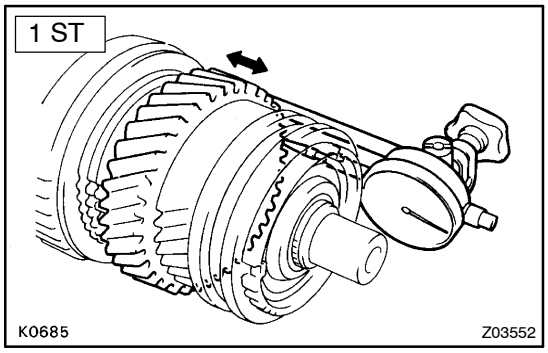
OUTPUT SHAFT ASSY (R150F)

4103S–02

OVERHAUL

HINT:

COMPONENTS: See page 41–1

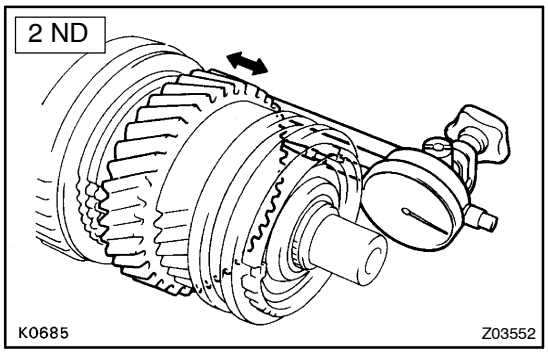


1. INSPECT 1ST GEAR THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance of the first gear.

Standard clearance:

0.20 – 0.45 mm(0.0079 – 0.0177 in.)

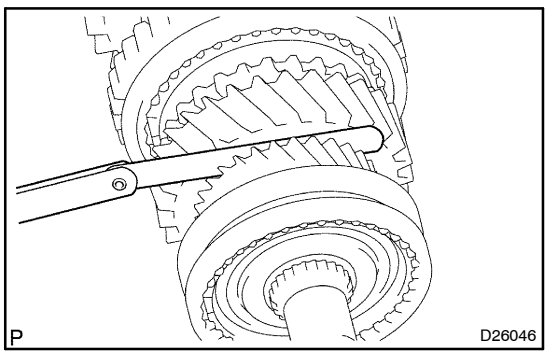


2. INSPECT 2ND GEAR THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance of the second gear.

Standard clearance:

0.10 – 0.25 mm (0.0039 – 0.0098 in.)

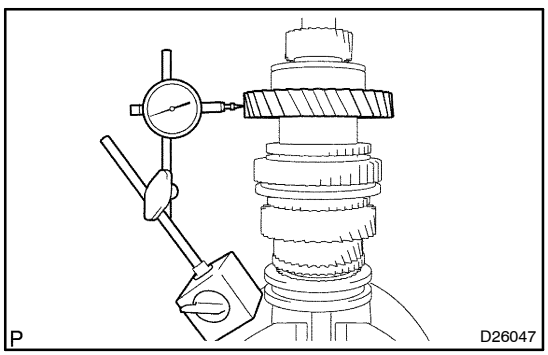


3. INSPECT 3RD GEAR THRUST CLEARANCE

(a) Using a feeler gauge, measure the thrust clearance of the third gear.

Standard clearance:

0.10 – 0.25 mm (0.0039 – 0.0098 in.)



4. INSPECT 1ST GEAR RADIAL CLEARANCE

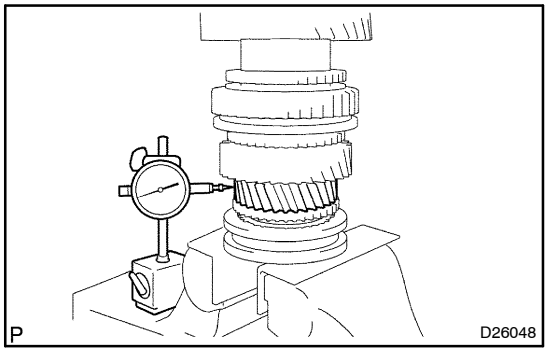
(a) Using a dial indicator, measure the radial clearance of the first gear.

Standard clearance:

0.020 – 0.073 mm (0.0008 – 0.0029 in.)

NOTICE:

If the clearance is outside the specification, replace the first gear needle roller bearing with a new one.



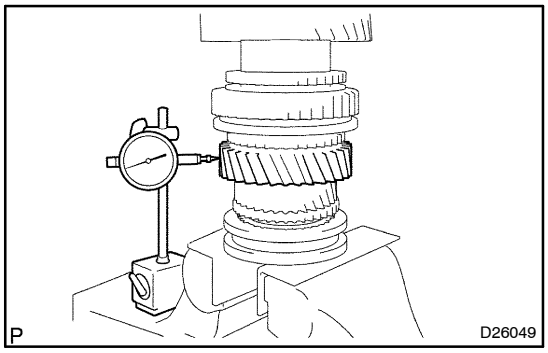
5. INSPECT 2ND GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the radial clearance of the second gear.

Standard clearance:
0.015 – 0.068mm (0.0006 – 0.0027 in.)

NOTICE:

If the clearance is outside the specification, replace the 2nd gear needle roller bearing with a new one.



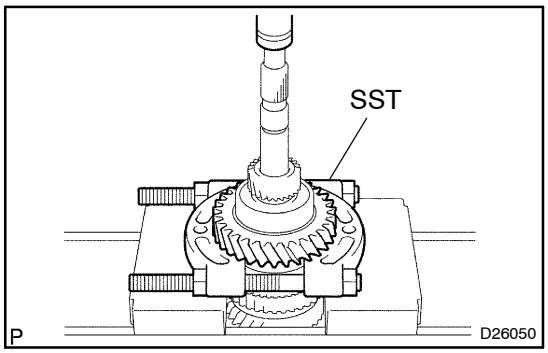
6. INSPECT 3RD GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the radial clearance of the 3rd gear.

Standard clearance:
0.015 – 0.068 mm (0.0006 – 0.0027 in.)

NOTICE:

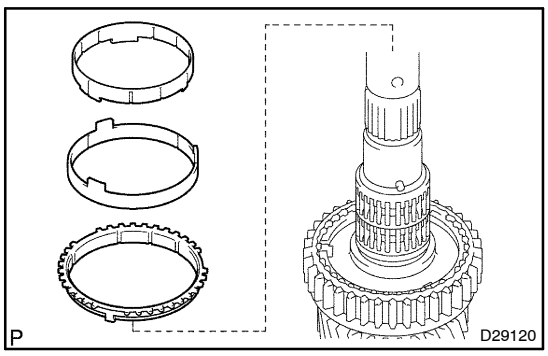
If the clearance is outside the specification, replace the 3rd gear needle roller bearing with a new one.



7. REMOVE 1ST GEAR

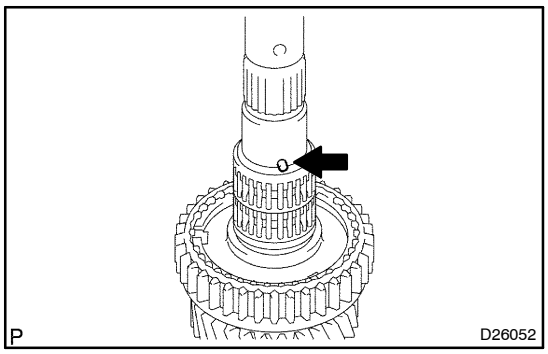
(a) Using SST and a press, remove the fifth gear, the output shaft center bearing, the 1st gear thrust washer and the first gear from the output shaft.

