TRANSMISSION

DESCRIPTION

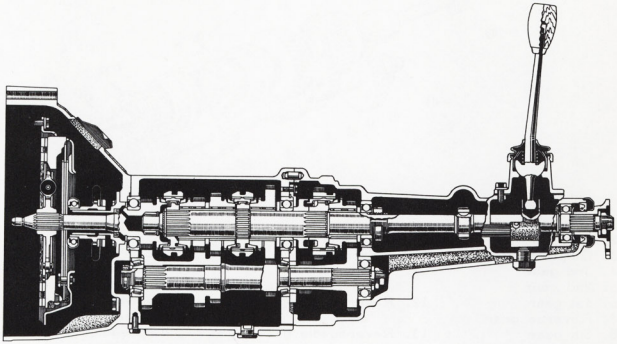


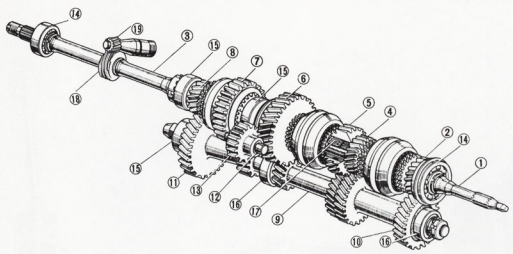
Fig. 9-1 Transmission Cross Sectional View Y5213

This transmission is of the five-speed type, and fully synchronized type, with all gears except the reverse gear are of single helical form, and are in constant mesh. All forward speed changes are accomplished with the transmission hub sleeves, and reverse gear.

The synchronizers permit quicker shifting, greatly reduce gear clash, and permit down shifting from high to low.

All gears and shafts are supported with radial ball bearings, tapered roller bearings, or needle roller bearings which are possible for smoothness and durability on high speed cruising.

Synchronizers are blocking ring type with the conventional tapered ring and straight clutch gear type. A system of interlocks, and detents in the transmission case prevent the selection of more than one gear speed at one time, and help to hold any gear in the selected position.



1. Input shaft
2. 4th gear
3. Output shaft
4. 3rd gear
5. 2nd gear
6. 1st gear
7. Reverse gear
8. 5th gear
9. Countershaft
10. Countershaft drive gear
11. Countershaft reverse gear
12. Reverse idle gear shaft
13. Reverse idle gear
14. Bearing
15. Bearing
16. Bearing
17. Needle roller bearing
18. Speedometer drive gear
19. Speedometer driven gear

Fig.9-2 Transmission Gears Y5068

Specification:

Type	Five speeds forward, and one speed reverse
Gear ratio:	
First	3.143
Second	1.636
Third	1.179
Fourth	1.000
Fifth	0.844
Reverse	3.238
Speedometer gear ratio	17 to 5
Transmission lubricant capacity	2.1 liters (2.22 US qts., 1.85 Imp. qts)
Weight	43 kg (94.6 lb)

TROUBLE SHOOTING

1. Hard Gear Shifting
   Hard shifting is caused from shift mechanism or transmission trouble, but many are resulted from improper clutch release. If the clutch function is proper after checking it, and any exists, the following check should be made.

a. Improper gear shift mechanism Damaged, worn, stuck or rusted shift lever, and shift lever retainer sliding portion	Replace
b. Improper synchromesh mechanism	
(1) Damaged or worn synchronizer ring or synchromesh shiftin keys	Replace
(2) Synchronizer ring to gear tapered surface poor contact.	Replace
(3) Weak synchromesh shifting key springs	Replace
(4) Damaged or worn gears tapered surface or spline portion	Replace
c. Worn gears, shafts or bearings	Replace

2. Gear Jumping Out

a. Improper gear shift mechanism	
(1) Damaged or worn groove for shift fork shaft detent ball	Replace
(2) Insufficient spring tension of lock ball springs	Replace
(3) Worn shift fork or hub sleeve	Replace
b. Improper shafts or gears	
(1) Large axial play or bent shaft	Replace
(2) Large axial play or worn gears	Replace
c. Worn bearings	Replace

