

#### **FOREWORD**

This service manual contains diagnosis, "On-Vehicle" maintenance, and light repair for Light Duty Truck Models ("C-K, P-Truck, and G-Van"). Procedures involving disassembly and assembly of major components for these vehicles are published in a separate "Truck Unit Repair Manual." Wiring diagrams for these models are also published in a separate "Truck Wiring Diagram" booklet.

This manual should be kept in a handy place for ready reference. If properly used, it will meet the needs of technicians and vehicle owners.

# CAUTION:

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These vehicles contain some parts dimensioned in the metric system as well as in the customary system. Some fasteners are metric and are very close in dimension to familiar customary fasteners in the inch system. It is important to note that, during any vehicle maintenance procedures, replacement fasteners must have the same measurements and strength as those removed, whether metric or customary. (Numbers on the heads of metric bolts and on surfaces of metric nuts indicate their strength. Customary bolts use radial lines for this purpose, while most customary nuts do not have strength markings.) Mismatched or incorrect fasteners can result in vehicle damage or malfunction, or possibly personal injury. Therefore, fasteners removed from the vehicle should be saved for re-use in the same location whenever possible. Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that matches the original. For information and assistance, see your authorized dealer.

CHEVROLET MOTOR DIVISION
General Motors Corporation
Detroit, Michigan

# 1986

# LIGHT DUTY TRUCK SERVICE MANUAL

# C-K, P-TRUCK AND G-VAN MODELS

The Table of Contents on this page indicates the sections covered in this manual. At the beginning of each individual section is a Table of Contents which gives the page number on which each major subject begins.

When reference is made in this manual to a brand name, number, or specific tool, an equivalent product may be used in place of the recommended item.

All information, illustrations, and specifications contained in this Manual are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

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#### **SECTION 3B1**

# STEERING LINKAGE

The following "Notice" applies to one or more steps in the assembly procedure of components in this portion of the manual as indicated at appropriate locations by the terminology: "NOTICE: See 'Notice' on page 3B1-1 of this section."

NOTICE: All steering linkage fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.

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#### **DESCRIPTION**

The steering linkage for the C, G, and P20 + 30(42) model is composed of a pitman arm, idler arm, relay rod, two adjustable tie rods and a steering shock absorber (G-model). When the steering wheel is turned, the gear rotates the pitman arm which forces the relay rod to one side. The tie rods, which are connected to the relay rod by ball studs, transfers the steering force to the wheels. The tie rods are adjustable and are used for toe-in adjustments. The relay rod is supported by the pitman arm and idler arm. The idler arm pivots on a support attached to the frame rail. On the G-model the steering shock absorber is attached to a relay rod and a mounting bracket to the steering gear.

The P30(32) Motorhome model steering linkage has a similar adjustable tie rod assembly as described above. When the steering wheel is turned, the gear rotates the pitman arm which forces the nonadjustable connecting rod and relay arm to move the relay rod to one side. The relay arm and idler arm are attached to

the frame by support assemblies. The support assemblies are adjustable for shaft end play. The steering shock absorber is attached to the frame and relay arm (figures 1 through 3).

The K model has a front driving axle assembly and the P30(00) with RPO-FS3 has an I-Beam axle assembly. The steering linkage consists of an adjustable connecting rod, steering shock absorber, pitman arm and a tie rod which connects the two steering knuckles together (figures 7 and 8).

The overall condition of the steering linkage affects steering performance. If parts are bent, damaged, worn or poorly lubricated, improper and possibly dangerous steering action will result.

Whenever any steering linkage components are repaired or replaced, check the steering geometry and front end alignment. Refer to FRONT END ALIGN-MENT (SEC. 3A).

#### DIAGNOSIS OF STEERING LINKAGE

Refer to MANUAL STEERING (SEC. 3B2) or POWER STEERING (SEC. 3B3) in this manual, depending on vehicle equipment.

#### **ON-VEHICLE SERVICE**

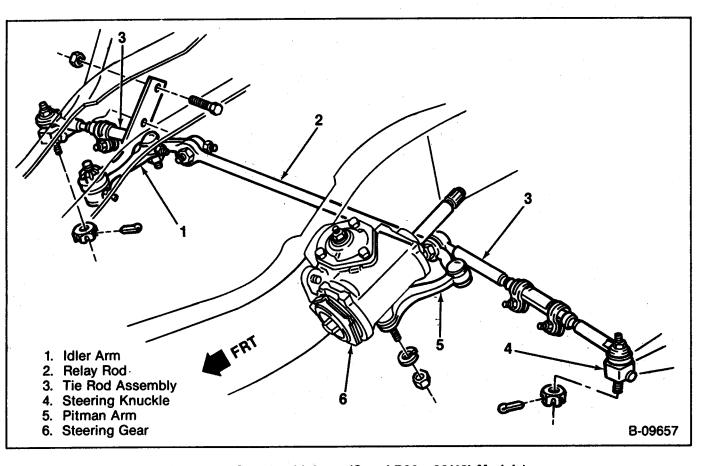


Figure 1—Steering Linkage (C and P20 + 30(42) Models)

#### **IDLER ARM INSPECTION**



- Raise the vehicle. Allow the front wheels to rotate freely and the steering mechanism freedom to turn. Position the wheels in a straight ahead position.
- 2. Place a spring scale near the relay rod end of the idler arm. Exert a 110 N (25 lb.) force upward and then downward (G model the force is forward and rearward) while measuring the total distance the arm moves. The allowable deflection is ±3.18mm (1/8 inch) for a total of 6.35mm (1/4 inch) (figures 4 and 5). Replace the idler arm if it fails this test with the exception of the P model motorhome. Refer to "Idler Arm Adjustment (P 30(32) Motorhome)" in this section.

# [ ] Important

- Jerking the right wheel and tire assembly back and forth, causing an up and down movement of the idler arm, is NOT an acceptable testing procedure. There is no control on the amount of force being applied to the idler arm.
- Care should be used whenever shimmy complaints are suspected of being caused by loose idler arms. Before suspecting suspension or steering components, technicians should consider areas such as dynamic imbalance, runout or force variation of wheel and tire assemblies and road surface irregularities. Refer to WHEELS AND TIRES (SEC. 3E).

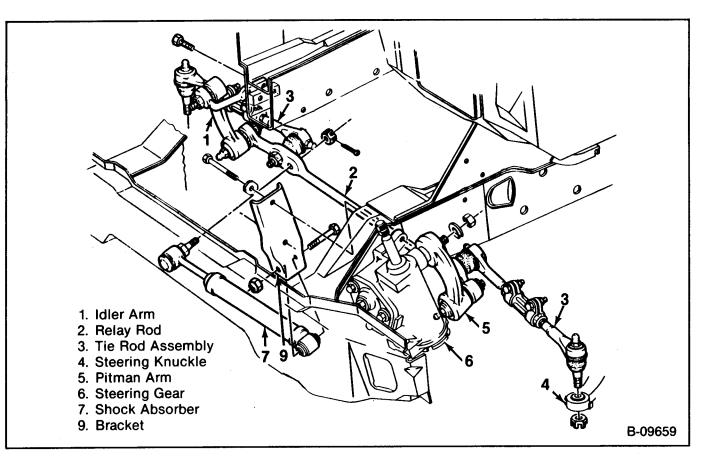


Figure 2—Steering Linkage (G Model)

# IDLER ARM ADJUSTMENT (P30(32) MOTORHOME)

The frame mounted idler support assembly (10) is adjustable for support shaft end play. Check for idler arm movement as described in "Idler Arm Inspection." If the idler arm fails this test, adjust the support shaft end-play.



#### Adjust (Figure 3)

- 1. Loosen the support assembly jam nut.
- 2. Tighten the adjuster plug to metal-to-metal contact.
- 3. Back off the adjuster plug 1/8 of a turn (1/2 of a flat on the square nut).



 Jam nut to 40 N·m (30 ft. lbs.). The adjusting plug should not rotate.

#### **IDLER ARM REPLACEMENT**

# Ŷ

#### **Important**

 Do not attempt to free the ball stud by using a pickle fork or wedge type tool, because seal or bushing damage could result (figure 6). Use the proper tool to separate all ball joints.

## ++

#### Remove or Disconnect (Figures 1 and 2)

**Tool Required:** 

J-24319-01 Steering Linkage Puller.

- · Raise the vehicle.
- 1. Idler arm frame bolts.
- 2. Nut from the idler arm ball stud.
- 3. Idler arm (1) from the relay rod (2). Use J-24319-01.

# 10

#### Inspect

- Ball stud threads for damage.
- Ball stud seal for cuts or other damage.



#### Clean

• Threads on the ball stud and in the ball stud nut.

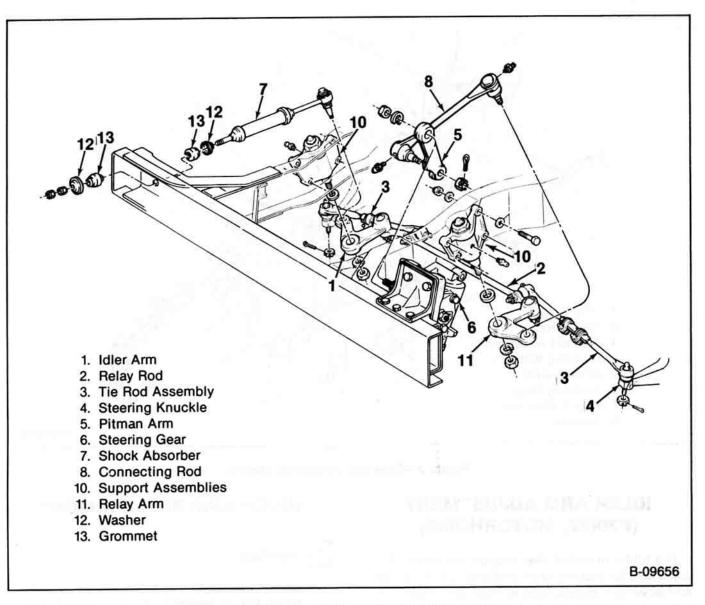


Figure 3—Steering Linkage (P30(32) Motorhome)

++ Install or Connect (Figures 1 and 2)

Tools Required:

J-29193 Steering Linkage Installer (12mm). J-29194 Steering Linkage Installer (14mm).

NOTICE: For steps 1 and 3 see "Notice" on page 3B1-1 of this section.

- · Position the idler arm (1) on the frame.
- 1. Frame bolts to the idler arm.

## হ্ম Tighten

- Bolts to "Specifications" at the end of this section.
- Relay rod (2) to the idler arm ball stud. Make certain the seal is on the stud. Tighten tool J-29193 or J-29194 to 54 N·m (40 ft. lbs.) to seat the tapers. Remove the tool.

3. Prevailing torque nut to the idler arm ball stud.

# (1) Tighten

- Nut to "Specifications" at the end of this section.
- Lower the vehicle.

# Adjust

 Toe-in if necessary. Refer to FRONT END ALIGNMENT (SEC. 3A) in this manual.

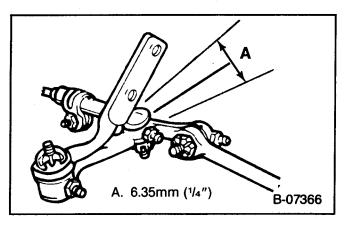


Figure 4—Checking Idler Arm Movement

#### **RELAY ROD REPLACEMENT**

## !mportant

 Use the proper tool to separate all tie rod and ball joints.

Remove or Disconnect (Figures 1 through 3)

## Tool Required:

J-24319-01 Steering Linkage Puller.

- · Raise the vehicle.
- 1. Inner tie rod (3) from the relay rod (2). Refer to "Tie Rod Replacement" in this section.
- 2. Nuts from the idler arm (1) and pitman arm (5) or relay arm (11) ball studs at the relay rod (2).
- 3. Relay rod (2) from the idler arm (1). Use J-24319-01.
- 4. Relay rod (2) from the pitman arm (5) or relay arm (11). Use J-24319-01.

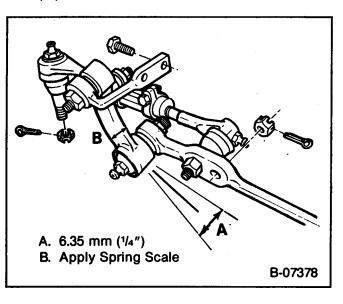


Figure 5—Checking Idler Arm Movement (G-Model)

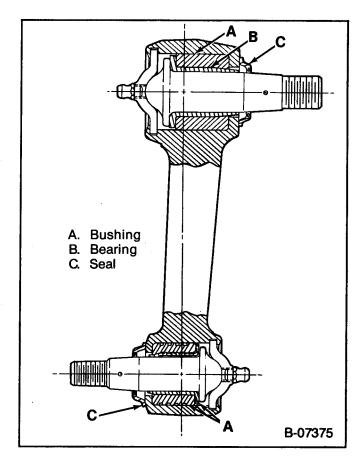


Figure 6—Idler Arm (Internal View)

# Inspect

- Threads on the tie rod and the tie rod end for damage.
- Ball stud threads for damage.
- Ball stud seals for excessive wear.

#### Clean

• Threads on the ball stud and the ball stud nut.

## ++ Install or Connect (Figures 1 through 3)

#### **Tools Required:**

J-29193 Steering Linkage Installer (12mm).

J-29194 Steering Linkage Installer (14mm).

 Relay rod (2) to the idler arm (1) and the pitman arm (5) or relay arm (11) ball stud. Make certain the seal is on the stud. Tighten J-29193 or J-29194 to 54 N·m (40 ft. lbs.) to seat the tapers. Remove the tool.

# NOTICE: See "Notice" on page 3B1-1 of this section.

2. Nuts to the idler arm and the pitman arm or relay arm ball stud.

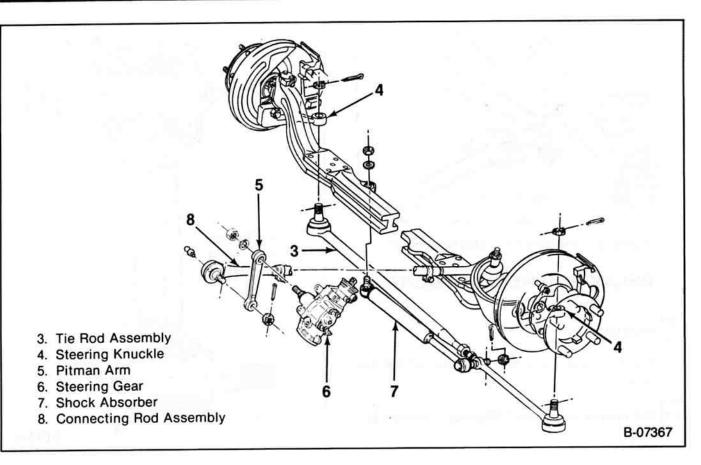


Figure 7—Steering Linkage (P30(00)FS3)

# **ર** Tighten

- Nuts to "Specifications" at the end of this section.
- Inner tie rod (3) to the relay rod. Refer to "Tie Rod Replacement."
- · Lower the vehicle.

#### PITMAN ARM REPLACEMENT

- ? Important
  - Use the proper tool to separate all ball joints.
- Remove or Disconnect (Figures 1, 2, 3, 7 and 8)

Tools Required:

J-24319-01 Steering Linkage Puller.

J-29107 Pitman Arm Puller.

J-6632-01 Pitman Arm Remover.

- · Raise the vehicle.
- Relay rod nut or connecting rod nut and cotter pin from the pitman arm ball stud.
- Relay rod (2) or connecting rod (8) from the pitman arm (5). Use J-24319-01.
- 3. Pitman arm nut and washer.

 Mark the pitman arm and the pitman shaft. This will permit proper alignment at assembly.

NOTICE: Do not hammer on pitman arm, pitman shaft, or puller. Damage to pitman arm or steering gear may result.

Pitman arm (5). Use J-6632-01 or J-29107.

## Inspect

- · Ball stud threads for damage.
- · Ball stud seals for excessive wear.

## Clean

· Threads on the ball stud and ball stud nut.

# →+ Install or Connect (Figures 1, 2, 3, 7 and 8)

Tools Required:

J-29193 Steering Linkage Installer (12mm).

J-29194 Steering Linkage Installer (14mm).

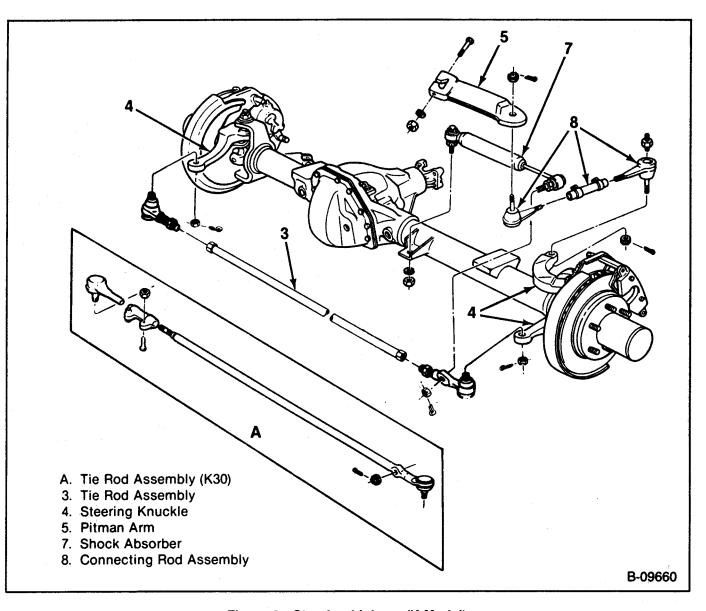


Figure 8—Steering Linkage (K Model)

NOTICE: For steps 2 and 4 see "Notice" on page 3B1-1 of this section.

NOTICE: If a clamp type pitman arm is used, spread the pitman arm just enough, with a wedge, to slip the arm onto the pitman shaft. Do not spread the pitman arm more than required to slip over the pitman shaft with hand pressure. Do not hammer, or damage to the steering gear may result.

- 1. Pitman arm (5) on the pitman shaft. Line up the marks made at removal.
- 2. Pitman arm washer and nut.

# **Q** Tighten

• Pitman arm nut to "Specifications" at the end of this section.

- Relay rod (2) or connecting rod (8) to the pitman arm ball stud. Make certain the seal is on the stud. Tighten tool J-29193 or J-29194 to 54 N·m (40 ft. lbs.) to seat the tapers. Remove the tool.
- 4. Relay rod nut or the connecting rod castellated nut and cotter pin to the pitman arm ball stud.

# **Q** Tighten

- Castellated nut to "Specifications" as instructed at the end of this section.
- · Lower the vehicle.

# STEERING SHOCK ABSORBER INSPECTION

Steering shock absorbers are a sealed assembly and are nonrepairable. Replace the complete assembly if damaged.



#### Inspect (Figures 2, 3, 7 and 8)

- Shock absorber for fluid leakage. A slight film of fluid is allowable near the shaft seal. If there is excessive fluid leakage, be sure it's from the shock absorber and then replace the shock absorber.
- 2. Shock absorber bushing for excessive wear. Replace shock absorber if necessary.
- 3. Test the shock absorber.
  - Disconnect the shock absorber from the frame or axle end.
  - Extend and compress the shock absorber using as much travel as possible.
     Resistance should be smooth and constant for each stroking rate. Replace the shock absorber if any binding or unusual noises are present.
  - Install the end of the shock absorber. Torque to specifications.

# STEERING SHOCK ABSORBER REPLACEMENT



#### **Remove or Disconnect**

- 1. Shock absorber mounting nuts and washers.
- Washer (12) and grommet (13) (P30(32) model).
- 2. Cotter pin and castellated nut.
- 3. Shock absorber (7).



#### Inspect

- Shock absorber for leaks and damage.
- Shock absorber bushings for wear and damage.
- Grommet (13) for wear.



#### **Install or Connect**

NOTICE: For steps 2 and 3 see "Notice" on page 3B1-1 of this section.

- Shock absorber with bushings to the axle bracket.
- Washer (12) and grommet (13) (P30(32) model).
- 2. Shock absorber mounting nuts and washers.



#### Tighten

- Shock absorber nuts to "Specifications" at the end of this section.
- 3. Castellated nut and cotter pin.

# Q

#### **Q** Tighten

 Castellated nut to "Specifications" as instructed at the end of this section.

# TIE ROD REPLACEMENT (C, G, P20 AND 30(42) MODELS)

There are two tie rod assemblies. Each assembly is of a five piece construction, consisting of an adjuster tube, two clamps and two tie rod ends. The ends are threaded into the sleeve and secured with the clamps. Right and left hand threads are used for toe-in adjustments and steering gear centering. The tie rod ends should be replaced when excessive up and down motion is present, or when excessive end play or loss of motion at the ball stud exists.

