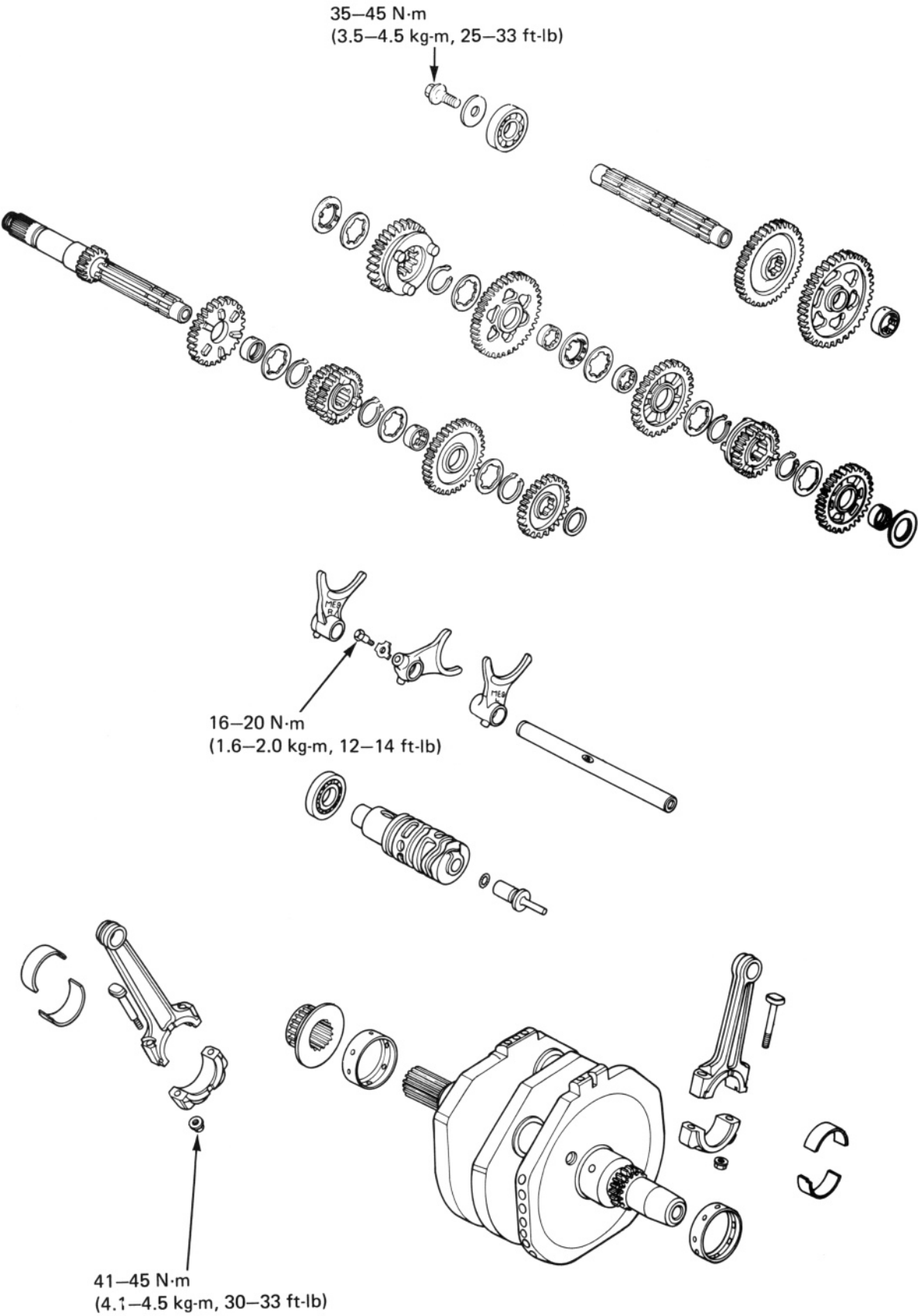
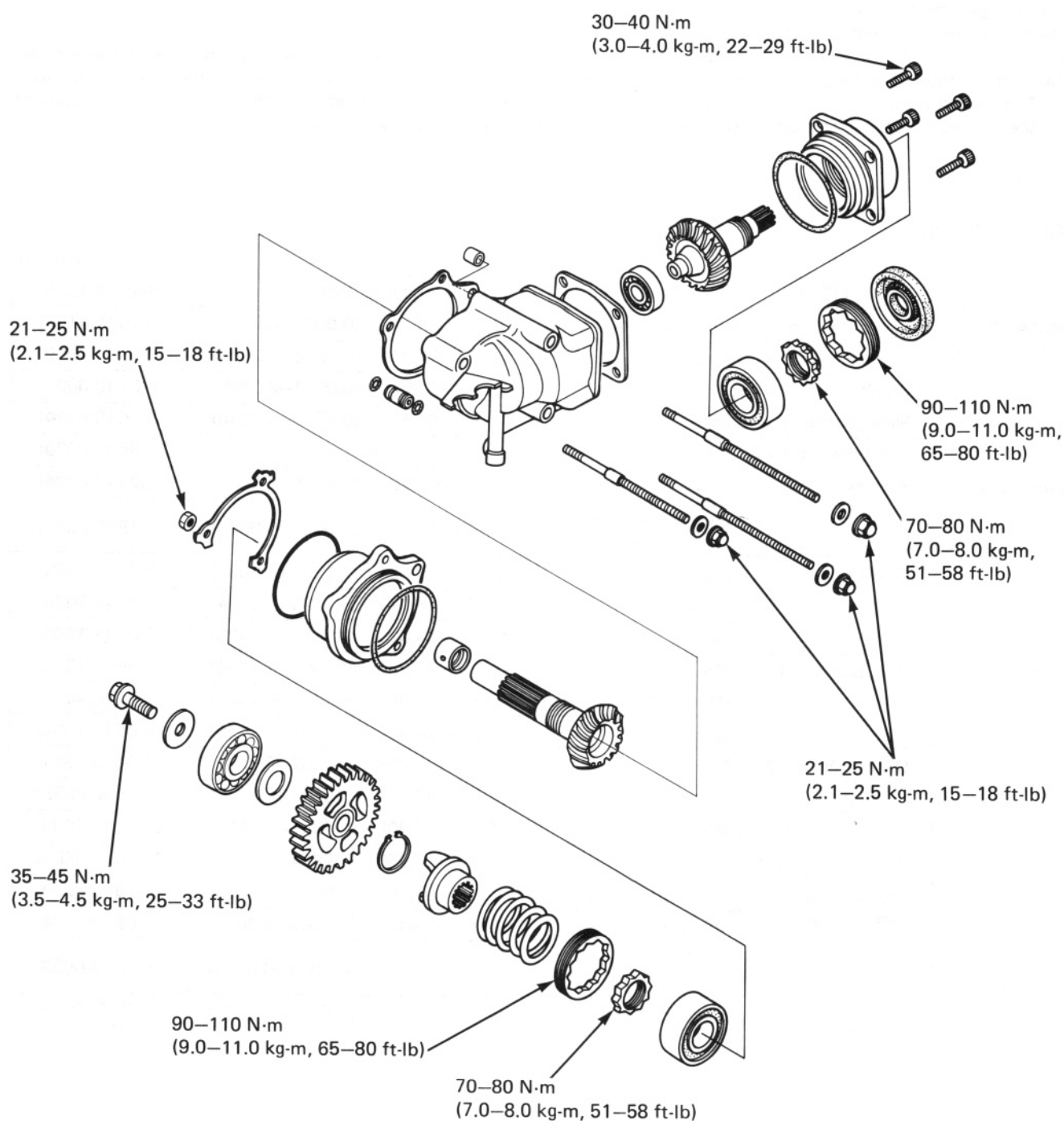


CRANKSHAFT/TRANSMISSION



13. CRANKSHAFT/TRANSMISSION

SERVICE INFORMATION	13-2	TRANSMISSION REMOVAL	13-12
TROUBLESHOOTING	13-3	OUTPUT GEAR	13-17
OUTPUT GEAR CASE REMOVAL	13-4	SHIFT FORK/SHIFT DRUM	13-32
OUTPUT GEAR CASE INSTALLATION	13-4	CRANKCASE BEARINGS REPLACEMENT	13-34
CRANKSHAFT/CONNECTING ROD	13-5	TRANSMISSION INSTALLATION	13-35



SERVICE INFORMATION

GENERAL

- For crankshaft and transmission repair, the crankcase must be separated (Section 12).
- All bearing inserts are select fitted and are identified by color code. Select replacement bearings from the code tables. After installing new bearings, recheck them with plastigauge to verify clearance.
- Apply molybdenum disulfide grease to the main journals and crankpins during assembly.
- When replacing the following output gear components, a new adjustment shim must be selected.
 - Output gear case.
 - Output gear assembly.
 - Output gear bearing.
 - Output gear bearing holder.
- Replace the final drive and output drive shafts as a set.
- When using the lock nut wrench, use a deflecting beam type torque wrench 14-20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the lock nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench when used with the lock nut wrench. The torque scale reading is given with the actual torque specifications.

SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Crankshaft/ connecting rod	Connecting rod big end side clearance		0.10–0.25 (0.0039–0.010)	0.40 (0.0157)
	Connecting rod small end I.D.		20.020–20.041 (0.7882–0.7890)	20.09 (0.7909)
	Crankpin oil clearance		0.028–0.052 (0.0011–0.0020)	0.07 (0.0028)
	Main journal oil clearance		0.025–0.041 (0.0010–0.0016)	0.06 (0.0024)
	Crankshaft runout		—	0.05 (0.0020)
Countershaft	Backlash	Low	0.089–0.170 (0.0035–0.0067)	0.24 (0.0094)
		2nd, 3rd, 4th, 5th and 6th gears	0.068–0.136 (0.0027–0.0054)	0.18 (0.0071)
	Gear I.D.	M5, M6	28.000–28.021 (1.1023–1.1034)	28.04 (1.1039)
		C1, C2, C3	28.000–28.021 (1.1023–1.1034)	28.04 (1.1039)
		C4	29.000–29.021 (1.1417–1.1426)	29.04 (1.1433)
	Gear bushing O.D.	M5, M6	27.959–27.980 (1.1007–1.1016)	27.94 (1.1000)
		C1, C2, C3	23.959–23.980 (0.9433–0.9441)	23.94 (0.9425)
		C4	28.959–28.980 (1.1401–1.1410)	28.94 (1.1394)
	Gear bushing I.D.	M5	24.985–25.006 (0.9837–0.9845)	25.04 (0.9858)
		C4	24.985–25.006 (0.9837–0.9845)	25.04 (0.9858)
	Mainshaft O.D.	M5	24.959–24.980 (0.9826–0.9835)	24.90 (0.9803)
	Countershaft O.D.	C4	24.959–24.980 (0.9824–0.9835)	24.90 (0.9803)
	Gear-to-bushing or shaft clearance	M5, 6 gear to bushing	0.020–0.060 (0.0008–0.0024)	0.10 (0.0039)
		M5 bushing to shaft	0.005–0.047 (0.0002–0.0019)	0.06 (0.0024)
		C1, 2, 3, 4 gear to bushing	0.020–0.062 (0.0008–0.0025)	0.10 (0.0039)
		C4 gear to bushing	0.005–0.047 (0.0002–0.0019)	0.06 (0.0024)

CRANKSHAFT/TRANSMISSION

Unit: mm (in)

ITEM			STANDARD		SERVICE LIMIT
Output gear	Backlash	Final drive gear	0.08–0.023	(0.0031–0.0091)	0.40 (0.0157)
	Damper shaft gear	Gear I.D.	24.000–24.021	(0.9449–0.9457)	24.10 (0.9488)
		Bushing O.D.	23.959–23.980	(0.9433–0.9441)	23.70 (0.9331)
		Bushing I.D.	20.020–20.041	(0.7882–0.7890)	20.10 (0.7913)
	Final drive shaft O.D.		19.979–20.000	(0.7866–0.7874)	20.05 (0.7894)
	Damper spring free length		65.1	(2.5630)	63.8 (2.5118)
Shift fork/fork shaft	Claw thickness		6.50–6.57	(0.2559–0.2587)	6.20 (0.2441)
	Right and left shift fork I.D.		14.000–14.021	(0.5512–0.5520)	14.04 (0.5528)
	Shaft O.D.		13.966–13.984	(0.5498–0.5506)	13.90 (0.5472)
Shift drum	Shift drum I.D.		12.500–12.518	(0.4921–0.4928)	12.54 (0.4937)
	Shift drum holder O.D.		12.457–12.484	(0.4904–0.4915)	12.33 (0.4854)

TORQUE

Connecting rod	41–45 N·m (4.1–4.5 kg-m, 30–33 ft-lb)
Final drive shaft	35–45 N·m (3.5–4.5 kg-m, 25–33 ft-lb)
Countershaft	35–45 N·m (3.5–4.5 kg-m, 25–33 ft-lb)
Output gear case	8 mm cap nut 21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)
	8 mm lock nut 21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)
	8 mm socket bolt 30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)
Output gear bearing lock nut (Inner)	70–80 N·m (7.0–8.0 kg-m, 51–58 ft-lb)
	(Outer) 90–110 N·m (9.0–11.0 kg-m, 65–80 ft-lb)
Shift fork	16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)

TOOLS

Special

Lock Nut Wrench, 30 x 64 mm	07916–MB00000
Shaft Holder	07923–6890101
Main Bearing Remover Attachment	07946–ME90100
Main Bearing Drive Attachment	07946–ME90200
Remover Handle	07936–3710100
Remover Weight	07936–3710200
Bearing Remover, 17 mm	07936–3710300
Main Journal Bearing Remover/Driver	07973–MC70000
Ring gear Dis/Assembly Tool	07965–3710100
Damper Compressor	07964–3710000
Bearing remover, 20 mm	07936–3710600
Driver	07949–3710000
Attachment	07946–3710200

Common

Remover weight	07741–0010201
Attachment, 32 x 35 mm	07746–0010100
Attachment, 42 x 47 mm	07746–0010300
Attachment, 52 x 55 mm	07746–0010400
Attachment, 62 x 68 mm	07746–0010500
Pilot, 17 mm	07746–0040400
Pilot, 25 mm	07746–0040600
Pilot, 30 mm	07746–0040700
Driver	07749–0010000
Attachment, 30 mm I.D.	07746–0030300

TROUBLESHOOTING

Excessive noise

1. Crankshaft
 - Worn main bearing
 - Worn rod bearing
2. Connecting rod
 - Worn rod small end

Hard to shift

1. Air in clutch system
2. Shift fork bent
3. Shift fork shaft bent
4. Shift spindle claw bent
5. Shift drum cam grooves damaged
6. Shift fork guide pin damaged

Transmission jumps out of gear

1. Gear dogs worn
2. Shift shaft bent
3. Shift shaft stopper broken
4. Shift forks bent

Excessive output gear noise

1. Output drive and driven gears worn or damaged
2. Bearings worn or damaged
3. Excessive backlash between output drive and driven gears
4. Improper shim thickness

OUTPUT GEAR CASE REMOVAL

NOTE:

The following output gear service can be performed with engine removed from the frame and without separating the crankcase.

- Final drive shaft side bearing holder O-ring replacement (page 13-4).
- Drive gear seal replacement (page 13-25).
- Driven gear shaft bearing replacement (page 13-26).
- Driven gear bearing holder O-ring replacement (page 13-26).
- Tooth contact adjustment (page 13-30).
- Oilorifice and O-ring inspection and replacement.

Remove the 8 mm cap nuts and sealing washers.

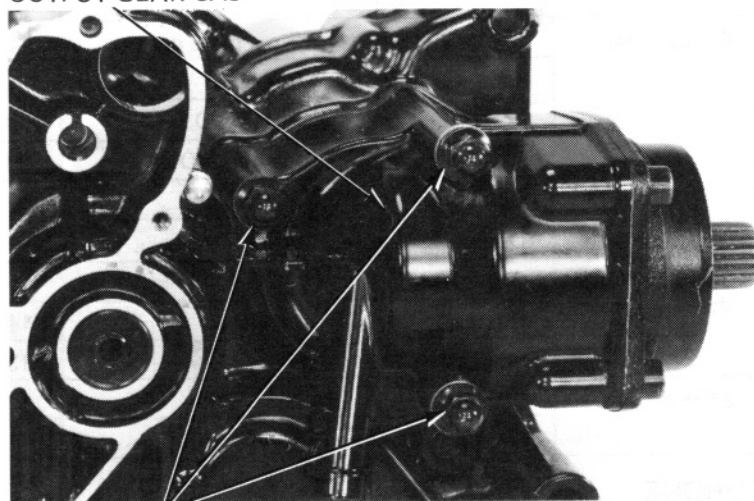
Remove the output gear case.

Remove the O-ring, dowel pin and shim from the bearing holder.

NOTE:

Take care not to damage the shim.

