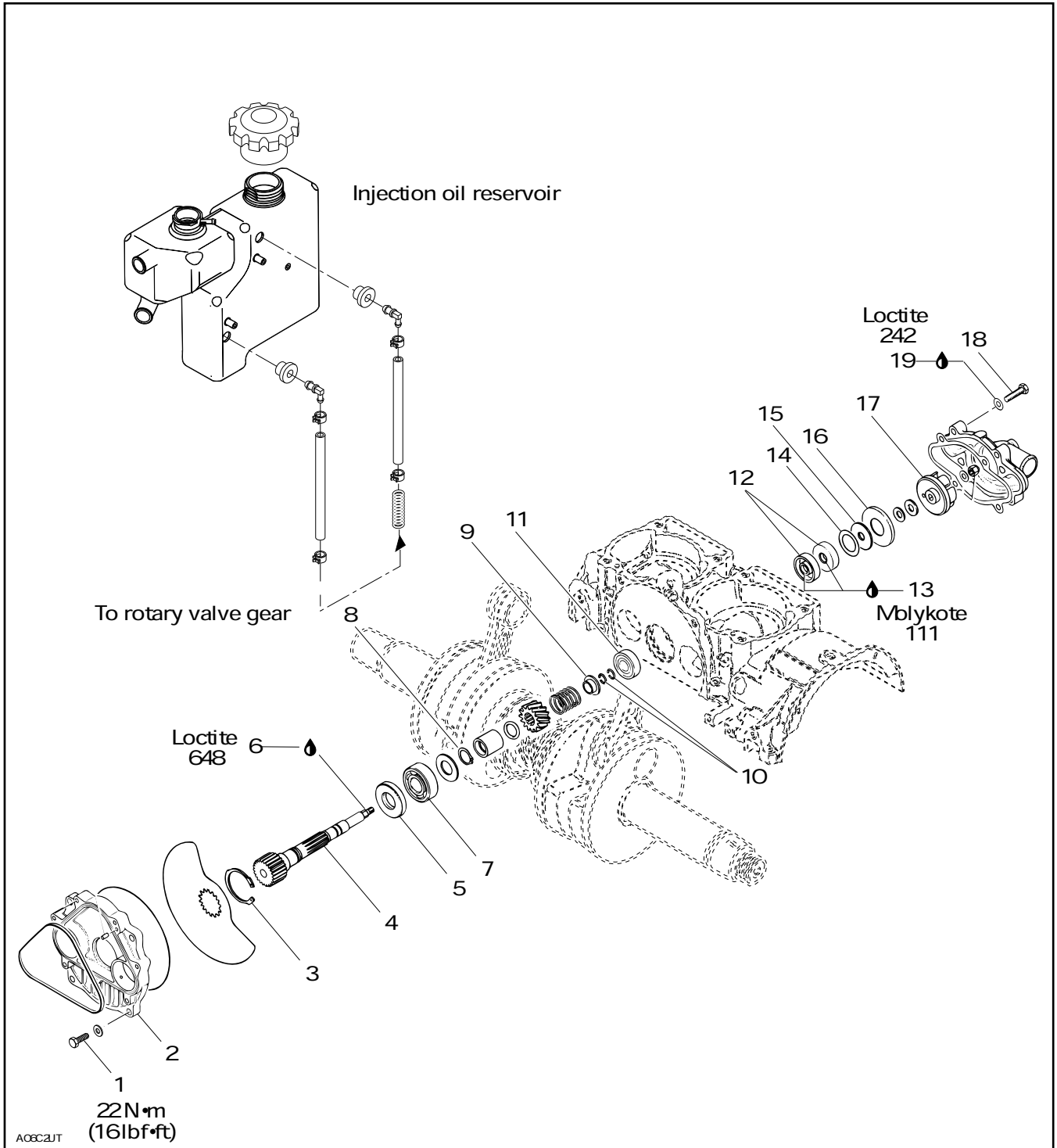


# ROTARY VALVE, COOLANT PUMP AND RESERVOIR

454, 583 and 670 Engines



A06C2JT

## Section 04 ENGINE

### Sub-Section 09 (ROTARY VALVE, COOLANT PUMP AND RESERVOIR)

○ **NOTE :** Some verifications can be performed with engine in vehicle. Refer to ENGINE DIMENSION MEASUREMENT 04-03.

## GENERAL

Engine must be removed from vehicle to work on rotary valve shaft /components. Refer to **Removal and installation** of appropriate engine for procedures.