Before servicing, note the position of the tie rod adjuster tube and the direction the bolts are installed. The tie rod adjuster tube components may be rusted. If the torque required to remove the nut from bolt exceeds 9 N·m (7 ft. lbs.) discard the nuts and bolts. Apply penetrating oil between the clamp and tube and rotate the clamps until they move freely. Install all parts, with the correct part number, in the proper position.

# ?

#### **Important**

 Use the proper tool to separate all tie rod and ball joints.

# ++

#### Remove or Disconnect (Figures 1 through 3)

Tool Required:

J-6627-A Wheel Stud Remover and Tie Rod Remover.

- Raise the vehicle.
- Cotter pins and castellated nuts from the outer tie rod ball stud.
- 2. Outer tie rod ball studs from the steering knuckle (4). Use J-6627-A (figure 9).
- 3. Inner tie rod ball stud from the relay rod (2). Use J-6627-A.
- 4. Tie rod ends from the adjuster tube. Loosen the clamp bolts and unscrew the end assemblies.

# 10

#### Inspect

- Tie rod end for damage.
- Tie rod end seals for excessive wear.
- Threads on the tie rod and tie rod end for damage.
- Ball stud threads for damage.
- Adjuster tube for bending or damaged threads.

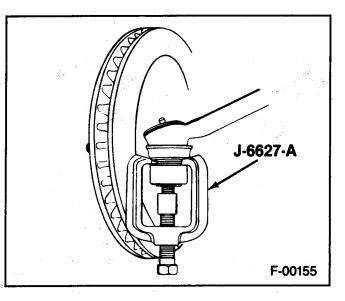


Figure 9-Freeing Ball Stud



#### Clean

- The tapered surfaces.
- Threads on the ball stud and in the ball stud nut.

## ++

#### Install or Connect (Figures 1 through 3)

**Tools Required:** 

J-29193 Steering Linkage Installer (12mm).

J-29194 Steering Linkage Installer (14mm).

# NOTICE: For steps 3 and 5 see "Notice" on page 3B1-1 of this section.

- If the rod ends were removed, lubricate the tie rod threads with chassis lubricant.
- Tie rod ends to the adjuster tube. The number of threads on both the inner and outer rod ends must be equal within three threads.
- Inner tie rod ball studs to the relay rod (2). The seal must be on the stud. Tighten J-29193 or J-29194 to 54 N·m (40 ft. lbs.) to seat the tapers. Remove the tool.
- 3. Prevailing torque nut to the inner tie rod ball stud.

# Tighten

- Nut to "Specifications" at the end of this section.
- 4. Outer tie rod ball studs to the steering knuckle.
- 5. Castellated nuts and cotter pins to the outer rod ball studs.

# **Q** Tighten

• Castellated nuts to "Specifications" as instructed at the end of this section.



#### Adiust

- Toe-in. Refer to FRONT END ALIGNMENT (SEC. 3A) in this manual.
- 6. Adjuster tube clamp bolts (figures 10, 11 and 12). Before tightening the clamp bolts, be sure the following conditions have been met:
  - The clamp must be positioned between the locating dimples at either end of the adjuster tube.
  - The clamps must be positioned within the angular travel shown in figures 10, 11 or 12.
  - Both inner and outer tie rod ends must rotate for their full travel. The position of each tie rod end must be maintained as the clamps are tightened to ensure free movement of each joint.
  - The clamp ends may touch when nuts are torqued to specification, but the gap next to the adjuster tube must NOT be less than the minimum dimension shown in figures 10, 11 or 12.

# ₹

#### **Tighten**

 Adjuster tube clamp bolts to "Specifications" at the end of this section.

# TIE ROD REPLACEMENT (K AND P30(00)FS3 MODELS)

## ++

#### Remove or Disconnect (Figures 7 and 8)

#### **Tool Required:**

J-6627-A Wheel Stud Remover and Tie Rod Remover.

- 1. Cotter pins and castellated nuts from the rod assembly (3).
- 2. Shock absorber (7) from the tie rod assembly (3).
- 3. The rod ball studs from the steering knuckle (4). Use J-6627-A.
- 4. Tie rod end bodies. Count the number of turns needed to remove the tie rod end bodies.
- Tie rod ends from the adjuster tube. On K30 models, note the position of the adjuster tube, and the direction from which the bolts are installed.

# [•

#### Inspect

- Tie rod for bending or damaged threads.
- Tie rod end seals for wear.
- Ball stud threads for damage.
- Adjuster tube for bending or damaged threads (K30).

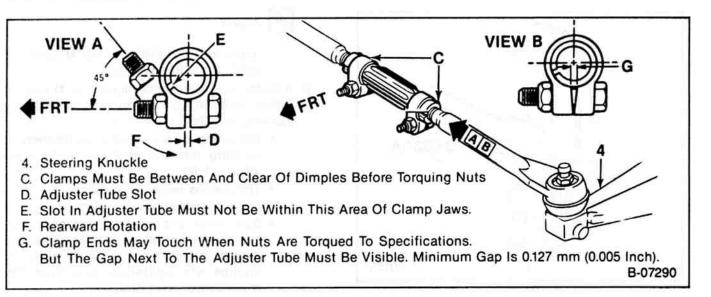


Figure 10—Tie Rod Clamp And Adjuster Tube Positioning (C Model)

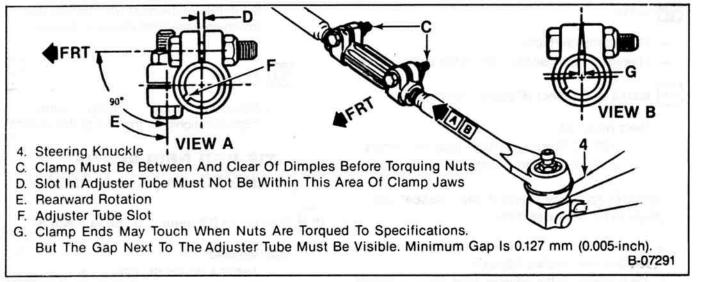


Figure 11—Tie Rod Clamp And Adjuster Tube Positioning (G Model)

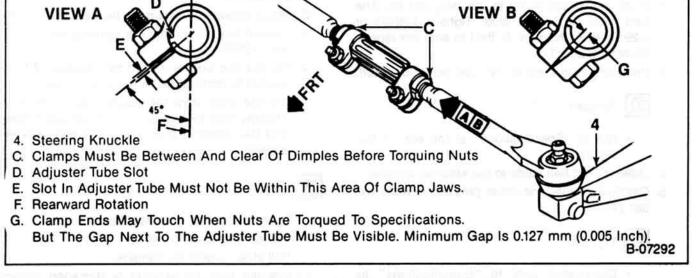


Figure 12—Tie Rod Clamp And Adjuster Tube Positioning (All P Models Excluding FS3)



#### Clean

- The tapered surfaces.
- Threads on the ball stud and in the ball stud nut.

# ++

#### Install or Connect (Figures 7 and 8)

- If the tie rod ends were removed, lubricate the tie rod threads with chassis lubricant.
- Tie rod end bodies to the tie rod (if removed).
   Screw the rod assembly on the same number of turns as when removed.
- Tie rod ends to the adjuster tube (K30).
- 2. Outer tie rod ball studs to the steering knuckle (4).
- 3. Shock absorber (7) to the tie rod assembly.

# NOTICE: See "Notice" on page 3B1-1 of this section.

4. Castellated nuts and cotter pins to the tie rod assembly.



#### **Tighten**

 Castellated nuts to "Specifications" as instructed at the end of this section.



#### **Adjust**

• Toe-in. Refer to FRONT END ALIGNMENT (SEC. 3A) in this manual.

# **Q** Tighten

- Jam nut at the tie rod end bodies to "Specifications" at the end of this section.
- Adjuster tube clamp bolts to "Specifications" at the end of this section (K30).

# CONNECTING ROD REPLACEMENT (K AND P30(00)FS3 MODEL)

The adjustable connecting rod is used for centering the steering gear with the front axle. Replace the connecting rod if the rod is bent or if the ball stud is loose.

## ? Important

Use the proper tool to separate all ball joints.

#### ++

#### Remove or Disconnect (Figures 7 and 8)

#### Tool Required:

J-24319-01 Steering Linkage Puller.

- Raise the vehicle.
- 1. Castellated nuts and cotter pins from the connecting rod (8).
- 2. Connecting rod (8) from the pitman arm (5). Use J-24319-01.
- 3. Connecting rod (8) from the steering knuckle (4). Use J-24319-01.

## ? Important

- Before removing the connecting rod adjuster tube, note the position of the tube and the direction from which the bolts are installed.
- Connecting rod ends from the adjuster tube.
   Loosen the clamp bolts and unscrew the end assemblies.
  - The connecting rod adjuster tube components may be rusted. If the torque required to remove the nut from the bolt exceeds 9 N·m (7 ft. lbs.) discard the nuts and bolts.
  - Apply penetrating oil between the clamps and the tube. Rotate the clamps until they move freely.

# 10

#### Inspect

- Ball stud threads for damage.
- Ball stud seals for wear.
- Adjuster tube for bending or damaged threads.

#### Clean

• Threads on the ball stud and ball stud nut.



#### Install or Connect (Figures 7 and 8)

# NOTICE: For steps 3 and 5 see "Notice" on page 3B1-1 of this section.

- If the connecting rod ends were removed, lubricate the connecting rod threads with chassis lubrication.
- Connecting rod ends to the adjuster tube. The number of threads on both the inner and outer connecting rod ends must be equal within three threads.
- 2. Inner connecting rod (8) ball stud to the pitman arm (5) (on K models install the short end). Make certain the seal is on the stud.
- 3. Castellated nut and cotter pin to the inner connecting rod ball stud.

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#### **Tighten**

- Castellated nut to "Specifications" as instructed at the end of this section.
- 4. Outer connecting rod ball stud to the steering knuckle (4).
- 5. Castellated nut and cotter pin to the outer connecting rod ball stud.



#### **Tighten**

- Castellated nut to "Specifications" as instructed at the end of this section.
- The connecting rod ends to the pitman arm and steering knuckle must be in correct relationship to each other after adjustment within ± 2 degrees (K model).



#### **Adjust**

- Steering gear high point centering. Refer to POWER STEERING (SEC. 3B3) in this manual.
- 6. Adjuster tube clamp bolts (figures 13 and 14). Before tightening the clamp bolts, be sure the following conditions have been met.
  - The clamps must be positioned between the locating dimples at either end of the adjuster tube.
  - The clamps must be positioned within the angular travel shown in figures 13 and 14.
  - The clamp ends may touch when nuts are torqued to specification, but the gap adjacent to adjuster tube must NOT be less than minimum dimension shown in figures 13 and 14.
  - Both inner and outer connecting rod ends must rotate for their full travel. The position of each connecting rod end must be maintained as the clamps are tightened to ensure free movement of each joint.

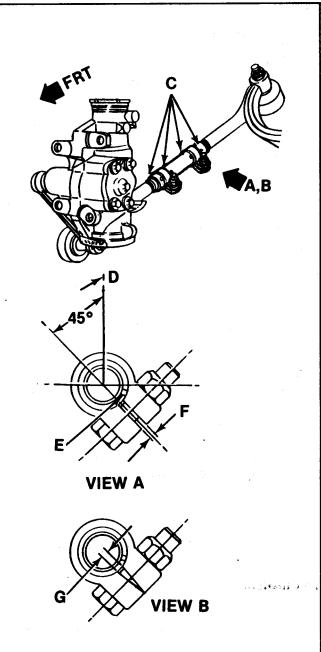


#### **Tighten**

- Adjuster tube bolts to "Specifications" at the end of this section.
- Lower the vehicle.

#### CONNECTING ROD REPLACEMENT (P30(32) MOTORHOME)

The non-adjustable connecting rod is used to connect the pitman arm to the relay arm. Replace the connecting rod if the rod is bent or the ball stud is loose.



- C. Clamps must be between and clear of dimples before torquing nuts.
- D. Outboard Rotation
- E. Adjuster Tube Slot
- F. Slot in adjuster tube must not be within this area of clamp jaws.
- G. Clamp ends may touch when nuts are torqued to specifications. But the gap next to the adjuster tube must be visible. Minimum gap is 0.127 mm (0.005-inch).

B-07293

Figure 13—Connecting Rod Clamp And Adjuster Tube Positioning (P30(00)FS3)

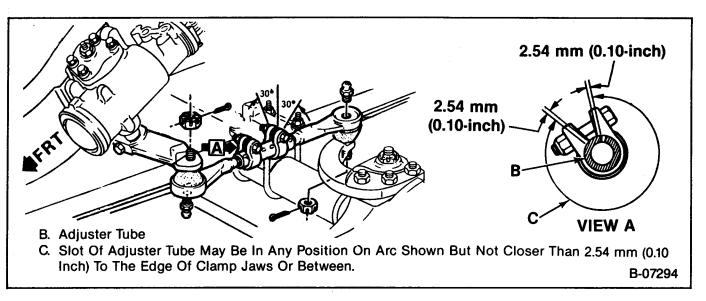


Figure 14—Connecting Rod Clamp And Adjuster Tube Positioning (K Model)

#### ? Important

· Use the proper tool to separate the ball joints.

#### Remove or Disconnect (Figure 3)

Tool Required:

J-24319-01 Steering Linkage Puller.

- Raise the vehicle.
- 1. Castellated nuts and cotter pins from the connecting rod (8).
- 2. Connecting rod (8) from the pitman arm (5). Use J-24319-01.
- 3. Connecting rod (8) from the relay arm (11). Use J-24319-01.

# Inspect

- Ball stud threads for damage.
- Ball stud seals for excessive wear.

# Clean

• Threads on the ball stud and ball stud nut.

#### →← Install or Connect (Figure 3)

- 1. Connecting rod (8) to the pitman arm (5) and relay arm (11).
- 2. Castellated nuts and cotter pins.

# **Q** Tighten

- Castellated nuts to "Specifications" as instructed at the end of this section.
- · Lower the vehicle.

# SPECIFICATIONS

	S	C Model	9	G Model	P20 AN	P20 AND 30(42)	P30(32) N	P30(32) Motorhome	P30(t	P30(00)FS3	KN	K Model
	E-N	Ft. Lbs.	M-M	Ft. Lbs.	N-m	Ft. Lbs.	N-i	Ft. Lbs.	E-N	Ft. Lbs.	E-N	Ft. Lbs.
Tie Rod (3) End To Steering Knuckle (4)*	62	46	62	46	62	46	62	46	220	162	55	40
Tie Rod (3) Adjuster Tube Bolts	19	14	19	14	19	14	19	14	1	1	55	4
Tie Rod (3) To Relay Rod (2)	06	99	06	99	06	99	6	99	l	1	1	1
Idler Arm (1) To Relay Rod (2)	06	99	06	99	06	99	96	99	ı	ı	1	1
Idler Arm (1) To Frame	40	30	47	35	40	30	1	1	1	1	ı	Ţ
Pitman Arm (5) To Relay Rod (2)	06	99	06	99	06	99	ĵ	1	1	l i	I,	ı
Pitman Arm (5) To Steering Gear (6)	250	184	250	184	250	184	170	125	170	125	125	92
Bolt To Shock Absorber Bracket (9)	Ĺ	i	100	75	1	1	1	1	į	1	1	1
Shock Absorber (7) To Tie Rod (3)*	í	T	62	46	1	I	1	1	62	46	62	46
Shock Absorber (7) To Frame	Î	ı	62	46	1	Ī	Ŧ	8	47	35	110	81
Shock Asborber (7) To Idler Arm (1)*	1	1	1	Ļ	ſ	1	62	46	1	1	1	ij
Connecting Rod (8) To Adjuster Tube Bolts	ì	1	1	1	1	Î	Ĩ	ı	89	20	54	40
Connecting Rod (8) To Pitman Arm (5)*	Ī		1	1	1	ı	92	02	95	20	120	88
Connecting Rod (8) To Steering Knuckle (4)*	1	-	Ţ	1	t	1	ı	1	95	70	120	88
Connecting Rod (8) To Relay Arm (11)*	1	1	1	L	1	1	95	20	1	ĺ	1	ı
Support Assemblies (10) To Frame	į	1	1	1	1	1	65	48	1	I	1	I
Idler Arm (1) And Relay Arm (11) To Support Assemblies (10)	1	1	1		1	Į,	170	125	ı	1	I	1
Relay Rod (2) To Relay Arm (11)	Ţ	1	1	1	1	1	06	99	1	ı	1	ı
Tie Rod Jam Nut (K10, 20) & P30(00)FS3	ţ	ı	1	ì	1	1	ĺ	1	375	277	125	8

<sup>Tightening Procedure (Castellated Nuts)
1. Tighten to the specified torque.
2. Advance the nut to align the nut slot with the cotter pin hole. Never back the nut off to align the cotter pin hole.
3. Insert a new cotter pin of the correct size.</sup> 

#### STEERING LINKAGE 3B1-15

# **SPECIAL TOOLS**

J-6627-A J-6632-01 Wheel Stud Remover & Tie Rod Remover

J-6632-01 J-29107 J-24319-01 Pitman Arm Remover Pitman Arm Puller

Steering Linkage Puller

J-29193 Steering Linkage Installer (12mm)
J-29194 Steering Linkage Installer (14mm)

#### **SECTION 3B3**

# **POWER STEERING**

The following "Notice" applies to one or more steps in the assembly procedure of components in this portion of the manual as indicated at appropriate locations by the terminology: "NOTICE: See 'Notice' on page 3B3-1 of the section."

NOTICE: All steering fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specific during reassembly to assure proper retention of all parts.

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# **POWER STEERING SYSTEM ON-VEHICLE SERVICE**

#### **MAINTENANCE**

The hydraulic system should be kept clean and at regular intervals the pump steering fluid level in the reservoir should be checked and fluid added when required. Refer to MAINTENANCE AND LUBRICATION (SEC. 0B) of this manual for type of fluid to be used and intervals for filling.

If the system contains some dirt, flush it as detailed later in this section. If it is exceptionally dirty, both the pump and the gear must be completely disassembled before further usage.

All tubes, hoses, and fittings should be inspected for leakage at regular intervals. Fittings must be tight. Make sure the clips, clamps and supporting tubes and hoses are in place and properly secured.

Inspect the hoses with the wheels in the straightahead position, then turn the wheels fully to the left and right, while observing the movement of the hoses. Correct any hose contact with other parts of the vehicle that could cause chafing or wear.

Power steering hoses and lines must not be twisted, kinked or tightly bent. The hoses should have sufficient natural curvature in the routing to absorb movement and hose shortening during vehicle operation.

Air in the system will cause spongy action and noisy operation. When a hose is disconnected or when fluid is lost, for any reason, the system must be bled after refilling. Refer to "Bleeding the Power Steering System" in this section.

# PUMP BELT TENSION ADJUSTMENT

When adjusting a power steering pump belt, never pry against the pump reservoir or pull against the filler neck. Two systems are used for belt adjustment. On some models, the pump is loosened from the bracket and moved outward to increase the tension. On other models, a half-inch square drive hole is located in the bracket, and this hole is used to rotate the pump-and-bracket assembly outward to increase belt tension.



Tool Required:

J-23600-B Belt Tension Gage.

- Place belt tension gage, J-23600-B or equivalent, midway between the pulleys on drive belts being checked.
- Power steering pump driven by a single belt.
  - Loosen the pump attaching bolts and adjust the belt to correct tension by moving the pump outward, away from the engine.
  - Tighten finger tight all pump mounting bolts and remove the pry bar.
  - Tighten all pump mounting bolts. Refer to "Power Steering Pump Replacement" in this section.
  - Inspect belt tension and remove the belt tension gage.
- 2. Loosen the pivot bolt and pump brace adjusting

NOTICE: Do not move the pump by prying against the reservoir or by pulling on the filler neck, or damage may occur.

- 3. Move the pump, with the belt in place until the belt is tensioned to specifications. Refer to ENGINE COOLING (SEC. 6B).
- Tighten the pump bracket adjusting nut and the pivot bolt nut. Refer to "Power Steering Pump Replacement" in this section.
- 5. Inspect the belt tension and remove the belt tension gage.

#### FLUID LEVEL ADJUSTMENT

- 1. Run the engine until the power steering fluid reaches normal operating temperature, about 80°C (170°F), then shut the engine off.
- 2. Remove the reservoir cap and check the fluid level on the dipstick. On models equipped with a remote reservoir, the fluid level should be about 12.7 to 25.4 mm (1/2 to 1-inch) from the top when the wheels are in full left turn position.
- 3. If the fluid level is low, add power steering fluid (GM #1050017 or equivalent) to the proper level and install the reservoir cap.
- 4. When checking the fluid level after the steering system has been serviced, air must be bled from the system. Refer to "Bleeding the Power Steering System" in this section.

