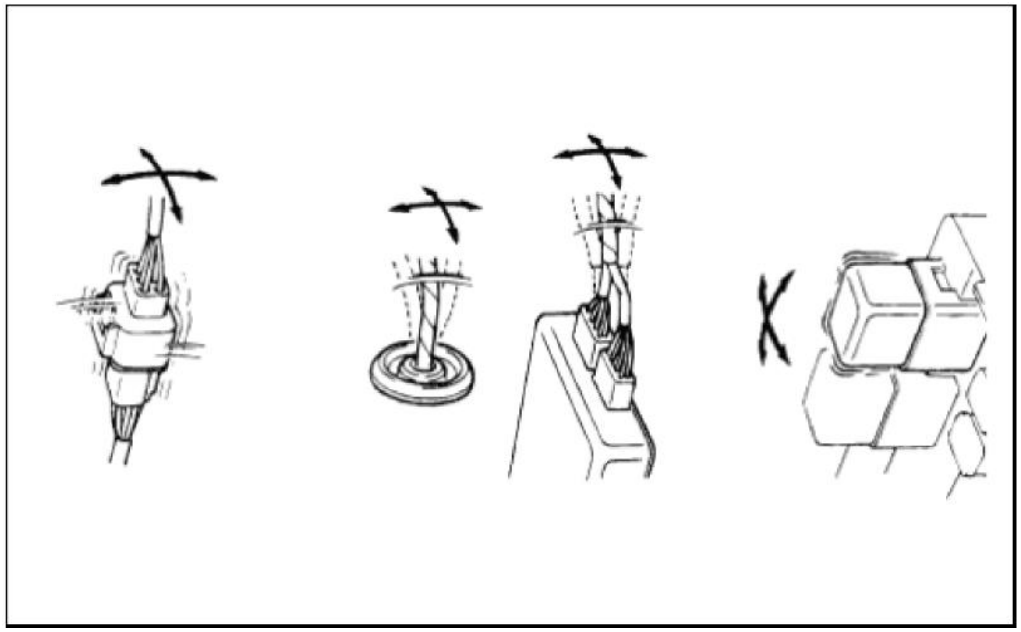
Connector pin expanded

Connector damaged

Connector pin loose / uprooted /

Carry out the following checks with the connectors and components to confirm whether the trouble symptom occurs.

- Gently shake the connector up, down and to the left and right
- Gently shake the wiring harness up, down and to the left and right.
- Gently shake the fuse / relay board, etc. by hand.
- Gently shake the wiring harness at the location of hanging and other moving parts



5. Check the male pin on the sensor for burnt, bent or broken pins or physical damages.

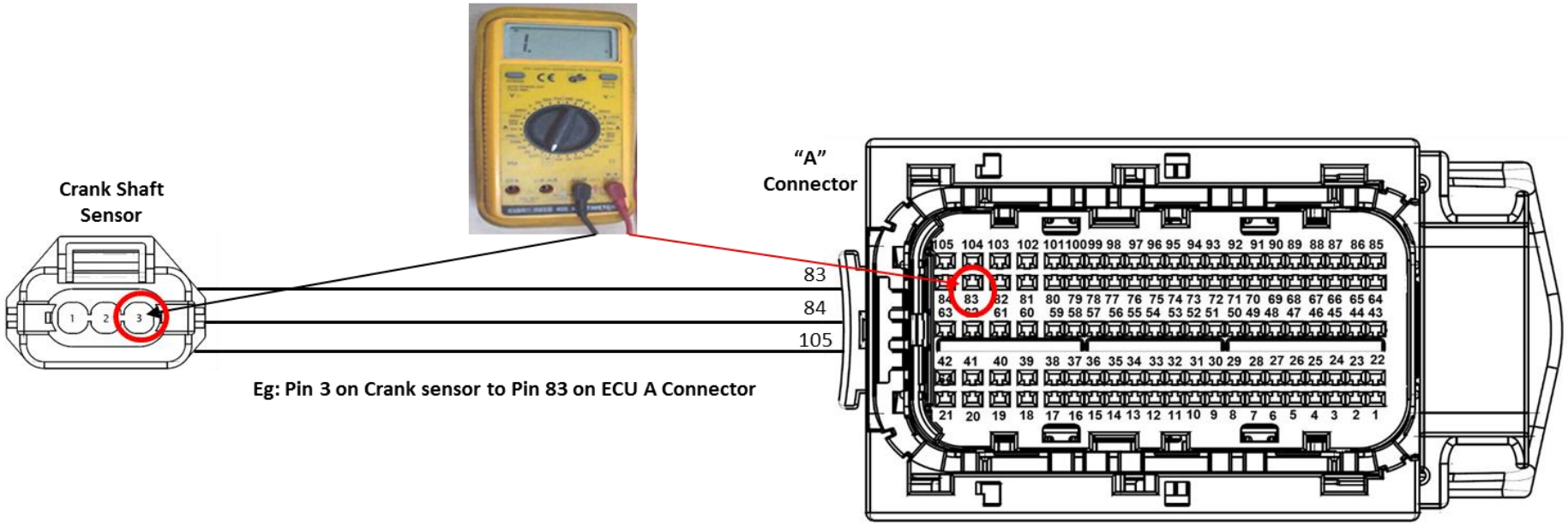
6. When inspecting wiring harness for any complaints, always check for **Open circuit, short circuit & Ground circuit.**

7. To start with carryout end to end checking - Sensor / Actuator to respective ECU Connector. If complaint is observed, then check form sensor/actuator to respective interconnectors (if applicable) & then from interconnectors to respective ECU Connector. Replace only that harness in which the complaint is observed.

8. At the time of replacement of wiring harness, in order to avoid cross connections between sensors/actuators, in some cases, the wiring color codes can be referred from schematics to understand the connector name.

Sample procedure to check Open, Ground and short circuit in wiring harness:

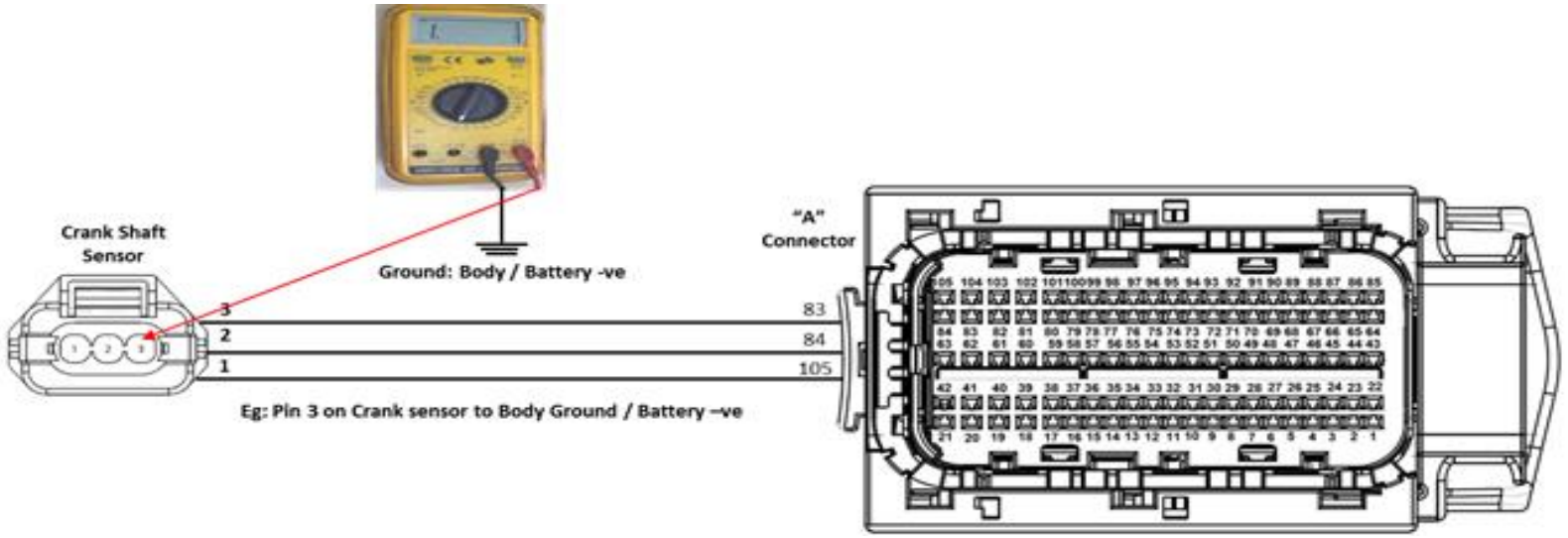
1. Open Circuit test or Continuity test



Check Point	From	To	Multimeter "Buzzer"	
			If - Yes	If - No
Open Circuit	Crank Shaft Sensor Pin No. – 1	ECU "A" Connector Pin No. – 105	Wiring **Ok**	Wiring **Not Ok**
	Crank Shaft Sensor Pin No. – 2	ECU "A" Connector Pin No. – 84		
	Crank Shaft Sensor Pin No. – 3	ECU "A" Connector Pin No. – 83		

- Find whether there is electrical continuity between the pins of the sensor / actuator being checked and the corresponding ECU pin.
- Set the multimeter (DMM) in continuity mode and ensure a beep sound.
- ECU Pin out diagram to be referred and continuity between the pin no. 1, 2, 3 of sensor to the corresponding EMS ECU pin no. 105, 84, 83 respectively is to be checked.
- If continuity is observed, it means the wiring is OK; else if no continuity is observed, it means there is a complaint of open circuit – replace the corresponding wiring harness.

2. Ground Circuit test:

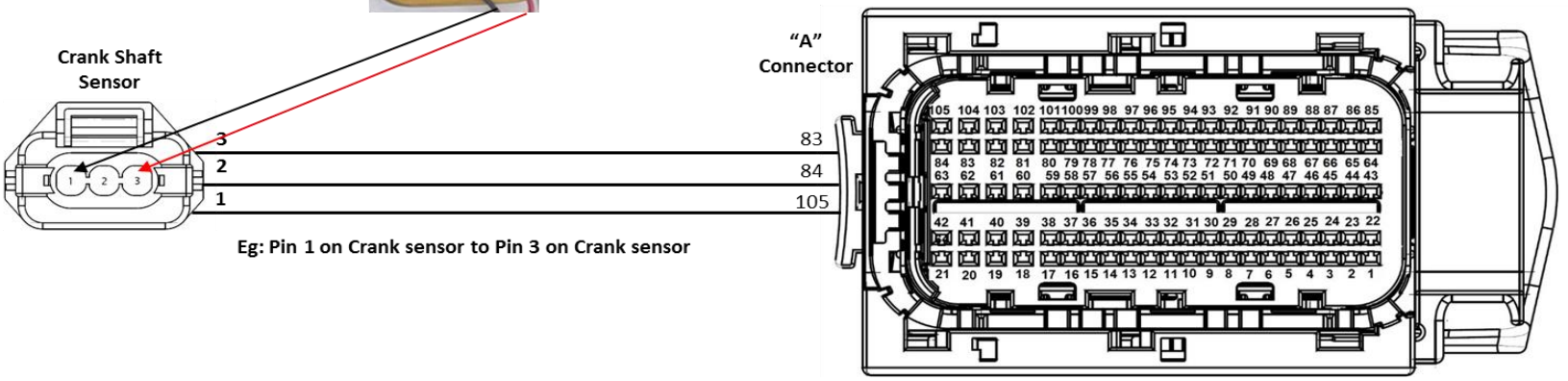


Check Point	From	To	Multimeter "Buzzer"	
			Yes	No
Ground Circuit	Crank Shaft Sensor Pin No. – 1	Body Ground / Battery –ve	Wiring **Not Ok**	Wiring **Ok**
	Crank Shaft Sensor Pin No. – 2	Body Ground / Battery –ve		
	Crank Shaft Sensor Pin No. – 3	Body Ground / Battery –ve		

- Find whether there is electrical continuity between the pins of the sensor / actuator being checked and the ground.
- Set the multimeter (DMM) in continuity mode and ensure a beep sound.
- The connector view of sensor / actuator being checked to be referred and continuity between the pin no. 1 and body ground / battery -ve; pin no. 2 and body ground / battery -ve; pin no. 3 and body ground / battery -ve to be checked.
- If no continuity is observed, it means the wiring is OK; else if continuity is observed, it means there is a complaint of ground circuit – replace the corresponding wiring harness. Sometimes it may be required to shake the wiring under inspection at every 6 – 8 inches apart to verify ground issues.

NOTE
While checking any part of engine, chassis, for ground it should be free from paint, grease or rust.

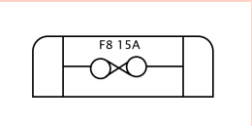
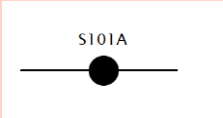
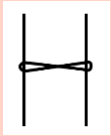
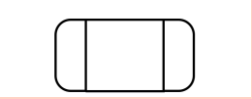
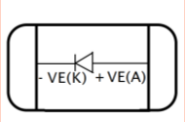
3. Short Circuit test:

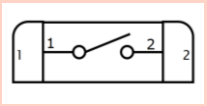
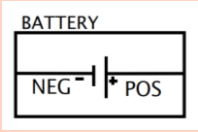
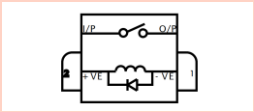
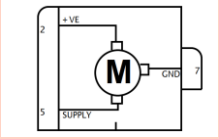


Check Point	From	To	Multimeter "Buzzer"	
			Yes	No
Short Circuit	Crank Shaft Sensor Pin No. – 1	Crank Shaft Sensor Pin No. – 2	Wiring **Not Ok**	Wiring **Ok**
	Crank Shaft Sensor Pin No. – 1	Crank Shaft Sensor Pin No. – 3		
	Crank Shaft Sensor Pin No. – 2	Crank Shaft Sensor Pin No. – 3		

- Find whether there is electrical continuity between the pins of the sensor / actuator being checked.
- Set the multimeter (DMM) in continuity mode and ensure a beep sound.
- The connector view of sensor / actuator being checked to be referred and continuity between the pin no. 1 and pin no. 2; pin no. 1 and pin no. 3; pin no. 2 and pin no. 3 to be checked.
- If no continuity is observed, it means the wiring is OK; else if continuity is observed, it means there is a complaint of short circuit – replace the corresponding wiring harness.

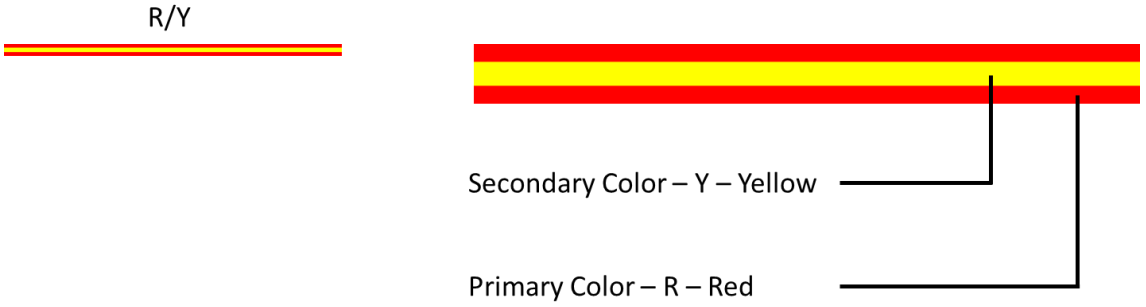
3.3.2 Electrical Symbols

Electrical Symbol	Description
	Low rating Fuse with Number and Fuse rating
	Higher rating fuse (Maxi Fuse) and Fuse rating
	Splice with Splice number
	Twisted wire
	Part of Component
	Entire Component
	Crossed wires without Connecting
	Diode

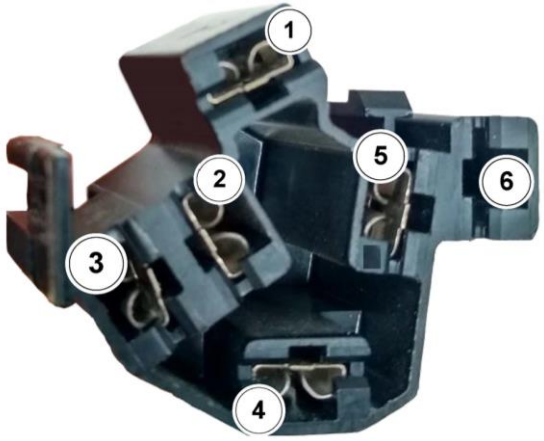
Electrical Symbol	Description
	Switch
	Wire with Color Coding Y – Base wire with Yellow Color R – Tracer wire with Red Color
	Battery
	Relay (with diode)
	Motor / Pump

3.3.3 Wire Color Codes

WIRE CODE	WIRE COLOUR
B	Black
Br	Brown
L	Blue
W	White
R	Red
Y	Yellow
G	Green
O	Orange
Gr	Grey
Pr	Purple
P	Pink
Si	Silver
V	Violet
Sb	Light Blue
N	Navy
M	Maroon

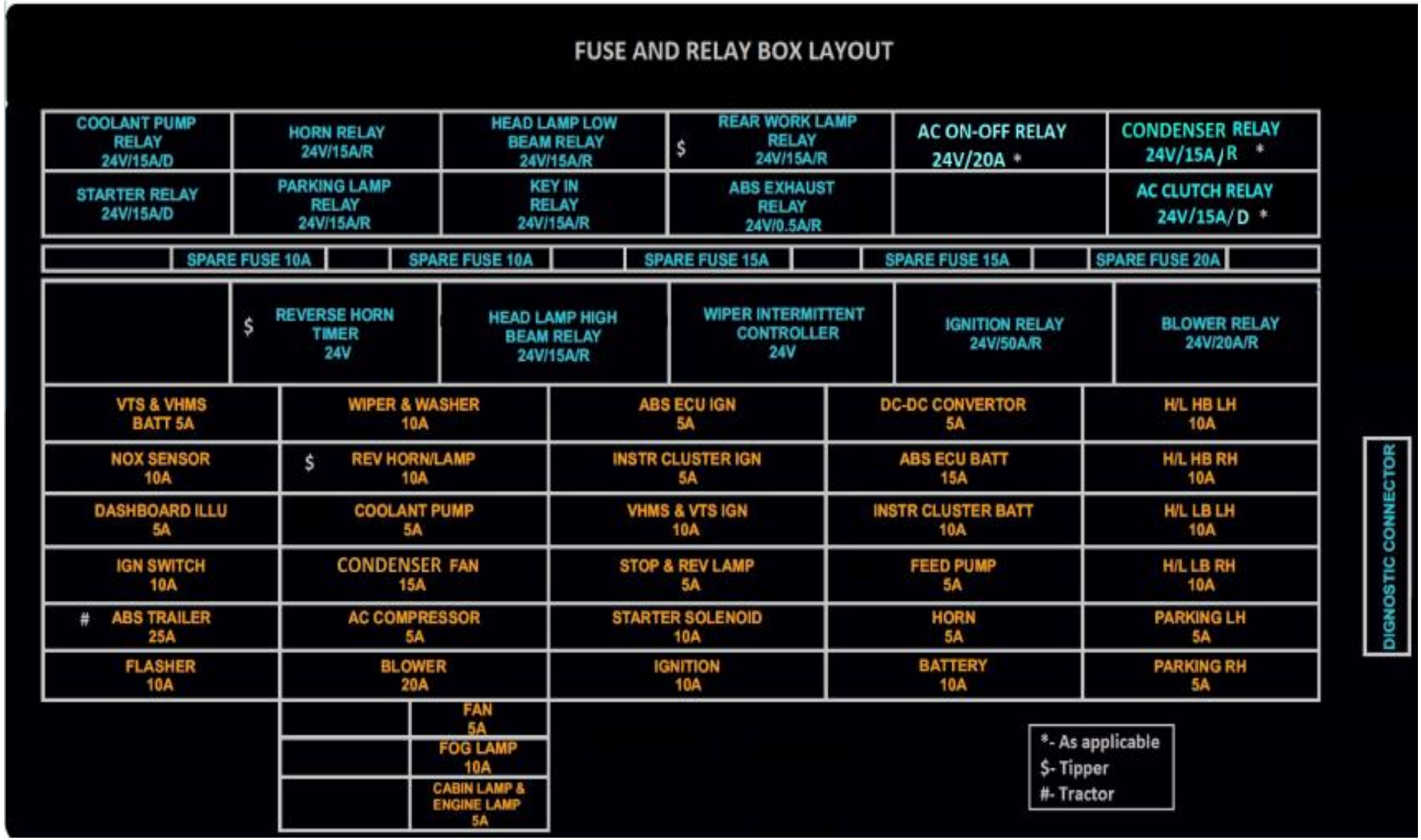


3.3.4 Ignition Connector

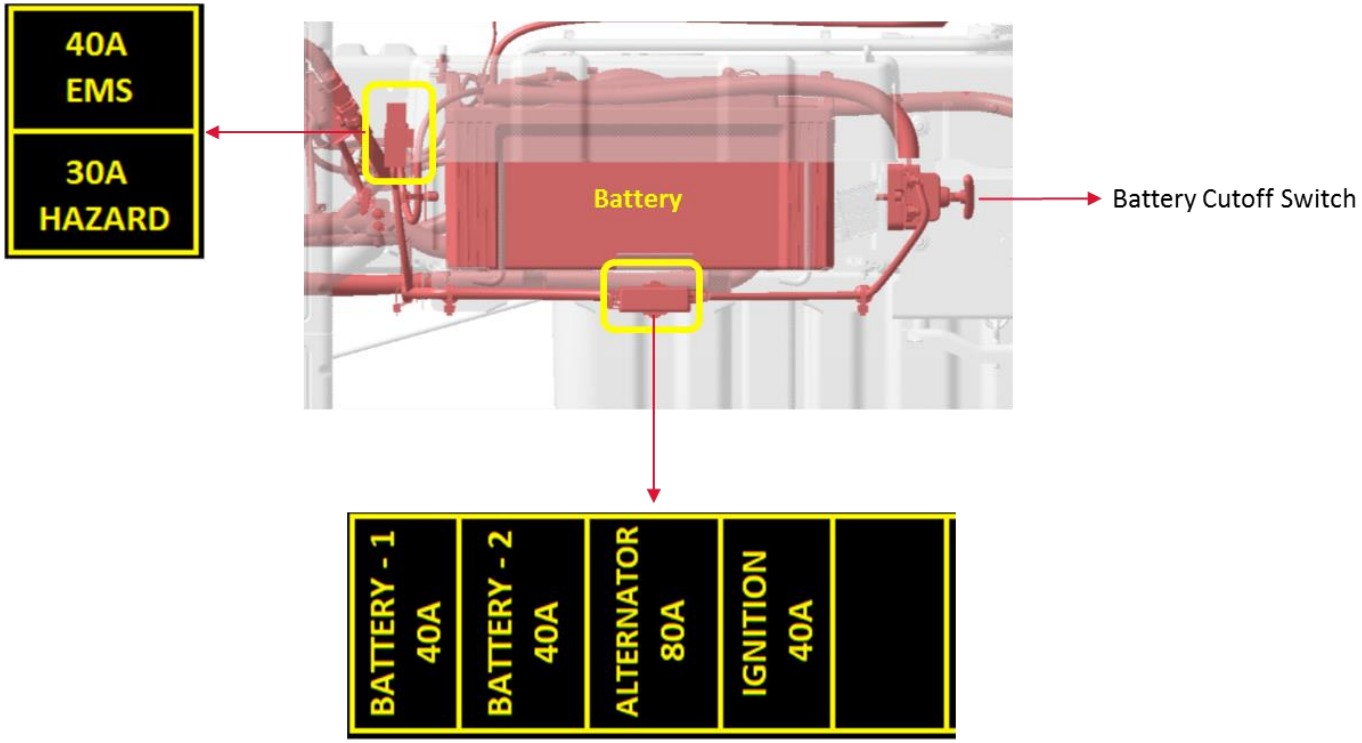


Cavity No.	Wire Color	Circuit
1	Red / Black	30 (Power In)
2	Red / Black	KA (Key Acc)
3	Yellow / Blue	50 (Starter)
4	White	15A (Ignition Acc)
5	Red / Yellow	15 (Ignition Circuit)
6	Empty	

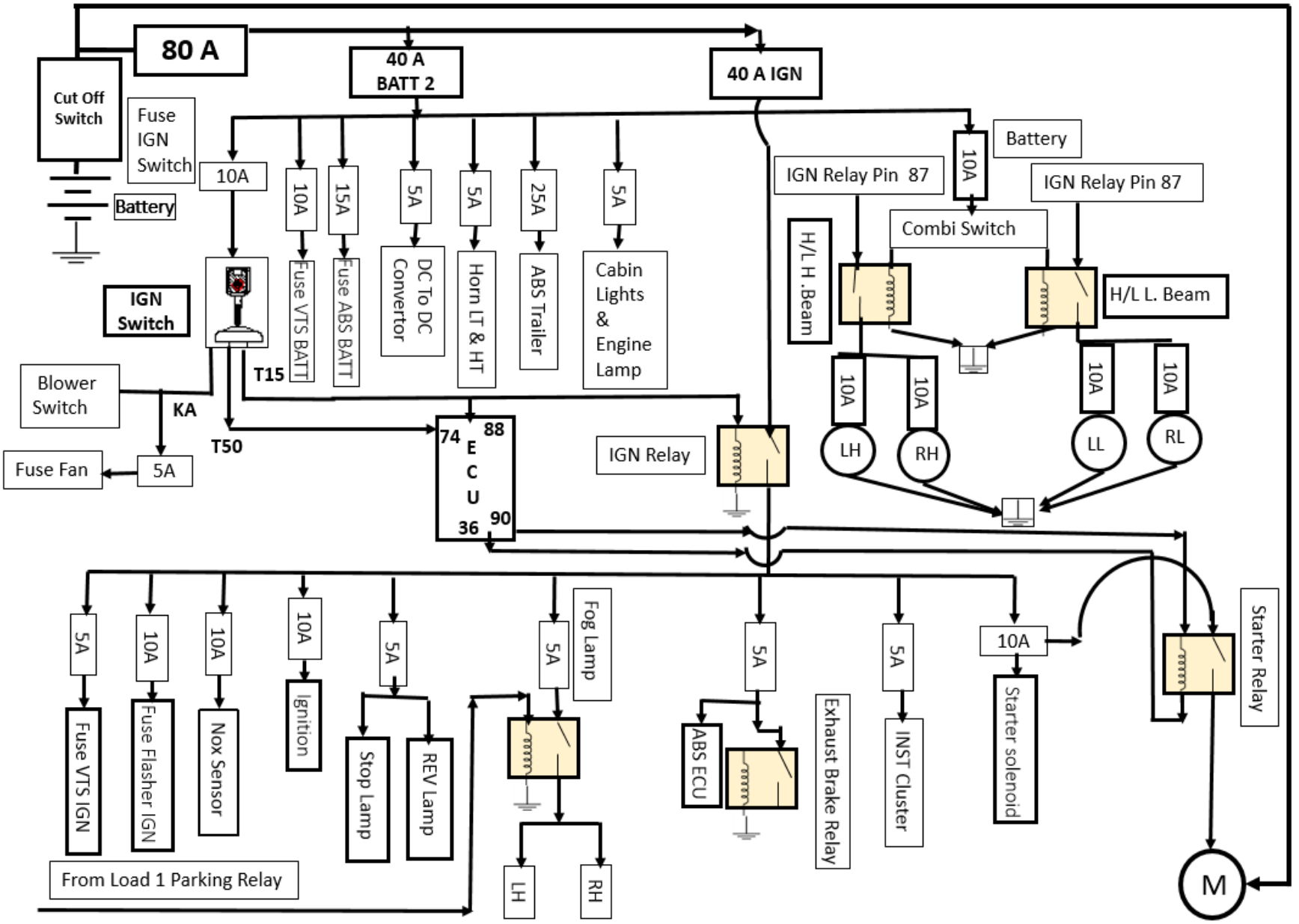
3.3.5 Cabin Fuse and Relay Details



Maxi Fuse Details:



3.3.6 Load Distribution



3.4 Fuses and Relays Reactions

Fuse Name	Cluster lights	Check lamp	MIL	Cranking	Starting	Remarks
80A MAXI FUSE	NO	NO	NO	NO	NO	
40A MAXI FUSE (BATT-2)	NO	NO	NO	NO	NO	
40A MAXI FUSE (IGNITION)	NO	NO	NO	NO	NO	
IGN SWITCH – 10A	NO	NO	NO	NO	NO	
IGN RELAY	NO	NO	NO	NO	NO	
40A MAXI FUSE – EMS ECU	YES	Normal	Comes during self-checking & goes OFF	NO	NO	Check Lamp comes and goes off during Cluster Self Checking. Temp Gauge indicates full & High Temp Lamp Blinks.
INST CLUST IGN – 5A	NO	NO	NO	YES	YES	
FUSE VTS BATT – 10A	NO	NO	NO	YES	YES	
STARTER SOLENOID – 10A	YES	YES	YES	NO	NO	

NOTE
Above electrical failures may be due to wiring defects also, for which related wiring needs to be checked.

Note: When checking for ground circuit (short to ground) on fuses supplying power to several loads, switch OFF the ignition and disconnect the battery.

Referring the wiring diagrams, disconnect or isolate all items on the suspected fused circuits, if applicable. Replace the blown fuse. Supply power to the fuse by turning ON the ignition switch or re-connecting the battery as applicable. Start connecting the components in the fuse circuit one at a time. When the fuse blows, the circuit with the short to ground has been identified.

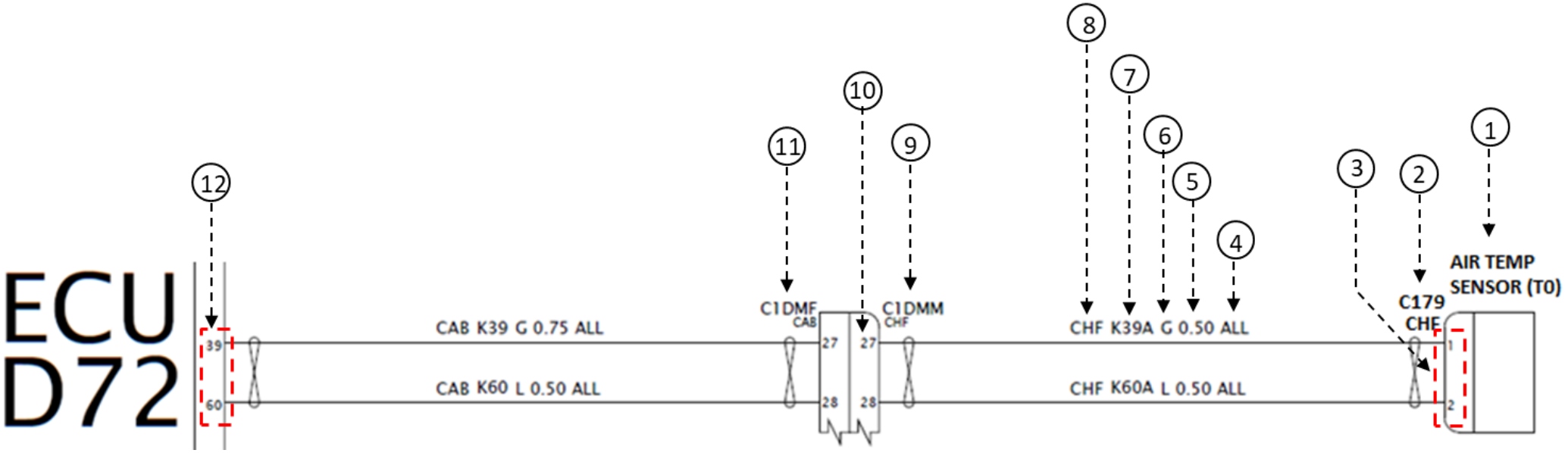
Conditions when the Vehicle is unable to Start.

Sr No	Fault condition	Reason
1	Engine will not crank and not start	• Alternator – 80A • BATT 2: 40A Maxi Fuse • IGN 40A Maxi Fuse • EMS ECU – 40A Maxi Fuse • Starter Solenoid – 10A • Fuse IGN Switch – 10A • Ignition Switch • Ignition Relay • Starter Relay • ECU failure • No supply / ground to ECU from battery. • Along with the above-mentioned components / fuses / relays, the corresponding wiring also needs to be checked.

Sr No	Fault condition	Reason
2	Engine will crank but does not start	• If more than 2 injectors are faulty • Any injector is short or grounded. • Air lock in the vehicle • Fuel starvation • Crankshaft sensor and Cam sensor fails together.

NOTE
Along with the above-mentioned components, the corresponding wiring also needs to be checked wherever applicable

Sample schematic for understanding the wiring harness nomenclature.



Sr. No	Description
1	Sensor / Actuator Name (Eg: Air Temp Sensor (T0))
2	Sensor / Actuator Connector Number (Eg: C179)
3	Sensor / Actuator Connector Pin numbers (Eg: Pins 1 & 2 respectively)
4	Common for all D72 Variants (Eg: Haulage, Tipper, Tractor)
5	Cross Sectional Thickness (Eg: 0.50 mm)
6	Wire Color Code (Eg: G – Green; L – Blue)

Sr. No	Description
7	Wire Number
8	Wiring Harness Name* (E.g. CHF – Front Chassis Harness)
9	Wiring Harness Interconnector (Eg: C1DM**M** – Male Side of CIDM Connector)
10	Interconnector Pin Number (Eg: 27 / 28)
11	Wiring Harness Interconnector (Eg: C1DM**F** – Female Side of CIDM Connector)
12	ECU Pin Number (Eg: Pins 39 & 60 respectively)

*CHF: Front Chassis, CAB: Cabin, ENG: Engine, ATS : After Treatment System, DNOx, TRANS+: Transmission, BAP : Battery Positive, BAN : Battery Negative

Main Interconnectors: Removal & Refit Procedure

i. C1AG Interconnector: Connects Front Chassis & Engine wiring harness. Female connector Chassis Front side; Male connector Engine side

Sl No	Interconnector Name	From Wiring	To Wiring
1	C1AG	FRONT CHASSIS (CHF)	ENGINE (ENG)
		C1AGF – FEMALE	C1AGM – MALE
			

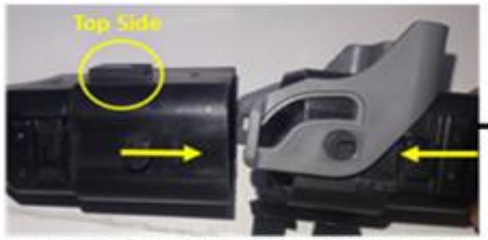
C1AG: Connector Removing

Press the connector lock retainer on top & rotate the connector as shown

Connector lock in open position

Pull the mating connectors apart

C1AG: Connector Refitting

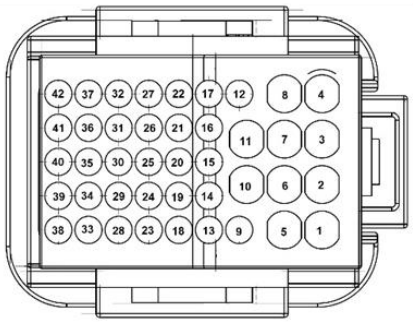
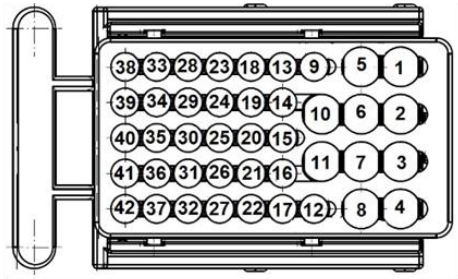


Insert the mating connectors into one another

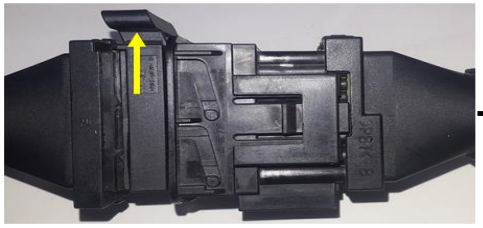
Rotate the connector lock as shown in the image

Connector locking is completed when clicking noise is heard

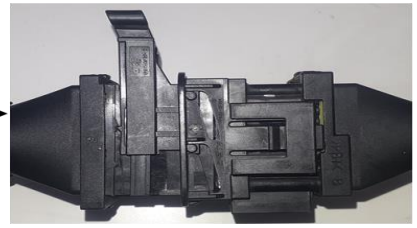
ii. C1DM Interconnector: Connects Front Chassis & Cabin wiring harness. Male connector Chassis Front side; Female connector Cabin side.

		FRONT CHASSIS (CHF)	CABIN (CAB)
		C1DMM - MALE	C1DMF - FEMALE
2	C1DM		

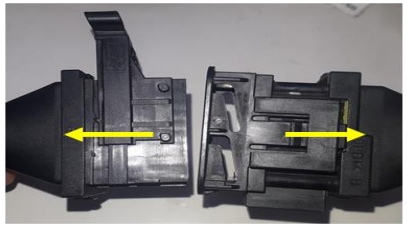
C1DM: Connector Removing



Pull the connector lock up as shown in the image



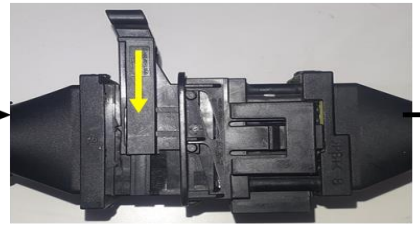
Connector lock in open position



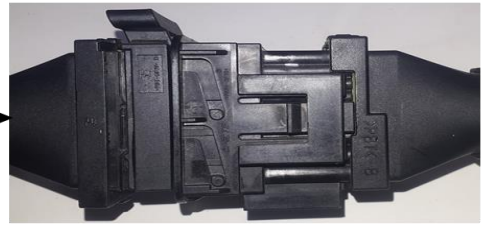
Pull the mating connectors apart

C1DM: Connector Refitting

Insert the mating connectors into one another

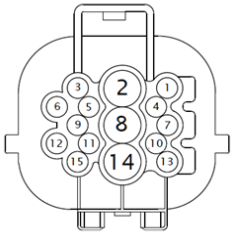
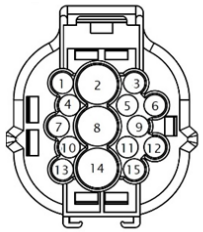


Push the connector lock down as shown in the image

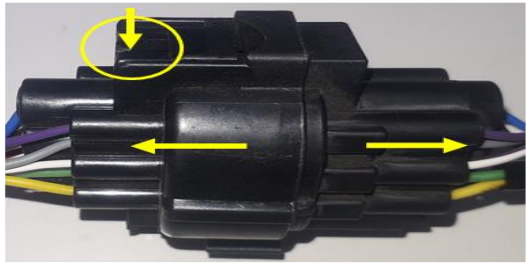


Connector is in locked position

iii. C1DC Interconnector: Connects DNOx & Front Chassis wiring harness. Male connector DNOx side; Female connector Chassis Front side.

Sl No	Interconnector Name	From Wiring	To Wiring
3	C1DC	DNOX	FRONT CHASSIS (CHF)
		C1DCM - MALE	C1DCF - FEMALE
			

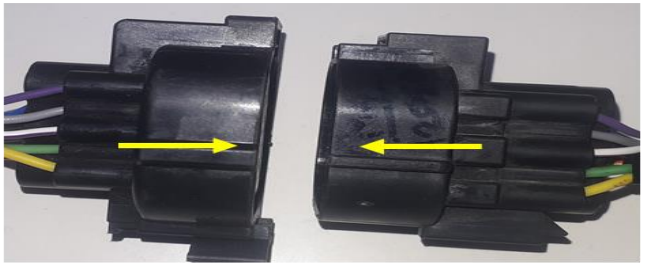
C1DC: Connector Removing



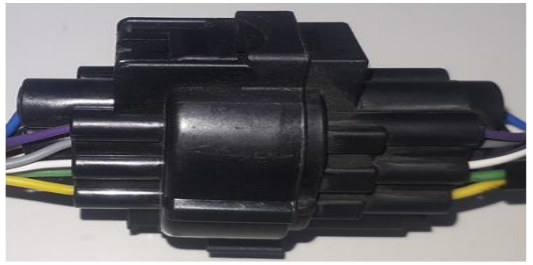
Press the lock as shown in the image & pull the mating connectors apart

Mating connectors separated

C1DC: Connector Refitting

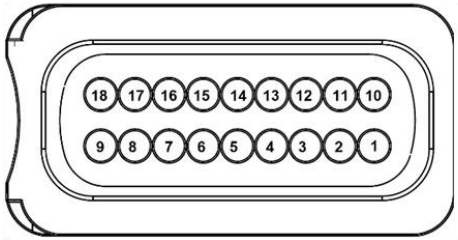
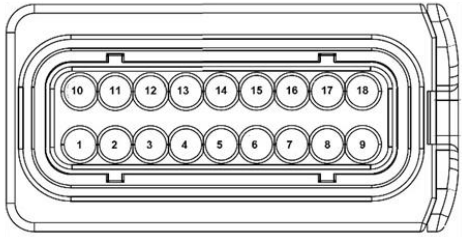


Insert the mating connectors into one another

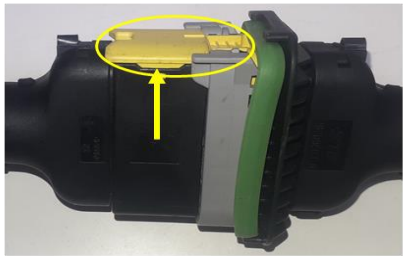


Connector is in locked position

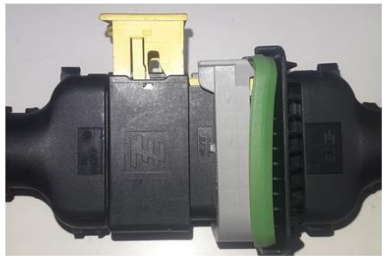
iv. C1YM Interconnector: Connects ATS & Front Chassis wiring harness. Male connector ATS side; Female connector Chassis Front side.

		AFTER TREATMENT SYSTEM (ATS)	FRONT CHASSIS (CHF)
		C1YM - MALE	C1YF - FEMALE
4	C1Y		

C1Y: Connector Removing



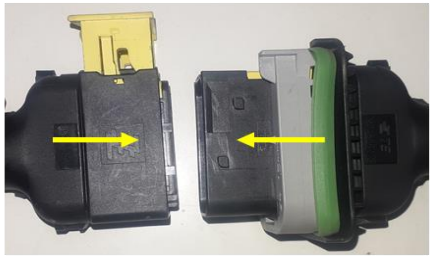
Pull the connector lock up as shown in the image



Connector lock in open position

Pull the mating connectors apart

C1Y: Connector Refitting

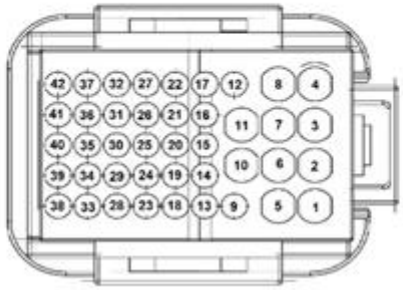
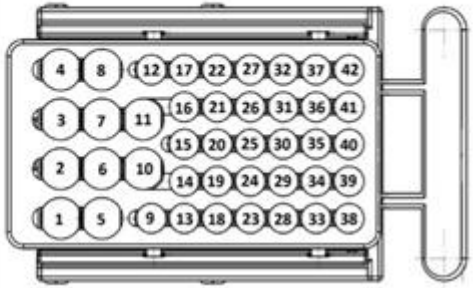


Insert the mating connectors into one another

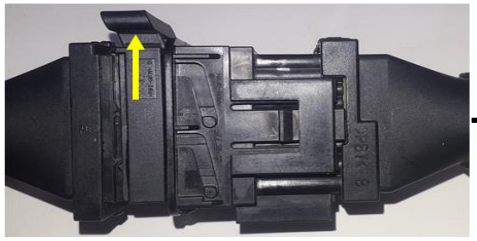
Push the connector lock down as shown in the image

Connector is in locked position when you hear a clicking noise

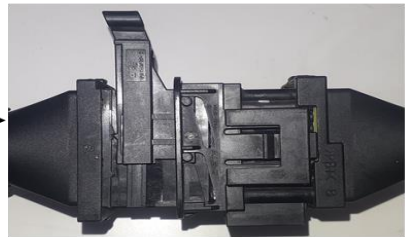
v. C1AJ Interconnector: Connects Cabin & Chassis Front wiring harness. Male connector Cabin side; Female connector Chassis Front side.

		CABIN (CAB)	FRONT CHASSIS (CHF)
		C1AJM - MALE	C1AJF - FEMALE
5	C1AJ		

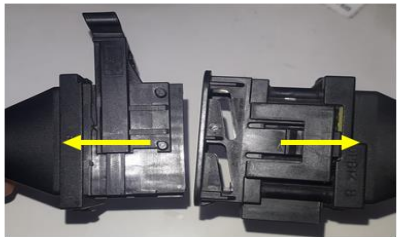
C1AJ: Connector Removing



Pull the connector lock up as shown in the image

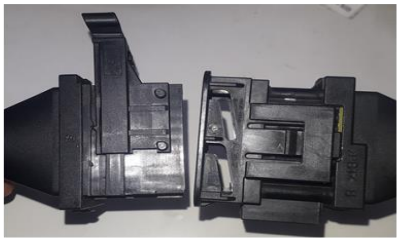


Connector lock in open position

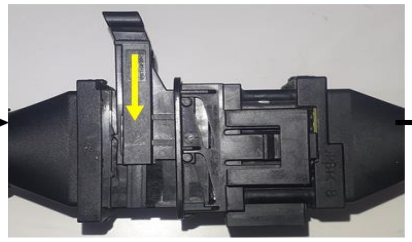


Pull the mating connectors apart

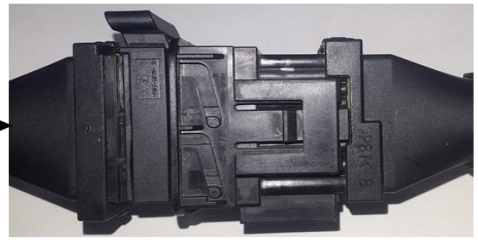
C1AJ: Connector Refitting



Insert the mating connectors into one another



Push the connector lock down as shown in the image



Connector is in locked position

Key Sensor / Actuator Connectors R&R:

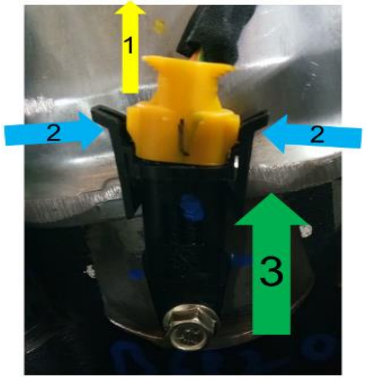
1. Accelerator Pedal Sensor:

Pull the connector lock slightly outwards as shown above.

Pull out the sensor connector as shown. above

Refit the sensor connector as shown above. Ensure proper locking.

2. Fuel Injector:

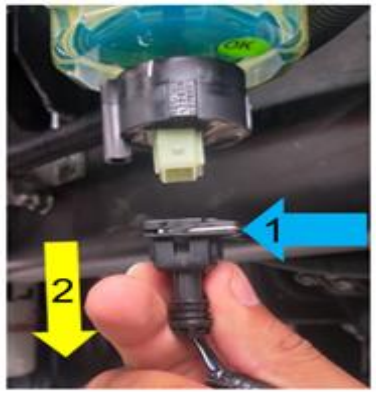


1. Pull the CPA (Yellow) up
2. Press the lock
3. Pull out the injector connector

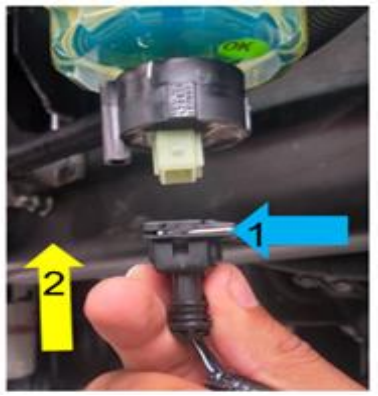
To refit the injector connector:
1. Insert the connector in its seating
2. Press down the CPA to lock the injector connector in its seating

3. Water in Fuel Sensor:

Sensor connector in proper seated position

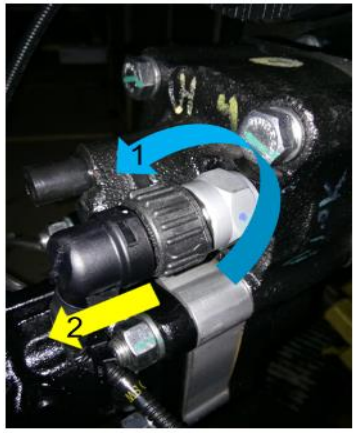


1. Push the connector ring
2. Pull out the connector



1. Push the connector ring
2. Insert the connector in its seating

4. Vehicle Speed Sensor:

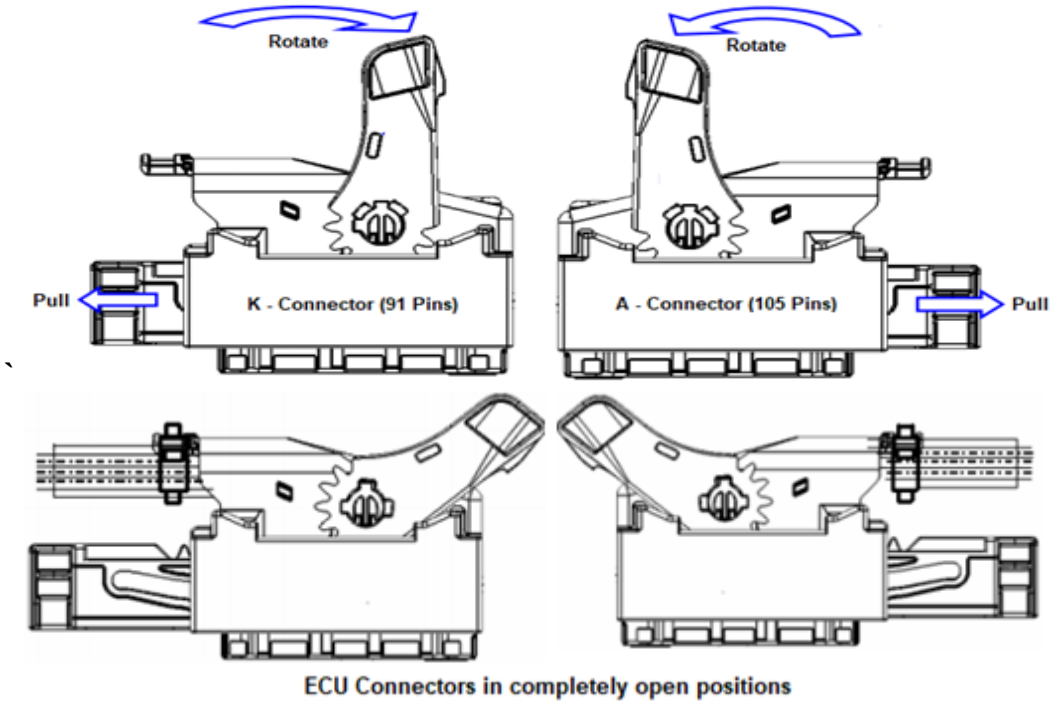


1. To remove, rotate connector lock anti clockwise
2. Pull out the sensor connector

1. To refit, insert connector in its seating
2. Rotate the connector lock clockwise

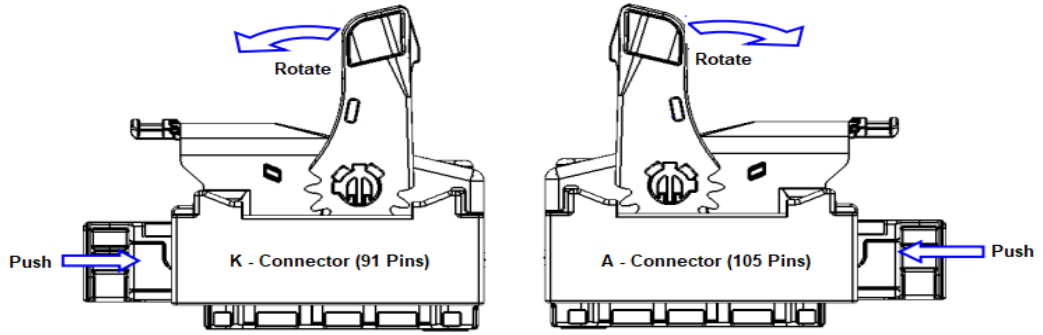
5. ECU Connectors (A & K):

Removal:



ECU Connectors in completely open positions

Refit:



4. ECU, Sensors & Actuators: Location, Functioning, Schematics, Fault Codes & Diagnosis

Note:

i. In BSVI vehicles, multiple P-Codes may be triggered simultaneously for a single root cause / complaint. These may be termed as Secondary P-Codes, which may be triggered as a resultant of a Primary P-Code. Under such circumstances, attention needs to be given to solve the primary P-Code.

- The following are the reasons for this:

ii. **Sharing of common pins**: Certain sensors / actuators either share a common supply or a common ground from the ECU. Under this circumstance, if there is complaint with this common pin / corresponding wiring, then the P-Codes pertaining to all those sensors / actuators will be triggered that are associated with the common pins. The details of sensors / actuators sharing the common pins is given in the table below & the same can be referred in the wiring diagrams under EMS ECU Engine Signal & EMS ECU Vehicle Signal sheets:

ECU Pin No.	Sensors/Actuators sharing the ECU pin commonly	Common Connection Type
K72	Multi-Mode Switches & WIF Sensor	Ground
K13	T5 & T6 Temperature Sensors	Ground
A09	BP & T & Oil Pressure Sensors	Supply
A57	Coolant Temperature & Oil Pressure Sensor	Ground
A04	EV Fan, Fuel Level Sensor, DPF Regeneration Switch	Ground
A52	Electronic EGR, ETV & HFM	Supply
K71	Ad Blue Pump & Ad Blue Level, Temperature, Quality Sensor	Supply
K07	Ad Blue Pump & Ad Blue Level, Temperature, Quality Sensor	Ground
K68	Brake Switch, Exhaust Brake Switch, Multi-Mode Switches, Water in Fuel Sensor	Supply
K73	Multi-Mode LED's,	Supply
A28	Fan Relay, Gear Neutral Switch, Clutch Switch, DPF Regeneration Inhibit Switch, AC Switch, PM Sensor	Supply

iii. **Sensor Supply (SSP):** Some sensors / actuators share a common supply circuit from within the ECU. These sensors / actuators are grouped, and supply is provided from a common circuit within the ECU. In case of any ground circuit / short circuit occurs in any of these grouped sensors / its corresponding wiring, then the error pertaining to Sensor supply may be triggered along with the corresponding errors of the sensors / actuators that are grouped under this supply circuit. The details of sensors / actuators that are grouped in the ECU for supply are given below:

a. Rail Pressure Sensor, Oil Pressure Sensor, Accelerator Pedal Sensor 2, Intake Throttle Valve are grouped together (RPS/OPS/APP2/ITV)

b. Accelerator Pedal Sensor 1, Electronic Exhaust Gas Recirculation, Metering Unit (IMV), Electronic Waste Gate Turbocharger (APP1/EGR/Meun/Turbocharger)

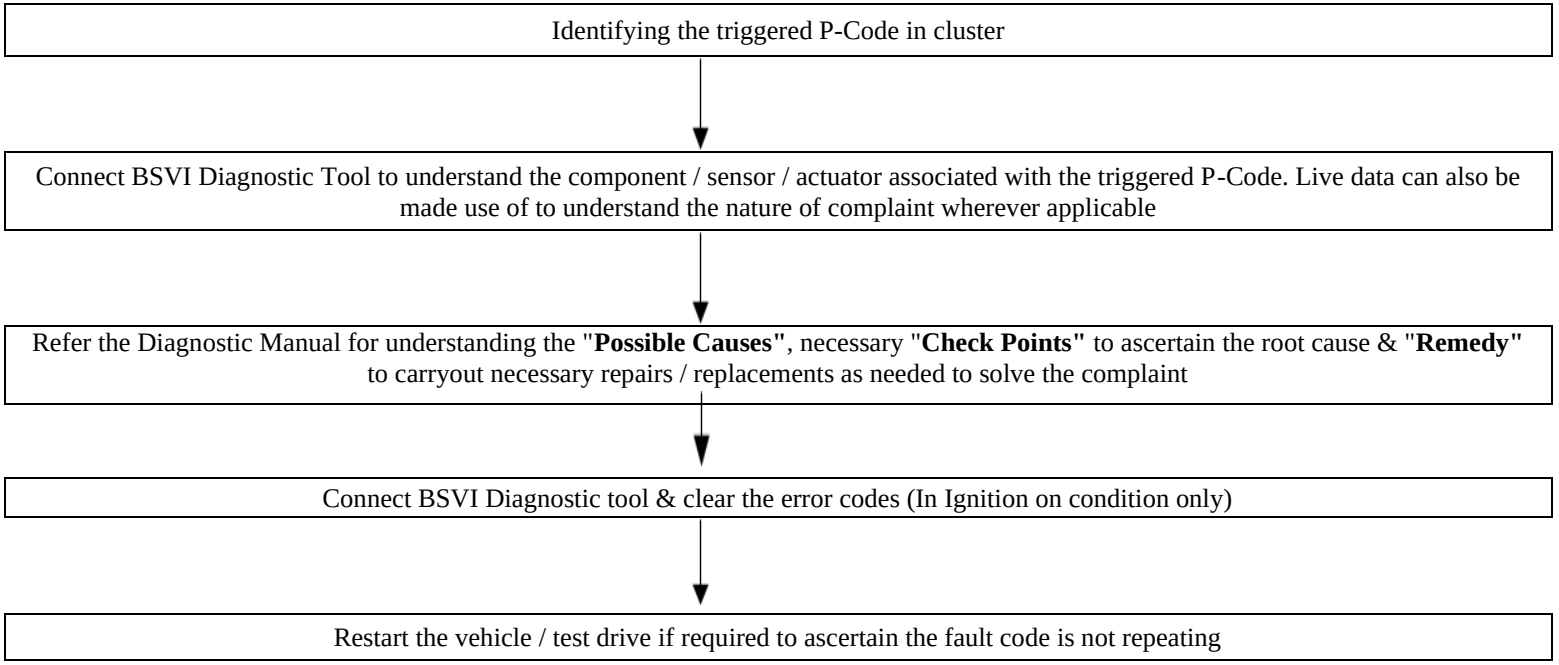
E.g.: If the Oil pressure sensor is grounded, then the error pertaining to Sensor Supply will be triggered along with Rail Pressure Error, as Oil Pressure & Rail Pressure sensors are grouped together.

.

- **Consequential / Secondary Fault Codes**: Certain P-codes may be triggered as a consequential effect of failure of a sensor / actuator. Eg: P-Code: (1) P3BA9 – Nox Exceedance – Nox Control Monitoring System, may be associated with failure of many sensors / actuators viz Rail Pressure Sensor, HFM Sensor, Boost Pressure & Temperature Sensor, Coolant Temperature sensor etc, (2) P3BA1 - NOx Exceedance - NOx control monitoring system may be associated with failure of EGR System, Ad Blue Supply Module & Dosing Module etc. In cases where there is possibility of emissions increasing due to failure of a component, the ECU will trigger this consequential error along-side primary error code. In such cases, addressing the root cause of the complaint (i.e. addressing the Primary fault codes) will automatically result in clearing of these consequential fault codes.
- Before checking for any wiring connections for faults, check that all the FUSES are OK. If the fuses are found to be blown, check the source of failure and then rectify. Do not change the fuse without addressing the root-cause.
- Before replacing any sensor / actuator / ECU, ensure that the wiring harness & supply voltages are free from any complaints, else due to consequential effect, the replaced component might fail.
- While trouble shooting, to understand the root cause of complaint, avoid replacing the suspected sensor / actuator / wiring directly. Instead it is recommended to refer the diagnostic manual for complaint diagnosis.
- Once the root cause is identified, after changing the failed components, ensure that the error is cleared using diagnostic software.
- For certain complaints, especially related to short / ground circuit / sensor failure, there is a possibility that the error might be stored in the ECU

permanently even after the affected component is replaced. If this is the case, then the ECU must be replaced & the new ECU flashed with corresponding dataset.

- Since the failure possibility of sensors/actuator & ECU are minimum, priority needs to be given on inspecting wiring harness first, followed by sensor / actuator & lastly ECU.
- In certain cases, viz Fuel injectors, IMV are found short circuited to supply / ground, then even after replacing the faulty component if the fault code persists, the replace the ECU & check.
- It is to be ensured that before installing a new ECU on the vehicle, there are no faults associated with wiring, as it may damage the new ECU also.
- PRV error is generally a consequential error & it is important to find the root cause which in turn has triggered the PRV error.
- Healing Cycle: In BSVI vehicles, after successful rectification of faults, a healing cycle needs to be given to the ECU to clear the CEL & / MIL.
- Follow below mentioned sequence for understanding fault codes, diagnosis, root cause & remedy:

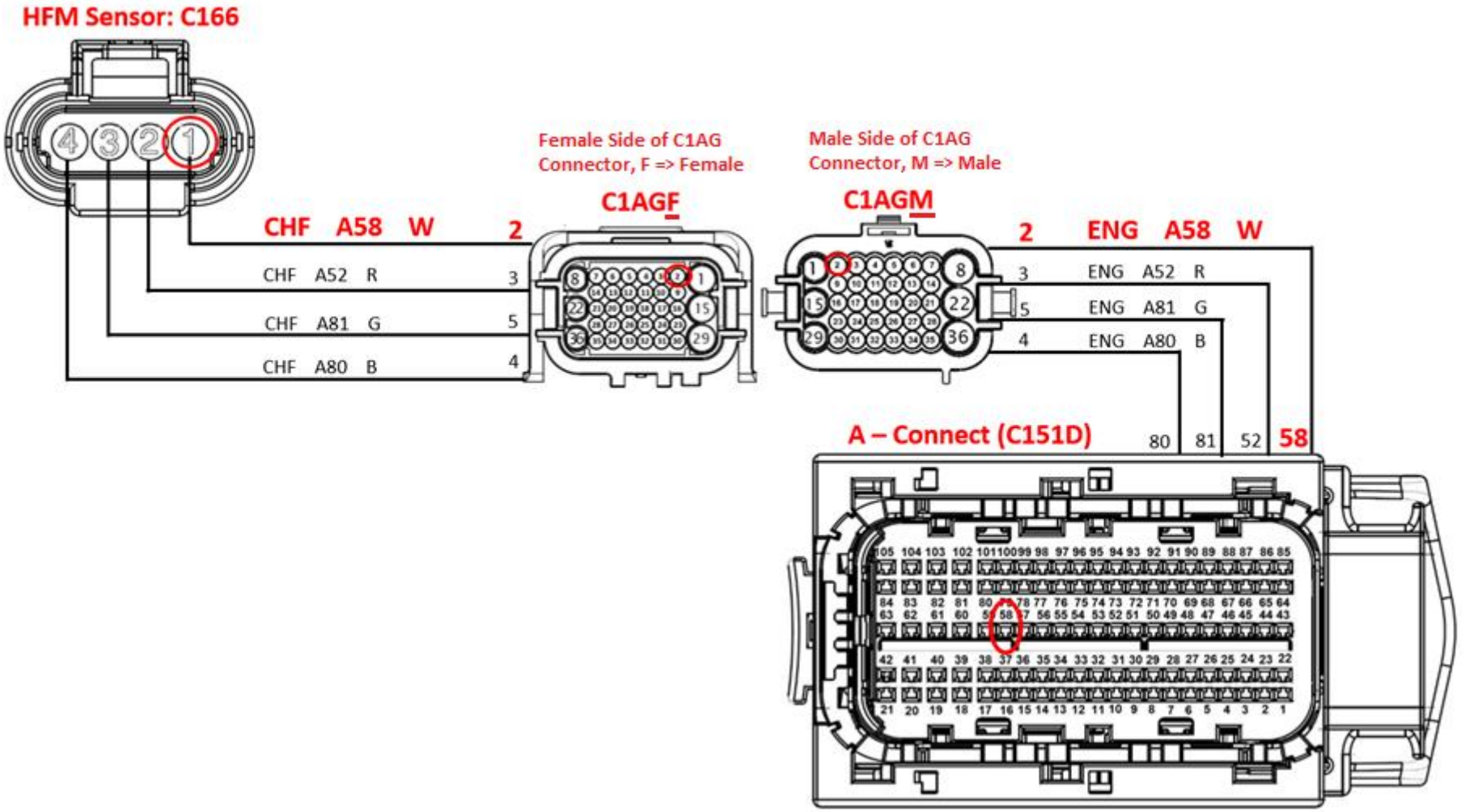


- In the following sections of diagnostic manual, Sensor / actuator image, location, working, wiring schematics & Fault code diagnosis table are given together for easy understanding. One can use **“Control F”** function to directly search for P-Code & corresponding diagnosis procedure.
- During the process of interpreting the descriptions of Fault Codes, in majority of the cases, we can conclude the following:

  a. Fault codes with description “Voltage above upper limit” generally indicates an Open circuit or a short circuit / Short to battery / Short to supply failure.

  b. Fault codes with Description “Voltage below lower limit” generally indicates a Ground circuit / Short to ground failure.
- During the process of diagnosis of a fault code, if the problem persists even after replacing the corresponding wiring harness & Sensor / Actuator, if the fault does not get rectified, then replace ECU & confirm.

Sample schematic reference:



- To begin with, when diagnosing any fault code: Read DTC, CEL & MIL conditions from cluster, connect MTBD BSVI Diagnostic tester software & read the fault code description to understand which sensor category it belongs to.
- Fault code description can also be searched and understood from diagnostic manual. In the above example, HFM sensor is considered for understanding the schematics.

- Switch off the ignition and wait for some time (approx. 3 mins) to allow the ECU to shut down.
- Identify Sensor / Actuator location & disconnect the corresponding connector.
- Disconnect the ECU connectors (A & K). It is recommended to disconnect both ECU connectors during checking.
- Wiring needs to be checked for: Open circuit (Continuity), Ground & Short circuits. As a general procedure, process can be started with continuity test.
- HFM Sensor connector (Connector No: C166) Pin 1 to ECU A-Connector Pin 58.
- Similarly, continuity must be checked for HFM sensor pins 2, 3 & 4 with ECU A-Connector pins 52, 81 & 80 respectively.
- If continuity is observed, then one can proceed for checking Ground & Short circuit. Do not connect the sensor & ECU connections when checking for Ground & Short circuits.
- If no continuity is observed during Open circuit test, then the wiring is faulty. By looking at the HFM sensor circuit diagram, it can be understood that the sensor is connected to ECU through C1AG harness interconnector. In such cases, the fault may be present in Chassis Front harness (connected from HFM sensor to female side of C1AG connector) or in Engine harness (connected from male side of C1AG connector to ECU A-connector). To clarify the root cause, the C1AG interconnector needs to be disconnected and the following steps need to be followed.
- HFM Sensor connector (Connector No: C166) Pin 1 to Pin 2 of C1AG Female Connector (C1AGF)
- Pin 2 of C1AG Male Connector (C1AGM) to Pin 58 on ECU A-Connector
- Similarly check for continuity from HFM sensor Pins 2, 3 & 4 to Pins 3, 5 & 4 respectively on C1AGF & Pins 3, 5 & 4 on C1AGM to Pins 52, 81 & 80 on ECU K Connector respectively.
- Similarly, when checking wiring for Ground & Short circuit, if the fault is observed, then the wiring must be inspected by removing the C1AG interconnector.
- Only that harness needs to be replaced in which the fault is observed. Eg: If no continuity is observed from HFM sensor Pin 1 to C1AGF pin 2, the Chassis Front harness needs to be replaced, else replace Engine Harness.
- The above procedure can be referred during wiring checking for all sensors / actuators since the checking procedure will remain similar.

