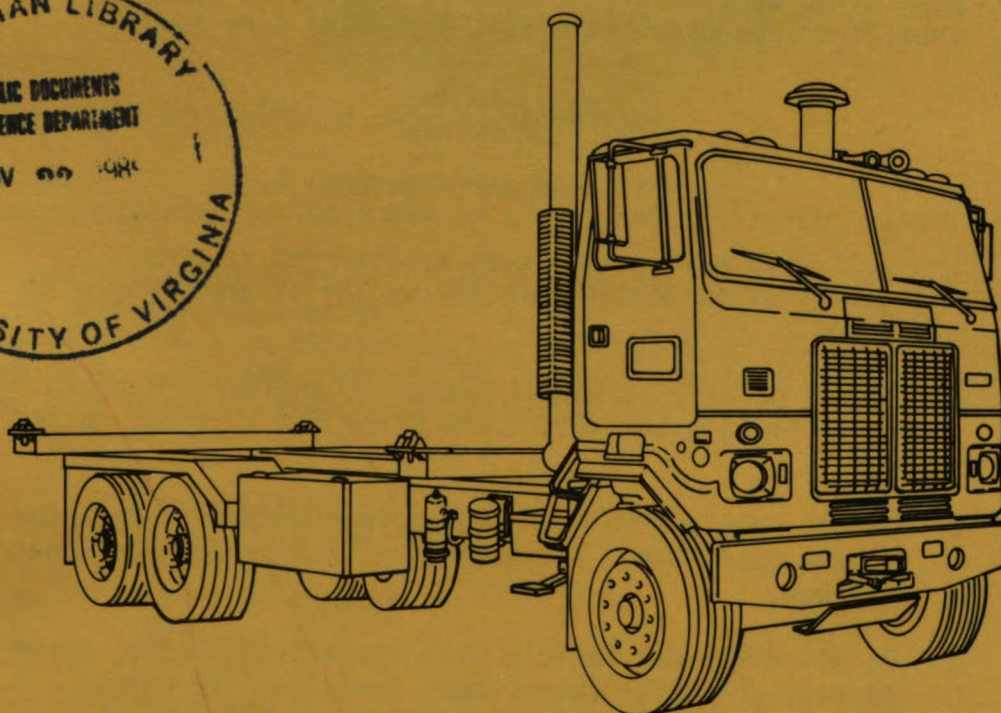
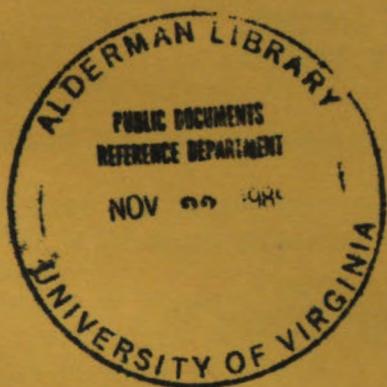


# DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR TRUCK CHASSIS:



**FOR DIRECT SUPPORT SECTION  
TOPOGRAPHIC SUPPORT  
SYSTEM (TSS)  
NSN: 2320-01-113-3616**



**HEADQUARTERS, DEPARTMENT OF THE ARMY**

This copy is a reprint which includes current  
pages from Change 1

**SEPTEMBER 1984**

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89-742-P



WARNING

## TOXIC MATERIALS

Minor concentrations of acetic acid vapor may be produced during application of silicone gasket material. Adequate ventilation should be provided when silicone is applied in confined areas. Further, eye contact may cause irritation; if eye contact takes place, flush eyes with water for 15 minutes and have eyes examined by a doctor.

When using alkali cleaners, avoid skin contact or inhalation. Skin rashes and toxic effects may result.

When using solvent-type cleaners, avoid skin contact, inhalation, or conditions that may cause fire hazards.

WARNING

## EXHAUST FUMES

The following precautions must be observed to ensure the safety of personnel when the engine of any vehicle is operated:

1. DO NOT operate personnel heater or engine of vehicle in a closed place unless the place has a lot of moving air.
2. DO NOT idle engine for long periods without ventilator blower operation. If tactical situation permits, open hatches.
3. DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
4. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY VENTILATE personnel compartment. If symptoms persist, remove affected crew to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration and get immediate medical attention.
5. BE AWARE; neither the gas particulate filter unit nor the filed protection mask for nuclear-biologic-chemical protection will protect you from carbon monoxide poisoning.



CHANGE  
NO. 1

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C.  
27 MARCH 1987

Direct Support and General Support  
Maintenance Manual

TRUCK CHASSIS  
FOR DIRECT SUPPORT SECTION  
TOPOGRAPHIC  
SUPPORT SYSTEM (TSS)

(2320-01-113-3616)

TM 9-2320-281-34, September 1985 is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.
4. The purpose of Change 1 to this manual is to identify configuration differences between the 1980, 1982, and 1984 models. Model designators can be determined by viewing the data plate on your truck chassis.

Remove Pages	Insert Pages	Remove Pages	Insert Pages
i and ii	i and ii		
10-19 thru 10-21	10-19 thru 10-22		
12-5 and 12-6	12-5 and 12-6		
13-1 and 13-2	13-1 and 13-2		
13-7 and 13-8	13-7 and 13-8		
	C-5/(C-6 blank)		
INDEX-1 and INDEX-2	INDEX-1 and INDEX-2		

File this change sheet in front of the publication for reference purposes.



**By Order of the Secretary of the Army:**

**JOHN A. WICKHAM, JR.**  
*General, United States Army*  
*Chief of Staff*

**Official:**

**R.L. DILWORTH**  
*Brigadier General, United States Army*  
*The Adjutant General*

**Distribution:**

To be distributed in accordance with DA Form 12-38, Direct Support and General Support Maintenance requirements for Truck Chassis.



---

**WARNING**

---

**FIRE AND EXPLOSION**

Do not use gasoline for cleaning or as fuel.

When inspecting or filling batteries, never smoke or expose battery to sparks or flames. The explosive gas mixture in each cell of the battery escapes through the vent plug holes and can ignite.

When disconnecting battery terminals, always disconnect the ground terminal first.

When reconnecting battery terminals, always connect the ground terminal last.

Methyl alcohol is highly flammable, poisonous, and can be absorbed through the skin. Do not drink or breathe it. If you spill any on your skin, wash it off immediately with water. Keep it away from sparks or flames.

Ether quick-start is explosive and poisonous. Do not permit canisters to be subjected to excessive heat. Do not attempt to start vehicle if ether lines to engine are broken or disconnected.

When filling fuel tank with diesel fuel, be sure hose nozzle on container contacts filler tube on fuel tank to carry off static electricity. Do not smoke, permit open flames or uncovered battery compartments while you are servicing the diesel fuel system.

---

**WARNING**

---

**EXHAUST PIPE AND MUFFLER**

During normal operation, the exhaust pipe and muffler can become very hot. Do not touch these components with your bare hands.

---

**WARNING**

---

**COMPRESSED AIR**

Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles, shield, gloves, etc.).



**WARNING**

**SPRING BRAKE AIR CHAMBER**

Spring brake air chamber employs a spring with high forces and extreme care should be used to service this air chamber only as outlined in procedure. Deviating from procedure may result in injury as result of high spring force.

**WARNING**

**VEHICLE SUPPORTS**

Do not attempt to perform maintenance on, under, or around vehicle with vehicle supported by hoisting device of jack only. Jack stands must be used to support vehicle to protect personnel from possible serious injury.

Do not attempt wheel disassembly or steering knuckle repair with vehicle supported by jacks only. Severe injury can result from inadequately supported vehicle.

**WARNING**

**COOLING FAN**

When working in engine compartment with the engine running, stay clear of the cooling fan. The fan may engage automatically at any time and cause serious injury.

**WARNING**

**FRONT AND/OR REAR AXLES**

Do not lie under axle during removal or installation procedures. Death or serious injury may result.

Do not lie under carrier after fasteners are removed. Use transmission jack to support differential carrier assembly during removal or assembly. Death or serious injury may result.

**WARNING**

**STEERING GEAR**

Steering gear assembly weighs approximately 110 lbs (49.6 kg). Use lift device to assist in moving assembly. Ensure adequate support is provided under assembly when removing to prevent possible personal injury.



**WARNING****AIR COMPRESSOR**

Air compressor weighs approximately 50 lbs (22.7 kg). Ensure proper support is provided to prevent personal injury or equipment damage.

**WARNING****CAB DOOR**

Personal injury and damage to door will result if door is not supported when hinges are being unbolted. Use an overhead hoist to take the weight off the hinges.

**WARNING****FRONT SPRINGS**

Ensure that spring is securely supported to prevent personal injury.

**WARNING****CAB**

Personal injury or damage to equipment could result if lifting equipment is not centered above cab and lifting vertically. Have two assistants (one on each side of cab) steady cab as it is disconnected from pivot brackets. Keep hands clear. Drive out pins with a long drift pinch.

**WARNING****LOCKOUT OR SHIFTER ASSEMBLY**

Exercise caution to prevent personal injury when removing piston. Piston is under spring pressure and will pop out when removed.

**WARNING****WINDSHIELD AND REAR WINDOWS**

Use extreme care when handling glass. Always wear suitable eye protection to prevent eye injuries from fine chips when removing and installing windshield or rear windows.



WARNING

**REAR AXLE**

Wear safety glasses while removing snap ring. Snap ring may pop off during removal. With snap ring removed, the helical side gear may fall off shaft. Exercise care to prevent injury or damage.

WARNING

**BRAKE DRUM**

A deeply grooved drum will result in rapid new wear and make it difficult, if not impossible, to obtain efficient brake performance. Personnel injury from ineffective brakes may result.

Do not attempt to weld cracked drum. A cracked drum is unsafe for further service. Personnel injury from defective brakes may result.

WARNING

**BRAKE ASSEMBLY**

Do not use a dry brush or compressed air to clean brake assembly components. There may be asbestos dust on components which can be hazardous to your health if inhaled. (Brake shoes must be wet, and a soft bristle brush must be used.)



TECHNICAL MANUAL  
No. 9-2320-281-34-2

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 12 September 1985

**DIRECT SUPPORT AND GENERAL SUPPORT  
MAINTENANCE MANUAL  
TRUCK CHASSIS  
FOR DIRECT SUPPORT SECTION  
TOPOGRAPHIC SUPPORT SYSTEM (TSS)**

NSN 2320-01-113-3616

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

**VOLUME 2 of 2**

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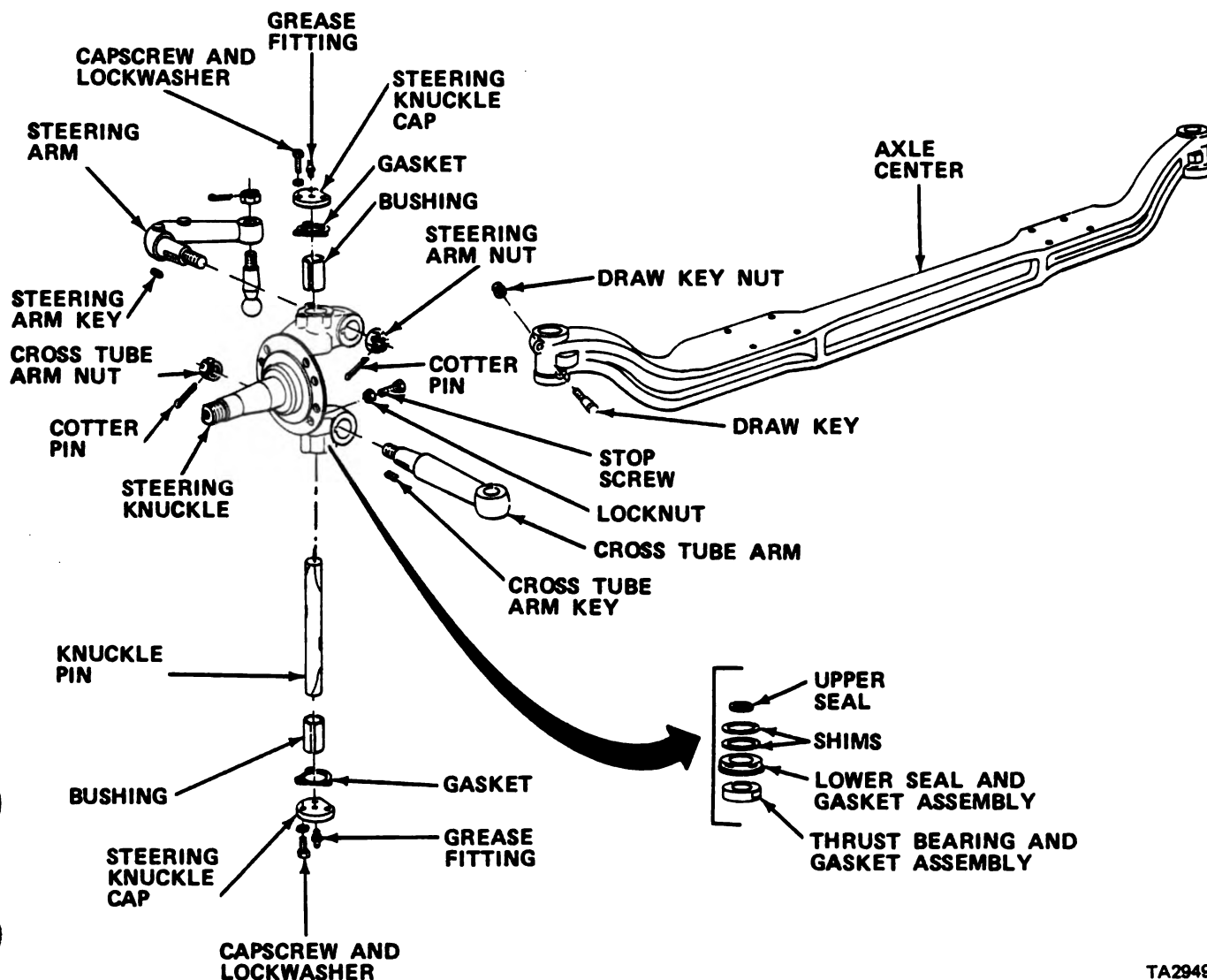


## CHAPTER 8

## FRONT AXLE ASSEMBLY REPAIR

**8-1. INTRODUCTION.** This chapter provides maintenance instructions for the front axle assembly.

**8-2. DESCRIPTION.** The Rockwell Standard Model FL-931 non-driving front axle has sealed knuckle (king) pins of straight design which are held in place by tapered dowel keys. Grease seals and gaskets enclose the upper and lower knuckle pin bushings. The lower bushing is enclosed at the top by a thrust bearing and seal assembly, and at the bottom by a gasket positioned between the lower knuckle boss and lower cap. A cross tube (tie-rod) interconnects the left and right cross tube arms at the lower end of the steering knuckle. Steering arms are attached to the top of the steering knuckle. The drag link is secured to the left steering arm and the power steering cylinder (ram) is attached to the right knuckle. Wedge-type brake assemblies are secured to the steering knuckles.



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### 8-3. REPAIR FRONT AXLE ASSEMBLY

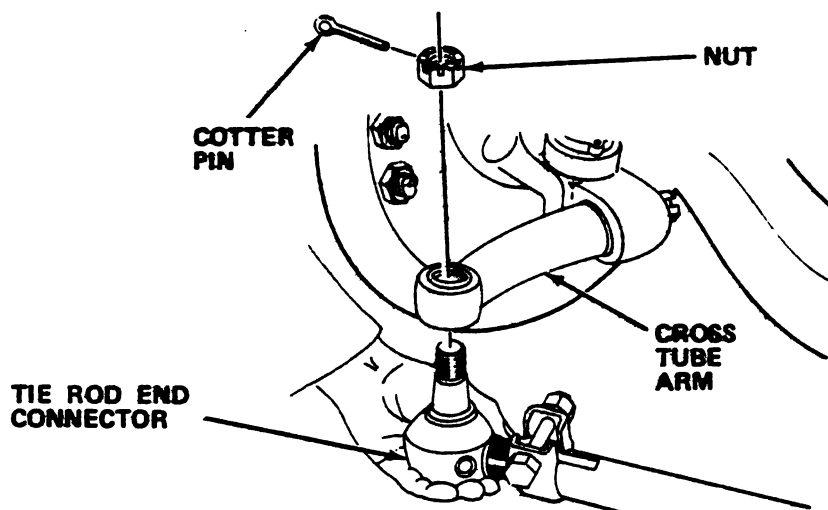
- a. Drain air tanks to 0 psi (TM 9-2320-281-10).

#### WARNING

DO NOT ATTEMPT TO PERFORM MAINTENANCE ON, UNDER, OR AROUND VEHICLE WITH VEHICLE SUPPORTED BY HOISTING DEVICE OF JACK ONLY. JACK STANDS MUST BE USED TO SUPPORT VEHICLE TO PROTECT PERSONNEL FROM POSSIBLE SERIOUS INJURY.

DO NOT ATTEMPT WHEEL DISASSEMBLY OR STEERING KNUCKLE REPAIR WITH VEHICLE SUPPORTED BY JACKS ONLY. SEVERE INJURY CAN RESULT FROM INADEQUATELY SUPPORTED VEHICLE.

- b. Raise front end of vehicle so tires clear floor.
- c. Place jack stands under axle and lower vehicle onto stands.
- d. Remove wheel and tire assemblies and wheel hubs as assemblies (TM 9-2320-281-20).
- e. Remove steering knuckle from axle center.
  - (1) Remove drag link (TM 9-2320-281-20).
  - (2) If right side being disassembled, disconnect power steering cylinder (ram) from upper arm (TM 9-2320-281-20).
  - (3) Remove brake assembly (TM 9-2320-281-20).

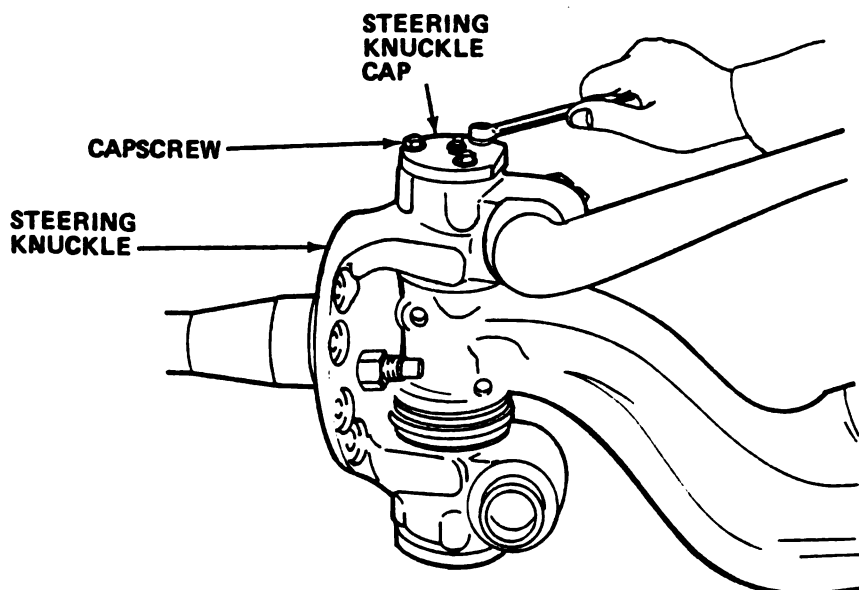


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- (4) Remove tie-rod end cotter pin and nut and disconnect tie-rod from cross tube arm.

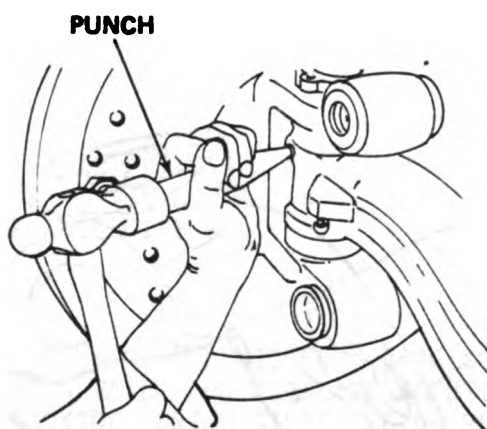


- (5) Remove cotter pin and nut and remove steering arm and key.
- (6) Remove cotter pin and nut and remove cross tube arm and key.



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- (7) Remove steering knuckle cap capscrews, lockwashers, cap, and gasket from top and bottom of knuckle. Discard gaskets.



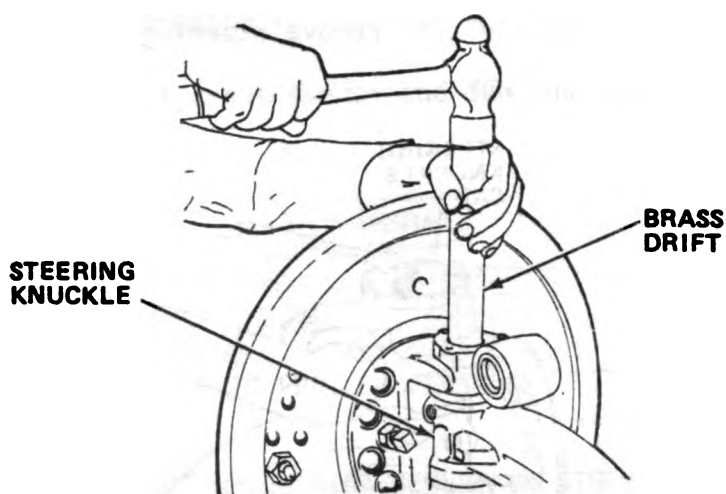
TA294912

### **CAUTION**

DO NOT STRIKE DRAW KEY DIRECTLY WITH A STEEL HAMMER.

- (8) Remove draw key nuts and tap out keys with punch.





TA294913

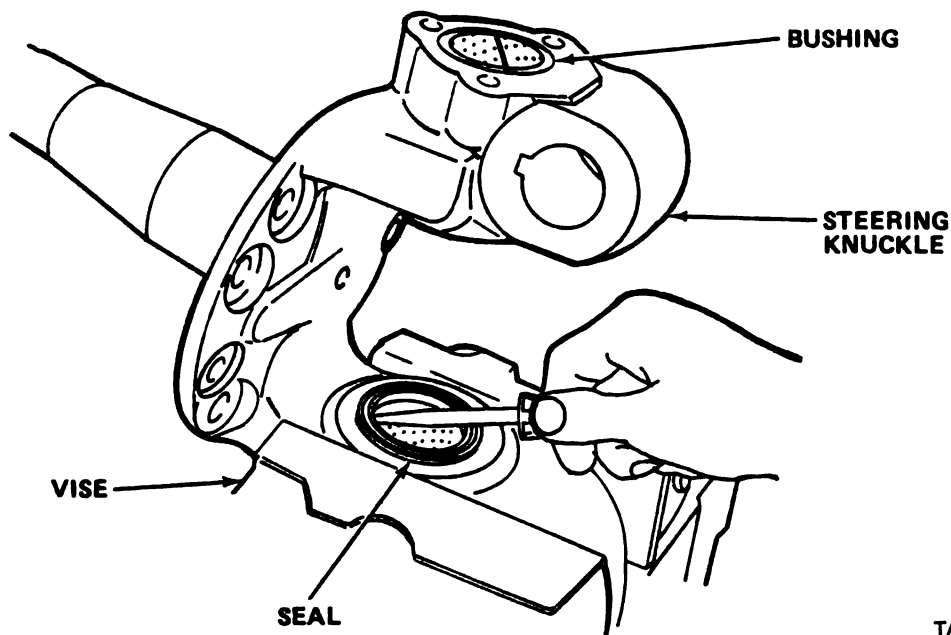
**CAUTION**

DO NOT STRIKE KNUCKLE PIN DIRECTLY WITH STEEL HAMMER.

(9) Using a brass drift, tap knuckle pin out of axle center.

(10) Lift knuckle assembly, thrust bearing and gasket assembly, lower seal and gasket assembly, and shims from axle center. Discard lower seal and gasket assembly.

f. Disassemble steering knuckle.



TA294914

(1) Place steering knuckle with bottom side up in a vise with soft metal jaw protectors.



- (2) With top end of knuckle held firmly in vise, insert screwdriver between knuckle counterbore and seal case. Pry seal out of knuckle.
- (3) Remove knuckle from vise and position in arbor press right-side up.
- (4) With bushing removal and installation tool (Appendix C), press worn bushing out of knuckle.

**g. Reassemble steering knuckle bushing.**

- (1) Place new bushing on pilot of tool (Appendix C) and press bushing into knuckle bore approximately 1/8 in. (3.175 mm), then relieve pressure on bushing.
- (2) Press bushing in another 1/2 in. (12.70 mm), then relieve pressure on bushing.
- (3) Continue pressing bushing in until flush with inside surface of lower knuckle boss for bottom bushing and flush with surface of upper seal counterbore for top bushing.
- (4) Line ream upper and lower bushing to 2.002 - 2.003 in. (50.85 - 50.88 mm).

**h. Clean parts.**

**WARNING**

DO NOT USE GASOLINE TO CLEAN PARTS. GASOLINE CREATES FIRE AND EXPLOSION HAZARD.

P-D-680 SOLVENT IS POTENTIALLY DANGEROUS. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

**CAUTION**

DO NOT CLEAN GROUND AND POLISHED SURFACES IN HOT TANK SOLUTION OR WITH WATER AND ALKALINE SOLUTIONS SUCH AS SODIUM HYDROXIDE, ORTHO-SILICATES OR PHOSPHATES.

- (1) Parts having ground and polished surfaces such as knuckle pins, knuckle pin bushings, bearings, and spindles, should be cleaned in dry cleaning solvent.

**CAUTION**

DO NOT USE COMPRESSED AIR TO DRY BEARINGS. DAMAGE TO BEARINGS COULD RESULT.

- (2) Dry parts with lintfree cloths or paper towels. Do not dry bearings by spinning with compressed air.



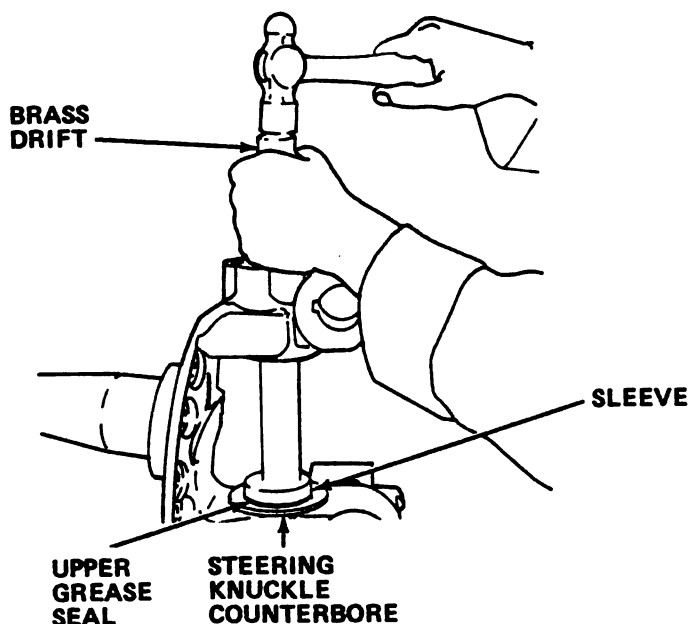
i. Inspect parts.

- (1) Inspect steering knuckle thrust bearing, wheel bearing cones and cups. Replace if rollers or cups are indented, pitted, cracked, broken, or evidence of spalling and flaking are found. If wheel bearing cups are to be replaced, remove from hubs (TM 9-2320-281-20). Avoid use of drifts and hammers as they may easily mutilate cup bores.
- (2) Inspect steering knuckles and replace if indications of weakness or excessive wear are found.
- (3) Check thrust bearing and lower seal gaskets for wear. Some axles may employ an integral gasket in lower seal or thrust bearing.
- (4) Check axle center for bends, cracks, or other damage. Replace if defective.
- (5) Inspect steering arm, cross tube arm, and cross tube for bends. Replace if bent.

j. Parts that have been cleaned, dried, inspected and are to be immediately assembled should be coated with light oil. Steering knuckles, knuckle pins, and arms that are to be placed in storage should be treated with rust preventive, wrapped in oiled paper, and boxed to keep dry and clean.

k. Reassemble axle assembly.

- (1) Place steering knuckle bottom side up in a vise with soft metal jaw protectors.
- (2) Place new grease seal over knuckle counterbore with rubber lip facing up.

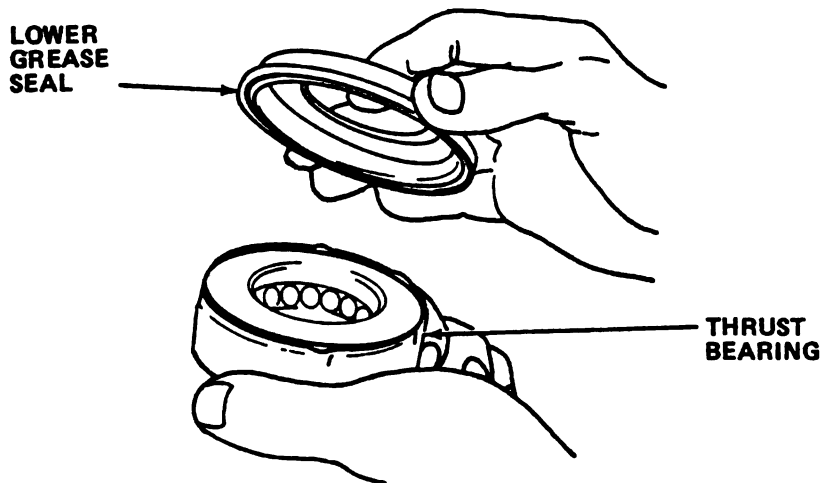


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- (3) Using sleeve and brass drift, tap grease seal into knuckle counterbore until seal bottoms.

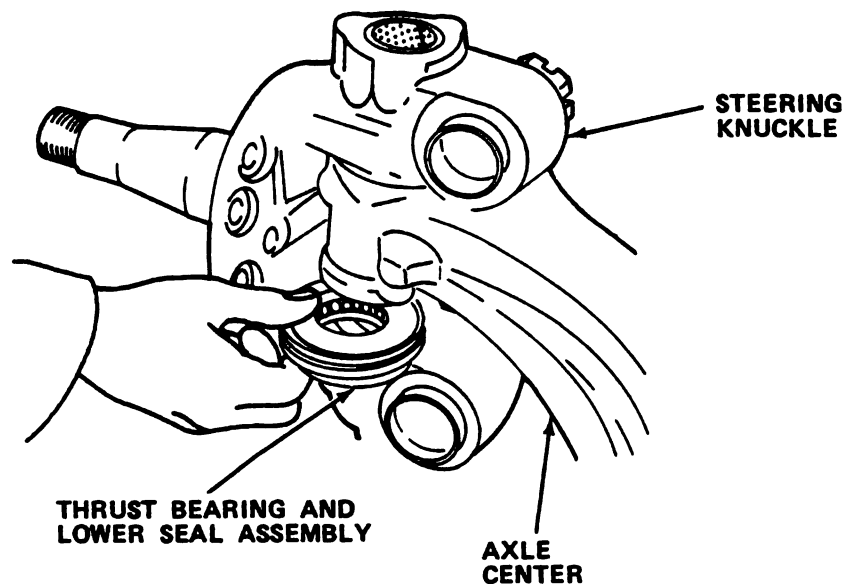


- (4) Remove knuckle from vise.



TA294916

- (5) Hold thrust bearing with seal face down and snap lower grease seal over bearing chamfered side.
- (6) With knuckle pin hole in axle center clean and lightly oiled, position steering knuckle on axle.



TA294917

- (7) Slide thrust bearing and lower seal assembly between lower face of axle center and lower knuckle boss.
- (8) Align knuckle pin holes in axle center, knuckle, upper seal, and thrust bearing and lower seal.
- (9) Place jack under lower side of knuckle yoke and slowly raise knuckle so that all clearance is taken up between lower yoke, thrust bearing and seal, and lower face of axle center end.

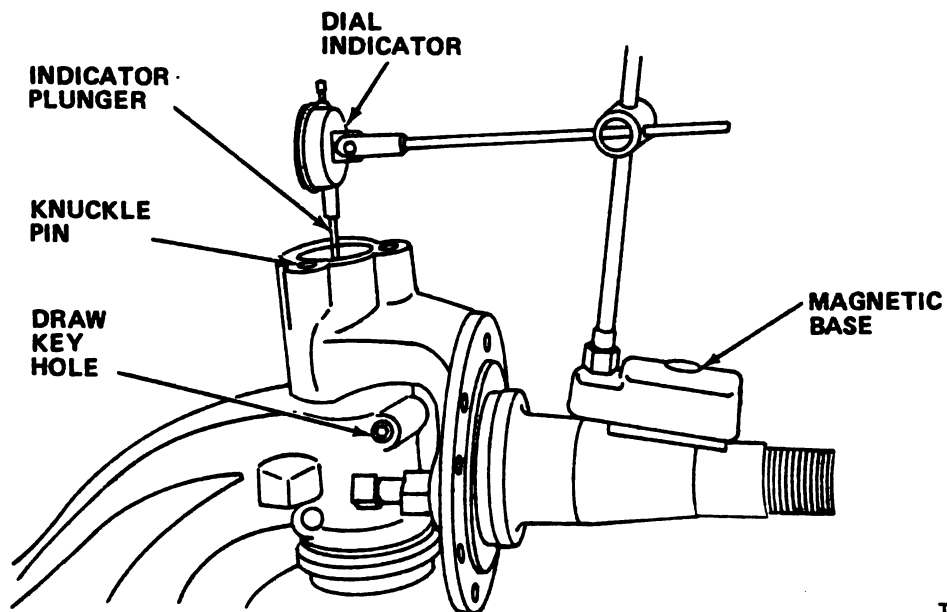


- (10) Align knuckle pin flats to mate with draw key holes and tap pin into knuckle, axle center, and thrust bearing.

#### NOTE

Draw keys should be installed one from each side of axle center. Do not install both keys from same side. Before setting draw keys, center knuckle pin to equalize gap between upper and lower gap mounting surfaces.

- (11) Install draw keys so that flat on key mates with corresponding flats on knuckle pin.
- (12) Install draw key nuts and torque to 30 - 40 ft lbs (41 - 54 Nm).
- (13) Measure clearance between top face of upper axle center surface and lower face of upper knuckle pin boss.



TA294918

- (a) Set dial indicator with the magnetic base placed on knuckle spindle so that knuckle can be turned freely.
- (b) Place indicator plunger on exposed end of knuckle pin so that its line of action is approximately parallel to knuckle pin center line.
- (c) Zero dial indicator.
- (d) Using a lever, lift knuckle and read and record measurement.



**NOTE**

Three steering knuckle positions are necessary to accurately measure end play with dial indicator. Positions are: full right turn, full left turn, and straight ahead.

- (e) Turn knuckle to each of three positions and repeat steps (a) through (d) above.
- (14) Add shims between upper steering knuckle boss and axle center and as required to obtain end play of 0.005 - 0.025 in. (0.127 - 0.635 mm) through full range of turn.
- (15) Install knuckle gaskets and caps and secure with lockwashers and capscrews. Torque capscrews to 20 - 30 ft lbs (27 - 41 N•m).
- (16) Install grease fittings in caps.
- (17) Install key and steering arm into upper steering knuckle boss and torque nut to 775 - 1050 ft lbs (1051 - 1424 N•m). Use torque wrench to line up cotter pin hole. Do not back off to aline hole. Install and bend cotter pin.
- (18) Install key and cross arm tube in lower steering knuckle boss and torque nut to 775 - 1050 ft lbs (1051 - 1424 N•m). Use torque wrench to line up cotter pin hole. Do not back off nut to aline hole. Install and bend cotter pin.
- (19) Install tie-rod end in lower steering knuckle boss and torque nut to 160 - 215 ft lbs (217 - 292 N•m). Use torque wrench to line up cotter pin hole. Do not back off nut to aline hole. Install and bend cotter pin.
- (20) Secure drag link (ram, if on right side) to steering arm and torque nut to 160 - 215 ft lbs (217 - 292 N•m). Use torque wrench to line up cotter pin hole. Do not back off nut to aline hole. Install and bend cotter pin.
- (21) Install brake assembly to steering knuckle (TM 9-2320-281-20).
- (22) Secure air lines to brake chamber.
- l. Install wheel and tire assemblies and hubs as assemblies (TM 9-2320-281-20).
- m. Lubricate tie rod ends, drag link ends, and knuckle pins (LO 9-2320-281-12).
- n. Check front end for proper alinement (para 8-4).
- o. Check brakes for air leaks at chambers.
- p. Perform road test to check steering and brake systems (TM 9-2320-281-20).



## 8-4. ALINE FRONT END

### NOTE

Proper front end alinement must be maintained to insure ease of steering and satisfactory tire life. The most important factors of front end alinement are toe-in, wheel camber, and axle caster.

#### a. Pre-alinement checks.

- (1) Check tire pressure. Inflate to 70 psi (483 kPa).

### WARNING

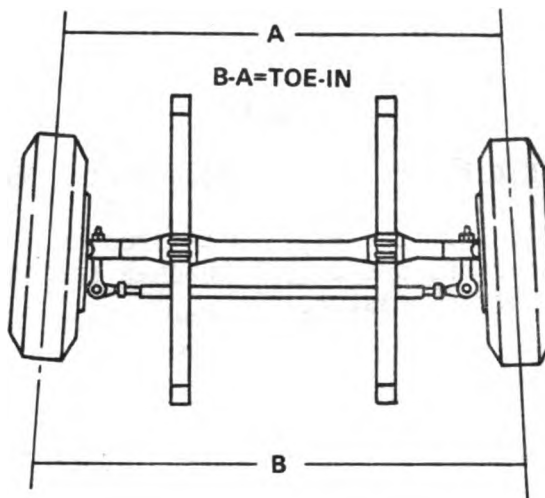
DO NOT ATTEMPT TO PERFORM MAINTENANCE ON, UNDER, OR AROUND VEHICLE WITH VEHICLE SUPPORTED BY HOISTING DEVICE OF JACK ONLY. JACK STANDS MUST BE USED TO SUPPORT VEHICLE TO PROTECT PERSONNEL FROM POSSIBLE SERIOUS INJURY.

DO NOT ATTEMPT WHEEL DISASSEMBLY OR STEERING KNUCKLE REPAIR WITH VEHICLE SUPPORTED BY JACKS ONLY. SEVERE INJURY CAN RESULT FROM INADEQUATELY SUPPORTED VEHICLE.

- (2) Raise front end and place on jack stands.
- (3) Check for loose or worn steering knuckle pins and knuckle bearings. Replace as necessary (para 8-3).
- (4) Check for worn drag link and tie-rod ends. Replace as necessary (TM 9-2320-281-20).
- (5) Check for bent or distorted tie-rods. Replace as necessary (TM 9-2320-281-20).
- (6) Check for loose spring U-bolts, shackle and bolts, and front attaching bolts. Replace as necessary (para 2-13).
- (7) Raise front end, remove jack stands, and lower vehicle to floor.
- (8) Tighten lug nuts to 300 ft lbs (407 N•m).

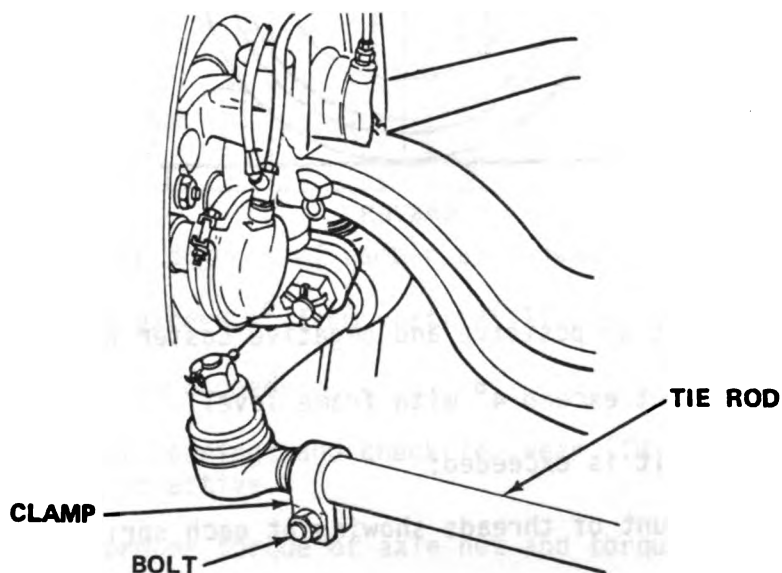


## b. Adjust toe-in.



TA294919

- (1) Move vehicle forward and stop with wheels in straight ahead position.
- (2) Measure from center of treads at height of wheel centers to front (dimension A) and rear (dimension B).
- (3) Subtract A dimension from B. This resultant dimension should be  $\frac{1}{32}$  in. (0.79 mm)  $\pm \frac{1}{32}$  in. ( $\pm 0.79$  mm).
- (4) To adjust toe-in.



TA294920

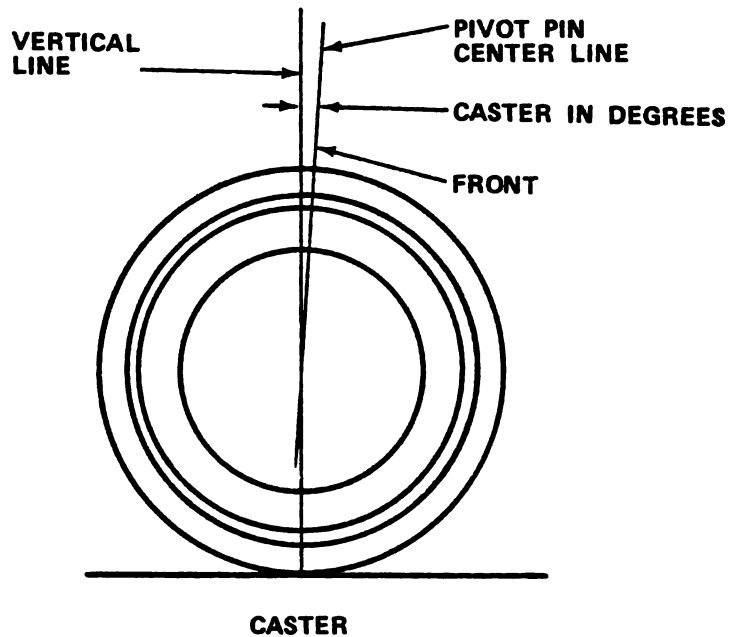
- (a) Loosen clamp bolts and nuts on each end of tie-rod.
- (b) Turn tie-rod with pipe wrench until desired toe-in is obtained.
- (c) Tighten clamp.



c. Adjust axle caster.

**NOTE**

This vehicle has no caster adjustment. Should the vehicle tend to wander to one side or the other, it is possible that the axle is twisted as a result of impact; however, unevenly tightened spring clip nuts will also affect caster.



TA294921

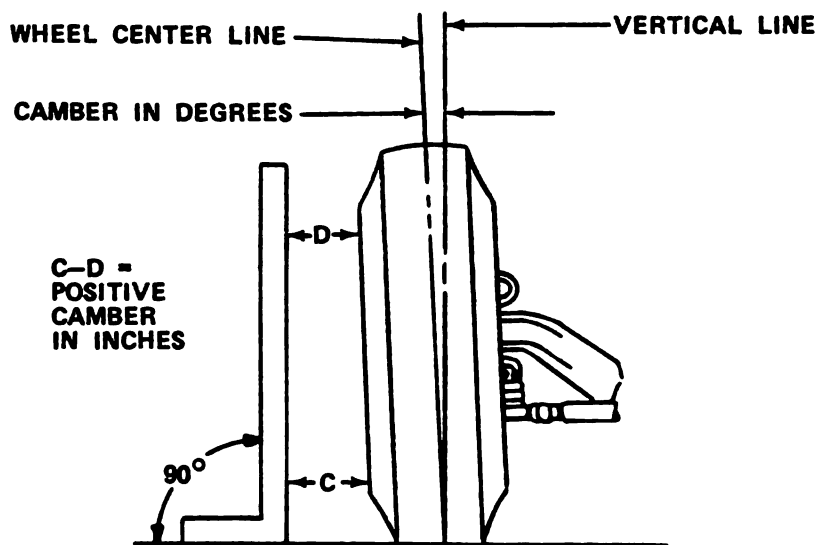
- (1) Measure amount of positive and negative caster as shown.
- (2) Caster must not exceed  $4^{\circ}$  with frame level.
- (3) If caster limit is exceeded:
  - (a) Check amount of threads showing at each spring clip nut location.
  - (b) If uneven thread number appears, readjust clips.
  - (c) Recheck caster.
  - (d) If still beyond limit, replace axle (para 2-13).



## d. Adjust wheel camber.

## NOTE

This vehicle has no camber adjustment. Excessive positive camber would result in irregular wear of outside shoulder of tire. Excessive negative camber would result in irregular wear of inside shoulder of tire, or hard steering and possible wandering. Excessive positive camber is usually caused by bent axle parts whereas excessive negative camber is caused by excessive wear or looseness of front wheel bearings, axle parts, or as a result of a sagging axle.



TA294922

- (1) Carefully measure degrees of camber as shown.
- (2) Camber must not exceed  $1^{\circ}$  from vertical line.
- (3) If camber limit is exceeded:
  - (a) Remove wheel bearings and check for wear (TM 9-2320-281-20). Replace if defective.
  - (b) Check for proper torque of axle nut and torque to specifications.
  - (c) Check for worn or loose steering knuckle thrust bearings. Replace as necessary (para 8-3).
  - (d) If camber still beyond limits, replace axle (para 2-13).







## CHAPTER 9

## REAR AXLE ASSEMBLY REPAIR

**9-1. INTRODUCTION.** This chapter provides maintenance instructions for the rear axle assembly.

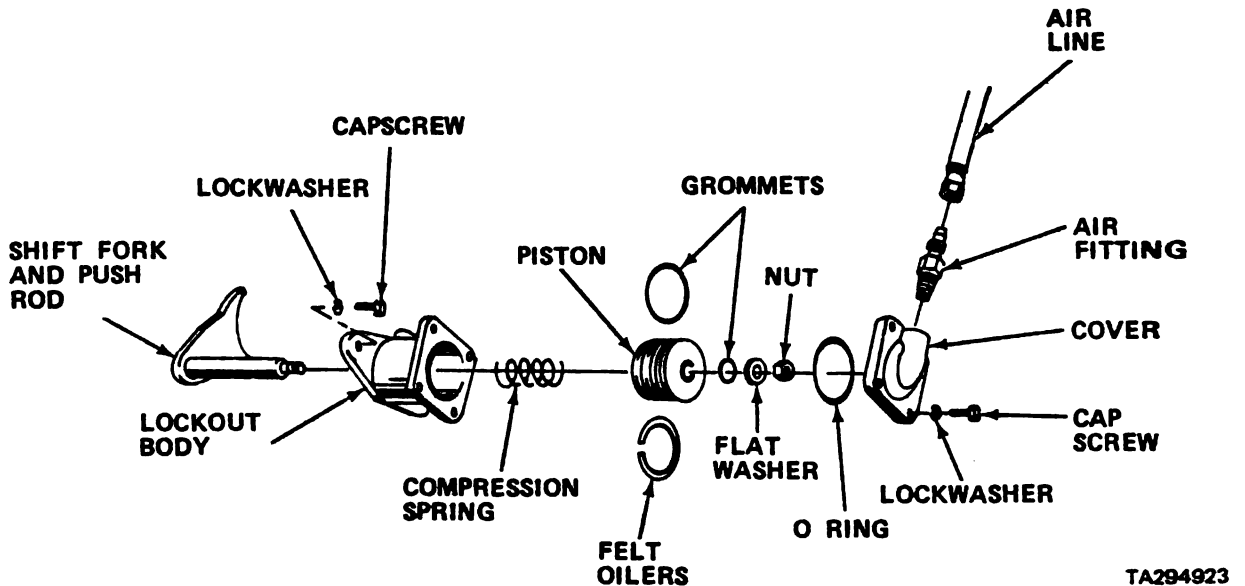
**9-2. DESCRIPTION.** The Eaton Model DT-440-P, Two Speed Tandem Drive Axle consists of two axle units coupled by a power divider and interaxle propeller shaft. The power divider incorporated in the forward axle consists of two constant-mesh helical gears and an interaxle differential. The power divider distributes power from the transmission to both forward and rear axles. The interaxle differential, mounted on the output shaft, operates the same as a conventional differential action between the forward rear axle and the rear rear axle. The differential in each axle unit provides action for its respective wheels. An air pressure actuated lockout unit is used on the forward rear axle to lock out the interaxle differential and provide maximum traction for unfavorable road conditions. A positive displacement gear-type pump mounted in the forward rear axle power divider provides positive pressure lubrication to metered orifices and passages distributed within the axle. A cleanable filter screen protects internal parts from contamination. An air shifter assembly is attached to each axle. The assembly shifts the axles simultaneously from high to low range and back to high as selected by the vehicle operator. Low range operation provides increased power for off-the-road, rough terrain operation. Removable axle shafts spline into the axle differentials. Wheel bearings are lubricated by the oil contained in the axle housings. The axles are secured to suspension equalizer beams which are pinned to frame mounted support brackets. Brake chamber mounting brackets are welded to the axle housings. The brake system incorporates S-cam actuated brake shoes with automatic slack adjusters. Suspension is provided by air springs (bags) and shock absorbers. Torque rods provide stability against axial and radial torque loads.



### 9-3. REPAIR LOCKOUT ASSEMBLY

a. Remove/Disassemble lockout assembly.

- (1) Drain air from air tanks to 0 psi, then close draincocks (TM 9-2320-281-10).



#### NOTE

Air line may have to be removed at tee frame before it can be removed at lockout assembly.

- (2) Remove air line and fitting, and retain fitting.
- (3) Remove cover and discard O-ring.

#### WARNING

EXERT CAUTION TO PREVENT PERSONAL INJURY WHEN REMOVING PISTON. PISTON IS UNDER SPRING PRESSURE AND WILL POP OUT WHEN REMOVED.

- (4) Remove nut and flat washer securing piston to shift fork and push rod assembly. Remove piston.
- (5) Remove grommet from push rod and discard.
- (6) Remove spring and discard.
- (7) Remove lockout body.



**NOTE**

Shift fork and push rod assembly will remain in power divider cover. If damage has occurred to the shift fork and push rod assembly, removal and disassembly of the power divider cover will be necessary to replace the fork (para 9-9).

- (8) Remove grommet and felt oilers from piston and discard.
- (9) Inspect piston friction surface for worn, grooved, or damaged condition. Replace if faulty (para 9-9).

**b. Install/Assemble lockout assembly.**

**NOTE**

Prior to assembly, piston felt oilers should be soaked in SAE 10 oil for one hour.

- (1) Install new piston felt oilers and new grommet on piston.
- (2) Reinstall lockout body. Torque capscrews to 48 - 56 ft lbs (65 - 76 **Nm**).
- (3) Install new spring.
- (4) Install new grommet on push rod.
- (5) Reinstall piston on push rod. Torque nut to 20 - 26 ft lbs (27 - 35 **Nm**).
- (6) Coat new cover O-ring with silicone lubricant.
- (7) Reinstall cover with O-ring. Torque nuts to 9 - 11 ft lbs (12 - 15 **Nm**).
- (8) Coat threads of air fitting with sealant.
- (9) Install fitting.
- (10) Coat threads of air fitting with sealant and secure air line to fitting.
- (11) Perform operational and leak check of lockout assembly (TM 9-2320-281-10).



#### 9-4. REPLACE LOCKOUT ASSEMBLY

- a. Remove lockout assembly (para 9-3).
- b. Install lockout assembly.
  - (1) Install new lockout body.
  - (2) Torque capscrews to 30 - 40 ft lbs (41 - 54 N•m).
  - (3) Install new spring and push rod grommet.

#### NOTE

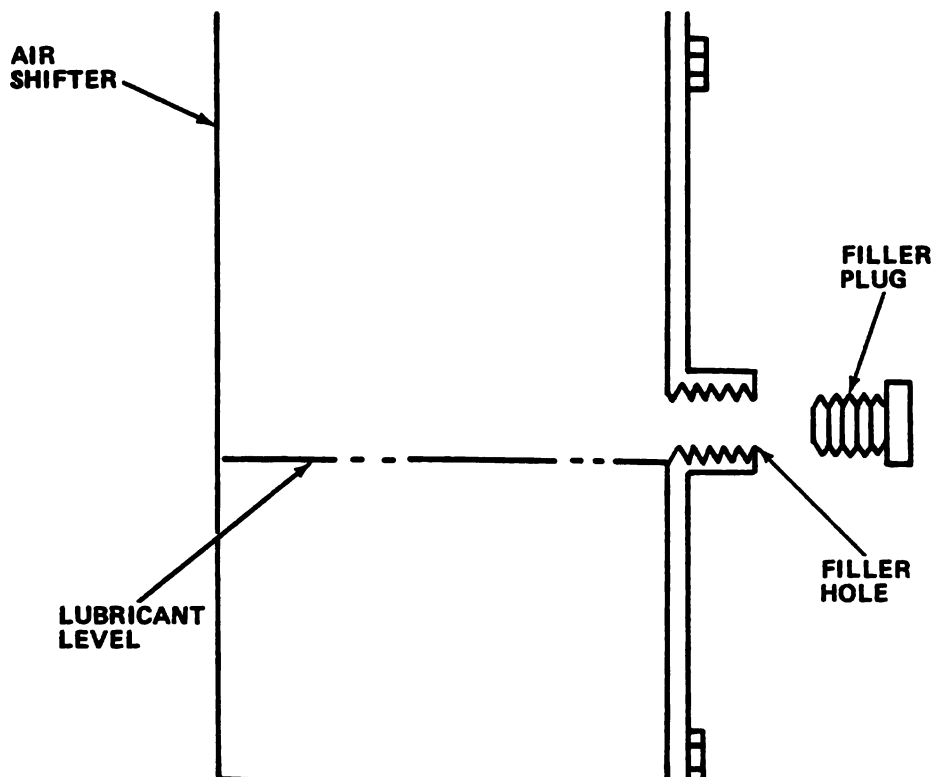
Prior to assembly, piston felt oilers should be soaked in SAE 10 oil for one hour.

- (4) Install felt oilers and grommet on piston.
  - (5) Install piston on push rod.
  - (6) Torque nut to 20 - 26 ft lbs (27 - 35 N•m).
  - (7) Coat new O-ring cover with silicone lubricant.
  - (8) Install cover and O-ring.
  - (9) Torque nuts to 9 - 11 ft lbs (12 - 15 N•m).
  - (10) Coat fitting threads with sealant and install fitting.
  - (11) Coat air fitting threads with sealant and secure air line to fitting.
- c. Perform operational and leak check of lockout assembly (TM 9-2320-281-10).



