

1975-79 EXHAUST EMISSION SYSTEMS

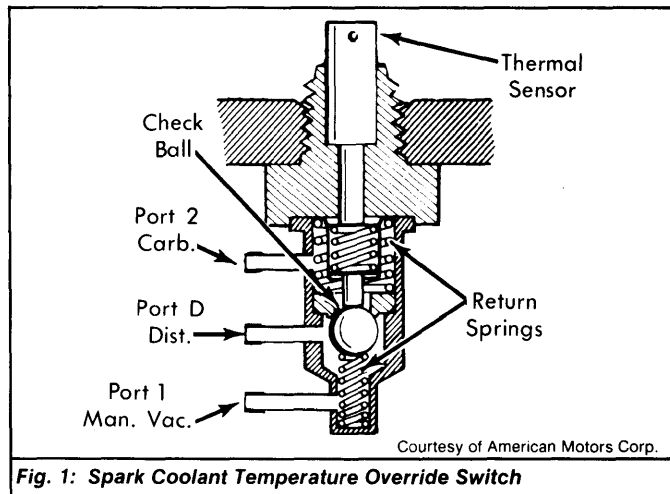
American Motors Spark Control Systems

DESCRIPTION

American Motors vehicles use three spark control devices to assist the ignition system in controlling exhaust emissions. They are the Spark Coolant Temperature Override (CTO) System, a Non-Linear Vacuum Regulator (NLVR) Valve and a Transmission Controlled Spark (TCS) System.

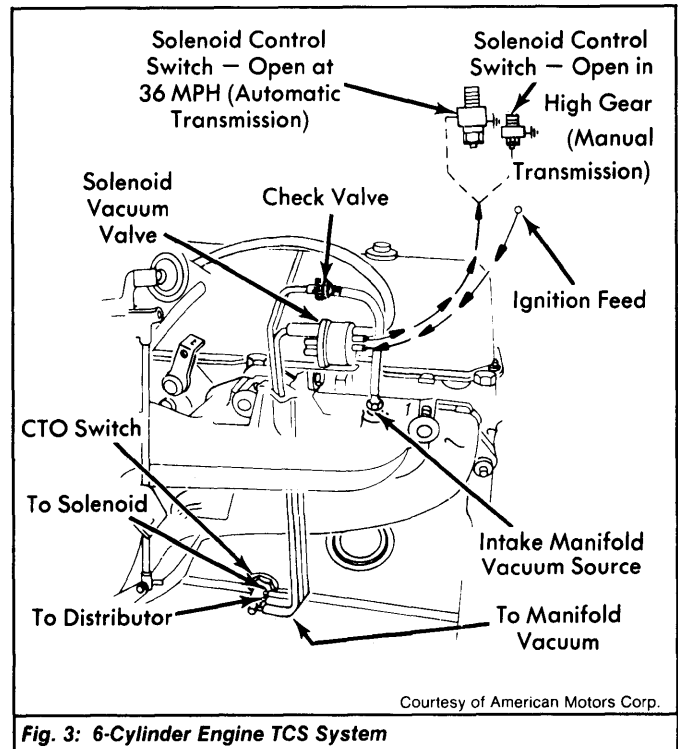
SPARK COOLANT TEMPERATURE OVERRIDE (CTO) SYSTEM

This system operates during cold engine warm-up to improve driveability. The CTO switch is threaded into bottom of intake manifold on 4-cylinder engines, into left rear of block on 6-cylinder engines or thermostat housing on V8 engines. The CTO switch responds to coolant temperature to allow either manifold vacuum or carburetor ported vacuum to the distributor. On some models, this switch is used alone, on others it is used in conjunction with the Transmission Controlled Spark (TCS) system.



