

# 1974-79 EXHAUST EMISSION SYSTEMS

## Toyota Spark Control/Delay Systems

### 1976-79 Models

### DESCRIPTION

#### SPARK DELAY SYSTEM

On 1975-76 Federal 2T-C engine, a spark delay system is used. System delays distributor vacuum advance to reduce oxides of nitrogen (NOx) emissions. System consists of spark delay valve and a thermostatic vacuum switch.

#### SPARK CONTROL SYSTEM

This system helps reduce oxides of nitrogen (NOx) and hydrocarbon (HC) emissions by delaying vacuum advance and lowering maximum combustion temperature. System typically consists of a spark delay valve, vacuum switching valves, metered orifices, and connecting vacuum hoses.

The 1978 spark control system is operated by vacuum from advance port on carburetor or through EGR port (2F engine only). On 1979 Cressida, Corolla 1200 and Supra, the system also helps improve cold engine performance by advancing timing when engine is cold.

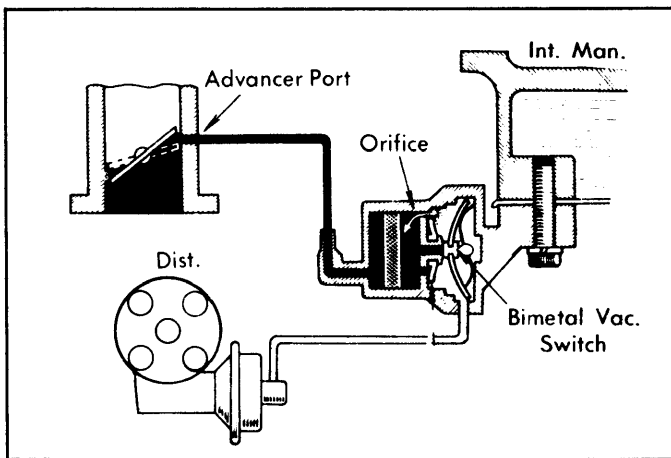


Fig. 1: 1978 Spark Control System (2T-C Engine)

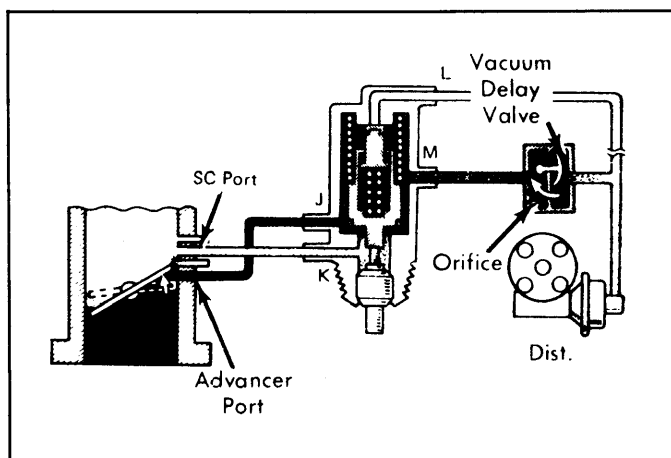


Fig. 2: 1978 Spark Control System (20R Engine)

### OPERATION

#### SPARK DELAY SYSTEM

When engine coolant temperature is below 95°F (35°C), the Thermostatic Vacuum Transmitting Valve (TTVV) is open and normal vacuum advance is allowed. When coolant temperature rises to 140°F (60°C), the TTVV closes, forcing vacuum to flow through spark delay valve.

Vacuum must flow through a small orifice in valve, delaying time when full vacuum advance will occur. When intake manifold vacuum drops, check valve opens, allowing vacuum advance to release immediately.

#### 1977 SPARK CONTROL SYSTEM

The Transmission Controlled Spark (TCS) system has been combined with the Spark Control System on 1977 models. On Federal 2F engine equipped Pickup, a shift point switch is installed to detect transmission gear position. Switch is off in all positions except high gear. Vacuum is allowed to advance normally under all conditions except when coolant temperature is above 122°F (50°C) and Bimetallic Vacuum Switching Valve (BVSV) is open, when transmission is in 1st, 2nd, or 3rd gear, or when throttle valve is opened and EGR vacuum is 3 in. Hg. On 20R engine equipped Pickup, only a Vacuum Transmitting Valve (VTV) is used in the advance circuit. When check valve closes in VTV, advancer port vacuum acts on distributor diaphragm through orifice in