**9-5. INSPECT FORWARD REAR AXLE SHIFTER ASSEMBLY****a. Inspect shifter assembly.**

- (1) Check assembly housing for dents, cracks, oil leakage, and air leakage. Repair or replace as necessary (para 9-7 and 9-8).
- (2) Check oil level.



TA284924

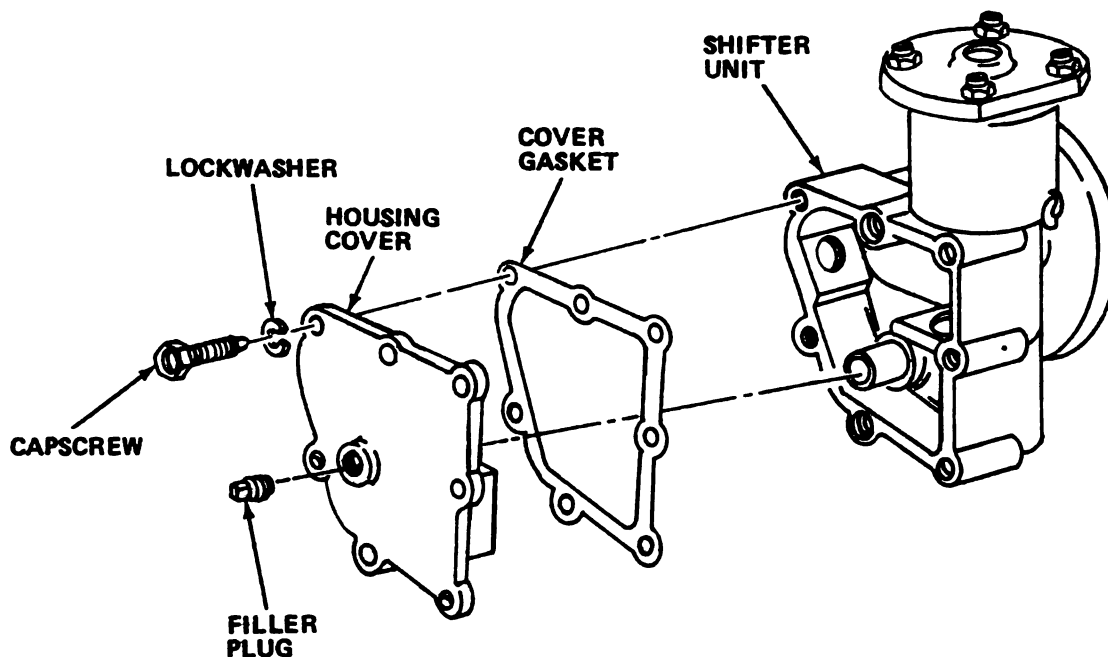
- (a) Remove filler plug from assembly housing cover.
- (b) Check lubricant level. Lubricant should be level with bottom of filler hole.
- (c) If level is incorrect, fill assembly to bottom of filler hole with SAE 10 oil.
- (3) Coat threads of filler plug with sealant.
- (4) Install plug.



## 9-6. SERVICE FORWARD REAR AXLE SHIFTER ASSEMBLY

### a. Drain oil from shifter assembly.

- (1) Place drain pan under assembly.

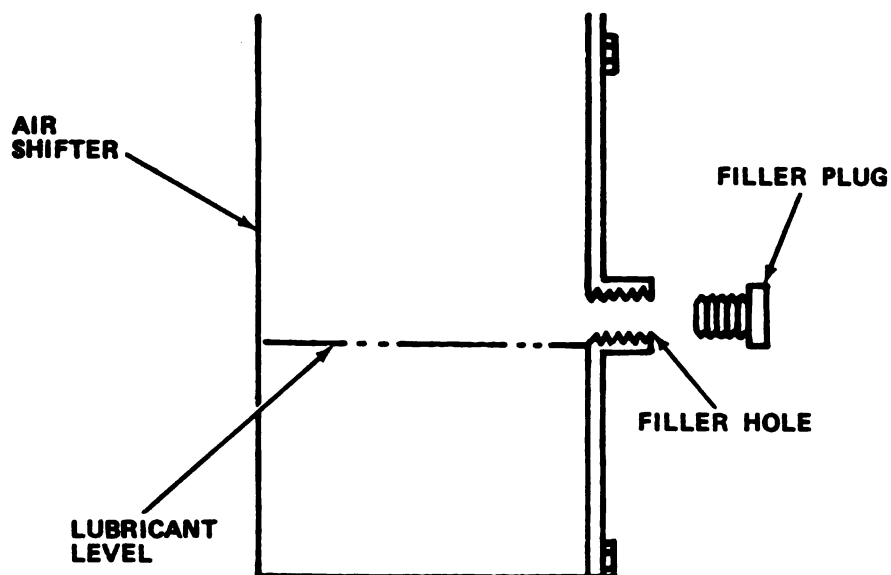


TA294925

- (2) Remove capscrows, lockwashers, and housing cover and allow oil to drain into pan.
- (3) Remove and discard cover gasket.
- (4) Reinstall cover and new gasket. Secure with capscrows and lockwashers.
- (5) Torque capscrows to 45 - 50 ft lbs (61 - 68 Nm).
- (6) Remove filler plug.



b. Fill shifter assembly with oil.



TA294926

#### NOTE

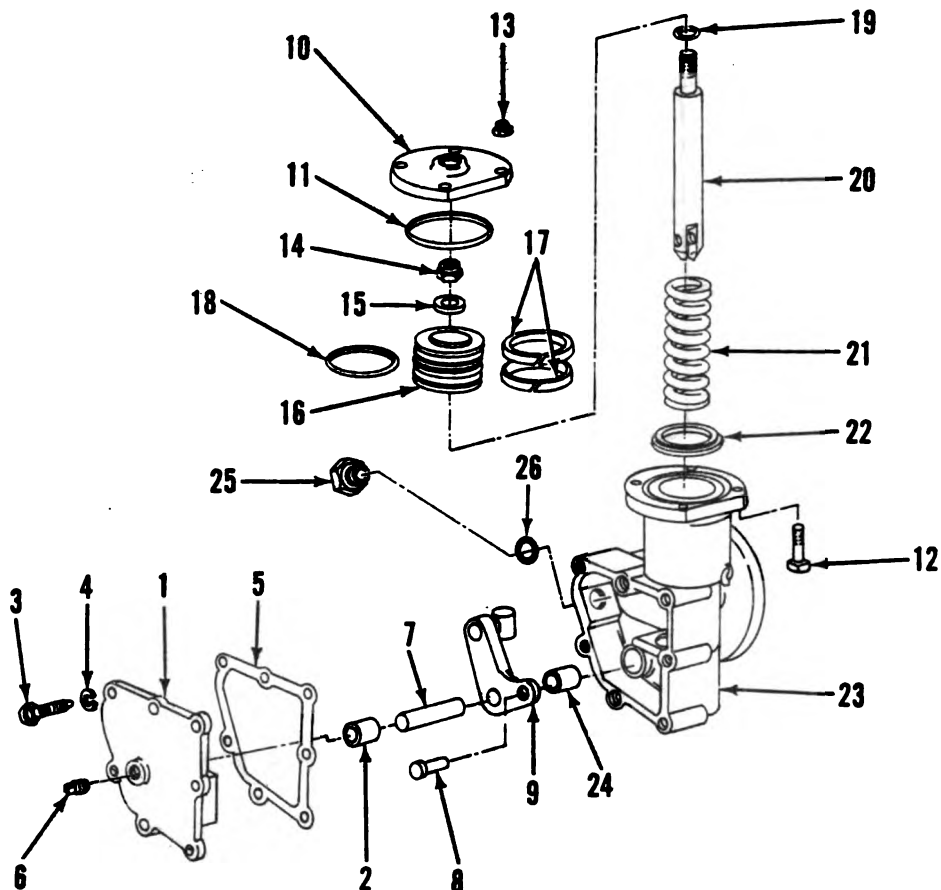
For Arctic operation, refer to FM 9-207.

- (1) Fill assembly housing to level of filler plug with SAE 10 oil (LO 9-2320-281-12).
- (2) Coat threads of filler plug with sealant and install plug.



## 9-7. REPAIR FORWARD REAR AXLE SHIFTER ASSEMBLY

### a. Disassemble shifter assembly.



TA294827

#### LEGEND:

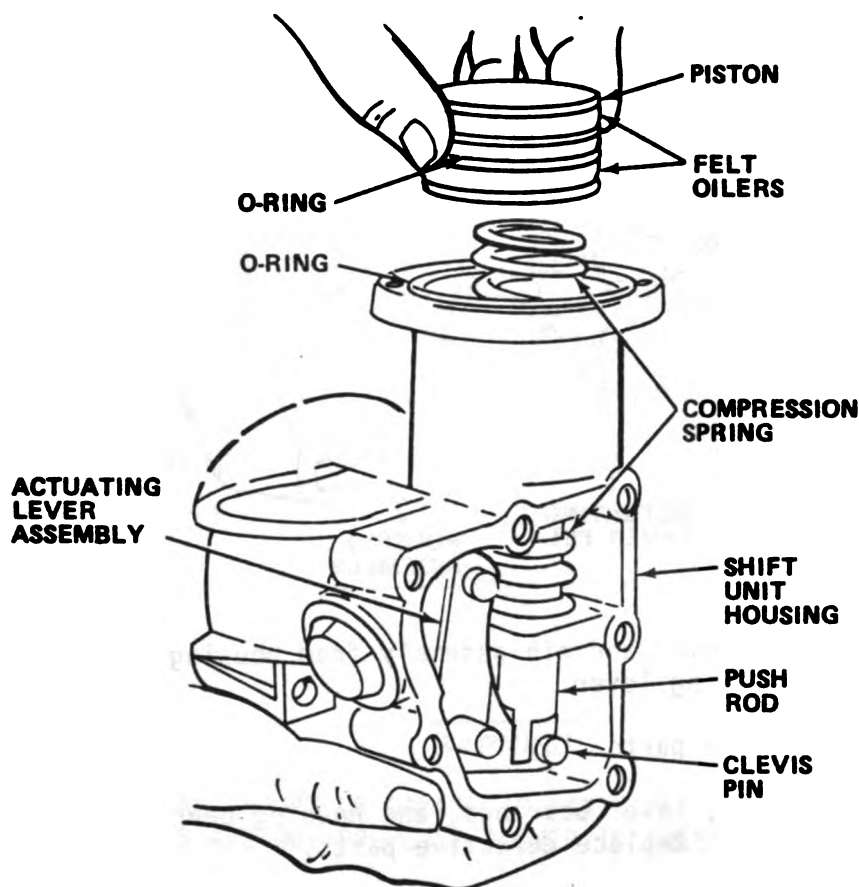
- |  |   |
|--|---|
| 1. Housing cover                           | 14. Piston locknut  |
| 2. Cover bearing                           | 15. Flat washer   |
| 3. Capscrew                                | 16. Piston  |
| 4. Lockwasher                              | 17. Piston felt oiler                                     |
| 5. Cover gasket                            | 18. Piston O-ring   |
| 6. Cover plug                              | 19. Push rod O-ring                                       |
| 7. Actuating lever pin                     | 20. Push rod  |
| 8. Clevis pin                              | 21. Compression spring                                    |
| 9. Actuating lever, pin and block assembly | 22. Piston stop   |
| 10. Housing cover (piston end)             | 23. Housing assembly                                      |
| 11. Cover O-ring                           | 24. Housing bearing                                       |
| 12. Capscrew                               | 25. Capscrew (for valve hole, 2-Speed, Forward Axle only) |
| 13. Cover locknut                          | 26. O-ring  |



- (1) Remove housing cover (1) from shifter housing assembly (23) and discard cover gasket.
- (2) Remove piston end housing cover (10) and discard cover O-ring (11).

### WARNING

EXERT CAUTION TO PREVENT PERSONAL INJURY WHEN REMOVING PISTON. PISTON IS UNDER SPRING PRESSURE AND WILL POP OUT WHEN REMOVED.

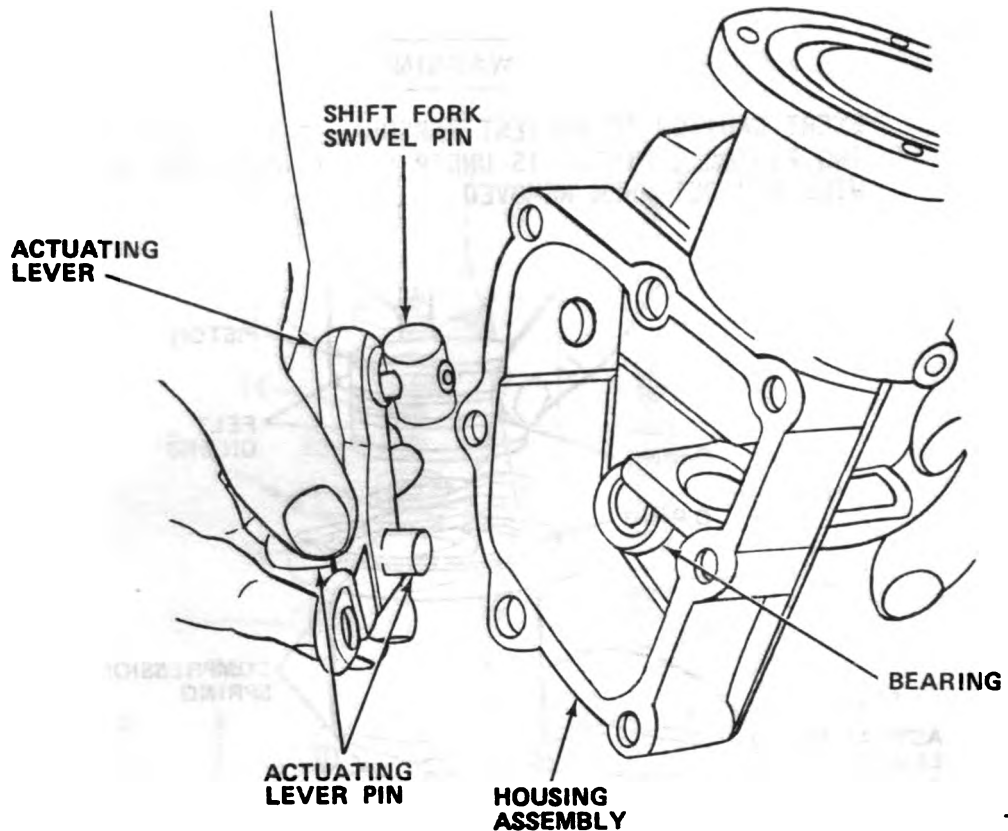


TA294928

- (3) Remove piston (16) from push rod (20).
- (4) Remove O-ring (18) and felt oilers (17) from piston (16) and discard O-ring and oilers.
- (5) Remove compression spring (21) and piston stop (22) from bore of housing assembly. Discard spring.
- (6) Remove clevis pin (8).



- (7) Remove push rod (20) from housing assembly (23).
- (8) Remove push rod O-ring (19) from push rod (20).



TA294929

- (9) Remove actuating lever and pin assembly from housing assembly. Do not disassemble actuating lever.

b. Inspect shifter assembly parts.

- (1) Inspect lever pins, lever bearings, and housing bearing for worn or grooved condition. Replace defective parts.
- (2) Inspect actuating lever and push rod for worn or elongated holes at point where they are connected. Replace defective parts.
- (3) Inspect piston friction surface for worn, grooved, or damaged condition. Replace if defective.

c. Assemble shifter assembly.

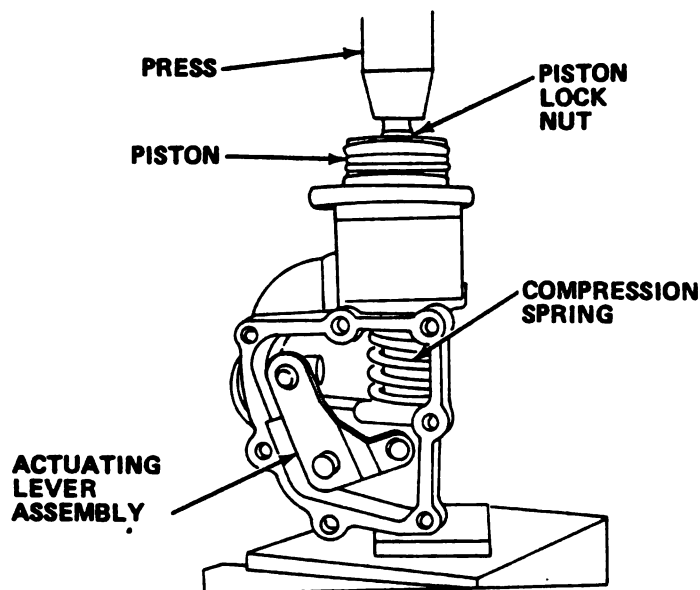
- (1) Reinstall actuating lever and pin assembly in housing assembly.
- (2) Assemble new O-ring and piston to push rod.
- (3) Torque nut to 10 - 13 ft. lbs (14 - 18 Nm).



**NOTE**

Prior to assembly, piston felt oilers should be soaked in SAE 10 oil for one hour.

- (4) Install new O-ring and felt oilers.
- (5) Insert piston stop and new compression spring in housing assembly.
- (6) Place piston and push rod assembly in housing assembly.



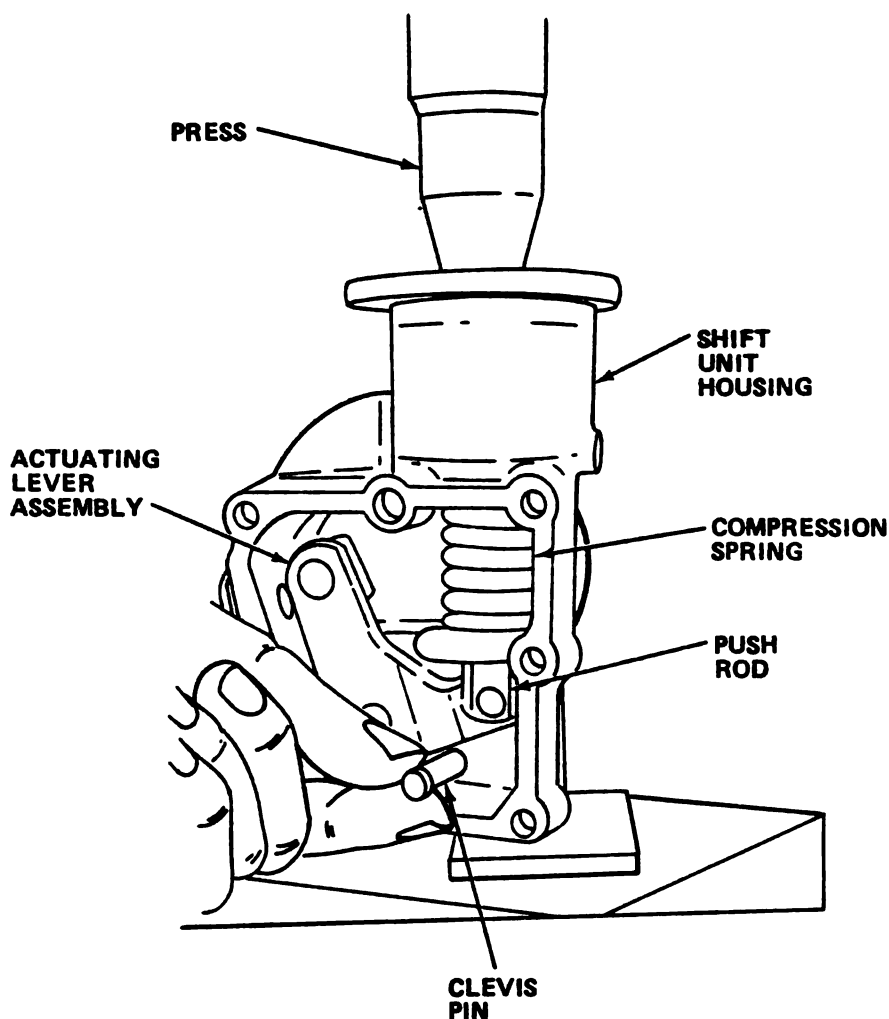
TA294930

**WARNING**

PERSONAL INJURY OR DAMAGE TO PARTS MAY OCCUR IF COMPONENTS ARE NOT PROPERLY ALINED IN PRESS.

- (7) Position housing assembly in arbor press.

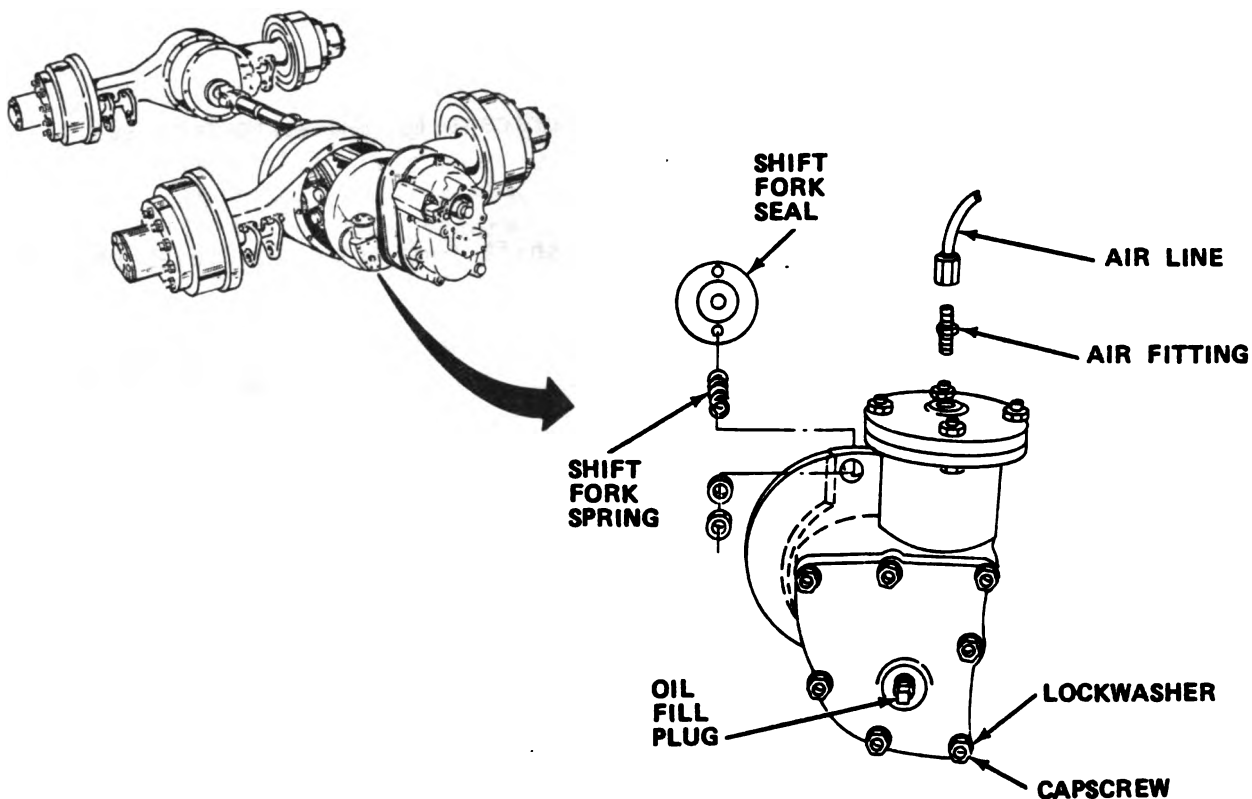




TA294931

- (8) Apply pressure to piston until actuating lever is in alignment with push rod end.
- (9) Install clevis pin and release press.
- (10) Install housing cover and new cover gasket. Coat threads of capscrews with sealant and install screws.
- (11) Torque capscrews to 8 - 9 ft lbs (11 - 12 Nm).
- (12) Apply light coat of silicone lubricant to O-ring.
- (13) Place new O-ring in groove of assembly housing and install piston end cover.
- (14) Tighten locknuts evenly to a torque of 9 - 11 ft lbs (12 - 15 Nm).



**9-8. REPLACE FORWARD REAR AXLE SHIFTER ASSEMBLY****a. Remove shifter assembly.**

(1) Drain air tanks to 0 psi, then close draincocks.

TA294932

**NOTE**

Air line will have to be disconnected at other end first.

- (2) Disconnect air line.
- (3) Remove and retain air fitting.
- (4) Place drain pan under assembly.



- (5) Remove housing cover and allow oil to drain.
- (6) Remove assembly from differential carrier.
- (7) Remove and discard shift fork seal and spring.

b. Install shifter assembly.

- (1) Apply a light coat of silicone lubricant to new shift fork seal.
- (2) Install new shift fork seal and spring.
- (3) Install new shift unit. Be sure shift fork actuating lever engages slot in shift fork.
- (4) Torque nuts to 45 - 50 ft lbs (61 - 68 Nm).
- (5) Remove oil fill plug.

NOTE

For Arctic operation, refer to FM 9-207.

- (6) Fill housing assembly to level of filler plug with SAE 10 oil (LO 9-2320-281-12).
- (7) Coat threads of filler plug with sealant.
- (8) Install plug.
- (9) Coat air fitting threads with sealant.
- (10) Install air fitting.
- (11) Coat air fitting threads with sealant and reconnect air line.

c. Perform operational and leak check of shifter assembly (TM 9-2320-281-10).

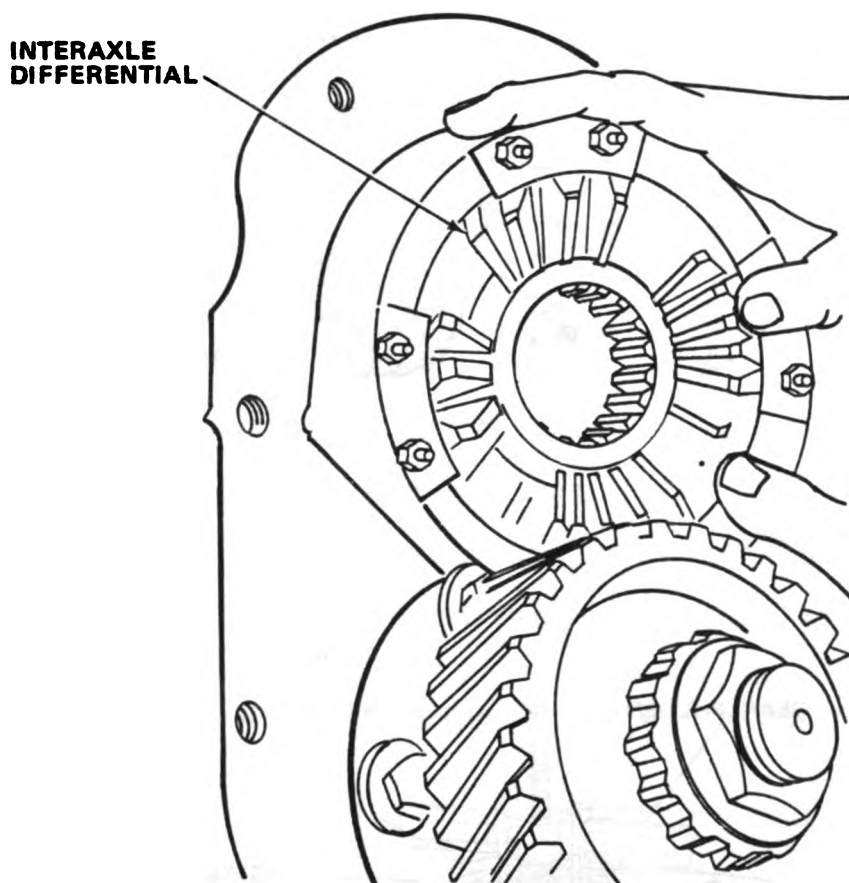


## 9-9. REPAIR POWER DIVIDER

- a. Remove output shaft.

### NOTE

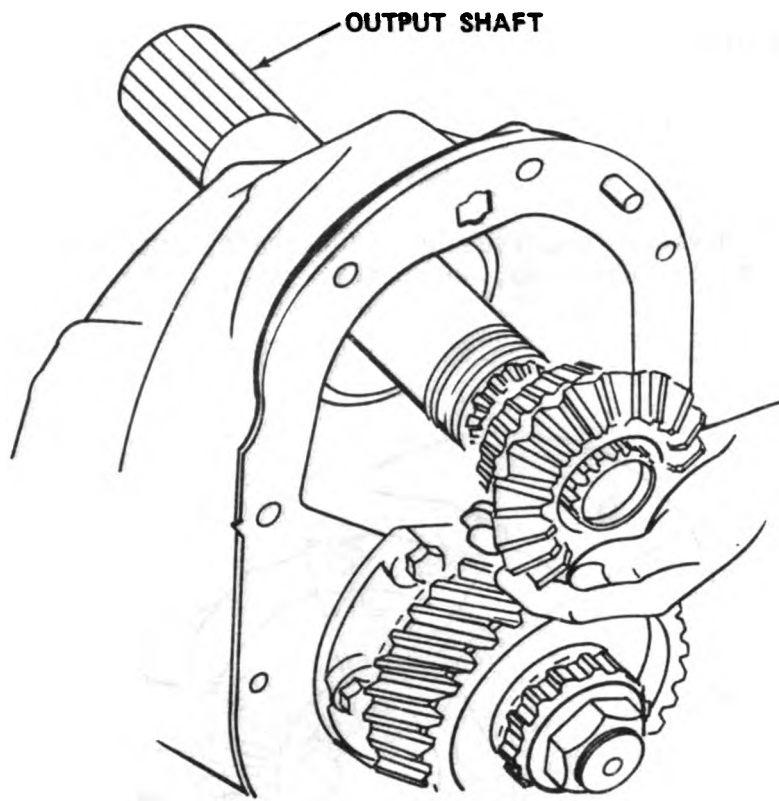
Power divider comprises an input shaft, interaxle differential, lube pump, and output shaft. The entire assembly (differential carrier cover and power divider) is called the Differential Carrier Assembly.



TA294933

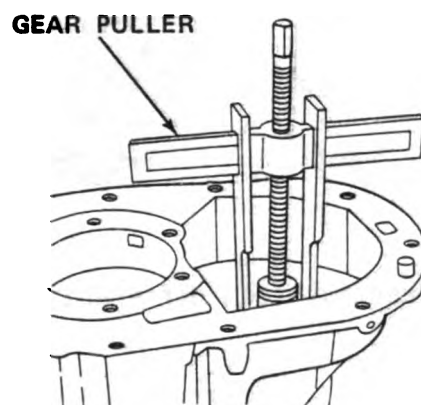
- (1) Remove interaxle differential from differential carrier.





TA294934

(2) Remove output shaft.

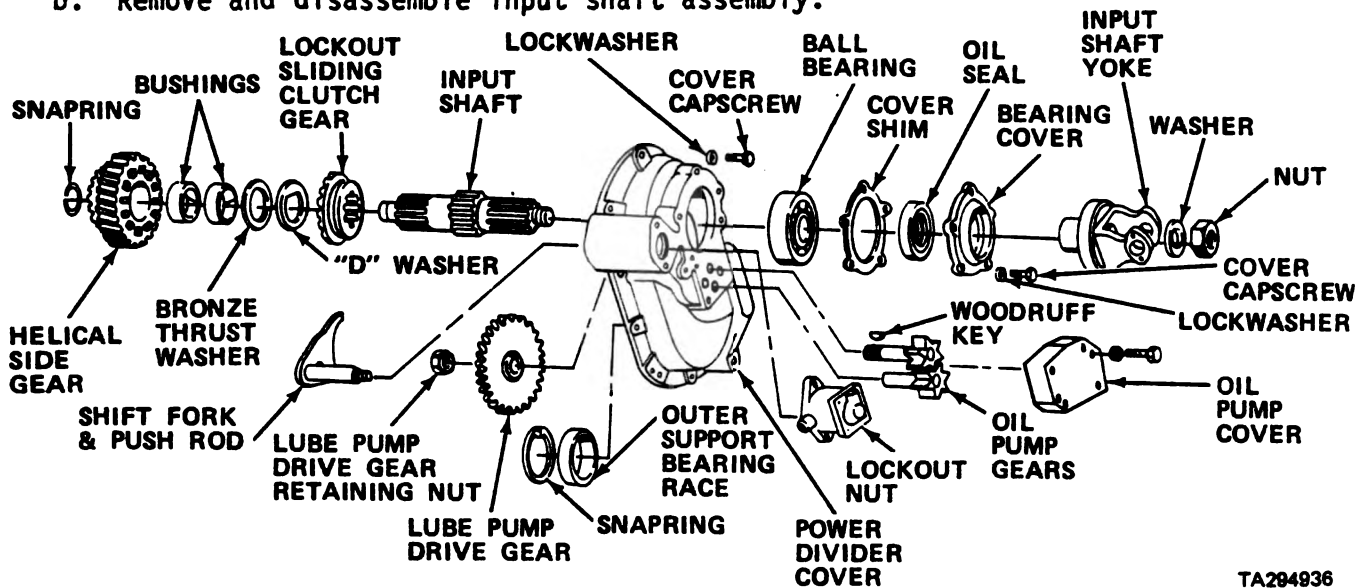


TA294935

(3) With gear puller, remove bearing cup from differential carrier.



## b. Remove and disassemble input shaft assembly.

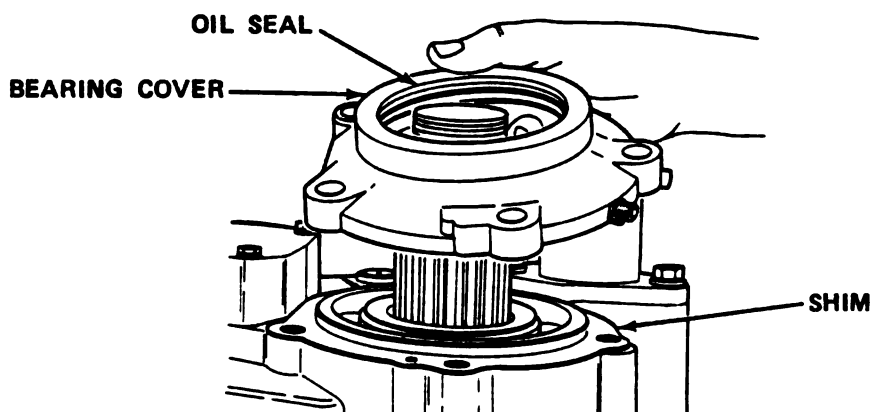


TA294936

**WARNING**

WEAR SAFETY GLASSES WHILE REMOVING SNAPRING. SNAPRING MAY POP OFF DURING REMOVAL. WITH SNAPRING REMOVED, THE HELICAL SIDE GEAR MAY FALL OFF SHAFT. EXERT CARE TO PREVENT PERSONAL INJURY OR DAMAGE TO EQUIPMENT.

- (1) Remove snapring from machined groove at rear of input shaft.
- (2) Slide helical side gear off input shaft.
- (3) Remove bronze thrust washer and "D" washer from input shaft.
- (4) While firmly holding input shaft yoke, loosen and remove lube pump drive gear retaining nut.
- (5) Remove nut and washer securing yoke to input shaft and remove yoke.

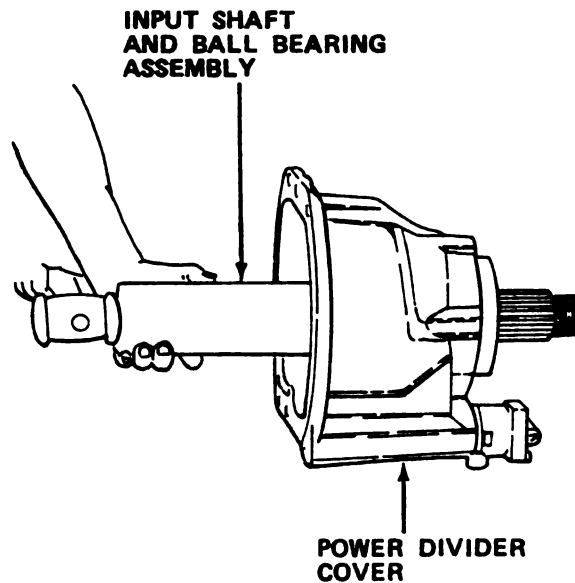


TA294937

- (6) Remove bearing cover and shim.

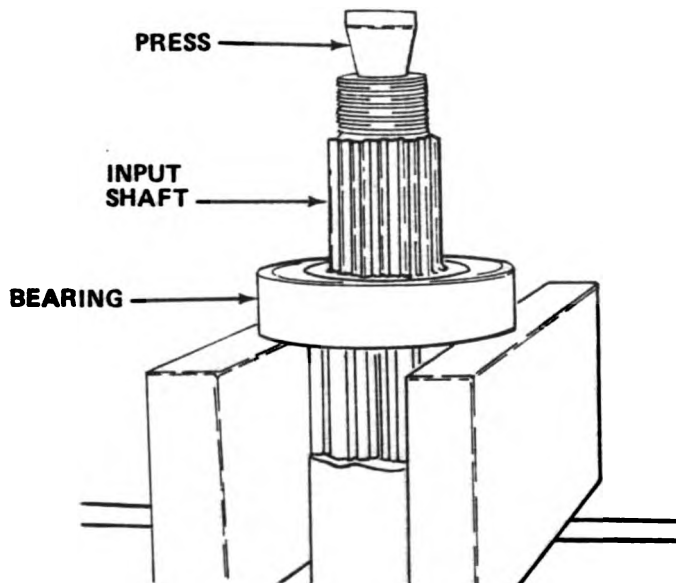


(7) Remove oil seal from bearing cover and discard.



TA294938

(8) Remove input shaft and ball bearing from power divider cover with a driver and softnosed hammer.



TA294939

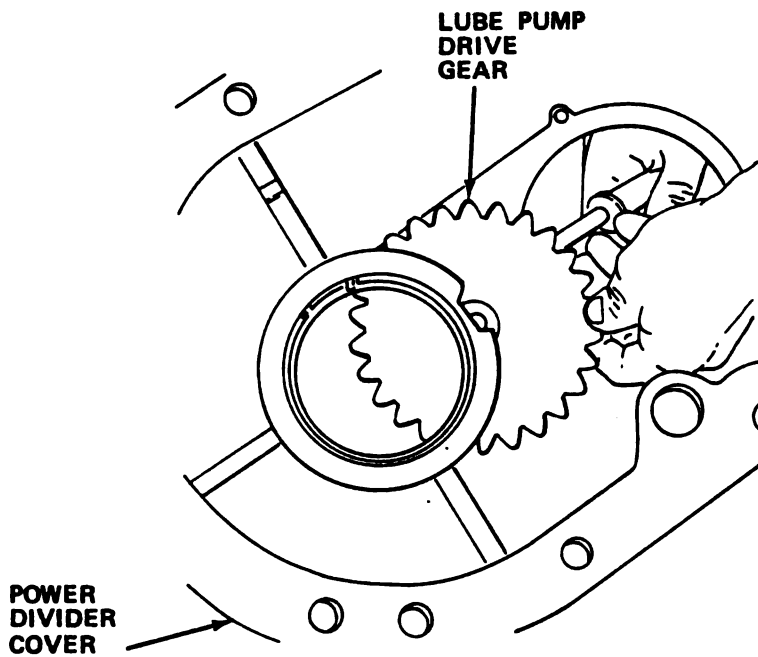
(9) Remove ball bearing from input shaft with a press.

(10) Remove lockout sliding clutch gear.

c. Remove lockout assembly (para 9-3).

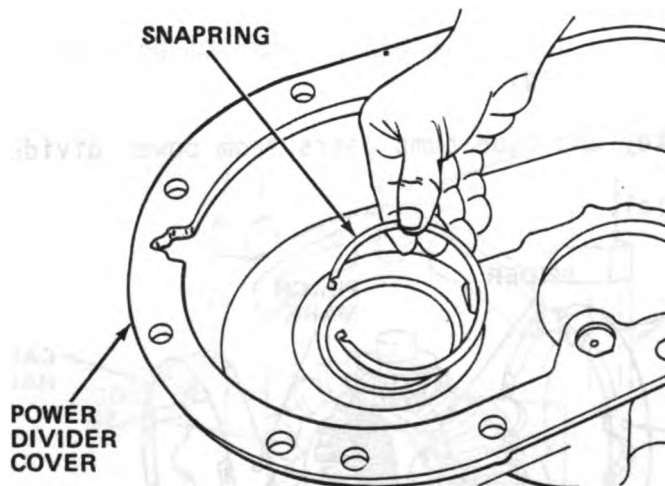
d. Remove lube oil pump and gear.





TA284940

- (1) Remove nut, and with a flat-tipped screwdriver, gently pry lube pump drive gear from its shaft inside power divider cover and remove gear.



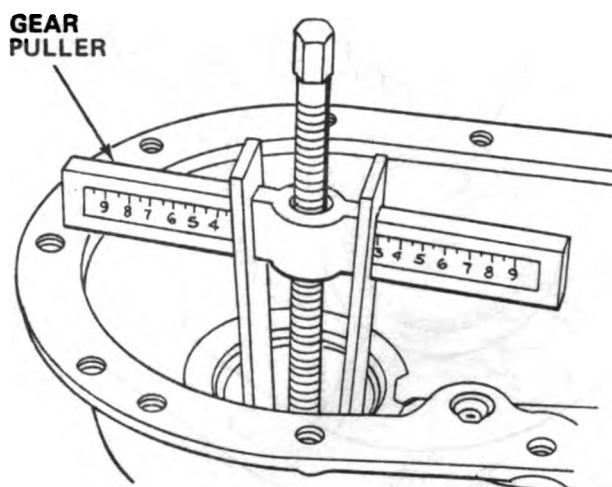
TA294941

### WARNING

TO PREVENT PERSONAL INJURY, WEAR SAFETY GLASSES WHILE REMOVING OR INSTALLING SNAPRING. SNAPRING CAN SLIP OFF PLIERS CAUSING PERSONAL INJURY.

- (2) Remove snapring securing pinion outer support bearing race.

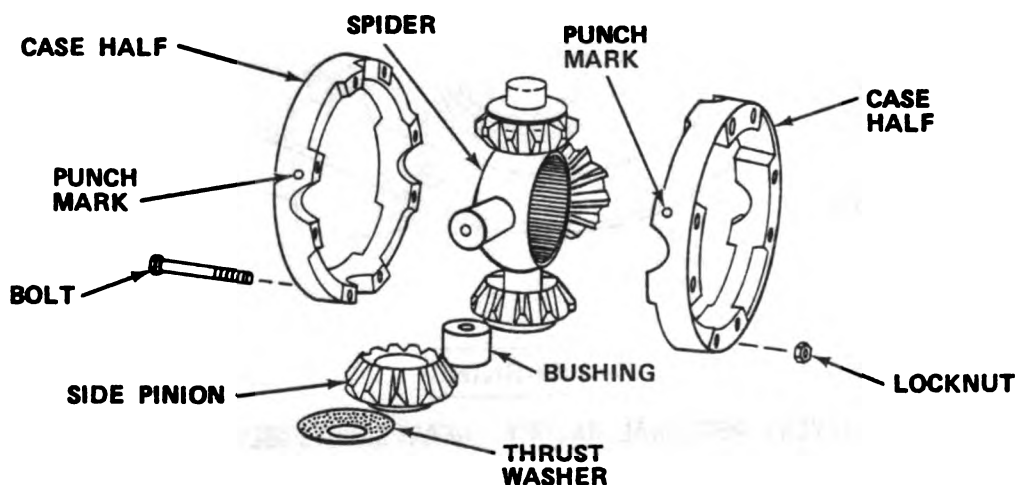




TA294942

- (3) Remove pinion outer support bearing race with puller.
- (4) Remove magnetic strainer from power divider cover.
- (5) Remove oil pump cover.
- (6) Remove and discard O-ring.
- (7) Remove woodruff key and lube pump gears from power divider cover.

e. Disassemble differential.



TA294943

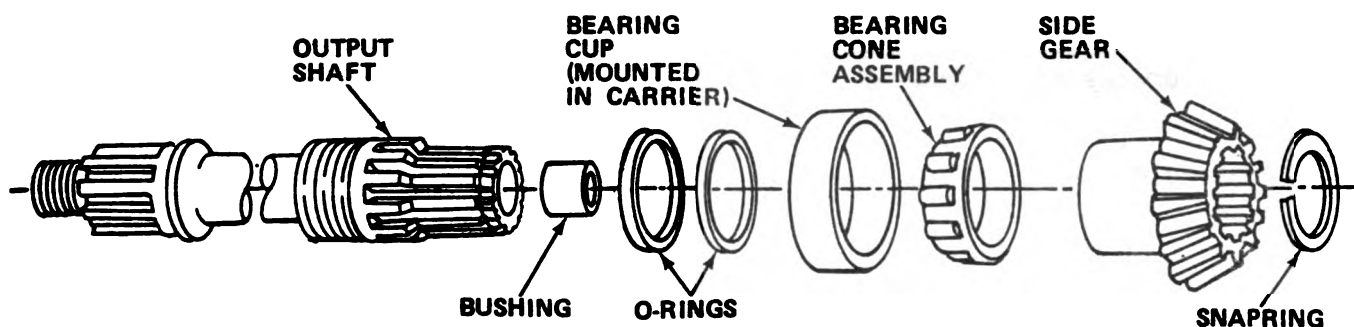
- (1) Match mark differential case halves with punch mark to ensure correct positioning during reassembly.
- (2) Remove case-half bolts and locknuts and separate halves.



(3) Remove thrust washers, side pinions, bushings, and spider.

f. Disassemble output shaft.

(1) Mount output shaft assembly in vise using brass vise jaw protectors.



TA294944

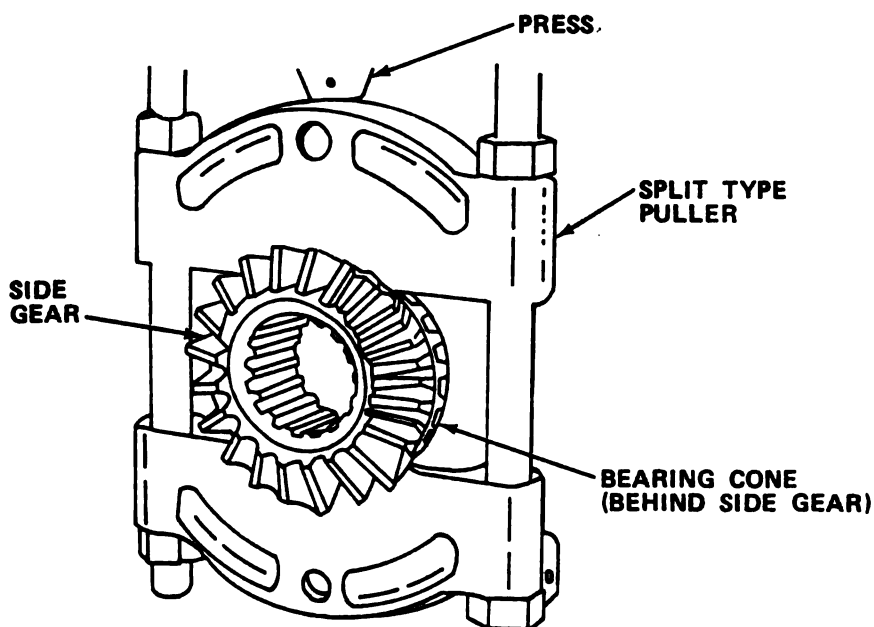
**WARNING**

TO PREVENT PERSONAL INJURY, WEAR SAFETY GLASSES WHILE REMOVING OR INSTALLING SNAPRING. SNAPRING CAN SLIP OFF PLIERS CAUSING PERSONAL INJURY.

(2) Remove snapring, side gear, and bearing cone assembly.

(3) Remove output shaft O-rings and discard.

(4) Remove bushing mounted in end of output shaft.



TA294945

(5) Remove bearing cone from side gear using press and split-type puller.



g. Inspect power divider parts.

- (1) Inspect all gears, bushings, shafts, bearings, and washers for worn, grooved, or damaged condition. Replace as necessary.
- (2) Inspect power divider cover and oil pump cover for cracks, distortions, or any other damaged condition. Replace as necessary.

h. Assemble output shaft.

**NOTE**

During assembly of power divider, be sure to lubricate parts with gear lube.

- (1) Press bearing cone on output shaft side gear.
- (2) Mount output shaft in vise and lubricate and install O-rings.
- (3) Install bushing in end of output shaft.
- (4) Install side gear and bearing cone assembly.

**WARNING**

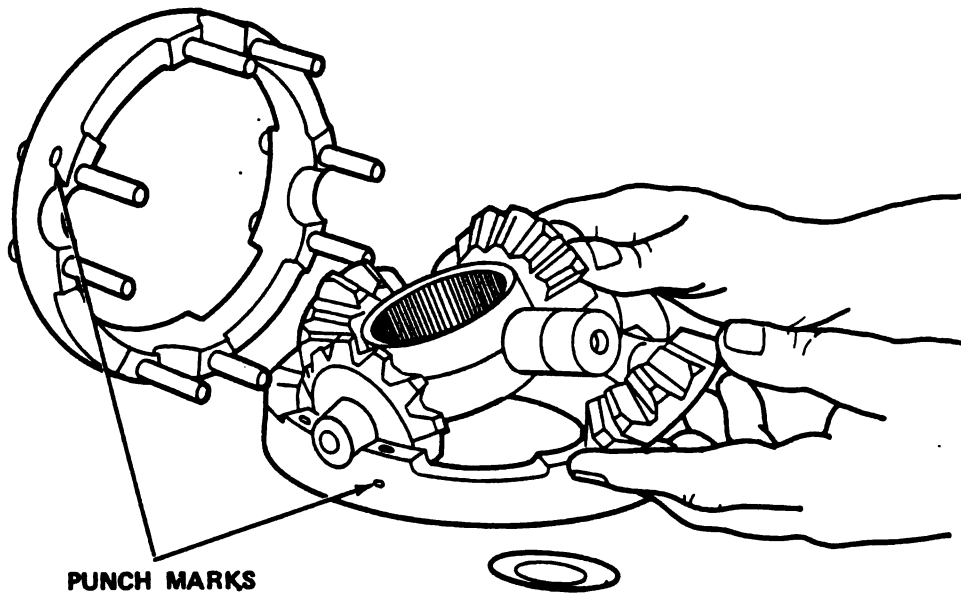
TO PREVENT PERSONAL INJURY, WEAR SAFETY GLASSES WHILE INSTALLING OR REMOVING SNAPRING. SNAPRING CAN SLIP OFF PLIERS CAUSING PERSONAL INJURY.

- (5) Install snapring.



**j. Assemble differential.****NOTE**

Lubricate bushing during assembly of differential.



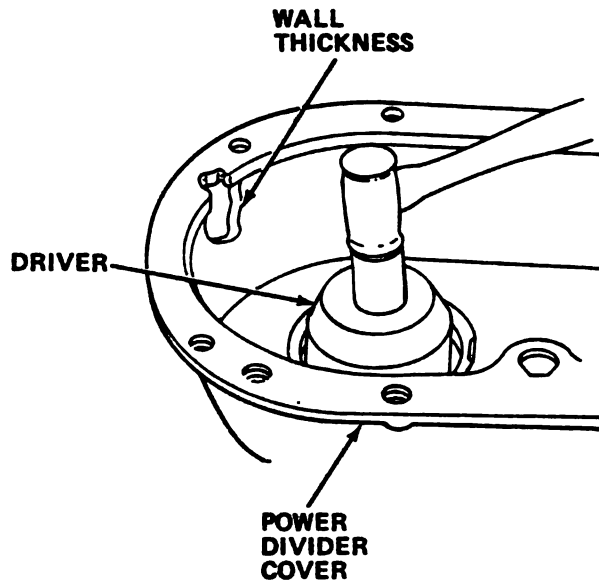
TA294946

- (1) Install bushings, side pinions, and thrust washers on interaxle differential spider.
- (2) Install spider assembly in one differential case-half.
- (3) Align punch marks and mate case halves. Secure with bolts, lockwashers, and nuts.
- (4) Torque nuts to 17 - 23 ft lbs (23 - 31 Nm).



j. Install lube oil pump and gear.

- (1) Install magnetic strainer in power divider cover. Torque strainer to 40 - 60 ft lbs (54 - 81 Nm).



TA294947

- (2) Install pinion outer bearing race in power divider cover using a driver and hammer.

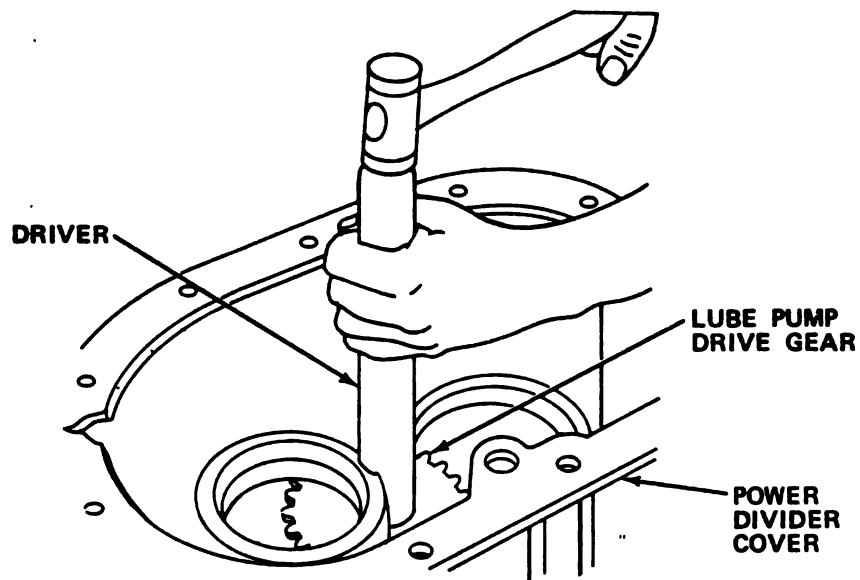
**WARNING**

TO PREVENT PERSONAL INJURY, WEAR SAFETY GLASSES WHILE INSTALLING OR REMOVING SNAPRING. SNAPRING CAN SLIP OFF PLIERS CAUSING PERSONAL INJURY.

- (3) Install snapring to secure bearing race.
- (4) Install pump gears in power divider cover (position gear with long shaft in opening adjacent to input shaft).
- (5) Lubricate new pump cover O-ring with silicone lubricant.
- (6) Install O-ring in pump cover.
- (7) If removed, install dowel alignment pins.
- (8) Install pump cover.
- (9) Torque capscrews to 7 - 9 ft lbs (9 - 12 Nm).



(10) Place woodruff key in keyway of lube pump drive gear shaft.