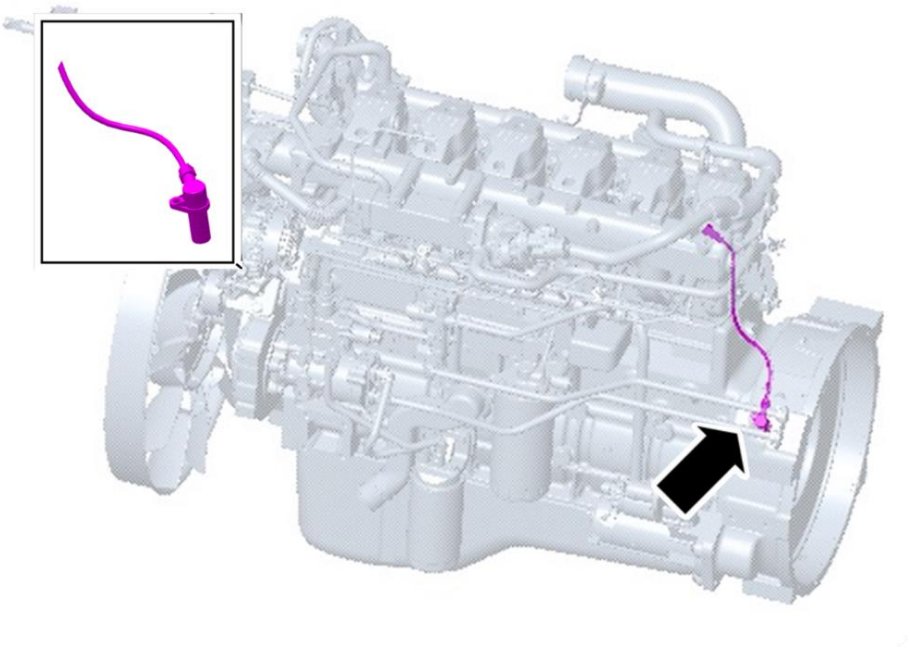
Performance Limitation with respect to Fault Codes:

Performance limitation is provided in the form of reduction in Output Torque & / Speed. The same is highlighted in the respective columns, wherever applicable, in the subsequent troubleshooting tables w.r.t fault / P- codes for various sensors & actuators. The color references for the same are provided below for ready reference and are also mentioned below respective sensor troubleshooting tables as applicable.

TORQUE REDUCTION	
	Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately
	Torque Reduced by 25% - Immediate attention required
	Torque Reduction by 25% - Prioritized Attention of the vehicle required
	Torque Reduction by 25% - Prioritized Attention of the vehicle required

SPEED LIMITATION - MAX 20 KMPH	
	Speed Reduced to 20 Kmph - Immediate attention required & advice to stop the vehicle immediately
	Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required
	Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.1 CRANKSHAFT POSITION SENSOR

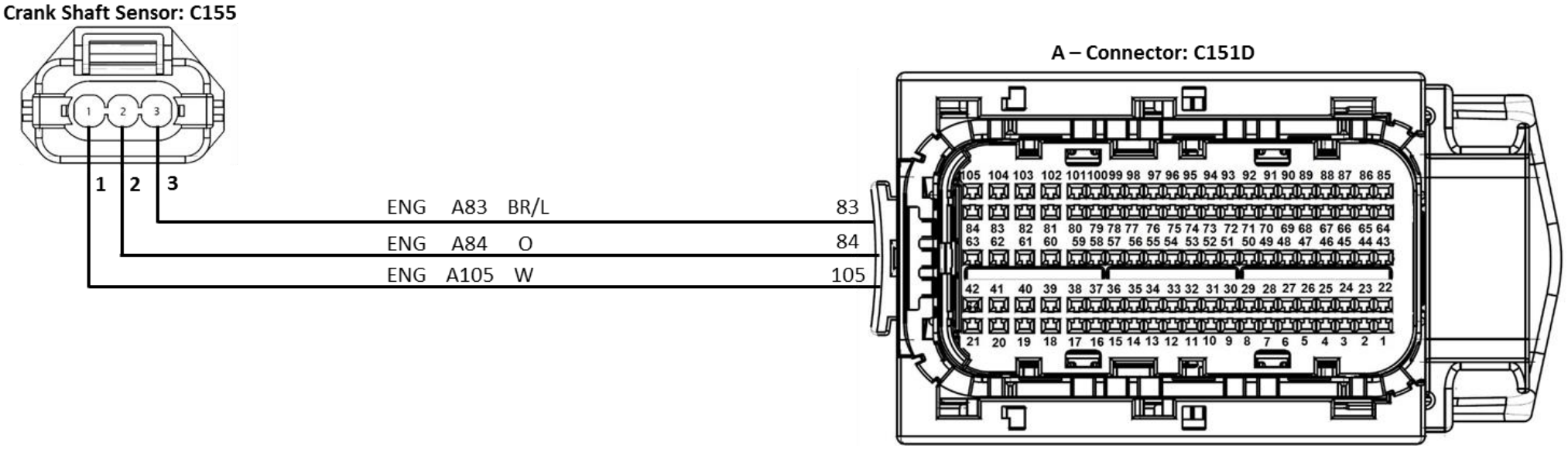


Location: On Flywheel Housing

Function:

- The Crankshaft Position Sensor is a non-contact speed sensor that measures the rotational speed of the crankshaft. The sensor is an inductive type of sensor which generates a magnetic flux & has a coil.
- It is mounted on the engine flywheel housing.
- Electrical pulses are generated when the hole on the flywheel passes through sensor axis.
- The electrical pulses (sin wave) generated by the sensor is proportional to the engine speed.
- The two missing holes on the flywheel generate a flat electrical pulse which is used to calculate the position of the 1st and 6th cylinder TDC.

4.1.1 Circuit Diagram: Crank Shaft Sensor



4.1.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0335	Crankshaft Sensor No Signal			Open Circuit - Pin 1 on Crank sensor to Pin A105 on ECU	Continuity - Pin 1 to Pin A105	If no continuity is present - Replace Engine harness	√	√	x	x	x	x	2000 RPM
					Open Circuit - Pin 2 on Crank sensor to Pin A84 on ECU	Continuity - Pin 2 to Pin A84	If no continuity is present - Replace Engine harness							
					Ground Circuit – Pin 2 on Crank sensor	Continuity – Pin 2 on Crank Sensor to Body ground / Battery -ve	If continuity is present - Replace Engine harness							
					Short Circuit - Pin 1 & Pin 2 on Crank sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine harness							
					Crank sensor wiring faulty	Crank sensor wiring - Open, Ground, Short circuit	Replace Engine harness							
					Incorrect air gap between Crank sensor & flywheel surface / Deposits on sensor tips / Sensor mounting loose	Check sensor seating area / Physical inspection of sensor for deposits	Remove & refit the sensor & verify / Clean the sensor & refit / Tighten the sensor mounting screw							
					Crankshaft Sensor Faulty	Crankshaft sensor	Replace Crank Sensor & verify							
					Wrong Flywheel fitted	Flywheel	Assemble matching flywheel							
					Flywheel Holes Damaged	Flywheel	Replace Flywheel							
					Crank sensor damaged	Crank Sensor	Replace Crank Sensor							
2	P0336	Crankshaft Sensor Signal Error			Incorrect air gap between Crank sensor & flywheel surface / Deposits on sensor tips / Sensor mounting loose	Check sensor seating area / Physical inspection of sensor for deposits	Remove & refit the sensor & verify / Clean the sensor & refit / Tighten the sensor mounting screw	√	√	x	x	x	x	2000 RPM
					Wrong Flywheel fitted / Flywheel holes damaged	Flywheel	Assemble correct flywheel / Replace if damaged							
					Open Circuit - Pin 1 on Crank sensor to Pin A105 on ECU	Continuity - Pin 1 to Pin A105	If no continuity is present - Replace Engine harness							

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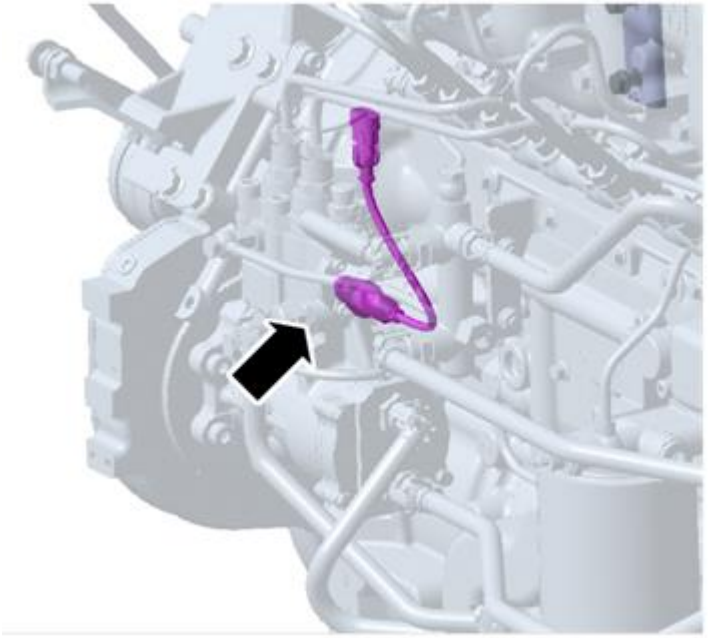
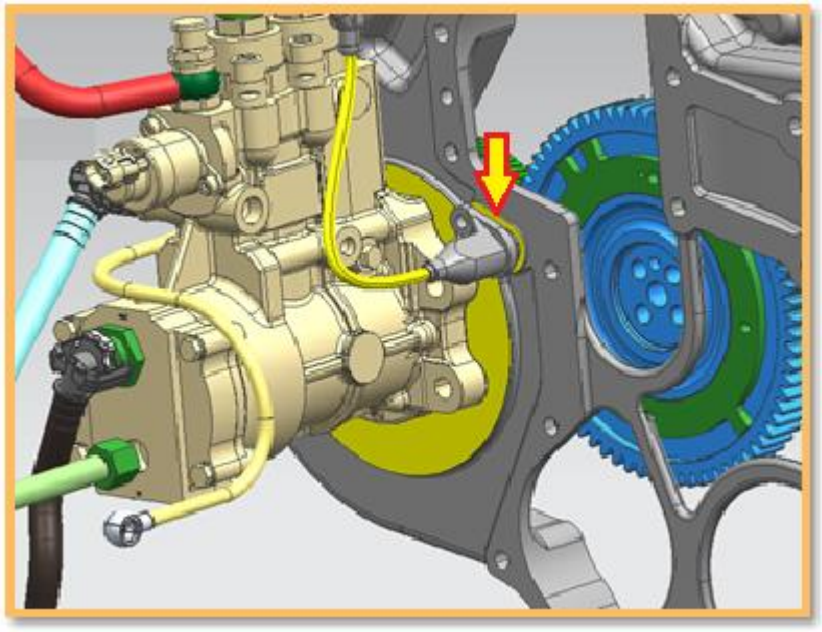
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 2 on Crank sensor to Pin A84 on ECU	Continuity - Pin 1 to Pin A84	If no continuity is present - Replace Engine harness							
					Short Circuit - Pin 1 & Pin 2 on Crank sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine harness							
					Crank sensor wiring faulty	Crank sensor wiring - Open, Ground, Short circuit	Replace Engine harness							
					Crankshaft Sensor Faulty	Crankshaft sensor	Replace Crank Sensor & verify							
					Crank sensor damaged	Crank Sensor	Replace Crank Sensor							

4.2 CAM PHASE SENSOR





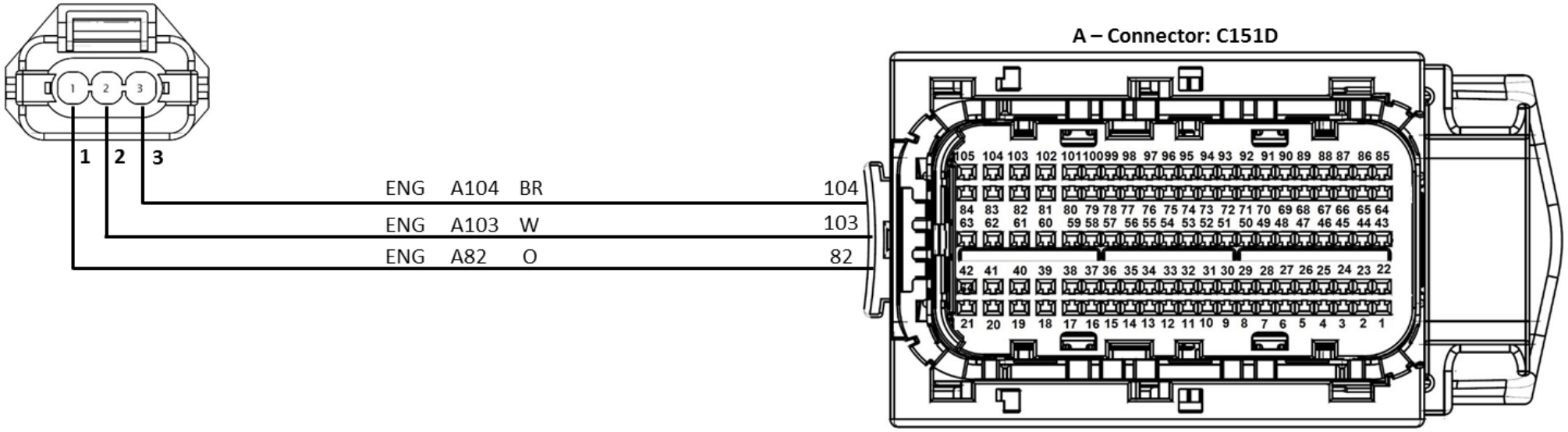
Location: On timing gear housing, behind the Cam Gear

Function

- Cam phase sensor is an inductive type of sensor.
- Electrical pulses are generated when the projections provided on the cam gear pass through sensor axis.
- The electrical plus frequency (sin wave) generated by the sensor detects the position of the formed slot on the cam gear to calculate the 1st cylinder piston TDC and the engine speed.

4.2.1 Circuit Diagram: Cam Phase Sensor

Cam Phase Sensor: C154



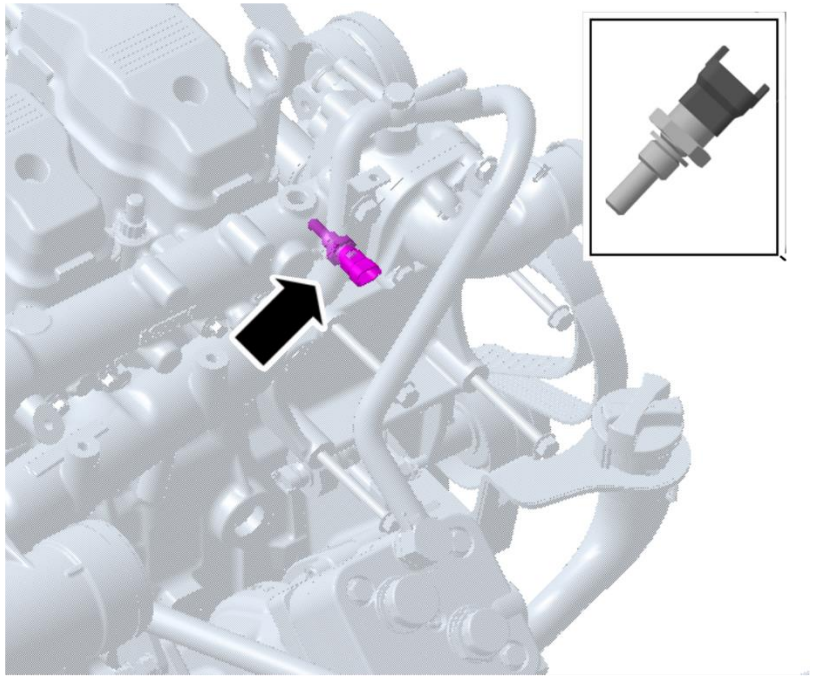
4.2.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0344	Camshaft Sensor Signal Error			Incorrect air gap between Crank sensor & flywheel surface / Deposits on sensor tips / Sensor mounting loose	Check sensor seating area / Physical inspection of sensor for deposits	Remove & refit the sensor & verify / Clean the sensor & refit / Tighten the sensor mounting screw	√	√	x	x	x	x	2000 RPM
					Cam sensor wiring faulty	Cam sensor wiring - Open, Ground, Short circuit	Replace Engine harness							
					Cam Sensor Faulty / Mounting loose	Cam sensor / Mounting screw	Replace Cam Sensor & verify / Tighten mounting screw							
					Cam sensor damaged	Cam Sensor	Replace Cam sensor							
					Cam Gear damaged	Cam Gear	Replace Cam Gear							
					Ground Circuit - Pin 1 on Cam sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine harness							
					Ground Circuit - Pin 2 on Cam sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine harness							

CONTINUED IN PAGE 113

2	P0340	Camshaft Sensor No Signal			Open Circuit - Pin 1 on Cam sensor to Pin A82 on ECU	Continuity - Pin 1 to Pin A82	If no continuity is present - Replace Engine harness	√	√	x	x	x	x	**2000 RPM**
					Open Circuit - Pin 2 on Cam sensor to Pin A103 on ECU	Continuity - Pin 1 to Pin A103	If no continuity is present - Replace Engine harness							
					Short Circuit - Pin 1 & Pin 2 on Cam sensor short with each other	Continuity - Pin 1 to Pin 2	Replace Engine harness							
					Ground Circuit - Pin 1 / Pin 2 on Cam sensor short circuit to ground	Continuity - Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine harness							
					Cam sensor wiring faulty	Cam sensor wiring - Open, Ground, Short	Replace Engine harness							
					Incorrect air gap between Crank sensor & flywheel surface / Deposits on sensor tips / Sensor mounting loose	Check sensor seating area / Physical inspection of sensor for deposits	Remove & refit the sensor & verify / Clean the sensor & refit / Tighten the sensor mounting screw							
					Cam Sensor Faulty / Mounting loose	Cam sensor / Mounting screw	Replace Cam Sensor & verify / Tighten mounting screw							
					Cam sensor damaged	Cam Sensor	Replace Cam sensor							
					Cam Gear damaged	Cam Gear	Replace Cam Gear							
					Faulty ECU	ECU	Replace ECU							

4.3 COOLANT TEMPERATURE SENSOR

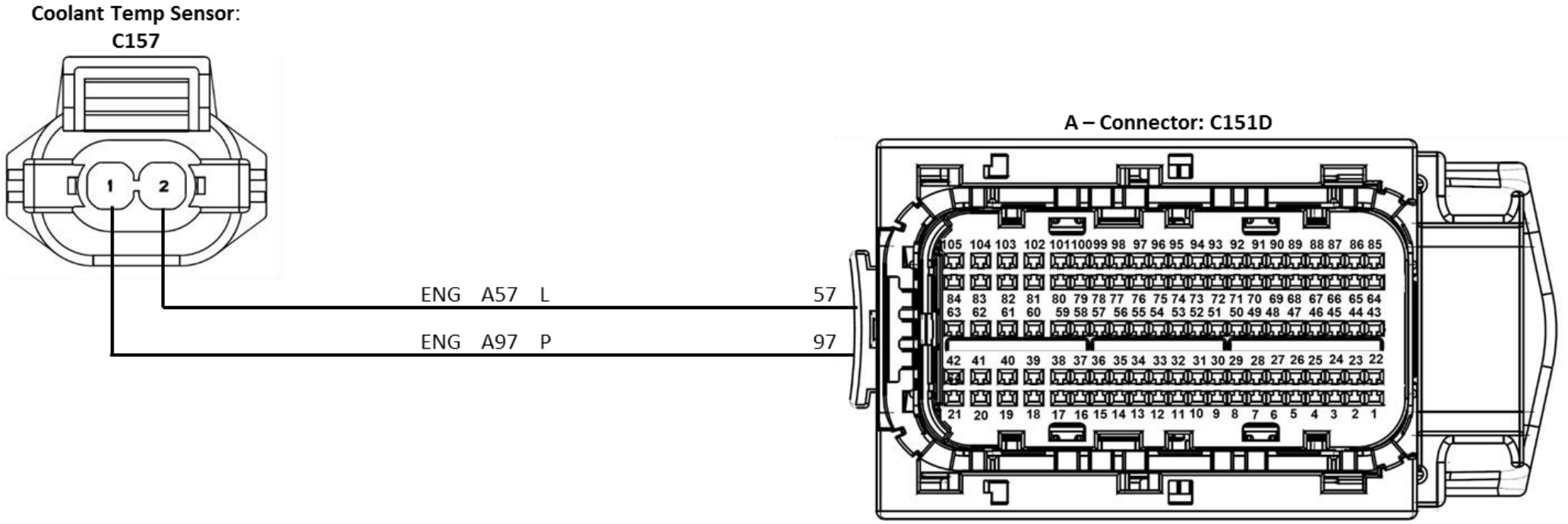


Location: On the Coolant Manifold near thermostat

Function:

- The coolant temperature sensor is an NTC resistor in which the resistance changes with temperature. The electrical resistance of a thermistor decreases as the temperature increases, and resistance increases as the temperature decreases. The varying resistance affects the voltage drop across the sensor terminals and provides electrical signals to the ECU corresponding to the temperature.
- Operating Range: 100 mv – 4850 mv

4.3.1 Circuit Diagram: Coolant Temperature Sensor



4.3.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0117	CTS Output voltage below lower limit	1	P3BA9 – NOx Exceedance – NOx Control Monitoring System	Ground Circuit - Pin 1 on sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	√	√	√	x
					Coolant Temperature Sensor Faulty	Coolant temperature Sensor	Replace Coolant Temperature sensor if the sensor resistance is not in between: 0.186 K - 2.5 K Ohms							
					Coolant Temperature Sensor wiring Faulty	Coolant Temperature Sensor wiring - Open, Ground & Short circuit	Replace Engine harness							
			2	P3BA9 - NOx Exceedance – NOx Control Monitoring System P2183 - Measured value of coolant temp above limit	Short Circuit - Pin 1 & Pin 2 on sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness							
					Coolant Temperature Sensor Faulty	Coolant temperature Sensor	Replace Coolant Temperature sensor if the sensor resistance is not in between: 0.186 K - 2.5 K Ohms							
					Coolant Temperature Sensor wiring Faulty	Coolant Temperature Sensor wiring - Open, Ground & Short circuit	Replace Engine harness							

Torque Reduction: √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P0118	CTS Output voltage above upper limit	1	P3BA90 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on sensor to Pin A97 on ECU	Continuity - Pin 1 to Pin A97	If no continuity - Replace Engine Harness	√	√	x	√	√	√	x
					Short Circuit - Pin 1 to Supply/Battery positive	Continuity - Pin 1 to Supply/Battery Positive	If continuity is present - Replace Engine Harness							
					Coolant Temperature Sensor Faulty	Coolant temperature Sensor	Replace Coolant Temperature sensor if the sensor resistance is not in between: 0.186 K - 2.5 K Ohms							
					Coolant Temperature Sensor wiring Faulty	Coolant Temperature Sensor wiring - Open, Ground & Short circuit	Replace Engine harness							
			2	P0523 - Oil Pressure Sensor Output Voltage Above Upper Limit P0521 - High Oil Pressure P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 2 on sensor to Pin A57 on ECU	Continuity - Pin 2 to Pin A57	If no continuity - Replace Engine Harness							
					Coolant Temperature Sensor Faulty	Coolant temperature Sensor	Replace Coolant Temperature sensor if the sensor resistance is not in between: 0.186 K - 2.5 K Ohms							
					Coolant Temperature Sensor wiring Faulty	Coolant Temperature Sensor wiring - Open, Ground & Short circuit	Replace Engine harness							
3	P0116	Coolant temperature sensor defective			Coolant Temperature Sensor Faulty / Deposits or contamination on sensor	Coolant temperature Sensor / Contamination or deposits on Coolant sensor	Replace Coolant Temperature sensor / Clean contamination or deposits on sensor – Refit & verify	√	x	x	x	x	x	x

CONTINUED IN PAGE 118

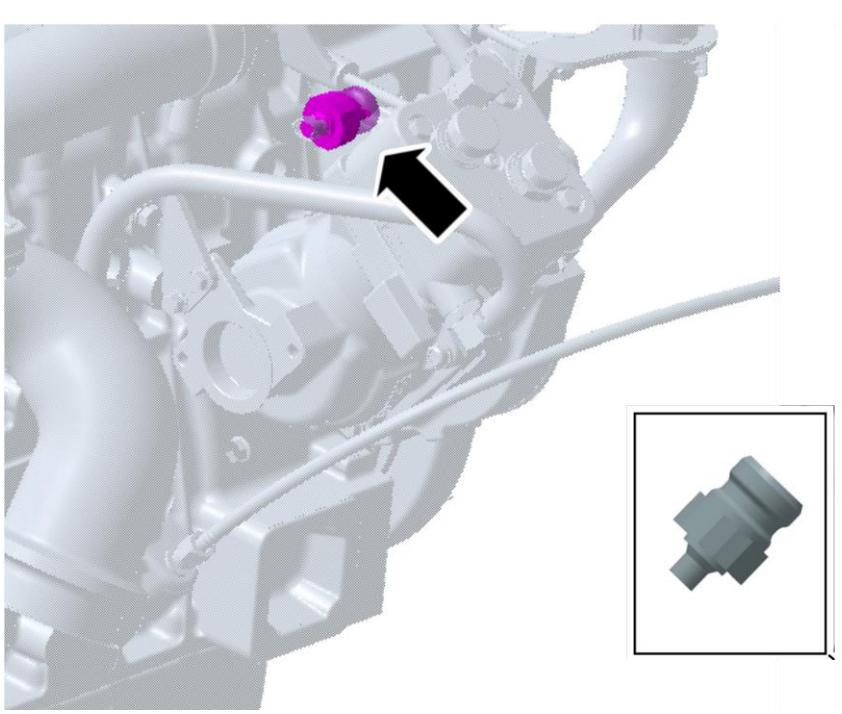
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					T0 / T21 / Boost Pressure & Temperature / TEGR Sensor faulty	T0 / T21 / Boost Pressure & Temperature / TEGR Sensor	Replace Faulty sensor - T0 / T21 / Boost Pressure & Temperature / TEGR Sensor							
4	P2183	Measured value of Coolant Temp above limit			Coolant Temperature Sensor Faulty / Sensor value drifted	Coolant temperature Sensor	Replace Coolant Temperature sensor if the sensor resistance is not in between: 0.186 K - 2.5 K Ohms	x	√	x	x	√	x	x
					Low Coolant Level	External leakages, consumption	Rectify leakages & top up coolant							
					Water Pump Failure	Physical inspection for corrosion, seizure	Replace water pump							
					Thermostat stuck in closed condition / faulty	Thermostat operation as per SOP	Replace thermostat							
					Radiator clogged/restriction to coolant flow	Physical inspection for leakages, block	Check & rectify leakages / Replace affected parts							
					EV fan fouling with shroud	Physical inspection	Rectify fouling / Replace affected parts							
					Degassing Tank Cap defective	-------	Replace degassing tank cap							
					Coolant mixing with engine oil	Cylinder liner "O" Ring damaged, Cylinder head crack at coolant passage	Check & replace affected parts. Top up Coolant, Replace engine oil							
					Non recommended coolant used / Coolant quality poor	Physical inspection - Quality of coolant using refractometer. Minimum concentration required is 70:30	Replace coolant							
					Thermostat Missing	Physical inspection	Install new thermostat							
					EV Fan engaged constantly	EV Fan operation	Replace EV Fan							
5	P050C	Coolant Temperature not rising as desired w.r.t set temperature			Thermostat stuck in open condition / faulty	Thermostat operation as per SOP	Replace thermostat							
					Thermostat Missing	Physical inspection	Install new thermostat							
					EV Fan engaged constantly	EV Fan operation	Replace EV Fan							

CONTINUED IN PAGE 119

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Coolant Temperature Sensor Faulty / Sensor value drifted	Coolant temperature Sensor	Replace Coolant Temperature sensor	√	X	X	X	X	X	X
					Coolant temperature sensor seating improper	Coolant Temperature seating for debris	Remove & clean the sensor seating area							
					Leakage /hose pinch /air entrapment in coolant circuit	Check Coolant circuit for any leakage /hose pinch /air entrapment in coolant circuit	Replace affected component							
6	P0119	Coolant Temperature not rising as desired w.r.t set time			Thermostat stuck in open condition / faulty	Thermostat operation as per SOP	Replace thermostat	√	X	X	X	X	X	X
					Thermostat Missing	Physical inspection	Install new thermostat							
					EV Fan engaged constantly	EV Fan operation	Replace EV Fan							
					Coolant Temperature Sensor Faulty / Sensor value drifted	Coolant temperature Sensor	Replace Coolant Temperature sensor							
					Coolant temperature sensor seating improper	Coolant Temperature seating for debris	Remove & clean the sensor seating area							
					Leakage /hose pinch /air entrapment in coolant circuit	Check Coolant circuit for any leakage /hose pinch /air entrapment in coolant circuit	Replace affected component							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.4 OIL PRESSURE SENSOR

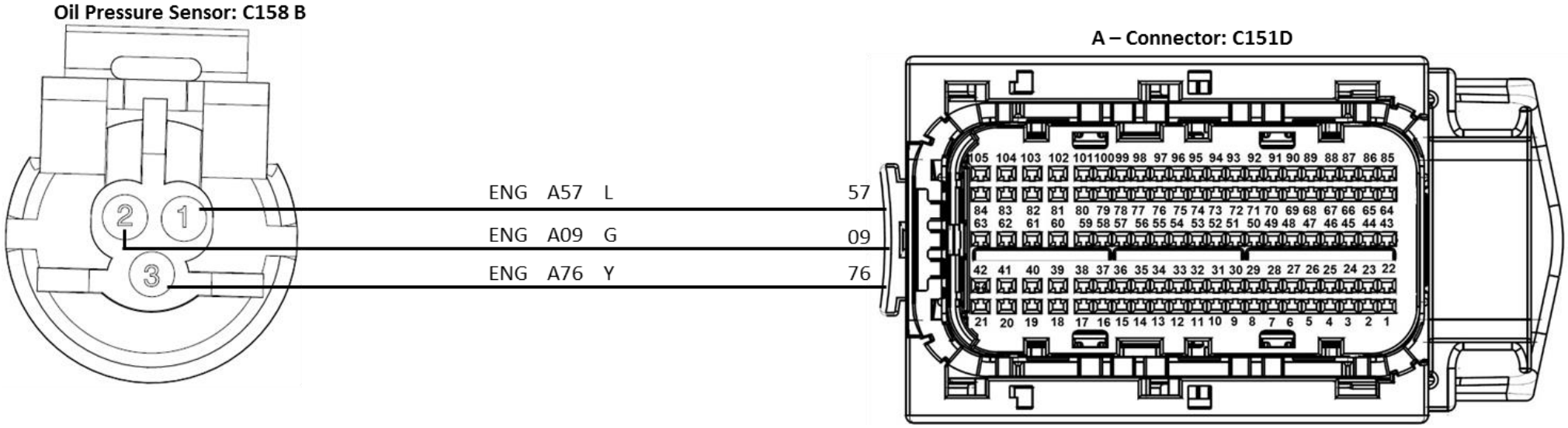


Function:

- The oil pressure sensor consists of a Ceramic Capacitive Sensing Element (CSE), custom ASIC signal conditioning, and a standard housing with integral connector. The sensor provides a ratio metric analog voltage output proportional to the applied pressure and supply voltage.
- Operating Range: 600 mv – 4150 mv

Location: Exhaust side of engine on timing gear housing above air compressor

4.4.1 Circuit Diagram: Oil Pressure Sensor



Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0521	High Oil Pressure			Oil Pressure Relief Valve Stuck Close	Oil Cooler Assembly	Replace Oil Cooler Assembly	x	√	x	x	x	x	1600 RPM
					Restrictions in Lubrication system	Lubrication circuit	Replace affected component / rectify complaint							
					Oil Pressure Sensor Faulty / Sensor value drifted	Oil Pressure Sensor	Replace Oil Pressure Sensor							
					Oil quality deteriorated / Non genuine oil used	Oil Quality	Replace Oil & Oil filter							
2	P0522	Oil Pressure Sensor Output Voltage below lower limit			Pin 3 Short to Ground	Continuity between Pin 3 & Ground (Body / Battery -ve)	If continuity is present - Replace Engine Harness	x	√	x	x	√	x	1600 RPM
					Pin 1 & Pin 3 Short Circuit	Check Short Circuit between Pins 1 & 3	If Continuity is present - Replace Engine Harness							
					Oil Pressure Sensor Wiring Faulty	Oil Pressure Sensor wiring - Open, Ground, Short circuit	Replace Engine Harness							
					Improper voltage between sensor pins 1 & 2	Voltage between Pin 1 & 2 should be = 5V	If voltage is not as per specification – Replace Engine Harness							
			1	P0524 - Low Oil Pressure P1111 - Boost Pressure Sensor Short to Ground P3BA9 - NOx Exceedance – NOx Control Monitoring System	Pin 2: Wiring Backout/Slot Expanded	Physical inspection of connector wire	If complaint is observed - Replace Engine Harness							
					Pin 2 to ECU A09 Open	Continuity between Pin 2 & A09	If no continuity - Replace Engine Harness							
					Oil Pressure Sensor Wiring Faulty	Oil Pressure Sensor wiring - Open, Ground, Short circuit	Replace Engine Wiring Harness							
					Improper voltage between sensor pins 1 & 2	Voltage between Pin 1 & 2 should be = 5V	If voltage is not as per specification – Replace Engine Harness							
					Oil Pressure Sensor Faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							

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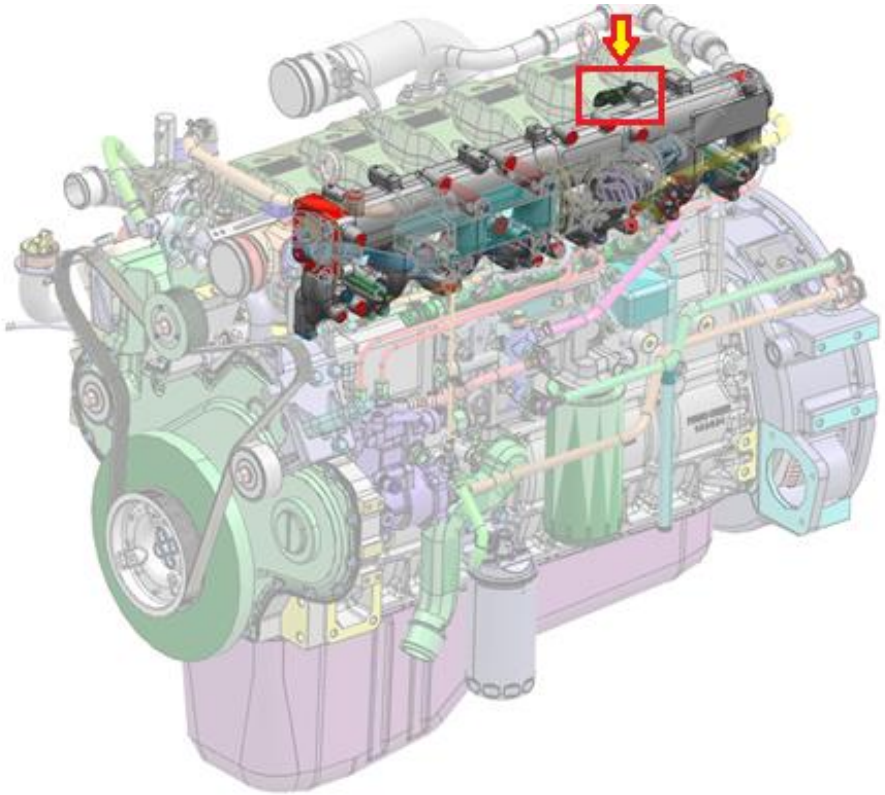
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
			2	P0193 - Rail Pressure Sensor Voltage above upper limit P1111 - Boost Pressure Sensor Short to Ground P3BA9 - NOx Exceedance – NOx Control Monitoring System P06B0 - Sensor Supply voltage error of RPS/OPS/AP P2/ITV P06B1 - Sensor Supply Short to ground of RPS/OPS/AP P2/ITV P0097 - PRV Open due to Rail Pressure Out of range.	Pin 2 Short to Ground	Continuity between Pin 2 & Ground (Body / Battery - ve)	If continuity is present - Replace Engine Harness							
					Oil Pressure Sensor Wiring Faulty	Oil Pressure Sensor wiring - Open, Ground, Short circuit	Replace Engine Wiring Harness							
					Oil Pressure Sensor Faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P0523	Oil Pressure Sensor Output Voltage above upper limit	1	P0521 - High Oil Pressure P0521 - High Oil Pressure P0118 - Coolant Temperature Sensor Voltage above upper limit P3BA9 - Nox Exceedance – Nox Control Monitoring System	Pin 3 to ECU A76 Open	Continuity between Pin 3 & A76	If no continuity - Replace Engine Harness	x	√	x	x	√	x	1600 RPM
					Pin 1 & Pin 2 Short Circuit	Check Short Circuit between Pins 1 & 2	If continuity is present - Replace Engine Harness							
					Pin 2 & Pin 3 Short Circuit	Check Short Circuit between Pins 2 & 3	If continuity is present - Replace Engine Harness							
					Pin 3 Short Circuit to Supply / Battery Positive	Check Short Circuit between Pin 1 & Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Oil Pressure Sensor Wiring Faulty	Oil Pressure Sensor wiring - Open, Ground, Short circuit Voltage between pins 1 & 2 should be 5V	Replace Engine Wiring Harness							
					Improper voltage between sensor pins 1 & 2	Voltage between Pin1 & 2 should be = 5V	If voltage is not as per specification – Replace Engine Harness							
					Oil Pressure Sensor Faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							
			2		Pin 1: Wiring Backout/Slot Expanded	Physical inspection of connector wire	If complaint observed - Replace Engine Harness							
					Pin 1 to ECU A57 Open	Continuity between Pin 1 & A57	If no continuity - Replace Engine Harness							
					Oil Pressure Sensor Wiring Faulty	Oil Pressure Sensor wiring - Open, Ground, Short circuit	Replace Engine Wiring Harness							
					Improper voltage between sensor pins 1 & 2	Voltage between Pin1 & 2 should be = 5V	If voltage is not as per specification – Replace Engine Harness							
					Oil Pressure Sensor Faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
4	P0524	Low Oil Pressure			Engine Oil Pressure Low	Check Engine Oil Pressure – Verify value through Live Data / Cluster / Pressure Gauge. Oil Pressure Range for Hot Engine: * At Idle: Min. 1.5 Bar * At Full RPM: 3.5 – 5.3 Bar	If Oil Pressure value is less than specified, follow the check points mentioned below.	x	√	x	x	√	x	1600 RPM
					If vehicle is parked without starting for a long time, then due to cold starting this fault code will be triggered for approximately 10 seconds after start, till the pressure is built in the lubrication system.	Check for auto healing of fault code after approximately 10 seconds of engine start.	If the fault code auto heals, then there is no issue in the vehicle and the occurrence of this code can be considered as normal. No action to be taken in this regard.							
					Insufficient Oil Quantity	Check oil quantity	Ensure specified oil level and grade after rectifying the reason for reduced quantity							
					Oil Pump Faulty	Inspect for worn bush, scoring marks etc	Replace Oil Pump							
					Oil Pressure Relief Valve Stuck open/faulty	Oil Cooler Assembly	Replace Oil Cooler Assembly							
					Excessive play in Crank & Connecting Rod Bearings	Inspect affected parts	Replace affected parts							
					Air Compressor Faulty	Air compressor	Replace Air compressor Assembly							
					Oil Pressure Sensor Faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							
					External Leakages	Physical inspection for leakages	Rectify leakages / Replace affected parts							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.5 BOOST PRESSURE AND TEMPERATURE SENSOR

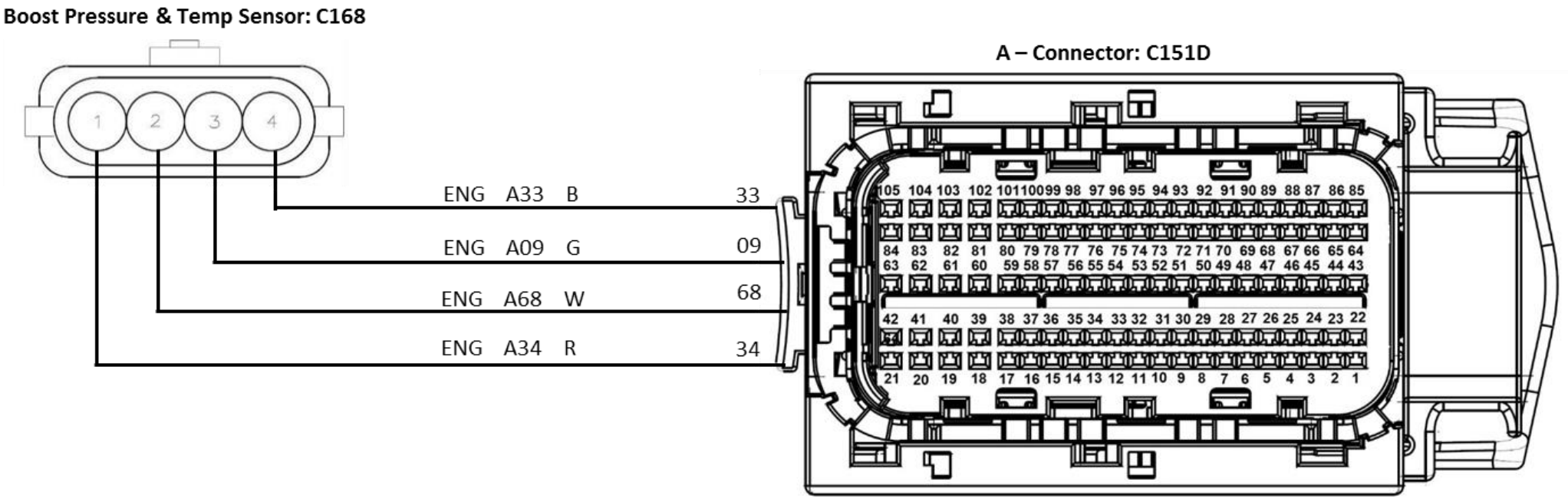


Location: On Intake Manifold (Cylinder Head Side)

Function

- The ECU determines if the correct amount of boost is being generated, in response to engine speed, load, manifold pressure and barometric pressure values. If the boost pressure is lower or higher than expected, a DTC is set and the Malfunction Indication Lamp (MIL) is illuminated
- It also measures the temperature of the boost air input at the inlet of the engine.
- Operating Range: 150 mv – 4850 mv

4.5.1 Circuit Diagram: Boost Pressure & Temperature Sensor



Boost Pressure - Approximate Reference Values:

- Ad Idling : 0.9 Bar (Can reduce up to 0.7 Bar when driven at high altitudes)
- At High Idle : Minimum 1.3 Bar

4.5.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0113	Intake air temperature sensor value above upper limit	1	P0108 - Boost Pressure Sensor Short to Battery P3BA9 – NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on sensor to Pin A34 on ECU	Continuity - Pin 1 to Pin A34	If no continuity - Replace Engine Harness	√	√	x	√	√	√	1600 RPM
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor	Replace Boost Pressure & Temperature Sensor							
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							
			2	P3BA9 NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 2 on sensor to Pin A68 on ECU	Continuity - Pin 2 to Pin A68	If no continuity - Replace Engine Harness							
					Pin 2 & Pin 3 on sensor short circuit with each other	Continuity - Pin 2 to Pin 3	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 2 on sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor	Replace Boost Pressure & Temperature Sensor							
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							
2	P0112	Intake air temperature sensor value below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit - Pin 2 on sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	√	√	√	1600 RPM
					Short Circuit - Pin 1 & Pin 2 on sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 2 on sensor short circuit to Sensor Pin 3	Continuity - Pin 2 to Pin 3	If continuity is present - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor	Replace Boost Pressure & Temperature Sensor							
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							
3	P1111	Boost pressure sensor Short to Ground	1	P0522 - Oil Pressure Sensor output voltage below lower limit P3BA9 - Nox Exceedance – Nox Control Monitoring System P0524 - Low oil pressure	Ground Circuit - Pin 4 on sensor short circuit to ground	Continuity - Pin 4 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	√	√	√	x
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor	Replace Boost Pressure & Temperature Sensor							
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							
					Open Circuit - Pin 3 on sensor to Pin A09 on ECU	Continuity - Pin 3 to Pin A09	If no continuity - Replace Engine Harness							
					Short Circuit - Pin 1 & Pin 4 on sensor short circuit with each other	Continuity - Pin 1 to Pin 4	If continuity is present - Replace Engine Harness							
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor Check Boost Pressure Value in Live Data: Reference Values - 1. Ad Idling : 0.9 Bar (Can reduce up to 0.7 Bar when driven at high altitudes) 2. At High Idle: Minimum 1.3 Bar	Replace Boost Pressure & Temperature Sensor							
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
			3	P0522 - Oil Pressure Sensor Output Voltage Below Lower Limit P0193 - Rail Pressure Sensor Voltage above upper limit P3BA9 - NOx Exceedance – NOx Control Monitoring System P06B1 - Sensor Supply Short to ground of RPS/OPS/APP2/ITV P06B0 - Sensor Supply voltage error of RPS/OPS/APP2/ITV	Ground Circuit - Pin 3 on sensor short circuit to ground	Continuity - Pin 3 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 1 & Pin 3 on sensor short circuit with each other	Continuity - Pin 1 to Pin 3	If continuity is present - Replace Engine Harness							
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor	Replace Boost Pressure & Temperature Sensor							
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							
4	P0108	Boost Pressure Sensor Short to Battery	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Short Circuit - Pin 3 & Pin 4 on sensor short circuit with each other	Continuity - Pin 3 to Pin 4	If continuity is present - Replace Engine Harness	√	√	x	√	√	√	x
					Short Circuit – Pin 4 on sensor short to Supply / Battery Positive	Continuity – Pin 4 to Supply / Battery Positive	Replace Engine Harness							
					Open Circuit - Pin 4 on sensor to Pin A33 on ECU	Continuity - Pin 4 to Pin A33	If no continuity - Replace Engine Harness							
					Faulty Boost Pressure & Temperature Sensor	Boost Pressure & Temperature Sensor Check Boost Pressure Value in Live Data: Reference Values - 1. Ad Idling : 0.9 Bar (Can reduce up to 0.7 Bar when driven at high altitudes)	Replace Boost Pressure & Temperature Sensor							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						2. At High Idle: Minimum 1.3 Bar								
					Boost Pressure & Temperature Sensor wiring faulty	Boost Pressure & Temperature sensor wiring - Open, Ground, Short circuit	Replace Engine wiring harness							
5	P0109	T22 (Boost temperature) sensor defective			Foreign Deposits on Boost Pressure & Temperature sensor Boost Pressure & Temperature Sensor Faulty	Debris / Dust / Moisture on sensor Boost Pressure & Temperature Sensor	Clean / Replace Boost Pressure & Temperature Sensor Replace Boost Pressure & Temperature Sensor	√	x	x	x	x	x	x
6	P1105	Correlation between Boost & Ambient pressure in MAP sensor is out of Range-higher side			Foreign Deposits on Boost Pressure & Temperature sensor	Debris / Dust / Moisture on sensor	Clean / Replace Boost Pressure & Temperature Sensor	√	x	x	x	√	x	x
					Boost Pressure & Temperature Sensor Faulty	Boost Pressure & Temperature Sensor Check Boost Pressure Value in Live Data: Reference Values - 1. Ad Idling : 0.9 Bar (Can reduce up to 0.7 Bar when driven at high altitudes) 2. At High Idle: Minimum 1.3 Bar	Replace Boost Pressure & Temperature Sensor							
					Cross connection in wiring	Check for short circuit or wrong connections	Replace Engine wiring harness							
					T0 Sensor Faulty	T0 Sensor	Replace T0 Sensor							
					ECU Faulty	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
7	P0299	Turbocharger Under boost		N. A	Choked air filter. Air leakage after HFM sensor Turbo charger stuck open / Turbocharger failed	Air Filter Condition Check Air Intake system for leakages. Turbocharger	Replace Air Filter if it is found choked. Rectify / Replace affected components causing leakages. Replace Turbocharger	√	x	x	x	√	x	x
					SCR Chocked Due to contaminated Ad Blue or Dosing module Faulty	Check SCR & Ad Blue quality by using Refractometer	Replace SCR and Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests. Flush the ad Blue & refill fresh Ad Blue.							
8	P1106	Correlation between Boost & Ambient pressure in MAP sensor is out of Range-lower side			Foreign Deposits on Boost Pressure & Temperature sensor	Debris / Dust / Moisture on sensor	Clean / Replace Boost Pressure & Temperature Sensor	√	x	x	x	√	x	x
					Boost Pressure & Temperature Sensor Faulty	Boost Pressure & Temperature Sensor Check Boost Pressure Value in Live Data: Reference Values - 1. Ad Idling : 0.9 Bar (Can reduce up to 0.7 Bar when driven at high altitudes) 2. At High Idle: Minimum 1.3 Bar	Replace Boost Pressure & Temperature Sensor							
					Cross connection in wiring	Check for short circuit or wrong connections	Replace Engine wiring harness							

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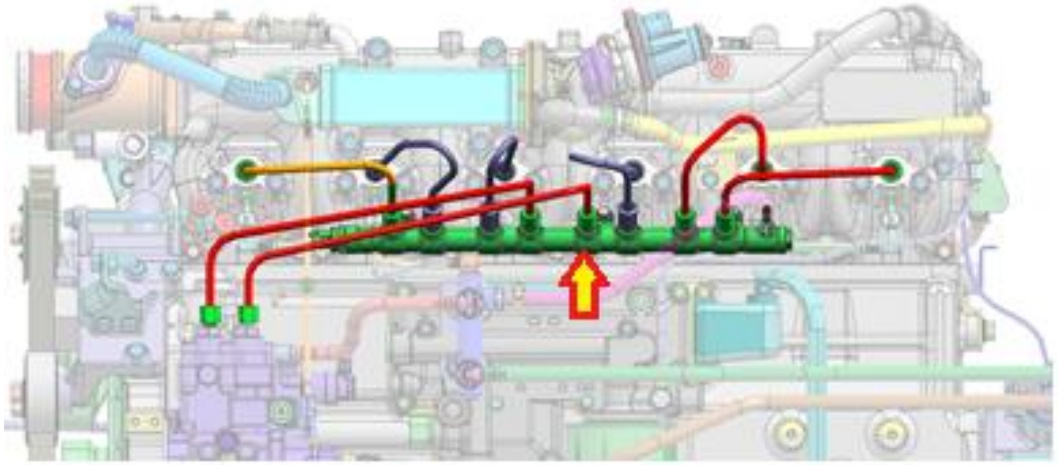
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					T0 Sensor Faulty	T0 Sensor	Replace T0 Sensor							
					ECU Faulty	ECU	Replace ECU							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.6 RAIL PRESSURE SENSOR

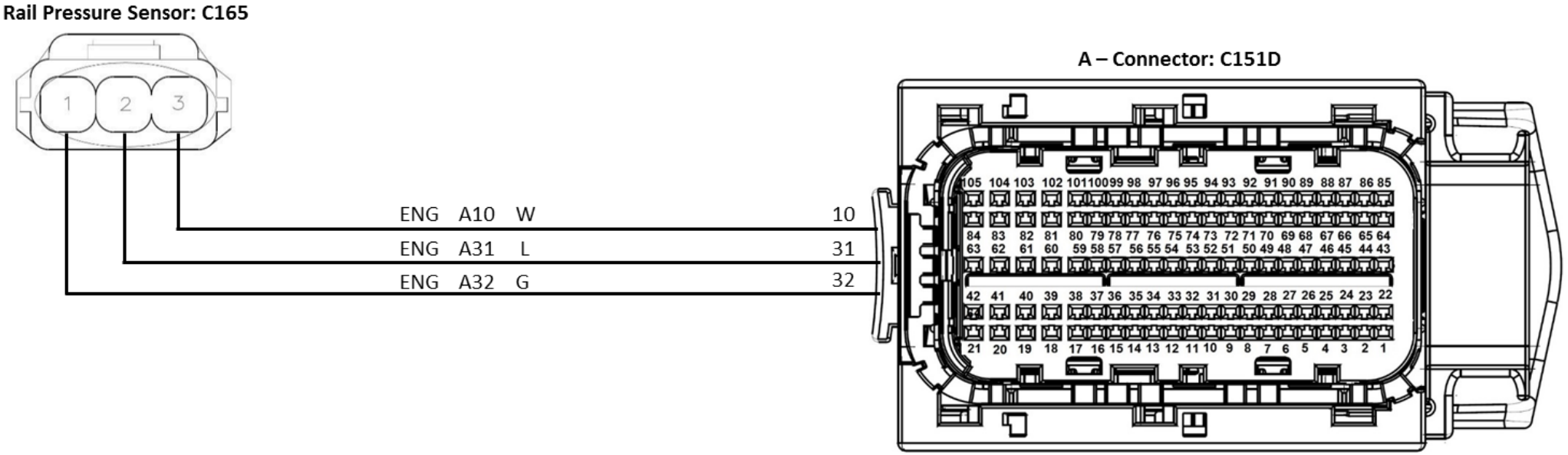


Location: On the Common rail

Function:

- The rail pressure sensor is mounted on the common rail and monitors the rail pressure.
- ECU determines the optimum fuel injection quantity at specific engine condition based on rail pressure sensor, it uses this value to calculate the injector energizing time.
- Range up to 1600 bar.

4.6.1 Circuit Diagram: Rail Pressure Sensor:



4.6.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0193	Rail Pressure Sensor Voltage above upper limit	1	P0095 - PRV Open due to Pressure Increase P0096 - PRV Open due to High Pressure Spike P0194 - PRV open error	Short circuit between Rail pressure sensor pins 2 & 3	Continuity between Rail pressure sensor pins 2 & 3	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Open Circuit in rail pressure sensor wiring	Continuity between Pin 1 to A32	If no continuity - Replace Engine Harness							
						Continuity between Pin 2 to A31	If no continuity - Replace Engine Harness							
						Continuity between Pin 3 to A10	If no continuity - Replace Engine Harness							
					Short circuit – Pin 2 short to supply / Battery Positive	Continuity – Pin 2 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Rail Pressure Sensor defective	Common rail assembly	Replace Common Rail Assembly							
					Rail Pressure Sensor wiring defective	Rail Pressure Sensor wiring - Ground, Short circuit	Replace Engine Harness							
			2	P0522 - Oil Pressure Sensor Output Voltage below lower limit P1111 - Boost Pressure Sensor short to ground P3BA9 - NOx Exceedance – NOx Control Monitoring System P06B0 - Sensor supply voltage error of RPS/OPS/APP2/ITV P06B1 - Sensor supply short to ground of RPS/OPS/APP2/ITV	Rail Pressure Sensor Pin 3 wire short to ground	Check continuity between Pin 3 & Body ground / Battery negative	If continuity is present - Replace Engine Harness							
					Rail Pressure Sensor Pin 1 & Pin 3 wire short with each other	Check Continuity between Pin 1 & Pin 3	If continuity is present - Replace Engine Harness							
					Rail Pressure Sensor defective	Common rail assembly	Replace Common Rail Assembly							
					Rail Pressure Sensor wiring defective	Rail Pressure Sensor wiring - Open, Ground, Short circuit	Replace Engine Harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P0192	Rail Pressure Sensor Voltage below lower limit			Short between Rail pressure sensor Pin 2 & Ground	Check continuity between Rail Pressure sensor Pin 2 & Body ground / Battery negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Open Circuit in rail pressure sensor wiring	Check continuity between Pin 1 to A32	If no continuity - Replace Engine Harness							
						Check continuity between Pin 2 to A31	If no continuity - Replace Engine Harness							
						Check continuity between Pin 3 to A10	If no continuity - Replace Engine Harness							
					Rail Pressure Sensor defective	Change common rail assembly	Replace Common Rail Assembly							
					Rail Pressure Sensor wiring defective	Rail Pressure Sensor wiring - Ground, Short circuit	Replace Engine Harness							
3	P0191	Rail pressure sensor defective			Rail Pressure Sensor faulty	Rail Pressure Sensor	Replace Common Rail Assembly	√	√	x	x	√	x	x
4	P0195	Rail pressure sensor defective			Rail Pressure Sensor faulty	Rail Pressure Sensor	Replace Common Rail Assembly	√	√	x	x	√	x	x

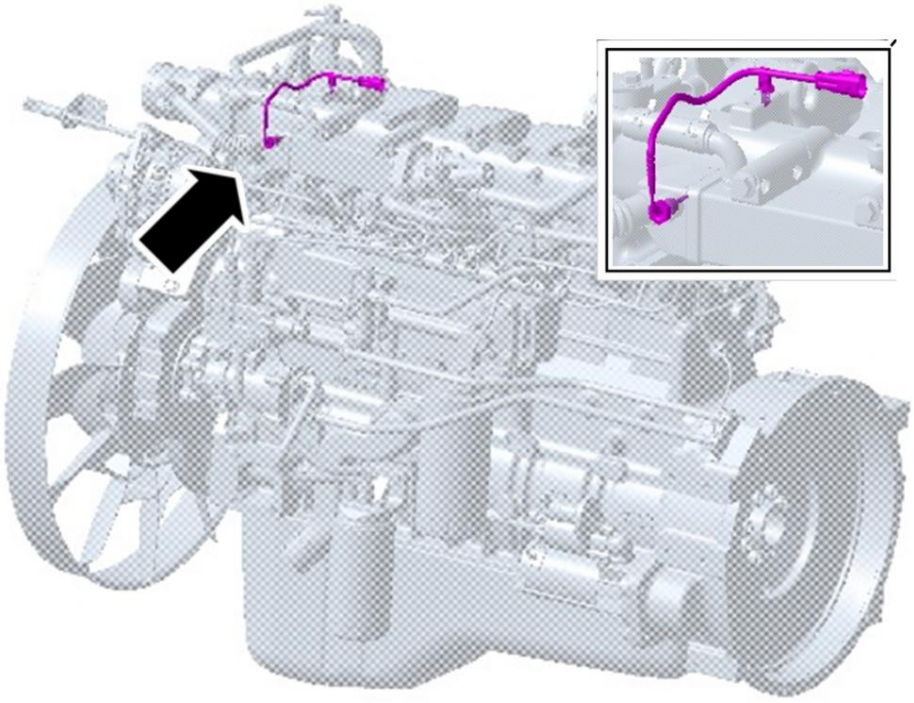
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
5	P1088 (Consequential P-Code)	Fuel pressure in rail too high			Rail Pressure Sensor connector improper seating IMV Connector improper seating Bends/crimps/restrictions/clog in fuel return line H.P Pump /IMV Faulty PRV / PLV stuck in closed condition Injector/Injectors faulty (Hydraulic part)	Rail Pressure Sensor connector seating IMV connector seating Fuel return line H.P Pump / IMV Common Rail Assembly Fuel Injector	Ensure correct fitment of sensor connector Ensure correct fitment of connector Replace return line/Rectify bends, restrictions, clog Replace H.P Pump Assembly. – If required get the pump checked from authorized BOSCH dealer. Replace Common Rail Assembly Replace faulty fuel Injector	√	√	x	x	x	x	x

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
6	P0091 (Consequential P-Code)	PRV Not Plausible with Rail pressure			Low Fuel Level Fuel Tank Breather Choked Fuel strainer choked Restriction in Suction line - tank to water separator & water separator to feed pump Water separator / Fuel Filter choked Restriction in Suction line from feed pump to fuel filter & fuel filter to H.P pump H.P Pump faulty Leakage in High pressure line - Pump to rail & rail to injector, Common Rail Fuel Return Line Fuel Injector Faulty Common Rail faulty	Fuel Level Fuel float unit Fuel strainer Bend / block / restriction in fuel line Water separator / Fuel Filter Bend / block / restriction in fuel line H.P Pump Joints, Pipes - leakages in High pressure circuit, Common Rail Fuel Return Line choked Fuel Injector Common Rail	Refill fuel in tank Replace Fuel float assembly Clean / Replace strainer Clean suction pipe / Replace suction pipe Replace water separator / Fuel Filter Clean suction pipe / Replace suction pipe Replace H.P Pump Replace affected parts Clean / Replace Fuel line Replace Fuel Injector Replace Common Rail assembly	√	√	x	x	x	x	x

7	P101C	Rail Pressure Voltage out of the allowed band (SRC)		N. A	Rail Pressure Sensor Faulty / ECU Faulty	Common Rail / ECU	Replace Common Rail Assembly / Replace ECU	x	√	x	x	x	x	2200 RPM

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.7 TEGR: TEMPERATURE SENSOR

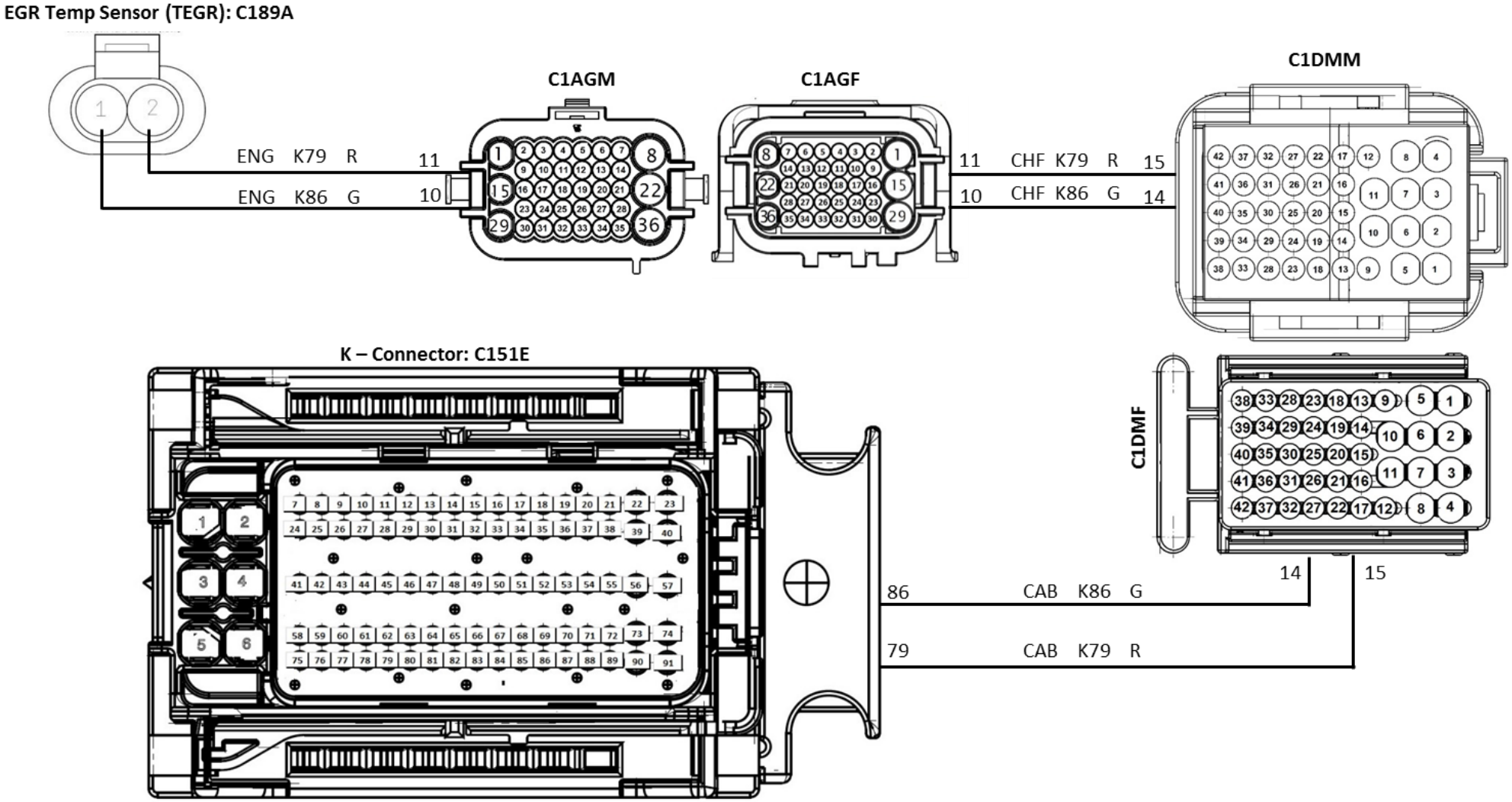


Location: On the EGR cooler outlet

Function:

- Measures the temperature of the exhaust gas under recirculation at EGR cooler outlet & communicates to ECU.
- Operating Range: 1050 mv – 3350 mv

4.7.1 Circuit Diagram: EGR Temperature Sensor



4.7.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P040D	EGR Temperature sensor output voltage above upper limit			Open Circuit - Pin 1 on TEGR sensor to Pin K86 on ECU	Continuity - Pin 1 to Pin K86	If no continuity - Check & replace affected harness 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness	√	√	x	x	x	x	x
					Open Circuit - Pin 2 on TEGR sensor to Pin K79 on ECU	Continuity - Pin 2 to Pin K79	If no continuity - Check & replace affected harness 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness							
					Pin 1 Short Circuit to Supply / Battery Positive	Continuity between Pin 1 & Supply / Battery Positive	If continuity is present – Replace affected harness. 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							4. Engine, Chassis Front, Cabin harness							
					TEGR Sensor faulty	TEGR Sensor	Replace TEGR Sensor							
					TEGR Sensor wiring faulty	TEGR Wiring of Engine, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness							
2	P040C	EGR Temperature sensor output voltage below lower limit			Ground Circuit - Pin 1 on TEGR sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness	√	√	x	x	√	√	x
					Short Circuit - Pin 1 & Pin 2 on TEGR sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. Engine (TEGR sensor to C1AGM connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness							
					TEGR Sensor faulty	TEGR Sensor	Replace TEGR Sensor							
					Open Circuit - Pin 1 on TEGR sensor to Pin K86 on ECU	Continuity - Pin 1 to Pin K86	If no continuity - Check & replace affected harness 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness							
					Open Circuit - Pin 2 on TEGR sensor to Pin K79 on ECU	Continuity - Pin 2 to Pin K79	If no continuity - Check & replace affected harness 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness							

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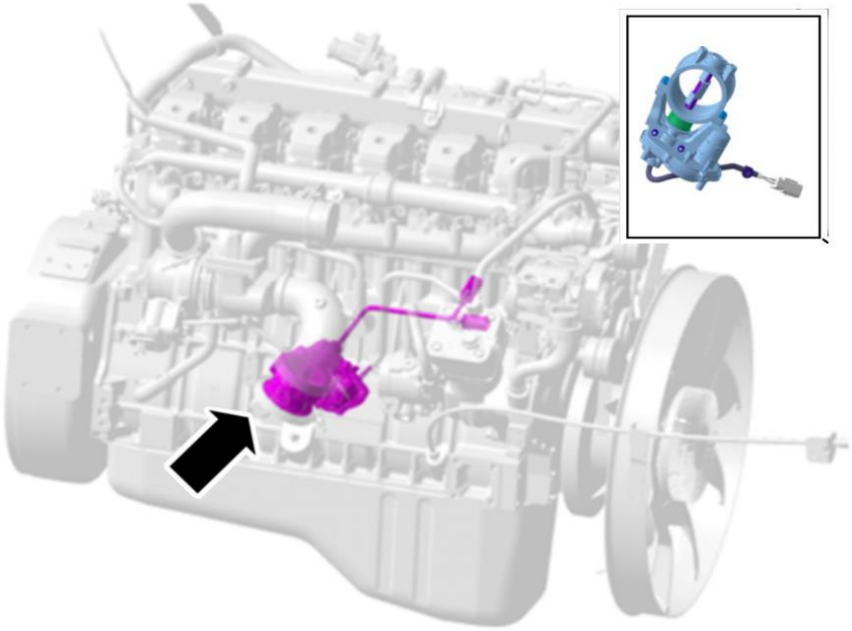
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					TEGR Sensor wiring faulty	TEGR Wiring of Engine, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Engine (TEGR sensor to C1AGM connector) 2. Chassis Front (C1AGF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. Engine, Chassis Front, Cabin harness							
3	P041B	EGR cooler temperature sensor defective			TEGR Sensor Faulty	TEGR Sensor	Replace TEGR Sensor	√	x	x	x	x	x	x
4	P2457	EGR Cooler Efficiency Low			EGR Cooler	Leakages (Exhaust Gas) / Scaling / Restrictions / Blockages	Clean / Rectify / Replace affected components	√	x	x	x	x	x	x
					TEGR Sensor Faulty / Sensor value drifted	TEGR Sensor	Replace TEGR Sensor							
					EGR Cooler Faulty	EGR Cooler	Replace EGR Cooler							
					Coolant leakage inside EGR Cooler	EGR Cooler – Physical inspection	Replace affected component							

Torque Reduction: √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.8 EXHAUST THROTTLE VALVE



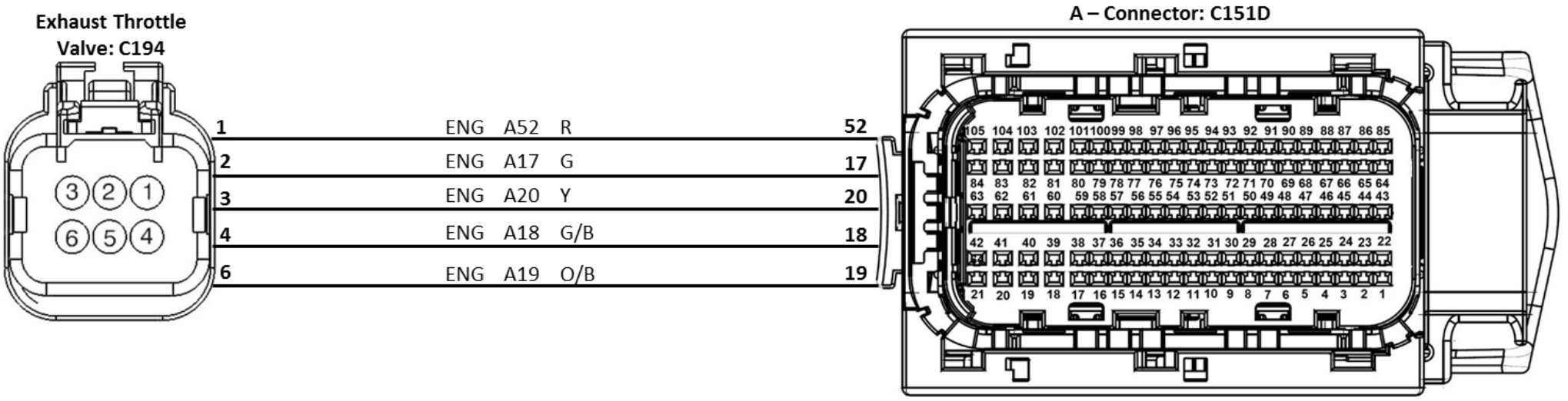
Location: On the exhaust outlet pipe of Turbocharger

Function

An Exhaust Throttle Valve (ETV) is controlled by the ECU whenever there is a requirement of increase the exhaust gas temperature. In short, ETV is used for thermal management of exhaust gases. ETV also functions as an exhaust brake. Management of this valve as an ETV or exhaust brake is decided by the ECU. ETV consists of a position sensor, which informs the ECU regarding the valve position and a motor that is used by the ECU to open and close the valve.

