S T E E R I N G

DESCRIPTION

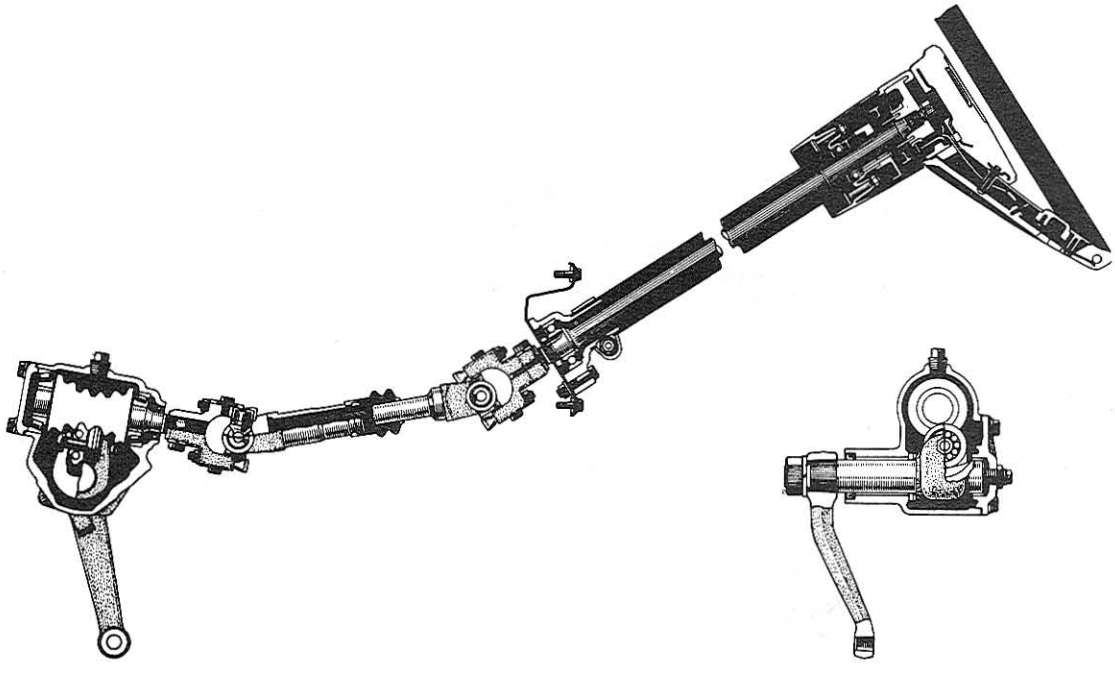


Fig.6-1 Steering Cross Section View G2442

The steering gear mechanism is of the worm and sector roller type with a gear ratio of 21 to 1, and the steering gear housing is of a unit constructed casting.

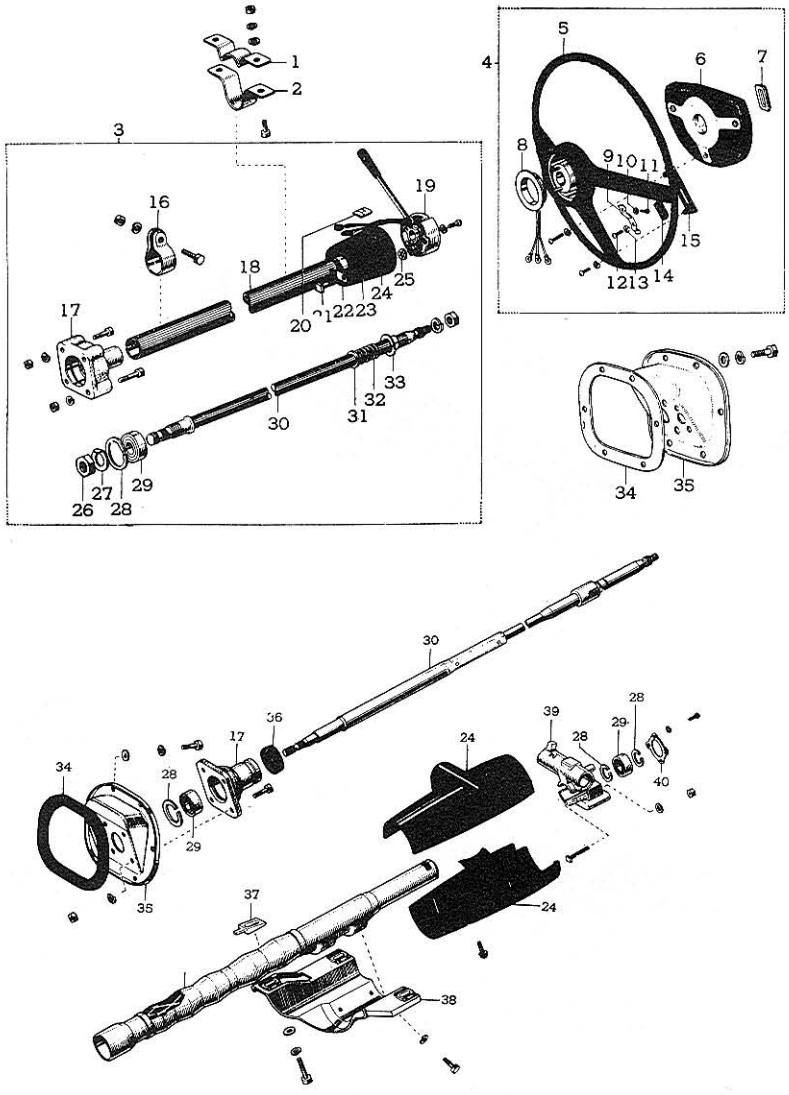
The steering gear housing is mounted onto the frame with the steering gear housing bracket, and the worm and sector roller tooth backlash is controlled by the adjusting shims and the set bolt on the sector shaft end cover.

The steering shafts are incorporated with two universal joints and a sliding joint, and are provided to allow a complete flexible mount between the frame and the body which improves the steering stability.

TROUBLE SHOOTING

Since the Trouble Shooting on the steering has a close relation with the front axle, therefore, it is recommended that the Trouble Shooting described in the Front Axle & Front Suspension be referred.

STEERING WHEEL & STEERING MAIN SHAFT (55V)



1. Steering column upper clamp
2. Steering column lower clamp
3. Steering post assembly
4. Steering wheel assembly
5. Steering wheel
6. Steering wheel pad
7. Pad mark
8. Contact ring
9. Horn contact spring
10. Lock washer
11. Screw
12. Screw
13. Lock washer
14. Horn button
15. Horn button setting cover
16. Steering column lower clamp
17. Steering column tube support
18. Steering column tube
19. Turn signal switch
20. Control lever caution plate
21. Housing retaining bolt
22. Steering column tube lock
23. Bearing
24. Contact ring housing
25. Washer
26. Nut
27. Claw washer
28. Hole snap ring
29. Bearing
30. Steering main shaft
31. Shaft snap ring
32. Spring
33. Bearing thrust collar
34. Steering column hole sealed
35. Steering column hole cover
36. Oil seal
37. Caster wedge
38. Brake away bracket
39. Steering column upper bracket
40. Main shaft bearing retainer

Fig.6-2 Steering Wheel & Steering Main Shaft Components G2443

Removal

1. Loosen and remove the three screws attaching the steering wheel pad onto the steering wheel, and remove the pad

2. Loosen and remove the steering wheel retaining nut, then remove the steering wheel from the main shaft with the Steering Wheel Puller 09609-20010.

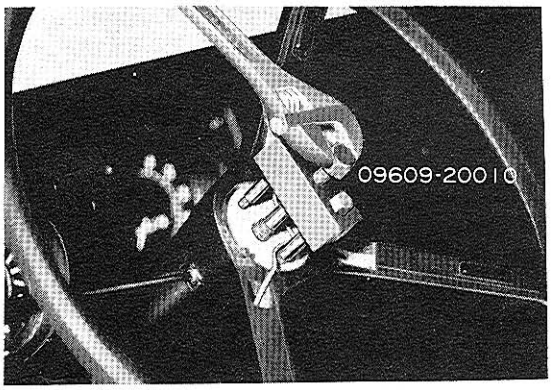


Fig.6-3 Removing Steering Wheel V5136

3. Loosen and remove the control select lever shaft, and also remove the bushings from the control select lever.

4. Cut the lock wire, and remove the shift fork lock bolt.
Next, slide the control shift lever out of the control shaft.

5. Remove the bolt securing the steering worm yoke onto the steering main shaft.

6. Disconnect the wirings, then remove the back-up light switch with the bracket.

7. Disconnect the wirings of the turn signal switch from the wiring connectors.

8. Remove the bolts attaching the steering column hole cover onto the floor.

9. Remove the steering column upper and lower clamps, and pull out the steering column tube together with the steering main shaft, steering column hole cover and the control shaft towards the interior.

Disassembly

1. Remove the turn signal switch retaining screws, and remove the turn signal switch assembly from the contact ring housing.

2. Remove the "E" ring and the washer from the end of the control shaft upper shaft.
Remove the two nuts retaining the contact ring housing onto the steering column tube, then pull out the housing.
Remove the control shaft.

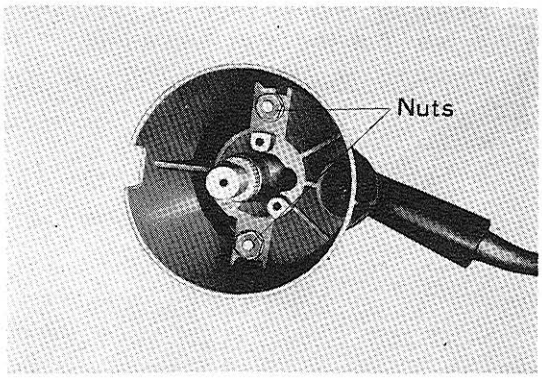


Fig.6-4 Contact Ring Housing Removal V5150

3. Remove the steering column hole cover and the control shaft lower bracket from the steering column tube support.

4. Remove the steering main shaft upper bearing, thrust collar and the spring.

5. Loosen the steering column lower clamp bolt, and pull out the steering column tube from the steering column tube support.

6. Secure the steering main shaft in

a vise, and straighten the claw washer.
Next, remove the steering main shaft bearing retaining nut and the claw washer.

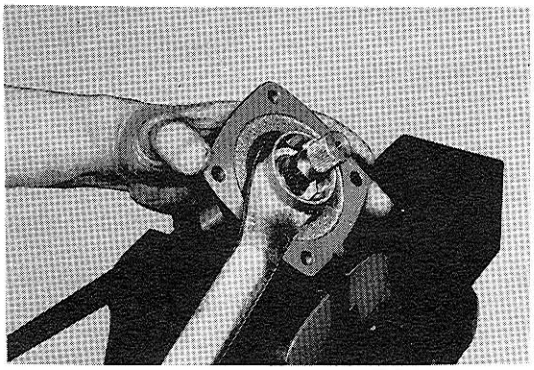


Fig.6-5 Removing Bearing Retaining Nut V5117

7. Remove the hole snap ring in the steering column tube support, then drive out the steering main shaft and the main shaft lower bearing from the steering column tube support.

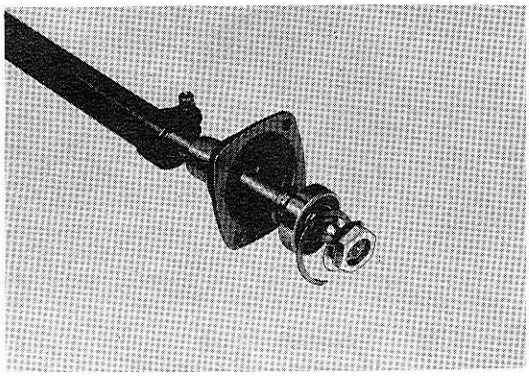


Fig.6-6 Steering Column Tube Support Related Part V5118

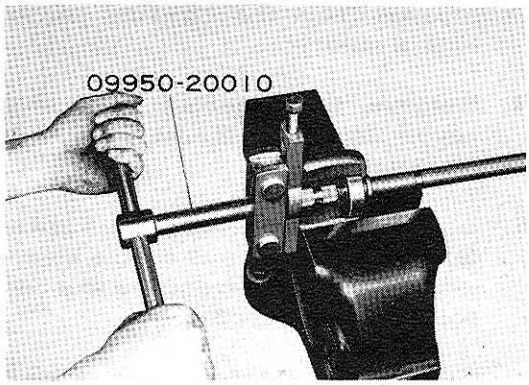


Fig.6-7 Removing Lower Bearing V5119

8. If necessary, remove the lower bearing from the steering main shaft using the Universal Puller 09950-20010.

Inspection

Clean the disassembled parts thoroughly, and check for damage.
Replace the defective part/s if necessary.