Bottom end must be opened to remove rotary valve shaft.

## CLEANING

Discard all seals and O-rings.

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

## DISASSEMBLY

### 1,2 Screw and Rotary Valve Cover

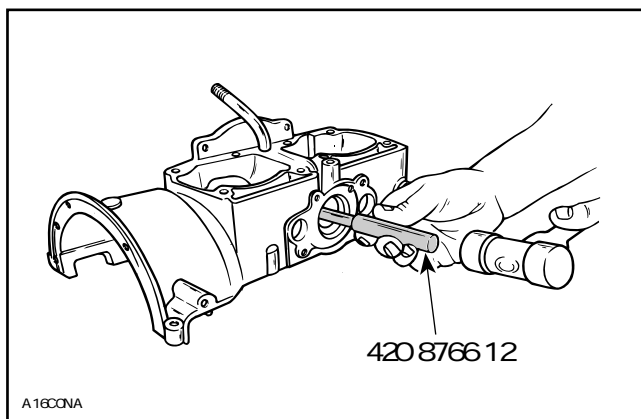
○ **NOTE :** Before removing rotary valve, check valve timing as described in **Rotary valve timing** at the end of this sub-section.

Unscrew 4 retaining screws and withdraw rotary valve cover and valve.

### 317, Circlip and Pump Impeller

▼ **CAUTION :** Bottom end must be opened to remove rotary valve shaft.

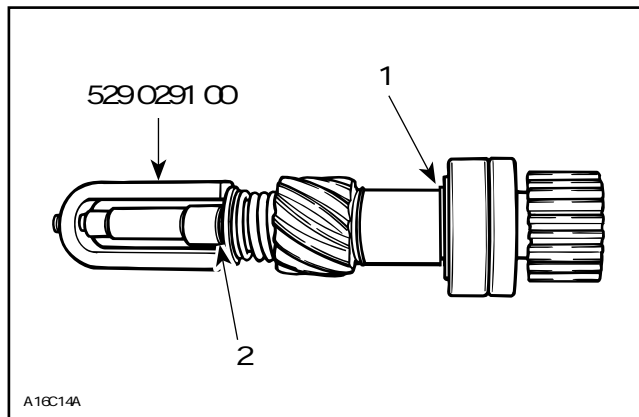
To remove rotary valve shaft assembly from crankcase, first remove coolant pump impeller and circlip on valve side. Using the suitable pusher (P /N 420 8766 12) and a fiber hammer, push shaft assembly.



▼ **CAUTION :** To prevent damage to the end of the rotary valve shaft, use pusher (P /N 420 8766 12).

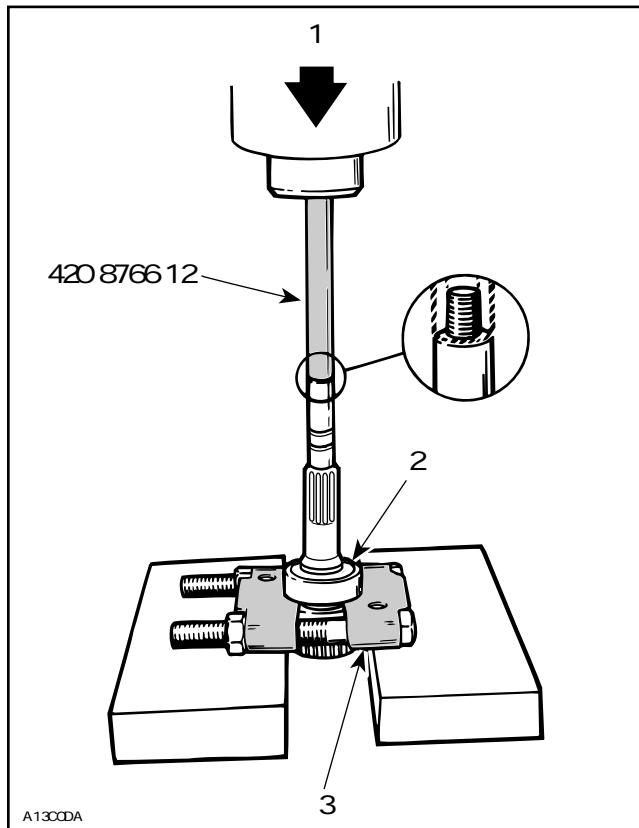
### 891Q Circlip and Spring Retaining Cup

If it is necessary to disassemble components of rotary valve shaft assembly, compress spring retaining cup with rotary valve circlip tool (P /N 529 0291 00) in order to remove circlip. Remove gear and distance sleeve then external circlip.



