

AUTO TRANS DIAGNOSIS - AW03-72LE

Article Text

1995 Suzuki Sidekick

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ARTICLE BEGINNING

1995 AUTOMATIC TRANSMISSIONS
AW03-72LE Electronic Controls (Except OBD-II)

Suzuki; Sidekick

APPLICATION

APPLICATION

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Vehicle	Transmission Model
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1995 Sidekick	AW03-72LE
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DESCRIPTION

Automatic transmission is electronically controlled. Transmission shifting and torque converter lock-up are controlled by Transmission Control Module (TCM).

The TCM receives information from various input devices and uses this information to control shift solenoids No. 1 and 2 on transmission valve body for transmission shifting, and Torque Converter Clutch (TCC) solenoid for torque converter lock-up.

An Overdrive (OD) switch is mounted on shift lever. When OD switch is depressed to ON position, transmission will shift into 4th gear when shift lever is in "D" position, and OD OFF light on instrument panel will go off. When OD switch is released to OFF position, transmission will shift into 3rd gear, and OD OFF light on instrument panel will illuminate. The OD OFF light is located on instrument panel.

OPERATION

TCM

The TCM receives information from various input devices and uses this information to control shift solenoids No. 1 and 2 on transmission valve body for transmission shifting, and TCC solenoid for torque converter lock-up.

The TCM contains a self-diagnostic system, which will store a trouble code if failures or problems are present in electronic control system. Trouble code can be retrieved to determine problem area. See SELF-DIAGNOSTIC SYSTEM. Note location of TCM. See Fig. 1.

TCM INPUT DEVICES

Brakelight Switch Signal

Brakelight switch delivers input signal to TCM, indicating vehicle braking. Brakelight switch is located on brake pedal support.

Cruise Control Electronic Control Unit (ECU)

Cruise control unit delivers an input signal to control overdrive operation in accordance with vehicle speed when cruise control is operating. When in overdrive with cruise control on, if vehicle speed drops 2 MPH less than the set speed, overdrive is released to prevent reduction in vehicle speed. Once vehicle speed is more than the set speed, the overdrive is resumed. If coolant temperature is low, transmission will not shift into overdrive. Cruise control unit is located next to TCM. See Fig. 1.

Engine Coolant Temperature (ECT) Sensor

ECT sensor delivers input signal to TCM, indicating engine coolant temperature. ECT sensor is located on front of engine. See Fig. 2.

Overdrive (OD) Switch

The OD switch provides an input signal to TCM to indicate when overdrive is selected by operator. When OD switch is depressed to ON position, transmission will shift into 4th gear when shift lever is in "D" position, and OD OFF light on instrument panel will go off. The OD OFF light is located on instrument panel. When OD switch is released to OFF position, transmission will shift into 3rd gear, and OD OFF light on instrument panel will illuminate. The OD switch is mounted on shift lever.

Park/Neutral Position (PNP) Switch Signal

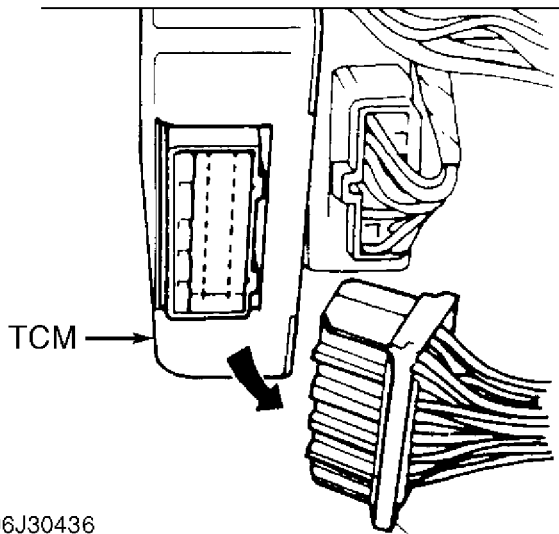
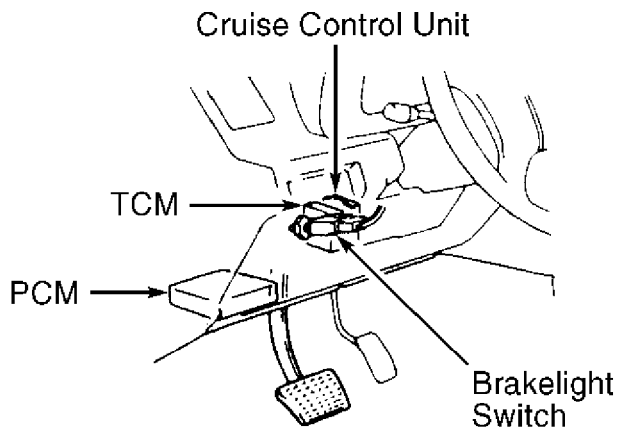
PNP switch delivers an input signal to TCM indicating shift lever position. Switch is located on side of transmission.

