

BOTTOM END (800R ENGINES)

SERVICE TOOLS

Description	Part Number	Page
BEARING HEATER	529 035 969	13
CERAMIC SEAL INSTALLER.....	529 036 014	6-7
CRANKSHAFT BEARING PULLER	529 036 004	12
DISTANCE GAUGE	529 036 060	14
OIL SEAL GUIDE.....	529 035 822	7
OIL SEAL PUSHER.....	529 035 757	6
TEMPERATURE INDICATOR STICK.....	529 035 970	14

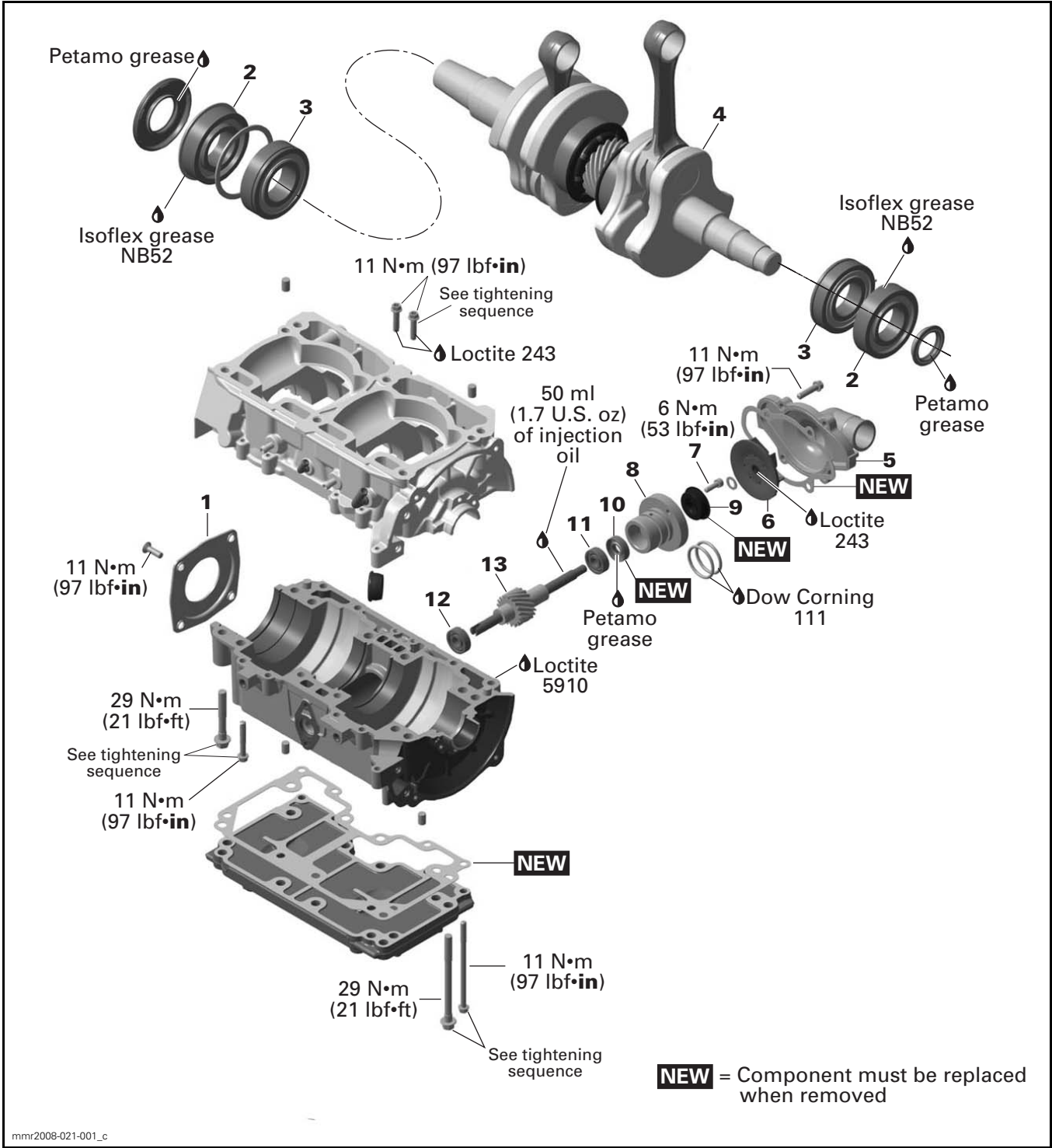
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
SNAP-ON BEARING SEPARATOR.....	CJ 951	12
SNAP-ON MANUAL IMPACT DRIVER	PIT120	8
SPX/OTC BEARING SEPARATOR.....	1124	12

SERVICE PRODUCTS

Description	Part Number	Page
ISOFLEX GREASE TOPAS NB 52	293 550 021	16
LOCTITE 5910	293 800 081	9
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	13
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	9
PULLEY FLANGE CLEANER	413 711 809	13
XPS LUBE.....	293 600 016	12

Subsection XX (BOTTOM END (800R ENGINES))



GENERAL

Engine removal is required to repair bottom end except for the water pump impeller.

All oil seals and gaskets must be discarded and replaced with new ones when crankcase is split.

Clean all metal components in a non-ferrous metal cleaner.

To measure internal parts, refer to *ENGINE MEASUREMENT* subsection.

During assembly or installation:

- Use torque values and service products as shown in the exploded view.
- Clean threads before applying a threadlocker. Refer to the *INTRODUCTION* subsection.

WARNING

Torque wrench tightening specifications must be strictly adhered to.

Locking devices when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be replaced with new ones.

NOTICE Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.

WARNING

Always disconnect the magneto connector prior to:

- Disconnecting any fuel hose.
 - Removing a fuel injector (E-TEC).
 - Removing a spark plug cable or spark plug.
- Otherwise, if the engine is cranked, fuel vapors may ignite in presence of a spark creating a fire hazard.

ENGINE BREAK-IN

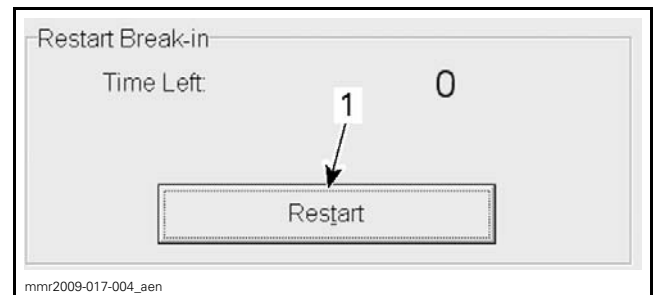
NOTICE After a repair involving major parts replacement, a break-in period must be observed.

800R Power TEK

1. Follow *OPERATOR'S GUIDE* recommendation relating to break-in.
2. Add 500 ml (17 U.S. oz) of recommended injection oil into a full fuel tank.

800R E-TEC

1. Follow *OPERATOR'S GUIDE* recommendation relating to break-in.
2. Restart break-in period in B.U.D.S. as follows:
 - 2.1 Ensure to use the latest B.U.D.S. software specific to the E-TEC engine.
 - 2.2 Select **Setting** tab.
 - 2.3 Click on **Restart** button in **Restart Break-in** box.



1. Click on Restart

PROCEDURES

WATER PUMP

Water Pump Removal

Engine In Vehicle

Refer to *BODY* subsection and remove:

- Hood
- Bottom pan cover
- RH side panel.

Refer to *EXHAUST SYSTEM* subsection and remove:

- Tune pipe
- Muffler.

Remove acoustic panel.

Put a large drain pan under vehicle bottom pan.

