

DRIVE LINE

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DESCRIPTION

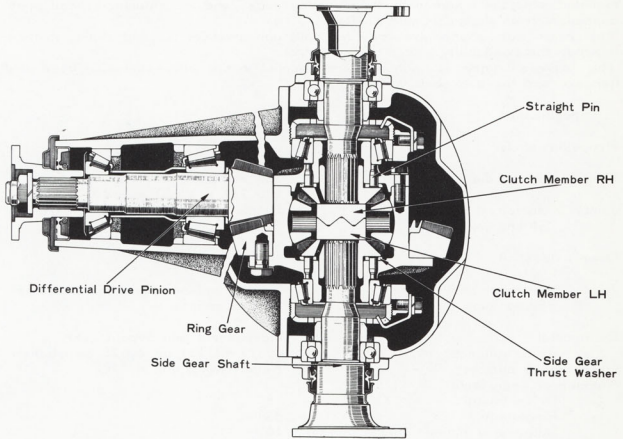
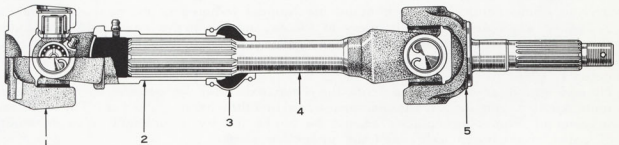


Fig.10-1 Cross Sectional View of Differential

Y5219



- 1. Universal joint flange yoke
- 2. Rear axle shaft sleeve
- 3. Rear axle shaft boot

- 4. Rear axle shaft
- 5. Hub shaft yoke

Fig.10-2 Cross Sectional View of Rear Axle Shaft

Y5220

10-2 DRIVE LINE - Description, Trouble Shooting

The principle components of the rear axle unit consist of the differential, and the rear axle shafts.

The differential is of a limited slip type, and the differential carrier case is mounted onto the frame with the mounting rods, and the mountings, and is independent from the rear axle shafts.

The rear axle shafts are provided with universal joints, and sliding joints to improve the roadability.

The universal joints at each end are coupled to the differential side gear shaft flanges, and the hub shaft yokes.

Specification

Propeller shaft

Length x outer dia. x inside dia.	528 x 42.7 x 35.7 mm (20.787 x 1.681 x 1.405")
Joints: Universal joint	Spider and needle roller bearings
Sliding joint	Sliding splines

Rear axle shaft

Joint: Universal joint	Spider and needle roller bearings
Sliding joint	Sliding splines

Differential	Independent and hypoid gear
Reduction ratio	4.375 (4.111 or 4.625 as optional)
Gear type & number	Bevel-two pinion
Number of gear teeth	
Drive pinion	8
Ring gear	35
Differential pinion	10
Differential side gear	16
Lubricant capacity	1.03 liter (1.09 US qts., 0.91 Imp. qts)

TROUBLE SHOOTING

An unusual noise is usually the first indication of improper functioning of the axle driving components. Although some mechanical failures of the rear axle, and the propeller shaft are relatively easy to locate, noises in the rear axle are a little more difficult to diagnose, and repair. When noise is experienced in the rear axle assembly, it is advisable to test thoroughly, and detect the location of the noise.

Noises which seem to come from the rear axle may be caused by some other units such as engine, transmission, tires or other parts of the car. These noises originating from other places cannot be corrected by adjustment or replacement of parts of the rear axle, and the propeller shaft.

To make the rear axle diagnosis, the car should be road-tested on smooth level road. Before road-testing, make sure that the tire inflation, and the rear axle lubricant level are normal.

Symptoms & Probable CausesRemedies

1. Vibration of propeller shaft or rear axle
While running at intermediate or high speed, vibration is produced in the propeller shaft, and rear axle shaft, and is transmitted to the body.

a. Worn or damaged universal joint spider bearings	Replace bearings and spider
b. Bent propeller shaft, and axle shaft	Replace
c. Out of balance of propeller shaft and axle shaft	Repair or replace
d. Loose universal joint yoke mountings	Tighten
e. Worn bearing	Replace

2. Noisy propeller shaft or axle shaft at starting or while coasting

a. Worn or damaged universal joints	Replace
b. Worn spline portion	Replace
c. Loose universal joints	Replace snap ring
d. Loose universal joint yoke mounting	Tighten

3. Differential case, gears or bearings damaged
The car will be inoperative due to worn or damaged components, producing abnormal noise. In this case, the differential must be disassembled, and the defective parts must be replaced. Other parts must be checked for defects. Adjust the bearing pre-load, gear backlash before assembly. Always replace the gaskets, and the oil seals. Replace the lubricant with proper grade hypoid gear lubricant.

a. Lack of lubricant or improper grade	Replenish or replace with proper grade
b. Overload or improper use of clutch	Avoid overload and slipping the clutch
c. Incorrectly adjusted side bearings, and drive pinion bearings	Adjust pre-load
d. Incorrectly adjusted drive pinion, and ring gear	Adjust pre-load, and gear backlash
e. Incorrectly selected thrust washer	Correct
f. Excessive backlash from worn side gear thrust washers, and pinion.	Replace thrust washers, and check
g. Loose ring gear, and differential case attaching bolts	Tighten, and adjust

4. Noisy differential
The differential noises can be classified into two types, that is gear noise, and bearing noise.
Gear noise can be recognized since it produces a cycling pitch, and tends to peak in a narrow speed range, while bearing noise will tend to remain constant in pitch, and produce a rough whine. Differential side gears and pinions seldom cause noise except when turning curves as they are used

Symptoms & Probable Causes

Remedies

only when the rear wheels travel at different speeds. Test on a straight road, and also test while turning on a curve.

Typical differential noises originate from the faulty ring gear, and the drive pinion.

Drive pinion bearing, and side bearing noise will occur if the bearings are rough or damaged, and will produce a whine.

The drive pinion bearing or wheel bearing noise sometimes mingle at different speeds.

