

Product: INDUSTRIAL ENGINE
Model: 3512E INDUSTRIAL ENGINE MR4
Configuration: 3512E Marine Engine MR400001-UP

Disassembly and Assembly 3512E and 3516E Marine Engines

Media Number -M0075247-08

Publication Date -01/09/2018

Date Updated -11/09/2018

i04188249

Housing (Front) - Remove

SMCS - 1151-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-0074	Slide Hammer Puller	1
	8B-7557	Threaded Adapter	1
B	138-7573	Link Bracket	2
C	1P-0520	Driver Group	1
D	-	Guide Stud 5/8 - 11 by 8 inch	2

Start By:

- a. Remove the engine oil filter housing. Refer to Disassembly and Assembly, "Engine Oil Filter Housing - Remove".
 - b. Remove the crankshaft front seal and the wear sleeve. Refer to Disassembly and Assembly, "Crankshaft Front Seal and Wear Sleeve - Remove".
 - c. If necessary, remove the accessory drive. Refer to Disassembly and Assembly, "Accessory Drive (Front) - Remove".
 - d. If necessary, remove the engine oil pump and water pump drive. Refer to Disassembly and Assembly, "Accessory Drive (Front) - Remove".
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NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

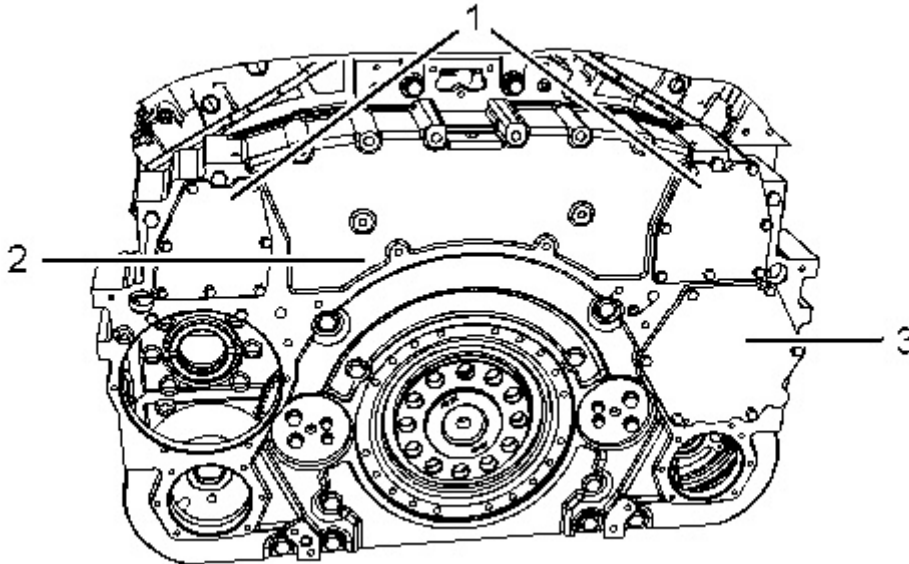


Illustration 1

g01246380

1. Remove bolts and covers (1). Remove the gaskets from front housing (2).
2. Remove bolts and cover (3). Remove the O-ring seal from the cover.

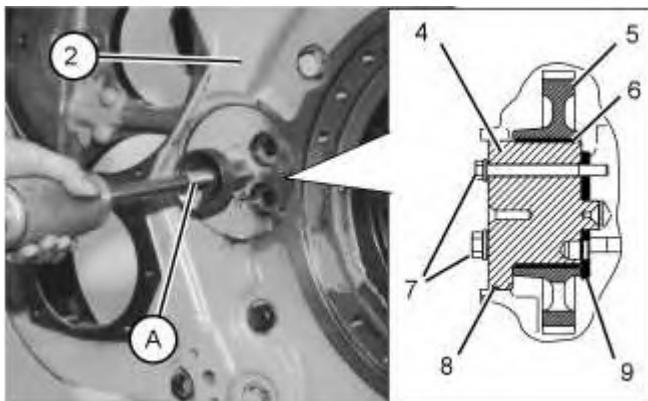


Illustration 2

g01131889

3. Remove bolts (7). Use Tooling (A) to remove shaft (4) from front housing (2). Remove O-ring seal (8) from the shaft.
4. Remove idler gear (5) and thrust washer (9) from the front housing.