1. External circlip
2. Circlip

To remove bearing, use a bearing puller (ex. : Snap-on no. CJ 950) and pusher (P /N 420 8766 12) as illustrated.



1. Press
2. Bearing
3. Bearing puller. Ex. : Snap-on no. CJ 950

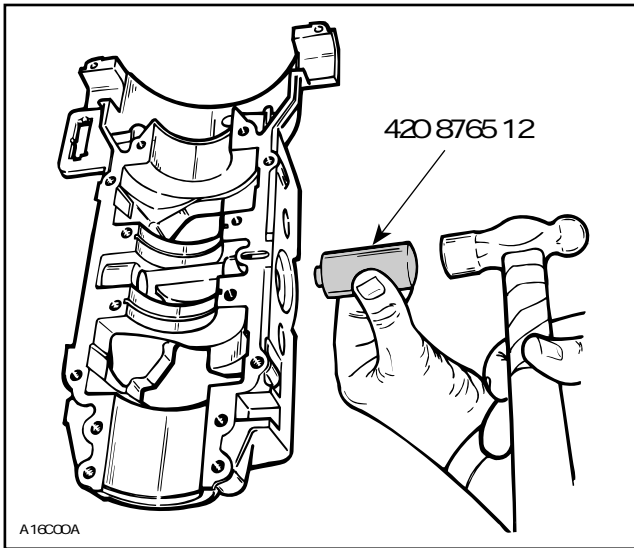
▼ **CAUTION :** Ensure that the rotary valve shaft is perfectly perpendicular with the press tip or damage will occur.

**14,15,16 Shim, Rubber Washer and Support Plate**

Pry support plate out of crankcase and remove rubber washer and shim.

**11,12,14,15 Bearing 6201 and Seal**

To remove bearing 6201 (the smallest one), seals and rubber washer, use seal pusher (P /N 420 8765 12).



**INSPECTION**

Inspect rotary valve cover for warpage. Small deformation can be corrected by surfacing with fine sand paper on a surface plate. Surface part against oiled sand paper.

Inspect bearings. Check for scoring, pitting, chipping or other evidence of wear. Make sure plastic cage (on bigger bearing) is not melted. Rotate them and make sure they turn smoothly.

Check for presence of brass fillings in gear housing.

Visually check gear wear pattern. It should be even on tooth length all around. Otherwise it could indicate a bent shaft ; check deflection. Replace gear if damaged.

Refer to ENGINE DIMENSION MEASUREMENT 04-04.

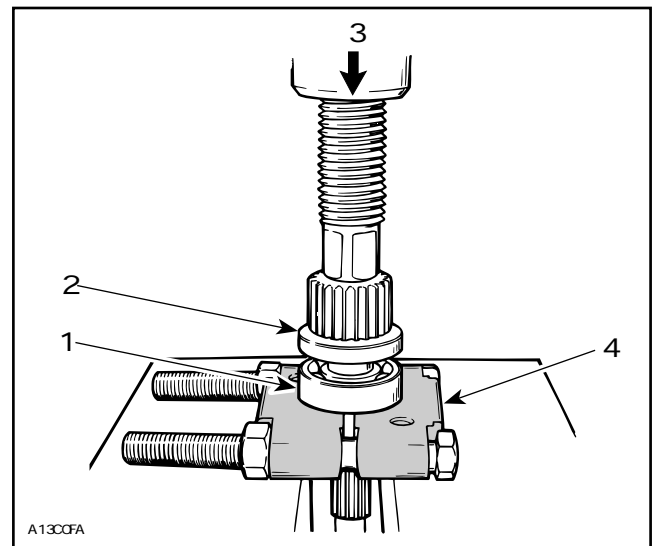
**ASSEMBLY**

Assembly is essentially the reverse of disassembly procedures. However pay particular attention to the following.

