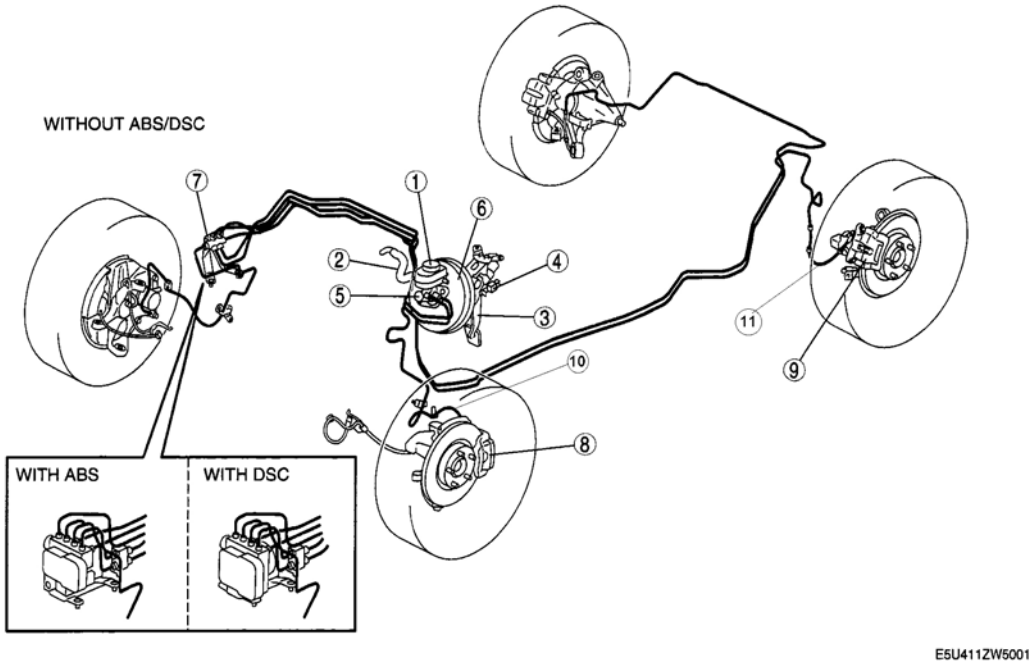
2008 BRAKES

Conventional Brake System - MX-5 Miata

CONVENTIONAL BRAKE SYSTEM LOCATION INDEX



1	Brake fluid
2	Vacuum line
3	Brake pedal
4	Brake switch
5	Master cylinder
6	Power brake unit
7	Dual proportioning valve
8	Front brake (disc)
9	Rear brake (disc)
10	Brake hose (Front)
11	Brake hose (Rear)

Fig. 1: Identifying Location Of Conventional Brake System Components
Courtesy of MAZDA MOTORS CORP.

AIR BLEEDING

CAUTION:

- **Brake fluid will damage painted surfaces. Be careful not to spill any on painted surfaces. If it is spilled, wipe it off immediately.**

NOTE:

- **Keep the fluid level in the reserve tank at 3/4 full or more during the air bleeding.**
- **Begin air bleeding with the master cylinder and then continue with the brake caliper that is furthest away from the master cylinder. Finish by bleeding air from the master cylinder again.**

Brake fluid type

SAE J1703, FMVSS 116 DOT-3

1. Remove the bleeder cap from the brake caliper, and connect a vinyl tube to the bleeder screw.
2. Place the other end of the vinyl tube in a clear container, and fill the container with fluid during air bleeding.
3. Working with two people, one should depress the brake pedal a few times and then depress and hold the pedal down.
4. While the brake pedal is being held down, the other person should loosen the bleeder screw using the **SST** , and bleed any fluid containing air bubbles. Once completed, tighten the bleeder screw.

   Tightening torque

   Front: 6.9-9.8 N.m {71-99 Kgf.cm, 62-86 in.lbf}

   Rear: 6.0-8.0 N.m {62-81 Kgf.cm, 54-70 in.lbf}

5. Repeat Steps 3 and 4 until no air bubbles are seen.
6. Perform air bleeding as described in the above procedures for all brake calipers.
7. After air bleeding, inspect the following:
   - Brake operation
   - Fluid leakage
   - Fluid level

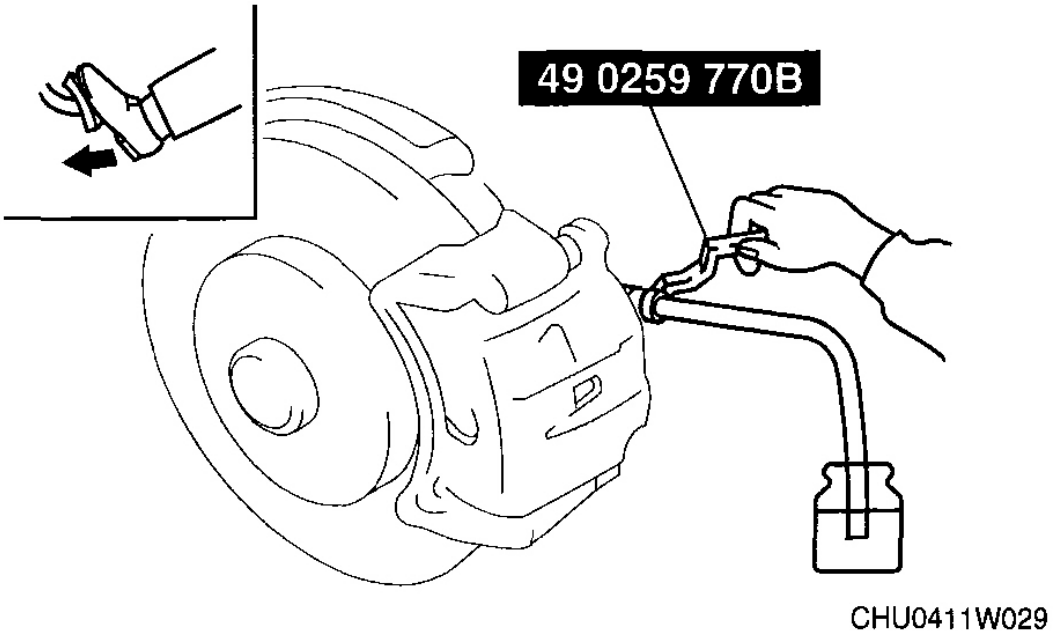


Fig. 2: Brake Bleeding Procedure
Courtesy of MAZDA MOTORS CORP.

VACUUM LINE INSPECTION

1. Remove the vacuum hose between the power brake unit and the intake manifold using pliers.
2. Verify that air can be blown from the power brake unit side of the vacuum hose towards the intake manifold side, and that air cannot be blown in the opposite direction.
    - If there is any malfunction of the inner check valve, replace it together with the vacuum hose as a single unit.

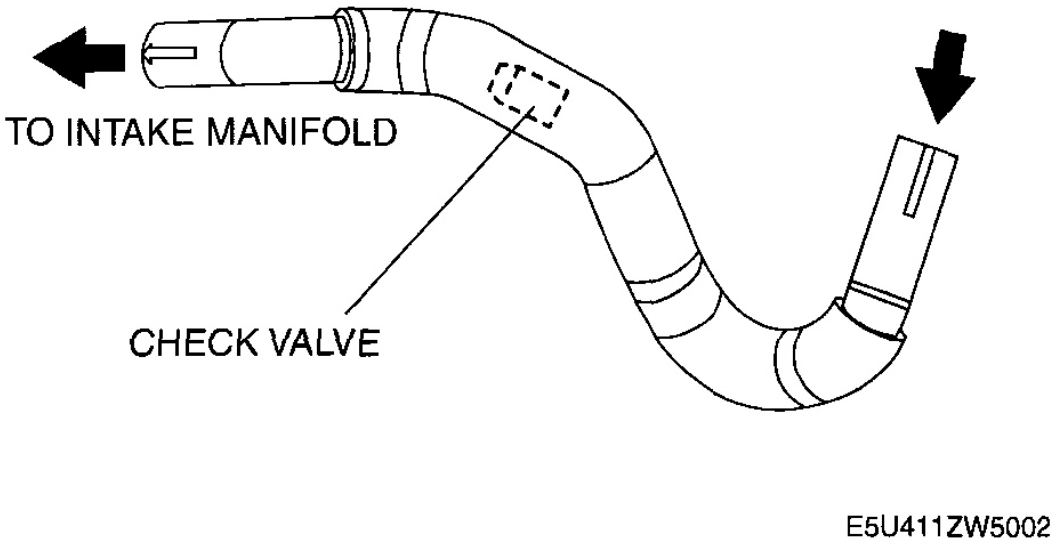


Fig. 3: Inspecting Vacuum Line Check Valve
Courtesy of MAZDA MOTORS CORP.

BRAKE PEDAL INSPECTION

BRAKE PEDAL HEIGHT INSPECTION

1. Measure the distance from the center of the upper surface of the pedal pad to the insulator and verify that it is as specified.
    - If not within the specification, adjust the pedal height.

Brake pedal height (reference value) 167 mm {6.57 in}

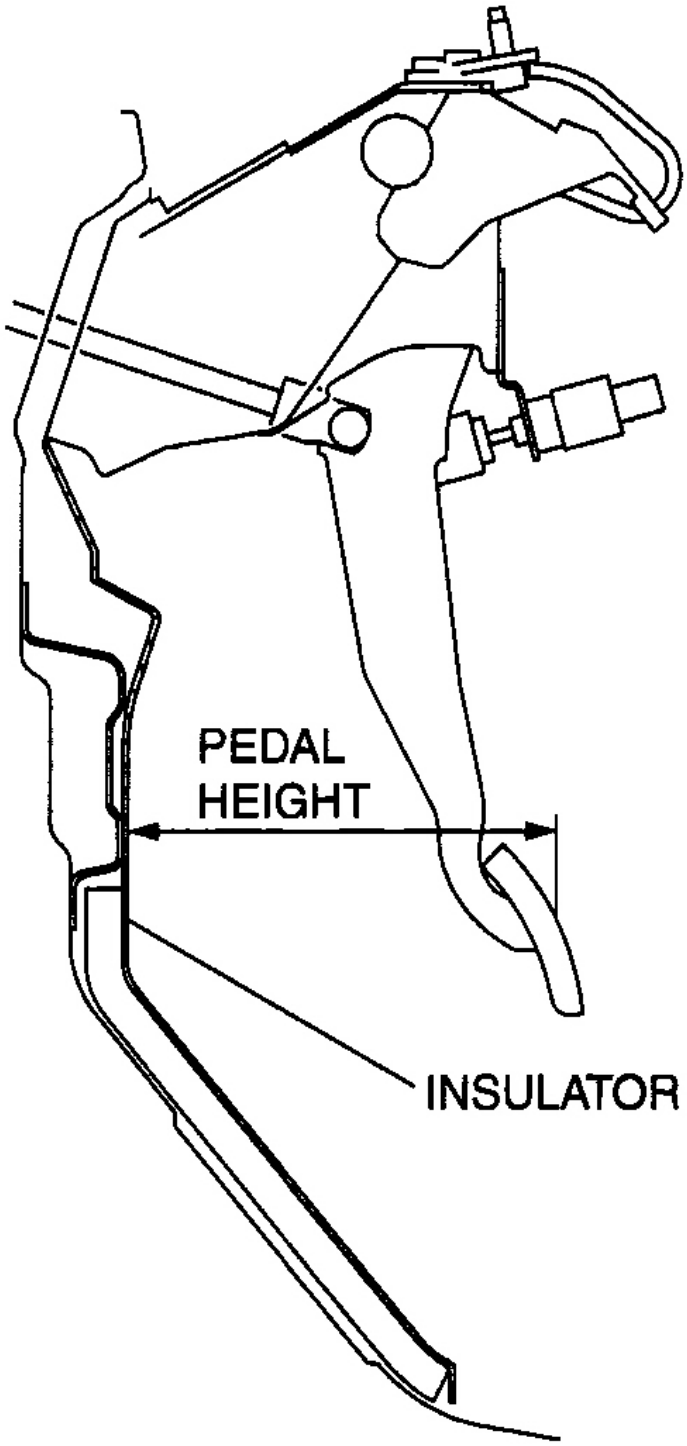


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Fig. 4: Inspecting Brake Pedal Height
Courtesy of MAZDA MOTORS CORP.

BRAKE PEDAL HEIGHT ADJUSTMENT

CAUTION:

- **The brake switch may not operate normally after adjusting the pedal height. Whenever adjusting the pedal height, replace the brake switch with a new one.**
- **The interlock cable may not operate normally after adjusting the pedal height. Whenever adjusting the pedal height, refer to the interlock cable installation note. (See INTERLOCK CABLE INSTALLATION NOTE .)**

1. Loosen the locknut and turn the push rod to adjust the pedal height.
2. Tighten the locknut.

   Tightening torque

   20.4-30.6 N.m {2.09-3.12 Kgf.m, 15.0-22.5 ft.lbf}

3. After adjustment, inspect the pedal play.

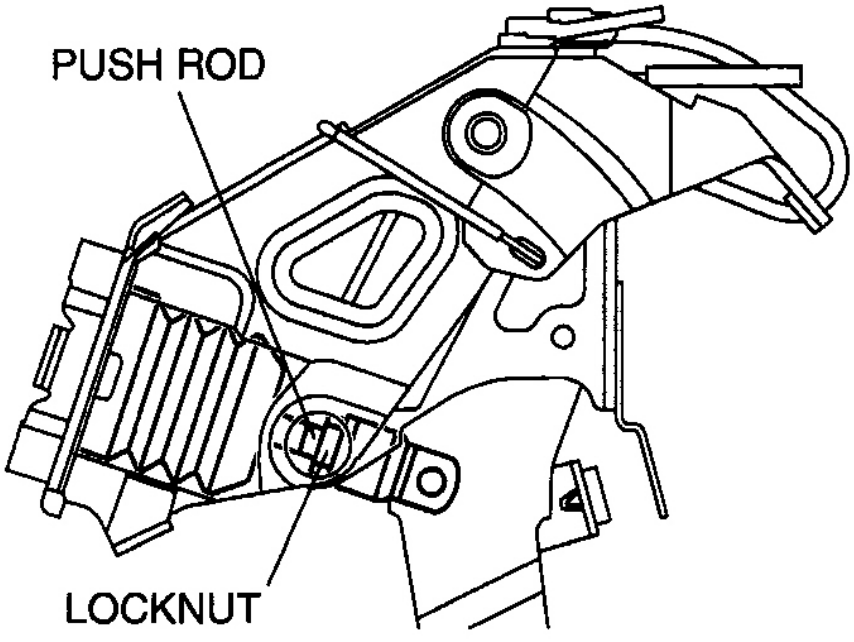

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Fig. 5: Adjusting Brake Pedal Height
Courtesy of MAZDA MOTORS CORP.

BRAKE PEDAL PLAY INSPECTION

1. Depress the pedal several times to release the vacuum in the power brake unit.
2. Gently depress the pedal by hand, and measure the pedal play.
   - If not within the specification, inspect the wear of the clevis pin and replace it if there is any malfunction.

Brake pedal play

2-5 mm {0.08-0.19 in}

NOTE:

- **If there is no malfunction in the clevis pin, there is a possibility that the power brake unit has some malfunction. Verify that there are no malfunctions, and replace it if necessary.**

PEDAL-TO-FLOOR CLEARANCE INSPECTION

1. Start the engine and depress the pedal with a pedal force of **147 N {15.0 kgf, 33.0 lbf}** .
2. Measure the distance between the pedal pad center and the insulator, and verify that it is as specified.
   - If the pedal-to-floor clearance is less than the specification, check for air in the brake system.

Brake pedal-to-floor clearance (Brake pedal when depressed at 147 N {15.0 kgf, 33.0 lbf}

106.9 mm {4.209 in} or more

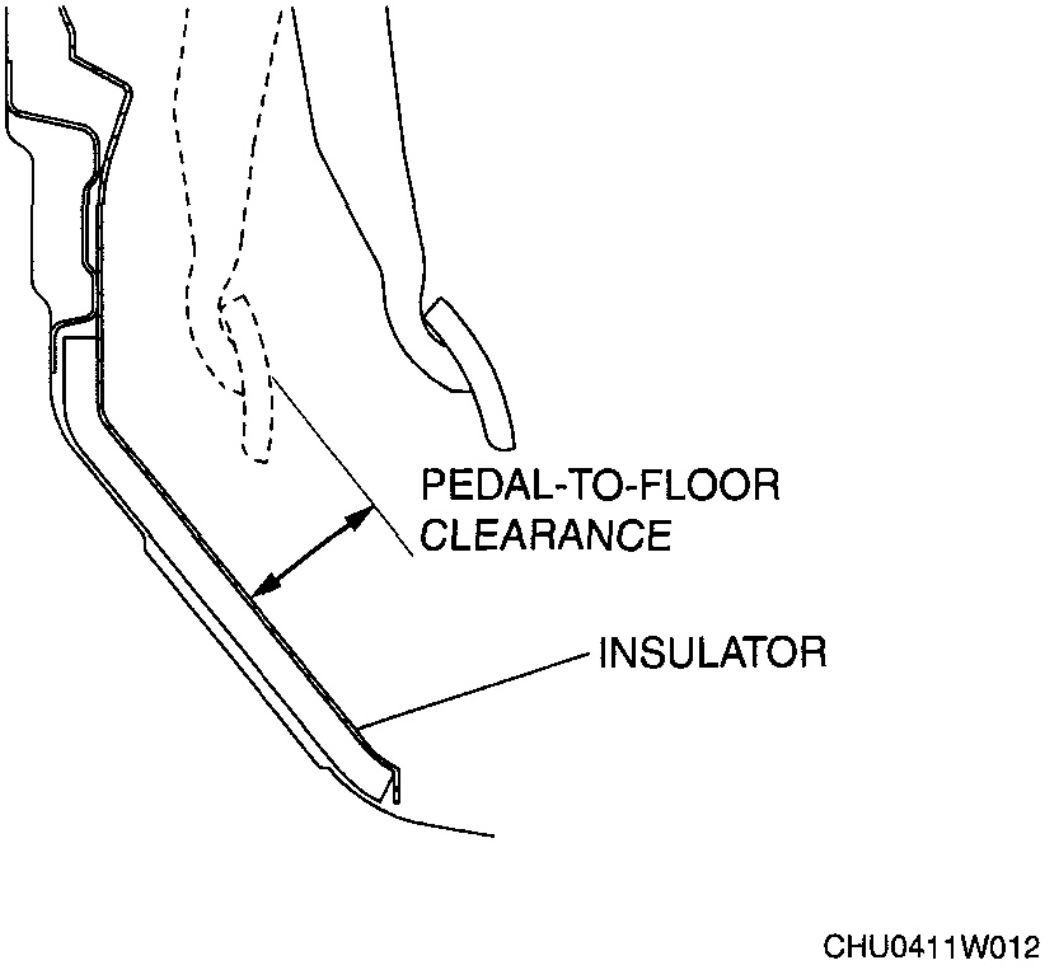


Fig. 6: Inspecting Pedal-To-Floor Clearance
Courtesy of MAZDA MOTORS CORP.