- | | |
|--|---|
| a. Lack of lubricant | Replenish |
| b. Incorrectly adjusted ring gear and drive pinion | Check and adjust tooth contact |
| c. Worn ring gear and drive pinion tooth | Replace ring and drive pinion kit |
| d. Loose drive pinion bearing | Adjust bearing pre-load, backlash, and tooth contact |
| e. Loose side bearing | Adjust bearing pre-load, backlash, and tooth contact |
| f. Worn side gear thrust washer or clutch member | Replace |
| g. Deformation of ring gear or differential case | Replace ring gear and drive pinion or differential case |
| h. Loose differential case cover | Tighten attaching bolts |
| i. Damaged clutch member | Replace |
| j. Incorrectly adjusted side gear thrust washer | Adjust thrust washer |

5. Rear wheel noise

- | | |
|---------------------------------|-----------------------------|
| a. Loose rear wheel hub nuts | Tighten |
| b. Worn or damage wheel bearing | Replace bearing |
| c. Improper tires | Replace tires |
| d. Loose wheel set pin | Replace and tighten cap nut |

DIFFERENTIAL

Construction & Operation

The conventional differential delivers the same amount of torque to each rear wheel. If one wheel slips, then the other wheel cannot deliver the torque. To prevent this, the TOYOTA 2000 GT is equipped with a Limited Slip Differential. This differential is very similar in construction to the conventional type except, that it has the clutch right member, and the clutch left member in addition, and the ends of the clutch right member lie rather loosely in the clutch member lock openings of the differential case. The clutch members are provided with taper lands, and these mesh each other.

During normal straight road driving, power-flow is same as the conventional differential. The turning force is transmitted from the drive pinion through the ring gear, and the differential case to the clutch right, and left members, and through the differential pinions, and differential side gears to the rear axle shafts. Note that the turning differential pinions carries the clutch left member around with it. Since there is considerable side thrust, the taper lands on the clutch

left member tend to slide up the opposite taper lands of the clutch right member in the differential case. As these drive up, these are forced outwardly, and this force is transmitted to the differential side gears. The side gears thus lock the differential side gear shafts. Then, if one wheel should encounter a patch of ice or mud that causes it to lose traction temporary, it will not spin since it cannot turn faster than the other wheel.

When rounding a curve, the differential acts in the conventional manner to permit the outer wheel to rotate a little faster than the inner wheel. This action is permitted by slipping of the differential side gears.

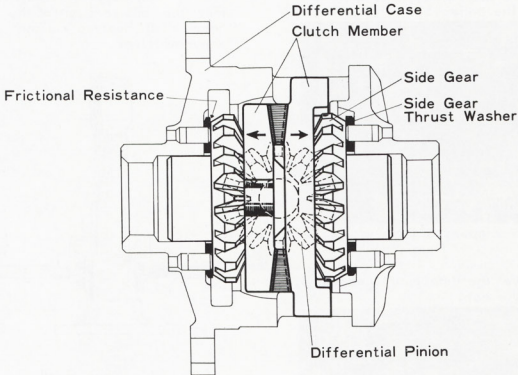


Fig. 10-3 Limited Slip Differential Operation G0094

Removal

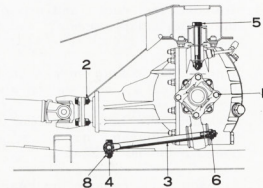


Fig. 10-4 Differential Assembly Removal Y5223

Jack the rear of the car, and support with stands.

1. Loosen the bolts (1), and disconnect the rear axle shafts from the side gear shaft flanges of the differential.
Do not remove the rear axle shaft sleeve from the rear axle shaft.
2. Loosen the bolts (2), and disconnect the propeller shaft from the universal joint flange of the differential.
3. Remove the cotter pins, then loos-

en the nuts (6). Remove the washers, and the cushions from the differential mounting rods.

4. Loosen the nuts (4), and (8), and remove the mounting rods (3), and the torque rod pivot shaft.
5. Open the zippers (9) of the carpet, and remove the hole plugs. Remove the cotter pins, then remove the bolts (5).

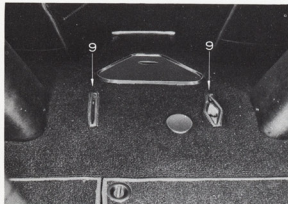


Fig.10-5 Zippers & Hole V1313 Plug

6. Remove the differential assembly from the car.

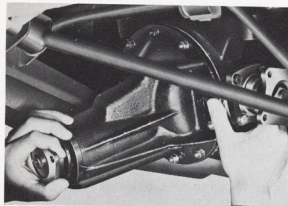


Fig.10-6 Removing V1888 Differential

Disassembly

1. Loosen the bolts securing the side gear shaft bearing retainer onto the differential carrier case, then remove the differential side gear shaft together with the side gear

shaft bearing retainer, bearing and the rear axle bearing retainer from the carrier case.

2. If only the side gear shaft bearing or oil seal is to be replaced, place the side gear shaft bearing retainer upon the anvils, and press out the shaft from the bearing retainers, and the bearing with a press, then separate them. Pry the oil seal out of the side gear shaft bearing retainer with a screwdriver.

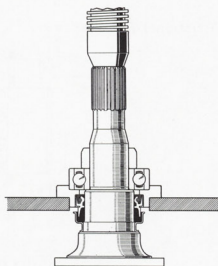
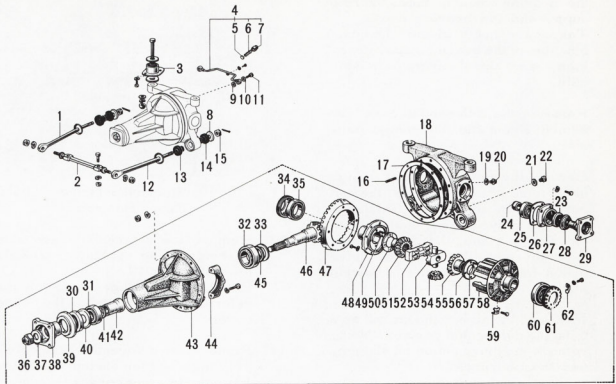


