

12. V-MATIC BELT DRIVE SYSTEM

| | | | |
|---------------------|------|----------------------|-------|
| SERVICE INFORMATION | 12-1 | DRIVE BELT | 12-5 |
| TROUBLESHOOTING | 12-1 | DRIVE PULLEY | 12-6 |
| SYSTEM DESCRIPTION | 12-2 | CLUTCH/DRIVEN PULLEY | 12-10 |

SERVICE INFORMATION

- Avoid getting grease and oil on the V-belt and pulley drive faces in order to prevent belt slippage.
- Refer to the Model Specific manual for removal/installation of the left crankcase cover and specific clutch maintenance.

TROUBLESHOOTING

Engine starts but vehicle won't move

- Worn drive belt
- Damaged ramp plate
- Worn or damaged clutch lining

Engine stalls or vehicle creeps

- Broken clutch shoe spring

Poor performance at high speed or lack of power

- Worn drive belt
- Weak driven face spring
- Worn weight roller
- Faulty driven pulley face

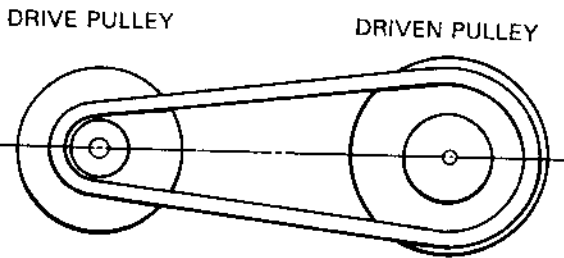
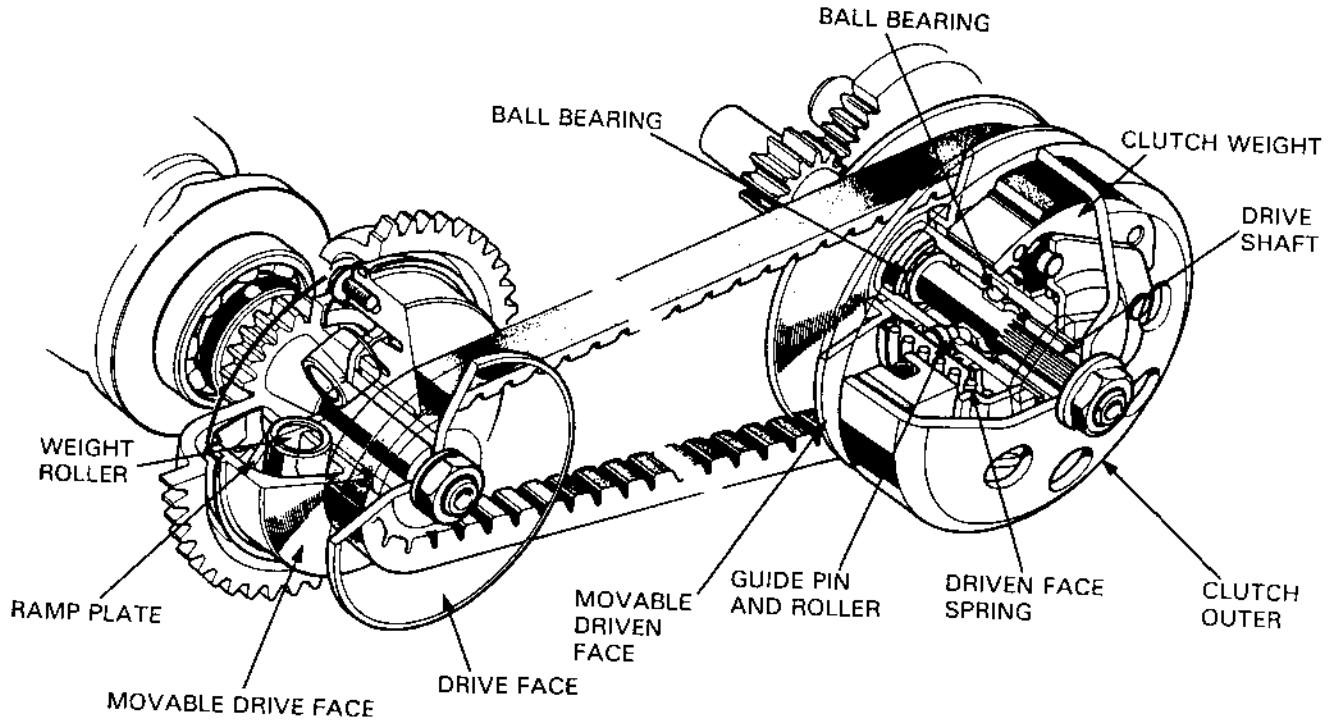
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V-MATIC BELT DRIVE SYSTEM

SYSTEM DESCRIPTION

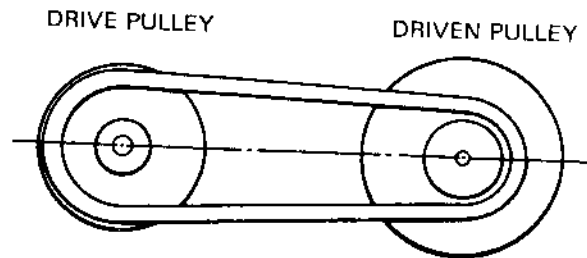
OPERATION

HONDA V-MATIC provides variable drive ratios between the engine and rear wheel according to the engine speed and load. It accomplishes this with two sets of pulleys, drive and driven, connected by a drive belt. The drive pulley is attached to the engine crankshaft. The driven pulley is attached to a shaft that incorporates a centrifugal clutch. In the V-Matic Drive, there is a final gear reduction between the driven pulley and rear wheel, providing an increase in torque.



When the engine is running at low speed, the unit increases or multiplies torque. This delivers more torque than a higher engine speed at a greater drive ratio.

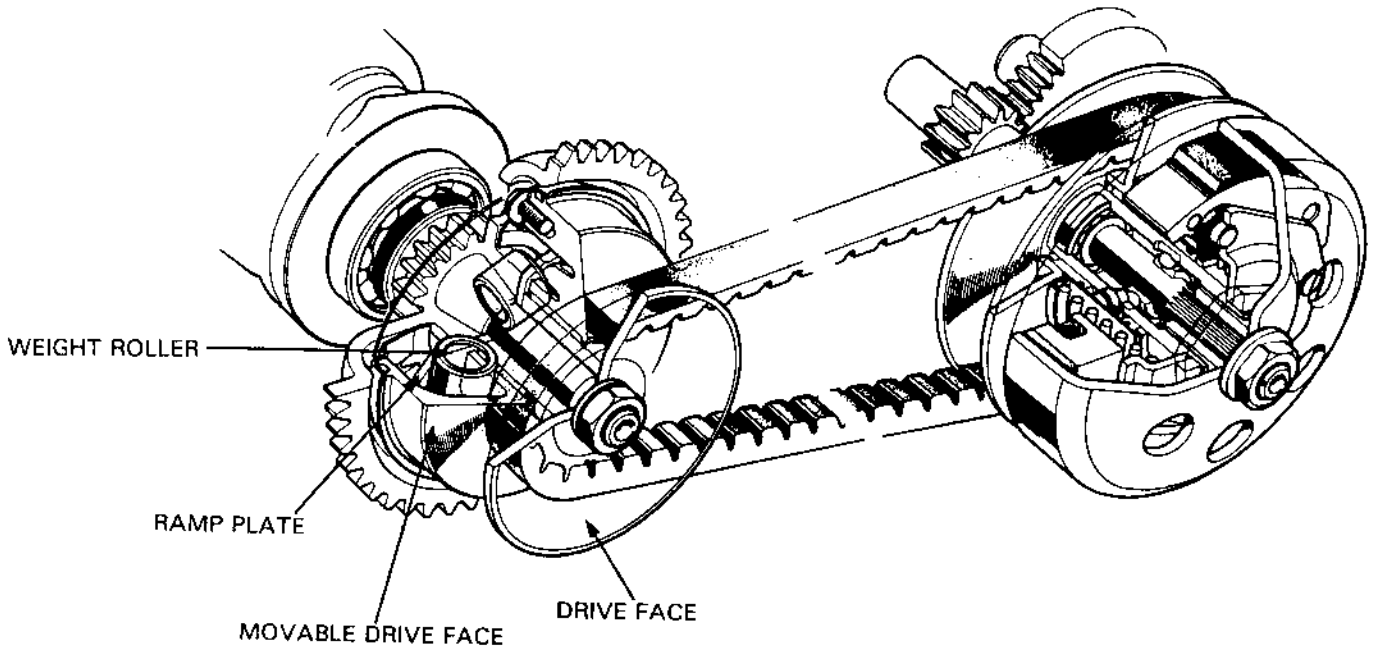
REDUCTION: LOW



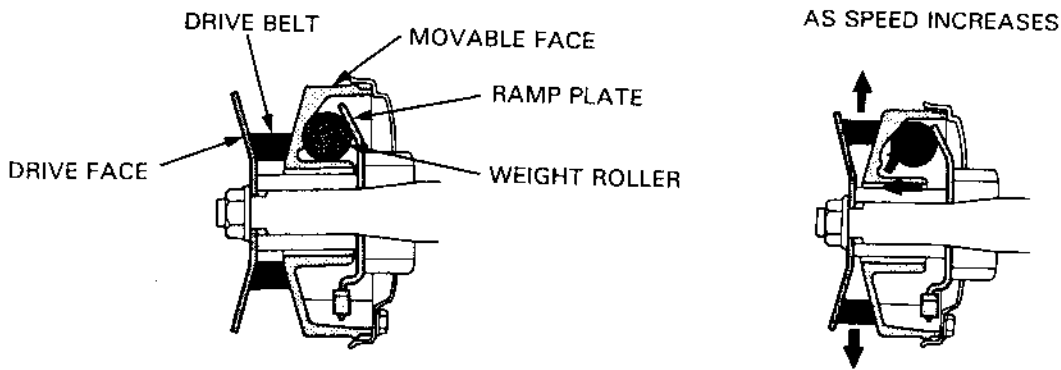
As the engine rpm increases, or the load on the rear wheel decreases, centrifugal force on the weight rollers throws the rollers outward. When the rollers are forced outward, they push the movable face of the drive pulley closer to the drive face. The result is a reduced drive ratio between the driven and drive pulleys.

REDUCTION: HIGH

DRIVE PULLEY OPERATION



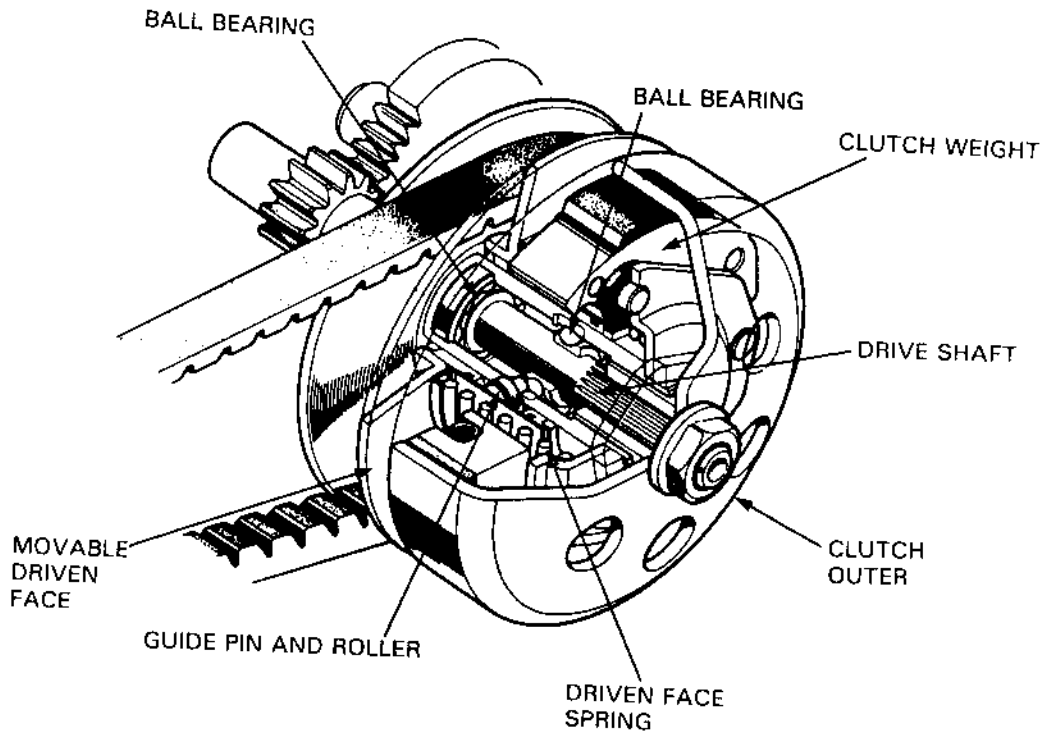
The drive pulley consists of a fixed and a movable face. The movable face is capable of sliding axially on the shaft of the fixed face. The ramp plate, which pushes the weight rollers against the drive face, is attached to the shaft of the drive face with a nut.



