

ANTI-LOCK BRAKE SYSTEM

1993 Toyota Celica

1993 BRAKES
Toyota Anti-Lock
Celica

DESCRIPTION

The Anti-Lock Brake System (ABS) consists of an ABS Electronic Control Unit (ECU), control relay, actuator, deceleration sensor (All-Trac), and 4 speed sensors. See Fig. 1.

An ABS indicator light is located on the instrument panel. This light 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 vehicle speed exceeds 4 MPH. If brake pedal is pressed before vehicle exceeds 4 MPH, primary check will not occur until brake pedal is released.

NOTE: For more information on brake system, see BRAKE SYSTEM article in this section.

OPERATION

Under normal driving conditions, the ABS functions as a standard brake system. With detection of wheel lock-up, short pedal pulsations occurring in rapid succession will be felt in brake pedal. Pedal pulsation will continue until there is no longer a need for ABS function.

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

ANTI-LOCK BRAKE SAFETY PRECAUTIONS

- * NEVER open a bleeder valve or loosen a hydraulic line while ABS is pressurized
- * NEVER disconnect or reconnect any electrical connectors while ignition is on. Damage to ABS control unit may result.
- * DO NOT attempt to bleed hydraulic system without first referring to the appropriate article.
- * Only use specially designed brake hoses/lines on ABS-equipped vehicles.
- * DO NOT tap on speed sensor components (sensor, sensor rings). Speed rings must be pressed, NOT hammered into hubs. Striking these components can cause demagnetization or a loss of polarization, affecting the accuracy of the speed signal returning to the ABS control unit.
- * DO NOT mix tire sizes. Increasing the width, as long as tires remain close to the original diameter, is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause inaccurate wheel speed readings.
- * DO NOT contaminate speed sensor components with grease. Only use recommended anti-corrosion coating.
- * When speed sensor components have been removed, ALWAYS check sensor-to-ring air gaps when applicable. These specifications can be found in each appropriate article.
- * ONLY use recommended brake fluids. DO NOT use silicone brake fluids in an ABS-equipped vehicle.

- * When installing transmitting devices (CB's, telephones, etc.) on ABS-equipped vehicles, DO NOT locate the antenna near the ABS control unit (or any control unit).
- * Disconnect all on-board computers, when using electric welding equipment.
- * DO NOT expose the ABS control unit to prolonged periods of high heat (185°F/85°C for 2 hours is generally considered a maximum limit).

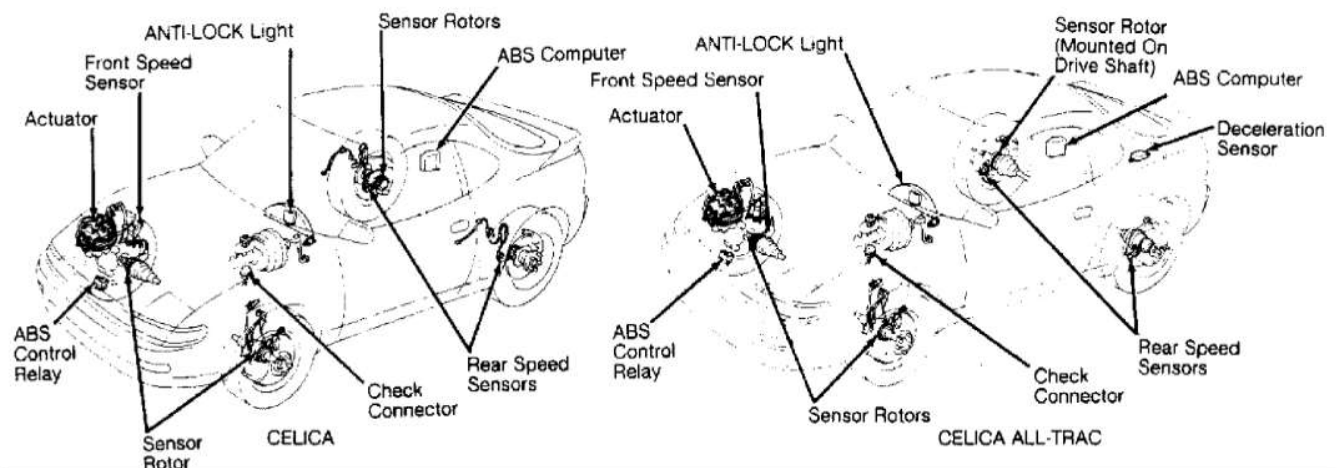


Fig. 1: Locating ABS Components
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

BLEEDING BRAKE SYSTEM

CAUTION: Brake fluid will damage painted surfaces. If brake fluid gets on a 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.

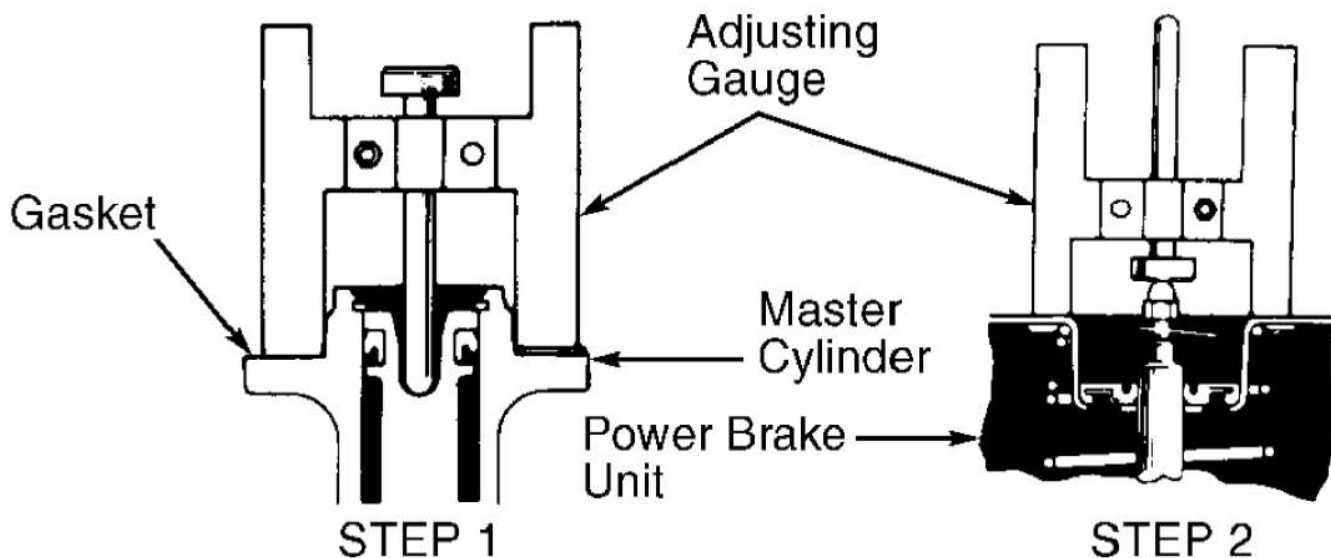
Brake bleeding procedure is same procedure used to bleed non-ABS systems. If master cylinder was rebuilt or reservoir ran empty, bleed master cylinder first. Bleed remaining wheels, starting with brake having longest hydraulic line, working to brake with shortest hydraulic line.

