

17 - EMISSION CONTROL

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EMISSION CONTROL

Three systems are used to control the vehicle atmospheric emissions these are:

- Engine crankcase fume emissions.
- Fuel tank evaporative emissions
- Engine exhaust gas emissions.

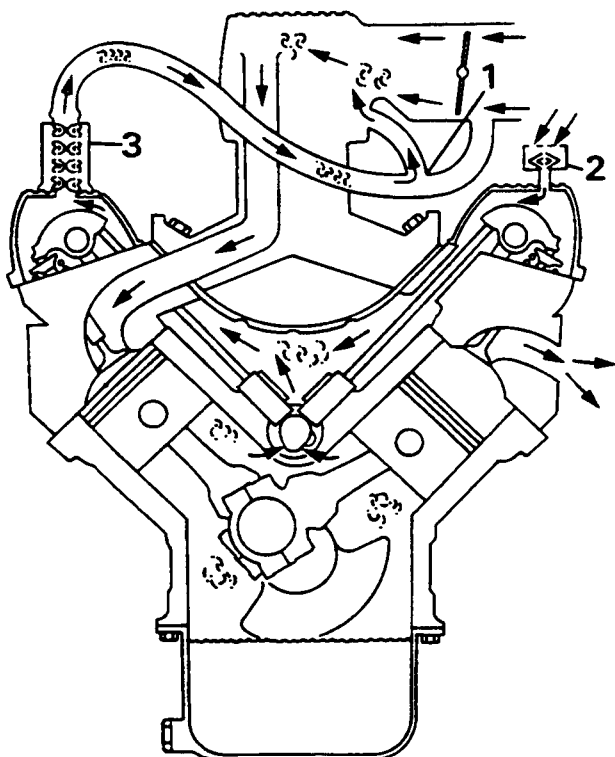
Crankcase ventilation system

The crankcase ventilation system which is an integral part of the air supply to the engine combustion chambers, is often overlooked when diagnosing problems associated with engine performance. A blocked ventilation pipe or filter or excessive air leak into the inlet system through a damaged pipe or leaking gasket can effect the mixture, performance and economy of the engine.

The purpose of the crankcase ventilation system is to ensure that any noxious gas generated in the engine crankcase is rendered harmless by burning in the combustion chambers as follows:

Oil laden noxious gas in the engine crankcase is drawn through an oil separator 3 located on the right hand cylinder head rocker cover, where the oil is separated and returned to the sump. The gas flows through a restrictor in the three way connection 1 and into the inlet plenum chamber where it is drawn into the combustion chambers and burned. The volume of fresh air which is drawn from the atmospheric side of the throttle butterfly to mix with the gas, depends on the position of the throttle and the engine speed.

The air filter 2 fitted to the left hand cylinder head rocker cover, must be maintained in clean condition to ensure sufficient air enters the crankcase under varying throttle openings and manifold depression, to prevent excessive crankcase pressure or depression developing.



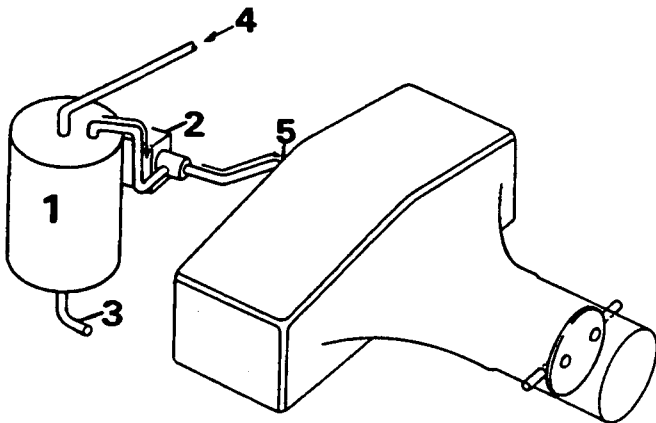
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1. Three way connector
2. Air filter
3. Oil separator

EVAPORATIVE EMISSION CONTROL

Fuel tank evaporative control

The specification for certain countries requires the recycling of petrol evaporation from the fuel tank. For these countries only, a charcoal canister and purge valve are installed in the engine compartment.



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Evaporative purge system

1. Charcoal canister
2. Purge valve
3. Charcoal canister air vent
4. Fuel purge connection from separator/expansion tank
5. Plenum chamber connection

Operation

When the engine is not running, the purge valve 2 seals the plenum chamber connection 5. Any vapour entering the canister at 4 from fuel tank, is condensed by the air entering at 3 which is then absorbed by the charcoal.

The opening of the purge valve 2, which is controlled by the EFI ECU occurs when the following conditions prevail:

When the engine is running at speeds above 1700 rev/min and temperatures above 54°C the ECU will hold open the purge valve as necessary.

