## TOYOTA HIGH ALTITUDE COMPENSATION (HAC) SYSTEM

**Corolla (Federal)**
**Land Cruiser**
**Pickup (Calif. 4-WD & Federal)**
**Starlet**
**Tercel (Federal)**

NOTE – *The HAC system is optional on high altitude area vehicles. Not all vehicles will be equipped with this system.*

### DESCRIPTION

As altitude increases, air pressure decreases and the air/fuel mixture becomes richer. The HAC system supplies additional air to the primary low and high speed circuits on Corolla, Pickup and Land Cruiser models, intake manifold on Starlet models and high speed circuits only on Tercel models. This helps to reduce emissions and improve driveability. On all models except Corolla, the ignition timing is also advanced for better driveability.

The systems include a high altitude compensation valve and, on all models except Starlet, a check valve. Starlet models use a thermostatic vacuum switching valve (TVSV) and Tercel models use a bimetal vacuum switching valve (BVSV). Both serve to eliminate compensation while the engine is cold.

### OPERATION

At altitudes over 4000 feet, the HAC valve opens and allows air to bleed through the valve into the carburetor. When the vehicle is at an altitude below 2600 feet, the valve is closed and no air can pass through. The valve may or may not be open between these altitudes. The BVSV on Tercel models is closed when coolant temperature is below 122° F (50° C). This cuts off vacuum from the HAC valve so air can't bleed into carburetor, but still allows vacuum advance.

### TESTING

#### HAC VALVE

**Corolla, Land Cruiser, Pickup & Tercel** – Before testing each system, remove hoses or caps from top of HAC valve. Blow into ports on valve. If air passes through, valve is in the high altitude position. If not, valve is in the low altitude position. Replace valve if position does not correspond to test altitude.

**Starlet** – Before testing system, remove hoses or caps from top of HAC valve. Blow into lower port on valve. If air passes through, valve is in the low altitude position. If not, valve is in high altitude position. Replace valve if position does not correspond to test altitude.

#### SYSTEM TESTS

**Corolla** – Disconnect hoses from top of HAC valve and blow through each hose. Air should flow freely to carburetor. Blow through check valve. Air should pass from white to black side, but not in the other direction.

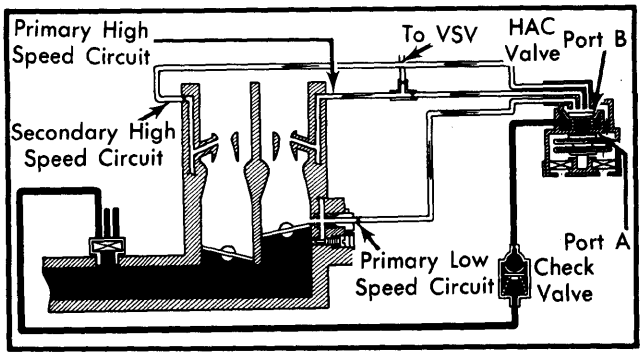


***Fig. 1 High Altitude Compensation System (Corolla)***

**Land Cruiser** – 1) If at high altitude, disconnect and plug hose at distributor sub-diaphragm. Ignition timing should be 7° BTDC. Reconnect hose – timing should advance 5°. Disconnect and plug vacuum hose at black side of check valve. Timing should not change for at least one minute.

2) Stop engine and blow through hoses from HAC valve to carburetor. Air should pass freely. Remove check valve and see that air passes from white to black side, but not the other direction.

3) If at low altitude, ignition timing should be 7° BTDC. Pinch hose at HAC valve leading to distributor sub-diaphragm. Timing should advance.

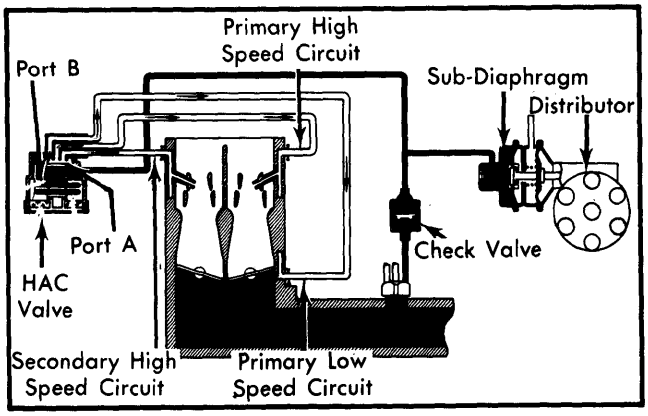


***Fig. 2 High Altitude Compensation System (Land Cruiser)***

**Pickup** – 1) If at high altitude, disconnect and plug hose at distributor sub-diaphragm. Ignition timing should be 8° BTDC. Reconnect hose – timing should advance 7°. Disconnect and plug vacuum hose located between vacuum pipe and check valve at vacuum pipe. Timing should not change for at least one minute.

