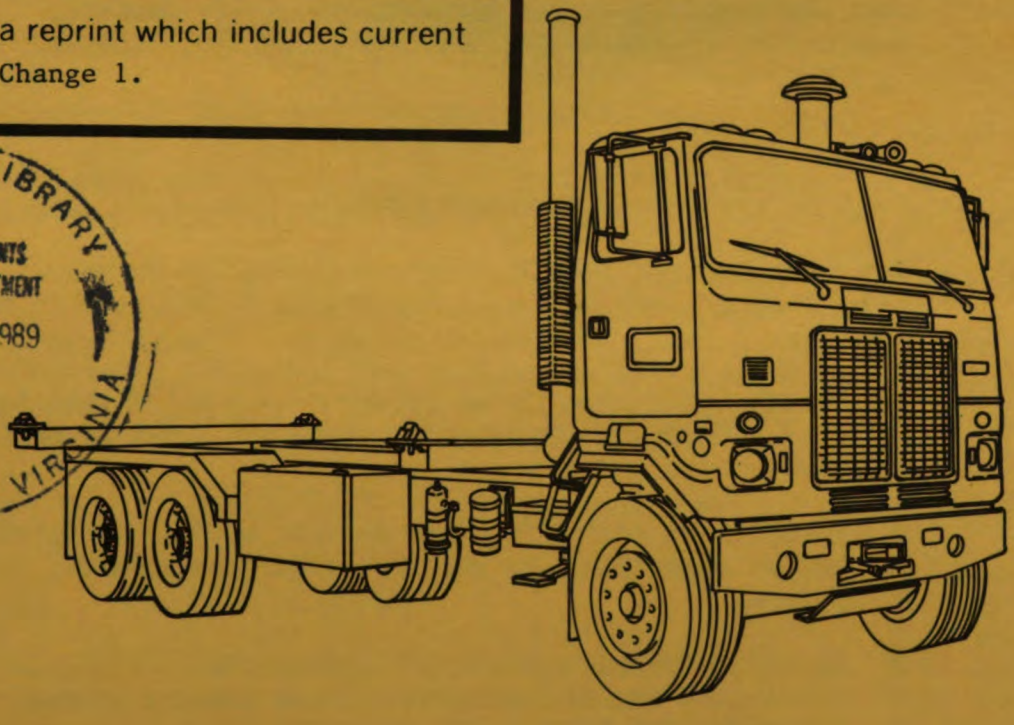
TM 9-2320-281-34-

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR

TRUCK CHASSIS:

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



FOR DIRECT SUPPORT SECTION TOPOGRAPHIC SUPPORT SYSTEM (TSS)

NSN: 2320-01-113-3616

HEADQUARTERS, DEPARTMENT OF THE ARMY

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 wll protect you from carbon monoxide poisoning.

TM 9-2320-281-34
C1

CHANGE
NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C.
25 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	6-1 and 6-2	6-1 and 6-2
iii/(iv blank)	iii/(iv blank)		6-25 and 6-26
1-1 and 1-2	1-1 and 1-2	7-11 and 7-12	7-11 and 7-12
1-3/(1-4 blank)	1-3 and 1-4	7-81 and 7-82	7-81 and 7-82
2-17 thru 2-76	2-17 thru 2-76	7-97 and 7-98	7-97 and 7-98
2-77 thru 2-97	2-77 thru 2-96	7-101 and 7-102	7-101 and 7-102
3-5 and 3-6	3-5 and 3-6	INDEX-1 and INDEX-2	INDEX-1 and INDEX-2
3-11 and 3-12	3-11 and 3-12		
4-11 and 4-12	4-11 and 4-12		

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 and General Support Maintenance requirements for Truck Chassis, Direct Support Section RC25-64.

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 or 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. 9-2320-281-34-1

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 OF 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-MBS, Warren, MI 48397-5000. A reply will be furnished to you.

VOLUME 1 of 2

VOLUME 2 of 2

HOW TO USE THIS MANUAL

This manual is divided into volumes and chapters that cover specific systems of the Truck Chassis. Advanced troubleshooting procedures are given in Chapter 2. These troubleshooting procedures supplement the procedures given in TM 9-2320-281-10, Operator's Manual, and TM 9-2320-281-20, Organizational Maintenance Manual.

To use this manual, first isolate the section or system malfunction. Then refer to the appropriate section of the manual for authorized procedures to repair the malfunction. During repair operations, both the Operator's Manual and the Organizational Maintenance Manual should be available for reference and to cover some procedures not covered by this manual.

Special tools and test equipment required to perform the procedures specified in this manual are listed in TM 9-2320-281-34P, Direct Support and General Support Repair Parts and Special Tools List (RPSTL) for Truck Chassis: for Direct Support Section, Topographic Support System (TSS).

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

a. This manual contains instructions for Direct and General Support Maintenance of the Truck Chassis for Direct Support Section, Topographic Support System (TSS).

b. Appendix A contains a list of references, supply manuals, forms, technical manuals, and other publications applicable to this vehicle.

c. Appendix B contains a list of the expendable supplies and materials needed to maintain this vehicle.

d. Appendix C contains an illustrated list of manufactured items that can be made to support the maintenance of this vehicle.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS. Department of the Army forms and procedures used for equipment maintenance will be prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE. Refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use, for procedures applicable to this vehicle.

1-4. PREPARATION FOR STORAGE OR SHIPMENT. Storage information is given in TM 740-90-1, Administrative Storage of Equipment.

1-5. NOMENCLATURE CROSS-REFERENCE LIST.

COMMON NAME	OFFICIAL NOMENCLATURE
Air Bag	Spring Assembly
Crankcase Breather	Breather Tube
Drive Shaft	Propeller Shaft
Dual Control Valve, Treadle Valve	Dual Brake Valve
Engine Coolant	Antifreeze, Ethylene Glycol Mixture

COMMON NAME	OFFICIAL NOMENCLATURE
Ether Quick-Start System	Cold Start System
Exhaust Pipe	Turbo Outlet Pipe
Float Switch	Fuel Level Sending Unit
FOD	Foreign Object Damage
Gladhand	External Air Coupling
Hand Control Valve for Trailer	Trailer Brake Valve
Ignition Switch	Master Lock Switch
Intermediate Pipe	Muffler Inlet Pipe
Lockout Switch	Differential Lockout Engaged Switch
Mud Flaps	Splash Shields
Park Brake Valve	Brake Control Valve
Power Steering Cylinder (RAM)	Auxiliary Assist Cylinder
Ratio Valve	Limiting Valve
Rear Propeller Shaft	Interaxle Drive Shaft
Rocker Lever Housing Cover	Jacobs Brake Cover, Valve Cover, Cylinder Head Cover
Tailpipe	Exhaust Stack
Tie-Rod	Cross Tube
Tool Box	Storage Box

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S). If your Truck Chassis needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design. Put it on an SF 368, Quality Deficiency Report. Mail it to us at Commander, US Army Tank-Automotive Command, ATTN: AMSTA-OR, Warren, MI 48397-5000. We will send you a reply.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-7. EQUIPMENT DESCRIPTION AND DATA. This manual covers components repaired at Direct and General Support Maintenance levels. Tabulated data is covered in TM 9-2320-281-10 and TM 9-2320-281-20. Coolant, fuel, lubricant, and hydraulic capacities are listed below:

Radiator	48 qts (45.6 l)
Engine Oil	
Refill capacity (includes filters)	43.36 qts (41.2 l)
Engine Sump	28 qts (26.6 l)
Engine Filter	3.72 qts (3.5 l)
Engine Bypass Oil Filter	11.64 qts (11.1 l)
Power Steering Reservoir	8 qts (7.6 l)
Alcohol Evaporator	1 pt (0.5 l)
Transmission	64 pts (30.1 l)
Front, Rear Axle	44 pts (20.7 l)
Rear, Rear Axle	41 pts (19.3 l)
Fuel (Diesel)	100 gal (397 l)

1-8. **DIFFERENCES BETWEEN MODELS.** Configuration differences have been identified by model years. Actual manufactured dates may differ from model year date as stamped on your vehicle's data plate. To avoid confusion, Usable-on-Codes have been cross-referenced to U.S. Registration Numbers (stenciled on vehicle chassis) as shown below:

U.S. Registration Number	Model Year	Usable-on-Codes
NPO 8AO	1980	RCS
NPO 89Z	1980	RCS
NPO 89X	1980	RCS
NPO 8AI	1980	RCS
NPO 89W	1980	RCS
NPO 89Y	1980	RCS
NPO 89V	1980	RCS
NPO 62L	1982	RCT
NPO 62M	1982	RCT
NPO 62N	1982	RCT
NPO 62P	1982	RCT
NPO 62Q	1982	RCT
NPO 62R	1982	RCT
NPO 62S	1982	RCT
NPO 62T	1982	RCT
NPO 62U	1982	RCT
NPO 62V	1982	RCT
NPO 62W	1982	RCT
NPO 62X	1982	RCT
NPO 62Y	1982	RCT
NPO 89S	1984	RCV
NPO 89R	1984	RCV
NPO 633	1984	RCV
NPO 89Q	1984	RCV
NPO 632	1984	RCV
NPO 631	1984	RCV
NPO 630	1984	RCV
NPO 62Z	1984	RCV
NPO 89T	1984	RCV
NPO 89U	1984	RCV

CHAPTER 2

MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT. For authorized common tools and equipment specified, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT. Special tools and equipment specified for use in this manual are listed in TM 9-2320-281-34P, Direct Support and General Support Repair Parts and Special Tools List (RPSTL). Complete instructions with accompanying illustrations for the fabrication of tools and equipment used in Direct and General Support Maintenance are provided in Appendix C of this manual.

2-3. REPAIR PARTS. Repair parts are listed and illustrated in the repair parts and special tools list TM 9-2320-281-34P, covering Direct Support and General Support Repair Parts and Special Tools List (RPSTL) for this equipment.

Section II. TROUBLESHOOTING

2-4. INTRODUCTION. This section provides you with troubleshooting procedures performed at the Direct and General Support levels of maintenance. The following systems are addressed:

a. Transmission (Table 2-1).

b. Rear Axle (Table 2-2).

c. Wheel Brake System (Table 2-3).

d. Steering System (Table 2-4).

These procedures are in addition to the procedures given for the Truck Chassis in the following TMs:

a. TM 9-2320-281-10, Operator/Crew Level.

b. TM 9-2320-281-20, Organizational Level.

Table 2-1. TRANSMISSION TROUBLESHOOTING PROCEDURES

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. ENGINE DOES NOT TURN DRIVE SHAFT IN ANY SPEED, FORWARD OR REVERSE.	
Step 1. Check transmission oil level.	Locate leak source; repair and fill transmission with oil to proper level (LO 9-2320-281-12).
Step 2. Check for clogged transmission oil filter.	Replace oil filter (para 7-3c and 7-5g(2)).
Step 3. Check for damaged transmission shift control.	Repair shift control (para 7-8).
Step 4. Check for damaged or worn main pump in transmission.	Repair transmission oil pump (para 7-4d).
Step 5. Check for damaged or sticking main pressure regulator.	Repair transmission valve body (para 7-4e).
2. TRANSMISSION SHIFT IS ERRATIC.	
Step 1. Check for defective modulator control cable.	Replace modulator control cable (TM 9-2320-281-20).
Step 2. Check modulator for defects.	Replace modulator (TM 9-2320-281-20).

Table 2-1. TRANSMISSION TROUBLESHOOTING PROCEDURES (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
3. TRANSMISSION SLIPS EXCESSIVELY IN ALL GEARS.
Step 1. Check transmission oil level.
a. Locate leak source and repair as necessary.
b. Fill transmission with oil to proper level (LO 9-2320-281-12).
Step 2. Check for clogged transmission oil filter.
Replace oil filter (para 7-3c and 7-5g(2)).
Step 3. Check for damaged or worn torque converter pump in transmission.
Repair torque converter pump (para 7-4d).
Step 4. Check for damaged or sticking main pressure regulator.
Repair transmission valve body (para 7-4e).
4. TRANSMISSION SLIPS EXCESSIVELY IN FIRST AND REVERSE GEARS ONLY.
Step 1. Check for damaged or worn low clutch.
Establish low clutch clearances (para 7-5a).
Step 2. Check for damaged or sticking low clutch trimmer valve.
Repair low trimmer valve body (para 7-4f).

Table 2-1. TRANSMISSION TROUBLESHOOTING PROCEDURES (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. TRANSMISSION SLIPS EXCESSIVELY IN ALL FORWARD GEARS BUT NOT REVERSE. Check for defective forward clutch. Repair forward clutch (para 7-4h).
6. EXCESSIVE NOISE DURING OPERATION. Check for damaged or worn internal case components. Replace case components (para 7-5g).
7. LUBRICANT LEAKING. Step 1. Check for defective seals or gaskets. Replace seals or gaskets (para 7-5). Step 2. Check for cracked case. Replace defective case (para 7-3h).

Table 2-2. REAR AXLE TROUBLESHOOTING PROCEDURES

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. EXCESSIVE PLAY (BACKLASH).	
Step 1. Check differential bearing adjustment.	a. Remove differential carrier (para 9-10 and 9-11). b. Adjust bearing (para 9-12).
Step 2. Check for damaged or worn differential.	Replace differential (para 9-12).
2. EXCESSIVE NOISE.	
Step 1. Check for damaged or worn pinion bearings.	a. Remove differential carrier (para 9-10 and 9-11). b. Replace defective bearings (para 9-12).
Step 2. Check for damaged or worn differential carrier bearings.	Replace defective bearings (para 9-12).
Step 3. Check for damaged or worn spider gears.	Replace defective gears (para 9-12).
Step 4. Check for damaged or worn ring and pinion gears.	Replace defective gear set (para 9-12).

Table 2-2. REAR AXLE TROUBLESHOOTING PROCEDURES (Cont)

MALFUNCTION / TEST OR INSPECTION	CORRECTIVE ACTION
3. LUBRICANT LEAKING.	
Step 1. Check for defective seals or gaskets.	
	a. Remove differential carrier, if necessary to replace defective seal or gasket (para 9-10 and 9-11).
	b. Replace defective seals or gaskets (para 9-10 and 9-11).
Step 2. Check for cracked housing.	
	a. Remove differential carrier (para 9-10 and 9-11).
	b. Replace housing.

Table 2-3. WHEEL BRAKE TROUBLESHOOTING PROCEDURES

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. EXCESSIVE AIR PRESSURE BUILD-UP AND RECOVERY TIME.	
Step 1. Check inlet strainer for foreign matter.	Clean strainer (para 10-5d).
Step 2. Check for kinked or restricted compressor inlet or discharge lines.	Remove kinks or clear lines of blockage or restrictions.
Step 3. Check for leaking or broken discharge valve(s).	Replace defective valve(s) (para 10-5c).
Step 4. Check if inlet valve(s) is excessively worn or stuck open.	Replace defective valve(s) (para 10-5c).
Step 5. Check piston rings and/or cylinders for excessive wear.	Repair pistons and cylinders as necessary (para 10-5l).
2. COMPRESSOR NOISY.	
Step 1. Check for excessively worn drive coupling.	Remove air compressor (para 10-4) and replace defective coupling (para 10-4).
Step 2. Check for worn or burned out crankshaft bearings.	Replace defective bearings (para 10-5j).

Table 2-3. WHEEL BRAKE TROUBLESHOOTING PROCEDURES (Cont)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
2. (Cont)	
Step 3. Check for loose connecting rods and worn rod bearings and wrist pins.	Repair as necessary (para 10-5l).
Step 4. Check for restricted oil flow to compressor.	Remove compressor and clean accessory drive-to-compressor oil passage and passages in crankshaft and crankcase (para 10-5k).
3. COMPRESSOR IS PUMPING OIL.	
Step 1. Check for broken or excessively worn piston ring(s).	Replace ring(s) (para 10-5l and m).
Step 2. Check for excessively worn cylinders.	Hone or rebore cylinders to accept oversize pistons (para 10-5i).
4. COMPRESSOR FAILS TO UNLOAD.	
Step 1. Check for defective or worn unloader pistons.	Replace defective pistons (para 10-5g and n).
Step 2. Check for unloader inlet cavity restrictions.	Clean cavity (para 10-5d).

Table 2-3. WHEEL BRAKE TROUBLESHOOTING PROCEDURES (Cont)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
4. (Cont)	
Step 3. Check for defective governor.	If no response occurs to governor adjustment, replace governor (TM 9-2320-281-20).
5. COMPRESSOR HEAD LEAKING WATER.	
Step 1. Check head-retaining capscrews for proper torque.	Torque to 175 - 225 in. lbs (20 - 25 N•m).
Step 2. Check for blown cylinder head gasket.	Replace defective gasket (para 10-5b and o).
Step 3. Check for cracked cylinder head.	Replace defective head (para 10-5b and o).

Table 2-4. STEERING SYSTEM TROUBLESHOOTING PROCEDURES

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. STEERING GEAR LEAKING AT TRUNNION COVER AREA.

Step 1. Check for loose trunnion cover bolts or defective cover O-ring seal.

a. Torque bolts to 15 - 22 ft lbs (20 - 30 Nom).

b. If leaks still persist, replace cover O-ring seal (para 12-4a).

Step 2. Sector shaft seal leaking around shaft.

Replace seal (para 12-4a).

2. STEERING GEAR LEAKING AT INPUT SHAFT AREA.

Step 1. Check for proper seating of input shaft seal retaining ring.

Reseat or replace retaining ring (para 12-4b).

Step 2. Input shaft seal leaking around shaft.

Replace seal (para 12-4b).

Step 3. Check for leaking valve cover gasket.

Replace steering gear (para 12-5).

3. ROAD WANDER.

Check for proper operation of steering gear.

Replace steering gear (para 12-5).

Table 2-4. STEERING SYSTEM TROUBLESHOOTING PROCEDURES (Cont)

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
4. NO RECOVERY. Check steering gear for proper poppet valve adjustments (external).	a. Adjust poppet valves (para 12-5g). b. If problem still exists after valves are adjusted, replace steering gear (para 12-5).
5. OVERSTEERING OR DARTING. Check for proper operation of steering gear.	Replace steering gear (para 12-5).
6. HIGH STEERING EFFORT IN ONE OR BOTH DIRECTIONS. Check for excessive steering gear internal leakage.	Replace steering gear (para 12-5).
7. LOST MOTION OR LASH AT STEERING WHEEL. Check for proper operation of steering gear.	Replace steering gear (para 12-5).
8. EXCESSIVELY HOT (150°F [65.6°C] OVER AMBIENT) STEERING GEAR. Check steering gear for proper poppet valve adjustments (external).	Adjust poppet valve(s) (para 12-5g).

Section III. GENERAL MAINTENANCE

2-5. INTRODUCTION. These instructions cover cleaning, inspection, and repair in general terms. Publications listed in Appendix A provide additional information about procedures and techniques necessary for repair.

2-6. CLEANING. The importance of cleaning cannot be overemphasized. General cleaning procedures are given here and specific cleaning procedures are given only when there is a change or special consideration necessary.

a. GENERAL INSTRUCTIONS. Dirt, grit, or other material will cause malfunctions, premature wear, and reduced effectiveness. The following steps apply to all cleaning operations unless there is specific guidance not to follow these steps:

(1) Clean all parts before disassembly, before inspection, after repair, and before reassembly.

(2) Keep hands and clothing clean to prevent bringing dust and grit into contact with components.

(3) Wrap cleaned parts in plastic or suitable paper for protections.

(4) Machined surfaces should be lightly oiled to prevent rusting or oxidation of surfaces.

b. CASTINGS

(1) Clean inner and outer surfaces of castings and all areas subject to oil or grease with solvent.

(2) Remove sludge and gum deposits with stiff brush.

WARNING

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.).

(3) Use clean, dry, compressed air to blow out and dry all tapped holes in castings. Air pressure should be set no higher than 30 psi (207 kPa) unless otherwise specified.

TM 9-2320-281-34-1

c. OIL PASSAGES. All oil passages in casting, forged, and machined parts must be clean and free of obstructions.

(1) Clean passages with wire or suitable probe to break up any sludge or gum deposits.

CAUTION

DO NOT LET DRY-CLEANING SOLVENTS CONTACT SEALS OR FLEXIBLE HOSES. THESE SOLVENTS CAUSE LEATHER, RUBBER, AND SYNTHETIC MATERIAL TO DRY OUT, ROT, OR CRACK.

(2) Flush passages with solvent.

(3) Clear and dry passages with compressed air.

d. OIL SEALS AND FLEXIBLE HOSES. Clean with soap and water.

e. BALL AND ROLLER BEARINGS. Bearings require special cleaning procedures:

(1) Wipe surface oil and gum deposits from bearings.

(2) Place bearings in hot oil, at 140°F (60°C).

(3) Wipe bearings dry. Do not use compressed air to blow bearings dry. Bearings will wear rapidly if not properly lubricated.

(4) After cleaning, coat bearings with a light film of oil and wrap in paper until inspection and assembly.

(5) Refer to TM 9-214, Inspection, Care, and Maintenance of Antifriction Bearings for additional procedures.

2-7. INSPECTION. Basic inspection procedures are the same for parts and components. Special techniques or requirements, such as tolerances, magnafluxing, or dye penetrant, are covered in the section dealing with the component. General procedures are listed here and should be followed without having to repeat the procedures in the individual task steps.

a. CASTINGS.

(1) Inspect all ferrous and nonferrous castings for cracks using magnifying glass and strong light. Particularly check areas adjacent to studs, pipe plugs, threaded inserts, and in sharp corners and fillets.

(2) Inspect machined surfaces of castings for nicks, burrs, and raised metal. Mark damaged areas for repair.

(3) Check all mating flanges on housings and supports for warpage with straightedge or on a surface plate. Inspect mating flanges for discoloration which may indicate persistent oil leakage.

(4) Inspect all pipe plug and capscrew-tapped openings for damaged or stripped threads.

b. BALL AND ROLLER BEARINGS. Refer to TM 9-214 Inspection, Care, and Maintenance of Antifriction Bearings.

c. STUDS. Inspect all studs for stripped or damaged threads, bending, loose fit, and evidence of stretching.

d. GEARS

(1) Inspect all gears for cracks using magnifying glass and strong light.

(2) Inspect all gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.

e. BUSHINGS AND BUSHING-TYPE BEARINGS

(1) Check all bushings and bushing-type bearings for secure fit and evidence of heating.

(2) Inspect bushings and bushing-type bearings for wear, burrs, nicks, scoring, and out-of-round condition.

(3) Check for dirt in lubrication holes or grooves of bushings and bushing-type bearings. Holes and grooves must be clean and free from damage to be sure of proper lubrication.

f. SEALS

NOTE

Metal-encased oil seals should not be replaced unless inspection indicates damage or unless specified in the repair procedures for a particular component.

(1) Inspect feather edge of oil seal for damage.

(2) Check seal for loss of pliability and resiliency.

2-8. REPAIR. To avoid repetition of instructions, general procedures for repair are detailed below. Any repair procedures which are peculiar to a specific part or component are covered in the item's section or paragraph. After repair, clean all parts thoroughly to remove metal chips or abrasives. Then preserve or lubricate as necessary.

a. CASTINGS

(1) Replace all castings. Castings should be forwarded to higher maintenance levels for evaluation and repair as soon as possible.

(2) Repair minor damage to machined surfaces with fine file, emery cloth, or crocus cloth dipped in dry-cleaning solvent. Replace castings on which machined surfaces are burred or nicked to the point of impairing subsequent assembly or operation.

(3) Repair minor warpage of mounting flanges and gasket surfaces by working surface across sheet of emery cloth held tightly on surface plate or like flat surface. Finish with crocus cloth. Replace castings having flanges which are warped to the point of impairing assembly or operation.

NOTE

Pipe plug threads in castings must be in good condition to prevent oil or water leakage.

(4) Repair damaged pipe or capscrew threads in tapped holes with used tap.

b. BALL AND ROLLER BEARINGS. Replace all galled, pitted, or damaged ball bearings. (Refer to TM 9-214.)

c. STUDS

(1) Replace all bent or loose studs showing evidence of stretching.

(2) Repair minor thread damage with thread chaser.

(3) Replace all studs having stripped or damaged threads.

(4) Remove and replace studs as follows:

(a) Removal. Using stud extractor, back studs out slowly to avoid heating and possible seizure. When studs are broken off too short to use stud extractor, drill stud and extract it with an easy out. Another technique that can be used is to heat stud with torch and apply wax stick to stud threads so that hot wax can flow through threads, then remove stud.

NOTE

All new studs have special coating and must have small amount of mica-base antiseize compound MIL-A-13881 applied on threads before stud is installed in casting unless thread-locking compound is specified.

(b) Replacement. Only standard studs are supplied for replacement. If threaded openings are damaged and retapping will not clean up threads, drill and tap opening in casting and install threaded insert or coil depending on material.

d. GEARS

(1) Replace all cracked gears.

(2) Replace gears having worn, pitted, or galled teeth. Remove sharp fins and burrs from gear teeth with crocus cloth dipped in dry-cleaning solvent.

e. BUSHINGS AND BUSHING-TYPE BEARINGS. When bushings and bushing-type bearings are damaged or worn beyond limits, generally the associated parts with which they are used must also be replaced.

f. OIL SEALS. Replace oil seals, when thin feather edge is damaged or when seal material has become hard or brittle, as follows:

(1) Removal. Remove damaged oil seal from casting or adapter, being careful not to damage bore in casting or adapter. Use proper removal tools if specifically called for.

(2) Repair. When a casting oil seal bore or adapter is burred to point where oil-tight seal is impossible, replace casting or adapter. Remove slight nicks, burrs, and scratches from casting bore or adapter with crocus cloth dipped in dry-cleaning solvent.

(3) Installation. Install new oil seal in bore of casting or adapter using proper oil seal installation tool.

2-9. ASSEMBLY INSTRUCTIONS. Extreme care must be exercised in all component assembly operations to be sure of satisfactory component performance. Step-by-step procedures for assembly of various components are covered in the paragraph relating to the specific component. Precautionary rules for assembly are as follows:

a. Cleanliness is essential in all component assembly operations. Dirt and dust, even in minute quantities, are abrasive. Parts must be cleaned, as specified, and kept clean. Wrap or cover parts and components when assembly procedures are not immediately completed.

b. Coat all bearings and contact surfaces with operating oil (rear axle oil for axle parts, transmission oil for transmission parts, etc) to be sure of lubrication of parts during initial operation after repair.

c. Install new gaskets and preformed packings (O-rings) during assembly.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

2-10. INTRODUCTION. This section provides the procedures used to remove or install major components. These are in addition to those procedures listed in TM 9-2320-281-20. The following components are covered in this section:

a. Engine

b. Transmission

c. Front Axle

d. Rear Tandem Axles

2.11. ENGINE REPLACEMENT

a. Remove engine.

(1) Place vehicle on level surface and chock rear wheels.

(2) Disconnect negative battery cables from all batteries (TM 9-2320-281-20).

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

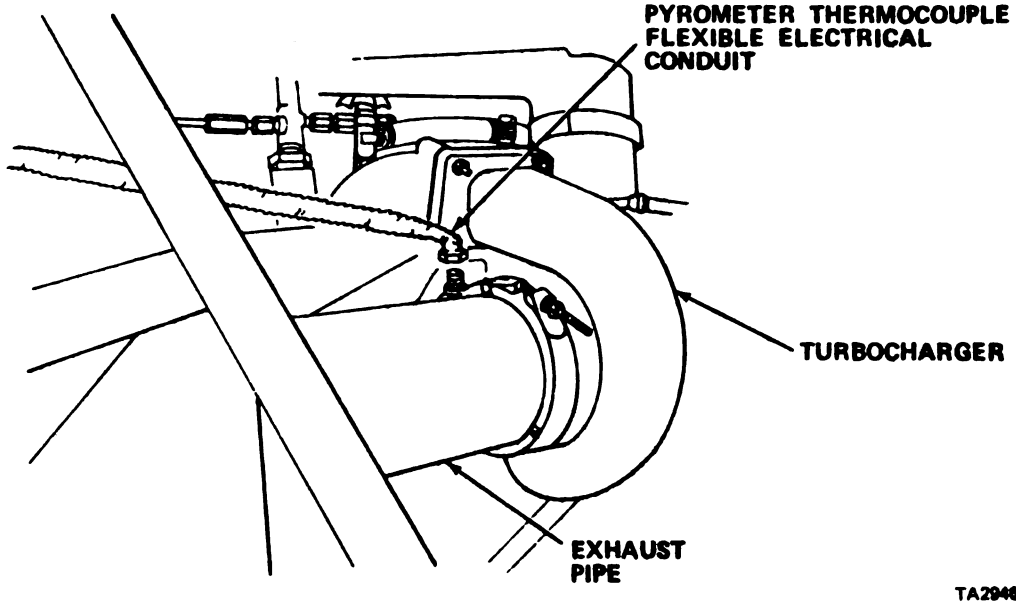
(4) Remove radiator (TM 9-2320-281-20).

(5) Remove turbocharger air inlet ducting (TM 9-2320-281-20).

CAUTION

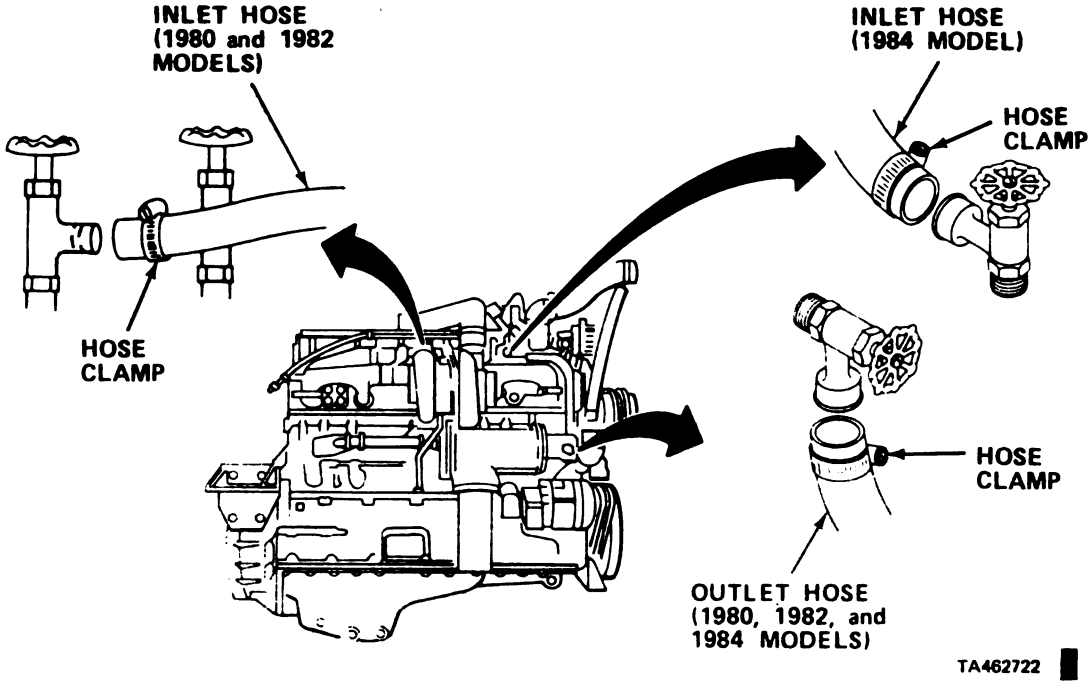
BE SURE TO COVER TURBOCHARGER AIR INLET PORT AND AIR CLEANER AIR OUTLET PORT TO PREVENT ENTRY OF FOREIGN MATTER WHICH COULD CAUSE EXTENSIVE DAMAGE TO TURBOCHARGER.

(6) Close off turbocharger air inlet and air cleaner air outlet ports.



(7) Tag and disconnect engine exhaust pyrometer thermocouple flexible electrical conduit from thermocouple in exhaust pipe. Lift conduit free from engine.

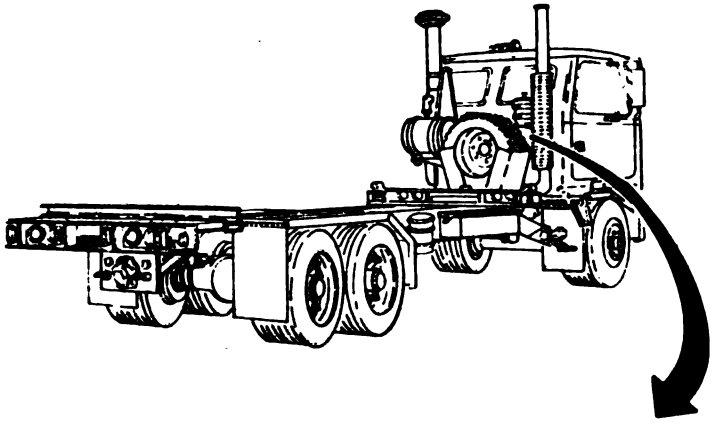
(8) Remove exhaust piping from turbocharger exhaust port and muffler inlet port (TM 9-2320-281-20).

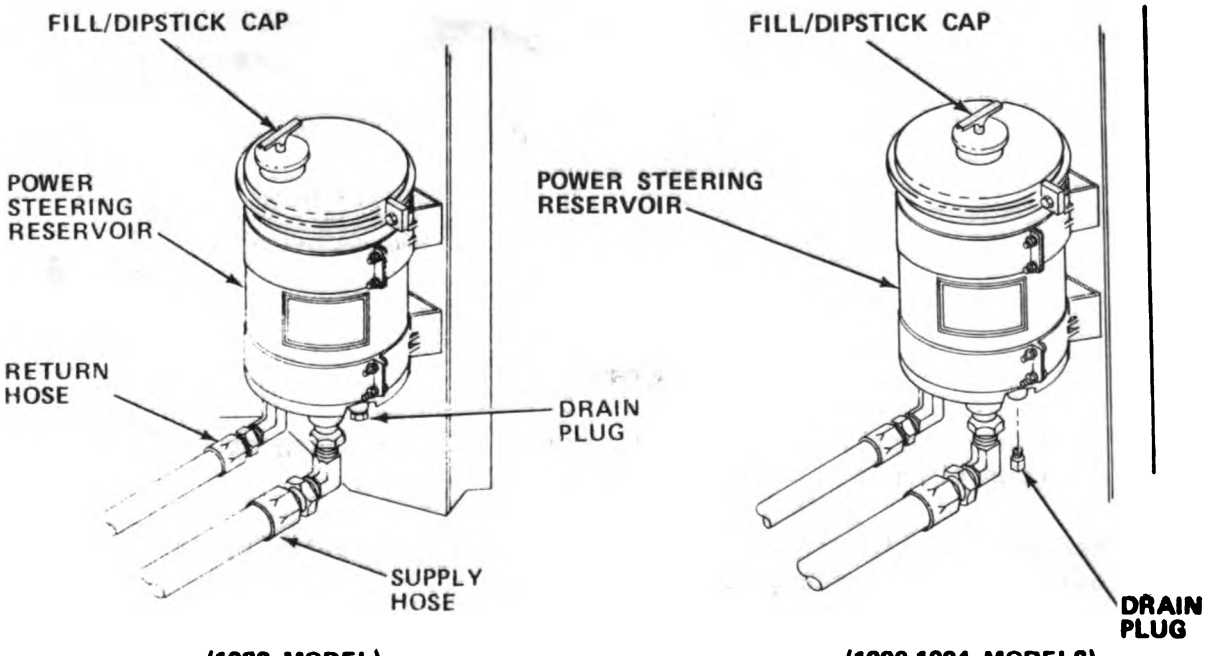


NOTE

Use protective caps and plugs when disconnecting hose connections.

(9) Loosen hose clamps and tag and disconnect cab heater water inlet and outlet hoses from engine.





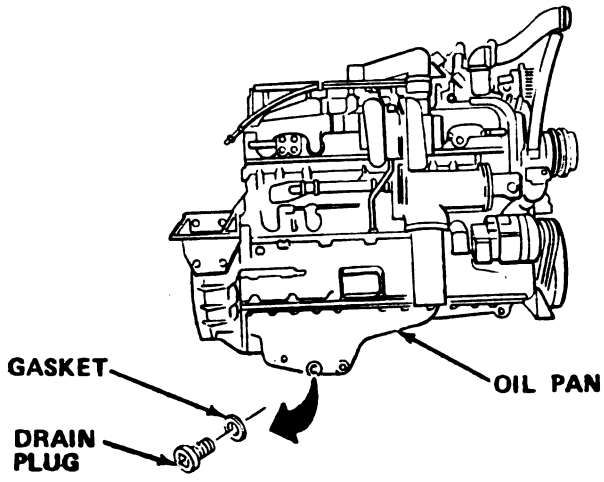
NOTE

Power steering reservoir has 2 gal. (7.6 l) capacity.

(10) Place container under power steering reservoir drain plug and remove fill/dipstick cap.

(11) Remove reservoir drain plug and drain reservoir.

(12) Apply thread sealant to drain plug and reinstall plug. Reinstall fill/dipstick cap.



NOTE

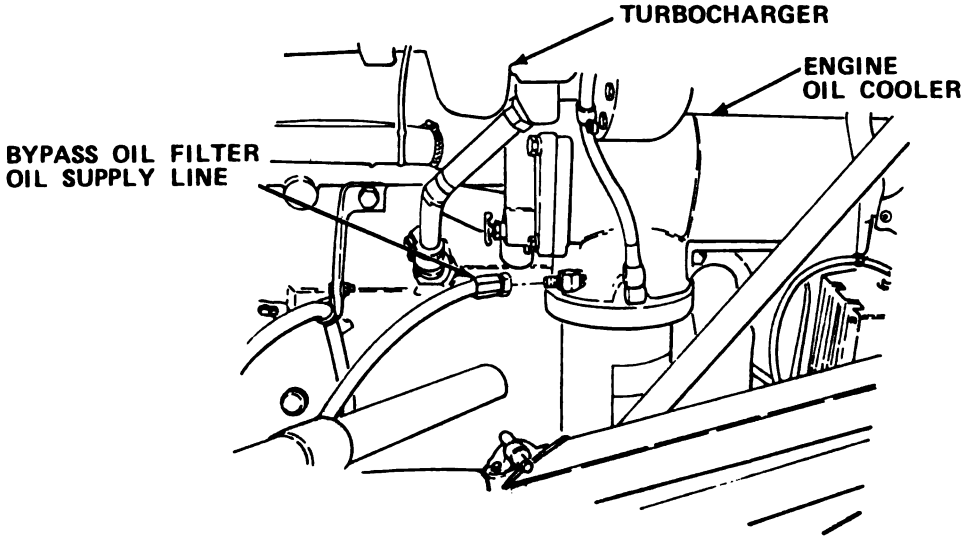
Engine crankcase has 28 qt (26.6 l) capacity.

(13) Place container under engine oil pan drain plug.

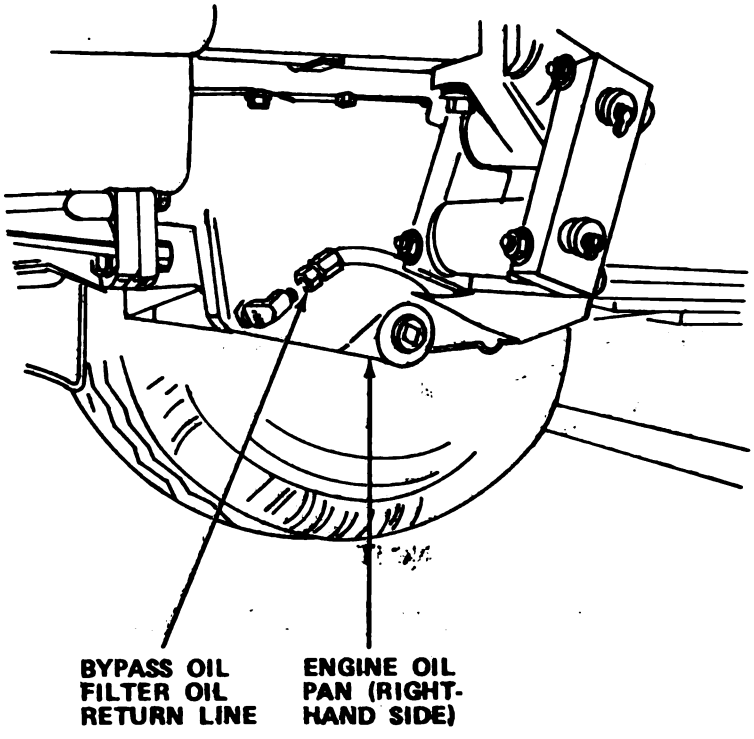
(14) Remove oil pan drain plug and gasket and drain oil.

(15) Check condition of drain plug gasket. Replace if defective.

(16) Reinstall oil pan drain plug and gasket.



(17) Tag and disconnect bypass oil filter oil supply line from engine oil cooler.



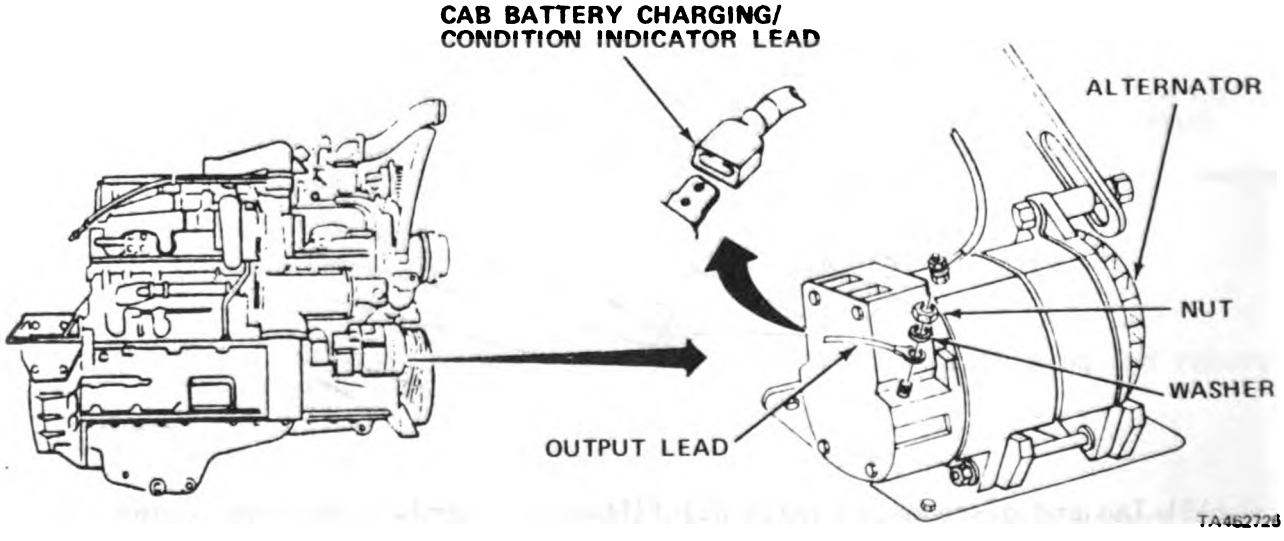
TA296511

(18) Tag and disconnect bypass oil filter oil return line from engine oil pan.

(19) Remove engine oil fill tube (TM 9-2320-281-20).

(20) Remove engine oil dipstick tube (TM 9-2320-281-20).

(21) Close off oil fill tube and dipstick tube ports on engine.



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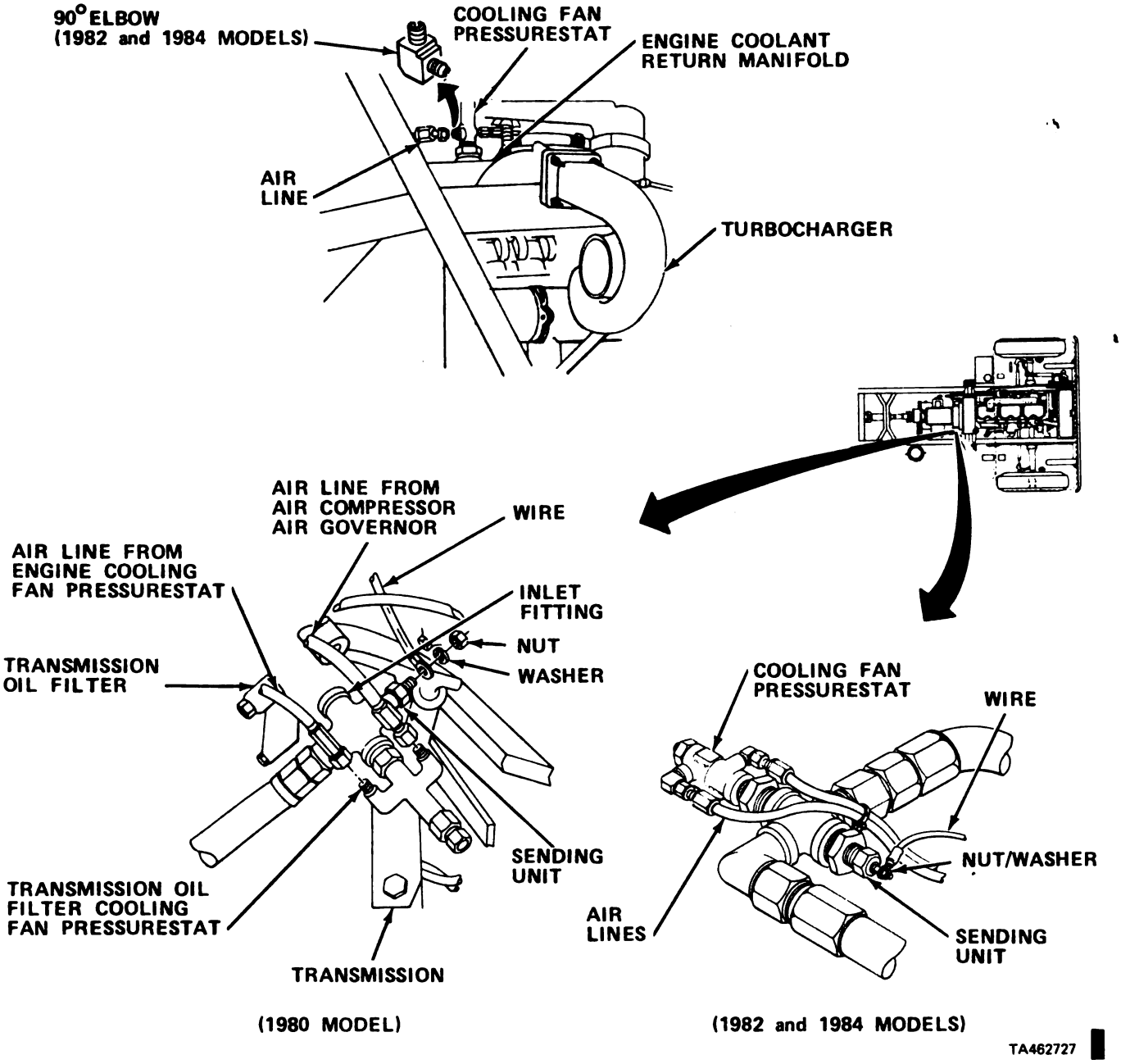
(22) Remove nut and washer securing alternator output lead. Tag and disconnect alternator output lead and cab battery charging/condition indicator leads from alternator.

(23) Cut wire ties retaining alternator wiring harness at alternator. Remove clamps securing alternator wiring harness to lower front of engine.

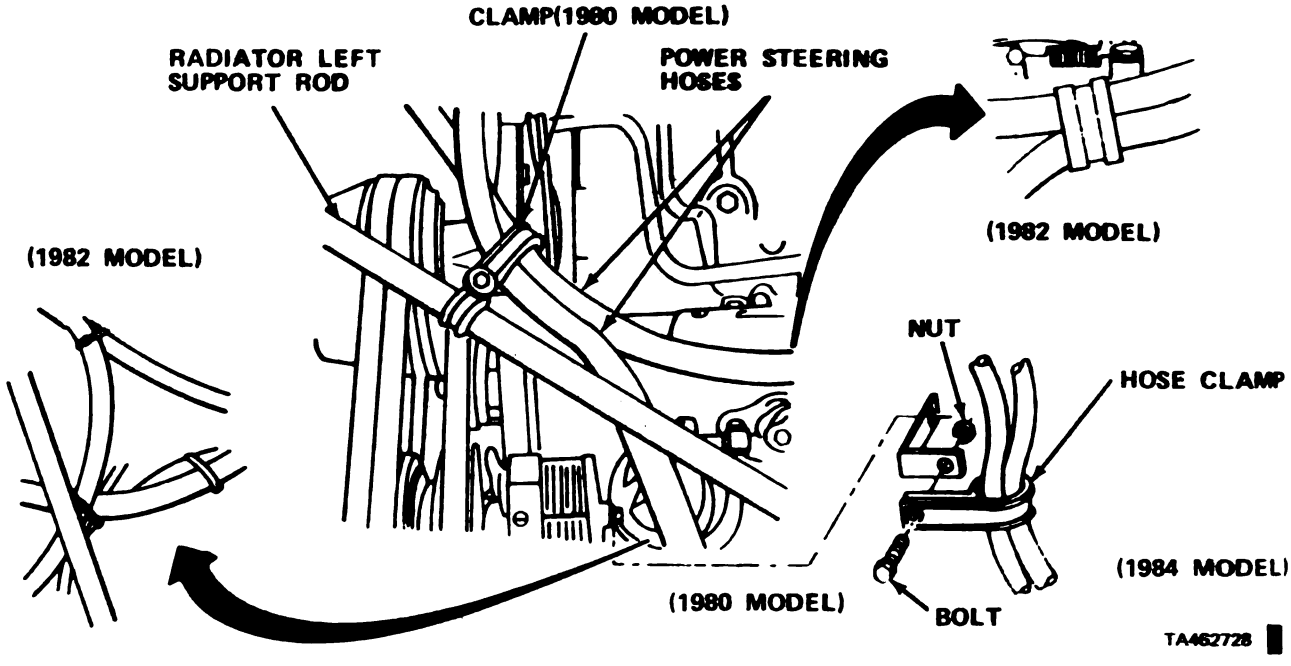


(24) Tag and disconnect air line from cooling fan pressurestat mounted on engine coolant return manifold. Disconnect other end of air line from transmission oil filter inlet fitting.

(24.1) Remove nut, washer, and wire from sending unit.

(25) Remove clamps and wire ties securing air line and remove line.

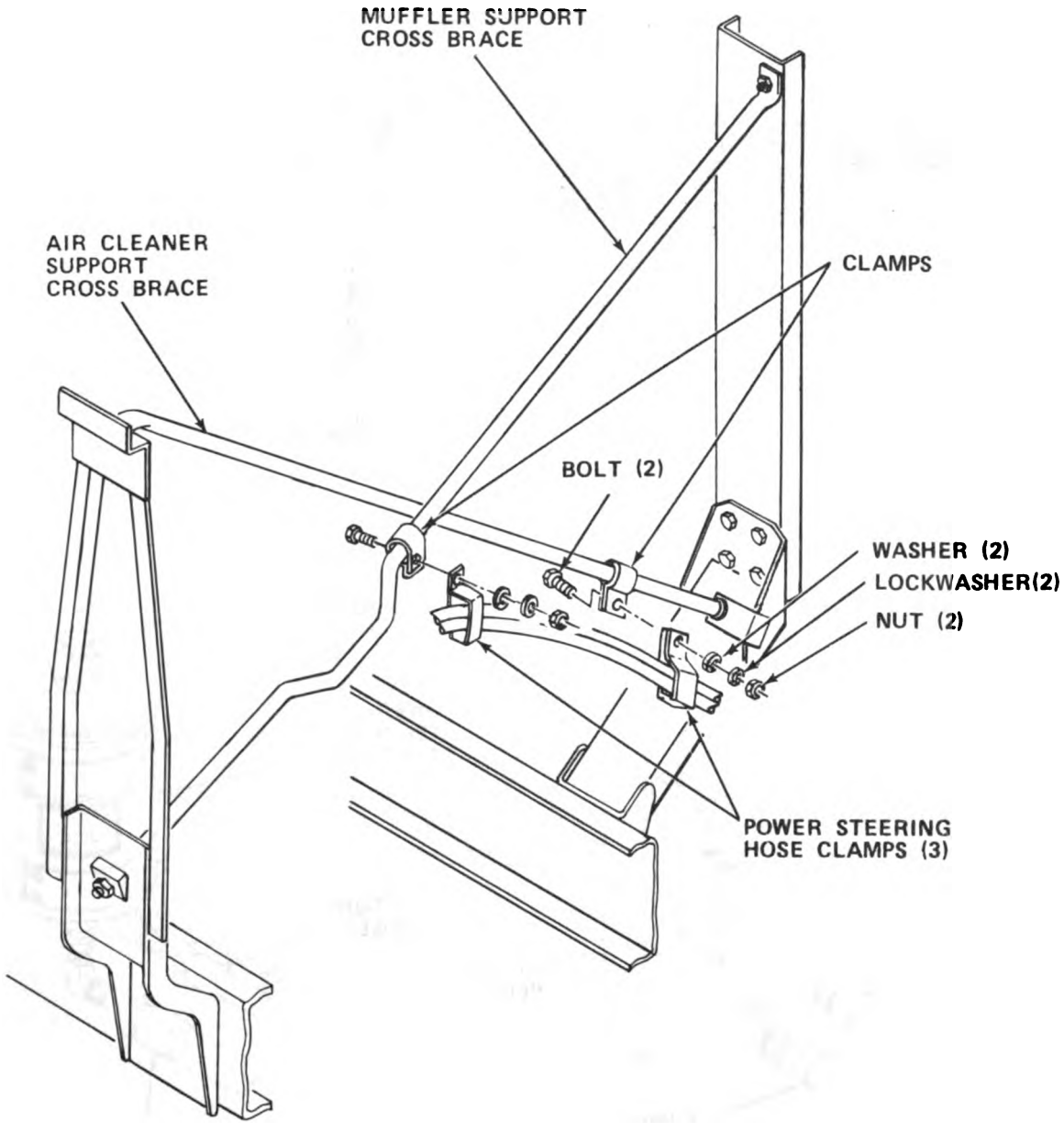
(26) Tag and disconnect air compressor air governor air line from transmission oil filter cooling fan pressurestat and disconnect other end from air compressor air governor. Remove clamps and wire ties securing air line and remove line.



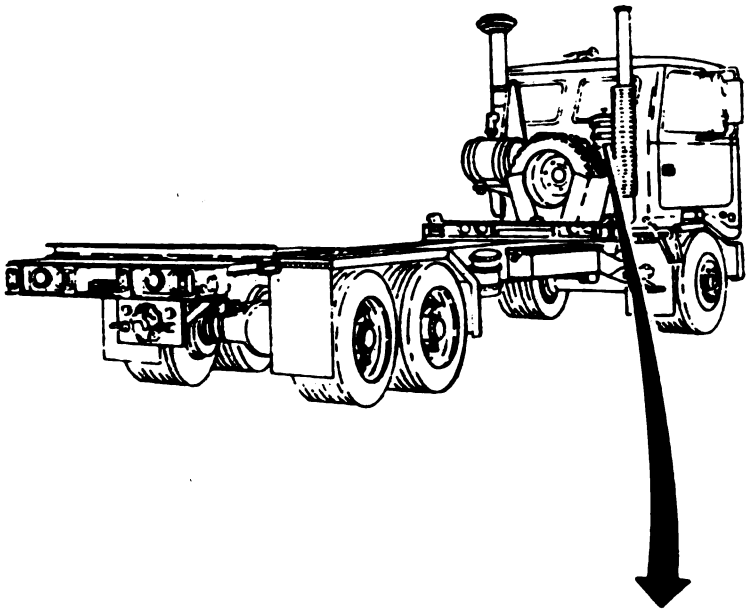
(27) Remove bolt, nut, washer, and lockwasher; disconnect and remove clamp securing power steering hoses to radiator left support rod on 1980 model, or to fuel pump support bracket on 1982 model, or to air compressor front adapter housing cover on 1984 model.

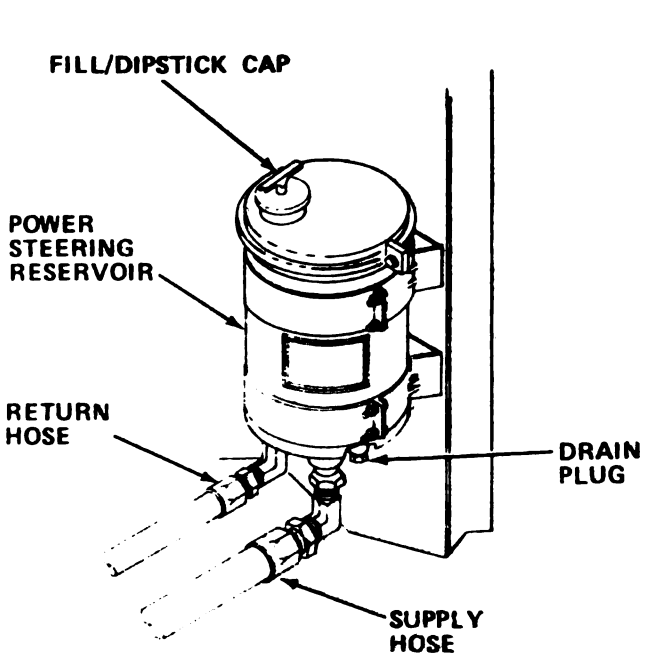
(28) Swing radiator left support rod out of way so that it points towards rear of vehicle.

(29) Cut all wire ties, as necessary, securing power steering hoses.

