

# SUSPENSION

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### DESCRIPTION

The suspension system employs coil springs front and rear. Ball joints are used on the steering knuckle at the outer ends of the upper and lower control arms.

The rear suspension consists of a basic four-link suspension, made up of two lower control arms, one on each side, and two upper control arms which are held by pivot bolts at the rear axle and frame cross member.

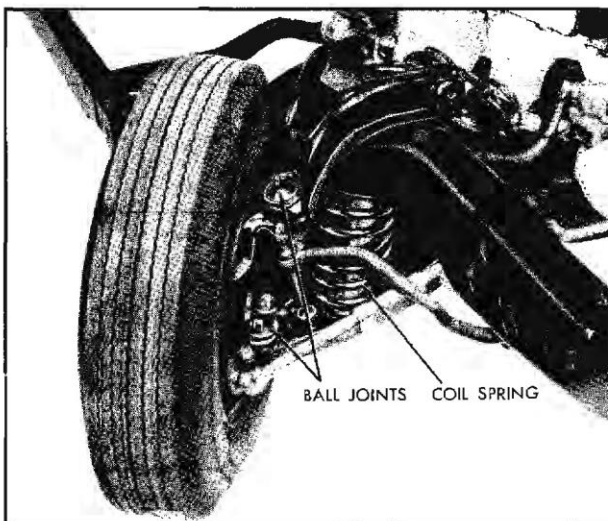


Fig. 3-1 Front Suspension Ball Joints

### FRONT SUSPENSION

The ball joints, located at the outer ends of the upper and lower controls arms (Fig. 3-1), serve as pivot points for both the vertical movement of the wheel and rotation of the steering knuckle. The ball joint assemblies have a "fixed boot" grease seal for protection against dirt and water entry (Fig. 3-2). The spherical joints take thrust from any angle. The steering knuckles and spindles are of integral design and the brake cylinders are rigidly attached to the knuckles with the backing plate serving principally as a support for brake shoes and as a protective cover (Fig. 3-3).

Rubber bushings at the inner ends of the upper

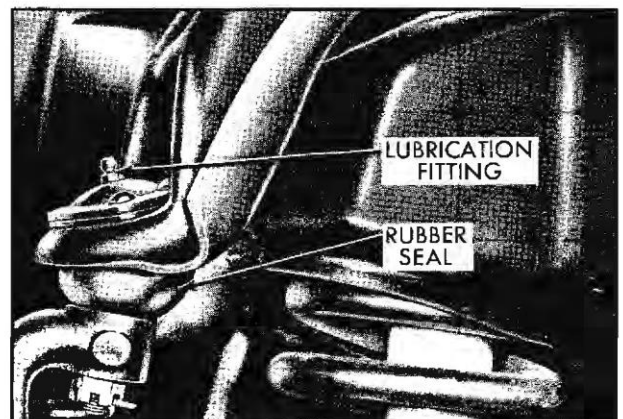


Fig. 3-2 Upper Control Arm Lubrication Fitting

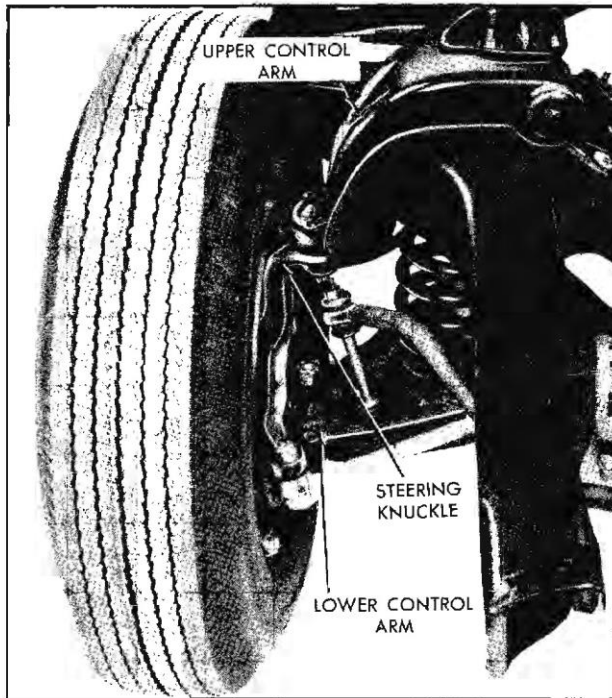


Fig. 3-3 Attachment of Front Suspension to Wheel control arms pivot on shafts attached to the car frame. Caster and camber adjustments are made with shims at this point (Fig. 3-4).

The inner ends of the lower control arms are rubber mounted to the front cross member and frame brackets thus avoiding metal to metal contact.

The upper ends of the front coil springs seat in the frame side members; the lower ends of these springs rest on the lower control arms (Fig. 3-1).

A direct acting double action shock absorber is carried inside each front coil spring. The upper

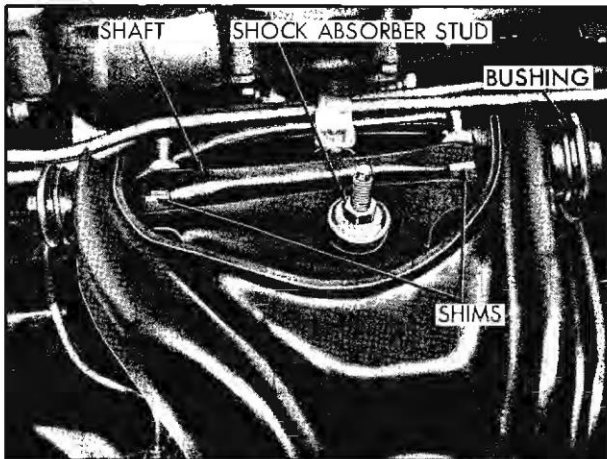


Fig. 3-4 Shimming of Upper Control Arm

stud of the shock absorber is fastened to a bracket on the frame by a nut. The lower end of shock absorber is attached to the lower control arm with two bolt and washer assemblies. Noise insulation is provided by rubber bushings which fit over the shock absorber upper studs to prevent metal to metal contact between each stud and metal bracket.

A stabilizer shaft, mounted in rubber to the frame forward of the front springs and connected to the lower control arms by links at each end, provides roll stability (Fig. 3-5).

Rubber bumpers attached to the frame below the upper control arm cushion downward movement of the suspension system, and bumpers attached to the front lower control arms cushion the upward movement.

### REAR SUSPENSION

The two rear axle upper control arms and two lower control arms (Fig. 3-6) form the basic links of rear suspension. The function of the control arms is to keep the geometry relationship of the rear axle with respect to the frame, provide for optimum handling and oppose torque reaction on both acceleration and braking.

Rubber bushings are used at all connecting pivot points of the two upper and two lower control arms.

The upper ends of rear springs are retained in seats welded to the frame while the lower ends are attached to brackets welded to the rear axle (Fig. 3-7).

Direct acting double action shock absorbers are mounted with upper ends inclined toward center of

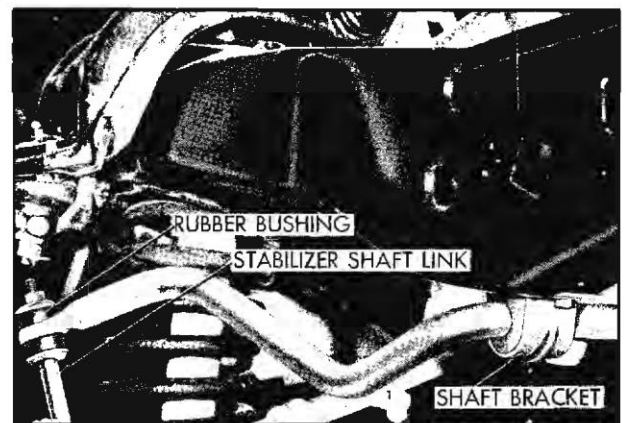


Fig. 3-5 Stabilizer Shaft Assembly

car. Rubber bumpers, attached to the rear axle, cushion extreme downward movement of the frame and body.

### PERIODIC SERVICE

Periodic service of the suspension system consists of regular lubrication as outlined in the GENERAL LUBRICATION section.

Lubrication fittings are provided at the front suspension ball joints for service lubrication at the recommended interval. Grease seals are constructed with one-way relief valves which provide for the escape of old grease and a thorough flushing of the joints on being lubricated. Shock absorbers do not require lubrication and, in case of leaks or malfunction, they should be replaced.

