

CHAPTER 6

FRONT AXLE & FRONT SUSPENSION

FRONT END ALIGNMENT	6— 2
FRONT AXLE HUB, DRUM & BRAKE FLANGE PLATE	6— 5
UPPER SUSPENSION ARM ASSEMBLY.....	6— 9
UPPER SUSPENSION ARM & ARM SHAFT	6— 9
UPPER BALL JOINT	6—10
LOWER SUSPENSION ARM ASSEMBLY	6—11
VEHICLE HEIGHT ADJUSTMENT (FRONT)	6—13
LOWER BALL JOINT	6—14
LOWER SUSPENSION ARM & ARM SHAFT	6—14
FRONT STRUT BAR	6—15

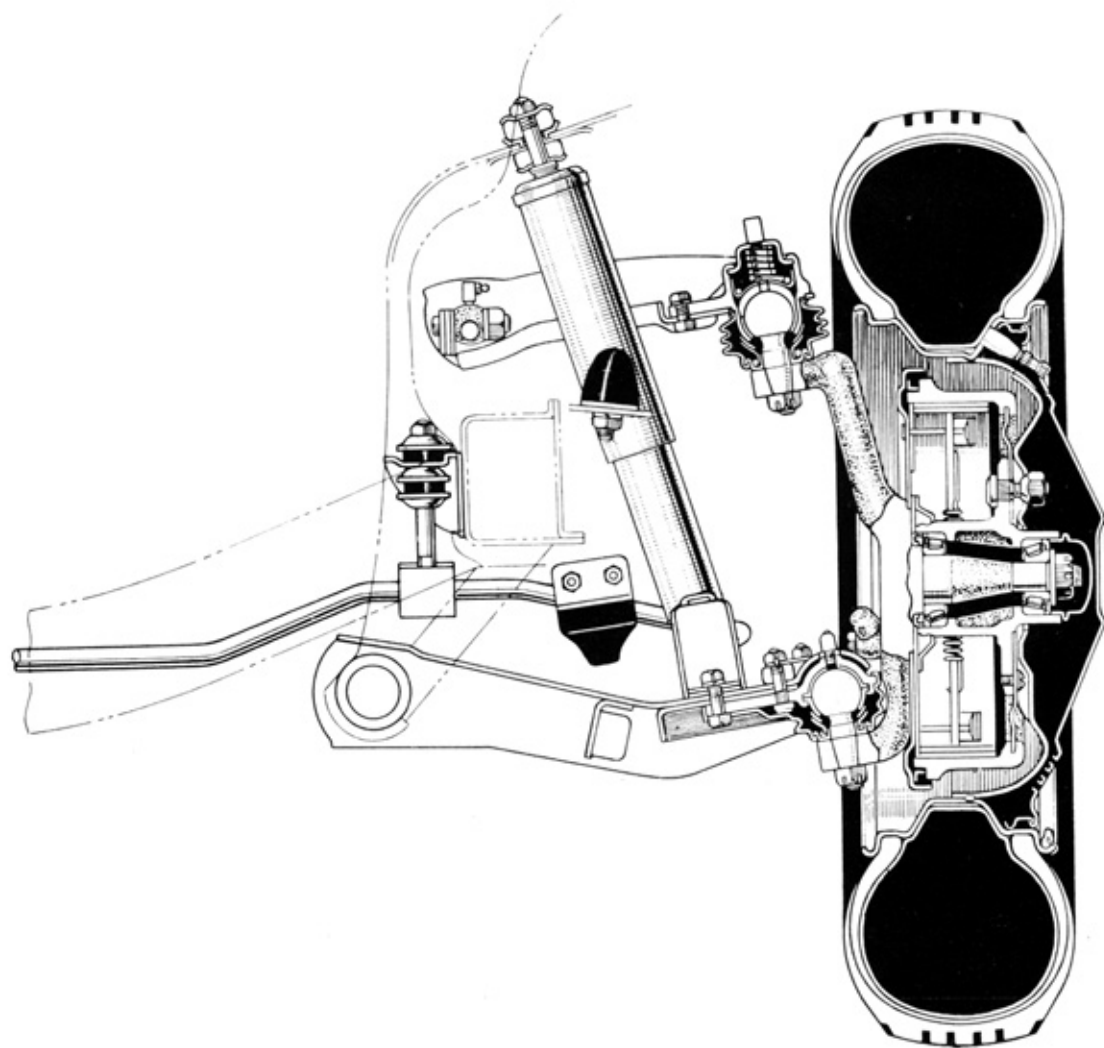


Fig. 6-1 Section of Front Axle & Front Suspension

FRONT END ALIGNMENT

A front end alignment is the process of checking or adjusting all the inter-related steering components of the front suspension

system. Correct alignment must be maintained in order to assure ease and stability of steering and satisfactory tire life.

