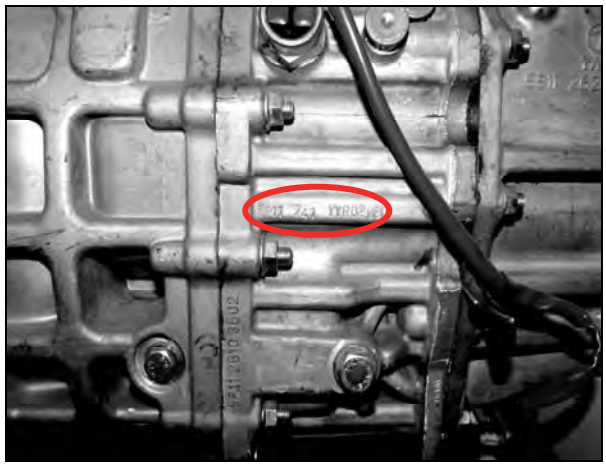
B) GEAR BOX

The gear box identification number can be seen on the rear housing. It is in near the mounting bolts of idler shafts.



Gear box number consists of 17 digits. *(5 barrels)*

1	2	3	4	5
XXXX(XX)	**XXX**	**XX**	**X**	**XXXXX**

BARREL 1: Indicates basic model number.

BARREL 2:

FIRST DIGIT indicates type of gear engagement and shift.

SECOND DIGIT indicates types of vehicle.

THIRD DIGIT indicates first gear ratio.

BARREL 3: Indicates the Year of manufacturing

CODE	YEAR	CODE	YEAR
ZZ	2000	ZY	2010
YZ	2001	YY	2011
XZ	2002	XY	2012
WZ	2003	WY	2013
VZ	2004	VY	2014
UZ	2005	UY	2015
TZ	2006	TY	2016
SZ	2007	SY	2017
RZ	2008	RY	2018
QZ	2009		

BARREL 4: Indicates the plant location.

CODE	PLANT LOCATION
0	WC-1,Lucknow
1	Jamshedpur-I
2	Jamshedpur-II
3	Jamshedpur-III
4	WC-2,Lucknow
5	EC-1,Lucknow
6	Dharwad
7	D-Block, Pune
8	H-Block, Pune
9	J-Block, Pune, First Assembly Line.
A	EC-2,Lucknow
B	IBF-1,Lucknow
J	Pantnagar-IV
K	Sanand
L	TML, Ranjangaon-II
M	Lucknow - MASOP
N	J-Block, Pune, Second Assembly Line
P	K-Block, Pune, First TCF Line
R	J14-Block, Pune
S	J13-Block, Pune
T	TML, Ranjangaon-
U	E9-Block, Pune
V	Pantnagar-I
W	K-Block, Pune, Second TCF Line
X	Singur
Y	Pantnagar-II
Z	Pantnagar-III

BARREL 5: Indicates cumulative serial number of gear box produced during the year at each plant location.

3.4 DISMANTLING

1. Observe cleanliness when dismantling components, particularly when brake, fuel or hydraulic system parts are being worked on. A particle of dirt or a cloth fragment could cause a dangerous malfunction if trapped in these systems.
2. Blow out all tapped holes, crevices, oil-ways and fluid passages with an air line. Ensure that any “O-rings” used for sealing are correctly replaced or renewed, if disturbed.
3. Use marking ink to identify mating parts, to ensure correct reassembly. If a centre punch or scriber is used they may initiate cracks or distortion of components.
4. Wire together mating parts where necessary to prevent accidental interchange *(e.g. roller bearing components).*
5. Wire labels on to all parts which are to be renewed, and to parts requiring further inspection before being passed for reassembly; place these parts in separate containers from those containing parts for rebuild.
6. Do not discard a part due for renewal until it has been compared with the new part, to ensure that its correct replacement has been obtained.

3.5 INSPECTION

1. Never inspect a component for wear or dimensional check unless it is absolutely clean; a slight smear of grease can conceal a failure.
2. When a component is to be checked dimensionally against figures quoted for it, use correct equipment *(surface plates, micrometers, dial gauges, etc.)* in serviceable condition. Makeshift checking equipment can be dangerous.
3. Reject a component if its dimensions are outside limits quoted, or if damage is apparent. A part may, however, be refitted if its critical dimension is exactly limit size, and is otherwise satisfactory.
4. Use ’Plastigauge’ for checking bearing surface clearances. Directions for its use and a scale giving bearing clearances in 0.0025 mm steps are provided with it.

3.6 JOINTS AND JOINT FACES

1. Always use correct gaskets where they are specified.
2. Use jointing compound only when recommended. Otherwise fit joints dry.
3. When jointing compound is used, apply in a thin uniform film to metal surfaces; take great care to prevent it from entering oil-ways, pipes or blind tapped holes.
4. Remove all traces of old jointing materials prior to reassembly. Do not use a tool which could damage joint faces.
5. Inspect joint faces for scratches or burrs and remove with a fine file or oil stone; do not allow removed material or dirt to enter tapped holes or enclosed parts.
6. Blow out any pipes, channels or crevices with compressed air, fit new ’O’ rings or seals displaced by air blast.

3.7 FLEXIBLE HYDRAULIC PIPES, HOSES

1. Before removing any brake or power steering hose, clean end fittings and area surrounding them as thoroughly as possible.
2. Obtain appropriate plugs or caps before detaching hose end fittings, so that ports can be immediately covered to exclude dirt.
3. Clean hose externally and blow through with airline. Examine carefully for cracks, separation of plies, security of end fittings and external damage. Reject any hose found faulty.
4. When refitting hose, ensure that no unnecessary bends are introduced, and that hose is not twisted before or during tightening of union nuts.
5. Containers for hydraulic fluid must be kept absolutely clean.
6. Do not store brake fluid in an unsealed container. It will absorb water, and fluid in this condition would be dangerous to use due to a lowering of its boiling point.
7. Do not allow brake fluid to be contaminated with mineral oil, or use a container which has previously contained mineral oil.
8. Do not re-use brake fluid bled from system.
9. Always use clean brake fluid to clean hydraulic components.

2.2 REGULAR MAINTENANCE

NOTE

None of the procedures should be performed with ENGINE RUNNING, unless specified in the procedure.

