

## VOLKSWAGEN ENGINE MODIFICATION

Type I & 14 (1968-73)  
 Type II (1968-73)  
 Type III & IV (1972-73)

**NOTE** — Type III & IV models use Bosch Electronic Fuel Injection. For more information, see Bosch Fuel Injection in CARBURETION Section.

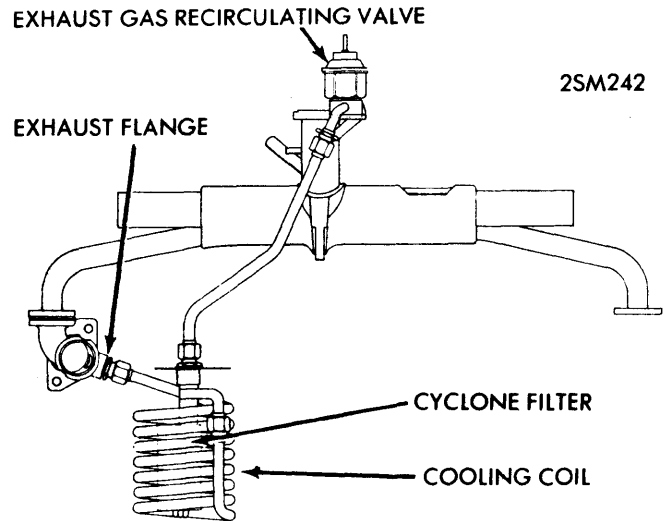
### DESCRIPTION

Carburetor (or fuel injection) and distributor are set to maintain minimum proportions of carbon monoxide and hydrocarbon in exhaust. Ignition timing, temperature and engine condition are also of importance. A throttle positioner, on carbureted manual transmission vehicles only, opens throttle valve in accordance with intake manifold vacuum to prevent proportions of hydrocarbons in exhaust from increasing when vehicle is over running engine.

**Carburetor** — A Solex downdraft carburetor with automatic choke, accelerator pump and double vacuum drillings are used on Type I, II & 14 models. In addition, 1971-73 models have a by-pass air drilling and a by-pass air cut-off valve.

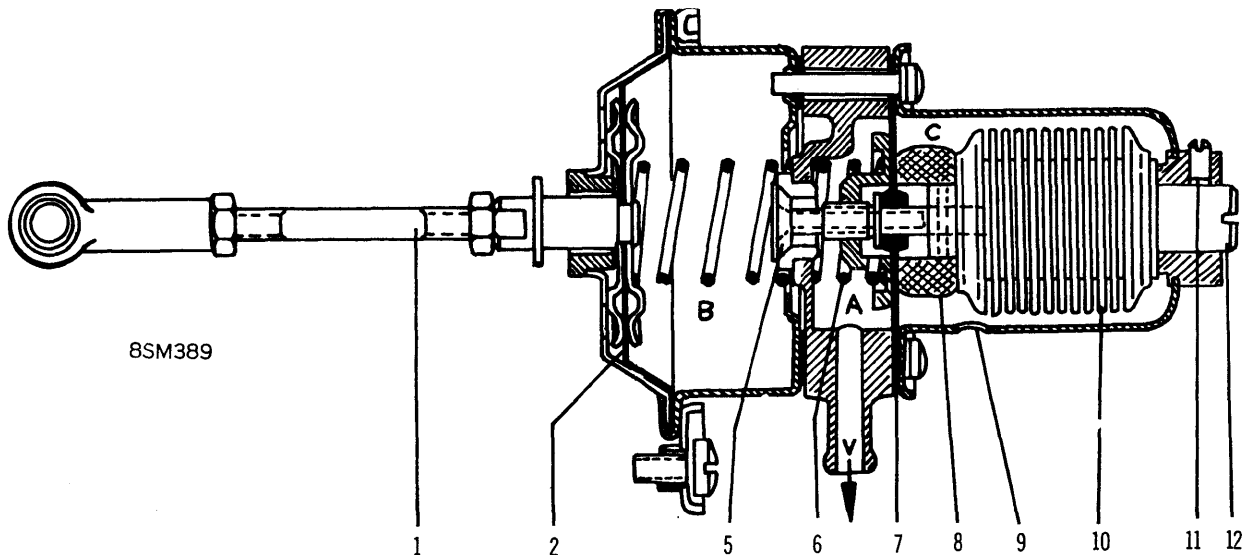
**Throttle Positioner (Type I, II & 14)** — Throttle positioner opens throttle slightly when vehicle is over running engine, this prevents intake manifold vacuum from rising as high as it would with a closed throttle. This makes sure that upon deceleration, engine receives an adequate amount of combustible air/fuel mixture and stops fuel from passing into exhaust in an unburnt state.