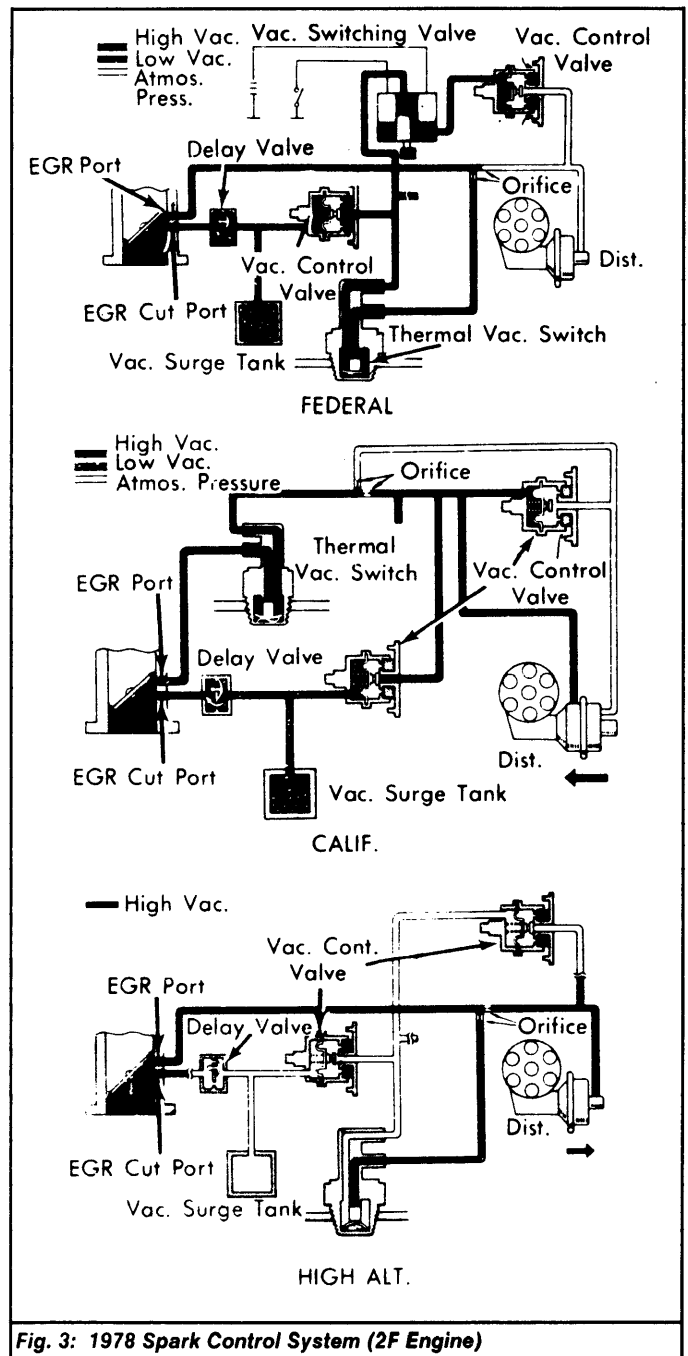


Fig. 3: 1978 Spark Control System (2F Engine)

# 1974-79 EXHAUST EMISSION SYSTEMS

## Toyota Spark Control/Delay Systems (Cont.)

VTV. Vacuum is slowed down and vacuum advance is delayed. If advancer port vacuum drops, check valve opens and allows quicker vacuum transmission.

When coolant temperature is below 95°F (35°C) on Corolla, the Thermostatic Vacuum Transmitting Valve (TVTV) opens a vacuum passage. Vacuum from advance port on carburetor acts directly on distributor diaphragm and normal advance takes place. When coolant temperature is above 95°F (35°C), the TVTV closes vacuum passage. Now vacuum is delayed as vacuum can only be drawn through small orifice in TVTV. If vacuum at carburetor advancer port drops, check valve opens and allows faster transmission of vacuum.