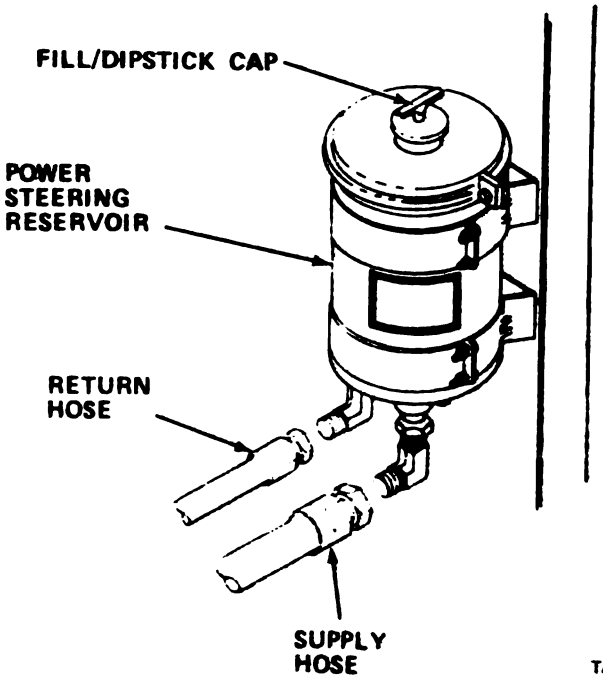


(30) Remove bolt, nut, washer, and lockwasher from power steering hose clamps. Remove clamps from muffler support cross brace and air cleaner support cross brace.



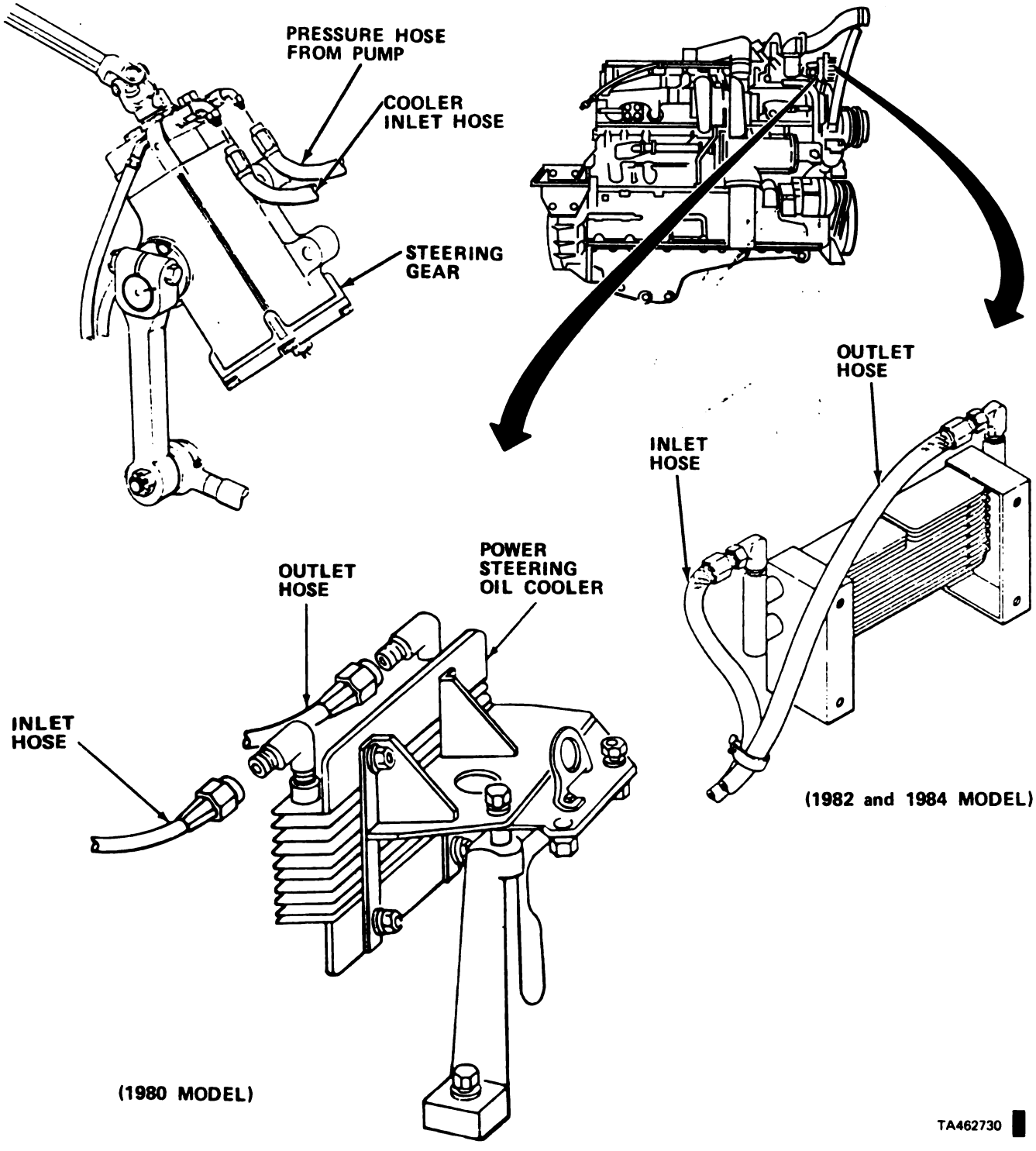


(1982 MODEL)



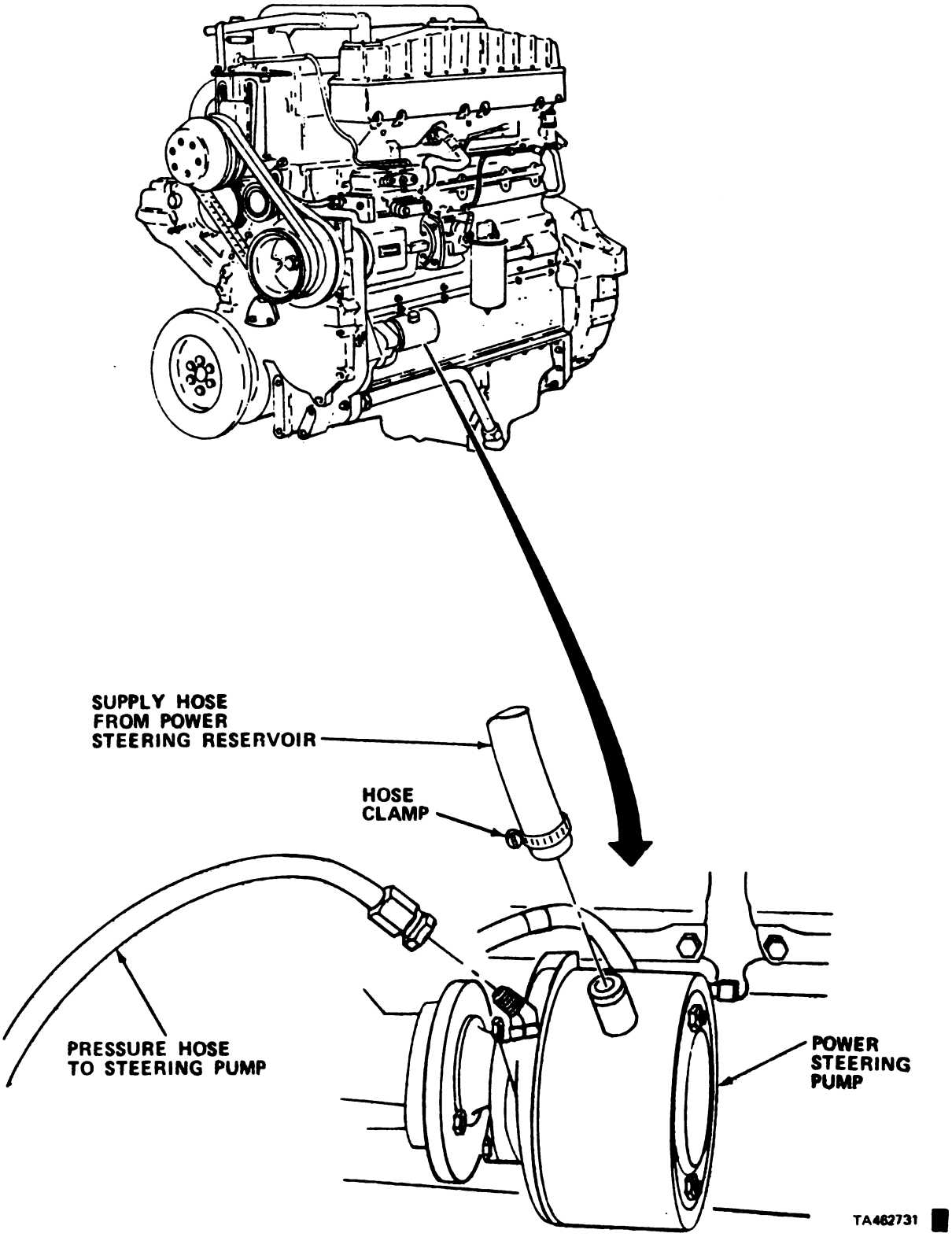
(1980,1984 MODELS)

(31) Tag and disconnect power steering supply and return hoses from power steering reservoir.

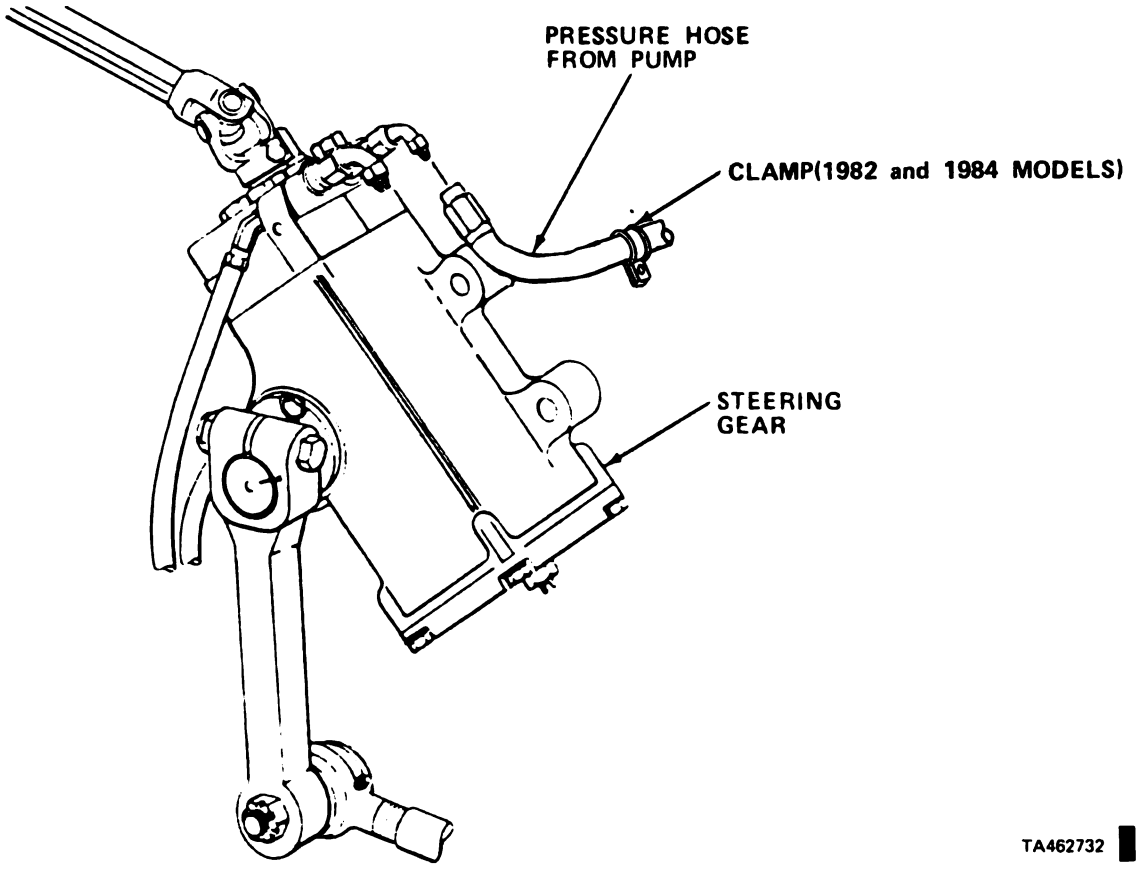


(32) Tag and disconnect power steering cooler outlet hose from cooler and move hose to side of vehicle.

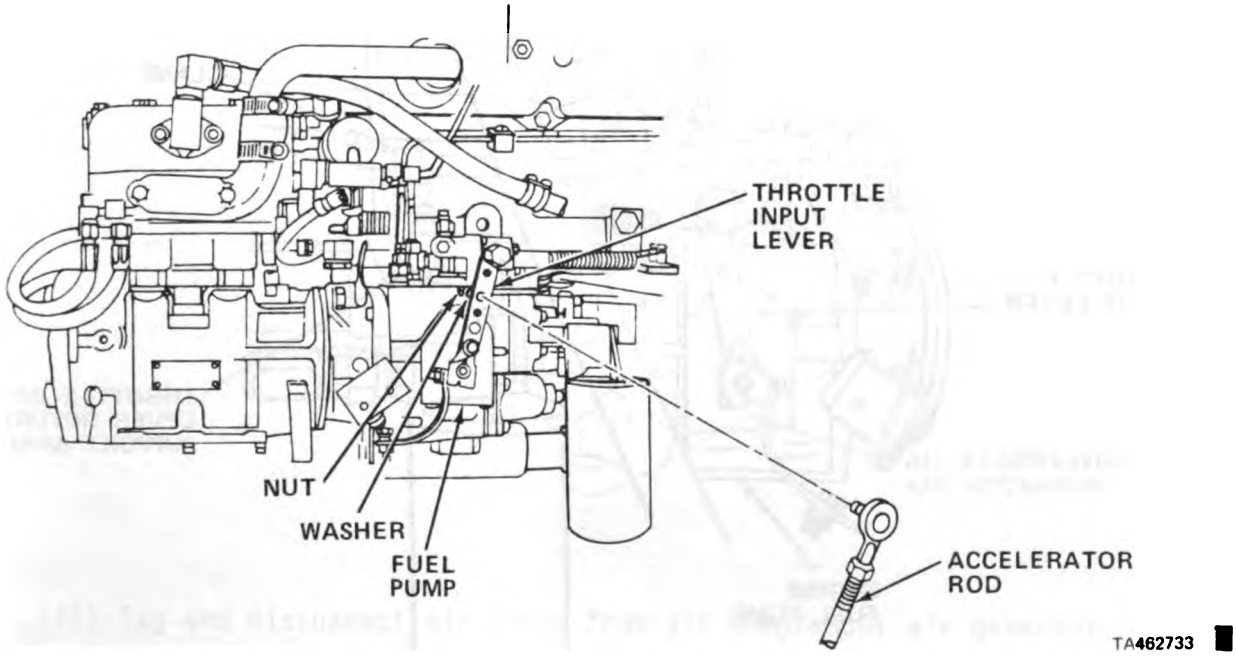
(33) Tag and disconnect power steering cooler inlet hose at cooler. Disconnect inlet hose from steering gear and remove hose.



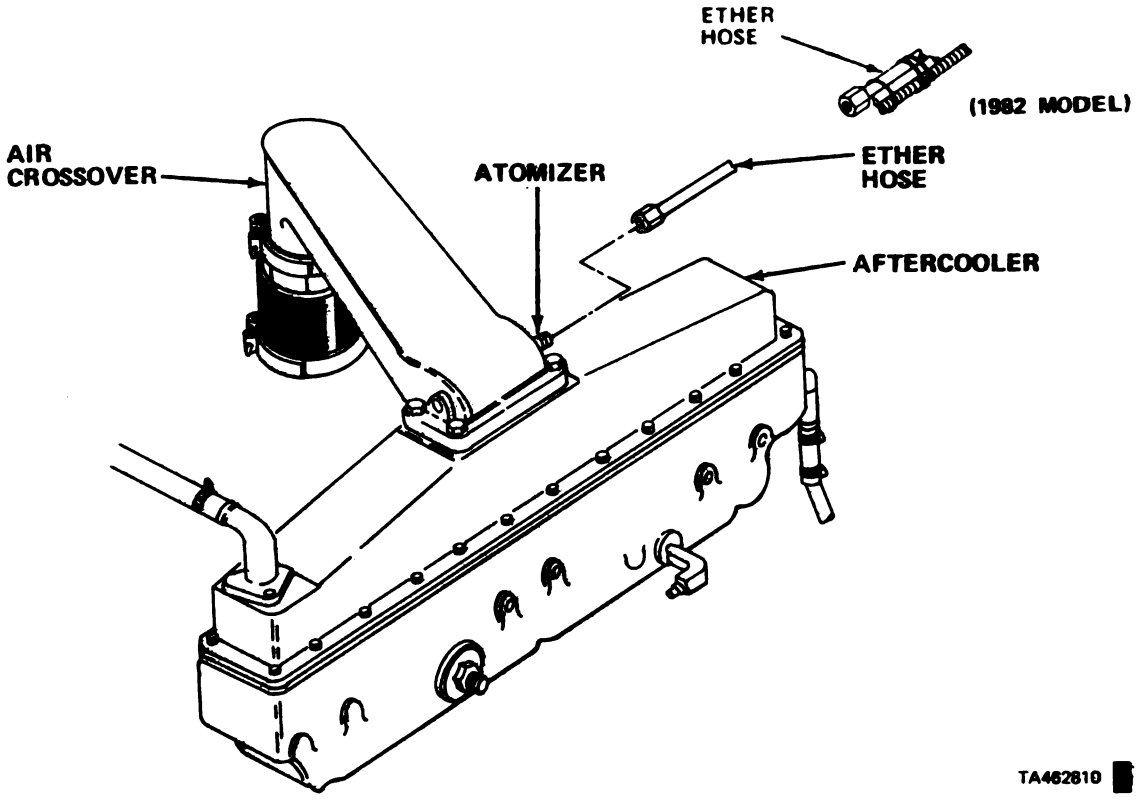
(34) Loosen clamp on supply hose and tag and disconnect pressure hose and supply hose from power steering pump.



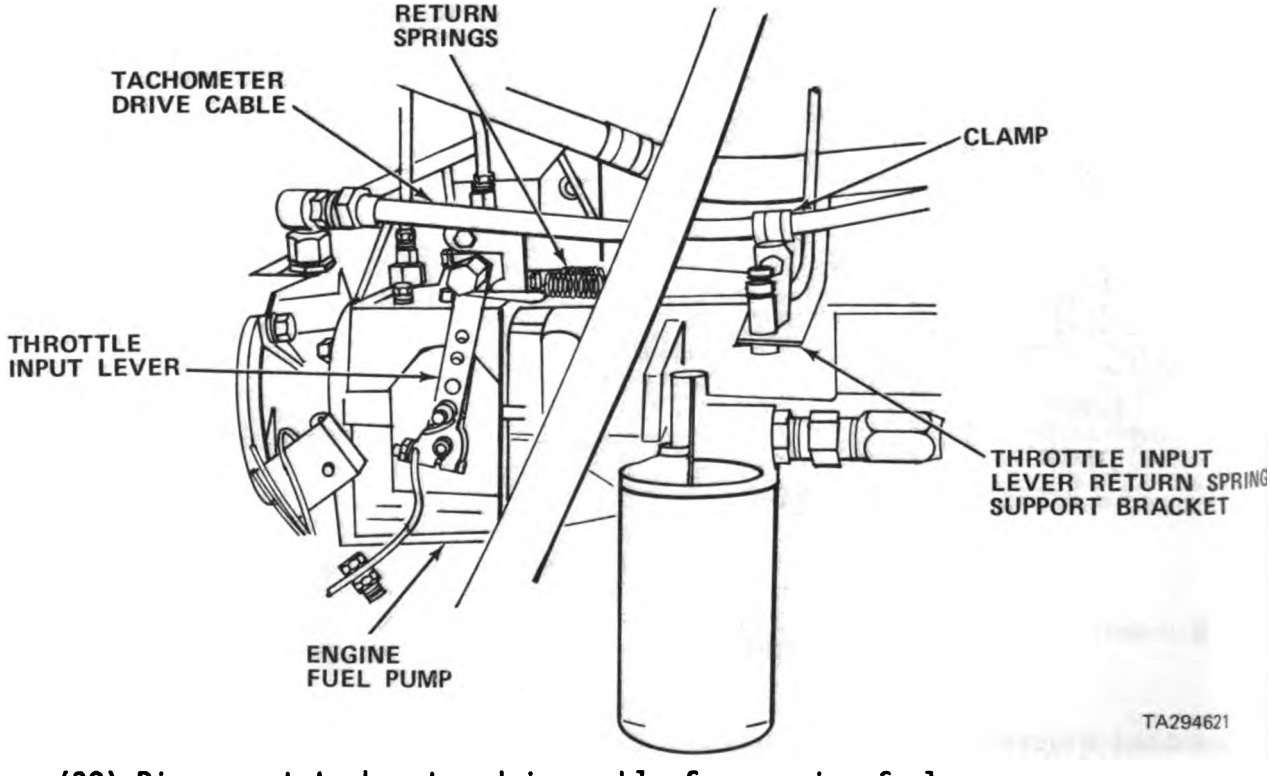
(35) Tag and disconnect power steering pump pressure hose at steering gear. Remove hose. Remove clamp (1982 and 1984 models).



(36) Remove nut and washer; disconnect accelerator rod from engine fuel pump throttle input lever.

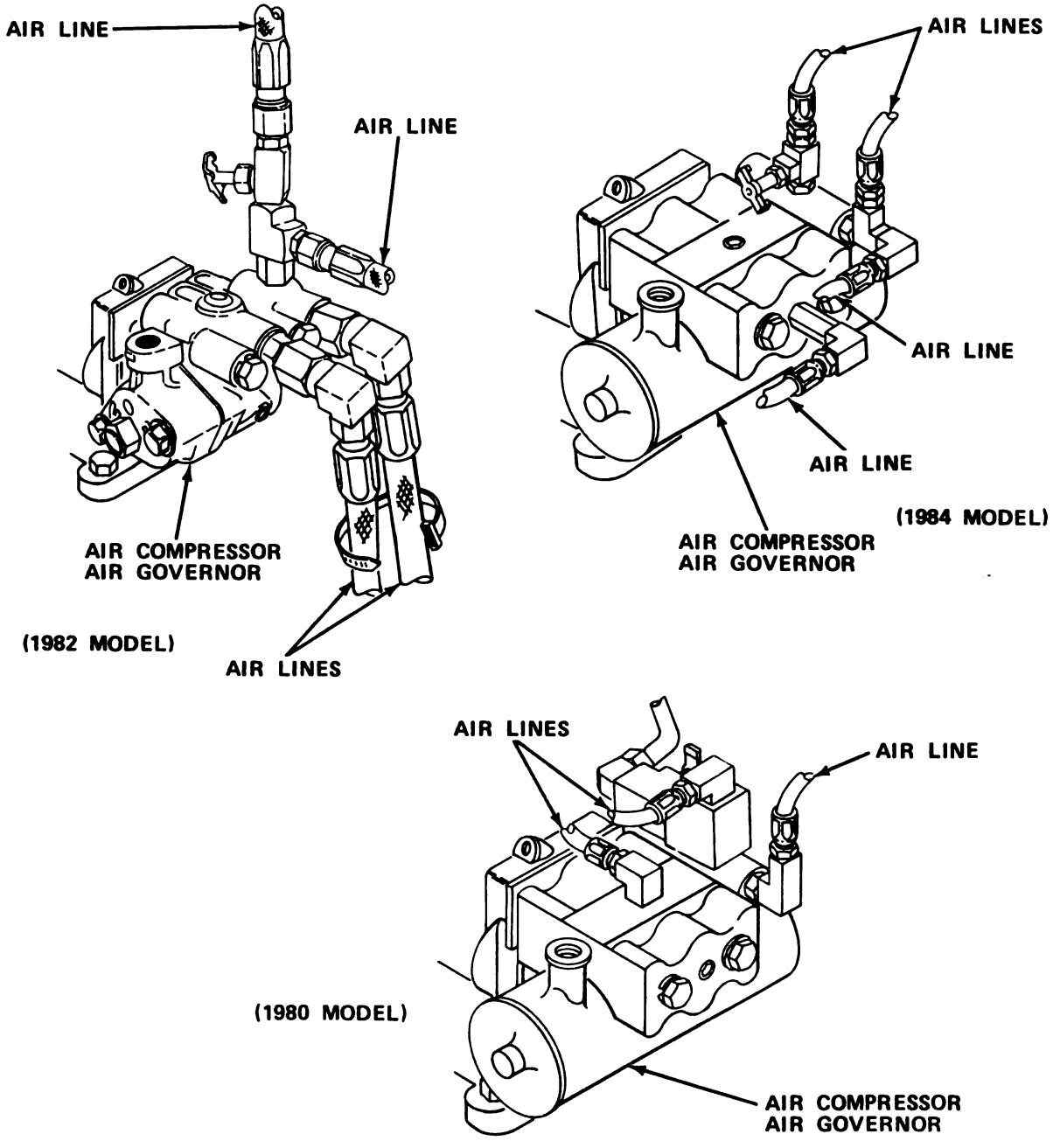


(37) Tag and disconnect ether hose from atomizer on air crossover. Remove clamps and tiedowns; move ether hose clear of engine.



(38) Disconnect tachometer drive cable from engine fuel pump.

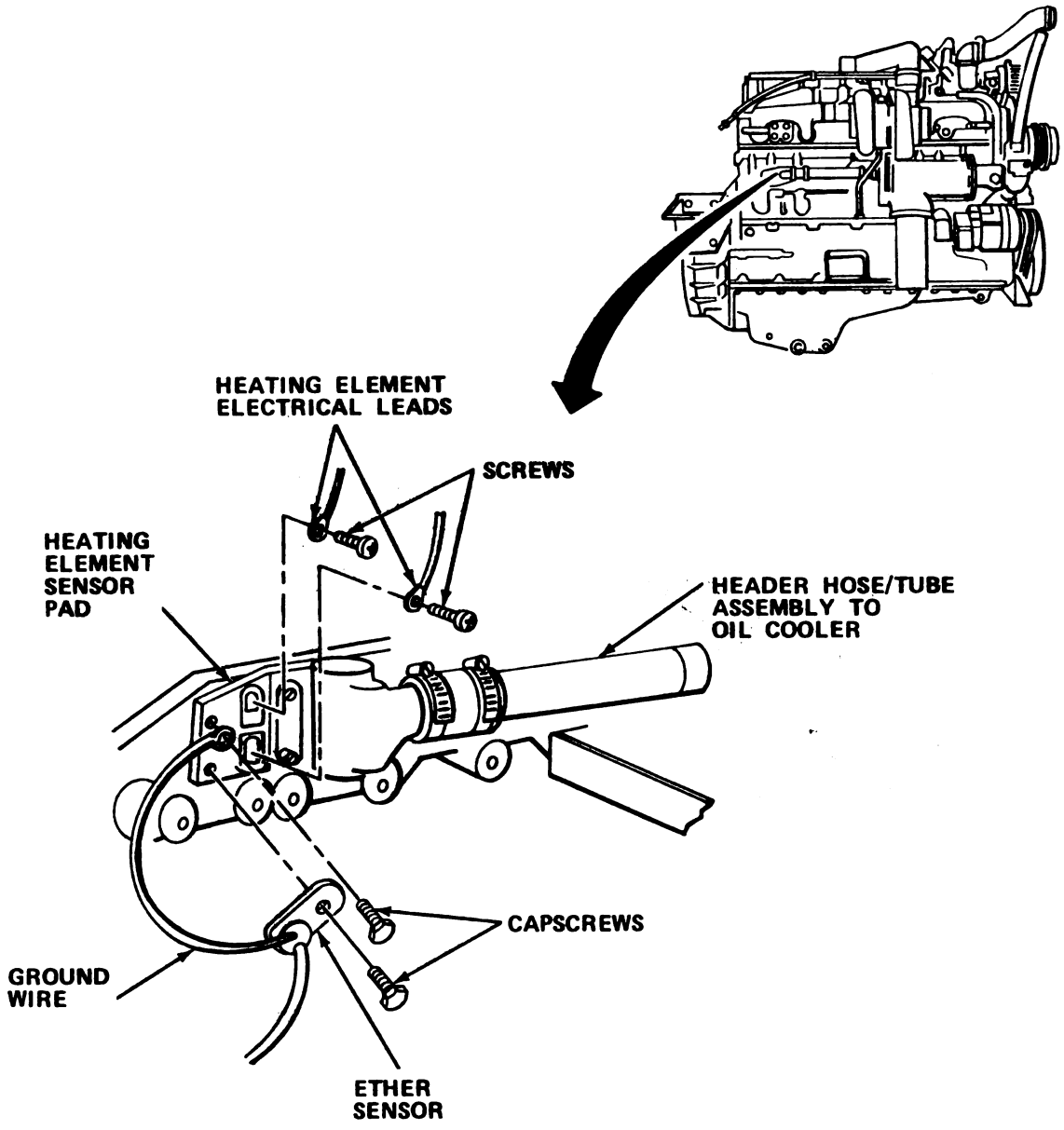
(39) Remove clamp securing tachometer drive cable to throttle input lever return spring support bracket and move tachometer cable to side of vehicle.



TA462734

(40) Tag and disconnect air lines from air compressor air governor.

(41) Remove clamp securing air compressor air governor air lines and move lines to side of vehicle (1980 model).



(42) Remove sealant from ether sensor and engine winterization kit electrical heating element leads and connectors.

(43) Remove capscrews securing ether sensor and its ground wire to heating element electrical sensor pad. Remove ether sensor and ground wire.

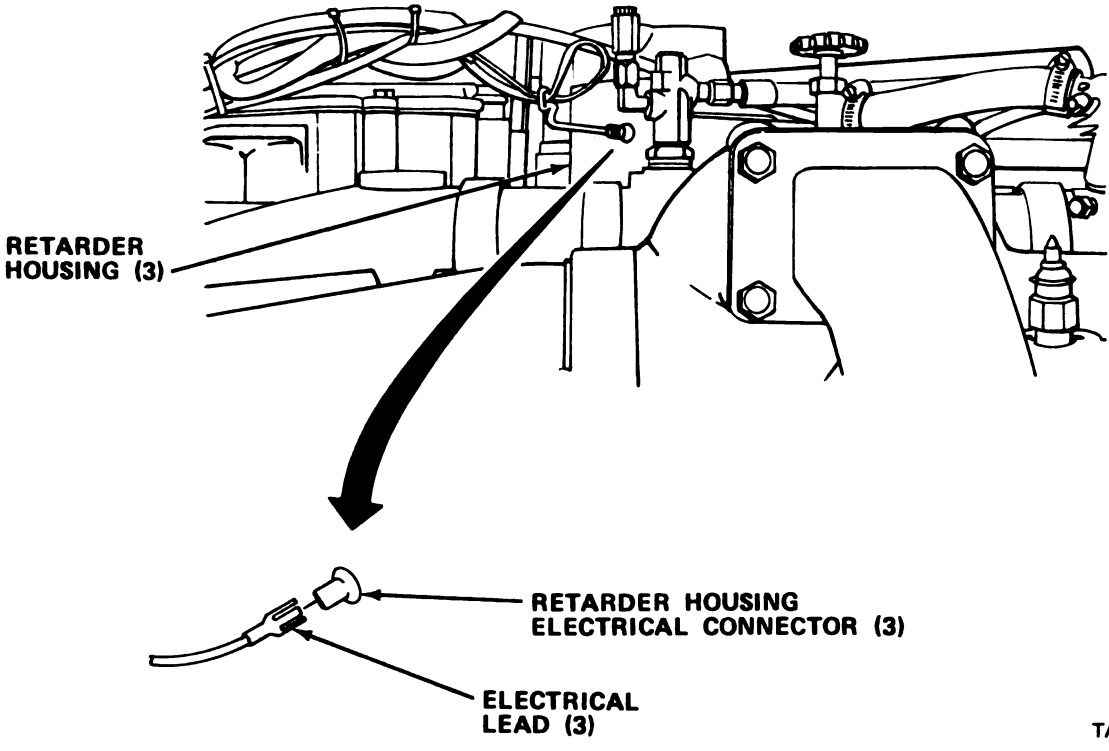
(44) Cut wire ties securing sensor electrical lead and move sensor with lead to side of vehicle.

(45) Remove screws securing heating element electrical leads to heating element connectors. Tag and disconnect heating element electrical leads.

(46) Cut wire ties and move heating element wiring harness to side of vehicle.

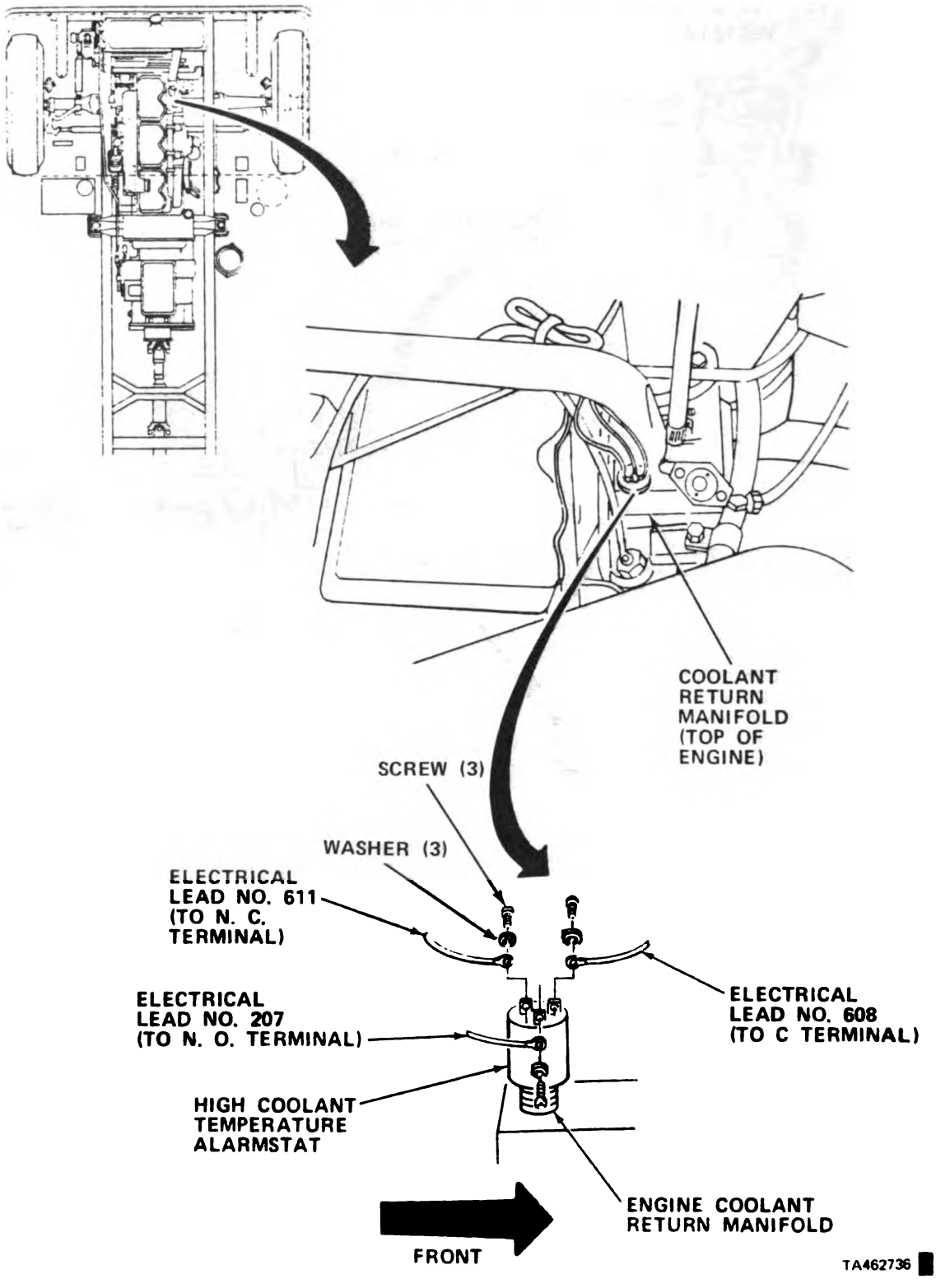
NOTE

VIEW FROM EXHAUST MANIFOLD SIDE OF ENGINE

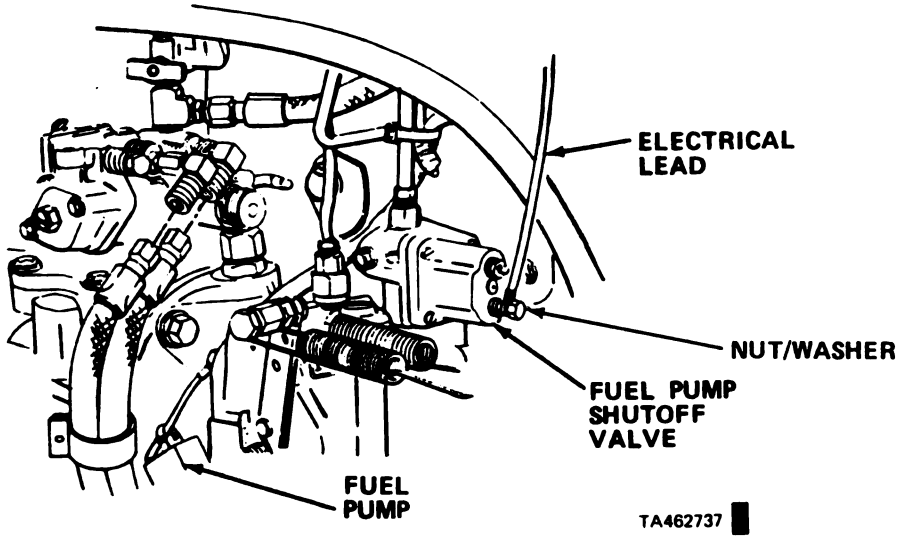


(47) Tag and disconnect engine retarder electrical leads from each engine retarder housing.

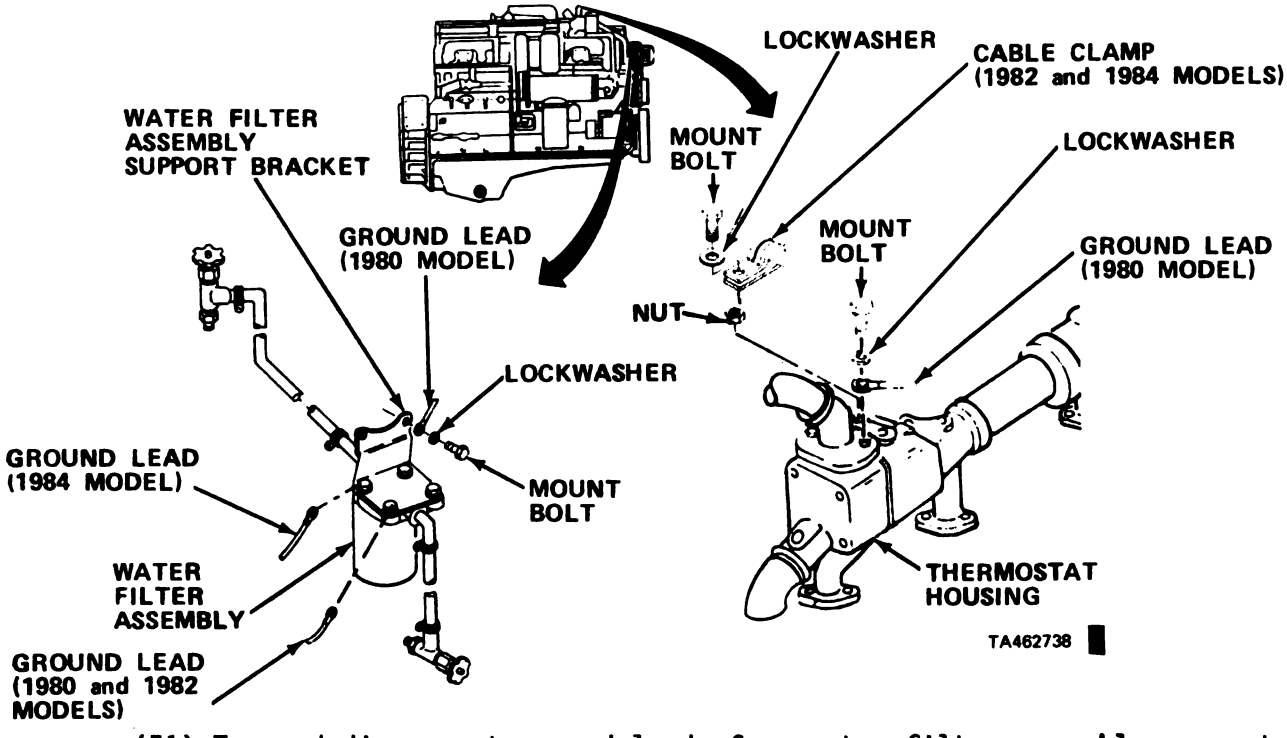
(48) Remove clamps and wire ties and remove engine retarder housing wiring harness from engine.



(49) Remove screws and washers securing electrical leads to high coolant temperature alarmstat on engine coolant return manifold. Tag and disconnect electrical leads.

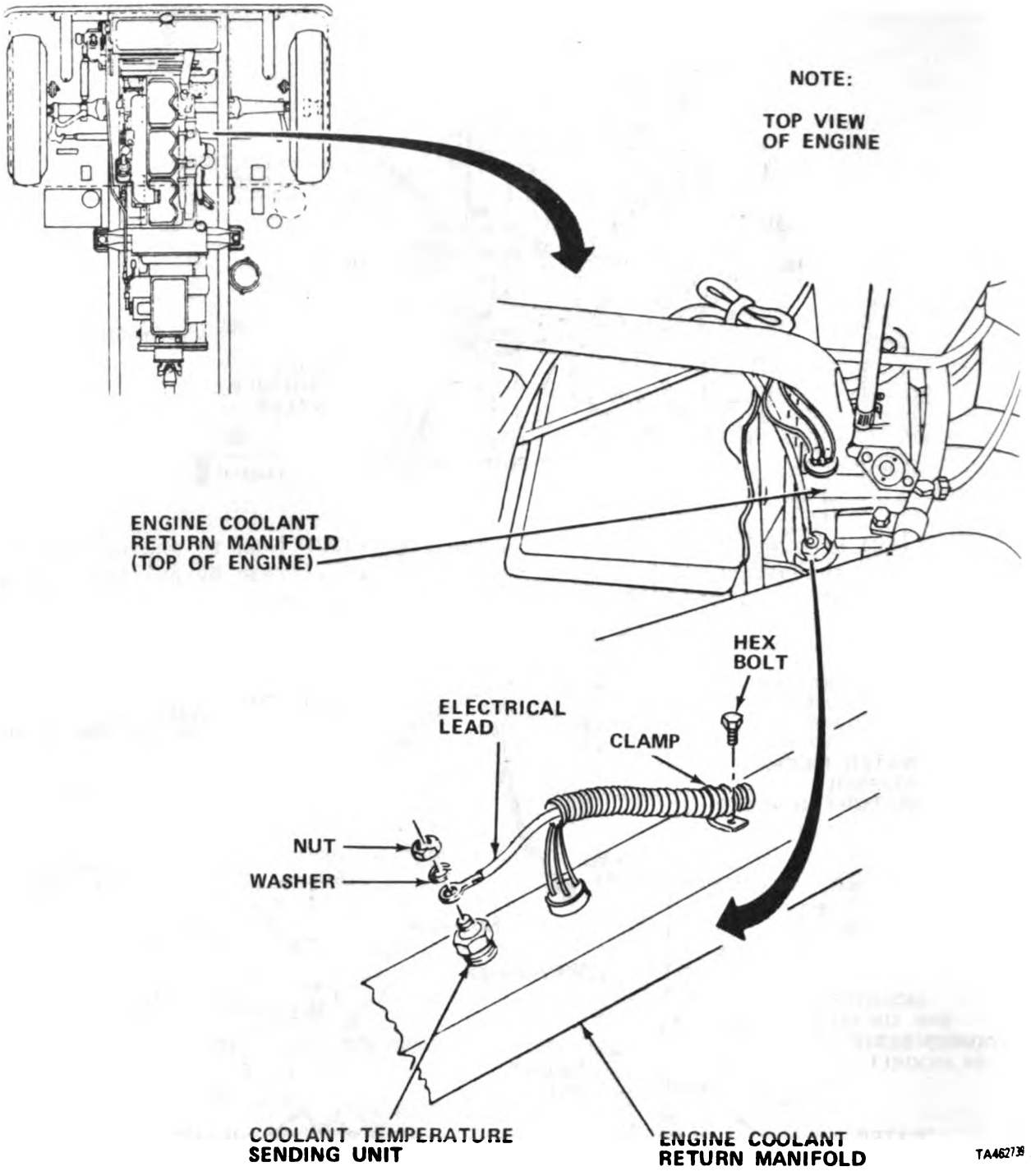


(50) Remove nut and washer securing electrical lead to engine fuel pump shutoff valve. Tag and remove electrical lead by pulling lead clear from engine intake manifold and cylinder heads.



(51) Tag and disconnect ground leads from water filter assembly support bracket and thermostat housing mount bolt and lockwasher (1980 model).

(51.1) Remove mount bolt, lockwasher, and nut securing cable clamp to thermostat housing (1982 and 1984 models).

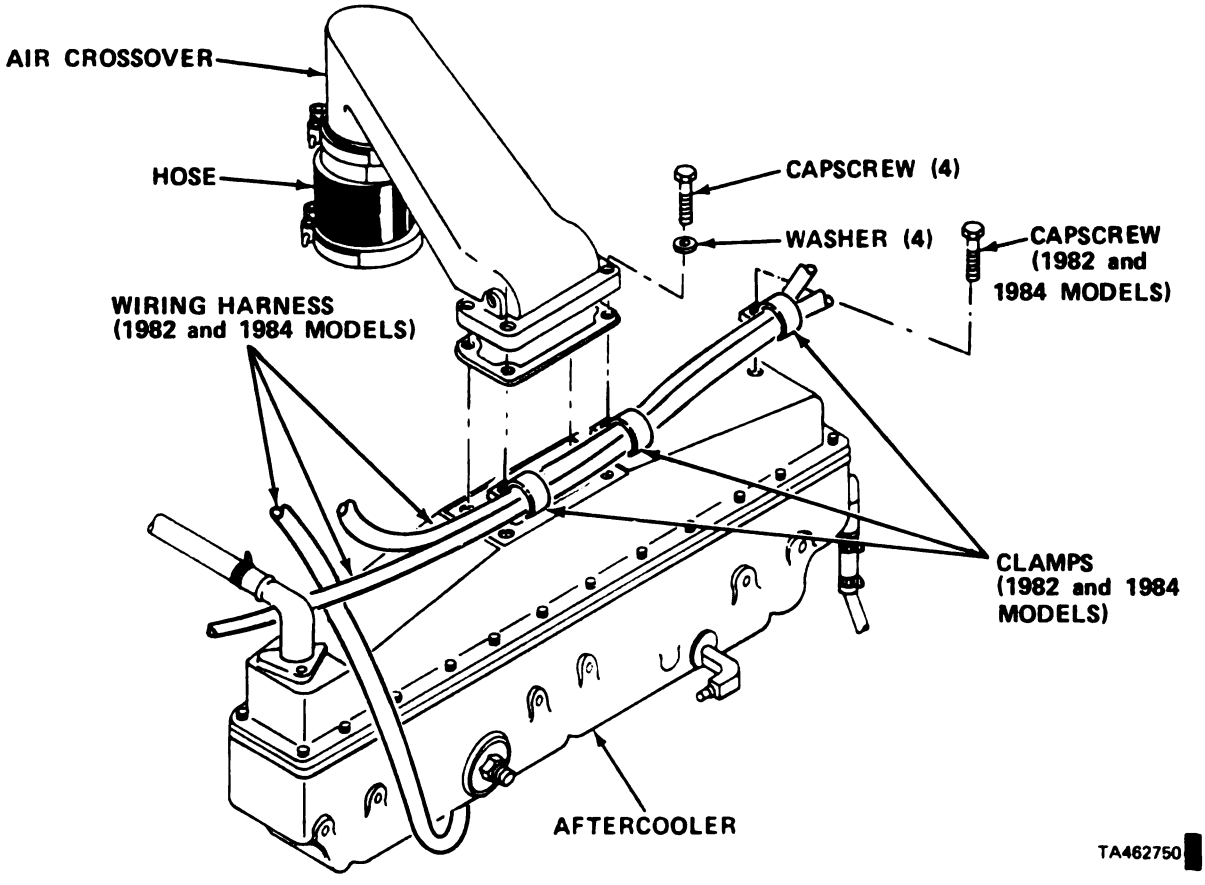


(52) Remove nut and washer securing electrical lead from coolant temperature sending unit on engine coolant return manifold. Tag and remove electrical lead.

(53) Remove clamp securing high coolant temperature alarmstat wiring harness to top of engine.

NOTE

It is not necessary to disconnect air crossover from turbocharger. Hose will allow for free movement of air crossover.



(54) Remove capscrews and washers securing air crossover to aftercooler (1980 model).

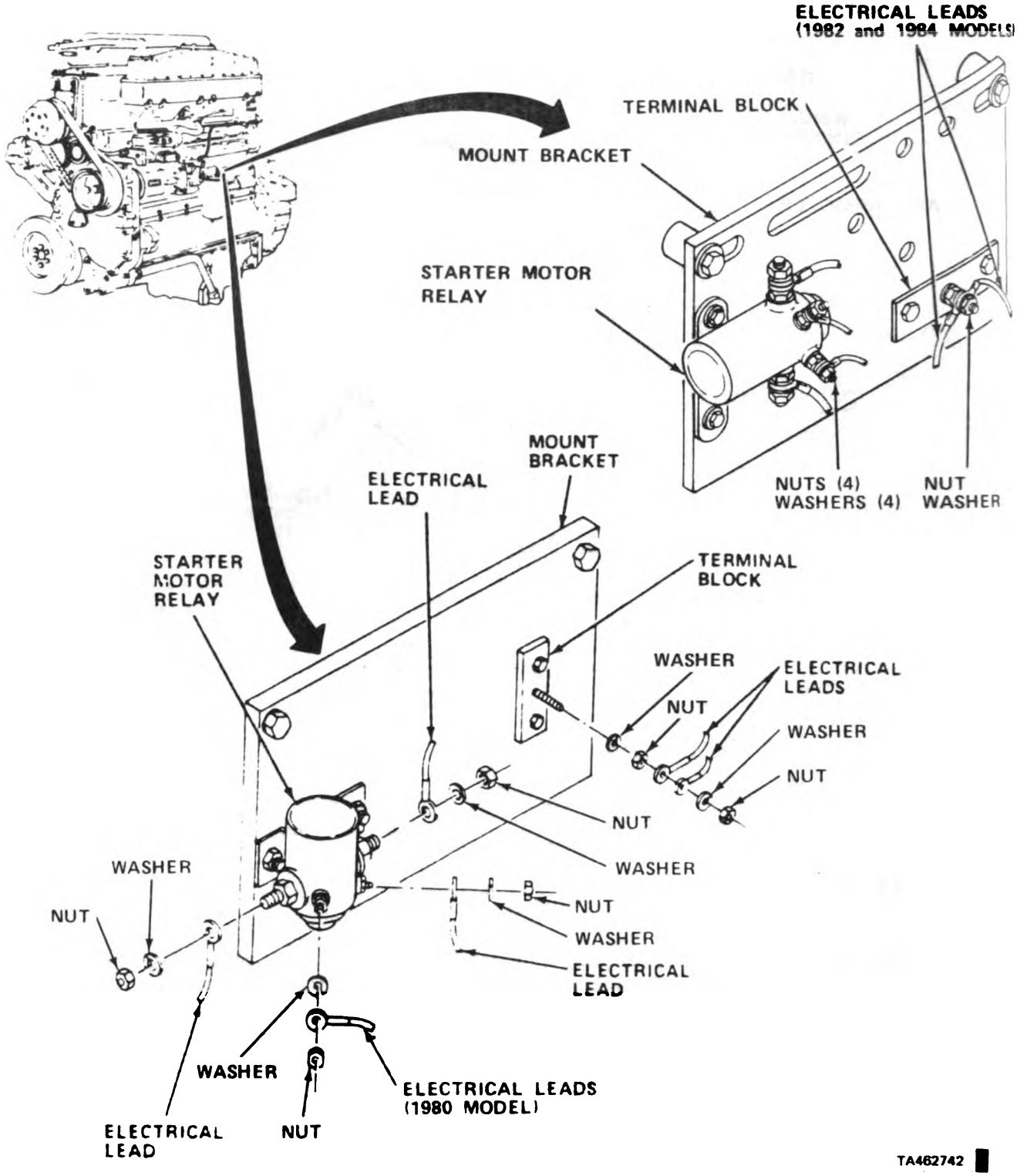
(55) Lift air crossover high enough to allow removal of wiring harness and remove harness from top of engine (1980 model).

(56) Remove capscrews securing wiring harness clamps to top of engine. Remove harness (1982 and 1984 models).

NOTE

Check condition of air crossover mounting gasket before reinstalling air crossover.

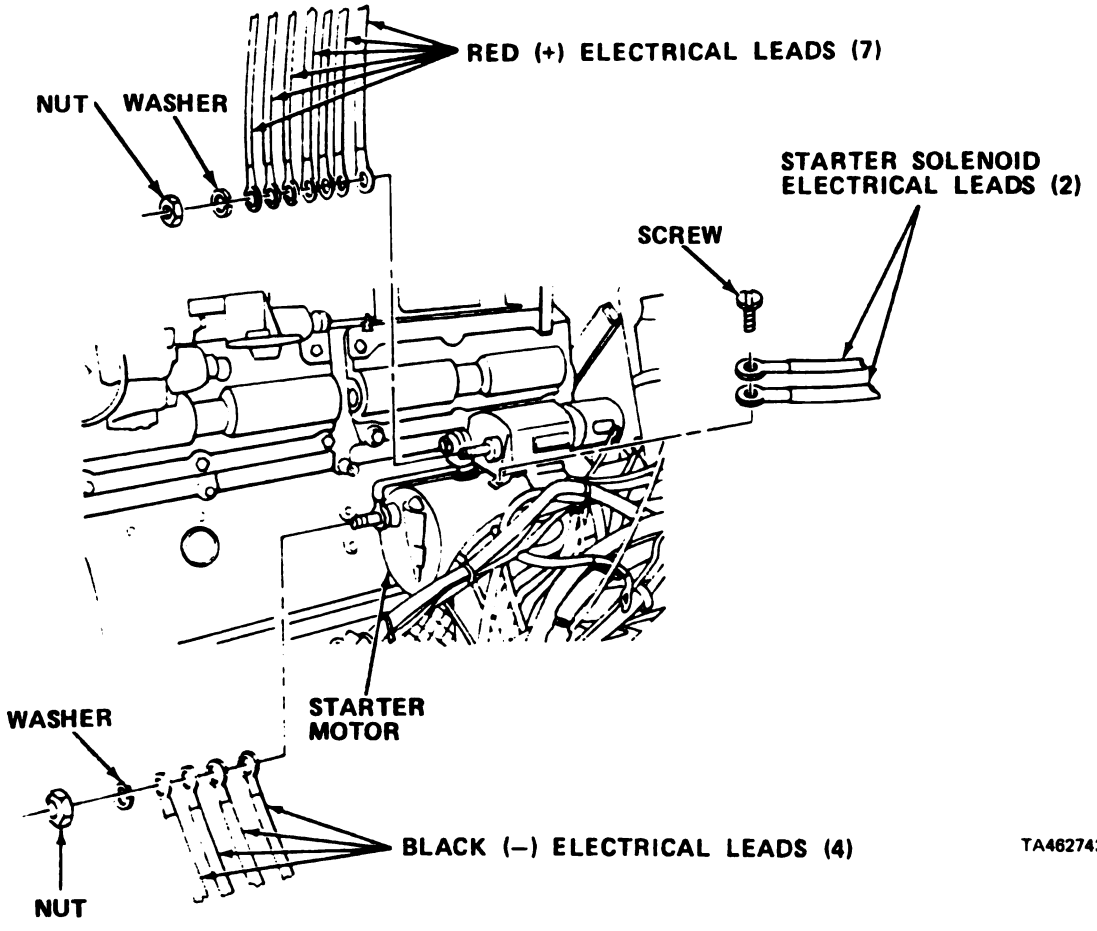
(57) Reinstall air crossover on aftercooler and secure with capscrews and washers (1980 model).



TA462742

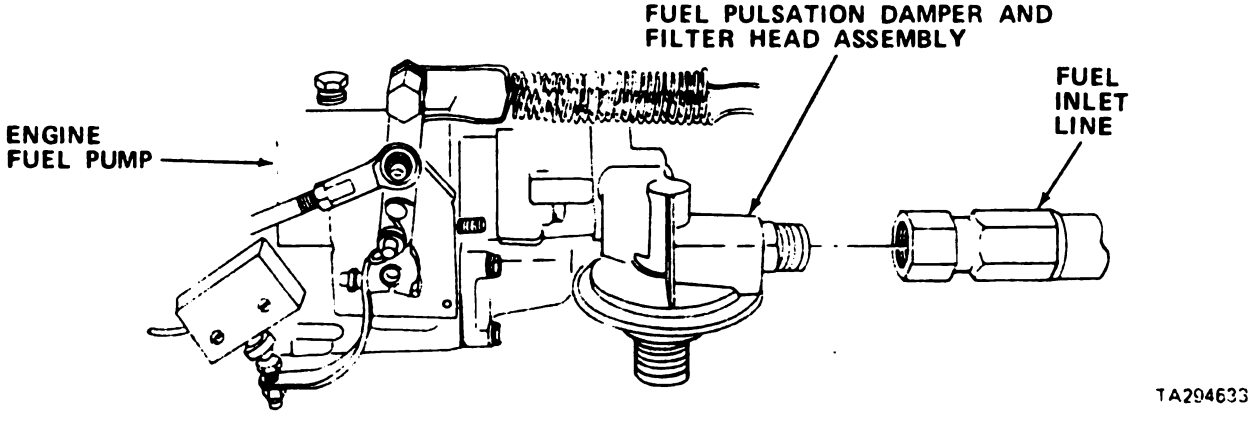
(58) Remove nuts and washers securing electrical leads to engine starter motor relay. Tag and remove electrical leads.