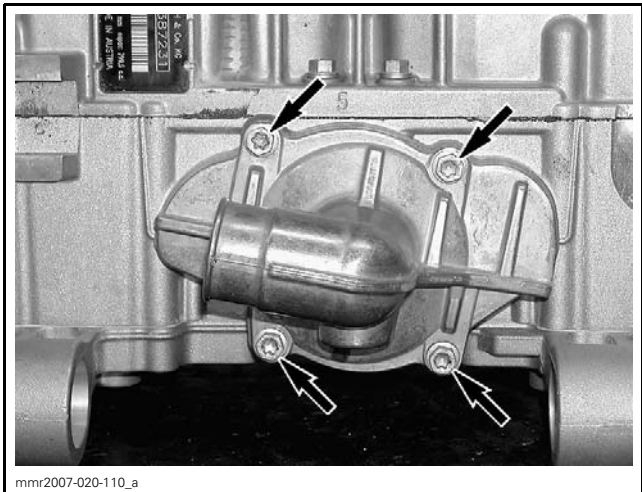
Remove starter, refer to *STARTING SYSTEM* subsection.

Refer to *ENGINE OUT OF VEHICLE* to complete procedure.

Engine Out of Vehicle

Remove water pump cover **no. 5**.

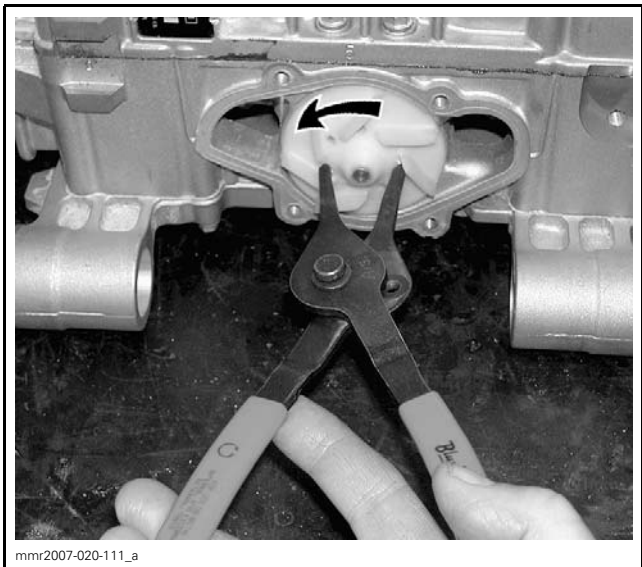
Subsection XX (BOTTOM END (800R ENGINES))



TYPICAL

Remove impeller no. 6 by turning it counterclockwise.

NOTICE Be careful not to damage impeller fins.



TYPICAL

Clean gasket surfaces of water pump cover and crankcase.

Water Pump Installation

The installation is the reverse of removal procedure. However, pay attention to the following details.

Ensure to use the 1 mm (.039 in) thick washer.

Install a **NEW** gasket.

Tighten screws of water pump cover to specification in a crisscross sequence.

WATER PUMP COVER SCREWS TORQUE
11 N•m (97 lbf•in)

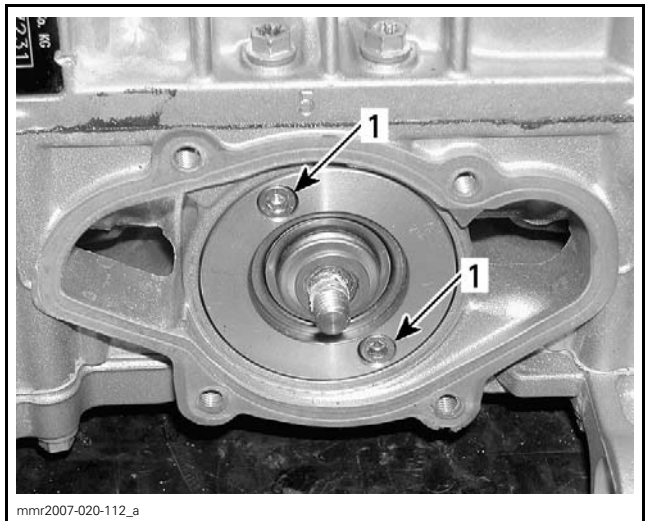
BEARING CARRIER AND PUMP SHAFT

Bearing Carrier and Pump Shaft Removal

On 800R Power TEK model, remove oil injection pump. Refer to *LUBRICATION SYSTEM* subsection.

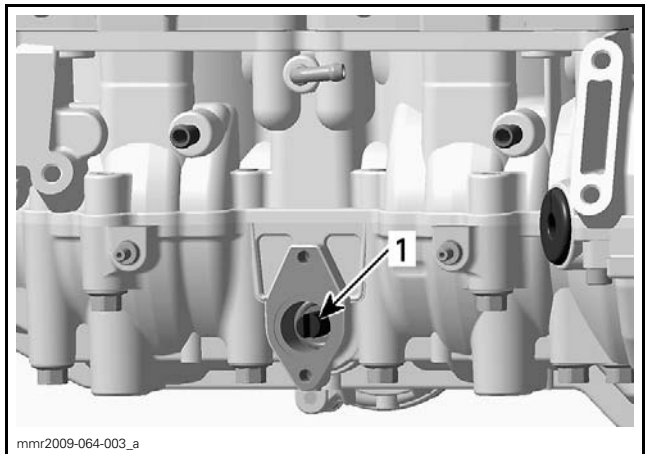
Remove *WATER PUMP*. See procedure in this subsection.

Remove bearing carrier retaining screws no. 7.



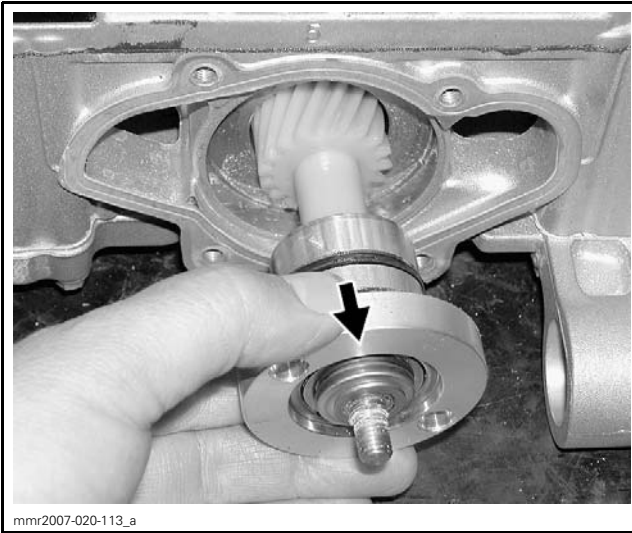
TYPICAL
1. Screws

Push pump shaft out while turning shaft to release it from crankshaft worm gear.



TYPICAL
1. Push out shaft here

Extract bearing carrier and pump shaft.



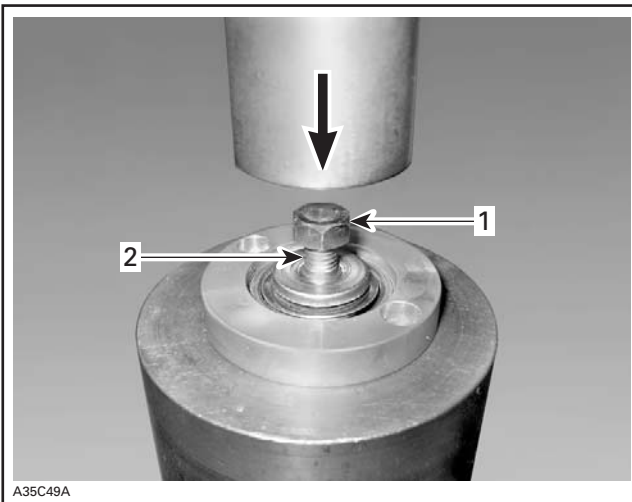
TYPICAL

Bearing Carrier and Pump Shaft Disassembly

NOTE: The pump shaft cannot be disassembled without damaging the ceramic seal and oil seal. Protect the threads of shaft with a suitable M8 nut.