SST 09950–00020



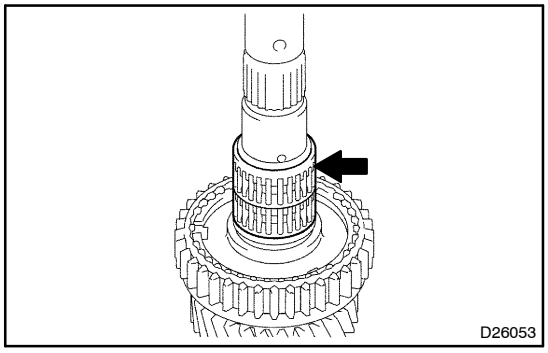
8. REMOVE SYNCHRONIZER RING SET NO.1 (FOR FIRST SYNCHRONIZER RING)

(a) Remove synchronizer ring No.1 (for 1st synchronizer ring) from the output shaft.



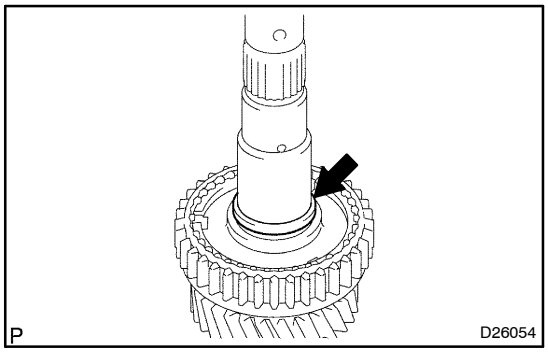
9. REMOVE 1ST GEAR THRUST WASHER PIN OR BALL

(a) Remove the 1st gear thrust washer pin (ball) from the output shaft.



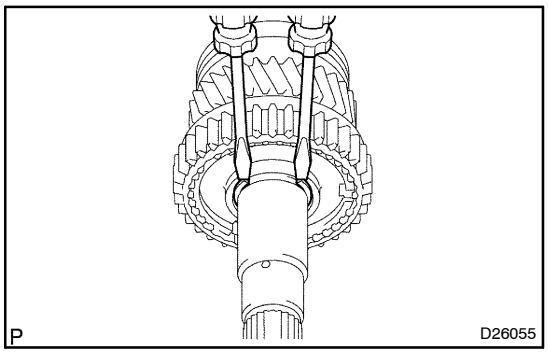
10. REMOVE 1ST GEAR NEEDLE ROLLER BEARING

(a) Remove the 1st gear needle roller bearing from the output shaft.



11. REMOVE 1ST GEAR BEARING SPACER

(a) Remove the 1st gear bearing spacer from the output shaft.

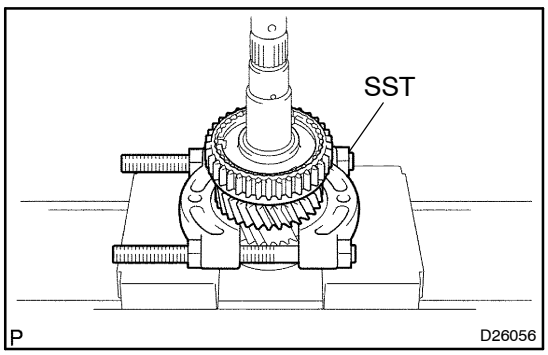


12. REMOVE BEARING SHAFT SNAP RING

(a) Using 2 screwdrivers and a hammer, remove the bearing shaft snap ring from the output shaft.

NOTICE:

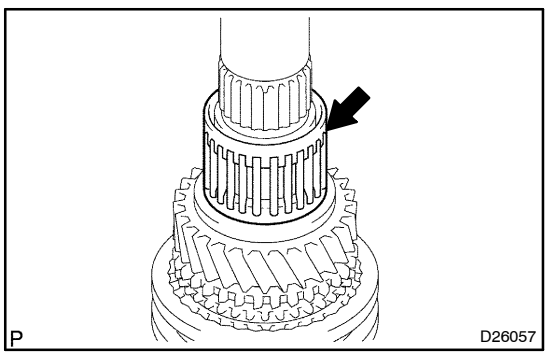
Use a shop rag to prevent the snapring from flying off.



13. REMOVE 2ND GEAR

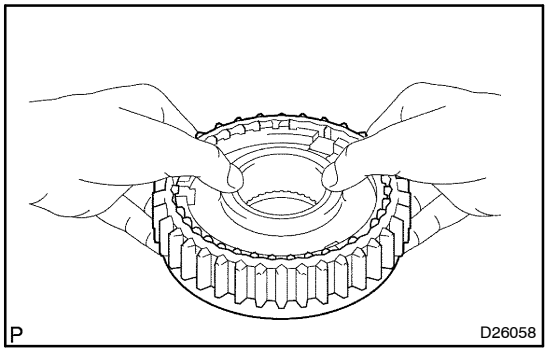
(a) Using SST and a press, remove the transmission clutch hub No.1, the synchronizer ring No.1, the revers gear and the second gear from the output shaft.

SST 09950–00020



14. REMOVE 2ND GEAR NEEDLE ROLLER BEARING

(a) Remove the 2nd gear needle roller bearing from the output shaft.

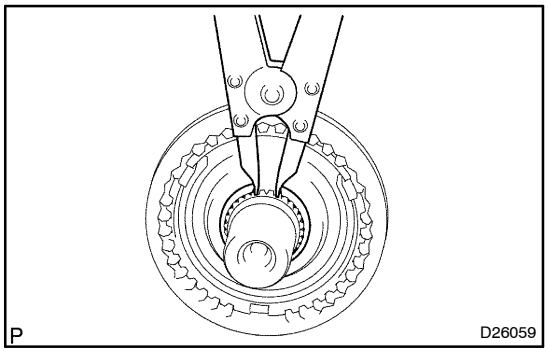


15. REMOVE REVERSE GEAR

(a) Remove the reverse gear, the 3 synchro–mesh shifting keys No.1 and the 3 synchro–mesh shifting key No.1 compression springs.

NOTICE:

Use waste to prevent the shifting key and the compression spring from popping out.

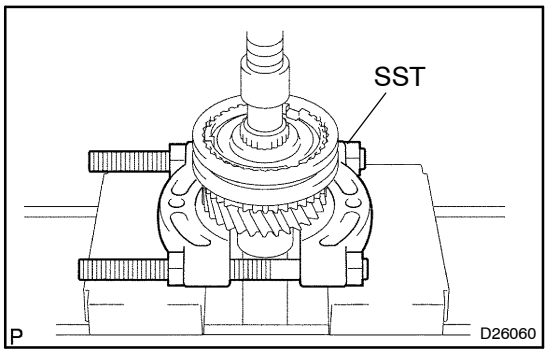


16. REMOVE CLUTCH HUB SET SHAFT SNAP RING

(a) Using snap ring pliers, remove the clutch hub shaft snap ring from the output shaft.