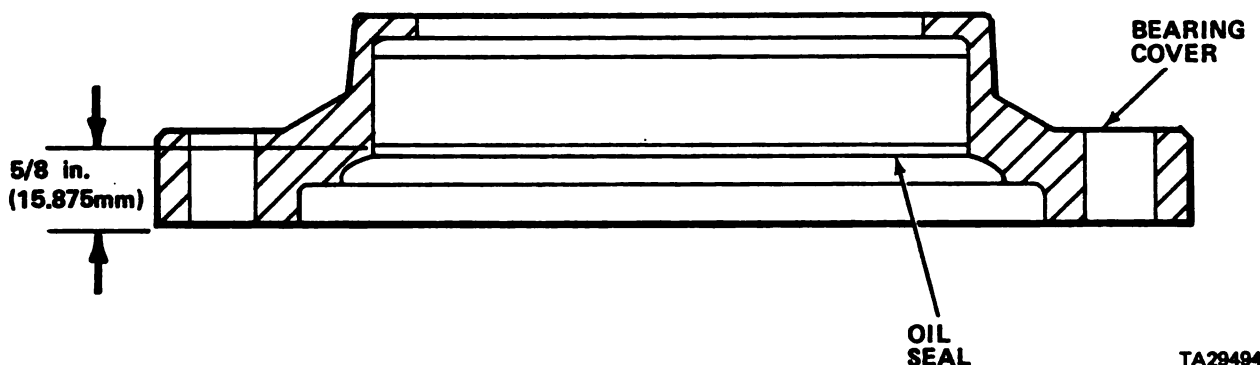


TA294948

(11) Position lube pump drive gear on shaft aligning gear keyway with shaft woodruff key, then install gear with driver and hammer.

k. Assemble input shaft.

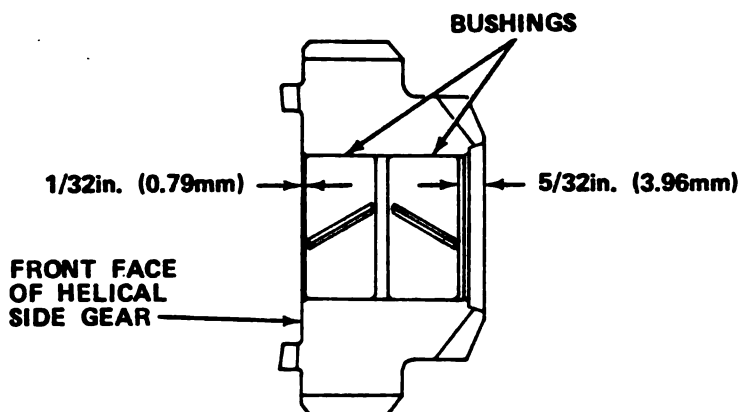
(1) Install ball bearing on input shaft using a press.



TA294949

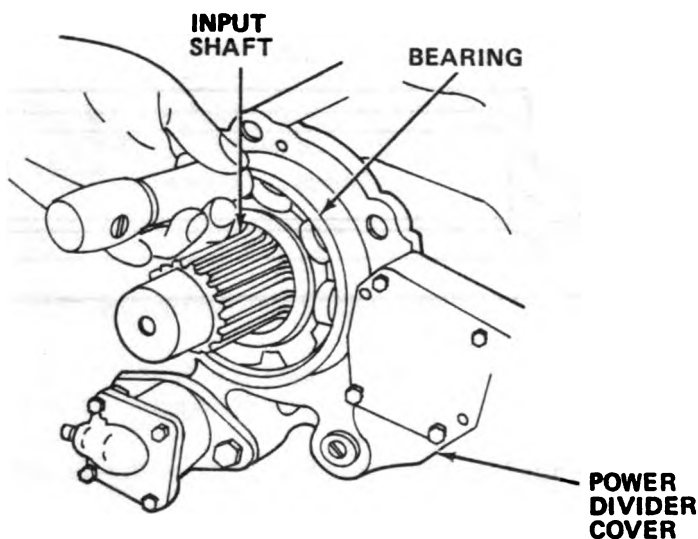
(2) Install oil seal in bearing cover. When correctly installed, seal should be recessed 5/8 in. (15.875 mm) from cover surface as illustrated.





TA294950

- (3) Install bronze bushing in helical side gear (if removed). Bushing should be recessed below front and rear faces of gear as illustrated.
- (4) Install shift fork in power divider cover.
- (5) Place lockout sliding clutch gear in power divider cover, engaging groove in clutch gear with shift fork.
- (6) Install lockout assembly (para 9-3).
- (7) With lockout sliding clutch gear and lube pump drive gear teeth in alignment, place input shaft and bearing assembly in cover, engaging helical side gear and clutch gear.

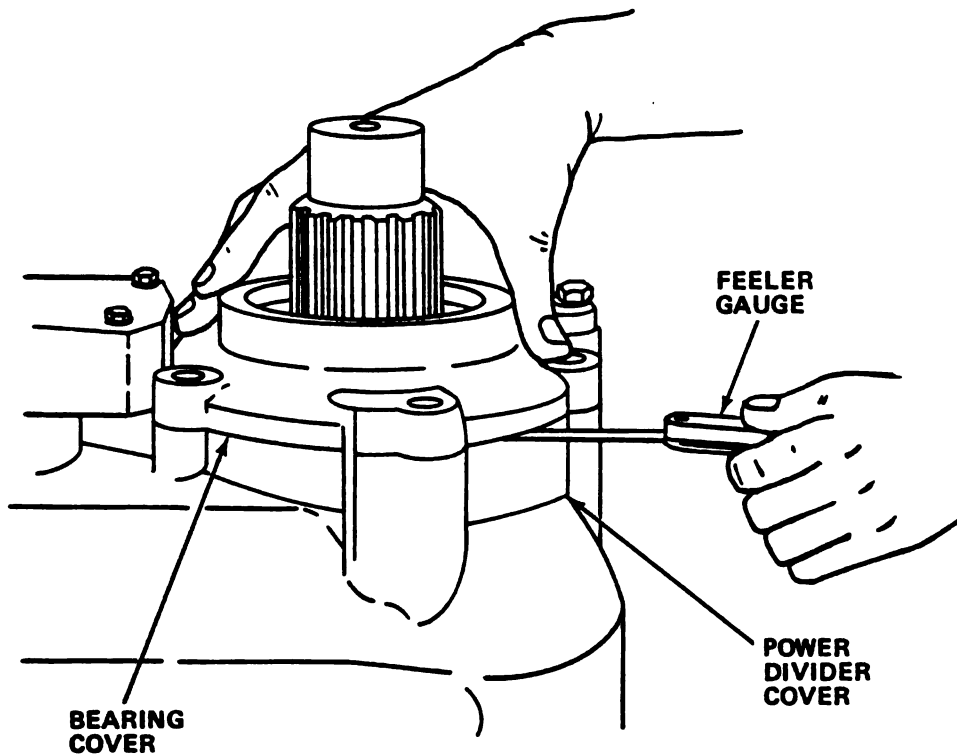


TA294951

- (8) Seat input shaft by carefully tapping bearing into power divider cover with a brass drift and hammer.
- (9) Lubricate bearing and check shaft to be sure that it rotates freely and is properly engaged with lube pump drive gear.



- (10) Temporarily install bearing cover without shim.



TA294952

#### NOTE

For accurate measurement, check at three places.

- (11) Hold bearing cover firmly in position and measure clearance between bearing cover and power divider cover with a feeler gage.

#### NOTE

This measured clearance plus 0.001 in. (0.025 mm) will equal thickness of shim required to secure the ball bearing.

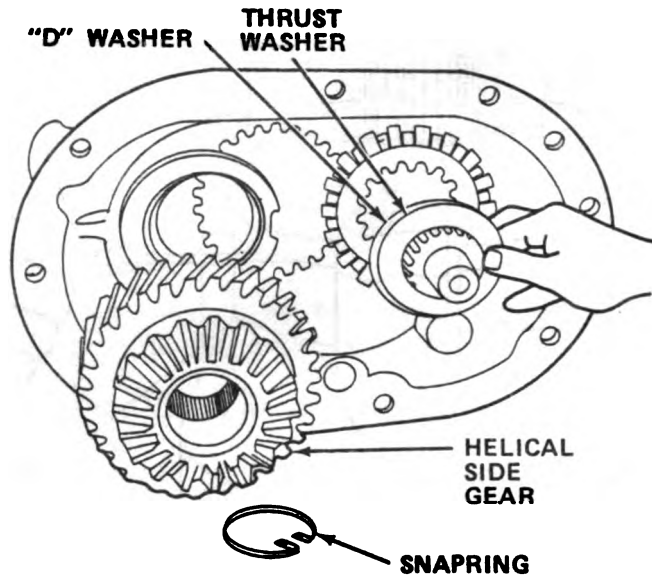
- (12) Remove bearing cover and install premeasured shim.  
 (13) Install bearing cover and secure with lockwashers and capscrews.  
 (14) Torque capscrews to 76 - 85 ft lbs (103 - 115 Nm).  
 (15) Lubricate oil seal and install in bearing cover.

#### NOTE

Make sure yoke bearing surface is clean and dry before installing yoke.



- (16) Install yoke onto input shaft. Secure with flat washer and nut.
- (17) Torque nut to 840 - 1020 ft lbs (1139 - 1383 Nm) and install cotter pin.
- (18) Install lube pump drive gear locknut.
- (19) Torque nut to 35 - 45 ft lbs (47 - 61 Nm).



TA294953

- (20) Slide "D" washer over input shaft and position against sliding clutch gear splines.
- (21) Install bronze thrust washer.
- (22) Install helical side gear.

#### WARNING

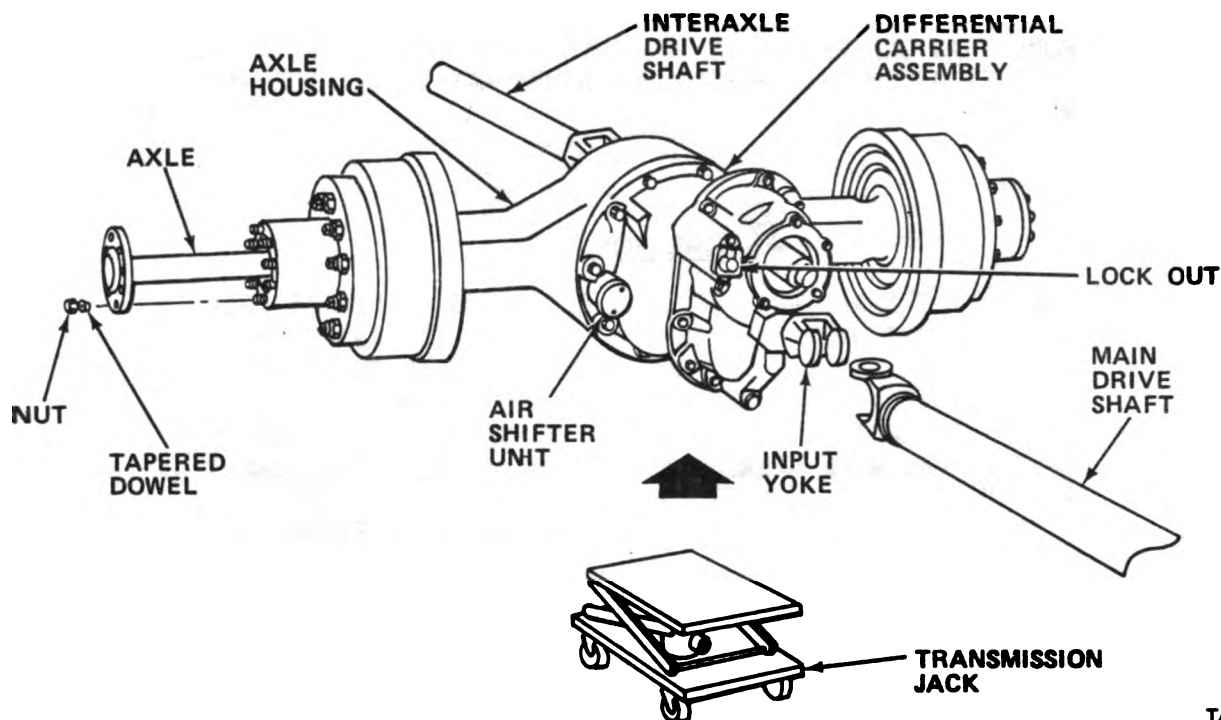
TO PREVENT PERSONAL INJURY, WEAR SAFETY GLASSES WHILE INSTALLING OR REMOVING SNAPRING. SNAPRING CAN SLIP OFF PLIERS CAUSING PERSONAL INJURY.

- (23) Secure helical side gear with snapring.

#### 1. Install output shaft.

- (1) Lubricate O-rings on output shaft and install output shaft into power divider cover.
- (2) Install differential assembly on output shaft side gear with nuts facing away from output shaft side gear.



**9-10. REPLACE FORWARD REAR AXLE DIFFERENTIAL CARRIER ASSEMBLY****a. Remove differential carrier assembly.**

TA294954

- (1) Drain axle lubricant (LO 9-2320-281-12).
- (2) Disconnect interaxle drive shaft (TM 9-2320-281-20).
- (3) Remove output shaft nut, washer, and yoke.
- (4) Disconnect differential lockout air line from lockout assembly.
- (5) Remove axle shifter assembly (para 9-8).
- (6) Remove interaxle drive shaft (TM 9-2320-281-20).
- (7) Remove main drive shaft (TM 9-2320-281-20).
- (8) Remove attaching brackets.
- (9) Loosen input shaft yoke nut and yoke, but do not remove yoke.
- (10) Remove axle shafts (TM 9-2320-281-20).



### WARNING

DO NOT LIE UNDER CARRIER AFTER FASTENERS ARE REMOVED. USE TRANSMISSION JACK TO SUPPORT DIFFERENTIAL CARRIER ASSEMBLY DURING REMOVAL OR INSTALLATION. DEATH OR SERIOUS INJURY MAY RESULT.

MORE THAN ONE PERSON IS REQUIRED TO REMOVE DIFFERENTIAL CARRIER ASSEMBLY. PERSONNEL INJURY MAY RESULT DUE TO WEIGHT.

### CAUTION

THE OUTPUT SHAFT REAR BEARING RETAINING WASHER IS FREQUENTLY LOST WHEN THE DIFFERENTIAL CARRIER ASSEMBLY IS REMOVED. IT MAY ADHERE TO THE YOKE, TO THE FACE OF THE OUTPUT SHAFT BEARING, OR FALL ON THE FLOOR OR INTO THE HOUSING. IF IT IS NOT REINSTALLED, THE END OF THE YOKE WILL CREATE RAPID WEAR OF THE OUTPUT SHAFT BEARING. IF IT IS LEFT IN THE HOUSING, IT CAN BE PICKED UP BY THE RING GEAR MOTION AND CAUSE PREMATURE AXLE FAILURE.

### NOTE

Tapered dowels are used on four carrier fasteners. When carrier is removed, they may stick in carrier or fall off. Exercise care not to lose or misplace these dowels. They must be used when installing new carrier.

(11) Remove differential carrier assembly.

(12) Remove input shaft yoke nut, washer, and yoke.

b. Install differential carrier assembly.

(1) Reinstall input yoke on new differential carrier. Torque nut to 840 - 1020 ft lbs (1139 - 1383 Nm).

### WARNING

P-D-680 SOLVENT IS POTENTIALLY DANGEROUS. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

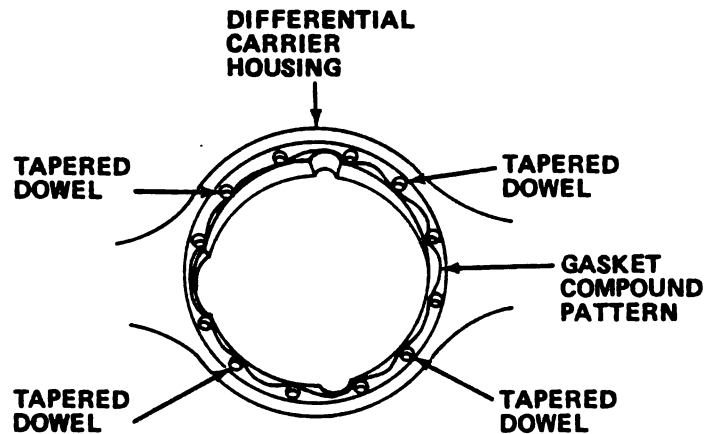
(2) Clean differential carrier housing with dry cleaning solvent.

(3) Inspect axle housing for cracks and distortion. Replace if faulty.



**NOTE**

Gasket compound will set in 20 minutes. Install carrier before compound sets or compound will have to be reapplied.



TA294955

- (4) Apply gasket compound to carrier housing mounting surface.

**WARNING**

DO NOT LIE UNDER CARRIER BEFORE FASTENERS ARE INSTALLED. USE TRANSMISSION JACK TO SUPPORT DIFFERENTIAL CARRIER ASSEMBLY DURING REMOVAL AND INSTALLATION. DEATH OR PERSONAL INJURY MAY RESULT.

MORE THAN ONE PERSON IS REQUIRED TO INSTALL DIFFERENTIAL CARRIER ASSEMBLY. PERSONNEL INJURY MAY RESULT DUE TO WEIGHT.

- (5) Install differential carrier assembly with four tapered dowels.
- (6) Torque capscrews at tapered dowels to 150 - 170 ft lbs (203 - 230 N•m).
- (7) Torque remaining capscrews to 210 - 300 ft lbs (285 - 407 N•m).
- (8) Torque stud nuts to 220 - 240 ft lbs (298 - 325 N•m).
- (9) Install output yoke and nut. Torque nut to 840 - 1020 ft lbs (1139 - 1383 N•m).
- (10) Install axle shifter assembly (para 9-8).
- (11) Install attaching brackets.
- (12) Install axle shafts (TM 9-2320-281-20).
- (13) Install main drive shaft (TM 9-2320-281-20).



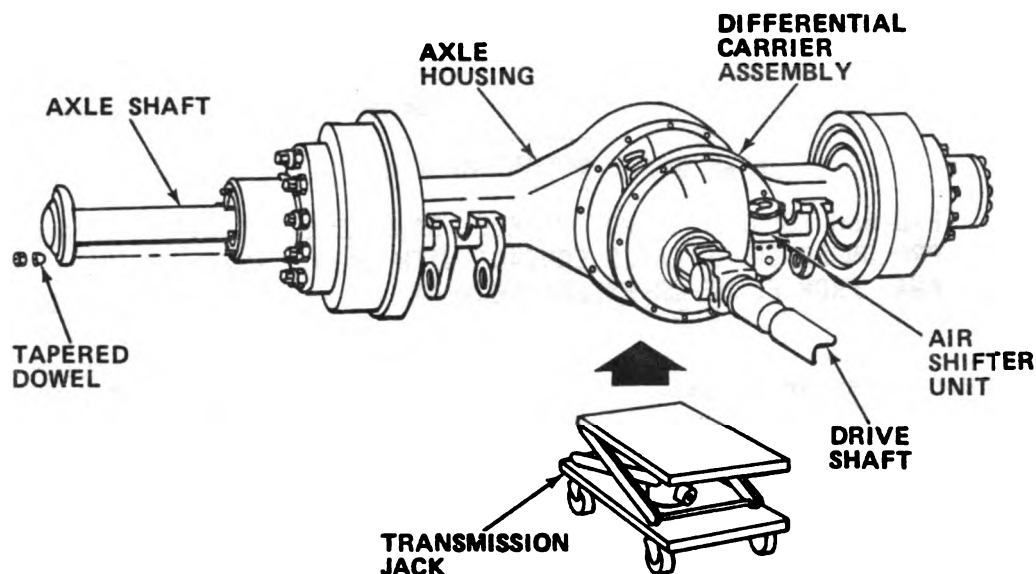
- (14) Install interaxle drive shaft (TM 9-2320-281-20).
  - (15) Coat threads with sealant and reconnect differential lockout air line to lockout assembly.
  - (16) Fill axle with proper lubricant (LO 9-2320-281-12).
- c. Perform operational check.

**CAUTION**

DO NOT ATTEMPT TO OPERATE VEHICLE UNTIL AXLE ASSEMBLY HAS BEEN CHECKED FOR PROPER DIFFERENTIAL ACTION. ERRORS IN ASSEMBLY COULD RESULT IN SEVERE DAMAGE TO VEHICLE TRANSMISSION, DRIVE SHAFTS, OR DIFFERENTIALS.

- (1) Check axle assembly for proper differential action. Wheels must rotate freely and independently.
- (2) Check carrier housing for oil leaks.



**9-11. REPLACE REAR REAR AXLE DIFFERENTIAL CARRIER ASSEMBLY****a. Remove differential carrier.**

TA294956

- (1) Drain axle lubricant (LO 9-2320-281-12).
- (2) Remove interaxle drive shaft (TM 9-2320-281-20).
- (3) Remove axle shafts (TM 9-2320-281-20).
- (4) Remove axle shifter assembly (para 9-8).
- (5) Remove attaching brackets.

**NOTE**

For easier disassembly, the drive pinion nut can be loosened after drive shaft is disconnected.

- (6) Loosen drive pinion nut.

**WARNING**

DO NOT LIE UNDER CARRIER AFTER FASTENERS ARE REMOVED. USE TRANSMISSION JACK TO SUPPORT DIFFERENTIAL CARRIER ASSEMBLY DURING REMOVAL. DEATH OR SERIOUS INJURY MAY RESULT.

MORE THAN ONE PERSON IS REQUIRED TO REMOVE DIFFERENTIAL CARRIER ASSEMBLY. PERSONNEL INJURY MAY RESULT DUE TO WEIGHT.



- (7) Remove differential carrier assembly.
  - (8) Remove input yoke, nut, washer, and yoke.
- b. Install differential carrier assembly.

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**WARNING**

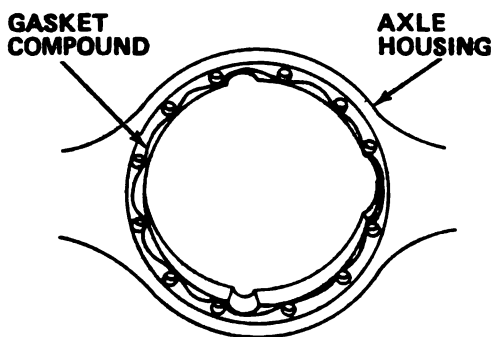
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P-D-680 SOLVENT IS POTENTIALLY DANGEROUS. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

- (1) Clean interior of axle housing with dry cleaning solvent.
- (2) Inspect axle housing for cracks or distortion. Replace if faulty.

**NOTE**

Gasket compound will set in 20 minutes. Install carrier before compound sets or compound will have to be reapplied.



TA294857

- (3) Apply gasket compound to carrier housing mounting surface.

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**WARNING**

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DO NOT LIE UNDER CARRIER BEFORE FASTENERS ARE INSTALLED. USE TRANSMISSION JACK TO SUPPORT DIFFERENTIAL CARRIER ASSEMBLY DURING REMOVAL OR INSTALLATION. DEATH OR SERIOUS INJURY MAY RESULT.

MORE THAN ONE PERSON IS REQUIRED TO INSTALL DIFFERENTIAL CARRIER ASSEMBLY. PERSONNEL INJURY MAY RESULT DUE TO WEIGHT.



- (4) Install new differential carrier assembly.
  - (5) Torque capscrews to 160 - 176 ft lbs (217 - 239 N•m).
  - (6) Torque stud nuts to 220 - 240 ft lbs (298 - 325 N•m).
  - (7) Install input yoke, washers, and nut.
  - (8) Torque nut to 500 - 700 ft lbs (678 - 949 N•m).
  - (9) Reinstall brackets.
  - (10) Reinstall axle shifter assembly (para 9-8).
  - (11) Reinstall axle shafts (TM 9-2320-281-20).
  - (12) Reinstall interaxle drive shaft (TM 9-2320-281-20).
  - (13) Fill axle with proper lubricant (LO 9-2320-281-12).
- c. Perform operational check.

#### **CAUTION**

DO NOT ATTEMPT TO OPERATE VEHICLE UNTIL AXLE ASSEMBLY HAS BEEN CHECKED FOR PROPER DIFFERENTIAL ACTION. ERRORS IN ASSEMBLY COULD RESULT IN SEVERE DAMAGE TO VEHICLE TRANSMISSION, DRIVE SHAFTS, OR DIFFERENTIALS.

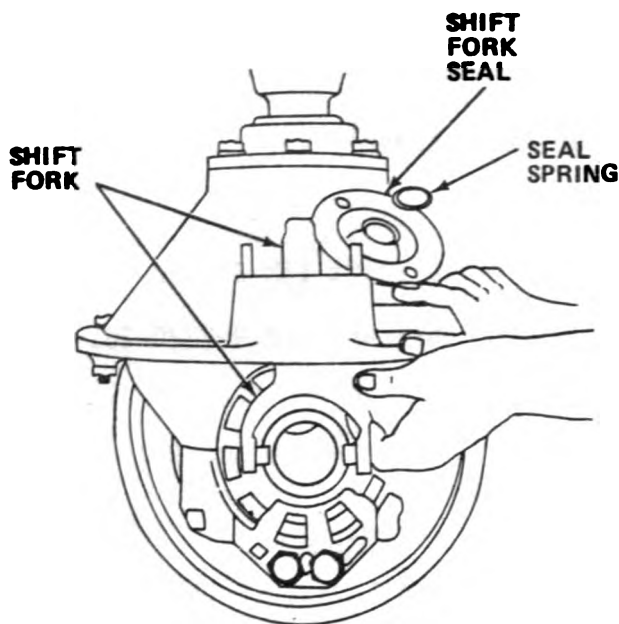
- (1) Check axle assembly for proper differential action. Wheels must rotate freely and independently.
- (2) Check carrier housing for oil leaks.



## 9-12. REPAIR FORWARD REAR AND REAR REAR AXLE DIFFERENTIAL CARRIER ASSEMBLIES

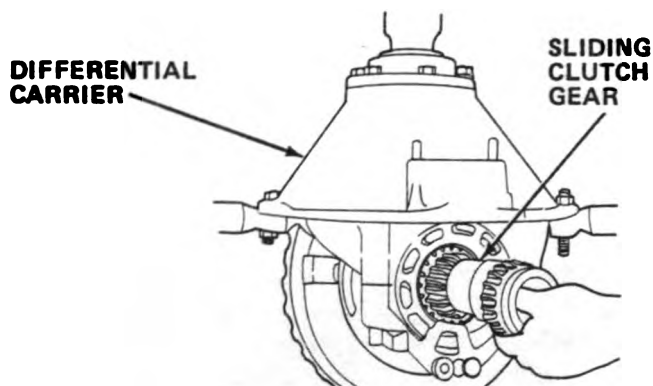
### a. Disassemble differential carrier.

- (1) Mount differential carrier assembly on repair stand.



TA294958

- (2) Remove shift fork seal and seal spring from shift fork.
- (3) Remove expansion plugs and drive out shift fork shaft.
- (4) Disengage and remove shift fork.



TA294959

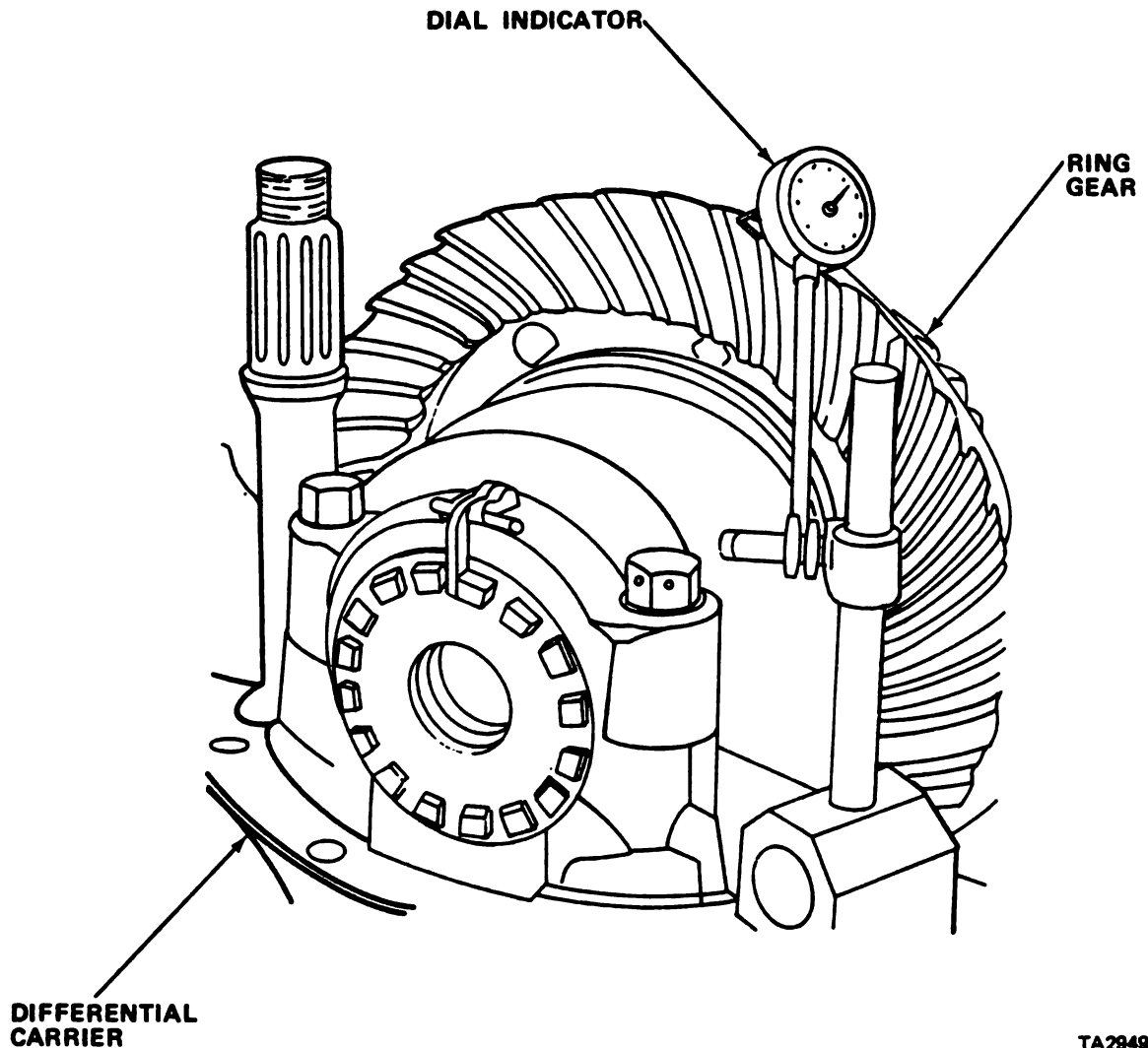
- (5) Remove sliding clutch gear.



**NOTE**

If drive pinion and ring gear require replacement, step (6) need not be completed. Tooth pattern is checked to allow easier adjustment during reassembly.

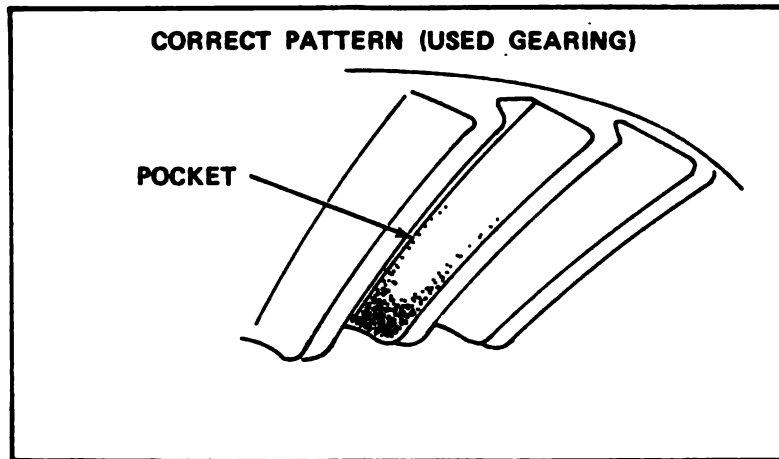
(6) Check ring gear backlash.



TA294960

- (a) Mount dial indicator.
- (b) Test ring gear backlash and record reading.
- (c) Remove dial indicator.
- (d) Paint twelve ring gear teeth with Prussian bluing.
- (e) Roll gear to obtain a contact pattern.

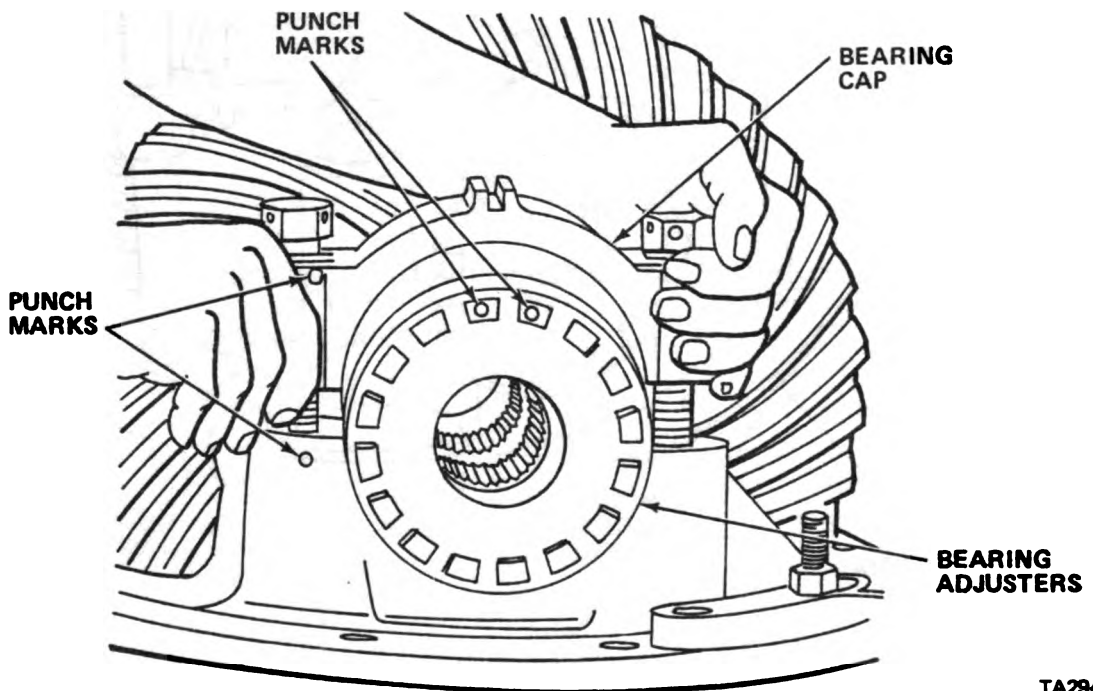




TA294961

(f) If tooth contact pattern looks similar to illustration above, tooth contact pattern is correct. If pattern is incorrect, refer to para c(36) of this task and find the pattern that most closely resembles the tooth contact pattern. Note the correction procedures so that during assembly, adjustments can be made.

(7) Disassemble differential.



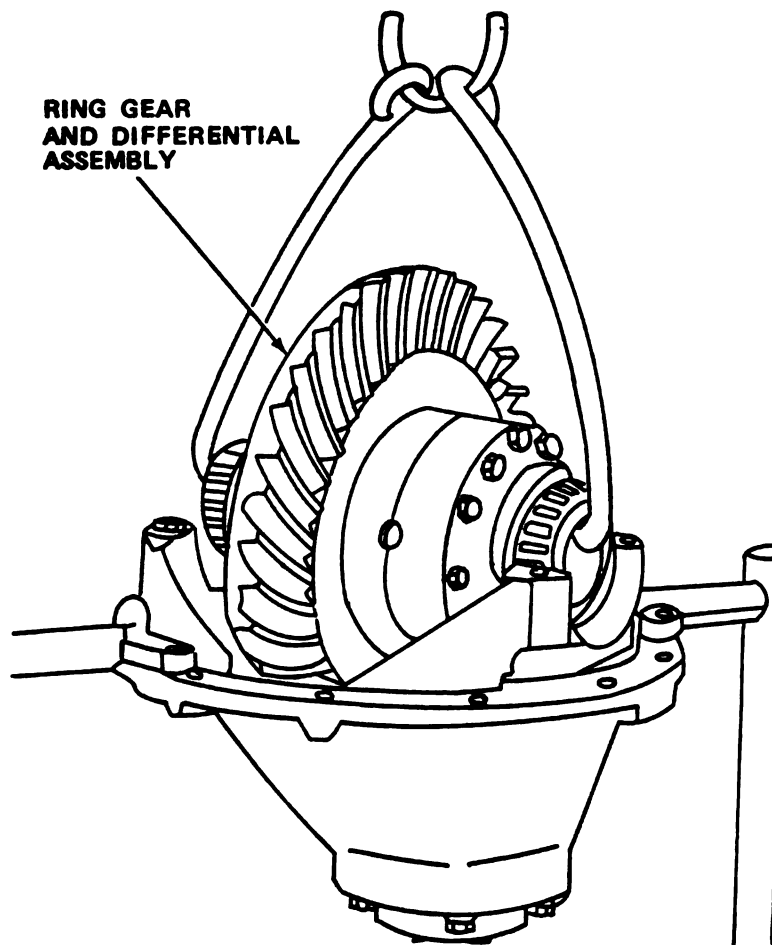
TA294962

(a) Punch mark differential bearing caps for reference during reassembly.

(b) If reusing gear set, punch mark bearing adjuster for reference during reassembly.

(8) Cut lockwire and remove bearing caps.





TA294963

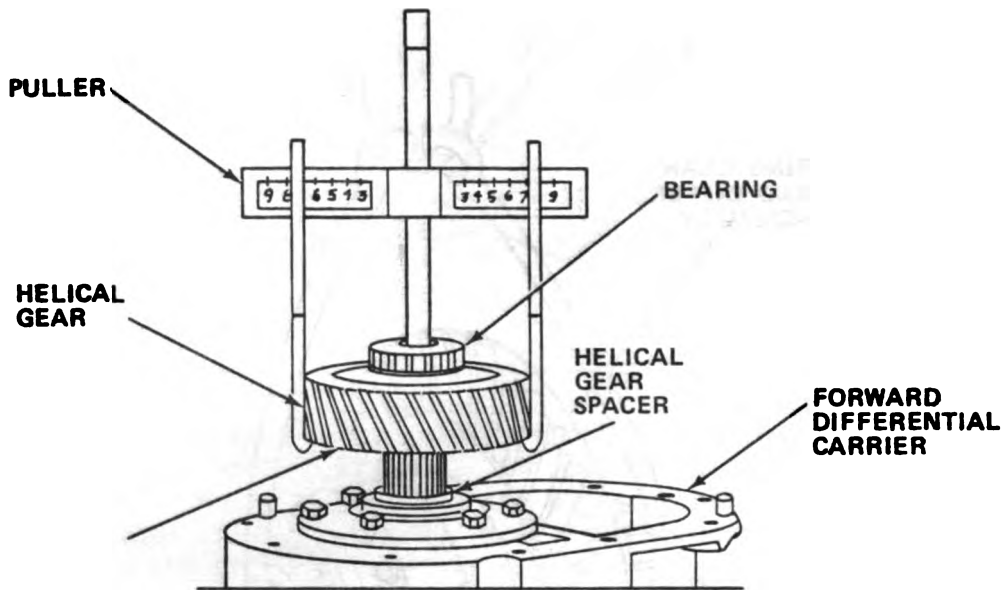
- (9) Using a chain hoist, lift ring gear and differential assembly out of carrier.

**NOTE**

Step (10) applies only to forward differential carrier assembly.

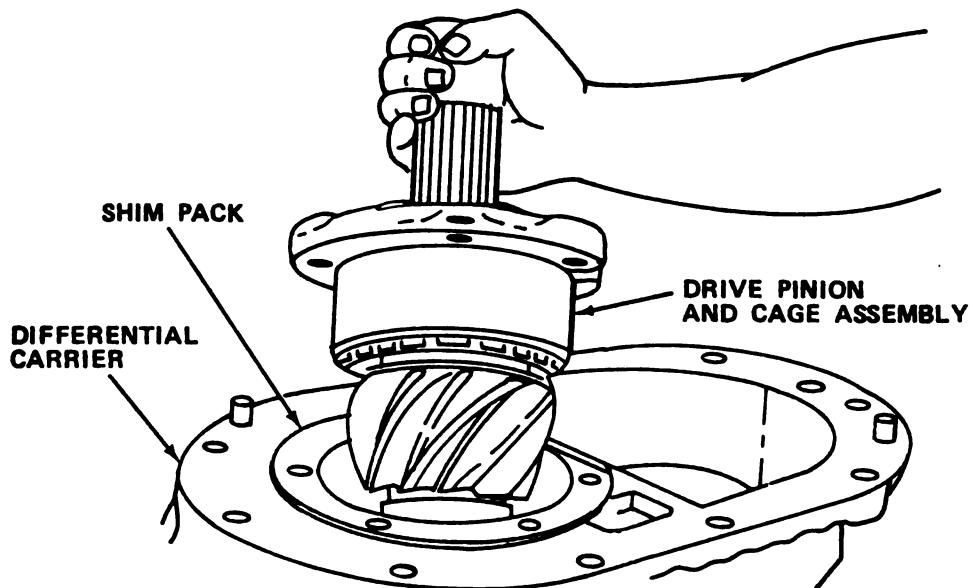
- (10) Remove forward differential carrier drive pinion assembly.





TA294964

- (a) Remove bearing and helical drive gear using puller.
- (b) Remove helical gear spacer.



TA294965

- (c) Remove drive pinion and cage assembly from carrier.
- (d) Remove shim pack.



**CAUTION**

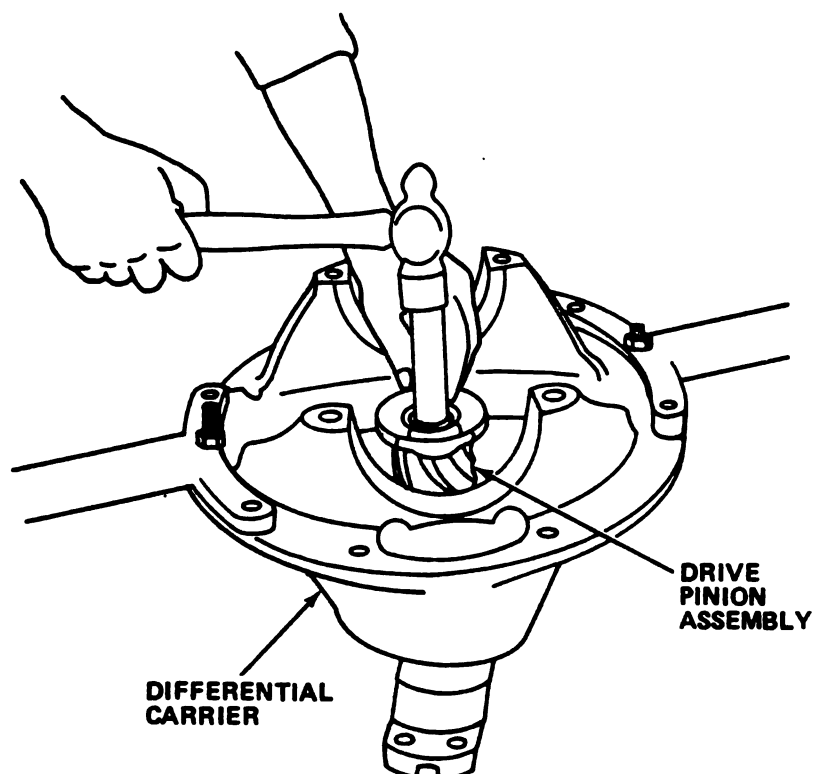
TO PREVENT DAMAGE TO PINION, DO NOT ALLOW PINION TO DROP ON HARD SURFACE.

**NOTE**

If gear set is to be reused, keep pinion bearing cage shim pack intact for use in reassembly. If the original shims cannot be reused, record the number and size of shims in the pack.

Steps (11) thru (12) apply to the forward rear axle only.

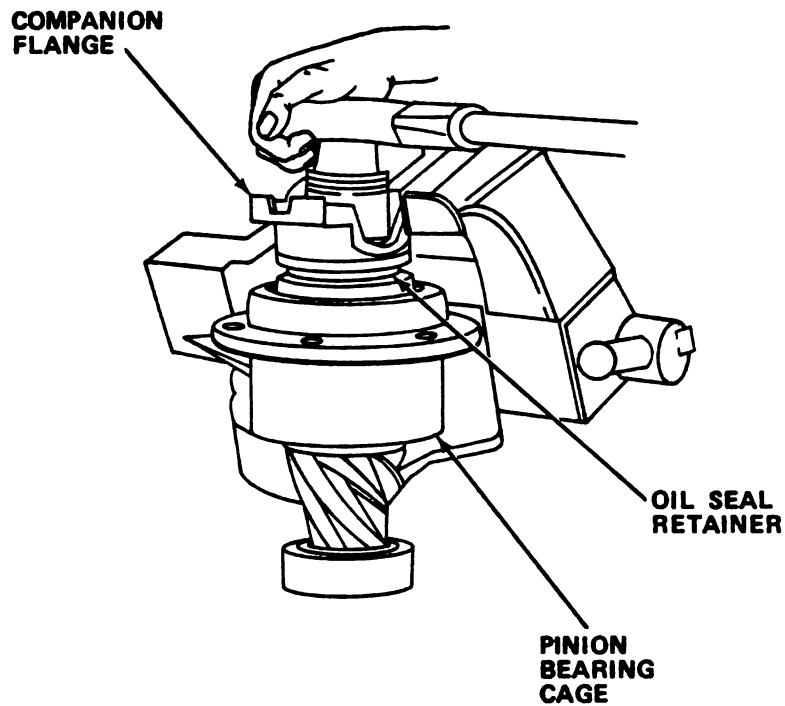
(11) Remove rear differential carrier drive pinion assembly.



TA294966

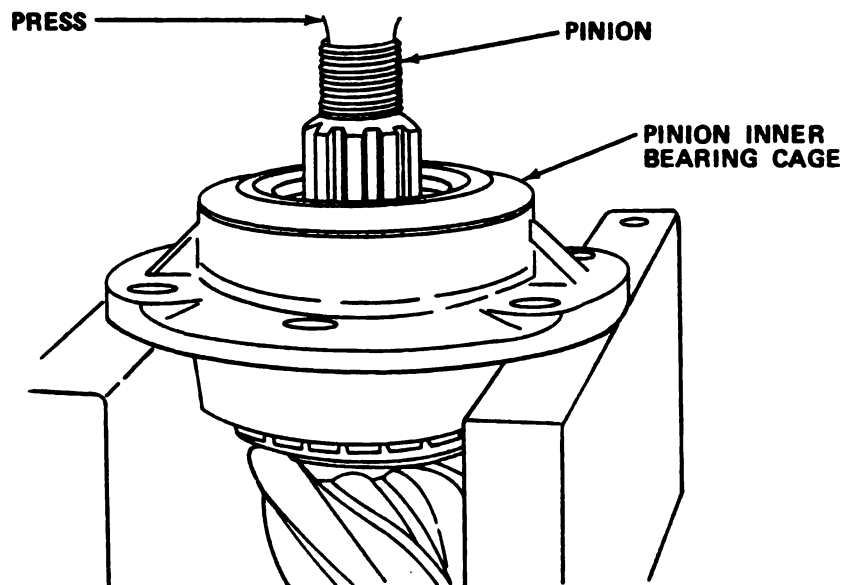
(a) Remove drive pinion assembly.





TA294967

(b) Remove companion flange.



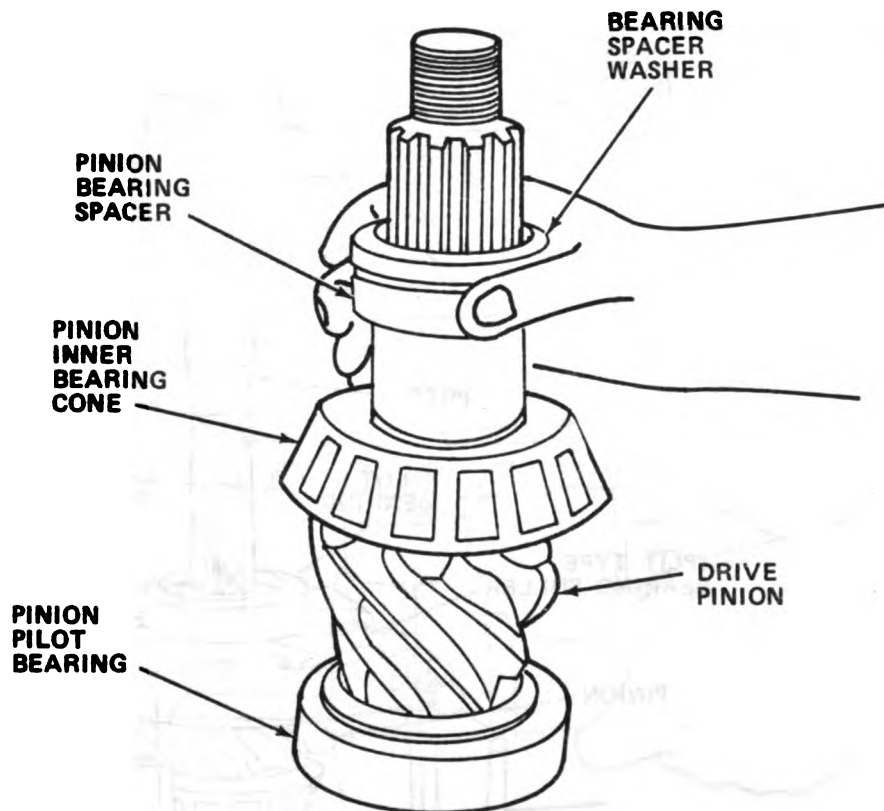
TA294968

(c) Support pinion bearing cage and press pinion out of bearing cage and bearing cone.



(12) Disassemble drive pinion assembly.

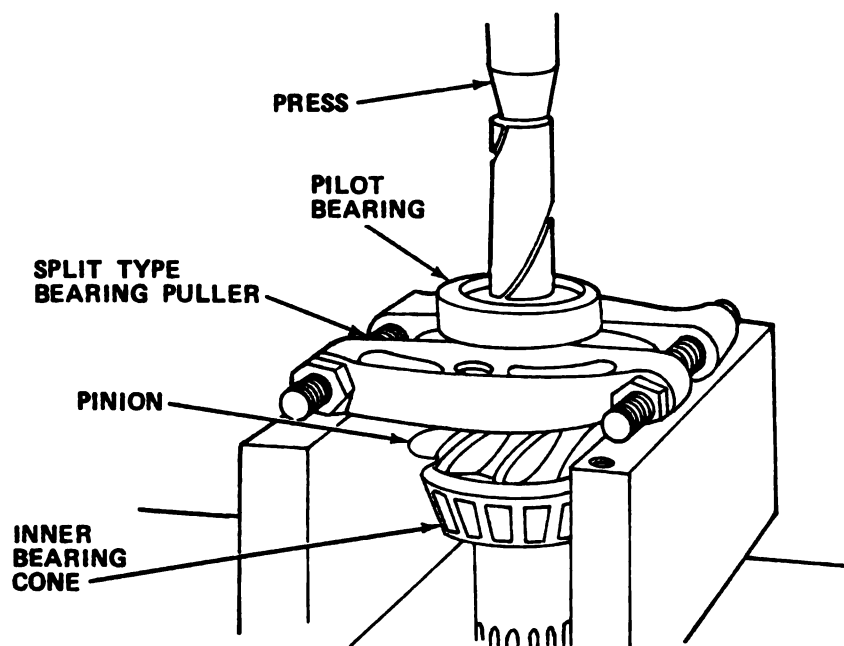
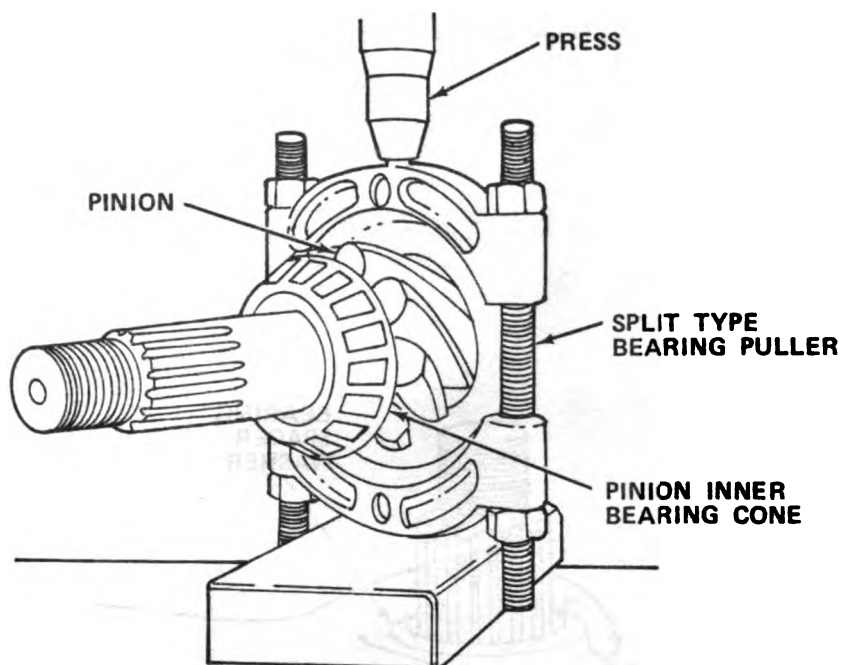
- (a) Remove and discard oil seal.
- (b) Remove bearing cone from cage.
- (c) Remove bearing cups from pinion bearing cage with puller.



TA294969

- (d) Remove pinion bearing spacer and bearing spacer washer from drive pinion.