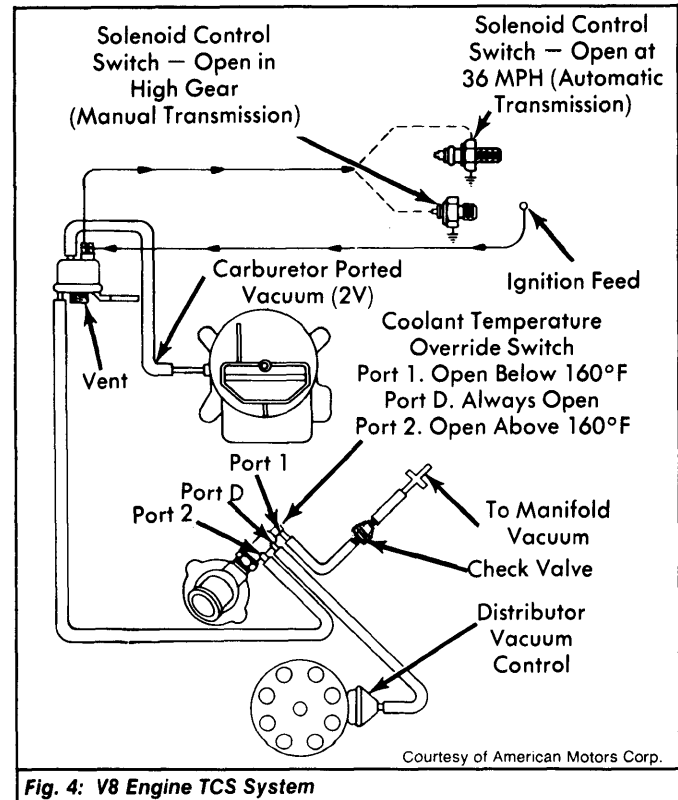
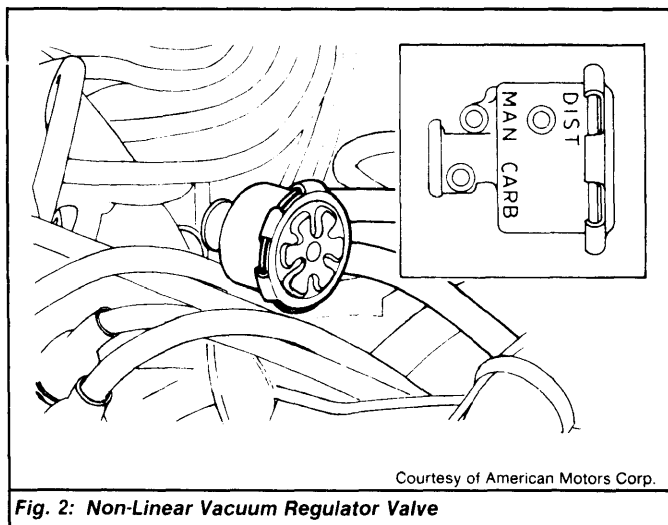
TRANSMISSION CONTROLLED SPARK (TCS) SYSTEM

Used on all 1975-79 6-cylinder, V8 Calif. vehicles, and some 1978 Federal vehicles, this system reduces NOx emissions by helping lower peak combustion temperatures during high engine load conditions. Vacuum advance is allowed only in high gear (Man. Trans.) or above 36 MPH (Auto. Trans.). System uses the coolant temperature override switch, a solenoid vacuum valve, and a solenoid control switch and a vacuum spark control check valve.



NON-LINEAR VACUUM REGULATOR VALVE

Used on some 1979 AMC vehicles, this valve combines regulated manifold vacuum at idle speed and carburetor ported vacuum to the ignition spark advance mechanism. It is mounted in line between the vacuum source port and distributor vacuum can.



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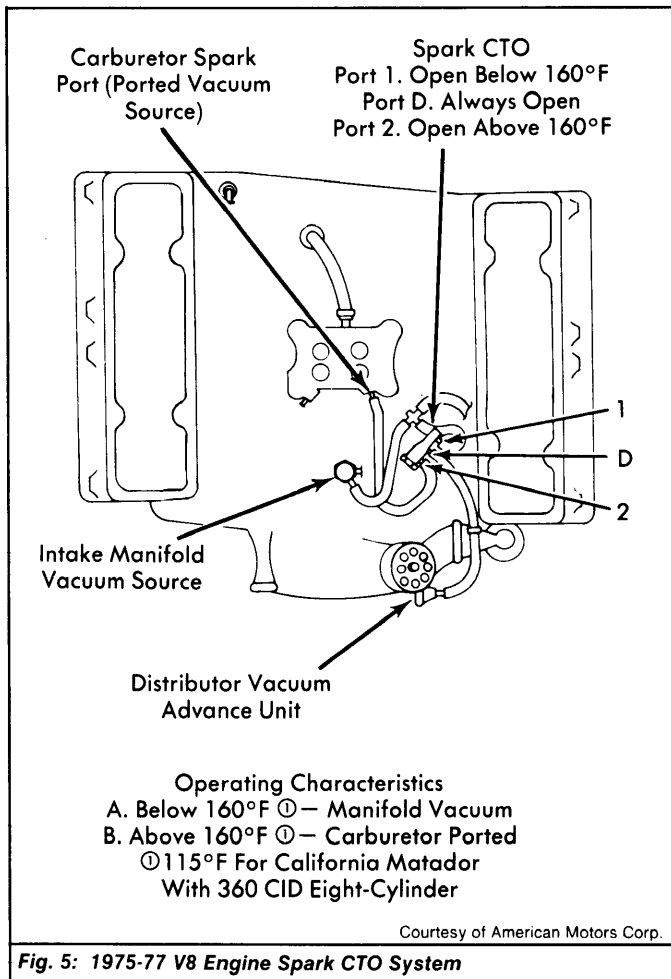


Fig. 5: 1975-77 V8 Engine Spark CTO System

OPERATION

SPARK CTO SWITCH

When coolant temperature is below 160°F, check ball is held against inner seat by spring pressure. Manifold vacuum enters Port "1" and is applied through Port "D". This allows full manifold vacuum to the distributor. Above 160°F, Port "1" is blocked and carburetor ported vacuum enters through Port "2" and connects to Port "D". Ported vacuum now controls spark advance.