On Corona and Celica, wax in Thermostatic Vacuum Switching Valve (TVSV) is contracted and allows spring tension to force valve down when coolant temperature is below 122°F (50°C). Advancer port vacuum can now act directly on distributor diaphragm for normal advance. With coolant temperature above 122°F (50°C), wax expands and forces valve up. At low speeds, advancer port vacuum is low and only low vacuum can act on distributor diaphragm through small orifice in Vacuum Transmitting Valve (VTV). Vacuum advance cannot operate because of outside air bleed into system. Under acceleration, both advancer port and SC port vacuum act on distributor diaphragm through orifice in VTV and vacuum advance can operate under a delayed condition. If vacuum drops, check valve in VTV opens and transmission of vacuum is faster.

On Land Cruiser, when coolant temperature is below 122°F (50°C), the Bimetallic Vacuum Switching Valve (BVSV) is closed. Carburetor EGR port vacuum can act directly on distributor diaphragm and advance works normally, by-passing all other valves. When coolant temperature rises above 122°F (50°C), the BVSV is opened. Through action of various vacuum switching valves, transmission gear detecting valves and switches, and amount of vacuum available at surge tank and EGR port, spark delay valve is activated. When engine is hot, spark delay is in effect when starting to drive or just after heavy load driving, or under acceleration. Normal advance takes place whenever transmission is in high gear position.

### 1978-79 SPARK CONTROL SYSTEM

As throttle valve opens, vacuum through the EGR or carburetor advancer port increases. This draws the delay valve closed and vacuum to the advance mechanism is momentarily slowed down. This occurs during such engine modes as acceleration or high speed driving. Some models have a thermal control valve which will not allow this action until engine coolant temperature reaches normal operating range.

### TESTING

#### SPARK DELAY SYSTEM

**1975-76 Models** - 1) Visually inspect vacuum hoses and ensure distributor vacuum unit is operating. With coolant temperature below 95°F (35°C), start engine and pinch off hose between distributor and spark delay valve. See Fig. 4.

2) Check that vacuum advance unit operates in conjunction with throttle valve operation. As engine warms up, vacuum unit should stop functioning. If not, replace thermostatic vacuum switching valve.

3) With engine idling, pinch off hose between "T" fitting and spark delay valve. Increase engine speed to 2000 RPM and release hose. Vacuum advance should operate 4-12 seconds after releasing hose. Return engine to idle speed and check that vacuum advance returns quickly. If not, vacuum delay valve is defective.

#### SPARK CONTROL SYSTEM

**1977 Models** - See applicable spark control system diagnostic chart and perform test as outlined. See Figs. 5 through 10.

**1978 Models** - 1) Disconnect vacuum hose to distributor advance mechanism and attach vacuum gauge to hose. With engine cold, start and run engine at 2000 RPM. Vacuum gauge should indicate manifold vacuum.

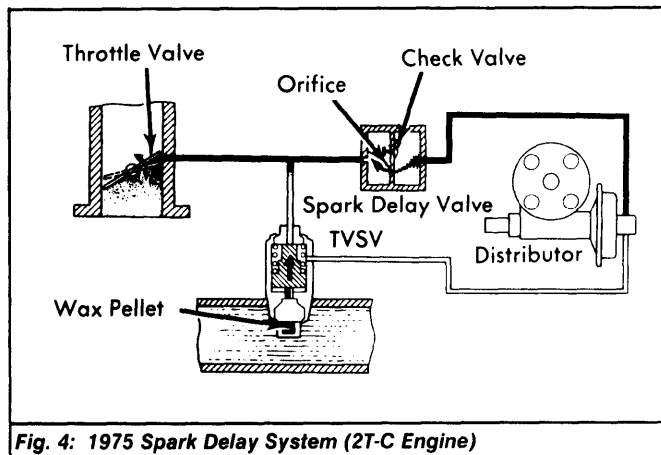


Fig. 4: 1975 Spark Delay System (2T-C Engine)

2) On 2T-C engine, warm engine to normal operating temperature. Increase and maintain engine speed at 3000 RPM. Check that vacuum gauge reading changes from low to high within 3 seconds. Reconnect vacuum hose to distributor.

3) On 20R and 2F engines, pinch hose to carburetor port. Warm engine to normal operating temperature. Increase and maintain engine speed at 3000 RPM. Check that vacuum gauge reading changes from low to high within 3 seconds. Reconnect vacuum hose to distributor.

4) On all models, remove delay valve and blow through it. Air should flow in one direction only (toward colored side). Use cold/hot water to test thermal vacuum switch to determine if it allows passage of vacuum. When cold, vacuum should not pass. When hot, vacuum should pass.