# BLEEDING THE POWER STEERING SYSTEM

When a power steering pump or gear has been installed, or an oil line has been disconnected, the air that has entered the system must be bled out before the vehicle is operated. If air is allowed to remain in the power steering fluid system, nosiy and unsatisfactory operation of the system may result. Bleed air from the hydraulic system as follows:

- When bleeding the system, and any time fluid is added to the power steering system, be sure to use only power steering fluid as specified in MAINTENANCE AND LUBRICATION (SEC. 0B).
- 1. Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two minutes.
- 2. Start the engine and let it run for a few seconds. Then turn the engine off.
- 3. Add fluid if necessary.
- 4. Repeat the above procedure until the fluid level remains constant after running the engine.
- 5. Raise the front end of the vehicle so that the wheels are off the ground.
- 6. Start the engine. Slowly turn the steering wheel right and left, lightly contacting the wheel stops.
- 7. Add power steering fluid if necessary.
- 8. Lower the vehicle and turn the steering wheel slowly from lock to lock.
- 9. Stop the engine. Check the fluid level and refill as required.
- If the fluid is extremely foamy, allow the vehicle to stand a few minutes and repeat the above procedure.

## Inspect

- Belt for tightness.
- Pulley for looseness or damage. The pulley should not wobble with the engine running.
- Hoses so they are not touching any other parts of the vehicle.
- Fluid level and fill to the proper level.
- Fluid for air and if present attempt to bleed the system.

# FLUSHING THE POWER STEERING SYSTEM

- 1. Raise the front end of the vehicle off the ground until the wheels are free to turn.
- Remove the fluid return line at the pump inlet connector and plug the connector port on the pump. Position the line towards a large container to catch the draining fluid.
- While an assistant is filling the reservoir with new power steering fluid, run the engine at idle. Turn the steering wheel from stop to stop. DO NOT

- contact wheel stops or hold the wheel in a corner or fluid will stop and the pump will be in pressure relief mode. A sudden overflow from the reservoir may develop if the wheel is held at a stop.
- 4. Install all the lines, hoses and components (if removed) on the vehicle. Fill the system with new power steering fluid and bleed the system as described in "Bleeding The Power Steering System." Operate the engine for about 15 minutes. Remove the pump return line at the pump inlet and plug the connection on the pump. While refilling the reservoir, check the draining fluid for contamination. If foreign material is still evident, replace all lines, disassemble and clean or replace the power steering system components. Do not re-use any drained power steering fluid.

#### STEERING GEAR HIGH POINT CENTERING

- Set the front wheels in the straight ahead position. This can be checked by driving the vehicle a short distance on a flat surface.
- With the front wheels set straight ahead, check the position of the mark on the wormshaft designating steering gear high point. This mark should be at the top side of the shaft at the 12 o'clock position and lined up with the mark in the coupling lower clamp.
- 3. On C, G and P models except P30(00)FS3, if the steering gear has been moved off high point when setting the wheel in the straight ahead position, loosen the adjuster tube clamps on both the left and right hand tie rods. Then turn both adjuster tubes an equal number of turns in the same direction to bring the gear back on high point.

# | Important

- Turning the adjuster tubes an unequal number of turns or in different directions will disturb the toe-in setting of the wheels.
- 4. On K and P30(00)FS3 models, if the gear has been moved off high point when setting the wheels in the straight ahead position, loosen the adjuster tube clamps on the connecting rod. Then turn the adjuster tube to bring the gear back on high point.
- 5. Adjust toe-in. Refer to FRONT END ALIGNMENT (SEC. 3A).
- Refer to STEERING LINKAGE (SEC. 3B1) for adjuster tube clamping instructions.

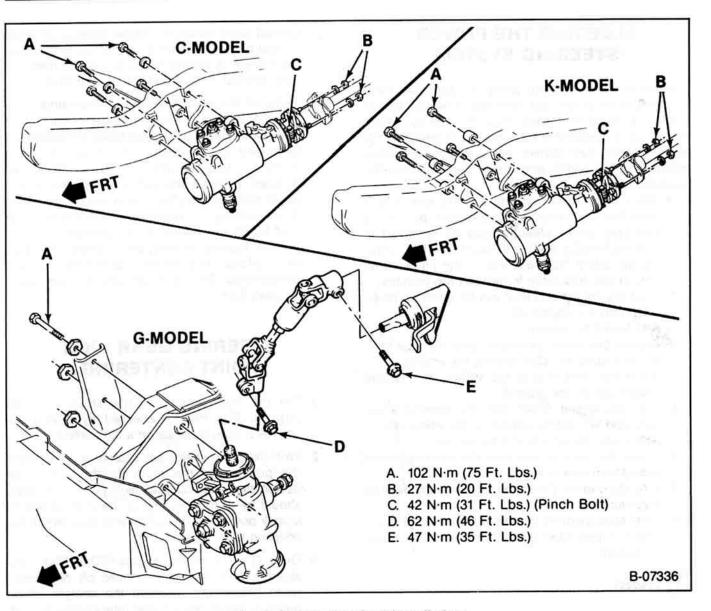


Figure 7—Steering Gear Installation

#### POWER STEERING GEAR REPLACEMENT

- Remove or Disconnect (Figures 7 and 8)
- · Place a drain pan below the steering gear.
- 1. Battery ground cable.
- Hoses from the steering gear. Raise the hose up to prevent oil drainage. Cap or tape the ends of the hose and gear fittings to prevent the entrance of dirt.
- Remove the flexible coupling to steering shaft flange bolts (C, K and P300(32) models).
- Remove the lower universal joint pinch bolt. Mark the relationship of the universal yoke to the stub shaft (G and P models).
- Pitman arm. Refer to STEERING LINKAGE (SEC. 3B1).

- 4. Steering gear frame bolts and the steering gear.
- Tap lightly, using a soft mallet, on the flexible coupling to remove the coupling from the steering gear stub shaft (C, K and P300(32) models).

#### C, K And P300(32) Models

→+ Install Or Connect (Figures 7 and 8)

NOTICE: For steps 2, 3 and 4 see "Notice" on page 3B3-1.

- Flexible coupling onto the steering gear stub shaft.
  - Align the flat in the coupling with the flat on the shaft.
  - Push the coupling onto the stub shaft until the coupling reinforcement bottoms against the end of the shaft.

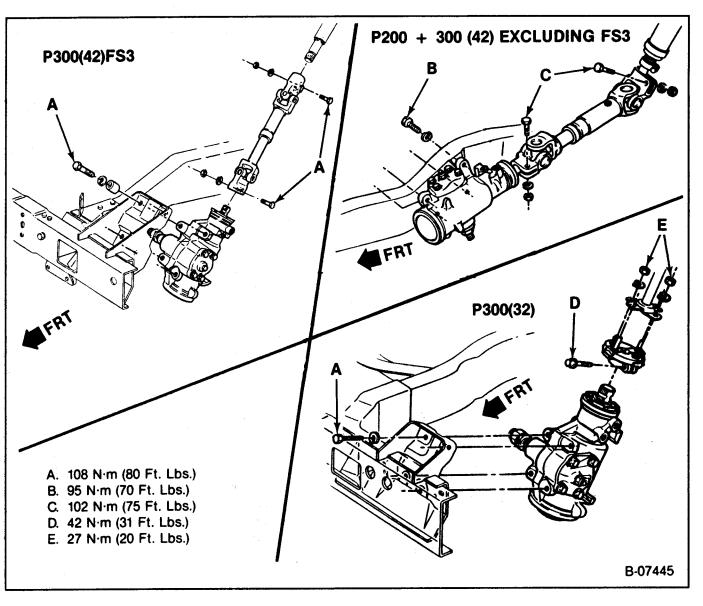


Figure 8—Steering Gear Installation

2. Pinch bolt into the split clamp. The pinch bolt must pass through the shaft undercut.

# (1) Tighten

- Pinch bolt to 42 N·m (31 ft. lbs.).
- Place the steering gear into position, guiding the coupling bolts into the proper holes in the shaft flange.
- 3. Steering gear to frame bolts. Torque to "Specifications" at the end of this section.
- 4. Coupling flange nuts and washers. The coupling alignment pins should be centered in the flange slots.

# **Tighten**

 Coupling flange nuts to 27 N·m (20 ft. lbs.).
 Maintain a coupling to flange dimension of 6.4 to 9.5 mm (0.250 to 0.375-inch).

- Pitman arm. Refer to STEERING LINKAGE (SEC. 3B1).
- Remove the plugs and caps from the steering gear and hoses.
- 6. Hoses to the steering gear. Torque hose fittings to "Specifications" at the end of this section.

#### **G And P Models**

# → Install or Connect (Figures 7 and 8)

- Place the steering gear in position. Guide the stub shaft into the universal joint assembly by lining up the marks made at removal.
- 1. Steering gear to the frame bolts. Torque to "Specifications" at the end of this section.
- Intermediate shaft pinch bolt. Torque to "Specifications" at the end of this section. The pinch bolt must pass through the shaft undercut.

- Pitman arm. Refer to STEERING LINKAGE (SEC. 3B1).
- Remove the plugs and caps from the steering gear and hoses.
- 4. Hoses to the steering gear. Torque hose fittings to "Specifications" at the end of this section.

# PITMAN SHAFT SEAL REPLACEMENT

## ++

#### **Remove or Disconnect**

Tools Required:

J-29107 Pitman Arm Puller.

J-4245 Internal Snap Ring Pliers.

- Mark the position of the pitman arm to the pitman shaft. Remove the pitman arm using J-29107.
   Refer to STEERING LINKAGE (SEC. 3B1).
- Position a drain pan under the steering gear.
- 1. Retaining ring using J-4245.
- Start the engine and full turn the steering wheel to the left-turn position for one or two seconds at a time. This will force the pitman shaft seals and washers out of the housing.
- Stop the engine.
- 2. Pitman shaft seals and washers from the pitman shaft.



#### Inspect

- Pitman shaft seal surfaces for roughness or pitting. If pitted, replace the shaft.
- Housing for burrs. Remove the burrs before installing the new seals.



#### Clean

Pitman shaft and seal areas using a crocus cloth.



#### **Install or Connect**

Tools Required:

J-6219 Steering Gear Pitman Shaft Oil Seal Installer.

J-4245 Internal Snap Ring Pliers.

- · Lubricate the new seals with power steering fluid.
- Apply a single layer of tape to the pitman arm shaft to avoid damaging the seals.
- Single lip seal and washer use J-6219. Install far enough to provide clearance for the remaining seal, washer and retaining ring. DO NOT allow the seal to bottom on the end of the counter bore.
- 2. Double lip seal and washer use J-21553.
- 3. Retaining ring use J-4245.
- Pitman arm. Refer to STEERING LINKAGE (SEC. 3B1).

# STEERING GEAR ADJUSTMENTS

# ? Important

 Before any adjustments are made to the steering gear, refer to "Diagnosis of Power Steering System" for reviewing the possible steering system problems.

The steering gear adjustment is made only as a correction and not as a periodic adjustment. Adjusting the steering gear in the vehicle is NOT recommended for two reasons:

- 1. The complexity involved in adjusting the worm thrust bearing preload.
- 2. The friction effect provided by the hydraulic fluid in the steering gear.

For proper adjustment, remove the steering gear from the vehicle. Drain the power steering fluid from the gear. Mount the gear in a vise and make the following adjustments.

The steering gear requires two adjustments which are: the worm thrust bearing preload and the pitman shaft over-center preload adjustment.

The worm thrust bearing preload is controlled by the amount of compression force exerted on the conical worm bearing thrust races by the adjuster plug.

The pitman shaft over-center preload is controlled by the pitman shaft adjuster screw which determines the clearance between the rack piston and the pitman shaft sector teeth.

# ? Important

 Adjust the worm thrust bearing preload first, then adjust the pitman shaft over-center preload.

#### **Worm Bearing Preload**



#### Adjust (Figures 1, 2, 9 through 13)

**Tool Required:** 

J-7624 Adjustable Spanner Wrench.

- 1. Loosen and remove the adjuster plug nut (6) (figure 9).
- 2. Turn the adjuster plug (3) in (clockwise), using J-7624, until the plug and thrust bearing are firmly bottomed in the housing.

# **(**Tighten

- Adjuster plug to 27 N·m (20 ft. lbs.).
- 3. Place an index mark on the housing even with one of the holes in the adjust plug (figure 10).

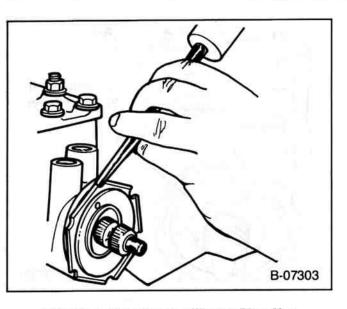


Figure 9—Loosening Adjuster Plug Nut

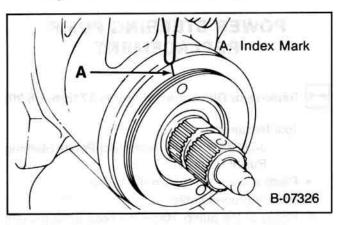


Figure 10—Marking Housing Even With Adjuster Plug

 Measure back (counterclockwise) 4.7-6.3 mm (<sup>3</sup>/<sub>16</sub>-<sup>1</sup>/<sub>4</sub>-inch) from the index mark and mark the housing (figure 11).

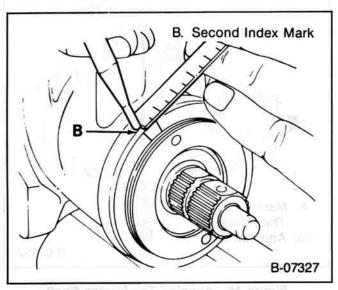


Figure 11—Remarking The Housing

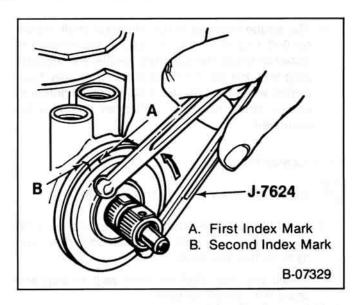


Figure 12—Aligning Adjuster Plug To Second Mark

- Rotate the adjuster plug back (counterclockwise) until the hole in the plug is aligned with the second mark on the housing (figure 12).
- 6. Install the adjuster plug nut (6).

# **(** Tighten

- Nut to 110 N·m (81 ft. lbs.). Be sure the adjuster plug does not turn when tightening the nut.
- 7. Use a inch-pound torque wrench and a 12-point deep socket to measure the required torque to turn the stub shaft (4). Take the reading with the handle of the torque wrench near the vertical position. Turn the stub shaft to the right stop and then back (counterclockwise) 1/4 turn at an even rate (figure 13). Record the torque reading.

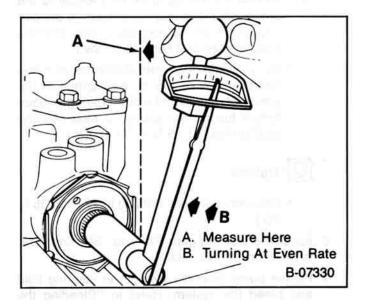


Figure 13—Checking Rotational Torque

8. The torque required to turn the stub shaft should be 0.45-1.13 N·m (4-10 in. lbs.). If the reading is above or below the specified torque; the adjuster plug may not be tightened properly or may have turned when the adjuster plug nut was tightened, or the thrust bearings and races (22) may be damaged.

#### **Over Center Preload**



#### Adjust (Figures 1, 2, 14 through 16)

- Turn the pitman shaft adjuster screw (79) counterclockwise until fully extended, then turn back 1/2 turn clockwise.
- 2. Rotate the stub shaft (4) from stop to stop and count the number of turns.
- Starting at either stop, turn the stub shaft back 1/2 the total number of turns. This is the "center" of the gear.
  - When the gear is centered, the flat on the stub shaft should face upward and be parallel with the side cover (21) (figure 14) and the master spline on the pitman shaft should be in line with the adjuster screw (79) (figure 15).
- Place the torque wrench, in the vertical position, on the stub shaft. Rotate the torque wrench 45 degrees each side of the center and record the highest drag torque measured on or near center (figure 16).
- Adjust over-center drag torque by loosening the adjuster screw jam nut (17) and turning the pitman shaft adjuster screw (79) clockwise until the correct drag torque is obtained.
  - On new steering gears (under 400 miles), add 0.6-1.2 N·m (6-10 in. lbs.) torque to the previously measured worm bearing preload torque but do not exceed a total steering gear preload of 2 N·m (18 in. lbs.).
  - On used steering gears (400 miles or more) add 0.5-0.6 N·m (4-5 in. lbs.) torque to the previously measured worm bearing preload torque but do not exceed a total steering gear preload of 1.5 N·m (14 in. lbs.).

# **Tighten**

- Adjuster screw jam nut (17) to 47 N·m (35 ft. lbs.).
- 6. Install the steering gear. Refer to "Steering Gear Installation" in this section.
- 7. Fill the pump reservoir with power steering fluid and bleed the system. Refer to "Bleeding the Power Steering System" in this section.

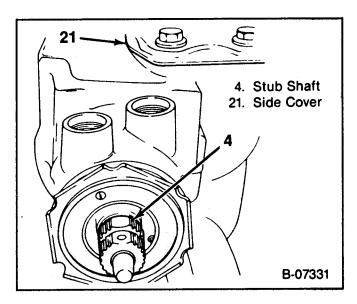


Figure 14—Aligning The Stub Shaft

#### POWER STEERING PUMP REPLACEMENT

++

#### Remove or Disconnect (Figures 17 through 20)

**Tool Required:** 

J-29785-A Water Pump and Power Steering Pulley Remover.

- Place a drain pan below the pump.
- 1. Battery ground cable.
- 2. Hoses at the pump. Raise the hose up to prevent drainage of the oil. Cap or tape the ends of the hose and pump to prevent the entrance of dirt.
  - On models with remote reservoir, disconnect the reservoir hose at the pump.
     Cap the hose pump fittings.

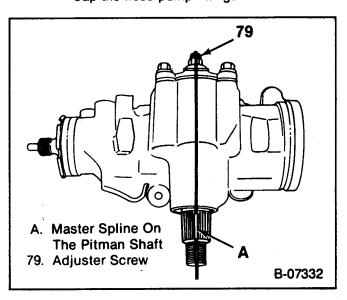


Figure 15—Aligning The Pitman Shaft Master Spline

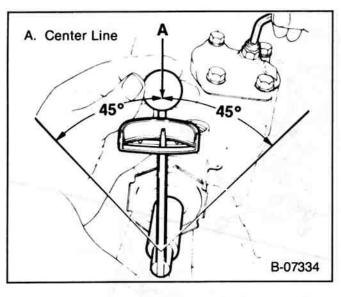


Figure 16—Checking Over-Center Rotational Torque

- · Loosen the pump adjusting bolts and nuts.
- 3. Pump belt.
- 4. Pump adjusting bolts, nuts and brackets.
- Pump assembly.
- Pulley from the pump.
  - Install J-29785-A. Be sure the pilot bolt bottoms in the pump shaft by turning the nut to the top of the pilot bolt.
  - Hold the pilot bolt and turn the nut counterclockwise (figure 21).

# →← Install or Connect (Figures 17 through 20)

#### Tool Required:

J-25033-B Power Steering Pump Pulley Installer.

- 1. Brackets to the pump.
- 2. Pulley to the pump.