Fig.10-7 Side Gear Shaft G1153 Disassembly

3. Loosen the union bolts, and remove the breather from the case.
4. Remove the nuts, and separate the differential carrier, and the case.
5. Punch the mating marks on the bearing caps, and the carrier.
6. Remove the bolts securing the bearing adjusting nut locks, and remove the nut locks.
7. Loosen and remove the bearing



- | | |
|--------------------------------------|-----------------------------|
| 1. Differential mounting rod | 32. Bearing |
| 2. Torque rod pivot shaft | 33. Adjusting washer |
| 3. Differential carrier mounting | 34. Bearing adjusting nut |
| 4. Breather assembly | 35. Bearing |
| 5. Breather plug No. 3 | 36. Nut |
| 6. Spring | 37. Washer |
| 7. Breather plug No. 2 | 38. Universal joint flange |
| 8. Washer | 39. Dust deflector |
| 9. Gasket | 40. Oil slinger |
| 10. Gasket | 41. Adjusting shim |
| 11. Union bolt | 42. Drive pinion spacer |
| 12. Differential mounting rod | 43. Differential carrier |
| 13. Cushion | 44. Bearing cap |
| 14. Cushion | 45. Adjusting shim |
| 15. Nut | 46. Drive pinion |
| 16. Stud bolt | 47. Ring gear |
| 17. Gasket | 48. Differential case cover |
| 18. Differential carrier case | 49. Straight pin |
| 19. Gasket | 50. Side gear washer |
| 20. Plug | 51. Side gear |
| 21. Gasket | 52. Clutch member right |
| 22. Plug | 53. Clutch member left |
| 23. Oil seal | 54. Differential pinion |
| 24. Bearing retainer | 55. Side gear |
| 25. Bearing | 56. Side gear washer |
| 26. Gasket | 57. Straight pin |
| 27. Side gear shaft bearing retainer | 58. Differential case |
| 28. Dust cover | 59. Lock plate |
| 29. Differential side gear shaft | 60. Bearing |
| 30. Oil seal | 61. Bearing adjusting nut |
| 31. Bearing | 62. Adjusting nut lock |

Fig. 10- 8 Differential Carrier Components

Y2372

cap attaching bolts, and remove the bearing adjusting nuts, bearing cups, and the bearing caps.

Take care not to change the combination of the bearing caps, bearings, and the bearing adjusting nuts.

8. Remove the differential case assembly from the differential carrier.
9. Secure the universal joint flange in a vise, and remove the nut retaining the universal joint flange onto the drive pinion, then take out the flange, and the drive pinion together with the bearing, drive pinion spacer and the adjusting shim.
10. Pry out the drive pinion oil seal from the differential carrier. Next, remove the drive pinion oil slinger, and the bearing.
11. Remove the drive pinion front and rear bearing cups from the differential carrier using the Front Hub & Drive Pinion Bearing Tool Set 09608-30010. The cups should be removed only for replacement.

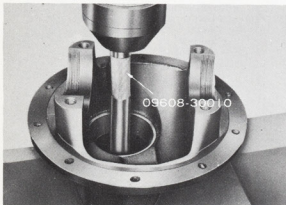


Fig.10-9 Removing Bearing Cup V3440

12. Remove the drive pinion rear bearing using the Universal Puller 09950-20010, and take care not to damage the adjusting shim, and washer.

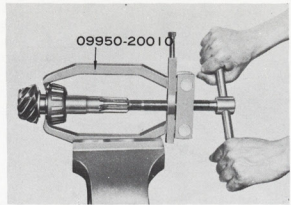


Fig.10-10 Removing Drive W0566 Pinion Bearing

13. Remove the differential case side bearings using the Universal Puller 09950-20010. Punch the mating marks on the differential case, and the case cover.
14. Remove the differential case cover (1), and disassemble the side gear (2), thrust washers (3), clutch right member (5), pinions (6) with the clutch left member (7), and the straight pins (4).

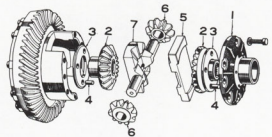


Fig.10-11 Differential Case Y5224 Disassembly

15. Punch the mating marks on the differential ring gear, and the differential case for assembly in the original position. Straighten the bolt lock plates, and remove the bolts securing the ring gear to differential case. Remove the ring gear from the differential case.

Inspection

Wash all the disassembled parts thoroughly in cleaning solvent.

Oil the bearings immediately after cleaning to prevent rusting.

Inspect the parts for wear, damage, and other defects.

1. Check the bearings for scores, roughness or erratic wear pattern. When operated in the cups, the bearings must turn without any roughness.
2. Inspect the drive pinion, and ring gear for scores or signs of excessive wear, and if necessary, replace the ring gear, and drive pinion as a set.
The pattern taken during disassembly should be helpful in judging if gears can be reused.

3. Inspect the differential case, and cover for cracks, and other defects.

Make sure that the hubs where the bearings mount are smooth. Check the fit of the gears, and the clutch right member in the counterbores.

Carefully examine the thrust surfaces.

Be sure that the mating surfaces of the case, and the face of the ring gear attaching flange are smooth, and free from nicks or burrs.

4. Inspect the taper lands and pinion shafts of the clutch members for scores, and excessive wear. Make sure the clutch members where the side gears thrust surfaces are smooth, and free from scores or burrs.
5. Inspect the pinions, side gears, and thrust washers for wear, scores, and other defects. Examine the teeth, and thrust surfaces of the gears.
Wear of splines, thrust surfaces

or thrust washers can contribute to excessive drive line backlash.

Assembly

Clean all parts before assembly.

Lubricate all parts liberally with differential lubricant during assembly.

Replace the oil seals or gaskets upon assembly.

1. Adjustment of the side gear thrust clearance.
 - a. To adjust the side gears thrust clearance, install the case cover onto the differential case, and tighten the bolts to 4.5 m-kg (33 ft-lb) torque.
 - b. Check the measurement between the thrust washer contact surface of the differential case, and the case cover, and record it.