As the engine rpm increases, centrifugal force on the weight rollers is increased. This pushes the movable drive face toward the fixed face. This reduces the drive ratio by allowing the drive belt to run on a pulley of greater diameter.

V-MATIC BELT DRIVE SYSTEM

DRIVEN PULLEY/CENTRIFUGAL DRY CLUTCH



The centrifugal clutch is disengaged when the engine speed is low. When engine speed increases, the rotating clutch shoes of the clutch weight will expand as the centrifugal force increases. In this way, the clutch is automatically engaged. The drive belt is pushed out towards the drive face circumference of the drive pulley as the engine speed increases. As the belt remains constant in length, the belt, in turn, is pulled in toward the center of the driven face, pushing out the movable driven face and compressing the driven face spring. By this mechanism, the diameter of the belt on the driven pulley decreases at high engine speed. When the engine speed decreases, the belt is pulled back towards the center of the drive pulley releasing the tension on the belt. This allows the driven face spring to move the movable driven face toward the original position, pushing the belt back toward the circumference of the driven pulley. In the manner described above, the reduction ratio varies with engine speed automatically, without the need to manually shift between gear ratios.

DRIVE BELT

REMOVAL

Remove the left crankcase cover (see Model Specific manual).

Hold the clutch outer using the universal holder and remove the nut and clutch outer.

 S TOOL

UNIVERSAL HOLDER

07725-0030000

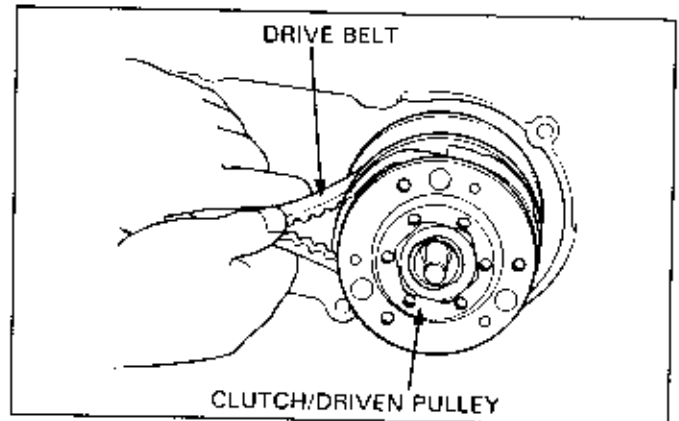
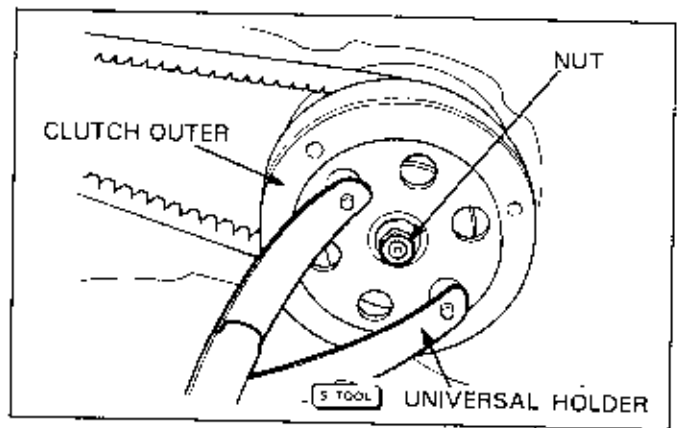
CAUTION

- Use the special tool when loosening the lock nut. Holding the rear wheel or rear brake will damage the final reduction system.

Squeeze the drive belt into the pulley groove as shown so that it slackens enough to remove the driven pulley from the drive shaft.

Remove the driven pulley/clutch with the drive belt in place.

Remove the drive belt from the driven pulley groove and drive pulley groove.



INSPECTION

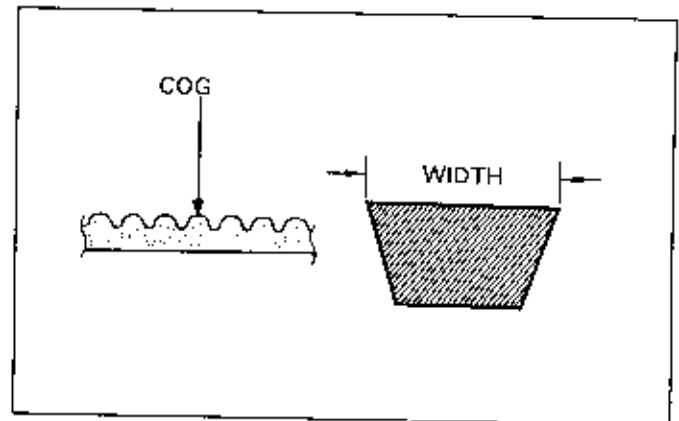
Check the drive belt for cracks, pry separation and wear; replace as necessary.

Measure the width of the drive belt as shown.

Replace the belt if the service limit is exceeded.

NOTE

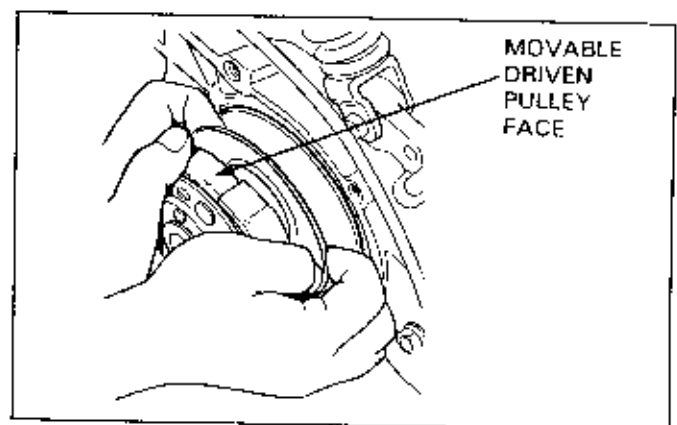
- Use only a genuine HONDA replacement drive belt.
- Do not get oil or grease on the drive belt or pulley faces. Clean off any grease or oil before reinstalling.



INSTALLATION

Temporarily install the driven pulley/clutch assembly on the drive shaft.

Turn the pulley clockwise and spread the faces apart while installing the drive belt.



V-MATIC BELT DRIVE SYSTEM

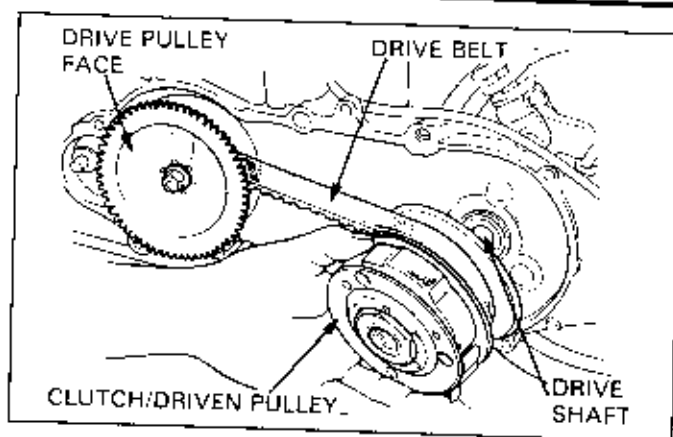
Remove the pulley assembly once with the drive belt installed.

NOTE

- Hold the pulley faces apart preventing them from closing.

Put the drive belt over the drive pulley.

Reinstall the driven pulley on the drive shaft with the drive belt attached.



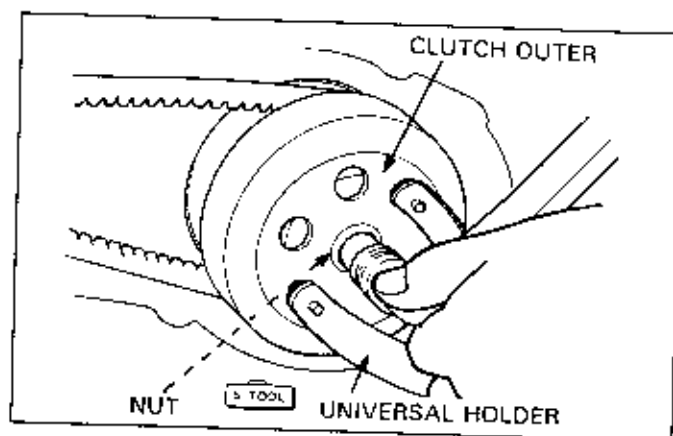
Install the clutch outer and the universal holder. Tighten the nut to the specified torque.

S TOOL

UNIVERSAL HOLDER

07725-0030000

Reinstall the left crankcase cover (see Model Specific manual).



DRIVE PULLEY

REMOVAL

Remove the left crankcase cover (see Model Specific manual).

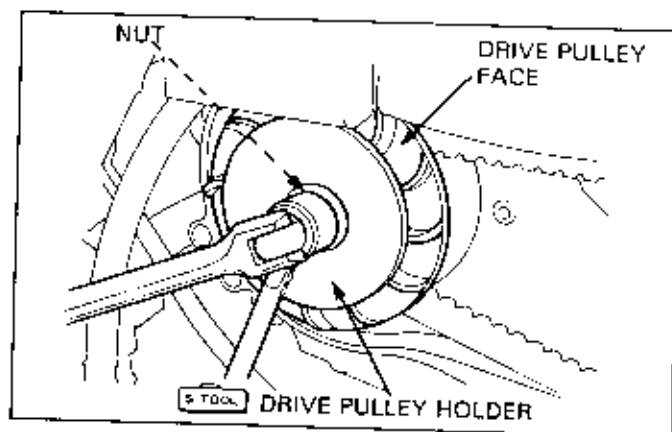
Hold the drive pulley face using the drive pulley holder and remove the nut and washer.

Remove the drive pulley face.

S TOOL

DRIVE PULLEY HOLDER

07923-KM10000

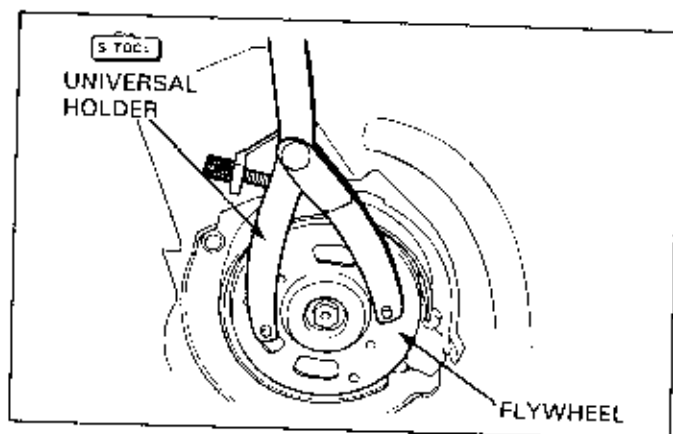


If the drive pulley holder cannot be used, remove the cooling fan at the right side of the crankshaft, and hold the flywheel with the universal holder.

S TOOL

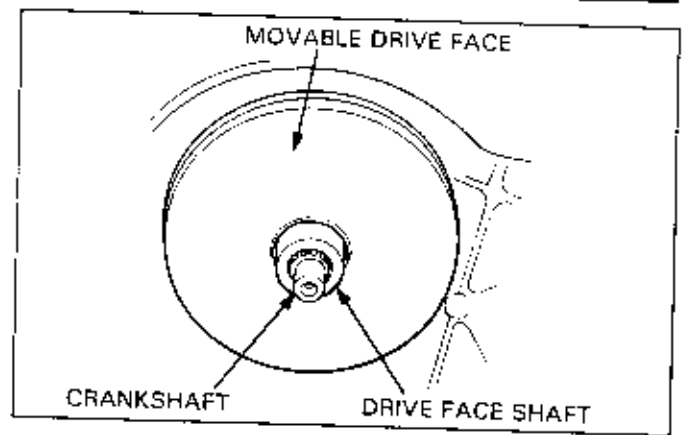
UNIVERSAL HOLDER

07725-0030000



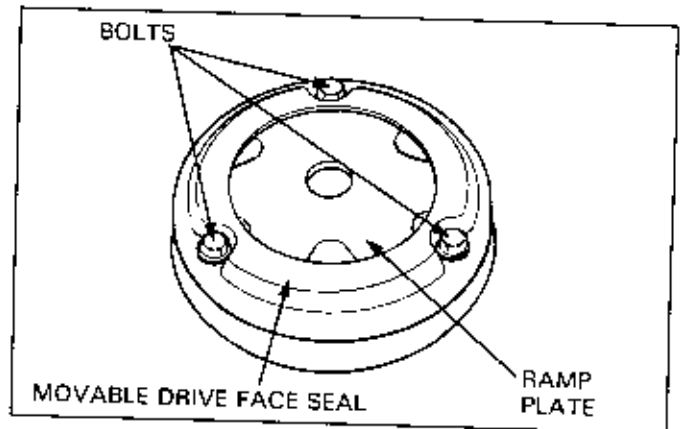
DISASSEMBLY

Remove the movable drive face and drive face shaft from the crankshaft.

