

## EMISSION AND EVAPORATIVE CONTROL

Range Rover—carburettor and electronic fuel injection models are fitted during manufacture with various items of emission and evaporative control equipment to meet individual territory requirements. Therefore, some operations in this section may not be applicable to all vehicles. Where possible, items have been territorised to help identify individual requirements.

Unauthorised replacement or modification of the emission or evaporative control equipment may contravene local territory legislation and render the vehicle user and/or repairer liable to legal penalties. Any repairs or adjustments to the systems must be undertaken by an approved dealer. Refer to 'Engine Tuning Data' for the appropriate CO levels applicable to the vehicle specification.

## CRANKCASE BREATHING SYSTEM

### Description

The 'blow-by' gases from the crankcase are vented into the combustion system to be burned with the fuel/air mixture. The system provides positive emission control under all conditions. During engine running, crankcase fumes which may collect in the crankcase are vented to the carburettor or plenum chamber via hoses and flame traps.

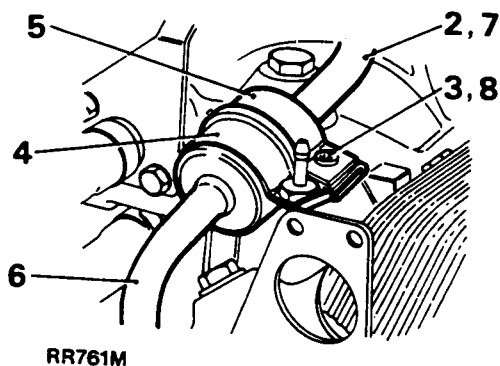
**NOTE:** Filters may have alternative locations according to engine build specification.

## ENGINE BREATHER FILTER—carburettor models

### Remove and refit

#### Removing

1. Remove the air cleaner.
2. Withdraw the filter top hose.
3. Slacken the filter clip.
4. Withdraw the filter from the bottom hose.



### Refitting

5. Fit the filter with the end marked 'IN' facing forward.
6. Connect the filter bottom hose.
7. Connect the filter top hose.
8. Secure the filter retaining clip.
9. Fit the air cleaner.

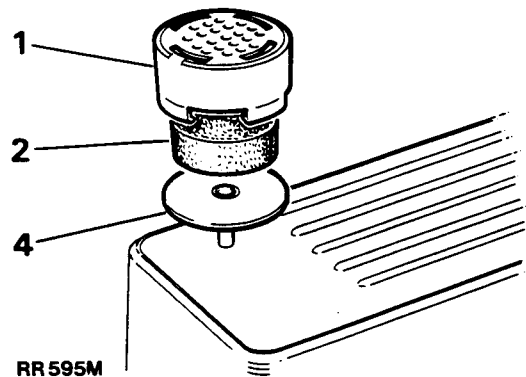
## ENGINE BREATHER FILTER—fuel injection models

The engine breather filter is located at the rear of the left-hand rocker cover, beneath the throttle linkage bracketry.

### Remove and refit

#### Removing

1. Prise the filter outer cover upwards to release it from its mounting.
2. Remove the sponge filter from the cover and discard the sponge.



### Refitting

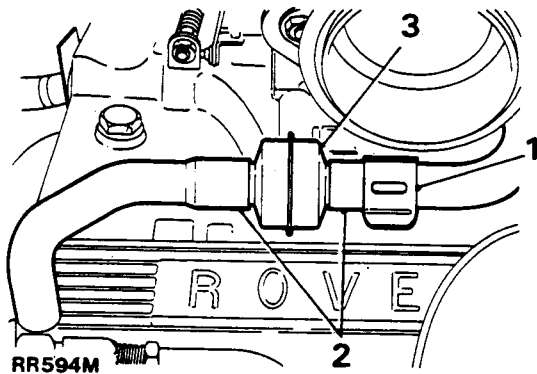
3. Insert a new filter into the filter cover.
4. Press the filter onto its mounting until it clips firmly into position.