(59) Remove nut and washer securing electrical leads to terminal block on starter motor relay mount bracket. Tag and move electrical leads clear of engine.

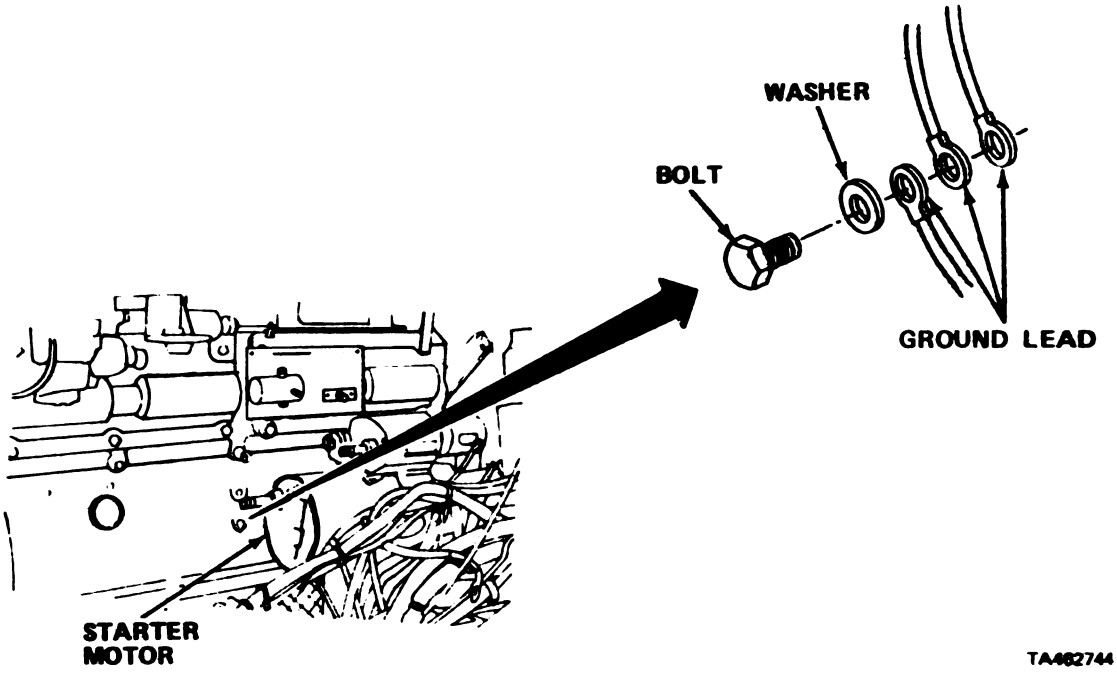


(60) Tag wires and remove nuts, washers, (screw from starter solenoid leads) and electrical leads from engine starter motor.

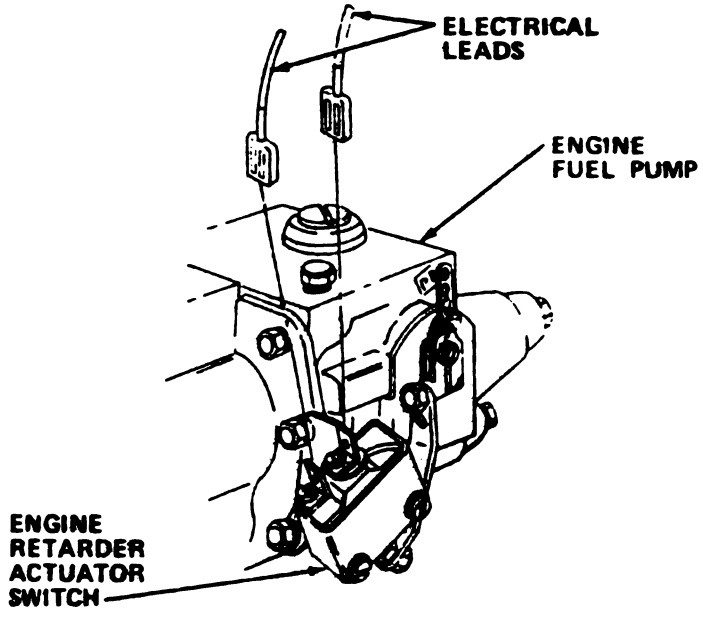
(61) Remove final fuel filter element (TM 9-2320-281-20).



(62) Remove fuel inlet line from fuel pulsation damper and filter head assembly.

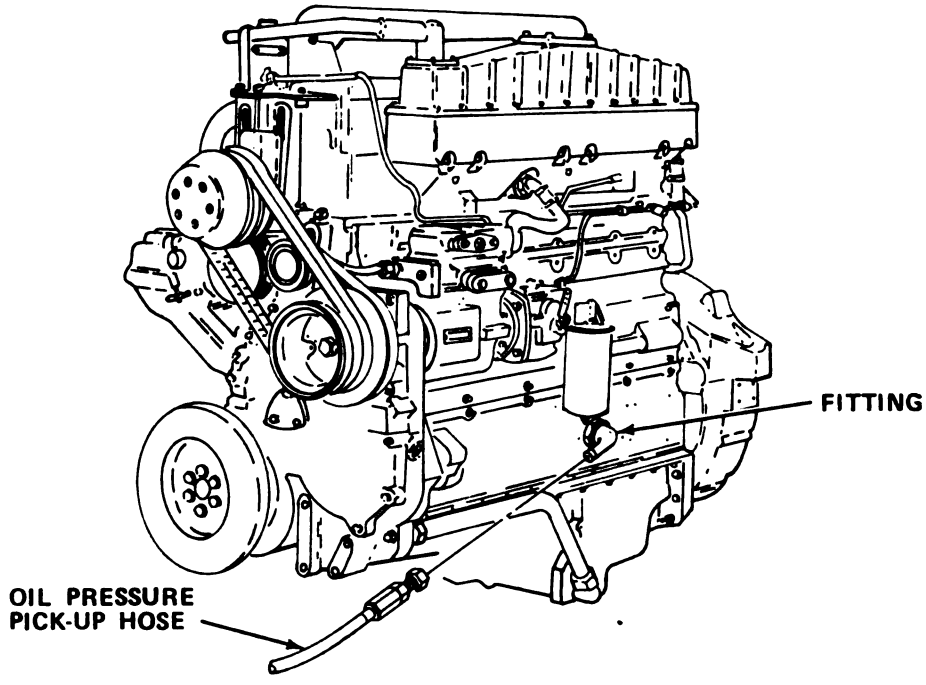


(63) Tag wires and remove bolt, washer, and ground leads from connector point above starter motor.



(64) Tag and disconnect electrical leads from engine retarder actuator switch on engine fuel pump.

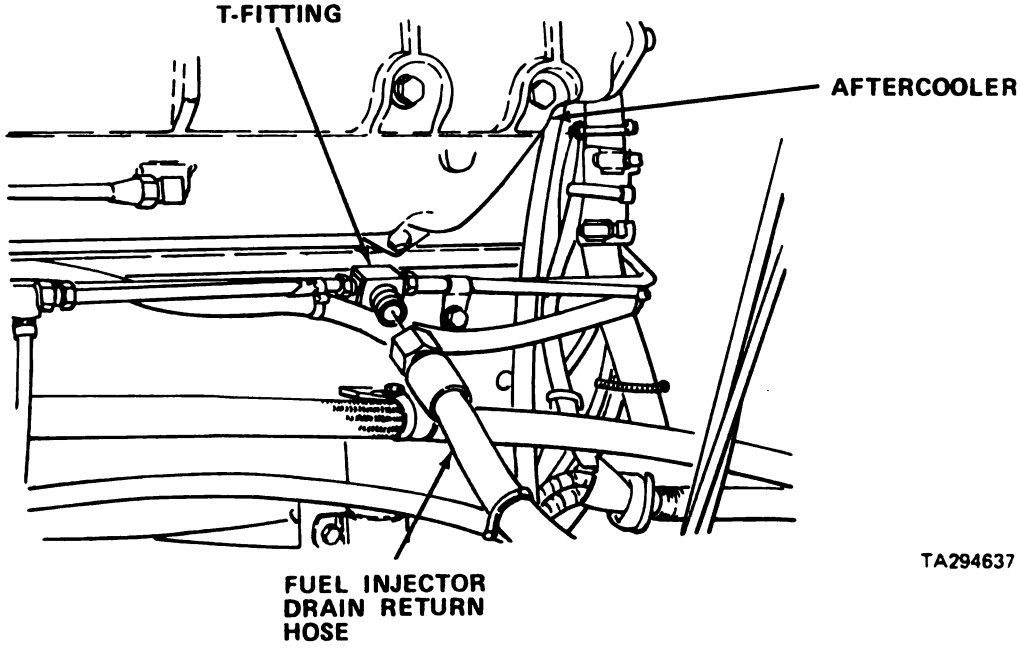
(65) Remove wire ties securing wiring harness to left side of engine.



TA294636

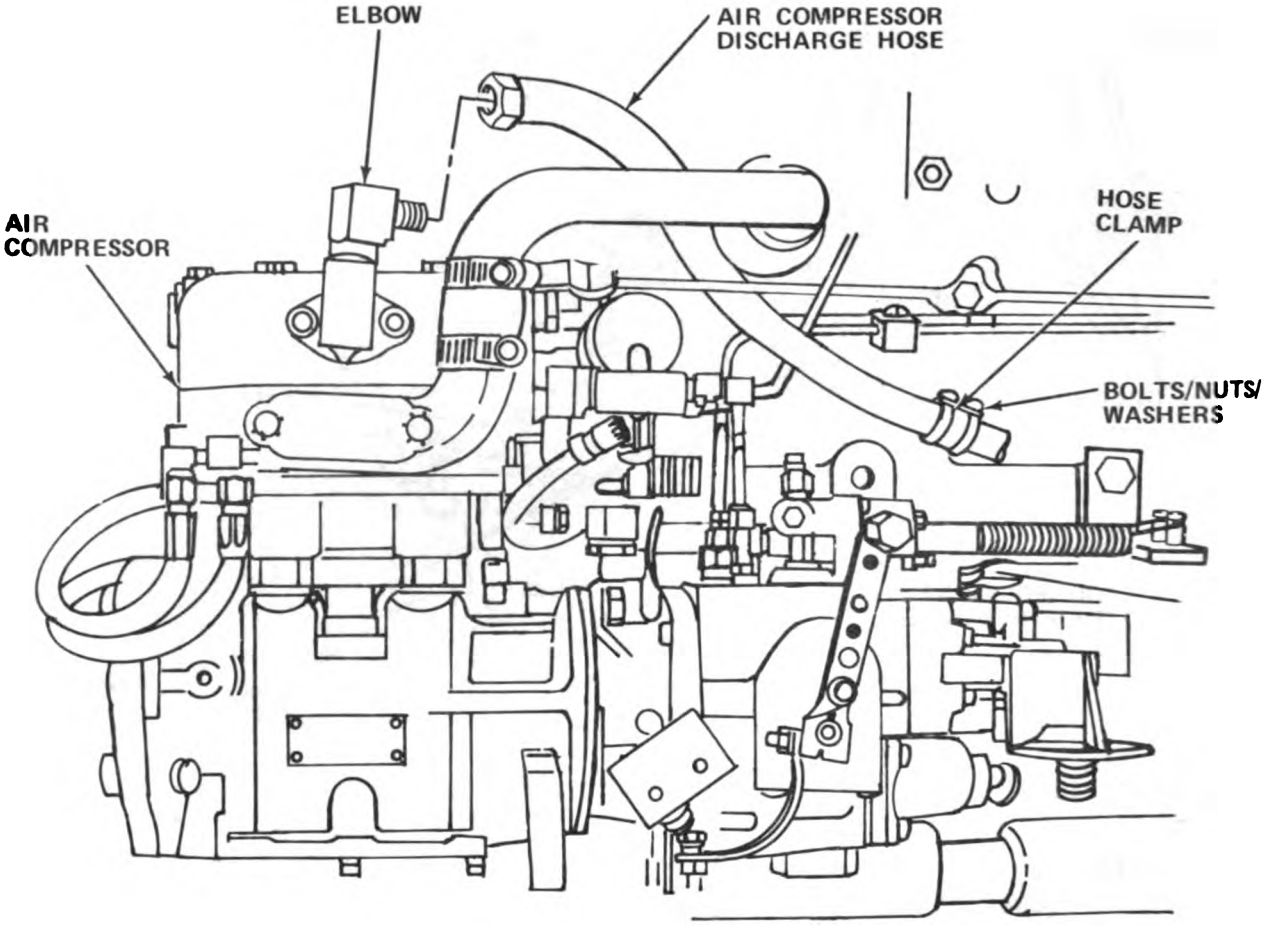
(66) Tag and disconnect oil pressure pickup hose from fitting located at lower left rear of engin block.

NOTE:
LEFT-HAND REAR
OF ENGINE



TA294637

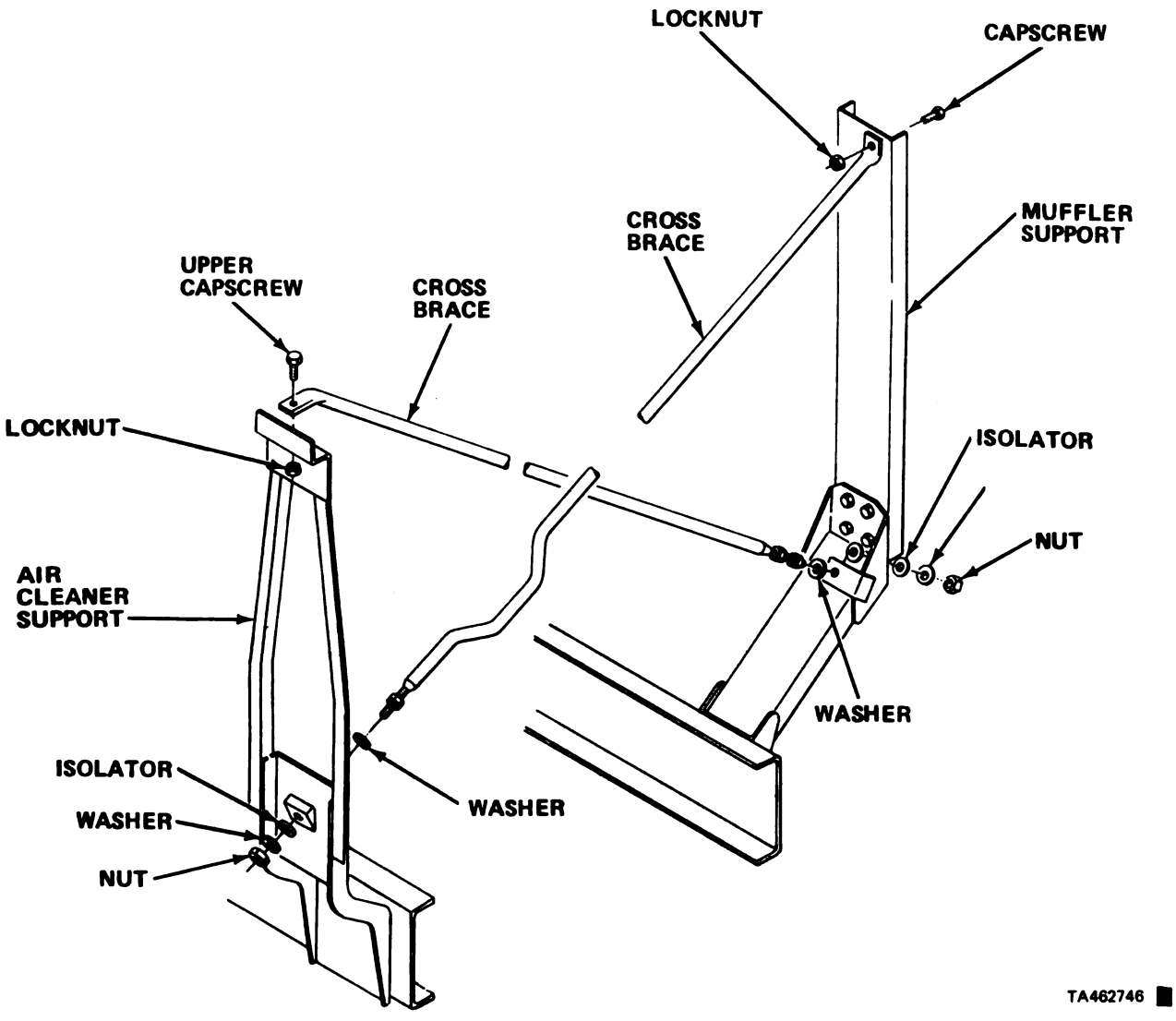
(67) Tag and disconnect engine fuel injector drain return hose from T-fitting in engine fuel injector drain line on left side of engine.



(67.1) Remove bolts, nuts, and washers from hose clamp. Remove hose clamp.

(68) Tag and disconnect air compressor discharge hose from compressor elbow.

(69) Remove bolts, nuts, and washers securing air compressor discharge hose. Move hose to side of vehicle.

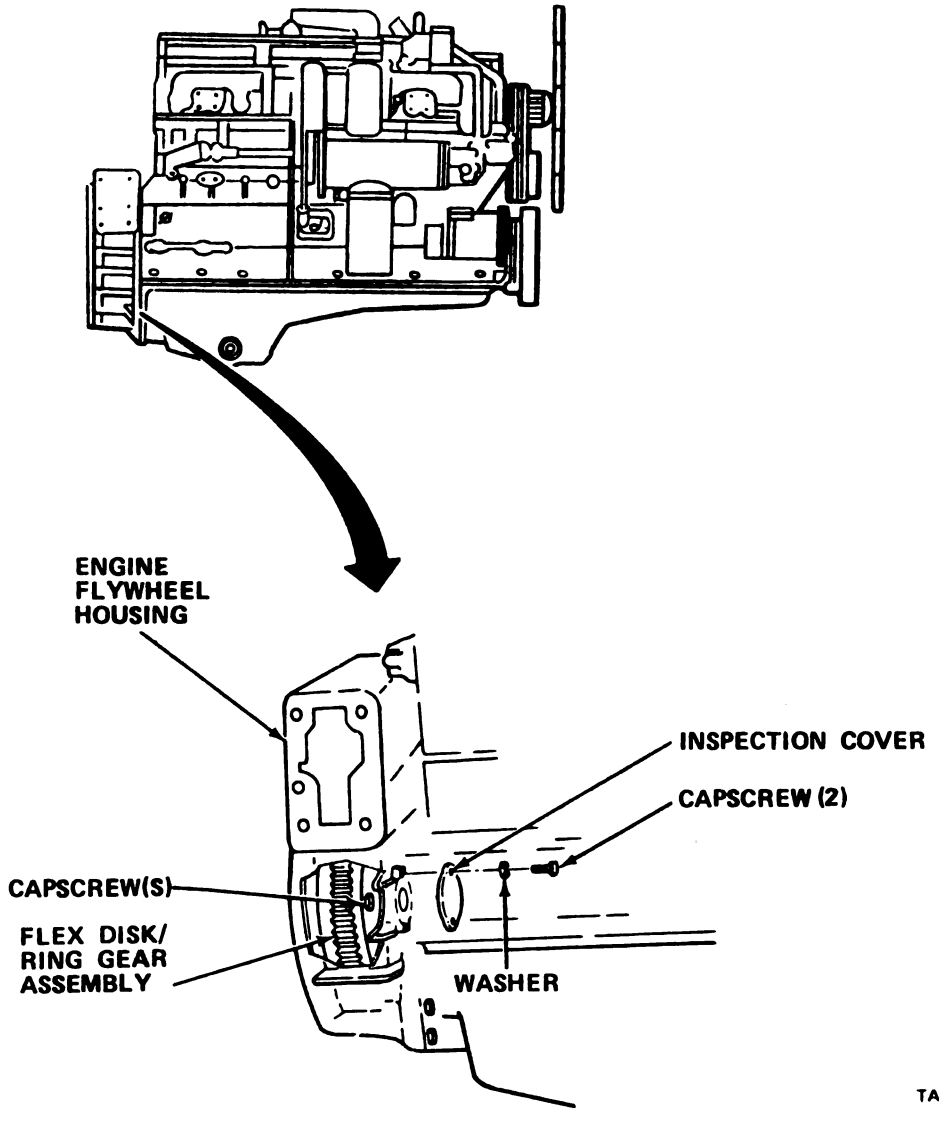


(70) Remove upper capscrews and locknuts securing cross braces to muffler support and air cleaner support.

(71) Remove lower nuts, washers, and isolators from cross braces and remove braces.

(72) Position lifting fixture on hoist and raise fixture above engine.

(73) Engage lifting fixture hooks with engine front and rear lift brackets. Apply slight load with hoist lift fixture.



(74) Remove capscrews and washers securing flywheel housing inspection cover to right front face of flywheel housing and remove cover.

NOTE

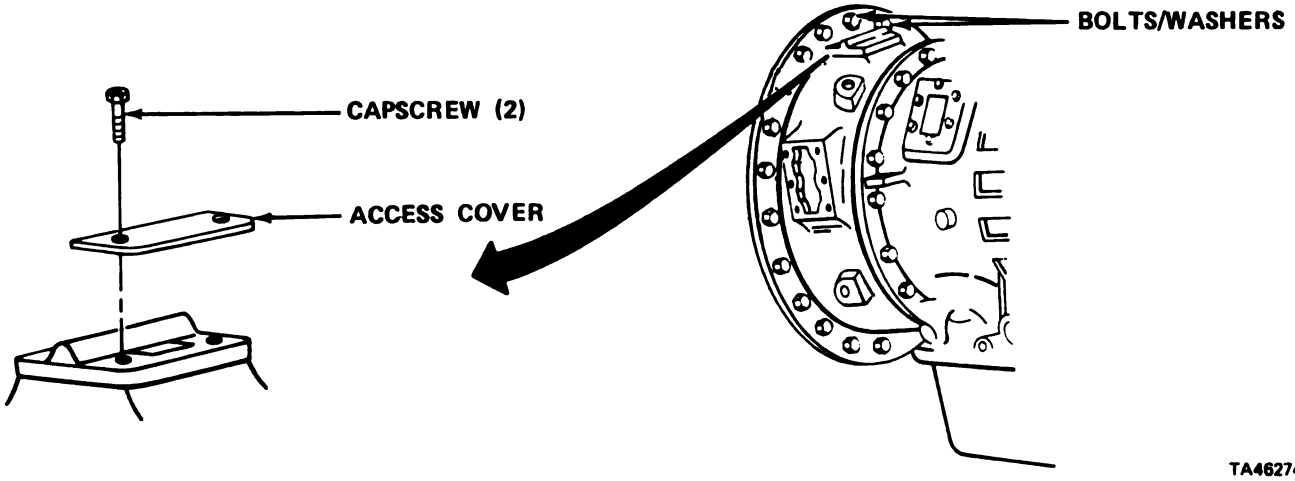
- Capscrews securing transmission flywheel to flex disk and ring gear assembly are removed through flywheel housing inspection cover hole.
- Rotate engine from accessory drive pulley nut to gain access to all capscrews.

(75) Working through flywheel housing inspection cover hole, remove capscrews and washer securing flex disk and ring gear assembly to transmission flywheel.

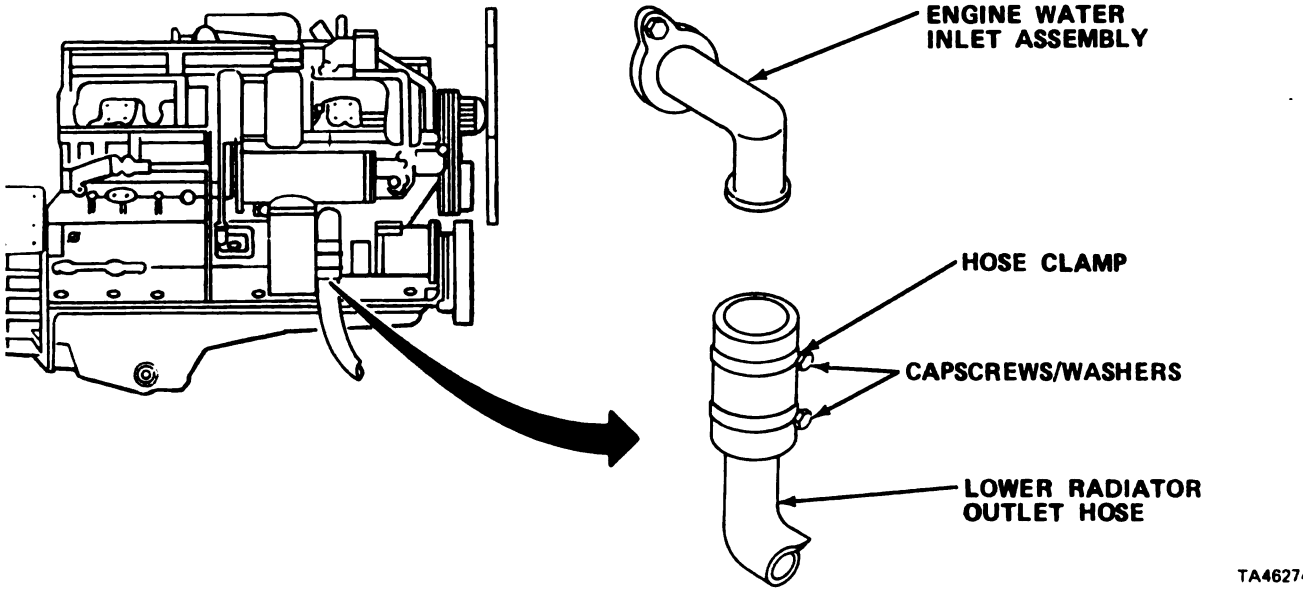
CAUTION

BE SURE TO PLACE TRANSMISSION JACK UNDER TRANSMISSION BEFORE REMOVING CAPSCREWS WHICH SECURE TRANSMISSION TO ENGINE FLYWHEEL HOUSING TO PREVENT SEVER DAMAGE TO EQUIPMENT.

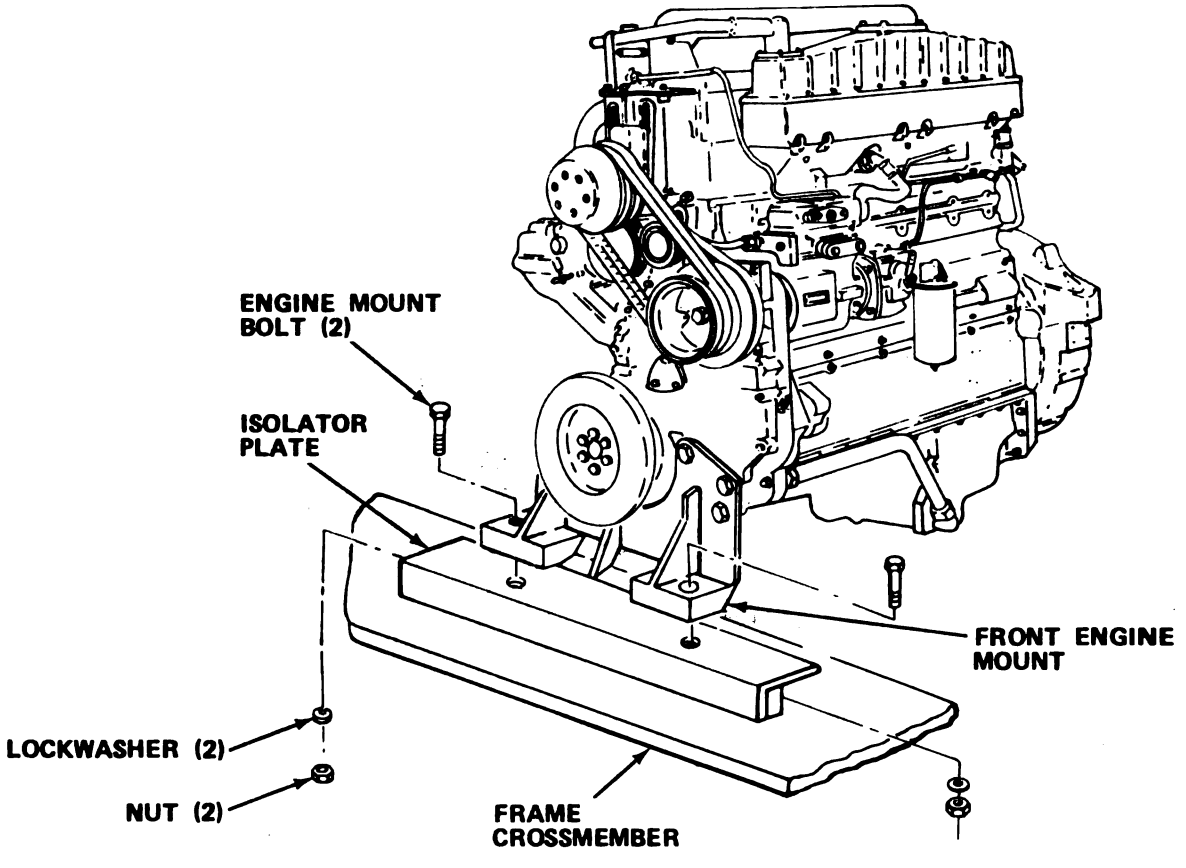
(76) Place transmission jack under transmission and raise jack enough to apply slight load on jack.



(77) Remove capscrews and washers securing transmission to engine flywheel housing.



(78) Loosen hose clamp securing lower radiator outlet hose to engine water inlet assembly and disconnect hose from inlet engine water assembly.



(79) Remove two bolts, lockwashers, and nuts securing front engine mount to isolator plate.

WARNING

- DIRECT PERSONNEL TO STAND CLEAR DURING HOISTING OPERATION. FAILURE TO DO THIS MAY CAUSE INJURY TO PERSONNEL.
- KEEP HANDS CLEAR OF ENGINE AND TRUCK FRAME TO PREVENT PERSONAL INJURY.

NOTE

More than one person is required to perform steps (80) through (82).

(80) Raise engine until front engine mount is elevated approximately 1 in. (25.4 mm) above isolator plate.

(81) Carefully move engine forward 3 to 4 in. (7.6 to 10.1 mm) to clear transmission assembly.

CAUTION

BE SURE THAT ALL ENGINE COMPONENTS ARE CLEAR OF CHASSIS BEFORE LIFTING ENGINE. DAMAGE COULD OCCUR TO COMPONENTS.

(82) Slowly raise and remove engine from vehicle.

CAUTION

DO NOT REST ENGINE ON ITS OIL PAN. SEVERE DAMAGE TO OIL PAN COULD RESULT.

(83) Place engine on stand and remove lift fixture.

b. Install engine.

NOTE

Compare replacement engine to removed engine to determine which accessories (components) will have to be transferred from removed engine to replacement engine.

(1) Transfer all necessary components from removed engine to replacement engine.

(2) Inspect engine components to ensure that there are no wires, cables, hoses, or other components in the way of engine installation.

(3) Secure lift fixture to hoist and attach hoist to engine lift brackets.

WARNING

- DIRECT PERSONNEL TO STAND CLEAR DURING HOISTING OPERATION. FAILURE TO DO THIS MAY CAUSE INJURY TO PERSONNEL.
- KEEP HANDS CLEAR OF ENGINE AND TRUCK FRAME TO PREVENT PERSONAL INJURY.

CAUTION

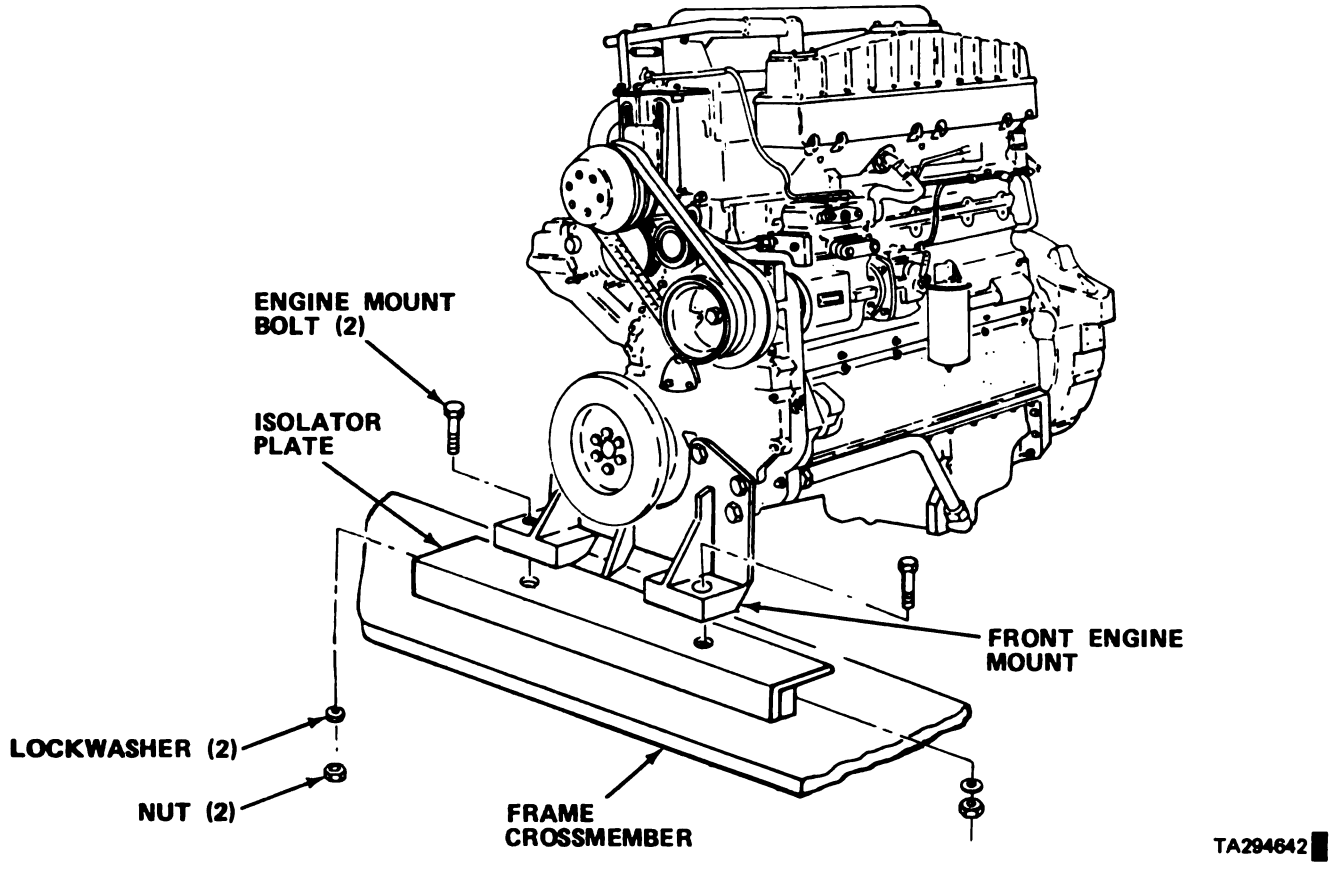
PAY CLOSE ATTENTION TO THE STARTER, ALTERNATOR, OIL PUMP, AND POWER STEERING PUMP DURING ENGINE INSTALLATION - CLEARANCE TO VEHICLE FRAME IS CLOSE. DAMAGE TO EQUIPMENT COULD RESULT.

NOTE

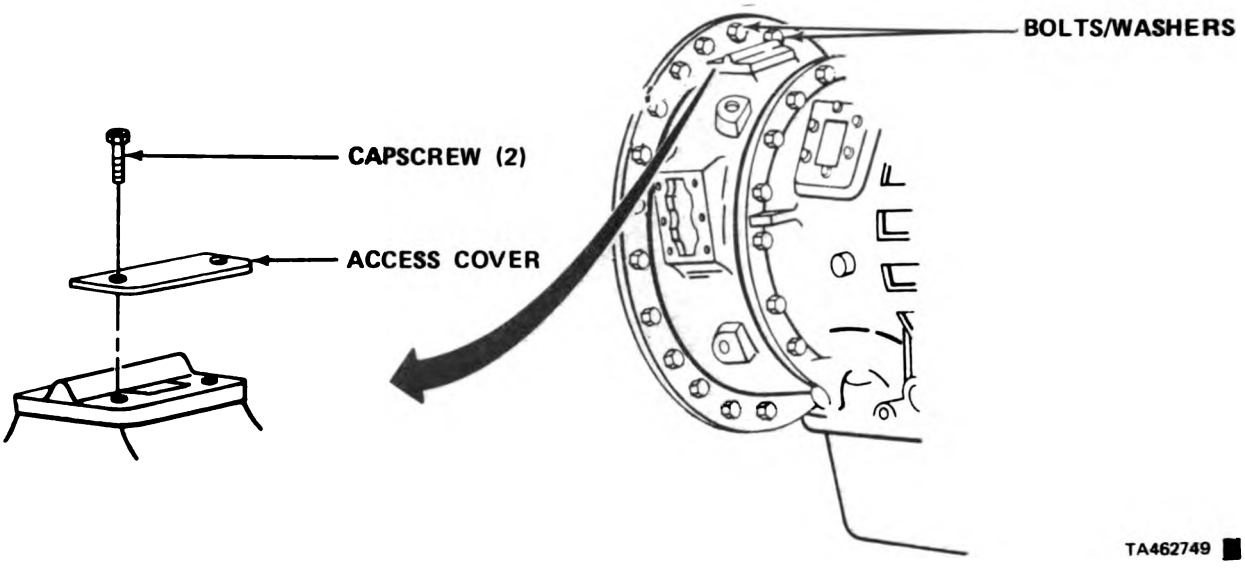
- Check condition of isolator plate before installing engine. If plate defective, replace.
- More than one person is required to perform steps (4) and (5).

(4) Raise engine carefully and guide the engine into its compartment. Aline forward engine mount holes with isolator plate holes.

(5) Check that engine flywheel housing flange holes aline with transmission mount flange holes.



(6) Secure front engine mount with bolts, lockwashers, and nuts. Torque nuts to 125 - 165 ft lbs (169 - 224 N•m).

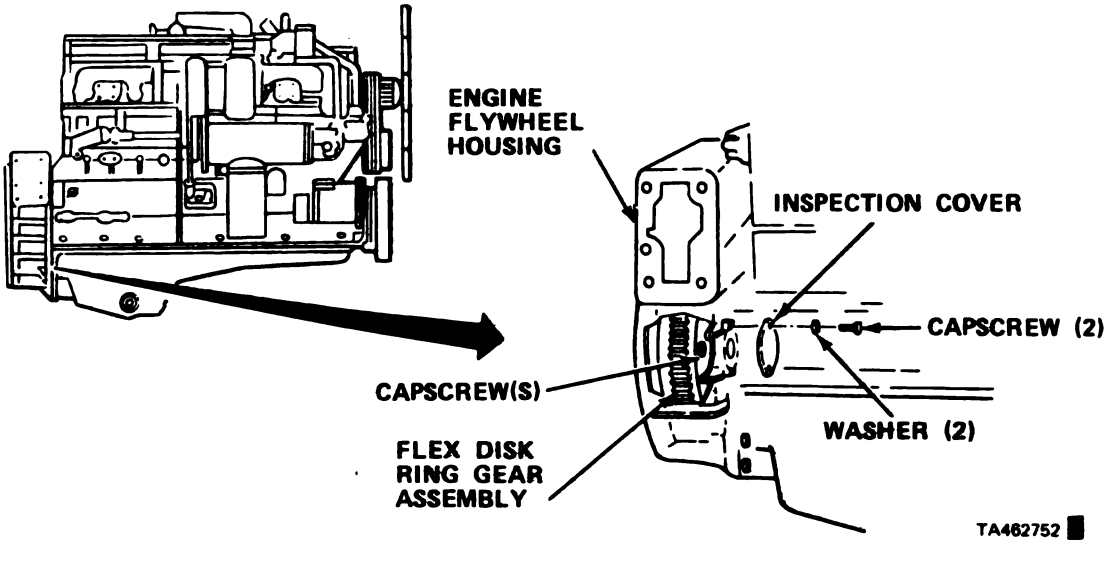


NOTE

Steps (7) thru (9) are only for installation of the first capscrew that secures engine flex disk to transmission flywheel.

(7) Install bolts and washers retaining transmission to flywheel housing. Torque bolts to proper setting (Appendix D). (Install battery cable clamps when installing flywheel housing bolts.)

(8) Remove capscrews and access cover from top of transmission.



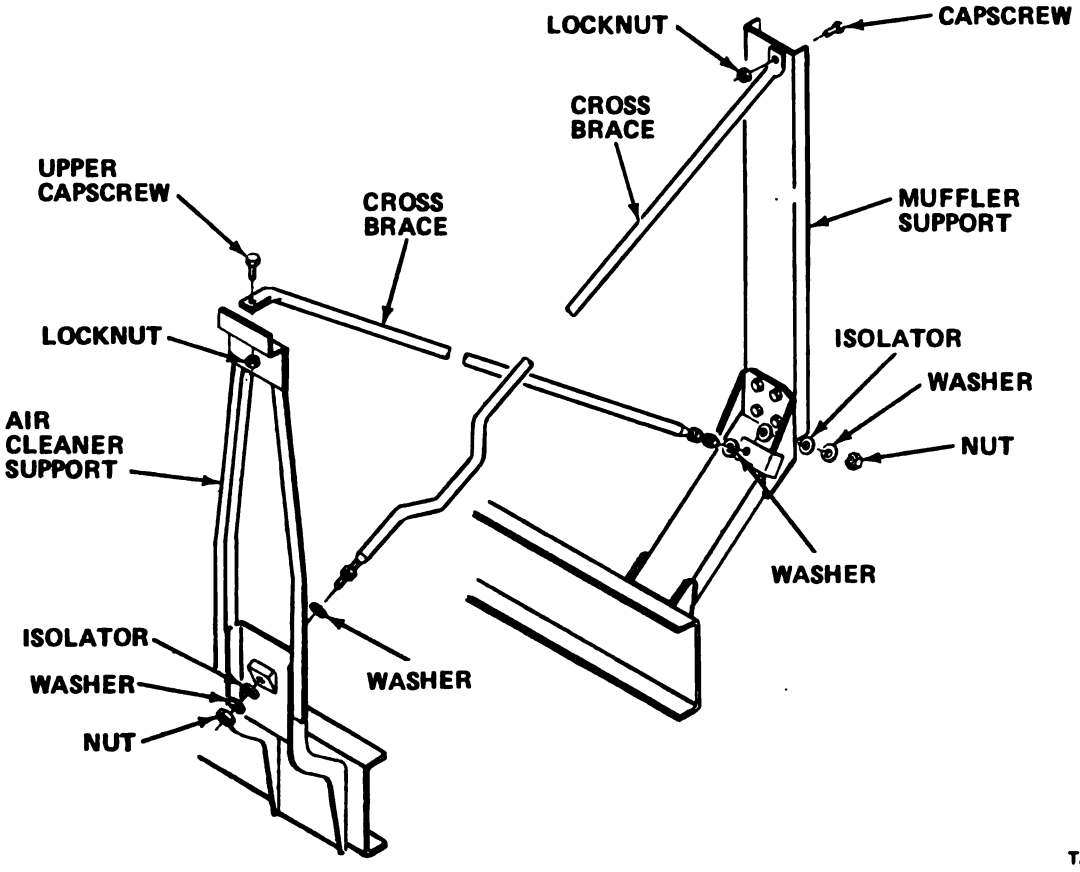
(9) Working through flywheel housing inspection hole, rotate flex disk until mounting hole in flex disk is fully visible.

(10) Rotate flywheel and transmission torque converter from transmission top access cover until transmission flywheel mounting hole alines with engine flex disk mounting hole.

(11) Working through flywheel housing inspection hole, secure capscrew through engine flex disk and transmission flywheel. Torque capscrews to 41 to 49 ft lbs (55.6 to 66.4 N•M).

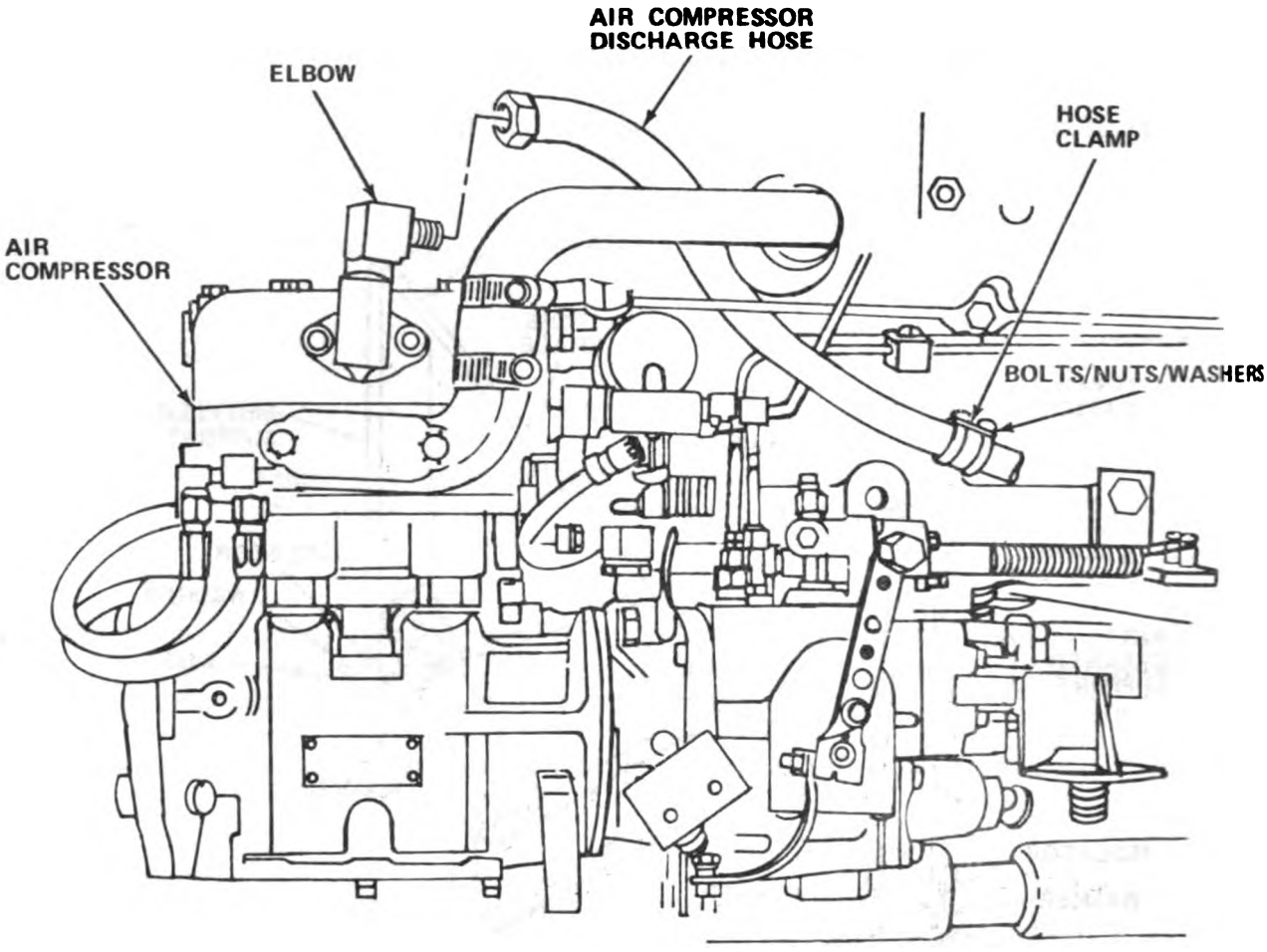
(12) Install top transmission access cover and secure with capscrews.

(13) Install flywheel housing inspection cover and secure with capscrews.



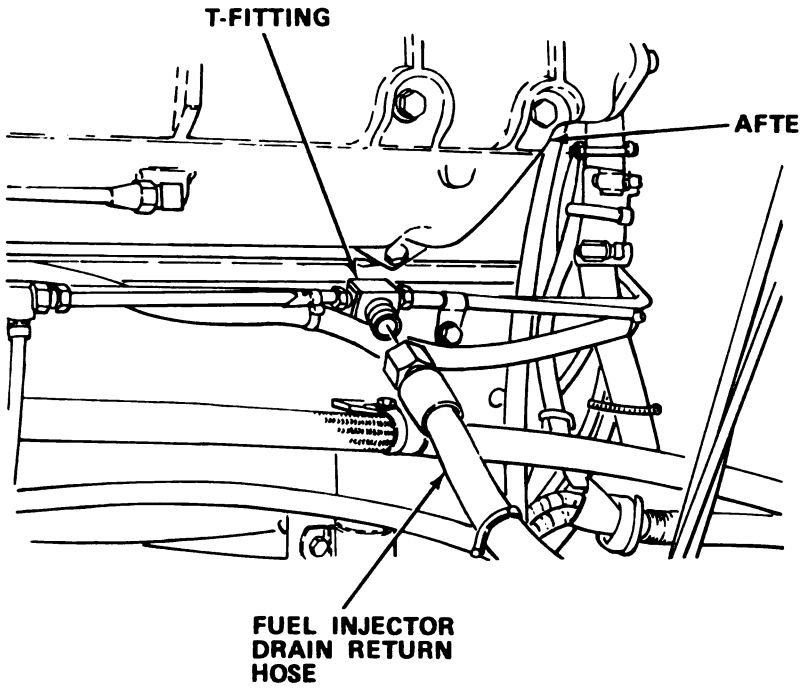
(14) Secure cross braces to muffler support and air cleaner support.

(15) Apply thread sealant and secure air compressor discharge hose to air compressor elbow.

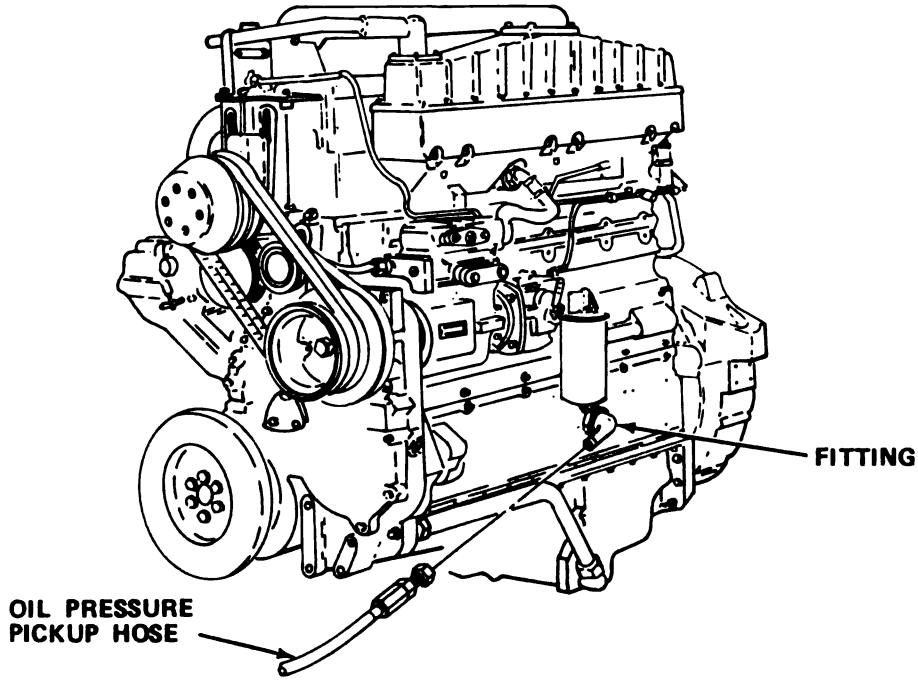


(16) Secure compressor discharge hose with clamp bolts, nuts, and washers.

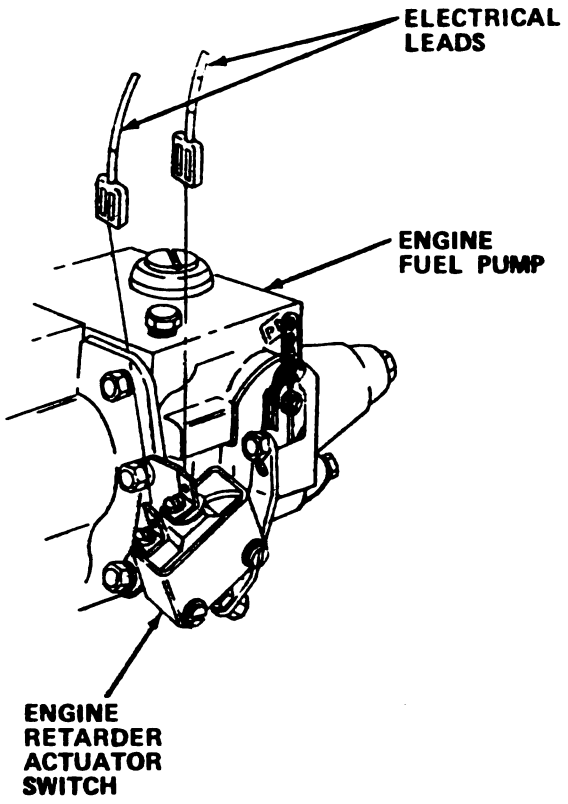
(17) Secure alternator wiring harness clamps to lower front of engine.



(18) Apply thread sealant to engine fuel injector drain return hose T-fitting and secure drain hose to T-fitting.



(19) Apply thread sealant to engine oil pressure pickup fitting and secure oil pressure pickup hose to fitting.



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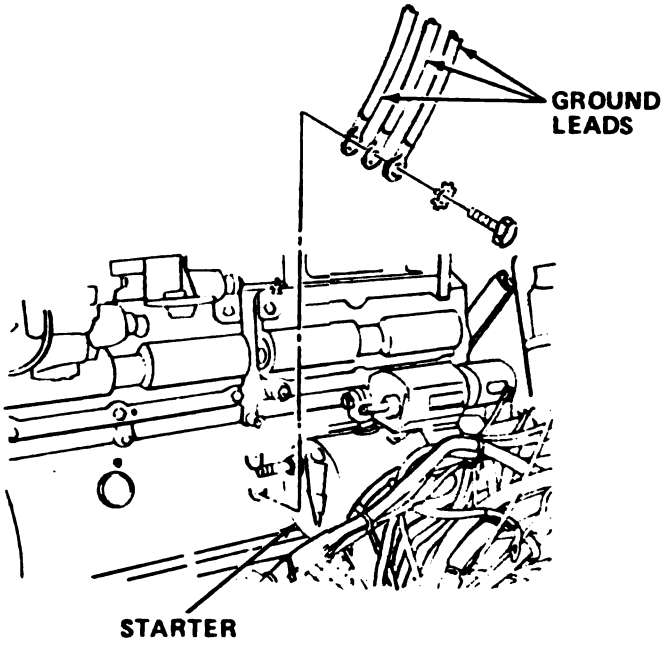
(20) Connect electrical leads to engine retarder actuator switch.

(20.1) Secure wiring harness to left side of engine with wire ties.