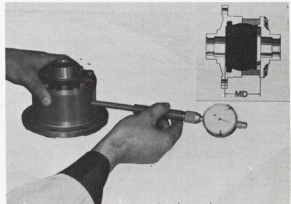


Fig.10-12 Differential Case Inside Measurement G0353 V1889

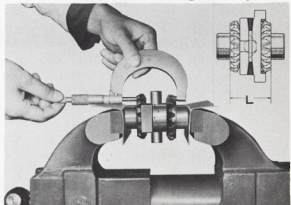


Fig.10-13 Side Gear & Clutch Members Measurement G0354, V1890

c. Assemble the differential side gears, and the clutch right and left members, then secure them in a vise.

Check the measurement from the thrust surface of the side gear to the other side gear.

The specified measurement is 56 mm (2.205").

d. Select the side gear thrust washers to obtain the specific clearance.

The thrust clearance should be 0.03 ~ 0.11 mm or 0.0012 to 0.0043".

The side gear thrust washers are available in the following four different thicknesses in increments of 0.04 mm (0.0016").

Part Number	41361-62010
Thickness:	3.0 mm (0.1181")
Part Number	41362-62010
Thickness:	3.04 mm (0.1197")
Part Number	41363-62010
Thickness:	3.08 mm (0.1213")
Part Number	41364-62010
Thickness:	3.12 mm (0.1228")

Note:

The thrust washers selected for both sides should have the same thicknesses.

If it is necessary to select a different thickness washers, the difference should be within 0.04 mm or 0.0016".

The thinner thickness washer should be used at the ring gear side.

- Remove the bolts securing the case cover to the differential case. Next, wash the differential case, case cover, and the bolts thoroughly in cleaning solvent. Carefully clean the threaded holes in the case, and blow out with compressed air for drying.
- Install the straight pins into the differential case, and case cover, and then position the selected thrust washer in the differential case.

The thrust washer locking holes should align with the straight pins, and the indents on the thrust washer should face towards the working face of the side gear.

- Install the side gear, clutch left member with pinions, and clutch right member into the differential case.
- Apply a thin coat with "LOCTITE" Sealant on the attaching surfaces of the differential case, and the case cover, and also apply on the threads of the case cover securing bolts.

Note:

When re-installing the case cover to the differential case, it is advisable to use "LOCTITE" Sealant in the following manner.

Ensure that both attaching surfaces are free of grease, and oil by using a cleaning solvent, and apply a Sealant to the attaching surfaces and threads of the bolts, using a small paint brush to ensure even spreading.

Re-assemble the case cover to the differential case in the normal way. Best results will be obtained if the joint is allowed to set for more than three hours, that is this period should be allowed to elapse before the car is run.

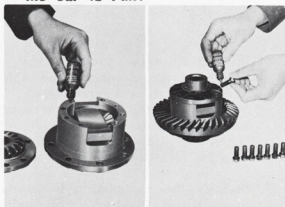


Fig.10-14 Retaining Compound Coating V1542,

- Install the side gear thrust washer, and the side gear onto the case

cover, then install the case cover with the side gear onto the differential case.

The mating marks on the differential case, and the case cover should align when assembled.

Tighten the securing bolts to 4.5 m-k_g (33 ft-lb) torque.

7. Align the mating marks on the ring gear, and the differential case, and assemble the ring gear onto the differential case.

Position the lock plates, and tighten the securing bolts to 7 ~ 8 m-k_g (51 ~ 58 ft-lb) torque.

Bend the lock plates, and secure the bolts.

8. Install the bearings onto the flanges of the differential case, and the case cover with the Differential Side Bearing Replacer 09505-30010, and a press.

9. If the bearing cups of the drive pinion bearing were removed, install the cups into the differential carrier using the Front Hub & Drive Pinion Bearing Tool Set 09608-30010, and a press.

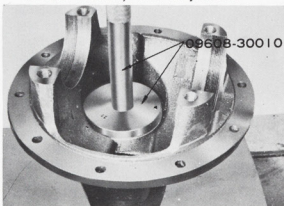


Fig.10-15 Installing Bearing V3454 Cup

10. Adjustment of the drive pinion bearing pre-load, and drive pinion depth must be performed using the Differential Drive Pinion Adjusting Gauge 09530-30010.

a. To adjust the bearing pre-load apply gear lubricant on the bearings

and install the drive pinion rear bearing, drive pinion spacer, and the shim removed at disassembly onto the Base Rod, and then assemble them into the differential carrier.

Next, install the drive pinion front bearing, Push Collar, and the Pre-load Flange onto the Base Rod, then tighten the Nut to 17 to 19 m-k_g (123 ~ 137 ft-lb) torque. Turn the Base Rod, and if it becomes hard to turn, replace the spacer with a thicker shim.

b. Wind a cord onto the Pre-load Flange, then hook a pull-scale to the other end of the cord.

Pull the scale slowly, then read the scale applying a steady pull on it.

The pre-load should be checked without the oil seal assembled.

The reading of the scale should be 3.8 ~ 5.2 kg (8.36 ~ 11.44 lb) for using new bearings, and 0.8 to 2.0 kg (1.76 ~ 4.40 lb) for using the removed bearings.

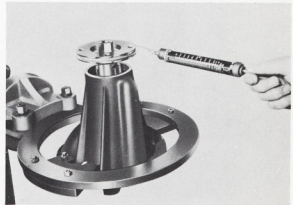


Fig.10-16 Checking Drive Pinion Pre-load V2497

c. Repeat the above procedures until the specified pre-load is obtained by selecting proper spacer from the following spacers.

The thickness of the shim is 0.3 mm (0.012").