### ADJUSTMENTS AND CHECKS ON CAR

The following adjustments and checks are made with the suspension parts on the car:

#### CHECK AND ADJUST FRONT WHEEL BEARINGS

*NOTE: Tapered roller bearings have a slightly loose feel when properly adjusted. This differs from ball bearings which may be pre-loaded without adverse effect. Tapered roller bearings can be damaged by the steady thrust on roller ends which comes from pre-loading.*

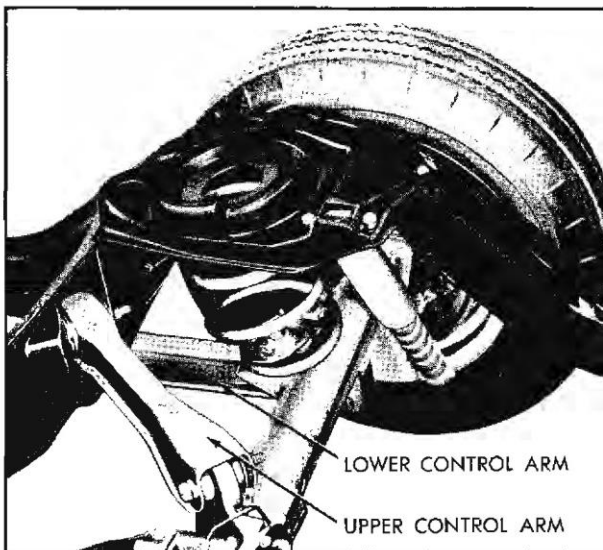


Fig. 3-6 Upper and Lower Rear Control Arms

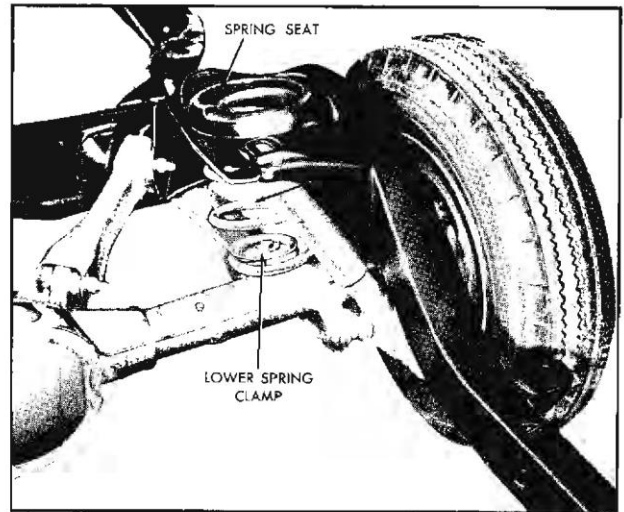


Fig. 3-7 Position of Rear Coil Spring

To Check:

1. Place lift or car jack under lower frame front cross member and raise wheel off floor. This will maintain load on the ball joints.
2. Spin wheel to check for unusual noise.
3. Grip tire at top and bottom and rock. If movement of tire at outer edge exceeds 1/4", the wheel bearing may be excessively loose. If bearings are noisy or looseness is excessive, they should be cleaned and inspected prior to adjustment.

TORQUE WRENCH METHOD (Preferred)

1. Remove dust cap.
2. Check for slip fit of bearing cones on spindles. Bores of bearing cones should have a light coat of wheel lubricant to allow cones to creep on spindle.
3. If nut turns hard on spindle, check for and remove any burrs from spindle threads and cotter pin holes or key slot in nut.
4. With tire off ground, adjust bearing as follows:
  - a. While rotating tire, tighten nut with torque wrench to approximately 10-12 lb. ft. to insure all parts are properly seated.
  - b. Back off nut one flat (1/6) of a turn. If locking holes line up, insert cotter pin. If holes do not line up, continue to back off the adjusting nut to the nearest locking hole. Final adjustment should be

one flat to 1-1/2 flats backed off from the initial tightened position. This should result in the desired limits of .001"-.010" end play. Nut should be finger loose.

c. Clinch cotter pin and cut off extra length to ensure ends will not interfere with static collector or dust cap.

5. Install dust cap and lower tire to ground.

#### HAND FEEL METHOD (Optional)

1. Remove dust cap.

2. Check for slip fit of bearing cones on spindles. Bores of bearing cones should have a light coat of wheel bearing lubricant to allow cones to creep.

3. If nut turns hard on spindle, check for and remove any burrs from spindle threads and cotter pin holes or key slots in nut.

4. With tire off ground, adjust as follows:

a. Tighten nut with 8" or 10" wrench using enough arm length leverage to ensure parts are properly seated while spinning wheel.

b. Back off nut finger loose, then tighten finger tight.

c. If hole in spindle lines up with slot in nut, install cotter pin. If not, back off to next slot and install cotter pin.

d. Clinch cotter pin and cut off extra length to ensure ends will not interfere with static collector or dust cap.

5. Install dust cap and lower tire to ground.

#### CHECK BALL JOINTS

1. Check and lubricate all ball joints. Insure that lubricant used meets current Pontiac extended interval specifications.

2. Raise car at the lower control arm, supporting outside of the spring seat, so that the upper control arm is not touching rebound rubber bumper and front wheels are free from contact with lift or floor.

3. Remove dust cap, wheel bearing nut cotter pin, and temporarily tighten nut just enough to remove all end play from wheel bearings.

*CAUTION: It is imperative that the wheel bearing nut be loosened and the wheel bearing readjusted according to the procedure outlined under "Check and Adjust Front Wheel Bearing," after the ball joint check is completed.*

4. Check movement of each front wheel by moving top and bottom of tire in and out, using sufficient hand load to take up any clearance, but not in excess to deform tire or suspension parts. An excess of 1/4" travel (measured at the periphery of the tire) indicates a worn or loose wheel bearing, worn ball joints, looseness at the upper or lower control arm shafts, or a combination of all these. When moving tire, as mentioned above, observe each ball joint and each bushing on upper arm shaft to check each part independently for looseness.

5. If above check indicates looseness, check wheel bearings using torque wrench or hand feel method. Replace bearings if worn excessively.

6. If wheel bearings or upper arm shafts were not the cause of looseness, use J-6627 ball stud remover to remove the upper ball stud, and disconnect the upper arm from steering knuckle.

7. Make sure that the upper ball joint is properly lubricated, then install a nut (snug against the upper ball joint) and rotate the ball stud in its socket with a torque wrench. If the torque required is less than 1/2 lb. ft. or more than 6 lb. ft. the ball joint should be replaced.

8. Install upper ball stud in knuckle and tighten stud nut to 55-70 lb. ft. torque.

9. If excessive looseness still exists at periphery of tire, then use J-6627 ball stud remover to disconnect lower ball stud from steering knuckle.

*NOTE: It is permissible to support the suspension assembly anywhere on the lower arm.*

10. Install nut on lower ball stud and check for excessive wear or looseness by measuring the ball joint end play.

a. When the ball joint is new, it is permissible to have a maximum of .010" end play.

b. When checking a used or worn ball joint, it is permissible to have a maximum of .060" end play.

11. Replace lower ball joint in control arm, if necessary.

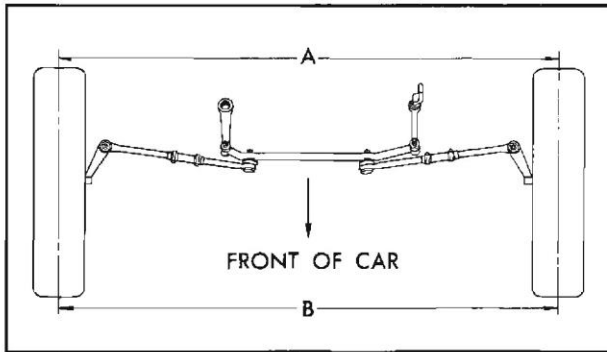


Fig. 3-8 Toe-In

12. Install lower ball stud in knuckle and tighten stud nut to 85-100 lb. ft. torque.

**WHEEL ALIGNMENT—DEFINITIONS**

**TOE-IN**

Toe-in is the drawing together of the front wheels so that they are closer at the front "B" than at the back "A" as shown in Fig. 3-8.

**CASTER AND CAMBER**

Forward tilt of the front ball joints relative to the true vertical is negative caster; backward tilt is positive caster (Fig. 3-9). Camber is the outward tilt of front wheels at top (Fig. 3-10).

**TOE-OUT ON TURNS**

Toe-out on turns is the relationship between front wheels on turns (Fig. 3-11). Since the front wheels

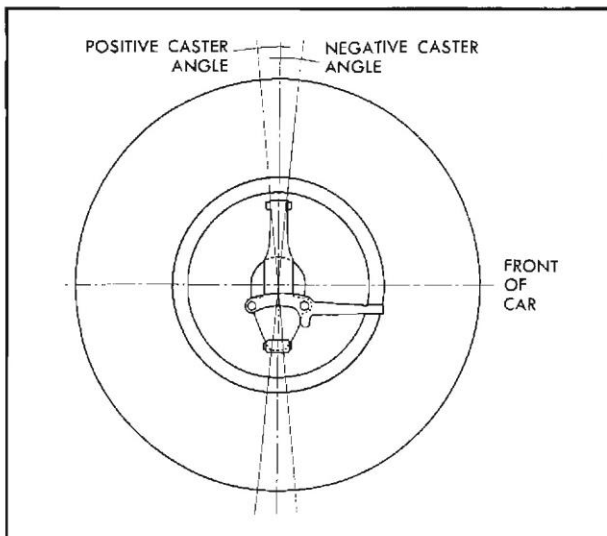


Fig. 3-9 Caster Angle

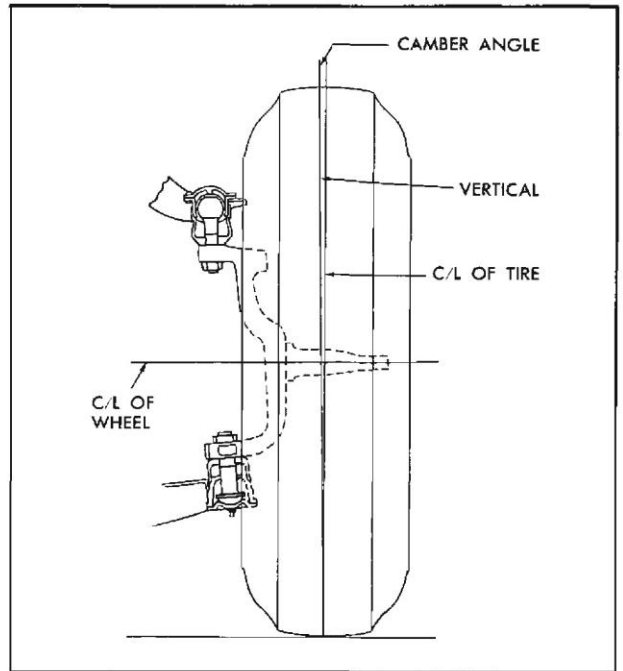


Fig. 3-10 Camber Angle

must turn on different radius circles, the steering arms are inclined inward at the back to provide the correct turning angles in degrees.