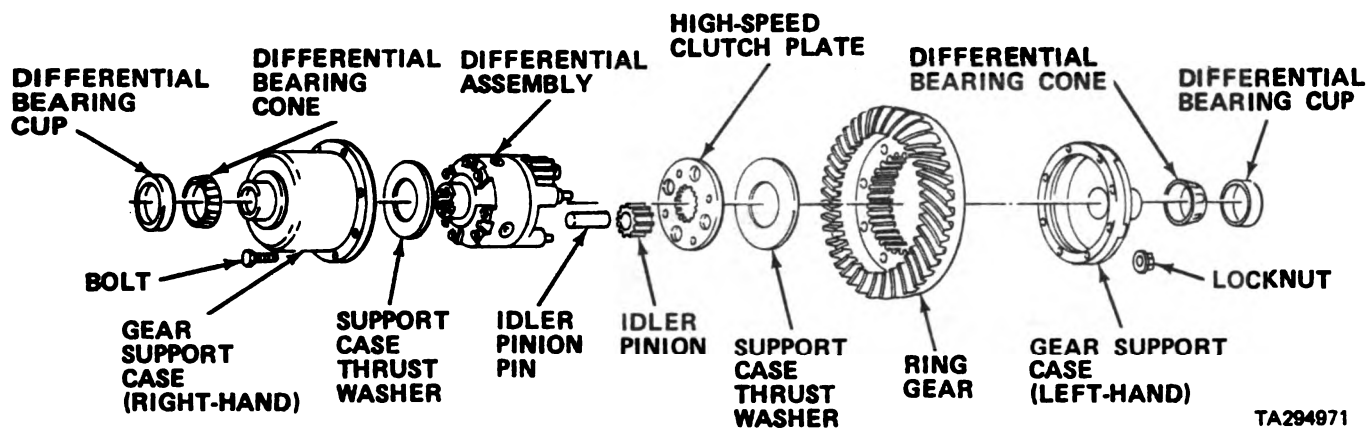




TA294970

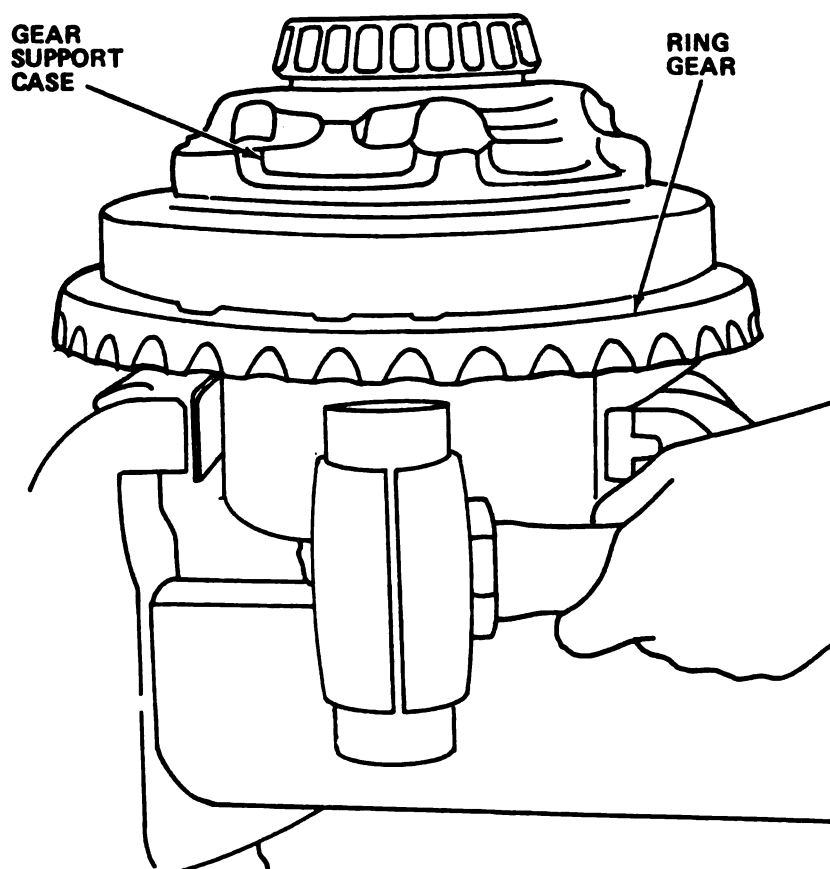
- (e) Remove pilot bearing and pinion inner bearing cone by first mounting puller vertically to split pinion and bearings apart. Then mount puller horizontally to remove bearings.





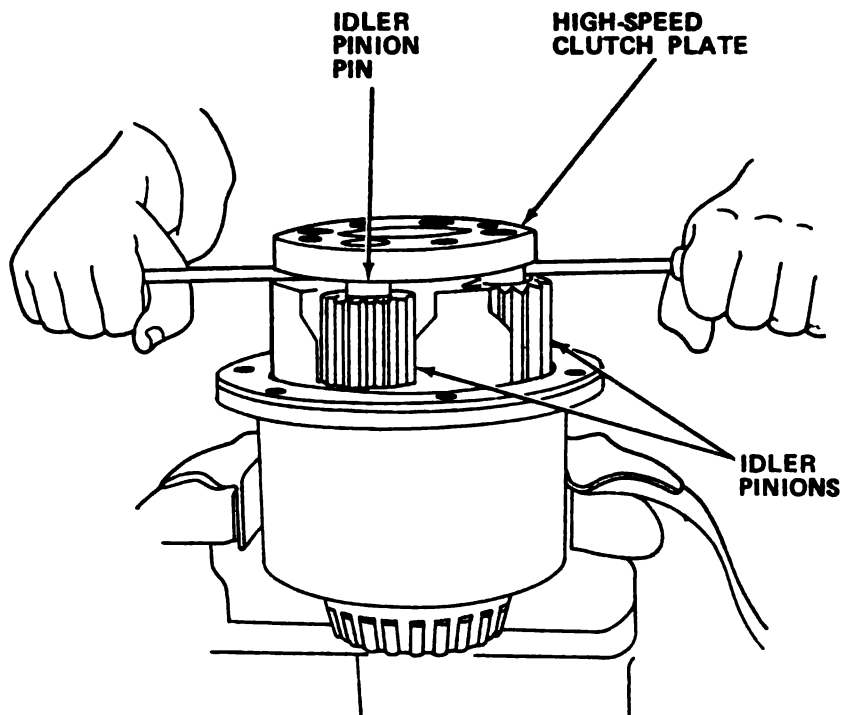
(13) Remove ring gear.

(a) Cut lockwire.



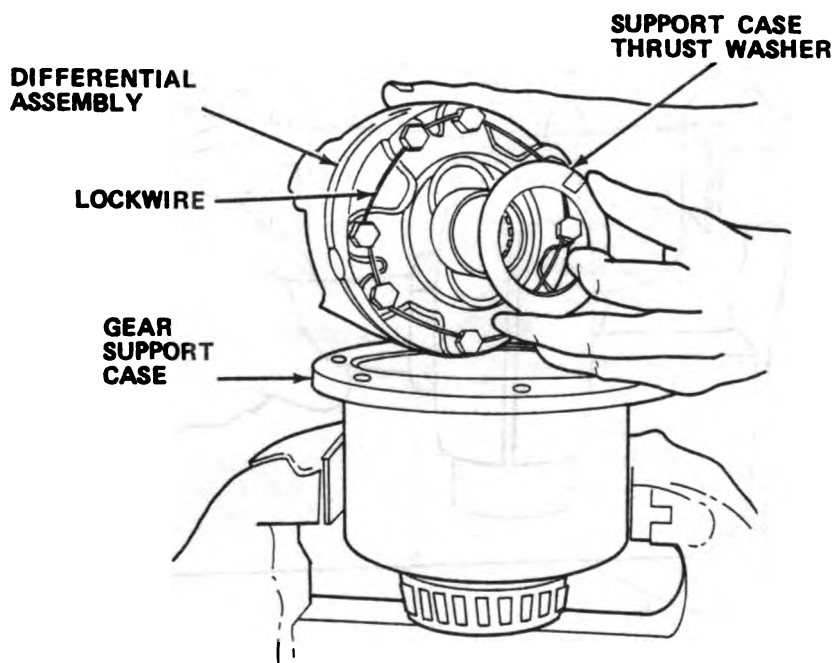
(b) Remove ring gear support case and thrust washer by tapping alternately on opposite sides of ring gear with soft-nosed hammer until ring gear is free of flange on support case.





TA294973

(14) Pry off high-speed clutch plate, then remove idler pinions and pins.



TA294974

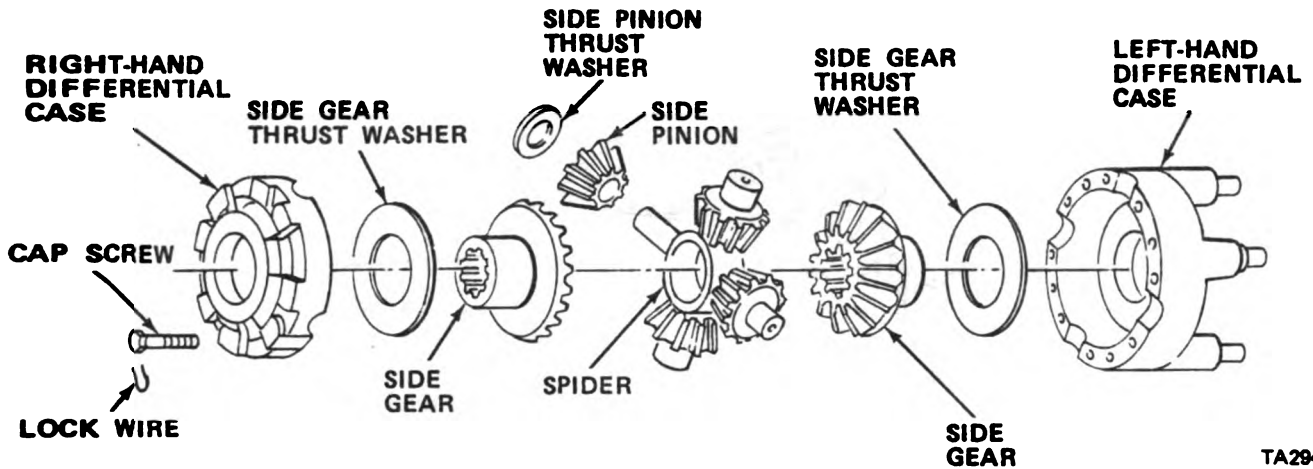
(15) Lift out differential assembly and remove support case thrust washer.



## (16) Disassemble differential.

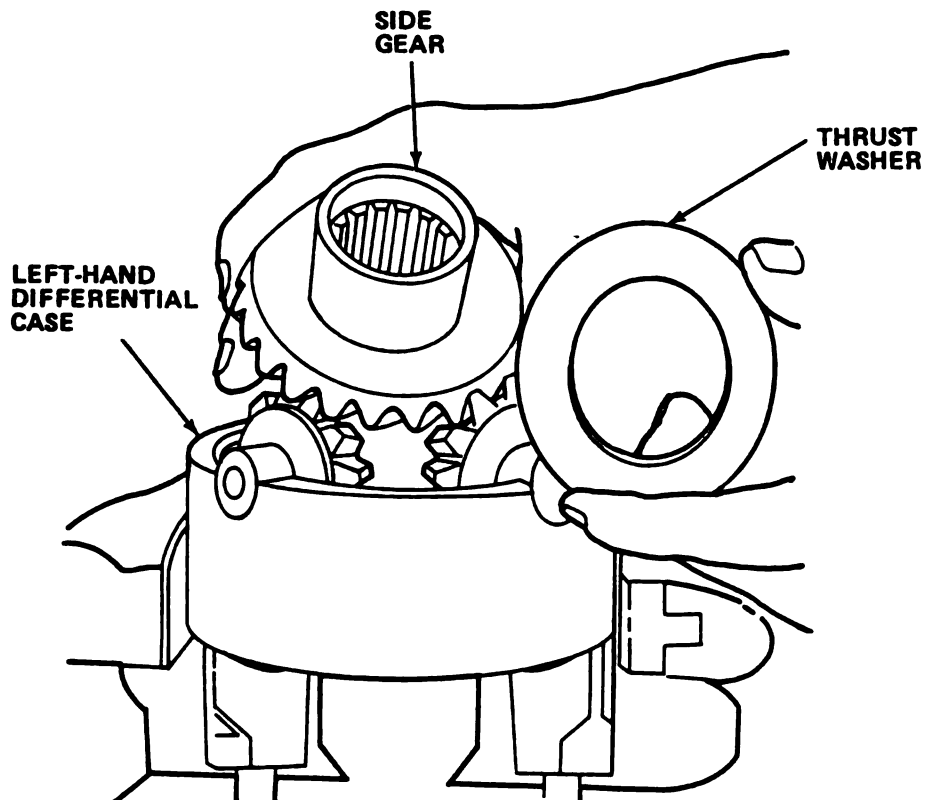
(a) Punch mark differential cases for correct location during reassembly.

(b) Cut lockwire.



TA294975

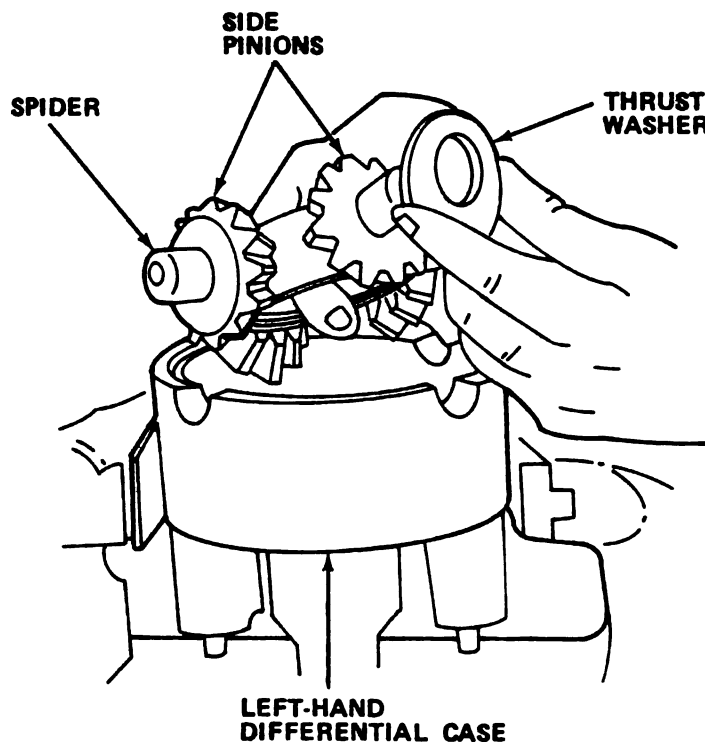
(c) Remove right hand differential case.



TA294976

(d) Lift out side gear and side gear thrust washer.

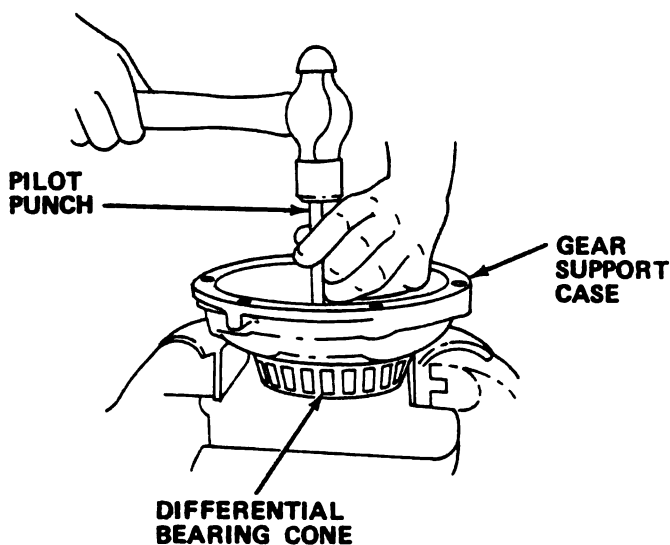




TA294977

(e) Lift out spider, side pinions, and thrust washer.

(f) Remove side gear and thrust washer from left-hand differential case.



TA294978

- (17) To remove differential bearing cone, place pilot punch in holes provided in gear support case. Tap on bearing cone inner race alternately through each hole until cone is removed. Remove bearing cone from other case half in the same manner.



**b. Inspect differential carrier parts.**

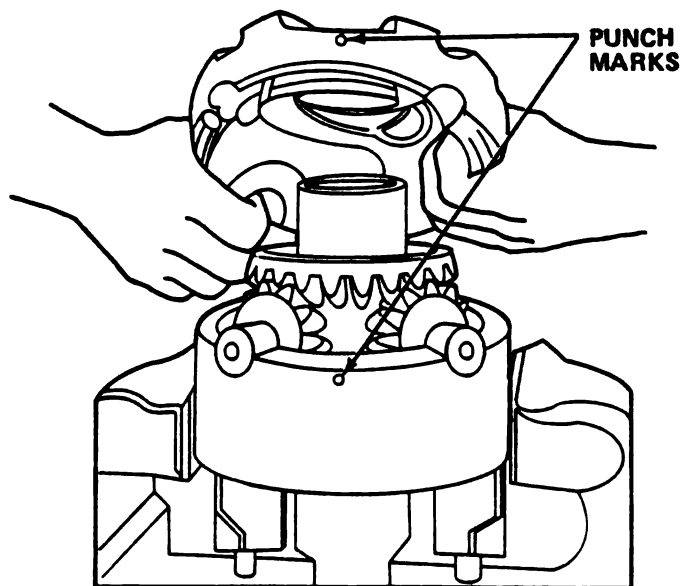
- (1) Inspect all gears, bushings, shafts, bearings, and washers for worn, grooved, or damaged condition. Replace if worn, grooved, or damaged.
- (2) Inspect differential assembly case, gear support cases, pinion bearing cage, and differential carrier for cracks, distortions or damaged condition. Replace if cracked, distorted, or damaged.

**c. Assemble differential carrier.**

**NOTE**

Lubricate internal parts of differential during assembly.

- (1) Press bearing cones on gear support cases.
- (2) Assemble differential.
  - (a) Place thrust washer and side gear in left-hand differential case.
  - (b) Assemble side pinions and thrust washers to spider, then place assembly in left-hand differential case.
  - (c) Place side gear with thrust washer on side pinions.

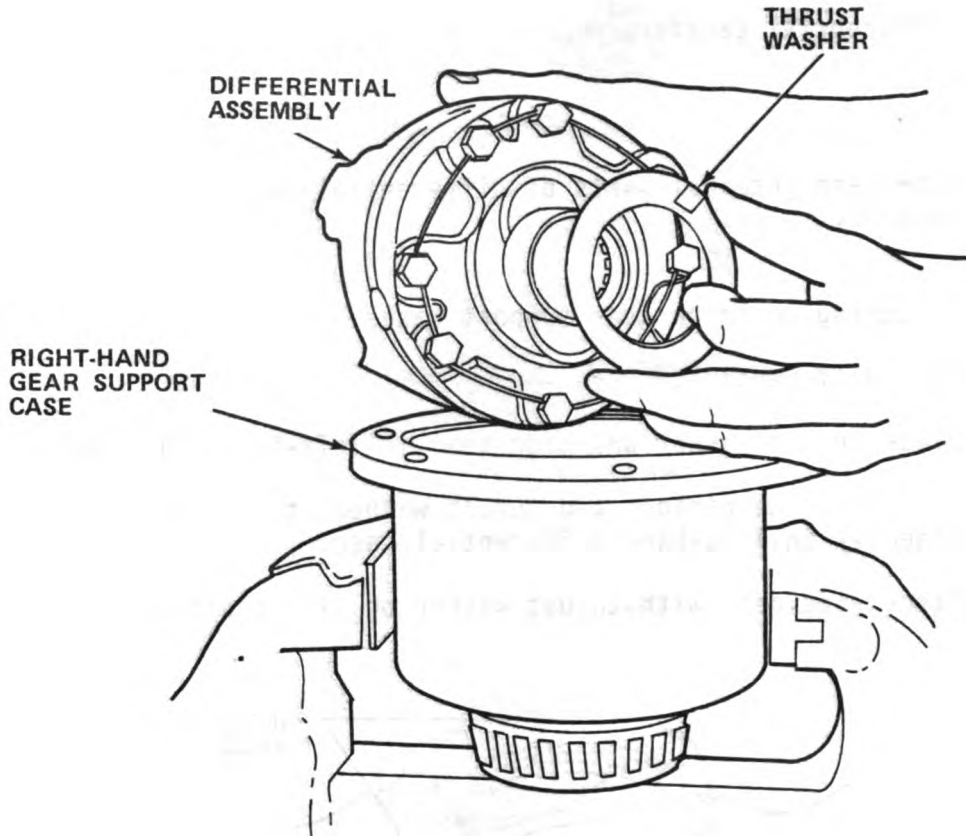


TA294979

- (d) Install right-hand differential case aligning punch marks on both case halves.



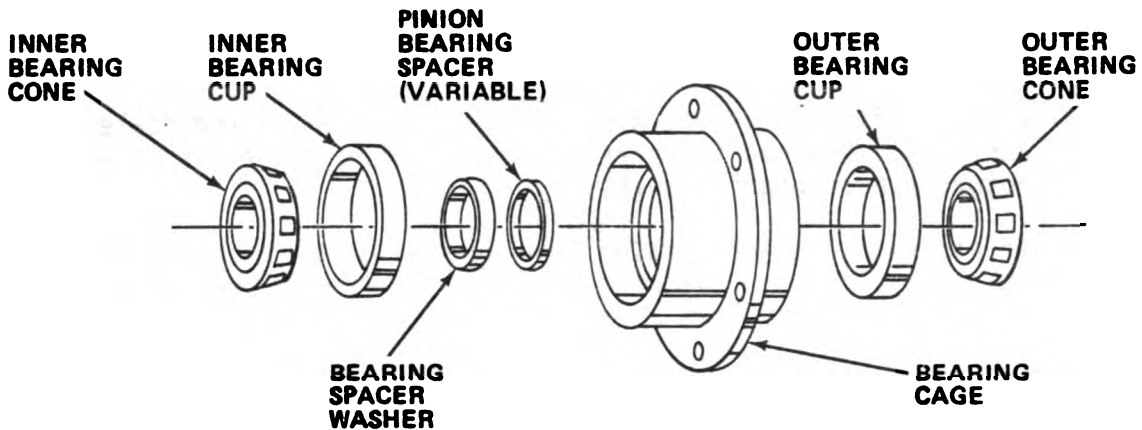
- (e) Torque capscrews to 50 - 60 ft lbs (68 - 81 Nm).
- (f) Lockwire capscrews.



TA294980

- (3) Place right-hand support case thrust washer and differential assembly in right-hand gear support case.
- (4) Install idler pins and pinions.
- (5) Install high-speed clutch plate on idler pinions making sure that chamfered teeth of clutch plate are positioned toward idler pinions.
- (6) Mount ring gear, thrust washer, and left-hand support case on right-hand support case.
- (7) Temporarily install sliding clutch gear and rotate idler pinions to make sure parts are assembled correctly.
- (8) Torque capscrews to 85 - 105 ft lb (115 - 142 Nm).
- (9) Check pinion bearing preload.



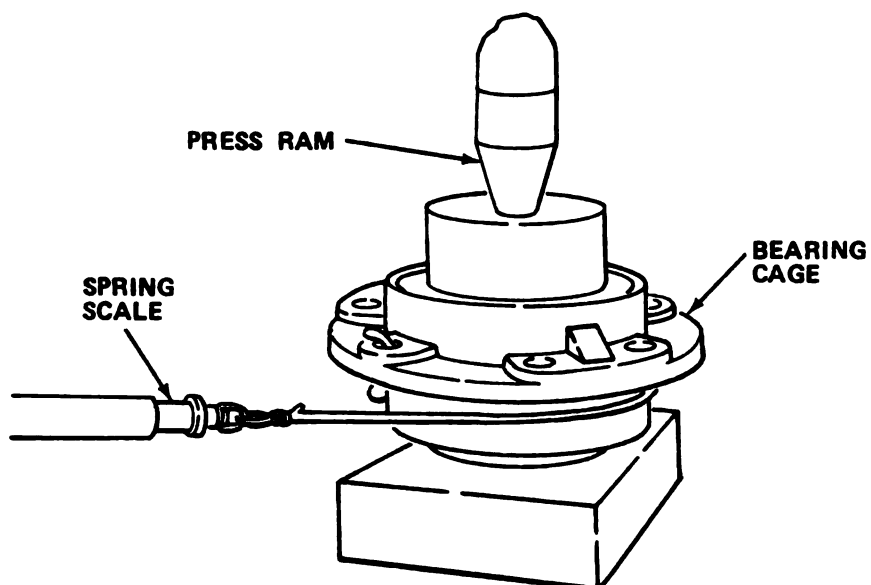


TA294981

### NOTE

When new gear set or pinion bearings are used, use a nominal pinion bearing spacer size of 0.185 in. (4.699 mm). If original parts are used, use spacer removed during disassembly.

- (a) Assemble pinion bearing cage, bearings, spacer, and spacer washer (without drive pinion or oil seal). Center bearing spacer and spacer washer between two bearing cones.

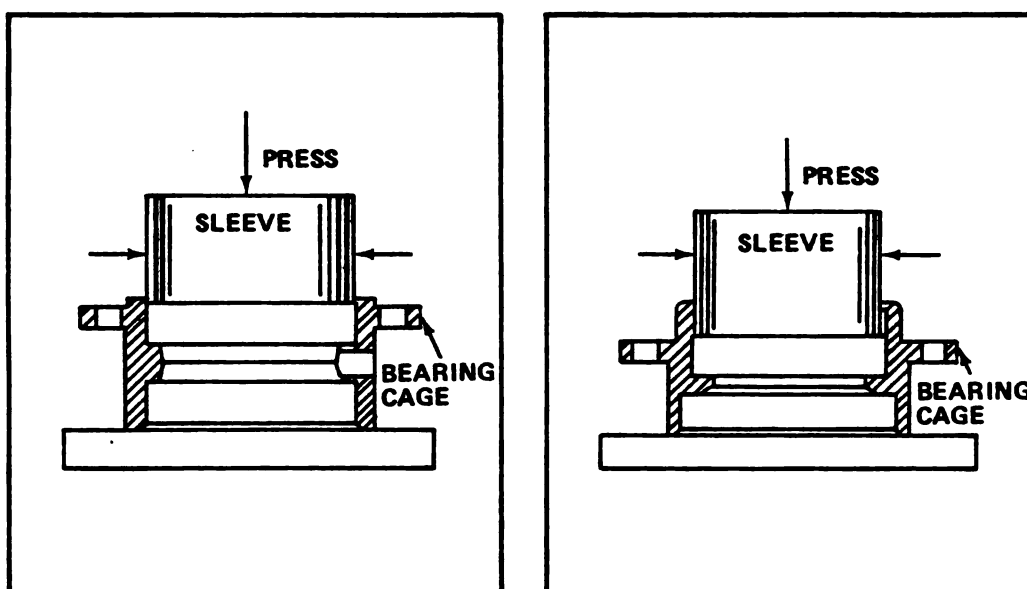


TA294982

- (b) With bearings well lubricated, place assembly in press. Position sleeve so that load is applied directly to the back face of the outer bearing cone.



- (c) Apply a press load of 18 - 20 tons (16.3 - 18 metric tons) to pinion assembly.
- (d) Wrap a soft wire around bearing cage. Attach spring scale to wire and pull. Preload is correct when it takes 3 - 7 lbs (1 - 3 kg) to rotate pinion bearing cage.
- (e) If necessary, adjust pinion bearing preload by changing the pinion bearing spacer. A thicker spacer will decrease preload and a thinner spacer will increase preload.
- (f) Repeat preload test until correct preload is obtained. Once correct bearing preload has been established, note the spacer size used. Select a spacer 0.001 in. (0.025 mm) larger for use in the final pinion bearing cage assembly.



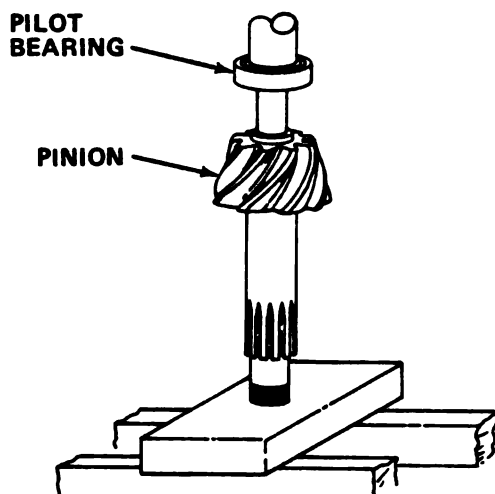
TA294983

#### NOTE

Sleeve outside diameter must be smaller than cup outside diameter. When correctly installed, cups will be recessed below outer surface of cage.

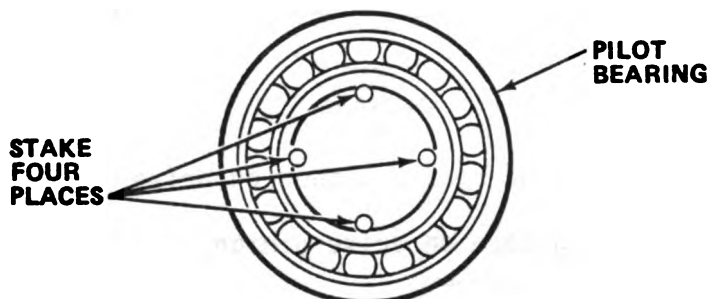
- (10) Press inner bearing in cage.
- (11) Press outer bearing in cage.
- (12) Check outer and inner bearing cup installation with 0.001 in. (0.025 mm) feeler gage to be sure bearing cups are firmly seated in cage.
- (13) Assemble drive pinion.





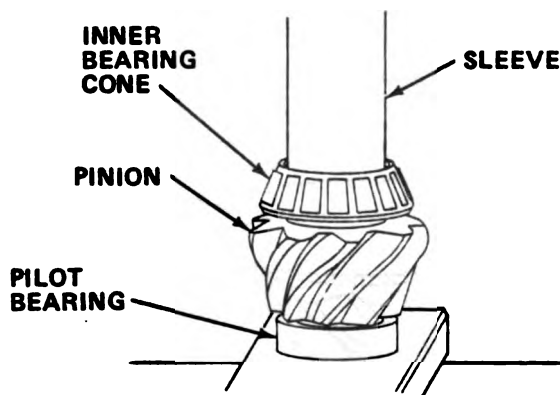
TA294984

(a) Press pilot bearing on drive pinion.



TA294985

(b) With punch and hammer, stake pilot bearing in four places.



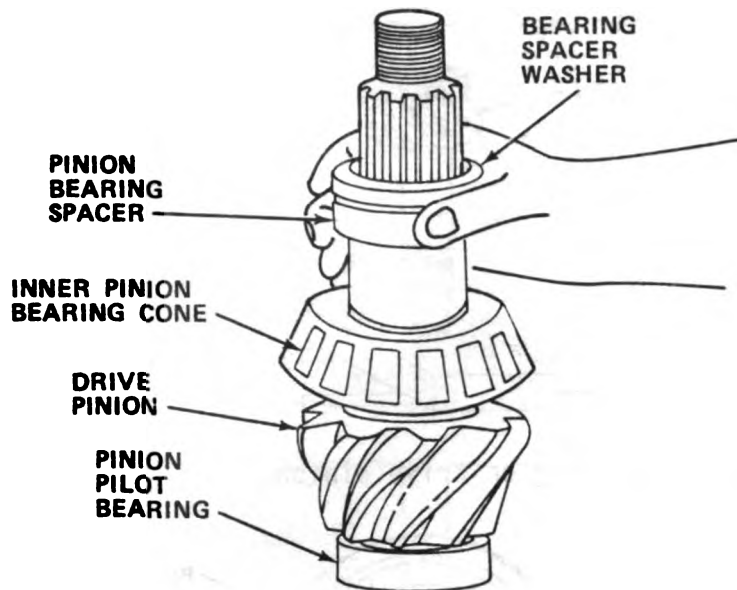
TA294986

#### NOTE

During pinion bearing installation, locate each part in same position that was used in the trial preload test.

(c) Press inner bearing cone on drive pinion.

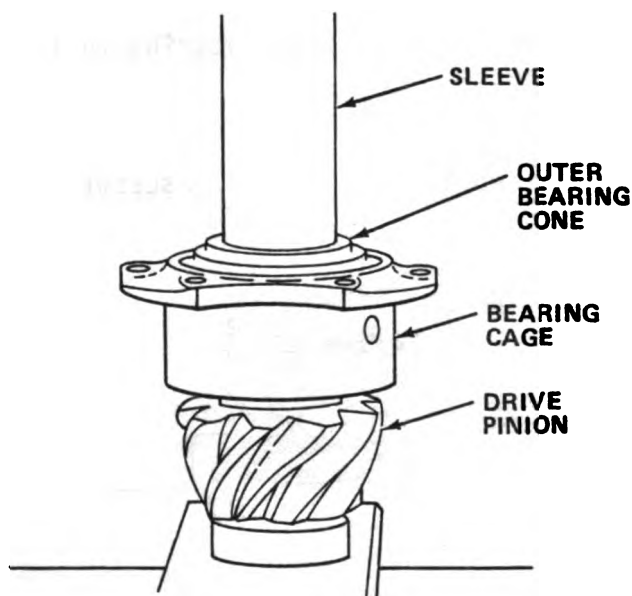




TA294987

(d) Install spacer and spacer washer on drive pinion.

(e) Install bearing cage on drive pinion.

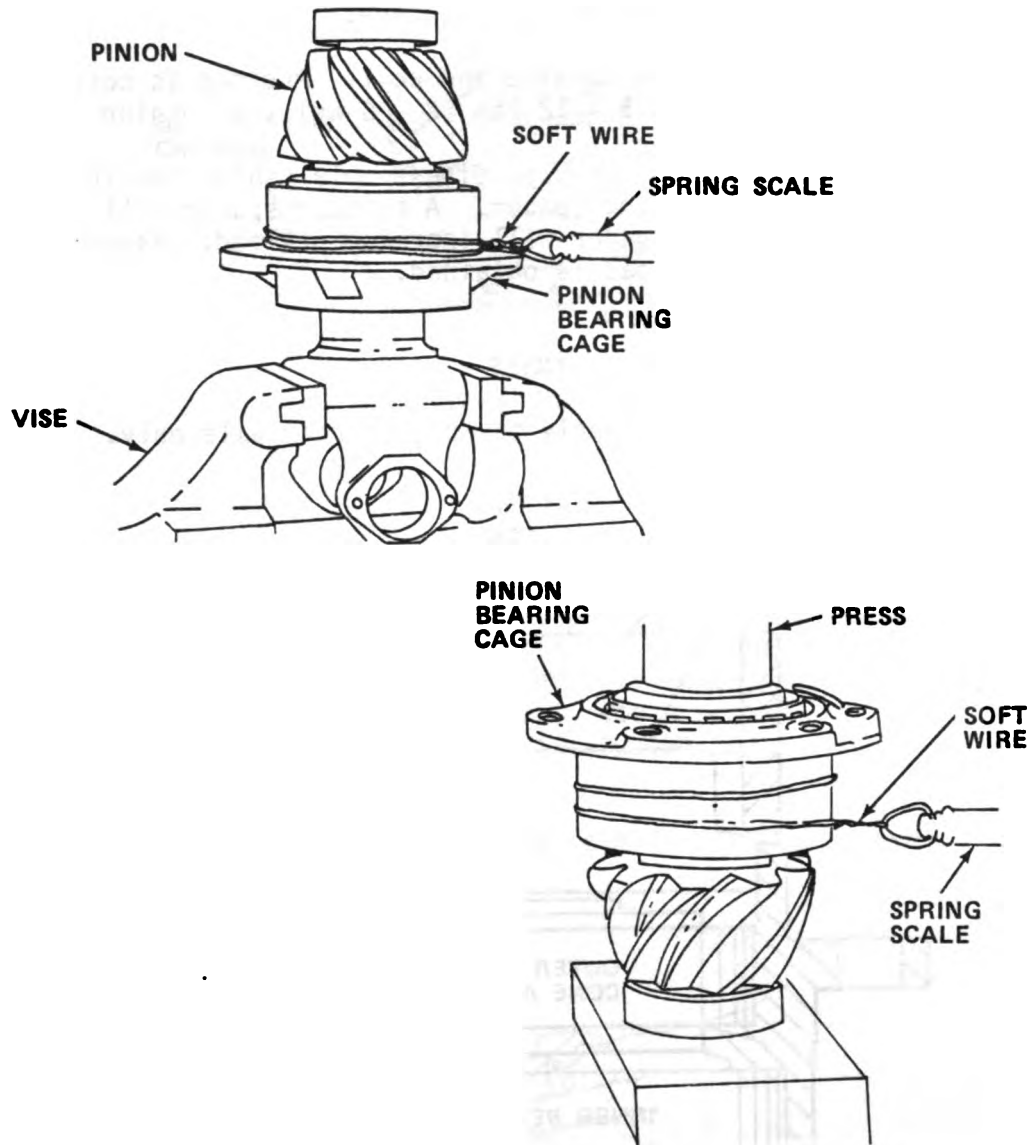


TA294988

(f) Press outer bearing cone on drive pinion.

(14) Check front pinion bearing preload.





TA294989

**NOTE**

Forward axle pinion is equipped with helical gear. For easier disassembly during bearing adjustment procedures, use a dummy yoke (if available) in place of helical gear. If yoke is not available, a press can be used to simulate nut torque. Use a press load of 18 - 20 tons (16.3 - 18 metric tons).

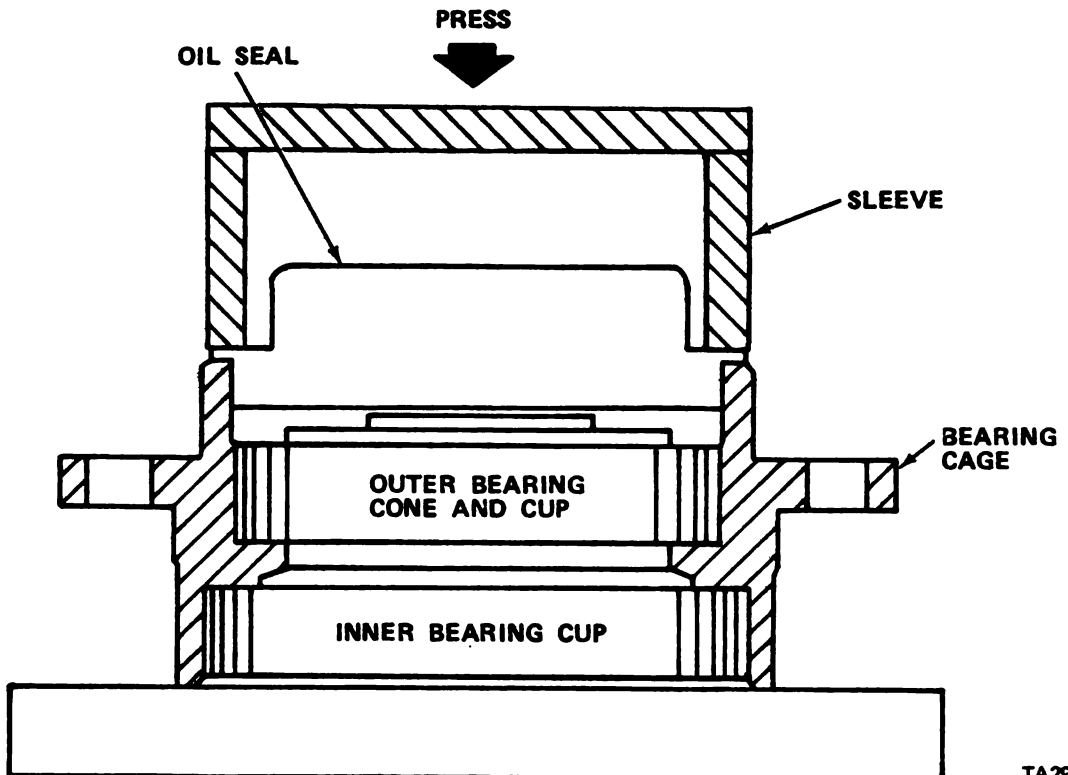
- (a) If a yoke and nut are used, torque nut to 840 - 1020 ft lbs (1139 - 1383 Nm) and mount assembly in a vise, clamping yoke firmly.



- (b) If a press is used, position a sleeve or spacer so that load is applied directly to the back face of the outer bearing cone.
- (c) Wrap a soft wire around bearing cage.
- (d) Attach spring scale to wire and pull. Preload is correct when spring scale reads 5 - 12 lbs (2 - 5 kg) when pinion cage rotates.
- (e) If adjustment is necessary, disassemble pinion bearing cage and change pinion bearing spacer. A thicker spacer will decrease preload. A thinner spacer will increase preload. Repeat step (14) until correct preload is obtained.

#### NOTE

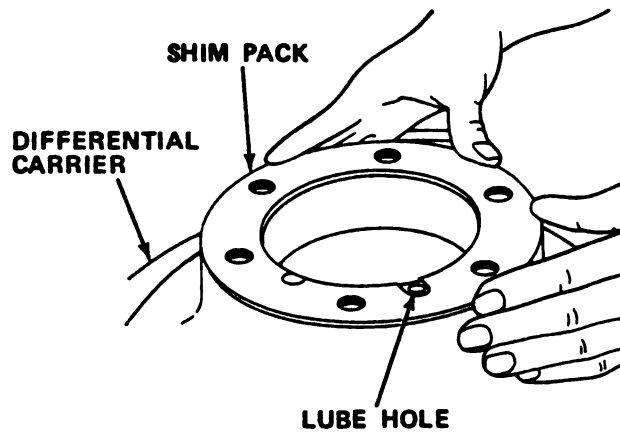
Steps (15) thru (24) apply to forward rear axle only.



TA284990

- (15) Install oil seal with a press. Use properly sized sleeve to fit seal to prevent distortion.
- (16) Lubricate oil seal lip.
- (17) Make sure yoke is clean and dry and install yoke, washer, and nut.
- (18) Torque nut to 840 - 1020 ft lbs (1139 - 1383 Nm).
- (19) Recheck front pinion bearing preload.



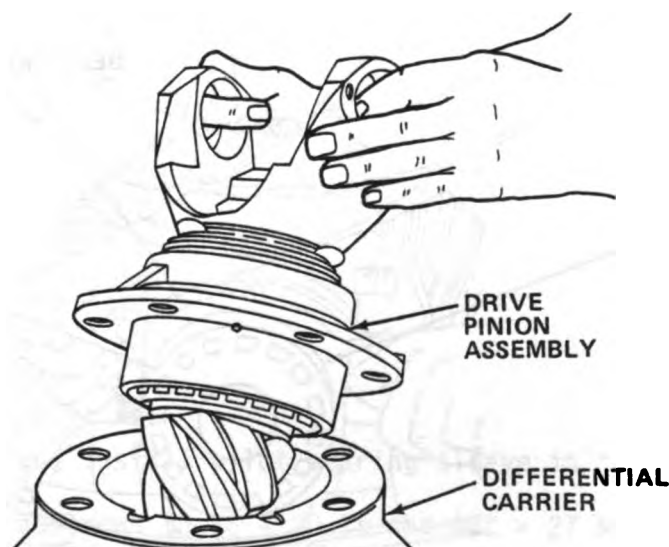


TA294991

**NOTE**

If gear set is to be reused, install same quantity and size of shims removed during disassembly. When installing new gear set, use a nominal shim pack of 0.023 in. (0.584 mm).

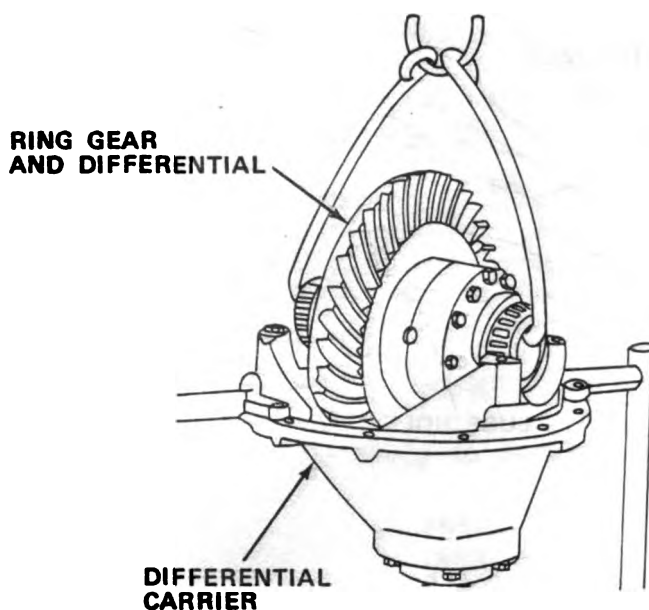
(20) Install shim pack. Be sure lube hole is not obstructed.



TA294992

(21) Install drive pinion assembly.



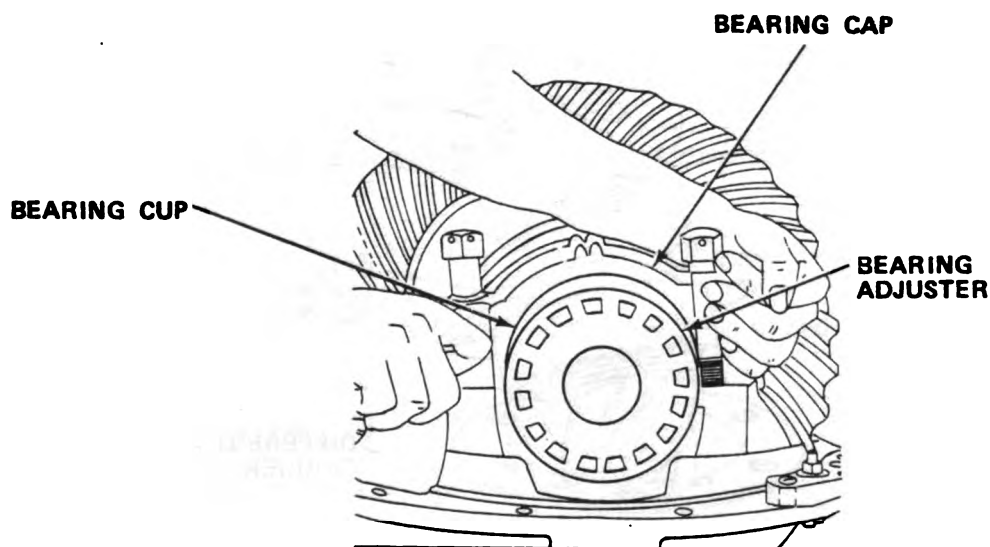


TA294993

**NOTE**

Lubricate bearings during assembly.

- (22) Place ring gear and differential in carrier by carefully lowering assembly until bearing cones rest on carrier.



TA294994

- (23) Install bearing cups at both sides of differential case.

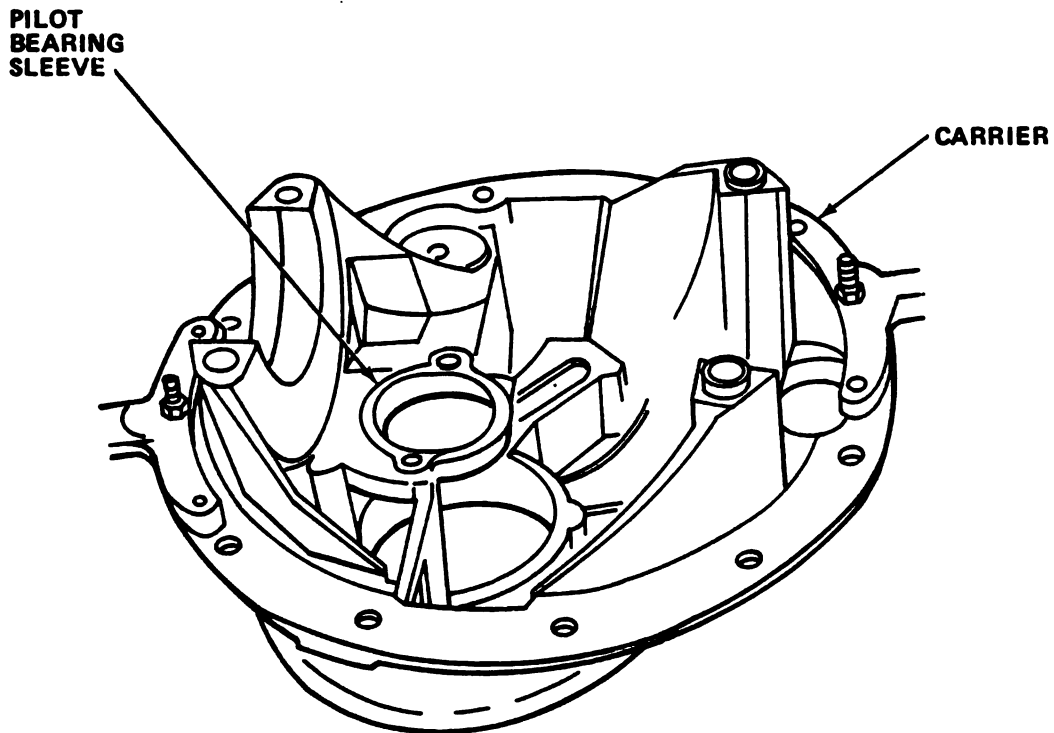


- (24) Install bearing adjusters and bearing caps.
- (25) Install and tighten bearing capscrews finger tight.

**NOTE**

Step (26) applies to forward rear axle only.

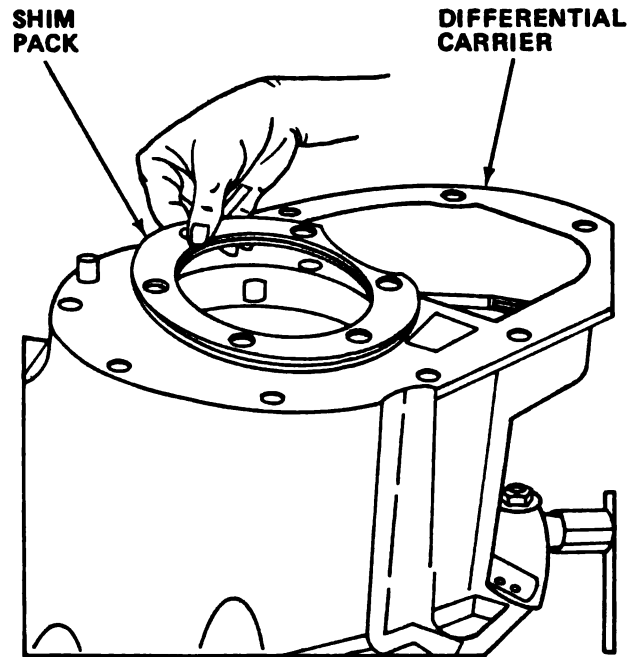
- (26) Install drive pinion in forward rear axle.



TA294995

- (a) If removed, install pilot bearing sleeve in carrier.
- (b) Torque capscrews to 16 - 20 ft lbs (22 - 27 Nm).
- (c) Bend ears of lock over capscrew heads.
- (d) If removed, install output shaft bearing cup in carrier.



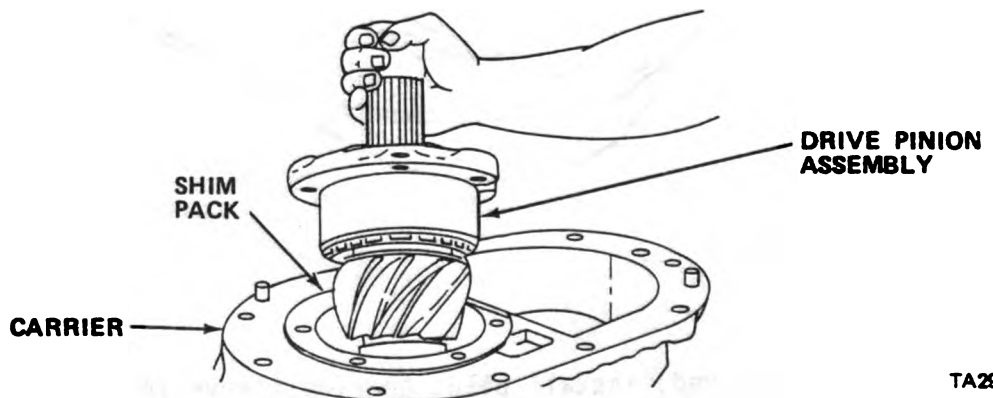


TA294996

**NOTE**

If gear set is to be reused, install same quantity and size of shims removed during disassembly. When installing new gear set use nominal shim pack size of 0.024 in. (0.609 mm).

(e) Install shim pack on carrier.



TA294997

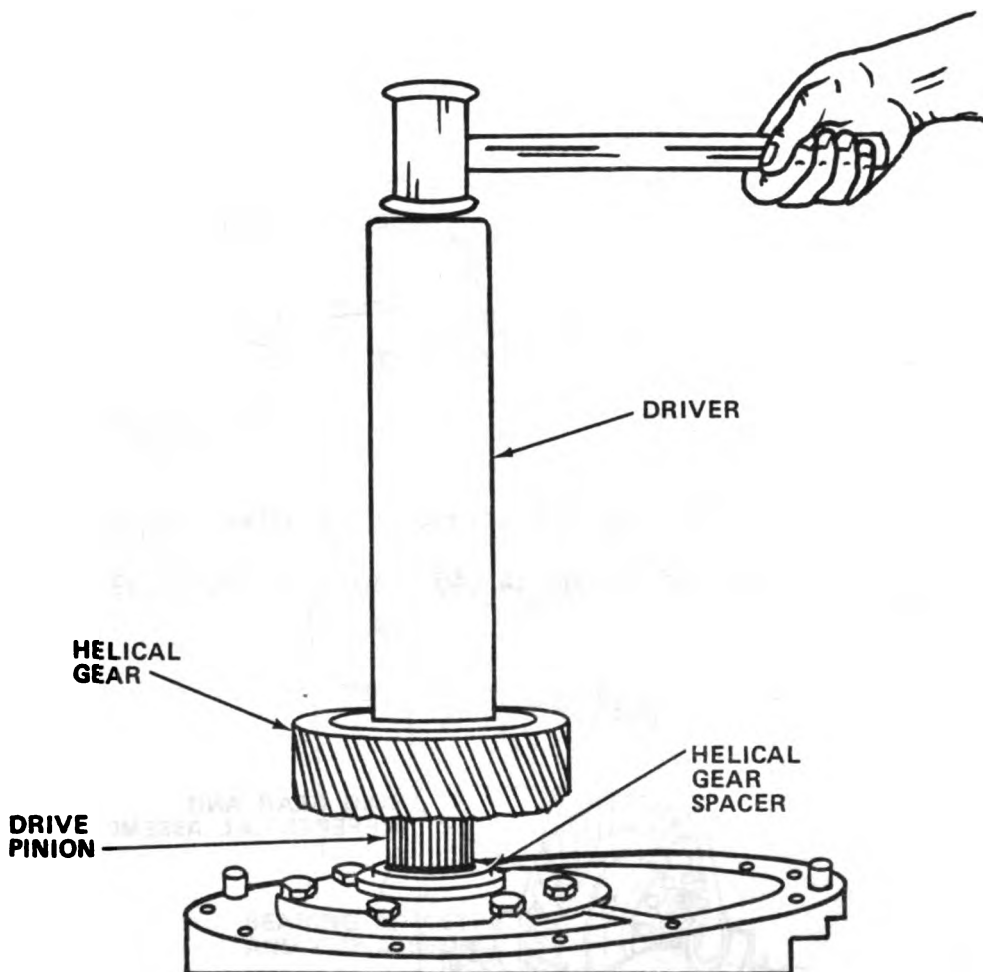
(f) Install drive pinion assembly in carrier.