Properly support bearing carrier.

Push pump shaft out using a press.



TYPICAL

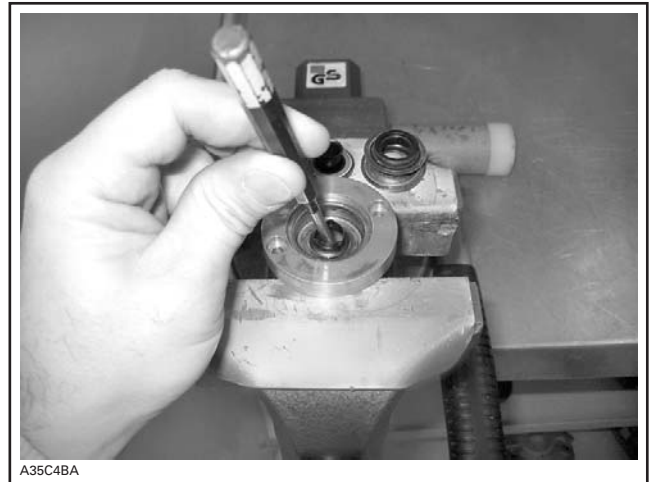
1. M8 nut
2. Shaft

NOTICE Pay attention not to damage the bearing carrier during disassembly. Marks or other damages will lead to coolant or oil leakage.

Pry inner part of ceramic seal no. 9 out.



Push out bearing no. 11 from the bearing carrier using an appropriate pusher.



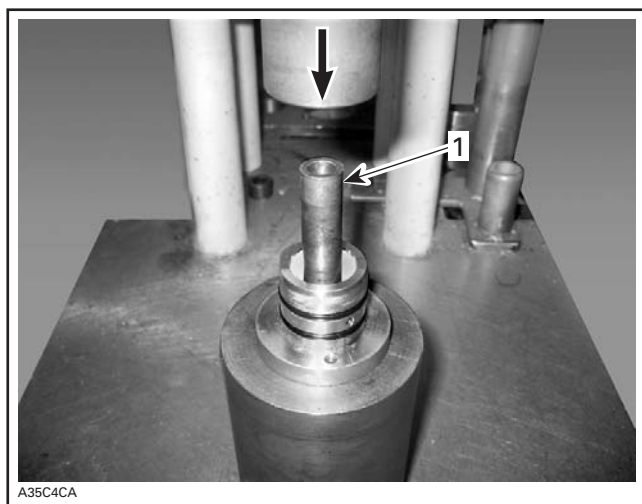
Push oil seal no. 10 out.



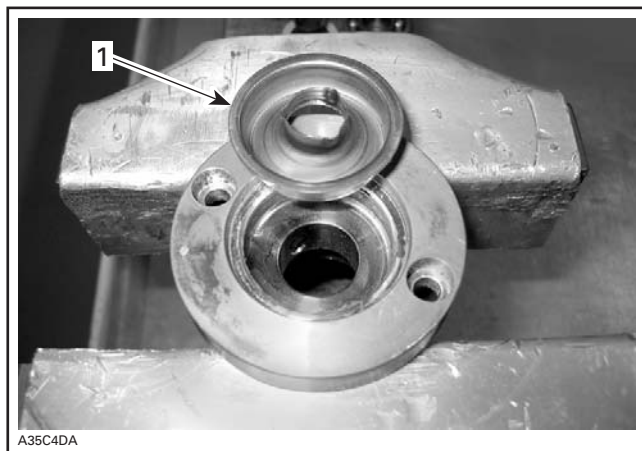
Carefully press the outer part of ceramic seal out.

NOTE: Use a mandrel with a diameter of approximately 16 mm (.63 in).

Subsection XX (BOTTOM END (800R ENGINES))

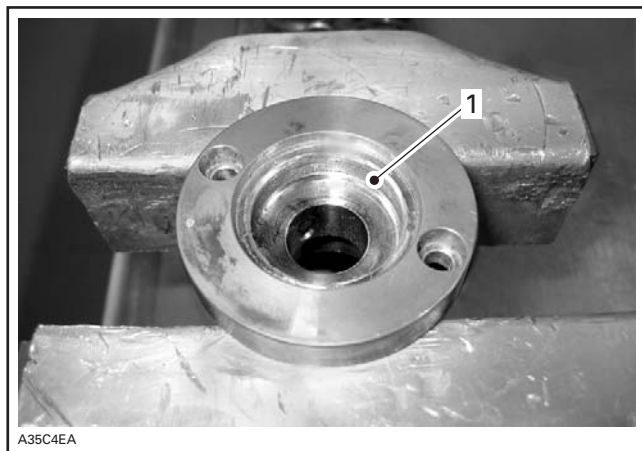


1. 16 mm (.63 in) mandrel



1. Outer part of ceramic seal

Remove sealant from bearing carrier with sand paper no. 180.



1. Remove sealant

Bearing Carrier and Pump Shaft Reassembly

Reverse disassembly procedure and pay attention to the following.

NOTE: Never put oil in the press fit area of the oil seal and ceramic seal.

Push the **NEW** oil seal **no. 10** in bearing carrier using the OIL SEAL PUSHER (P/N 529 035 757).



Press bearing **no. 11** into bearing carrier **no. 8**.

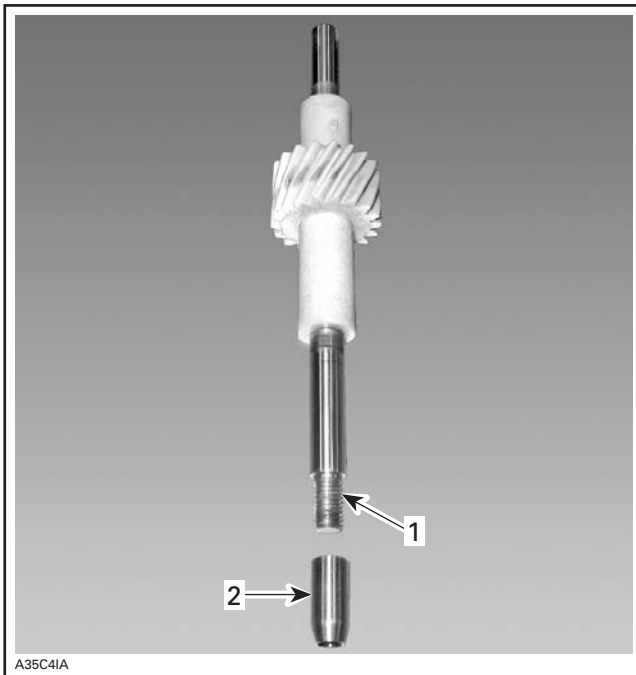


Push the **NEW** ceramic seal **no. 9** in bearing carrier **no. 8** using the CERAMIC SEAL INSTALLER (P/N 529 036 014).



NOTICE Never use a hammer for the ceramic seal installation. Only use a press to avoid damaging the ceramic component.

Put OIL SEAL GUIDE (P/N 529 035 822) on pump shaft **no. 13**.

