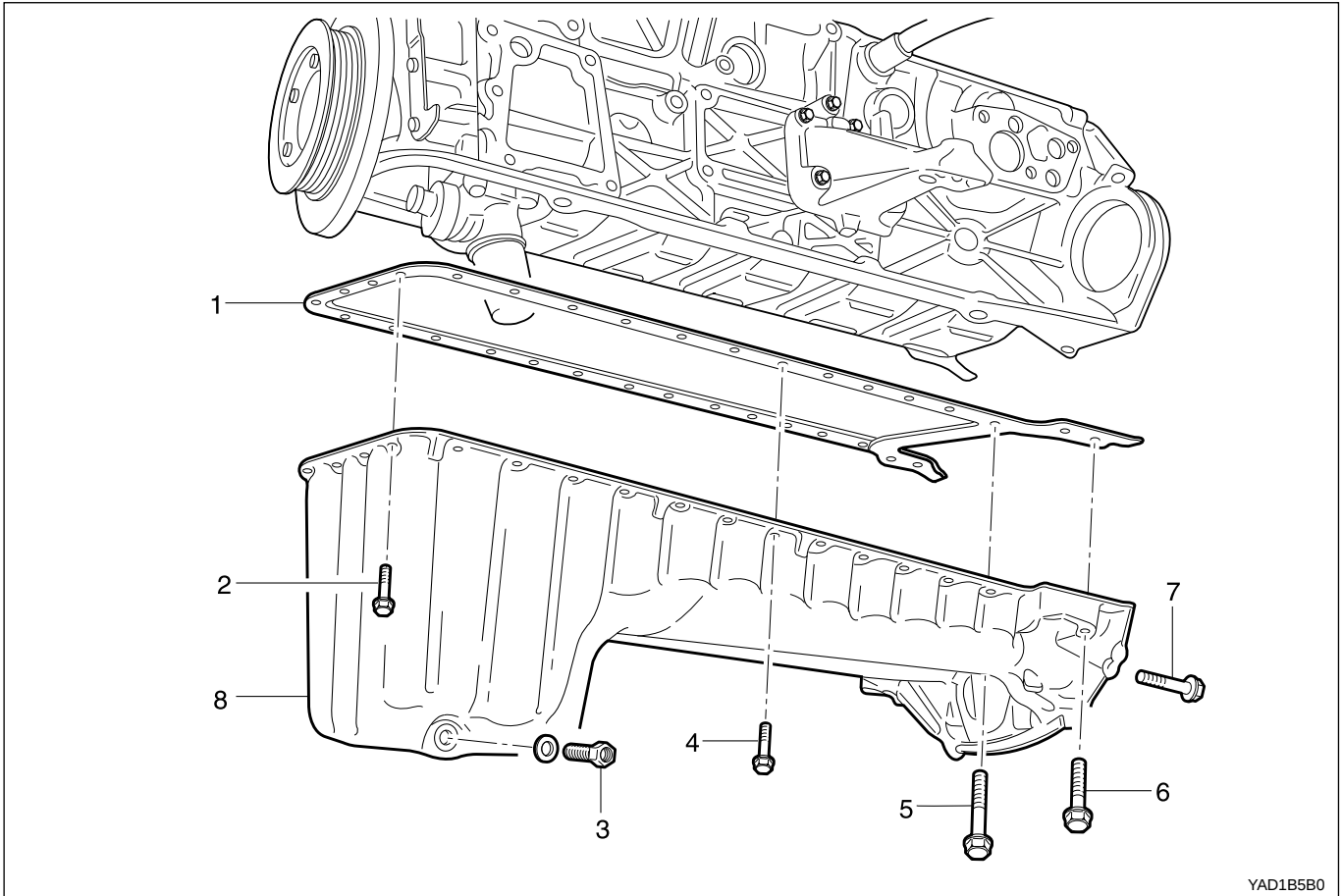
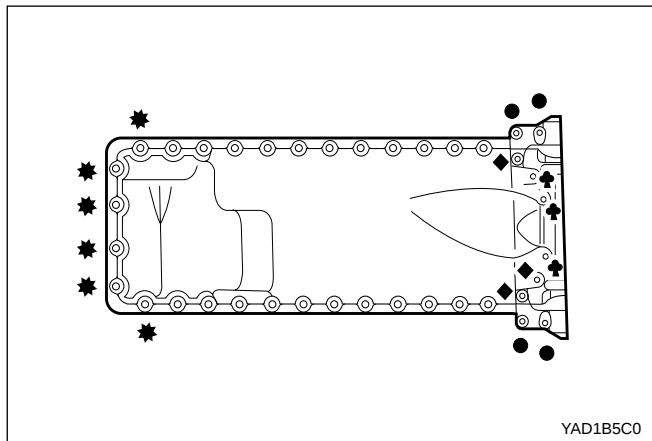


OIL PAN



- | | | | |
|-----------------------------|---------------------------------|----------------------------|---------------------------------|
| 1 Gasket..... | Replace | 5 Bolt (M6 x 85, 3 pieces) | |
| 2 Bolt (M6 x 22, 6 pieces) | | | 9-11 N•m (80-97 lb-in) |
| | 9-11 N•m (80-97 lb-in) | 6 Bolt (M8 x 40, 4 pieces) | |
| 3 Drain Plug | 22.5-27.5 N•m (16.6-20.3 lb-ft) | | 22.5-27.5 N•m (16.6-20.3 lb-ft) |
| 4 Bolt (M6 x 20, 22 pieces) | | 7 Bolt (M10) | 40 N•m (30 lb-ft) |
| | 9-11 N•m (80-97 lb-in) | 8 Oil Pan | |



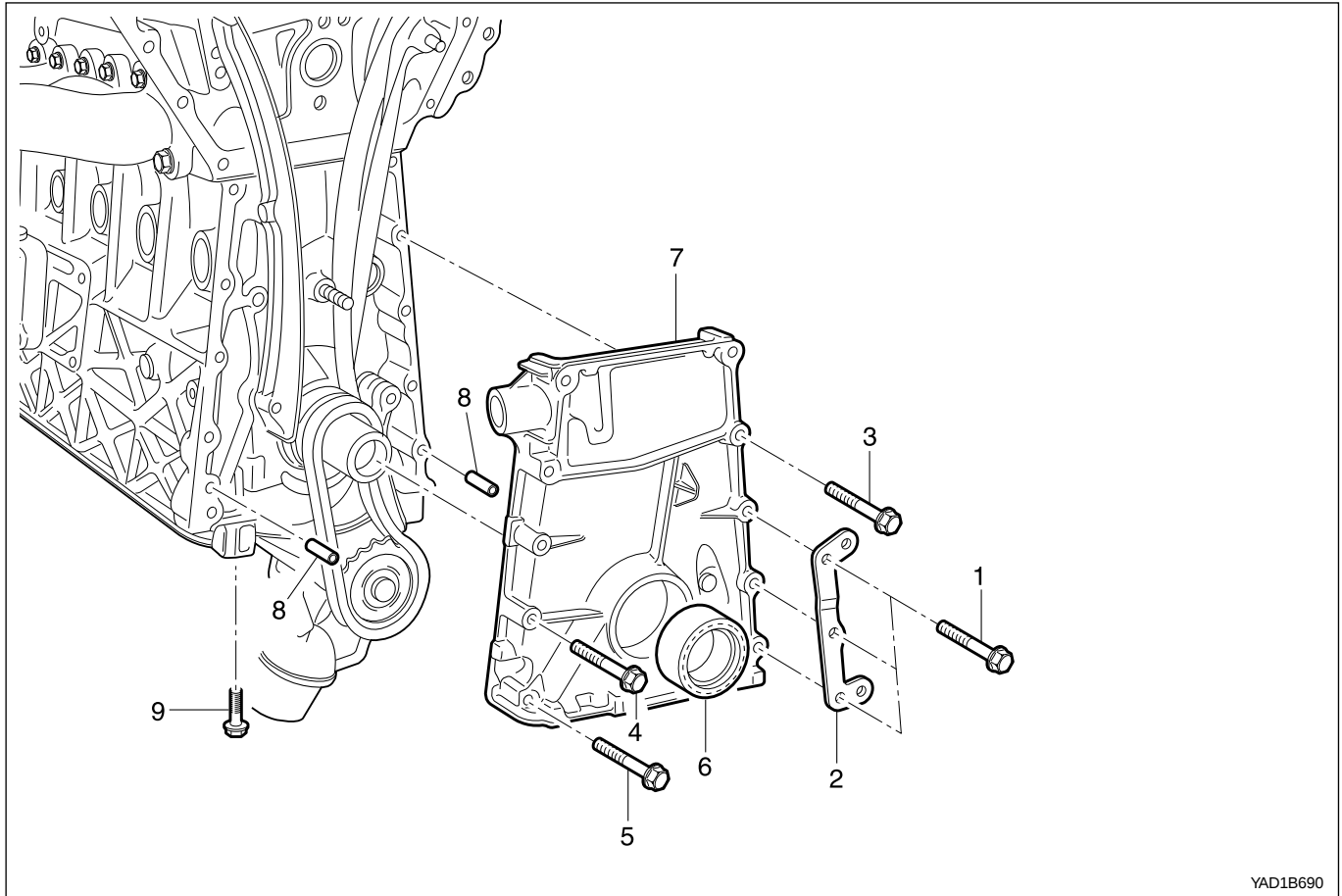
- M8 X 40, 4 pieces
- ✚ M6 X 85, 3 pieces
- ◆ M6 X 35, 3 pieces
- ★ M6 X 22, 6 pieces
- Others M6 X 20, 28 pieces

Removal & Installation Procedure

1. Remove the drain plug and drain the oil completely.
2. Unscrew the bolts and remove the oil pan and gasket.
Notice: Arrange the bolts according to each size.
3. Clean the inside of oil pan and sealing surface, then apply the sealant.
4. Replace the gasket with new one.
5. Install the oil pan with gasket, and tighten each bolt in specified torque.
6. Check for oil leaks while running the engine.

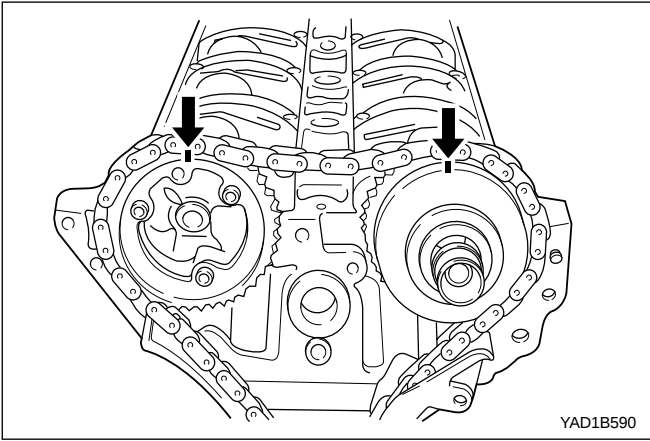
TIMING GEAR CASE COVER

Preceding Work : Removal of cylinder head front cover
 Removal of generator bracket
 Removal of tensioning device
 Removal of belt pulley and vibration damper



YAD1B690

- | | |
|---------------------------------------|---------------------------------------|
| 1 Bolt (M8 x 60, 3 pieces) | 5 Bolt (M8 x 60, 1 piece) |
| 22.5-27.5 N•m (16.6-20.3 lb-ft) | 22.5-27.5 N•m (16.6-20.3 lb-ft) |
| 2 A/C Bracket | 6 Seal |
| 3 Bolt (M8 x 65, 3 pieces) | 7 Timing Gear Case Cover |
| 22.5-27.5 N•m (16.6-20.3 lb-ft) | 8 Roll Pin |
| 4 Bolt (M8 x 40, 1 piece) | 9 Bolt (M6 x 22, 6 pieces) |
| 22.5-27.5 N•m (16.6-20.3 lb-ft) | 9-11 N•m (80-97 lb-in) |

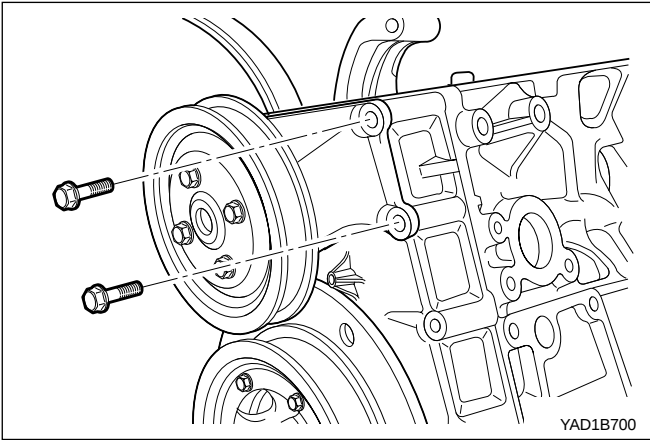


Removal & Installation Procedure

1. Put the alignment marks (arrows) on the timing chain and camshaft sprocket.
2. Unscrew the A/C bracket bolts (1) and remove the bracket.