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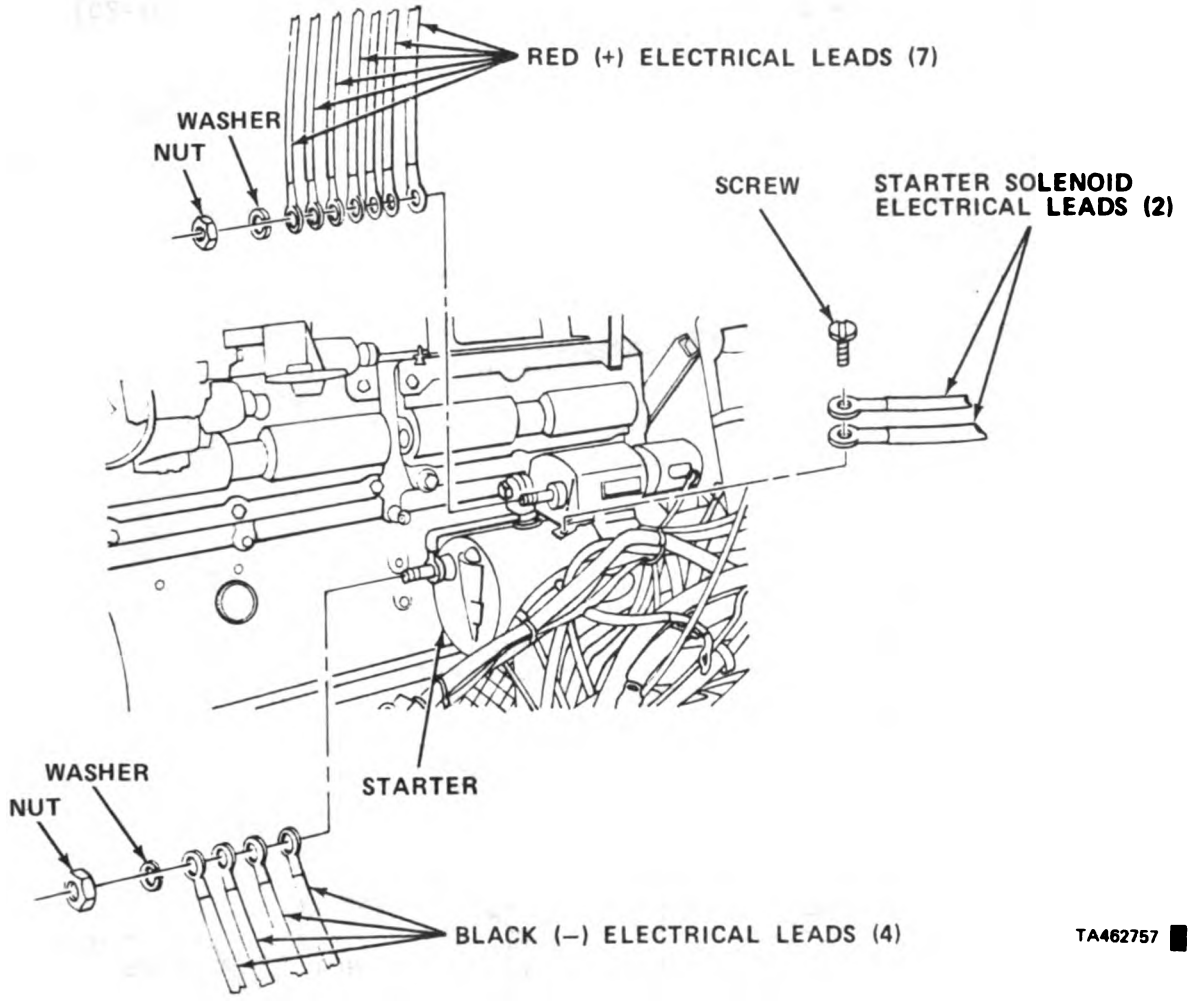
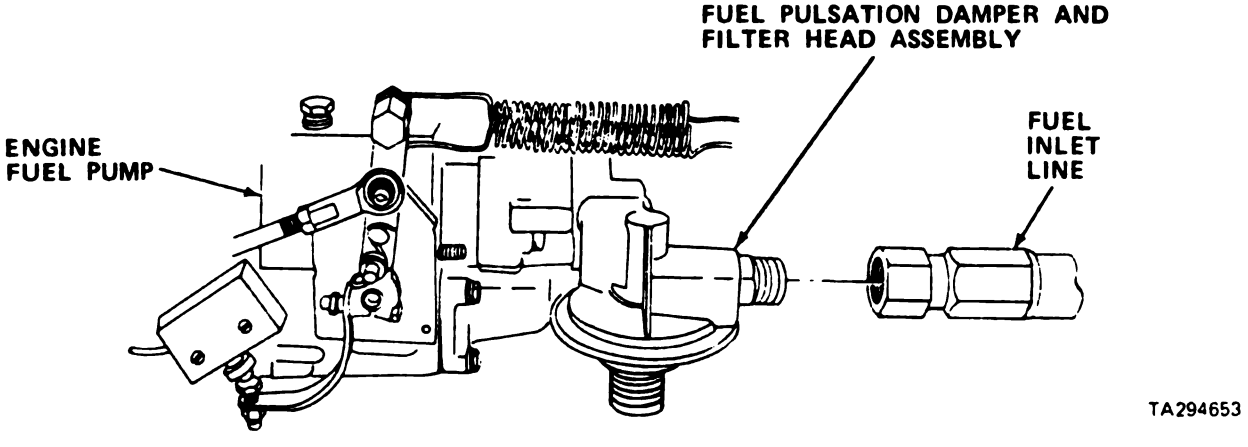
(21) Secure ground leads to engine block at connection point above starter motor.

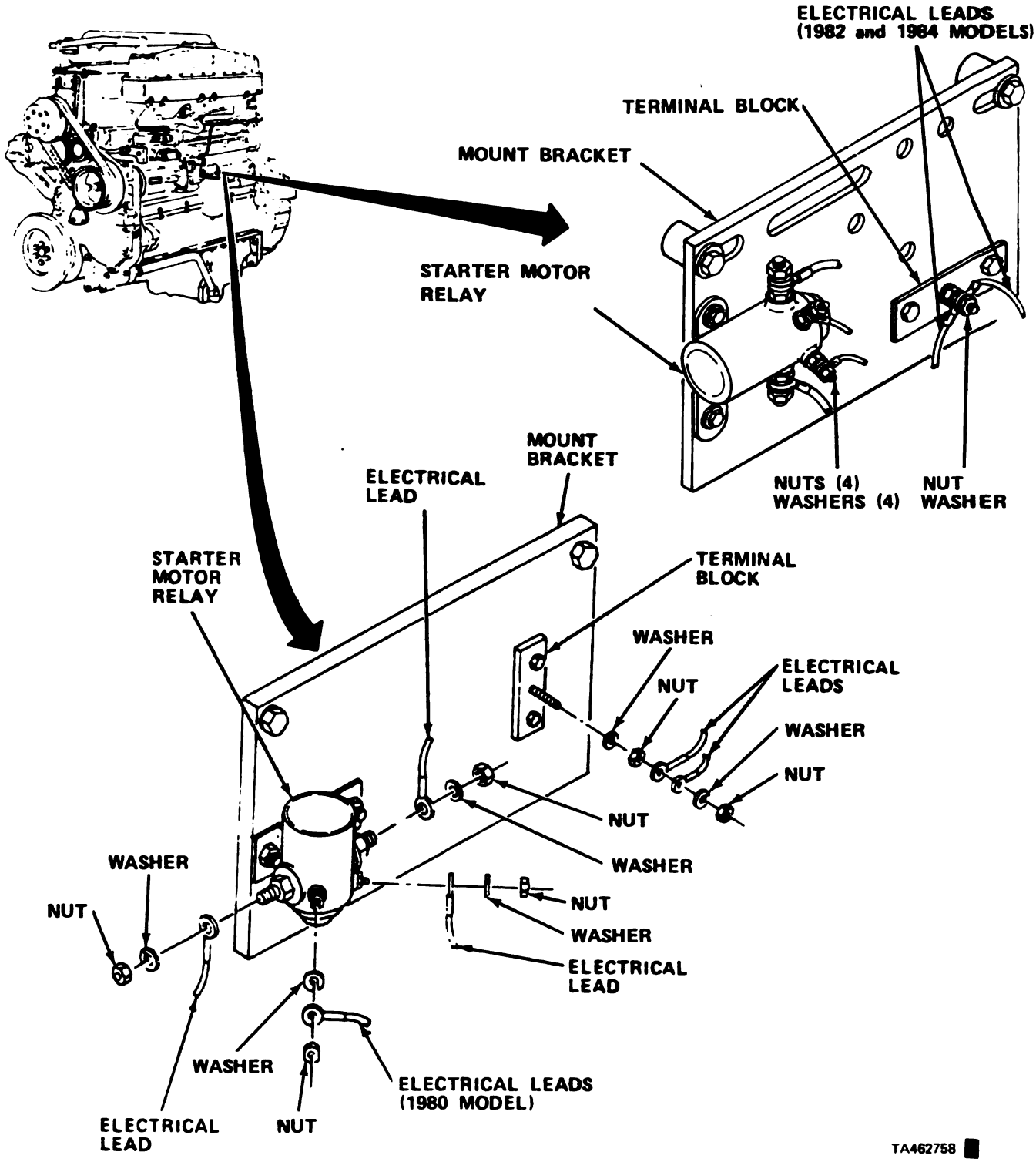


(22) Secure electrical leads to starter motor with nuts and washers. Secure starter solenoid leads with screw.



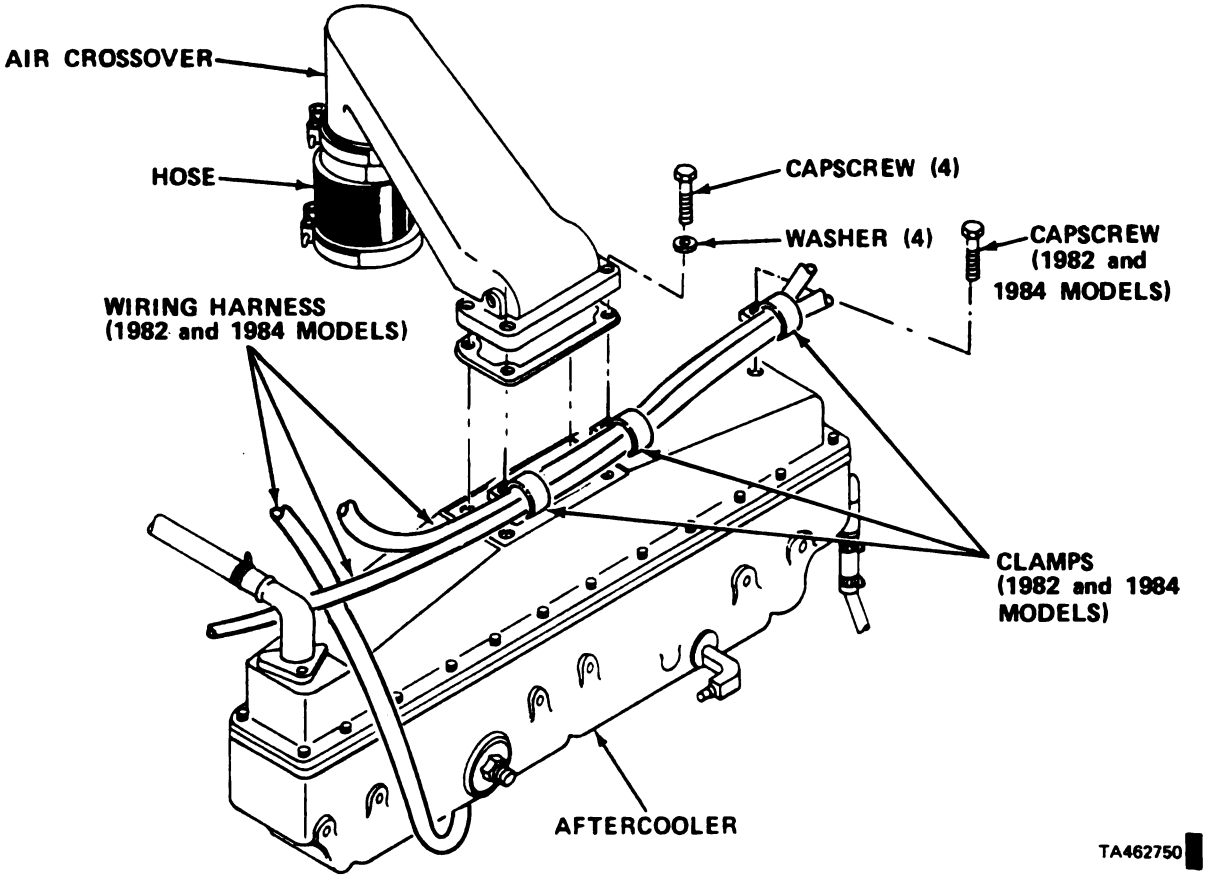
(23) Apply thread sealant to fuel pulsation damper and filter head assembly and secure fuel inlet hose to head.

(24) Install new primary fuel filter element (TM 9-2320-281-20).



(25) Secure ground leads to terminal block on starter relay mount bracket with nut and washer.

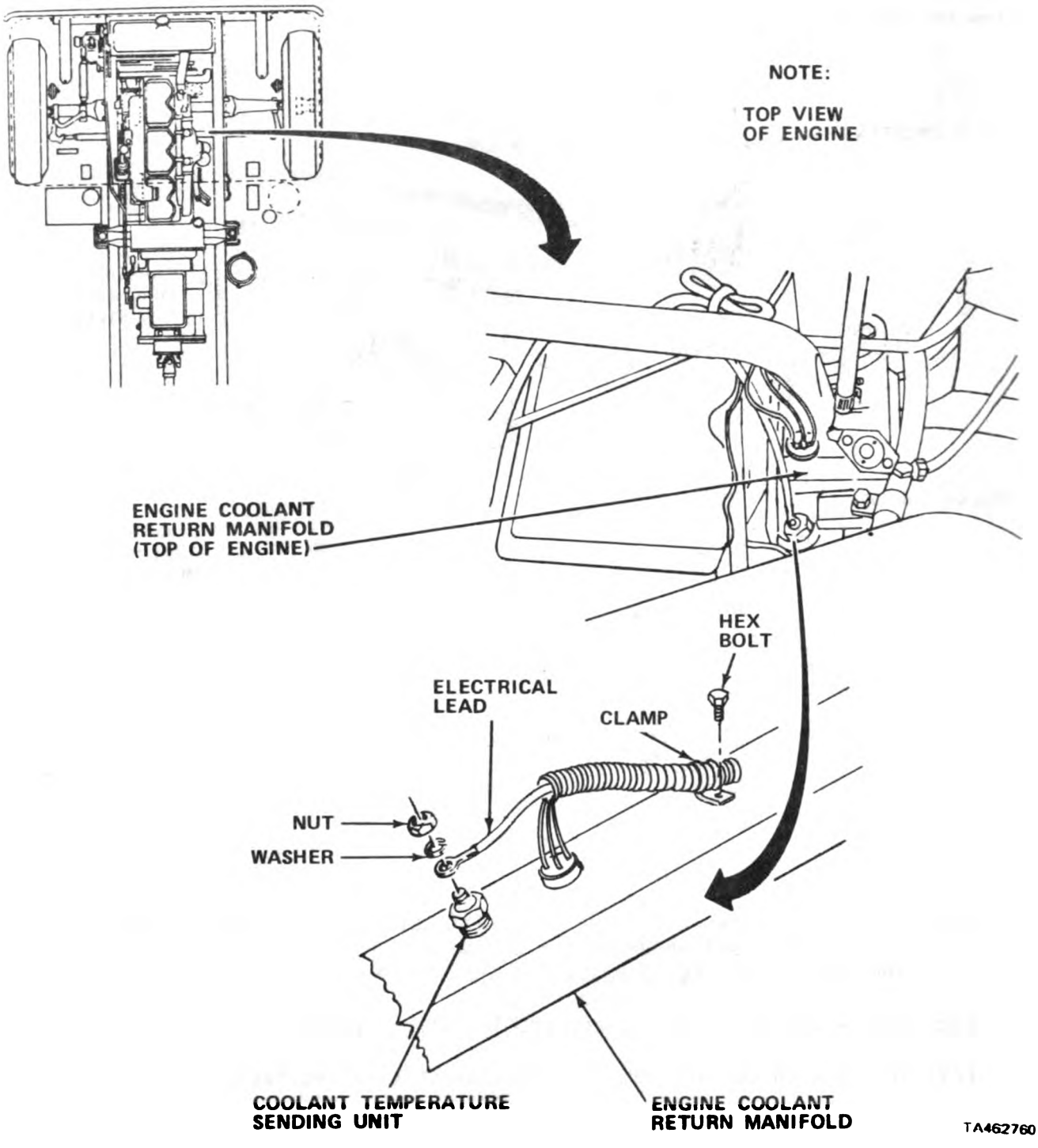
(26) Secure electrical leads to starter relay with nut and washer.



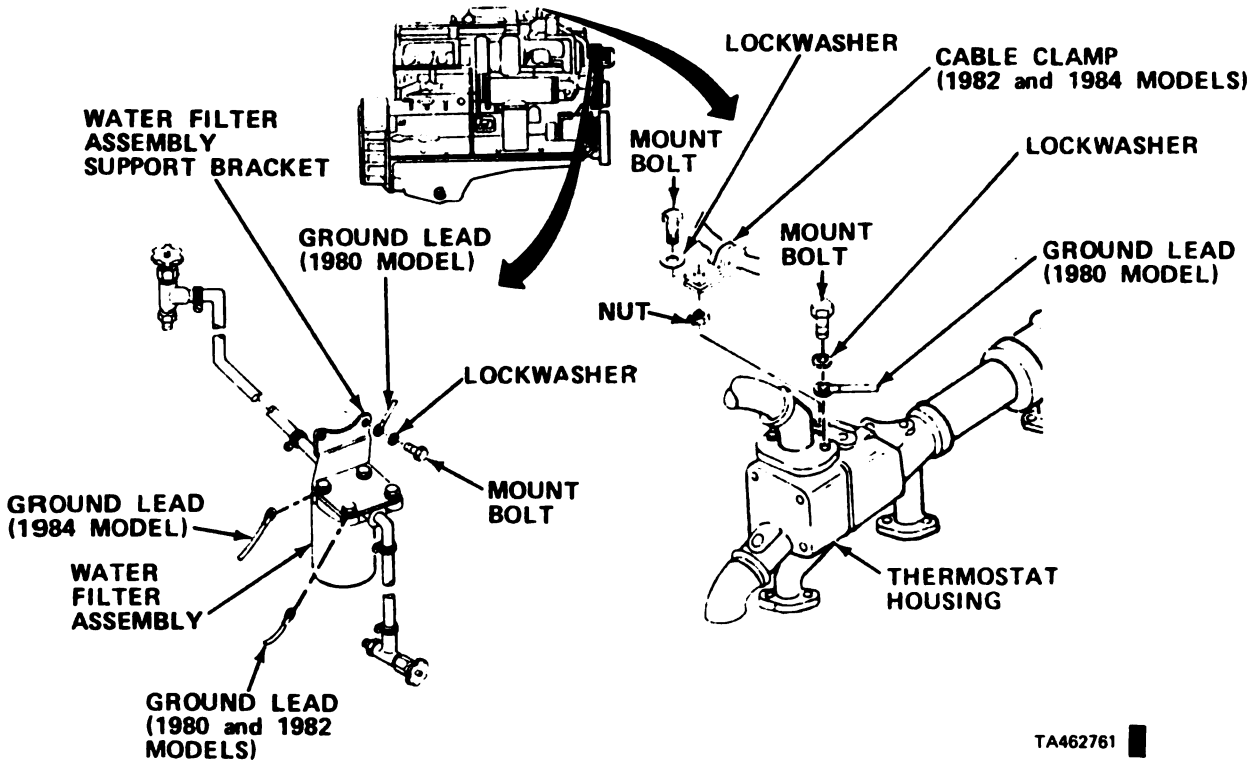
(27) Remove capscrews and washers and lift air crossover and place wiring harness in position on top of engine (1980 model). Install fasteners and harness wiring clamps (1982 and 1984 models).

(28) Secure air crossover to aftercooler with capscrews and lockwashers.

(29) Secure high coolant temperature alarmstat wiring harness to top of engine.

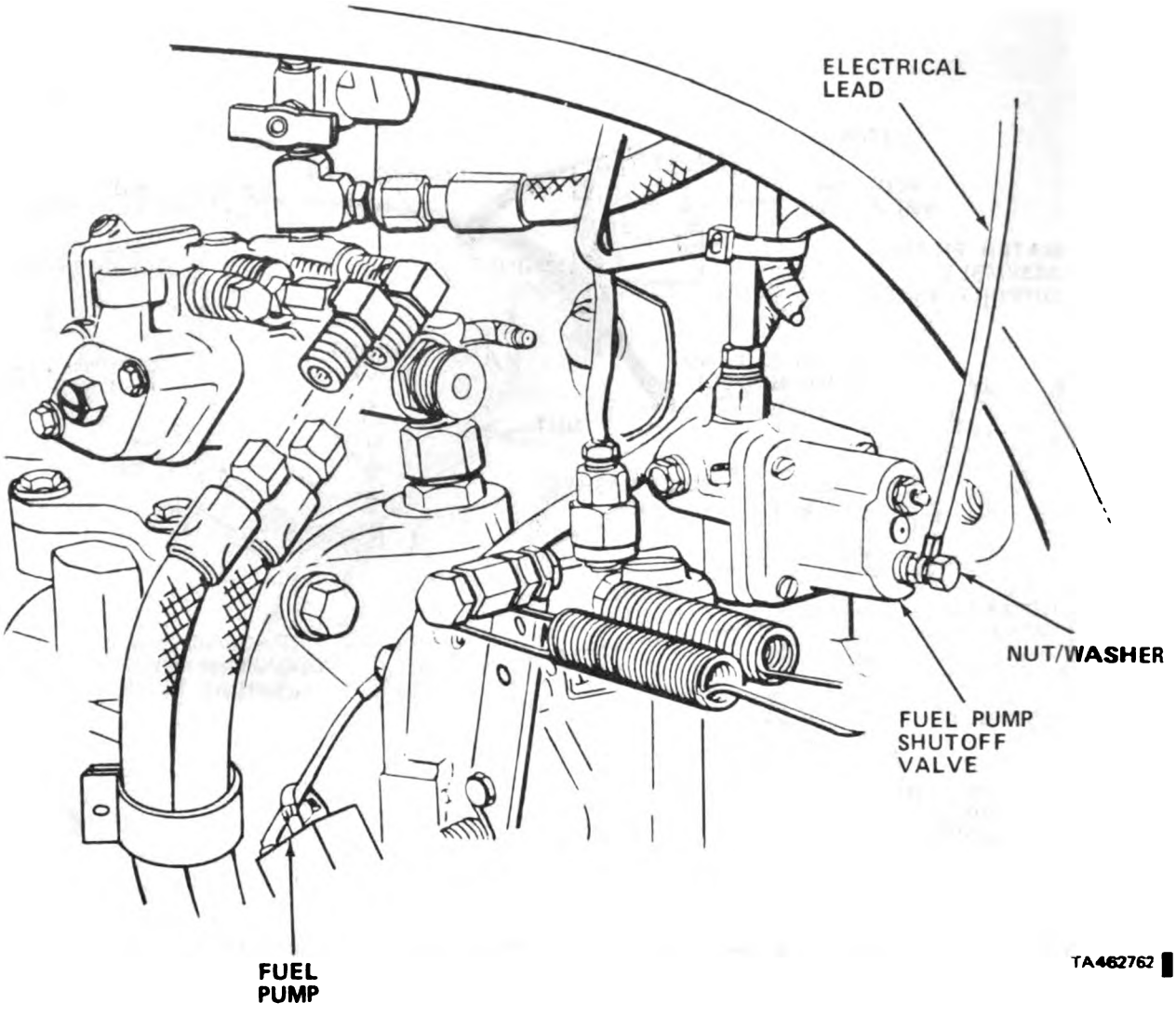


(30) Secure electrical leads to coolant temperature sending unit with nut and washer. Secure leads with clamp bolt.

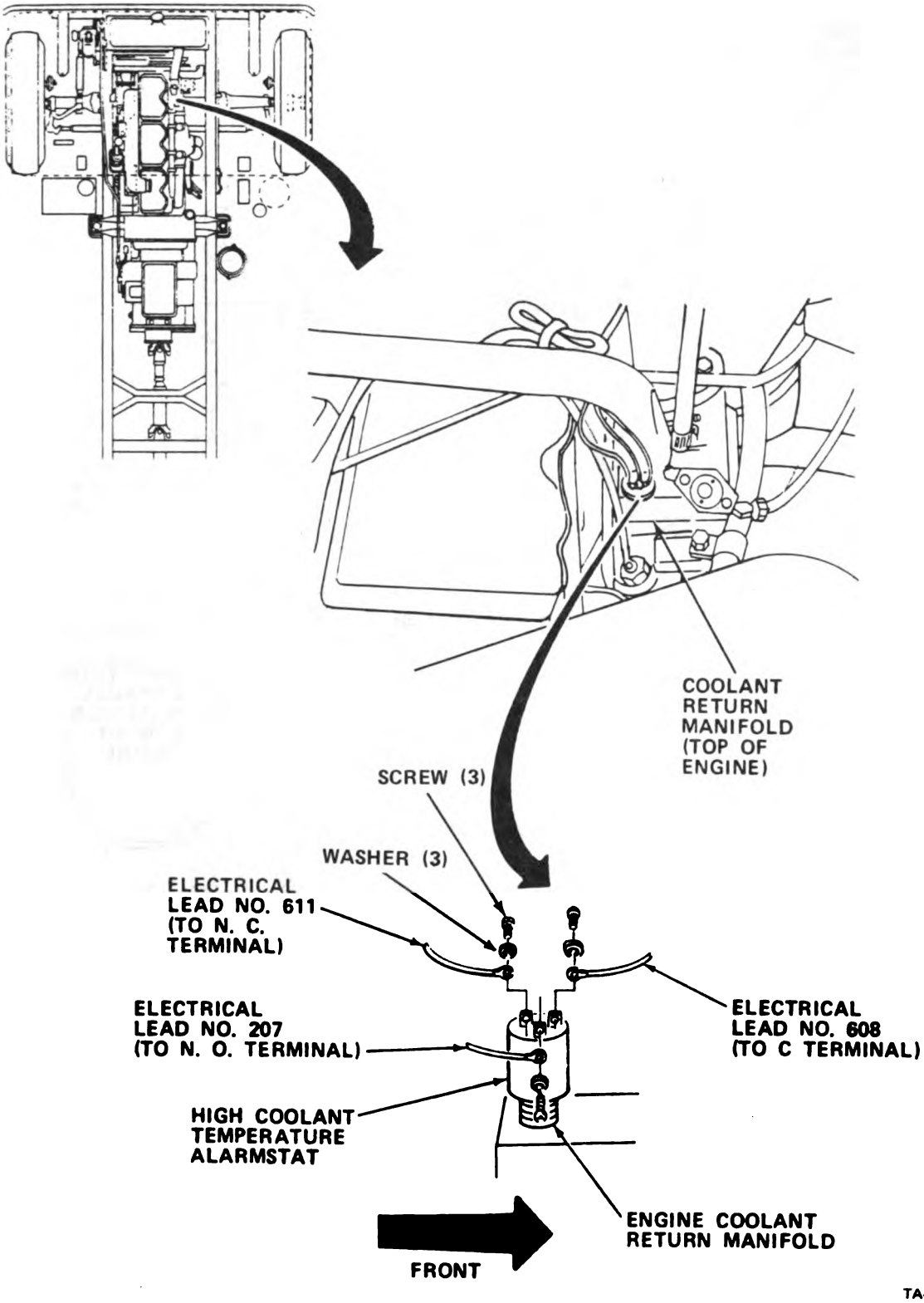


(31) Secure ground leads to water filter assembly support bracket and thermostat housing with lockwashers and mount bolts (1980 model).

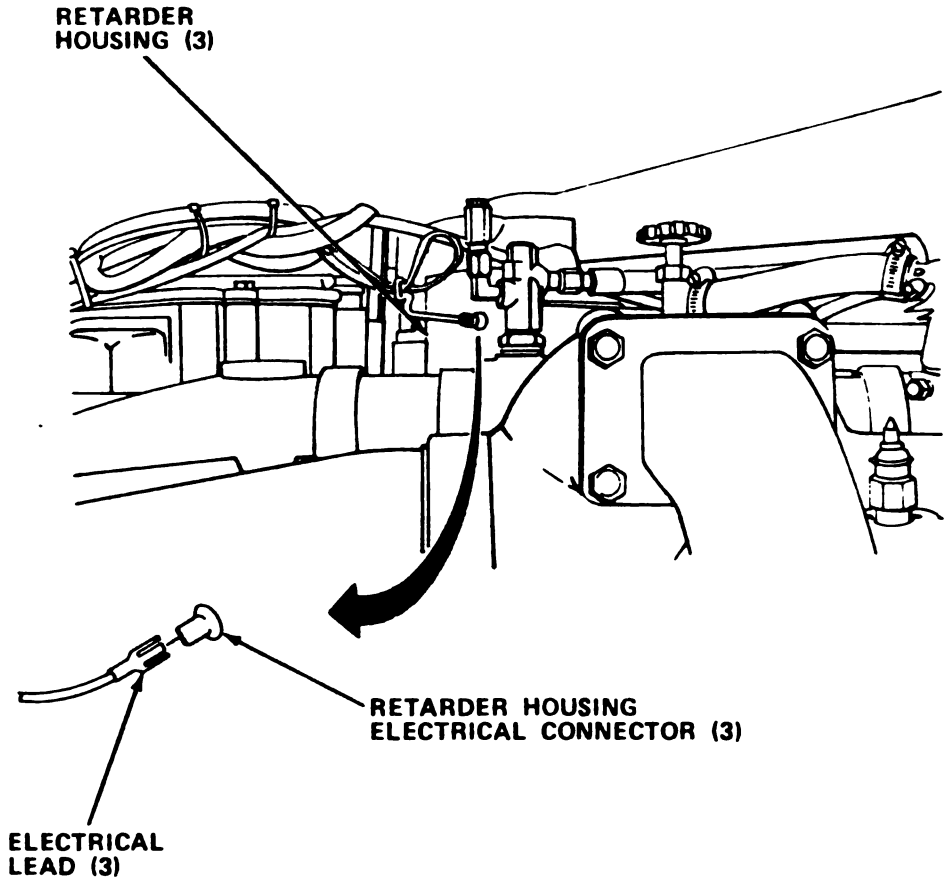
(31.1) Secure cable clamp to thermostat housing with mount bolt lockwasher, and nut (1982 and 1984 models).



(32) Route fuel pump shutoff valve electrical lead between aftercooler and cylinder block; then secure electrical lead to fuel pump shutoff valve with nut and washer.



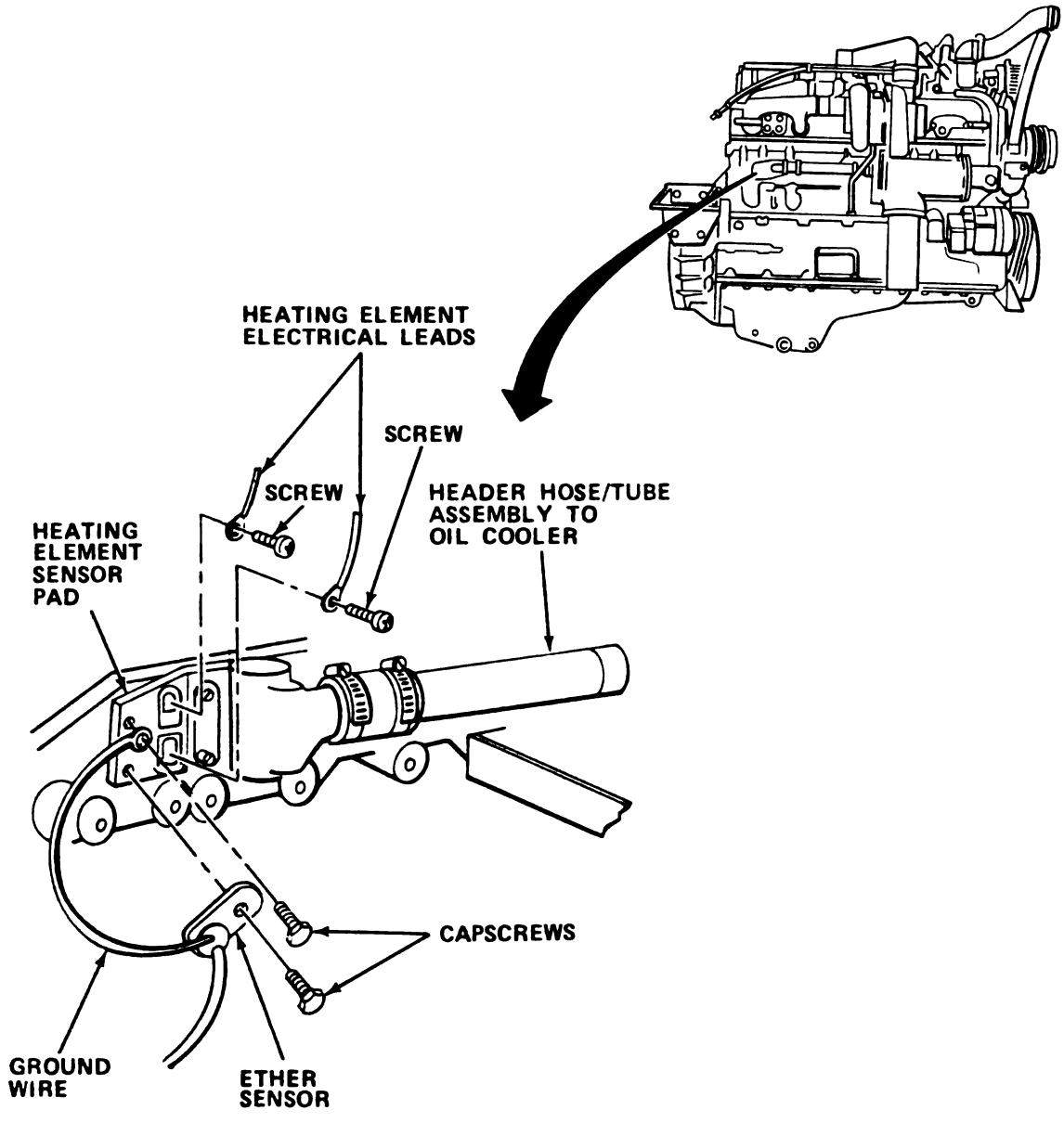
(33) Secure electrical leads to high coolant temperature alarmstat with screws and washers.



(34) Secure engine retarder wiring harness to engine with clamps.

(35) Secure engine retarder wiring harness with wire ties.

(36) Connect engine retarder wiring harness leads to connectors on retarder housings.

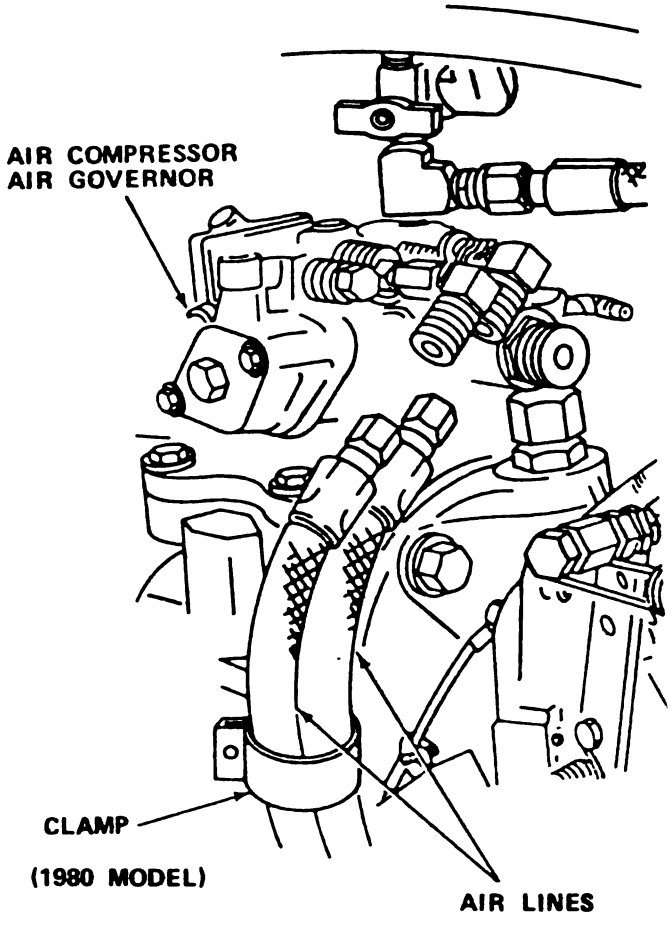


(37) Connect engine winterization kit heating element electrical leads to element connectors with screws.

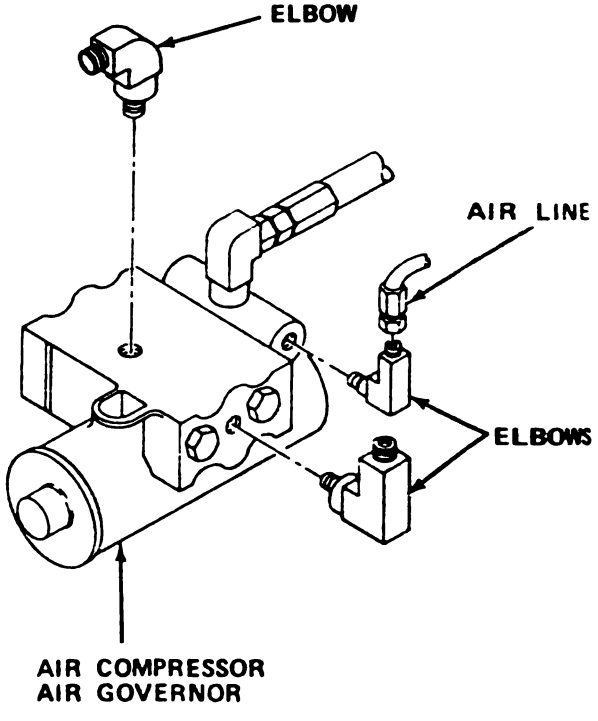
(38) Secure heating element wiring harness with wire ties.

(39) Secure ether sensor and its ground wire to heating element sensor pad with capscrews.

(40) Apply sealant to heating element connectors and ether sensor.



(1980 and 1984 MODELS)



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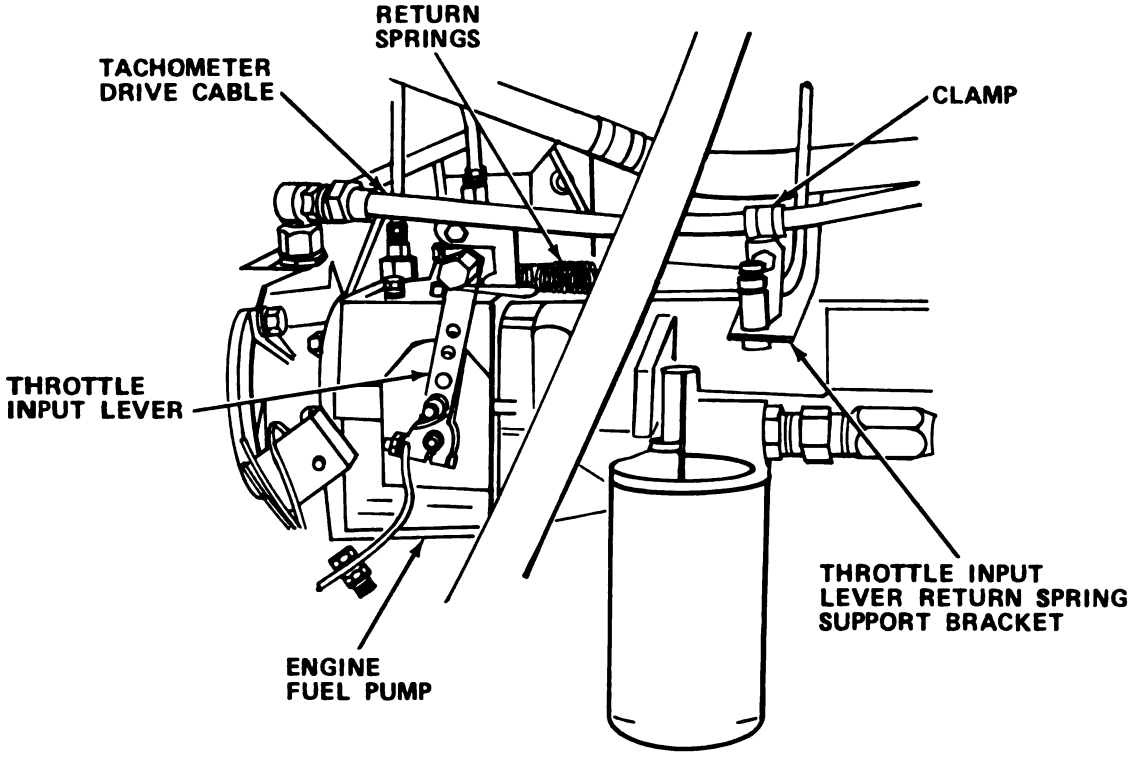
(1982 MODEL)

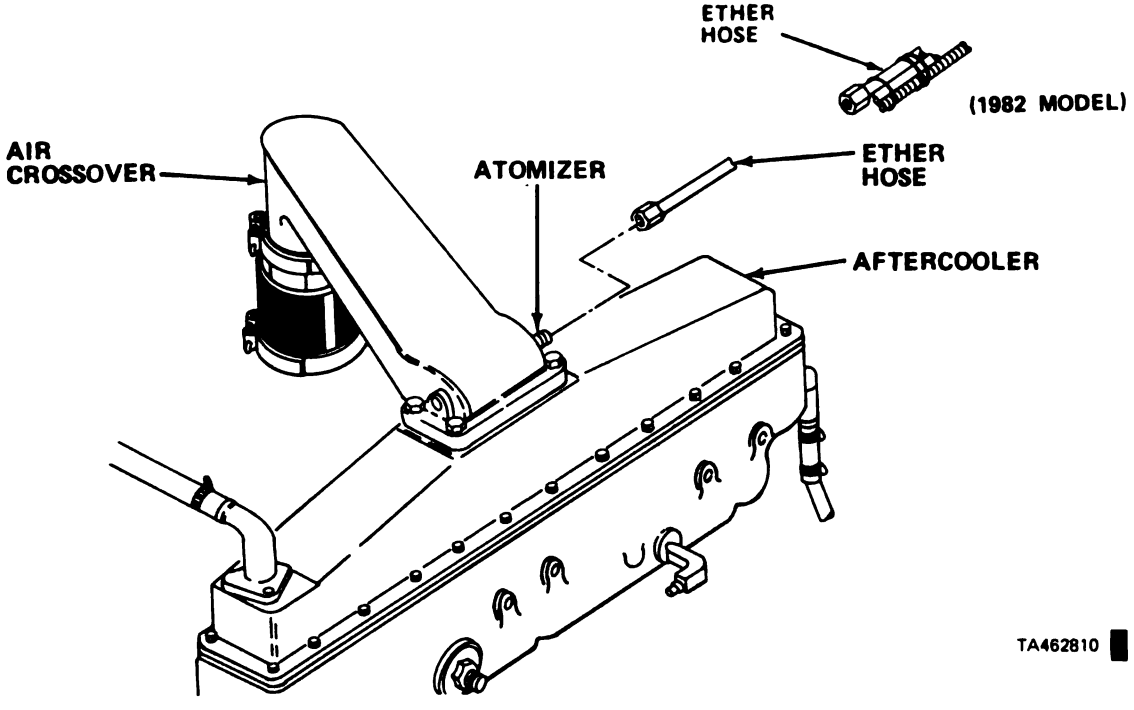
(41) Secure air compressor air governor air lines with clamp (1980 model).

(42) Apply thread sealant and secure air lines to air compressor air governor.

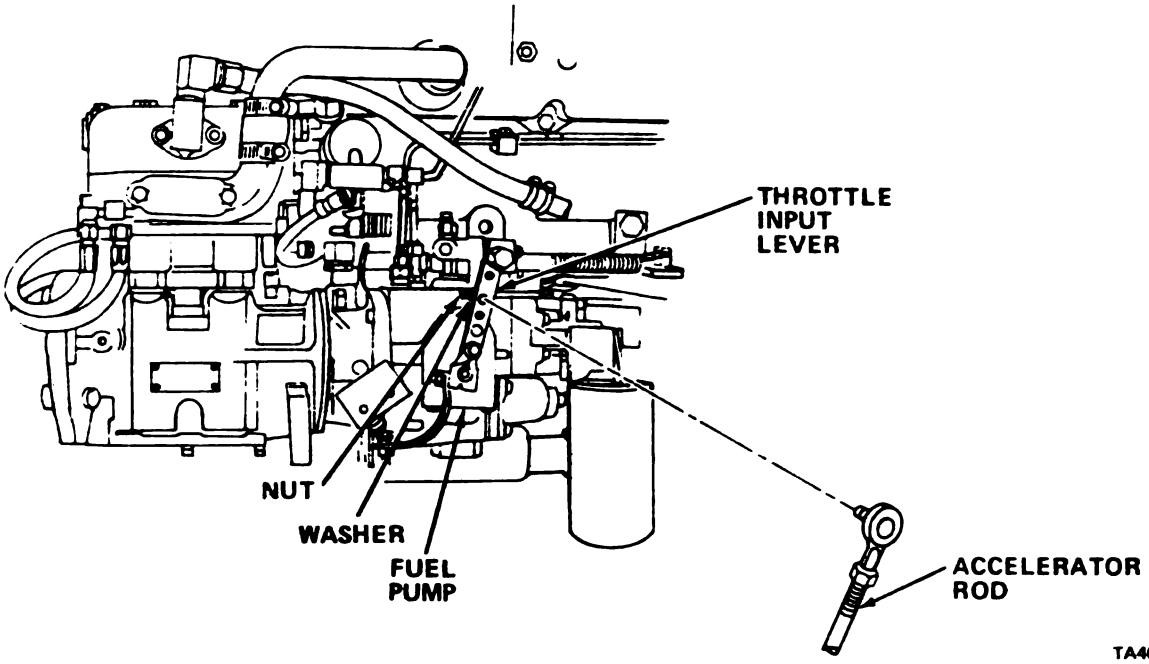


(43) Secure tachometer drive cable to engine fuel pump.

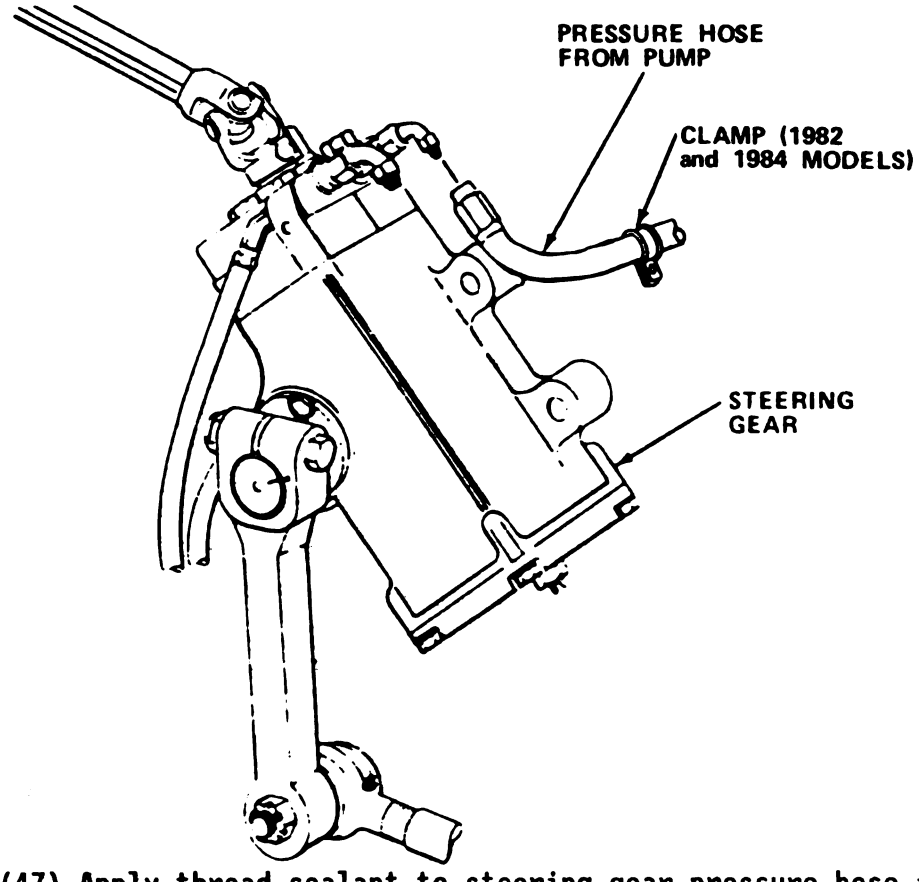
(44) Secure tachometer drive cable clamp to throttle input lever return spring support bracket.



(45) Secure ether hose to atomizer on air crossover.

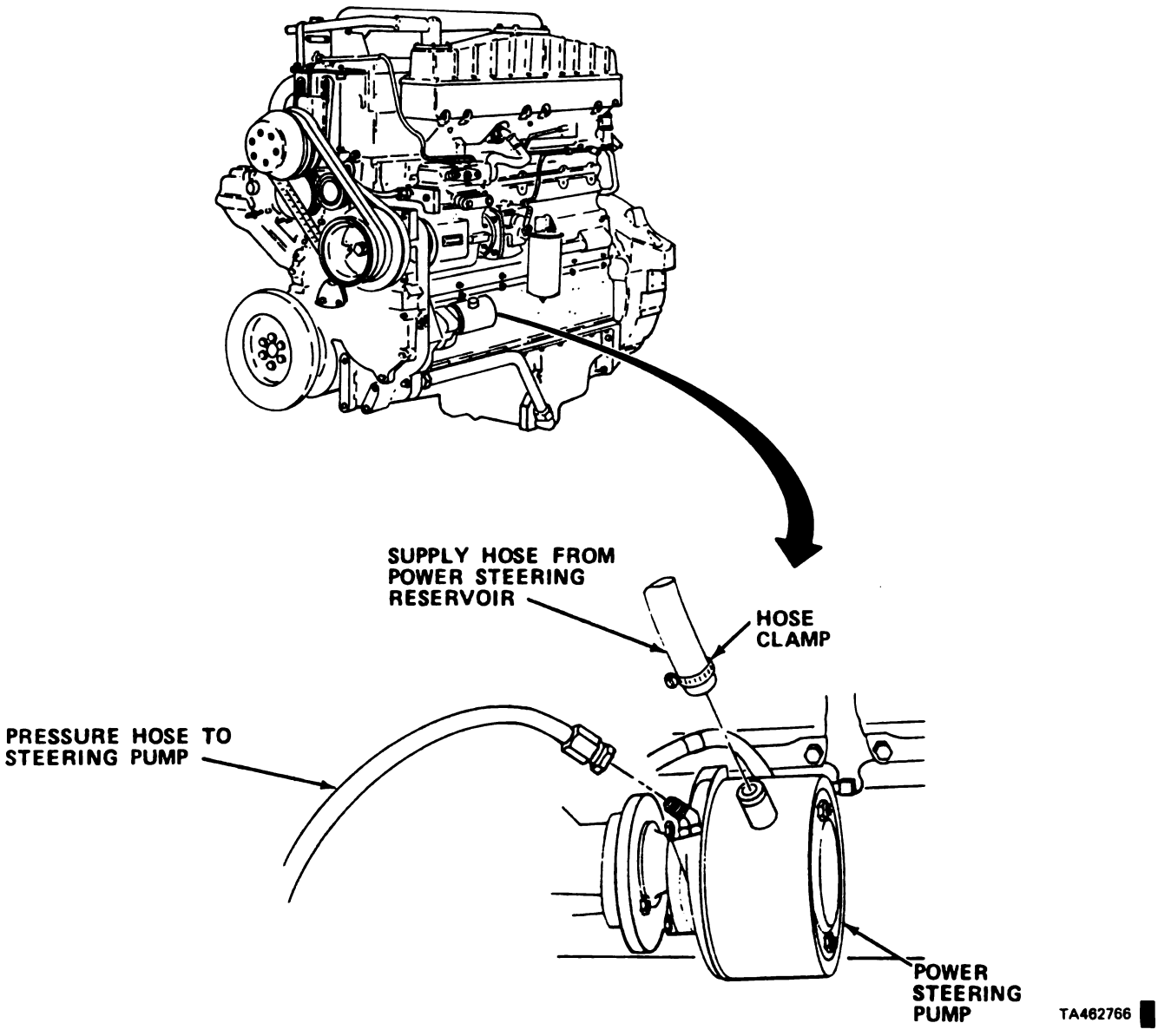


(46) Secure accelerator rod to engine fuel pump throttle input lever with nut and washer.



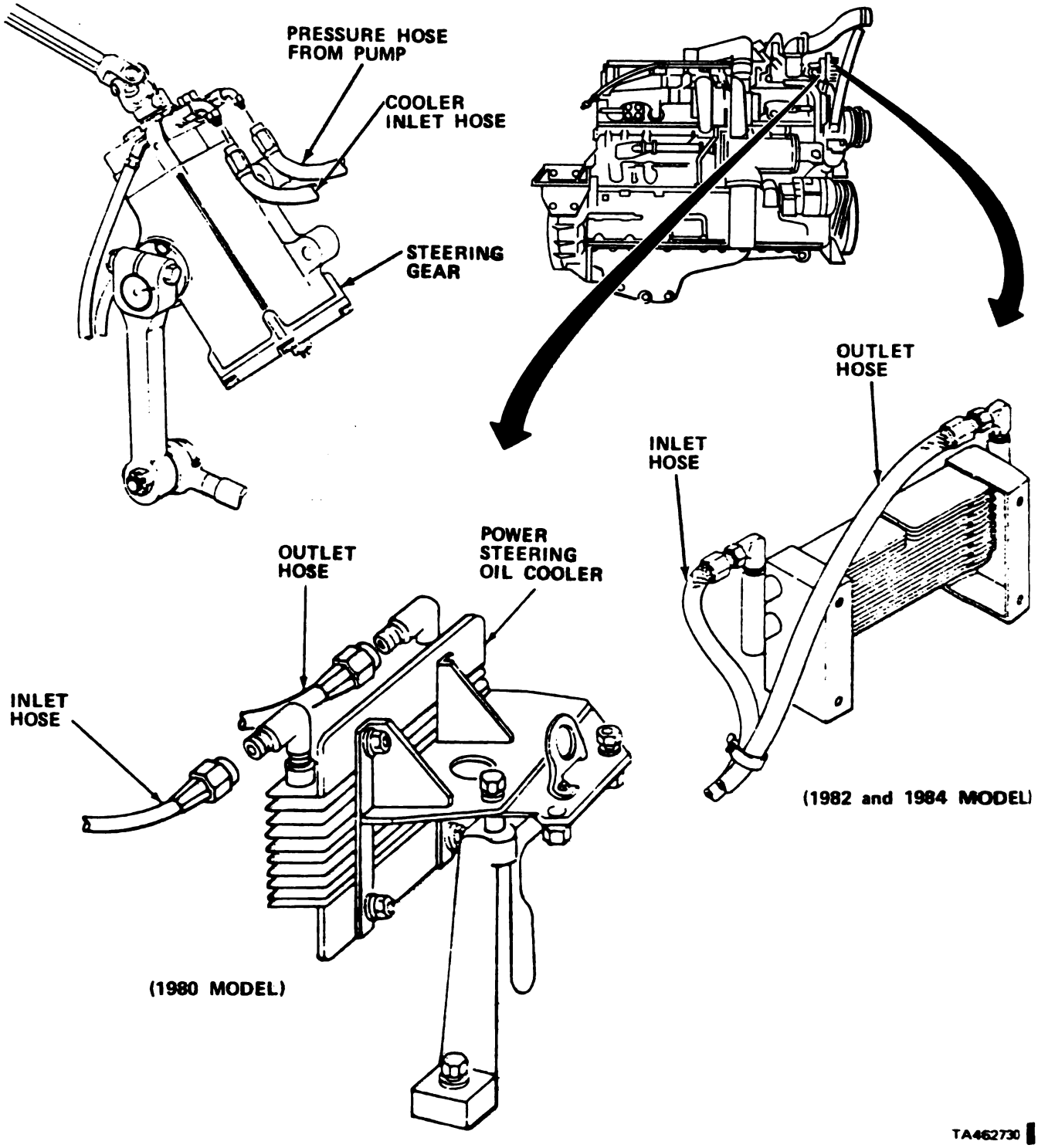
(47) Apply thread sealant to steering gear pressure hose fitting and secure pressure hose to steering gear. Secure hose with clamp (1982 and 1984 models).

(48) Secure wiring harness to left side of engine with clamps.



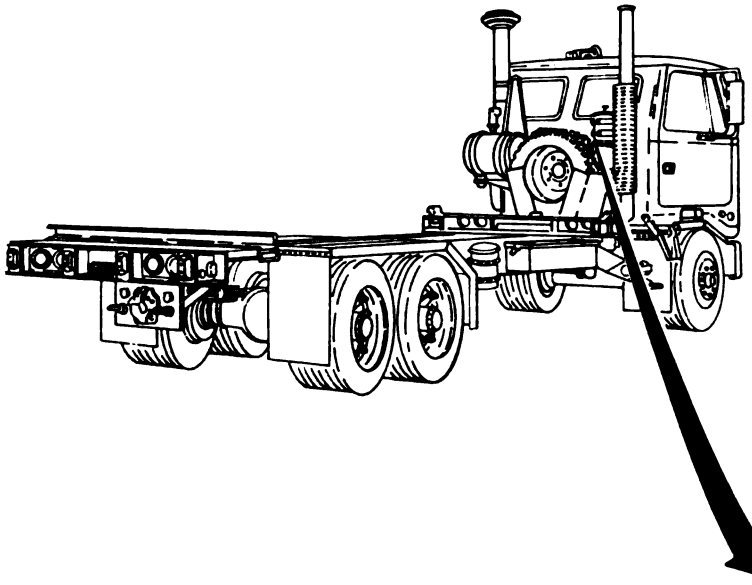
(49) Apply thread sealant to power steering pump pressure hose fitting and secure hose to pump.

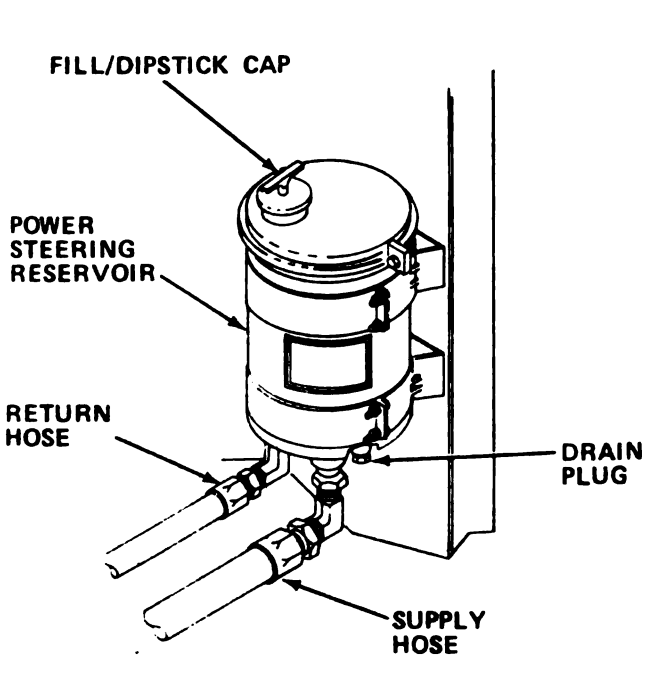
(50) Secure supply hose to power steering pump with hose clamp.