A. ENGINE OIL REPLACEMENT

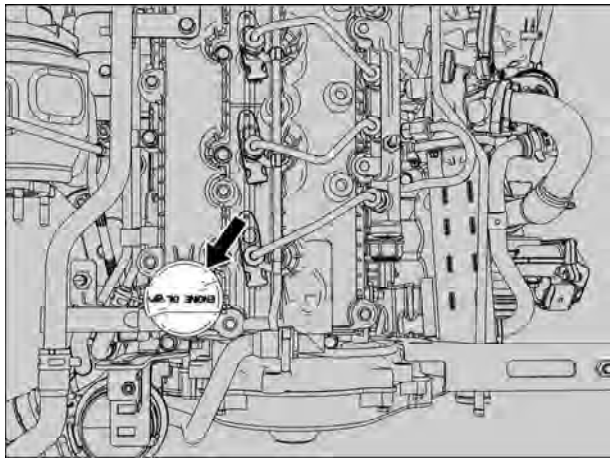
!WARNING

- *New and used engine oil can be hazardous.*
- *Used oil filter and oil to be disposed as per local regulation.*

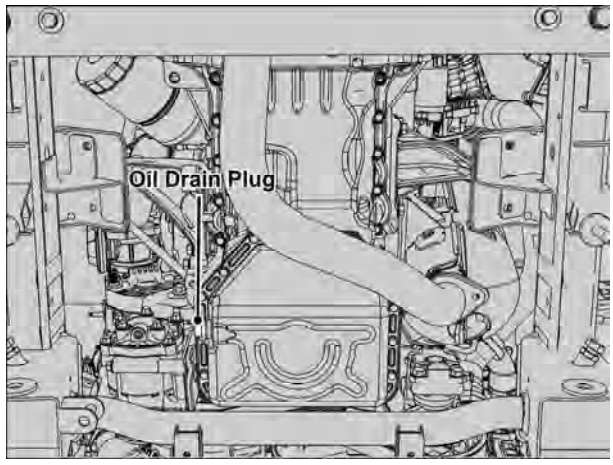
NOTE

Before draining engine oil, check engine for any oil leakage. If any leakage is found, make a note of it and repair or replace the defective part before refilling the engine oil.

1. Position the vehicle in a 2 post lift.
2. If required remove the stone guard.
3. Open the Engine oil filling cap.



4. Position a suitable container for collecting the drained Engine oil below the oil Sump drain plug.
5. Loosen and remove the Engine oil sump drain plug.



6. Drain Engine oil in the container placed in step 4.
7. After draining the oil completely, wipe the drain plug and reinstall the drain plug.

NOTE

When replacing the Engine Oil, allow the oil to drain completely and then refill it with new oil after ensuring that drain plug is reinstalled and tightened to a torque of 5±1 kg-m with new sealing washer.

- **Leaving Battery Idle**

Causes the battery to run down due to self-discharge. The lead sulphate crystals formed as a result of self-discharge grow as the battery stands idle and are not easily converted back on recharge. The Sulphation in other words tends to become permanent thus affecting battery capacity and lowering battery life.

- **High Specific gravity**

It is destructive for both positive and negative plates to separator and shortens battery life.

2. LACK OF WATER

- **Impure topping –up water**
  - Impure water or electrolyte introduces impurities into the battery, which accumulate with each such topping – up.
  - The most common impurities are iron and chlorine, which attack plates and shorten overall life.
  - This will result in higher water loss and premature failure.
- **Neglecting topping-up**

De-mineralized water (*DM*) water or distilled water is one of the four essential chemicals of a lead acid battery and under normal conditions of operation the only component of the battery, which is lost as the result of charging. It should be replaced as soon as the liquid level falls to the top of the separator. If water is not replaced, plates will soon be exposed and the acid will reach a dangerously high concentration that may oxidize the separator. It further can permanently impair the performance of the plates. Plates cannot play full part in the battery reactions unless they are completely covered by the electrolyte. Acid should not be added to cells.

3. INSTALLATION:

- **Loose Hold –downs**

Container damages arise from gross mishandling or dropping batteries, from hold-downs either over tightened or extremely loose. This may physically damage the plates and separators in cells or cause leakage of electrolyte so that the battery becomes unserviceable.

- **Excessive loads**

A battery should never be used to propel the car by the use of the starter motor with clutch engaged except in a great emergency. This may produce extremely high internal battery temperature and may also damage the starter motor.

4. OPERATIONAL PROBLEMS

- **Discharge without recharge**

A fully discharged or near fully discharged cell will be damaged and possibly ruined if not recharged within 24 to 48 hours. As a battery discharges, the electrolyte starts changing from an acid solution to almost pure water. Lead dissolves in water and some of the plate material mixes with water to form lead hydrate. Lead hydrate causes the plate surfaces to turn white and, because it is conductive it forms a short circuit between the plates rendering the battery permanently damaged.

- **Over discharge**

Over discharge causes abnormal expansions of the active materials in the plates which leads to permanent damage and also recharge problems.

BATTERY TESTING

Battery testing has two basic elements

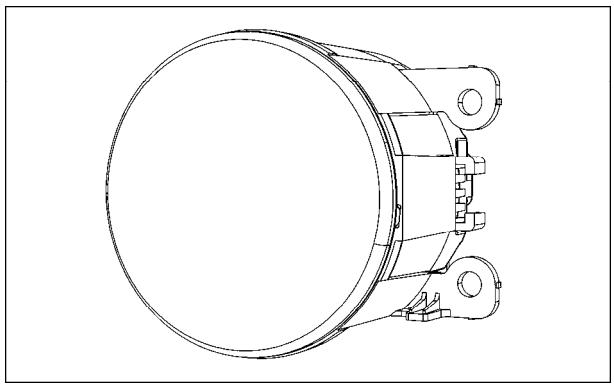
1. Visual Inspection
2. State of Charge
   a. Specific Gravity
   b. Open Circuit Voltage
3. Capacity or Heavy load test

1. VISUAL INSPECTION

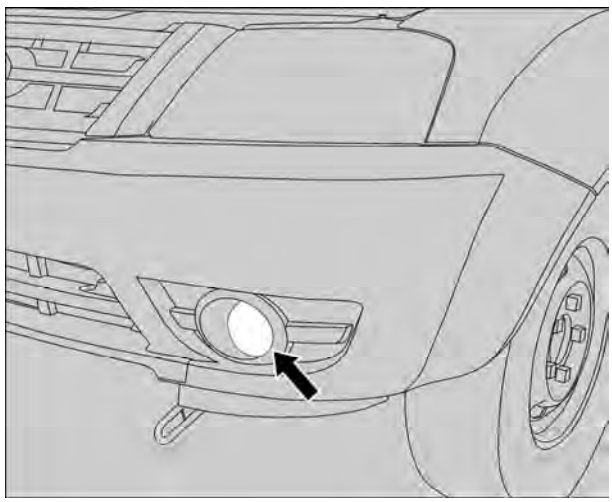
- Battery service should begin with a thorough visual inspection. This inspection may reveal simple, easily correctable problems.
- Check for cracks in the battery container and broken terminals. Either may allow electrolyte leakage and warrant battery replacement.
- Check for broken cable or connectors. Replace as needed.
- Check for corrosion on terminals and dirt or acid on the battery top. Clean the terminals – and battery top with a mixture of water and baking soda. A battery wire brush tool is

4.12 FRONT FOG LAMP

The fog lamps are located in the lower part of the front bumper. The bulb used for the fog lamp function is a halogen H11 bulb, 12V - 55W.Fog lamp on/off is done by using Head lamp rotary switch.