Throttle Position (TP) Sensor

TP sensor delivers a variable throttle position input signal to TCM. TP sensor is located on side of throttle body.

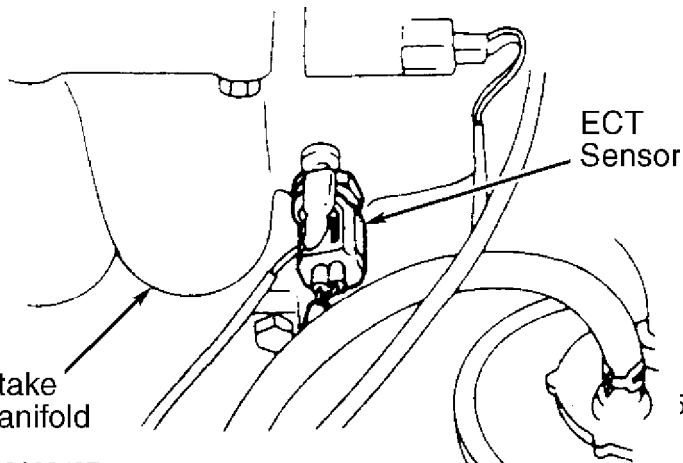
Vehicle Speed Sensor (VSS)

Vehicle speed signal is delivered to TCM by No. 1 and No. 2 speed sensors.



96J30436

Fig. 1: Locating TCM Location
 Courtesy of Suzuki of America Corp.



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Fig. 2: Locating ECT Sensor
 Courtesy of Suzuki of America Corp.

TCM OUTPUT DEVICES

No. 1 & No. 2 Shift Solenoids

The TCM controls transmission shifting by delivering an output signal to operate proper shift solenoid. Shift solenoids are located on transmission valve body. Shift solenoids are operated in accordance with shift lever range. If a shift solenoid malfunctions, TCM will select a gear. See FAIL SAFE GEAR POSITION table.

FAIL SAFE GEAR POSITION

Application	Solenoid No. 1 Failure	Solenoid No. 2 Failure	Solenoid No. 1 & 2 Failure
"D"			
1st Gear	3rd	1st	OD
2nd Gear	3rd	OD	OD
3rd Gear	3rd	OD	OD
OD Gear	OD	OD	OD
"2"			
1st Gear	3rd	1st	3rd
2nd Gear	3rd	3rd	3rd
"L"			
1st Gear	1st	1st	1st

TCC Lock-Up Solenoid

The TCM controls torque converter lock-up by delivering an output signal to TCC lock-up solenoid. Lock-up solenoid is activated when shift lever is in "D" position, and vehicle is at a predetermined specified speed.

SELF-DIAGNOSTIC SYSTEM

SYSTEM DIAGNOSIS

NOTE: Before testing transmission, ensure fluid level is correct and throttle and shift cables are properly adjusted. Ensure engine starts with shift lever in Park and Neutral to ensure proper adjustment of Park/Neutral Position (PNP) switch. Transmission must first be tested for stored trouble codes. See RETRIEVING TROUBLE CODES.

The TCM monitors transmission operation and contains a self-diagnostic system which stores a trouble code if an electronic control system failure or problem is present. If a problem is present in the

No. 1 or No. 2 shift solenoids and/or vehicle speed sensor, and a trouble code is present, the TCM will deliver a signal to flash OD OFF light on instrument panel to warn the driver.