NON-LINEAR VACUUM REGULATOR VALVE

There are 2 input ports on the NLVR: intake manifold vacuum and carburetor ported vacuum. One outlet port connects to the distributor vacuum unit. At curb idle, regulated vacuum is supplied to the advance unit, when manifold vacuum is high and ported vacuum is very low. The NLVR regulates the vacuum signal so it is between these two vacuum source levels at idle. As engine load increases and ported vacuum signal is above 7.5 in. Hg, regulator valve switch to ported vacuum output.

TCS SYSTEM

Solenoid Control Switch - This switch is located at the transmission. It opens or closes in relation to vehicle speed (auto. trans.), or gear range (man. trans.). On auto. trans. the switch is operated by transmission oil pressure, on man. trans. it is operated by shifter shaft. At speeds above 36 MPH (auto. trans.), or in high gear (man. trans.), the switch opens and breaks ground circuit to solenoid vacuum valve. At speeds under 36 MPH (auto. trans.) or in lower gear ranges (man. trans.) the switch closes and completes the ground circuit to the solenoid vacuum valve.

Solenoid Vacuum Valve - This valve is attached to a bracket on rear of intake manifold. When valve is energized (ground circuit complete), carburetor ported vacuum is blocked and distributor vacuum line is vented to atmosphere through port in valve, resulting in no vacuum advance. When valve is de-energized, ported vacuum is applied to distributor, resulting in normal advance.

Coolant Temperature Override Switch - See Operation of Spark Coolant Temperature Override Switch in this article.

Vacuum Spark Control Check Valve - This is a one-way valve installed in the vacuum line on some engines. It functions during cold engine warm-up to improve driveability. Its purpose is to prevent loss of distributor advance due to manifold vacuum drop when engine is accelerated. With this valve, the distributor remains in the full advance mode until the CTO switches to ported vacuum. The trapped vacuum slowly bleeds down when the engine is not running.

MAINTENANCE

Periodic maintenance is not normally required; should any switch or valve fail to function properly it should be replaced.

TESTING

SPARK CTO SWITCH

Connect a vacuum gauge to center port ("D") of CTO switch. Below 160°F, manifold vacuum should register. Above 160°F, carburetor ported vacuum should be shown. If valve does not respond, it must be replaced.

NOTE: Ported vacuum is not available with throttle closed. Ported vacuum is available at part throttle (equivalent of 1000 RPM).

NON-LINEAR VACUUM REGULATOR VALVE

Connect vacuum gauge to distributor port ("DIST") on NLVR. With engine at idle speed, a vacuum reading of 7 in. Hg should be shown. As throttle is opened and engine speed increases, ported vacuum level should be indicated. If not, replace NLVR.

TCS SYSTEM

Current Supply Test - 1) Turn ignition switch on. Disconnect wire from solenoid vacuum valve. See Fig. 7.

2) Connect wire lead of test lamp to ground. Touch probe end of test lamp to each terminal of connector. Lamp should light at terminal of Orange wire. If not, ignition feed to TCS system is defective.

Ground Circuit Test (Man. Trans.) - 1) Move gearshift to Neutral. Connect test lamp wire to battery positive post. Touch probe to Orange solenoid switch wire terminal in solenoid connector. Test lamp should light.

2) Shift transmission to each gear except high. Test lamp should remain on. Shift transmission to high. Test lamp should go out. If test lamp does not light at all, perform SOLENOID CONTROL SWITCH TEST.

Ground Circuit Test (Auto. Trans.) - 1) Support vehicle so wheels are off the ground. Connect test lamp wire to battery positive post.

2) Disconnect wire from solenoid vacuum valve and insert probe in Orange wire terminal.

3) Start engine and put transmission in "D". Accelerate slowly and note speed at which test lamp goes out (above 37 mph). Slowly decelerate and note speed at which test lamp goes on (below 33 mph).

4) Adjust switch if operation is outside operating range. Turn 1/16" Allen screw in switch terminal to change setting (clockwise to increase opening speed; counterclockwise to decrease). See Fig. 6.

5) If lamp does not light at all, perform SOLENOID CONTROL SWITCH TEST.

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NOTE: Perform next test if test lamp did not light in the previous tests.

Solenoid Control Switch Test - 1) Disconnect wire from solenoid control switch at transmission (man. trans.) or at rear of engine (auto. trans.)

