

2000-06 BRAKES

Disc - X5 (E53)

DESCRIPTION & OPERATION

WARNING: Brake friction materials such as brake linings or pads contain abrasive fibers which can lead to illnesses. Do not create dust by grinding or sanding, or cleaning the pads with compressed air. Wash away or vacuum up brake dust. Avoid breathing any brake friction fibers or dust.

WARNING: Brake fluid is poisonous, highly corrosive and dangerous to the environment. Wear safety glasses and rubber gloves when working with brake fluid. Do not siphon brake fluid with your mouth. Use a siphon system dedicated to brake fluid only. Immediately clean away any fluid spilled on painted surfaces and wash with water. Dispose of brake fluid properly.

CAUTION: Do not reuse self-locking nuts, bolts or fasteners. They are designed to be used only once and may fail if reused. Always replace them with new self-locking nuts. Ensure cleanliness and only use rags which do not lose lint. Ensure that no oils or grease enter the brake system. These substances would cause complete failure of the entire brake system. When cleaning brake components with brake cleaning fluid, none must enter the brake system.

NOTE: For information on Anti-Lock Brake Systems (ABS), see [ANTI-LOCK/TRACTION CONTROL](#) article.

The brake system is one of the most important safety systems on any motor vehicle. For this reason it is necessary to exercise particular caution when working on the brake system and to comply with all instructions.

Brake system is hydraulically-operated, using a tandem master cylinder and power brake booster. Some models use a power steering pump driven booster. All models are equipped with single piston front and rear disc brake calipers. A brake pressure regulator is used to reduce fluid pressure to rear brakes.

Parking brake is cable actuated on rear brake and consists of internally mounted parking brake shoes. Basic adjustment of the parking brake is required whenever:

1. Brake shoes are replaced.
2. Brake discs are replaced.
3. Bowden cable is replaced.
4. Bowden cable guide tube is replaced.
5. Adjusting unit is reset.

6. Actuating stroke is excessive.

BLEEDING BRAKE SYSTEM

BLEEDING PROCEDURES

CAUTION: Use only clean brake fluid. Ensure no dirt or other foreign matter contaminates brake fluid. DO NOT mix different brands of brake fluid, as they may not be compatible. DO NOT spill brake fluid on car, as it will damage paint. If brake fluid contacts paint, immediately flush with water.

CAUTION: The 4.6is with M62S engine requires brake fluid DOT4 (low viscosity). All other models can be filled with the same brake fluid.

NOTE: Check relevant operating instructions for each device. Charging pressure should not exceed 29 PSI (2 bar).

1. Connect BMW Diagnosis and Information System (DIS).
2. Call up service function Bleeding ABS/DSC3 Hydraulics.
3. Connect bleeding unit to expansion tank and switch on.
4. To flush system completely see **FLUSHING BRAKE SYSTEM COMPLETELY**.
5. To only bleed front or rear system see **BLEEDING FRONT OR REAR-AXLE BRAKE CIRCUIT**.
6. Switch off bleeder unit and disconnect from expansion tank.
7. Check brake fluid level.

NOTE: Take care of rubber gasket in lid.

8. Close expansion tank.

Flushing Brake System Completely

1. Connect bleeder hose with container to bleed valve on rear right brake caliper.
2. Open bleed valve and flush until clear, bubble-free brake fluid emerges.
3. Close bleeder valve.
4. Follow same procedure at rear left, front right, then front left calipers.

Bleeding Front Or Rear-Axle Brake Circuit

1. Connect bleeder hose with container to bleed valve on right brake caliper.
2. Open bleed valve.
3. Run bleeding routine with BMW Diagnosis and Information System (DIS) with bleeder valve open.
4. After running routine, press brake pedal 5 times to stop. Clear, bubble-free brake fluid must flow out.

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5. Close bleeder valve.
6. Repeat procedure at left caliper.

Testing And Bleeding Brakes E53

TESTING AND BLEEDING BRAKES E53 SPECIFICATIONS

Leak test with engine stopped: if applicable discharge vacuum reservoir by operating brake pedal firmly about 10 times		
Approx. force on pedal	approx. N	500
equals approx. line pressure	approx. bar	33
Max. pressure drop within 2 min.	%	8
Brake booster function test (with engine running)		75 ... 90
Approx. force on pedal	approx. N	200
Line pressure	bar	

ADJUSTMENTS

PARKING BRAKE

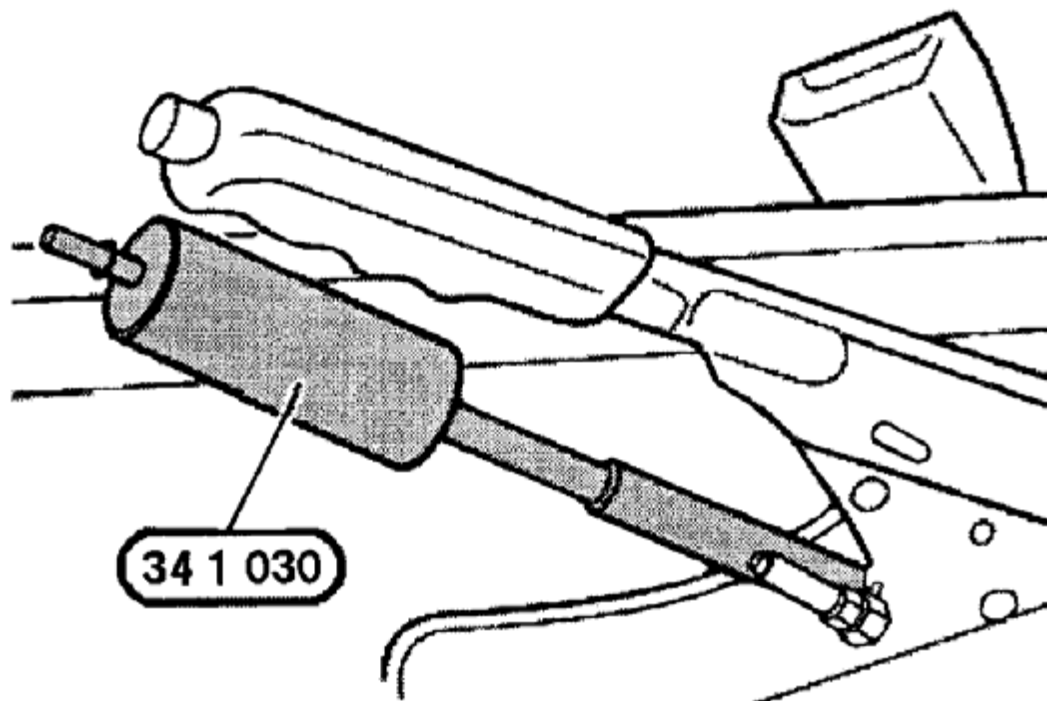
NOTE: Accurate adjustment of the parking brake is only possible if the Bowden cables and all moving parts move easily and function correctly.

Parking brake adjustment is necessary when:

- Replacing parking brake shoes.
- Replacing brake discs.
- Resetting adjustment unit
- Excessive actuation stroke (10 teeth).
- Replacing parking brake Bowden cables.

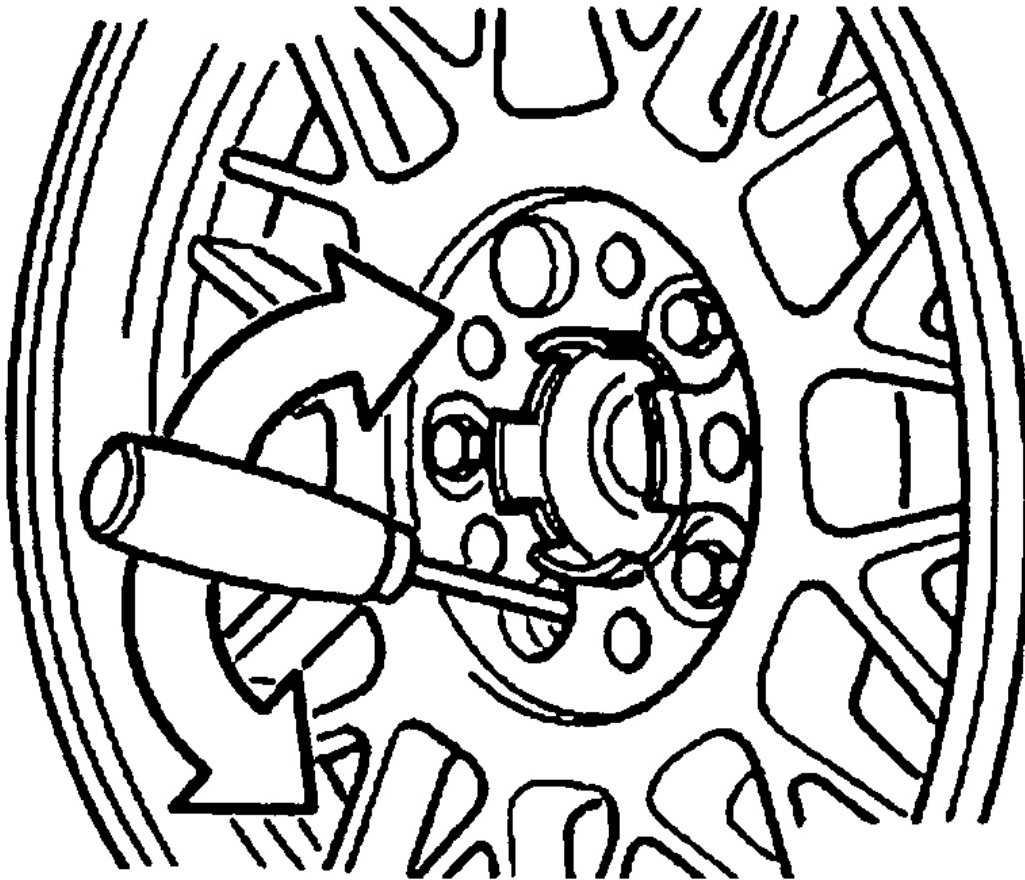
Basic Setting

1. Lift out dust cover.
2. Using special tool 34 1 030, release lock nuts and completely loosen Bowden cables. See **Fig. 1**.
3. Completely remove one wheel stud on each wheel.
4. Rotate wheel until open hole is located at bottom.
5. Insert screwdriver into rotor inspection hole and turn adjusting screw until it is no longer possible to turn wheel. See **Fig. 2**.
6. Back off adjusting screw 12 notches.



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Fig. 1: Loosening Parking Brake Bowden Cables
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 2: Turning Adjusting Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Setting Bowden Cables

1. After basic setting has been completed, the adjustment nuts must be uniformly hand-tightened before the Bowden cables are adjusted.
2. Tighten parking brake lever 5 times to approximately 400 N hand-lever force with the release button pressed.

Setting By Hand

1. Apply 2 teeth of parking brake lever and adjust adjusting nuts until braking action begins.
2. Release parking brake lever. It must be possible to turn wheels easily.
3. Switch ignition on. Indicator light must not be on when parking brake lever is released. At the first tooth

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with no breaking effect, the indicator light may be lit. At the second tooth the light must be lit. If not the switch contact on the lever must be adjusted.

Setting On Roller Dynamometer

WARNING: Use only brake dynamometers whose test speed is 3 mph (5 km/h) or less. Follow without fail the guidelines contained in the operating instructions of the relevant test stand manufacturer. Failure to do so may result in damage to the vehicle and the system and also personal injury.

CAUTION: The maximum test duration for four-wheel drive vehicles is 3 minutes per axle. If the test has to be repeated, the vehicle must be driven over a distance of at least .6 miles (1 km) to ensure the transfer case is sufficiently lubricated.

Check tires for damage. Check tire treads. Check tire pressures.

NOTE: On cars equipped with ASC+T or DSC, the system must be deactivated with the switch. ASC+T/DSC indicator lamp in instrument cluster must light up.

The brakes must be at normal operating temperature. To achieve this, brake the car several times to slightly warm and dry brake discs and drums.

1. With parking brake released, shift transmission into neutral. Wheel circumferential force at idle should be less than or equal to 150 N.
2. At first tooth, there is no brake force increase. Indicator lamp may be lit.
3. At second tooth, indicator lamp must be lit.
4. At third tooth, adjust parking brake cables until brake force indicator shows 500-550N.

Breaking In Duo-Servo Parking Brake

The following breaking in procedures are applicable in case of insufficient braking effect or after replacing brake discs and/or brake shoes.

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CAUTION: The maximum test duration for four-wheel drive vehicles is 3 minutes per axle. If the test has to be repeated, the vehicle must be driven over a distance of at least .6 miles (1 km) to ensure the transfer case is sufficiently lubricated.

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The brakes must be at normal operating temperature. To achieve this, brake the car several times to slightly warm and dry brake discs and drums.

1. On roller dynamometer, actuate parking brake lever until the wheel circumferential force on both wheels is at least 800 N. Release lever after approximately 40 seconds.

NOTE: Do not do this procedure if parking brake cables are not adjusted uniformly.

2. When driving on road (where possible on private property or quiet road), at approximately 40 km/h, apply parking brake lever until braking action can be felt. Pull up lever into next catch and drive on for approximately 400 m.
3. Repeat breaking in procedure if necessary. Allow brakes to cool down sufficiently.

TROUBLESHOOTING

Brake performance is mainly affected by 3 things: the level and condition of the brake fluid, the brake system's ability to create and maintain hydraulic pressure, and condition of the friction components. Tires and wheels are important parts of the braking system. Check tires for wear, flat spots, trueness and proper inflation. Visually check the hydraulic system starting at the master cylinder. Check all brake fluid lines and couplings for leaks, kinks, chafing and corrosion.

On vehicles with vacuum brake booster, check brake booster by pumping brake pedal approximately 12 times with the engine off. Then hold down brake pedal and start engine. Pedal should fall slightly. If not, check for any visible faults before suspecting a faulty brake booster. Check for strong vacuum at vacuum hose fitting on booster. Ensure vacuum check valve has one-way flow. For trouble shooting symptoms, see **SYMPTOM INDEX** table.

SYMPTOM INDEX

Symptom	See Symptom Table
Brakes Pull To One Side	<u>A</u>
Brakes Excessively Hot While Driving	<u>B</u>
Poor Braking Effect In Spite Of Great Force On Pedal, Brake Pedal Travel Normal	<u>C</u>
Poor Braking Effect In Spite Of Great Force On Pedal, Brake Pedal Travel Short	<u>C</u>
Poor Braking Effect In Spite Of Great Force On Pedal, Brake Pedal Travel Long	<u>C</u>
Brake Pedal Motion Too Soft & Spongy	<u>D</u>
Brake Pedal Travel Is Excessive Even Though Brakes Have Been Bled & Adjusted	<u>E</u>

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Uneven Pad Wear	<u>F</u>
Brake Pads Worn At Angle	<u>G</u>
Seized Brake Pads, Pad Does Not Move Off Brake Disc	<u>H</u>
Brakes Squeal Or Rattle	<u>I</u>
Brake Pedal Dead Travel Excessive	<u>J</u>
Jammed Piston In Brake Caliper	<u>K</u>
Pulsating Effect On Brake Pedal	<u>L</u>
Parking Brake Effect Insufficient	<u>M</u>

SYMPTOM A: BRAKES PULL TO ONE SIDE**SYMPTOM A: BRAKES PULL TO ONE SIDE**

Possible Cause	Solution
Tire Pressure Incorrect	Bring Tire To Correct Pressure
Unevenly Worn Tire Treads	Change Or Replace Tires
Oil On Pads	Replace Brake Pads, Check For Source Of Oil
Wrong Type Of Pads	Replace Brake Pads
Dirty Floating Caliper Recesses	Remove & Install Clean Floating Calipers
Guide Bolts Dirty Or Damaged	Replace Guide Bolts
Rear Wheel Alignment Adjusted Incorrectly	Check Wheel Alignment
Corrosion In Floating Calipers	Remove & Install, Repair Or Replace Floating Calipers
No Shock Absorber Action	Check Shock Absorbers & Replace If Necessary
Pad Of One Caliper Worn	Replace Brake Pads, Check Floating Caliper
Pad Glazed	Replace Brake Pads, Check Floating Caliper

SYMPTOM B: BRAKES EXCESSIVELY HOT WHILE DRIVING**SYMPTOM B: BRAKES EXCESSIVELY HOT WHILE DRIVING**

Cause	Solution
Vent Bore In Master Cylinder Clogged	Overhaul Master Brake Cylinder
No Play Between Push Rod & Master Cylinder Piston	Adjust Push Rod
Swollen Rubber Parts Due To Use Of Wrong Brake Fluid	Flush Brake System, Overhaul Master Brake Cylinder, Or Replace If Necessary
Vent Bore In Expansion Tank Clogged	Clean Expansion Tank
Corroded Floating Calipers	Remove & Install, Repair Or Replace Floating Calipers
Cross Spring Broken	Replace Cross Spring
Parking Brake Lever Not Released Fully	Check Parking Brake & Parking Brake Cables, Repair If Necessary

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SYMPTOM C: POOR BRAKING EFFECT**SYMPTOM C: POOR BRAKING EFFECT**

Travel	Cause	Solution
Normal	Brake Pads Oil-Splattered Or Burnt, Wrong Type Of Brake Pads	Replace Brake Pads
Short	Brake Booster Malfunctions- Engine Vacuum	Check Brake Booster System - Check Engine (Valves, Cylinder Head Gasket, Etc.)
Long	One Brake Circuit Failed Due To Leaks Or Damage	Find & Repair Leak(s) Or Damage

SYMPTOM D: BRAKE PEDAL MOTION TOO SOFT & SPONGY**SYMPTOM D: BRAKE PEDAL MOTION TOO SOFT & SPONGY**

Cause	Solution
Air In Braking System	Top Up Or Change Brake Fluid, Bleed Brake System
Insufficient Brake Fluid In Expansion Tank	Top Up Or Change Brake Fluid, Bleed Brake System
Overheated Brake Fluid, Vapor Lock Due To Excessive Water Content In Brake Fluid Or Excessive Brake Loads	Top Up Or Change Brake Fluid, Bleed Brake System

SYMPTOM E: BRAKE PEDAL TRAVEL EXCESSIVE**SYMPTOM E: BRAKE PEDAL TRAVEL EXCESSIVE**

Cause	Solution
Primary Cup In Master Cylinder Damaged	Overhaul Or Replace Brake Master Cylinder
Separating Cups On Floating Piston Of Tandem-Brake, Master Cylinder Leak	Overhaul Or Replace Brake Master Cylinder
Leak In Braking System	Find & Repair Leak(s)

SYMPTOM F: UNEVEN PAD WEAR**SYMPTOM F: UNEVEN PAD WEAR**

Cause	Solution
Wrong Type Of Pads/Liners	Replace Brake Pads
Dirty Floating Caliper Recesses, Damaged Caps	Remove & Install, Repair Or Replace Floating Calipers
Corrosion In Floating Calipers Or Wheel Cylinders	Remove & Install, Repair Or Replace Floating Calipers
Swollen Rubber Ring For Piston Control	Remove & Install, Repair Or Replace Floating Calipers

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SYMPTOM G: BRAKE PADS WORN AT ANGLE**SYMPTOM G: BRAKE PADS WORN AT ANGLE**

Cause	Solution
Wheel-Bearing Play Excessive	Replace Wheel Bearings
Brake Disc Not Aligned With Floating Caliper	Check Floating Caliper Installation
Corrosion In Floating Calipers	Remove & Install, Repair Or Replace Floating Calipers
Angular Brake-Disc Wear	Grind Or Replace Brake Discs
Pads Worn To Less Than Minimum Thickness	Replace Brake Pads
Spring Force Insufficient	Replace Spring
Guide Bolts Damaged	Replace Guide Bolts

SYMPTOM H: SEIZED BRAKE PADS**SYMPTOM H: SEIZED BRAKE PADS**

Cause	Solution
Dirty Floating Caliper Recesses, Damaged Caps	Remove & Install, Repair Or Replace Floating Calipers
Corrosion In Floating Calipers	Remove & Install, Repair Or Replace Floating Calipers
Vent Bore In Master Cylinder Clogged	Overhaul Or Replace Brake Master Cylinder

SYMPTOM I: BRAKES SQUEAL OR RATTLE**SYMPTOM I: BRAKES SQUEAL OR RATTLE**

Cause	Solution
Wrong Type Of Pads/Liners	Replace Brake Pads
Dirty Floating Caliper Recesses	Remove & Install Clean Floating Calipers
Spring Force Insufficient	Replace Spring
Brake Disc Not Aligned With Floating Caliper	Check Floating Caliper Installation
Brake-Disc Runout	Check Brake Disc for Runout, Replace If Necessary
Excessive Thickness Deviation Within Braking Surface	Measure Thickness Of Brake Disc, Grind Down Discs Or Replace
Pad Wear Excessive Or One-Sided	Replace Brake Pads
Rust Edges On Brake Discs	Grind Or Replace Brake Discs
Pad Loose	Replace Brake Pads
Wheel Bearing Play Excessive	Replace Wheel Bearings