When the exhaust throttle valve is actuated, the valve obstructs the flow of exhaust gas and increases the temperature of the exhaust gas Heated exhaust gas helps for thermal management of After treatment System in cold vehicle conditions.

4.8.1 Circuit Diagram: Exhaust Throttle Valve



Note:

1. Every time the ignition is switched off after engine operation, the ECU triggers a learning of ETV position sensor. ECU sends a request signal to ETV to close & open. During this time, the voltage signal corresponding to the open position is monitored & stored in the EMS ECU. EMS ECU compares the last stored value with the value stored from previous driving cycle. This movement of ETV can be observed physically for verification.
2. If ETV valve is replaced, then ETV Actuator Learning Process needs to be carried out after replacement.

4.8.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P04A9	Exhaust Flap Sensor Signal above upper limit		P1405 - EGR Valve sensor signal below lower limit P1100- HFM Sensor Signal open load / Signal Line short to supply line P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on sensor to Pin A52 on ECU	Continuity - Pin 1 to Pin A52	If no continuity - Replace Engine Harness	√	√	x	√	√	√	x
					Pin 1 / Pin 2 / Pin 3 Short to Supply or Battery positive	Continuity between Pin1 / Pin 2 / Pin 3 and Supply or Battery Positive Check Voltage between Pin 1 & Pin 2 – Should be 5V	If continuity is present / Voltage value is not as per specs - Replace Engine Harness							
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV. Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
				P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 2 on sensor to Pin A17 on ECU	Continuity - Pin 2 to Pin A17	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 3 on sensor to Pin A20 on ECU	Continuity - Pin 3 to Pin A20	If no continuity - Replace Engine Harness							
					Pin 1 & Pin 3 on sensor short circuit with each other	Continuity - Pin 1 to Pin 3	If continuity is present - Replace Engine Harness							
					Pin 1 / Pin 2 / Pin 3 Short to Supply or Battery positive	Continuity between Pin1 / Pin 2 / Pin 3 and Supply or Battery Positive	If continuity is present / Voltage value is not as per specs - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Check Voltage between Pin 1 & Pin 2 – Should be 5V								
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
2	P04A8	Exhaust Flap Sensor Signal below lower limit			Ground Circuit - Pin 1 / Pin 3 on ETV short circuit to ground	Continuity - Pin 1 / Pin 3 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	√	√	√	x
					Short Circuit - Pin 2 & Pin 3 on ETV short circuit with each other	Continuity - Pin 2 to Pin 3	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 3 & Pin 4 on ETV short circuit with each other	Continuity - Pin 3 to Pin 4	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 3 & Pin 6 on ETV short circuit with each other	Continuity - Pin 3 to Pin 6	If continuity is present - Replace Engine Harness							
					Open Circuit – ETV Pin 1 / Pin 2 / Pin 3	Continuity between Pin 1 & A57 / Pin 2 & A17 / Pin 3 & A20	If no continuity is present – Replace Engine Harness							
					ETV – Voltage Value improper	Voltage between Pin1 & Pin 2 = 5V	If voltage is not as per specification – Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
3	P0475	Exhaust flap open circuit			Open Circuit - Pin 4 on sensor to Pin A18 on ECU	Continuity - Pin 4 to Pin A18	If no continuity - Replace Engine Harness	√	√	x	x	√	x	x
					Open Circuit - Pin 6 on sensor to Pin A19 on ECU	Continuity - Pin 6 to Pin A19	If no continuity - Replace Engine Harness							
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
4	P0473	Exhaust Flap short circuit to Battery			Short Circuit - Pin 1 & Pin 4 on ETV short circuit with each other/ Pin 4 Short to Battery Positive	Continuity - Pin 1 to Pin 4 / Pin 4 to Battery Positive	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Short Circuit - Pin 1 & Pin 6 on ETV short circuit with each other/ Pin 6 Short to Battery Positive	Continuity - Pin 1 to Pin 6 / Pin 6 to Battery Positive	If continuity is present - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit – Pin 6 to ECU A19	Continuity between Pin 1 & ECU A18	If no continuity – Replace Engine Harness							
					Short Circuit – Pin 1 Short to Supply / Battery Positive	Continuity – Pin 1 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 4 & Pin 6 on ETV short circuit with each other/ Pin 6 Short to Battery Positive	Continuity - Pin 4 to Pin 6 / Pin 6 to Battery Positive	If continuity is present - Replace Engine Harness							
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV – Voltage Value improper	Voltage between Pin1 & Pin 2 = 5V	If voltage is not as per specification – Replace Engine Harness							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
5	P047D	Exhaust Flap short circuit to Battery			Short Circuit - Pin 1 & Pin 4 on ETV short circuit with each other / Pin 4 Short to Battery Positive	Continuity - Pin 1 to Pin 4 / Pin 1 to Battery Positive	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Open Circuit – Pin 4 to ECU A18	Continuity between Pin 4 & ECU A18	If no continuity – Replace Engine Harness							
					Short Circuit - Pin 4 & Pin 6 on ETV short circuit with each other	Continuity - Pin 4 to Pin 6	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 4 on ETV short circuit with Battery Positive	Continuity - Pin 4 to Battery Positive	If continuity is present - Replace Engine Harness							
					Short Circuit – Pin 1 to Supply / Battery Positive	Continuity between Pin 1 & Supply or Battery Positive	If continuity is present – Replace Engine Harness							
					ETV – Voltage Value improper	Voltage between Pin1 & Pin 2 = 5V	If voltage is not as per specification – Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
6	P0472	Exhaust Flap short circuit to Ground			Ground Circuit - Pin 4 on ETV short circuit to ground	Continuity - Pin 4 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Ground Circuit - Pin 6 on ETV short circuit to ground	Continuity - Pin 6 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 1 on ETV short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Open Circuit – Pin 6 & ECU A19	Continuity between Pin 6 & ECU A19	If no continuity is present – Replace Engine Harness							
					Short Circuit - Pin 4 & Pin 6 on ETV short circuit with each other	Continuity - Pin 4 to Pin 6	If continuity is present - Replace Engine Harness							
					ETV – Voltage Value improper	Voltage between Pin1 & Pin 2 = 5V	If voltage is not as per specification – Replace Engine Harness							
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before &	Replace EGR Valve Perform **"EGR Actuator Learning**							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						After replacement of component for verification	**Process"** under actuator test tab using diagnostic tool after replacement							
7	P047C	Exhaust Flap short circuit to Ground			Ground Circuit - Pin 4 on ETV short circuit to ground	Continuity - Pin 4 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Ground Circuit - Pin 6 on ETV short circuit to ground	Continuity - Pin 6 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Open Circuit – Pin 4 & ECU A18	Continuity between Pin 4 & ECU A18	If no continuity is present – Replace Engine Harness							
					Short Circuit - Pin 4 to Pin 6 ON ETV	Continuity - Pin 4 to Pin 6	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 1 on ETV short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					ETV – Voltage Value improper	Voltage between Pin1 & Pin 2 = 5V	If voltage is not as per specification – Replace Engine Harness							
					ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					ETV Wiring faulty	ETV Wiring - Open, Ground, Short circuit	Replace Engine harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
8	P0476	Exhaust flap defective			ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement	X	X	X	X	X	X	X
9	P0477	Exhaust flap defective			ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement	X	X	X	X	X	X	X
10	P047F	Exhaust Throttle valve jammed in closed position			ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Clean carbon deposits & verify operation. If problem persists, replace ETV. If no movement is observed - Replace ETV. Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.	√	√	X	X	√	X	X
					ETV actuator wiring faulty.	ETV Wiring - Open circuit.	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							

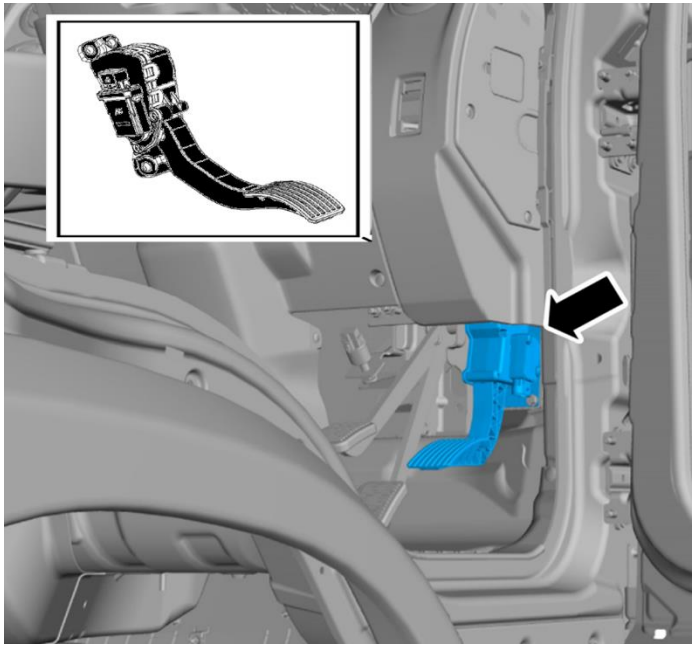
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
11	P048A	Exhaust Throttle valve jammed in open position			ETV Faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Clean carbon deposits & verify operation. If problem persists, replace ETV. If no movement is observed - Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.	√	√	x	x	√	x	x
					ETV actuator wiring faulty.	ETV Wiring - Open circuit.	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							

Torque Reduction: 1. √ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately

2. √ => Torque Reduced by 25% - Immediate attention required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.9 ACCELERATOR PEDAL POSITION SENSOR

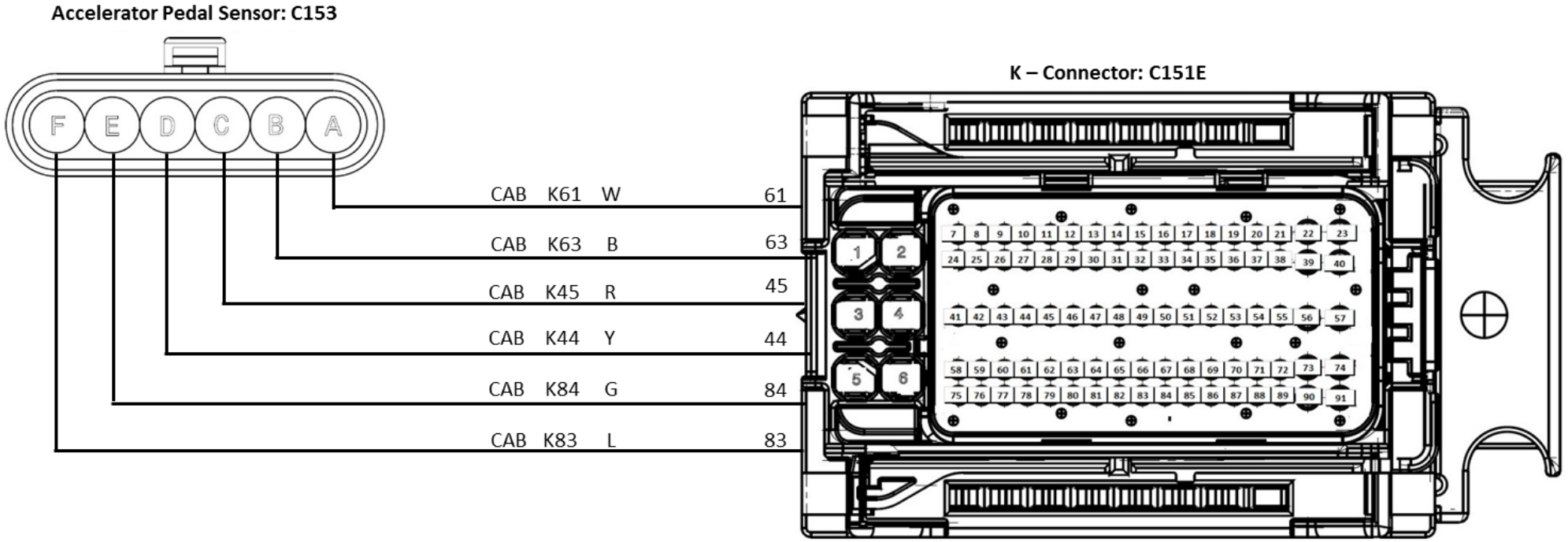


Location: On Accelerator pedal

Function:

- The sensor measures the pedal position and communicates to ECU.
- Sensor measures the position of accelerator pedal module from 0% travel position to 100% travel position.
- Two Hall Effect position sensors are incorporated to provide a redundant and report error in case of malfunction of the pedal and avoid wrong accelerator response.
- Voltage across redundant sensor is almost half of the first sensor.
- ECU uses the APP sensor signal for calculation of fueling and engine operational parameters.

4.9.1 Circuit Diagram: Accelerator Pedal Position Sensor



4.9.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0122	APP1 Sensor value below lower limit			Open Circuit - Pin C on APP sensor to Pin K45 on ECU	Continuity - Pin C to Pin K45	If no continuity is present - Replace Cabin Harness	x	√	x	x	x	x	x
					Open Circuit - Pin A on APP sensor to Pin K61 on ECU	Continuity - Pin A to Pin K61	If no continuity is present - Replace Cabin Harness							
					Ground Circuit - Pin A on APP sensor short circuit to ground	Continuity - Pin A to Body Ground / Battery Negative	If continuity is present - Replace Cabin Harness							
					Short Circuit - Pin A & Pin B on APP sensor short circuit with each other	Continuity - Pin A to Pin B	If continuity is present - Replace Cabin Harness							
					APP1 Sensor faulty	Replace APP sensor	Replace Accelerator Pedal Sensor							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace Cabin Harness							
2	P0123	APP1 Sensor value above upper limit			Open Circuit - Pin B on APP sensor to Pin K63 on ECU	Continuity - Pin B to Pin K63	If no continuity is present - Replace Cabin Harness	x	√	x	x	x	x	x
					Short Circuit - Pin B & Pin C on APP sensor short circuit with each other	Continuity - Pin B to Pin C	If continuity is present - Replace Cabin Harness							
					APP1 Sensor faulty	Replace APP sensor	Replace Accelerator Pedal Sensor							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace Cabin Harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P0222	APP2 Sensor Value			Open Circuit - Pin D on APP sensor to Pin K44 on ECU	Continuity - Pin D to Pin K44	If no continuity is present - Replace Cabin Harness	x	√	x	x	x	x	x

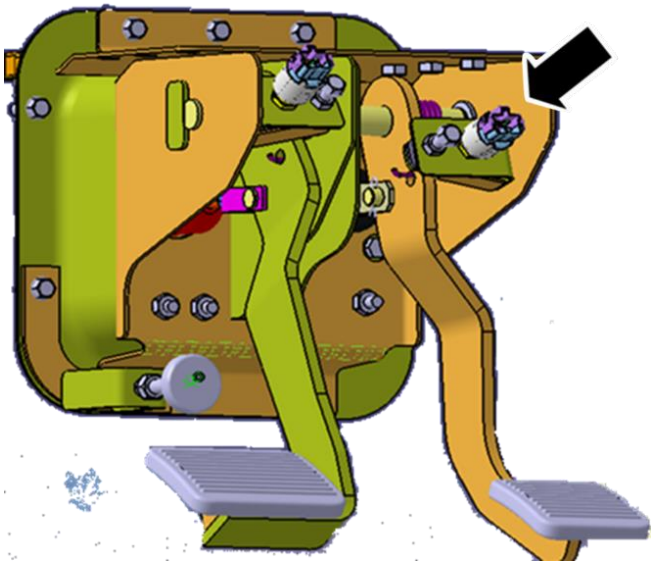
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
		Below Lower Limit			Open Circuit - Pin F on APP sensor to Pin K83 on ECU	Continuity - Pin F to Pin K83	If no continuity is present - Replace Cabin Harness							
					Ground Circuit - Pin F on APP sensor short circuit to ground	Continuity - Pin F to Body Ground / Battery Negative	If continuity is present - Replace Cabin Harness							
					Short Circuit - Pin E & Pin F on APP sensor short circuit with each other	Continuity - Pin E to Pin F	If continuity is present - Replace Cabin Harness							
					APP2 Sensor faulty	Replace APP sensor	Replace Accelerator Pedal Sensor							
					APP2 Sensor wiring faulty	APP2 Sensor wiring - Open, Ground, Short circuit	Replace Cabin Harness							
4	P0223	APP2 Sensor Value Above Upper Limit			Open Circuit - Pin E on APP sensor to Pin K84 on ECU	Continuity - Pin E to Pin K84	If no continuity is present - Replace Cabin Harness	x	√	x	x	x	x	x
					Short Circuit - Pin D & Pin F on APP sensor short circuit with each other	Continuity - Pin B to Pin C	If continuity is present - Replace Cabin Harness							
					APP2 Sensor faulty	Replace APP sensor	Replace Accelerator Pedal Sensor							
					APP2 Sensor wiring faulty	APP2 Sensor wiring - Open, Ground, Short circuit	Replace Cabin Harness							

5	P060D	APP1 & APP2 Sensor Sync Error			APP Sensor Wiring Faulty	Cabin Wiring Harness – Open, Ground, Short	Replace Cabin Harness	x	√	x	x	x	x	2200 RPM
					APP Sensor faulty	APP Sensor	Replace APP Sensor							
					ECU Faulty	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
6	P061D	APP & Brk Plausible			Brake switch – Loose connection	Brake switch wires, Brake switch connector seating on switch	Rectify – Ensure proper seating	X	X	X	X	X	X	X
					Brake switch terminals / wires interchanged / wrong connection	Confirm using live data values / status for brake switch in diagnostics / wiring colour codes w.r.t connector pin numbers	Rectify / Replace Cabin harness							
					Brake switch setting not as per specification	Brake switch setting, Check pedal free play	Adjust brake setting, as per specification							
					Brake switch stuck	Brake switch plunger position	Replace Brake switch							
					Brake switch faulty	Brake switch	Replace brake switch							
					Brake switch wiring faulty	Cabin Harness	Replace Cabin Harness							
					APP Sensor Stuck in a particular operated position / APP Faulty	APP Sensor Position (Live Data Can be referred for understanding)	Replace Accelerator Pedal							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace Cabin Harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					ECU Faulty	ECU	Replace ECU & confirm							

4.10 BRAKE SWITCH

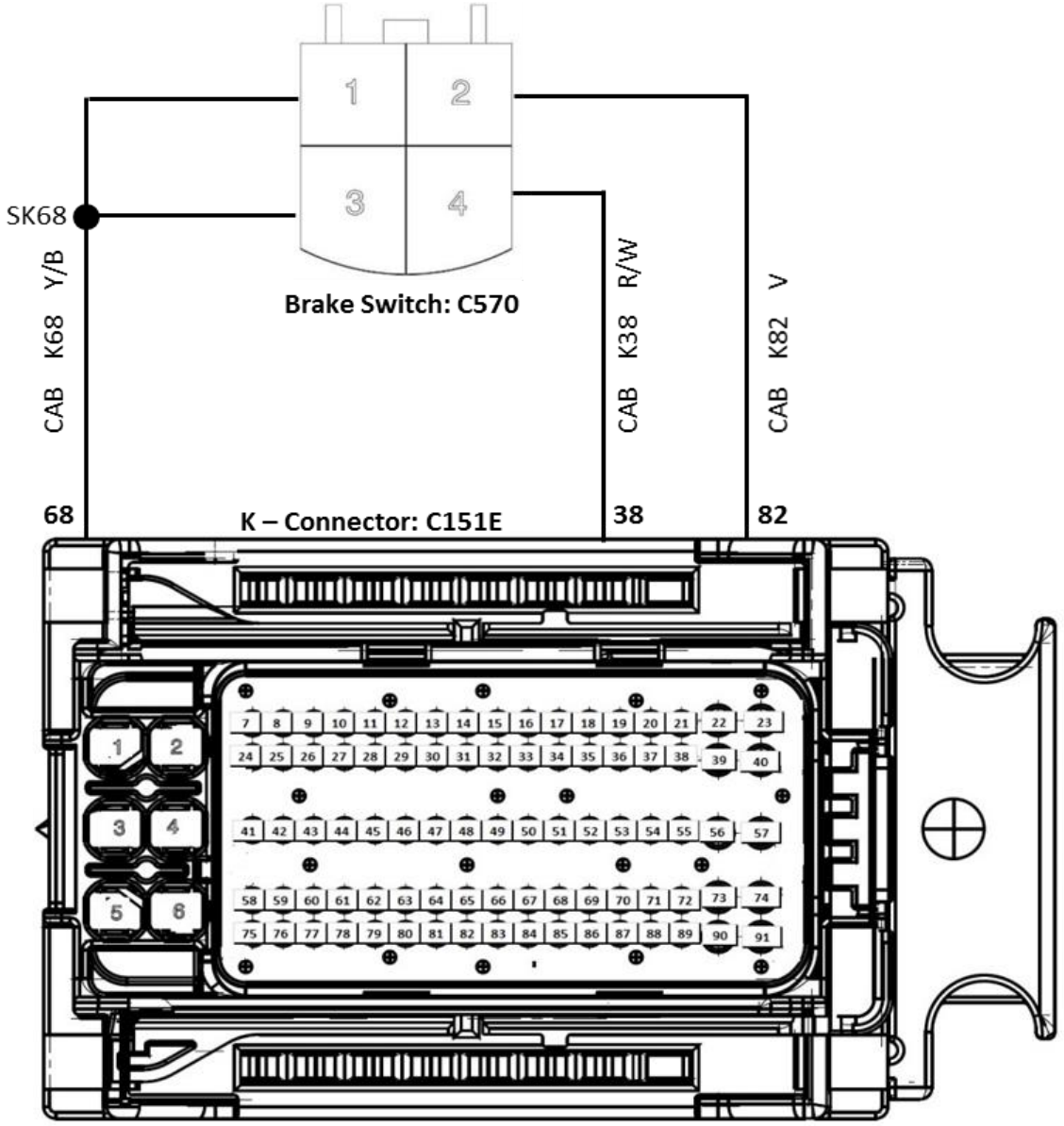


Location: Behind Brake Pedal

Function:

- The brake switch is a normal ON or OFF type switch.
- The brake switch provides a signal to the ECU indicating the brake pedal is pressed. The brake switch is normally open and mounted on the brake pedal support. The brake switch is hardwired to the ECU a signal when the brake pedal is applied.
- The main and redundant brake signals are input to EMS ECU from the brake switch. They are mutually and individually checked for plausibility.

4.10.1 Circuit Diagram: Brake Pedal Switch



Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0504	Brake Signal without pressing brake pedal			Brake switch – Loose connection	Brake switch wires, Brake switch connector seating on switch	Rectify – Ensure proper seating	X	X	X	X	X	X	X
					Brake switch terminals / wires interchanged / wrong connection	Confirm using live data values / status for brake switch in diagnostics / wiring colour codes w.r.t connector pin numbers	Rectify / Replace Cabin harness							
					Brake switch setting not as per specification	Brake switch setting, Check pedal free play	Adjust brake setting, as per specification							
					Brake switch stuck	Brake switch plunger position	Replace Brake switch							
					Brake switch faulty	Brake switch	Replace brake switch							
					Brake switch wiring faulty	Cabin Harness	Replace Cabin Harness							

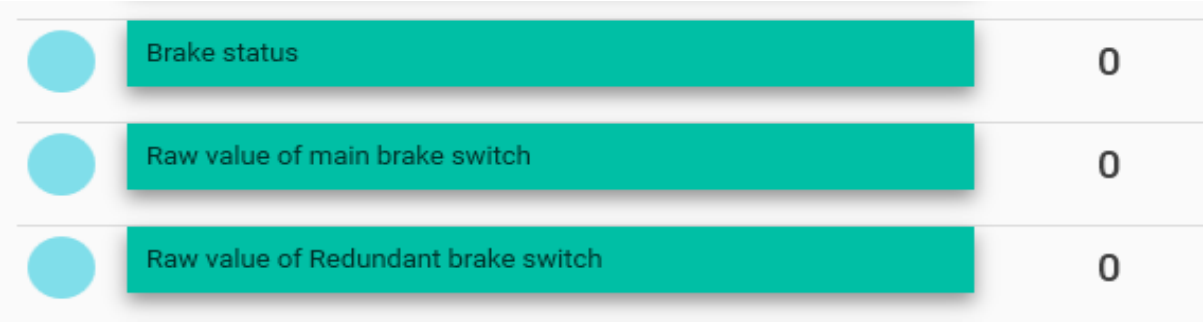
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P162D	Brake switch not Plausible			Brake switch – Loose connection	Brake switch wires, Brake switch connector seating on switch	Rectify – Ensure proper seating	X	X	X	X	X	X	X

CONTINUED IN PAGE 165

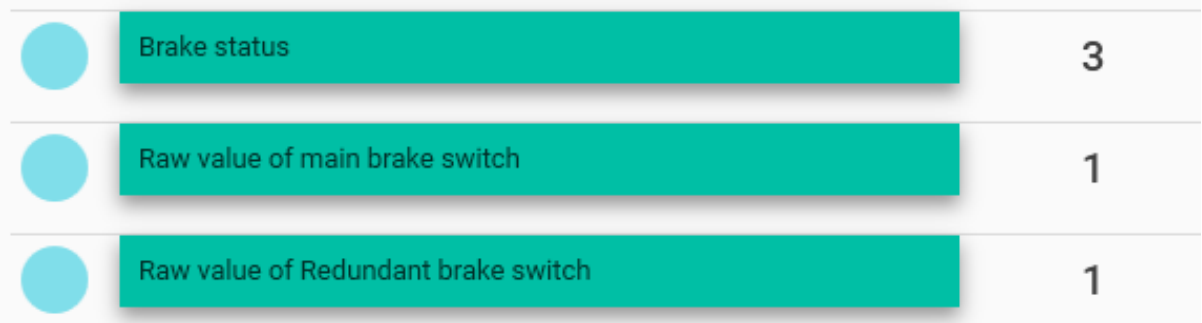
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Brake switch terminals / wires interchanged / wrong connection	Confirm using live data values / status for brake switch in diagnostics / wiring colour codes w.r.t connector pin numbers	Rectify / Replace Cabin harness							
					Brake switch setting not as per specification	Brake switch setting, Check pedal free play	Adjust brake setting, as per specification							
					Brake switch stuck	Brake switch plunger position	Replace Brake switch							
					Brake switch faulty	Brake switch	Replace brake switch							
					Brake switch wiring faulty	Cabin Harness	Replace Cabin Harness							
					APP Sensor Stuck in a particular operated position / APP Faulty	APP Sensor Position (Live Data Can be referred for understanding)	Replace Accelerator Pedal							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace Cabin Harness							
					ECU Faulty	ECU	Replace ECU & confirm							

Brake Switch values as displayed in Live Data of diagnostic tool:

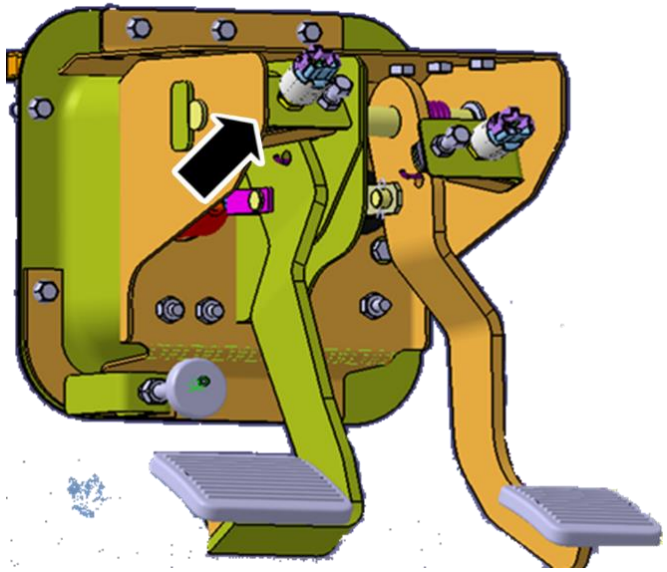
- **Brake Released / Disengaged Completely:**



- **Brake Completely Applied / Completely Engaged:**



4.11 CLUTCH SWITCH



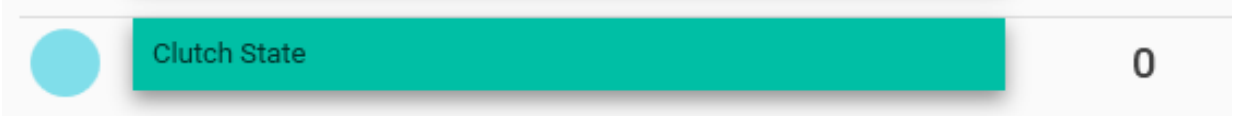
Location: Behind Clutch Pedal

Function:

- The clutch switch is an ON or OFF type switch.
- It is mounted on the clutch pedal to detect whether the clutch pedal is pressed or not
- It provides information to ECU before the gear change which helps in faster gear change detection. Based on this input the ECU maintains optimum fuel supply

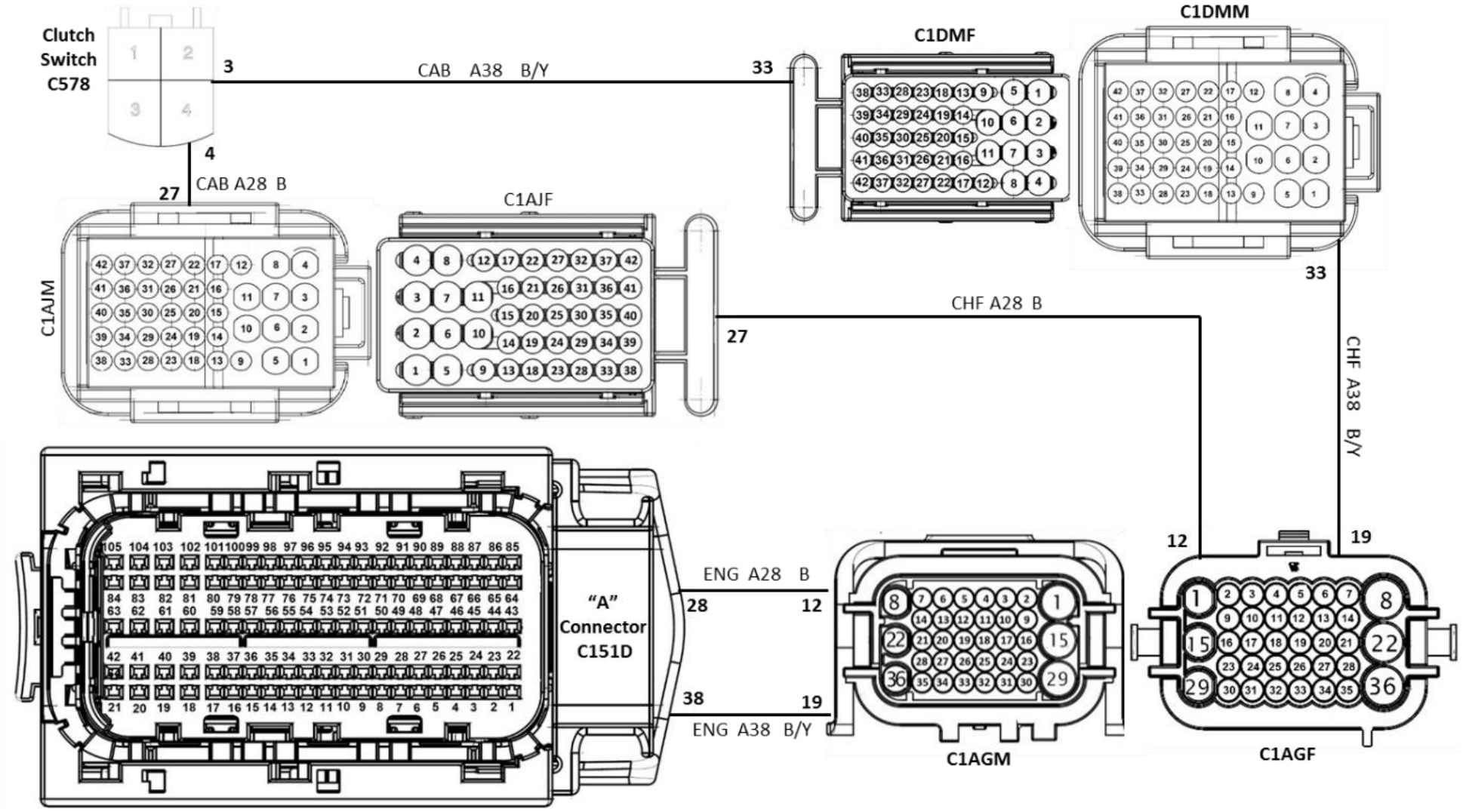
Clutch Switch values as displayed in Live Data of diagnostic tool:

- **Clutch Released / Engaged:**



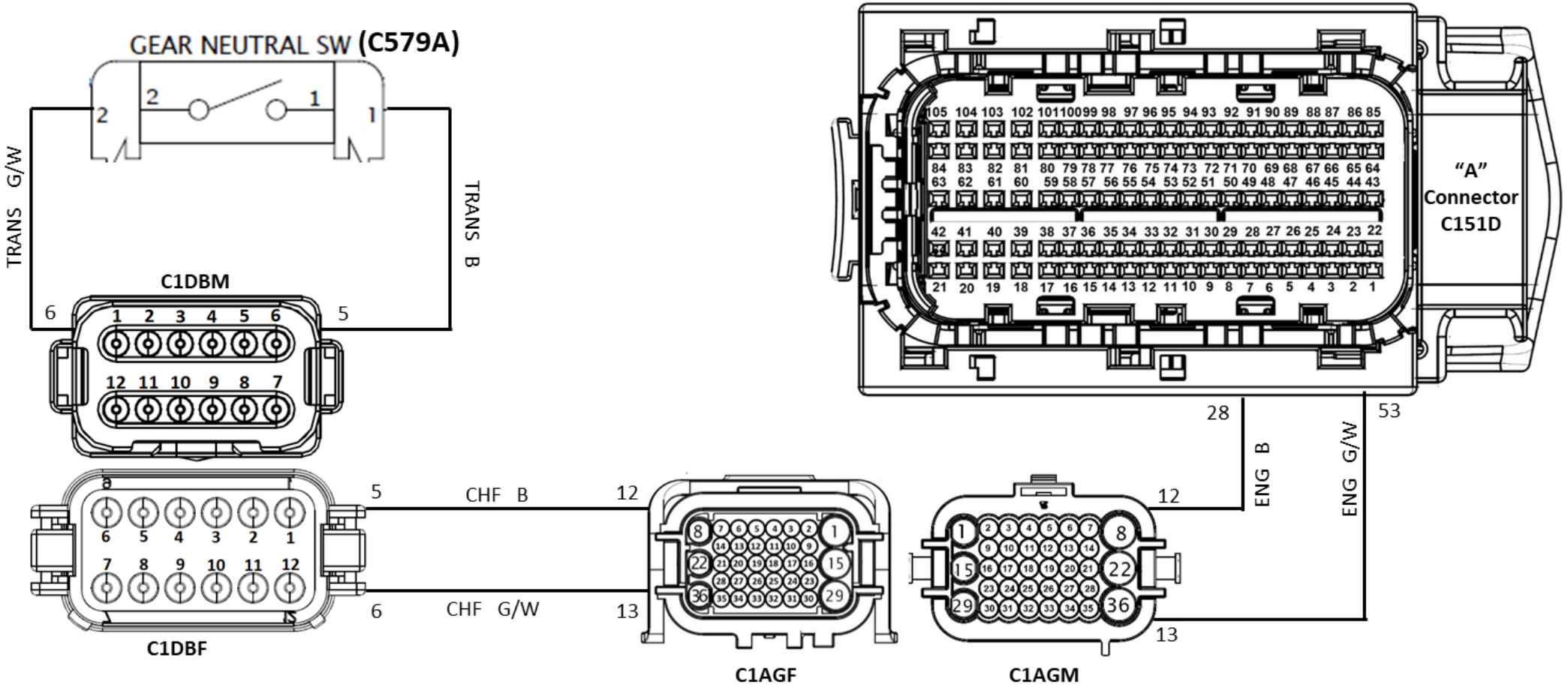
- **Clutch Pressed / Disengaged:**

4.11.1 Circuit Diagram: Clutch Pedal Switch



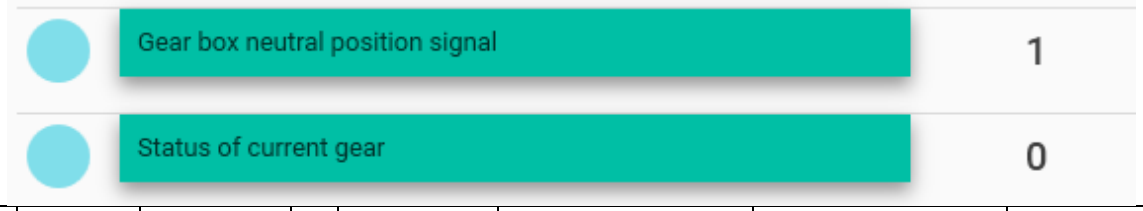
4.12 NEUTRAL SWITCH:

ECU will not crank the vehicle until it receives a signal from the Neutral Switch. The Neutral indication can be seen in the DIS cluster.



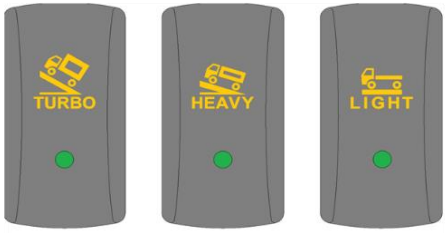
Neutral Switch & Gear Status values as displayed in Live Data of diagnostic tool:

- **Gear in Neutral Position:**
-



1	P161D	GNS is not Plausible			Neutral Switch wiring Harness Faulty	Transmission Harness / Chassis Front Harness / Engine Harness) – Open, Ground, Short Circuit	Replace affected harness – Transmission / Chassis Front / Engine Harness	X	X	X	X	X	X	X
					Neutral Switch Faulty	Neutral Switch	Replace Neutral Switch							

4.13 MULTIMODE SYSTEM

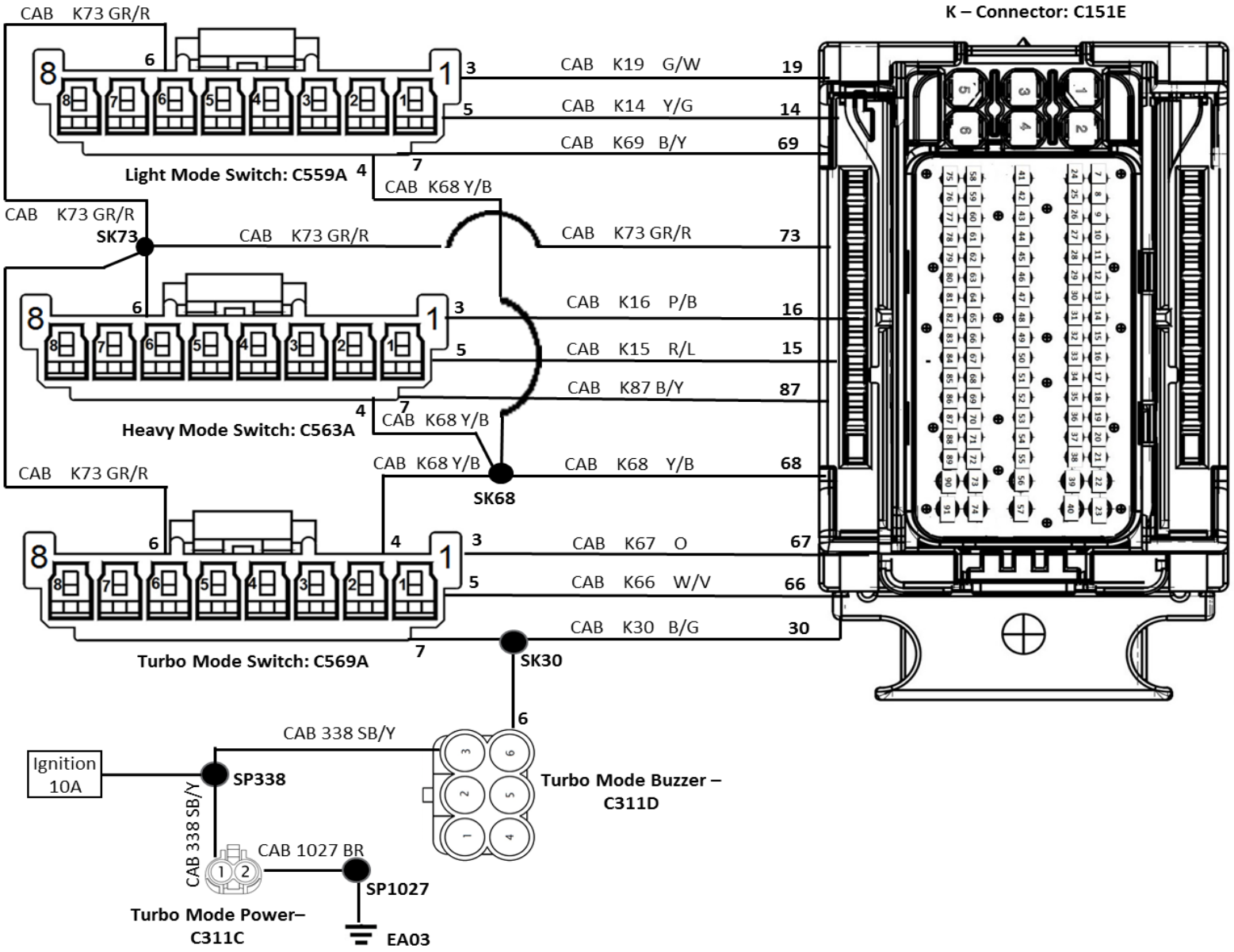


Location: Cabin – Dashboard Switch Plane

Function:

Multimode switches are directly connected to the ECU. Whenever a mode switch is selected, based on its input, the ECU will vary the power and torque output of the engine.

4.13.1 Circuit Diagram: Multi-Mode System



4.13.2 P-Codes

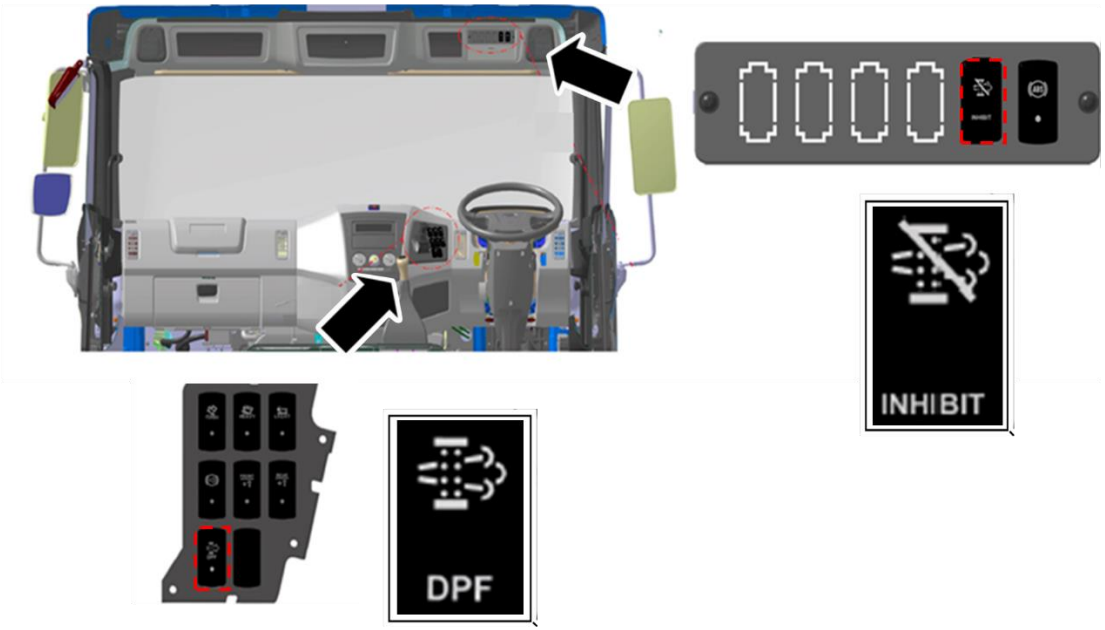
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	**P05D7**	LED not glowing - Heavy Mode			Heavy Mode Switch faulty Heavy mode harness faulty	Heavy Mode Switch Heavy Mode wiring - Ground, Short wiring	Replace Heavy Mode Switch Replace Cabin harness	X	X	X	X	X	X	X
2	**P05D8**	LED not glowing - Light Mode			Light Mode Switch faulty Light Mode harness faulty	Light Mode Switch Light Mode wiring - Ground, Short wiring	Replace Light Mode Switch Replace Cabin harness	X	X	X	X	X	X	X
3	**P05D9**	LED not glowing - Turbo Mode			Turbo Mode Switch faulty Turbo Mode harness faulty	Turbo Mode Switch Turbo Mode wiring - Ground, Short wiring	Replace Turbo Mode Switch Replace Cabin harness	X	X	X	X	X	X	X
4	P05D3	Heavy Mode Switch Correlation			Heavy Mode Switch faulty Heavy Mode wiring - Open Circuit / Continuity check Heavy mode harness faulty	Heavy Mode Switch Continuity between: 1. K68 & K15 (Normally Closed) 2. K68 & K16 (Normally Open) Heavy Mode wiring – Ground, Short wiring	Replace Heavy Mode Switch If no continuity – Replace Cabin Harness If continuity is present – Replace Cabin Harness Replace Cabin harness	X	X	X	X	X	X	X
5	P05D4	Light Mode Switch Correlation			Light Mode Switch faulty Light Mode wiring - Open Circuit / Continuity check Light Mode harness faulty	Light Mode Switch Continuity between: 1. K68 & K14 (Normally Closed) 2. K68 & K19 (Normally Open) Light Mode wiring - Ground, Short wiring	Replace Light Mode Switch If no continuity – Replace Cabin Harness If continuity is present – Replace Cabin Harness Replace Cabin harness	X	X	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
6	P05D5	Turbo Mode Switch Correlation			Turbo Mode Switch faulty Turbo Mode wiring - Open Circuit / Continuity check Turbo Mode harness faulty	Turbo Mode Switch Continuity between: 1. K68 & K66 (Normally Closed) 2. K68 & K67 (Normally Open) Turbo Mode wiring - Ground, Short wiring	Replace Turbo Mode Switch If no continuity – Replace Cabin Harness If continuity is present – Replace Cabin Harness Replace Cabin harness	X	X	X	X	X	X	X
7	P05D6	Heavy Mode Switch Stuck			Heavy Mode Switch faulty	Heavy Mode Switch	Replace Heavy Mode Switch	X	X	X	X	X	X	X
					Heavy Mode switch pressed for a long time	Switch operating process by operator	Educate the operator to press the switch correctly							
					Heavy Mode wiring faulty	Cabin Wiring	Replace Cabin Harness							
8	P05D1	Light Mode Switch stuck			Light Mode Switch faulty	Light Mode Switch	Replace Light Mode Switch	X	X	X	X	X	X	X
					Light Mode switch pressed for a long time	Switch operating process by operator	Educate the operator to press the switch correctly							
					Light Mode wiring faulty	Cabin Wiring	Replace Cabin Harness							
9	P05D0	Turbo Mode Switch stuck			Turbo Mode Switch faulty	Turbo Mode Switch	Replace Turbo Mode Switch	X	X	X	X	X	X	X
					Light Mode switch pressed for a long time	Switch operating process by operator	Educate the operator to press the switch correctly							
					Light Mode wiring faulty	Cabin Wiring	Replace Cabin Harness							
10	P0300	Multimode Switch multiple switches pressed at same time			More than 1 mode switch pressed at the same time	Switch operating process by operator	Educate the operator to press the switch correctly	X	X	X	X	X	X	X
					Multi-Mode Harness Faulty - Short Circuit between Mode wirings	Cabin harness	Replace Cabin harness							
					Mode Switches faulty	Mode Switches	Replace Mode Switches							

Note: If Heavy Mode & Turbo Mode LED's are on together, then check for the following faults

- Open / Ground / Short Circuit with EV Fan wiring (Engine Wiring) or EV Fan Pig Tail or EV Fan. Replace the faulty component & verify.
- Open / Ground / Short Circuit with Clutch switch wiring

4.14 DPF SWITCHES: REGENERATION & INHIBIT



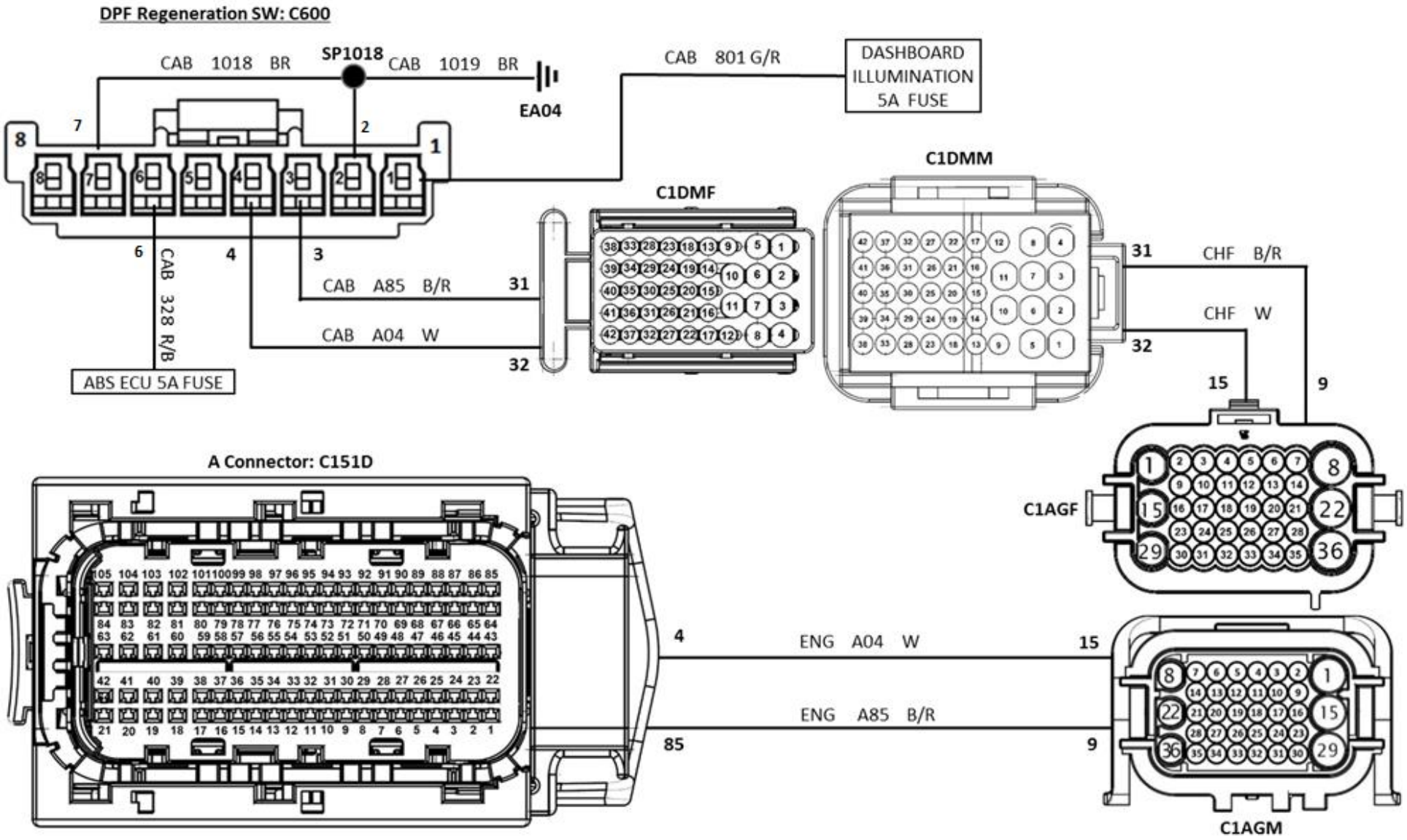
Function:

- DPF Regeneration Switch is used to carry out parked regeneration of the DPF. In order to carry out DPF regeneration, the DPF regeneration switch must be pressed for 5 seconds and released. The ECU will begin the regeneration of the DPF after all the necessary conditions are met.
- **DPF Regeneration Inhibit** switch must be used to override “Active” Regeneration, only when the vehicle is operating in hazardous condition.
- As long as the **DPF Regeneration Inhibit** switch is in pressed condition, there will be a message displayed in the cluster which says: **“DPF REGENERATION INHIBITED”**

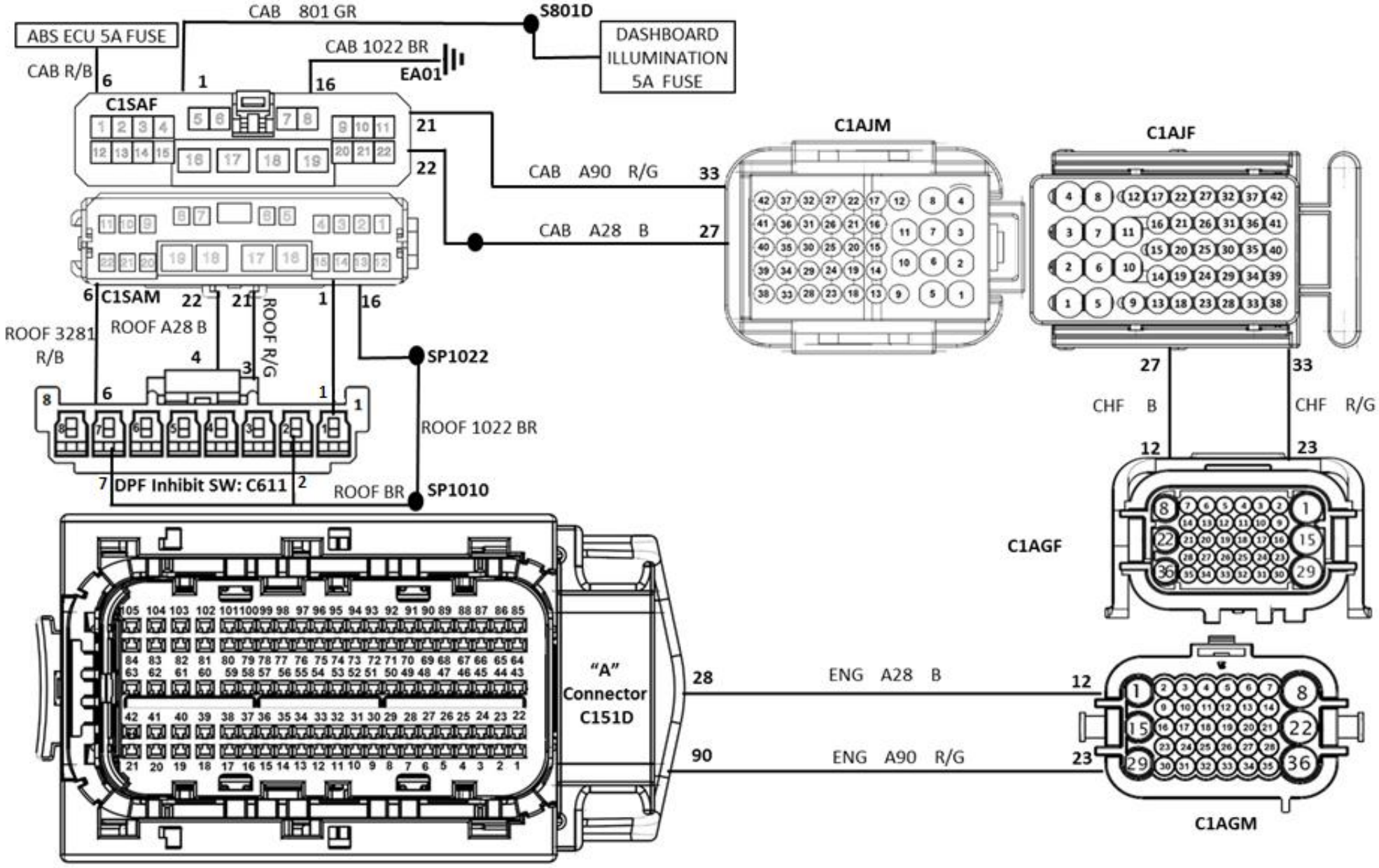
Location: Cabin – DPF Regeneration Switch - on dashboard switch plane; DPF Regeneration Inhibit Switch – On Cabin RH top side near ABS diagnostic switch

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2268	DPF Regen demand switch defective			1. Regen Switch pressed for longer time 2. Switch stuck at a position 3. Cabin / Chassis Front Wiring Harness Faulty	1. Switch Press Time 2. Switch Stuck in closed position 3. DPF Regen switch Wiring Harness – Open, Ground, Short circuit	1. Ensure that the Regeneration switch is pressed for required time only 2. Replace DPF Regeneration switch 3. Replace Cabin Harness / Front Chassis / Engine Harness – If Faulty	X	X	X	X	X	X	X

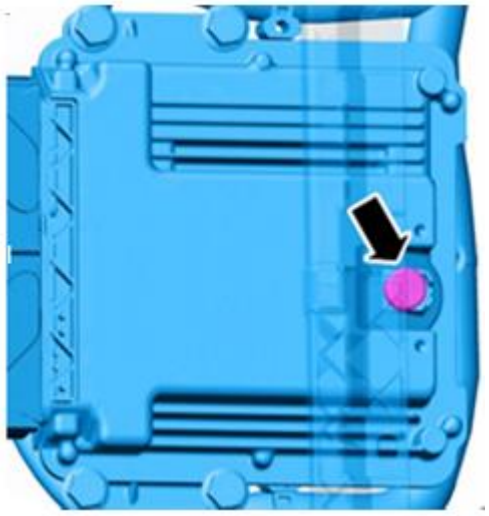
Circuit Diagram: DPF Regeneration Switch



Circuit Diagram: DPF Inhibit Switch



4.15 BAROMETRIC SENSOR



Location: Inside the EMS ECU.

Function:

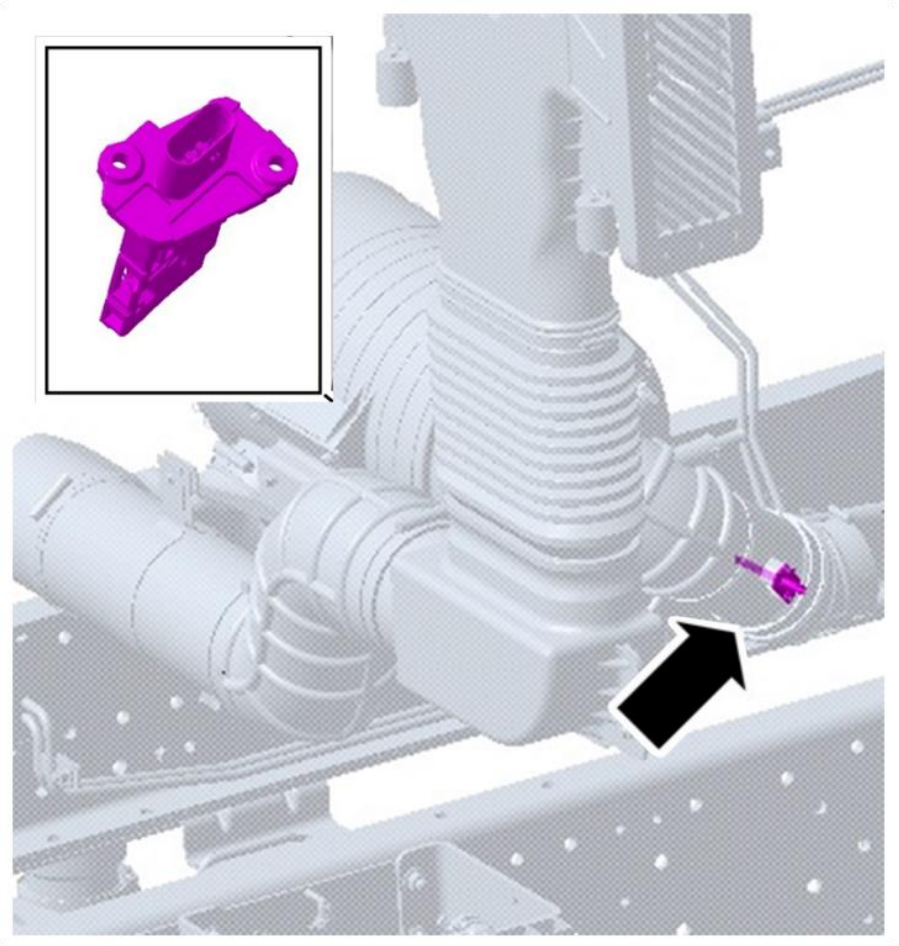
- The sensor provides the atmospheric pressure value to the EMS ECU and help ECU to correct injection quantity accordingly.
- Measures the atmospheric pressure and sends the information to ECU. ECU then makes necessary corrections in fueling accordingly.

