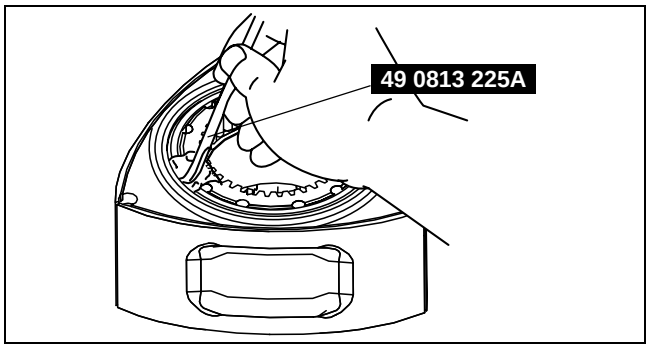
5	Outer oil seal spring (See 01–10–13 Oil Seal Spring Disassembly Note.)
6	Inner oil seal (See 01–10–13 Oil Seal Disassembly Note.)
7	Inner O-ring (small radius)
8	Inner oil seal spring (See 01–10–13 Oil Seal Spring Disassembly Note.)

Oil Seal Disassembly Note

1. Remove the oil seal using the **SST**.

Caution
- **Be sure to keep the removed oil seals separated according to their removal position.**



BHJ0110E025

Oil Seal Spring Disassembly Note

Caution
- **Be sure to keep the removed oil seal springs separated according to their removal positions.**

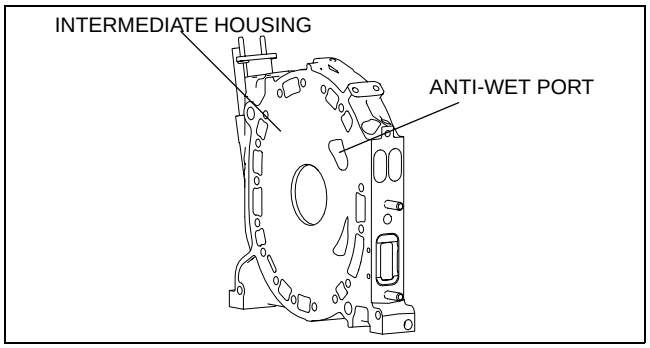
SIDE HOUSING (FRONT, INTERMEDIATE, REAR) INSPECTION

CHU011010D00E01

1. Inspect the intermediate housing for clogging in the intake and exhaust port.

Caution
- **Carefully inspect the anti-wet port of the intermediate housing since it is an essential port.**

- If there is any malfunction, replace the corresponding side housing.

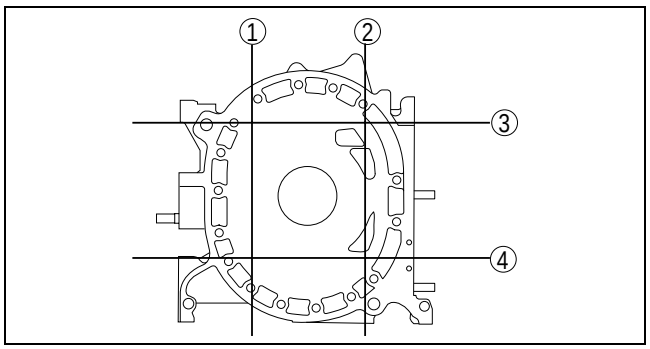


CHU0110E001

2. Inspect the side housing for distortion in four positions as shown in the figure using a straight edge and a feeler gauge.
   - If the distortion exceeds the maximum, replace the corresponding side housing.

Maximum distortion
0.04 mm {0.0016 in}

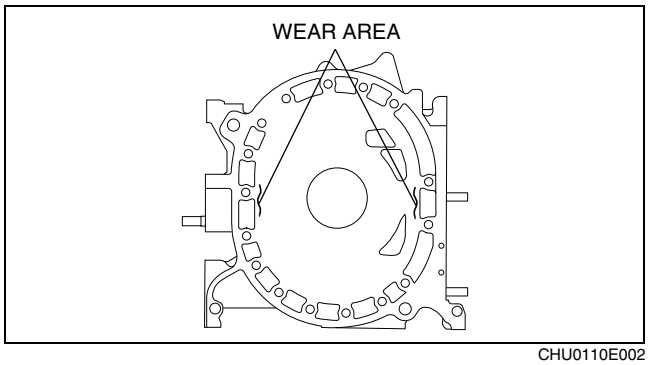
3. Inspect the following three items related to wear in the areas where the rotor contacts the side housing using a dial gauge.
   - If any one of the items exceeds the maximum, replace the corresponding side housing.



BHJ0110E026

(1) Vertical wear

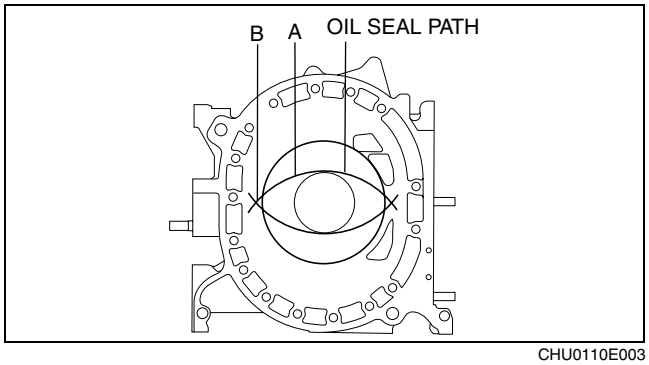
Maximum wear
0.10 mm {0.0039 in}



CHU0110E002

(2) Convex oval

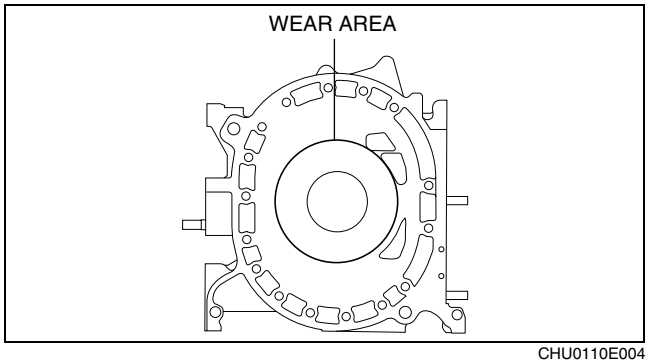
Maximum wear
Oil seal inner path (A): 0.01 mm {0.0004 in}
Oil seal outer path (B): 0.10 mm {0.0039 in}



CHU0110E003

(3) Oil seal stepped path wear

Maximum wear
0.02 mm {0.0008 in}



CHU0110E004

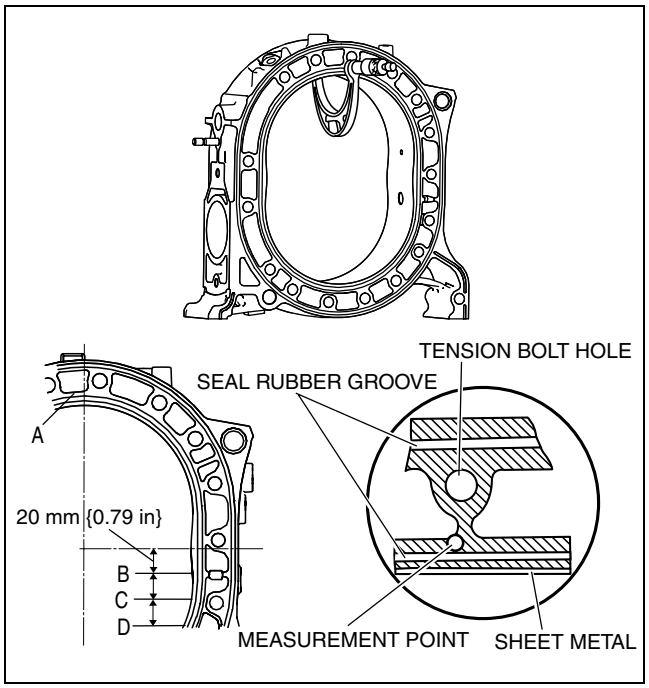
ROTOR HOUSING INSPECTION

1. Measure the width of the rotor housing at four points (A, B, C, and D) as shown in the figure using a micrometer.
2. Compute the width variation.
   - If it exceeds the maximum, replace the rotor housing.