ADJUSTMENTS

MASTER CYLINDER PUSH ROD

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

2) Measure clearance between brake unit push rod and head of adjusting gauge. Clearance should be zero. If clearance is not zero, adjust brake unit push rod length until push rod just touches head of 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 rib of floor panel. See Fig. 3. Brake pedal height should be 6.7-7.0" (169-178 mm). To adjust brake pedal height, loosen stoplight switch and lock nut on brake pedal push rod.

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

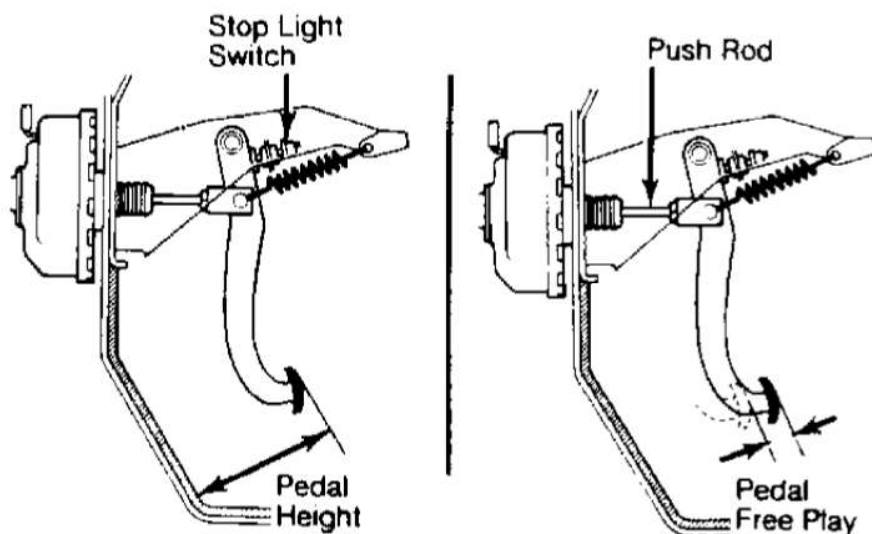


Fig. 3: Measuring Brake Pedal Height & Free Play
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

BRAKE PEDAL FREE PLAY

1) Brake pedal free play is distance brake pedal travels (with engine stopped) before encountering resistance. To measure brake pedal free play, press brake pedal several times to exhaust vacuum from power brake unit. Press brake pedal and measure travel until initial resistance occurs.

2) Brake pedal free play should be 0.04-0.24" (1.0-6.0 mm). If free play is not within specification, adjust by rotating push rod. See Fig. 3. After adjusting brake pedal free play, check brake pedal height. See BRAKE PEDAL HEIGHT.

BRAKE PEDAL RESERVE

Measure brake pedal reserve from face of brake 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 should be 3.54" (90.0 mm). If distance is less than specified, inspect brake system.

STOPLIGHT SWITCH

Stoplight switch is located above brake pedal. See Fig. 3. To adjust stoplight switch, loosen stoplight switch lock nuts and rotate stoplight switch until clearance between pedal stop and threaded end of switch is 0.02-0.09" (0.5-2.4 mm). Tighten lock nut. Check stoplight operation.

PARKING BRAKE SHOES

Raise and support vehicle. Remove wheels. Temporarily install lug nuts to hold brake rotor in place. Remove hole plug to gain access to adjuster. Turn adjuster to expand shoes until brake rotor locks. Back off adjuster 8 notches. Install hole plug.

PARKING BRAKE

NOTE: Service brake on rear drum brakes and parking brake shoe clearance on rear disc brakes must be adjusted before adjusting parking brake cable.

Parking brake lever stroke should be 4-7 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

ANTI-LOCK WARNING LIGHT

ABS Light Comes On

1) Unplug service connector. See Fig. 4. Connect jumper wire between Data Link Connector (DLC) terminals Tc and E1. See Fig. 5. Turn ignition on. If ABS light flashes codes, see DIAGNOSTIC CODES under DIAGNOSIS & TESTING. If ABS light stays on constantly or flashes 4 times per second, go to next step.