4.15.1 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2229	Environmental Pressure Signal above upper limit			Barometric Sensor Faulty	----------	Replace ECU	√	√	x	x	√	x	x
2	P2228	Environmental Pressure Signal below lower limit			Barometric Sensor Faulty	----------	Replace ECU	√	√	x	x	√	x	x
3	P2230	Environment Pressure out of range			Barometric Sensor Faulty	----------	Replace ECU	x	x	x	x	x	x	x

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.16 HFM SENSOR

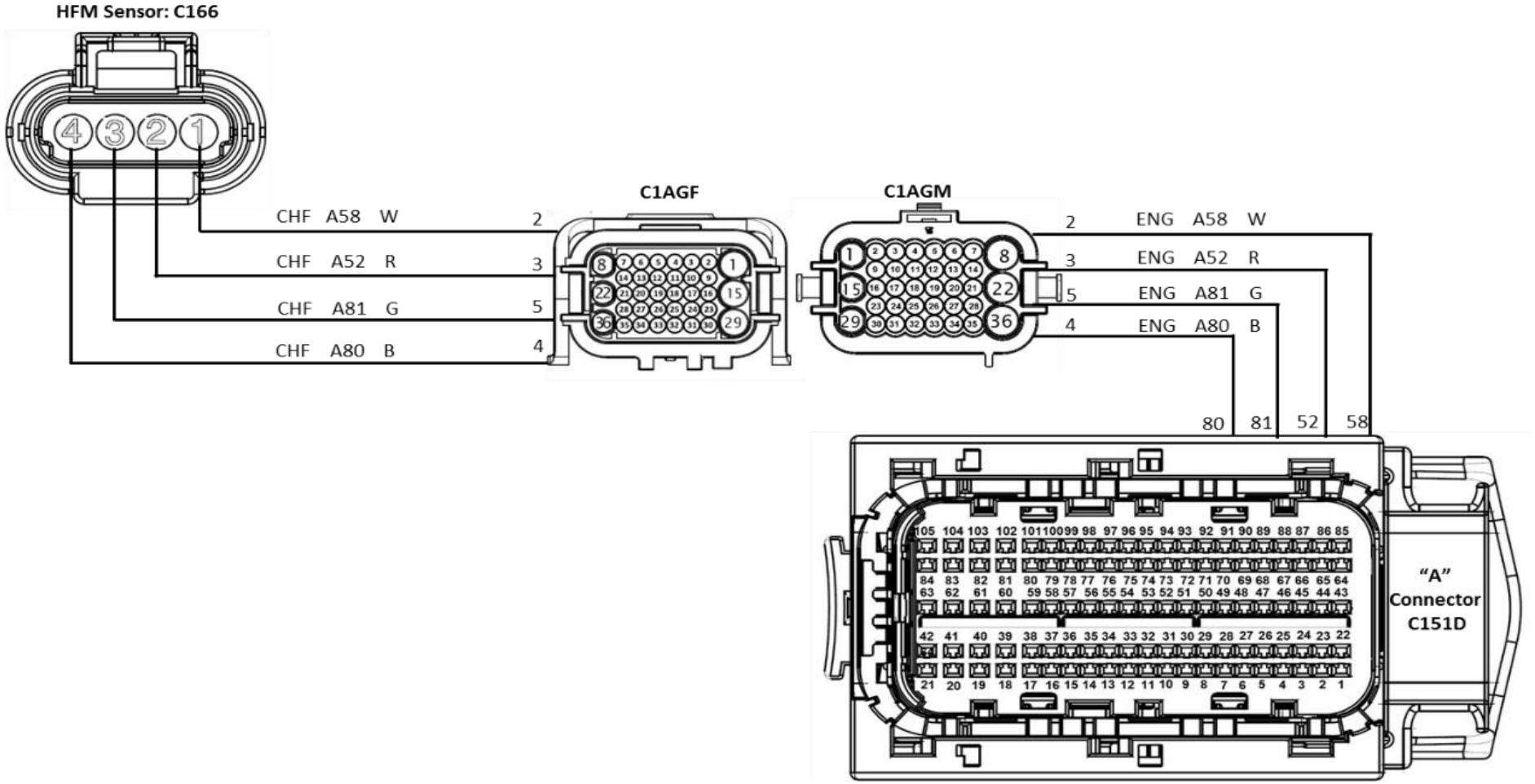


Location: On air filter outlet

Function:

- The HFM sensor monitors the air mass flowing through the air intake & intake air temperature just after the air filter. The sensor consists of a hot film that is heated, when intake air flows over the hot film there is a linear drop in temperature of the film. The temperature across the film is monitored by a control unit in the sensor itself. The sensor also monitors the temperature of the intake air through an NTC sensor. The sensor control unit then converts the air mass into a frequency signal and a correction factor and sends both to the EMS ECU. The EMS ECU then calculates the air mass flowing through the intake.
- Operating Range: 100 mv – 4850 mv

4.16.1 Circuit Diagram: HFM Sensor



HFM Sensor - Approximate Reference Values: **At High Idle: 740 to 850 Kg/Hr** **(Note: HFM Value is not to be referred if DPF is choked or if any DPF related DTC is triggered, as in such cases, HFM sensor will show a lower value due to consequential effect of DPF choking)**

Procedure to measure:

1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel
2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times.
3. Record the value of HFM in the 5th time when the RPM reaches high idle.

4.16.2 P-Code List

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P1100	HFM Sensor signal open load / Signal line short to supply line	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on sensor to Pin A58 on ECU	Continuity - Pin 1 to Pin A58	If no continuity - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness	√	√	x	√	√	√	x
					1. Pin 1 & Pin 2 on sensor short circuit with each other 2. Pin 1 / Pin 2 Short circuit to Supply or Battery Positive	1. Continuity - Pin 1 to Pin 2 2. Continuity – Pin 1 / Pin 2 to Supply or Battery Positive	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th	Replace HFM Sensor							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						time when the RPM reaches high idle.								
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
			2	P1113 - Intake air temperature sensor output voltage above upper limit P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 3 on sensor to Pin A81 on ECU	Continuity - Pin 3 to Pin A81	If no continuity - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					Pin 1 / Pin 2 Short circuit to Supply or Battery Positive	Continuity – Pin 1 / Pin 2 to Supply or Battery Positive	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel	Replace HFM Sensor							

CONTINUED IN PAGE 184

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.								
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
			3	P1405 - EGR Valve sensor signal below lower limit P04A9 - ETV Position Sensor Signal above upper limit P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 2 on sensor to Pin A52 on ECU	Continuity - Pin 2 to Pin A52	If no continuity - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					Pin 1 / Pin 2 Short circuit to Supply or Battery Positive	Continuity – Pin 1 / Pin 2 to Supply or Battery Positive	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor	Replace HFM Sensor							

CONTINUED IN PAGE 185

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.								
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness								
			4	P3BA9 - NOx Exceedance – Nox Control Monitoring System P06B3 - Sensor supply voltage error of APP1/EGR/ Meun/Turbo	Ground Circuit - Pin 2 on sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness								
					Pin 1 / Pin 2 Short circuit to	Continuity – Pin 1 / Pin 2 to Supply or Battery Positive	If continuity is present - Check & replace affected harness								

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
				charger P06B4 - Sensor supply short to ground of AAP1/EGR/ Meun/Turbo charger	Supply or Battery Positive		1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor						
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
			5	P3BA9 - NOx Exceedance – NOx Control Monitoring System P06B3 - Sensor supply voltage error of APP1/EGR/ Meun/Turbo charger P06B4 - Sensor supply short to ground of AAP1/EGR/ Meun/Turbo charger P06B700 - Sensor supply under voltage of APP1/EGR/ Meun/Turbo charger	Short Circuit - Pin 2 & Pin 3 on sensor short circuit with each other	Continuity - Pin 2 to Pin 3	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					Pin 1 / Pin 2 Short circuit to Supply or Battery Positive	Continuity – Pin 1 / Pin 2 to Supply or Battery Positive	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor						

CONTINUED IN PAGE 188

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					EV Fan Wiring Open Circuit / EV Fan Pig Tail Open / EV Fan Faulty	EV Fan Wiring – Open / Ground / Short Circuit EV Fan (Fan Side Pigtail – Open / Ground / Short) EV Fan Faulty	Replace Engine Harness Replace EV Fan Replace EV Fan							
2	P1113	Intake air temperature sensor output voltage above upper limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit: 1. Pin 2 on sensor to Pin A52 on ECU 2. Pin 4 on sensor to Pin A80 on ECU	1. Continuity - Pin 2 to Pin A52 2. Continuity – Pin 4 to Pin A80	If no continuity - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness	√	√	x	√	√	√	x
					Short Circuit: 1. Pin 2 & Pin 3 on sensor short circuit with each other 2. Pin 4 Short circuit to supply or Battery Positive	1. Continuity - Pin 2 to Pin 3 2. Continuity - Pin 4 to Supply / Battery Positive	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor							
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
3	P1112	Intake air temperature sensor output voltage below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit - Pin 4 on sensor short circuit to ground	Continuity - Pin 4 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness	√	√	x	√	√	√	x

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit - Pin 3 & Pin 4 on sensor short circuit with each other	Continuity - Pin 3 to Pin 4	If continuity is present - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor							
					Open Circuit - Pin 4 on sensor to Pin A80 on ECU	Continuity – Pin 4 to Pin A80	If no continuity - Check & replace affected harness 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
4	P00BD	HFM sensor faulty - Drift High			HFM Sensor wrongly orientation	HFM Sensor orientation	Orient HFM sensor properly – Refer arrow mark direction on the sensor. Direction should be in the direction of air flow / towards engine	√	x	x	x	√	x	x
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor						
					Air Intake System – Air intake hose, Air filter condition, Leakages/Restrictions in Intake system from Air intake hose to Engine	Intake System	Rectify / Replace affected components							

CONTINUED IN PAGE 192

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Air Filter Clogged	Air Filter	Replace Air Filter							
5	P00BC	HFM sensor faulty - Drift Low			HFM Sensor Duct wrongly orientation	HFM Sensor Duct orientation	Orient HFM sensor Duct properly – Refer arrow mark direction on the sensor. Direction should be in the direction of air flow / towards engine	√	x	x	x	√	x	x
					Mesh in the HFM duct dislocated / damaged	HFM Duct	Replace HFM Duct							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor						
					Air Intake System – Air intake hose, Air filter condition, Leakages/Restrictions in Intake system from Air intake hose to Engine	Intake System	Rectify / Replace affected components							
					Air Filter Clogged	Air Filter	Replace Air Filter							

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
6	P0101	HFM Input Voltage variation from ECU / Battery			Supply voltage either too low or too high (Out of range 14V – 28V)	Battery voltage, Battery wiring, Battery condition, Battery charge, Alternator output, Alternator wiring	Check & replace affected component: 1. Battery 2. Battery Supply / Battery charging wiring 3. Alternator	√	√	x	x	X	x	x
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor							

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
7	P0103	HFM Sensor output Voltage above upper limit			HFM Sensor Faulty	HFM Sensor	Replace HFM Sensor	√	√	x	√	√	√	x
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							
8	P009A	Correlation between T0 & Air temperature in HFM Sensor			T0 Sensor fitment in wrong location / T0 Sensor faulty / Contamination / dirt / dust on sensor element	T0 Sensor	Refit the T0 sensor in the specified location / Replace T0 Sensor / Clean T0 Sensor & verify.	√	x	x	x	X	x	x
					HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor						

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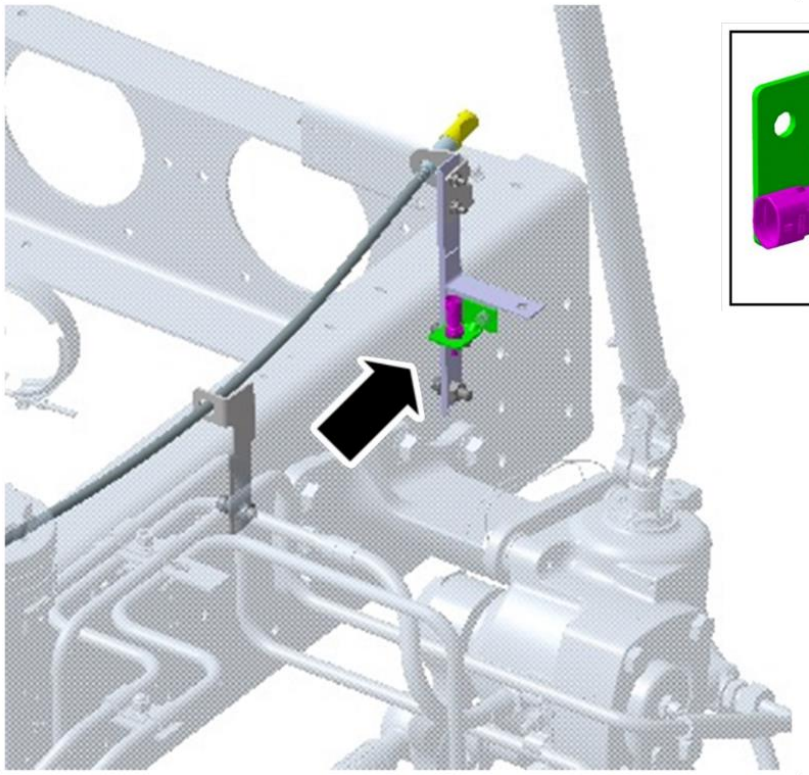
Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
9	P0102	HFM Sensor output Voltage below lower limit			HFM Sensor Faulty	HFM Sensor Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	Replace HFM Sensor	√	√	x	√	√	√	X
					HFM Sensor wiring faulty	HFM sensor wiring of Chassis Front & Engine Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (HFM sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front & Engine harness							

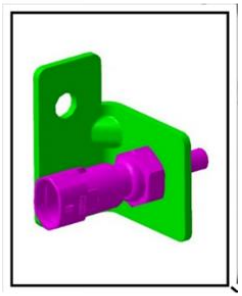
Torque Reduction: 1. √ => Torque Reduced by 25% - Immediate attention required.

2. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.17 T0: TEMPERATURE SENSOR



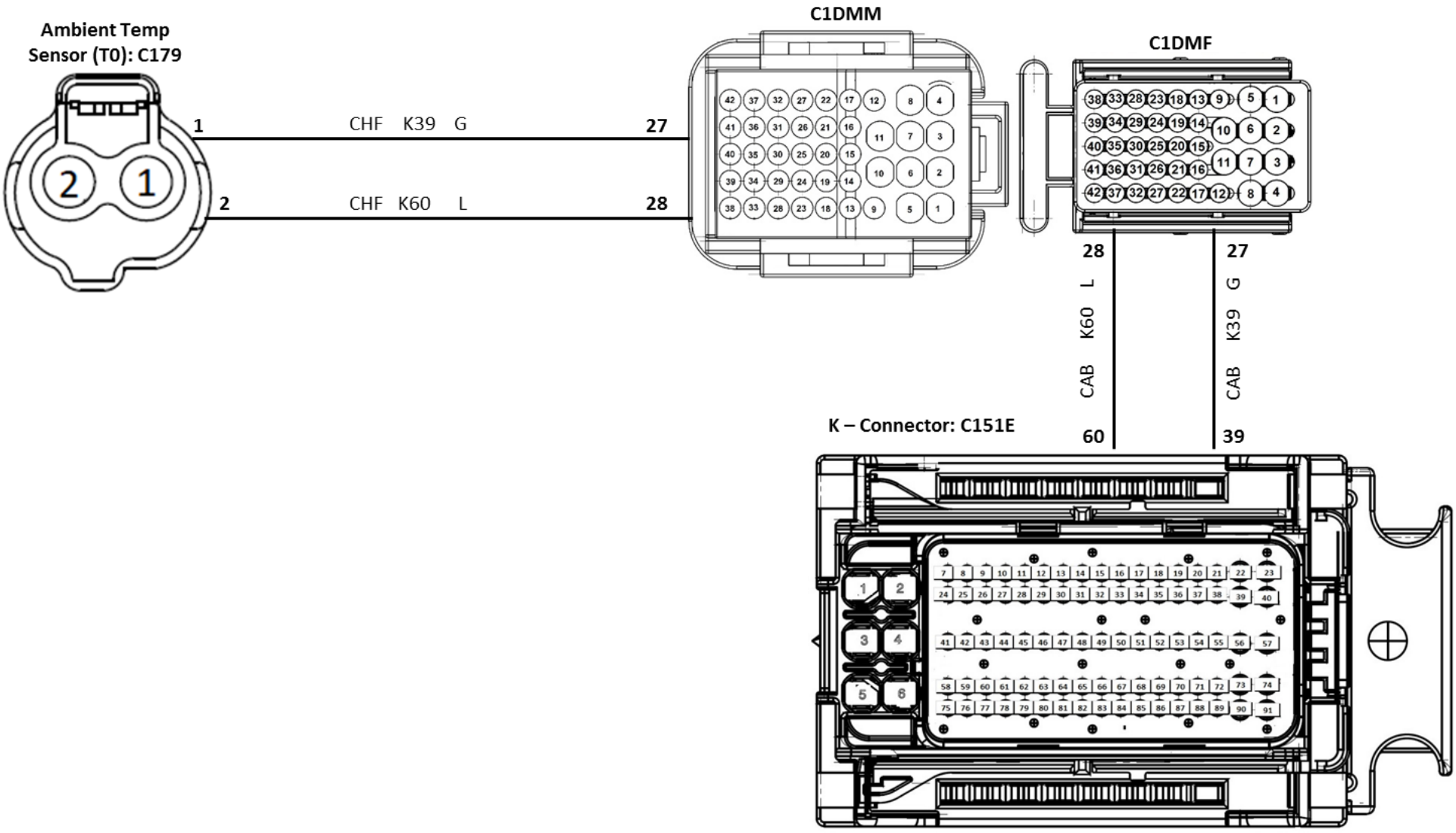


Location: On the chassis cross member

Function:

- Measures the ambient / atmospheric temperature and communicates to ECU.
- Operating Range: 150 mv - 4650 mv

4.17.1 Circuit Diagram: T0 Temperature Sensor



4.17.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0073	Environment Temperature sensor voltage value above upper limit	1	P3BA9 - Nox Exceedance – Nox Control Monitoring System	Open Circuit - Pin 1 on T0 sensor to Pin K39 on ECU	Continuity - Pin 1 to Pin K39	If no continuity - Check & replace affected harness 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness	√	√	x	√	√	√	x
					Open Circuit - Pin 2 on T0 sensor to Pin K60 on ECU	Continuity - Pin 2 to Pin K60	If no continuity - Check & replace affected harness 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness							
					Short circuit to supply / battery	Continuity between: 1.Pin 1 & supply/battery positive 2. Pin 2 & supply/battery positive	If continuity is present, then replace the affected harness: 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness:							
					T0 Sensor Faulty	T0 Sensor	Replace T0 Sensor							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					T0 Sensor Wiring Faulty	T0 Sensor wiring of Chassis Front, Cabin Harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness							
2	P0072	Environment Temperature sensor voltage value below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit: 1. Pin 1 on T0 sensor short circuit to ground 2. Pin 2 on T0 sensor short circuit to ground	Continuity between: 1. Pin 1 to Body Ground / Battery Negative 2. Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness	√	√	x	√	√	√	x
					Short Circuit - Pin 1 & Pin 2 on T0 sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness							
					Open Circuit - Pin 1 & or Pin 2 with ECU	Continuity between: 1. Pin 2 to Pin K60 2. Pin 1 to Pin K39	If no continuity - Check & replace affected harness 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							3. Chassis Front & Cabin harness							
					T0 Sensor Faulty	T0 Sensor	Replace T0 Sensor							
					T0 Sensor Wiring Faulty	T0 Sensor wiring of Chassis Front, Cabin Harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (T0 sensor to C1DMM connector) 2. Cabin (C1DMF to ECU A Connector) 3. Chassis Front & Cabin harness							
3	P0074	T0 Temperature value above upper limit			T0 Sensor Faulty / T0 sensor Drift	T0 Sensor	Replace T0 Sensor	X	X	X	X	X	X	X
4	P0075	Environment Temperature value below lower limit			T0 Sensor Faulty / T0 sensor Drift	T0 Sensor	Replace T0 Sensor	X	X	X	X	X	X	X
5	P0071	T0 Temperature sensor defective			T0 Sensor fitment in wrong location / T0 Sensor faulty / Contamination / dirt / dust on sensor element	T0 Sensor location / T0 Sensor / Deposits on sensor	Refit the T0 sensor in the specified location / Replace T0 Sensor / Clean TO Sensor & verify	√	X	X	√	√	√	X

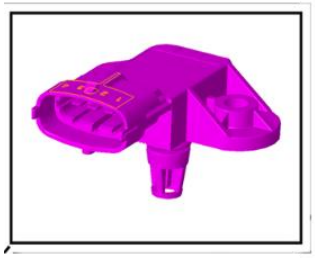
Torque Reduction: 1. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

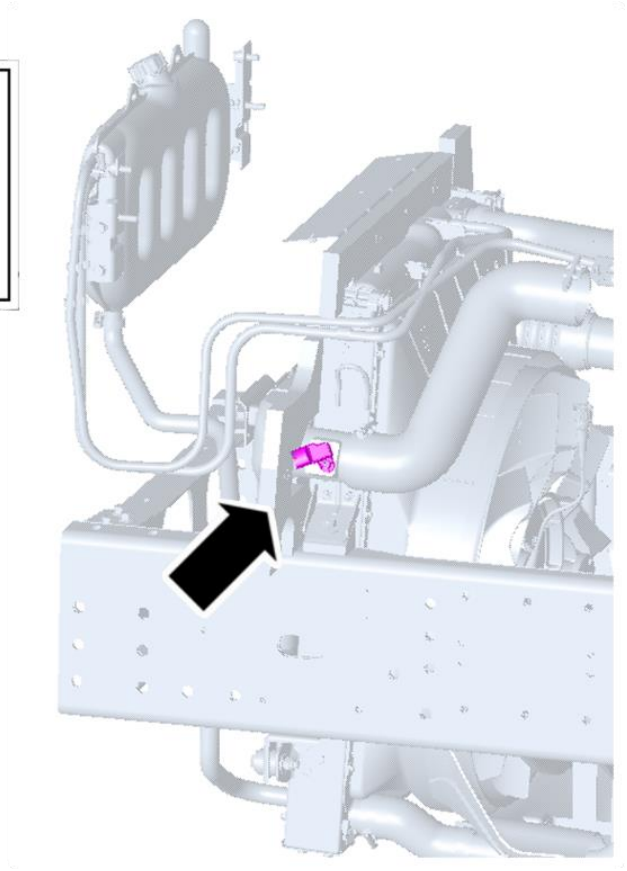
2. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: 1. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

2. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.18 T21: TEMPERATURE SENSOR



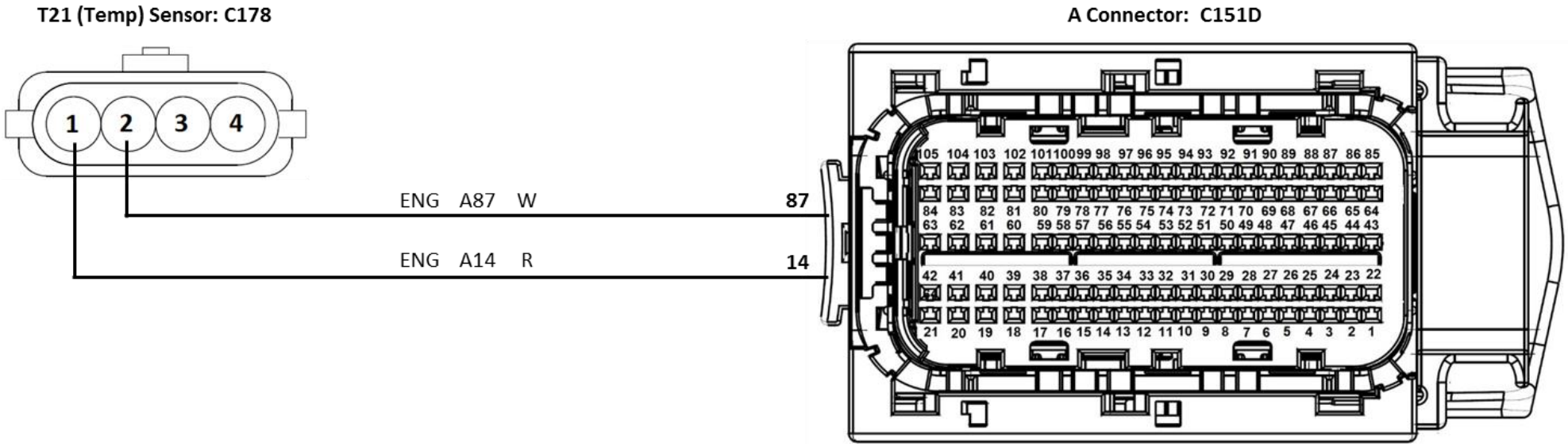


Location: On the Intercooler outlet

Function:

- Measures the air temperature at intercooler outlet & communicates to ECU. The value helps the ECU to decide the intercooler cooling efficiency.
- Operating Range: 120 mv – 4850 mv

4.18.1 Circuit Diagram: T21 Temperature Sensor



4.18.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P007D	T21 Sensor output voltage above upper limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on T21 sensor to Pin A14 on ECU	Continuity - Pin 1 to Pin A14	If no continuity is present - Replace Engine harness	√	√	x	√	√	√	x
					Open Circuit - Pin 2 on T21 sensor to Pin A87 on ECU	Continuity - Pin 2 to Pin A87	If no continuity is present - Replace Engine harness							
					Short Circuit – Pin 2 on sensor to Supply / Battery Positive	Continuity – Pin 2 to Supply / Battery Positive	If no continuity is present - Replace Engine harness							
					T21 Sensor faulty	T21 Sensor	Replace T21 sensor							
					T21 Sensor wiring faulty	T21 Sensor wiring - Open, Ground, Short circuit	Replace Engine harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P007C	T21 Sensor output voltage below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit - Pin 1 on T21 sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine harness	√	√	x	√	√	√	x
					Short Circuit - Pin 1 & Pin 2 on T21 sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine harness							
					Ground Circuit - Pin 2 on T21 sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine harness							
					T21 Sensor faulty	T21 Sensor	Replace T21 sensor							
					T21 Sensor wiring faulty	T21 Sensor wiring - Open, Ground, Short circuit	Replace Engine harness							
3	P2AC8	T21 (IC Out) Temperature sensor defective			T21 Sensor Faulty / Contamination or deposits on T21 sensor	T21 Sensor / Contamination or deposits of sensor	Replace T21 sensor / Clean sensor & refit	√	x	x	x	x	x	x
4	P026A	Intercooler Efficiency Low			Intercooler	Block/Restrictions/Leakages	Replace Intercooler	√	x	x	x	√	x	x
					Intercooler inlet & outlet connections	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					T21 Sensor Faulty	T21 Sensor / Deposits on sensor	Replace T21 sensor. If deposits are observed, clean the same, refit & verify.							
					Air Intake System	Block/Restrictions/Leakages	Rectify / Replace affected parts							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

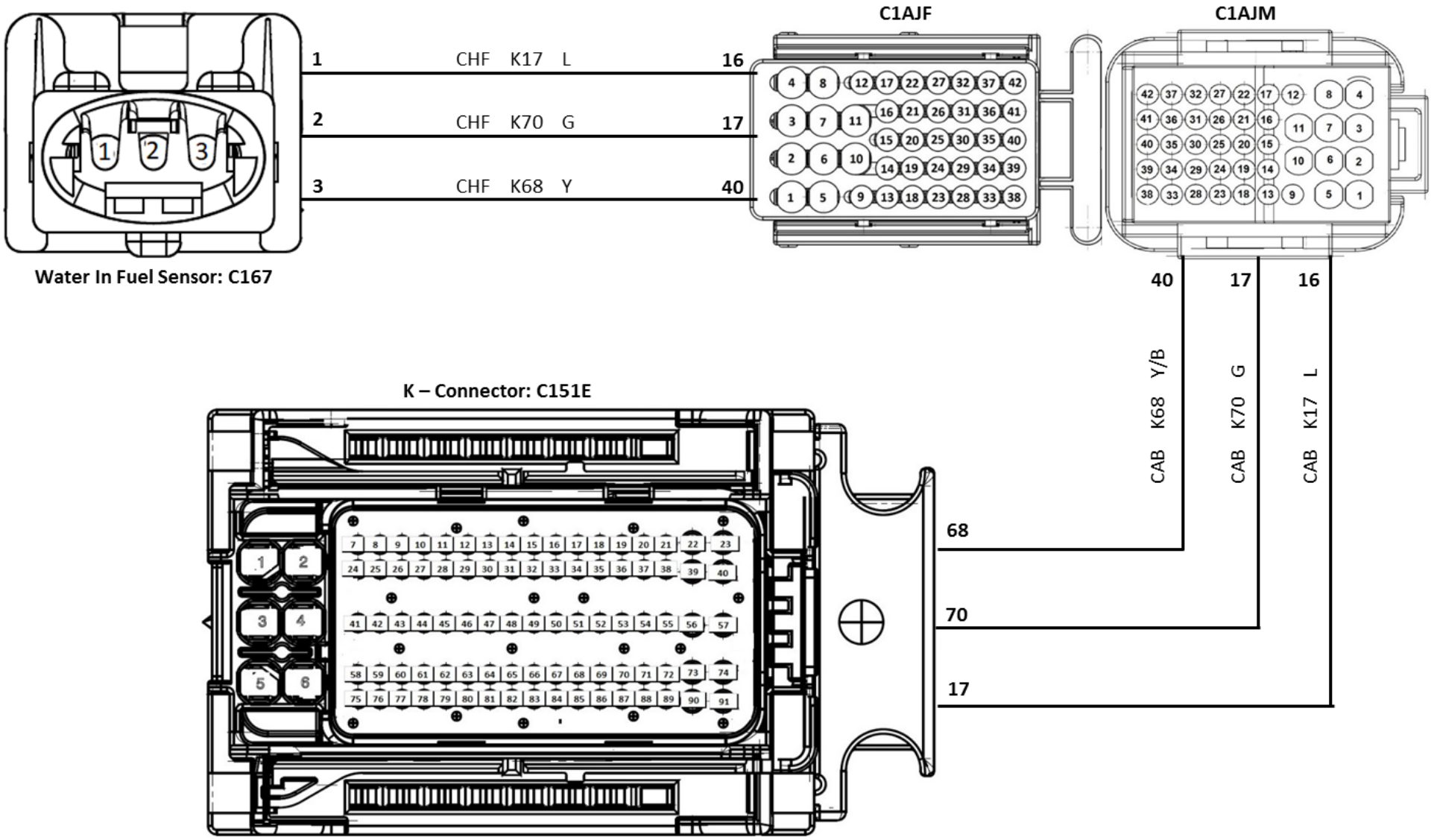
4.19 WATER IN FUEL SENSOR

Location: Below Water Separator

Function:

- Water-in-Fuel sensor is a part of the water separator assembly in which the sensor is mounted.
- As the water gets separated and collected in the bowl, level of water content rises in the bowl. This leads to change in conductivity which is detected by the sensor.
- The ECU checks whether this voltage is within a specified range. The measured output voltage of the sensor is more than the range for a few seconds.
- Water in Fuel lamp is provided on the dashboard. Water in fuel sensor is a part of Water separator assembly which senses the water level in diesel.
- When the defined threshold exceeds, the water in fuel indicator on the cluster indicates the excess amount of water in fuel and brings a need for draining the water in the water separator.

4.19.1 Circuit Diagram: Water in Fuel Sensor



4.19.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2169	Water In Fuel Detected			Water in fuel detected	----------	Drain Water from Water Separator	√	√	x	x	√	x	x
					Poor Quality Fuel	Fuel Quality	Drain & replace Fuel							
					Ground Circuit - Pin 1 on Water In Fuel sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. Chassis Front (Water in Fuel sensor to C1AJF connector) 2. Cabin (C1AJM to ECU K Connector) 3. Chassis Front, Cabin harness							
					Short Circuit - Pin 1 & Pin 3 on Water in Fuel sensor short circuit with each other	Continuity - Pin 1 to Pin 3	If continuity is present - Check & replace affected harness 1. Chassis Front (Water in Fuel sensor to C1AJF connector) 2. Cabin (C1AJM to ECU K Connector) 3. Chassis Front, Cabin harness							
					Water In Fuel Sensor Wiring Faulty	Water in Fuel sensor wiring of Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (Water in Fuel sensor to C1AJF connector) 2. Cabin (C1AJM to ECU K Connector) 3. Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P2269	Water in Fuel sensor faulty			Water in Fuel sensor faulty	Water In Fuel Sensor	Replace Water In Fuel Sensor	√	√	x	x	√	x	x
					Open Circuit: 1. Pin 1 to ECU Pin K17 2. Pin 2 to ECU Pin K70 3. Improper Voltage between Pin 2 & Pin 3	1. Continuity between Pin 1 to ECU Pin K17 2. Continuity between Pin 2 to ECU Pin K70 3. Voltage should be = 24V	If no continuity is observed / If Voltage between Pin 2 & Pin3 is not 24V, then replace the affected harness: 1. Chassis Front (Water in Fuel sensor to C1AJF connector) 2. Cabin (C1AJM to ECU K Connector) 3. Chassis Front, Cabin harness							
					Water In Fuel Sensor Wiring Faulty	Water in Fuel sensor wiring of Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (Water in Fuel sensor to C1AJF connector) 2. Cabin (C1AJM to ECU K Connector) 3. Chassis Front, Cabin harness							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.20 VEHICLE SPEED SENSOR

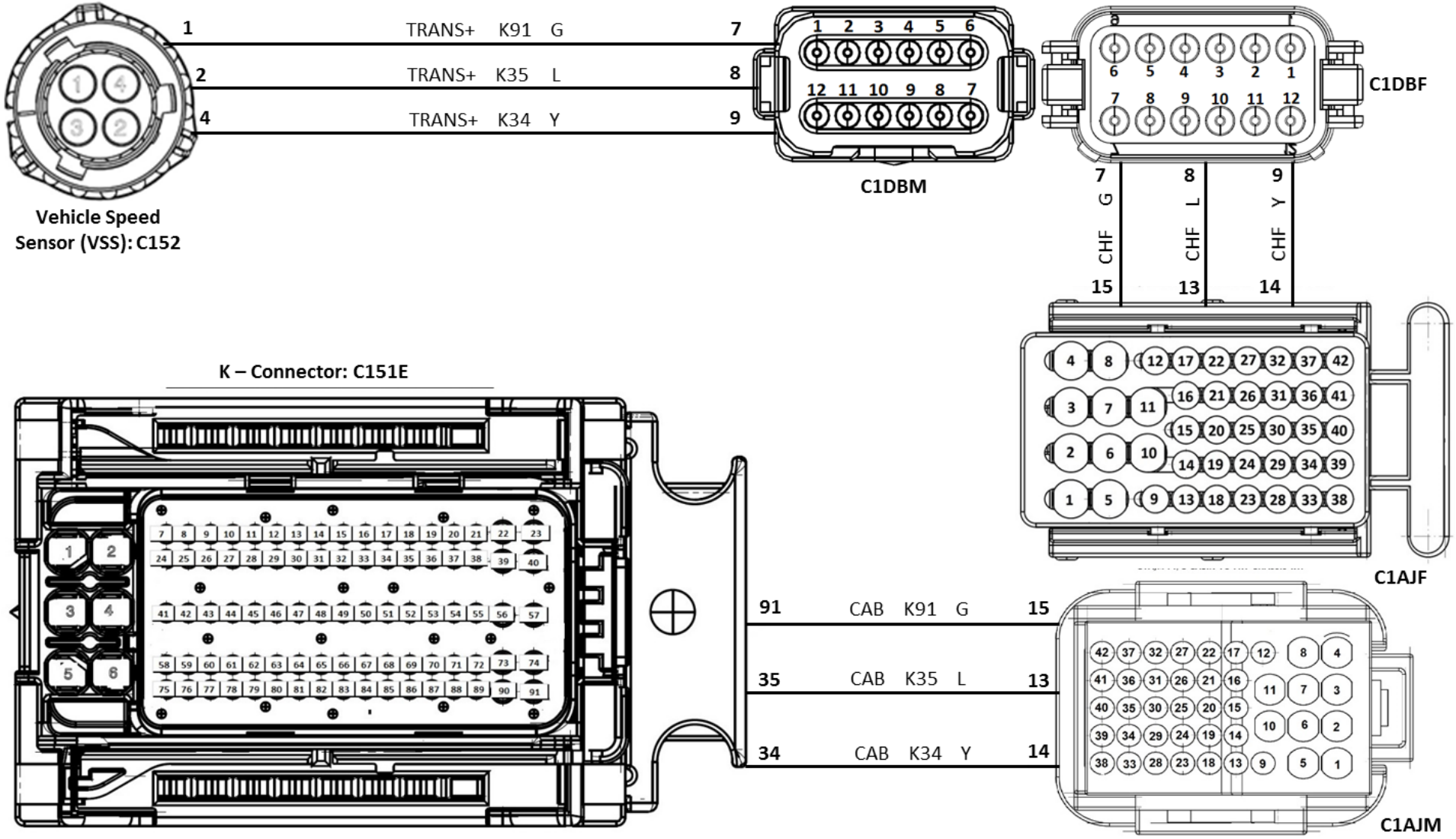

s

Location: On the Transmission Output Shaft

Function

Vehicle speed sensor (VSS) is hall effect sensor. When the gearbox output shaft rotates, the Hall switch is turned ON and OFF consecutively, sending a rectangular signal to the ECU. The frequency of this signal is used to calculate the speed of the vehicle.

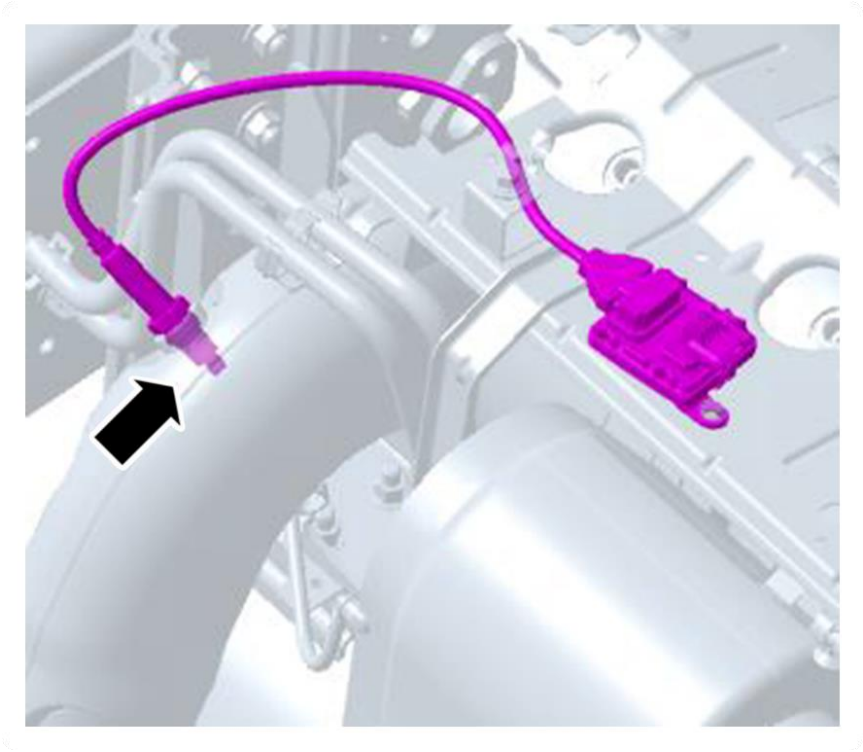
4.20.1 Circuit Diagram: Vehicle Speed Sensor



4.20.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0502	Vehicle Speed input to ECU not available			Vehicle Speed Sensor Faulty	Vehicle Speed Sensor	Replace Vehicle Speed sensor	x	√	x	x	x	x	x
					Vehicle Speed Sensor Wiring Faulty	Vehicle Speed Sensor Wiring of TRANS+, Chassis Front, Cabin - Open, Ground, Short circuit	If no continuity - Check & replace affected harness 1. Transmission - Trans+ (Vehicle Speed sensor to C1DBM connector) 2. Chassis Front (C1DBF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. Transmission, Chassis Front, Cabin harness							
					Speedo Rotor missing / Damaged	Presence of / Damage to speedo rotor	Replace with correct Speedo Rotor							

4.21 NOX SENSOR 1 (UPSTREAM)



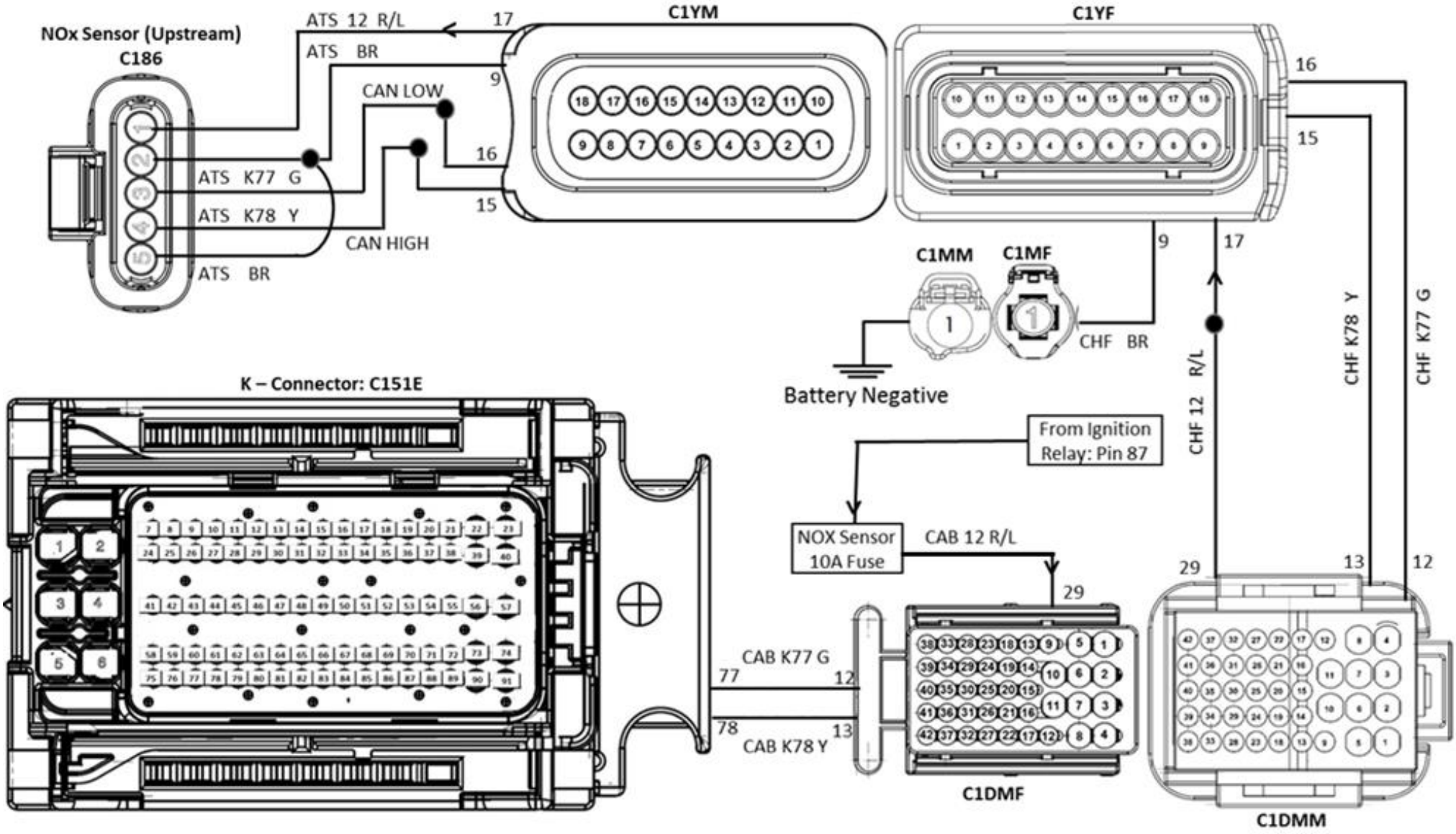
Location: On the inlet side of the DOC assembly

Function:

Upstream NOx sensor is used to measure engine out NOx (NO & NO_2).

The NOx concentration is communicated to the ECU over a CAN line.

4.21.1 Circuit Diagram: NOx Sensor (Upstream)



4.21.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2206	Upstream NOx Sensor Open circuit			Upstream NOx Sensor wiring faulty	Upstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Upstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	x	x	x
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
					Upstream NOx Sensor Faulty	Upstream NOx Sensor	Replace Upstream NOx Sensor							
2	P2202	Upstream NOx Sensor Short circuit			Upstream NOx Sensor wiring faulty	Upstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Upstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	x	x	x
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
					Upstream NOx Sensor Faulty	Upstream NOx Sensor	Replace Upstream NOx Sensor							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P2A00	Upstream O2 signal from sensor is higher than Model O2 in under normal driving condition (OP1)			Leakage in exhaust system	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV, DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating.	Rectify Leakages	√	x	x	√	√	√	x
					Air Intake System	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					Intercooler inlet & outlet connections	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					Intercooler	Block/Restrictions/Leakages	Replace Intercooler							
					Upstream Nox Sensor Faulty	Upstream Nox Sensor	Check Nox sensor seating – Mount if not proper / Replace Upstream Nox Sensor							
					Injector Faulty	Injector	Replace the Injector							
4	P2A10	Upstream O2 signal from sensor is lower than Model O2 in under normal driving condition (OP1)			Upstream NOx Sensor Faulty	Upstream NOx Sensor	Check NOx sensor seating – Mount if not proper / Replace Upstream NOx Sensor	√	x	x	√	√	√	x
5	P2A20	Upstream O2 signal from sensor is higher than Model O2 in under over run condition (OP2)			Upstream NOx Sensor / Downstream NOx Sensor	Replace Upstream NOx Sensor / Downstream NOx Sensor	Check NOx sensor seating – Mount if not proper / Replace Upstream NOx Sensor / Downstream NOx Sensor	√	x	x	x	x	x	x
6	P2A30	Upstream O2 signal from sensor is lower than Model O2 in under over run condition (OP2)			Upstream NOx Sensor	Replace Upstream NOx Sensor	Check NOx sensor seating – Mount if not proper / Replace Upstream NOx Sensor	√	x	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
7	P2201	Sensor readiness signal is not received from upstream NOx sensor after dew release			Upstream NOx Sensor Faulty	Upstream NOx Sensor	Replace Upstream NOx Sensor	√	x	x	√	√	√	x
					Upstream NOx Sensor wiring faulty / CAN Wiring Faulty	Upstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Upstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness						
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
8	P2211	Upstream NOx sensor sensing higher value due to drift in sensor			Upstream NOx Sensor Faulty / Drift in sensor value of upstream NOx sensor	Upstream NOx Sensor	Replace Upstream NOx Sensor	√	x	x	x	x	x	x
9	P2221	Upstream NOx sensor sensing lower value due to drift in sensor			Upstream NOx Sensor Faulty / Drift in sensor value of upstream NOx sensor	Upstream NOx Sensor	Replace Upstream NOx Sensor	√	x	x	x	x	x	x
10	P2203	NOx sensor signal higher than limit - Upstream sensor			Upstream NOx Sensor Faulty / Sensor corroded	Upstream NOx Sensor	Replace Upstream NOx Sensor	√	x	x	x	x	x	x
					EGR Valve faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.						
					Ad Blue dosing improper	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module –	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.						

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Before & After Replacement								
					Upstream NOx Sensor wiring faulty	Upstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	affected harness. 1. ATS (NOx sensor-Upstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
11	P2205	Inlet NOx compatibility error			Upstream / Downstream NOx sensor faulty	Upstream / Downstream NOx Sensor	Replace Upstream / Downstream NOx Sensor	√	√	x	x	x	x	x
12	P225D	NOx sensor signal lesser than limit - Upstream sensor			Upstream NOx Sensor Faulty / Sensor corroded	Upstream NOx Sensor	Replace Upstream NOx Sensor	√	x	x	x	x	x	x
					Upstream NOx Sensor wiring faulty	Upstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Upstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
13	U059E	CAN Error related to NOx			CAN Wiring faulty	Open, Ground, Short Circuit in: 1. Pin 3 on Upstream NOx sensor to Pin 16 on C1YM connector 2. Pin 4 on Upstream NOx sensor to Pin 15 on C1YM connector 3. Pin 16 on C1YF to Pin 12 on C1DMM connector (Upstream) 4. Pin 15 on C1YF to Pin 13 on C1DMM connector (Upstream) 5. Pin 3 on Downstream NOx sensor to Pin 11 on C1YM connector 6. Pin 4 on Downstream NOx sensor to Pin 10 on C1YM connector 7. Pin 11 on C1YF to Pin 12 on C1DMM connector (Upstream) 8. Pin 10 on C1YF to Pin 13 on C1DMM connector (Upstream) 9. Pin 13 on C1DMF to Pin 78 on ECU K connector 10. Pin 12 on C1DMF to Pin 77 on ECU K connector	Check & replace affected harness. 1. ATS (NOx sensor-Upstream/Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	x	x	x
					NOx Sensor faulty	NOx Sensor - Upstream	Replace NOx Sensor - Upstream							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Controllers connected to CAN may be faulty - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit	Disconnect the connectors of ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit one by one & verify whether the DTC gets healed after disconnecting these controllers. The problem may be with any of the controller wiring or with the controllers	Replace the respective wiring harness or the controller after disconnecting which the DTC is getting healed.							
					Terminating Resistance Faulty	Resistance Value of Terminating Resistance – 120 Ohms	If resistance value is not as per specification – Replace DNOx Harness							
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
14	U059F	CAN Error related to NOx			/CAN Wiring faulty	Open, Ground, Short Circuit in: 1. Pin 3 on Upstream NOx sensor to Pin 16 on C1YM connector 2. Pin 4 on Upstream NOx sensor to Pin 15 on C1YM connector 3. Pin 16 on C1YF to Pin 12 on C1DMM connector (Upstream) 4. Pin 15 on C1YF to Pin 13 on C1DMM connector (Upstream) 5. Pin 3 on Downstream NOx sensor to Pin 11 on C1YM connector 6. Pin 4 on Downstream NOx sensor to Pin 10 on C1YM connector	Check & replace affected harness. 1. ATS (NOx sensor-Upstream/Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						7. Pin 11 on C1YF to Pin 12 on C1DMM connector (Upstream) 8. Pin 10 on C1YF to Pin 13 on C1DMM connector (Upstream) 9. Pin 13 on C1DMF to Pin 78 on ECU K connector 10. Pin 12 on C1DMF to Pin 77 on ECU K connector								
					NOx Sensor faulty	NOx Sensor - Upstream / Downstream	Replace NOx Sensor - Upstream / Downstream							
					Controllers connected to CAN may be faulty - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit	Disconnect the connectors of ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit one by one & verify whether the DTC gets healed after disconnecting these controllers. The problem may be with any of the controller wiring or with the controllers	Replace the respective wiring harness or the controller after disconnecting which the DTC is getting healed.							
15	U05A8	Level sensor signal defective			CAN Wiring faulty	Open, Ground, Short Circuit in: 1. Pin 3 on Upstream NOx sensor to Pin 16 on C1YM connector 2. Pin 4 on Upstream NOx sensor to Pin 15 on C1YM connector 3. Pin 16 on C1YF to	Check & replace affected harness. 1. ATS (NOx sensor-Upstream/Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector)	√	√	x	x	x	x	x

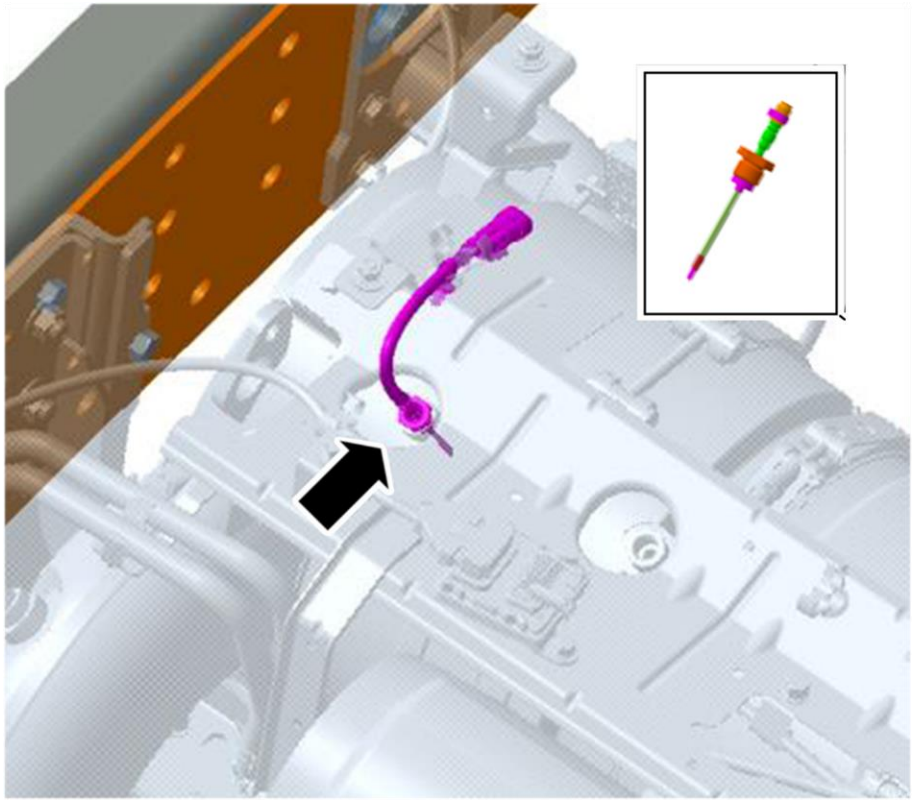
CONTINUED IN PAGE 220

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Pin 12 on C1DMM connector (Upstream) 4. Pin 15 on C1YF to Pin 13 on C1DMM connector (Upstream) 5. Pin 3 on Downstream NOx sensor to Pin 11 on C1YM connector 6. Pin 4 on Downstream NOx sensor to Pin 10 on C1YM connector 7. Pin 11 on C1YF to Pin 12 on C1DMM connector (Upstream) 8. Pin 10 on C1YF to Pin 13 on C1DMM connector (Upstream) 9. Pin 13 on C1DMF to Pin 78 on ECU K connector 10. Pin 12 on C1DMF to Pin 77 on ECU K connector	4. ATS, Chassis Front, Cabin harness							
					Ad Blue Float / Header unit faulty	Ad Blue Float / Header unit	Replace Ad Blue Float / Header unit							
					Terminating Resistance Faulty / Missing	Resistance Value of Terminating Resistance – 120 Ohms	If resistance value is not as per specification – Replace DNOx Harness							

Torque Reduction: √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.22 T4: TEMPERATURE SENSOR

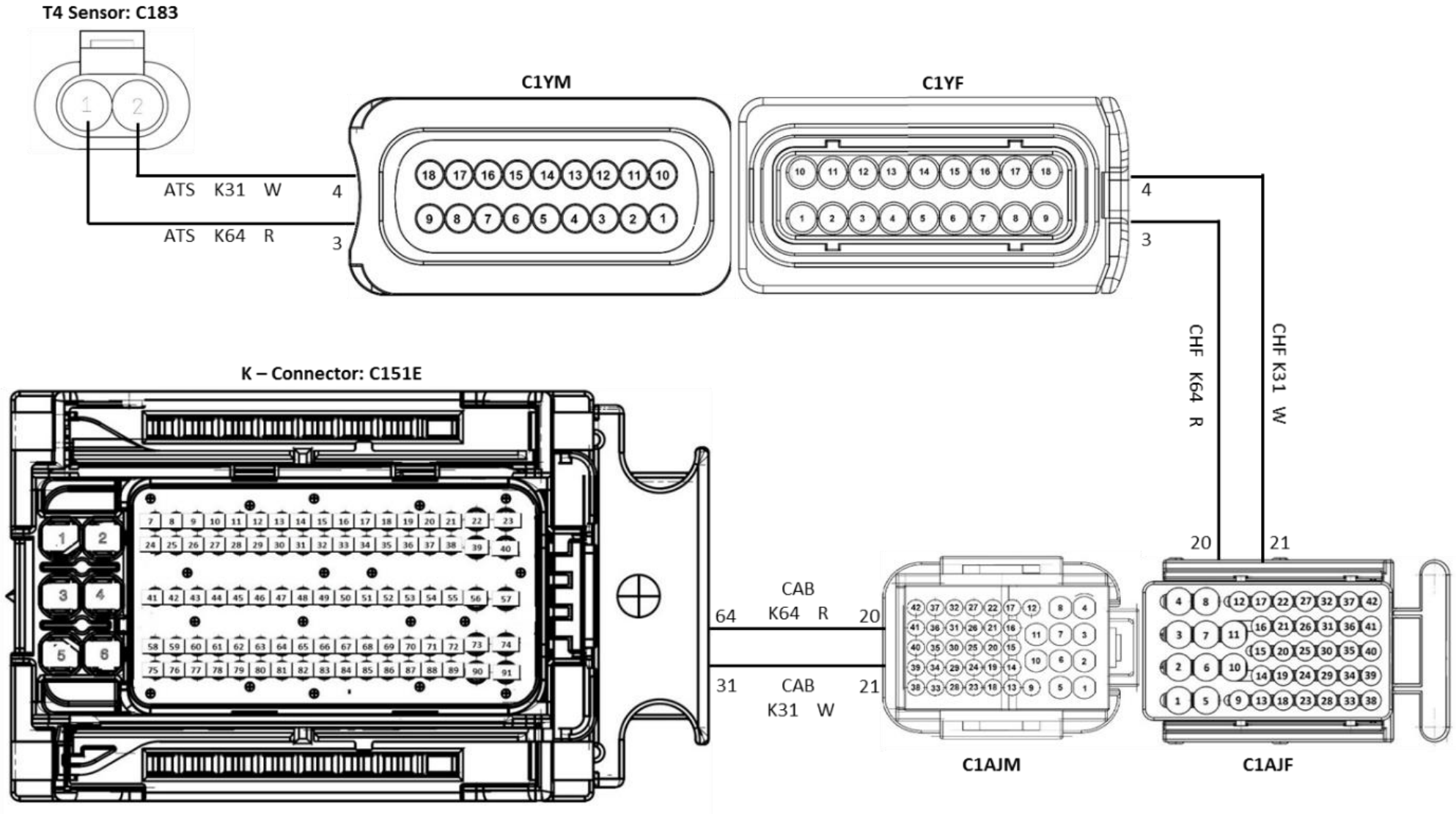


Location: DOC Inlet

Function:

- Measures the exhaust gas temperature at the inlet of DOC.
- Operating Range: 100 mv – 3300 mv

4.22.1 Circuit Diagram: T4 Temperature Sensor



4.22.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0547	T4 Sensor output voltage above upper limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on T4 sensor to Pin K64 on ECU	Continuity - Pin 1 to Pin A64	If no continuity - Check & replace affected harness 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Open Circuit - Pin 2 on T4 sensor to Pin K31 on ECU	Continuity - Pin 2 to Pin K31	If no continuity - Check & replace affected harness 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Short Circuit: 1. Pin 1 with Supply or Battery Positive 2. Pin 2 with Supply or Battery Positive	Continuity: 1. Pin 1 to Supply or Battery Positive 2. Pin 2 to Supply or Battery Positive	If no continuity - Check & replace affected harness 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							4. ATS, Chassis Front, Cabin harness							
					T4 Sensor faulty	T4 Sensor	Replace T4 Sensor							
					T4 sensor wiring faulty	T4 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
2	P0545	T4 Sensor output voltage below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit: 1. Pin 1 on T4 sensor short circuit to ground 2. Pin 2 on T4 sensor short circuit to ground	Continuity: 1. Pin 1 to Body Ground / Battery Negative 2. Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x

CONTINUED IN PAGE 225

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit - Pin 1 & Pin 2 on T4 sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Open Circuit: 1. Pin 1 on T4 sensor to Pin K64 on ECU 2. Open Circuit - Pin 2 on T4 sensor to Pin K31 on ECU	Continuity: 1. Pin 1 to Pin K64 2. 1. Pin 2 to Pin K31	If no continuity - Check & replace affected harness 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					T4 Sensor faulty	T4 Sensor	Replace T4 Sensor							
					T4 sensor wiring faulty	T4 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

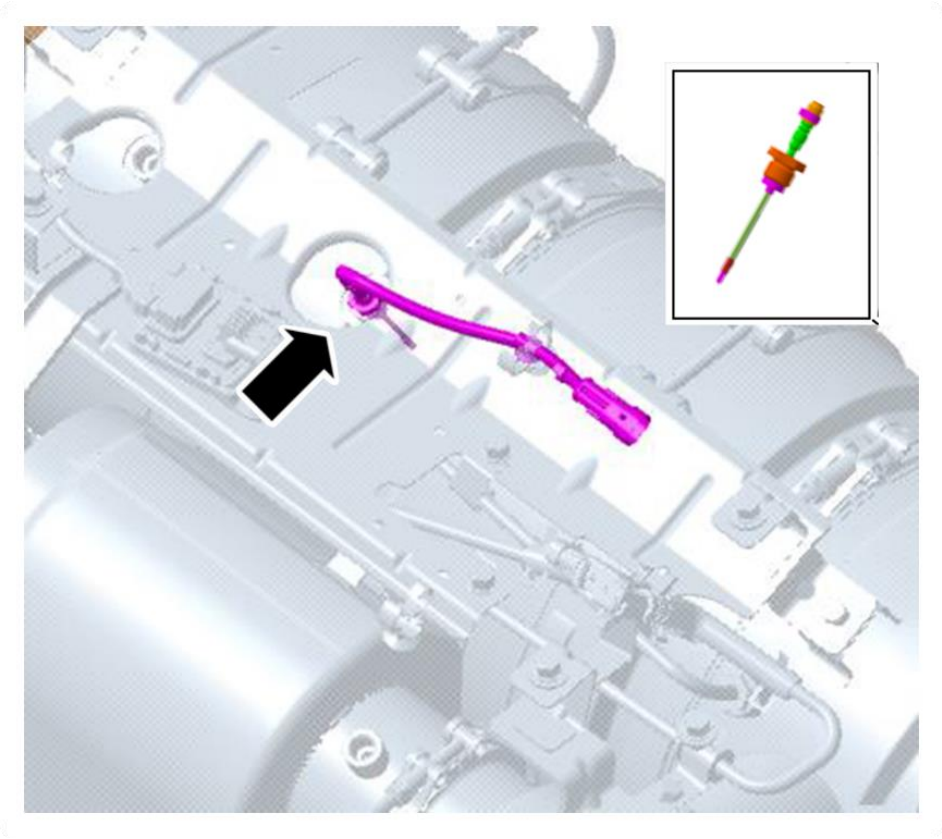
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P2080	T4 Sensor value defective			Deposits on T4 Sensor / T4 Sensor Faulty	T4 Sensor	Clean deposits & check / Replace T4 Sensor	√	X	X	X	X	X	X
4	P20E2	T4 Sensor value defective			Deposits on T4 Sensor / T4 Sensor Faulty	T4 Sensor	Clean deposits & check / Replace T4 Sensor	√	X	X	X	X	X	X
5	P2478	DOC in Temperature above the limit			Restriction / Block / Bens in Exhaust Layout	Exhaust System for Restriction / Block / Bend	Rectify / Replace Restriction / Block / Bend	√	√	X	X	√	X	X
					T4 Sensor Faulty	T4 Sensor	Replace T4 Sensor							
					T4 sensor wiring faulty	T4 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T4 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Injector Faulty (heavy back leak)	Check the Injector Back leak	Replace the injector							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

√ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.23 T5: TEMPERATURE SENSOR

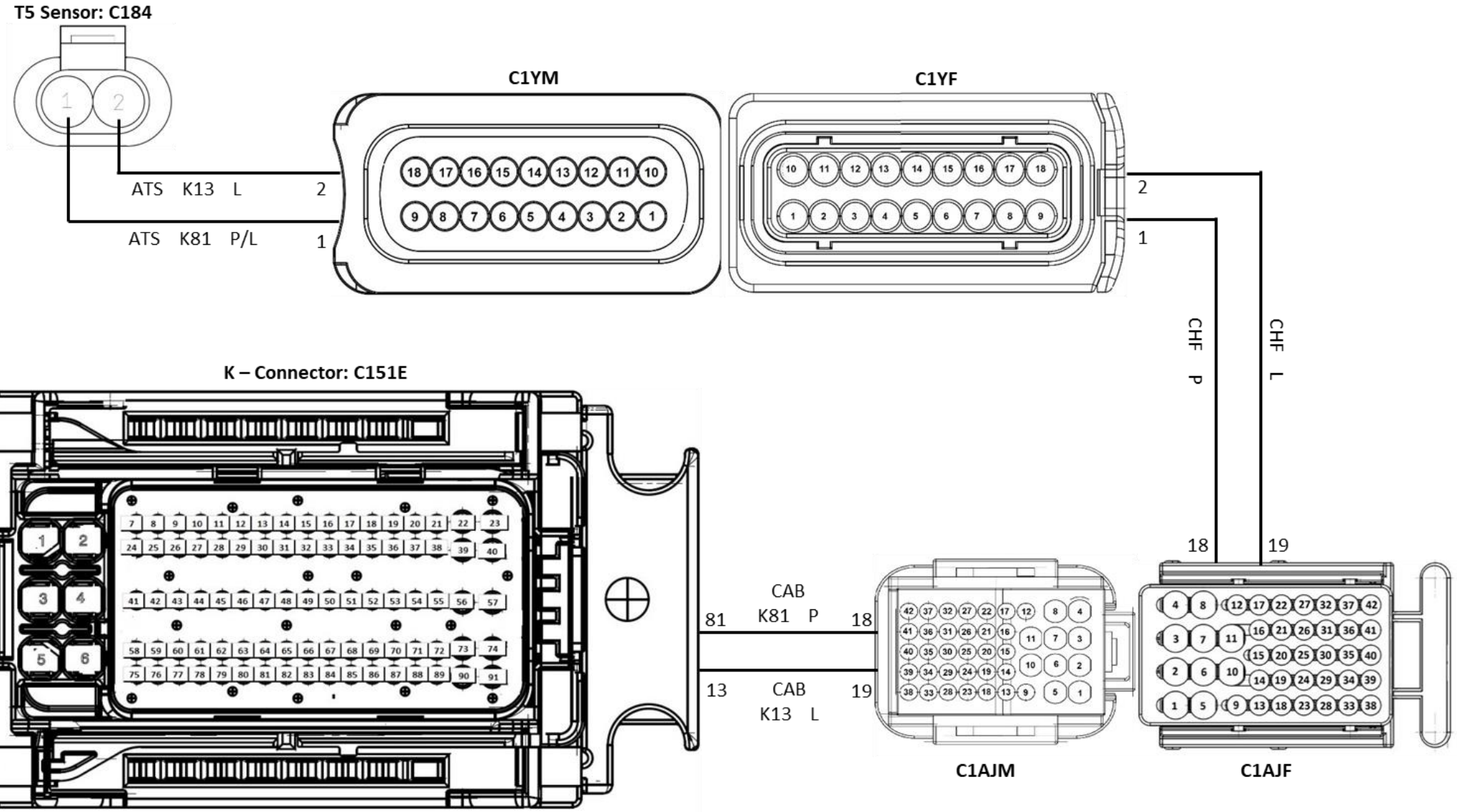


Location: DOC Outlet / DPF Inlet

Function:

- Measures the exhaust gas temperature at the outlet of DOC / Inlet of DPF. By comparing the temperature values of T4 & T5 sensors, ECU will decide the operating efficiency of DOC in reducing CO & HC.
- Operating Voltage: 500 mv – 2500 mv

Circuit Diagram: T5 Temperature Sensor



4.23.1 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2034	T5 Sensor output voltage above upper limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 1 on T5 sensor to Pin K81 on ECU	Continuity - Pin 1 to Pin K81	If no continuity - Check & replace affected harness 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	√	x	x
					Open Circuit - Pin 2 on T5 sensor to Pin K13 on ECU	Continuity - Pin 2 to Pin K13	If no continuity - Check & replace affected harness 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Short Circuit: 1. Pin 1 with Supply or Battery Positive 2. Pin 2 with Supply or Battery Positive	Continuity: 1. Pin 1 to Supply or Battery Positive 2. Pin 2 to Supply or Battery Positive	If no continuity - Check & replace affected harness 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							4. ATS, Chassis Front, Cabin harness							
					T5 Sensor Faulty	T5 Sensor	Replace T5 Sensor							
					T5 Sensor wiring Faulty	T5 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
2	P2032	T5 Sensor output voltage below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit: 1. Pin 1 on T5 sensor short circuit to ground 2. Pin 2 on T5 sensor short circuit to ground	Continuity: 1. Pin 1 to Body Ground / Battery Negative 2. Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	√	x	x

CONTINUED IN PAGE 231

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit - Pin 1 & Pin 2 on T5 sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Open Circuit: 1. Pin 1 on T5 sensor to Pin K81 on ECU 2. Open Circuit - Pin 2 on T5 sensor to Pin K13 on ECU	Continuity: 1. Pin 1 to Pin K64 2. 1. Pin 2 to Pin K31	If no continuity - Check & replace affected harness 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					T5 Sensor Faulty	T5 Sensor	Replace T5 Sensor							
					T5 Sensor wiring Faulty	T5 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P2084	T5 Sensor value defective			Deposits on T5 Sensor / T5 Sensor Faulty	T5 Sensor	Clean deposits & check / Replace T5 Sensor	√	x	x	√	√	√	x
4	P2085	T5 Sensor value defective			Deposits on T5 Sensor / T5 Sensor Faulty	T5 Sensor	Clean deposits & check / Replace T5 Sensor	√	x	x	√	√	√	x
5	P2479	DPF in Temperature above the limit			Restriction / Block / Bens in Exhaust Layout	Exhaust System for Restriction / Block / Bend	Rectify / Replace Restriction / Block / Bend	√	√	x	x	√	x	x
					T5 Sensor Faulty	T5 Sensor	Replace T5 Sensor							
					T5 Sensor wiring Faulty	T5 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T5 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

Torque Reduction: 1. √ => Torque Reduced by 25% - Immediate attention required

2. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

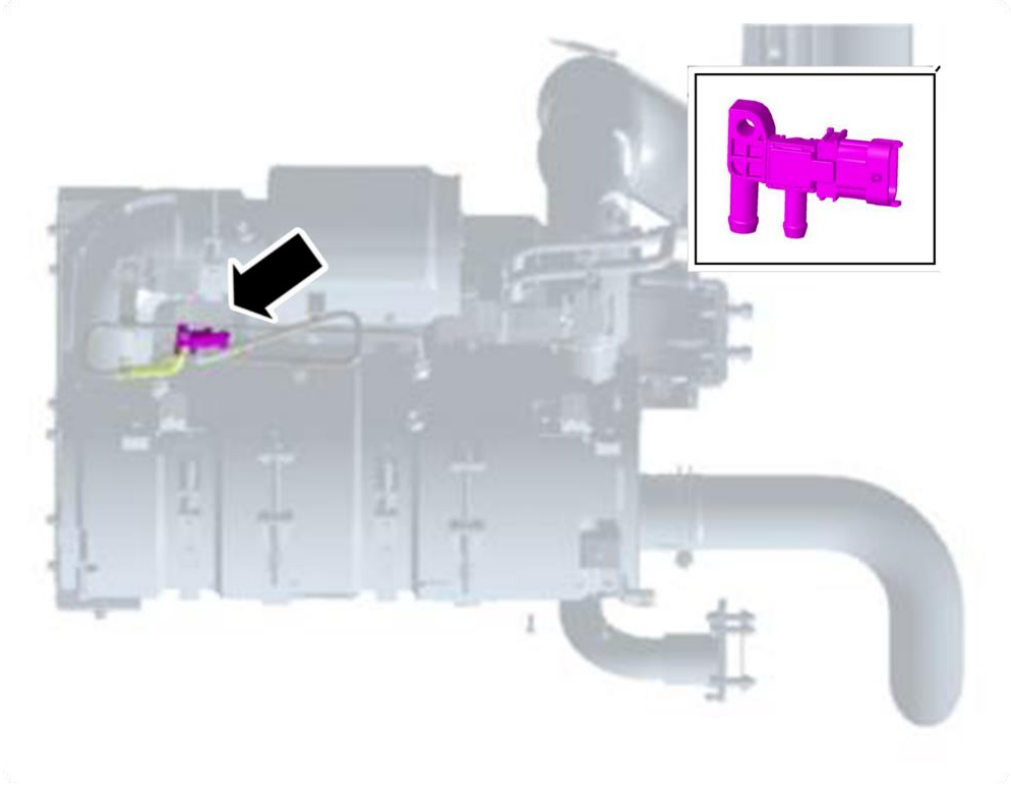
3. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

4. √ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately

Speed Limitation: 1. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

2. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.24 DIFFERENTIAL PRESSURE (DELTA P) SENSOR (OBDI)

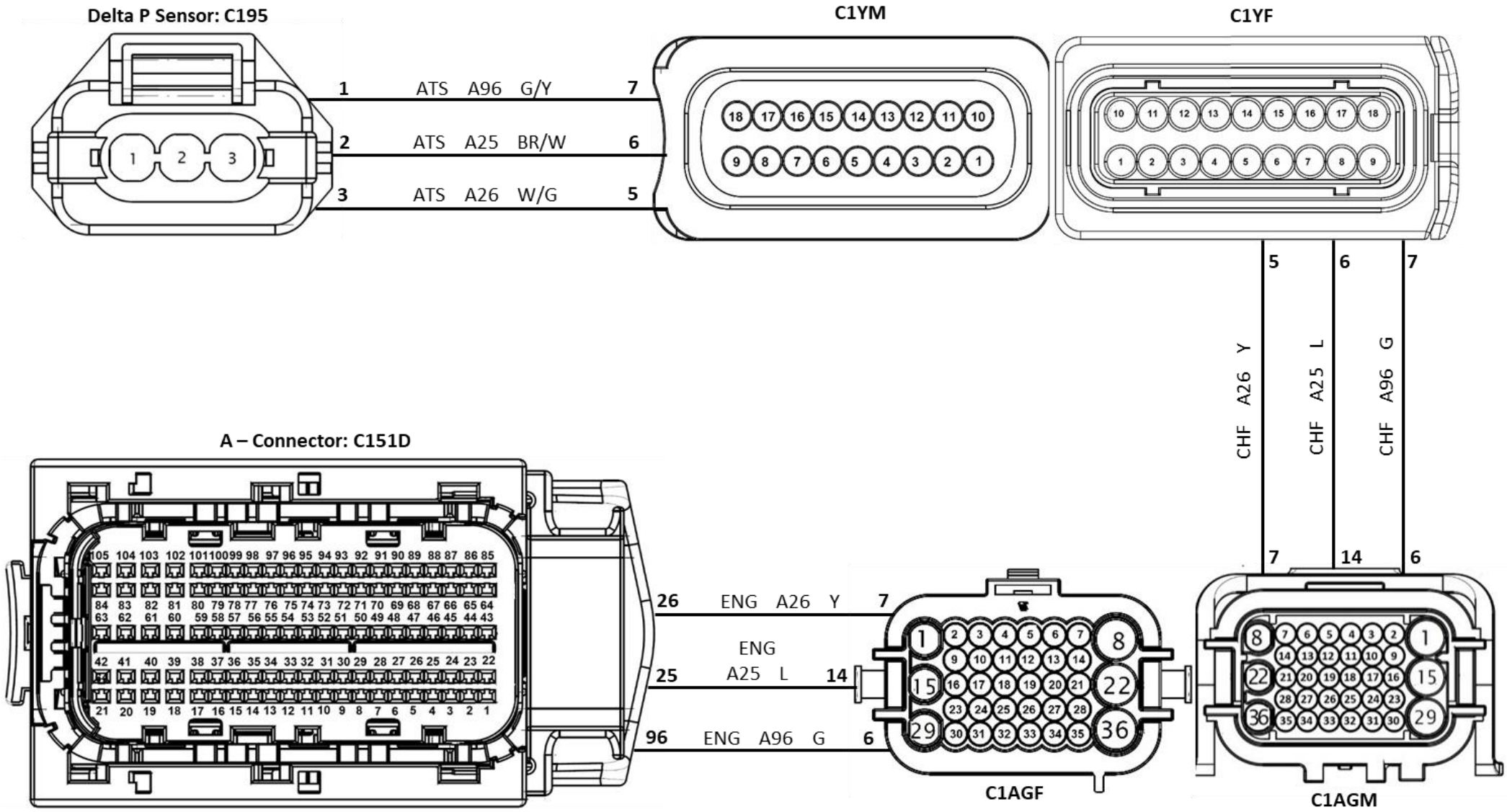


Location: On the ATS sensor mounting bracket

Function

- Differential pressure sensor, or “Delta P sensor,” provides a voltage output to the engine management system proportional to the differential pressure between inlet and outlet of DPF assembly.
- Operating Range: 247 mv – 4757 mv

4.24.1 Circuit Diagram: Delta P Sensor (OBDI)



Delta P Sensor – Approximate value for reference: Should be less than **80 mBar.** Vehicle needs to be kept in high idle / full RPM for a minimum of 10 seconds. Maintain this condition for further 10 seconds & then note the reading.

