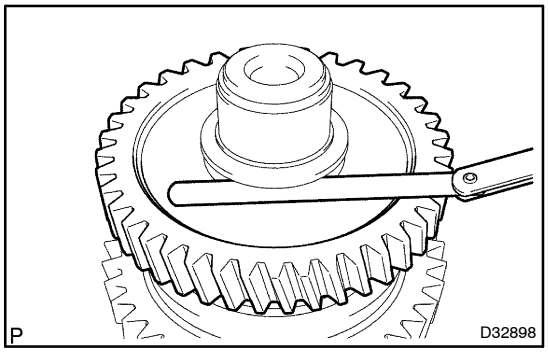
410HI–01

OVERHAUL

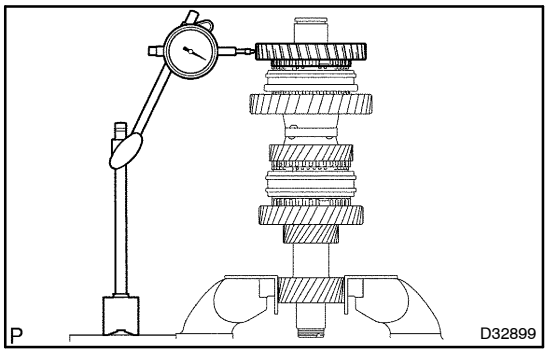


1. INSPECT REVERSE GEAR THRUST CLEARANCE

(a) Fix the counter gear through 2 protective aluminum plates in a vise

(b) Using a feeler gauge, measure the counter gear thrust clearance.

Standard clearance:
0.10 to 0.45 mm (0.0039 to 0.0177 in.)
Maximum clearance: 0.45 mm (0.0177 in.)

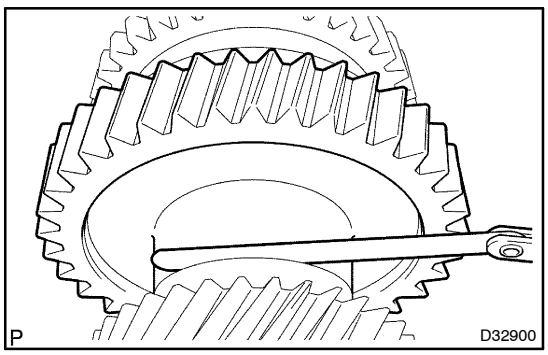


2. INSPECT REVERSE GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the reverse gear radial clearance between the gear and shaft.

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

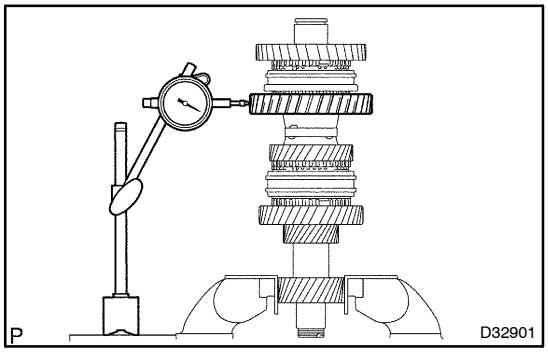
If the clearance exceeds the maximum, replace the reverse gear needle roller bearing.



3. INSPECT 1ST GEAR THRUST CLEARANCE

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

Standard clearance:
0.10 to 0.45 mm (0.0039 to 0.0177 in.)
Maximum clearance: 0.45 mm (0.0177 in.)

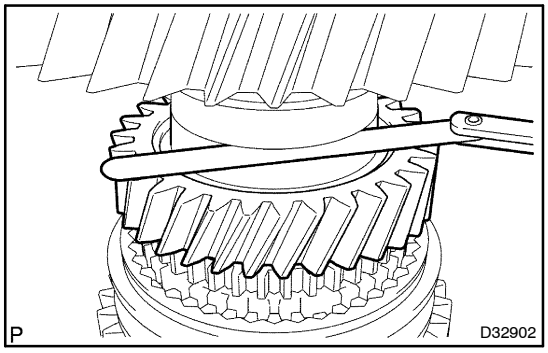


4. INSPECT 1ST GEAR RADIAL CLEARANCE

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

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

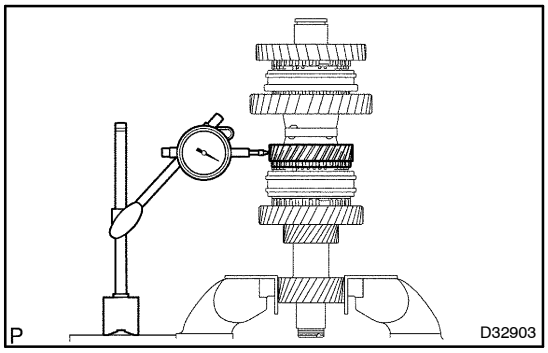
If the clearance exceeds the maximum, replace the gear needle roller bearing.



5. INSPECT 3RD GEAR THRUST CLEARANCE

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

Standard clearance:
0.10 to 0.45 mm (0.0039 to 0.0177 in.)
Maximum clearance: 0.45 mm (0.0177 in.)

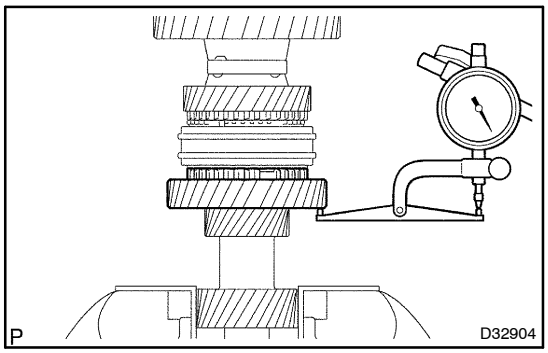


6. INSPECT 3RD GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the gear radial clearance between the gear and shaft.

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

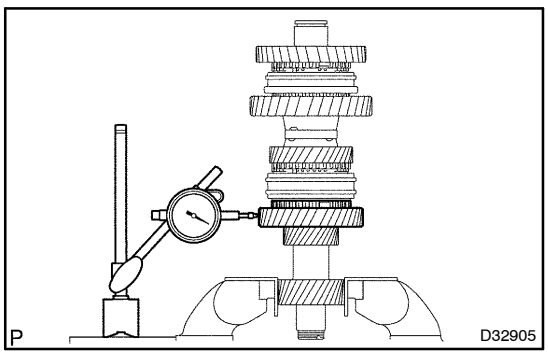
If the clearance exceeds the maximum, replace the 3rd gear needle roller bearing.



7. INSPECT 2ND GEAR THRUST CLEARANCE

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

Standard clearance:
0.10 to 0.35 mm (0.0039 to 0.0138 in.)
Maximum clearance: 0.35 mm (0.0138 in.)

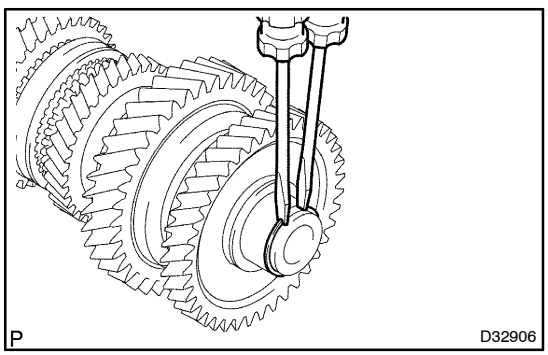


8. INSPECT 2ND GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the gear radial clearance between the gear and shaft.

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

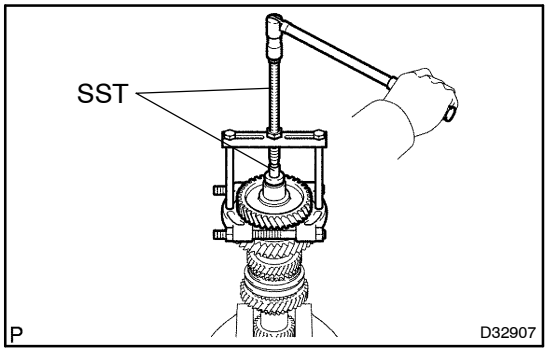
If the clearance exceeds the maximum, replace the 2nd gear needle roller bearing.



9. REMOVE COUNTER GEAR FRONT BEARING HOLE SNAP RING

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

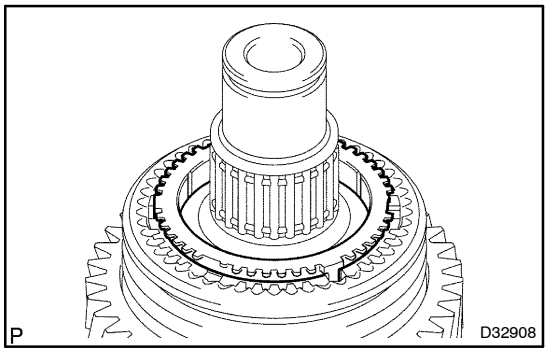
NOTICE:
Use a shop rag to keep the shaft snap ring from flying.