1. Inspect the steering main shaft for bend, and the serrations on the main shaft for damage.

2. Inspect the bearings for wear, and abnormal noise.

3. Inspect the steering wheel for cracks, and the installing portion onto the steering main shaft for wear or other defects.

Assembly

1. With the Transmission Oil Plug 09325-12010, press the lower bearing onto the steering main shaft.

2. Install the steering main shaft and the bearing into the steering column tube support using the Transmission & Transfer Bearing Replacer 09316-60010 and a press.

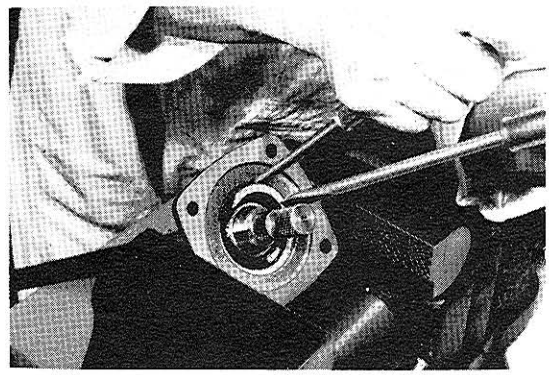


Fig.6-8 Installing Hole Snap Ring V5120

3. Install the new claw washer, and tighten the bearing retainer nut securely, then bend the claw washer to prevent the nut from loosening.

4. Install the steering column tube onto the steering column tube support, then tighten the lower clamp bolt securely.

5. Lubricate the upper bearing with grease, and install the spring, thrust collar and the upper bearing onto the steering main shaft.
   Check the steering main shaft for smooth rotation.

6. Assemble the steering column hole cover and the control shaft lower bracket.

7. Apply grease onto the control shaft lower bushing and the control shaft upper shaft, and install the control shaft.
   Next, install the contact ring housing onto the steering column tube.
   To assemble the contact ring housing, temporarily install the two retaining bolts and the steering column tube locks into the contact ring housing, and screw in the nut one thread.
   Align the steering column tube locks and the slots in the steering column tube, then install the housing onto the steering column tube further into the steering column tube securely.

8. Secure the control shaft upper shaft to the contact ring housing with the washer and the "E" ring.

9. Install the turn signal switch into the contact ring housing.

Installation

1. Install the steering post assembly onto the vehicle, and connect the steering main shaft to the steering worm yoke.
   Install the steering column upper and lower clamps, and tighten the clamp attaching bolts with the fingers.
   Align the holes in the steering column hole cover and the floor, and tighten the hole cover attaching bolts securely.
   Next, tighten the steering column clamp attaching bolts securely.

2. Secure the steering worm yoke clamp bolt.

3. Lubricate the cut portion on the control shift lever with grease, and install the control shift lever onto the control shaft.
   Align the hole of the control shift lever, and the set screw recess of the control shaft, then install the shift fork lock bolt.
   Secure the bolt with lock wire.

4. Apply grease onto the bushings in the control select lever and assemble the control select lever.
   Tighten the control select shaft securely.

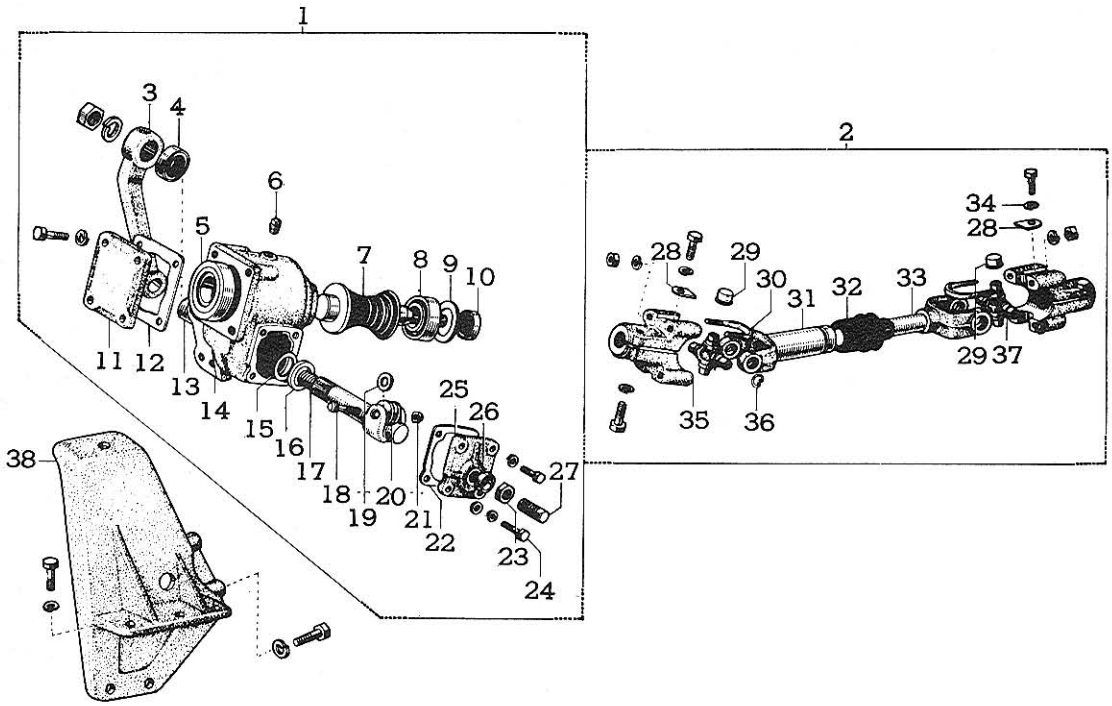
5. Install the back-up light switch with the bracket, and connect the wirings.

6. Connect the turn signal switch wirings.
   Check the turn signal switch for proper operation.

7. Install the steering wheel temporarily onto the steering main shaft.
   The final setting of the steering wheel should be determined after driving the vehicle.

8. Install the steering wheel pad.

STEERING INTER-MEDIATE SHAFT & GEAR HOUSING (55V)



1. Steering gear housing assembly
2. Steering intermediate shaft assembly
3. Pitman arm
4. Oil seal
5. Steering worm front bearing
6. Plug
7. Steering worm
8. Steering worm rear bearing
9. Adjusting shim
10. Oil seal
11. Gear housing end cover
12. Gasket
13. Sector shaft bushing
14. Steering gear housing
15. Adjusting shim
16. Adjusting plate
17. Steering sector shaft
18. Sector roller shaft
19. Shim
20. Sector roller
21. Nut
22. Gasket
23. Lock nut
24. Bolt
25. Sector shaft end cover
26. Bushing
27. Set bolt
28. Cup stopper plate No.1
29. Spider bearing
30. "U" bolt
31. Steering sliding yoke
32. Dust cover
33. Steering sliding shaft
34. Lock washer
35. Steering worm yoke
36. Hole snap ring
37. Universal joint spider
38. Steering gear housing bracket

Fig.6-9 Steering Inter-mediate Shaft & Gear Housing Components G2444

Removal

1. Raise the front of the vehicle, and support with suitable stands.
   Pry off the wheel cap, and remove the wheel.

2. Remove the bolts securing the steering worm yokes to the steering worm and the steering main shaft.
   Next, remove the steering inter-mediate shaft assembly.

3. Loosen and remove the pitman arm securing nut from the steering sector shaft.
   Punch mating marks onto the pitman arm and the sector shaft.
   Disconnect the pitman arm from the sector shaft using the Pitman Arm Puller 09610-55010.

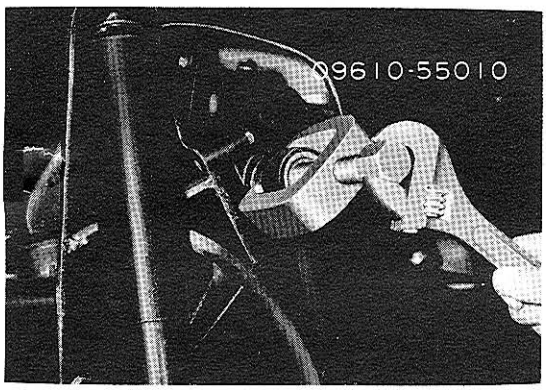


Fig.6-10 Removing Pitman Arm V5129

4. Remove the bolts retaining the steering gear housing onto the steering gear housing bracket, then dismount the gear housing assembly.

Disassembly

1. Inter-mediate shaft disassembly.

   a. Remove the cup stopper plates No.1 (1), then remove the U-bolts (2) securing the universal joint spider bearing to the steering worm yoke, and separate the worm yokes from the sliding yoke and the sliding shaft.

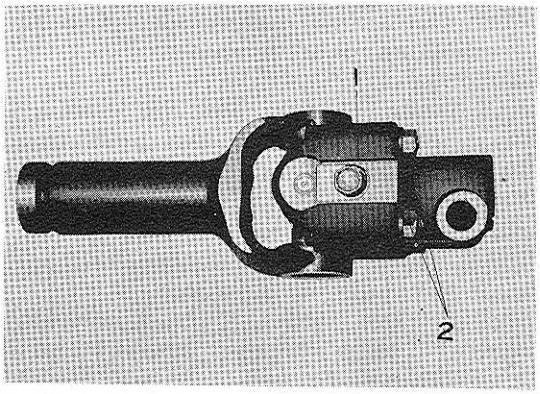


Fig.6-11 Inter-mediate Shaft V5130 Disassembly

   b. Remove the hole snap rings from the bearing holes, and tap the yoke lightly with a mallet, and remove the spider bearing.
   Next, push out the spider, and remove the opposite side bearing, and remove the spider from the yoke.

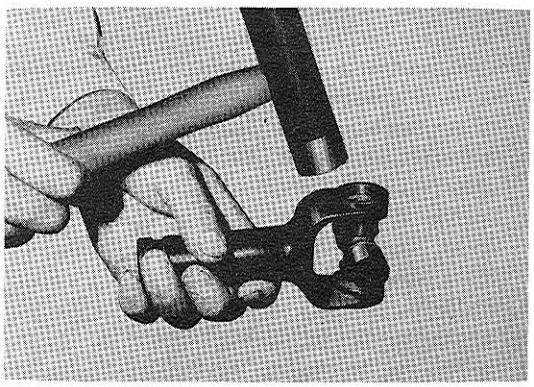


Fig.6-12 Removing Spider Bearing V5131

2. Steering gear housing disassembly

   a. Drain the gear lubricant from the steering gear housing.

   b. Secure the steering gear housing in a vise.

   c. Remove the sector shaft end cover retaining bolts, and remove the end cover with the gasket.

   d. Tap the end of the sector shaft lightly with a mallet, and drive the

sector shaft assembly out of the steering gear housing.

Caution:

Adjusting shims and the plate are installed on the sector shaft, thus care should be taken not to lose them when removing.

e. Remove the gear housing end cover and the gasket.
Tap the end of the steering worm with a mallet, and drive out the steering worm together with the bearings.

Inspection

Wash all disassembled parts thoroughly, and inspect the parts for wear, scores and other defects.
Repair or replace as necessary.

Steering Gear Housing

1. Inspect the sector roller and the sector roller bearing for wear, looseness, cracks or roughness when rotated.
To replace the sector roller, remove the weld at the sector roller shaft nut with a grinder, and remove the nut.
Pull the roller shaft out of the sector shaft, and remove the sector roller.