Installation Notice

Tightening Torque	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
-------------------	--



3. Remove the cooling fan and the viscous clutch. Unscrew the three bolts from the cooling fan bracket and remove the bracket.

Installation Notice

Tightening Torque	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
-------------------	--

4. Remove the timing gear case cover after unscrewing the bolts (3) and (4) from the timing gear case cover and the bolt (9) from the oil pan.

Notice: Be careful not to damage the oil pan gasket.

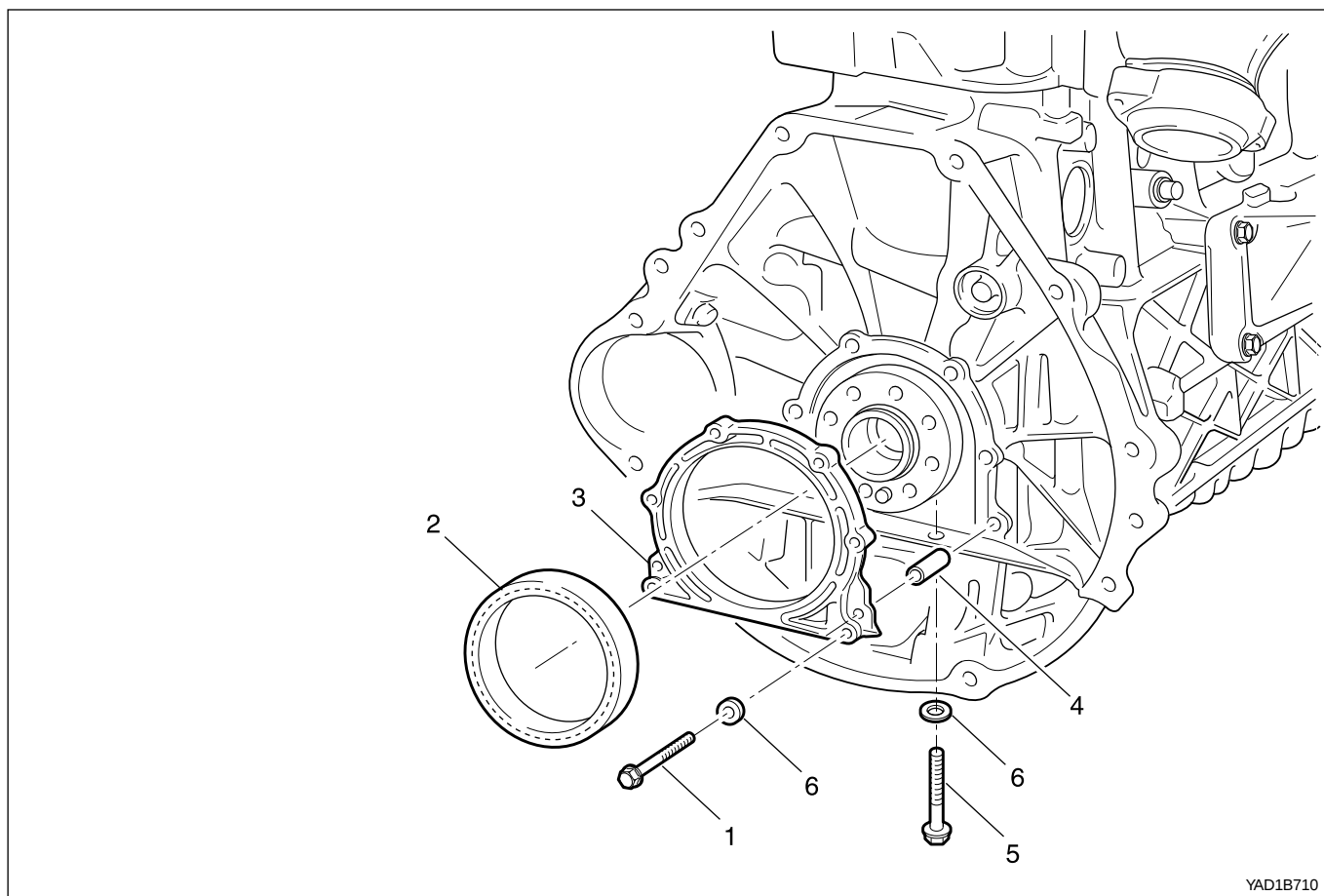
Installation Notice

Tightening Torque	Bolt (3, 4) : 22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
	Bolt (9) : 9 - 11 N•m (80 - 97 lb-in)

- Apply the sealant after cleaning the timing gear case cover surface.
 - Be careful not to stain the oil chamber of chain tensioner with the sealant.
5. Installation should follow the removal procedure in the reverse order.
 6. Warm up the engine and check for oil leaks.

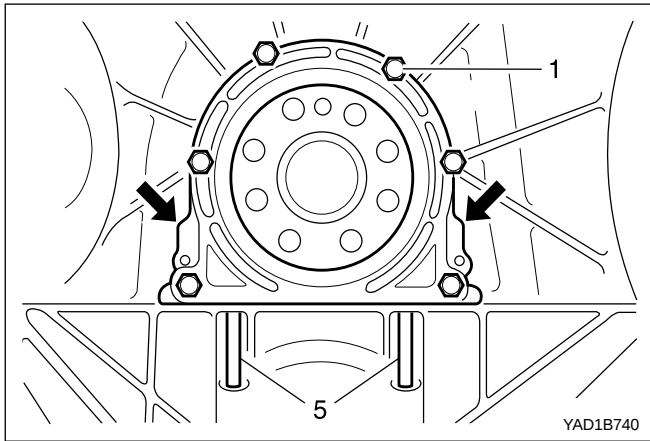
CRANKSHAFT SEALING REAR COVER

Preceding Work : Removal of the automatic transmission drive plate



YAD1B710

- | | |
|-----------------------------|-----------------------------|
| 1 Bolt (M6 x 20, 6 pieces) | 4 Sleeve |
|9-11 N•m (80-97 lb-in) | 5 Bolt (M6 x 85, 2 pieces) |
| 2 Radial Shaft Seal |9-11 N•m (80-97 lb-in) |
| 3 Rear Cover | 6 Washer |



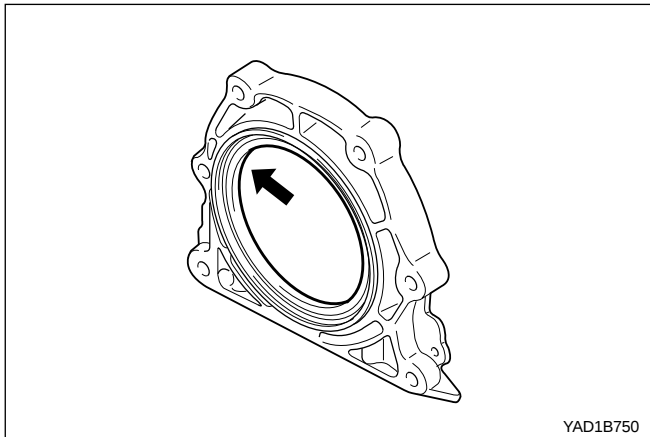
Tools Required

601 589 03 43 00 Crankshaft Rear Seal Installer

Removal & Installation Procedure

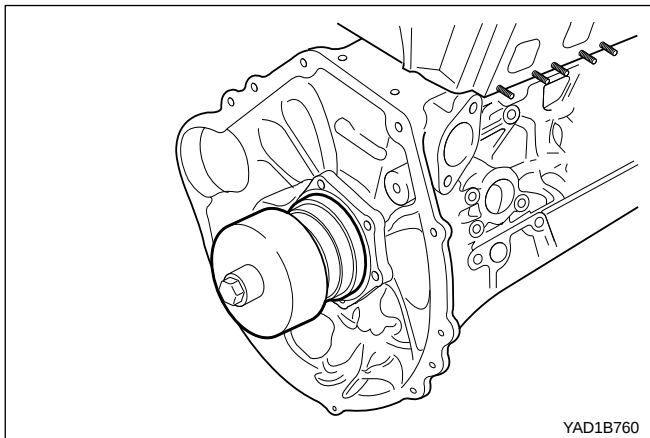
1. Unscrew the bolts (1) and (5) and remove the closing cover by pulling the rear cover lug (arrows).

Notice: Be careful not to damage the oil pan gasket.

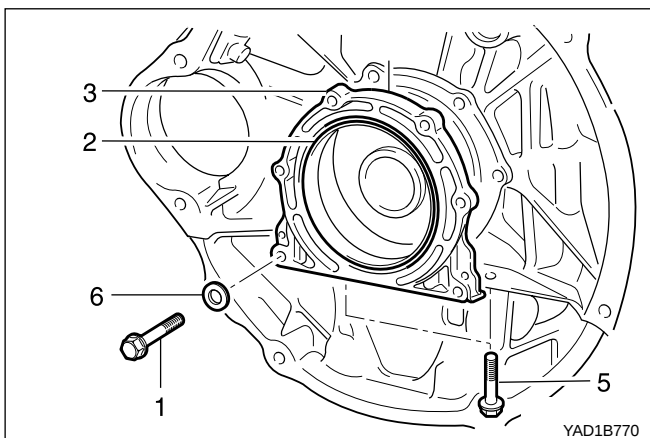


2. Clean the sealing surface of the crankcase and the rear sealing cover.
3. Check the radial shaft seal and replace it if necessary.
4. Apply the Loctite 573 to the rear cover sealing surface.
5. Apply the engine oil to the dust lip of the radial shaft seal.

Notice: Do not use the grease.



6. Install the crankshaft rear radial seal and the crankshaft sealing rear cover, using crankshaft rear seal installer 601 589 03 43 00.



7. Install the crankshaft sealing rear cover mounting bolts and remove the crankshaft rear seal installer 601 589 03 43 00.

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
-------------------	-------------------------------