5) Remove distributor cap and rotor dust cover. Apply vacuum to advance mechanism and check that distributor advance mechanism moves when vacuum is applied.

**1979 Celica, Corona & Pickup** - With cold engine, disconnect distributor hose and connect vacuum gauge. Vacuum should change as throttle is opened and closed. Warm engine and pinch hose from advancer port to thermal vacuum switch. Raise engine speed to 2000 RPM, release hose, and check that vacuum rises within 2-4 seconds. Disconnect hose from advancer port. Vacuum should drop quickly to zero.

**1979 Corolla 1200** - Connect a vacuum gauge to distributor sub-diaphragm hose. With a cold engine, vacuum should rise and fall as throttle is opened and closed. With engine warm, vacuum should drop to zero.

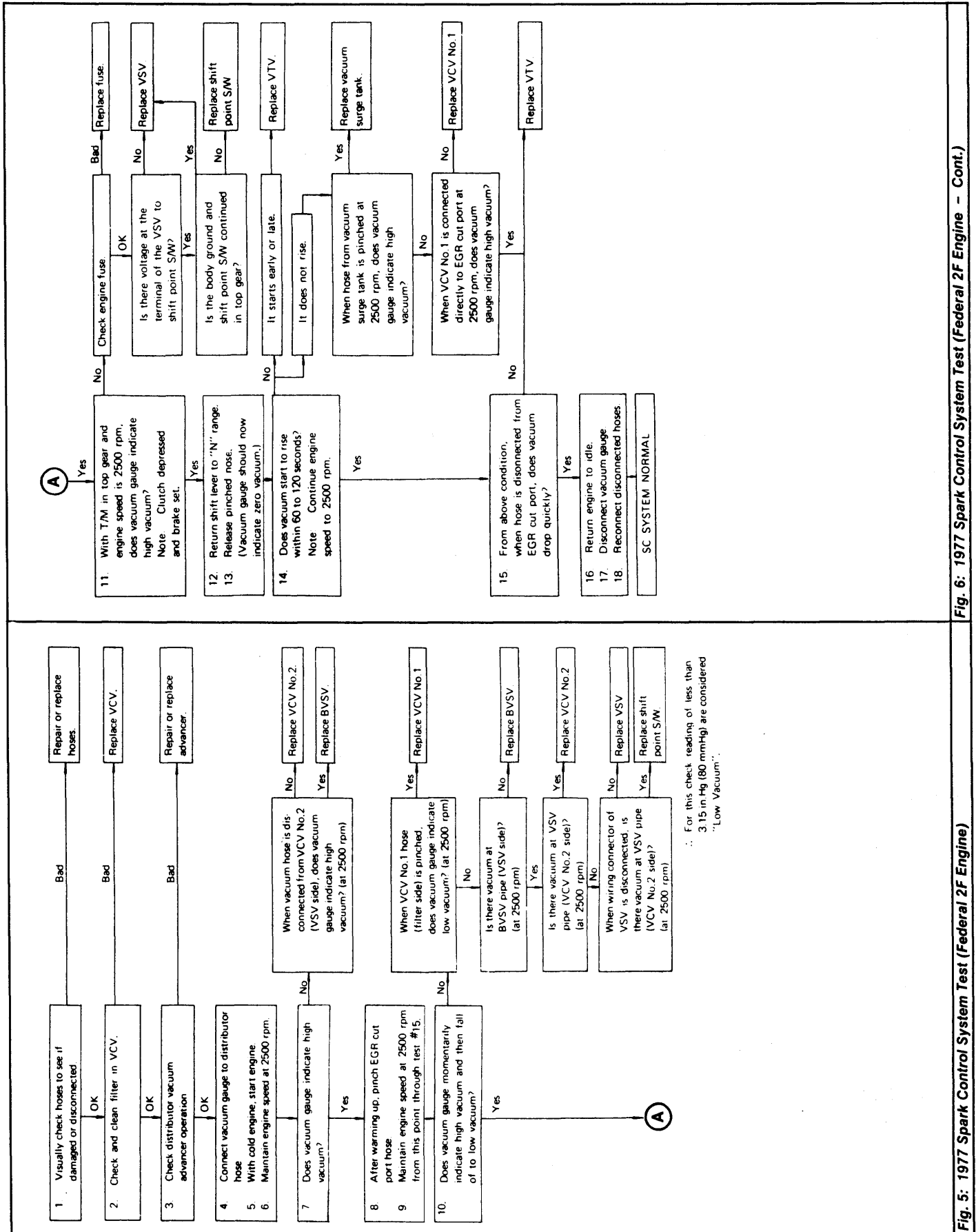
**1979 Corolla 1600** - Connect vacuum gauge to distributor sub-diaphragm hose. With cold engine, gauge should read manifold vacuum at 3000 RPM. With warm engine, vacuum should rise within 1-3 seconds after engine speed is raised to 3000 RPM. Vacuum should drop quickly when engine speed drops.