   Width difference = (width A) – (the smallest of widths B, C, or D)

   Maximum width difference
   0.06 mm {0.0024 in}

CHU011010B08E01

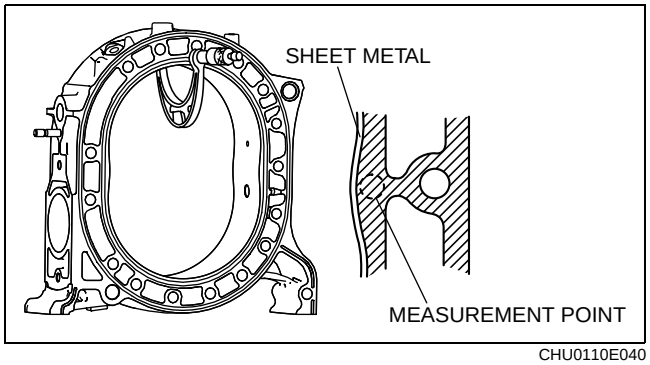


CHU0110E005

ROTOR INSPECTION

CHU011011B10E01

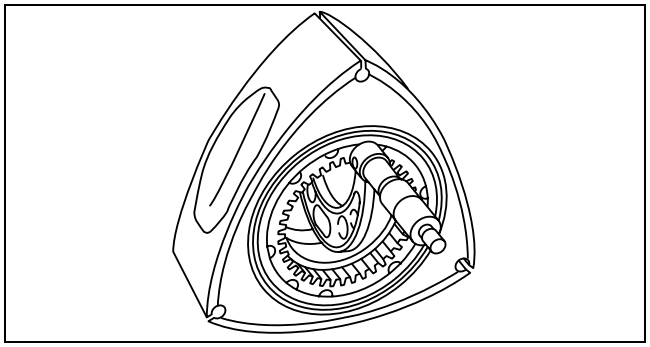
1. Inspect the rotor and side housing clearance according to the following procedure:
   - If it is less than the minimum specification, replace the rotor.
   (1) Measure the width of the rotor housing in the position shown in the figure using a micrometer.



CHU0110E040

Caution
- **Move the sheet metal piece out of the way when measuring.**

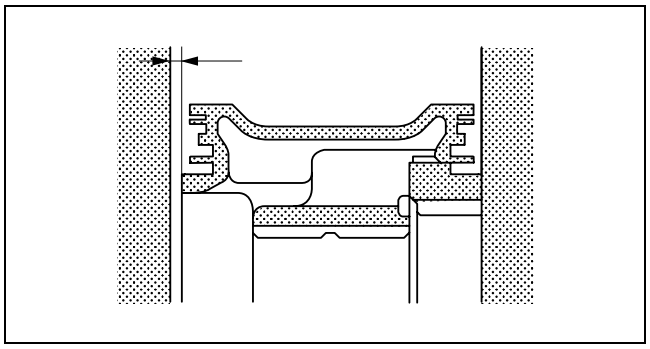
   (2) Measure the rotor width at various positions around the rotor round periphery using a micrometer.



BHJ0110E032

   (3) Compute the rotor and side housing clearance using the measurements from (1) and (2).

Rotor and side housing clearance = (rotor housing width) – (maximum rotor width)
Standard clearance
0.05—0.19 mm {0.0020—0.0074 in}
Minimum clearance
0.05 mm {0.002 in}



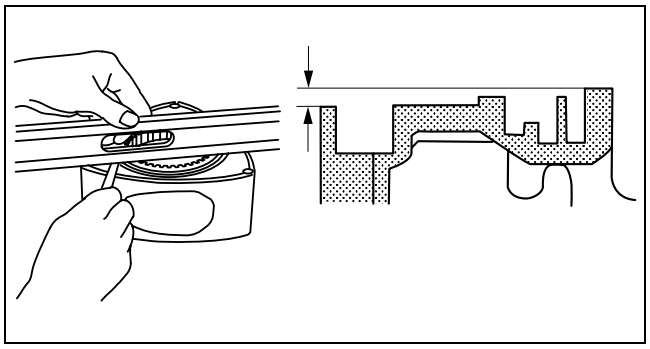
CHU0110E006

2. Measure the protrusion of the rotor round using a straight edge and a feeler gauge.

Caution
- **Measure the the protrusion of the rotor round in the three apexes of the rotor on both the front and rear sides.**
- **Because the rotor round has two levels, be careful not to measure the level difference of the middle level.**

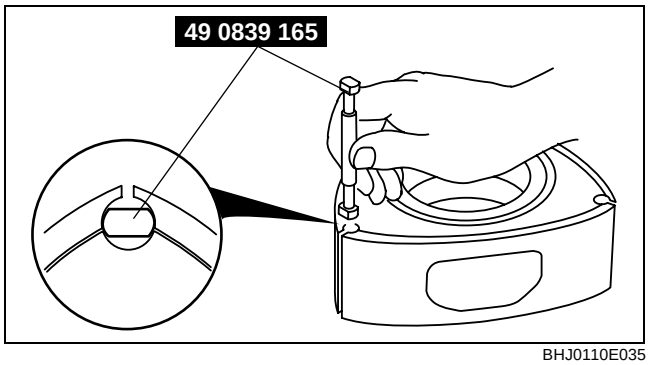
- If it is less than the minimum specification, replace the rotor.

Standard projection
0.12—0.18 mm {0.0048—0.0070 in}
Minimum projection
0.1 mm {0.0039 in}



CHU0110E007

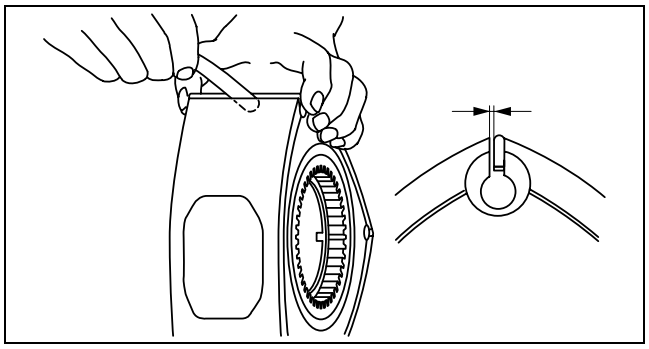
3. Inspect the corner seal groove of the rotor by inserting the **SST**.
   - If **1/2 or more** of either end of the **SST** can be inserted into the seal groove, replace the corner seal.
   - If **1/2 or more** of both ends of the **SST** can be inserted into the corner seal groove, replace the rotor.



BHJ0110E035

Caution
- **Do not push the SST in with force.**
- **Keep the SST perpendicular to the seal groove.**
- **When replacing the corner seal, replace with one that matches the S or L inscription on the rotor.**

4. Measure the clearance between the apex seal groove and the apex seal using a feeler gauge.
   - If it exceeds the maximum specification, replace the apex seal.
   - If the clearance is still not within the standard after replacing the apex seal, replace the rotor.

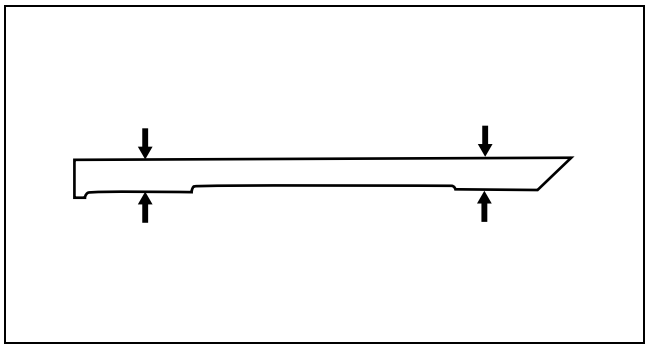

CHU0110E008

Standard clearance
0.042—0.101 mm {0.0017—0.0039 in}
Maximum clearance
0.15 mm {0.0059 in}

APEX SEAL INSPECTION

CHU011011B10E02

1. Measure the height in the positions shown in the figure.
   - If it is less than the minimum specification, replace the apex seal.
   - Replace the apex seal spring also whenever replacing the apex seal.


BHJ0110E037

Standard Height
5.3 mm {0.20 in}
Minimum height
4.3 mm {0.17 in}

SIDE SEAL INSPECTION

CHU011011B10E04

Replacing with a new side seal.