2) Connect jumper wire from disconnected wire to ground. If test lamp now lights as outlined in CURRENT SUPPLY TEST and GROUND CIRCUIT TEST, control switch is defective.

Solenoid Vacuum Valve Function Test - 1) With engine at normal operating temperature, place man. trans. in Neutral, auto. trans. in Park and apply parking brake.

2) Disconnect distributor vacuum advance line at solenoid valve. Install vacuum gauge to vacuum solenoid valve. Start and run engine at 1000 RPM. No vacuum should be indicated.

3) Maintain speed and disconnect 2-wire connector from solenoid. Vacuum gauge should indicate ported vacuum. Connect and disconnect wire several times to verify operation. Replace valve if defective.

Check Valve Test - 1) Disconnect distributor advance hose from vacuum advance unit. Connect vacuum gauge to disconnected hose.

2) Start engine. Gauge should indicate manifold vacuum. Stop engine and observe gauge. If vacuum falls off rapidly, check valve is defective.

NOTE: A very gradual loss of vacuum is normal because of slight leakage in the CTO switch.

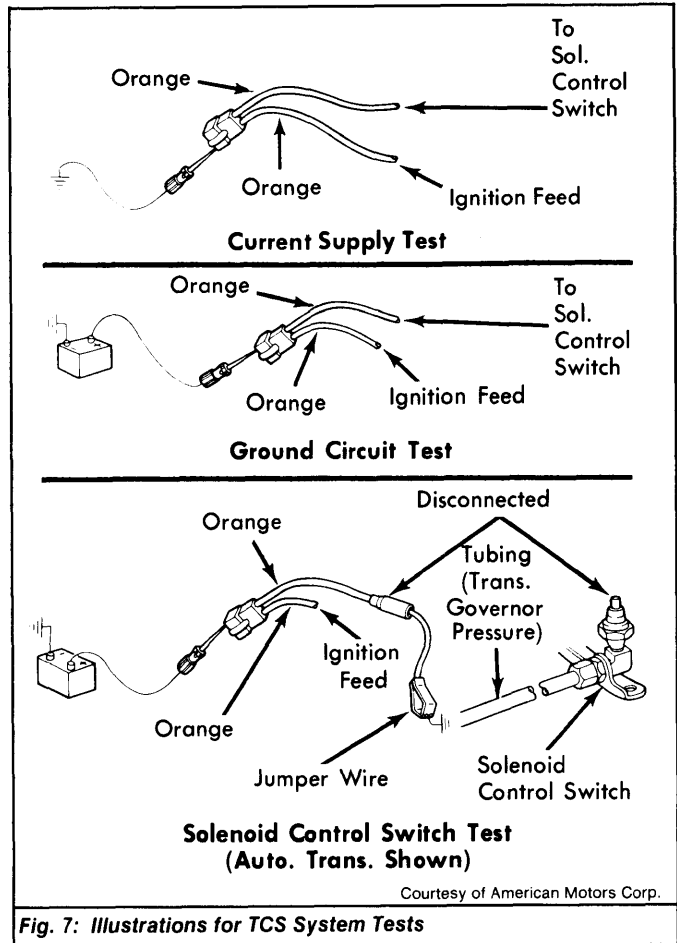


Fig. 7: Illustrations for TCS System Tests

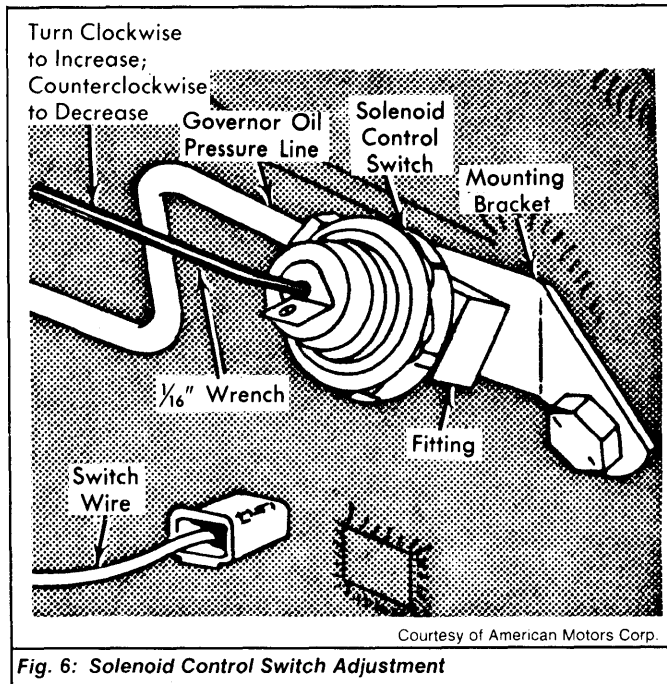


Fig. 6: Solenoid Control Switch Adjustment