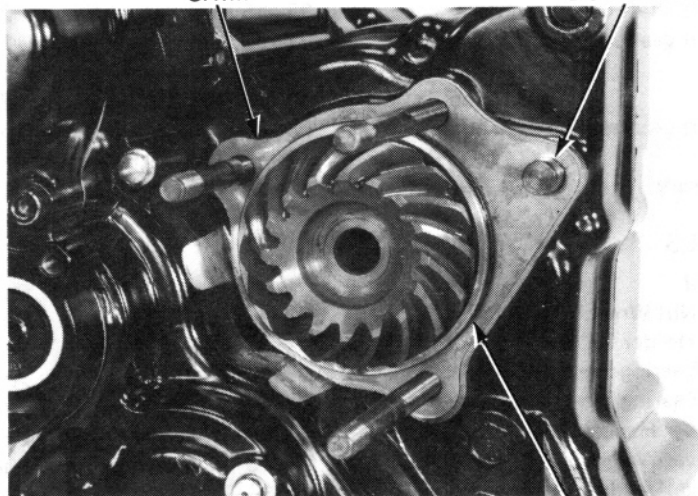
OUTPUT GEAR CASE



8 mm CAP NUT
AND SEALING WASHERS

SHIM

DOWEL PIN

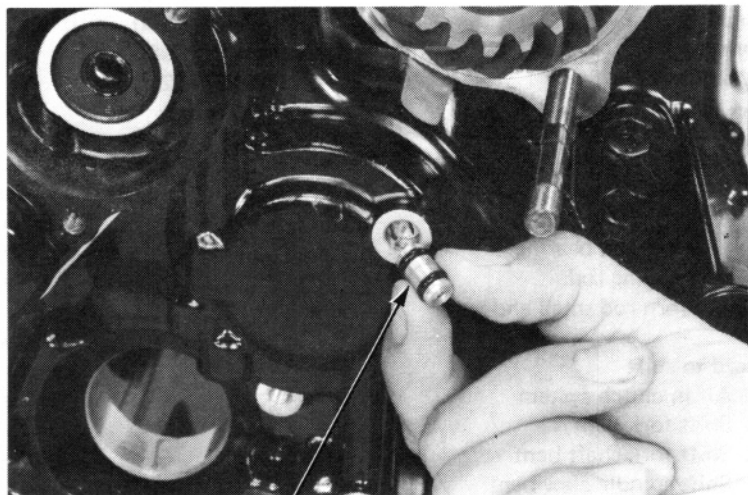


O-RING

Remove the oil orifice and clean it with the compressed air.

OUTPUT GEAR CASE INSTALLATION

Replace the O-rings with new ones and install the output gear case in the reverse order of removal.



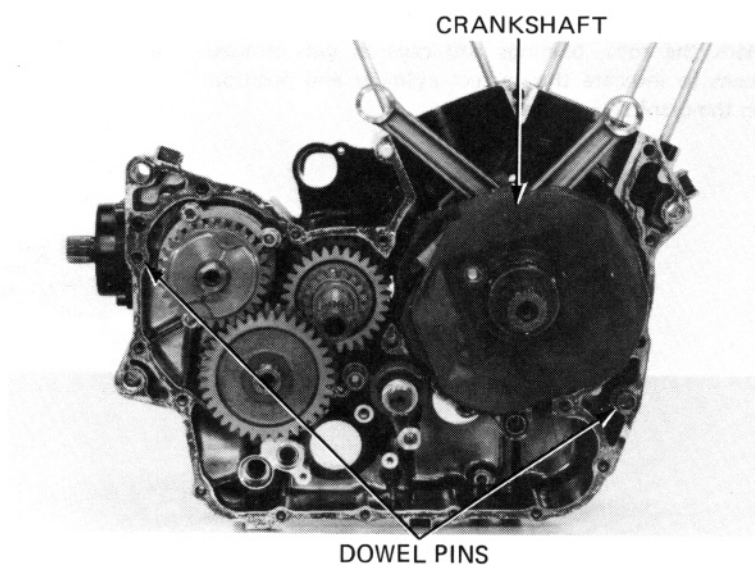
OIL ORIFICE

CRANKSHAFT/CONNECTING ROD

CRANKSHAFT REMOVAL

Separate the crankcase (page 12-2) and remove the dowel pins.

Remove the crankshaft.



CONNECTING ROD REMOVAL

Check the connecting rod side clearance.

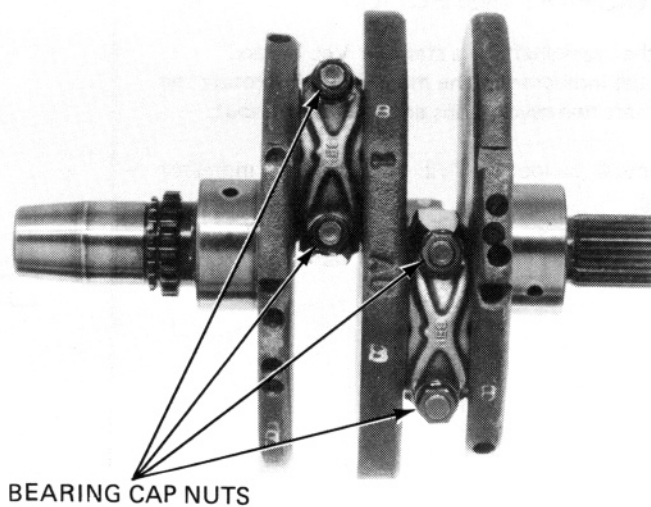
SERVICE LIMIT: 0.40 mm (0.0157 in)



Remove the connecting rod bearing caps and note their locations.

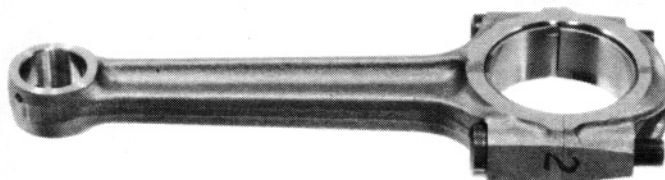
NOTE:

Tap the side of the cap lightly if it is hard to remove.



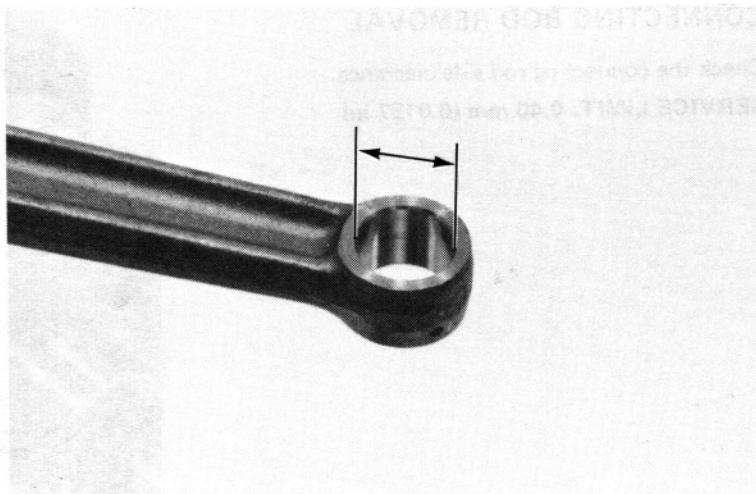
CRANKSHAFT/TRANSMISSION

Mark the rods, bearings and caps as you remove them to indicate the correct cylinder and position on the crankpins for reassembly.



Measure the connecting rod small end I.D.

SERVICE LIMIT: 20.09 mm (0.7909 in)

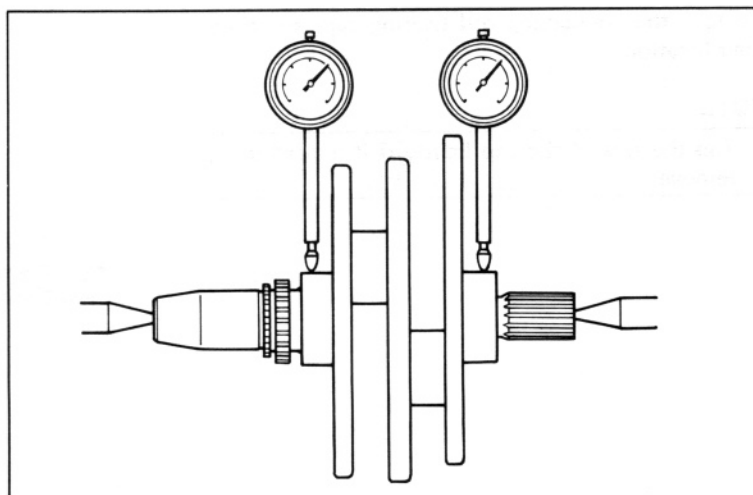


CRANKSHAFT INSPECTION

Place the crankshaft on a stand or Vee blocks. Set a dial indicator on the main journals. Rotate the crankshaft two revolutions and read the runout.

The actual runout is 1/2 of the total indicator reading.

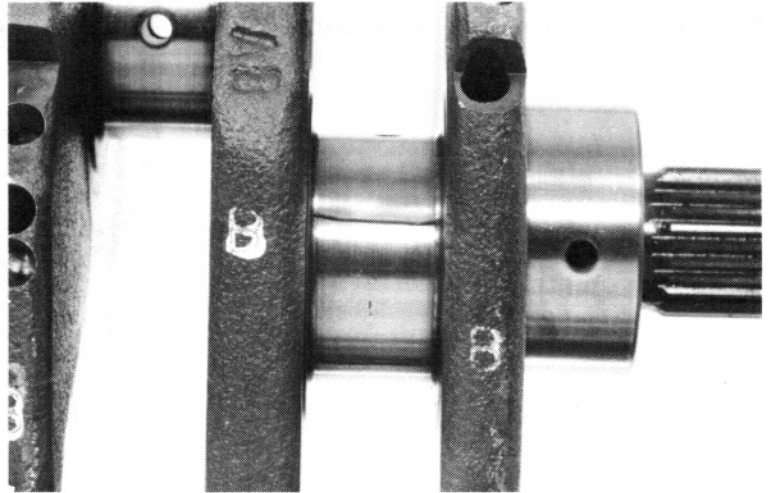
SERVICE LIMIT: 0.05 mm (0.002 in)



BEARING INSPECTION

CONNECTION ROD

Inspect the bearing inserts for damage or separation. Clean all oil from the bearing inserts and crankpins. Put a piece of plastigauge on each crankpin avoiding the oil hole.

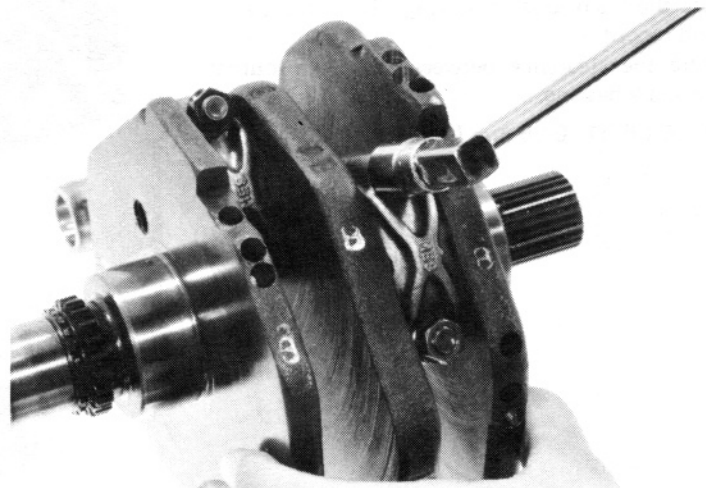


Install the bearing caps and rods on the correct crankpins, and tighten them evenly.

TORQUE: 41–45 N·m (4.1–4.5 kg-m, 30–33 ft-lb)

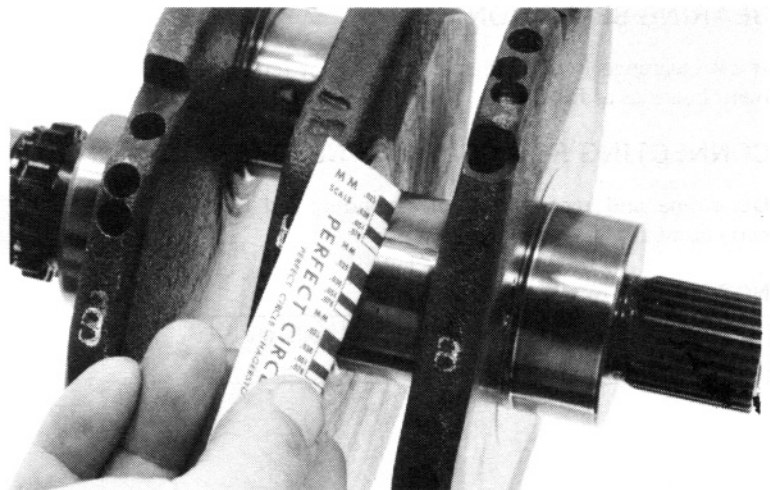
NOTE:

Do not rotate the crankshaft during inspection.



Remove the caps and measure the compressed plastigauge at its widest point on each crankpin to determine the oil clearance.

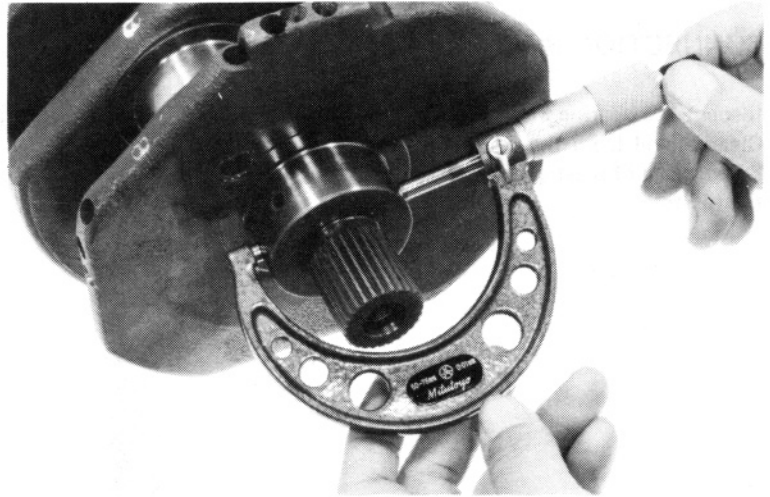
SERVICE LIMIT: 0.07 mm (0.003 in)



CRANKSHAFT/TRANSMISSION

MAIN BEARINGS

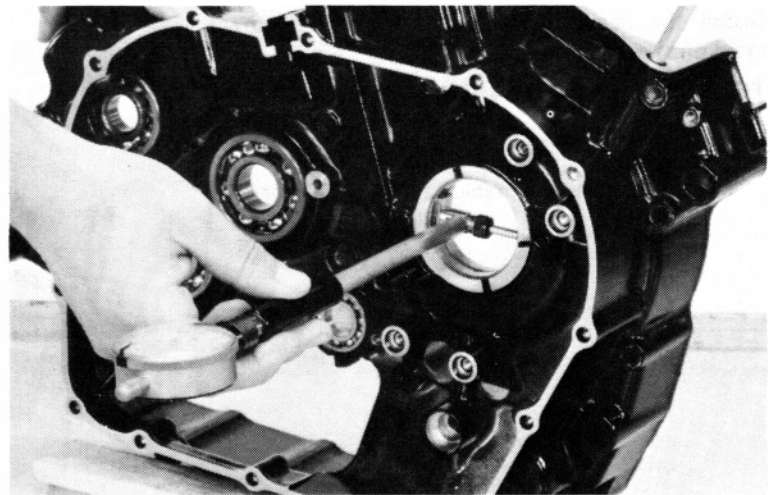
Measure the main journal O.D. and record it.



Measure the main journal bearing I.D. in the crankcase and record it.

Calculate the clearance between the main journal and the main bearing.

SERVICE LIMIT: 0.06 mm (0.0024 in)



BEARING SELECTION

If oil clearance is beyond tolerance, select replacement bearings as follows:

CONNECTING ROD BEARING INSERTS

Determine and record the corresponding rod I.D. code number.

NOTE:

Numbers 1 or 2 on the connecting rods are the codes for the connecting rod I.D.

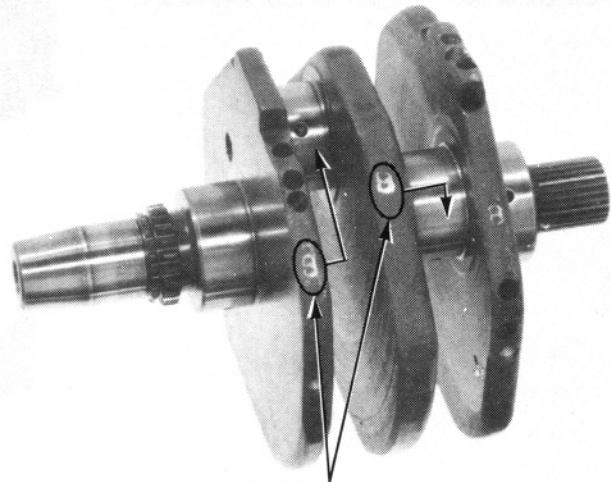


I.D. CODE

Determine and record the corresponding crankpin O.D. code number (or measure the crankpin O.D.).

NOTE:

Letters A or B on each crank weight are the codes used for each crankpin O.D.



CRANK PIN O.D. CODE

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

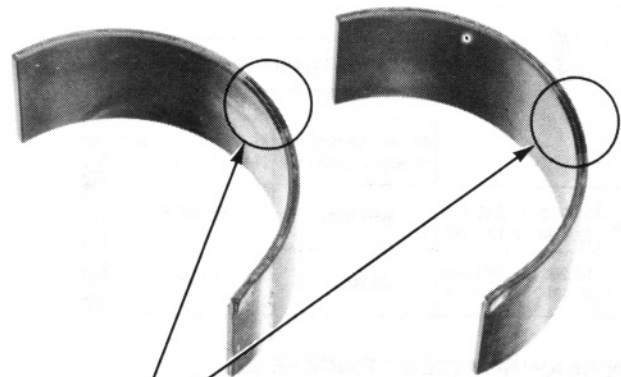
		CONNECTING ROD I.D. CODE NO.	
		1	2
		46.000— 46.008mm	46.008— 46.016mm
CRANK PIN O.D. CODE	A	42.982— 42.990mm	F (Pink)
	B	42.974— 42.982mm	E (Yellow)
		E (Yellow)	D (Green)

BEARING INSERT THICKNESS:

D (Green): 1.495—1.499 mm (0.0589—0.0590 in)

E (Yellow): 1.491—1.495 mm (0.0578—0.0589 in)

F (Pink): 1.487—1.491 mm (0.0585—0.0587 in)



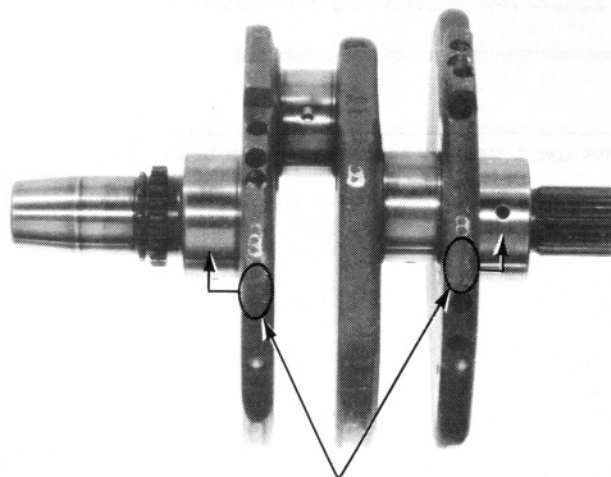
COLOR CODE

MAIN BEARING INSERTS

Determine and record the corresponding main journal O.D. codes, (or measure the main journal O.D.).