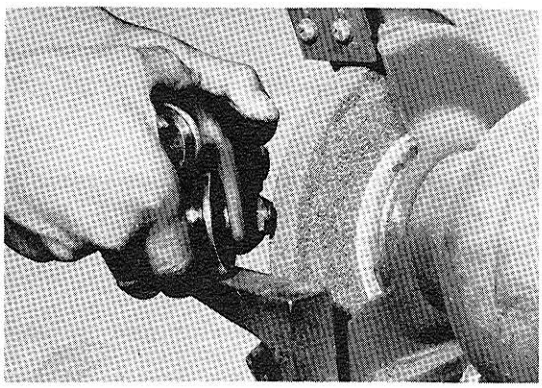


Fig.6-13 Sector Roller Removal V5121

Assemble the sector roller onto the sector shaft, and install the sector roller shaft and tighten the nut securely.
Weld it with an electric arc welder to secure it in place.

2. Inspect the serrations and the rotating portion of the sector shaft for wear and other defects.

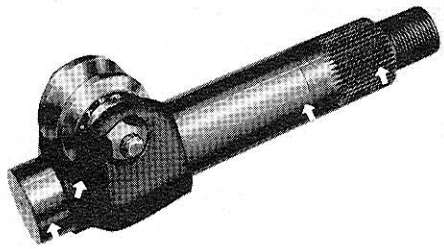


Fig.6-14 Sector Shaft Inspection V5122

3. Inspect the sector shaft bushings in the steering gear housing and the sector shaft end cover for scores and excessive wear.
Assemble the sector shaft into the steering gear housing and check the sector shaft to bushing oil clearance, and also check the sector shaft to sector shaft end cover bushing oil clearance.
The specified oil clearance should be 0.009 ~ 0.06 mm (0.00035 to 0.00236"), and if the clearance exceeds this specified clearance, replace the bushing/s or the sector shaft.

a. To replace the sector shaft bushing, pry off the oil seal, then using the Transmission Extension Housing Metal Tool 09307-12010, and press the sector shaft bushing out of the steering gear housing.

b. To install, follow the removal procedure in the same manner

c. After installation, hone the bushing with a pin hole grinder so that the sector shaft to bushing oil clearance will be within the specified clearance as described previously.

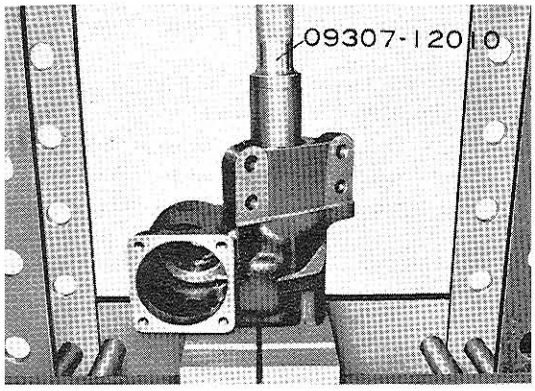


Fig.6-15 Removing Sector Shaft Bushing V5132

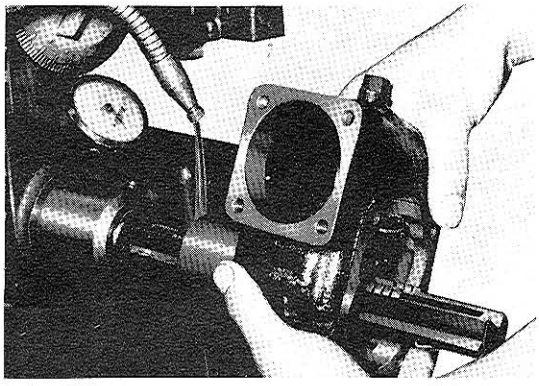


Fig.6-16 Honing Sector Shaft Bushing V5006

4. Inspect the steering worm for wear scores or chipped teeth.

5. Inspect the worm bearings for wear and improper movement.

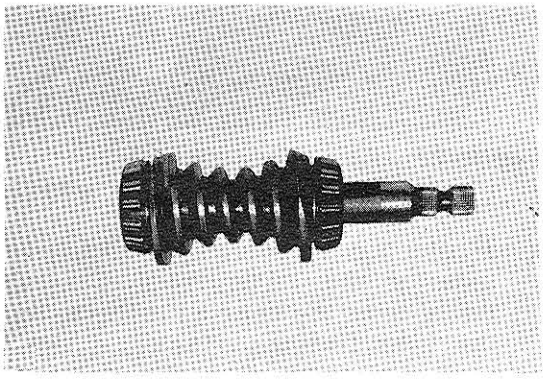


Fig.6-17 Steering Worm Inspection V5123

a. To remove the steering worm bearings, use the Steering Worm Bearing Cone Remover 09613-26010, and press out the bearings from the steering worm.

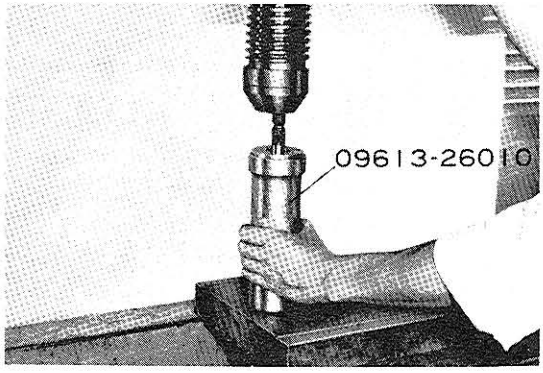


Fig.6-18 Removing Steering Worm Bearing V5124

b. To install the steering worm front bearing, use the Distributor Drive Gear Replacer 09212-10010 and press the bearing onto the steering worm.

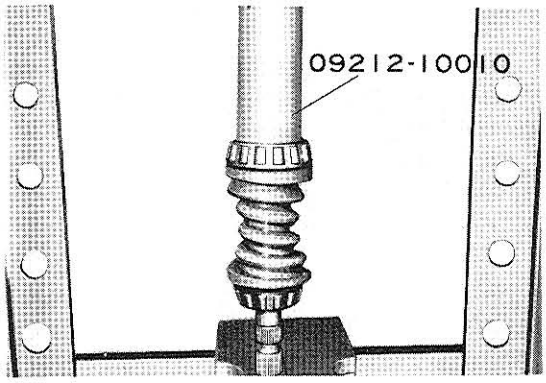


Fig.6-19 Installing Front Bearing V5151

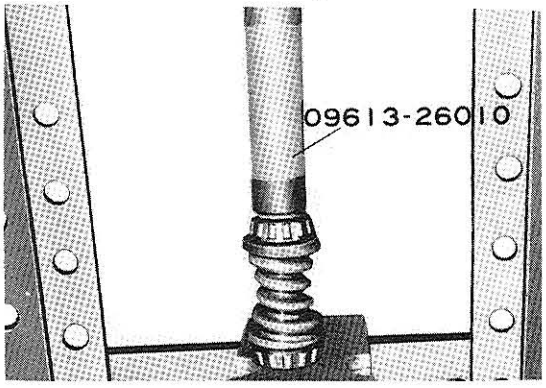


Fig.6-20 Installing Rear Bearing V5152

c. With the Steering Worm Bearing Cone Remover 09613-26010, install the steering worm rear bearing.

d. Using the Steering Worm bearing Puller 09612-30011, remove the steering worm rear bearing cup and the adjusting shim/s from the steering gear housing.

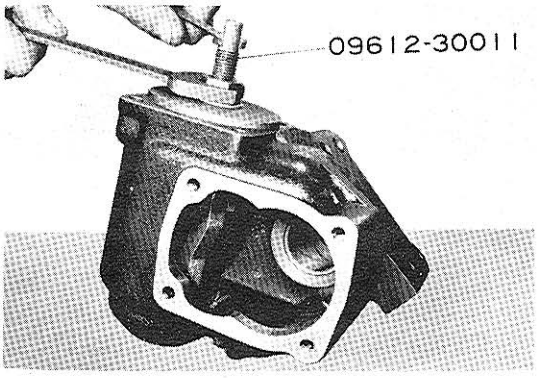


Fig.6-21 Removing Worm Bearing Cup V5133

e. To install the bearing cup, use the Transmission & Transfer Bearing Replacer 09316-60010, and press the bearing cup with the same shim/s which was removed from the steering gear housing.

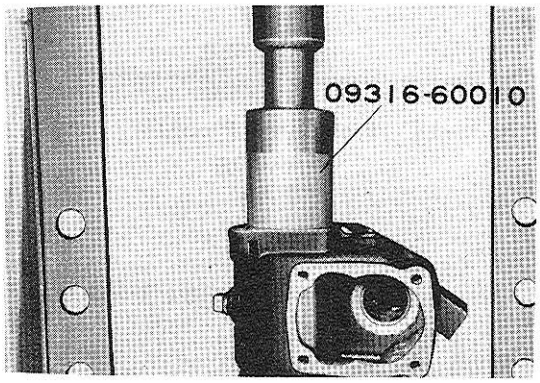


Fig.6-22 Installing Worm Bearing Cup V5153

Inter-mediate Shaft

1. Inspect the splines of the steering sliding yoke and the steering sliding shaft for cracks, excessive wear or other defects.

2. Inspect the universal joint spider journal for rust and wear.
Also inspect the spider bearing cups and the bearing rollers for rusty condition, wear and damage.

3. Check the dust cover for hardness cracks and deterioration.

Assembly & Adjustment

It is recommended that the gaskets and the oil seals should be replaced when assembling.
Apply liquid sealer onto the gaskets to prevent oil leak.
Coat the lips of the oil seals with grease, and lubricate all interior parts with gear lubricant when assembling.

Inter-mediate Shaft

1. Pack the spider bearing cups with multipurpose grease, and assemble the bearing rollers into the bearing cups.

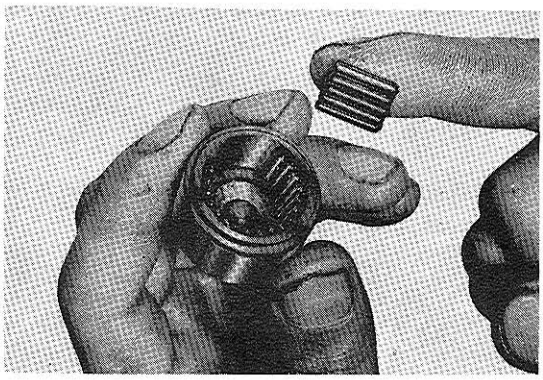


Fig.6-23 Assembling Bearing Rollers V5125

2. Press the spider bearing into one side of the sliding shaft bearing holes until the bearing is flush with the yoke flange surface.

3. Install the bearing seal onto the joint spider, then install the joint spider onto the yoke.

4. Press the opposite bearing with

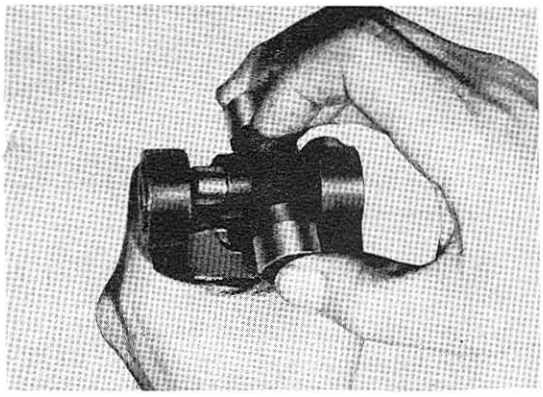


Fig.6-24 Installing Joint Spider V5126

the bearing seal onto the joint spider into the yoke.

5. Install the hole snap rings, and check the joint spider for smooth operation.
   Check the joint spider thrust clearance.
   If the clearance exceeds 0.5 mm (0.02"), adjust the clearance to become less than 0.5 mm (0.02") by selecting the hole snap ring.

