

2002-03 BRAKES

Disc & Drum - RAV4

DESCRIPTION & OPERATION

WARNING: For warnings and procedures regarding vehicles equipped with Anti-Lock Brake Systems (ABS), see appropriate ANTI-LOCK article.

Hydraulic brake system uses a tandem master cylinder with a vacuum power assist servo. RAV4 is equipped with front disc brakes and rear drum brakes standard. Rear brakes on all models are self-adjusting.

Parking brake lever mechanically activates rear brakes, and a cable applies the rear shoes.

BLEEDING BRAKE SYSTEM

BRAKE BLEEDING SEQUENCE

For correct bleeding sequence, see **BRAKELINE BLEEDING SEQUENCE** table.

BRAKELINE BLEEDING SEQUENCE

Application	Sequence
All Models	Right Rear, Left Rear, Right Front, Left Front

BLEEDING PROCEDURES

CAUTION: DO NOT allow reservoir to run dry during brake bleeding procedure. Use only clean brake fluid. Ensure no dirt or other foreign matter contaminates brake fluid. DO NOT mix different types of brake fluid, as they may not be compatible. DO NOT spill brake fluid on vehicle, as it may damage paint. If brake fluid contacts paint, immediately wash with water.

1. If master cylinder is rebuilt or reservoir is empty, bleed master cylinder first. Bleed wheels in sequence. Start on wheel with longest hydraulic line, and work toward wheel with shortest hydraulic line. See **BRAKE BLEEDING SEQUENCE** table.
2. Raise and support vehicle. Ensure brake fluid reservoir is at least half full during bleeding procedure. Connect one end of transparent vinyl tube to bleeder screw. Submerge other end of tube in a container half filled with clean brake fluid.
3. Have an assistant depress brake pedal several times and hold in depressed position. Loosen bleeder screw, and drain fluid into container. Tighten bleeder screw.

NOTE: Ensure brake pedal remains depressed until bleeder screw is tightened.

4. Refill brake fluid reservoir as necessary. Repeat step 3 until air is no longer discharged. Tighten front

bleeder screw to 70 INCH lbs (8.0 N.m), and tighten rear bleeder screw to 74 INCH lbs. (8.3 N.m). Ensure fluid leakage is not present. Add fluid to reservoir. Repeat procedure for remaining wheels.

ADJUSTMENTS

BRAKE PEDAL HEIGHT

1. Brake pedal height is measured from face of pedal pad to asphalt sheet under carpet. To adjust clearance, loosen stoplight switch and lock nut on brake push rod. See **Fig. 1**.
2. Adjust pedal height by turning push rod. See **BRAKE PEDAL SPECIFICATIONS** table. After setting pedal height, tighten lock nut on push rod. Adjust stoplight switch and tighten switch lock nut. See **STOPLIGHT SWITCH**.