RETRIEVING TROUBLE CODES

NOTE: Before retrieving trouble codes, ensure battery is fully charged for proper self-diagnostic system operation. Perform diagnostic circuit check before retrieving trouble codes to ensure operation of OD OFF light. See DIAGNOSTIC CIRCUIT CHECK. Trouble codes must be cleared from TCM memory once repairs have been performed. See CLEARING TROUBLE CODES.

Diagnostic Circuit Check

1) Turn ignition on. Release OD switch to OFF position. Ensure OD OFF light on instrument panel illuminates. If OD OFF light does not illuminate, check OD switch and wiring circuit. See wiring diagram in WIRING DIAGRAM.

2) Depress OD switch to the ON position. Ensure OD OFF light on instrument panel goes off. If OD OFF light remains on, check OD switch and wiring circuit. If OD OFF light is blinking, check for stored trouble codes. See TCM TROUBLE CODES.

TCM Trouble Codes

1) Turn ignition on. DO NOT start engine. Connect a jumper wire between terminals on monitor coupler. See Fig. 3. Note number of flashes from OD OFF light on instrument panel. If system operation is normal, OD OFF light will flash trouble code 12. See Fig. 4.

2) If system is operating normally, and no trouble codes are present, turn ignition off and remove jumper wire. Perform manual shifting test to determine if problem is electrical or mechanical. See MANUAL SHIFTING TEST under TRANSMISSION SHIFT TESTING. Check system by symptom. See SYMPTOM TROUBLE SHOOTING.

3) If a trouble code is present, OD OFF light will flash a trouble code. The number of flashes will equal first digit of trouble code. After a one second pause, second digit will be displayed. See Fig. 4.

4) If more than one trouble code is present, next trouble code will be displayed after a 3 second pause. Smallest number trouble code will be displayed first. Trouble codes will be repeated. Once trouble code is obtained, determine probable cause. See TROUBLE CODE IDENTIFICATION table.

NOTE: Manufacturer does not provide diagnostic trouble code testing information. Only symptom trouble shooting and component testing procedures are given. For additional component information, see appropriate ENGINE PERFORMANCE **AUTO TRA** article.

