

ANTI-LOCK BRAKE SYSTEM

1998 Toyota Supra

1997-98 BRAKES
Toyota - Anti-Lock

Supra

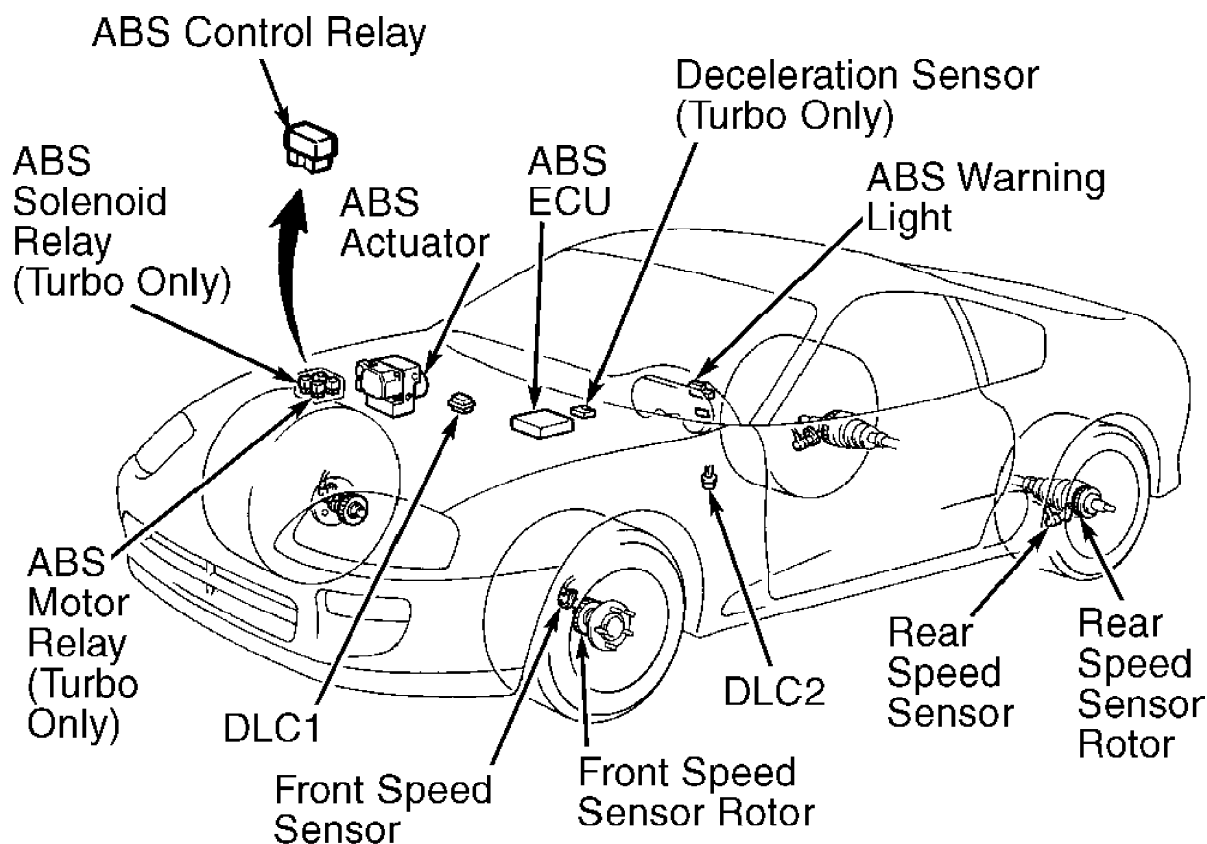
DESCRIPTION

NOTE: For traction control systems, see TRACTION CONTROL article.

The Anti-Lock Brake System (ABS) consists of hydraulic unit, brake actuator, actuator solenoids, lateral acceleration sensor, pump motor, ABS Electronic Control Unit (ECU), indicator light, and 4 wheel speed sensors. See Fig. 1.

An ABS indicator light, located in the instrument cluster, comes on for 3 seconds as a bulb test when ignition is first turned on. A primary check is performed after each engine start and initial time vehicle speed exceeds 6 MPH. An actuator noise is heard during this period of time. This is normal.

NOTE: For additional information on brake system, see BRAKE SYSTEM RWD article.



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Fig. 1: Identifying ABS Component Locations (Supra)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OPERATION

Under normal driving conditions, ABS functions like a standard brake system. Upon detection of wheel lock-up, short pedal pulsations will occur. Pedal pulsation will continue until there is no longer a need for ABS function or until vehicle is stopped. Maintaining a constant force on the brake pedal provides shortest stopping distance.

CAUTION: See ANTI-LOCK BRAKE SAFETY PRECAUTIONS article in GENERAL INFORMATION.

BLEEDING BRAKE SYSTEM

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on painted surface, wipe off immediately and clean with alcohol. Use only DOT 3 brake fluid from a sealed container. DO NOT mix brake fluid with any other type.

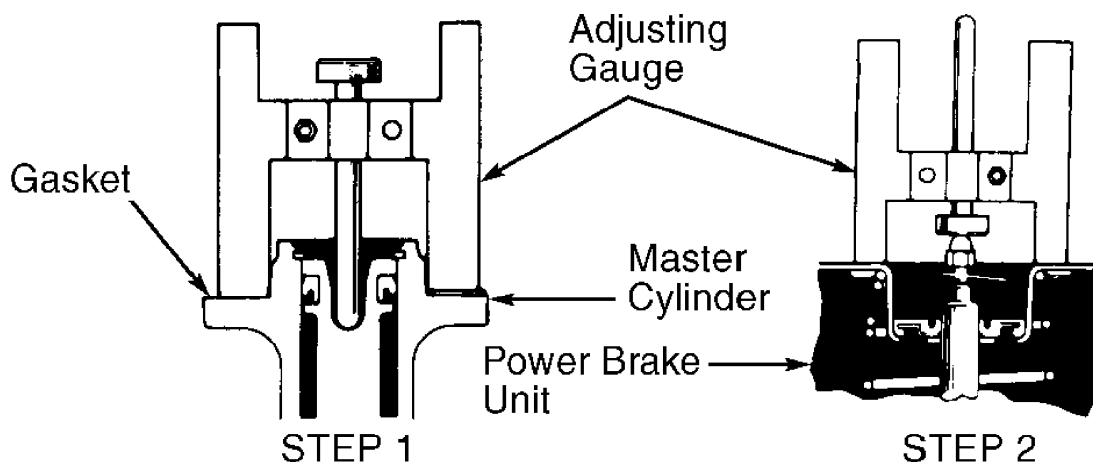
Brake bleeding procedure for ABS is the same as brake bleeding procedure for non-ABS. If master cylinder is rebuilt or reservoir runs empty, bleed master cylinder first. Bleed wheels in sequence. Start on wheel with longest hydraulic line, and work toward wheel with shortest hydraulic line.

ADJUSTMENTS

BRAKE BOOSTER PUSH ROD

1) Install Adjusting Gauge (09737-00010) onto master cylinder, with master cylinder gasket in place. Lower gauge pin until pin just touches master cylinder piston. Perform STEP 1. See Fig. 2. Invert and install gauge onto power brake booster. Perform STEP 2. See Fig. 2.

2) Measure clearance between power brake booster push rod and adjusting gauge pin head. Clearance should be zero. If clearance is not zero, adjust power brake booster push rod length until push rod just touches adjusting gauge pin.



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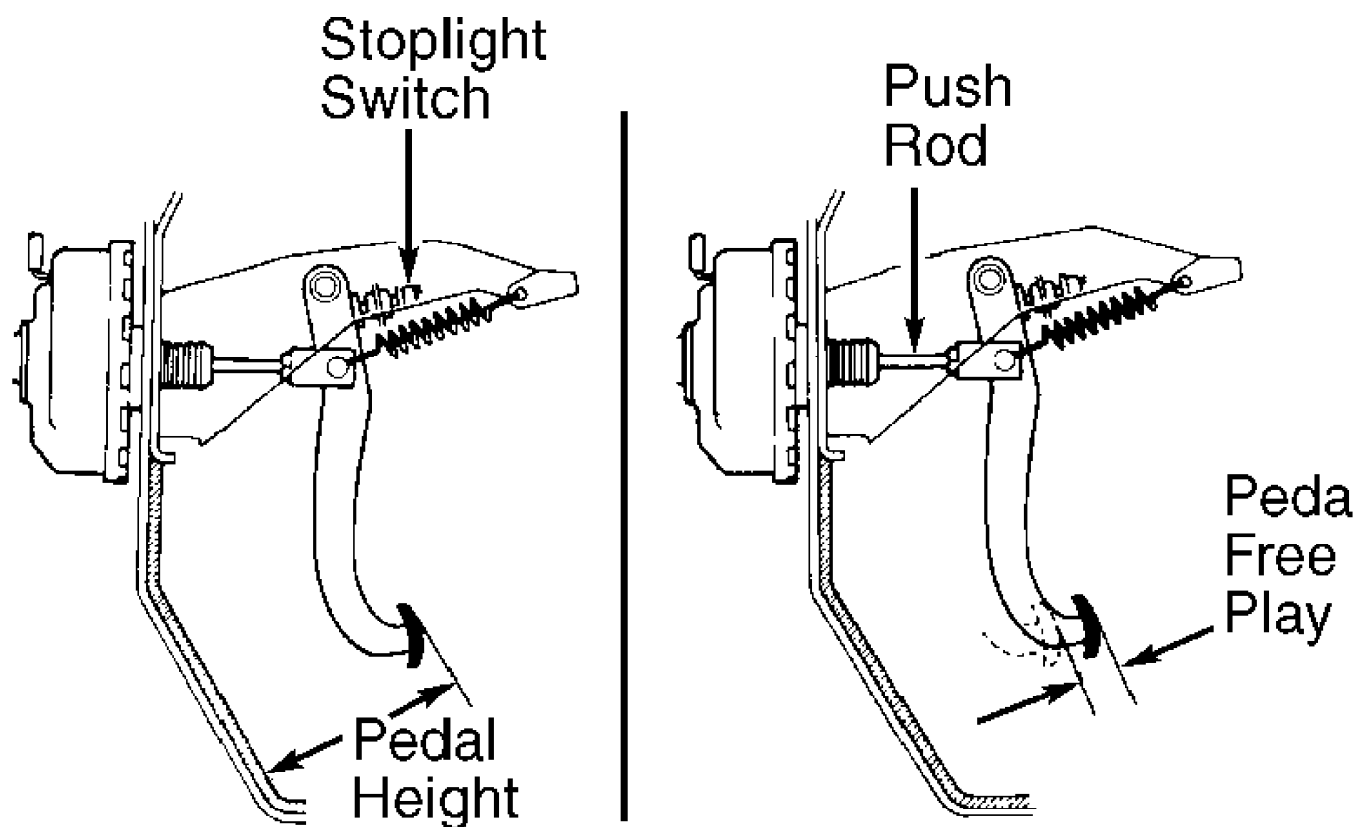
Fig. 2: Adjusting Master Cylinder Push Rod
Courtesy of Toyota Motor Sales, U.S.A., Inc.

BRAKE PEDAL HEIGHT

1) Measure brake pedal height from face of brake pedal pad to asphalt sheet under carpet. See Fig. 3. Brake pedal height should be 6.1-6.5" (155-165 mm).

2) To adjust brake pedal height, remove instrument lower finish panel. Unplug stoplight switch connector. Loosen stoplight switch lock nut. Remove stoplight switch.

3) Adjust pedal height by rotating brake pedal push rod. After adjusting brake pedal height, tighten push rod lock nut. Install and adjust stoplight switch. See STOPLIGHT SWITCH. Check and adjust brake pedal free play. See BRAKE PEDAL FREE PLAY.



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Fig. 3: Measuring Pedal Height & Free Play
Courtesy of Toyota Motor Sales, U.S.A., Inc.