**ENGINE FLAME TRAPS—carburettor models**

**NOTE:** Flame traps may have alternative locations according to engine build specification.

**Remove and refit****Removing**

1. Pull the flame trap hoses out of the retaining clips.
2. Pull the hoses from the flame trap.
3. Withdraw the flame trap.



4. Visually inspect the wire gauze inside the flame trap, if in poor condition, renew the unit. If the unit is in a satisfactory condition, clean as follows:
5. Immerse the flame trap in a small amount of petrol, allow time for the petrol to dissolve and loosen any debris.
6. Remove the flame trap from the petrol bath and allow it to dry in still air.

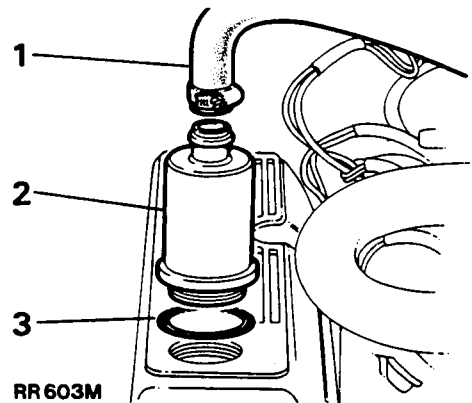
**WARNING:** Do not use a compressed air line to dry or clean the flame traps as this could cause fire or personnel injury.

**Refitting**

7. Push the hoses onto the flame trap and ensure that they are secure.
8. Locate the hoses in their respective retaining clips.

**ENGINE FLAME TRAP—fuel injection models****Remove and refit****Removing**

1. Release the hose clip and pull the hose off the canister.
2. Unscrew the canister and remove it from the rocker cover.
3. Remove the large rubber 'O' ring and inspect for deterioration.



4. Visually inspect the condition of the wire gauze within the canister, if in poor condition, renew the whole assembly, if the flame trap is in an acceptable condition, clean as follows:
5. Immerse the canister in a small amount of petrol and allow time for the petrol to dissolve or loosen any debris.
6. Remove the canister from the petrol bath and allow to dry in still air.

**WARNING:** Do not use a compressed air line to dry; clean or remove any remaining particles of debris within the canister as this could cause fire or personnel injury.

**Refitting**

7. If the original canister is being refitted, fit a new 'O' ring.
8. Screw the canister into the rocker cover securely—hand tight only.
9. Refit the hose and tighten the hose clip securely.

### EVAPORATIVE LOSS CONTROL SYSTEM (Saudi Arabia carburetter models only)

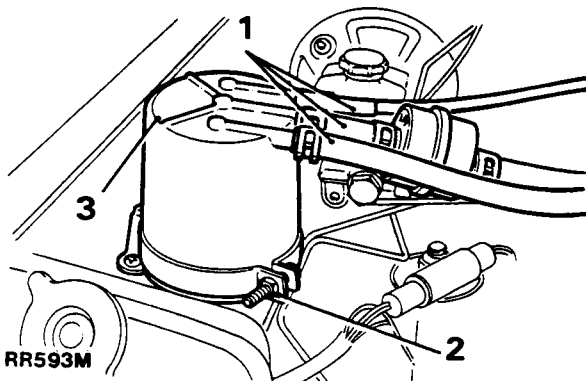
The evaporative loss control system reduces the amount of fuel vapour vented to the atmosphere. An adsorption canister receives vapour from the carburetter float chamber and from the fuel tank. The canister is purged of these vapours by inlet manifold or carburetter depression.

#### ADSORPTION CANISTER

##### Remove and refit

##### Removing

1. Disconnect from the canister:
  - (i) Canister line to fuel tank.
  - (ii) Canister purge line.
  - (iii) Carburetter vent pipe.
2. Slacken the clamp nut screw.
3. Remove the canister.



##### Refitting

4. Secure the canister in the clamp.
5. Reverse instructions 1 and 2 above.

### EVAPORATIVE LOSS CONTROL SYSTEM (Australian and Saudi Arabia fuel injection models only)

The evaporative loss control system reduces the amount of fuel vapour vented to the atmosphere. An adsorption canister receives vapour from the fuel tank. The canister is purged of these vapours by plenum chamber depression.