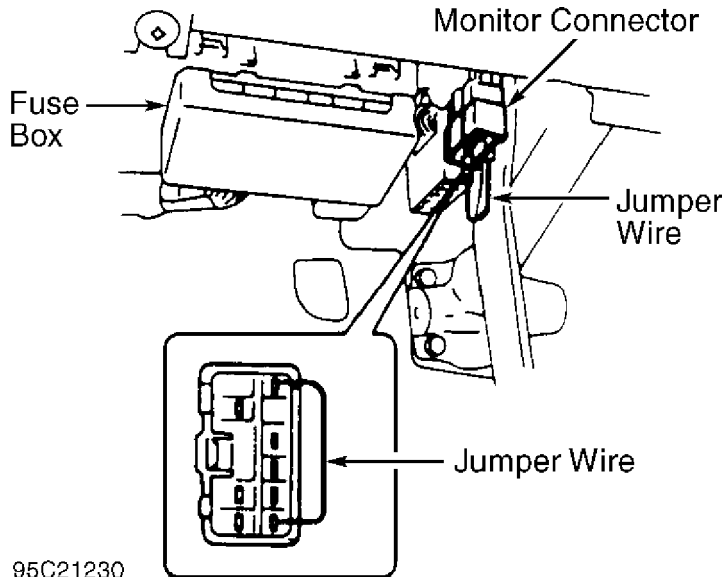
TROUBLE CODE IDENTIFICATION

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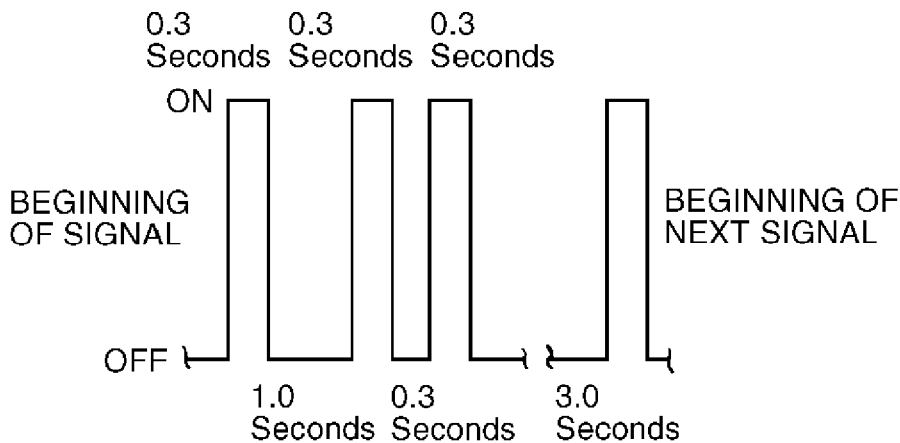
Trouble Code	(1) Probable Cause
12	System Operation Normal
21	No. 1 Shift Solenoid Open Circuit
22	No. 1 Shift Solenoid Short Circuit
23	No. 2 Shift Solenoid Open Circuit
24	No. 2 Shift Solenoid Short Circuit
25	TCC Solenoid Open Circuit
26	TCC Solenoid Short Circuit
31	Vehicle Speed Sensor Open Or Short Circuit
32	Throttle Position Sensor Short Circuit
33	Throttle Position Sensor Open Circuit
34	Defective Park/Neutral Position Switch
36	(2) No Signal-Both Vehicle Speed Sensors

- (1) - Check listed component for probable cause. Also check wiring and connections of specified component.
- (2) - No signal from both transmission and speedometer mounted vehicle speed sensors.

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95C21230
Fig. 3: Identifying Monitor Coupler Terminals
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



95D21231 CODE NO. 12
Fig. 4: Identifying Trouble Code Displays
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

CLEARING TROUBLE CODES

Once repairs have been performed, trouble codes must be cleared from TCM memory. To clear, disconnect negative battery cable for at least 10 seconds.

TRANSMISSION SHIFT TESTING

MANUAL SHIFTING TEST

NOTE: Perform manual shifting test if no trouble codes are present. Manual shifting test determines if problem is an electrical or mechanical related problem.

1) Start and operate vehicle until normal operating temperature is achieved. Disconnect TCM harness connector. See Fig. 1. Road test vehicle and ensure transmission gear changes correspond with shift lever position. See GEAR APPLICATION table.

2) If an abnormality is present, problem is mechanically related. If all gears are correct, perform trouble shooting in accordance with symptom. See SYMPTOM TROUBLE SHOOTING. Turn ignition off.

3) Reconnect TCM harness connector. Clear trouble codes from TCM memory, as disconnecting electrical connector may set a trouble code. See CLEARING TROUBLE CODES.

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GEAR APPLICATION

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Shift Lever Position	Gear
"D"	Overdrive

"2" 3rd Gear
 "L" 1st Gear
 "R" Reverse
 "P" Park
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SYMPTOM TROUBLE SHOOTING

DOES NOT SHIFT

1) Ensure engine and transmission are at normal operating temperature. Retrieve trouble codes. See RETRIEVING TROUBLE CODES. If a trouble code is present, repair as needed. Clear trouble codes. See CLEARING TROUBLE CODES. If no trouble codes are present, go to next step.

2) Perform manual shifting test. See MANUAL SHIFTING TEST under TRANSMISSION SHIFT TESTING. Raise and support vehicle. Access TCM harness connector (leave connected). See Fig. 1. Go to next step.

3) Using a DVOM, measure voltage (backprobe) between chassis ground and TCM harness connector terminal S1, then terminal S2 while operating vehicle through all gears with shift selector in "D" position. See Fig. 5. Record readings and compare with table. See SHIFT SOLENOID VOLTAGE table. Go to next step.