   Hole snap ring thickness:
   Part No. 90521-22011
   Thickness: 1.20 mm (0.047")
   Part No. 90521-22012
   Thickness: 1.25 mm (0.049")
   Part No. 90521-22013
   Thickness: 1.30 mm (0.051")

6. Install the two bearings with the bearing seals onto the joint spider, and then connect the sliding shaft to the steering worm yoke.
   Next, install the cup stopper plates No.1 and the U-bolts.

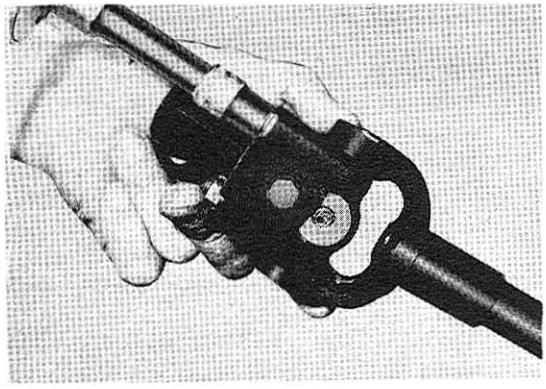


Fig.6-25 Tightening U-bolt Nut V5127

7. Assemble the joint spider and the bearings onto the steering sliding yoke in the same manner.

8. Pack the inside hole of the sliding yoke with multipurpose grease to about one-half of the interior area.
   Align the cup stopper plates No.1 of the sliding yoke side and the sliding shaft side.
   Next, install the dust cover, and connect the sliding shaft with the sliding yoke.

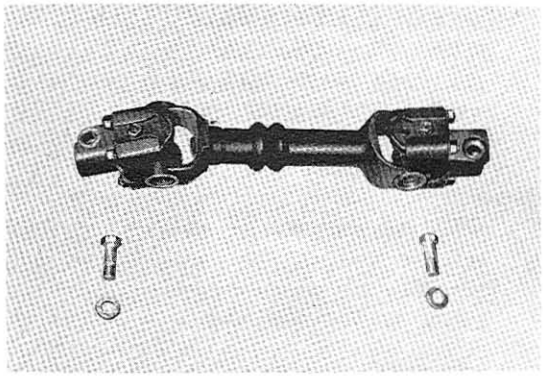


Fig.6-26 Inter-mediate Shaft Assembly V5154

Steering Gear Housing

Before assembling the gear housing, the following adjustment should be performed.

1. Steering worm centering adjustment.

   a. Assemble the steering worm into the gear housing.
   Install the steering worm front bearing cup and the gear housing end cover with the gasket.
   Tighten the end cover attaching bolts to 1.5 ~ 2.0 m-kg (11 ~ 14 ft-lb) torque.

   b. Install the same sector shaft adjusting shims and the plate which were removed during disassembly onto the sector shaft, then assemble

into the gear housing.
Push the sector shaft end towards the steering worm with the hand, and maintaining this condition, check the backlash between the steering worm and the sector roller. Adjust so that the backlash will be zero or hardly noticeable in value by selecting the adjusting shim.

c. Install the sector shaft end cover with the gasket, then screw in the set bolt temporarily into the sector shaft end cover.

d. Install the pitman arm onto the sector shaft temporarily, and remove the backlash between the steering worm and the sector roller by turning the set bolt.
The backlash should be removed at the center position.

Note:
The sector roller center position is one half of the revolution when turning the steering worm from the right to the left side.

e. Turn the steering worm clockwise all the way, attach the plunger of the dial gauge onto the pitman arm, and check the pitman arm end play.
Next, turn the steering worm counterclockwise all the way, and check the pitman arm end play in the same manner.
The pitman arm end play should be within the same value.
If the pitman arm end plays are different, adjust the plays to be the same with the steering worm adjusting shim/s to be installed behind the steering worm rear bearing cup.

For RHD
Increase the adjusting shim if the pitman arm end play increases when the steering worm is rotated clockwise.
Decrease the adjusting shim if it decreases.

For LHD
Increase the adjusting shim if the pitman arm end play decreases when the steering worm is rotated clockwise.
Decrease the adjusting shim if it increases.

Steering worm adjusting shim thickness:
Part No. 90564-40037
Thickness: 0.5 mm (0.0197")
Part No. 90564-40038
Thickness: 0.2 mm (0.0079")
Part No. 90564-40039
Thickness: 0.1 mm (0.0039")

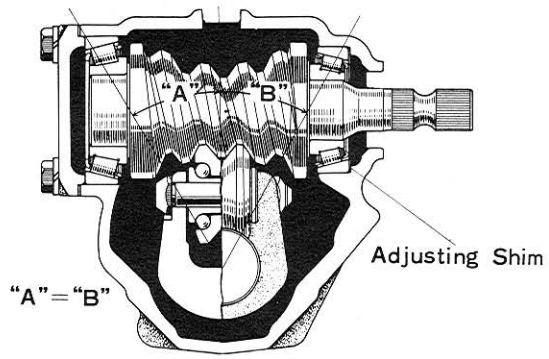


Fig.6-27 Steering Worm Centering Y5736

f. After the adjustment, remove the sector shaft end cover and the sector shaft from the steering gear housing.

2. Steering worm bearing pre-load adjustment.

Before assembling the steering worm, lubricate the steering worm bearings with gear lubricant.
The pre-load should be checked without the steering worm oil seal assembled.

a. Install the steering worm assembly into the gear housing, then install the gear housing end cover with the gasket.
Tighten the end cover attaching bolts to 1.5 ~ 2.0 m-kg (11 ~ 14 ft-lb) torque.

b. Wind a cord onto the steering worm shaft, then hook a pull-scale to the other end of the cord.
Pull the pull-scale slowly, then read the scale while applying a steady pull on the pull-scale.
The reading of the pull-scale should be 3.94 ~ 6.56 kg (8.67 ~ 14.43 lb).

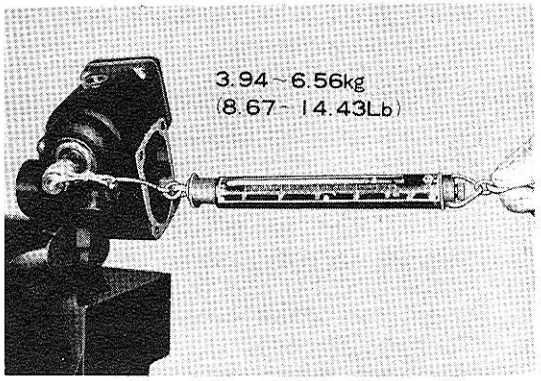


Fig.6-28 Checking Worm Bearing Pre-load V5155

c. Repeat the above procedure until the specified pre-load is obtained by selecting the following gasket.

Gear housing end cover gasket thickness:

Part No.	45322-55010
Thickness:	0.1 mm (0.004")
Part No.	45323-55010
Thickness:	0.2 mm (0.008")
Part No.	45324-55010
Thickness:	0.3 mm (0.012")
Part No.	45322-60010
Thickness:	0.5 mm (0.020")

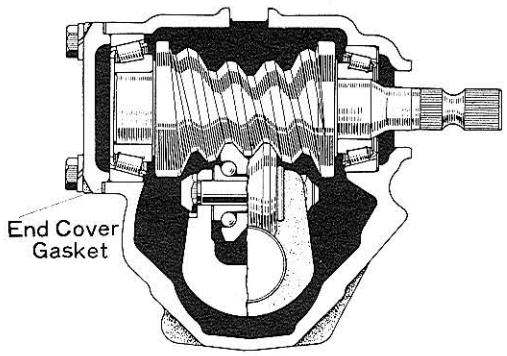


Fig.6-29 Gear Housing Cover Gasket Y5736

3. Adjustment of steering worm and sector roller backlash.

After adjusting the steering worm bearing pre-load, next, adjust the backlash between the steering worm and the sector roller in the following manner.

a. Install the sector shaft adjusting plate with the tapered face towards the sector shaft flange and the adjusting shims onto the sector shaft.

b. Assemble the sector shaft into the gear housing, then install the sector shaft end cover with the gasket.
Tighten the end cover attaching bolts to 1.5 ~ 2.0 m-kg (11 ~ 14 ft-lb) torque.
Next, screw in the set bolt until the sector shaft end play is removed.
Do not over screw in the set bolt to prevent the steering worm from turning hard.
The backlash between the steering worm and the sector roller is at the mid-way point of the steering worm and the sector roller travel.
To locate this mid-way point, turn the steering worm from one stop all the way to the other, counting the number of turns. Then turn the steering worm back exactly one half of the number of turns.

c. Next, check the backlash. If it exceeds, remove it by selecting

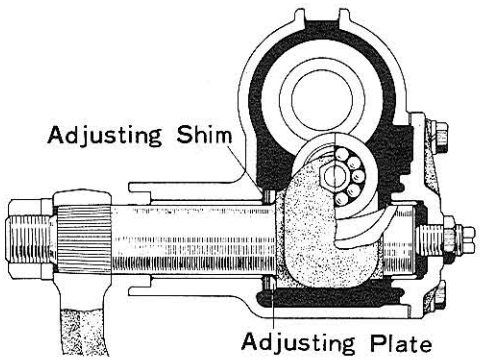


Fig.6-30 Backlash Adjustment Y5737

the following sector shaft adjusting shims.

Sector shaft adjusting shim thickness:

Part No. 90564-33110
Thickness: 0.31 mm (0.012")
Part No. 90564-33106
Thickness: 0.50 mm (0.020")

d. After the adjustment, rotate the steering worm from one stop all the way to the other, and check for smooth rotation.
Tighten the set bolt lock nut securely.

4. After the adjustment, install the new sector shaft oil seal and the steering worm oil seal into the steering gear housing.

5. Refill the gear housing with gear lubricant.
Grade: SAE 90
Capacity: 320 cc (0.34 US qt., 0.28 Imp qt)

Installation

1. Mount the steering gear housing assembly onto the gear housing bracket.

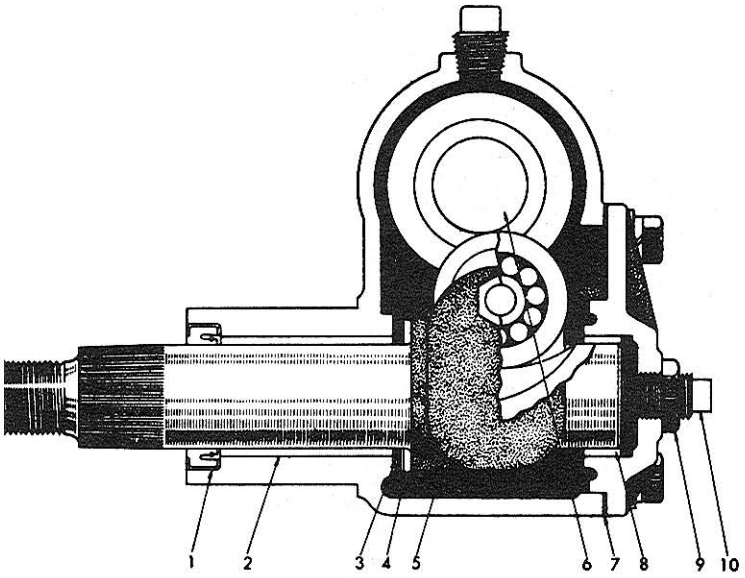
2. Align the mating marks on the sector shaft and the pitman arm, and tighten the pitman arm securing nut to 16.5 ~ 19.5 m-kg (119 to 141 ft-lb) torque.

3. Straighten the front wheels and the steering wheel. Maintaining these positions, install the inter-mediate shaft assembly.
Tighten the clamp bolts on the steering worm yokes securely.