**INSPECTION BEFORE CHECKING FRONT WHEEL ALIGNMENT**

Before any checking or corrective work is started on wheel alignment elements, including toe-in, caster, camber and toe-out on turns, the following items which will affect steering should be considered:

1. Check tire inflation and bring to recommended pressure.

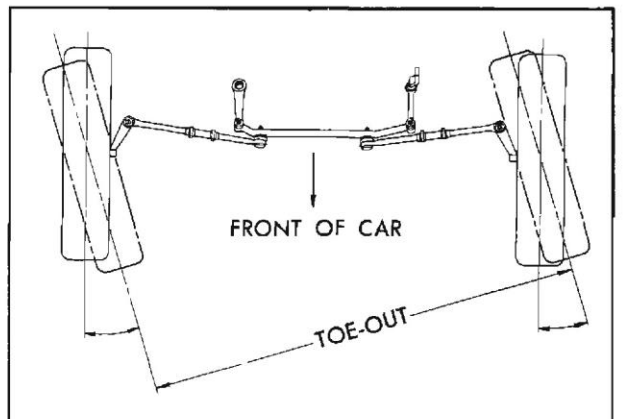


Fig. 3-11 Toe-Out on Turns

2. Check front wheel bearing adjustment and correct if necessary.
3. Check wheel and tire run-out and balance.
4. Check ball joints.
5. Check steering linkage for looseness. Replace or tighten parts.
6. Check shock absorbers for leaks or lack of control.
7. Check for extraordinary load in car. Remove load or compensate by setting height. (Samples, tools, etc., carried regularly should not be considered extraordinary load.)
8. The suspension parts must be at normal curb load position before alignment. Curb load is defined as car with full tank of gasoline and unoccupied.

To determine whether car is at normal curb load, compare height measurement on the car in question with others of the same body style and having comparable equipment. The front and rear of car should be jounced up and down, decreasing the amount of movement until the suspension parts are equalized, before any measurements are made.

#### CHECK AND SET TOE-IN

Check and set toe-in (see SPECIFICATIONS) with a trammel or with other reputable front end aligning equipment, measuring from sidewall of tire or wheel felloes using methods given below.

#### MEASURING BY TRAMMEL

1. After moving car forward on level floor, chalk tread on both front tires at point 9" above floor.
2. With trammel set at center to center distance of front tires, make mark with chalk on each front tire exactly trammel width apart.
3. Push car forward (never backward) until chalk with trammel marks is 9" above floor at rear of wheels.
4. Measure difference from trammel marks made when chalk was in front of wheel; if trammel marks are now greater than when marked at front, wheels toe-in by this amount (see SPECIFICATIONS).

#### EQUIPMENT MEASURING FROM SIDEWALL OR WHEEL FELLOES

When using this type of equipment, wheel run-out will have a very direct bearing on the readings. Since the allowable run-out is 1/8" the readings could possibly be off as far as 1/8" on each wheel if the effect of run-out is not cancelled. By taking the average of three readings with the wheel rotated 120° for each reading, the error due to wheel run-out can be cancelled. This should be done as follows:

1. After moving the car forward on level floor, take first reading.
2. Mark sidewall of both tires with the number "1" at rear of tire where instrument bears.
3. At 120° intervals (i.e. 1/3 and 2/3 distance around the tire) mark the numbers "2" and "3" on both tires.
4. Jack up and turn wheels until the number "2" is in the position which number "1" occupied when the first reading was taken.
5. Push car back one foot and bring forward to position and take second reading. This reading will then be taken with the instrument bearing 120° around the wheel from where the first reading was taken.
6. Use the same procedure for taking the third reading.
7. Average the three readings to find the actual toe-in.

#### SET TOE-IN

1. Remove horn button and set gear on high point of worm by turning steering wheel until mark on shaft is exactly at top. This mark locates the high point, or middle of gear travel.
2. Loosen tie rod end clamp bolts and turn tie rod tubes an equal amount until toe-in is 0-1/8". Turn right tie rod in direction of rotation of wheels, when car moves forward, to increase toe-in; turn left tie rod in opposite direction to increase toe-in.
3. Make sure front wheels are straight ahead by measuring from a reference point at same place on each side of frame center to front of wheel rims. If measurements are not equal, turn both tie rod tubes in same direction (so as not to change toe-in) until

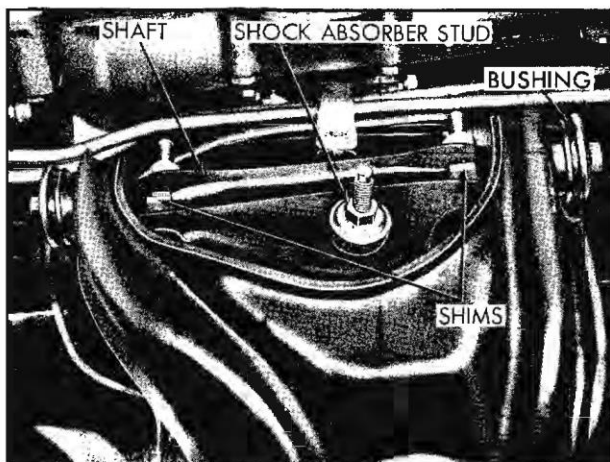


Fig. 3-12 Caster and Camber Shim Location

measurements become equal. Re-check toe-in since toe-in measurement is accurate only with wheels in straight-ahead position.

4. Tighten tie rod adjuster sleeve bolts to 14-20 lb. ft. torque, making sure bolts are to lower rear side of tie rod.

#### ADJUST CASTER AND CAMBER

Caster and camber are adjusted to specifications by placing shims between the upper pivot shafts and the frame (Fig. 3-12). Both adjustments can be made at the same time. In order to remove or install shims, raise car to remove weight from front wheel then loosen the control arm shaft to frame bolts. Addition to camber angle moves top of wheel out-subtraction in.

1. To decrease positive caster add shims to front bolt.
2. To increase positive caster remove shims from front bolt.
3. To increase camber remove shims from both front and rear bolts.
4. To decrease camber add shims to both front and rear bolts.
5. Compensate for drift to right due to road camber by setting left camber angle  $1/4^\circ$  greater than right.

*NOTE: By adding or subtracting an equal amount of shims from front and rear bolts camber will be changed without affecting caster.*

After the correct number of shims have been installed, torque the pivot shaft mounting bolts to 55-75 lb. ft.

#### CHECK TOE-OUT ON TURNS

Check toe-out after any necessary corrections to camber, caster, and toe-in have been made.

1. Check with any reputable front end aligning equipment using full floating turn tables. With front wheels resting on turn tables, turn wheels to left until left wheel has been turned  $20^\circ$  from straight ahead. The right wheel should then be turned  $18^\circ$  to  $19^\circ$ .

2. Turn wheels to right until right wheel has been turned  $20^\circ$  from straight ahead. Left wheel should now be turned  $18^\circ$  to  $19^\circ$ .

3. Incorrect toe-out on turns may be caused by other incorrect front end adjustments, but generally indicates bent steering arms which must be replaced.

Replacement of one or both steering arms should be followed by a complete front end check.

### MINOR REPAIRS

#### FRONT WHEEL BEARING REPLACEMENT

1. Insert a brass drift through hub, indexing end of drift with notches in hub shoulder behind bearing cup.
2. Tap lightly on cup, alternating through each notch, to remove cup from hub.
3. Install new bearing cup in hub using Tool J-8849 on the outer race and Tool J-8914 on the inner race. Tool J-8092, Driver Handle must be used with the above installers.
4. Make certain that the cup is not cocked and that it is fully seated against shoulder in hub.

#### FRONT SHOCK ABSORBER—REMOVE AND REPLACE

1. Raise car on hoist, or jack up front end so weight of car is fully off front wheels.
2. Remove nut, retainer and grommet which attach upper end of shock absorber to frame bracket.

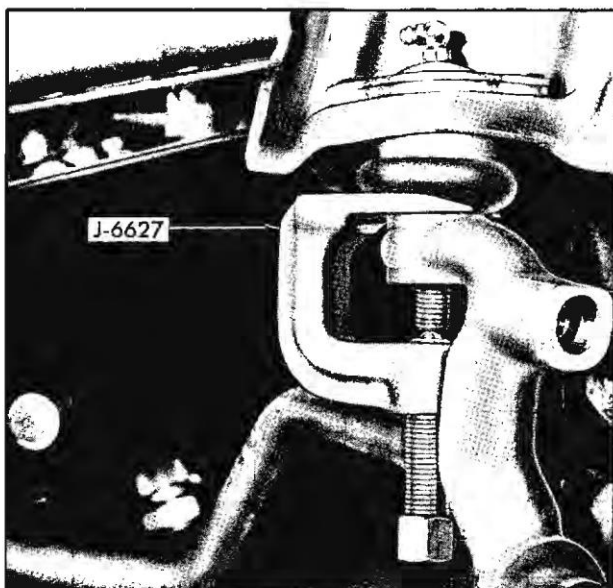


Fig. 3-13 Pressing Ball Stud from Steering Knuckle

*NOTE: Shock absorber piston rod must not turn while loosening nuts. If necessary, use pliers or wrench to hold top of shock absorber stud mounting while removing nuts.*

3. Remove two lower bolts and washer assemblies retaining shock absorber and remove shock absorber through lower control arm.