NOTICE:

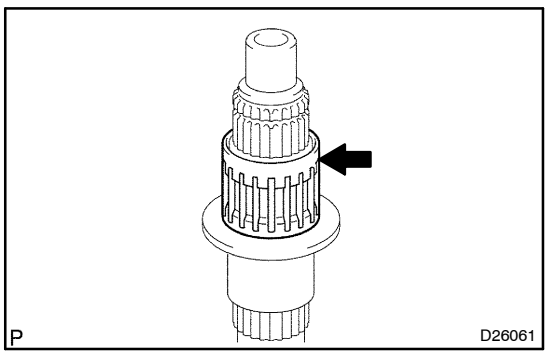
Do not damage the sliding surface of the bearing.



17. REMOVE 3RD GEAR

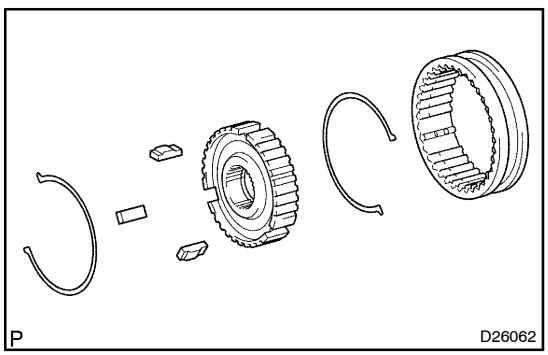
(a) Using SST and a press, remove the No.2 synchronizer ring, the transmission hub sleeve No.2 ASSY and the third gear form the output shaft.

SST 09950–00020



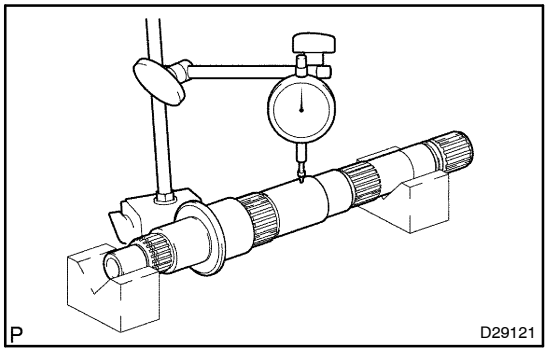
18. REMOVE 3RD GEAR NEEDLE ROLLER BEARING

(a) Remove the 3rd gear needle roller bearing from the output shaft.



19. REMOVE TRANSMISSION HUB SLEEVE NO.2

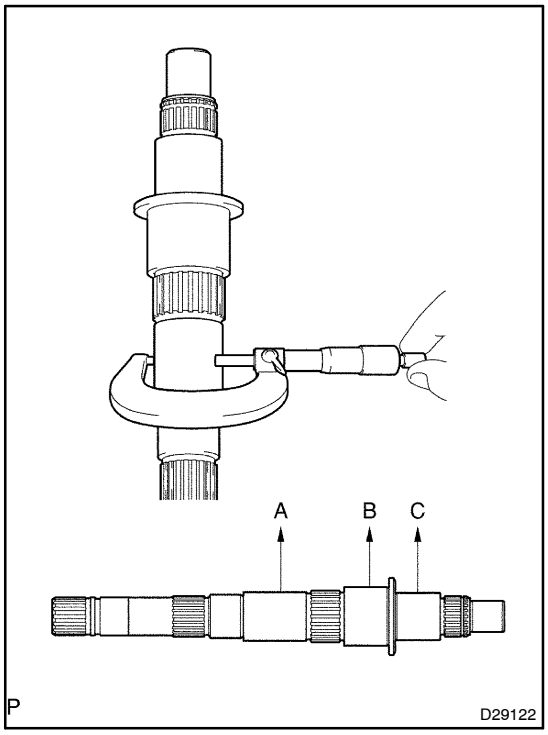
(a) Remove the transmission hub sleeve No.2, the 2 synchro–mesh shifting key springs No.2 and the 3 synchro–mesh shifting keys No.2 from the transmission clutch hub No.2.



20. INSPECT OUTPUT SHAFT

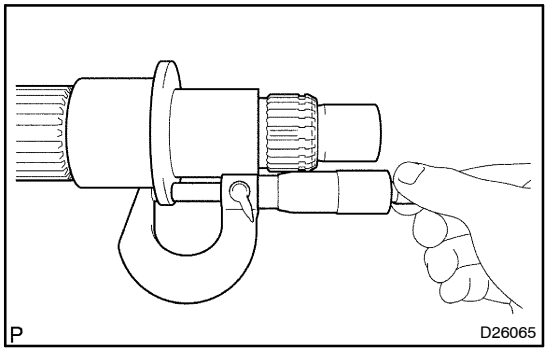
(a) Using a dial indicator, measure the output shaft runout.
Maximum runout: 0.03 mm (0.0012 in.)

NOTICE:
If the bend exceeds the maximum, replace the output shaft with a new one.



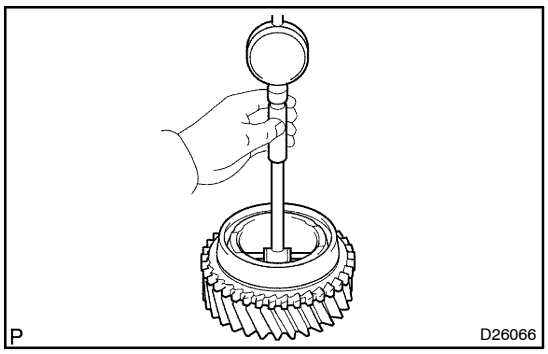
(b) Using a micrometer, measure the outer diameter at A, B and C on the output shaft.
Standard diameter:
A: 38.979 – 38.995 mm (1.5334 – 1.5352 in.)
B: 46.984 – 47.000 mm (1.8498 – 1.8504 in.)
C: 37.984 – 38.000 mm (1.4954 – 1.4961 in.)
Maximum diameter:
A: 38.979 mm (1.5334 in.)
B: 46.984 mm (1.8498 in.)
C: 37.984 mm (1.4954 in.)

NOTICE:
If the outer diameters are less than the minimum, replace the output shaft with a new one.



(c) Using a micrometer, measure the thickness of the output shaft flange as shown in the illustration.
Standard clearance:
4.8 – 5.2 mm (0.1890 – 0.2047 in.)

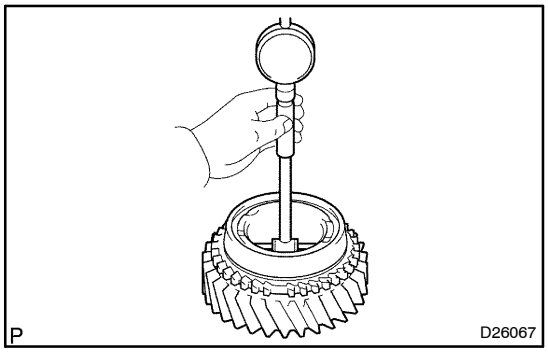
NOTICE:
If the clearance is outside the specification, replace the output shaft.



21. INSPECT 3RD GEAR

(a) Using a cylinder gauge, measure the inner diameter of the 3rd gear.
Standard clearance:
44.015 – 44.040 mm (1.7329 – 1.7339 in.)
Maximum clearance:
44.040 mm (1.7339 in.)