BRAKE PEDAL REMOVAL/INSTALLATION

CAUTION:

- **The clearance between the brake switch and the brake pedal is automatically adjusted to the correct amount when the brake switch connector is connected after the brake switch has been properly installed. If the brake switch is not properly installed or the connector is connected before installation, the clearance may be incorrect, causing a brake light malfunction. Therefore, always verify that the brake switch is properly installed before connecting the connector.**
- **Once the brake switch clearance has automatically been adjusted, it cannot be adjusted again. Therefore, replace the switch with a new**

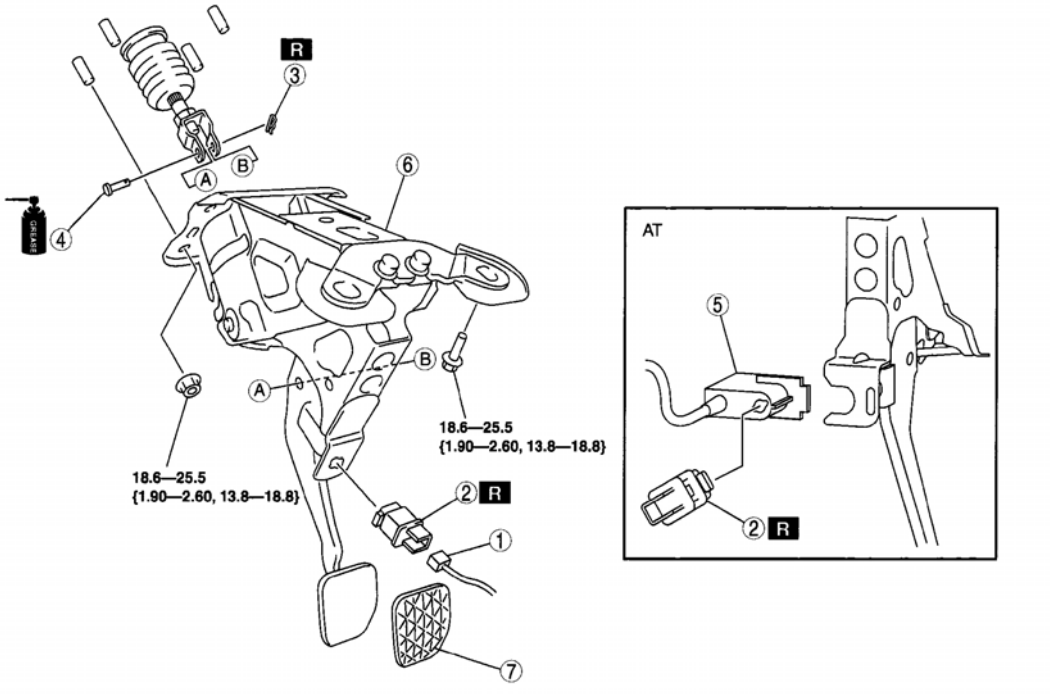
one when replacing the power brake unit or the pedal, or performing any procedure that changes the pedal stroke.

- **When replacing the brake pedal (AT), it is possible that the installation of the interlock cable could become defective. Always refer to the interlock cable installation note when replacing the brake pedal. (See INTERLOCK CABLE INSTALLATION NOTE .)**

NOTE:

- **When the brake switch connector is connected to the brake switch, the clearance between the pedal and the brake switch is adjusted automatically. However, this mechanism will only function one time.**

1. Remove in the order indicated in **Fig. 7**.
2. Install in the reverse order of removal.



1	Brake switch connector
2	Brake switch
3	Snap pin

4	Clevis pin
5	Interlock cable (AT)
6	Brake pedal
7	Pedal pad

Fig. 7: Identifying Brake Pedal Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

BRAKE PEDAL REMOVAL NOTE

1. Move the power brake unit to the vehicle front where the power brake unit fork does not interfere with the brake pedal arm.
2. Remove the brake pedal.

BRAKE SWITCH INSTALLATION NOTE

1. Install the new brake switch to the brake pedal (MT) or the interlock cable (AT), and secure it by turning it clockwise **45°** (AT) or counterclockwise **45°** (MT).

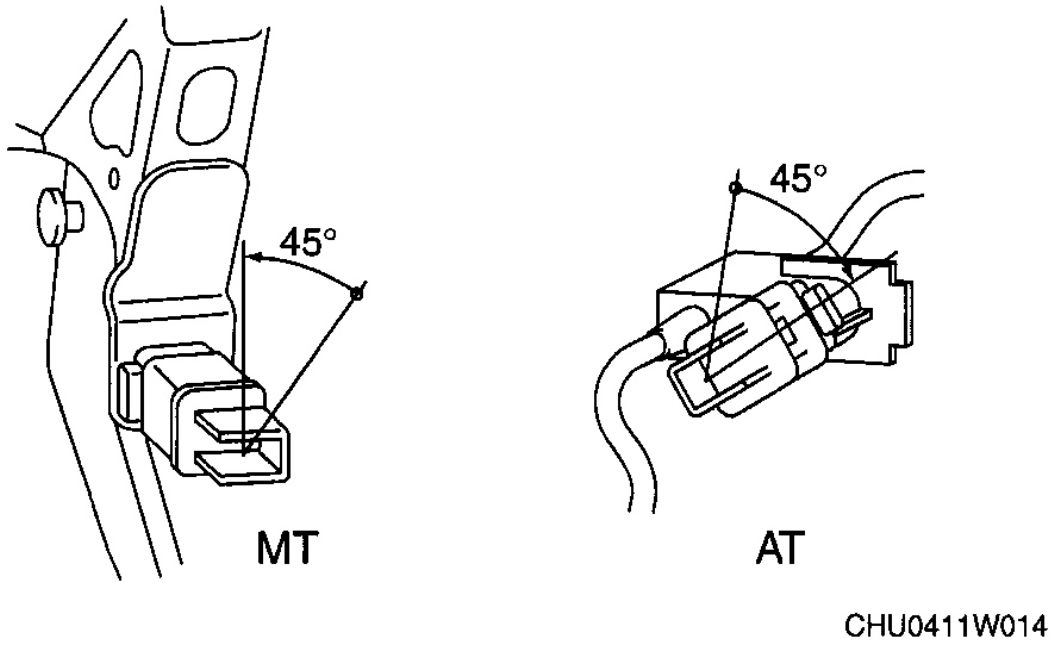


Fig. 8: Identifying Brake Switch Installing Angle
Courtesy of MAZDA MOTORS CORP.

BRAKE SWITCH CONNECTOR INSTALLATION NOTE

1. Inspect the brake pedal. (See **BRAKE PEDAL INSPECTION** .)
2. With the brake pedal in its original position, install the brake switch to the brake switch connector.

BRAKE SWITCH INSPECTION

CAUTION:

- **If the brake switch is removed from the brake pedal or the interlock unit, its proper functioning cannot be guaranteed when reinstalled. Therefore, inspect the brake switch with it still installed, or replace**

the brake switch if it is removed.

1. Verify continuity as indicated in **Fig. 9** .
    - If not as indicated in **Fig. 9** replace the brake switch.

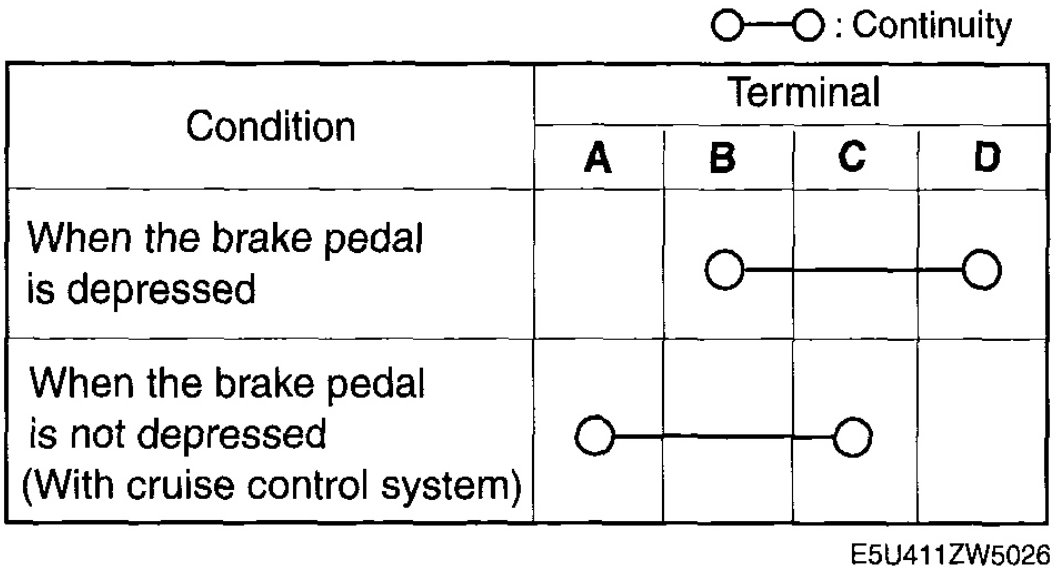


Fig. 9: Terminal Continuity Reference Table
Courtesy of MAZDA MOTORS CORP.

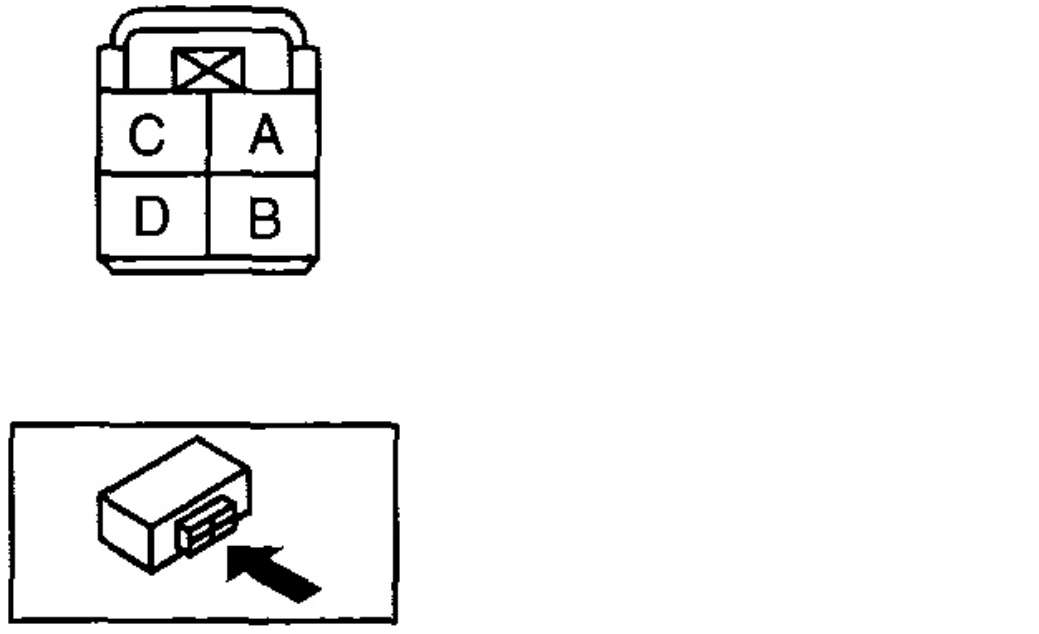
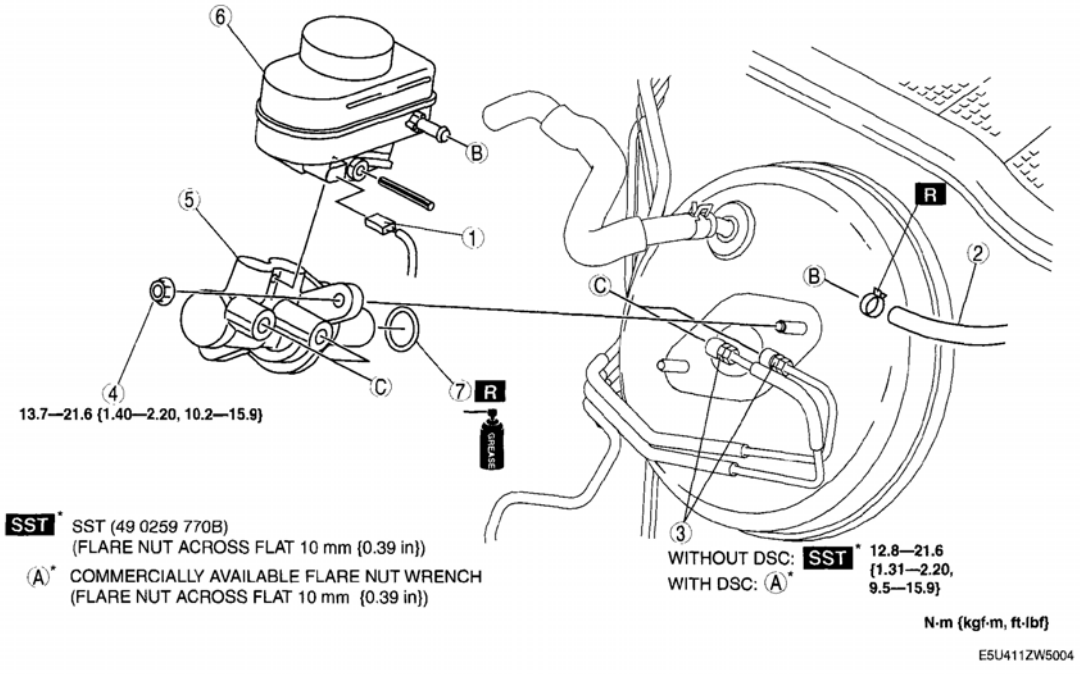


Fig. 10: Identifying Brake Switch Connector
Courtesy of MAZDA MOTORS CORP.

MASTER CYLINDER REMOVAL/INSTALLATION

1. Remove in the order indicated in **Fig. 11** .
2. Install in the reverse order of removal.



1	Brake fluid level sensor connector
2	Hose (MT)
3	Brake pipe
4	Nut

5	Master cylinder
6	Reserve tank
7	O-ring

Fig. 11: Identifying Master Cylinder Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

MASTER CYLINDER INSTALLATION NOTE

CAUTION:

- **If the master cylinder is installed at an angle, the master cylinder piston may push against the push rod retainer of the power brake unit causing poor air bleeding, brake drag, or other malfunctions. Be sure to install the master cylinder at a perpendicular angle to the power brake unit.**

1. Install the **SST** to the power brake unit and tighten to the specified torque.

   Tightening torque

   13.7-21.6 N.m {1.4-2.2 kgf.m, 10.2-15.9 ft.lbf}

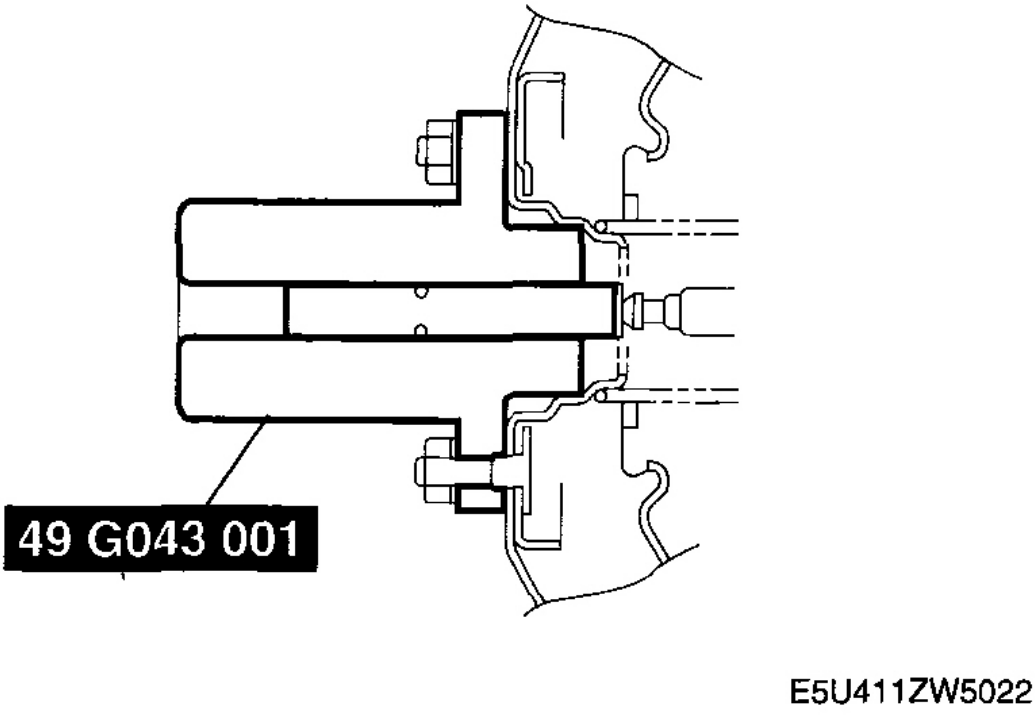


Fig. 12: Identifying Special Tool To Power Brake Unit
Courtesy of MAZDA MOTORS CORP.

2. Apply a vacuum of **66.7 kPa {500 mmHg, 19.7 inHg}** to the power brake unit using a vacuum gauge.

NOTE:

- **Use any commercially available vacuum gauge.**

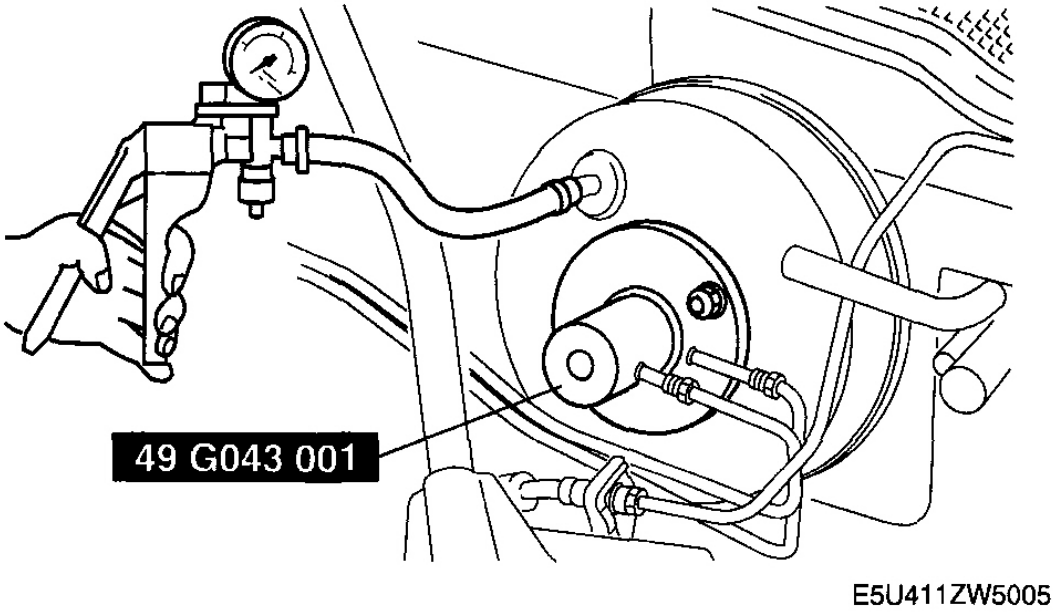


Fig. 13: Applying Vacuum To Power Brake Unit Using Vacuum Gauge
Courtesy of MAZDA MOTORS CORP.