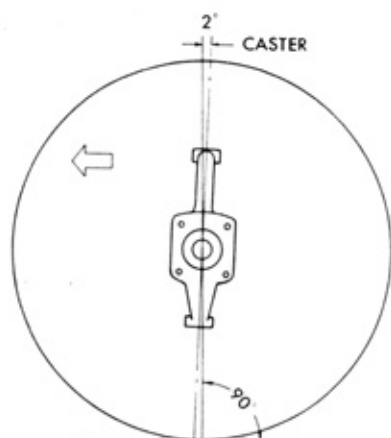


Fig. 6-2 Caster

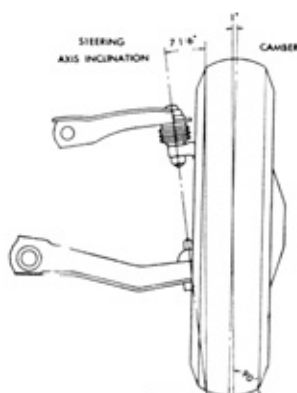


Fig. 6-3 Steering Axis Inclination & Camber

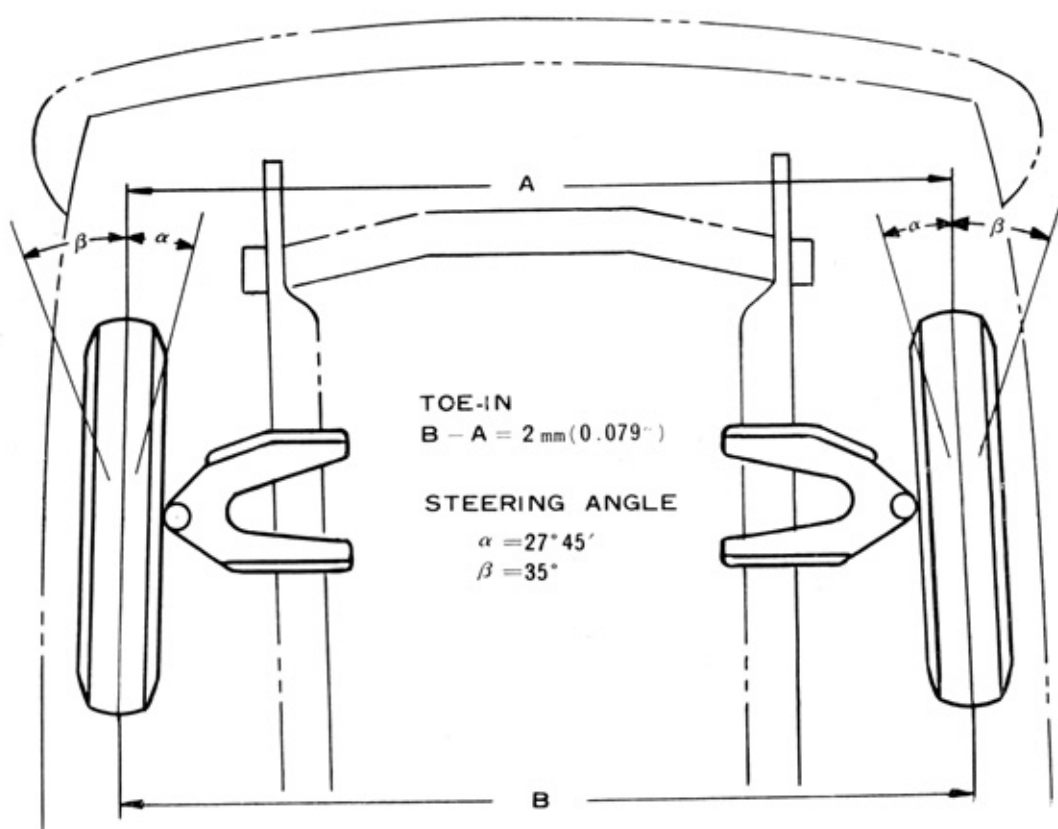


Fig. 6-4 Toe-in & Steering Angle

Alignment Preliminary Steps

There are several types of front end alignment machines, all of which outline proper procedure for checking the factors of front end alignment. The instructions furnished by each manufacturer for the operation of his particular machine should be followed. Regardless of type of equipment used, all checks must be made with the vehicle level and with the curb weight of the vehicle on the wheels.

Steering complaints are not always the result of improper front wheel alignment. Therefore, it is recommended that the following factors be checked and corrected if necessary prior to placing on the front end machine.

1. Loose or improperly adjusted steering gear.
2. Steering gear housing loose at frame.
3. Play or excessive wear in ball joint.
4. Loose tie-rod or steering connections.
5. Unbalanced vehicle height.
6. Under inflated tires.
7. Unbalanced tires.
8. Wheel bearings improperly adjusted.
9. Shock absorbers not operating properly.

Caster and Camber Adjustment

The caster and camber adjustment are made by means of shims between the upper suspension arm shaft and the body.

Shims may be changed at either the front of the shaft or the rear of the shaft to change caster or at both points equally to change camber.

The addition of shims at the front of the shaft or removal of shims at the rear of the shaft will increase positive caster.

Adding shims at both front and rear of the shaft will increase positive camber.

Note :

1. Both caster and camber should be adjusted in one operation.
2. The adjusting shims are available in two

size in thickness.

Adjusting Shim A 2 mm (0.08")

Adjusting Shim B 1 mm (0.04")

Caster should be 2° and camber should be 1° .

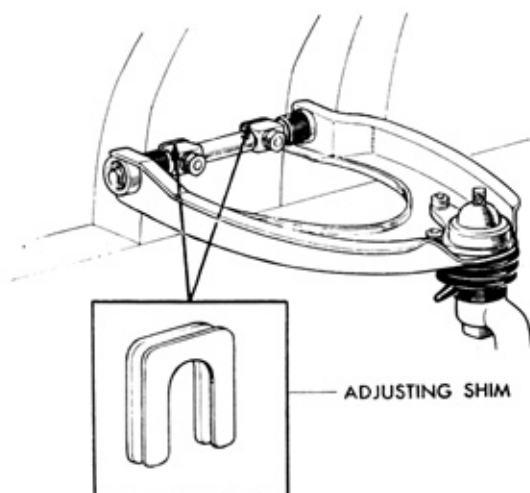


Fig. 6-5 Adjusting Shim

Steering Axis Inclination Adjustment

From the definitions of "steering axis inclination" and "camber", one being the inward tilt of the knuckle and the other the outward tilt of the wheels, it is evident that one cannot be corrected without changing the other.

The correct steering axis inclination should be $7\frac{1}{2}^{\circ}$.

If a new knuckle is installed, caster, camber and toe-in must be readjusted.

Toe-in Adjustment

Toe-in, which should be 2 mm (0.079"), can be adjusted by loosening the clamp bolts at each end of each adjusting tube and turning each adjusting tube to increase or decrease its length as necessary, until proper toe-in is secured.

Both adjusting tubes must be turned exactly the same amount, but in opposite direction when adjusting toe-in.

