1974-79 EXHAUST EMISSION SYSTEMS
Datsun Transmission Controlled Spark

All TCS Equipped Models

DESCRIPTION

The Transmission Controlled Spark (TCS) system is used to reduce HC and NOx emission by controlling distributor vacuum advance. Through the use of various switches and valves, this system allows vacuum advance only when the transmission is in 4th or 5th gear (manual transmission) or "D3" and "R" (automatic transmission). The system consists of a vacuum switching valve, top gear detecting switch, overdrive detecting switch (if equipped), thermal vacuum valve, vacuum delay valve (if equipped), and vacuum hose and wiring harness. *See Fig. 1.*

OPERATION

1974 MODELS

The transmission controlled spark system allows distributor vacuum advance in high gear only. When electric current flows through vacuum solenoid valve, valve opens allowing air to enter vacuum advance hose, thus eliminating vacuum advance. In high gear, current flow stops, allowing vacuum solenoid valve to close. This stops air from entering advance system and allows vacuum advance.

1975-76 MODELS

The transmission controlled spark system is used on all manual transmission equipped models, except California 280Z, 710, and all pickups. The system consists of transmission Neutral detecting switch, a high gear detecting switch, and a vacuum switching valve. On F10, the high gear switch and Neutral switch are combined into one unit.

1977-78 MODELS

When transmission is placed in high gear, the top gear detecting switch allows electrical current to flow to vacuum switching valve. This valve closes and cuts off outside air to distributor, permitting vacuum advance using intake manifold vacuum.

In all other gear positions, current is interrupted by top gear detecting switch. This opens the vacuum switching valve which, in turn, allows atmospheric pressure into the vacuum control unit of the distributor. With pressure equalized (no vacuum present), the advance mechanism cannot operate and spark timing cannot advance.

1979 MODELS

When transmission is shifted into high gear, the top gear detecting switch and overdrive detecting switch (if equipped) on the transmission send an electrical signal to the vacuum switching valve. This signal activates the vacuum switching valve, closing the vent passage and allowing full vacuum to the distributor vacuum advance unit.

In all other gear positions, the vacuum switching valve interrupts the vacuum normally directed to the vacuum advance unit and, at the same time, opens the vent passage so that vacuum can be released. On 210 (except 5-Speed Hatchback) and 310 models, a thermal vacuum valve is added to this system to allow full vacuum advance when engine coolant temperature is below 41-64°F (5-18°C), or above 122-145°F (50-63°C).