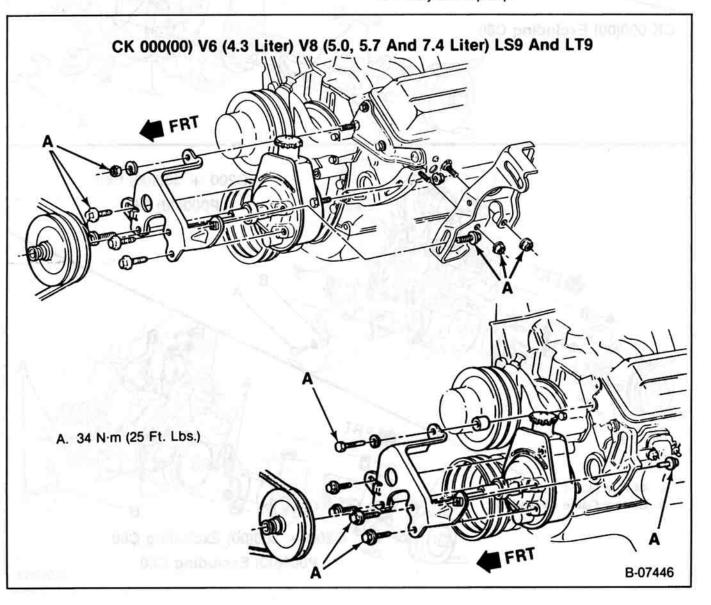


Figure 17—Power Steering Pump Mounting

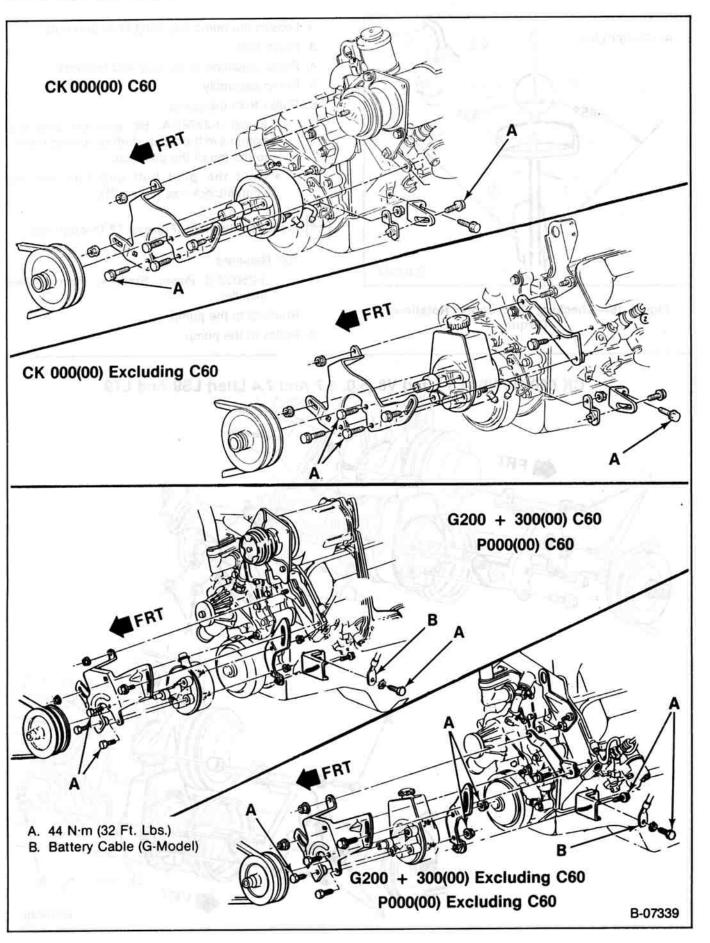


Figure 18—Power Steering Pump Mounting V8 (6.2 Liter)

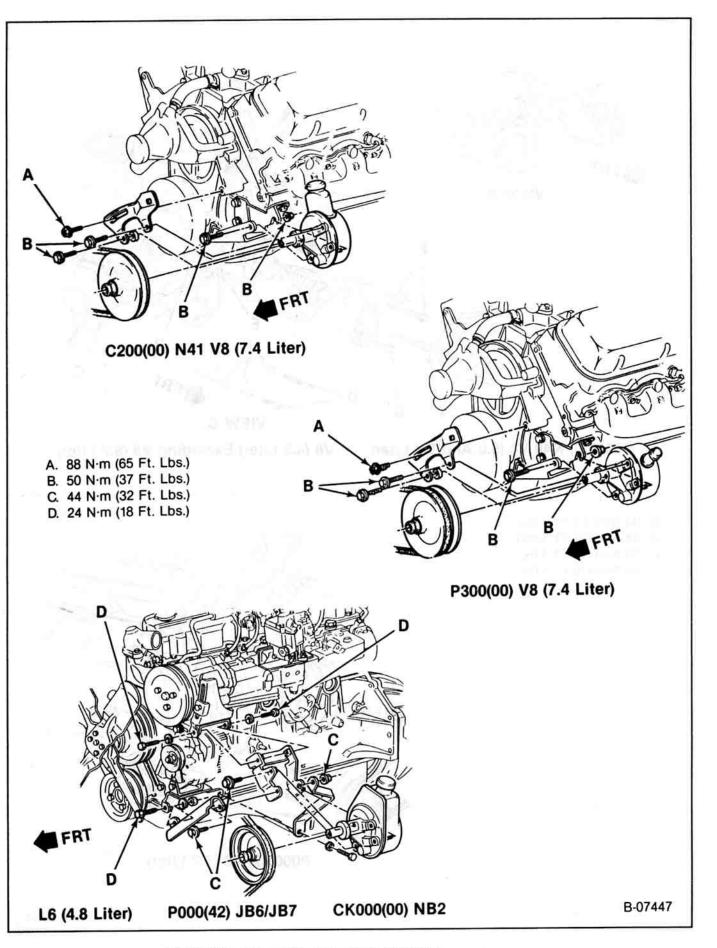


Figure 19—Power Steering Pump Mounting

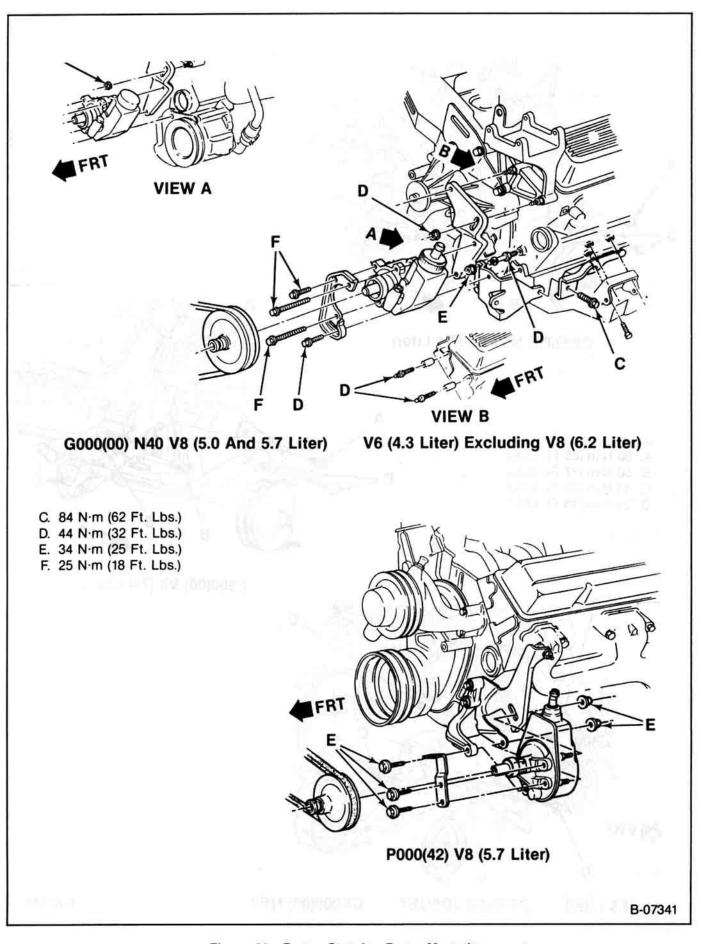


Figure 20—Power Steering Pump Mounting

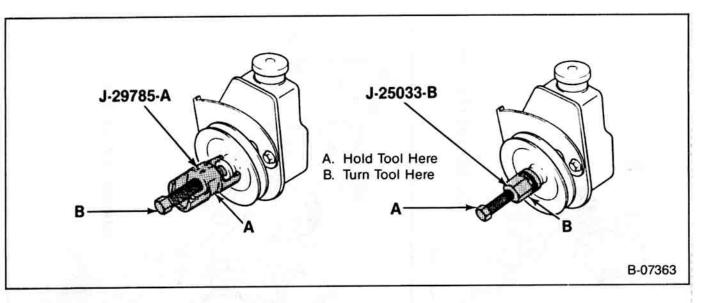


Figure 21—Installing And Removing Pulley

- Place pulley on the end of the pump shaft and install J-25033-B. Be sure the pilot bolt bottoms in the shaft by turning the nut to the top of the pilot bolt.
- Hold the pilot bolt and turn the nut clockwise (figure 21).
- On models equipped with a remote power steering pump reservoir fill the pump housing with as much fluid as possible before mounting.
- Pump assembly and attaching parts loosely to the engine.
- Power steering hoses to the pump. Hoses installed out of position may be subjected to chafing or other abuses during sharp turns. Refer to "Power Steering Hoses" in this section.

# 9 Important

- Do not start the engine with any power steering hose disconnected. After connecting the power steering hoses make sure there is clearance between the hoses and the drive belt, sheet metal or any other components where hose rub or interference could result.
- Fill the reservoir. Bleed the pump by turning the pulley backwards (counter-clockwise as viewed Internal Snap Ring Pliers appear.
- 5. Pump belt over the pulley.

# Adjust

- Belt tension. Refer to "Pump Belt Tension Adjustment" in this section.
- Fill and bleed the system. Refer to "Bleeding the Power Steering System" in this section.

#### **POWER STEERING HOSES**

When either a hose is reinstalled or replaced, the following points are essential:

- Route hoses in the same position they were in before removal (figures 22 through 29).
- Route hoses smoothly, avoid sharp bends and kinking.
- Tighten the pump end hose fitting, gear line fitting, and booster line fitting to specifications.
   Refer to "Specifications" at the end of this section.
- After hoses are installed, check for leaks while the system is being bled. Refer to "Bleeding the Power Steering System" in this section.

NOTICE: Do not start the engine with any power steering hose disconnected, or damage to the components could occur.

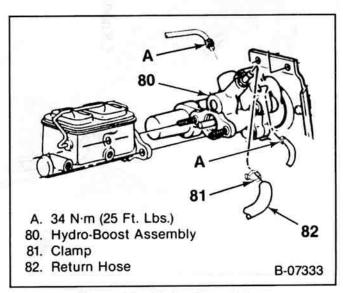


Figure 22—Hydro-Boost Lines

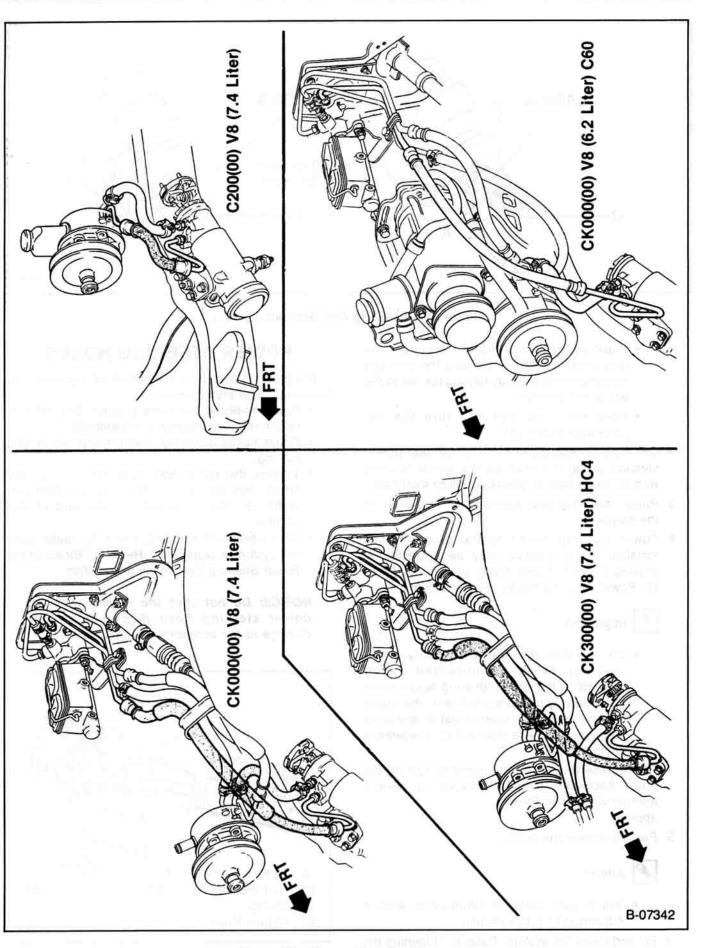


Figure 23—Power Steering Hoses

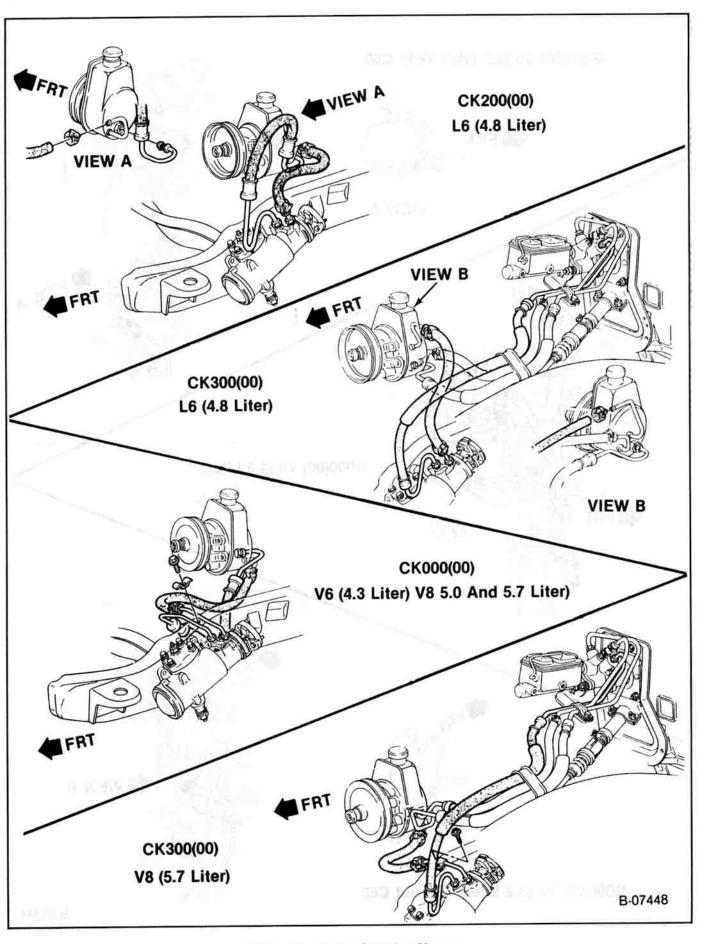


Figure 24—Power Steering Hoses

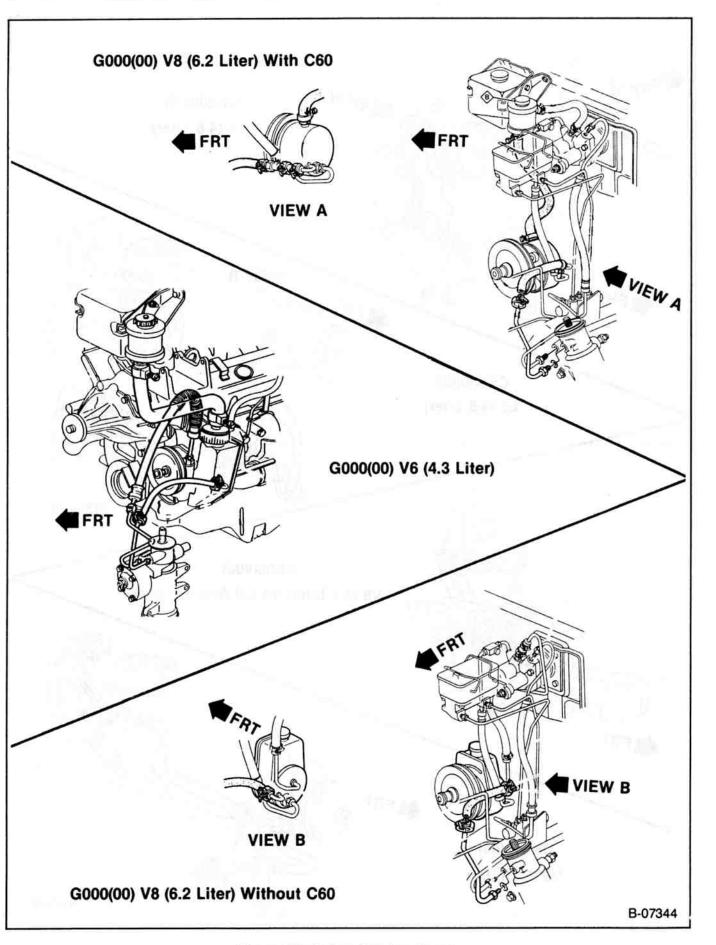
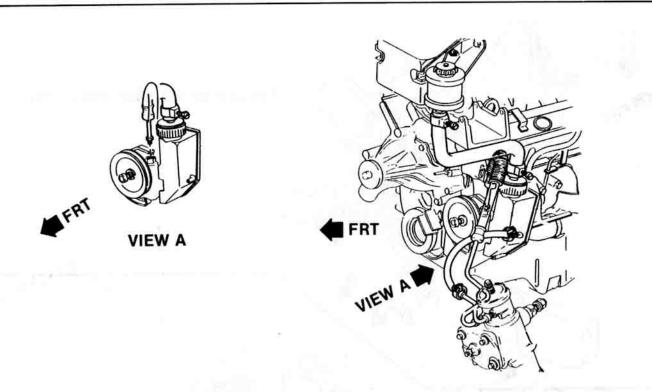