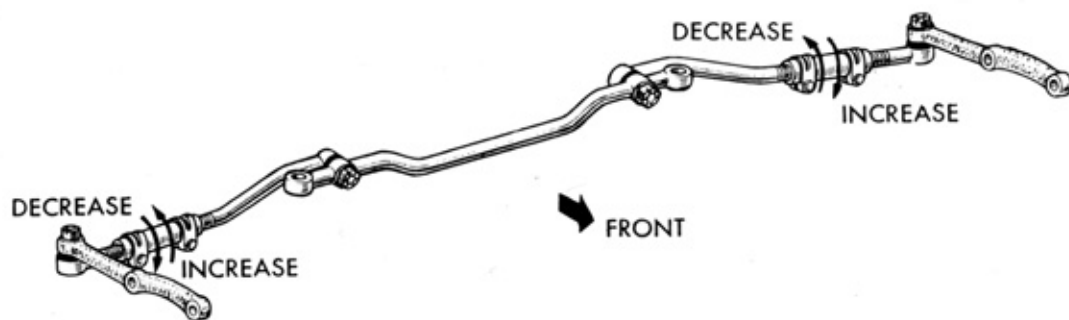


Fig. 6-6 Toe-in Adjustment

FRONT AXLE HUB, DRUM & BRAKE FLANGE PLATE

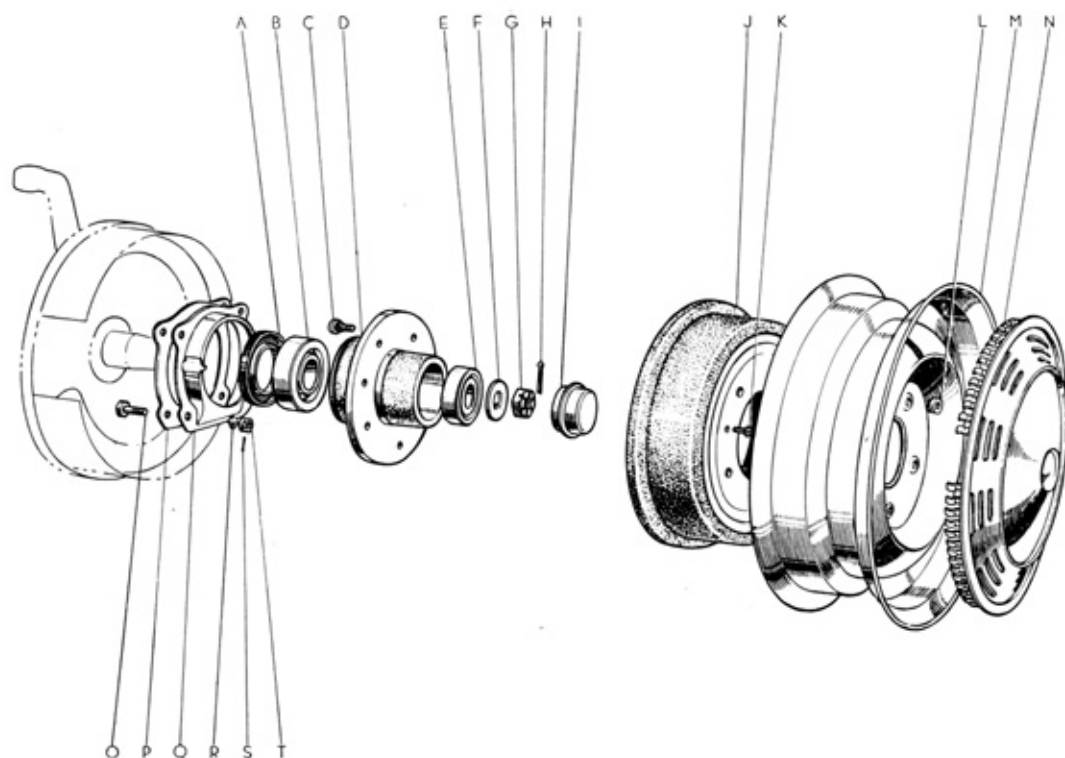


Fig. 6-7 Front Axle Hub & Drum

- | | | | |
|---|---|---|---|
| A | Steering Knuckle Grease Retainer | J | Brake Drum Complete |
| B | Taper Roller Bearing Cup
Taper Roller Bearing Cone | K | Screw |
| | } (For Front Wheel Inner) | L | Axle Nut |
| C | Axle Hub Bolt | M | Disc Wheel Complete |
| D | Front Axle Hub | N | Wheel Cap Complete |
| E | Taper Roller Bearing Cup
Taper Roller Bearing Cone | O | Bolt |
| | } (For Front Wheel Outer) | P | Steering Knuckle Grease Retainer Cap Packing |
| F | Steering Knuckle Washer | Q | Steering Knuckle Grease Retainer Cap Complete |
| G | Nut | R | Spring Washer |
| H | Cotter Pin | S | Cotter Pin |
| I | Front Axle Cover | T | Nut |

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Removal

1. Remove wheel caps, loosen axle nuts, raise vehicle from floor, place on stand jacks and remove wheels.
2. Remove front axle hub cover, cotter pin, nut and steering knuckle washer.
3. Remove front axle outer bearing cone and remove front axle hub with brake drum.
4. Remove brake drum set screw and remove brake drum from axle hub.
5. Remove bearing cup from axle hub.
6. Disconnect brake hose.
7. Remove tie-rod end from steering knuckle

- arm using Tie-rod End Puller (PT20 SST-2083).
8. Remove brake shoe return springs using Brake Shoe Return Spring Tool (RS21 SST-2073), and remove brake shoes.
 9. Remove steering knuckle grease retainer cap, and remove brake flange plate.

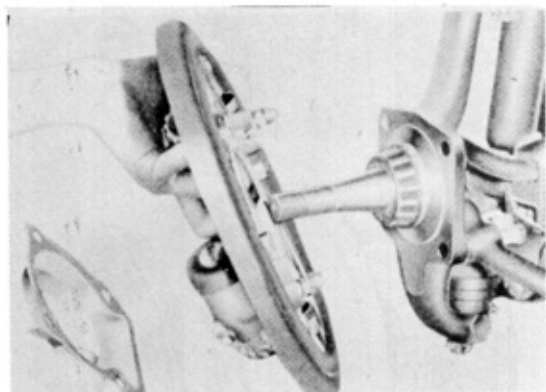


Fig. 6-8 Removing Flange Plate

10. Remove inner bearing cone and grease retainer using Front Axle Inner Bearing Puller (RK21 SST-2063).

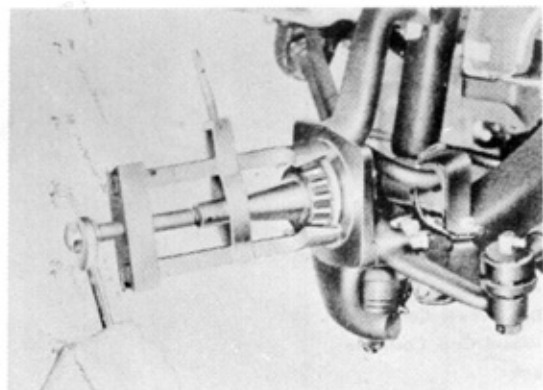


Fig. 6-9 Removing Bearing Cone

Inspections

1. Replace wheel bearing if it is worn, noisy or damaged.

2. Replace front axle hub if it is worn, damaged or cracked.
3. Replace axle hub bolt if it is damaged.
4. Replace knuckle if it is bent, damaged or cracked.

Installation

1. Install brake drum on axle hub.
2. Install outer bearing cup on axle hub.
3. Pack bearing cone, hub inside and hub cover with new bearing grease.
4. Install grease retainer and inner bearing cone on steering knuckle.
5. Install brake flange plate and knuckle grease retainer cap to steering knuckle.
Torque Spec. 3.5~4 m-kg (25~30ft-lb)
Caution: After tightening nut, install cotter pin.
6. Install brake shoes and brake shoe return spring.
7. Install tie-rod end on steering knuckle arm.
Torque Spec. 4.2~5 m-kg (30~36 ft-lb)
Caution: After tightening nut, install cotter pin.
8. Connect brake flexible hose.
9. Install axle hub on steering knuckle.
10. Install outer bearing knuckle washer and knuckle nut.
11. Adjust wheel bearing preload.
 Tighten knuckle nut fully. If the nut lines up with the hole in the knuckle, back off the nut (1/6 turn) until the next slot in the nut lines up with the same hole in the knuckle.
Caution: After adjusting preload, lock knuckle nut with cotter pin.
12. Install axle hub cover.
13. Install wheel and wheel cap.
14. Lower the vehicle.
15. Bleed air of wheel cylinder and adjust front end alignment.