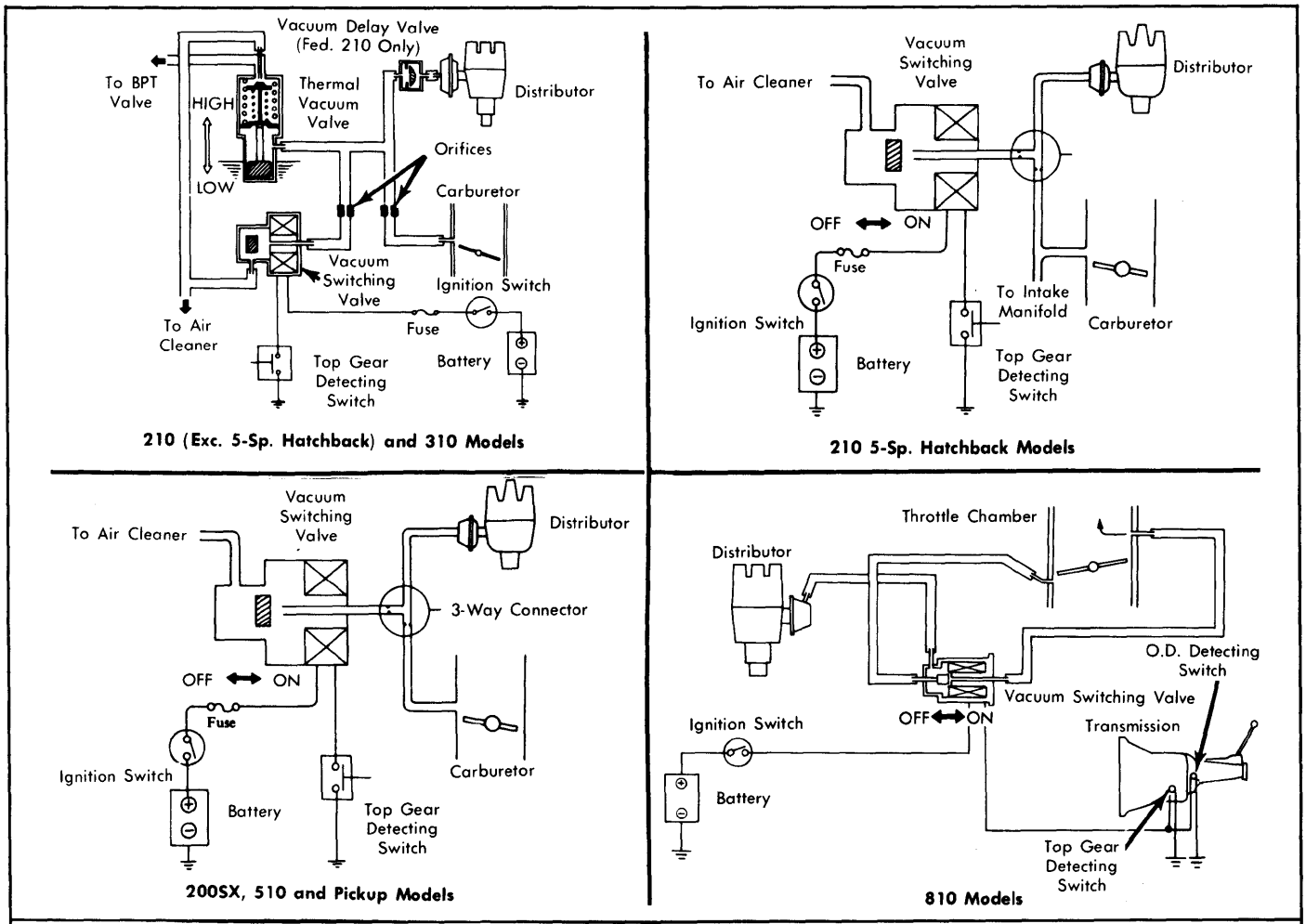

Fig. 1: 1979 Transmission Controlled Spark Systems (Others Similar)

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Datsun Transmission Controlled Spark (Cont.)

TESTING

NOTE: Before testing the Transmission Controlled Spark system, make sure all electrical and vacuum lines are properly connected and that distributor vacuum advance unit is functioning correctly.

1974 MODELS

1) Block front wheels and apply parking brake. Start engine depress clutch pedal, and place place transmission in high gear. Pull off vacuum hose to distributor. Vacuum should be felt.
2) If vacuum is not present, check vacuum hoses for damage and replace if necessary. If there is still no vacuum, check high gear detecting switch. To do so, go to next step.
3) Make sure wiring harness and connectors are in good condition. Disconnect harness from switch and connect ohmmeter to switch leads. Reading should be infinity with transmission in high gear, zero (0) in all other gear positions. If not, replace high gear detecting switch.

1975-76 MODELS

1) Make sure wiring and vacuum hoses are properly connected and that distributor is working properly. Connect timing light to engine. Start engine and increase speed to 1600 RPM on B210 and F10, 1800 RPM on 610 and 710, or 3200-3500 RPM on 280Z. Check and note ignition timing.
2) On B210, 610 and 710, disengage clutch and place transmission in high gear, 3rd gear, and Neutral. System is operating correctly if timing advances 5 degrees or more in high gear and Neutral.
3) On 1976 F10, disengage clutch and place transmission in high gear and all other forward gears while checking ignition timing in each gear. System is operating properly if timing is 10-15 degrees greater in high gear than in other gear positions.
4) On 280Z, disengage clutch and place transmission in Neutral and high gear. System is operating properly if timing is 5 degrees greater in high gear than in Neutral position.