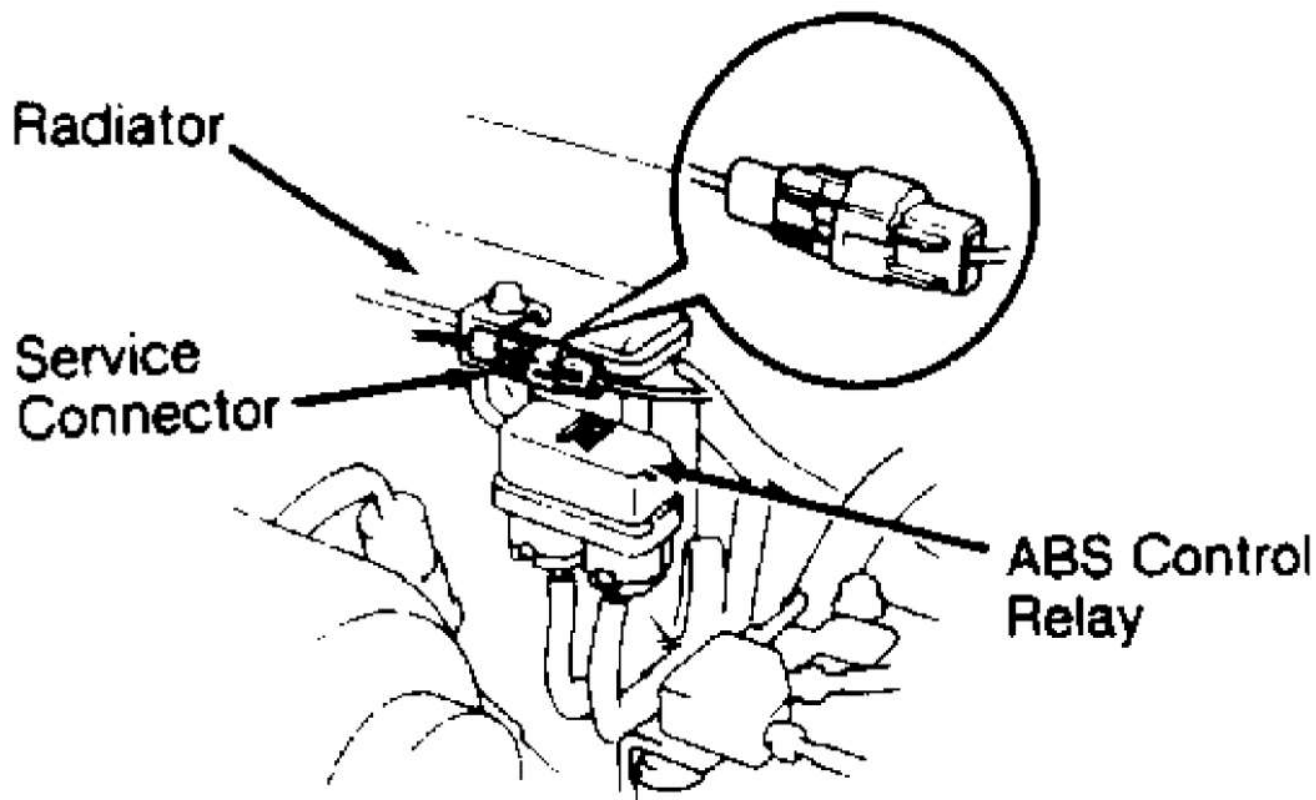
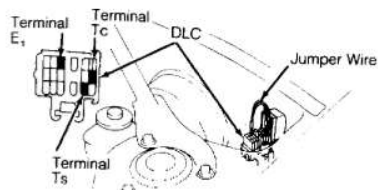


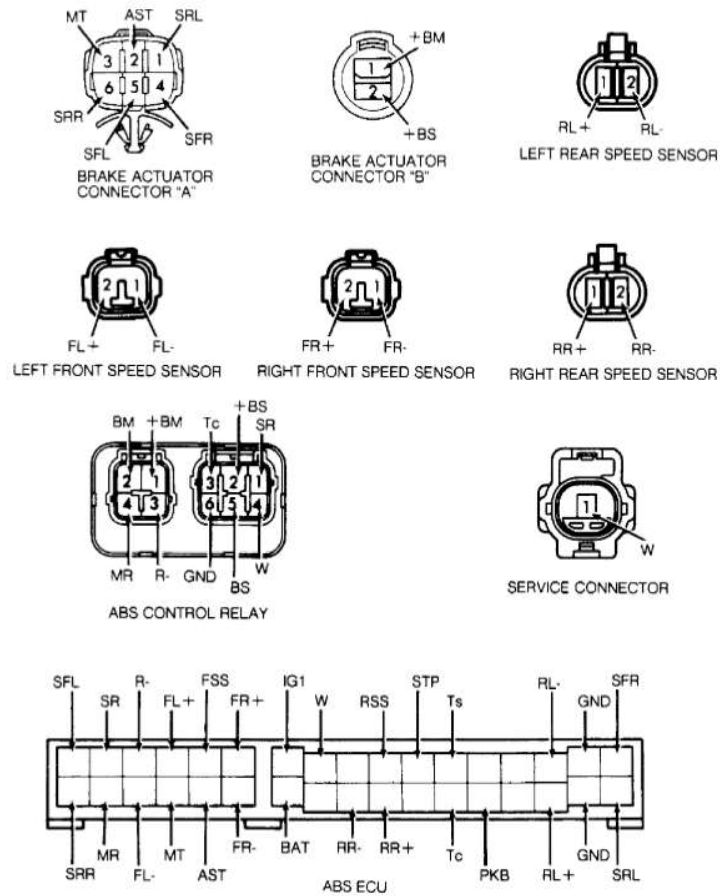
Fig. 4: Locating Service Connector
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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