Figure 25—Power Steering Hoses



G100 + 200 V8 (5.0 And 5.7 Liter) G300 V8 (5.7 Liter) LS9 Or LT9 With JB7

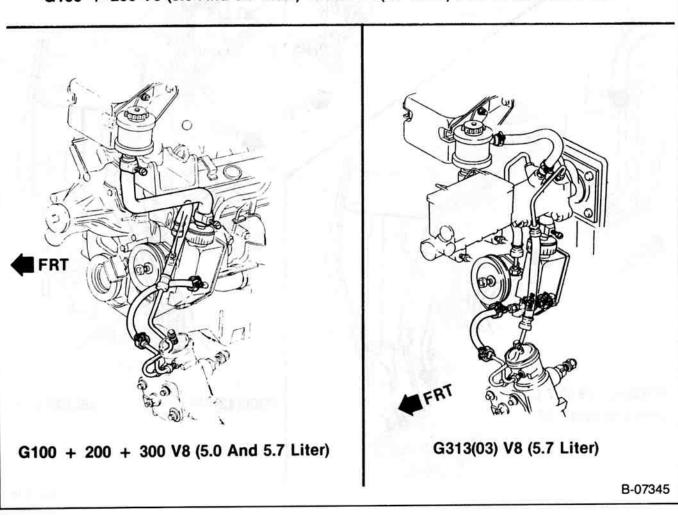


Figure 26—Power Steering Hoses

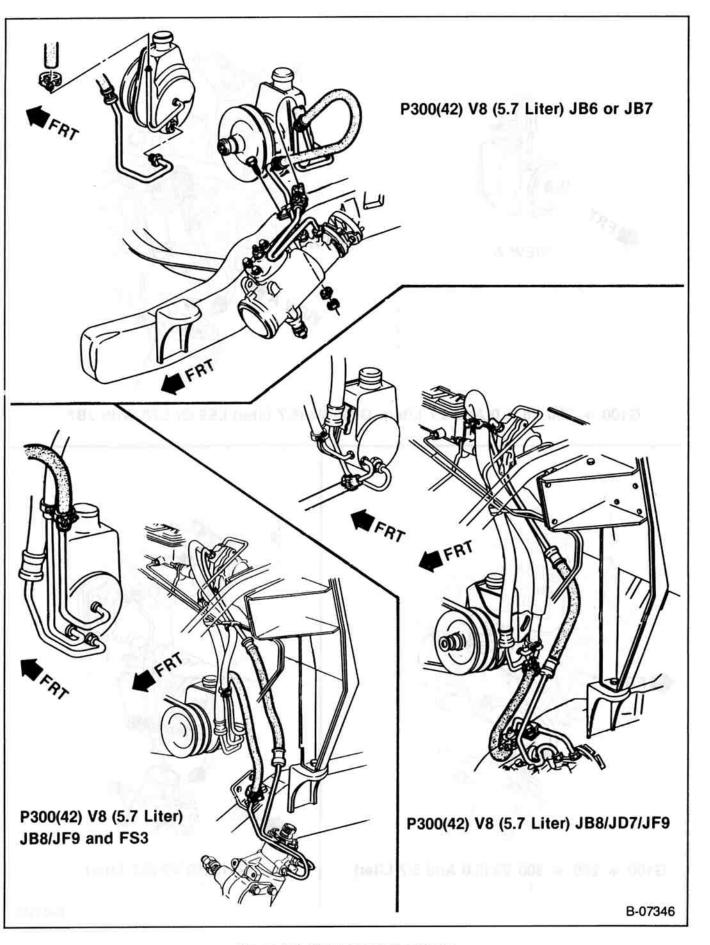


Figure 27—Power Steering Hoses

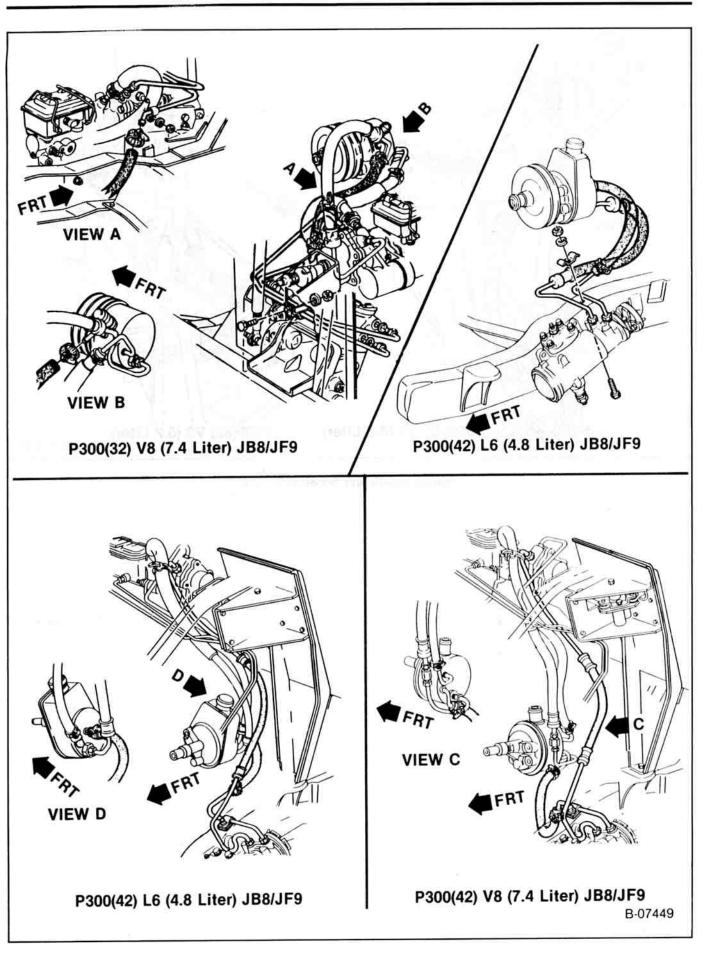


Figure 28—Power Steering Hoses

### 3B3-30 POWER STEERING

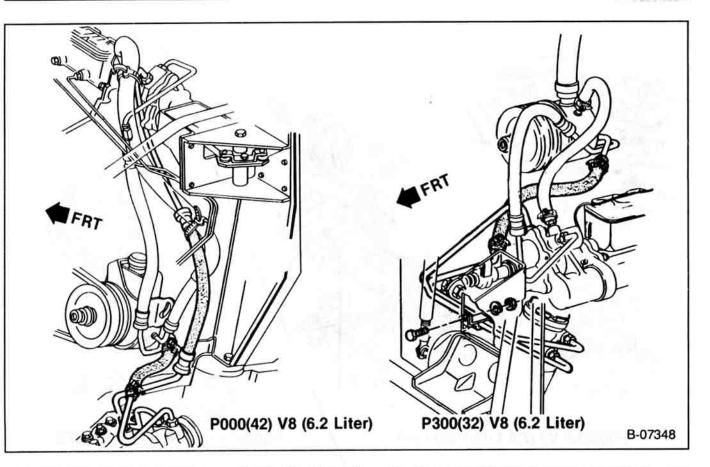


Figure 29—Power Steering Hoses

### **SPECIFICATIONS**

#### STEERING GEAR ADJUSTMENTS

Valve Assembly And Seal Drag	
Thrust Bearing Preload (In Excess Of Valve Assembly And Seal Drag	g)0.3-0.4 N·m (3-4 in. lbs.)
Pitman Shaft Over Center Preload	
New Gear	0.6-1.2 N·m (6-10 in. lbs.)
Used Gear	
Final Over Center Reading (Total-Maximum)	
New Gear	2 N·m (18 in. lbs.)
Used Gear	

### **TORQUE SPECIFICATIONS**

	10	RQUE
	N·m	Ft. Lbs.
Steering Gear To Frame Nuts (C, K, and G Models)	102	. 75
Steering Gear To Frame Nuts (P300(32) andP300(42)FS3)	108	80
Steering Gear To Frame Nuts (P200 + 300(42) Excluding FS3)	95	70
High Pressure Line Fitting (At Gear)	34	25
Oil Return Line Fitting (At Gear)	34	25
Pitman Shaft Adjuster Screw Jam Nut	47	35
Side Cover To Housing Bolt	60	45
Adjuster Plug Nut	110	81
Reservoir Bolt (At Pump)	48	35
Flow Control Fitting (At Pump)	48	35
Pressure Hose (At Pump)	27	20
Power Steering Pump To Booster Line	34	25
Booster To Gear Line	34	25
Return Line At Booster And Gear	34	25
Coupling Flange Nuts	27	20
Coupling Flange Pinch Bolt	42	31
Lower Intermediate Shaft Pinch Bolt (G Model)	62	46
Upper Intermediate Shaft Pinch Bolt (G Model)	47	35
Intermediate Shaft Pinch Bolts (P200 + 300(42) Excluding FS3)	102	75
Intermediate Shaft Pinch Bolts (P300(42)FS3)	108	80

### **SPECIFICATIONS (CONTINUED)**

#### **PUMP SPECIFICATIONS**

	Part		Minimum Output (1)		Maximum Output (2)		Relief Val Minimum		ve Settings Maximum	
Vehicle	Number	Model	GPM	L/Min.	GPM	L/Min.	PSI	kPa	PSI	kPa
	7838933	132-P-122	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7838934	132-P-123	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7838935	132-P-124	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7838936	132-P-125	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7839797	132-P-143	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7839798	132-P-144	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
СК	7839799	132-P-145	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
Model	7839800	132-P-146	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7839801	132-P-147	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7839802	132-P-148	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7839804	132-P-150	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7839813	132-P-159	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7839816	132-P-161	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7839818	132-P-163	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	26000518	132-P-260	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	89
- 8	7841731	132-P-222	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
G	7842049	132-P-228	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
Model	7847616	T115-PT-003	1.15	4.35	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7849229	132-P-253	1.32	5.00	3.1-3.5	11.7-13.2	1350	9308	1450	999
	7839808	132-P-154	1.32	5.00	2.4-2.8	9.1-10.6	1200	8274	1300	896
	7839809	132-P-155	1.32	5.00	2.4-2.8	9.1-10.6	1200	8274	1300	896
	7839812	132-P-158	1.32	5.00	2.4-2.8	9.1-10.6	1350	9308	1450	999
	7839817	132-P-162	1.32	5.00	2.4-2.8	9.1-10.6	1200	8274	1300	896
Р	7842032	132-P-226	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
Model	7842033	132-P-227	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7842489	132-P-230	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896
	7842490	132-P-231	1.32	5.00	2.4-2.8	9.1-10.6	1350	9308	1450	999
	7842491	132-P-232	1.32	5.00	3.1-3.5	11.7-13.2	1200	8274	1300	896

<sup>1 —</sup> Output of Power Steering Fluid at 32°C (90°F) temperature when operating pump at 465 rpm against 4585-5068 kPa (665-735 psi) pressure.

<sup>2 —</sup> Output of Power Steering Fluid at 32°C (90°F) temperature when operating pump at 1500 rpm against 345 kPa (50 psi) pressure.

### **SPECIAL TOOLS**

J-5176-20 Power Steering Gage Adapter — 18 mm

J-5421-02 Pocket Thermometer (0°-220°F)

J-25323 Power Steering Analyzer

J-29525 Power Steering Analyzer Adapter

J-24600-B Belt Tension Gage J-29107 Pitman Arm Puller

J-4245 Internal Snap Ring Pliers

J-6219 Steering Gear Pitman Shaft Oil Seal Installer

J-7624 Adjustable Spanner Wrench

J-29785-A Water Pump And Power Steering Pulley Remover

J-25033-B Power Steering Pump Pulley Installer

DAGE

#### **SECTION 3C**

### FRONT SUSPENSION

The following "Notice" applies to one or more steps in the assembly procedure of components in this portion of the manual as indicated at appropriate locations by the terminology "NOTICE: Refer to 'Notice' on page 3C-1 of this section."

NOTICE: All front suspension fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

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### **ON-VEHICLE SERVICE:** TWO WHEEL DRIVE INDEPENDENT FRONT SUSPENSION

#### SHOCK ABSORBER

+→ Remove or Disconnect (Figures 5, 6, 7, 8, and

- · Raise the vehicle on a hoist.
- 1. Shock absorber (20) from the lower control arm.
  - Nuts (23), washers (22) and bolts (21) (Figure 9).
- 2. Shock absorber (20) from the frame.
  - Nuts (16), washers (17), and bolts (21) (Figure 9).

#### BENCH TEST: SPIRAL GROOVE SHOCK **ABSORBERS**

- 1. Purge the air from the pressure chamber.
  - Extend the shock vertically—top end up.
  - Turn the shock over and collapse it vertically-top end down.
  - · Repeat the above step five times.
- 2. Place the shock absorber in a vise with the jaws clamped onto the shock's bottom mount.
  - Shock absorber should be positioned vertically in the vise-top end up.
  - Do not clamp the vise jaws on the shock's reservoir tube.
- 3. Pump the shock absorber at various rates of speed and observe the rebound force.
  - Rebound force is normally stronger than the compression force (approximately two to one).
  - Rebound force should be smooth and constant for each stroke rate.
- 4. Compare with a good shock absorber.
- 5. If one of the following are observed, replace the shock absorber.
  - A skip or lag at reversal near mid-stroke.
  - A seize (except at the extreme ends of travel).
  - A noise (grunt or squeal) after completing one full stroke in both directions.
  - A clicking noise at fast reversal.

#### **BENCH TEST: NON-SPIRAL GROOVE** RESERVOIR SHOCK ABSORBERS

- Purging air from non-spiral groove shock absorbers is not necessary. The shock absorbers have a gas filled cell in their reservoirs (as opposed to the air filled cell in the spiral groove shock absorber reservoirs).
- 1. Place the shock absorber in a vise with the jaws clamped on the shock absorber's top mount.
  - Shock absorber should be held vertically in the vise with its bottom end up.

- Do not clamp the vise jaws on the shock's reservoir tube.
- 2. Pump the shock absorber at various rates of speed and observe the rebound force.
  - Rebound force is normally stronger than the compression force (approximately two to one).
  - Rebound force should be smooth and constant for each stroke rate.
- 3. Compare with a good shock absorber.
- 4. If one of the following are observed, replace the shock absorber.
  - A skip or lag at reversal near mid-stroke.
  - A seize (except at the extreme ends of
  - A noise (grunt or squeal) after completing one full stroke in both directions.
  - A clicking noise at fast reversal.

Install or Connect (Figures 5 through 9)

NOTICE: Refer to "Notice" on page 3C#1 of this section.

- 1. Shock absorber (20) onto the vehicle.
  - Bolts (21), washers (17, 22), and nuts (16, 23) (figure 9).

### ₹ Tighten

- C and P series upper mount nuts (16) to 190 N·m (140 ft. lbs.).
- C and P series lower mount bolts (21) to 80 N·m (59 ft. lbs.).
- · G series upper and lower mount bolts (21) to 103 N·m (80 ft. lbs.).
- 2. Lower the vehicle.

#### STABILIZER BAR



Remove or Disconnect (Figures 5-8 and 10)

- Raise the vehicle and support with suitable safety stands. Remove the wheel and tire assembly.
- 1. Stabilizer bar (59) from the frame.
  - Bolts (54), nuts (58), washers (55, 57) and clamps (52).
- 2. Stabilizer bar (59) from the lower control arm (36).
  - Bolts (43), nuts (38), washers (39, 41) and clamps (42).
  - Stabilizer bar (59) drops down-remove the bushings (40, 53).

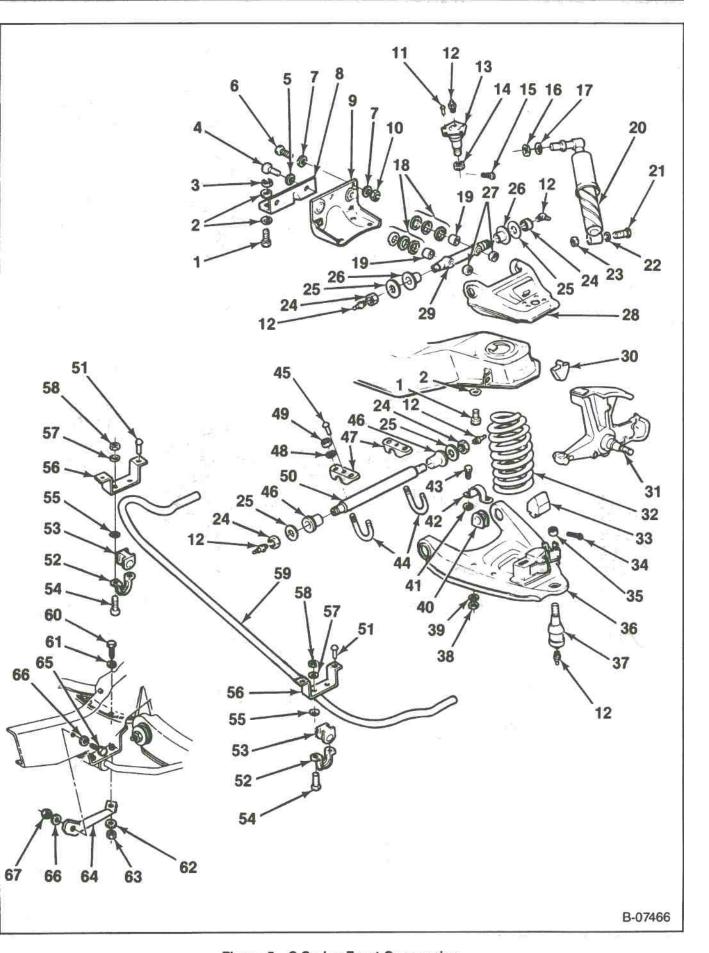


Figure 5—C Series Front Suspension

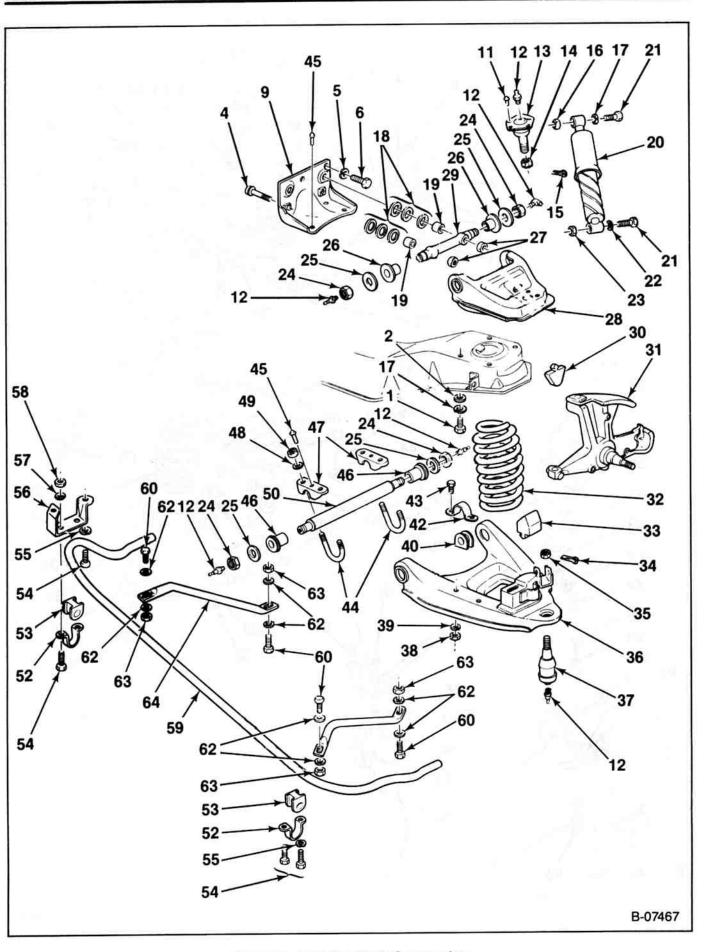


Figure 6—G Series Front Suspension

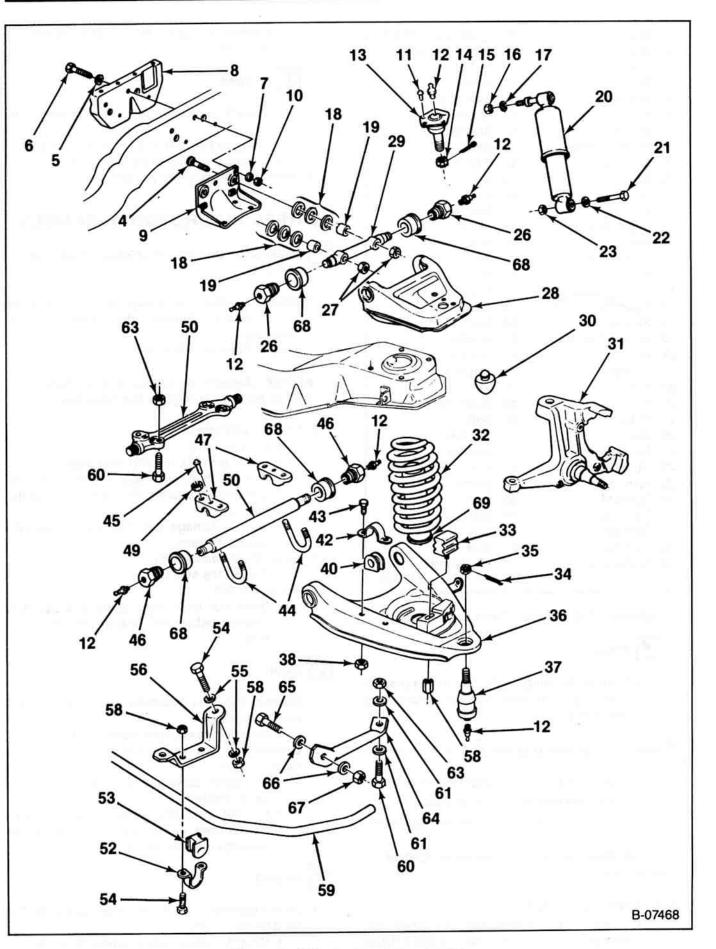


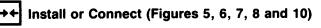
Figure 7—P Series Front Suspension

1. Bolt	36. Lower Control Arm
2. Washer	37. Lower Ball Joint
3. Nut	38. Nut
4. Bolt	39. Washer
5. Washer	40. Bushing
6. Bolt	41. Washer
7. Washer	42. Bracket
8. Reinforcement	43. Bolt
9. Bracket	44. U-Bolt
10. Nut	45. Rivet
11. Rivet	46. Bushing
12. Fitting	47. Bracket
13. Upper Ball Joint	48. Washer
14. Nut	49. Nut
15. Cotter Pin	50. Pivot Shaft
16. Nut	51. Rivet
17. Washer	52. Bracket
18. Shim Pack	53. Bushing
19. Spacer	54. Bolt
20. Shock Absorber	55. Washer
21. Bolt	56. Bracket
22. Washer	57. Washer
23. Nut	58. Nut
24. Nut	59. Stabilizer Bar
25. Retainer	60. Bolt
26. Bushing	61. Washer
27. Nut	62. Washer
28. Upper Control Arm	
29. Pivot Shaft	64. Brace
30. Bumper	65. Bolt
31. Steering Knuckle	66. Washer
32. Coil Spring	67. Nut
33. Bumper	68. Seal
34. Cotter Pin	69. Air Cylinder
35. Nut	B-07469

#### Figure 8—C-G-P Series Front Suspension



• Rubber bushings (40, 53) for excessive wear, aging, or other damage. Replace as necessary.



- 1. Bushings (40, 53) to the stabilizer bar (59).
  - · Slit on the insulator faces forward.
  - Use rubber lubricant to ease the installation.

#### NOTICE: Refer to "Notice" on page 3C#1 of this section.

- 2. Stabilizer bar (59) to the vehicle.
  - · Position the stabilizer bar and attach the clamps (52), bolts (54), washers (55, 57) and nuts (58).

• Clamps (42), bolts (43), washers (39, 41) and nuts (38).



- C and P series nuts (38, 58) to 33 N·m (24 ft.
- G series bolt (54) to 33 N·m (24 ft. lbs.).
- G series nut (38) to 29 N·m (21 ft. lbs.).
- 3. Wheel and tire assembly. Lower the vehicle.

#### WHEEL HUB/ROTOR ASSEMBLY



- Raise the vehicle and support it with suitable safety stands. Remove the wheel and tire assembly.
- 1. Caliper. Refer to BRAKES (SEC. 5).