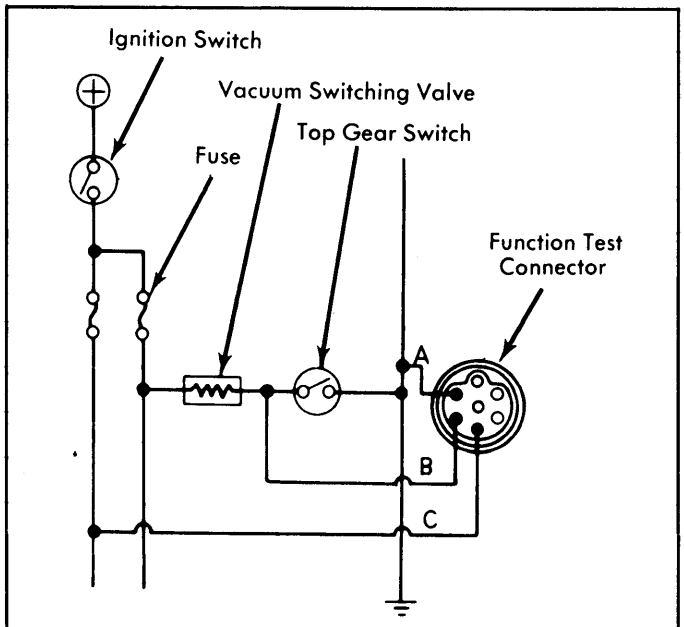

Fig. 2: 1976-78 F10 TCS Electrical Circuit

5) If timing does not vary as indicated on 1976 F10, turn ignition off and check continuity between terminals "B" and "C". *See Fig. 2.* If continuity does not exist, check fuse wiring, and vacuum switching valve. Turn ignition on and check voltage across terminals "A" and "B". Reading should be zero (0) volts in high gear an Neutral, 12 volts in all other gear positions.
6) If timing does not vary as indicated on all other models, disconnect vacuum switching valve wire (White on 280Z, Green on all others). Repeat ignition timing advance procedure.
7) Connect vacuum switching valve wire directly to battery positive terminal and recheck timing. Timing should change 5 degrees when wire is disconnected from battery. If not, replace high gear detecting switch. If timing does not change through entire test procedure, replace vacuum switching valve.
8) Turn ignition on and check voltage across terminals "A" and "B". *See Figs. 3 and 4.* On B210, 610 and 710, reading should be zero (0) volts in high gear an Neutral, 12 volts in 3rd gear positions. On 280Z, reading should be zero (0) volts in high gear, 12 volts in all other gear positions.