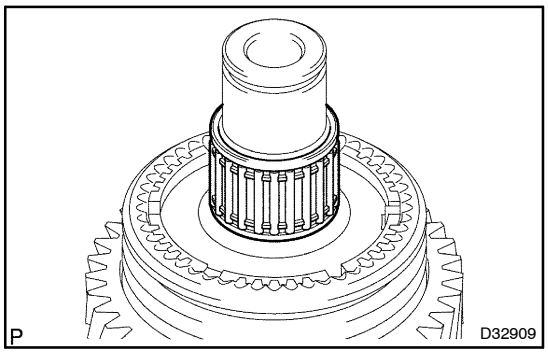
10. REMOVE REVERSE GEAR

(a) Using SST, remove the reverse gear and counter gear front bearing (inner race).

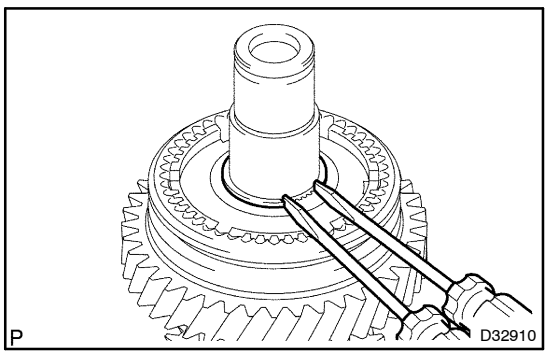
SST 09950–00020, 09950–00030, 09950–40011 (09957–04010), 09950–60010 (09951–00180, 09951–00370, 09952–06010)



11. REMOVE REVERSE SYNCHRONIZER RING



12. REMOVE REVERSE GEAR NEEDLE ROLLER BEARING

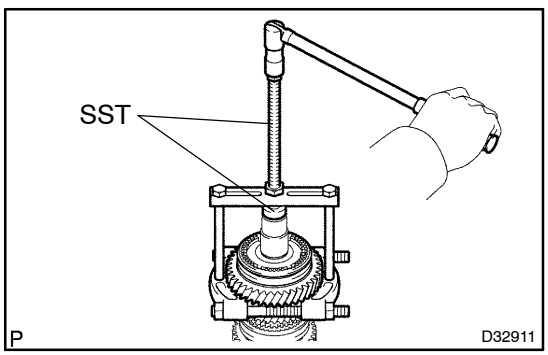


13. REMOVE TRANSMISSION CLUTCH HUB SHAFT SNAP RING NO. 1

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

NOTICE:

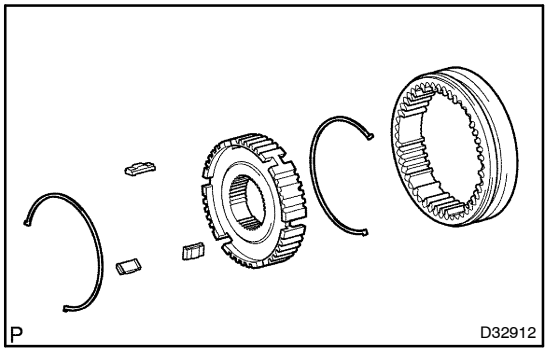
Use a shop rag to keep the shaft snap ring from flying.



14. REMOVE 1ST GEAR

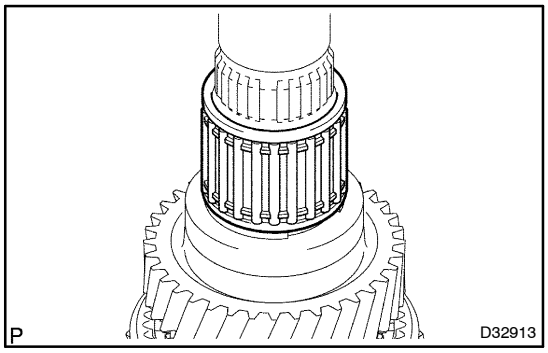
(a) Using SST, remove the 1st gear, transmission clutch hub No. 1 and synchronizer ring.

SST 09950–00020, 09950–00030, 09950–40011 (09957–04010), 09950–60010 (09951–00370)

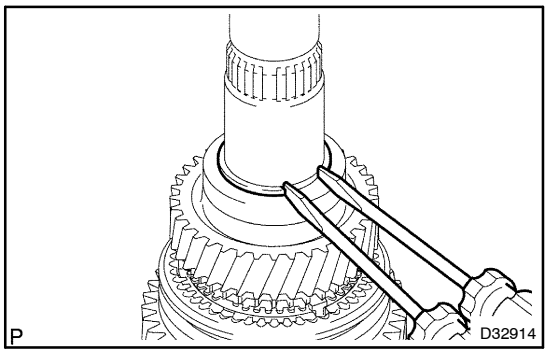


15. REMOVE TRANSMISSION CLUTCH HUB NO. 1

(a) Using a screwdriver, remove the 2 key springs, 3 keys and hub sleeve from the clutch hub.



16. REMOVE 1ST GEAR NEEDLE ROLLER BEARING

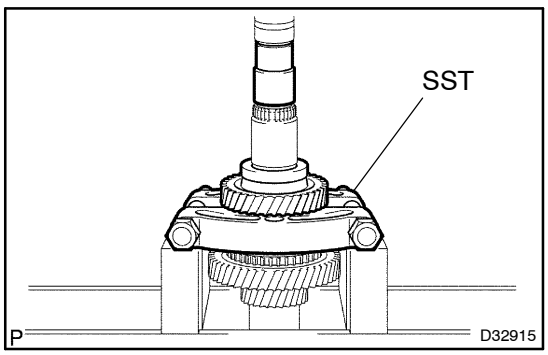


17. REMOVE 3RD GEAR THRUST WASHER HOLE SNAP RING

(a) Using 2 screwdrivers and a hammer, tap out the hole snap ring from the counter gear.

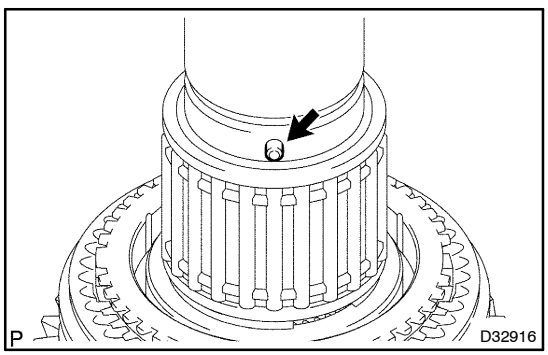
NOTICE:

Use a shop rag to keep the shaft snap ring from flying.



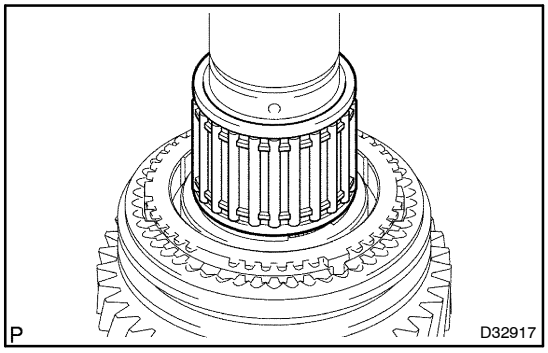
18. REMOVE 3RD GEAR

(a) Using SST and a press, press out the thrust washer.
SST 09950–00020

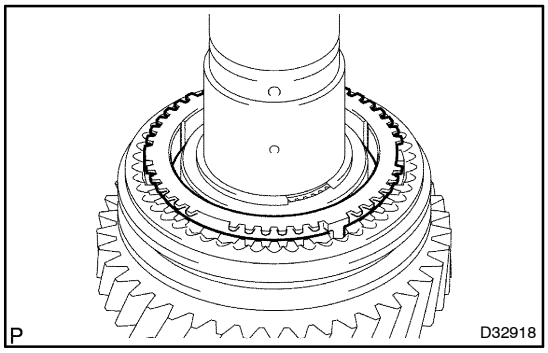


19. REMOVE 3RD GEAR THRUST WASHER PIN

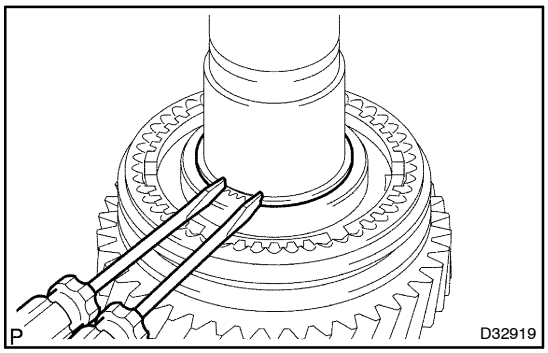
(a) Remove the pin.