(g) Torque capscrews to 155 - 175 ft lbs (210 - 237 Nm).



**NOTE**

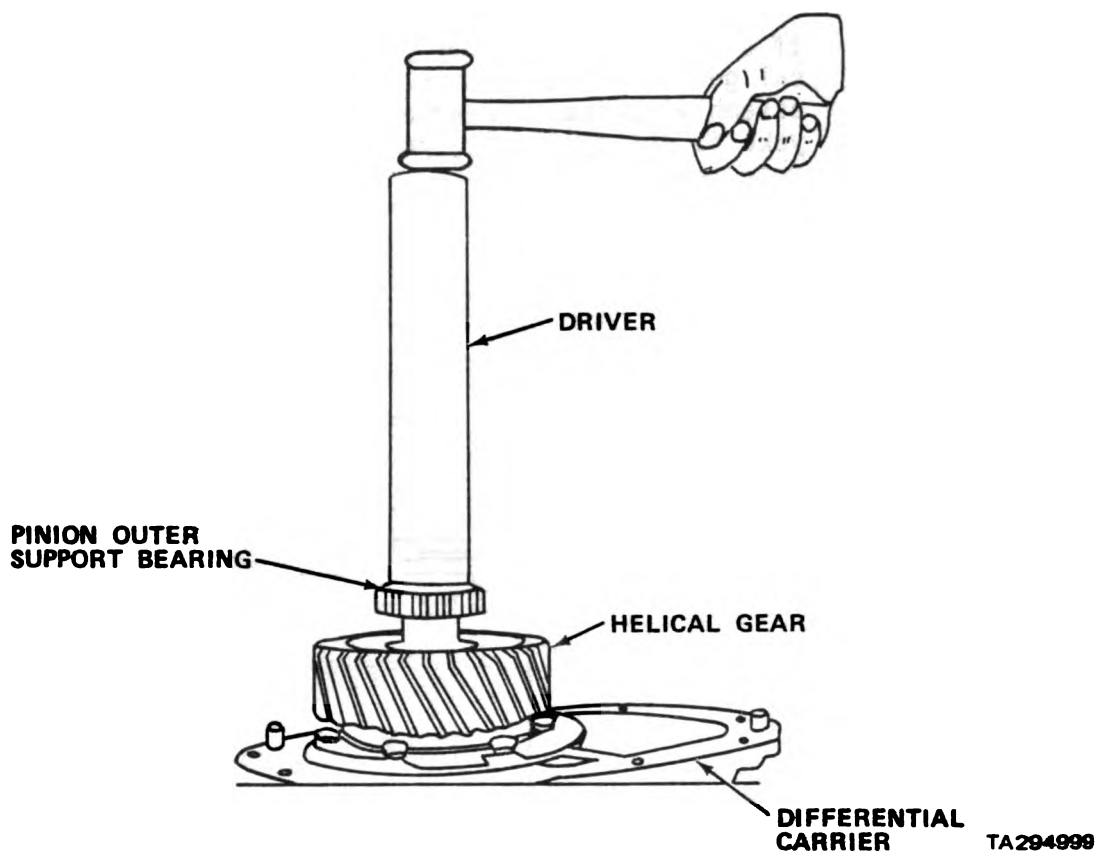
If available, use dummy yoke in place of helical gear to allow easier disassembly and re-assembly during carrier adjustments. If dummy yoke is not available, proceed with helical gear installation.



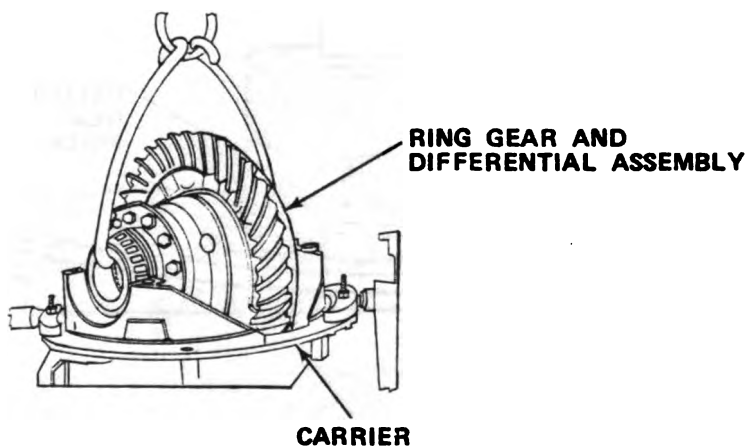
TA294998

- (h) Install helical gear spacer.
- (i) Install helical gear on drive pinion using driver and hammer.





- (j) Install pinion outer support bearing, using driver and hammer.
- (k) Install pinion nut and torque to 840 - 1020 ft lbs (1139 - 1383 Nm).

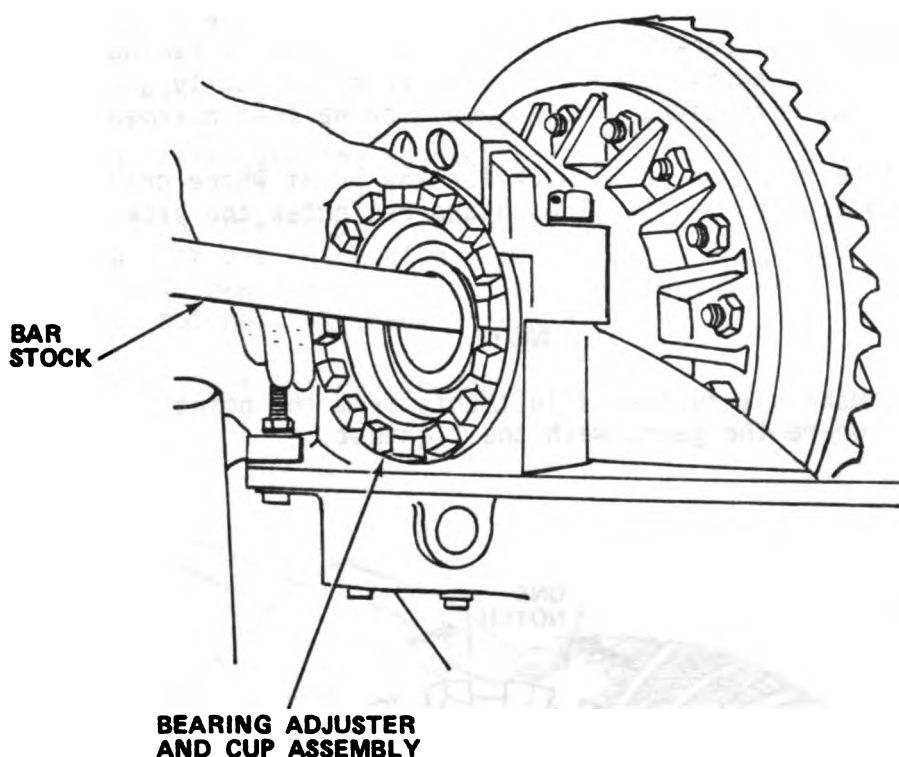


#### NOTE

Lubricate bearings during assembly.



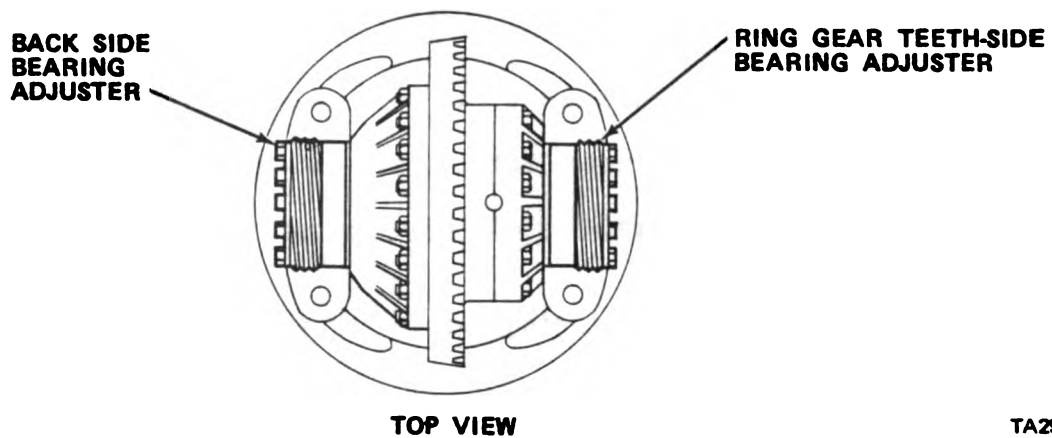
- (27) Place ring gear and differential assembly in carrier by carefully lowering assembly until bearing cones rest on carrier.
- (28) At teeth side of ring gear, install bearing cup, bearing adjuster, and bearing cap.
- (29) Install and tighten bearing cap capscrews finger tight.
- (30) Tighten bearing adjuster until its first thread is visible.
- (31) At back side of gear, install bearing cap. Tighten capscrews finger tight.
- (32) If removed, install bearing cup in adjuster using press.



TA295001

- (33) Place bar stock through opening in differential.
- (34) Place bearing adjuster and cup assembly on bar stock.
- (35) Lubricate bearing adjuster threads and raise and lower differential assembly while threading adjuster into proper position.
- (36) Adjust ring gear backlash.



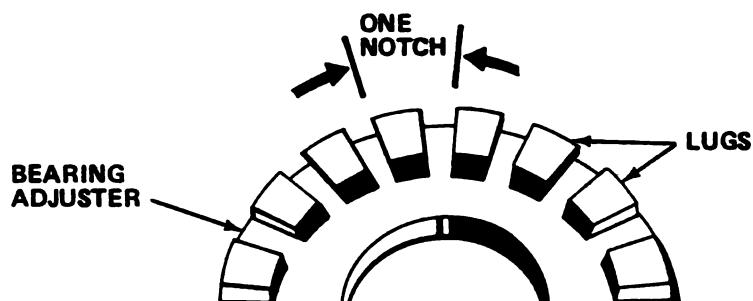


TA295002

- (a) Tighten the bearing adjuster on the back side of ring gear until there is no backlash. This can be tested by facing the ring gear teeth and pushing the gear away from body while gently rocking gear from side to side. There should be no free movement.
- (b) Rotate ring gear and check for any point where gear may bind. If such a point exists, loosen and retighten the back side adjuster.

#### NOTE

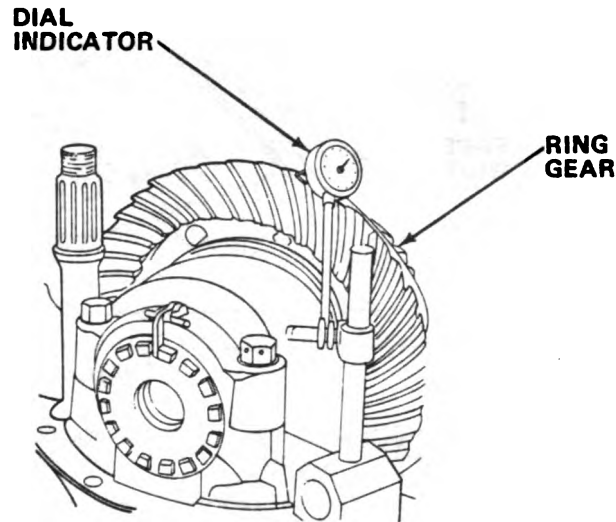
Make all further adjustments from the point where the gears mesh the tightest.



TA295003

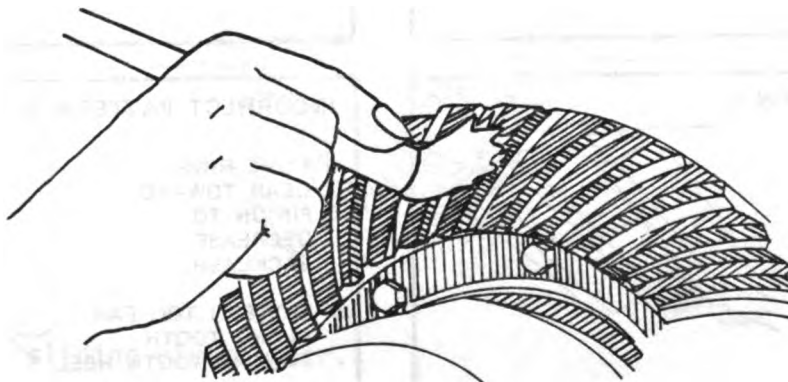
- (c) Loosen adjuster on back side of ring gear one notch.
- (d) Tighten adjuster on teeth-side of ring gear until it contacts the bearing cup.





TA295004

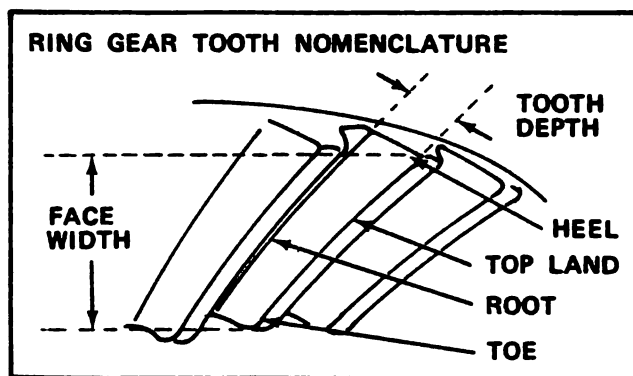
- (e) Mount dial indicator.
  - (f) Test ring gear backlash. Backlash should be between 0.008 - 0.018 in. (0.2032 - 0.4572 mm) for new gear set. If original gearing is used, reset gearing to backlash recorded before disassembly.
  - (g) If it is necessary to add backlash, loosen adjuster at back side of ring gear one notch at a time. Tighten opposite adjuster until it contacts bearing cup. Continue to tighten same adjuster two or three notches. Recheck backlash.
- (37) Adjust ring gear and pinion tooth contact.



TA316810

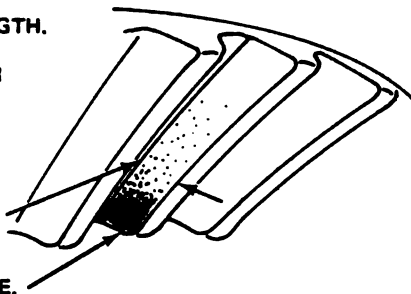
- (a) Paint 12 ring gear teeth with Prussian bluing.





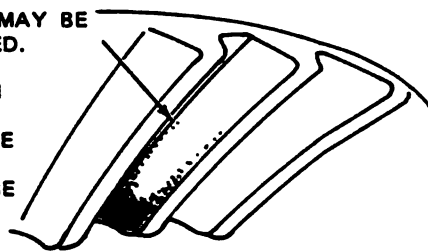
**CORRECT PATTERN (NEW GEARING)**

- COULD VARY IN LENGTH. PATTERN SHOULD COVER 1/2 TOOTH OR MORE (FACE WIDTH).
- PATTERN SHOULD BE EVENLY CENTERED BETWEEN TOOTH TOP LAND AND ROOT.
- PATTERN SHOULD BE CLEAR OF TOOTH TOE.



**CORRECT PATTERN (USED GEARING)**

- POCKET MAY BE EXTENDED.
- PATTERN ALONG THE FACE WIDTH COULD BE LONGER.

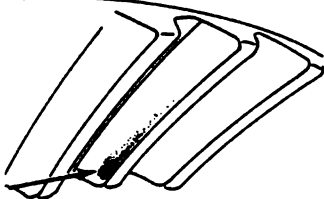


TA316811

(b) Roll gear to obtain contact pattern.

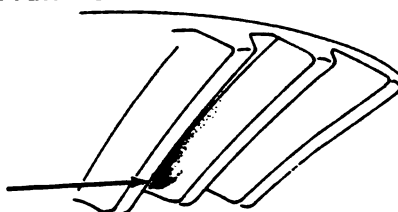
**INCORRECT PATTERN A**

- MOVE PINION TOWARD RING GEAR.
- PATTERN TOO CLOSE TO TOOTH TOP LAND AND OFF CENTER.



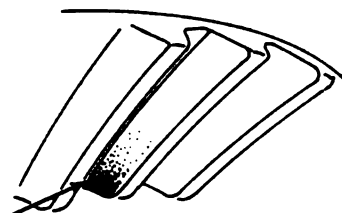
**INCORRECT PATTERN B**

- MOVE PINION AWAY FROM RING GEAR.
- PATTERN TOO CLOSE OR OFF TOOTH ROOT.



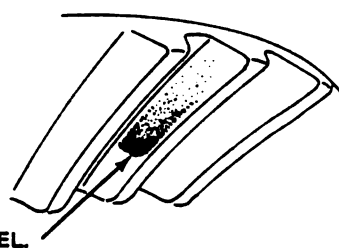
**INCORRECT PATTERN C**

- MOVE RING GEAR AWAY FROM PINION TO INCREASE BACKLASH.
- PATTERN TOO FAR OFF TOOTH TOE.



**INCORRECT PATTERN D**

- MOVE RING GEAR TOWARD PINION TO DECREASE BACKLASH.
- PATTERN TOO FAR ALONG TOOTH TOWARD TOOTH HEEL.



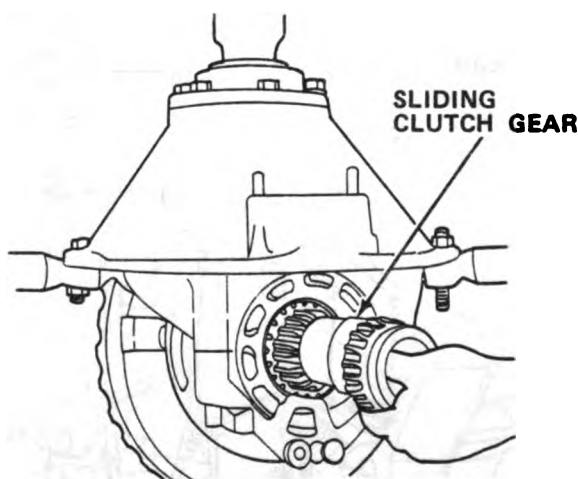
TA316812

(c) If contact pattern is incorrect, examine above figures to find one that most closely resembles contact pattern.

(d) If pattern resembles contact pattern "A", remove pinion shims and recheck backlash and tooth contact pattern.



- (e) If pattern resembles contact pattern "B", add pinion shims and recheck backlash and tooth contact pattern.
  - (f) If pattern resembles contact pattern "C", add backlash by loosening bearing adjuster on back side of ring gear one notch at a time. Tighten opposite adjuster until it contacts bearing cup. Continue to tighten same adjuster two or three notches. Recheck backlash and tooth contact pattern.
  - (g) If pattern resembles contact pattern "D", add backlash by loosening bearing adjuster on back side of ring gear one notch at a time. Tighten opposite adjuster until it contacts bearing cup. Continue to tighten same adjuster two or three notches. Recheck backlash and tooth contact pattern.
- (38) With ring gear and pinion adjusted correctly, align adjuster and locks.
  - (39) Torque differential bearing capscrews to 370 - 430 ft lbs (502 - 583 N•m). If rear rear axle is being repaired, install adjuster locks and cotter pins.
  - (40) If forward rear axle is being repaired, on teeth-side of ring gear, install lock and cotter pins. On back face side of ring gear, install T-shaped lock and capscrews. Torque capscrews to 160 - 176 ft lbs (217 - 239 N•m).
  - (41) Lockwire all capscrews on both sides of ring gear.



TA316813

- (42) Install sliding clutch gear.
- (43) Install shift fork and engage with sliding clutch gear.
- (44) Install expansion plugs.
- (45) Install shift fork seal and spring.



### 9-13. INSPECT REAR REAR AXLE SHIFTER ASSEMBLY

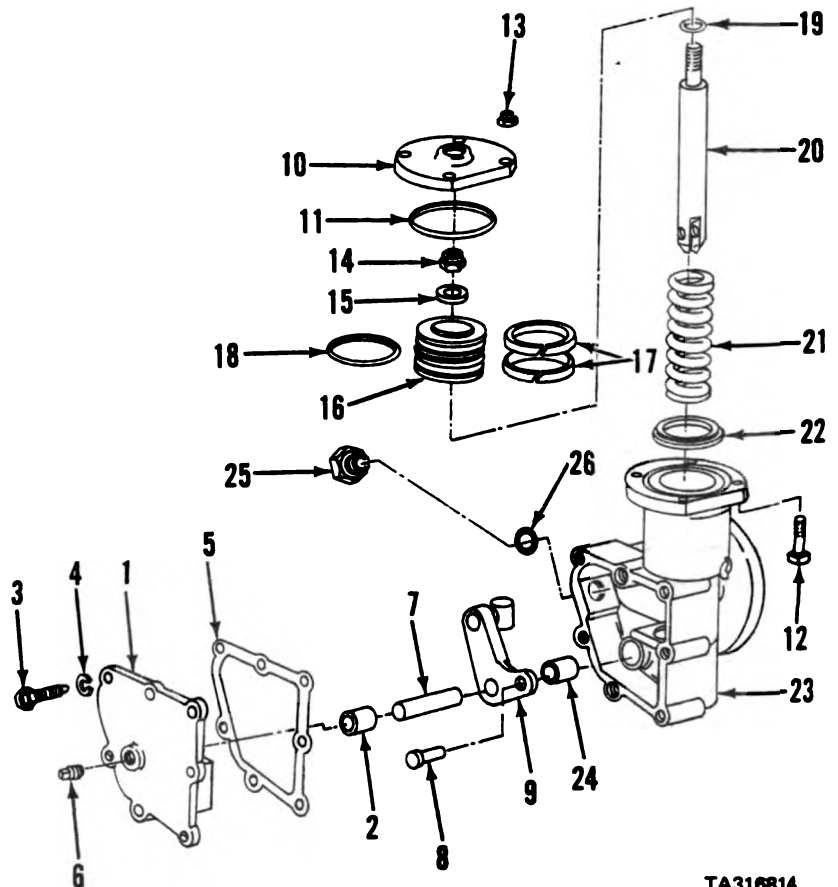
- a. Check assembly housing for dents, cracks, oil leakage, and air leakage. Repair or replace as necessary (para 9-8).
- b. Check oil level (LO-9-2320-281-12).

### 9-14. REPAIR REAR REAR AXLE SHIFTER ASSEMBLY

- a. Disassemble shifter assembly.

#### LEGEND:

1. Housing cover
2. Cover bearing
3. Capscrew
4. Lockwasher
5. Cover gasket
6. Cover plug
7. Actuating lever pin
8. Clevis pin
9. Actuating lever, pin and block assembly
10. Housing cover (piston end)
11. Cover O-ring
12. Capscrew
13. Cover locknut
14. Piston locknut
15. Flat washer
16. Piston
17. Piston felt oiler
18. Piston O-ring
19. Push rod O-ring
20. Push rod
21. Compression spring
22. Piston stop
23. Housing assembly
24. Housing bearing
25. Capscrew (for valve hole, 2-Speed, Forward Axle only)
26. O-ring



TA316814

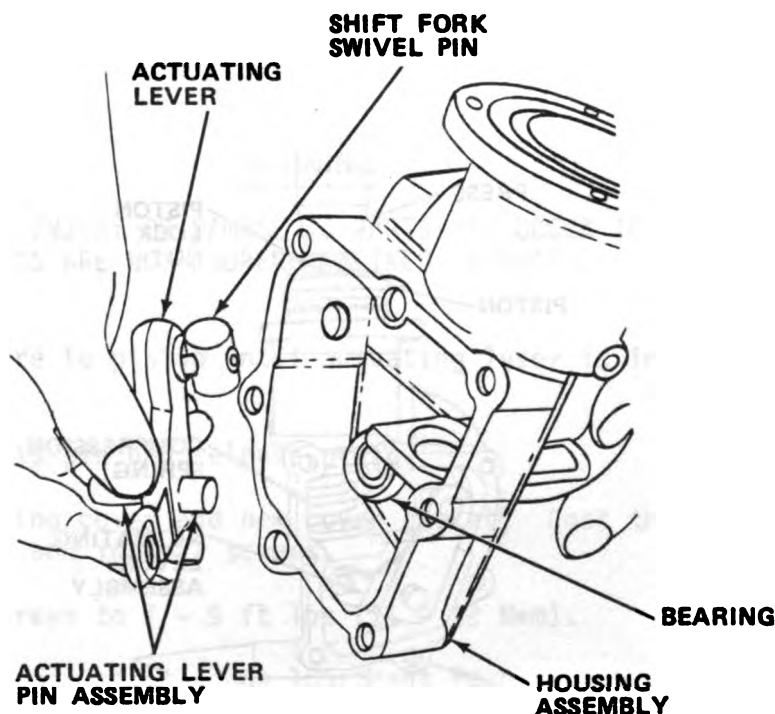


- (1) Remove housing cover (1) from shifter housing assembly (23) and discard cover gasket (5).
- (2) Remove piston end cover housing (10) and discard O-ring (11).

### WARNING

EXERT CAUTION TO PREVENT PERSONAL INJURY WHEN REMOVING PISTON. PISTON IS UNDER SPRING PRESSURE AND WILL POP OUT WHEN REMOVED.

- (3) Remove piston (16) from push rod (20).
- (4) Remove O-ring (18) and felt oilers (17) from piston (16) and discard O-ring and oilers.
- (5) Remove compression spring (21) and piston stop (22) from bore of housing assembly. Discard spring.
- (6) Remove clevis pin (8).
- (7) Remove push rod (20) from housing assembly (23).
- (8) Remove push rod O-ring (19) from push rod (20).



TA316815

- (9) Remove actuating lever and pin assembly from housing assembly. Do not disassemble actuating lever.



b. Inspect shifter assembly parts.

- (1) Inspect lever pins, lever bearings, and housing assembly for worn or grooved condition. Replace defective parts.
- (2) Inspect actuating lever and push rod for worn or elongated holes at point where they are connected. Replace defective parts.
- (3) Inspect piston friction surface for worn, grooved, or damaged condition. Replace if defective.

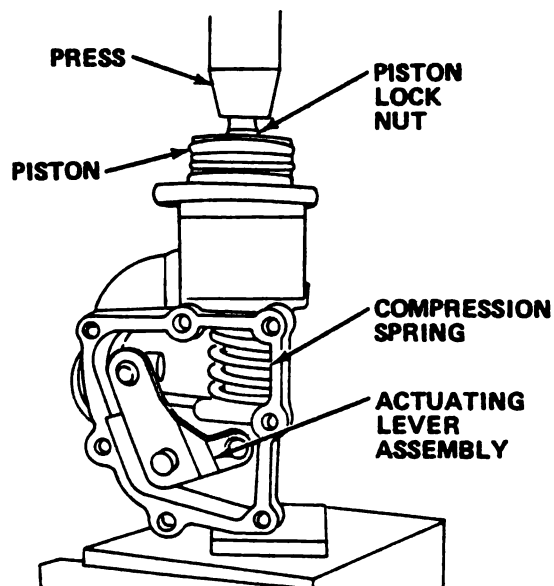
c. Assemble shifter assembly.

- (1) Reinstall actuating lever and pin assembly in assembly housing.
- (2) Assemble new O-ring and piston to push rod.
- (3) Torque nut to 10 - 13 ft lbs (14 - 18 Nm).

**NOTE**

Prior to assembly, piston felt oilers should be soaked in SAE 10 oil for one hour.

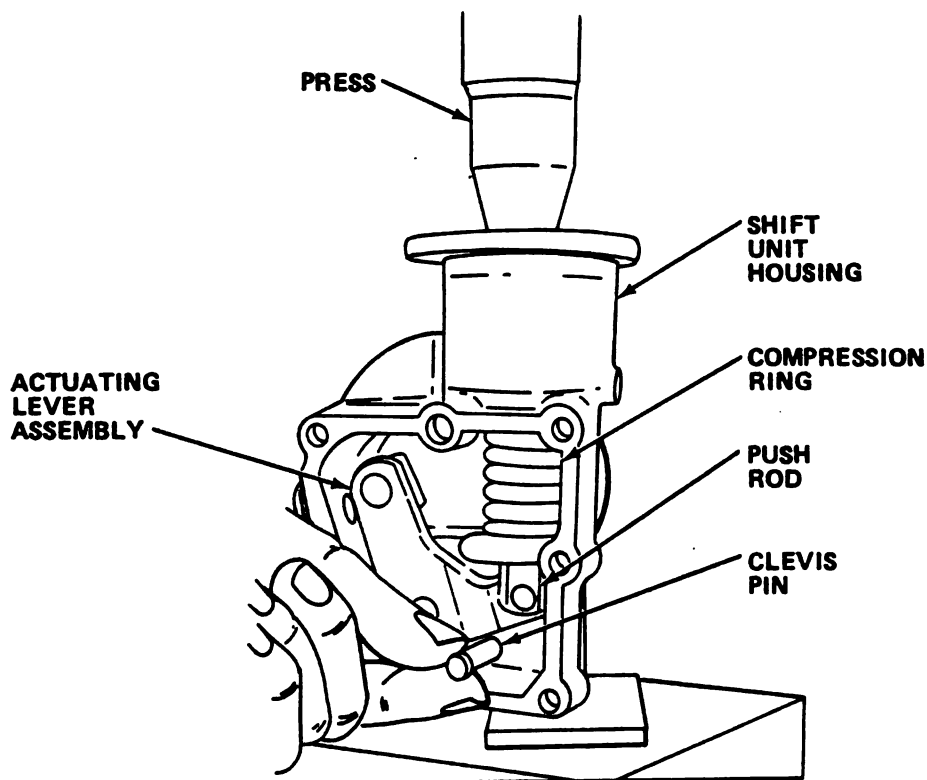
- (4) Install new O-ring and felt oilers.
- (5) Insert piston stop and new compression spring in housing assembly.
- (6) Place piston and push rod assembly in housing assembly.



TA316816

- (7) Position housing assembly in arbor press.





TA316817

### WARNING

PERSONAL INJURY OR DAMAGE TO PARTS MAY OCCUR IF COMPONENTS ARE NOT PROPERLY ALIGNED IN PRESS.

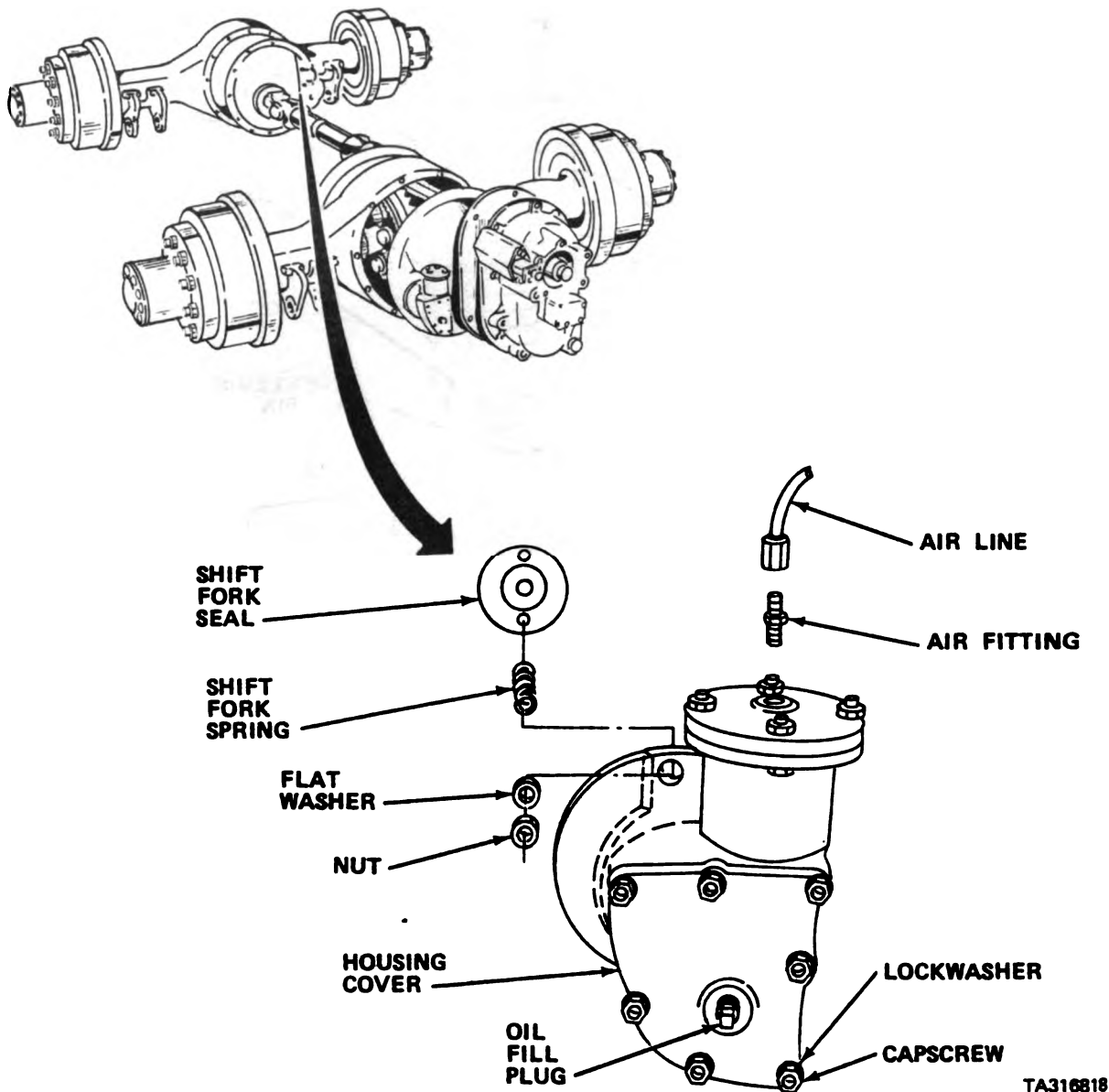
- (8) Apply pressure to piston until actuating lever is in alignment with push rod end.
- (9) Install clevis pin and release press.
- (10) Install housing cover and new cover gasket. Coat threads of capscrews with sealant and install screws.
- (11) Torque capscrews to 7 - 9 ft lbs (11 - 12 Nm).
- (12) Apply light coat of silicone lubricant to O-ring.
- (13) Place new O-ring in groove of assembly housing and install piston end cover.
- (14) Tighten locknuts evenly to a torque of 9 - 11 ft lbs (12 - 15 Nm).



## 9-15. REPLACE REAR REAR AXLE SHIFTER ASSEMBLY

### a. Remove shifter assembly.

(1) Drain air tanks to 0 psi (TM 9-2320-281-10).



### NOTE

Air line will have to be disconnected at other end first.

(2) Disconnect air line.



- (3) Remove and retain air fitting.
- (4) Place drain pan under assembly.
- (5) Remove housing cover and allow oil to drain.
- (6) Remove assembly from differential carrier.
- (7) Remove and discard shift fork seal and spring.

**b. Install shifter assembly.**

- (1) Apply a light coat of silicone lubricant to new shift fork seal.
- (2) Install new shift fork seal and spring.
- (3) Install new shift unit. Be sure shift fork actuating lever engages slot in shift fork.
- (4) Torque nuts to 45 - 50 ft lbs (61 - 68 Nm).
- (5) Remove oil fill plug.

**NOTE**

For Arctic operation, refer to FM 9-207.

- (6) Fill housing assembly to level of hole with SAE 10 oil (LO 9-2320-281-12).
- (7) Coat threads of filler plug with sealant.
- (8) Install plug.
- (9) Coat air fitting threads with sealant.
- (10) Install air fitting.
- (11) Coat air fitting threads with sealant and reconnect air line to fitting.

**c. Perform operational and leak check of shifter assembly.**







## CHAPTER 10

### BRAKE SYSTEM REPAIR

**10-1. INTRODUCTION.** This chapter provides maintenance instructions for the following brake system components:

- a. Brake Shoes (Section I).
- b. Air Compressor Assembly (Section II).
- c. Air Governor Assembly (Section III).

All other brake system repairs are covered in organizational technical manual TM 9-2320-281-20.

#### Section I. BRAKE SHOES

#### 10-2. REPAIR BRAKE SHOES

##### CAUTION

BE CAREFUL NOT TO ENLARGE RIVET HOLES. BRAKE SHOE DAMAGE COULD RESULT.

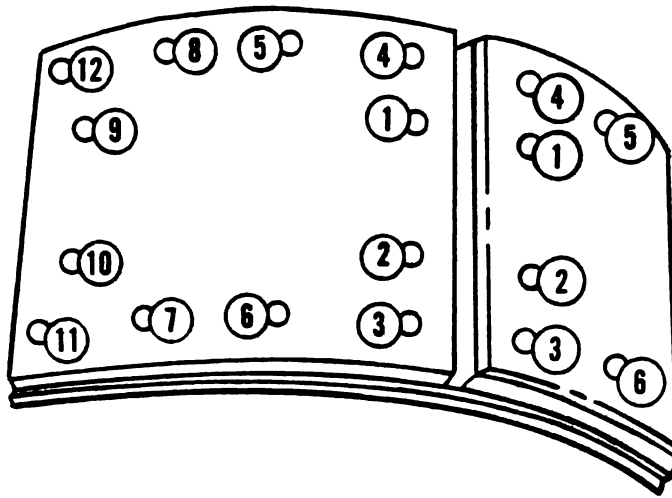
- a. Carefully drill out rivets securing brake pads to shoe.

##### CAUTION

KEEP PAD CLEAN OF OIL OR GREASE. OIL OR GREASE SATURATED PADS COULD IMPAIR BRAKE PERFORMANCE.

- b. Position new brake pads on brake shoe, aligning holes in pad with holes in shoe.
- c. Hold pads in place with C-clamps.





TA316819

- d. Install new rivets in the sequence shown.
- e. Wipe assembly clean.
- f. Wrap shoe in protective paper for storage.

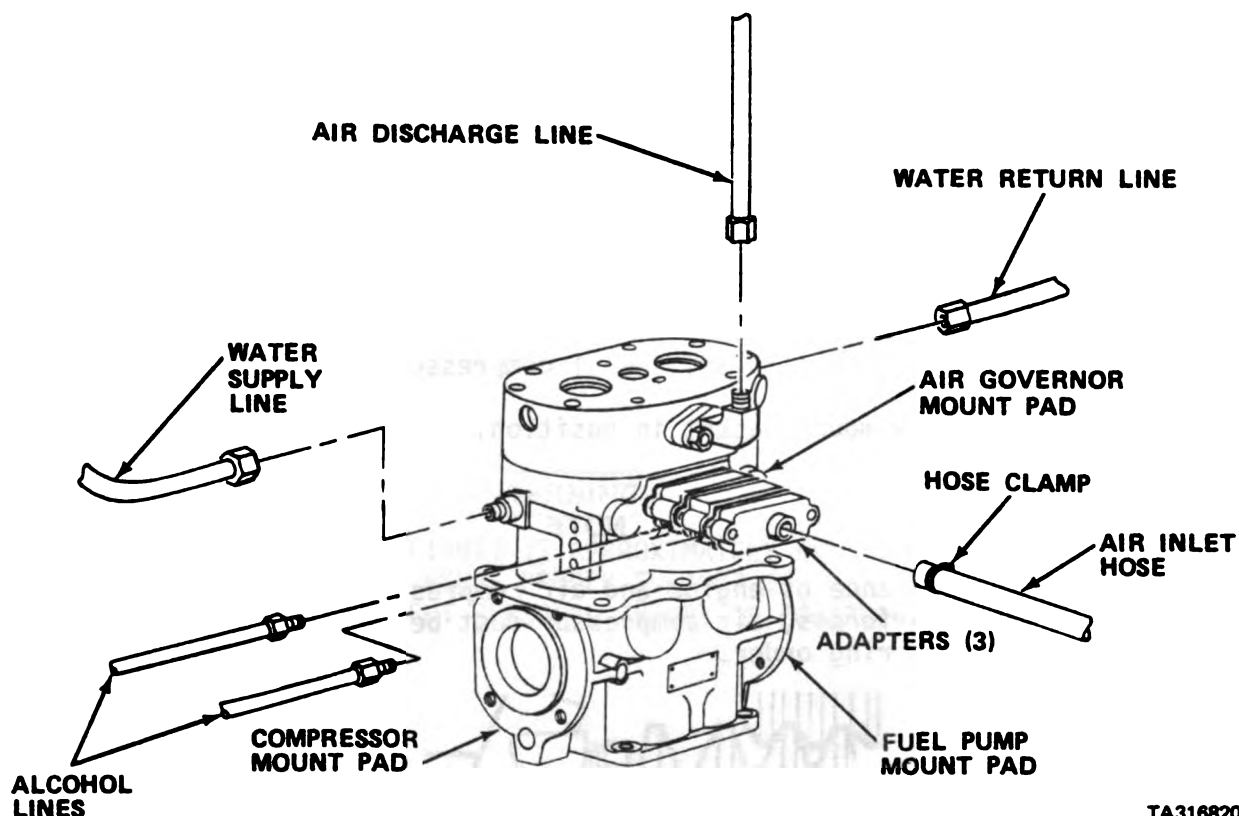
## Section II. AIR COMPRESSOR ASSEMBLY REPAIR

**10-3. DESCRIPTION.** The Bendix Model TU-FLO 700 Air Compressor provides and maintains air under pressure to operate devices in the air brake system, suspension system, and auxiliary air systems. The compressor is a two cylinder, single stage, reciprocating mechanism driven by the engine accessory drive using a splined coupling. It has a rated displacement of 15.5 cubic feet of air per minute at 1250 rpm. The compressor assembly consists of three cast iron major subassemblies; the cylinder head, the cylinder block, and the crankcase. The cylinder head houses the discharge valving and is secured to the cylinder block. The cylinder block houses the cylinder bores and piston assemblies. The crankcase houses the crankshaft and main bearings. The cylinder head and block are cooled by coolant routed to the compressor directly from the engine water pump. Lubrication of internal parts is provided by the engine's oil system through drilled passageways in the engine accessory drive. Air compression is controlled by an internal unloading mechanism ported to an externally mounted adjustable air governor. Air to the compressor is extracted off the engine aftercooler and routed through a cleanable screen secured to the compressor inlet port. The compressor drives the engine fuel pump and governor through a spider coupling.



**10-4. REPLACE AIR COMPRESSOR ASSEMBLY****a. Remove air compressor assembly.**

- (1) Raise cab (TM 9-2320-281-10).
- (2) Drain air tanks to 0 psi (TM 9-2320-281-10).
- (3) Remove fuel pump assembly from air compressor rear flange (para 4-4).
- (4) Remove air governor from right side of air compressor (TM 9-2320-281-20).



TA316820

- (5) Loosen hose clamp and disconnect air inlet hose. Cap off hose.
- (6) Disconnect both alcohol lines from inlet adapters and plug lines.
- (7) Disconnect water supply line and plug line.
- (8) Disconnect water return line and plug line.
- (9) Disconnect air discharge line from discharge fitting and plug line.



**WARNING**

AIR COMPRESSOR WEIGHT IS APPROXIMATELY 50 LBS (22.7 KG). ENSURE PROPER SUPPORT IS PROVIDED TO PREVENT PERSONAL INJURY OR EQUIPMENT DAMAGE.

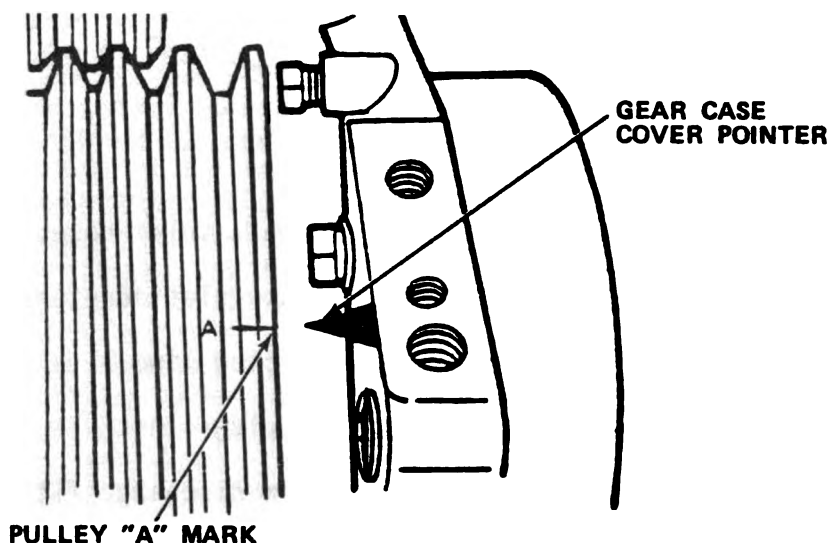
- (10) Remove capscrews and washers securing air compressor to accessory drive housing.
- (11) Remove air compressor and discard mount gasket.
- (12) Wipe up any oil around accessory drive housing compressor mount pad.
- (13) Plug and cap all compressor openings and fittings.

**b. Install new air compressor assembly.**

- (1) Check drive coupling in accessory drive housing for wear and damage. Replace if defective.
- (2) Check water supply and return lines for kinks, dents, and cracks. Replace if defective.
- (3) Apply gear grease to splines of compressor drive and driven couplings.
- (4) Install new mount gasket in position.

**NOTE**

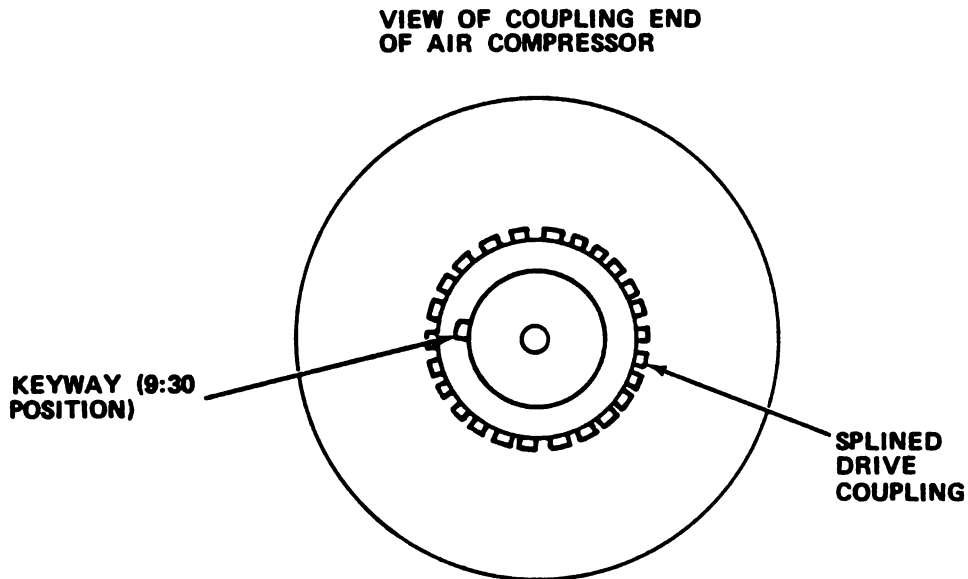
For balance of engine and air compressor reciprocating forces, air compressor must be timed to engine firing order.



TA316821

- (5) Rotate engine until "A" mark on pulley is aligned with pointer on gear case cover.





- (6) Rotate air compressor crankshaft so that male splined drive coupling half keyway points to 9:30 o'clock position when looking at coupling end of compressor.

**WARNING**

AIR COMPRESSOR WEIGHTS IS APPROXIMATELY 50 LBS (22.7 KG). ENSURE PROPER SUPPORT IS PROVIDED TO PREVENT PERSONAL INJURY OR EQUIPMENT DAMAGE.

- (7) Lift compressor in position and engage compressor drive coupling with accessory drive coupling.
- (8) Secure compressor with capscrews and washers. Torque capscrews to 40 - 45 ft lbs (54 - 61 Nm).
- (9) Remove all hose and line plugs.
- (10) Apply thread sealant to fitting and secure air discharge line to compressor.
- (11) Apply thread sealant to fitting and secure water supply line to compressor.
- (12) Apply thread sealant to fitting and secure water return line to compressor.



- (13) Secure both alcohol lines to inlet adapters.
- (14) Slip air inlet hose over inlet fitting and secure with hose clamp.
- (15) Install air governor (TM 9-2320-281-20).
- (16) Install fuel pump (para 4-4).

c. Perform operational and leak check.

- (1) Start engine (TM 9-2320-281-10).
- (2) Check compressor, air governor, and fuel pump for any fuel, water, and air leaks. Repair as necessary.
- (3) Listen for noisy compressor operation. If unusually noisy, shut down engine and troubleshoot (TM 9-2320-281-20).
- (4) Check that pressure builds up and is kept at 105 -120 psi (724 - 827 kPa). Adjust air governor as necessary (TM 9-2320-281-20).
- (5) Shut down engine (TM 9-2320-281-10).
- (6) Wipe compressor, fuel pump, and air governor clean.
- (7) Lower cab (TM 9-2320-281-10).







WARNING

WEAR PROTECTIVE CLOTHING AND GOGGLES WHEN STEAM  
CLEANING TO PREVENT POSSIBLE PERSONAL INJURY.

- (1) Steam clean road dirt and grease from exterior.
- (2) With scribe, match mark front cover to crankcase, cylinder head to block, block to crankcase, and crankcase cover to crankcase.
- (3) Remove capscrews and washers securing adapters and strainer to inlet port and remove adapters and strainer. Discard gaskets.
- (4) Remove nuts securing discharge fitting to cylinder head and remove fitting and gasket. Discard gasket.
- (5) Remove cotter pins from compressor crankshaft splined input drive coupling nut and spider coupling output (fuel pump) end nut. Discard cotter pins and remove nuts.
- (6) With gear puller, remove splined drive coupling from input end of crankshaft.
- (7) Remove woodruff key from shaft.
- (8) With gear puller, remove spider coupling from output end of crankshaft.
- (9) Remove woodruff key from shaft.
- (10) Remove water supply connector fitting and water return reducer bushing.

b. Remove cylinder head.

- (1) Remove and discard cylinder head capscrews.
- (2) Tap head with soft head mallet to separate from gasket seal. Discard gasket.

c. Disassemble cylinder head.

- (1) Remove inlet valve springs from head and inlet valves from their guides in block. Discard springs and valves.
- (2) Unscrew discharge valve seat from bottom of head and remove springs and valves. Discard all parts.
- (3) Remove discharge valve cap nuts/stops.
- (4) Remove all pipe plugs from head.

d. Clean cylinder head and component parts.

- (1) Scrape all gasket material from head and mating cylinder block.



**WARNING**

HOT TANK CLEANING SOLVENTS ARE POTENTIALLY DANGEROUS. WEAR PROTECTIVE CLOTHING AND GOGGLES TO PREVENT SERIOUS PERSONAL INJURY.

- (2) Submerge head in hot tank to remove carbon, dirt, rust, and scale from discharge cavities and cooling cavities.

**WARNING**

COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI. USE ONLY WITH EFFECTIVE CHIP GUARDING AND PERSONNEL PROTECTIVE EQUIPMENT (GOGGLES, SHIELD, GLOVES, ETC).

- (3) Blow shop air through all cavities to clear of carbon, dirt, rust, and scale particles.

- (4) Clean all other parts in cleaning solvent. Dry thoroughly.

e. Inspect cylinder head and component parts.

- (1) Check valve cap nuts/stops for wear as follows:

- (a) Reinstall cap nuts/stops, new valve spring, new valve, and new valve seat.
  - (b) Fully depress valve against nut/stop by pushing valve open with drift pin.
  - (c) Place dial indicator contact pin against valve and set indicator to 0.
  - (d) Slowly release tension on valve until it is fully seated closed.
  - (e) Read travel on dial indicator.
  - (f) If reading exceeds 0.046 in. (1.168 mm), replace cap nut/stop.
- (2) Inspect head for cracks using magnetic particle method. Replace if defective.

**WARNING**

USE PROTECTIVE CLOTHING AND GOGGLES TO GUARD AGAINST FLYING PARTICLES WHICH COULD CAUSE PERSONAL INJURY.

- (3) Check for coolant port cracks by applying 25 psi (172.4 kPa) air pressure to water supply port with all other ports plugged.



- (4) Submerge head in water and check for air bubbles. If leakage found, replace head.
- (5) Test for leakage of discharge valves as follows:
  - (a) Install new gasket and discharge port fitting to head.
  - (b) Secure regulated air source to discharge port fitting. Set pressure at 100 psi (690 kPa).
  - (c) Apply soap solution to discharge valves, seats, and cap nuts/stops.
  - (d) Leakage in form of soap bubbles is permitted. If excessive leakage found, leave air pressure applied.
  - (e) With hardwood dowel and hammer, tap valve off seat several times until leakage is reduced.
  - (f) If leakage is not reduced, replace valve, spring, and valve seat.
  - (g) Check leakage around valve cap nuts/stops. No leakage is permitted. Replace defective nut(s)/stop(s).
- (6) Inspect front drive coupling and rear spider coupling for cracks and wear. Replace if defective.

f. Remove cylinder block.

- (1) Remove capscrews and lockwashers securing cylinder block to crankcase and separate block from crankcase.
- (2) Scrape off block-to-crankcase gasket material from both mating surfaces.

g. Disassemble cylinder block.

- (1) Remove and discard unloader spring, spring saddle, and spring seat from block. Discard all parts.
- (2) Remove and discard plungers and their guides.

WARNING

USE PROTECTIVE CLOTHING AND GOGGLES TO GUARD  
AGAINST FLYING PARTICLES WHICH COULD CAUSE  
PERSONAL INJURY.

- (3) With shop air set at 10 psi (69 kPa), direct air into governor mount port. Piston will be pushed up and out of piston bore.



- (4) Remove and discard unloader piston, O-ring, and back-up ring.
  - (5) Remove and discard inlet valve guides.
  - (6) Remove and discard inlet valve seats.
- h. Clean cylinder block and component parts.

**WARNING**

HOT TANK CLEANING SOLVENTS ARE POTENTIALLY DANGEROUS. WEAR PROTECTIVE CLOTHING AND GOGGLES TO PREVENT SERIOUS PERSONAL INJURY.

- (1) Submerge block in hot tank to remove carbon, dirt, and rust deposits.

**WARNING**

COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI. USE ONLY WITH EFFECTIVE CHIP GUARDING AND PERSONNEL PROTECTIVE EQUIPMENT (GOGGLES, SHIELD, GLOVES, ETC).