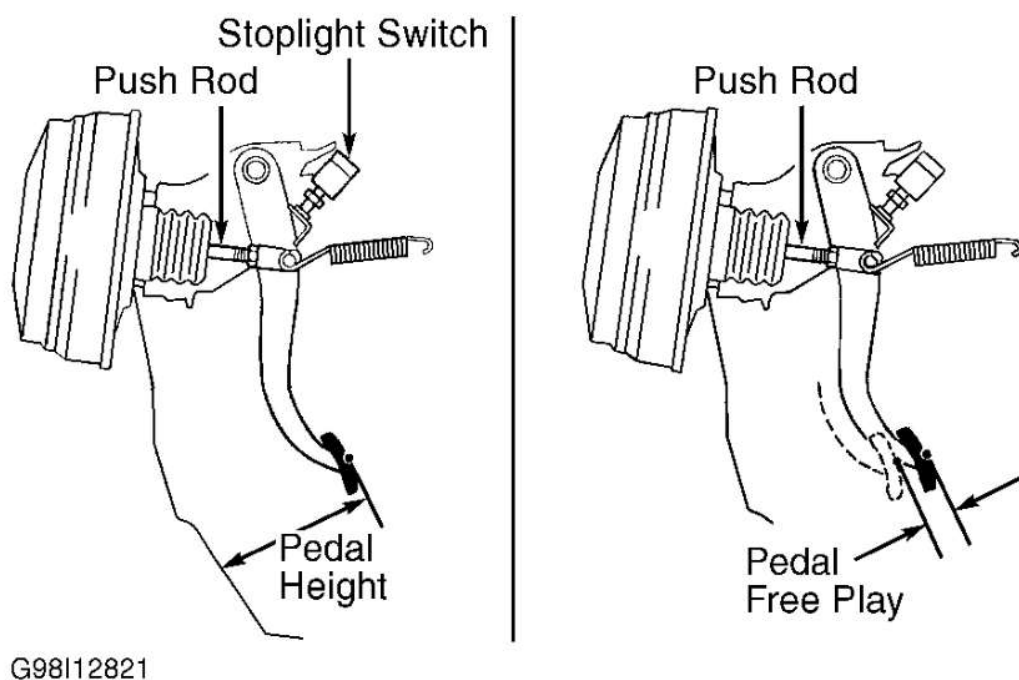


Fig. 1: Measuring Brake Pedal Height & Free Play
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

BRAKE PEDAL SPECIFICATIONS

Application	Free Play - In. (mm)	Pedal Height - In. (mm)
RAV4	.04-.24 (1-6)	6.69-7.09 (170-180)

BRAKE PEDAL FREE PLAY

1. Brake pedal free play is distance brake pedal travels before feeling resistance with engine stopped. To check pedal free play, depress brake pedal several times to exhaust vacuum from booster.
2. Depress pedal and measure travel until initial resistance is felt. See **BRAKE PEDAL SPECIFICATIONS** table. If free play is not within specification, adjust by turning push rod. See **Fig. 1** .

BRAKE PEDAL RESERVE DISTANCE

1. Pedal reserve distance is measured from face of pedal pad to asphalt sheet under carpet with brakes applied. Measure reserve distance with engine running and weight of 110 lbs. (50 kg) applied against pedal.
2. If measured reserve distance is less than specification, inspect brake system. See **BRAKE PEDAL MINIMUM RESERVE DISTANCE SPECIFICATIONS** table.

BRAKE PEDAL MINIMUM RESERVE DISTANCE SPECIFICATIONS

Application	In. (mm)
RAV4	4.65 (118)

PARKING BRAKE

NOTE: Rear brakes must be correctly adjusted before adjusting parking brake. See **REAR BRAKE DRUM** under REMOVAL & INSTALLATION.

Lever Stroke Adjustment

1. To check parking brake adjustment, depress parking brake pedal with specified weight. Count number of notches (clicks) until parking brake is fully applied. See **PARKING BRAKE LEVER STROKE SPECIFICATIONS** table. Adjust parking brake if travel is not within specification.

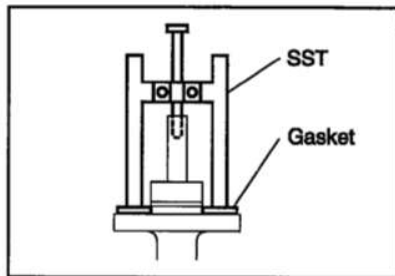
PARKING BRAKE LEVER STROKE SPECIFICATIONS

Application	Notches	Weight Applied Lbs. (Kg)
RAV4	6-8	44 (20)

2. Remove rear console box. Loosen lock nut and turn adjusting nut until lever travel is correct. Tighten lock nut. Install rear console box.

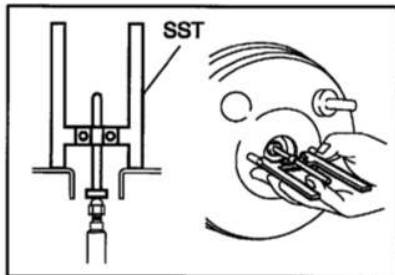
POWER BRAKE UNIT PUSH ROD

For procedure, see **Fig. 2** .



1. INSTALL BRAKE BOOSTER

- Install a new gasket and booster.
- Install the clevis to the operating rod.
- Install and torque the booster installation nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
- Insert the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
- Install the pedal return spring.

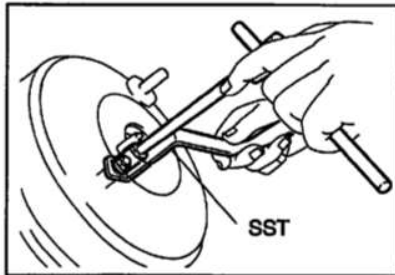


2. ADJUST LENGTH OF BOOSTER PUSH ROD

- Install a new gasket on the master cylinder.
- Set SST on the gasket, and lower the pin until its tip slightly touches the piston.
SST 09737-00011
- Turn the SST upside down, and set it on the booster.
SST 09737-00011
- Measure the clearance between the booster push rod and pin head (SST).
Clearance: 0 mm (0 in.)
- Using SST, adjust the booster push rod length until the push rod slightly touches the pin head.
SST 09737-00020

HINT:

When adjusting the push rod, depress the brake pedal enough so that the push rod is stuck out.