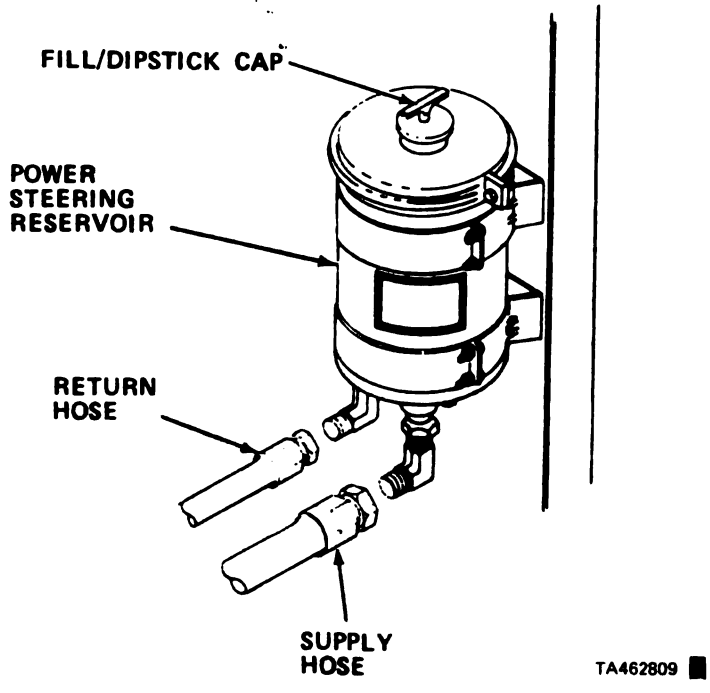
(51) Apply thread sealant to power steering cooler inlet hose fitting and steering gear fitting and secure hose to cooler and steering gear.

(52) Apply thread sealant to power steering cooler outlet hose fitting and secure outlet hose to cooler fitting.



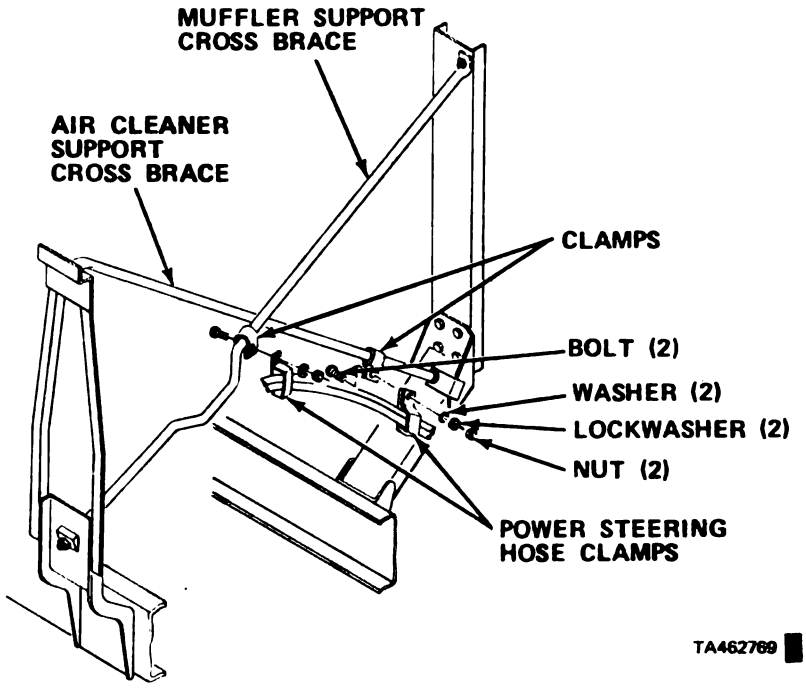


(1982 MODEL)



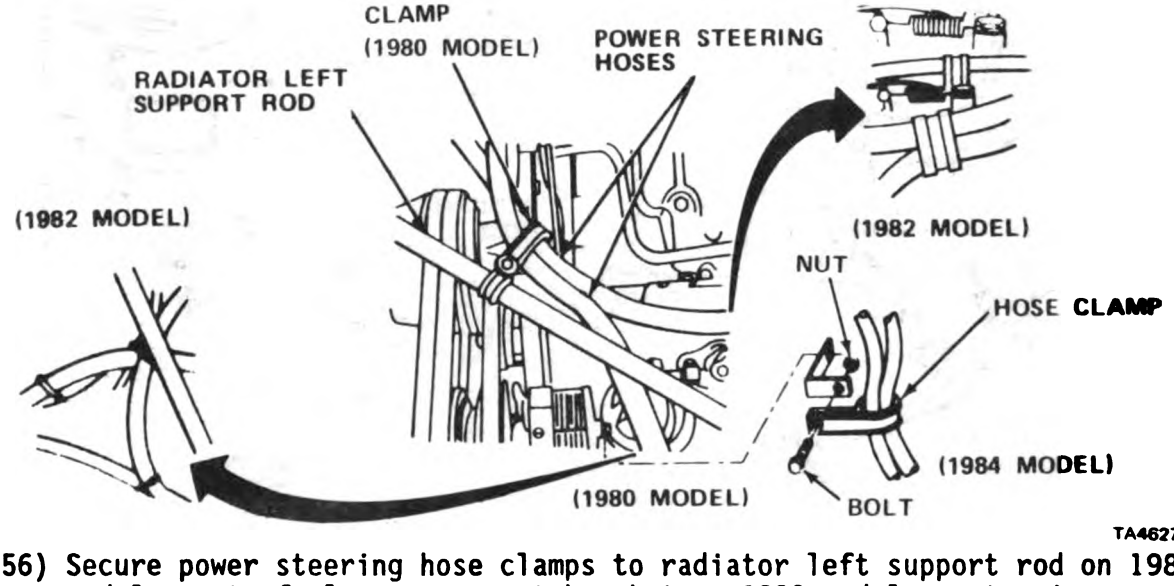
(1980,1984 MODELS)

(53) Apply thread sealant to power steering reservoir hose fittings and secure supply and return hoses to reservoir.



(54) Secure power steering hose clamps to muffler support cross brace and air cleaner support cross brace.

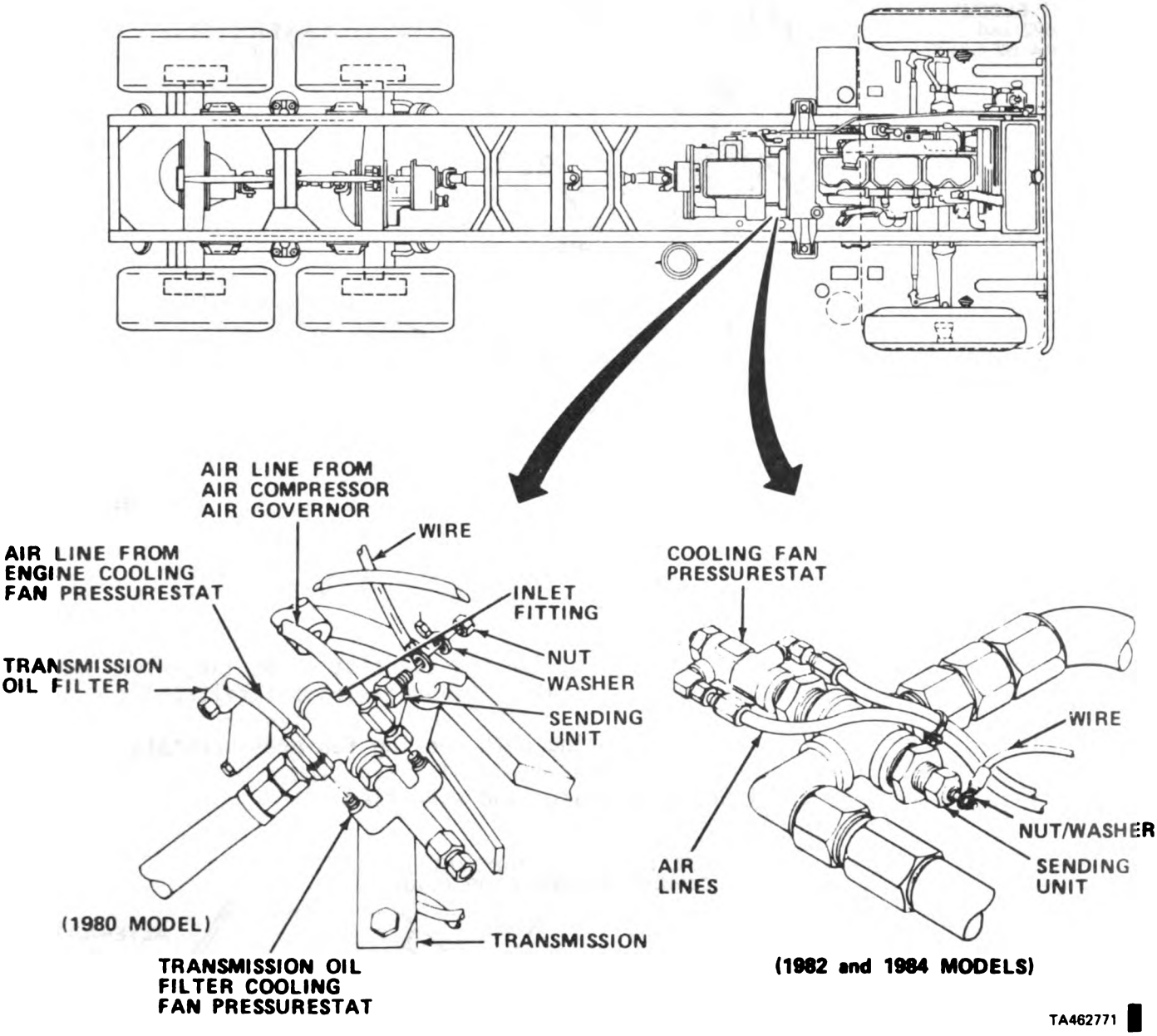
(55) Swing radiator left support rod toward front of vehicle.



(56) Secure power steering hose clamps to radiator left support rod on 1980 model, or to fuel pump support bracket on 1982 model, or to air compressor front adapter housing cover on 1984 model.

(56.1) Secure power steering hose clamp to bracket on accessory drive gear (1984 model).

(57) Secure all power steering hoses with wire ties as necessary.

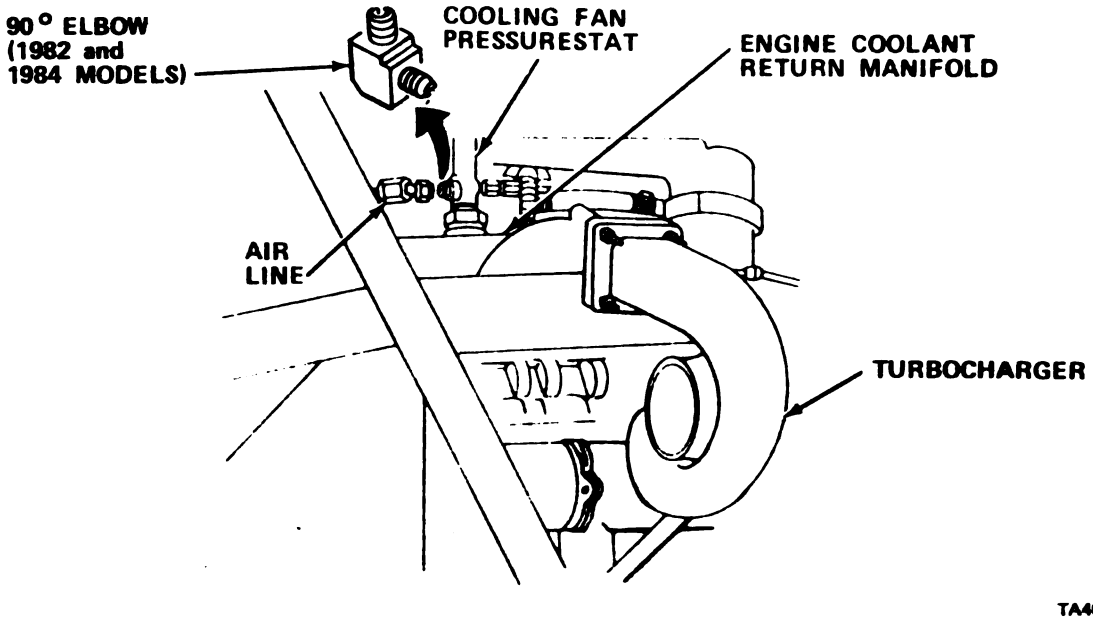


(58) Apply thread sealant to air compressor air governor fitting and transmission oil filter cooling fan pressurestat fittings.

(59) Secure air line to air governor and pressurestat.

(60) Secure air line with clamps and wire ties as necessary.

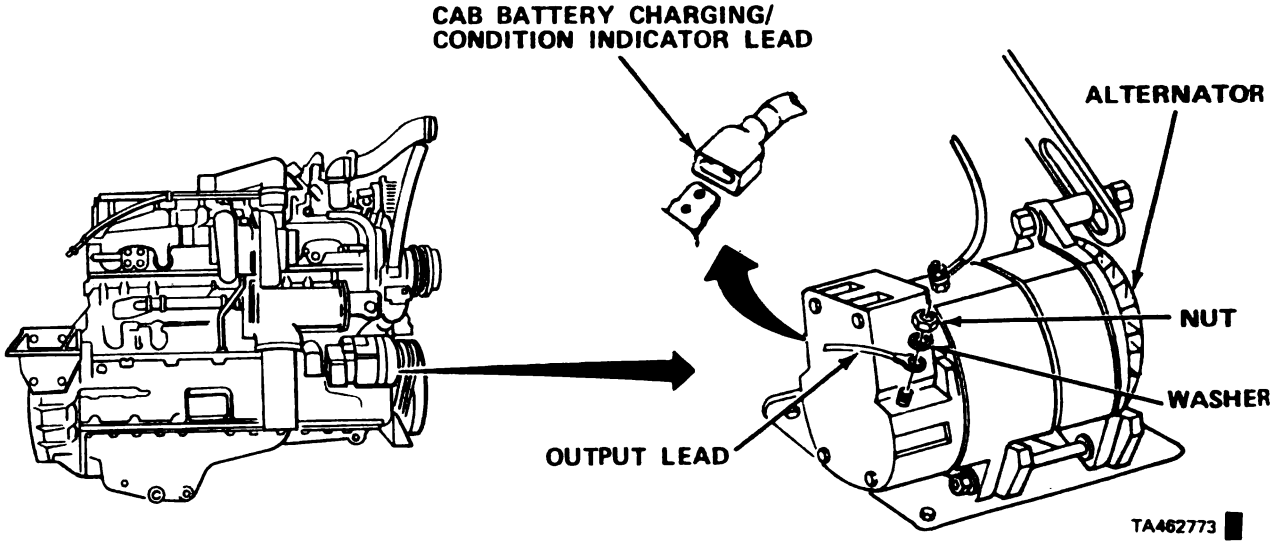
(60.1) Secure wire to sending unit with nut and washer.



(61) Apply thread sealant to cooling fan pressurestat on engine return manifold and cooling fan pressurestat on transmission oil filter.

(62) Install air line interconnecting both cooling fan pressurestats.

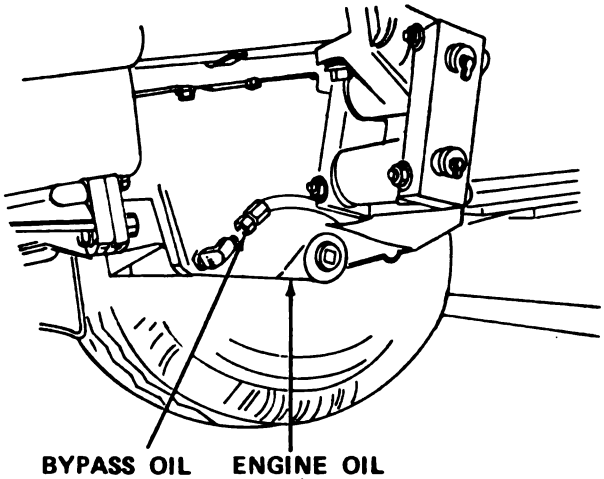
(63) Secure both air lines with clamps and wire ties.



(64) Secure output electrical lead and cab battery charging/condition indicator electrical lead to alternator.

(65) Install engine oil dipstick tube (TM 9-2320-281-20).

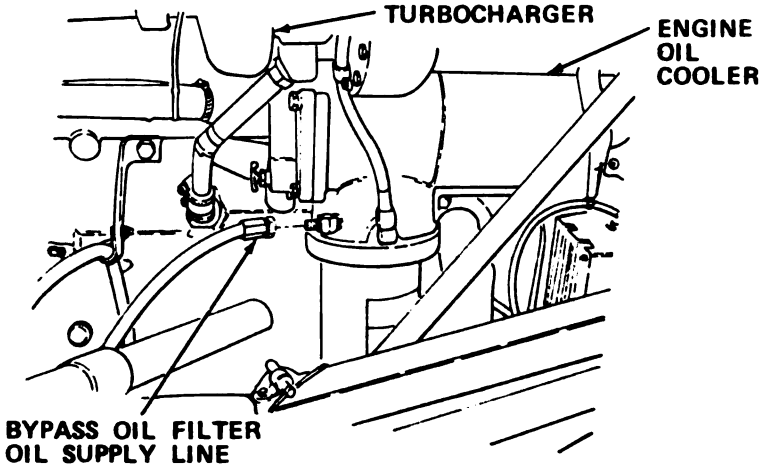
(66) Install engine oil fill tube (TM 9-2320-281-20).



TA294675

(67) Apply thread sealant to bypass oil filter oil return line fitting on engine oil pan.

(68) Secure bypass oil filter oil return line to engine oil pan fitting.



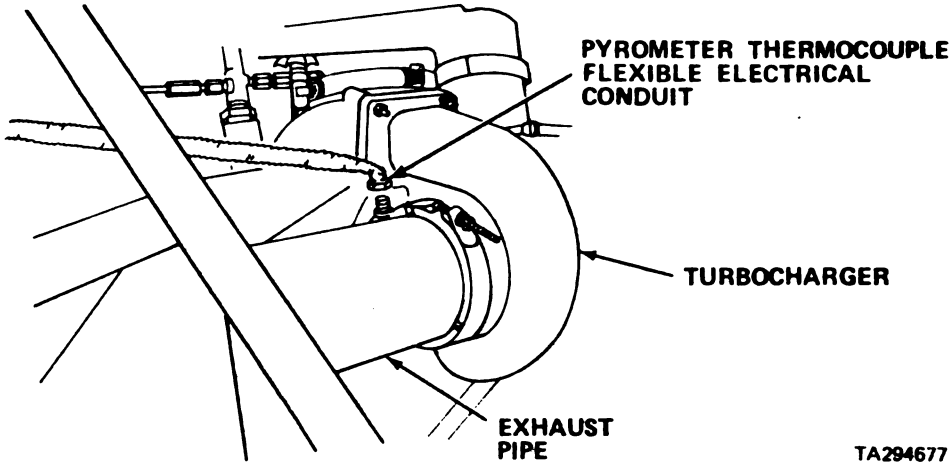
TA294676

(69) Apply thread sealant to bypass oil filter oil supply line fitting on engine oil cooler.

(70) Secure bypass oil filter oil supply line to engine oil cooler fitting.

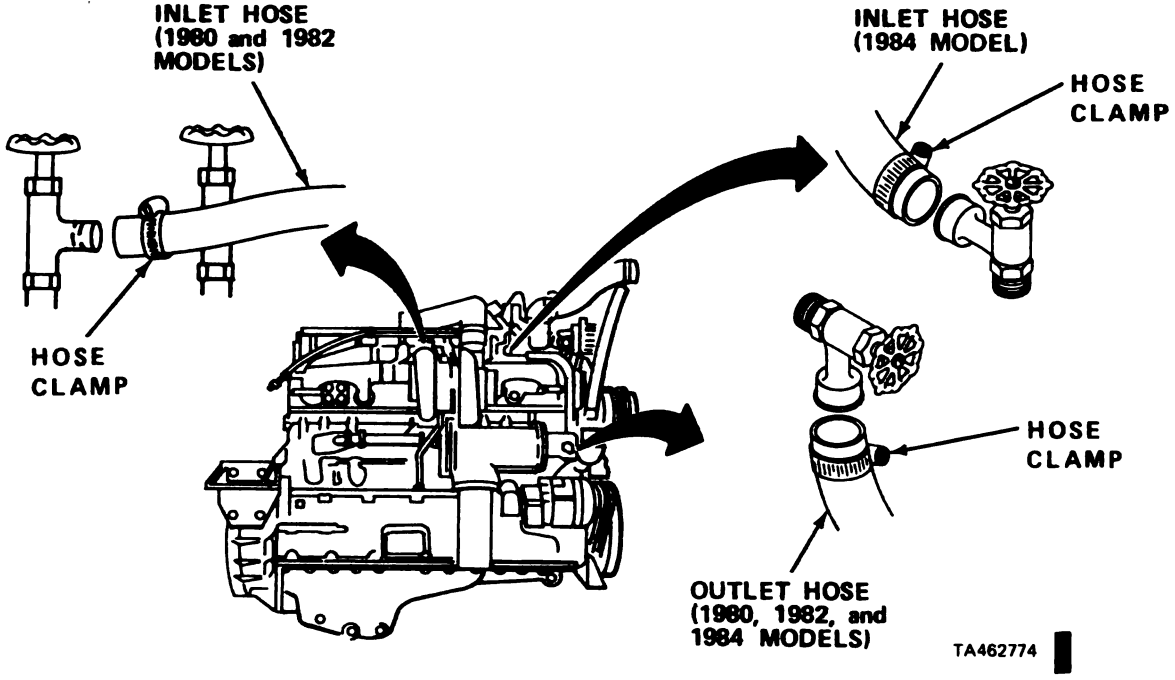
(71) Remove plugs from turbocharger exhaust port and muffler inlet port.

(72) Install and secure exhaust piping to turbocharger exhaust port and muffler inlet port (TM 9-2320-281-20).

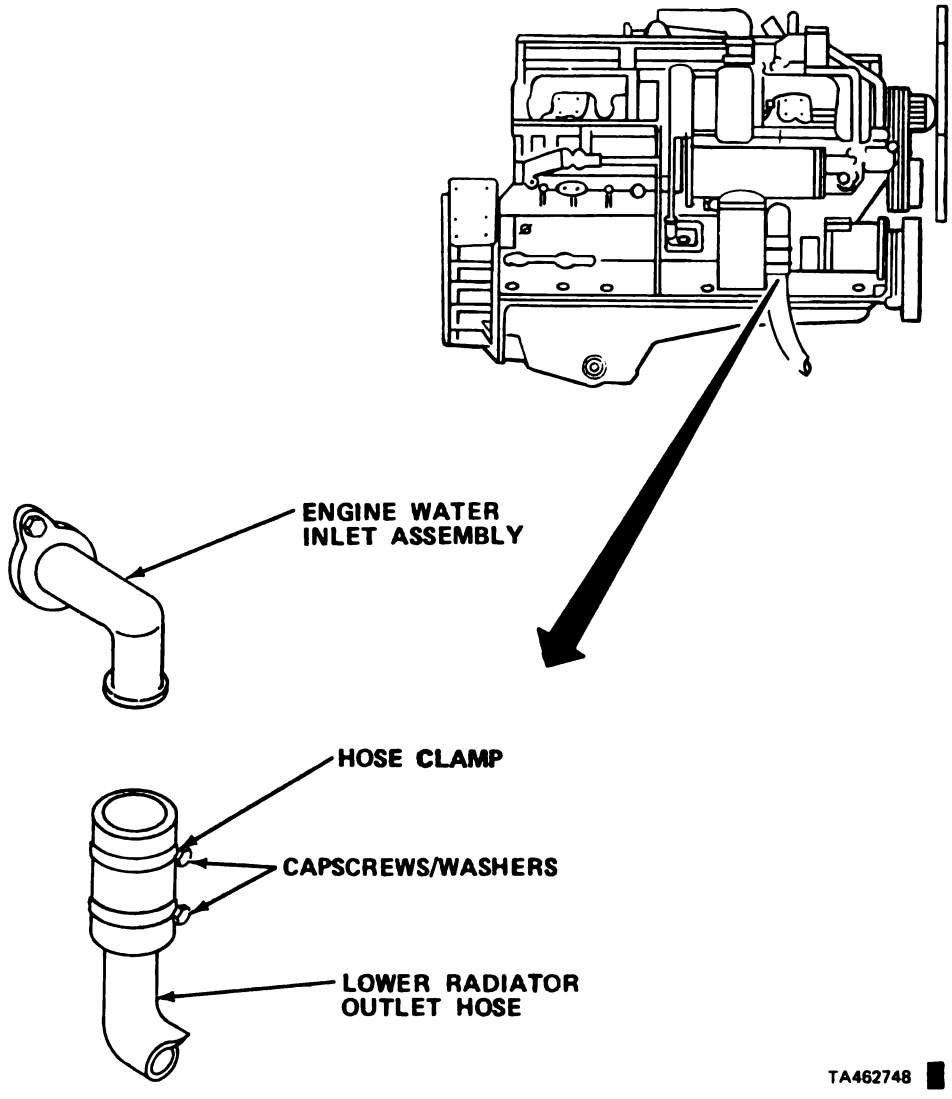


(73) Apply antiseize compound to threads of exhaust pyrometer thermocouple.

(74) Secure exhaust pyrometer thermocouple electrical conduit to thermocouple.



(75) Secure cab heater water inlet and outlet hoses to engine water heater shutoff valves and secure with clamps.



(76) Secure lower radiator outlet hose to engine water inlet assembly with hose clamp and washers and capscrews.

(77) Open cab heater water inlet and outlet shutoff valves.

(78) Install and secure turbocharger air inlet ducting (TM 9-2320-281-20).

(79) Install radiator (TM 9-2320-281-20).

(80) Connect negative battery cables to all batteries (TM 9-2320-281-20)

c. Perform after-installation checks.

(1) Install wire ties where needed to secure loose hoses, lines, leads, and harnesses to prevent chafing and excess movement. Remove all tags.

(2) Check all hoses and lines to ensure they are not pinched or kinked. Reposition as necessary.

(3) Check that coolant draincocks on engine block and oil cooler are closed.

(4) Check that fuel pump shutoff valve manual open knob is fully turned to left.

(5) Check that accelerator linkage is free from binding and obstructions.

(6) Check engine oil level and service as required (LO 9-2320-281-12).

(7) Service power steering reservoir (LO 9-2320-281-12).

(8) Service engine cooling system (TM 9-2320-281-20).

(9) Service transmission as required (LO 9-2320-281-12).

(10) Close all draincocks on air tanks.

d. Perform operational and leak check.

CAUTION

ENSURE THAT ENGINE COMPARTMENT IS FREE OF ANY LOOSE ITEMS, E.G. RAGS, TOOLS, ETC. AND THAT NO OBSTRUCTIONS ARE IN THE PATH OF MOVING ENGINE PARTS. FAILURE TO DO THIS COULD RESULT IN SERIOUS DAMAGE TO ENGINE COMPONENTS.

(1) Start engine (TM 9-2320-281-10).

(2) Check for any fluid and air leaks. Repair as necessary.

(3) Bleed power steering system (para 12-4f).

(4) Lower cab (TM 9-2320-281-20).

(5) Perform vehicle road test (TM 9-2320-281-20).

2-12. TRANSMISSION REPLACEMENT

a. Removal.

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

(2) Disconnect negative battery cables from all batteries (TM 9-2320-281-20).

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

(4) Remove spare tire (TM 9-2320-281-10).

(5) Raise cab (TM 9-2320-281-10).

(6) Remove spare tire support assembly (TM 9-2320-281-20).

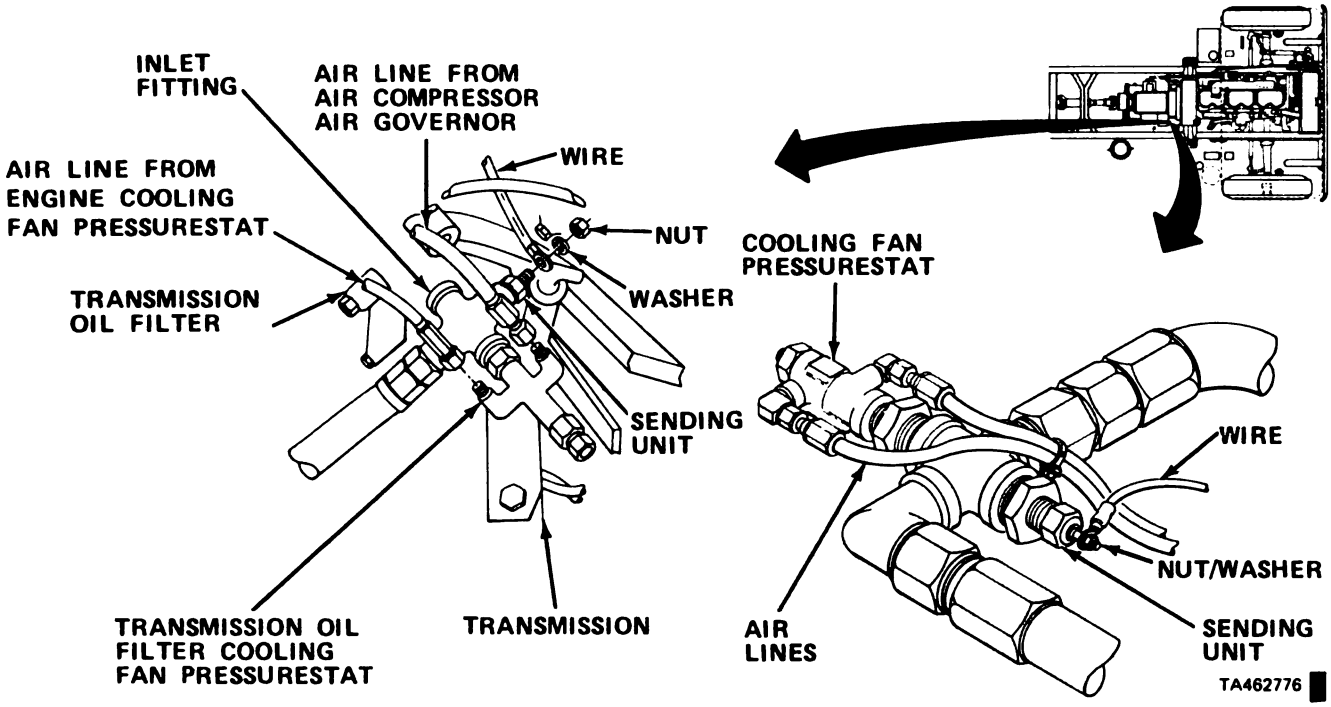
(7) Drain transmission (LO-9-2320-281-12).

NOTE

Use protective caps and plugs after tagging and disconnecting hoses and fittings.

(8) Tag and disconnect all air lines from A-system air tank (TM 9-2320-281-20).

(9) Remove A-system air tank (TM 9-2320-281-20).



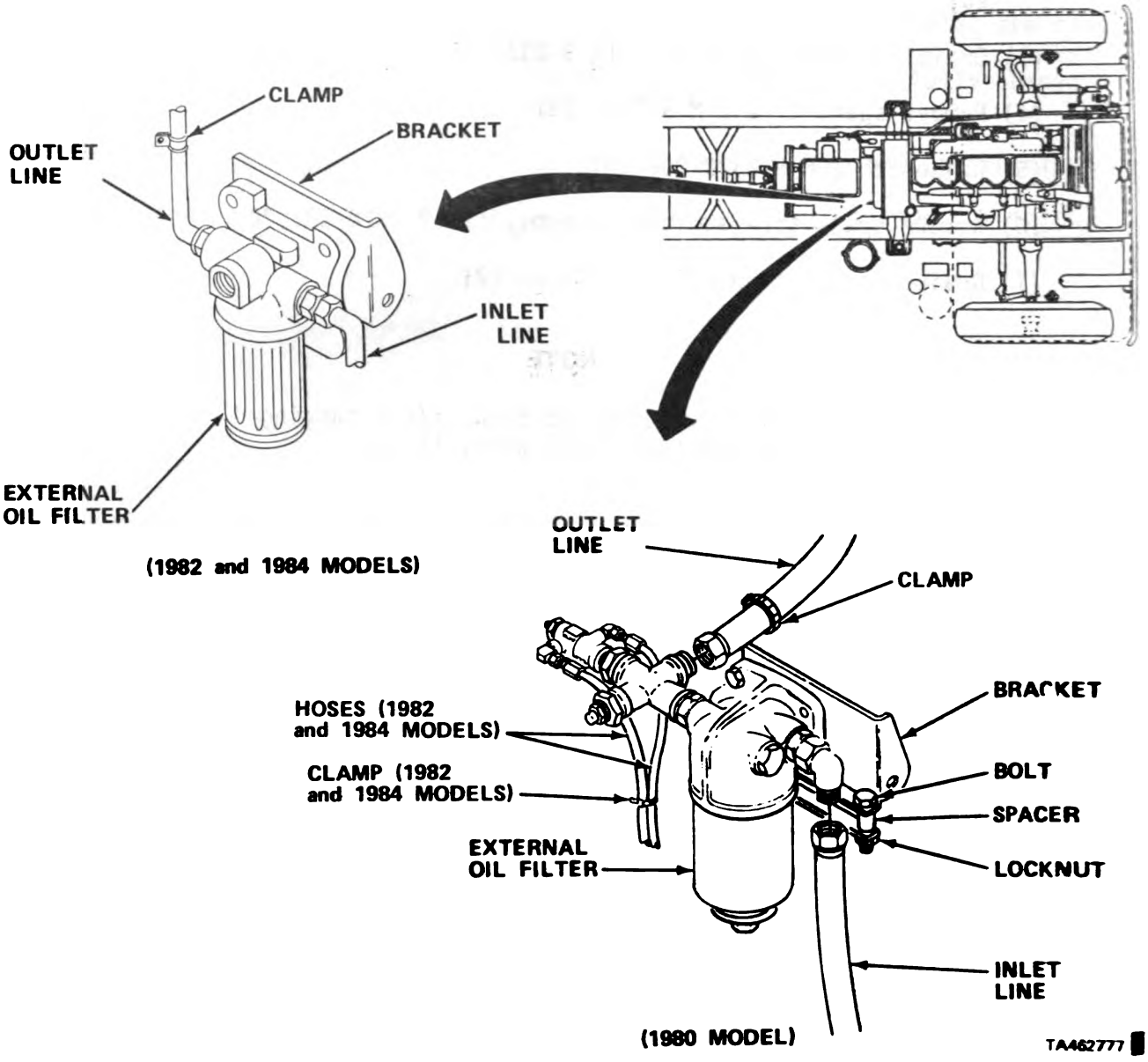
(1980 MODEL)

(1982 and 1984 MODELS)

(10) Tag and disconnect two air lines from cooling fan pressurestat on external oil filter. Remove line clamps and move lines to side.

(11) Remove nut and washer; tag and disconnect wiring to sending unit on oil filter assembly.

(12) Remove transmission dipstick tube and bracket (TM 9-2320-281-20).



(13) Tag and disconnect hoses to transmission external oil filter. Tag and remove bolt, nut, washer, and lockwashers securing hose clamps.

(14) Remove bolts, nuts, spacer, and washers securing external oil filter assembly to transmission housing. Remove filter assembly with mounting bracket.

WARNING

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

NOTE

Vehicle must be raised to provide clearance for transmission removal.

(15) Raise front of vehicle with a lifting device.

(16) Place jack stands under frame. Bottom of battery box must be 41 in. (104 cm) above ground.

CAUTION

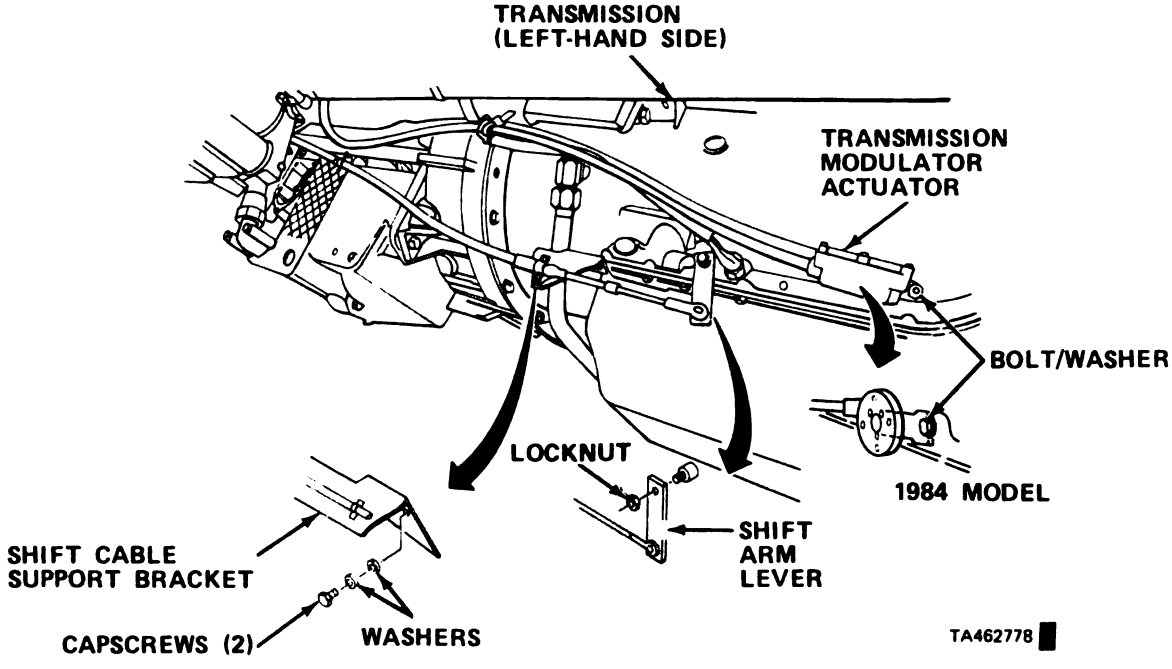
DO NOT PLACE JACK STANDS UNDER ENGINE OIL PAN TO SUPPORT ENGINE. DAMAGE TO THE ALUMINUM PAN COULD RESULT.

NOTE

Transmission mount fixture also supports rear of engine.

(17) To provide support of engine, secure lifting device to engine top lift brackets and place jack stands under engine flywheel housing.

(18) Disconnect propeller shaft from transmission (TM 9-2320-281-20).



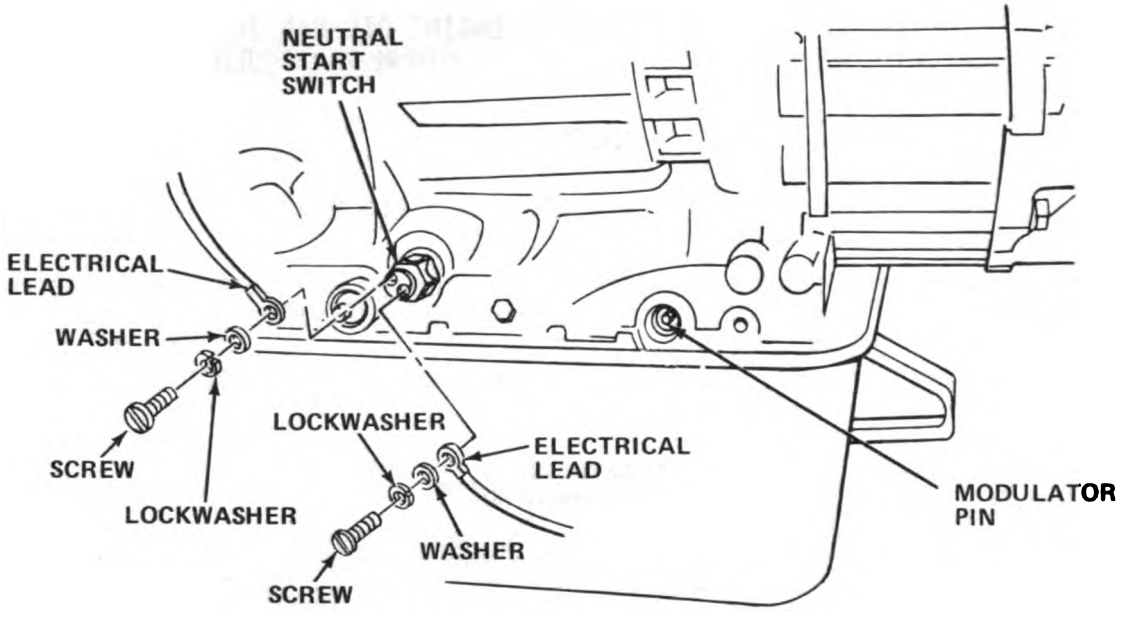
(19) Remove and tag elongated locknut securing transmission shift arm lever to left side of transmission. Remove shift arm lever.

(20) Remove capscrews and washers securing shift cable support bracket to left side of transmission. Remove shift cable support bracket.

CAUTION

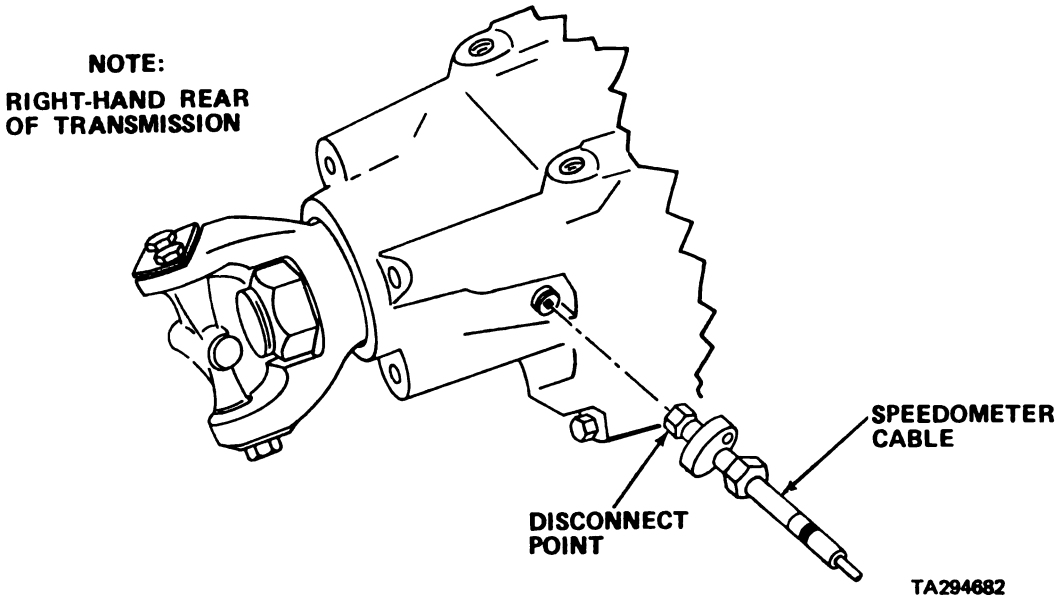
USE CARE WHEN REMOVING OR INSTALLING MODULATOR ACTUATOR TO PREVENT MODULATOR PIN FROM DROPPING INTO TRANSMISSION OIL PAN (1980, 1982 MODELS). SEVERE DAMAGE MAY RESULT.

(21) Remove bolt, washer, and bracket securing modulator actuator. Remove modulator actuator from transmission.

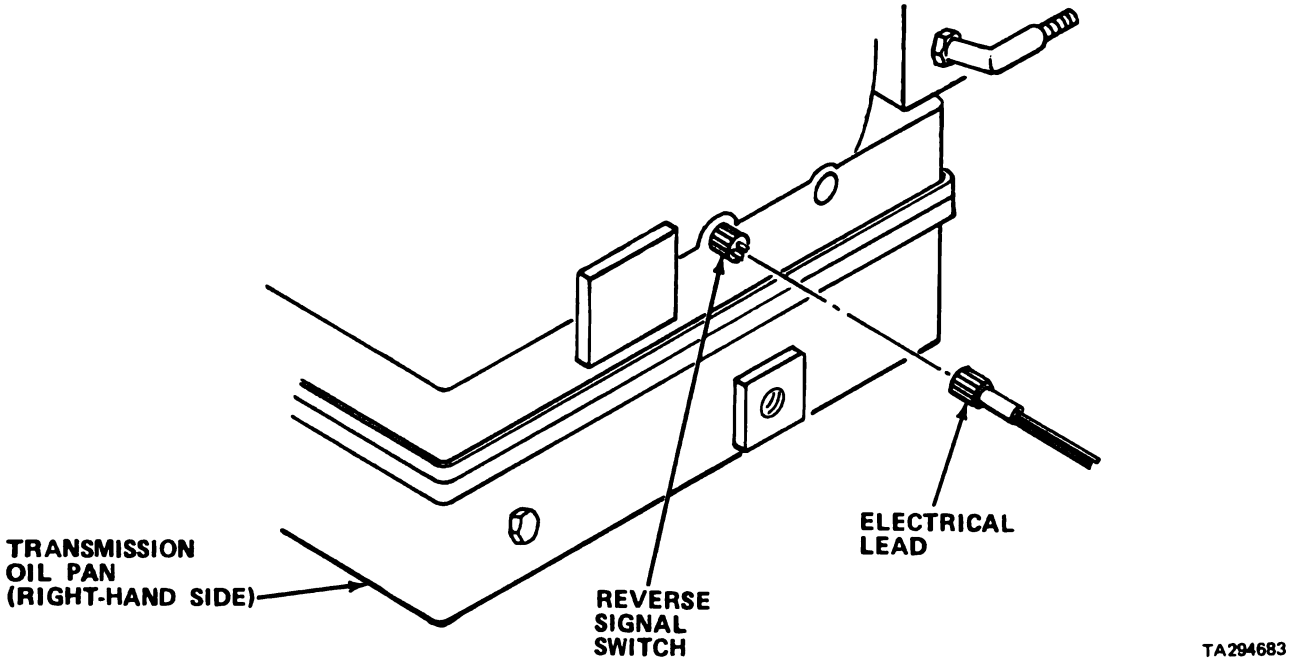


(22) Remove modulator pin from transmission with needle nose pliers (1980, 1982 models).

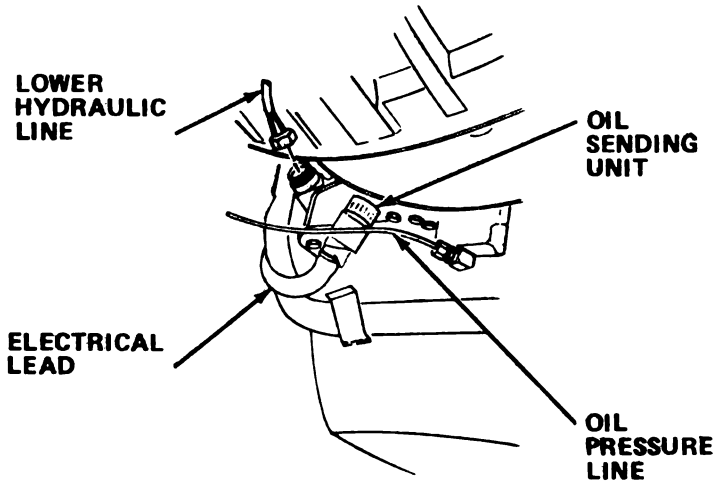
(23) Tag and remove screws, washers, and lockwashers securing electrical leads to neutral start switch on left side of transmission.



(24) Remove speedometer drive cable from end of transmission.



(25) Tag and unplug electrical lead from reverse signal switch on right side of transmission.

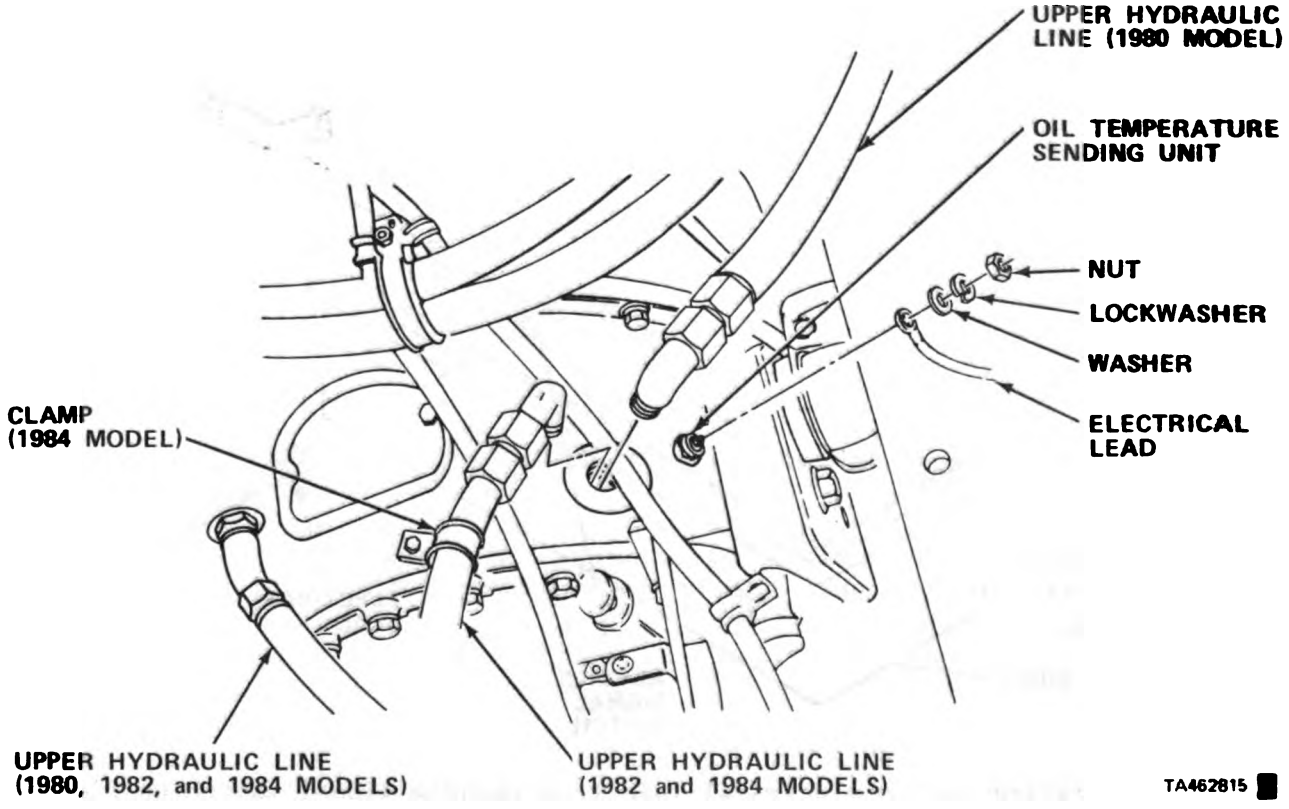


(26) Tag and disconnect electrical lead from oil sending unit on lower front of transmission.

(27) Tag and disconnect oil pressure line.

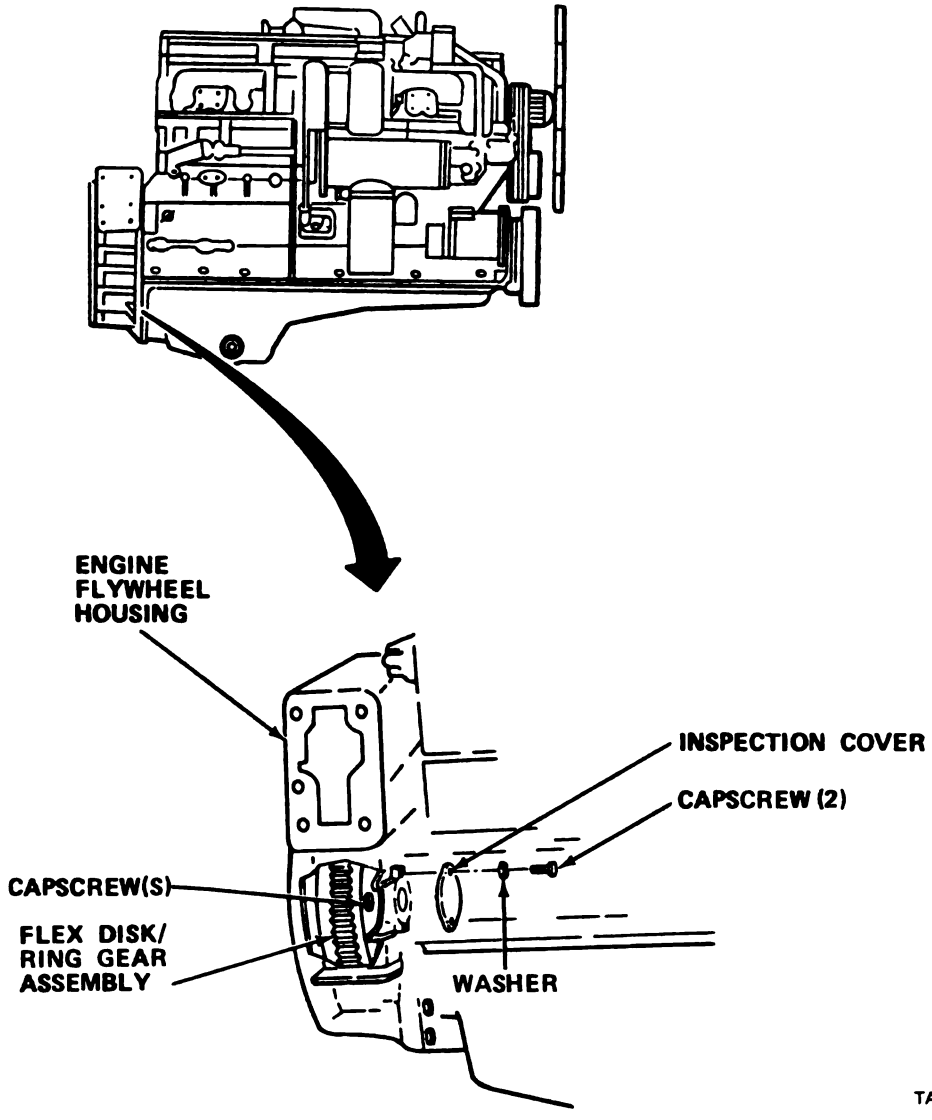
(28) Tag and disconnect lower hydraulic line.

(28.1) Remove clamp (1984 model).



(29) Tag and disconnect upper hydraulic lines.

(30) Remove nut, lockwasher, and washer. Tag and disconnect lead from oil temperature sending unit.



(31) Remove capscrews and washers securing flywheel inspection cover to right side of engine flywheel housing. Remove flywheel inspection cover.

NOTE

Working through flywheel housing inspection hole, rotate flex disk and ring gear assembly with a heavy duty flat tip screwdriver. This will provide access to each of the capscrews and washers securing the flex disk and ring gear assembly to the transmission flywheel.

(32) Working through flywheel housing inspection hole, remove capscrews and washers connecting flex disk and ring gear assembly to transmission flywheel.

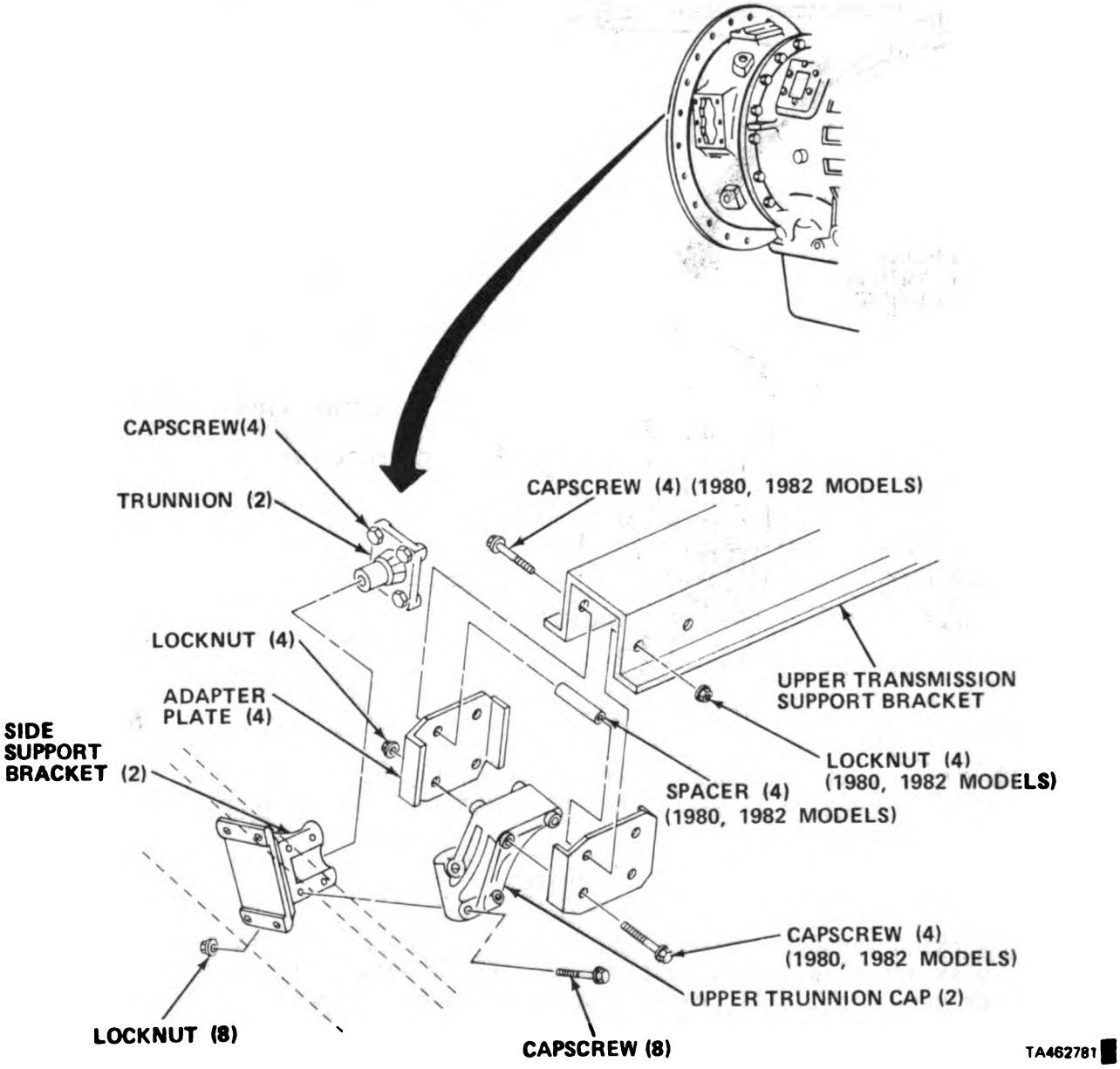
(33) Position a transmission jack under transmission oil pan.