SYMPTOM J: BRAKE PEDAL DEAD TRAVEL EXCESSIVE**SYMPTOM J: BRAKE PEDAL DEAD TRAVEL EXCESSIVE**

Cause	Solution
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Wheel Bearing Play Excessive	Replace Wheel Bearings
Brake Disc Not Aligned With Floating Caliper	Check Floating Caliper Installation
Break Disc Runout	Check Brake Disc For Runout, Replacing If Necessary
Excessive Thickness Deviation Within Braking Surface	Measure Thickness Of Brake Disc, Grind Down Discs Or Replace
Brake System Leaking	Find & Repair Leak(s)
Air In Braking System	Bleed Brakes
Wrong Type Of Pads	Replace Brake Pads Or Replace Brake Shoes

SYMPTOM K: JAMMED PISTON IN BRAKE CALIPER**SYMPTOM K: JAMMED PISTON IN BRAKE CALIPER**

Cause	Solution
Dirty Floating Caliper Recesses, Damaged Caps	Remove & Install, Repair Or Replace Floating Calipers
Brake Disc Not Aligned With Floating Caliper	Check Floating Caliper Installation
Corrosion On Pistons In Floating Calipers	Remove & Install, Repair Or Replace Floating Caliper

SYMPTOM L: PULSATING EFFECT ON BRAKE PEDAL**SYMPTOM L: PULSATING EFFECT ON BRAKE PEDAL**

Cause	Solution
Wheel Bearing Play Excessive	Replace Wheel Bearings
Brake Disc Not Aligned With Floating Caliper	Check Floating Caliper Installation
Brake Disc Runout	Check Brake Disc For Runout, Replace If Necessary
Excessive Thickness Deviation Within Braking Surface	Measure Thickness Of Brake Disc, Grind Down Discs Or Replace

SYMPTOM M: PARKING BRAKE EFFECT INSUFFICIENT**SYMPTOM M: PARKING BRAKE EFFECT INSUFFICIENT**

Cause	Solution
Parking Brake Shoes Oil-Splattered	Replace Parking Brake Shoes, Determine Cause Of Splattering
Excessive Dead Travel Between Brake Shoes & Brake Drums	Adjust Parking Brake
Excessive Dead Travel In Cables	Adjust Parking Brake
Cables Adjusted Incorrectly	Adjust Parking Brake
Corroded Transmitting Elements	Remove & Install Parking Brake & Expanding Locks, Check Bowden Cables & Replace If Necessary

TESTING

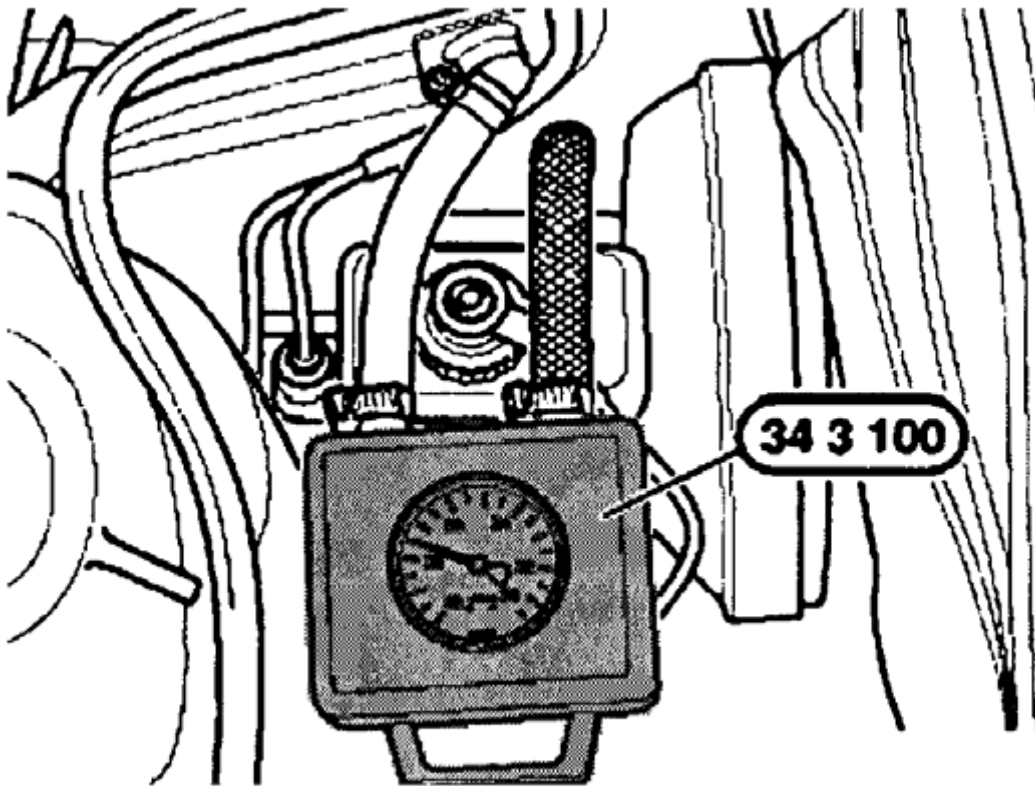
BRAKE BOOSTER

Low Pressure Test

1. Remove heater bulkhead. See **HEATER BULKHEAD**.
2. Pull hose off connection. Install vacuum tester 34 3 100 between connection and vacuum hose on non-return valve. See **Fig. 3**.
3. Start engine and check buildup of partial vacuum. Stop engine.
4. Press brake pedal to set a partial vacuum of no more than 11.6 PSI (.8 bar) and wait for value to stabilize.
5. When the brake pedal is not pressed, the partial vacuum is allowed to drop by maximum .8 PSI (.06 bar) over a test period of 1 minute.

If specified values are not reached:

1. Check line connections for vacuum seal.
2. Replace vacuum non-return valve.
3. Check seal between brake booster and brake master cylinder (sealing ring) for perfect condition and correct seating.
4. If the specified values are not achieved when the test is repeated, you must replace the brake booster.
5. After removing tester, reinstall heater bulkhead. See **HEATER BULKHEAD**.



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Fig. 3: Installing Vacuum Tester

Courtesy of BMW OF NORTH AMERICA, INC.

BRAKE WARNING LIGHT

Brake warning light is mounted on instrument panel. Turn ignition on and release parking brake. Verify light is off. Remove master cylinder filler cap. Warning light should come on. If warning light does not come on, check bulb and circuit connections.

PARKING BRAKE

1. At the first tooth, no braking effect should be present.
2. At the 2nd tooth, braking action can begin and the indicator light may be lit.
3. At the 3rd, tooth, braking action must begin and the indicator light must be lit.
4. At the 4th tooth, braking action increases.
5. At the 5th tooth, wheel circumferential force must be at least 1100 N at one of the two rear wheels, and at least 1000 N at the other wheel. Wheel circumferential force differential (left to right) maximum 30% from highest value (shortly before wheel lockup). A readjustment must be carried out in event of larger

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deviations of wheel circumferential force. See **PARKING BRAKE** under ADJUSTMENTS.

6. Braking with locked wheels must be possible with the parking brake.
7. The ABS/ASC warning lights, if on, will automatically switch off by switching off engine, waiting at least 30 seconds, restart engine and drive away. Warning lights will go out when speed exceeds 8 mph. (Fault codes will be retained in memory.)
8. The parking brake must be readjusted whenever the actuation stroke is greater than 10 teeth.

SERVICE BRAKE

NOTE: High-pressure and low-pressure tests (leakage test) must be performed with the engine switched off.

High-Pressure Test

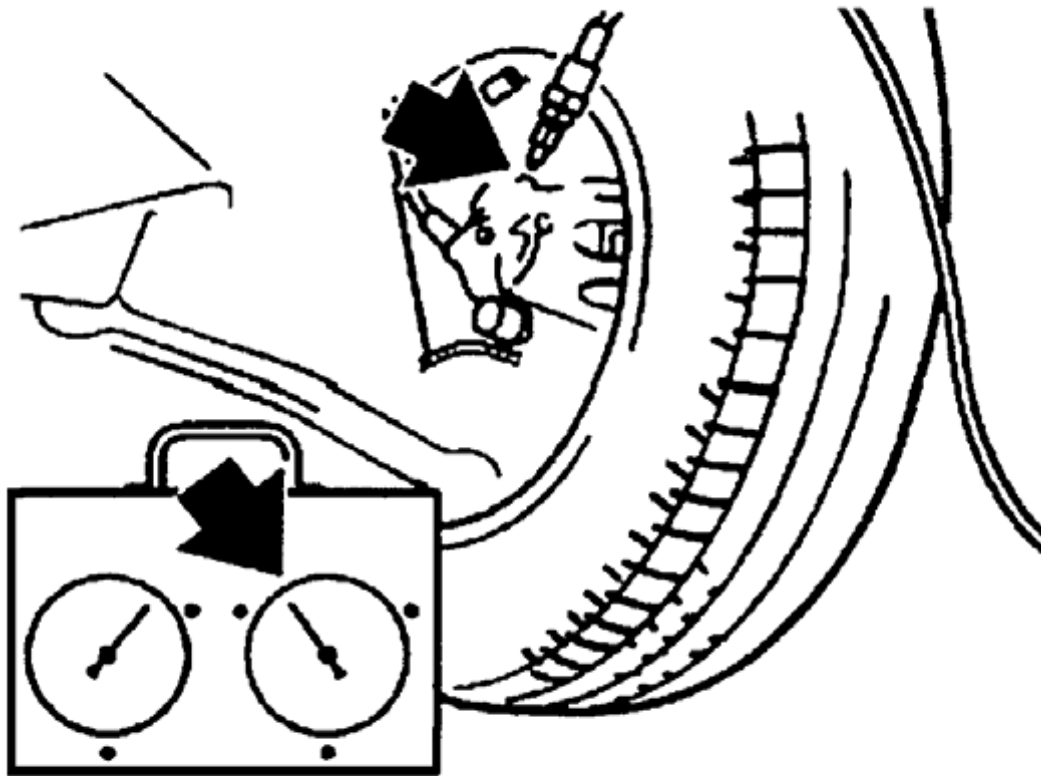
NOTE: Perform test on both brake circuits, front and rear.

1. Unscrew vent plug, connect pressure tester and vent. See **Fig. 4**.
2. Load brake pedal with a force of approximately 112 lbs. (500 N), and block pedal with pedal support. Line pressure should be approximately 479 PSI (33 bar).
3. After 2 minutes, pressure must not drop by more than 8 percent.
4. Perform low-pressure test.

Low-Pressure Test

NOTE: Perform test on both brake circuits, front and rear.

1. Reset pedal support until line pressure in brake system is equal to 30-72 PSI (2-5 bar). Car and measuring equipment must remain perfectly still as vibrations will distort the result.
2. Pressure should remain constant during five minute test.
3. Check all rubber parts in case of excessive pressure drop.
4. Bleed brake calipers after finishing test.



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Fig. 4: Connecting Pressure Tester
Courtesy of BMW OF NORTH AMERICA, INC.

THICKNESS OF BRAKE LINING

NOTE: The thickness of the outer brake linings can be determined without removing the wheels.

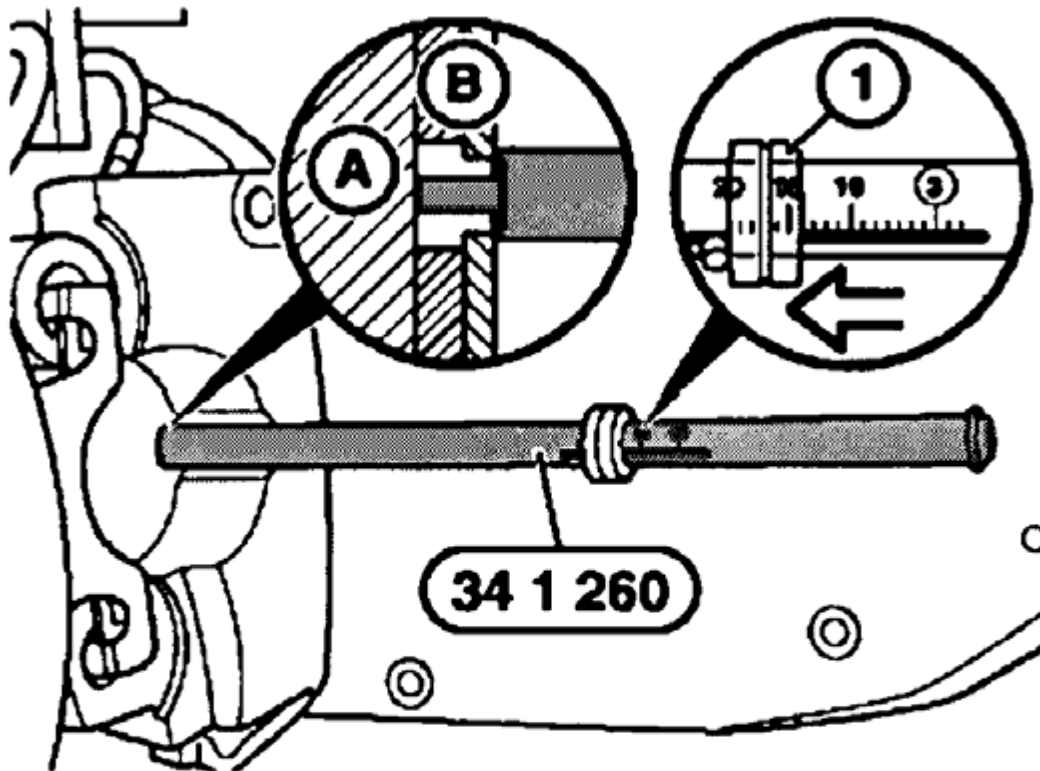
1. If necessary, move car until opening for brake lining wear indicator (brake lining) can be seen through rim styling.
2. Insert special tool (34 1 260) through rim into opening for brake lining wear indicator.
3. Press special tool onto brake lining. Slide ring (1) in direction of arrow as far as it will go and read off measured value. See **Fig. 5**.
4. Minimum thickness for all models is stamped in brake disc shell. Wear warning from residual lining thickness is 3 mm. Maximum machining limit per friction ring side is .8 mm. For minimum thickness see **BRAKE LINING MINIMUM THICKNESS** table.

BRAKE LINING MINIMUM THICKNESS

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Application	In. (mm)
Front	1.12 (28.4)
Rear	.72 (18.4)



(A) Brake disk

(B) Brake lining with backplate

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Fig. 5: Measuring Thickness Of Brake Lining
Courtesy of BMW OF NORTH AMERICA, INC.

REMOVAL & INSTALLATION

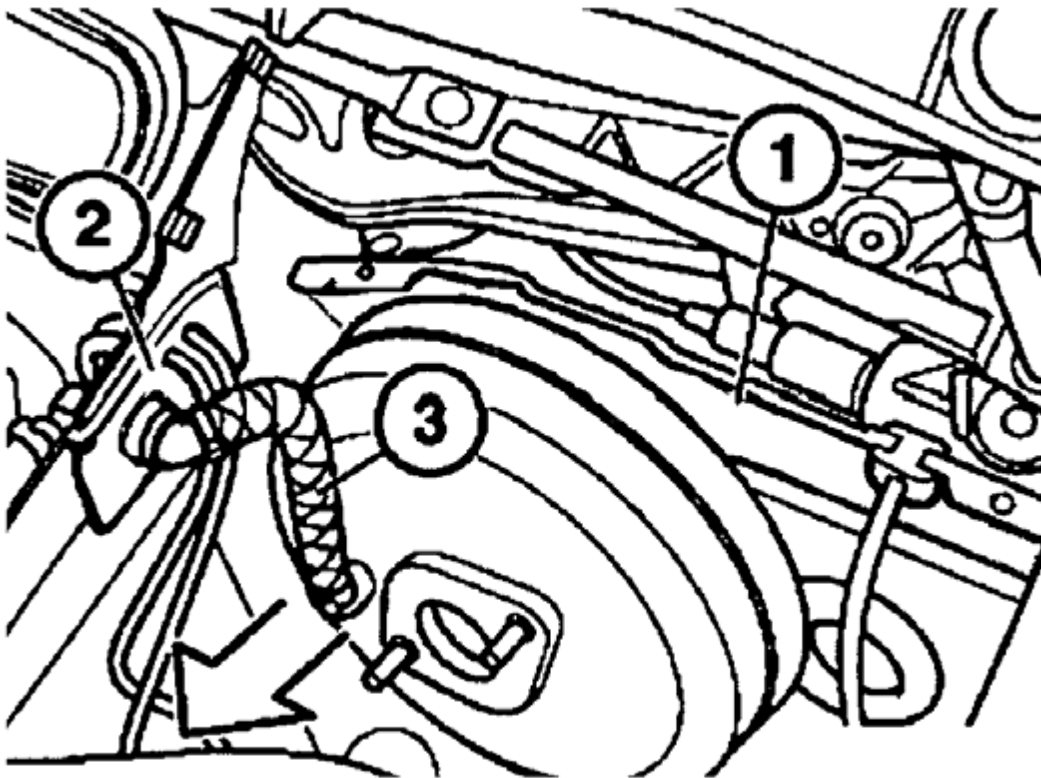
BRAKE BOOSTER

Removal

1. Remove the master cylinder. See **MASTER CYLINDER**.
2. Remove trim from pedal assembly.
3. Remove brake booster from brake pedal and from engine firewall.
4. Remove emergency siren with holder.
5. Force linkage of windshield wiper arms off wiper motor. Swivel out linkage to side.
6. Detach cover/cowl and fold out towards top.
7. Pull the vacuum hose (3) off of the brake unit. See **Fig. 6**.

CAUTION: Do not use any force when removing and installing the brake booster unit. The unit can be damaged under certain circumstances.

8. Carefully swing out the brake booster and remove towards top.



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Fig. 6: Removing Booster Components
Courtesy of BMW OF NORTH AMERICA, INC.

1. Carefully insert brake booster unit into place.
2. Push pedal assembly into place and replace self-locking nuts.
3. Balance of assembly is reverse of removal.

BRAKE BOOSTER NON-RETURN VALVE

Removal & Installation

1. Press the brake pedal several times to reduce the vacuum in the brake booster, making it easier to pull off the vacuum hose.
2. Remove heater bulkhead. See **HEATER BULKHEAD**.
3. Open hose clips and pull non-return valve out of brake unit and detach from vacuum hose.
4. To install, reverse removal procedure.

BRAKE BOOSTER VACUUM HOSE

Operation is identical to replacing non-return valve with the addition of removing vacuum hose on suction jet pump. See **BRAKE BOOSTER NON-RETURN VALVE**.

BRAKE DISCS

CAUTION: If the thickness of the brake discs drops below the minimum the discs must be replaced. Always replace discs in pairs. If the discs are replaced, you must also fit new brake pads.

Removal

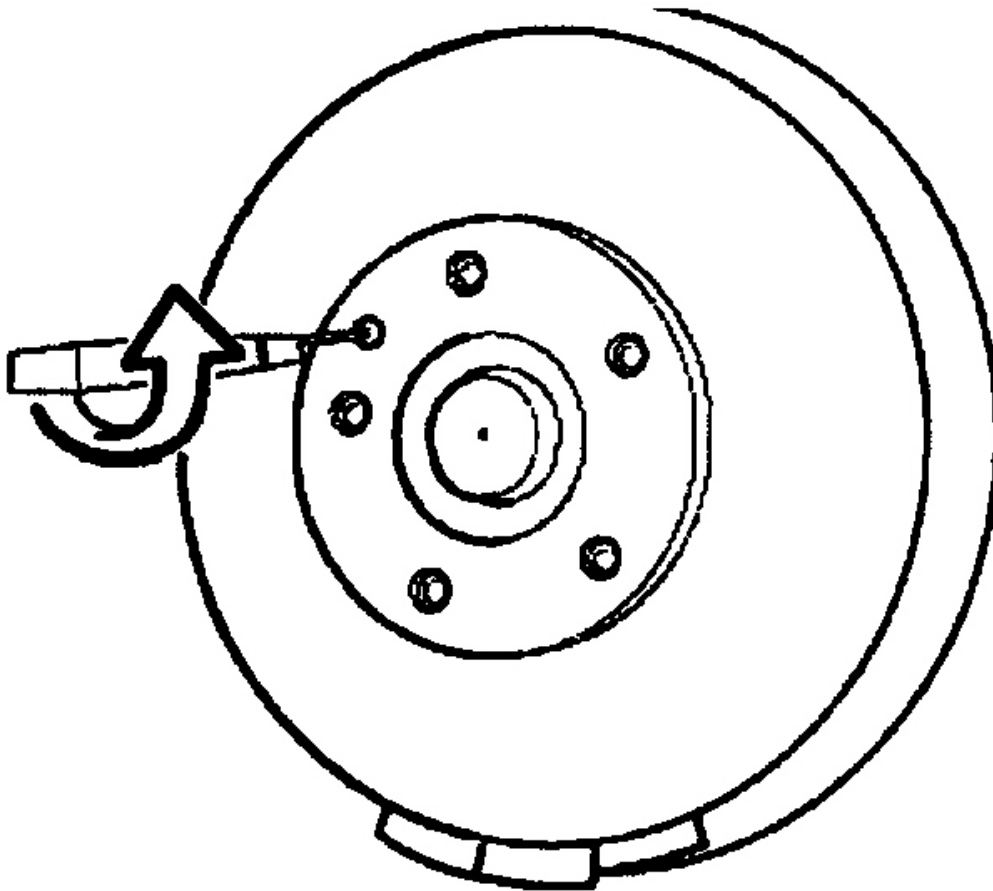
1. Raise and support vehicle. Remove wheel(s).
2. If necessary, remove and clean disc pads. See **BRAKE DISC PADS**.