BRAKE PEDAL FREE PLAY

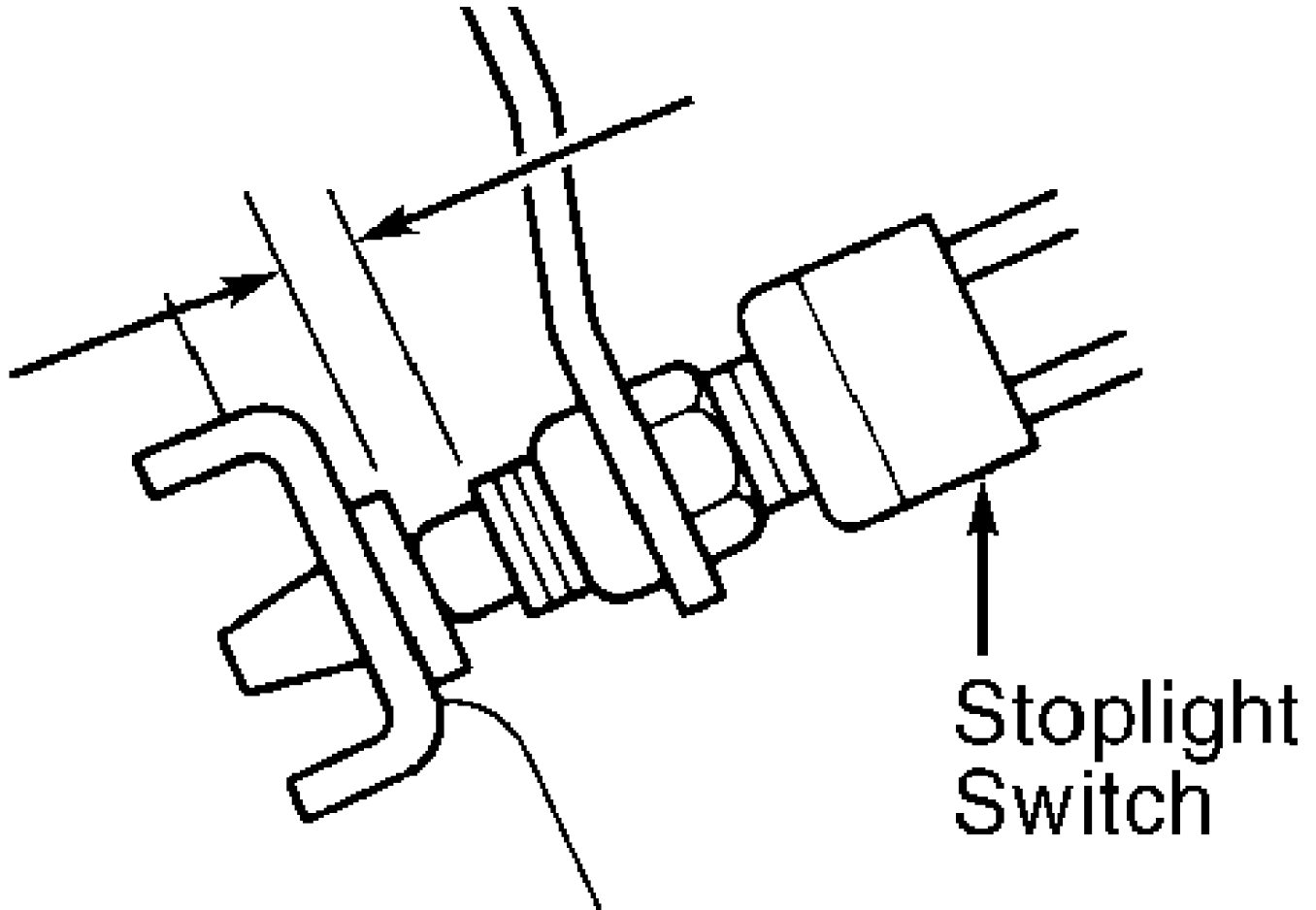
NOTE: Stoplight switch adjustment should be performed before brake pedal free play adjustment is made. See STOPLIGHT SWITCH.

1) Brake pedal free play is distance brake pedal travels, with engine off, before feeling resistance. To check brake pedal free play, press brake pedal several times to exhaust vacuum from power brake unit. Depress brake pedal until initial resistance is felt, and measure distance traveled.

2) Brake pedal free play should be .04-.24" (1.0-6.0 mm). If free play is not within specification, adjust by rotating brake booster push rod. See Fig. 3. After adjusting brake pedal free play, check brake pedal height. See BRAKE PEDAL HEIGHT.

STOPLIGHT SWITCH

Stoplight switch is located above brake pedal. See Fig. 4. To adjust stoplight switch, loosen stoplight switch lock nut, and turn stoplight switch until clearance between switch and brake pedal stop is .02-.09" (.5-2.4 mm). Tighten lock nut. Check stoplight operation. Check brake pedal free play, see BRAKE PEDAL FREE PLAY.



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Fig. 4: Adjusting Stoplight Switch Clearance
Courtesy of Toyota Motor Sales, U.S.A., Inc.

BRAKE PEDAL RESERVE DISTANCE

Measure brake pedal reserve distance from face of pedal pad to asphalt sheet under carpet with engine running and force of 110 lbs. (50 kg) applied to brake pedal. Minimum brake pedal reserve distance should be 2.83" (72.0 mm) for non-turbo models and 2.76" (70.0 mm) for turbo models. If distance is less than specified, inspect brake system. See BRAKE SYSTEM - RWD CARS article.

PARKING BRAKE

Parking Brake Shoes

Raise and support vehicle. Remove rear wheels. Temporarily install hub nuts to hold disc brake rotor in place. Remove hole plug

to access parking brake shoe adjuster. Rotate adjuster to expand shoes until disc brake rotor locks. Back off adjuster 8 notches. Install hole plug. Settle brake shoes in disc.

Settling Parking Brake Shoes & Disc

Drive vehicle at 31 MPH. Hold park brake release button and pull park brake lever with a force of 20 lbs. (9 kg) for .25 miles (400 meters), then release. Perform this procedure 2 or 3 times, then adjust park brake cable. See PARKING BRAKE CABLE.

PARKING BRAKE CABLE

NOTE: Parking brake shoe clearance on rear disc brakes must be adjusted before adjusting parking brake cable. See PARKING BRAKE.

Parking brake lever stroke should be 5-8 notches (clicks) with a pull force of 44 lbs. (20 kg). To adjust stroke, remove console box. Loosen parking brake cable lock nut. Rotate adjuster nut until parking brake lever travel is as specified. Tighten lock nut. Install console box.

TROUBLE SHOOTING

SYMPTOM DIAGNOSIS

If a normal DTC is displayed during DTC check but problem still occurs, check circuits for each problem symptom in order given, then see appropriate chart.

SYMPTOM DIAGNOSIS

Symptom	Circuit	Circuit, DTC Or Procedure
ABS Does Not Operate (1)	Check DTC, Confirm Normal Code Is Output	(2) RETRIEVING ABS DTCs
ABS Does Not Operate (1)	Power Source Circuit (IG)	(3) DTC 41
ABS Does Not Operate (1)	Speed Sensor Circuit	(3) DTCS 31-34
ABS Does Not Operate (1)	Check Actuator	(4) ACTUATOR TEST
ABS Does Not Operate (1)	Check For Hydraulic Leakage	Visual Inspection
ABS Does Not Operate Efficiently (1)	Check DTC, Confirm Normal Code Is Output	(2) RETRIEVING DTCs
ABS Does Not Operate Efficiently (1)	Speed Sensor Circuit	(3) DTCS 31-34
ABS Does Not Operate Efficiently (1)	Stoplight Switch Circuit	(3) DTC 49

ABS Does Not Operate Efficiently (1)	ABS Actuator	(4) ACTUATOR TEST
ABS Does Not Operate Efficiently (1)	Check For Hydraulic Leakage	Visual Inspection
ABS Warning Light Abnormal	ABS Warning Light Circuit	ABS WARNING LIGHT CIRCUIT
ABS Warning Light Abnormal	ABS (& TRAC) ECU	(6) PIN VOLTAGE TESTS
DTC Check Cannot Be Done (1)	ABS Warning Light Circuit	(5) ABS WARNING LIGHT CIRCUIT
DTC Check Cannot Be Done (1)	Tc Terminal Circuit	(5) Tc TERMINAL CIRCUIT
Sensor Diagnostics Cannot Be Done	Ts Terminal Circuit	(5) Ts TERMINAL CIRCUIT
Speed Sensor Diagnostics Cannot Be Done	ABS (& TRAC) ECU	(6) PIN VOLTAGE TESTS
(1) - If all circuits check okay and problem is still occurring, replace ABS ECU. (2) - under SELF-DIAGNOSTICS. (3) - under DIAGNOSTIC TESTS. (4) - under COMPONENT TESTS. (5) - under CIRCUIT TESTS. (6) - under PIN VOLTAGE.		

SELF-DIAGNOSTICS

* PLEASE READ FIRST *

NOTE: DO NOT start engine when accessing DTC.

RETRIEVING ABS DTC

NOTE: There are 2 Data Link Connectors (DLC1 and DLC2). DLC1 is located in engine compartment on firewall to right of center line. DLC2 is located below left side of instrument panel.

NOTE: Speed sensor diagnostics and DTC retrieval use different DLC1 terminals with short connector installed. If a speed sensor or speed sensor circuit problem is suspected, see RETRIEVING SPEED SENSOR & DECELERATION SENSOR DTC.

ABS Light Diagnostics

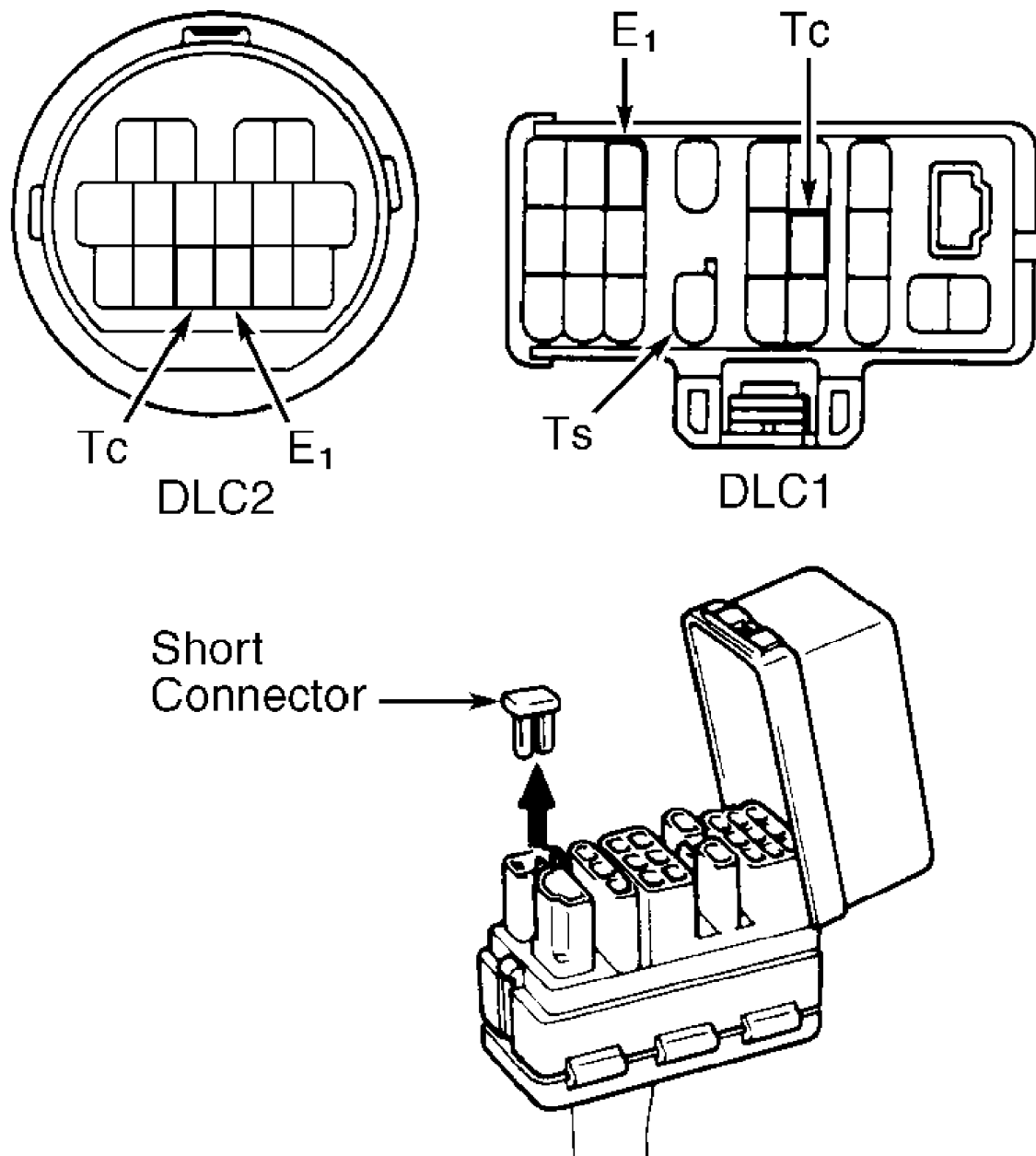
1) Turn ignition on. ABS light should come on then go out after 3 seconds. If light does not come on, check fuse, bulb, and wiring harness.