4. Install by reversing above procedure. Make sure all grommets and retainers are correctly installed.

*NOTE: Upper stud nut must be pre-tightened until it bottoms at end of steel threads.*

5. Tighten upper stud nut 60-120 lb. ft. torque and lower bolts 15-25 lb. ft. torque.

#### **FRONT SPRING—REMOVE AND REPLACE**

1. Raise front end of car supporting so that lower control arm hangs free.

2. Remove wheel.

3. Remove shock absorber.

4. Disconnect stabilizer link from lower control arm.

5. Disconnect tie rod from steering arm.

6. Support under control arm.

7. Disconnect upper and lower ball stud from steering knuckle using tool J-6627 (Fig. 3-13) and remove brake drum and steering knuckle as an assembly.

*CAUTION: Brake line is still connected. Support drum so that line is not damaged.*

*CAUTION: Ball stud rubber seal is not serviced. Removal or damage to seal necessitates replacement of complete ball stud assembly.*

8. Carefully lower arm until spring is free.

9. Install by reversing removal procedure.

Tighten shock absorber lower bolts to 15-25 lb. ft. torque.

Tighten stabilizer link nut to 60-120 lb. in. torque.

Tighten tie rod to steering arm nut to 30-45 lb. ft. torque.

Tighten upper ball stud retaining nuts to 55-70 lb. ft. torque and lower to 85-100 lb. ft. torque.

#### **FRONT UPPER CONTROL ARM, SHAFT AND BUSHINGS—REMOVE AND REPLACE**

1. Place jack under lower control arm, raise wheel off floor and remove.

2. Remove upper ball stud from steering knuckle, using tool J-6627.

3. Remove two bolts and self locking nuts holding control arm shaft to frame and remove arm and shaft assembly.

4. Remove bolts and retainers from pivot shaft ends.

5. Replace one bolt at either end of cross shaft.

6. Set up control arm as shown in Fig. 3-14 and install Spacer J-9502.

7. Invert control arm for bushing removal as shown in Fig. 3-15 with retainer bolt in opposite end of shaft and press out with arbor. Other bushing may be removed in same manner.

8. Install shaft in control arm as follows:

a. Place tool J-7167 in position (Fig. 3-17) and expand until distance between outer faces of arm is 9-3/4" (Fig. 3-16).



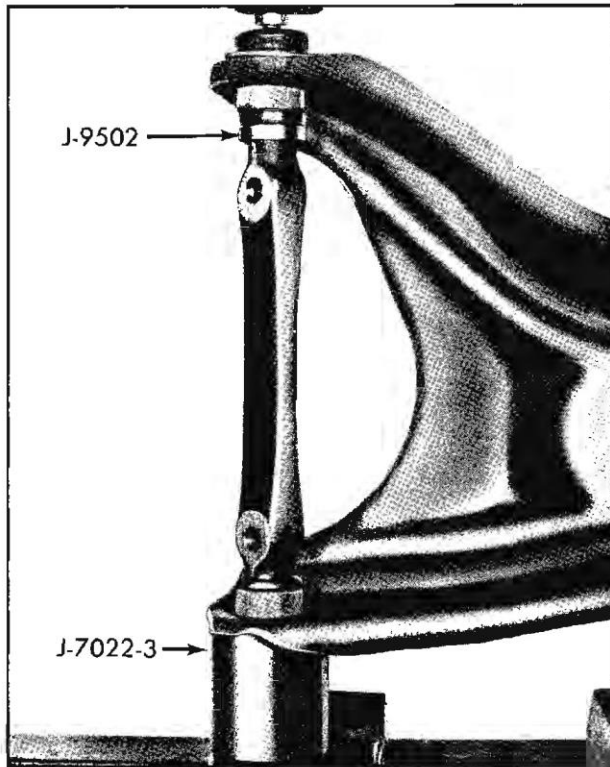


Fig. 3-14 Installing Spacer

- b. Position pivot shaft in control arm.
- c. Insert bushings on ends of shaft.

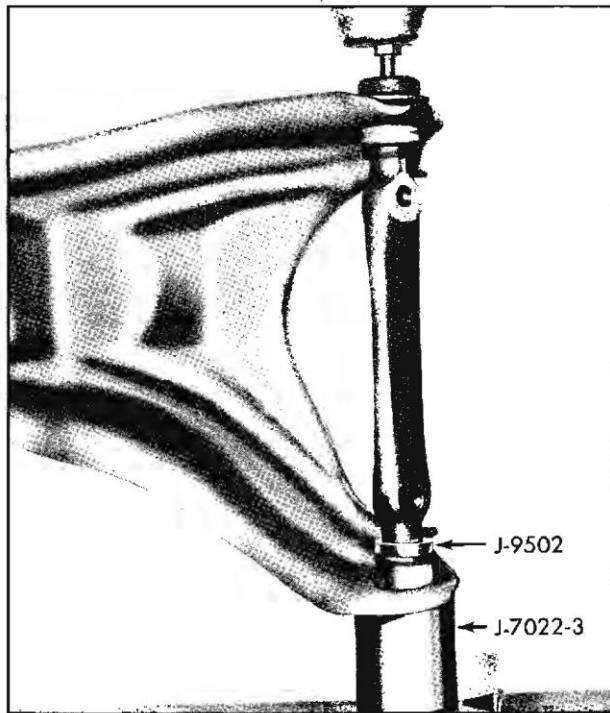


Fig. 3-15 Removing Bushing

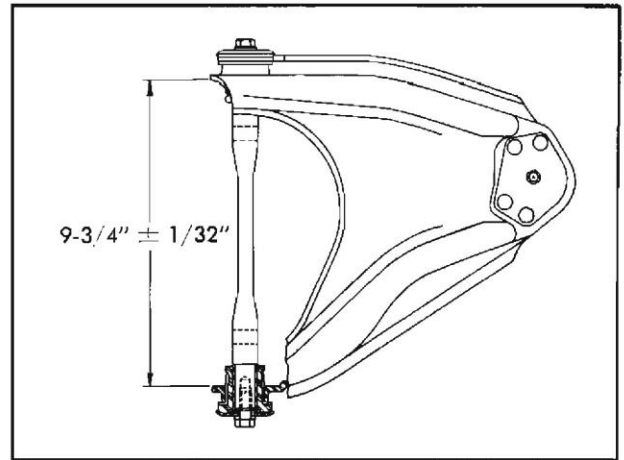


Fig. 3-16 Correct Installation of Upper Control Arm Shaft

- d. Press bushings in control arm with arbor using two J-9502-1 Installers as shown in Fig. 3-17.
- e. Install retainers and nuts on ends of shaft, tighten nuts finger tight.
- f. Line up pivot shaft by rotating shaft in bushing so that frame mounting holes in shaft line up as shown in Fig. 3-16.
- g. Tighten bolts to 35-45 lb. ft. torque.

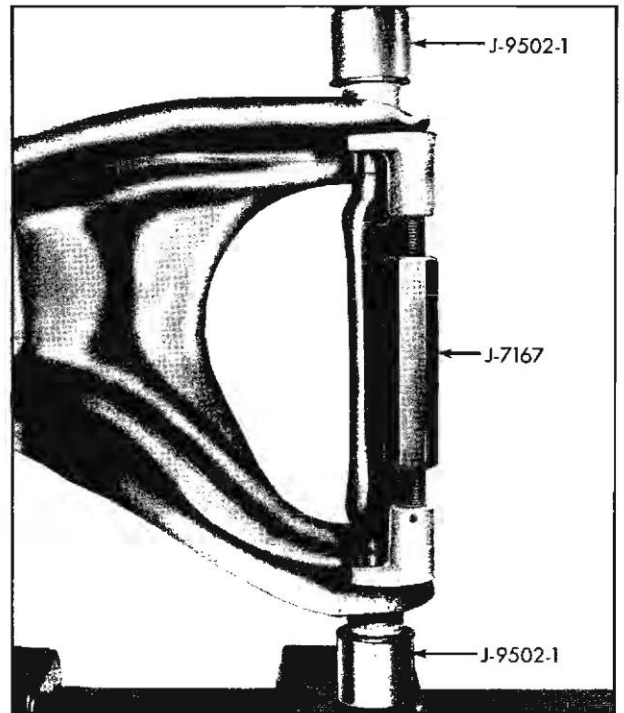


Fig. 3-17 Install Front Upper Control Arm Bushings

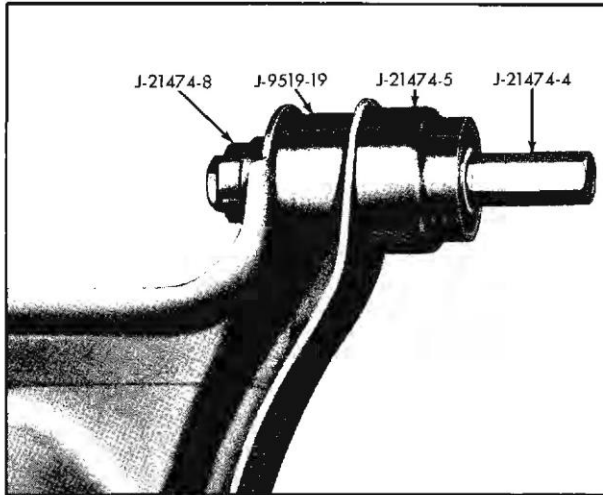


Fig. 3-18 Removing Rear Bushing from Front Lower Control Arm

9. Position upper control arm and shaft on frame cross member and install two bolts and self locking nuts. Tighten nuts to 55-75 lb. ft. torque.