5. Use Tooling (C) and a suitable press to remove sleeve bearing (6) from idler gear (5).

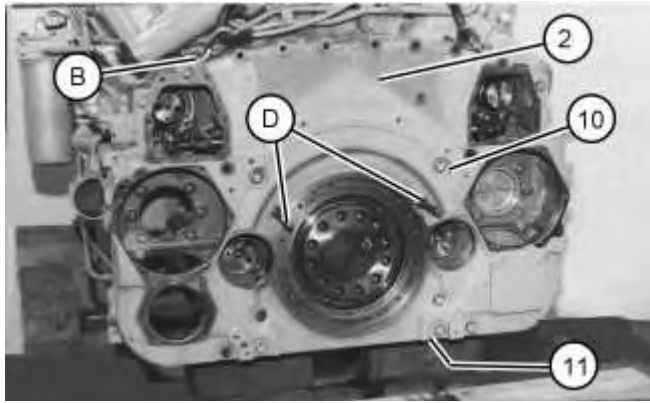


Illustration 3

g01131907

6. Attach Tooling (B) and attach a suitable lifting device to front housing (2). The weight of front housing (2) is approximately 181 kg (400 lb). Remove two bolts (10) and install Tooling (D). Remove remaining bolts (10) that hold the front housing to the cylinder block. Remove the front housing.
 7. Remove gasket (11) from the front housing and the cylinder block.
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i04188291

Housing (Front) - Install

SMCS - 1151-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
B	138-7573	Link Bracket	2
C	1P-0520	Driver Group	1
D	-	Guide Stud 5/8 - 11 by 8 inch	2

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

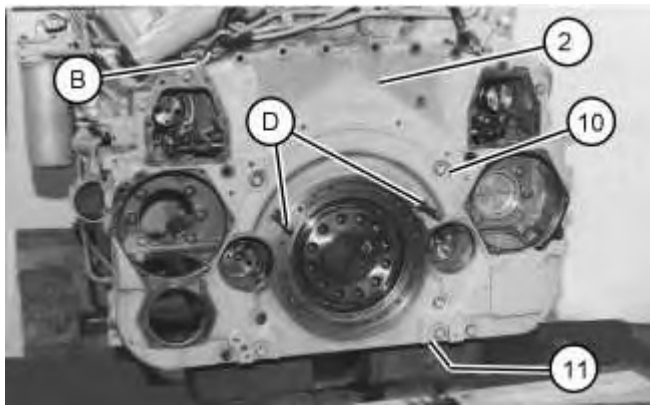


Illustration 1

g01131907

1. Install gasket (11) on the cylinder block. Install Tooling (D) into the cylinder block.
2. Attach Tooling (B) and attach a suitable lifting device to front housing (2). The weight of front housing (2) is approximately 181 kg (400 lb). Position the front housing onto Tooling (D).
3. Install bolts (10) that hold front housing (2) to the cylinder block. Remove Tooling (D) and install remaining bolts (10). Tighten the bolts evenly.
4. Cut any excess gasket (11) from the bottom of the front housing.