- (2) Blow shop air through all passages and cavities to remove loose matter:

**WARNING**

P-D-680 SOLVENT IS POTENTIALLY DANGEROUS. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

- (3) Clean all other parts in cleaning solvent and dry thoroughly.
- i. Inspect cylinder block and component parts.
- (1) Check unloader bore bushings for wear, corrosion, or damage.
  - (2) If defective, replace as follows:
    - (a) Run 1/8 in. (3.175 mm) pipe tap into bushing.
    - (b) Screw 1/8 in. (3.175 mm) pipe threaded rod into bushing and pull rod and bushing straight up and out.
    - (c) Tap new bushing into block until fully seated.



- (3) Inspect inlet valve seats for nicks and scratches. Slight nicks and scratches can be redressed with fine piece of emery cloth or lapped with compound and stone. Replace seat(s) if defective.
- (4) Inspect cylinder bores from scoring or out-of-round by more than 0.001 in. (0.025 mm).
- (5) If scored or excessively out-of-round, hone or rebore to accept oversize pistons. Pistons are available in 0.010, 0.020, or 0.030 in. (0.254, 0.508, or 0.762 mm) oversizes. Clearance between pistons and cylinder bores should be between 0.002 in. (0.05 mm) minimum and 0.004 in. (0.10 mm) maximum.

j. Disassemble crankcase.

- (1) Remove capscrews and lockwashers securing crankcase cover.
- (2) Tap on cover with softhead mallet to break cover loose from gasket. Scrape off gasket material from crankcase and cover.

**NOTE**

Match mark each connecting rod and its cap. Rods are matched to their caps for precise fit and must not be interchanged.

- (3) Remove connecting rod cap bolts and caps. Discard bolts.
- (4) Pull piston and connecting rod from top of crankcase.
- (5) Remove rod bearing shells from rods and caps and reattach caps to their respective rods. Discard bearing shells.
- (6) Remove and discard piston rings from pistons.
- (7) Remove teflon buttons and press wrist pins from pistons and connecting rods. Discard wrist pins.
- (8) Press on input drive end of crankshaft.
- (9) When crankshaft rear bearing disengages from crankcase, remove crankshaft from crankcase.
- (10) Press off and discard rear bearing from crankshaft.
- (11) Remove and discard thrust washer from crankshaft.
- (12) Remove front sleeve bearing and discard.



k. Clean crankcase and components.

**WARNING**

HOT TANK CLEANING SOLVENTS ARE POTENTIALLY DANGEROUS. WEAR PROTECTIVE CLOTHING AND GOGGLES TO PREVENT SERIOUS PERSONAL INJURY.

- (1) Submerge crankcase in hot tank to clean.
- (2) Clean pistons, connecting rods, caps, crankshaft, and crankcase cover in cleaning solvent. Rinse and dry thoroughly.
- (3) Thoroughly clean all oil passages through crankshaft and crankcase with medium bristle bore cleaning brush.

**WARNING**

COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI. USE ONLY WITH EFFECTIVE CHIP GUARDING AND PERSONNEL PROTECTIVE EQUIPMENT (GOGGLES, SHIELD, GLOVES, ETC).

- (4) Blow loosened foreign matter out with compressed air.

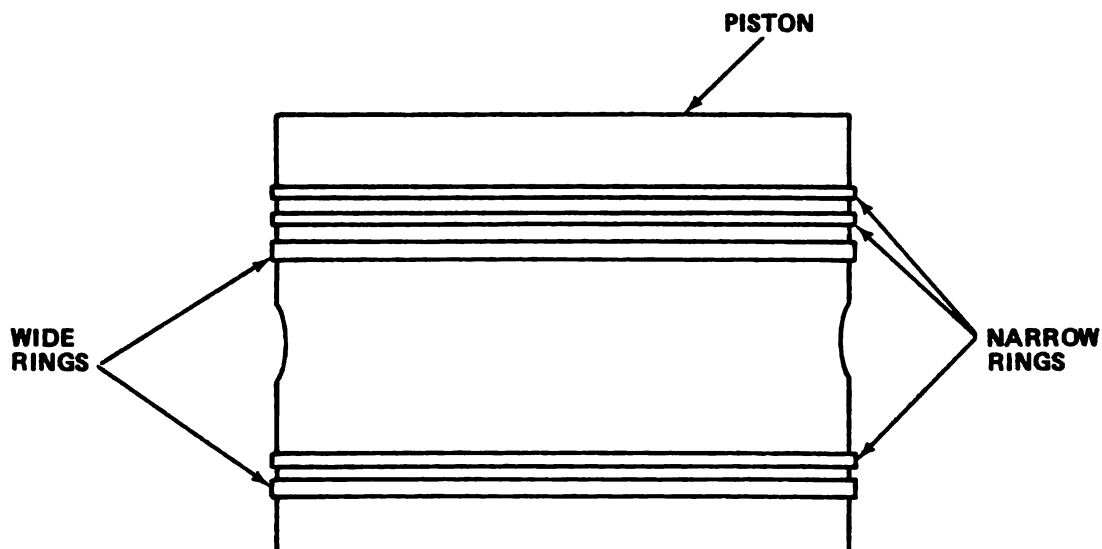
l. Inspect crankcase, pistons, and crankshaft.

- (1) Check crankcase surfaces for cracks or damage.
- (2) Measure inside diameter of crankcase, rear bearing bore, and outside diameter of new rear bearing outer race. Replace crankcase if difference between diameters is greater than 0.0015 in. (0.0381 mm). Over-size rear bearing is not available.
- (3) Check crankshaft threads, keyways, and all machined and ground surfaces for wear, scores, or damage. Crankshaft can be ground to accept undersized bearings.
- (4) Check crankshaft rod journals for out-of-round. Replace if defective.
- (5) Measure inside diameter of new standard size front bearing and outside diameter of crankshaft front journal. Compare differences between diameters. If difference is greater than 0.005 in. (0.127 mm), grind journal to accept undersize bearing. Bearings are available in 0.010, 0.020, or 0.030 in. (0.254, 0.508, or 0.762 mm) undersizes.
- (6) Place plastigage on connecting rod bearing journals.
- (7) Attach rods with new bearing shells to crankshaft.
- (8) Torque rod cap bolts to 10 - 12 ft lbs (14 - 16 Nm).



- (9) Remove rod caps and rods and measure clearance between new bearing shells and rod journals as determined by thickness of plastigage. Clearance must not be less than 0.003 in. (0.076 mm) or more than 0.0021 in. (0.0533 mm).
- (10) Measure outside diameter of piston and inside diameter of cylinder to determine clearance. Clearance should be between 0.002 in. (0.050 mm) minimum and 0.004 in. (0.101 mm) maximum. Oversize pistons and rings are available in 0.010, 0.020 and 0.030 in. (0.254, 0.508, and 0.762 mm).
- (11) Check fit of wrist pin to piston. Pin should be a light press fit into piston. If pin is loose fit, replace piston and pin.
- (12) Check clearance of wrist pin to connecting rod bushing by securing piston and rocking pin while measuring pin movement. Replace connecting rod assembly if clearance exceeds 0.0007 in. (0.0117 mm).
- (13) Check piston ring grooves-to-ring clearance. Replace piston if clearance of any one ring groove exceeds 0.004 in. (0.101 mm).
- (14) Check ring gap clearance when ring installed in cylinder approximately 1 in. (25.4 mm) from top. Ring gap should be from 0.002 in. (0.050 mm) to 0.010 in. (0.254 mm).

m. Reassemble crankcase (fig. 10-6).



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#### NOTE

Lubricate rings, pistons, and wrist pins with engine oil before installing.

- (1) With pip-marks on rings facing up, install piston rings using expansion tool. Locate wide and narrow rings as illustrated.



- (2) Stagger ring gaps so that each gap is 90 degrees from preceeding gap.
- (3) Attach piston to connecting rod by pressing wrist pin through piston and rod.
- (4) Install teflon button on each side of piston to retain wrist pin.
- (5) Press new rear bearing on crankshaft journal.
- (6) Press new front bearing into front bore of crankcase until flush with crankcase.
- (7) Place new thrust washer on crankshaft front end.
- (8) Carefully press crankshaft and rear bearing into crankcase through rear bearing bore.
- (9) Apply loctite to cylinder block capscrew threads.
- (10) Place new gasket in position, aline match marks, and secure cylinder block to crankcase with lockwashers and capscrews. Torque screws to 13 - 15 ft lbs (18 - 20 N•m).
- (11) Lubricate piston, piston rings, and connecting rod bearings with engine oil.
- (12) Remove connecting rod cap from one rod.
- (13) With ring compression tool in place, insert connecting rod and piston into cylinder.
- (14) Rotate crankshaft so that a connecting rod journal is fully downward and centered.
- (15) Place upper rod bearing shell in rod and slide rod over journal.

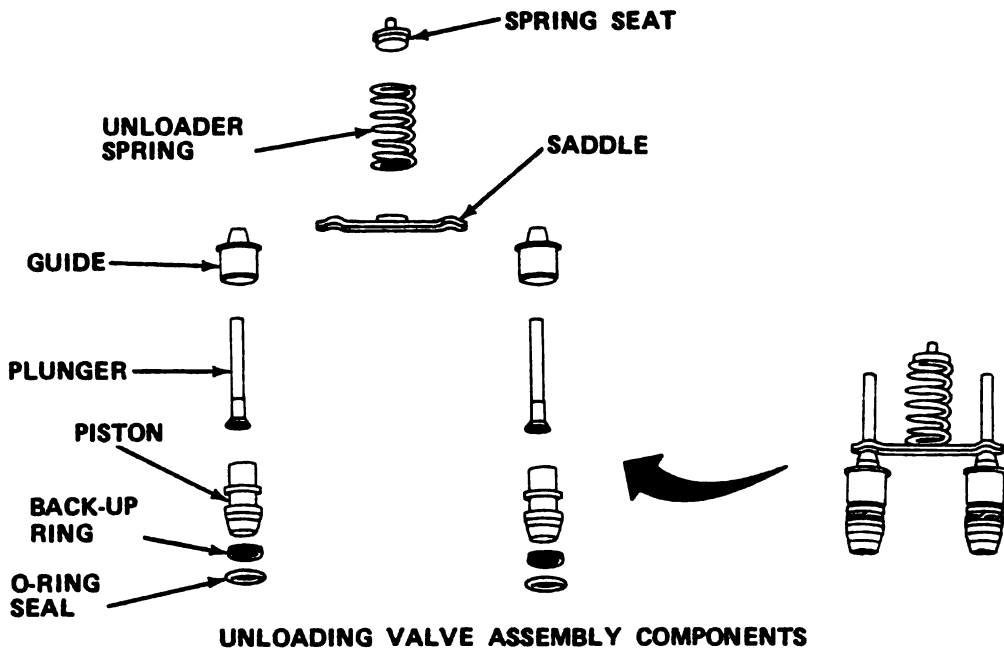
#### NOTE

Caps and rods have locking slots which must aline with each other.

- (16) With lower rod bearing shell in cap, engage cap over journal.
- (17) Secure cap and torque new cap bolts evenly to 10 - 12 ft lbs (14 - 16 N•m).
- (18) Install second piston assembly in same manner as first.



n. Reassemble cylinder block.



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**NOTE**

Use new unloader kit which contains all parts required to build up unloader assembly.

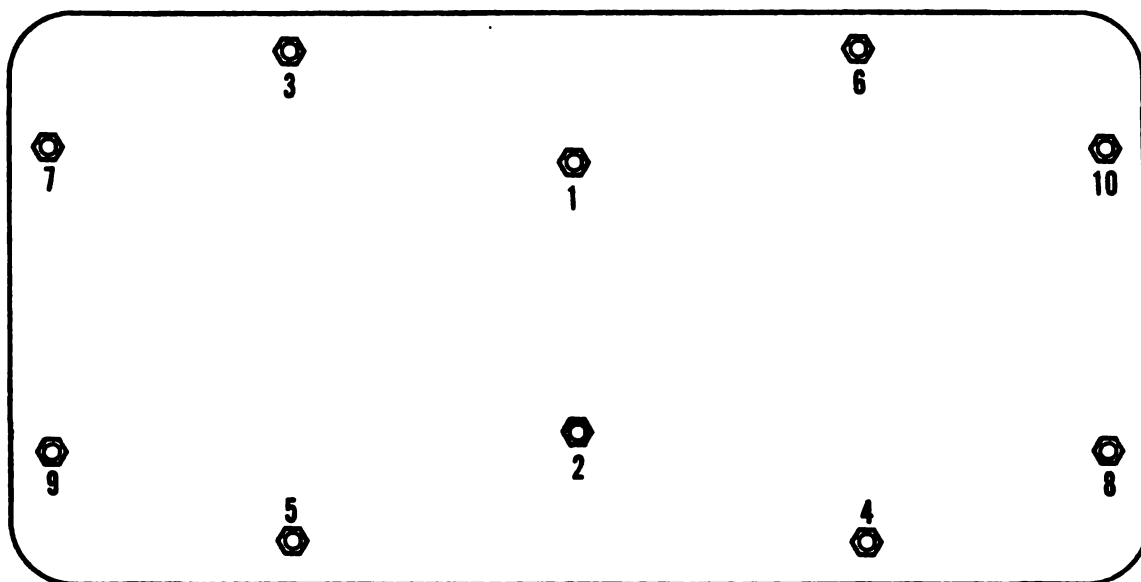
- (1) Insert new unloader pistons in their bores being careful not to cut O-rings or damage back-up rings.
- (2) Position new unloader plungers in their guides and slip new guides over top of unloader pistons.
- (3) Install new unloader spring seat in cylinder block cavity engaging tip of seat with hole in block.
- (4) Position new saddle between unloader piston guides so forks on saddle are centered on the guides.
- (5) Install new unloader spring, ensuring it seats over spring seat on saddle and spring seat in block.
- (6) Install new inlet valve seats and guides into cylinder block and drop new inlet valves into guides. Ensure that valves slide freely in guides.

o. Reassemble cylinder head.

- (1) Apply a very small quantity of grease to inlet valve springs and install springs with turning motion into head.



- (2) Place cylinder head gasket on cylinder block.
- (3) Place cylinder head on block aligning match mark, carefully watching that inlet valve springs do not fall out.
- (4) Install new cylinder head capscrews, tightening them just enough to seat head.



TORQUE SEQUENCE DIAGRAM

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- (5) Using torquing sequence diagram, torque head capscrews to 8 ft lbs (11 N•m), then apply an additional 8 ft lbs (11 N•m). Torque range is 15 - 19 ft lbs (20 - 26 N•m).

p. Install exterior components.

- (1) Install crankcase cover gasket and cover on crankcase and install cover retaining capscrews. Torque capscrews to 8 - 10 ft lbs (11 - 14 N•m).
- (2) Apply thread sealant to water supply connector fitting and water return bushing threads and install fitting and bushing.
- (3) Install woodruff keys in slots at both ends of crankshaft.
- (4) Lubricate shaft and key with engine oil and install spider coupling on fuel pump end.
- (5) Install coupling retaining nut and secure with cotter pin.
- (6) Lubricate shaft and key with engine oil and install splined drive coupling on compressor drive input end.



- (7) Install coupling retaining nut and secure with cotter pin.
- (8) Install new gasket and air discharge fitting. Secure with nuts and washers.
- (9) Install adapters, gaskets, and screen on air inlet port. Secure with capscrews and washers.
- (10) Wrap ends of crankshaft with protective paper and masking tape.
- (11) Install plugs and covers on all ports and fittings.
- (12) Wipe assembly clean.



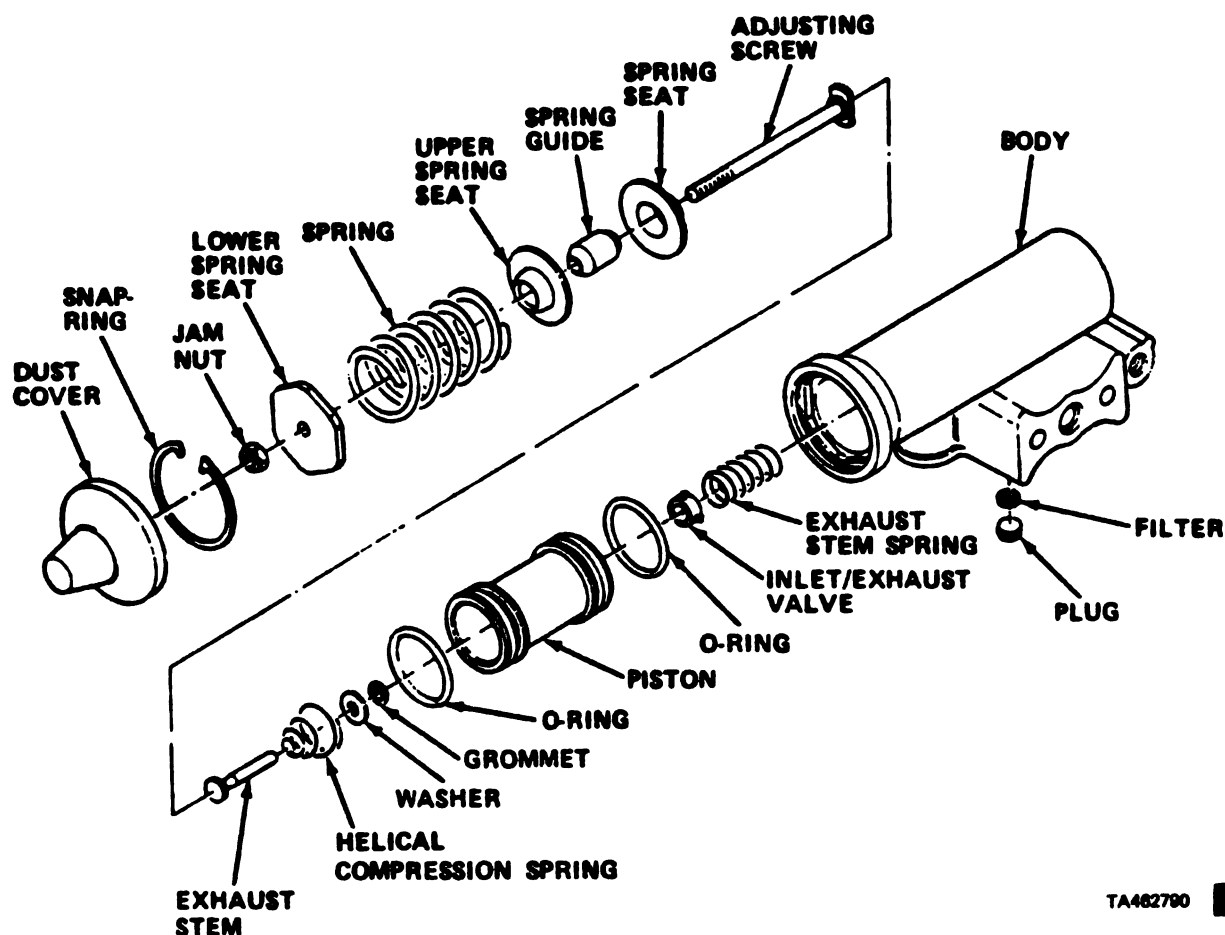
## Section III. AIR GOVERNOR REPAIR

## 10-6. REPAIR AIR GOVERNOR ASSEMBLY

## NOTE

The air governor on the 1982 model is not repairable. Refer to TM 9-2320-281-34P for ordering data.

## a. Disassemble air governor assembly.



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- (1) Remove and discard dust cover (cover screws onto adjusting screw).
- (2) Remove snapring and withdraw adjusting screw and spring assembly.

## NOTE

It is not necessary to disassemble adjusting screw and spring assembly unless parts in the assembly are damaged. If damaged, proceed to next step; if not damaged, proceed to step (4).

- (3) Disassemble adjusting screw and spring assembly.

- (a) Note number of threads protruding through jam nut to assist in reassembly.



- (b) Remove jamnut.
- (c) Separate spring seat, spring, upper spring seat, spring guide, spring seat, and adjusting screw.
- (d) Discard spring and any defective part(s).
- (4) Carefully tap open end of governor body on wooden surface until piston drops out of body.
- (5) Withdraw exhaust stem and exhaust stem spring from piston. Discard spring.
- (6) Disengage inlet/exhaust valve spring from groove in piston.
- (7) Remove spring and inlet/exhaust valve. Discard spring and valve.

#### **NOTE**

Washer is staked in piston and retains grommet.

- (8) Remove stock that was upset by staking and remove washer and grommet from inside of piston. Discard grommet.
  - (9) Remove O-rings from piston.
  - (10) Remove plug and filter. Discard filter.
- b. Clean and inspect parts.

#### **WARNING**

P-D-680 SOLVENT IS POTENTIALLY DANGEROUS.  
AVOID PROLONGED OR REPEATED CONTACT WITH  
SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

- (1) Clean all metal parts with cleaning solvent. Dry thoroughly.
- (2) Inspect body bore for grooves, scratches, and burrs.
- (3) Rework body bore with crocus cloth to remove any minor defects. Replace if excessively grooved or scratched.
- (4) Inspect piston for grooves or scratches. Replace if defective.
- (5) Inspect exhaust stem for defects. Replace if defective.



- (6) Inspect body for exterior cracks, dents, or thread damage. Rework threads with appropriate size tap. Replace if cracked or otherwise damaged.

c. Reassemble air governor assembly.

**NOTE**

Barium grease is part of air governor repair kit.

- (1) Coat all parts with barium grease.
- (2) Install new grommet in counterbore in piston.
- (3) Position washer behind grommet and stake counterbore at two places 180 degrees apart. This secures washer and grommet.
- (4) Install new exhaust stem spring in piston and carefully insert exhaust stem through spring, washer, and grommet.
- (5) Position new inlet/exhaust valve on piston and place spring against valve.
- (6) Engage spring in groove of piston and snap spring into place.
- (7) Install new O-rings in piston grooves.
- (8) Carefully slide piston (exhaust stem facing out) into body.
- (9) Assemble adjusting screw and spring assembly (if disassembled).
  - (a) Install spring, seat, spring guide, lower spring seat, spring, and upper spring seat on adjusting screw.
  - (b) Install jamnut on adjusting screw.
  - (c) Turn nut down until number of threads showing equals number noted during disassembly.
- (10) Install adjusting screw assembly in housing with jamnut facing out.
- (11) Install snapring.
- (12) Install dust cover.
- (13) Install new filter and secure with plug.
- (14) Wipe assembly clean.



#### Section IV. AIR LINES

10-7. REPAIR AIR LINES. Repair is limited to replacement only of new air line. Refer to Appendix C of this manual for manufacturing instructions.



## CHAPTER 11

### WHEEL SYSTEM REPAIR

**11-1. INTRODUCTION.** This chapter provides maintenance instructions for wheel system components.

#### **11-2. BRAKE DRUM REPAIR**

- a. Inspect drum.

#### **WARNING**

DO NOT ATTEMPT TO WELD A CRACKED DRUM. A CRACKED DRUM IS UNSAFE FOR FURTHER SERVICE. PERSONNEL INJURY FROM DEFECTIVE BRAKES MAY RESULT.

- (1) Check drum for cracks. Discard if cracked.
- (2) Check drum for scores, deepgrooves, out-of-round, or taper.
  - (a) Smooth up slight scores with fine emery cloth.

#### **WARNING**

A DEEPLY GROOVED DRUM WILL RESULT IN RAPID NEW WEAR AND MAKE IT DIFFICULT, IF NOT IMPOSSIBLE, TO OBTAIN EFFICIENT BRAKE PERFORMANCE. PERSONNEL INJURY FROM INEFFECTIVE BRAKES MAY RESULT.

- (b) If grooves are deep, drum must be turned.

#### **NOTE**

An out-of-round drum makes accurate brake shoe adjustment impossible and is likely to cause excessive wear of other parts of brake mechanism due to its eccentric action. It will also cause severe irregular tire wear.

- (c) With an inside micrometer fitted with extension rods, measure drum for out-of-round, taper, and wear. Take measurements at open and closed edges of machined surface and at right angles to each other. If out-of-round or tapered, turn drum.



- b. Turn drum.

**NOTE**

The following procedures apply to front and rear brake drums.

- (1) Position drum on turning machine and secure in place.

**NOTE**

Remove only enough material to leave a smooth, true (in-round), untapered braking surface.

- (2) Align tool bit and start turning procedure.
- (3) Remove drum and remeasure diameter.
- (4) Discard drum if diameter exceeds maximum stamped on outside of drum.

**11-3. TIRE REPAIR.** Perform all tire repairs in accordance with TM 9-2610-200-20, Pneumatic Tire, Inner Tubes, and Radial Tires.



## CHAPTER 12

## STEERING SYSTEM REPAIR

**12-1. INTRODUCTION** This chapter provides maintenance instructions for the following steering system components:

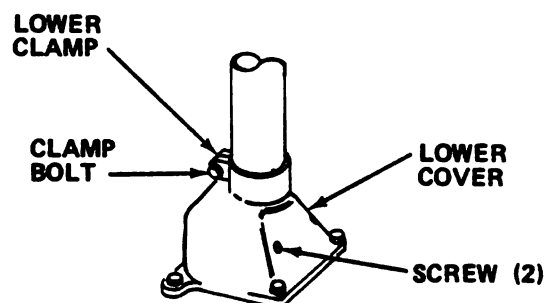
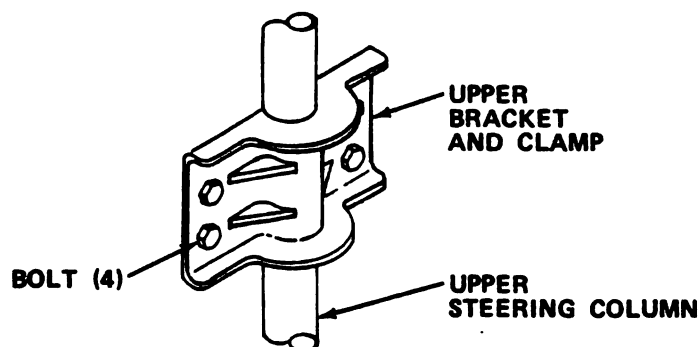
- a. Upper Steering Column (Section I).
- b. Steering Gear Assembly (Section II).

All other steering system repairs are covered in organizational technical manual TM 9-2320-281-20.

## Section I. UPPER STEERING COLUMN

**12-2. REPLACE UPPER STEERING COLUMN**

- a. Remove steering column.
  - (1) Position wheels straight ahead.
  - (2) Remove screws and small cover at bottom of column.



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- (3) Remove bolt from universal joint yoke (turn steering column to gain access to bolt).



- (4) Remove steering wheel (TM 9-2320-281-20).
- (5) Follow horn wire (green) from side of steering column to underside of dash. Unplug wire at connector.
- (6) Loosen clamp bolt at bottom of column. It is not necessary to remove clamp.
- (7) Remove bolts and clamp from bracket at top of column. Remove column.

b. Install column.

- (1) Fit new column into lower clamp and install upper clamp with bolts.
- (2) Tighten upper and lower clamp bolts.
- (3) Reinstall steering wheel (TM 9-2320-281-20).
- (4) Reconnect horn wire.
- (5) Position steering wheel straight ahead.
- (6) Connect universal joint at bottom of column. Secure with bolt and nut.
- (7) Replace cover at bottom of column.
- (8) Test horn.
- (9) Check steering system for smooth, trouble-free operation.



## Section II. STEERING GEAR ASSEMBLY

### 12-3. DESCRIPTION AND SUBASSEMBLIES

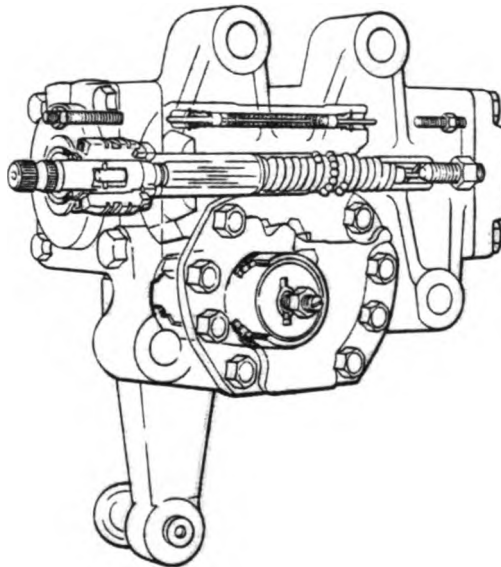
- a. General. The Ross HFB-70 power steering gear is an integral power steering gear. Integral power steering means that the gear box contains a manual steering mechanism, a hydraulic control valve, and a hydraulic power cylinder, all in a single, compact housing.

When the driver turns the steering wheel, he transmits force from the wheel to the steering gear input shaft. A torsion bar is pinned at one end to the input shaft and at its other end to the worm shaft. In response to this rotational force, the worm shaft, acting through the ball nut mechanism, tries to move the rack piston axially through the gear housing. The rack piston's axial movement is resisted by its engagement to the sector shaft, which is connected by linkage to the steered wheels. Because of this resistance, the torsion bar is twisted by the input shaft. Pressurized fluid, instead, moves the rack piston axially through the cylinder bore. The rack piston then turns the sector shaft and steers the vehicle. If the steered wheels receive a shock load, the shock forces are transmitted through the sector shaft to the rack piston and on to the worm shaft. This force causes the control valve to send high-pressure fluid to the proper cylinder cavity to resist the shock force. By absorbing the shock load hydraulically, the steering gear prevents objectionable kickback at the steering wheel.



b. Subassemblies.

- (1) Rotary control valve. The rotary control valve directs oil flow from the engine-driven pump to either one of the cylinder cavities, for left or right turn. The flow (measured in gallons per minute) directed to a cylinder cavity is dependent upon the speed at which the driver turns the steering wheel. The pressure (measured in psi) required for the gear to steer the vehicle is created by the resistance at the steered wheels. The control valve functions by sensing these requirements and supplies fluid to the cylinder cavity at the proper flow rate and pressure.
- (2) Unloading (Poppet) valves. The gear is equipped with two unloading valves at each end of the housing. One valve or the other, for left or right turn, trips as the steered wheels approach the axle stops. The tripped valve reduces pressure in the gear and helps to reduce heat generated by the pump. The tripped valve also reduces load force on the steering linkage.



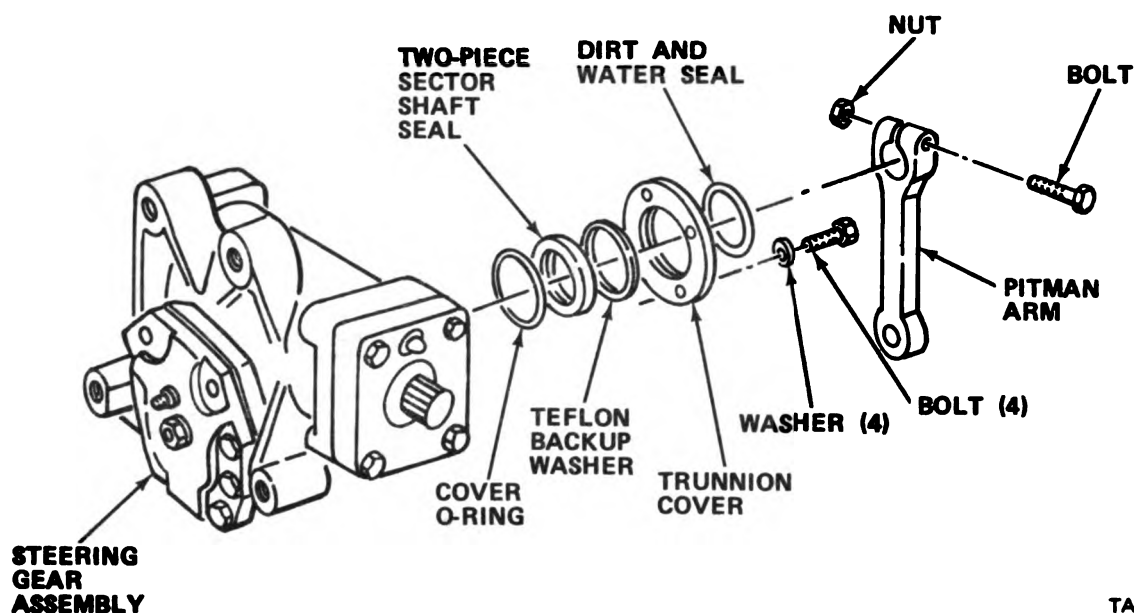
**STEERING GEAR  
ASSEMBLY**

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**12-4. REPAIR STEERING GEAR ASSEMBLY ON-VEHICLE****NOTE**

If leak detected in trunnion cover area, sector shaft seal must be replaced.



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**a. Replace sector shaft seal.**

- (1) Matchmark pitman arm to sector shaft and remove bolt and nut securing arm to shaft (TM 9-2320-281-20).
- (2) With puller, remove pitman arm.
- (3) With screwdriver, carefully pry dirt and water seal from trunnion cover. Discard seal.
- (4) Clean sector shaft with fine grade of emery paper.
- (5) Remove trunnion cover bolts and washers.
- (6) Remove trunnion cover.
- (7) Remove and discard teflon backup washer, two-piece sector shaft seal, and trunnion cover O-ring.
- (8) Clean trunnion cover.



- (9) Inspect cover seal cavity and sealing face for nicks or corrosion. Replace cover if nicked or corroded.
- (10) Place new backup washer in sealing cavity of cover.

WARNING

WORDS "OIL SIDE" MUST BE VISIBLE ON TWO-PIECE SEAL WHEN INSTALLED. IF INSTALLED BACKWARDS, IT WILL NOT FUNCTION POSSIBLY CAUSING LOSS OF POWER STEERING AND ROAD ACCIDENT.

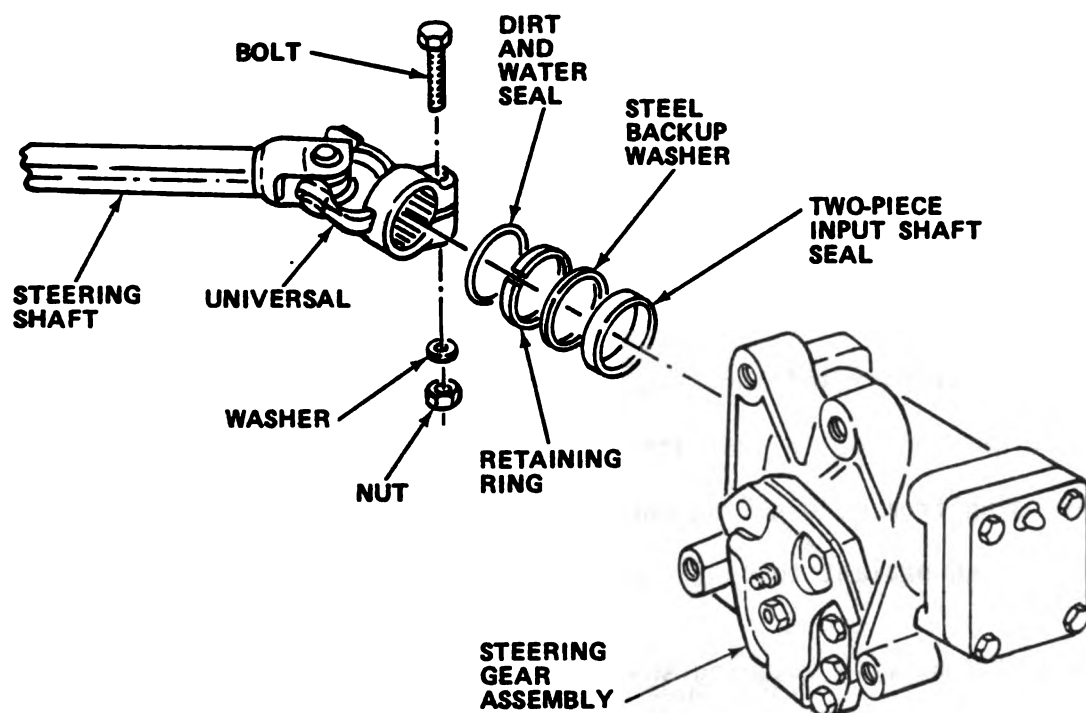
- (11) Install two-piece seal in cover with words "OIL SIDE" visible when in position.
- (12) Grease new trunnion O-ring and install in cover.
- (13) Cover sector shaft serrations with one layer of masking tape. This prevents seal damage during installation.
- (14) Install trunnion cover and secure with washers and bolts. Torque bolts to 15 - 22 ft lbs (20 - 30 Nm).
- (15) Tap new dirt and water seal in position around sector shaft.
- (16) Remove tape from sector shaft.
- (17) Align match mark on pitman arm with mark on sector shaft.
- (18) Spread slot in pitman arm with wedge and tap arm on sector shaft. Secure with bolt and nut.
- (19) If bolt is lubricated or plated, torque nut to 300 - 320 ft lbs (407 - 434 Nm). If bolt is dry or unplated, torque to 380 - 420 ft lbs (515 - 570 Nm).
- (20) Wipe assembly clean.
- (21) Service power steering reservoir (LO 9-2320-281-12).
- (22) Bleed air from systems by cycling full left and full right turns several times.
- (23) Check gear for leaks. Repair as necessary.



## b. Replace input shaft seal.

**NOTE**

If leak detected in input shaft seal area, seal must be replaced.



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- (1) Remove bolt, lockwasher, and nut securing steering shaft universal to input shaft.
- (2) Match mark universal to input shaft and pull universal off of input shaft.
- (3) Clean area around input shaft with fine grade of emery paper.
- (4) Disconnect return line (outboard) from top of steering gear.
- (5) Plug return line connector to prevent entry of foreign matter.
- (6) With screwdriver, pry dirt and water seal from valve cover.
- (7) Remove retaining ring from valve cover.



**WARNING**

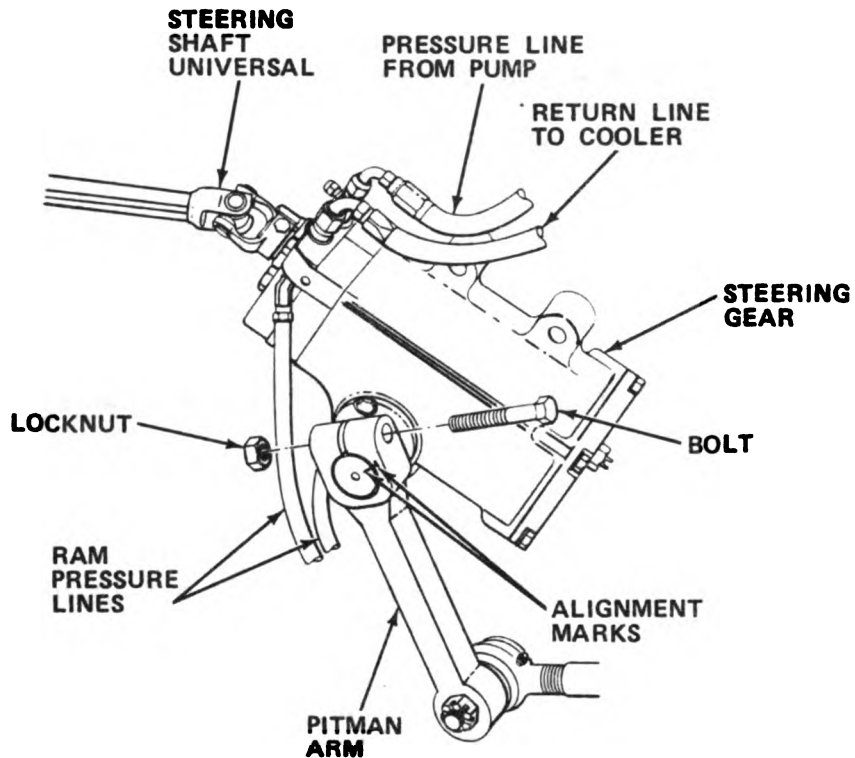
USE PROTECTIVE CLOTHING AND GOGGLES TO GUARD AGAINST FLYING PARTICLES WHICH COULD CAUSE PERSONAL INJURY.

- (8) Hold rag over input shaft and apply 10 psi (69 kPa) of compressed air to valve housing return port. Two-piece seal and steel backup washer will pop out of housing along with some fluid.
- (9) Discard seal.
- (10) Apply grease to input shaft seal and washer.
- (11) With J-28490 seal driving tool, press new two-piece seal (flat side up) and backup washer into valve housing.
- (12) Install retaining ring.
- (13) Pack area behind retaining ring with grease.
- (14) Tap new dirt and water seal into valve housing.
- (15) Remove plug from return line connector.
- (16) Apply thread sealant to connector and reconnect line to valve housing fitting.
- (17) Aline match mark on steering shaft universal with mark on input shaft.
- (18) Slide universal on input shaft.
- (19) Secure universal with bolt, lockwasher, and nut.
- (20) Wipe assembly clean.
- (21) Service power steering reservoir (LO 9-2320-281-12).
- (22) Bleed air from system by cycling full left and full right turns several times.
- (23) Check gear for leaks. Repair as necessary.



**12-5. REPLACE STEERING GEAR ASSEMBLY**

- a. Drain power steering reservoir (TM 9-2320-281-20).
- b. Raise cab (TM 9-2320-281-10).
- c. Remove steering gear assembly.



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- (1) Remove locknut and bolt securing pitman arm to sector shaft.
- (2) Scribe mark on pitman arm and sector shaft to ensure proper reassembly.
- (3) With puller, remove pitman arm.
- (4) Tag and disconnect fluid return and pressure lines from top front of steering gear.
- (5) Tag and disconnect pressure lines to and from power steering cylinder (ram) at steering gear.
- (6) Wipe up all fluid spillage.
- (7) Remove nut, lockwasher, and bolt securing steering shaft universal to steering gear input shaft.



- (8) Disengage universal from input shaft.

**WARNING**

STEERING GEAR ASSEMBLY WEIGHS APPROXIMATELY 110 LBS (49.6 KG). USE DEVICE TO ASSIST IN MOVING ASSEMBLY. ENSURE ADEQUATE SUPPORT IS PROVIDED UNDER ASSEMBLY WHEN REMOVING TO PREVENT POSSIBLE PERSONAL INJURY.

- (9) Support steering gear assembly.
  - (10) Remove locknuts, washers, and bolts retaining harness clamps to steering gear assembly.
  - (11) Remove locknuts and bolts securing assembly to gear mount bracket and truck frame.
  - (12) Carefully lower assembly to ground.
  - (13) Remove fluid pressure and return fittings from assembly.
  - (14) Remove ram pressure line fittings from assembly.
  - (15) Install plugs in fitting ports.
  - (16) Install plugs in all line connectors if not immediately installing new steering gear.
- d. Install steering gear.
- (1) Remove shipping plugs from all ports in assembly.

**NOTE**

Pressure fitting (from power steering pump) has a pressure tap built into fitting.

- (2) Apply thread sealant to fittings and install return and pressure fittings in top of assembly. Pressure fitting is installed in port marked "P".
- (3) Apply thread sealant to fittings and install ram pressure fittings.
- (4) Lift assembly into position.
- (5) Secure assembly to gear mount bracket and truck frame with locknuts and bolts.
- (6) Torque nuts to 260 - 280 ft lbs (353 - 380 Nm).



- (7) Aline truck wheels so that they are tracking straight.
- (8) Turn steering gear input shaft so that sector gear line is pointing straight up.
- (9) Turn steering wheel to desired position and slip steering shaft universal onto input shaft of steering gear.
- (10) Secure universal with bolt, lockwasher, and nut.
- (11) Remove plugs from line connectors (if installed).
- (12) Apply thread sealant to fittings and secure ram pressure lines to gear assembly and remove tags.
- (13) Apply thread sealant to fittings and secure pressure and return lines to gear assembly and remove tags.

### CAUTION

DO NOT USE EXCESS POUNDING FORCE WHEN INSTALLING  
PITMAN ARM. INTERNAL GEAR DAMAGE COULD RESULT.

- (14) Drive a wedge in slot of pitman arm to slightly open slot.
  - (15) Aline top scribe mark on pitman arm with mark on sector shaft.
  - (16) Carefully tap arm into place.
  - (17) Install bolt through arm and groove in sector shaft.
  - (18) Secure arm with locknut.
  - (19) If bolt is lubricated or plated, torque nut to 300 - 320 ft lbs (407 - 434 Nm). If bolt is dry or unplated, torque nut to 380 - 420 ft lbs (515 - 569 Nm).
- e. Service power steering reservoir (LO 9-2320-281-12).
  - f. Bleed system and check for leaks.

### **NOTE**

For steps (1) thru (7) below, do not turn steering wheel. This will induce air into system.

- (1) Remove electrical lead from engine fuel pump shutoff valve to keep engine from starting.
- (2) Crank engine for 10 seconds.



- (3) Check and fill reservoir (LO 9-2320-281-12).

**CAUTION**

DO NOT ALLOW FLUID LEVEL TO DROP SIGNIFICANTLY IN RESERVOIR. AIR WILL BE INDUCED, MAKING STEERING SLUGGISH OR INOPERATIVE.

- (4) Perform steps (2) and (3) two to three times.
- (5) Reconnect electrical lead to fuel pump shutoff valve.
- (6) Start engine and let idle for 2 minutes (TM 9-2320-281-10).
- (7) Shut down engine and check fluid level (TM 9-2320-281-10).
- (8) Restart engine (TM 9-2320-281-10).

**CAUTION**

DO NOT HOLD STEERING IN FULL TURN POSITION MORE THAN 10 SECONDS. DAMAGE TO POWER STEERING PUMP MAY RESULT.

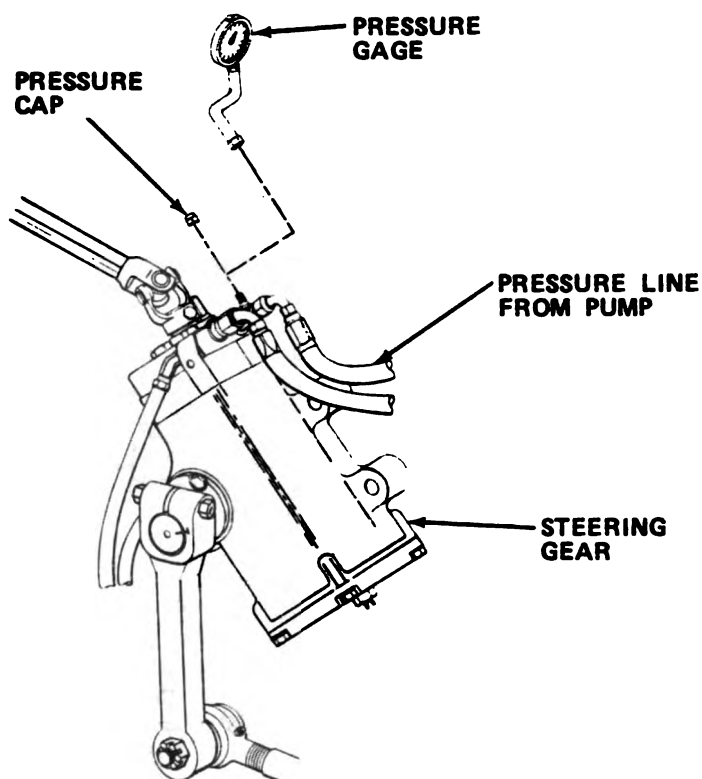
- (9) Steer vehicle from full left to full right several times. This allows poppet valves to bleed off air.
- (10) Check steering gear assembly for leaks. Repair as necessary.
- (11) Shut down engine and add fluid if necessary to full line (hot) on reservoir dipstick (TM 9-2320-281-10).



g. Adjust poppet valves.

### **CAUTION**

POPPET VALVES ARE DESIGNED TO REDUCE PRESSURE IN STEERING GEAR AND HELP REDUCE HEAT GENERATED BY POWER STEERING PUMP WHEN STEERING WHEELS APPROACH AXLE STOPS. IMPROPERLY ADJUSTED POPPET VALVE CAN CAUSE PREMATURE FAILURE OF PUMP AND SEALS IN STEERING GEAR.



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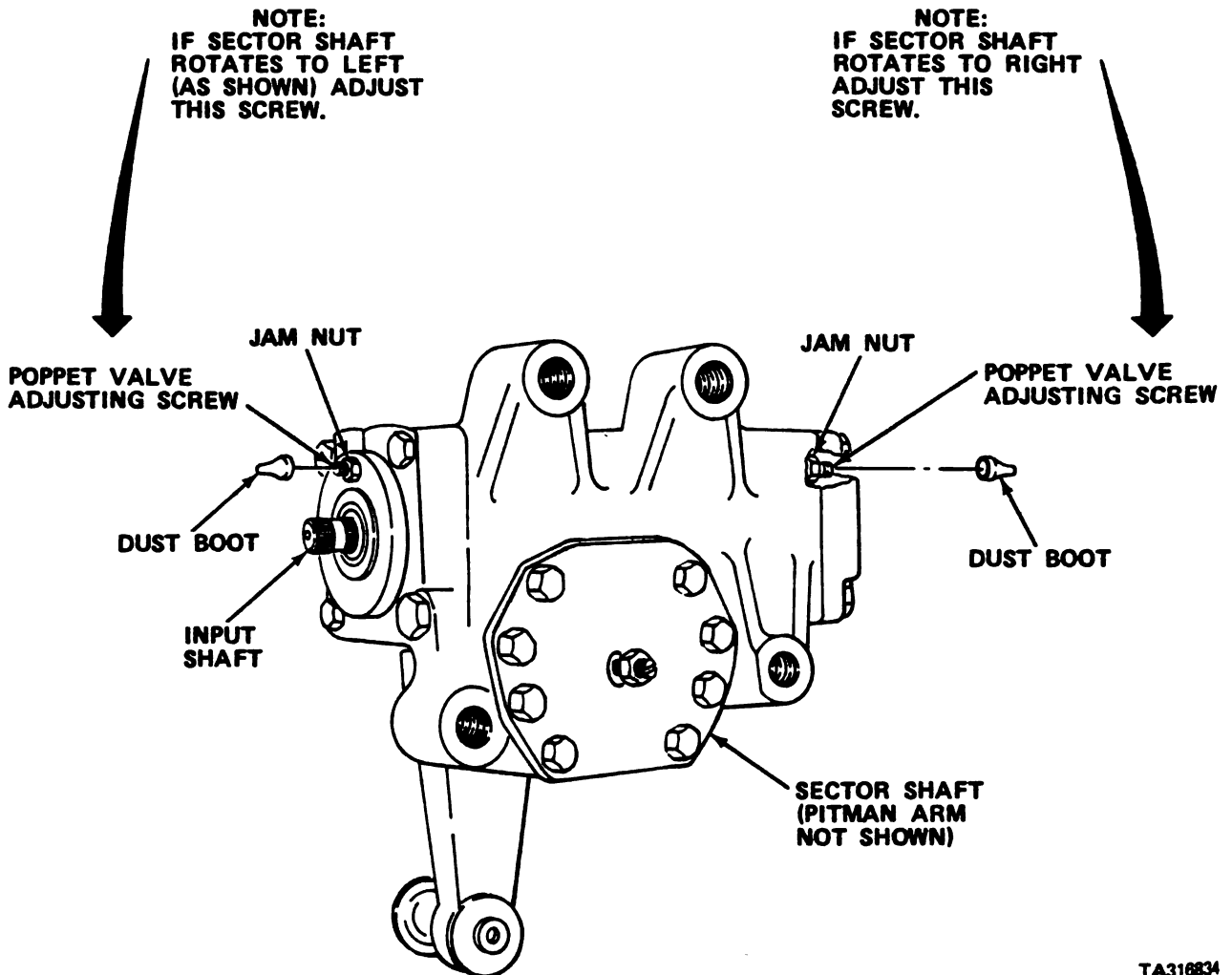
- (1) Remove pressure tap cap from pressure line fitting at steering gear.
- (2) Attach 0 - 3000 psi (0 - 20,700 kPa) pressure gage to tap.
- (3) Place thermometer in power steering reservoir.
- (4) Start engine (TM 9-2320-281-10).
- (5) Bring fluid temperature up to approximately 130°F (54°C).



**CAUTION**

DO NOT HOLD STEERING IN FULL TURN POSITION MORE THAN 10 SECONDS. DAMAGE TO POWER STEERING PUMP MAY RESULT.

- (6) With engine at idle, turn steering wheel in one direction, observing direction of rotation of sector shaft.
- (7) If sector shaft rotates to left, front poppet valve will be adjusted. If shaft rotates to right, rear poppet valve will be adjusted.



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- (8) Remove dust boots and loosen both poppet valve adjusting screw jam nuts.
- (9) Turn steering wheel to same full turn position and back out appropriate poppet valve adjusting screw until pressure peaks out at highest level.



- (10) Quickly turn adjusting screw in until pressure drops to less than 900 psi (6205 kPa).
- (11) Return steering wheel to neutral position.
- (12) Turn steering wheel once again in same direction until full turn is made.
- (13) Recheck pressure for just below 900 psi (6205 kPa).
- (14) Return steering wheel to neutral.
- (15) While holding poppet valve adjusting screw, tighten and torque jam nut to 12 - 18 ft lbs (16 - 24 Nm).
- (16) Make adjustment on other poppet valve for full turn in opposite direction. Perform steps (8) - (15) above.
- (17) Shut down engine (TM 9-2320-281-10).
- (18) Remove pressure gage. Apply thread sealant to pressure cap fitting, and reinstall cap on fitting.
- (19) Reinstall poppet valve adjustment screws' dust boots.
- (20) Wipe up fluid spillage.
- (21) Remove thermometer from reservoir.
- (22) Service reservoir to hot full mark (LO 9-2320-281-12).
- (23) Perform road test of steering system (TM 9-2320-281-20).







## CHAPTER 13

## FRAME AND CAB ASSEMBLIES REPAIR

**13-1. INTRODUCTION.**

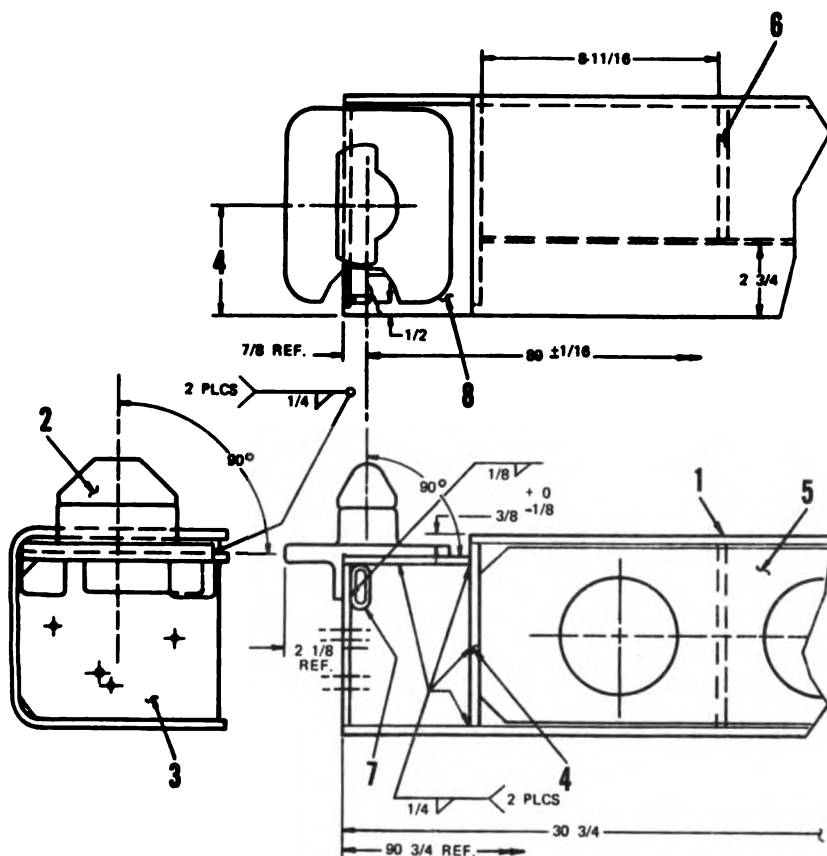
This chapter provides maintenance instructions for the following assemblies:

- a. Frame Assembly (Section I).
- b. Cab Assembly (Section II).