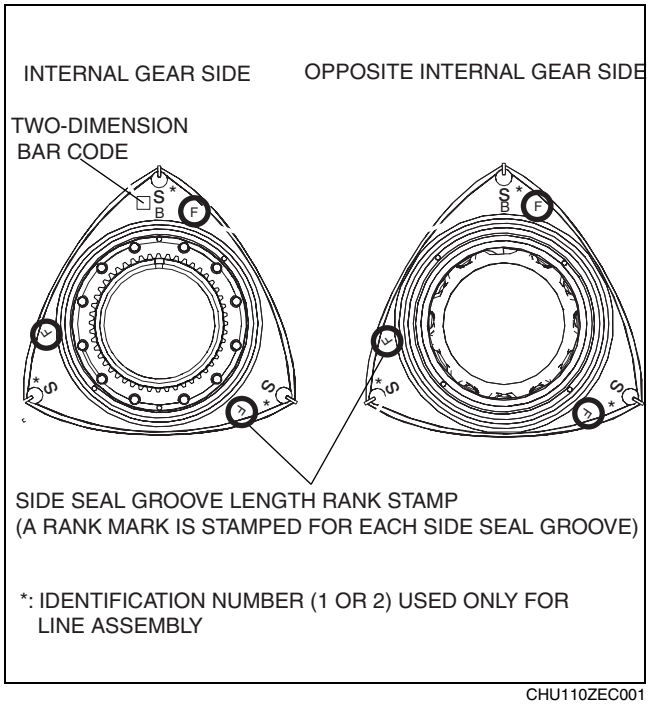
If replacing the side seal, select the appropriate side seal from the side seal groove length rank marked on the rotor.

Note

- If a new side seal is inserted, measuring the clearance is not recommended to maintain an appropriate side seal clearance value.

Side seal selection table

Side seal groove length rank stamp	Part number of side seal
F	N3Z1 11 C10*
G	
H	
I	
J	N3Z2 11 C10*
K	
L	
M	
N	N3Z3 11 C10*
O	
P	
Q	
R	N3Z4 11 C10*
S	
T	
U	
V	N3Z5 11 C10*
W	
X	
Y	



CHU110ZEC001

* : Revision indication (alphabetical order)

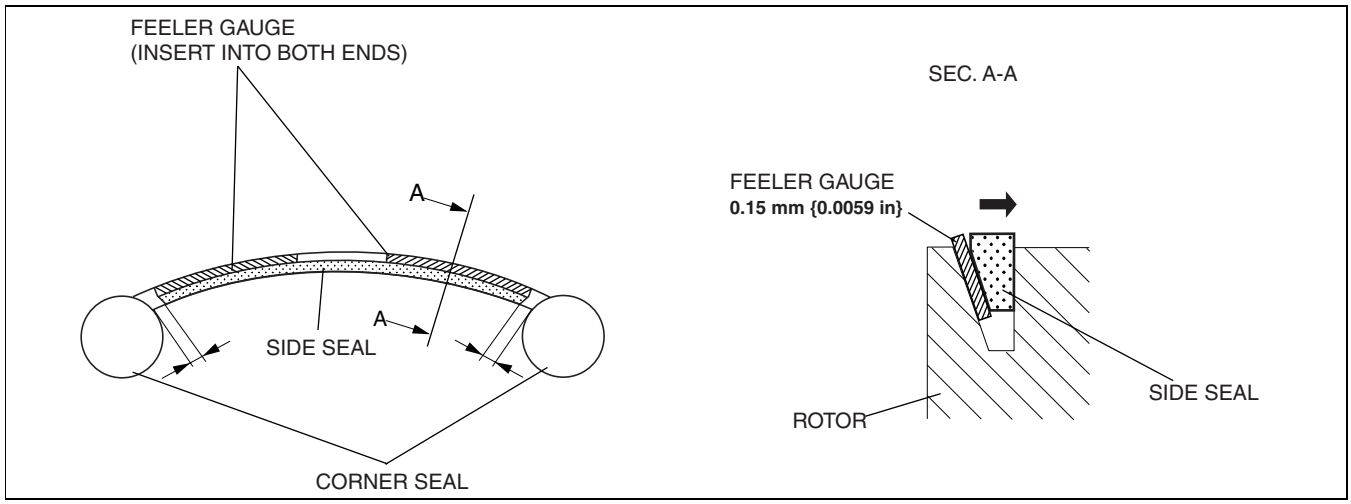
Reusing the side seal

1. Measure the side seal and corner seal clearance and verify that it doesn't exceed the maximum.
   (1) Assemble the corner seal.
   (2) Insert a **0.15 mm {0.0059 in}** feeler gauge into the tapered surface side of the side seal as shown in the figure, and fix the side seal by pressing uniformly so that it contacts the inner side of the groove (straight surface).

   Caution

   - **Press the feeler gauge firmly on both ends of the side seal.**

   (3) Measure the clearance between both ends of the side seal and the corner seal using a feeler gauge.



CHU110ZEC002

(4) If the sum of the clearances on both ends exceeds the maximum, replace with a new side seal by selecting one from the side seal selection table.

Maximum clearance
0.4 mm {0.016 in}

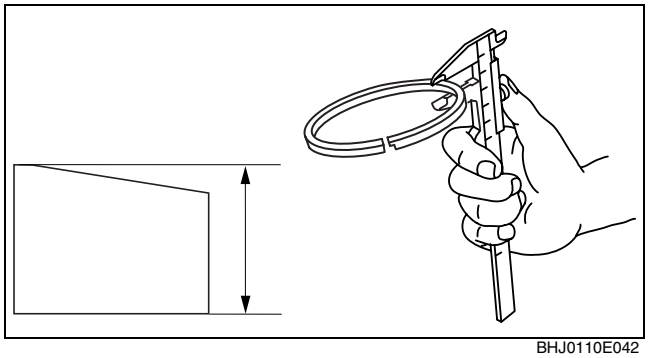
CUT-OFF SEAL INSPECTION

CHU011011B10E05

1. Measure the cut-off seal height using a vernier caliper.
   - If it is less than the minimum specification, replace the cut-off seal.

Caution
- **Measure the cut-off seal height around the complete perimeter.**

Standard height
3.95 mm {0.1555 in}
Minimum height
3.8 mm {0.15 in}



BHJ0110E042

OIL SEAL INSPECTION

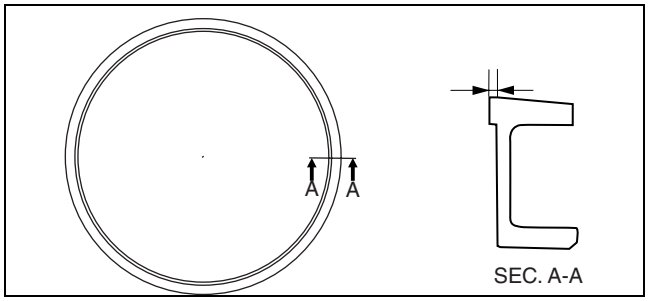
CHU011011B10E06

1. Measure the following two items using a vernier caliper.
   - If either of the items exceeds the maximum specification, replace the oil seal.

(1) Width of area that contacts the oil seal lip.

Caution
- **Measure the contact width around the complete perimeter.**

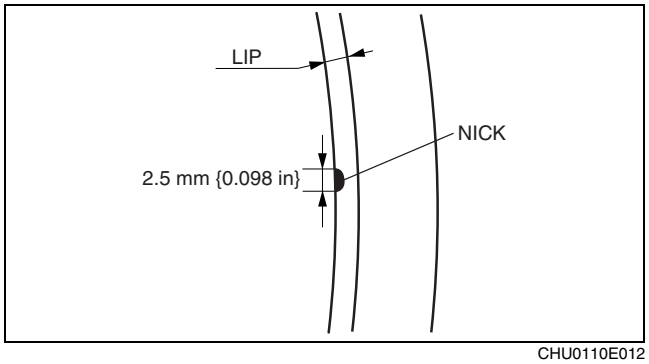
Maximum contact width
0.5 mm {0.02 in}



BHJ0110E043

(2) Circumferential width of any damage along the lip.

Maximum circumferential width of the oil seal lip
2.5 mm {0.098 in} or 10 nicks or more



CHU0110E012

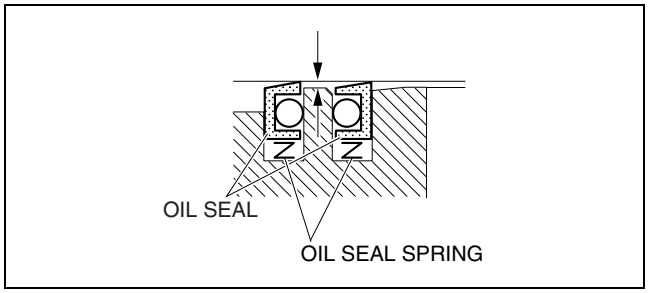
SPRING INSPECTION

CHU011011B10E07

Oil Seal Spring

1. Assemble the oil seal springs into the rotor.
2. Assemble the O-rings into the oil seals.
3. Assemble the oil seals into the rotor.
4. Measure the oil seal projection using a vernier caliper.
   - If it is less than the minimum specification, replace the oil seal spring.