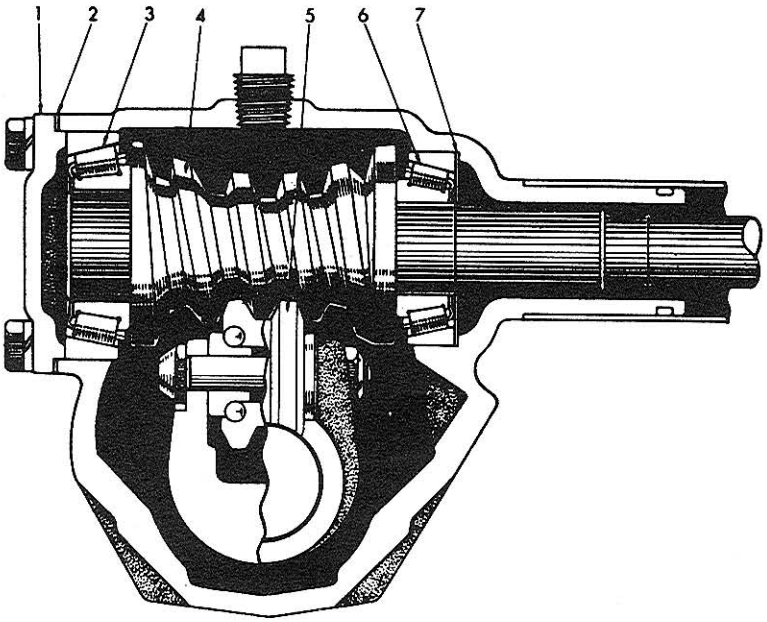
4. Install the wheel, and tighten the hub nuts securely.
Install the wheel cap, and remove the stand.

* *

STEERING WHEEL & GEAR HOUSING (FJ40, 43,45)

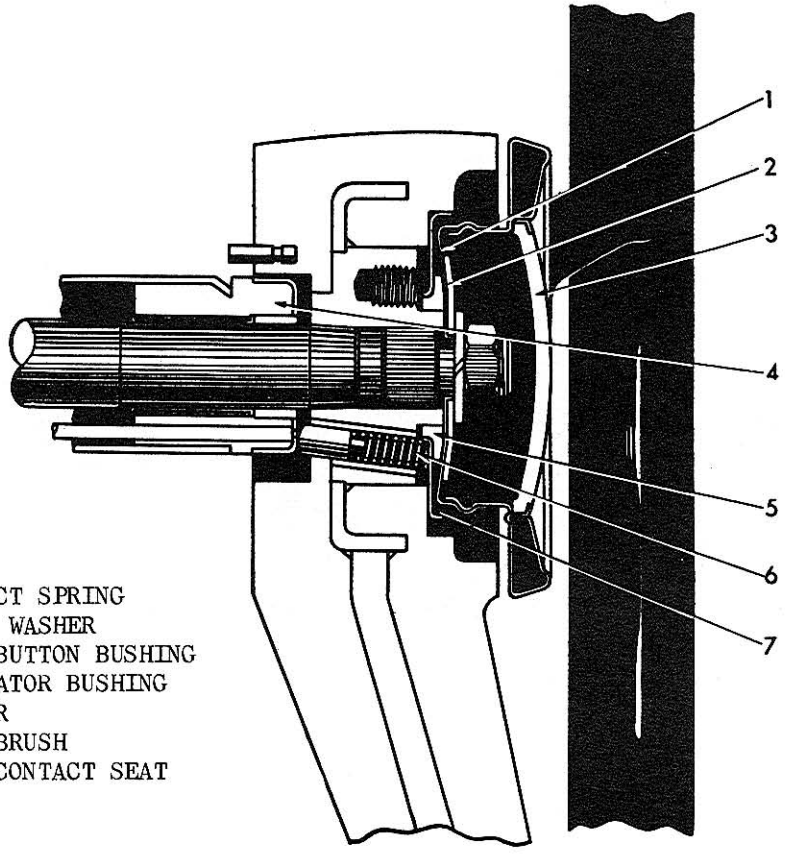


1. STEERING SECTOR OIL RETAINER
2. SECTOR SHAFT BUSHING
3. STEERING SECTOR ADJUSTING SHIM
4. STEERING SECTOR ADJUSTING PLATE
5. SECTOR SHAFT
6. WORM GEAR
7. PACKING
8. BUSHING
9. NUT
10. STEERING SECTOR THRUST SCREW



1. STEERING WORM BEARING CAP
2. PACKING
3. STEERING WORM REAR BEARING
4. WORM GEAR
5. SECTOR ROLLER
6. STEERING WORM FRONT BEARING
7. STEERING WORM FRONT BEARING ADJUSTING SHIM

Fig.6-31 Steering Gear



1. CONTACT SPRING
2. PLATE WASHER
3. HORN BUTTON BUSHING
4. INSULATOR BUSHING
5. SPACER
6. HORN BRUSH
7. HORN CONTACT SEAT

Fig.6-32 Steering Wheel

Removal & Installation

1. Remove the horn button, contact spring, and other related parts from the steering wheel.
2. Remove the steering wheel from the main shaft using Steering Wheel Puller 09609-20010.
3. Disconnect the horn button wire connection at the side of the mast jacket.
4. Remove the mast jacket lower clamp.
5. Remove the turn signal switch assembly.
6. Remove the mast jacket hole cover rubber see plate and hole cover rubber.

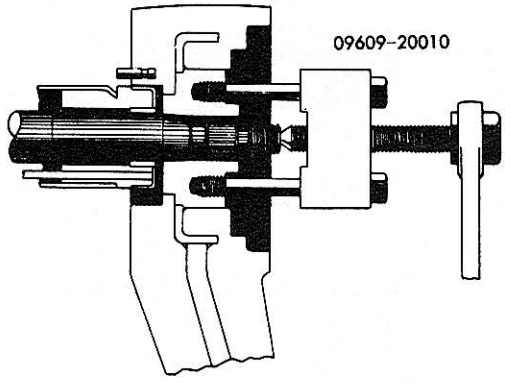


Fig.6-33 Steering Wheel Removal

7. On the right hand drive vehicle, remove the battery. On the left hand drive vehicle, remove the carburetor and oil cleaner.

8. Disconnect the gear shifting rod No.1 and gear selecting rod at the ends of the control shift lever and control select lever.

9. Remove the control shaft lower bracket clamp.

10. Remove the control shift lever, control select lever, and the control shaft lower bracket. Also remove the control shaft low speed lever and control shaft lower bracket.

11. Pull out the control shaft toward the driver's seat.

12. Using Pitman Arm Puller, 09610-55010 remove the pitman arm.

13. Remove the steering gear box bracket cap, and then lifting the steering gear box and mast jacket, take them out through the engine compartment.

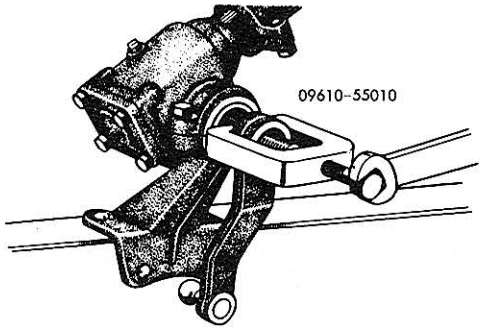


Fig.6-34 Pitman Arm Removal

For Installation, follow "Removal" in reverse order.

Note:
1. Tighten the steering gear box bracket cap bolts to 75~90 ft-lbs forue.

2. Tighten the pitman arm nut to 120~140 ft-lbs torque.

3. Tighten the steering wheel nut to 4.5~7 m-kg (30~50 ft-lbs) torque.

Disassembly

1. Remove the steering gear box oil plug and drain out the gear oil.

2. Hold the steering assembly in a vise and unloosen the bolt holding the lower clamp on the steering mast jacket and pull out the mast jacket from the steering main shaft.
3. Unscrew the steering sector thrust screw, then remove the sector shaft end cover and take out the sector shaft assembly.

Note: Take care not to lose the sector adjusting shims as they must be reinstalled to obtain proper lash when reassembling.

4. Remove the steering worm bearing cap along with the steering worm rear bearing cap packings. Check the number of the adjusting packings, so that preload adjusting can be done easily upon installation.

5. Tap the end of the steering main shaft with a wooden hammer and remove the steering main shaft worm gear assembly together with the steering worm rear taper roller bearing and front taper roller bearing cone.

Caution: Take care as the rear bearing cup drops out when removing.

6. Using Bearing Puller 09612-65010, remove the steering worm front bearing cup together with the front bearing adjusting shims.

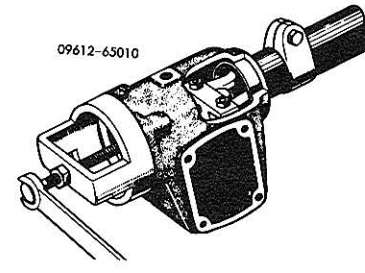


Fig.6-35 Front Bearing Cup Removal

7. To remove the steering worm front and rear bearing cones at both ends of the worm gear, use the Steering Worm Bearing Cone Remover 09613-30010.

8. To remove the worm gear from the main shaft, use a press and force out the gear.

9. The removal of the sector shaft bushing and oil retainer in the gear box may be deferred until a thorough inspection of the parts can be made.
If preliminary inspection shows damage, drive the bushing and the oil retainer out of the gear box using a suitable bushing remover and replacer.

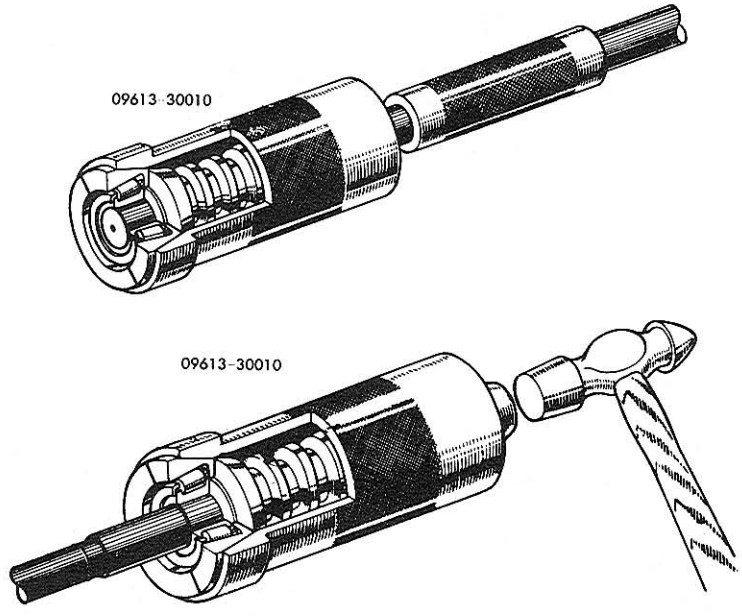


Fig.6-36 Bearing Cone Removal

Inspection

1. Wash all parts in cleaning solvent and dry completely.

2. Inspect the steering main shaft and worm for worn or rough grooves and bent conditions.

3. Inspect the sector shaft assembly for damaged serrations, worn or twisted shaft, worn sector roller and roller balls.
If any of these parts is found defective, they should be replaced as a sector shaft assembly.

4. Inspect the worm bearings for excessively worn, damaged, or noisy conditions.
Replace the defective bearings with the new ones.

5. Inspect the sector shaft bushing for wear. If the clearance between the bushing and the shaft exceeds 0.2 mm (0.08 in.), replace the bushing.

6. Replace the gear box if inspection reveals cracks or other damages.

7. Replace the oil retainer or "O" ring if found damaged.

8. Inspect the gear box for cracks.

Caution: No attempt should be made to weld, machine, or repair any component parts of the steering gear assembly. Parts which are worn or cracked should be replaced with new parts.

Assembly & Adjustment

Described below are the assembly and adjustment procedures of the steering gear mechanism. The instructions on adjustment are covered under each assembling order although the adjustment may not always be done at that time of assembling.

1. Install the steering worm front taper roller bearing cup in the steering gear box inserting the selective fit front bearing adjusting shim between them.

End Play in Steering Worm Adjustment

The centerlines of the steering worm and sector roller are in proper alignment if the steering wheel has the same amount of play when turned in eigher direction. If there is a difference of play in either direction, adjust by increasing or decreasing the number of front bearing adjusting shims.