2) With ignition on, unplug short connector from DLC1. See Fig. 5. Using a jumper wire, jumper check connector terminals Tc and E1 of DLC1 or DLC2. If system is functioning properly, ABS light will flash 2 times per second. If a malfunction is detected, 4 seconds will

elapse, then ABS light will begin flashing 2-digit DTC.

3) ABS light will flash first digit of DTC, followed by a 1.5-second pause, then second digit of DTC. If 2 or more DTC are stored, a 2.5-second pause will separate DTC. After all DTC are flashed, there will be a 4-second pause, then all DTC will repeat. For code definitions, see ABS DTC. If light does not operate as specified, see ABS WARNING LIGHT CIRCUIT under CIRCUIT TESTS.

4) After replacing or repairing malfunctioning component, clear DTC. See CLEARING DTC.



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Fig. 5: Identifying Data Link Connector Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

NOTE: Supra uses 3 warning lights; ABS light, TRAC light and TRAC OFF light. ABS light displays ABS DTC.

Check suspect components in given order. Unless otherwise noted, checks consist mainly of visual inspection and continuity checks. See appropriate DTC TEST under DIAGNOSTIC TESTS.

Code 11

Open or short in solenoid relay circuit. Check actuator wiring harness, solenoid relay, solenoid relay wiring harness, and solenoid relay connector.

Code 12

Short to voltage in solenoid relay circuit. Check actuator wiring harness, solenoid relay, solenoid relay wiring harness, and solenoid relay connector.

Code 13

Open or short in pump motor relay circuit. Check actuator wiring harness, pump motor relay, wiring harness, and pump motor connector.

Code 14

Short to voltage in pump motor relay circuit. Check actuator wiring harness, pump motor relay, wiring harness and pump motor connector.

Code 21

Open or short circuit in solenoid for right front wheel. Check actuator solenoid, wiring harness, and connector.

Code 22

Open or short circuit in solenoid for left front wheel. Check actuator solenoid, wiring harness, and connector.

Code 23

Open or short circuit in solenoid for right rear wheel. Check actuator solenoid, wiring harness, and connector.

Code 24 (Turbo Only)

Open or short circuit in solenoid for left rear wheel. Check actuator solenoid, wiring harness, and connector.

Code 31

Malfunction of right front wheel speed sensor signal. Check speed sensor, sensor rotor, wiring harness, and connector.

Code 32

Malfunction of left front wheel speed sensor signal. Check speed sensor, sensor rotor, wiring harness, and connector.

Code 33

Malfunction of speed sensor signal for right rear wheel. Check speed sensor, sensor rotor, wiring harness, and connector.

Code 34

Malfunction of speed sensor signal for left rear wheel. Check speed sensor, sensor rotor, wiring harness, and connector.

Code 41

Battery voltage is abnormally high or low. Check battery and voltage regulator.

Code 43 (Turbo Only)
Malfunction of deceleration sensor (constant output). Check sensor, wiring harness, and connector.

Code 44 (Turbo Only)
Open or short in deceleration sensor. Check sensor, wiring harness, and connector.

Code 45 (Turbo Only)
Malfunction of deceleration sensor. Check sensor, wiring harness, and connector.

Code 49
Open in stoplight switch circuit. Check switch, wiring harness, and connector.

Code 51
Actuator pump motor is locked or pump motor circuit is open. Check pump motor, pump motor relay, vehicle battery, actuator wiring harness, connectors, actuator pump motor circuit, and actuator ground bolt.

ABS Light Always On
Malfunction of ABS ECU. Check battery, voltage regulator and wiring for open or short. Inspect ABS ECU connector for security and undamaged terminals. If connector is okay, replace ABS ECU.

RETRIEVING SPEED SENSOR & DECELERATION SENSOR DTC

Speed Sensor and Deceleration Sensor Diagnostics

1) Turn ignition off. Using a jumper wire, jumper check connector terminals Ts and E1 of DLC1 or DLC2. See Fig. 5. Start engine. Ensure ABS light blinks. If ABS light stays on, check deceleration sensor. See DECELERATION SENSOR under COMPONENT TESTS. If ABS light does not blink, check ABS warning light circuit. See ABS WARNING LIGHT CIRCUIT under CIRCUIT TESTS.

2) Drive vehicle at 28 MPH or more for several seconds. Stop vehicle. Using a jumper wire, jumper check connector terminals Tc and E1 of DLC1. If system is functioning properly, ABS light will flash 2 times per second. If a malfunction is detected, ABS light will begin flashing 2-digit DTC.

3) ABS light will flash first digit of DTC, followed by a 1.5-second pause, then second digit of DTC. If 2 or more DTC are stored, a 2.5-second pause will separate DTC. After all DTC are flashed, there will be a 4-second pause, then all DTC will repeat. For code definitions, see ABS DTC.

4) After replacing or repairing malfunctioning component, clear DTC. See CLEARING DTC.

SPEED SENSOR & DECELERATION SENSOR DTC

If ABS light flashes any wheel speed sensor DTC, see SPEED SENSOR TEST under COMPONENT TESTS.

Code 71
Low voltage of right front speed sensor signal. Inspect right front speed sensor, sensor rotor and sensor installation.

Code 72
Low voltage of left front speed sensor signal. Inspect left front speed sensor, sensor rotor and sensor installation.

Code 73

Low voltage of right rear speed sensor signal. Inspect right rear speed sensor, sensor rotor and sensor installation.

Code 74

Low voltage of left rear speed sensor signal. Inspect left rear speed sensor, sensor rotor and sensor installation.

Code 75

Abnormal signal from right front speed sensor. Inspect right front sensor rotor.

Code 76

Abnormal signal from left front speed sensor. Inspect left front sensor rotor.

Code 77

Abnormal signal from right rear speed sensor. Inspect right rear sensor rotor.

Code 78

Abnormal signal from left rear speed sensor. Inspect left rear sensor rotor.

Code 79 (Turbo Only)

Deceleration sensor is faulty. Inspect deceleration sensor and sensor installation.

CLEARING DTC

NOTE: 1997 TRAC DTC can be cleared by removing ECU-B fuse but 1998 TRAC DTC and all ABS DTC will not be cleared.

Remove short connector from DLC1. See Fig. 5. Using a jumper wire, jumper DLC1 or DLC2 terminals Tc and E1. Turn ignition on. With vehicle stopped, depress brake pedal 8 or more times within 5 seconds. DTC are now erased. Ensure ABS light blinks 2 times per second. Reconnect short connector.

DIAGNOSTIC TESTS

DTC 11 & 12: ABS SOLENOID RELAY CIRCUIT

Description

DTC 11 sets when ABS solenoid relay terminal No. A9-1 (Non-Turbo) or No. 6 (Turbo) voltage is less than 1.5 volts, and ABS ECU terminal No. A19-16 (Non-Turbo) or No. A21-4 (Turbo) voltage is zero volts. Problem is ABS solenoid relay or open or short in relay circuit.

DTC 12 sets when battery voltage exists at ABS solenoid relay terminal No. A9-1 (Non-Turbo) or No. 6 (Turbo), and battery voltage exists at ABS ECU terminal No. A19-16 (Non-Turbo) or No. A21-4 (Turbo). Problem is ABS solenoid relay or short to voltage in relay circuit.

Testing (Non-Turbo)

1) Disconnect ABS solenoid relay connector A9. Check voltage between harness connector A9 terminals No. 2 and 6. If 10-14 volts exists, go to next step. If 10-14 volts does not exist, repair wiring as necessary. See appropriate wiring diagram under WIRING DIAGRAMS.

2) Check circuit from ABS solenoid relay, through ABS actuator to ABS ECU. Circuit includes:

- * Blue/White wire between relay harness connector A9 terminal No. 5 and ABS actuator harness connector A6 terminal No. 4.
- * ABS actuator from connector A6 terminal No. 4 to No. 5. (Resistance of 26-40 ohms exists in actuator).
- * Yellow/Green wire between ABS actuator harness connector A6

terminal No. 5 and ABS ECU harness connector A19 terminal No. 16.

If circuit is okay, go to next step. If continuity does not exist, repair or replace as necessary.

3) Check ABS solenoid relay. See ABS SOLENOID RELAY under COMPONENT TESTS. If relay is okay, go to next step. If relay is faulty, replace ABS solenoid relay.

4) Check continuity of Blue/Black wire between relay harness connector A9 terminal No. 1 and ABS ECU harness connector A19 terminal No. 18. If continuity does not exist, repair as necessary. If circuit is okay, ensure connector terminals are okay. If connectors are okay, Perform appropriate ECU pin voltage test under PIN VOLTAGE.

Testing (Turbo)

1) Remove ABS solenoid relay. Check voltage between relay cavity terminals No. 1 and 2. If 10-14 volts exists, go to next step. If 10-14 volts does not exist, repair wiring as necessary. See appropriate wiring diagram under WIRING DIAGRAMS.

2) Check circuit from ABS solenoid relay, through ABS actuator to ABS ECU. Circuit includes:

- * Blue/White wire between relay cavity terminal No. 3 and ABS actuator harness connector A6 terminal No. 4.
- * ABS actuator from connector A6 terminal No. 4 to 5. (Resistance of 26-40 ohms exists in actuator).
- * Yellow/Green wire between ABS actuator harness connector A6

terminal No. 5 and ABS ECU harness connector A21 terminal No. 4.

If circuit is okay, go to next step. If continuity does not exist, repair or replace as necessary.

3) Check ABS solenoid relay. See ABS SOLENOID RELAY under COMPONENT TESTS. If relay is okay, go to next step. If relay is faulty, replace ABS solenoid relay.

4) Check continuity of circuits from ABS solenoid relay to ABS ECU. Circuits include:

- * Violet/White wire between relay cavity terminal No. 4 and ABS ECU harness connector A20 terminal No. 26.
- * Blue/Black wire between relay cavity terminal No. 6 and ABS ECU harness connector A21 terminal No. 7.

If continuity in any circuit does not exist, repair as necessary. If circuits are okay, ensure connector terminals are okay. If connectors are okay, perform appropriate ECU pin voltage test under PIN VOLTAGE.

DTC 13 & 14: ABS MOTOR RELAY CIRCUIT

Description

DTC 13 sets when ABS motor relay terminal No. A8-4 (Non-Turbo) or No. 4 (Turbo) voltage is less than 1.5 volts, and ABS ECU terminal No. A19-9 (Non-Turbo) or No. A21-10 (Turbo) voltage is 0 volts. Problem is ABS motor relay or open or short in relay circuit. DTC 14 sets when battery voltage exists at ABS motor relay terminal

No. A8-4 (Non-Turbo) or No. 4 (Turbo), and battery voltage exists at ABS ECU terminal No. A19-9 (Non-Turbo) or No. A21-10 (Turbo). Problem is ABS motor relay or short to voltage in relay circuit.

Testing (Non-Turbo)

1) Disconnect ABS motor relay connector. Check voltage between harness connector A8 terminal No. 1 and ground. If 10-14 volts exists, go to next step. If 10-14 volts does not exist, repair wiring as necessary. See appropriate wiring diagram under WIRING DIAGRAMS.

2) Check circuit from ABS motor relay, through ABS actuator to ABS ECU. Circuit includes:

- * Blue wire between relay harness connector A8 terminal No. 2 and ABS actuator harness connector A6 terminal No. 2.
- * ABS actuator from connector A6 terminal No. 2 to No. 3. (Resistance of 26-40 ohms exists in actuator).
- * Green/White wire between ABS actuator harness connector A6 terminal No. 3 and ABS ECU harness connector A19 terminal No. 9.

If circuit is okay, go to next step. If continuity does not exist, repair or replace as necessary.

3) Check ABS motor relay. See ABS MOTOR RELAY under COMPONENT TESTS. If relay is okay, go to next step. If relay is faulty, replace ABS motor relay.

4) Check continuity of circuits from ABS motor relay to ABS ECU. Circuits include:

- * Violet wire between relay harness connector A8 terminal No. 4 and ABS ECU harness connector A19 terminal No. 7.
- * Violet/White wire between relay harness connector A8 terminal No. 3 and ABS ECU harness connector A19 terminal No. 8.

If continuity in any circuit does not exist, repair as necessary. If circuits are okay, ensure connector terminals are okay. If connectors are okay, perform appropriate ECU pin voltage test under PIN VOLTAGE.

Testing (Turbo)

1) Remove ABS motor relay. Check voltage between relay cavity terminal No. 1 and ground. If 10-14 volts exists, go to next step. If 10-14 volts does not exist, repair wiring as necessary. See appropriate wiring diagram under WIRING DIAGRAMS.