Minimum projection
0.5 mm {0.02 in}

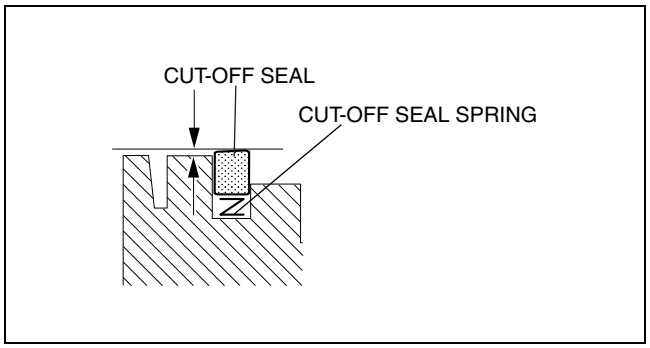


CHU0110E013

Cut-off Seal Spring

1. Assemble the cut-off seal spring into the rotor.
2. Referring to the cut-off seal inspection procedure, verify that the height of the cut-off seal is at the minimum specification or more. (See 01–10–18 CUT-OFF SEAL INSPECTION.)
3. Assemble the cut-off seal into the rotor.
4. Measure the cut-off seal projection using a vernier caliper.
   - If it is less than the minimum specification, replace the cut-off seal spring.

Minimum projection
0.5 mm {0.02 in}

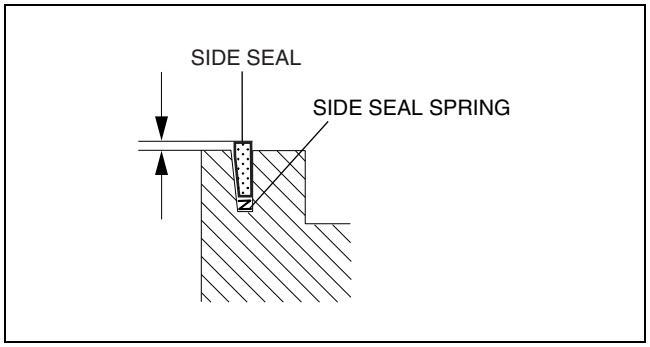


CHU0110E041

Side Seal Spring

1. Assemble the side seal spring into the rotor.
2. Assemble the side seal into the rotor.
3. Measure the side seal projection using a vernier caliper.
   - If it is less than the minimum specification, replace the side seal spring.

Minimum projection
0.5 mm {0.02 in}

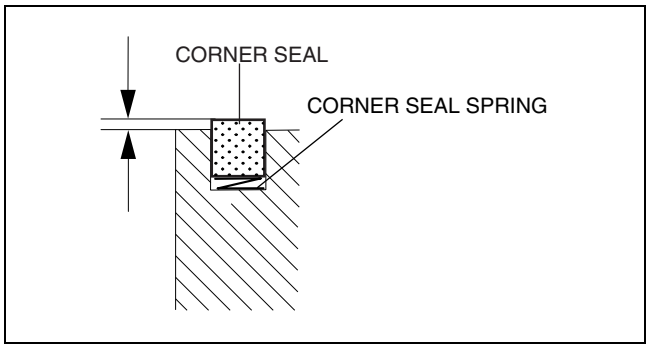


CHU0110E015

Corner Seal Spring

1. Assemble the corner seal spring into the rotor.
2. Assemble the corner seal into the rotor.
3. Measure the corner seal projection using a vernier caliper.
   - If it is less than the minimum specification, replace the corner seal spring.

Minimum projection
0.5 mm {0.02 in}



CHU0110E016

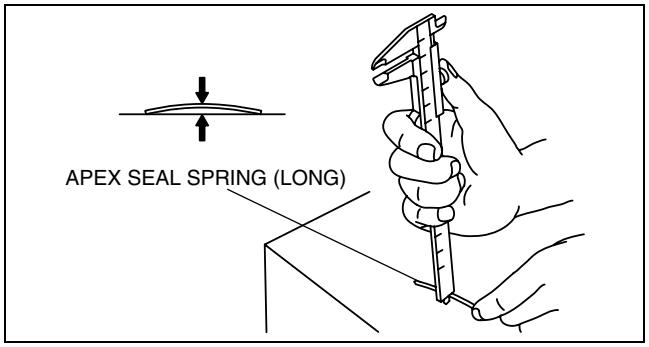
Apex Seal Spring

Note
- Inspect the long apex seal spring.

1. Measure the height of the apex seal spring using a vernier caliper with the spring placed on a surface plate.
   - If it is less than the minimum specification, replace the apex seal spring.

Standard height
5.4 mm {0.213 in}

Minimum height
3.5 mm {0.148 in}



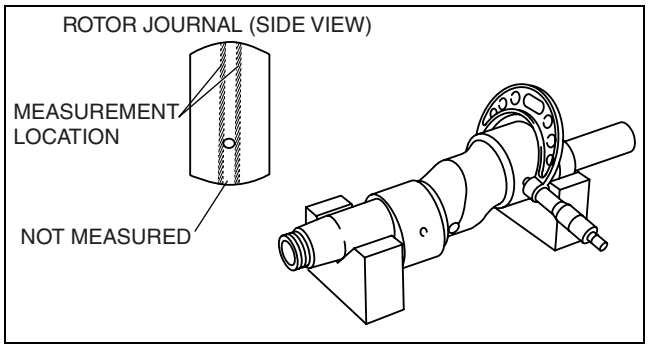
CHU0110E064

ROTOR BEARING OIL CLEARANCE INSPECTION

CHU011011B10E08

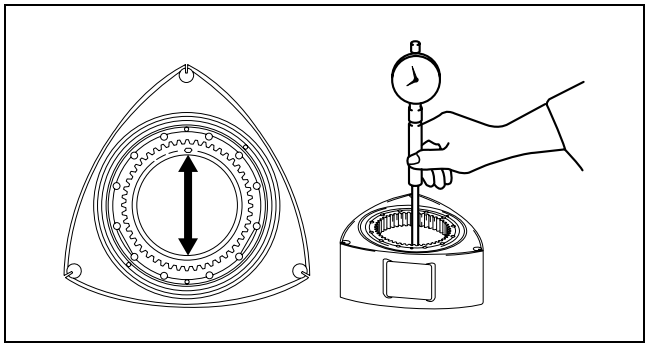
1. Measure the outer diameter of the rotor journal using a micrometer.

Caution
- **Measure the rotor journal at a point slightly off-center since the center section is raised. Do not measure at the center because it does not contact the rotor bearing.**



CHU0110E071

2. Measure the inner diameter of the rotor bearing using a cylinder gauge.

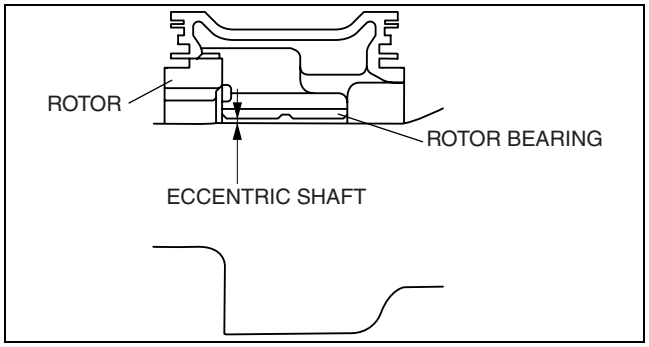

BHJ0110E062

3. Calculate the rotor bearing oil clearance from the rotor journal outer diameter and the rotor bearing inner diameter.

Rotor bearing oil clearance = (rotor bearing inner diameter) – (rotor journal outer diameter)

- If it exceeds the minimum specification, replace the rotor bearing. (See 01–10–21 ROTOR BEARING REPLACEMENT.)
- If not within the specification, even with the rotor bearing replaced, replace the eccentric shaft.