Drive pinion spacer length:

Part Number 41231-30010

Length: 61.000 ~ 61.025 mm
(2.4016 ~ 2.4026")

- Part Number 41232-30010
Length: 61.045 ~ 61.070 mm
(2.4033 ~ 2.4043")
- Part Number 41233-30010
Length: 61.090 ~ 61.115 mm
(2.4051 ~ 2.4061")
- Part Number 41234-30010
Length: 61.135 ~ 61.160 mm
(2.4069 ~ 2.4079")
- Part Number 41235-30010
Length: 61.180 ~ 61.205 mm
(2.4087 ~ 2.4096")
- Part Number 41236-30010
Length: 61.225 ~ 61.250 mm
(2.4104 ~ 2.4114")

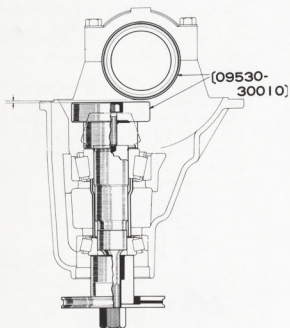


Fig.10- 17 Differential Drive Pinion Adjusting Gauge Y5225

d. To select the pinion locating adjusting washer for controlling the depth of mesh, assemble the Base Rod Head onto the Base Rod, and the Master Gauge onto the differential carrier, and secure with the side bearing caps. Tighten the bearing cap securing bolts to 7.0 ~ 9.0 m-kg (51 to 65 ft-lb) torque.

e. Select a proper washer out from the following pinion locating adjusting washers so as to minimize the

clearance between the Master Gauge, and the washer when inserted between the Master Gauge, and the Base Rod Head. The adjusting washers are available in the following ten thicknesses. The thickness of the shim is 0.271 mm (0.0107").

- Adjusting washer thickness:
Part Number 90209-35022
Thickness: 2.99 ~ 3.01 mm
(0.1177 ~ 0.1185")
- Part Number 90209-35023
Thickness: 3.02 ~ 3.04 mm
(0.1189 ~ 0.1197")
- Part Number 90209-35024
Thickness: 3.05 ~ 3.07 mm
(0.1201 ~ 0.1209")
- Part Number 90209-35025
Thickness: 3.08 ~ 3.10 mm
(0.1213 ~ 0.1220")
- Part Number 90209-35026
Thickness: 3.11 ~ 3.13 mm
(0.1224 ~ 0.1232")
- Part Number 90209-35027
Thickness: 3.14 ~ 3.16 mm
(0.1236 ~ 0.1244")
- Part Number 90209-35028
Thickness: 3.17 ~ 3.19 mm
(0.1248 ~ 0.1256")
- Part Number 90209-35029
Thickness: 3.20 ~ 3.22 mm
(0.1260 ~ 0.1268")
- Part Number 90209-35030
Thickness: 3.23 ~ 3.25 mm
(0.1272 ~ 0.1279")
- Part Number 90209-35058
Thickness: 3.26 ~ 3.28 mm
(0.1283 ~ 0.1291")

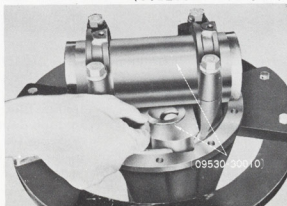


Fig.10-18 Selecting W0581 Adjusting Washer

- f. Remove the Master Gauge, and the Base Rod assembly from the differential carrier.
11. Install the selected adjusting washer, shim, and the rear bearing onto the drive pinion.
When installing the adjusting washer, always position the chamfer on the washer facing towards the gear of the drive pinion.
 12. Install the selected drive pinion spacer, and the shim onto the drive pinion, then install them into the differential carrier.
 13. Install the drive pinion front bearing, oil slinger, and the universal joint flange onto the drive pinion. Place the washer, and install the universal joint flange retaining nut which was removed during the disassembly.
Tighten the nut to 17 ~ 19 m-kg (123 ~ 137 ft-lb) torque.
 14. Attach the Pre-load Flange in the Differential Drive Pinion Adjusting Gauge 09530-30010 to the universal joint flange, and recheck the drive pinion bearings pre-load. The pull-scale reading should be 3.8 ~ 5.2 kg (8.36 ~ 11.44 lb) for using the new bearings, and 0.8 to 2.0 kg (1.76 ~ 4.40 lb) for using the removal bearings.
 15. Position the differential case, and the ring gear assembly on the differential carrier, then install the side bearing cups, bearing adjusting nuts, and the bearing caps onto the differential carrier, aligning the mating marks punched at disassembly.
Next, install the bearing cap attaching bolts, and screw them, and tighten temporary.
Carefully set the bearing caps in place so that the threads of adjusting nuts, and the bearing caps fit snugly.
16. Differential side bearing pre-load, and the drive pinion and ring gear backlash adjustment.
 - a. Check the bearing adjusting nuts for free movement as the bearing cap attaching bolts are tightened temporary. If the adjusting nuts do not turn, again inspect for damaged thread or incorrectly positioned bearing caps.
To tighten the bolts to the specified torque, be sure that the bearing cups, and the adjusting nuts are properly seated.
 - b. Loosen the bearing cap attaching bolts about 45° for adjustment of the side bearing pre-load.
 - c. Install a dial indicator on the differential carrier with a plunger against the back face of the ring gear.
Rotating the ring gear all the time to seat the side bearings in the bearing cups, use the Differential Adjusting Nut Wrench 09504-30010, and back off the adjusting nut on the ring gear side, and screw in the adjusting nut on the drive pinion side until the side play is removed.
Then, from this zero side play position, screw in the adjusting nut on the drive pinion side one and a half to two notches to pre-load the bearings.

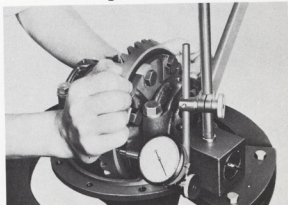


Fig.10-19 Checking Ring Gear Side Play W0586

Tighten the bearing cap attaching bolts to 7 ~ 9.0 m-kg (51 ~ 65 ft-lb) torque.

d. Check the total pre-load of the drive pinion bearings with the differential case side bearings.

Wind a cord on the Pre-load Flange in the Differential Drive Pinion Adjusting Gauge 09530-30010, and hook a pull scale.