**4,5,7, Rotary Valve Shaft, Seal and Bearing 6203**

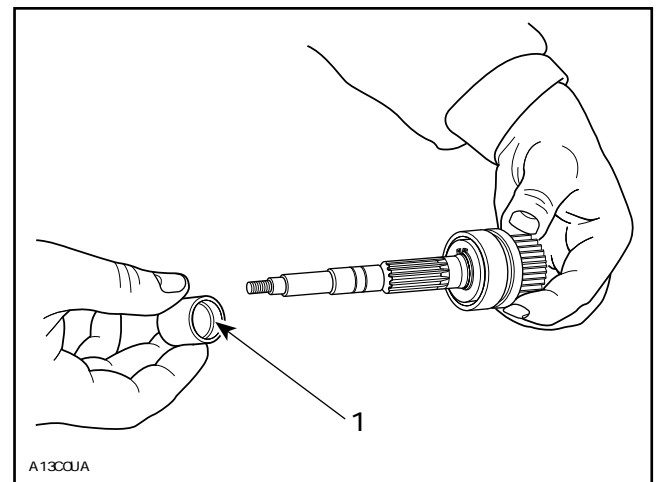
At assembly apply lithium grease on seal lips. Position the seal with shielded portion against splines of shaft

Install bearing as illustrated.



- 1. Bearing
- 2. Shielded portion of seal here
- 3. Press
- 4. Bearing puller. Ex. : Snap-on no. CJ 950

Install distance sleeve with its counterbore first



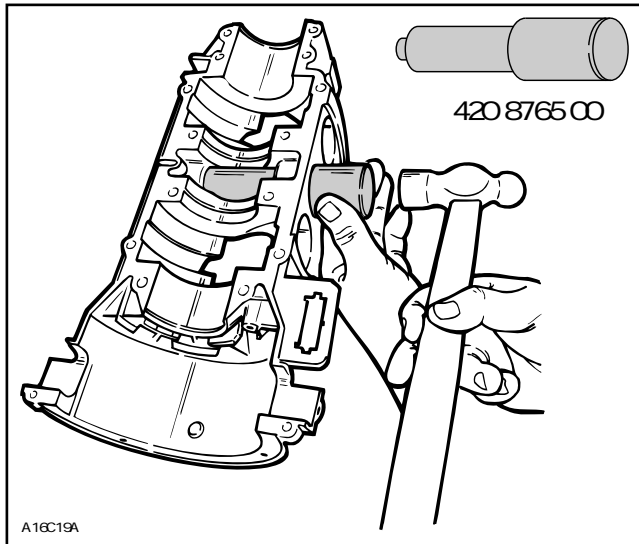
- 1. Counterbore first

## Section 04 ENGINE

### Sub-Section 09 (ROTARY VALVE, COOLANT PUMP AND RESERVOIR)

#### 11, Bearing 6201

To install bearing 6201 use bearing pusher (P /N 420 8765 00).



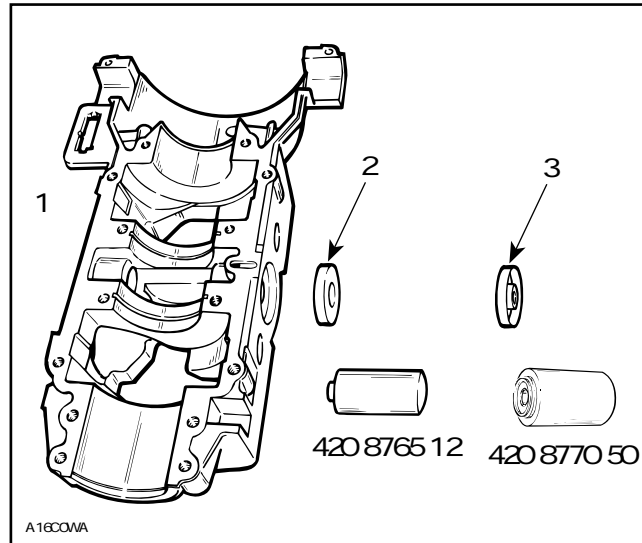
○ **NOTE** : Bearing shielded side must be facing rotary valve.

Refer to **Rotary valve timing** at the end of this sub-section to properly install gear on rotary valve shaft

#### 12, 13, 14, 15, Seals, Shim, Rubber Washer and Molykote Grease

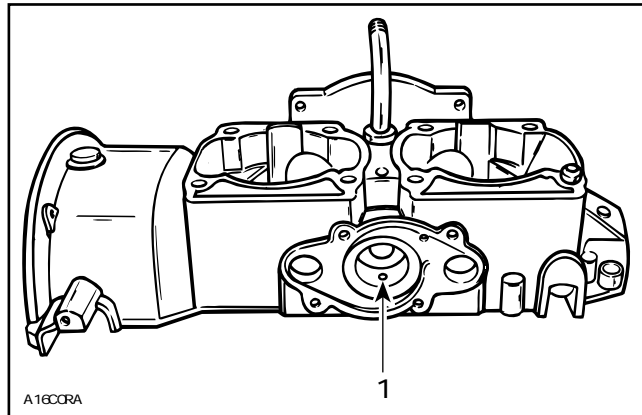
To install seals on water pump side proceed as follows :