3. Using calipers, measure dimension L as shown in **Fig. 14** .

   Standard L dimension

   30.4-30.6 mm {1.197-1.204 in}

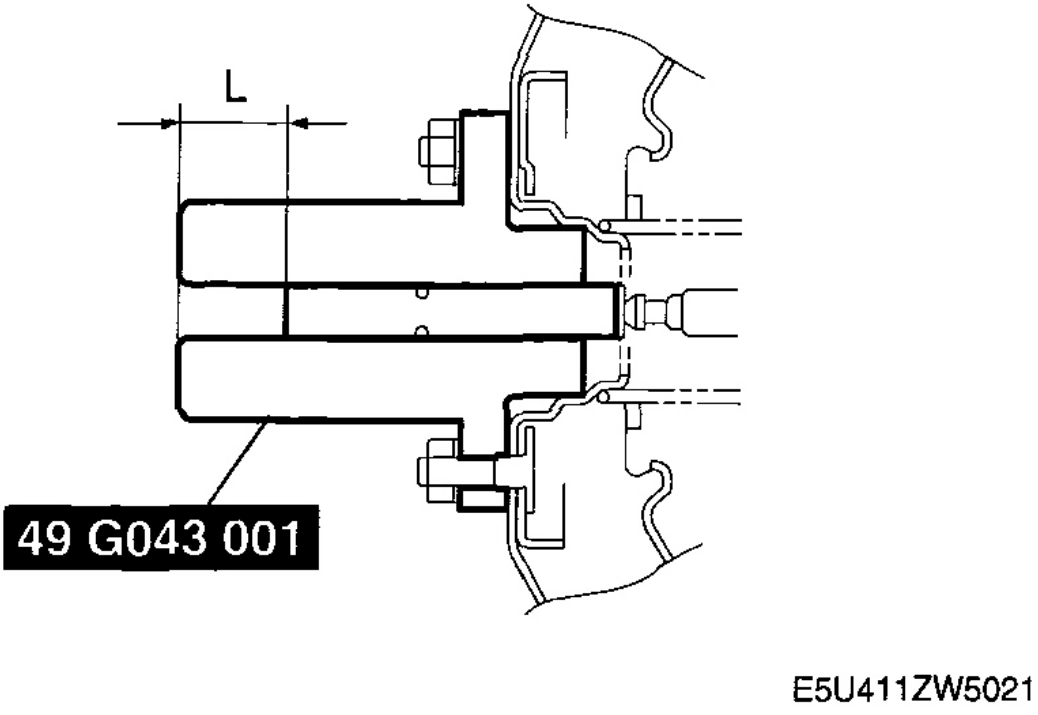


Fig. 14: Measuring Dimension L Using Calipers
Courtesy of MAZDA MOTORS CORP.

4. If dimension L is not within the standard, remove the **SST** (49 G043 001) and, while stopping the push rod rotation with the **SST** (49 E043 003A), adjust the push rod length with the **SST** (49 B043 004).
5. Switch the **SSTs** and remeasure dimension L.

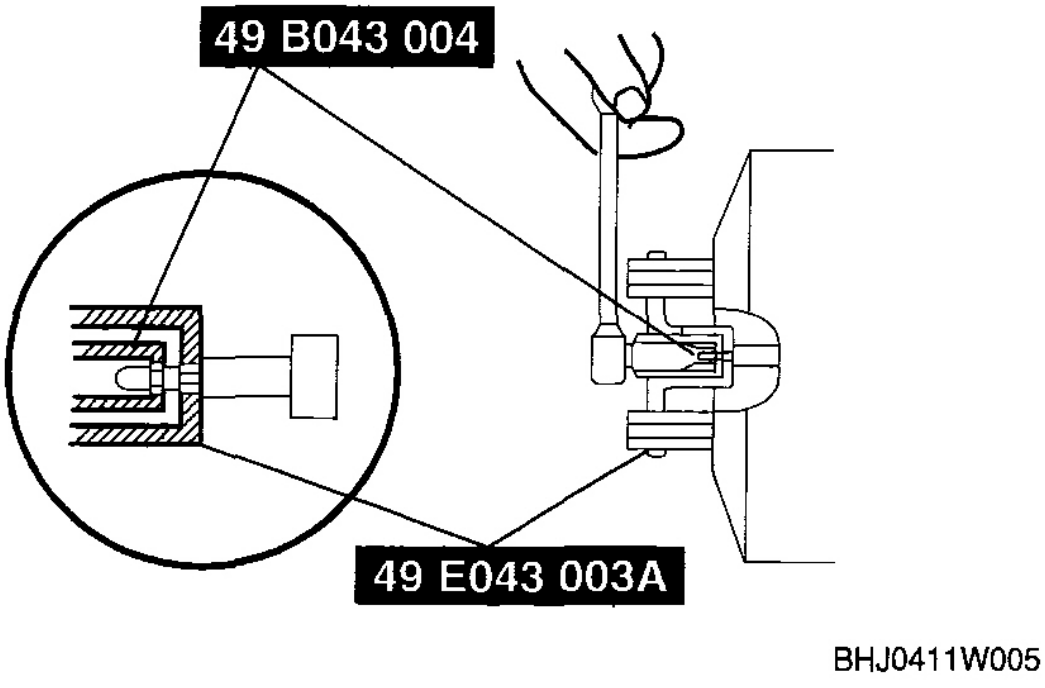


Fig. 15: Adjusting Pushrod Length
Courtesy of MAZDA MOTORS CORP.

6. Install the master cylinder to the power brake unit.

BRAKE FLUID LEVEL SENSOR INSPECTION

1. Disconnect the brake fluid level sensor connector from the master cylinder.
2. Inspect for continuity according to fluid level between the brake fluid level sensor terminals.
   - If not as indicated in **Fig. 16** , replace the reserve tank.

O—O: Continuity

Condition	Terminal	
	A	B
Above MIN		
Below MIN	O	O

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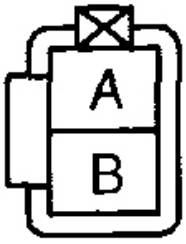
Fig. 16: Brake Fluid Sensor Terminal Continuity Table
Courtesy of MAZDA MOTORS CORP.



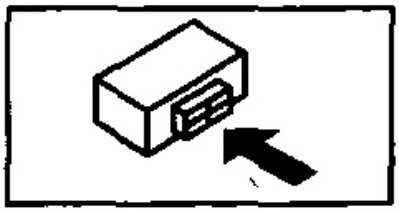


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Fig. 17: Identifying Brake Fluid Level Sensor Connector
Courtesy of MAZDA MOTORS CORP.

POWER BRAKE UNIT INSPECTION

NOTE:

- **The following inspection methods are simple inspection methods to judge the function of the power brake unit.**
- **If there is any malfunction in the power brake unit, replace the power brake unit as a single unit.**

WITHOUT USING SST

Operation Inspection

1. With the engine stopped, depress the pedal several times.
2. With the pedal depressed, start the engine.
3. If the pedal moves down slightly immediately after starting the engine, the unit is normal.

Vacuum Function Inspection

1. Start the engine.
2. After driving the vehicle for **1-2 min** , stop the engine.
3. Depress the pedal with normal force.
4. If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is normal.
    - If a problem is found, inspect for damage to or improper installation of the check valve and vacuum hose. After repairing, inspect again.

Vacuum Loss Function Inspection

1. Start the engine.
2. Depress the pedal with normal force.
3. With the pedal depressed, stop the engine.
4. Maintain the pedal depressed for **approx. 30 s** .
5. If the pedal height does not change during this time, the unit is normal.

USING SST

Pre-inspection Preparation

1. Install the **SST** (49 N043 001) in the orientation shown in **Fig. 18** , (with DSC)

NOTE:

- **Install the SST (49 N043 001) to the master cylinder using a commercially available flare nut wrench.**

- **Flare nut across flat: 12 mm {0.47 in}**

2. Connect the **SSTs** , a vacuum gauge and a pedal force gauge to the master cylinder and bleed the air from the **SSTs** and the brake line. (Bleed the air from the **SSTs** through air bleeding valve A.)

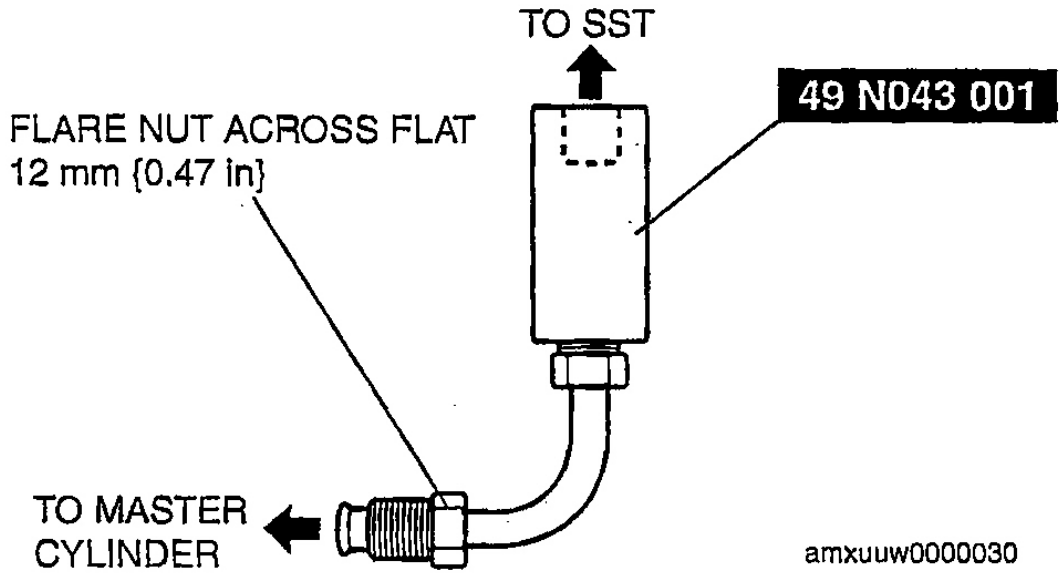


Fig. 18: Installing SST (49 N043 001)
Courtesy of MAZDA MOTORS CORP.

WITHOUT DSC

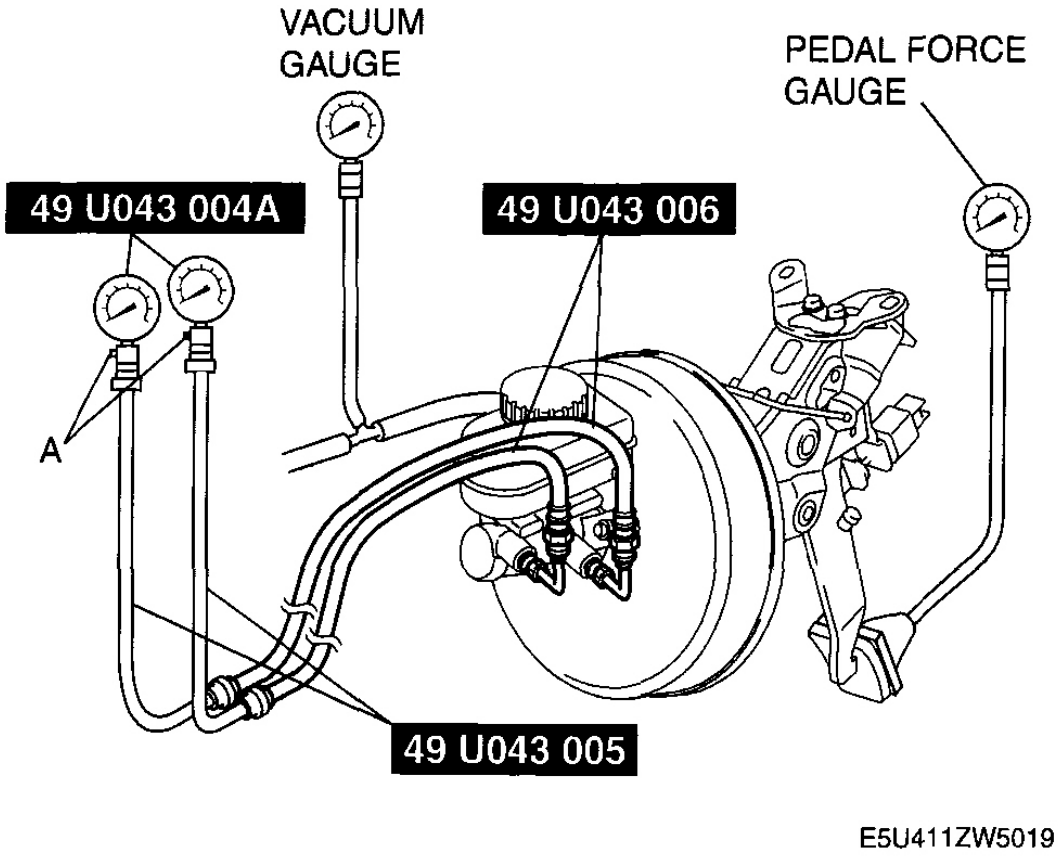


Fig. 19: Inspecting Vacuum Loss Function - Without DSC
Courtesy of MAZDA MOTORS CORP.

WITH DSC

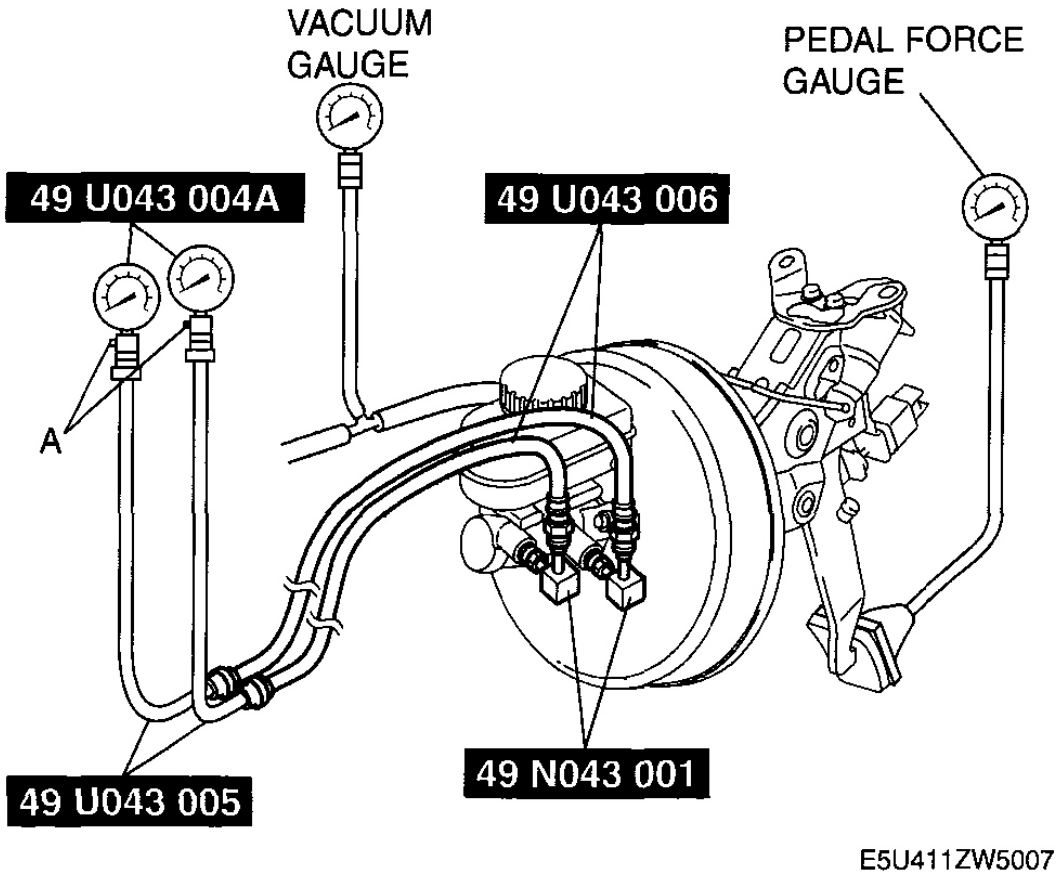


Fig. 20: Inspecting Vacuum Loss Function - With DSC
Courtesy of MAZDA MOTORS CORP.

Checking For Vacuum Loss (Loaded Condition)

1. Start the engine.
2. Depress the brake pedal with a force of **200 N {20.4 kgf, 44.9 lbf}** .
3. With the brake pedal depressed, turn off the engine when the vacuum gauge reaches **68 kPa {510 mmHg, 20.1 inHg}** .
4. Within **15 s** right after stopping the engine, measure the lowest amount of vacuum.
5. If the lowest amount is **3.3 kPa {25 mmHg, 1.0 inHg}** or less, the system is normal.

Lack of Hydraulic Pressure Inspection

1. With the engine stopped and the vacuum amount at **0 kPa {0 mmHg, 0 inHg}** if the pedal force and fluid pressure correlation is within the specification, the system is normal.

Power Brake Unit Fluid Pressure

POWER BRAKE UNIT FLUID PRESSURE SPECIFICATIONS

Vacuum amount at o kPa {0 mmHg, 0 inHg}	
Pedal force (N {kgf, lbf})	Fluid pressure (kPa {kgf/cm^2 , psi})
200 {20.4, 44.9}	620 {6.33, 90.0} or more

Hydraulic Pressure Inspection

1. Start the engine and when the vacuum amount reaches **66.7 kPa {500 mmHg, 19.7 inHg}** , depress the brake pedal.
2. At this time, apply the indicated pedal force and if the fluid pressure is within the specification, the unit is normal.