Pull the scale slowly, and read it. The reading should be 4.6 ~ 6.4 kg (10 ~ 14 lb) for using the new bearings, and 1.0 ~ 2.4 kg (2.0 ~ 5.3 lb) for using the removed bearings.

e. Check the backlash between the ring gear, and the drive pinion. Mount a dial indicator, and attach the plunger to the ring gear tooth at right angle.

Hold the drive pinion, and rock the ring gear backward, and forward noting the maximum, and minimum readings on the dial indicator.

The specified backlash is 0.13 to 0.18 mm (0.005 ~ 0.007").

f. To adjust the backlash, loosen the bearing cap attaching bolts slightly.

To decrease the backlash, loosen the bearing adjusting nut on the pinion side, and tighten the ring gear side adjusting nut the same number of notches, in order to maintain the pre-load using the

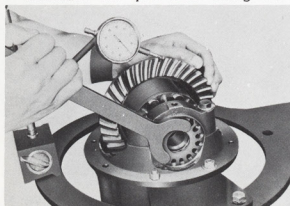


Fig.10-20 Adjusting Gear Backlash V1891

Differential Adjusting Nut Wrench 09504-30010.

When moving the bearing adjusting nuts, the final movement should always be made in a tightening direction.

For example, if one nut is to be loosened one notch, loosen it two notches, then tighten it one notch.

Tighten the bearing cap attaching bolts to 7 ~ 9.0 m-kg (51 ~ 65 ft-lb) torque, and recheck the backlash.

17. Ring gear and drive pinion tooth contact pattern adjustment.

Note:

After the differential is completely assembled, and adjusted, the tooth contact pattern should be checked. The correct tooth contact is considered to be the final check on pinion depth, and backlash adjustment.

a. Apply a thin coat of red-lead evenly on the ring gear teeth, and rotate the ring gear back and forth until a clean tooth contact pattern is obtained, holding the universal joint flange with the hand to act as a brake.

b. If necessary to adjust, remove the differential case assembly, and the drive pinion assembly from the differential carrier, and select the pinion locating adjusting washer for controlling the depth of mesh.

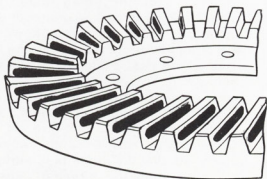


Fig.10-21 Correct Tooth Contact Pattern X4119

Do not change the adjusted spacer, and shim on the drive pinion for controlling the bearing pre-load.

c. Repeat the following adjustment until the correct pattern is obtained, and check the backlash, and bearing pre-load to be within the specification.

For detail adjustment, and procedures refer to paragraph 10 ~ 16 in the Differential Assembly.

d. Heel contact

To obtain the correct tooth pattern, move the drive pinion towards the ring gear by increasing the thickness of the drive pinion locating adjusting washer.

Adjust the backlash by moving the ring gear away from the drive pinion.

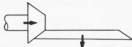
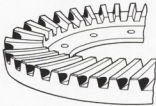


Fig.10-22 Heel Contact X4115 Pattern

e. Toe contact

Move the drive pinion away from the ring gear by reducing the thick-

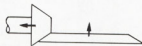
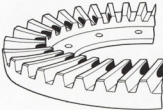


Fig.10-23 Toe Contact X4116 Pattern

ness of the drive pinion locating adjusting washer.

Adjust the backlash by moving the ring gear towards the drive pinion.

f. Flank contact

To correct this contact, perform the same procedure as the Toe Contact.

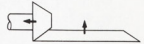
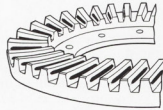


Fig.10-24 Flank Contact X4117 Pattern

g. Face contact.

To correct this contact, adjust in the same manner as the Heel contact.

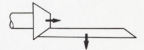
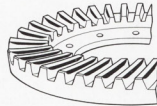


Fig.10-25 Face Contact X4118 Pattern

The tooth contacts shown above do not occur individually in the actual operation, but in most cases Heel and Face contacts or Toe and Flank contacts appear overlapping with each other.

After the adjustment, clean the gear teeth thoroughly, and install and tighten the bearing adjusting nut locks on the bearing caps securely.

18. Using the Universal Joint Flange Holding Tool 09330-20010, retain the flange, and remove the nut with a socket wrench, then remove the flange.
19. Install the drive pinion oil slinger, and coat the new oil seal with multipurpose grease, then install the oil seal into the differential carrier.
20. Install the dust deflector on the universal joint flange, then install the flange into the drive pinion. Place the washer, and tighten the new flange retaining nut to 18.5 m·kg (134 ft·lb) torque. As the flange retaining nut is of a self-locking type, it must be replaced with the new nut when assembling.
21. Apply a thin coat of liquid sealer on the differential carrier, and case attaching surfaces. Install the assembled differential into the differential carrier case with the new gasket. Tighten the nuts to 2 ~ 3.5 m·kg (14 ~ 25 ft·lb) torque.
22. Side gear shaft assembly.
 - a. Apply a coat of multipurpose grease on the oil seal, then install the oil seal into the side gear shaft bearing retainer using the Drive Shaft Oil Seal Replacer 09517-62010.
 - b. Install the side gear shaft bearing retainer, and the bearing onto the side gear shaft. Next, heat the rear axle bearing retainer to about 150°C (302°F), then install it quickly onto the side gear shaft. The bearing retainer should be installed while it is still hot.

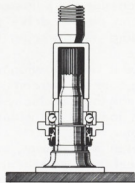


Fig. 10-26 Bearing Retainer G1154 Installation

23. Install the side gear shaft assembly with the gasket onto the differential carrier case.
24. Refill the differential with hypoid gear lubricant.

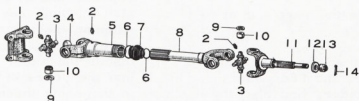
Grade: SAE-90
Capacity: 1.03 liters (1.09 US qts, 0.91 Imp qts)

Installation

Follow the removal procedure in the reverse order.