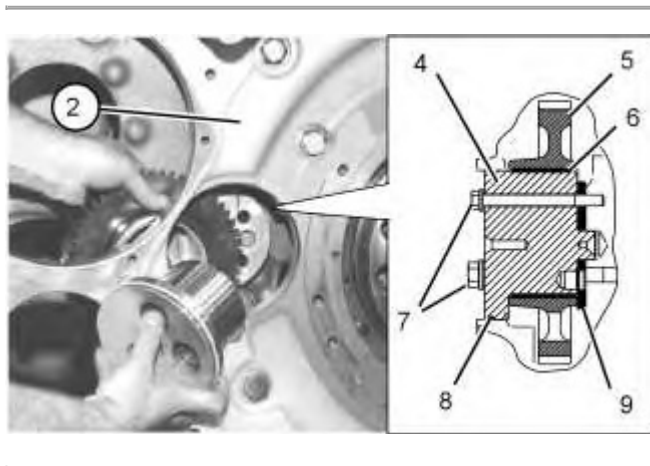


Illustration 2

g01131955

5. Use Tooling (C) to install sleeve bearing (6) in idler gear (5).
6. Install O-ring seal (8) on shaft (4). Apply clean engine oil to the bore in front housing (2) for the shaft.
7. Position thrust washer (9), idler gear (5), and shaft (4) in the front housing. Install bolts (7).

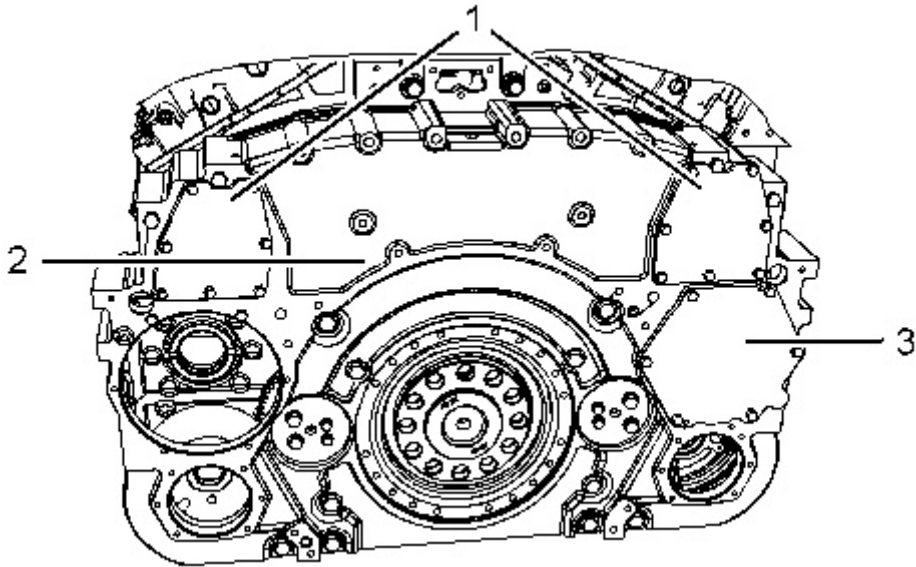


Illustration 3

g01246380

8. Install the O-ring seal in cover (3). Position cover (3) on front housing (2) and install the bolts.
9. Position the gaskets and covers (1) on front housing (2) and install the bolts.

End By:

- a. If necessary, install the engine oil pump and water pump drive. Refer to Disassembly and Assembly, "Accessory Drive (Front) - Install".
 - b. If necessary, install the accessory drive. Refer to Disassembly and Assembly, "Accessory Drive (Front) - Install".
 - c. Install the crankshaft front seal and the wear sleeve. Refer to Disassembly and Assembly, "Crankshaft Front Seal and Wear Sleeve - Install".
 - d. Install the engine oil filter housing. Refer to Disassembly and Assembly, "Engine Oil Filter Housing - Install".
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i06704985