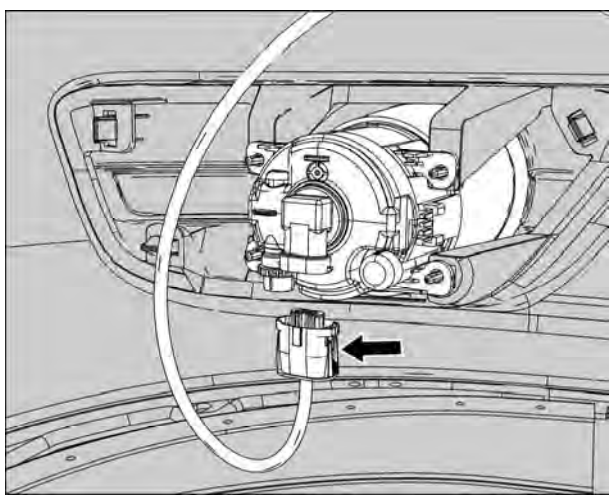


LOCTION:

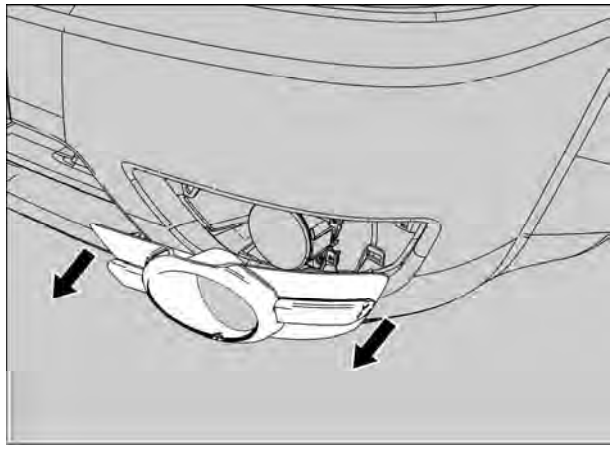


REMOVAL:

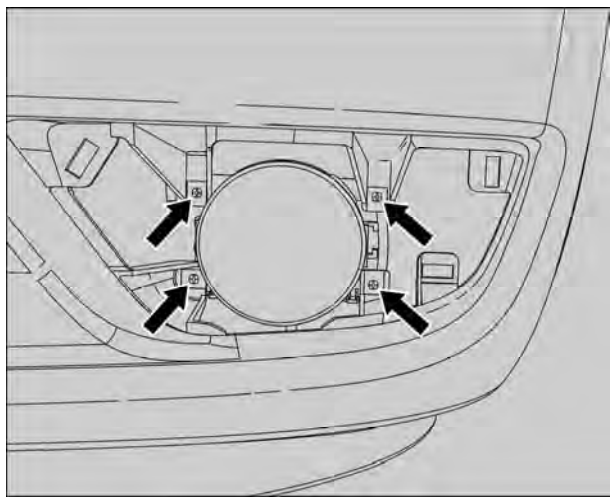
1. Disconnect the electrical connection of fog lamp.



2. Pry out the front fog lamp adaptor (*Snap fitted*).



3. Remove the four mounting screw of fog lamp



4. Take out the fog lamp.

REFITMENT:

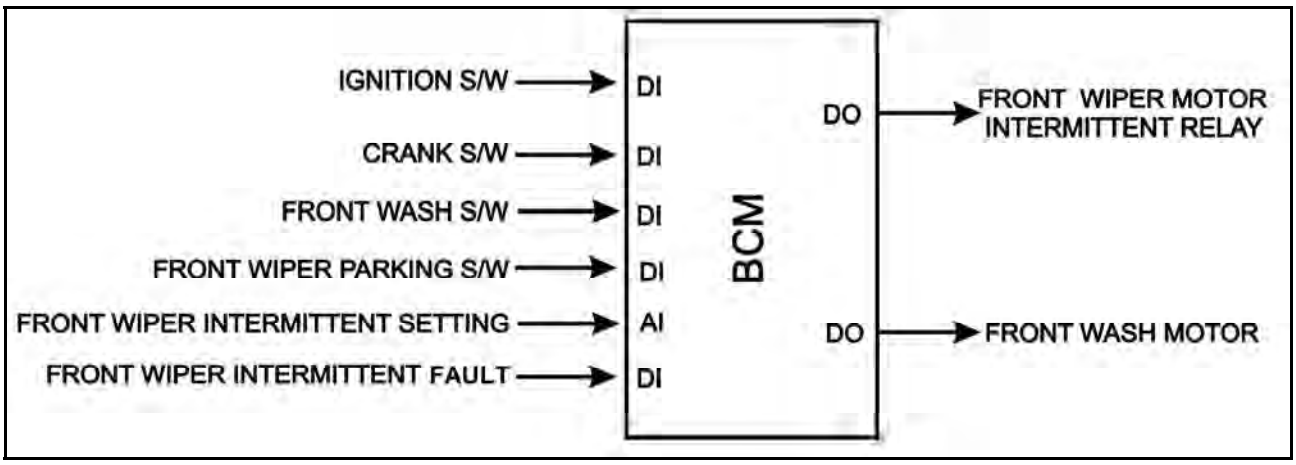
1. Fit the 4 mounting screws of fog lamp assembly.

   Tightening torque for screws – 0.6 kgfm.

2. Fit the fog lamp adaptor on bumper (*Snap fitted*).
3. Connect the electrical connection.

BULB REPLACEMENT PROCEDURE:

1. Remove the front fog lamp assembly.
2. Remove the lens of front fog lamp.
3. Remove the bulb assembly by rotating in anticlockwise direction.
4. Take out the bulb from holder and replace with new one.
5. Fit the assembly by rotating in clockwise direction.
6. Fit the front fog lamp assembly.



INPUT/OUTPUT DIAGRAM:

A. FRONT WIPE:

There are five wiping modes of Front wiper:

- OFF
- FLICK WIPE (*not controlled by BCM*)
- INTERMITTENT (*controlled y BCM*)
- LOW SPEED (*not controlled by BCM*)
- HIGH SPEED (*not controlled by BCM*)

The wiper park position input switch is used to detect when the wiper blade is at the bottom of the wind screen.