Power Brake Unit Fluid Pressure

POWER BRAKE UNIT FLUID PRESSURE SPECIFICATIONS

Vacuum amount at 66.7 kPa {500 mmHg, 19.7 inHg}	
Pedal force (N {kgf, lbf})	Fluid pressure (kPa {kgf/cm^2 , psi})
200 {20.4, 44.9}	6,340 {64.65, 919.6} or more

POWER BRAKE UNIT REMOVAL/INSTALLATION

1. Remove the master cylinder. (See **MASTER CYLINDER REMOVAL/INSTALLATION** .)
2. Remove the clutch pipe. (MT)

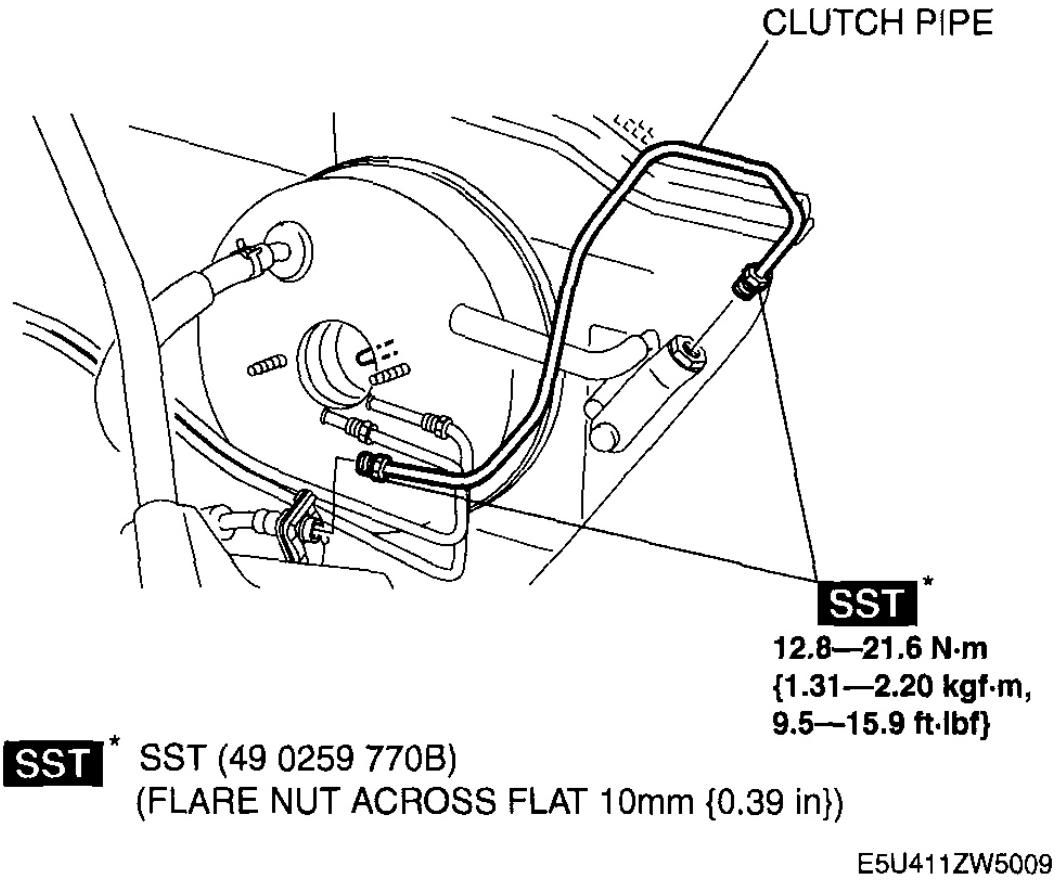


Fig. 21: View Of Clutch Pipe & Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

3. Remove the nut shown in **Fig. 22** , then remove the cooler hose (LO) bracket from the vehicle.

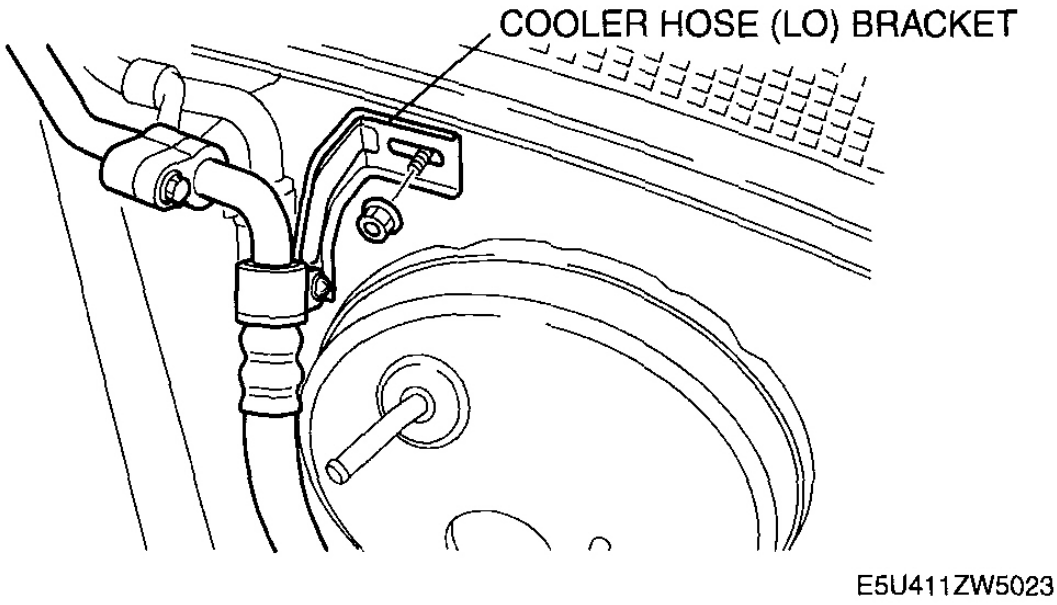
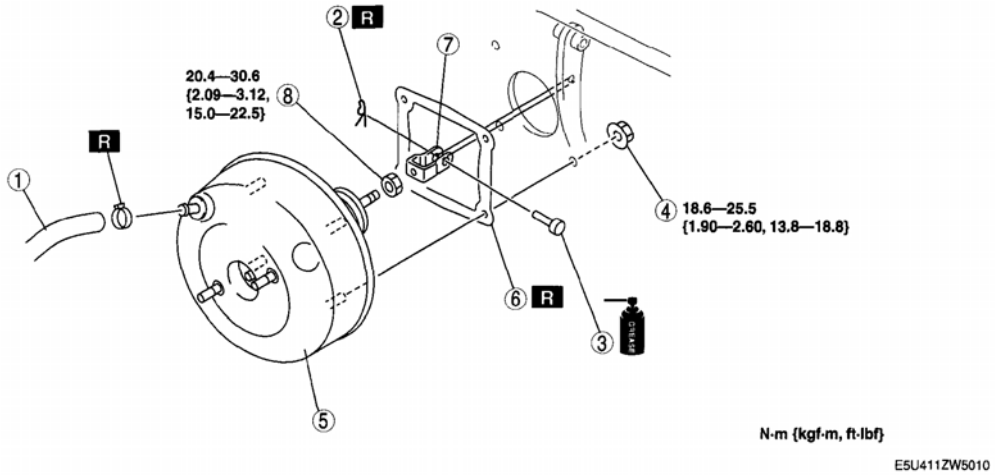


Fig. 22: View Of Cooler Hose (LO) Bracket
Courtesy of MAZDA MOTORS CORP.

4. Remove in the order indicated in **Fig. 23** .



1	Vacuum hose
2	Snap pin
3	Clevis pin
4	Nut

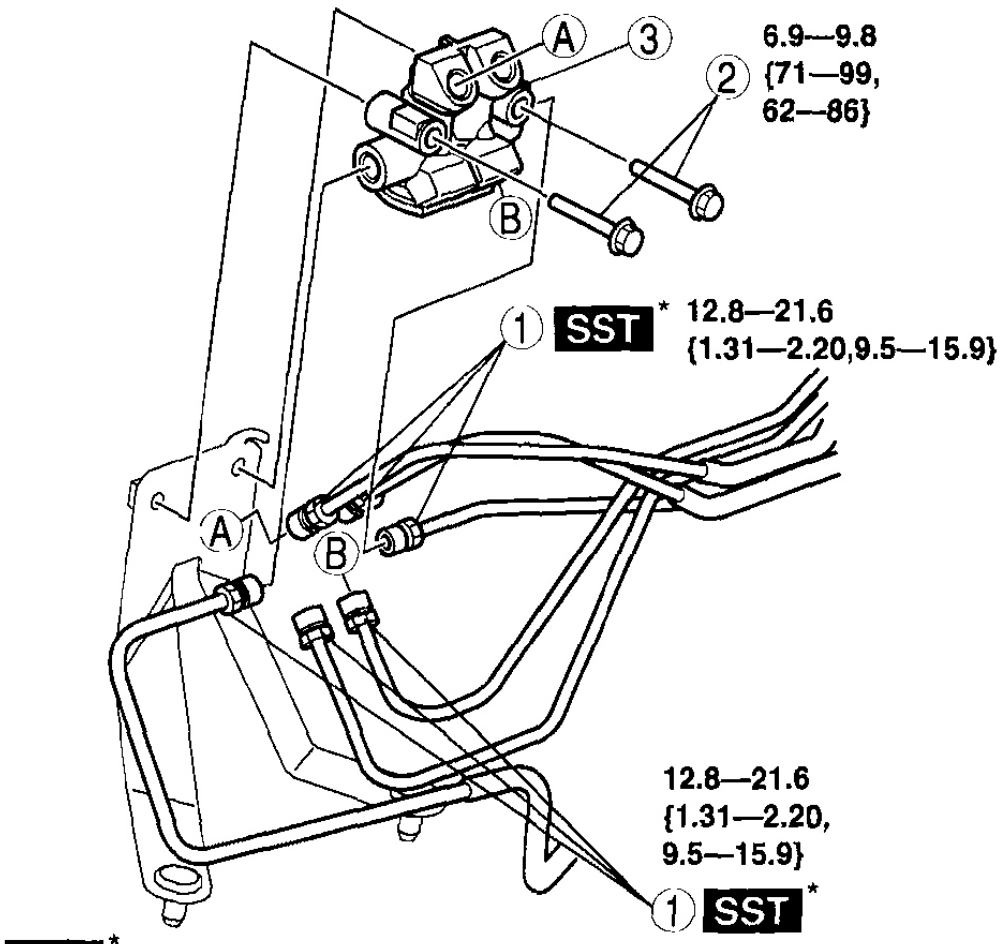
5	Power brake unit
6	Gasket
7	Fork
8	Locknut

Fig. 23: Identifying Power Brake Unit Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

5. Install in the reverse order of removal.
6. After installation, perform brake pedal inspection. (See **BRAKE PEDAL INSPECTION** .)

DUAL PROPORTIONING VALVE REMOVAL/INSTALLATION

1. Remove in the order indicated in **Fig. 24** .



1	Brake pipe
2	Bolt
3	Dual proportioning valve

Fig. 24: View Of Dual Proportioning Valve Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

2. Install in the reverse order of removal.

BRAKE PIPE REMOVAL NOTE

1. Place an alignment mark on the brake pipe and dual proportioning valve.

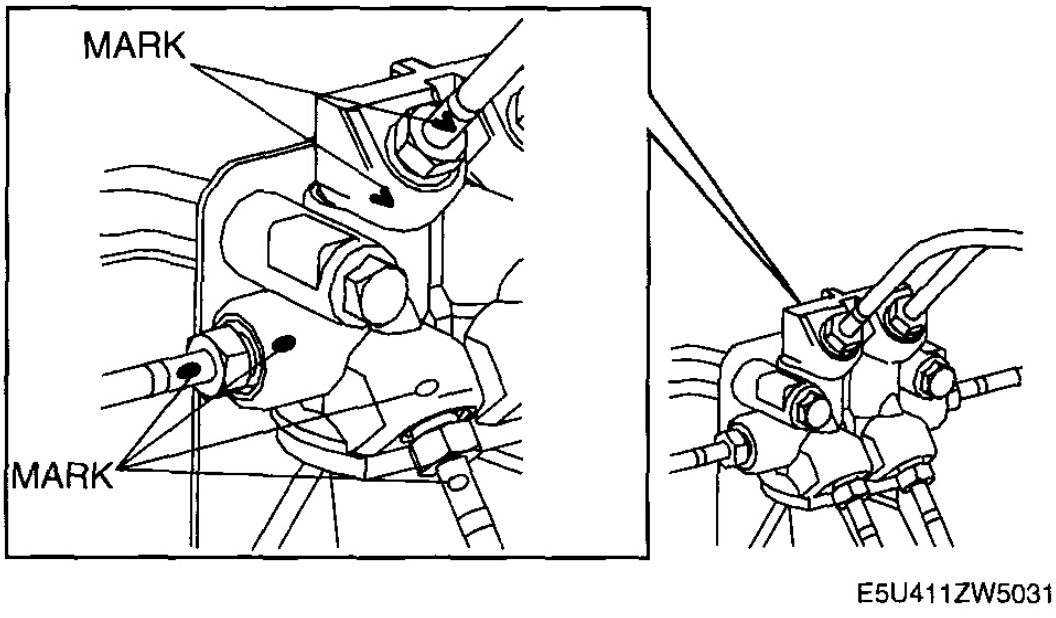


Fig. 25: Placing Alignment Mark On Brake Pipe & Dual Proportioning Valve
Courtesy of MAZDA MOTORS CORP.

DUAL PROPORTIONING VALVE INSTALLATION NOTE

1. Install the dual proportioning valve so that the R marks faces the upper side of the vehicle.

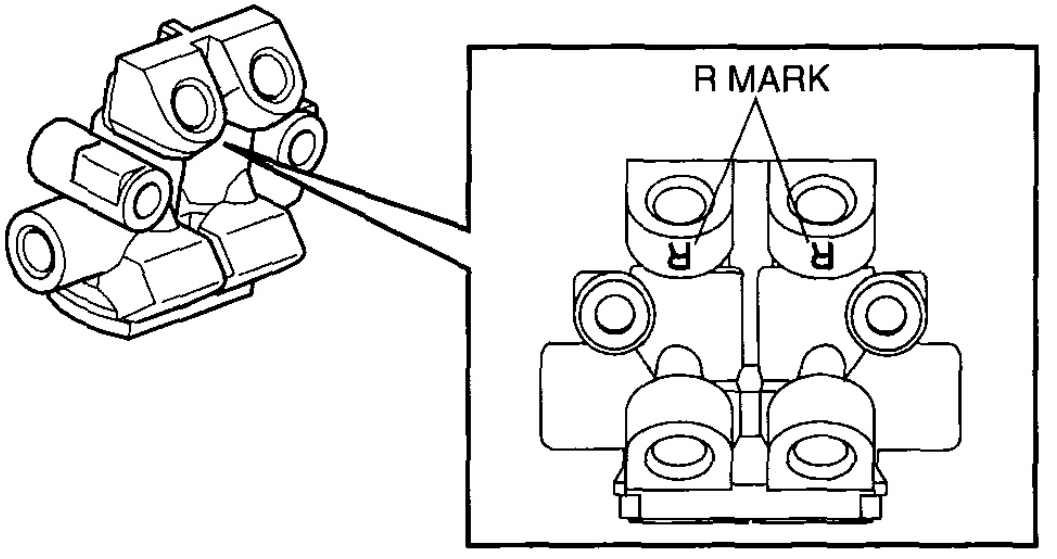


Fig. 26: Identifying Dual Proportioning Valve R Marks
Courtesy of MAZDA MOTORS CORP.

BRAKE PIPE INSTALLATION NOTE

1. Align the marks made before removal and install the brake pipe to the dual proportioning valve referring to **Fig. 27** .

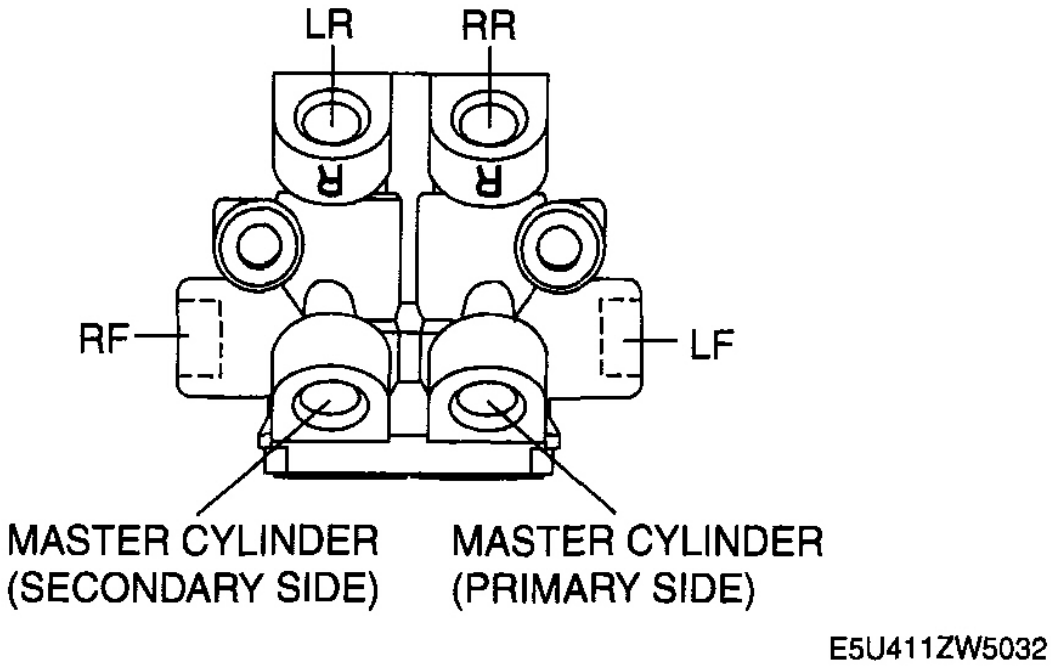


Fig. 27: Aligning Brake Pipe To Dual Proportioning Valve Marks
Courtesy of MAZDA MOTORS CORP.

DUAL PROPORTIONING VALVE INSPECTION

1. Connect the **SSTs** to the brake pipes as shown in **Fig. 28** .
2. Bleed the air from the brake system and the **SSTs** . (Bleed the air from the **SSTs** through air bleeding valve A.)

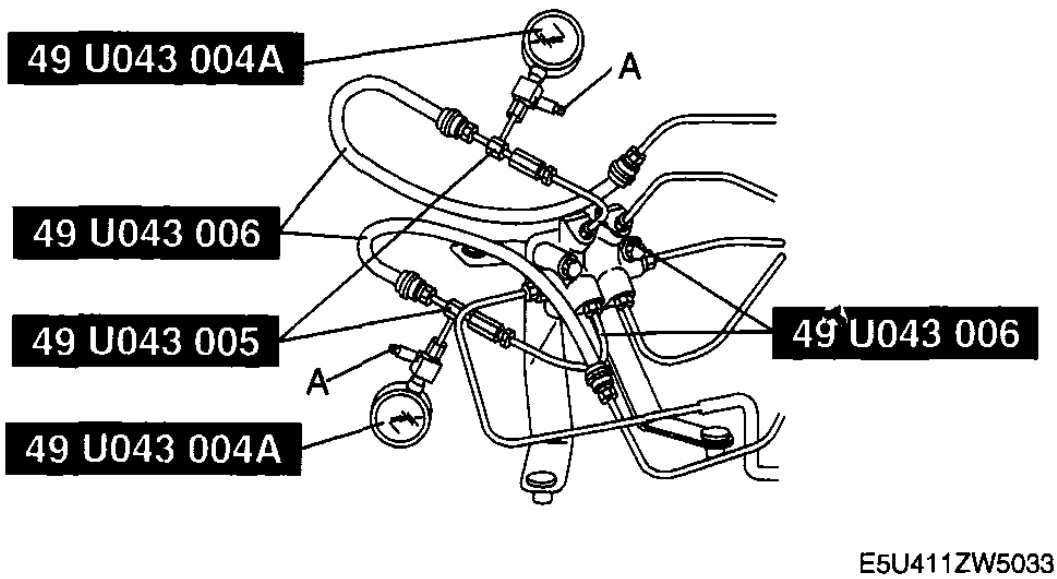


Fig. 28: Identifying Special Tools
Courtesy of MAZDA MOTORS CORP.