10. Connect upper ball stud to steering knuckle tightening stud nut to 55-70 lb. ft. torque.

11. Replace wheel, lower car and check front wheel alignment.

#### FRONT LOWER CONTROL ARM— REMOVE AND REPLACE

1. Remove spring as outlined above.

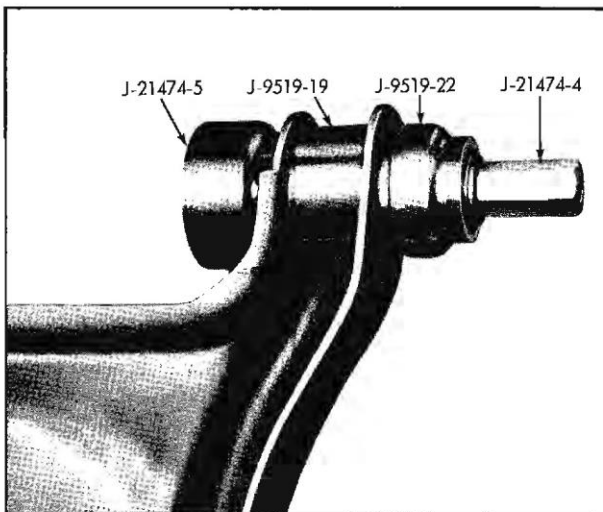


Fig. 3-19 Installing Rear Bushing in Front Lower Control Arm

2. Disconnect inner ends of lower control arms by removing pivot bolts.

3. Install by reversing removal procedure. Tighten pivot bolts 75-100 lb. ft. torque.

#### FRONT LOWER CONTROL ARM REAR BUSHING— REMOVE AND REPLACE

1. Support car under frame at front of siderail.

2. Place support under control arm relieving tension on pivot bolts and remove rear pivot bolt. Lower arm and block to provide access to bushing.

3. Remove bushing using tool J-21474 as shown in Fig. 3-18.

4. Install new bushing in control arm using components of tool J-21474 as shown in Fig. 3-19.

#### FRONT LOWER CONTROL ARM FRONT BUSHING— REMOVE AND REPLACE

1. Support car under frame at front of siderail.

2. Place support under control arm relieving tension on pivot bolts and remove front pivot bolt. Lower arm and block to provide access to bushing.

3. Remove bushing using tool J-21474 as shown in Fig. 3-20.

4. Install new bushing in control arm using components of tool J-21474 as shown in Fig. 3-21.

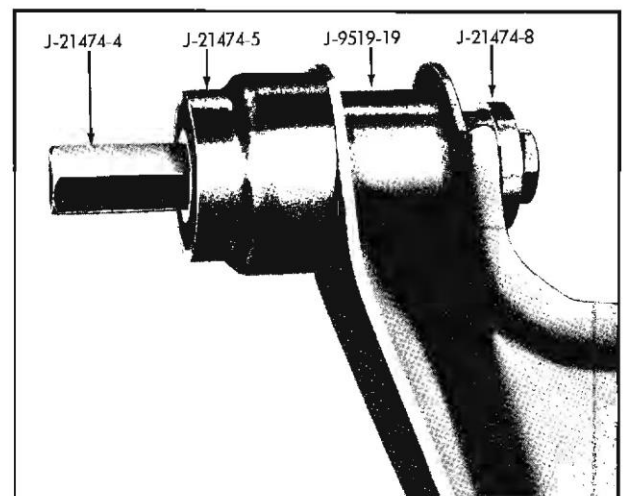


Fig. 3-20 Removing Bushing from Control Arm

### UPPER BALL JOINT REMOVE AND REPLACE

1. Raise car supporting under control arms.
2. Remove upper ball stud retaining nut and remove stud from knuckle using tool J-6627.
3. Remove ball stud from upper arm by chiseling or drilling rivet heads which retain ball joint in arm.
4. Install new ball joint, retaining with special bolts, nuts and washers supplied with new joints.

*CAUTION: Use only special alloy bolts supplied with stud package for this operation.*

5. Torque nuts to 10-12 lb. ft.

### LOWER BALL JOINT REMOVE— CONTROL ARM ON CAR

1. Raise car supporting under lower control arms and remove wheel.
2. Disconnect tie rod from steering arm.
3. Disconnect upper and lower ball stud from steering knuckle using tool J-6627 (Fig. 3-13) and remove brake drum and steering knuckle as an assembly.

*CAUTION: Brake line is still connected. Support drum so that line is not damaged.*

4. Remove grease seal and drive lower ball joint

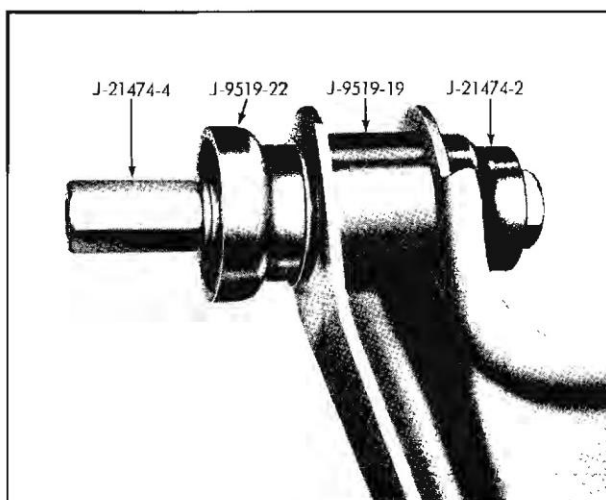


Fig. 3-21 Installing Bushing in Control Arm

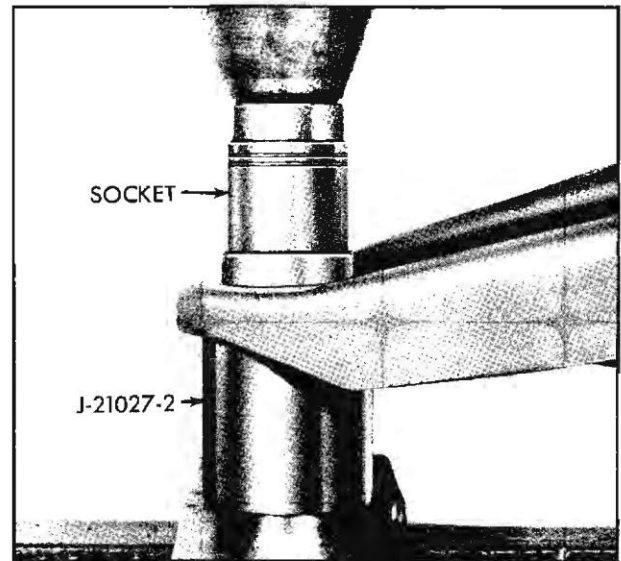


Fig. 3-22 Pressing Ball Joint from Lower Control Arm

from control arm using drift. Drive alternately on either side of ball stud housing.

### REPLACE

1. Position new ball joint in lower control arm and start into place with tool J-5154.

*CAUTION: Ball joint rubber seal is not serviced. Removal or damage to seal necessitates replacement of complete ball joint assembly.*

2. Reassemble suspension. Tighten upper ball stud retaining nut to 55-70 lb. ft. torque. Tighten tie rod to steering arm nut to 30-45 lb. ft. torque. Tighten lower ball stud retaining nut to 85-100 lb. ft. torque.

3. Remove support under lower control arms and support at cross member.

4. Firmly seat ball joint in lower control arm (with aid of front spring pressure) using tool J-5154 and replace wheel.

### REMOVE AND REPLACE—CONTROL ARM OFF CAR

1. Using suitable socket as driver and tool J-21027-2 as support press ball joint from control arm as shown in Fig. 3-22.

2. Install new ball joint by pressing into place using tool J-21027-2 support and installer J-8901 (Fig. 3-23).

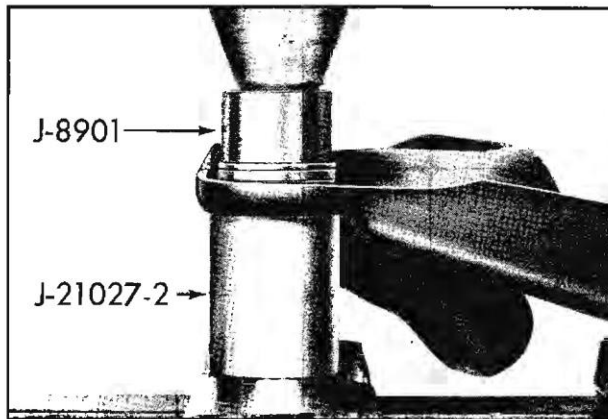


Fig. 3-23 Installing New Ball Joint in Lower Control Arm

*CAUTION: Ball joint rubber seal is not serviced. Removal or damage to seal necessitates replacement of complete ball joint assembly.*

#### FRONT STABILIZER SHAFT—REMOVE AND REPLACE

1. Disconnect both links from stabilizer shaft by removing nut from link and rotating shaft up from lower control arm (Fig. 3-24).
2. Remove bolts holding two stabilizer shaft brackets to frame and remove shaft.
3. Attach stabilizer shaft to frame by placing two brackets over rubber insulators on bar and installing mounting bolts to frame. Tighten bolts to 10-15 lb. ft. torque. When properly installed the central portion of the shaft will be toward the front of car.
4. Place rubber grommet above and below lower control arm bracket and above and below eye of shaft with link spacer in between and insert link.