OFF

In this state the front wipers should be in the park position. (*Indicated by the wiper park switch being active*) When the wiper mode is changed from FLICK WIPE, INTERMITTENT, LOW SPEED, or HIGH SPEED to OFF the wiper continues the current wipe operation until the park switch indicates the wiper is in the park position.

FLICK WIPE

When FLICK WIPE is selected, the wipers move once across the windshield at low speed and return to the park position. If FLICK WIPE is permanently selected (*switch held on*), then the wipers will move continuously across the windshield at low speed. This mode is not controlled by the BCM but will be detected as LOW SPEED by the state change of the front wiper parking switch input.

INTERMITTENT WIPE:

Front wiper intermittent relay will be ON when Front Wiper Intermittent fault input is ON, ignition switch is ON & crank is OFF. Front Wiper Motor Intermittent Relay will be made OFF when wiper reaches to parking position, unless driven externally. There are five steps of the intermittent wipe delay: 3, 6,9,12 & 15 seconds as per front wiper intermittent setting input. If Front Wiper Intermittent fault input is ON the delay between successive wipes will be 6 seconds, provided front intermittent wipe input is open circuit, ignition switch is ON & crank is OFF. Front wiper will not start next cycle if crank input is ON. When crank goes OFF front wiper resumes its normal operation.

If delay between successive wipes changed from high to low value an immediate wipe (without delay) is executed & next wipes will be executed with shorter delay selected. If delay between successive wipes changed from low to high value next wipe is executed with longer delay selected.

Delay Table:

For BCM Intermittent Version			
Circuit	Position	Delay In Secs.	
	0	3	
	1	6	
	2	9	
	3	12	
	4	15	

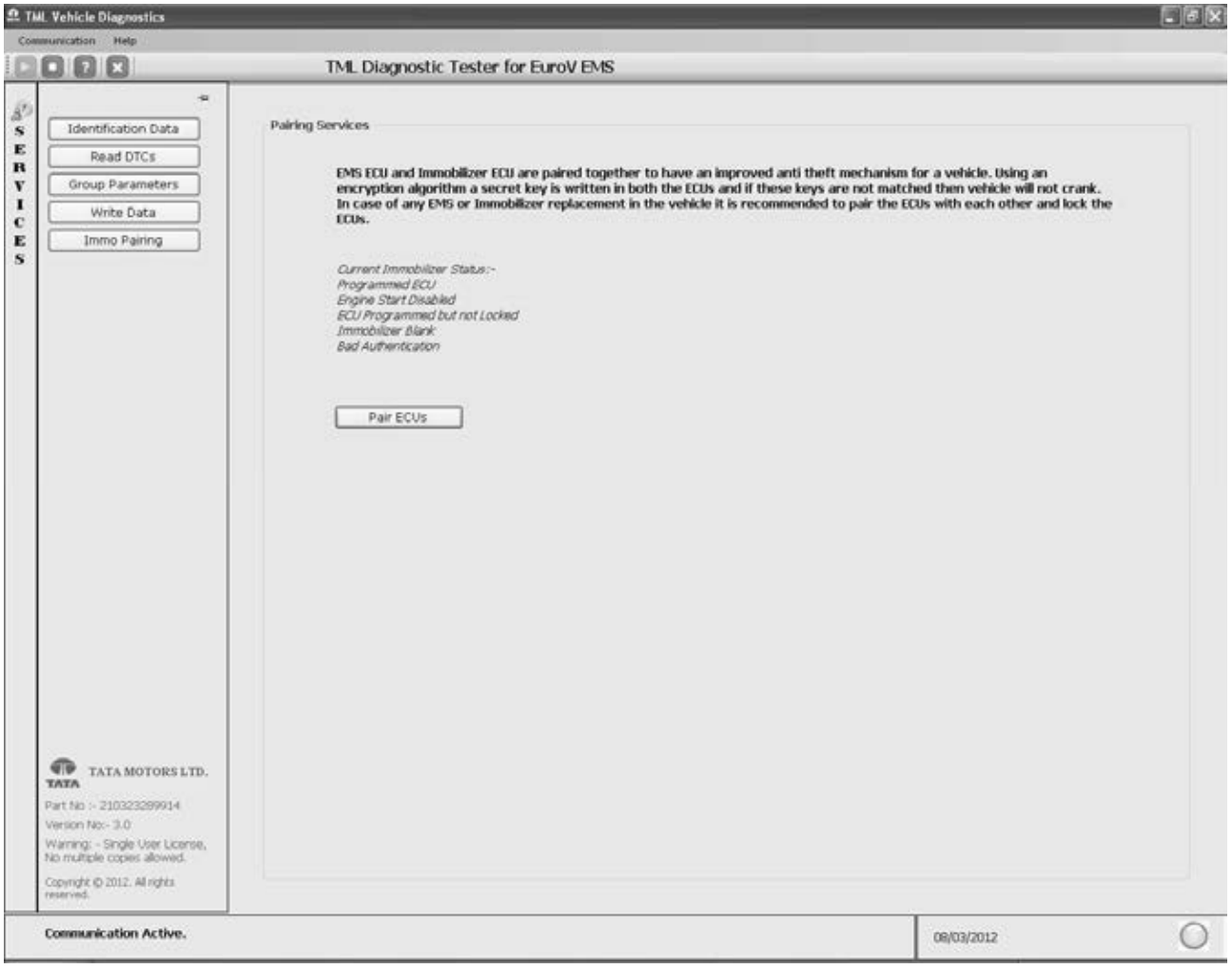
LOW SPEED

When LOW SPEED is selected then the wipers will move continuously across the windshield at low speed. This mode is not controlled by the BCM but will be detected by the state change of the front wiper parking switch input.

2.1.9 IMMOBILIZER PAIRING

As part of the new antitheft mechanism in the vehicles the EMS ECU needs to be paired with Immobilizer ECU.

Read the instructions before paring the ECUs. It is recommended to understand the pairing process thoroughly to avoid the problems that can be caused if process not followed properly.