SHIFT SOLENOID VOLTAGE

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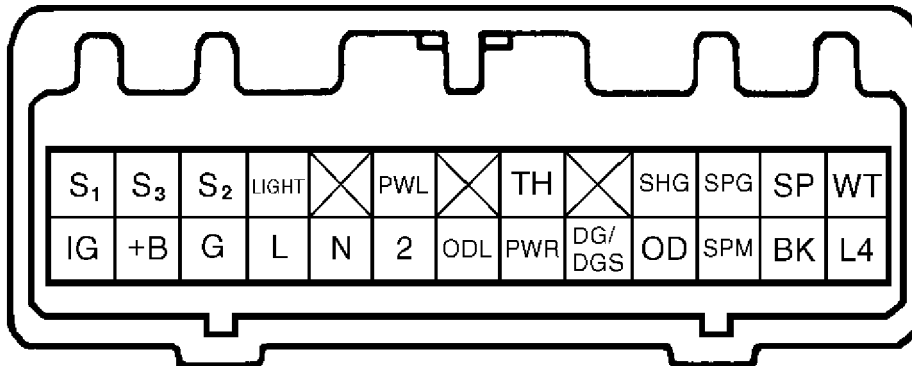
Application

1st Gear	2nd Gear	3rd Gear	OD Gear
No. 1 Shift Solenoid			
10-14 Volts	10-14 Volts	0 Volt	0 Volt
No. 2 Shift Solenoid			
0 Volt	10-14 Volts ..	10-14 Volts	0 Volt

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4) If any reading is not as specified, go to next step. If all readings are as specified, inspect shift solenoids. See SHIFT SOLENOIDS under COMPONENT TESTING. If shift solenoids are okay, inspect and repair circuits between TCM and shift solenoids as needed. If circuits are okay, replace TCM and retest.

5) Repeat vehicle operation through all gears while monitoring voltage between chassis ground and TCM harness connector terminal "L", then terminal "2". Reading should be zero volts at each terminal. If readings are not as specified, replace Park/Neutral Position (PNP) switch and retest. If both readings are zero volts, replace TCM and retest.



95E21232

Fig. 5: Identifying TCM Harness Connector Terminals
 Courtesy of Suzuki of America Corp.

INCORRECT SHIFT SPEEDS

1) Ensure engine and transmission are at normal operating temperature. Retrieve trouble codes. See RETRIEVING TROUBLE CODES. If a trouble code is present, repair as needed. Clear trouble codes. See CLEARING TROUBLE CODES. If no trouble codes are present, go to next step.

2) Access TCM harness connector (leave connected). See Fig. 1. Using a DVOM, measure voltage (backprobe) between chassis ground and TCM harness connector terminal TH. See Fig. 5. Go to next step.

3) Slowly depress accelerator pedal to Wide Open Throttle (WOT). Monitor voltage while depressing throttle pedal. Voltage should decrease as throttle is depressed. Voltage should be within the following range: battery voltage multiplied by .95 (idle position) to battery voltage multiplied by .39 (WOT). Go to next step.

4) If voltage is not within range in step 3), or changes erratically, inspect Throttle Position (TP) sensor. See appropriate ENGINE PERFORMANCE article. If voltage is within range, turn ignition off and go to next step.

5) Disconnect TCM harness connector. Disconnect speedometer cable from transmission. Using a DVOM, measure resistance between chassis ground and TCM harness connector terminal SPM. See Fig. 5. Monitor DVOM while turning speedometer cable. Go to next step.

6) If reading pulses between zero ohms and infinity 4 times per revolution, go to next step. If reading is not as specified, inspect for a broken speedometer cable, faulty sensor in speedometer or faulty circuit between speedometer and TCM.

7) Ensure ignition is off. Reconnect TCM harness connector. Turn ignition on. Using a DVOM, measure voltage (backprobe) between chassis ground and TCM harness connector terminal PWR. See Fig. 5. If reading is 5 volts with shift selector in "N" position, and zero volts

inspect and repair circuits between PNP switch and TCM.

NO UPSHIFT TO OVERDRIVE

1) Ensure engine and transmission are at normal operating temperature. Retrieve trouble codes. See RETRIEVING TROUBLE CODES. If a trouble code is present, repair as needed. Clear trouble codes. See CLEARING TROUBLE CODES. If no trouble codes are present, go to next step.

2) Perform manual shifting test. See MANUAL SHIFTING TEST under TRANSMISSION SHIFT TESTING. Reconnect TCM harness connector. Raise and support vehicle. Using a DVOM, measure voltage (backprobe) between chassis ground and TCM harness connector terminal S1, then terminal S2 while operating vehicle through all gears with shift selector in "D" position. See Fig. 5. Record readings and compare with table. See SHIFT SOLENOID VOLTAGE table. Go to next step.