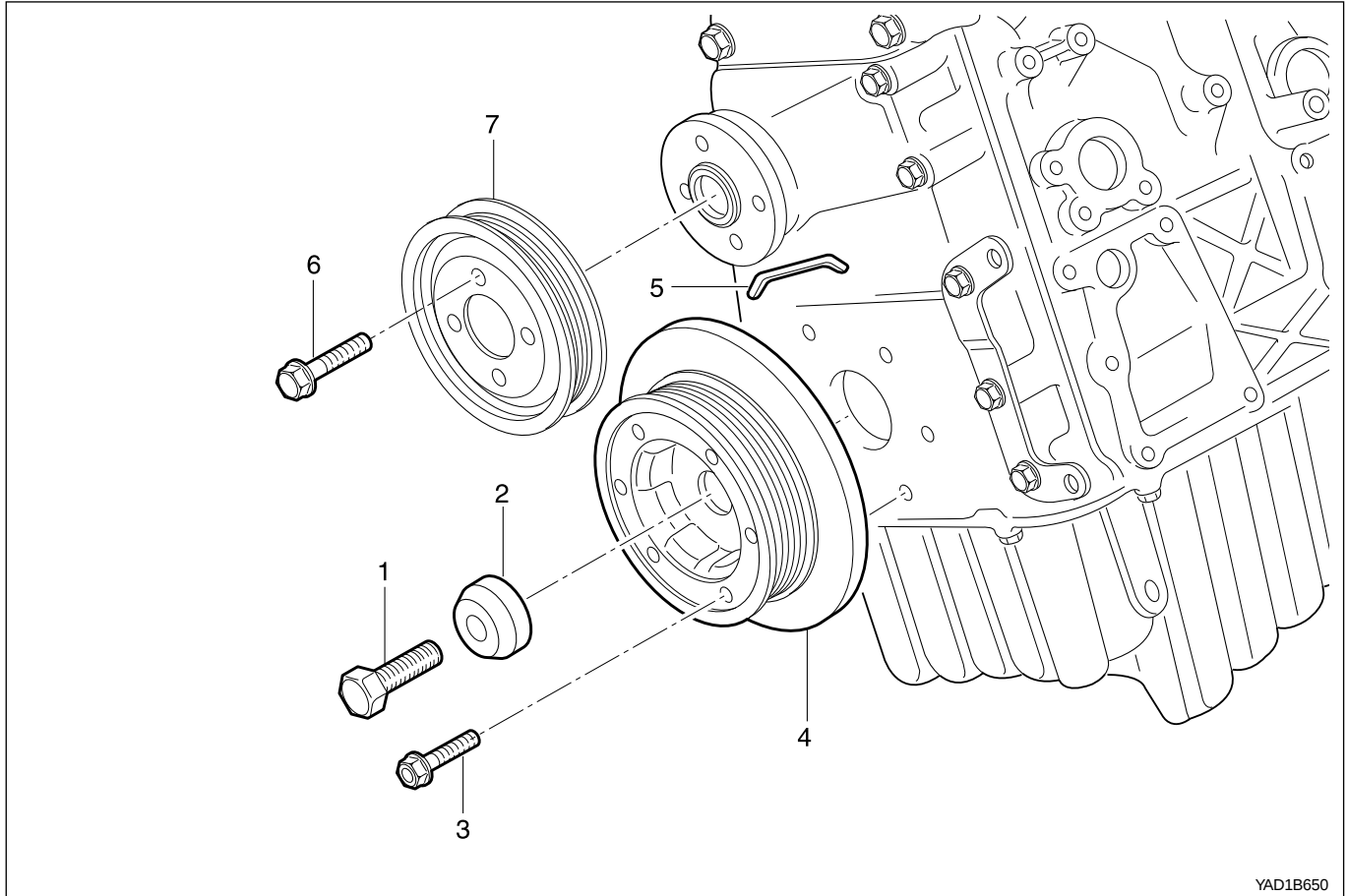
CRANKSHAFT ASSEMBLY

BELT PULLEY AND VIBRATION DAMPER

Preceding Work : Removal of cooling fan and viscous clutch

Removal of fan shroud

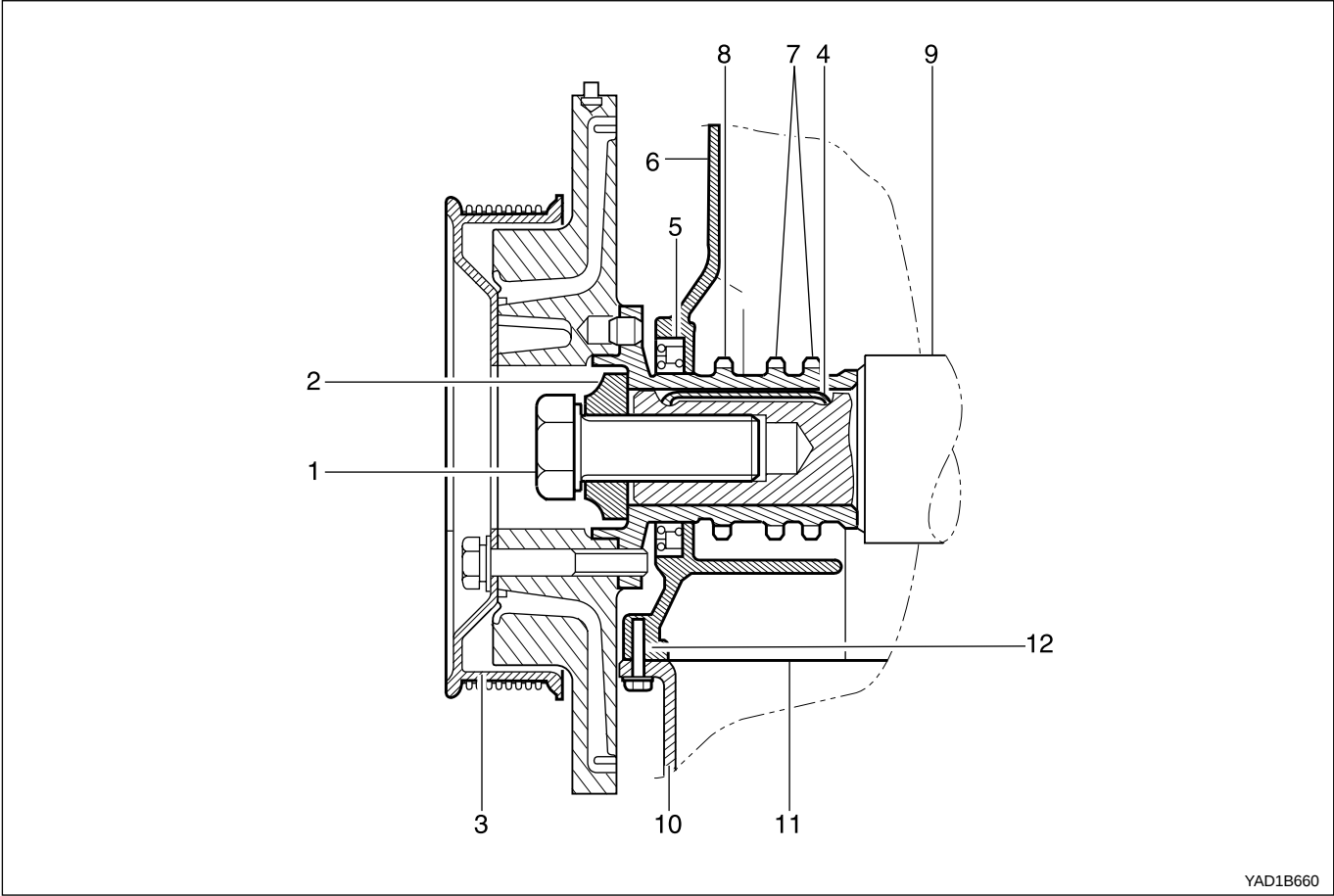
Removal of drive belt



YAD1B650

- | | |
|---|------------------------------|
| 1 Center Bolt (M18 x 50) | 4 Vibration Damper Assembly |
| 1st step 180- 220 N•m (133-162 lb-ft) | 5 Woodruff Key |
| 2nd step 90°+10° | 6 Bolt (M6 x 12, 4 pieces) |
| 2 Vibration Damper Disk | 9-11 N•m (80-97 lb-in) |
| 3 Bolt (M6 x 20, 6 pieces) | 7 Cooling Fan Pulley |
| 7.7-9.5 N•m (68.1-84.1 lb-in) | |

Components

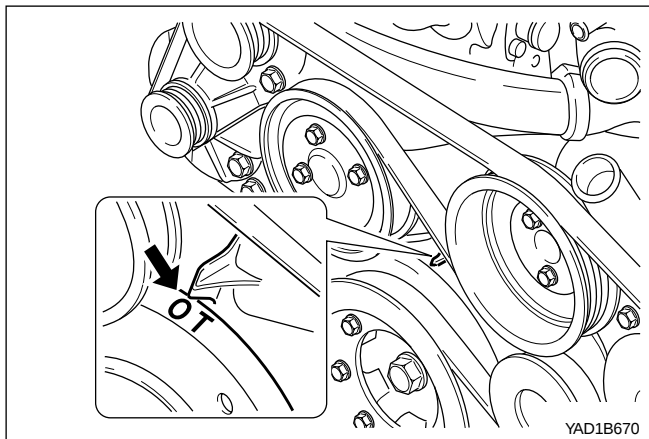


YAD1B660

- | | |
|--|---|
| 1 Center Bolt (M18 x 50) | 7 Crankshaft Sprocket (Camshaft Driven) |
| 2 Vibration Damper Disk | 8 Crankshaft Sprocket (Oil Pump Driven) |
| 3 Vibration Damper and Pulley Assembly | 9 Crankshaft |
| 4 Woodruff Key | 10 Oil Pan |
| 5 Crankshaft Front Seal | 11 Oil Pan Gasket |
| 6 Timing Gear Case Cover | 12 Oil Pan Mounting Bolt (M6 x 22) |

Service Data Standard

Permissble Deviation of The Vibration Damper	Radial Runout	0.6 mm
	Axial Runout	0.6 mm

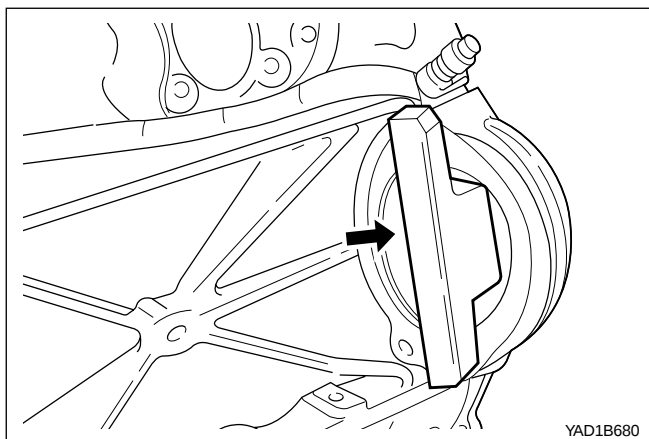


Tools Required

602 589 00 40 00 Engine Lock

Removal & Installation Procedure

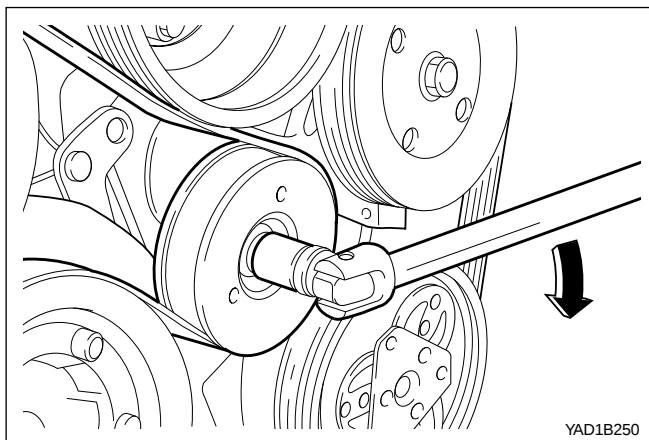
1. Adjust the piston of number 1 cylinder to the TDC.



2. Remove the start motor and install the engine lock 602 589 00 40 00 to the flywheel ring gear.
3. Remove the vibration damper center bolt.

Installation Notice

Tightening Torque	1st step: 180 - 220 N•m (133 - 162 lb-ft)
	2nd step: 90° + 10°

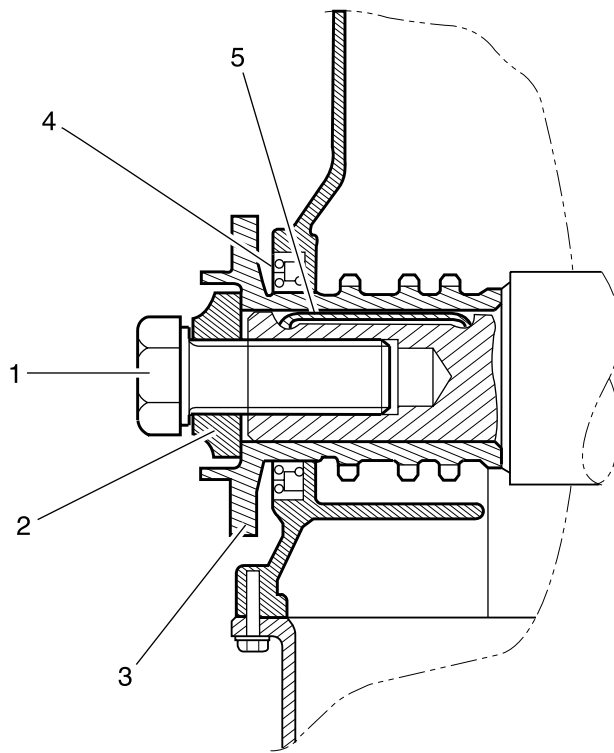


4. Remove the vibration damper assembly using the puller.
5. Installation should follow the removal procedure in the reverse order.

Notice: If possible, don't separate the vibration damper and the pulley.