**1979 Cressida** - Use a 3-way connector to install a vacuum gauge between the distributor sub-diaphragm and the thermal vacuum switch. With cold engine at idle vacuum should be high; with warm engine at idle vacuum should be low. Move vacuum gauge and 3-way connector to distributor main diaphragm hose. Low vacuum should be present at idle; high vacuum at 2000 RPM.

**Land Cruiser** - Connect a vacuum gauge to distributor main diaphragm hose. With engine warm and idling, pinch hose between vacuum pipe and vacuum transmitting valve. Raise engine speed to 2500 RPM and release hose. Gauge should indicate high vacuum within 2-5 seconds after releasing hose. Remove hose from VTV on vacuum pipe side. Gauge reading should drop quickly to zero.

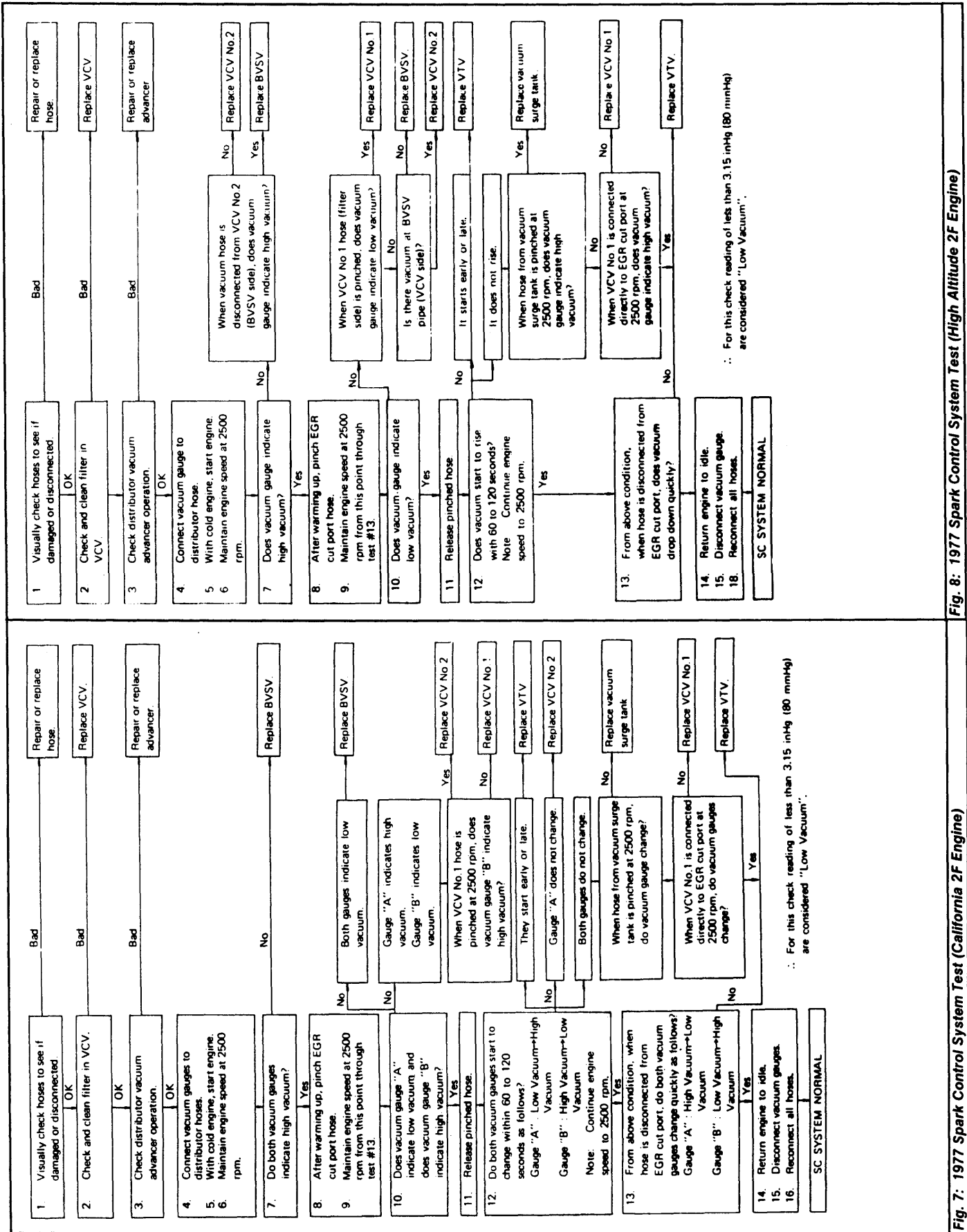
**Supra** - Connect vacuum gauge to distributor sub-diaphragm hose. With cold engine idling, vacuum reading should be high. With warm engine idling, vacuum should be low. Move vacuum gauge to the main diaphragm of distributor. Low vacuum should be present at idle; high vacuum at 2000 RPM.