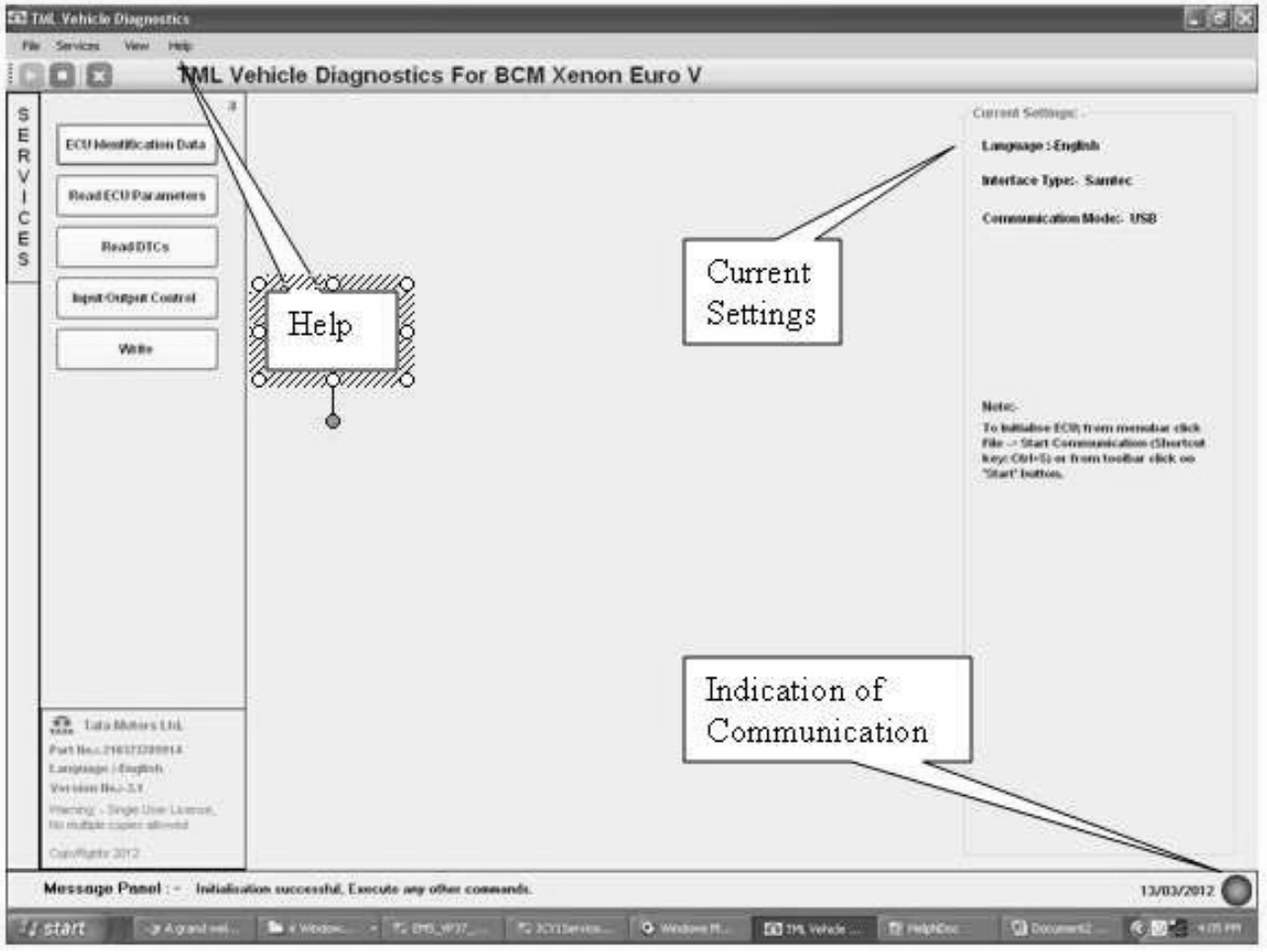


Pairing process takes few moments to complete the activity and user should not perform any other activity in between the pairing process.

2.2.3 MAIN SCREEN

The below is the main screen for the BCM .User has to click on Start button which is in green to start the communication with BCM. At the right hand side User gets the Current setting information as showing below screen.

After successful start user will enable to use different services implemented with service menu or service side screen. User also gets help from Help menu as in below screen.



DTC CODE	DTC DESCRIPTION	FTB NUMBER	CAUSES	REMEDIES	COMMENTS
				B) Reading should be close to 14 V if alternator is charging	
P0402	EGR "A" Flow Excessive Detected	22	1. This DTC gets logged if the difference between the EGR demand and the EGR feedback is higher than a calibrated error threshold.	1. Check the electrical continuity between the EMS ecu pins A83 and A84 to the EGR valve DC motor connector. Rectify if any wiring harness connectivity issues are found. 2. Check for rust/dirt on the connector and clean it if any rust/dirt found. 3. Check whether EMS ecu pins A83 & A84 are either short circuited to vbatt/ground/short circuited across. If so, then rectify the wiring harness connections. 4. Check the continuity between the EMS ecu pins A65, A16,A20 and the motorized EGR actuator connector pins 3, 5 & 4. Rectify if any issues found. Check for any reference voltage supply 3 faults (P0697), if so then follow the rectification procedure of those faults. 5. Check whether the EMS ecu feedback sensor signal pin A16 is short circuited to battery supply/Ground due to wrong wiring harness connections; if so then rectify the wiring harness connections to make them inline with circuit schematics. 6. Check sensor for oxidation, rust etc, if observed clean deposit. 7. Check for rust/dirt accumulated on the sensor connector, if found clean the connector and refit it. 8. Check the air inlet circuit and air filter, if they are clogged then clean them. 9. If still problem persists then replace the motorized EGR actuator. 10. If still problem persists then replace the EMS ecu. 11. Ensure whether the EGR demand and feedback parameters are matching before handing the vehicle to customer.	
P0401	EGR "A" Flow Insufficient Detected	21	1. This DTC gets logged if the difference between the EGR demand and the EGR feedback is lower than a calibrated error threshold.	1. Check the electrical continuity between the EMS ecu pins A83 and A84 to the EGR valve DC motor connector. Rectify if any wiring harness connectivity issues are found. 2. Check for rust/dirt on the connector and clean it if any rust/dirt found. 3. Check whether EMS ecu pins A83 & A84 are either short circuited to vbatt/ground/short circuited across. If so, then rectify the wiring harness connections. 4. Check the continuity between the EMS ecu pins A65, A16,A20 and the motorized EGR actuator connector pins 3, 5 & 4. Rectify if any issues found. Check for any reference voltage supply 3 faults (P0697), if so then follow the rectification procedure of those faults. 5. Check whether the EMS ecu feedback sensor signal pin A16 is short circuited to battery supply/Ground due to wrong wiring harness connections; if so then rectify the wiring harness connections to make them inline with circuit schematics. 6. Check sensor for oxidation, rust etc, if observed clean deposit. 7. Check for rust/dirt accumulated on the sensor connector, if found clean the connector and refit it. 8. Check the air inlet circuit and air filter, if they are clogged then clean them. 9. If still problem persists then replace the motorized EGR actuator. 10. If still problem persists then replace the EMS ecu. 11. Ensure whether the EGR demand and feedback parameters are matching before handing the vehicle to customer.	