FRONT SUSPENSION

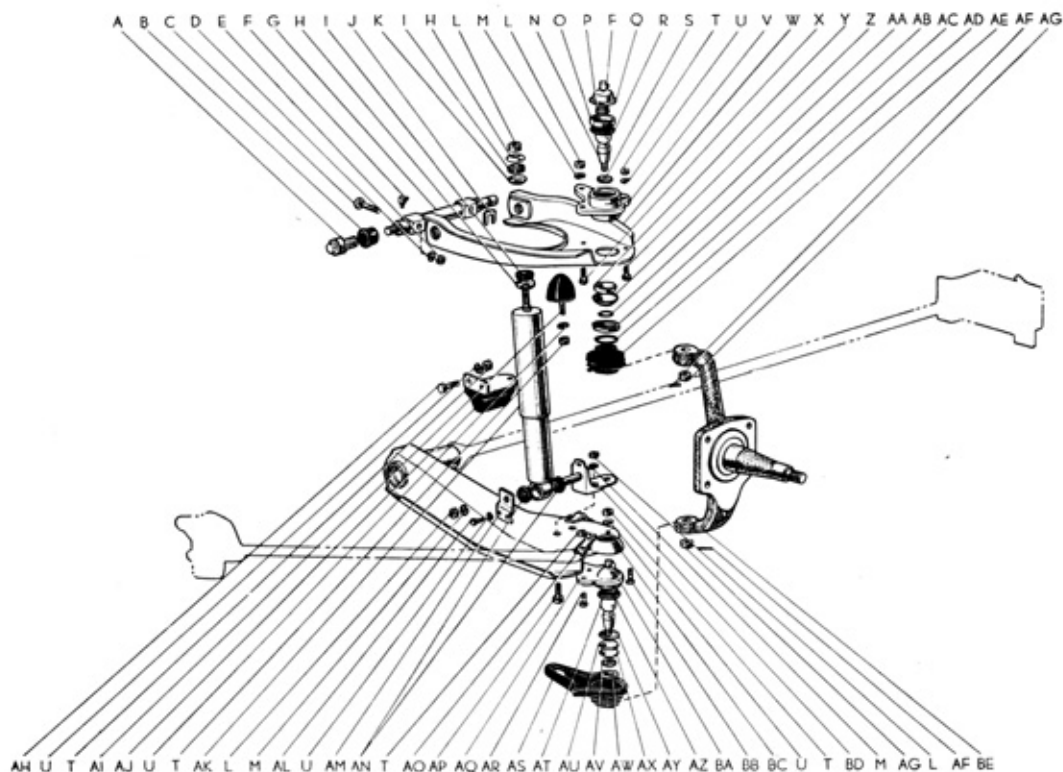


Fig. 6-10 Front Axle Link & Steering Knuckle

- | | | | |
|---|--|----|---|
| A | Upper Suspension Arm Inner Pivot Bushing | T | Nut |
| B | Suspension Arm Inner Pivot Bushing Dust Seal | U | Spring Washer |
| C | Upper Suspension Arm Set Bolt | V | Upper Ball Joint Socket |
| D | Spring Washer | W | Upper Suspension Arm Complete |
| E | Nut | X | Bolt |
| F | 90° Bend Small Grease Nipple | Y | Upper Ball Joint Dust Seal Inner Plate |
| G | Upper Suspension Arm Shaft | Z | Bolt |
| H | Shock Absorber Cushion Rubber Retainer | AA | Upper Ball Joint Dust Seal Outer Plate |
| I | Shock Absorber Cushion Rubber | AB | Upper Ball Joint Dust Seal Compression Rubber |
| J | Camber Adjusting Shim | AC | Upper Ball Joint Dust Cover Holder |
| K | Retainer (For Front Shock Absorber Cushion Rubber) | AD | Upper Ball Joint Dust Cover Clip |
| L | Nut | AE | Upper Ball Joint Dust Cover |
| M | Spring Washer | AF | Cotter Pin |
| N | Upper Ball Joint Stud | AG | Nut |
| O | Upper Ball Joint Spring Seat | AH | Bolt |
| P | Upper Ball Joint Spring | AI | Front Rebound Bumper Complete |
| Q | Upper Ball Joint Plug | AJ | Front Compression Bumper Complete |
| R | Upper Ball Joint Upper Seat | AK | Front Shock Absorber |
| S | Upper Ball Joint Lower Seat | AL | Bolt |

- | | | | |
|----|---|----|---|
| AM | Front Shock Absorber Lower Front Bracket | AW | Lower Ball Joint Dust Cover Holder |
| AN | Shock Absorber Pivot Bushing | AX | Lower Ball Joint Dust Seal Outer Plate |
| AO | Ball Joint Socket Bolt Lock Plate | AY | Lower Ball Joint Cap |
| AP | Bolt | AZ | Lower Ball Joint Seat |
| AQ | Lower Ball Joint Socket | BA | 75.5° Bend Small Grease Nipple |
| AR | Ball Joint Socket Bolt | BB | Ball Joint Socket Bolt |
| AS | Lower Ball Joint Dust Cover | BC | Lower Suspension Arm Complpta |
| AT | Lower Ball Joint Stud | BD | Front Shock Absorber Lower Bracket Complete |
| AU | Lower Ball Joint Dust Seal Inner Plate | BE | Steering Knuckle |
| AV | Lower Ball Joint Dust Seal Compression Rubber | | |