(34) Raise transmission jack enough to remove pressure from side mounts.

(35) Place light load on engine hoist.

NOTE

Note positions of brackets before removal to be sure of proper reassembly.

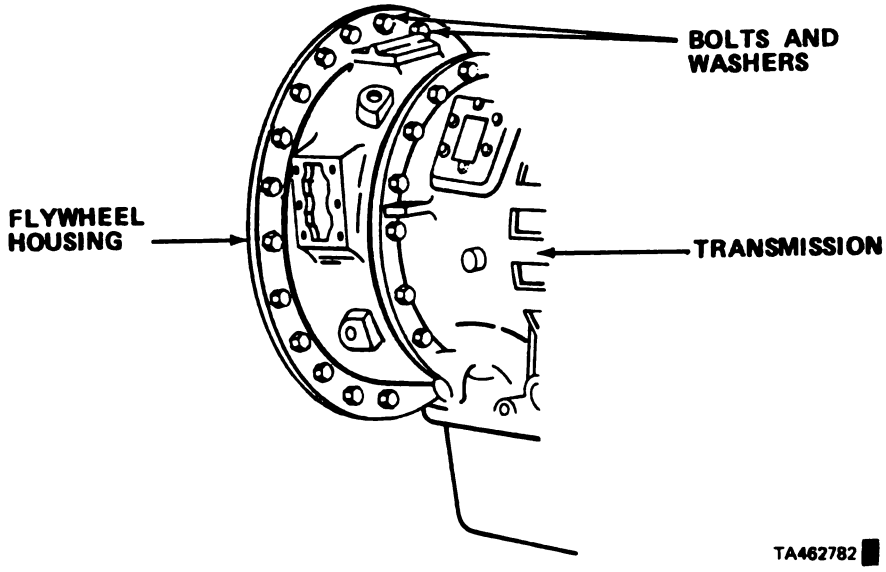


(36) Remove capscrews, locknuts, spacers, (lockbolts and locknuts on 1984 model), and upper transmission support bracket.

(37) Remove capscrews and locknuts securing trunnion caps to side support brackets. Remove trunnion caps.

(38) Remove capscrews securing trunnions to transmission.

(39) Remove bolts and washers retaining transmission to engine flywheel housing. Tag battery cable clamps that are secured with flywheel housing bolts.



WARNING

KEEP HANDS CLEAR OF TRANSMISSION AND TRUCK FRAME TO PREVENT PERSONAL INJURY.

NOTE

More than one person is required to perform steps (40) and (41).

(40) Slide transmission rearward until transmission flywheel clears flywheel housing.

CAUTION

BE SURE THAT ALL TRANSMISSION COMPONENTS ARE CLEAR OF CHASSIS BEFORE LOWERING TRANSMISSION. DAMAGE COULD OCCUR TO COMPONENTS.

(41) Lower transmission slowly and guide it carefully out from under truck.

(42) Tag and remove transmission oil pressure sending unit, oil temperature sending unit, neutral safety switch, and reverse signal switch.

(43) Remove all fittings and elbows from transmission.

(44) Install plugs in all open transmission ports.

b. Install

NOTE

Compare replacement transmission to removed transmission to determine which accessories (components) will have to be transferred from removed transmission to replacement transmission.

(1) Service external oil filter (TM 9-2320-281-20).

(2) Apply thread sealant to all elbows and fittings and install elbows and fittings in transmission.

(3) Apply thread sealant to transmission oil pressure sending unit, oil temperature sending unit, reverse signal switch, and neutral safety switch. Install sending units and switches in transmission.

(4) Inspect flywheel on engine. Ensure ring gear is in place. Ensure flywheel, ring gear, and flex disk mounting holes are alined.

NOTE

Ring gear is mounted to flywheel with same capscrews that secure flex disk and flywheel to transmission torque converter. Ring gear will fall from flywheel if moved before steps 5 through 11 are completed.

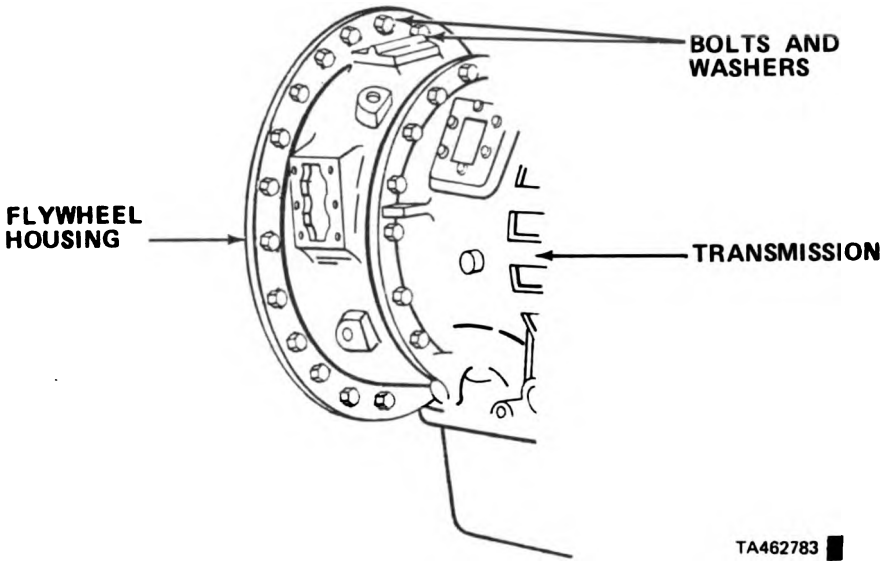
WARNING

KEEP HANDS CLEAR OF TRANSMISSION AND TRUCK FRAME TO PREVENT PERSONAL INJURY.

NOTE

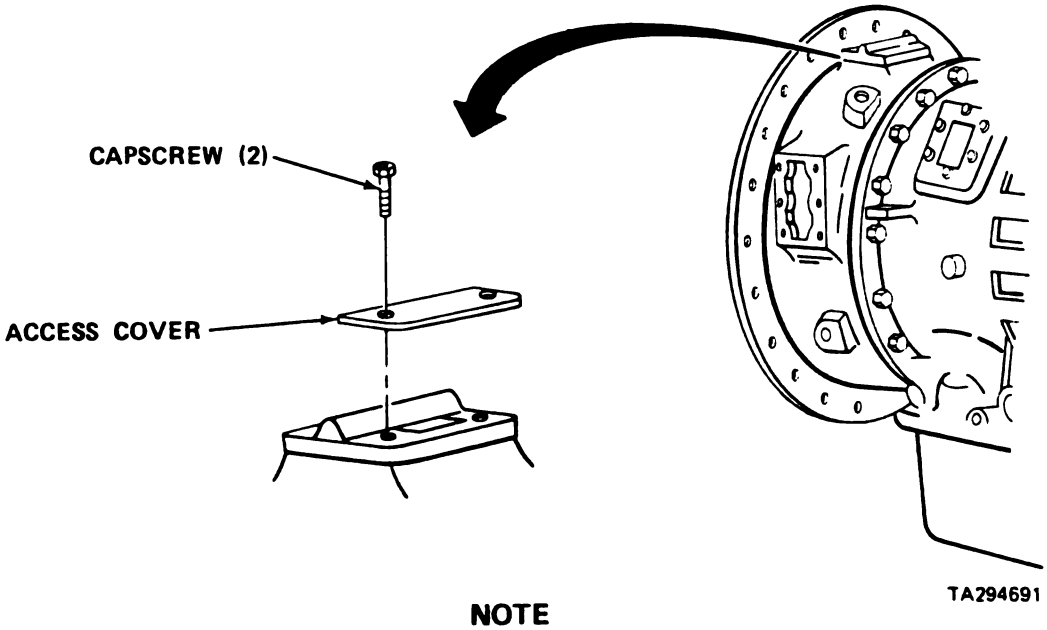
More than one person is required to perform steps (5) and (6).

(5) Guide transmission under truck and slowly raise into position.



(6) Move transmission forward until transmission mates with engine flywheel housing. Install bolts and washers retaining transmission to flywheel housing.

(7) Install battery cable clamps that are secured with flywheel housing capscrews. Torque bolts to proper setting (Appendix D).



NOTE

Steps (8) thru (12) are only for installation of the first capscrew that secures engine flex disk to transmission flywheel.

(8) Remove capscrews and access cover from top of transmission.

(9) Working through flywheel housing inspection hole, rotate flex disk until mounting hole in flex disk is fully visible.

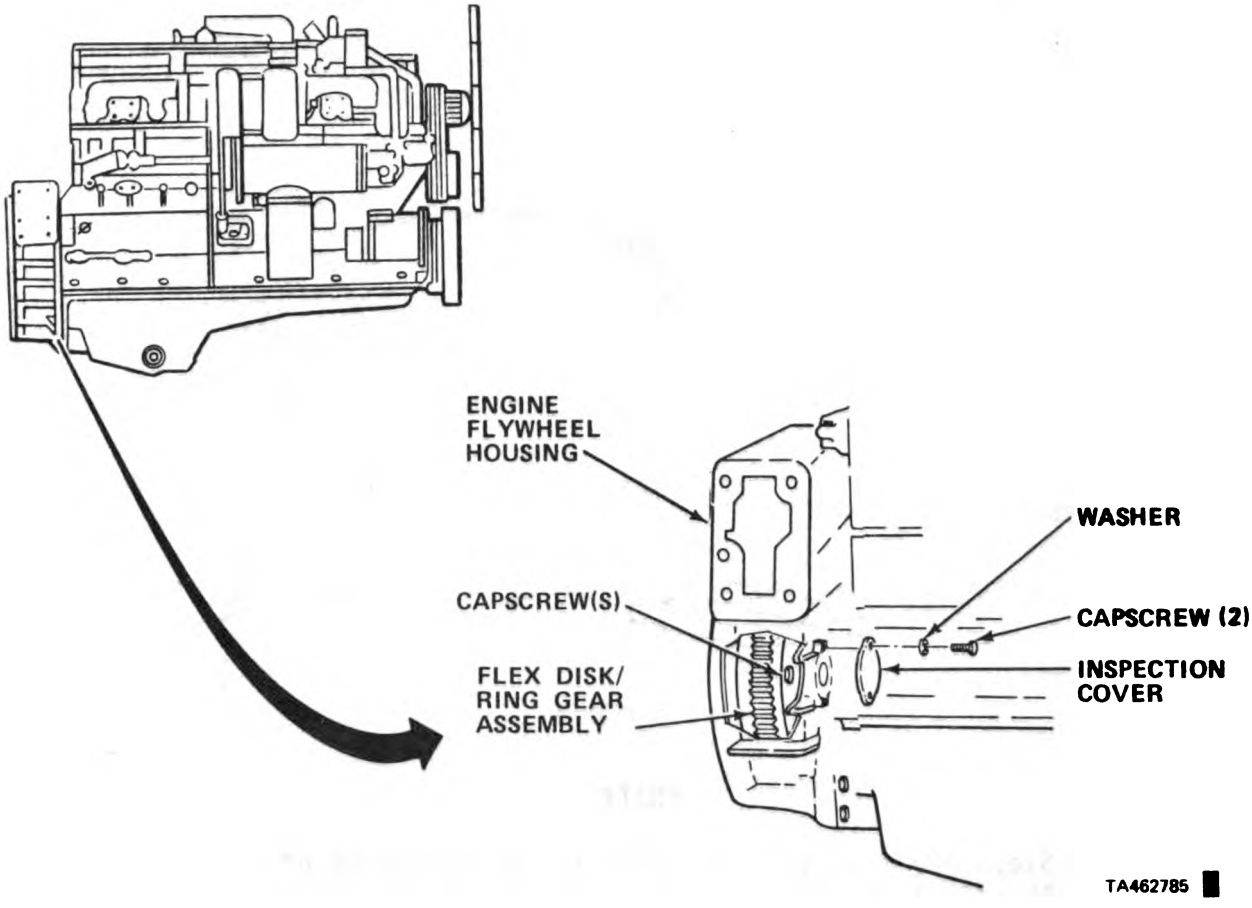
(10) Rotate flywheel and transmission torque converter from transmission top access cover until transmission flywheel mounting hole alines with engine flex disk mounting hole.

(11) Working through flywheel housing inspection hole, secure capscrew through engine flex disk and transmission flywheel.

(12) Install top transmission access cover and secure with capscrews.

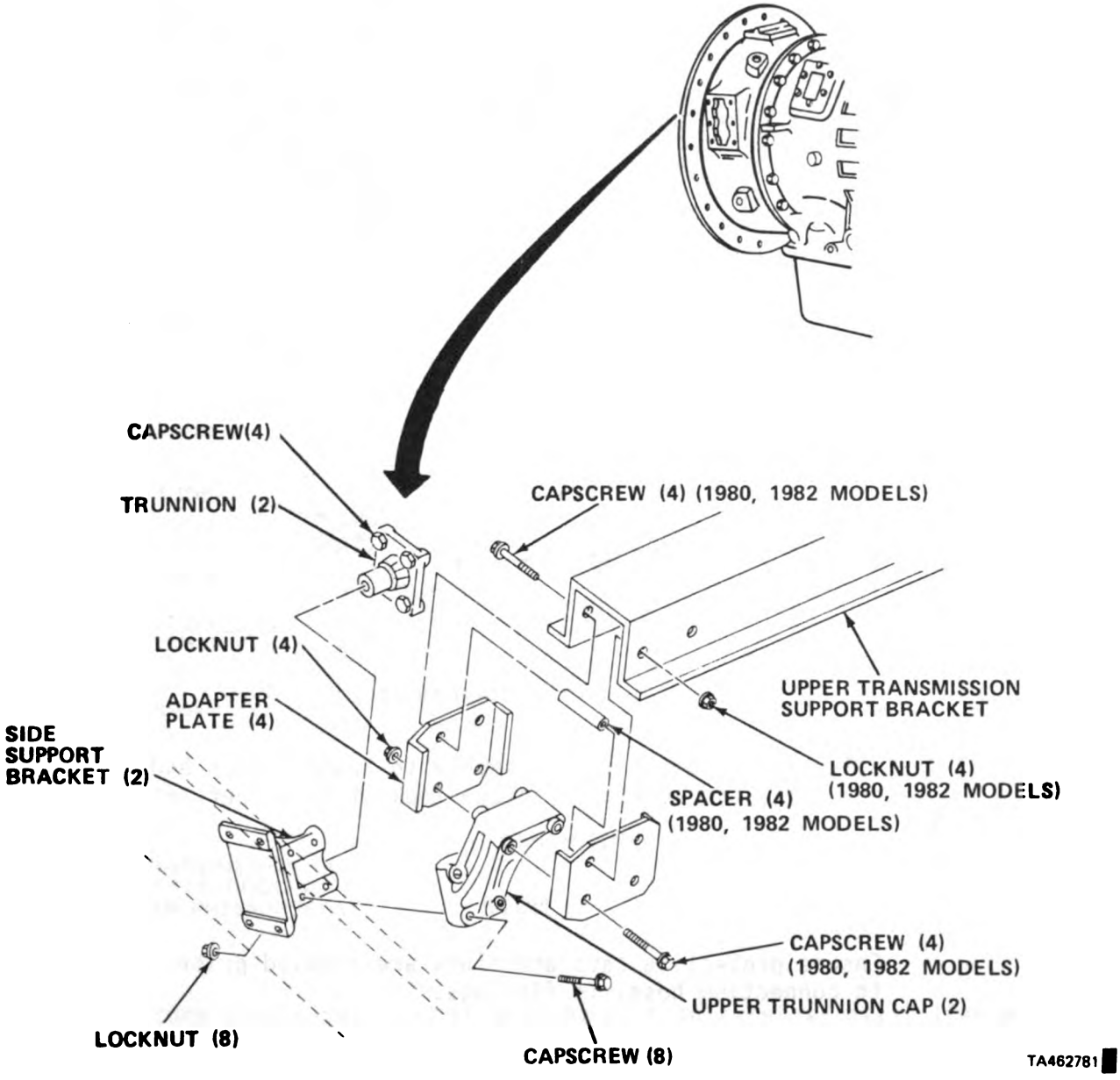
NOTE

For installation of the remaining torque converter to flex disk capscrews, rotate the engine either with the accessory drive pulley nut or through flywheel inspection hole.



(13) Working through flywheel housing inspection hole, install capscrews retaining disk and ring gear assembly to transmission flywheel. Torque capscrews to 41 - 49 ft lbs (54.2 - 66.4 N•m).

(14) Install flywheel inspection cover on flywheel housing; secure with capscrews and washers.



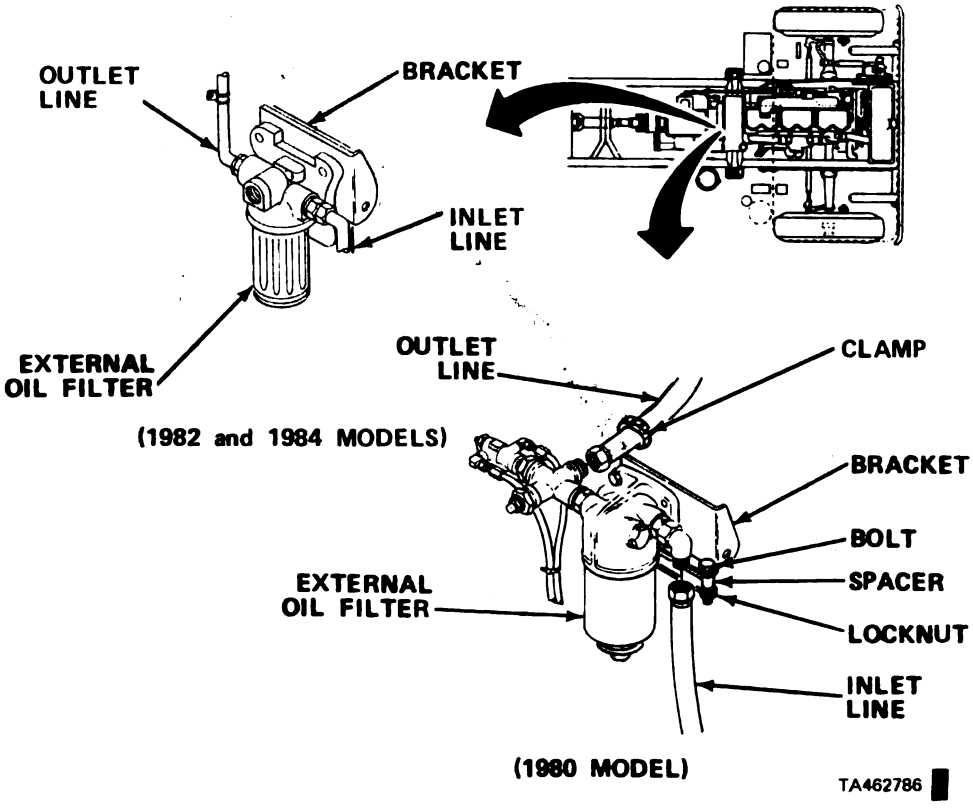
(15) Install trunnions to transmission side mounts and install upper transmission support bracket with capscrews and locknuts. Install bolts and torque to proper setting (Appendix D).

(16) Install upper trunnion caps and secure to side support brackets and secure with bolts and locknuts. Torque bolts to proper setting (Appendix D).

(17) Lower and remove transmission jack.

NOTE

Torque all bolts and nuts to proper settings as specified in Appendix D.



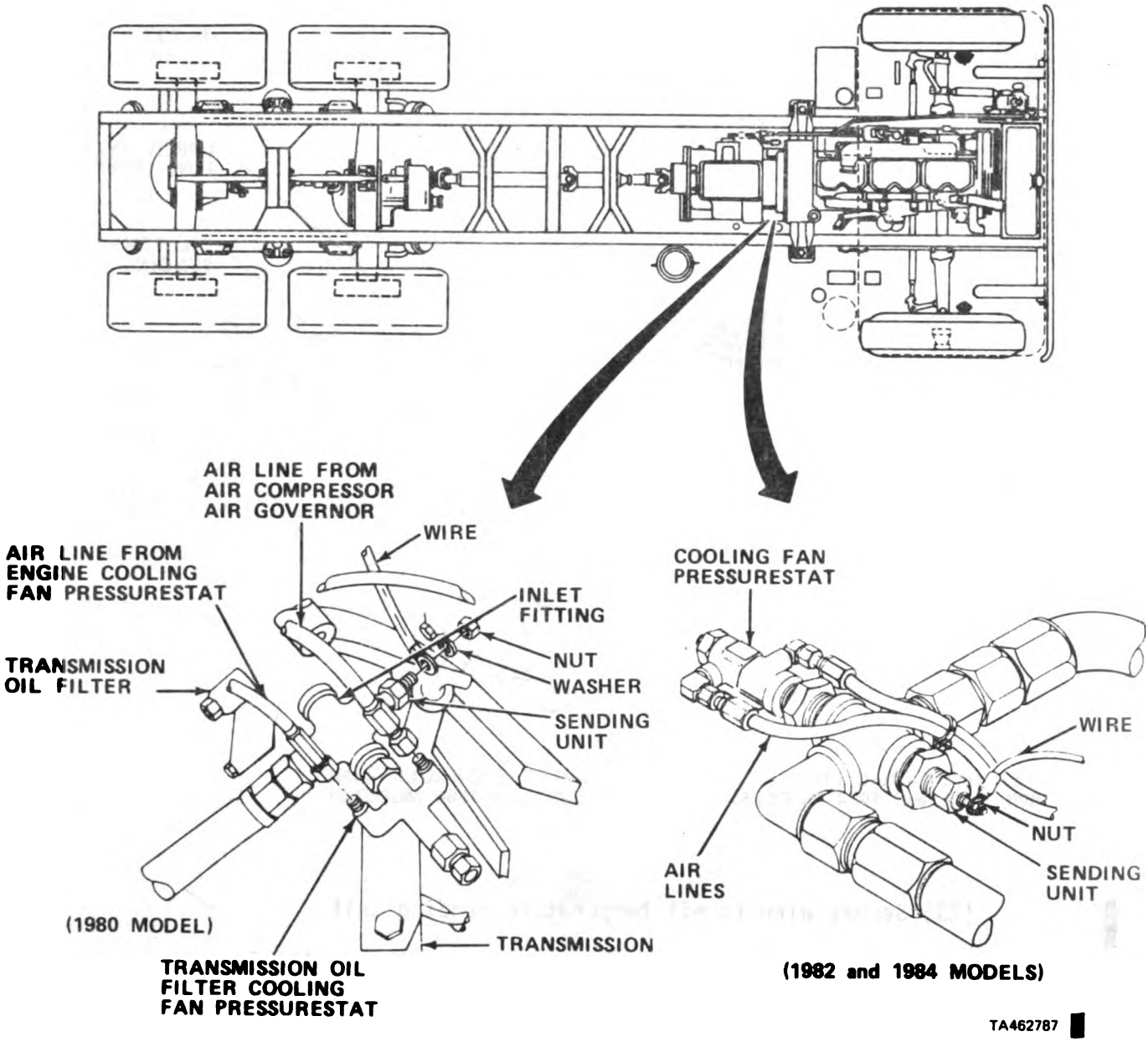
(18) Install external oil filter assembly to transmission and retain with spacer, bolt, and locknut. Torque locknut to proper setting (Appendix D).

NOTE

Ensure protective caps and plugs are removed prior to connecting hoses to fittings.

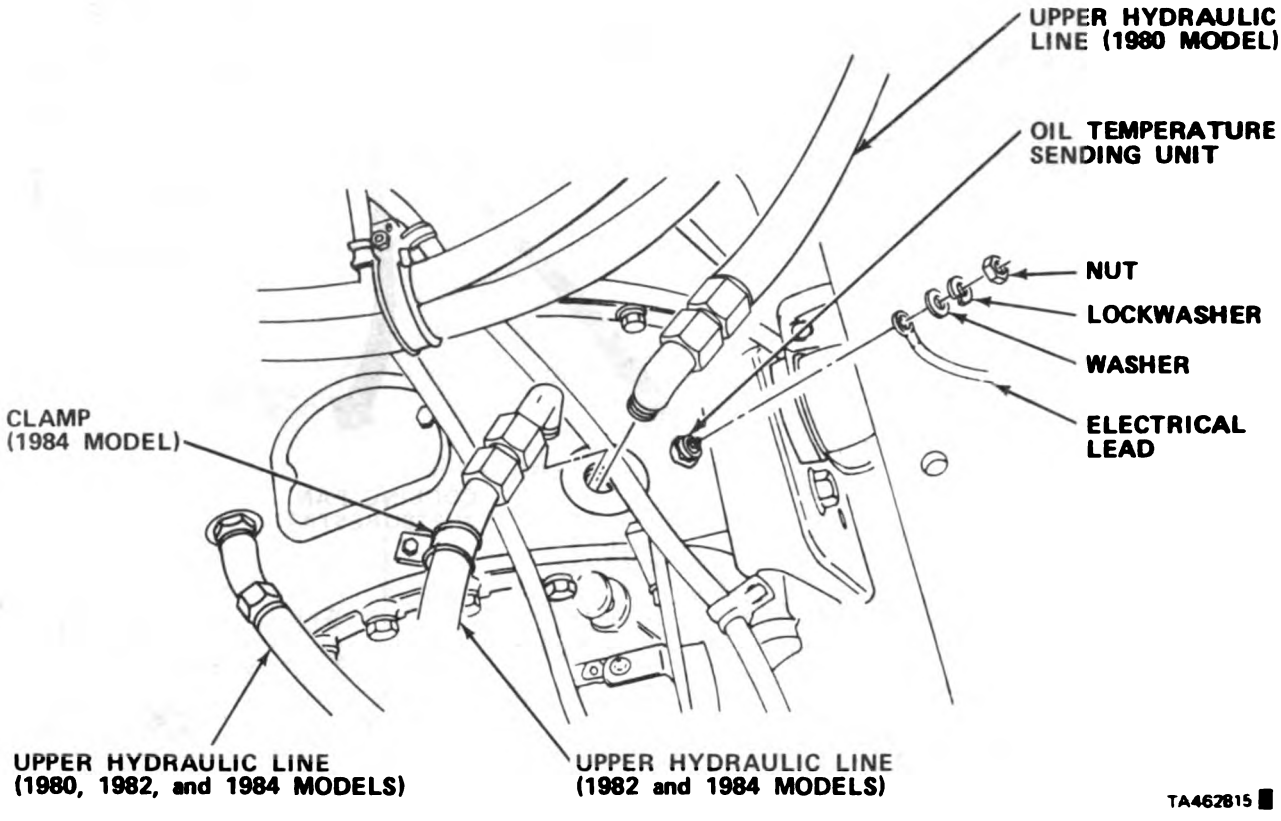
(19) Secure inlet and outlet lines to external oil filter assembly. Secure hose clamp with bolt, washers, and nut.

(20) Install transmission dipstick tube and bracket (TM 9-2320-281-20).



(21) Secure electrical lead to sending unit on external oil filter with washer and nut.

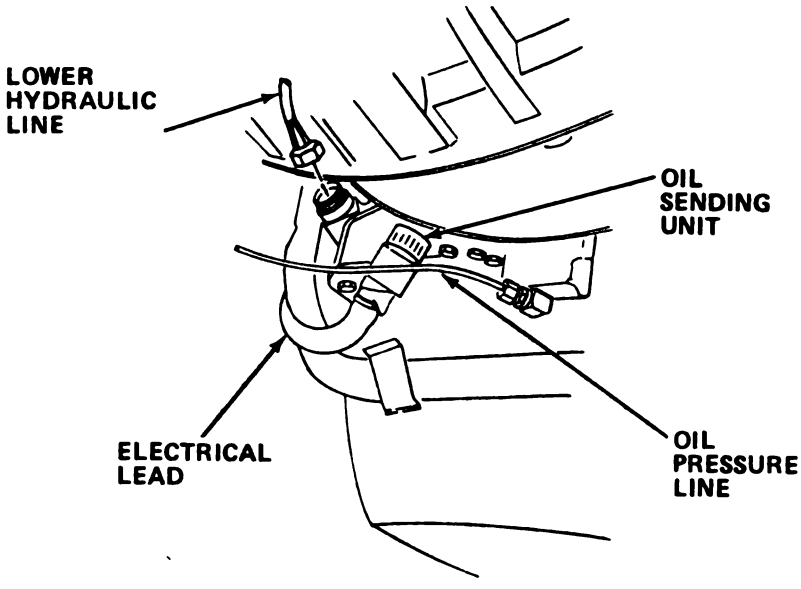
(22) Apply thread sealant and secure air lines to cooling fan pressurestat on external oil filter. Remove tags and secure line retaining clamps.



(23) Secure wire to oil temperature sending unit.

(24) Apply thread sealant and secure upper hydraulic line to transmission.

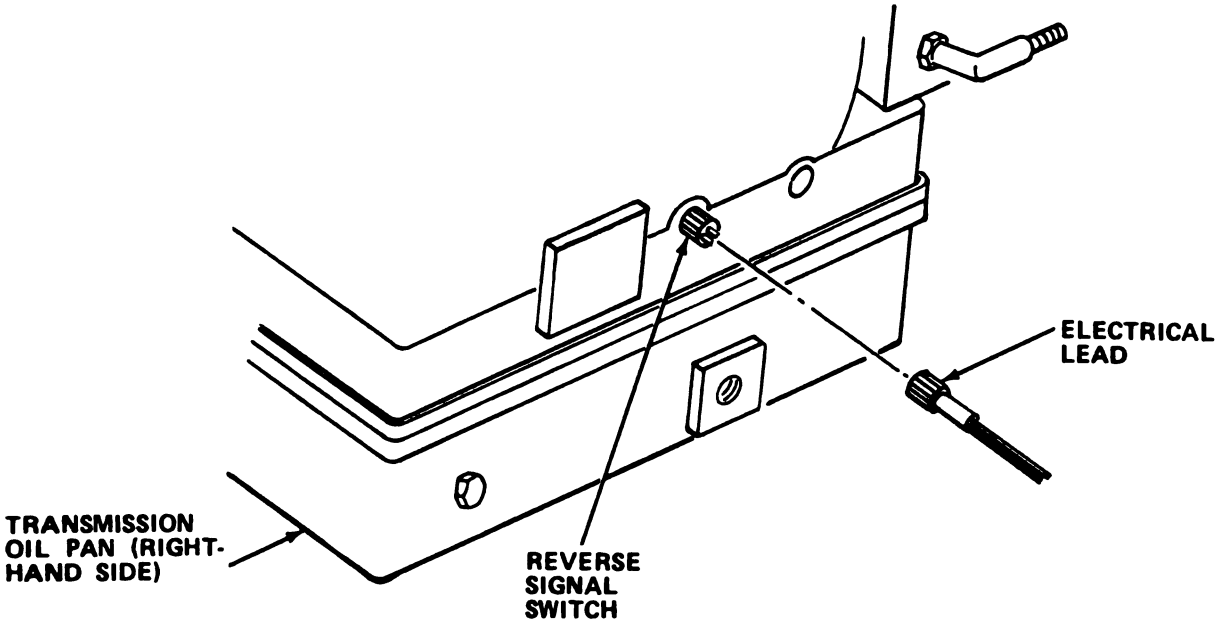
(24.1) Install clamp (1984 model).



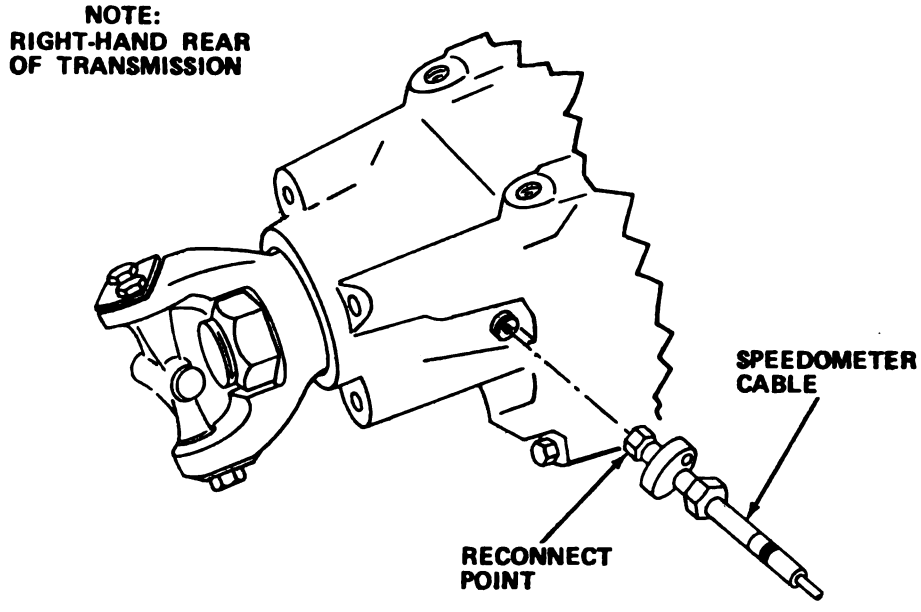
(25) Apply thread sealant and secure lower oil cooler line to transmission.

(26) Apply thread sealant and secure oil pressure line to transmission.

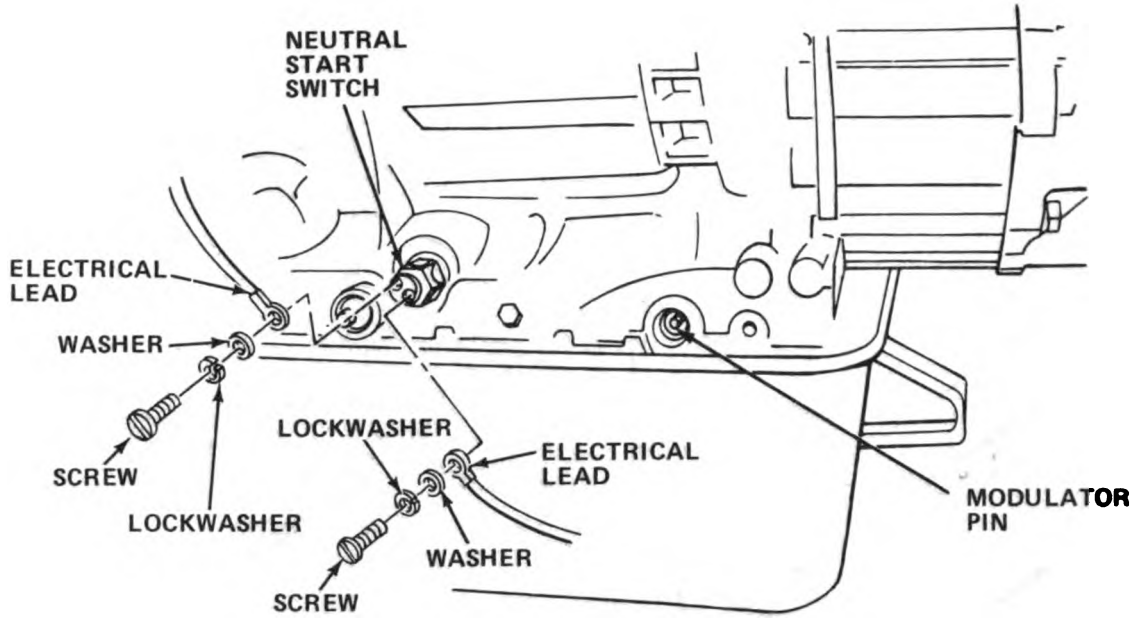
(27) Connect electrical lead to sending unit on lower front of transmission.



(28) Plug wiring into reverse signal switch on right side of transmission.



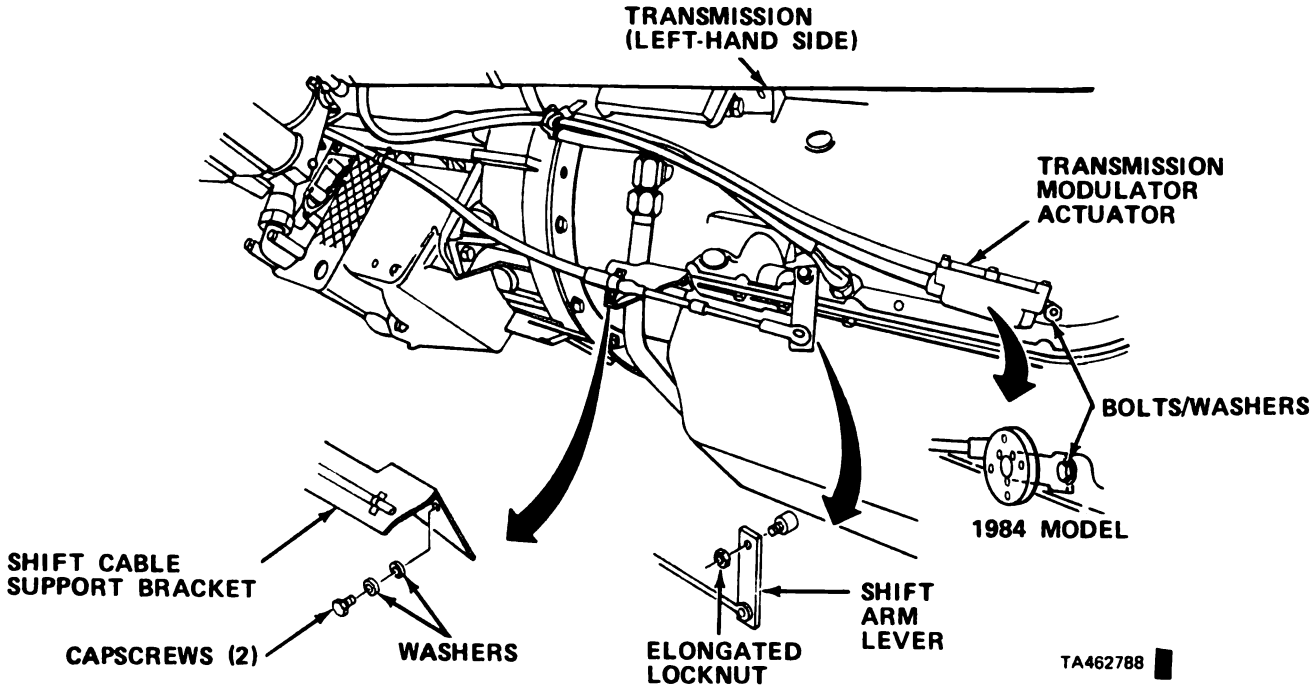
(29) Secure speedometer drive cable to transmission.



(30) Secure wiring to neutral start switch with screws, washers, and lockwashers.

(31) Install modulator pin in transmission (1980 and 1982 models).

(32) Install modulator actuator. Secure with bracket, washer, and bolt.



(34) Install shift cable support bracket. Secure with washers and capscrews.

(35) Install transmission shift arm lever. Secure with elongated locknut.

(36) Remove all tags.

(37) Connect propeller shaft to transmission (TM 9-2320-281-20).

(38) Remove jack stands and lifting device from engine.

(39) Lower cab (TM 9-2320-281-10).

(40) Raise vehicle and remove jack stands from under truck frame.

(41) Lower vehicle to ground and remove lifting device.

(42) Install A-system air tank and mount brackets (TM 9-2320-281-20).

(43) Install spare tire support assembly (TM 9-2320-281-20).

(44) Install spare tire (TM 9-2320-281-10).

(45) Service transmission (LO 9-2320-281-12).

(46) Reconnect batteries (TM 9-2320-281-20).

c. Perform operational and leak check of transmission.

(1) Start engine (TM 9-2320-281-10).

(2) Check for any fluid and air leaks. Repair as necessary.

(3) Perform vehicle road test (TM 9-2320-281-20).

2-13. FRONT AXLE REPLACEMENT

a. Remove axle.

(1) Loosen all front wheel lug nuts.

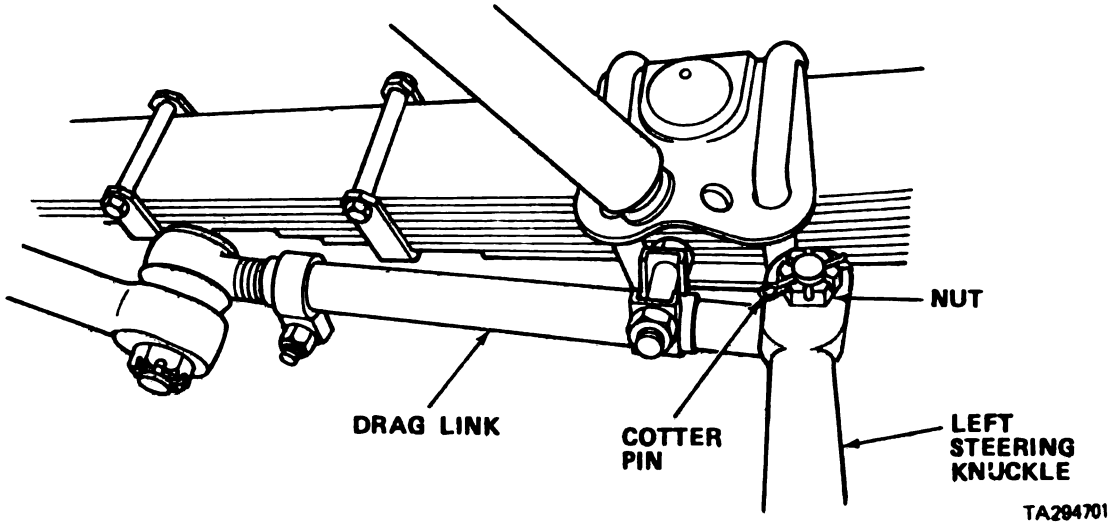
WARNING

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

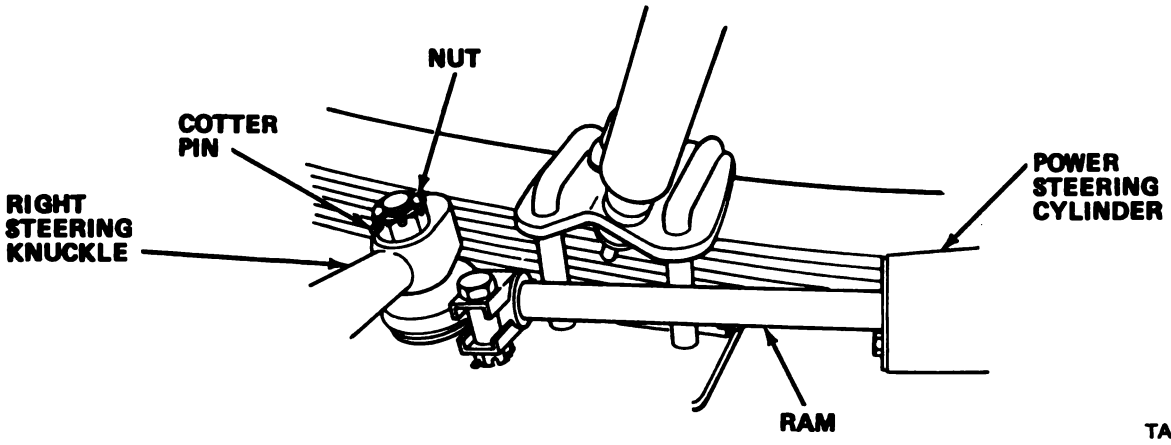
DO NOT ATTEMPT WHEEL DISASSEMBLY OR STEERING KNUCKLE REPAIR WITH VEHICLE SUPPORTED BY JACKS ONLY. SEVERE INJURY CAN RESULT FROM INADEQUATELY SUPPORTED VEHICLE.

(2) Raise front end of vehicle and place jack stands under left and right frames next to battery boxes.

(3) Remove front brake spiders and backing plates (TM 9-2320-281-20).



(4) Disconnect drag link from left steering knuckle.



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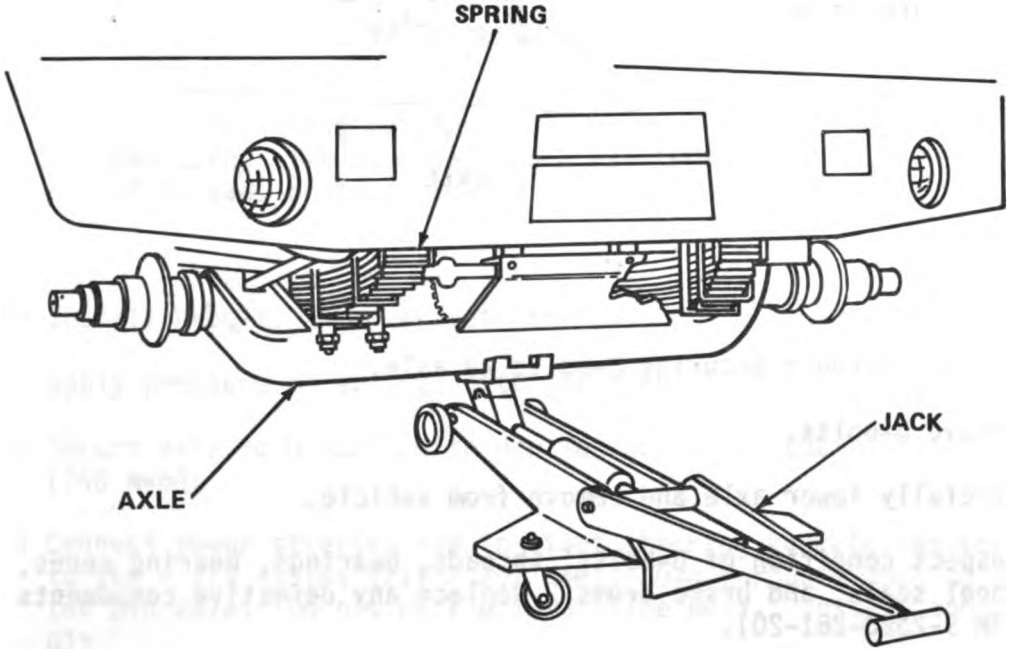
(5) Disconnect power steering ram from right steering knuckle.



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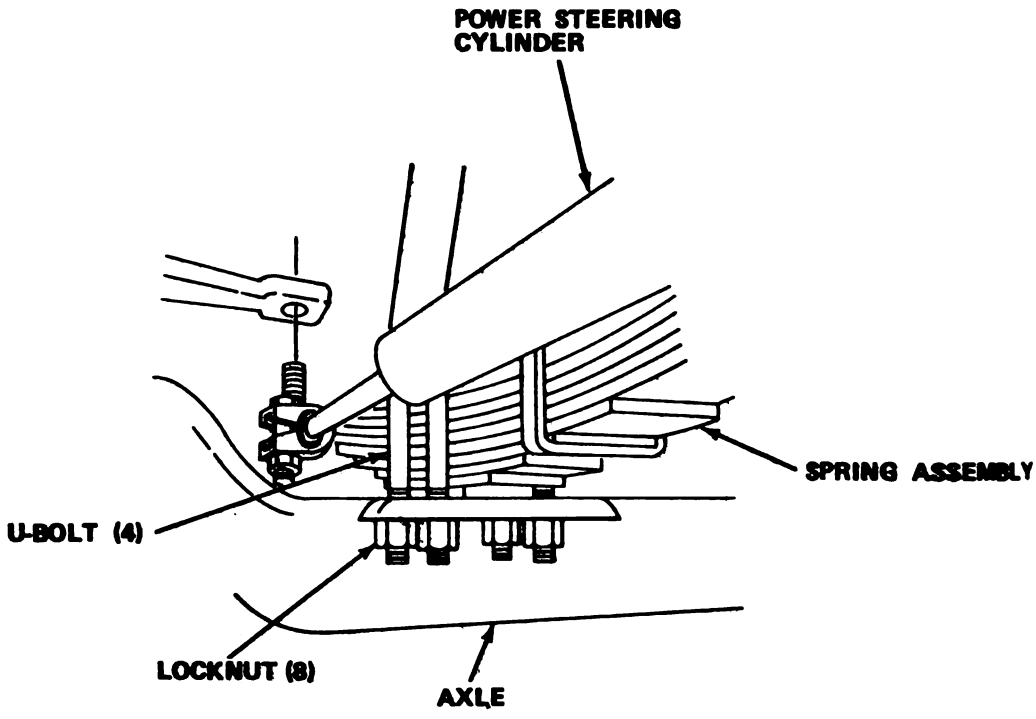
WARNING

DO NOT LIE UNDER AXLE DURING REMOVAL PROCEDURE.
DEATH OR SERIOUS INJURY MAY RESULT.

NOTE

Two assistants will be required to perform this task; one on each end of axle to keep it balanced.

(6) Place a jack under axle.



(7) Remove locknuts securing U-bolts to axle.

(8) Remove U-bolts.

(9) Carefully lower axle and remove from vehicle.

(10) Inspect condition of U-bolts' threads, bearings, bearing cones, inner wheel seals, and brake drums. Replace any defective components (TM 9-2320-281-20).

b. Install new axle.

NOTE

Two assistants will be required to perform this task; one on each end of axle to keep it balanced.

(1) With sling and hoist, place axle on jack.

(2) Position axle under vehicle.

(3) Carefully raise axle until spring assemblies center bolts seat in holes of axle. Axle must be flush with bottom of spring assemblies.

NOTE

When installing nuts on U-bolts, tighten each nut a few turns at a time so approximately the same number of threads protrude beyond nut on each side of clip.

(4) Install U-bolts and lubricate threads.

(5) Apply pressure on springs with jacks until springs are almost flat.

(6) Secure axle to U-bolts with new locknuts. Torque nuts to 550 ft lbs (746 N•m).

(7) Connect power steering ram to right steering knuckle 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 to aline hole. Install and bend cotter pin.

(8) Connect drag link to left steering knuckle 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 to aline hole. Install and bend cotter pin.

(9) Reinstall front brake spiders and backing plates (TM 9-2320-281-20).

(10) Aline front end (para 8-4).

(11) Road test truck and check for vibration, steering, or brake problems (TM 9-2320-281-20).

2-14. FORWARD REAR AXLE REPLACEMENT

a. Remove forward rear axle.

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

(2) Raise vehicle with lifting device until wheels are clear of ground..

WARNING

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

(3) Position jack stands under frame and lower vehicle on jack stands.

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

(5) Remove wheel and tire assemblies (TM 9-2320-281-10).

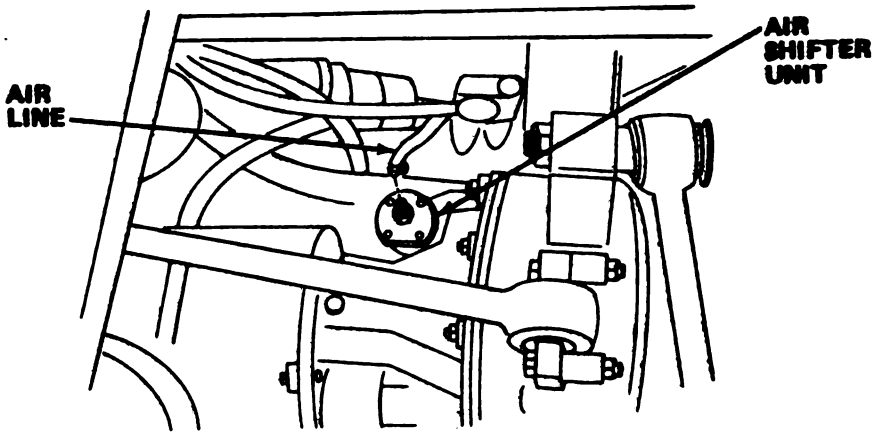
WARNING

DO NOT LIE UNDER AXLE DURING REMOVAL PROCEDURE. DEATH OR SERIOUS INJURY MAY RESULT.

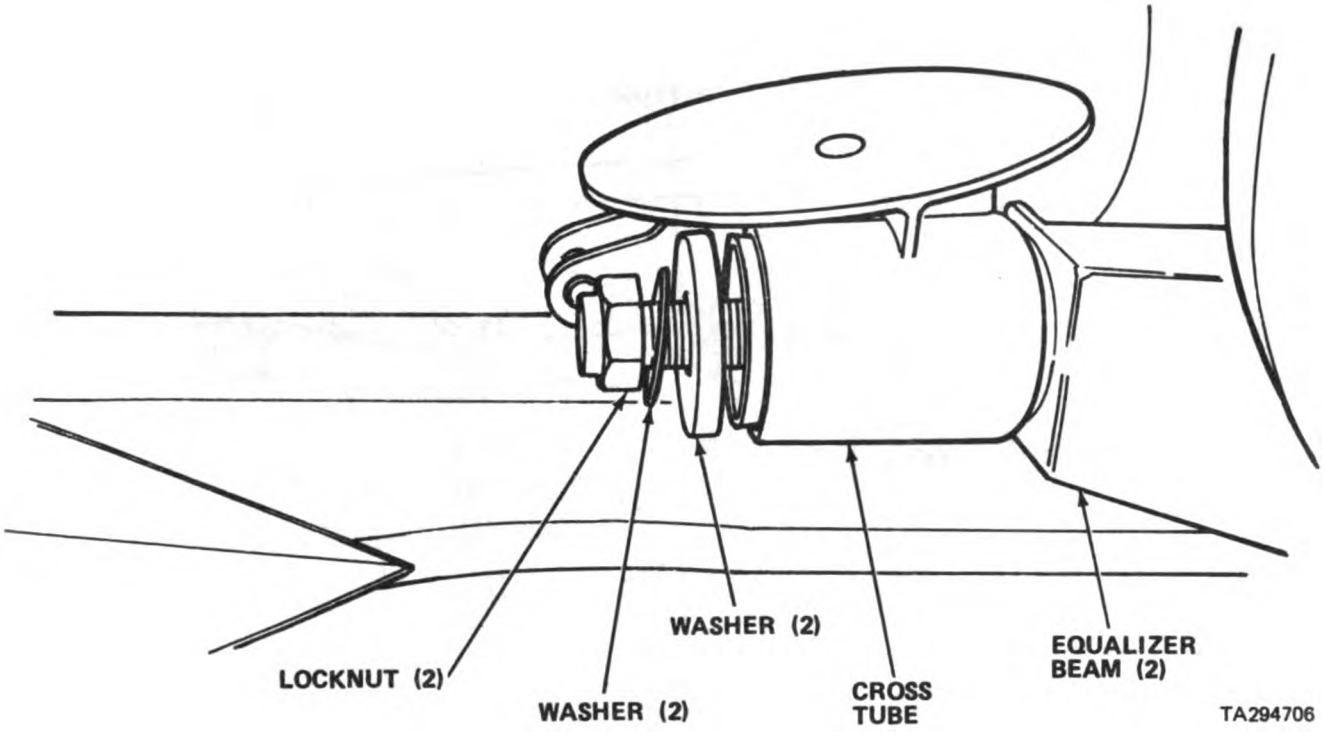
(6) Position lifting device under axle and raise axle slightly to remove pressure from shock absorber.

(7) Remove shock absorbers (TM 9-2320-281-20).

(8) Remove air bags (TM 9-2320-281-20).



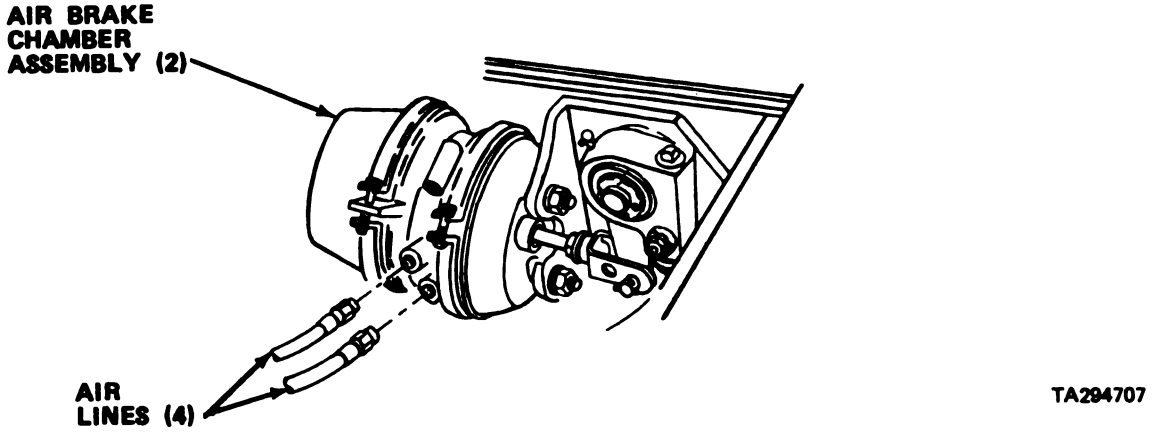
(9) Tag and disconnect air line from air shifter unit.