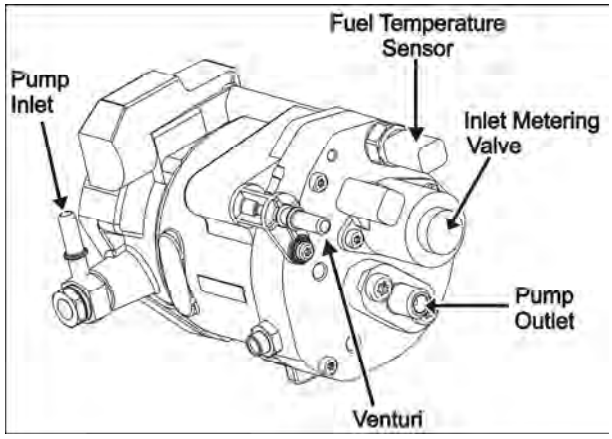
DTC CODE	DTC DESCRIPTION	FTB NUMBER	CAUSES	REMEDIES	COMMENTS
				13. If vehicle is unable to start the perform 'Static injector back leak test', Please check if any injector back leak is abnormally high compared to other injectors, then replace corresponding injectors. 14. If vehicle is able to start then start the vehicle and perform 'Dynamic IMV test' - If test result shows IMV is faulty then replace IMV. 15. If vehicle is able to start then start the vehicle and perform 'Dynamic injector back leak test', Please check if any injector back leak is abnormally high compared to other injectors, then replace corresponding injectors. 16. If vehicle is able to start then start the vehicle and perform "Pump pressure build capacity test' - If test result shows not ok then replace HP pump. 17. Check whether High pressure pump is functioning properly/able to build pressure else replace high pressure pump. 18. Check whether IMV is Stuck closed, if so replace the IMV. 19. After rectification ensure the following before handing over to customer. a) Rail pressure at ignition key on is < 10 bar, b) By removing the rail pressure sensor connector shows a very rail pressure value in bar, c) High pressure leak detection test can be carried out. d) Please drive the vehicle on road, check and ensure rail pressure feed-back follows the demand continuously.(feedback and demand parameters can be monitored by using diagnostic tool)	
P06B8	Internal Control Module Non-Volatile Random Access Memory (NVRAM) Error	45	This fault gets logged due to EMS ecu Internal control module NVM failure	Replace the EMS ecu if this fault appears	
PBA35	Throttle/Pedal Position Sensor / Switch "A"/"B" Voltage Correlation	62	1. This fault appears when EMS ecu finds lack of correlation between Accelerator pedal switch 1 & 2 inputs.	1. Check for any faults related to accelerator pedal track 1 and track 2; if noticed Rectify the concerned faults by following their rectification procedure. 2. Check Electrical continuity between ECU pins B25,B24 & B26 to Pedal connector pins 4,2 & 3 && ECU pins B13,B29, & B14 to pedal connector pins 6,1 & 5 as per circuit schematics; Follow Electrical continuity check procedure. Replace/ Rectify if any faults found. 3. After rectification ensure the following checks before handing over the vehicle to customer. A) When pedal is not pressed - Pedal position in tata diagnostic tool should be less than 5%. B) When the pedal is fully pressed - Pedal position in tata diagnostic tool should be more than 95 %.	
P060D	Internal Control Module Accelerator Pedal Position Performance	96	This fault gets logged when pedal track 1 and pedal track 2 failures are confirmed.	1. Check for any faults related to accelerator pedal track 1 and track 2: P0A23-12, P0A22-14, P0223-12, and P0222-14 && reference voltage faults: P0641, P0651; if noticed Rectify the concerned faults by following their rectification procedure. 2. Check Electrical continuity between ECU pins B25,B24 & B26 to Pedal connector pins 4,2 & 3 && ECU pins B13,B29, & B14 to pedal connector pins 6,1 & 5 as per circuit schematics; Follow Electrical continuity check procedure. Replace/ Rectify if any faults found. 3. After rectification ensure the following checks before handing over the vehicle to customer. A) When pedal is not pressed - Pedal position in tata diagnostic tool should be less than 5%. B) When the pedal is fully pressed - Pedal position in tata diagnostic tool should be more than 95 %.	

DTC	DESCRIPTION	CAUSES	EFFECT	CHECK POINTS	CORRECTIVE ACTION
B1767	Daytime Running Lamps short to Battery/Open	1) Daytime Running Lamps wire from BCM is open circuit. 2) Both Left & Right Daytime Running Lamps are open connections. 3) Both Left & Right Daytime Running Lamps get blow. 4) BCM Daytime Running Lamps output is short to Battery.	In case of Short to Battery Daytime Running Lamps will remain continuously ON. And in case of Open Daytime Running Lamps will remain continuously OFF.	1) Check the physical connection of the BCM connector & Daytime Running Lamps mating connector. 2) Check the terminal insertion for BCM connector & Daytime Running Lamps mating connector. 3) Turn off ignition and unplug BCM X1 connector. Check continuity between BCM connector pin no X1.F4 to Daytime Running Lamps mating connector. If continuity not found then refer corrective action 2. Then plug BCM X1 connector. 4) Turn off ignition and unplug BCM X1 connector. Check if any 12 V supply is seen across pins X1.F4. If 12 V found across pins X1.F4 correct the wiring harness. Refer corrective action 3.Then plug BCM X1 connector. 5) Switch On the ignition & Clear DTC. 6) Turn OFF the Daytime Running Lamps then turns ON the Daytime Running Lamps. 7) Read DTC.	1) Connect the BCM mating connector & Daytime Running Lamps mating connector. 2) Correct the wiring harness. 3) Correct the wiring harness (Remove the BCM pin X1.F4 short to battery). 4) Check Daytime Running Lamps mating connector & BCM wiring insertion. 5) If Daytime Running Lamps get blow replace with new one.
B14A0	HRW Switch Stuck	If Front wash switch stuck more than 1 min then Front wash switch stuck DTC will set		1) Clear DTC	
B1768	Daytime Running Lamps short to Ground	Daytime Running Lamps output is short to ground.	Daytime Running Lamps will remain continuously OFF.	1) Turn off ignition and unplug BCM X1 connector. Check for continuity between BCM pin no X1.F4 with Vehicle ground. If continuity found correct the wiring harness. Refer corrective action. Then plug BCM X1 connector. 2) Switch On the ignition. Clear the existing DTC. 3) Turn OFF the Daytime Running Lamps then turns ON the Daytime Running Lamps. 4) Read DTC.	Correct the wiring harness (remove the BCM output to short to ground).