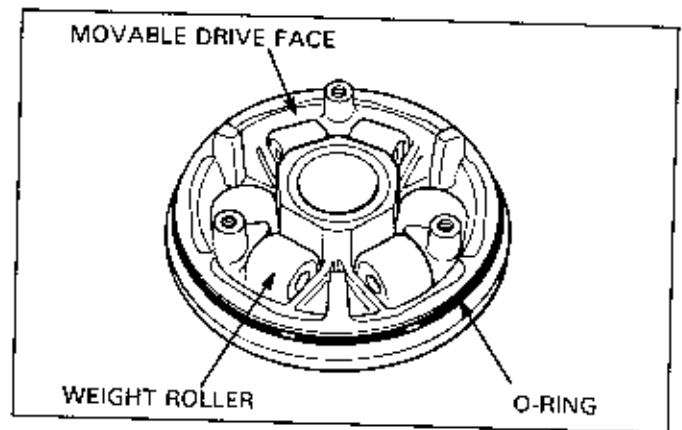


Remove the three bolts attaching the movable drive face seal and remove the seal.

Remove the ramp plate.



Remove the weight rollers and the O-ring from the movable drive face. Discard the O-ring.

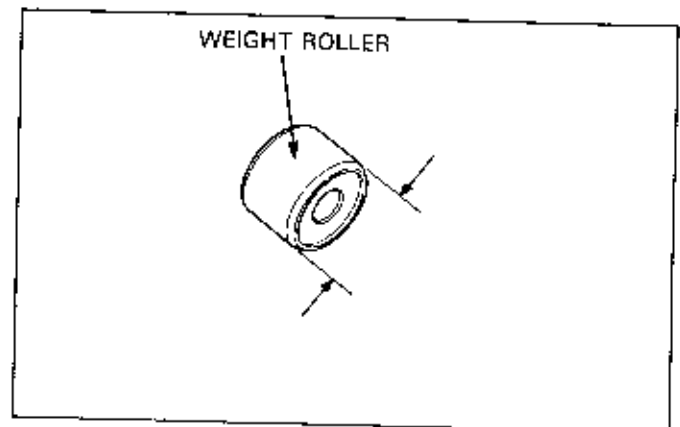


INSPECTION

The weight rollers push on the movable drive pulley face (by centrifugal force); worn or damaged weight rollers will interfere with this force.

Check the rollers for wear or damage and replace as necessary.

Measure the O.D. of each roller, replace if the service limit is exceeded.

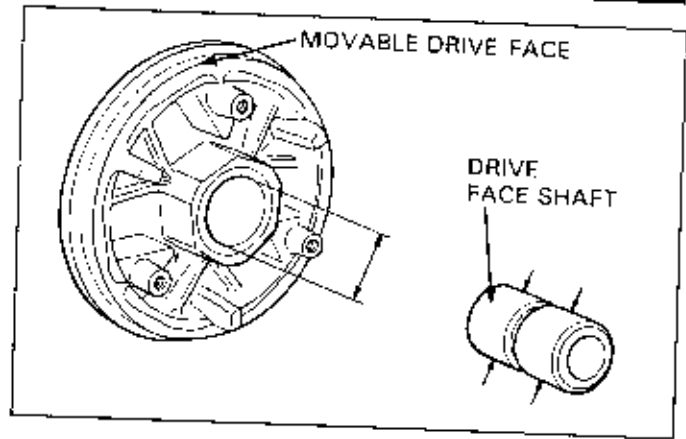


V-MATIC BELT DRIVE SYSTEM

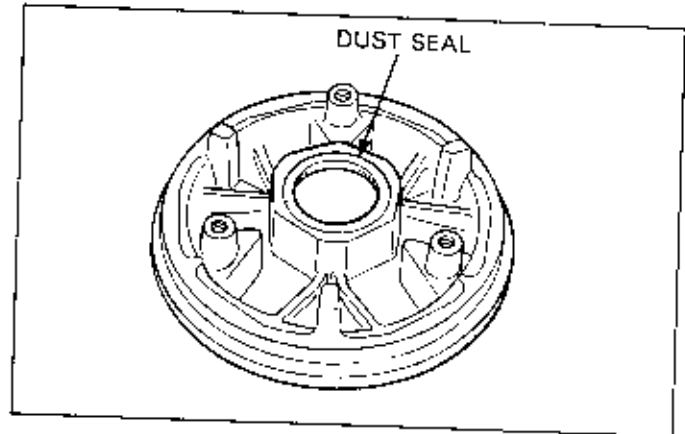
Check the drive face shaft for wear or damage and replace as necessary.

Measure the O.D. of the drive face shaft. Replace the shaft if the service limit is exceeded.

Measure the I.D. of the drive face. Replace it if the service limit is exceeded.



If a dust seal is installed on the drive face, check it for damage and replace as necessary.



ASSEMBLY/INSTALLATION

Pack the inside of the movable drive face with the specified amount of grease, then install the weight rollers.

NOTE

- Use only the specified grease in the specified amount or the clutch operation will be affected.
- Apply the grease equally over the inside of the pulley face.

SPECIFIED GREASE (Lithium Based Grease):

- Mitsubishi HD-3
- Nippon Sakiyu Lipanox Deluxe 3
- Idemitsu Coronex 3
- Sta-Lube MP #3141
- Bal-Ray Moly Lube 126 EP#0

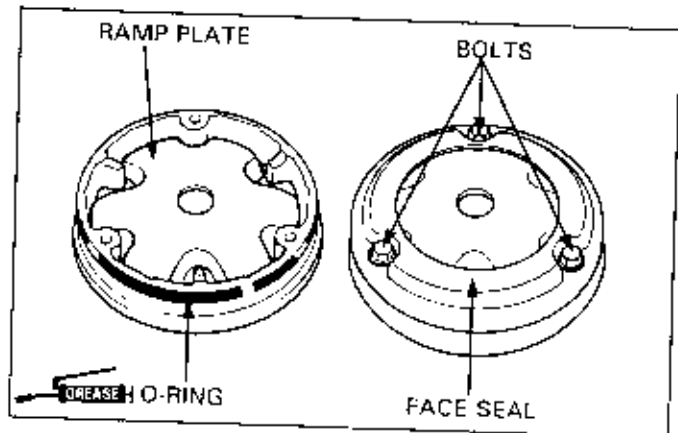
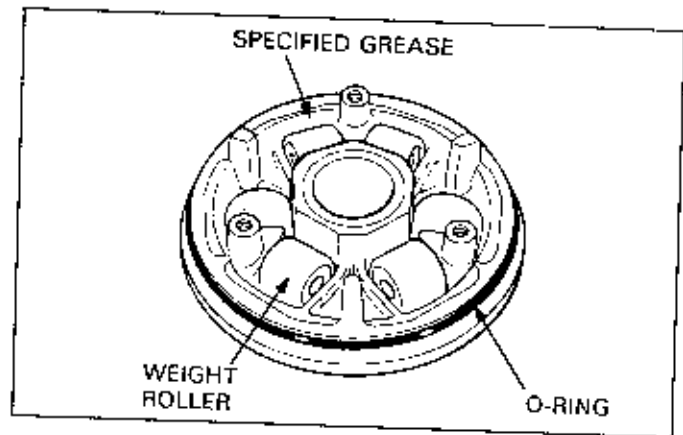
Apply grease to a new O-ring and install it.

Install the ramp plate.

Install the face seal and tighten the bolts to the specified torque.

NOTE

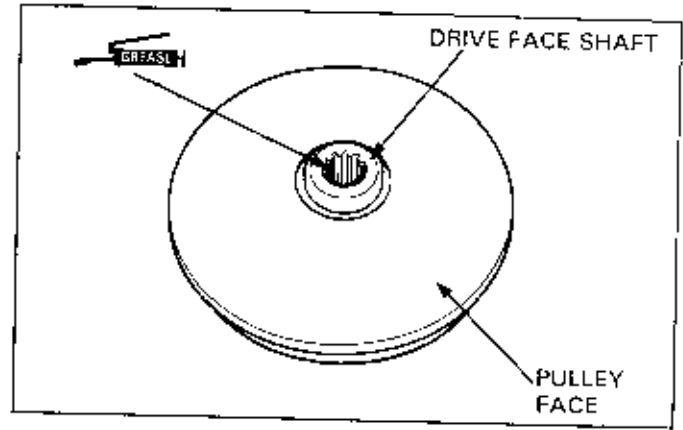
- Make sure that the O-ring is correctly installed.



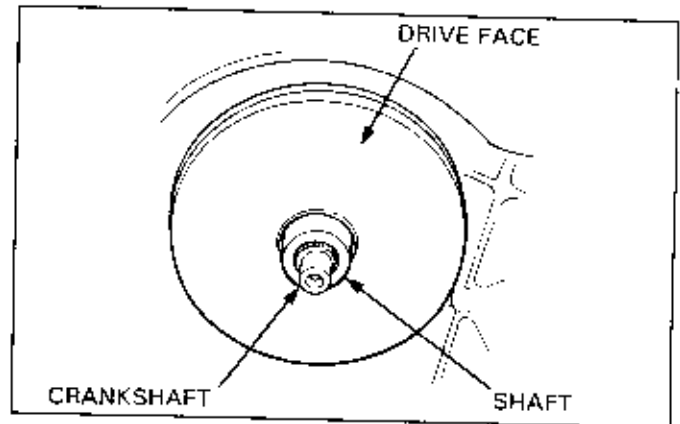
Coat the inside of the drive face shaft with 4–5 g of grease. Install the shaft with the splined hole facing out.

NOTE

- Do not get the grease on the pulley face. Remove any misplaced grease with a degreasing agent.

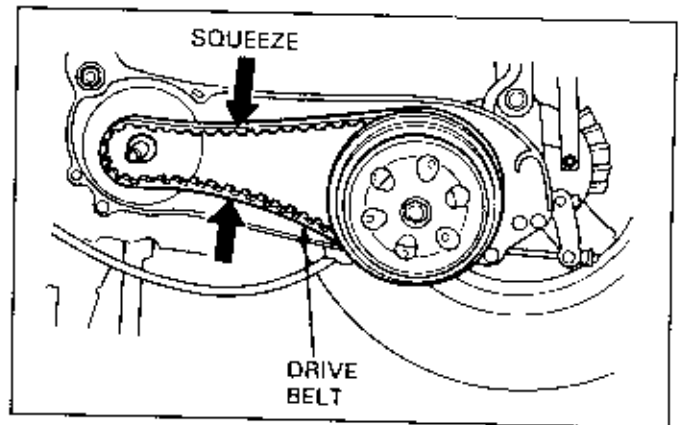


Install the movable face assembly on the crankshaft.



DRIVE PULLEY FACE INSTALLATION

Squeeze the drive belt into the pulley groove and pull the drive belt over the drive face shaft.



Install the drive pulley face, washer and nut.

NOTE

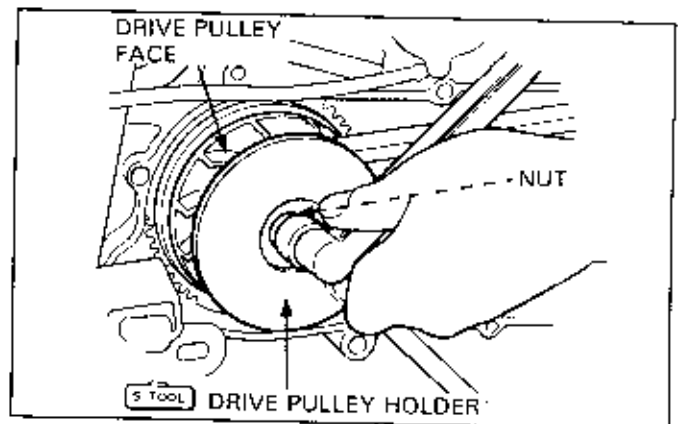
- Be sure both pulley faces are free of oil and grease.

Hold the drive pulley face using the drive pulley holder and tighten the nut to the specified torque.

S TOOL

DRIVE PULLEY HOLDER

07923-KM10000



V-MATIC BELT DRIVE SYSTEM

NOTE

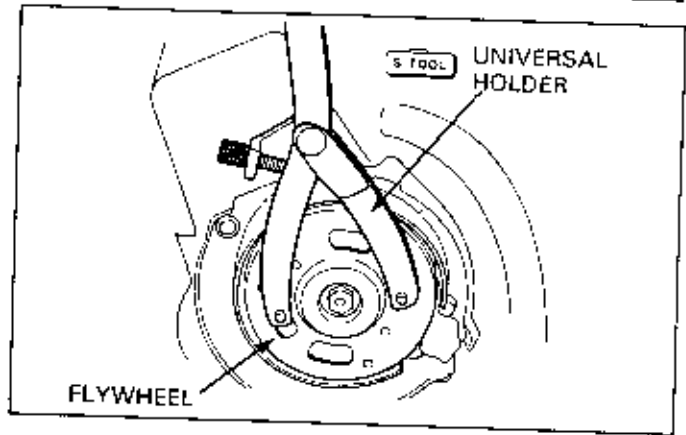
- If the pulley holder cannot be used, remove the cooling fan and hold the flywheel with the universal holder.

 S TOOL

UNIVERSAL HOLDER

07725-0030000

Install the left crankcase cover (see Model Specific manual).