The remove and refit of the canister is as described for carburetter models, noting that the carburetter vent pipe marked 'C' is blanked off.

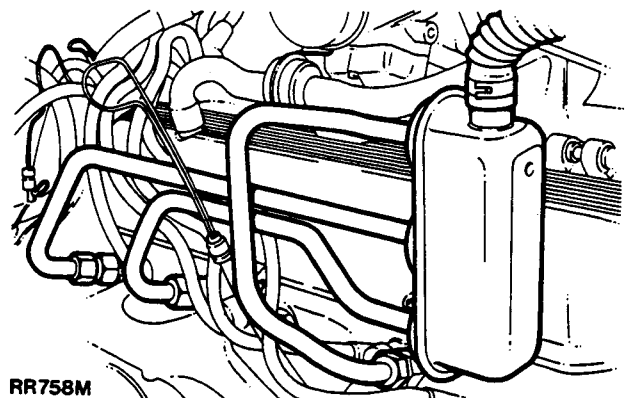
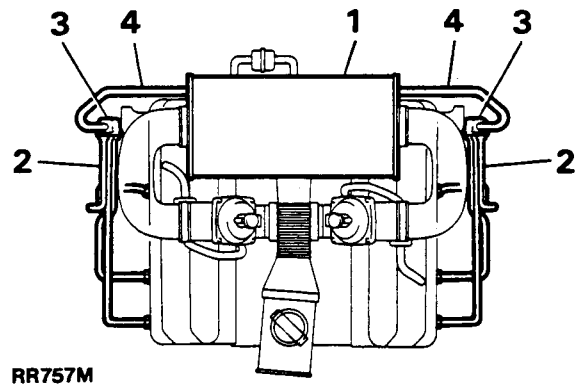
**WARNING:** The use of compressed air to clean an adsorption canister or clear a blockage in the evaporative system is very dangerous. An explosive gas present in a fully saturated canister may be ignited by the heat generated when compressed air passes through the canister.

### PULSAIR AIR INJECTION (UK, Europe and Saudi Arabia carburetter models only)

'Pulsair' is a system of self-induced air injection. The induced air which is taken from the air cleaner (UK and Europe models) or from the air intake elbows (Saudi Arabia models) at high manifold depressions, passes through one-way valves and a configuration of pipes which inject clean air into the exhaust gases via the manifold, thereby reducing carbon monoxide emission to the atmosphere.

#### UK and Europe Version

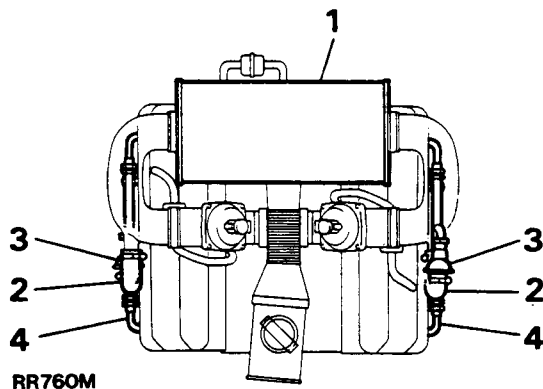
1. Air cleaner.
2. Pulsair manifolds.
3. Check valve housings.
4. Connecting hoses.