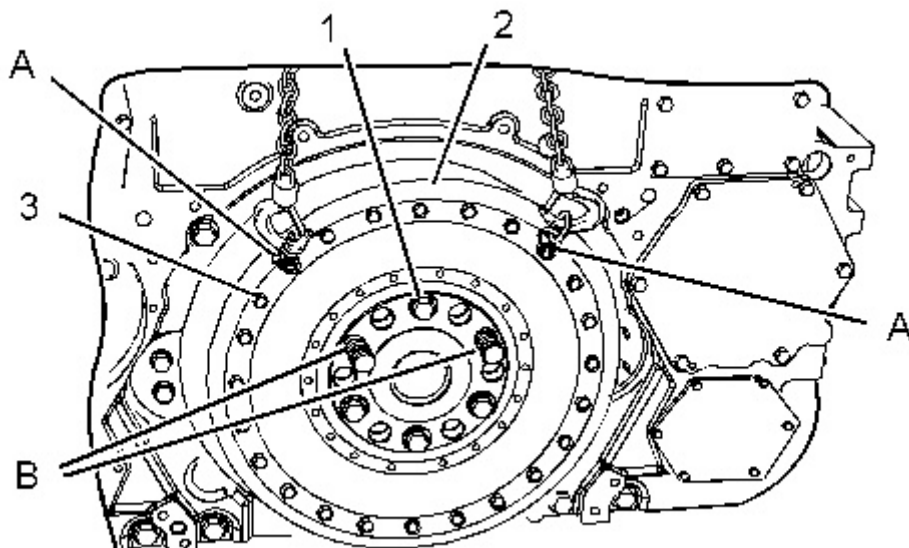
Vibration Damper - Remove and Install

SMCS - 1205-010

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Lifting Bracket	2
B	-	Guide Stud 1 - 14 by 10 inch	2



1. Remove two bolts (1) and install Tooling (B).
2. Remove two bolts (3) and attach Tooling (A) and a suitable lifting device to vibration damper (2). The weight of vibration damper (2) is approximately 175 kg (385 lb). Remove remaining bolts (1). Remove vibration damper (2).

Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Lifting Bracket	2
B	-	Guide Stud 1 - 14 by 10 inch	2
C		Loctite 243	-

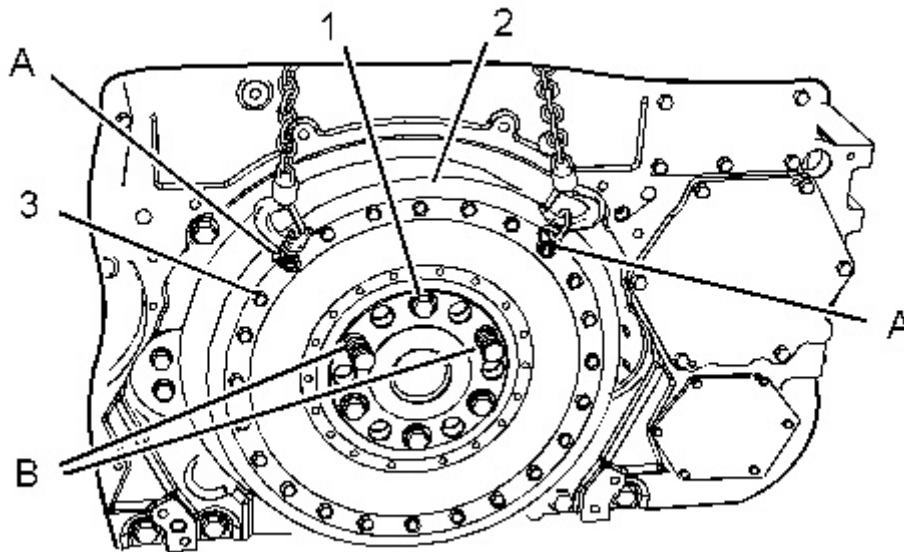


Illustration 2

1. Install Tooling (B) in the crankshaft.
2. Attach Tooling (A) and a suitable lifting device to vibration damper (2). The weight of vibration damper (2) is approximately 175 kg (385 lb).
3. Install the vibration damper on Tooling (B). Install bolts (1). Remove Tooling (B) and install remaining bolts (1). Tighten bolts (1) to a torque of $1125 \pm 100 \text{ N}\cdot\text{m}$ ($820 \pm 74 \text{ lb ft}$).
4. Remove Tooling (A). Apply Tooling (C) to the threads of bolts (3). Install bolts (3) and tighten to a torque of $55 \pm 7 \text{ N}\cdot\text{m}$ ($41 \pm 5 \text{ lb ft}$).