3. Noisy
   In this case, care should be taken not to confound the noisy transmission with a noisy drive line (clutch, propeller shaft, differential or rear axle).

a. Improper input shaft, output shaft, counter shaft or needle roller bearings	Replace
b. Large axial play or bent shaft	Replace

c. Large axial play or worn gear, damaged tooth surface or large gear backlash	Replace
d. Play of spline contact portion	Replace
4. Lubricant Leaks	
a. Improper installation, worn or damaged oil seals	Replace
b. Damaged gasket or loose stud bolt nuts	Replace
c. Damaged or casting pores in transmission case	Replace
d. Weak "O" ring for speedometer shaft sleeve or worn driven gear shaft bushing	Replace

Removal

1. Remove the engine together with the transmission from the car. For detail removal procedures refer to ENGINE Removal.

2. Remove the transmission with the clutch housing from the rear end plate on the cylinder block.

Disassembly

1. Drain the transmission lubricant.

2. Remove the following parts in order:

   a. Back-up lamp switch (1).

   b. Transmission oil pan (2), and gasket.

   c. Reverse restrict pin (3).

   d. Speedometer shaft sleeve (4), and driven gear.

   e. Control shift lever retainer (5).

   f. Case cover (6), locking ball springs, and locking balls.

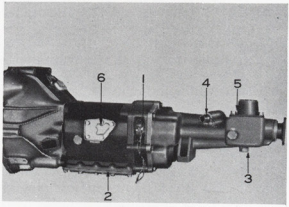
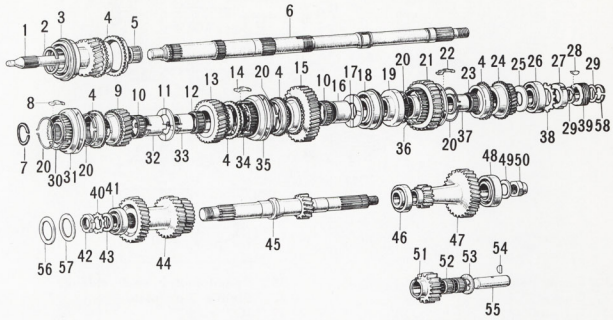


Fig. 9-3 Transmission Assembly V1280

3. Remove the nut retaining the output shaft companion flange to the output shaft using the Universal Joint Flange Holding Tool 09330-20010, and a wrench. Remove the companion flange.

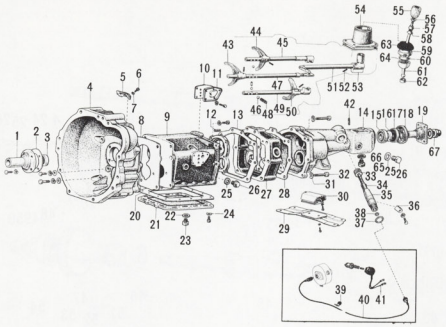
4. Remove the extension housing No. 1.

   a. Shift the fifth and reverse fork shaft to reverse position using a screwdriver (Fig. 9-6).



1. Input shaft
2. Shaft snap ring
3. Bearing
4. Synchronizer ring No.2
5. Bearing
6. Output shaft
7. Shaft snap ring
8. Shifting key No.1
9. Third gear
10. Bearing
11. Second & third gear washer
12. Bearing
13. Second gear
14. Shifting key No.1
15. First gear
16. Bearing inner race
17. First gear thrust washer
18. Bearing
19. Shifting key retainer
20. Shifting key spring
21. Reverse gear
22. Shifting key No.3
23. Bearing
24. Fifth gear
25. Fifth gear thrust washer
26. Output shaft bearing
27. Bearing lock nut
28. Key
29. Shaft snap ring
30. Clutch hub No.2
31. Hub sleeve No.2
32. Bearing inner race
33. Bearing inner race
34. Clutch hub No.1
35. Hub sleeve No.1
36. Clutch hub No.3
37. Bearing inner race
38. Lock washer
39. Speed meter drive gear
40. Lock washer
41. Bearing
42. Bearing lock nut
43. Bearing spacer
44. Counter shaft drive gear
45. Counter shaft
46. Bearing
47. Counter shaft reverse gear
48. Bearing
49. Washer
50. Bearing lock nut
51. Reverse idler gear
52. Bearing
53. Idler gear thrust washer
54. Key
55. Reverse idler gear shaft
57. Adjusting shim
58. Shaft snap ring