2) Check circuit from ABS motor relay, through ABS actuator to ABS ECU. Circuit includes:

- * Blue wire between relay cavity terminal No. 2 and ABS actuator harness connector A6 terminal No. 2.
- * ABS actuator from connector A6 terminal No. 2 to No. 3. (Resistance of 26-40 ohms exists in actuator).
- * Green/White wire between ABS actuator harness connector A6 terminal No. 3 and ABS ECU harness connector A21 terminal No. 10.

If circuit is okay, go to next step. If continuity does not exist, repair or replace as necessary.

3) Check ABS motor relay. See ABS MOTOR RELAY under COMPONENT TESTS. If relay is okay, go to next step. If relay is faulty, replace ABS motor relay.

4) Check circuits from ABS motor relay to ABS ECU. Circuits include:

- * Violet/White wire between relay cavity terminal No. 3 and ABS ECU harness connector A20 terminal No. 26.
- * Violet wire between relay cavity terminal No. 4 and ABS ECU

harness connector A21 terminal No. 1.

If continuity in any circuit does not exist, repair as necessary. If circuits are okay, ensure connector terminals are okay. If connectors are okay, perform appropriate ECU pin voltage test under PIN VOLTAGE.

DTC 21, 22, 23 & 24: ABS ACTUATOR SOLENOID CIRCUIT

Description

DTC sets when ABS solenoid relay terminal No. A9-1 (Non-Turbo) or No. 6 (Turbo) voltage is less than 1.5 volts, ABS ECU terminal No. A19-9 (Non-Turbo) or No. A21-10 (Turbo) voltage is 0 volts and voltage at ECU driver for applicable solenoid is zero volts or battery voltage. Problem is ABS actuator or open or short in applicable solenoid circuit.

Testing

1) Disconnect ABS actuator connector. Check solenoids in actuator by measuring resistance between actuator connector A6 terminal No. 4 and actuator connector A7 terminals. See ABS ACTUATOR SOLENOID RESISTANCE table. If resistance is as specified, go to next step. If any resistance is not as specified, replace actuator.

ABS ACTUATOR SOLENOID RESISTANCE

Connector (1)/Terminal No.	Resistance (Ohms)
Non-Turbo	
A7/1 (Right Front Hold)	5
A7/2 (Left Front Hold)	5
A7/4 (Rear Hold)	5
A7/5 (Left Front Release)	2.2
A7/6 (Right Front Release)	2.2
A7/8 (Rear Release)	2.2
Turbo	
A7/1 (Right Front Hold)	5
A7/2 (Left Front Hold)	5
A7/3 (Left Rear Hold)	5
A7/4 (Right Rear Hold)	5
A7/5 (Right Front Release)	2.2
A7/6 (Left Front Release)	2.2
A7/7 (Left Rear Release)	2.2
A7/8 (Right Rear Release)	2.2

(1) - ABS actuator connector A7

2) Check for open or short in wiring between ABS actuator and ABS ECU. See ABS ACTUATOR TO ABS ECU CIRCUIT table. If continuity in any circuit does not exist, repair as necessary. If any open or short circuit is found, repair circuit as necessary. If circuits are okay, ensure connector terminals are okay. If connectors are okay, perform appropriate ECU pin voltage test under PIN VOLTAGE.

ABS ACTUATOR TO ABS ECU CIRCUIT

Connector (1)/Terminal No.	ECU Connector/Terminal No.
----------------------------	----------------------------

(Circuit)	(Wire Color)
Non-Turbo	
A7/1 (Right Front Hold)	19/4 (Yellow)
A7/2 (Left Front Hold)	19/10 (Black/Yellow)
A7/4 (Rear Hold)	19/21 (Pink)
A7/5 (Right Front Release)	19/1 (Yellow/Red)
A7/6 (Left Front Release)	19/11 (Black/Red)
A7/8 (Rear Release)	19/22 (Pink/Blue)
Turbo	
A7/1 (Right Front Hold)	20/2 (Yellow)
A7/2 (Left Front Hold)	21/5 (Black/Yellow)
A7/3 (Left Rear Hold)	20/15 (Pink/Black)
A7/4 (Right Rear Hold)	21/11 (Pink)
A7/5 (Right Front Release)	20/1 (Yellow/Red)
A7/6 (Left Front Release)	21/6 (Black/Red)
A7/7 (Left Rear Release)	20/14 (Red/Blue)
A7/8 (Right Rear Release)	21/12 (Pink/Blue)

(1) - ABS actuator connector A7.

DTC 31, 32, 33 & 34: SPEED SENSOR CIRCUIT

Description

DTC will set if speed sensor signal is not input for 15 seconds with vehicle speed more than 6 MPH, or at least 7 momentary losses of speed sensor signal occur in one ignition cycle, or an abnormal fluctuation of speed sensor signal occurs at vehicle speed more than 12 MPH. Problem is wheel speed sensor, sensor rotor or sensor circuit.

Testing

1) Disconnect suspect speed sensor connector. See FRONT WHEEL SPEED SENSOR or REAR WHEEL SPEED SENSOR under REMOVAL & INSTALLATION for steps necessary to access connectors. Ensure sensor connector terminals are not damaged or corroded. Check resistance between sensor connector terminals No. 1 and 2. Resistance should be 600-2500 ohms (front) or 650-1800 ohms (rear). Check resistance between sensor connector terminals and ground. Continuity should not exist. If continuity is as specified, go to next step. If resistance is not as specified, replace sensor.

2) Check for open or short in wiring between speed sensor and ABS ECU. See SPEED SENSOR TO ABS ECU CIRCUIT table. If continuity in any circuit does not exist, repair as necessary. If any open or short circuit is found, repair circuit as necessary. If circuits are okay, ensure connector terminals are okay. If connectors are okay, go to next step.

SPEED SENSOR TO ABS ECU CIRCUIT

Sensor Terminal No. (Wire Color)	ECU Connector/ Terminal No.
Non-Turbo	
Right Front	
1 (Blue)	A19/14
2 (Red)	A19/3
Left Front	
1 (Black)	A19/20
2 (White)	A19/19
Right Rear	
1 (Blue)	A18/1

2 (Pink)	.....	A18/7
Left Rear		
1 (Light Green)	.....	A18/10
2 (Violet)	.....	A18/3
Turbo		
Right Front		
1 (Blue)	.....	A21/9
2 (Red)	.....	A21/3
Left Front		
1 (Black)	.....	A21/2
2 (White)	.....	A21/8
Right Rear		
1 (Blue)	.....	A20/10
2 (Pink)	.....	A20/23
Left Rear		
1 (Light Green)	.....	A20/9
2 (Violet)	.....	A20/22

3) Ensure speed sensor is installed fully in knuckle or carrier. Replace sensor if necessary. Check speed sensor output. See RETRIEVING SPEED SENSOR & DECELERATION SENSOR DTC under SELF-DIAGNOSTICS. Repair as necessary. If no problem is found, remove ABS ECU with connectors still connected. Backprobe ECU terminals using an oscilloscope. Drive vehicle at 19 MPH to check sensor waveform. If waveform is bad, go to next step. If waveform is okay, perform appropriate ECU pin voltage test under PIN VOLTAGE.

4) Check sensor tip for debris and scratches. Check sensor rotor for missing teeth, debris and scratches. Repair if necessary. If no problems are found, perform appropriate ECU pin voltage test under PIN VOLTAGE.

DTC 41: POWER SOURCE CIRCUIT

Description

This DTC sets when voltage at ECU is less than 9.5 volts and vehicle speed is more than 1.9 MPH for more than 10 seconds. Problem is battery, regulator or open or short in power source circuit.

Testing

1) Ensure battery voltage is 10-14 volts. Repair battery and/or charging system if necessary.

2) Remove ABS ECU with connectors still connected. Turn ignition on. Check voltage by backprobing ECU connector terminals. See POWER SOURCE TERMINAL IDENTIFICATION table. If 10-14 volts does not exist, go to next step. If 10-14 volts exists, perform appropriate ECU pin voltage test under PIN VOLTAGE.

POWER SOURCE TERMINAL IDENTIFICATION

ECU Power Connector/Terminal	ECU Ground Connector/Terminal
Non-Turbo	
A18/2	A19/2 & A19/13
Turbo	
A20/13	A20/12 & A20/25

3) Check resistance between ECU ground terminals and a good ground. See POWER SOURCE TERMINAL IDENTIFICATION table. If resistance is one ohm or less, go to next step. If resistance is more than one ohm, repair wiring or connection to ground.

4) Remove ECU-IG fuse from junction block No. 1. Check fuse and connections. Repair and/or replace if necessary. If fuse is okay, check for open circuit between battery and ABS ECU. If fuse is faulty, check for short circuit in wiring protected by ECU-IG fuse. Repair as necessary.

DTC 43 & 45: DECELERATION SENSOR MALFUNCTION (TURBO ONLY)

Description

DTC 43 sets when input from sensor does not change during cycle of zero MPH to more than 19 MPH to zero MPH for 16 cycles in a row, or when brake pedal is not depressed at 3 MPH or more and a forward or backward G (more than .4 G) is detected for 30 seconds or more. DTC 45 sets when speed sensor and deceleration sensor are abnormally different for 60 seconds or more at 19 MPH or more. Problem is deceleration sensor or wiring harness.

Testing

Check deceleration sensor. See DECELERATION SENSOR under COMPONENT TESTS. Replace if necessary. Check sensor to ABS ECU wiring. See appropriate wiring diagram under WIRING DIAGRAMS. Repair wiring if necessary. If no problems are found, perform appropriate ECU pin voltage test under PIN VOLTAGE.

DTC 44: DECELERATION SENSOR CIRCUIT (TURBO ONLY)

NOTE: If DTC 44 sets, ABS will still operate.

Description

DTC 44 sets when ignition is on and sensor output (GL1 or GL2) is less than .5 volts or more than 4.5 volts for more than 1.2 seconds, or abnormal output with vehicle stopped for 60 seconds or more, or ignition is on and sensor input (VGS) is less than 4.4 volts or more than 5.5 volts for more than 1.2 seconds. Problem is deceleration sensor or wiring harness.

Testing

1) Check for open or short in wiring between deceleration sensor and ABS ECU. See appropriate wiring diagram under WIRING DIAGRAM. If no problem is found, go to next step. If open or short exists, repair wiring as necessary.

2) Remove ABS ECU with connectors still connected. Turn ignition on. Check voltage by backprobing ECU connector A20 terminals No. 3, 4 and 16. If 4.5-5.5 volts exists at terminal No. 3 and 0.5-4.5 volts exists at terminals No. 4 and 16, check deceleration sensor. See DECELERATION SENSOR under COMPONENT TESTS. Replace if necessary. If specified voltage does not exist, perform appropriate ECU pin voltage test under PIN VOLTAGE.

DTC 49: STOPLIGHT SWITCH

Description

DTC 49 sets when switch output is 1.2-1.7 volts for .3 second or more. Problem is open circuit in stoplight circuit.

Testing

1) Depress brake pedal. Check stoplight operation. If stoplight bulbs illuminate, go to next step. Replace stoplight bulb if necessary.

2) Remove ABS ECU with connectors still connected. Depress brake pedal. Check voltage by backprobing Green/White wire at ECU connector A18 terminal No. 12 (Non-Turbo) or connector A20 terminal No. 5 (Turbo). If voltage is not 10-14 volts, go to next step. If

voltage is 10-14 volts, go to next operation or procedure under symptom diagnosis.

3) Check for open in Green/White wire between stoplight switch terminal No. 1 and ECU connector A18 terminal No. 12 (Non-Turbo) or connector A20 terminal No. 5 (Turbo). See appropriate wiring diagram under WIRING DIAGRAM. Repair wiring if necessary. If no problems are found, perform appropriate ECU pin voltage test under PIN VOLTAGE.

DTC 51: ABS PUMP MOTOR LOCK

Description

DTC 51 sets when pump motor does not operate normally during initial check. Problem is pump motor.

Testing

Check pump motor using Toyota ABS actuator checker. See ACTUATOR under COMPONENT TESTS. Follow tester manufacturers instructions. Replace actuator assembly (with motor) if necessary.

ABS LIGHT ALWAYS ON

Description

Voltage input at ECU terminal is more than 17 volts for one second or more. Problem is battery, regulator open or short in power source circuit or ECU.

Testing

1) Check for DTC. See RETRIEVING ABS DTC under SELF-DIAGNOSTICS. If no DTC exist, go to next step. If any DTC exist, go to appropriate DTC TEST.

2) If normal code is not displayed, go to next step. If normal code is displayed, check ABS solenoid relay. See DTC 11 & 12: ABS SOLENOID RELAY CIRCUIT.