At speeds below 1700 rev/min the ECU will only pulse the purge valve open for short periods.

While the purge valve 2 is open, engine depression draws air through vent 3 and fuel tank fumes via 4 into the engine combustion chambers, where they are burned. Air entering at 3, passes through the charcoal, where any accumulation of condensed fuel is also extracted and burned in the engine.

A permanent leakage of air into the plenum chamber through the purge system will affect engine performance. See FUEL SYSTEM, Description and operation, Hot wire electronic fuel injection

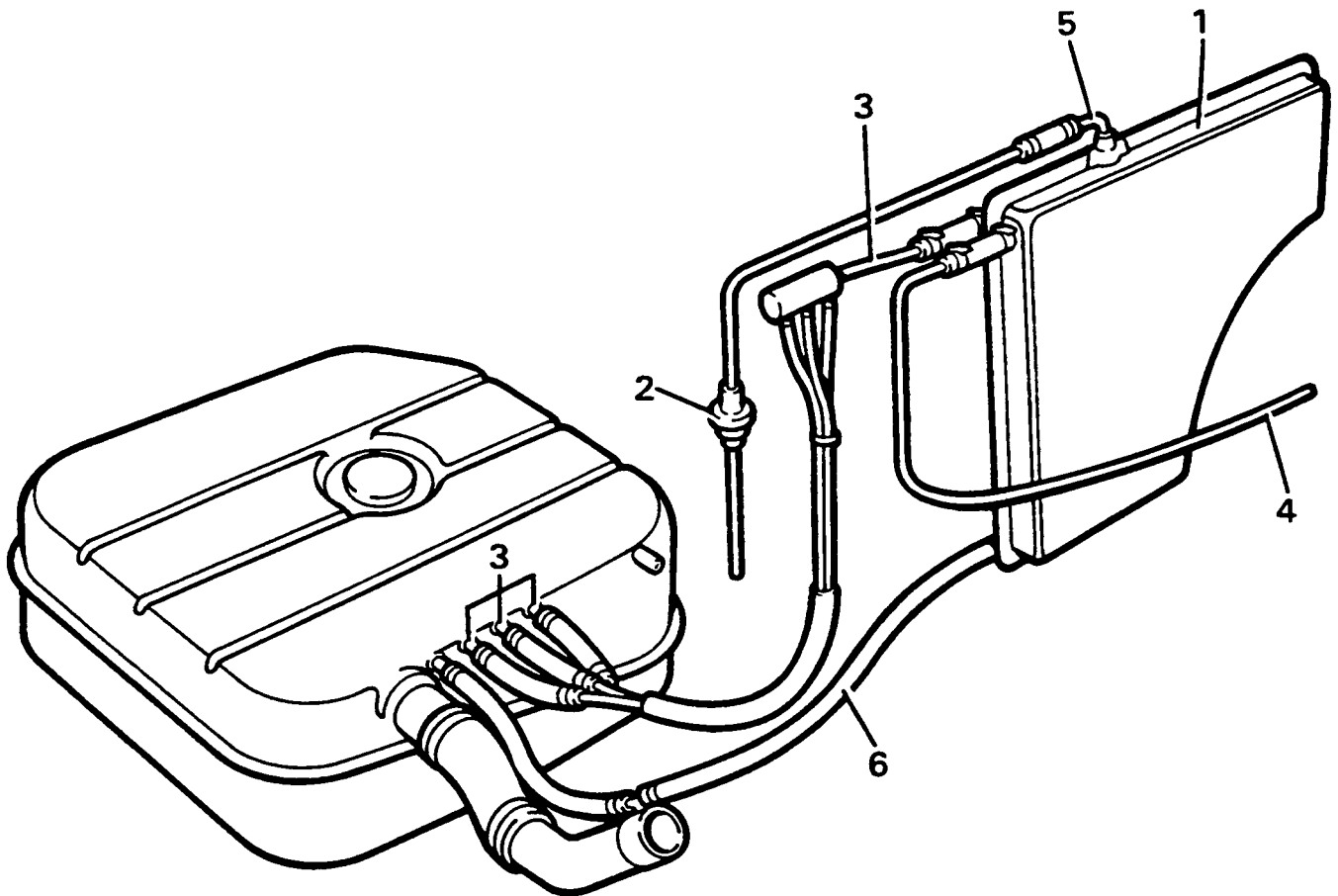
Fuel tank evaporative control system

The system consists of a fuel separator/expansion tank located at a higher level than the fuel tank, between the inner body side and the right rear fender. The tank is vented to atmosphere through a relief valve and is connected to the fuel tank and the charcoal canister purge system in the engine compartment.