Fig.9-4 Transmission Gear Components Y5214



1. Front bearing retainer
2. Gasket
3. Oil seal
4. Clutch housing
5. Clutch housing cover No.1
6. Bolt
7. Lock washer
8. Gasket
9. Transmission case
10. Gasket
11. Transmission case cover
12. Straight pin
13. Gasket No.2
14. Extension housing No.1
15. Bearing
16. Oil slinger
17. Oil seal
18. Dust deflector
19. Output shaft companion flange
20. Gasket
21. Transmission oil pan
22. Gasket
23. Drain plug
24. Washer
25. Gasket
26. Case cover plug
27. Extension housing No.2
28. Gasket
29. Mounting rear bracket
30. Mounting insulator
31. Washer
32. Bolt
33. Speedometer driven gear
34. Bushing
35. Speedometer shaft sleeve
36. Sleeve lock plate
37. "O" ring
38. Oil seal
39. Clamp
40. Speedometer drive cable
41. Back up lamp switch
42. Stud bolt
43. Third & fourth shift fork
44. First & second shift fork
45. First & second shift fork shaft
46. Locking ball
47. Third & fourth shift fork shaft
48. Locking ball spring
49. Fifth & reverse shift fork shaft
50. Fifth & reverse shift fork
51. Shift & select shaft
52. Slotted spring pin
53. Shift lever housing
54. Control shift lever retainer
55. Shift lever knob
56. Lock nut
57. Nut
58. Boot retainer
59. Shift lever cap
60. Spring seat
61. Shift lever
62. Shift lever bushing
63. Boot
64. Spring
65. Reverse restrict pin
66. Washer
67. Flange lock nut

Fig.9-5 Transmission Case & Shift Fork Components Y5215

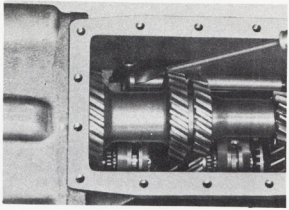


Fig.9-6 Sliding Fifth & Reverse Fork Shaft V1281

b. Next, disengage the shift and select shaft from the fifth and reverse fork shaft as shown in figure 9-7.
Next, remove the extension housing No.1, and the gasket.

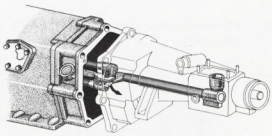


Fig.9-7 Extension Housing No.1 Removal X6192

5. Remove the slotted spring pin from the shift lever housing using a long drift punch, then remove the shift and select shaft, and the shift lever housing from the extension housing No.1.

6. Remove the oil seal, oil slinger, and the bearing from the extension housing No.1.

7. Remove the shaft snap ring with Snap Ring No.1 Expander 09905-00010, then remove the speedometer drive gear, and the shaft snap ring.

8. Straighten the tabs of the lock washer, and loosen and remove the output shaft bearing lock nut with the Output Shaft Bearing Lock Nut Wrench 09326-62010.

9. Remove the lock washer, output shaft bearing, and the fifth gear thrust washer.

10. Straighten the locking portion of the nut, then loosen the nut, and remove the washer, and the bearing at the rear end of the counter shaft.

11. Remove the slotted spring pin connecting the fifth and reverse shift frok to the fork shaft using a long drift punch.
Next, pull out the fifth and reverse shift fork shaft slightly.