4.24.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2454 (OBDI)	Particulate pressure sensor output below lower limit			Open Circuit: 1. Pin 1 on Delta P sensor to Pin A96 on ECU 2. Pin 2 on Delta P sensor to Pin A25 on ECU 3. Pin 3 on Delta P sensor to Pin A26 on ECU	Continuity: 1. Pin 1 to Pin A96 2. Pin 2 to Pin A25 3. Pin 3 to Pin A26	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness	√	√	x	x	√	x	x
					Ground Circuit: 1. Pin 1 on Delta P sensor short circuit to ground 2. Pin 2 on Delta P sensor short circuit to ground 3. Pin 2 on Delta P sensor short circuit to ground	Continuity: 1. Pin 1 to Body Ground / Battery Negative 2. Pin 3 to Body Ground / Battery Negative 3. Pin 3 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit - Pin 1 & Pin 2 on Delta P sensor short circuit with each other	Continuity – Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGM connector) 3. Engine (C1AGF to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Short Circuit - Pin 2 & Pin 3 on Delta P sensor short circuit with each other	Continuity – Pin 2 to Pin 3	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor							
					Delta P Sensor wiring faulty	Delta P Sensor wiring of ATS, Chassis Front, Engine harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P2461 (OBDI)	Particulate filter pressure above upper limit	1	P2455 - Particulate pressure sensor output above upper limit	DPF is loaded with soot. Possibility of Rapid soot build up within a short span of time.	Delta P Value & Soot Mass Value in Diagnostic tool. Delta P Value at high idle should be less than 80 mBar. If the value exceeds 80 mBar, then DPF regeneration needs to be performed. Excessive soot built up in DPF. Check Air Intake system & Exhaust System for leakages or restrictions. Check fuel system for faults (Restrictions in Low pressure side / Leakages in High Pressure Side / Faulty Fuel Injectors / Fuel Quality). Check for blockages / restrictions in the pipes of Delta P Sensor	Rectify leakages or restrictions, if any and Perform DPF Parked Regeneration using DPF switch. If Regeneration does not trigger even after 2 attempts (in-spite of pre-conditions being met), perform service regeneration. Follow **"DPF SOOT CLEANING SOP" as provided in – Soot Mass Reset** heading under Diagnostic Software Topic	√	√	x	x	√	x	**1600 RPM**
					Cooling System – Thermostat not operating as desired	Check Thermostat for proper operation. Coolant Temperature value in Live Data can be made use to understand. Thermostat can also be checked for its operation using a testing fixture	Replace Thermostat							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 2 on Delta P sensor to Pin A25 on ECU	Continuity - Pin 2 to Pin A25	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Open Circuit - Pin 3 on Delta P sensor to Pin A26 on ECU	Continuity - Pin 3 to Pin A26	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Short Circuit - Pin 1 & Pin 3 on Delta P sensor short circuit with each other	Continuity - Pin 1 to Pin 3	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGFconnector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor							
					Delta P Sensor Pipelines blocked / choked	Delta P Pipes (Inlet & Outlet Pipes)	Clean / Replace as required							
					DPF Choked	Delta P Value & Soot Mass Value in Diagnostic tool Delta P Value at high idle should be less than 80 mBar	Rectify leakages or restrictions, if any and Perform DPF Parked Regeneration using DPF switch. If Regeneration does not trigger even after 2 attempts (in-spite of pre-conditions being met), perform service regeneration. Follow **"DPF SOOT CLEANING SOP" as provided in – Soot Mass Reset** heading under Diagnostic Software Topic							
					Delta P Sensor wiring faulty	Delta P Sensor wiring of ATS, Chassis Front, Engine harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
3	P2452 (OBDI)	DPF pressure sensor defective			Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor	√	x	x	x	x	x	x
4	P2455 (OBDI)	Particulate Filter Pressure sensor output above upper limit			Open Circuit: 1. Pin 1 on Delta P sensor to Pin A96 on ECU	Continuity: 1. Pin 1 to Pin A96	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to	√	√	x	x	√	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
				2. Pin 2 on Delta P sensor to Pin A25 on ECU 3. Pin 3 on Delta P sensor to Pin A26 on ECU	2. Pin 2 to Pin A25 3. Pin 3 to Pin A26	C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
				Short Circuit: 1. Pin 1 on Delta P sensor short circuit to Supply / Battery Positive 2. Pin 2 on Delta P sensor short circuit to Supply / Battery Positive 3. Pin 3 on Delta P sensor short circuit to Supply / Battery Positive	Continuity: 1. Pin 1 to Supply / Battery Positive 2. Pin 2 to Supply / Battery Positive 3. Pin 3 to Supply / Battery Positive	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
				Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor							

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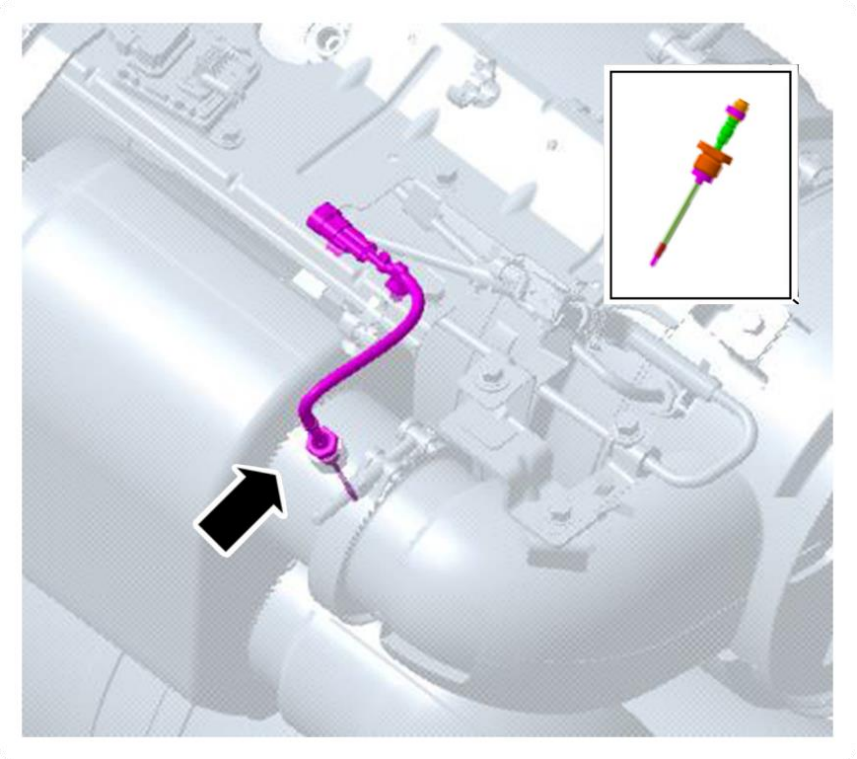
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Delta P Sensor wiring Faulty	Delta P Sensor wiring of ATS, Chassis Front, Engine harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGFconnector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
5	P2458	DPF check for a locked regeneration.			Insufficient T5 temperatures for carrying out regeneration / Insufficient Exhaust Gas Flow / Improper soot burning / Insufficient fuel quantity to raise temperature.	T5 Sensor / T5 Sensor wiring Faulty.	* Replace - T5 Sensor / ATS Wiring / Chassis Front / Engine Wiring Harness	√	x	x	x	x	x	x
						* Exhaust Gas leakage in Exhaust system	* Rectify exhaust gas leakage							
						* DOC ineffective	* Replace DOC							
						* Check whether T4 & T5 sensors are swapped	* Mount T4 & T5 sensors in their specified locations							
						*Vehicle application – Low duty & ultra-low duty cycle	*Perform parked regeneration, if not successful perform service regeneration as per SOP.							

Torque Reduction: 1. √ => Torque Reduced by 25% - Immediate attention required

2. √ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle

4.25 T6: TEMPERATURE SENSOR

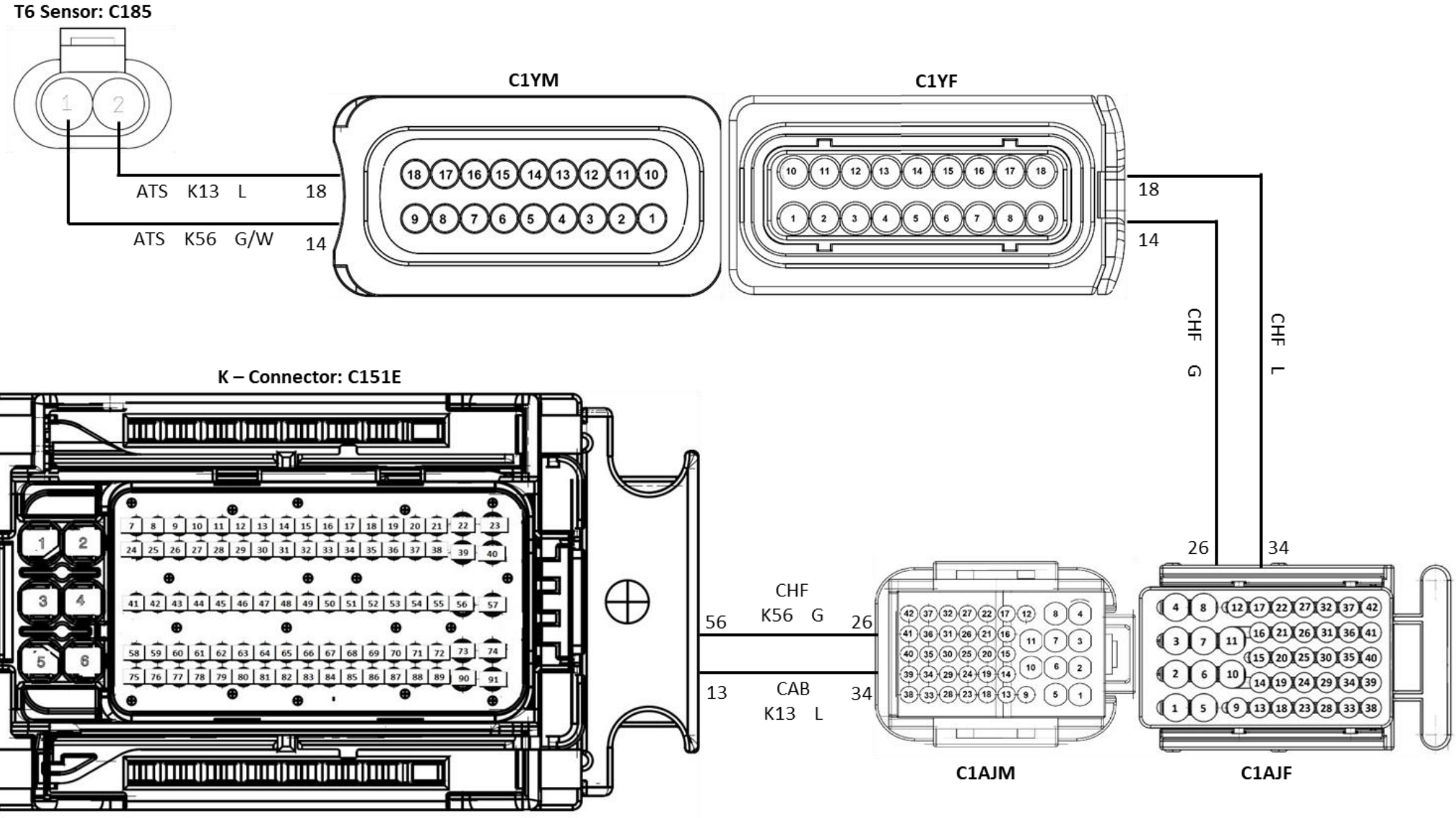


Location: DPF Outlet / SCR Inlet

Function:

- Measures the exhaust gas temperature at outlet of DPF / Inlet of SCR system. Difference between the temperature values of T5 & T6 provides valuable information about regeneration happening in DPF.
- Operating Voltage: 500 mv to 2500 mv

4.25.1 Circuit Diagram: T6 Temperature Sensor



4.25.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P242D	T6 Sensor output voltage above upper limit	1	P3B A9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit: 1. Pin 1 on T6 sensor to Pin K56 on ECU 2. Pin 2 on T6 sensor to Pin K13 on ECU	Continuity: 1. Pin 1 to Pin K56 2. Pin 2 to Pin K13	If no continuity - Check & replace affected harness 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Short Circuit: 1. Pin 1 on T6 sensor to Supply / Battery Positive 2.. Pin 1 on T6 sensor to Supply / Battery Positive	Continuity: 1. Pin 1 to Supply / Battery Positive 2. Pin 2 to Supply / Battery Positive	If continuity is present - Check & replace affected harness 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					T6 Sensor Faulty	T6 Sensor	Replace T6 Sensor							
					T6 Sensor wiring Faulty	T6 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P242C	T6 Sensor output voltage below lower limit	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit: 1. Pin 1 on T6 sensor short circuit to ground 2. Pin 2 on T6 sensor short circuit to ground	Continuity: 1. Pin 1 to Body Ground / Battery Negative 2. Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Short Circuit - Pin 1 & Pin 2 on T6 sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					T6 Sensor Faulty	T6 Sensor	Replace T6 Sensor							
					Open Circuit: 1. Pin 1 on T6 sensor to Pin K56 on ECU 2. Pin 2 on T6 sensor to Pin K13 on ECU	Continuity: 1. Pin 1 to Pin K56 2. Pin 2 to Pin K13	If no continuity - Check & replace affected harness 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					T6 Sensor wiring Faulty	T6 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
3	P242B	T6 Sensor value defective			Deposits on T6 Sensor / T6 Sensor Faulty	T6 Sensor	Clean deposits & check / Replace T6 Sensor	√	x	x	√	√	√	x
4	P2470	T6 Sensor value defective			Deposits on T6 Sensor / T6 Sensor Faulty	T6 Sensor	Clean deposits & check / Replace T6 Sensor	√	x	x	√	√	√	x
5	P05F7	T6 temp plausibility with Environment Temp			T6 Sensor Faulty	T6 Sensor	Replace T6 Sensor	√	√	x	x	x	x	x
6	P247A	SCR in Temperature above the limit			Restriction / Block / Bens in Exhaust Layout	Exhaust System for Restriction / Block / Bend	Rectify / Replace Restriction / Block / Bend	√	√	x	x	√	x	x
					T6 Sensor Faulty	T6 Sensor	Replace T6 Sensor							
					T6 Sensor wiring Faulty	T6 Sensor wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (T6 sensor to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

Torque Reduction: 1. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

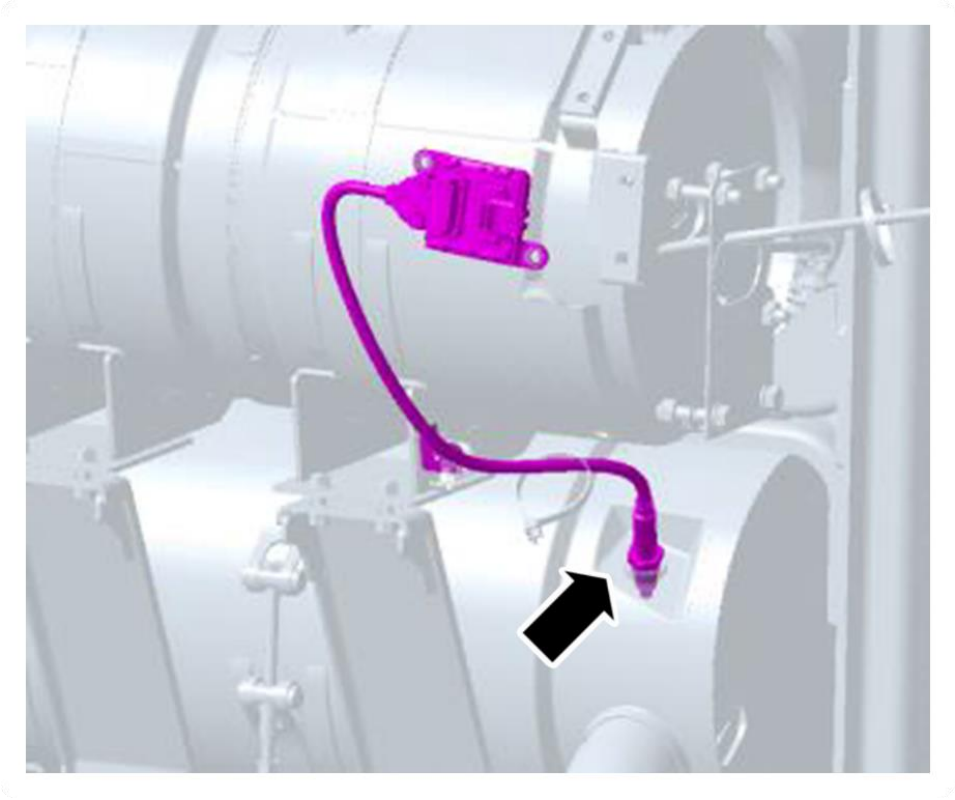
2. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

3. √ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately

Speed Limitation: 1. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

2. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.26 NOX SENSOR 2 (DOWNSTREAM)

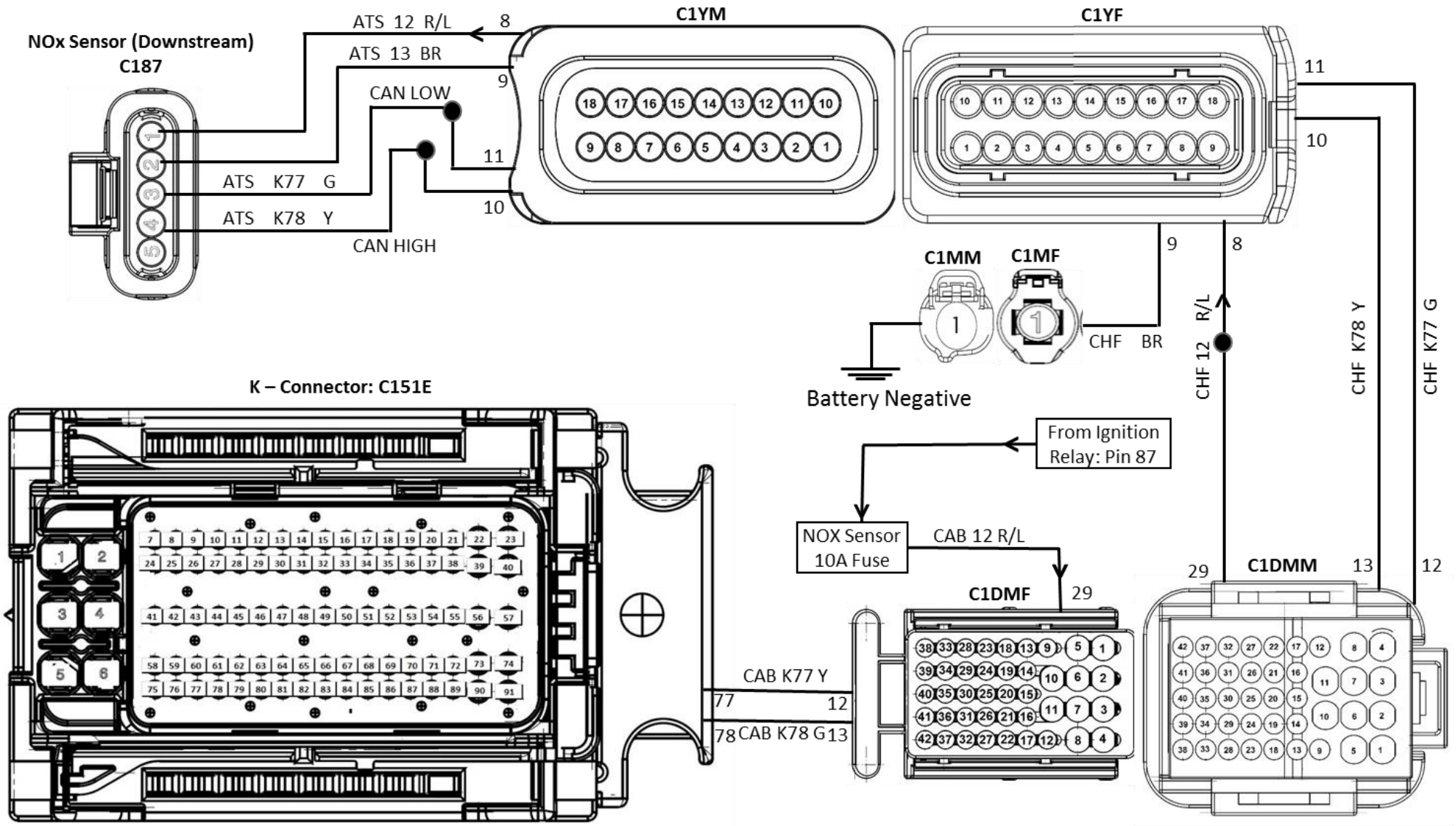


Location: On ASC outlet pipe

Function

Downstream NOx sensor is used to measure the concentration of NOx (NO & NO_2) after reduction using SCR. The NOx concentration is communicated to the ECU over a CAN line. The input from this sensor indicates the SCR conversion efficiency.

4.26.1 Circuit Diagram: NOx Sensor (Downstream)



4.26.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2207	Downstream NOx Sensor Open circuit			Downstream NOx Sensor wiring faulty	Downstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	x	x	X
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
					Downstream NOx sensor faulty	Downstream NOx Sensor	Replace Downstream NOx Sensor							
2	P22A0	Downstream NOx Sensor Short circuit			Downstream NOx Sensor wiring faulty	Downstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	x	x	x	X
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
					Downstream NOx sensor faulty	Downstream NOx Sensor	Replace Downstream NOx Sensor							
3	P2A01	Downstream O2 signal from sensor is lower than Model O2 in under normal driving condition (OP1)			Leakage in exhaust system	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV, DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating.	Rectify Leakages	√	x	x	√	√	√	X

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Downstream NOx sensor mounted in air	Downstream NOx sensor mounting	Mount the Downstream NOx sensor on the exhaust line							
					Air Intake System	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					Intercooler inlet & outlet connections	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					Intercooler	Block/Restrictions/Leakages	Replace Intercooler							
					Downstream Nox Sensor Faulty	Downstream Nox Sensor	Check Nox sensor seating – Mount if not proper / Replace Downstream Nox Sensor							
4	P2A02	Downstream O2 signal from sensor is lower than Model O2 in under normal driving condition (OP1)			Leakage in exhaust system	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV, DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating.	Rectify Leakages	√	x	x	√	√	√	X
					Downstream Nox sensor mounted in air	Downstream Nox sensor mounting	Mount the Downstream Nox sensor on the exhaust line							
					Downstream Nox Sensor Faulty	Downstream Nox Sensor	Replace Downstream Nox Sensor							
					Air Intake System	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					Intercooler inlet & outlet connections	Block/Restrictions/Leakages	Rectify / Replace affected parts							
					Intercooler	Block/Restrictions/Leakages	Replace Intercooler							
					Injector Faulty	Injector	Replace the Injector							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
5	P2A03	Downstream O2 signal from sensor is lower than Model O2 in under over run condition (OP2)			Leakage in Exhaust System	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV, DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating.	Rectify Leakages	√	x	x	x	x	x	X
					Downstream NOx sensor mounted in air	Downstream NOx sensor mounting	Mount the Downstream NOx sensor on the exhaust line							
					Downstream NOx Sensor Faulty	Downstream NOx Sensor	Replace Downstream NOx Sensor							
6	P2A04	Downstream O2 signal from sensor is lower than Model O2 in under over run condition (OP2)			Leakage in Exhaust System	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV, DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating.	Rectify Leakages	√	x	x	x	x	x	x
					Downstream NOx sensor mounted in air	Downstream NOx sensor mounting	Mount the Downstream NOx sensor on the exhaust line							
					Downstream NOx Sensor Faulty	Downstream NOx Sensor	Replace Downstream NOx Sensor							
7	P229F	Sensor readiness signal is not received from downstream NOx sensor after dew release			Downstream NOx Sensor wiring faulty	Downstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	x	x	√	√	√	x
					Downstream NOx Sensor Faulty	Downstream NOx Sensor	Replace Downstream NOx Sensor							
8	P229E	Downstream NOx sensor sensing			Leakage in Exhaust System	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV,	Rectify Leakages	√	x	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
		higher value due to drift in sensor			Downstream NOx Sensor Faulty / Drift in sensor value	DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating. Downstream NOx Sensor	Replace Downstream NOx Sensor							
9	P2101	Downstream NOx sensor sensing lower value due to drift in sensor			Downstream NOx Sensor Faulty / Drift in sensor value	Downstream NOx Sensor	Replace Downstream NOx Sensor	√	x	x	x	x	x	x
10	P22A1	NOx sensor signal higher than limit - Downstream sensor			Leakage in exhaust system	Check for leakages in exhaust pipes & clamps of Turbocharger, ETV, DOC, DPF, Ad Blue Mixer, SCR & Upstream & Downstream NOx Sensor seating.	Rectify Leakages	√	x	x	x	x	x	x
					Upstream NOx Sensor Faulty / Sensor corroded	Upstream NOx Sensor	Replace Upstream NOx Sensor							
					EGR Valve faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					Ad Blue dosing improper	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Downstream NOx Sensor wiring faulty	Downstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
11	P2208	Outlet NOx compatibility error			Outlet NOx compatibility error	Upstream / Downstream NOx sensor faulty	Upstream / Downstream NOx Sensor	√	√	x	x	x	x	x
12	P225F	NOx sensor signal lesser than limit - Downstream sensor			Downstream NOx Sensor Faulty	Downstream NOx Sensor	Replace Downstream NOx Sensor	√	x	x	x	x	x	x
					NOx Sensor wiring faulty	Upstream / Downstream NOx Sensor wiring of ATS, Chassis Front, Cabin Wiring - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (NOx sensor-Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
13	U029D	CAN Error related to NOx			Battery Positive / Battery Cut Off Switch connection loose / Rusty / Positive Supply on Starter Motor / Alternator loose / faulty	Condition of Battery Terminal / Battery Cut off Switch	Rectify / Replace affected component.	√	√	x	√	√	√	x
					CAN Wiring faulty	Open, Ground, Short Circuit in: 1. Pin 3 on Upstream NOx sensor to Pin 16 on C1YM connector 2. Pin 4 on Upstream	Check & replace affected harness. 1. ATS (NOx sensor-Upstream/Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						NOx sensor to Pin 15 on C1YM connector 3. Pin 16 on C1YF to Pin 12 on C1DMM connector (Upstream) 4. Pin 15 on C1YF to Pin 13 on C1DMM connector (Upstream) 5. Pin 3 on Downstream NOx sensor to Pin 11 on C1YM connector 6. Pin 4 on Downstream NOx sensor to Pin 10 on C1YM connector 7. Pin 11 on C1YF to Pin 12 on C1DMM connector (Upstream) 8. Pin 10 on C1YF to Pin 13 on C1DMM connector (Upstream) 9. Pin 13 on C1DMF to Pin 78 on ECU K connector 10. Pin 12 on C1DMF to Pin 77 on ECU K connector	3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
					Upstream NOx Sensor faulty	NOx Sensor - Upstream	Replace NOx Sensor - Upstream							
					Controllers connected to CAN may be faulty - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit, NOx Sensor –	Disconnect the connectors of - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit, NOx Sensor – Upstream, Downstream one by one & verify whether the DTC gets healed after	Replace the respective wiring harness or the controller after disconnecting which the DTC is getting healed.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Upstream, Downstream	disconnecting these controllers. The problem may be with any of the controller wiring or with the controllers								
					Terminating Resistance Faulty	Resistance Value of Terminating Resistance – 120 Ohms	If resistance value is not as per specification – Replace DNOx Harness							
14	U029E	CAN Error related to NOx			Battery Positive / Battery Cut Off Switch connection loose / Rusty / Positive Supply on Starter Motor / Alternator loose / faulty	Condition of Battery Terminal / Battery Cut off Switch	Rectify / Replace affected component.	√	√	x	√	√	√	x
					CAN Wiring faulty	Open, Ground, Short Circuit in: 1. Pin 3 on Upstream NOx sensor to Pin 16 on C1YM connector. 2. Pin 4 on Upstream NOx sensor to Pin 15 on C1YM connector 3. Pin 16 on C1YF to Pin 12 on C1DMM connector (Upstream) 4. Pin 15 on C1YF to Pin 13 on C1DMM connector (Upstream) 5. Pin 3 on Downstream NOx sensor to Pin 11 on C1YM connector 6. Pin 4 on Downstream NOx sensor to Pin 10 on C1YM connector 7. Pin 11 on C1YF to Pin 12 on C1DMM connector (Upstream)	Check & replace affected harness. 1. ATS (NOx sensor-Upstream/Downstream to C1YM connector) 2. Chassis Front (C1YF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						8. Pin 10 on C1YF to Pin 13 on C1DMM connector (Upstream) 9. Pin 13 on C1DMF to Pin 78 on ECU K connector 10. Pin 12 on C1DMF to Pin 77 on ECU K connector								
					NOx Sensor Fuse (10A Fuse) Blown	NOx Sensor Fuse - 10A	Replace fuse if blown							
					NOx Sensor faulty	NOx Sensor - Upstream / Downstream	Replace NOx Sensor - Upstream / Downstream							
					Controllers connected to CAN may be faulty - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit, NOx Sensor – Upstream, Downstream	Disconnect the connectors of - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit, NOx Sensor – Upstream, Downstream one by one & verify whether the DTC gets healed after disconnecting these controllers. The problem may be with any of the controller wiring or with the controllers	Replace the respective wiring harness or the controller after disconnecting which the DTC is getting healed.							
					Terminating Resistance Faulty	Resistance Value of Terminating Resistance – 120 Ohms	If resistance value is not as per specification – Replace DNOx Harness							

Torque Reduction: √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

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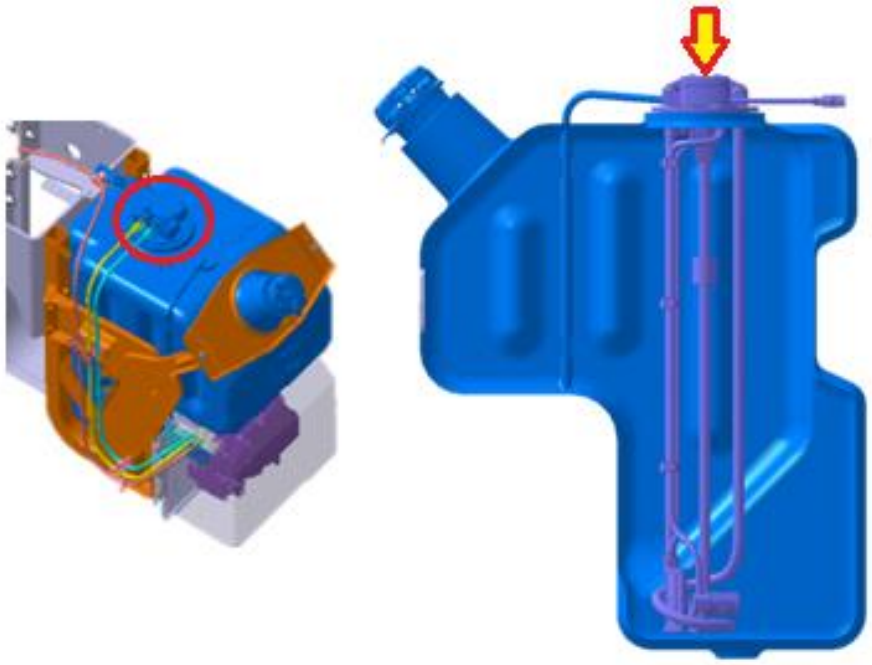
4.27 ADBLUE HEADER UNIT (LEVEL SENSOR, TEMPERATURE SENSOR, QUALITY SENSOR)

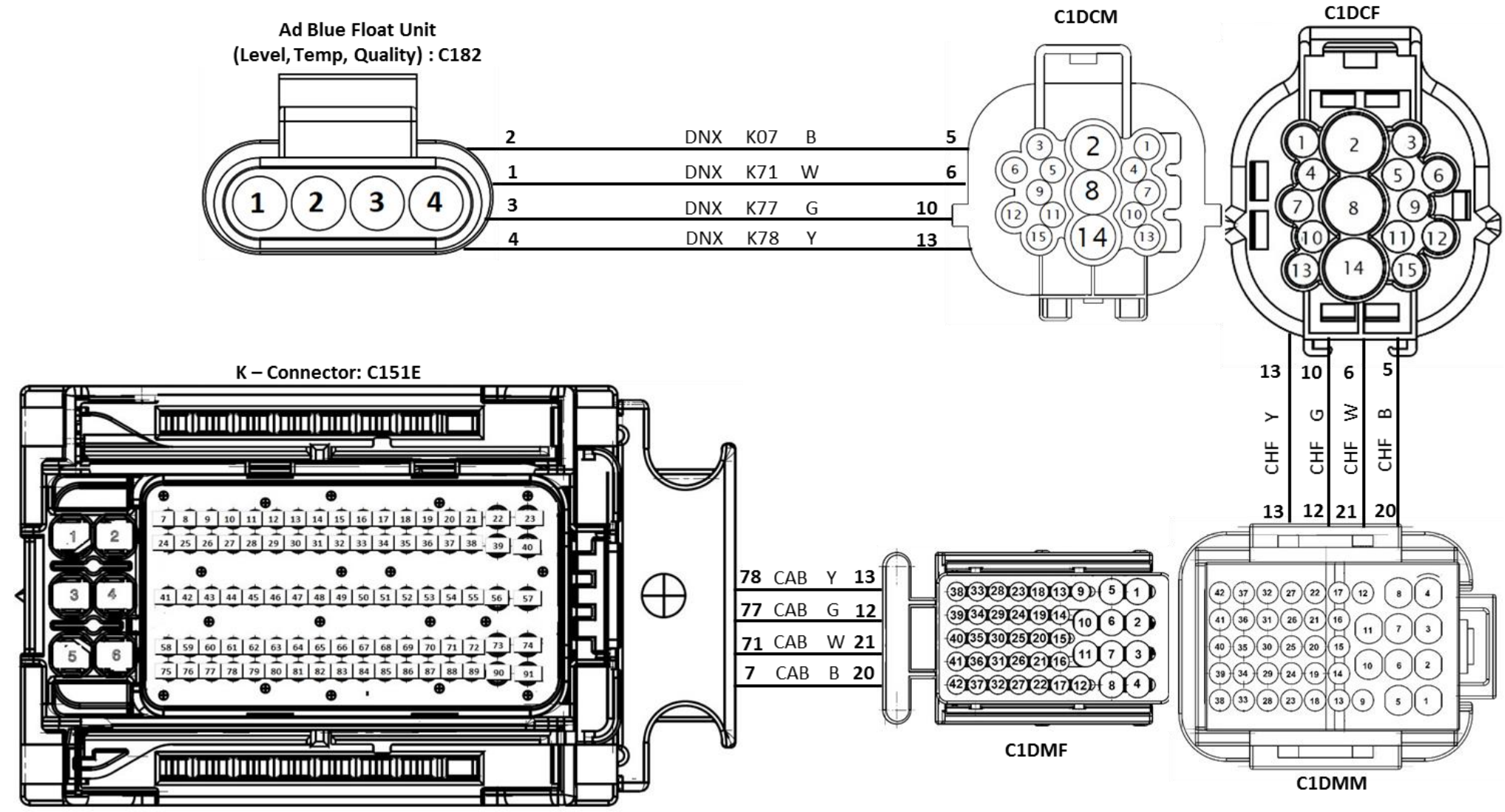


Location: On the AdBlue Header Unit assembly

Function

- Level Sensor – Measures the level of ad blue inside the tank.
- Temperature Sensor – Measures the temperature of ad blue inside the tank.
- Quality Sensor – Measures the concentration of ad blue inside the tank.

4.27.1 Circuit Diagram: Ad Blue Header Unit



4.27.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P24FF	Ad blue Temperature Too High			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	X	x	x	x	x	x	x
2	P2031	Ad blue Level Sensor signal defective			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	x	x	x	x	x	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
3	P203F	Ad blue Level Too Low			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	√	x	x	X
					Ad Blue level below minimum / Empty	Ad Blue level in tank	Refill Ad Blue							
4	P206B	Ad Blue Quality Deteriorated, Faulty Quality Sensor			Wrong / Non genuine ad blue used	Ad Blue quality – Check value using Diagnostic tool. Concentration can be cross verified using refractometer also.	If non recommended ad blue is present - Empty tank content, Flush the system & refill recommended ad blue	x	x	x	x	x	x	x
					Ad Blue quality sensor faulty	Ad Blue Header	Replace Ad Blue Tank Header							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit Wiring (CAN Wiring) Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
5	P2061	Ad blue Quality Sensor absent			Ad Blue quality sensor faulty	Ad Blue Header	Replace Ad Blue Tank Header	X	X	X	X	X	X	X
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
6	P2065	Ad blue Quality Sensor invalid			Ad Blue quality sensor faulty	Ad Blue Header	Replace Ad Blue Tank Header	X	X	X	X	X	X	X
					Ad Blue Header Unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
7	P206D	Ad blue Quality Sensor Circuit High			Ad Blue quality sensor faulty	Ad Blue Header	Replace Ad Blue Tank Header	X	X	X	X	X	X	X
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
8	P206C	Ad blue Quality Sensor Circuit Low			Ad Blue quality sensor faulty	Ad Blue Header	Replace Ad Blue Tank Header	X	X	X	X	X	X	X

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
9	P202B	Ad blue Level Sensor output invalid			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	x	x	x	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
10	P203B	Ad Blue/DEF Overfill in Tank			Excessive Ad Blue Filled in Ad Blue Tank	Check Physical level / quantity of ad blue in tank.	Maintain optimum Ad Blue level. For 50 Ltr tank, filling should not be more than 45 ltrs.	√	√	x	√	x	x	x
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
11	P213F	Ad blue Level Too Low			Ad Blue level in tank too low	Ad Blue level in tank	Refill Ad Blue	√	√	x	x	x	x	x
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
12	P203C	Ad blue Level Sensor short circuit to ground			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	√	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
13	P24FE	Ad blue Temperature Too High			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	x	x	x	x
					Ad Blue Header Float Unit Wiring Harness faulty	Ad Blue Header Float Unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
14	P225B	Ad blue Temperature Too High			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
15	P205C	Ad blue Tank Temperature short Circuit to Ground			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	√	√	√	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Ground, Open, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
16	P205D	Ad blue Tank Temperature Sensor signal error			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	`√	x	√	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
17	P2BAA	NOx Exceedance - Low Ad blue Consumption			Excessive Ad Blue Filled in Ad Blue Tank	Check Physical level / quantity of ad blue in tank.	Maintain optimum Ad Blue level. For 50 Ltr tank, filling should not be more than 45 ltrs.	√	x	x	√	√	√	x
					Dosing Module Blocked / Restriction / Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Ad Blue Lines: Suction, Return, Delivery - Blocked / Restriction / Leakage Incorrect routing of ad blue lines	Ad Blue Lines: Suction, Return, Delivery Ad Blue Lines Routing	Replace Ad Blue Lines: Suction, Return, Delivery Ensure proper routing of ad blue lines							
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
					Ad Blue Tank Breather Blocked	Ad Blue Tank Breather	Replace Ad Blue Tank Breather Unit							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
18	P2BA9	Wrong Ad Blue Filled, Quality Deteriorated			Wrong / Non genuine ad blue used	Ad Blue quality – Check value using Diagnostic tool. Concentration can be cross verified using a DIGITAL refractometer also.	If non recommended ad blue is present - Empty tank content, Flush the system & refill recommended ad blue. **Ad Blue Quality Reset needs to be done as per SOP**	√	x	x	√	√	√	x
					Dust accumulation on ad blue quality sensor	Ad blue quality sensor	Clean the ad blue quality sensor under clean running water. Refit the header unit & verify							
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
19	P216B	Ad Blue Quality Deteriorated, Faulty Quality Sensor			Wrong / Non genuine ad blue used	Ad Blue quality – Check value using Diagnostic tool. Concentration can be cross verified using a DIGITAL refractometer also.	If non recommended ad blue is present - Empty tank content, Flush the system & refill recommended ad blue. **Ad Blue Quality Reset needs to be done as per SOP**	√	x	x	√	√	√	x
					Dust accumulation on ad blue quality sensor	Ad blue quality sensor	Clean the ad blue quality sensor under clean running water. Refit the header unit & verify							
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
20	P1BA9	Wrong Ad Blue Filled, Quality Deteriorated			Wrong / Non genuine ad blue used	Ad Blue quality – Check value using Diagnostic tool. Concentration needs to be cross verified using A DIGITAL refractometer also.	If non recommended ad blue is present - Empty tank content, Flush the system & refill recommended ad blue. Verify ad blue concentration in Garuda & Refractometer. If DTC is still present even after clearing, then - Ad **Blue Quality Reset needs to be done as per SOP, mentioned in Diagnostic Software Topic.**	√	x	x	√	√	√	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Dust accumulation on ad blue quality sensor	Ad blue quality sensor	Clean the ad blue quality sensor under clean running water. Refit the header unit & verify							
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
21	P2BA1	NOx Exceedance - Low Ad blue Consumption			Dosing Module Blocked / Restriction / Faulty Supply Module Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement Supply Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests. Replace Supply Module & Verify for proper functioning by conducting Actuator & Routine Tests.	x	x	x	√	x	x	x
22	P05F8	Ad Blue Tank temp too high			Exhaust gas leak near AdBlue / AUS32 tank	Check for leakages in exhaust system	Rectify leakages / Replace affected parts	√	√	x	√	√	√	x
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
					AdBlue tank Wiring Harness faulty	Ad Blue Header unit wiring – Open/Ground/Short circuit	Replace affected harness – DNOx Harness/Chassis Front Harness/Cabin Harness							
23	P203A	AdBlue tank level not ok			Ad Blue re-filling quantity below minimum	Check Re-filling quantity	During re-filling, fill a minimum of 10 Ltrs, when re-filling in Ad Blue tank of capacity 50 Ltrs.	√	x	x	√	√	√	x
					Excessive Ad Blue Filled in Ad Blue Tank	Check Physical level / quantity of ad blue in tank.	Maintain optimum Ad Blue level. For reference, Stop filling once the level bar indicates full.							
					Dosing Module Faulty / Partially Blocked	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Lines: Suction, Return, Delivery - Blocked / Restriction / Leakage	Ad Blue Lines: Suction, Return, Delivery	Replace Ad Blue Lines: Suction, Return, Delivery							
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
24	P205B	AdBlue tank temp too low			Ad Blue Header Unit Faulty	Ad Blue Header Unit	Replace Ad Blue Tank Header Unit	x	x	x	x	x	X	x
25	P2062	AdBlue Quality not ok			Wrong / Non genuine ad blue used.	Ad Blue quality – Check value using Diagnostic tool & cross verify using a DIGITAL refractometer.	If non recommended ad blue is present - Empty tank content, Flush the system & refill recommended ad blue. If DTC does not get cleared after flushing the ad blue, then perform ad blue reset procedure as per SOP provided in Diagnostic Manual	√	x	x	√	√	√	x
					Ad Blue quality sensor not sensing the ad blue concentration due to dust accumulation on the quality sensor.	Ad Blue Quality Sensor	Clean the Ad Blue quality sensor under clean running water. Refit & confirm the concentration using Diagnostic tool & Refractometer. If DTC does not get cleared after flushing the ad blue, then perform ad blue reset procedure as per SOP provided in Diagnostic Manual							
					Ad Blue Header Unit fitment issue / Faulty	Ad Blue Header Unit	Refit Replace Ad Blue Tank Header Unit & check. If complaint persists, replace the Ad Blue Header Unit & verify.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							If DTC does not get cleared after flushing the ad blue, then perform ad blue reset procedure as per SOP provided in Diagnostic Manual							
26	P2064	AdBlue quality sensor SCG			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	x	x	x	x	x	x	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of NOx, Chassis Front, Cabin harness – Ground, Open, Short circuit	Check & replace affected harness. 1. NOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. NOx, Chassis Front, Cabin harness							
27	P205A	Tank temp SCB/OL			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	x	x	x	x	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
28	P2063	Quality sensor SCB/ Open load			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	x	x	x	x	x	x	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
29	P213A	Level sensor SCB/Open load			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	√	√	X	x	x	x	x
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
30	P215B	Tank temp incorrect values			Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header	x	x	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
31	U02A1	Level sensor communication error on CAN			CAN wiring faulty	Check Open, Ground & short circuit of CAN Line	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness	√	√	x	√	√	√	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Ad Blue Header unit faulty	Ad Blue Header	Replace Ad Blue Tank Header							
					Ad Blue Header unit Wiring Harness faulty	Ad Blue Header unit Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Ad Blue Header unit to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Controllers connected to CAN may be faulty - ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit	Disconnect the connectors of ABS ECU, IMAXX, Instrument Cluster, Ad Blue Header Unit one by one & verify whether the DTC gets healed after disconnecting these controllers. The problem may be with any of the controller wiring or with the controllers	Replace the respective wiring harness or the controller after disconnecting which the DTC is getting healed.							
32	P216F	Ad blue temperature/ambient temperature Low detected			Check if Ad Blue has frozen inside tank. Ad Blue Header unit faulty	Ad Blue Condition Ad Blue Header	Check whether ambient temperature is suitable for operation of DNOx system. Replace Ad Blue Tank Header	√	√	x	x	x	x	x

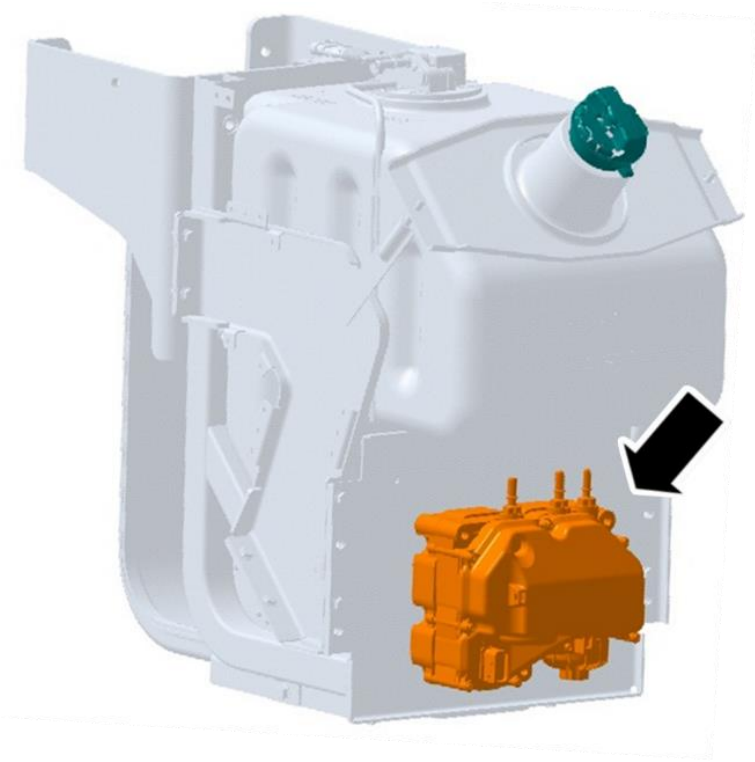
Note:

1. If Ad Blue level is not showing (without any fault codes triggered) in the DIS Cluster, then check whether the Transmission Wiring pig tail connection is reversed / interchanged. Rectify the fault & confirm.
2. Check faults (Open, Ground, Short circuit) with Engine Wiring Harness. Rectify the fault & confirm.
3. Ad Blue Over filling & Under filling will also result in triggering of Ad Blue level & Consumption related fault codes.

Torque Reduction: 1. √ => Torque Reduced by 25% - Immediate attention required; 2. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle Required; 3. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: 1. √ => Speed Reduced to 20 Kmph - Immediate attention required & advice to stop the vehicle immediately; 2. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required; 3. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.28 AD BLUE SUPPLY MODULE

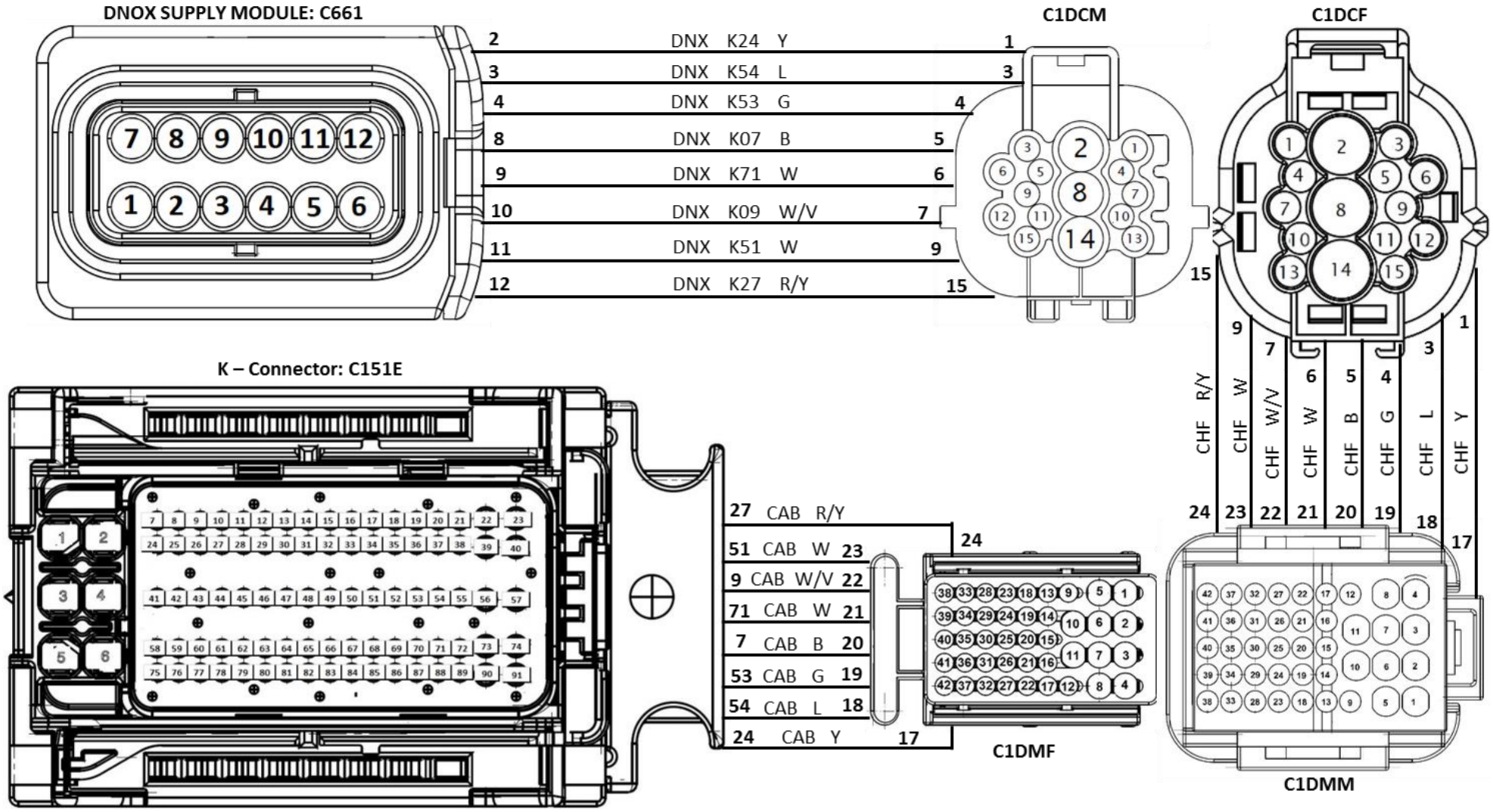


Location: On the AdBlue Tank

Function

- Consists of (Ad blue lines), Ad Blue reverting valve, Ad Blue filter, Ad blue pressure sensor & a pressure relief valve. The ad blue pump is controlled by the ECU to deliver the ad blue under pressure to Dosing Module. The pressure built in the system is measured by the Ad Blue pressure sensor & the input is given to the ECU. After switching off the ignition, the ECU stops the ad blue pump & operates the ad blue reverting valve for purging the ad blue.
- The ad blue pressure sensor is an integral part of the Supply Module and measures the ad blue pressure in the system. It indirectly informs the ECU about the performance of the ad blue pump & filter condition.

4.28.1 Circuit Diagram: Ad Blue Supply Module



Note: Whenever any DTC w.r.t Supply Module is triggered, Supply Module Actuator Test & Routine Test need to be performed before & after replacement of affected component. The Supply Module for DNOx 2.2 develops pressure of about 8 to 9 bars. It is to be noted that for this pressure to build in the system, the ATS temperatures have to reach a certain threshold.