3. Measure the fluid pressure of the master cylinder and the rear brake.
    - If not within the specification, replace the dual proportioning valve.

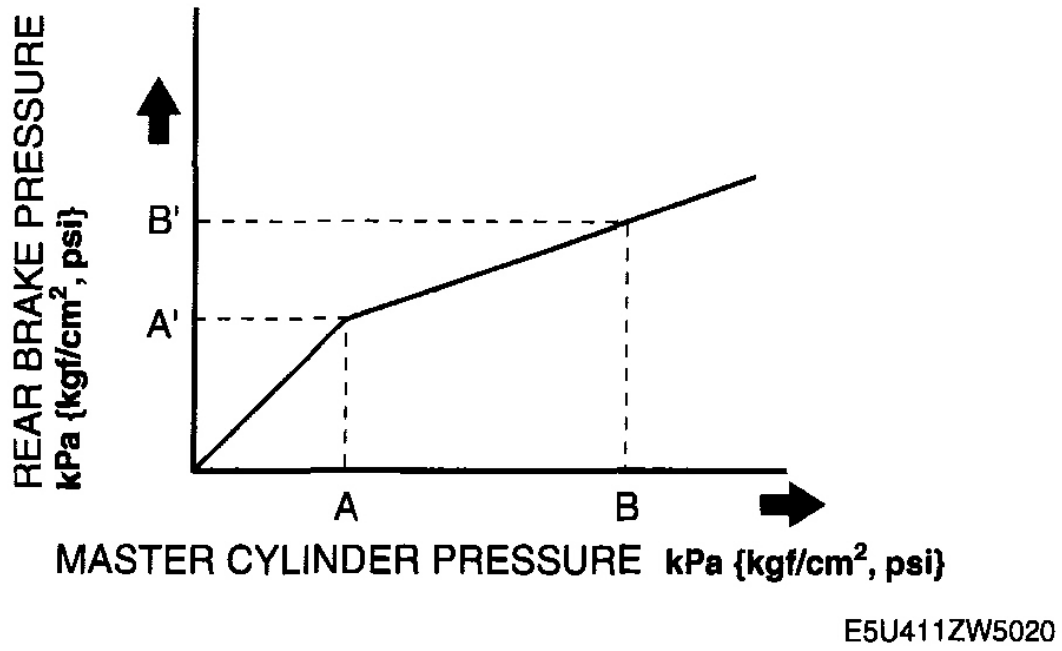


Fig. 29: Dual Proportioning Valve Fluid Pressure Graph
Courtesy of MAZDA MOTORS CORP.

DUAL PROPORTIONING VALVE FLUID PRESSURE SPECIFICATIONS

MASTER CYLINDER PRESSURE (kPa {kgf/cm^2 , psi})	REAR BRAKE PRESSURE (kPa {kgf/cm^2 , psi})
A: 3,430 {34.98, 497.5}	A': 3,130 {31.92, 453.9} - 3,730 {38.04, 540.9}
B: 5,880 {59.96, 852.8}	B': 4,010 {40.9, 581.7} - 4,810 {49.05, 697.6}

FRONT BRAKE (DISC) INSPECTION

BRAKE JUDDER REPAIR HINTS

Description

1. Brake judder concern has the following 3 characteristics:

Steering Wheel Vibration

1. Steering wheel vibrates in the rotation direction. This characteristic is most noticeable when applying brakes at a vehicle speed of **100-140 km/h {62.1-86.8 mph}** .

Floor Vibration

1. When applying the brakes, the vehicle body shakes back and forth. The seriousness of the shaking is not influenced by vehicle speed.

Brake Pedal Vibration

1. When applying brakes, a pulsating force tries to push the brake pad back. The pulsation is transmitted to the brake pedal.
2. The following are the main possible causes of brake judder:

Due To An Excessive Runout (Side-To-Side Wobble) Of The Disc Plate, The Thickness Of The Disc Plate Is Uneven

1. If the runout is **more than 0.05 mm {0.002 in}** at the position **10 mm {0.39 in}** from the disc plate edge, uneven wear occurs on the disc plate because the pad contacts the plate unevenly.
2. If the runout is **less than 0.05 mm {0.002 in}** , uneven wear does not occur.

The Disc Plate Is Deformed By Heat

1. Repeated panic braking may raise the temperature in some portions of disc plate by **approx. 1,000°C {1,832°F}** . This results in a deformed disc plate.

Due To Corrosion, The Thickness And Friction Coefficient Of Disc Plate Change

1. If a vehicle is parked in damp conditions for a long time, corrosion occurs on the friction surface of disc plate.
2. The thickness of corrosion is uneven and sometimes appears like a wave pattern, which changes the friction coefficient and causes a reaction force.

Inspection and Repair Procedure

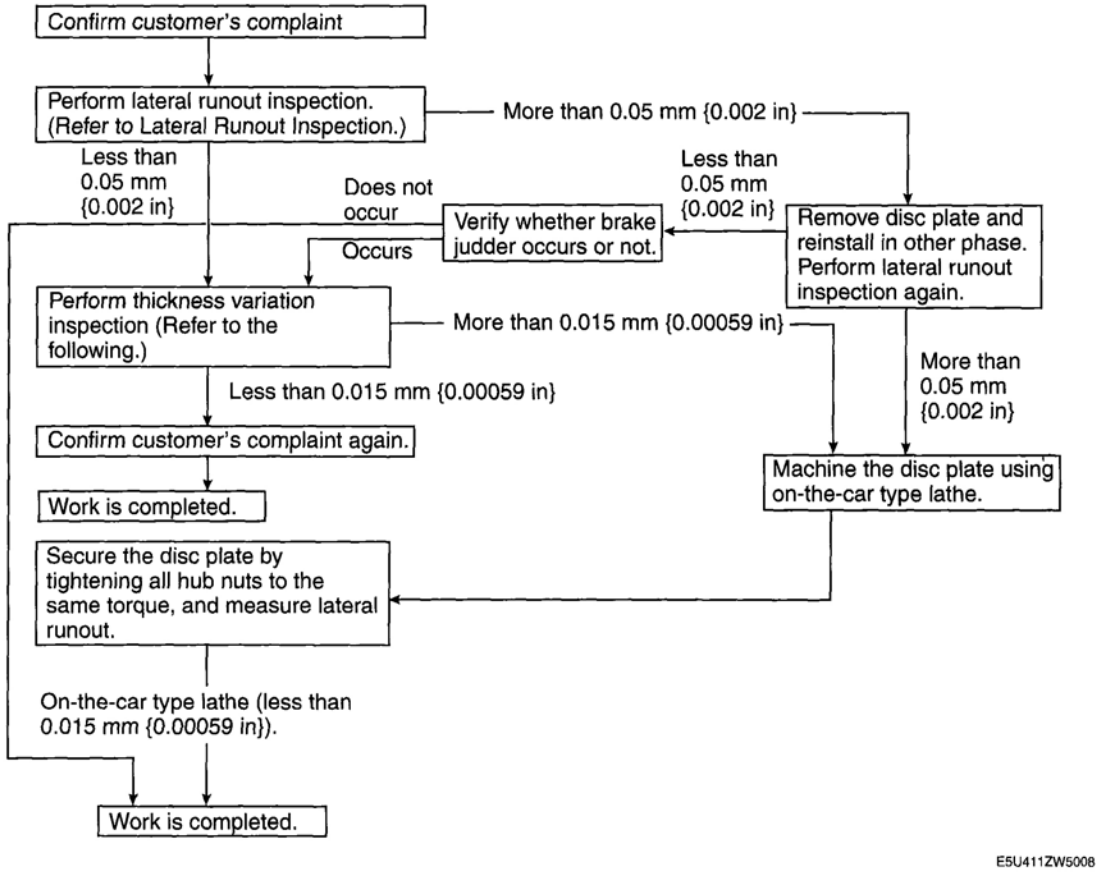


Fig. 30: Front Brake Inspection & Repair Flow Procedure
Courtesy of MAZDA MOTORS CORP.

Lateral Runout Inspection

1. To secure the disc plate and the hub, insert the washer (thickness **10 mm {0.39 in}** , inner diameter **more than 12 mm {0.47 in}**) between each hub bolt and the hub nut, then tighten all the hub nuts.

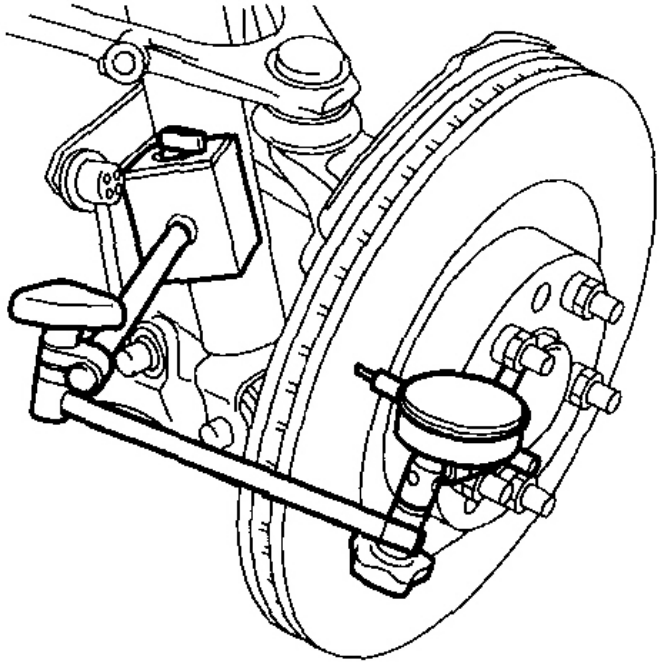
NOTE:

- **The component parts of the SST (49 B017 001 or 49 G019 003) can be used as a suitable washer.**

2. After tightening all the hub nuts to the same torque, put the dial gauge on the friction surface of disc plate **10 mm {0.12-0.28 in}** from the disc plate edge.
3. Rotate the disc plate one time and measure the runout.

Front disc plate runout limit

0.05 mm {0.002 in}



CHU0411W030

Fig. 31: Measuring Front Disc Plate Runout
Courtesy of MAZDA MOTORS CORP.

Thickness Variation Inspection

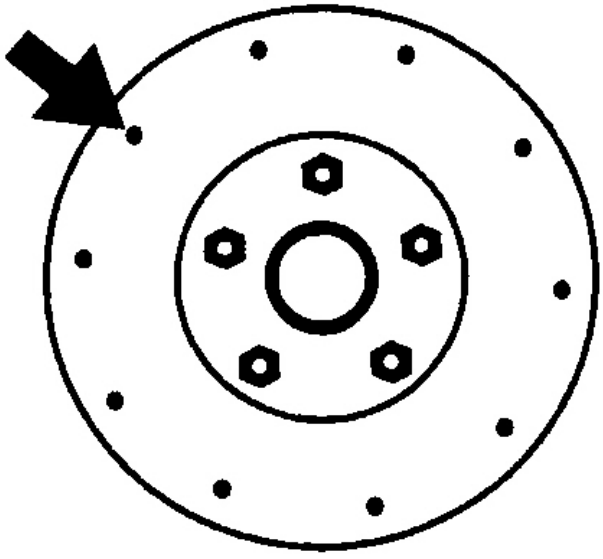
1. Clean the disc plate-to-pad friction surface using a brake cleaner.
2. Measure the points indicated in **Fig. 32** using a caliper (micrometer).
3. Subtract the minimum value from the maximum, and if the result is not within specification, machine the disc plate using a lathe.

Thickness variation limit

0.015 mm {0.00059 in}

WARNING:

- **Do not exceed minimum disc plate thickness.**



CHU0411W027

Fig. 32: Inspecting Disc Plate-To-Pad Friction Surface
Courtesy of MAZDA MOTORS CORP.

Disc Plate Thickness Inspection

CAUTION:
- **Excessive runout may result if the disc plate is removed from the vehicle then machined. Machine the disc plate while installed on the vehicle.**

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.

Minimum front disc plate thickness

20 mm {0.79 in}

Minimum front disc plate thickness after machining using a brake lathe on-vehicle

20.8 mm {0.82 in}

Disc Pad Thickness Inspection

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheel and tires.
3. Verify the remaining thickness of the pads.

   Minimum front disc pad thickness

   2.0 mm {0.079 in} min.

4. Replace the pads as a set (right and left wheels) if either one is at or less than the minimum thickness.

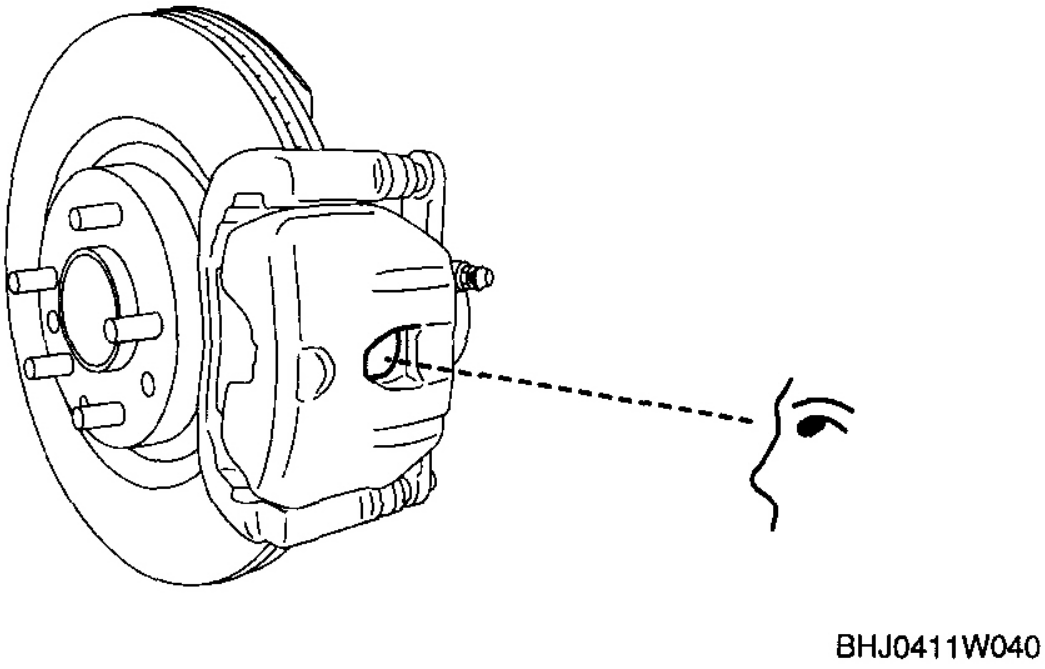
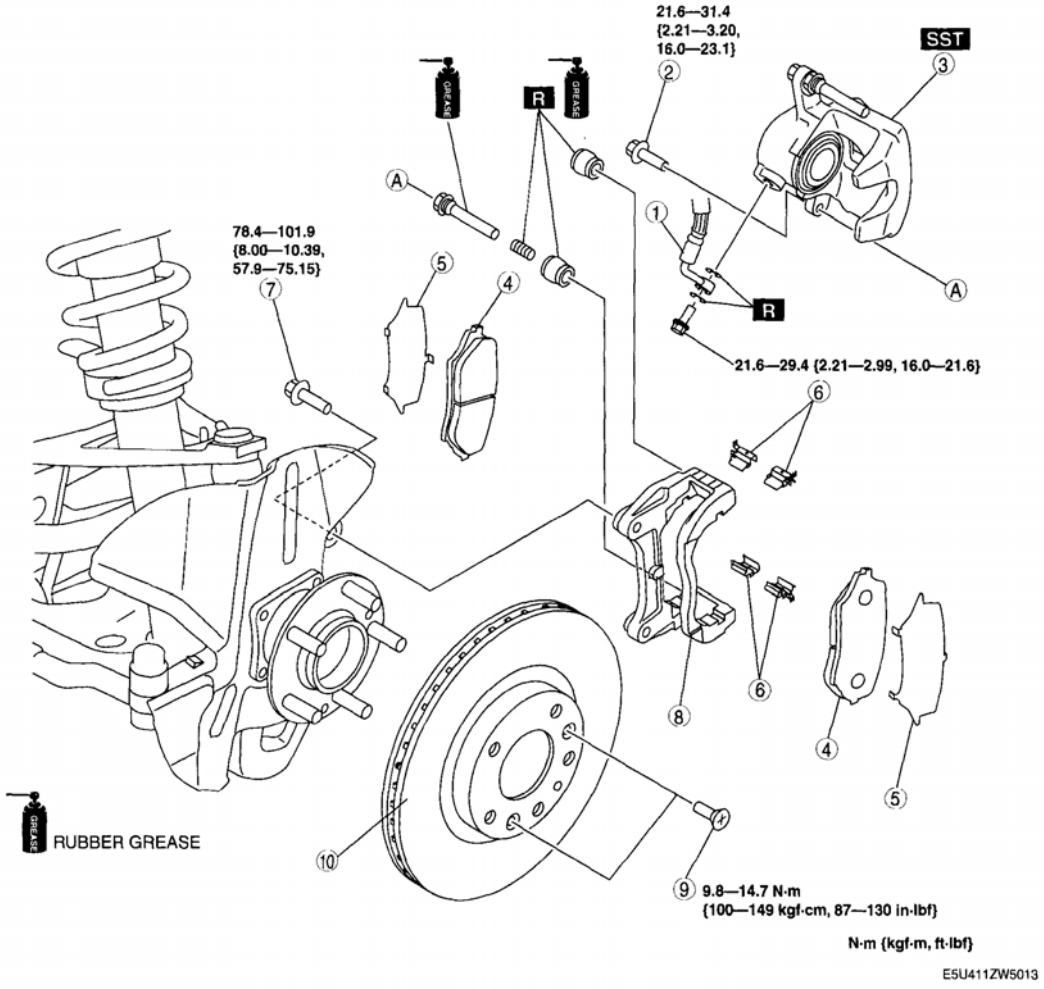


Fig. 33: Inspecting Disc Pad Thickness
Courtesy of MAZDA MOTORS CORP.

FRONT BRAKE (DISC) REMOVAL/INSTALLATION

1. Remove in the order indicated in **Fig. 34** .
2. Install in the reverse order of removal.
3. After installation, depress the brake pedal a few times, then verify that the brakes do not drag.



1	Brake hose
2	Bolt
3	Caliper
4	Disc pad
5	Shim

6	Guide plate
7	Bolt
8	Mounting support
9	Screw
10	Disc plate

Fig. 34: Identifying Front Brake (Disc) Components (With Torque Specifications) Courtesy of MAZDA MOTORS CORP.