3) If ABS warning light does not turn off, go to next step. If ABS warning light turns off, remove ECU-IG fuse from junction block No. 1. Check fuse and connections. Repair and/or replace if necessary. If fuse is okay, check for open circuit between battery and ABS ECU. If fuse is faulty, check for short circuit in wiring protected by ECU-IG fuse. Repair as necessary.

4) Start engine. Check battery voltage. If voltage is 10-16 volts exists, go to next step. If voltage is not 10-16 volts, check and repair charging system.

5) Turn ignition off. Disconnect ABS ECU connector. Turn ignition on. Check ABS warning light. If ABS light turns off after 3 seconds, check for short in wiring between ABS ECU, instrument panel and DLC1. See appropriate wiring diagram under WIRING DIAGRAMS. Repair wiring if necessary. If ABS light does not turn off after 3 seconds, perform appropriate ECU pin voltage test under PIN VOLTAGE.

COMPONENT TESTS

*** PLEASE READ FIRST ***

For components not included, see appropriate DTC TEST under DIAGNOSTIC TESTS. ABS ECU values can be measured using Toyota Hand-Held Tester and Breakout Box. ABS circuits and harness can also be tested by backprobing ABS ECU connectors and comparing measured voltages. See appropriate pin voltage check under PIN VOLTAGE.

ABS SOLENOID RELAY

Non-Turbo

1) Disconnect relay. Check continuity between relay terminals listed. See ABS SOLENOID RELAY (NON-TURBO) table. See Fig. 6. Go to next step.

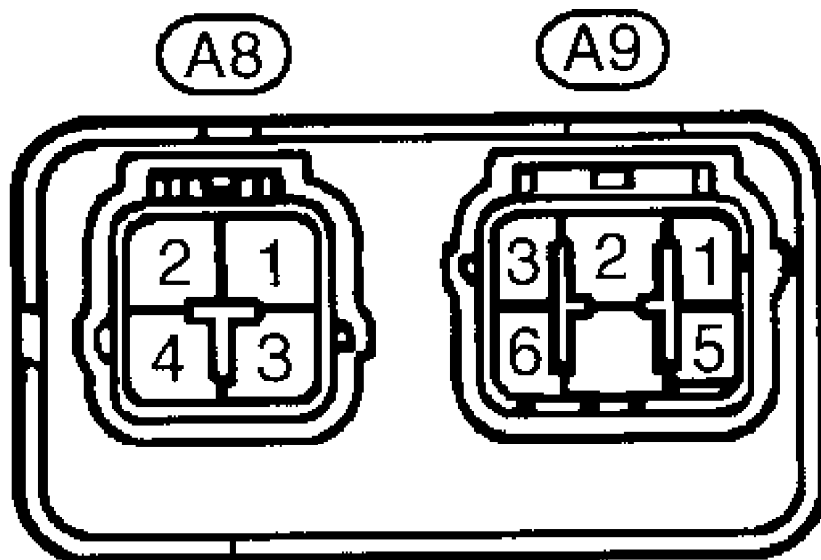
2) Using jumper wires, apply battery voltage between relay terminals A8-1 and A8-2 (1997) or A9-1 and A8-3 (1998). See Fig. 6. Check continuity between relay terminals listed. See ABS SOLENOID RELAY (NON-TURBO) table. Go to next step.

3) Disconnect jumper wires. On 1998 vehicles, check continuity between terminal A9-4 (+) and A9-5 (-). Continuity should exist. Check continuity between terminal A9-5 (+) and A9-4 (-). Continuity should not exist. On all vehicles, replace relay if results are not as specified.

ABS SOLENOID RELAY (NON-TURBO)

Application/Terminals No.	Condition
Relay Disconnected	
1997	
A8-3 & A8-4	Continuity (62 Ohms)
A8-1 & A8-2	Open
1998	
A9-1 & A8-3	Continuity (80 Ohms)
A9-5 & A9-6	Continuity
A9-2 & A9-5	Open
Battery Voltage Applied (1)	
1997 (A8-1 & A8-2)	Continuity
1998	
A9-5 & A9-6	Continuity
A9-2 & A9-5	Open

(1) - Relay terminals A8-1 and A8-2 (1997) or A9-1 and A8-3 (1998).



98C13013

Fig. 6: Identifying ABS Solenoid Relay Terminals (Non-Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Turbo (1997)

1) Disconnect relay. Check resistance between relay terminals

No. 3 and 4. See Figs. 7-8. Resistance should be 62 ohms. Check continuity between relay terminals No. 1 and 2. Continuity should not exist.

2) Using jumper wires, apply battery voltage between relay terminals No. 3 and 4. Check continuity between relay terminals No. 1 and 2. Continuity should exist. Replace relay if results are not as specified.

Turbo (1998)

1) Disconnect relay. Check continuity between relay terminals listed. See ABS SOLENOID RELAY (TURBO) table. See Figs. 7-8. Go to next step.

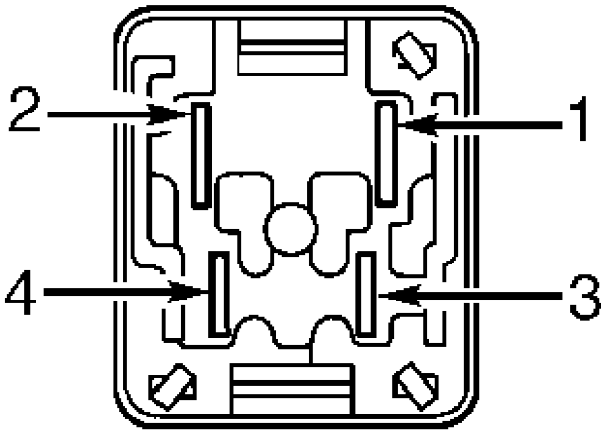
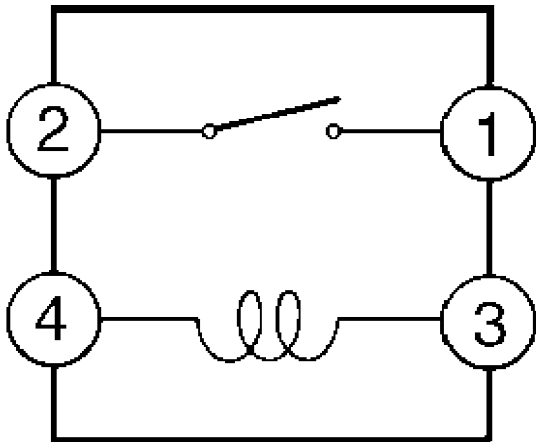
2) Using jumper wires, apply battery voltage between relay terminals No. 4 and 6. See Figs. 7-8. Check continuity between relay terminals listed. See ABS SOLENOID RELAY (TURBO) table. Go to next step.

3) Disconnect jumper wires. Check continuity between terminals 5 (+) and 3 (-). Continuity should exist. Check continuity between terminals 3 (+) and 5 (-). Continuity should not exist. Replace relay if results are not as specified.

ABS SOLENOID RELAY (TURBO)

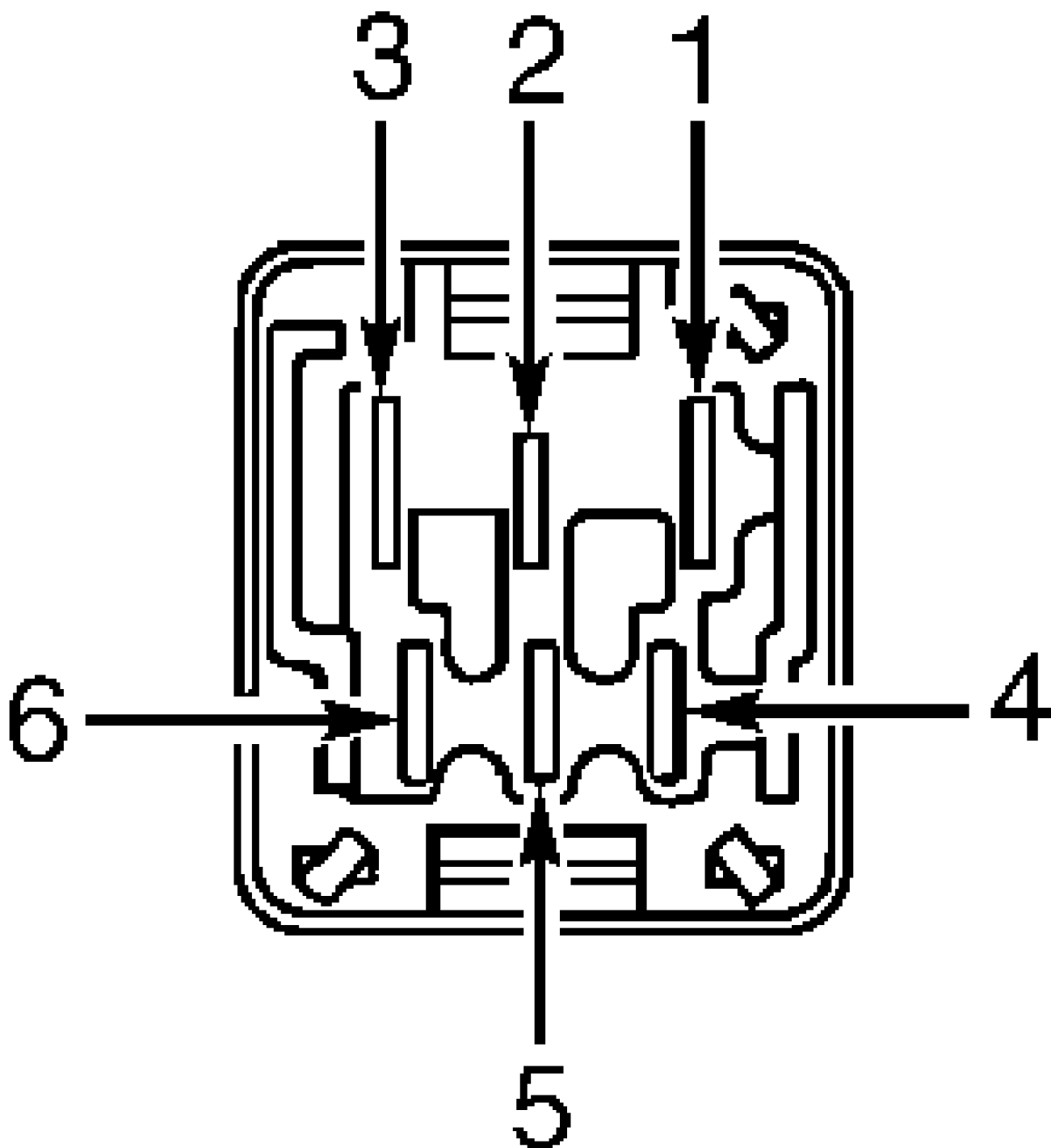
Application/Terminals No.		Condition
Relay Disconnected		
4 & 6	.....	Continuity (80 Ohms)
2 & 3	.....	Continuity
1 & 3	.....	Open
Battery Voltage Applied (1)		
1 & 3	.....	Continuity
2 & 3	.....	Open

(1) - Relay terminals No. 4 and 6.