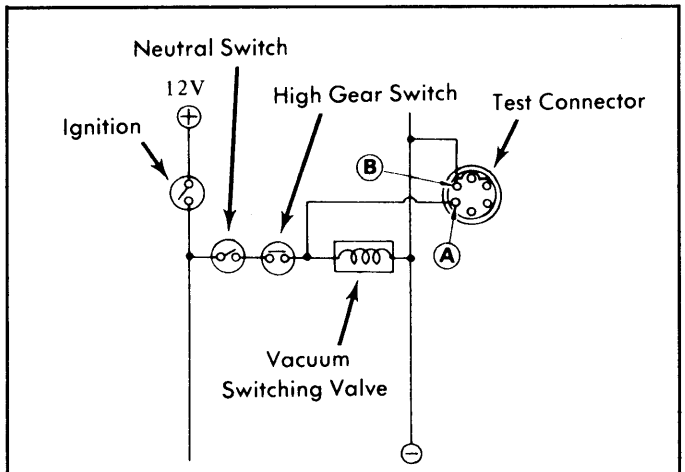

Fig. 3: 1975-78 B210, 610 & 710 TCS Electrical Circuit

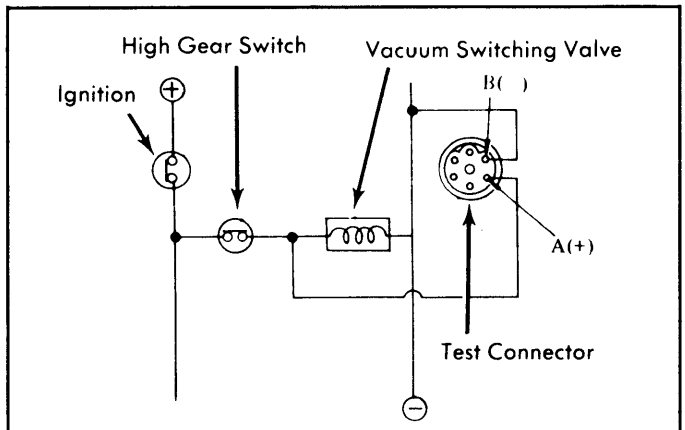

Fig. 4: 1975-76 280Z TCS Electrical Circuit

1977-78 MODELS

B210 & F10 - 1) Make sure wiring and vacuum hoses are properly connected and that distributor is working properly. Connect timing light to engine. With engine warm, adjust engine speed to approximately 1600 RPM.
2) Depress clutch pedal to disengage clutch, then shift transmission through all forward gears while checking ignition timing in each gear.
3) The system is functioning correctly if timing increase 10-15 degrees (5 degrees on B210) in high gear. If timing does not vary as specified, go to step **4)** on B210 or step **5)** on F10.
4) Check electrical system at function test connector. *See Figs. 2 and 3.* Turn ignition on (DO NOT start engine). Check voltage across terminals "A" and "B". Reading should be 12 volts in high gear, zero (0) volts in all other gear positions. If not, check harness and/or fuse.
5) Turn ignition off. Check continuity between terminals "B" and "C" at function test connector. *See Figs. 2 and 3.* If no continuity exists, check fuse, wiring, and vacuum switching valve.

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6) Turn ignition on (DO NOT start engine). Check voltage across terminals "A" and "B". Reading should be 12 volts in high gear, zero (0) volts in all other gear positions. If not, check harness and/or fuse.
7) On both models, check vacuum switching valve for continuity. If ohmmeter needle deflects, check vacuum switching valve for a "click" when power is applied to it. If "click" is not heard, replace valve.
8) Check top gear detecting switch for correct on/off operation by connecting ohmmeter leads to switch while shifting transmission through all gear positions. Ohmmeter should read infinity in all gear positions except high gear. Replace switch if not working properly.
200SX, 510 & 710 - 1) Make sure wiring and vacuum hoses are properly connected and that distributor is working properly. Connect timing light to engine. With engine warm, adjust engine speed to approximately 2000 RPM.
2) Depress clutch pedal to disengage clutch, then shift transmission through all forward gears while checking ignition timing in each gear. The system is functioning correctly if timing varies when transmission is shifted into 4th or 5th gear. If not, go to next step.
3) Check vacuum switching valve by disconnecting Green wire connector. Start engine, maintain speed at 2000 RPM, and check timing. Connect Green wire connector directly to battery positive terminal and recheck timing. If timing does not change, replace vacuum switching valve.
4) Check electrical system at function test connector. *See Fig. 5.* Turn ignition on (DO NOT start engine). Check voltage across terminals "A" and "B". Reading should be zero (0) volts in 4th or 5th gear, 12 volts in all other gear positions.