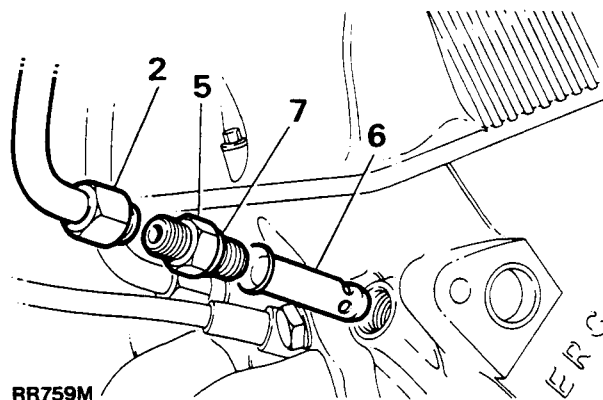
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**Saudi Arabia Version**

1. Air cleaner.
2. Connecting pipes.
3. Connecting hoses.
4. Pulsair valves.
5. Air manifolds.

**PULSAIR MANIFOLD (UK and Europe carburettor models)****Remove and refit****Removing**

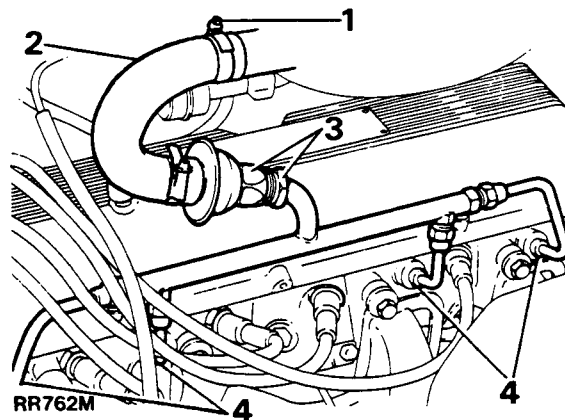
1. Release the clip securing the hose to the check valve housing.
2. Release the manifold from the cylinder head.
3. Release the single screw securing the check valve housing to the rocker cover.
4. Withdraw the manifold.
5. Remove the threaded inserts from the cylinder head.
6. Using a piece of bent wire, retrieve the spargus tube from the bottom of the insert bore.

**Refitting**

7. Reverse the removal procedure ensuring that the threaded double ended insert is fitted with the plain shank nearest the cylinder head.
8. Run the engine and check for air leaks at the manifold.

**PULSAIR MANIFOLD (Saudi Arabia carburettor models)****Remove and refit****Removing**

1. Release the hose clip securing the hose at the air intake elbow.
2. Pull the hose from the elbow.
3. Release the check valve from the manifold.
4. Release the manifold from the cylinder head.
5. Lift off the manifold.

**Refitting**

6. Reverse the removal procedure.
7. Run the engine and check for air leaks at the manifold.

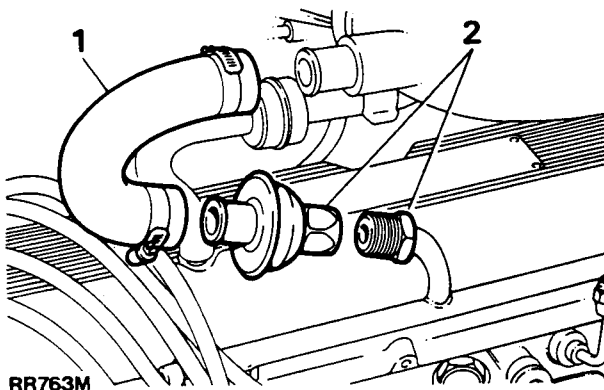
### PULSAIR CHECK VALVE (Saudi Arabia carburettor models only)

#### Remove and refit

#### Removing

1. Disconnect the hose from the check valve/pulse air valve.
2. Using two open-ended spanners—one on the air distribution manifold hexagon, to support the manifold, and the other to remove the valve anti-clockwise.

**CAUTION:** Do not impose any strain on the air manifold.



#### Refitting

3. Reverse instructions 1 and 2.

**NOTE:** The pulsair valve is identified by a pink paint spot and the part number 4974-196 on the face.

### PULSAIR CHECK VALVE

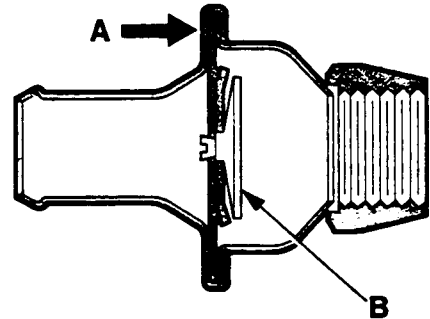
#### Test

The check valve is a one-way valve positioned to prevent the back-flow of exhaust gases.