CLUTCH/DRIVEN PULLEY

DISASSEMBLY

Remove the drive belt and clutch/driven pulley (see page 12-5).

Install a clutch spring compressor on the pulley assembly and tighten the tool to gain access to the nut.

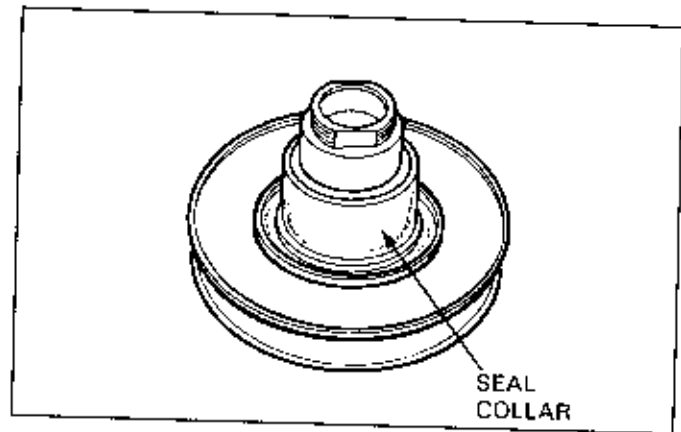
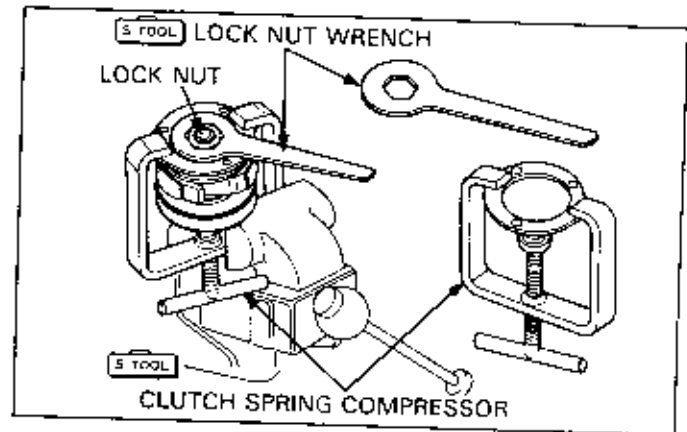
NOTE

- Do not overtighten the compressor.

Hold the clutch spring compressor in a vise as shown and remove the lock nut using the lock nut wrench.

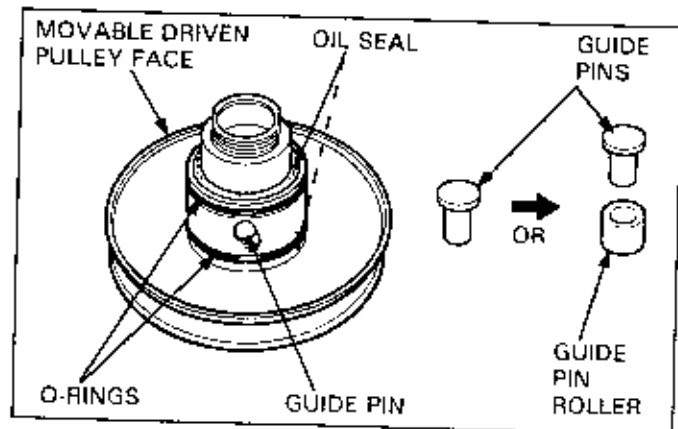
Loosen the clutch spring compressor and disassemble the clutch and spring from the driven pulley.

Remove the seal collar from the driven pulley.



Remove the guide pins and guide pin rollers and the movable driven pulley face.

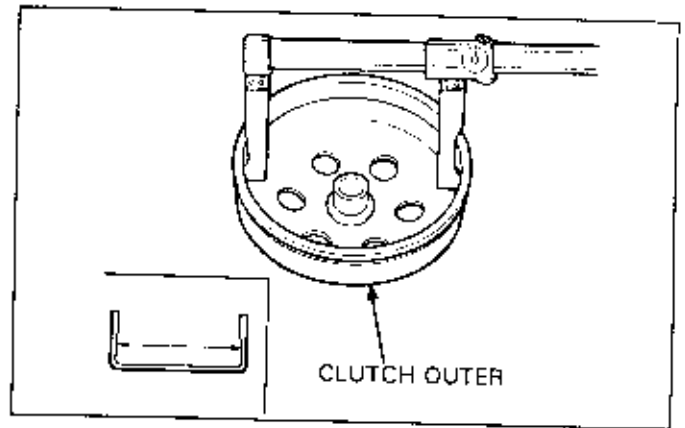
Remove the O-ring and oil seals from the movable face.



INSPECTION

Clutch Outer

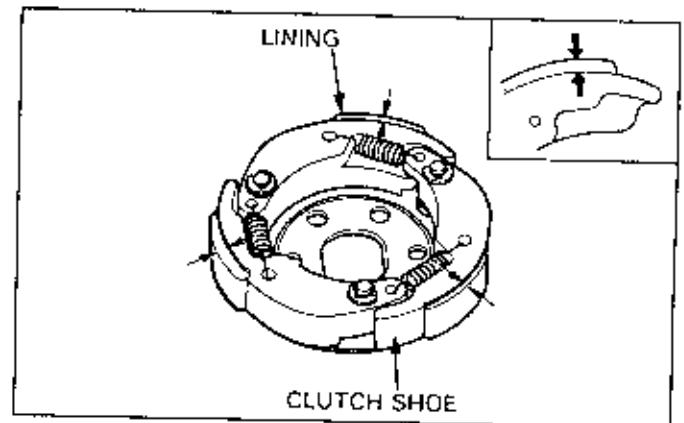
Measure the I.D. at shoe contact surface of the clutch outer.
Replace the outer if the service limit is exceeded.



Clutch Shoe

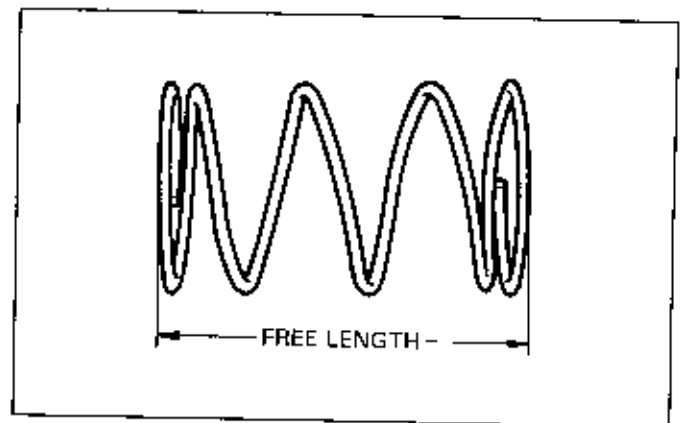
Measure the thickness of each shoe; replace if the service limit is exceeded.

Refer to page 12-12 for clutch shoe replacement.



Driven Pulley Spring

Measure the free length of the driven pulley spring and replace if the service limit is exceeded.



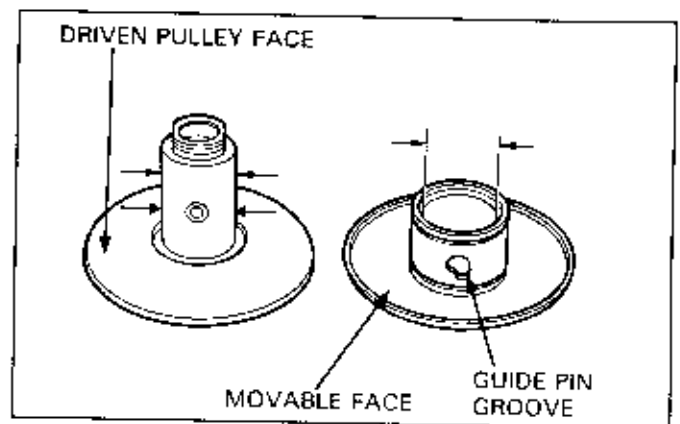
Driven Pulley

Check the following:

- Both faces for damage or excessive wear.
- Guide pin groove for damage or deformation.

Replace damaged or worn parts as necessary.

Measure the O.D. of the driven face and the I.D. of the movable driven face. Replace either part if the service limit is exceeded.



V-MATIC BELT DRIVE SYSTEM

Driven Face Bearing Inspection

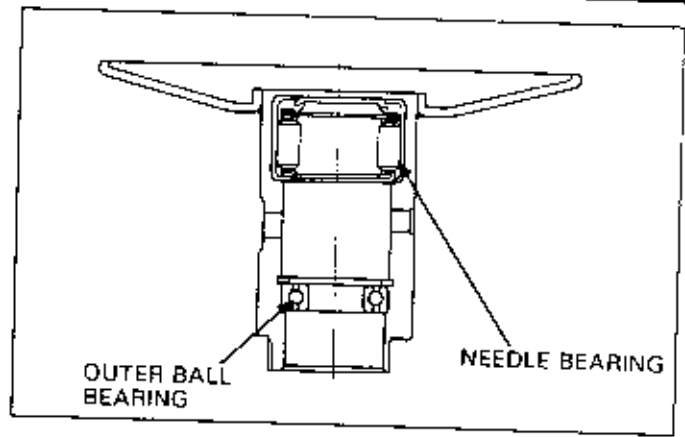
Check the inner bearing oil seal (if installed) for damage; replace as necessary.

Check the needle bearing for damage or excessive play and replace as necessary.

Turn the inner race of the outer bearing with your finger. Check that the bearing turns smoothly and quietly, and that the bearing outer race fits securely. Replace the bearing if necessary.

NOTE

- Some models use two ball bearings.



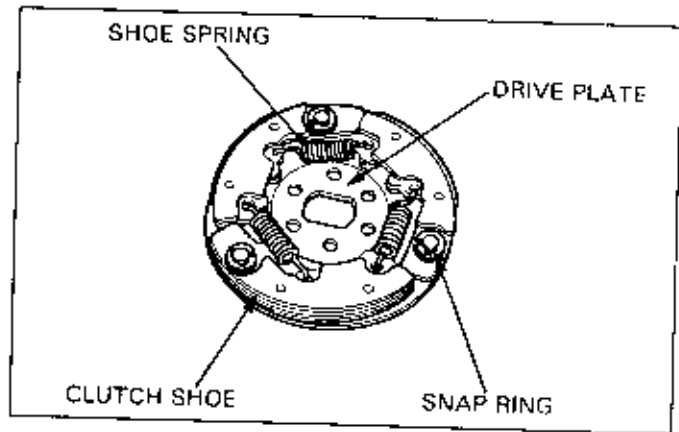
Refer to page 12-13 for bearing replacement.

CLUTCH SHOE REPLACEMENT

Remove the snap rings and washers, then remove the clutch shoes and shoe springs from the drive plate.

NOTE

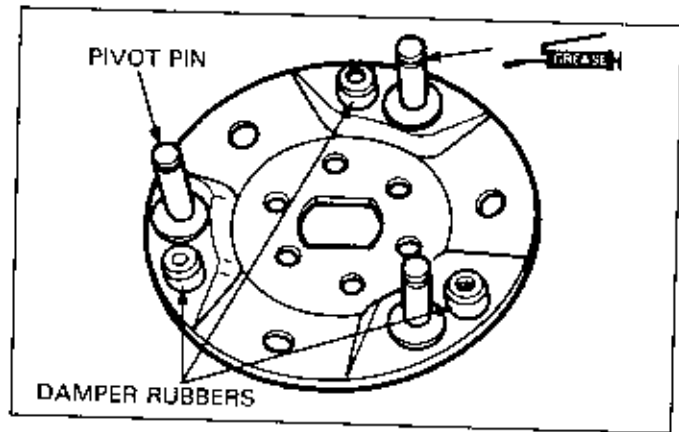
- Some models use one retainer plate instead of three snap rings.



Check the shoe springs for damage or loss of tension.

Check the damper rubbers for damage or deformation; replace as necessary.

Apply a small amount of grease on the pivot pins.

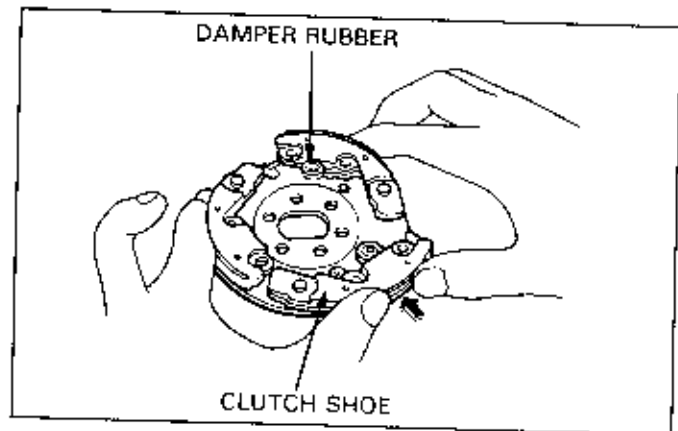


Install new clutch shoes on the pivot pins and push them into place.