# 1974-79 EXHAUST EMISSION SYSTEMS Toyota Spark Control/Delay Systems (Cont.)



# 1974-79 EXHAUST EMISSION SYSTEMS

## Toyota Spark Control/Delay Systems (Cont.)



# 1974-79 EXHAUST EMISSION SYSTEMS

## Toyota Spark Control/Delay Systems (Cont.)

3-453

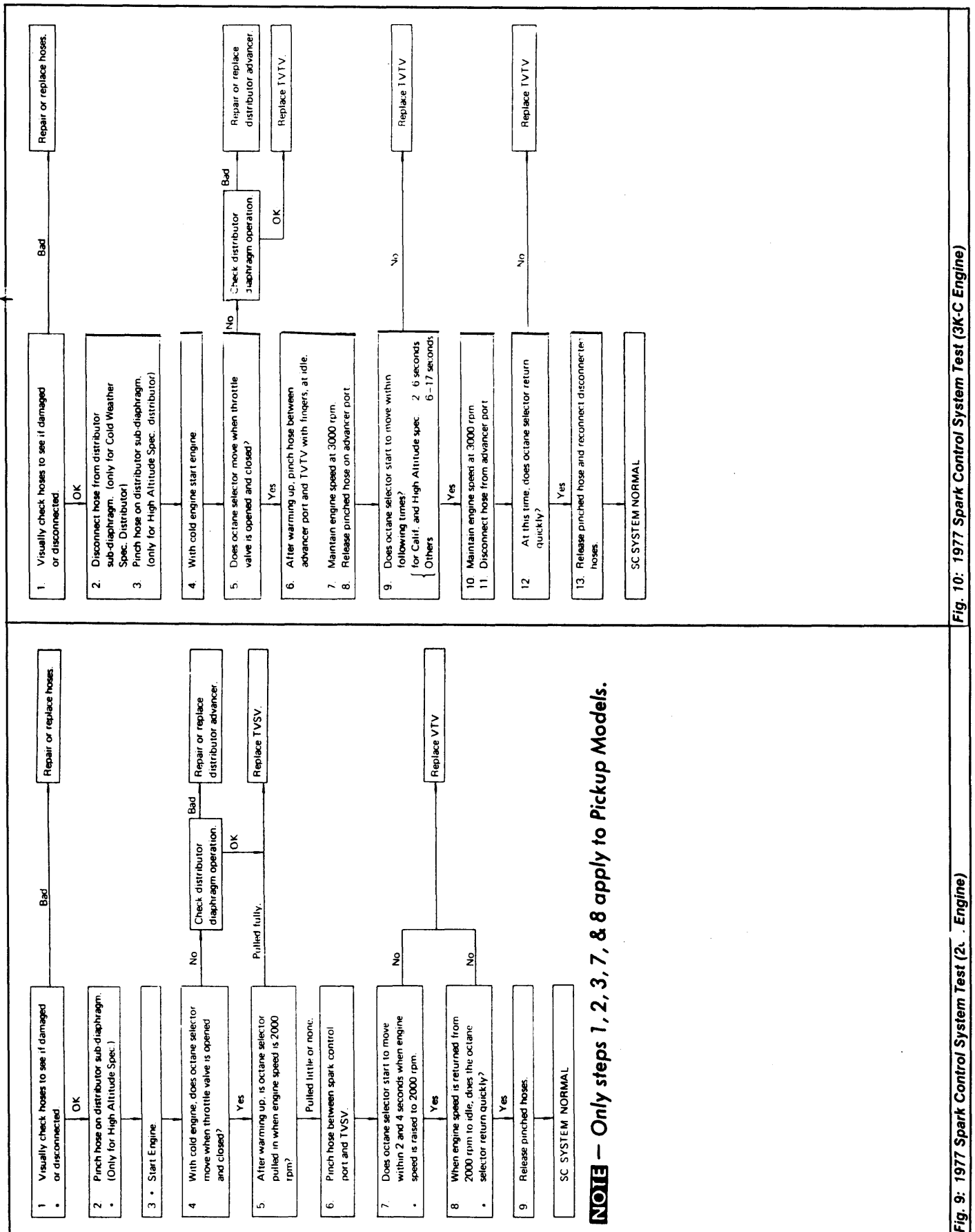


Fig. 10: 1977 Spark Control System Test (3K-C Engine)

Fig. 9: 1977 Spark Control System Test (2L Engine)