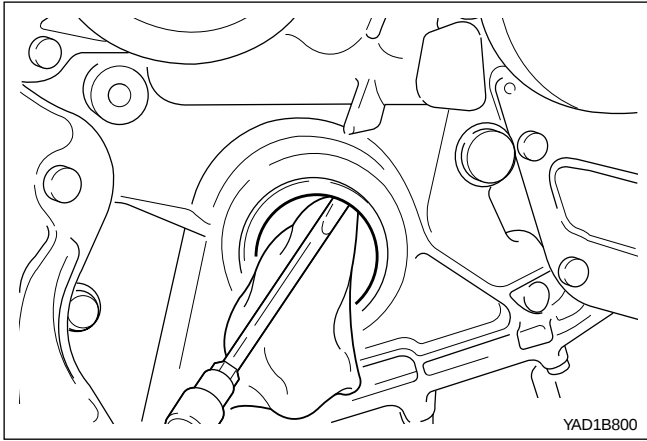
CRANKSHAFT FRONT RADIAL SEAL

Preceding Work : Removal of belt pulley and vibration damper



YAD1B780

- | | |
|---|-------------------------|
| 1 Center Bolt (M18 x 50) | 3 Sleeve (Special Tool) |
| 1st step 180- 220 N•m (133-162 lb-ft) | 4 Crankshaft Front Seal |
| 2nd step 90°+10° | 5 Key |
| 2 Center Bolt Washer | |

**Tools Required**

601 589 03 14 00 Crankshaft Front Seal Installer

Replacement Procedure

1. Remove the radial seal with a screw driver.

Notice: Use a clean cloth not to damage the radial seal mounting hole and the crankshaft.

2. Coat the radial sealing lip with engine oil.
3. Using the crankshaft front seal installer 601 589 03 14 00, assemble the radial seal.
4. Align the sleeve groove and the woodruff key and tighten the center bolt until the center bolt and the damper disk stop in the movement.

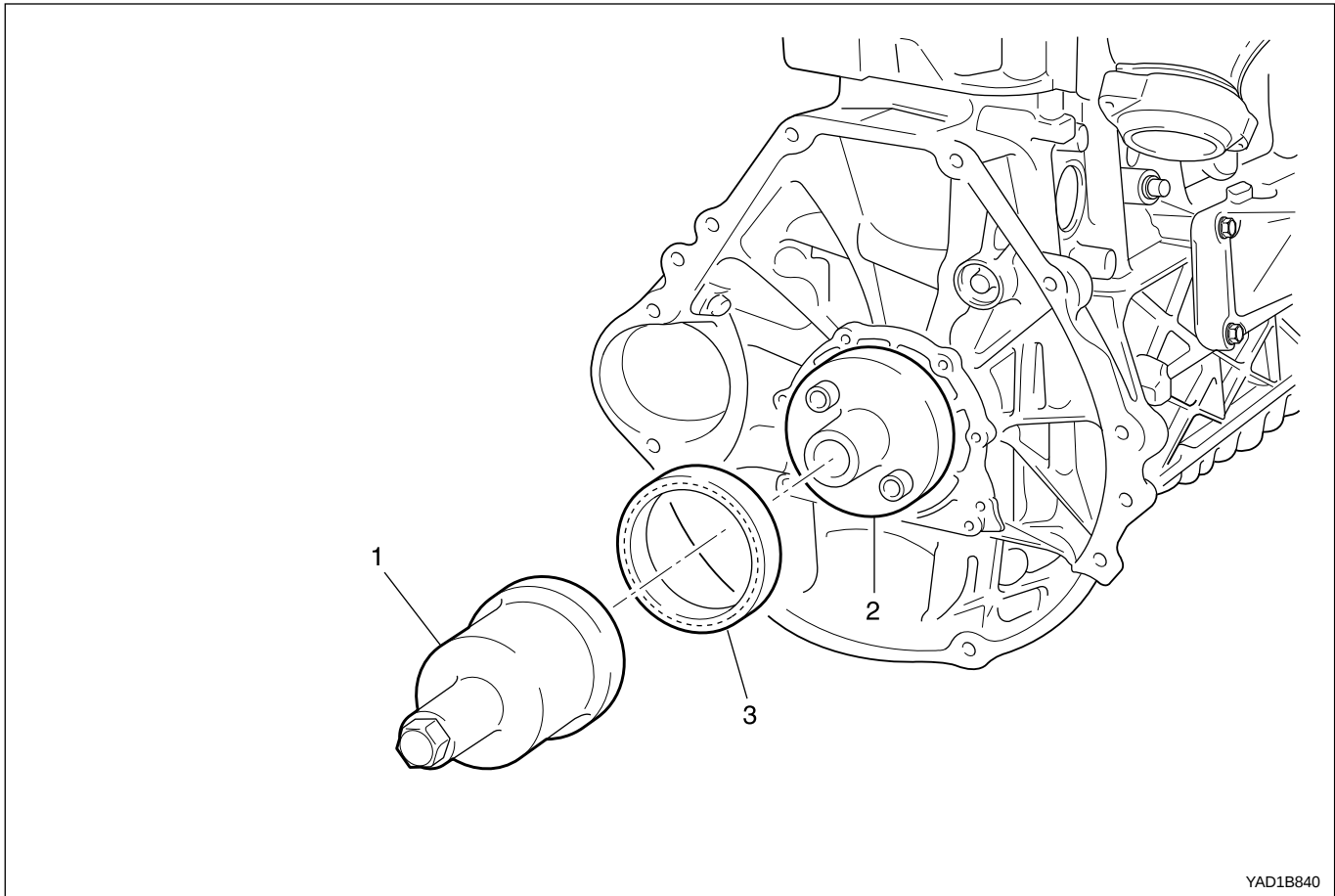
Installation Notice

Tightening Torque	1st step: 180 - 220 N•m (133 - 162 lb-ft)
	2nd step: 90° + 10°

5. Remove the crankshaft front seal installer 601 589 03 14 00, and install the belt pulley and the vibration damper.
6. Check for leaks while operating the engine.

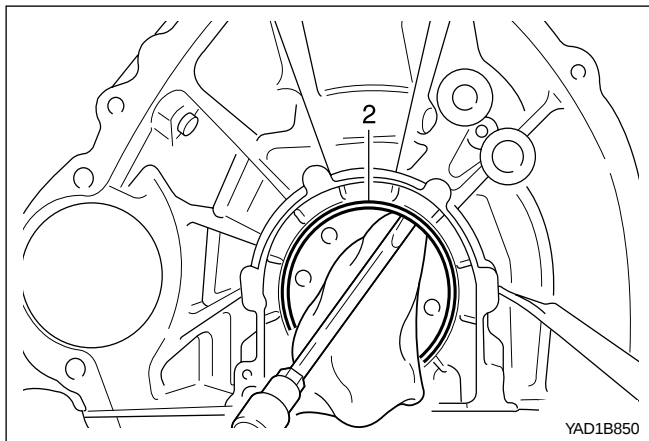
CRANKSHAFT REAR RADIAL SEAL

Preceding Work : Removal of flywheel or drive plate



- 1 Special Tool
- 2 Special Tool

- 3 Crankshaft Rear Seal

**Tools Required**

601 589 03 43 00 Crankshaft Rear Seal Installer

Replacement Procedure

1. Remove the radial seal with a screw driver.

Notice: Use a clean cloth not to damage the radial seal mounting hole and the crankshaft.

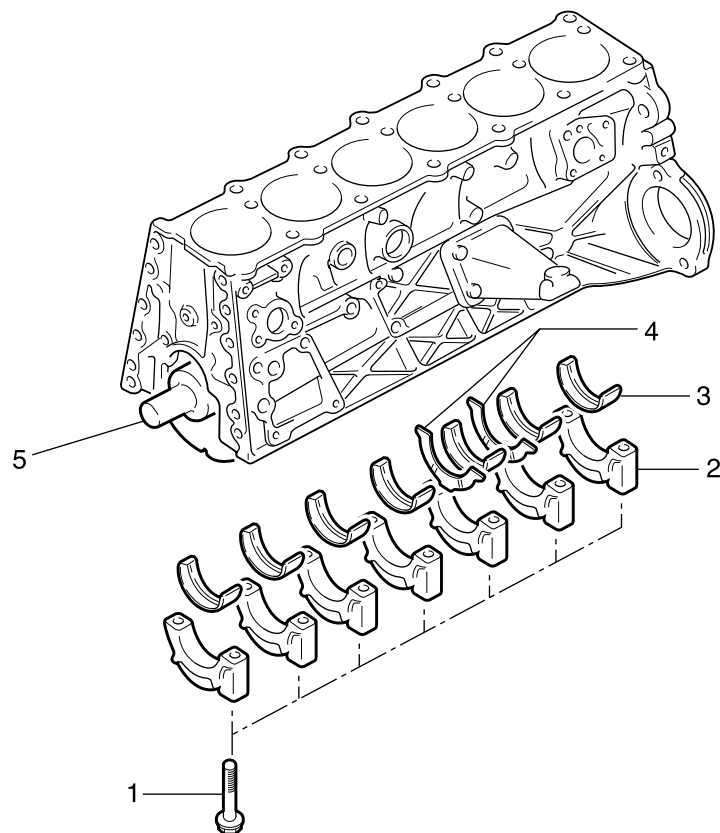
2. Install the crankshaft rear seal installer 601 589 03 43 00 (2) to the crankshaft.
3. Apply the engine oil on the crankshaft rear seal installer 601 589 03 43 00 (2).

Notice: Do not use the grease.

4. Install the radial seal on the inner parts assembler.
5. Press in the crankshaft rear seal installer 601 589 03 43 00 (1) until the radial seal is stopped.
6. Check for leaks while operating the engine.

CRANKSHAFT

Preceding Work : Removal of engine assembly
 Removal of timing gear case cover
 Removal of cylinder head
 Removal of crankshaft sealing rear cover
 Removal of oil pan
 Removal of oil pump
 Removal of baffle plate

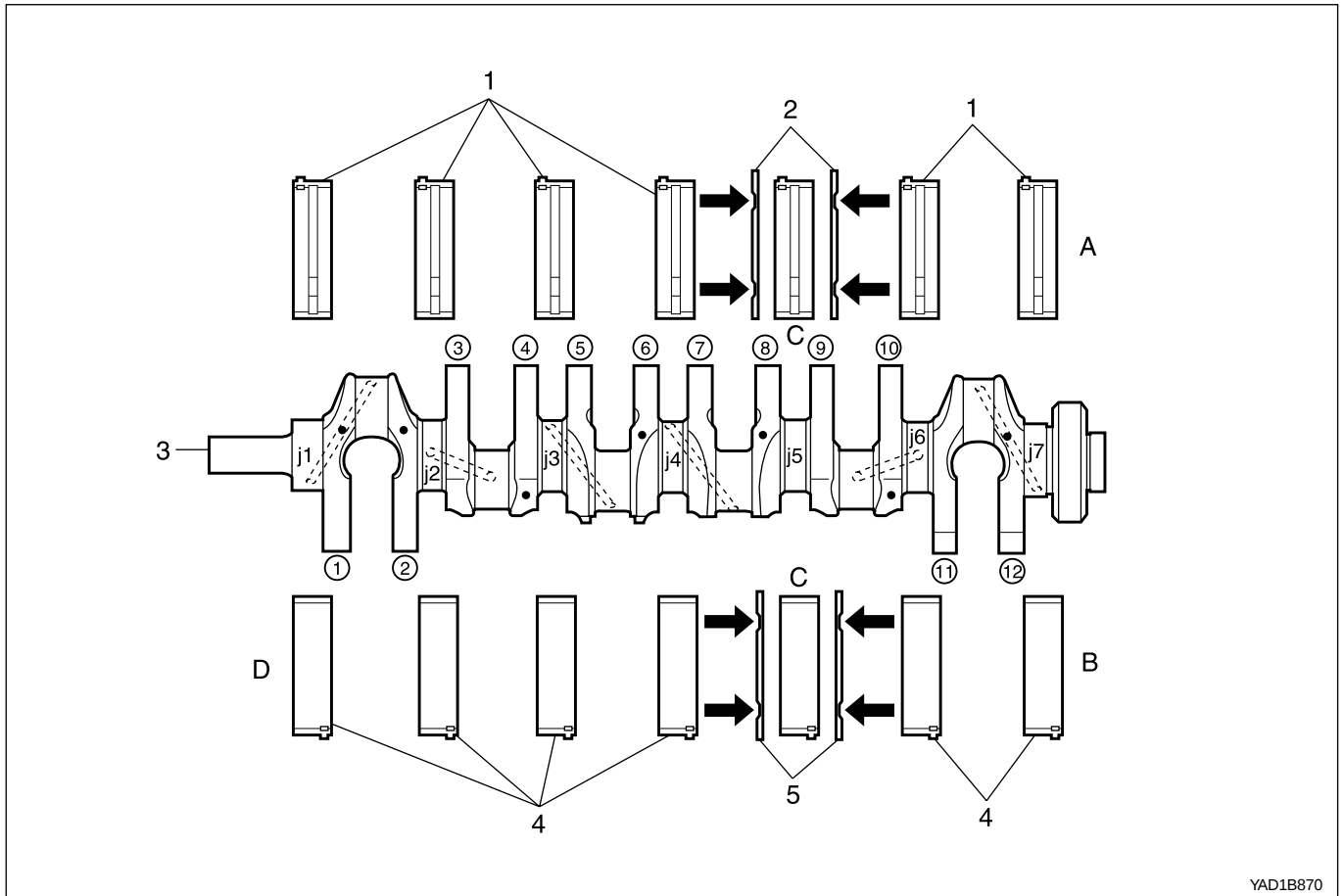


YAD1B860

- 1 Crankshaft Bearing Cap Bolt
 (M8 x 55, 14 pieces)
 1st step 50- 60 N•m (37-44 lb-ft)
 2nd step 90°+5°