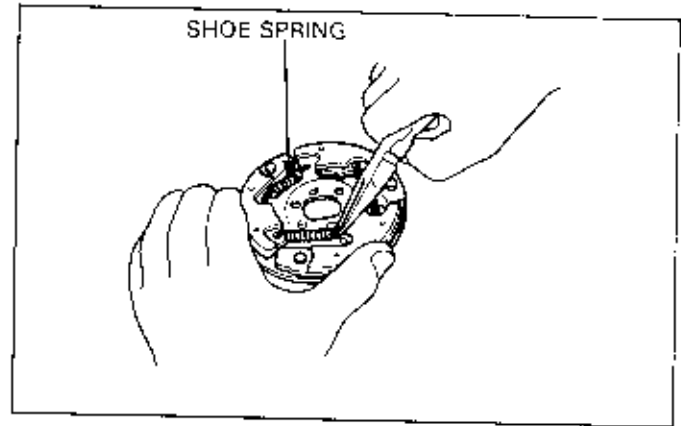
Use a small amount of grease on the pivot pin and keep grease off of the brake shoes. Replace the brake shoes if there is any grease on them.

CAUTION

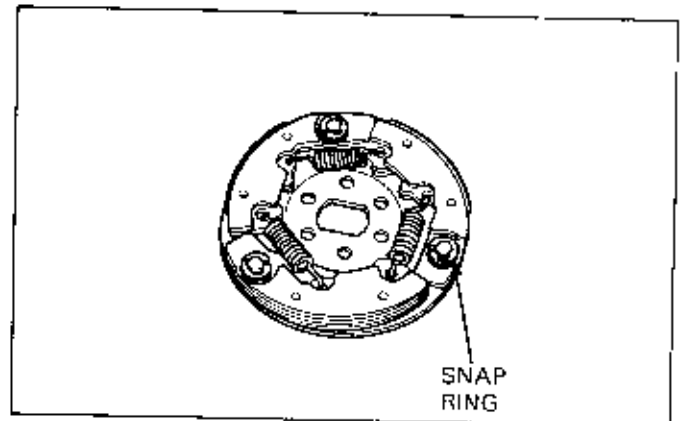
- Grease or oil damages clutch shoes and can lead to a loss of engaging ability.



Use pliers to hook the springs to the shoes.



Install the snap rings and washers or retainer plate onto the pivot pins.



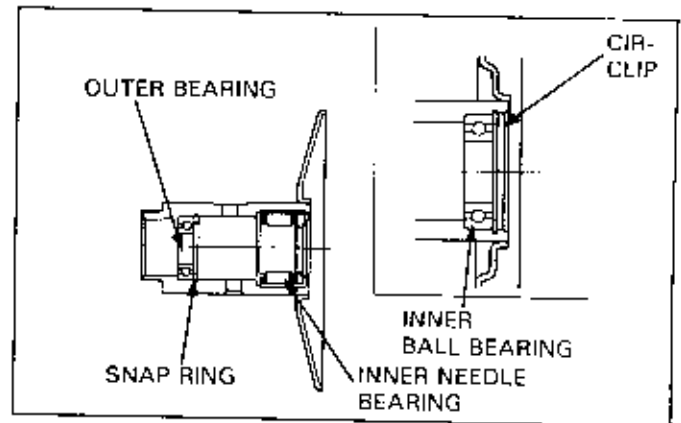
DRIVEN FACE BEARING REPLACEMENT

Remove the inner bearing.

NOTE

- If the driven face has an oil seal at inner bearing side, remove the oil seal first.
- If a ball bearing is used on the inside, remove the snap ring first then remove the bearing.

Remove the snap ring then drive out the outer bearing toward the inner bearing side.



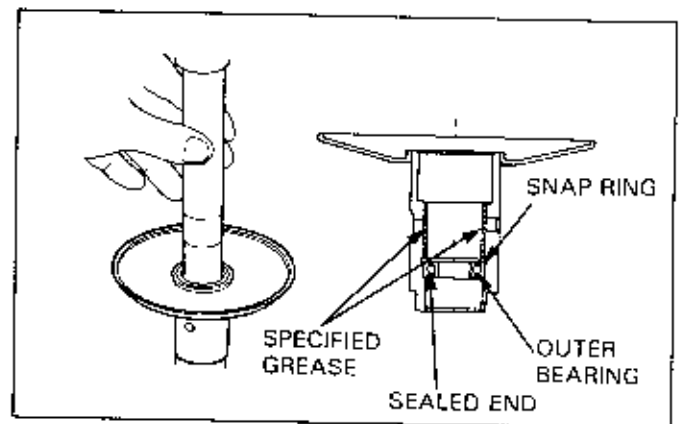
Drive a new outer bearing into place with the sealed end toward the outside.

Install the snap ring securely.

Apply the specified amount of specified grease as shown.

SPECIFIED GREASE (Lithium Based Grease):

- Mitsubishi HD-3
- Nippon Sekiyu Lipanox Deluxe 3
- Idemitsu Coronex 3
- Sta-Lube MP #3141
- Bel-Ray Moly Lube 126 EP#0



V-MATIC BELT DRIVE SYSTEM

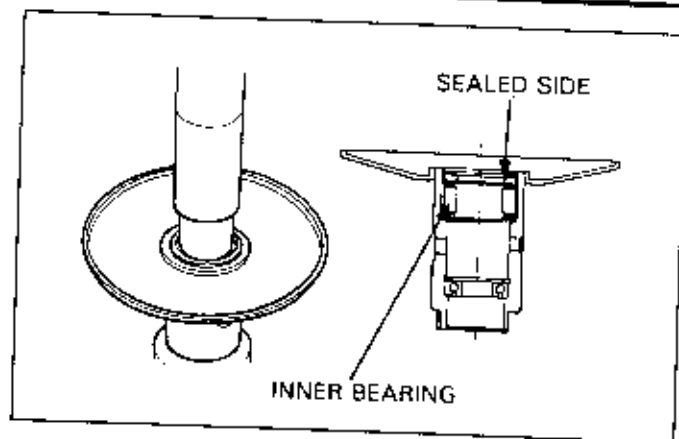
Install in a new inner bearing.

NOTE

- Install the bearing with the sealed side facing out.
- Install the needle bearing using a hydraulic press. Install the ball bearing by driving it in or using a hydraulic press.

Install the snap ring into the groove in the driven face.

Install a new oil seal with the lip toward the bearing (if required).



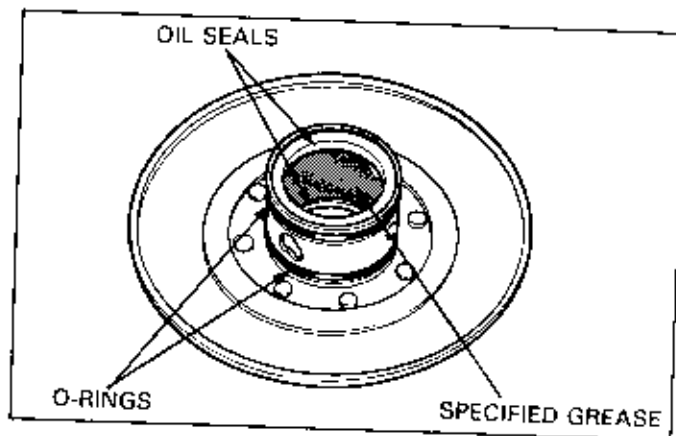
CLUTCH/DRIVEN PULLEY ASSEMBLY

Install new oil seals and O-rings on the movable driven pulley face.

Lubricate the inside of the movable face with the specified amount of grease.

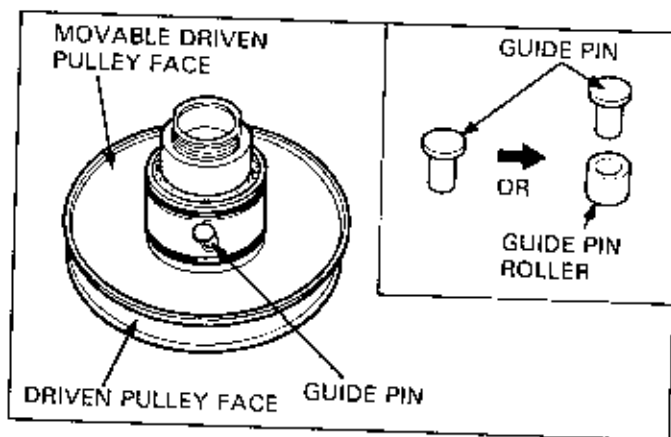
SPECIFIED GREASE (Lithium Based Grease):

- Mitsubishi HD-3
- Nippon Sekiyu Lipanox Deluxe 3
- Idemitsu Coronax 3
- Sta-Lube MP #3141
- Bel-Ray Moly Lube 126 EP#0

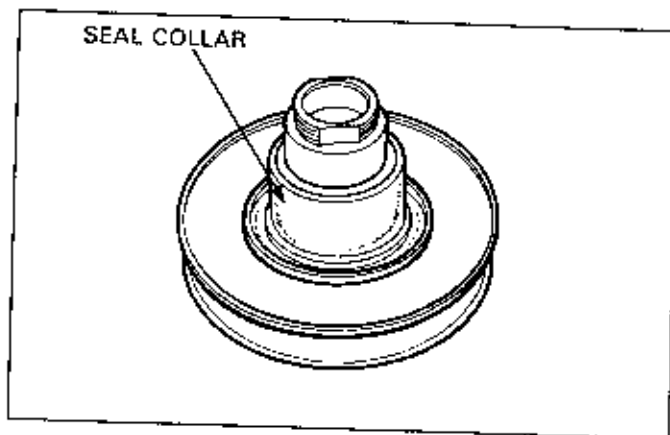


Install the movable face on the driven pulley face.

Install the guide pins, or guide pins and guide pin rollers.



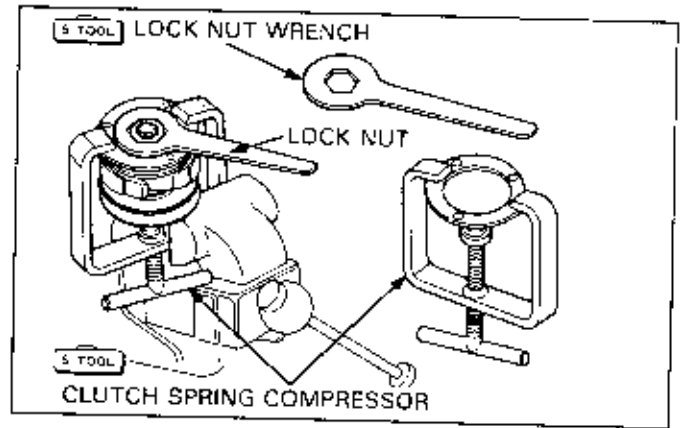
Install the seal collar.



Assemble the driven pulley, spring and clutch in the clutch spring compressor. Compress the assembly by turning the tool handle until the lock nut can be installed.

Clamp the clutch spring compressor in a vise and tighten the lock nut to the specified torque using the lock nut wrench. Remove the spring compressor.

Install the clutch/driven pulley and drive belt onto the drive shaft (see page 12-5).



13. TRANSMISSION

| | | | |
|---------------------|------|--------------------------|------|
| SERVICE INFORMATION | 13-1 | TRANSMISSION DISASSEMBLY | 13-6 |
| TROUBLESHOOTING | 13-1 | TRANSMISSION INSPECTION | 13-6 |
| SYSTEM DESCRIPTION | 13-2 | TRANSMISSION ASSEMBLY | 13-7 |

SERVICE INFORMATION

- Refer to the Model Specific manual for proper servicing information on the particular model in question.

TROUBLESHOOTING

Hard to shift

- Improper clutch operation
- Incorrect engine oil weight
- Incorrect clutch adjustment
- Bent shift forks
- Bent fork shaft
- Bent fork claw
- Damaged shift drum cam grooves
- Bent shift spindle

Transmission jumps out of gear

- Worn gear dogs or slots
- Bent fork shaft
- Broken shift drum stopper
- Worn or bent shift forks
- Broken shift linkage return spring

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14. CRANKCASE/CRANKSHAFT

| | | | |
|-----------------------|------|-------------------------|-------|
| SERVICE INFORMATION | 14-1 | CRANKSHAFT MAIN BEARING | 14-3 |
| TROUBLESHOOTING | 14-1 | CONNECTING ROD BEARINGS | 14-8 |
| SYSTEM DESCRIPTIONS | 14-2 | CONNECTING ROD | 14-10 |
| CRANKSHAFT INSPECTION | 14-3 | | |

SERVICE INFORMATION

- Refer to the Model Specific manual for removal/installation of the crankshaft.
- Mark and store the bearing inserts to be sure of their correct locations for reassembly. If the inserts are improperly installed they will block the oil holes, causing insufficient lubrication and eventual engine seizure.

TROUBLESHOOTING

Excessive noise

- Worn connecting rod big end bearing
- Bent connecting rod
- Worn crankshaft main bearing

SYSTEM DESCRIPTIONS

The crankshaft changes the reciprocating action of the piston and connecting rod into rotary motion, so the energy can be transmitted to the clutch and transmission.

It is necessary that the reciprocating and rotating components are properly balanced to produce a smooth running engine.