NOTE: Brake hose remains connected.

3. Remove caliper mounting bolts and raise caliper off mounting assembly and suspend from vehicle with wire.

CAUTION: To release brake disc, do not strike friction ring with a hammer or similar. If necessary, carefully tap on base of brake disc chamber with a rubber mallet.

4. Unscrew bolts and take off brake disc. See **Fig. 7**.



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Fig. 7: Removing Brake Disc

Courtesy of BMW OF NORTH AMERICA, INC.

Installation

CAUTION: Internally ventilated brake discs are balanced. Never remove or reposition balance clips.

1. Thoroughly clean contact surface of brake disc at wheel hub. Remove traces of corrosion if necessary. Unevenness on contact surface may result in distortion of brake disc.
2. Install brake disc and tighten bolts to specification. See **TORQUE SPECIFICATIONS**.
3. If removed, install brake pads.

4. Check that brake hose has not been disconnected. If disconnected make sure it is positively attached.
5. Replace caliper and tighten screws to specification. See **TORQUE SPECIFICATIONS**.
6. Install wheels and bleed brakes if brake hose was disconnected.
7. If work was on rear brakes, adjust parking brake. See **PARKING BRAKE** under ADJUSTMENTS.

BRAKE DISC PADS

Removal

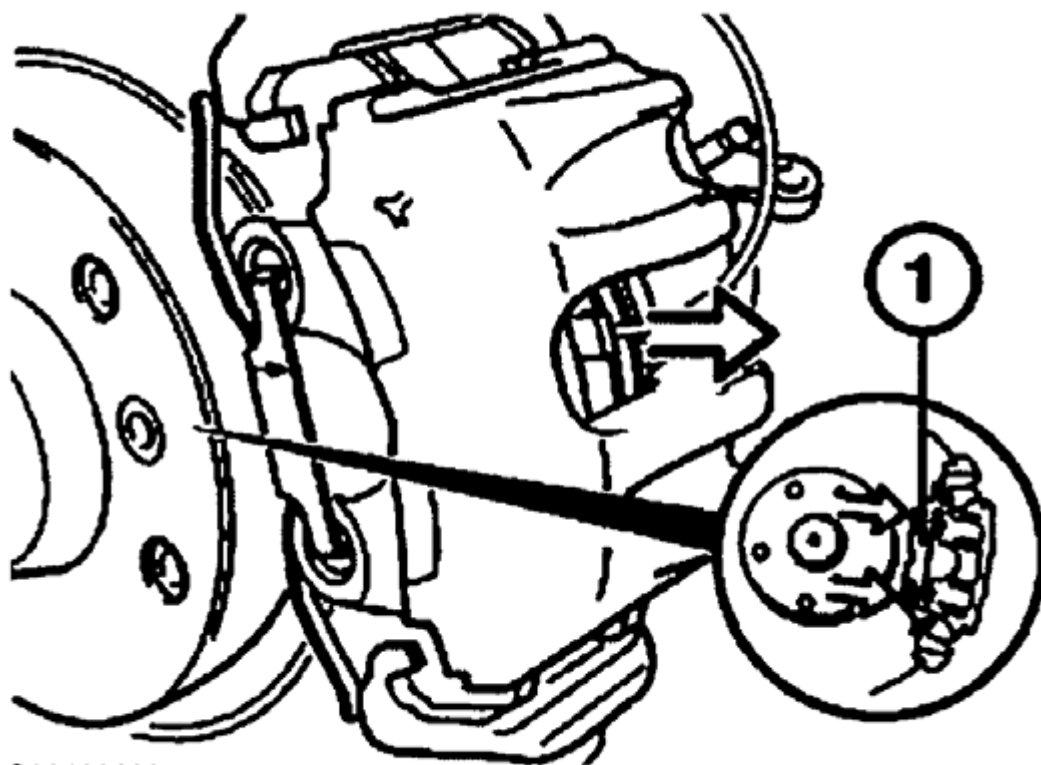
1. Raise and support vehicle. Remove wheel(s).
2. Lift out retaining spring (1). See **Fig. 8**.
3. On left front side, disconnect plug connection for brake lining wear indicator. On right rear side, disconnect plug connection for brake pad sensor.
4. On all sides, remove plastic plugs (2). See **Fig. 9**.
5. Lift brake hose out of bracket.
6. Release guide screws (1) with special tool 34 1 080. See **Fig. 10**. Withdraw brake caliper backwards.
7. Check threads. Replace all guide screws which are not in perfect condition.

CAUTION: When forcing piston back, pay attention to brake fluid level in expansion tank. Brake fluid that spills over will damage paintwork.

8. Turn piston fully back with special tool 34 1 050. See **Fig. 11**.
9. Remove outer brake pad. Inner brake pad is located with its spring in the piston.
10. Mark any worn brake pads. In the event of one-sided brake lining wear, do not change brake pads around.
11. New brake linings may only be installed if the brake disc thickness is greater than or equal to the minimum thickness. See **BRAKE SPECIFICATIONS**.
12. Clean brake pads.
13. Do not apply grease to brake pad backplate.

CAUTION: Dust sleeve must not come into contact with anti-squeak compound as this would cause dust sleeve to swell.

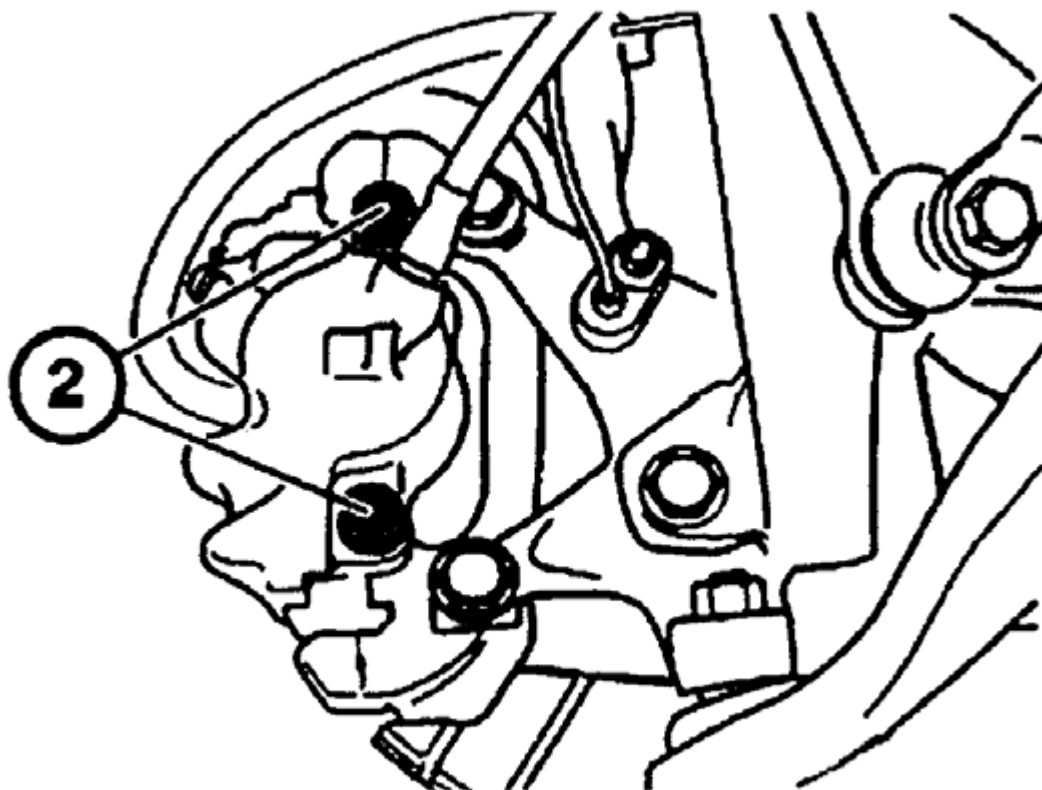
14. Check dust sleeve (1) for damage and replace if necessary. Clean contact face (2) of brake piston and apply a thin coating of anti-squeak compound. See **Fig. 12**.
15. Clean contact faces (1,2) of brake pad hammer heads/brake caliper housing and coat with anti-squeak compound. See **Fig. 13**.
16. Grease contact surfaces on brake caliper at top and bottom.
17. Clean contact face (3) of brake caliper and apply a thin coating of anti-squeak compound. See **Fig. 14**.
18. Clean contact face of brake caliper mounting bracket and apply a thin coating of anti-squeak compound.



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Fig. 8: Locating Retaining Spring

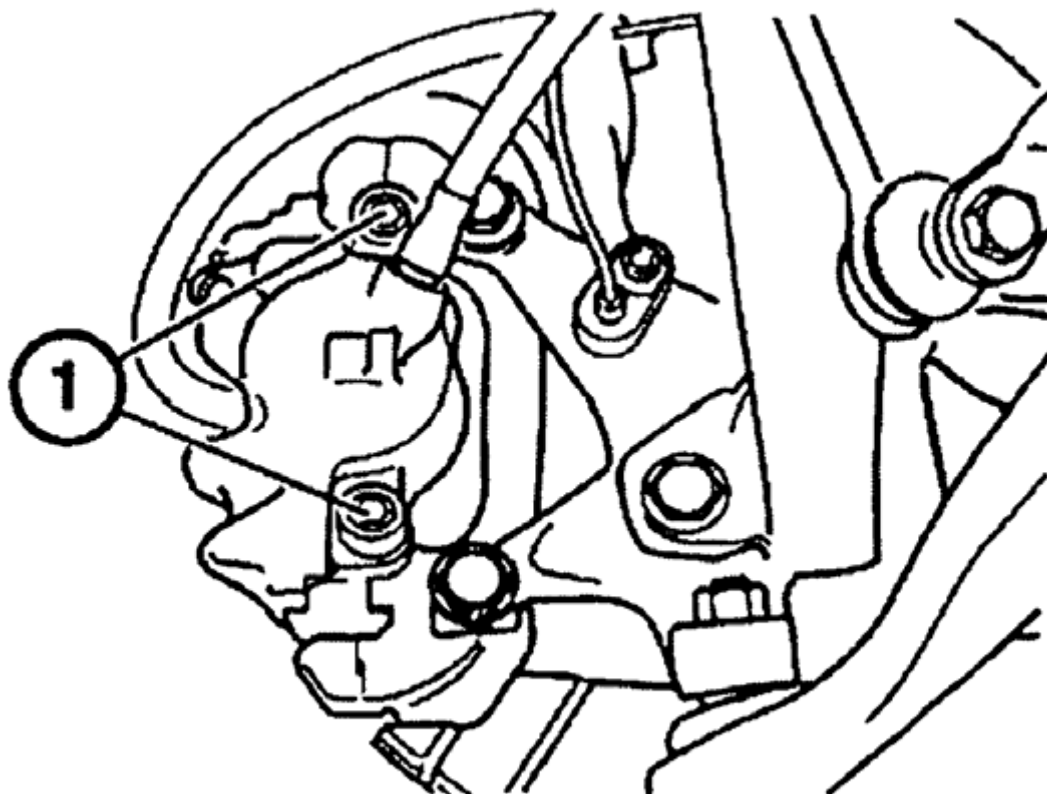
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 9: Locating Plastic Plugs

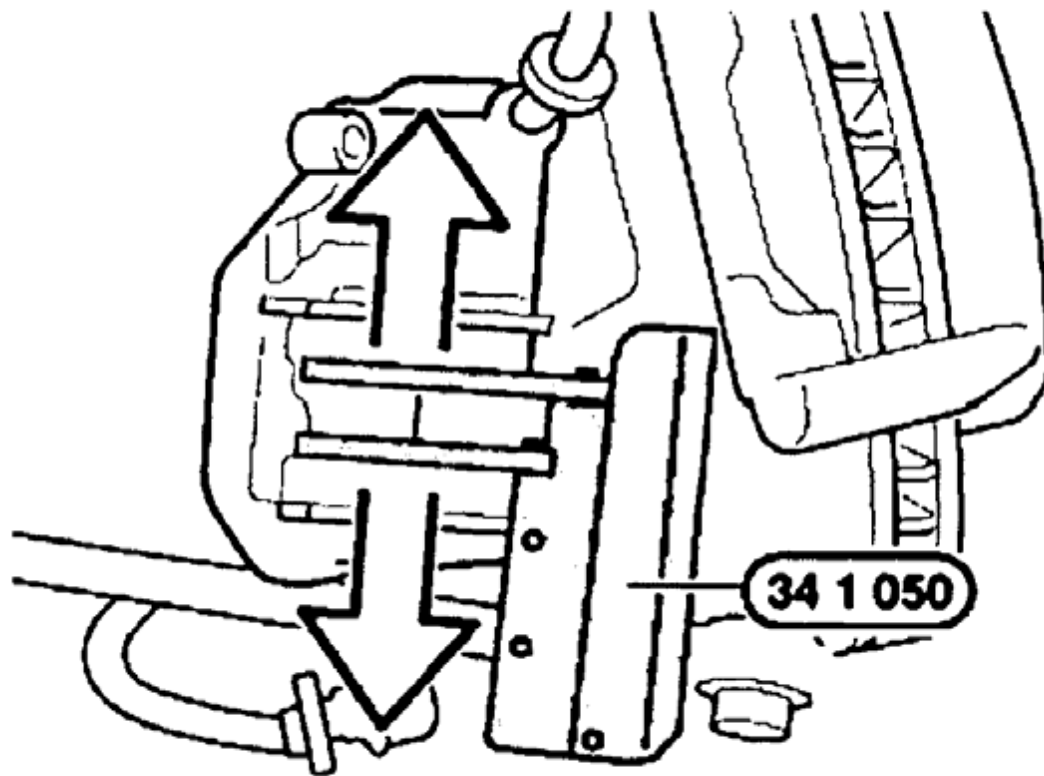
Courtesy of BMW OF NORTH AMERICA, INC.



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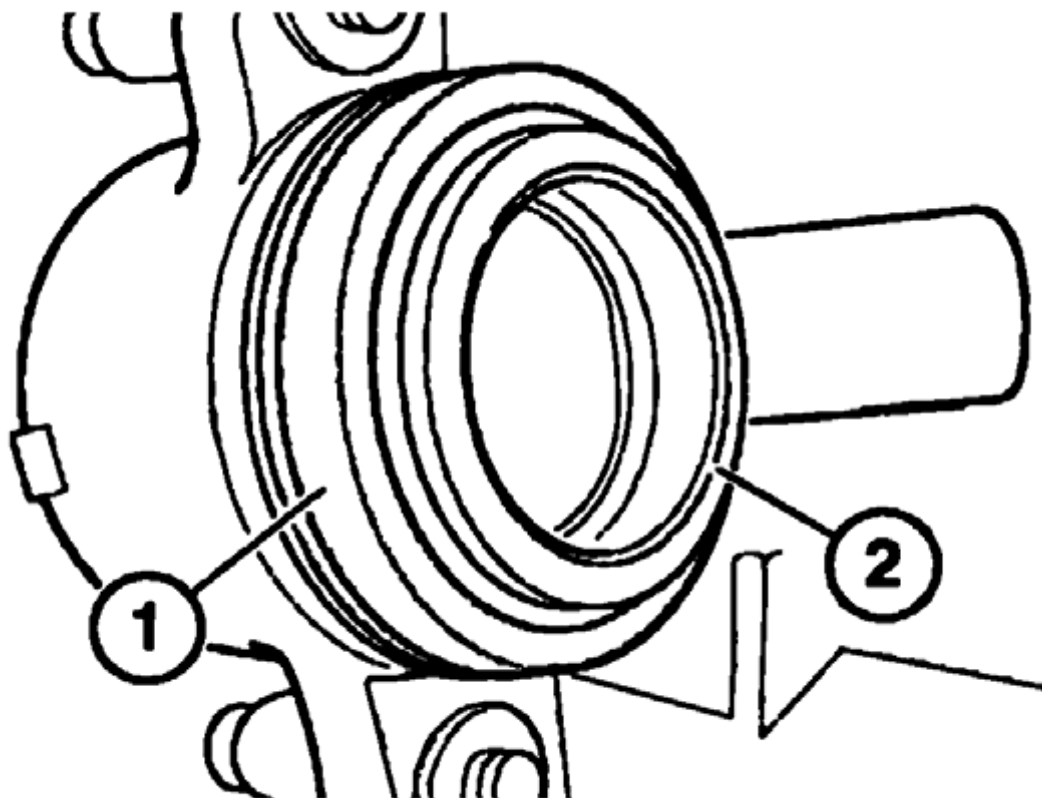
Fig. 10: Locating Guide Screws

Courtesy of BMW OF NORTH AMERICA, INC.



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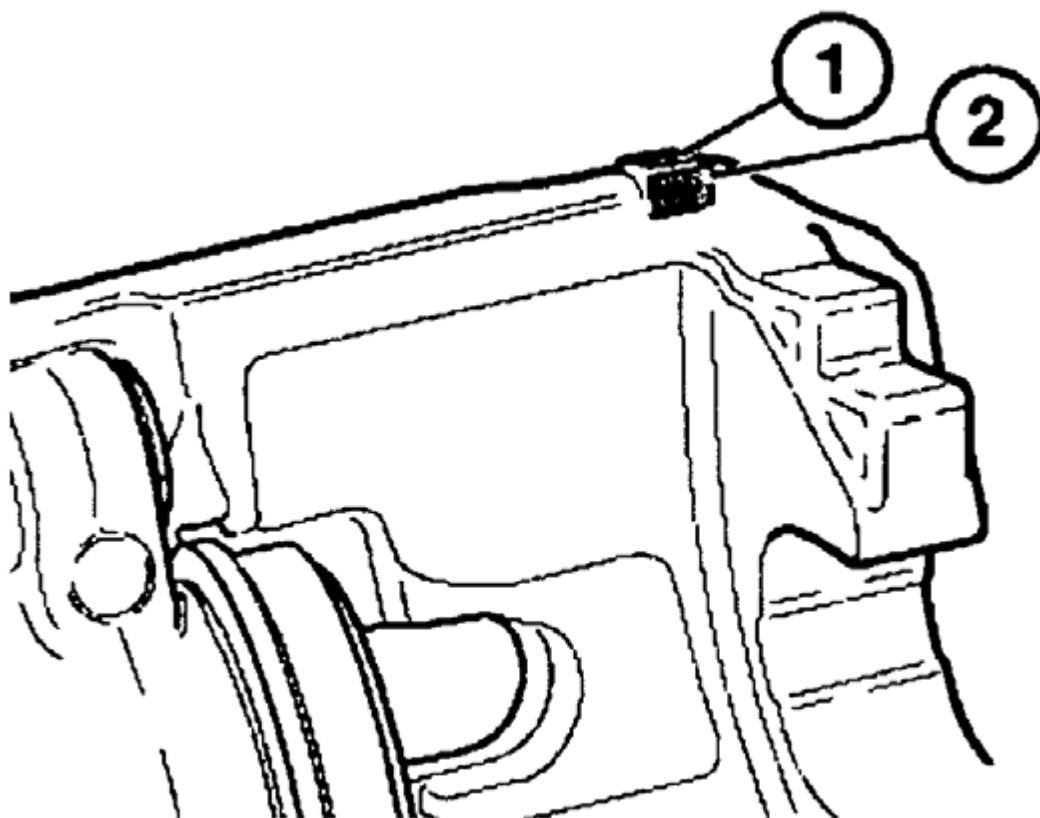
Fig. 11: Forcing Piston Back
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 12: Locating Dust Sleeve

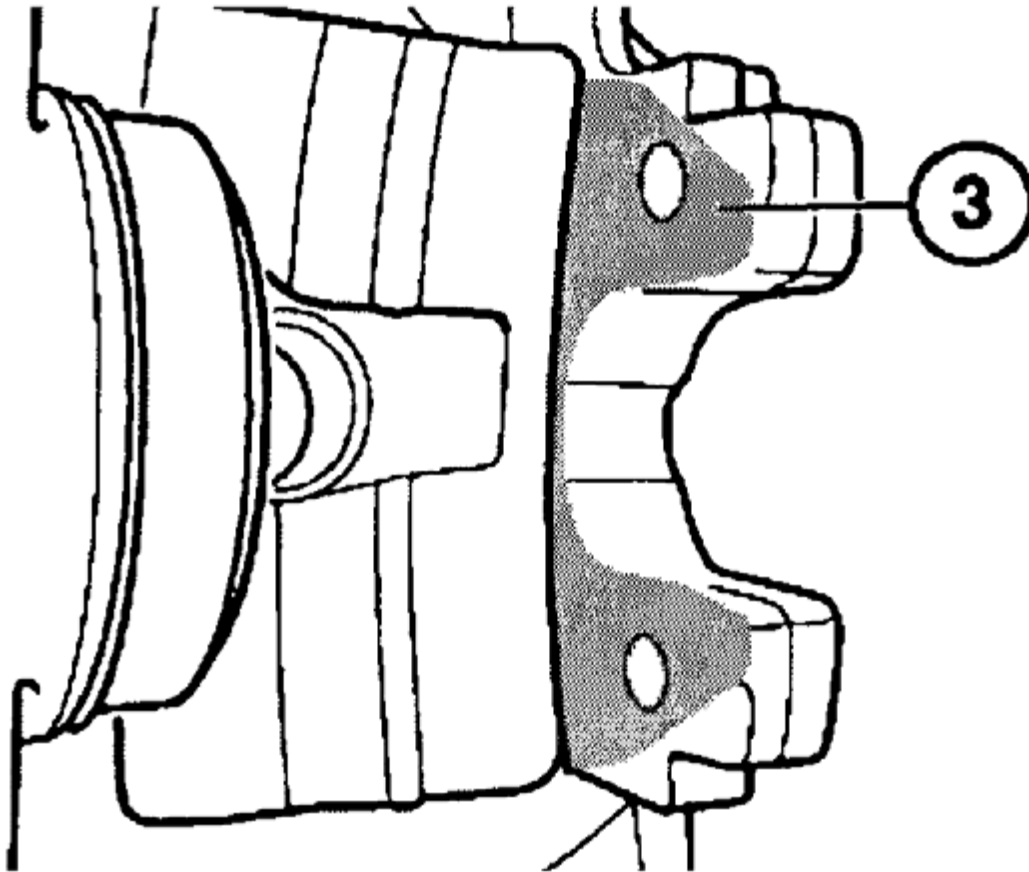
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 13: Locating Contact Faces

Courtesy of BMW OF NORTH AMERICA, INC.