NOTE:

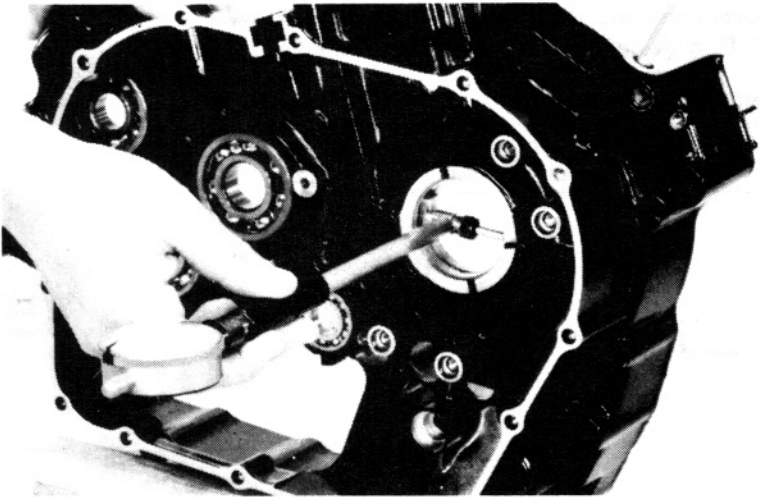
Letters 1 or 2 on each crank weight are the codes used for each main journal O.D.



MAIN JOURNAL O.D.

CRANKSHAFT/TRANSMISSION

Measure the crankcase main journal I. D. and record it.



Cross reference the case I. D. and journal code to determine the replacement bearing.

		MAIN JOURNAL O.D. CODE		NEW
		1	2	
CRANK- CASE I. D.	53.970–53.980 mm (2.1248–2.1252 in)	BROWN	BLACK	
	53.980–53.990 mm (2.1252–2.1256 in)	BLACK	BLUE	

MAIN BEARING INSERT THICKNESS:

- BROWN: 1.989–1.999 mm (0.0783–0.0787 in)
- BLACK: 1.994–2.004 mm (0.0785–0.0798 in)
- BLUE: 1.999–2.009 mm (0.0787–0.0791 in)

MAIN JOURNAL BEARING REMOVAL

Press the main bearing out of the crankcase.

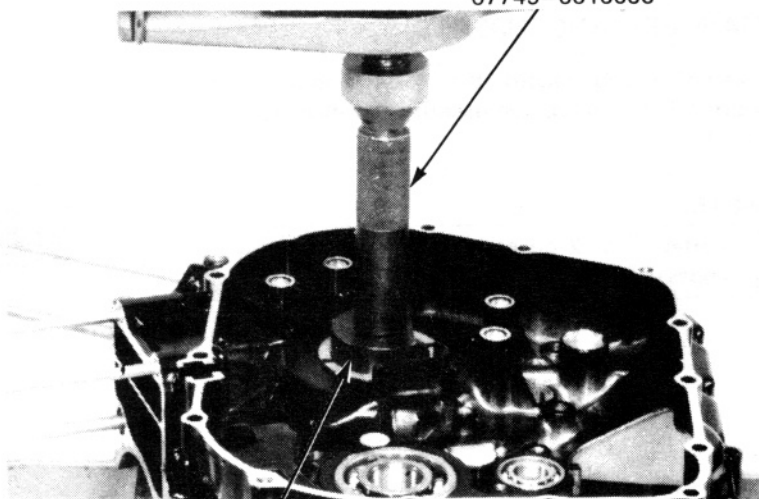
NOTE:

Always use a press to remove the main bearings.



COLOR CODE

DRIVER
07749-0010000



MAIN BEARING REMOVER ATTACHMENT
07946-ME90100

MAIN BEARING INSTALLATION

Apply molybdenum disulfide grease to the outer surface of the main bearings.

Align the tab on the bearing with the groove in the crankcase and press the bearing into the crankcase.

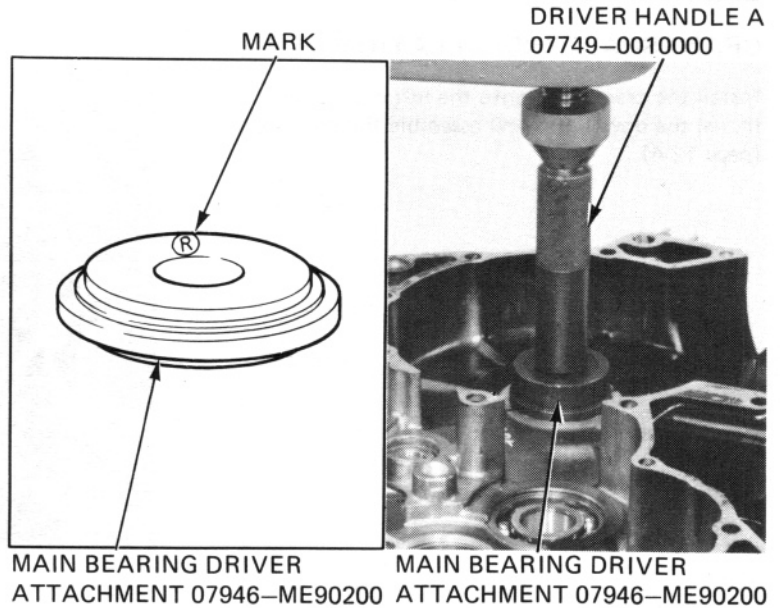
CAUTION:

Be careful not to damage the bearings.

NOTE:

The marks on both side of Main Bearing Driver Attachment means:

- "R" → Use for right side bearing.
- "L" → Use for left side bearing.

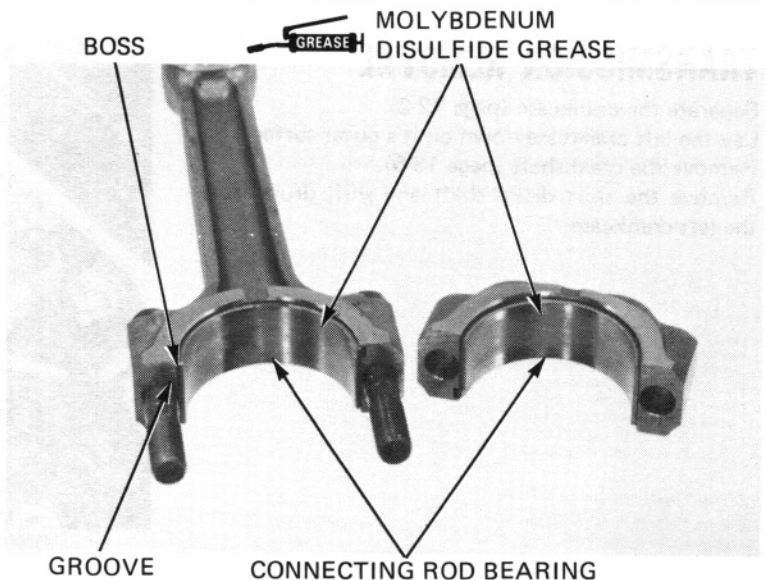


CONNECTING ROD INSTALLATION

Install the bearing inserts on the rods and caps.

NOTE:

- Align the boss on the bearing with the groove in the rod or cap.
- Apply molybdenum disulfide grease to the bearings.



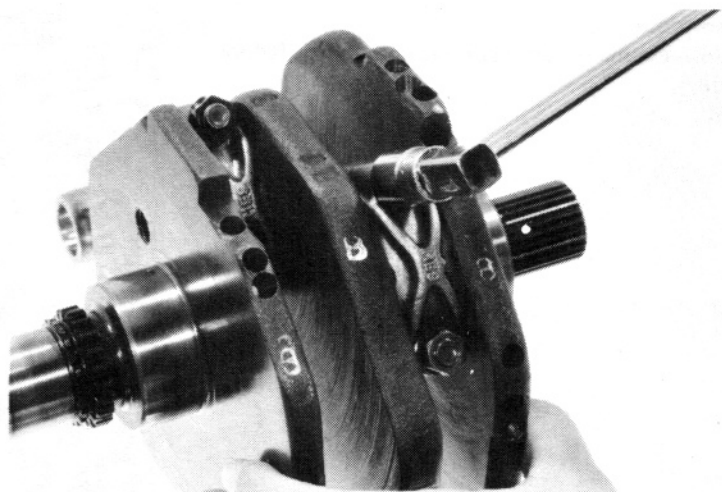
Install the rods and caps on the crankshaft. Be sure each part is installed in its original position, as noted during removal.

Tighten the cap nuts.

TORQUE: 41–45 N·m (4.1–4.5 kg·m, 30–33 ft·lb)

NOTE:

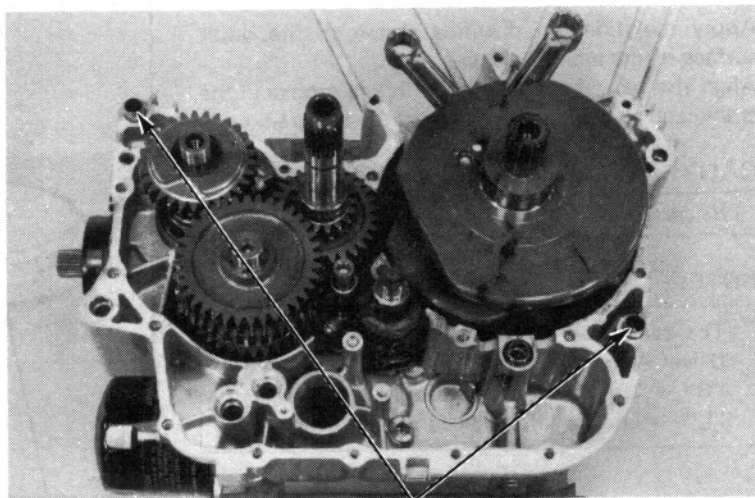
- Align the I.D. code on the cap and rod.
- Tighten the nuts in two or more steps.
- After tightening the nuts, check that the rods move freely without binding.



CRANKSHAFT/TRANSMISSION

CRANKSHAFT INSTALLATION

Install the crankshaft onto the left crankcase.
Install the dowel pins and assemble the crankcase
(page 12-4).

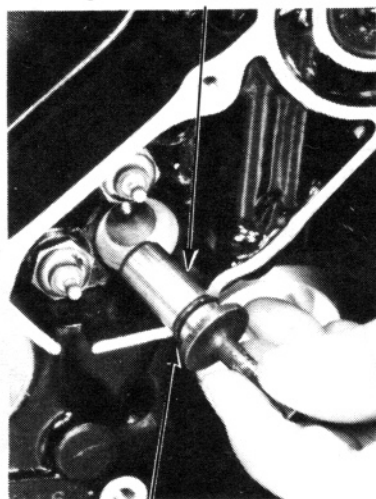


DOWEL PINS

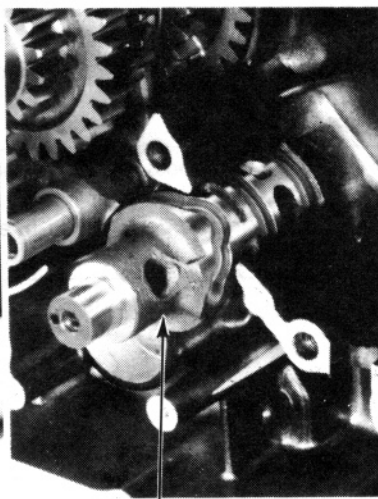
TRANSMISSION REMOVAL

Separate the crankcase (page 12-2).
Lay the left crankcase down on it's outer surface.
Remove the crankshaft (page 13-5).
Remove the shift drum shaft and shift drum from
the left crankcase.

SHIFT DRUM SHAFT

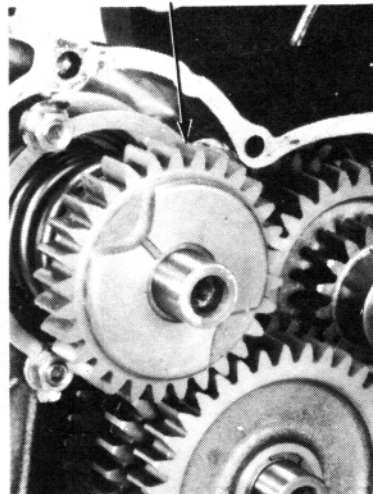


O-RING

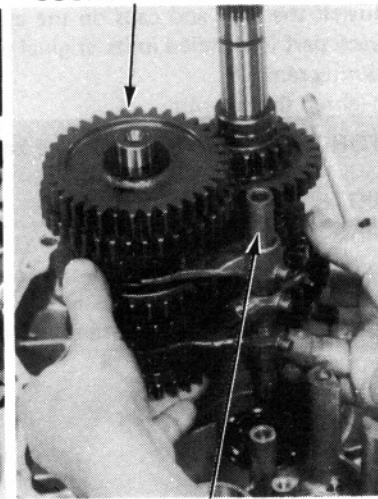


SHIFT DRUM

FINAL GEAR



COUNTERSHAFT

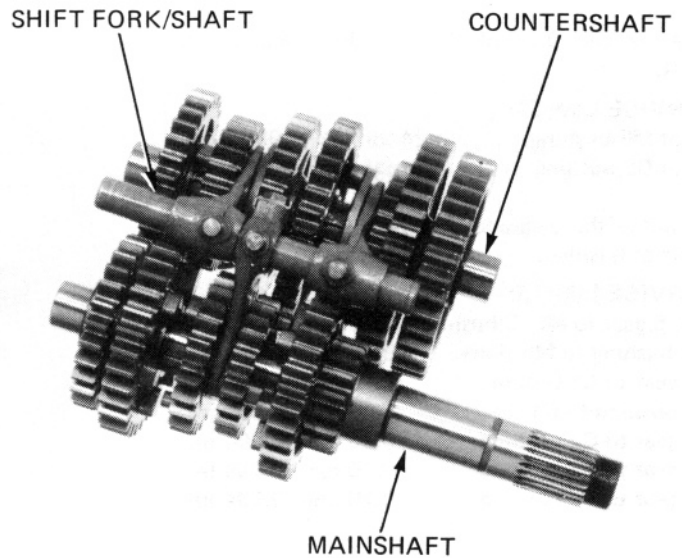


SHIFT FORK

Remove the final gear.
Remove the mainshaft, countershaft, and shift fork
together.

TRANSMISSION DISASSEMBLY

Separate the shift forks, shaft, mainshaft and countershaft assemblies from each other.



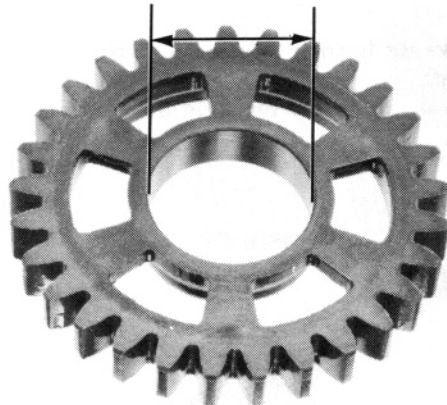
TRANSMISSION INSPECTION

Check the gear dogs, holes and teeth for excessive or abnormal wear, or evidence of insufficient lubrication.

Measure the I.D. of each gear.

SERVICE LIMIT:

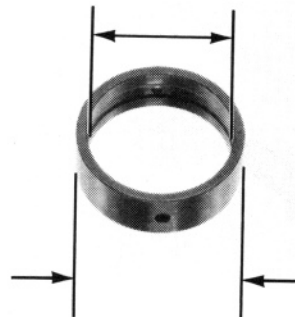
M5, M6 gears:	28.04 mm (1.104 in)
C1, C2, C3 gears:	28.04 mm (1.104 in)
C4 gear:	29.04 mm (1.143 in)



Measure the I.D. and O.D. of each gear bushing.

SERVICE LIMIT:

M5, M6 bushing O.D.:	27.94 mm (1.100 in)
C1, C2, C3 bushing O.D.:	27.94 mm (1.100 in)
C4 bushing O.D.:	28.94 mm (1.139 in)
M5 bushing I.D.:	25.04 mm (0.986 in)
C4 bushing I.D.:	25.04 mm (0.986 in)



CRANKSHAFT/TRANSMISSION

Measure the O.D. of the mainshaft and countershaft.

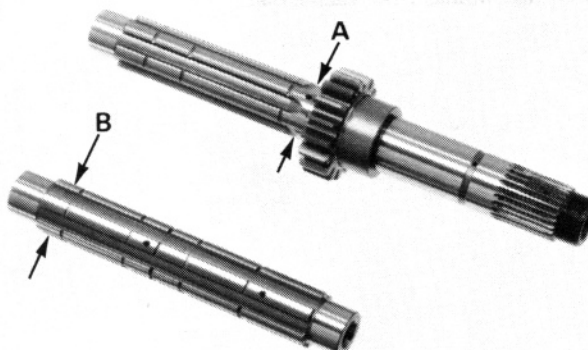
SERVICE LIMITS:

A (at M5 bushing):	24.90 mm (0.980 in)
B (at C5 bushing):	24.90 mm (0.980 in)

Calculate the clearance between the gear and gear shaft or bushing.