- 2 Crankshaft Bearing Cap
- 3 Crankshaft Lower Main Bearing
- 4 Crankshaft Lower Thrust Bearing
- 5 Crankshaft

Arrangement of the Thrust Bearing and the Main Bearing



YAD1B870

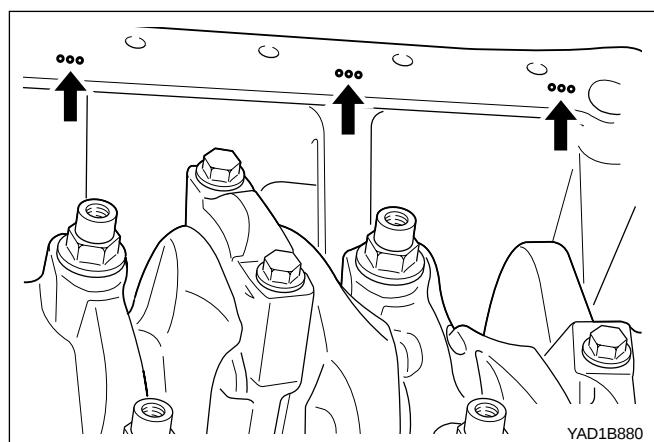
- 1 Upper Main Bearing
- 2 Upper Thrust Bearing
- 3 Crankshaft
- 4 Lower Main Bearing
- 5 Lower Thrust Bearing

- A Crankcase Side
- B Bearing Cap Side (Oil Pan Side)
- C Axial Fit Bearing (Number 5 Bearing Point)
- D Radial Bearing

- ① - ⑫ Weight Balance/Color Marking Point
- j1 - j7 Journal Main Bearing #1 - #7
- Color Dot Marking

The color dot marking are put on the ①, ②, ④, ⑥, ⑧, ⑩, ⑫ and it indicates the diameter of crankshaft journal by color as below.

Color Dot Marking	Crankshaft Journal Diameter (mm)
Blue	57.960 - 57.965
Yellow	57.955 - 57.960
Red	57.950 - 57.955
White	57.945 - 57.950
Violet	57.940 - 57.945

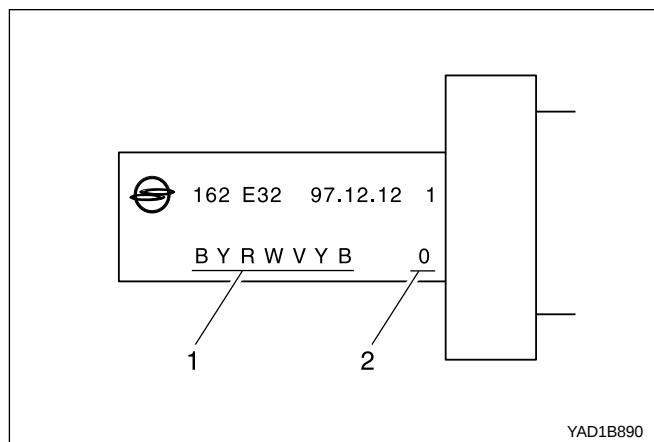


Selection of Crankshaft Main Bearing

1. Crankcase Side

There are seven punching marks on the mating surface to oil pan. This mark is correspondent to the bearing distinguished by color. Select the relevant bearing according to the punching mark when repaired.

Punching Mark	Bearing Color Selected
●	Blue
● ●	Yellow
● ● ●	Red



2. Crankshaft Bearing Cap Side

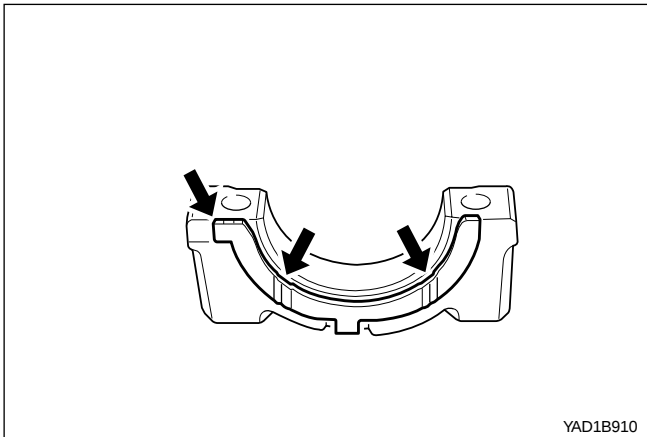
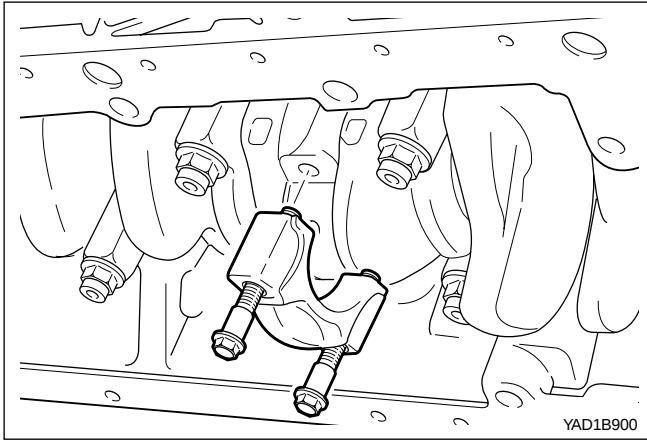
Select the crankshaft main bearing according to the marking letter on the crankshaft main journal when repaired.

Marking Letter	Bearing Color Selected
B	Blue
Y	Yellow
R	Red
W	White
V	Violet

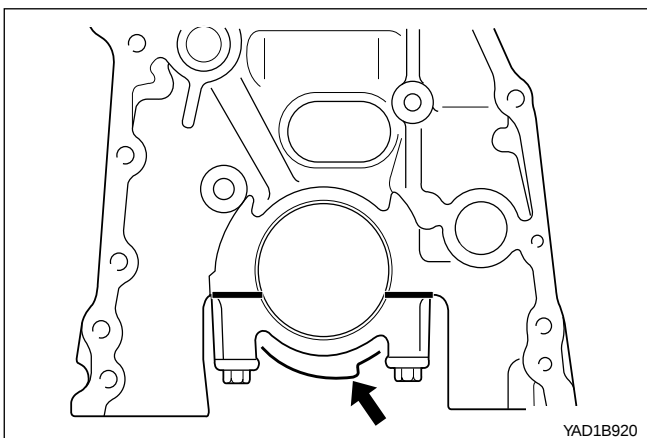
Service Data

Unit : mm

Crankshaft Standard and Repair Size	Crankshaft Bearing Journal Diameter	Thrust Washer Thickness	Crankshaft Journal Width at fit bearing	Connecting Rod Bearing Journal Diameter	Connecting Rod Bearing Journal Width
Standard size	57.950 - 57.965	2.15 or 2.20	24.50 - 24.533	47.94 - 47.96	27.958 - 28.042
1st repair size	57.700 - 57.715	2.25 or 2.35 or 2.40	-	47.75	-
2nd repair size	57.450 - 57.465			47.50	
3rd repair size	57.200 - 57.215			47.25	
4th repair size	56.950 - 56.965			47.00	



Part No. : 601 030 00 62	2.15 mm
Part No. : 601 030 01 62	2.20 mm
Part No. : 601 030 02 62	2.25 mm
Part No. : 601 030 03 62	2.30 mm
Part No. : 601 030 04 62	2.40 mm



Removal & Installation Procedure

1. Unscrew the connecting rod bearing cap bolt and remove the bearing cap.

Installation Notice

Tightening Torque	1st step: 40 + 5 N•m (30 + 3.7 lb-ft)
	2nd step: 90° + 10°

- Make sure that the upper and lower bearing shells do not change each other.
- Coat the bearing shell with engine oil.
- Install the bearing cap according to the consecutive number.

2. Unscrew the crankshaft bearing cap bolts and separate the upper and lower bearing shells and thrust washers.

Installation Notice

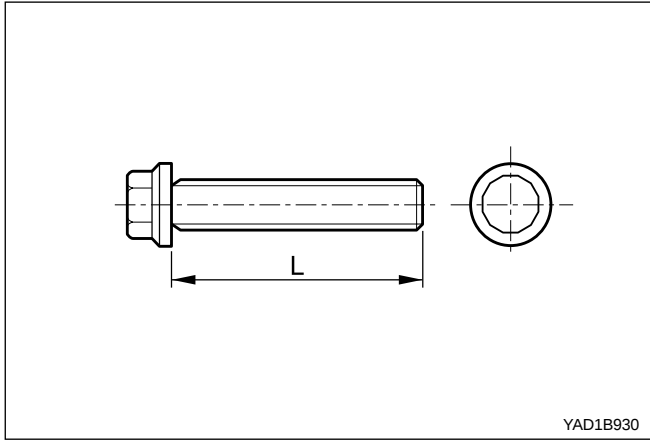
Tightening Torque	1st step: 50 - 60 N•m (37 - 44 lb-ft)
	2nd step: 90°

- Remove the bearing cap from front (pulley side) to rear.
- Make sure that the upper and lower bearing shells do not change each other and coat with engine oil.
- The oil grooves (arrows) in the thrust washers must face outward and insert the thrust bearing into the bearing cap.
- There are five kinds of thrust washers by thickness. Select the proper washer when repaired.

3. Remove the crankshaft.
4. Installation should follow the removal procedure in the reverse order.
5. After completion of the installation, check for the rotating condition of the crankshaft.

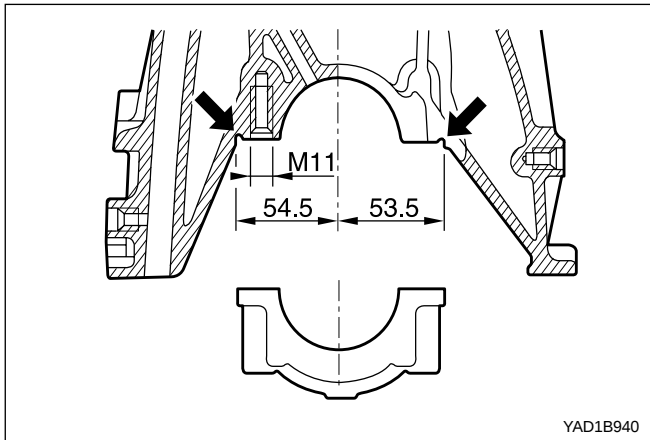
Notice:

- Make sure the crankshaft bearing cap properly seated in place in the crankcase side. When perfectly installed, the projected part (arrow) locates in the left side (intake manifold side).
- Assemble so that the projected part of the cap and crankcase face the same direction.