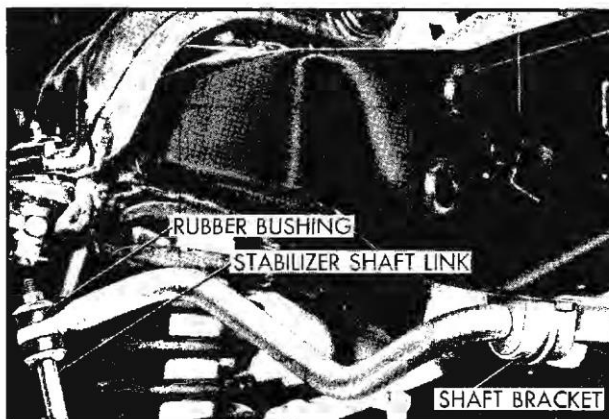


Fig. 3-24 Stabilizer Shaft Assembly

5. Install nut on each link, tightening to 60-120 lb. in. torque.

#### REAR SHOCK ABSORBER—REMOVE AND REPLACE

1. Remove nuts, bolts and lock washers at upper end of shock absorber (Fig. 3-25).
2. Remove self-locking nut from lower end and remove shock absorber.
3. Clean and inspect rubber inserts. If inserts have shifted from their original position in either eye, discard old shock absorber and replace with new one.
4. Install shock absorber by reversing above steps.
5. Tighten lower self-locking nut 55-75 lb. ft. torque and upper bolt 15-25 lb. ft. torque.

#### REAR SPRING REMOVE

1. Raise car until rear wheels are approximately 8" off floor.
2. Place safety stands under frame at both sides to support car.
3. Remove wheel assembly.
4. Disconnect brake line at cross member (Fig. 3-26).

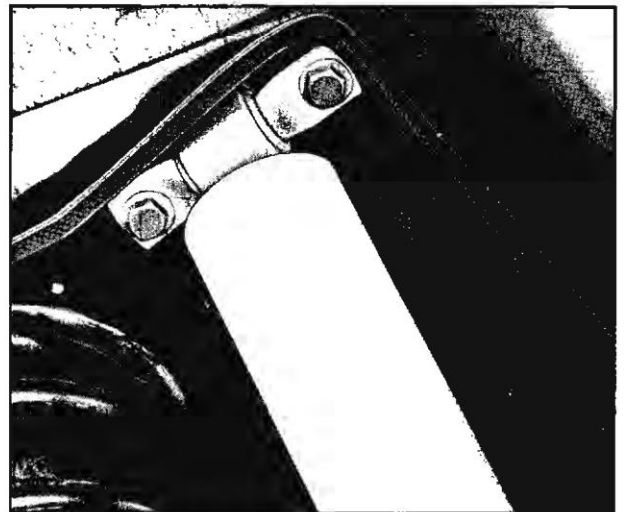


Fig. 3-25 Removal of Rear Shock Absorber

5. Remove self-locking nuts at lower end of right and left shock absorbers and disconnect shock absorbers from axle housing brackets.

6. Raise car as necessary and carefully lower rear axle assembly to allow spring to expand.

7. Remove nut, bolt, lock washer, flat washer and spring clamp at bottom of spring.

8. Remove spring (it may be necessary to force the axle down slightly to assist in removing the spring).

#### REPLACE

1. Place rubber insulator on top coil and position spring seat and rotate until seated.

2. Install lower clamp on spring and insert bolt, nut, lock washer and flat washer and tighten nut 30-40 lb. ft. torque (Fig. 3-27).

3. Raise rear axle assembly.

4. Attach both shock absorbers to axle housing brackets and tighten self-locking nuts 55-75 lb. ft. torque.

5. Attach brake tube bracket and line to cross member.

6. Install wheel assembly and bleed brakes.

#### REAR UPPER CONTROL ARM— REMOVE AND REPLACE

If both control arms are to be replaced, the axle may roll or slip sideways with both upper control

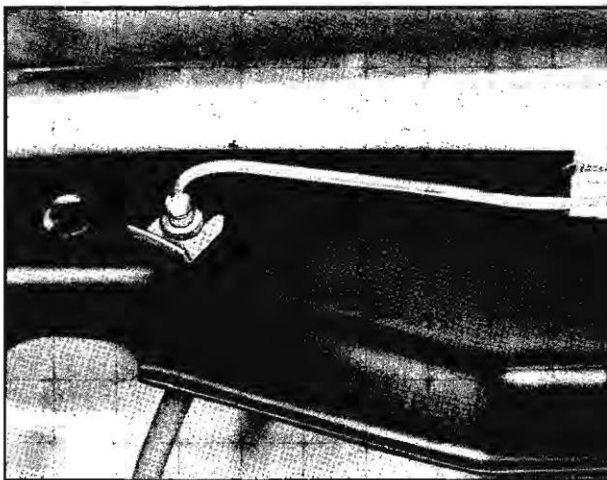


Fig. 3-26 Brake Tube and Line

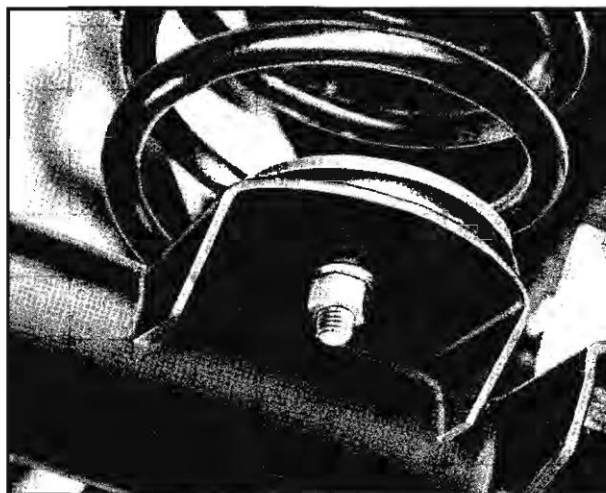


Fig. 3-27 Installing Spring Lower Clamp

arms removed making replacement difficult. Remove and replace one control arm at a time.

1. Place car on hoist and raise rear end.

2. Remove bolt at rear axle housing and lift upper control arm to clear mounting bracket.

3. Disconnect rear upper control arm at frame cross member and remove upper arm assembly.

4. Clean and inspect rubber bushings and, if worn, replace.

5. Replace rear upper control arm by reversing above steps.

6. Tighten pivot bolts to 75-100 lb. ft. torque.

#### REAR LOWER CONTROL ARM— REMOVE AND REPLACE

If both control arms are to be replaced, the axle may roll or slip sideways with both lower control arms removed making replacement difficult. Remove and replace one control arm at a time.