- Apply Molykote 111 (P /N 413 7070 00) on lip both seals.
- Position **oil seal** shielded portion towards pump impeller. Drive in place with a seal pusher (P /N 420 8765 12).
- Position **coolant seal** shielded portion towards rotary valve. Drive in place with the rotary valve shaft seal pusher (P /N 420 8770 50).



1. Rotary valve side
2. Oil seal
3. Coolant seal

Make sure not to obstruct draining hole. Position seals so that hole is between them.



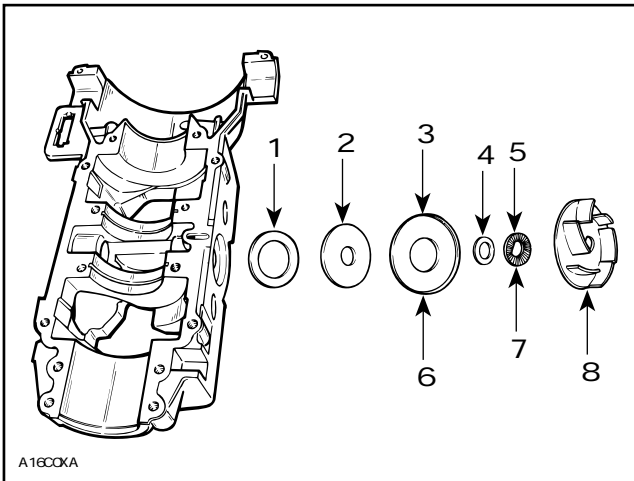
1. Draining hole

▼ **CAUTION** : Failure to position the seals as specified may cause the seal spring to be corroded by coolant. Severe damage may occur if these notices are disregarded.

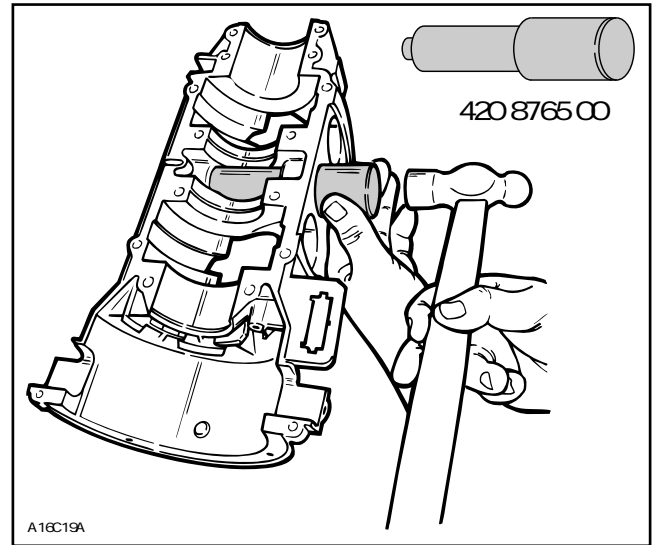
○ **NOTE** : The draining hole is used to detect seal malfunction. If you notice oil or coolant at the exit of the draining hole, this means that oil seal or coolant seal leaks.

- Install large shim and pack space with Molykote 111 (P /N 413 7070 00).
- Install rubber washer then support plate with its flange towards pump impeller. Use impeller support plate pusher (P /N 529 0207 00) for proper installation.

- Install small thrust washer then friction washer positioning its grooves against pump impeller.



- |                        |                      |
|------------------------|----------------------|
| 1. Large shim          | 5. Friction washer   |
| 2. Rubber washer       | 6. Flange this side  |
| 3. Support plate       | 7. Grooves this side |
| 4. Small thrust washer | 8. Pump impeller     |