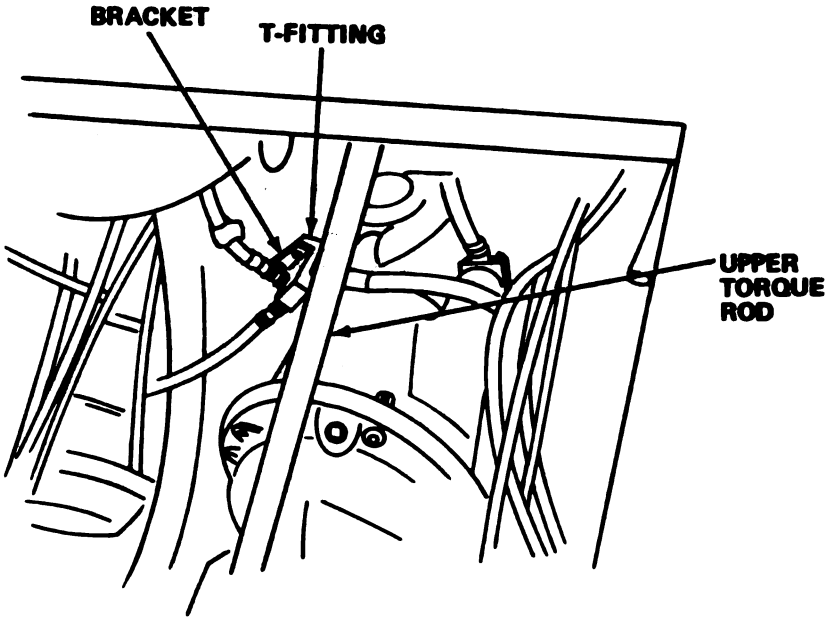
NOTE

Some equalizer beams have a cotter pin installed through the beam threaded area directly behind the locknut. In order to remove the locknut, the cotter pin must be removed.

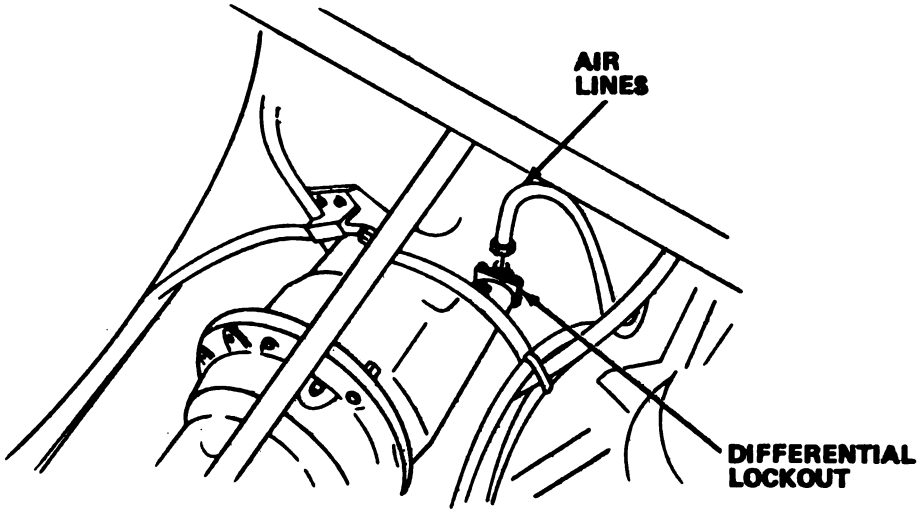
(10) Remove cotter pin (if installed), locknut, and washers securing suspension cross tube to equalizer beams.



(11) Tag and disconnect air lines from air brake chambers.



(12) Remove T-fitting from bracket on top front of forward rear axle.



(13) Tag and disconnect air line from differential lockout.

NOTE

It is necessary to cage air brake chamber assemblies to allow free rotation of axle shafts and propeller shaft.

(14) Cage air brake chamber assemblies (TM 9-2320-281-20).

(15) Disconnect interaxle propeller shaft from forward rear axle (TM 9-2320-281-20).

(16) Disconnect main propeller shaft from forward rear axle (TM 9-2320-281-20).

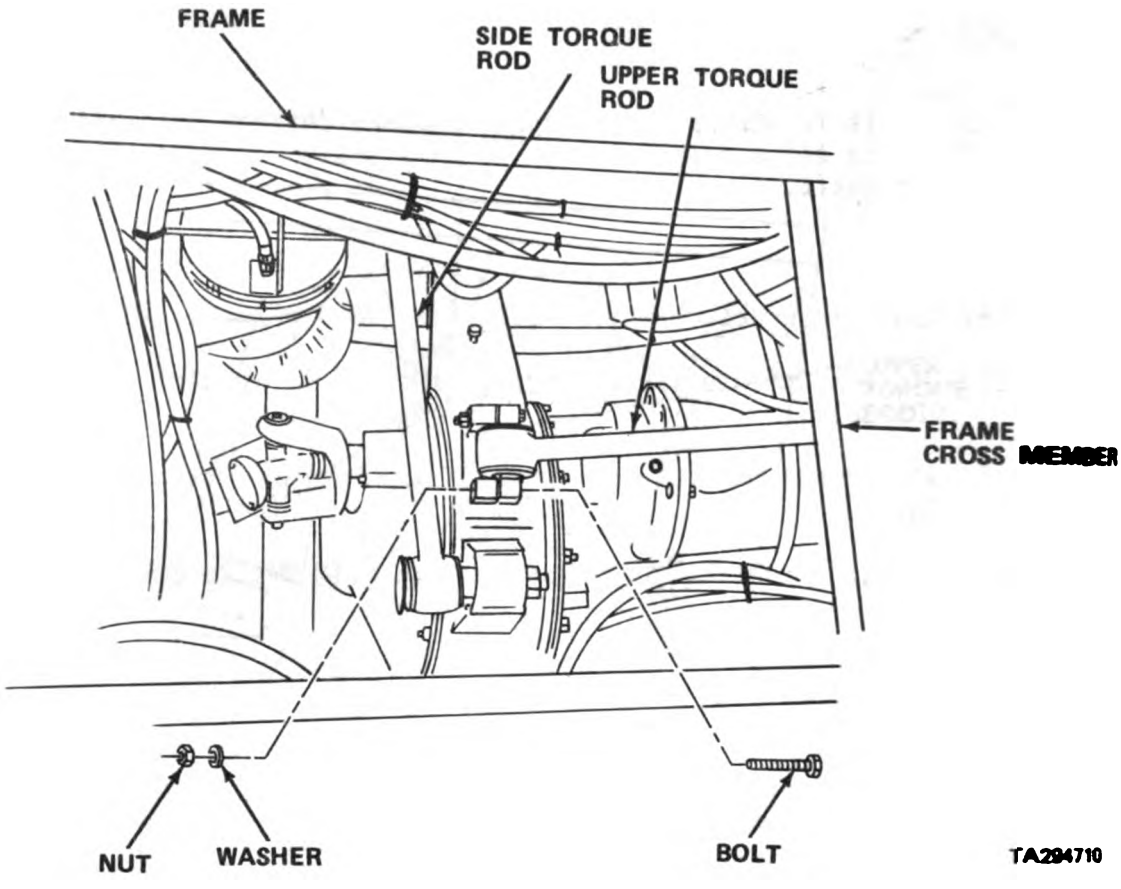
(17) Uncage air brake chamber assemblies (TM 9-2320-281-20).

WARNING

TO PREVENT SERIOUS PERSONAL INJURY, A CHAIN MUST BE WRAPPED AROUND THE INPUT FLANGE AND SECURED TO THE BASE PLATE OF A TRANSMISSION JACK. THIS WILL PREVENT FORWARD ROLLING OF AXLE AFTER ATTACHING HARDWARE HAS BEEN REMOVED.

(18) Position transmission jack underneath axle housing, and raise axle slightly to apply load to axle housing.

(19) Wrap chain around differential input flange, and secure chain to base plate of jack.



(20) Remove nuts, washers, and bolts securing upper torque rod to forward rear axle and frame crossmember.

(21) Remove nuts, washers, and bolts securing side torque rod to forward rear axle and frame.

(22) Remove equalizer beams (para 14-5).

(23) Remove forward rear axle from underneath truck.

(24) Remove air brake chambers from forward rear axle (TM 9-2320-281-20).

(25) Remove forward rear axle brake spider from forward rear axle (TM 9-2320-281-20).

(26) Remove bolts, washers, and T-fitting bracket from front of forward rear axle.

b. Inspection.

(1) Inspect all attaching hardware for damaged or worn condition.

(2) Replace any component that is damaged or worn.

c. Install forward rear axle.

(1) Reinstall bolts, washers, and T-fitting bracket on front of forward rear axle.

(2) Reinstall forward rear axle brake spider on forward rear axle (TM 9-2320-281-20).

(3) Reinstall air brake chamber assembly on forward rear axle (TM 9-2320-281-20).

(4) Uncage brake chamber assemblies (TM 9-2320-281-20).

WARNING

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

(5) Position forward rear axle under truck.

(6) Reinstall equalizer beams (para 14-5).

NOTE

It may be necessary to raise or lower axle to allow easier installation of attaching hardware.

(7) Reinstall side torque rod. Torque nuts to 175 - 225 ft lbs (237 - 305 N•m).

(8) Reconnect upper torque rod. Torque nuts to 175 - 225 ft lbs (237 - 305 N•m).

(9) Reconnect interaxle propeller shaft (TM 9-2320-281-20).

(10) Reconnect main propeller shaft (TM 9-2320-281-20).

(11) Reinstall T-fitting on bracket.

(12) Apply thread sealant and reconnect air lines to air brake chambers and remove tags.

(13) Reinstall suspension cross tube on equalizer beams.

(14) Secure with washers and locknuts. Torque nuts to 600 - 700 ft lbs (813 - 949 N•m).

(15) Install cotter pins directly behind locknuts (if applicable).

(16) Apply thread sealant and reconnect air lines to air shifter unit and differential lockout. Remove tags.

(17) Reinstall air bags (TM 9-2320-281-20).

(18) Reinstall shock absorbers (TM 9-2320-281-20).

(19) Remove chain from forward rear axle.

(20) Lower jack and remove from under forward rear axle.

(21) Reinstall wheel and tire assembly (TM 9-2320-281-10).

(22) Raise vehicle with jack and remove jack stands.

(23) Lower vehicle to ground.

d. Perform operational and leak check of forward rear axle.

(1) Start engine and allow air system to charge to 120 psi (827 kPa) (TM 9-2320-281-10).

(2) Check for air leakage at differential lockout, air shifter unit, brake chambers, and air bags.

(3) Perform vehicle road test (TM 9-2320-281-20).

2-15. REAR REAR AXLE REPLACEMENT

a. Remove rear rear axle.

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

(2) Raise vehicle with lifting device until rear wheels are clear of ground.

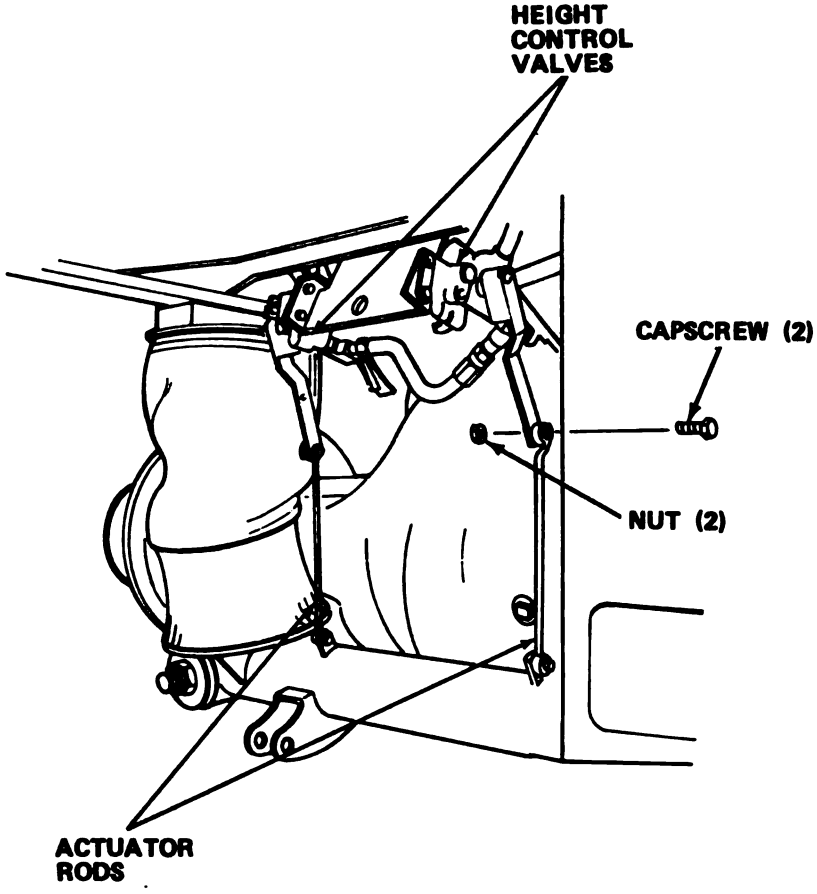
WARNING

DO NOT ATTEMPT TO PERFORM MAINTENANCE ON, UNDER, OR AROUND VEHICLE WITH VEHICLE SUPPORTED BY HOISTING DEVICE OR 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.

(3) Position jack stands under frame and lower vehicle on jack stands.

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



(5) Remove nuts, and capscrews from actuator rods at height control valves.

(6) Remove wheel and tire assembly from rear rear axle (TM 9-2320-281-10).

WARNING

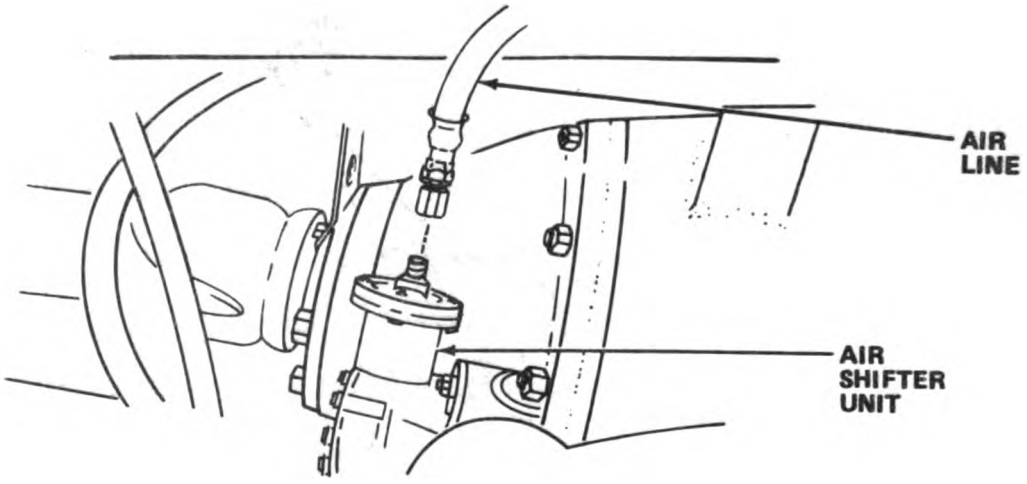
DO NOT LIE UNDER AXLE DURING REMOVAL PROCEDURE.
DEATH OR SERIOUS INJURY MAY RESULT.

(7) Position lifting device under rear rear axle and raise axle slightly to remove pressure from shock absorber.

(8) Remove rear mud flaps (TM 9-2320-281-20).

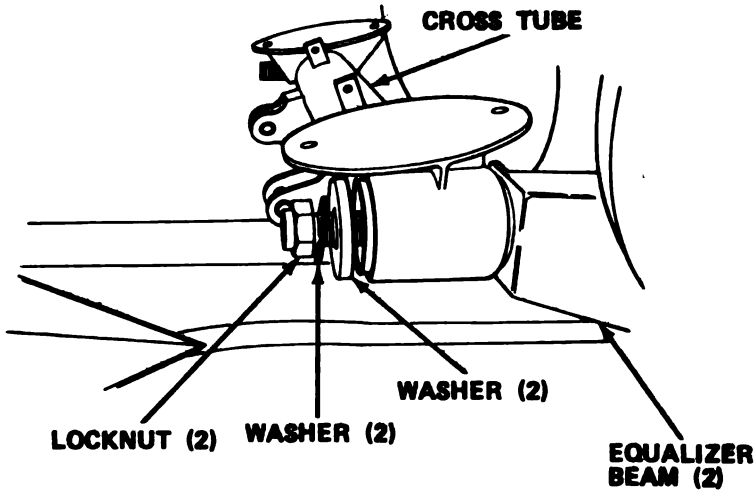
(9) Remove shock absorbers (TM 9-2320-281-20).

(10) Remove air bags (TM 9-2320-281-20).



TA294712

(11) Tag and disconnect air line from air shifter unit.

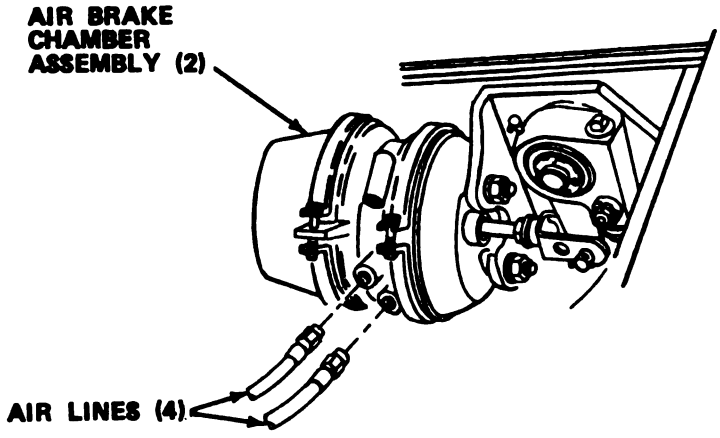


TA294713

NOTE

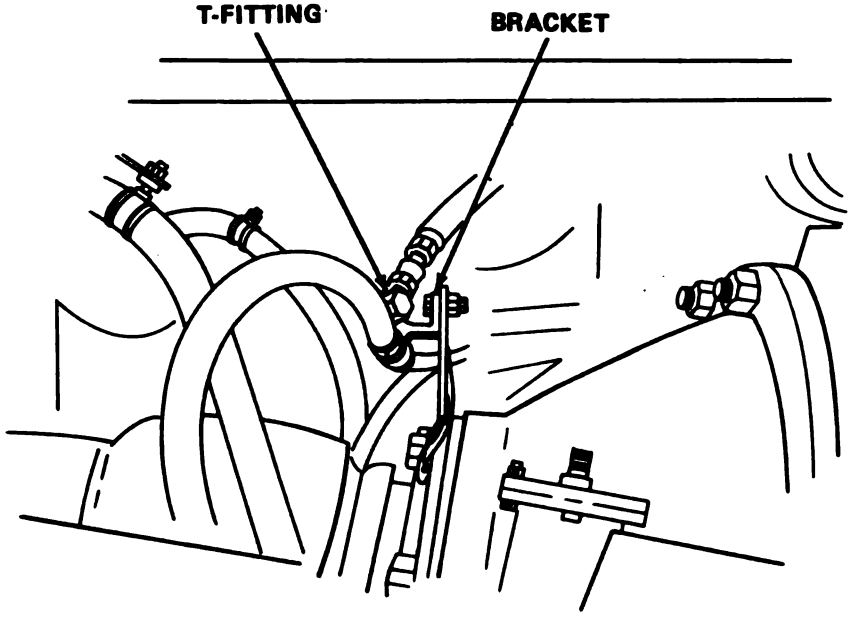
Some equalizer beams have cotter pins installed through the beam threaded area directly behind the locknut. In order to remove the locknut, the cotter pin must be removed.

(12) Remove cotter pin (if installed), locknut, and washers securing suspension cross tube to equalizer beams.



TA294714

(13) Tag and disconnect air lines from air brake chambers.



TA294715

(14) Remove T-fitting from bracket on top front of rear rear axle.

NOTE

It is necessary to cage air brake chamber assemblies to allow free rotation of axle shafts and propeller shaft.

(15) Cage air brake chamber assemblies (TM 9-2320-281-20).

(16) Disconnect interaxle propeller shaft at rear rear axle (TM 9-2320-281-20).

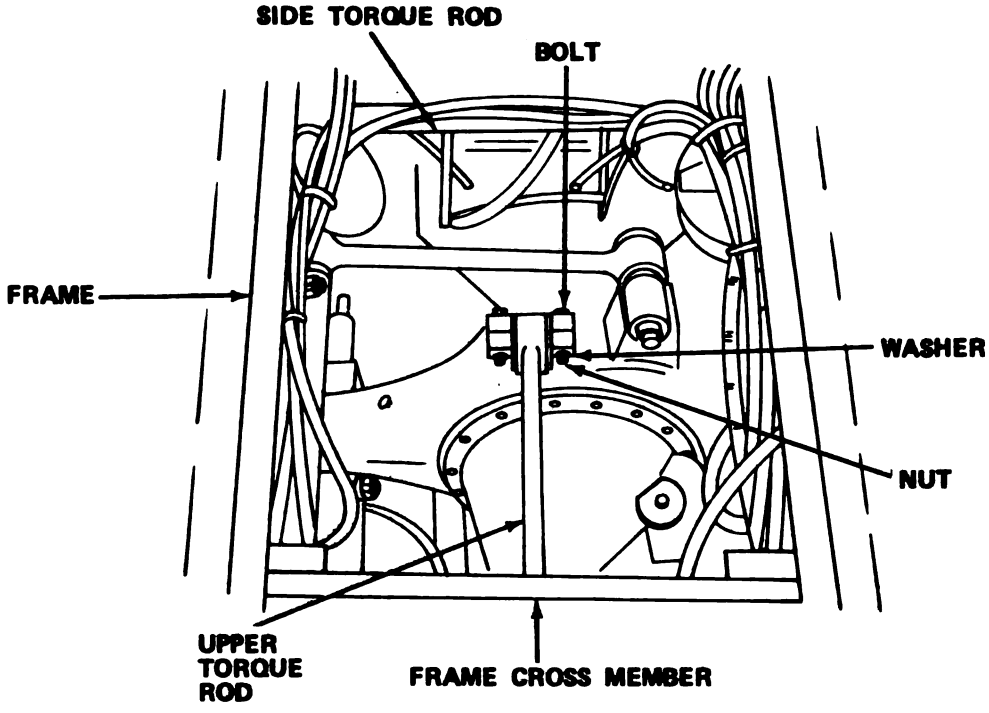
(17) Uncage air brake chamber assemblies (TM 9-2320-281-20).

WARNING

TO PREVENT SERIOUS PERSONAL INJURY, A CHAIN MUST BE WRAPPED AROUND THE INPUT FLANGE AND SECURED TO THE BASE PLATE OF A TRANSMISSION JACK. THIS WILL PREVENT FORWARD ROLLING OF AXLE AFTER ATTACHING HARDWARE HAS BEEN REMOVED.

(18) Position transmission jack underneath rear rear axle housing and raise axle slightly to apply load to axle housing.

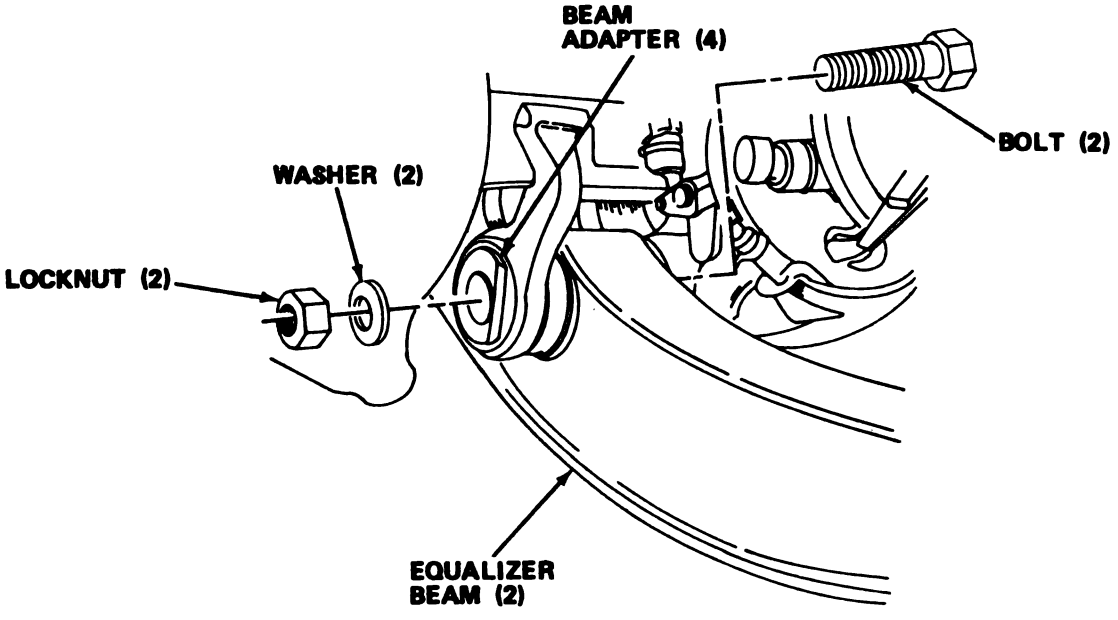
(19) Wrap a chain around differential input flange, and secure chain to base plate of jack.



(20) Remove nuts, washers, and bolts securing upper torque rod to rear rear axle and frame crossmember.

(21) Remove nuts, washers, and bolts securing side torque rod to rear rear axle and frame.

(22) Position lifting device under equalizer beams and raise beam slightly.



(23) Remove locknuts, washers, and bolts securing beam adapters to equalizer beams and rear rear axle.

WARNING

TO PREVENT PERSONAL INJURY WHEN REMOVING BEAM ADAPTERS, TWO PERSONNEL MUST STABILIZE EACH END OF AXLE TO PREVENT AXLE FROM FALLING.

NOTE

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

(24) Pry out beam adapters from rear rear axle.

(25) Lower equalizer beams and remove rear rear axle from truck.

(26) Remove air brake chambers from rear rear axle (TM 9-2320-281-20).

(27) Remove rear rear axle brake spider from rear rear axle (TM 9-2320-281-20).

(28) Remove bolts, washers, and T-fitting bracket from front of rear rear axle.

b. Inspection.

(1) Inspect all attaching hardware for damaged or worn condition.

(2) Replace any component that is damaged or worn.

c. Install rear rear axle.

(1) Reinstall bolts, washers, and T-fitting bracket on front of rear rear axle.

(2) Reinstall rear rear axle brake spider on rear rear axle (TM 9-2320-281-20).

(3) Reinstall air brake chambers on rear rear axle (TM 9-2320-281-20).

(4) Uncage air brake chamber assemblies (TM 9-2320-281-20).

WARNING

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

(5) Position rear rear axle under truck and raise to full up position.

NOTE

It may be necessary to raise or lower axle to allow easier installation of attaching hardware.

(6) Raise equalizer beams and reinstall beam adapters.

(7) Reinstall bolts, washers, and locknuts to beam adapters.

(8) Reinstall side torque rod. Torque nuts to 175 - 225 ft lbs (237 - 305 N•m).

(9) Reconnect upper torque rod. Torque nuts to 175 - 225 ft lbs (237 - 305 N•m).

(10) Reconnect propeller shaft at rear rear axle (TM 9-2320-281-20).

(11) Reinstall T-fitting on bracket.

(12) Apply thread sealant and reconnect air hoses to air brake chambers and remove tags.

(13) Reinstall suspension cross tube on equalizer beams.

(14) Secure cross tube with washers and locknuts. Torque nuts to 600 - 700 ft lbs (813 - 949 Nom).

(15) Install cotter pins directly behind locknuts (if applicable).

(16) Apply thread sealant and reconnect air line to air shifter unit and remove tag.

(17) Reinstall air bags (TM 9-2320-281-20).

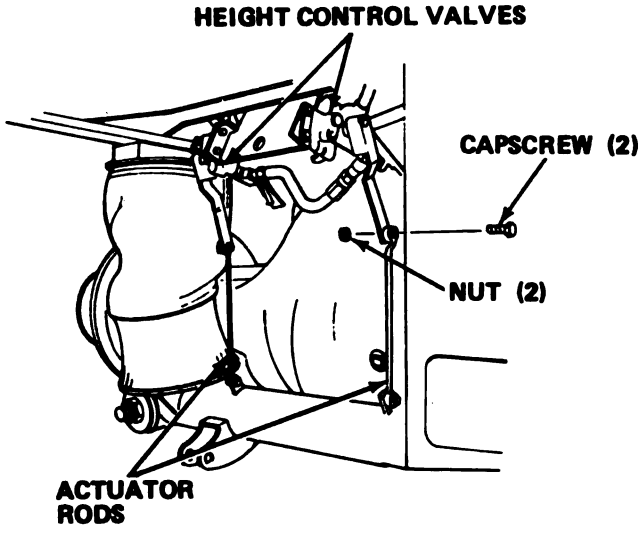
(18) Reinstall shock absorbers (TM 9-2320-281-20).

(19) Reinstall rear mud flaps (TM 9-2320-281-20).

(20) Remove chain from rear rear axle.

(21) Lower jack and remove from under rear rear axle.

(22) Reinstall wheel and tire assembly (TM 9-2320-281-10).



TA294718

(23) Reconnect actuator rods to height control valves and secure with capscrews and nuts.

(24) Raise vehicle with jack and remove jack stands.

(25) Lower vehicle to ground.

d. Perform operational and leak check of rear rear axle.

(1) Start engine and allow air system to charge to 120 psi (827 kPa) (TM 9-2320-281-10).

(2) Check for air leakage at air shifter unit, brake chambers, and air bags.

(3) Perform vehicle road test (TM 9-2320-281-20).

CHAPTER 3

ENGINE REPAIR

3-1. INTRODUCTION. This chapter provides replacement information for the following components:

Aftercooler Assembly (Section I)

Accessory Drive Housing Assembly (Section II)

Oil Cooler and Water Header Connection (Section III)

All other engine repairs at Direct Support and General Support Maintenance levels are covered in engine technical manual TM 9-2815-226-34.

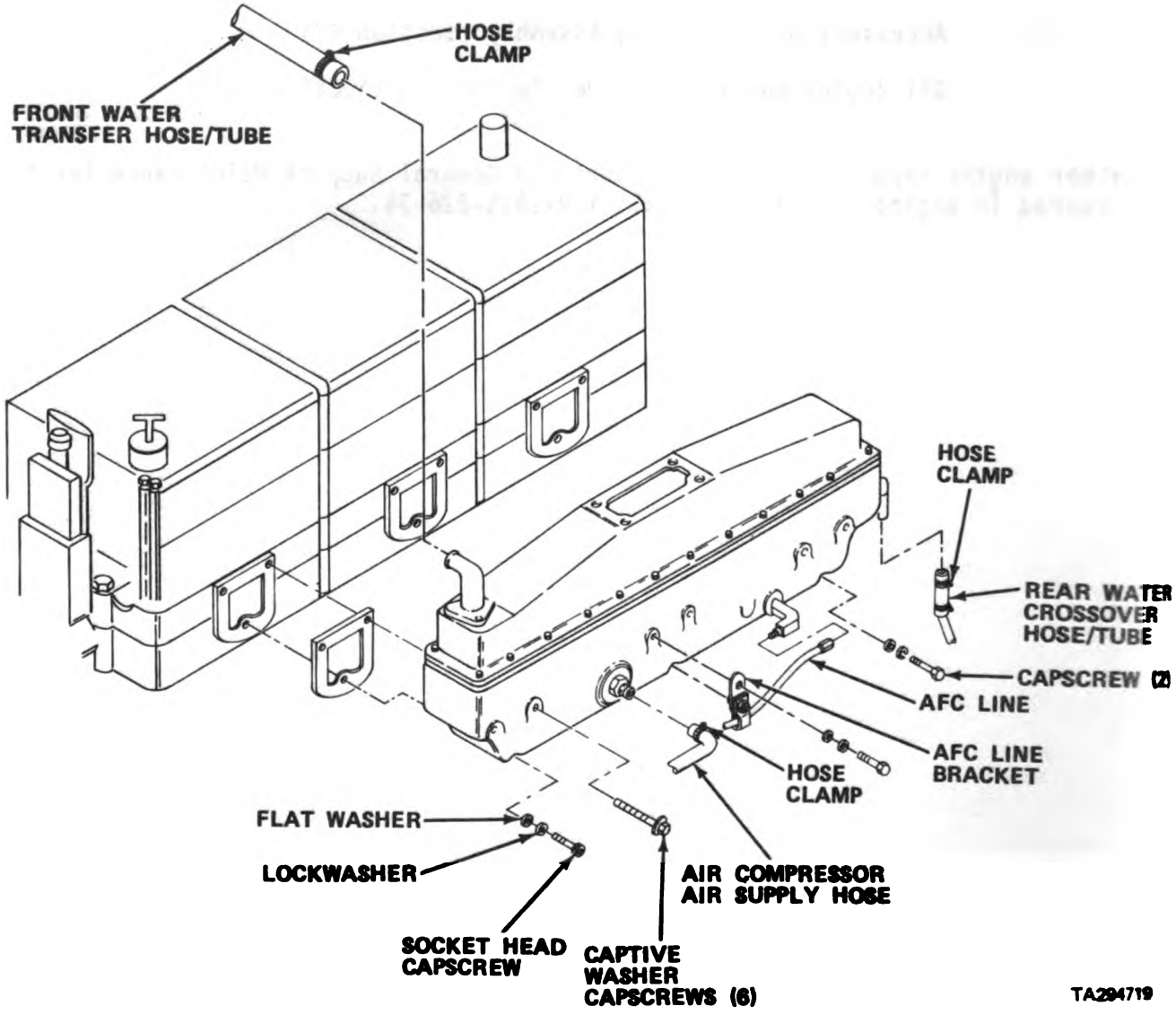
Section I. AFTERCOOLER ASSEMBLY

3-2. REPLACE AFTERCOOLER ASSEMBLY

a. Raise cab (TM 9-2320-281-10).

b. Remove aftercooler assembly.

(1) Drain cooling system (TM 9-2320-281-20).



(2) Remove air crossover pipe (TM 9-2320-281-20).

(3) Loosen hose clamp at rear water crossover hose/tube and disconnect hose from connector.

(4) Loosen hose clamp at front water transfer hose/tube and disconnect hose from connector.

(5) Disconnect Air Fuel Control (AFC) line from aftercooler connector.

(6) Loosen air compressor air supply hose clamp at supply connector and disconnect hose from connector.

(7) Remove six upper captive washer capscrews, AFC line bracket, lockwashers and flat washers securing aftercooler to cylinder heads.

(8) Loosen one lower socket head capscrew, lockwasher, and flat washer; and two lower hex head capscrews, lockwashers, and flat washers securing aftercooler to cylinder heads.

(9) Lift aftercooler from engine.

(10) Remove lower capscrews, lockwashers, flatwashers, and aftercooler mount gaskets. Discard gaskets.

(11) Scrape off any gasket material from cylinder head.

b. Install aftercooler.

NOTE

Socket head capscrew is installed in front hole.

(1) Place new mount gaskets on cylinder heads and start lower capscrews and washers through gaskets into heads.

(2) Place aftercooler in position slipping cooler slots over lower capscrews.

(3) Install upper captive washer capscrews, AFC line bracket, and washers, ensuring that gaskets are properly positioned.

(4) Starting with three center capscrews, torque screws to 22 - 27 ft lbs (30 - 37 N•m).

(5) Connect air compressor air supply hose to connector and tighten hose clamp.

(6) Connect AFC line to aftercooler.

(7) Secure air crossover pipe (TM 9-2320-281-20).

(8) Connect rear water outlet hose/tube to connector and tighten hose clamp.

(9) Connect front water transfer hose/tube to connector and tighten hose clamp.

(10) Service cooling system (TM 9-2320-281-20).

(11) Start engine (TM 9-2320-281-10).

(12) Check for water and air leaks.

(13) Shut down engine and lower cab (TM 9-2320-281-10).

Section II. ACCESSORY DRIVE HOUSING ASSEMBLY

3-3. REPLACE ACCESSORY DRIVE HOUSING ASSEMBLY

a. Raise cab (TM 9-2320-281-10).

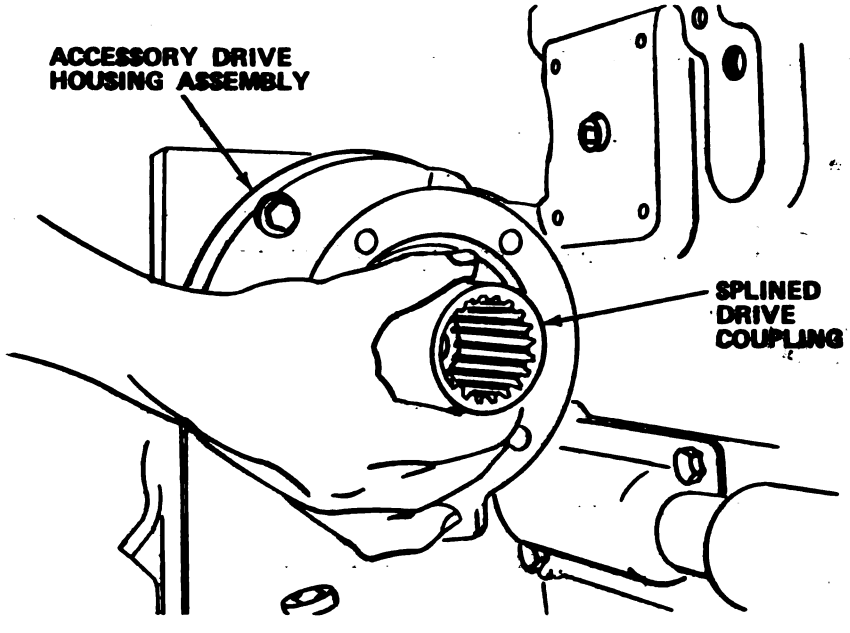
b. Remove accessory drive.

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

(2) Drain cooling system (TM 9-2320-281-20).

(3) Remove fuel pump from air compressor rear flange (para 4-4).

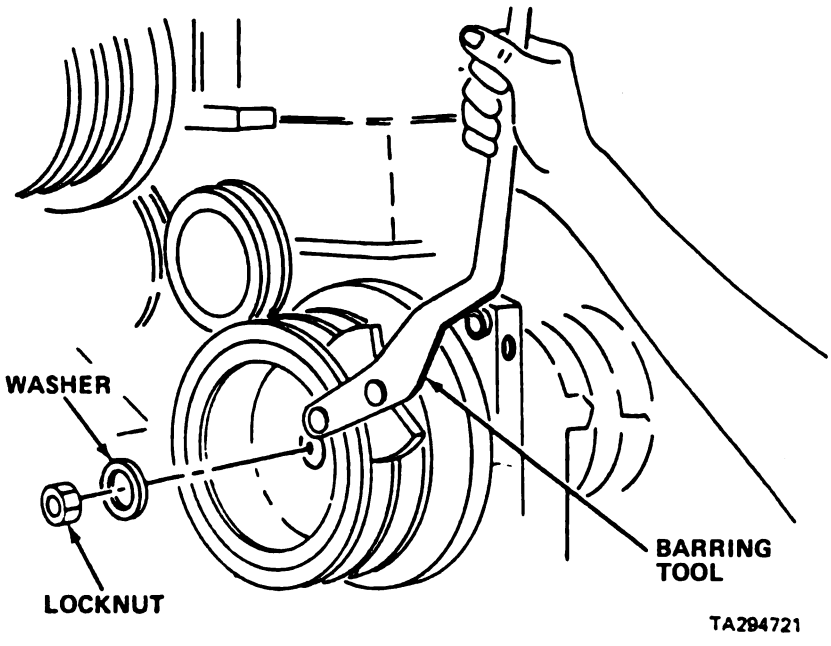
(4) Remove air compressor (para 10-5).



(5) Remove splined drive coupling.

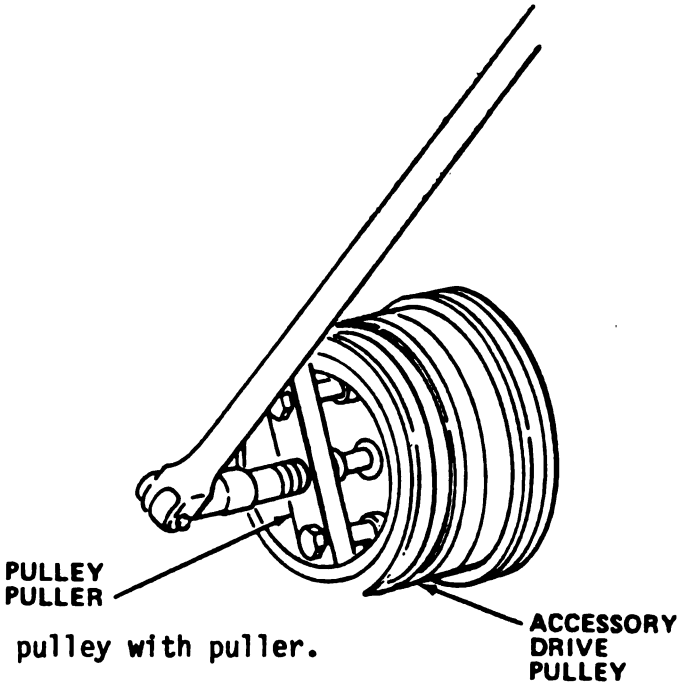
(6) Remove cooling fan and fan clutch drive belts (TM 9-2320-281-20).

(7) Remove water pump drive belt (TM 9-2320-281-20).



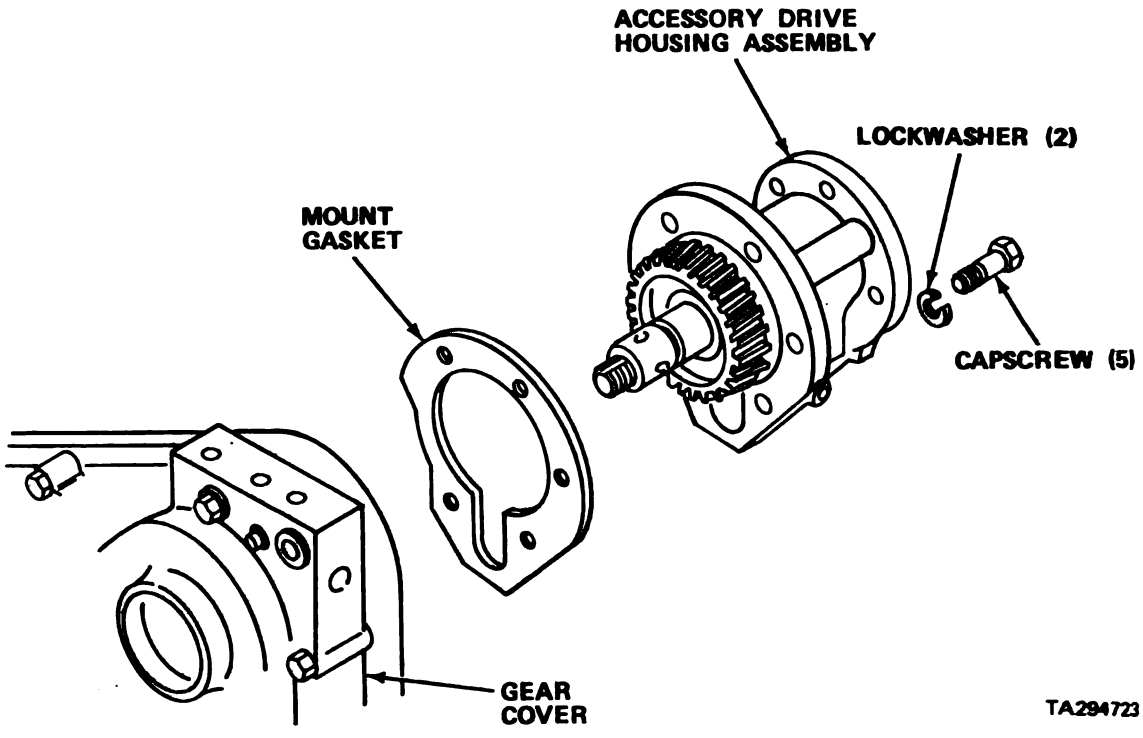
(8) Engage barring tool with accessory drive housing assembly pulley.

(9) While firmly holding barring tool, remove locknut and washer retaining pulley to accessory drive shaft. Remove and discard keyway seal.



(10) Remove pulley with puller.

(11) Remove pulley positioning pin.



(12) Remove capscrews and lockwashers securing accessory drive housing assembly to engine.

(13) Tap on accessory drive housing assembly with plastic mallet until accessory drive housing assembly separates from engine gear cover.

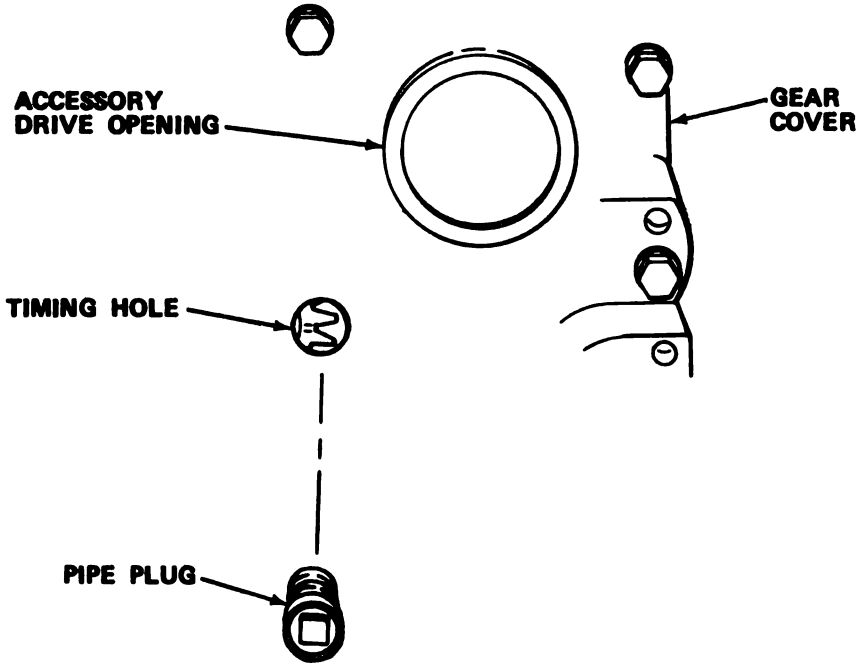
(14) Remove mount gasket.

c. Install accessory drive housing assembly.

NOTE

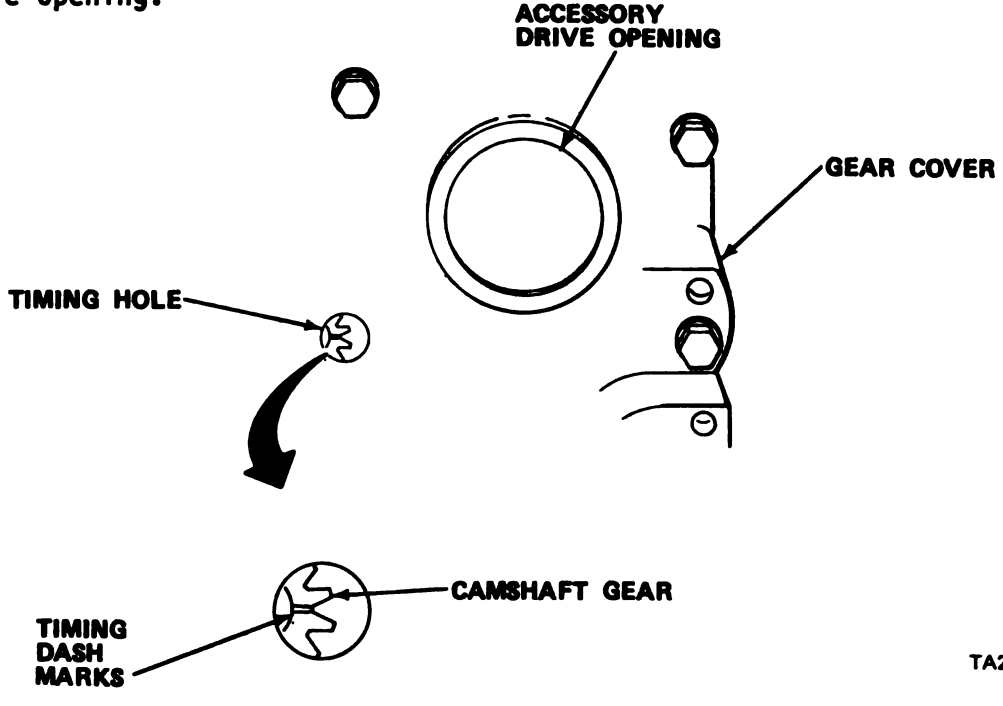
Ensure that gasket mounting surfaces are free of gasket material.

(1) Install new mount gasket.



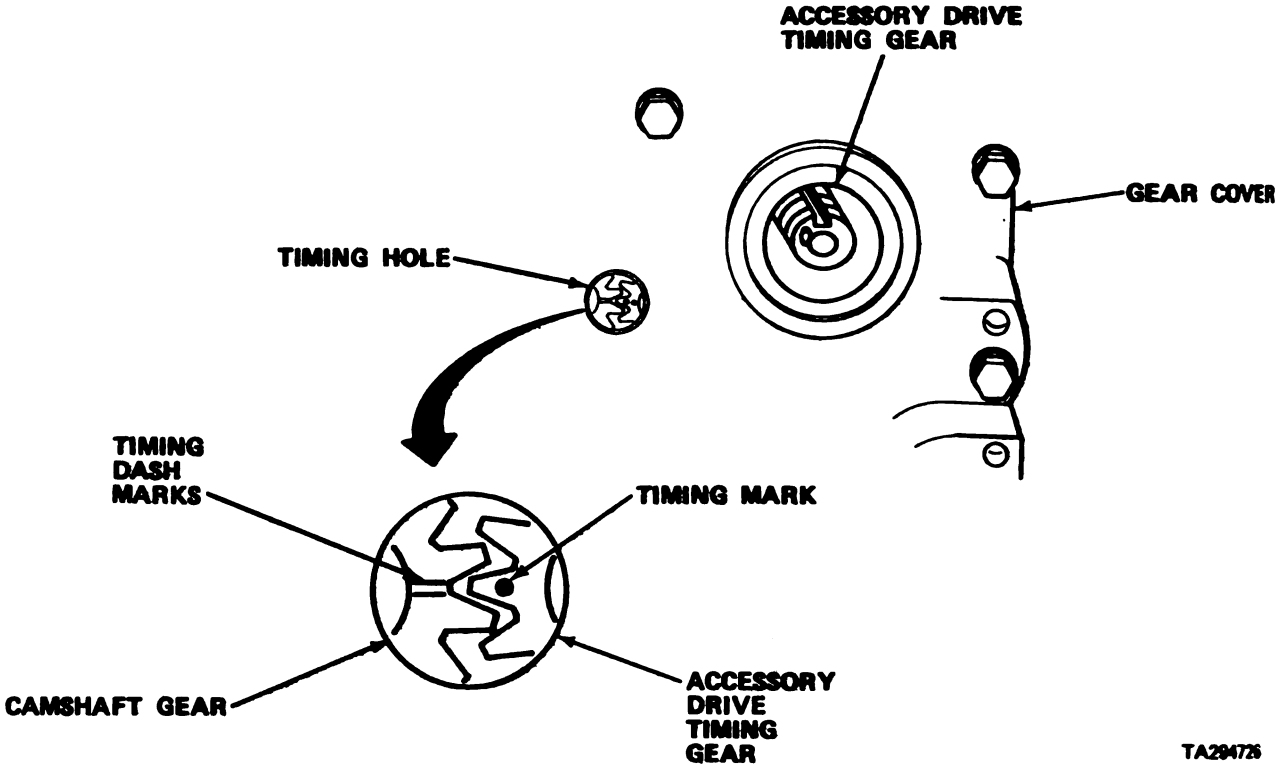
TA294724

(2) Remove pipe plug from timing hole in front of gear cover near accessory drive opening.



TA294725

(3) Rotate engine until two dash timing marks on camshaft gear are visible through timing hole. Crankshaft is now at no. 1 cylinder 90° after top dead center position.

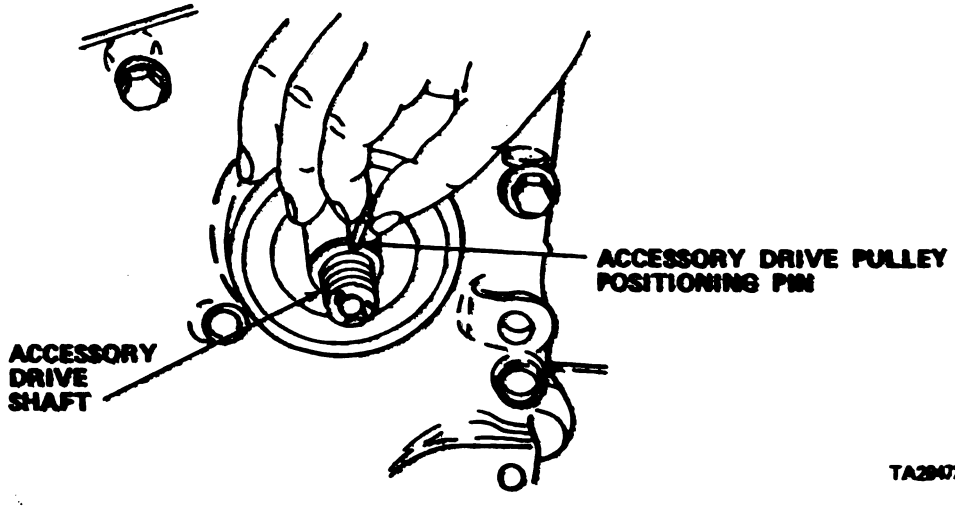


(4) Pre-position accessory drive housing assembly timing gear so that its one centerpunch mark will aline with camshaft gear timing dash marks.

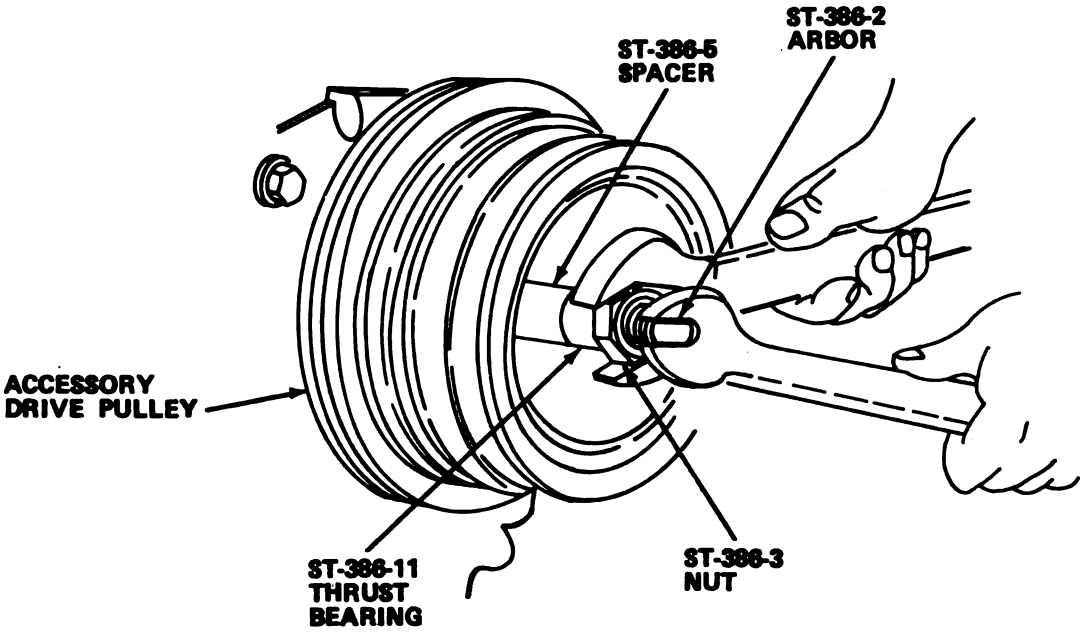
(5) Place accessory drive housing assembly on mount pad and check that timing marks on both gears are alined.

(6) Secure accessory drive housing assembly with capscrews and lockwashers.

(7) Reinstall timing hole pipe plug and torque plug to 35 - 45 ft lbs (47 - 61 Nom).



(8) Install pulley positioning pin.

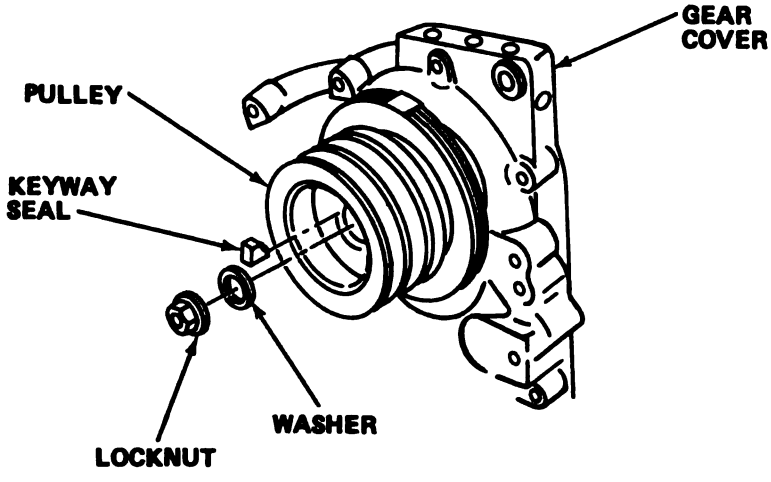


TA294728

NOTE

Aline pulley keyway with pin on shaft.