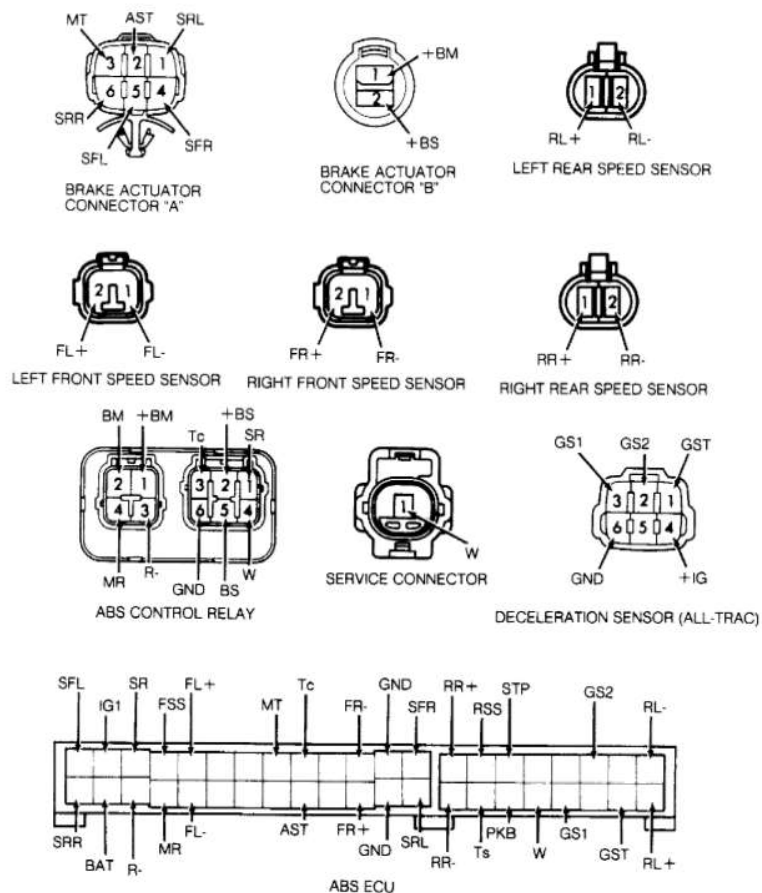
2) Inspect ABS ECU connector for secure attachment and undamaged terminals. Repair connector as necessary. Turn ignition on. Check for battery voltage between ABS ECU connector terminal IG1 (Black/Red wire) and ground. See Fig. 6 or 7. If battery voltage exists, go to next step. If battery voltage does not exist, repair faulty Black/Red wire.

3) Turn ignition off. Unplug ABS ECU connector. Turn ignition on. If ABS light comes on, repair short circuit between 6-pin ABS control relay connector terminal No. 4 (Green wire) and ABS ECU connector terminal "W" (Gray wire). If ABS light does not come on, temporarily substitute known good ABS ECU. Retest system.



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Fig. 6: Identifying ABS System Connector Terminals (FWD)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 7: Identifying ABS System Connector Terminals (All-Trac)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

ABS Light Does Not Come On For 3 Seconds After Ignition Is Turned On

1) Unplug service connector. See Fig. 4. Connect service connector terminal "W" on harness (female) side to ground. Turn ignition on. If ABS light comes on, go to next step. If ABS light does not come on, replace ABS bulb, or repair open circuit between ABS light and service connector terminal "W". See Fig. 6 or 7.

2) Turn ignition off. Unplug ABS ECU connector and ABS control relay connectors. Connect ABS ECU connector terminal "W" (Gray wire) on wire harness side to ground. Turn ignition on. If ABS light comes on, go to next step. If ABS light does not come on, repair open circuit between ABS ECU connector terminal "W" (Gray wire) and ABS light.

3) Turn ignition off. Unplug ABS control relay connector. Check for continuity between 6-pin ABS control relay connector terminals No. 4 and 5. Transpose ohmmeter leads. Again check for continuity.

4) If continuity exists with ohmmeter connected only one way, temporarily substitute known good ABS ECU, then retest system. If continuity exists with ohmmeter connected both ways, or continuity does not exist at all, see ABS CONTROL RELAY under COMPONENT TESTING.

5) If short in ABS control relay diode exists, a malfunction at ABS ECU terminal "W" (Gray wire) will occur. When inspecting terminal, reconnect ABS wiring. Unplug control relay connectors and

DLC. Turn ignition on. If ABS light comes on, ABS ECU terminal "W" (Gray wire) is okay.

ABS Light Comes On Intermittently

Inspect for a short in wiring harness between DLC terminals Tc and E1 or between terminals Ts and E1. See Fig. 5.

SYMPTOM DIAGNOSIS

Symptoms:

- * Brakes Pull
- * Braking Inefficient
- * ABS Operates During Normal Braking
- * ABS Operates Just Before Stopping During Normal Braking
- * Brake Pedal Pulsates Abnormally With ABS Functioning

Diagnosis

1) Unplug service connector. See Fig. 4. Connect jumper wire between DLC terminals Tc and E1. See Fig. 5. Turn ignition on. If ABS light flashes 2 times per second, go to next step. If ABS light does not flash 2 times per second, refer to DIAGNOSTIC CODES under DIAGNOSIS & TESTING.

2) On FWD vehicles, go to next step. On All-Trac vehicles, enter deceleration sensor diagnostics. See DECELERATION SENSOR DIAGNOSTICS (ALL-TRAC) under DIAGNOSIS & TESTING. If deceleration sensor operation is okay, go to next step. If deceleration sensor operation is not as specified, inspect sensor for proper installation. If sensor is installed properly, replace sensor.

3) Check actuator operation. See ACTUATOR CHECK under DIAGNOSIS & TESTING. If actuator operation is okay, temporarily substitute known good ECU. Retest system. See ABS ECU under REMOVAL & INSTALLATION. If actuator operation is not as specified, replace faulty actuator.

4) Enter speed sensor diagnostics. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING. If speed sensor signal level is okay, go to next step. If speed sensor signal level is not okay, inspect sensor and sensor rotor. Replace as necessary.

5) Inspect all speed sensors for proper installation, and repair as necessary. Clean all foreign material and metal chips from speed sensor tip.

6) Turn ignition off. Unplug ABS ECU connector. Ensure continuity exists between each speed sensor connector and ABS ECU connector. If continuity readings change when wiring harness is twisted or moved, repair faulty wiring harness between speed sensor and ABS ECU connector.

Symptom:

- * ABS Works Inefficiently

Diagnosis

1) Unplug service connector. See Fig. 4. Connect jumper wire between DLC terminals Tc and E1. See Fig. 5. Turn ignition on. If ABS light flashes 2 times per second, go to next step. If ABS light does not flash 2 times per second, refer to DIAGNOSTIC CODES under DIAGNOSIS & TESTING.