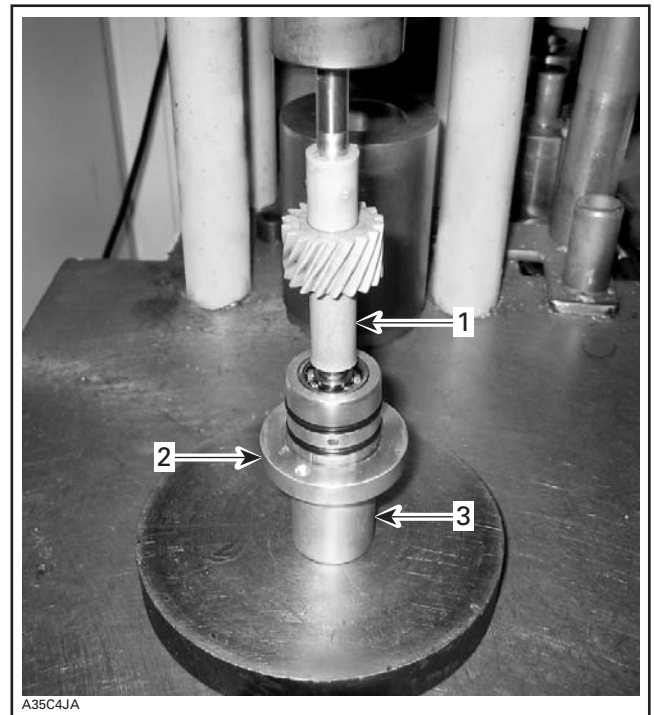


1. Pump shaft
2. Oil seal protector

Press pump shaft **no. 13** into the bearing carrier **no. 8** with the appropriate force.

NOTICE Inadequate force will damage the oil seal and bearing.

NOTE: During installation support the ceramic seal using the CERAMIC SEAL INSTALLER (P/N 529 036 014) as shown on the following illustration.



1. Pump shaft
2. Bearing carrier
3. Ceramic seal installer

Remove oil seal protector from pump shaft.

Bearing Carrier and Pump Shaft Installation

The installation is the reverse of removal procedure, however pay attention to the following.

Pour 50 ml (1.7 U.S. oz) of injection oil in the pan under crankshaft worm gear.

Install pump shaft and bearing carrier in crankcase while turning shaft to mesh gears.

Tighten bearing carrier retaining screws **no. 7** to specification.

BEARING CARRIER SCREWS TORQUE

6 N•m (53 lbf•in)

CRANKCASE

Crankcase Disassembly

Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.

Remove cylinder head and cylinder-block. Refer to *TOP END (800R ENGINES)* subsection.

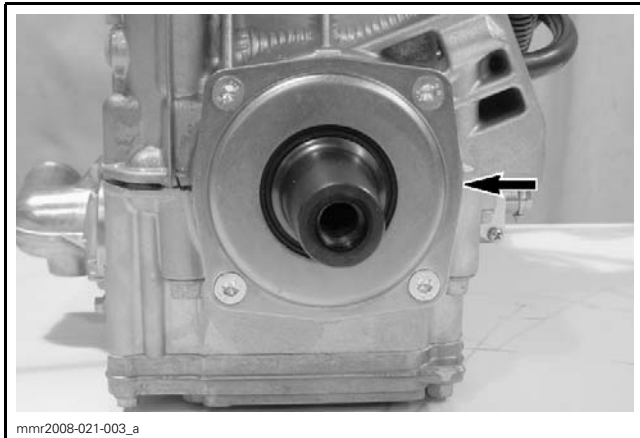
Remove magneto housing. Refer to *MAGNETO SYSTEM* subsection.

Remove drive pulley. Refer to *DRIVE PULLEY* subsection.

Subsection XX (BOTTOM END (800R ENGINES))

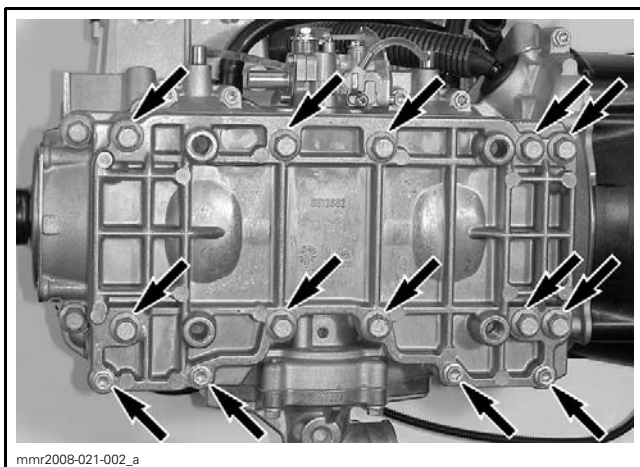
Remove PTO oil seal cover **no. 1**.

NOTE: Tap screw heads to break the Loctite bond or use a SNAP-ON MANUAL IMPACT DRIVER (P/N PIT120).



PTO OIL SEAL COVER

Remove base plate.

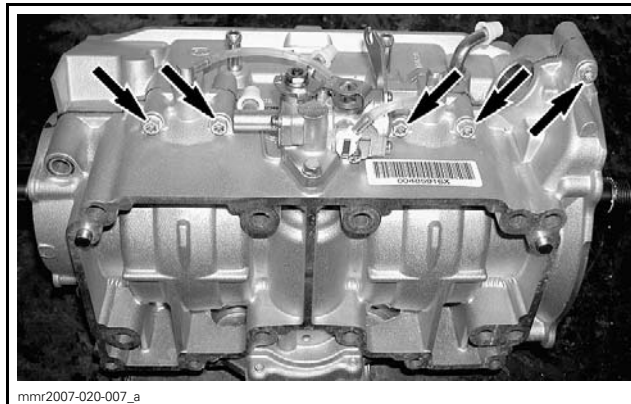


BASE PLATE RETAINING SCREWS

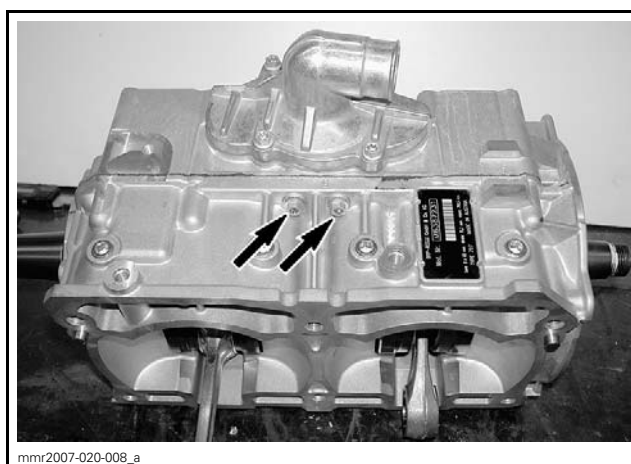
NOTICE Whenever base plate is removed, crankcase must be opened, cleaned, and re-sealed.

Remove engine front supports.

Remove crankcase screws.



CRANKCASE SCREWS - OIL INJECTION PUMP SIDE



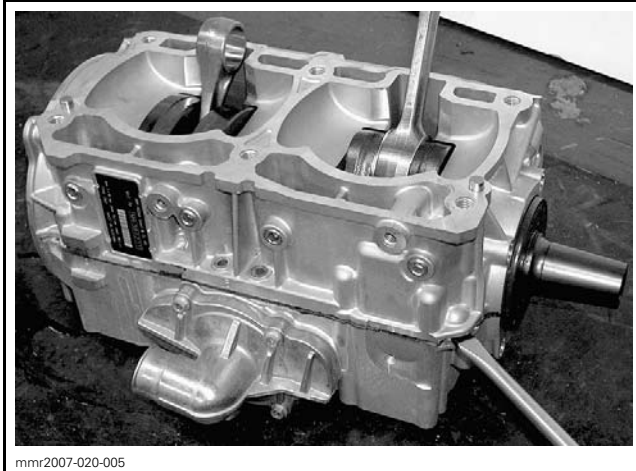
CRANKCASE SCREWS - WATER PUMP SIDE

Split crankcase.