**Heat Valve (Type I, II & 14)** — Valve allows either heated or cool air into carburetor to make sure there is good fuel vaporization at lower ambient temperatures. Valve is controlled by a bi-metal spring located in the air intake duct.



EXHAUST GAS RECIRCULATION SCHEMATIC

**Exhaust Gas Recirculating Valve** — This system is used on 1972-73 Type I with automatic stick shift or 1972-73 Type III with automatic transmission only. System is designed to reduce NOx emissions. Exhaust gas which has been cleaned and cooled (in cyclone filter) is recirculated into intake system, during partial load operation. **NOTE** — System does not operate during periods of idle, wide open throttle, third gear operation, or when intake air temperature is below 65°F. Components of system are: An air intake distributor, exhaust gas recirculating valve, cyclone filter and container, throttle valve switch, and thermo switch, and transmission oil pressure switch.



- 1 - PULL ROD
- 2 - OPERATING DIAPHRAGM
- 5 - VALVE
- 6 - SPRING
- 7 - CONTROL DIAPHRAGM

- 8 - PLASTIC FOAM FILTER
- 9 - DRILLING
- 10 - ALTITUDE CORRECTOR
- 11 - SET SCREW
- 12 - ADJUSTING SCREW

CUT-AWAY OF THROTTLE POSITIONER (1968-69 MODELS)

# Exhaust Emission Systems

## VOLKSWAGEN ENGINE MODIFICATION (Cont.)

**Thermostatic Air Cleaner** – Unit is temperature and vacuum controlled type and supplies heated air to engine at a temperature of 113°F. Air cleaner consists of temperature sensor, vacuum motor, a hot air pipe and the air cleaner housing which is equipped with a mixing door.

### OPERATION

**Throttle Positioner** – 1) When vacuum (V) is created below throttle plate upon deceleration, it becomes effective in chamber (A). This vacuum pulls diaphragm (7) to the left against pressure of spring (6).

2) Valve (5), which is attached to diaphragm (7), opens allowing vacuum in chamber (A) to enter chamber (B) and pull diaphragm (2) to the right. This moves pull rod (1) and opens throttle plate via damper lever.

3) When manifold vacuum decreases, spring (6) forces diaphragm (7) to the right, closing valve (5). This eliminates vacuum in chamber (B) allowing throttle return spring to force diaphragm (2) to the left.

4) The altitude corrector (10) is installed with a slight preload and presses on valve (5). This preload will vary according to atmospheric pressure.

5) When atmospheric pressure is low and manifold vacuum is reduced, the corresponding opening force by diaphragm (7) on valve (5) is also reduced. However, preload on altitude corrector (10) on valve (5) increases by the same amount. This makes sure that operation of throttle positioner is not affected by atmospheric pressure.

6) Throttle positioner can be adjusted with adjusting screw (12), which is locked by a set screw (11).