# 1974-79 EXHAUST EMISSION SYSTEMS Toyota Spark Control/Delay Systems (Cont.)

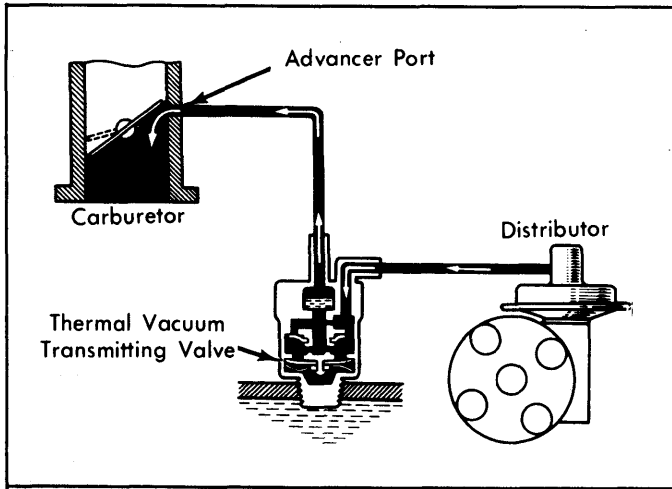


Fig. 11: 1979 Celica, Corona & Pickup Spark Control System

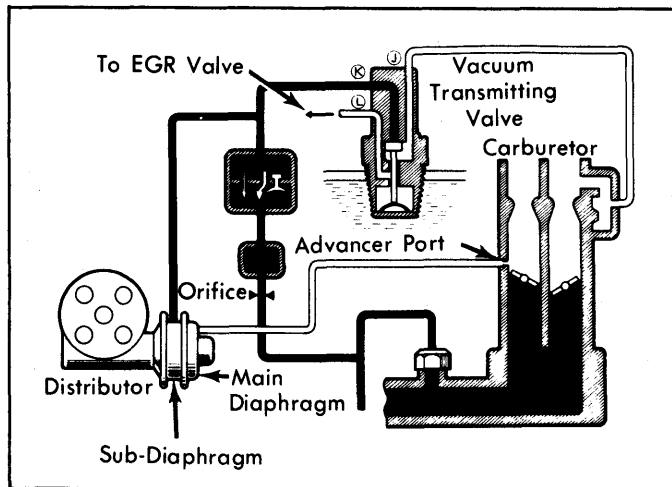


Fig. 12: 1979 Corolla 1200 Spark Control System

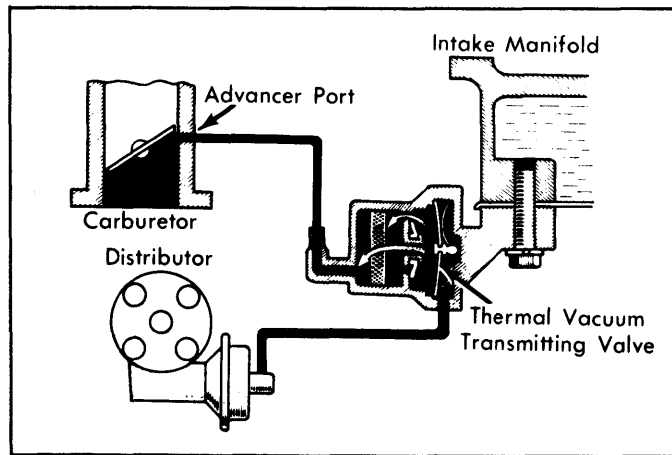


Fig. 13: 1979 Corolla 1600 Spark Control System

## DELAY VALVE

Remove valve and flow through it. Air should flow in one direction only (toward colored side).