Note: If there is any difference in play or stiffness between right and left when turning the steering wheel, it means that the center line of the worm gear is not aligned with the pivoting center of the sector shaft.

Front Bearing Adjusting Shim Thickness

Part No.	mm	inch
90564-40037	0.5	0.020
90564-40038	0.2	0.008
90564-40039	0.1	0.004

2. Install the main shaft assembly with bearing cones attached. Then install the rear bearing cup.

3. Install the selective fit rear bearing cap packings and attach the worm bearing cap.

Worm Bearing Preload Adjustment

Adjust preload of worm bearing using cap packings. Place one packing and tighten the cap to specified 1.5~2.2 m-kg (10~16 ft-lb) torque. Attach the steering wheel temporarily. Apply the pull scale to a spoke at a rim of wheel and exert a steady pull while keeping the scale at 90 degrees to the spoke as shown in the figure. The pull required to keep wheel turning slowly should be approximately 0.4 kg (0.88 lbs). If preload is excessive, increase thickness of packing. If preload is not enough, decrease thickness of parking.

Steering Worm Rear Bearing Cap Packing Thickness

Part No.	mm	inch
45322-60010	0.5	0.020
45322-55010	0.31	0.012

Fig.6-37 Worm Bearing Preload Adjustment

4. Attach the sector adjusting shims and adjusting plate to the sector shaft and install the sector shaft assembly to the gear box.

Steering Wheel play Adjustment

The steering wheel play can be adjusted by increasing or decreasing the number of sector adjusting shims. Decreasing the shims will move the roller closer o the worm to make the mesh tighter, while increasing the shims will make the mesh looser. To adjust, install the steering wheel on end of the main shaft and while holding the sector roller shaft with hand,

turn the steering wheel in both directions. The point on the steering wheel where the roller shaft is felt to begin turning is made as the starting point and made adjustments by increasing or decreasing the number of shims until there is about 1 inch play in the steering wheel.

Note: The standard number of steering sector adjusting shims are as follows.

Thickness 0.3 mm (0.012 in.) 6pcs.
0.5 mm (0.020 in.) 5pcs.
Total is 11 pieces.

5. Install the sector shaft end cover. Tighten the bolts to 1.5~2.2 m-kg (10~16 ft-lb) torque.

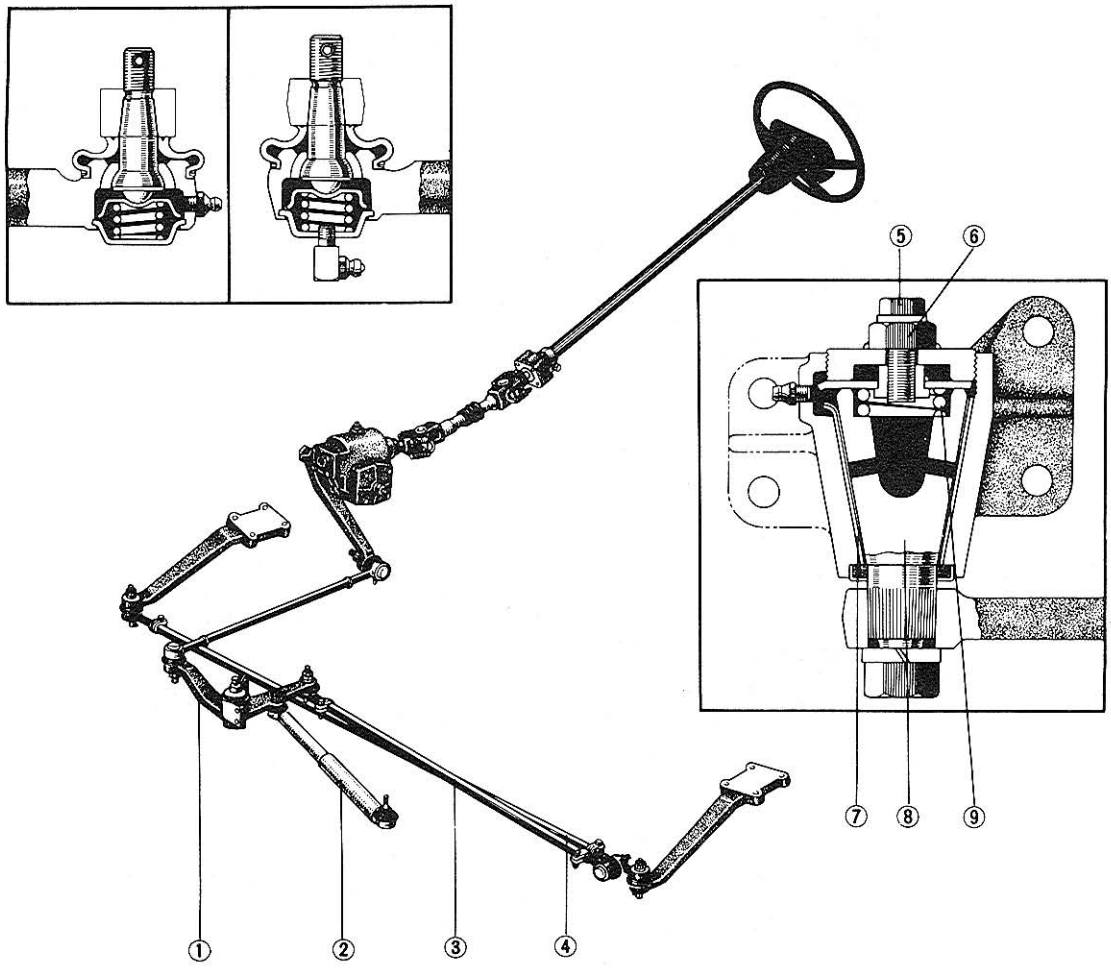
Sector Roller Shaft Axial Play Adjustment

Adjust the sector roller shaft axial play by turning the sector thrust adjusting screw. Loosen the lock nut and tighten the screw until the steering shaft feels heavy to turn. Then loosen the screw 1/4 to 1/2 turn and tighten the lock nut. the lock nut to 5~8 m-kg (37~60 ft-lb).

6. Install the mast jacket "O" ring and install the mast jacket onto the gear box and then tighten with the mast jacket lower clamp.

* *

STEERING LINKAGE



1. Steering center arm
2. Shimmy damper
3. Steering relay rod
4. Tie rod
5. Bolt
6. Center arm shaft nut
7. Bushing
8. Center arm shaft
9. Compression spring

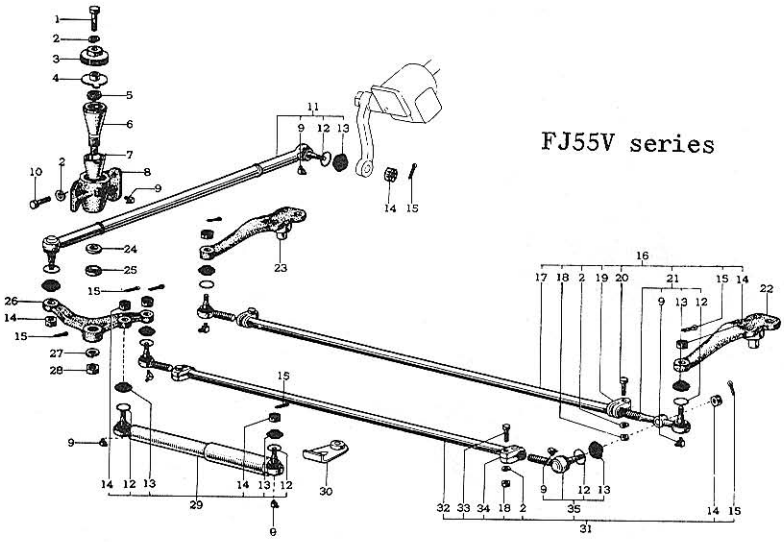
Fig.6-38 Steering Linkage Y5735

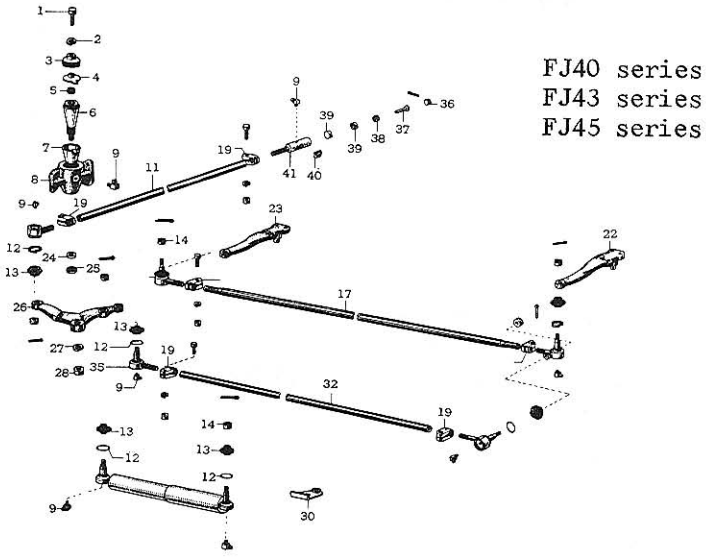
Removal

1. Jack the front end of the vehicle, and support with stands.
   Pry off the wheel caps, and remove the front wheels.

2. Loosen and remove the pitman arm securing nut.
   Punch the mating marks onto the pitman arm and the steering sector shaft.
   These mating marks are for guidance when installing the pitman arm.
   Disconnect the pitman arm from the sector shaft using the Pitman Arm Puller 09610-55010.

3. Disconnect the steering drag link





1. Bolt
2. Lock washer
3. Center arm shaft nut
4. Center arm nut lock plate
5. Compression spring
6. Center arm shaft
7. Shaft bushing
8. Center arm blacket
9. Grease fitting
10. Bolt
11. Steering drag link assembly
12. Set ring
13. Joint dust seal
14. Lock nut
15. Cotter pin
16. Tie-rod assembly
17. Steering tie-rod
18. Lock nut
19. Tie-rod end clamp
20. Bolt
21. Tie-rod end assembly
22. Steering knuckle arm No.2
23. Steering knuckel arm No.1
24. Dust seal
25. Center arm dust lower seal
26. Steering center arm
27. Lock washer
28. Nut
29. Steering shimmy damper
30. Shimmy damper bracket
31. Steering relay rod assembly
32. Steering relay rod
33. Bolt
34. Tie-rod end clamp
35. Relay rod end assembly
36. Straight screw plug
37. Steering link joint spring seat
38. Compression spring
39. Ball stud seat
40. Drag link dust seal
41. Drag link end

Fig.6-39 Steering Linkage Components G2445

Fig.6-40 Removing Pitman Arm V5129

from the steering center arm with the Tie-rod End Puller 09611-20011 or the Ball Joint Puller 09628-62010, and withdraw the drag link with the pitman arm.

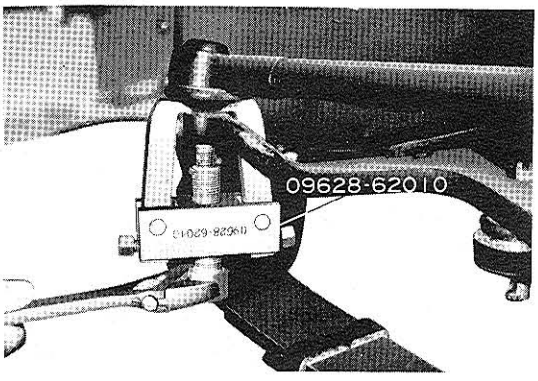


Fig.6-41 Disconnect Drag Link V5156

4. Disconnect the tie-rod ends on both sides of the tie-rod from the steering knuckle arm No.1 and No.2 using the Tie-rod End Puller 09611-20011.
   Also disconnect the steering relay rod end from the steering center arm, and then remove the tie-rod assembly together with the steering relay rod assembly.