#### Testing

**CAUTION:** Do not use a pressure air supply for this test.

1. Remove the check valve.
2. Blow through the valve orally in both directions in turn. Air should only pass through the valve when blown from the hose connection end. Should air pass through the valve when blown from the air manifold end, renew the valve.



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- A. Direction of flow.  
B. Valve diaphragm.

3. Refit the pulsair check valve.

### PULSAIR CHECK VALVE (UK and Europe carburettor models only)

The pulsair check valves are an integral part of the pulsair manifold assembly and are located in the check valve housing. If a single valve within that housing fails it will be necessary to renew the complete pulsair manifold assembly.

To remove the pulsair assembly see pulsair manifold, remove and refit.

#### TEST

1. Remove the pulsair manifold.
2. Blow through the valve orally in both directions in turn. Air should only pass through the valve or valves when blown from the check valve housing. Should air pass through the valves when blown from the manifold end, renew the complete assembly.

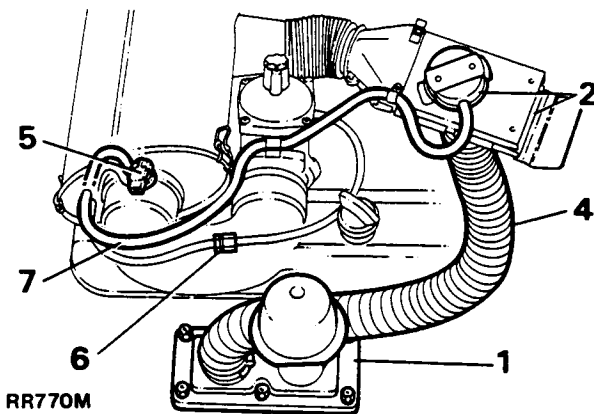
## AIR INTAKE TEMPERATURE CONTROL SYSTEM (UK, Europe and Saudi Arabia carburettor models only)

### Description

To maintain an efficient air intake temperature, a sensor is incorporated in the air cleaner. The sensor allows inlet manifold vacuum to operate a flap in the air cleaner intake. The flap permits cold air, from forward of the radiator and/or hot air, from a scoop around the exhaust manifold, to mix in varying amounts to provide the required air temperature.

### The specification comprises:

1. A hot box surrounding the exhaust manifold.
2. A vacuum operated thermostatically controlled flap valve in the air cleaner.
3. The flap valve controls the source of the intake air supply which may be warm air drawn entirely from the hot box or cold air drawn from the under bonnet area or a combination of both.
4. The hot box is connected via a hose to the flap valve in the air intake.
5. The temperature sensing device is situated in the air cleaner on the clean side of the element.
6. A pipe from the manifold is attached to the temperature sensing device via a non-return valve.
7. From the other side of the temperature sensing device is a pipe connecting the vacuum capsule operating the flap valve.



## CONTROL VALVE

### Check operation

1. Check operation of the mixing flap valve in the air cleaner by starting the engine from cold and observing the flap valve as the engine temperature rises.
2. The valve should start to open slowly within a few minutes of starting and continue to open until a stabilised position is achieved. This position and the speed of operation will be entirely dependent on prevailing ambient conditions.
3. Failure to operate indicates failure of the flap valve vacuum capsule or the thermostatically controlled vacuum switch or both.
4. Check by connecting a pipe directly to the flap valve, thus by-passing the temperature sensor.
5. If movement of the flap valve is evident the temperature sensor is faulty. If no movement is detected, the vacuum capsule is faulty.
6. Fit new parts where necessary.