20. REMOVE 3RD GEAR NEEDLE ROLLER BEARING



21. REMOVE SYNCHRONIZER RING NO. 3

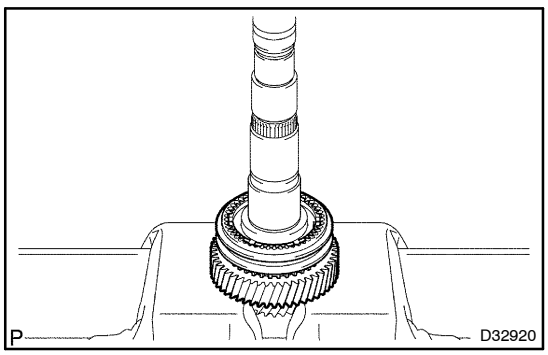


22. REMOVE TRANSMISSION CLUTCH HUB SHAFT SNAP RING NO. 2

(a) Using 2 screwdrivers and a hammer, tap out snap ring.

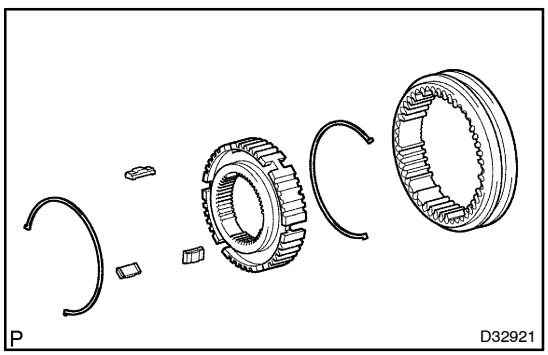
NOTICE:

Use a shop rag to keep the shaft snap ring from flying.



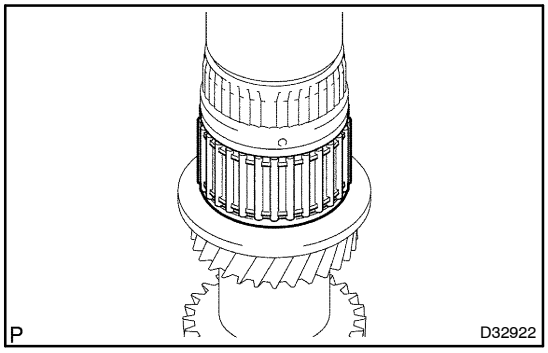
23. REMOVE 2ND GEAR

(a) Using a press, press out the 2nd gear, transmission clutch hub No. 2 and synchronizer ring.

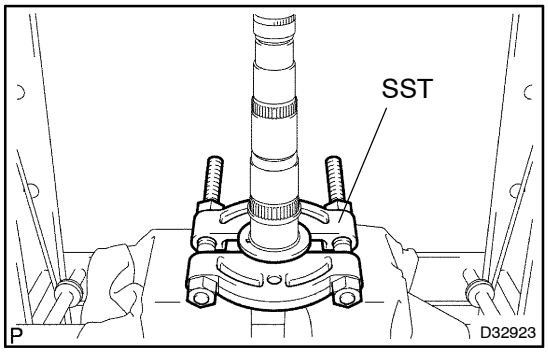


24. REMOVE TRANSMISSION CLUTCH HUB NO. 2

(a) Using a screwdriver, remove the 2 key springs, 3 keys and hub sleeve from the clutch hub.

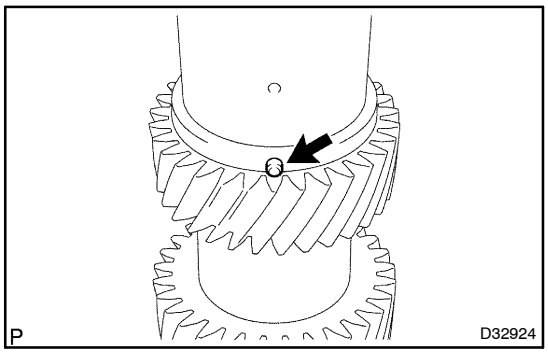


25. REMOVE 2ND GEAR NEEDLE ROLLER BEARING

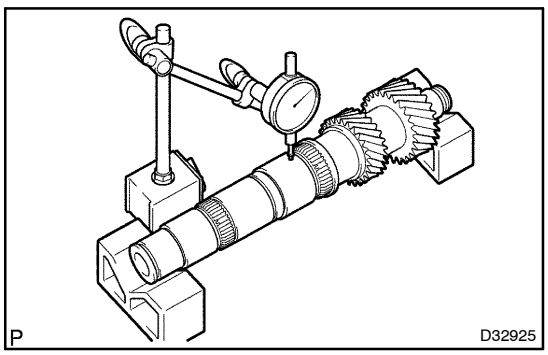


26. REMOVE 2ND GEAR THRUST WASHER

(a) Using SST and a press, press out the thrust washer.
SST 09950–00020



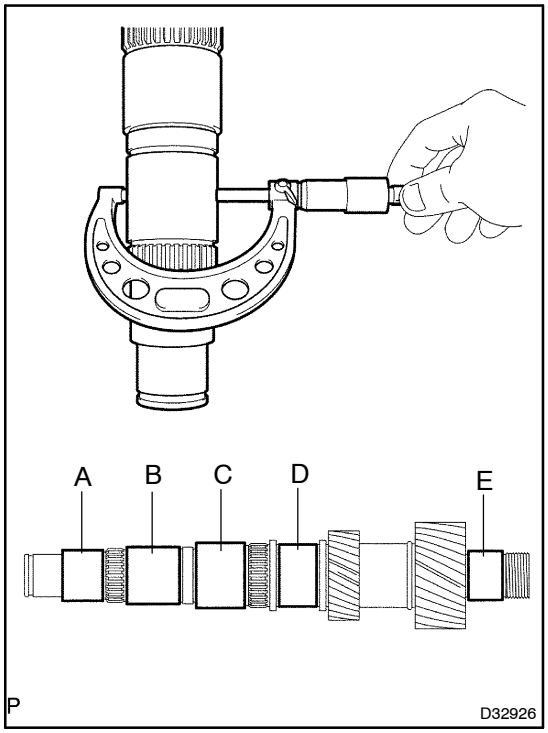
27. REMOVE 2 ND GEAR THRUST WASHER PIN



28. INSPECT COUNTER GEAR ASSY

(a) Using a dial indicator, measure for the shaft runout.
Maximum runout: 0.015 mm (0.0006 in.)

If the runout exceeds the maximum, replace the counter shaft assy.



(b) Using a micrometer, measure the diameter of the counter shaft journal surface.

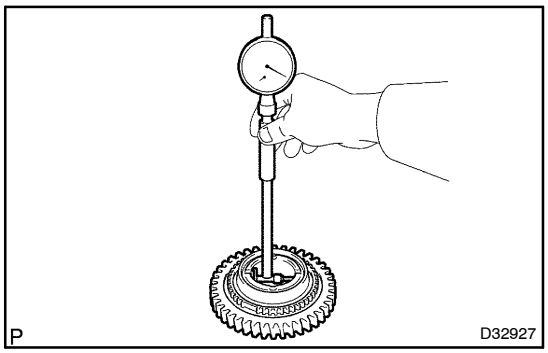
Standard:

Part	Outer diameter
A	43.484 to 43.500 mm (1.7120 to 1.7126 in.)
B	48.984 to 49.000 mm (1.9285 to 1.9291 in.)
C	53.984 to 54.000 mm (2.1253 to 2.1260 in.)
D	53.984 to 54.000 mm (2.1253 to 2.1260 in.)
E	40.002 to 40.018 mm (1.5749 to 1.5755 in.)

Minimum:

Part	Outer diameter
A	43.484 mm (1.7120 in.)
B	48.984 mm (1.9285 in.)
C	53.984 mm (2.1253 in.)
D	53.984 mm (2.1253 in.)
E	40.002 mm (1.5749 in.)

If the diameter is less than the minimum, replace the output shaft.

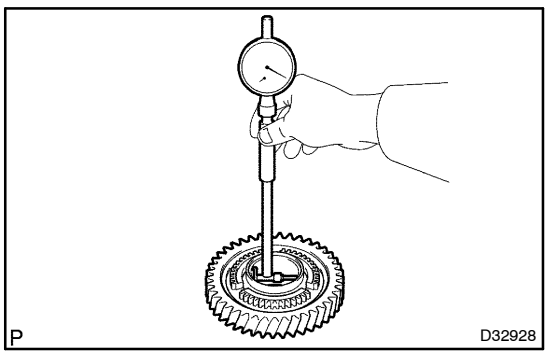


29. INSPECT REVERSE GEAR

(a) Using a cylinder gauge, measure the inside diameter of the gear.

Standard inside diameter:
50.515 to 50.540 mm (1.9888 to 1.9898 in.)
Maximum inside diameter: 50.540 mm (1.9898 in.)