The 1990 and 1991 systems are slightly different to one another as follows:

Operation - 1990 system

As the temperature rises, fuel vapour in the fuel tank is allowed to vent into the separator/expansion tank 1 via three pipes and a manifold connector 3. Any vapour which condenses into liquid fuel drains through pipe 6 back into the main fuel tank and residual vapour is dealt with by the purge system connection 4 in the engine compartment, previously explained. The atmosphere relief valve 2 will only open if a blockage occurs in the charcoal canister or purge system.



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Fuel tank evaporative control system 1990

1. Fuel separator/expansion tank
2. Relief valve to atmosphere
3. Fuel tank vent
4. Purge connection to Purge System in engine compartment
5. Shut off valve
6. Condensed fuel return to fuel tank

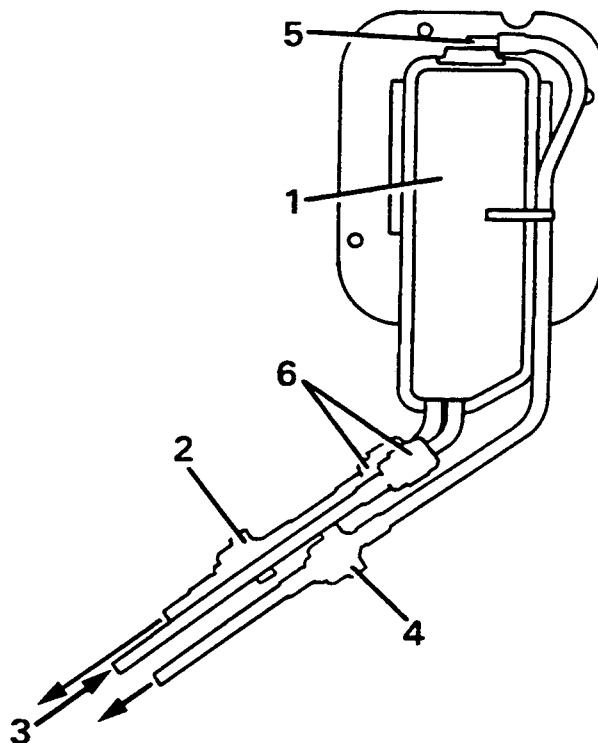
Fuel tank evaporative control system 1991

The 1991 system consists of small vapour separator located between the inner body side and the right rear fender.

Operation

As the temperature rises fuel vapour is allowed to enter the separator tank 1 through pipe 3. Any condensed liquid fuel returns to the fuel tank by the same pipe. When the pressure inside the separator tank reaches between 0.75 and 1.0 psi the relief valve 4 allows the fumes to pass to the purge system in the engine compartment. Should a blockage or fault develop in pipe 4, excessive pressure is then released to atmosphere by the safety valve 2. In the event of the vehicle rolling over a shut off valve 5 located at the top of the atmospheric vent pipe 4, prevents fuel flowing to the engine compartment.

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Fuel tank evaporative control system 1991

1. Fuel separator/expansion tank
2. Relief valve to atmosphere
3. Fuel tank vent
4. Purge connection to Purge System in engine compartment
5. Shut off valve
6. 'Speed Fit' pipe connections



EVAPORATIVE LOSS CONTROL PRESSURE TEST - 1991 MODEL ONWARDS

This procedure provides a method for checking system if a leak is suspected. Excessive leakage will affect evaporative loss control.

Equipment required.

Nitrogen cylinder

Water manometer (0 - 30" H₂O or more).

Pipework and a "T" piece.

Method.

1. Ensure at least two gallons of fuel in tank.
2. Disconnect, at adsorption canister, pipe to vapor separator.
3. Connect this pipe to nitrogen cylinder and water manometer using "T" piece.
4. Pressurize system to 26.5 and 27.5 inches of water, allow reading to stabilize, turn off nitrogen supply.
5. Measure pressure drop, if drop exceeds 2.5 inches of water after 2 min 30 secs, a leak is indicated. Note that a fully sealed system will show a slight pressure increase.
6. If system leaks, maintain pressure, and apply soap solution round all connections until bubbles reveal source of leak.
7. Repair leak.
8. Repeat test. Remove test equipment, if successful.
9. Reconnect pipe to adsorption canister.

POSITIVE CRANKCASE VENTILATION AIR INTAKE FILTER

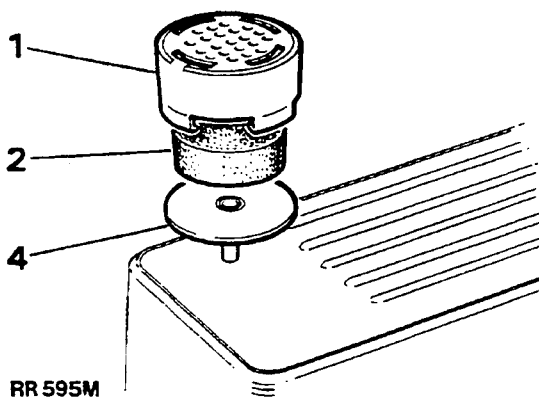
Service repair no - 17.10.02

Remove and refit

The PCV air intake filter is located at rear of left hand rocker cover, beneath throttle linkage bracket.