2) Stop engine. Reconnect hose to check valve. Disconnect and blow through hoses on top of HAC valve. Air should pass freely through to carburetor. Reconnect hoses.

3) If at low altitude, ignition timing should be 8° BTDC. Disconnect and plug vacuum hose from lower port of HAC valve. Timing should advance 7°.

## TOYOTA HIGH ALTITUDE COMPENSATION (HAC) SYSTEM (Cont.)

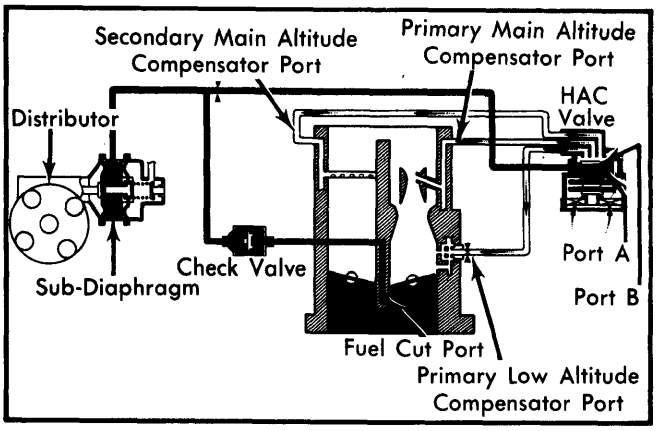


**Fig. 3 High Altitude Compensation System (Pickup)**

**Starlet – 1)** If at high altitude, connect a vacuum gauge to distributor sub-diaphragm hose. Gauge should indicate manifold vacuum and should not change when engine is accelerated.

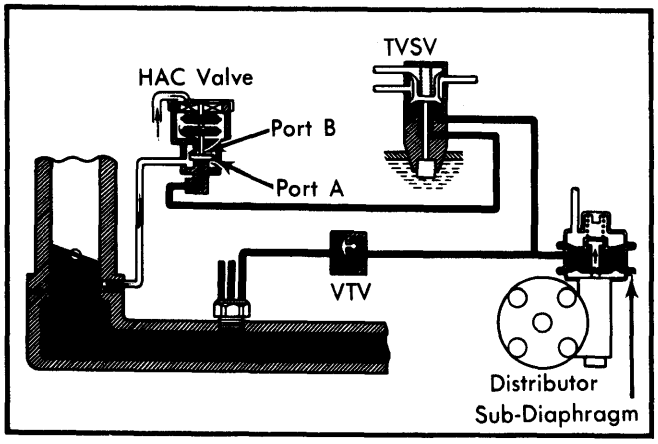


***Fig. 4 High Altitude Compensation System (Starlet)***

**2)** If at low altitude, perform above test with engine at normal operating temperature. Check that vacuum gauge indicates high manifold vacuum and fluctuates when engine is accelerated.

**Tercel – 1)** Check BVSV to see that air does not pass through when coolant is below 122°F (50°C). Warm engine and recheck. Air should pass through.

**2)** If testing at high altitude position, ignition timing should be 13° BTDC. Disconnect hose at distributor sub-diaphragm and see that timing changes to 5° BTDC. Reconnect hose, then disconnect from black side of check valve. Plug hose end and see that timing does not change for one minute. Disconnect hose from top of HAC and see that air passes freely into carburetor.

**3)** If testing at low altitude, disconnect and plug vacuum hose from BVSV to HAC and from check valve to sub-diaphragm. Timing should be 5° BTDC. Reconnect hose to sub-diaphragm. Timing should now be 13°BTDC.

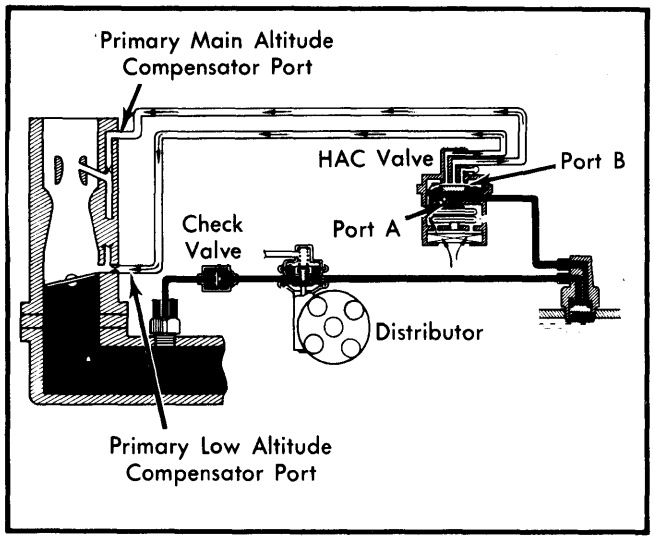


***Fig. 5 High Altitude Compensation System (Tercel)***