**Heat Valve** – Heat valve admits warm air from engine cooling system or cool air from engine compartment. Valve is

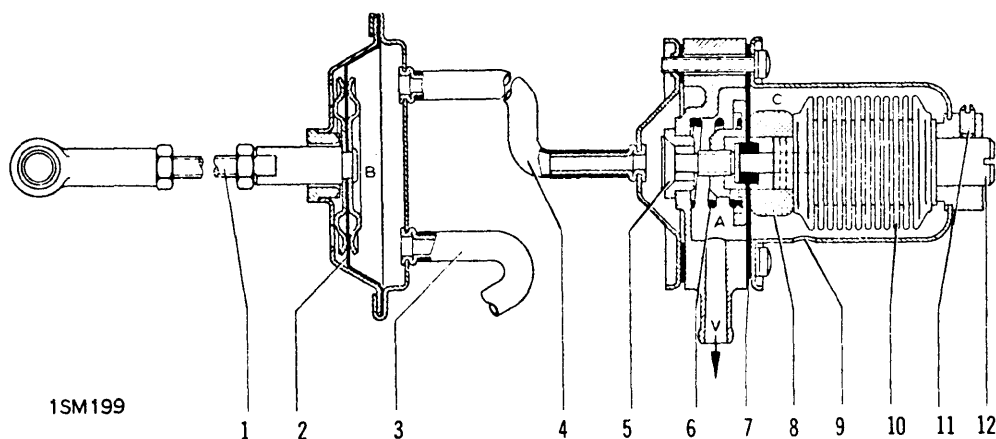
operated by a bi-metal spring in air duct. Valve shuts off supply of heated air at ambient temperatures of 79°F or above. A second flap in air cleaner, controlled by a cable to cooling fan flap thermostat, admits warm air to carburetor at lower engine temperatures.

**Exhaust Gas Recirculating Valve** – A small amount of exhaust gas is taken from left rear exhaust flange and cooled in a cooling coil. Any coarse impurities are filtered out by cyclone filter. Exhaust gas which has been cleaned by filter passes into intake manifold by way of vacuum controlled exhaust recirculating valve. A relay gives signals to valve when proper conditions exist for exhaust gas recirculation. Exhaust gas recirculating valve controls exhaust gas flow, depending on throttle valve position, so that mixing is only possible during partial load operation.

**Thermostatic Air Cleaner (Type I & II, 1973 Only)** – When ambient air temperature is low (below 65°F), sensor at top of air cleaner body closes and vacuum is applied to vacuum motor, actuating a regulating flap, which cuts off flow of cold air. As temperature rises, a bi-metal spring in temperature sensor opens valve and reduces vacuum to vacuum motor. Flap then opens to cold air and cuts off hot air. Flap is also controlled by engine load. When throttle is opened wider, manifold vacuum decreases and is no longer sufficient to operate vacuum motor so that cold air intake is open. However, during engine warmup periods vacuum override is eliminated so that engine receives only heated air.

### MAINTENANCE

**Throttle Positioner** – Oil temperature should be between 122-158°F, measured at dipstick tube. Check idling speed and correct if necessary. Idling speed for manual transmission is 850±50 RPM. No throttle positioner is used on vehicles with



1 – PULL ROD

2 – OPERATING DIAPHRAGM

3 – HOSE (TO VACUUM DRILLING  
IN CARBURETOR)

4 – HOSE (CONNECTION FROM CONTROL  
PART TO OPERATING PART)

5 – VALVE

6 – SPRING

7 – CONTROL DIAPHRAGM

8 – PLASTIC FOAM FILTER

9 – DRILLING

10 – ALTITUDE CORRECTOR

11 – SET SCREW

12 – ADJUSTING SCREW

CUT-AWAY OF THROTTLE POSITIONER (1970-72 MODELS)