2) Check for battery voltage between ABS ECU connector terminal STP (Green/White wire) and ground when brake pedal is pressed. If battery voltage does not exist, repair open circuit in stoplight switch or wiring harness. Check actuator operation. See ACTUATOR CHECK under DIAGNOSIS & TESTING.

DIAGNOSIS & TESTING

NOTE: DO NOT start engine when retrieving diagnostic codes.

RETRIEVING CODES

1) Ensure battery voltage is about 12 volts. Turn ignition on. ABS light should come on, then go out after 3 seconds. If warning light does not come on, check fuse, bulb, and wiring harness.

2) With ignition on, unplug DLC. See Fig. 4. Connect jumper wire between DLC terminals Tc and E1. See Fig. 5. If a malfunction is detected, 4 seconds will elapse, then ABS light will begin to flash a 2-digit code. First series of flashes indicates first digit of code. After a 1.5-second pause, second series of flashes indicates second digit of code.

3) If 2 or more codes are stored, there will be a 2.5-second pause between each code. After all codes are displayed, a 4-second pause will occur, then all codes will repeat. If ABS system is functioning properly, ABS light will flash 2 times every second. For code interpretation, see DIAGNOSTIC CODES.

4) After replacing or repairing malfunctioning components, clear diagnostic codes. If a battery cable was disconnected during repairs, all codes will be erased. If battery cable was not disconnected during repairs, see CLEARING CODES.

DIAGNOSTIC CODES

Check suspect components in order given. Checks consist mainly of a visual inspection and continuity tests.

Code 11

Open in solenoid relay circuit. Check actuator wiring harness, ABS control relay (solenoid relay), solenoid relay wiring harness, and solenoid relay connector. See ABS CONTROL RELAY under COMPONENT TESTING.

Code 12

Short in solenoid relay circuit. Check actuator wiring harness, ABS control relay (solenoid relay), solenoid relay wiring harness, and solenoid relay connector. See ABS CONTROL RELAY under COMPONENT TESTING.

Code 13

Open in pump motor relay circuit. Check actuator wiring harness, ABS control relay (pump motor relay), pump motor relay wiring harness, and pump motor relay connector. See ABS CONTROL RELAY under COMPONENT TESTING.

Code 14

Short in pump motor relay circuit. Check actuator wiring harness, ABS control relay (pump motor relay), pump motor relay wiring harness, and pump motor relay connector. See ABS CONTROL RELAY under COMPONENT TESTING.

Code 21

Open or short circuit in solenoid for right front wheel. Check actuator solenoid, wiring harness, and connector. See ACTUATOR CHECK under DIAGNOSIS & TESTING.

Code 22

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

under DIAGNOSIS & TESTING.

Code 23

Open or short circuit in solenoid for right rear wheel. Check actuator solenoid, wiring harness, and connector. See ACTUATOR CHECK under DIAGNOSIS & TESTING.

Code 24

Open or short circuit in solenoid for left rear wheel. Check actuator solenoid, wiring harness, and connector. See ACTUATOR CHECK under DIAGNOSIS & TESTING.

Code 31

Malfunction of right front wheel speed sensor signal. Check speed sensor, sensor rotor, wiring harness, and connector. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING.

Code 32

Malfunction of left front wheel speed sensor signal. Check speed sensor, sensor rotor, wiring harness, and connector. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING.

Code 33

Malfunction of right rear wheel speed sensor signal. Check speed sensor, sensor rotor, wiring harness, and connector. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING.

Code 34

Malfunction of left rear wheel speed sensor signal. Check speed sensor, sensor rotor, wiring harness, and connector. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING.

Code 35

Open in left front or right rear wheel speed sensor circuit. Check speed sensor, sensor rotor, wiring harness, and connector. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING.

Code 36

Open in right front or left rear wheel speed sensor circuit. Check speed sensor, sensor rotor, wiring harness, and connector. See SPEED SENSOR DIAGNOSTICS under DIAGNOSIS & TESTING.

Code 37 (FWD)

Wrong rear axle hubs on both sides. Check rear sensor rotors.

Code 41

Battery voltage is less than 9.5 volts or more than 16.2 volts. Check battery and voltage regulator.

Code 43 (All-Trac)

Deceleration sensor malfunction. Check deceleration sensor, deceleration sensor installation, wiring harness, and connector. See DECELERATION SENSOR DIAGNOSTICS (ALL-TRAC) under DIAGNOSIS & TESTING.

Code 44 (All-Trac)

Open or short circuit in deceleration sensor. Check deceleration sensor, deceleration sensor installation, wiring harness, and connector. See DECELERATION SENSOR DIAGNOSTICS (ALL-TRAC) under DIAGNOSIS & TESTING.

Code 51

Actuator pump motor is locked or pump motor circuit open. Check pump motor, ABS control relay (pump motor relay), vehicle

battery, actuator wiring harness, connectors, actuator pump motor circuit, and actuator ground bolt. See ACTUATOR CHECK under DIAGNOSIS & TESTING. See ABS CONTROL RELAY under COMPONENT TESTING.

ABS Light Always On

Malfunction of ABS ECU. Inspect ABS ECU connector for proper installation and undamaged terminals. Repair as necessary. If connector is okay, temporarily substitute known good ABS ECU. Retest system.

CLEARING CODES

Turn ignition on. Connect jumper wire between DLC terminals Tc and E1. See Fig. 5. With vehicle stopped, press brake pedal 8 or more times within 3 seconds. Codes will be erased. Turn ignition on. Verify ABS light goes out after 3 seconds. Verify ABS light flashes a normal code. See RETRIEVING CODES under DIAGNOSIS & TESTING.

ACTUATOR CHECK

1) Turn ignition off. Unplug actuator and control relay electrical connectors. See Fig. 6 or 7. Connect Test Harness (09990-00200) and Actuator Checker (09990-00150) to vehicle according to manufacturer's instructions.

2) Place Sheet "A" (09990-00163) onto actuator checker. Start and idle engine. Set SELECTOR switch to FRONT RH position. Press and hold MOTOR switch for a few seconds. Press and hold brake pedal.