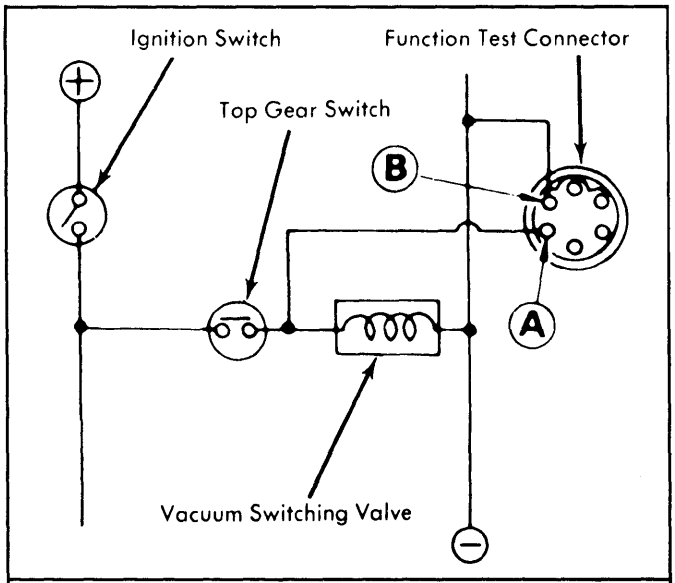

Fig. 5: 1977-78 200SX & 710 TCS Electrical Circuit

810 - 1) Make sure wiring and vacuum hoses are properly connected and that distributor is working properly. Connect timing light to engine. With engine warm, adjust engine speed to 2500-2800 RPM.
2) Depress clutch pedal to disengage clutch, then shift transmission through all forward gears while checking ignition timing in each gear. The system is functioning correctly if timing advances 5 degrees or more when transmission is shifted into 4th or 5th gear. If not, go to next step.
3) Check vacuum switching valve by disconnecting Green wire connector. Start engine, maintain speed at 2500-2800 RPM, and check timing. Connect Green wire connector directly to battery positive terminal.
4) Timing should advance 5 degrees or more. If not, replace top gear detecting switch. If timing does not change through entire test procedure, replace vacuum switching valve.
5) Check electrical system at function test connector. *See Fig. 6.* Turn ignition on (DO NOT start engine). Check voltage across terminals "A" and "B". Reading should be zero (0) volts in 4th gear, 12 volts in all other gear positions. If not, check harness and/or fuse.

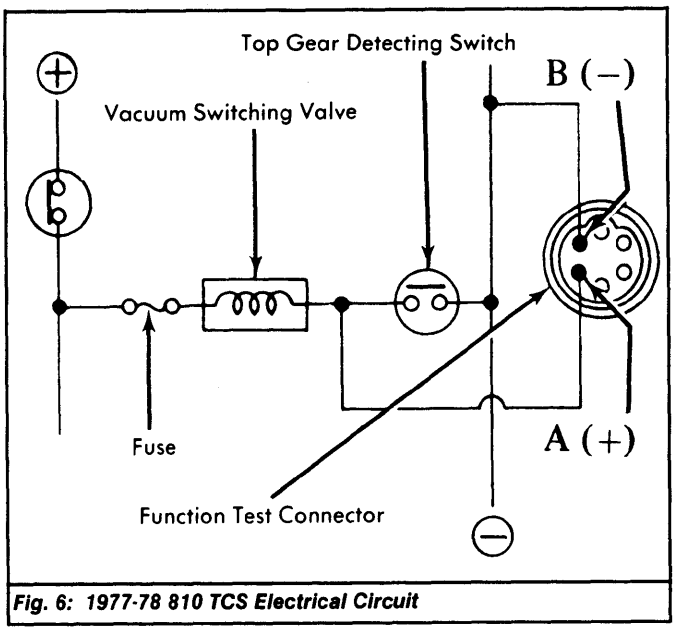

Fig. 6: 1977-78 810 TCS Electrical Circuit

1979 MODELS

210 (Exc. Hatchback) & 310 Man. Trans. Equipped Models - 1) With engine coolant temperature below 122°F (50°C), start engine and adjust engine speed to approximately 1600 RPM.
2) Depress clutch pedal to disengage clutch, then shift transmission through all forward gears while checking ignition timing in each gear.
3) The system is functioning correctly if timing is the same in all gears. If timing varies between gears, check for a defective thermal vacuum valve.
4) Allow engine to reach normal operating temperature, then again check timing in each gear. System is functioning properly if timing advances when transmission is shifted into high gear. If not, test individual system components to locate cause.
210 Auto. Trans. Equipped Models - 1) With engine coolant temperature below 122°F (50°C), start engine and adjust engine speed to approximately 1600 RPM with transmission in "P" Check ignition timing.
2) From inside vehicle, connect a jumper wire between test connector terminals. *See Fig. 7.* Recheck ignition timing. System is functioning properly if timing does not change with jumper wire installed. If timing changes, check for a defective thermal vacuum switch.

NOTE: System damage will occur if jumper wire is connected between any other terminals.

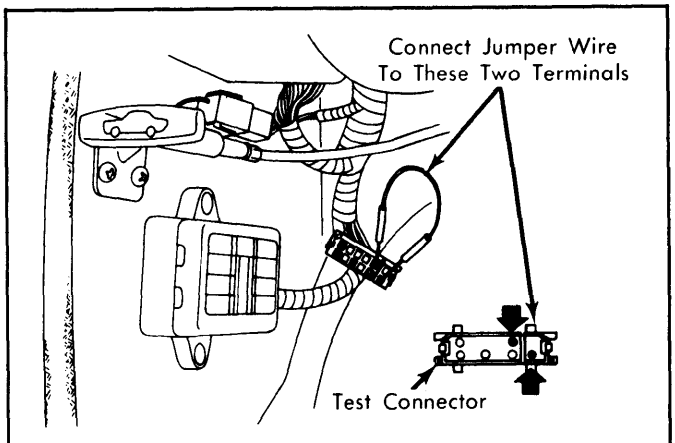

Fig. 7: Connecting Jumper Wire To Test Connector (210 With Auto. Trans.)