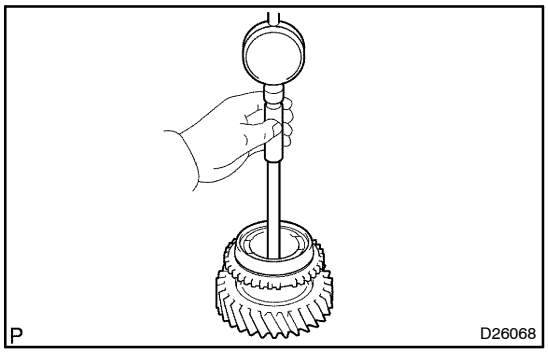
NOTICE:
If the inner diameter exceeds the maximum, replace the 3rd gear with a new one.



22. INSPECT 2ND GEAR

(a) Using a cylinder gauge, measure the inner diameter of the second gear.
Standard clearance:
53.015 – 53.040 mm (2.0872 – 2.0881 in.)
Maximum clearance:
53.040 mm(2.0881 in.)

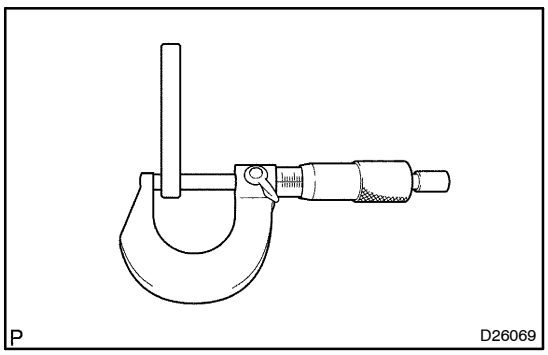
NOTICE:
If the inner diameter exceeds the maximum, replace the second gear with a new one.



23. INSPECT 1ST GEAR

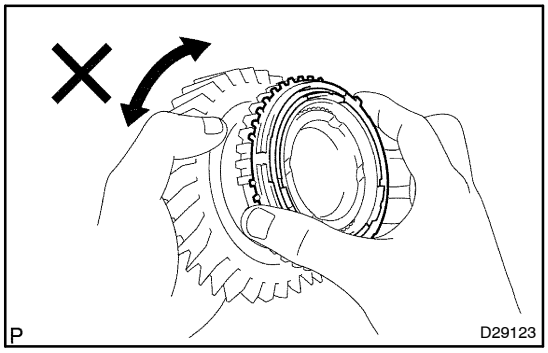
(a) Using a cylinder gauge, measure the inner diameter of the 1st gear.
Standard clearance:
46.015 – 46.040 mm (1.812 – 1.8126 in.)
Maximum clearance:
46.040 mm (1.8126 in.)

NOTICE:
If the inner diameter exceeds the maximum, replace the 2nd gear with a new one.



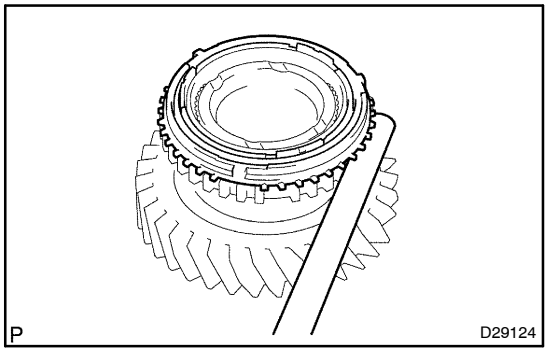
24. INSPECT 1ST GEAR THRUST WASHER

(a) Using a micrometer, measure the thickness of the first gear thrust washer.
Standard clearance:
5.95 – 6.05 mm (0.2346 – 0.2382 in.)
Minmum clearance:
5.96 mm (0.2346 in.)



25. INSPECT SYNCHRONIZER RING SET NO.1 (FOR FIRST SYNCHRONIZER RING)

(a) Apply gear oil to the cone of the 1st gear, and check that it does not turn in the both direction while pushing the No.1 synchronizer ring (for the 1st synchronizer ring).

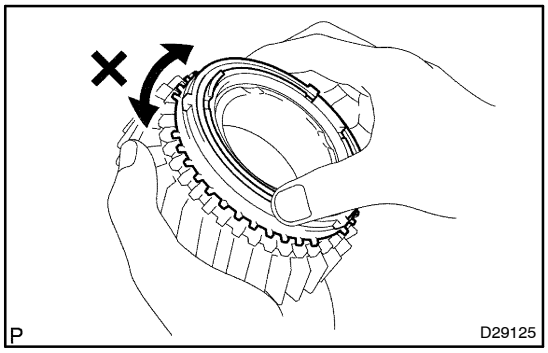


(b) Measure the clearance between the synchronizer ring No.1 and the 1st gear while pushing the synchronizer ring No.1 to the cone of the 1st gear.

Standard clearance:
0.65 – 1.75 mm (0.0256 – 0.0689 in.)

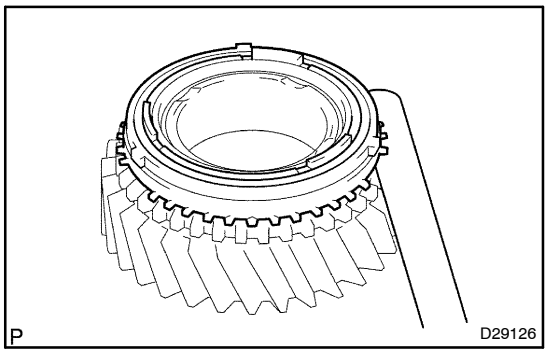
NOTICE:

If the clearance is outside the specification, replace the synchronizer ring No.1 with a new one.



26. INSPECT SYNCHRONIZER RING SET NO.1 (FOR SECOND SYNCHRONIZER RING)

(a) Apply gear oil to the cone of the 2nd gear, and check that it does not turn in the both direction while pushing the synchronizer ring No.1 (for the 2nd synchronizer ring).

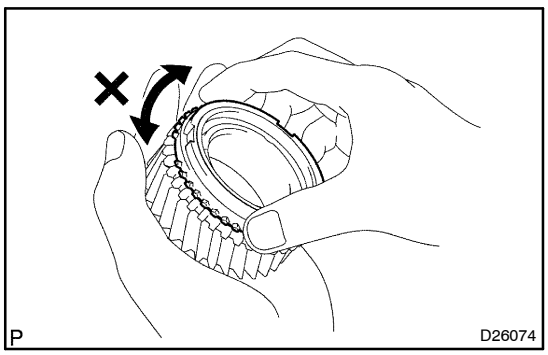


(b) Measure the clearance between the synchronizer ring No.1 (for the 2nd synchronizer ring) and the 2nd gear while pushing the synchronizer ring No.1 to the cone of the 2nd gear.

Standard clearance:
0.65 – 1.75 mm (0.0256 – 0.0689 in.)

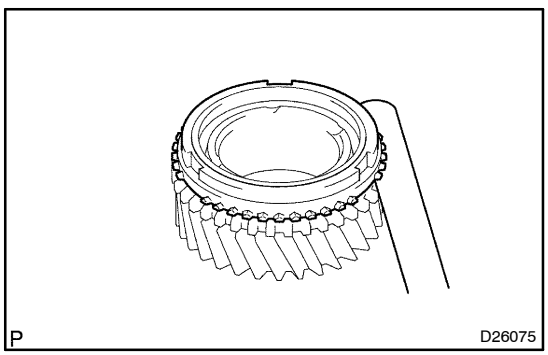
NOTICE:

If the clearance is outside the specification, replace the synchronizer ring No.1 (for the 2nd synchronizer ring) with a new one.