NOTE: To prevent damage to crankcase mating surfaces, use prying lugs to "unstick" crankcase.



PRYING LUGS



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PRYING LUGS

Remove crankshaft assembly.

Crankcase Cleaning

Clean all metal components in a non-ferrous metal cleaner. Use LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) accordingly.

NOTICE Never use a sharp object to remove sealant as score marks incurred are harmful to crankcase sealing.

Crankcase Inspection

Check crankcase for cracks or other damages. Replace if necessary.

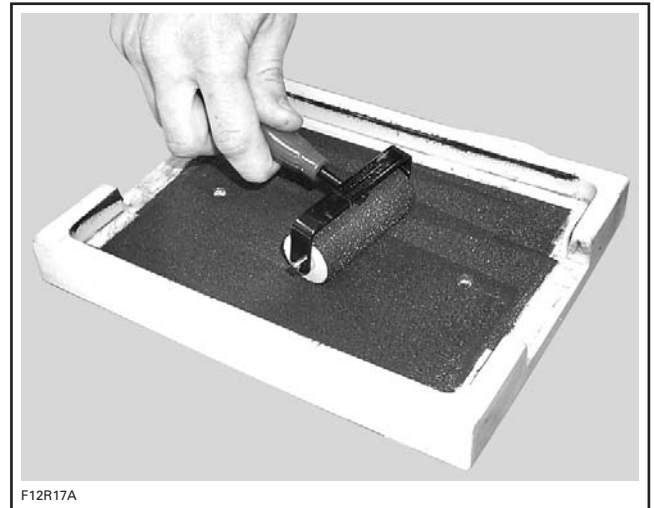
Crankcase Assembly

Install crankshaft in lower crankcase. See *CRANKSHAFT* for procedure.

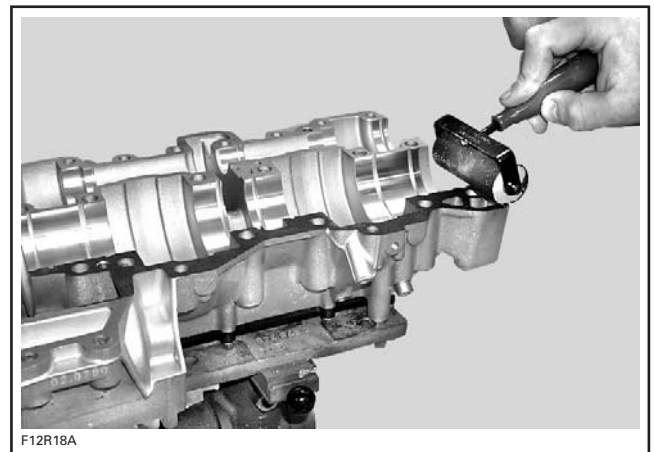
Apply LOCTITE 5910 (P/N 293 800 081) on crankcase halves as per following procedure.

NOTE: IMPORTANT: The total assembly sequence, including sealing compound application and crankcase torquing, must be performed within 10 minutes.

Use a plexiglass plate and apply some sealant on it. Use a 50 - 75 mm (2 - 3 in) soft rubber roller and spread the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on crankcase mating surfaces.



F12R17A



F12R18A

TYPICAL

NOTE: If you do not use the roller method, you may use your finger to uniformly distribute the sealant.

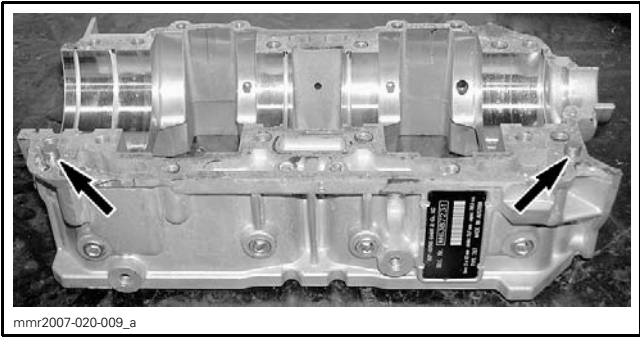
Spread a small bead of sealant around the water passage groove as illustrated.



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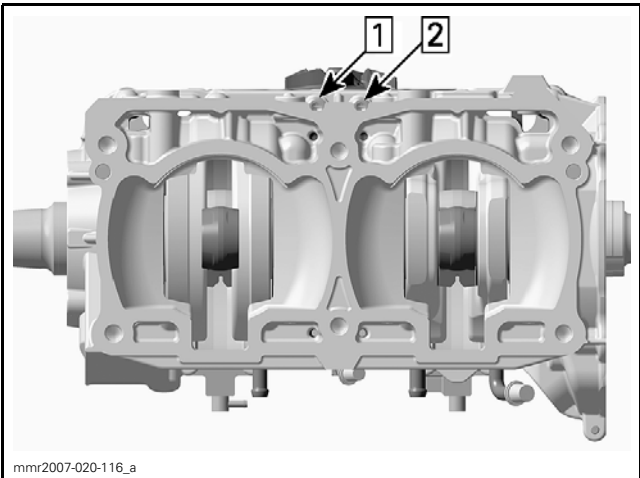
Ensure dowel pins are in their holes.

Subsection XX (BOTTOM END (800R ENGINES))

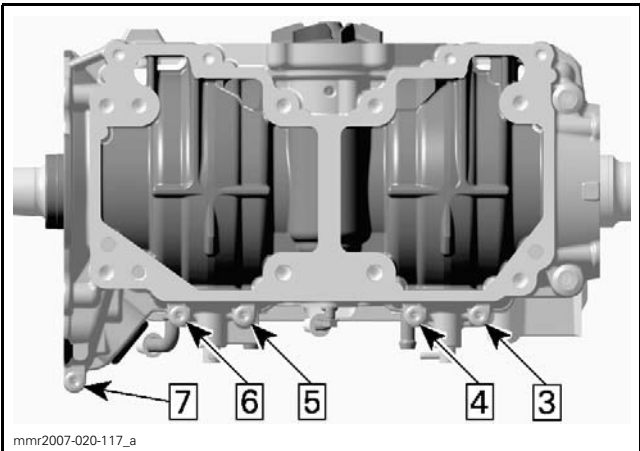


Assemble both crankcase halves.
Install M6 screws (7x) in crankcase.
Tighten M6 screws to specification as per illustrated sequence.