SHIFT SOLENOID VOLTAGE

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Application

1st Gear	2nd Gear	3rd Gear	OD Gear
No. 1 Shift Solenoid			
10-14 Volts	10-14 Volts	0 Volt	0 Volt
No. 2 Shift Solenoid			
0 Volt	10-14 Volts	10-14 Volts	0 Volt

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3) If any reading is not within specification, go to next step. If all readings are within specification, inspect shift solenoids. See SHIFT SOLENOIDS under COMPONENT TESTING. If shift solenoids are okay, inspect and repair circuits between TCM and shift solenoids as needed. If circuits are okay, replace TCM and retest.

4) Repeat vehicle operation through all gears while monitoring voltage between chassis ground and TCM harness connector terminal "L", then terminal "2". If reading is zero volts for both circuits, go to next step. If reading is not as specified, replace Park/Neutral Position (PNP) switch and retest.

5) Measure voltage (backprobe) between chassis ground and TCM harness connector terminal OD. See Fig. 5. If reading is 5 volts with OD switch in OFF position, and zero volts in ON position, go to next step. If reading is not as specified, inspect OD switch and applicable circuits. See wiring diagram in WIRING DIAGRAM. Repair as needed.

6) Measure voltage (backprobe) between chassis ground and TCM harness connector terminal WT. See Fig. 5. If reading is zero volts with engine coolant temperature below 77°F (25°C), and battery voltage with engine coolant temperature above 86°F (30°C), go to step 8). If reading is not as specified, go to next step.

7) Inspect ECT sensor. See ENGINE COOLANT TEMPERATURE sensor under COMPONENT TESTING. If ECT tests okay, see appropriate ENGINE PERFORMANCE article for further diagnostic information.

8) Measure voltage (backprobe) between chassis ground and TCM harness connector terminal L4. If reading is zero volts with transfer case in 4WD position, and battery voltage in 2WD position, replace TCM and retest. If reading is not as specified, replace 4WD switch (located on side of transfer case).

NO TCC LOCK-UP

1) Ensure engine and transmission are at normal operating temperature. Retrieve trouble codes. See RETRIEVING TROUBLE CODES. If a trouble code is present, repair as needed. Clear trouble codes. See CLEARING TROUBLE CODES. If no trouble codes are present, go to next step.

2) Raise and support vehicle. Using a DVOM, measure voltage (backprobe) between chassis ground and TCM harness connector terminal S3 while operating vehicle through all forward gears with shift selector in "D" position. See Fig. 5. Go to next step.

3) Ensure mode switch is in "N" (normal) position. Accelerate to 35 MPH. If battery voltage is present, inspect TCC solenoid. See SHIFT SOLENOIDS under COMPONENT TESTING. Replace as needed and retest. If battery voltage is not present, measure voltage (backprobe) between chassis ground and TCM harness connector terminal BK. See Fig. 5. Go to next step.

4) Depress and release brake pedal while monitoring voltage. If reading is zero volts with pedal released, and battery voltage with pedal depressed, go to next step. If reading is not as specified, inspect brake switch and circuit. Repair as needed.

5) Measure voltage (backprobe) between chassis ground and TCM harness connector terminal WT. See Fig. 5. If reading is zero volts with engine coolant temperature below 77°F (25°C), and battery voltage with engine coolant temperature above 86°F (30°C), go to step 7). If reading is not as specified, go to next step.

6) Inspect ECT sensor. See ENGINE COOLANT TEMPERATURE (ECT) SENSOR under COMPONENT TESTING. If ECT is okay, see appropriate ENGINE PERFORMANCE article for further diagnostic information.

7) Measure voltage (backprobe) between chassis ground and TCM harness connector terminal L4. If reading is zero volts with transfer case in 4WD position, and battery voltage in 2WD position, replace TCM and retest. If reading is not as specified, replace 4WD switch (located on side of transfer case).

COMPONENT TESTING

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Remove sensor from intake manifold and place in water with a thermometer. Heat water to specified temperature and check resistance. See ENGINE COOLANT TEMPERATURE (ECT) SENSOR RESISTANCE table. Replace sensor if resistance is not within specification.