Remove

1. Pry filter cover upwards to release it.
2. Remove filter from cover and discard.



Refit

3. Insert new filter into filter cover.
4. Press filter onto mounting until it clips firmly into position.

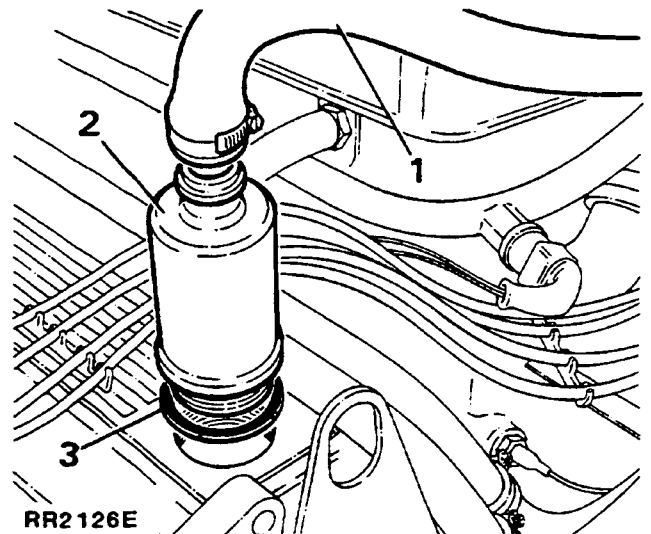
POSITIVE CRANKCASE VENTILATION BREATHER FILTER - NOT Tdi

Service repair no - 17.10.03

Remove and refit

Remove

1. Release hose clamp, pull hose off canister.
2. Unscrew canister and remove.
3. Remove large rubber 'O' ring, inspect for deterioration.



4. Inspect condition of wire screen within canister, if necessary, replace assembly. If filter unit is in acceptable condition, clean as follows.
5. Immerse canister in small amount of solvent (mineral spirits), allow solvent to dissolve or loosen debris.
6. Remove canister from solvent, allow to dry in still air.

WARNING: Do not use compressed air to dry, clean or remove particles of debris within the canister. This could cause fire or personal injury.

Refit

7. Fit a new 'O' ring to original canister.
8. Screw canister into rocker cover securely - hand tight only.
9. Refit hose, tighten hose clamp securely.

FUEL EXPANSION TANK - PRE 1991 MODEL YEAR

Service repair no - 17.15.19

Remove and refit

The fuel expansion tank is located between right hand rear wing and inner body side assembly. Access to tank is gained by removing rear wing and body corner panel.

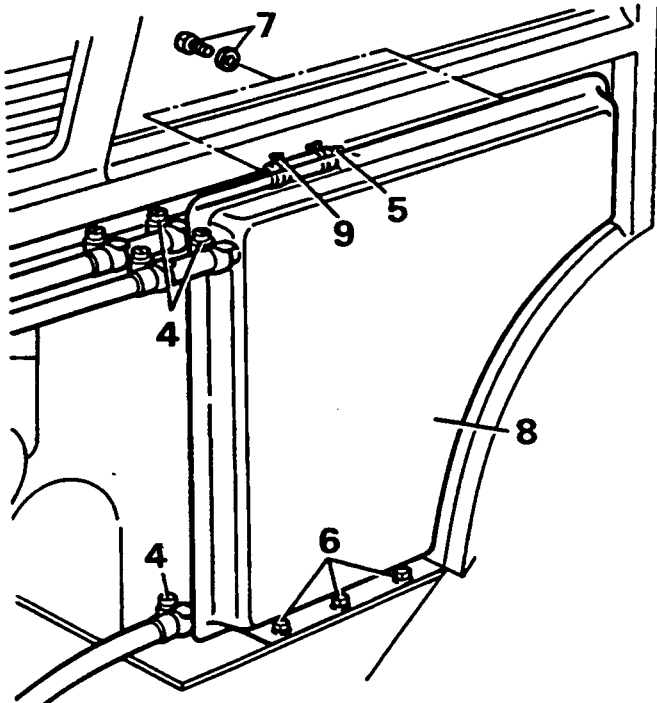


WARNING: Ensure all necessary precautions are taken against spillage of fuel when disconnecting expansion tank hoses.

hoses.