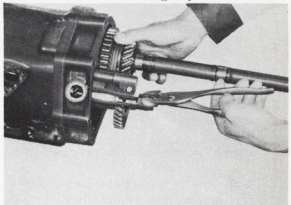


Fig.9-8 Pulling Out Fifth & Reverse Shift Fork Shaft V1282

12. Slide and remove the fifth gear

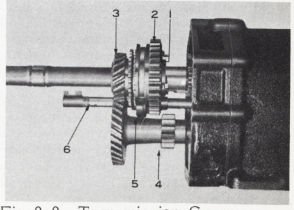


Fig.9-9 Transmission Gears Removal V1283

(3) synchronizer ring, reverse gear (2), clutch hub No.3 (1), fifth and reverse shift fork (5), shaft (6), and the counter shaft reverse gear (4) at the same time.

13. Remove the extension housing No.2 together with the reverse idler gear, and the gasket.

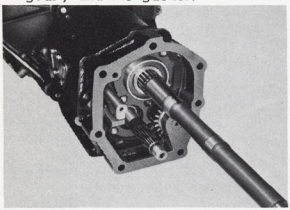


Fig.9-10 Extension Housing V1284 No.2 Removal

14. Remove the shifting key retainer.

15. Remove the output shaft rear bearing retainer.

16. Remove the clutch release fork.

17. Loosen the bolts retaining the clutch housing to the transmission case, and separate the clutch housing, and the transmission case. Take care not to lose the adjusting spacer, and the shim at the front end of the counter shaft. Be carefull not to damage the oil seal in the front bearing retainer. Do not remove the front bearing retainer if it is not necessary.

18. Straighten the tabs of the lock washer, and loosen the bearing lock nut at the front end of the counter shaft using the Counter Shaft Bearing Lock Nut Wrench 09327-62010, and remove the lock washer, and the spacer.

19. Remove the counter shaft with the bearing towards the rear, then remove the counter shaft drive gear, and the counter shaft front bearing.

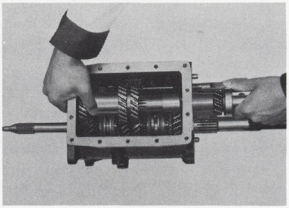


Fig.9-11 Removing Counter V1285 Shaft

20. Remove the slotted spring pins using a long drift punch, then remove the first and second shift fork shaft, fork, third and fourth shift fork shaft, and the fork.

21. Remove the input shaft with the bearing.

22. Remove the output shaft together with the gears from the transmission case.

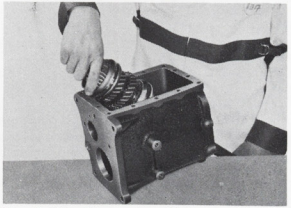


Fig.9-12 Removing Output Shaft & Gears V1286

23. Remove the shaft snap ring with a snap ring expander, then remove the bearing from the input shaft only for replacement with a press.

24. Remove the roller bearings from the input shaft.

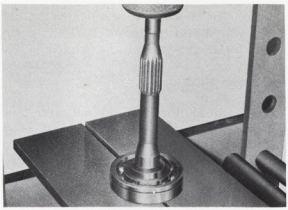


Fig.9-13 Removing Input Shaft Bearing V0324

25. Remove the shaft snap ring at the front end of the output shaft with a snap ring expander, and remove all the gears, bearings, bearing inner races, synchronizer rings clutch hubs, hub sleeves, and the washers.

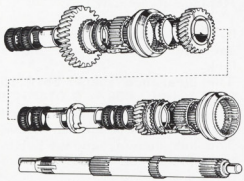


Fig.9-14 Gears on Output Shaft Components Y5216

26. Disassemble the clutch hub No.2, and hub sleeve No.2, clutch hub No.1, and hub sleeve No.1, and the reverse gear, and clutch hub No.3.
Do not mix the mated parts with the others.
The clutch hubs, and the hub sleeves are a selected assembly, and should be kept together as originally assembled.