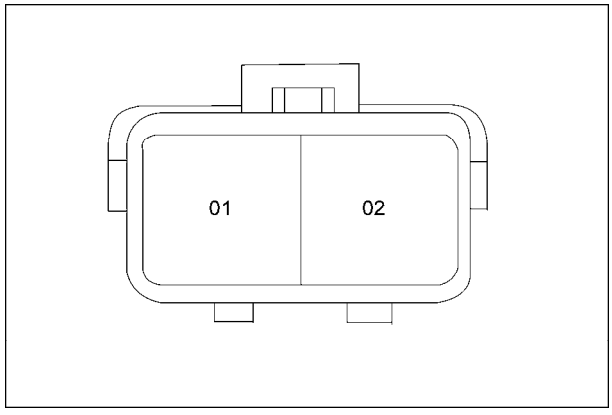
3.8 FUEL TEMPERATURE SENSOR (*FTS*):

This sensor monitors the temperature of fuel entering in the HP pump. The fuel temperature sensor measures fuel temperature on the pump hydraulic head in the low pressure circuit, between the transfer pump outlet and the inlet to the HP pumping stage. This sensor information issued to modify rail pressure control, injection etc. This sensor is in built with HP Pump.

LOCATION:



Connector Details:



Pinout Detail:

PIN NO	DESCRIPTION
1	Fuel temperature signal
2	Fuel temperature return

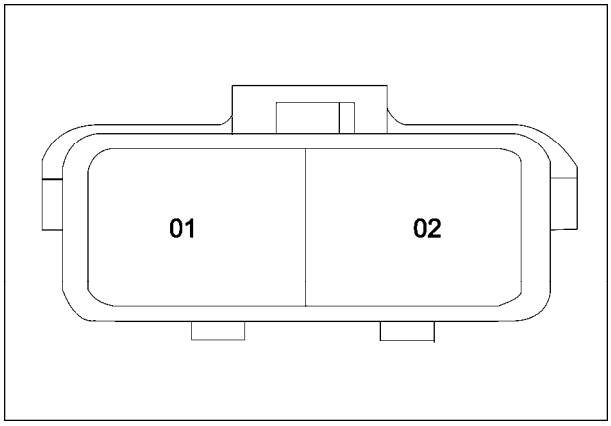
INSPECTION:

1. Measure the resistance between the two Fuel temperature sensor connector terminals; it should be ~1814.2 ohms at 30 degrees (Consider 30 deg as room temperature).

3.9 INLET METERING VALVE (*IMV):*

This controls fuel flow into pumping element in order to control rail pressure. This sensor is in built with HP Pump.

CONNECTOR DETAIL:



Pinout Details:

PIN NO	DESCRIPTION
1	IMV Signal
2	IMV Supply

INSPECTION:

1. Measure the resistance between the two IMV connector terminals, it should be between 5.44 ohms.

3.10 VENTURI:

It is an integral part of High pressure pump. It has inlet & outlet connections. One connection comes from injector back leak circuit and another from the HP pump *(back leak)* the third connection goes to the fuel tank (*return Line*), in between there is a "T" connector which goes to the fuel filter.

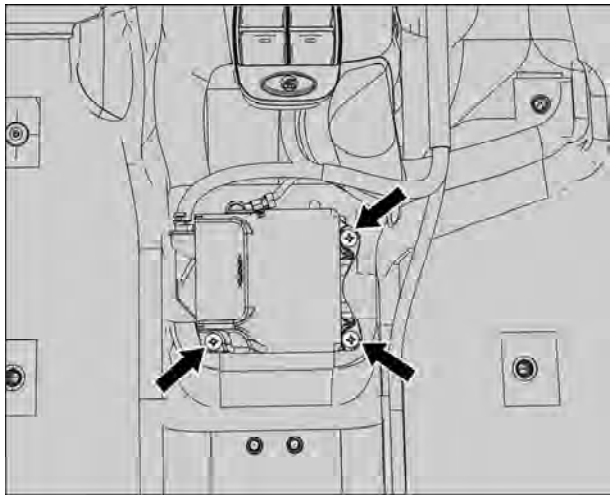
SUPPLEMENTARY RESTRAINT SYSTEM (SRS)

ON VEHICLE SERVICE

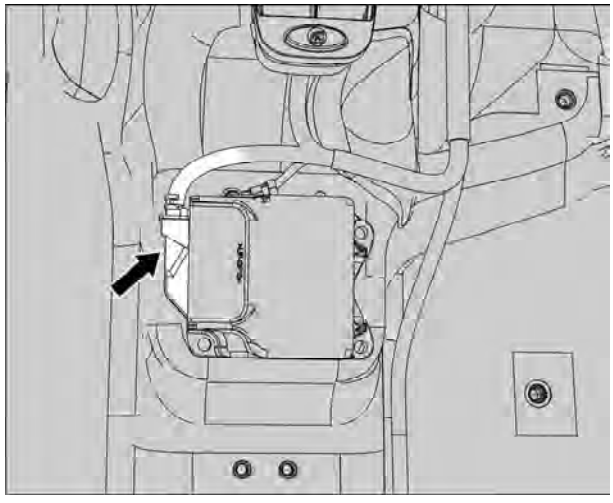
ECU

REMOVAL

1. Disconnect the battery connections.
2. Remove the floor console assembly.
3. Loosen and remove the mounting fasteners of the ECU and lift it up.



4. Disconnect the electrical connection from the air bag ECU and remove the ECU assembly.

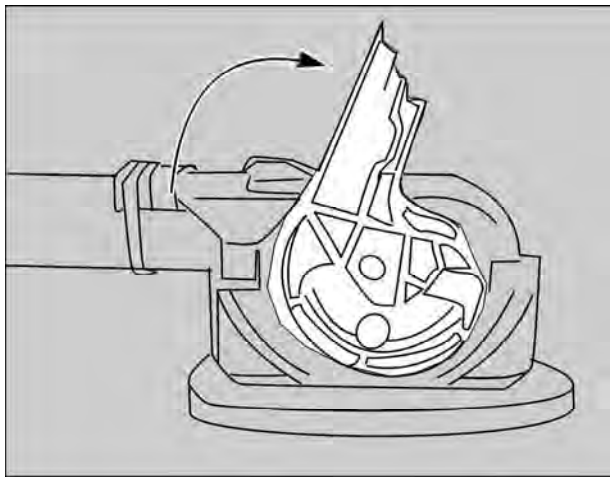


FITMENT

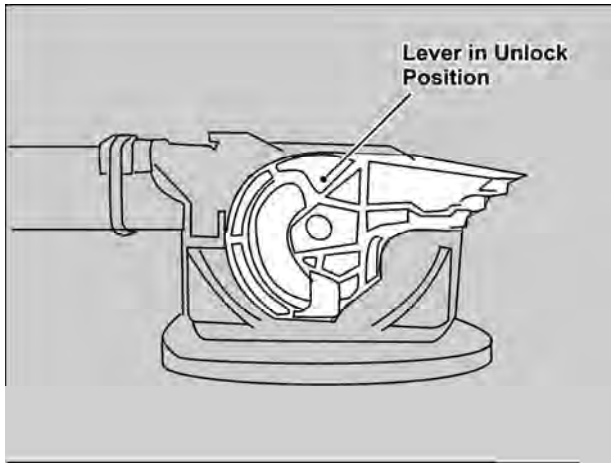
For fitment follow reverse procedure of removal.