98D13014

Fig. 7: Identifying Turbo ABS Solenoid Relay Terminals (1997)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



98E13015

Fig. 8: Identifying Turbo ABS Solenoid Relay Terminals (1998)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

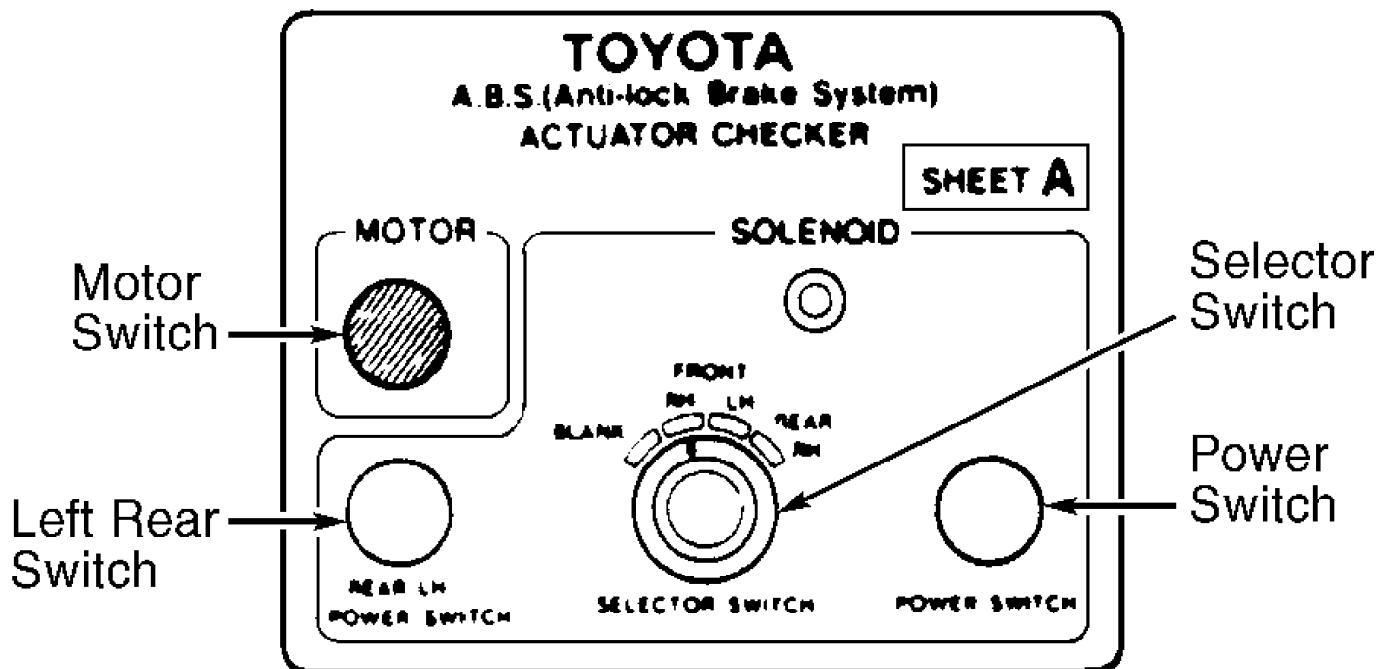
ACTUATOR TEST

1) Ensure battery voltage exists. Disconnect actuator and control relay electrical connectors. Connect Test Harness (09990-00200

and 09990-00300) and Actuator Checker (09990-00150) to vehicle, following manufacturer's instructions. Connect actuator checker positive and negative power cables to vehicle battery.

2) Place Sheet "O" (09990-00420) on actuator checker. Start engine and let idle. Turn actuator checker SELECTOR switch to FRONT RH position. See Fig. 9. Press and hold MOTOR switch for a few seconds. Press and hold brake pedal. Press the POWER Switch and ensure brake pedal cannot be depressed.

NOTE: DO NOT press POWER switch for more than 10 seconds.



93G84695

Fig. 9: Identifying Actuator Checker Switches
Courtesy of Toyota Motor Sales, U.S.A., Inc.

3) With brake pedal still applied, release POWER switch and ensure brake pedal can be depressed. Press and hold MOTOR switch for a few seconds and ensure brake pedal returns. Release brake pedal.

4) Press and hold MOTOR switch for a few seconds. Press and hold brake pedal for about 15 seconds. Press and hold MOTOR switch for a few seconds. While pressing brake pedal, press MOTOR switch for a few seconds. Brake pedal should not pulsate.

5) Repeat steps 2) through 4) for FRONT LH, REAR RH and REAR LH by turning SELECTOR switch on actuator checker. When checking REAR LH position, press REAR LH POWER switch, instead of POWER switch.

6) After checking remaining wheels, press and hold MOTOR switch for a few seconds. Stop engine. Remove actuator checker and test harnesses. Reconnect vehicle harnesses to actuator and control relay. Install windshield washer reservoir. Clear DTC. See CLEARING DTC under SELF-DIAGNOSTICS.

SPEED SENSOR TEST

NOTE: While testing speed sensors, brake system functions as a conventional system.

1) Ensure battery voltage exists. Turn ignition on. Ensure ABS light illuminates, then goes out after about 3 seconds. If ABS

light does not illuminate, check fuse, bulb and wiring harness.

2) Turn ignition off. DO NOT remove short pin from DLC1. Using a jumper wire, jumper terminals Ts and E1 of DLC1. See Fig. 5. Start engine. Ensure ABS light blinks 4 times per second. If ABNS light does not blink, check warning light and circuit. If light stays on, check deceleration sensor.

3) Drive vehicle straight ahead above 28 MPH for several seconds. Stop vehicle. Using a second jumper wire, connect terminals Tc and E1 of DLC1. See Fig. 5. If a malfunction is detected, 4 seconds will elapse and ABS light will begin to flash a 2-digit DTC. First number of blinks will equal first digit in a DTC. After a 1.5-second pause, second number of blinks will equal second digit in a DTC.

4) If 2 or more DTC are stored, there will be a 2.5-second pause between each DTC. After all DTC are flashed, there will be a 4 second pause and all DTC will repeat.

5) Record DTC. Turn ignition off. Repair as necessary. See SPEED SENSOR DTC. Remove jumper wire from DLC1. Clear DTC. See CLEARING DTC.

DECELERATION SENSOR

CAUTION: Do not drop sensor or turn sensor upside down. Do not apply 6 volts or more to sensor. Replace sensor if damaged.

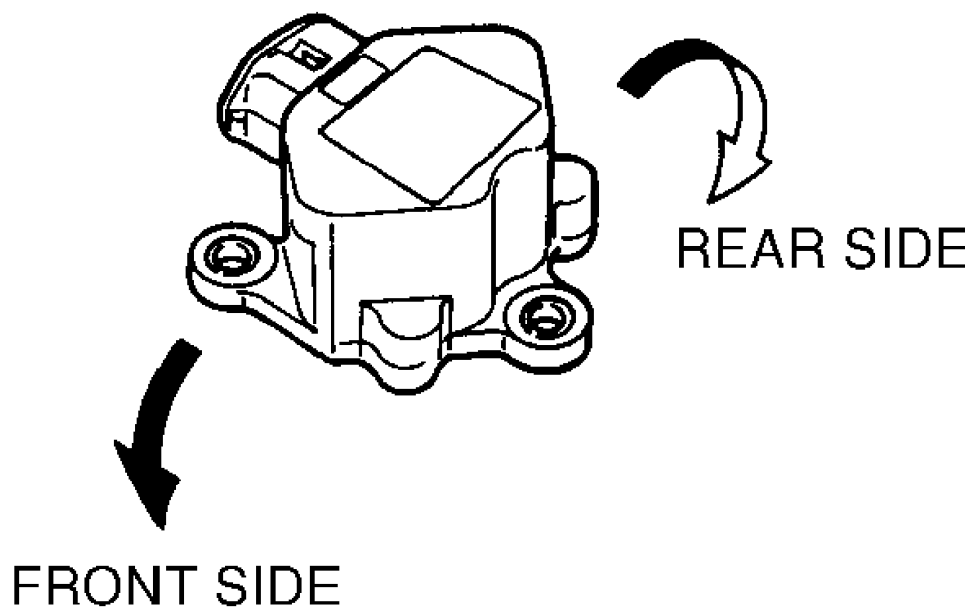
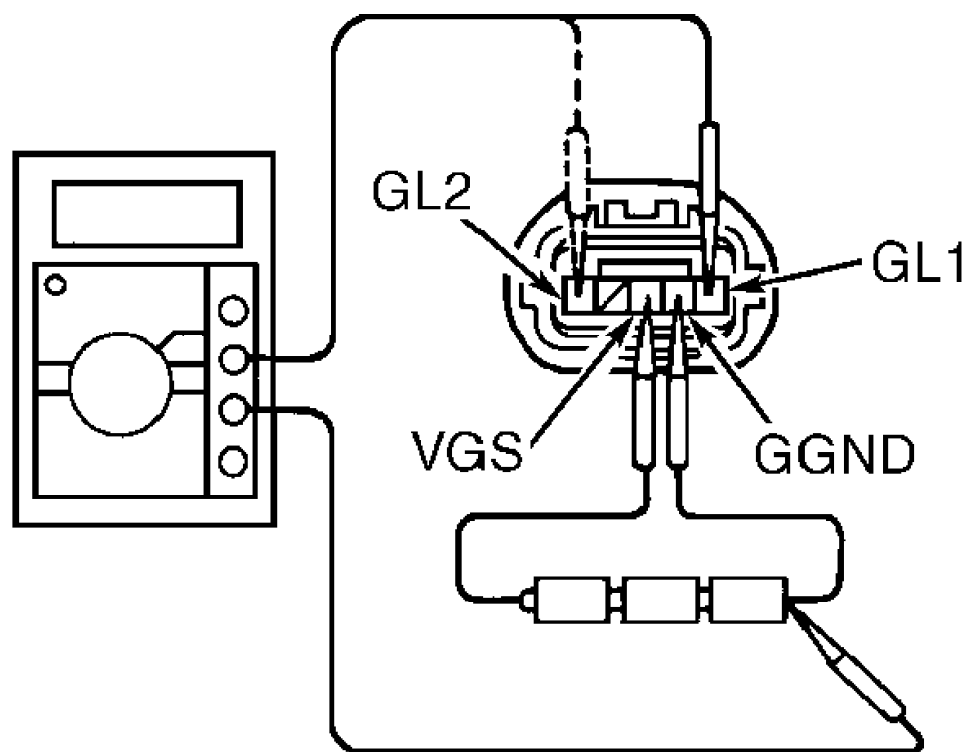
1) Connect three 1.5 volt batteries in series. Connect battery positive to sensor terminal VGS. See Fig. 10. Connect battery negative to sensor terminal GGND. Connect voltmeter between sensor terminal GL1 or GL2 and ground.

2) Check voltage while tilting sensor. See DECELERATION SENSOR OUTPUT table. If sensor output is not as specified, replace sensor.

DECELERATION SENSOR OUTPUT

Terminal	Condition (1)	Voltage
GL1	Horizontal	About 2.3
GL1	Tilt Sensor Forward	0.4-2.3
GL1	Tilt Sensor Back	2.3-4.1
GL2	Horizontal	About 2.3
GL2	Tilt Sensor Forward	2.3-4.1
GL2	Tilt Sensor Back	0.4-2.3

(1) - Tilting sensor too far will change voltage output.



98F13016

Fig. 10: Testing Deceleration Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CIRCUIT TESTS

ABS WARNING LIGHT CIRCUIT TEST

Description

If ECU detects trouble, ABS warning light illuminates, ABS does not operate and a DTC will be set. Remove DLC1 short pin and connect terminals Tc and T1 to output DTC. If ABS warning light does not illuminate, go to step 1). If ABS warning light stays on (does not blink), start at step 3).

Testing

1) Check ABS warning light. See INSTRUMENT PANEL article. Replace bulb or instrument panel as necessary.

2) Remove and check ABS solenoid relay. See ABS SOLENOID RELAY under COMPONENT TESTS. Replace if necessary. Check wiring between DLC1, ABS solenoid relay and ground. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary.

3) If ABS warning light outputs DTC, go to ABS DTC under SELF-DIAGNOSTICS. If ABS warning light does not output DTC, go to next step.

4) Remove short pin from DLC1. If ABS warning light turns off, go to next step. If ABS warning light does not turn off, check for short in wiring between warning light, DLC1 and ABS ECU. See appropriate wiring diagram under WIRING DIAGRAMS.

5) Remove and check ABS solenoid relay. See ABS SOLENOID RELAY under COMPONENT TESTS. Replace if necessary. If relay is okay, check wiring between DLC1 and ABS solenoid relay. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary.

Tc TERMINAL CIRCUIT TEST

Description

Connecting terminals Tc and E1 of DLC1 causes ECU to flash DTC using ABS warning light.

Testing

1) Turn ignition on. Check voltage between terminals Tc and E1 of DLC1. If 10-14 volts does not exist, go to next step. If 10-14 volts exists, and ABS warning light does not flash, ABS ECU may be defective. Perform appropriate ECU pin voltage test under PIN VOLTAGE.

2) Check for open or short in wiring between DLC1, ABS ECU and ground. See appropriate wiring diagram under WIRING DIAGRAMS. If open or short exists, repair wiring. If no problem exists, replace ABS ECU.

Ts TERMINAL CIRCUIT TEST

Description

Connecting terminals Ts and E1 of DLC1 causes ECU output of speed sensor signal.

Testing

1) Turn ignition on. Check voltage between terminals Ts and E1 of DLC1. If 10-14 volts does not exist, go to next step. If 10-14 volts exists, and ABS warning light does not flash, ABS ECU may be defective. Perform appropriate ECU pin voltage test under PIN VOLTAGE.

2) Check for open or short in wiring between DLC1, ABS ECU and ground. See appropriate wiring diagram under WIRING DIAGRAMS. If open or short exists, repair wiring. If no problem exists, replace ABS ECU.

PIN VOLTAGE

PIN VOLTAGE TESTS

Non-Turbo ABS ECU

Remove ABS ECU with connectors attached. Measure voltage between following ABS ECU connector terminals. See Fig. 11. If voltage is not as specified, repair wire harness or replace components as necessary. If voltage is as specified, replace ABS ECU.