If the inside diameter exceeds the maximum, replace the reverse gear.

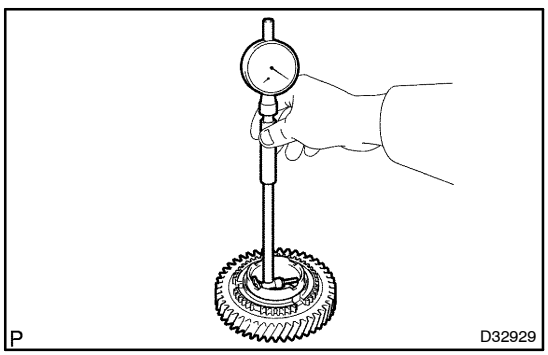


30. INSPECT 1ST GEAR

(a) Using a cylinder gauge, measure the inside diameter of the gear.

Standard inside diameter:
56.015 to 56.040 mm (2.2053 to 2.2063 in.)
Maximum inside diameter: 56.040 mm (2.2063 in.)

If the inside diameter exceeds the maximum, replace the 1st gear.

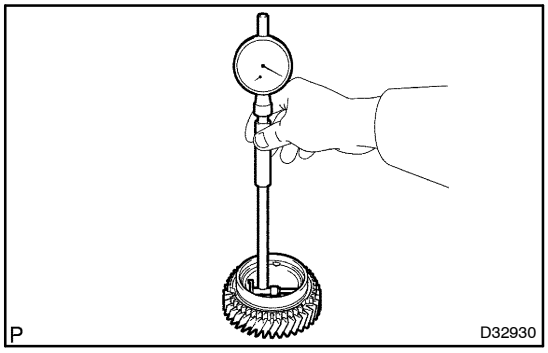


31. INSPECT 2ND GEAR

(a) Using a cylinder gauge, measure the inside diameter of the gear.

Standard inside diameter:
61.015 to 61.040 mm (2.4022 to 2.4031 in.)
Maximum inside diameter: 61.040 mm (2.4031 in.)

If the inside diameter exceeds the maximum, replace the 2nd gear.

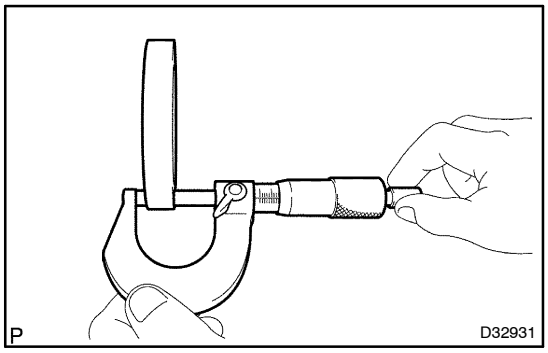


32. INSPECT 3RD GEAR

(a) Using a cylinder gauge, measure the inside diameter of the 3rd gear.

Standard inside diameter:
61.015 to 61.040 mm (2.4022 to 2.4031 in.)
Maximum inside diameter: 61.040 mm (2.4031 in.)

If the inside diameter exceeds the maximum, replace the 3rd gear.

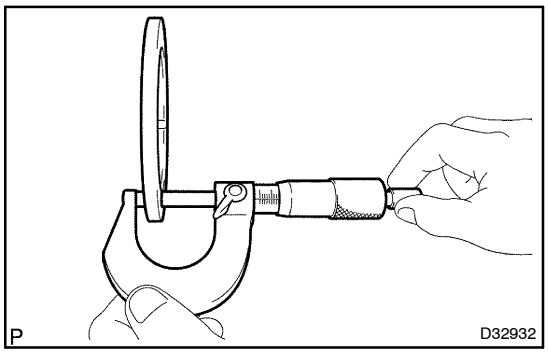


33. INSPECT 3RD GEAR THRUST WASHER

(a) Using a micrometer, measure the thrust washer thickness.

Standard thickness:
11.45 to 11.55 mm (0.4508 to 0.4547 in.)
Minimum thickness: 11.45 mm (0.4508 in.)

If the thickness is less than the minimum, replace the 3rd gear thrust washer.

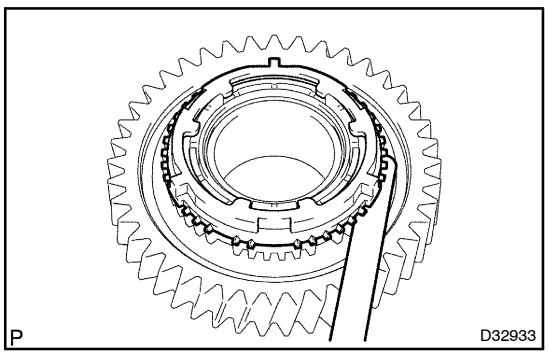


34. INSPECT 2ND GEAR THRUST WASHER

(a) Using a micrometer, measure the thrust washer thickness.

Standard thickness:
5.45 to 5.55 mm (0.2146 to 0.2185 in.)
Minimum thickness:
5.45 mm (0.2146 in.)

If the thickness is less than the minimum, replace the 2nd gear thrust washer.

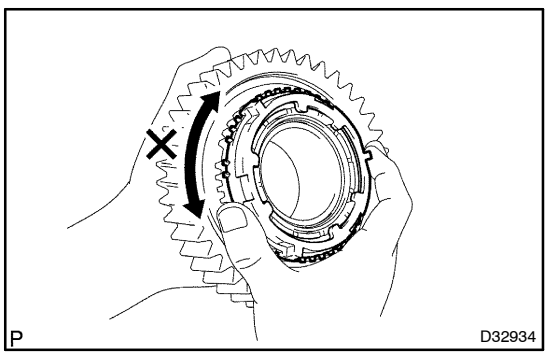


35. INSPECT SYNCHRONIZER RING SET NO. 1

(a) Using a feeler gauge, measure the clearance between the synchronizer ring and 1st gear spline.

Standard clearance:
1.10 to 2.10 mm (0.0433 to 0.08217 in.)
Minimum clearance: 1.10 mm (0.0433 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

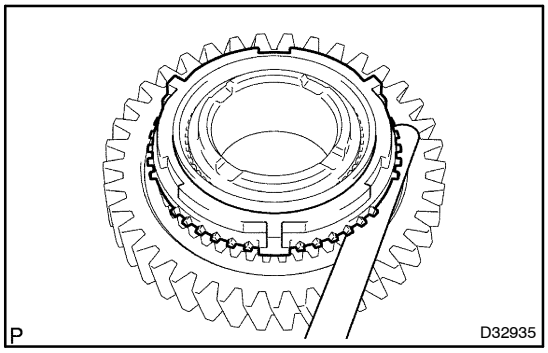


(b) Coat the 1st gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 1st gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and 1st gear cone. Lightly rub the synchronizer ring and 1st gear cone together.

NOTICE:
Ensure the fine lapping compound is completely washed off after rubbing.

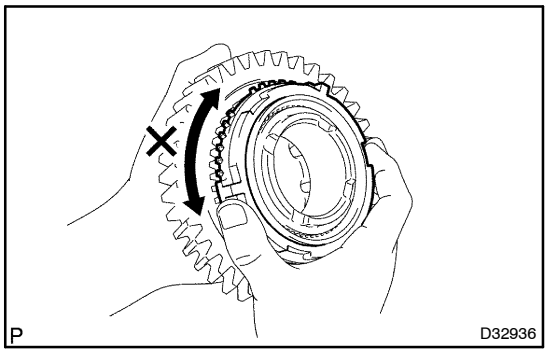
(c) Check again the braking effect of the synchronizer ring.



36. INSPECT REVERSE SYNCHRONIZER RING

(a) Using a feeler gauge, measure the clearance between the synchronizer ring and reverse gear spline.
Standard clearance:
0.78 to 1.62 mm (0.0307 to 0.0638 in.)
Minimum clearance: 0.78 mm (0.0307 in.)

If the clearance is less than the minimum, replace the reverse synchronizer ring.

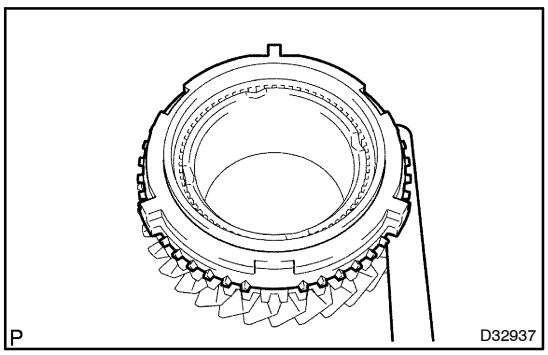


(b) Coat the reverse gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the reverse gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and reverse gear cone. Lightly rub the synchronizer ring and reverse gear cone together.

NOTICE:
Ensure the fine lapping compound is completely washed off after rubbing.