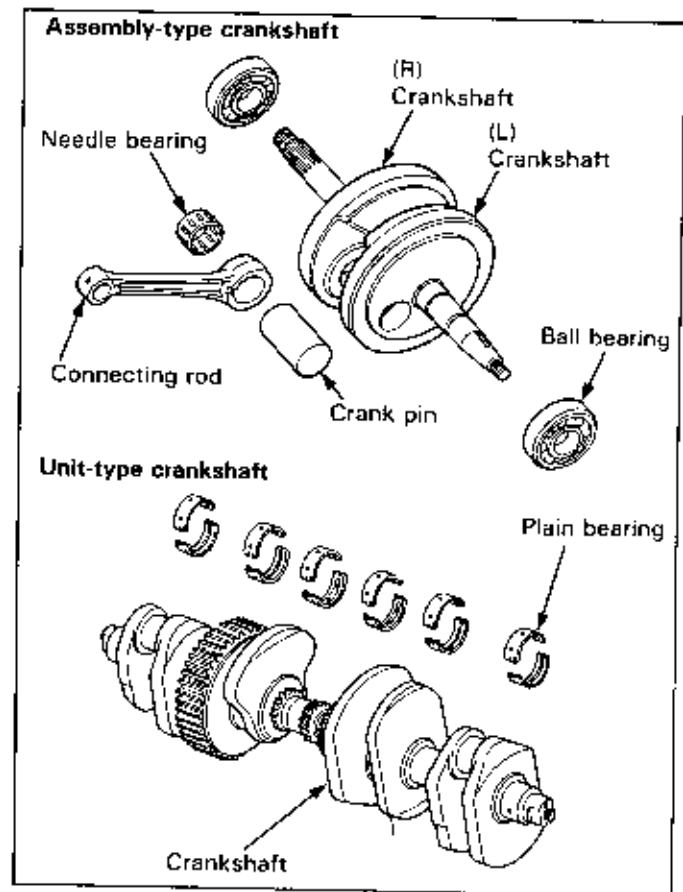
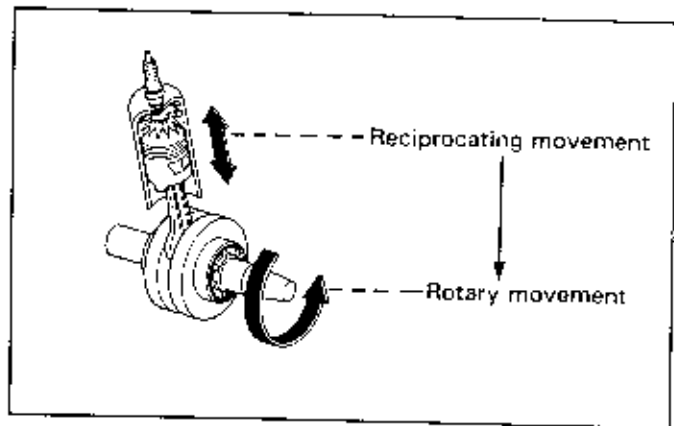
Stresses on the components increase proportional with an increase in rpm's.

Because of this increased stress, it is critical that the balance is maintained when components are replaced.

There are two types of crankshafts; the assembly type in which the right and left crankshafts are assembled with the aid of a crank pin, and the single unit type, in which a unibody crankshaft is employed. In the case of the former, caution should be exercised when handling it, because if it is dropped, the crank pin will be knocked out of alignment.

The unit type employs plain-type main bearings. While the crankshaft is designed to rest directly on the metal bearing material, strictly speaking, the crankshaft and metals are lubricated on their surfaces by an oil film.

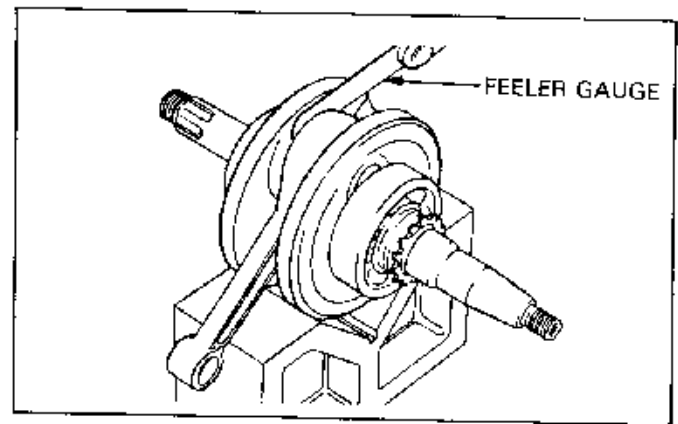
Consequently, scratches, burrs or dust on the bearing surface spoils the oil film, leading to bearing seizure.



CRANKSHAFT INSPECTION

SIDE CLEARANCE

Measure the side clearance by inserting the feeler gauge between the crankshaft and connecting rod big end as shown.

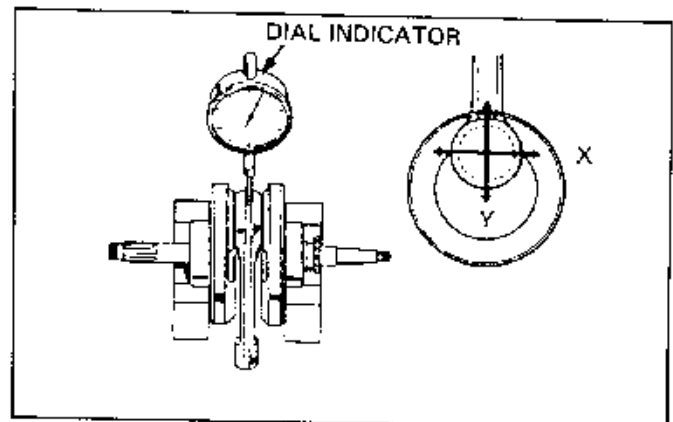


RADIAL CLEARANCE (ASSEMBLY-TYPE CRANKSHAFT ONLY)

Measure the side clearance at the connecting rod big end with a feeler gauge. Replace the crankshaft if the service limit is exceeded.

Measure the connecting rod radial clearance in both X and Y directions.

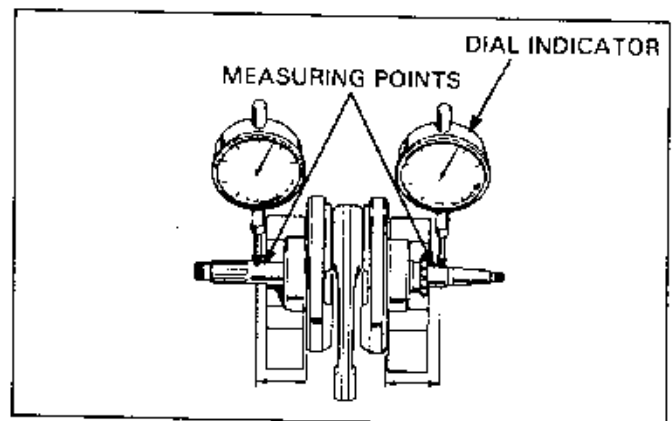
Replace the crankshaft if the service limit is exceeded.



Measure the crankshaft runout using dial indicators.

NOTE

- The single unit crankshaft uses the plain bearings at the main journal. Excessive runout can cause engine seizure.
- Refer to the Model Specific manual for measuring and supporting points.



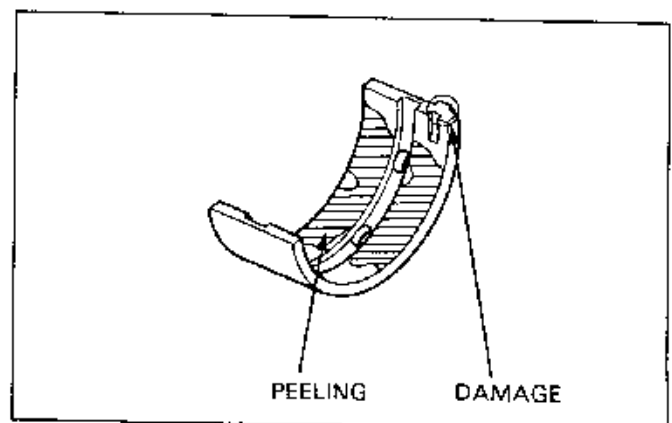
CRANKSHAFT MAIN BEARING

OIL CLEARANCE INSPECTION

NOTE

- Main bearings may be either two-piece or one-piece bushing types.

Check the bearing inserts for unusual wear, damage or peeling and replace as necessary.



CRANKCASE/CRANKSHAFT

Two-Piece Type:

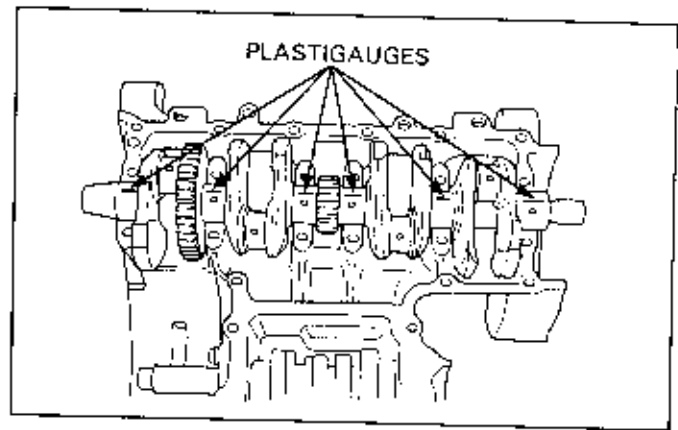
Wipe all oil from the bearing inserts and journals.

Reinstall the upper crankcase's main bearing inserts, then carefully lower the crankshaft in place.

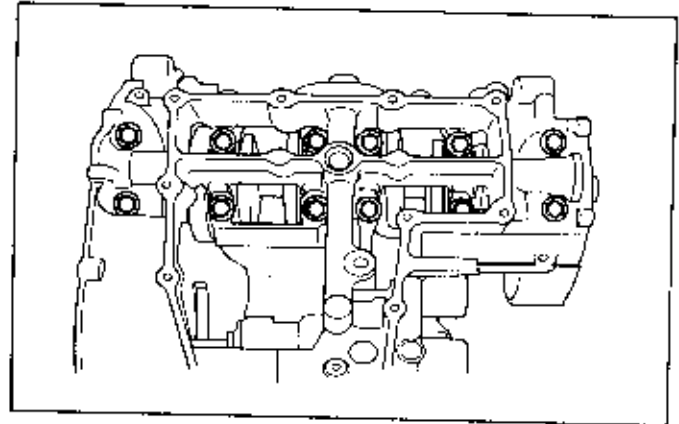
Put a piece of plastiguage on each journal.

NOTE

- Do not put the plastiguage over the oil holes.
- Do not rotate the crankshaft during the inspection.

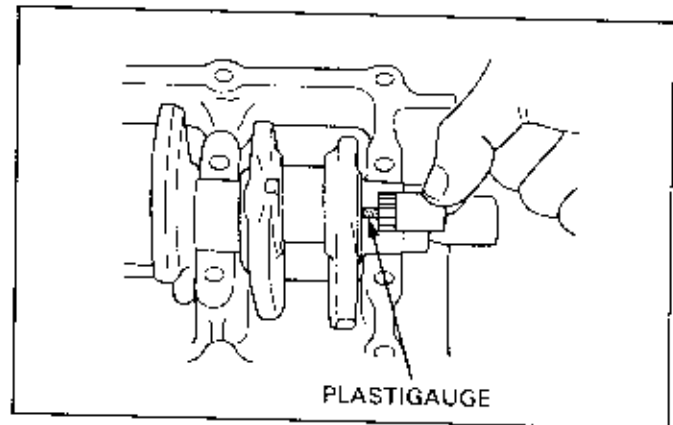


Install the main bearing inserts on the correct journals in the lower crankcase, then assemble and tighten the bolts evenly in 2 or 3 steps to the specified torque.



Remove the lower crankcase and measure the compressed plastiguage on each journal.

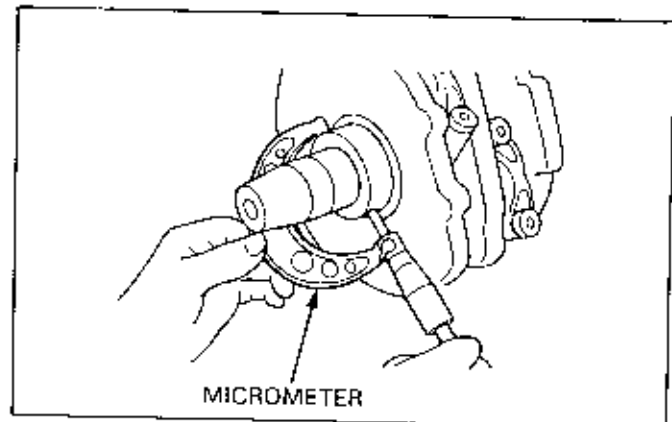
If the clearance is beyond the service limit, select the correct replacement bearings.