G00103294

Fig. 14: Locating Contact Face Three
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

1. The piston side front brake pads are directional. Install brake pad with identification mark "L" on left and "R" on right side of vehicle.
2. Use only clean guide screws to install caliper. Do not grease. Tighten to specification. See **TORQUE SPECIFICATIONS**.
3. Make sure the brake hose is positively attached in the mounting fixture.
4. Install plastic plugs.
5. Connect plug connection for brake pad wear indicator in front and pad sensor in rear.
6. Fully depress brake pedal several times so that brake pads contact brake discs.
7. Bring brake fluid level up to "MAX" marking.

8. Hold ignition key for at least 30 seconds in position "1" without starting engine. This clears a fault entry in the RAM. This prevents the brake wear indicator lamp from lighting up again.

BRAKE EXPANSION TANK

Removal & Installation

1. Remove cover/microfilter.
2. Suck the brake fluid out of the expansion tank. Use a suction device used exclusively for drawing off brake fluid.
3. Unfasten plug connection and disconnect.
4. Pull supply hose (1) off of clutch hydraulic system, if equipped. See **Fig. 15**.
5. Press left and right retaining lugs apart.
6. On vehicles with a precharging pump for DSC, the supply hose must be secured in a vertical position to prevent fluid from emerging.
7. Lift out the expansion tank from the master brake cylinder by tilting it laterally.
8. Check rubber plug in master brake cylinder. No damage may be present.
9. Push the expansion tank vertically onto the master brake cylinder.
10. Connect hoses, fill expansion tank, and bleed system.

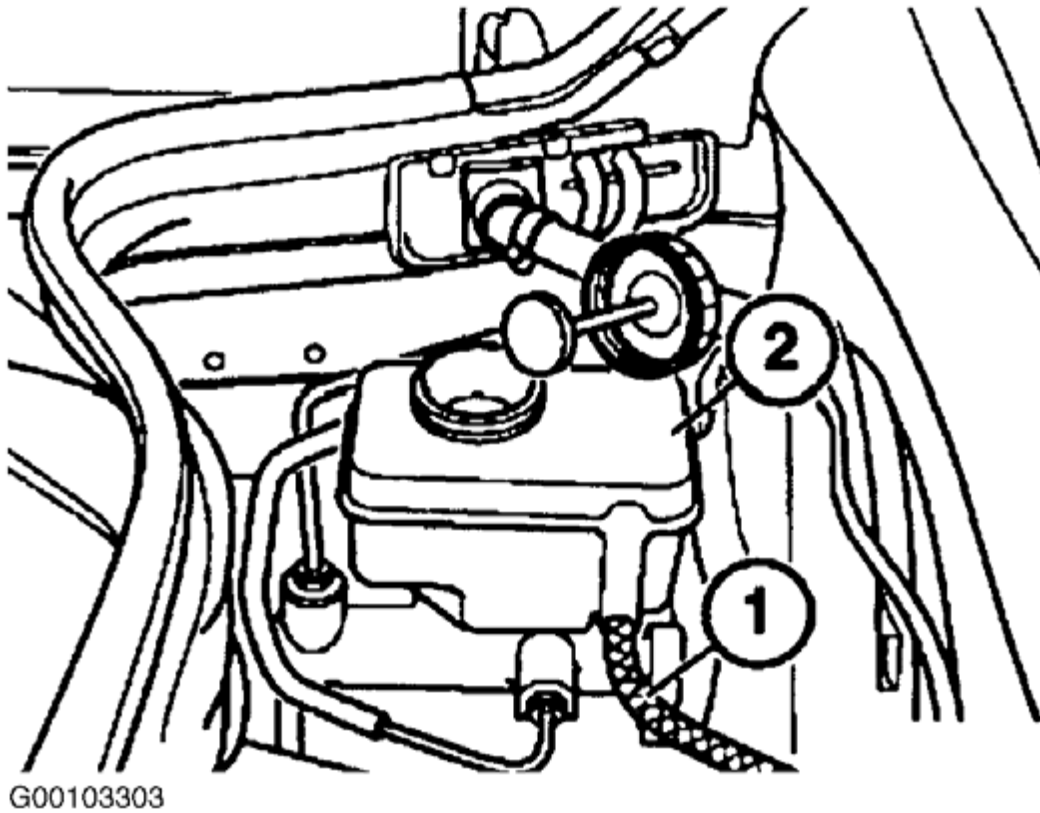


Fig. 15: Locating Supply Hose Of Clutch Hydraulic System
Courtesy of BMW OF NORTH AMERICA, INC.

BRAKE LIGHT SWITCH

Removal & Installation

1. Remove trim for pedal assembly.
2. Depress brake pedal as far as possible, using pedal support if necessary.
3. Pull tappet and sleeve forward completely (1). Press together clips and pull back switch (2). See **Fig. 16**.
4. A gap of .7 mm must be set between brake pedal and brake light switch. If this fails to ensure correct operation, it must be reduced to .6 mm.
5. To install, reverse removal procedure.
6. Slowly bring brake pedal into initial position.

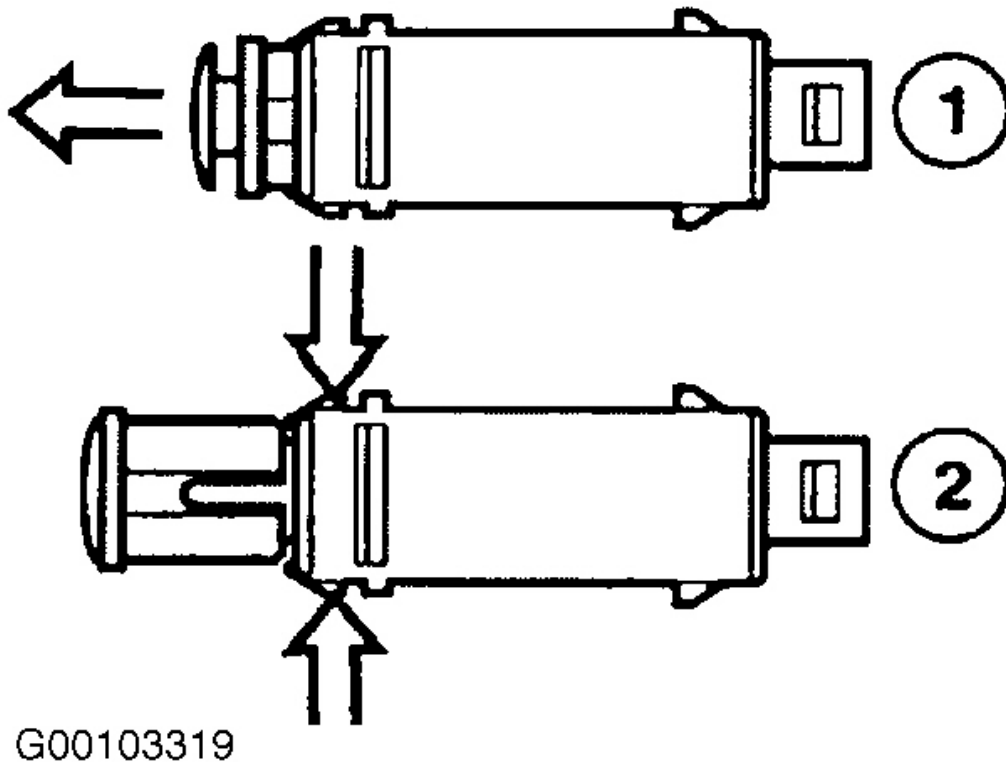


Fig. 16: Removing Brake Light Switch

Courtesy of BMW OF NORTH AMERICA, INC.

BRAKE LINES

CAUTION: The rear brake lines are secured on the upper control arm by line holders. The flaps of the line holders must not be opened. If this does occur, replace the holders.

New Brake Line Precautions

1. Protective coating on brake lines must not be damaged while bending.
2. Brake lines must not be bent back and forth.
3. Watch distances to fixed and movable vehicle parts. Brake lines must not contact or rub.
4. Tighten brake line couplings with torque wrench to specifications. See **TORQUE SPECIFICATIONS**.

Removal & Installation

2000 BMW X5

2000-06 BRAKES Disc - X5 (E53)

1. Apply pedal prop and depress brake pedal slightly. This prevents brake fluid from flowing out of expansion tank and into brake system when brake lines are opened.
2. Disconnect brake hose from line.

NOTE: Brake pipes are only supplied straight, in correct length and fitted with connecting nipples.

3. Bend new pipe as required using bending tool 34 5 100. Removed pipe can be used as template.
4. If replacing front brake pipe, move wheels into straight-ahead position. Install new pipe and tighten to specification. See **TORQUE SPECIFICATIONS**.
5. Remove pedal prop and bleed brake system. See **BLEEDING BRAKE SYSTEM**.

CALIPER ASSEMBLY

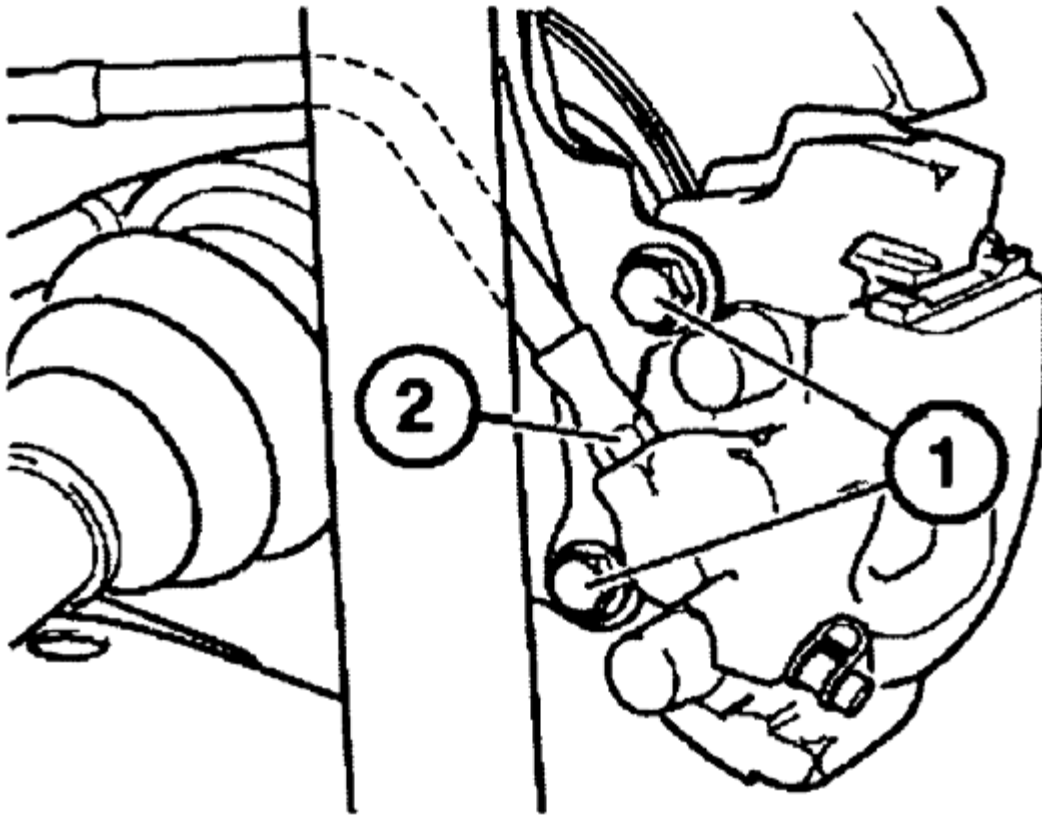
CAUTION: After completing work, bleed brake system. See **BLEEDING BRAKE SYSTEM**.

Removal

1. Raise and support vehicle. Remove wheel(s).
2. Apply pedal support and press brake pedal slightly. This prevents brake fluid from emerging from expansion tank and air from entering the brake system after the brake lines have been detached.

CAUTION: The rear brake hose is secured on the upper control arm by a line holder. The flaps of the line must not be opened. If this happens, the holder must be replaced.

3. Loosen bolts (1). Use special tool 34 1 080. Disconnect brake hose (2). See **Fig. 17**.
4. On right rear disconnect plug connection for brake lining sensor. On left front remove connector for wear indicator.
5. Lift brake hose out of bracket.
6. Withdraw brake caliper backwards.



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Fig. 17: Disconnecting Brake Hose

Courtesy of BMW OF NORTH AMERICA, INC.

Installation

CAUTION: Check routing and securing of brake pad wear sensor cable. Check for correct securing with tab of dust cap. Rubbing of cable on rim must be prevented.

1. To install, reverse removal procedure.
2. Only clean guide screws. Do not grease. Check threads. Replace all guide screws which are not in perfect condition.
3. Tighten caliper mounting bolts to specification. See **TORQUE SPECIFICATIONS**.
4. Bleed hydraulic system.
5. Install and tighten wheel bolt. See **TORQUE SPECIFICATIONS**.

See appropriate FRONT article in SUSPENSION.

HEATER BULKHEAD

Removal & Installation

1. Detach sealing strips (1). See **Fig. 18**.
2. Turn toggles through approximately 90 degrees. See **Fig. 19**.
3. Lift out cover (1). Unfasten screws and pull out heater bulkhead (2). See **Fig. 20**.
4. Check rubber seals (1) on left and right and replace if necessary. Coat rubber seals (1) on left and right with rubber protection coating agent. Heater bulkhead is guided at sides with guide channels. Clean guide channels and coat with rubber protection coating agent. See **Fig. 21**.
5. To install, reverse removal procedure.



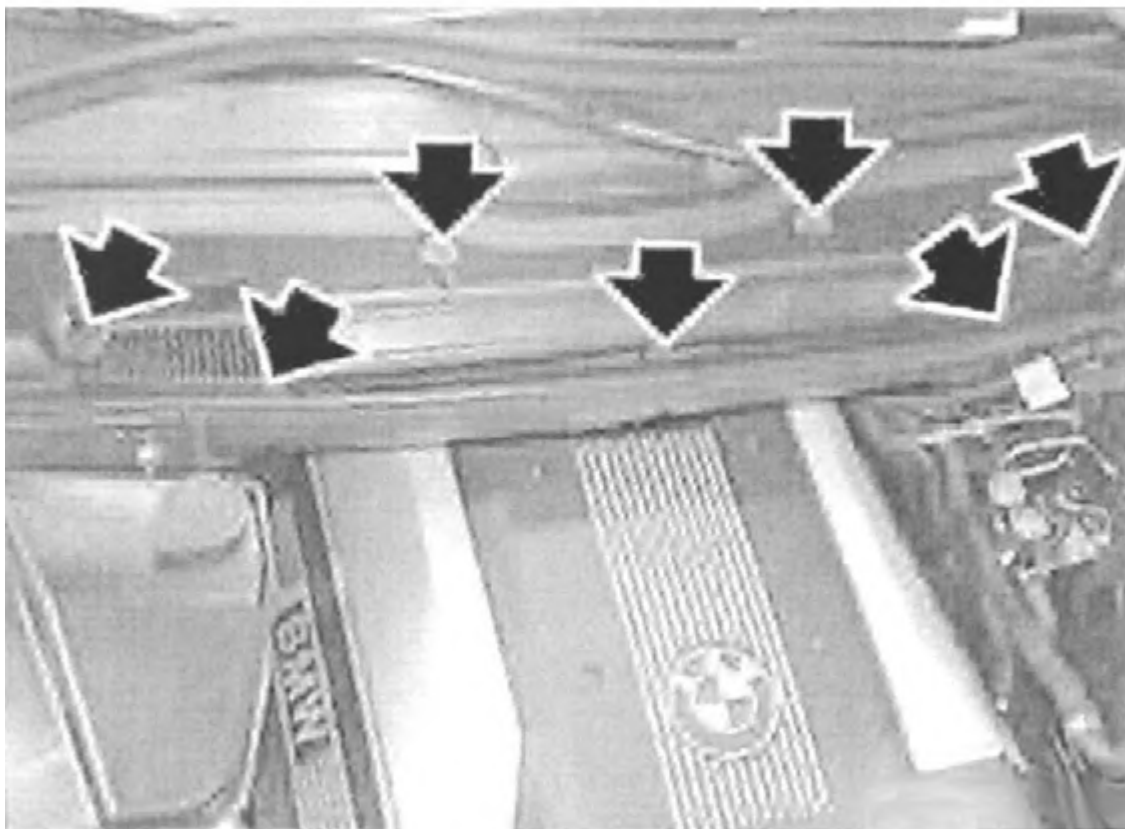
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Fig. 18: Locating Sealing Strips

Courtesy of BMW OF NORTH AMERICA, INC.

2000 BMW X5

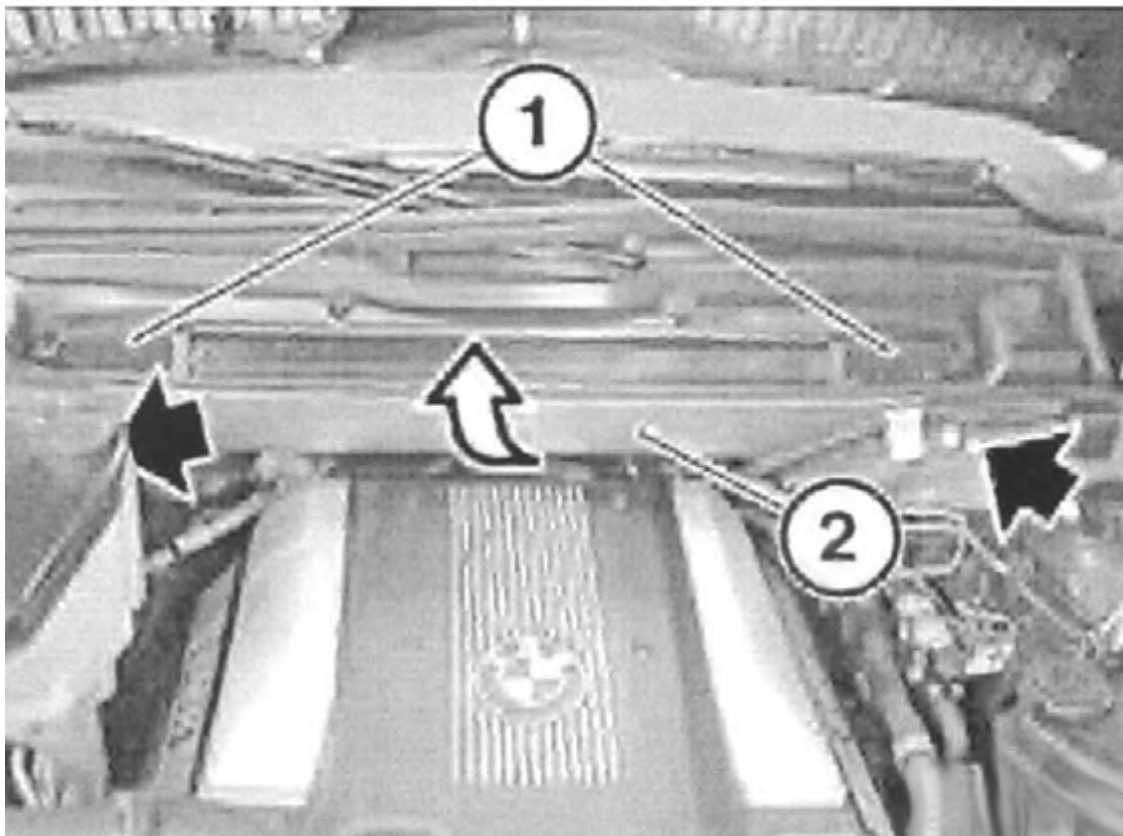
2000-06 BRAKES Disc - X5 (E53)



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Fig. 19: Locating Toggles

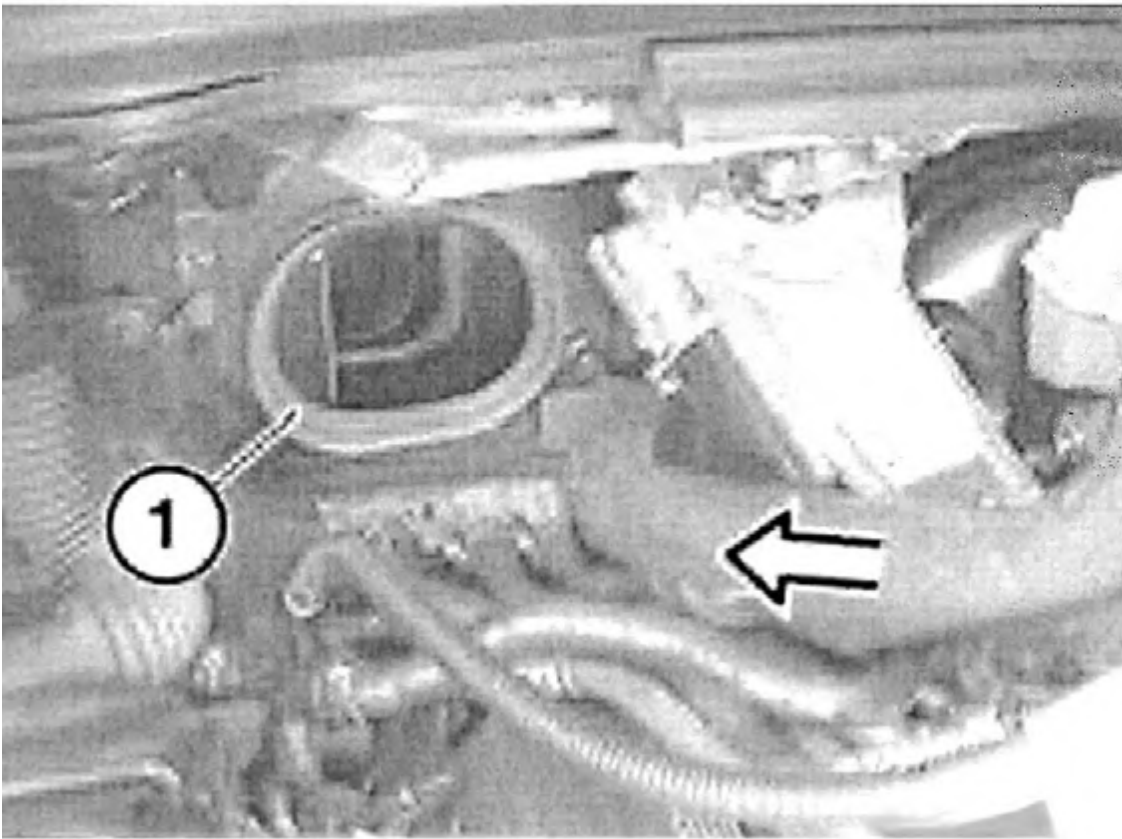
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 20: Removing Heater Bulkhead

Courtesy of BMW OF NORTH AMERICA, INC.