## THERMAL VACUUM SWITCH

Use cold water/hot water test to check thermal vacuum switch. Switch should allow passage of vacuum when warm, no vacuum when cold.

## DISTRIBUTOR DIAPHRAGM OPERATION

Remove distributor cap and rotor dust cover. Apply vacuum to advance mechanism and note that mechanism operates properly as vacuum is applied.

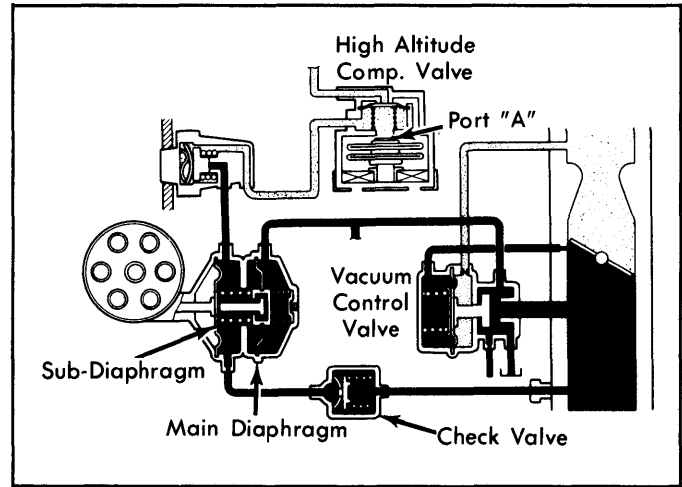


Fig. 14: 1979 Cressida Spark Control

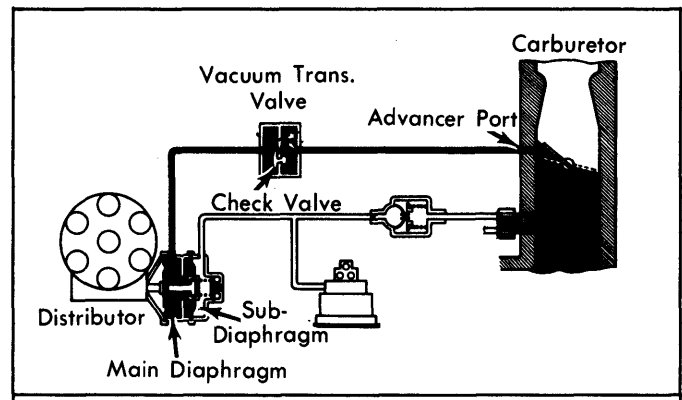


Fig. 15: 1979 Land Cruiser Spark Control

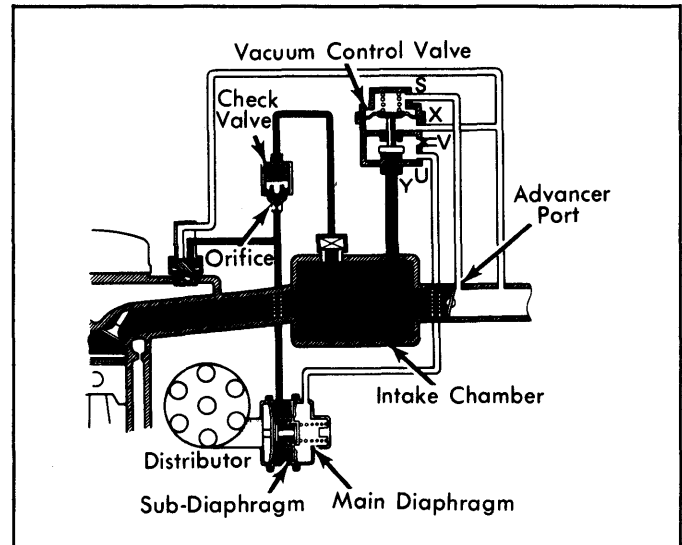


Fig. 16: 1979 Supra Spark Control