CALIPER INSTALLATION NOTE

1. Clean the exposed area of the piston.
2. Install the piston using the **SST** .
3. Install the caliper.

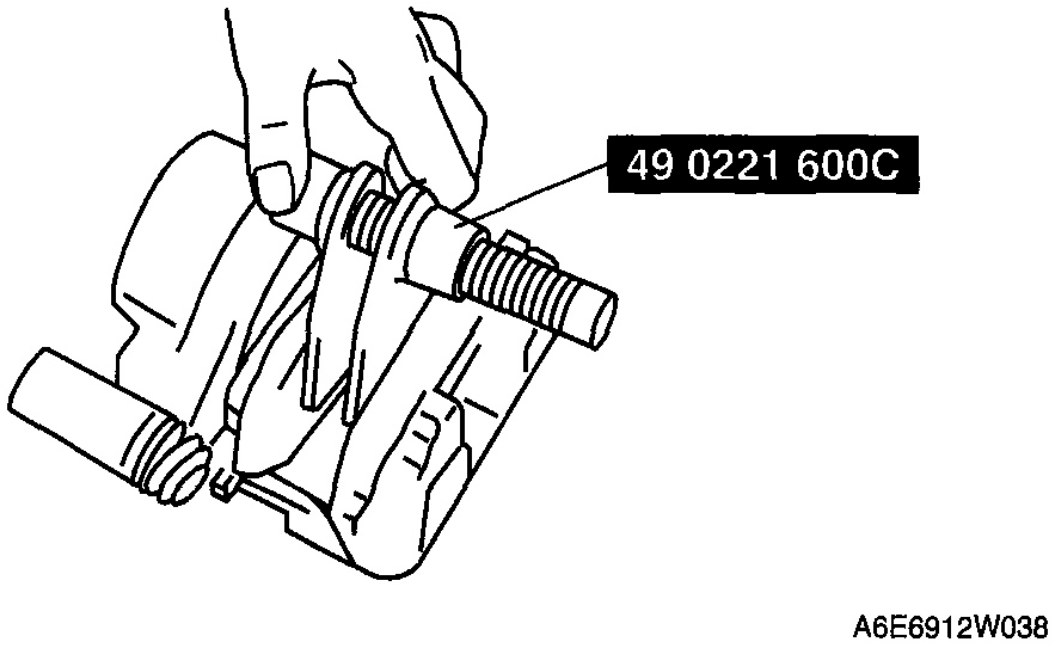
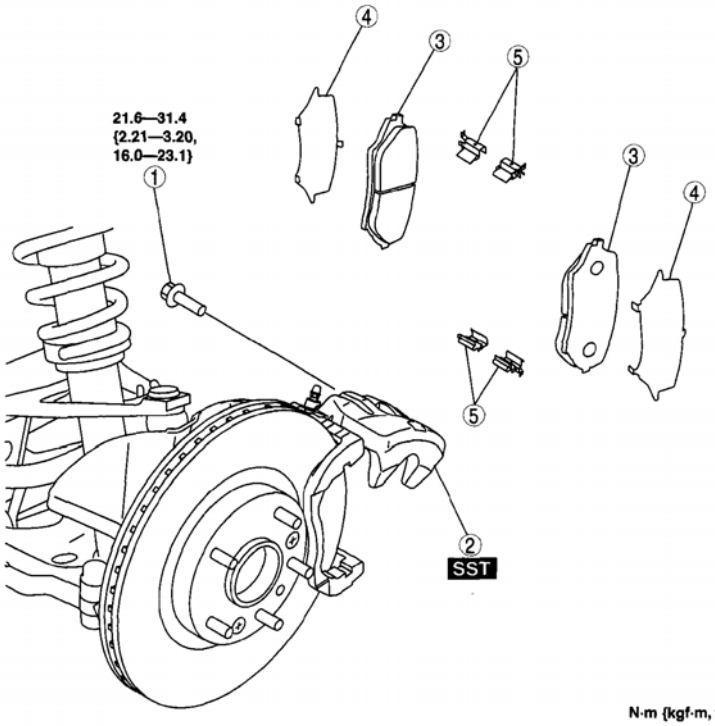


Fig. 35: Installing Piston Using Special Tool
Courtesy of MAZDA MOTORS CORP.

DISC PAD (FRONT) REPLACEMENT

1. Remove in the order indicated in **Fig. 36** .
2. Install in the reverse order of removal.
3. After installation, depress the brake pedal a few times, then verify that the brakes do not drag.

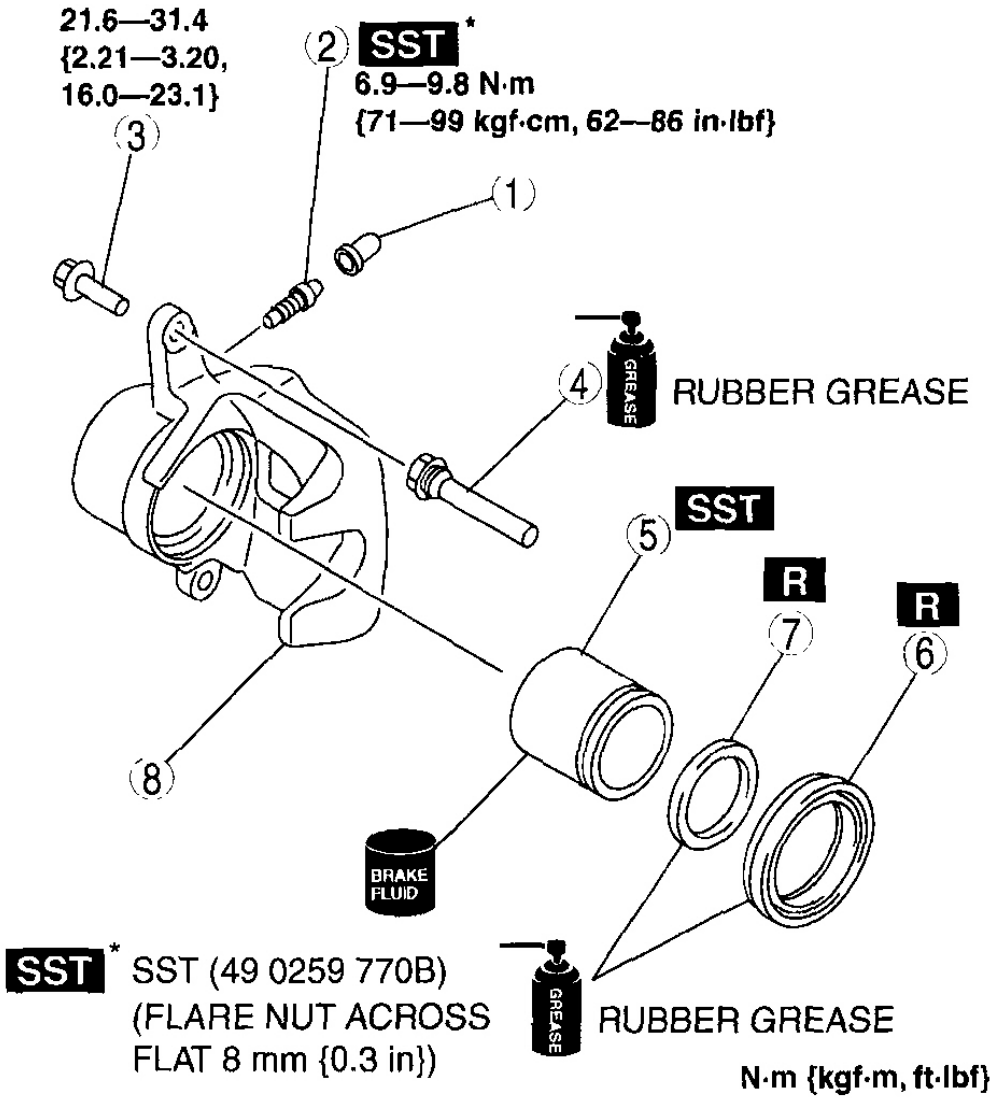


1	Bolt
2	Caliper
3	Disc pad
4	Shim
5	Guide plate

Fig. 36: Identifying Disc Pad Components (Front) (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

CALIPER (FRONT) DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in **Fig. 37** .



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1	Bleeder cap
2	Bleeder screw
3	Bolt
4	Sleeve
5	Piston
6	Dust seal
7	Piston seal
8	Caliper body

Fig. 37: Exploded View Of Caliper (Front) (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

2. Assemble in the reverse order of disassembly.

PISTON DISASSEMBLY NOTE

CAUTION:
- **The piston could be damaged if blown out with great force. Blow the compressed air slowly to prevent the piston from suddenly popping out.**

1. Insert a piece of wood in the caliper as shown in **Fig. 38** , and then blow compressed air through the bleeder screw hole to remove the piston from the caliper body.

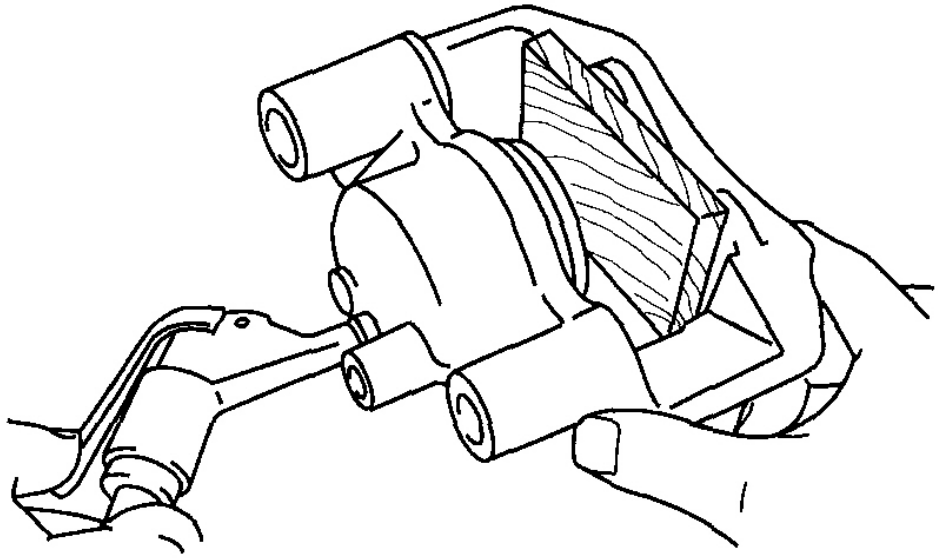


Fig. 38: Removing Piston From Caliper Body By Blowing Compressed Air Through Bleeder Screw Hole
Courtesy of MAZDA MOTORS CORP.

REAR BRAKE (DISC) INSPECTION

BRAKE JUDDER REPAIR HINTS

Description

1. Brake judder concern has the following 3 characteristics:

Steering Wheel Vibration

1. Steering wheel vibrates in the rotation direction. This characteristic is most noticeable when applying brakes at a vehicle speed of **100-140 km/h {62.1-86.8 mph}** .

Floor Vibration

1. When applying the brakes, the vehicle body shakes back and forth. The seriousness of the shaking is not influenced by vehicle speed.

Brake Pedal Vibration

1. When applying brakes, a pulsating force tries to push the brake pad back. The pulsation is transmitted to the brake pedal.
2. The following are the main possible causes of brake judder:

Due to an excessive runout (side-to-side wobble) of the disc plate, the thickness of the disc plate is uneven.

1. If the runout is **more than 0.05 mm {0.002 in}** at the position **10 mm {0.39 in}** from the disc plate edge, uneven wear occurs on the disc plate because the pad contacts the plate unevenly.
2. If the runout is **less than 0.05 mm {0.002 in}** , uneven wear does not occur.

The disc plate is deformed by heat.

1. Repeated panic braking may raise the temperature in some portions of disc plate by **approx. 1,000°C {1,832°F}** . This results in a deformed disc plate.

Due to corrosion, the thickness and friction coefficient of disc plate change.

1. If a vehicle is parked in damp conditions for a long time, corrosion occurs on the friction surface of disc plate.
2. The thickness of corrosion is uneven and sometimes appears like a wave pattern, which changes the friction coefficient and causes a reaction force.

Inspection and Repair Procedure

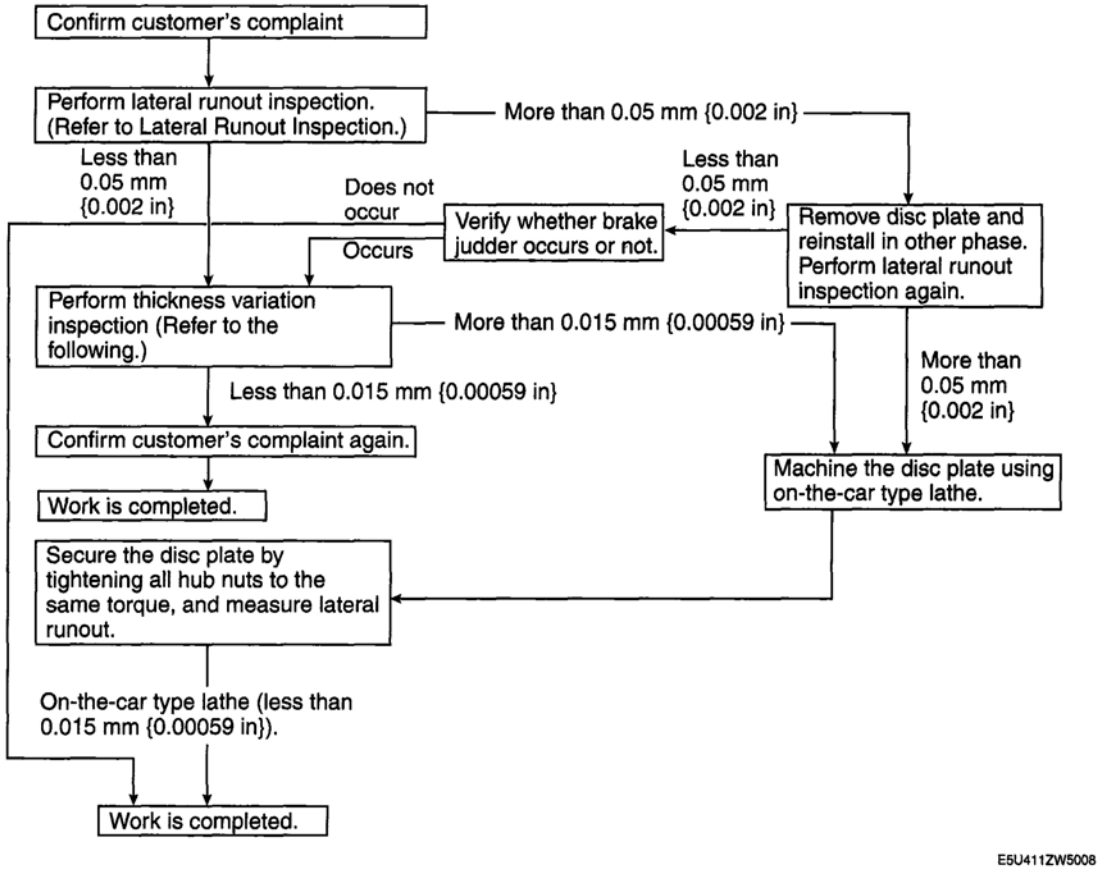


Fig. 39: Rear Brake Inspection & Repair Flow Procedure
Courtesy of MAZDA MOTORS CORP.

Lateral Runout Inspection

1. To secure the disc plate and the hub, insert the washer (thickness **10 mm {0.39 in}** , inner diameter **more than 12 mm {0.47 in}**) between each hub bolt and the hub nut, then tighten all the hub nuts.

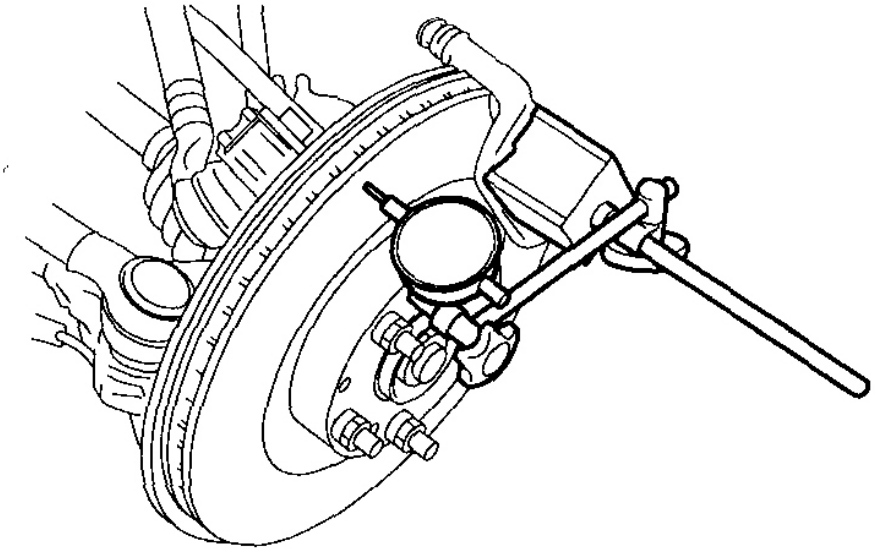
NOTE:

- **The component parts of the SST (49 B017 001 or 49 G019 003) can be used as a suitable washer.**

2. After tightening all the hub nuts to the same torque, put the dial gauge on the friction surface of disc plate **10 mm {0.39 in}** from the disc plate edge.
3. Rotate the disc plate one time and measure the runout.

Rear disc plate runout limit

0.05 mm {0.002 in}



CHU0411W031

Fig. 40: Measuring Rear Disc Plate Runout
Courtesy of MAZDA MOTORS CORP.

Thickness Variation Inspection

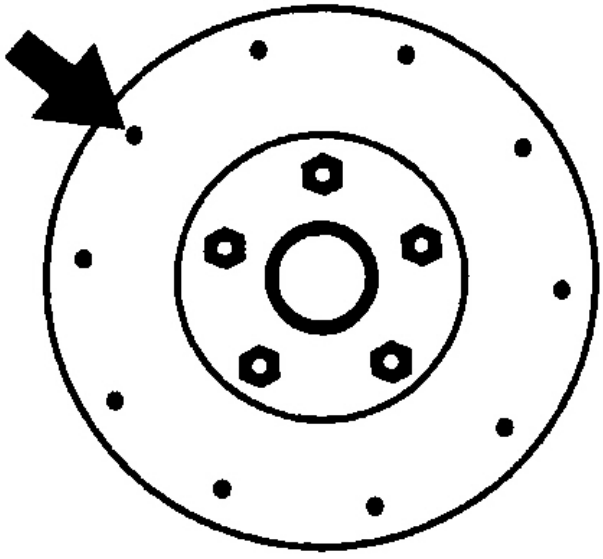
1. Clean the disc plate-to-pad friction surface using a brake cleaner.
2. Measure the points indicated in **Fig. 41** using a caliper (micrometer).
3. Subtract the minimum value from the maximum, and if the result is not within specification, machine the disc plate using a lathe.