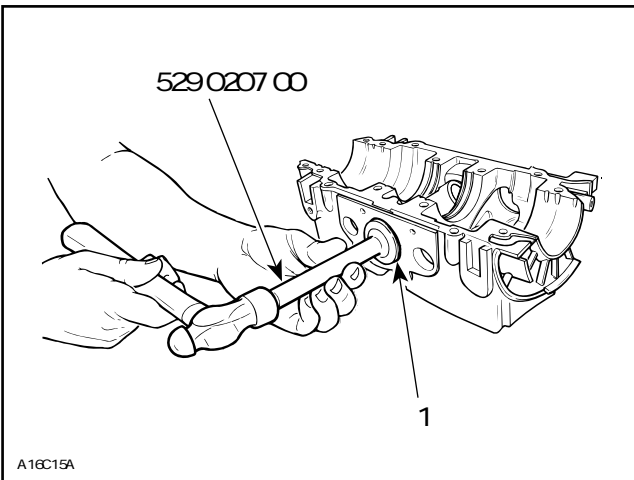


**4.6 Rotary Valve Shaft and Loctite 648**

**CAUTION :** Crankcase halves must be separated and crankshaft must not be present to install rotary valve shaft ass'y in crankcase.

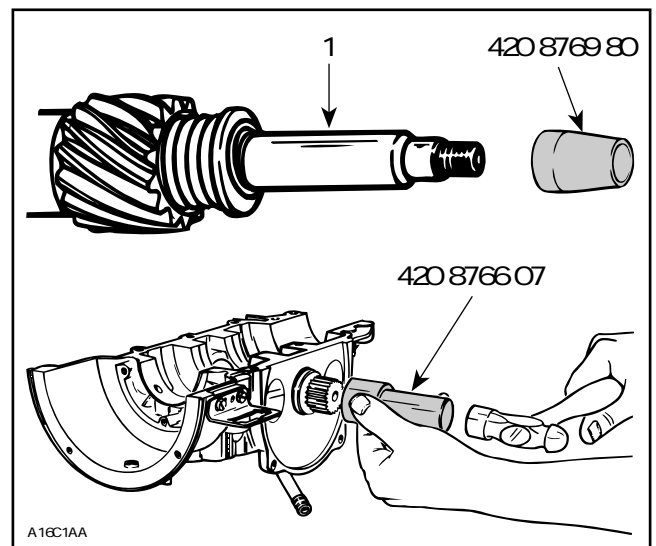
To install rotary valve shaft proceed as follows with the suitable tools :

- rotary valve seal pusher (P /N 420 8766 07)
- seal protector sleeve (P /N 420 8769 80)



1. Support plate

**NOTE :** After seals installation, check if the water pump end bearing is correctly positioned with bearing pusher (P /N 420 8765 00).



1. Rotary valve shaft

Apply Loctite 648 (P /N 420 8997 88) on shaft threads.

## Section 04 ENGINE

### Sub-Section 09 (ROTARY VALVE, COOLANT PUMP AND RESERVOIR)

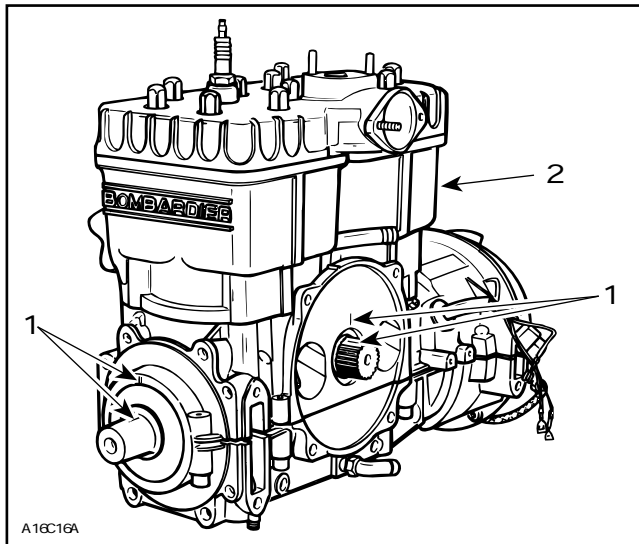
#### 1819 Pump Housing Bolt and Loctite 242 (Blue)

Apply Loctite 242 (blue) on bolt threads.