A18-2 & A19-2, 13

Ignition on, voltage 10-14 volts.

A19-18 & A19-8

Ignition on, ABS warning light off, voltage less than 1.5 volts.

A19-7 & A19-8

Ignition on, voltage 10-14 volts.

A19-4 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-1 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-10 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-11 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-22 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-21 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-16 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A18-4 & A19-2, 13

Ignition on, ABS warning light on, voltage less than 2 volts.

A18-4 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A18-12 & A19-2, 13

Stoplight switch off, voltage less than 1.5 volts.

A18-12 & A19-2, 13

Stoplight switch on, voltage 8-14 volts.

A18-11 & A19-2, 13

Ignition on, ABS warning light off, voltage 10-14 volts.

A19-9 & A19-2, 13

Ignition on, voltage less than 1.5 volts.

A18-9 & A19-2, 13

Ignition on, voltage 10-14 volts.

A18-8 & A19-2, 13

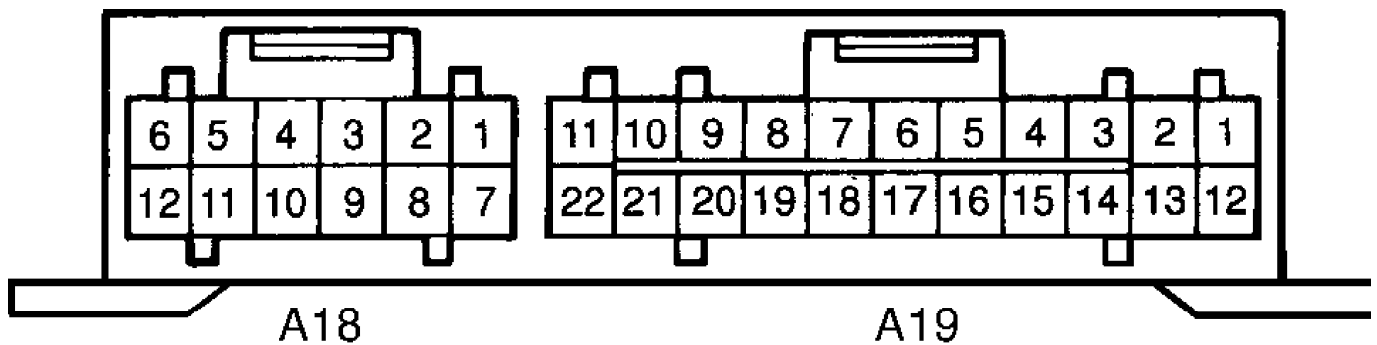
Ignition on, voltage 10-14 volts.

A19-3 & A19-14
Ignition on, spin right front wheel, AC generation.

A19-19 & A19-20
Ignition on, spin left front wheel, AC generation.

A18-1 & A18-7
Ignition on, spin right rear wheel, AC generation.

A18-3 & A18-10
Ignition on, spin left rear wheel, AC generation.



98G13017

Fig. 11: Identifying ABS ECU Terminals (Non-Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Turbo ABS ECU

Remove ABS ECU with connectors attached. Measure voltage between following ABS ECU connector terminals. See Fig. 12. If voltage is not as specified, repair wire harness or replace components as necessary. If voltage is as specified, replace ABS ECU.

A20-13 & A20-12, 25
Ignition on, voltage 10-14 volts.

A21-7 & A20-26
Ignition on, ABS warning light off, voltage should 10-14 volts.

A21-1 & A20-26
Ignition on, voltage less than 1.0 volt.

A20-2 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A20-1 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-5 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-6 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-6 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-11 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-12 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A20-15 & A20-12, 25
Ignition on, ABS warning light off, voltage less than 2
volts.

A20-14 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-4 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A20-11 & A20-12, 25
Ignition on, ABS warning light on, voltage less than 2 volts.

A20-11 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A20-5 & A20-12, 25
Stoplight switch off, voltage less than 1.5 volts.

A20-5 & A20-12, 25
Stoplight switch on, voltage 8-14 volts.

A20-24 & A20-12, 25
Ignition on, ABS warning light off, voltage 10-14 volts.

A21-10 & A20-12, 25
Ignition on, voltage less than 1.5 volts.

A20-8 & A20-12, 25
Ignition on, voltage 10-14 volts.

A20-21 & A20-12, 25
Ignition on, voltage 10-14 volts.

A21-3 & A21-9
Ignition on, spin right front wheel, AC generation.

A21-8 & A21-2
Ignition on, spin left front wheel, AC generation.

A20-10 & A20-23
Ignition on, spin right rear wheel, AC generation.

A20-22 & A20-9
Ignition on, spin left rear wheel, AC generation.

A20-7 & A20-12, 25
Driving at about 19 MPH, pulse generation.

A20-20 & A20-12, 25
Driving at about 19 MPH, pulse generation.

A20-6 & A20-12, 25
Driving at about 19 MPH, pulse generation.

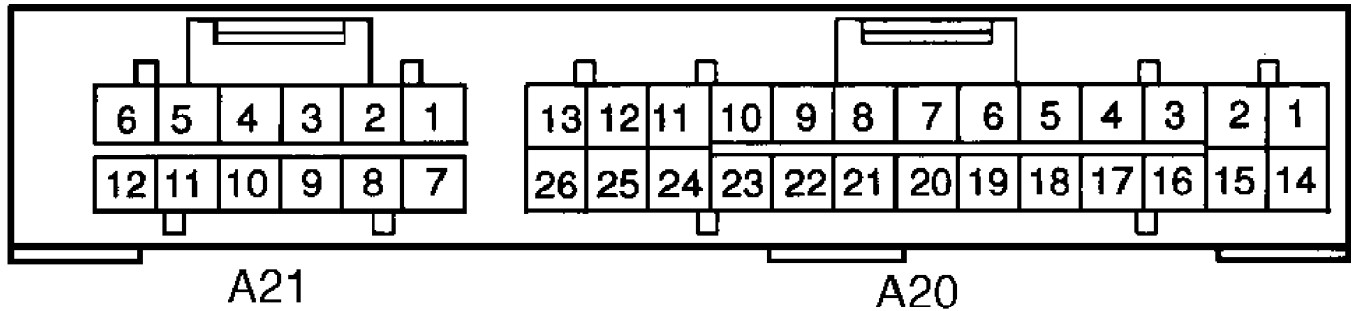
A20-19 & A20-12, 25
Driving at about 19 MPH, pulse generation.

A20-4 & A20-12, 25

Ignition on, voltage .5-4.5 volts.

A20-16 & A20-12, 25
Ignition on, voltage .5-4.5 volts.

A20-3 & A20-12, 25
Ignition on, voltage 4.5-5.5 volts.



98H13018

Fig. 12: Identifying ABS ECU Terminals (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REMOVAL & INSTALLATION

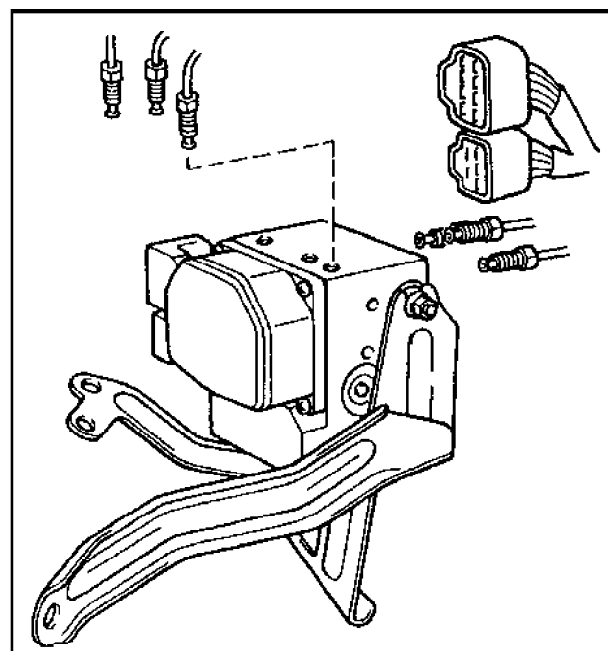
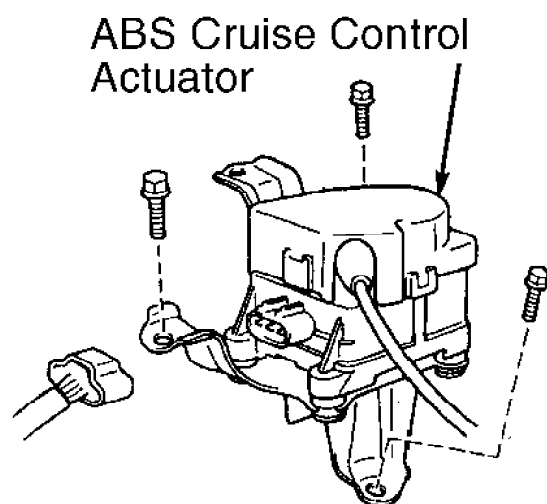
* PLEASE READ FIRST *

WARNING: Hydraulic system may be under high pressure. Use caution
when opening hydraulic system.

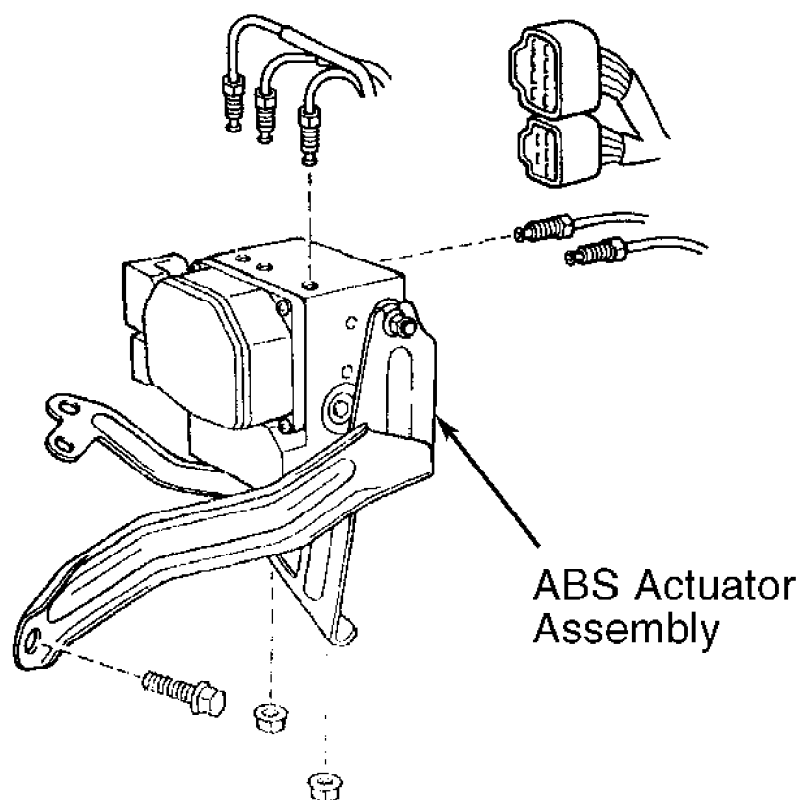
ACTUATOR

Removal & Installation

Turn ignition off. Remove cruise control actuator. Disconnect brakelines attached to actuator. Disconnect actuator electrical connectors. Remove bolts, nuts and washers. Remove actuator from actuator bracket. Remove actuator cushions and holders. To install, reverse removal procedure. Bleed brake system. See BLEEDING BRAKE SYSTEM. See Fig. 13.



TURBO ABS



9813019

Fig. 13: Removing & Installing ABS Actuator
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ABS ECU

Removal & Installation

Turn ignition off. Disconnect negative battery cable. ABS ECU is located behind right side of dashboard, near glove box. Unplug ABS ECU connector. Remove ABS ECU. To install, reverse removal procedure.

FRONT WHEEL SPEED SENSOR

Removal & Installation

Raise and support front of vehicle. Remove front wheel. Remove inner fender splash shield. Unplug connector. Remove harness bolts. Remove mounting bolt. Remove wheel speed sensor. To install, reverse removal procedure. Tighten mounting bolt to specification. See TORQUE SPECIFICATIONS.

REAR WHEEL SPEED SENSOR

Removal & Installation

Remove rear seat cushion, seat back, and quarter trim panel. Unplug sensor connector and remove sensor harness with grommet. Remove harness bolts from body and upper arm. Remove speed sensor from axle housing. To install, reverse removal procedure. Tighten mounting bolt to specification. See TORQUE SPECIFICATIONS.

SOLENOID & PUMP MOTOR RELAYS

Removal & Installation

Relays are mounted in right side of engine compartment. See Fig. 1. Unplug relays. To install, reverse removal procedure.