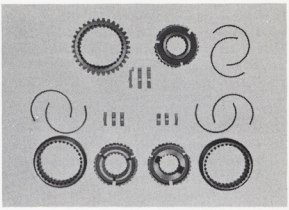


Fig.9-15 Clutch Hubs & Hub Sleeves Disassembly V1287

Inspection

After disassembling, wash all parts thoroughly, and inspect for the followings.
If oil seals are not available for replacement, do not wash them in cleaning solvent.
Oil the bearings immediately after cleaning to prevent rusting.

1. Gears.

   a. Check the gears for tooth wear or damage. Also check the tooth contact which may result in noisy operation.
   If defective, replace the necessary gear/s.

   b. Check the synchronizer ring contacting surface of the gear cone for uneven wear or roughness.

   Specified gear backlash:

Input shaft gear to counter shaft drive gear is 0.10 mm (0.0039").
Third gear to counter shaft drive gear is 0.10 mm (0.0039").
Second gear to counter shaft drive gear is 0.10 mm (0.0039").
First gear to counter shaft gear is 0.10 mm (0.0039").
Fifth gear to counter shaft reverse gear is 0.10 mm (0.0039").

Reverse gear to reverse idler gear is 0.12 mm (0.0047").
Reverse idler gear to counter shaft reverse gear is 0.12 mm (0.0047").

2. Synchronizer rings.

   a. Check the synchronizer rings for external tooth wear or damage. Also check the internal surface wear or damage.

   b. Check the contacting surface of the ring for uneven wear or damage.
   Place the ring on the gear cone, and check the clearance between the gear, and the ring.
   If the clearance is less than 0.5 mm (0.02"), replace the synchronizer ring.

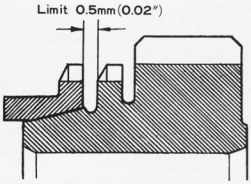


Fig. 9-16 Synchronizer Ring Inspection X0294

3. Synchromesh shifting keys, and springs.

   a. Check the shifting keys for improper wear or warpage.
   Replace if defective.

   b. Check the shifting key springs for weakness or bent condition.
   Replace if necessary.

4. Output shaft.

   a. Check the output shaft splines, snap ring grooves, and bearing contact surfaces for wear, scores or damage. Replace if defective.

   b. Check the output shaft for bend. If the bend exceeds 0.03 mm or 0.0012", replace the shaft.

5. Input shaft.

   a. Check the input shaft splines, and the input shaft front bearing fitting portion for wear or damage. If necessary replace the shaft.

   b. Inspect the roller bearing contact surface in the gear for wear, scores or damage, and replace if necessary.

6. Gear shift mechanism.

   a. Check the shift fork shafts, shift forks, and the shift and select shaft sliding or contacting surfaces for excessive wear or scores.
   Replace if defective.

   b. Check the clearance between each hub sleeve, and the shift fork.
   The clearance should be 0.15 to 0.35 mm (0.006 ~ 0.014"). If it exceeds this clearance, replace the shift fork/s or the hub sleeve/s. The hub sleeve, and the hub must be replaced as a set.

7. Oil seals.
   It is recommended that all oil seals should be replaced at the time of assembly.
   If no oil seal is available for replacement, check the seal for wear or damage.

8. Bearings.
   Check the bearings for roughness, and wear.
   Check for noise or damage while rotating the bearing after lubricating with few drops of oil.
   Replace the bearing/s if necessary.

9. Speedometer drive & driven gears.
   Check the speedometer drive and driven gears for scores and wear.
   Replace if necessary.

Assembly

Always install new gaskets, and apply liquid sealer or gasket cement upon assembly.
To provide initial lubrication, put a thin coating of transmission lubricant on all parts before installation.

1. Counter shaft bearing pre-load adjustment.

a. Install the bearing onto the counter shaft rear end with a press.

b. Insert the counter shaft drive gear onto the counter shaft, and then install the front bearing with a press.

c. Place the counter shaft assembly into the transmission case.

d. Position the output shaft rear bearing retainer, and tighten the bolts to 0.5 m-kg (3.6 ft-lb) torque.

e. Install only the bearing spacer, and tighten the front bearing lock nut to 10 ~ 13 m-kg (72 ~ 94 ft-lb) torque using the Counter Shaft Bearing Lock Nut Wrench 09327-62010.