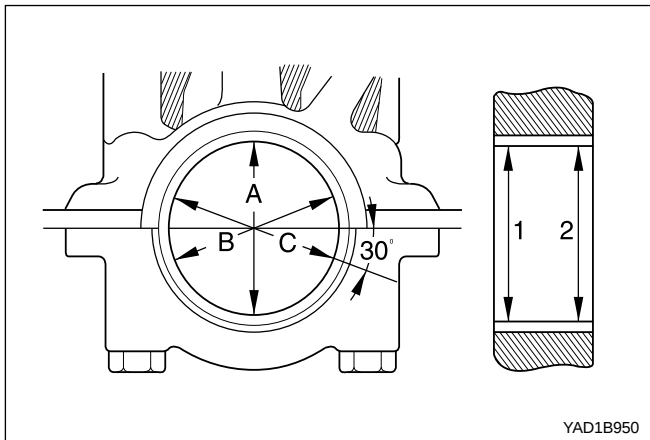


Inspection

1. If the length 'L' of the crankshaft bearing cap bolt exceeds 63.8 mm, replace it.



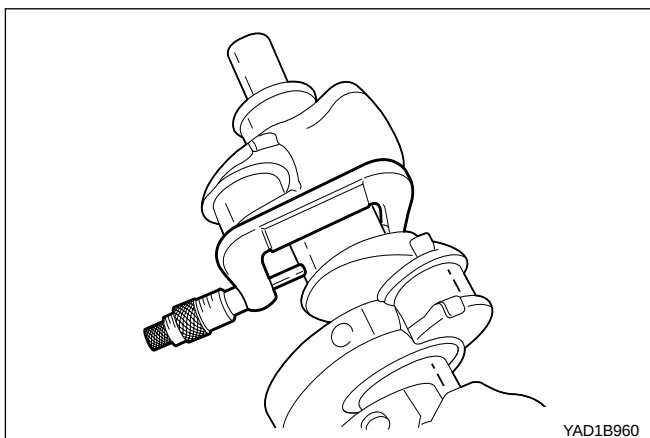
2. Make sure the crankshaft bearing cap is properly seated on the cylinder block (arrows).



3. Measure and record the inner diameter of the crankshaft bearing.

Notice:

- Measure at 2 points (1, 2).
- Measure 'A', 'B' and 'C' as shown. If average value of 'B' and 'C' is less than value 'A', then the average value of 'B' and 'C' is actual average value. If average value of 'B' and 'C' is more than value 'A', then the value 'A' is actual average value.



4. Measure and record the diameter of the crankshaft bearing journal.

Notice:

- Record the mean value when measured at 3 points (A, B, C).
- Measure the inner diameter of bearing and the diameter of journal and if it is out of the standard data, replace the bearing shell.

Service Data Standard (Crankshaft Main Bearing Gap)

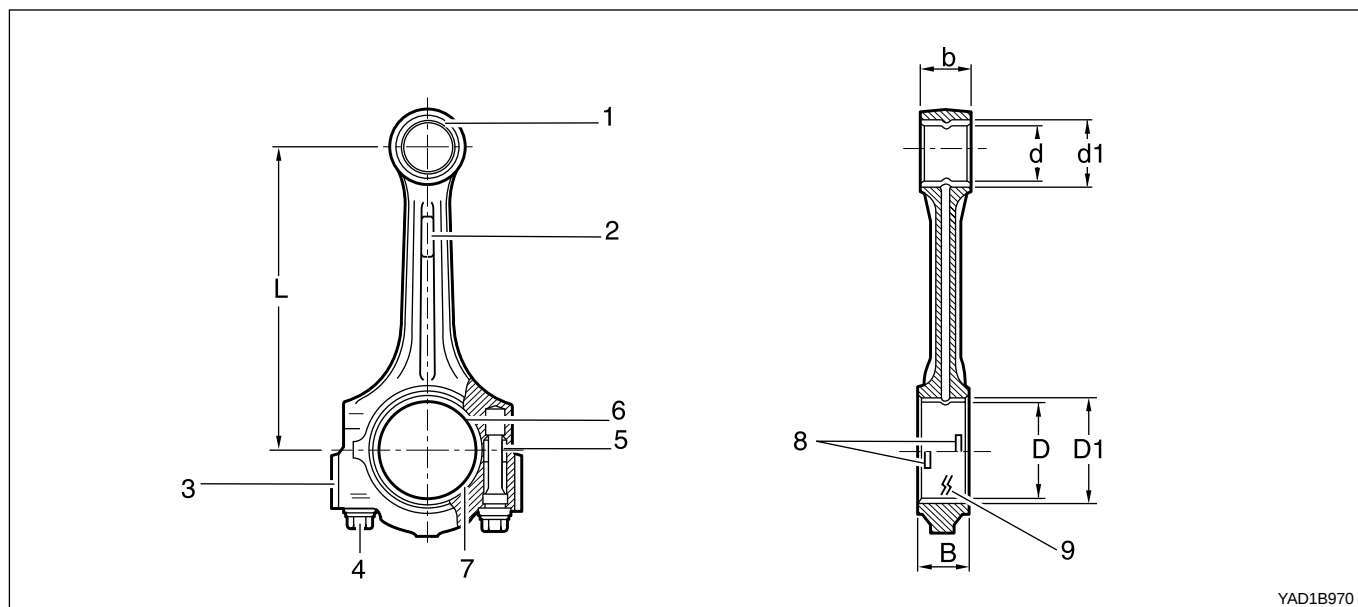
Item	Measuring Position	Gap (mm)
Main Bearing Journal (NO. 1, 5, 7)	Radial	Static condition :0.015 - 0.039 Dynamic condition: 0.031 - 0.051 (Consider the expansion 0.011 - 0.016)
	Axial	0.010 - 0.254
Main Bearing Journal (NO. 3, 4, 6)	Radial	Static condition :0.011 - 0.039 Dynamic condition: 0.031 - 0.051 (Consider the expansion 0.015 - 0.022)
	Axial	0.010 - 0.254

(Connecting Rod Bearing Gap)

Item	Measuring Position	Gap (mm)
Connecting Rod Bearing	Radial	0.030 - 0.050

CONNECTING ROD

Preceding Work : Removal of piston

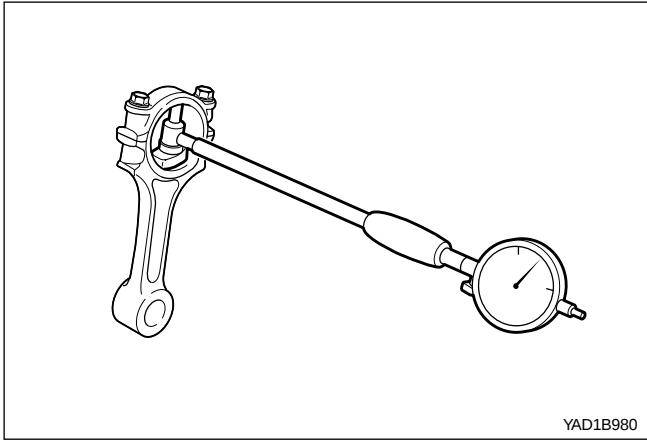


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- | | |
|--|--------------------------------------|
| 1 Connecting Rod Bushing | 5 Fit Sleeve |
| 2 Oil Gallery | 6 Upper Connecting Rod Bearing |
| 3 Balance Weight | 7 Lower Connecting Rod Bearing |
| 4 Connecting Rod Bolt (M9 x 52, 12 pieces) | 8 BearingShell Lug |
| 1st step 40+5 N•m (30+3.7 lb-ft) | 9 Marking [Indication(/) or Numbers] |
| 2nd step 90°+10° | |

Service Data Standard

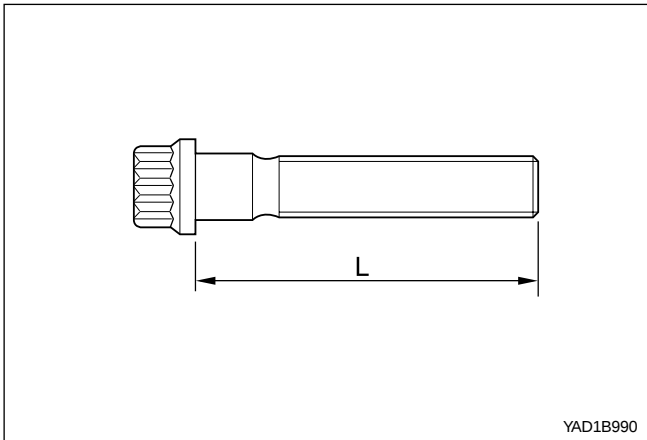
Distance (L) from The Connecting Rod Bearing Bore Center to The Bushing Bore Center	145 ± 0.05 mm
Width of The Connecting Rod (B) at Bearing Bore	21.940 - 22.000 mm
Width of The Connecting Rod (b) at Bushing Bore	21.940 - 22.000 mm
Basic Bore at The Bearing Shell (D1)	51.600 - 51.614 mm
Basic Bore at The Bushing (d1)	24.500 - 24.571 mm
Bushing Inner Diameter (d)	22.007 - 22.013 mm
Clearance Between The Piston Pin and The Bushing	0.007 - 0.018 mm
Peak-to-valley Height of Connecting Rod Bushing on Inside	0.005 mm
Permissible Twist of Connecting Rod Bearing Bore to Connecting Rod Bushing Bore	0.15 mm
Permissible Deviation of Axial Paralleism of Connecting Rod Bearing Bore to Connecting Rod Bushing Core	0.07 mm
Permissible Deviation of Connecting Rod Bearing Bore from Concentricity	0.01 mm
Permissible Difference of Each Connecting Rod in Weight	0.4 g



Inspection

1. Measure the basic bore of the connecting rod bearing.

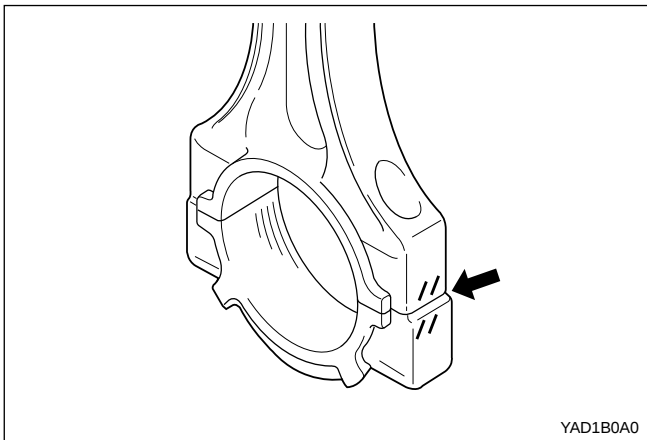
Notice: If the basic bore exceeds the value of 51.614 mm, replace the bearing or check the connecting rod.



2. Check connecting rod bolts.

Length When New (L)	51.7 - 52 mm
Max. Length (L)	52.9 mm
Tightening Torque	1st step: 40 + 5 N•m (30 + 3.7 lb-ft)
	2nd step: 90°+10°

Notice: If the length exceeds max. length, replace it.