5. Disconnect the end of the steering shimmy damper from the shimmy damper bracket on the front cross-member frame.

6. Loosen and remove the steering center arm securing nut, then using the Ball Joint Puller 09628-62010, remove the steering center arm with the simmy damper.

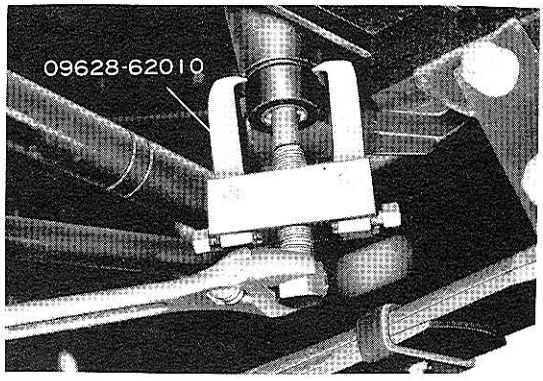


Fig.6-42 Removing Steering Center Arm V5157

7. Remove the engine under cover, then remove the center arm bracket from the frame.

Disassembly

1. Remove the steering shimmy damper from the steering center arm, and also remove the steering relay rod from the tie-rod using the Tie-rod End Puller 09611-20011.

2. Steering center arm shaft disassembly.

   a. Secure the center arm bracket in a vise, remove the bolt on the center arm shaft nut, then loosen and remove the center arm shaft nut.

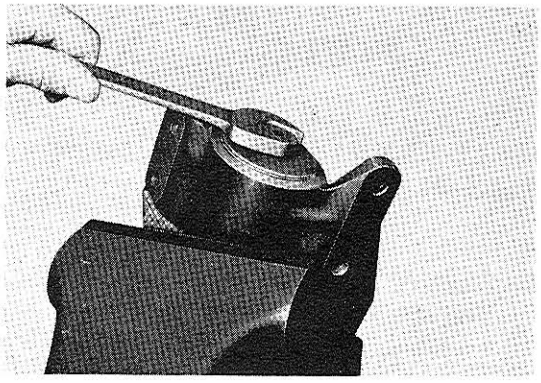


Fig.6-43 Removing Center Arm Shaft Nut V5134

b. Carefully press the end of the center arm shaft with the lock plate and the spring out of the center arm bracket.

c. Remove the bushing from the center arm bracket.

Inspection

Wash all disassembled parts in cleaning solvent, and inspect the followings. Repair or replace any defective part as necessary.

1. Inspect the rod ends for excessive looseness at the ball stud.
   Check the rod end dust seals for cracks and damages.

2. Inspect the relay rod, tie-rod and the drag link for bend or other defects.
   Do not attempt to straighten a bent rod. Also replace if bent.

3. Inspect the steering center arm, pitman arm, and the center arm shaft bracket for cracks or other defects.
   Use Magna-flux if available, and always demagnetize the part after using the tester.

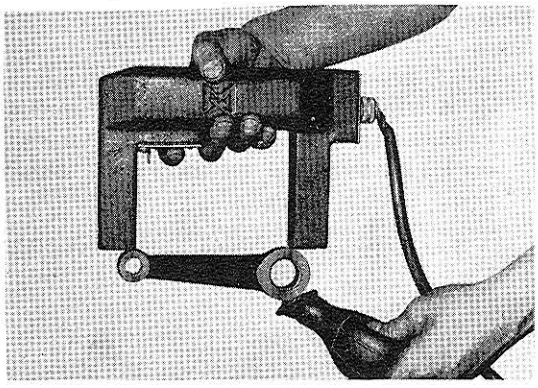


Fig.6-44 Checking for Cracks V5128

4. Inspect the condition of the serration on the pitman arm and the steering center arm for damage.

5. Inspect the center arm shaft for wear, and the serration of the shaft for damage.

6. Inspect the center arm shaft bushing for wear or other defects.

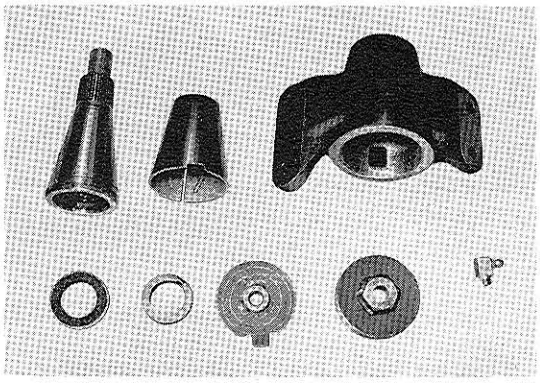


Fig.6-45 Steering Center Arm Shaft Components V5135

7. Inspect the steering shimmy damper for operating condition and abnormal noise.

Assembly

1. Install the center arm lower dust seal into the center arm bracket.

2. Install the bushing into the center arm bracket, and then bend the tab on the bushing.

3. Apply the bushing with multipurpose grease, and also pack the multipurpose grease into the center arm shaft.
   Next, install the center arm shaft into the center arm bracket.

4. Place the spring and the center arm nut lock plate onto the end of the center arm shaft.
   Tighten the center arm shaft nut firmly, then loosen the nut 1/4 of a turn.

5. Install the bolt located on the center arm shaft nut, and tighten the bolt securely.

Installation

Follow the removal procedures in the reverse order.

1. Align the mating marks on the pitman arm and the steering sector shaft, and tighten the pitman arm securing nut.

2. If the rod end/s is replaced, adjust the length of the steering relay rod and the tie-rod.

   Steering relay rod length:
   827 mm (32.56")
   Tie-rod length:
   1,205 mm (47.44")

3. After the installation, check and adjust the toe-in.
   To adjust, refer to Front End Alignment on page 6-24.

4. Lubricate all rod ends and the ends of the steering shimmy damper with multipurpose grease.

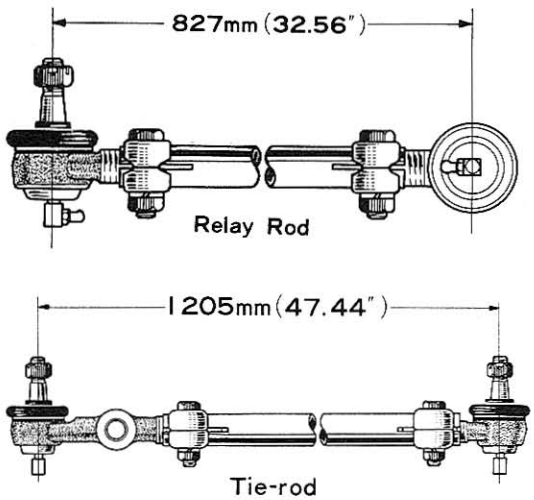
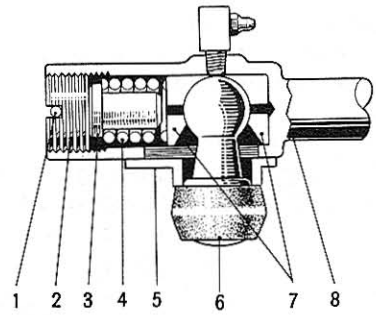


Fig.6-46 Tie-rod & Steering Relay Rod G2446 G2431

DRAG LINK



1. Cotter pin
2. End plug
3. Spring seat
4. Spring
5. Dust seal
6. Pitman arm
7. Ball seat
8. Drag link end

Fig.6-47 Drag Link End X4769

Disassembly

1. Pitman Arm End. Remove the cotter pin and drag link end plug. Then, disconnect the drag link assembly from the pitman arm knob, and remove the spring seat, spring, ball seats, and dust cover.

2. Center Arm End. To disconnect the drag link end from the center arm end, remove the cotter pin and nut retaining the tie-rod end knob. Then disconnect using Tie-rod End Puller 09611-20011. Refer Section 3, Tie-rod Ends.

Inspection

Wash all parts in cleaning solvent and check them for wear and the spring for lost tension. Discard all parts that are worn excessively.

Assembly

For Assembly, follow "Disassembly" in reverse order.

Note: Coat ample grease on the ball, ball seat and other sliding parts. Tighten the drag link end plug fully at first and then screw back 1/2 turn and install the cotter pin after making sure that the knob will move smoothly and with no looseness.

WHEEL & TIRES

The rotation of the wheel and tire as an assembly can be affected by several factors, some of which are created by the alignment of the front wheels, while others are created by the assembly itself.

A wheel assembly that is out of balance or alignment may affect the riding qualities of the vehicle, cause hard steering or be responsible for rapid tire wear. Several symptoms which appear to be caused by wheel and tire troubles are also common to suspension and steering troubles.

Tires

Normal tire tread wear varies in relation to the type and condition of road surface, amount of traffic, temperature, and the driving habits of the driver.
Abnormal tire wear will occur under certain circumstances, and in various degrees can be accounted for by such conditions as incorrect tire inflation, improperly adjusted suspension and steering parts, improper brake operation, and vehicle overloading.
Check the tires frequently to be sure that the air pressure agrees with the specification.
Inspect the tire treads, and remove all stones, nails, glass, or other objects that may be wedged into the tread grooves. Check for holes or cuts that may permit air leakage from the tire, and make the necessary repairs.
Inspect the tire side walls for cuts, bruises, and other damages. If internal damage is suspected, demount the tire from the disc wheel for further inspection and repair or replace.
Check the tire valve for air leakage, and replace the valve if necessary. Replace any missing valve cap.

TIRE PRESSURE SPECIFICATION

Model	Tire Size	Tire Pressure kg/cm² (lb/in²)						
		Front Tire			Rear Tire			
		Local Road	Highway	Sandy Road	Local Road	Highway	Sandy Road	
FJ40(V)(L)	7.15-15 4P	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)	Laden: G.V.W. (Gross vehicle weight) 2,000 kg (4,500 lb)
	7.60-15 4P	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)	
	7.60-15 6P	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)	
	7.00-15 6P LT	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	
	7.00-15 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	
	7.00-16 6P LT	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	
	7.00-16 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	
	7.50-16 6P LT	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	
	9.00-15 6P	1.2 (17.1)	———	0.7 (10.0)	1.2 (17.1)	———	0.7 (10.0)	
	Do not exceed 50 km/h (30 mph), when using 9.00-15 6P tires at paved road.							
FJ40LV-A	7.60-15 4P	1.8 (25.5)	2.0 (28.4)	1.5 (21.3)	1.8 (25.5)	2.0 (28.4)	1.5 (21.3)	
FJ43(L)	7.60-15 4P	1.8 (25.5)	2.0 (28.4)	1.2 (17.1)				Laden: G.V.W. (Gross vehicle weight) 2,300 kg (5,000 lb)
	7.60-15 6P	2.4 (34.1)	2.4 (34.1)	1.8 (25.5)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	
	7.00-15 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	2.4 (34.1)	2.8 (39.8)	2.4 (34.1)	
	7.00-15 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.8 (39.8)	2.4 (34.1)	
	7.00-16 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	2.4 (34.1)	2.8 (39.8)	2.4 (34.1)	
	7.00-16 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.8 (34.1)	2.4 (34.1)	
	7.50-16 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	2.4 (34.1)	2.8 (39.8)	2.4 (34.1)	
	7.50-16 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.8 (39.8)	2.4 (34.1)	
	9.00-15 6P	1.2 (17.1)	———	0.7 (10.0)	2.0 (28.4)	———	2.0 (28.4)	
	Do not exceed 50 km/h (30 mph), when using 9.00-15 6P tires at paved road.							
FJ45P-B(L)	7.00-16 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	3.3 (46.9)	3.3 (46.9)	3.3 (46.9)	Laden: G.V.W. (Gross vehicle weight) 2,900 kg (6,380 lb)
	7.00-16 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	3.8 (54.0)	4.3 (61.1)	3.8 (54.0)	
	7.50-16 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	3.0 (42.7)	3.5 (49.8)	3.0 (42.7)	
	7.50-16 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	3.0 (42.7)	3.5 (49.8)	3.0 (42.7)	
	9.00-15 6P	1.3 (18.5)	———	0.9 (12.8)	2.3 (32.7)	———	2.3 (32.7)	
	Do not exceed 50 km/h (30 mph), when using 9.00-15 6P tires at paved road.							
FJ55V(L) FJ55V-B(L)	7.00-15 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	2.8 (39.8)	3.3 (46.9)	2.8 (39.8)	Laden: G.V.W. (Gross vehicle weight) 2,600 kg (5,700 lb)
	7.00-15 8P LT	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	2.8 (39.8)	3.3 (46.9)	2.8 (39.8)	
	7.00-16 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	2.6 (37.0)	3.0 (42.7)	2.6 (37.0)	
	7.50-16 6P LT	1.8 (25.5)	2.2 (31.3)	1.8 (25.5)	2.6 (37.0)	3.0 (42.7)	2.6 (37.0)	
	7.60-15 6P	2.0 (28.4)	2.4 (34.1)	1.8 (25.5)	2.4 (34.1)	2.4 (34.1)	2.4 (34.1)	
	9.00-15 6P	1.4 (16.2)	———	1.2 (17.1)	2.3 (32.7)	———	2.1 (29.9)	
	Do not exceed 50 km/h (30 mph), when using 9.00-15 6P tires at paved road.							
FJ55L-G	7.60-15 4P	1.8 (25.5)	2.0 (28.4)	1.8 (25.5)	2.0 (28.4)	2.0 (28.4)	1.8 (25.5)	

Disc Wheels

Check and tighten the wheel hub nuts regularly to avoid accidental loosening of the wheels. Loose wheel hub nuts may cause shimmy and vibration.
Elongated hub bolts also result from loose hub nuts. Check for damage that may affect the run-out of the disc wheels.
Wobble or shimmy caused by a damaged disc wheel will damage the hub bearings as a result.