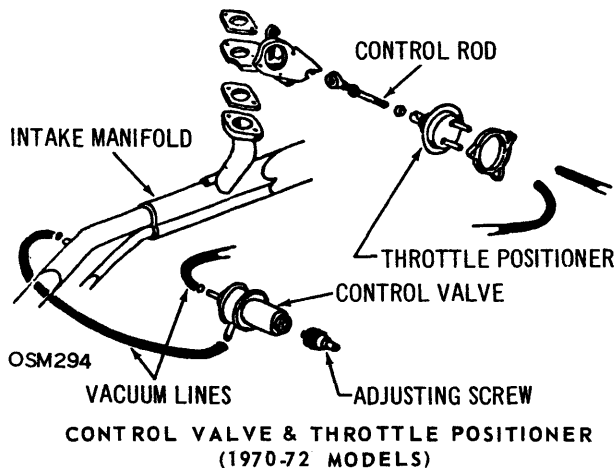
## VOLKSWAGEN ENGINE MODIFICATION (Cont.)

automatic transmissions. Check fast idle speed and, if necessary, adjust as follows. Pull special lever against stop and adjusting screw on bracket. Adjust by turning adjusting screw to following specifications.

1968-70 Type I & II .....	1700-1800 RPM
1971-73 Type I .....	1450-1650 RPM
1971 Type II .....	1650-1850 RPM
1972-73 Type II .....	1450-1650 RPM

After a warm up drive, check that fast idle speed does not exceed 1700 RPM for 1971-73 Type I vehicles, or 1900 RPM for 1971-73 Type II. When installing a new throttle positioner, pull rod must be adjusted. Special lever must not touch carburetor body or throttle valve lever when throttle valve is closed. Adjust screw ("12") on control valve so that valve closing time from release of throttle lever at 3000 RPM is to following specifications.

1968-70 Type I & II .....	3-4 secs.
1971-73 Type I .....	3.5±1 secs.
1971-73 Type II .....	4.0±1 secs.



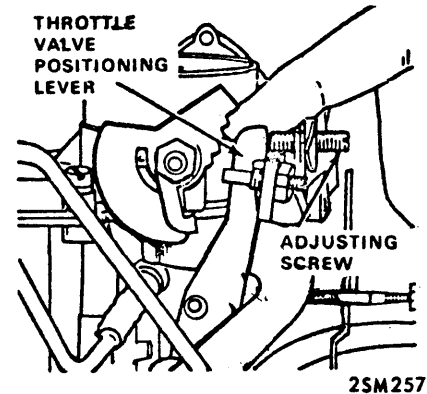
CONTROL VALVE & THROTTLE POSITIONER  
(1970-72 MODELS)

If time is shorter, turn adjusting screw clockwise, if time is longer, turn adjusting screw counterclockwise. After a warm up drive, a closing time of six seconds must not be exceeded.

**Checking and Adjusting Ignition Timing** — Set timing to specifications given in tune-up charts. With engine warm, set engine speed to 850 RPM (1968-70) or 900 RPM (1971-73). Connect timing light to number one cylinder and disconnect vacuum hose connected on 1968-70 models, leave hose connected on 1971-73 models. Rotate distributor to achieve correct timing.

**Idle Adjustment (1968-70)** — With engine warm and idling at 850 RPM, turn volume control screw to right until speed starts to drop. From this position, turn volume control screw to left until engine runs fastest. *NOTE* — Variations in engine speed when turning volume control screw are very slight. Engine still runs even when volume control screw is turned all the way in. If necessary, regulate engine speed again with idle adjusting screw.

**Idle Adjustment (1971-73)** — Idle speed is adjusted at by-pass air screw with engine warm (oil temperature a minimum of 140°F) and with choke fully open. Set idle speed to following specifications.



FAST IDLE ADJUSTMENT

Type	Idle RPM	
	Man. Trans.	Auto. Trans.
I .....	850±50	950±50
II .....	850±50	

*NOTE* — Do not turn limiting screw or volume control screw to adjust idle.

It is only necessary to adjust volume control screw if a new carburetor or volume control screw is installed. To adjust, carefully turn volume control screw in as far as possible and back off 2 ½ to 3 turns. Set idle speed with by-pass air screw to 850-950 RPM. Adjust volume control screw to obtain maximum RPM, then turn screw in so that speed drops 20-30 RPM.