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3) Allow engine to reach normal operating temperature, then recheck ignition timing with jumper wire still installed. System is functioning properly if timing has advanced. If timing does not advance, test individual system components to locate cause.
4) To complete system testing, check top gear detecting switch. With engine idling, disconnect lead wires from vacuum switching valve at connectors. Apply parking and service brakes and block drive wheels.

NOTE: Vacuum switching valve wires MUST be disconnected during step 5) or damage to ohmmeter will result.

5) Using an ohmmeter, check continuity between test connector terminals with transmission in "R" and then again with transmission in "N". *See Fig. 7.*
6) Top gear detecting switch is okay if ohmmeter shows continuity with transmission in "R" and no continuity with transmission in "N". If not, replace top gear detecting switch.
All Other Models - 1) Start engine. Adjust engine speed to 1600 RPM on 210 5-speed Hatchback, 2500-2800 RPM on 810, or 2000 RPM on 200SX, 510 and Pickup models. Check ignition timing.
2) Depress clutch pedal to disengage clutch, then recheck timing with transmission in 4th or 5th gear. System is functioning properly if ignition timing or engine speed in 4th or 5th gear is greater than that in Neutral.
3) If timing or engine speed does not increase, test individual system components to locate cause.

VACUUM SWITCHING VALVE

1979 810 Models - 1) Disconnect vacuum switching valve green wire at connector and connect a timing light to engine. Adjust engine speed to 2500-2800 RPM and check ignition timing.
2) Connect a jumper wire between Green wire connector and the positive terminal of battery. *See Fig. 8.* Recheck ignition timing.
3) Vacuum switching valve is okay if ignition timing advances 5° or more with green wire connected to battery voltage. If timing does not advance, replace vacuum switching valve.

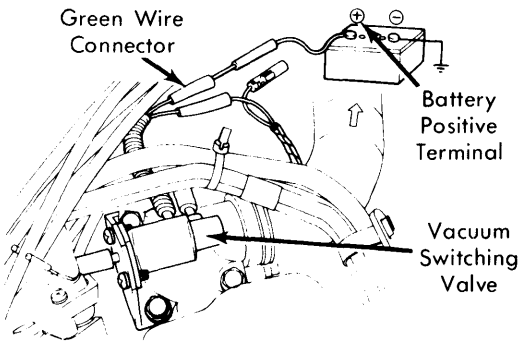

Fig. 8: Testing Vacuum Switching Valve (810 Models)

All Other 1979 Models - 1) With engine at normal operating temperature, disconnect vacuum switching valve wires at connectors and connect a timing light to engine.
2) Start engine and adjust engine speed to 1600 RPM on 210 and 310 models, or 2000 RPM on all other models. Check ignition timing.

NOTE: On 210 models with automatic transmission, place transmission selector lever in "N" or "P" for test.

3) Connect one of the switching valve wires directly to the battery positive terminal and connect the other wire to ground. Recheck ignition timing.
4) Vacuum switching valve is okay if ignition timing advances approximately 5° with wire connected to battery voltage. If not, replace vacuum switch valve.

TOP GEAR DETECTING SWITCH & OVERDRIVE DETECTING SWITCH

1979 Man. Trans. Equipped Models Only - 1) To test for proper on/off operation of top gear detecting switch and overdrive detecting switch, connect ohmmeter leads to detecting switch leads and shift transmission from 4th or 5th gear to other forward gears and check for continuity.
2) The top gear or overdrive detecting switch is okay if ohmmeter shows continuity with transmission in 4th or 5th gear and no continuity with transmission in any other gear. If not, replace top gear or overdrive detecting switch.

THERMAL VACUUM VALVE

1979 210 & 310 - 1) Remove thermal vacuum valve from engine with hoses attached. Submerge valve in a container of water below 41-64°F (5-18°C). Apply vacuum to top port of valve. Valve passage should be closed.
2) Heat water to 65-120°F (18-49°C). DO NOT allow water to enter thermal vacuum valve. Again apply vacuum to top port of valve. *See Fig. 9.* Valve passage should now be open.
3) Continue to heat water to above 122-145°F (50-63°C), and again apply vacuum to top port of valve. Valve passage should again be closed. If thermal vacuum valve operates as specified, valve is okay. If not, replace thermal vacuum valve.