1. Place car on hoist and raise rear end.

2. Remove bolt at rear end of rear lower control arm (below axle housing).

3. Remove bolt from front of rear lower control arm at frame and remove control arm assembly.

4. Clean and inspect rubber bushings and, if worn, replace.

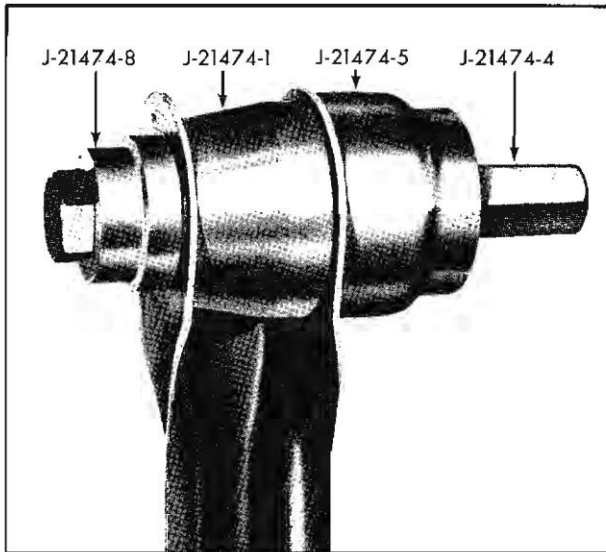


Fig. 3-28 Removing Bushing

5. Reverse above procedures for replacement of rear lower control arm. Tighten pivot bolts 75-100 lb. ft. torque.

*NOTE: Before tightening control arm pivot bolts, lower car to curb height.*

#### REAR CONTROL ARM BUSHINGS (EXCEPT UPPER REAR BUSHING)—REMOVE AND REPLACE

1. Remove control arm from car as outlined above.

2. Support arm and remove bushing using tool J-21474 as shown in Fig. 3-28.

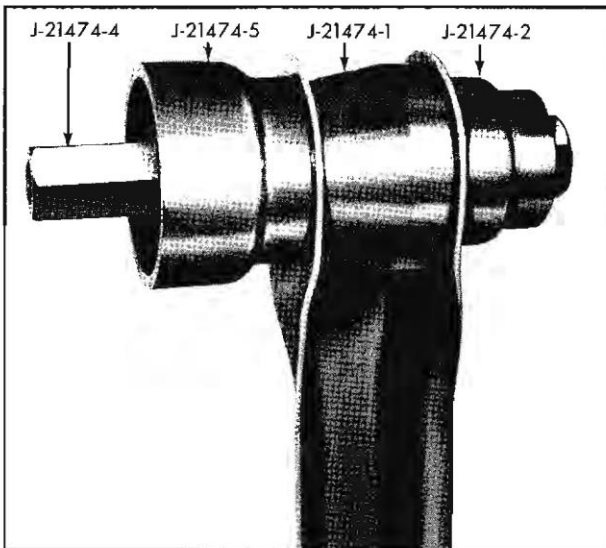


Fig. 3-29 Installing Bushing

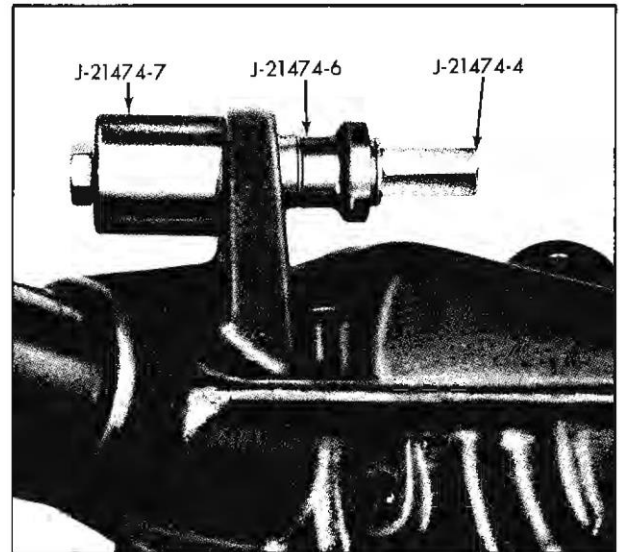


Fig. 3-30 Removing Rear Upper Control Arm Rear Bushing

3. Replace using components of tool J-21474 as shown in Fig. 3-29. Tighten pivot bolt to 75-100 lb. ft. torque.

#### REAR UPPER CONTROL ARM REAR BUSHING—REMOVE AND REPLACE

1. Remove pivot bolt from control arm.

2. Remove bushing from axle housing using tool J-21474 as shown in Fig. 3-30.

3. Replace using components of tool J-21474 as shown in Fig. 3-31. Tighten pivot bolt to 75-100 lb. ft. torque.

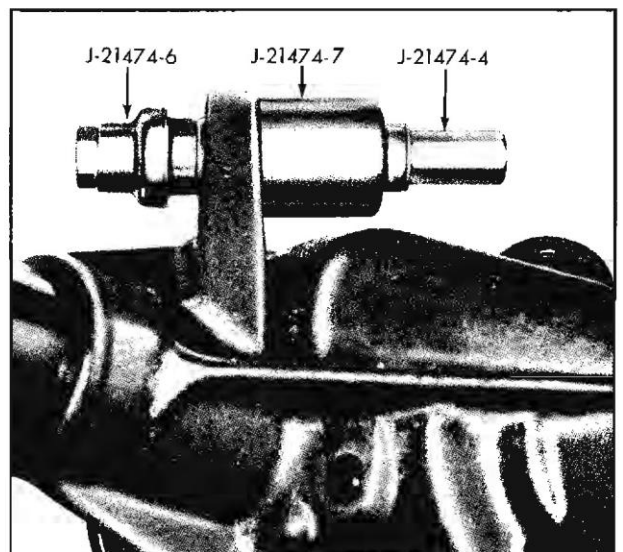


Fig. 3-31 Installing Rear Upper Control Arm Rear Bushing

## TROUBLE DIAGNOSIS AND TESTING

### HARD STEERING

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure, section 3A.
2. Steering gear or connections adjusted too tight.	2. Test steering system for bind with front wheels off floor. Adjust, as necessary, and lubricate.
3. Insufficient or incorrect lubricant used.	3. Check lubricant in steering gear and lubricate steering system as required.
4. Excessive caster.	4. Check caster and adjust as necessary.
5. Suspension arms bent or twisted.	5. Check camber and caster. If arms are out of car, compare with new arms and replace if bent.
6. Front spring sagged.	6. Check front end jounce height. Jounce height should be approximately the same at both wheels. Compare dimensions with those on car having about same mileage and equipment and believed to be standard. Replace front springs if sagged.
7. Frame bent or broken.	7. Repair or replace frame as necessary.
8. Steering knuckle bent.	8. Install new knuckle.
9. Ball joint galled or too tight.	9. Replace ball joint.
10. Ball joint grease seal deteriorated.	10. Lubricate ball joints and steering linkage.

### EXCESSIVE PLAY OR LOOSENESS IN STEERING

CAUSE	REMEDY
1. Steering gear or connections adjusted too loose or worn.	1. Adjust or install new parts as necessary.
2. Ball joints too loose.	2. Install new ball joints.
3. Front wheel bearings incorrectly adjusted or worn.	3. Adjust or replace bearings as necessary.

### ERRATIC STEERING ON APPLICATION OF BRAKES

CAUSE	REMEDY
1. Oil or brake fluid on brake lining.	1. Replace lining and correct leak.
2. Brakes incorrectly or unevenly adjusted.	2. Adjust brakes.
3. Front springs weak.	3. Replace with new springs.

**ERRATIC STEERING ON APPLICATION OF BRAKES**  
(Cont.)

CAUSE	REMEDY
4. Low or uneven tire pressure.	4. Inflate tires to recommended pressure.
5. Incorrect or uneven caster or toe.	5. Check and adjust caster and toe as necessary.
6. Steering knuckle or control arms bent or pivot bushings badly worn.	6. Replace with new parts.
7. Front wheel bearings incorrectly adjusted.	7. Adjust bearings as necessary.

**CAR PULLS TO ONE SIDE**

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Incorrect or uneven caster or camber.	2. Check caster and camber and correct by adjustment or by replacing worn or faulty parts.
3. Wheel bearings adjusted too tight.	3. Adjust wheel bearings.
4. Front springs sagged.	4. Check as outlined under HARD STEERING.
5. Toe-in incorrect.	5. Adjust toe-in as required.
6. Oil or brake fluid on brake lining.	6. Replace linings and correct leak.
7. Brakes incorrectly or unevenly adjusted.	7. Adjust brakes.
8. Steering knuckle bent.	8. Install new knuckle.
9. Frame bent or broken.	9. Check frame for proper alignment, and repair or replace frame as necessary.
10. Shock absorber control weak.	10. Check and replace shock absorbers if necessary.
11. Rear wheels not tracking with front wheels.	11. Check alignment of rear wheels with front wheels and correct as necessary. Check alignment of frame.
12. Rear axle shifted.	12. Check entire rear suspension.

**SCUFFED TIRES**

CAUSE	REMEDY
1. Tire improperly inflated.	1. Inflate tires to recommended pressure.
2. Toe-in incorrect.	2. Adjust toe-in as required.
3. Excessive wheel or tire runout.	3. Check wheels and tires for wobble and proper mounting.



**SCUFFED TIRES (Cont.)**

CAUSE	REMEDY
4. Ball joints too loose.	4. Install new ball joints.
5. Uneven camber.	5. Check camber and adjust as necessary.
6. Incorrect toe-out on turns.	6. Install new steering knuckle arms.
7. Arms bent or twisted.	7. Check camber, ball joint inclination and caster. Replace arms with new ones if bent.
8. Steering knuckle bent.	8. Install new knuckle.
9. Excessive speed on turns.	9. Caution driver.

**CUPPED TIRES**

CAUSE	REMEDY
1. Toe-in incorrect.	1. Adjust toe-in as required.
2. Tires improperly inflated.	2. Inflate tires to recommended pressure.
3. Worn ball joints, or wheel bearings incorrectly adjusted or worn.	3. Adjust or replace parts as necessary.
4. Uneven camber.	4. Check camber and adjust as necessary.
5. Steering knuckle bent.	5. Install new knuckle.
6. Excessive mileage without rotating tires.	6. Rotate tires every 4000 miles.

**FRONT WHEEL SHIMMY**

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Wheels, tires or brake drums out of balance. (Near 70 mph)	2. Balance wheels and tires. Also check for out-of-balance brake drums.
3. Eccentric or bulged tires.	3. Replace tires as necessary.
4. Excessive wheel or tire runout.	4. Check wheels and tires for wobble, radial runout, and proper mounting.
5. Shock absorbers weak or no control.	5. Check and replace shock absorbers if necessary.
6. Steering linkage incorrectly adjusted or worn.	6. Adjust or install new parts as necessary.
7. Steering gear incorrectly adjusted.	7. Adjust steering gear.
8. Front wheel bearings incorrectly adjusted or worn.	8. Adjust or replace bearings as necessary.

**FRONT WHEEL SHIMMY (Cont.)**

CAUSE	REMEDY
9. Incorrect or uneven caster.	9. Check and adjust caster as necessary.
10. Ball joints too loose.	10. Install new ball joints.
11. Toe-in incorrect.	11. Adjust toe-in as required.
12. Steering knuckle bent.	12. Install new knuckles.
13. Stabilizer shaft inoperative.	13. Inspect bushings and links and replace worn parts.