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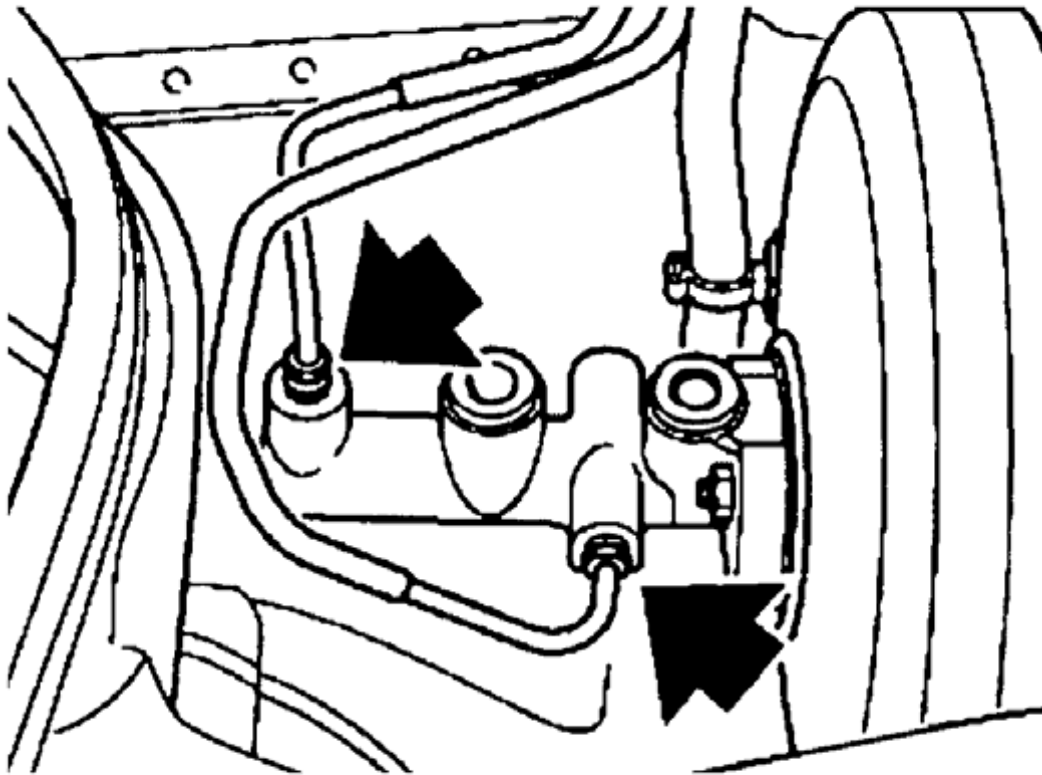
Fig. 21: Locating Rubber Seals

Courtesy of BMW OF NORTH AMERICA, INC.

MASTER BRAKE CYLINDER**Removal**

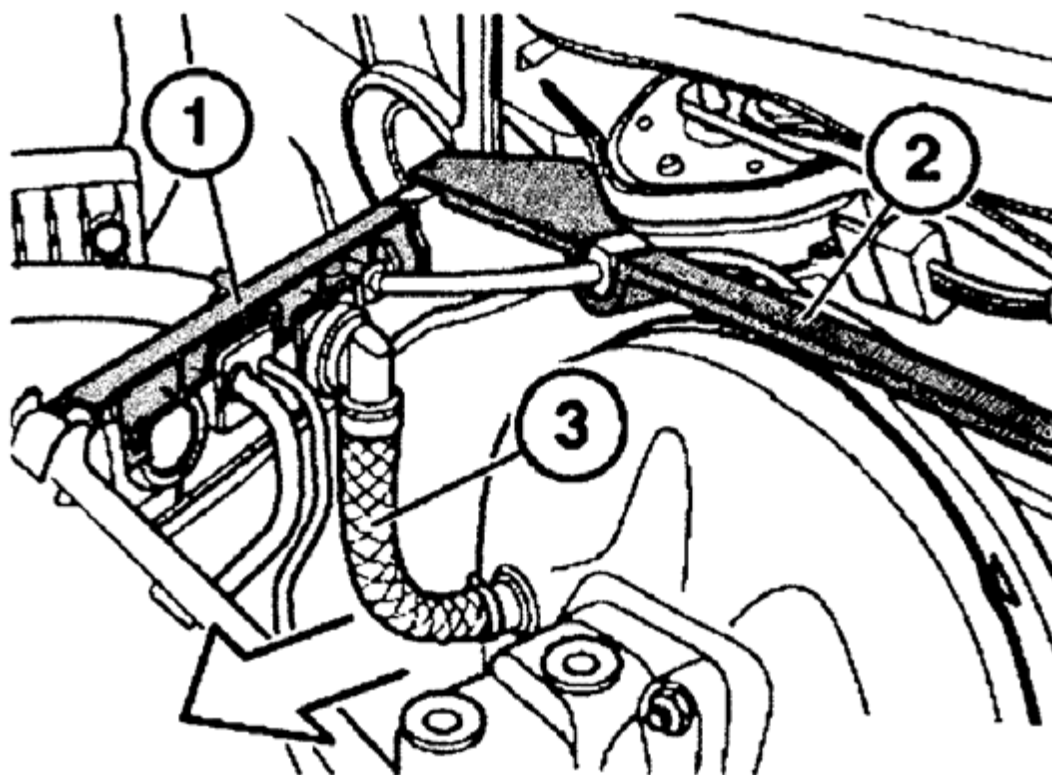
1. Remove cover in luggage compartment and remove grounding strap from body.
2. Suck the brake fluid out of expansion tank. Use a suction device used exclusively for drawing off brake fluid.
3. Remove brake fluid expansion tank. See **BRAKE EXPANSION TANK**.
4. Remove heater bulkhead. See **HEATER BULKHEAD**.
5. Remove positive support point at partition wall on left.
6. Unclip Bowden cable for engine hood locking.
7. Pull wiring harness upwards out of partition wall. Unscrew nuts.
8. Release screws. Remove rubber mount for windshield washer unit. Pull out partition wall.
9. Disconnect all hydraulic lines from master cylinder. See **Fig. 22**. Close off the brake lines and the master brake cylinder using appropriate seal plugs.
10. Remove cover (1) from line aperture. Pull the vacuum hose (3) off of the brake unit. See **Fig. 23**.

11. Remove master cylinder-to-power booster nuts. Remove support and master cylinder.
12. Replace O-ring. See **Fig. 24**.



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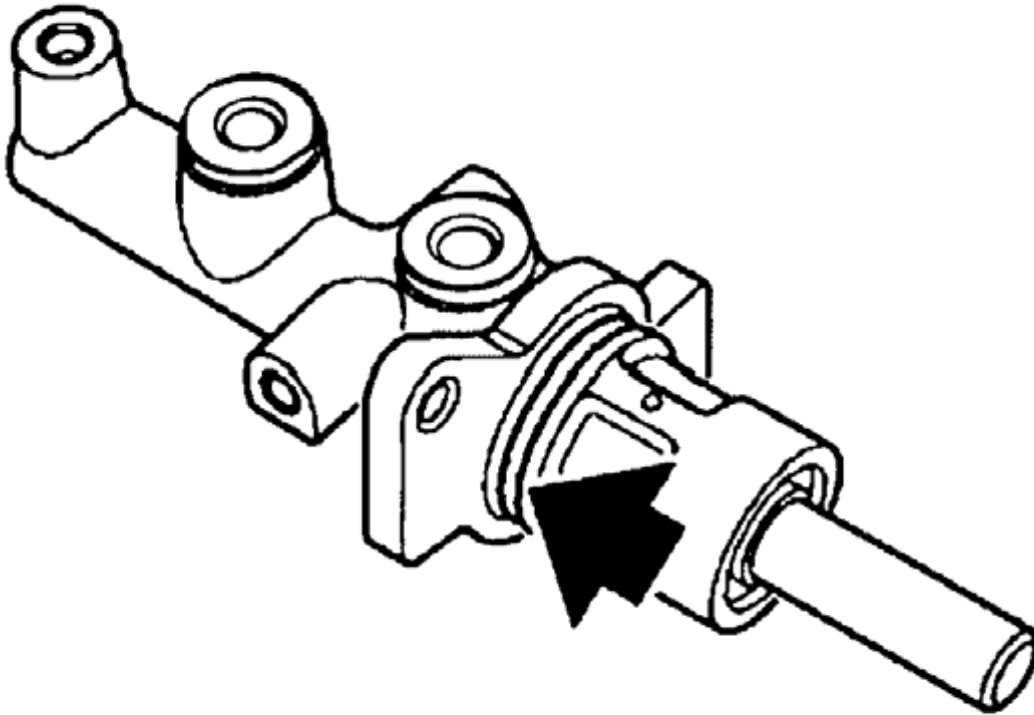
Fig. 22: Locating Screw Connections
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 23: Removing Vacuum Hose

Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 24: Locating O-Ring

Courtesy of BMW OF NORTH AMERICA, INC.

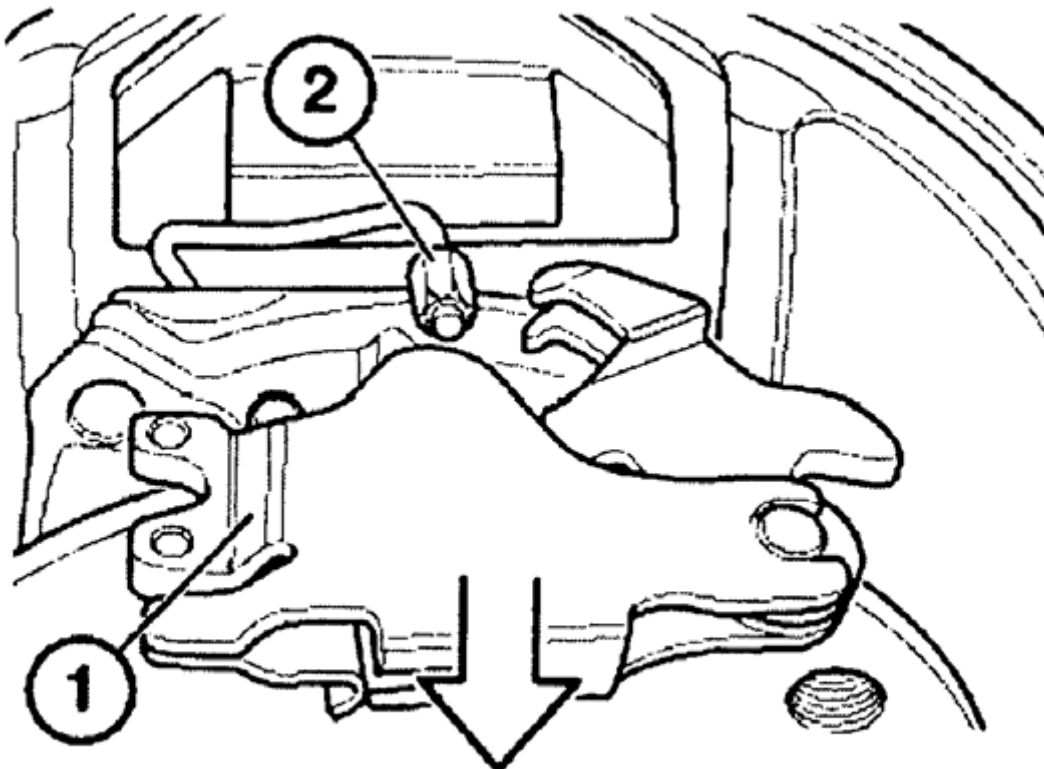
Installation

1. Install master brake cylinder to brake unit. When inserting master brake cylinder make sure that pressure rods of brake booster and master brake cylinder lie in one plane. Replace self-locking nuts and tighten to specification. See **TORQUE SPECIFICATIONS**.
2. Attach and tighten screw connections of brake lines and tighten to specification. See **TORQUE SPECIFICATIONS**.
3. To install, reverse removal procedure.
4. Push the expansion tank vertically onto the master brake cylinder.
5. Refill brake fluid and bleed the system. See **BLEEDING BRAKE SYSTEM**.

PARKING BRAKE BOWDEN CABLES**Removal & Installation**

1. Remove parking brake shoes. See **PARKING BRAKE SHOES**.

2. Pull expander locks (1) forward, disconnect parking brake cables (2), and remove expander locks. See **Fig. 25**.
3. Remove rubber gaiter.
4. Release lock nuts with special tool 34 1 030. Screw out lock nuts and adjustment nuts fully from Bowden cables.
5. Pull parking brake cable out of mounts.
6. Pull parking brake cable out of guide tube and out of wheel carrier.
7. Make sure parking brake cables are correctly laid.
8. Secure adjustment nuts with lock nuts.
9. Install expander locks and connect cables.
10. Adjust parking brake. See **PARKING BRAKE** under ADJUSTMENTS.
11. Replace rubber gaiter.



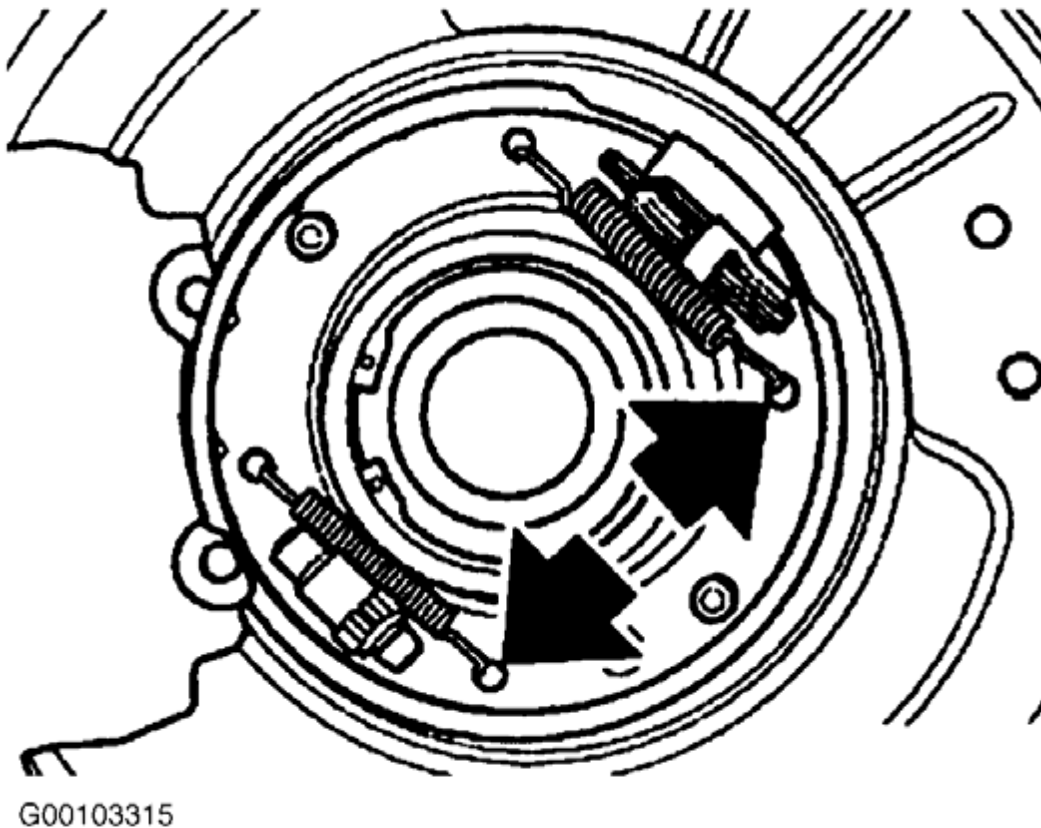
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Fig. 25: Removing Expander Lock

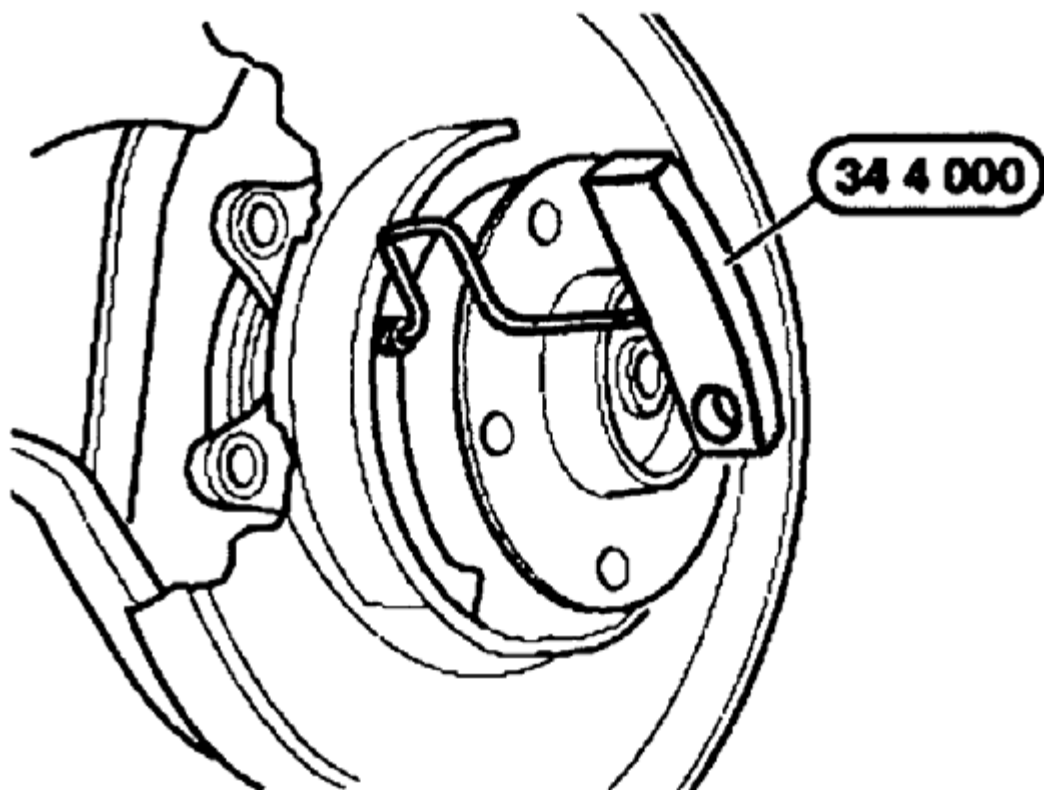
Courtesy of BMW OF NORTH AMERICA, INC.