Standard rotor bearing oil clearance
0.06—0.08 mm {0.0024—0.0030 in}
Maximum rotor bearing oil clearance
0.1 mm {0.0039 in}



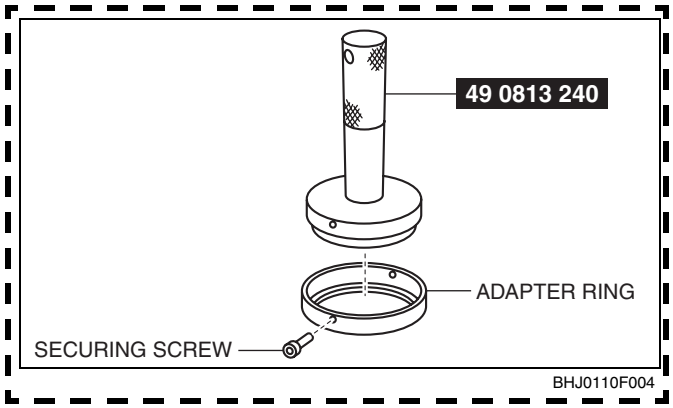
CHU0110E017

ROTOR BEARING REPLACEMENT

CHU011011B10E09

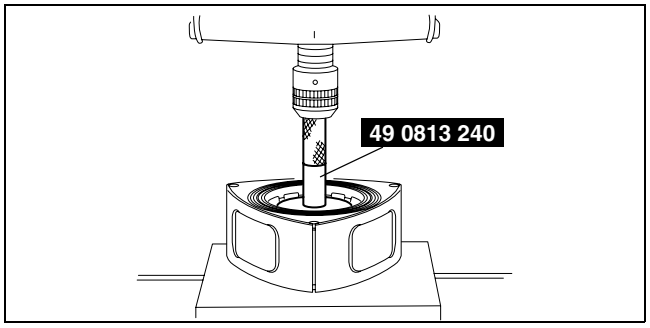
Removal

1. Set the rotor with the internal gear at the bottom.
2. Remove the adapter ring and the securing screw from the SST.



BHJ0110F004

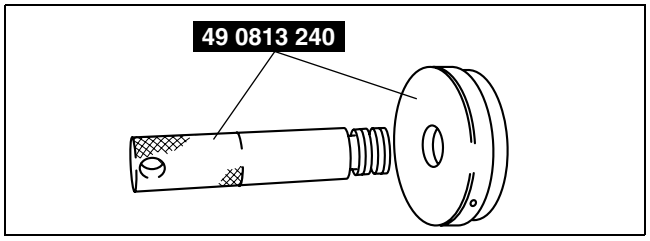
3. Remove the rotor bearing using the **SST**.



BHJ0110E063

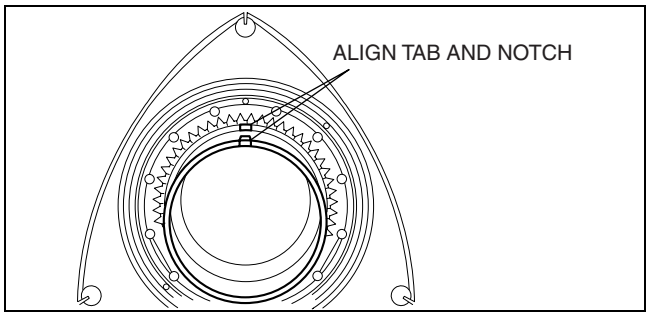
Installation

1. Remove the **SST** handle.



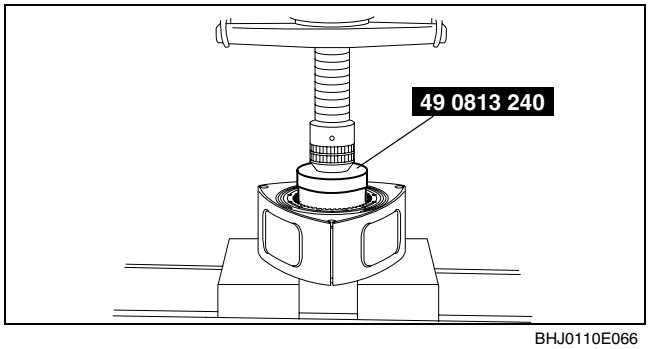
BHJ0110E064

2. Temporarily assemble so that the rotor bearing tab and the rotor notch are aligned after pressing in the rotor bearing and rotor.
3. Set the temporarily assembled rotor bearing and rotor on a hydraulic press.



CHU0110E018

4. Press in the rotor bearing using the **SST**.

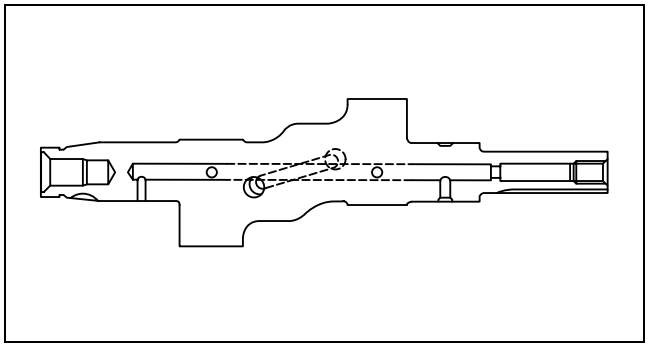


BHJ0110E066

ECCENTRIC SHAFT INSPECTION

1. Inspect for clogging in the oil passage.
   - If there is any clogging, remove it with a needle or similar device and clean with compressed air.

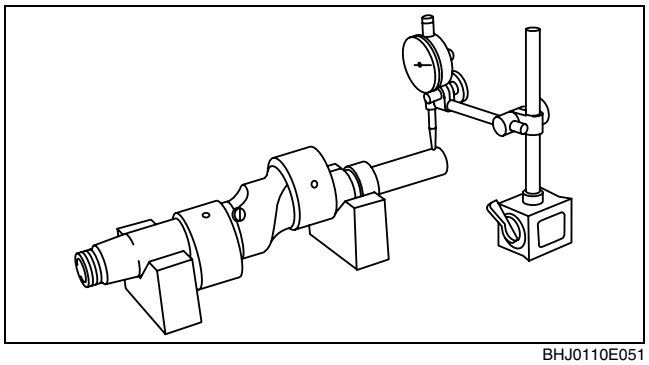
CHU011011D01E01



BHJ0110E050

2. After setting the eccentric shaft main journal on V-blocks and a surface plate, measure the runout at the end of the eccentric shaft using a dial gauge.
   - If it exceeds the maximum specification, replace the eccentric shaft.

Standard runout
0.02 mm {0.0008 in}
Maximum runout
0.06 mm {0.0024 in}

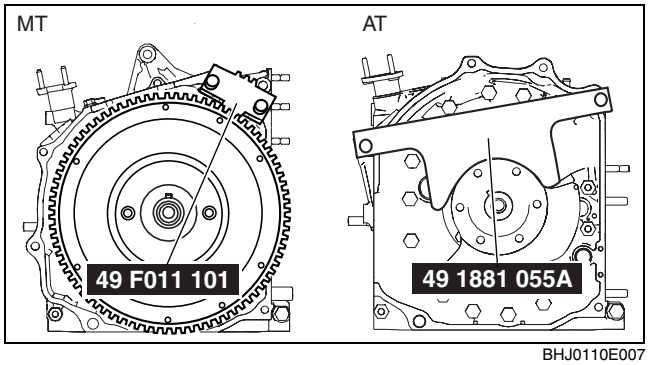


BHJ0110E051

ECCENTRIC SHAFT END PLAY INSPECTION

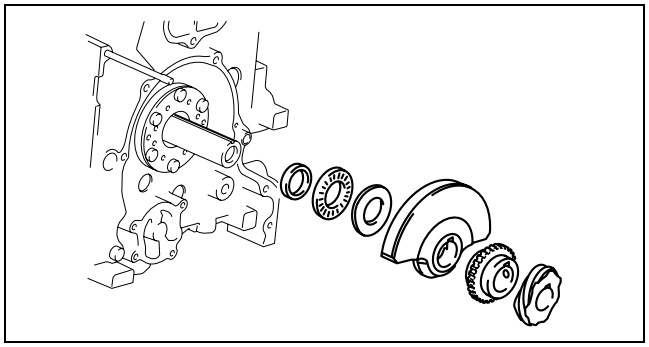
1. Lock the flywheel (MT) or counterweight (AT) against rotation using the **SST**.
2. Assemble the parts in the following order:
   (1) Spacer
   (2) Needle bearing
   (3) Thrust plate
   (4) Balance weight
   (5) Oil pump drive gear
   (6) Metering oil pump drive gear (Type A)

CHU011011D01E02



BHJ0110E007

Caution
- **When assembling the spacer, do not allow the spacer to be caught in the needle bearing in the plate.**

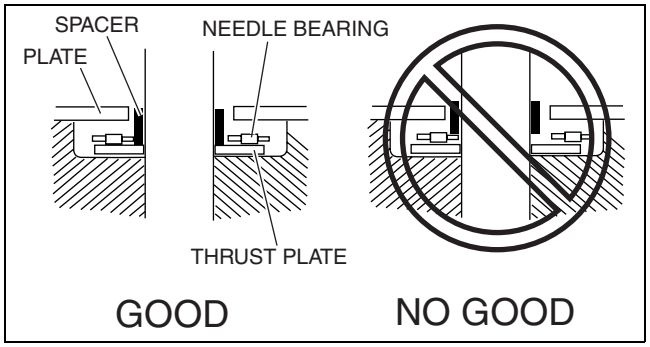


BHJ0110E052

3. Assemble the eccentric shaft pulley, eccentric shaft position plate, pulley boss component apply engine oil to the pulley lockbolt threads, and then tighten.