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i06616604

Crankshaft Front Seal and Wear Sleeve - Remove

SMCS - 1160-011; 7558-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1U-7600	Slide Hammer Puller	1
B	1U-7325	Distorter Adapter	-
	6V-3143	Distorter Adapter ⁽¹⁾	-
C	5P-7409	Sleeve Distorter	1

⁽¹⁾ For use with engines equipped with a seal adapter.

Start By:

- a. Remove the vibration damper. Refer to Disassembly and Assembly, "Vibration Damper - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Every time that the crankshaft seal is removed from the wear sleeve, a new wear sleeve and crankshaft seal must be installed.

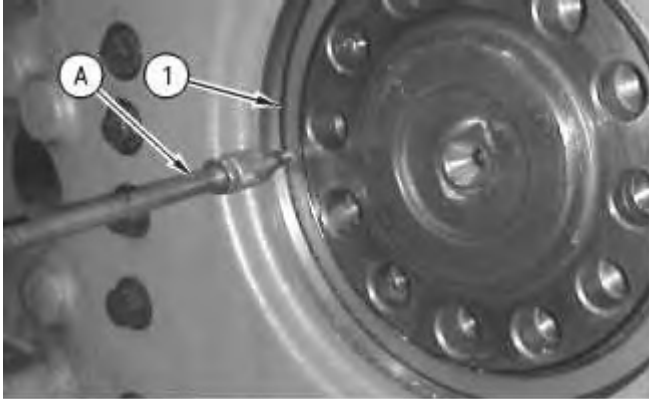


Illustration 1

g00659180

1. Drill three evenly spaced holes in crankshaft front seal (1) and use Tooling (A) to remove crankshaft front seal (1) from the front housing.

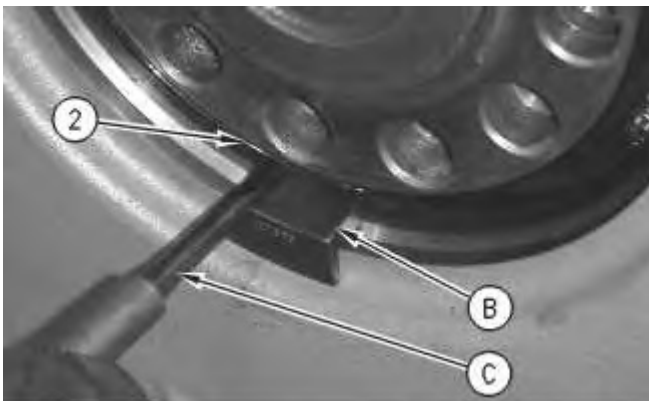


Illustration 2

g00659181

2. Insert Tooling (B) between the front housing and wear sleeve (2).

NOTICE

The use of excessive force on the sleeve distorter can cause the distorter adapter to crack the housing. To help avoid damage to the engine, do not use excessive force to remove the wear sleeve.

3. Insert Tooling (C) between Tooling (B) and wear sleeve (2). Carefully turn Tooling (C) until the edge of the tool creates a crease in wear sleeve (2).

Repeat this procedure several times around wear sleeve (2) until wear sleeve (2) can be removed by hand.

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i06603184

Crankshaft Front Seal and Wear Sleeve - Install

SMCS - 1160-012; 7558-012

Installation Procedure For Seals 113-8432 and 113-8433

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
D	6V-4003 ⁽¹⁾	Seal Locator As	1
	2N-5006 ⁽¹⁾	Bolt	2
E	8T-3099 ⁽¹⁾	Seal Installer	1
F	9S-8858 ⁽¹⁾	Nut	1
G	-	(Loctite 620)	-
H	484-7863 ⁽²⁾	Tool As	1

⁽¹⁾ For installation of seals 113-8432 and 113-8433

⁽²⁾ For Installation of seals 436-1478 and 436-1479

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: The crankshaft front seal and the wear sleeve must be replaced at the same time. Once the crankshaft front seal and the wear sleeve are separated, these components cannot be used again.