Removal & Installation

1. Raise and support vehicle. Remove rear wheel(s).
2. Remove rear brake disc. See **BRAKE DISCS**.
3. Disconnect return springs with brake spring pliers. See **Fig. 26**.
4. Twist clamping pins with special tool 34-4-000 through 90 degrees and disconnect. See **Fig. 27**.
5. Remove brake shoes.
6. To install, reverse removal procedure. Coat thread of adjusting bushing (1) and screw (2) with grease. Notice installation position of adjusting screws. See **Fig. 28**.
7. Check return springs and replace if necessary.
8. Adjust parking brake and check operation. See **PARKING BRAKE** under ADJUSTMENTS.

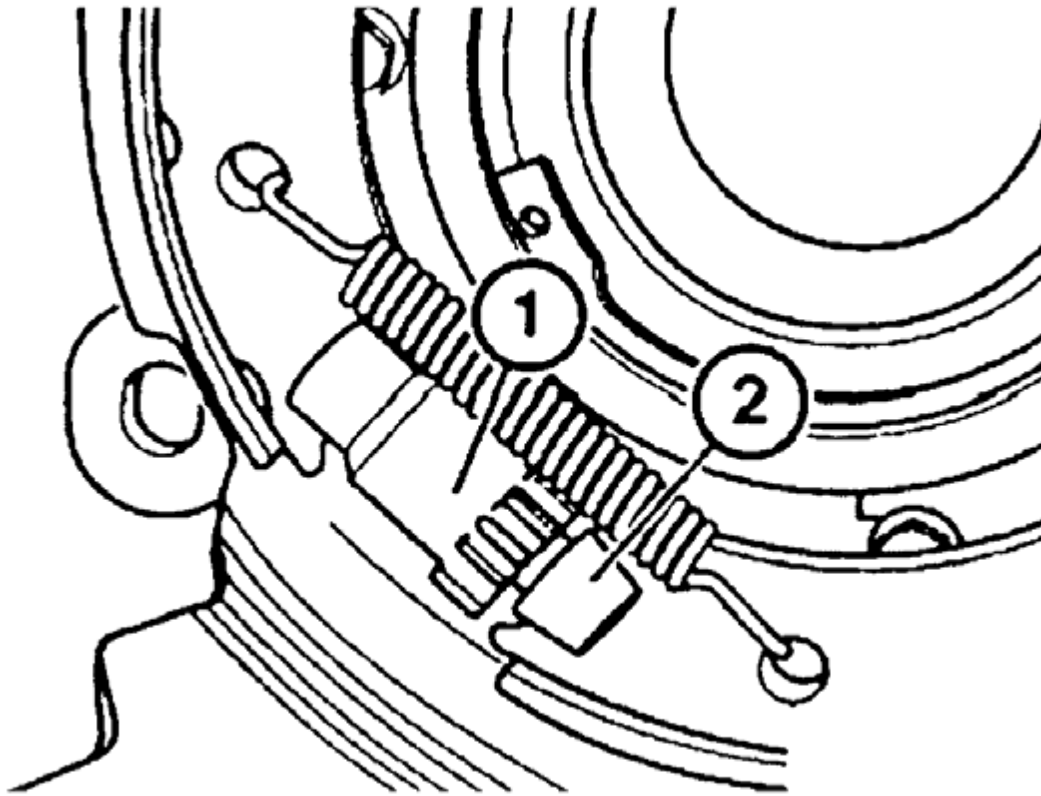
**Fig. 26: Locating Return Springs**

Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 27: Removing Parking Brake Shoes
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 28: Locating Adjusting Screws

Courtesy of BMW OF NORTH AMERICA, INC.

REAR AXLE WHEEL BEARINGS**Removal & Installation**

1. Raise and support vehicle. Remove wheel(s).
2. Unfasten collar nut (1). See **Fig. 29**. It may be necessary to apply brakes to keep hub from rotating.
3. Remove brake disc. See **BRAKE DISCS**.
4. Screw special tool 33 2 116 onto drive flange with wheel studs. Drive out drive flange with special tool 33 4 201/202/203. See **Fig. 30**.
5. If necessary, pull off bearing inner race from drive flange.
6. Unfasten screws and remove wheel bearing. See **Fig. 31**.

CAUTION: Do not reuse old wheel bearing.

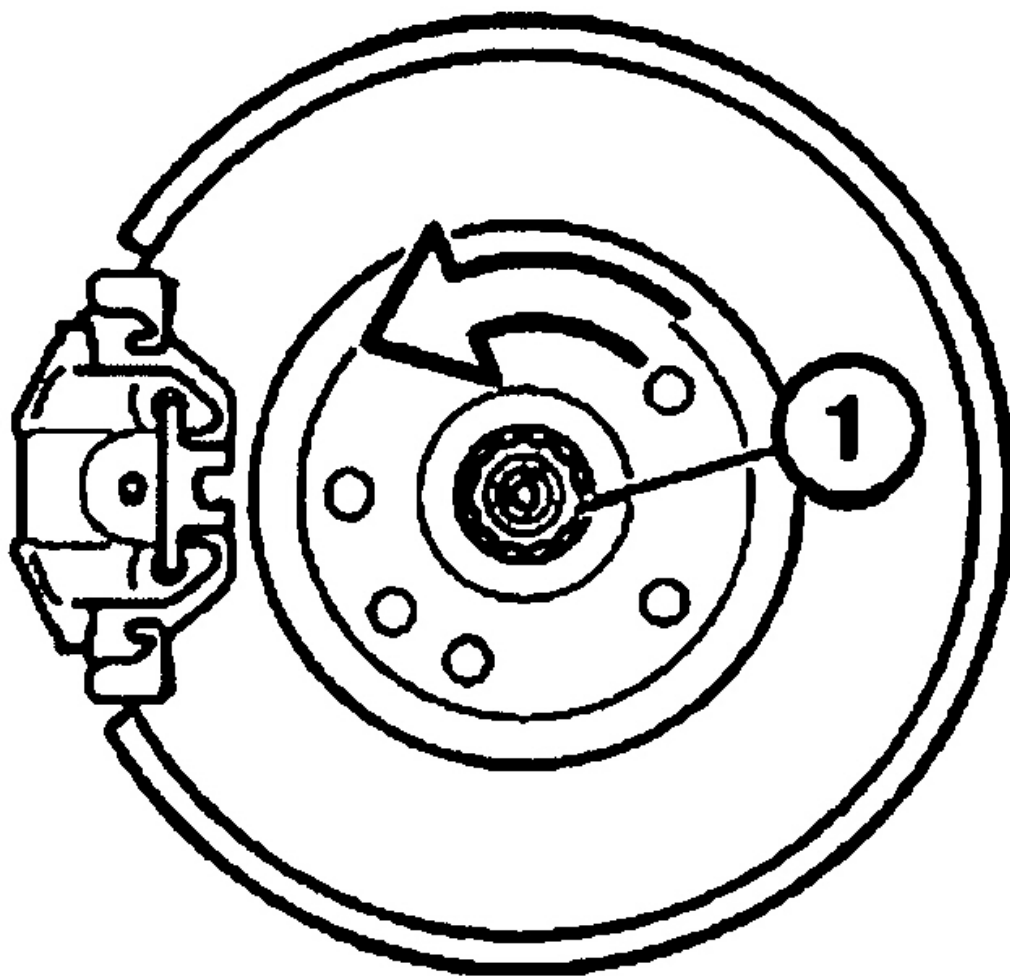
2000 BMW X5

2000-06 BRAKES Disc - X5 (E53)

7. Install new wheel bearing. The contact faces (2) of wheel bearing and wheel carrier and the tapped bores (1) must be clean and free of grease. See **Fig. 32**.
8. Tighten to specification. See **TORQUE SPECIFICATIONS**.
9. Apply light coat of oil to drive flange (1). Attach drive flange on spline of axle shaft and tighten it down using special tool 33 2 115/ 116/ 118. See **Fig. 33**.
10. Install brake disc.
11. Lightly oil and replace collar nut. Tighten to specification. See **TORQUE SPECIFICATIONS**.

WARNING: Collar nut must be locked.

12. Secure collar nut by caulking it at flat areas of axle shaft.



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Fig. 29: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

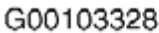
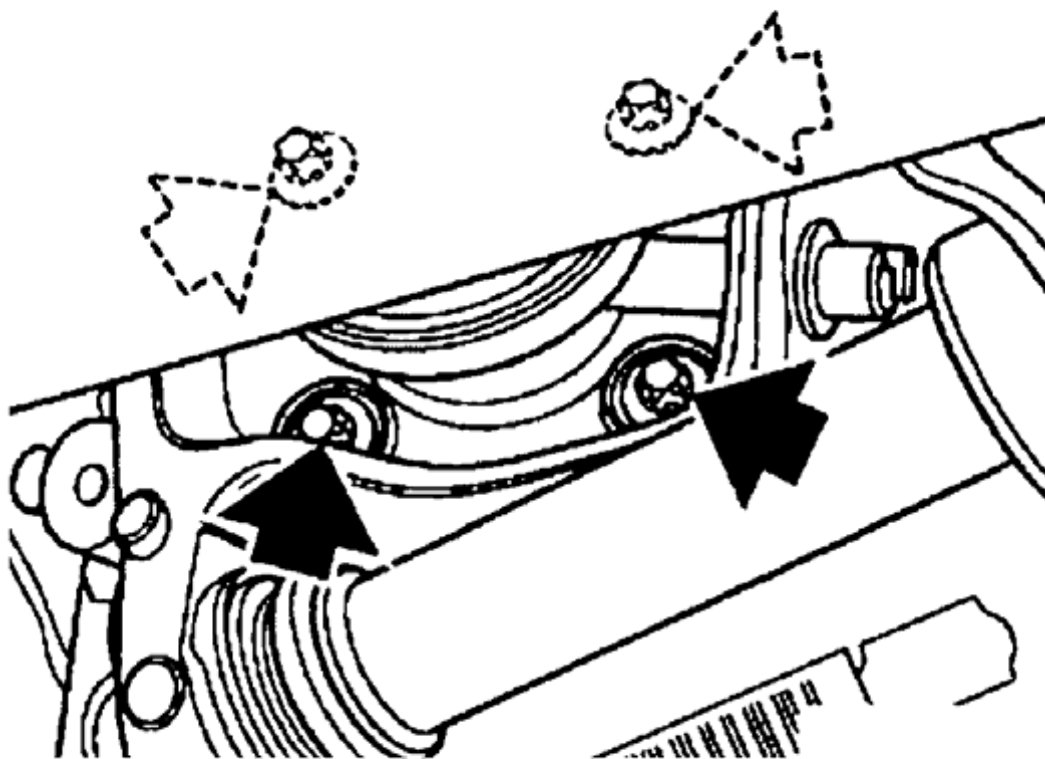


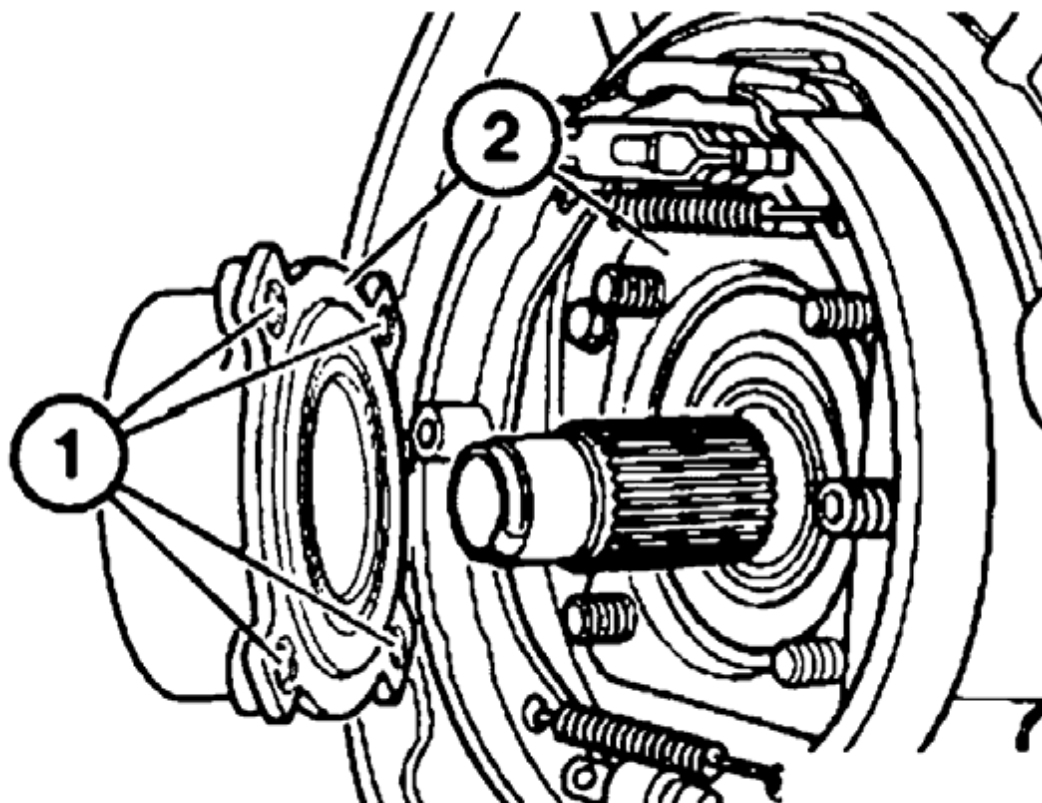
Fig. 30: Removing Drive Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Courtesy of BMW OF NORTH AMERICA, INC.



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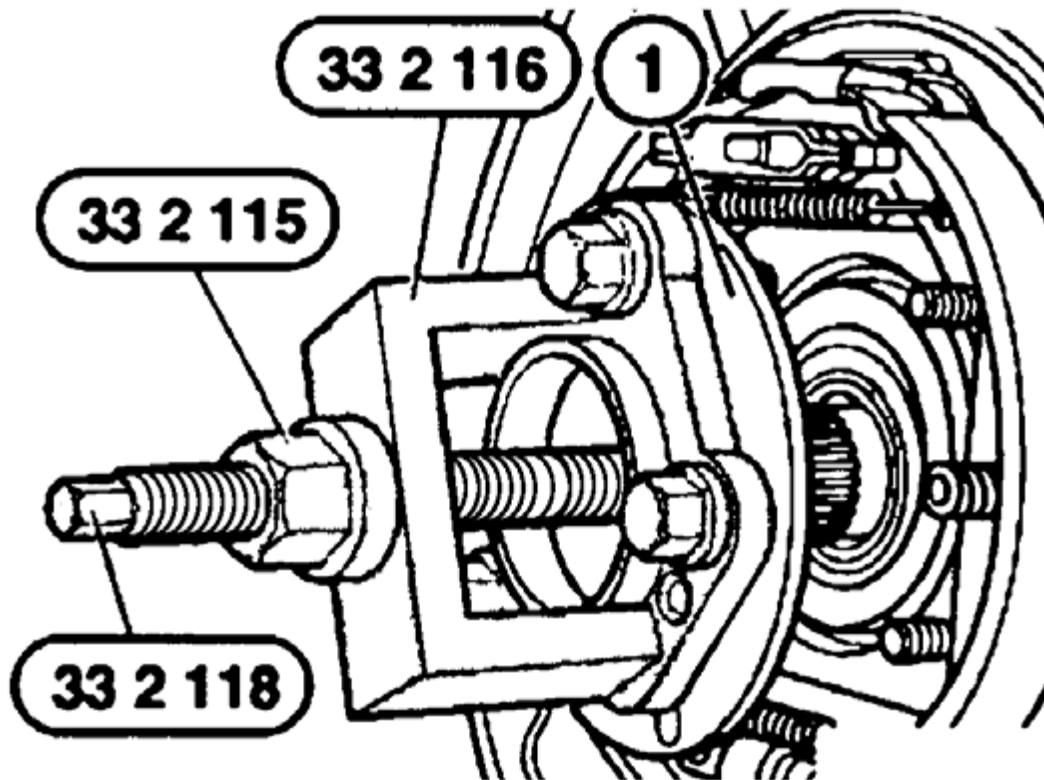
Fig. 31: Locating Wheel Bearing Screws
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 32: Locating Contact Faces

Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 33: Attaching Drive Flange

Courtesy of BMW OF NORTH AMERICA, INC.

OVERHAUL

BRAKE CALIPER

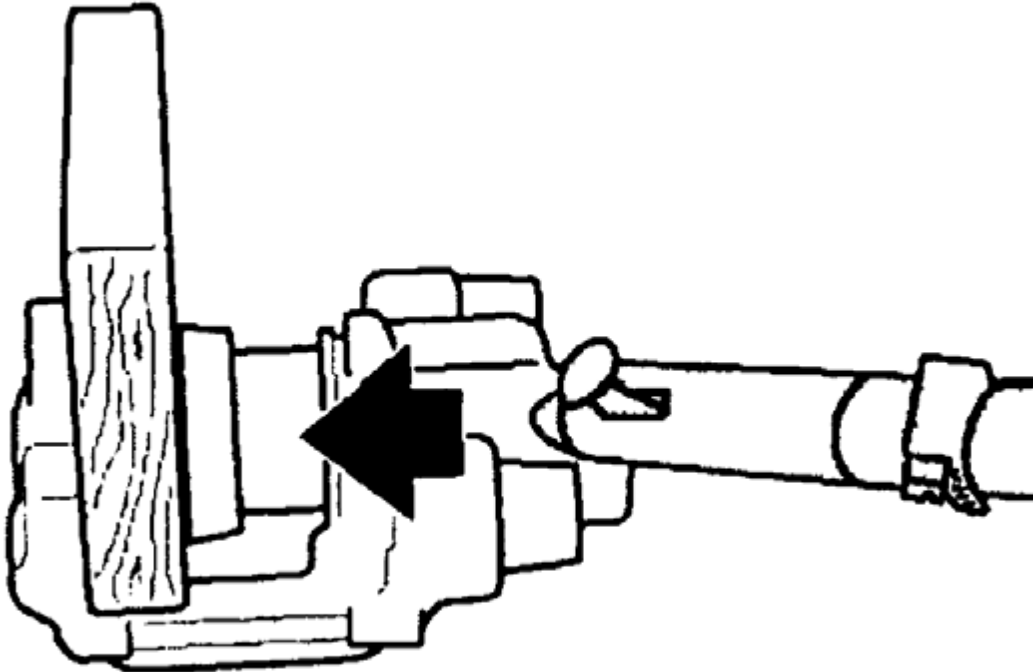
Disassembly

1. Remove caliper. See **CALIPER ASSEMBLY** under REMOVAL & INSTALLATION.
2. Remove pads from caliper. See **BRAKE DISC PADS** under REMOVAL & INSTALLATION.

WARNING: When pressing out brake caliper piston large forces occur. Be careful of fingers.

3. Slowly apply air pressure to fluid inlet of caliper to force out piston. To protect piston, place a protective plate (hard wood or hard felt) in caliper recess. See **Fig. 34**.
4. Check guide sleeves (5), fitting repair-kit guide sleeve if necessary. See **Fig. 35**.

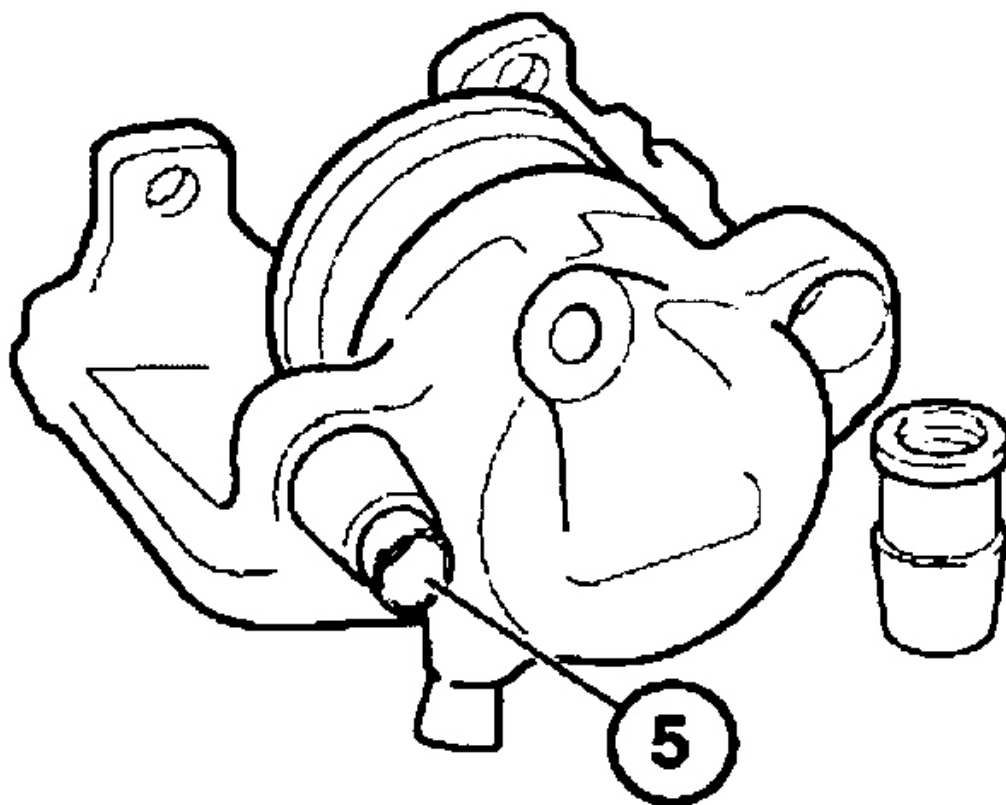
5. Remove sealing ring carefully with a plastic needle. See **Fig. 36**.
6. Thoroughly inspect cylinder bore, piston and flange surfaces. Machining of cylinders and pistons is not permitted.