Remove

1. Depressurise fuel system. *See FUEL SYSTEM, Repair, Depressurising fuel system*
2. Disconnect the battery negative lead.
3. Remove rear wing and corner panel assembly. *See CHASSIS AND BODY, Repair, Rear corner panel and wing*
4. Release three hose clamps and remove three hoses from expansion tank.
5. Release hose clamp and remove hose from float valve located on top of expansion tank.

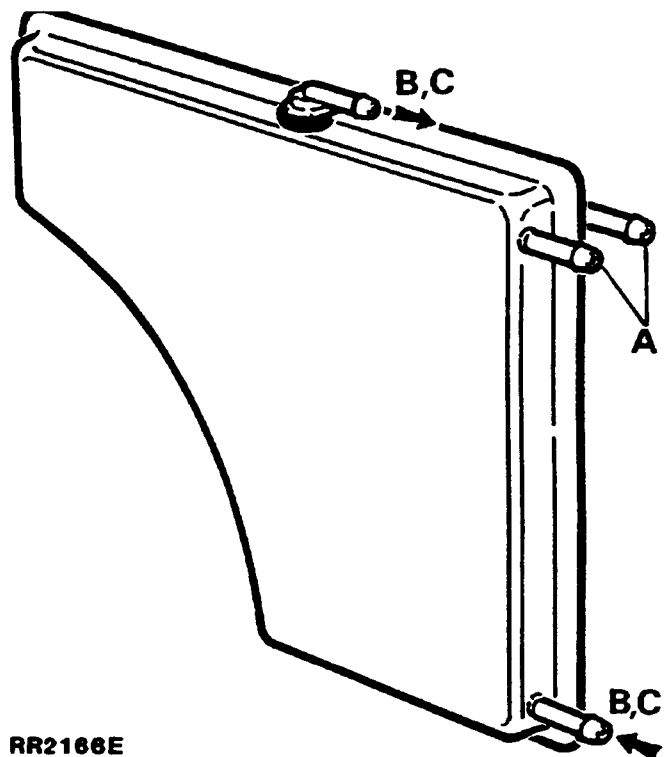


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6. Remove three bolts retaining bottom of expansion tank.
7. Lift trim covering vehicle tool kit, remove two expansion tank securing bolts.
8. Remove tank from vehicle.
9. Remove short hose from top vapour hose. Check restrictor in hose is free from blockages.
10. Check operation of the float/rollover valve with tank removed from vehicle as follows:
 - A. Seal top two outlet pipes.
 - B. Apply air pressure at 2 p.s.i to bottom pipe. With tank in its upright position air flow will pass through valve. Rotate tank 90° onto its side, air flow should not pass through the valve.
 - C. Disconnect air supply to tank. With bottom pipe sealed fill tank with mineral spirit. Hold tank upright, float valve should shut off and prevent fluid passing through the valve.
 - D. If valve does not operate as above, replace float valve.



NOTE: DO NOT remove float valve unless faulty. If new valve is fitted, always fit new grommet.



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11. Before refitting tank remove breather hose attached to top of filler neck, identify filler neck to breather hose end to aid reassembly. Vigourously shake hose, listen for valve ball movement, no sound from valve, replace hose assembly.

Refit

12. Refit expansion tank ensuring all connections are secure, all hose clamps securely tightened.

LAMBDA (OXYGEN) SENSOR

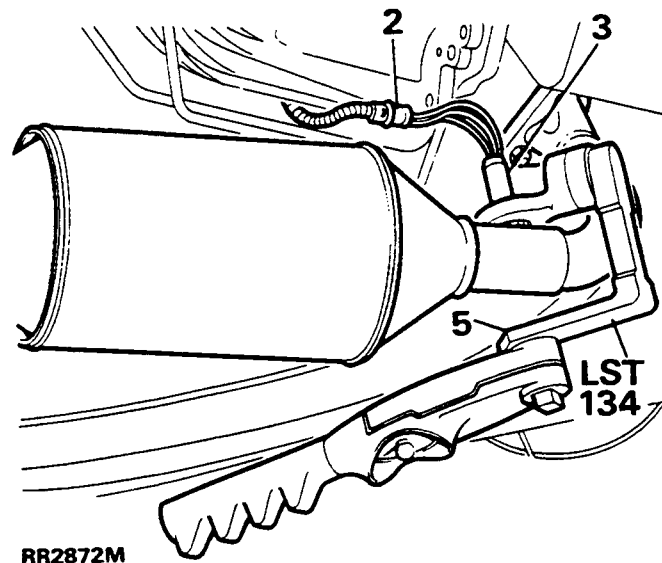
Service repair no - 18.30.39

Remove and refit

Remove sensors from exhaust system only when engine is cold.

Remove

1. Disconnect the battery negative lead.
2. Disconnect electrical plugs from sensors.
3. Remove sensors from exhaust downpipes.