CRANKCASE M6 SCREWS TORQUE
11 N•m (97 lbf•in)

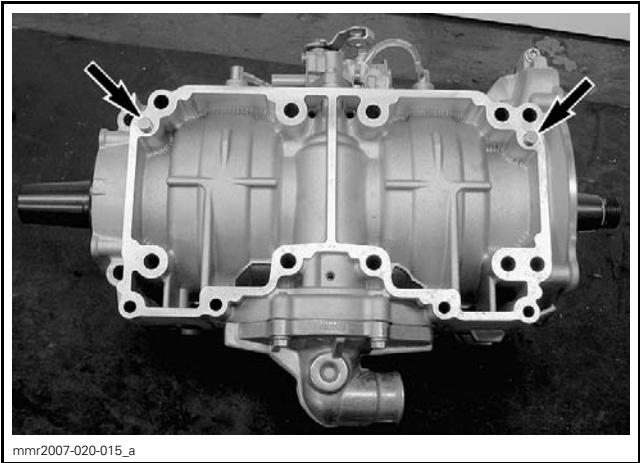


TIGHTENING SEQUENCE - TOP VIEW



TIGHTENING SEQUENCE - BOTTOM VIEW

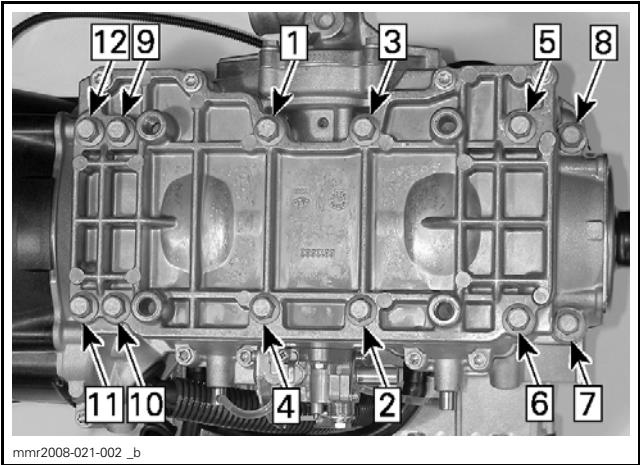
Ensure dowel pins are in their holes.



BOTTOM VIEW

Install engine support.
Install a **NEW** base plate gasket.
Install M8 screws (12x) in base plate.
Tighten M8 screws to specification as per illustrated sequence.

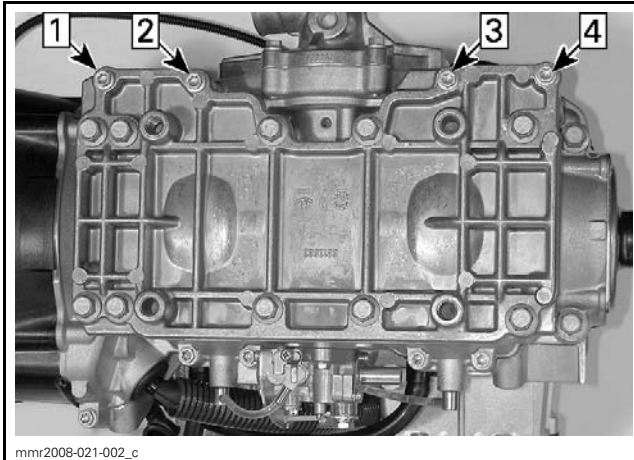
BASE PLATE M8 SCREWS TORQUE	
FIRST STEP	14 N•m (124 lbf•in)
FINAL STEP	29 N•m (21 lbf•ft)



TIGHTENING SEQUENCE (M8 SCREWS)

Install M6 screws (4x) in base plate.
Tighten M6 screws to specification as per illustrated sequence.

BASE PLATE M6 SCREWS TORQUE
11 N•m (97 lbf•in)

**TIGHTENING SEQUENCE (M6 SCREWS)**

Install PTO oil seal cover **no. 1**.

Tighten oil seal cover to specification.

OIL SEAL COVER SCREWS TORQUE
11 N•m (97 lbf•in)

NOTE: It is recommended to test engine cooling system for leaks after engine assembly, before installation in vehicle. Refer to *COOLING SYSTEM* subsection.

CRANKSHAFT

Crankshaft Removal

To remove crankshaft, use crankcase disassembly procedure.

Crankshaft Inspection

Refer to table below to find bottom end engine dimension specifications. For dimension measurement procedures, refer to *ENGINE MEASUREMENT* subsection.

ENGINE MEASUREMENT	TOLERANCES		
	NEW PARTS (min.) (max.)		WEAR LIMIT
Crankshaft deflection on PTO side	N.A.	0.06 mm (.002 in)	N.A.
Crankshaft deflection on MAG side	N.A.	0.05 mm (.002 in)	N.A.
Crankshaft deflection in center of crankshaft	N.A.	0.04 mm (.002 in)	N.A.
Connecting rod big end axial play	0.23 mm (.009 in)	0.62 mm (.024 in)	1.20 mm (.047 in)
Crankshaft end-play	0.10 mm (.004 in)	0.30 mm (.012 in)	N.A.

Crankshaft Bearing Removal

NOTE: 10 minutes is required to heat up a new bearing for its installation. To save time, it is recommended to start the heating process prior to bearing removal operation. See procedure further.

To remove bearings **no. 2** and **no. 3** from crankshaft **no. 4**, install proper half rings and puller ring on the outer bearing.

NOTE: On MAG side, position tools on inner bearing and pull out both bearings together.

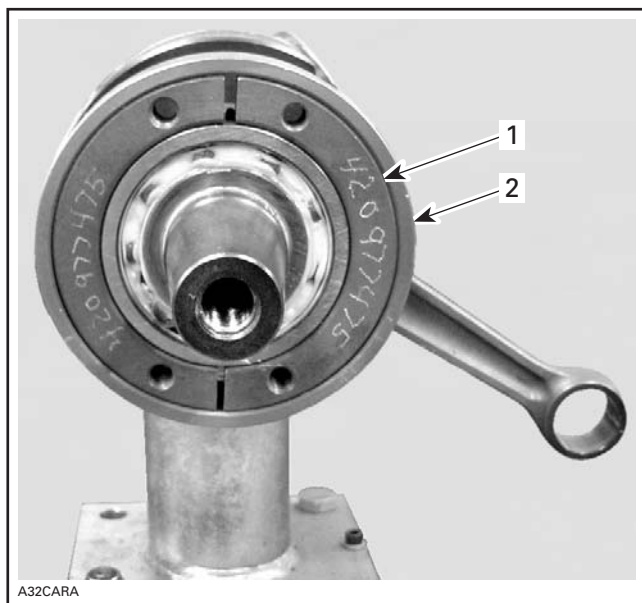
PART	MAG SIDE	PTO SIDE
Half rings	420 977 475	420 977 479
Puller ring	420 977 490	420 977 494
Crankshaft protector	420 876 557	420 877 414

Ensure to position bearing pin between half ring gap.

Subsection XX (BOTTOM END (800R ENGINES))



MAG SIDE



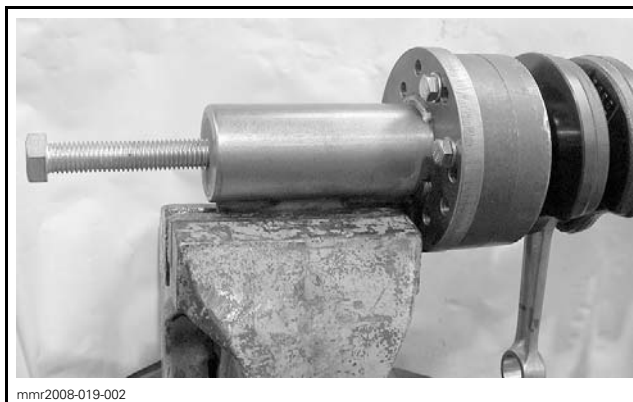
PTO SIDE

1. Half ring
2. Puller ring

NOTE: Apply some grease on crankshaft end to hold in place the proper crankshaft protector.

Install the CRANKSHAFT BEARING PULLER (P/N 529 036 004) on the half rings.

Secure the bearing puller in a vise by one of its rib.