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Fig. 34: Pressing Out Piston

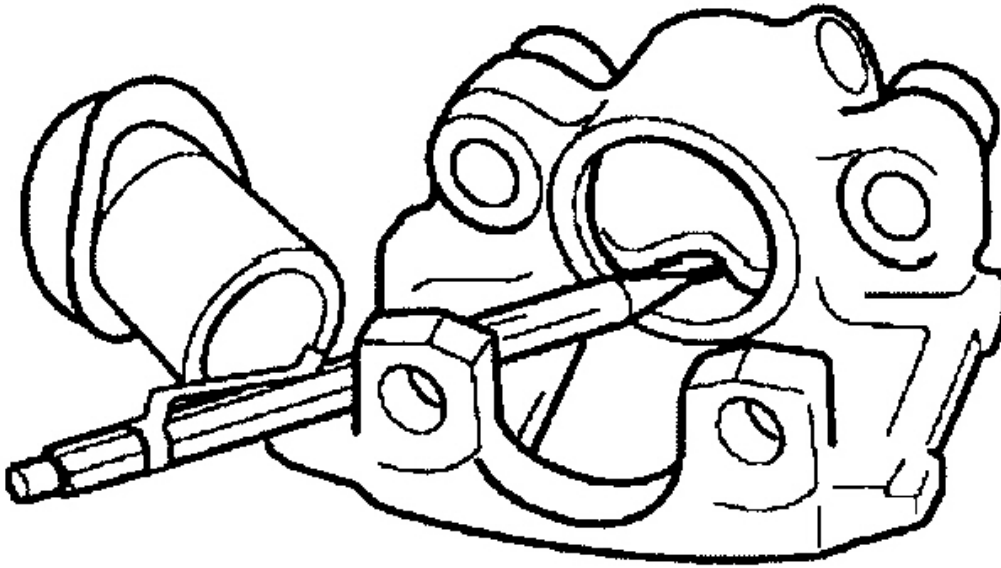
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 35: Locating Guide Sleeves

Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 36: Removing Sealing Ring

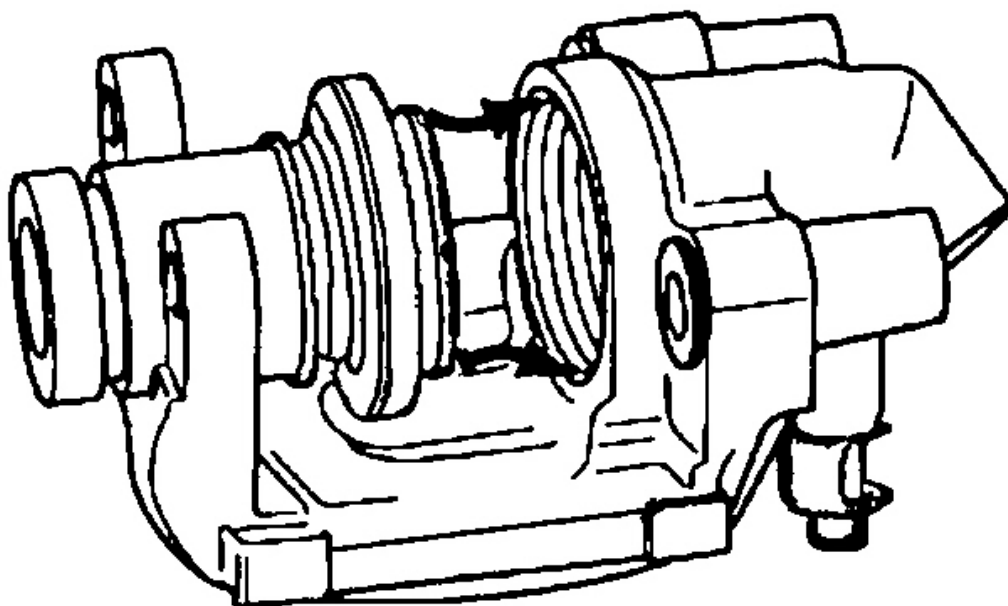
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

1. Coat cylinder bore, piston, dust sleeve and sealing ring with a light coat of brake cylinder paste.

NOTE: **Ensure piston is not tilted when installing.**

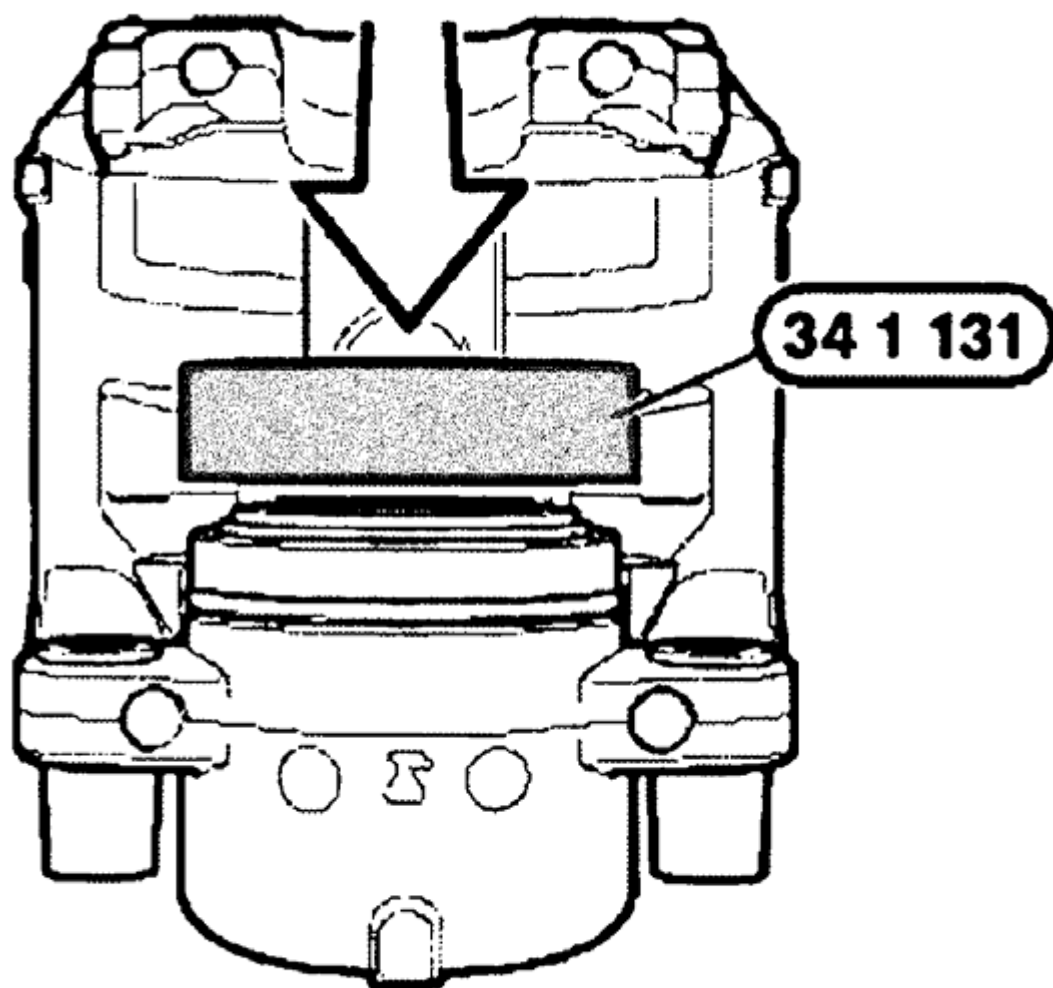
2. Install sealing cover in rear annular groove of cylinder bore. Press in piston with a hardwood board. See **Fig. 37**.
3. The area between dust cover and brake caliper housing must be kept dry so as to ensure correct seating for the dust cover. Keep brake cylinder paste or brake fluid away from this area. Install dust cover evenly up to stop with special tool 34 1 131. See **Fig. 38**.
4. For rear use special tool 34 1 132. See **Fig. 39**.
5. Press brake lining fully outwards and insert spring (4). See **Fig. 40**.
6. Only clean guide screws, do not grease. Check and replace if necessary. Tighten to specification. See **TORQUE SPECIFICATIONS**.
7. Install caliper. See **CALIPER ASSEMBLY**.



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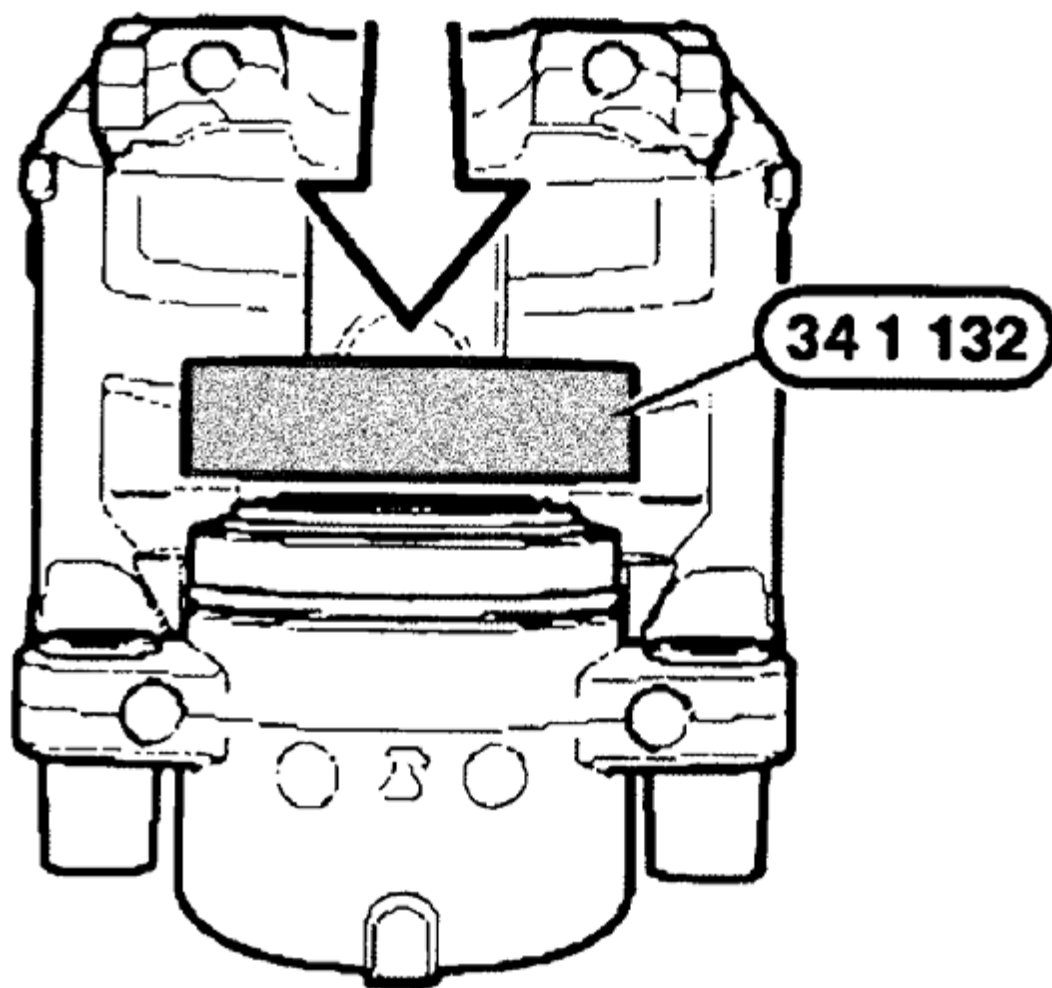
Fig. 37: Pressing In Piston

Courtesy of BMW OF NORTH AMERICA, INC.



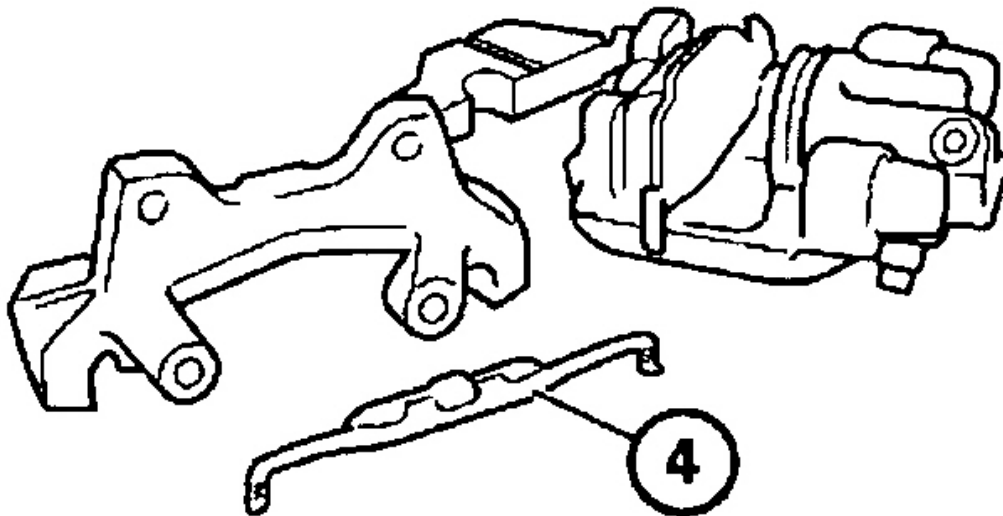
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Fig. 38: Pressing On Dust Cover (Front)
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 39: Pressing On Dust Cover (Rear)
Courtesy of BMW OF NORTH AMERICA, INC.



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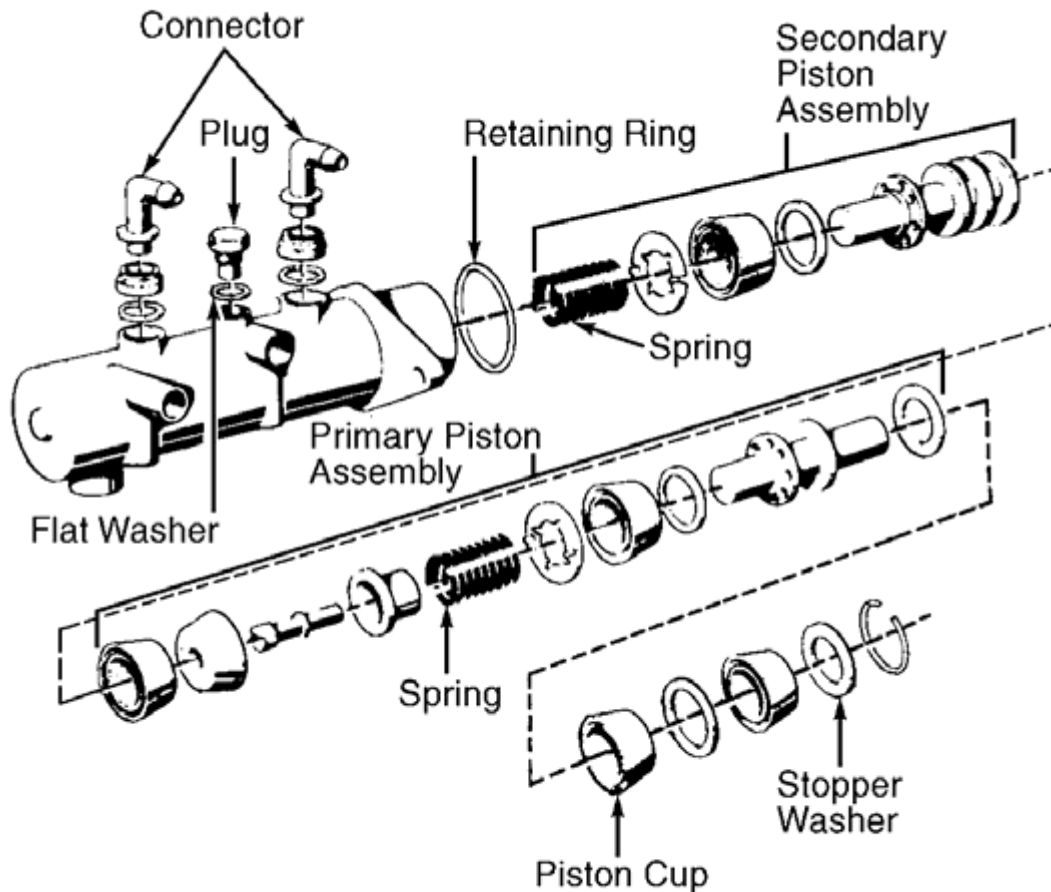
Fig. 40: Identifying Retaining Spring

Courtesy of BMW OF NORTH AMERICA, INC.

MASTER CYLINDER**Disassembly**

Push in primary piston and remove plug. See [Fig. 41](#). Remove retaining ring from end of cylinder. Remove primary and secondary piston assemblies and stopper washer. Disassemble piston assemblies, noting number and position of parts used for reassembly reference. See [Fig. 41](#).

NOTE: Replace master cylinder if cylinder bore is scored.



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Fig. 41: Exploded View Of Master Cylinder Assembly
 Courtesy of BMW OF NORTH AMERICA.

Reassembly

1. Reassemble piston assemblies using thin coating of brake assembly lubricant. Install piston assemblies into cylinder bore, using Guide Sleeve (34-3-000) to prevent seal damage.
2. Push piston fully forward and install plug. Install retaining ring in master cylinder bore. Replace "O" ring between master cylinder and brake booster. Bench bleed master cylinder before installation.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Adapter To Power Flow Regulator	12 (16)
Bearing Pedestal To Brake Assembly & Body	

2000 BMW X5
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NOTE: Retighten 1x on brake booster after 30 min.	16 (21)
Bleed Screw	
7 mm	(1)
9 mm	5.2-8.1 (7-11)
11 mm	9-12 (12-16)
Brake Booster To Pedal Assembly Console	23 (31)
Brake Caliper On Semi-trailing Arm/Wheel Carrier	49 (67)
Brake Caliper To Steering Knuckle	81 (110)
Brake Carrier On Semi-trailing Arm/Wheel Carrier	48 (65)
Brake Disc To Wheel Hub Bolt	12 (16)
Brake Hose Couplings	10.3 (14)
Brake hose to brake caliper:	
Front	17.7 (24)
Rear	30 (40)
Brake Master Cylinder To Brake Booster (Vacuum)	19 (26)
Collar Nut	310 (420)
Guide Screw, Front	22 (30)
Guide Screw, Rear	21 (28)
Parking Brake Lever To Body	16 (21)
Hydraulic Pipe Coupling To Brake Booster	23 (31)
Hydraulic Pipe From Power Steering Pump On Power Flow Regulator	30 (40)
Hydraulic Pipe To Brake Booster On Power Flow Regulator	23 (31)
Hydraulic Pipe To Pressure Reservoir	30 (40)
Hydraulic Pipe To Pressure Reservoir On Power Flow Regulator	35 (47)
Hydraulic Pipe To Steering Gear On Power Flow Regulator	37 (50)
Hydraulic Switch (Warning Switch) To Power Flow Regulator	13 (18)
Orifice Valve To Brake Booster	26 (35)
Reservoir To Power Flow Regulator	37 (50)
Return Pipe To Oil Tank On Power Flow Regulator	12 (16)
Wheel Bearing Unit On Wheel Carrier	74 (100)
	INCH Lbs. (N.m)
Wheel Cylinder To Brake Backplate	88.5 (10)
(1) Tighten 7 mm bleed screw to 31.0-44.3 INCH Lbs. (3.5-5.0 N.m).	