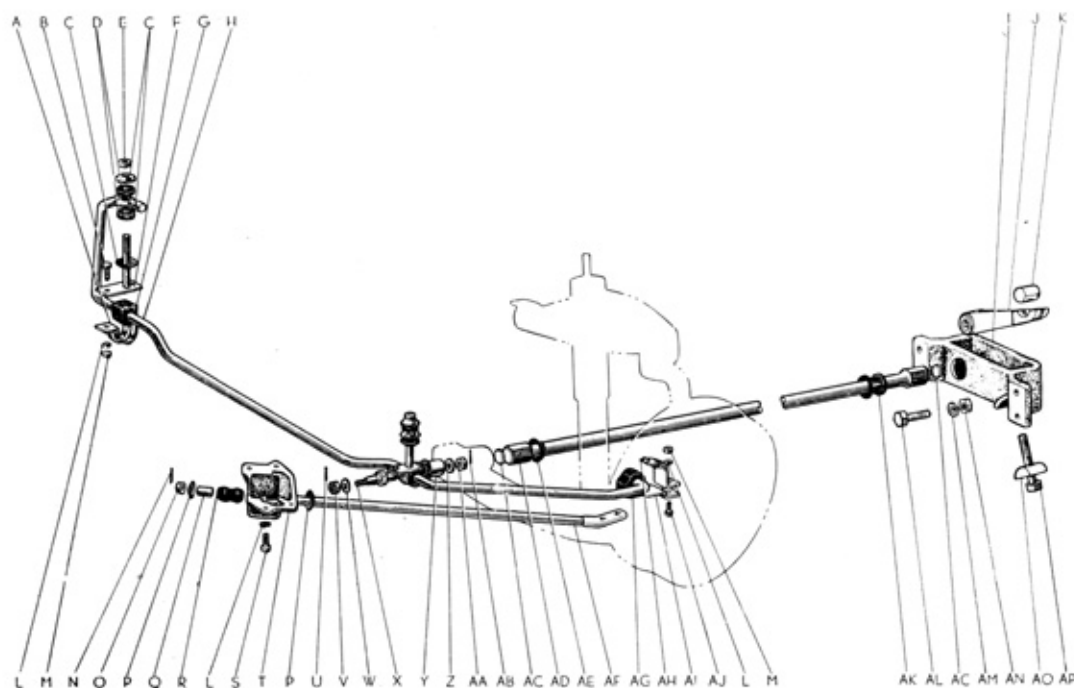


Fig. 6-11 Torsion Bar Spring & Front Strut Bar

- | | | | |
|---|---|----|---|
| A | Stabilizer Support Cover Plate | R | Front Strut Bar Bushing |
| B | Bolt | S | Bolt |
| C | Retainer (For Stabilizer Support Link Cushion Rubber) | T | Front Strut Bar Bracket |
| D | Cushion Rubber (Fore Stabilizer Support Link) | U | Cotter Pin |
| E | Nut | V | Nut |
| F | Stabilizer Support Link Complete | W | Plate Washer |
| G | Stabilizer Support Rubber | X | Lower Suspension Arm Shaft |
| H | Stabilizer | Y | Lower Suspension Arm Bushing Complete |
| I | Anchor Bracket | Z | Lower Suspension Arm Shaft Plate Washer |
| J | Anchor Arm | AA | Nut |
| K | Anchor Arm Swivel | AB | Cotter Pin |
| L | Spring Washer | AC | Torsion Bar Spring Rubber Thrust Washer |
| M | Nut | AD | Torsion Bar Spring |
| N | Cotter Pin | AE | Torsion Bar Spring Front Cover |
| O | Nut | AF | Front Strut Bar |
| P | Front Strut Bar Bushing Retainer | AG | Stabilizer End Support Rubber |
| Q | Front Strut Bar Bushing Inner Pipe | AH | Stabilizer End Support Cover Plate |

AI Stabilizer End Support Plate
 AJ Bolt
 AK Torsion Bar Spring Rear Cover
 AL Bolt

AM Spring Washer
 AN Nut
 AO Anchor Arm Adjusting Bolt Seat
 AP Anchor Arm Adjusting Bolt

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UPPER SUSPENSION ARM ASSEMBLY

Removal

1. Jack up lower suspension arm, then place stand under the vehicle.
2. Remove wheel cap and wheel.
3. Remove front shock absorber.
4. Remove steering knuckle from upper ball joint.

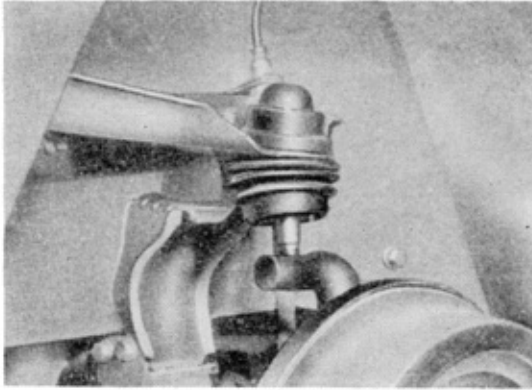


Fig. 6-12 Removing Steering Knuckle

5. Remove two nuts retaining upper suspension arm shaft to body. Note number and kinds of shims at each bolt.

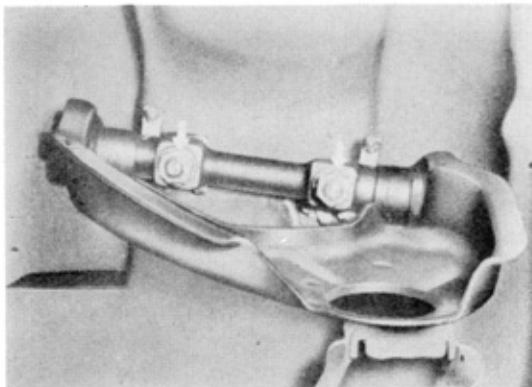


Fig. 6-13 Removing Upper Suspension Arm Shaft Nuts

6. Remove upper suspension arm from vehicle.

Installation

1. Install upper suspension arm on vehicle.

2. Install two nuts retaining upper suspension arm shaft to body.

Install same number and kinds of shims as removed at each bolt, and tighten nut.

Torque Spec. 5.8~6.4 m·kg (42~46 ft·lb)

3. Install upper ball joint through steering knuckle, install nut, tighten securely and install cotter pin.

Torque Spec. 11~12.5 m·kg (80~90 ft·lb)

4. Install front shock absorber.
5. Install wheel and wheel cap.
6. Lower vehicle to floor.

UPPER SUSPENSION ARM & ARM SHAFT (OLD TYPE)

Disassembly

1. Remove dust cover and plate washer outer, and remove inner pivot bushing.
2. Remove upper suspension arm shaft from suspension arm.
3. Remove shaft collar.
4. Remove nylon bushing, inner plate washer and inner dust cover.

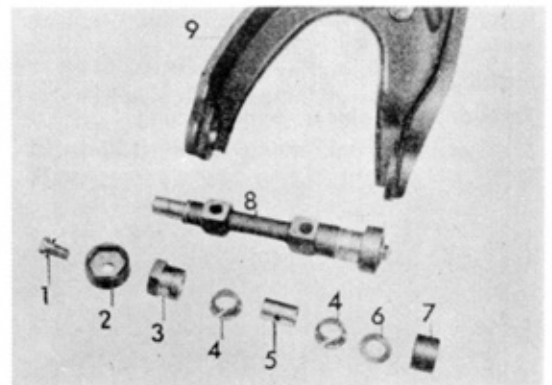


Fig. 6-14

1. Bolt
2. Dust Cover Outer & Plate Washer Outer
3. Inner Pivot Bushing
4. Nylon Bushing
5. Shaft Collar
6. Plate Washer Inner

7. Dust Cover Inner
8. Upper Suspension Arm Shaft
9. Upper Suspension Arm

Inspection

1. Replace upper suspension arm if it is cracked, bent or damaged.
2. Replace upper suspension arm shaft if it is bent or cracked.
3. Check screw of inner pivot bushing, if found defective replace inner pivot bushing.
4. Replace nylon bushing if it is worn or damaged.