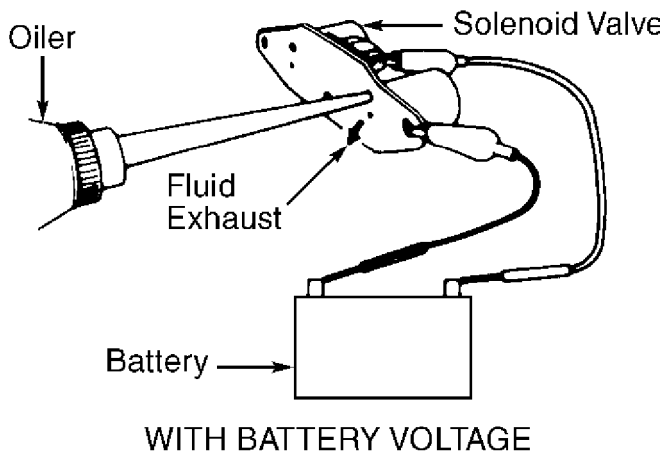
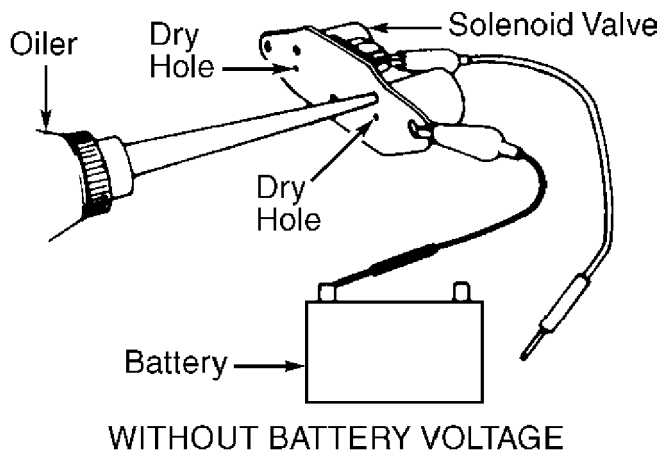
ENGINE COOLANT TEMPERATURE (ECT) SENSOR RESISTANCE TABLE

Temp. °F (°C)	Ohms
32 (0)	5880
68 (20)	2210-2690
104 (40)	1140
140 (60)	580
176 (80)	290-350

SOLENOIDS

1) Obtain access to TCM. See Fig. 1. Ensure ignition is off. Disconnect TCM harness connector. Turn ignition on. Using a fused jumper wire, connect one end to TCM harness connector terminal +B. With other end, probe terminals S1, S2 and S3, one at a time. See Fig. 5. Ensure a "clicking" sound can be heard when battery voltage is applied. Replace solenoid if no sound is heard.

2) To check solenoid seals, apply battery voltage to solenoid. Apply ATF to solenoid with battery voltage connected. See Fig. 6. ATF should pass through solenoid. Remove battery voltage. Ensure ATF does not pass through solenoid. Replace solenoid if defective.



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Fig. 6: Checking Solenoids
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

PARK/NEUTRAL POSITION (PNP) SWITCH

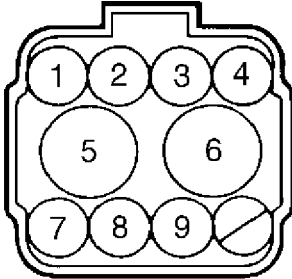
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 Disconnect PNP switch harness connector. Switch is located on side of transmission. Using a DVOM, check for continuity between specified terminals in accordance with shift lever position. See Fig. 7. Replace switch if defective.