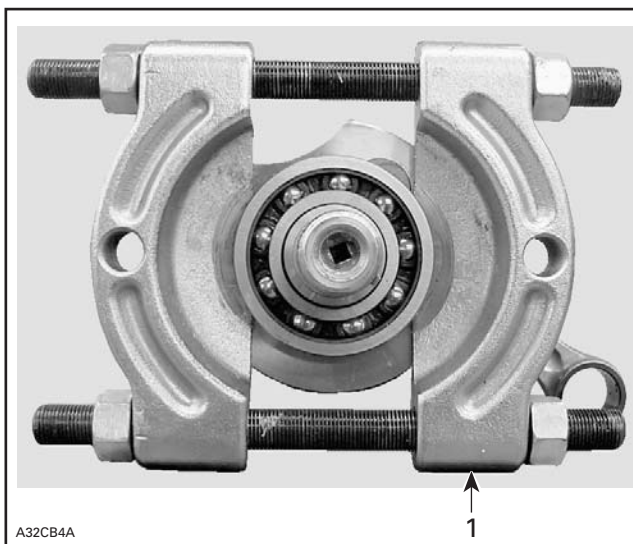
BEARING PULLER SECURED IN THE VISE

NOTICE Never use any air impact tool for tightening the puller bolt. Lubricate the bolt with XPS LUBE (P/N 293 600 016) to avoid damaging the threads.

Screw in the puller bolt until the bearing comes out.

Follow the same procedure for the inner bearing (PTO side).

NOTE: As an alternate method to remove bearings, use SNAP-ON BEARING SEPARATOR (P/N CJ 951) or SPX/OTC BEARING SEPARATOR (P/N 1124). Use a press to remove bearings.

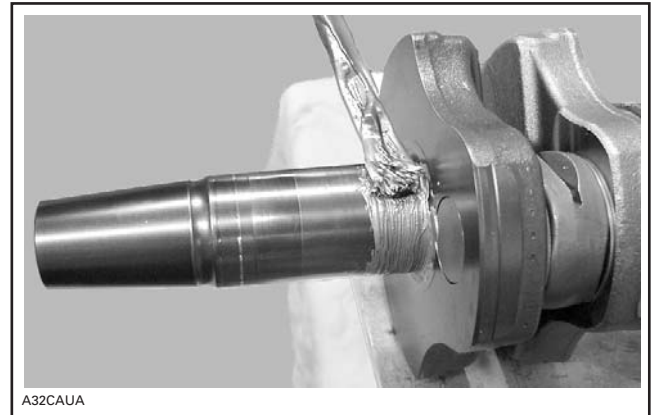


1. Bearing separator

Crankshaft Bearing Installation

Inspect crankshaft ends for damage.

Clean crankshaft ends with sand paper no. 180 to remove possible seal marks and debris.



Bearing Heating

Heat up the bearing(s) using BEARING HEATER (P/N 529 035 969). This will expand bearings and ease installation. If required, put a suitable plate or shim to avoid the direct contact between the integrated seal with the heating surface.



Remove all residue using PULLEY FLANGE CLEANER (P/N 413 711 809).

Apply LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) on crankshaft bearing mounting area.



NOTICE Bearing(s) should not be heated to more than 80°C (176°F). Do not heat bearing(s) with direct flame, or with a heat gun or soaked in a heated oil bath. Inappropriate bearing(s) heating may result in inner seals or cage failure.

For even heat distribution, turn bearing several times during heating process.

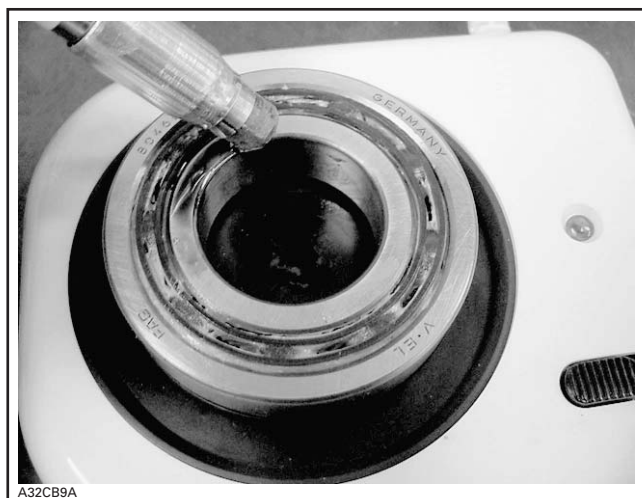
NOTE: Two bearings can be heated at the same time on one bearing heater.

Subsection XX (BOTTOM END (800R ENGINES))



1. Bearings

Probe the side of the inner race of the bearing with the temperature TEMPERATURE INDICATOR STICK (P/N 529 035 970). Stick will liquefy when the bearing reaches the proper temperature.



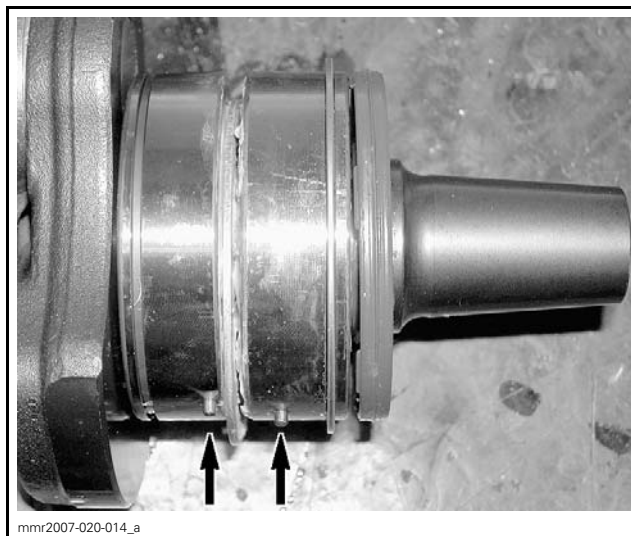
WARNING

Do not touch heated bearing with bare hands. Always wear heat resisting gloves before handling the heated bearing(s).

NOTICE Never reinstall a bearing that has been removed.

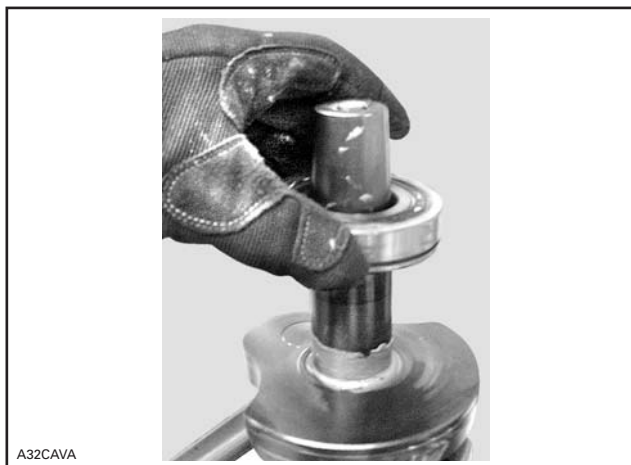
PTO Side Bearings

Install PTO bearings on crankshaft so that locating pins will be positioned as shown.



PTO SIDE

Slide the heated inner PTO bearing on crankshaft until it bottoms on crankshaft shoulder.

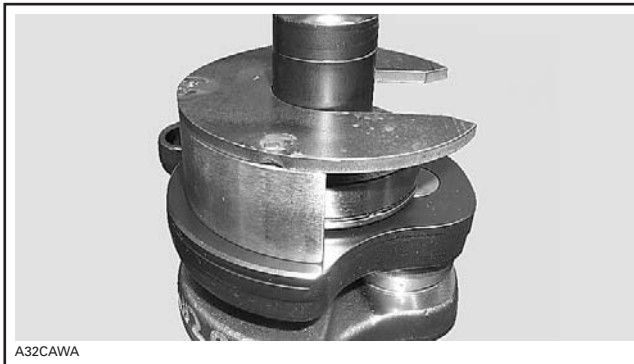


NOTE: Heated bearing should slide easily onto the crankshaft. If required, push with a steel tube on the inner race of the bearing.