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

3) Press POWER switch. When POWER switch is pressed, brake pedal should not go down. Release POWER switch. Brake pedal should go down. Press and hold MOTOR switch for a few seconds. Brake pedal should return. Release MOTOR switch. Release brake pedal.

4) Press and hold MOTOR switch for a few seconds. Release MOTOR switch. Press and hold brake pedal for about 15 seconds. As brake pedal is held, 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 setting SELECTOR switch to appropriate positions. When checking REAR LH position, press REAR LH switch instead of POWER switch.

6) After checking remaining wheels, press and hold MOTOR switch for a few seconds. Remove test harnesses and actuator checker.

7) If any actuator solenoid does not operate as specified, measure actuator solenoid resistance. Measure resistance of each actuator solenoid between 6-pin connector terminal No. 4 (White wire) and appropriate actuator solenoid connector. Resistance should be 1.2 ohms.

8) Replace actuator if resistance of any actuator solenoid is not as specified. Reconnect wiring harnesses to actuator and control relay. Clear diagnostic codes. See CLEARING CODES.

SPEED SENSOR DIAGNOSTICS

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

1) Ensure battery voltage is about 12 volts. Turn ignition on. ABS light should come on, then go out after about 3 seconds. If ABS light does not come on, check fuse, bulb, and wiring harness.

2) Turn ignition off. DO NOT remove short pin from DLC. Connect DLC terminals Ts and E1. See Fig. 5. Engage parking brake. Start engine. Verify ABS light flashes 4 times per second.

3) Drive vehicle straight ahead at speed greater than 50 MPH. Verify ABS light flashes while vehicle is traveling at less than 28 MPH. ABS light will stop flashing at more than 28 MPH, and will then flash once at 50 MPH. If ABS light flashes as described, check is complete. If ABS light does not flash as indicated, stop vehicle.

4) Connect jumper between DLC terminals Tc and E1. See Fig. 5. If a malfunction is detected, 4 seconds will elapse, then ABS light will begin to flash a 2-digit code. First series of flashes indicates first digit of code. After a 1.5 second pause, second series of flashes indicates second digit of code.

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

6) Record diagnostic codes. Turn ignition off. Repair as necessary. See SPEED SENSOR DIAGNOSTIC CODES. Remove jumper wire from DLC. Clear diagnostic codes. See CLEARING CODES.

SPEED SENSOR DIAGNOSTIC CODES

Code 71

Low voltage of right front speed sensor signal. Check right front speed sensor and sensor installation.

Code 72

Low voltage of left front speed sensor signal. Check left front speed sensor and sensor installation.

Code 73

Low voltage of right rear speed sensor signal. Check right rear speed sensor and sensor installation.

Code 74

Low voltage of left rear speed sensor signal. Check left rear speed sensor and sensor installation.

Code 75

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

Code 76

Abnormal signal from left front speed sensor. Check right front sensor rotor.

Code 77

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

Code 78

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

ABS Light Blinks 4 Times A Second

All speed sensors and sensor rotors are normal.

DECELERATION SENSOR DIAGNOSTICS (ALL-TRAC)

NOTE: While diagnosing deceleration sensor, brake system functions as a conventional system.

System Inspection

1) Ensure battery voltage is about 12 volts. Turn ignition on. ABS light should come on, then go out after 3 seconds. If ABS light does not come on, check fuse, bulb, and wiring harness.

2) Turn ignition off. Connect jumper wire between DLC terminals E1 and Ts. See Fig. 5. Engage parking brake. Start engine. DO NOT press brake pedal.

3) If ABS flashes 4 times per second, inspect sensor detection point and sensor operation. If ABS light does not flash, inspect parking brake switch, stoplight switch, DLC Ts terminal, deceleration sensor installation, and ABS ECU.

Sensor Detection Point

1) Raise rear of vehicle 26-28", measured from bottom of rear bumper to ground. Verify ABS light is off. Completely lower rear of vehicle. As vehicle is lowered, ABS light will start flashing. Raise front of vehicle 21-24", measured from lower body or spoiler edge of vehicle to ground.

2) Verify ABS light is off. As vehicle is lowered, ABS light will start flashing. If ABS light stays on steadily, inspect deceleration sensor installation. If sensor installation is okay, replace deceleration sensor.

Sensor Operation

1) Drive vehicle straight ahead at speed greater than 50 MPH. Verify ABS light flashes while vehicle is traveling at less than 28 MPH. ABS light will stop flashing at more than 28 MPH, and then will flash once at 50 MPH. If ABS light flashes as described, check is complete. If ABS light does not flash as indicated, stop vehicle.

2) Connect jumper between DLC terminals Tc and E1 (do not disconnect Ts and E1) of DLC. See Fig. 5. If a malfunction is detected, 4 seconds will elapse, then ABS light will begin to flash a 2-digit code. First series of flashes indicates first digit of code. After a 1.5-second pause, second series of flashes indicates second digit of code.

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

4) Record diagnostic codes. Turn ignition off. Repair as necessary. See DIAGNOSTIC CODES. Remove jumper wires from DLC. Clear diagnostic codes. See CLEARING CODES.

COMPONENT TESTING

ABS ECU Wiring Harness

1) Remove ABS ECU, leaving connectors attached. See ABS ECU under REMOVAL & INSTALLATION. Backprobe each terminal to measure voltage or resistance at each terminal, as specified in table. See STEP 1

See Fig. 8 or 9 and 10. If circuit values are not as specified, check and repair or replace indicated component.

2) Unplug ABS ECU connectors. Measure resistance on wire harness side of ABS ECU connector terminals, as specified in table. See STEP 2

See Fig. 8 or 10. If circuit values are not as specified, check and repair or replace indicated component.



Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
SFR ↔ AST	Resistance	About 6 Ω	Actuator	SR ↔ R-	Resistance	80 ~ 100 Ω	Control relay
SRL ↔ AST	Resistance	About 6 Ω	Actuator	SFL ↔ AST	Resistance	About 6 Ω	Actuator
RL ↔ RL-	Resistance	1.1 ~ 1.7 kΩ	Rear LH speed sensor	AST ↔ Body ground	Resistance	About 5 Ω	Actuator
RR ↔ RR-	Resistance	1.1 ~ 1.7 kΩ	Rear RH speed sensor	MT ↔ Body ground	Continuity	Continuity	Actuator
FR ↔ FR-	Resistance	0.8 ~ 1.3 kΩ	Front LH speed sensor	MR ↔ R-	Resistance	50 ~ 80 Ω	Control relay
FL ↔ FL-	Resistance	0.8 ~ 1.3 kΩ	Front RH speed sensor	SAR ↔ AST	Resistance	About 6 Ω	Actuator

STEP 2 - RESISTANCE CHECKS WITH CONNECTORS UNPLUGGED

Fig. 8: Testing Specifications Table For ABS ECU Wiring Harness - FWD
Courtesy of Toyota Motor Sales, U.S.A., Inc.

SFL IG1 SR	FSS FL+	MT TC	FR- GND SFR	RR+ RSS STP	D/G GS2	RL-
SRR BAT R-	MR FL-	AST	FR+ GND SRL	RR- TS PKB W	GS1 GST	RL+

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Tester Connection	Check Item	Condition	Specified Value	Trouble Part
RL-	Continuity	IG switch off	Continuity	ABS ECU
GS2	Voltage	IG switch on	4 ~ 6 V	Deceleration Sensor
D/G	Voltage	IG switch on and check connector T+E, not connected	About 0V	ABS ECU
STP	Voltage	IG switch off and brake pedal depressed	Battery voltage	Stoplight switch
	Continuity	IG switch off and brake pedal returned	Continuity	Stoplight
RSS	Continuity	IG switch off	Continuity	ABS ECU
GS1	Voltage	IG switch on	4 ~ 6 V	Deceleration Sensor
W	Voltage	IG switch on and "ABS" warning light goes on	About 0V	ABS ECU
		IG switch on and "ABS" warning light goes off	Battery voltage	"ABS" warning light
PKB	Voltage	IG switch on and PKB lever pulled	About 0V	Parking brake switch
		IG switch on and PKB lever returned	Battery voltage	Level warning switch
TS	Voltage	IG switch on and check connector T+E, not connected	Battery voltage	ABS ECU
		IG switch on and check connector T+E, connected	About 0V	
RR-	Continuity	IG switch off	Continuity	Actuator
SFR	Voltage	IG switch on and "ABS" warning light goes on	About 0V	
		IG switch on and "ABS" warning light goes off	Battery voltage	
GND	Continuity	IG switch off	Continuity	Wiring harness
FR-	Continuity	IG switch off	Continuity	ABS ECU
TC	Voltage	IG switch on and check connector Tc-E, not connected	Battery voltage	
		IG switch on and check connector Tc-E, connected	About 0V	
FSS	Continuity	IG switch off	Continuity	
SR	Voltage	IG switch on and "ABS" warning light goes on	About 0V	ECU-IG Fuse
		IG switch on and "ABS" warning light goes off	Battery voltage	
IG1	Voltage	IG switch on	Battery voltage	

STEP 1 - VOLTAGE & CONTINUITY CHECKS WITH CONNECTORS ATTACHED

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Fig. 9: Testing Specs Table For ABS ECU Wir Harness All-Trac (1 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Tester Connection	Check Item	Condition	Specified Value	Trouble Part
SFL	Voltage	IG switch on and "ABS" warning light goes on	About 0V	Actuator
		IG switch on and "ABS" warning light goes off	Battery voltage	
SRL	Voltage	IG switch on and "ABS" warning light goes on	About 0V	
		IG switch on and "ABS" warning light goes off	Battery voltage	
AST	Voltage	IG switch on and "ABS" warning light goes on	About 0V	ABS ECU
		IG switch on and "ABS" warning light goes off	Battery voltage	
FL-	Continuity	IG switch off	Continuity	DOME Fuse
R-	Continuity	IG switch off	Continuity	
BAT	Voltage	IG switch off	Battery voltage	Actuator
SRR	Voltage	IG switch on and "ABS" warning light goes on	About 0V	
		IG switch on and "ABS" warning light goes off	Battery voltage	

STEP 1 - VOLTAGE & CONTINUITY CHECKS WITH CONNECTORS ATTACHED (Cont.)

Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
RR+ ↔ RR-	Resistance	1.1 ~ 1.7 kΩ	Rear RH speed sensor	SFL ↔ AST	Resistance	About 6 Ω	Actuator
RL+ ↔ RL-	Resistance	1.1 ~ 1.7 kΩ	Rear LH speed sensor	SRL ↔ AST	Resistance	About 6 Ω	Actuator
SFR ↔ AST	Resistance	About 6 Ω	Actuator	FR+ ↔ FR-	Resistance	0.8 ~ 1.3 kΩ	Front RH speed sensor
MT ↔ Body ground	Continuity	Continuity	Actuator	AST ↔ Body ground	Resistance	About 5 Ω	Actuator
FL+ ↔ FL-	Resistance	0.8 ~ 1.3 kΩ	Front LH speed sensor	MR ↔ R-	Resistance	50 ~ 80 Ω	Control relay
SR ↔ R-	Resistance	50 ~ 100 Ω	Control relay	SRR ↔ AST	Resistance	About 6 Ω	Actuator

STEP 2 - RESISTANCE CHECKS WITH CONNECTORS UNPLUGGED

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Fig. 10: Testing Specs Table For ABS ECU Wir Harness All-Trac (2 Of 2)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

ABS Control Relay

1) Remove ABS control relay. See Fig. 1. Using ohmmeter capable of testing diodes, check for continuity between ABS control relay connector terminals A3 and A4. See Fig. 11. Transpose ohmmeter leads. Repeat measurement.