BRAKE SPECIFICATIONS

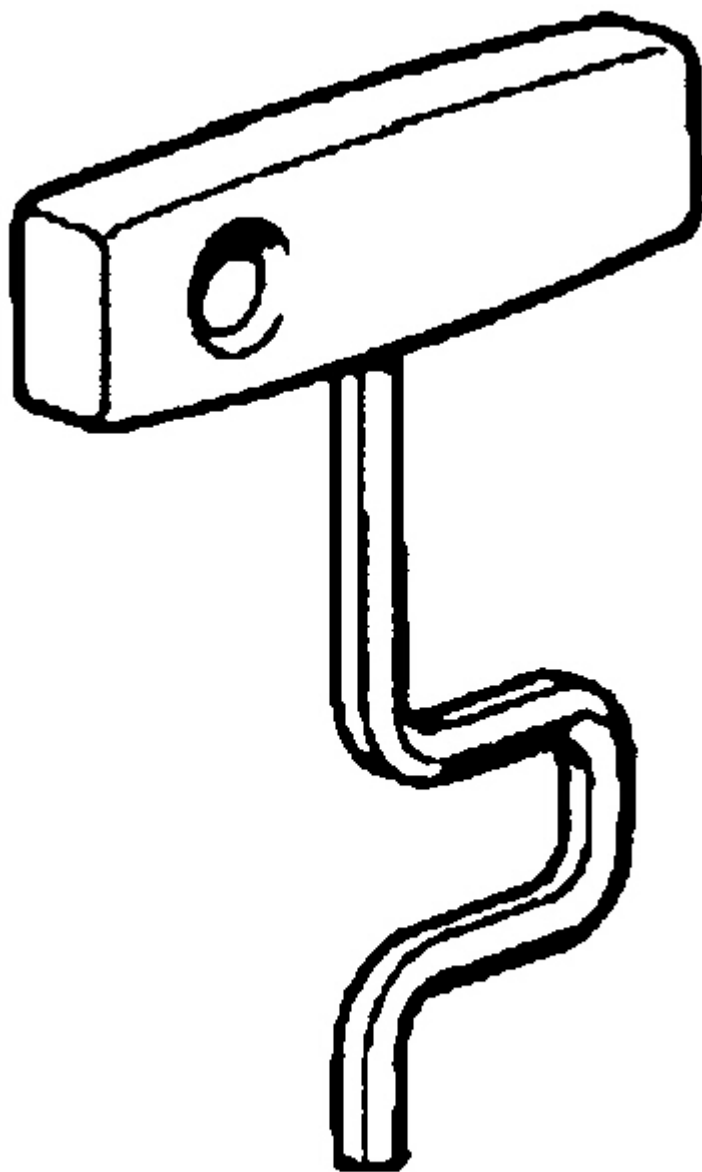
DISC BRAKE SPECIFICATIONS

Application	In. (mm)
Front	

2000 BMW X5	
2000-06 BRAKES Disc - X5 (E53)	

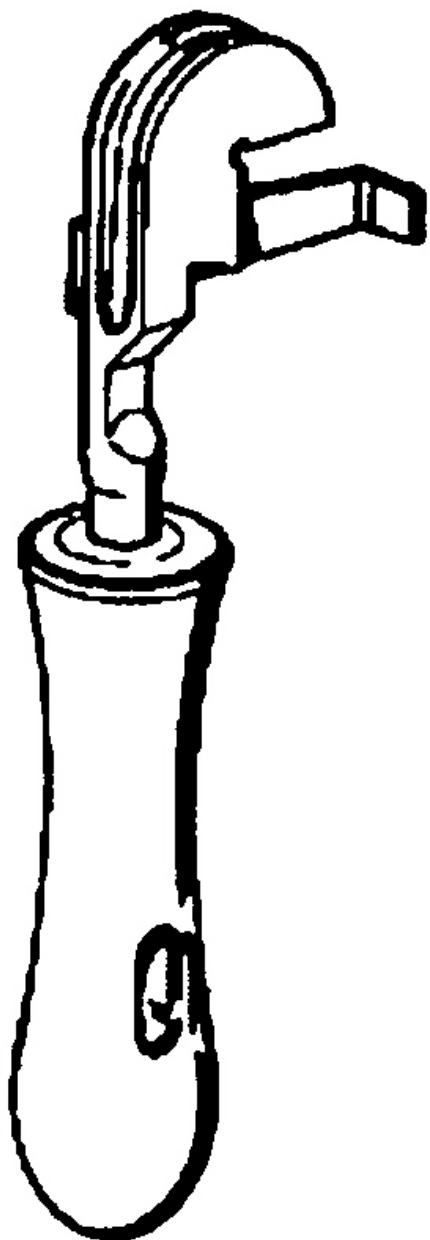
Disc Diameter	13.1 x 1.4 (356 x 36)
Minimum Thickness	1.35 (34.4)
Disc Diameter	13.1 x 1.2 (332 x 30)
Minimum Thickness	1.1 (28.4)
Parallelism	.0004 (.01)
Radial Runout	
Disc Installed	.008 (.20)
Disc Removed	.002 (.04)
Wear warning from residual lining thickness	.12 (3)
Rear	
Nominal size (diameter x thickness)	12.8 x .8 (324 x 20)
Minimum Thickness	.7 (18.4)
Nominal size (diameter x thickness)	12.8 x .5 (324 x 12)
Minimum Thickness	.41 (10.4)
Parallelism	.0004 (.01)
Radial Runout	
Disc Installed	.008 (.20)
Disc Removed	.002 (.04)
Wear warning from residual lining thickness	.12 (3)

SPECIAL TOOLS



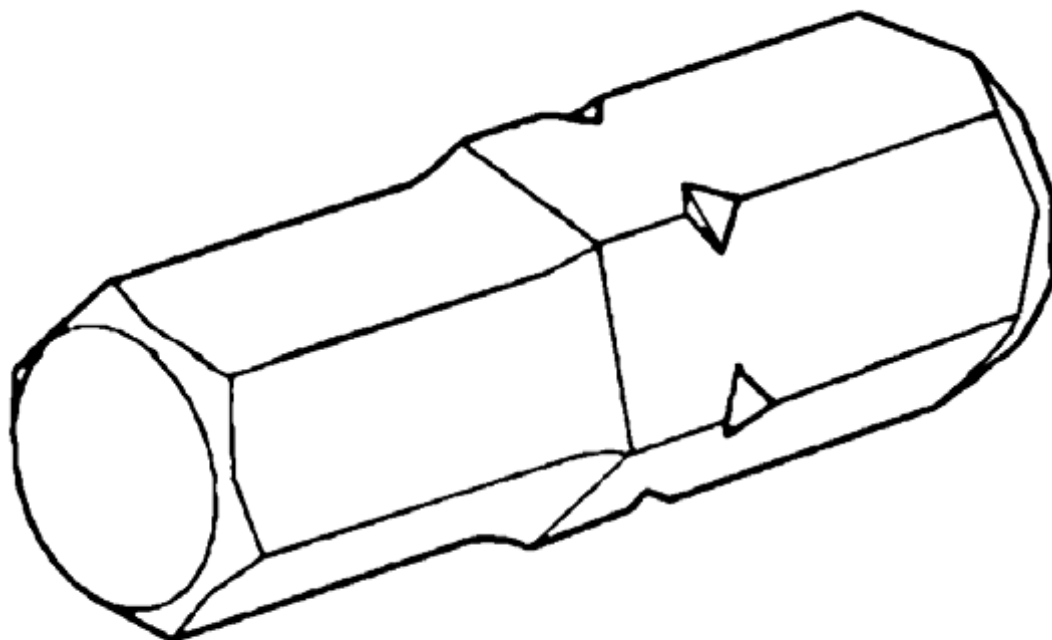
G00103320

Fig. 42: Identifying Allen Key (34 4 000)
Courtesy of BMW OF NORTH AMERICA, INC.



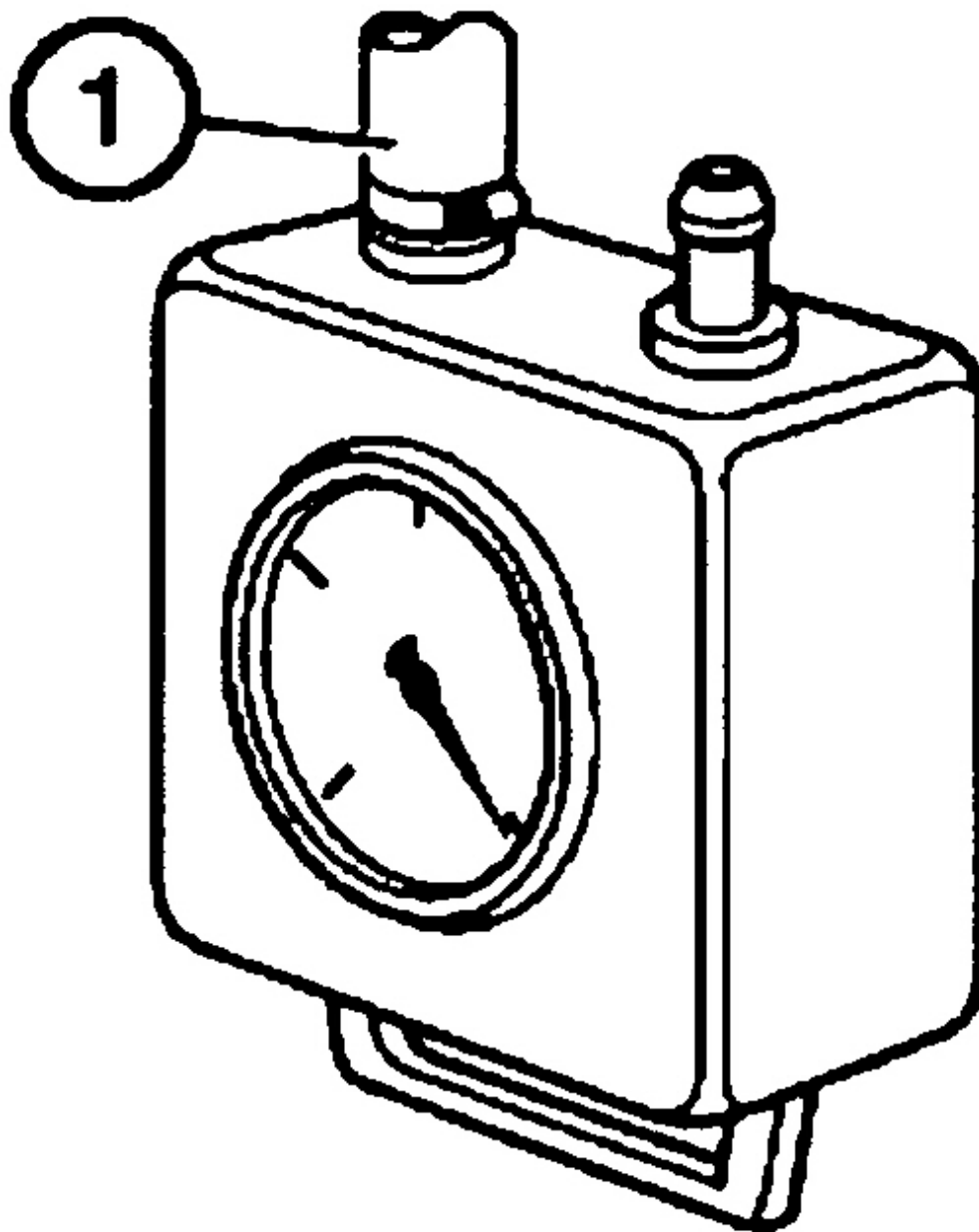
G00103322

Fig. 43: Identifying Bending Tool (34 5 100)
Courtesy of BMW OF NORTH AMERICA, INC.



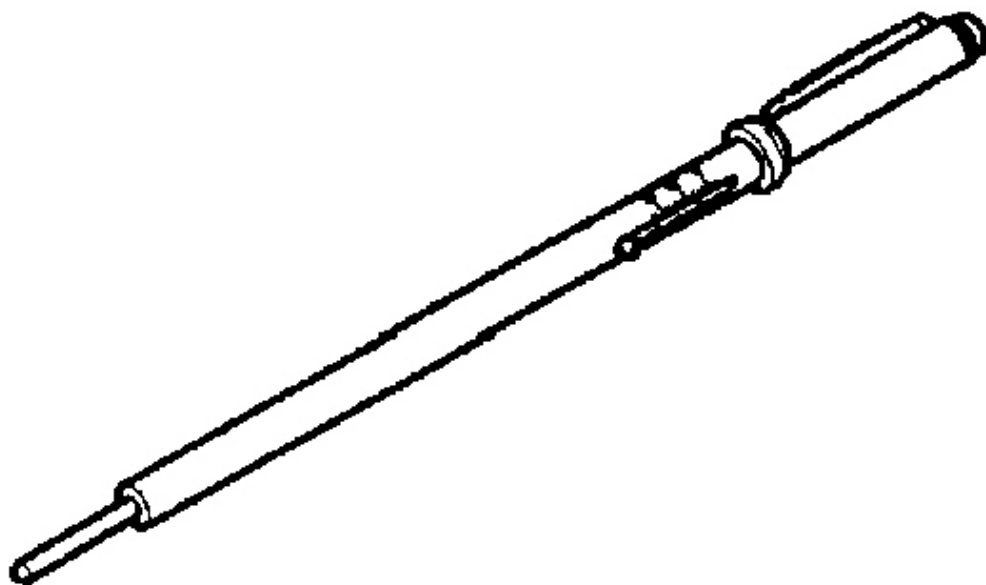
G00103364

Fig. 44: Identifying Bit Insert (34 1 080)
Courtesy of BMW OF NORTH AMERICA, INC.



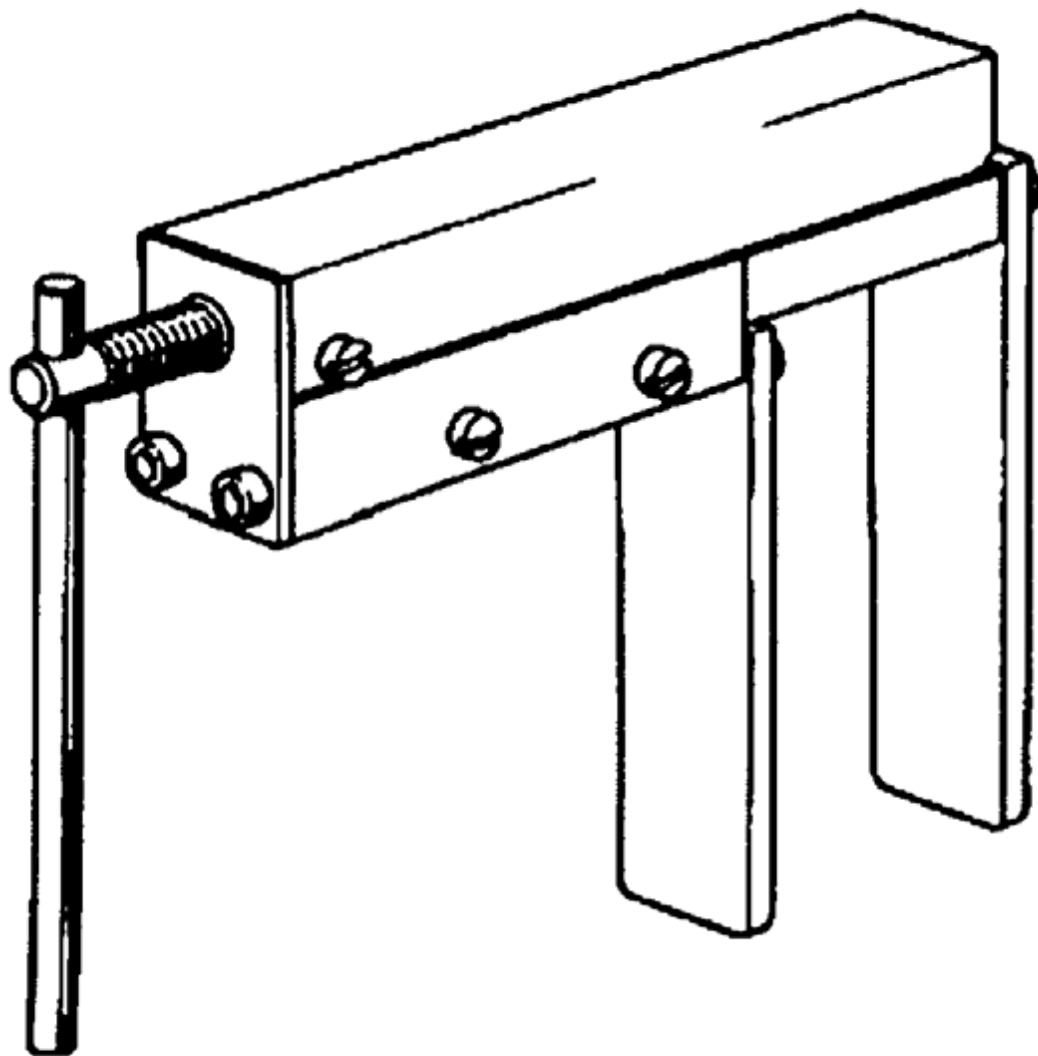
G00103323

Fig. 45: Identifying Brake Booster Tester (34 3 100)
Courtesy of BMW OF NORTH AMERICA, INC.



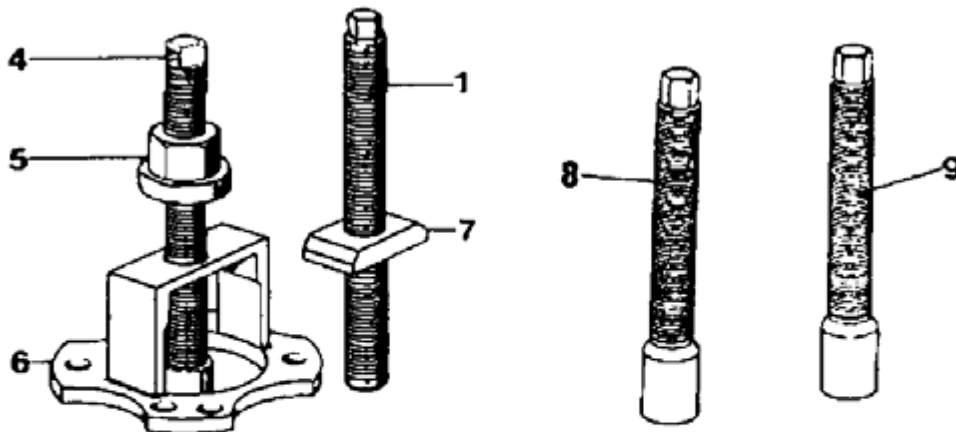
G00103327

Fig. 46: Identifying Brake Lining Measuring Gauge (34 1 260)
Courtesy of BMW OF NORTH AMERICA, INC.



G00103321

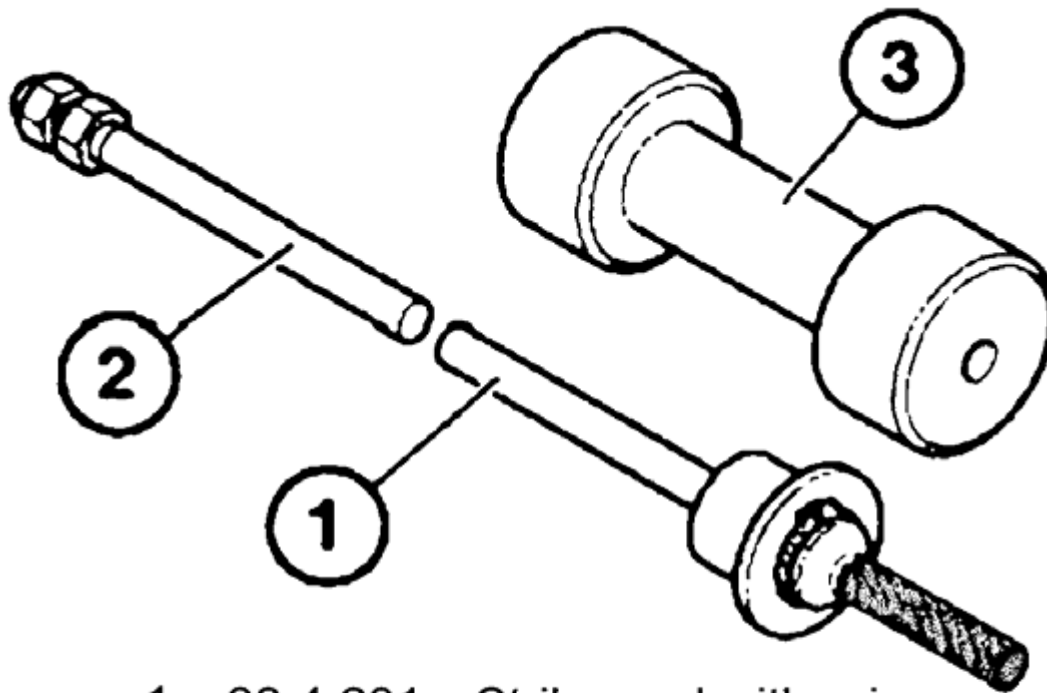
Fig. 47: Identifying Fixture (34 1 050)
Courtesy of BMW OF NORTH AMERICA, INC.



- | | | | |
|--------------|------------------|--------------|---------------------|
| 1 = 33 2 111 | Pressure spindle | 7 = 33 2 117 | Threaded piece |
| 4 = 33 2 114 | Spindle | 8 = 33 2 118 | Spindle for fitting |
| 5 = 33 2 115 | Nut with bearing | 9 = 33 2 119 | Spindle |
| 6 = 33 2 116 | Bridge | | |

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Fig. 48: Identifying Removal & Installation Tool (33 2 110)
 Courtesy of BMW OF NORTH AMERICA, INC.



1 = 33 4 201 Striker rod with grip

2 = 33 4 202 Striker rod

Note: With end piece and nut

3 = 33 4 203 Weight

4 = 33 4 205 Adapter

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Fig. 49: Identifying Set of Tools (33 4 200)

Courtesy of BMW OF NORTH AMERICA, INC.