Install retaining disc.

Install the DISTANCE GAUGE (P/N 529 036 060) as shown.



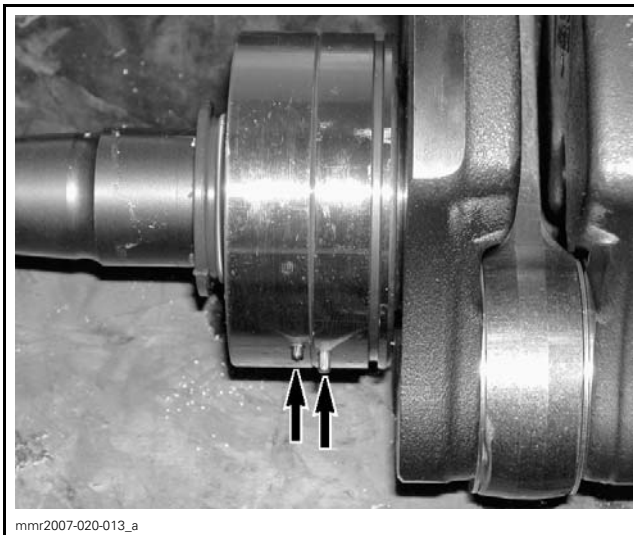


TYPICAL

Slide the heated outer PTO bearing onto the crankshaft until it contacts the distance gauge.

MAG Side Bearings

Install MAG bearings on crankshaft so that locating pins will be positioned as shown.



MAG SIDE

Slide the inner MAG bearing until it bottoms on crankshaft shoulder.

NOTE: Heated bearing should slide easily onto the crankshaft. If required, push with a steel tube on the inner race of the bearing.



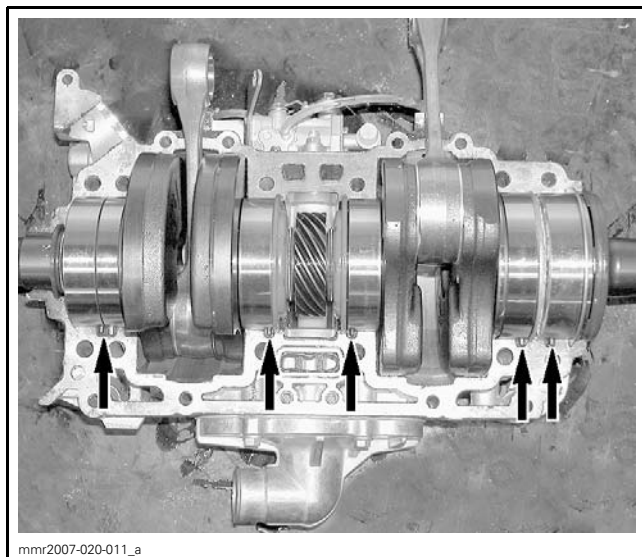
Slide the outer bearing until it sits on inner bearing.



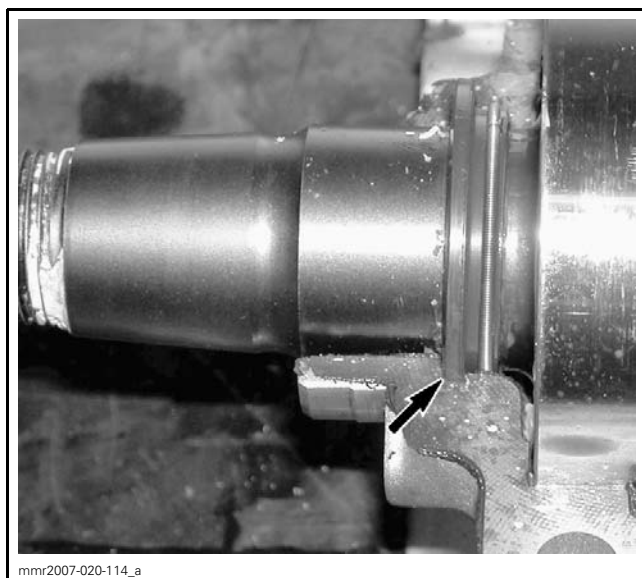
Crankshaft Installation

1. Position locating pins in their recess as illustrated.

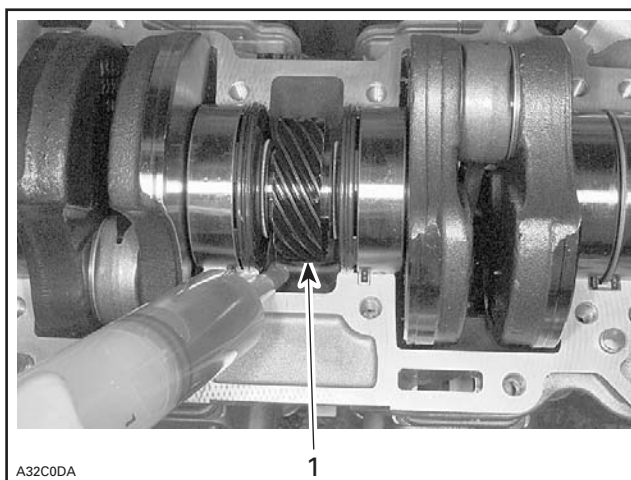
Subsection XX (BOTTOM END (800R ENGINES))



2. Pay attention to properly locate MAG seal in its groove.



3. Pour 50 ml (1.7 U.S. oz) of injection oil in the oil bath under worm gear as shown.



TYPICAL

1. Oil bath

4. Apply ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021) as follows:

NOTICE

- Use only the recommended grease.
- Make sure not to push grease between the outside bearing race and the crankcase half.
- Do not exceed the recommended amount of grease.

- 4.1 Put approximately 25 ml (.8 U.S. oz) of grease in a syringe.

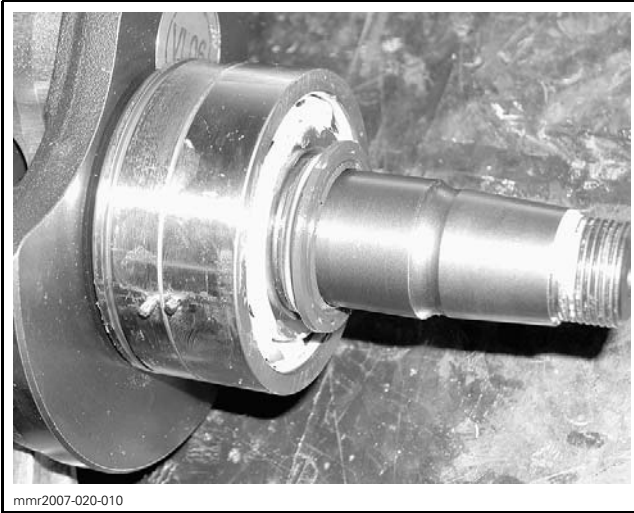
NOTE: The 50 g tube corresponds to 50 ml of grease.

- 4.2 With the syringe, fill the PTO side outer bearing with 19 ml (.6 U.S. oz) of grease.



NOTE: Inner PTO bearing is already filled with grease (about 8 ml (.3 U.S. oz)).

- 4.3 Apply 5 ml (.2 U.S. oz) of grease to MAG side outer bearing.



NOTE: Inner MAG bearing is already filled with grease (about 5 ml (.2 U.S. oz)).

5. Install MAG seal.
6. Proceed with crankcase assembly. Refer to *CRANKCASE* in this subsection.