SERVICE LIMITS:

M5, 6 gear to M5, 6 bushing:	0.10 mm (0.004 in)
M5 bushing to M5 shaft:	0.06 mm (0.002 in)
C1 gear to C1 bushing:	0.10 mm (0.004 in)
C1 bushing to C1 shaft:	0.10 mm (0.004 in)
C2 gear to C2 bushing:	0.10 mm (0.004 in)
C3 gear to C3 bushing:	0.10 mm (0.004 in)
C4 gear to C4 bushing:	0.10 mm (0.004 in)

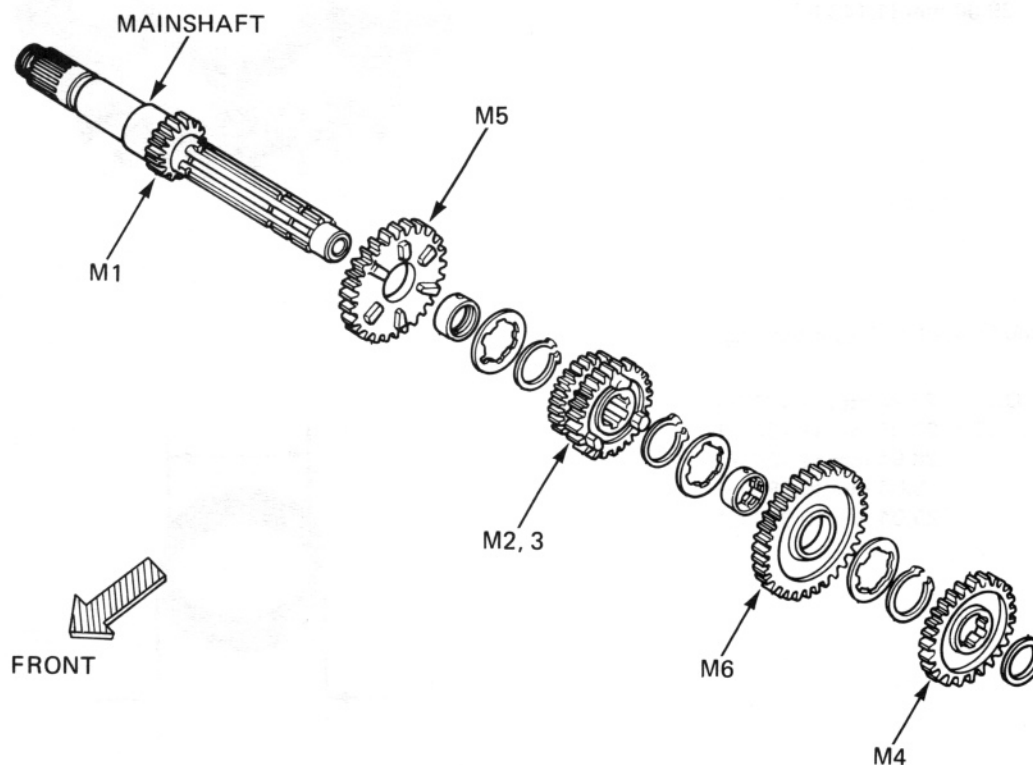


TRANSMISSION ASSEMBLY

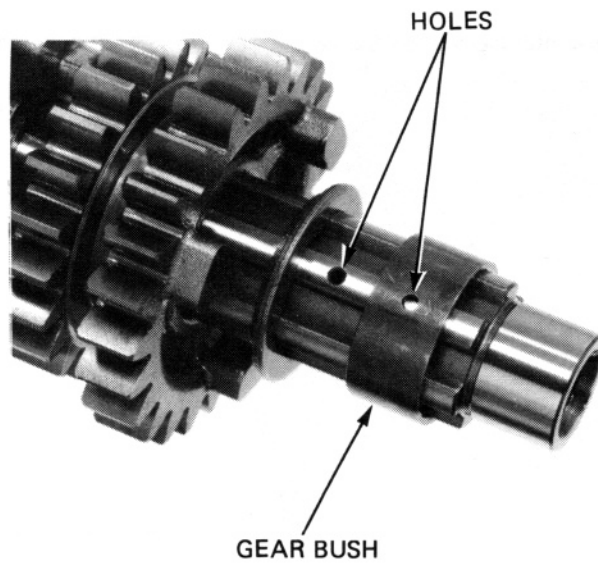
Mainshaft

Check the gears for freedom of movement of rotation on the shaft.

Check the the snap rings are seated in the grooves.



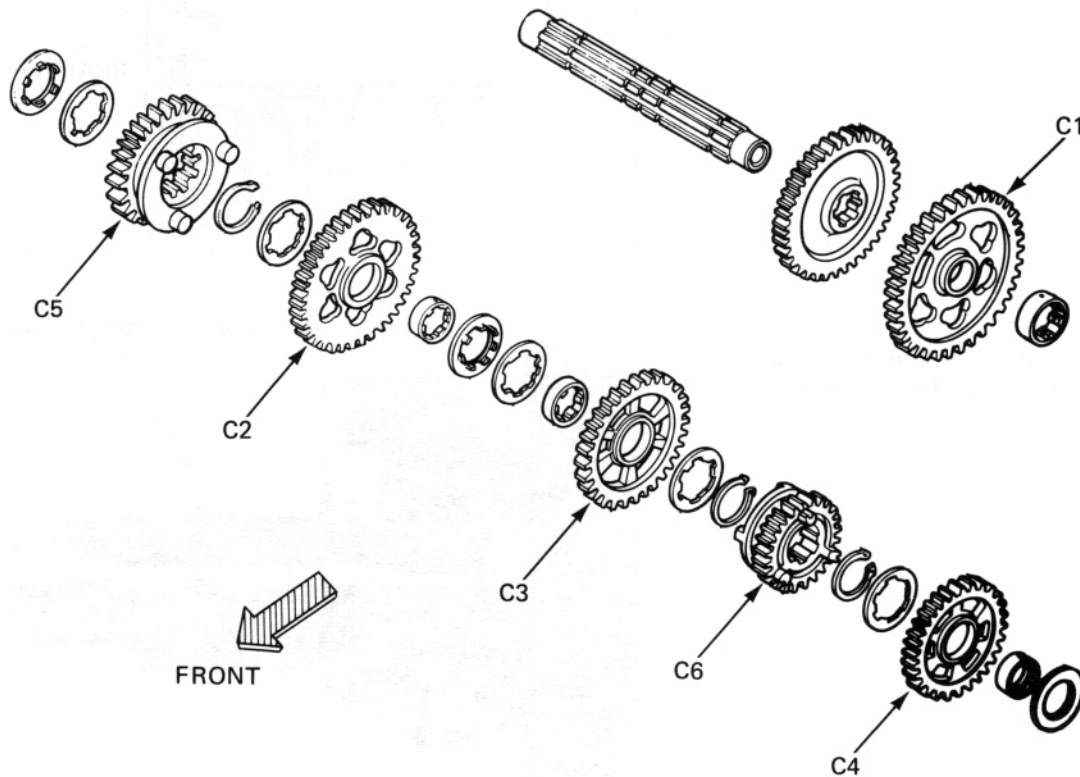
Align the hole in the M5, M6 gear bushing with the hole in the mainshaft when installing.



Countershaft

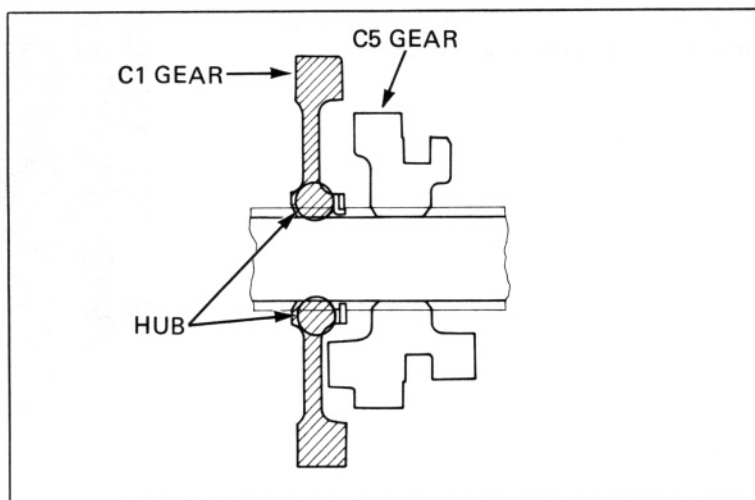
Check the gears for freedom of movement or rotation on the shaft.

Check that the snap rings are seated in the grooves.

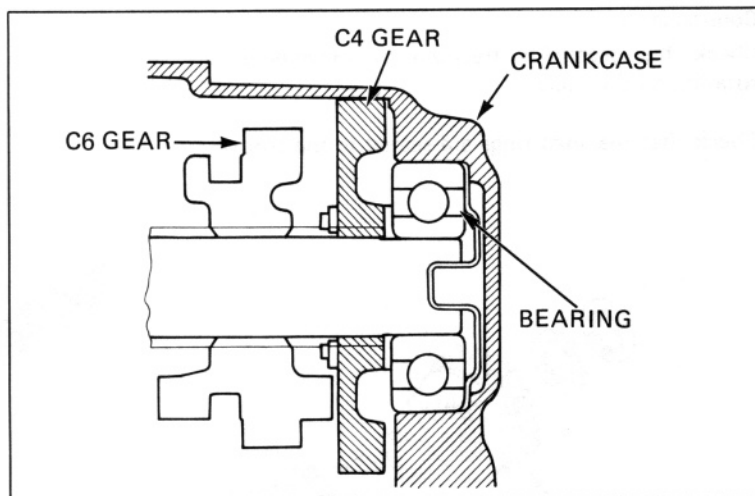


CRANKSHAFT/TRANSMISSION

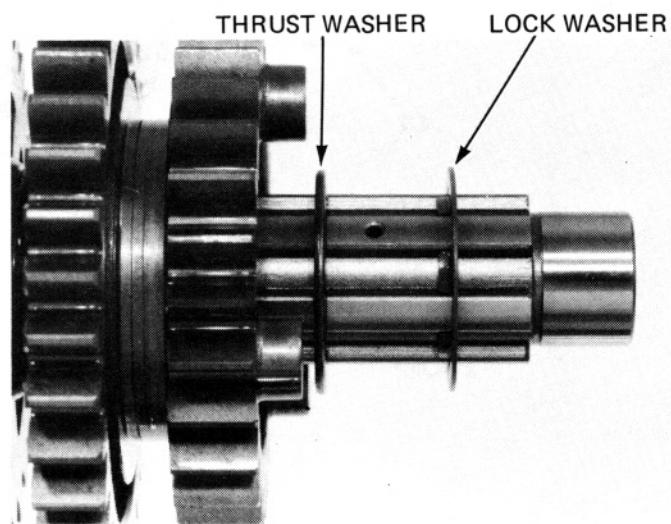
Install the C1 gear hub facing the C5 gear.



Install the C4 gear recess facing the crankcase bearing, not the C6 gear.



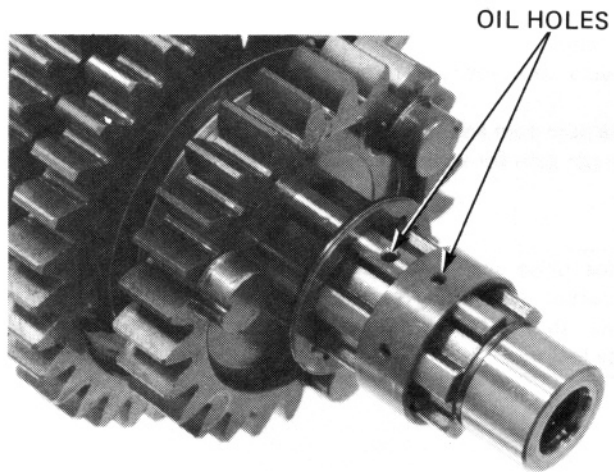
Align the lock washer tab into the thrust washer groove between the C5 and C1 gears, and the C2 and C3 gears.



Align the oil hole in the C1, 2, 3, 4 gear bushing with the hole in the countershaft.

NOTE:

Do not install the C1 bushing (6 holes) to the C4 bushing place. It is different width from the C4 bushing.



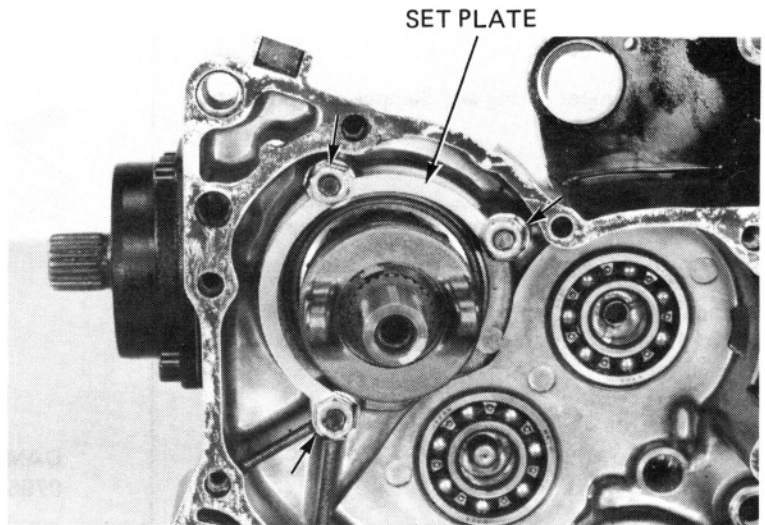
OUTPUT GEAR

OUTPUT GEAR ASSEMBLY REMOVAL

Bend the lock washer tab down, remove the nuts and the set plate.

Pull the output gear assembly off the crankcase.

Remove the gasket and dowel pin.



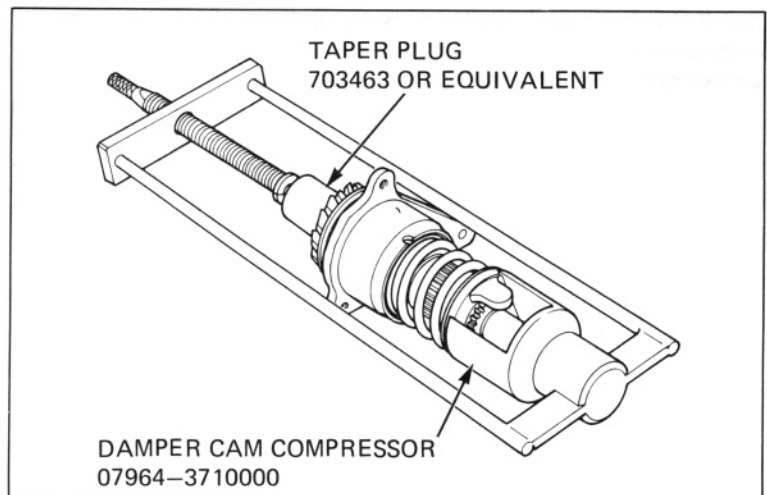
OUTPUT DRIVE GEAR DAMPER ASS'Y REMOVAL

Separate the output drive shaft and bearing holder from the output gear case.

Set the shaft and holder into the special tool and compress the damper cam.

NOTE:

Use taper plug 703463 with damper cam compressor 07964-3710000.



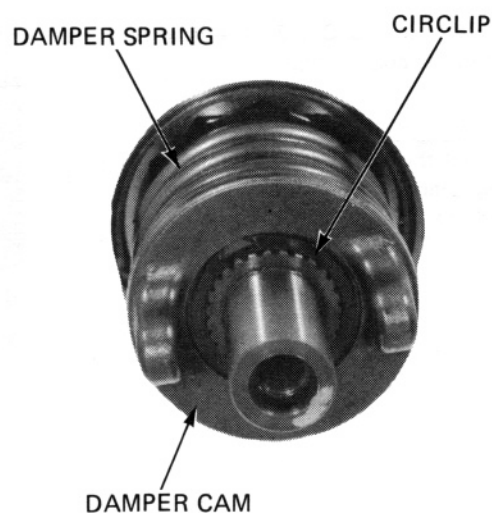
CRANKSHAFT/TRANSMISSION

Remove the circlip.
Loosen the special tool slowly to remove it.

Remove the damper cam and spring.
Check the damper cam for wear or damage.

NOTE:

Reinstall the drive shaft and bearing holder into the output gear case for removal and torquing of the output drive shaft inner bearing race lock nut.



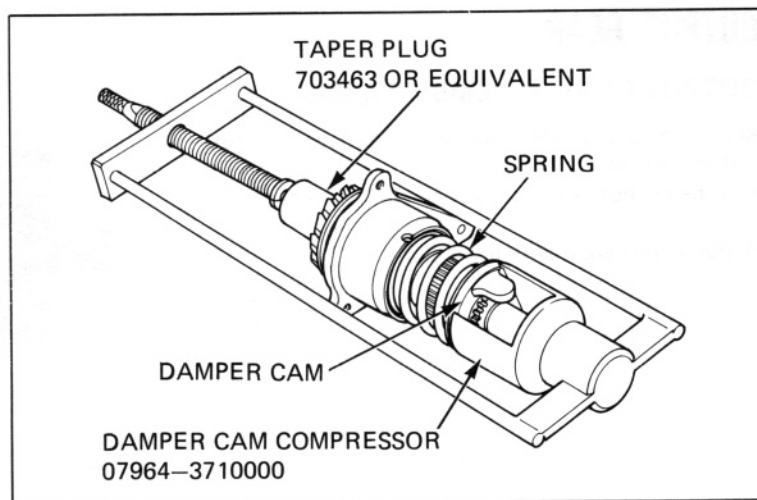
INSTALLATION

Install the damper spring and damper cam on to the output drive shaft.