1. Before installing the differential assembly, remove the carrier mountings from the frame, and inspect the carrier mountings, and the cushions for weakness, cracks, and damage. If necessary, replace the them.
2. Tightening torque:
 - Carrier mounting attaching bolts 2.0 ~ 3.5 m·kg (14 ~ 25 ft·lb).
 - Carrier case to carrier mounting 7 ~ 9 m·kg (51 ~ 65 ft·lb).
 - Mounting rod to carrier case 7 to 9 m·kg (51 ~ 65 ft·lb).
 - Pivot shaft to mounting rod 2 ~ 3 m·kg (14 ~ 22 ft·lb).
3. After installation, road-test the car and check for abnormal noise.

REAR AXLE SHAFT



- | | |
|--------------------------------|------------------------|
| 1. Universal joint flange yoke | 8. Rear axle shaft |
| 2. Grease fitting | 9. Hole snap ring |
| 3. Universal joint spider | 10. Spider bearing cup |
| 4. Expansion plug | 11. Hub shaft yoke |
| 5. Rear axle shaft sleeve | 12. Washer |
| 6. "O" ring | 13. Nut |
| 7. Shaft boot | 14. Cotter pin |

Fig. 10-27 Rear Axle Shaft Components

Y5226

Removal

1. Loosen the hub nuts with the hub nut wrench, and mallet supplied in the car tool set. Straight and remove the cotter pin at the end of the hub shaft yoke, then remove the nut and washer.

gear shaft flange, then disconnect the rear axle shaft from the differential.

3. Pull out the hub shaft yoke from the axle hub, and remove the rear axle shaft assembly. Avoid damaging the oil seal when removing the shaft.

Disassembly

1. Punch the mating marks on both joint yokes, and the mated joint yokes.
2. Remove the "O" rings secured on the axle shaft boot, then pull out the axle shaft sleeve from the rear axle shaft. Remove the axle shaft boot.
3. Remove the hole snap rings from the inner side of the yokes.

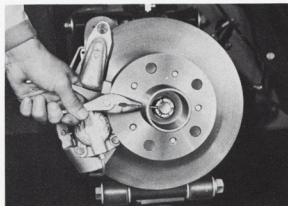


Fig. 10-28 Removing Cotter V1323 Pin

2. Remove the bolts retaining the universal joint flange yoke to the side

- Remove the universal joint spider, and the bearing cups.
For detail operation, and procedures, refer to universal joint spider removal.

Inspection

Clean all the disassembled parts thoroughly except the axle shaft boot, and inspect for damage, wear, and rusty condition.

Repair or replace the part/s if necessary.

- Check the joint spider journal for rust, and wear, and if necessary, replace the spider, and also the bearings should be replaced.
- Inspect the splines of the shaft, and sleeve for wear or evidence of twist.
- Inspect the joint yoke bearing flanges for cracks, and other damage.
- Check the bearing cup and needle rollers for rusty condition, wear, and damage.
- Check the shaft boot for hardness, cracks, and deterioration.

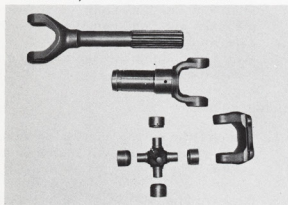


Fig.10-29 Rear Axle Shaft V1324 Inspection

Assembly

- Repack the spider bearing cup with multipurpose grease, and as-

semble the needle rollers into the cup.

- Install the joint spider into the yoke, then fit the spider bearing and bearing seal into one end of the yoke, and install the hole snap ring.
Place the joint spider into the spider bearing, then fit the other bearing and bearing seal into the opposite end of the yoke, and install the hole snap ring.
Align the mating marks on the yokes punched at disassembly, and install the other spider bearings into the yokes of the opposite shaft in the same manner.

Note:

If the established reference point on the yoke as shown in figure 10-31, the spider bearing should be used with the red paint mark on the head.

The reference point, and red paint mark bearing show the oversize, and the reference point (A) is shown with the oversize bearing bore (1) of the yoke, and point (B) is shown with the oversize bearing bore (2) of the yoke.

Spider bearing cup outer diameter:

No marking
Part Number 37402-60020
Size: 28.515 ~ 28.528 mm
(1.1226 ~ 1.1231")

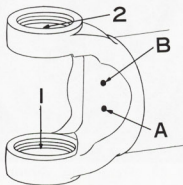


Fig.10-30 Reference Points G0359

Painted mark
 Part Number 37402-60030
 Size: 28.536 ~ 8.549 mm
 (1.1234 ~ 1.1240")

The grease fittings are provided on the joint spiders, and these should face towards the shaft boot facing each other when the joint spiders are assembled.

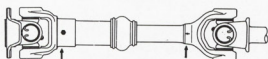


Fig.10-31 Position of Grease Fitting Y5227

3. Assemble the other universal joint in the similar manner as described.
4. After assembling the universal joints, check the joint spider thrust play.

The thrust play should be less than 0.05 mm (0.002"). If this exceeds select and install new hole snap rings.

Hole snap ring thickness:

Part Number	90521-31038
Thickness:	1.40 mm (0.0551")
Part Number	90521-31039
Thickness:	1.45 mm (0.0571")
Part Number	90521-31040
Thickness:	1.50 mm (0.0590")
Part Number	90521-31041
Thickness:	1.55 mm (0.0610")

5. Repack the shaft sleeve with multipurpose grease, and install the shaft boot, and "O" ring onto the shaft sleeve.
 Align the grease fitting on the shaft sleeve, and the mating mark on the axle shaft in line.
 Next, insert the shaft into the shaft sleeve, and secure the shaft boot with the "O" ring.

Installation

Follow the removal procedures in the reverse order.
 Tighten the nuts retaining the axle hub with the disc to the hub shaft yoke to 17 ~ 19 m-kg (123 ~ 137 ft-lb) torque.