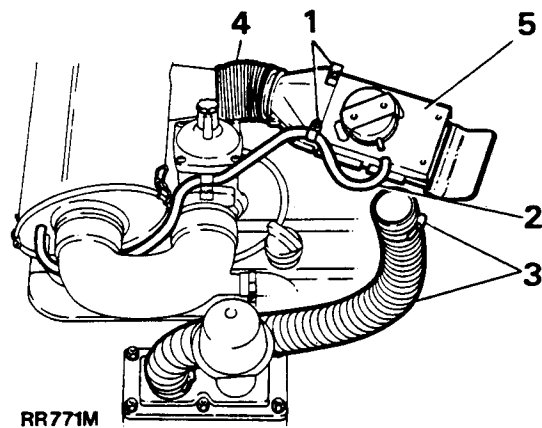
## AIR INTAKE TEMPERATURE CONTROL VALVE

### Remove and refit

**NOTE:** Alternative valves may be fitted according to engine build specifications.

### Removing

1. Release the two clips securing the pipes at either side of the valve unit.
2. Pull the pipe from the vacuum capsule.
3. Release the hose clip and remove the hot box hose from the bottom of the valve unit.
4. Disconnect the hose between the valve unit and air cleaner.
5. Release the valve unit from its support and lift it from the engine compartment.



### Refitting

6. Reverse the removal procedure. Ensure that all hoses and pipes are fitted securely.

## TEMPERATURE SENSOR

The temperature sensor is incorporated into the clean air side of the air cleaner case. The sensor is located in the right-hand end cover of the air cleaner. Access to the unit is gained as follows:

### Remove and refit

#### Removing

1. Remove the right-hand air cleaner elbow.

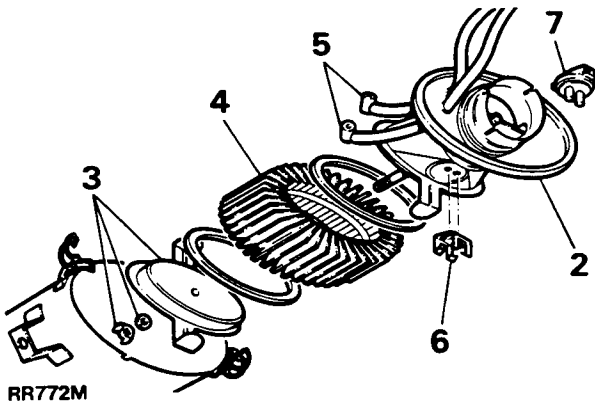
**NOTE: Saudi Arabia versions only—disconnect the hose from the check valve at the air cleaner elbow.**

Care should be taken not to damage any seals or 'O' rings when removing the elbows.

2. Remove the air cleaner right-hand end cover.

**NOTE: UK and Europe versions only—remove the hose from the pulsair manifold at the right-hand air cleaner end cover.**

3. Remove the wing nut, fibre washer and end plate securing the air cleaner element.
4. Remove the element.
5. Pull the two pipes off the sensor, noting their position for re-assembly.
6. Prise the spring retaining clip of the sensor.
7. Manoeuvre the sensor and remove it from the end cover.



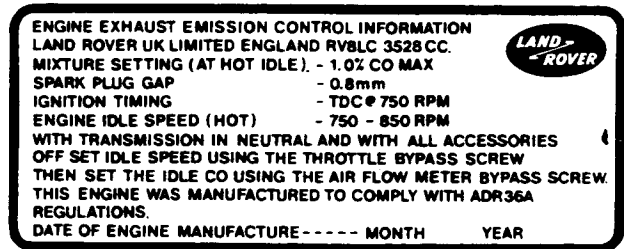
#### Refitting

8. Reverse the removal procedure.

**NOTE: When refitting the elbows coat the air cleaner seal and carburettor 'O' ring with petroleum jelly. Ensure that all hoses and connections are secure.**

## EMISSIONS LABEL (Australian and Saudi Arabian fuel injection models only)

An exhaust emission control information label is attached to the right-hand rocker cover. The label is fitted to comply with local territory emission requirements.



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## VACUUM DELAY VALVE—all carburettor emission controlled models

The coloured end of the vacuum delay valve should always be fitted to the short hose from the distributor.