27. INSPECT SYNCHRONIZER RING NO.2 (FOR THIRD SYNCHRONIZER RING)

(a) Apply gear oil to the cone of the 3rd gear, and check that it does not turn in the both direction while pushing the synchronizer ring No.2 (for the 3rd synchronizer ring).

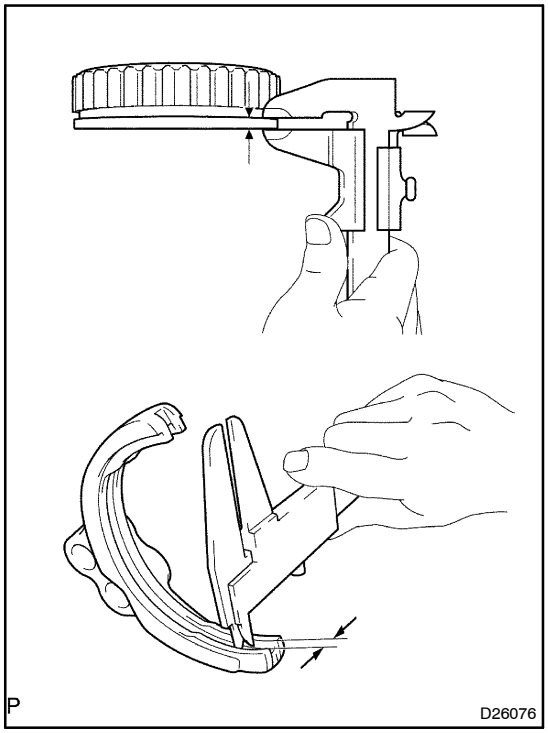


(b) Check the clearance between the synchronizer ring No.2 (for the 3rd synchronizer ring) and the 3rd gear while pushing the synchronizer ring No.2 (for the 2nd synchronizer ring) to the cone of the 3rd gear.

Standard clearance:
0.75 – 1.65 mm (0.0295 – 0.0650 in.)

NOTICE:

If the clearance is outside the specification, replace the synchronizer ring No.2 (for the 3rd synchronizer ring) with a new one.



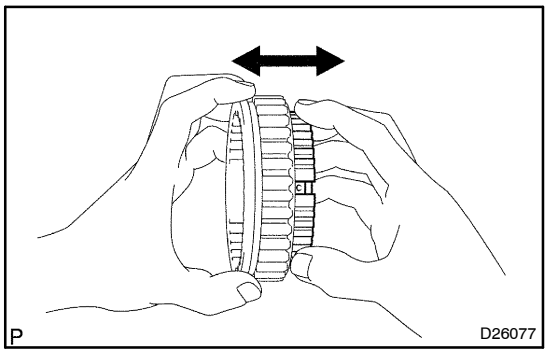
28. INSPECT REVERSE GEAR

(a) Using a vernier caliper, measure the reverse gear groove and the thickness of the gear shift fork claw No.1 clearance.

Standard clearance:
0.15 – 0.41 mm (0.0060 – 0.0161 in.)

NOTICE:

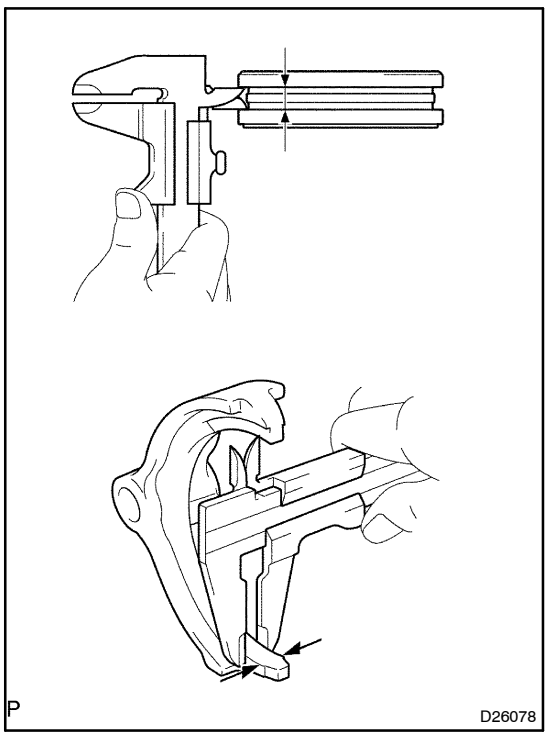
If the clearance is outside the specification, replace the reverse gear and the No.1 gear shift with new ones.



29. INSPECT TRANSMISSION CLUTCH HUB NO.1

(a) Check the sliding condition between the No.1 transmission clutch hub and the reverse gear.

(b) Check the tip of the spline gear sleeve of the reverse gear for wear.



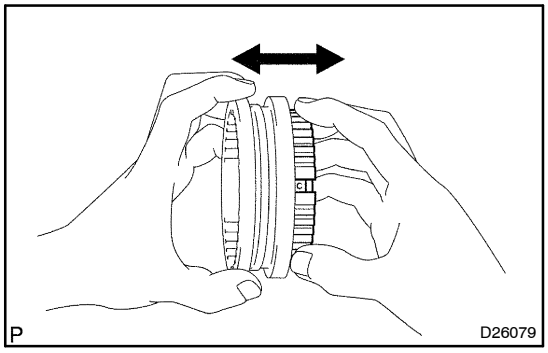
30. INSPECT TRANSMISSION HUB SLEEVE NO.2

(a) Using a vernier caliper, check the transmission hub sleeve No.2 groove and the thickness of the gear shift fork claw No.2.

Standard clearance:
0.15 – 0.35 mm (0.0059 – 0.0138 in.)

NOTICE:

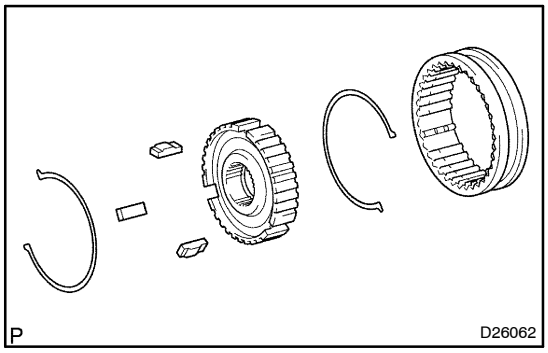
If the clearance is out of the specification, replace the No.2 transmission hub sleeve and the No.2 gear shift fork with the new ones.



31. INSPECT TRANSMISSION CLUTCH HUB NO.2

(a) Check the sliding condition between the transmission clutch hub No.2 and the transmission hub sleeve No.2.

(b) Check the tip of the spline gear of the sleeve of the reverse gear for wear.



32. INSTALL TRANSMISSION HUB SLEEVE NO.2

(a) Apply gear oil to the sliding part of the transmission hub sleeve No.2, and install it to the transmission clutch hub No.2.