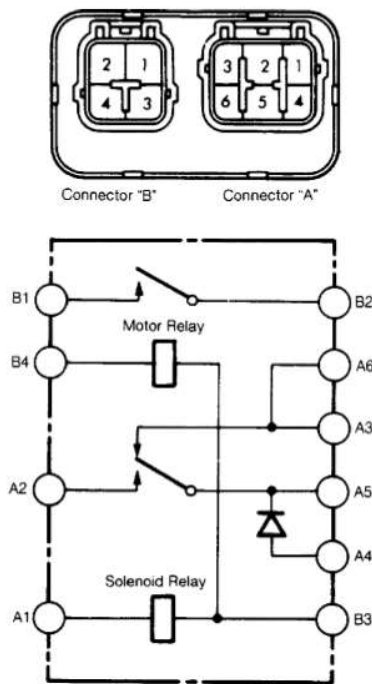
2) If continuity exists or circuit is open for both measurements, actuator diode is defective. Repair or replace relay, then go to next step. If continuity exists for only one measurement, temporarily substitute known good ABS ECU. Retest system.

3) Continuity should exist between terminals A3 and A6, between terminals A3 and A5, and between terminals A5 and A6.

4) Continuity should not exist between terminals A2 and A3, or between terminals B1 and B2.

5) Using fused jumper wire, connect positive battery terminal to terminal B3. Connect negative battery terminal to terminal B4. Continuity should not exist between terminals B1 and B2.

6) Using fused jumper wire, connect positive battery terminal to terminal B3. Connect negative battery terminal to terminal A1. Continuity should exist between terminals A2 and A5. Continuity should not exist between terminals A3 and A5. Replace relay if operation is not as specified.



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Fig. 11: Identifying ABS Control Relay Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Front Speed Sensors

1) Remove harness connector clamp. Unplug connector from front wheel speed sensor. Measure resistance between speed sensor terminals. Resistance should be 800-1300 ohms.

2) Measure insulation resistance between each sensor terminal and sensor body. Continuity should not exist. If resistance and continuity are not as specified, replace speed sensor.

Rear Speed Sensors

1) Remove rear seat cushion. Unplug wheel speed sensor

connector. Measure resistance between speed sensor terminals. On All-Trac models, resistance should be 800-1500 ohms. On FWD models, resistance should be 1100-1700 ohms.

2) Measure insulation resistance between each sensor terminal and sensor body. Continuity should not exist. If resistance and continuity are not as specified, replace speed sensor.

Sensor Rotors

Visually inspect sensor rotor serrations for scratches, cracks, missing teeth, or warping. Replace front drive shaft or rear hub as necessary if rotor is damaged.

REMOVAL & INSTALLATION

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

ABS ECU

Removal & Installation

1) Turn ignition off. Disconnect negative battery cable. ABS ECU is located on right side of luggage compartment (left side on convertible models). Remove screws attaching ABS ECU to vehicle.

2) Remove wire harness from ECU bracket clamp. Unplug ABS ECU connector. Remove ABS ECU from vehicle. To install, reverse removal procedure.

ABS CONTROL RELAY

Removal & Installation

Remove connector from wire harness clamp. Remove relay bolt. Remove relay from vehicle. See Fig. 1. To install, reverse removal procedure.

ACTUATOR

Removal & Installation

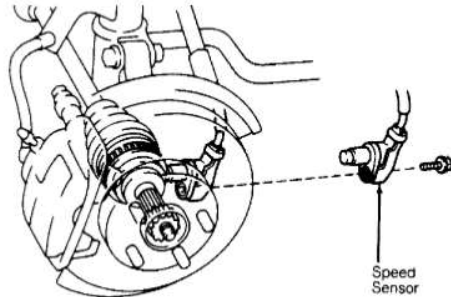
Turn ignition off. Remove actuator cover. Unplug electrical connectors. Remove cover bracket and bolt. Disconnect brake lines. Remove actuator from bracket. To install, reverse removal procedure. Bleed brake system. See BLEEDING BRAKE SYSTEM.

FRONT SENSOR ROTOR

Front speed sensor rotor is an integral part of outboard CV joint. See appropriate DRIVE AXLES article in the POWERTRAIN section.

FRONT WHEEL SPEED SENSORS

See Fig. 12.



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Fig. 12: Removing & Installing Front Speed Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

REAR SENSOR ROTOR (ALL TRAC)

Rear speed sensor rotor is an integral part of outboard CV joint. See appropriate DRIVE AXLES article in the POWERTRAIN section.

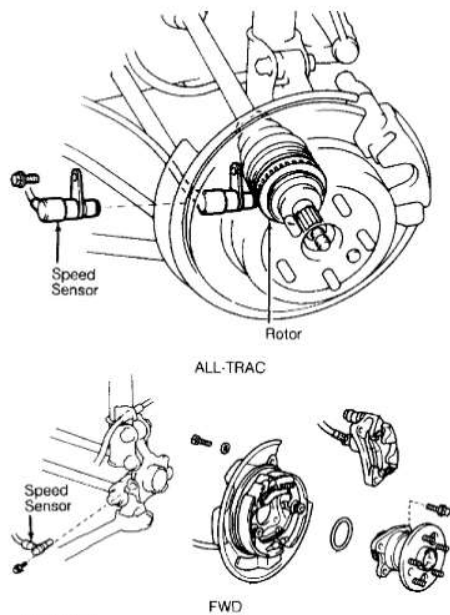
REAR SENSOR ROTOR (FWD)

Removal & Installation

Rear speed sensor rotor is an integral part of rear hub. Remove rear hub. See SUSPENSION - REAR article in the SUSPENSION section.

REAR WHEEL SPEED SENSORS

See Fig. 13.



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Fig. 13: Removing & Installing Rear Speed Sensor
Courtesy of Toyota Motor Sales, U.S.A., Inc.

OVERHAUL

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

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Brakeline Nuts	11 (15)
Power Steering Reservoir Tank Mounting Bolts	14 (19)
Wheel Lug Nuts	76 (103)
3-Way Union Bolt	12 (16)
	INCH Lbs. (N.m)
ABS ECU Mounting Screws	27 (3)
Actuator Mounting Nuts	44 (5)
Deceleration Sensor Mounting Bolts	27 (3)
Proportioning Valve Bolts	80 (9)
Wheel Speed Sensor Mounting Bolt	71 (8)