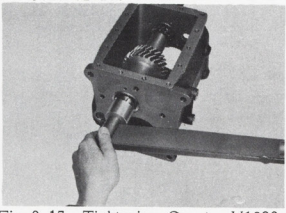


Fig. 9-17 Tightening Counter V1289 Shaft Front Bearing

f. Install the same adjusting spacer, and shim thickness those removed from the counter shaft at the time of disassembly.
Install the clutch housing with the gasket.
Tighten the bolts to 5 ~ 7 m-kg (36 ~ 51 ft-lb) torque, for the 12 mm bolts, and 3.0 ~ 4.5 m-kg (22 ~ 33 ft-lb) torque for the 10 mm bolts.

g. Wind a cord on the output shaft companion flange, then hook a pull scale onto the other end of the cord.
Pull the scale slowly, then read the pull scale applying a steady pull on the scale.
The pre-load should be 500 ~ 800 grams (17.6 ~ 28 oz) when a new bearing is used, and 200 to 400 grams (7 ~ 14 oz) when re-using an old bearing.
If necessary re-adjust the pre-load by the spacer and adjusting shim.
The adjusting spacer are available in the following six different thicknesses in increments of 0.04 mm (0.0016").

90560-43212 - 1.17 mm (0.0460")
90560-43213 - 1.21 mm (0.0476")
90560-43214 - 1.25 mm (0.0492")
90560-43215 - 1.29 mm (0.0508")
90560-43216 - 1.33 mm (0.0523")
90560-43217 - 1.37 mm (0.0539")

The thickness of the adjusting shim is 0.25 mm (0.0098").

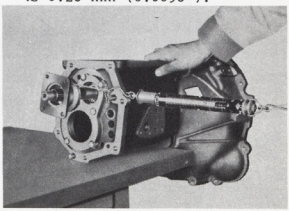


Fig. 9-18 Checking Pre-load V1290

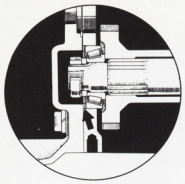


Fig.9-19 Adjusting Spacer & Shim X6186

Remove the clutch housing, rear bearing retainer, and the counter shaft with the gear.

2. Output shaft assembly.

a. Slide the bearing inner race (1), bearings (2), and the first gear (3).

b. Assemble the synchronizer units No.1, and No.2 by installing the two shifting key springs onto the hub, and placing the three shifting keys into the hub key slots. When installing the shifting key springs, the open ends of the springs should be kept at 120° apart as shown in figure 9-20. The spring tension on each key must be uniform.

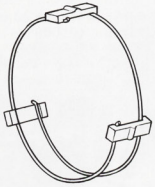


Fig.9-20 Shifting Key Spring Installation X4359

The clutch hubs, and the hub sleeves are a selected assembly, and should be kept together for smooth operation.

c. Slide the assembled synchronizer unit No.1 (4), and the synchronizer ring (5) onto the output shaft.
The shifting keys, and the slots on the synchronizer ring should be aligned.

d. Slide the bearing inner race (6), bearings (7), synchronizer ring (8), and the second gear (9) onto the output shaft.
The bearing inner race is provided with two claws, and these claws must be positioned at the front.

e. Install the second and third gear washer (10), and align the claws of the bearing inner race, and the slots of the washer.

f. Slide the bearing inner race (11), and align the claws, and the slots of the washer, then install the bearings (12), and the third gear (13).

g. Install the synchronizer ring (14), and the assembled synchronizer unit No.2 (15) onto the output shaft.