#### NOTICE: Support the caliper with a piece of wire to prevent damage to the brake line.

- 2. Wheel Hub/Rotor (81)
  - Dust cap (79).
  - Cotter pin (80), nut (78), and washer (77).
  - Pull the hub/rotor free, making sure the outer wheel bearing (76) comes free of the hub/rotor.
  - Do not damage the steering knuckle (70) spindle threads.
- 3. Inner wheel bearing (73).
  - Pry out the seal (72).
- 4. Races (75, 82).
  - · Drive out each race using a brass drift inserted behind the race in notches in the hub.



#### Clean

- 1. Grease from the hub/rotor (81) and steering knuckle spindle.
  - Remove grease from inside the hub.
- 2. Grease from the wheel bearings (73, 76) and races (72, 75).
  - Use clean solvent and a small brush (no loose bristles).
  - Do not spin the wheel bearings with compressed air to dry them-the wheel bearings may be damaged.

### Inspect

- 1. Wheel bearings (73, 76) and their races (72, 75) for damage or wear.
  - · Refer to "Diagnosis of Wheel Bearings," in this section.

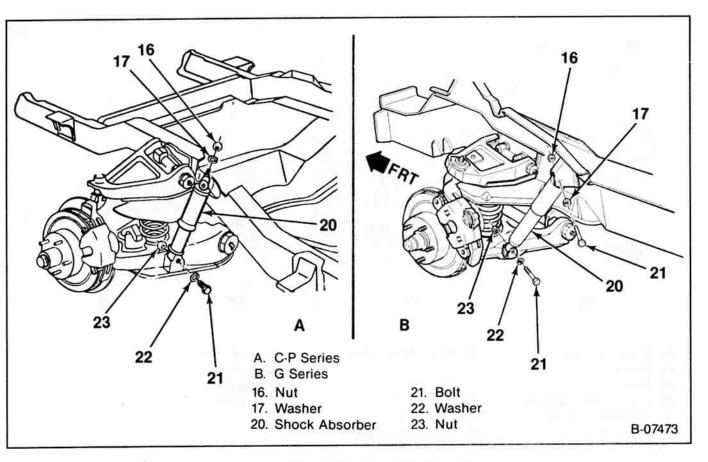


Figure 9—Shock Absorber Attachments

- If either a bearing or its race is damaged or worn, replace both.
- Install or Connect (Figures 5 through 8, 11 and 12)

#### 2. Hub/rotor for damage.

- · Check for out-of-round or scored conditions.
- · Check for pitting or cracks.
- · Repair or replace as necessary.

#### Tools Required:

- J-8092 Driver Handle
- J-8457 Wheel Bearing Race Installer
- J-8849 Wheel Bearing Race Installer
- J-9746-02 Hub/Rotor Support

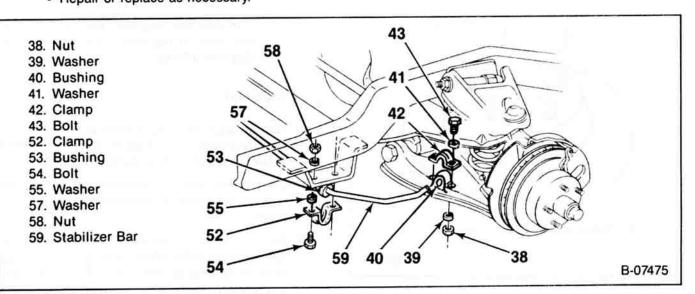


Figure 10-Stabilizer Bar Attachments

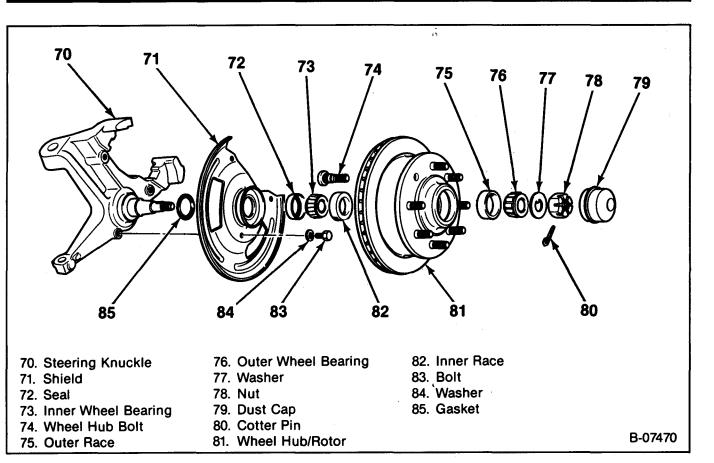


Figure 11—Steering Knuckle And Hub Assembly

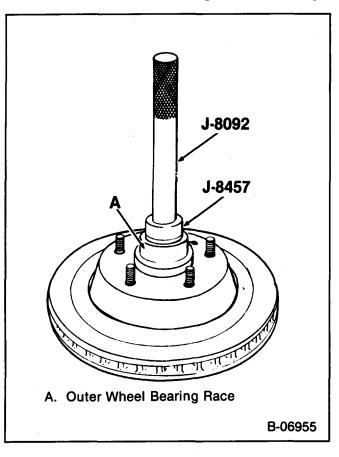


Figure 12—Installing The Outer Wheel Bearing Race

NOTICE: Start the races squarely inside the hub/rotor to avoid distortion and possible cracking.

- 1. Races (72, 75) into the hub/rotor (81).
  - Place the hub/rotor on J-9746-02 and rest this assembly on press bars.
  - Use J-8457 to drive the outer bearing outer race (75) into position (figure 12).
  - Turn over the hub/rotor, remove J-9746-02, and drive in the inner bearing outer race (82) with J-8449.

### ? Important

- Use an approved high-temperature front wheel bearing grease to lubricate the bearings. Refer to MAINTENANCE AND LUBRICATION (SEC. 0B).
- Do not mix different greases as mixing may change the grease's properties resulting in poor performance.
- 2. Apply a thin film of grease to the steering knuckle spindle at the outer wheel bearing seat and at the inner wheel bearing seat, shoulder, and seal seat.
- 3. Put a small quantity of grease inboard of each wheel bearing dust cap (79).

# NOTICE: Failure to completely pack the wheel bearing (cones, rollers, and cage) with grease will result in premature wheel bearing damage and/or wear.

- Fill each wheel bearing (cone and roller assembly) full of grease.
  - Use a cone-type grease machine that forces grease into the bearing.
  - If a cone-type grease machine is not available, pack the wheel bearing by hand.
  - When packing the wheel bearing by hand, work the grease into the bearings between the rollers, cones, and the cage.
- 5. Inner wheel bearing (73) into the hub/rotor (81).
  - Put an additional quantity of grease outboard of this bearing.
- 6. New seal (72).
  - Use a flat plate or block to install the seal to insure it is flush with the hub/rotor flange.
  - Lubricate the seal lip with a thin layer of grease.
- 7. Hub/rotor (81).
  - Do not damage the steering knuckle spindle threads.
- 8. Outer wheel bearing (76).
  - Slide it over the spindle until the wheel bearing (76) fully seats against the hub/rotor outer race (75).

## NOTICE: Refer to "Notice" on page 3C#1 of this section.

- 9. Washer (77), nut (78), and cotter pin (80).
  - Do not place the cotter pin through the hole in the spindle until the wheel bearings are adjusted.

### Tighten

- Nut (78) to 16 N·m (12 ft. lbs.) while turning the hub/rotor assembly in either direction.
- 10. Put an additional quantity of grease outboard of the wheel bearing (76).
- 11. Adjust the wheel bearings.
  - Refer to "Wheel Bearing Adjustment," in this section.
- 12. Dust cap (79) on the hub/rotor (81).
- 13. Caliper. Refer to BRAKES (SEC. 5).
- 14. Tire and wheel assembly and lower the vehicle.

#### WHEEL BEARING ADJUSTMENT

### [ ] Important

 The proper functioning of the front suspension cannot be maintained unless the front wheel bearings are correctly adjusted. The bearings must be a slip fit on the spindle and the inside diameter of the wheel bearing must be lubricated to ensure the bearings will creep. The spindle nut (78) must have a free-running fit on the spindle threads.

NOTICE: Never preload the front wheel bearings. Damage can result by the steady thrust on the roller ends which comes from preloading.

### P

#### **Adjust**

- Raise the vehicle and support it with suitable safety stands under the lower control arms.
- 1. Remove the dust cap (79) from the hub/rotor (81).
- 2. Remove the cotter pin (80).

### **રા** Tighten

- Nut (78) to 16 N·m (12 ft. lbs.) while rotating the wheel and tire assembly (this will seat the bearings).
- 3. Back off the nut (78) to the "just loose" position.
- 4. Hand tighten the nut (78).
- 5. Back off the nut (78) until the hole in the spindle lines up with a slot on the nut.
  - Do not back off more than 1/2 of a flat.
- 6. New cotter pin (80).
  - Make sure the bent ends do not interfere with the dust cap (79).

### 围

#### Measure

- Endplay in the hub/rotor assembly (81).
- It should measure between 0.03 mm (0.0012 inches) and 0.13 mm (0.005 inches) when properly adjusted.
- 7. Install the dust cap (79) on the hub/rotor (81).
- 8. Install the wheel and tire assembly if removed and lower the vehicle.

#### WHEEL HUB BOLT

++

Remove or Disconnect (Figures 5 through 8, and 13)

Tools Required:

J-9746-02 Hub/Rotor Support

- 1. Hub/rotor from the vehicle.
  - Refer to "Wheel Hub, Bearing and Race" in this section.

NOTICE: Place J-9746-02 between the press bars and the hub/rotor to protect the rotor surfaces.

- 2. Wheel hub bolts (74) with a press.
  - Support the hub/rotor (81) using J-9746-02 and press bars (figure 13).
  - Do not damage the wheel mounting surface on the hub/rotor flange.



Install or connect (Figures 5 through 8, and 14)

NOTICE: Refer to the "Notice" on page 3C#1 of this section.

- 1. Wheel hub bolts (74) into the hub/rotor (81).
  - Place four washers onto the bolt, then fasten a nut onto the bolt until the nut bottoms on the washers (figure 14).
  - Tighten the nut until the bolt fully seats into the hub/rotor (81).
  - · Remove the nut and washers.
- 2. Hub/rotor to the vehicle.
  - Refer to "Wheel Hub, Bearing and Race," in this section.
- 3. Wheel and tire assembly. Lower the vehicle.

#### STEERING KNUCKLE



Remove or Disconnect (Figures 5 through 8, 15 and 16)

Tools Required: J-23742 Ball Joint Separator



- It is recommended that the vehicle be raised and supported as on a twin-post hoist so that the front coil spring remains compressed, yet the wheel and steering knuckle assembly remain accessible. If a frame hoist is used, support the lower control arm with an adjustable jackstand to safely retain the spring in its curb height position.
- 1. Wheel and tire assembly.

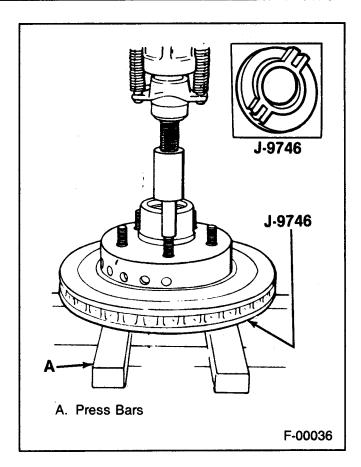


Figure 13—Pressing The Hub Bolt Out

- 2. Caliper.
  - Refer to BRAKES (SEC. 5).
- 3. Hub/Rotor (81).
  - Refer to "Wheel Hub, Bearing and Race," in this section.
- 4. Splash shield (71).
  - Bolts (83) and washers (84).
  - Gaskets (85).
- 5. Steering knuckle from the tie rod end.
  - Refer to STEERING LINKAGE (SEC. 3B1).
- 6. Steering knuckle (70) from the upper ball joint (13).

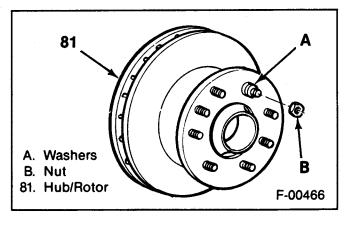


Figure 14—Installing The Wheel Hub Bolts

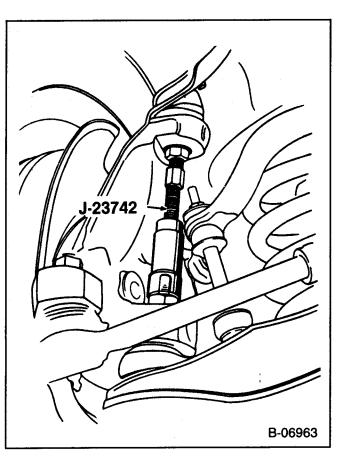


Figure 15—Disconnecting The Upper Ball Joint From The Steering Knuckle

- Position a floor jack under the lower control arm (36) near the spring seat.
- Raise the jack until it just supports the lower control arm.
- Use J-23742 to break the upper ball joint free of the steering knuckle (figure 15).
- Raise the upper control arm (28) to disengage the upper ball joint from the steering knuckle.

### ? Important

- Floor jack must remain under the lower control arm spring seat during removal and installation to retain the spring and the lower control arm in position.
- 7. Steering knuckle (70) from the lower ball joint (37).
  - Use J-23742 to break the lower ball joint free from the steering knuckle (figure 16).
  - Lift the steering knuckle off the lower ball joint.

### Inspect

- 1. Tapered holes in the steering knuckle that attach to the ball joints and the tie rod end.
  - · Remove any dirt.

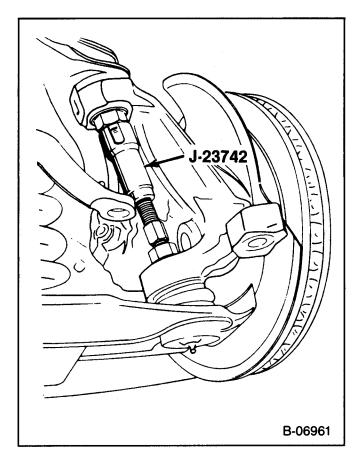


Figure 16—Disconnecting The Lower Ball Joint From The Steering Knuckle

- If any tapered hole is out of round, deformed, or damaged in any way, replace the steering knuckle (70).
- 2. Spindle for wear or damage.
  - The steering knuckle (70) must be replaced if the spindle is damaged or worn.

### →← Install or Connect (Figures 5 through 8)

NOTICE: For steps 3 and 8, refer to the "Notice" on page 3C#1 of this section.

- 1. Steering knuckle (70) to the lower ball joint (37).
  - Press the steering knuckle onto the lower ball joint (37) until it is fully seated.
- 2. Steering knuckle (70) to the upper ball joint (13).
  - Lower the upper control arm (28) to seat the upper ball joint (13) into the steering knuckle.
- 3. Nuts (14, 35).

### **1** Tighten

- Nuts (14, 35) to "Specifications" at the end of this section.
- 4. Cotter pins (15, 34).
  - Tighten the nuts (14, 35), if needed, to install the cotter pins.

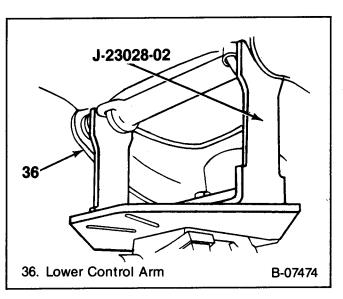


Figure 17—Removing The Coil Spring

- 5. Remove the floor jack.
- 6. Gasket.
- 7. Tie rod end to the steering knuckle (70).
  - Refer to STEERING LINKAGE (SEC. 3B1).
- 8. Splash shield (71).
  - Washers (84) and bolts (83) in position.

### **Q** Tighten

- Bolts (83) to 13.5 N·m (120 in. lbs.).
- 4. Hub/rotor assembly.
  - Refer to "Wheel Hub, Bearing and Race" in this section.
- 5. Caliper.
  - Refer to BRAKES (SEC. 5).
- 6. Adjust the wheel bearings.
  - Refer to "Wheel Bearing Adjustment" in this section.
- 7. Check the front alignment and reset as required.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).
- 8. Wheel and tire assembly, and lower the vehicle to the ground.

#### **COIL SPRING**

++) F

Remove or Disconnect (Figures 5 through 8, and 17)

Tools Required:

J-23028-02 Spring Remover

- Raise the vehicle and support it with suitable safety stands, allowing the control arms to hang free. Remove the wheel and tire assembly.
- 1. Shock absorber (20) at the lower end and move it aside.
- 2. Stabilizer bar (59) from the lower control arm (36).

 Nuts (38), bolts (43), washers (41) and clamp (42).

CAUTION: Failure to secure J-23028 to a suitable floor jack could result in personal injury.

- 3. J-23028-02 to a suitable jack.
- 4. Place J-23028-02 under the lower control arm shaft (50) as shown in figure 17.

### | Important

- Install a chain around the coil spring (32) and through the lower control arm (36) as a safety precaution.
- Raise the jack to remove the tension from the lower control arm shaft (50) and remove the "U" bolts.
  - Nuts (49) and washers (48).
- 6. Lower the control arm by slowly releasing the jack until the spring can be removed.
  - Do not damage the ball joint (37) by applying too much force on it.
- 7. Spring (32) and safety chain only after all compression is removed from the spring.
  - Proper maneuvering of the spring will allow for easy removal.

### →← Install or Connect (Figures 5 through 8 and 17)

**Tools Required:** 

J-23028-02 Spring Remover

NOTICE: For steps 3, 5 and 6, refer to the "Notice" on page 3C#1 of this section.

1. Coil spring (32) into position on the lower control arm (36).

### ? Important

 Install a chain around the coil spring and through the lower control arm as a safety precaution.

CAUTION: Failure to secure J-23028 to a suitable floor jack could result in personal injury.

- 2. Slowly lift the lower control arm into position.
  - Line up the front indexing hole in the shaft (50) with the crossmember attaching studs.
  - Do not damage the lower ball joint (37).
  - Use J-23028-02 bolted on a floor jack.
- 3. U-bolts (44), washers (48), and nuts (49).

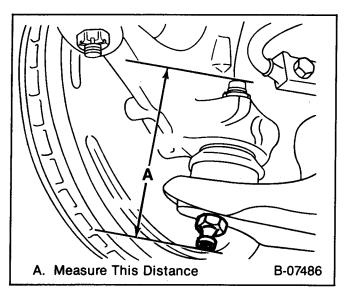


Figure 18—Inspecting The Lower Ball Joint



- For G10/1500-20/2500 series vehicles, torque to 88 N·m (65 ft. lbs.).
- For all other series vehicles, torque to 115 N·m (85 ft. lbs.).
- 4. Lower the floor jack, and remove J-23028-02.
- 5. Stabilizer bar (59) to the lower control arm (36).
  - Clamp (42), washers (41), bolts (43) and nuts (38).

### **Q** Tighten

- Nuts (38) to 33 N·m (24 ft. lbs.).
- 6. Shock absorber (20) to the lower control arm (36).
  - Washer (22), bolt (21), and nut (23).

### হি Tighten

- Nut (23) to "Specifications" at the end of this section.
- 7. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A)
- 8. Wheel and tire and lower the vehicle.

#### LOWER BALL JOINT



- Raise the vehicle and remove the wheel and tire assembly. Support the weight of the control arms at the wheel hub and drum.
- 2. Measure the distance between the tip of the ball joint stud and the tip of the grease fitting below the ball joint (figure 18).
- 3. Move the support to underneath the control arm allowing the wheel hub and drum to hang free.

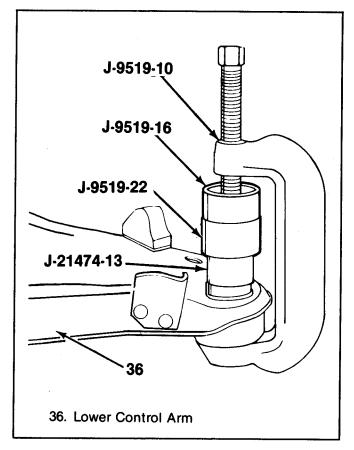


Figure 19—Removing The Lower Ball Joint

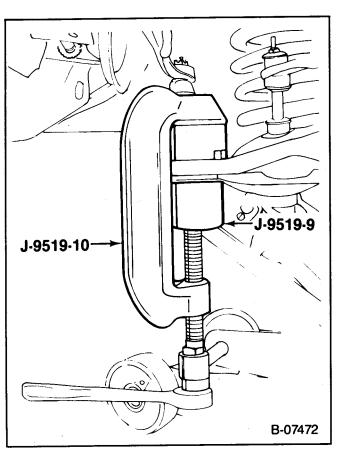
- 4. Measure the distance as in Step 2.
  - If the difference in measurements exceeds 2.38 mm (3/32 inches), for all models, the ball joint is worn and must be replaced.
- 5. If the ball joint seals are cracked, cut, or torn, replace them.