- CONNECT VACUUM HOSE TO BRAKE BOOSTER
- INSTALL MASTER CYLINDER
- FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
- CHECK FOR LEAKS
- CHECK AND ADJUST BRAKE PEDAL
Check and adjust the brake pedal, then tighten the clevis lock nut.
Torque: 26 N·m (260 kgf·cm, 20 ft·lbf)
- DO OPERATIONAL CHECK

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Fig. 2: Adjusting Brake Booster Push Rod

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REAR DRUM BRAKE SHOES

NOTE: All rear drum brakes have a self-adjuster which is activated when brake pedal is applied with vehicle traveling in reverse.

To set initial lining-to-drum clearance, raise and support rear of vehicle. Release parking brake. Remove rear wheels and brake drums. Measure brake drum inside diameter and brake lining diameter. Measured clearance between linings and braking surface of drum should be .024 in. (.60 mm). Turn brake adjuster to obtain specified clearance. Install brake drum and wheel and adjust brakes (if necessary).

STOPLIGHT SWITCH

Remove lower instrument panel and air duct (if necessary). Loosen lock nuts. Turn switch until clearance between threaded end of switch and pedal stop is .02-.09 in. (.5-2.4 mm). See **Fig. 1** . Check brake pedal height and brake light operation.

TESTING

POWER BRAKE UNIT

Operational Check

Depress brake pedal several times with engine off. There should be no change in pedal reserve distance. Depress brake pedal and start engine. If pedal goes down slightly, operation is normal.

Air Tightness Check

1. Start engine and run for 1-2 minutes, then turn engine off. Depress brake pedal several times slowly. If pedal goes down farthest on first time, but gradually rises after second or third time, power brake unit is airtight.
2. With engine stopped, depress brake pedal several times using normal pressure. Pedal should be low when first depressed. On consecutive applications, pedal height should gradually rise. If pedal height does not increase, check for air leaks.

PROPORTIONING VALVE

Attach and bleed pressure gauge set. Raise master cylinder pressure and check rear wheel pressure. See **PROPORTIONING VALVE PRESSURE SPECIFICATIONS** table. When inspecting fluid pressure, check left front and right rear together, then check right front and left rear together. If rear cylinder pressure is incorrect, replace ABS actuator. See appropriate ANTI-LOCK article in BRAKES. Remove pressure gauge set. Bleed brake system and check for leaks.

PROPORTIONING VALVE PRESSURE SPECIFICATIONS

Application	Master Cylinder Pressure - psi (kg/cm ²)	Rear Wheel Cylinder Pressure - psi (kg/cm ²)
Low Pressure Reading	497 (35)	497 (2-35)
High Pressure Reading	1138 (80)	749 (52)