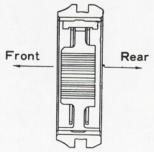


Fig.9-21 Installing Direction of Synchronizer Unit No.2 X3678

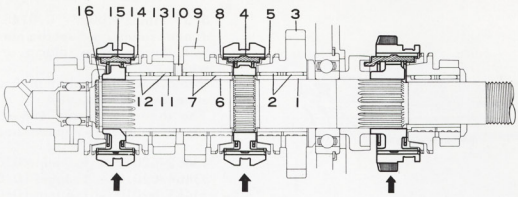


Fig.9-22 Output Shaft & Gears Assembly Y5217

The clutch hub No.2 is provided with slots, and should be aligned with the claws of the bearing inner race (11).

h. Install the shaft snap ring (16) onto the output shaft.

3. Place the assembled output shaft, and gears into the transmission case.

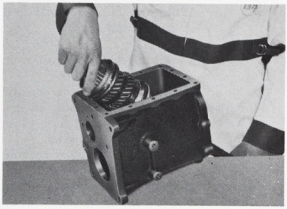


Fig.9-23 Installing Output Shaft & Gear Assembly V1286

Install the first gear thrust washer, and the bearing onto the output shaft.
The indented surface of the thrust washer should face towards the first gear thrust side.

4. Install the bearing onto the input shaft using a press, then install the shaft snap ring, and fit it.

Shaft snap ring thickness
90520-33011 - 2.30 ~ 2.42 mm (0.090 ~ 0.095")
90520-33010 - 2.43 ~ 2.57 mm (0.095 ~ 0.101")

5. Pack multipurpose grease onto the bearing, and install the input shaft into the transmission case.

6. Place the first and second shift fork onto the hub sleeve No.1, then insert the first and second shift fork shaft into the fork through the transmission case.

7. Turn the first and second shift fork shaft to the position (1) as shown in figure 9-24.
Place the third and fourth shift fork onto the hub sleeve No.2.
Install the inter-lock ball into the inter-lock hole.
Install the inter-lock pin into the third and fourth shift fork shaft, then insert the shaft into the fork through the transmission case.
Next, return the first and second shift fork shaft to position (2).

8. Insert the slotted spring pins into the first and second shift fork and shaft, and the third and fourth shift fork and shaft using a long drift punch.

9. Place the counter shaft drive gear into the transmission case, and insert the counter shaft with the

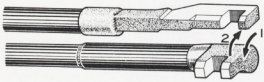


Fig.9-24 Shift Forks Assembly G0351

bearing into the gear through the case.

10. Install the output shaft rear bearing retainer, and tighten the bolts to 0.5 m-kg (3.6 ft-lb) torque. Install the counter shaft front bearing, bearing spacer and the lock washer.
Tighten the bearing lock nut to 10 ~ 13 m-kg (72 ~ 94 ft-lb) torque using the Counter Shaft Bearing Lock Nut Wrench 09327-62010.
Bend the tabs of the lock washer, and secure the nut.

11. Position the selected adjusting shim and spacer onto the counter shaft front bearing, and install the clutch housing, and the gasket.
Tighten the bolts to 5 ~ 7 m-kg (36 ~ 51 ft-lb) torque, for the 12 mm bolts, and 3.0 ~ 4.5 m-kg (22 ~ 33 ft-lb) torque for the 10 mm bolts.

12. If the reverse idler gear is removed, assemble the gear, bearings, thrust washer, shaft and the key into the extension housing No.2, and install them onto the transmission case.
Tighten the bolts to 3.0 ~ 4.5 m-kg (22 ~ 33 ft-lb) torque, and check the reverse idler gear thrust clearance with a feeler gauge.
The clearance should be 0.05 to 0.35 mm (0.002 ~ 0.014"), and if necessary, adjust the clearance with the reverse idler gear thrust washer.
Remove the bolts after thrust clearance is adjusted.
The thrust washers are available on the following thicknesses

33462-62010 - 1.0 mm (0.0394")
33464-62010 - 1.3 mm (0.0512")
33465-62010 - 1.6 mm (0.0630")