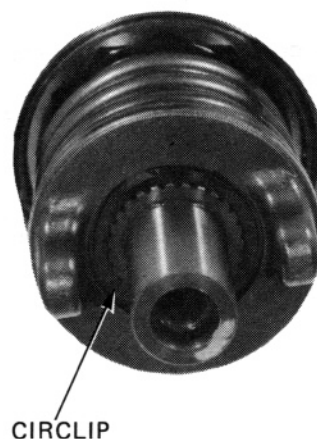
NOTE:

Seat the damper spring on the bearing lock nut.

Attach the spring compressor in the output drive shaft threads. Compress the damper cam with the special tool.



Install the circlip onto the shaft, being sure it seats in its groove.
Loosen and remove the special tool from the shaft.

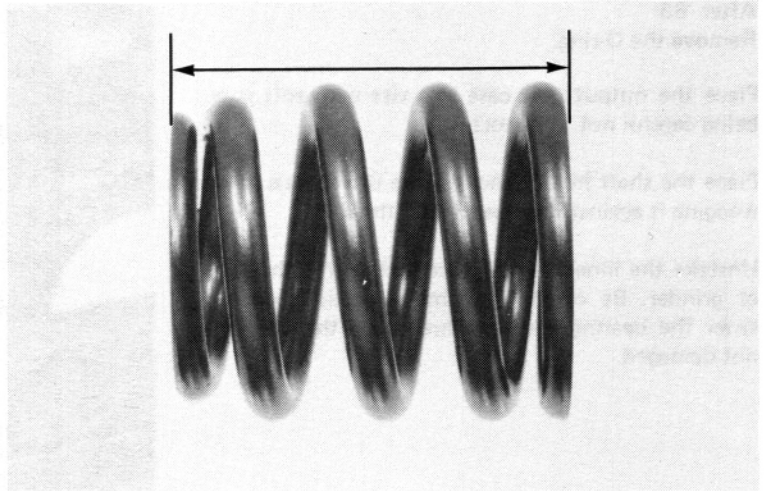


SPRING FREE LENGTH

Measure the damper spring free length.

SERVICE LIMIT: 63.8 mm (2.512 in)

Replace it if it is shorter than the service limit.



BACKLASH INSPECTION

Place the output gear case in a vise with soft jaws or a shop towel.

Set a horizontal type dial indicator on the final drive shaft as shown.

Hold the driven gear with the shaft holder and rotate the drive shaft until gear slack is taken up.

Turn the drive shaft back and forth to read backlash.

**STANDARD: 0.08–0.23 mm
(0.003–0.009 in)**

SERVICE LIMIT: 0.40 mm (0.016 in)

Remove the dial indicator. Turn the output drive shaft 120° and measure backlash. Repeat this procedure once more.

Compare the difference of the three measurements.

DIFFERENCE OF MEASUREMENTS

SERVICE LIMIT: 0.10 mm (0.004 in)

If the difference in measurements exceeds the limit, it indicates that the bearing is not installed squarely. Inspect the bearings and reinstall if necessary.

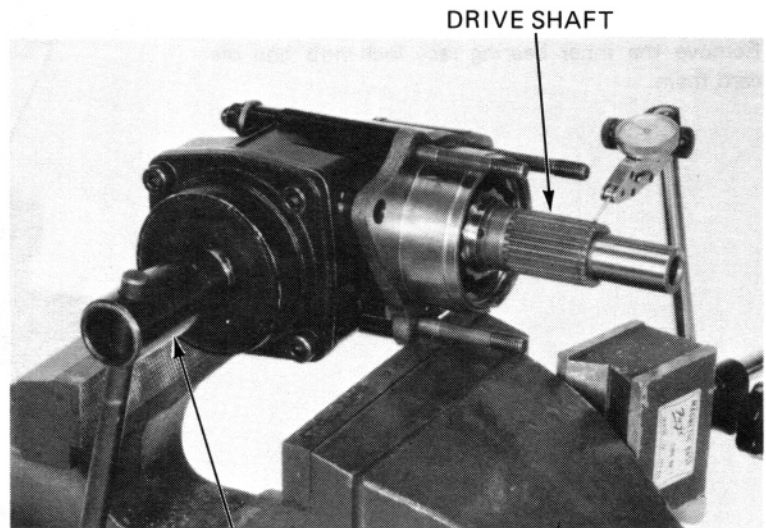
If backlash is excessive, replace the drive shaft adjustment shim with a thinner one.

If the backlash is too small, replace the drive shaft adjustment shim with a thicker one.

Backlash is changed by about 0.06–0.07 mm (0.002–0.003 in) when thickness of the shim is changed by 0.10 mm (0.004 in).

COUNTERSHAFT/OUTPUT DRIVE GEAR ADJUSTMENT SHIMS:

- A: 0.40 mm (0.016 in)
- B: 0.45 mm (0.018 in)
- C: 0.50 mm (0.020 in) Standard
- D: 0.55 mm (0.022 in)
- E: 0.60 mm (0.024 in)



SHAFT HOLDER
07923-6890101

OUTPUT DRIVE SHAFT
ADJUSTMENT SHIM



CRANKSHAFT/TRANSMISSION

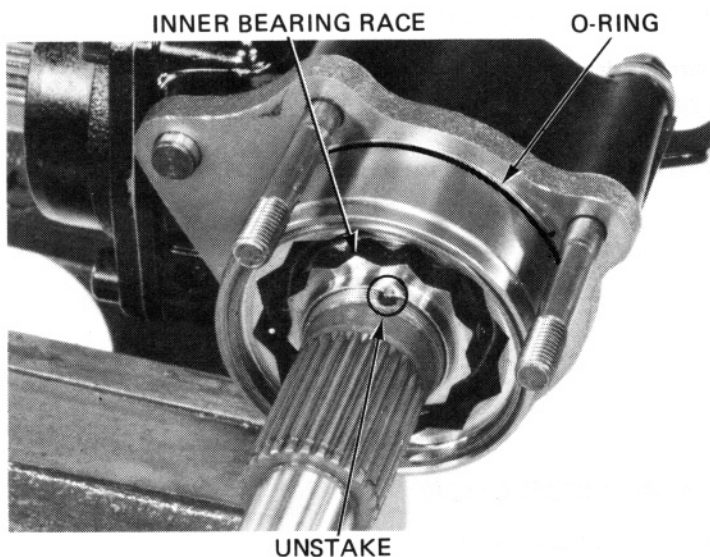
After '83:

Remove the O-ring.

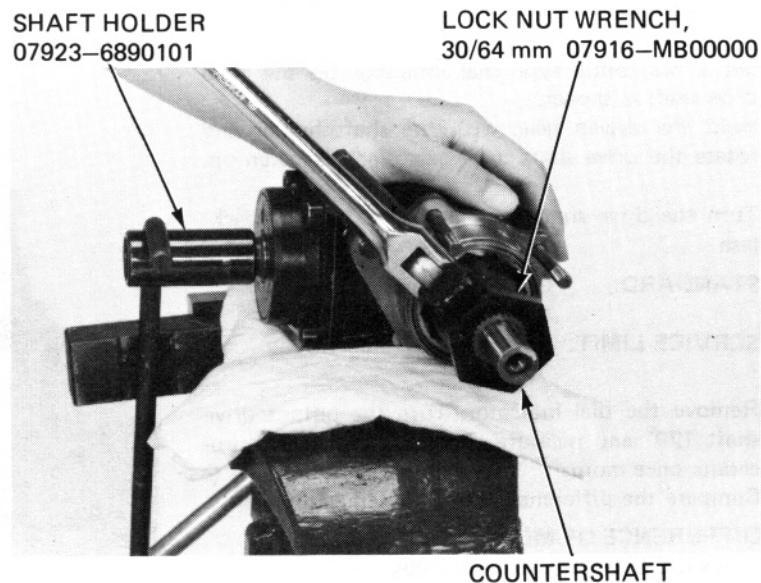
Place the output gear case in a vise with soft jaws, being careful not to distort it.

Place the shaft holder tool on the driven gear shaft wedging it against the vise to lock the shaft.

Unstake the inner bearing race lock nut with a drill or grinder. Be careful that metal particles do not enter the bearing and the threads on the shaft are not damaged.

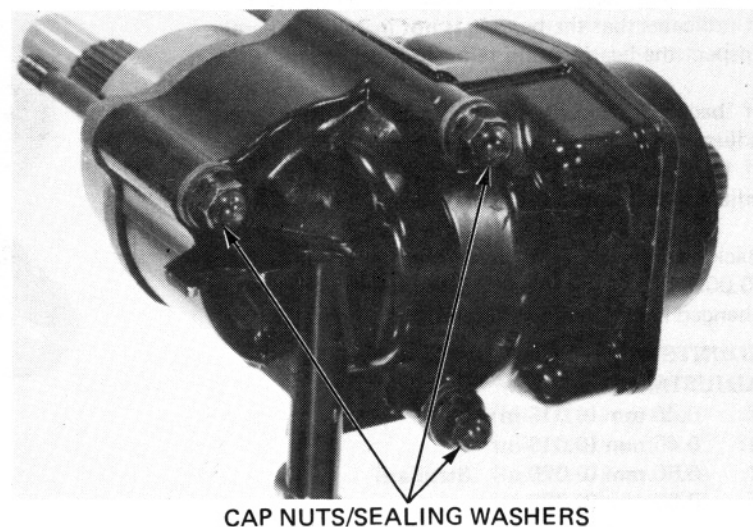


Remove the inner bearing race lock nuts and discard them.



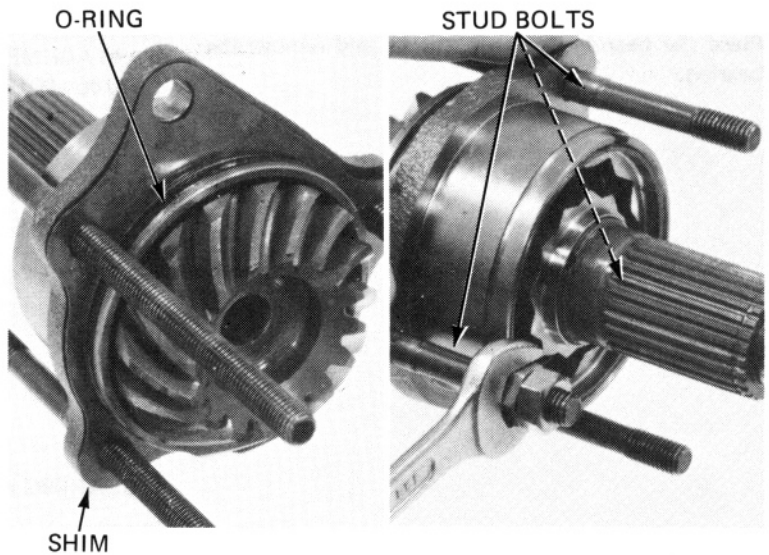
Remove the output drive shaft bearing holder nuts and sealing washers from the case.

Remove the output drive shaft.



Remove the O-ring and shim.

Lock two units together on the gear case stud bolts.
Remove the studs from the bearing holder.

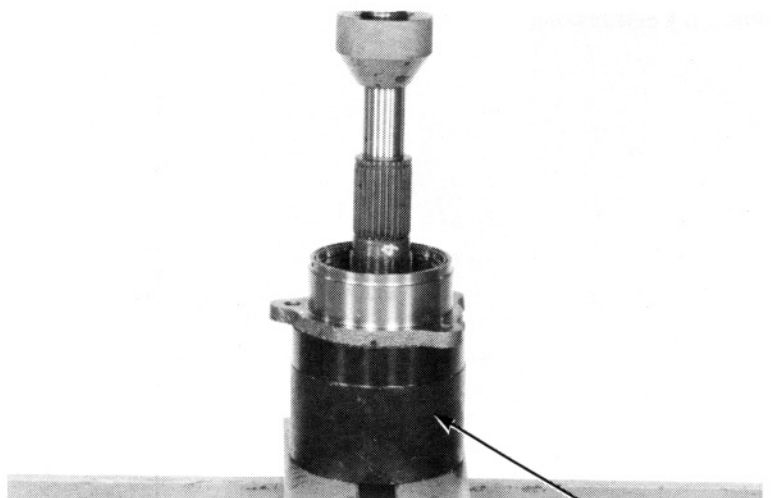


Place the output drive shaft and a disassembly tool in a press.

NOTE:

Remove the center guide from the dis/assembly tool before using it.

Press the output drive shaft out of the bearing holder.



LOCK NUT WRENCH, 30/64 mm
07916-MB00000

DIS/ASSEMBLY TOOL
07965-3710100

OUTPUT DRIVE SHAFT BEARING REPLACEMENT

NOTE:

The drive shaft must be removed before replacing the bearing.

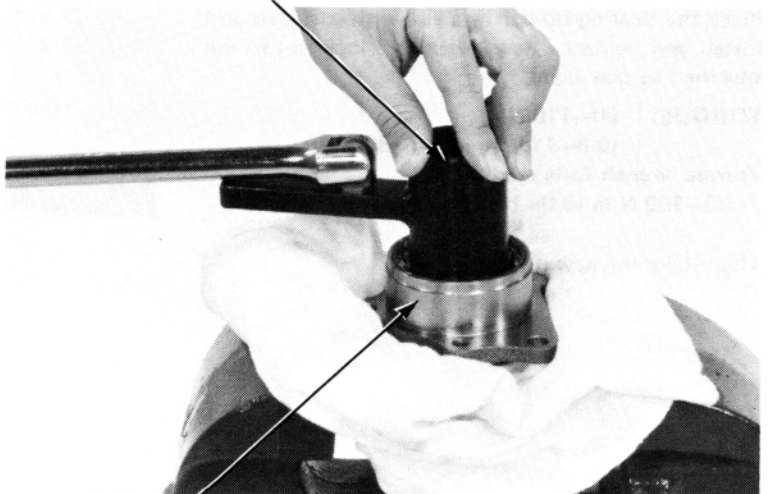
Place the bearing holder in a vise with soft jaws or a shop towel.

NOTE:

Do not damage the bearing holder, especially the crankcase mating surface.

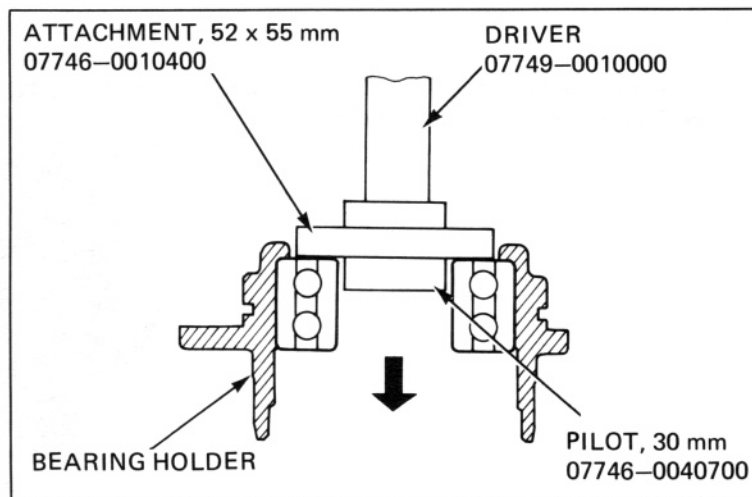
Unstake the outer race lock nut with a punch.

Remove the bearing outer race lock nut with a special tool and discard the lock nut.

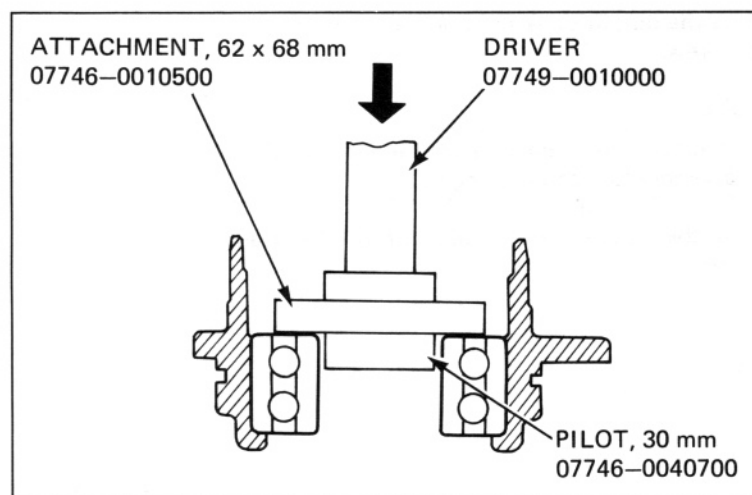


CRANKSHAFT/TRANSMISSION

Place the bearing holder in a press and remove the bearing.



Press in a new bearing.

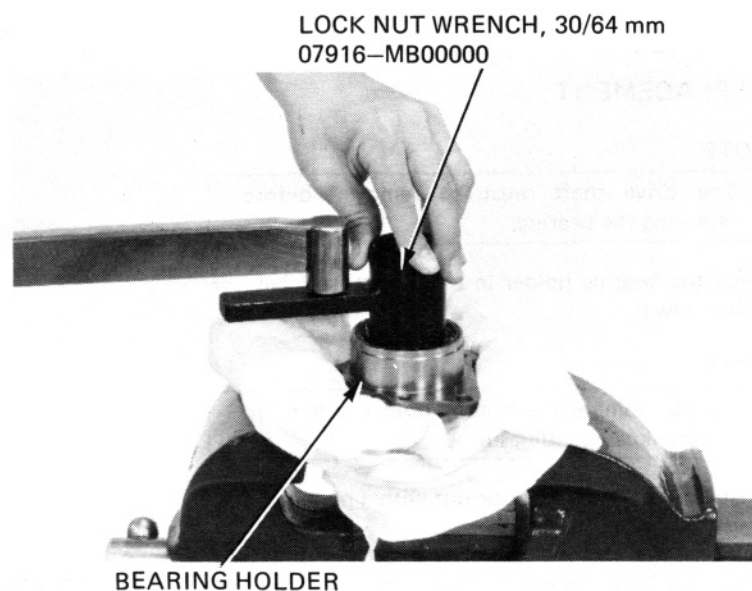


Place the bearing holder in a vise with soft jaws and install and tighten a new outer race lock nut to the specified torque value.