### ROTARY VALVE TIMING

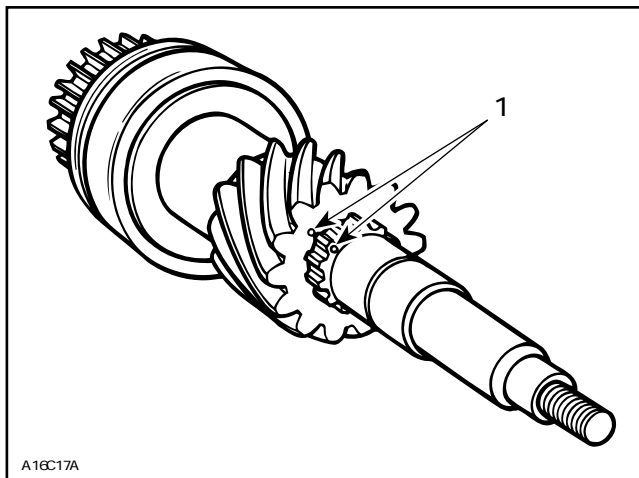
At disassembly, before removing rotary valve, note original rotary valve timing : it may be out of specifications by 1 to 4 degrees of retard or advance. To do so bring MAG piston to TDC and scribe a mark on crankshaft end at top (12 o'clock) and also on upper crankcase half.

Mark position of rotary valve shaft gear in relation to upper crankcase.



1. Mark here
2. MAG piston at TDC

After removing rotary valve shaft but before disassembling, mark brass gear in relation to shaft.



1. Mark here

These marks will be useful to time rotary valve exactly to the specifications.

**NOTE :** Tolerance of rotary valve timing is  $\pm 5$  degrees.

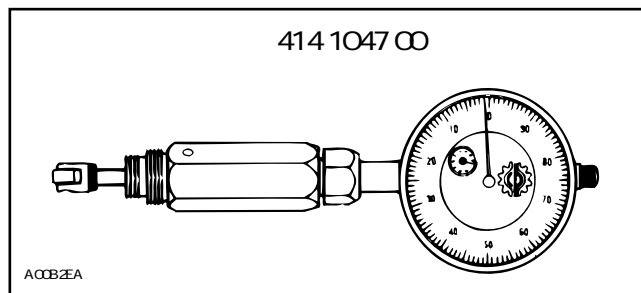
When the same crankcase is reassembled, the first timing method is to be followed. However, since replacement crankcases do not have timing marks (ridge), the second method is required. Take note that the second method is more accurate and may be used any time.

### Installation

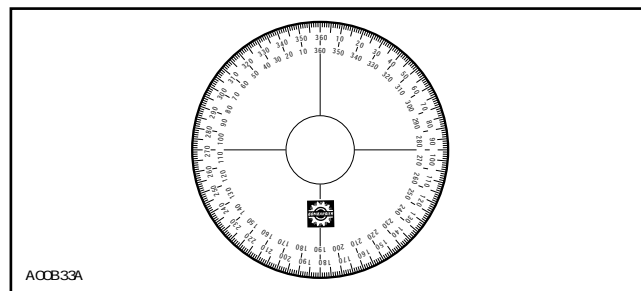
To correctly install rotary valve, proceed as follows :

- Turning crankshaft, bring **MAG**neto side piston to Top Dead Center.

Use a dial indicator (P /N 414 1047 00).



A degree wheel (P /N 414 3529 00) is required to measure rotary valve opening and closing angles in relation with **MAG**neto side piston. Degree wheel will be installed on rotary valve shaft for measurements.



Rotary valve must be set as specified in TECHNICAL DATA 10.

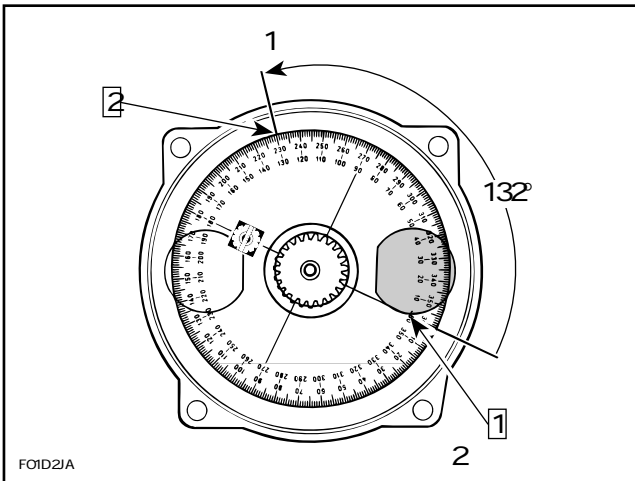
For the following instructions, use these specifications as example :