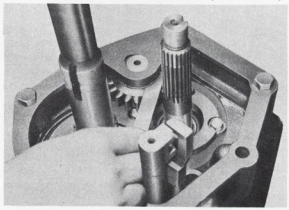


Fig.9-25 Checking Thrust Clearance V1292

13. Slide the shifting key retainer onto the output shaft.
Install the bearing inner race, and the bearings into the fifth gear. The bearing inner race flange must face towards the front side.
Position the fifth and reverse shift fork onto the reverse gear, and assemble the reverse gear and clutch hub No.3 unit, synchronizer ring, fifth gear, counter shaft re-

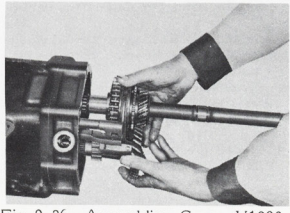


Fig.9-26 Assembling Gears & Forks V1293

verse gear, and the shift fork onto the shafts at the same time.

14. Install the inter-lock ball into the inter-lock hole, then insert the fifth and reverse fork shaft.
Install the slotted spring pin into the fork and shaft with a long drift punch.

15. Install the bearing and washer onto the counter shaft, then tighten the nut to 11 ~ 13 m-kg (79 ~ 94 ft-lb) torque.

16. Install the fifth gear thrust washer, bearing and the lock washer onto the output shaft.
Tighten the output shaft bearing lock nut to 12 ~ 14 m-kg (87 to 101ft-lb) torque using the Output Shaft Bearing Lock Nut Wrench 09326-62010.
Bend the lock washer tabs and secure the nut.

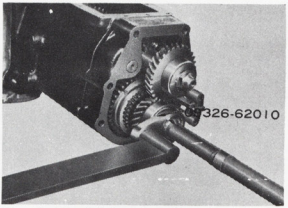


Fig. 9-27 Tightening Bearing V1294 Lock Nut

Face the indented surface toward the fifth gear thrust side.

17. Install the shaft snap rings, key, and the speedometer drive gear onto the output shaft.

18. Assemble the shift and select shaft, and the shift lever housing into the extension housing No.1, then insert the slotted spring pin with the long drift punch.

19. If the bearing is removed, install the bearing, oil slinger, and the oil seal into the rear end of the extension housing No.1.
Apply a thin coat of multipurpose grease on the oil seal when assembling.

20. Install the locking balls, and spring into the locking ball holes in the transmission case.
Install the cover with the gasket.

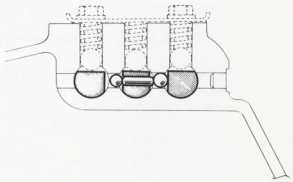


Fig. 9-28 Inter-lock Balls & X6193 Locking Balls Position

21. Install the extension housing No.1 onto the extension housing No.2.

a. Shift the gear to the reverse position with a screwdriver.
Also position the shift and select shaft to reverse position.

b. Next, engage the shift and select shaft with the fifth and reverse fork shaft, and install the extension housing No.1, and the gasket. Tighten the bolts to 3.0 ~ 4.5 m-kg (22 ~ 33 ft-lb) torque.

c. Release the fifth and reverse fork shaft to neutral position.

22. Install the output shaft companion flange, and the dust deflector, and tighten the nut to 11 ~ 13 m-kg (79 ~ 94 ft-lb) torque using the Universal Joint Flange Holding Tool 09330-20010, and a wrench.

23. Install the control shift lever retainer onto the extension housing No.1.

Tighten the nuts to 1 ~ 1.6 m-kg (7 ~ 11 ft-lb) torque.

24. Screw in the reverse restrict pin with the gasket, and tighten it to 3.7 ~ 4.3 m-kg (27 ~ 31 ft-lb) torque.

25. Assemble the speedometer shaft sleeve, and the driven gear.

26. Install the transmission oil pan, and the gasket.

27. Screw in the back-up lamp switch.

28. Assemble the clutch release fork, and the bearing.

29. Fill the transmission with gear lubricant SAE-90.
Capacity:
Transmission case - 1700 cc (1.80 US qts., 1.50 Imp qts)
Extension housing - 400 cc (0.84 US pint, 0.70 Imp pint)

Installation

Follow the removal procedures in the reverse order. Refer to ENGINE Removal.

* *