PRECAUTIONS

- If the ECU is accidentally dropped on the concrete floor from the height of more than 1m then that ECU should not be used on a vehicle.
- ECU should be transported with proper packing material.
- Always store the ECU in dry place.
- A person handling any restraints module assembly shall have to wear ESD *(electro-static discharge)* straps to reduce any risk of inadvertent deployment.



(ii) Lock the lever to it's unlocking position by pressing the lever till the **Click** sound is heard and remove the connector from ABS ECU.



!! WARNING

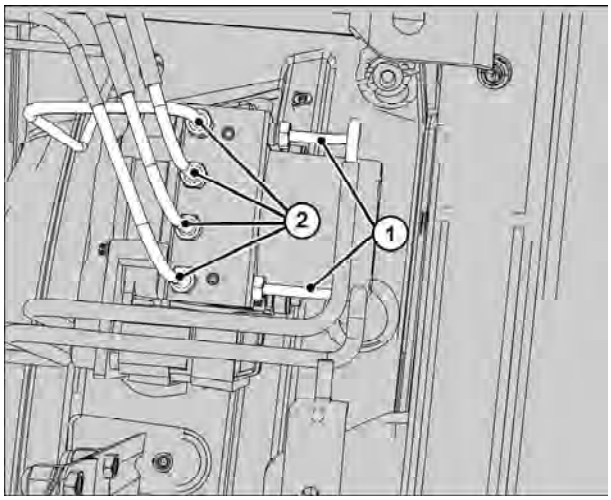
Never apply a 12V power source to any terminal of the ECU connector when it's disconnected.

4. Identify the brake pipes going into and out of the Hydraulic Unit *(HCU)* with tags so that reinstallation of the brake lines becomes easy.

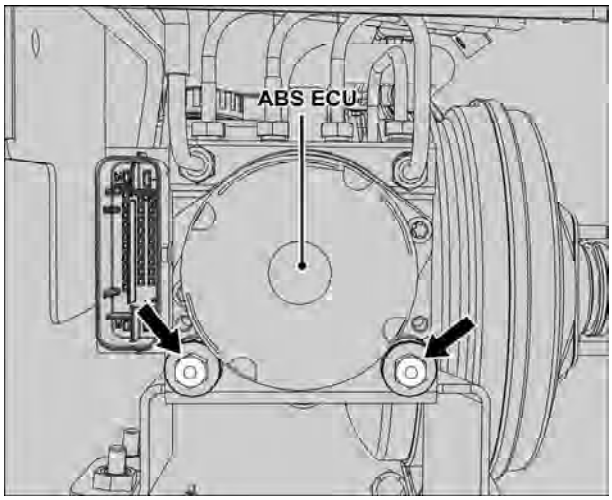
NOTE

Proper care should be taken before disconnecting the brake pipes from HCU and the HCU must be thoroughly cleaned on the outside to prevent any dirt particles from falling into the ports of HCU or entering the brake pipes.

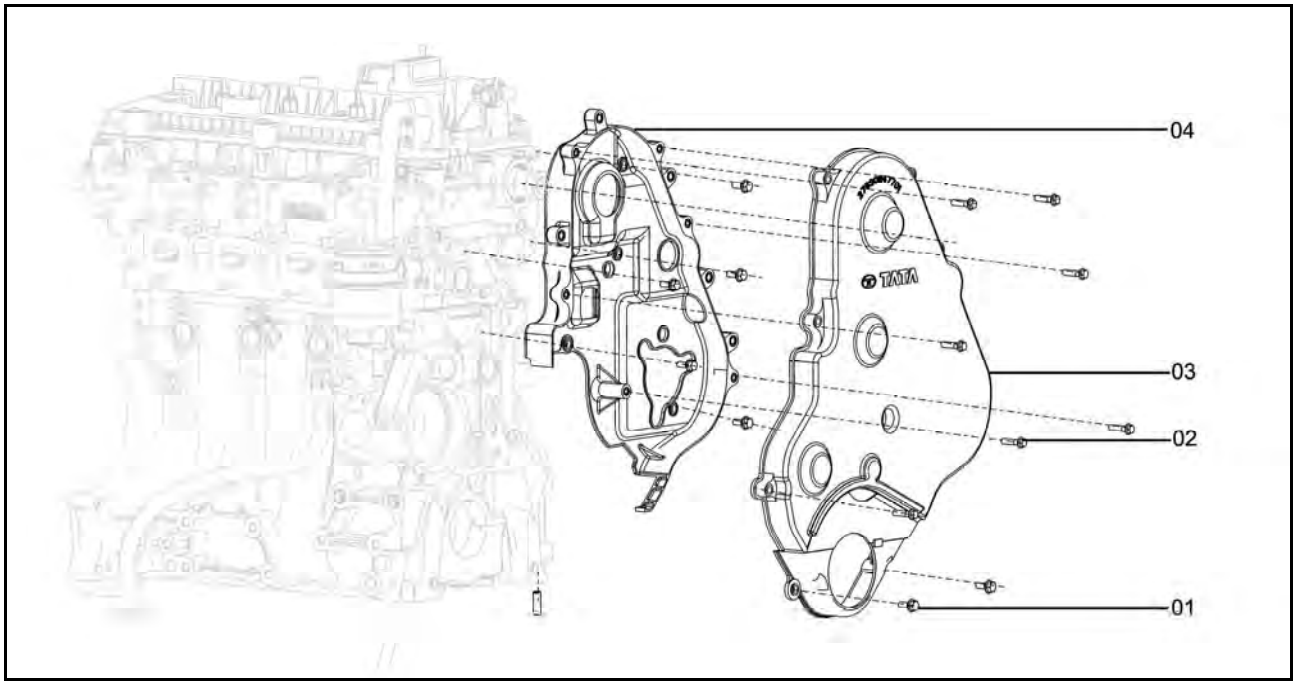
5. Remove the brake pipes from MC *(1)* and feed pipes to calipers *(2)* from the HCU and plug the ports with suitable grommet / Cap.



6. Loosen the 2 holding nuts of the ABS ECU.



TIMING COVER FRONT AND REAR



SR. NO.	DESCRIPTION
01	Hexagonal flange screw M6x16
02	Hexagonal flange bolt M6x25
03	Front cover-top *(Timing belt)*
04	Assembly Cover-back*(Timing belt)*