All other frame and cab repairs are covered in organizational technical manual TM 9-2320-281-20.

**Section I. FRAME ASSEMBLY REPAIR**

**13-2. DESCRIPTION.** The frame side rails are heat treated. NO WELDING is permitted as structural failure may result. DO NOT DRILL TOP OR BOTTOM FLANGES. Drilling in web of rail is allowed, provided that spacing between edges of holes is held to at least 1-1/4 in. (31.75 mm) from inside of flange to edge of hole. Damaged frame crossmembers and mount brackets can be replaced but cannot be repaired.

**13-2.1 Replace Twist Locks.****NOTE**

SECURELY WELD ITEM 2 TO ITEM 8 USING DRAWING AS A GUIDE. THE WELDMENTS ARE TO BE IN ACCORDANCE WITH MIL-W-6858.

**LEGEND**

- 1 REAR BOLSTER
- 2 TWIST LOCK PEDESTAL
- 3 END PLATE
- 4 GUSSET
- 5 LIGHT PLATE
- 6 GUSSET
- 7 CHAIN LINK
- 8 BOLSTER END PLATE

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### 13-3. REPAIR REAR FENDERS

#### NOTE

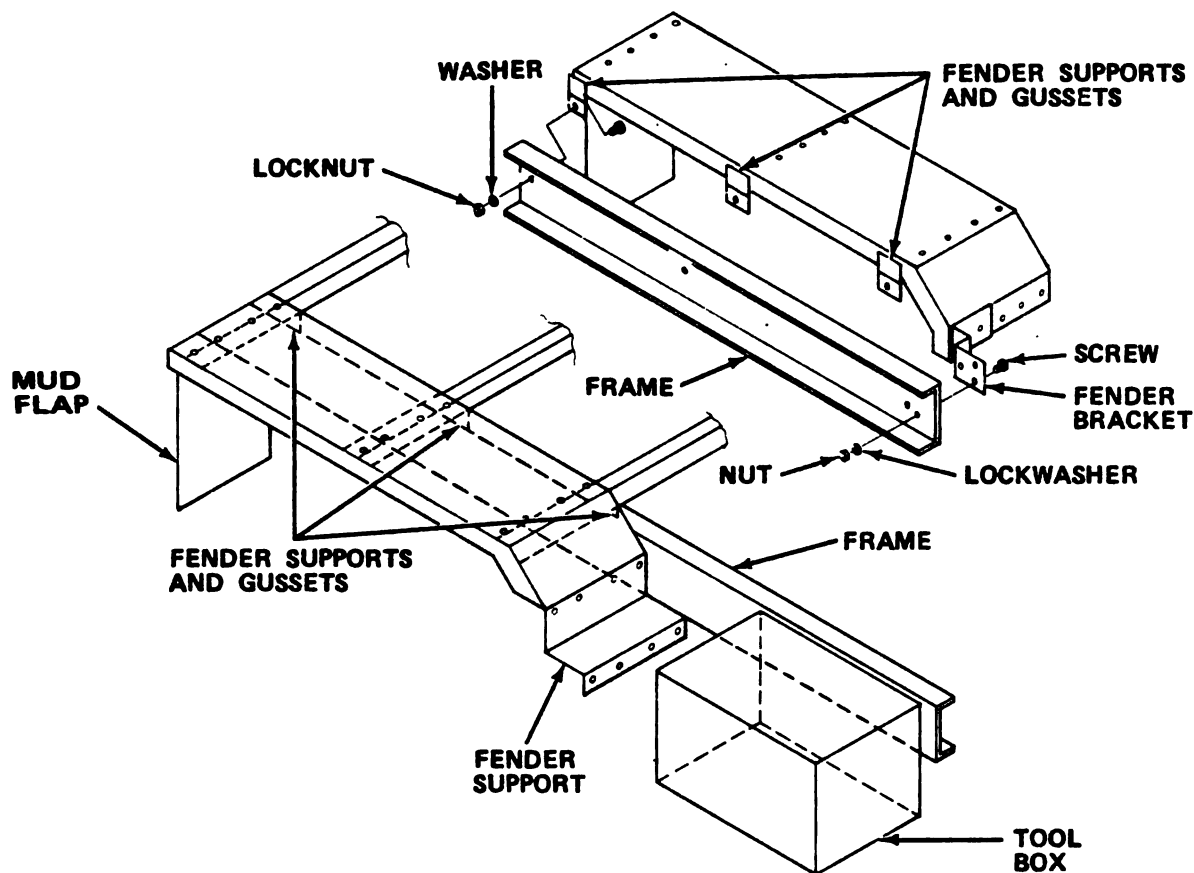
For painting instructions,  
refer to TB 43-0209.

- a. Inspect fenders for dents.
  - (1) Hammer out dents to form a smooth surface.
  - (2) Prepare repaired area for painting.
  - (3) Paint repaired area.
- b. Inspect fenders for scratches.
  - (1) Sand scratches until smooth.
  - (2) Prepare scratched area for painting.
  - (3) Paint scratched area.
- c. Inspect fenders for torn areas.
  - (1) Prepare torn area for welding and weld.
  - (2) Grind repaired area until smooth.
  - (3) Prepare repaired area for painting.
  - (4) Paint required area.
- d. Inspect fenders for missing or broken rivets.
  - (1) Remove old rivet.
  - (2) Install new rivet.



**13-4. REPLACE REAR FENDER ASSEMBLY**

- a. Remove rear fender assembly.



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**NOTE**

The tool box may remain secured to frame during removal and installation of fender assembly.

- (1) Remove rivets securing fender support to tool box.



- (2) Remove screws, lockwashers, and nuts securing fender bracket to frame.
- (3) Remove mud flaps (TM 9-2320-281-20).
- (4) Remove bolts, washers, and locknuts from fender supports and gussets on both left and right fenders.
- (5) Attach lifting device to fender assembly and remove assembly.

b. Install rear fender assembly.

**NOTE**

Use lifting device as needed to assist in aligning fender supports and gussets for reinstallation of attaching hardware.

- (1) With lifting device, position fender assembly on vehicle frame.
- (2) Reinstall bolts, washers, and locknuts securing fender supports and gussets on both left and right fenders to frame.
- (3) Reinstall mud flaps (TM 9-2320-281-20).
- (4) Reinstall screws, lockwashers, and nuts securing fender bracket to frame.

**NOTE**

Capscrews may be used in place of rivets.

- (5) Install rivets or capscrews, lockwashers, and nuts to secure fender support to tool box.
- (6) Remove lifting device.



## Section II. CAB ASSEMBLY REPAIR

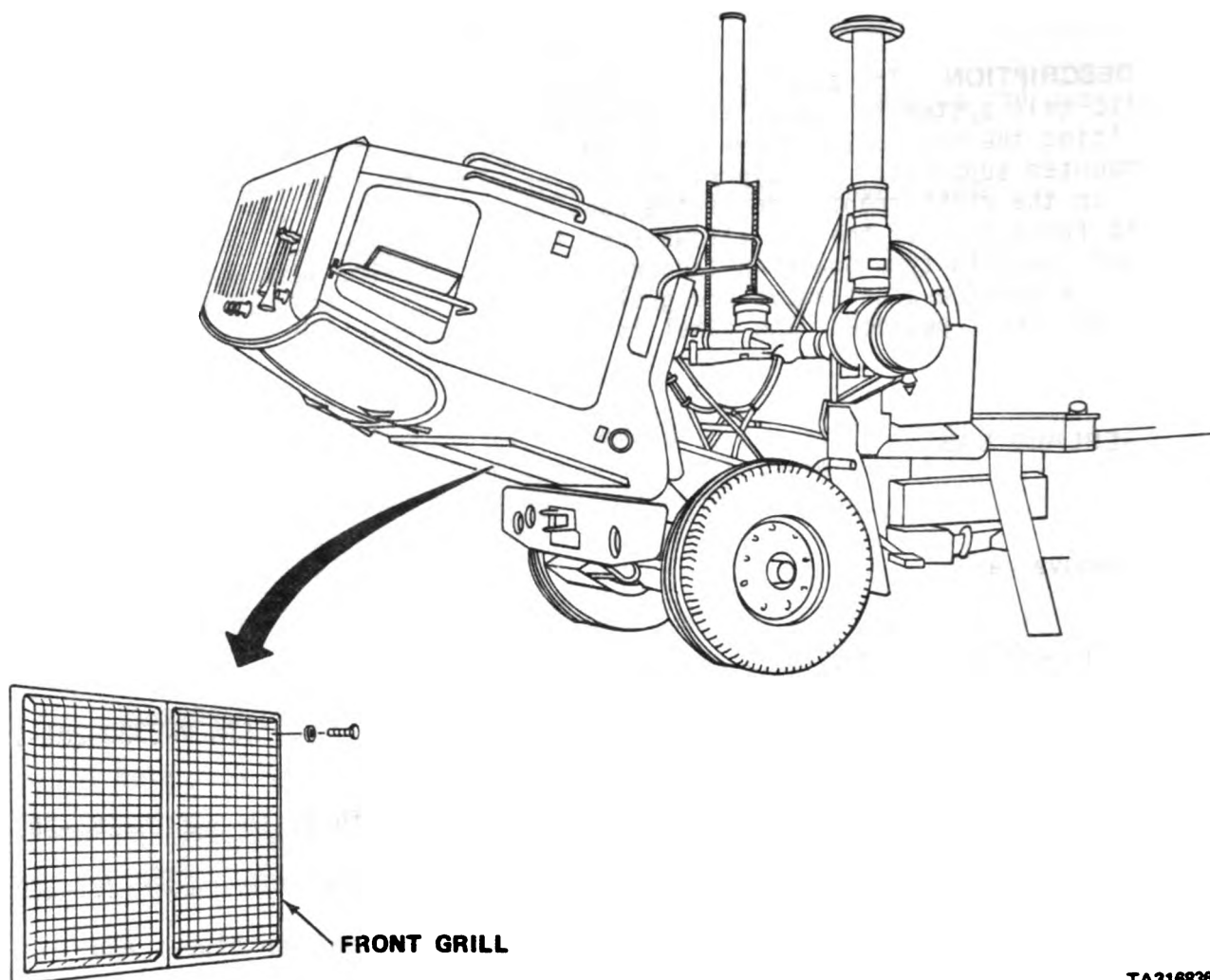
**13-5. DESCRIPTION.** The aluminum and fiberglass cab is a tilt type using a dual ram hydraulic tilt system to assume the cab weight when tilting the cab open as well as when tilting the cab to the drive position. Two pivot pins secure the cab to the frame mounted supports. A louvered ventilator, leading into the cab heater, is located on the right front side of the cab. A manually operated ventilation door on the left front side of the cab allows free flow of outside air into the cab. Grab rails and non-skid type boarding ladders and steps provide safe entry and exit from the cab. A service panel above the grill provides access to the radiator cap and the coolant level petcock. The panel is spring held open for servicing of radiator.

### 13-6. REPLACE CAB

#### a. Remove cab.

- (1) Raise cab (TM 9-2320-281-10).
- (2) Open draincocks on all air tanks and drain to 0 psi (TM 9-2320-281-10).  
Close draincocks.
- (3) Disconnect air lines at truck air center manifold (TM 9-2320-281-20).
- (4) Disconnect negative battery cables from batteries (TM 9-2320-281-20).
- (5) Tag and disconnect wiring at chassis-to-cab junction blocks and connectors.
- (6) Close heater hoses' shutoff valves on engine (TM 9-2320-281-20).
- (7) Disconnect heater hoses (TM 9-2320-281-20).
- (8) Disconnect steering column universal joint (para 12-2).
- (9) Disconnect speedometer and tachometer cables (TM 9-2320-281-20).
- (10) Disconnect throttle (TM 9-2320-281-20) and transmission shift cable (para 7-9).
- (11) Remove mud flaps (TM 9-2320-281-20).
- (12) Partially lower and lock cab to allow removal of grill and installation of lifting fixture (TM 9-2320-281-10).





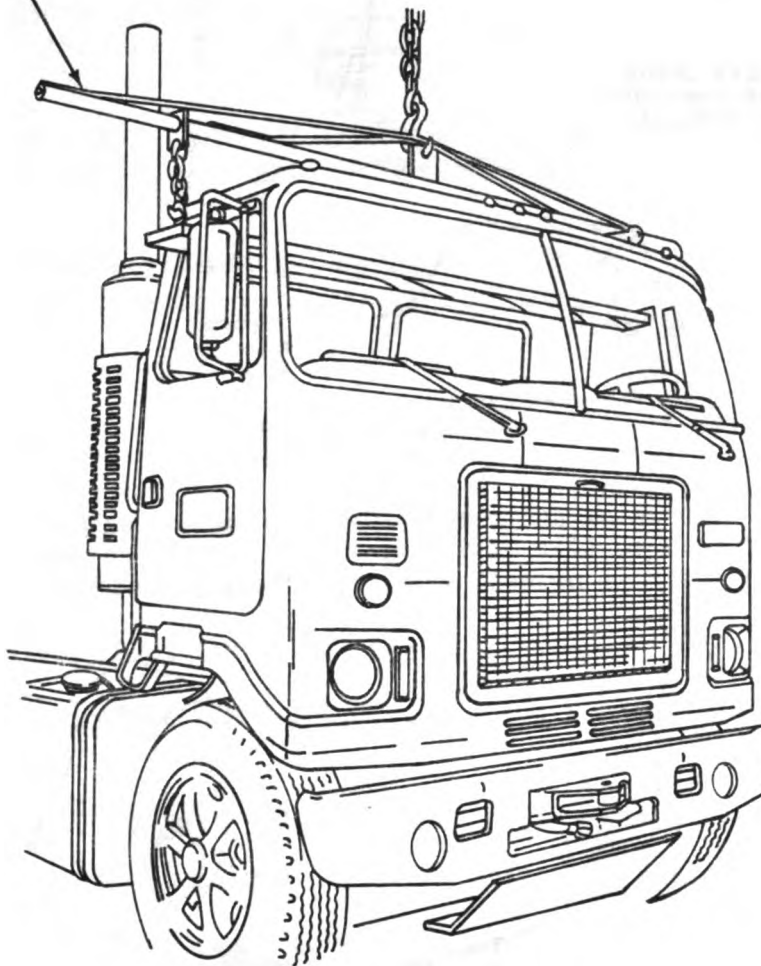
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(13) Remove grill (TM9-2320-281-20).

(14) Close cab doors and open door windows.



LIFTING  
FIXTURE



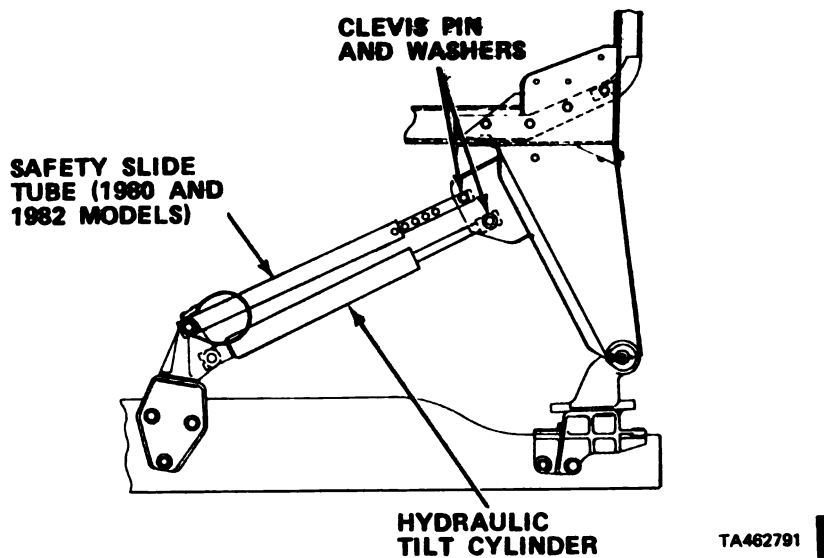
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### WARNING

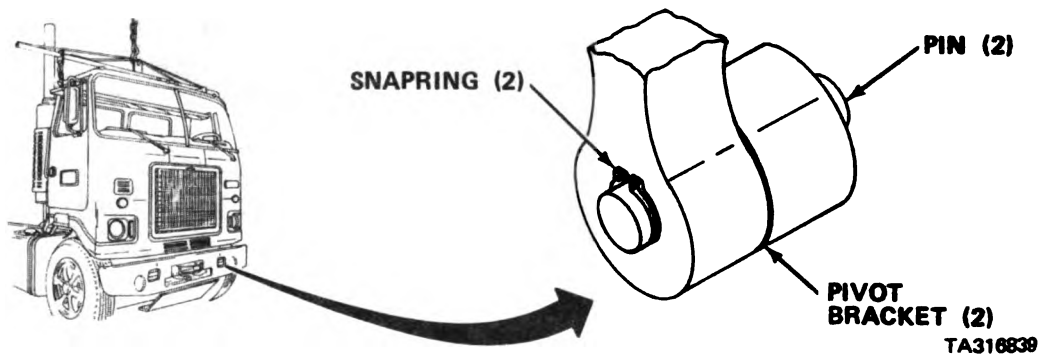
PERSONAL INJURY OR DAMAGE TO EQUIPMENT COULD RESULT IF LIFTING EQUIPMENT IS NOT CENTERED ABOVE CAB AND LIFTING VERTICALLY. HAVE TWO ASSISTANTS (ONE ON EACH SIDE OF CAB) STEADY CAB AS IT IS DISCONNECTED FROM PIVOT BRACKETS. KEEP HANDS CLEAR. DRIVE OUT PINS WITH A LONG DRIFT PUNCH.

- (15) Place lifting fixture (Appendix C) in position. Hoist must have a minimum of one ton capacity. Take up until the hoist is supporting weight of the cab. Remove safety lock pin on the safety slide tube.





- (16) Remove cotter pins and remove clevis pins and washers from ram (upper) end of hydraulic tilt cylinders and safety slide tube. Adjust tension on chain hoist as necessary to facilitate removal.



- (17) Remove snaprings and drive out pins from cab tilt pivot brackets. Adjust tension on chain hoist to facilitate removal.

b. Install cab.

- (1) Close cab doors and open door windows.



**WARNING**

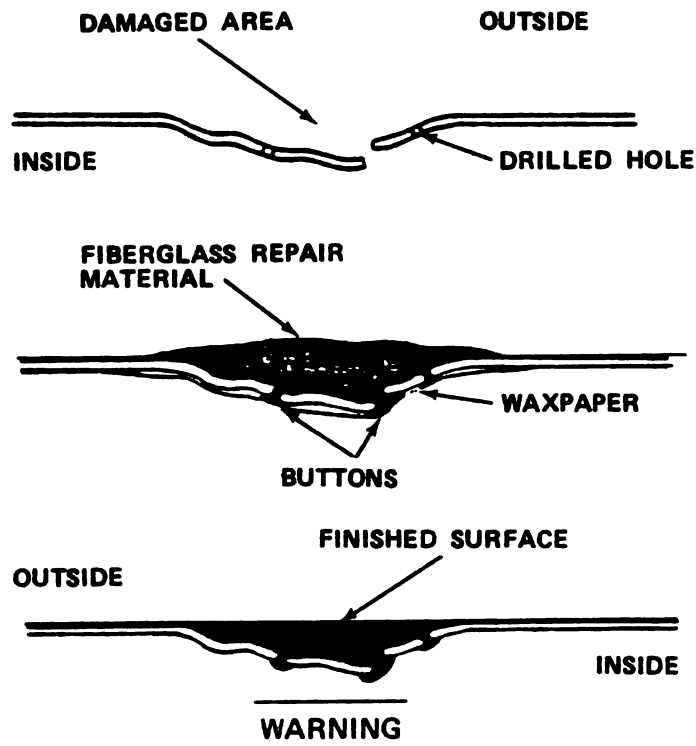
PERSONAL INJURY OR DAMAGE TO EQUIPMENT COULD RESULT IF LIFTING EQUIPMENT IS NOT CENTERED ABOVE CAB AND LIFTING VERTICALLY. HAVE TWO ASSISTANTS (ONE ON EACH SIDE OF CAB) STEADY CAB AS IT IS DISCONNECTED FROM PIVOT BRACKETS. KEEP HANDS CLEAR. DRIVE OUT PINS WITH A LONG DRIFT PUNCH.

- (2) Place lifting fixture and hoist in position. Hoist must have a minimum of one ton capacity.
- (3) Position cab over truck chassis.
- (4) Line up holes and install pins and snaprings in cab tilt pivot brackets.
- (5) Line up hydraulic tilt cylinders and safety slide tube, then insert clevis pins, washers, and cotter pins.
- (6) Install grill (TM 9-2320-281-20).
- (7) Attach mud flaps (TM 9-2320-281-20).
- (8) Connect throttle (TM 9-2320-281-20) and transmission shift cable (para 7-9).
- (9) Connect speedometer and tachometer cables (TM 9-2320-281-20).
- (10) Connect steering column universal joint (para 12-2).
- (11) Connect heater hoses. Open heater shutoff valves on engine (TM 9-2320-281-20).
- (12) Reconnect all electrical wiring and remove tags.
- (13) Reconnect negative battery cables to batteries (TM 9-2320-281-20).
- (14) Reconnect air lines at truck air center manifold.
- (15) Double check tightness of all fittings and connections. Lower cab (TM 9-2320-281-10).
- (16) Start engine and replenish radiator coolant, as required (TM 9-2320-281-10).
- (17) Check all electrical, air, and other systems for proper operation before testing (TM 9-2320-281-10).
- (18) Test drive vehicle (TM 9-2320-281-20).



## 13-7. REPAIR CAB

- a. General. Severe damage to individual aluminum panels or to a complete section of a cab (where a number of panels are involved) will require that they be replaced. Nominal damage to aluminum panels such as dents, deep scratch and gouge marks, and even punctures may be repaired by the use of fiberglass repair material available in kit form. Fiberglass repair resins work well on aluminum, as their co-efficients of expansion are nearly identical and adhesion is very satisfactory, particularly if surface is slightly roughened. A typical repair is described in the following to serve as a guide. The technique may be modified to cover a variety of damage repairs.



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WARNING

P-D-680 SOLVENT IS POTENTIALLY DANGEROUS. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI. USE ONLY WITH EFFECTIVE CHIP GUARDING AND PERSONAL PROTECTIVE EQUIPMENT (GOGGLES, SHIELD, GLOVES, ETC).

WHEN USING PAINT, PAINT THINNER, MINERAL SPIRITS, AND SIMILAR SOLVENTS, AVOID SKIN CONTACT, INHALATION, OR CONDITIONS THAT MAY CAUSE FIRE HAZARDS.

- (1) Remove paint from repair area with thinner, paint remover, or sand paper. Blow clean with compressed air.



- (2) Slightly roughen aluminum surface with wire brush or emery cloth to provide for better adhesion of repair material. In the case of a puncture, bend metal back into position as far as possible in order to reduce actual opening. Blow clean with compressed air. At this stage do not wash with a solvent or cleaner.
- (3) Drill a few 1/8 in. or 3/32 in. (3.175 mm or 2.381 mm) holes in the metal indented area. This will provide adhesion as small "buttons" of fiberglass will form on backside of holes when repair material is troweled on.
- (4) Mix a moderate quantity of fiberglass material (resin and catalyst) in accordance with the instructions in the repair kit. When thoroughly mixed, trowel mixture onto repair area, pressing firmly to force away any air pockets and to be certain that material passes through previously drilled holes. If backside of repair area is accessible, hold a sheet of wax paper or cellophane against surface to aid in formation of bonding "buttons".
- (5) To expedite curing of repair material (resin mix), provide external heat, preferably an infrared lamp, no closer than 12 in. (304.8 mm) from the resin. The high temperature limit for this material is 250°F - 275°F (121°C - 135°C). Any higher temperature could create possible damage to repair material.

#### WARNING

P-D-680 SOLVENT IS POTENTIALLY DANGEROUS. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. KEEP AWAY FROM FLAME OR EXCESSIVE HEAT.

COMPRESSED AIR USED FOR CLEANING PURPOSES WILL NOT EXCEED 30 PSI. USE ONLY WITH EFFECTIVE CHIP GUARDING AND PERSONAL PROTECTIVE EQUIPMENT (GOGGLES, SHIELD, GLOVES, ETC).

WHEN USING PAINT, PAINT THINNER, MINERAL SPIRITS, AND SIMILAR SOLVENTS, AVOID SKIN CONTACT, INHALATION, OR CONDITIONS THAT MAY CAUSE FIRE HAZARDS.

- (6) When fully hard, grind smooth and flush with surrounding area, using a disk sander and no. 36 grit, or finer. Finish with no. 150 emery cloth. Area may now be wiped with lacquer thinner or a high solvent, dried with compressed air, primed, and painted (TB 43-0209).



### 13-8. REPAIR CAB FLOOR

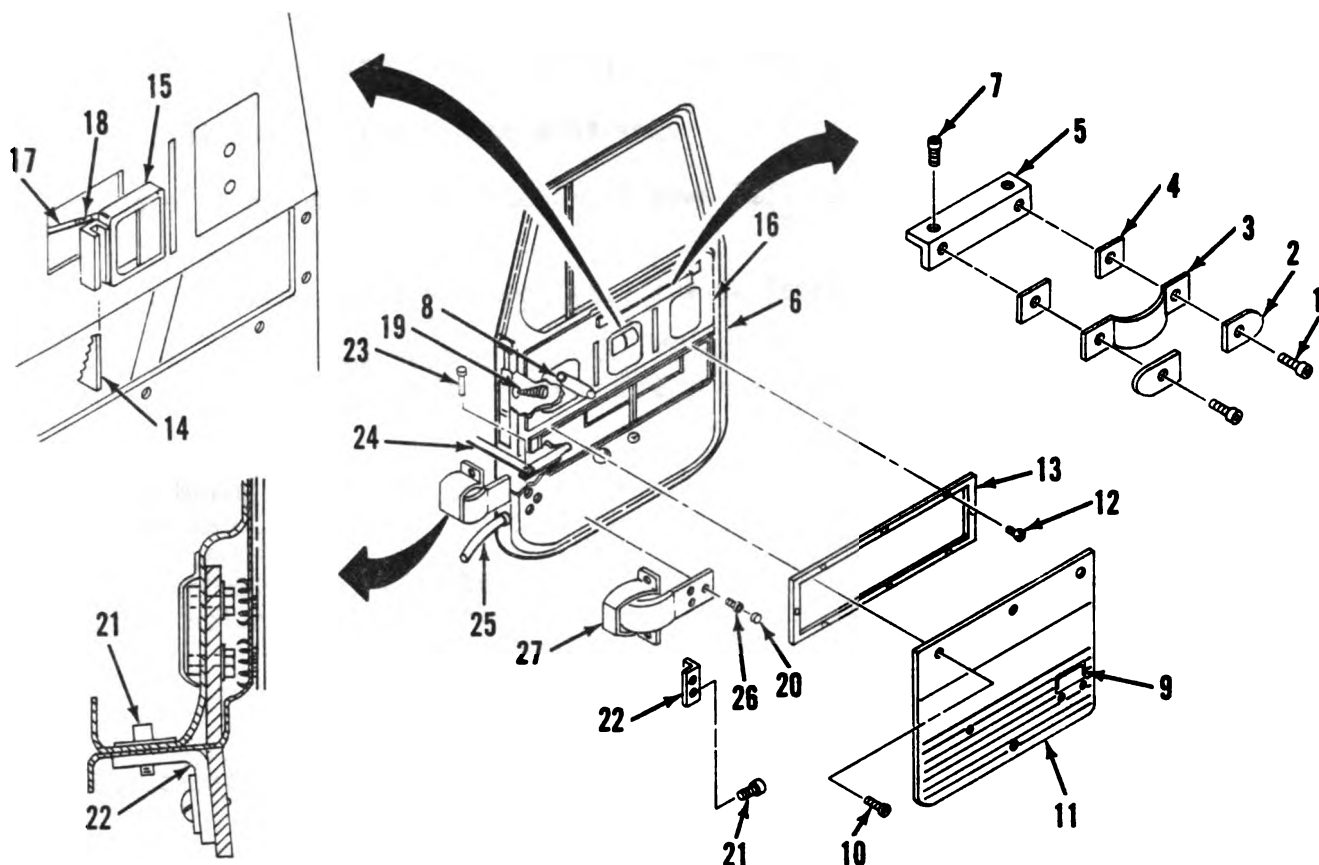
- a. Remove driver's or passenger's seat as applicable (TM 9-2320-281-20).
- b. Measure dimensions of floor.
- c. Cut a patch, same dimensions as floor, from 1/8 in. (3.2 mm) thick aluminum.

#### CAUTION

ENSURE THAT NO OBSTACLES ARE IN WAY UNDER FLOOR WHEN DRILLING SCREW HOLES. DAMAGE TO AIR LINES, ELECTRICAL WIRES, ETC. COULD RESULT.

- d. Fasten patch to floor using self-tapping sheet metal screws. Be sure screws will not project into anything beneath cab.
- e. Reinstall seat (TM 9-2320-281-20).



**13-9. REPLACE DOOR****a. Remove door.****LEGEND:**

- |                            |                                 |
|----------------------------|---------------------------------|
| 1. Sockethead Capscrew (2) | 15. Inside Door Handle Assembly |
| 2. End Cap (2)             | 16. Upper Trim Panel            |
| 3. Pull Strap              | 17. Latch Link Rod              |
| 4. Spacer (2)              | 18. Clip                        |
| 5. Armrest                 | 19. Plastic Retainer            |
| 6. Door                    | 20. Plug (6)                    |
| 7. Sockethead Capscrew (2) | 21. Sockethead Capscrew (4)     |
| 8. Window Crank Handle     | 22. Hinge Reinforcement (2)     |
| 9. Courtesy Light Fixture  | 23. Pin                         |
| 10. Screw (8)              | 24. Door Stop Slider            |
| 11. Lower Trim Panel       | 25. Electrical Lead             |
| 12. Screw (8)              | 26. Capscrew (6)                |
| 13. Door Access Panel      | 27. Hinge (2)                   |
| 14. Key (Wedge) (2)        |                                 |

(1) Remove sockethead capscrews (1) securing end caps (2), door pull strap (3), spacers (4), and armrest (5) to door (6).



- (2) Remove end caps (2), door pull strap (3) and spacers (4).
- (3) Remove sockethead capscrews (7) securing top of armrest (5) to door (6) and remove armrest (5).
- (4) Remove window regulator crank handle (8). (TM 9-2320-281-20).
- (5) Remove door courtesy light fixture (TM 9-2320-281-20).
- (6) Remove screws (10) securing lower trim panel (11) to door (6).
- (7) Pull lower trim panel (11) away from door (6) far enough to expose door access panel screws (12).
- (8) Remove door access panel screws (12) and door access panel (13).
- (9) Reach through door access panel opening in door and remove retaining keys (wedges) (14) securing inside door handle assembly (15) to door (6).
- (10) Pull inside door handle assembly (15) out of upper trim panel (16) far enough to expose latch link rod (17).
- (11) Disengage clip (18) securing latch link rod (17) to inside door handle assembly (15) and disconnect latch link rod (17) from inside door handle assembly (15).
- (12) Remove inside door handle assembly (15).
- (13) Carefully pry on upper trim panel (16) until plastic retainers (19) which secure upper trim panel (16) are free of door (6).
- (14) Remove hinge capscrew plugs (20).
- (15) Remove sockethead screws (21) securing hinge reinforcement (22) to door (6).
- (16) Remove pin (23) from door stop slider (24).
- (17) Pull door courtesy light electrical lead (25) out from door (6).

#### WARNING

PERSONAL INJURY AND DAMAGE TO DOOR WILL RESULT IF DOOR IS NOT SUPPORTED WHEN HINGES ARE BEING UNBOLTED. USE AN OVERHEAD HOIST TO TAKE THE WEIGHT OFF THE HINGES.

- (18) Adjust tension on overhead hoist to provide support for door to take weight off hinges.

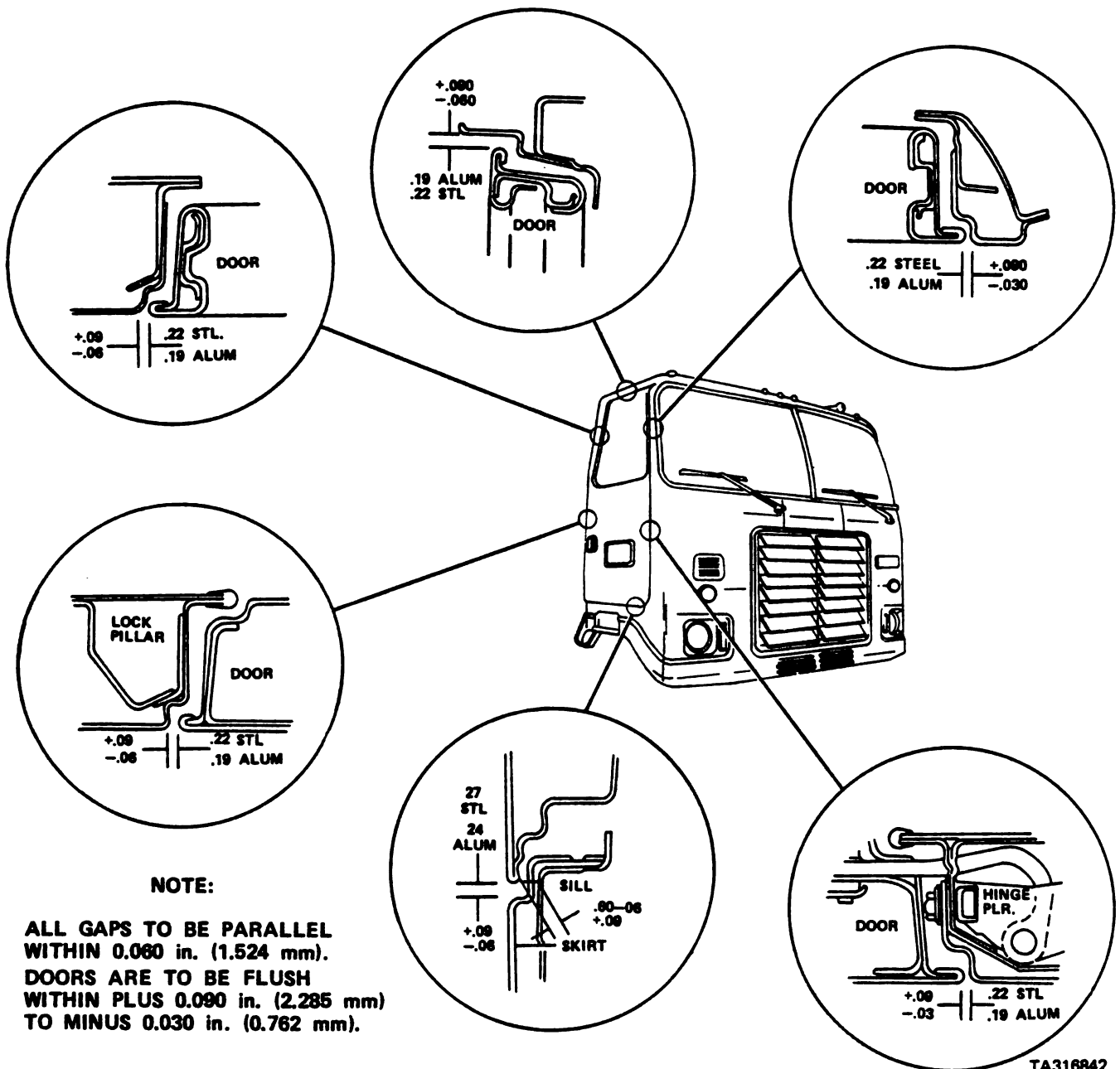


(19) Remove hinge capscrews (26) from door and remove door (6).

(20) If necessary to replace hinges, remove bolts from door jam and remove hinges (27).

**b. Install door.**

(1) Assemble replacement door (6) to hinges (27) with capscrews (26). Tighten bolts only enough to hold door in stable position, yet still allow door to be adjusted with a rubber mallet or with your hands.



(2) Adjust door (6) so that clearances are as shown. Tighten hinge capscrews (26) and check clearances again.

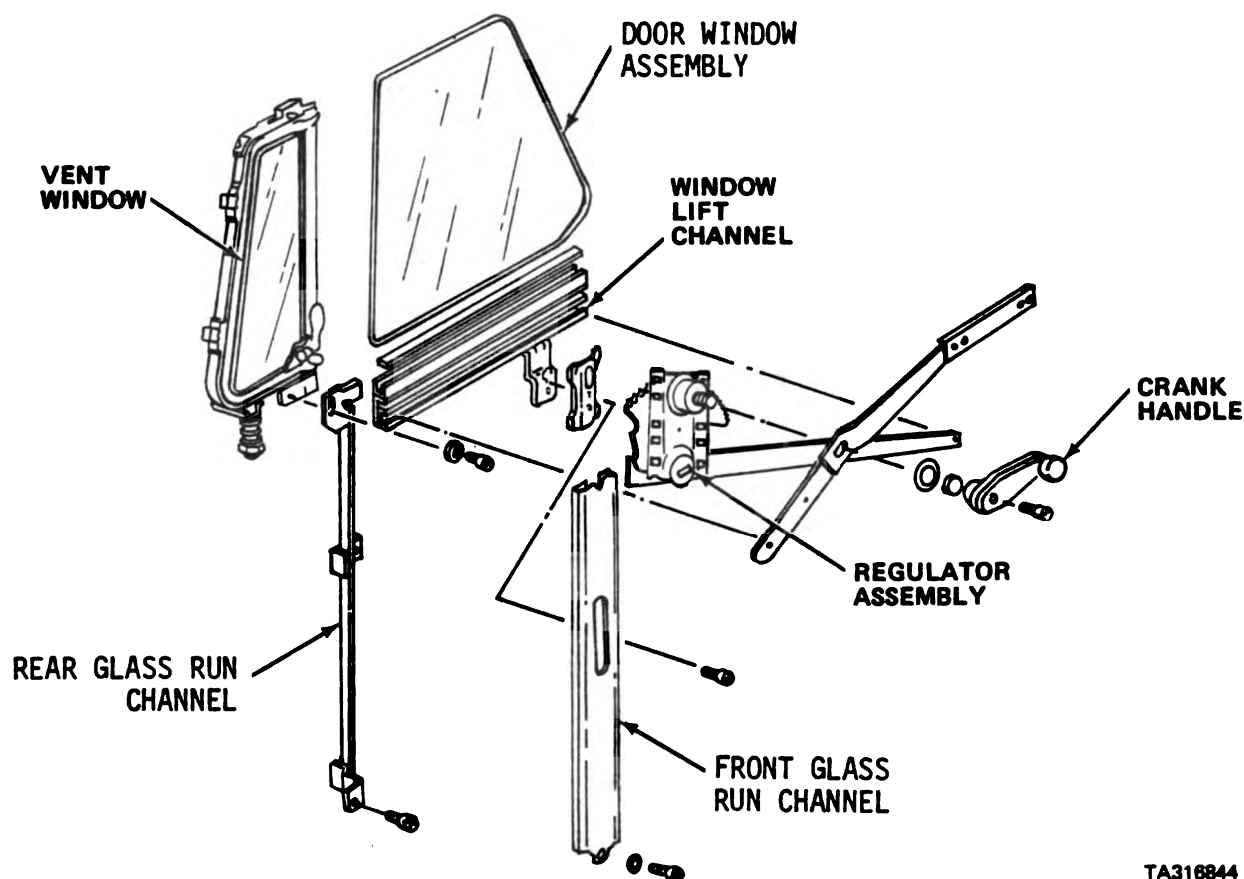


- (3) Install hinge reinforcement sockethead capscrews (21) and tighten.
- (4) After hinge adjustments have been made, check striker-to-latch jaws contact. Striker should contact center of latch jaws to prevent door from being lifted or forced downward when it is closed.
- (5) If adjustment is necessary, loosen the 12-point 3/4-in. (19.05 mm) striker bolt and then loosen the two sockethead screws.
- (6) Move striker assembly as necessary. Partially tighten screws and striker bolt and check adjustment. First be sure up-and-down adjustment is correct before making in-and-out adjustment.
- (7) Tighten two sockethead screws before tightening striker bolt.
- (8) Insert door courtesy light electrical lead (25) through door.
- (9) Insert pin (23) in door stop slider (24).
- (10) Install hinge capscrew plugs (20) in door.
- (11) Secure upper trim panel (16) (with lower trim panel (11) attached) to door with plastic retainers (19).
- (12) Engage link rod (17) with inside door handle assembly (15) and secure rod to handle assembly with clip (18).
- (13) Push inside door handle assembly (18) into door (6) and secure handle assembly to door with wedges (14).
- (14) Secure door access panel (13) to door (6) with screws (12).
- (15) Secure lower trim panel (11) to door (6) with screws (10).
- (16) Install door courtesy light fixture (9) (TM 9-2320-281-20).
- (17) Install window regulator crank handle (8) (TM 9-2320-281-20).
- (18) Secure top of armrest (5) to door (6) with sockethead capscrews (7).
- (19) Secure armrest (5), spacers (4), door pull strap (3), and end caps (2) to door with sockethead capscrews (1).



**13-10. REPLACE DOOR WINDOW ASSEMBLY****a. Remove door window assembly.**

- (1) Remove window regulator crank handle (TM 9-2320-281-20).
- (2) Remove door courtesy light (TM 9-2320-281-20).
- (3) Remove door pull strap, armrest, door access panel, inside door handle assembly, upper trim panel, and lower trim panel (para. 13-9).
- (4) Temporarily install window regulator crank handle and lower door window.



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- (5) Remove mounting screws and remove window lift channel and front and rear glass run channels.
- (6) Remove mounting screws and remove window regulator assembly.
- (7) Remove door window assembly.



b. Install door window assembly.

- (1) Install front glass run channel and slider on new window and window lift channel.
- (2) Install window, lift channel, and regulator assembly in door. Allow window to rest in down position.
- (3) Bolt channel and regulator in place.
- (4) Assemble window regulator assembly to window lift channel.
- (5) Temporarily put crank handle on regulator and wind regulator to down position.
- (6) Operate window throughout its travel to ensure smooth operation.
- (7) Adjust vertical channel, if necessary, with securing bolts.
- (8) Install inside door handle assembly, door access panel, upper trim panel, lower trim panel, armrest, and door pull strap.
- (9) Install door courtesy light (TM 9-2320-281-20).
- (10) Install window crank handle (TM 9-2320-281-20).



**13-11. REPLACE VENT WINDOW****a. Remove vent window.**

- (1) Remove door window (para 13-10).
- (2) Remove inner and outer weatherstrips from bottom of window frame.
- (3) Pry upper end of glass run channel out of top of window frame.
- (4) Remove three ventilator window retaining screws from outside edge of door.
- (5) Lift top of ventilator window toward rear of door and remove ventilator window and channel run assembly.

**b. Install vent window.**

- (1) Position new ventilator window in door. Firmly seat it in the front edge of door.
- (2) Reinstall three ventilator window retaining screws at outside edge of door.
- (3) Reinstall glass run channel for door window.
- (4) Reinstall inner and outer weatherstripping at bottom of window frame.
- (5) Reinstall door window (para 13-10).
- (6) Ventilator window pivot shaft clamp pressure can be adjusted, if necessary, by turning adjusting screw to increase or decrease the grip of the clamp.

**NOTE**

For passenger door visibility window replacement, see para 13-13.



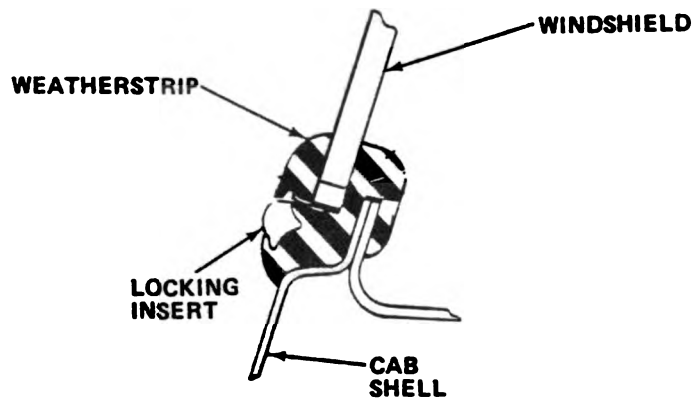
## 13-12. REPLACE WINDSHIELD

- a. Remove windshield.

### WARNING

USE EXTREME CARE WHEN HANDLING GLASS. ALWAYS WEAR SUITABLE EYE PROTECTION TO PREVENT EYE INJURIES FROM FINE CHIPS WHEN REMOVING AND INSTALLING WINDSHIELD OR REAR WINDOWS.

- (1) Remove windshield wiper arms and blades (TM 9-2320-281-20).

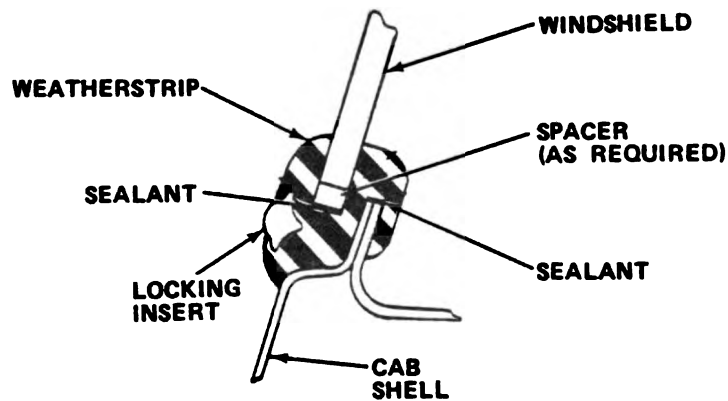


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- (2) Disengage windshield weatherstrip locking insert to free glass.

- (3) Remove windshield by working out of weatherstrip groove. Remove weatherstrip if unserviceable.

- b. Install windshield.



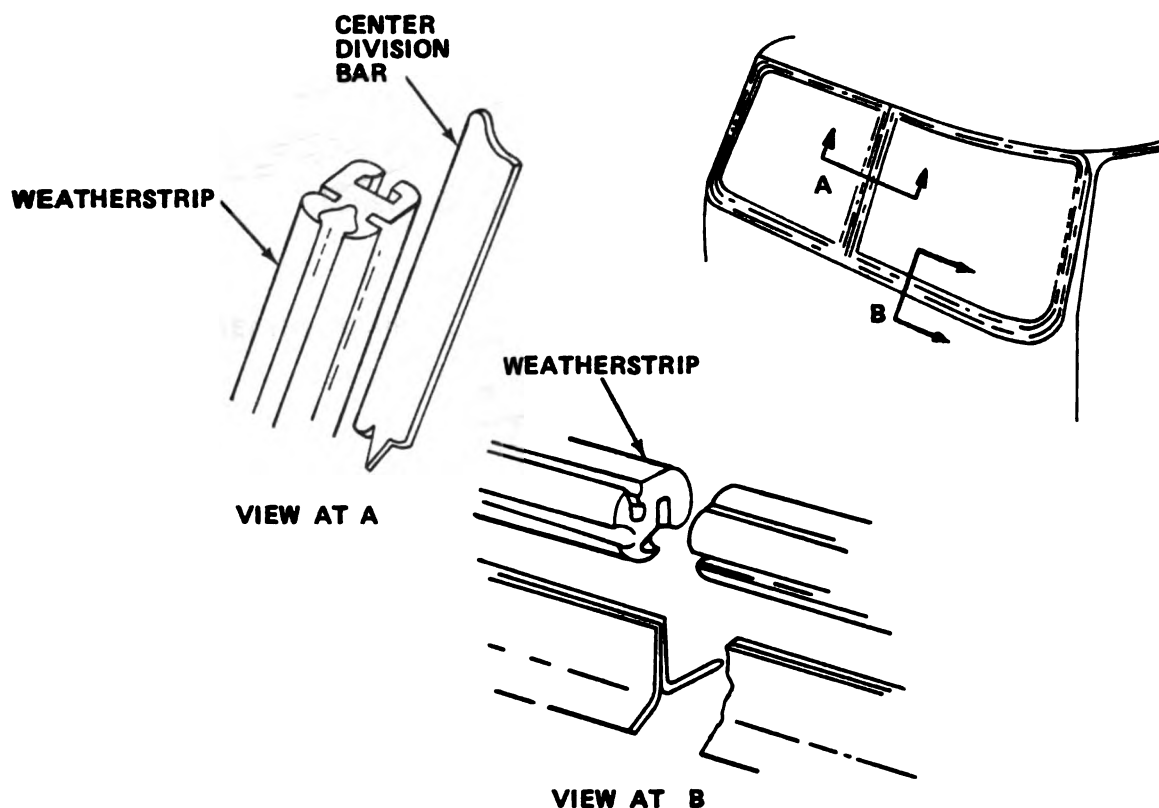
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**NOTE**

To obtain a more perfect fit and optimum sealing, slight variations in height of each windshield opening should be compensated for through use of spacers placed in the windshield grooves of weatherstripping prior to installing windshield. These spacers, 0.190 and 0.250 in. (4.83 and 6.35 mm) thick and 0.250 in. (6.35 mm) wide, are available for use on an "as required" basis.

If weatherstrip was removed, measure windshield opening from top to bottom in a number of places to determine extent and location of variations. The thickness, length, and positioning of the spacer strips can then be based on measurements taken.

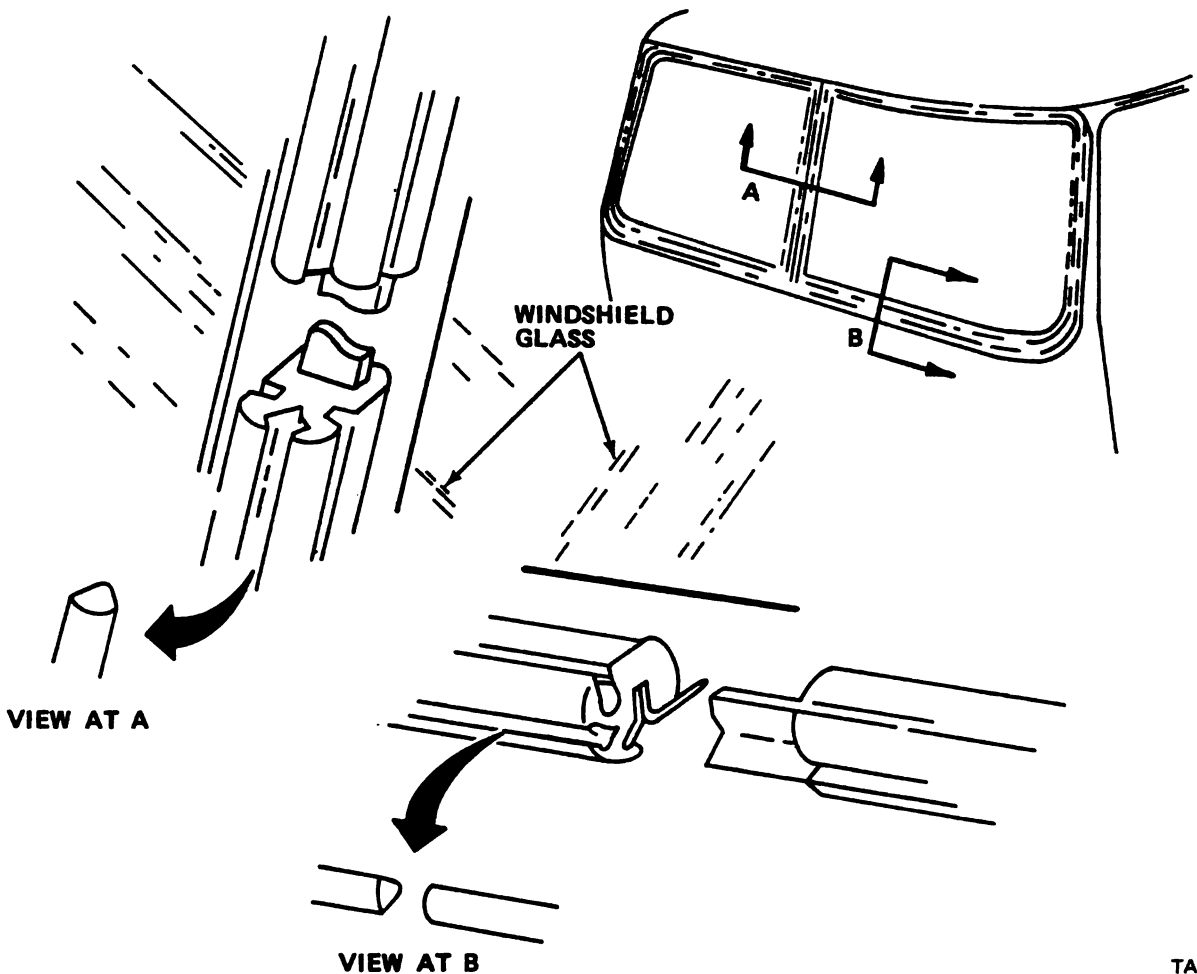


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- (1) Coat cab groove of weatherstrip with sealant. Install new weatherstrip by first feeding the center section over the edges of center division bar. Then seat the right and left sections over the edges of windshield opening. Be sure weatherstrip is firmly seated at all points around windshield opening so as to prevent leakage.
- (2) Coat glass grooves of weatherstrip with liquid soap.



- (3) Position left-hand glass in grooves of windshield weatherstrip as shown. Then push glass through the grooves until it seats in the center divider weatherstrip groove.
- (4) Work top, bottom, and end edges of glass into weatherstrip. Then push against glass with palm of hand following along as screwdriver is moved. Repeat steps (3) and (4) when installing right-hand glass.
- (5) Run a light bead of glass sealer between weatherstrip and body and between weatherstrip and glass.



TA316848

- (6) Install locking insert in weatherstrip.