Wheel Balancing

Wheel balancing is the correct distribution of weight around a disc wheel and tire assembly to counteract centrifugal forces acting on the heavy area.
The purpose of wheel balancing is to maintain a true running wheel perpendicular to its rotating axis.

A properly balanced wheel will eliminate vibration and abnormal wear of suspension parts and tire wear.
There are two types of wheel balancing; as static balance and dynamic balance to check and correct an unbalanced condition.

Static balance should be established first.

1. A wheel that is statically unbalanced will rotate by itself until the heavy side will be at the bottom.
   Balancing a wheel statically is accomplished by adding a compensating weight to the top of the wheel opposite to the heavy section.

2. If a wheel is dynamically unbalanced, it will wiggle or oscillate horizontally in motion.
   To eliminate this dynamic unbalance, install the compensating weight 180° opposite each other, one on the outside of the wheel, and another one on the inside.
   The static balance will not be affected.

Tire Rotation

To obtain maximum protection of the tire wear, the rotation of the tires is essential.
It is recommended that the tires should be rotated every 6,000 kilos (4,000 miles).
Rotate the tires as per the illustration.

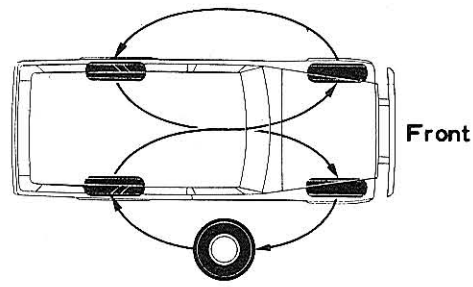
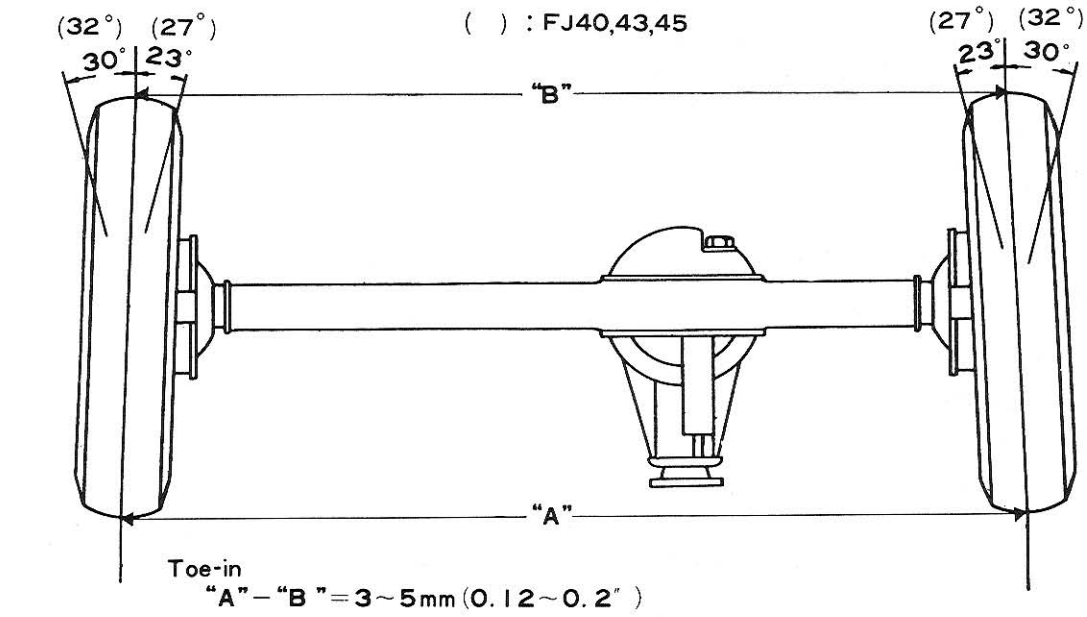


Fig.6-48 Tire Rotation G1329

FRONT END ALIGNMENT



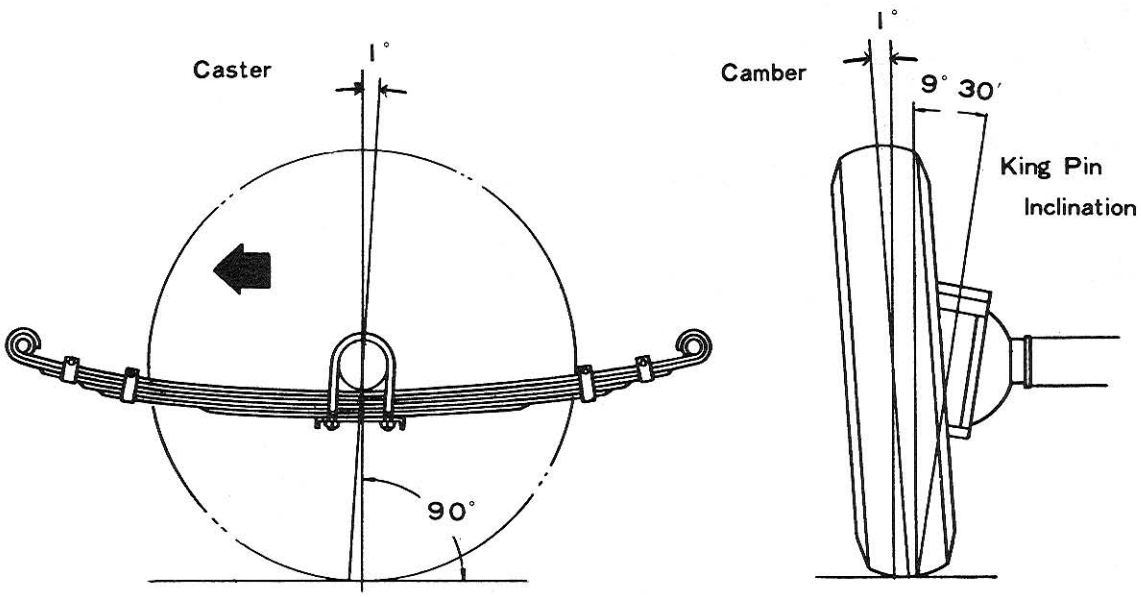


Fig.6-49 Front End Alignment G2428

The front end alignment should be correctly maintained in order to insure and reduce tire wear to a minimum.
The satisfactory operation of the vehicle with almost effortless control of the steering requires the following factors.

1. Steering wheel must operate easily.
2. Steering wheel must return to its original position.
3. Steering must be steady.

The most important factors of the front end alignment are; Toe-in, Caster, Camber and King pin inclination.
Before checking and adjusting the front end alignment, the following preliminary check should be made.

1. Check all tires for inflation and wear.
   The tires should have about the same wear and be inflated to specified pressure.
2. Check the hub bearing for loosenness, wear or damage.
3. Check the steering gear housing mountings, and all rod ends and clamps for looseness.
   Worn or bent linkage should be replaced.
4. Check all rod ends for wear and damage.
5. Check the shock absorber action, and replace if necessary.
6. Bounce the vehicle at the front and rear ends several times to allow the frame to level up.

There are several kinds of front end alignment gauges, and to perform the front end alignment, the operation instruction furnished by each manufacturer must be followed.
Regardless of any type of equipment used, it is essential that the vehicle is placed on a level surface at all times with tires properly inflated.

Specifications:

Toe-in:	3 ~ 5 mm (0.12 ~ 0.20")
Camber:	1°
Caster:	1°
King pin inclination:	9° 30'
Front wheel turning angle:	
Inner wheel:	30° (32°)
Outer wheel:	23° (27°)

( ) : FJ40,43,45 series

Camber

Using the front end alignment gauge, measure the caster.
The specified camber is 1°.
There is no adjustment for camber, however loose hub bearings, bent steering knuckle spindle, or bent axle housing may cause defective camber

Caster

Using the front end alignment gauge, check the caster.
The value should be 1°.
Caster is established by the design, and will be changed only by the shifting of the front axle housing on the springs or by the distorsion of the springs or chassis frame. There is no adjustment for caster.

King Pin Inclination

Inspect the king pin inclination with the front end alignment gauge.
The king pin inclination should be 9 degrees and 30 minutes.
There is no adjustment for king pin inclination.
If it is incorrect, inspect the steering knuckle bearings for wear or other damage, and the steering knuckle spindle for bend or other defects.

Toe-in

Using the toe-in gauge, measure the toe-in.
The toe-in should be 3 ~ 5 mm or 0.12 ~ 0.20".
To adjust, loosen the clamp bolts at each end of the tie-rod.
Rotate the tie-rod with a pipe wrench or another tool to obtain the correct toe-in.
Tighten the clamp bolts, and position the bolts at right angle to the slot in the tie-rod.

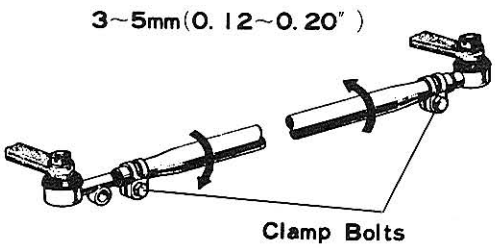


Fig.6-50 Toe-in Adjustment G2429

Side Slip

After adjusting the toe-in, and checking the camber, caster and the king pin inclination, check the side slip with a side slip tester.
If the side slip exceeds the specified movement of 3/1,000 meter 10/3,000 feet, the toe-in must be re-adjusted.

Front Wheel Turning Angles

Check the turning angle by placing the front wheels on a turning gauge.
Adjust the turning angle with the knuckle stopper bolts located on the steering knuckles.
The specified turning angles are 30° for the inner wheel, and 23° for the outer wheel.

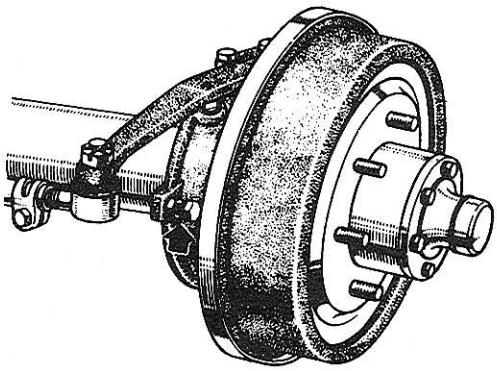


Fig.6-51 Turning Angle Adjustment G2430

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