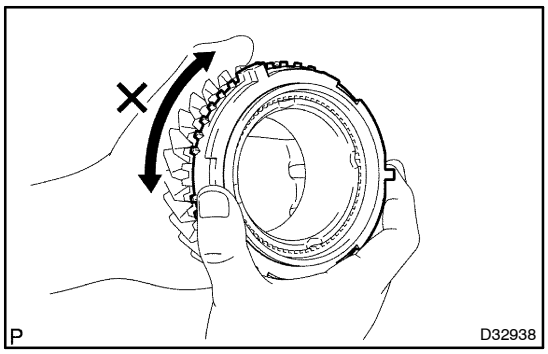
(c) Check again the braking effect of the synchronizer ring.



37. INSPECT SYNCHRONIZER RING NO. 3

(a) Using a feeler gauge, measure the clearance between the synchronizer ring and 3rd gear spline end.
Standard clearance:
0.78 to 1.62 mm (0.0307 to 0.0643 in.)
Minimum clearance: 0.78 mm (0.0307 in.)

If the clearance is less than minimum, replace the synchronizer ring.

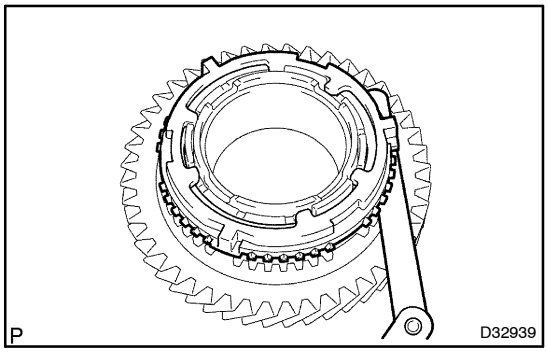


(b) Coat the 3rd gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 3rd gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and 3rd gear cone. Lightly rub the synchronizer ring and 3rd gear cone together.

NOTICE:
Ensure the fine lapping compound is completely washed off after rubbing.

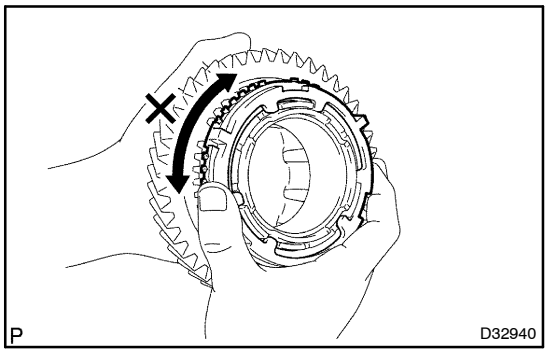
(c) Check again the braking effect of the synchronizer ring.



38. INSPECT SYNCHRONIZER RING SET NO. 2

(a) Using a feeler gauge, measure the clearance between the synchronizer ring and 2nd gear spline.
Standard clearance:
1.10 to 2.10 mm (0.0433 to 0.0827 in.)
Minimum clearance: 1.10 mm (0.0433 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

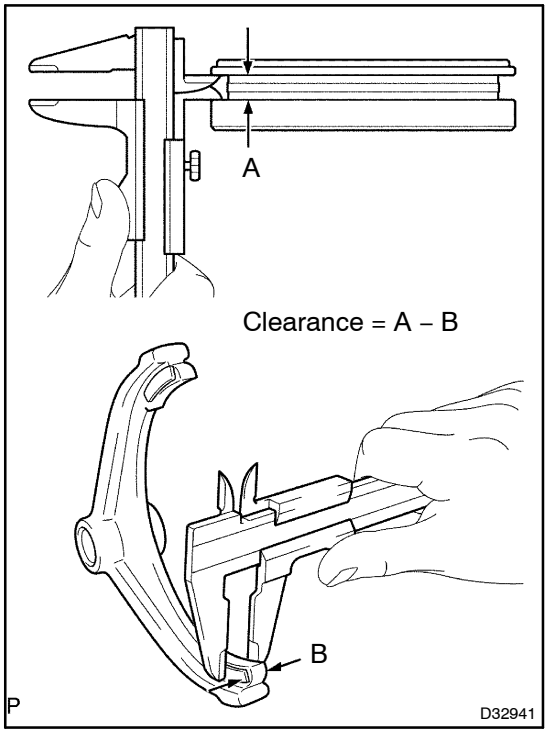


(b) Coat the 2nd gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 2nd gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and 2nd gear cone. Lightly rub the synchronizer ring and 2nd gear cone together.

NOTICE:
Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.

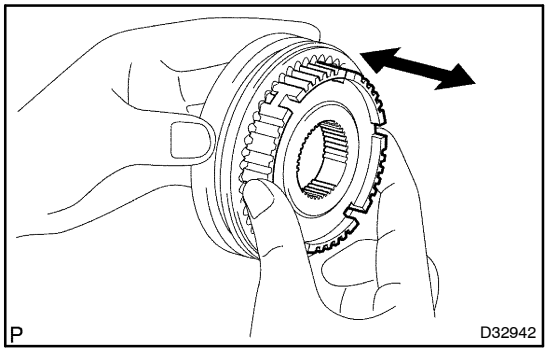


39. INSPECT TRANSMISSION HUB SLEEVE NO. 1

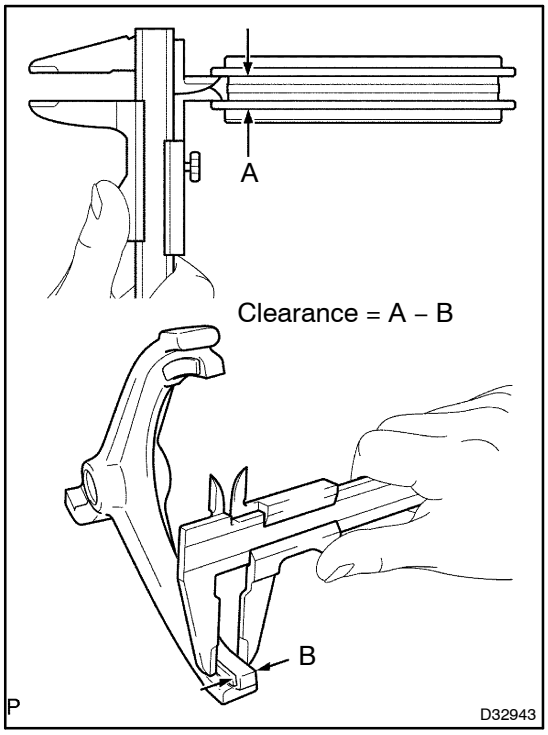
(a) Using a vernier caliper, measure the wide of the hub sleeve and thickness of the gear shift fork No. 1 as shown in the illustration.

(b) Calculate the clearance using the formula below.
Formula:
Clearance = A – B
Standard: 0.25 to 0.85 mm (0.0098 to 0.0335 in.)

If the clearance not as specified, replace the transmission hub sleeve No. 1 and gear shift fork No. 1.



(c) Check the sliding condition between the hub sleeve and clutch hub.



40. INSPECT TRANSMISSION HUB SLEEVE NO. 2

(a) Using a vernier caliper, measure the clearance between gear shift fork No. 2 and transmission hub sleeve No. 2.

(b) Calculate the clearance using the formula below.

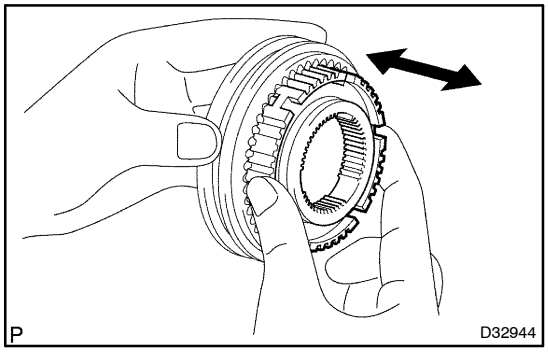
Formula:

Clearance = A – B

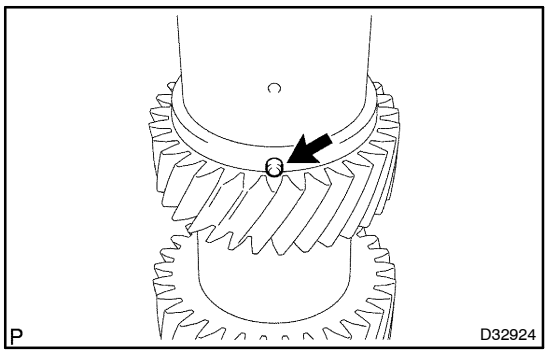
Standard clearance:

0.25 to 0.85 mm (0.0098 to 0.0335 in.)

If the clearance exceeds the standard, replace the gear shift fork No. 2 and transmission hub sleeve No. 2.