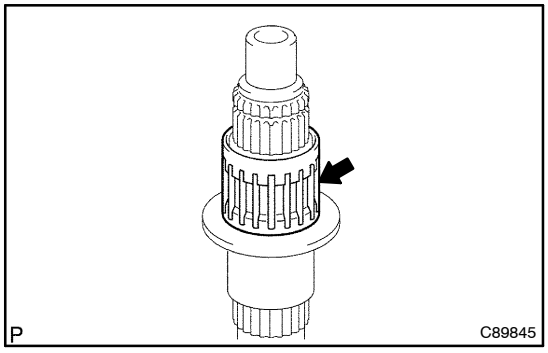
NOTICE:

Be sure of the direction of the transmission hub sleeve No.2 and that of the transmission clutch hub No.2.

(b) Install the 2 synchro–mesh shifting key springs No.2 and the 3 synchro–mesh shifting key No.2 to the transmission clutch hub No.2.

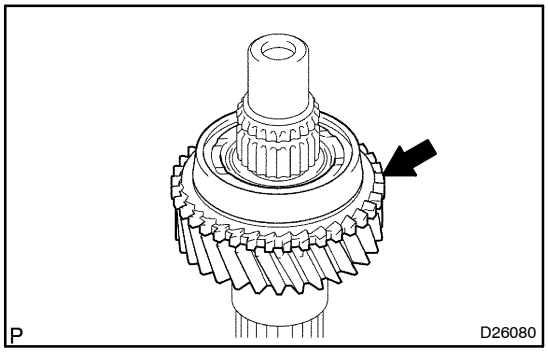
NOTICE:

Do not set both openings of the shifting key spring in the same direction.



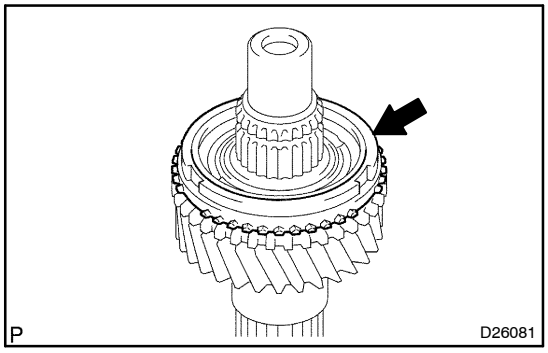
33. INSTALL 3RD GEAR NEEDLE ROLLER BEARING

(a) Apply gear oil to the third gear needle roller bearing, and install it to the output shaft.



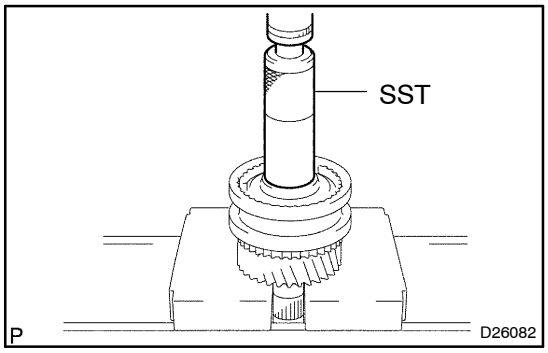
34. INSTALL 3RD GEAR

(a) Apply gear oil to the 3rd gear, and install it to the output shaft.



35. INSTALL SYNCHRONIZER RING NO.2 (FOR THIRD SYNCHRONIZER RING)

(a) Apply gear oil to the synchronizer ring No.2, and install it to the 3rd gear.



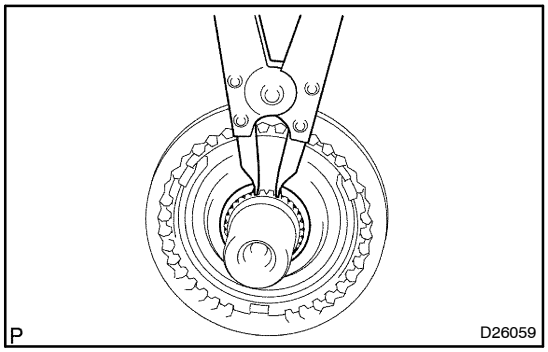
36. INSTALL TRANSMISSION CLUTCH HUB NO.2

(a) Using SST, install the transmission clutch hub No.2 to the output shaft.

SST 09608–06041

NOTICE:

- **Install it with aligning the synchronizer ring key No.2 groove and the shifting key position.**
- **3rd gear should rotate lightly.**



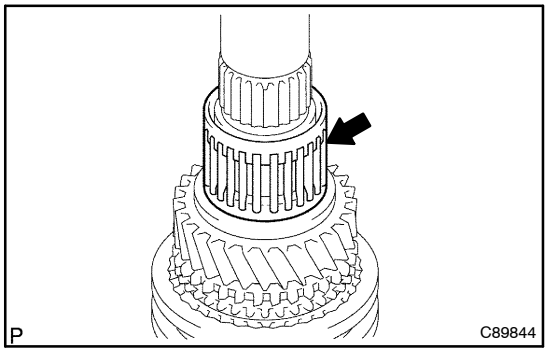
(b) Select a clutch hub shaft snap ring that makes the gap between the transmission clutch hub No.2 and the shaft snap ring No.2 thrust to be within the specification. Using a brass bar and a hammer, install it to the output shaft.

Standard clearance:0.1 mm or less

NOTICE:

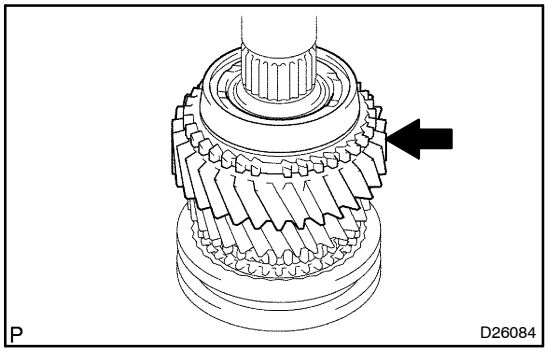
Do not damage the sliding surface of the bearing.

Mark	Thicness mm (in.)
A	1.80 – 1.85 (0.0709 – 0.0728)
B	1.85 – 1.90 (0.0728 – 0.0748)
C	1.90 – 1.95 (0.0748 – 0.0768)
D	1.95 – 2.00 (0.0768 – 0.0787)
E	2.00 – 2.05 (0.0787 – 0.0807)
F	2.05 – 2.10 (0.0807 – 0.0827)
G	2.10 – 2.15 (0.0827 – 0.0846)



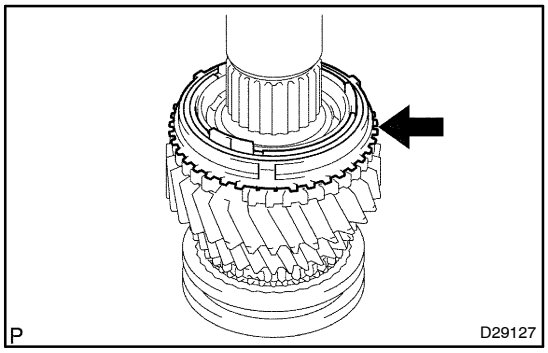
37. INSTALL 2ND GEAR NEEDLE ROLLER BEARING

(a) Apply gear oil to the 2nd gear needle roller bearing, and install it to the output shaft.



38. INSTALL 2ND GEAR

(a) Apply gear oil to the 2nd gear, and install it to the output shaft.