SENSOR ROTOR

Removal & Installation

Front rotor is part of front hub. See appropriate article in SUSPENSION. Rear rotor is part of outboard CV joint. See appropriate article in DRIVE AXLES.

OVERHAUL

ABS ACTUATOR

DO NOT overhaul or disassemble actuator. If actuator is defective, replace entire assembly.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Brakeline Fittings	
10-mm Tubing	11 (15)
12-mm Tubing	15 (20)
Cruise Control Actuator	14 (19)
Pedal Pushrod Nut	19 (25)
Wheel Lug Nuts	76 (103)
	INCH Lbs. (N.m)
ABS ECU Mounting Screws	27 (3)
Actuator Nuts	48 (5)
Wheel Speed Sensor Bolt	69 (7.8)

WIRING DIAGRAM

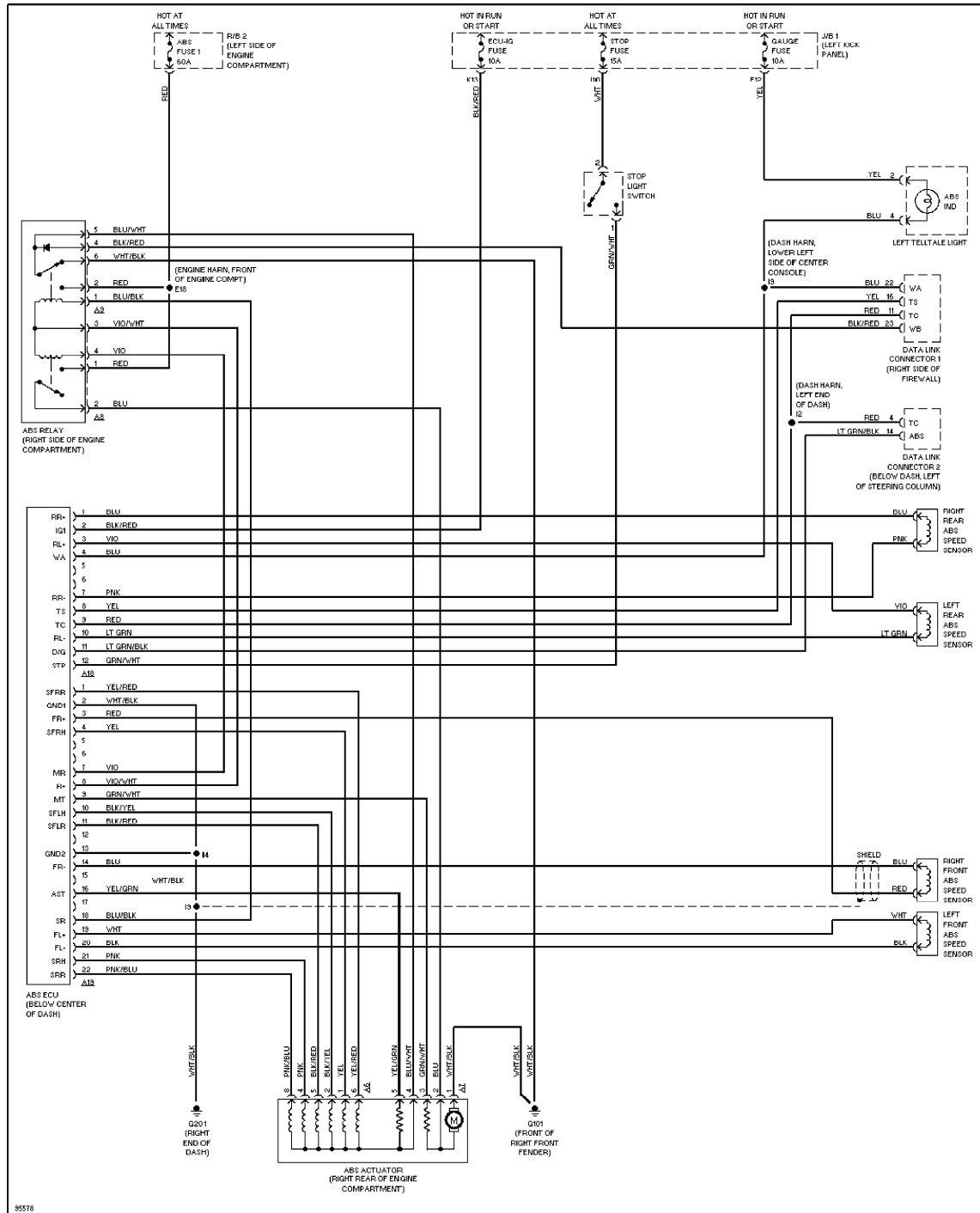


Fig. 14: Anti-Lock Brake System (ABS) Wiring Diagram (1997-98 Supra Non-Turbo - Without Traction Control)

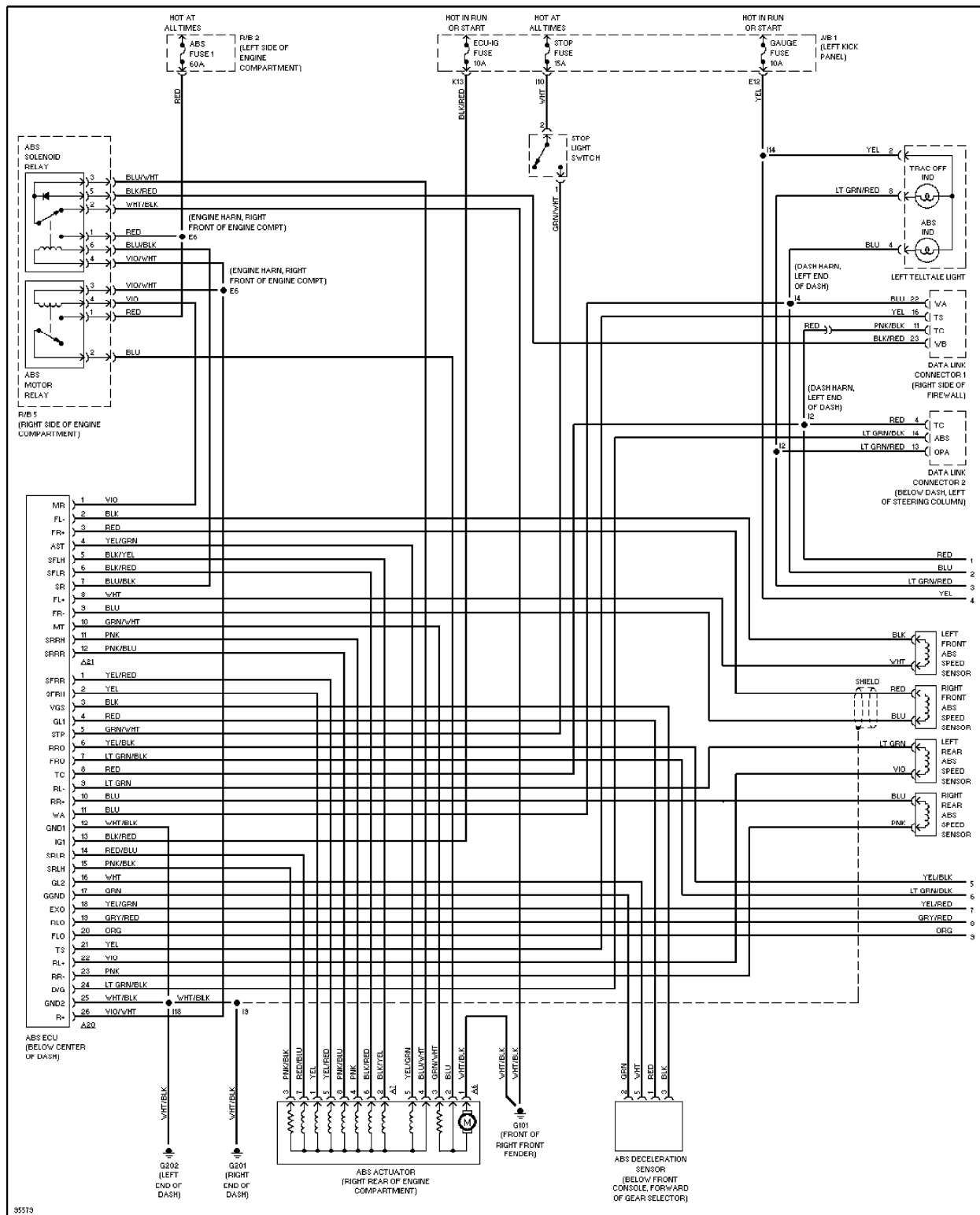


Fig. 15: Anti-Lock Brake System (ABS) Wiring Diagram (1997-98 Supra Turbo - 1 Of 2)

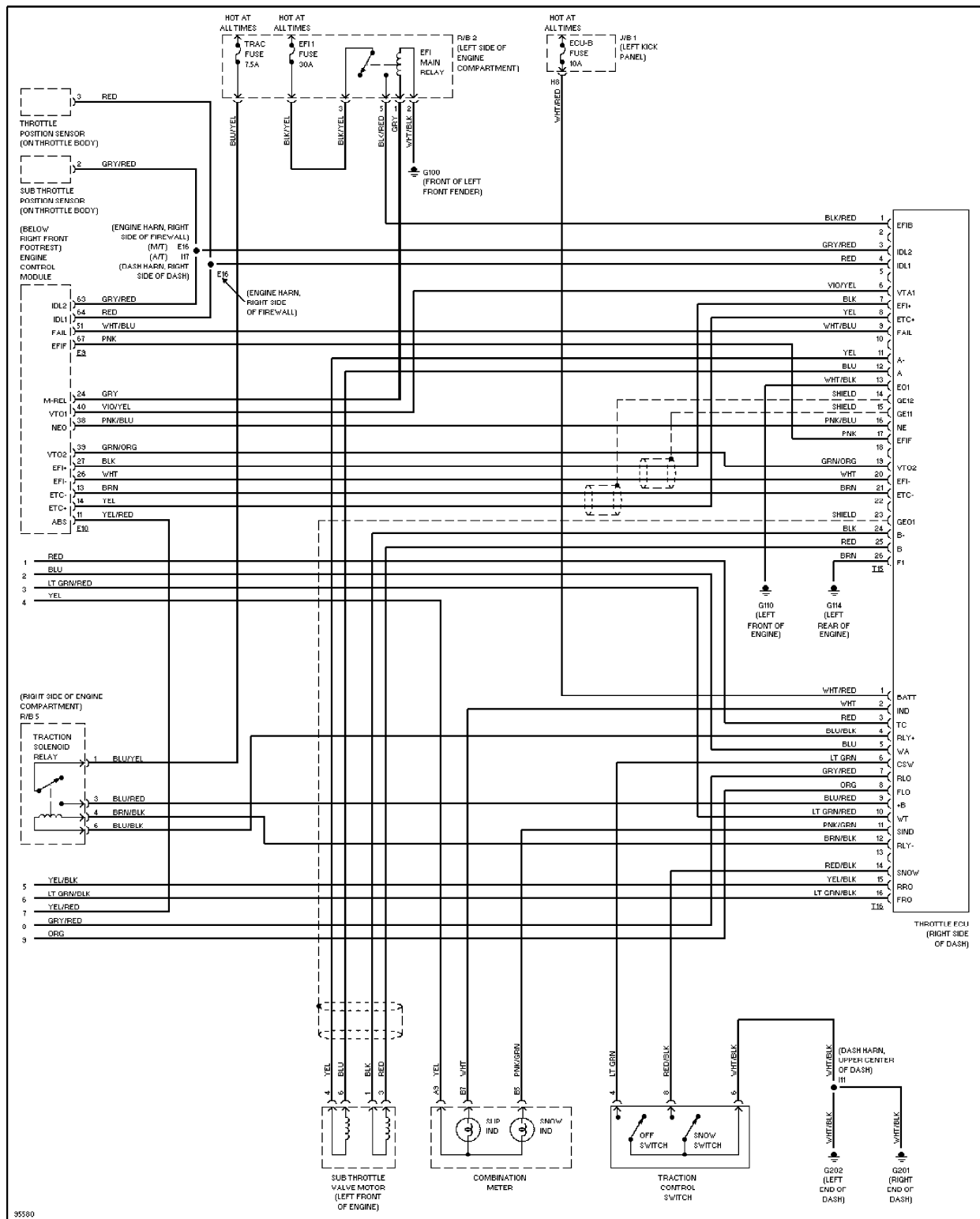


Fig. 16: Anti-Lock Brake System (ABS) Wiring Diagram (1997-98 Supra Turbo - 2 Of 2)

END OF ARTICLE