### Test check valve air flow

1. Attach a 10.00 ± .250 in<sup>3</sup> vacuum tank to the coloured side of the valve.
2. Expose the black side to atmospheric pressure.
3. **Expected result:** The time required for the vacuum to drop from minus 20 in Hg to minus 2 in Hg will be 0.5 seconds maximum.

### Test

4. **Vacuum recovery air flow:** Attach a 22.75 ± .5 in<sup>3</sup> vacuum tank to the black side of the valve.
5. Expose the coloured side to atmospheric pressure.
6. **Expected result:** The time required for the vacuum to drop from 16 in Hg to 8 in Hg will be 240 to 360 seconds.

### Test: external leakage check

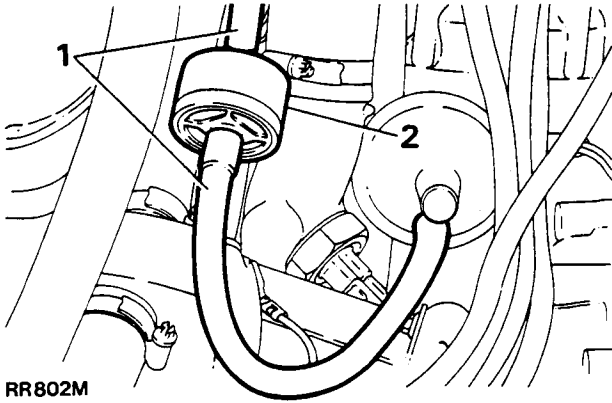
1. Seal the coloured side of the valve and attach a short flexible pipe to the other end.
2. Submerge the valve in water and orally blow through the valve.
3. If any external leakage is noticeable, renew the valve.

If the delay valve does not comply with any of the test results, renew the unit.

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**Remove and refit****Removing**

1. Pull the two flexible hoses from the delay unit.
2. Remove the unit from the engine compartment.



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**Refitting**

3. Reverse the removal instructions ensuring that the coloured side of the valve is fitted to the short hose from the distributor.



## AIR INTAKE TEMPERATURE CONTROL — FAULT FINDING

SYMPTOM	POSSIBLE CAUSE	ACTION
Poor or erratic idle Hesitation or flat spot (cold engine) Excessive fuel consumption Lack of power Engine overheating	Hot air inlet hose loose, adrift or blocked	Check hot air inlet hose for condition and security. Renew if necessary.
Poor or erratic idle Hesitation or flat spot (cold engine) Excessive fuel consumption Lack of power Engine cuts out or stalls (at idle) Engine 'runs-on' Engine 'knocks or pinks' Rich running (excess CO)	Flap valve jammed	Check operation of flap valve. If fault cannot be rectified renew air cleaner outer cover which includes flap valve.
Poor or erratic idle Hesitation or flat spot (cold engine) Excessive fuel consumption Lack of engine power Engine cuts out or stalls (at idle) Engine misfires Lean running (low CO)	Vacuum pipes disconnected or leaking	Check the vacuum pipes for security and deterioration. Renew if necessary.
Hesitation or flat spot (cold engine) Excessive fuel consumption Lack of power Engine overheating Engine cuts out or stalls (at idle) Engine 'runs-on' Engine 'knocks or pinks' Rich running (excess CO)	One-way valve faulty	Blow through valve to check 'one-way' action. If the valve leaks fit a new valve.
Poor or erratic idle Hesitation or flat spot (cold engine) Excessive fuel consumption Lack of power Engine overheating Engine cuts out or stalls (at idle) Engine 'runs-on' Engine 'knocks or pinks' Rich running (excess CO)	Temperature sensor faulty, leaking or jammed	Check and renew if necessary.
Poor or erratic idle Hesitation or flat spot (cold engine) Excessive fuel consumption Lack of power Engine cuts out and stalls Rich running	Flap valve diaphragm leaking	Check with a distributor vacuum test unit. If leakage is apparent renew air cleaner outer cover which includes the servo motor.