PARK/NEUTRAL POSITION SWITCH CONTINUITY

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Shift Lever Position	Continuity Between Terminals
"P"	5 & 6, 8 & 9
"R"	4 & 9
"N"	5 & 6, 7 & 9
"D"	3 & 9
"2"	2 & 9
"L"	1 & 9

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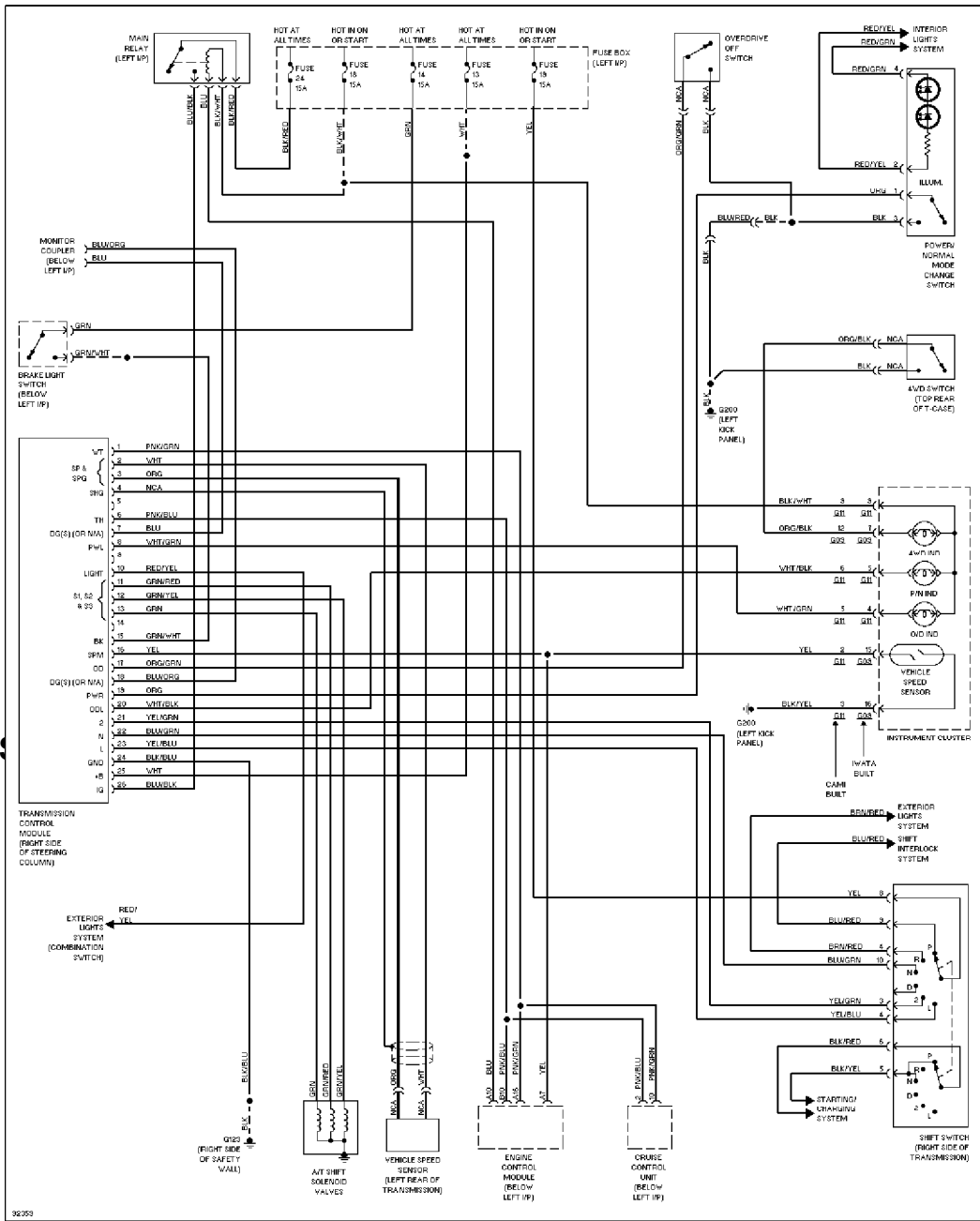
Fig. 7: Identifying Park/Neutral Position (PNP) Switch Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

VEHICLE SPEED SENSOR

Ensure ignition is off. Disconnect TCM harness connector. See Fig. 1. Using a DVOM, measure resistance between TCM harness connector terminals SP and SPG. See Fig. 5. Resistance should be 387-473 ohms. Replace as needed.

WIRING DIAGRAM

AUTO TRANS



Nira Sakhalin Rus

Fig. 8: Transmission Wiring Diagram (1995 Suzuki Sidekick)

END OF ARTICLE