Refit

4. Coat threads of sensor with anti-seize compound.



CAUTION: To ensure efficiency of sensor is not impaired, **DO NOT** allow anti-seize compound to come into contact with sensor nose.

5. Fit sensor and tighten to **20 Nm**, using service tool LRT-12-047.
6. Connect electrical plugs and battery lead.

CHARCOAL CANISTER

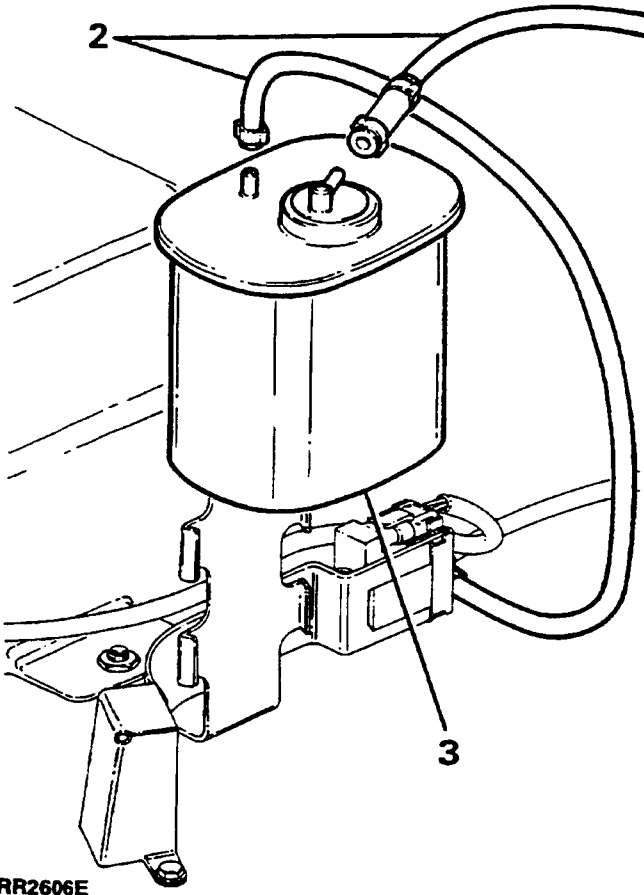
Service repair no - 17.15.39

Remove and refit

NOTE: If crimped hoses are removed it is essential that they are recrimped on reassembly to ensure a leak free joint.

Remove

1. Disconnect the battery negative lead.
2. Disconnect both purge lines.
3. Release canister from mounting.



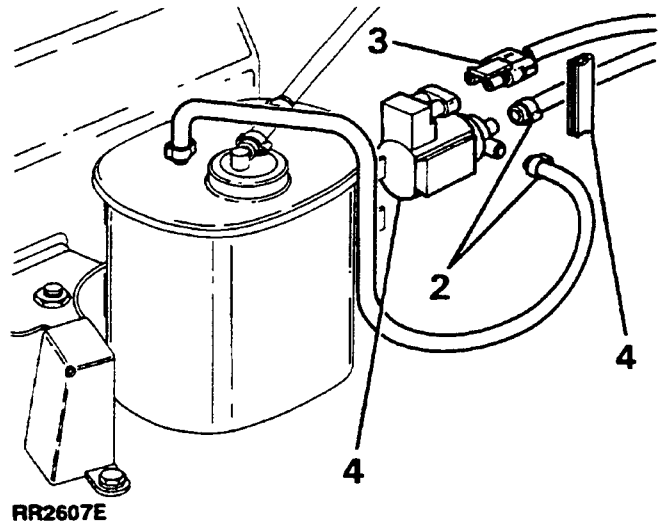
RR2606E

Refit

4. Reverse removal procedure. Ensure that canister is securely located and both purge lines are fitted correctly to canister.

CHARCOAL CANISTER - PURGE VALVEPurge valve fault diagnosis. See *ETM, A1***Remove and refit****Remove**

1. Disconnect the battery negative lead.
2. Disconnect two purge valve pipes.
3. Disconnect electrical connection.
4. Remove edge clip retaining purge valve and withdraw purge valve.