Assembly

1. Install inner dust covers and inner plate washers on arm shaft and insert them into upper suspension arm.

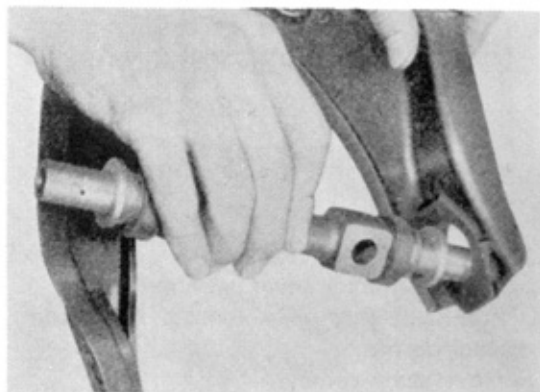


Fig. 6-15 Installing Arm Shaft

2. Assemble shaft collar, nylon bushings and inner pivot bushing and install them on suspension arm and tighten inner pivot bushing.

Torque Spec. Inner pivot bushing
15~17 m-k g (110~120 ft-lb)

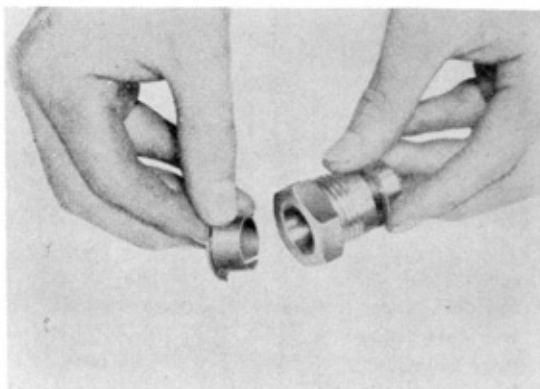


Fig. 6-16 Assembling Nylon Bushing

3. Install plate washer and dust cover, and tighten nut.

Torque Spec.

3.8~4.2 m-k g (28~30 ft-lb)

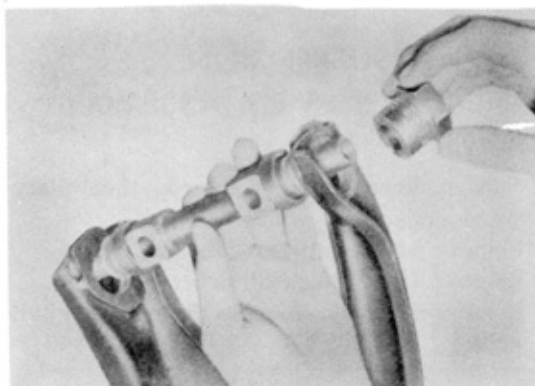


Fig. 6-17 Installing Inner Pivot Bushing

(NEW TYPE)

Disassembly

1. Remove upper suspension arm inner pivot bushings.
2. Remove inner pivot bushing dust seals.
3. Remove upper suspension arm shaft.

Inspection

1. Replace upper suspension arm if it is cracked, bent or damaged.
2. Replace upper suspension arm shaft if it is bent or cracked.
3. Check screw of inner pivot bushing, if found defective replace inner pivot bushing.

Assembly

1. Install upper suspension arm shaft into upper suspension arm.
2. Install inner pivot dust seals.
3. Install inner pivot bushings on upper suspension arm.

Torque Spec.

15~17 m-k g (110~120 ft-lb)

UPPER BALL JOINT

Disassembly

1. Remove nuts and bolts attaching upper

ball joint to upper suspension arm.

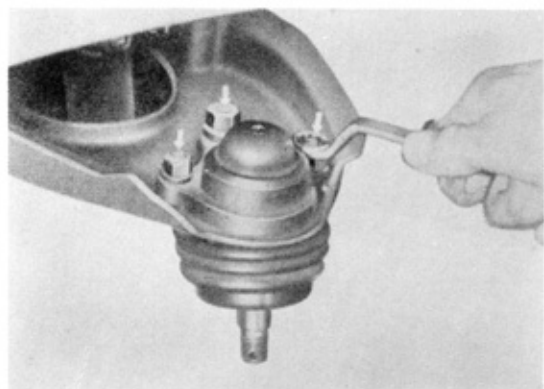


Fig. 6-18 Removing Three Nuts

2. Remove dust cover clip.
3. Remove upper ball joint dust cover with dust cover holder and compression rubber.
4. Remove dust seal outer plate and inner plate.
5. Remove upper ball joint socket from upper suspension arm.

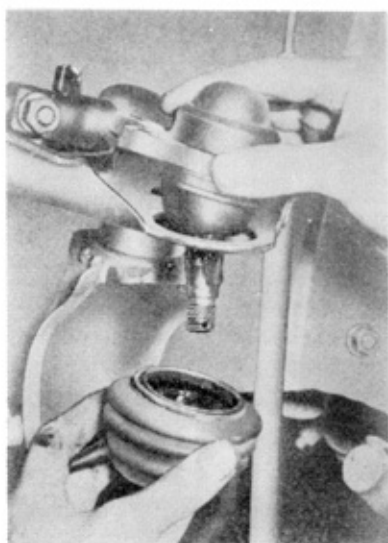


Fig. 6-19 Removing Ball Joint Socket

Inspection

Caution: Upper ball joint and lower ball joint must be replaced as one set.

1. Check ball joint socket for crack or damage, if found defective replace ball joint assembly.
2. Check torque to turn ball joint stud, if it is under 0.3 m-kg (2 ft-lb), replace the ball joint assembly.

3. Replace dust cover and compression rubber if they are damaged or worn out.

Assembly

1. Install upper ball joint socket, nuts and bolts.
2. Install dust seal inner plate and outer plate.
3. Install upper ball joint dust cover, dust cover holder and compression rubber.
4. Install dust cover clip.

LOWER SUSPENSION ARM ASSEMBLY

Removal

1. Jack up front crossmember.
2. Remove wheel cap and wheel.
3. Remove tie-rod end from steering knuckle arm using Tie-rod End Puller (RT20 SST-2083).