4.28.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P204D	SM Pressure High	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 2 on Supply Module to Pin K24 on ECU	Continuity - Pin 2 to Pin K24	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Open Circuit - Pin 3 on Supply Module to Pin K54 on ECU	Continuity - Pin 3 to Pin K54	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 4 on Supply Module to Pin K53 on ECU	Continuity - Pin 4 to Pin K53	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Ground Circuit - Pin 2 on Supply Module short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Short Circuit - Pin 2 & Pin 3 on Supply Module short circuit with each other	Continuity - Pin 2 to Pin 3	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit - Pin 2 & Pin 4 on Supply Module short circuit with each other	Continuity - Pin 2 to Pin 4	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Supply Module Pressure Sensor / Supply Module Pump Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Ad Blue Tank Breather Choked / Restriction to Breathing	Ad Blue Tank Breather – Physical Check	Replace Tank Breather							
					Supply Module Wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P204C	SM Pressure Less	1	P3BA9 - NOx Exceedance – NOx Control Monitoring System	Ground Circuit - Pin 3 on Supply Module short circuit to ground	Continuity - Pin 3 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Short Circuit - Pin 3 & Pin 4 on Supply Module short circuit with each other	Continuity - Pin 3 to Pin 4	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Supply Module Pressure Sensor / Supply Module Pump Faulty	Supply Module Pressure Sensor / Supply Module Pump Faulty Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Supply Module Pressure Sensor / Supply Module Pump Faulty Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Supply Module Wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
3	P2039	Ad Blue Pressure Sensor Faulty			Supply Module Pressure Sensor / Supply Module Pump Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Restriction/Block in Suction Circuit/Delivery/Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts							
4	P2038	Ad Blue Pressure Sensor Faulty			Supply Module Pressure Sensor / Supply Module Pump Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Block / Restrictions in ad blue lines	Check for blockages in suction line, return line, delivery line and filter	Clear blocks / Restrictions / Replace affected parts							
5	P20E8	Ad blue Pressure Too Low			Restriction/Block in Suction Circuit/Delivery/Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts	√	√	x	√	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Reverting Valve Faulty	Reverting Valve Note: Perform Actuator Test for Reverting Valve, Supply Module & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Supply Module Pressure Sensor Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Dosing Module Faulty	Dosing Module								
6	P20E9	Ad blue Pressure Too High			Block / Restrictions in ad blue lines	Check for blockages in suction line, return line, delivery line and filter	Clear blocks / Restrictions / Replace affected parts	√	√	x	√	√	√	x
					Dosing Module Blocked / Not Opening	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Supply Module / Pressure Sensor Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
7	P20E7	Ad blue Pressure Too High			Block / Restrictions in ad blue lines	Check for blockages in suction line, return line, delivery line and filter	Clear blocks / Restrictions / Replace affected parts	√	√	x	√	√	√	x
					Supply Module / Pressure Sensor Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Module – Before & After Replacement								
8	P22E8	Ad Blue (DEF) Pressure Low			Blockage / Restriction in suction line	Tank Breather, Strainer, Ad blue lines,	Clear blocks / Restrictions / Replace affected parts	√	√	x	√	√	√	x
					Restriction/Block in ad blue filter	Ad Blue filter	Replace Ad Blue filter							
					Leakage in pressure line	Ad blue lines, Dosing Module Leakage	Rectify / Replace affected parts							
					Low Ad Blue Level	Ad Blue Level	Refill ad blue							
					Pressure Relief Valve is open	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Suction & Return Lines interchanged	Check physical connection of ad blue lines	Reconnect the ad blue lines correctly							
					Supply Module / Pressure Sensor Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Neutral Switch wiring Harness Faulty Neutral Switch Faulty	Engine Harness – Open, Ground, Short Circuit Neutral Switch	Replace affected harness – Engine Harness Replace Neutral S/W							
9	P202D	Ad Blue Leakage			Ad Blue Leakages	Leakage in Ad Blue - Suction, Return & Delivery Lines	Rectify / Replace affected parts	√	√	x	√	√	√	x
					Dosing Module Leakage	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
10	P20A1	Ad blue Pressure not Plausible			Supply Module Faulty Supply Module Wiring Harness Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement Open/Ground/Short circuit	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests If faulty – Replace affected harness – DNOx Harness / Chassis Front Harness / Cabin Harness	√	√	x	x	x	x	x
11	P20E6	Ad blue Pressure Too High			Blockage / Restriction in pressure line	Ad blue lines	Rectify Block/Restrictions/Replace affected parts	√	√	x	√	√	√	x
					Dosing Module Blocked / Not Opening	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Ad Blue Frozen	Ad Blue condition	Replace Ad Blue & affected components							
					Supply Module / Pressure sensor Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
12	P21E8	Ad blue Pressure Too Low			Blockage / Restriction in suction line	Tank Breather, Strainer, Ad blue lines,	Rectify Block/Restrictions/Replace affected parts	√	√	x	√	√	√	x
					Restriction/Block in ad blue filter	Ad Blue filter	Replace Ad Blue filter							
					Leakage in pressure line	Ad blue lines, Dosing Module Leakage	Rectify Block/Restrictions/Replace affected parts							
					Dosing Module Leaking	Dosing Module Note: Perform Actuator & Routine Tests for Supply	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Module – Before & After Replacement								
					Low Ad Blue Level	Ad Blue Level	Refill ad blue							
					Supply Module Signal line may be disconnected	Supply Module wiring – Open / ground Short	Replace affected harness – DNOx harness / Chassis Front harness / Cabin harness							
					Pressure Relief Valve is faulty inside Supply Module	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
13	P21A0	Reverting valve Open Load			Open Circuit - Pin 11 on Dosing Module to Pin K51 on ECU	Continuity - Pin 11 to Pin K51	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness	√	√	x	x	x	x	x
					Open Circuit - Pin 12 on Dosing Module to Pin K27 on ECU	Continuity - Pin 12 to Pin K27	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Reverting Valve Faulty	Supply Module Note: Perform Actuator Test for Reverting Valve, Supply Module & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Reverting Valve wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
14	P20A3	Rev valve SCB			Reverting Valve Faulty	Supply Module Note: Perform Actuator Test for Reverting Valve, Supply Module & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Short Circuit: Pin 12on Supply Module Short to Supply / Battery Positive	Continuity: Pin 12 on Supply module to Supply / Short to Battery	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 11 on Dosing Module to Pin K51 on ECU	Continuity - Pin 11 to Pin K51	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Open Circuit - Pin 12 on Dosing Module to Pin K27 on ECU	Continuity - Pin 11 to Pin K27	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Reverting Valve wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
15	P20A0	Over pressure in purging /after run			Reverting Valve Faulty	Supply Module Note: Perform Actuator Test for Reverting Valve, Supply Module & Routine Tests for Supply Module –	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Before & After Replacement								
					Block / Restrictions / Leakages in ad blue lines	Check for blockages / leakages in suction line, return line, delivery line and filter	Clear blocks / Restrictions / leakages / Replace affected parts							
					Back flow (return) & Suction lines are interchanged	Ad Blue Line routing	Re-route ad blue lines							
					Leakage in Dosing Module	Dosing Valve Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Reverting Valve wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
16	P21A1	Reverting valve temp too high			Reverting Valve Faulty	Supply Module Note: Perform Actuator Test for Reverting Valve, Supply Module & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	X

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 11 on Dosing Module to Pin K51 on ECU	Continuity - Pin 11 to Pin K51	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Open Circuit - Pin 12 on Dosing Module to Pin K27 on ECU	Continuity - Pin 11 to Pin K27	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Short Circuit in wiring	Short between pins 11 & 12 of Supply Module	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Reverting Valve wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
17	P20A2	Reverting valve SCG			Reverting Valve Faulty	Supply Module Note: Perform Actuator Test for Reverting Valve, Supply Module & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	X
					Ground Circuit: Pin 12 on Supply Module short to ground	Continuity between: Pin 12 & Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit in wiring	Short between pins 11 & 12 of Supply Module	If continuity is present - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Reverting Valve wiring faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
18	P15F8	SM temp not ok after cold conditions			Temperature Sensor Faulty	Ad Blue Header Unit	Replace Ad Blue Header Unit	√	√	x	x	x	x	x
19	P25F8	SM temp duty cycle not ok			Supply Module wiring faulty. Supply Module Faulty	Open/Ground/Short Circuit Supply Module	Replace affected harness if faulty – DNOx Harness / Chassis Front Harness / Cabin Harness	√	√	x	x	x	x	x

CONTINUED IN PAGE 292

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
20	P05F6	Supply module internal temp not functional(for cleaning)			Supply Module wiring faulty. Supply Module Faulty	Open/Ground/Short Circuit Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace affected harness if faulty – DNOx Harness / Chassis Front Harness / Cabin Harness Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	x
21	P05F5	SM not available			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					ECU Circuit pertaining to DNOx system	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
22	P20FF	SM PWM beyond limits			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	x
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
23	P20F1	Supply module Faulty Signal			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	x
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
24	P20F2	SM temp duty cycle not ok			Supply Module Faulty	Supply Module Note: Perform Actuator &	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Routine Tests for Supply Module – Before & After Replacement								
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
25	P20F3	SM temp duty cycle not ok			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	x	x	x	x
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
26	P208B	Supply Module inside ECU -			Supply Module Faulty	Supply Module Note: Perform Actuator &	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
		Temperature High				Routine Tests for Supply Module – Before & After Replacement								
					Ground Circuit: Pin 8 / Pin 9 / Pin 10 on Supply module short circuited to Ground	Continuity between Pin 8 / Pin 9 / Pin 10 on Supply Module to Body Ground / Battery Negative	If continuity is observed - check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					ECU Circuit pertaining to DNOx system	ECU	Replace ECU							
27	P207B	Supply module not running/working			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x

CONTINUED IN PAGE 296

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
28	P218B	Supply module not running/working			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
29	P208D	Supply Module - Short to Supply			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Short Circuit: Pin 10 on Supply module short circuited to Supply / Battery Positive	Continuity: Pin 10 Supply module to Supply / Battery Positive	If continuity is observed - check & replace affected harness 1. DNOx (Supply Module to C1DCM connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
30	P208C	Supply Module - Short to Ground			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Ground Circuit: Pin 10 on Supply Module short circuit to ground	Continuity: Pin 10 on supply module to Body Ground / Battery Negative	If continuity is observed - check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
31	P209B	SM pump speed beyond limit			Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Ground Circuit: Pin 8 / Pin 9 / Pin 10 on Supply module short circuited to Ground	Continuity between Pin 8 / Pin 9 / Pin 10 on Supply Module to Body Ground / Battery Negative	If continuity is observed - check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
32	P208A	Supply Module Open Load	1	U02A1 - Ad Blue Level Sensor Time Out / Level sensor communication error on CAN P208C - Supply Module - Short to Ground P213F - Ad Blue Level Too Low P3BA9 - NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 9 on Dosing Module to Pin K71 on ECU	Continuity - Pin 9 to Pin K71	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Open Circuit - Pin 10 on Dosing Module to Pin K09 on ECU	Continuity - Pin 10 to Pin K09	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 8 on Dosing Module to Pin K07 on ECU	Continuity - Pin 8 to Pin K07	If no continuity - Check & replace affected harness 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Wiring Harness Faulty	Supply Module Wiring of DNOx, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. DNOx (Supply Module to C1DCM connector) 2. Chassis Front (C1DCF to C1DMM connector) 3. Cabin (C1DMF to ECU K Connector) 4. DNOx, Chassis Front, Cabin harness							
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

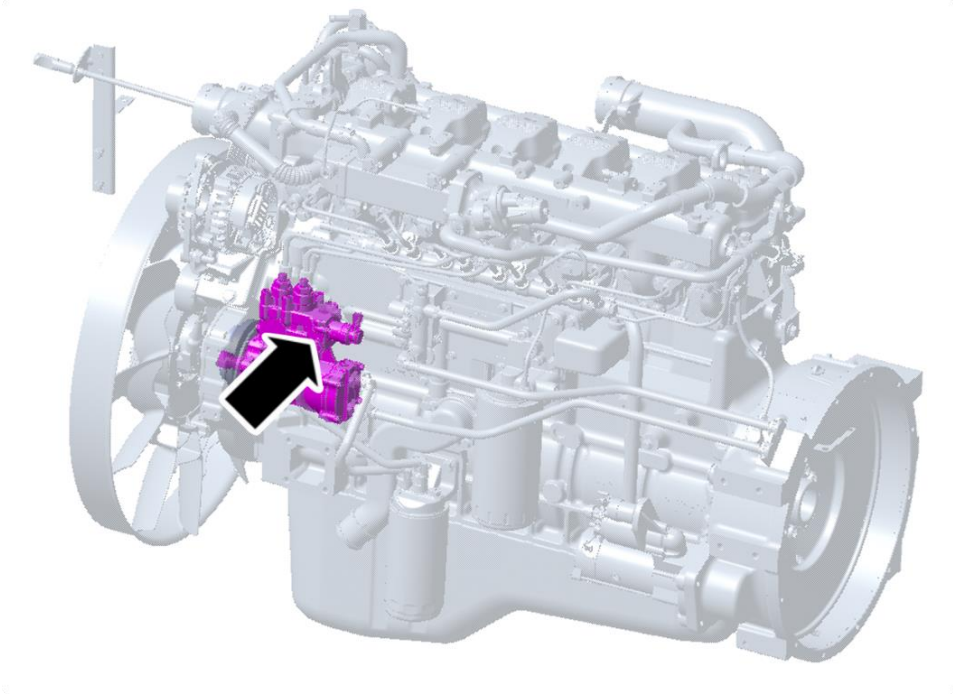
Torque Reduction: 1. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle

2. √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: 1. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

2. √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.29 INLET METERING VALVE (IMV)

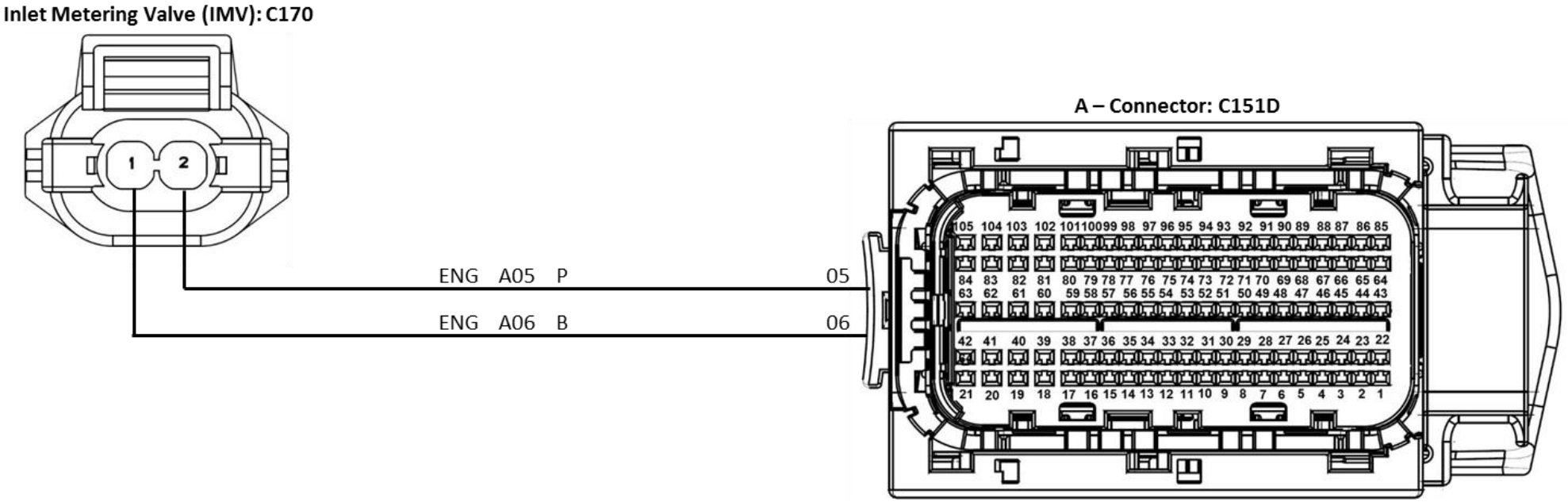


Location: On the High-Pressure Pump

Function

- The Inlet Metering Valve is in an integral part of High-pressure pump and regulates the opening and closing of the inlet metering valve based on the rail pressure set point and the actual value.
- Inlet metering valve controls the fuel flow to the high-pressure pump.
- It is controlled by the PWM signal from the EMS ECU

4.29.1 Circuit Diagram: Inlet Metering Valve



4.29.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0251	IMV Open Load	1	P0095 - PRV open due to pressure increase P0096 - PRV Open due to high pressure spike P0194 - PRV Open	Open Circuit - Pin 1 on sensor to Pin A06 on ECU	Continuity - Pin 1 to Pin A06	If no continuity - Replace Engine Harness	√	√	x	x	√	x	x
					Open Circuit - Pin 2 on sensor to Pin A05 on ECU	Continuity - Pin 2 to Pin A05	If no continuity - Replace Engine Harness							
					IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					IMV Wiring Faulty	IMV Wiring - Open, Ground, Short circuit	Replace Engine Harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P0252	IMV Controller inside ECU - Temperature High	1	P0095 - PRV Open due to Pressure Increase P0096 - PRV Open due to high Pressure spike P0194 – PRV Open Error	Ground Circuit - Pin 1 on sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Short Circuit: Pin 1 / Pin 2 on IMV Short to Supply / Battery Positive	Continuity: Pin 1 / Pin 2 on IMV to Supply/ Battery Positive	If continuity is present – Replace Engine Harness							
					IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					IMV Wiring Faulty ECU Faulty (ECU Failure is due to short circuit of IMV wiring harness)	IMV Wiring - Open, Ground, Short circuit ECU	Replace Engine Harness Replace ECU							
3	P0255	IMV actuation signal short to ground			Ground Circuit - Pin 2 on sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					IMV Wiring Faulty ECU Faulty	IMV Wiring - Open, Ground, Short circuit ECU	Replace Engine Harness Replace ECU							
4	P0089	IMV Stuck Open			IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.	√	√	x	x	x	x	x
					Rail Pressure Sensor improper seating	Connector seating on common rail	Ensure proper fitment of connector							
					Bends/crimps/restrictions/clog in fuel return line	Fuel return line	Replace return line/Rectify bends, restrictions, clog							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Bends/crimps/restrictions/clog in fuel suction line (tank to H.P Pump) & delivery line (H.P Pump to injectors)	Fuel Line - Suction / Delivery	Replace return line/Rectify bends, restrictions, clog							
5	P0254	IMV actuation signal short to supply			Pin 1 short circuit to supply	Continuity - Pin 1 to Supply / Battery Positive	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Pin 2 short circuit to supply	Continuity - Pin 2 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					IMV Wiring Faulty	IMV Wiring - Open, Ground, Short circuit	Replace Engine Harness							
					IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					ECU Internal Short	ECU	Replace ECU							
6	P0253	IMV actuation signal short to ground			Ground Circuit - Pin 1 on sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Ground Circuit - Pin 2 on sensor short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					IMV Wiring Faulty	IMV Wiring - Open, Ground, Short circuit	Replace Engine Harness							
					IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					ECU Internal Short	ECU	Replace ECU							
7	P0256	IMV actuation signal short to ground			Short Circuit - Pin 1 & Pin 2 on sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					IMV Wiring Faulty	IMV Wiring - Open, Ground, Short circuit	Replace Engine Harness							
					IMV Faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							authorized BOSCH dealer.							
					ECU Internal Short	ECU	Replace ECU							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.30 FUEL INJECTORS (Cylinder 1,2,3,4,5,6)

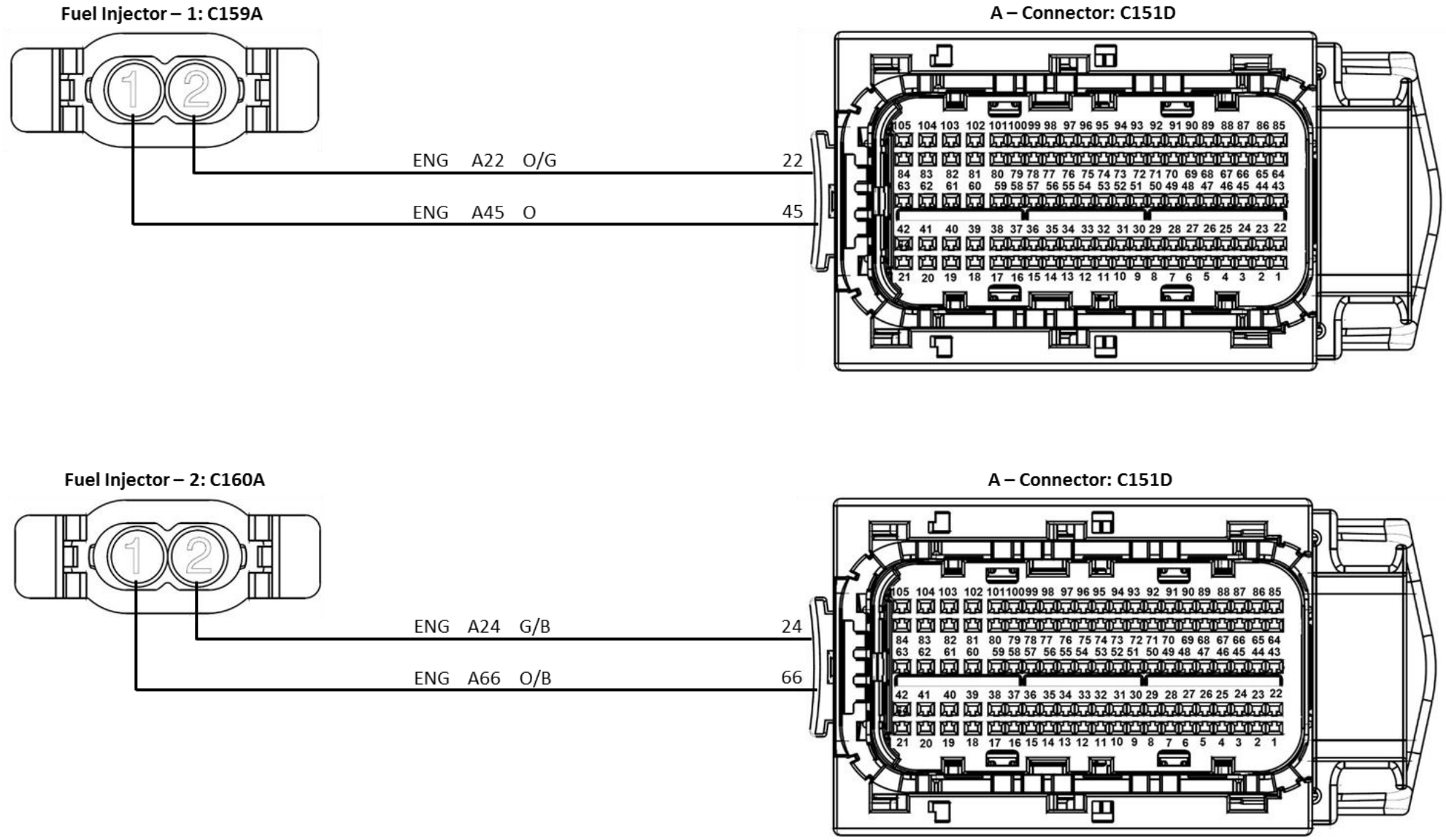
Location: On the Cylinder Head

Function:

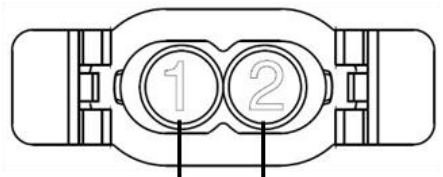
- The fuel injector atomizes and injects the fuel into the combustion cylinders. Fuel to the injector is pressurized & supplied via the high-pressure common rail. The injector has a solenoid that when energized, lifts a needle. The needle lift creates a low-pressure zone inside the injector body. Fuel is then pushed through the holes in the injector tip due to the low pressure inside the injector. The quantity of fuel injected is controlled by the duration for which the injector solenoid is energized. The solenoid is controlled on its high & low side by the ECU.

Note: The Fuel Injectors for BSVI vehicles are unique and should not be interchanged with BSIII / BSIV injectors & vice versa.

4.30.1 Circuit Diagram: Fuel Injectors (Cylinder 1,2,3,4,5,6)



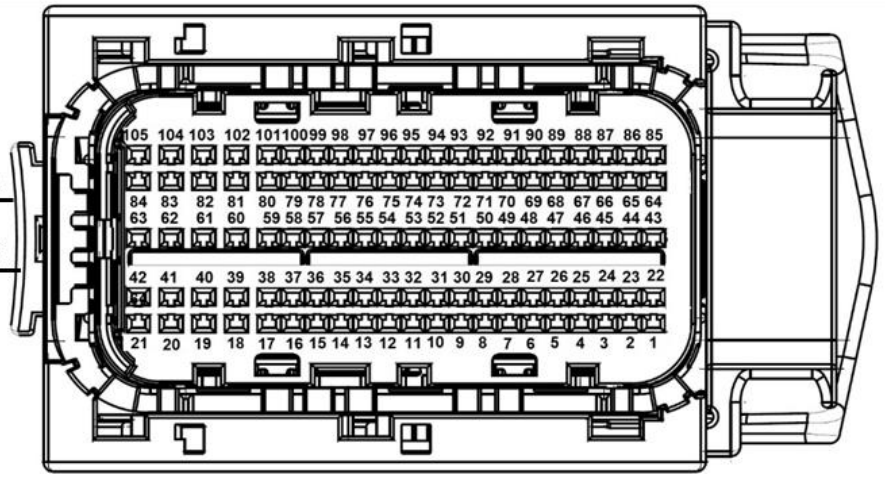
Fuel Injector – 3: C161A



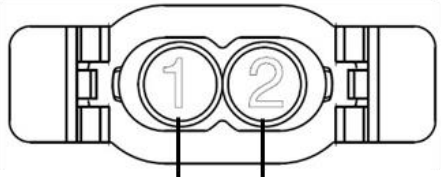
ENG A23 G/L 23

ENG A65 O/L 65

A – Connector: C151D



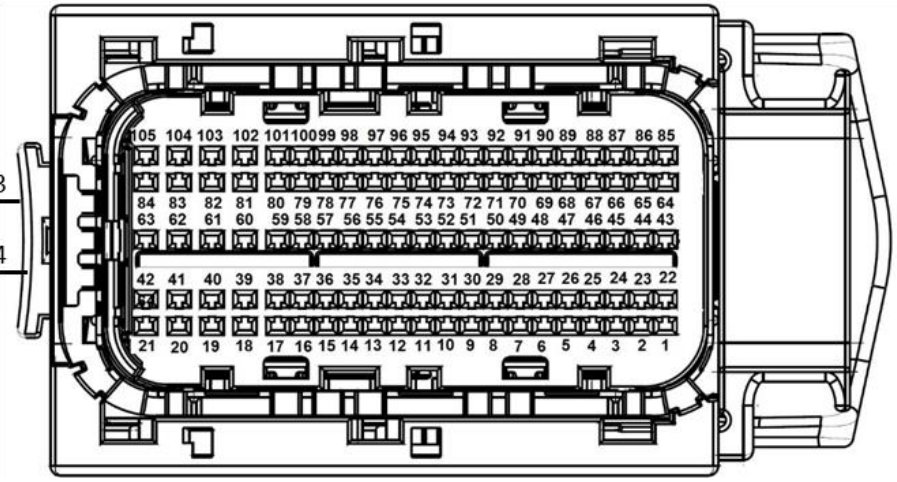
Fuel Injector – 4: C162A



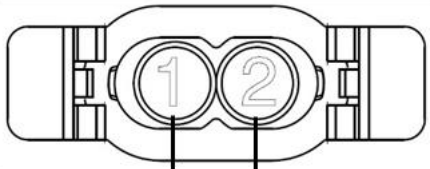
ENG A03 O/R 03

ENG A64 G/R 64

A – Connector: C151D



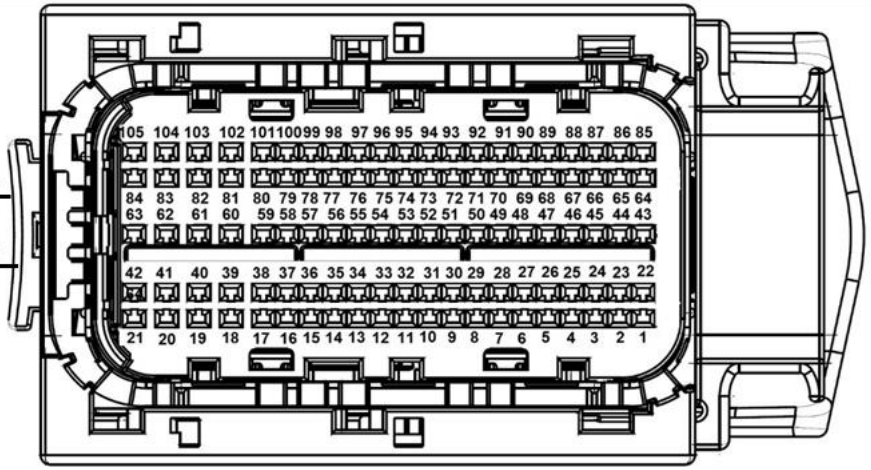
Fuel Injector – 5: C163



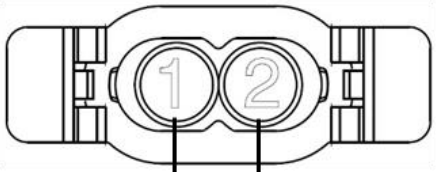
ENG A01 O/Y 01

ENG A43 G/B 43

A – Connector: C151D



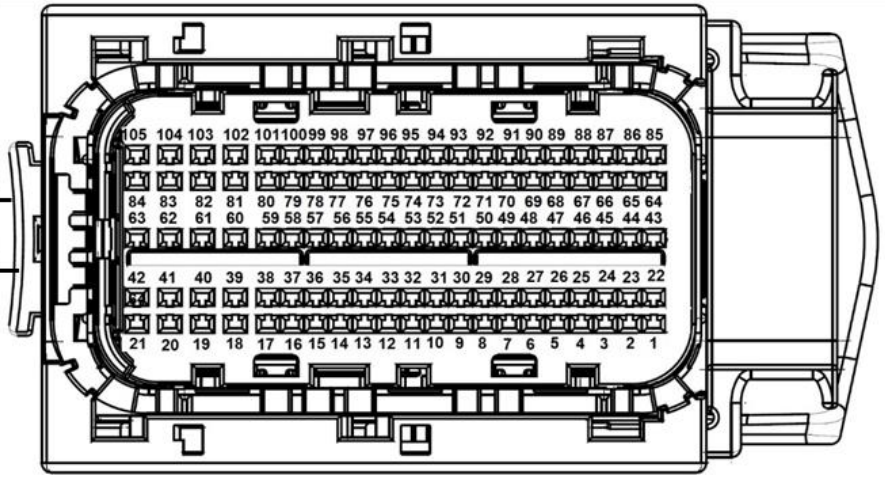
Fuel Injector – 6: C164



ENG A02 R/G 02

ENG A44 GR 44

A – Connector: C151D



4.30.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0201	Injector 1 Open Load			Open Circuit - Pin 1 on Injector 1 to Pin A45 on ECU	Continuity - Pin 1 to Pin A45	If no continuity - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Open Circuit - Pin 2 on Injector 1 to Pin A22 on ECU	Continuity - Pin 2 to Pin A22	If no continuity - Replace Engine Harness							
					Injector 1 Faulty	Injector 1	Replace Injector 1							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
2	P1201	Injector 1 Short Circuit Error			Ground Circuit - Pin 1 / Pin 2 on injector 1 short circuit to ground	Continuity – Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 1 Faulty	Injector 1	Replace Injector 1							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
3	P0262	Injector 1 Wiring Short Circuit			Short Circuit - Pin 1 & Pin 2 on injector 1 short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 1 Faulty	Injector 1	Replace Injector 1							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
4	P0202	Injector 2 Open Load			Open Circuit - Pin 1 on Injector 2 to Pin A66 on ECU	Continuity - Pin 1 to Pin A66	If no continuity - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Open Circuit - Pin 2 on Injector 2 to Pin A24 on ECU	Continuity - Pin 2 to Pin A24	If no continuity - Replace Engine Harness							
					Injector 2 Faulty	Injector 2	Replace Injector 2							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
5	P1205	Injector 2 Short Circuit Error			Ground Circuit - - Pin 1 / Pin 2 on injector 2 short circuit to ground	Continuity - Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	X
					Injector 2 Faulty	Injector 2	Replace Injector 2							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					ECU Faulty	ECU	Replace ECU							
6	P0274	Injector 2 Wiring Short Circuit			Short Circuit - Pin 1 & Pin 2 on injector 2 short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 2 Faulty	Injector 2	Replace Injector 2							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
7	P0205	Injector 3 Open Load			Open Circuit - Pin 1 on injector 3 to Pin A65 on ECU	Continuity - Pin 1 to Pin A65	If no continuity - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Open Circuit - Pin 2 on Injector 3 to Pin A23 on ECU	Continuity - Pin 2 to Pin A23	If no continuity - Replace Engine Harness							
					Injector 3 Faulty	Injector 3	Replace Injector 3							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
8	P1203	Injector 3 Short Circuit Error			Ground Circuit - Pin 1 / Pin 2 on injector 3 short circuit to ground	Continuity - Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 3 Faulty	Injector 3	Replace Injector 3							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
9	P0268	Injector 3 Wiring Short Circuit			Short Circuit - Pin 1 & Pin 2 on injector 3 short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 3 Faulty	Injector 3	Replace Injector 3							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
10	P0204	Injector 4 Open Load			Open Circuit - Pin 1 on Injector 4 to Pin A64 on ECU	Continuity - Pin 1 to Pin A64	If no continuity - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Open Circuit - Pin 2 on Injector 4 to Pin A03 on ECU	Continuity - Pin 2 to Pin A03	If no continuity - Replace Engine Harness							
					Injector 4 Faulty	Injector 4	Replace Injector 4							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							

CONTINUED IN PAGE 312

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					ECU Faulty	ECU	Replace ECU							
11	P1206	Injector 4 Short Circuit Error			Ground Circuit – Pin1 / Pin 2 on injector 4 short circuit to ground	Continuity - Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 4 Faulty	Injector 4	Replace Injector 4							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
12	P0277	Injector 4 Wiring Short Circuit			Short Circuit - Pin 1 & Pin 2 on injector 4 short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 4 Faulty	Injector 4	Replace Injector 4							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
13	P0206	Injector 5 Open Load			Open Circuit - Pin 1 on Injector 5 to Pin A43 on ECU	Continuity - Pin 1 to Pin A43	If no continuity - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Open Circuit - Pin 2 on Injector 5 to Pin A01 on ECU	Continuity - Pin 2 to Pin A01	If no continuity - Replace Engine Harness							
					Injector 5 Faulty	Injector 5	Replace Injector 5							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
14	P1202	Injector 5 Short Circuit Error			Ground Circuit – Pin 1 / Pin 2 on injector 5 short circuit to ground	Continuity - Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 5 Faulty	Injector 5	Replace Injector 5							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
15	P0265	Injector 5 Wiring Short Circuit			Short Circuit - Pin 1 & Pin 2 on injector 5 short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 5 Faulty	Injector 5	Replace Injector 5							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
16	P0207	Injector 6 Open Load			Open Circuit - Pin 1 on Injector 6 to Pin A44 on ECU	Continuity - Pin 1 to Pin A44	If no continuity - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Open Circuit - Pin 2 on Injector 6 to Pin A02 on ECU	Continuity - Pin 2 to Pin A02	If no continuity - Replace Engine Harness							
					Injector 6 Faulty	Injector 6	Replace Injector 6							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
17	P1204	Injector 6 Short Circuit Error			Ground Circuit - Pin 1 / Pin 2 on injector 6 short circuit to ground	Continuity – Pin 1 / Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	X
					Injector 6 Faulty	Injector 6	Replace Injector 6							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
18	P0271	Injector 6 Wiring Short Circuit			Short Circuit - Pin 1 & Pin 2 on injector 6 short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Injector 6 Faulty	Injector 6	Replace Injector 6							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
19	P2148	Injector Bank 0 short Circuit error			Ground Circuit - Pin 1 on injector 1 short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Ground Circuit - Pin 1 on injector 2 short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 1 on injector 3 short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit between Injector 1 & Injector 2	Continuity between: 1. Pin 1 on Injector 1 to Pin 1 on Injector 2 2. Pin 1 on Injector 1 to Pin 2 on Injector 2 3. Pin 2 on Injector 1 to Pin 1 on Injector 2 4. Pin 2 on Injector 1 to Pin 2 on Injector 2	If continuity is present - Replace Engine Harness							
					Short Circuit between Injector 1 & Injector 3	Continuity between: 1. Pin 1 on Injector 1 to Pin 1 on Injector 3 2. Pin 1 on Injector 1 to Pin 2 on Injector 3 3. Pin 2 on Injector 1 to Pin 1 on Injector 3 4. Pin 2 on Injector 1 to Pin 2 on Injector 3	If continuity is present - Replace Engine Harness							
					Short Circuit between Injector 2 & Injector 3	Continuity between: 1. Pin 1 on Injector 2 to Pin 1 on Injector 3 2. Pin 1 on Injector 2 to Pin 2 on Injector 3 3. Pin 2 on Injector 2 to Pin 1 on Injector 3 4. Pin 2 on Injector 2 to Pin 2 on Injector 3	If continuity is present - Replace Engine Harness							
					Short Circuit: Pin 2 on Injector 1 Short to Supply / Battery Positive	Continuity: Pin 2 on Injector 1 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Short Circuit: Pin 2 on Injector 2 Short to Supply / Battery Positive	Continuity: Pin 2 on Injector 2 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit: Pin on Injector 3 Short to Supply / Battery Positive	Continuity: Pin 2 on Injector 3 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Injector 1 / Injector 2 / Injector 3 Faulty	Injector 1 / Injector 2 / Injector 3	Replace Faulty injector							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					Injector Supply – 24V Faulty	Voltage – Pin1 & Body Ground / Battery Negative should be 24V	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							
20	P2151	Injector Bank 1 short Circuit error			Ground Circuit - Pin 1 on injector 4 short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	1600 RPM
					Ground Circuit - Pin 1 on injector 5 short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 1 on injector 6 short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Short Circuit between Injector 4 & Injector 5	Continuity between: 1. Pin 1 on Injector 4 to Pin 1 on Injector 5 2. Pin 1 on Injector 4 to Pin 2 on Injector 5 3. Pin 2 on Injector 4 to Pin 1 on Injector 5 4. Pin 2 on Injector 4 to Pin 2 on Injector 5	If continuity is present - Replace Engine Harness							
					Short Circuit between Injector 4 & Injector 6	Continuity between: 1. Pin 1 on Injector 4 to Pin 1 on Injector 6 2. Pin 1 on Injector 4 to Pin 2 on Injector 6 3. Pin 2 on Injector 4 to Pin 1 on Injector 6	If continuity is present - Replace Engine Harness							

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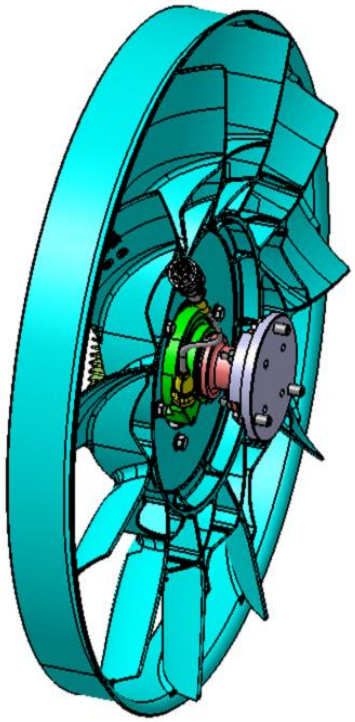
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						4. Pin 2 on Injector 4 to Pin 2 on Injector 6								
					Short Circuit between Injector 5 & Injector 6	Continuity between: 1. Pin 1 on Injector 5 to Pin 1 on Injector 6 2. Pin 1 on Injector 5 to Pin 2 on Injector 6 3. Pin 2 on Injector 5 to Pin 1 on Injector 6 4. Pin 2 on Injector 5 to Pin 2 on Injector 6	If continuity is present - Replace Engine Harness							
					Short Circuit: Pin 2 on Injector 4 Short to Supply / Battery Positive	Continuity: Pin 2 on Injector 4 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Short Circuit: Pin 2 on Injector 5 Short to Supply / Battery Positive	Continuity: Pin 2 on Injector 5 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Short Circuit: Pin on Injector 6 Short to Supply / Battery Positive	Continuity: Pin 2 on Injector 6 to Supply / Battery Positive	If continuity is present - Replace Engine Harness							
					Injector 4 / Injector 5 / Injector 6 Faulty	Injector 4 / Injector 5 / Injector 6	Replace Faulty injector							
					Injector Supply – 24V Faulty	Voltage – Pin1 & Body Ground / Battery Negative should be 24V	Replace Engine Harness							
					Engine wiring harness faulty	Engine wiring harness	Replace Engine Harness							
					ECU Faulty	ECU	Replace ECU							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.31 EV Fan Speed Sensor & Fan Actuation Solenoid



Location: On the EV Fan

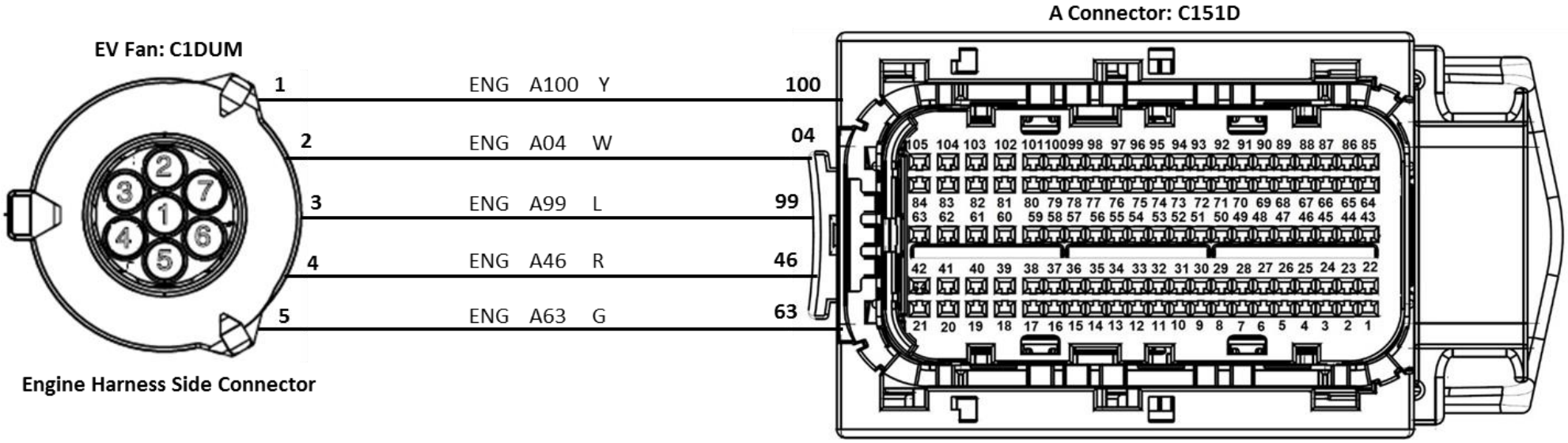
Function:

The engagement of fan through viscous coupling is controlled through a solenoid by the ECU, which helps to couple & de-couple the fan with the engine. When the temperature of the engine is below the operating temperature, the fan is in a disengagement condition, thus rotating with a slip. But once the operating temperatures are reached, the ECU operates the EV Fan solenoid to engage the fan with the engine.

Note:

When the engine is cold, the EV fan will operate at engine speed to increase the load on the engine so that the engine reaches the operating temperature faster. Once the engine reaches its operating temperature range, the Fan disengages (operates in slippage). After the temperature reaches a certain value, the fan engages, thus cooling the engine. This engagement & disengagement will continue, in order to maintain the engine at a certain temperature range. If the EV fan operation needs to be checked for proper operation, then it needs to be done throughout the engine operation range.

4.31.1 Circuit Diagram: EV Fan



4.31.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0480	EV Fan Open Load			Open circuit: 1. Pin 4 to ECU A46 2. Pin 3 to ECU A99	Continuity: 1. Pin 4 to ECU A46 2. Pin 3 to ECU A99	If no continuity is observed – Replace Engine Harness	X	X	X	X	X	X	X
					Voltage error – Between Pin 5 & Pin 2	Voltage between Pin 5 & Pin 2 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EV Fan Faulty	EV Fan	Replace EV Fan							
					EV Fan Wiring Faulty	EV Fan Wiring - Open, Ground, Short circuit	Replace Engine Harness							
2	P0692	EV FAN actuation signal-			Open Circuit – Pin 3 to ECU Pin A99	Continuity between Pin 3 & ECU A99	If no continuity is present, Replace Engine Harness	X	X	X	X	X	X	X

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
		Solenoid short to supply			Short Circuit: Between Pin 3 & Pin 4	Continuity between Pin 3 & Pin 4	If continuity is present – Replace Engine Harness							
					Short Circuit: Between 1. Pin 3 & Supply / Battery Positive 2. Pin 5 & Supply / Battery Positive	Continuity between: 1.Pin 3 & Supply / Battery Positive 2. Pin 5 & Supply / Battery Positive	If continuity is observed – Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 2	Voltage between Pin 5 & Pin 2 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EV Fan Faulty	EV Fan	Replace EV Fan							
					EV Fan Wiring Faulty	EV Fan Wiring - Open, Ground, Short circuit	Replace Engine Harness							
3	P0691	EV FAN actuation signal - Solenoid short to ground			Ground Circuit between: 1. Pin 3 & Body ground / Battery Negative 2. Pin 4 & Body ground / Battery Negative	Continuity between: 1. Pin 3 & Body ground / Battery Negative 2. Pin 4 & Body ground / Battery Negative	If continuity is present – Replace Engine Harness	X	X	X	X	X	X	X
					Open Circuit – Pin 3 to ECU Pin A99	Continuity between Pin 3 & ECU A99	If no continuity is present, Replace Engine Harness							
					Short Circuit: Between Pin 3 & Pin 4	Continuity between Pin 3 & Pin 4	If continuity is present – Replace Engine Harness							
					Short Circuit: Between 1. Pin 3 & Supply / Battery Positive 2. Pin 5 & Supply / Battery Positive	Continuity between: 1.Pin 3 & Supply / Battery Positive 2. Pin 5 & Supply / Battery Positive	If continuity is observed – Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 2	Voltage between Pin 5 & Pin 2 should be = 5V	If voltage is not within specification, replace Engine Harness							

CONTINUED IN PAGE 320

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					EV Fan Faulty	EV Fan	Replace EV Fan							
					EV Fan Wiring Faulty	EV Fan Wiring - Open, Ground, Short circuit	Replace Engine Harness							
4	P0526	Fan Speed Sensor open Circuit			Open Circuit: 1. Pin 1 to ECU Pin A100 2. Pin 2 to ECU Pin A04 3. Pin 5 to ECU Pin A63	Continuity between: 1. Pin 1 to ECU Pin A100 2. Pin 2 to ECU Pin A04 3. Pin 5 to ECU Pin A63	If no continuity is present, Replace Engine Harness	X	X	X	X	X	X	X
					Voltage error – Between Pin 5 & Pin 2	Voltage between Pin 5 & Pin 2 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EV Fan Faulty	EV Fan	Replace EV Fan							
					EV Fan Wiring Faulty	EV Fan Wiring - Open, Ground, Short circuit	Replace Engine Harness							

- **Note: Whenever the following fault codes are triggered together: P1100, P04A9, P06B3, then the possible root cause for trigger of all the 3 fault codes is: Open/Ground/Short circuit of EV fan pig tail. If this fault is rectified, all the 3 fault codes will get cleared automatically.**

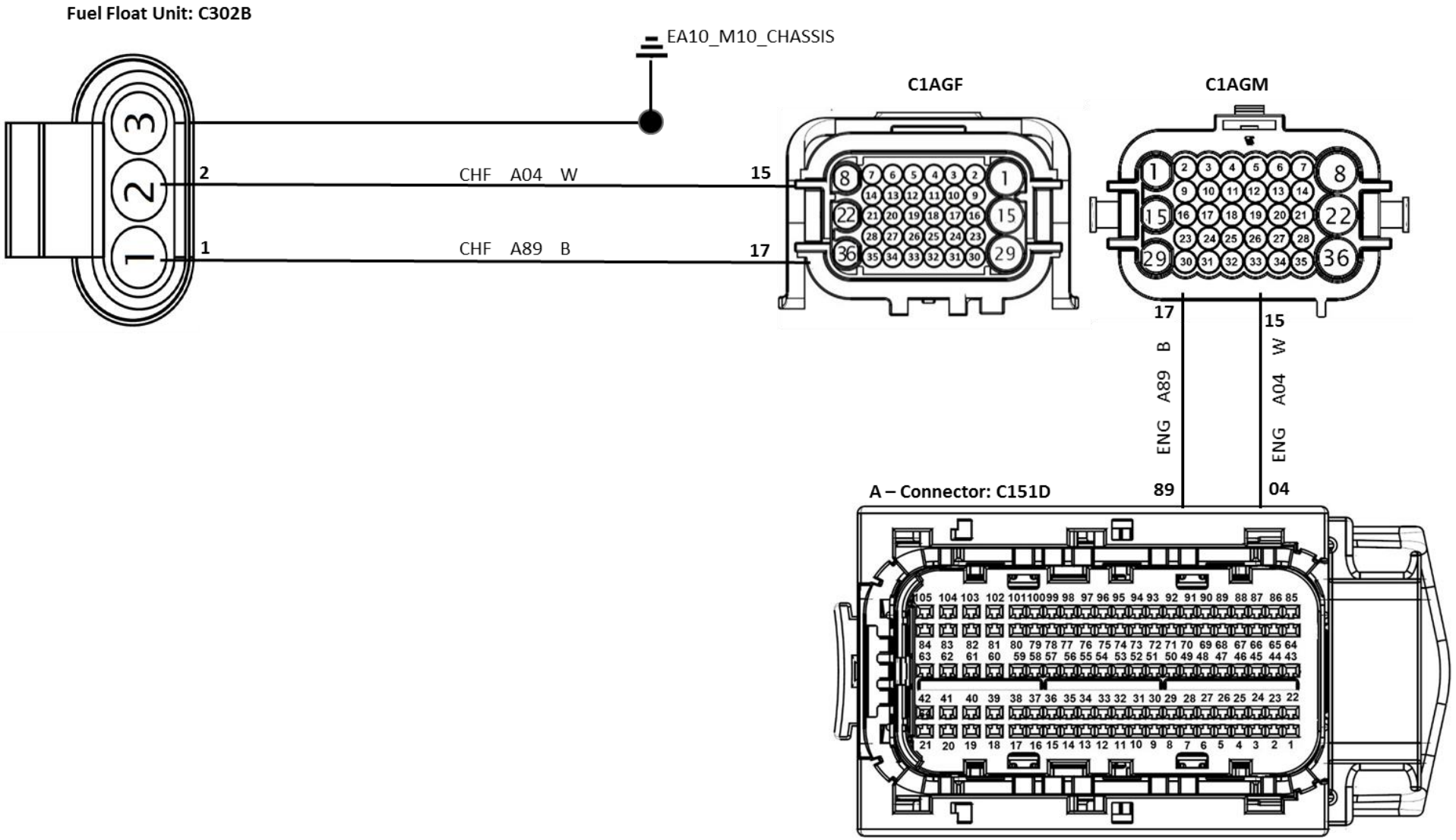
4.32 FUEL TANK FLOAT UNIT

Location: On Fuel Tank

Function:

To indicate the fuel level in the fuel tank to ECU. ECU will in turn send a corresponding signal to Fuel Gauge in the cluster for display**.**

4.32.1 Circuit Diagram: Fuel Tank Float Unit

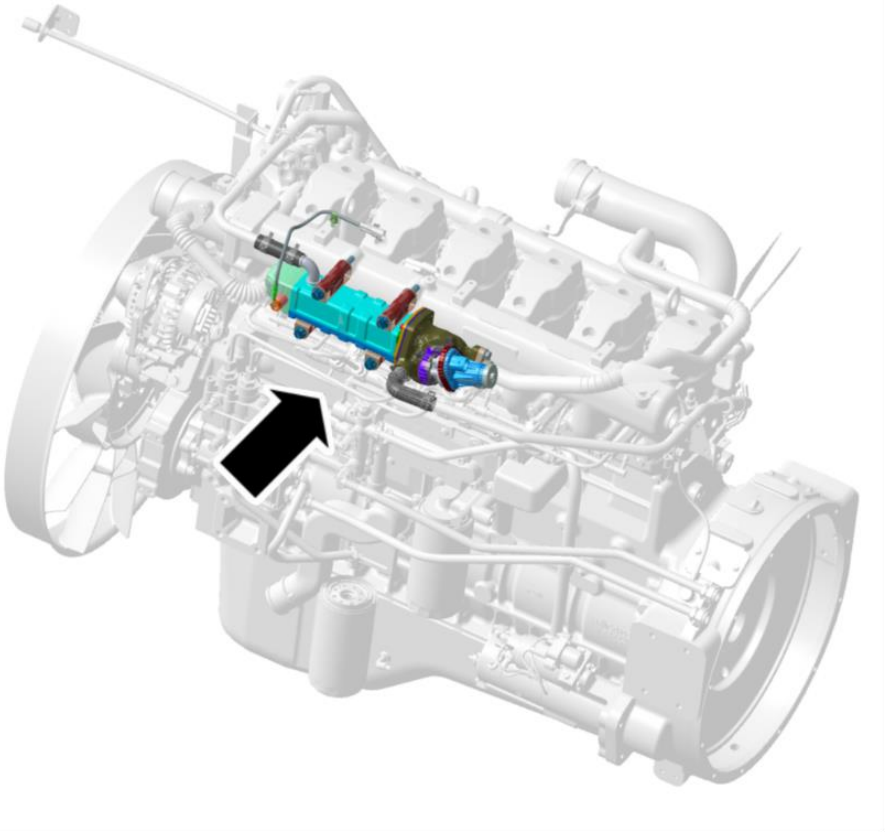


4.32.2 P-code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0463	Fuel Level Sensor Value above upper limit			Open Circuit - Pin 1 on Fuel Level sensor to Pin A89 on ECU	Continuity - Pin 1 to Pin A89	If no continuity - Check & replace affected harness 1. Chassis Front (Fuel Level Sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front, Engine harness	x	√	x	x	x	x	x
					Open Circuit - Pin 2 on Fuel Level sensor to Pin A04 on ECU	Continuity - Pin 2 to Pin A04	If no continuity - Check & replace affected harness 1. Chassis Front (Fuel Level Sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front, Engine harness							
					Fuel Level Sensor Faulty	Fuel Float Unit	Replace Fuel Float Unit							
					Fuel Level Sensor wiring Faulty	Fuel Level Sensor wiring of Chassis Front, Engine Harness - Open, Ground, Short (**Pin 1 Short to supply / battery)** circuit	Check & replace affected harness. 1. Chassis Front (Fuel level sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front, Engine harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P0462	Fuel Level Sensor Value Below Lower Limit			Ground Circuit - Pin 1 on Fuel Level sensor short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. Chassis Front (Fuel level sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front, Engine harness	x	√	x	x	x	x	x
					Short Circuit - Pin 1 & Pin 2 on Fuel Level sensor short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. Chassis Front (Fuel level sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front, Engine harness							
					Fuel Level Sensor Faulty	Fuel Float Unit	Replace Fuel Float Unit							
					Fuel Level Sensor wiring Faulty	Fuel Level Sensor wiring of Chassis Front, Engine Harness - Open, Ground, Short circuit	Check & replace affected harness. 1. Chassis Front (Fuel level sensor to C1AGF connector) 2. Engine (C1AGM to ECU A Connector) 3. Chassis Front, Engine harness							

4.33 Electronic EGR Valve

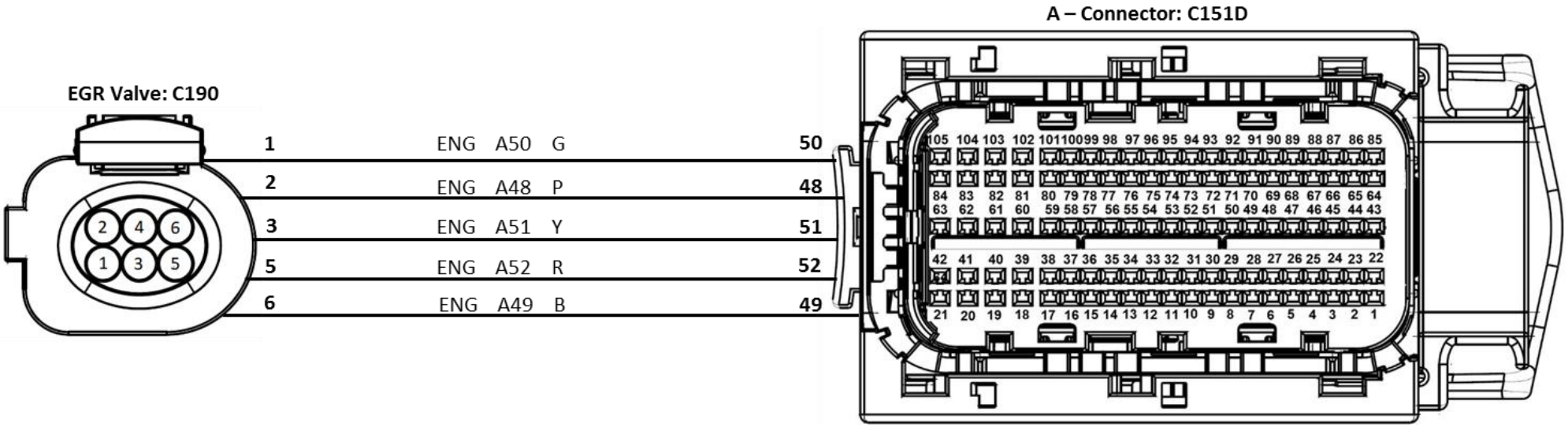


Location: On the EGR Cooler (Intake System Side)

Function:

- The electronic EGR (Electric-Exhaust Gas Recirculation) valve reduces the NOx emission level by recirculating some of the exhaust gas to the intake system. The EGR valve is a spring-loaded poppet valve, that is normally closed.
- The Electronic EGR valve is ECU controlled using a motor to actuate the EGR valve position. It also consists of an EGR valve position sensor which informs the ECU of the EGR valve position.
- The EGR valve is electronically controlled directly by the ECU which ensures the recirculation of exhaust gases whenever required.

4.33.1 Circuit Diagram: Electronic EGR Valve



Note:

1. Every time the ignition is switched off after engine operation, the ECU triggers a signal for EGR valve cleaning by operating the valve followed by learning of EGR position sensor. ECU sends a request signal to EGR Valve to close & open. During this time, the voltage signal corresponding to the open position is monitored & stored in the ECU. The ECU compares the last stored value with the value stored from previous driving cycle. This movement of EGR can be observed (after removing the dust cover) physically for verification.
2. If EGR valve is replaced, then EGR Valve Actuator Learning Process needs to be carried out after replacement.

4.33.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P1406	EGR Valve sensor signal above upper limit	1	P3BA9 - Nox Exceedance – Nox Control Monitoring System	Open Circuit - Pin 1 on EGR to Pin A50 on ECU	Continuity - Pin 1 to Pin A50	If no continuity - Replace Engine Harness	√	√	x	√	√	√	x
					Open Circuit - Pin 3 on EGR to Pin A51 on ECU	Continuity - Pin 3 to Pin A51	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 5 on EGR to Pin A52 on ECU	Continuity - Pin 5 to Pin A52	If no continuity - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit to Battery: 1. Pin 1 to Supply or Battery Positive 2. Pin 3 to Supply or Battery Positive 3. Pin 5 to Supply or Battery Positive	Continuity between: 1. Pin 1 to Supply or Battery Positive 2. Pin 3 to Supply or Battery Positive 3. Pin 5 to Supply or Battery Positive	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 3 & Pin 5 on EGR short circuit with each other / Body Ground	Continuity - Pin 3 to Pin 5	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
2	P1405	EGR Valve sensor signal below lower limit	1	P3BA9- NOx Exceedance – NOx Control Monitoring System	Ground Circuit - Pin 3 / Pin 5 on EGR short circuit to ground.	Continuity - Pin 3 / Pin 5 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	√	√	√	x
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
					Open Circuit - Pin 1 on EGR to Pin A50 on ECU	Continuity - Pin 1 to Pin A50	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 3 on EGR to Pin A51 on ECU	Continuity - Pin 3 to Pin A51	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 5 on EGR to Pin A52 on ECU	Continuity - Pin 5 to Pin A52	If no continuity - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
			2	P1100 - HFM Sensor signal open load / Signal line short to supply line P04A9 - ETV Position Sensor Signal above upper limit P3BA9 - Nox Exceedance – Nox Control Monitoring System	Open Circuit - Pin 5 on EGR to Pin A52 on ECU	Continuity - Pin 5 to Pin A52	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 1 on EGR to Pin A50 on ECU	Continuity - Pin 1 to Pin A50	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 3 on EGR to Pin A51 on ECU	Continuity - Pin 3 to Pin A51	If no continuity - Replace Engine Harness							
					Ground Circuit: 1. Pin 3 Short circuit to ground 2. Pin 5 Short circuit to ground	Continuity: 1. Pin 3 to Body Ground / Battery Negative 2. Pin 5 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement	Replace EGR Valve Assembly Perform **"EGR Actuator Learning**							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						of component for verification	**Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
3	P1403	Supply To EGR -Open load	1	P3BA9- NOx Exceedance – NOx Control Monitoring System	Open Circuit - Pin 2 on EGR to Pin A48 on ECU	Continuity - Pin 2 to Pin A48	If no continuity - Replace Engine Harness	√	√	x	x	√	x	x
					Open Circuit - Pin 6 on EGR to Pin A49 on ECU	Continuity - Pin 6 to Pin A49	If no continuity - Replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					Short circuit: Between Pins 2 & 6. Pins 2 / 3 / 6 short circuit to battery	Continuity between Pins 2 & 6. Continuity – pins 2 / 3 / 6 to battery	If continuity is present - Replace Engine Harness							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit Voltage between Pins 1 & 5 Should be = 5V	Replace Engine harness							
					H-Bridge circuit inside ECU Faulty ECU Pins A48, A49, A50, A51, A52 damaged/bent	ECU	Replace ECU							
4	P0408	Excessive Current Supply to EGR Valve			EGR Valve Faulty	EGR Valve – Note: Perform EGR Actuator Test before & After replacement of component for verification.	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic	√	√	x	x	x	x	X

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
5	P0490	EGR valve short circuit to battery			Open Circuit - Pin 2 on EGR to Pin A48 on ECU	Continuity - Pin 2 to Pin A48	If no continuity - Replace Engine Harness	√	√	x	x	√	x	X
					Short Circuit - Pin 2 & Pin 6 on EGR short circuit with each other	Continuity - Pin 2 to Pin 6	If continuity is present - Replace Engine Harness							
					Short Circuit – Pin 2 to Supply / Battery Positive	Continuity – Pin 2 to Supply / Battery Supply	If continuity is present - Replace Engine Harness							
					Short Circuit – Pin 5 to Supply / Battery Positive	Continuity – Pin 5 to Supply / Battery Supply	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					Short Circuit - Pin 2 & Pin 5 on EGR short circuit with each other	Continuity - Pin 2 to Pin 5	If continuity is present - Replace Engine Harness							
					Short Circuit - Pin 6 & Pin 5 on EGR short circuit with each other	Continuity - Pin 6 to Pin 5	If continuity is present - Replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
6	P045D	EGR valve short circuit to battery			Short Circuit - Pin 2 & Pin 5 on EGR short circuit with each other	Continuity - Pin 2 to Pin 5	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Short Circuit - Pin 6 & Pin 5 on EGR short circuit with each other	Continuity - Pin 6 to Pin 5	If continuity is present - Replace Engine Harness							
					Open Circuit - Pin 6 on EGR to Pin A49 on ECU	Continuity - Pin 6 to Pin A49	If no continuity - Replace Engine Harness							
					Short Circuit - Pin 2 & Pin 6 on EGR short circuit with each other	Continuity - Pin 2 to Pin 6	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 2 on EGR short circuit to ground.	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 5 on EGR short circuit to ground.	Continuity - Pin 5 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
7	P0409	EGR valve short circuit to battery			Short Circuit - Pin 2 & Pin 5 on EGR short circuit with each other	Continuity - Pin 2 to Pin 5	If continuity is present - Replace Engine Harness	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Short Circuit - Pin 6 & Pin 5 on EGR short circuit with each other	Continuity - Pin 6 to Pin 5	If continuity is present - Replace Engine Harness							
					Open Circuit - Pin 2 on EGR to Pin A48 on ECU	Continuity - Pin 2 to Pin A94	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 6 on EGR to Pin A49 on ECU	Continuity - Pin 6 to Pin A90	If no continuity - Replace Engine Harness							
					Short Circuit - Pin 2 & Pin 6 on EGR short circuit with each other	Continuity - Pin 2 to Pin 6	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 2 on EGR short circuit to ground.	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 6 on EGR short circuit to ground.	Continuity - Pin 6 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 5 on EGR short circuit to ground.	Continuity - Pin 5 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
8	P1489	EGR valve short circuit to ground			Ground Circuit - Pin 2 on EGR short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Ground Circuit - Pin 6 on EGR short circuit to ground	Continuity - Pin 6 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Open Circuit - Pin 2 on EGR to Pin A94 on ECU	Continuity - Pin 2 to Pin A94	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 6 on EGR to Pin A90 on ECU	Continuity - Pin 6 to Pin A90	If no continuity - Replace Engine Harness							
					Short Circuit - Pin 2 & Pin 6 on EGR short circuit with each other	Continuity - Pin 2 to Pin 6	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 5 on EGR short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit`	Replace Engine harness							
9	P045C	EGR valve short circuit to ground			Ground Circuit - Pin 2 on EGR short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness	√	√	x	x	√	x	x
					Ground Circuit - Pin 6 on EGR short circuit to ground	Continuity - Pin 6 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit - Pin 2 on EGR to Pin A48 on ECU	Continuity - Pin 2 to Pin A94	If no continuity - Replace Engine Harness							
					Open Circuit - Pin 6 on EGR to Pin A49 on ECU	Continuity - Pin 6 to Pin A90	If no continuity - Replace Engine Harness							
					Short Circuit - Pin 2 & Pin 6 on EGR short circuit with each other	Continuity - Pin 2 to Pin 6	If continuity is present - Replace Engine Harness							
					Ground Circuit - Pin 5 on EGR short circuit to ground.	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Replace Engine Harness							
					Voltage error – Between Pin 5 & Pin 1	Voltage between Pin 5 & Pin 1 should be = 5V	If voltage is not within specification, replace Engine Harness							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
10	P0402	EGR to air mass flow Maximum deviation			HFM Sensor related error.	Check HFM Value in Diagnostic Tool: HFM Sensor - Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator	If measured value is less, check & rectify restrictions / leakages in Intake system / Replace HFM sensor & confirm.	√	x	x	x	√	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.								
					HFM Sensor orientation not correct	HFM sensor orientation is not correct	Properly orient the HFM sensor							
					EGR Valve Faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					ETV faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					DPF Clogged	Cluster indications for regeneration / Delta P Sensor Value from Diagnostics	Carryout DPF regeneration as indicated in cluster / Replace DPF							
					SCR Chocked Due to contaminated Ad Blue or Dosing module Faulty	Check SCR & Ad Blue quality by using Refractometer	Replace SCR and Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests. Flush the ad Blue & refill fresh Ad Blue.							
					High Back Pressure in the Exhaust System	Restriction / Blockage in the exhaust	Rectify leakages / blockages							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Intake System: Air filter to Engine (Restrictions/Leakages)	Intake System	Rectify / Replace affected components							
					Air Filter Clogged	Air Filter	Replace Air Filter							
					ETV faulty	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
11	P0401	EGR to air mass flow Minimum deviation			HFM Sensor related error.	Check HFM Value in Diagnostic Tool: HFM Sensor - Approximate Reference Values: At High Idle: 740 to 850 Kg/Hr Procedure to measure: 1. Maintain 1500 RPM till T6 values reaches 300 Deg Cel 2. Slowly increase the RPM to high idle. Bring RPM to idle by releasing accelerator pedal. Again, increase the RPM to high idle. Repeat this for 5 times. 3. Record the value of HFM in the 5th time when the RPM reaches high idle.	If measured value is less, check & rectify restrictions / leakages in Intake system / Replace HFM sensor & confirm.	√	x	x	x	√	x	x
					HFM Sensor orientation not correct	HFM sensor orientation is not correct	Properly orient the HFM sensor							
					EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							tool after replacement							
					Air Filter Clogged	Air Filter	Replace Air Filter							
					Intake System: Air filter to Engine (Restrictions/Leakages)	Intake System	Rectify / Replace affected components							
12	P2457	EGR Cooler Efficiency Low			EGR Cooler	Leakages / Scaling / Restrictions / Blockages	Clean / Rectify / Replace affected components	√	x	x	x	x	x	x
					TEGR – EGR Temp. Sensor Faulty	EGR Temp. Sensor	Replace EGR Temp. Sensor (TEGR)							
					EGR Coolant Circuit	Leakages / Restrictions / Blockages	Rectify / Replace affected components							
13	P2BA3 (Consequential P-Code)	NOx Exceedance - Incorrect EGR Flow			EGR Valve Faulty	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement	x	x	x	√	x	x	x
					EGR Exhaust gas circuit	Leakage / Restrictions / Blockages in Exhaust Manifold to EGR valve, EGE Cooler to Intake connection	Rectify / Replace affected components							
					Intake System: Air filter to Engine (Restrictions/Leakages)	Intake System	Rectify / Replace affected components							
14	P042F	EGR valve jammed in closed position			EGR Valve wiring harness faulty – Open circuit (Note: If P042E & P042F appear simultaneously, then the problem is associated with EGR wiring harness)	Check EGR wiring for open circuit: -Continuity - Pin 1 to Pin A50 -Continuity - Pin 3 to Pin A51 -Continuity - Pin 5 to Pin A52 -Continuity - Pin 2 to Pin A48 -Continuity - Pin 6 to Pin A49	If no continuity: Replace Engine Harness	√	√	x	√	√	√	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					EGR Valve wiring harness faulty (Note: If P042E & P042F appear simultaneously, then the problem is associated with EGR wiring harness)	EGR Wiring Short / Ground circuit	If continuity is present: Replace Engine Harness							
					EGR Valve Faulty Excessive dirt & sludge accumulation inside EGR	EGR Valve – Valve operation while ignition is switched off. Note: Perform EGR Actuator Test before & After replacement of component for verification EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	If valve operation is not observed - Replace EGR Valve Assembly Clean EGR Valve / Replace EGR Valve Perform **"EGR Valve Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
15	P042E	EGR valve jammed in open position			EGR Valve wiring harness faulty – Open circuit (Note: If P042E & P042F appear simultaneously, then the problem is associated with EGR wiring harness)	Check EGR wiring for open circuit: -Continuity - Pin 1 to Pin A50 -Continuity - Pin 3 to Pin A51 -Continuity - Pin 5 to Pin A52 -Continuity - Pin 2 to Pin A48 -Continuity - Pin 6 to Pin A49	If no continuity: Replace Engine Harness	√	√	X	x	√	x	x
					EGR Valve wiring harness faulty (Note: If P042E & P042F appear simultaneously, then the problem is associated with EGR wiring harness)	EGR Wiring Short / Ground circuit	If continuity is present: Replace Engine Harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					EGR Valve Faulty	EGR Valve – Valve operation while ignition is switched off. Note: Perform EGR Actuator Test before & After replacement of component for verification	If valve operation is not observed - Replace EGR Valve Assembly							
					Excessive dirt & sludge accumulation inside EGR	EGR Valve Note: Perform EGR Actuator Test before & After replacement of component for verification	Clean EGR Valve / Replace EGR Valve Perform **"EGR Valve Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
16	P0403	EGR valve Supply - undervoltage			Battery Voltage fluctuation	Battery Voltage / Charging circuit wiring / Alternator Charging	Check & replace affected component	√	√	x	x	x	x	x
					EGR Valve Faulty	EGR Valve – Valve operation while ignition is switched off	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					EGR Valve wiring faulty	EGR Valve wiring - Open, Ground, Short circuit	Replace Engine harness							
17	P1404	EGR Valve not operating as desired			EGR Valve Faulty	EGR Valve – Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.	√	√	x	x	x	x	X

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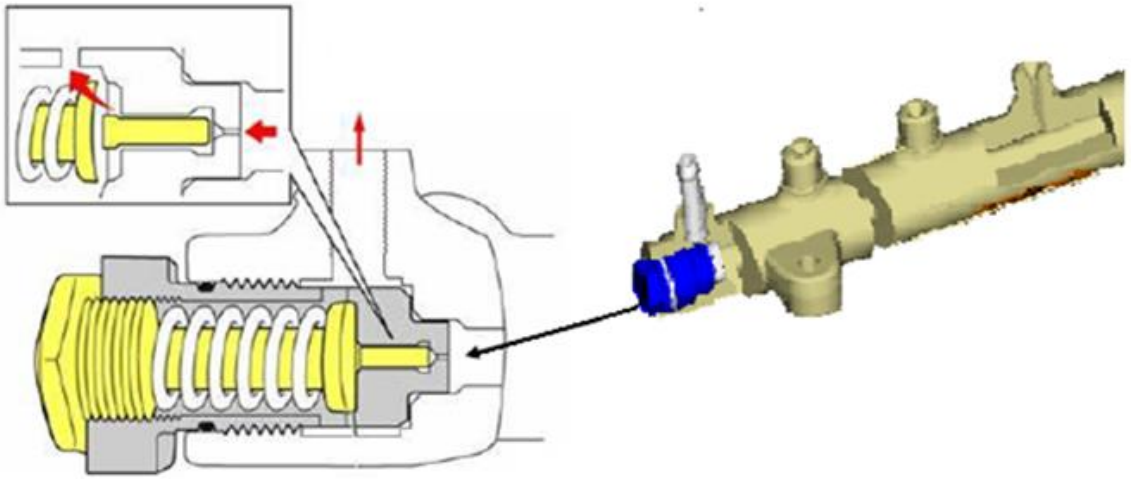
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							If sludge deposits are present, clean EGR – Refit & verify							
18	P0404	EGR Valve not operating as desired			EGR Valve Faulty	EGR Valve – Note: Perform EGR Actuator Test before & After replacement of component for verification	Replace EGR Valve Assembly Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement. If sludge deposits are present, clean EGR – Refit & Verify	√	√	x	x	x	x	X

Torque Reduction: 1. √ => Torque Reduced by 25% - Immediate attention required

2. √ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.34 Pressure Relief Valve (PRV)



Location: On Common Rail

Function:

- An/ integral part of common rail, PRV is a mechanical pressure relief valve is fitted to end of the common rail.
- Its function is to relieve rail pressure if abnormally high system pressure is generated.
- If excessive fuel pressure is generated, the valve opens a fuel return port.
- Excess fuel is relieved back to the fuel tank.