OPENING : 132° BTDC

CLOSING : 52° BTDC

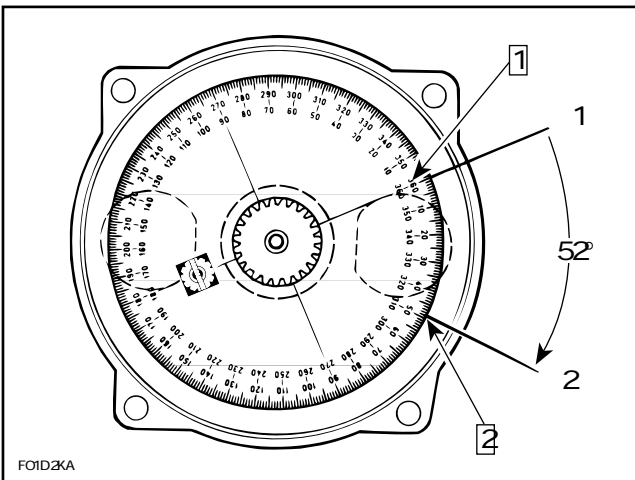
Proceed as follows :

- Turning crankshaft, bring **MAGneto** side piston to Top Dead Center as done before with a crankcase having a ridge.
- For opening mark, first align 360° line of degree wheel with **BOTTOM** of **MAGneto** side inlet port. Then, find 132° line on degree wheel and mark crankcase at this point.



Step **1**: Align 360° line of degree wheel here  
 Step **2**: Find 132° on degree wheel and mark here  
 1. Opening mark  
 2. Bottom of **MAGneto** inlet port

- For **closing** mark, first align 360° line of degree wheel with **TOP** of **MAGneto** side inlet port. Then, find 52° line on degree wheel and mark crankcase at this point.



Step **1**: Align 360° line of degree wheel here  
 Step **2**: Find 52° on degree wheel and mark here  
 1. Top of **MAGneto** inlet port  
 2. Closing mark

- Position rotary valve on shaft splines to have edges as close as possible to marks.

**NOTE** : Rotary valve is asymmetrical. Therefore, try turning it inside out then reinstall on splines to determine best installation position.

Apply injection oil on rotary valve before closing rotary valve cover.

**To Time Rotary Valve Exactly to Specifications**

**NOTE** : If desynchronization (out of spec.) is unknown, install rotary valve to determinate it before proceeding with the following.

**First Method**

Turn crankshaft to bring **MAG** piston to TDC. Scribed marks of crankshaft and upper crankcase must aligned. These marks were scribed while determinating desynchronization.

Install brass gear on rotary valve shaft with its marked spline 4 positions (splines) away for one degree of desynchronization. Turn in the opposite direction of desynchronization. For instance, a rotary valve is retarded by 2.5°, turn brass gear by 10splines counterclockwise.

**Second Method**

Turn crankshaft to bring **MAG** piston to TDC. Scribed marks of crankshaft and upper crankcase must aligned. These marks were scribed while determinating desynchronization.

For each degree of desynchronization, rotary valve shaft should be turned in the opposite direction by about 5splines on the rotary valve gear.

Note position of rotary valve gear mark when brass gear disengage worm gear of crankshaft at removal of rotary valve shaft. From this position, turn shaft accordingly then reinstall.

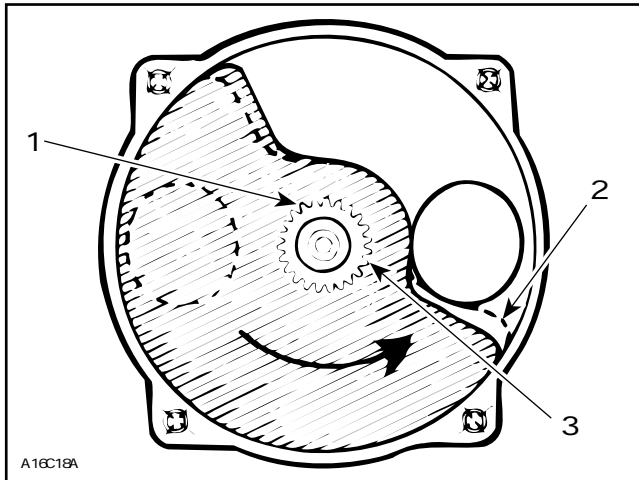
For instance, take a valve advanced by 2°.

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## Section 04 ENGINE

### Sub-Section 09 (ROTARY VALVE, COOLANT PUMP AND RESERVOIR)

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1. Position of mark when brass gear disengage worm gear
2. Advanced by 2°
3. Position of mark before installation (about 10 splines from original position)

#### 1,2 Screw and Rotary Valve Cover

Install O-ring and cover then torque screws to 22 N•m (16 lbf•ft) in a criss-cross sequence.