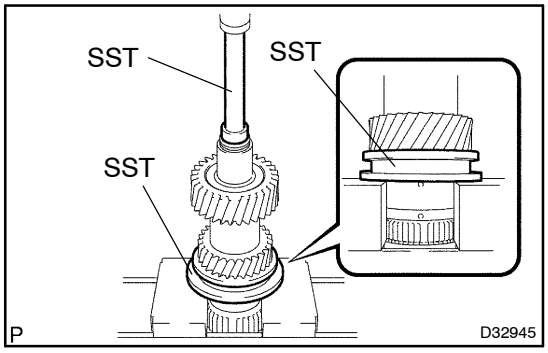


(c) Check the sliding condition between the hub sleeve and clutch hub.



41. INSTALL 2ND GEAR THRUST WASHER PIN

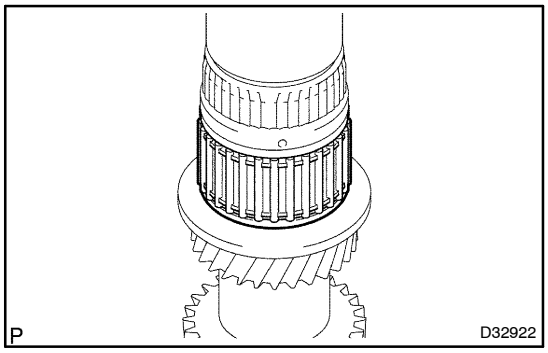
(a) Coat the pin with gear oil and install it.



42. INSTALL 2ND GEAR THRUST WASHER

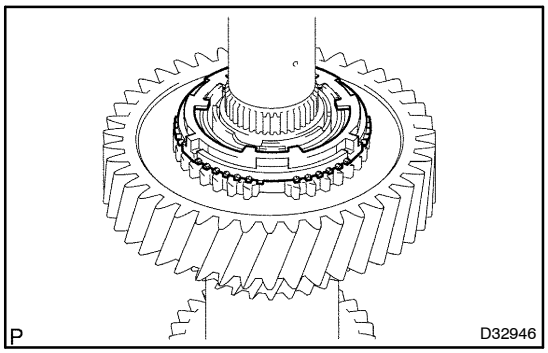
(a) Using SST and a press, press in the 2nd gear thrust washer.

SST 09502–12010, 09950–60010 (09951–00300), 09950–70010 (09951–07100)



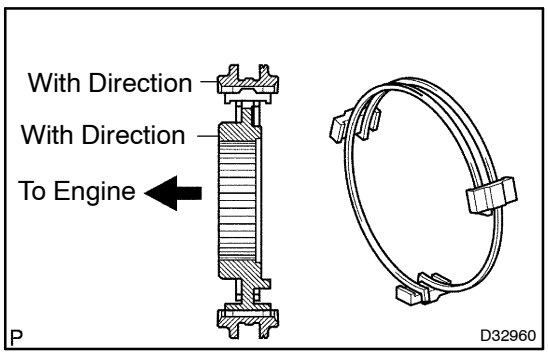
43. INSTALL 2ND GEAR NEEDLE ROLLER BEARING

(a) Coat the needle roller bearing with gear oil and install it.



44. INSTALL SYNCHRONIZER RING SET NO. 2

(a) Coat the synchronizer ring with gear oil and install it.



45. INSTALL TRANSMISSION CLUTCH HUB NO. 2

(a) Coat the clutch hub with gear oil and install it to the hub sleeve.

HINT:

Set the hub sleeve and the clutch hub in correct orientation.

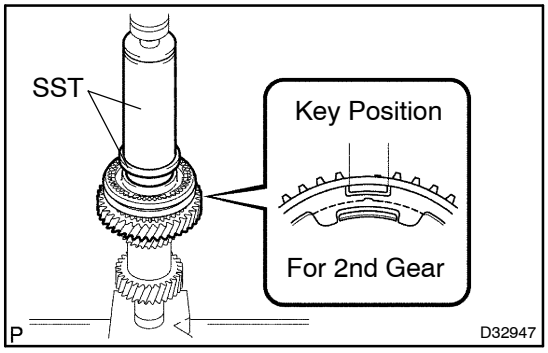
(b) Install the 2 key springs and 3 keys to the hub sleeve.

NOTICE:

Do not set both opening of the shifting key springs in the same position.

46. INSTALL 2ND GEAR

(a) Coat the 2nd gear with gear oil.

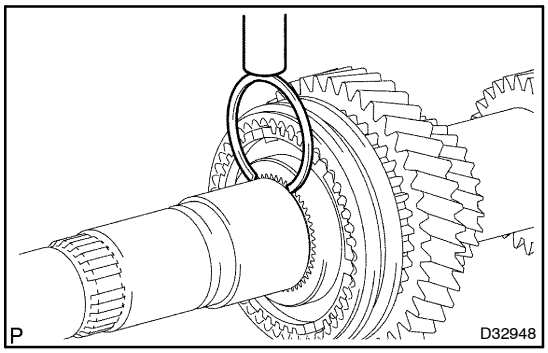


(b) Using SST and a press, press in the 2nd gear.
SST 09316–20011, 09513–36040

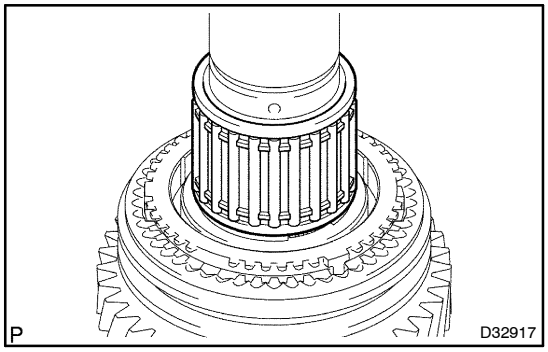
47. INSTALL TRANSMISSION CLUTCH HUB SHAFT SNAP RING NO. 2

(a) Select a snap ring that allows minimum axial play.
Standard clearance: 0.10 mm (0.0039 in.) or less
Snap ring thickness:

Mark	Specified Condition
A	2.40 to 2.45 mm (0.0945 to 0.0965 in.)
B	2.45 to 2.50 mm (0.0965 to 0.0984 in.)
C	2.50 to 2.55 mm (0.0984 to 0.1004 in.)
D	2.55 to 2.60 mm (0.1004 to 0.1024 in.)
E	2.60 to 2.65 mm (0.1024 to 0.1043 in.)
F	2.65 to 2.70 mm (0.1043 to 0.1063 in.)

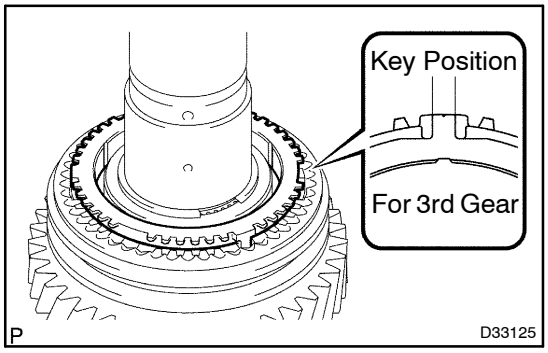


(b) Using a brass bar and hammer, tap in the snap ring.



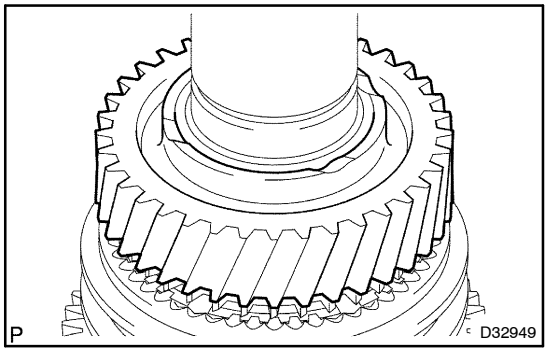
48. INSTALL 3RD GEAR NEEDLE ROLLER BEARING

(a) Coat the needle roller bearing with gear oil and install it.



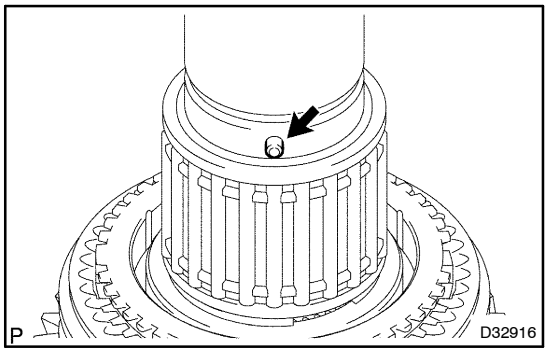
49. INSTALL SYNCHRONIZER RING NO.3

(a) Coat the synchronizer ring with gear oil and install it.