Note: PRV count & time resetting using diagnostic tool should be done only if the PRV count exceeds **50 count** & or PRV time exceeds **300 mins**. In such case the PRV count resetting needs to be done after replacing the common rail assembly with a new one.

4.34.1 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0194	PRV Open Error			IMV Connector Improper seating	IMV Connector seating	Ensure proper seating of IMV connector	√	√	x	x	√	x	x
					Rail Pressure Sensor Connector Improper seating	Rail Pressure Sensor connector seating	Ensure proper seating of Rail pressure sensor connector							
					IMV Wiring faulty	Rail pressure sensor wiring	Replace engine harness							
					Rail pressure sensor wiring faulty	Return line for block / choke / bend	Replace engine harness							

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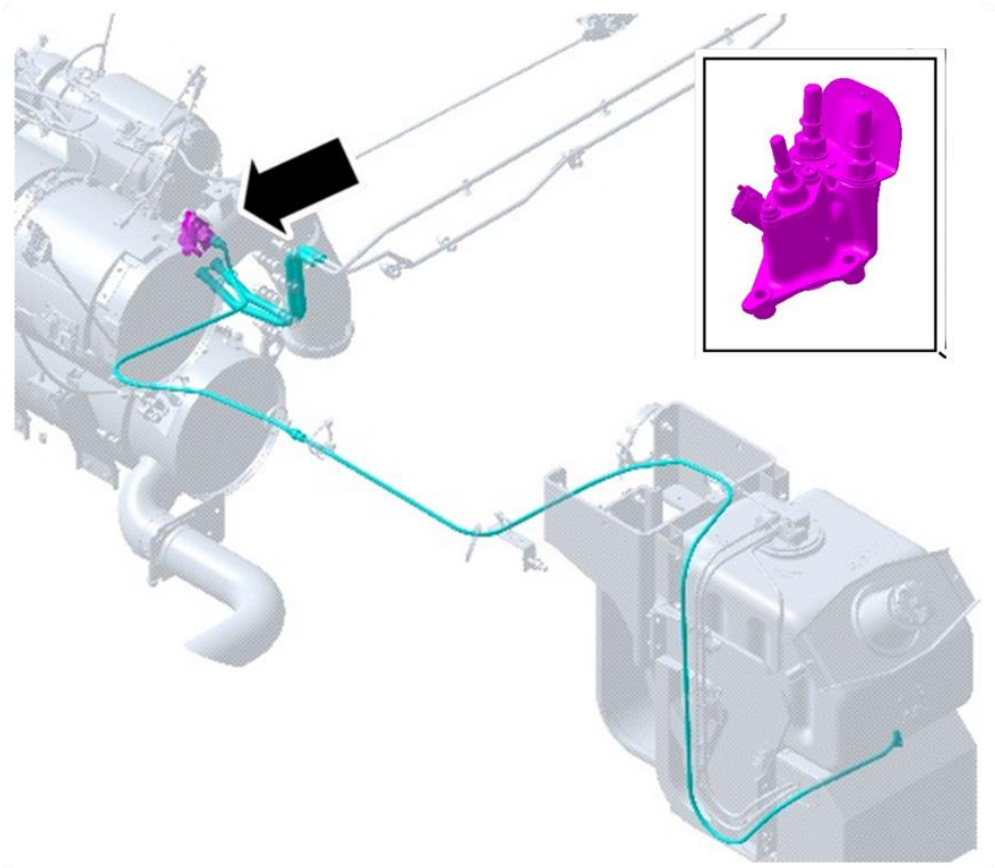
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					IMV Faulty	H.P Pump	Replace H.P Pump							
					Rail Pressure sensor faulty	Common rail assembly	Replace Common Rail Assembly							
					Fuel Return Line blocked / choked / bent	Return line for block / choke / bend	Rectify block / choke / bend / Replace affected parts							
					ECU Supply/Ground wire, Ground points in vehicle faulty	ECU Supply/Ground wire, Ground points	Rectify connections / Replace affected components							
					Electrical / Fuel Line related / Low Fuel Level in Tank	Refer PRV Check sheet with following topic: **"Points to be checked in case of PRV errors"**	Rectify as per observations from check sheet							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

4.35 AD BLUE DOSING MODULE

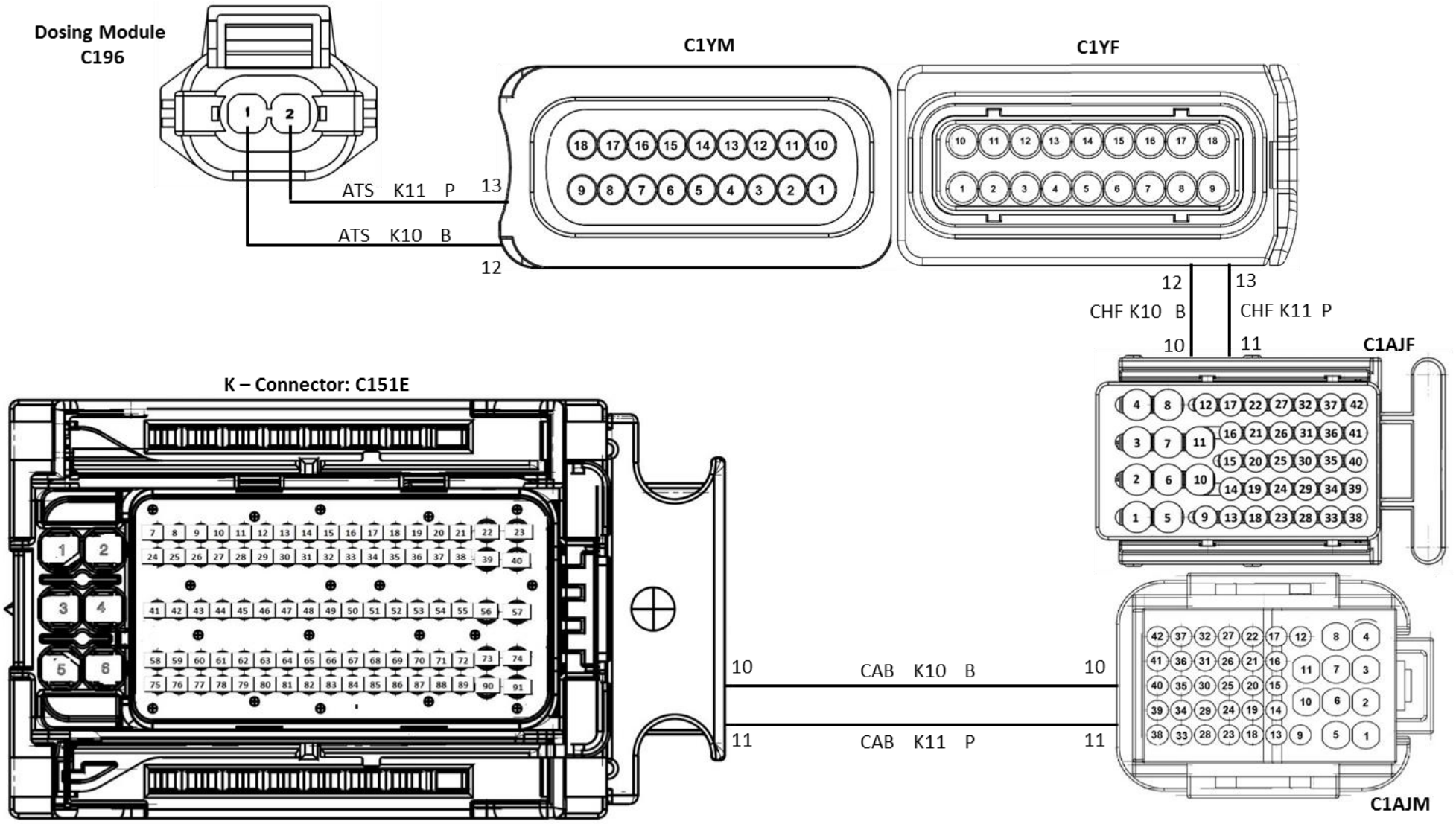


Location: On the AdBlue Mixer

Function:

- Dosing Module is controlled by the ECU to inject the necessary quantity of ad blue to reduce NOx.

4.35.1 Circuit Diagram: Ad Blue Dosing Module



Note:
Whenever any DTC w.r.t Dosing Module is triggered, Dosing Module Actuator Test & Routine Test need to be performed before & after replacement of affected component.

4.35.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2047	Dosing Valve Open Load	1	P20FE00 - Excessive NOx detected due to dosing interruption due to system tampering	Open Circuit - Pin 1 on Dosing Module to Pin K10 on ECU	Continuity - Pin 1 to Pin K10	If no continuity - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Open Circuit - Pin 2 on Dosing Module to Pin K11 on ECU	Continuity - Pin 2 to Pin K11	If no continuity - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Dosing Module Wiring Faulty	Dosing Module Wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
2	P2248	Dosing Valve Short to Ground			Ground Circuit - Pin 1 on Dosing Module short circuit to ground	Continuity - Pin 1 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Ground Circuit - Pin 2 on Dosing Module short circuit to ground	Continuity - Pin 2 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Short Circuit - Pin 1 & Pin 2 on Dosing Module short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Dosing Module Wiring Faulty	Dosing Module Wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
3	P2048	Dosing valve not opening as required			Blockages / Restrictions in Dosing Module	Dosing Module - Physical Inspection Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Battery related errors	Check & rectify Dosing Module Supply	Rectify / Replace affected components.							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
4	P204F	Dosing Valve Short to Ground			Faulty Dosing Module / Dosing Module Leaking	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Block / Leakages / Restrictions in Ad Blue Lines	Supply Line, Filter, Backflow line	Rectify Block / leakage / Restrictions							
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Dosing Module Wiring Faulty	Dosing Module Wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
5	P2049	Dosing Valve Short to Supply			Short Circuit - Pin 1 & Pin 2 on Dosing Module short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Dosing Module internal short	Dosing Module Note: Perform Actuator & Routine Tests for Dosing	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Module – Before & After Replacement								
					Short Circuit - Pin 1 on Dosing Module short circuit with Supply / Battery +	Continuity - Pin 1 to K01 / Battery +	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Short Circuit - Pin 2 on Dosing Module short circuit with Supply / Battery +	Continuity - Pin 2 to K01 / Battery +	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Dosing Module Wiring Faulty	Dosing Module Wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector)							

CONTINUED IN PAGE 350

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							4. ATS, Chassis Front, Cabin harness							
6	P2046	Dosing Valve Short Circuit			Short Circuit - Pin 1 & Pin 2 on Dosing Module short circuit with each other	Continuity - Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness	√	√	x	√	√	√	x
					Open Circuit - Pin 1 on DM to Pin K 10 on ECU & Pin 2 on DM to Pin K11 on ECU	Continuity - Pin 1 to K10 & Pin 2 to Pin K11	If no continuity - Check & replace affected harness 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
					Dosing Module internal short	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Dosing Module Wiring Faulty	Dosing Module Wiring of ATS, Chassis Front, Cabin harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Dosing Module to C1YM connector) 2. Chassis Front (C1YF to C1AJF connector) 3. Cabin (C1AJM to ECU K Connector) 4. ATS, Chassis Front, Cabin harness							
7	P208E	Ad Blue Injector Stuck Closed			Ad Blue Circuit	Tank Breather, Strainer, Pump, Lines, Filter, Dosing Module	Rectify / Replace affected components	x	x	x	x	x	x	x
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
8	P218E	Ad Blue Injector Stuck Closed			Blockages / Restrictions in Dosing Module	Dosing Module - Physical Inspection Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.	√	√	x	√	√	√	x
					Faulty Dosing Module	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Battery related errors	Check & rectify	Rectify / Replace affected components							
9	P204E	Ad Blue Injector Stuck Closed			Ad Blue Backflow line	Blockages / Restrictions	Clean / Rectify / Replace affected parts	√	√	x	√	√	√	x
					Ad Blue Pressure Sensor Faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							

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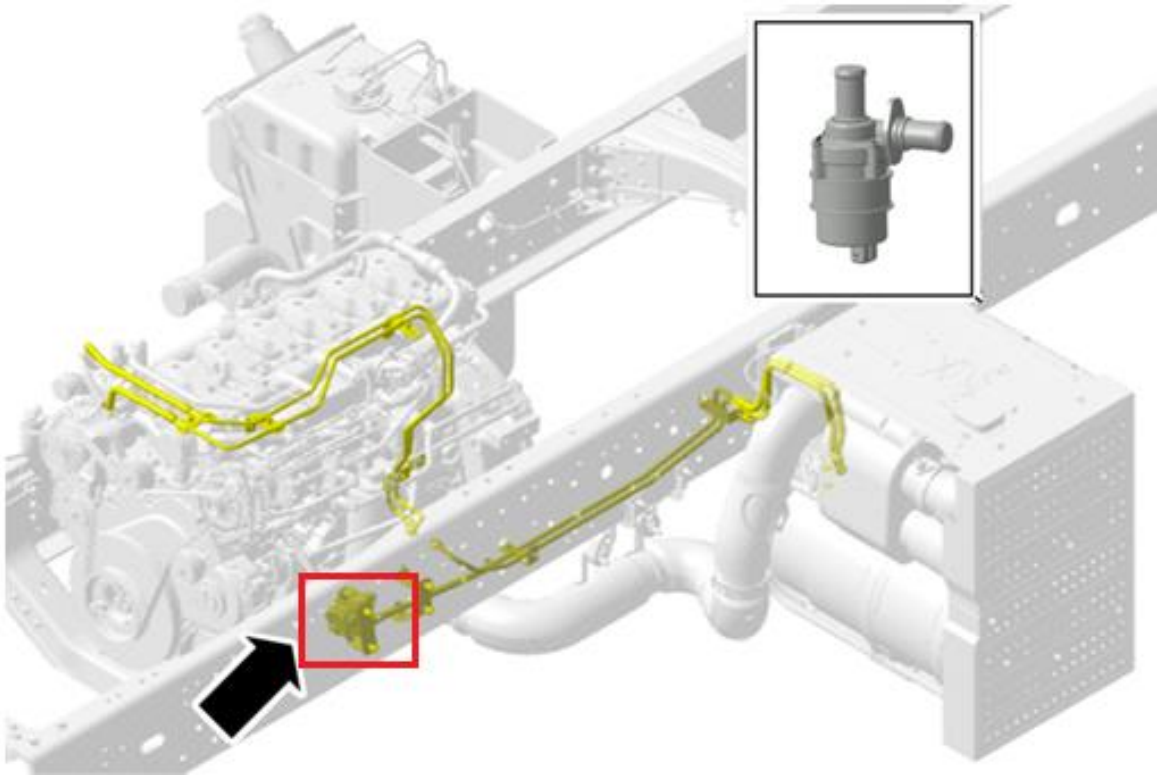
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Supply Module faulty	Supply Module Note: Perform Actuator & Routine Tests for Supply Module – Before & After Replacement	Replace Supply Module Assembly & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Block / Restriction / Leakage in ad blue Suction, Return & Delivery lines	Ad Blue Lines - Suction, Return & Delivery lines	Rectify Block / Restriction / Leakages / Replace affected parts							

Torque Reduction: √ => Torque Reduction by 25% - Prioritized Attention of the vehicle required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

4.36 COOLANT PUMP

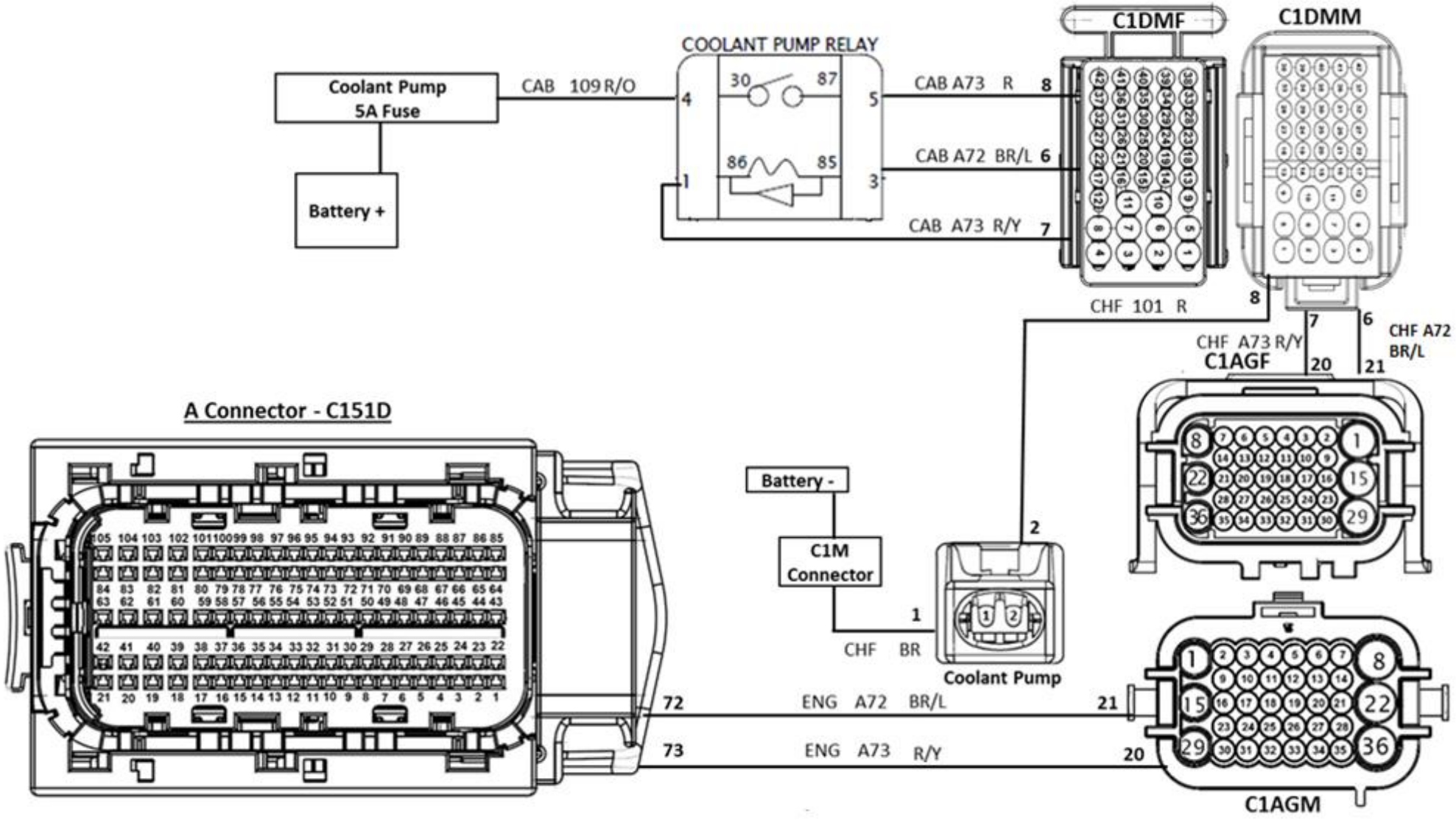


Location: On LH Long Member (Near H.P Pump)

Function:

The coolant pump is an electrically operated pump and is controlled by the ECU. It helps in supplying coolant to Dosing Module for cooling. Once the ignition is switched off, ECU operates the coolant pump for a maximum of 15 minutes.

4.36.1 Circuit Diagram: Coolant Pump



Note: After the ignition is switched off, depending on the T6 temperature value, ECU operates the coolant pump for a maximum of 15 minutes during which the battery should not be disconnected through any means. Coolant pump functioning needs to be checked only after ignition off.

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P257A	Electric water pump relay open			Coolant Pump Fuse Blown / Faulty	Coolant Pump Fuse – 5A Fuse	Replace Fuse if Blown / Faulty	x	√	x	x	x	x	x
					Coolant Pump Relay Faulty	Coolant Pump Relay – Check using test lamp method	Replace Coolant Pump Relay if Faulty							
					Coolant Pump Faulty	Coolant Pump – Check physical working	Replace Coolant Pump if Faulty							
					Wiring Harness Faulty	Cabin / Chassis Front / Engine Harness – open Circuit. Check Continuity 1. Coolant Pump Fuse to Coolant Relay Pin 30 (Cabin Harness) 2. Coolant Pump Relay Pin 87 to Pin 8 on C1DMF Connector (Cabin Harness) 3. Pin 8 on C1DMM Connector to Coolant Pump Pin 2 (Chassis Front Harness) 4. Coolant Pump Pin 1 to C1M connector (Chassis Front Harness 5. C1M connector to Battery Negative 6. Coolant Pump Relay Pin 87 to Pin 8 on C1DMF connector 7. Coolant Pump Relay Pin 85 to Pin 6 on C1DMF connector 8. Pin 6 on C1DMM connector to Pin 21 on C1AGF Connector 9. Pin 21 on C1AGM connector to ECU Pin A72 10. Pin 1 on Coolant Pump Relay to Pin 7 on C1DMF connector	If continuity is not present: Check & Replace affected harness – Cabin / Chassis Front / Engine Harness						
2	P257B	Electric water pump			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	X	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
		relay over temperature detected			Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Open / Ground / Short Circuit	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							
3	P257C	Electric water pump relay short circuit to battery			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	X	x	x
					Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Short Circuit to Supply or Battery Positive	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							
4	P257D	Electric water pump relay short circuit to ground			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	x	x	X
					Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Ground Circuit to Body Ground or Battery Negative	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							
5	P258A	Electric water pump open load Error detected			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	x	x	x
					Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Ground Circuit to Body Ground or Battery Negative	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							
6	P258B	Electric water pump over temperature detected			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	x	x	x
					Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Ground Circuit to Body Ground or Battery Negative	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							

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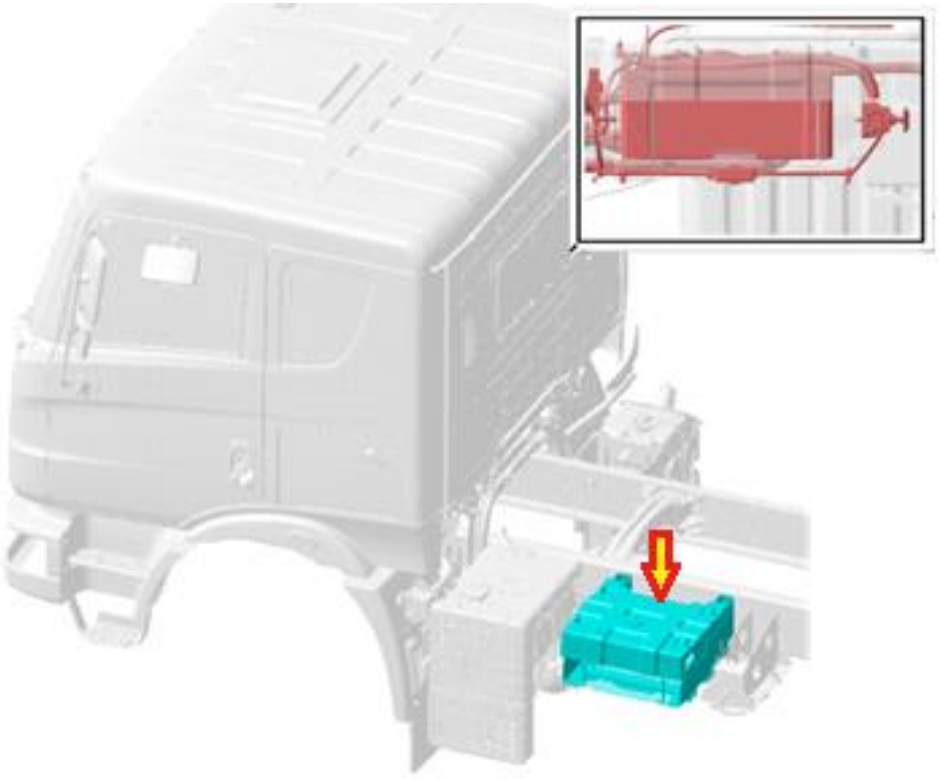
7	P258C	Electric water pump short circuit to battery			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	x	x	x
					Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Ground Circuit to Body Ground or Battery Negative	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							
8	P258D	Electric water pump short circuit to ground			Coolant Pump Relay Faulty	Coolant Pump Relay	Replace Coolant Pump Relay	x	√	x	x	x	x	x
					Coolant Pump Faulty	Coolant Pump	Replace Coolant Pump							
					Coolant Pump Wiring Faulty	Coolant Pump wiring of Cabin / Chassis Front / Engine harness for – Ground Circuit to Body Ground or Battery Negative	Check & Replace affected harness – Cabin / Chassis Front / Engine Harness							

4.37 BATTERY



Location: On LH Long member (behind ATS assembly)

Function:

The Electronic Control Unit continuously monitors the battery voltage for its proper functioning. ECU & various other components use battery supply to function.

4.37.1 P-codes

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0563	High Battery Voltage			Alternator faulty - Check Battery Voltage	Alternator output / Battery	Replace alternator if output is not as per specification / Replace Battery if faulty	√	√	x	x	x	x	x
					Starter to alternator wire faulty	Open, Ground, Short circuit	Replace starter to alternator wire - R/G wire							
					Alternator ground wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator ground wire / Tighten in case of loose							
					Alternator to Battery wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator to battery wire / Tighten in case of loose							
					Modifications to battery cable length	Battery Cable length	Re-route the battery cable / wire as per specification							
					Battery Charge Low	Specific Gravity	Top up distilled water (wherever applicable) & Recharge battery if the Specific gravity is less than 1.265							
					Battery / Cable / Terminals Faulty	Battery Cable / Wiring damaged / Terminals Broken / Loose / Battery Rating not as per specification	If complaint observed – Replace affected component / Battery							
2	P0562	Low Battery Voltage			Alternator faulty - Check Battery Voltage	Alternator output / Battery Specification	Replace alternator if output is not as per specification / Replace Battery if faulty	√	√	x	x	x	x	x
					Starter to alternator wire faulty	Open, Ground, Short circuit	Replace starter to alternator wire - R/G wire							
					Alternator ground wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator ground wire / Tighten in case of loose							
					Alternator to Battery wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator to battery wire / Tighten in case of loose							
					Modifications to battery cable length	Battery Cable length	Re-route the battery cable / wire as per specification							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Battery Charge Low	Specific Gravity	Top up distilled water (wherever applicable) & Recharge battery if the Specific gravity is less than 1.265							
					Battery / Cable / Terminals Faulty	Battery Cable / Wiring damaged / Terminals Broken / Loose / Battery Rating not as per specification	If complaint observed – Replace affected component / Battery							
3	P0561	Battery voltage higher than threshold			Alternator / Charging System failure	Alternator output	Replace alternator if output is not as per specification	√	√	x	x	x	x	x
					Battery Supply Fluctuation / improper to ECU	Check supply in ECU Pins K01, K03 & K05 from battery positive, Check ECU Fuses	Replace affected harness / Install fuse of proper ratings							
					Starter to alternator wire faulty	Open, Ground, Short circuit	Replace starter to alternator wire - R/G wire							
					Alternator ground wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator ground wire / Tighten in case of loose							
					Alternator to Battery wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator to battery wire / Tighten in case of loose							
					Battery Faulty	Battery Voltage	If complaint observed - Replace Battery							
					Battery Cables / Supply / Ground wire faulty	Battery Cables / Supply / Ground wire	Replace affected wiring							
4	P0560	Battery voltage lower than threshold			Alternator / Charging System failure	Alternator output	Replace alternator if output is not as per specification	√	√	x	x	x	x	x
					Starter to alternator wire faulty	Open, Ground, Short circuit	Replace starter to alternator wire - R/G wire							
					Alternator ground wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator ground wire / Tighten in case of loose							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Alternator to Battery wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator to battery wire / Tighten in case of loose							
					Battery Faulty	Battery Voltage	If complaint observed - Replace Battery							
					Battery Supply Fluctuation / improper to ECU	Check supply in ECU Pins K01, K03 & K05 from battery positive, Check ECU Fuses	Replace affected harness / Install fuse of proper ratings							
					Battery Cables / Supply / Ground wire faulty	Battery Cables / Supply / Ground wire	Replace affected wiring							
5	P058C	Battery Voltage is above upper limit			Alternator / Charging System failure	Alternator output	Replace alternator if output is not as per specification	X	X	X	X	X	X	X
					Starter to alternator wire faulty	Open, Ground, Short circuit	Replace starter to alternator wire - R/G wire							
					Alternator ground wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator ground wire / Tighten in case of loose							
					Alternator to Battery wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator to battery wire / Tighten in case of loose							
					Battery Faulty	Battery Voltage	If complaint observed - Replace Battery							
					Battery Supply Fluctuation / improper to ECU	Check supply in ECU Pins K01, K03 & K05 from battery positive, Check ECU Fuses	Replace affected harness / Install fuse of proper ratings							
					Battery Cables / Supply / Ground wire faulty	Battery Cables / Supply / Ground wire	Replace affected wiring							
6	P058D	Battery Voltage is			Alternator / Charging System failure	Alternator output	Replace alternator if output is not as per specification	X	X	X	X	X	X	X

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		below lower limit			Starter to alternator wire faulty	Open, Ground, Short circuit	Replace starter to alternator wire - R/G wire							
					Alternator ground wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator ground wire / Tighten in case of loose							
					Alternator to Battery wire faulty / loose connection	Open, Ground, Short circuit / Loose connection	Replace Alternator to battery wire / Tighten in case of loose							
					Battery Faulty	Battery Voltage	If complaint observed - Replace Battery							
					Battery Supply Fluctuation / improper to ECU	Check supply in ECU Pins K01, K03 & K05 from battery positive, Check ECU Fuses	Replace affected harness / Install fuse of proper ratings							
					Battery Cables / Supply / Ground wire faulty	Battery Cables / Supply / Ground wire	Replace affected wiring							

4.38 Starting Circuit

4.38.1 Function– Starter Motor

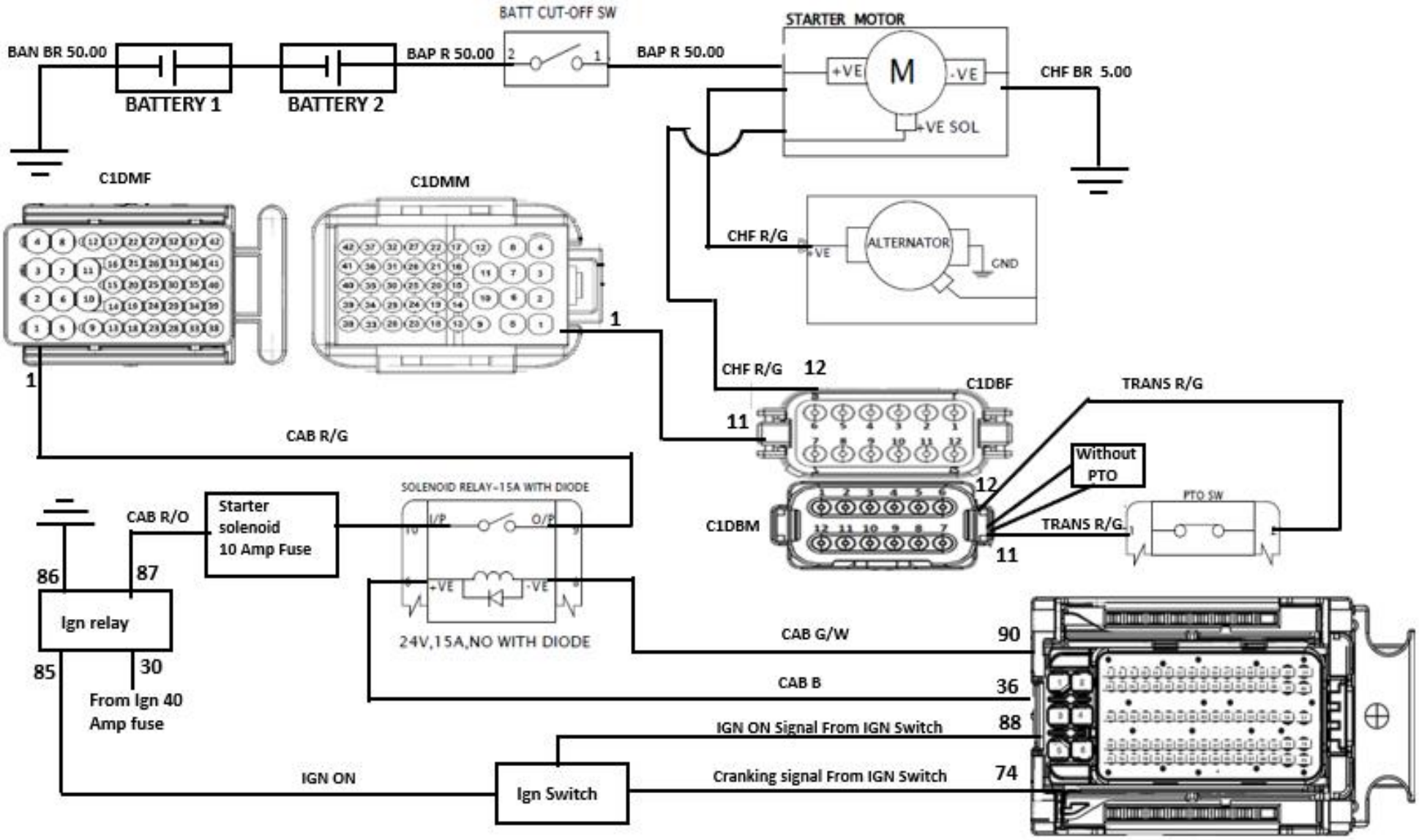
- The function of the starter motor is to start the engine. It is a DC motor with a gear reduction to drive the engine while cranking.
- When the starter switch is turned ON, the starter relay turns on the electric motor. This motor drives the starter gear ring via the pinion gear.
- Both Positive & Negative part of Starter Relay coil is controlled by ECU thereby controlling the actuation of relay.

Engine Cranking Status as displayed in Live Data of diagnostic tool:

- **Engine Not Cranking:**

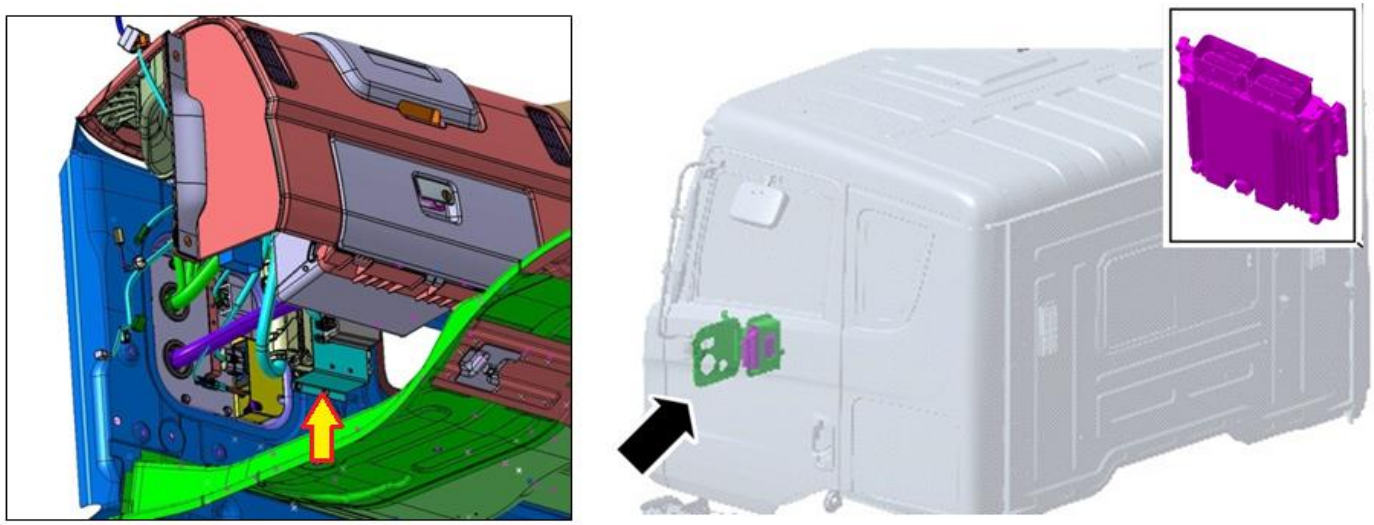
- **Engine Cranking (During Cranking):**

Circuit Diagram: Starting Circuit



1	P162E	Starter Relay Short circuit			Starter Relay wiring faulty.	Cabin Harness Short / Ground circuit	Replace Cabin Harness	X	X	X	X	X	X	X
					Starter Relay Faulty	Starter Relay – Check using test lamp method	Replace Starter Relay							
2	P1011	Starting Switch issue-long cranking			Ignition Switch Faulty	Ignition Switch	Replace Ignition Switch	X	X	X	X	X	X	X
					Ignition Switch to ECU Wire (T-50 Wire) faulty.	T-50 Wire from Ignition switch to ECU – Ground / Short Circuit	Replace Cabin Wiring							
					ECU Faulty	ECU	Replace ECU							

4.39 ECU



Location: Inside the cabin under the glovebox

4.39.1 Function

- The electronic Engine Control Unit (ECU) is the heart of the Engine Management System.
- ECU is common for Engine, ATS and DNOx related system. A single control unit monitors & controls the functions of Engine, ATS & DNOx systems to meet performance & emission standards.
- The ECU controls fuel supply, air control, fuel injection and ignition. Due to its scalability and enhanced performance, the control unit is also able to control the exhaust system to regulate the emissions of the vehicle.
- Software inside the ECU processes the incoming signals from the sensors and controls the various actuators and unit networks to operate the vehicle at optimal performance.
- The electronic controls provide a far superior precision and control over the air-fuel ratio, efficiency of combustion, ignition timing and power output.

4.39.2 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P26E9	Actuator Supply Voltage Short to Battery			Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin ECU Internal circuit failure	Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin - Open, Ground, Short Circuit ECU	Replace affected harness - Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin Replace ECU	√	√	x	x	x	x	x
2	P26E8	Actuator Supply Voltage Short to Ground			Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin ECU Internal circuit failure	Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin - Open, Ground, Short Circuit ECU	Replace affected harness - Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin Replace ECU	√	√	x	x	x	x	x
3	P062B	ECU circuit related to fuel injector defective			Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin ECU Internal circuit failure	Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin - Open, Ground, Short Circuit ECU	Replace affected harness - Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin Replace ECU	√	√	x	x	x	x	x
4	P0606	ECU Error in Drive state			ECU Internal circuit failure	ECU	Replace ECU	√	√	x	√	√	√	x
5	P0607	ECU Error in initialization state			ECU Internal circuit failure	ECU	Replace ECU	√	√	x	x	√	√	x
6	P060A	Software error			Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin	Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin - Open, Ground, Short Circuit	Replace affected harness - Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin	x	x	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Battery cut off switch operated before ECU shut off	Operator information on battery cut off switch operation	Educate driver on how to correctly use battery cut off switch							
					Software Error	ECU	Flash ECU with appropriate data set / Reset ECU							
					ECU Faulty	ECU	Replace ECU							
7	P060B	ADC Error detected during test voltage			Battery Voltage Low Battery Cut off switch operated before ECU shut down. ECU Internal circuit failure	Battery Charging circuit – Alternator output/Battery charging wire/Battery Positive & Ground Circuits to ECU Process followed by the operator as to when does he operate the battery cut off switch. ECU	Replace affected component. Educate the operator on proper process to operate the battery cut off switch. Replace ECU	X	√	X	X	X	X	1000 RPM
8	P060C	Internal Control Module Monitoring Processor Performance			Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin	Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin - Open, Ground, Short Circuit	Replace affected harness - Wiring Harness - Battery supply, ground to ECU /Chassis Front/Engine/Cabin	X	X	X	X	X	X	X
					Battery cut off switch operated before ECU shut off	Operator information on battery cut off switch operation	Educate driver on how to correctly use battery cut off switch							
					Software Error	ECU	Flash ECU with appropriate data set / Reset ECU							
					ECU Faulty	ECU	Replace ECU							
9	P2668	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
10	P2667	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
11	P2669	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
12	P1008	ECU Level-2 Monitoring			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	2200 RPM
13	P0612	ECU Level-2 Monitoring			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
14	P0611	ECU Level-2 Monitoring			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	IDLE RPM
15	P063B	ECU Power Stage Shut Off			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
16	P058A	ECU Level-2 Monitoring			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	X	X	X	X	X
17	P062C	Engine Speed difference (L1/L2) crossing the threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	2200 RPM
18	P1014	Injector energizing time more than threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	2200 RPM
19	P1015	Active injection angle deviates threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	2200 RPM
20	P1013	ZFC Injection error (Not active)			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	2200 RPM
21	P1018	POI 2 Angle deviates threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	2200 RPM

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
22	P1019	POI 3 Related quantity / angle error (Not Active)			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
23	P1080	ECU Level-2 Monitoring			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	x	x	x	x	x
24	P1081	POI 2 Quantity out of threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
25	P101B	QWC Quantity out of threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
26	P1082	RMP APP1 & RMP APP2 sensor sync error (Not Active)			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
27	P1083	Erroneous start of engine			Software Error / ECU Faulty	Starter Relay / Starter Motor / ECU	Replace – Starter Relay / Starter Motor / ECU	x	√	x	x	x	x	x
28	P061B	Energizing time above the threshold during over run			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
29	P061C	Energizing time above the threshold during cooling injection (Not Active)			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
30	P1084	Erroneous torque above the threshold			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	2200 RPM
31	P1085	SW Selected post build variant error			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	x
32	P1639	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	x

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
33	P2640	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
34	P2641	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
35	P1642	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
36	P2643	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
37	P2645	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
38	P2646	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
39	P2647	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
40	P2648	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
41	P2649	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
42	P2654	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
43	P2650	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
44	P2651	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
45	P2652	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
46	P2653	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
47	P2655	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
48	P2656	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
49	P2657	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
50	P2658	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
51	P2659	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
52	P2660	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
53	P2661	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
54	P2662	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
55	P2663	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
56	P2664	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
57	P2665	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
58	P2666	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
59	P2674	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
60	P2670	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
61	P2671	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
62	P2672	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
63	P2673	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
64	P2679	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
65	P2675	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
66	P2676	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
67	P2677	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
68	P2678	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
69	P2680	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
70	P2681	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
71	P2682	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
72	P2683	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
73	P2684	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
74	P2685	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
75	P2686	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
76	P2690	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
77	P2687	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
78	P2688	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
79	P2689	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
80	P2691	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
81	P2692	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
82	P2693	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
83	P2694	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
84	P2699	ECU Hardware Internal Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
85	P160C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
86	P161C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
87	P162C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
88	P063C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	X	√	X	X	X	X	X
89	P05F9	SAE checks for T6 Temp Sensor			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	X	X	X	X	X
90	P064C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	X	X	X	X	X
91	P065C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	X	X	X	X	X
92	P066C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	X	X	X	X	X

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
93	P067C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	x	x	x	x	x
94	P068C	ECU Failure			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	√	√	x	x	x	x	x
95	P162B	ADC Error detected during null load test pulse			Software Error / ECU Faulty	ECU	Flash ECU with appropriate data set / Reset ECU / Replace ECU	x	√	x	x	x	x	1000 RPM
96	P262B	Internal Control Module Monitoring Processor Performance			Wiring Harness faulty	Open / Ground / Short Circuit in: 1. ECU Supply: Battery Positive to ECU Pins K01, K03, K05 2. ECU Ground: Battery Negative to ECU Pins K02, K04, K06 Check all Ground points in the vehicle	If complaint is observed, replace affected harness / Correct ground points connection	x	x	x	x	x	x	x
					ECU Faulty	ECU	Reset ECU / Flash ECU with corresponding dataset / Replace ECU							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

Speed Limitation: √ => Speed Reduction to 20 Kmph - Prioritized Attention of the vehicle required

SSP Monitoring

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P06B0	Sensor Supply Voltage Error of RPS/OPS/APP2/ITV			Oil Pressure Sensor Pin 2 Short to Ground	Continuity between Pin B & Ground (Body / Battery -ve)	If continuity is present - Replace Engine harness	√	√	x	x	x	x	x
					Oil Pressure Sensor faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							
					Rail Pressure Sensor Pin 3 wire short to ground	Check continuity between Pin 3 & Body ground / Battery negative	If continuity is present - Replace Engine harness							
					Rail Pressure Sensor Pin 1 & Pin 3 wire short with each other	Check Continuity between Pin 1 & Pin 3	If continuity is present - Replace Engine harness							
					Rail Pressure Sensor faulty	Rail Pressure Sensor	Replace common rail assembly							
					APP2 Sensor wires Short to Ground	Check continuity between AAP2 Sensor pins & Body ground / Battery negative	If continuity is present - Replace Engine harness							
					APP2 Sensor wires short circuit with each other	Check Continuity between all pins of APP2 Sensor	If continuity is present - Replace Engine harness							
					APP2 Sensor faulty	APP Sensor	Replace APP Sensor							
					Rail Pressure / Oil Pressure Sensor wiring faulty	Rail Pressure Sensor / Oil Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					APP2 Sensor wiring faulty	APP2 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Boost Pressure Sensor wiring faulty	Boost Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					Boost Pressure Sensor faulty	Boost Pressure Sensor	Replace Boost Pressure Sensor							
2	P06B2	Sensor Supply Over Voltage of RPS/OPS/APP2/ITV			Oil Pressure Sensor faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor	√	√	x	x	x	x	x
					Rail Pressure Sensor faulty	Rail Pressure Sensor	Replace common rail assembly							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					APP2 Sensor faulty	APP Sensor	Replace APP Sensor							
					Rail Pressure / Oil Pressure Sensor wiring faulty	Rail Pressure Sensor / Oil Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					APP2 Sensor wiring faulty	APP2 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Boost Pressure Sensor wiring faulty	Boost Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					Boost Pressure Sensor faulty	Boost Pressure Sensor	Replace Boost Pressure Sensor							
2	P06B1	Sensor Supply Short to Ground of RPS/OPS/APP2/ITV			Oil Pressure Sensor Pin 2 Short to Ground	Continuity between Pin B & Ground (Body / Battery -ve)	If continuity is present - Replace Engine harness	√	√	x	x	x	x	x
					Oil Pressure Sensor faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor							
					Rail Pressure Sensor Pin 3 wire short to ground	Check continuity between Pin 3 & Body ground / Battery negative	If continuity is present - Replace Engine harness							
					Rail Pressure Sensor Pin 1 & Pin 3 wire short with each other	Check Continuity between Pin 1 & Pin 3	If continuity is present - Replace Engine harness							
					Rail Pressure Sensor faulty	Rail Pressure Sensor	Replace common rail assembly							
					APP2 Sensor wires Short to Ground	Check continuity between AAP2 Sensor pins & Body ground / Battery negative	If continuity is present - Replace Cabin harness							
					APP2 Sensor wires short circuit with each other	Check Continuity between all pins of APP2 Sensor	If continuity is present - Replace Cabin harness							
					APP2 Sensor faulty	APP Sensor	Replace APP Sensor							
					Rail Pressure / Oil Pressure Sensor wiring faulty	Rail Pressure Sensor / Oil Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					APP2 Sensor wiring faulty	APP2 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Boost Pressure Sensor wiring faulty	Boost Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					Boost Pressure Sensor faulty	Boost Pressure Sensor	Replace Boost Pressure Sensor							
3	P06B5	Sensor Supply Under Voltage of RPS/OPS/APP2/ITV			Oil Pressure Sensor faulty	Oil Pressure Sensor	Replace Oil Pressure Sensor	√	√	x	x	x	x	x
					Rail Pressure Sensor faulty	Rail Pressure Sensor	Replace common rail assembly							
					APP2 Sensor faulty	APP Sensor	Replace APP Sensor							
					Rail Pressure / Oil Pressure Sensor wiring faulty	Rail Pressure Sensor / Oil Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					APP2 Sensor wiring faulty	APP2 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Boost Pressure Sensor wiring faulty	Boost Pressure sensor wiring - Open, Short, Ground circuit	Replace Engine harness							
					Boost Pressure Sensor faulty	Boost Pressure Sensor	Replace Boost Pressure Sensor							
4	P06B3	Sensor Supply Voltage Error of APP1/EGR/Meun/Turbocharger			APP1 Sensor faulty	APP Sensor	Replace APP Sensor	√	√	x	x	x	x	x
					EGR Valve faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					Metering Unit (IMV) Faulty	H.P Pump	Replace H.P Pump							
					EGR Valve / IMV wiring faulty	EGR Valve / IMV wiring - Open, Short, Ground circuit	Replace Engine harness							

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Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Cam Sensor Faulty	Cam Sensor	Replace Cam Sensor							
					Cam Sensor wiring faulty	Engine Harness of Cam Sensor – Open, Ground & Short Circuit	Replace Engine Harness							
5	P06B6	Sensor Supply Over Voltage of APP1/EGR/Meun/Turbocharger			APP1 Sensor faulty	APP Sensor	Replace APP Sensor	√	√	x	x	x	x	x
					EGR Valve faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					Metering Unit (IMV) Faulty	H.P Pump	Replace H.P Pump							
					EGR Valve / IMV wiring faulty	EGR Valve / IMV wiring - Open, Short, Ground circuit	Replace Engine harness							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Cam Sensor Faulty	Cam Sensor	Replace Cam Sensor							
					Cam Sensor wiring faulty	Engine Harness of Cam Sensor – Open, Ground & Short Circuit	Replace Engine Harness							
6	P06B4	Sensor Supply Short to Ground of APP1/EGR/Meun/Turbocharger			APP1 Sensor faulty	APP Sensor	Replace APP Sensor	√	√	x	x	x	x	x
					EGR Valve faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					Metering Unit (IMV) Faulty	H.P Pump	Replace H.P Pump							

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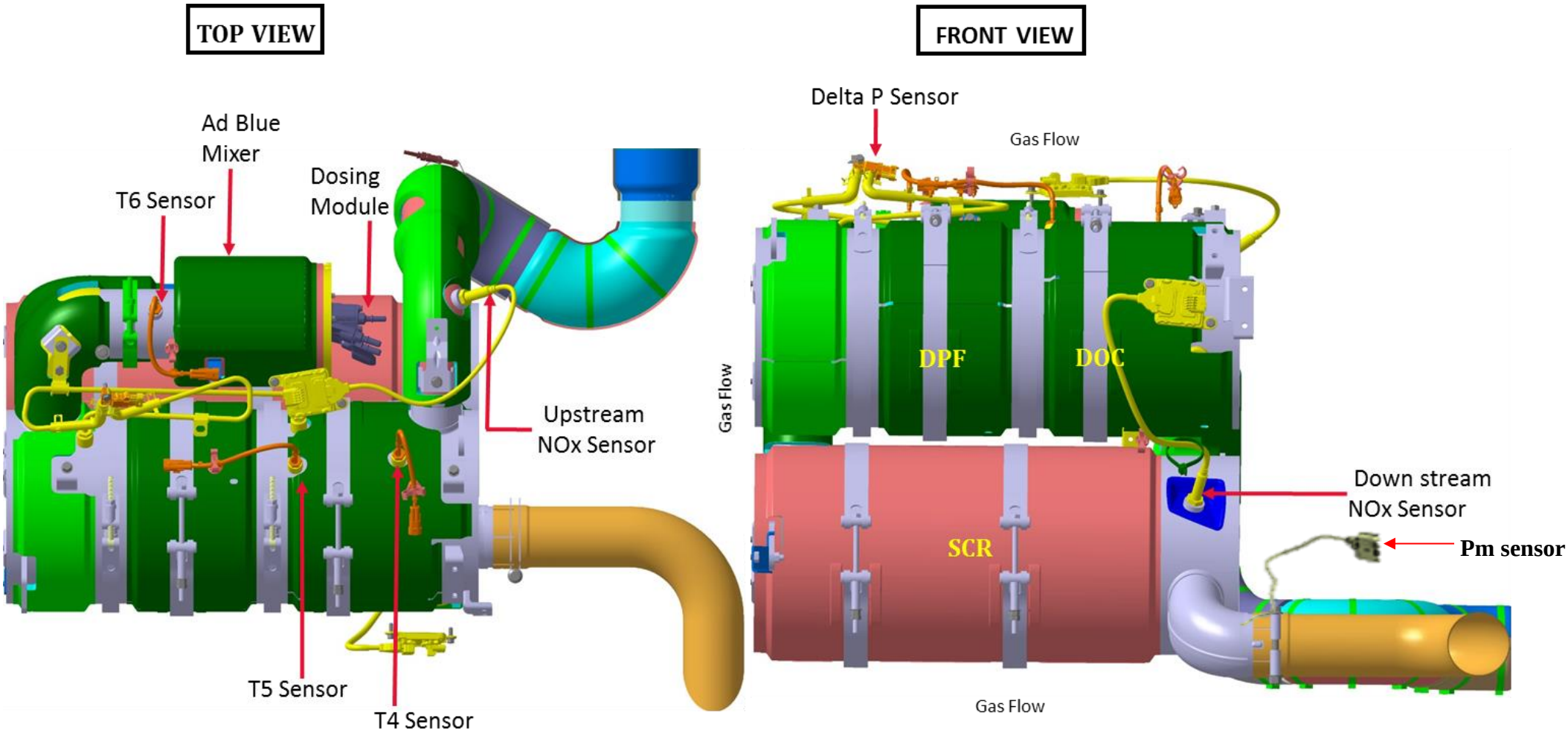
Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					EGR Valve / IMV wiring faulty	EGR Valve / IMV wiring - Open, Short, Ground circuit	Replace Engine harness							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Cam Sensor Faulty	Cam Sensor	Replace Cam Sensor							
					Cam Sensor wiring faulty	Engine Harness of Cam Sensor – Open, Ground & Short Circuit	Replace Engine Harness							
7	P06B7	Sensor Supply Under Voltage of APP1/EGR/Meun/Turbocharger			APP1 Sensor faulty	APP Sensor	Replace APP Sensor	√	√	X	X	X	X	X
					EGR Valve faulty	EGR Valve Note: Perform EGR valve Actuator Test before & After replacement of component for verification	Replace EGR Valve Perform **"EGR Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement.							
					Metering Unit (IMV) Faulty	H.P Pump	Replace H.P Pump							
					EGR Valve / IMV wiring faulty	EGR Valve / IMV wiring - Open, Short, Ground circuit	Replace Engine harness							
					APP1 Sensor wiring faulty	APP1 Sensor wiring - Open, Ground, Short circuit	Replace cabin harness							
					Cam Sensor Faulty	Cam Sensor	Replace Cam Sensor							
					Cam Sensor wiring faulty	Engine Harness of Cam Sensor – Open, Ground & Short Circuit	Replace Engine Harness							
8	P0608	Supply voltage for sensors monitoring High			Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply wiring faulty	Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply harness	Replace affected harness	X	X	X	X	X	X	X
					ECU internal circuit pertaining to Sensor supply faulty	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description		P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
9	P0609	Supply voltage for sensors monitoring low			Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply wiring faulty	Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply harness	Replace affected harness	X	X	X	X	X	X	X
					ECU internal circuit pertaining to Sensor supply faulty	ECU	Replace ECU							
10	P1608	Supply voltage for sensors monitoring High			Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply wiring faulty	Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply harness	Replace affected harness	X	X	X	X	X	X	X
					ECU internal circuit pertaining to Sensor supply faulty	ECU	Replace ECU							
11	P1609	Supply voltage for sensors monitoring low			Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply wiring faulty	Cabin / Chassis Front / Engine / ATS / DNOx / ECU Supply harness	Replace affected harness	X	X	X	X	X	X	X
					ECU internal circuit pertaining to Sensor supply faulty	ECU	Replace ECU							

5. ADDITIONAL FAULT CODES: ATS SYSTEM COMPONENTS, FUEL SYSTEM AND CAN LINE

5.1 ATS system – DNOx 2.2



5.1.1 P-Code List

1. SCR Catalyst

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P20EE	SCR NOx Catalyst Efficiency Below limit			SCR Catalyst Ineffective / SCR Defective / SCR Damaged / SCR Missing	SCR Unit - Physical inspection	Replace SCR + ASC Assembly	√	x	x	x	√	x	x
					DOC Catalyst Ineffective / DOC Defective / DOC Damaged	DOC Unit - Physical inspection	Replace DOC Assembly							
					Ad Blue Quality deteriorated / Non-Genuine Ad Blue	Ad Blue Quality – Check Quality in Live Data / Refractometer	Change Ad Blue							
					Ad Blue Mixer defective	Ad Blue Mixer - Physical inspection for damage / crack / Leakages / Blocks	Replace Ad Blue Mixer unit							
					Ad Blue Lines: Suction, Return, Delivery	Ad Blue Lines: Suction, Return, Delivery - Block / Restriction / Leakage	Replace affected component							
					Supply Module / Dosing Module Faulty	Supply Module / Dosing Module Note: Perform Actuator & Routine tests for Dosing Module & Supply Module before & after replacement	Replace Supply Module / Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.							

2. Diesel Oxidation Catalyst:

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2423	DOC Defective			DOC Catalyst Ineffective / DOC Defective / DOC Damaged	DOC Unit - Physical inspection	Replace DOC Assembly	√	x	x	x	√	x	x
					T5 Sensor faulty / Sensor value drifted	T5 Sensor	Replace T5 Sensor							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

Speed Limitation: √ => Speed Reduced to 20 Kmph - Immediate attention required & advice to stop the vehicle immediately

3. DPF

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P226D	DPF Missing			DPF Removed (Exhaust Line tampered) / DPF Bypassed	DPF Assembly	Replace DPF	√	x	x	x	√	x	x
					Restrictions / Leakages in pipes connecting the Delta P Sensor	Restrictions / Bends / Blocks / Leakages	Replace affected component							
					Delta P Sensor Faulty	Delta P Sensor	Replace Delta P Sensor							
2	P244B	DPF Clogged			Restrictions / Leakages in pipes connecting the Delta P Sensor	Restrictions / Bends / Blocks / Leakages	Replace affected component	√	x	x	x	√	x	x
					Delta P Sensor Faulty	Delta P Sensor	Replace Delta P Sensor							
					Problem with Fuel system / Air Intake System / Lubrication System / Exhaust System	Check any fault codes are present pertaining to fuel system / air intake system / Lubrication system / Exhaust system / Engine oil consumption / Improper fuel injection pattern due to fault injector	Check & replace affected component							
					Cooling System – Thermostat not operating as desired	Check Thermostat for proper operation. Coolant Temperature value in Live Data can be made use to understand. Thermostat can also be checked for its operation using a testing fixture	Replace Thermostat							
					DPF choked with soot	Delta P Value & Soot Mass Value in Diagnostic tool	Try to perform Parked / Service Regeneration. If they are not triggered, then DPF needs to be removed & cleaned - Follow DPF cleaning procedure / SOP to clean the soot.							
3	P2003	DPF Damaged			DPF Damaged - Physical damage	Damage visibility - External / Internal	Replace DPF Assembly							

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					Restrictions / Leakages in pipes connecting the Delta P Sensor	Restrictions / Bends / Blocks / Leakages in pipes connecting Delta P sensor	Replace affected component	√	x	x	x	√	x	x
					Leakages in Exhaust Line & ATS	Exhaust System	Rectify leakages							
					Delta P Sensor Faulty	Delta P Sensor	Replace Delta P Sensor							
4	P24A2	DPF regen incomplete			DPF Regeneration not completed	Partly completed regeneration count using diagnostic manual for reference	Carryout Service Regeneration	√	x	x	x	X	x	x
5	P24A0	Insufficient Temperatures for Regeneration			Leakages in ETV / DOC / Exhaust System / Exhaust system joints	Leakages from Joints	Rectify Leakage / Replace affected parts	√	x	x	x	x	x	x
					DOC Efficiency Low	DOC	Replace DOC							
					T5 Sensor faulty	T5 Sensor	Replace T5 sensor							
					Faulty ETV	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					Faulty Injector	Fuel Injector	Replace Injector							
6	P24A5	Torque limited due to max soot mass			DPF is overloaded with soot	Delta P Value & Soot Mass Value in Diagnostic tool / Excessive soot built up in DPF. Check Air Intake system & Exhaust System for leakages or restrictions. Check fuel system for faults (Restrictions in Low pressure side / Leakages in High Pressure Side / Faulty Fuel Injectors). Check for high engine oil consumption also.	Rectify leakages / restrictions / Faults if any and Perform DPF Parked Regeneration using DPF switch. If Parked Regeneration is not initiated even after 2 attempts (in-spite of pre-conditions being met), then carryout Service Regeneration through diagnostic tool	√	√	x	x	√	x	x
					Cooling System – Thermostat not operating as desired	Check Thermostat for proper operation. Coolant Temperature value in Live Data can be made use to understand. Thermostat can also be checked for its operation using a testing fixture	Replace Thermostat							

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7	P24A4	DPF soot mass exceeding maximum limit			DPF is highly overloaded with soot due to possible leakages / restrictions in Intake / Fuel system.	Delta P Value & Soot Mass Value in Diagnostic tool / Excessive soot built up in DPF. Check Air Intake system & Exhaust System for leakages or restrictions. Check fuel system for faults (Restrictions in Low pressure side / Leakages in High Pressure Side / Faulty Fuel Injectors). Check for high engine oil consumption also.	Rectify leakages / restrictions / Faults if any and Perform DPF Parked Regeneration using DPF switch. If Parked Regeneration is not initiated even after 2 attempts (in-spite of pre-conditions being met), then carryout Service Regeneration through diagnostic tool	√	√	x	x	√	√	x
					Boost Pressure Sensor Value below specification	Check Boost Pressure value in Live Data: Standard Value for reference: At Idling: 0.9 Bar At High Idle: Minimum 1.3 bar	If value is not within specification, replace Boost Pressure & Temperature Sensor & confirm.							
					Soot Loading in DPF due to Inhibit switch is in ON condition	Inhibit Switch Condition / Status	If Inhibit Switch is in ON condition, then switch it off & perform the regeneration as mentioned above							
					Cooling System – Thermostat not operating as desired	Check Thermostat for proper operation. Coolant Temperature value in Live Data can be made use to understand. Thermostat can also be checked for its operation using a testing fixture.	Replace Thermostat							

8	P24A1	Excessive temperature for regeneration			Leakages in ETV / DOC / Exhaust System / Exhaust system joints	Leakages from Joints	Rectify Leakage / Replace affected parts	√	x	x	x	x	x	x
					DOC Efficiency Low	DOC	Replace DOC							
					T5 Sensor faulty	T5 Sensor	Replace T5 sensor							
					Faulty ETV	ETV Note: Perform ETV Actuator Test before & After replacement of component for verification	Replace ETV Perform **"ETV Actuator Learning Process"** under actuator test tab using diagnostic tool after replacement							
					Faulty Injector	Fuel Injector	Replace Injector							

Torque Reduction: 1. √ => Torque Reduced by 25% - Immediate attention required.

2. √ => Torque Reduced by 75% - Immediate attention required & advice to stop the vehicle immediately

5.2 Engine Over-running

5.2.1 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0219	Engine Over Run			Exhaust Brake (ETV) not applied during descending a slope / Exhaust Brake (ETV) Faulty / Sudden downshifting from higher gear to lower gear. Leakage in Exhaust brake system	Customer enquiry regarding application of exhaust brake / Working of Exhaust Brake - Exhaust Brake switch, ETV Wiring, ETV Exhaust system for leakages	Customer education regarding proper application of exhaust brake – When descending a slope: Use exhaust brake switch, operate vehicle at lower gears, Use service brake in combination with exhaust brake. If complaint is observed in any of the components of exhaust brake system - Replace affected parts If exhaust leakage is observed – Repair or replace affected components.	x	√	x	x	x	x	x

5.3 Fuel System – Fuel Suction (Low Pressure), Delivery (High Pressure), Return Lines

5.3.1 P-Code List

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0087	Restriction in low pressure line			Low Fuel Level	Fuel Level	Refill fuel in tank	√	√	x	x	√	x	x
					Fuel Tank Breather Choked	Fuel float unit	Replace							
					Fuel strainer choked	Fuel strainer	Clean / Replace strainer							
					Restriction in Suction line from tank to water separator	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Water separator choked	Water separator	Replace water separator							
					Restriction in Suction line from water separator to feed pump	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Restriction in Suction line from feed pump to fuel filter	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Fuel filter choked	Fuel filter	Replace fuel filter							
					Restriction in Suction line from Fuel filter to H.P Pump inlet	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					H.P Pump faulty	H.P Pump	Replace H.P Pump – If required get the pump checked from authorized BOSCH dealer.							
					Leakage in High pressure line - Pump to rail & rail to injector	Joints, Pipes - leakages in High pressure circuit	Replace affected parts							
					Leakage in common rail	Common rail assembly / High pressure pipes	Replace affected parts							
					Fuel injector faulty	Fuel Injector	Ensure proper mounting of injector as per recommendation / Replace fuel injector. – If required get the injector checked from authorized BOSCH dealer.							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
2	P0088	Insufficient fuel pressure in Low pressure line than required			Low Fuel Level	Fuel Level	Refill fuel in tank	√	√	x	x	√	x	x
					Fuel Tank Breather Choked	Fuel float unit	Replace							
					Fuel strainer choked	Fuel strainer	Clean / Replace strainer							
					Restriction in Suction line from tank to water separator	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Water separator choked	Water separator	Replace water separator							
					Restriction in Suction line from water separator to feed pump	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Restriction in Suction line from feed pump to fuel filter	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Fuel filter choked	Fuel filter	Replace fuel filter							
					Restriction in Suction line from Fuel filter to H.P Pump inlet	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					H.P Pump faulty	H.P Pump	Replace H.P Pump – If required get the pump checked from authorized BOSCH dealer.							
					Rail Pressure sensor connector seating improper	Rail pressure sensor connector	Refit the sensor connector properly							
					Leakage in High pressure line - Pump to rail & rail to injector	Joints, Pipes - leakages in High pressure circuit	Replace affected parts							
					Leakage in common rail	Common rail assembly / High pressure pipes	Replace affected parts							
					Fuel injector faulty	Fuel Injector	Ensure proper mounting of injector as per recommendation / Replace fuel injector. – If required get the injector checked from authorized BOSCH dealer.							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P0093	Fuel System Leak Detected - Large Leak			Low Fuel Level	Fuel Level	Refill fuel in tank	√	√	x	x	√	x	x
					Fuel Tank Breather Choked	Fuel float unit	Replace							
					Fuel strainer choked	Fuel strainer	Clean / Replace strainer							
					Restriction in Suction line from tank to water separator	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Water separator choked	Water separator	Replace water separator							
					Restriction in Suction line from water separator to feed pump	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Restriction in Suction line from feed pump to fuel filter	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Fuel filter choked	Fuel filter	Replace fuel filter							
					Restriction in Suction line from Fuel filter to H.P Pump inlet	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					H.P Pump faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					Leakage in High pressure line - Pump to rail & rail to injector	Joints, Pipes - leakages in High pressure circuit	Replace affected parts							
					Leakage in common rail	Common rail assembly / High pressure pipes	Replace affected parts							
					Fuel injector faulty	Fuel Injector	Ensure proper mounting of injector as per recommendation / Replace fuel injector. – If required get the injector checked from authorized BOSCH dealer.							
					Leakage in low pressure circuit from tank to H.P Pump	Low pressure circuit - Float unit, Lines	Rectify leakage / Replace affected parts							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
4	P0094	Fuel System Leak Detected - Large Leak			Low Fuel Level	Fuel Level	Refill fuel in tank	√	√	x	x	√	x	x
					Fuel Tank Breather Choked	Fuel float unit	Replace							
					Fuel strainer choked	Fuel strainer	Clean / Replace strainer							
					Restriction in Suction line from tank to water separator	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Water separator choked	Water separator	Replace water separator							
					Restriction in Suction line from water separator to feed pump	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Restriction in Suction line from feed pump to fuel filter	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					Fuel filter choked	Fuel filter	Replace fuel filter							
					Restriction in Suction line from Fuel filter to H.P Pump inlet	Bend / block / restriction in fuel line	Clean suction pipe / Replace suction pipe							
					H.P Pump faulty	H.P Pump	Replace H.P Pump. – If required get the pump checked from authorized BOSCH dealer.							
					Leakage in High pressure line - Pump to rail & rail to injector	Joints, Pipes - leakages in High pressure circuit	Replace affected parts							
					Leakage in common rail	Common rail assembly / High pressure pipes	Replace affected parts							
					Fuel injector faulty	Fuel Injector	Ensure proper mounting of injector as per recommendation / Replace fuel injector. – If required get the injector checked from authorized BOSCH dealer.							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Leakage in low pressure circuit from tank to H.P Pump	Low pressure circuit - Float unit, Lines	Rectify leakage / Replace affected parts							

Torque Reduction: √ => Torque Reduced by 25% - Immediate attention required

6. Consequential / Secondary Fault Codes:

The following secondary fault codes are resultant of some other primary fault code being triggered. Addressing the primary fault code leads to rectification of secondary.