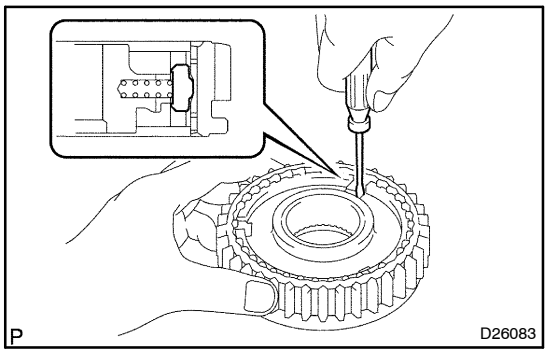


39. INSTALL SYNCHRONIZER RING SET NO.1 (FOR SECOND SYNCHRONIZER RING)

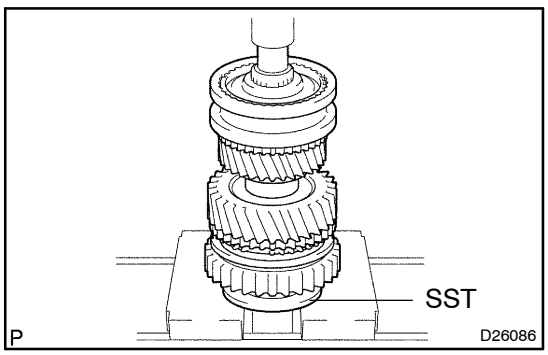
(a) Apply gear oil to the synchronizer ring No.1, and install it to the 2nd gear.

40. INSTALL REVERSE GEAR

(a) Apply gear oil to the revers gear, and install it to the transmission clutch hub No.1.



(b) Using a screw driver, install the 3 synchromesh shifting keys springs No.1 and the 3 synchromesh shifting keys No.1 to the transmission clutch hub No.1.



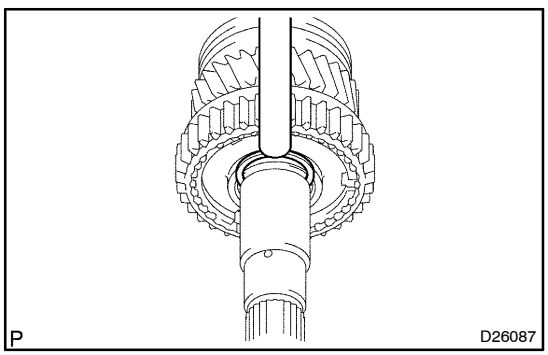
41. INSTALL TRANSMISSION CLUTCH HUB NO.1

(a) Using SST and a press, install No.1 transmission clutch hub to the output shaft.

SST 09316–60011 (09316–00041)

NOTICE:

- **Install it as checking the synchronizer ring key No.1 groove and the synchro–mesh shifting key No.1 position.**
- **1st gear should rotate.**



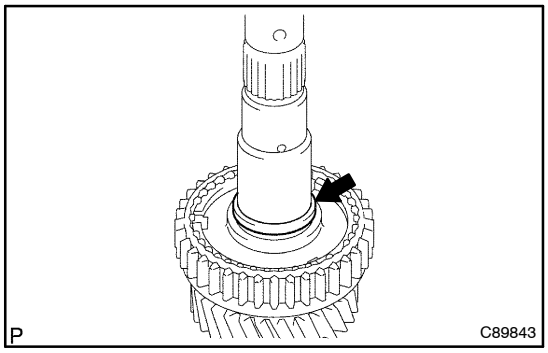
(b) Select a bearing shaft snap ring that makes the thrust gap between the transmission clutch hub No.1 and the bearing shaft snap ring to be within the specification. Using a brass bar and a hammer, install it to the output shaft.

Standard clearance: 0.1mm (0.039 in.) or less

NOTICE:

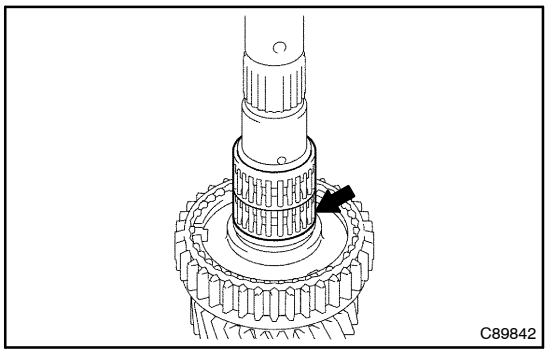
Do not damage the sliding surface of the bearing.

Mark	Thicness mm (in.)
A	2.30 – 2.35 (0.0906 – 0.0925)
B	2.35 – 2.40 (0.0925 – 0.0945)
C	2.40 – 2.45 (0.0945 – 0.0965)
D	2.45 – 2.50 (0.0965 – 0.0984)
E	2.50 – 2.55 (0.0984 – 0.1004)
F	2.55 – 2.60 (0.1004 – 0.1024)
G	2.60 – 2.65 (0.1024 – 0.1043)



42. INSTALL 1ST GEAR BEARING SPACER

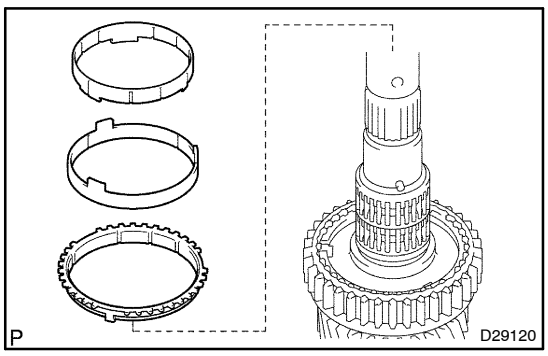
(a) Apply gear oil to the 1st gear bearing spacer, and install it to the output shaft.



43. INSTALL 1ST GEAR NEEDLE ROLLER BEARING

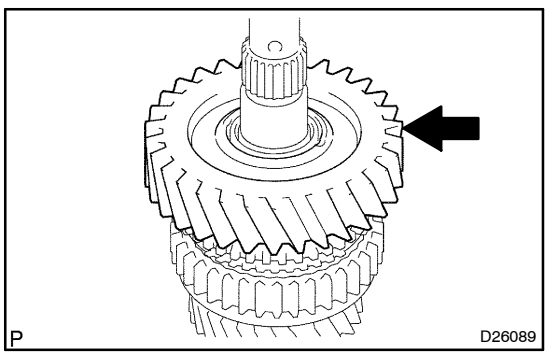
(a) Apply gear oil to the 1st gear needle roller bearing, and install it to the output shaft.

44. INSTALL 1ST GEAR THRUST WASHER PIN OR BALL



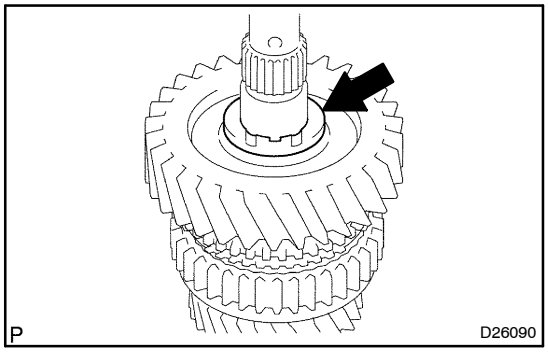
45. INSTALL SYNCHRONIZER RING SET NO.1 (FOR FIRST SYNCHRONIZER RING)

(a) Apply gear oil to the synchronizer ring No.1, and install it to the 1st gear.