Note: Do not use any type of lubricant during the installation of the crankshaft front seal and the wear sleeve.

1. Before installation of the crankshaft front seal and the wear sleeve, inspect the crankshaft for scratches. Also, inspect the crankshaft for any distortion on the surface that may lead to an out of round condition. Use a polishing cloth to remove any imperfections on the crankshaft.

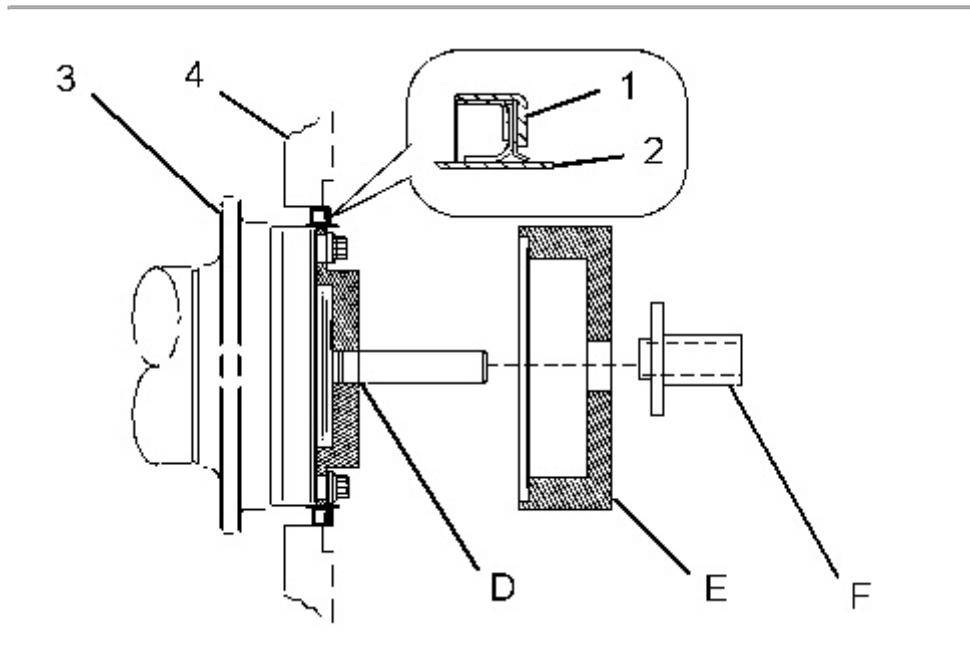


Illustration 1

g01136390

2. Clean the outside diameter of crankshaft (3) and the inside diameter of the new wear sleeve (2). Clean the bore for the crankshaft front seal in front housing (4). Apply Tooling (G) to the inner diameter of the wear sleeve and the surface of the crankshaft prior to assembly.
3. Install Tooling (D) on crankshaft (3).
4. Place crankshaft front seal (1) and wear sleeve (2) onto Tooling (D).
5. Position Tooling (E) onto Tooling (D). Lubricate the face of the washer on Tooling (F). Install Tooling (F) onto Tooling (E). Tighten Tooling (F) until Tooling (E) contacts Tooling (D).
6. Remove the Tooling from the crankshaft.
7. Check the crankshaft front seal and the wear sleeve for the correct installation.

Installation Procedure For Seals 436-1478 and 436-1479

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Do not place engine oil on the crankshaft seal for installation. Lubrication of the crankshaft seal can give a false indication of leakage at a later time.

Note: Ensure that there are no imperfections on the mating surfaces of the crankshaft, the installation tooling, or on the sealing surface of the crankshaft. Surface imperfections can distort the seal during installation and will cause the seal to malfunction.