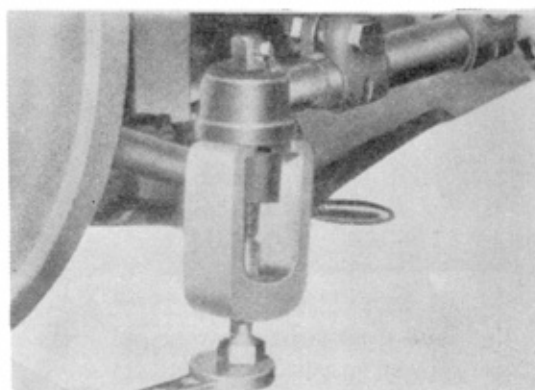


Fig. 6-20 Removing Tie-rod End

4. Remove front strut bar and stabilizer.

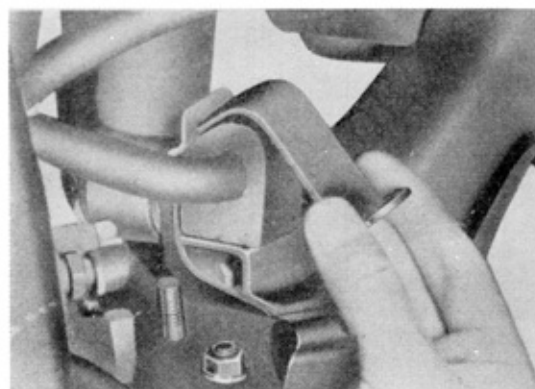


Fig. 6-21 Removing Stabilizer

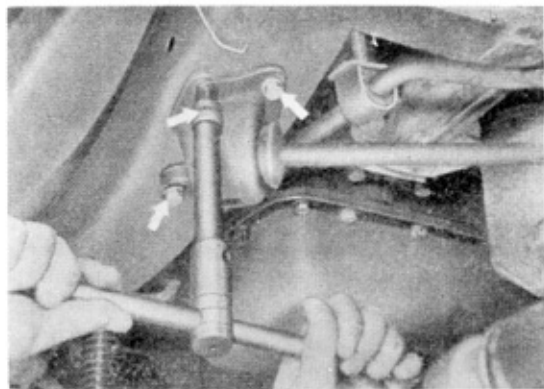


Fig. 6-22 Removing Strut Bar

5. Remove front shock absorber.
6. Loosen anchor arm adjusting bolt to unscrew the torsion bar twist.
7. Remove anchor bracket.



Fig. 6-23 Removing Anchor Bracket

8. Pull out torsion bar to rear to remove from lower suspension arm.

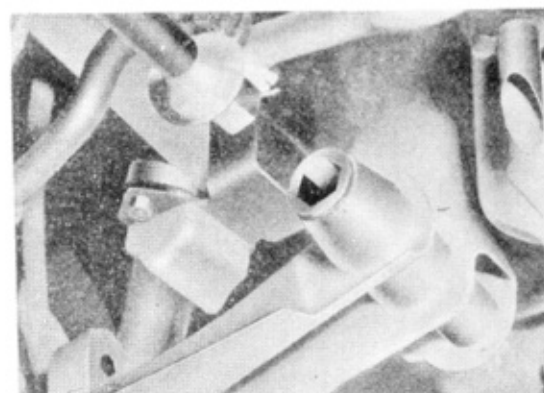


Fig. 6-24 Removing Torsion Bar

9. Disconnect lower suspension arm from lower ball joint.
10. Remove lower suspension arm from front

suspension bracket.

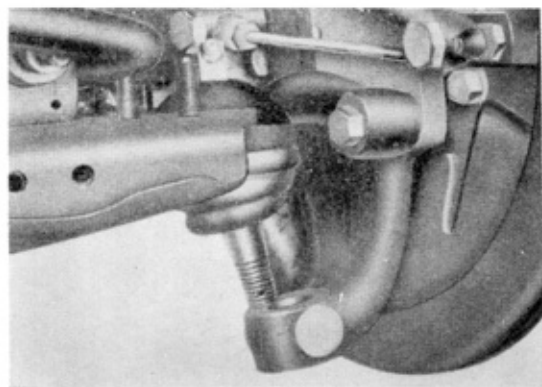


Fig. 6-25 Disconnecting Lower Suspension Arm

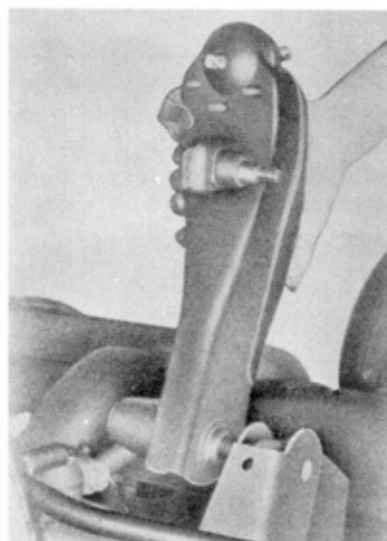


Fig. 6-26 Removing Lower Suspension Arm

Installation

1. Install lower suspension arm on front suspension bracket loosely.
2. Connect lower suspension arm to lower ball joint. After tightening nut, install cotter pin.

Torque Spec.

11~12.5 m·kg (80~90 ft·lb)

3. Hold lower suspension arm horizontally, tighten lower suspension arm shaft nut and install cotter pin.

Torque Spec. Arm Shaft to Bracket

12~13 m·kg (87~96 ft·lb)

Caution: Under standard load, it must not be found twist at rubber of lower suspension bushing.

4. Put rubber thrust washer into lower suspension arm coupling, then insert torsion bar spring.

Caution: Take care not to misinstall right and left torsion bar spring.

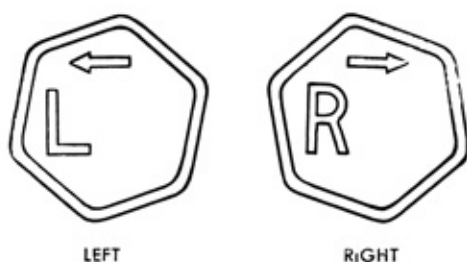


Fig. 6-27 Torsion Bar Spring

Install anchor bracket.

Torque Spec.

3.8~4.2 m·kg (27~30 ft·lb)

Note:

1. Install rubber thrust washer at the top of the torsion bar spring.
2. Loosen anchor arm adjust bolt fully, install the anchor arm to the torsion bar spring holding the top of the anchor arm at the highest position.
5. Tighten anchor arm adjusting bolt to produce twist on torsion bar spring.

Adjusting Bolt Standard Tightening Measurement

64 mm (2.56")

(From adjusting bolt seat surface to the center of the anchor arm swivel.)

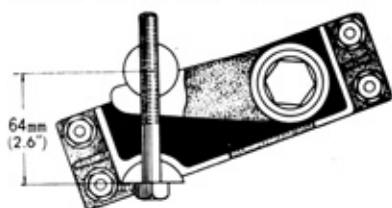


Fig. 6-28

6. Install front shock absorber.
7. Install front strut bar.

Torque Spec.

Strut Bar to Front Crossmember

1.4~1.6 m·kg (10~12 ft·lb)

8. Install stabilizer.
9. Install tie-rod end on knuckle arm and install cotter pin.

Torque Spec. 4.2~5 m·kg (30~36 ft·lb)

10. Install wheel and wheel cap.
11. Lower vehicle to floor.
12. Adjust the vehicle height.

VEHICLE HEIGHT ADJUSTMENT (FRONT)

Measure the distance from the floor to the center of the lower suspension arm shaft.