Thickness variation limit

0.015 mm {0.00059 in}

WARNING:

- **Do not exceed minimum disc plate thickness.**



CHU0411W027

Fig. 41: Inspecting Disc Plate-To-Pad Friction Surface
Courtesy of MAZDA MOTORS CORP.

Disc Plate Thickness Inspection

CAUTION:
- **Excessive runout may result if the disc plate is removed from the vehicle then machined. Machine the disc plate while installed on the vehicle.**

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.

Minimum rear disc plate thickness

8 mm {0.31 in}

Minimum rear disc plate thickness after machining using a brake lathe on-vehicle

8.8 mm {0.35 in}

Disc Pad Thickness Inspection

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheel and tires.
3. Verify the remaining thickness of the pads.

   Minimum rear disc pad thickness

   2.0 mm {0.079 in} min.

4. Replace the pads as a set (right and left wheels) if either one is at or less than the minimum thickness.

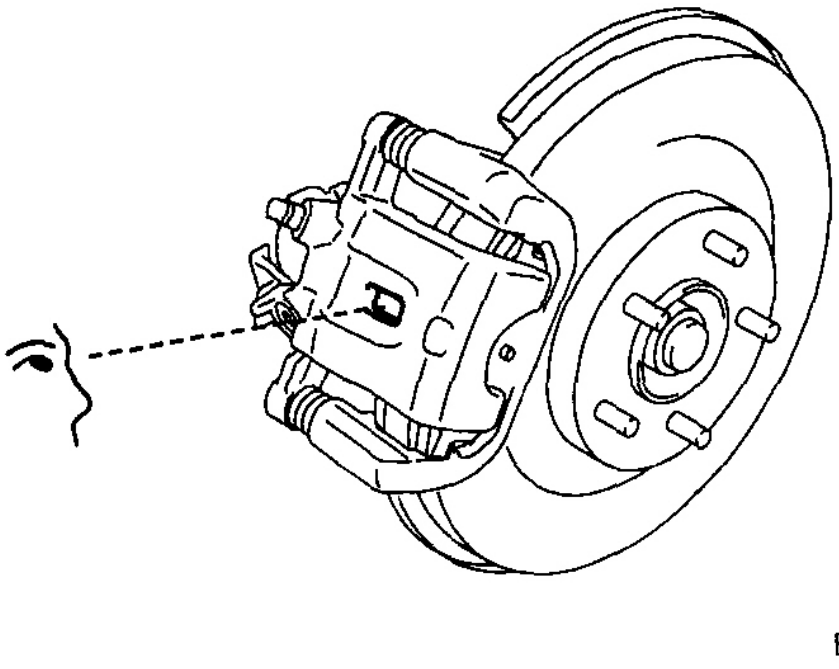
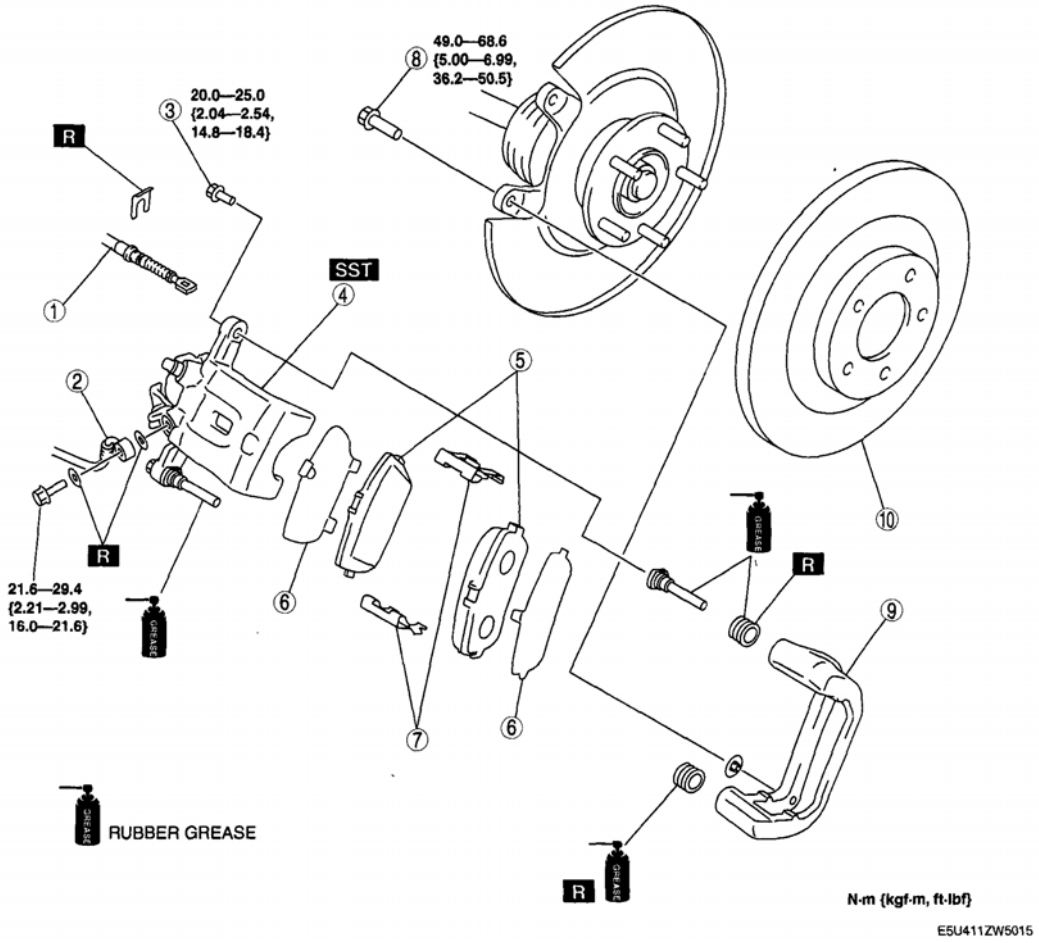


Fig. 42: Inspecting Disc Pad Thickness
Courtesy of MAZDA MOTORS CORP.

REAR BRAKE (DISC) REMOVAL/INSTALLATION

1. Remove in the order indicated in **Fig. 43** .
2. Install in the reverse order of removal.
3. After installation, depress the brake pedal a few times, and inspect the following.
   - The disc pad projection is securely installed to the piston groove
   - Parking brake lever stroke
   - Brake drag



1	Parking brake cable
2	Brake hose
3	Bolt
4	Caliper
5	Disc pad

6	Shim
7	Guide plate
8	Bolt
9	Mounting support
10	Disc plate

Fig. 43: Identifying Rear Brake (Disc) Components (With Torque Specifications) Courtesy of MAZDA MOTORS CORP.

DISC PLATE REMOVAL NOTE

1. Mark the wheel hub and disc plate.
2. Remove the disc plate.

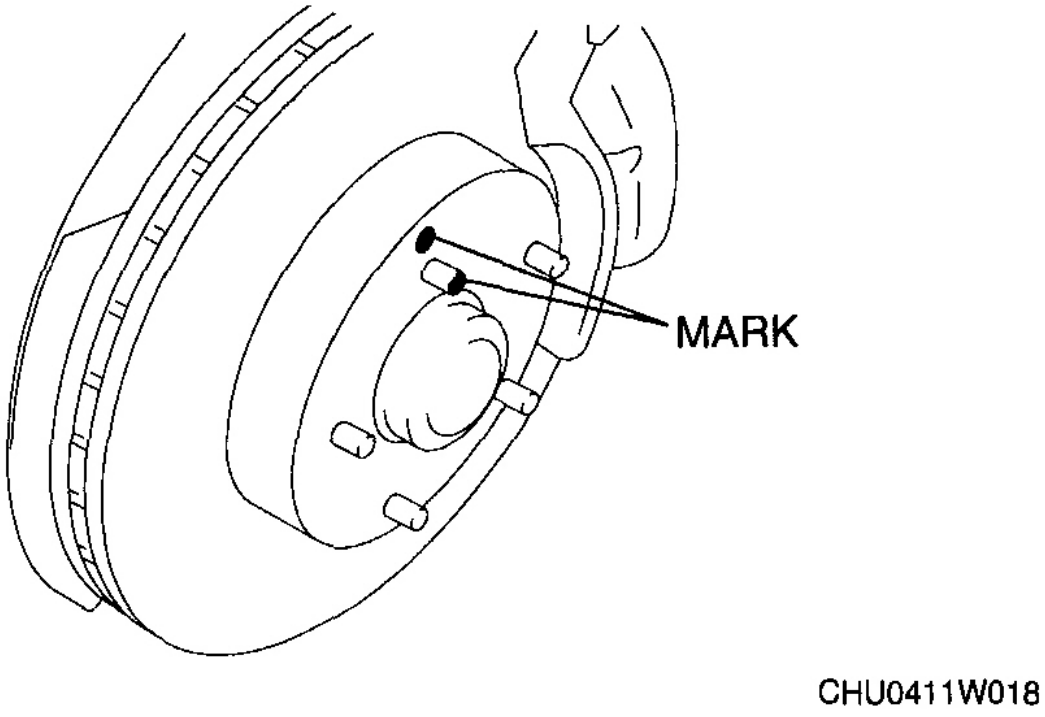


Fig. 44: Identifying Wheel Hub & Disc Plate Mark
Courtesy of MAZDA MOTORS CORP.

DISC PLATE INSTALLATION NOTE

1. Remove any rust or foreign material from the wheel hub and disc plate.
2. Align the marks made before removal and install the disc plate to the wheel hub.

CALIPER INSTALLATION NOTE

1. Clean the exposed area of the piston.
2. Rotate the piston clockwise slowly using the **SST** and push the piston completely until the piston grooves are in the position shown in **Fig. 45** .
3. Install the caliper.

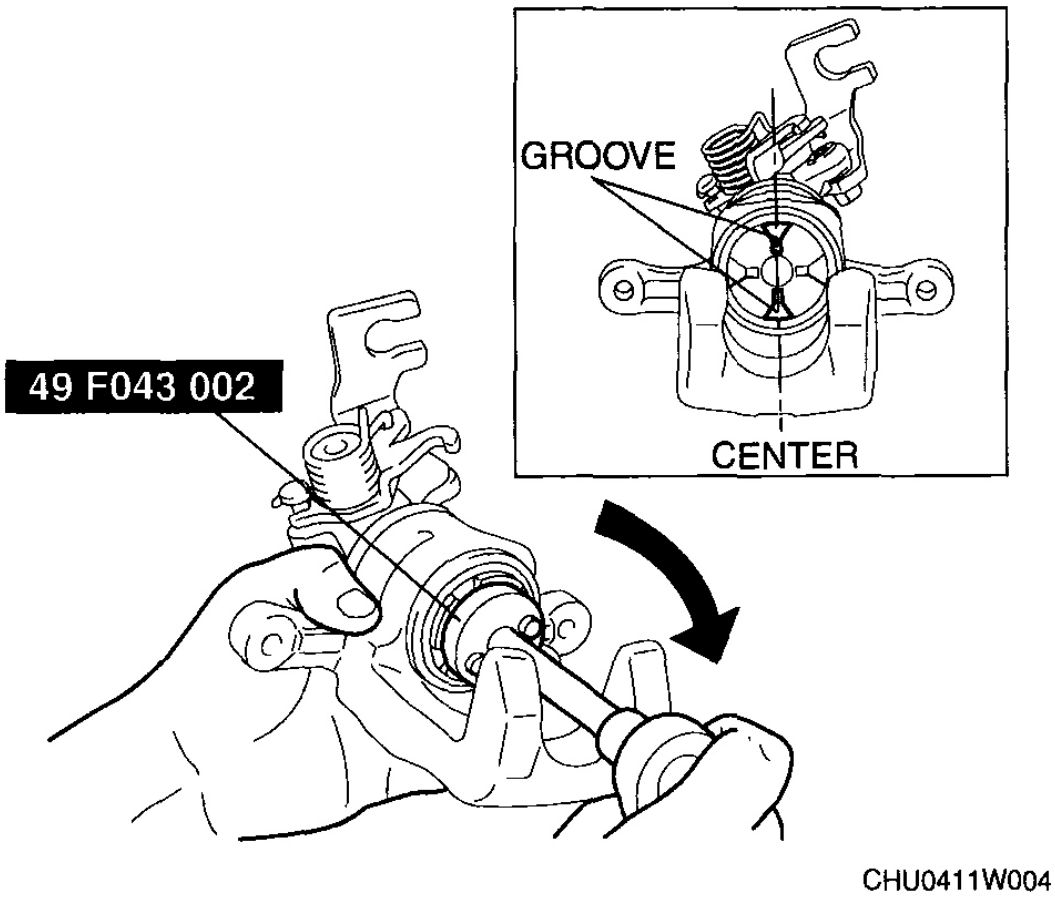


Fig. 45: Rotating Piston Clockwise Using SST
Courtesy of MAZDA MOTORS CORP.

PARKING BRAKE CABLE INSTALLATION NOTE

1. After installing the parking brake cable, verify that the operating lever returns to the stopper nut with the parking brake lever released.

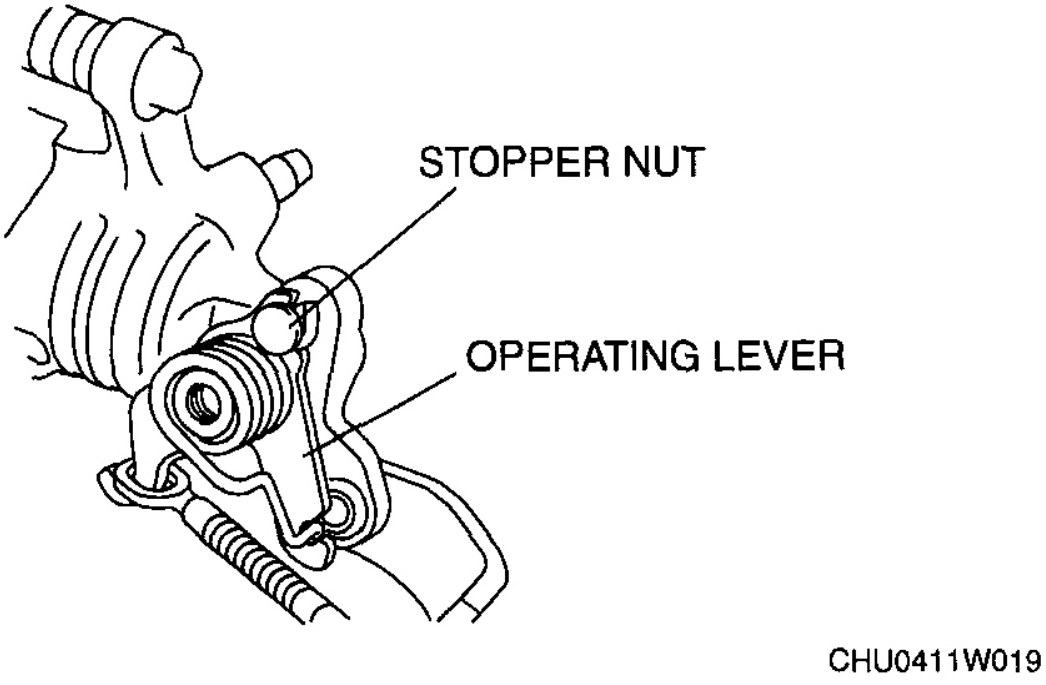
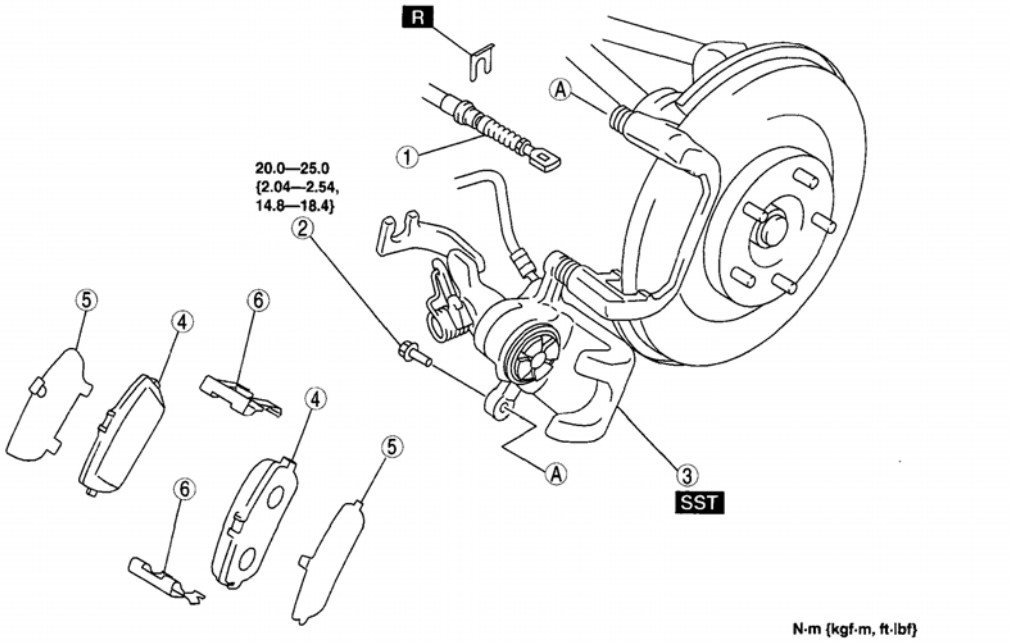


Fig. 46: Identifying Stopper Nut & Operating Lever
Courtesy of MAZDA MOTORS CORP.

DISC PAD (REAR) REPLACEMENT

1. Remove in the order indicated in **Fig. 47** .
2. Install in the reverse order of removal.
3. After installation, depress the brake pedal a few times, and inspect the following.
    - The disc pad projection is securely installed to the piston groove
    - Parking brake lever stroke
    - Brake drag



1	Parking brake cable
2	Bolt

3	Caliper
4	Disc pad
5	Shim
6	Guide plate

Fig. 47: Identifying Disc Pad (Rear) Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

CALIPER INSTALLATION NOTE

1. Clean the exposed area of the piston.
2. Rotate the piston clockwise slowly using the **SST** and push in the piston completely until the piston grooves are in the position shown in **Fig. 48** .