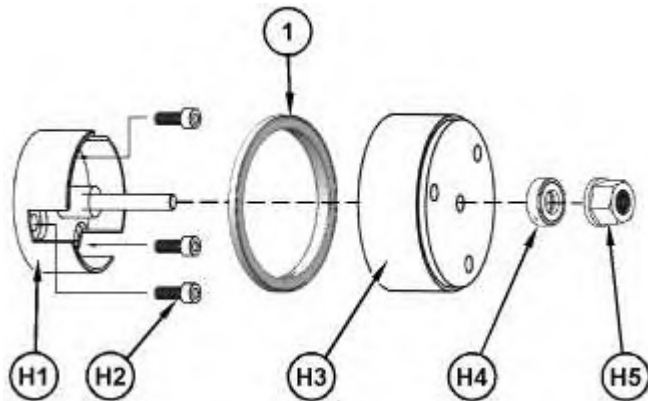


Illustration 2

g06042396

1. Using Tooling (H), install front seal (1) as outlined in the following steps:
 - a. Install pilot (H1) to the crankshaft and install bolts (H2).
 - b. Position front seal (1) onto pilot (H1).
 - c. Install driver (H3) onto the shaft of pilot (H1). Mark driver (H3) at the 12 O' Clock position. Install bearing (H4) and nut (H5).
 - d. Tighten nut (H5) until the base of driver (H3) contacts the skirt of pilot (H1). Loosen nut (H5) and rotate driver (H3) 180 degree. Retighten nut (H5) until driver (H3) contacts the skirt of pilot (H1).
2. Remove Tooling (H).

End By:

- a. Install the vibration damper.
-

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i02488070

Flywheel - Remove and Install

SMCS - 1156-010

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Lifting Bracket	2
B	-	Guide Stud 1 - 14 by 6 inch	2

Start By:

- a. Remove the engine speed sensor. Refer to Disassembly and Assembly, "Engine Speed Sensor - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

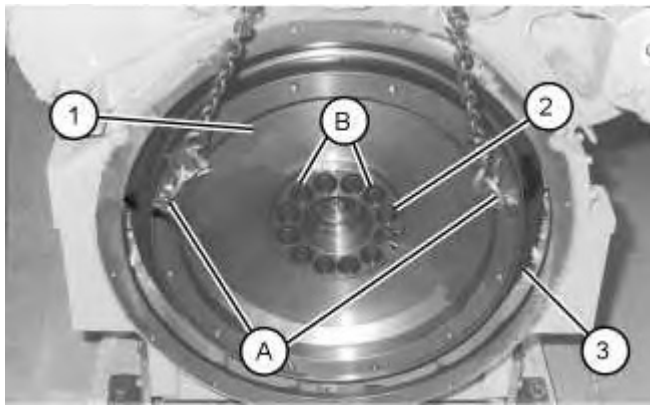


Illustration 1

g01126776

1. Attach Tooling (A) and a suitable lifting device to flywheel (1). The weight of flywheel (1) is approximately 170 kg (375 lb).
2. Remove two bolts (2) on each side of the crankshaft and install Tooling (B).
3. Remove remaining bolts (2).
4. Remove flywheel (1).

Note: If necessary, Use a prybar against Tooling (A) to remove the flywheel from the crankshaft.

5. Use a hammer and a punch in order to remove ring gear (3) from flywheel (1).

Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Lifting Bracket	2
B	-	Guide Stud 1 - 14 by 6 inch	2