* * * * *

PROPELLER SHAFT

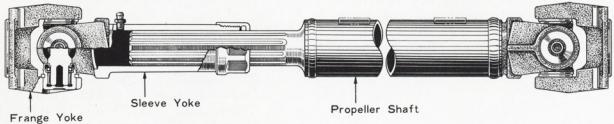


Fig. 10-32 Cross Sectional View of Propeller Shaft

Y5218

Removal

1. Remove the driver's seat RH side, and the access hole cover RH side.

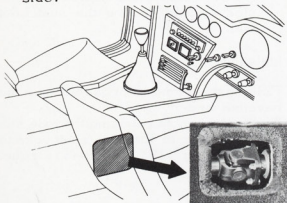


Fig. 10-33 Access Hole Cover & Universal Joint G0352, V1887

2. Remove the bolts securing the universal joint flange yoke to the output shaft companion flange, and disconnect the yoke from the companion flange.
3. Jack the rear end of the car, and support with stands.
4. Remove the bolts securing the universal joint flange yoke to the universal joint flange of the differential. Next, withdraw the propeller shaft assembly towards the rear.

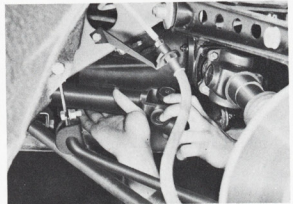
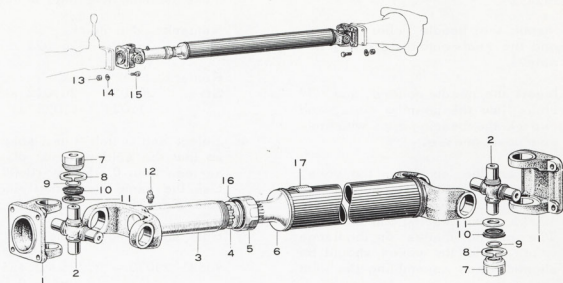


Fig. 10-34 Removing Propeller Shaft V1310

Disassembly

1. Punch the mating marks on both the universal joint flange yokes, and the yokes of the shaft.
2. Remove the hole snap rings from the bearing holes of the flange yokes, and the yokes.
3. Press one end of the spider bearing cup with a vise, and a suitable size socket wrench until the opposite spider bearing cup contacts the vise. Next, tap the yoke with a mallet to protrude the bearing cup, and pull out without dropping the needle rollers, then remove the universal joint spider.



- | | | |
|----------------------|-------------------------|------------------------|
| 1. Joint flange yoke | 7. Bearing cup | 13. Nut |
| 2. Joint spider | 8. Hole snap ring | 14. Lock washer |
| 3. Sleeve yoke | 9. "O" ring | 15. Bolt |
| 4. Yoke seal | 10. Needle roller seal | 16. Oil retainer plate |
| 5. Yoke oil retainer | 11. Needle roller cover | 17. Balance piece |
| 6. Propeller shaft | 12. Grease fitting | |

Fig.10-35 Propeller Shaft Components

Y5221

4. Remove the other spider bearing cups in the same manner.
5. Slide the universal joint sleeve yoke from the propeller shaft.
5. Loosen the joint oil yoke retainer, and remove the oil retainer plate, and the seal.

Inspection

Wash all the disassembled parts thoroughly, and inspect for damage, wear, and rusty condition. Repair or replace the part/s if necessary.

1. Inspect the splines of the propeller shaft, and the sleeve yoke for wear or evidence of twist.
2. Inspect the spider journals for rust, and wear.

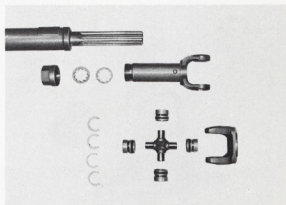


Fig.10-36 Disassembled V1311 Parts

3. Check the bearing cup, and needle rollers for rusty condition, wear and damage.
4. Inspect the propeller shaft for run-out, scores, and out-of-balance.
5. Check the bearing holes of the yokes, and shaft for wear, scores or damage.

Assembly

1. Install the needle roller covers, and the seals onto the spider journals.
2. Insert the needle rollers, and "O" rings into the bearing cups, and repack the bearing cups with multipurpose grease.
3. Position the spider in the yoke, and press the bearing cup into the bearing hole carefully mating the marks on the bearing cup and yoke. The mating marks on the flange yokes, and the yokes should be aligned when assembling the joint spiders.

Note:

If any of the bearing, flange yoke, sleeve yoke, and the propeller shaft requires replacement, select the proper part as per the following table.

If the stamped mark/s is near the bearing hole, use the red marked (oversize) bearing to obtain proper fit.

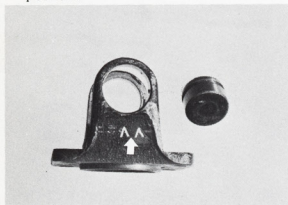


Fig.10-37 Indicating Mark V2494

Spider bearing cup outer diameter:

Part Number 37431-20010

Remark: No mark

Size: 26.015 ~ 26.028 mm
(1.024 ~ 1.025")

Part Number 37431-20020

Remark: Red mark

Size: 26.036 ~ 26.049 mm
(1.025 ~ 1.026")

Yoke bearing hole inner diameter:

Remark: No mark

Size: 26.000 ~ 26.021 mm
(1.024")

Remark: "V" mark

Size: 26.021 ~ 26.042 mm
(1.024 ~ 1.025")

4. Select and install a new snap ring so that the spider thrust play will be less than 0.05 mm (0.002"). Use the same size snap ring for both sides.

Hole snap ring thickness:

90521-29070 - 2.375 ~ 2.425 mm
(0.094 ~ 0.095")

90521-29071 - 2.425 ~ 2.475 mm
(0.095 ~ 0.097")

90521-29072 - 2.475 ~ 2.525 mm
(0.097 ~ 0.099")

90521-29073 - 2.525 ~ 2.575 mm
(0.099 ~ 0.101")

5. Pack the sleeve yoke with multipurpose grease, and install the joint yoke seal, and the oil retainer plate. Next, tighten the oil yoke retainer securely.

6. Align the grease fitting on the sleeve yoke, and the scribed mark on the propeller shaft in line, and insert the propeller shaft into the sleeve yoke.

Installation

Follow the removal procedures in the reverse order.