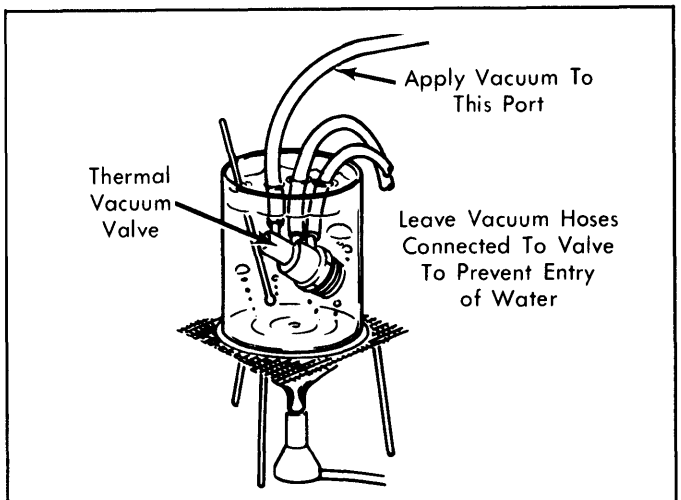

Fig. 9: Checking Thermal Vacuum Valve

VALVE DELAY VALVE

All 1979 Models - 1) Remove vacuum delay valve from engine. Blow air into valve from distributor side of valve. Air should pass through valve without resistance. If not, replace valve.
2) Next, blow air through carburetor side (brown side) of valve. Air should not pass through valve without resistance. If no resistance is encountered, replace valve.

ELECTRICAL WIRING CIRCUIT

All 1979 Models (Exc. 210 & 310) - 1) Turn ignition on, but do not start engine. Check for voltage across test terminals "A" and "B" of connector. *See Figs. 10 and 11.*
2) Electrical wiring circuit is okay if voltmeter reads 0 volts with transmission in 4th or 5th gear and 12 volts in all other gears. If not, check for loose harness connections and blown fuse.

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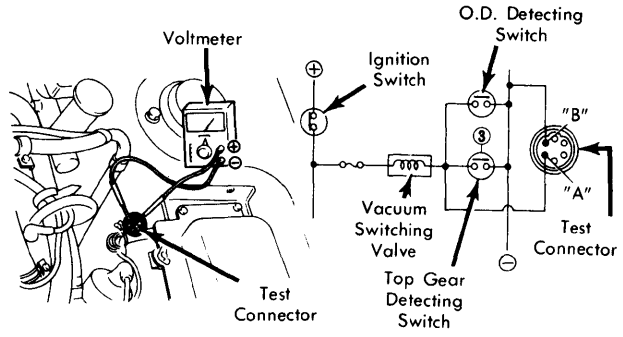

Fig. 10: Checking TCS Electrical Circuit (810 Models)

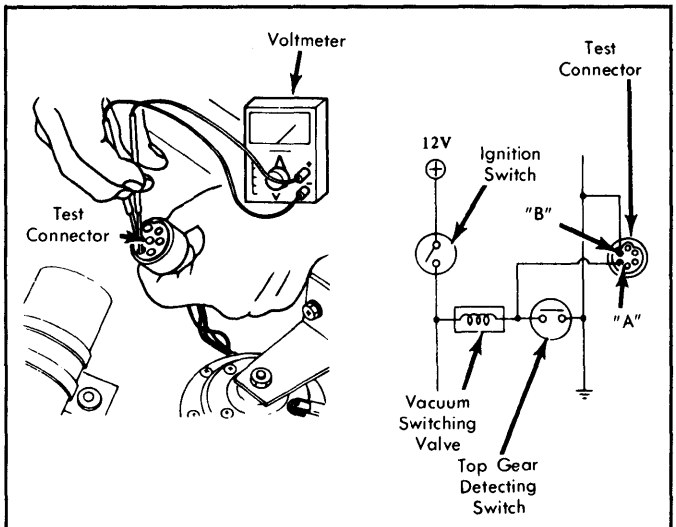

Fig. 11: Checking TCS Electrical Circuit (200SX, 510 & Pickup Models)