# Remove or Disconnect (Figures 5 through 8, and 19)

#### **Tools Required:**

J-23742 Ball Joint Separator J-9519-10 Ball Joint Fixture J-9519-16 Ball Joint Installer J-9519-22 Ball Joint Installer

- J-21474-13 Ball Joint Installer se the vehicle on a hoist. If a frame
- Raise the vehicle on a hoist. If a frame hoist is used it will be necessary to support the lower control arm with a floor stand. Remove the tire and wheel assembly.
- 1. Cotter pin (34), nut (35), and lube fitting (12).
  - Loosen (two turns) but do not remove the nut (35).
- 2. Loosen the ball joint in the steering knuckle (31).
  - Use J-23742 between the ball joint studs (figure 16).
  - It may be necessary to remove the caliper and wire it to the frame to gain clearance for J-23742. Refer to BRAKES (SEC. 5).



#### Figure 20—Installing The Lower Ball Joint

- Extend J-23742 until the lower ball joint (37) breaks free from the steering knuckle (31).
- Remove the nut (35) and J-23742.
- 3. Hub/rotor (70) and the knuckle assembly off the lower ball joint (37).
  - Support the upper control arm (28) with a block of wood to keep it clear of the work area.
- 4. Ball joint (37) from the lower control arm (36).
  - Install J-21474-13, J-9519-22, J-9519-16, and J-9519-10 (figure 19).
  - Turn the hex head screw until the ball joint is free of the lower control arm.
  - Remove the tools and the ball joint (37).

# Install or Connect (Figures 5 through 8, and 20)

Tools Required:

J-9519-9 Ball Joint Installer J-9519-10 Ball Joint Fixture

- 1. Ball joint (37) into the lower control arm (36).
  - Start the ball joint into the control arm and install J-9519-9 and J-9519-10 (Figure 20).
  - Position the bleed vent in the rubber boot facing inward.
  - Turn the hex head screw until the ball joint is seated in the lower control arm.
- 2. Ball joint into the steering knuckle (31).

- Mate the steering knuckle (31) to the lower ball joint (37).
- 3. Caliper if it was removed.
  - Refer to BRAKES (SEC. 5).

### NOTICE: Refer to "Notice" on page 3C#1 of this section.

4. Nut (35).

### **Tighten**

- Nut (35) to 122 N·m (90 ft. lbs.).
- 5. Cotter pin (34).
  - Tighten the nut (35) until the hole in the stud lines up with the slot in the nut.
  - Do not tighten more than one flat or 175 N·m (130 ft. lbs.) maximum.
- 5. Fitting (12).
  - Lubricate the ball joint (37) with recommended lubricant.
- 6. Tire and wheel assembly and lower the vehicle to the floor.

#### **UPPER BALL JOINT**

### Inspect

- The upper ball joint (13) is spring loaded in its socket. Replace the ball joint if there is any lateral shake or if it can be twisted in its socket with the fingers.
- The ball joint seals for cuts or tears. Replace the ball joint if any are found.

## Remove or Disconnect (Figures 5 through 8, and 15)

#### **Tools Required:**

J-23742 Ball Joint Separator

- Raise the vehicle on a hoist. If a frame hoist is used, support the lower control arm with a floor jack.
- 1. Cotter pin (15) from the upper ball joint (13).
- Loosen the nut (14) two turns, but do not remove the nut.
- Caliper.
  - Refer to BRAKES (SEC. 5).
- 3. Upper ball joint (13) from the steering knuckle (31).
  - Use J-23742 to separate the upper ball joint from the steering knuckle (figure 15).
  - Nut (14), and lift the upper control arm (28) free of the ball joint.
- 4. Ball joint (13) from the upper control arm (28).
  - Drill 6.35 mm (1/4 inch) deep holes in the rivet heads using a 3.175 mm (1/8 inch) diameter drill bit.

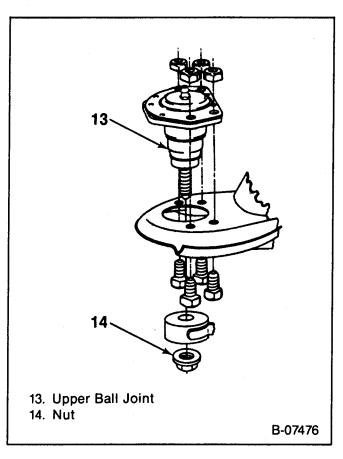
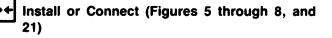


Figure 21—Installing The Upper Ball Joint

- Drill off the rivet heads using a 12.7 mm (½ inch) diameter drill bit.
- Punch out the rivets and remove the upper ball joint from the upper control arm.



NOTICE: For steps 1 and 2 refer to the "Notice" on page 3C#1 of this section.

- 1. Upper ball joint (13) into the upper control arm (28).
  - Position into the upper control arm and install four attaching bolts and nuts (figure 21).

### **ર** Tighten

- Attaching nuts to 25 N·m (18 ft. lbs.).
- 2. Upper ball joint to the steering knuckle (31).
  - The upper ball joint must be fully seated into the steering knuckle.
  - Nut (14).

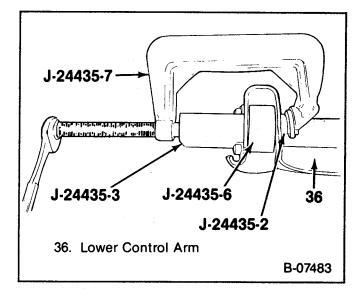


Figure 22—Removing The Lower Control Arm Bushings (C10/1500, G10/1500-20/2500 Series)

### **1** Tighten

- All 10/1500 series and G20/2500 series vehicle nuts (14) to 68 N·m (50 ft. lbs.).
- All 20/2500 and 30/3500 series (except G20/2500) vehicle's nuts (14) to 122 N·m (90 ft. lbs.).
- Apply additional torque to align the cotter pin (15), but do not exceed 120 N·m (90 ft. lbs.) for all 10 series and G20/2500 series or 175 N·m (130 ft. lbs.) for all other series.
- 3. Cotter pin (15).
- 4. Upper ball joint grease fitting (12).
- 5. Grease the upper ball joint (13).
  - Use a recommended lubricant.
- 6. Caliper.
  - Refer to BRAKES (SEC. 5).
- 7. Tire and wheel assembly.
- 8. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).

# LOWER CONTROL ARM PIVOT SHAFT AND BUSHINGS

#### C10/1500 SERIES VEHICLES

Remove or Disconnect (Figures 5, 8, 17 and 22)

#### **Tools Required:**

J-23028-02 Coil Spring Remover

J-22717 Lower Control Arm Bushing Stake Remover

J-24435-2 Lower Control Arm Bushing Spacer

J-24435-3 Lower Control Arm Bushing Remover

J-24435-6 Lower Control Arm Bushing Spacer

J-24435-7 Lower Control Arm Bushing Fixture

If just the bushings (46) or the pivot shaft (50) need replacement, the lower control arm (36) does not have to be removed from the vehicle.

 Raise the vehicle on a hoist and support the frame so the lower control arms hang free.

# CAUTION: Failure to install J-23028-02 to a suitable floor jack could result in personal injury.

 J-23028-02 to a suitable floor jack and raise it into position [under the lower control arm (26)] inboard of the spring and into the depression of the lower control arm.

### ? Important

- Install a chain over the upper control arm (28) inboard of the stabilizer bar (59) and outboard of the shock absorber (20).
- 2. Shock absorber (20) from the lower control arm (28).
  - Nut (23), washer (22), and bolt (21).
- 3. Stabilizer bar (59) from the lower control arm (28).
  - Nuts (38), washers (39, 41), clamp (42), and bolts (43).
- 42. Pivot shaft end nuts (24).
  - Loosen only, do not remove.
- 5. Lower control arm from the frame.
  - Nuts (49), washers (48), and U-bolts (44).
  - SLOWLY lower the floor jack until all compression is released from the spring (32).
- 6. Stakes on the front bushing.
  - Use J-22717 or an equivalent tool.
- 7. Bushings (46) and the pivot shaft (50) from the lower control arm (36).
  - Use J-24435-2, J-24435-3, J-24435-6, and J-24435-7 (figure 22).
  - Tighten the bolt on J-24435-7 to remove the bushing. Discard the old bushing.
  - The pivot shaft (50) will slide out of the lower control arm after one bushing is removed.
  - Leave the pivot shaft (50) inside the lower control arm (36) to remove the remaining bushing.

### →+ Install or Connect (Figure 5, 8 and 23)

**Tools Required:** 

J-23028-02 Coil Spring Compressor

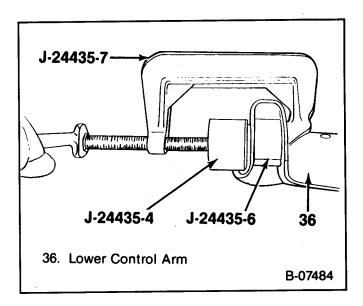


Figure 23—Installing The Lower Control Arm Bushings (C10/1500, G10/1500-20/2500 Series)

J-24435-4 Lower Control Arm Bushing Installer

J-24435-6 Lower Control Arm Bushing Spacer

J-24435-7 Lower Control Arm Bushing Fixture

## NOTICE: For steps 3, 4, 5 and 6, refer to the "Notice" on page 3C#1 of this section.

- 1. Bushings (46) and the pivot shaft (50).
  - Use J-24435-4, J-24435-6, and J-24435-7 (figure 23).
  - Tighten the bolt on J-24435-7 to install the bushings.
  - Install one bushing, then insert the pivot shaft and install the remaining bushing.
  - Make sure J-24435-6 is in position to prevent collapsing the control arm.
- 2. Stake the front bushing in at least two places.

# CAUTION: Failure to secure J-23028-02 to a suitable floor jack could result in personal injury.

- 3. Lower control arm (36) to the frame.
  - SLOWLY raise the floor jack until the front indexing hole in the pivot shaft (50) lines up with the crossmember attaching studs.
  - Do not damage the ball joint (37).
  - J-23028-02 is bolted to a suitable floor jack.
  - U-bolts (44), washers (48), and nuts (49).

### **Tighten**

- U-bolt nuts (49) to 115 N·m (85 ft. lbs.).
- 4. Pivot shaft end nuts (24).

### |**◯**| Tighten

- Nuts (24) to 95 N·m (70 ft. lbs.).
- 5. Stabilizer bar (59) to the lower control arm (28).
  - Washers (39, 41), clamp (42), bolts (43), and nuts (38).

### **Tighten**

- Nuts (38) to 34 N·m (25 ft. lbs.).
- 6. Shock absorber (20) to the lower control arm (36).
  - Washers (22), bolt (21), and nut (23).

### |읷| Tighten

- Nut (23) to 81 N·m (60 ft. lbs.).
- 7. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).
- 8. Wheel and tire and lower the vehicle.

#### G10/1500-20/2500 SERIES (EXCEPT 20/2500 SERIES W/6.2L DIESEL)

#### Remove or Disconnect (Figures 6, 8, and 22)

#### **Tools Required:**

- J-22717 Lower Control Arm Bushing Stake Remover
- J-24435-2 Lower Control Arm Bushing Spacer
- J-24435-3 Lower Control Arm Bushing Remover
- J-24435-6 Lower Control Arm Bushing Spacer
- J-24435-7 Lower Control Arm Bushing Fixture
- 1. Lower control arm.
  - Refer to "Lower Control Arm," in this section.
- 2. Pivot shaft nuts (24) and washers (25).
- 3. Rear bushing (46).
  - Place the lower control arm in an arbor press.
  - Press the front end of the pivot shaft (50) to remove the rear bushing. Discard the old bushing.
  - The pivot shaft can be removed at this time.
- 4. Front bushing (46).
  - Stakes from the front bushing using J-22717 or an equivalent tool.
  - Use J-24435-7, J-24435-3, J-24435-2, and J-24435-6.
  - Tighten J-24435-7 until the bushing comes free. Discard the old bushing (figure 22).

#### Install or Connect (Figures 6, 8, 23 and 24)

#### **Tools Required:**

- J-24435-4 Lower Control Arm Bushing Installer
- J-24435-6 Lower Control Arm Bushing Spacer
- J-24435-7 Lower Control Arm Bushing **Fixture**
- 1. New bushing (46) using J-24435-6, J-24435-4, and J-24435-7 (figure 23).
  - Tighten J-24435-7 until the bushing fully seats.
  - The outer tube hole must be lined up so it faces to the front or forward to the staked bushina.
- 2. Stake the front bushing in at least two places.
- 3. Pivot shaft (50) into installed bushing.
- 4. Remaining bushing (46) into the lower control arm.

#### NOTICE: Refer to "Notice" on page 3C#1 of this section.

5. Pivot shaft washers (25) and nuts (24).

### **Tighten**

- Nuts (24) to 156 N·m (115 ft. lbs.).
- 6. Lower control arm (76).
  - Refer to "Lower Control Arm," in this section.
  - This results with the vehicle being completely assembled and lowered to the ground.

#### G20/2500 SERIES WITH RPO LH6/LL4 (6.2L DIESEL ENGINE)

#### Remove or Disconnect (Figures 5 through 8, and 25)

#### **Tools Required:**

- J-24435-1 Lower Control Arm Bushing Remover
- J-24435-3 Lower Control Arm Bushing Remover
- J-24435-7 Lower Control Arm Bushing **Fixture**
- 1. Lower control arm (36).
  - Refer to "Lower Control Arm," in this section.
- 2. Bushings (46) and the pivot shaft (50) from the lower control arm (36).
  - Use J-24435-1, J-24435-3, and J-24435-7 (figure 25).
  - Tighten the clamp (J-24435-7) to remove the bushing (46).

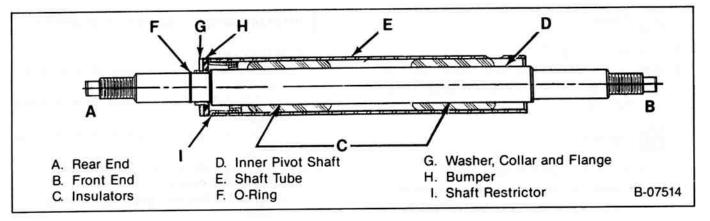


Figure 24—Lower Control Arm Pivot Shaft (G10/1500-20/2500 W/O 6.2L Diesel)

- The pivot shaft can be slipped out at this time.
- Repeat the procedure on the remaining bushing (46) to remove it from the lower control arm (36).
- Install or Connect (Figures 5 through 8, and 26)

#### Tools Required:

- J-24435-4 Lower Control Arm Bushing Installer
- J-24435-5 Lower Control Arm Bushing Installer
- J-24435-7 Lower Control Arm Bushing Fixture
- 1. Bushings (46) and the pivot shaft (50) into the lower control arm (36).
  - Use J-24435-4, J-24435-5, and J-24435-7 (figure 26).
  - Tighten the clamp (J-24435-7) to install the bushing (26).
- J-24435-7 J-24435-3 J-24435-1 B-07479

Figure 25—Removing The Lower Control Arm Bushing (G20/2500 W/6.2L Diesel)

- Slide the pivot shaft (50) into the lower control arm (36), then install the other bushing (36).
- 2. Lower control arm (36).
  - Refer to "Lower Control Arm," in this section.
  - This results with the vehicle being completely assembled and lowered to the ground.

#### CP20/2500-30/3500, G30/3500 SERIES VEHICLES

### ←→ Remove or Disconnect (Figures 5 through 8)

- Raise the vehicle and support the frame so the control arms hang free. Remove the tire and wheel assembly.
- Position an adjustable floor jack under the lower control arm (36) inboard of the spring and into the depression in the lower control arm.

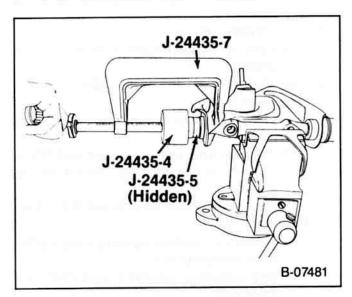
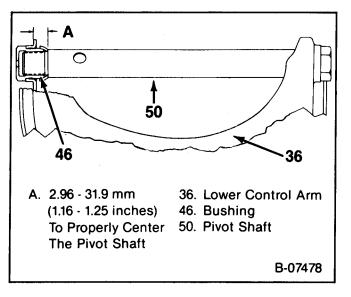


Figure 26—Installing The Lower Control Arm Bushing (G20/2500 W/6.2L Diesel)



### Figure 27—Centering The Lower Control Arm Shaft (CP20/2500-30/3500 And G30/3500 Series)

### ? Important

- Install a chain over the upper control arm (28) inboard of the stabilizer bar (59) and outboard of the shock absorber (20).
- 2. Shock absorbers (20) from the lower control arm (36).
  - Nut (23), washer (22) and bolt (21).
- 3. Stabilizer bar (59) from the lower control arm (36).
  - Nuts (38), washers (39, 41), bolts (43) and clamp (42).
- 4. Lower control arm (36) from the frame crossmember.
  - Nuts (49), washer (48), and U-bolts (44).
  - SLOWLY lower the floor jack to access the pivot shaft (50).
  - 5. Grease fittings (12).
  - 6. Bushings (46) and bushing seals, and pivot shaft (50).
  - Unscrew the bushings.
  - Slide the pivot shaft out of the lower control arm.
  - Seals are mounted between the bushings and the pivot shaft. Discard the old seals.

# Install or Connect (Figures 5 through 8, and 27)

NOTICE: For steps 1, 3, 4, and 5 refer to the "Notice" on page 3C#1 of this section.

- 1. Pivot shaft (50), seals, and bushings (46), to the lower control arm (36).
  - New seals onto the pivot shaft.
  - Pivot shaft into the lower control arm. Attach the bushings. Center the shaft in the lower control arm (figure 27).

### **રો** Tighten

• Bushings (46) to 379 N·m (280 ft. lbs.).

### Inspect

- · Pivot shaft (50) for free rotation.
- 2. Grease fitting (12).
  - Lubricate the bushings with an approved grease.
  - Refer to MAINTENANCE AND LUBRICATION (SEC. 0B).
- 3. Lower control arm (36) to the frame crossmember.
- SLOWLY raise the floor jack until the lower control arm (36) is in position.

### ? Important

- Be sure the hole in the pivot shaft mates with the bolt head in the frame crossmember saddle.
- U-bolts (44), washers (48), and nuts (49).

### **ર** Tighten

- Nuts (49) to 115 N·m (85 ft. lbs.).
- 7. Stabilizer bar (59) to the lower control arm (36).
  - Nuts (38), washers (39, 41), bolts (43), and clamp (42).

### **1** Tighten

- Nuts (38) to 33 N·m: (24 ft. lbs.).
- 5. Shock absorbers (20) to the lower control arm (36).
  - Bolt (21), washer (22), and nut (23).

### **Q** Tighten

- Nut (23) to "Specifications" at the end of this section.
- Remove the safety chain and the floor jack. Install the tire and wheel assembly and lower the vehicle to the ground.

# UPPER CONTROL ARM PIVOT SHAFT AND BUSHINGS

C10/1500, G10/1500-20/2500 SERIES VEHICLES

Remove or Disconnect (Figures 5 through 8, and 28)

#### **Tools Required:**

J-24435-1 Lower Control Arm Bushing Remover

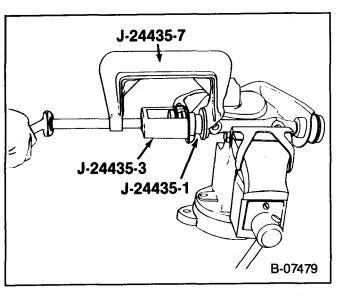


Figure 28—Removing The Upper Control Arm Bushings (C10/1500, G10/1500-20/2500 Series)

J-24435-3 Lower Control Arm Bushing Remover

J-24435-7 Lower Control Arm Bushing Fixture

- 1. Upper control arm (28).
  - Refer to "Upper Control Arm," in this section.
- 2. Nuts (24), bushings (26) and the pivot shaft (29) from the upper control arm (28).
  - Use J-24435-1, J-24435-3, and J-24435-7 (figure 28).
  - Tighten J-24435-7 to remove the bushing (26).
  - Pivot shaft (29) can be pulled free at this time.
  - Repeat this procedure on the remaining bushing (26). Discard the old bushings.

# Install or Connect (Figures 5 through 8, and 29)

#### **Tools Required:**

J-24435-4 Lower Control Arm Bushing Installer

J-24435-5 Lower Control Arm Bushing Installer

J-24435-7 Lower Control Arm Bushing Fixture

### NOTICE: Refer to the "Notice" on page 3C#1 of this section.

Bushings (26) and the pivot shaft (29) into the upper control arm (28).

• Use J-24435-4, J-24435-5, and J-24435-7 (figure 29).