RR2607E

Refit

5. Reverse removal procedure. Ensuring pipes are securely crimped.



VAPOUR SEPARATOR

Service tools:
LRS-19-002 Speedfit disconnecter

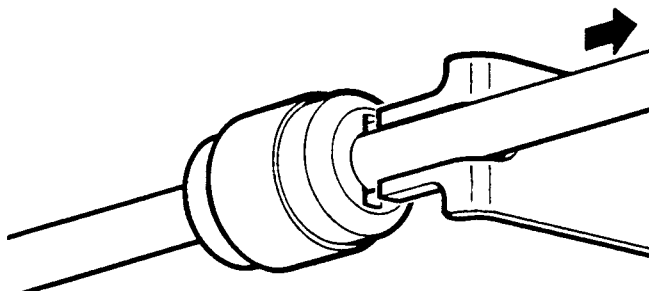
Remove and refit

Remove



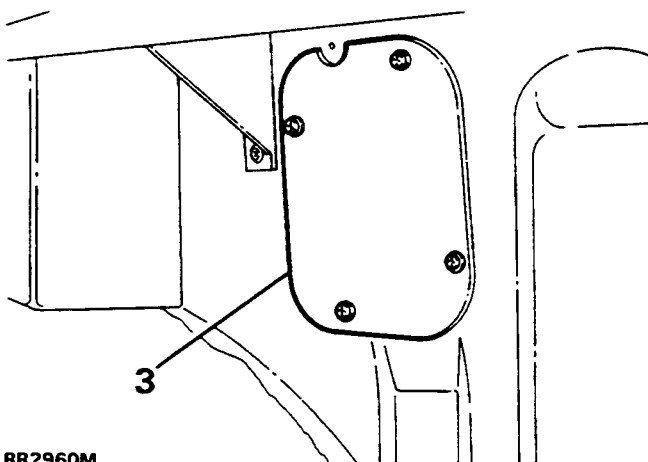
WARNING: Ensure that all necessary precautions are taken against fuel spillage and fuel vapor to prevent fire or explosion.

1. Disconnect the battery negative lead.
2. Working underneath vehicle, disconnect evaporative control pipes from green end of "speedfit" connectors. Use LRS-19-002, press down on collet and pull pipe from connector.



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3. Remove four screws securing vapor separator support plate to body panel situated in right hand side of load space.



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4. Remove separator and pressure relief valves.



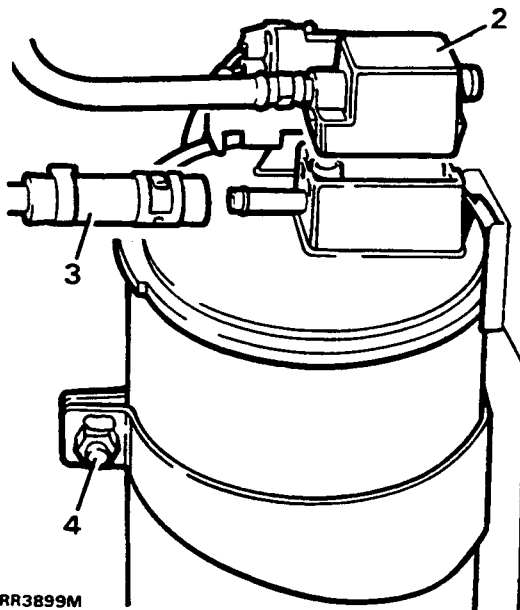
NOTE: Pressure relief valves are renewable, but shut-off valve in top of separator is only available as a complete new separator assembly.

Fitting vapor separator.

1. Fit separator and pipes into vehicle side panel. If necessary use a new seal, with self adhesive side to separator. Secure with four screws.
2. From beneath vehicle, fit pipes from separator to connectors. Push each pipe into its corresponding connector as far as it will go, ensure it is locked by collet. Check pipes are free, not trapped or kinked. Secure pipes to under body clips.

CHARCOAL CANISTER - 1993 MODEL YEAR**Remove and refit****Remove**

1. Disconnect the battery negative lead.
2. Pry out purge valve.
3. Disconnect pipe.
4. Loosen bolt.
5. Remove charcoal canister.

**Refit**

6. Reverse removal procedure.



EMISSION LABEL - U.S.A. VEHICLES

A vehicle Emission Control Information label is attached to the bonnet locking platform located above the right hand headlamp assembly. The label gives Engine Tune Details to ensure that correct Emissions Levels are achieved. The label is fitted to comply with U.S Federal and State of California Regulations and should not be removed from its location within the vehicle.

Example of Label - 1990 Model Year

LAND ROVER LTD.		IDLE SPEED ADJUSTMENT	
IMPORTANT VEHICLE INFORMATION		ENGINE HAS IDLE SPEED CONTROL - NO ADJUSTMENT NORMALLY REQUIRED.	
ENGINE FAMILY	:LLR3.9T5FSS5	REFER TO WORKSHOP MANUAL.	
DISPLACEMENT	:241 CU INS	NO OTHER ADJUSTMENTS NEEDED.	
EVAP. FAMILY	:RAF 1	<div style="border: 1px solid black; width: 150px; height: 20px; margin: 0 auto;"></div>	
EX.EM.CONTROL SYSTEM	:MP1:2-TWC/2 HO2S		
IGNITION TIMING	6° + 1° B.T.D.C. AT BELOW 800 r.p.m. WITH DISTRIBUTOR VACUUM UNIT DISCONNECTED		
IDLE SPEED	665-735 r.p.m.	3T39T5FSSA	
SPARK PLUG GAP	0.033-0.038in		
THIS VEHICLE CONFORMS TO U.S. EPA AND STATE OF CALIFORNIA REGULATIONS APPLICABLE TO 1990 MODEL YEAR NEW LIGHT DUTY TRUCKS.			