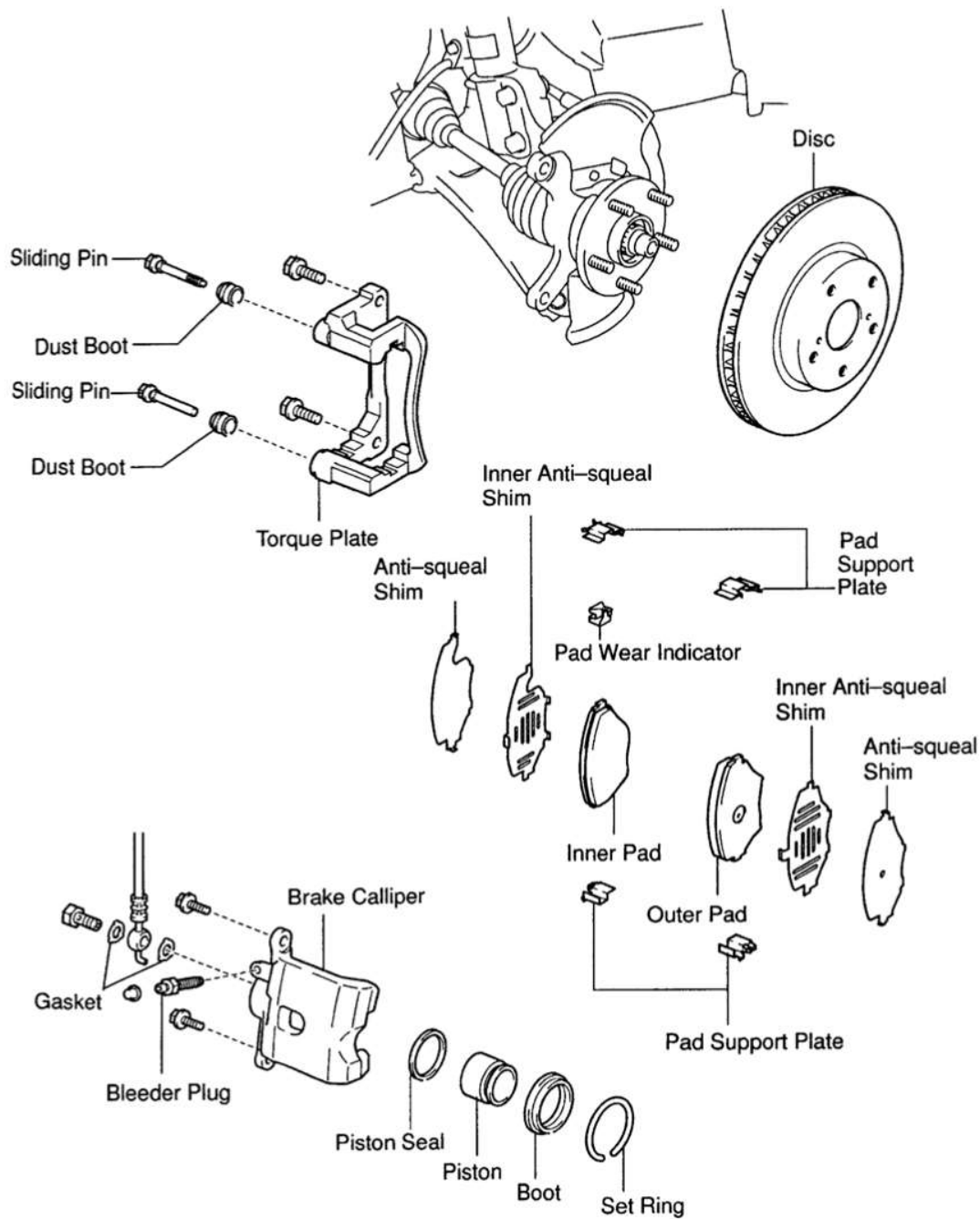
REMOVAL & INSTALLATION

FRONT DISC BRAKE PADS

NOTE: Pushing piston into caliper bore will force fluid back into master cylinder reservoir. Remove reservoir cap when compressing caliper piston.

Removal & Installation

1. Raise and support vehicle. Remove front wheel. Hold sliding pin on bottom and loosen installation bolt. Remove installation bolt and rotate caliper upward. Suspend caliper aside with wire.
2. Remove pads, 4 anti-squeal shims pad support plates, and wear indicator See **Fig. 3** .
3. Seat pistons using a hammer handle or equivalent. Slide NEW pads and anti-rattle shims into caliper. Check reservoir fluid level. To install, reverse removal procedure. Tighten lower caliper bolt to specification. See **TORQUE SPECIFICATIONS**



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Fig. 3: Exploded View Of Front Brake Caliper Assembly (RAV4)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FRONT BRAKE CALIPER

Removal & Installation

1. Raise vehicle and remove wheels. Disconnect flexible brake hose from caliper. Plug hose to prevent fluid spillage. Remove caliper mounting bolts or slide pins as necessary.
2. Pivot caliper up to clear edge of disc. Slide caliper off main pin. On all other models, remove caliper from knuckle or torque plate. To install, reverse removal procedure. Install boot end in groove of main pin.

FRONT BRAKE DISC

Removal & Installation

Remove caliper. See **FRONT BRAKE CALIPER** . Remove 2 bolts securing torque plate. See **Fig. 3** . Remove brake disc. To install, reverse removal procedure. Tighten bolts and nut to specifications. See **TORQUE SPECIFICATIONS** .

REAR BRAKE DRUM

Removal

Ensure parking brake is released. Raise and support vehicle. Remove wheel. Remove set screws from brake drum (if equipped). Pull drum from axle flange. It may be necessary to loosen brake shoe adjuster before removing drum.