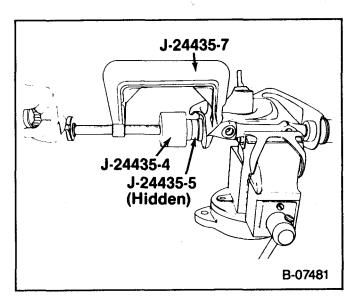


Figure 29—Installing The Upper Control Arm Bushings (C10/1500, G10/1500-20/2500 Series)

- Tighten the clamp (J-24435-7) to install the bushing (26).
- Slide the pivot shaft (29) into the upper control arm (28), then install the other bushing (26).
- Nuts (24) in place.

### **Tighten**

- Nuts (24) to 156 N·m (115 ft. lbs.).
- 2. Upper control arm (28) to the crossmember.
  - Refer to "Upper Control Arm," in this section.
- 3. Caliper if it was removed.
  - Refer to BRAKES (SEC. 5).
- 4. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).
- Remove the supports and lower the vehicle to the ground.

#### CP20/2500-30/3500, G30/3500 SERIES VEHICLES

### ←→ Remove or Disconnect (Figures 5 through 8)

- Raise the vehicle and support the lower control arms with a floor jack positioned under or near the ball joint assembly. Remove the wheel and tire assembly.
- 1. Loosen, but do not remove the pivot shaft to frame nuts (27).
- 2. Shim packs (18).
  - Tape each pack together and mark their position to assure exact replacement during installation.
- 3. Pivot shaft to frame nuts (27), bolts (4), and spacers (19).

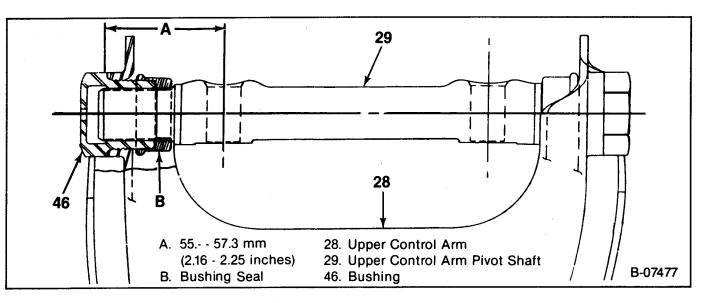


Figure 30—Centering The Upper Control Arm Shaft (CP20/2500-30/3500 G30/3500 Series)

 Do not allow the upper control arm (28) to swing too far from the frame crossmember.

### ? Important

- Install a chain over the upper control arm (28) inboard of the stabilizer bar (59) and outboard of the shock absorber (20), to retain the upper control arm in a close relationship to the frame crossmember.
- 4. Pivot shaft (29) and bushings (26).
  - · Grease fitting (12).
  - Unscrew the bushings (26).
  - Slide the pivot shaft out of the upper control arm. Remove and discard the inner seals (between the bushings and the pivot shaft).

# Install or Connect (Figures 6 through 8, and 30)

- 1. Pivot shaft (29), seals, and bushings (26) onto the upper control arm (28).
  - · New inner seals onto the pivot shaft.
  - Slide the pivot shaft into position inside the upper control arm. Screw on the new bushings. Do not tighten.

### ? Important

• The pivot shaft (29) must be centered in the upper control arm (28) as shown in figure 30.

### **Q** Tighten

• Bushings (26) to 257 N·m (190 ft. lbs.).

### Inspect

- · Pivot shaft for free rotation.
- 2. Grease fitting (12).
  - Grease the bushings (29). Refer to MAINTENANCE AND LUBRICATION (SEC. 0B).

### NOTICE: Refer to the "Notice" on page 3C-1 of this section.

- 3. Pivot shaft (29) to the frame.
  - Bolts (4), shim packs (18), spacers (19), and nuts (27).
  - Shims are positioned into their original positions. Make sure the convex and concave sides of the shims are together.

### **1** Tighten

- Nuts (27) to 142 N·m (105 ft. lbs.).
- Remove the safety chain and install the wheel and tire assembly.
- 5. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).
- 6. Lower the vehicle to the ground.

#### LOWER CONTROL ARM

## Remove or Disconnect (Figures 5 through 8, and 16)

#### Tools Required:

J-23742 Ball Joint Separator

 Raise the vehicle and support it with suitable safety stands. Remove the wheel and tire assembly.

- 1. Caliper.
  - Refer to BRAKES (SEC. 5).
- 2. Coil spring (32).
  - · Refer to "Coil Spring," in this section.
  - The lower control arm is separated from the frame.
- 3. Use a jack to support the inboard end of the lower control arm (36).
- 4. Lower control arm (36) from the steering knuckle (31).
  - Cotter pin (34), then loosen the nut (35) one turn.
  - Install J-23742, with the large cup end over the upper ball joint nut (14). Extend threaded end until the ball joint stud loosens from the steering knuckle. Remove J-23742 and the nut (35).

### Install or Connect (Figures 5 through 8)

- Lower control arm (36) to the steering knuckle (31).
  - Position the lower control arm ball joint stud (37) into the steering knuckle (31).
  - Nut (35) onto the stud. Do not tighten.
- 2. Coil spring (32).
  - Refer to "Coil Spring," in this section.
  - This step results with the lower control arm being attached to the frame.

### NOTICE: Refer to "Notice" on page 3C-1 of this section.

3. Cotter pin (34).

### **1** Tighten

- Nut (35) to 122 N·m (90 ft. lbs.).
- Cotter pin. Tighten further to a maximum of 176 N·m (130 ft. lbs.) for cotter pin installation, if necessary.
- 4. Caliper.
  - Refer to BRAKES (SEC. 5).
- 5. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).
- 6. Tire and wheel assembly and lower the vehicle.

#### **UPPER CONTROL ARM**

++

Remove or Disconnect (Figures 5 through 8, and 15)

Tools Required:

J-23742 Ball Joint Separator

- Raise the vehicle and support it with suitable safety stands. Remove the wheel and tire assembly. Place an adjustable jackstand under the lower control arm for support.
- 1. Caliper.
  - Refer to BRAKES (SEC. 5).
- 2. Upper control arm (28) from the steering knuckle (31).
  - Cotter pin (15).
  - Loosen the nut (14). Do not remove it.
  - Install J-23742 with the large cupped end over the lower control arm ball joint stud nut (35). Expand J-23742 until the upper control arm separates.
  - Nut (14) from the upper ball joint stud and raise the upper control arm to clear the steering knuckle.
- 3. Upper control arm (28) from the frame bracket (9).
  - Nuts (27), spacers (19), shims (18), washers
     (5) and bolts (6).

### | Important

 Tape the shims together in their original positions and tag for proper relocation.

→+ Install or Connect (Figures 5 through 8)

## NOTICE: For steps 2 and 3, refer to "Notice" on page 3C-1 of this section.

- 1. Shims (18) into position on the upper control arm frame bracket (9).
  - Make sure the shims are positioned with concave and convex sides together.
  - 2. Upper control arm (28) to the frame bracket (9).
  - Spacers (19) and nuts (27), washers (5), and bolts (6).

### | Important

- A normal shim pack will leave at least two threads of the bolt (6) exposed beyond the nut.
- If two threads cannot be obtained; check for damaged control arm or related parts. The difference between the front and rear shim

packs must not exceed 7.62 mm (0.30 inches). The front shim pack must be at least 6.09 mm (0.24 inches).

 Always tighten the thinner shim pack's nut (27) first for improved shaft to frame clamping force and torque retention.

### **(**Tighten

- Nuts (27) to "Specifications" at the end of this section.
- 3. Upper control arm (28) to the steering knuckle (31).
  - Insert the upper control arm ball joint stud
     (13) into the steering knuckle (31).
  - Nut (14) and cotter pin (15).

### হ্মি Tighten

- "Nut (14) to the "Specifications" at the end of this section.
- 4. Caliper.
  - Refer to BRAKES (SEC. 5).
- 5. Check the front end alignment.
  - Refer to FRONT END ALIGNMENT (SEC. 3A).
- 6. Wheel and tire assembly. Lower the vehicle to the ground.

#### SUSPENSION UNIT

The front suspension and frame crossmember can be removed or installed as a unit if extensive service is required.

# Remove or Disconnect (Figure 5 through 8, and 31)

- Raise the hood and disconnect the battery negative cable.
- Hoist the vehicle and support it with suitable safety stands placed at the frame side rails.
   Remove the tire and wheel assembly and then lower the hoist.
- 1. Front brake hose clip from each upper control arm.
- 2. Brake hoses from the calipers.
  - Clean the area adjacent to the brake hose fittings.
  - Discard the special washers (2 on each hose) and cover the disconnected ends of each hose with suitable material.
  - Refer to BRAKES (SEC. 5).
- 3. Tie rod ends from the steering knuckle (31).
  - Refer to STEERING LINKAGE (SEC. 3B1).
- 4. Front stabilizer from the lower control arms (36).
  - Nuts (38), washers (39, 41), bolts (43), and clamps (42).

- 5. Shock absorbers (20) from the lower control arms (36).
  - Nut (23), washer (22), and bolt (21).
- Brake line clip bolts from the front suspension crossmember.
  - On C series models the clip is located under the right side engine mount support bracket.

NOTICE: Failure to disconnect these clips from the suspension unit will result in severe damage to the brake line when the unit is lowered from the vehicle.

- Suspension crossmember from the engine mounts.
  - Refer to ENGINE (SEC. 6A).
- 8. Suspension crossmember from the frame rail (figure 31).
- 9. Raise the hoist to support the suspension crossmember.
- 10. Support the engine.
  - Must be done before the suspension unit is lowered from the vehicle.
- 11. Suspension unit and crossmember from the vehicle.
  - Upper control arm bracket to the frame side rail nuts (10), washer (7), and bolts (6).
  - Lower the suspension unit and the crossmember to bring the unit clear of the vehicle.

### →→ Install or Connect (Figures 5 through 8 and 31)

NOTICE: For steps 3, 7, and 8, refer to the "Notice" on page 3C-1 of this section.

- 1. Position the new suspension unit and crossmember and raise it with the hoist to align the suspension crossmember and frame holes.
- 2. Suspension crossmember to the frame rail bolts (figure 31).
- 3. Upper control arm (28) to the frame bracket bolts (6).
  - Washers (7) and nuts (10). Do not tighten.

### **Q** Tighten

- Upper control arm to the frame bracket bolts
   (6) to "Specifications" at the end of this section.
- Suspension crossmember to the frame rail bolts to "Specifications" at the end of this section.

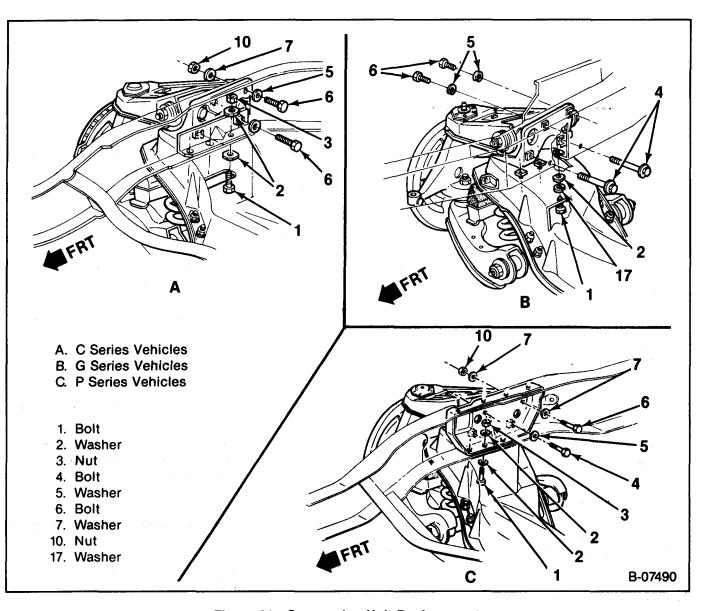


Figure 31—Suspension Unit Replacement

- The upper control arm to frame bracket bolts must be tightened first.
- The crossmember must be in contact with the frame side rails.
- 4. Remove the engine support and lower the hoist.
- 5. Engine mount support bracket to the suspension crossmember.
  - Refer to ENGINE (SEC. 6A).
- 6. Brake line clip to the crossmember.
  - Refer to BRAKES (SEC. 5).
- 7. Shock absorber to the lower control arm (28).
  - Washers (22), nuts (23), and bolts (21).

### **Q** Tighten

- Nuts (23) to "Specifications" at the end of this section.
- 8. Stabilizer bar (59) to the lower control arm (28).
  - Clamps (42), bolts (43), washers (39) and nuts (38).

### হ্ম Tighten

- Nuts (38) to "Specifications" at the end of this section.
- 9. Tie rod ends to the steering knuckle (31).
  - Refer to STEERING LINKAGE (SEC. 3B1).
- 10. Brake hose to the caliper.
  - Refer to BRAKES (SEC. 5).
- 11. Brake hose clips to the upper control arms.
  - Refer to BRAKES (SEC. 5).
- 12. Bleed the brake system.
  - Refer to BRAKES (SEC. 5).
- 13. Tires and wheels and lower the vehicle.
- 14. Battery cable.

# SPECIFICATIONS FRONT SUSPENSION BOLT TORQUE—N·m (FT. LBS.)

	C10	K10	G10	C20	K20	G20	P20	C30	K30	G30	P30	P30 w/FS3
Shock Absorber To Frame	190 (140)	88 (65)	103 (80)	190 (140)	88 (65)	103 (80)	190 (140)	190 (140)	88 (65)	103 (80)	190 (140)	185 (136)
Shock Absorber To Lower Control Arm	80 (59)	_	103 (80)	80 (59)	_	103 (80)	80 (59)	80 (59)	_	103 (80)	80 (59)	
Shock Absorber to Axle	_	88 (65)	_	_	88 (65)	_			88 (65)		-	50 (37)
Stabilizer To Frame	33 (24)	95 (70)	29 (21)	33 (24)	95 (70)	29 (21)	33 (24)	33 (24)	70 (52)	29 (21)	33 (24)	29 (21)
Stabilizer To Lower Control Arm	33 (24)	_	33 (24)	33 (24)	_	33 (24)	33 (24)	33 (24)		33 (24)	33 (24)	
Stabilizer To Stabilizer Link	_	_	_	_		_				_	_	68 (50)
Stabilizer To Spring Plate	_	180 (133)		- · ·	180 (133)		_	_	180 (133)		_	
Steering Knuckle To Upper Ball Joint	68 (50)	** 135 (100)			** 135 (100)	* 68 (50)	122 (90)	122 (90)	_	122 (90)	122 (90)	
Steering Knuckle To Lower Ball Joint	** 122 (90)	40 (30)	122 (90)	122 (90)	40 (30)	122 (90)	122 (90)	122 (90)		122 (90)	122 (90)	
Splash Shield To Knuckle	13 (10)	_	13 (10)	13 (10)	_	13 (10)	13 (10)	13 (10)	_	13 (10)	13 (10)	
Splash Shield to Anchor Plate	_		_				_	_		_		16 (12)
Anchor Plate To Knuckle	-	88 (65)	_		88 (65)		_	_	88 (65)		_	
Steering Arm To Knuckle		120 (90)	_	-	120 (90)	_	_	_	120 (90)	-	-	312 (230)
Caps To The Steering Knuckle	_	1	]	_	_	-	_	_	108 (80)	_	-	7 (5)
Lock Pin To Steering Knuckle	_	217 (160)		-	217 (160)	-	_	1	217 (160)	_	_	40 (29)
King Pin To Knuckle	_	_	_	_	_				745 (550)	_	_	_
Adjusting Ring To Spindle	_	70 (50)	-	-	70 (50)		_	_	_	_	_	_
Lower Control Arm Bushings	_	_		379 (280)			379 (280)	379 (280)	_	379 (280)	379 (280)	
Lower Pivot Shaft End Nuts	95 (70)	1	156 (115)	-	_	156 (115)	_	_	_			_
Lower Pivot Shaft U-Bolt Nuts	115 (85)	_	88 (65)	115 (85)	_	88 (65)	115 (85)	115 (85)	_	115 (85)	115 (85)	
Upper Control Arm Bushings	_	1	_	257 (190)	_	-	257 (190)	257 (190)	_	258 (190)	257 (190)	_
Upper Pivot Shaft End Nuts	156 (115)		156 (115)	_		156 (115)	_	_		_	_	
Upper Pivot Shaft Thru Bolt Nuts	95 (70)		95 (76)	142 (105)	_	95 (70)	142 (105)	142 (105)	_	142 (105)	142 (105)	
Upper Bolt Joint To Upper Control Arm	25 (18)	_	25 (18)	25 (18)		25 (18)	25 (18)	25 (18)	_	25 (18)	25 (18)	_
Crossmember To Bottom Frame Rail®	122 (90)	_	122 (90)	122 (90)	_	122 (90)	122 (90)	122 (90)		122 (90)	122 (90)	

# SPECIFICATIONS (CONT.) FRONT SUSPENSION BOLT TORQUE—N·m (FT. LBS.)

	C10	K10	G10	C20	K20	G20	P20	C30	K30	G30	P30	P30 w/FS3
Crossmember To Side Frame Rail**	88 (65)	_	88 (65)	88 (65)	_	88 (65)	88 (65)	88 (65)		88 (65)	88 (65)	-
Spring To Hanger Nuts	-	122 (90)		-	122 (90)	-	-	III,=	122 (90)	_	_	125 (92)
Spring To Shackle Nuts	_	68 (50)	-	_	68 (50)	-	_	_	68 (50)	_	_	125 (92)
Spring To Axle U-Bolt Nuts	-	203 (150)		_	203 (150)	1	_	-	203 (150)	-	_	109 (80)
Shackle To Frame Nuts Suspension Bumper	20 (15)	68 (50) 20 (15)	20 (15)	_ 26 (19)	68 (50) 20 (15)	_ 20 (15)	_ 26 (19)	_ 26 (19)	68 (50) 20 (15)	_ 20 (15)	_ 26 (19)	125 (92) 34 (25)
Crossmember To Brake Support Struts	81 (60)	-	81 (60)	81 (60)	_	81 (60)	81 (60)	81 (60)	_	81 (60)	81 (60)	

<sup>°</sup>P30 (32)—291 N·m (215 ft. lbs.); P30 (42) and JF9—176 N·m (130 ft. lbs.). °P30 (32), P30 (42) and JF9—135 N·m (100 ft. lbs.).

#### **ENDPLAY SPECIFICATIONS**

C-G-P Series	0.03-0.13 mm (0.0012-0.005 inches
K series	0.025-0.25 mm (0.001-0.010 inches)
P30 w/FS3	0.013-0.20 mm (0.0005-0.008)

<sup>\*</sup>Plus additional torque to align cotter pin. Not to exceed 122 N·m (90 ft. lbs.) maximum.

<sup>\*\*</sup>Plus additional torque to align cotter pin. Not to exceed 176 N·m (130 ft. lbs.). maximum.

<sup>\*\*\*</sup>Plus additional torque to align cotter pin.

FRONT SUSPENSION 30 33

# SPECIAL TOOLS

Tool Number	Tool Name  Driver Handle
J-8092	Wheel Bearing Race Installer
J-8457	Wheel Bearing Race Installer
J-8849	- ing Dace Installer
J-29040	Nut Wrench (K10/1500-20/2007)
J-6893-D	Wheel Bearing Nut Wrench (K30/3500)  Wheel Bearing Nut Wrench (K30/3500)
J-26878-A	Torque Wrench Adapter
J-23446	Outer Bearing Race Installer
J-6368	Paging Race Installer
J-23448	Needle Bearing Installer (K10/1500–20/2500)
J-24435-A	Needle Bearing Installer (K30/3500)
J-21465-17	Ball Joint Separator
J-23742	Ball Joint Installer
J-9519-9	Ball Joint Fixture
J-9519-10	Ball Joint Installer
J-9519-13	Ball Joint Installer
J-9519-16	Ball Joint Installer
J-9519-22	Lawer Ball Joint Separator
J-23454-1	And Lower Ball Joint Sleeve
J-23454-2	Upper And Lower Ball Joint Spacer
J-23454-3 or J-6382-3	Hub/Rotor Support
J-9746-02	Spring Remover
J-23028-02	Wheel Stud And Tie Rod Remover
J-6627-A	Ball Stud Nut Wrench
J-23447	Front Pinion Bearing Installer
J-7817	King Pin Bearing Seal Installer
J-22301	Ving Pin Installer
J-28871	A Pushing Stake Remover
J-22717	Control Alli Duoimis
J-24435-1	
J-24435-2	
J-24435-3	. I Lawer Conitol Airi Das
J-24435-4	
J-24435-5	Control Ariii Busining
J-24435-6	Upper And Lower Control Arm Bushing Fixture Upper And Lower Control Arm Bushing Fixture