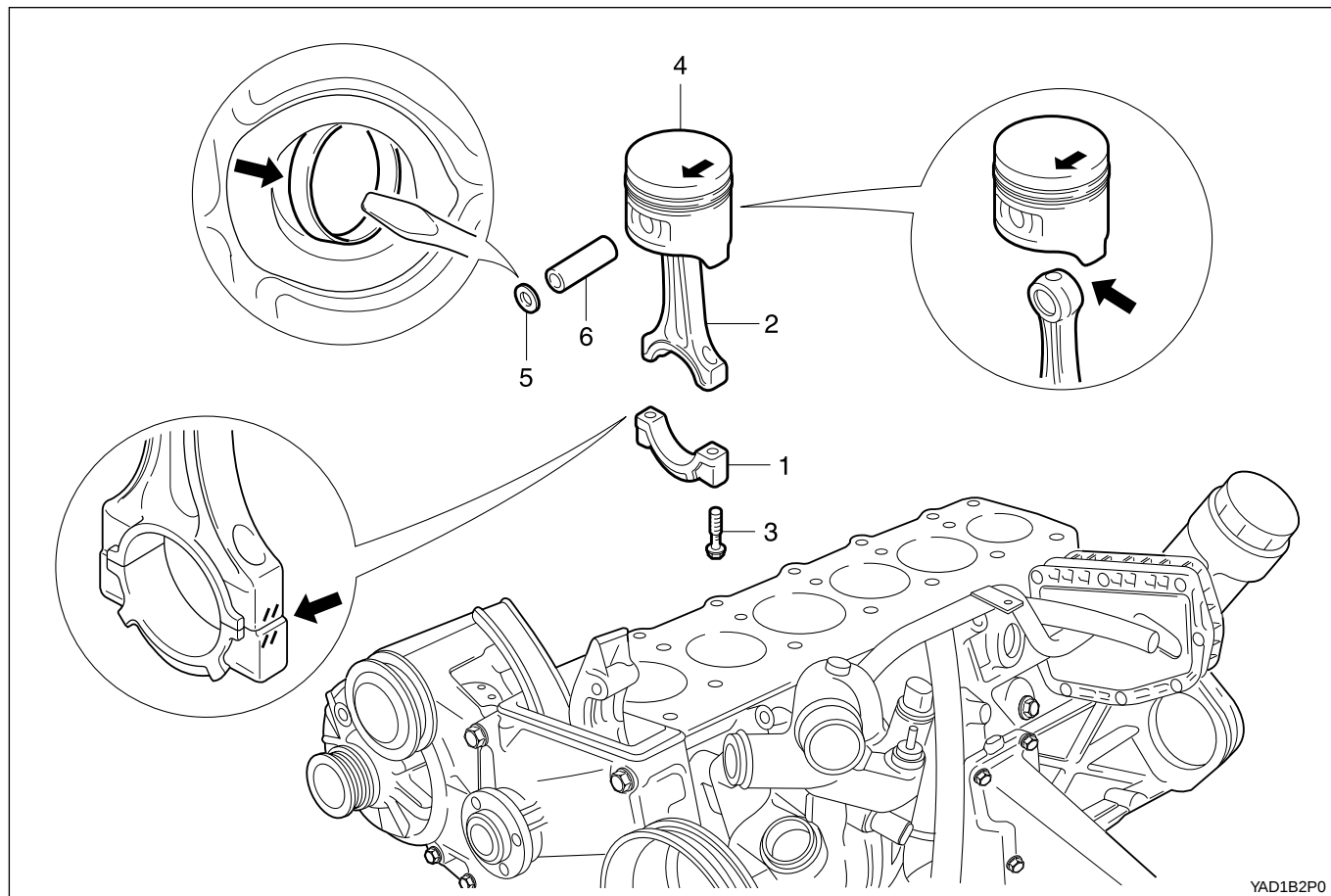
3. Check the assembly mark(indication//or number: arrow) of the connecting rods and the bearing cap when installing.

Notice:

- Make sure it doesn't exceed over 4g with other connecting rods when replacing the connecting rods.
- Check if the connecting rod and the bearing cap are accurately seated on the groove when replacing the bearing.

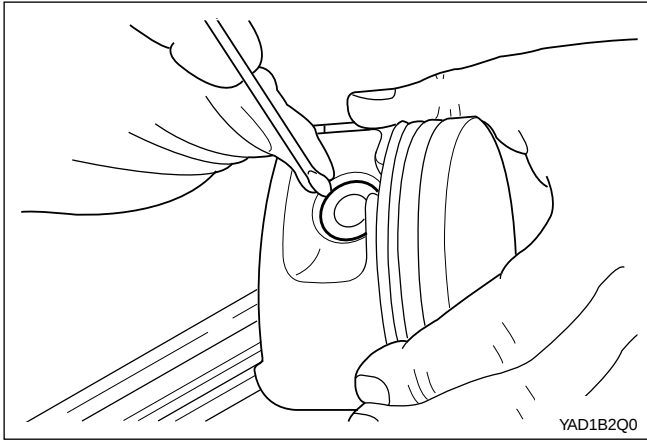
PISTON

Preceding Work : Removal of engine
Removal of cylinder head
Removal of oil pan
Removal of oil pump
Removal of baffle plate



YAD1B2P0

- | | |
|---|--------------|
| 1 Connecting Rod Bearing Cap | 4 Piston |
| 2 Connecting Rod | 5 Snap Ring |
| 3 Connecting Rod Bearing Cap Bolt
(M9 x 52, 12 pieces) | 6 Piston Pin |
| 1st step 40+5 N•m (30+3.7 lb-ft) | |
| 2nd step 90°+10° | |



Removal Procedure

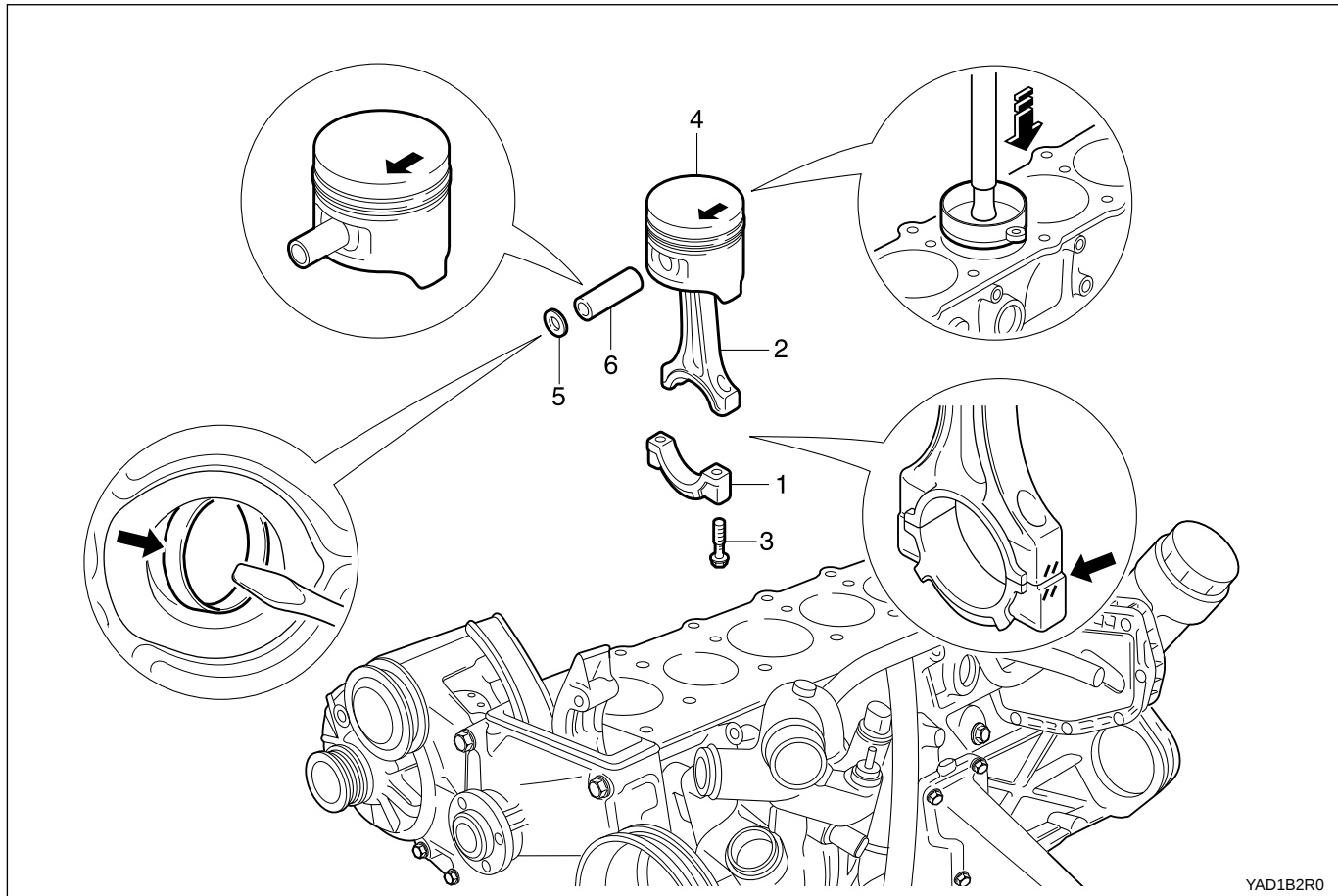
1. Unscrew the connecting rod bearing cap bolt (3) and remove the cap.
2. Remove the connecting rod and the piston upward.

Notice: Make sure that the bearing cap and shell are not changed each other.

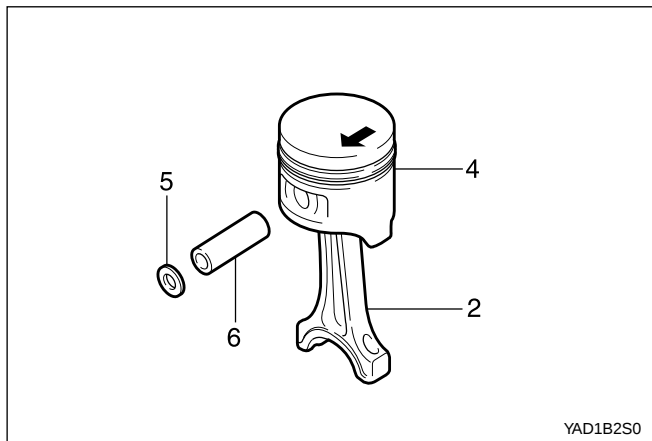
3. Remove the snap ring (5) and pull out the piston pin (6).

Notice: Remove the snap ring using a clean cloth as shown in the right picture so that the piston, piston ring, and the snap ring don't get damaged.

Installation Procedure



YAD1B2R0



YAD1B2S0

1. Check the piston ring gap and apply the engine oil to the piston pin and the connecting rod bushing.
2. Connect the piston and the connecting rod by pressing in the piston pin (6) and install the snap ring to the groove.
3. Clean the cylinder bore, connecting rod bearing journal, connecting rod bearing shell and the piston and coat them with engine oil.
4. Install the piston ring.
5. Install the piston so that the arrow on the piston head faces to the forward of the vehicle.
6. After aligning the connecting rod and the bearing cap mark (// or a number), tighten the bolts.

Installation Notice

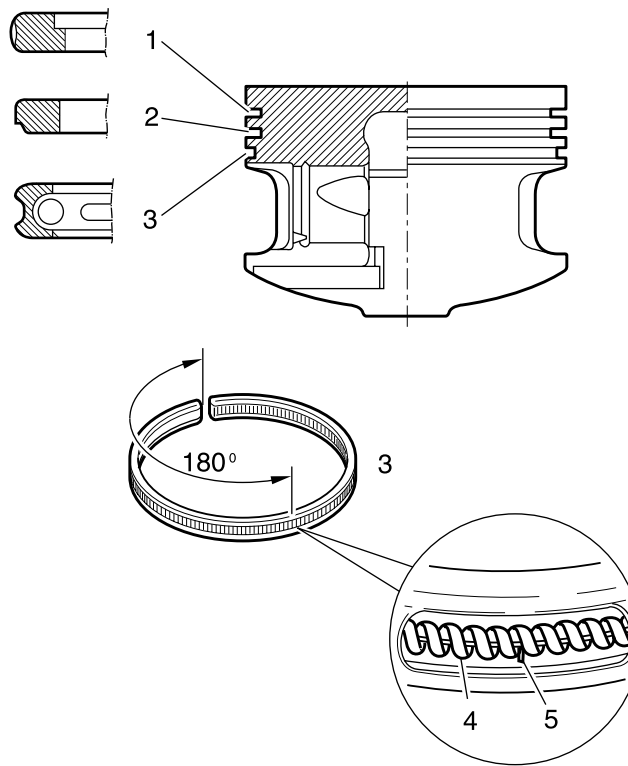
Tightening Torque	1st step: 40 + 5 N•m (30 + 3.7 lb-ft)
	2nd step: 90° + 10°

Apply the engine oil to the bearing cap upper and lower bearing shells.