   Tightening torque
   300—340 N·m {30.6—34.6 kgf·m, 222—250 ft·lbf}

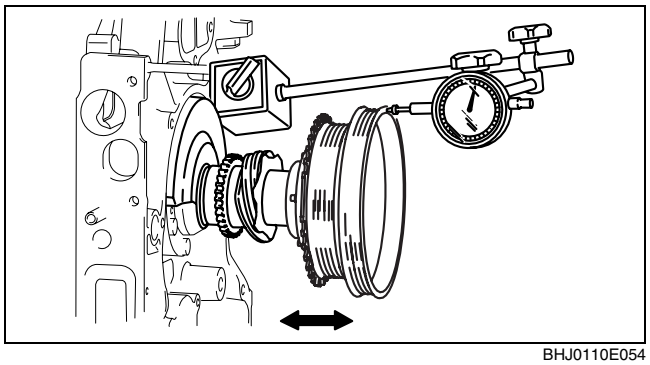
4. Remove the **SST**.



CHU0110E019

5. Measure the end play of the eccentric shaft using a dial gauge.
   - If not within the specification, replace the spacer with one that is thicker than the currently assembled one. If it exceeds the specification, replace with a thinner spacer.

   Standard end play
   0.04—0.09 mm {0.0016—0.0035 in}



BHJ0110E054

Spacer types

(mm {in})

Marking	Dimension
A	7.985 {0.3144}
B	8.005 {0.3152}
C	8.025 {0.3159}
D	8.045 {0.3167}
E	8.065 {0.3175}

Note
- If the end play is not within the specification even after replacing with an A-marked spacer, adjust by grinding it and reuse.

PILOT BEARING INSPECTION/REPLACEMENT [MT]

CHU011011D01E03

Inspection

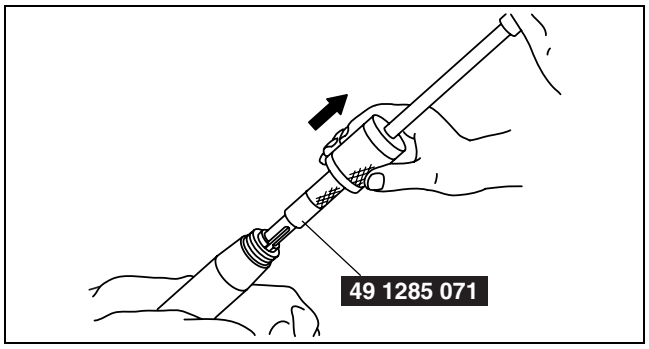
Caution
- **Inspect the pilot bearing when it is installed to the eccentric shaft.**

1. Before removing the pilot bearing, inspect it for damage, wear, and proper rotation.
   - If there is any malfunction, replace the pilot bearing.

Replacement

Removal

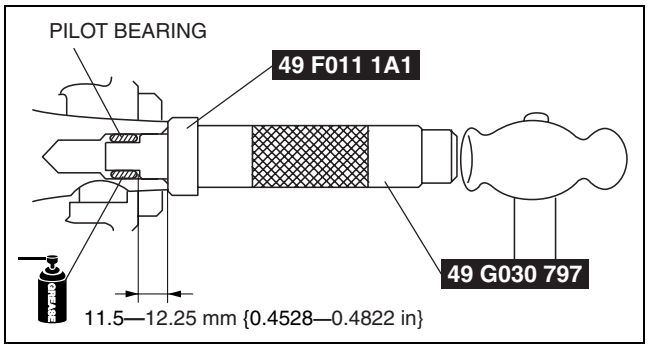
1. Fix the eccentric shaft on a vice.
2. Remove the pilot bearing and the oil seal together using the **SST**.



BHJ0110E070

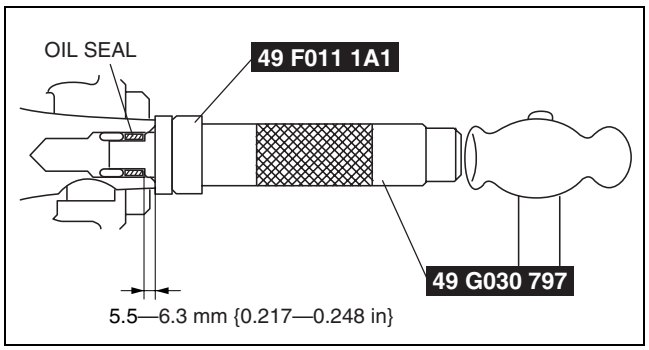
Installation

1. Install a new pilot bearing using the **SSTs**.
2. Apply grease to the pilot bearing.



CHU0110E020

3. Install a new oil seal using the **SSTs**.



CHU0110E021

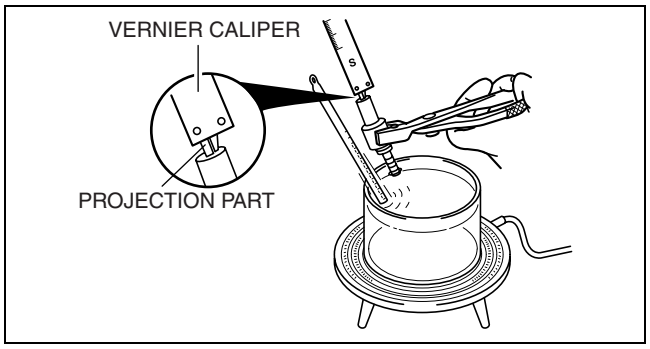
ECCENTRIC SHAFT BYPASS VALVE

CHU011011D01E04

Warning
- **Engine oil temperature will increase during the inspection and become very dangerous. Be careful not to burn yourself during the inspection.**

1. Put the eccentric shaft bypass valve in a container filled with engine oil.
2. Heat the container and verify that the projection protrudes more than the minimum specification when the engine oil temperature is **60 °C {140 °F}**.
   - If it is less than the minimum specification, replace the eccentric shaft bypass valve.

Minimum projection
6 mm {0.24 in}



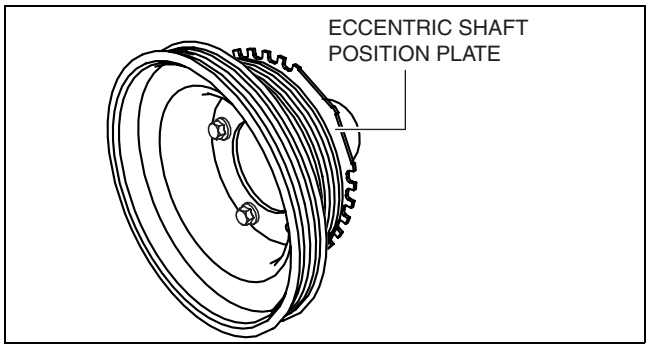
CHU0110E057

ECCENTRIC SHAFT POSITION PLATE INSPECTION

CHU011011D01E05

1. Visually inspect the eccentric shaft position plate for damage and erosion.
   - If there is any malfunction, replace the eccentric shaft position plate.