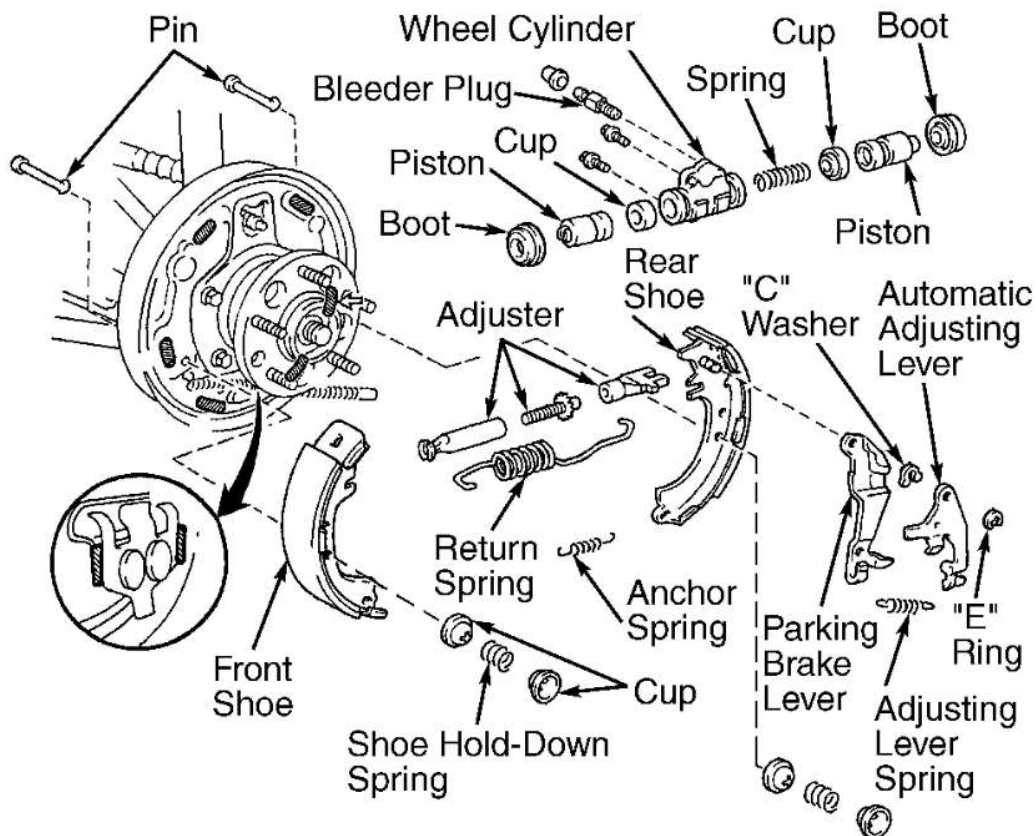
Installation

Measure inside diameter of brake drum and diameter of brake shoes. Turn brake adjuster until difference between diameters is .024 in. (.60 mm). Install brake drum and adjust brakes, if necessary.

REAR BRAKE SHOES

Removal & Installation

1. Remove brake drum. See **REAR BRAKE DRUM** . Disconnect return spring from both shoes. Remove hold-down spring, cups and pin from front shoe. Disconnect anchor spring, and remove front shoe. Remove anchor spring from rear shoe.
2. Remove rear shoe hold-down spring, cups and pin. Disconnect parking brake cable from brake lever. Remove rear shoe with adjuster. See **Fig. 4** .
3. To install, reverse removal procedure. Apply lithium soap-base glycol grease and high-temperature grease to moving parts (DO NOT get grease on brake shoe linings or drum).
4. Check operation of automatic adjuster by moving parking brake lever of rear shoe back and forth, and ensure that adjuster turns. Adjust parking brake-to-drum clearance to .024 in. (.60 mm). Bleed system and check for leaks.



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Fig. 4: Exploded View Of Rear Drum Brake Assembly (RAV4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REAR WHEEL CYLINDER

Removal & Installation

With brake drum and shoes removed, disconnect hydraulic line from wheel cylinder. Remove 2 mounting bolts and remove wheel cylinder. To install, reverse removal procedure. Adjust brakes and bleed system. See **BLEEDING BRAKE SYSTEM**.