One-piece Type

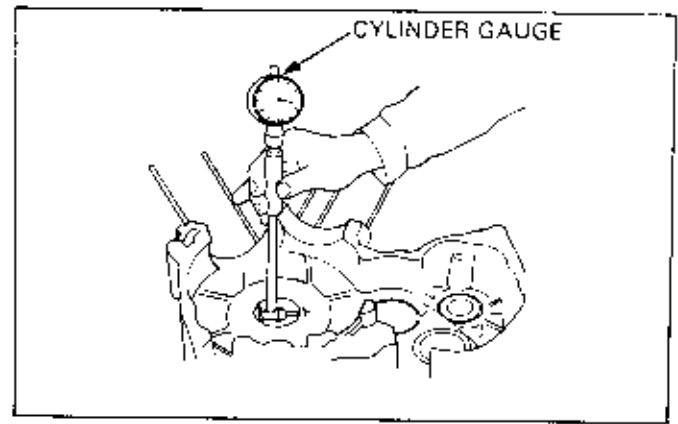
Wipe all oil from the bearing and the crankshaft journals.

Measure and record the crankshaft main journal O.D.



Measure and record the main bearing I.D.

Calculate the oil clearance by subtracting the journal O.D. from bearing I.D. Replace the bearing if the service limit is exceeded.



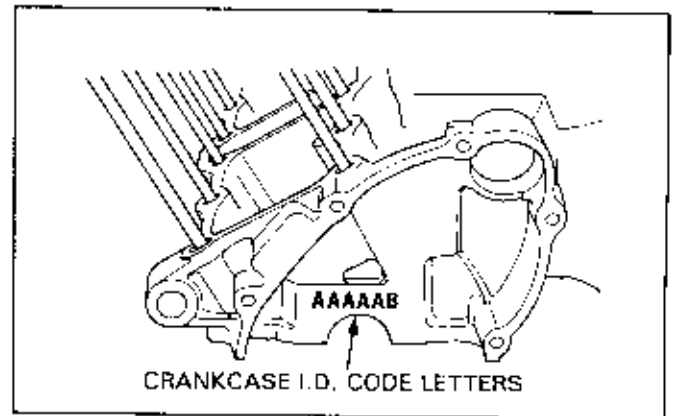
MAIN BEARING SELECTION

Two-piece Type:

Record the crankcase I.D. code letters.

NOTE

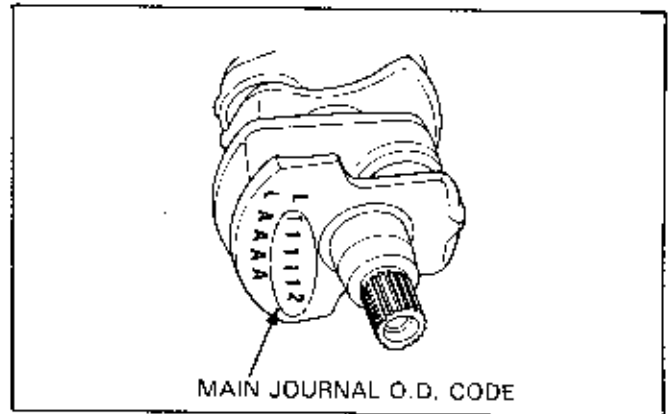
- Letters (A, B or C) on the upper crankcase are the codes for the main journal I.D.s from left to right.



Record the corresponding main journal O.D. code numbers (or measure the main journal O.D.).

NOTE

- Numbers (1, 2 or 3) on each crank weight are the codes for the main journal O.D.s from left to right.

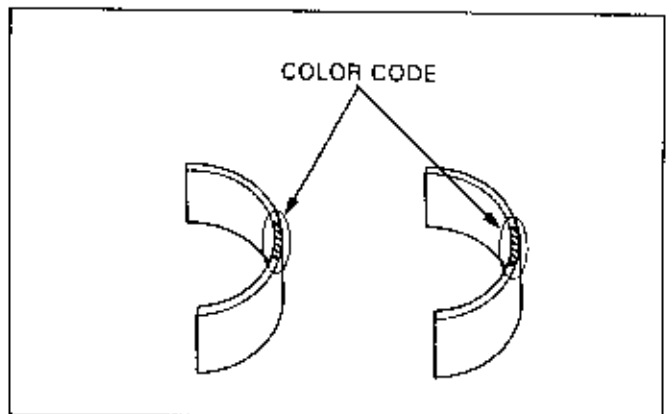


Cross reference the case and journal codes to determine the replacement bearing color code.

Example:

- I.D. code on the crankcase: A
- O.D. code on the crankshaft: 1
- Bearing color code: Pink

| | | CRANKCASE I.D. CODE | | |
|------------------------|---|---------------------|--------|-------|
| | | A | B | C |
| MAIN JOURNAL O.D. CODE | 1 | Pink | Yellow | Green |
| | 2 | Yellow | Green | Brown |
| | 3 | Green | Brown | Black |



CRANKCASE/CRANKSHAFT

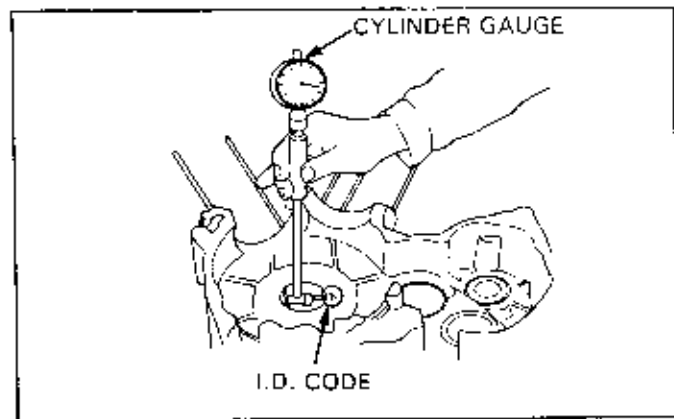
One-piece Type

NOTE

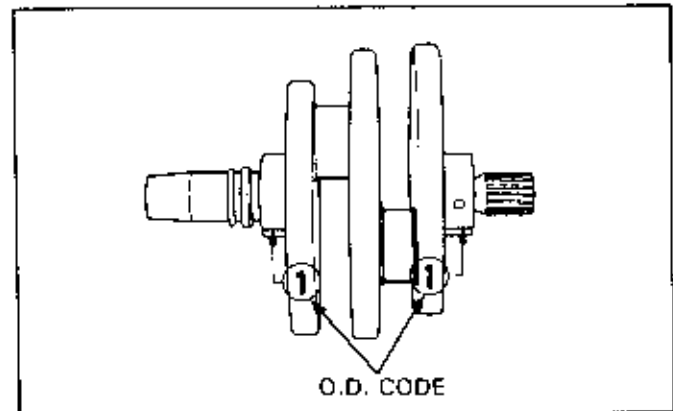
- Some bearings cannot be replaced. Refer to the Model Specific manual for complete information.

Press the old bearing out of the crankcase (page 11-7).

Record the I.D. code letter (A, B or C), or measure the crankcase I.D. after the bearing has been removed.



Record the main journal O.D. code number (1, 2 or 3).

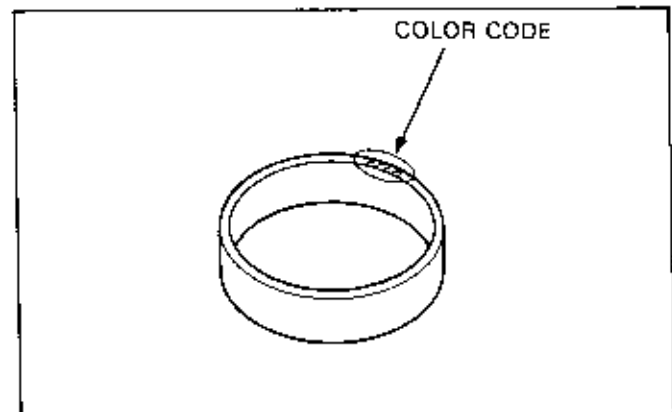


Cross-reference the case and journal codes to determine the replacement bearing color code.

Example:

I.D. code on the crankcase: A
 O.D. code on the crankshaft: 1
 Bearing code: Brown

| | | CRANKCASE I.D. CODE | |
|------------------------|---|---------------------|-------|
| | | A | B |
| MAIN JOURNAL O.D. CODE | 1 | Brown | Black |
| | 2 | Black | Blue |

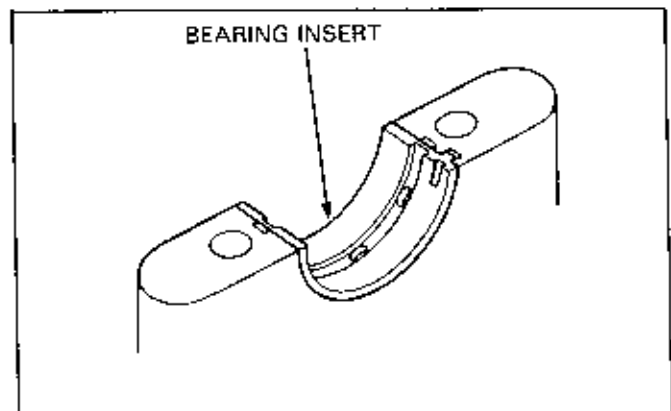


REMOVAL

Two-piece Type

Carefully remove the bearing inserts from the crankcase.

Wipe all oil from the insert seating areas.

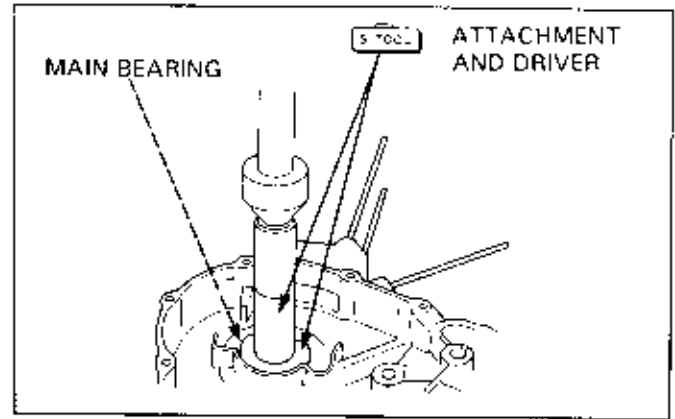


One-piece Type:

Press out the main bearing using the special tool and hydraulic press.

CAUTION

- When removing bearings, always use a hydraulic press and bearing removal tool to prevent crankcase damage.



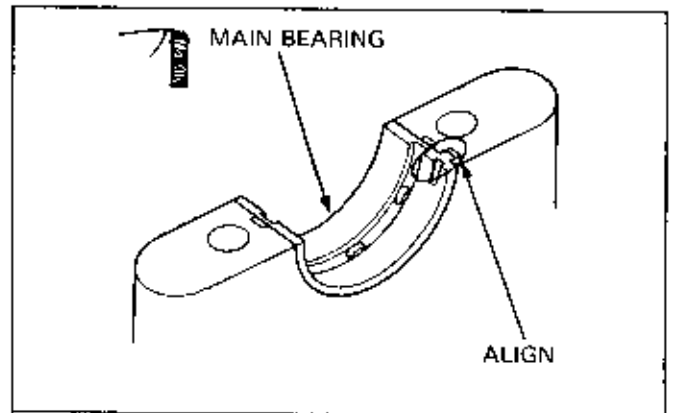
MAIN BEARING INSTALLATION

Two-piece Type:

Install the main bearings into the crankcase.

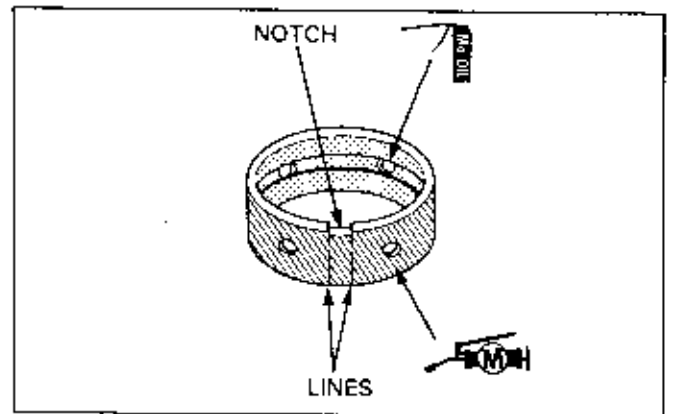
The bearing tabs should be aligned with the grooves in the case and caps.

Apply molybdenum disulfide solution to the upper and lower main bearings.



Mark a line perpendicular to the bearing surface from each edge of the notch as shown.

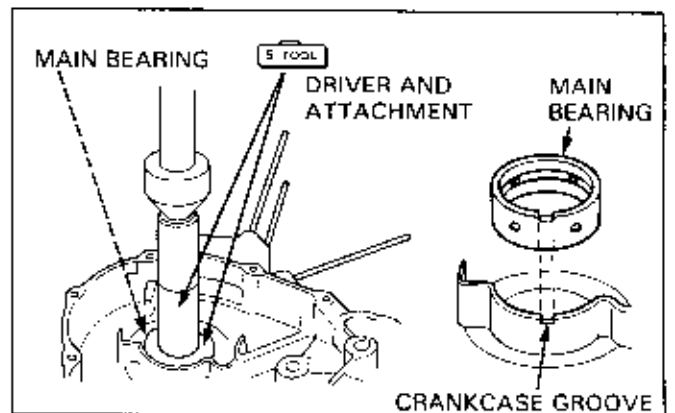
Apply molybdenum disulfide grease to the outer face of the bearing.