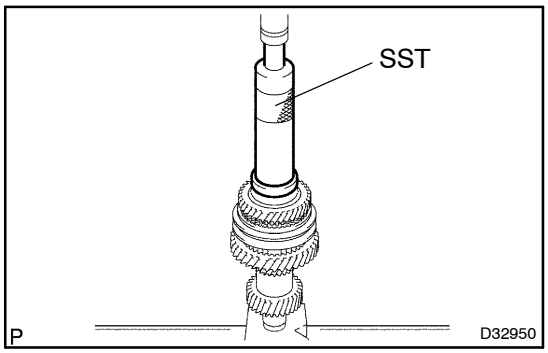
50. INSTALL 3RD GEAR

(a) Coat the gear with gear oil and install it.



51. INSTALL 3RD GEAR THRUST WASHER PIN

(a) Coat the pin with grease and install it.



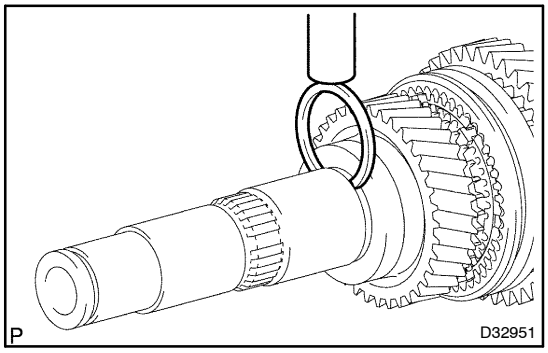
52. INSTALL 3RD GEAR THRUST WASHER

(a) Using SST and a press, press in the thrust washer.
SST 09316–60011 (09316–00011)

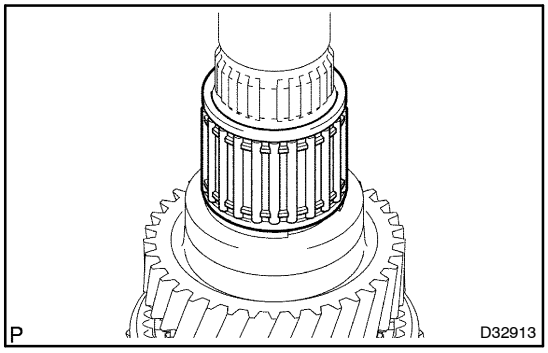
53. INSTALL 3RD GEAR THRUST WASHER HOLE SNAP RING

(a) Select a snap ring will allow the minimum axial play.
Standard clearance: 0.10 mm (0.039 in.) or less
Snap ring thickness:

Mark	Specified Condition
1	2.40 to 2.45 mm (0.0945 to 0.0965 in.)
2	2.45 to 2.50 mm (0.0965 to 0.0984 in.)
3	2.50 to 2.55 mm (0.0984 to 0.1004 in.)
4	2.55 to 2.60 mm (0.1004 to 0.1024 in.)
5	2.60 to 2.65 mm (0.1024 to 0.1043 in.)
6	2.65 to 2.70 mm (0.1043 to 0.1063 in.)

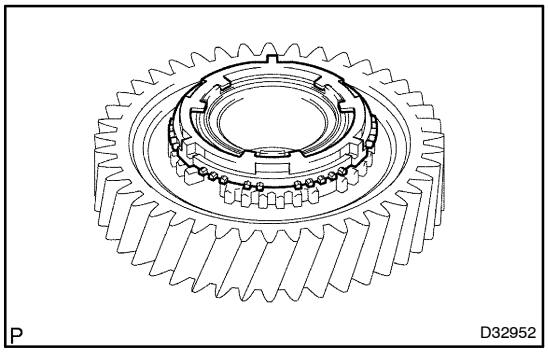


(b) Using a brass bar and hammer, tap in the snap ring.



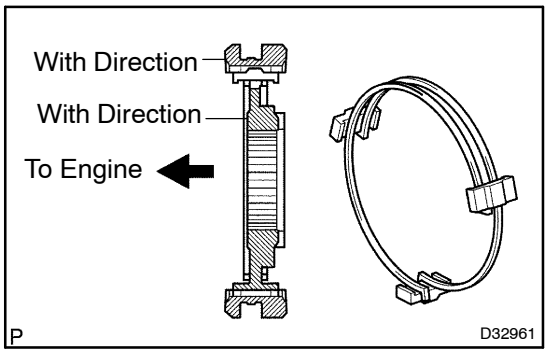
54. INSTALL 1ST GEAR NEEDLE ROLLER BEARING

(a) Coat the needle roller bearing with gear oil and install it.



55. INSTALL SYNCHRONIZER RING SET NO.1

(a) Coat the synchronizer ring with gear oil and install it on the 1st gear.



56. INSTALL TRANSMISSION CLUTCH HUB SLEEVE ASSY NO. 1

(a) Coat the hub sleeve with gear oil and install it to the clutch hub.

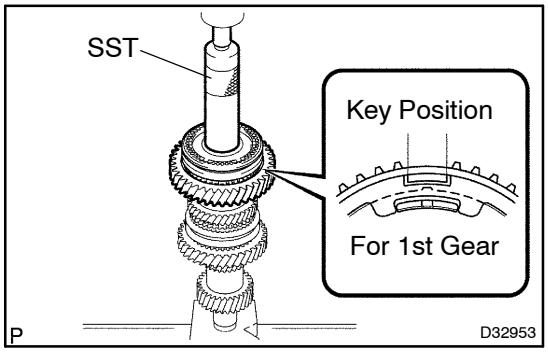
HINT:

Set the hub sleeve and the transmission clutch hub No. 1 in correct orientation.

(b) Install the 2 key springs and 3 keys to the hub sleeve.

NOTICE:

Do not set both opening of the shifting key springs in the same position.



57. INSTALL 1ST GEAR

(a) Coat the 1st gear with gear oil.

(b) Using SST and a press, press in the 1st gear.

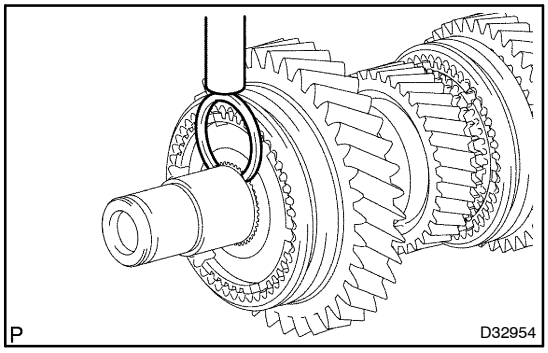
SST 09316–60011 (09316–00011)

58. INSTALL TRANSMISSION CLUTCH HUB SHAFT SNAP RING NO. 1

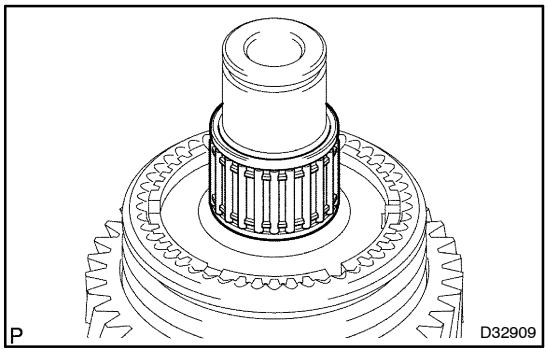
(a) Select a snap ring that allows minimum axial play.

Standard clearance: 0.10 mm (0.039 in.) or less

Mark	Specified Condition
A	2.40 to 2.45 mm (0.0945 to 0.0965 in.)
B	2.45 to 2.50 mm (0.0965 to 0.0984 in.)
C	2.50 to 2.55 mm (0.0984 to 0.1004 in.)
D	2.55 to 2.60 mm (0.1004 to 0.1024 in.)
E	2.60 to 2.65 mm (0.1024 to 0.1043 in.)
F	2.65 to 2.70 mm (0.1043 to 0.1063 in.)

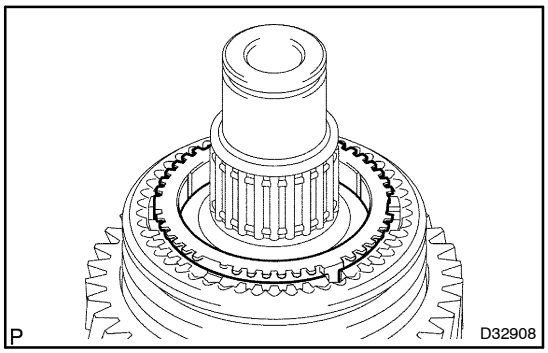


(b) Using a brass bar and hammer, tap in the snap ring.



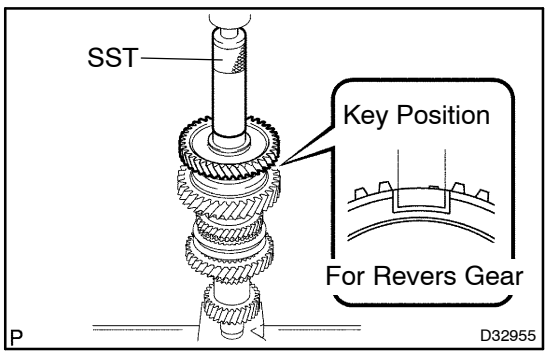
59. INSTALL REVERSE GEAR NEEDLE ROLLER BEARING

(a) Coat the needle roller bearing with gear oil and install it.