TORQUE: 90–110 N·m
(9.0–11.0 kg-m, 65–80 ft-lb)

Torque wrench scale reading:
80–100 N·m (8.0–10.0 kg-m, 58–72 ft-lb)

Then stake the new nut.



OUTPUT DRIVE GEAR INSTALLATION

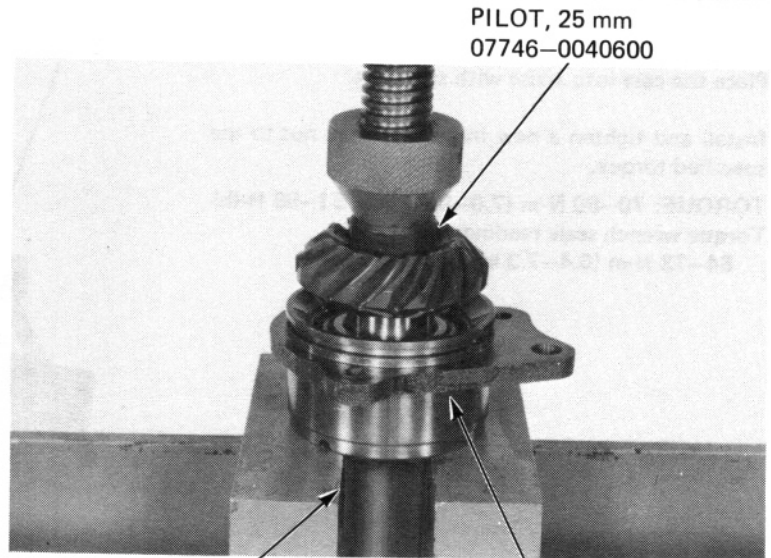
NOTE:

The output drive and driven gears must be replaced as a set if they or the gear case or bearing require replacement.

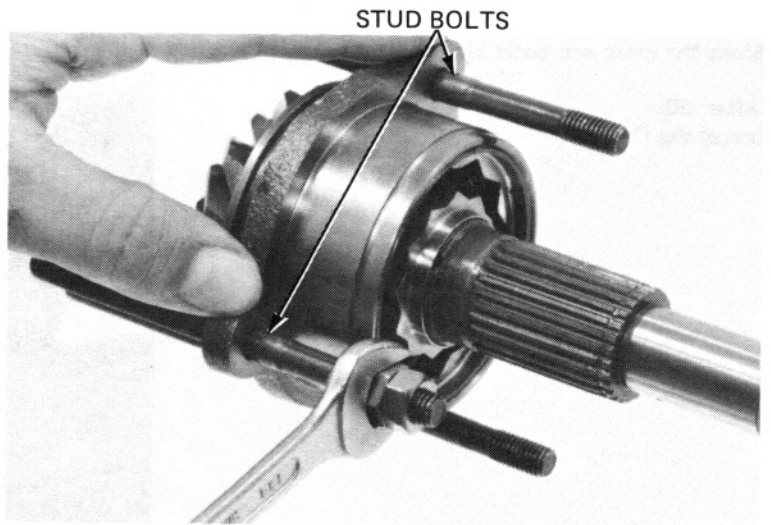
Place the output gear shaft and bearing holder into a press. Press the output drive shaft into the bearing. Support the inner bearing race using the special tools.

NOTE:

Place the pilot's threaded end into the final drive shaft.



Install the stud bolts into the bearing holder.

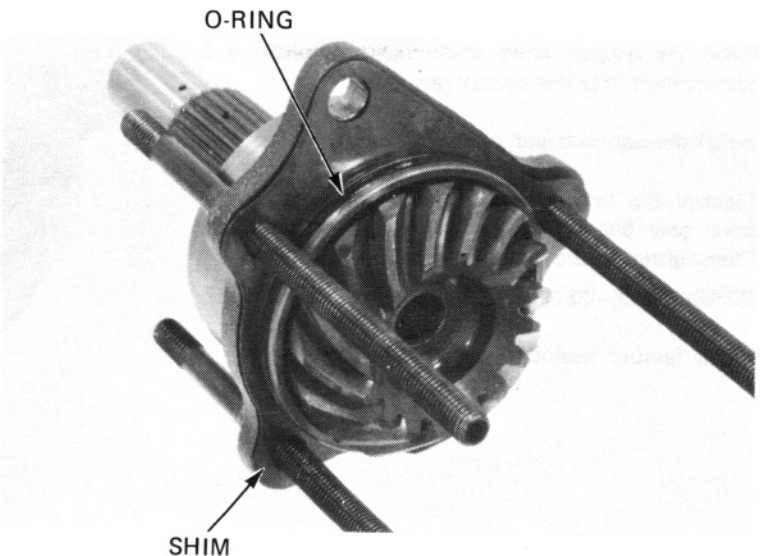


Place the adjustment shim over the bearing holder.

NOTE:

If the output gear case is replaced a new adjustment shim must be selected (page 13-19, Backlash Inspection).

Install the O-ring.



CRANKSHAFT/TRANSMISSION

Place the case into a vise with soft jaws.

Install and tighten a new inner race lock nut to the specified torque.

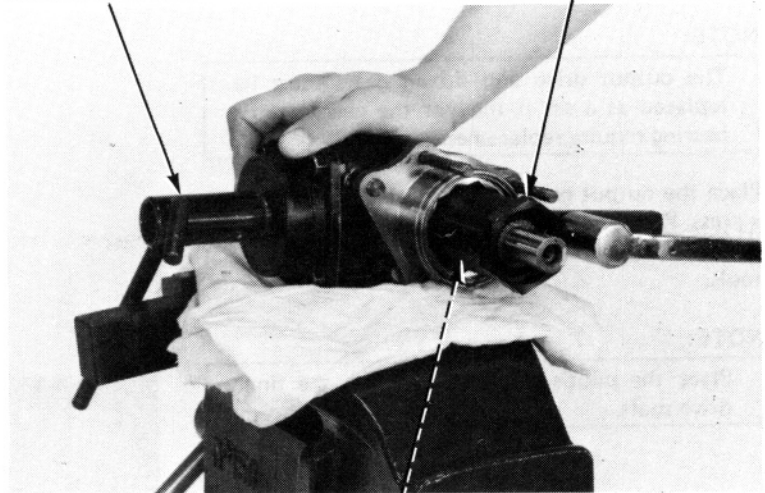
TORQUE: 70–80 N·m (7.0–8.0 kg-m, 51–58 ft-lb)

Torque wrench scale reading:

64–73 N·m (6.4–7.3 kg-m, 46–53 ft-lb)

SHAFT HOLDER
07923–6890101

LOCK NUT WRENCH,
30/64 mm 07916–MB00000

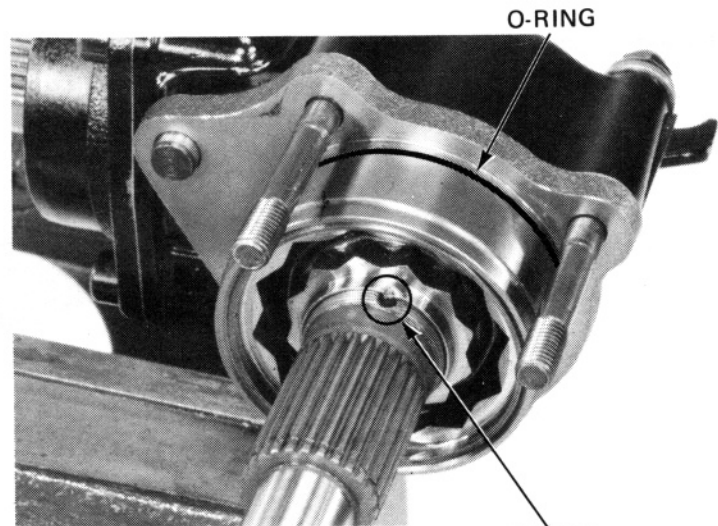


INNER RACE LOCK NUT

Stake the inner and outer lock nuts.

After '83:

Install the O-ring.



O-RING

STAKE

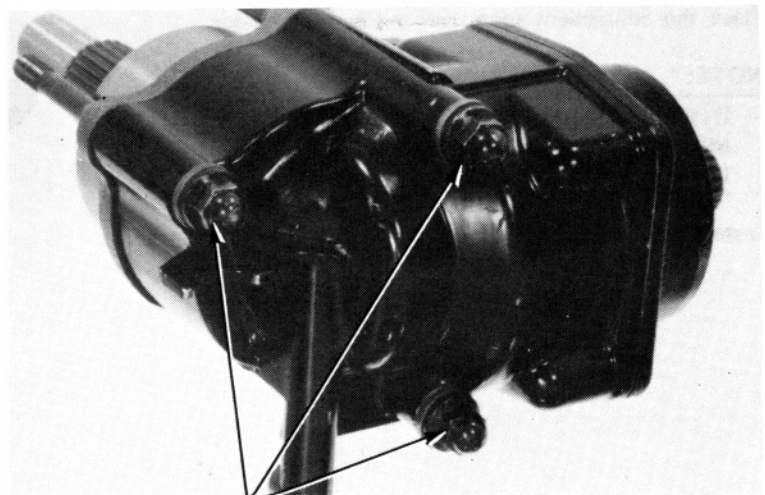
Place the output drive shaft bearing holder and correct shim into the output gear case.

Install the cap nuts and sealing washers.

Tighten the nuts in a crisscross pattern until the drive gear bearing holder seats against the case. Then tighten to the specified torque.

TORQUE: 21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)

Install damper assembly, (page 13-18).



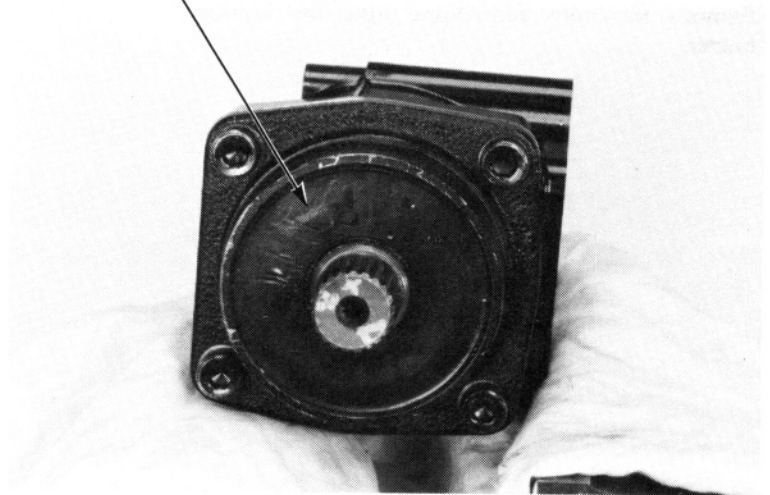
8 mm CAP NUTS/ SEALING WASHERS

OUTPUT DRIVEN GEAR REMOVAL

Remove the driven gear oil seal from the output driven gear case.

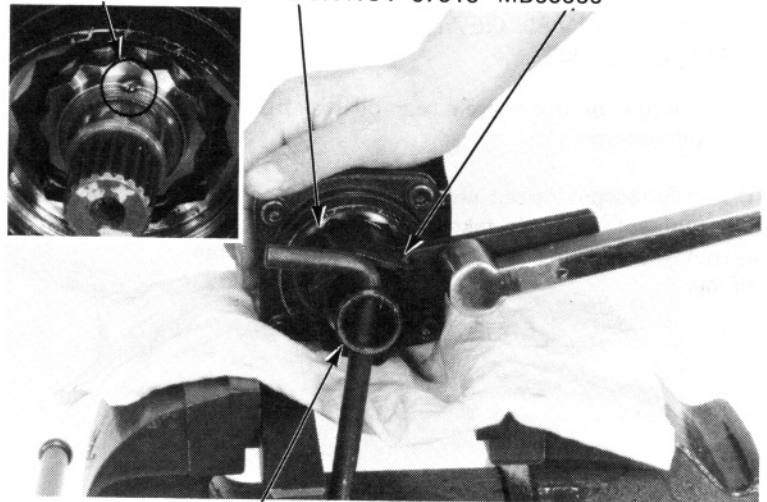
Place the output driven gear case into a vise.

OIL SEAL



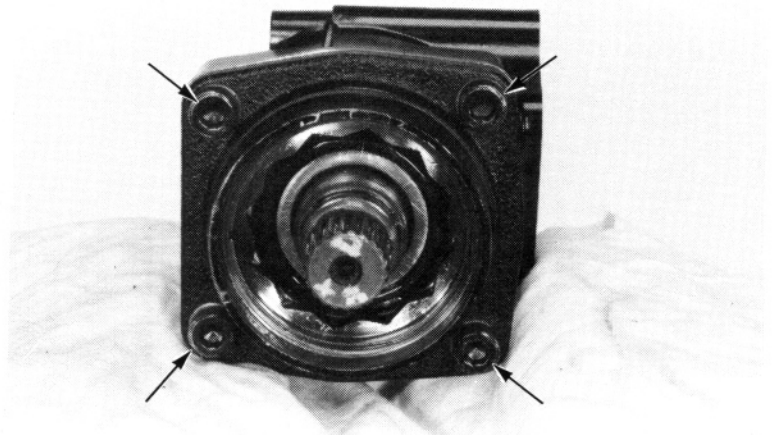
Unstake and remove the output driven gear bearing inner race lock nut.

BEARING INNER LOCK NUT WRENCH, 30/64 mm
INNER RACE RACE LOCK NUT 07916-MB00000



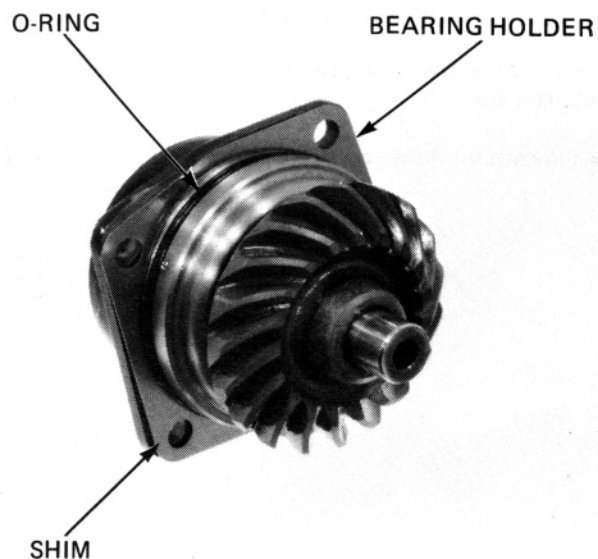
HOLDER
07923-6890101

Remove the driven gear bearing holder mounting bolts and remove the shim, gear and holder from the case.



CRANKSHAFT/TRANSMISSION

Remove the shim and O-ring from the bearing holder.

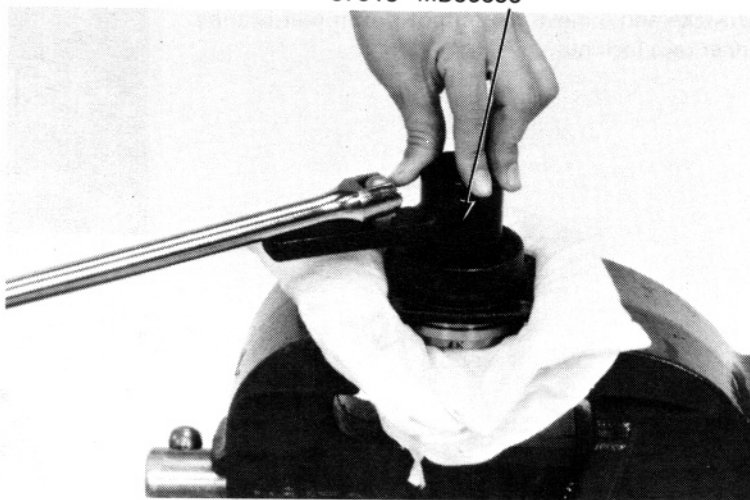


LOCK NUT WRENCH, 30/64 mm
07916-MB00000

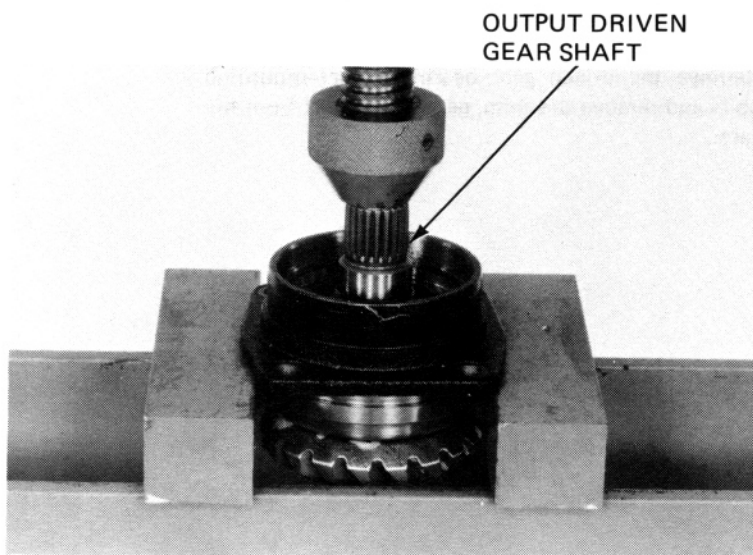
OUTPUT DRIVEN GEAR BEARING REPLACEMENT

Remove the output driven gear oil seal from the output gear case.