Eccentric shaft pulley tightening torque
14.2—17.2 N·m {1.45—1.75 kgf·m, 10.5—12.6 ft·lbf}

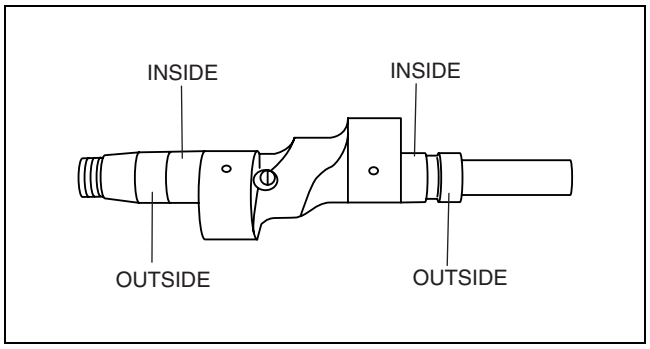


BHJ0110E106

MAIN BEARING OIL CLEARANCE INSPECTION

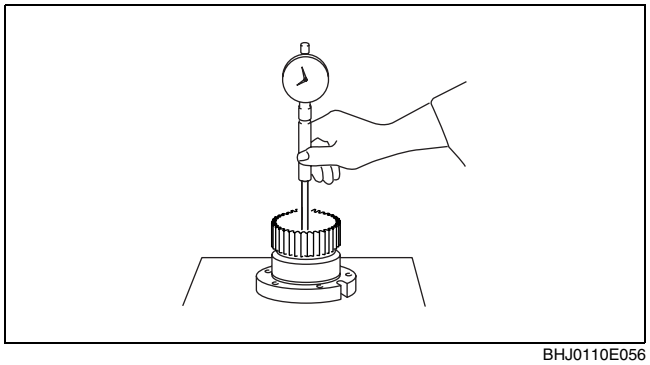
CHU011010E00E01

1. Using a micrometer, measure the outer diameters of the inside main journal.



CHU0110E022

2. Using a cylinder bore gauge, measure the inner diameter of the stationary gear main bearing.

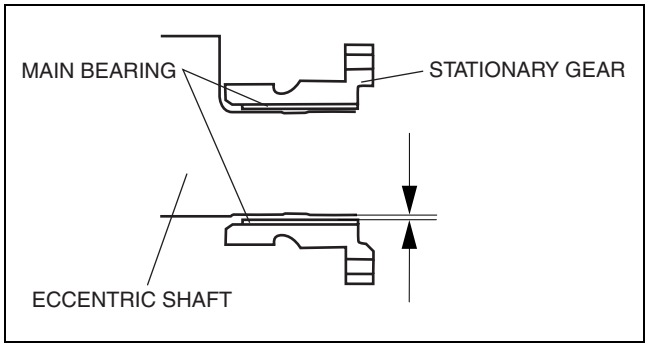


BHJ0110E056

3. Calculate the main bearing oil clearance from the main journal outer diameter and the main bearing inner diameter.

   Main bearing oil clearance = (main bearing inner diameter) – (main journal outer diameter)

   - If it exceeds the maximum specification, replace the main bearing. (See 01–10–26 MAIN BEARING REPLACEMENT.)
     — If the clearance is not within the specification after replacing the main bearing, replace the eccentric shaft.



CHU0110E023

Standard main bearing oil clearance
Without stopper screw: 0.045—0.085 mm {0.0018—0.0033 in}
With stopper screw: 0.055—0.075 mm {0.0022—0.0029 in}

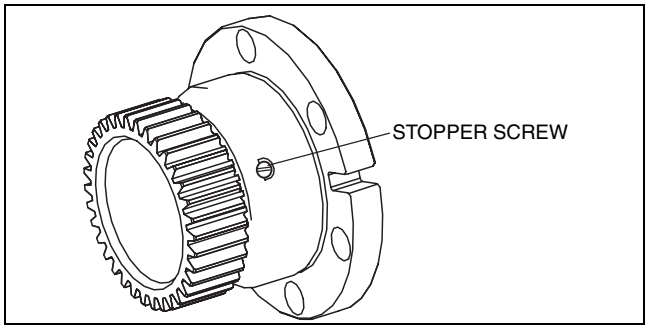
Maximum main bearing oil clearance
Without stopper screw: 0.1 mm {0.0039 in}
With stopper screw: 0.1 mm {0.0039 in}

MAIN BEARING REPLACEMENT

CHU011010E00E02

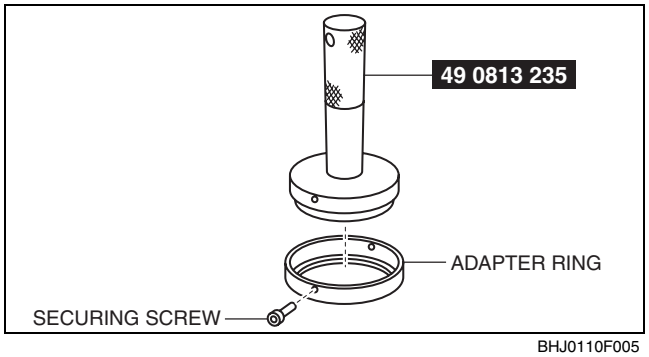
Removal

1. Remove the stopper screw. (With stopper screw)



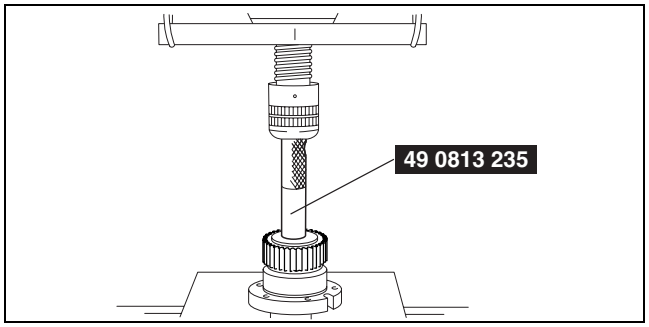
CHU0110E042

2. Remove the adapter ring and the securing screw from the SST.
3. Set the stationary gear to the hydraulic press so that the gear faces upward.



BHJ0110F005

4. Remove the main bearing using the **SST**.

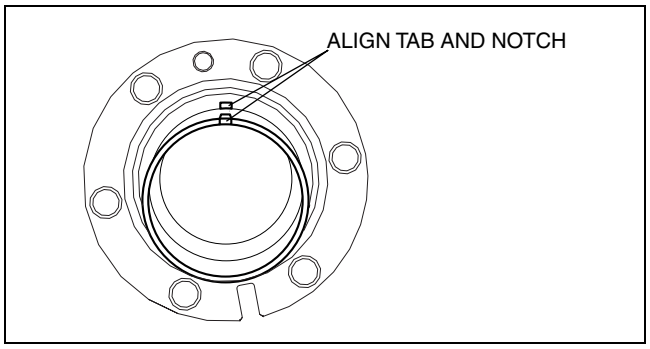


BHJ0110E057

Installation

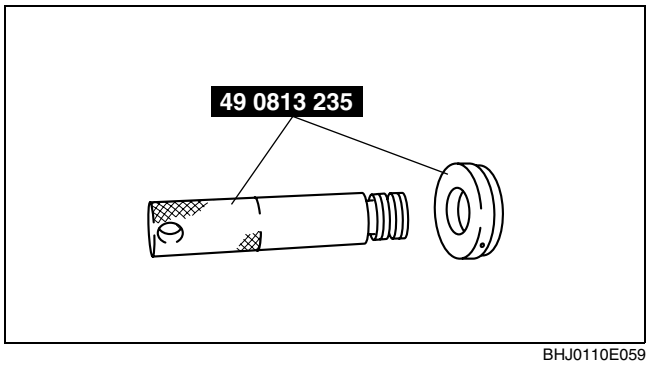
Without stopper screw

1. Temporarily assemble the stationary gear and the main bearing so that the main bearing tab and notch are aligned after pressing in the main bearing and stationary gear.