Set this final idle RPM using by-pass air screw only.

**E.G.R. Valve** — Replace every 12,000 miles.

**Cyclone Filter & Container** — Clean filter every 24,000 miles.

**Thermostatic Air Cleaner** — Make sure that system puts out only warm air when sensor is below 113°F and only cold air above this temperature.

### TESTING

**E.G.R. Valve** — Operation of valve should be checked at idling speed. When checking, make sure ambient temperature exceeds 65°F. Run engine at idling speed and alternately move throttle valve from idling to partial load positions. When doing this, an audible sound should be heard from the electro magnetic cut-off valve.

### TROUBLE SHOOTING

#### VEHICLES WITHOUT E.G.R. SYSTEM

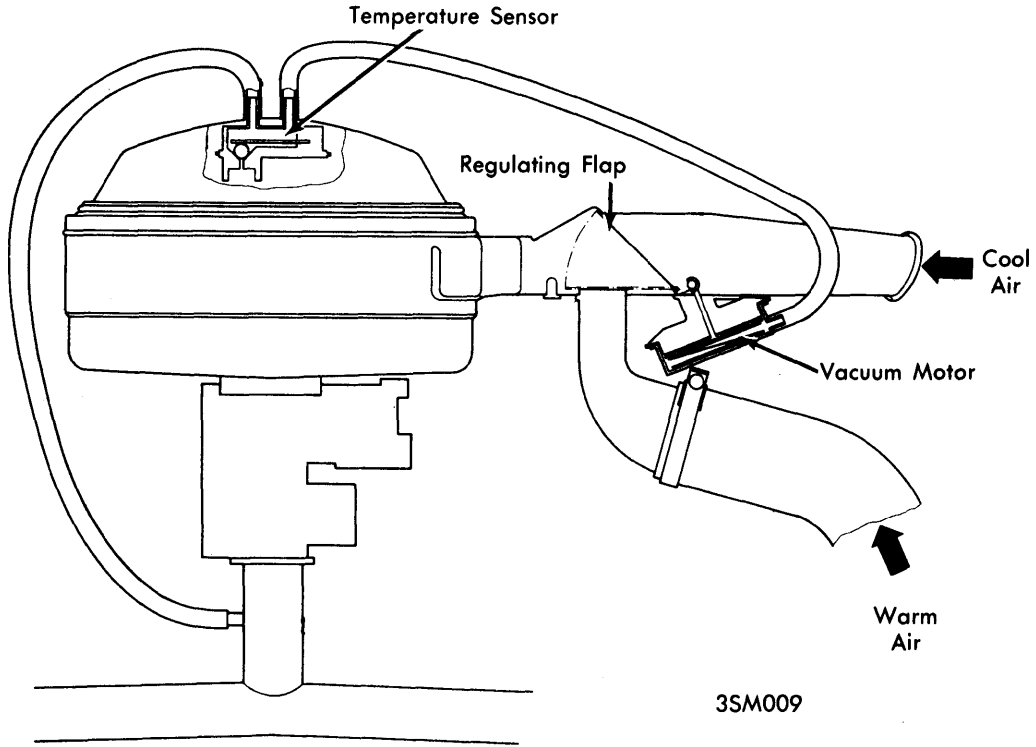
**Poor Idle & Idle Cannot Be Adjusted** — Carburetor has dirt in idle system. Carburetor must be overhauled.

**Engine Idle Too Fast** — Throttle valve is stuck. Free up throttle valve and pull rod. If pull rod is bent, it must be replaced. If throttle valve is out of adjustment, adjust it. If throttle valve cannot be adjusted, it must be replaced.

**Backfires When Coasting** — Throttle positioner is out of adjustment. Adjust as specified or replace it.

# Exhaust Emission Systems

## VOLKSWAGEN ENGINE MODIFICATION (Cont.)



**VOLKSWAGEN THERMO VACUUM AIR CLEANER**