60. INSTALL REVERSE SYNCHRONIZER RING

(a) Coat the synchronizer ring with gear oil and install it to the transmission hub sleeve No. 1.



61. INSTALL REVERSE GEAR

(a) Coat the gear with gear oil.

(b) Using SST and a press, press in the reverse gear and a new counter gear front bearing (inner race).

SST 09608–06041

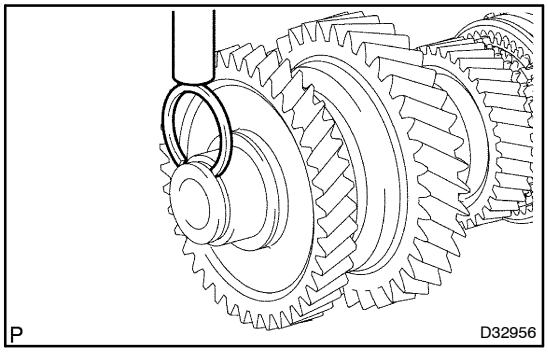
62. INSTALL COUNTER GEAR FRONT BEARING HOLE SNAP RING

(a) Select a hole snap ring that will allow minimum axial play.

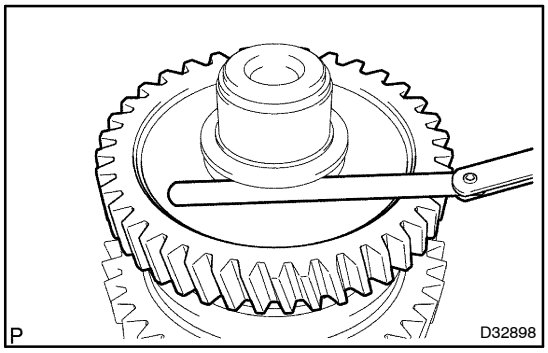
Standard clearance: 0.10 mm (0.039 in.) or less

Snap ring thickness:

Mark	Specified Condition
A	2.40 to 2.45 mm (0.0945 to 0.0965 in.)
B	2.45 to 2.50 mm (0.0965 to 0.0984 in.)
C	2.50 to 2.55 mm (0.0984 to 0.1004 in.)
D	2.55 to 2.60 mm (0.1004 to 0.1024 in.)
E	2.60 to 2.65 mm (0.1024 to 0.1043 in.)
F	2.65 to 2.70 mm (0.1043 to 0.1063 in.)



(b) Using a brass bar and hammer, tap in the snap ring.

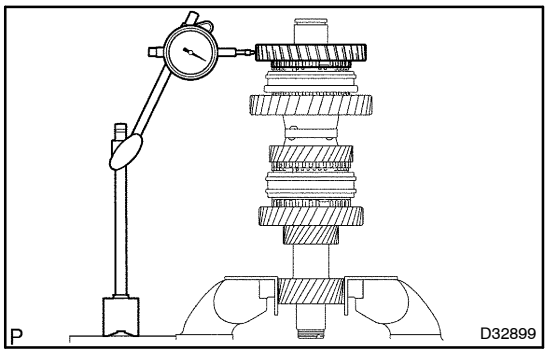


63. INSPECT REVERSE GEAR THRUST CLEARANCE

(a) Fix the counter gear through 2 protective aluminum plates in a vise.

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

Standard clearance:
0.10 to 0.45 mm (0.0039 to 0.0177 in.)
Maximum clearance: 0.45 mm (0.0177 in.)

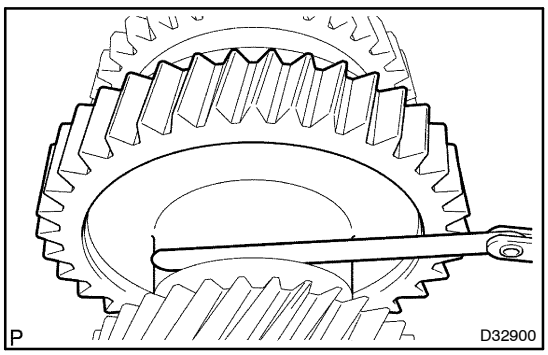


64. INSPECT REVERSE GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the reverse gear radial clearance between the gear and shaft.

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

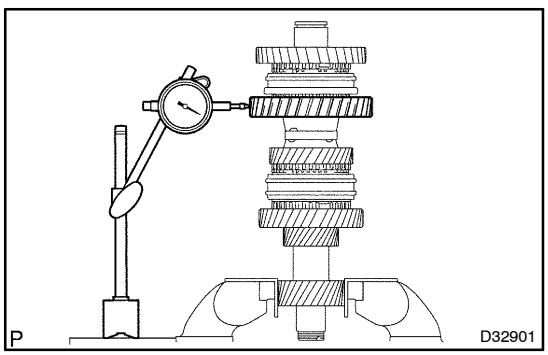
If the clearance is not as specified, replace the reverse gear needle roller bearing.



65. INSPECT 1ST GEAR THRUST CLEARANCE

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

Standard clearance:
0.10 to 0.45 mm (0.0039 to 0.0177 in.)
Maximum clearance: 0.45 mm (0.0177 in.)

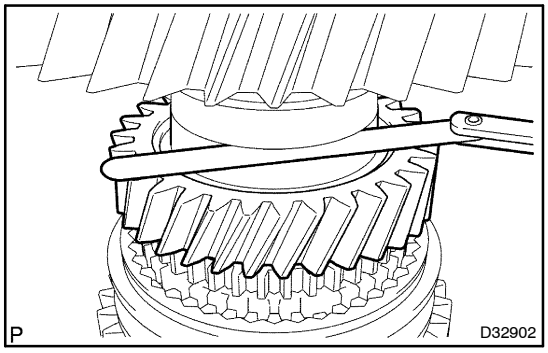


66. INSPECT 1ST GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the gear radial clearance between the gear and shaft.

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

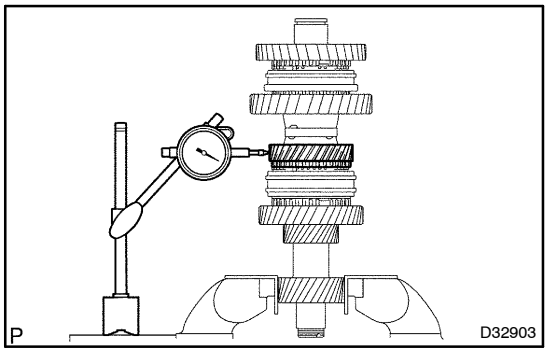
If the clearance is not as specified, replace the 1st gear needle roller bearing.



67. INSPECT 3RD GEAR THRUST CLEARANCE

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

Standard clearance:
0.10 to 0.45 mm (0.0039 to 0.0177 in.)
Maximum clearance: 0.45 mm (0.0177 in.)

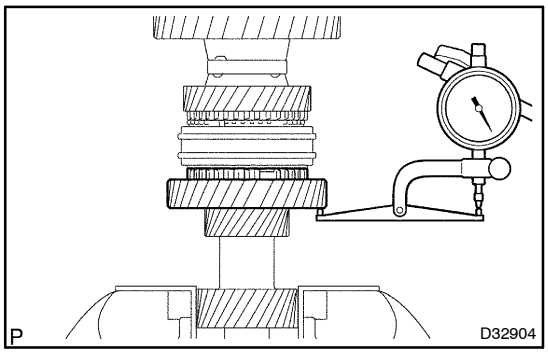


68. INSPECT 3RD GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the gear radial clearance between the gear and shaft.

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

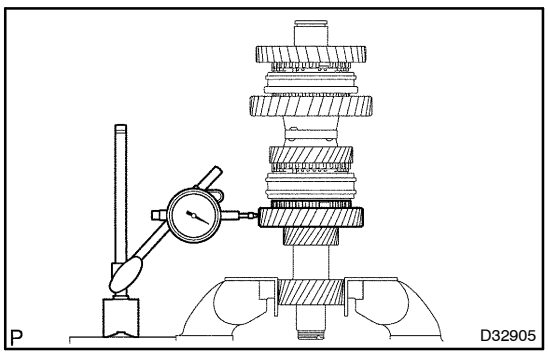
If the clearance is not as specified, replace the 3rd gear needle roller bearing.



69. INSPECT 2ND GEAR THRUST CLEARANCE

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

Standard clearance:
0.10 to 0.35 mm (0.0039 to 0.0138 in.)
Maximum clearance: 0.35 mm (0.0138 in.)



70. INSPECT 2ND GEAR RADIAL CLEARANCE

(a) Using a dial indicator, measure the gear radial clearance between the gear and shaft.

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

If the clearance is not as specified, replace the 2nd gear needle roller bearing.

(b) Remove the counter gear from the vise.