Place the output driven gear bearing holder into a vise with soft jaws. Unstake and remove the output driven gear bearing outer race lock nut from the holder.



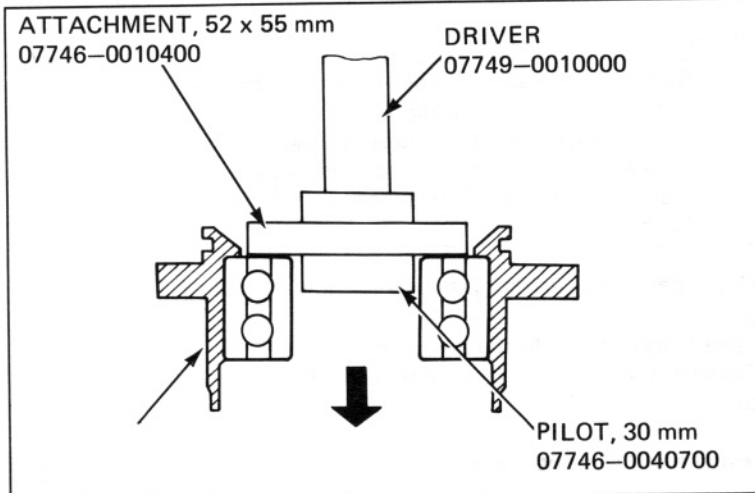
Press the output driven gear shaft from the holder.



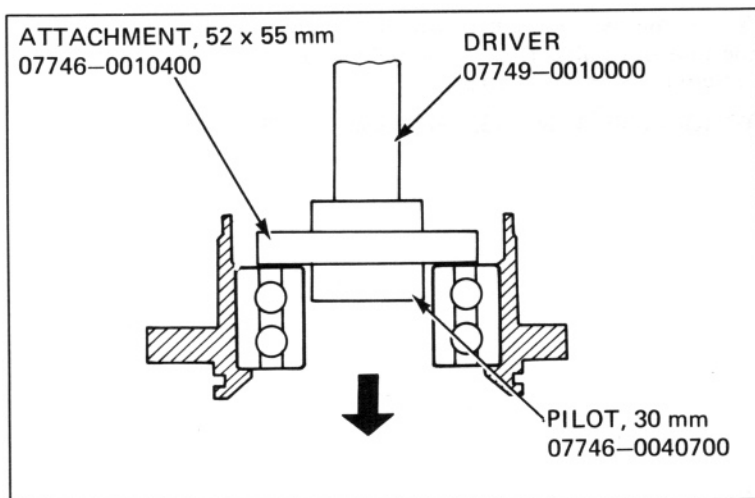
Place the bearing holder in a press and press the bearing out.

NOTE:

Be careful not to damage the bearing holder gear case mating surface.



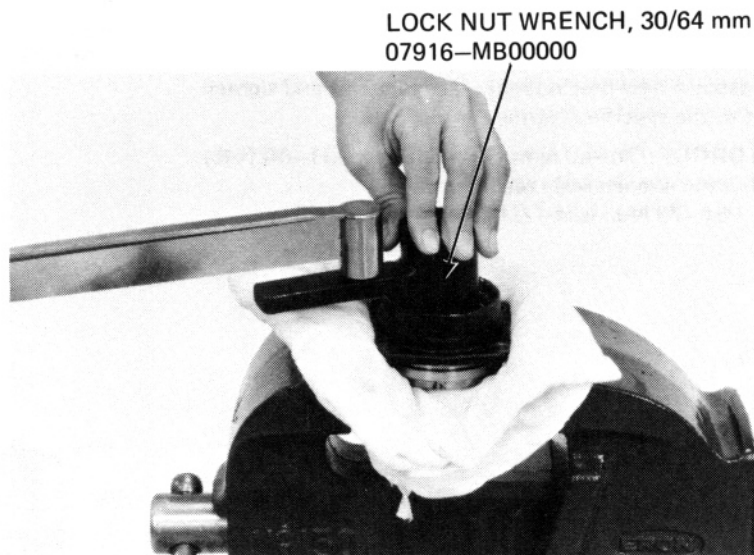
Press in a new bearing and make sure it rotates freely after installation.



Place the bearing holder into a vise with soft jaws. Install and tighten a new bearing outer race lock nut to the specified torque value.

TORQUE: 90–110 N·m
(9.0–11.0 kg-m, 65–80 ft-lb)

Torque wrench scale reading:
80–100 N·m (8.0–10.0 kg-m, 58–72 ft-lb)



CRANKSHAFT/TRANSMISSION

OUTPUT DRIVEN GEAR INSTALLATION

NOTE:

- Remove the center guide from the dis/assembly tool before using.
- When the gear set, driven gear bearing and/or gear case has been replaced, use a shim 0.30 mm (0.012 in) thick for initial reference.

Place the output driven gear bearing holder into a press.

Then press in the output driven gear.

Support the inner bearing race using the special tools.

Install the O-ring and correct shim.

Attach the bearing holder onto the gear case with the four hex bolts. Tighten the bolts in a crisscross pattern in two or more steps.

TORQUE: 30–40 N·m (3.0–4.0 kg-m, 22–29 ft-lb)

Install a new bearing inner race lock nut and tighten it to the specified torque.

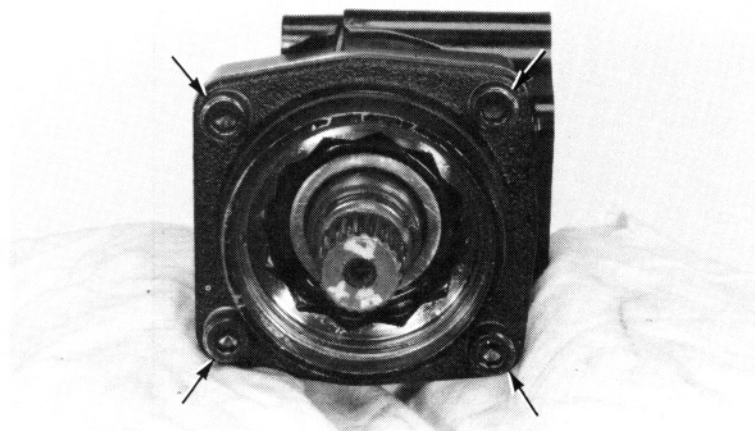
TORQUE: 70–80 N·m (7.0–8.0 kg-m, 51–58 ft-lb)

Torque wrench scale reading:

64–73 N·m (6.4–7.3 kg-m, 46–53 ft-lb)

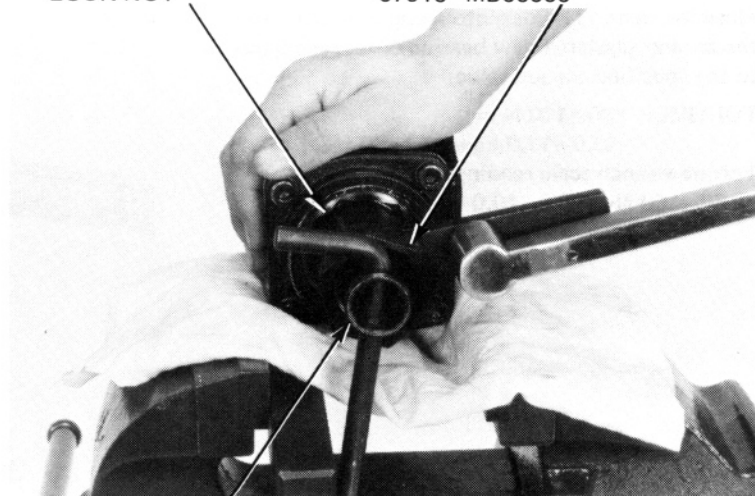


DIS/ASSEMBLY TOOL
07965-3710100



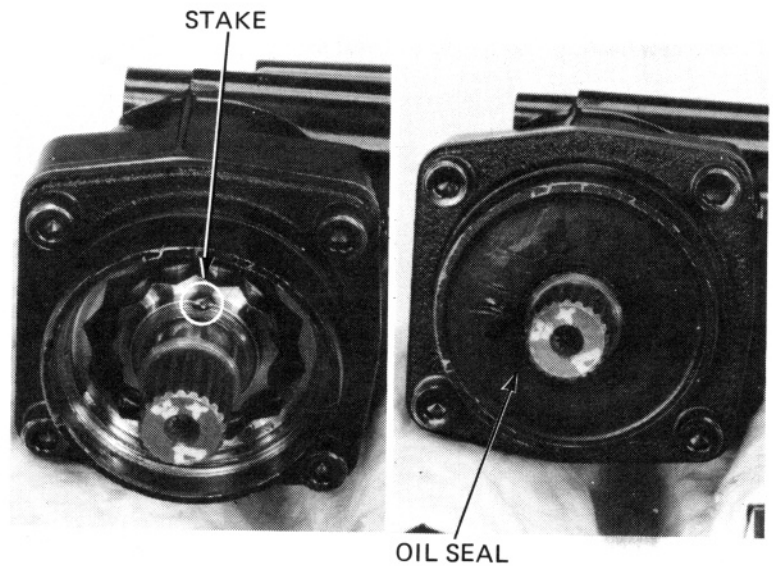
BEARING INNER RACE
LOCK NUT

LOCK NUT WRENCH, 30/64 mm
07916-MB00000



HOLDER
07923-6890101

Stake both new lock nuts and install a new oil seal.

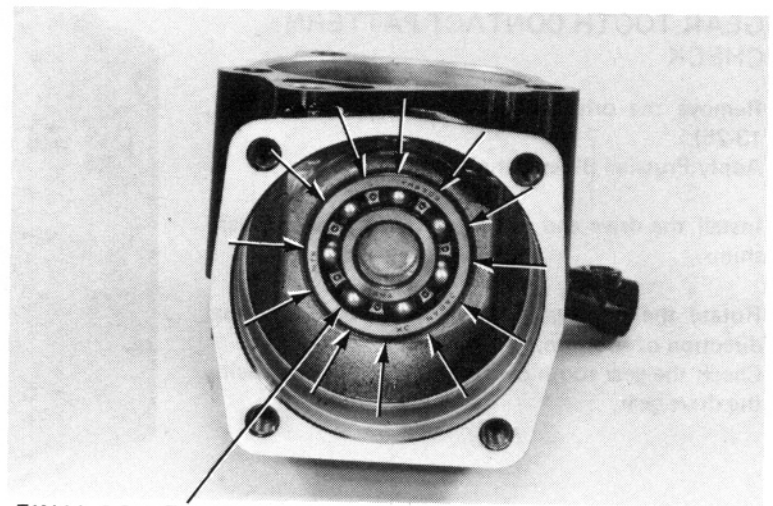


OUTPUT DRIVEN GEAR CASE BEARING REPLACEMENT

Heat the output gear case around the driven shaft bearing to 80°C (176°F).

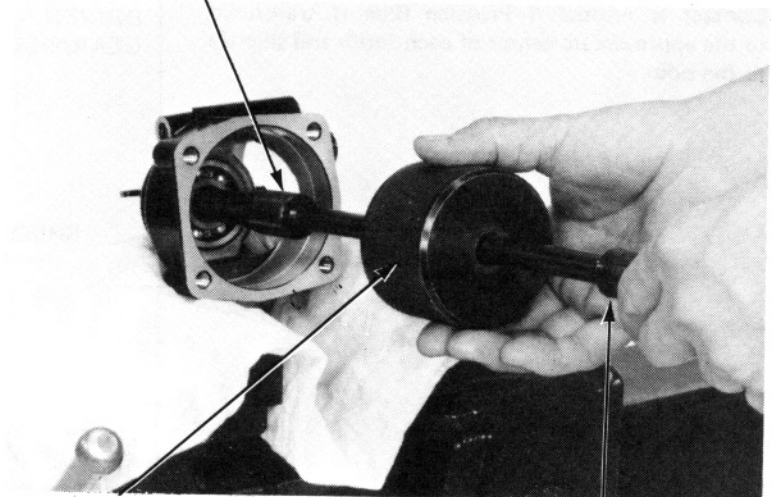
CAUTION:

Always wear gloves when handling a heated gear case.



FINAL DRIVEN SHAFT BEARING
BEARING REMOVER, 17 mm
07936-3710300

Remove the bearing with the bearing remover.

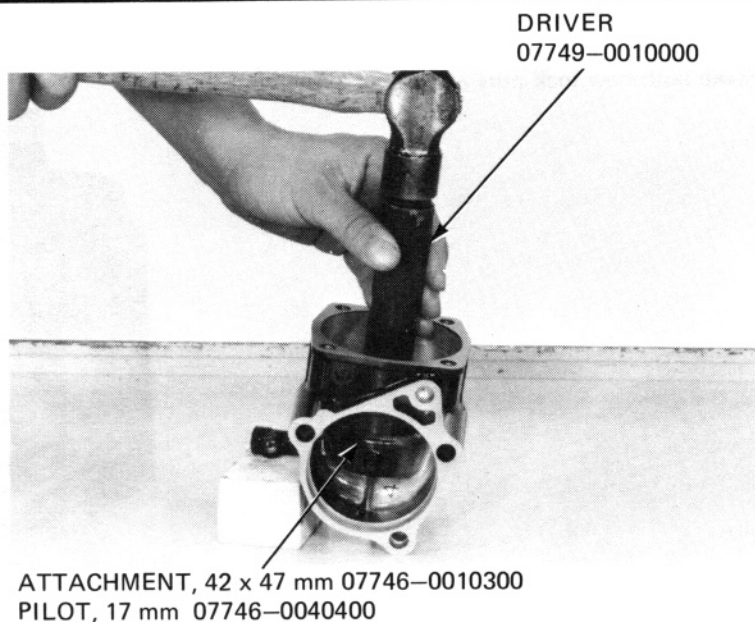


WEIGHT
07936-3710200

HANDLE
07936-3710100

CRANKSHAFT/TRANSMISSION

Drive a new bearing into the output gear case.



GEAR TOOTH CONTACT PATTERN CHECK

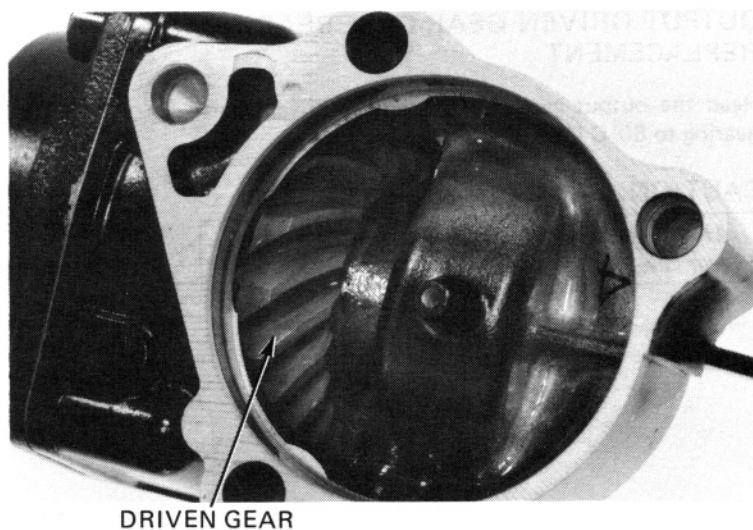
Remove the drive and driven gears (pages 13-17, 13-25).

Apply Prussian Blue to the driven gear teeth.

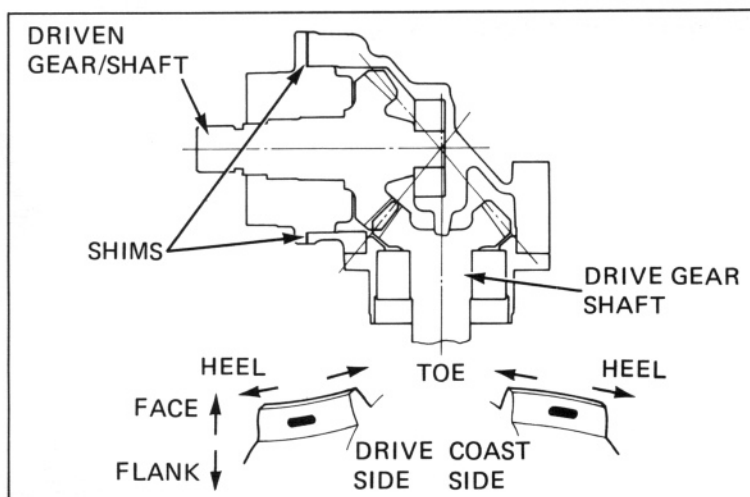
Install the drive and driven gears with the standard shims.

Rotate the drive gear several times in the normal direction of rotation.

Check the gear tooth contact pattern after removing the drive gear.

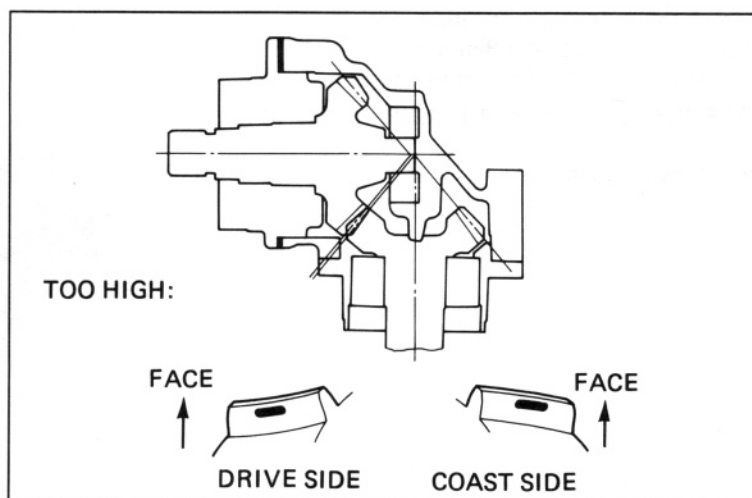


Contact is normal if Prussian Blue is transferred to the approximate center of each tooth and slightly to the side.