7. Check if the crankshaft rotates without any trouble by rotating it.

PISTON RING

Preceding Work : Removal of piston



YAD1B2T0

- 1 Piston Compression Ring
- 2 Piston Compression Ring
- 3 Piston Oil Ring

- 4 Coil Spring and Control Ring
- 5 Hook Spring

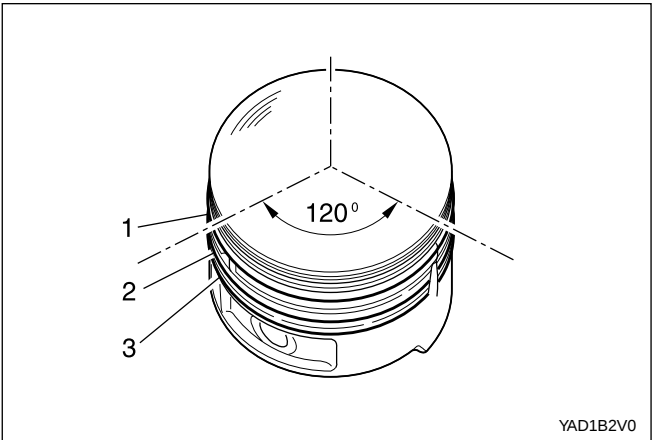
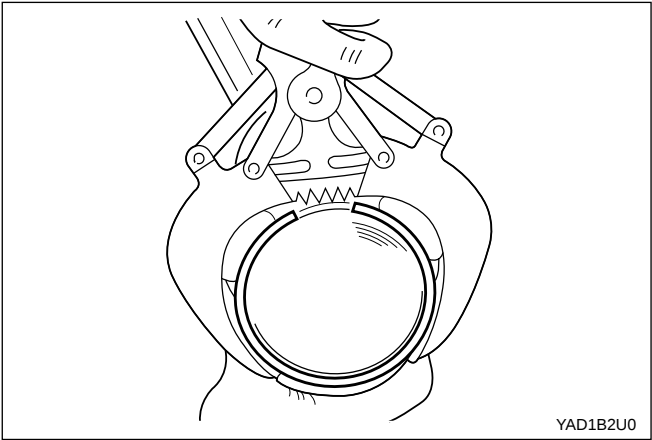
Replacement Procedure

1. Measure the piston ring's gap.

End Gap of The Piston Ring	Groove 1 0.20 - 0.40 mm
	Groove 2 0.20 - 0.40 mm
	Groove 3 0.20 - 0.45 mm
Gap Between The Piston and The Piston Ring	Groove 1 0.015 - 0.050 mm
	Groove 2 0.020 - 0.040 mm
	Groove 3 0.010 - 0.045 mm

Notice: If out of specification, replace the piston ring.

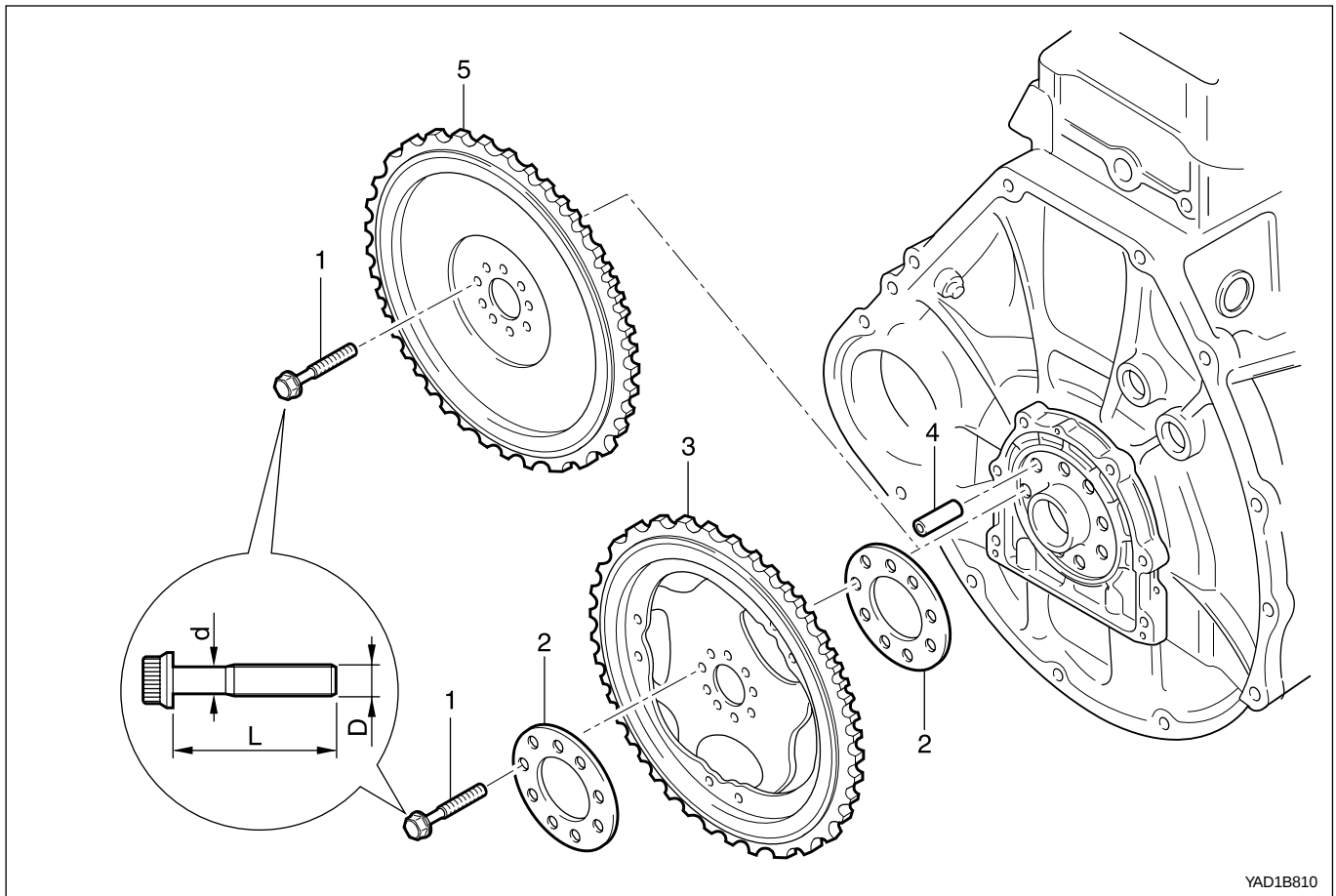
2. Remove the piston ring with a pliers.



3. For installation, position the piston ring to be the 'TOP' mark on the piston ring upward and arrange the piston ring ends to be 120° apart.
4. Adjust the hook spring joint in the oil ring 180° away from the ring end.

FLYWHEEL / DRIVEN PLATE

Preceding Work : Removal of manual or automatic transmission



YAD1B810

1 Flywheel Mounting Bolt (M10 x 22, 8 pieces)

..... 1st step 45+5 N•m (33+3.7 lb-ft)

2nd step 90°+10°

2 Plate

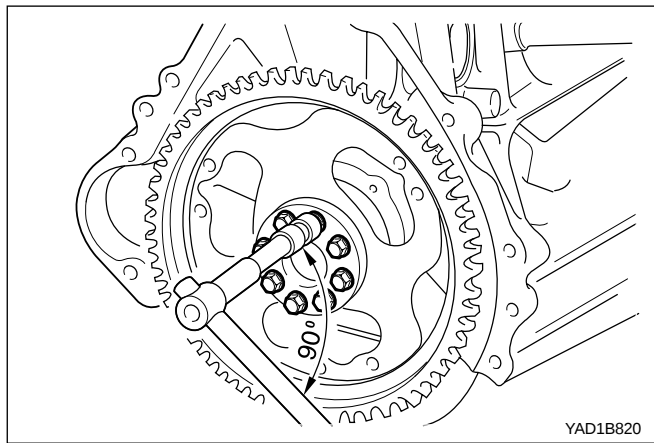
3 Driven Plate (A/T)

4 Dowel Pin

5 Flywheel (M/T)

Service Data Standard (Stretch Bolt)

Nominal Size	D	-	M x 1.5
Stretch Side Diameter	d	When New	8.5 - 0.2 mm
		Min. Diameter	8.0 mm
Bolt Length	L	When New	21.8 - 22.2 mm
Tightening Torque	1st step 45 + 5 N•m (33 + 3.7 lb-ft), 2nd step 90° + 10°		



Removal & Installation Procedure

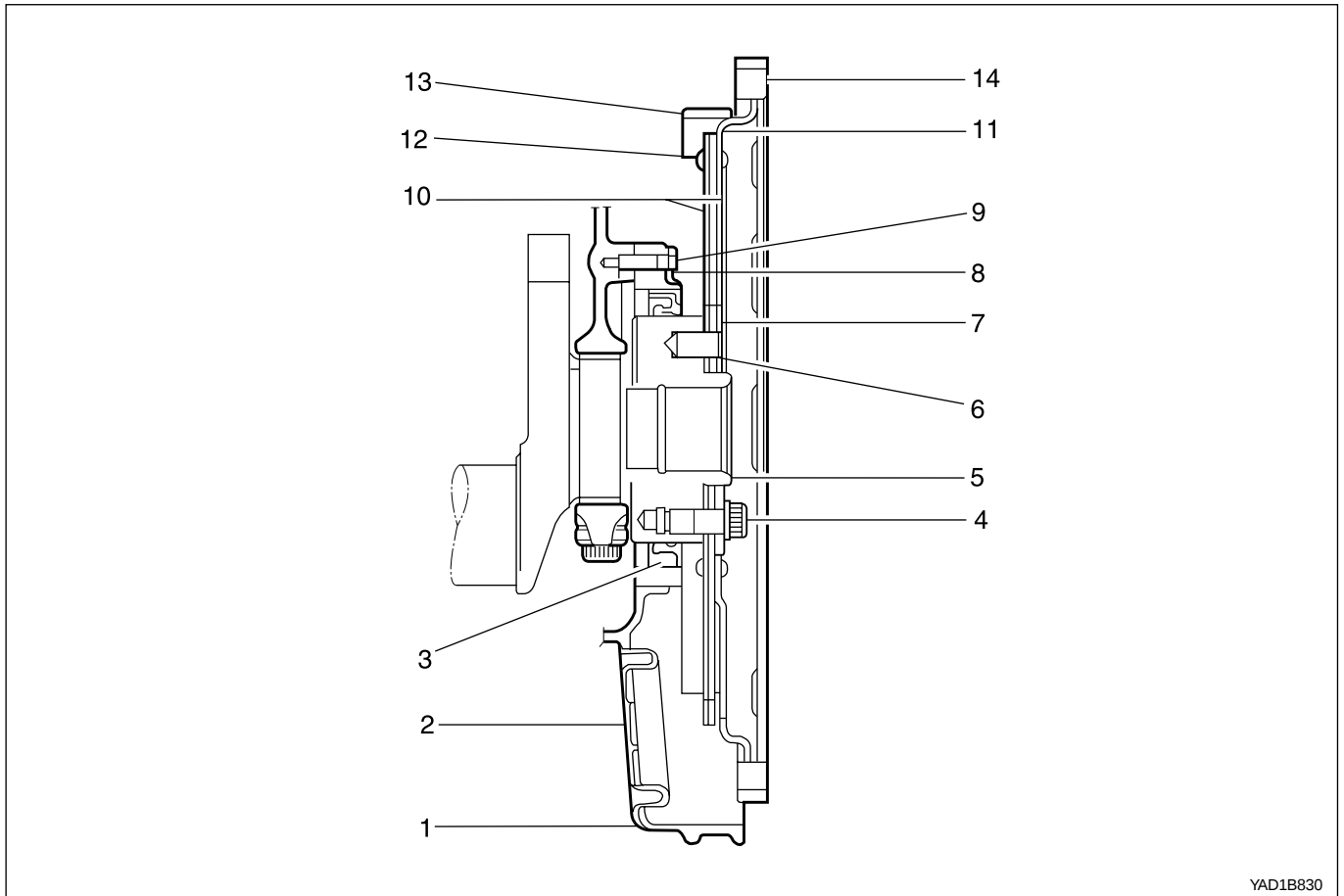
1. Unscrew the flywheel mounting bolt.

Installation Notice

Tightening Torque	1st step: 40 + 5 N•m (30 + 3.7 lb-ft)
	2nd step: 90° + 10°

- Replace the bolt when the stretch side diameter (d) of the flywheel mounting bolt is less than 8.0 mm.
 - For the stretch bolt tightening, keep the socket wrench and Tommy-bar to be 90° and tighten as specified.
2. Remove the flywheel for manual transmission vehicles, or the driven plate (3), and plate (2) for automatic transmission vehicle.
 3. Installation should follow the removal procedure in the reverse order.

Sectional View



YAD1B830

- | | |
|-------------------------------|----------------------|
| 1 Oil Pan | 8 Washer |
| 2 Cover | 9 Bolt |
| 3 Crankshaft Front Seal | 10 Front Drive Plate |
| 4 Flywheel Mounting Bolt | 11 Rear Drive Plate |
| 5 Crankshaft | 12 Rivet |
| 6 Dowel Pin | 13 Segment |
| 7 Washer (thickness = 3.5 mm) | 14 Ring Gear |