Place the bearing in the crankcase by aligning the two lines with the crankcase groove. Press it into place using a hydraulic press.

CAUTION

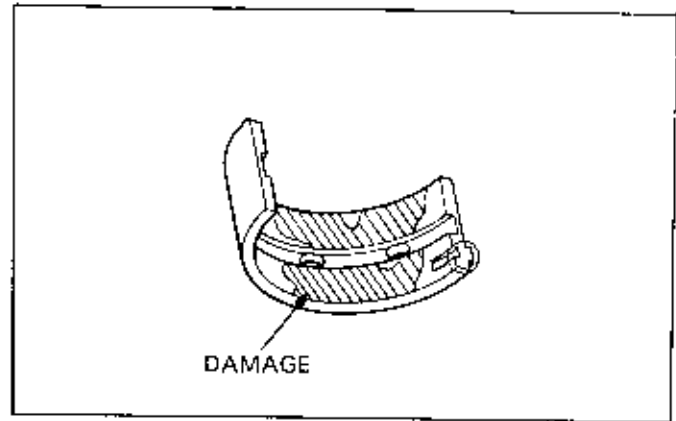
- Take care not to damage the inside surface of the new bearing during installation.



CONNECTING ROD BEARINGS

OIL CLEARANCE INSPECTION

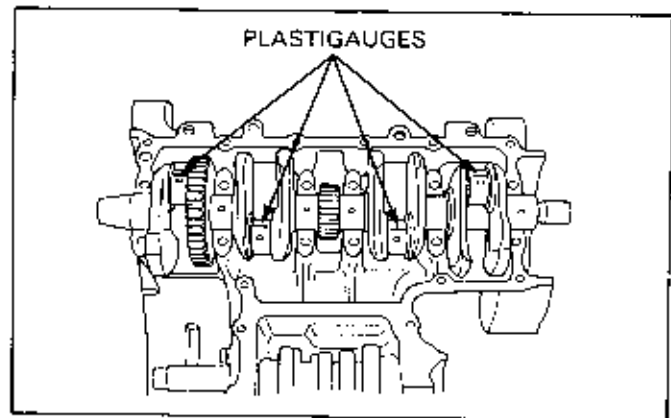
Check the bearing inserts for unusual wear or damage and replace as necessary.



Wipe all oil from the bearing inserts and crankpins. Put a piece of plastigauge on each crankpin.

NOTE

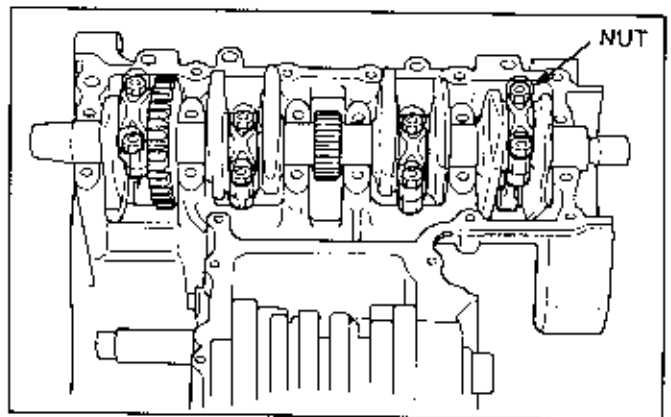
- Do not put the plastigauge over the oil hole in the crankpin.



Install the bearing caps and rods on the correct crankpins, and tighten them evenly.

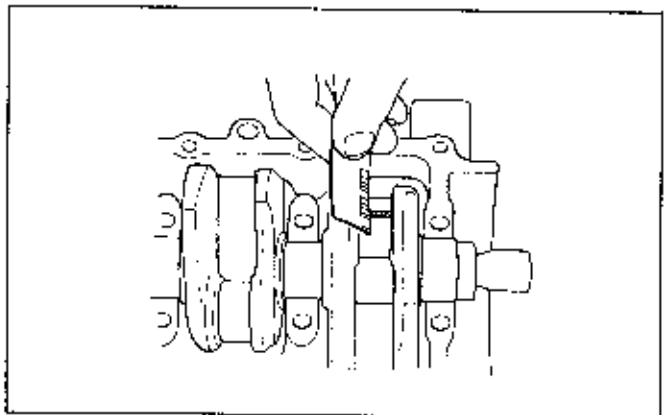
NOTE

- Do not rotate the crankshaft during inspection.



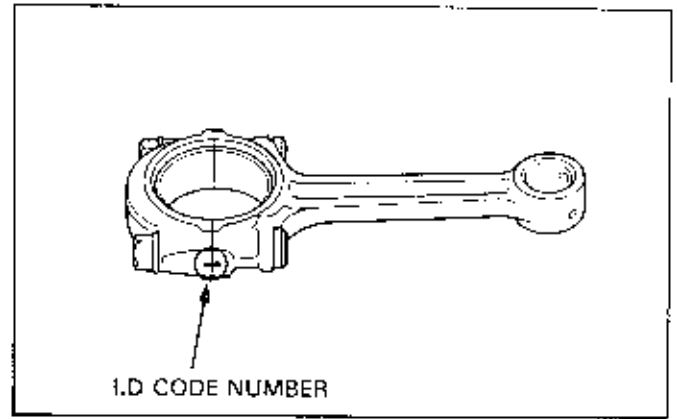
Remove the caps and measure the compressed plastigauge on each crankpin.

If the rod bearing clearance is beyond tolerance, select replacement bearings.

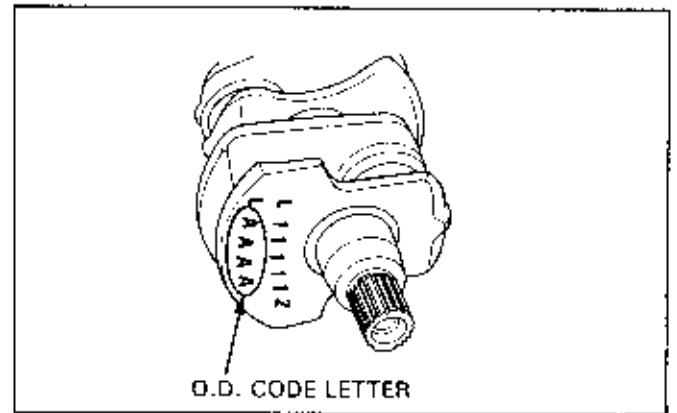


**4-STROKE
BIG END BEARING SELECTION**

Record the corresponding rod I.D. code number (1, 2 or 3) or measure the I.D. with the bearing cap installed without bearing inserts.



Record the corresponding crankpin O.D. code letter (A, B or C) or measure the crankpin O.D.

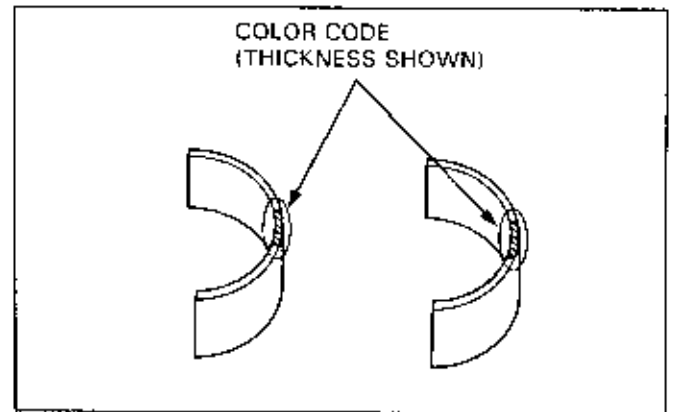


Cross-reference the crankpin and rod codes to determine the replacement bearing color.

Example:

- Crankpin code: A
- Connecting rod code: 1
- Bearing code: Pink

The pink code bearing should be selected.



| | | CRANKPIN I.D. CODE | |
|--------------------------|---|--------------------|--------|
| | | A | B |
| CONNECTING ROD I.D. CODE | 1 | Pink | Yellow |
| | 2 | Yellow | Green |

CRANKCASE/CRANKSHAFT

BEARING REPLACEMENT

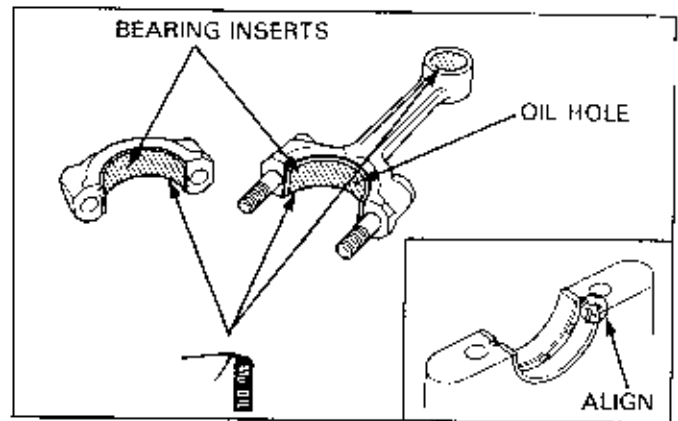
Remove the bearing inserts from the connecting rod and cap.

Wipe all oil from the connecting rod and the new bearing inserts.

Install the bearing inserts by aligning the tabs with the grooves in the connecting rod and cap.

NOTE

- The oil hole in the connecting rod should be aligned with the bearing insert oil hole.
- Apply molybdenum disulfide solution to the inside bearing surface for initial lubrication.



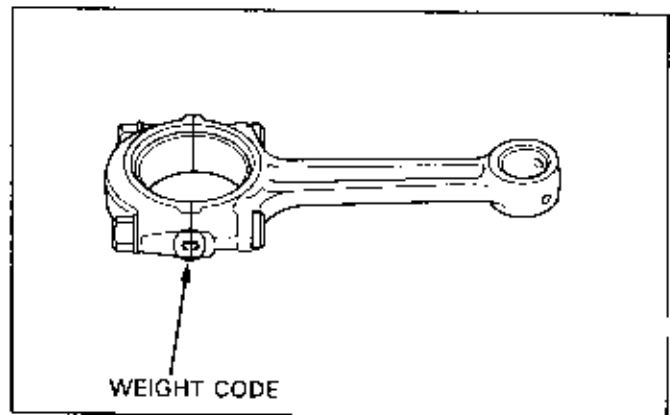
CONNECTING ROD

SELECTION

If a connecting rod requires replacement, you should select a rod with the same weight code (A, B or C) as the original.

NOTE

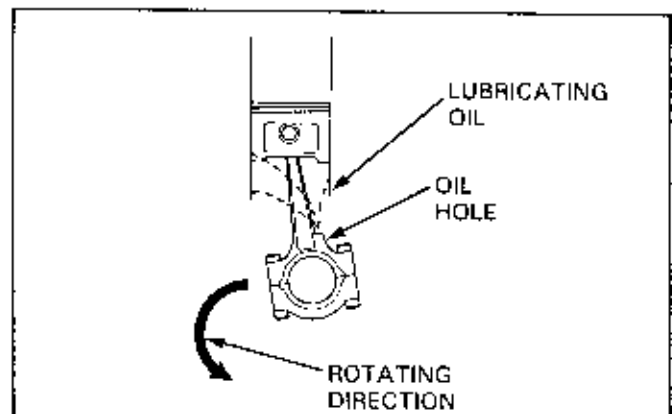
- An unbalanced connecting rod weight may cause abnormal engine vibration. If a rod with the same weight code is unavailable, use a replacement within one code letter of the original.



INSTALLATION

Coat the inside bearing surfaces with molybdenum disulfide solution for initial lubrication, and reinstall them into the original positions and directions.

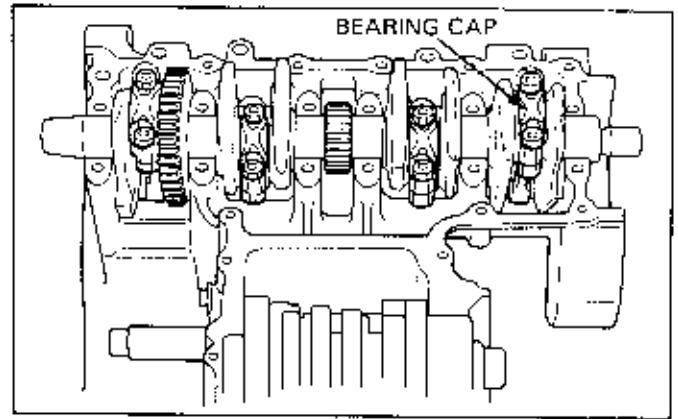
If the connecting rod has an oil hole, install the rod so that the hole is "behind" the crankshaft rotating direction as shown.



Install the bearing caps and connecting rods on the correct crankpins.

NOTE

- Install the connecting rods and bearing inserts in their original positions.
- Do not rotate the crankshaft and connecting rods during the plastigauge procedure.



Oil the threads of the connecting rod bolts and nuts so that the bolts will be tightened evenly. Tighten the nuts to the specified torque. After tightening, check that the connecting rods move freely without binding.