CHU0110E043

2. Remove the **SST** handle.

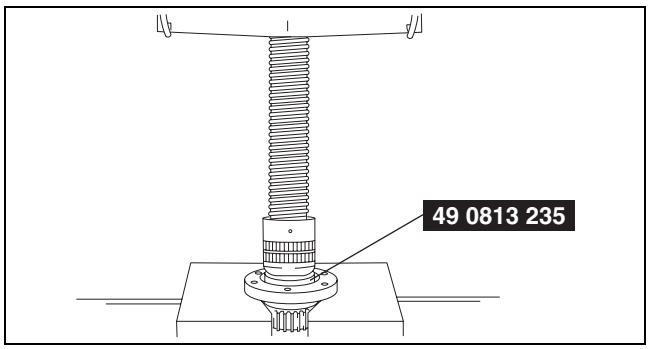


BHJ0110E059

3. Position the gear of the stationary gear downward, and install the main bearing by pressing it with the **SST**.

Caution

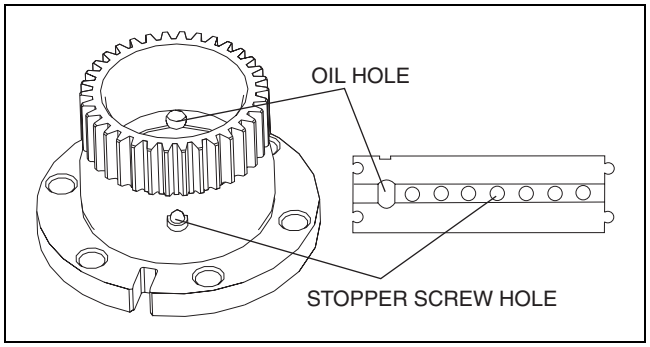
- **Press the main bearing in so that the top of the main bearing is flush with the top of the stationary gear flange.**



BHJ0110E060

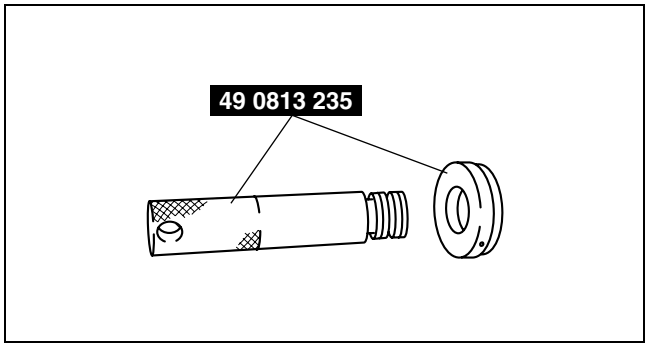
With stopper screw

1. Temporarily assemble the stationary gear and the main bearing so that the main bearing screw hole and the stationary gear screw hole are aligned after pressing in the main bearing and rotor.



CHU0110E044

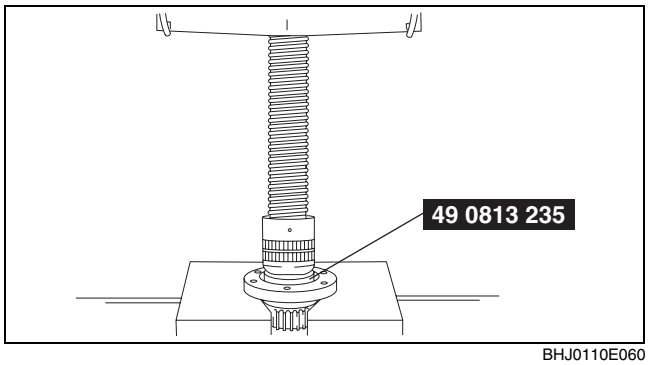
2. Remove the **SST** handle.



BHJ0110E059

3. Position the gear of the stationary gear downward, and install the main bearing using the **SST**.

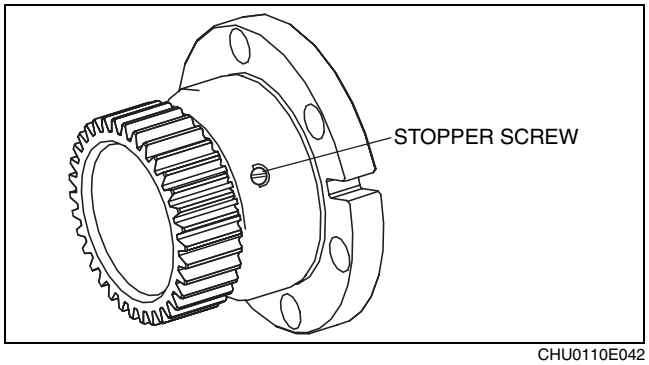
Caution
- **Press the main bearing in so that the top of the main bearing is flush with the top of the stationary gear flange.**



BHJ0110E060

4. Apply thread-locking compound to the stopper screw and install.

Tightening torque
3.2—4.7 N·m
{33—47 kgf·cm, 29—41 in·lbf}



CHU0110E042

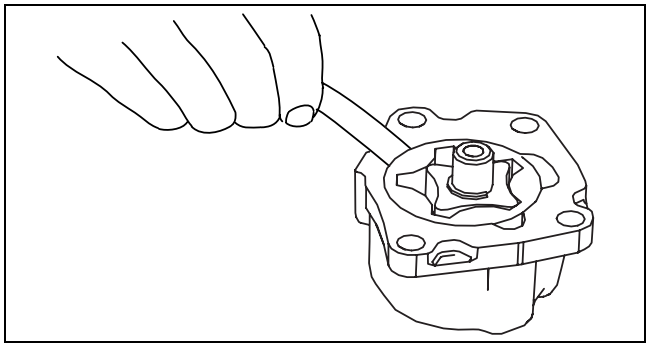
OIL PUMP INSPECTION

CHU011014100E01

Type A

1. Measure the body clearance between the outer rotor and the body using a feeler gauge.
   - If it exceeds the maximum specification, replace the oil pump.

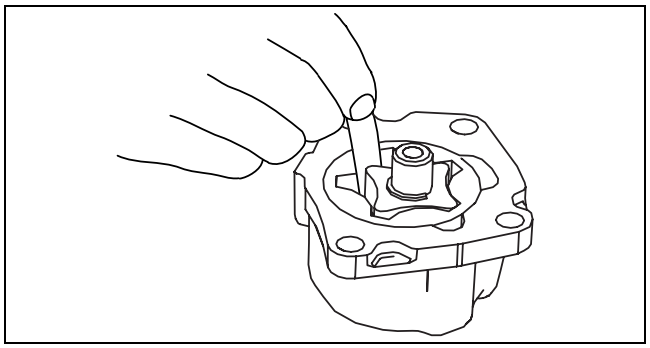
   Standard body clearance
   0.20—0.25 mm {0.0079—0.0098 in}
   Maximum body clearance
   0.3 mm {0.0118 in}



BHJ0110E067

2. Measure the tip clearance between the inner rotor and the outer rotor using a feeler gauge.
   - If it exceeds the maximum specification, replace the oil pump.

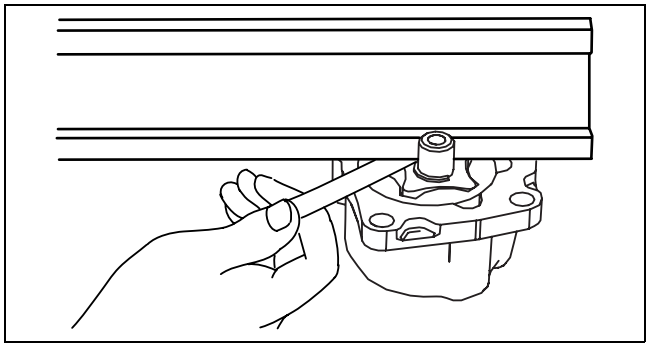
   Standard tip clearance
   0.03—0.12 mm {0.0012—0.0047 in}
   Maximum tip clearance
   0.15 mm {0.0059 in}



BHJ0110E068

3. Measure the side clearance between the rotor and the side housing using a straight edge and a feeler gauge.
   - If it exceeds the maximum specification, replace the oil pump.

   Standard side clearance
   0.03—0.125 mm {0.0012—0.0049 in}
   Maximum side clearance
   0.15 mm {0.0059 in}

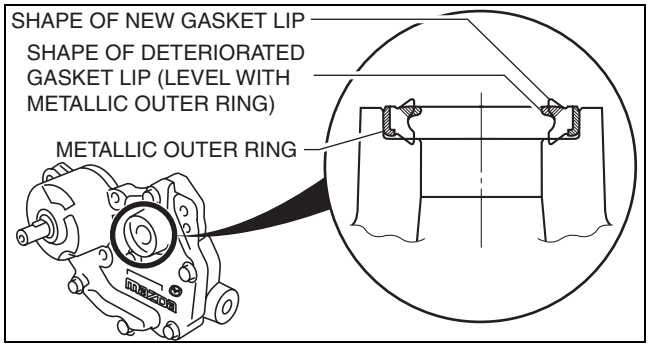


BHJ0110E069

Type B

Note
- The oil pump cannot be disassembled because it is a precision unit. If a malfunction occurs, replace the oil pump component as a single unit.

1. Visually inspect the oil pump gasket.
   - Replace the oil pump component if the condition corresponds to any one of the following:
     — The lip is damaged.
     — The lip and the metallic outer ring are at the same level.



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