If the pattern is not correct, remove and replace the driven gear adjustment shim.

Replace the shim with a thinner one if the contact pattern is too high.



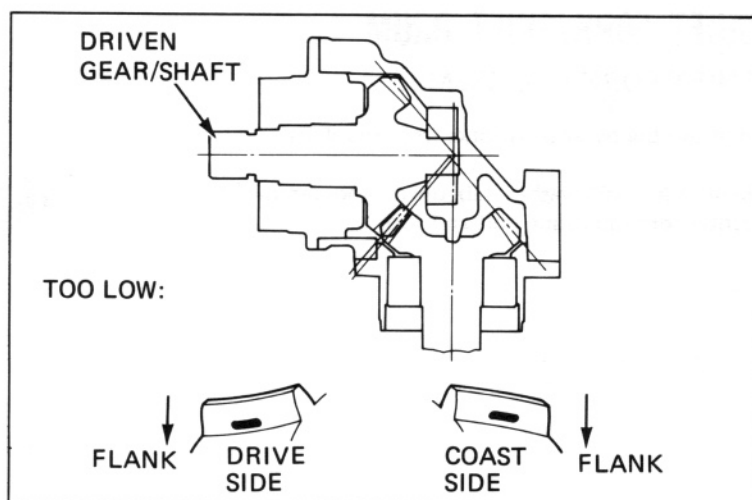
Replace the driven gear adjustment shim with a thicker one if the contact is too low.

The pattern will shift about 1.5–2.0 mm (0.06–0.08 in) when the thickness of the shim is changed by 0.10 mm (0.04 in).

OUTPUT DRIVEN GEAR ADJUSTMENT SHIM:

- A: 0.40 mm (0.016 in)
- B: 0.45 mm (0.018 in)
- C: 0.50 mm (0.020 in) STANDARD
- D: 0.55 mm (0.022 in)
- E: 0.60 mm (0.024 in)

Check the backlash (See page 13-19).



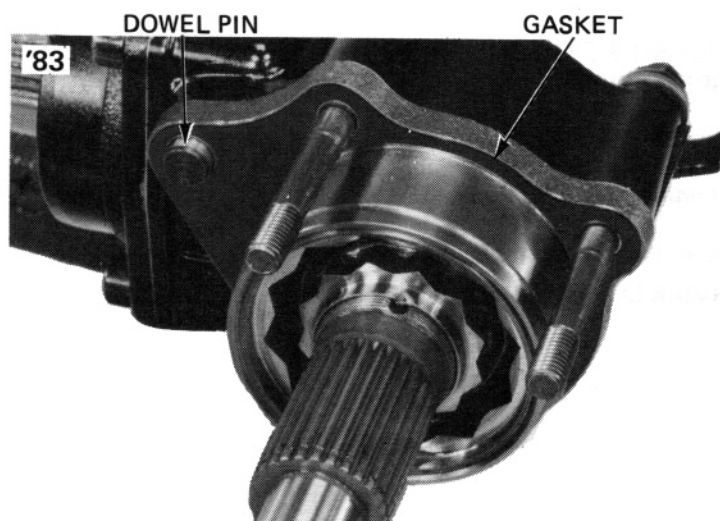
OUTPUT GEAR CASE INSTALLATION

'83:

Install the dowel pin and a new gasket over the output drive shaft bearing holder.

After '83:

Install the dowel pin.

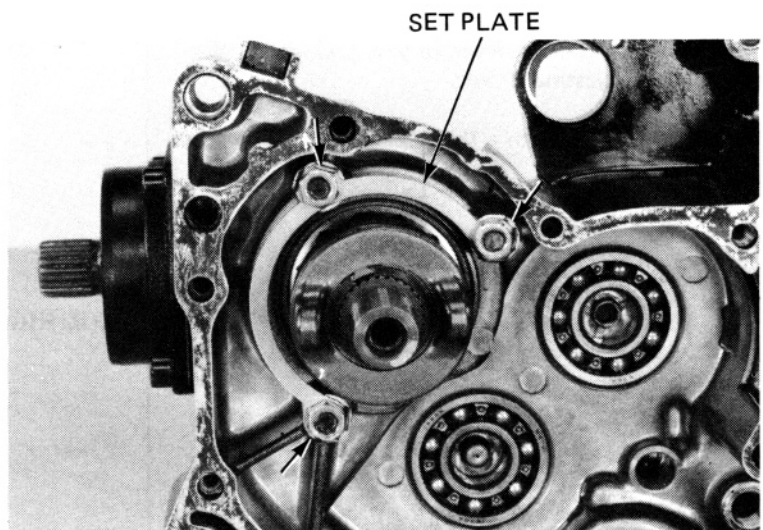


CRANKSHAFT/TRANSMISSION

Install the output gear assembly into the crankcase.
Install the set plate and 8 mm nuts.
Tighten the nuts to the specified torque.

TORQUE: 21–25 N·m (2.1–2.5 kg-m, 15–18 ft-lb)

Bend the lock tabs up.

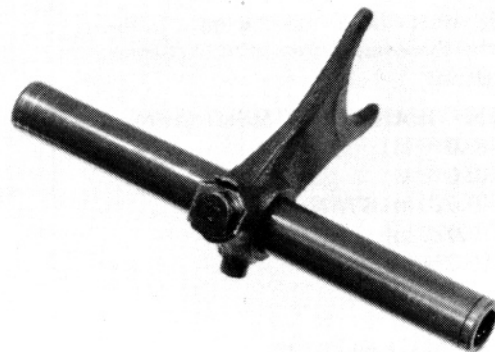


SHIFT FORK/SHIFT DRUM

SHIFT FORK DISASSEMBLY

Remove the outer shift forks from the shaft.

Bend the lock washer tab down and remove the center fork mounting bolt and fork.

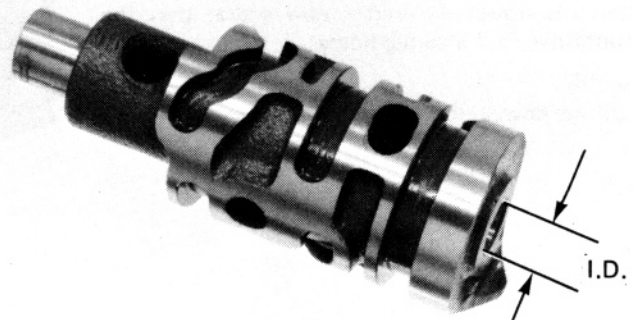


GEAR SHIFT DRUM AND SHIFT FORK INSPECTION

Inspect the shift drum end for scoring, scratches, or evidence of insufficient lubrication. Check the shift drum grooves for damage.

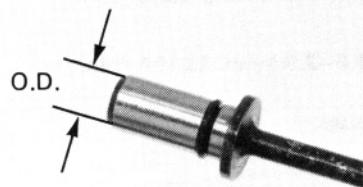
Measure the shift drum I.D.

SERVICE LIMIT: 12.55 mm (0.494 in)



Measure the shift drum holder O.D.

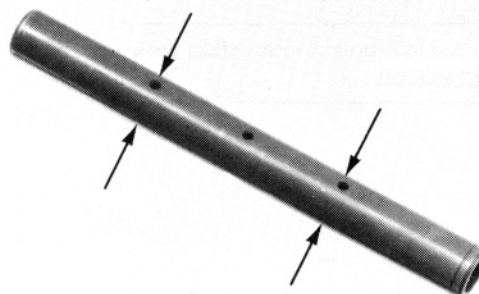
SERVICE LIMIT: 12.35 mm (0.486 in)



Check for scratches, scoring or evidence of insufficient lubrication.

Measure the shift fork shaft O.D. at the right and left shift fork surfaces.

SERVICE LIMIT: 13.90 mm (0.547 in)

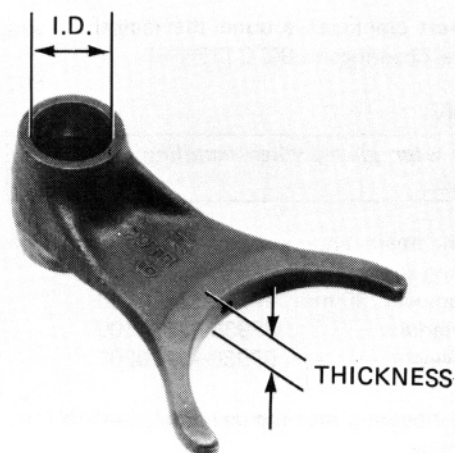


Measure the right and left shift fork I.D. and the shift fork claw thickness.

SERVICE LIMITS:

I.D. (right and left fork): 14.04 mm (0.553 in)

CLAW THICKNESS: 6.1 mm (0.24 in)



CRANKSHAFT/TRANSMISSION

SHIFT FORK ASSEMBLY

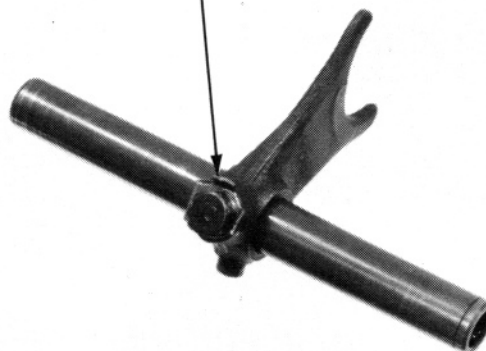
Install the center shift fork onto the shaft.

Install the lock washer and tighten the center fork bolt.

TORQUE: 16–20 N·m (1.6–2.0 kg-m, 12–14 ft-lb)

Bend the lock washer tabs up.

LOCK WASHER TAB

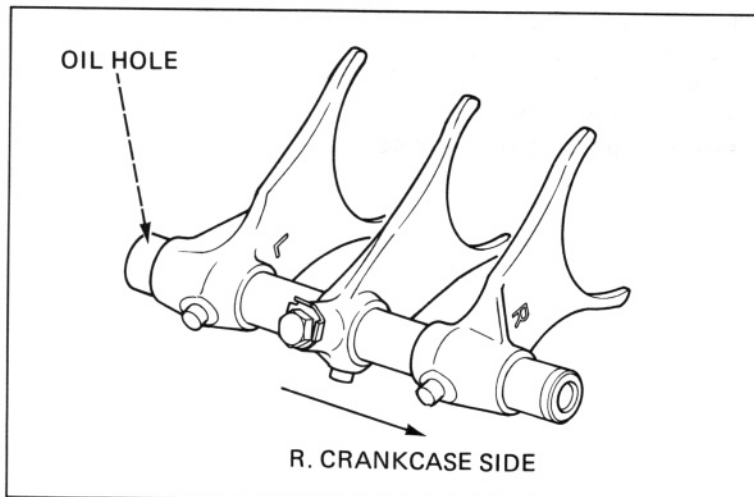


Install the R.L. forks facing as shown against the center shift fork.

NOTE:

Make sure the oil hole in the shift fork shaft toward the left.

OIL HOLE



CRANKCASE BEARINGS REPLACEMENT

LEFT CRANKCASE BEARINGS

Heat the left crankcase around the mainshaft and counter shaft bearings to 80°C (176°F).

CAUTION:

Always wear gloves when handling a heated crankcase.

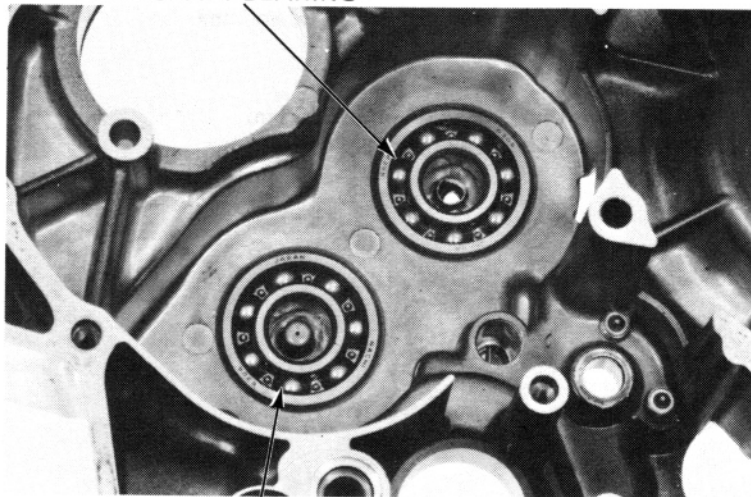
Remove the main and countershaft bearings with the following tools:

Bearing Remover, 20 mm	07936–3710600
Remover Handle	07936–3710100
Remover Weight	07936–3710200

Drive a new bearing into the left crankcase with the following tools:

Attachment	07946–3710200
Driver	07949–3710000

MAIN SHAFT BEARING



COUNTERSHAFT BEARING

RIGHT CRANKCASE BEARINGS

Heat the right crankcase around the mainshaft, countershaft, output drive shaft and shift drum bearings to 80°C (176°F).

CAUTION:

Always wear gloves when handling a heated crankcase.

Remove the bearings with the following tools:

Bearing Remover, 20 mm 07936-3710600

Remover Handle 07936-3710100

Remover Weight 07936-3710200

Drive the new bearings into the right crankcase with the following tools:

Main shaft:

Attachment, 62 x 68 mm 07746-0010500

Pilot, 25 mm 07746-0040600

Driver 07749-0010000

Counter shaft/Output drive shaft:

Driver 07749-0010000

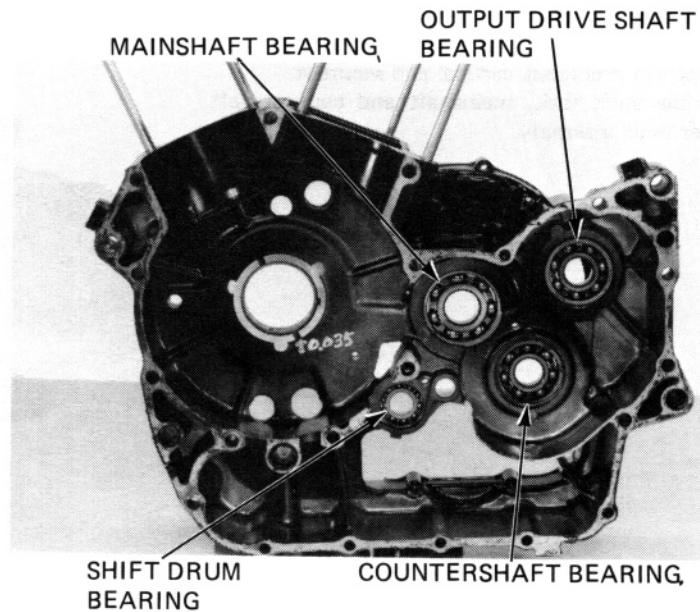
Attachment 07946-3710200

Shift Drum:

Attachment, 32 x 35 mm 07746-0010100

Pilot, 17 mm 07746-0040400

Driver 07749-0010000



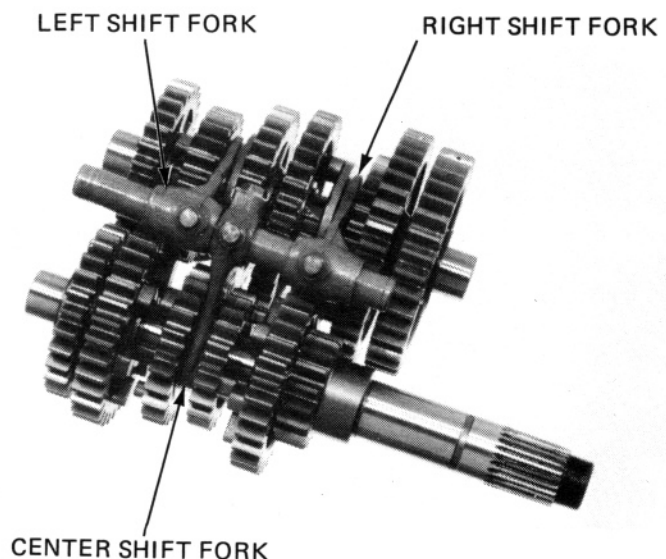
TRANSMISSION INSTALLATION

Install the shift fork onto the mainshaft and countershaft as shown:

Center shift fork to M2/3 gear groove.

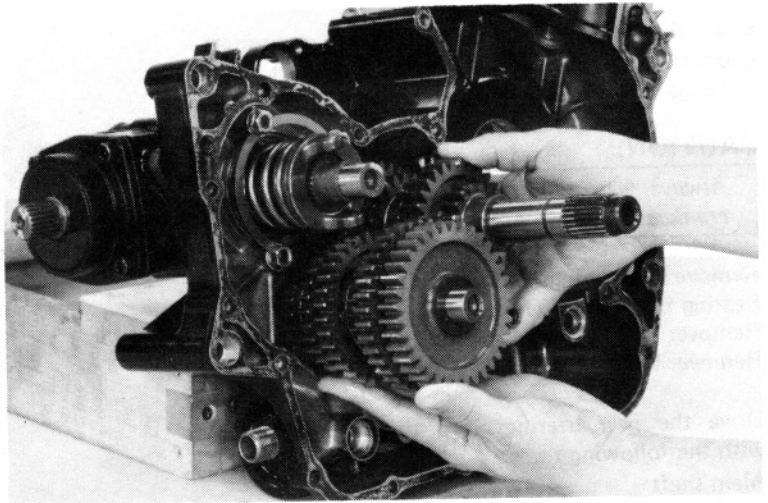
Right shift fork to C5 gear groove.

Left shift fork to C6 gear groove.



CRANKSHAFT/TRANSMISSION

Place the left crankcase vertical and secure it.
Install the shift fork, mainshaft and countershaft together as an assembly.



Install the shift drum aligning the grooves with the boss of each shift fork.

Install the shift drum shaft with a new O-ring.

Assemble the crankcase (page 12-4).