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

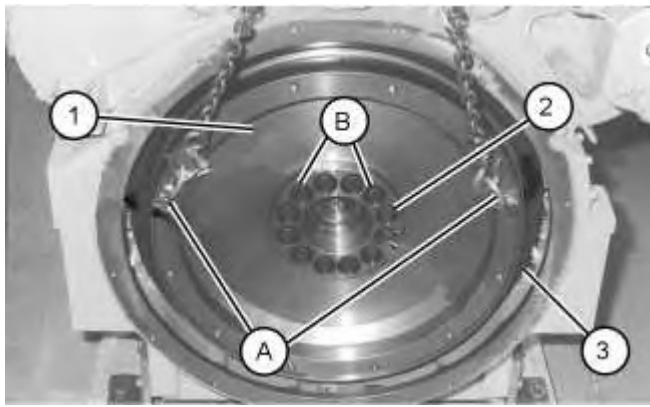


Illustration 2

g01126776

1. Raise the temperature of new ring gear (3). Install the ring gear on flywheel (1). Ensure that the chamfer of the gear teeth will be toward the pinion of the starting motor.
2. Install Tooling (B) in the end of the crankshaft.
3. Attach Tooling (A) and a suitable lifting device to flywheel (1). The weight of flywheel (1) is approximately 170 kg (375 lb).
4. Lift the flywheel into position onto Tooling (B). Ensure that the mark on the flywheel is aligned with the mark on the crankshaft.
5. Apply clean engine oil to the threads of bolts (2). Install bolts (2).
6. Remove Tooling (A) and Tooling (B). Install remaining bolts (2). Tighten bolts (2) to a torque of $1150 \pm 60 \text{ N}\cdot\text{m}$ ($848 \pm 44 \text{ lb ft}$).

End By:

- a. Install the engine speed sensor. Refer to Disassembly and Assembly, "Engine Speed Sensor - Remove and Install".
-

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i03565063

Crankshaft Rear Seal and Wear Sleeve - Remove

SMCS - 1161-011; 7558-011

Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1U-7600	Slide Hammer Puller	1
B	6V-3143 or 1U-7325	Distorter Adapter	1
C	5P-7409	Sleeve Distorter	1

Start By:

- A. Remove the flywheel. Refer to Disassembly and Assembly, "Flywheel - Remove and Install".

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

NOTICE

Every time that the crankshaft seal is removed from the wear sleeve, a new wear sleeve and crankshaft seal must be installed.

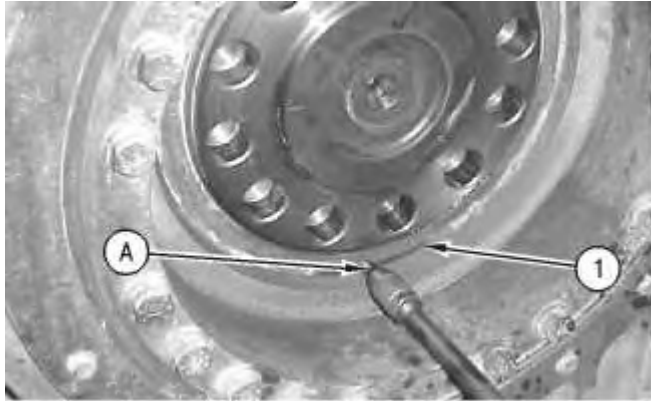


Illustration 1

g00659239

1. Drill three evenly spaced holes in crankshaft rear seal (1) . Use Tooling (A) in order to remove crankshaft rear seal (1) .

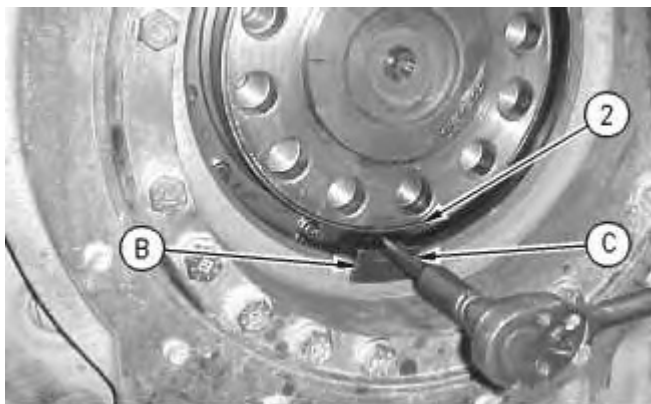


Illustration 2

g00659240

2. Insert Tooling (B) between the rear housing and wear sleeve (2) .

NOTICE

The use of excessive force on the sleeve distorter can cause the distorter adapter to crack the housing. To help avoid damage to the engine, do not use excessive force to remove the wear sleeve.

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