**FRONT WHEEL TRAMP**

CAUSE	REMEDY
1. Wheels, tires or brake drums out of balance. (Near 70 mph)	1. Balance wheels and tires. Also check for out-of-balance brake drums.
2. Eccentric or bulged tires.	2. Replace tires as necessary.
3. Wheel or tire not concentric.	3. Replace wheel or tires.
4. Shock absorbers weak or no control.	4. Install new shock absorbers.
5. Stabilizer shaft inoperative.	5. Inspect bushings and links and replace worn parts.

**CAR WANDERS**

CAUSE	REMEDY
1. Low or uneven tire pressure.	1. Inflate tires to recommended pressure.
2. Steering gear or connections adjusted too loose or worn.	2. Adjust or install new parts as necessary.
3. Steering gear or connections adjusted too tight.	3. Test steering system for bind with front wheels off floor. Adjust as necessary and lubricate.
4. Ball joints too loose.	4. Install new ball joints.
5. Toe-in incorrect.	5. Adjust toe-in as required.
6. Incorrect or uneven caster or camber.	6. Check caster and camber and correct by adjustment or by replacing worn or faulty parts.
7. Steering knuckle bent.	7. Install new knuckle.
8. Rear axle shifted.	8. Check entire rear suspension.
9. Stabilizer shaft inoperative.	9. Inspect bushings and links and replace worn parts.

**CAR WANDERS (Cont.)**

CAUSE	REMEDY
10. Ball joints too tight.	10. Install new ball joints.
11. Bind in upper or lower control arm shaft.	11. Free up or replace parts.
12. Excessive backlash in steering gear.	12. Adjust steering gear.

**ROAD SHOCKS**

CAUSE	REMEDY
1. High air pressure in tires.	1. Bleed tires to recommended pressure but not when warm.
2. Adjust steering gear and connections.	2. Steering gear or connections incorrectly adjusted.
3. Check caster and adjust as necessary.	3. Excessive caster.
4. Install new shock absorbers.	4. Shock absorbers weak or no control.
5. Check as outlined under HARD STEERING.	5. Front springs sagged.
6. Install new tires of correct type and size.	6. Wrong type or size tires used.
7. Install new knuckle.	7. Steering knuckle bent.

**SPECIFICATIONS**

Caster angle (Exc. Sta. Wag.) . . . . .	-1-1/2° ± 1/2°
Caster angle (Sta. Wag.) . . . . .	-2° ± 1/2°
Camber angle . . . . .	+1/4° ± 1/2°

*NOTE: Give left wheel up to 1/4° maximum more than right wheel to correct for road crown.*

Toe-in . . . . .	0" to 1/8"
(with trammel 9" above floor) Set to 1/16".	

Toe-out on turns . . . . .	1°
(difference in left to right in direction of toe-out at 20° turning of inside wheel)	

*NOTE: Adjust for caster, camber and toe-in with car at curb load. Compensate for drift to right due to road camber by setting left camber angle 1/4° greater than right. See CAMBER ADJUSTMENT PROCEDURE.*

**TORQUE SPECIFICATIONS**

Torque in lb. ft. unless otherwise specified.

APPLICATION	TORQUE
<b>Front Suspension</b>	
Bolt - Upper Control Arm Pivot Shaft . . . . .	35-45
Nut - Upper Control Arm Shaft to Upper Control Arm Frame Bracket . . . . .	55-75
Bolt - Lower Control Arm Assy. . . . .	75-100
Nut - Lower Control Arm Frame Bumper to Arm . . . . .	10-20
Nut - Steering Knuckle to Ball Stud Assembly - Upper . . . . .	55-70
Nut - Steering Knuckle to Ball Stud Assembly - Lower . . . . .	85-100

**TORQUE SPECIFICATIONS (Cont.)****Front Wheels, Hubs and Bearings**

Nut - Wheel to Hub - R.H. and L.H. . . . . 70-85

**Front Shock Absorbers**

Nut - Shock Absorber to Frame . . . . . 60-120 lb. in.  
 Bolt - Shock Absorber to Lower Arm . . . . . 15-25

**Front Stabilizer**

Bolt - Stabilizer Shaft Bracket to Frame . . . . . 10-15  
 Nut - Stabilizer Link . . . . . 60-120 lb. in.

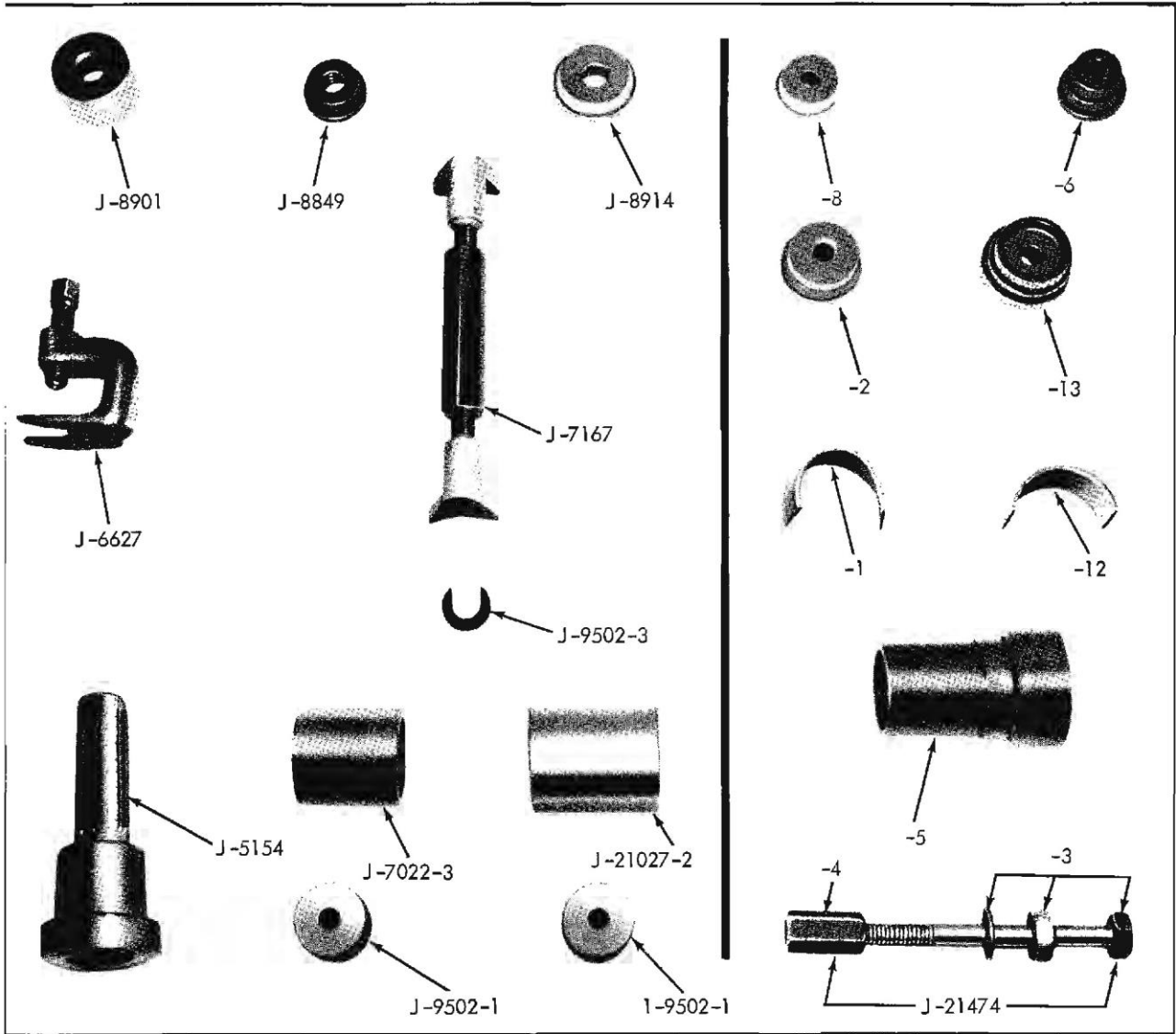
**Rear Spring Installation Parts**

Bolt - Upper Control Arm Assy. to Axle Hsg. . . . . 75-100  
 Bolt - Lower Control Arm Assy. to Axle Hsg. . . . . 75-100  
 Bolt - Lower Control Arm Assy. to Frame . . . . . 75-100  
 Bolt - Upper Control Arm Assy. to Frame . . . . . 75-100  
 Bolt and Nut - Axle Bumper to Frame . . . . . 40-55  
 Bolt and Nut - Spring Lower Clamp to Axle Hsg. Seat . . . . . 30-40

**Rear Shock Absorbers**

Bolt - Shock Absorber Upper . . . . . 15-25  
 Nut - Shock Absorber Lower . . . . . 55-75

### SPECIAL TOOLS



J-8901 Installer  
 J-8849 Installer  
 J-8914 Installer  
 J-6627 Puller  
 J-7167 Spreader  
 J-9502-3 Spacer  
 J-5154 Installer

J-7022-3 Support  
 J-21027-2 Support  
 J-9502-1 Installer  
 J-21474-1 Spacer  
 J-21474-2 Installer,  
 Remover  
 J-21474-3 Screw Assembly

J-21474-4 Nut  
 J-21474-5 Receiver  
 J-21474-6 Remover,  
 Installer  
 J-21474-8 Remover  
 J-21474-12 Spacer  
 J-21474-13 Installer

Fig. 3-32 Special Tools