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0613	Creep mode activated after flag			Consequential error code	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	x
2	P0623	Creep mode activated after parking			Creep mode activated after parking	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	x
3	P0614	Creep mode activated after restart			Creep mode activated after restart.	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. (Ad Blue Quality Reset needs to be done as per SOP)	√	√	x	x	x	x	X
4	P0624	Creep mode time out error in after restart			Creep mode time out error in after restart	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	X
5	P0615	Creep mode time out			Creep mode time out	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	x
6	P3BA1	NOx Exceedance - NOx control monitoring system			NOx Exceedance - NOx control monitoring system	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	x
7	P3BA2	NOx Exceedance - NOx control monitoring system			NOx Exceedance - NOx control monitoring system	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	x

8	P018F	PRV open count exceeded			Faults pertaining to IMV, Rail Pressure Sensor & / its related wiring, ECU Supply & Ground connections, all Ground points on vehicle. PRV Time / Count exceeded the allowable limit.	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. If the fault code is repeating even after rectification of root cause and clearing the fault code, the replace common rail assembly & verify	√	√	x	x	√	x	x
9	P0095	PRV open due to Pressure Increase			Faults pertaining to IMV, Rail Pressure Sensor & / its related wiring, ECU Supply & Ground connections, all Ground points on vehicle, Restriction in Fuel return line	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. If the fault code is repeating even after rectification of root cause and clearing the fault code, the replace common rail assembly & verify	√	√	x	x	x	x	x
10	P0096	PRV open due to high Pressure Spike			Faults pertaining to IMV, Rail Pressure Sensor & / its related wiring, ECU Supply & Ground connections, all Ground points on vehicle, Restriction in Fuel return line	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. If the fault code is repeating even after rectification of root cause and clearing the fault code, the replace common rail assembly & verify	√	√	x	x	x	x	x
11	P0091	PRV Not Plausible with Rail pressure			Faults in Fuel line: 1. Restrictions in Low Pressure line: Fuel Tank up to H.P Pump 2. Leakages in High Pressure line: H.P Pump to Fuel Injectors 3. Restrictions in Fuel return line.	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. If the fault code is repeating even after rectification of root cause and clearing the fault code, the replace common rail assembly & verify	√	√	x	x	x	x	x
12	P0097	PRV open due to rail pressure out of range			Faults in Fuel line: 1. Restrictions in Low Pressure line: Fuel Tank up to H.P Pump 2. Leakages in High Pressure line: H.P Pump to Fuel Injectors 3. Restrictions in Fuel return line. PRV Time / Count exceeded the allowable limit. Fuel leakage from PRV	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. If the fault code is repeating even after rectification of root cause and clearing the fault code, the replace common rail assembly & verify	√	√	x	x	√	x	x

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					IMV / H.P Pump / Rail Pressure Sensor & / wiring faulty									
13	P1110	PRV open time exceeded			Faults in Fuel line: 1. Restrictions in Low Pressure line: Fuel Tank up to H.P Pump 2. Leakages in High Pressure line: H.P Pump to Fuel Injectors 3. Restrictions in Fuel return line. PRV Time / Count exceeded the allowable limit. Fuel leakage from PRV IMV / H.P Pump / Rail Pressure Sensor & / its wiring faulty Faults pertaining to ECU Supply & Ground connections, all Ground points on vehicle.	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. If the fault code is repeating even after rectification of root cause and clearing the fault code, the replace common rail assembly & verify	√	√	x	x	√	x	x
14	P1088	Fuel pressure in rail too high			Rail Pressure Sensor connector improper seating IMV Connector improper seating Bends/crimps/restrictions/clog in fuel return line H.P Pump /IMV Faulty PRV / PLV stuck in closed condition Injector/Injectors faulty (Hydraulic part)	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	x	x	x	x
15	P20F4	Ad blue Consumption Too Low			Excessive Ad Blue Filled in Ad Blue Tank	Check Physical level / quantity of ad blue in tank.	Maintain optimum Ad Blue level. For 50 Ltr tank, filling should not be more than 45 ltrs.	√	√	x	x	x	x	x

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					Ad Blue Header Unit faulty Leakage in Ad Blue pressure line Supply Module faulty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.							
16	P2BA7	AD Blue / DEF Quantity too low / Empty			Ad Blue Header Unit faulty Ad Blue level below minimum / Ad Blue empty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	√	x	√	x
17	P202F	Ad blue Level Too Low			Ad Blue Header Unit faulty Ad Blue level below minimum / Ad Blue empty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	√	√	x	√	√	x	x
18	P1404	EGR Valve not operating as desired			EGR Valve Faulty Excessive dirt & sludge accumulation inside EGR	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	x	x	x	x
19	P0404	EGR Valve not operating as desired			EGR Valve Faulty Excessive dirt & sludge accumulation inside EGR	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	x	x	x	x
20	P2BAC	NOx Exceedance - Incorrect EGR Flow			EGR Valve Faulty Leakage, Restrictions in EGR Circuit Leakage / Restrictions in Air Intake system	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
21	P2BA3	NOx Exceedance - Incorrect EGR Flow			EGR Valve Faulty Leakage, Restrictions in EGR Circuit Leakage / Restrictions in Air Intake system	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x

22	P2BAB	NOx Exceedance - Incorrect EGR Flow			EGR Valve Faulty Leakage, Restrictions in EGR Circuit Leakage / Restrictions in Air Intake system	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
23	P2BA8	NOx Exceedance - Interruption of Ad blue Dosing Activity			Faulty Dosing Module Restrictions in Ad Blue Suction / Delivery / Return Lines Faulty Supply Module	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
24	P1BA7	NOx Exceedance - Interruption of Ad blue Dosing Activity			Faulty Dosing Module Restrictions in Ad Blue Suction / Delivery / Return Lines Faulty Supply Module	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
25	P20FE	Ad blue Metering Unit Performance			Supply Module Faulty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
26	P3BA7	NOx Exceedance - Interruption of Ad blue Dosing Activity			Faulty Dosing Module Restrictions in Ad Blue Suction / Delivery / Return Lines Faulty Supply Module	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
27	P1BAB	NOx Exceedance - Low Ad blue Consumption			Dosing Module Blocked / Faulty / Restriction in Dosing Module line	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x
28	P21FE	AdBlue warning for consumption too much or too less			Faulty Dosing Module Restrictions in Ad Blue Suction / Delivery / Return Lines	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	x	x	x	√	x	x	x

29	P2BA4	NOx Exceedance - Insufficient Ad blue Quality at level 1			Wrong / Non-Genuine Ad Blue used / Ad Blue level below minimum or empty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. **Ad Blue Quality Reset needs to be done as per SOP**	X	X	X	√	X	X	X
30	P2BA5	NOx Exceedance - Insufficient Ad blue Quality at level 3			Wrong / Non-Genuine Ad Blue used / Ad Blue level below minimum or empty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	X	X	X	√	X	X	X
31	P2BA6	NOx Exceedance - Insufficient Ad blue Quality at Warning level			Wrong / Non-Genuine Ad Blue used	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically. **Ad Blue Quality Reset needs to be done as per SOP**	X	X	X	√	X	X	X
32	P2BAE	NOx Exceedance - NOx control monitoring system			Upstream / Downstream NOx Sensor defective SCR catalyst Ineffective / SCR Defective/ Damaged Restriction / Leakages in Ad Blue Suction / Delivery / Return lines Supply Module / Dosing Module Faulty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	X	X	X	√	X	X	X
33	P3BA4	NOx Exceedance - NOx control monitoring system			Upstream / Downstream NOx Sensor defective SCR catalyst Ineffective / SCR Defective/ Damaged Restriction / Leakages in Ad Blue Suction / Delivery / Return lines Supply Module / Dosing Module Faulty	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	X	X	X	√	X	X	X
34	P3BA9	P3BA0 - NOx Exceedance – NOx Control Monitoring System			Upstream / Downstream NOx Sensor defective SCR catalyst Ineffective / SCR Defective/ Damaged Restriction / Leakages in Ad Blue Suction / Delivery / Return lines	N. A	Identify the root cause using diagnostic tool & rectify the same. If the root cause is addressed, then the consequential codes also will get cleared automatically.	X	X	X	√	X	X	X

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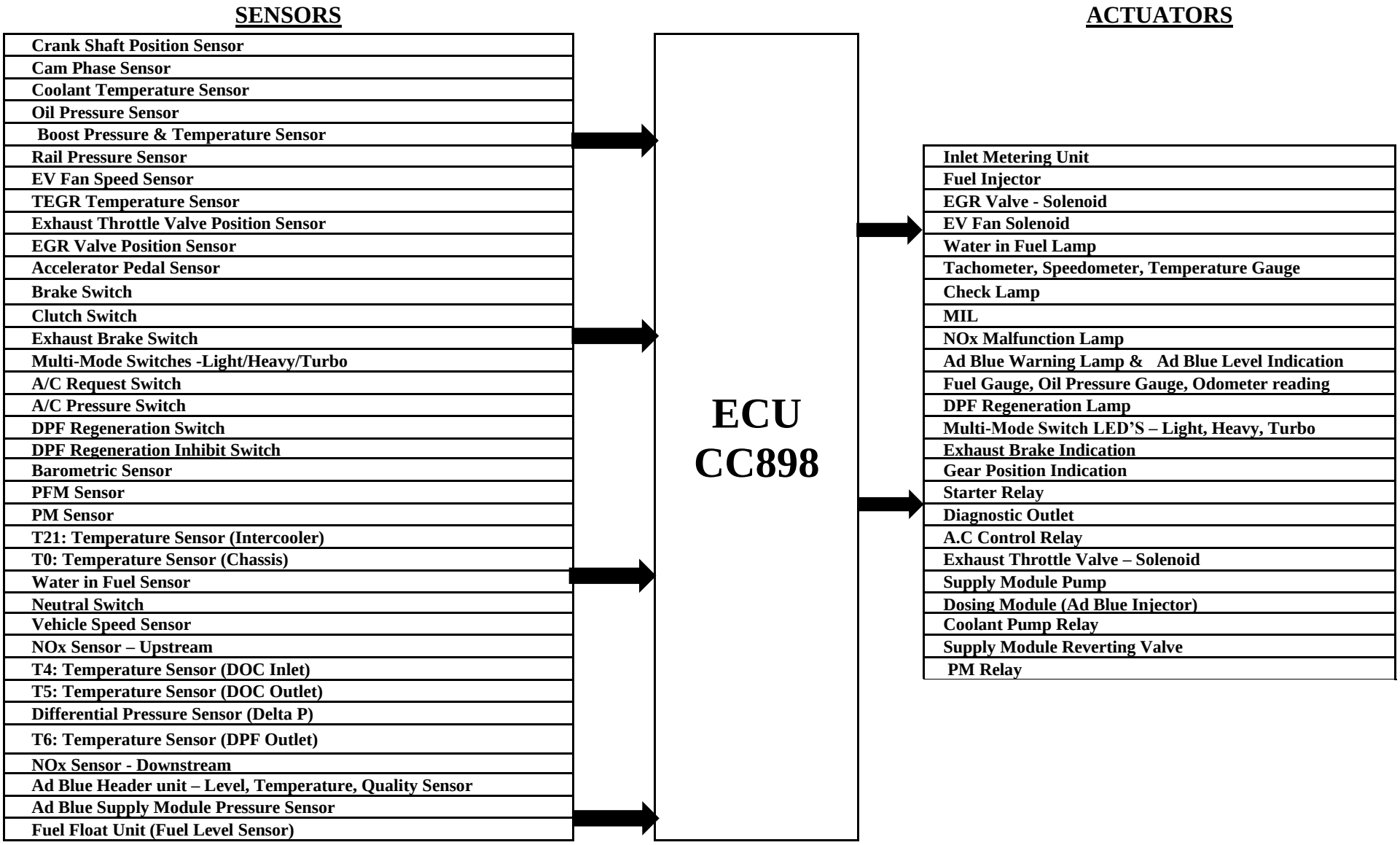
					Supply Module / Dosing Module Faulty									

7. Do’s & Don’ts: Electrical

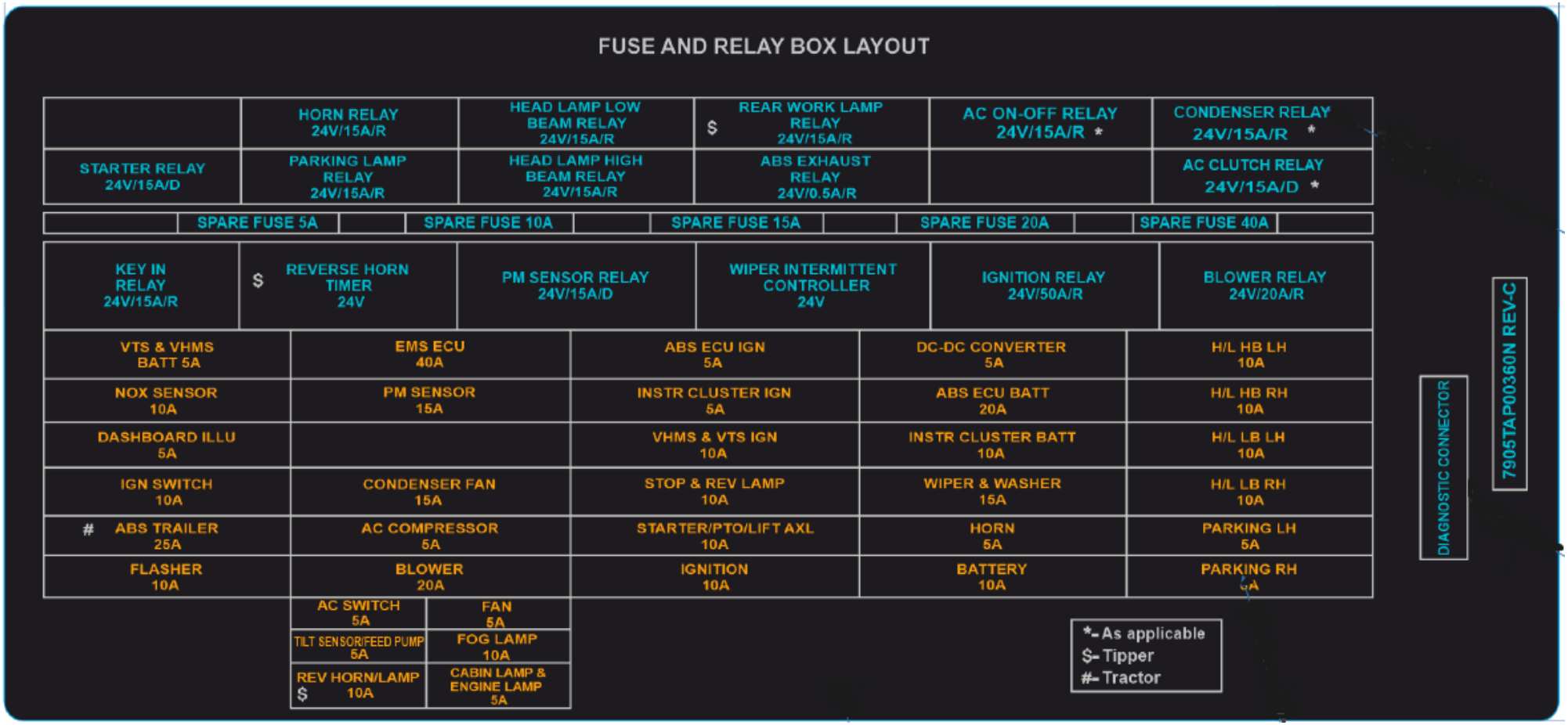
1. It is recommended to avoid high pressure jets for washing of the area around engine, ECU, ATS and sensors to avoid water entry and damages thereof.
2. Keep the ignition in off condition when working with electrical components viz fuses, relays, ECU etc.
3. Modifications - Re-routing, tapping of electrical wiring harness needs to be strictly avoided.
4. In case of any additional supply is needed, connection should be taken only from the power socket provided in cabin.
5. During body building, body repairs & welding – disconnect the battery and ECU.
6. Safeguard the electrical wiring harness and sensors, brake pipes, fuel, Ad Blue and coolant hoses from welding spatter. We recommend using steel sheets /wooden planks for this purpose.
7. ECU and sensors need to be stored safely once removed from the vehicle.
8. Jump starting the vehicle may damage the ECU and is therefore not recommended, instead use fully charged batteries.
9. It is not recommended to interchange, direct Fuses or Relays with different ratings. Use only correct rating fuse or relay.
10. After switching off the ignition, do not disconnect the battery, ECU immediately. It is recommended to wait for at least 15 minutes before disconnecting the same.
11. It is not recommended to fiddle with any of the electrical grounding points. Ensure the correctness of location and tightness.
12. It is important to follow the recommended guidelines while removing or fitting the electrical connections. Ensure the parking of connectors to avoid loose contacts or other defects.
13. Do not try to force fit any wiring interconnectors, connectors of sensor, actuators & ECU. They are designed to align with their mating connectors in a particular position only. Only once this initial seating between connectors is completed, the connectors can be locked in their final position.
14. All electrical safety related points also need to be followed when working on BSVI vehicles.

OBD II – Diagnostic Manual

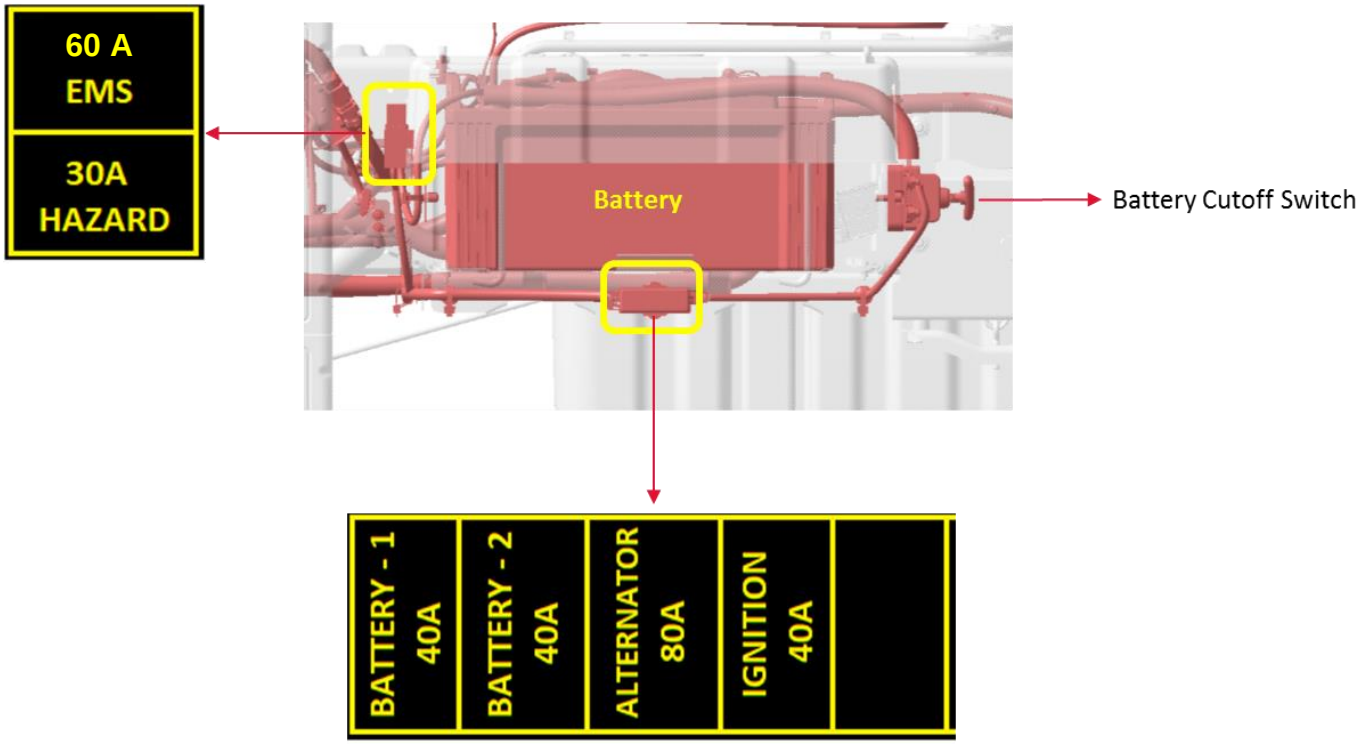
8. New Architecture – ECU, Sensors & Actuators



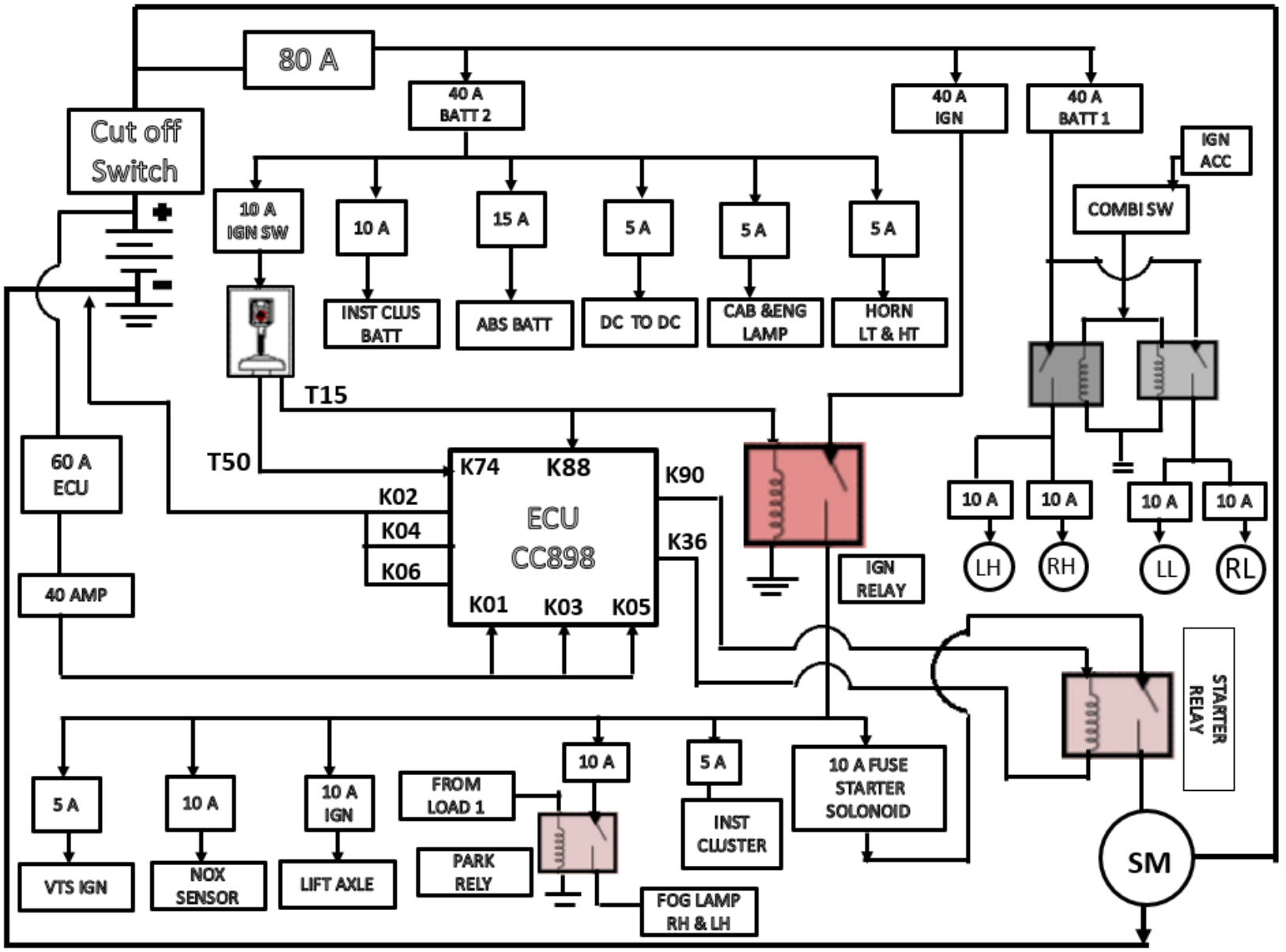
9. Cabin Fuse box Layout



10. Maxi Fuse Layout



11. Load Distribution Circuit



12. Reactions - Maxi Fuse, Fuses and Relays

Fuse Name	Cluster lights	Check lamp	MIL	Cranking	Starting	Remarks
80A MAXI FUSE	NO	NO	NO	NO	NO	
40A MAXI FUSE (BATT-2)	NO	NO	NO	NO	NO	
40A MAXI FUSE (IGNITION)	NO	NO	NO	NO	NO	
IGN SWITCH – 10A	NO	NO	NO	NO	NO	
IGN RELAY	NO	NO	NO	NO	NO	
60A MAXI FUSE – EMS ECU	YES	Normal	Comes during self-checking & goes OFF	NO	NO	Check Lamp comes and goes off during Cluster Self Checking. Temp Gauge indicates full & High Temp Lamp Blinks.
40A FUSE – EMS ECU	YES	Normal	Comes during self-checking & goes OFF	NO	NO	Check Lamp comes and goes off during Cluster Self Checking. Temp Gauge indicates full & High Temp Lamp Blinks.
INST CLUST IGN – 5A	NO	NO	NO	YES	YES	
FUSE VTS BATT – 10A	NO	NO	NO	YES	YES	
STARTER SOLENOID – 10A	YES	YES	YES	NO	NO	

NOTE
Above electrical failures may be due to wiring defects also, for which related wiring needs to be checked.

Note: When checking for ground circuit (short to ground) on fuses supplying power to several loads, switch OFF the ignition and disconnect the battery.

Referring the wiring diagrams, disconnect or isolate all items on the suspected fused circuits, if applicable. Replace the blown fuse. Supply power to the fuse by turning ON the ignition switch or re-connecting the battery. Start connecting the components in the fuse circuit one at a time. When the fuse blows, the circuit with the short to ground has been identified.

Conditions when the Vehicle is unable to Start.

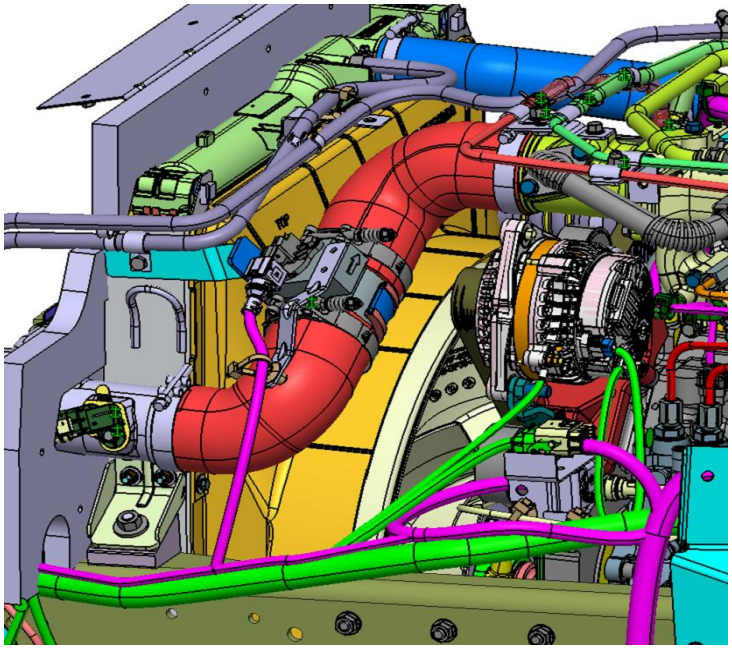
Sr No	Fault condition	Reason
1	Engine will not crank and not start	• Alternator – 80A • BATT 2: 40A Maxi Fuse • IGN 40A Maxi Fuse • EMS ECU – 60A Maxi Fuse • EMS ECU – 40A Fuse • Starter Solenoid – 10A • Fuse IGN Switch – 10A • Ignition Switch • Ignition Relay • Starter Relay • ECU failure • No supply / ground to ECU from battery. • Along with the above-mentioned components / fuses / relays, the corresponding wiring also needs to be checked.

Sr No	Fault condition	Reason
2	Engine will crank but does not start	• If more than 2 injectors are faulty • Any injector is short or grounded. • Air lock in the vehicle • Fuel starvation • Crankshaft sensor and Cam sensor fails together

NOTE
Along with the above-mentioned components, the corresponding wiring also needs to be checked.

13. OBDII Additional Sensors & Actuators: Location, Function, Schematics and Fault Codes

13.1 PFM Sensor

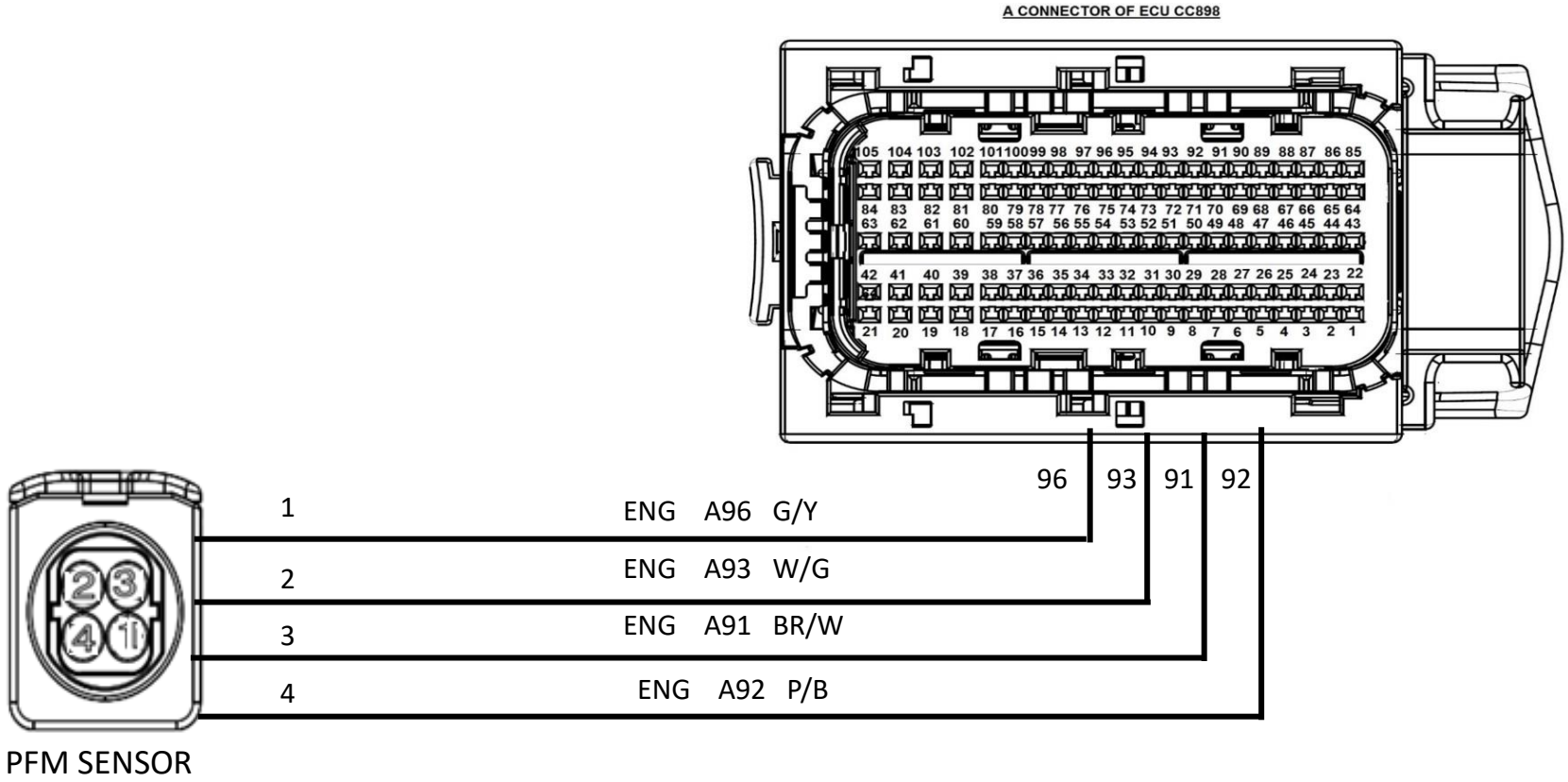


Location: In Between Inter cooler and Engine

Function:

- Registers the mass flow of fresh air drawn in by the engine.

13.1.1 Circuit Diagram: PFM Sensor



13.1.2 P-Code List for PFM Sensor

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2433	PFM sensor - Out of range - High			PFM Sensor kept open to atmosphere / Sensor Tampered / Damaged	Check PFM Sensor Mounting / Physical condition of PFM Sensor	Re-mount PFM Sensor / Replace PFM sensor & confirm.	√	√	x	x	x	x	x
					PFM Sensor Faulty	PFM Sensor	Replace PFM sensor & confirm.							
					Air Intake System – Air intake hose, Air filter condition, Leakages/Restrictions in Intake system from Air intake hose	Intake System	Rectify / Replace affected components.							
					PFM Sensor Wiring Faulty	PFM Sensor Wiring – Open / Ground / Short Circuit	Replace Engine Harness & confirm.							
2	P0100	Mass or Volume Air Flow Sensor "A" Circuit - No Signal			PFM Sensor Faulty	PFM Sensor	Replace PFM sensor & confirm.	√	√	x	x	x	x	x
					PFM Sensor Wiring Faulty	PFM Sensor Wiring – Open / Ground / Short Circuit	Replace Engine Harness & confirm.							
3	P010A	Mass or Volume Air Flow Sensor			PFM Sensor Faulty	PFM Sensor	Replace PFM sensor & confirm	√	√	x	x	x	x	x

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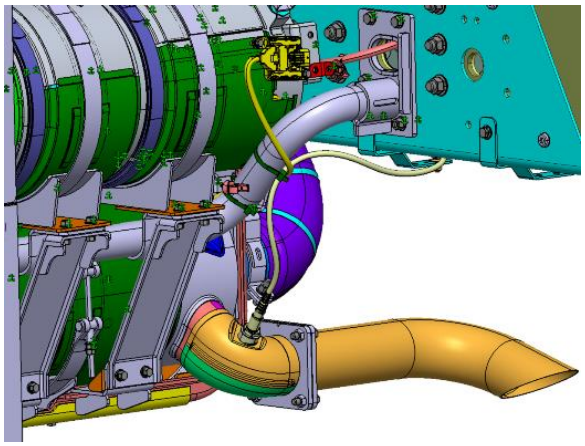
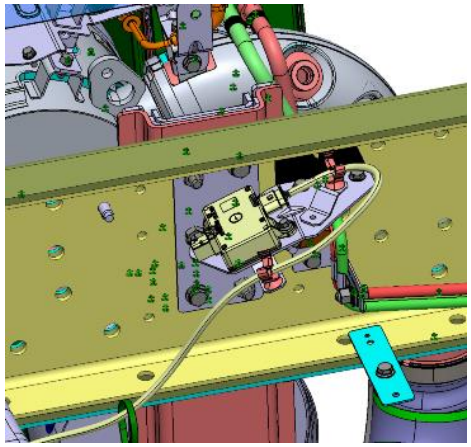
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
		"B" Circuit - No Signal												
					PFM Sensor Wiring Faulty	PFM Sensor Wiring – Open Ground / Short Circuit	Replace Engine Harness & confirm							
4	P010C	PFM sensor signal - Circuit Short to Ground			PFM Sensor Wiring Faulty	PFM Sensor Wiring –Ground / Short / Open Circuit	Replace Engine Harness & confirm.	√	√	x	x	x	x	x
					PFM Sensor Faulty	PFM Sensor	Replace PFM Sensor							
5	P010D	PFM sensor signal - Circuit Short to Battery			PFM Sensor Wiring Faulty	PFM Sensor Wiring –Short / Ground / Open Circuit	Replace Engine Harness & confirm	√	√	x	x	x	x	x
					PFM Sensor Faulty	PFM Sensor	Replace PFM Sensor							
6	P2432	PFM sensor - Out of range – Low			PFM Sensor kept open to atmosphere / Sensor Tampered / Damaged	Check PFM Sensor Mounting / Physical condition of PFM Sensor	Re-mount PFM Sensor / Replace PFM sensor & confirm.	√	√	x	x	x	x	x
					PFM Sensor Faulty	PFM Sensor	Replace PFM sensor & confirm.							
					Air Intake System – Air intake hose, Air filter condition, Leakages/Restrictions in Intake system from Air intake hose	Intake System	Rectify / Replace affected components.							
					PFM Sensor Wiring Faulty	PFM Sensor Wiring – Open / Ground / Short Circuit	Replace Engine Harness & confirm.							

13.2 PM SENSOR WITH CONTROLLER



Location: On the tail pipe

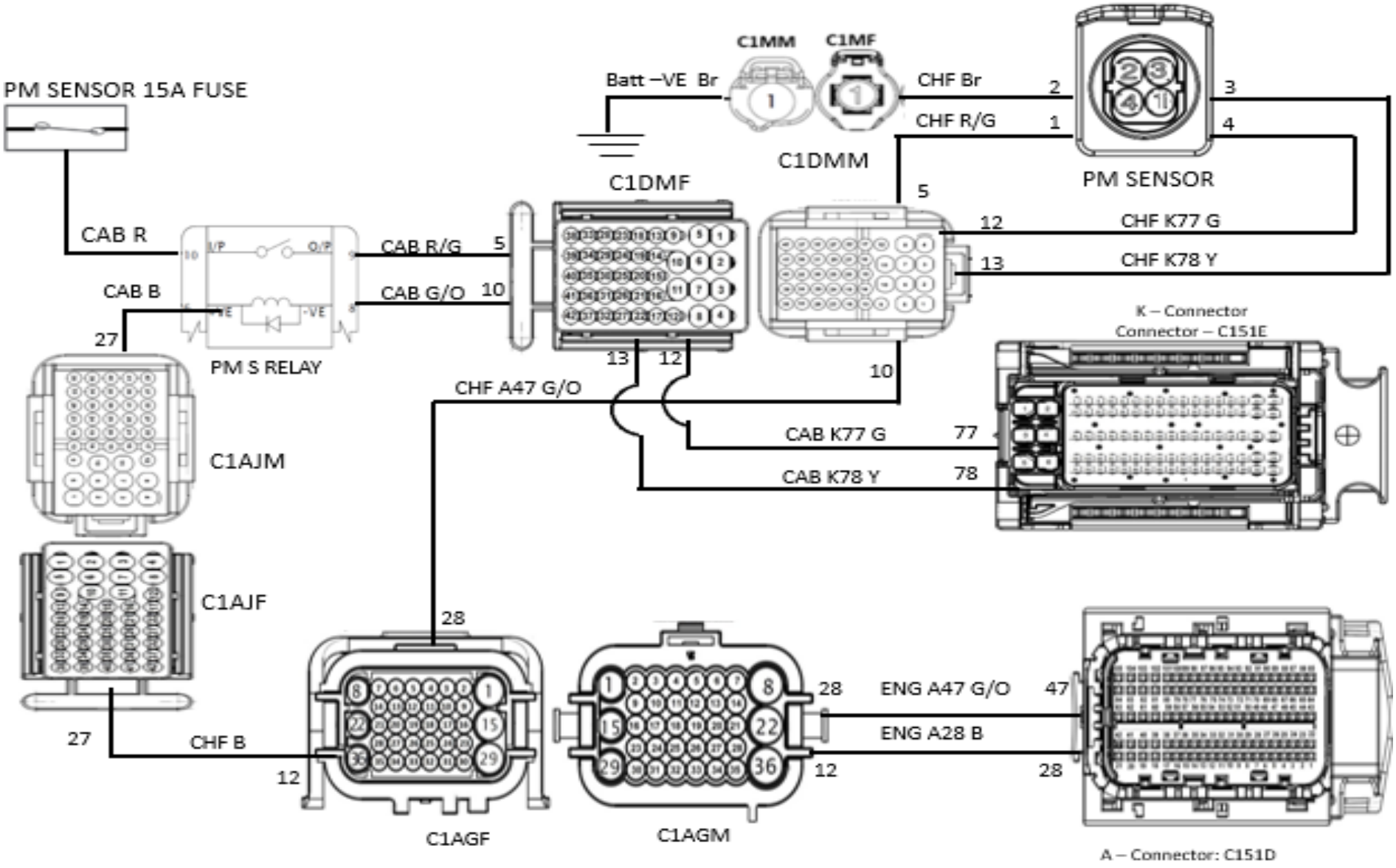


Location: On the chassis

Function:

- PM sensor is used to monitor the filtration efficiency of diesel particulate filter (DPF) in the exhaust system.

13.2.1 Circuit Diagram: PM Sensor



13.2.2 P-Code List for PM Sensor

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0606	PM sensor relay - Open circuit/Over temperature			PM Sensor Fuse Faulty	PM Sensor Fuse	Replace PM Sensor Fuse (Ensure the wiring is free from ground / short circuit – If it is ground / short, then the fuse may fail again. In such case, rectify wiring complaint & then replace the fuse)	√	√	x	x	x	x	X
					PM Sensor Relay faulty.	PM Sensor Relay – Check using test lamp method.	Replace Relay if faulty.							
					PM Sensor wiring Faulty.	Open / Ground / Short circuit – Continuity: Cabin harness: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector * While checking ground – check continuity with	Replace affected harness – Chassis Front / CABIN / Engine harness/ Front Chassis. 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						ground & for short circuit, check continuity between wires.								
					PM Sensor Faulty	PM Sensor	Replace PM Sensor							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							
2	U02A3 / U02A4 / U02A5 / U02A6 / U02A7	CAN time Out error of PM sensor			PM Sensor Fuse Faulty	PM Sensor Fuse	Replace PM Sensor Fuse (Ensure the wiring is free from ground / short circuit – If it is ground / short, then the fuse may fail again. In such case, rectify wiring complaint & then replace the fuse)	√	√	x	√	x	x	x
					PM Sensor Relay faulty.	PM Sensor Relay – Check using test lamp method.	Replace Relay if faulty.							
					PM Sensor wiring Faulty.	Open / Ground / Short circuit – Cabin harness: Continuity: * PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit						

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires.								
					PM Sensor Faulty	PM Sensor	Replace PM Sensor							
					PM Sensor wiring Faulty. CAN line Open circuit	Chassis Front Harness: CAN Circuit continuity: 1. Pin no 3 on pm sensor to Pin no 78 of K connector 2. Pin no 4 on pm sensor to Pin no 77 of K connector	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit							
					PM Sensor wiring Faulty. CAN line Short circuit	CAN line Continuity Pin no 77 on K Connector to Pin no 78 on K Connector.	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit							
					PM Sensor wiring Faulty. CAN line Short circuit	CAN circuit Continuity 1. Pin no 3 on PM Sensor Connector to short circuit to battery positive. 2. Pin no 4 on PM Sensor Connector to short circuit to battery positive	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							2. If there is no continuity when checking form Open circuit							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							
3	P24AB	Battery voltage high at PM sensor control unit			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					Faulty PM Sensor	PM Sensor	Replace PM Sensor							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGIN E RPM LIMIT
					CAN Line Faulty / Tampered	CAN Circuit pertaining to ECU, Instrument Cluster, Ad Blue Float Unit, Upstream/Downstream NOx Sensors, PM Sensor, IMAXX Control Unit, ABS ECU & Diagnostic Connector – Check the above circuits for possible tampering or Ground or Short circuits. Also check for presence of other DTC's w.r.t CAN circuits .	Replace Affected Harness if tampering / fault is observed (Cabin, Chassis Front, DNOx, ATS, VTS / IMAXX Harness)							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							
4	P24AA	Battery voltage low at PM sensor control unit			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	X	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						* Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires								
					Faulty PM Sensor	PM Sensor	Replace PM Sensor							
					CAN Line Faulty / Tampered	CAN Circuit pertaining to ECU, Instrument Cluster, Ad Blue Float Unit, Upstream/Downstream Nox Sensors, PM Sensor, IMAXX Control Unit, ABS ECU & Diagnostic Connector – Check the above circuits for possible tampering or Ground or Short circuits. Also check for presence of other DTC's w.r.t CAN circuits.	Replace Affected Harness if tampering / fault is observed (Cabin, Chassis Front, DNOx, ATS, VTS / IMAXX Harness)							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
5	P24AC	Supply line error to PM sensor control unit			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					Faulty PM Sensor	PM Sensor	Replace PM Sensor							
					CAN Line Faulty / Tampered	CAN Circuit pertaining to ECU, Instrument Cluster, Ad Blue Float Unit, Upstream/Downstream NOx Sensors, PM Sensor, IMAXX Control Unit, ABS ECU & Diagnostic Connector – Check the above circuits for possible tampering or Ground or Short circuits. Also check	Replace Affected Harness if tampering / fault is observed (Cabin, Chassis Front, DNOx, ATS, VTS / IMAXX Harness)							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGIN E RPM LIMIT
						for presence of other DTC's w.r.t CAN circuits.								
6	P24B3	PM sensor heater defective			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
7	P2002	DPF efficiency lower based on PM sensor reading			DPF Damaged / Cracked / Ineffective in Trapping soot particles	Physical inspection of DPF for cracks / damages	If Physical damages are observed – Replace DPF	√	x	x	x	x	x	x
8	P0607	PM sensor relay - short circuit to ground/battery			PM Sensor Relay faulty.	PM Sensor Relay – Check using test lamp method.	Replace Relay if faulty	√	√	x	x	x	x	X
					PM Sensor wiring Faulty (Short / Ground Circuit)	Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires.	If there is continuity when checking Ground / Short circuit, then replace affected harness – Chassis Front / CABIN / Engine harness.						

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							
9	P24B4	PM sensor electrical heater OL error			PM Sensor Faulty/connector open	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
10	P24B5	PM sensor electrical heater circuit board defective			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
11	P24B6	PM sensor electrical heater - short circuit to battery			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
12	P24B7	PM sensor electrical heater - short circuit to ground			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
13	P24B0	PM sensor measuring probe defective			PM Sensor Faulty/ PM sensor pin back-out	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
14	P24B1	Negative voltage deviation of PM sensor measuring probe in standby condition			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires								
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							
15	P24C6	PM sensor temperature monitoring − deviation high			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
16	P24C7	PM sensor temperature monitoring − deviation low			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
17	P24C8	PM sensor measuring temperature incorrect/sensor faulty			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	x	x	x	x	x	x

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
18	P24B8	PM sensor measuring probe - over voltage			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm.							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
19	P2AB0	PM sensor control unit PCB temperature sensor 1 above upper limit			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
20	P24B9	PM sensor measuring probe – short circuit to battery			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: * PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
21	P24C5	PM sensor control unit PCB temperature sensor 1 below lower limit			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
22	P2AB1	PM sensor control unit PCB temperature sensor 2 above upper limit			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
23	P2AB2	PM sensor control unit PCB temperature sensor 2 below lower limit			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
24	P24BA	PM sensor measuring probe – short circuit to ground			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires.	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm.							
25	P2AB3	PM sensor control unit PCB temperature above upper limit			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm	√	√	x	x	x	x	x
26	P2AB4	PM sensor control unit PCB temperature sensor faulty/connections not ok			PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm.	√	√	x	x	x	x	x
27	P24AF	PM sensor removed/faulty/not connected properly			PM Sensor probe open to atmosphere	PM Sensor mounting	Re-mount the PM Sensor & confirm	√	x	x	x	x	x	x
					Leakage in Exhaust line near PM Sensor	Check for leakages in exhaust line.	Rectify Leakages							
					PM Sensor connector loosely connected / not connected properly.	PM Sensor connection	Re-connect PM Sensor & confirm							
28	P24AE	PM sensor control unit - voltage deviation max			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector.	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						*Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires								
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
29	P24AD	PM sensor control unit - voltage deviation min			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm.							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
30	P24A3	PM sensor signal not valid			PM Sensor probe open to atmosphere / not connected properly.	PM Sensor mounting / PM Sensor Connection	Re-mount PM Sensor / Reconnect PM Sensor	√	√	x	x	x	x	x
					PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires.	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit						

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGIN E RPM LIMIT
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm.							
31	P24B2	Negative voltage deviation of PM sensor measuring probe in running condition			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm							
					Neutral switch Faulty	Neutral Switch	Replace Neutral Switch							

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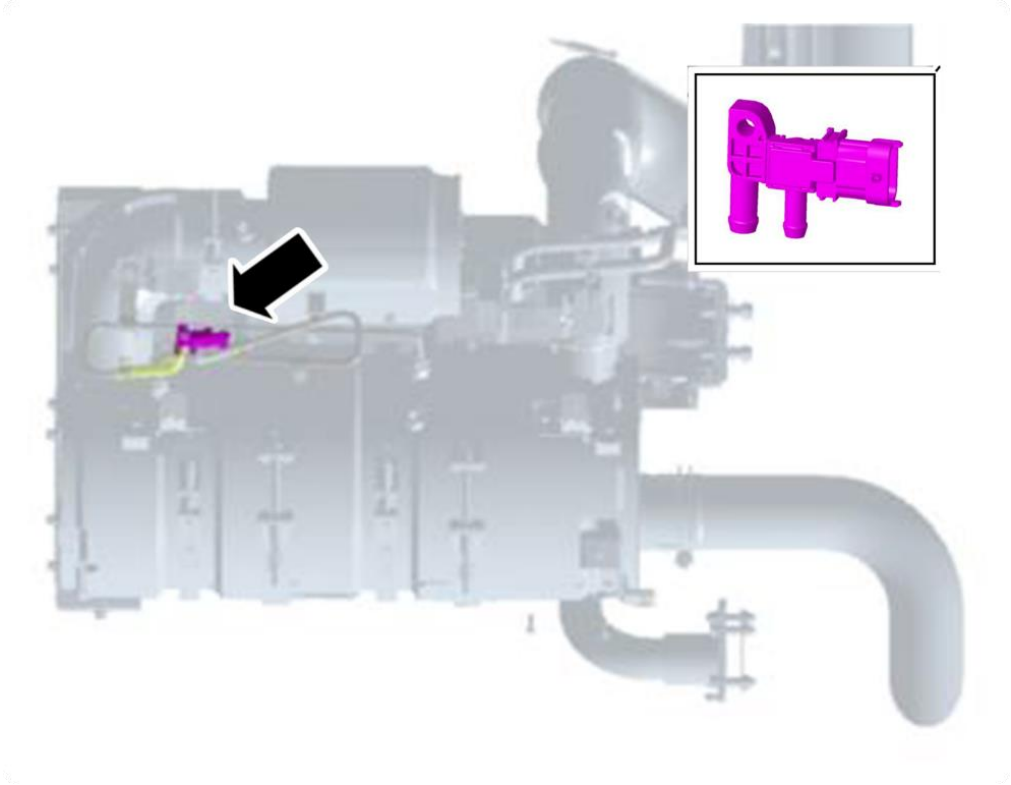
Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
32	P24BB	PM sensor measuring probe short circuit			PM Sensor wiring faulty.	Open / Ground / Short circuit- Cabin harness: Continuity: ***** PM Sensor Fuse to PM Sensor Relay Pin 30 * PM Sensor Relay Pin 87 to Pin no 1 of PM sensor connector. *Pin no 2 of pm sensor to Battery negative. *Pin no 86 on pm sensor relay to pin no 28 on A connector * Pin no 85 on pm sensor relay to pin no 47 on A connector CAN Circuit continuity: *Pin no 3 on pm sensor to Pin no 78 of K connector * Pin no 4 on pm sensor to Pin no 77 of K connector While checking ground – check continuity with ground & for short circuit, check continuity between wires	Replace affected harness – Chassis Front / CABIN / Engine harness: 1. If continuity is present when checking Ground/ Short circuit 2. If there is no continuity when checking form Open circuit	√	√	x	x	x	x	x
					PM Sensor Faulty	PM Sensor	Replace PM Sensor & confirm							

13.3 DIFFERENTIAL PRESSURE (DELTA P) SENSOR (OBDII)

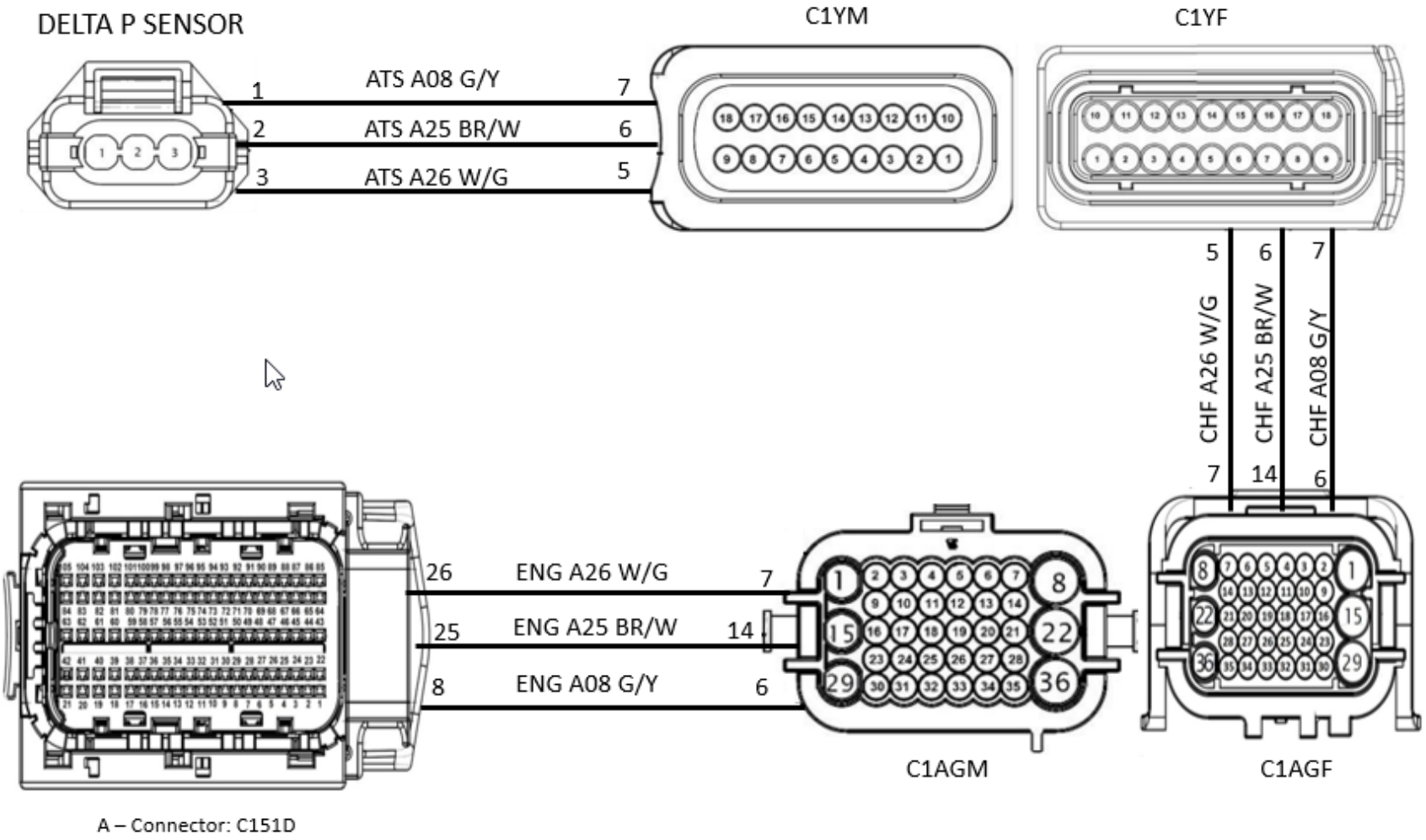


Location: On the ATS sensor mounting bracket

Function

- Differential pressure sensor, or “Delta P sensor,” provides a voltage output to the engine management system proportional to the differential pressure between inlet and outlet of DPF assembly.
- Operating Range: 247 mv – 4757 mv

13.3.1 Circuit Diagram: Delta P Sensor (OBDII)



Delta P Sensor – Approximate value for reference: Should be less than **80 mBar.** Vehicle needs to be kept in high idle / full RPM for a minimum of 10 seconds. Maintain this condition for further 10 seconds & then note the reading.

13.3.2 P-Code List For Delta P Sensor

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P2454 (OBDII)	Particulate pressure sensor output below lower limit			Open Circuit:	Continuity: * Pin 1 to Pin A08 *. Pin 2 to Pin A25 * Pin 3 to Pin A26	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness	√	√	x	x	√	x	x
					Ground Circuit:	Continuity: *. Pin 1 to Body Ground / Battery Negative * Pin 3 to Body Ground / Battery Negative *. Pin 3 to Body Ground / Battery Negative	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Short Circuit	Continuity: Pin 1 to Pin 2	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGM connector) 3. Engine (C1AGF to ECU A Connector) 4. ATS, Chassis Front, Engine harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						Continuity: Pin 1 to Pin 3 Continuity: Pin 2 to Pin 3	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor							
					Delta P Sensor wiring faulty	Delta P Sensor wiring of ATS, Chassis Front, Engine harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
2	P2461 (OBDII)	Particulate filter pressure above upper limit	1	P2455 - Particulate pressure sensor output above upper limit	DPF is loaded with soot. Possibility of Rapid soot build up within a short span of time.	Delta P Value & Soot Mass Value in Diagnostic tool. Delta P Value at high idle should be less than 80 mBar. If the value exceeds 80 mBar, then DPF regeneration needs to be performed. Excessive soot built up in DPF. Check Air Intake system & Exhaust System for leakages or restrictions.	Rectify leakages or restrictions, if any and Perform DPF Parked Regeneration using DPF switch. If Regeneration does not trigger even after 2 attempts (in-spite of pre-conditions being met), perform service regeneration. Follow **"DPF SOOT CLEANING SOP" as provided in – Soot Mass Reset** heading under Diagnostic Software Topic	√	√	x	x	√	x	**1600 RPM**

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)	Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Check fuel system for faults (Restrictions in Low pressure side / Leakages in High Pressure Side / Faulty Fuel Injectors / Fuel Quality). Check for blockages / restrictions in the pipes of Delta P Sensor								
				Cooling System – Thermostat not operating as desired	Check Thermostat for proper operation. Coolant Temperature value in Live Data can be made use to understand. Thermostat can also be checked for its operation using a testing fixture	Replace Thermostat							
				Open Circuit	Continuity – Pin 2 to Pin A25	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
					Open Circuit	Continuity – Pin 3 to Pin A26	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Short Circuit	Continuity – Pin 1 to Pin 3	If continuity is present - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGFconnector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor							
					Delta P Sensor Pipelines blocked / choked	Delta P Pipes (Inlet & Outlet Pipes)	Clean / Replace as required							
					DPF Choked	Delta P Value & Soot Mass Value in Diagnostic tool Delta P Value at high idle should be less than 80 mBar	Rectify leakages or restrictions, if any and Perform DPF Parked Regeneration using DPF switch. If Regeneration does not trigger even after 2 attempts (in-spite of pre-conditions being met), perform service							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
							regeneration. Follow **"DPF SOOT CLEANING SOP" as provided in – Soot Mass Reset** heading under Diagnostic Software Topic							
					Delta P Sensor wiring faulty	Delta P Sensor wiring of ATS, Chassis Front, Engine harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
3	P2452 (OBDII)	DPF pressure sensor defective			Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor	√	x	x	x	x	x	x
4	P2455 (OBDII)	Particulate Filter Pressure sensor output above upper limit			Open Circuit:	Continuity: * Pin 1 to Pin A08 * Pin 2 to Pin A25 * Pin 3 to Pin A26	If no continuity - Check & replace affected harness 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness	√	√	x	x	√	x	x
					Short Circuit:	Continuity:	If continuity is present - Check & replace affected harness							

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Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
						* Pin 1 to Supply / Battery Positive *. Pin 2 to Supply / Battery Positive *. Pin 3 to Supply / Battery Positive	1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGF connector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
					Delta P Sensor Faulty	DPF – Delta P Value in Diagnostics	Replace Delta P Sensor							
					Delta P Sensor wiring Faulty	Delta P Sensor wiring of ATS, Chassis Front, Engine harness - Open, Ground, Short circuit	Check & replace affected harness. 1. ATS (Delta P sensor to C1YM connector) 2. Chassis Front (C1YF to C1AGFconnector) 3. Engine (C1AGM to ECU A Connector) 4. ATS, Chassis Front, Engine harness							
5	P2458 (OBDII)	DPF check for a locked regeneration.			Insufficient T5 temperatures for carrying out regeneration / Insufficient Exhaust Gas Flow / Improper soot burning / Insufficient fuel quantity to raise temperature.	T5 Sensor / T5 Sensor wiring Faulty. * Exhaust Gas leakage in Exhaust system * DOC ineffective * Check whether T4 & T5 sensors are swapped *Vehicle application – Low duty & ultra-low duty cycle	* Replace - T5 Sensor / ATS Wiring / Chassis Front / Engine Wiring Harness * Rectify exhaust gas leakage * Replace DOC * Mount T4 & T5 sensors in their specified locations *Perform parked regeneration, if not successful perform service regeneration as per SOP.	√	X	X	X	X	X	X

13.4 P-Code List for Injector

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P0211	Monitoring of injection quantity - injector 1			Fuel Injector 1 Faulty	Fuel Injector – Check Injector back leak value for all injectors. Keep the engine in Idling condition & measure the volume of fuel collected	Replace the Injector 1 if the fuel volume collected is not less / more than the back leak values of other 5 injectors	√	√	x	x	√	x	x
2	P0216	Monitoring of injection quantity - injector 5			Fuel Injector 5 Faulty	Fuel Injector – Check Injector back leak value for all injectors. Keep the engine in Idling condition & measure the volume of fuel collected	Replace the Injector 5 if the fuel volume collected is not less / more than the back leak values of other 5 injectors	√	√	x	x	√	x	x
3	P0215	Monitoring of injection quantity - injector 3			Fuel Injector 3 Faulty	Fuel Injector – Check Injector back leak value for all injectors. Keep the engine in Idling condition & measure the volume of fuel collected	Replace the Injector 3 if the fuel volume collected is not less / more than the back leak values of other 5 injectors	√	√	x	x	√	x	x
4	P0217	Monitoring of injection quantity - injector 6			Fuel Injector 6 Faulty	Fuel Injector – Check Injector back leak value for all injectors. Keep the engine in Idling condition & measure the volume of fuel collected	Replace the Injector 6 if the fuel volume collected is not less / more than the back leak values of other 5 injectors	√	√	x	x	√	x	x

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
5	P0212	Monitoring of injection quantity - injector 2			Fuel Injector 2 Faulty	Fuel Injector – Check Injector back leak value for all injectors. Keep the engine in Idling condition & measure the volume of fuel collected	Replace the Injector 2 if the fuel volume collected is not less / more than the back leak values of other 5 injectors	√	√	x	x	√	x	x
6	P0214	Monitoring of injection quantity - injector 4			Fuel Injector 4 Faulty	Fuel Injector – Check Injector back leak value for all injectors. Keep the engine in Idling condition & measure the volume of fuel collected	Replace the Injector 4 if the fuel volume collected is not less / more than the back leak values of other 5 injectors	√	√	x	x	√	x	x

13.5 P-Code List for Supply Module

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
1	P21F4	Reductant Consumption Too Low - Invalid / Incompatible Software Component			Dosing Module Blocked / Restriction / Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.	x	√	x	x	x	x	x
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Supply Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Restriction/Block in Suction Circuit/Delivery /Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts.							
					Dataset Error	Verify applicable dataset.	Flash appropriate software							
					ECU Faulty	ECU	Replace ECU							
2	P2BAD	NOx Exceedance - Root Cause Unknown - Invalid / Incompatible Software Component			Dosing Module Blocked / Restriction / Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.	x	√	x	x	x	x	x
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Supply Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Restriction/Block in Suction Circuit/Delivery /Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts.							
					Dataset Error	Verify applicable dataset.	Flash appropriate software							
					ECU Faulty	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
3	P21F5	Reductant Control Module Performance - Invalid / Incompatible Software Component			Dosing Module Blocked / Restriction / Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.	x	√	x	x	x	x	x
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Supply Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Restriction/Block in Suction Circuit/Delivery /Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts.							
					Dataset Error	Verify applicable dataset.	Flash appropriate software							
					ECU Faulty	ECU	Replace ECU							
4	P21F7	NOx Exceedance - Low Reagent Consumption - Invalid / Incompatible Software Component			Dosing Module Blocked / Restriction / Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.	x	√	x	x	x	x	x
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Supply Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Restriction/Block in Suction Circuit/Delivery /Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts.							
					Dataset Error	Verify applicable dataset.	Flash appropriate software							
					ECU Faulty	ECU	Replace ECU							

Sr No	P-Code (Primary)	Description	P-Codes (Secondary)		Possible Causes	Check Points	Remedy	MIL ON	CEL ON	CEL BLINKS	DNOx Lamp ON	TORQUE REDUCTION (25%)	SPEED LIMITATION " 20 KMPH "	ENGINE RPM LIMIT
5	P21F8	NOx Exceedance - Interruption of Reagent Dosing Activity - Invalid / Incompatible Software Component			Dosing Module Blocked / Restriction / Faulty	Dosing Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Dosing Module & Verify for proper functioning by conducting Actuator & Routine Tests.	x	√	x	x	x	x	X
					Supply Module Faulty	Supply Module Note: Perform Actuator & Routine Tests for Dosing Module – Before & After Replacement	Replace Supply Module & Verify for proper functioning by conducting Actuator & Routine Tests.							
					Restriction/Block in Suction Circuit/Delivery /Return Circuit	Tank Breather, Strainer, Ad blue lines, Ad Blue Filter.	Rectify leakage/blocks/restrictions / Replace affected parts.							
					Dataset Error	Verify applicable dataset.	Flash appropriate software							
					ECU Faulty	ECU	Replace ECU							