**13-13. REPLACE REAR WINDOW OR PASSENGER DOOR VISIBILITY WINDOW**

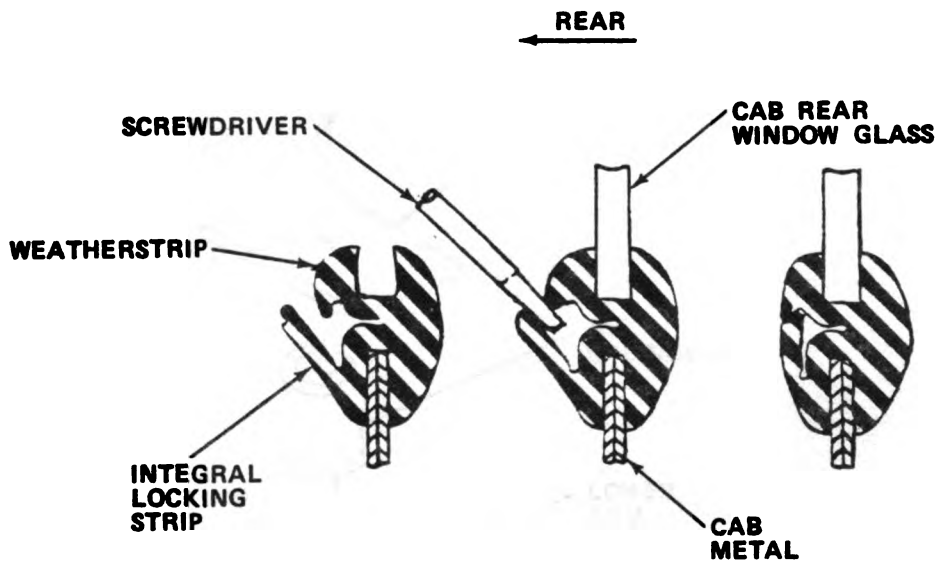
- a. Remove rear window or passenger door visibility window.

**WARNING**

USE EXTREME CARE WHEN HANDLING GLASS. ALWAYS WEAR SUITABLE EYE PROTECTION TO PREVENT EYE INJURIES FROM FINE CHIPS WHEN REMOVING AND INSTALLING WINDSHIELD OR REAR WINDOWS.

**NOTE**

The rear window and passenger door visibility window are mounted in a special type weatherstrip which has an integral locking strip.



TA316849

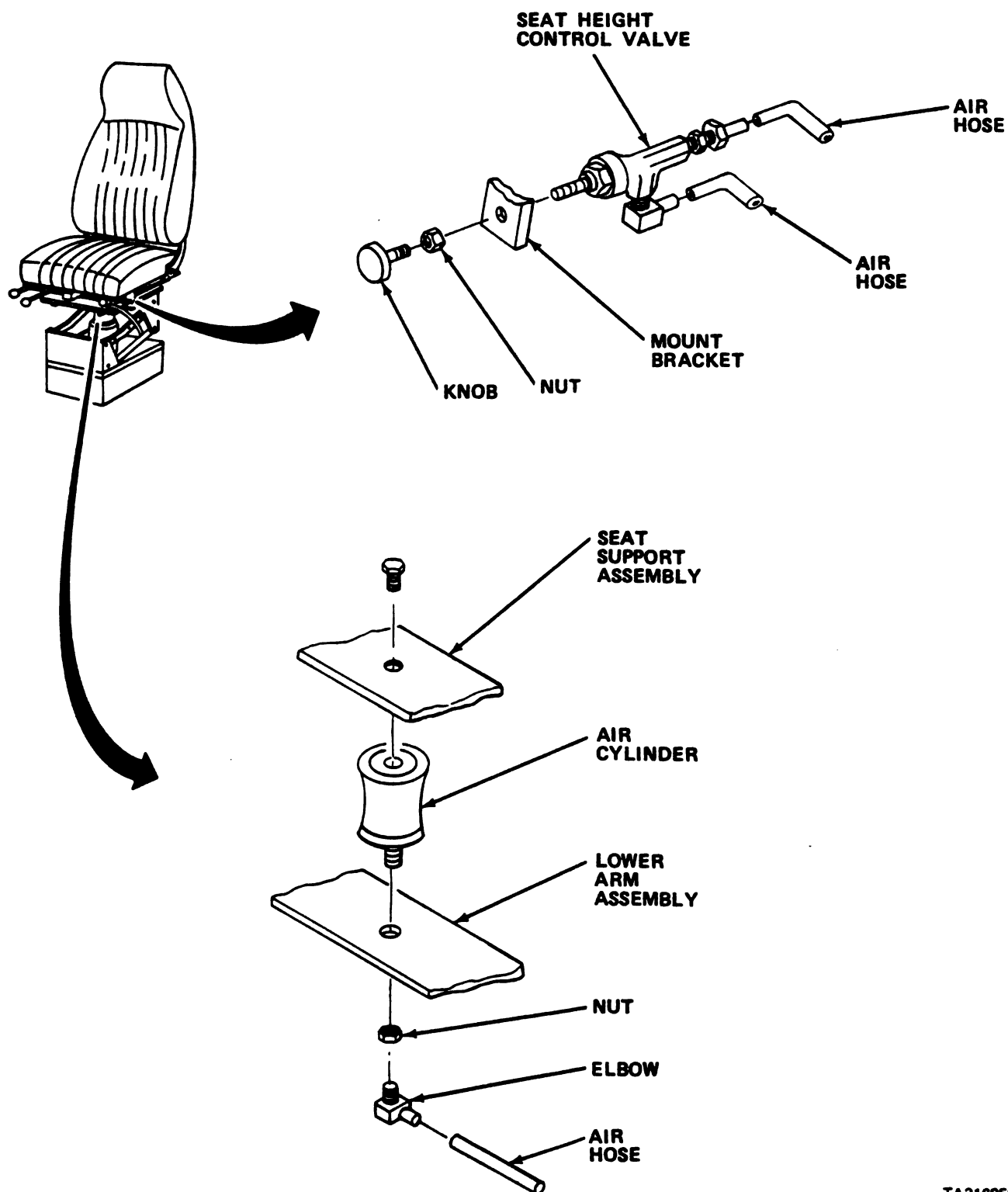
- (1) Loosen integral locking strip all around glass.
- (2) Remove window by working it out of weatherstrip groove.
- (3) Remove weatherstrip, if unserviceable.
- (4) If new strip is required, coat groove which fits over window frame with sealant and install strip. Be sure it is firmly seated all around.
- (5) Coat glass grooves of strip with liquid soap.



- (6) Start glass in grooves at one side of opening, and slide glass in grooves until edge of glass seats in strip on other side.
- (7) Very carefully, use a screwdriver or a dull knife to seat glass in remainder of strip.
- (8) Use a screwdriver or a dull knife to fully seat integral locking strip.
- (9) Run a light bead of glass sealer between the weatherstrip and cab body and between weatherstrip and glass.
- (10) Clean window(s).



## 13-14. REPAIR DRIVER'S SEAT



a. Replace air spring.

TA316850



- (1) Disconnect air line from elbow at bottom of spring. Remove elbow.
- (2) Remove nut from bottom of spring.
- (3) Remove bolt from top of spring.
- (4) Remove spring.
- (5) Install new spring with bolt at top.
- (6) Reinstall nut and elbow at bottom.
- (7) Coat air line fitting with thread sealant and reconnect air line. Test seat.
- (8) Start engine and charge air systems to 120 psi (828 kPa) (TM 9-2320-281-10).
- (9) Perform operational and leak check of air spring (TM 9-2320-281-10).

b. Replace seat height control valve.

- (1) Open draincocks on all air tanks and bleed pressure to 0 psi (TM 9-2320-281-10).
- (2) Disconnect air lines from seat height control valve.
- (3) Remove knob, nut, and valve.
- (4) Install valve, nut and knob.
- (5) Coat air lines' fittings with thread sealant and reconnect air line.
- (6) Start engine and charge air systems to 120 psi (828 kPa) (TM 9-2320-281-10).
- (7) Perform operational and leak check of seat height control valve (TM 9-2320-281-10).



## CHAPTER 14

### SUSPENSION SYSTEM REPAIR

**14-1. INTRODUCTION.** This chapter provides maintenance instructions for the following suspension system components:

- a. Front Spring Assembly (Section I)
- b. Air Bags Support Bracket Assembly (Section II)
- c. Equalizer Beam and Beam Mount Bracket (Section III)

#### Section I. FRONT SPRING ASSEMBLY

**14-2. DESCRIPTION.** The front springs are semi-elliptical type. The spring leaves are held together with rebound clips and a bolt through the center. They are anchored to a stationary bracket at the front and shackled at the rear to the vehicle's frame mounted brackets. Floating washers are provided at each end of the spring eye to increase the lateral load bearing surface. Washers of varying thicknesses are available to compensate for wear. The top spring clip plate has a hole to attach a shock absorber. Spring clips (U-bolts) secure springs to axle center (I beam). Lube fittings are provided for periodic lubrication of springs.

#### 14-3. REPLACE FRONT SPRING

- a. Remove front springs.

- (1) Place vehicle on level surface and chock rear wheels.
- (2) Remove front bumper (TM 9-2320-281-20).

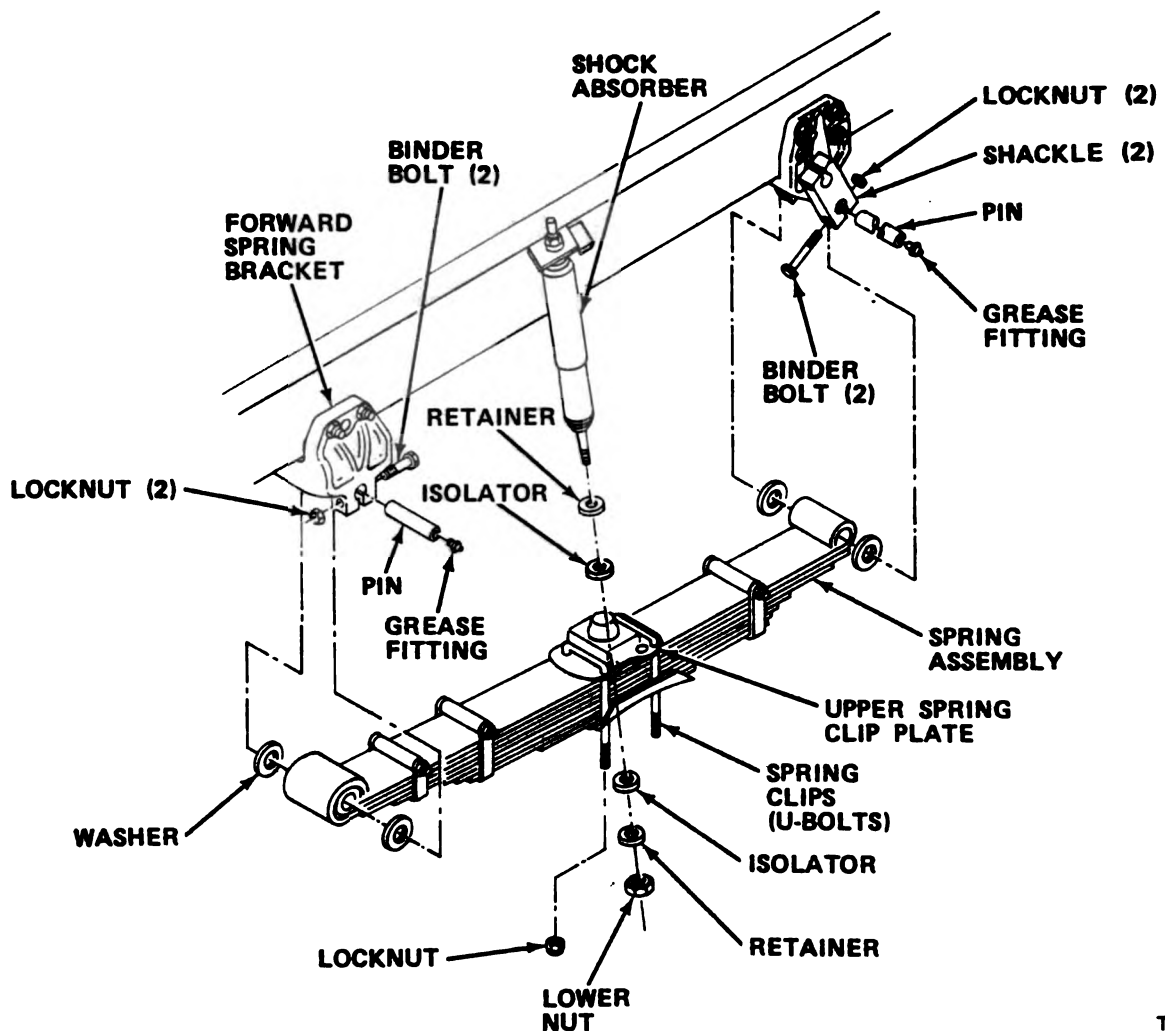
#### WARNING

HYDRAULIC JACK IS INTENDED FOR LIFTING THE TRUCK,  
NOT FOR SUPPORTING THE VEHICLE WHEN PERFORMING  
MAINTENANCE. DO NOT GET UNDER TRUCK UNLESS IT IS  
PROPERLY SUPPORTED WITH BLOCKS OR JACK STANDS.

- (3) Raise vehicle with lifting device and place jack stands under frame.
- (4) Place lifting device under axle.



(5) Raise axle enough to release pressure from springs.



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- (6) Remove lower nut, retainer, and isolator from shock absorber.
- (7) Compress shock absorber and remove lower end from spring clip plate.
- (8) Remove U-bolts from axle.
- (9) Remove upper spring clip plate.
- (10) Carefully lower axle until spring is clear of axle.
- (11) Place jack stands under axle for additional support.



**WARNING**

BE SURE THAT SPRING IS SECURELY SUPPORTED TO PREVENT PERSONAL INJURY.

- (12) Support spring at each end with device before removing attaching bolts.
- (13) Remove locknuts and tap binder bolts out of front support bracket.

**NOTE**

If right-hand spring to be removed, disconnect power steering cylinder (ram) from forward spring truck mount (TM 9-2320-281-20).

- (14) Remove grease fittings from pins. Plug fitting hole to prevent contamination.

**NOTE**

Washers between spring end and spring mount bracket may fall out at this time.

- (15) With drift pin, drive out pin from front bracket.
- (16) Remove locknuts and tap binder bolts out of rear shackle.

**NOTE**

Washers between spring end and spring shackle may fall out at this time.

- (17) With drift pin, drive pin out of shackle.
- (18) Carefully lower spring clear of vehicle.
- (19) Remove washers (if still installed).



b. Install front springs.

- (1) While supporting spring, position rear of spring, with new washers, into shackles.

**NOTE**

End play should be kept to a minimum with free action of spring shackles.

- (2) Check end play at spring attach point. If play is too great, use thicker washers to reduce play. If too tight, use thinner washers.
- (3) Coat pin with oil and install into shackles.
- (4) Rotate pin until its groove aligns with binder bolt holes.
- (5) Coat binder bolts with oil and install. Secure with locknuts.
- (6) Position front of spring, with new washers, in front spring bracket.
- (7) Check end play and use appropriate size washers to establish minimum play.
- (8) Coat pin with oil and install in spring bracket. Align pin grooves with binder bolt holes.
- (9) Coat binder bolts with oil and install. Secure with locknuts.
- (10) Remove lifting device from spring.
- (11) Install grease fittings in shackle pin and forward spring bracket pin.
- (12) Raise axle with lifting device to mate with spring.
- (13) Install upper spring clip plate.
- (14) Install U-bolts through spring clip plate and holes in axle.
- (15) Apply load to axle with lifting device to partially compress springs.
- (16) Apply oil to U-bolt threads and secure U-bolts with locknuts.



**CAUTION**

MAKE SURE THAT LOCKNUTS ARE DRAWN TIGHT AN EQUAL AMOUNT ON ALL U-BOLTS. ABOUT THE SAME NUMBER OF THREADS SHOULD SHOW ON ALL U-BOLTS WHEN NUTS ARE SEATED AND TORQUED.

- (17) If 3/4-16 locknuts are installed, torque to 270 - 290 ft lbs (366 - 393 Nm). If 5/8-18 locknuts are installed, torque to 150 - 170 ft lbs (203 - 230 Nm).
- (18) Remove jack stands and lifting device from under axle.
- (19) Raise vehicle, remove frame jack stands, and lower vehicle to ground.
- (20) Reinstall front bumper (TM 9-2320-281-20).
- (21) Remove wheel chocks.

**Section II. AIR BAG SUPPORT BRACKET ASSEMBLY****14-4. REPLACE AIR BAG SUPPORT BRACKET ASSEMBLY**

- a. Remove air bag support bracket assembly.

**NOTE**

Air bag support bracket assembly consists of a brace and mounting plate assembly.

- (1) Inflate air bags to maximum height (TM 9-2320-281-10).
- (2) Install jack stands under frame near air bag.
- (3) Slowly deflate air bags (TM 9-2320-281-10) until frame is resting on stands, then continue to deflate until all air is removed from air bag.

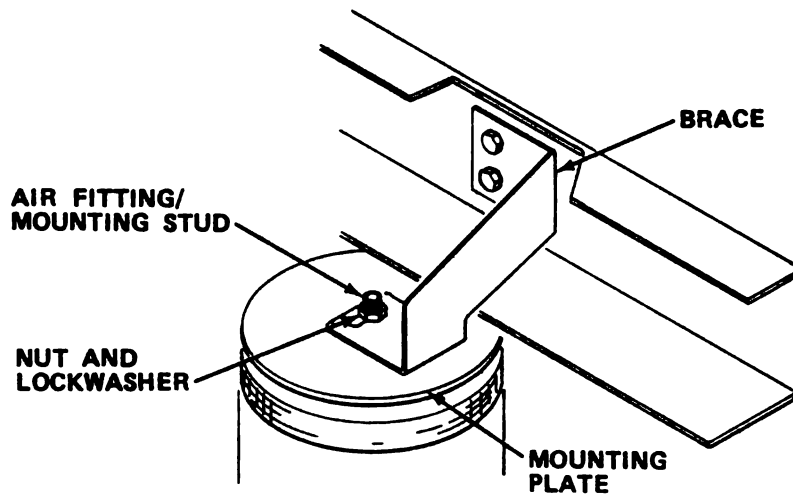


**NOTE**

The rear rear axle air bag contains a tee fitting with two air lines.

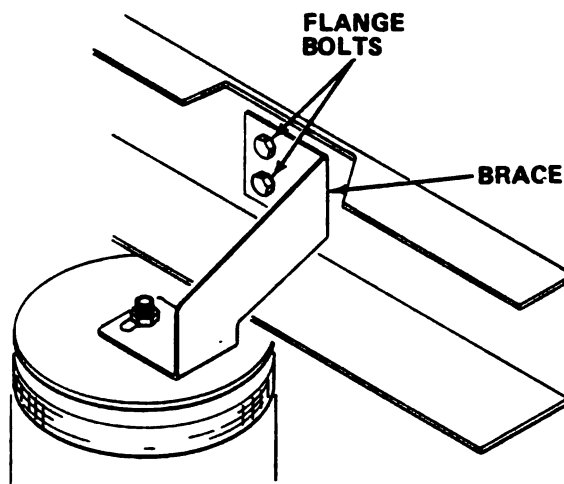
Inner air line fitting/mounting stud also contains a lockwasher and nut which secures brace to air bag upper mounting plate.

- (4) Remove air line(s) and tee fitting (if required) from inner air fitting/mounting stud.



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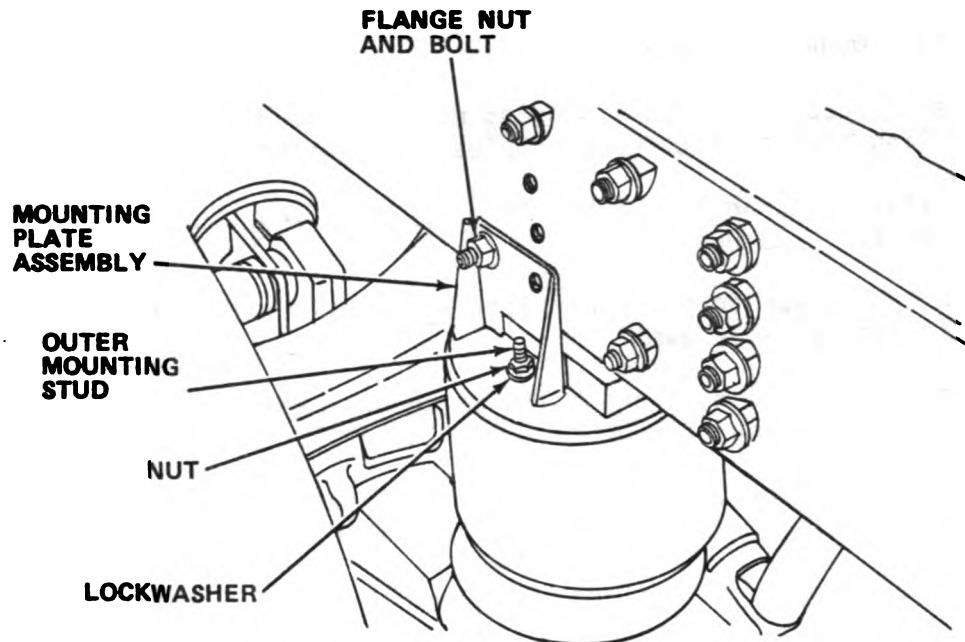
- (5) Remove nut and lockwasher from fitting/mounting stud.



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- (6) Remove flange nuts and bolts from brace and remove brace.





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- (7) Remove flange nut and bolt from mounting plate assembly.
- (8) Remove nut and lockwasher from outer mounting stud.

### **CAUTION**

WHEN LOWERING/RAISING AIR BAG, BE SURE OUTER MOUNTING STUD AND INNER AIR FITTING/MOUNTING STUD EXIT MOUNTING PLATE HOLES WITHOUT HITTING, OR DAMAGE TO THREADS MAY RESULT.

- (9) Lower air bag enough to allow outer mounting stud and inner air fitting/mounting stud to clear mounting plate assembly.
- (10) Remove mounting plate assembly.



b. Install air bag support bracket assembly.

- (1) Lower air bag enough to allow installation of mounting plate.
- (2) Install mounting plate.
- (3) Raise air bag to allow its outer mounting stud and inner air fitting/mounting stud to fit through holes in mounting plate.
- (4) Reinstall nut and lockwasher to outer mounting stud; torque to 20 - 25 ft lbs (27 - 33 Nm).
- (5) Reinstall brace to inner air fitting/mounting stud; torque to 20 - 25 ft lbs (27 - 33 Nm).
- (6) Reinstall flange nuts and bolts to secure brace and mounting plate assembly to frame; torque to 160 - 180 ft lbs (217 - 244 Nm).
- (7) Apply thread sealant and reinstall tee fitting (if required) and air line(s) to inner air fitting/mounting stud.
- (8) Inflate air bags to maximum height (TM 9-2320-281-10).
- (9) Remove jack stands.
- (10) Deflate air bags to desired operating height (TM 9-2320-281-10) and check for air leakage at connections.



**Section III. EQUALIZER BEAM AND BEAM MOUNT BRACKET****145. REPLACE EQUALIZER BEAM****NOTE**

There are two equalizer beams per axle. These procedures apply to both axles.

**a. Remove equalizer beam.**

- (1) Place vehicle on level ground and chock front wheels.

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**WARNING**

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HYDRAULIC JACK IS INTENDED FOR LIFTING THE TRUCK, NOT FOR SUPPORTING THE VEHICLE WHEN PERFORMING MAINTENANCE. DO NOT GET UNDER TRUCK UNLESS IT IS PROPERLY SUPPORTED WITH BLOCKS OR JACK STANDS.

- (2) Raise rear of vehicle with lifting device until rear wheels are clear of ground.
- (3) Position jack stands under frame and lower vehicle onto jack stands.
- (4) Remove wheel and tire assembly to gain access to beam (TM 9-2320-281-10).

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**WARNING**

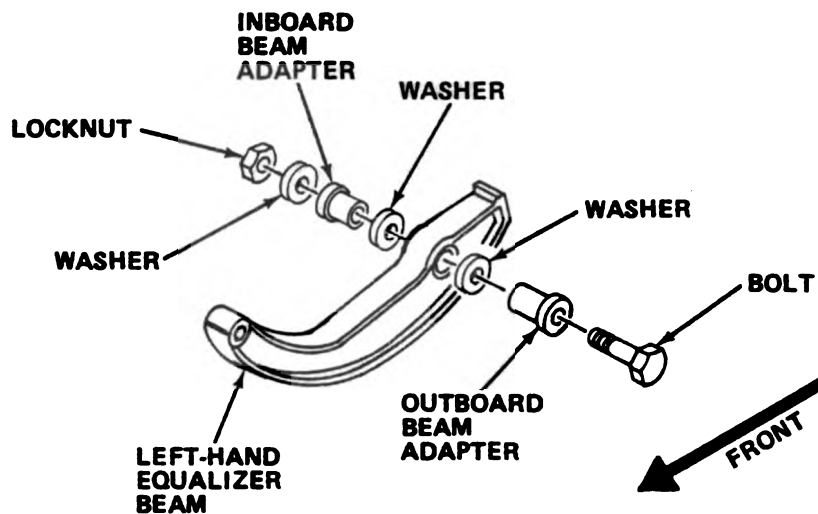
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DO NOT LIE UNDER AXLE OR EQUALIZER BEAM DURING REMOVAL PROCEDURES. DEATH OR SERIOUS INJURY MAY RESULT.

- (5) Position lifting device under axle and raise axle slightly to remove pressure from equalizer beam.
- (6) Position lifting device under equalizer beam.



(7) Position lifting device under suspension cross tube.



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**NOTE**

Right-hand equalizer beam inboard bolt must be removed with inboard beam adapter.

(8) Remove locknut, washer, and bolt retaining beam adapters to axle.

**NOTE**

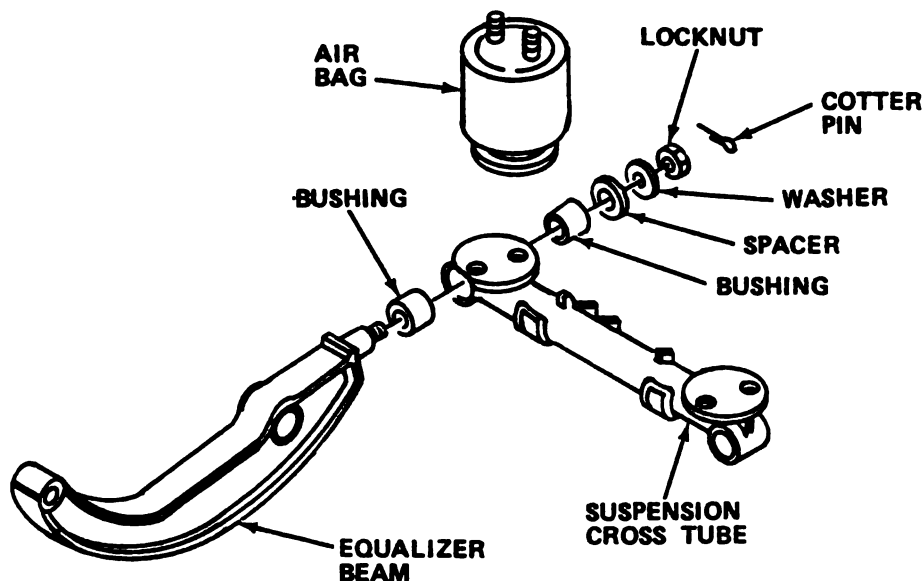
A chisel may be needed to pry beam adapters from axle.

(9) Pry out beam adapters from axle.



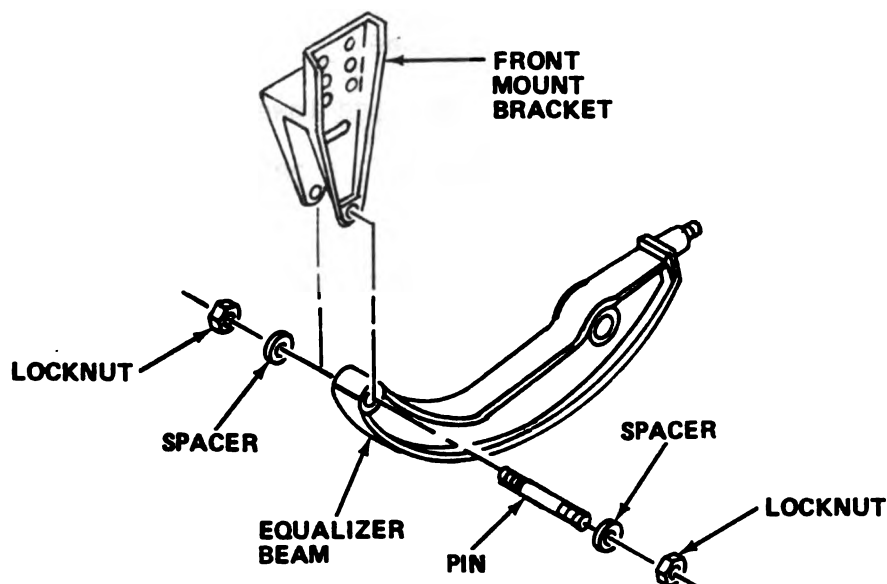
**NOTE**

Some suspension cross tubes have cotter pins installed directly behind the locknut.



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- (10) Remove cotter pins, washers, and locknuts securing equalizer beam to suspension cross tube.
- (11) Remove suspension cross tube.



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- (12) Disconnect nut from inboard end of pin and remove pin securing equalizer beam to frame mount bracket.
- (13) Remove equalizer beam and spacers.



- b. Install equalizer beam.

**WARNING**

DO NOT LIE UNDER EQUALIZER BEAM DURING INSTALLATION PROCEDURES. DEATH OR SERIOUS INJURY MAY RESULT.

- (1) Connect equalizer beam to frame mount bracket. Torque locknuts to 600 - 700 ft lbs (813 - 949 Nm).

**NOTE**

It may be necessary to raise or lower axle to allow installation of beam adapters.

- (2) Reconnect equalizer beam to cross tube. Torque nut to 600 - 700 ft lbs (813 - 949 Nm).
- (3) Reinstall beam adapters.
- (4) Reinstall bolt, washers, and locknut securing equalizer beam to axle.
- (5) Reinstall wheel and tire assembly (TM 9-2320-281-10).
- (6) Lower axle and suspension cross tube.
- (7) Raise vehicle, remove jack stands, and lower vehicle to ground.

- c. Perform operational check of axle (TM 9-2320-281-20).



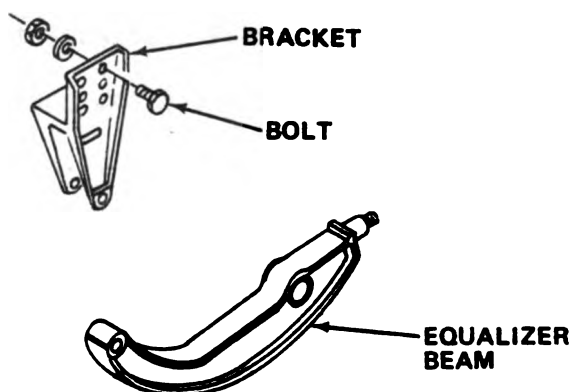
**14.6. REPLACE EQUALIZER BEAM MOUNT BRACKET****a. Remove equalizer beam mount bracket.**

- (1) Place vehicle on level ground and chock front wheels.

**WARNING**

HYDRAULIC JACK IS INTENDED FOR LIFTING THE TRUCK,  
NOT FOR SUPPORTING THE VEHICLE WHEN PERFORMING  
MAINTENANCE. DO NOT GET UNDER TRUCK UNLESS IT IS  
PROPERLY SUPPORTED WITH BLOCKS OR JACK STANDS.

- (2) Raise vehicle with lifting device until wheels are clear of ground.
- (3) Position jack stands under frame and lower vehicle onto jack stands.
- (4) Remove wheel and tire assembly (TM 9-2320-281-10).
- (5) Position jack under axle and raise axle.
- (6) Remove nut, washer, and bolt connecting equalizer beam to mount bracket.



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- (7) Remove locknuts and bolts securing mount bracket and remove bracket.

**b. Install equalizer beam mount bracket.**

- (1) Install mount bracket and torque locknuts to 169 - 172 ft lbs (229 - 233 Nm).
- (2) Reconnect equalizer beam to mount bracket. Torque nut to 600 - 700 ft lbs (813 - 949 Nm).
- (3) Reinstall wheel and tire assembly (TM 9-2320-281-10).
- (4) Lower axle and remove jack.
- (5) Raise vehicle, remove jack stands, and lower vehicle to ground.







## APPENDIX A

## REFERENCES

**A-1. PUBLICATION INDEX.** The following index should be consulted frequently for latest changes or revisions and for new publications relating to the material covered in this technical manual.

Consolidated Index of Army Publications and Blank Forms . . . . . DA PAM 310-1

**A-2. FORMS** Refer to DA PAM 738-750, The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to this material.

Identification and Distribution of DA Publications and Issue  
of Agency and Command Administrative Publications . . . . . AR 310-2

Equipment Daily Log . . . . . DA Form 2408-1

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404

Hand Receipt/Annex Number . . . . . DA Form 2062

Maintenance Request . . . . . DA Form 2407

Recommended Changes to Equipment Technical Publications . . . . . DA Form 2028-2

Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028

Quality Deficiency Report . . . . . SF368

**A-3. ARMY REGULATIONS, FIELD MANUALS, SUPPLY BULLETINS, TECHNICAL BULLETINS, AND TECHNICAL MANUALS.** The following publications contain information pertinent to the major items of materiel and associated equipment.

**a. Operating Vehicle.**

Army Motor Transport Units and Operations . . . . . FM 55-30

Manual for the Wheeled Vehicle Driver . . . . . FM 21-305

**b. Maintenance and Repair**

Metal Body Repair and Related Operations . . . . . FM 43-2

Lubrication Order: Truck Chassis: For Direct  
Support Section, Topographic Support System (TSS) . . . . . LO 9-2320-281-12



Description, Use, Bonding Techniques, and Properties of Adhesives . . . . .	TB ORD 1032
Cooling Systems: Tactical Vehicles . . . . .	TM 750-254
Direct Support and General Support Maintenance Manual, Engine, Diesel, 6 Cylinder Inline, Turbocharged Model NTC-400BC2 . . . . .	TM 9-2815-226-34
Direct Support and General Support Maintenance Repair Parts and Special Tools List (RPSTL) for Truck Chassis: For Direct Support Section, Topographic Support System (TSS) . . . . .	TM 9-2320-281-34P
Direct Support and General Support Maintenance Repair Parts and Special Tools List (RPSTL) for Engine, Diesel, 6 Cylinder Inline, Turbocharged Model NTC-400 BC2 . . . . .	TM 9-2815-226-34P
Hand Receipt Covering Contents of Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL), for Truck Chassis: For Direct Support Section, Topo- graphic Support System (TSS) . . . . .	TM 9-2320-281-10HR
Inspection, Care, and Maintenance of Antifriction Bearings . . . . .	TM 9-214
Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Materiel and Related Materiels Including Chemicals . . . . .	TM 9-247
Operator's Manual for Truck Chassis: For Direct Support Section, Topographic Support System (TSS) . . . . .	TM 9-2320-281-10
Operator's Manual for Welding Theory and Application . . . . .	TM 9-237
Organizational Care, Maintenance, and Repair of Pneumatic Tires, Inner Tubes, and Radial Tires . . . . .	TM 9-2610-200-20
Organizational Maintenance Manual for Truck Chassis: For Direct Support Section, Topographic Support System (TSS) . . . . .	TM 9-2320-281-20
Organizational Maintenance Repair Parts and Special Tools list (RPSTL) for Truck Chassis: for Direct Support Section, Topographic Support System (TSS). . . . .	TM 9-2320-281-208
Painting Instructions for Field Use . . . . .	TB 43-0209



### c. Cold Weather Operation and Maintenance

Basic Cold Weather Manual . . . . .	FM 31-70
Northern Operations . . . . .	FM 31-71
Operation and Maintenance of Ordnance Materiel in Extreme Cold Weather (0° to -65°F [-18° to -54°C]) . . . . .	FM 9-207

### d. Decontamination

Chemical, Biological, and Radiological (CBR) Decontamination . . . . .	TM 3-220
How to Fight (HTF) - Nuclear, Biological, and Chemical Reconnaissance and Decontamination Operations . . . . .	FM 3-87
NBC (Nuclear, Biological, and Chemical) Defense (Reprinted with Basic Incl. C1) . . . . .	FM 21-40

### e. General

Army Motor Transport Units and Operations . . . . .	FM 55-30
Camouflage . . . . .	FM 5-20
Administrative Storage of Equipment . . . . .	TM 740-90-1
Principles of Automotive Vehicles . . . . .	TM 9-8000
Procedures for the Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) . . . . .	TM 750-244-3
Procedures for the Destruction of Tank-Automotive Equipment to Prevent Enemy Use . . . . .	TM 750-244-6
Use and Care of Hand Tools and Measuring Tools . . . . .	TM 9-243
First Aid for Soldiers . . . . .	FM 21-11







**APPENDIX B****EXPENDABLE SUPPLIES AND MATERIALS LIST****Section I. INTRODUCTION**

**B-1. SCOPE** This appendix lists expendable supplies and materials you will need to operate and maintain the Truck Chassis for Direct Support Section. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class V, Repair Parts and Heraldic Items).

**B-2. EXPLANATION OF COLUMNS**

a. **COLUMN (1): ITEM NUMBER.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning solvent, Item 18, Appendix D.").

b. **COLUMN (2): LEVEL.** This column identifies the lowest level of maintenance that requires the listed item.

C	Operator/Crew
O	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance

c. **COLUMN (3): NATIONAL STOCK NUMBER.** This is the National stock number assigned to the item. Use it to request or requisition the item.

d. **COLUMN (4): DESCRIPTION.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. **COLUMN (5): UNIT OF MEASURE (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e.g., ea, in., pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.



## Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	6850-00-181-7929	Antifreeze, Permanent, Glycol, Inhibited (MIL-A-46153)	gl
2	F	6850-00-664-9067	Compound, Prussian Blue MIL-L-83795	pt
3	0	9150-00-223-4134	Fluid, Hydraulic (HIL-H-5606E)	gl
4	0		Fluid, Hydraulic, Non-Petroleum Base, Automotive (Arctic Type) (MIL-H-13910) U/I	
	0	9150-00-252-6375	1 gal. can	gl
5	0		Fluid, Hydraulic, Non-Petroleum Base, Automotive (HB) (VV-B-680) U/I	
	0	9150-00-190-0932	1 pt can	pt
	0	9150-00-231-9071	1 gal. can	gl
6	0	9150-00-935-9807	Fluid, Hydraulic, Petroleum Base, (MIL-H-6083)	qt
7	C		Grease, Automotive and Artillery GAA (MIL-G-10924)	
	0	9150-00-065-0029	2-1/4 oz tube	oz
	0	9150-00-935-1017	14 oz cartridge	oz
	0	9150-00-190-0904	1 lb can	lb
	0	9150-00-190-0905	5 lb can	lb
	0	9150-00-190-0907	35 lb can	lb
8	C		Grease, General Purpose (MIL-G-23549)	
	0	9150-00-985-7316	1 lb can	lb



## Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
9	F	8030-00-081-2330	Loctite, MIL-S-2274 (Grade CV)	pt
10	0	9150-00-905-9100	Lubricating Oil, Gear (MIL-L-2105)	gl
11	0	6850-00-275-6010	Methanol Technical (81348) OM-32	Cu
12	0		Oil, Fuel, Diesel DF-2, Winter (VV-F-800)	
	0	9140-00-286-5286	Bulk	gl
	0	9140-00-286-5287	5 gal. can	gl
	0	9140-00-286-5288	55 gal. drum, 16 gage	gl
	0	9140-00-286-5289	55 gal. drum, 18 gage	gl
13	0		Oil, Fuel, Diesel DF-2, Regular (VV-F-800)	
	0	9140-00-286-5294	Bulk	gl
	0	9140-00-286-5295	5 gal. can	gl
	0	9140-00-286-5296	55 gal. drum, 16 gage	gl
	0	9140-00-286-5297	55 gal. drum, 18 gage	gl
14	0		Oil, Lubricating, Exposed Gear, CW (VV-L-751)	
	0	9150-00-234-5197	5 lb can	lb
	0	9150-00-261-7891	35 lb pail	lb
15	0		Oil, Lubricating, Gear, Subzero, GOS (MIL-L-10324)	
	0	9150-00-261-7904	1 qt can	qt
	0	9150-00-257-5440	5 gal. drum	gl
	0	9150-00-257-5443	55 gal. drum	gl



## Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
16	0		Oil, Lubricating, OE/HDO 50 (MIL-L-2104C)	
	0	9150-00-188-9864	1 qt can	qt
	0	9150-00-188-9865	5 gal. drum	gl
	0	9150-00-188-9866	55 gal. drum, 16 gage	gl
17	0		Oil, Lubricating, OE/HDO 10 (MIL-L-2140)	
	0	9150-00-265-9425	1 qt can	qt
	0	9150-00-265-9428	5 gal. drum	gl
	0		55 gal. drum, 16 gage	gl
	0	9150-00-265-9430	55 gal. drum, 18 gage	gl
18	0		Oil, Lubricating, OE/HDO 30 (MIL-L-2104C)	
	0	9150-00-265-9433	1 qt can	qt
	0	9150-00-265-9435	5 gal. drum	gl
	0		55 gal. drum, 16 gage	gl
	0	9150-00-265-9437	55 gal. drum, 18 gage	gl
19	0		Oil, Lubricating, OEA ICE, Subzero, (MIL-L-46167) U/I	
	0	9150-00-402-4478	1 qt can	qt
	0	9150-00-402-2372	5 gal. drum	gl
	0	9150-00-402-7197	55 gal. drum, 16 gage	gl



## Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
20	0	8040-00-865-8991	Sealant, Liquid Thread, 1-pt Can, MIL-A-46106	pt
21	0	8030-00-543-4384	Sealant, Thread and Gasket, MIL-S-7916	oz
22	0		Solvent, Dry Cleaning, (SD), Type II (PD-680)	
	0	6850-00-664-5685	1 qt. can	qt
	0	6850-00-281-1985	1 gal. can	gal
	0	6850-00-285-8011	55 gal. drum	gal
23	F		Window Sealant	oz







## APPENDIX C

## ILLUSTRATED LIST OF MANUFACTURED ITEMS

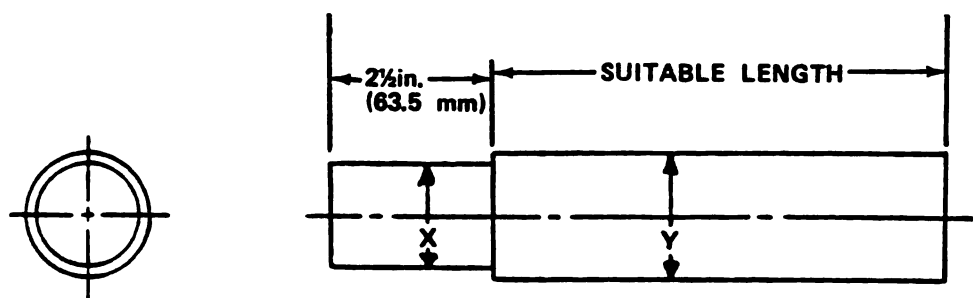
**C-1. GENERAL** This appendix includes complete instructions for making items authorized to be manufactured or fabricated at Direct Support and General Support Maintenance.

**C-2.** A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

**C-3.** All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list with the illustration.

**C-4.** Figure C-1 depicts removal and installation tool used to remove and replace the bushings in the front axle steering knuckles (Chapter 8).

**C-5.** Figure C-2 depicts a Volvo White Model RS-D217 cab lifting fixture used to remove and replace the cab assembly from the truck chassis frame (Chapter 13).



DIAMETER X IS 0.010 in. (0.25 mm) LESS THAN THE BUSHING BORE.  
DIAMETER Y IS 0.010 in. (0.25 mm) LESS THAN THE STEERING KNUCKLE BORE.

## NOTE:

USE BAR STOCK STEEL  
CONFORMING TO MIL-S-48042A

Figure C-1. Bushing Removal and Installation Tool

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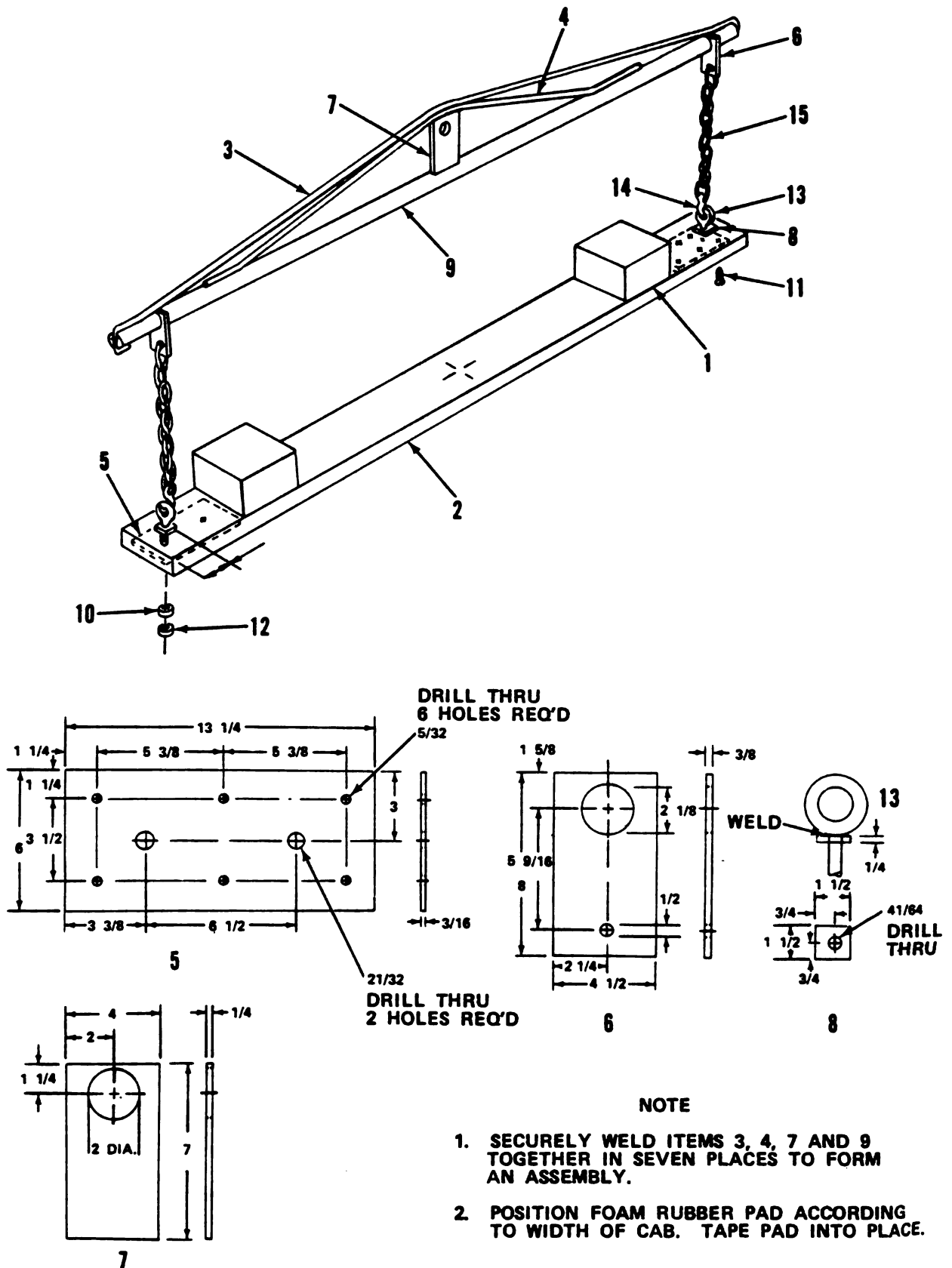


Figure C-2. Cab Lift Fixture (Sheet 1 of 3)

TA316880



**SPECIFICATION NUMBER/  
PART NUMBER INDEX**

Item No.	Quantity	Description	Material	Specification Number or Part No. (FSCM)	Dimensions
1	2	Pad	Foam Rubber	MIL-C-3133B	8"x4"x9"
2	1	Plank	Oak	MIL-L-19140C Type II, Category 2	8"x2-3/8"x 103-3/4"
3	1	Bar	Steel	MIL-S-46042A Class II	1/2"DIAx115"
4	1	Bar	Steel	MIL-S-46042A Class II	1/2"DIAx66"
5	2	Bottom Plate	Steel Plate	MIL-S-46042A Class II	6"x3/16"x 13-1/4"
6	2	Connecting Plate	Steel Plate	MIL-S-46042A Class II	4-1/2"x3/8"x 8"
7	1	Lifting Plate	Steel Plate	MIL-S-46042A Class II	4"x1/4"x7"
8	2	Washer	Steel Plate	MIL-S-46042A Class II	1/4"x1-1/4"x 1-1/4"

**Figure C-2. Cab Lift Fixture (Sheet 2 of 3)**



**SPECIFICATION NUMBER/  
PART NUMBER INDEX (Cont)**

Item No.	Quantity	Description	Material	Specification Number or Part No. (FSCM)	Dimensions
9	1	Tubing S.S.	Steel	MIL-T-5695D Type I	2"O.D.x5/8" I.D.x107
10	2	Flat Washer	Standard	MS15795	5/8"
11	12	Wood Screw	Standard	MS35492	1/4"x1-1/2"
12	2	Nut	Standard	MS35690	5/8"-11
13	2	Eye Bolt	Standard	MS51937	5/8"x4"Shank
14	2	Slip Hook	Standard	3547T16 (39428)	With 17/32" Eye
15	2	Chain (9 Link)	Common Coil	3588T16 (39428)	3/8"x24"

**Figure C-2. Cab Lift Fixture (Sheet 3 of 3)**



**C-6. AIR LINES.**

- a. Measure length and inner dimension of hose required and refer to Figure Bulk in TM 9-2320-281-34P for replacement hose.
- b. Cut length of hose required same length as hose being replaced.
- c. Refer to Figure Bulk (TM 9-2320-281-34P) and crimp end fittings as specified for hose being replaced.







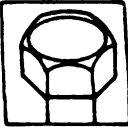
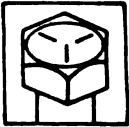


## APPENDIX D

### TORQUE LIMITS

**GENERAL.** This appendix lists standard torque values for capscrews and bolts. Specific torques to be applied to various components are listed in the procedural steps where they appear in this manual. If no specific torque is given in any application, use that listed in Table D-1. Pay particular attention to the notes and CAUTION found on the bottom of the table.



Table D-1. STANDARD TORQUE VALUES

USAGE	MUCH USED	MUCH USED	USED AT TIMES	USED AT TIMES
CAPSCREW DIAMETER AND MINIMUM TENSIL STRENGTH PSI	To 1/2-69,000 To 3/4-64,000 To 1-55,000	To 3/4-120,000 To 1-115,000	To 5/8-140,000 To 3/4-133,000	150,000
QUALITY OF MATERIAL	INDETERMINATE	MINIMUM COMMERCIAL	MEDIUM COMMERCIAL	BEST COMMERCIAL
SAE GRADE NUMBER	1 or 2	5	6 or 7	8
CAPSCREW HEAD MARKINGS: Manufacturer's marks may vary. These are all SAE Grade 5 (3-line).				
CAPSCREW BODY SIZE (INCHES)-(THREAD)	TORQUE Ft-Lb	TORQUE Ft-Lb	TORQUE Ft-Lb	TORQUE Ft-Lb
1/4 -20	5	8	10	12
-28	6	10		14
5/16-18	11	17	19	24
-24	13	19		27
3/8 -16	18	31	34	44
-24	20	35		49
7/16-14	28	49	55	70
-20	30	55		78
1/2 -13	39	75	85	105
-20	41	85		120
9/16-12	51	110	120	155
-18	55	120		170
5/8 -11	83	150	167	210
-18	95	170		240
3/4 -10	105	270	280	375
-16	115	295		420
7/8 - 9	160	395	440	605
-14	175	435		675
1 - 8	235	590	660	910
-14	250	660		990

1. Always use the torque values listed above when specific specifications are not available.

#### NOTE

Do not use above values in place of those specified in this manual; special attention should be observed in case of SAE Grade 6, 7, and 8 cap screw.

- The above is based on use of clean and dry threads.
- Reduce torque by 10% when oil is used as a lubricant.
- Reduce torque by 20% if new plated cap screws are used.

#### CAUTION

CAPSCREWS THREADED INTO ALUMINUM MAY REQUIRE REDUCTIONS IN TORQUE OF 30% OR MORE, UNLESS INSERTS ARE USED.

TA316861



**GLOSSARY****Section I. LIST OF ABBREVIATIONS**

ac	alternating current
amp	ampere
approx	approximate
attn	attention
cg	center of gravity
cm	centimeter
COE	cab over engine
cu ft	cubic foot/feet
DA	Department of the Army
dia	diameter
desc	description
fig.	figure
ft	foot
ft lbs	foot pounds force
gal.	gallon
GVWR	gross vehicle weight rating
gnd	ground
in.	inch
ISO	International Organization for Standardization
kg	kilogram
kPa	kilo Pascals
kph	kilometers per hour
kg/cm <sup>2</sup>	kilogram per square centimeter



l	liter
m	meter
mm	millimeter
MI	Michigan
mph	miles per hour
no.	number
N•m	Newton meter
NSN	National Stock Number
oz	ounce
para	paragraph
PMCS	Preventive Maintenance Checks and Services
pn	part number
psi	pounds per square inch
qt	quart
rpm	revolutions per minute
ref	reference
TM	technical manual
TMDE	test, measurement, and diag- nostic equipment
V	Volts
vert	vertical
vac	volts alternating current
vdc	volts direct current

## Section II. DEFINITION OF UNUSUAL TERMS

Not applicable to this technical manual.



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## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meter = 0.3937 Inch  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Mile

### WEIGHTS

1 Gram = 0.001 Kilogram = 1000 Milligrams = 0.035 Ounce  
 1 Kilogram = 1000 Grams = 2.2 Lb.  
 1 Metric Ton = 1000 Kilograms = 1 Magagram = 1.1 Short Tons

### LIQUID MEASURE

1 Milliliter = 0.001 Liter = 0.0338 Fluid Ounce  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

### SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. In.  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

### CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. In.  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

### TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5 (^{\circ}\text{C} + 32) = ^{\circ}\text{F}$

## APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