MASTER CYLINDER

Removal & Installation

1. Disconnect fluid level warning switch connector. Remove fluid from master cylinder with syringe.
2. Disconnect brake lines and 3-way line connector from master cylinder. If equipped with M/T, disconnect

clutch reservoir hose. On all models, remove 2 bolts and master cylinder.

3. Prior to installation, adjust length of brake booster push rod if necessary. See **POWER BRAKE UNIT PUSH ROD** under ADJUSTMENTS. If booster push rod is adjusted, remove 1 gasket before installing master cylinder.
4. Install master cylinder in reverse of removal procedure. Use NEW gasket. Fill and bleed system. Check for leaks and adjust pedal, if needed. Bleed clutch system, if equipped.

POWER BRAKE UNIT

Removal & Installation

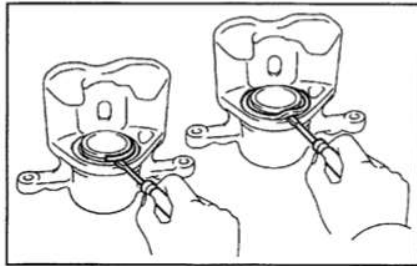
1. Remove master cylinder. See **MASTER CYLINDER** . Disconnect vacuum hose. Remove brake pedal return spring, clip and clevis pin. Remove 4 nuts, clevis pin, brake booster and gasket.
2. Install power brake unit. Install NEW gasket to power brake unit. Install clevis to operating rod. Attach clevis pin, clip and return spring. Adjust push rod length. See **POWER BRAKE UNIT PUSH ROD** under ADJUSTMENTS.
3. Install master cylinder with NEW gasket. Connect vacuum hose. Fill master cylinder. Bleed system and check for leaks. See **BLEEDING BRAKE SYSTEM** . Adjust brake pedal, if necessary.

OVERHAUL

NOTE: When overhauling caliper, if piston bores are pitted or scored beyond repair by light honing, replace entire assembly.

FRONT BRAKE CALIPER

NOTE: For overhaul of front brake calipers, see **Fig. 3** and **Fig. 5** . Install caliper components in reverse of removal procedure. Fill and bleed system. See **BLEEDING BRAKE SYSTEM** .



1. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT

Using a screwdriver, remove the cylinder boot set ring and cylinder boot.

2. REMOVE PISTON

- (a) Put a piece of cloth or equivalent between the piston and the caliper.
- (b) Use compressed air to remove the piston from the cylinder.

CAUTION:

Do not place your fingers in front of the piston when using compressed air.

3. REMOVE PISTON SEAL

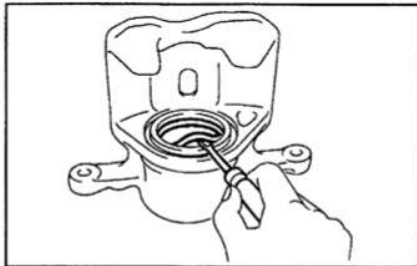
Using a screwdriver, remove the piston seal.

4. REMOVE SLIDING PINS AND DUST BOOTS

- (a) Remove the 2 sliding pins from the torque plate.
- (b) Remove the 2 dust boots.

5. INSPECT CYLINDER BORE

Inspect cylinder bore for rust or scoring. Inspect piston for damage. Replace if necessary.



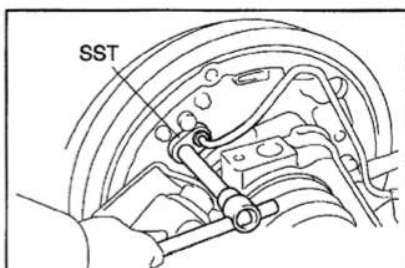
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Fig. 5: Front Brake Caliper Overhaul Procedure

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REAR WHEEL CYLINDERS

NOTE: For overhaul of rear wheel cylinders, see Fig. 4 and Fig. 6. Install wheel cylinder components in reverse of removal procedure. Fill and bleed system. See **BLEEDING BRAKE SYSTEM**.



1. REMOVE WHEEL CYLINDER

- (a) Using SST, disconnect the brake line. Use a container to catch the brake fluid.

SST 09023-00100

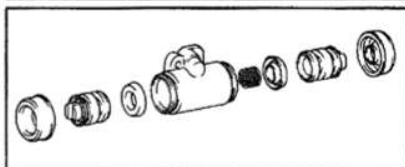
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

- (b) Remove the 2 bolts and the wheel cylinder.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

2. DISASSEMBLE WHEEL CYLINDER

- (a) Remove the 2 boots from the wheel cylinder.
- (b) Remove the 2 pistons and spring from the wheel cylinder.
- (c) Remove the 2 piston cups from each piston.



3. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage, and replace if necessary.

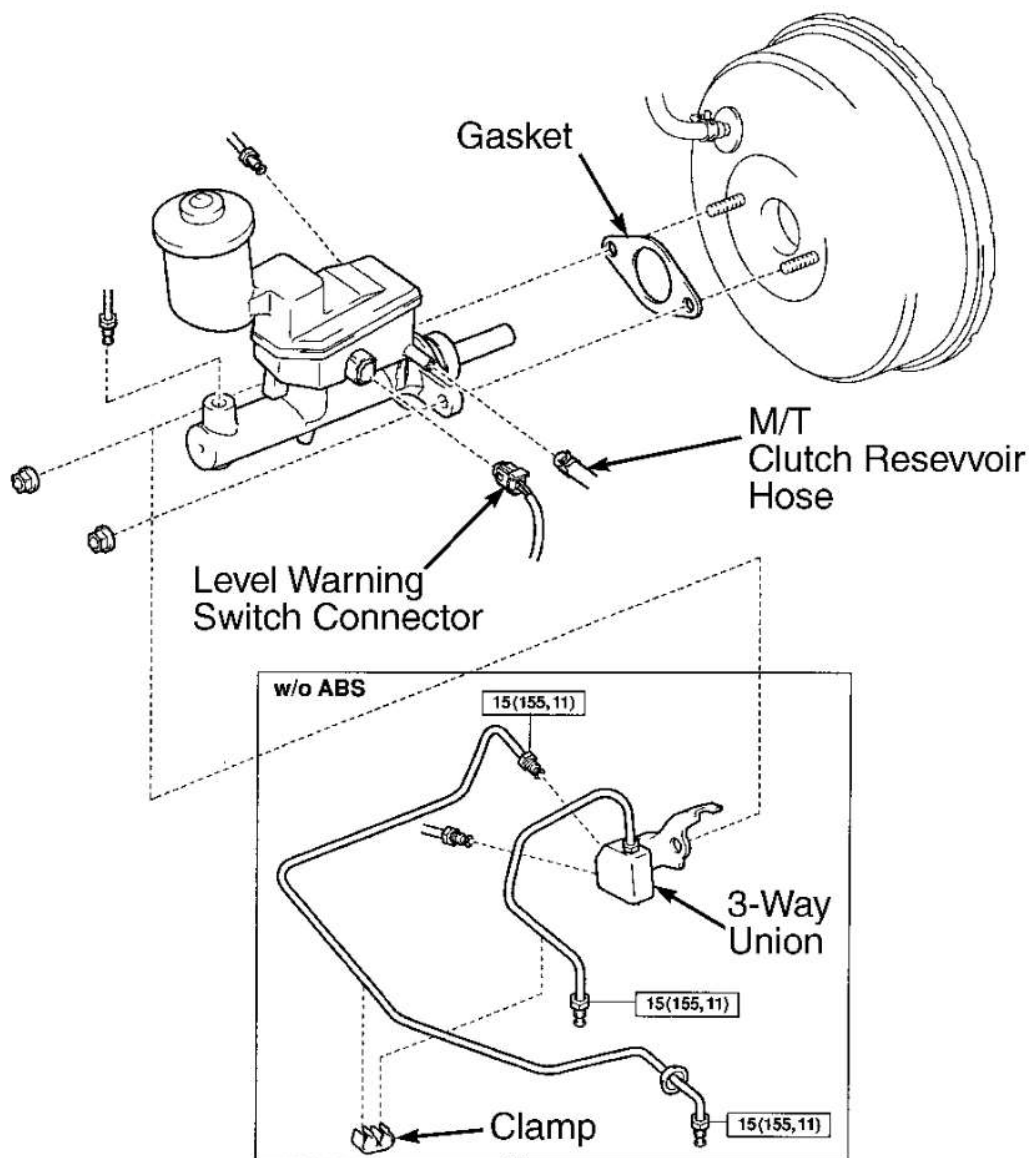
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Fig. 6: Rear Wheel Cylinder Overhaul Procedure

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

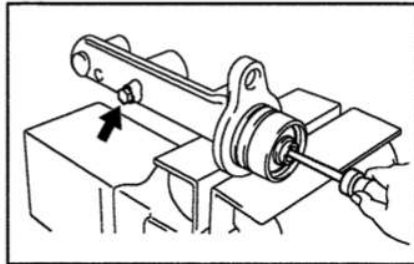
MASTER CYLINDER

NOTE: For overhaul of master cylinder assembly, see **Fig. 7** and **Fig. 8** . Install master cylinder components in reverse of removal procedure. Fill and bleed system. See **BLEEDING BRAKE SYSTEM** .