Standard vehicle height

under the standard load

214 mm (8½")

under the no load 240 mm (9½")

Caution:

1. Inflation pressure of all tires must be 1.5 kg/cm² (22 lb/in²).
2. When measuring the vehicle height, place the vehicle on a level floor, bounce and rock the car several times and allow it to settle to a normal height.

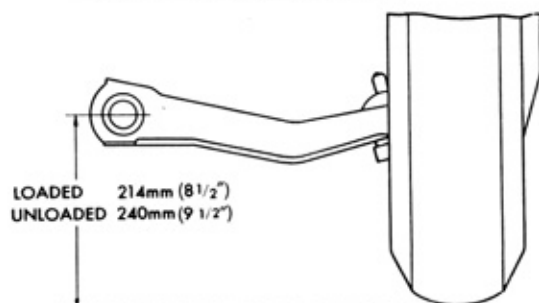


Fig. 6-29 Standard Vehicle Height

Vehicle height adjustment is made by the anchor arm adjusting bolt.

- a. Tighten bolt to raise vehicle height.
- b. Loosen bolt to lower vehicle height.

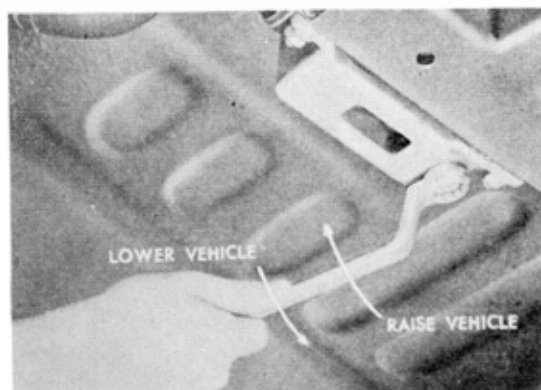


Fig. 6-30 Vehicle Height Adjustment

LOWER BALL JOINT

Disassembly

1. Remove lower ball joint socket from lower suspension arm.

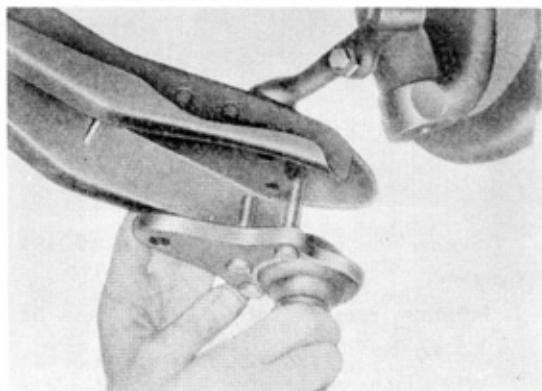


Fig. 6-31 Removing Ball Joint Socket

2. Remove lower ball joint dust cover with dust cover holder and compression rubber.
3. Remove dust seal outer plate and inner plate.

inspections

Inspections are the same as the upper ball joint.

Assembly

1. Assemble dust seal inner plate and outer plate.
2. Assemble dust cover, holder and compression rubber.
3. Install lower ball joint socket on lower suspension arm.

LOWER SUSPENSION ARM & ARM SHAFT

Removal

1. Press out lower suspension arm shaft with arm bushing using a press.
2. Remove nut and plate washer, pull out arm bushing from arm shaft.

Inspection

1. Replace lower suspension arm if it is bent, cracked or damaged.
2. Check fitting condition between lower suspension arm and bushing, if found

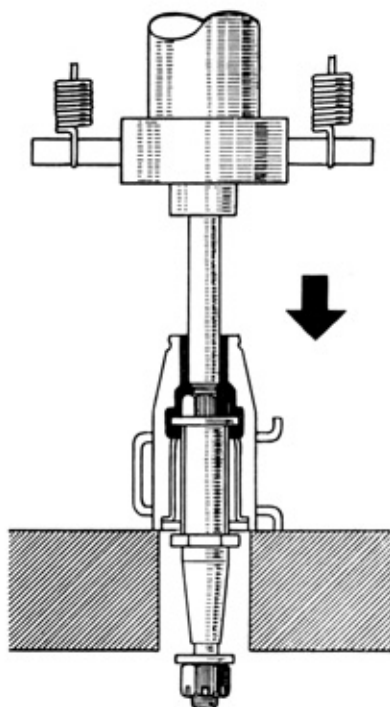


Fig. 6-32 Pressing Out Lower Suspension Arm Shaft defective, replace bushing.

3. Replace lower suspension arm bushing, if there is looseness between inner pipe and rubber parts, or if rubber parts is damaged.

Installation

1. Insert arm shaft to arm bushing.
2. Install arm shaft plate washer nut and install cotter pin.

Torque Spec.

13.4~14.8 m·kg (97~107 ft·lb)

3. Press lower suspension arm shaft and bushing into lower suspension arm.

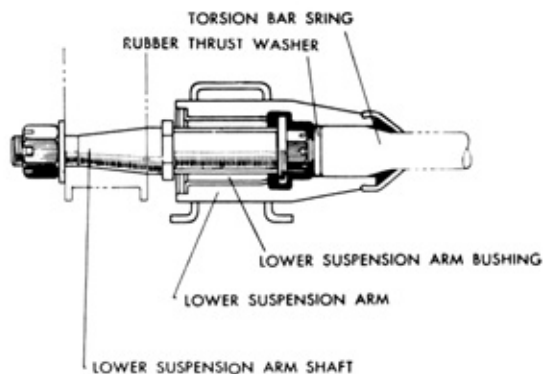


Fig. 6-33 Lower Suspension Arm Shaft

FRONT STRUT BAR

Removal

1. Remove nut and bushing retainer.
2. Pull out strut bar.
3. Remove strut bar bushing and inner pipe.

Inspection

1. Replace front strut bar if it is bent or damaged.
2. Replace front strut bar bracket if it is damaged.
3. Replace strut bar bushing if it is damaged or worn out.

Installation

1. Insert strut bar bushing into bracket.
2. Insert bushing inner pipe.
3. Insert strut bar, install bushing retainer and nut.
Torque Spec. 4~4.4 m·kg (29~32 ft·lb)
4. Install cotter pin.

TORSION BAR SPRING & ANCHOR ARM

Inspection

1. Replace torsion bar spring if it is bent or cracked.
2. Replace anchor arm, adjusting bolt, swivel, bolt seat or anchor bracket if they are cracked or damaged.

STEERING KNUCKLE

Inspection

Check steering knuckle for crack. If found defective replace it.

FRONT SHOCK ABSORBER

Inspection

1. Replace front shock absorber if it does not operate properly.
2. Replace bracket if it is damaged.
3. Replace strut bar bushing if it is damaged or worn out.