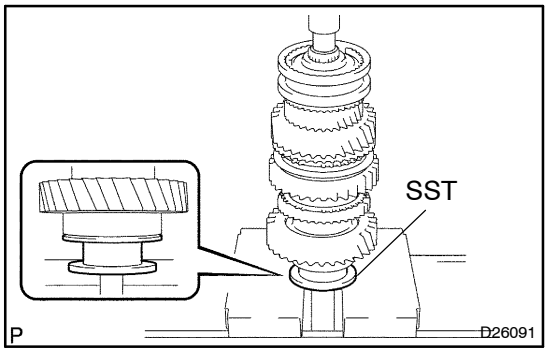
46. INSTALL 1ST GEAR

(a) Apply gear oil to the 1st gear, and install it to the output shaft.



47. INSTALL 1ST GEAR THRUST WASHER

(a) Apply gear oil to the 1st gear thrust washer, and install it to the output shaft.



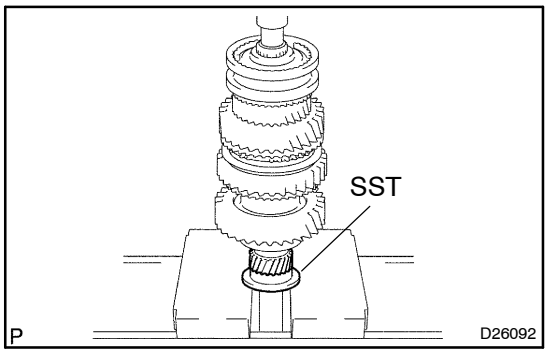
48. INSTALL OUTPUT SHAFT CENTER BEARING

(a) Using SST and a press, install a new output shaft center bearing to the output shaft.

SST 09316–60011 (09316–00031)

NOTICE:

Install it so that the snap ring groove of the bearing faces to the rear side.



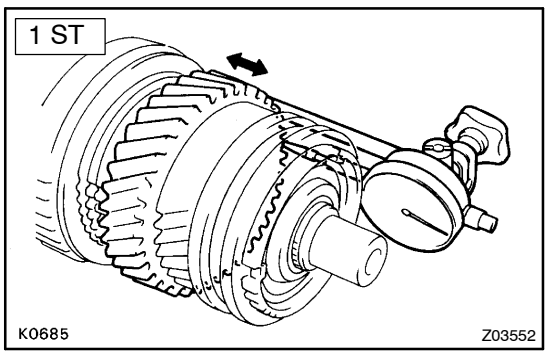
49. INSTALL 5TH GEAR

(a) Using SST and a press, install the 5th gear to the output shaft.

SST 09316–60011 (09316–00031)

NOTICE:

- **Check that the 5th gear and the spline of the output shaft fit before installing.**
- **Face the convex part of the gear to the front side.**

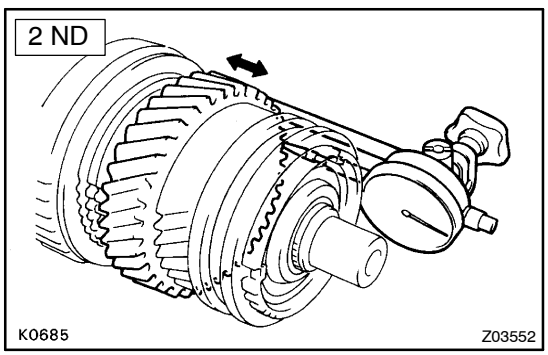


50. INSPECT 1ST GEAR THRUST CLEARANCE

(a) Using a dial indicator, measure the 1st gear thrust clearance.

Standard clearance:

0.20 – 0.45 mm (0.0079 – 0.0177 in.)

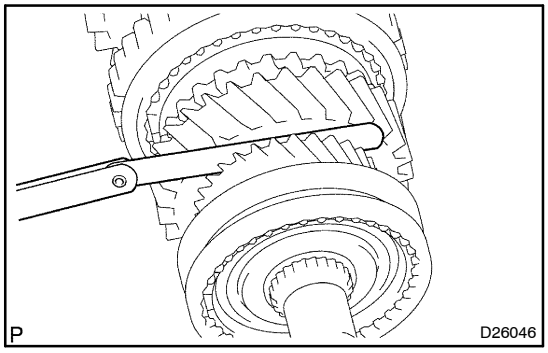


51. INSPECT 2ND GEAR THRUST CLEARANCE

(a) Using a dial indicator, measure the 2nd gear thrust clearance.

Standard clearance:

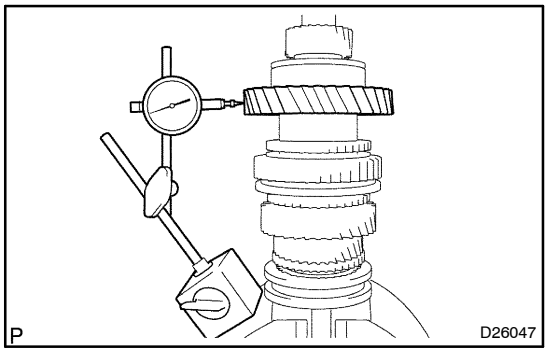
0.10– 0.25 mm (0.0039 – 0.0098 in.)



52. INSPECT 3RD GEAR THRUST CLEARANCE

(a) Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance:
0.10– 0.25 mm (0.0039 – 0.0098 in.)

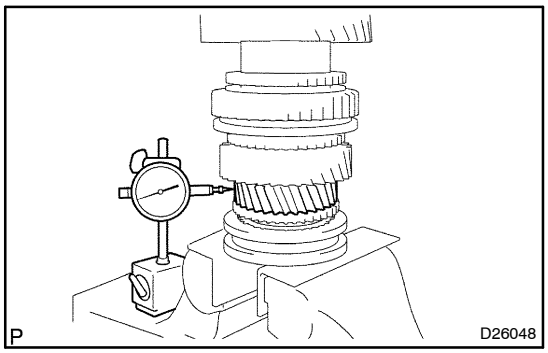


53. INSPECT 1ST GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the 1st gear radial clearance.

Standard clearance:
0.020 – 0.073 mm (0.0008 – .0029 in)

NOTICE:
If the clearance is outside the specification, replace the 1st gear needle roller bearing with a new one.

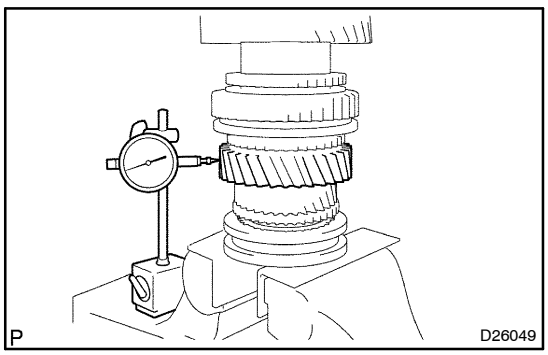


54. INSPECT 2ND GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the 2nd gear radial clearance.

Standard clearance:
0.015 – 0.068 mm (0.0006 – 0.0027 in.)

NOTICE:
If the clearance is outside the specification, replace the 2nd gear needle roller bearing with a new one.



55. INSPECT 3RD GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the 3rd gear radial clearance.

Standard clearance:
0.015 – 0.068 mm (0.0006 – 0.0027 in.)

NOTICE:
If the clearance is outside the specification, replace the 3rd gear needle roller bearing with a new one.