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Fig. 7: Exploded View Of Master Cylinder Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

**1. REMOVE RESERVOIR**

(a) Remove the set screw and pull out the reservoir.

Torque: 1.8 N·m (18 kgf·cm, 16 in.-lbf)

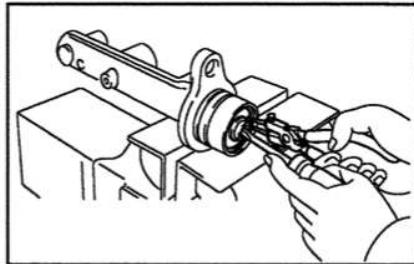
(b) Remove the cap and strainer from the reservoir.

2. REMOVE 2 GROMMETS**3. PLACE CYLINDER IN VISE****4. REMOVE PISTON STOPPER BOLT**

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT:

Tape the screwdriver tip before use.

Torque: 10 N·m (100 kgf·cm, 7 ft-lbf)**5. REMOVE 2 PISTONS AND SPRINGS**

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

HINT:

Tape the screwdriver tip before use.

(b) Remove the No. 1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE:

- If pulled out and installed at an angle, there is a possibility that the cylinder bore could be damaged.
- At the time of reassembly, be careful not to damage the rubber lips on the pistons.

(c) Place a rag and 2 wooden blocks on the work table and lightly tap the cylinder flange against the block edges until the piston drops out of the cylinder.

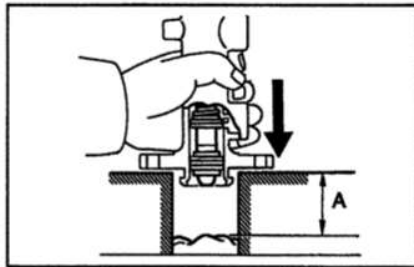
HINT:

Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING**2. INSPECT COMPONENTS FOR WEAR OR DAMAGE**

If necessary, clean or replace the master cylinder.



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Fig. 8: Master Cylinder Overhaul Procedure

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Application	Ft. Lbs. (N.m.)
Front Brake Caliper Bolt	19 (26)
Front Brake Caliper Torque Plate Bolt	78 (106)
Brake Hose-To-Brake Caliper Bolt	22 (30)
Brake Pedal Pivot Bolt/Nut	29 (39)
Brake Pedal Push Rod Lock Nut	19 (26)
Brakeline-To-Master Cylinder Nut	11 (15)

Brakeline-To-Wheel Cylinder Nut	11 (15)
Brakeline-To-3-Union Nut	11 (15)
Rear Axle Hub Nut (4WD)	159 (216)
Wheel Lug Nut	76 (103)
INCH Lbs. (N.m)	
Bleeder Screw	
Front Brake Caliper	71 (8)
Wheel Cylinder	73 (8.2)
Brake Booster Retaining Nut	115 (13)
Master Cylinder Mounting Nut	115 (13)
Master Cylinder Piston Stopper Bolt	89 (10.1)
Parking Brake Adjustment Lock Nut	48 (5.4)
Reservoir-To-Master Cylinder Set Screw	16 (1.8)
Wheel Cylinder Bolt	89 (10.1)

DISC & DRUM BRAKE SPECIFICATIONS

DISC BRAKE SPECIFICATIONS

Application	In. (mm)
Front Disc	
Original Disc Thickness	.984 (25)
Minimum Refinish Thickness	.906 (23)
Maximum Disc Runout	.002 (.05)
Brake Pad Thickness	
Standard Thickness	.472 (12)
Minimum Thickness	.039 (1.0)

DRUM BRAKE SPECIFICATIONS

Application	In. (mm)
Rear Brake Drum	
Brake Shoe-To-Drum Clearance	.024 (.61)
Drum Diameter	
Original Diameter	9.000 (228.60)
Maximum Diameter	9.080 (230.63)
Rear Brake Shoe Lining Thickness	
Standard Thickness	.197 (5.55)
Minimum	.039 (1.00)