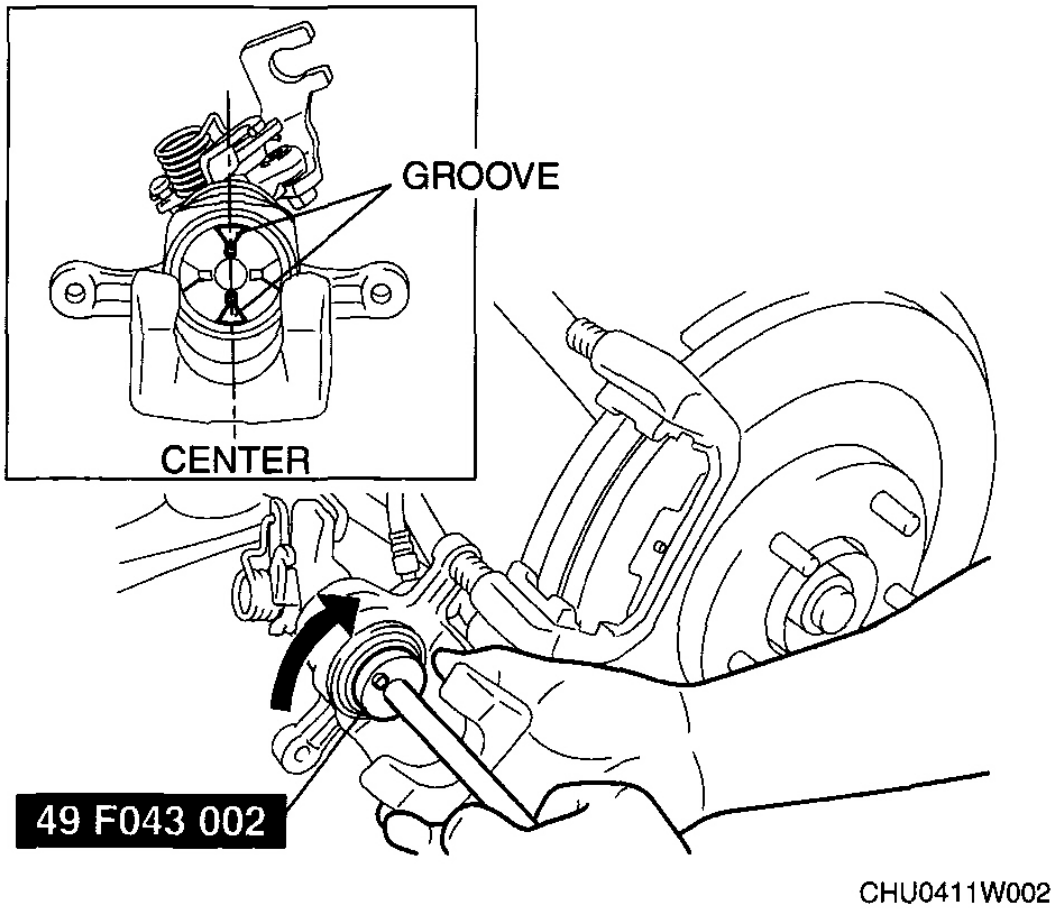
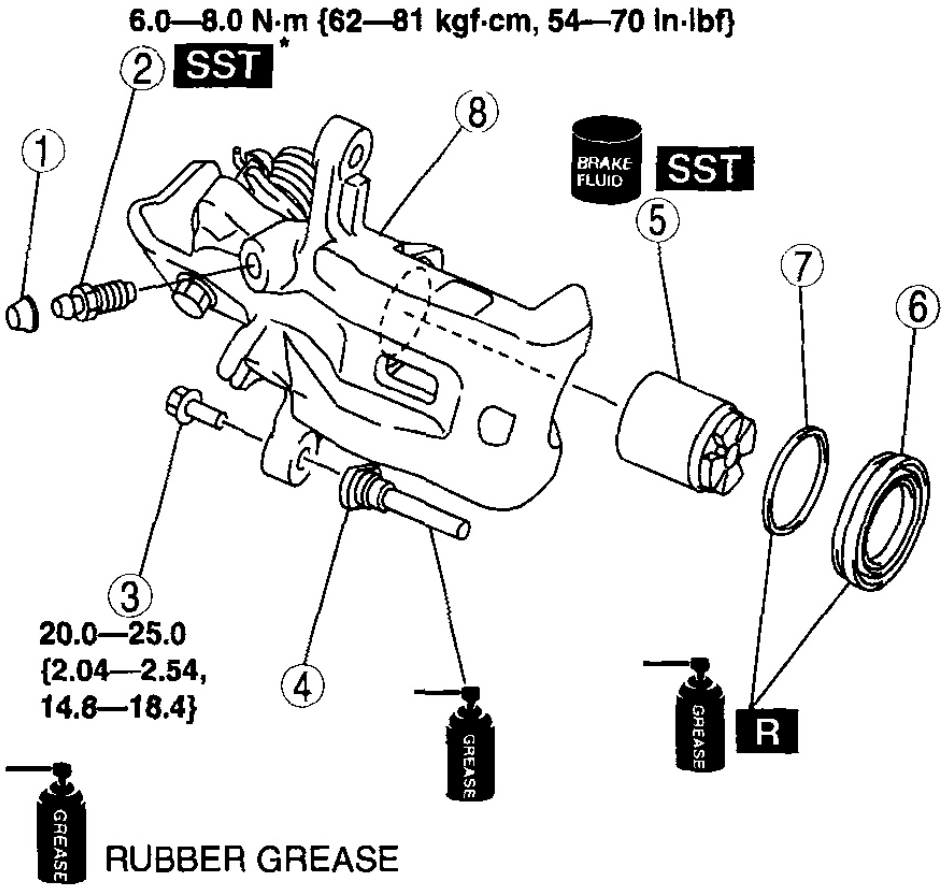


Fig. 48: Rotating Piston Clockwise Using SST
Courtesy of MAZDA MOTORS CORP.

3. Install the caliper.

CALIPER (REAR) DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in **Fig. 49** .



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1	Bleeder cap
2	Bleeder screw
3	Bolt
4	Sleeve
5	Piston
6	Dust seal
7	Piston seal
8	Caliper body

Fig. 49: View Of Caliper (Rear) Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

2. Assemble in the reverse order of disassembly.

PISTON DISASSEMBLY NOTE

1. Rotate the piston counter-clockwise using the **SST** , remove the piston from the caliper body.

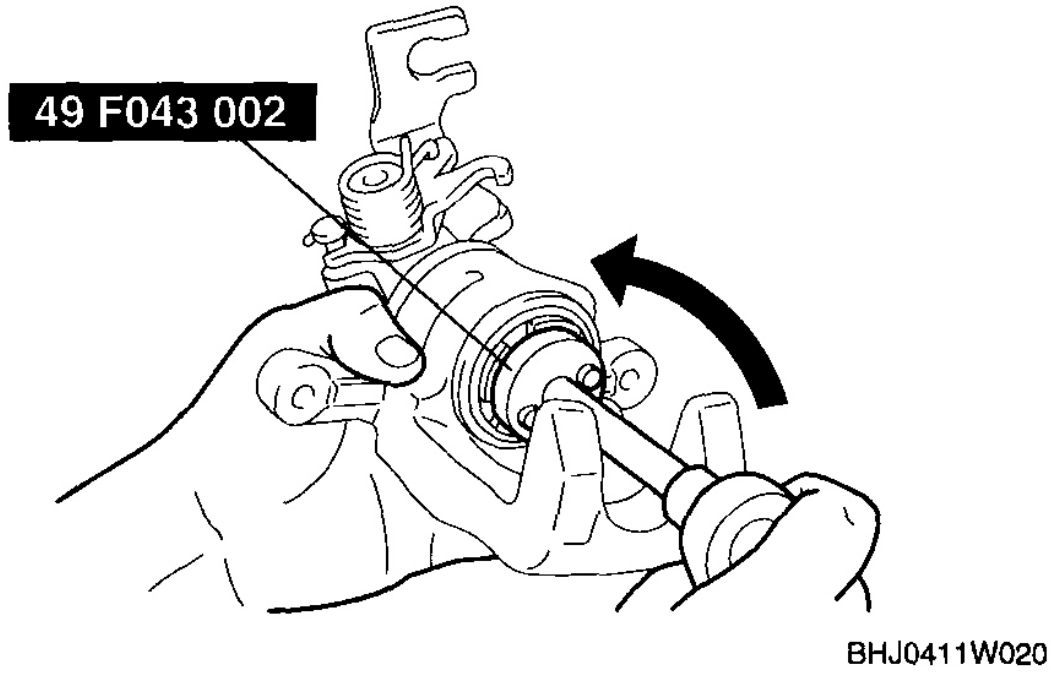


Fig. 50: Rotating Piston Counter-Clockwise Using SST
Courtesy of MAZDA MOTORS CORP.

DUST SEAL, PISTON ASSEMBLY NOTE

1. Assemble the dust seal to the piston.
2. Assemble the lip of the dust seal to the groove of the caliper body with the dust seal is assembled to the piston as shown in **Fig. 51** .

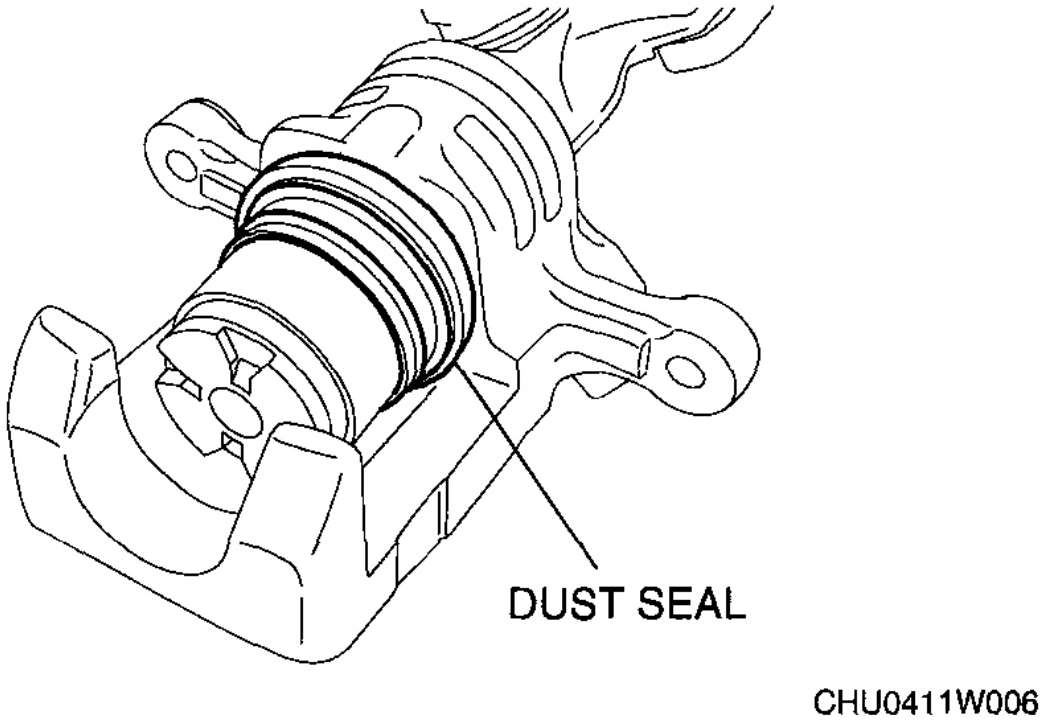


Fig. 51: Assembling Lip Of Dust Seal
Courtesy of MAZDA MOTORS CORP.

3. Rotate the piston clockwise using the **SST** slowly and push the piston inwards completely.
4. Verify that the dust seal is installed into the groove of the piston securely.

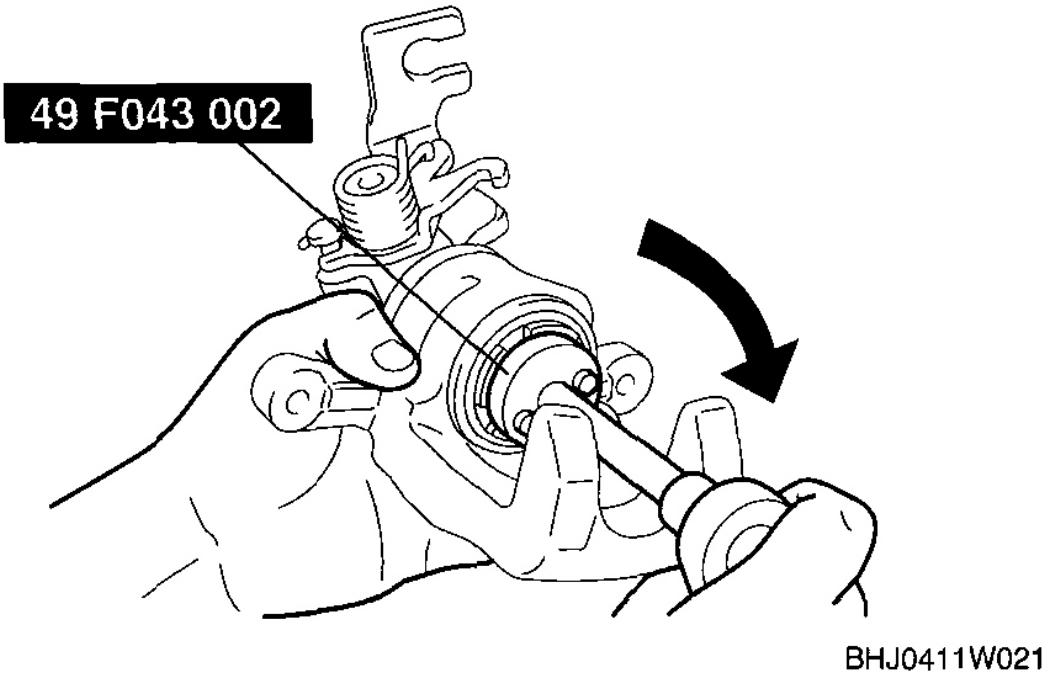
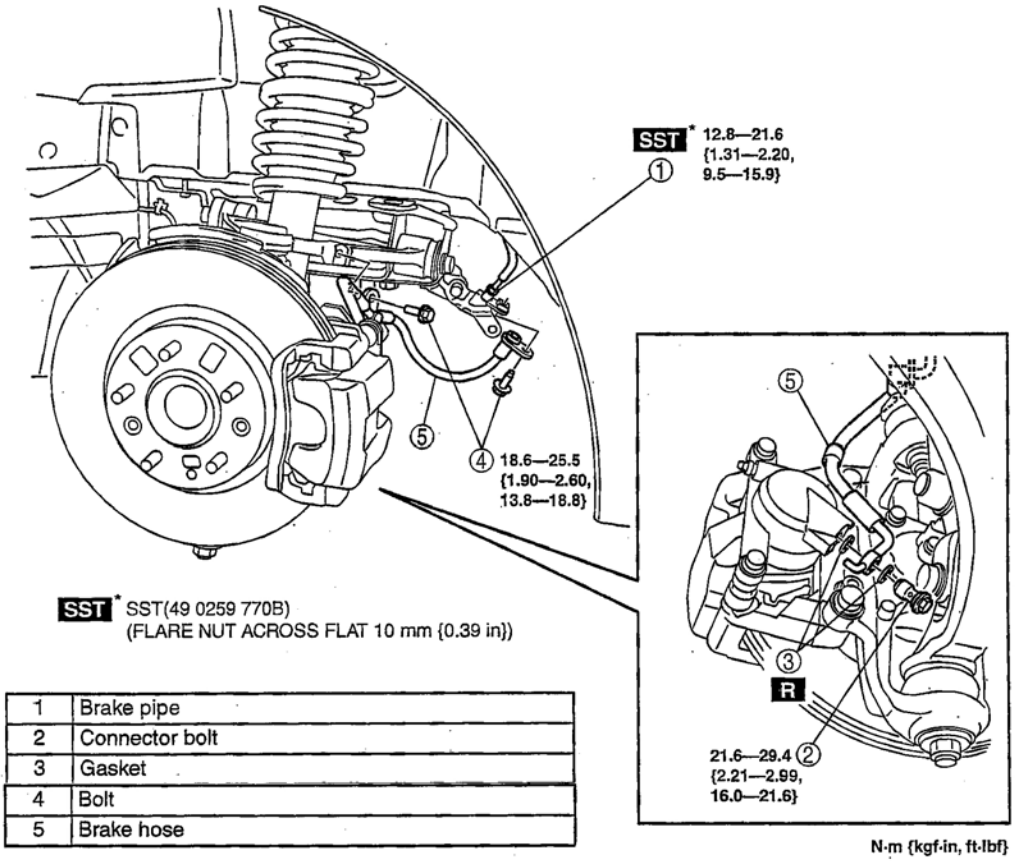


Fig. 52: Rotating Piston Clockwise Using SST
Courtesy of MAZDA MOTORS CORP.

BRAKE HOSE (FRONT) REMOVAL/INSTALLATION

1. Remove in the order indicated in FIG.....
2. Install in the reverse order of removal.
3. After installation, add brake fluid, bleed the air, and inspect for fluid leakage. (See **AIR BLEEDING**.)

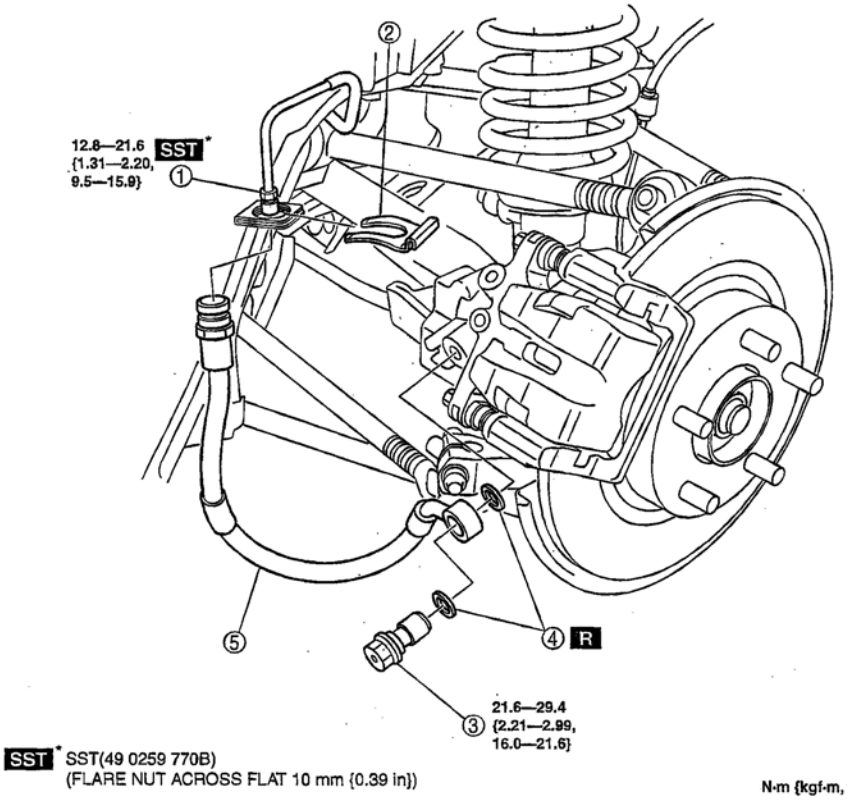


1	Brake pipe
2	Connector bolt
3	Gasket
4	Bolt
5	Brake hose

Fig. 53: Identifying Brake Hose (Front) Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.

BRAKE HOSE (REAR) REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, add brake fluid, bleed the air, and inspect for fluid leakage. (See **AIR BLEEDING**.)



1	Brake pipe
2	Clip
3	Connector bolt

4	Gasket
5	Brake hose

Fig. 54: Identifying Brake Hose (Rear) Components (With Torque Specifications)
Courtesy of MAZDA MOTORS CORP.