RR2698E

Example of Label - 1991 Model Year

ROVER GROUP LIMITED		
IMPORTANT VEHICLE INFORMATION - RANGE ROVER		
ENGINE FAMILY	:MLR3.9T5FSS6	CATALYST
DISPLACEMENT	:241 CU INS / 3.9 LITERS	
EVAP.FAMILY	:RBF1	TUNE UP SPECIFICATIONS TUNE UP CONDITIONS :- ENGINE AT NORMAL OPERATING TEMPERATURE TRANSMISSION IN PARK IDLE SPEED - 665-735 rpm ENGINE HAS IDLE SPEED CONTROL NO ADJUSTMENT NORMALLY REQUIRED SPARK PLUG GAP - 0.033-0.038 inch IGNITION TIMING - 6° ± 1° BTDC AT BELOW 800 rpm WITH DISTRIBUTOR VACUUM UNIT DISCONNECTED NO OTHER ADJUSTMENTS NEEDED
EXHAUST EMISSION CONTROL SYSTEM	:MPI:2-TWC/2-H02S	
39T5FSSA		
<div style="border: 1px solid black; width: 150px; height: 20px; margin: 0 auto;"></div>		
THIS VEHICLE CONFORMS TO U.S. EPA AND STATE OF CALIFORNIA REGULATIONS APPLICABLE TO 1991 MODEL YEAR NEW LIGHT DUTY TRUCKS.		

RR2935E

Example of Label - 1992 Model Year



ROVER GROUP LIMITED

IMPORTANT VEHICLE INFORMATION - RANGE ROVER

ENGINE FAMILY :NLR3.9T5FSS7
 DISPLACEMENT :241 CU INS / 3.9 LITERS
 EVAP.FAMILY :RBF1
 EXHAUST EMISSION CONTROL SYSTEM :MPI/2-TWC/2-H02S

39T5FSSA



TUNE UP SPECIFICATIONS

CATALYST

TUNE UP CONDITIONS :-
 ENGINE AT NORMAL OPERATING TEMPERATURE
 TRANSMISSION IN PARK
 IDLE SPEED - 665-735 rpm
 ENGINE HAS IDLE SPEED CONTROL
 NO ADJUSTMENT NORMALLY REQUIRED
 SPARK PLUG GAP - 0.033-0.038 inch
 IGNITION TIMING - 6° ± 1° BTDC AT BELOW 800 rpm
 WITH DISTRIBUTOR VACUUM UNIT DISCONNECTED
 NO OTHER ADJUSTMENTS NEEDED

THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO 1992 MODEL YEAR NEW LIGHT DUTY TRUCKS AND STATE OF CALIFORNIA REGULATIONS APPLICABLE TO 1992 MODEL YEAR NEW MEDIUM DUTY VEHICLES

RR3585M

Example of Label - 1993 Model Year



ROVER GROUP LIMITED.

IMPORTANT VEHICLE INFORMATION - RANGE ROVER 4.2

ENGINE FAMILY :PLR 4.2T5FSS8
 DISPLACEMENT :261 CU INS / 4.2 LITERS
 EVAP.FAMILY :RCFI
 EXHAUST EMISSION CONTROL SYSTEM :MP1/2-TWC/2-H02S
 OBD I CERTIFIED

42T5FSSA



TUNE UP SPECIFICATIONS

CATALYST

TUNE UP CONDITIONS :-
 ENGINE AT NORMAL OPERATING TEMPERATURE
 TRANSMISSION IN PARK
 IDLE SPEED - 665-735 rpm
 ENGINE HAS IDLE SPEED CONTROL
 NO ADJUSTMENT NORMALLY REQUIRED
 SPARK PLUG GAP - 0.033-0.038 inch
 IGNITION TIMING - 8° ± 1° BTDC AT BELOW 800 rpm
 WITH DISTRIBUTOR VACUUM UNIT DISCONNECTED
 NO OTHER ADJUSTMENTS NEEDED

THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS APPLICABLE TO 1993 MODEL YEAR NEW LIGHT DUTY TRUCKS AND STATE OF CALIFORNIA REGULATIONS APPLICABLE TO 1993 MODEL YEAR NEW MEDIUM DUTY VEHICLES

RR3913M

TORQUE VALUES



NOTE: Torque wrenches should be regularly checked for accuracy to ensure that all fixings are tightened to the correct torque.

	Nm
Lamda sensor	20