(9) Lubricate accessory drive housing shaft with MIL-L-2104C oil. With ST-386 assembly tool, push pulley onto shaft.



TA294729

(10) Install keyway seal on drive shaft.

(11) Secure pulley with washer and locknut. Torque locknut to 300 - 310 ft lbs (407 - 420 Nom).

(12) Install water pump drive belt (TM 9-2320-281-20).

(13) Install fan clutch and cooling fan (TM 9-2320-281-20).

(14) Install splined drive coupling.

(15) Service cooling system (TM 9-2320-281-20).

d. Install air compressor (para 10-5).

e. Install fuel pump (para 4-4).

f. Check air and fuel systems for leaks and proper operation.

(1) Start engine (TM 9-2320-281-10).

(2) Pressurize air system and check compressor for water, oil, air leaks, and proper air governor operation.

(3) Check fuel pump fittings for air and fuel leaks.

WARNING

WHEN WORKING IN ENGINE COMPARTMENT WITH ENGINE RUNNING, STAY CLEAR OF THE COOLING FAN. THE FAN MAY ENGAGE AUTOMATICALLY AT ANY TIME AND CAUSE SERIOUS INJURY.

(4) Check belts for slipping (squealing) or whipping upon acceleration. Make necessary adjustment/repairs at engine shutdown (TM 9-2320-281-20).

(5) Shut down engine (TM 9-2320-281-10).

g. Lower cab (TM 9-2320-281-10).

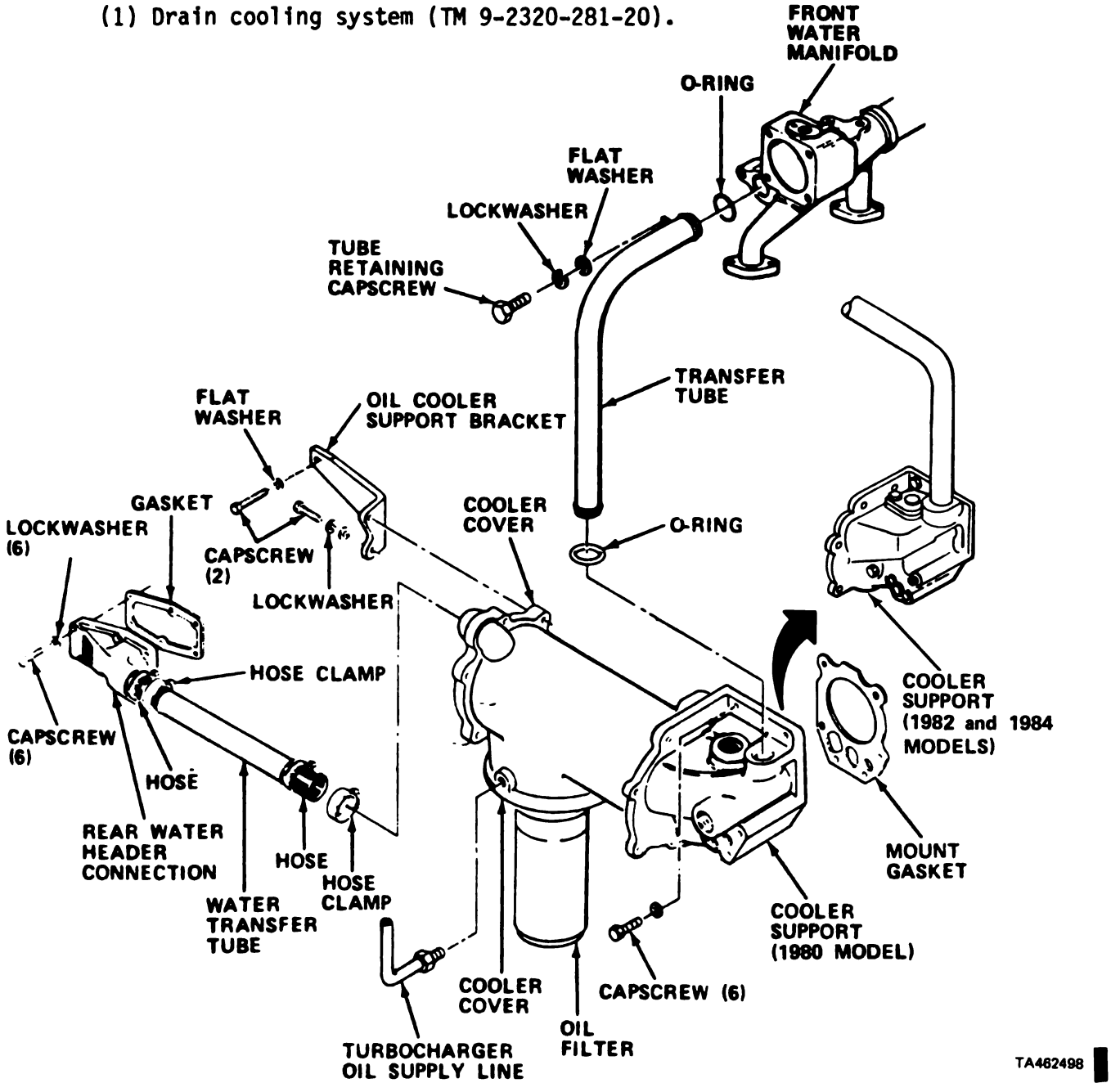
Section III. OIL COOLER AND WATER HEADER CONNECTION

3-4. REPLACE OIL COOLER AND WATER HEADER CONNECTION

a. Raise cab (TM 9-2320-281-10).

b. Remove oil cooler and water header connection.

(1) Drain cooling system (TM 9-2320-281-20).



(2) Loosen water transfer hose/tube clamp at point where it attaches to rear of oil cooler.

(3) Remove ether quick-start sensor (TM 9-2320-281-20).

(4) Remove capscrews and lockwashers securing rear water header connection to rear of cylinder block.

(5) Remove rear water header connection, tube and hose, and gasket. Discard gasket.

(6) Remove oil filter (TM 9-2320-281-20).

(7) Remove cooler support bracket capscrews, flat washers, and lockwashers and remove cooler bracket.

(8) Remove turbocharger oil supply line.

(9) Remove capscrew, lockwasher, and flat washer securing water transfer tube to front water manifold.

(10) Pull transfer tube out of housing and lift up and out of cooler support.

(11) Remove and discard transfer tube O-rings.

(12) Remove capscrews and lockwashers securing cooler support to engine block.

(13) Remove cooler and mount gasket. Discard gasket.

c. Install oil cooler and water header connection.

NOTE

Ensure that mount gasket surfaces are clean.

(1) Position new cooler mount gasket on cylinder block.

(2) Aline cooler support with cylinder block and secure with capscrews, and lockwashers. Do not tighten capscrews.

(3) Remove two oil cooler cover capscrews and lockwashers which aline with holes in cooler support bracket.

(4) Secure support bracket to cover with two long capscrews and lockwashers.

(5) Install cooler support bracket and secure to block with capscrews, flat washers, and lockwashers.

(6) Lubricate and install new O-rings on transfer tube, one on each end of tube.

(7) Carefully insert transfer tube into top of cooler support.

(8) Carefully insert other end of transfer tube into front water manifold.

(9) Torque cooler support-to-engine block capscrews to 30 ft lbs (41 Nom).

(10) Torque cooler bracket and cooler cover capscrews to 30 - 35 ft lbs (41 - 46 Nom).

(11) Install capscrew, lockwasher, and flat washer securing transfer tube to front water manifold.

(12) Using new hose sections, clamp hose sections to water transfer tube.

(13) Clamp hose/water transfer tube assembly to rear water header connection.

(14) Slide other end of hose/water transfer tube assembly over cooler cover flange. Clamp assembly to cover flange.

(15) Position new gasket on cylinder block rear water header port on cylinder block.

(16) Secure rear water header connection to block with capscrews and lockwashers. Leave rear two capscrews loose.

(17) Tighten all hose clamps.

(18) Install new oil filter (TM 9-2320-281-20).

(19) Apply thread sealant and secure turbocharger oil supply line to oil cooler.

(20) Install ether quick-start sensor (TM 9-2320-281-20).

d. Service cooling system (TM 9-2320-281-20).

e. Service engine crankcase (LO 9-2320-281-12).

f. Start engine (TM 9-2320-281-10).

g. Check for water and oil leaks.

h. Shut down engine (TM 9-2320-281-10).

i. Lower cab (TM 9-2320-281-10).

CHAPTER 4

FUEL SYSTEM REPAIR

4-1. INTRODUCTION. This chapter provides maintenance instructions for the following fuel system components:

a. Fuel Tank (Section I).

b. Fuel Injector Assembly (Section II).

c. Fuel Pump Assembly (Section III).

All other fuel system repairs are covered in organizational technical manual TM 9-2320-281-20 and engine technical manual TM 9-2815-226-34.

Section I. FUEL TANK

4-2. FUEL TANK CLEANING,REPAIR, AND TESTING

a. Cleaning.

(1) Wire brush all welded areas and remove any existing weld splatter.

(2) Vacuum interior.

b. Repair. Repair is limited to thread chasing, sheet metal straightening, and welding. For repair of that type, refer to the following:

(1) TM 9-450, Metal Body Repair and Related Operation.

(2) TM 9-237, Welding Theory and Application.

c. Testing. After all repairs, test tank at 10 psi (69 kPa) air pressure. Check for leaks and repair as necessary.

Section II. FUEL INJECTOR ASSEMBLY

4-3. REPLACE FUEL INJECTOR ASSEMBLY

a. Raise cab (TM 9-2320-281-10).

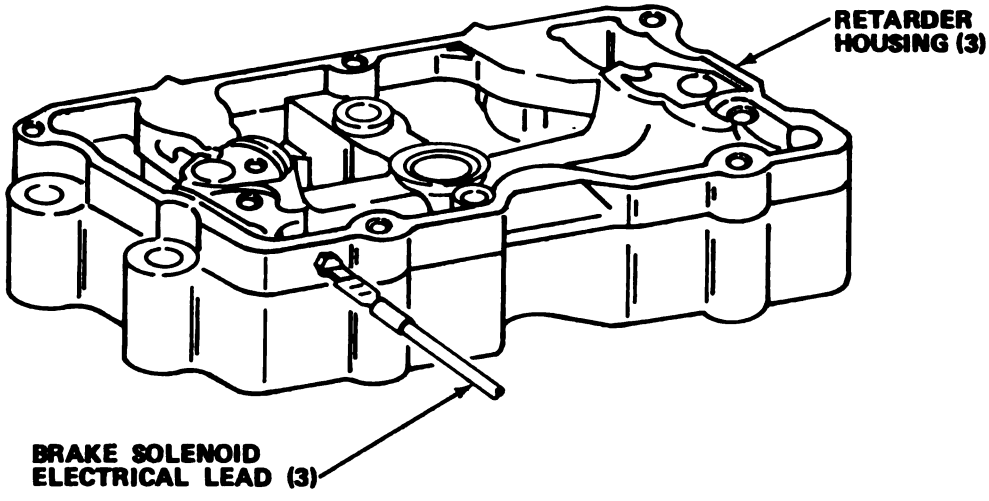
b. Remove fuel injector assembly.

(1) Remove air crossover (TM 9-2320-281-20).

(2) Remove front water transfer hose (TM 9-2320-281-20).

(3) Remove air inlet tube (TM 9-2320-281-20).

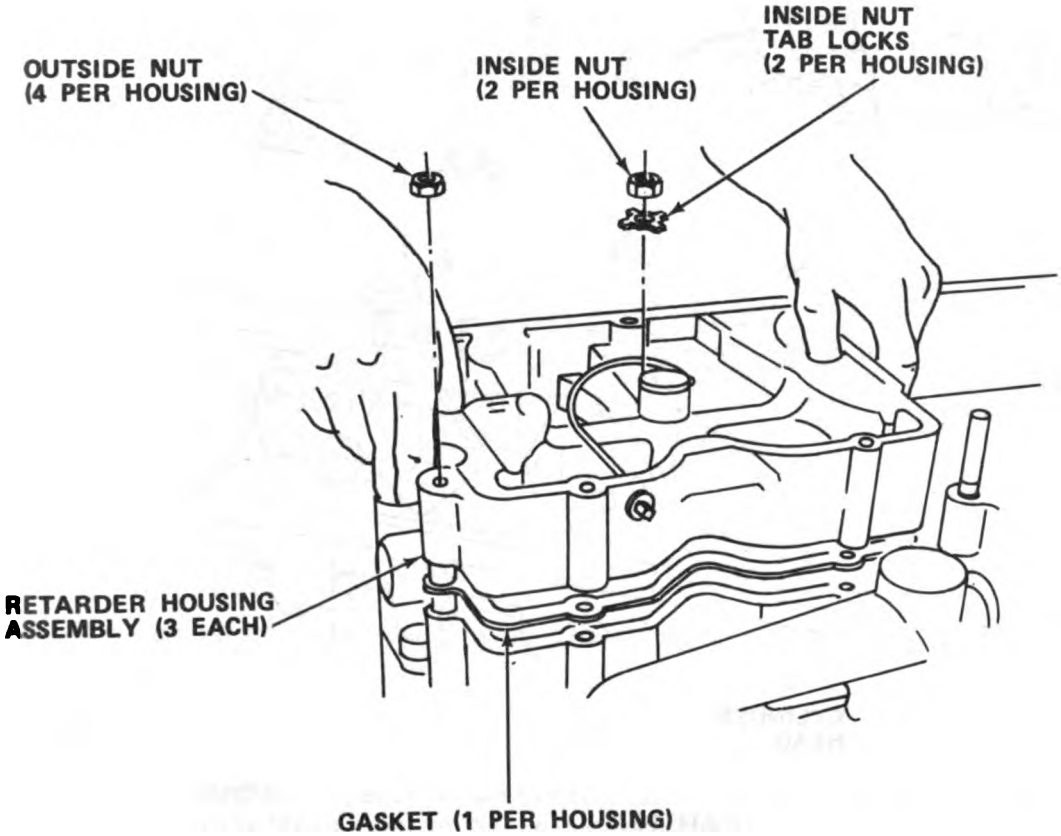
(4) Remove rocker lever housing covers (TM 9-2320-281-20).



(5) Tag and disconnect brake solenoid electrical leads from engine retarder housings.

NOTE

Note location of engine lift eyes, air intake tube center support bracket, and any other brackets and clamps secured to retarder housing.

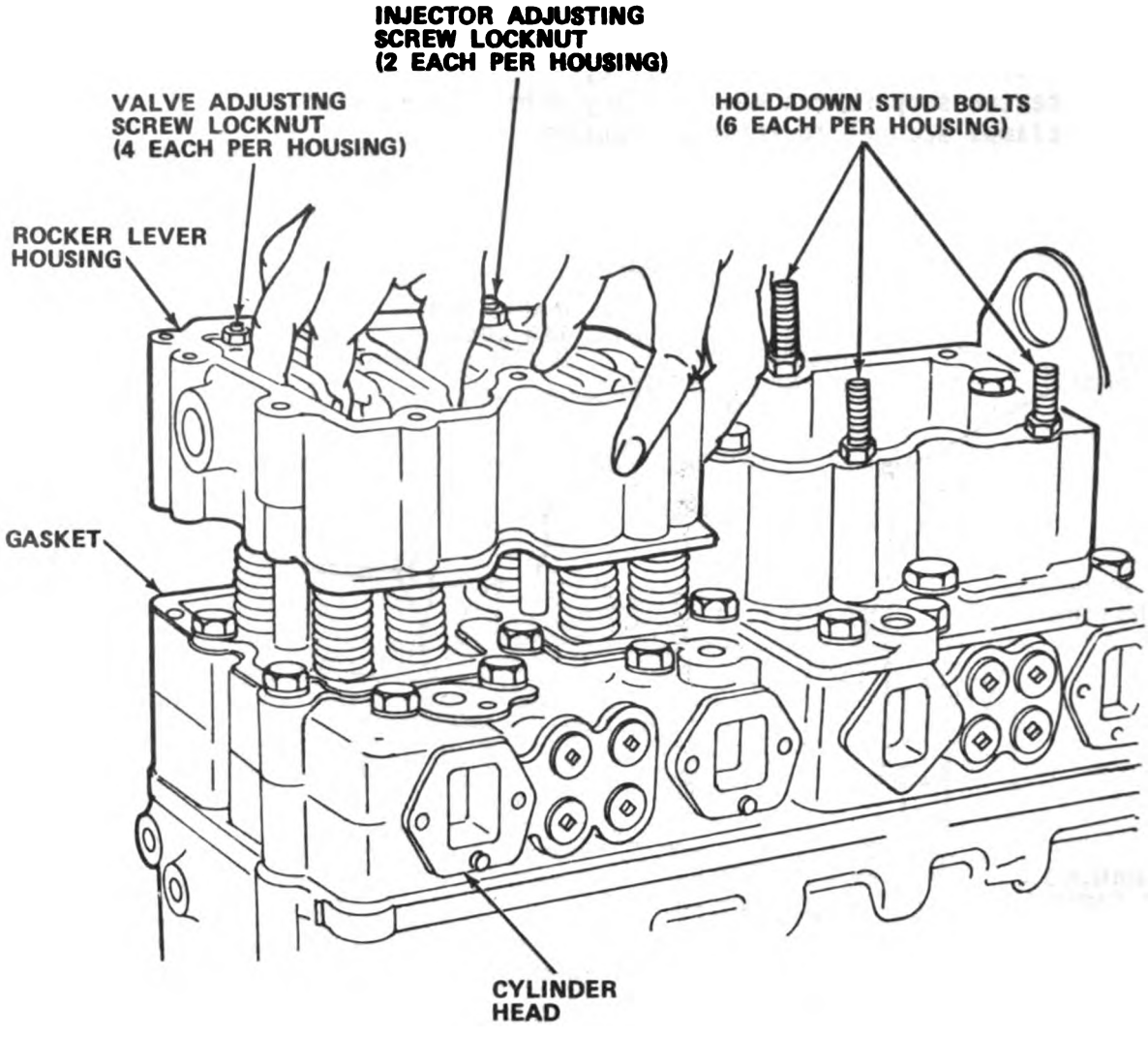


(6) Remove inside nuts, outside nuts, and tablocks securing engine retarder housings to rocker lever housings.

NOTE

Mark position of each retarder housing to ensure proper reassembly.

(7) Lift and remove three retarder housings and gaskets. Discard gaskets.



CAUTION

INJECTOR AND VALVE ADJUSTING SCREWS MUST BE BACKED OUT TO PREVENT HOUSING DAMAGE UPON REINSTALLATION.

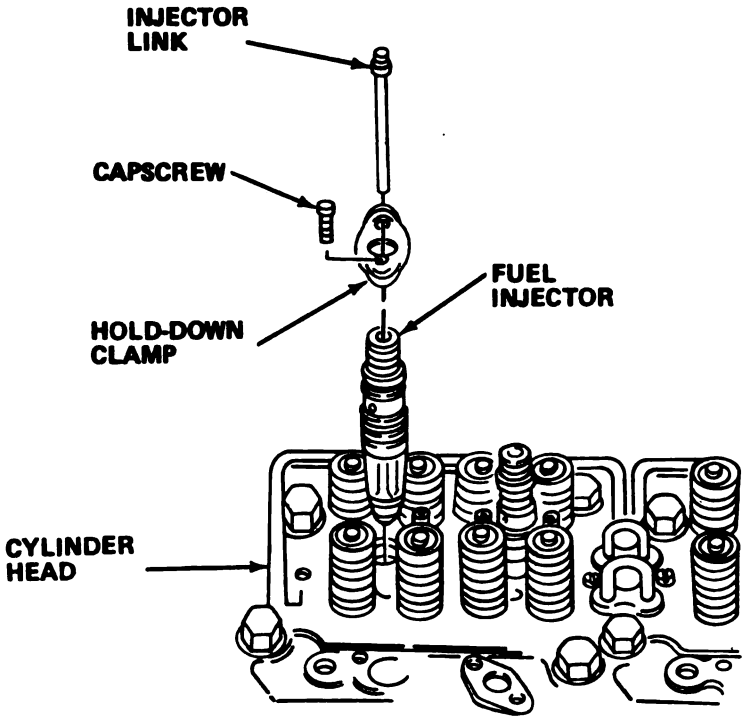
(8) Loosen valve and injector adjusting screw locknuts and back out adjusting screws until all rocker levers are loose.

NOTE

Take note of various lengths of retaining stud bolts to insure proper reassembly.

(9) Remove stud bolts and washers securing each rocker lever housing to cylinder heads.

(10) Lift and remove lever housings. Discard gaskets.



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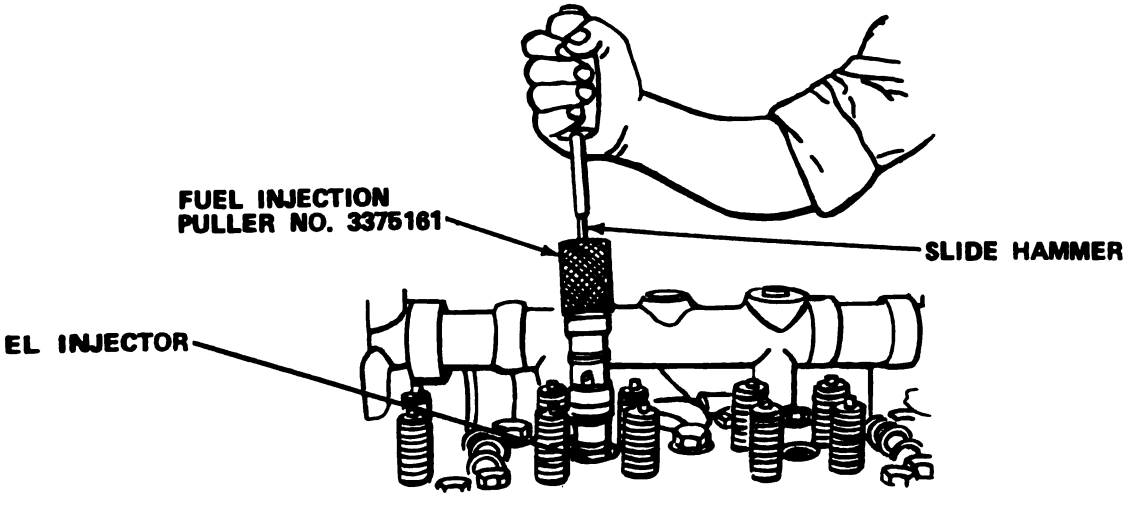
(11) Remove injector links.

(12) Remove injector hold-down clamp capscrews and clamp.

NOTE

Number injectors according to cylinder number if same injectors are to be reinstalled.



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(13) With 3375161 puller, remove injectors.

CAUTION

TAKE CARE NOT TO DROP ANYTHING IN INJECTOR SLEEVE. IT CAN CREATE FUTURE ENGINE FAILURE.

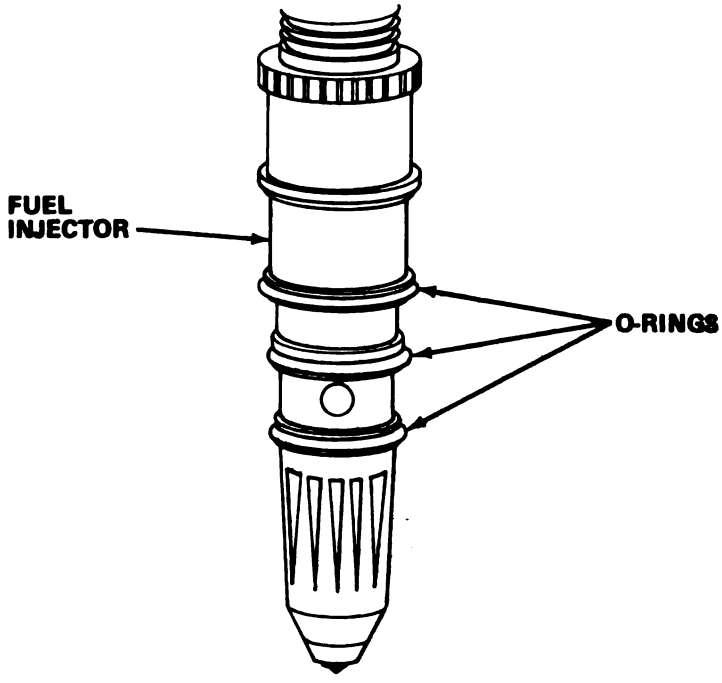
(14) With a clean lint-free cloth wrapped around a wooden dowel, carefully clean inside of injector sleeve.

(15) With a strong light, check injector sleeve for scratches. If scratched, engine cylinder head must be removed and sleeve replaced (TM 9-2815-226-34).

c. Install fuel injector assembly.

CAUTION

HANDLE INJECTORS WITH CARE. TURNING INJECTOR UPSIDE DOWN WILL ALLOW PLUNGER TO DROP OUT. DAMAGED PLUNGER WILL CAUSE ENGINE FAILURE.



TA29473

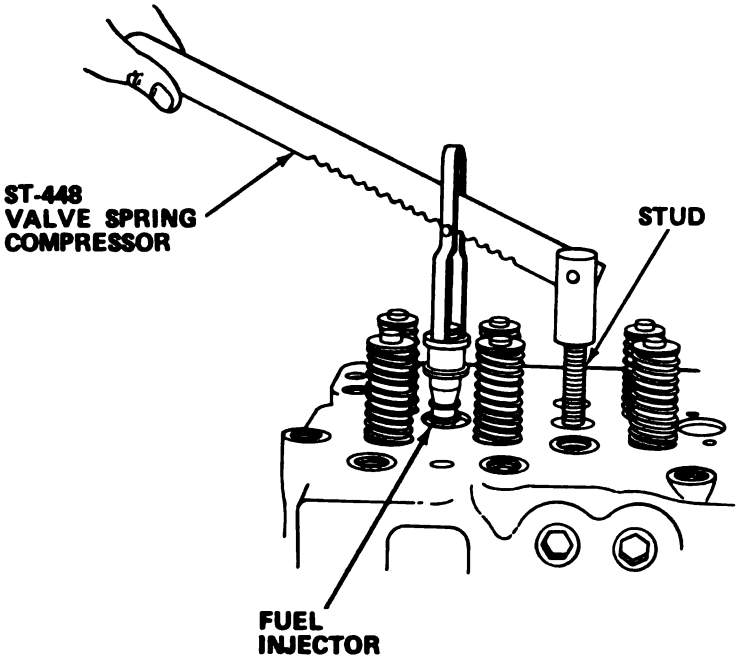
(1) Install new O-rings in grooves on injector.

(2) Lubricate O-rings with engine oil.

CAUTION

DO NOT USE WOODEN HAMMER HANDLE OR SIMILAR TOOL TO INSTALL INJECTOR. DIRT OR SPLINTER MAY DROP INTO PLUNGER LINK SEAT CAUSING EARLY FAILURE OF ENGINE.

(3) Start injector into bore. Guide it by hand until alined in bore and ensure that it is not bound.



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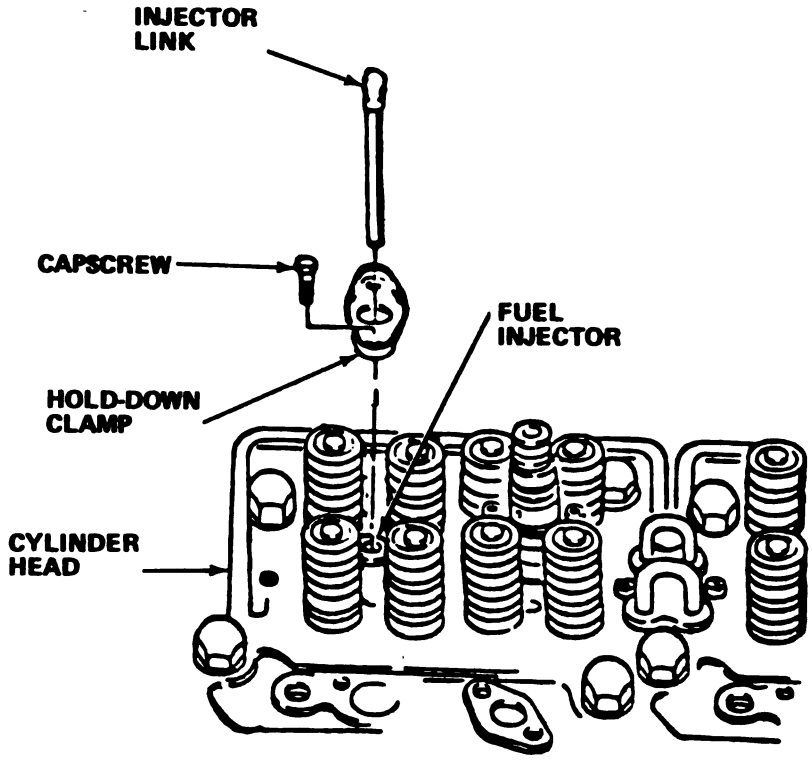
(4) Secure ST-448 valve spring compression tool to cylinder head.

(5) Seat injector by giving it a quick hard push. A snap should be heard and felt as injector seats in its sleeve.



(6) Place hold-down clamp (with counterbore up) over injector body and secure with capscrews.

(7) Torque capscrews in 5 ft lbs (7 Nom) increments until torqued to 12 ft lbs (16 Nom).

(8) Lift, then release plunger to check if it is binding.

NOTE

Injector plunger must move freely.

(9) If plunger is not free to move, loosen and retorque capscrews.

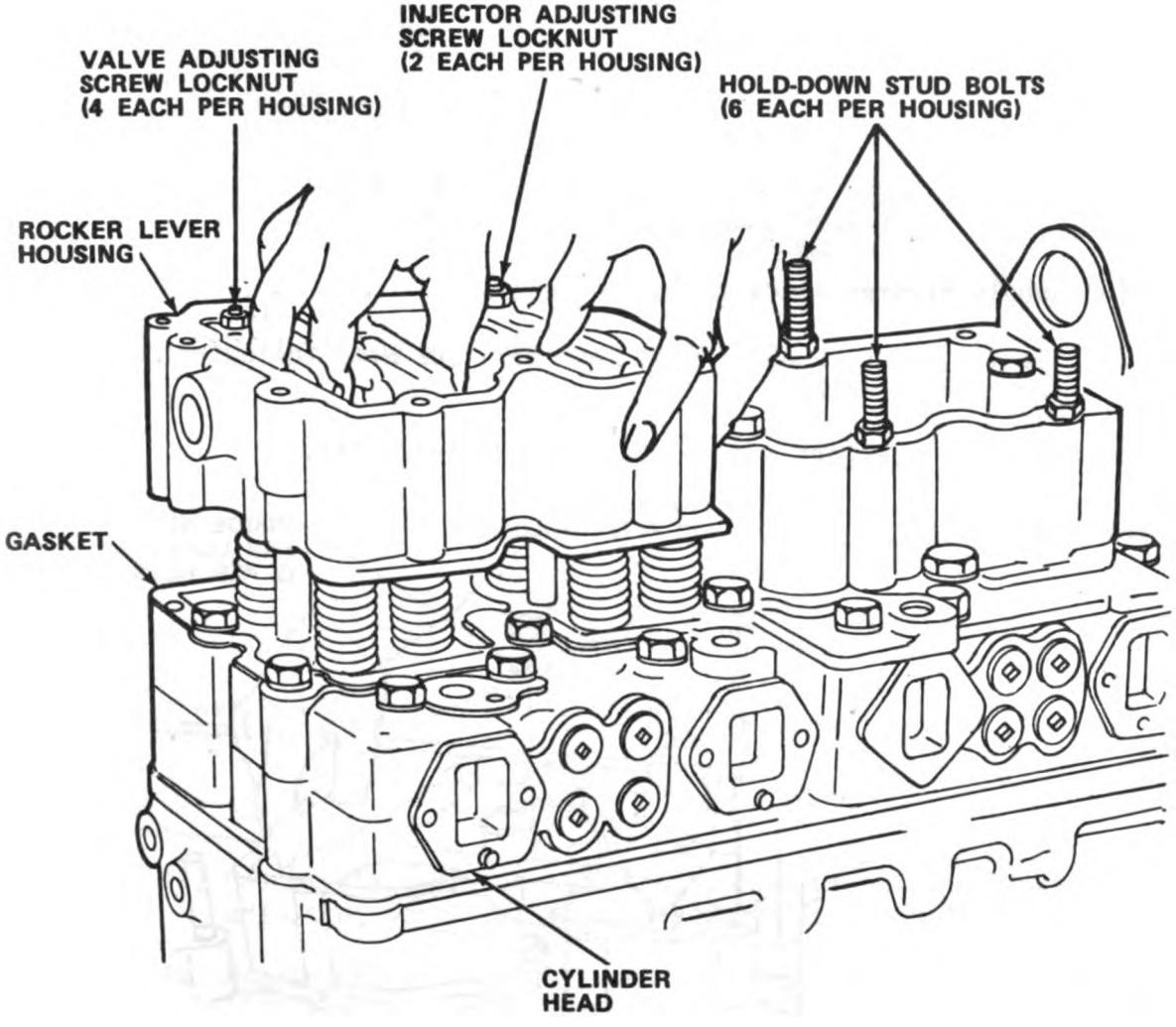
(10) Install injector link.

(11) Clean any gasket material from cylinder heads, rocker lever housings, and engine retarder housings.

(12) Check heads and housings for any irregularities before installing.

NOTE

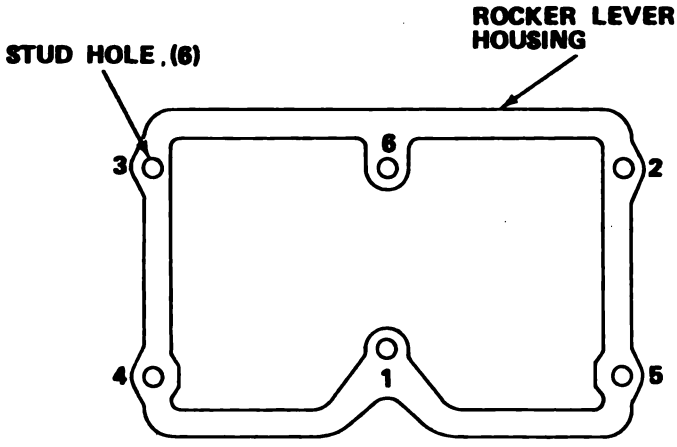
Ensure that all push tubes are in position before installing rocker lever housing.



(13) Position new gasket on cylinder head flange.

(14) Position rocker lever housing over gasket and secure with washers and stud bolts. Do not overtighten.

(15) Torque rocker lever housing studs:



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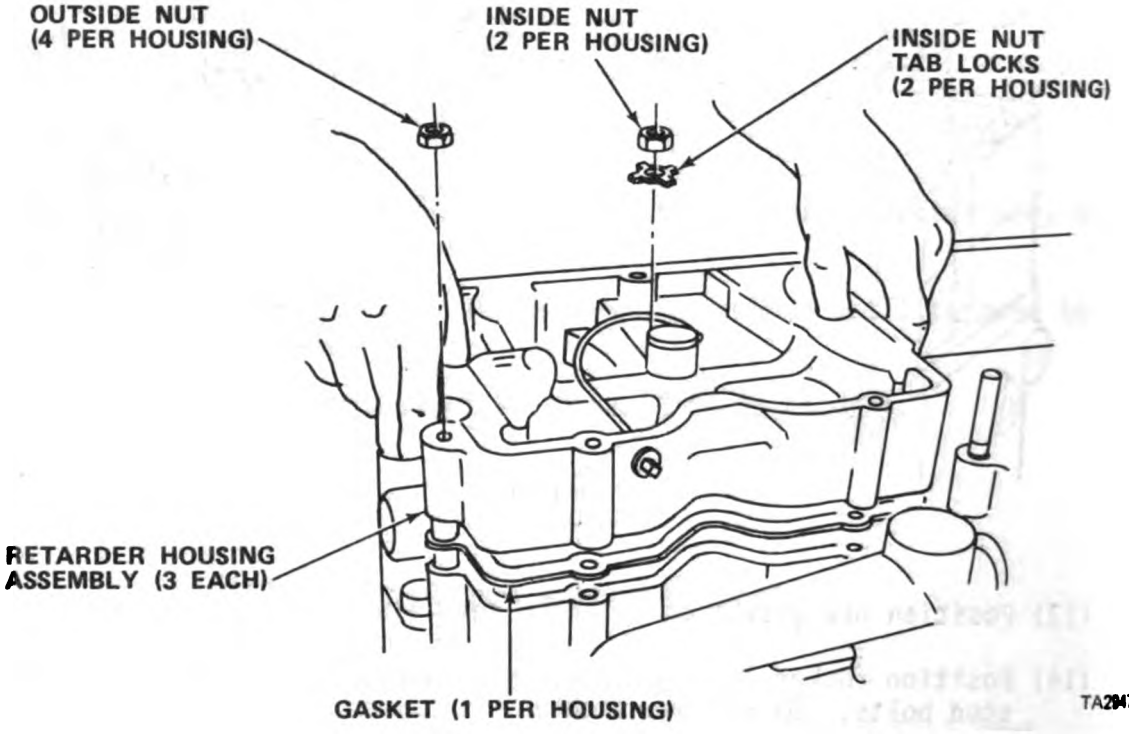
(a) Snugly tighten studs to insure seating.

(b) Tighten studs to 65 - 75 ft lbs (88 - 102 Nem) following numerical sequence as shown.

(16) Adjust fuel injectors and valves (TM 9-2815-226-34).



TA294740

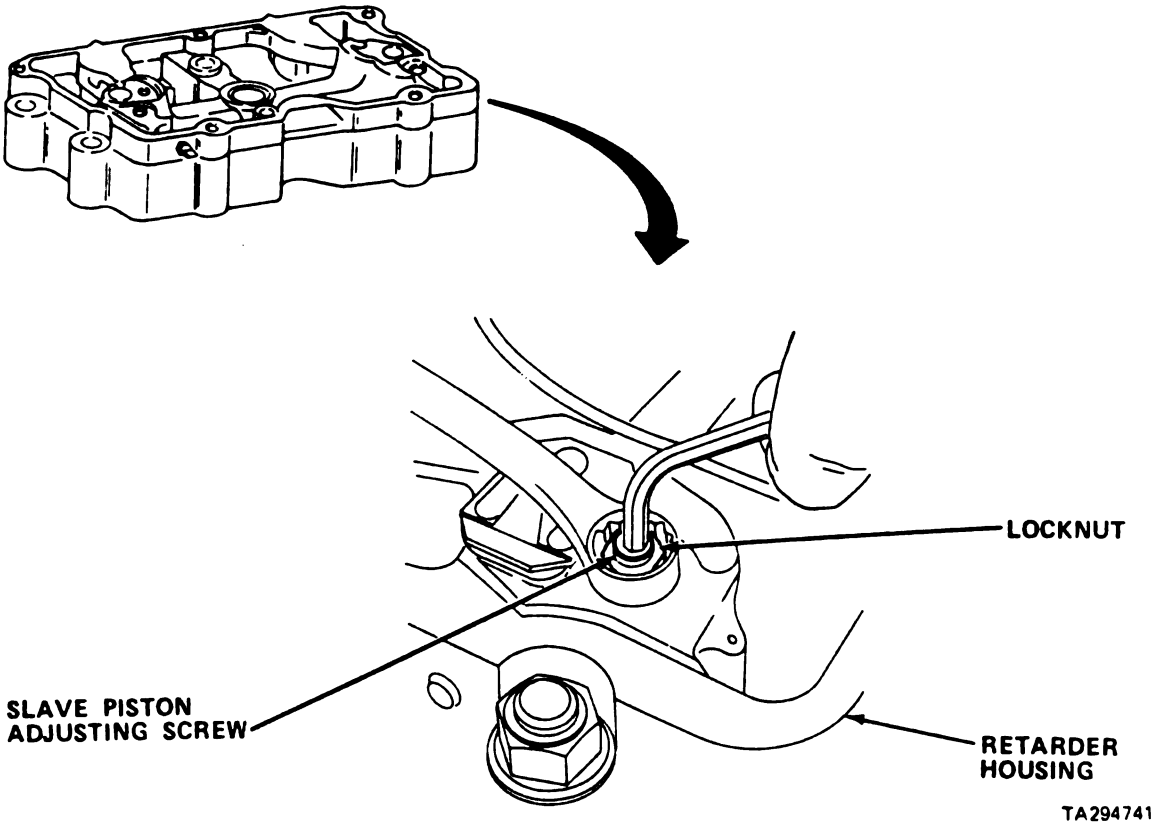
(17) Ensure that engine retarder housings and rocker lever housings' gasket mating surfaces are clean and install new gaskets.

(18) Install retarder housings over gaskets and position engine lift eyes and air intake tube center support on attaching studs.

(19) Place special tablocks on two studs located in center of each retarder housing. Torque hold-down nuts 55 - 60 ft lbs (75 - 81 Nem) in same sequence as rocker lever housing stud bolts.

(20) Bend long tab on each tablock down over retarder housing surface and bend one short tab up against hex flat on each nut.

(21) Adjust engine retarder slave piston.



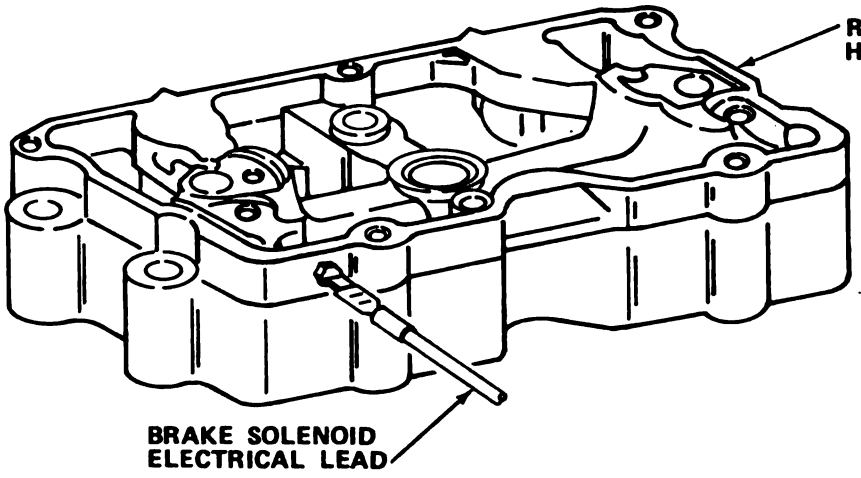
(a) Loosen slave piston adjusting screw locknut and back slave piston adjusting screw out of housing until slave piston seats in its bore.

(b) Rotate engine to right until "A" mark on accessory drive pulley lines up with timing mark on gear case cover. Exhaust valves of cylinder 1 and 6 are cleared at this time.

(c) Insert a 0.018 in. (0.457 mm) feeler gage (tool no. 3087) between slave piston and cross head. Turn adjusting screw in until a slight drag is felt on feeler gage.

(d) Torque slave piston adjusting screw locknut to 15 - 18 ft lbs (20 - 24 N•m).

(e) Continue turning engine in direction of rotation and set slave piston clearance on remaining cylinders in firing order (1-5-3-6-2-4).



TA294742

(22) Connect brake solenoid electrical leads to engine retarder housings.

(23) Install rocker lever housings (TM 9-2320-281-20).

(24) Install air inlet tube (TM 9-2320-281-20).

(25) Install front water transfer hose (TM 9-2320-281-20).

(26) Install air crossover (TM 9-2320-281-20).

d. Perform operational and leak check of engine.

(1) Start engine (TM 9-2320-281-10).

(2) Perform operational and leak check of engine.

(3) Shut down engine (TM 9-2320-281-10).

e. Lower cab (TM 9-2320-281-10).

f. Perform road test (TM9-2320-281-10).

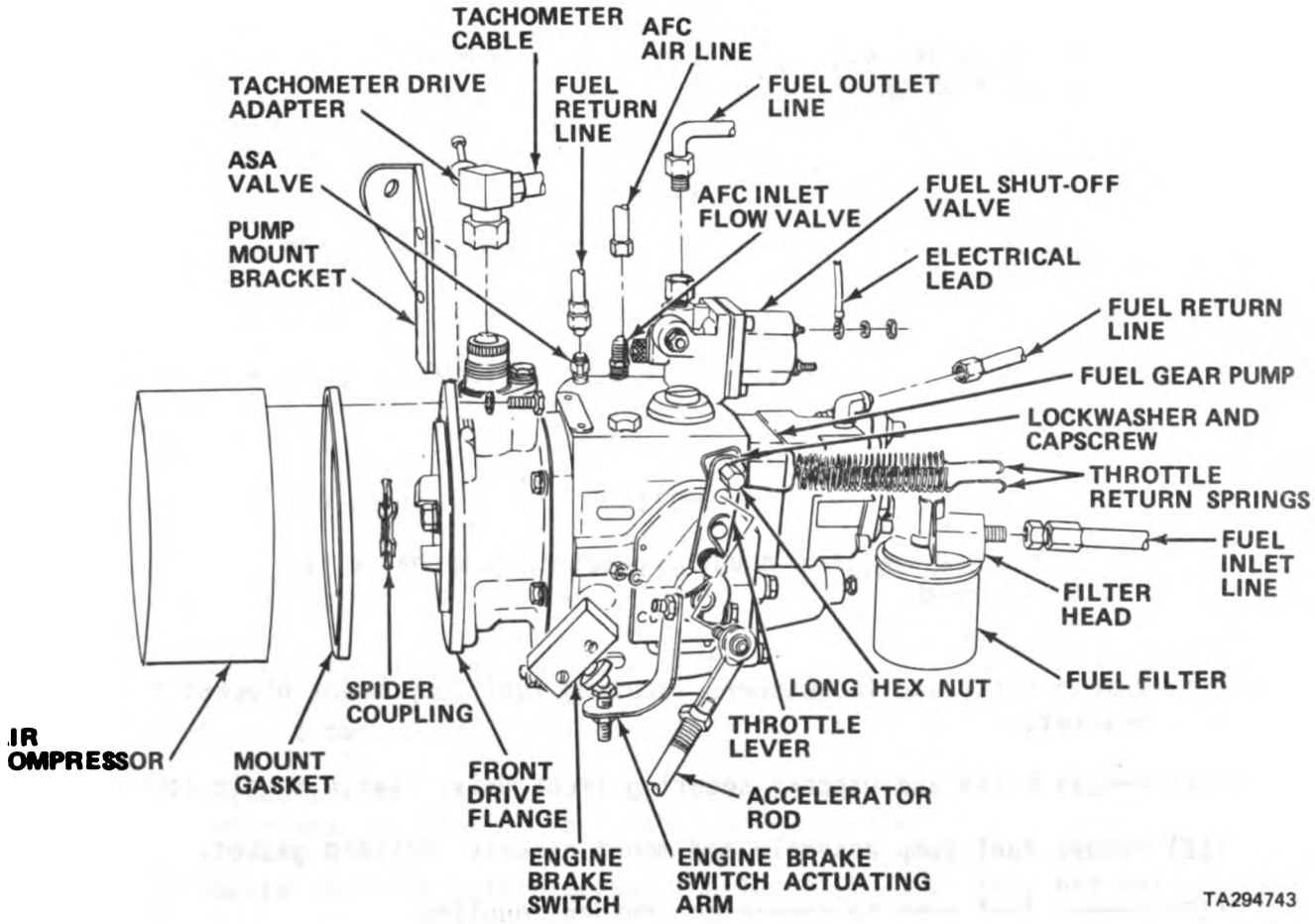
Section III. FUEL PUMP ASSEMBLY

4. REPLACE FUEL PUMP ASSEMBLY

a. Raise cab (TM 9-2320-281-10).

b. Disconnect negative battery cables from batteries (TM 9-2320-281-10).

c. Remove fuel pump assembly.



(1) Disconnect fuel inlet line at fuel filter head.

(2) Disconnect fuel return line at fuel gear pump.

(3) Disconnect fuel outlet line at fuel shutoff valve.

(4) Disconnect air line at air fuel control (AFC) inlet check valve.

(5) Disconnect fuel return line from ASA valve at top of fuel pump.

(6) Disconnect electrical lead from fuel shutoff valve terminal.

(7) Disconnect tachometer cable.

(8) Remove throttle return springs from throttle lever.

(9) Disconnect accelerator rod from throttle lever.

(10) Remove tachometer drive adapter.

(11) Remove fuel filter from filter head.

(12) Remove throttle lever retaining nut and remove engine brake switch actuating arm from throttle lever.

NOTE

It is not necessary to disconnect electrical leads from brake switch.

(13) Remove engine brake switch and bracket assembly from pump and set assembly aside.

NOTE

Bolt securing pump mount bracket to pump has a 12-point head.

(14) Remove bolts and lockwashers securing fuel pump mount bracket and remove bracket.

(15) Remove bolts and washers securing front drive flange to air compressor.

(16) Remove fuel pump assembly and mount gasket. Discard gasket.

(17) Remove fuel pump-to-compressor spider coupling.

d. Install fuel pump assembly (TM 9-2815-226-34P).

(1) Squirt SAE 30 weight oil on tachometer drive.

(2) Install fuel pump-to-compressor spider coupling.

(3) Place new mount gasket in position and position pump assembly on compressor and install three washers and bolts. Leave bolts loose.

(4) Install pump mount bracket and secure with washers and bolts to cylinder block.

(5) Secure mount bracket to pump front drive flange with 12 point head bolt.

(6) Secure remaining three bolts.

(7) Secure tachometer drive adapter to fuel pump.

(8) Attach fuel return line to ASA valve on top of fuel pump.

(9) Attach AFC air line to flow valve on AFC cover plate.

(10) Connect electrical lead to shutoff valve lower terminal and secure with lockwasher and nut.

(11) Attach fuel outlet line to shutoff valve outlet fitting. Ensure that valve is closed (manual knob turned fully to left).

(12) Remove throttle lever retaining nut and secure engine brake switch actuating arm to throttle lever.

(13) Remove two capscrews and washers from fuel pump-to-front drive flange.

(14) Secure engine brake switch and bracket assembly with two capscrews and washers to fuel pump-to-front drive flange. Torque capscrews to 9 - 10 ft lbs (12 - 14 N m).

(15) Attach electrical leads to engine brake switch (if previously removed).

(16) Fill fuel filter element with diesel fuel and install element on fuel filter head.

(17) Connect fuel inlet line to fuel filter head.

(18) Connect tachometer cable to tachometer drive adapter.

(19) Attach throttle return spring long hex nut to upper hole in throttle lever and secure with lockwasher and capscrew.

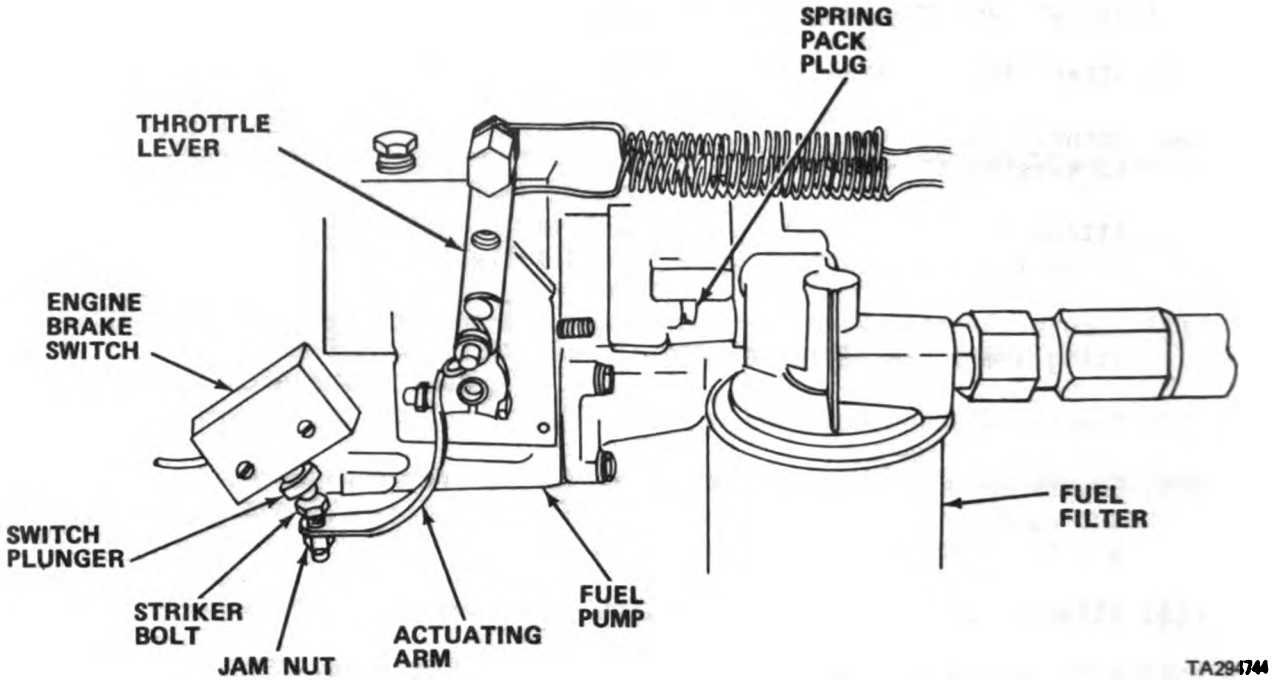
(20) Secure throttle return springs to throttle lever long hex nut.

(21) Leave accelerator rod disconnected from throttle lever until pump is tested.

e. Perform operational and leak check.

(1) Reconnect negative battery cables to batteries (TM 9-2320-281-10).

(2) Place ignition switch to ON position and listen for click of fuel pump shutoff valve. Turn switch to OFF and listen for click.



(3) Check that throttle lever actuating arm striker bolt has engine brake switch plunger pushed in when throttle lever is in idle (rearward) position.

(4) If switch plunger not fully depressed, adjust arm striker bolt as necessary.

f. Adjust fuel pump assembly.

NOTE

Accuracy of installed fuel pump adjustments change with condition of engine, engine loads, and accuracy of instruments used.

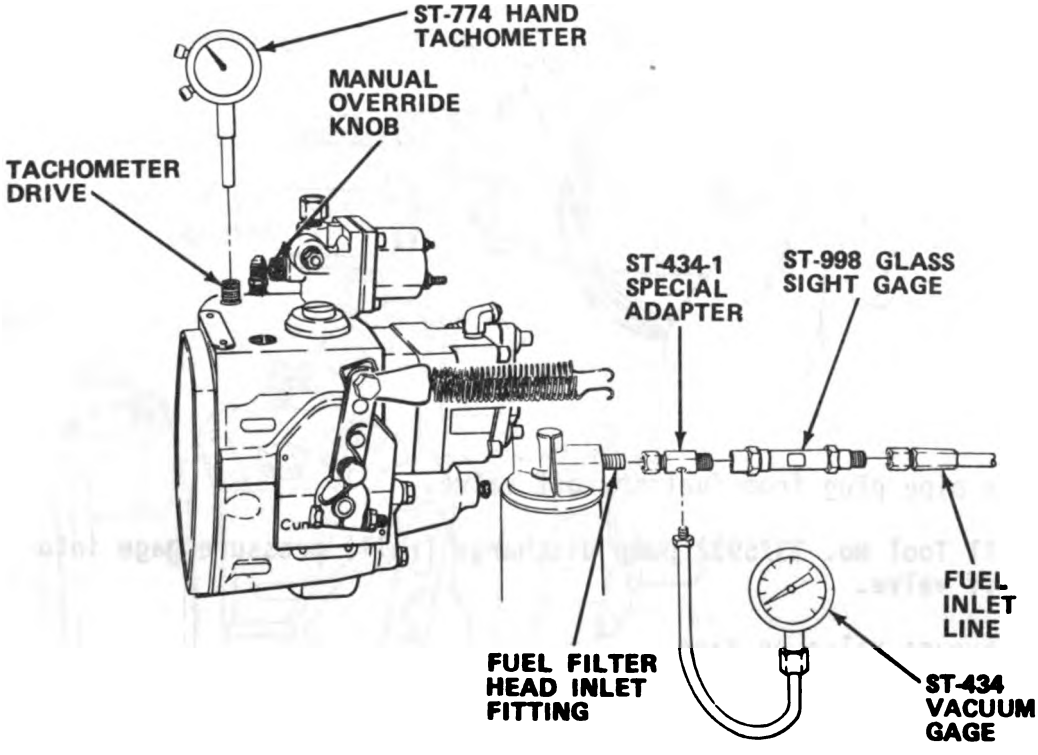
Adjustments are not to be made on a cold engine.

Engine must be run until oil temperature reaches at least 165°F (74°C).

Valves and injector must be properly timed and adjusted.

(1) Perform adjustment procedures.

(a) Remove fuel inlet line and squirt clean fuel into inlet of fuel filter head inlet fitting to assist gear pump in starting fuel through main pump.



(b) Install ST-434-1 special adapter and ST-998 glass sight gage onto fuel filter head inlet filling. Sight gage will show air bubbles in fuel line and will also show gasket or other air suction leaks. Secure fuel inlet line to sight gage.

(c) Secure ST-434 vacuum gage to special adapter. Gage is used to check if fuel filter is restricted.

(d) Disconnect tachometer drive cable from top of fuel pump.

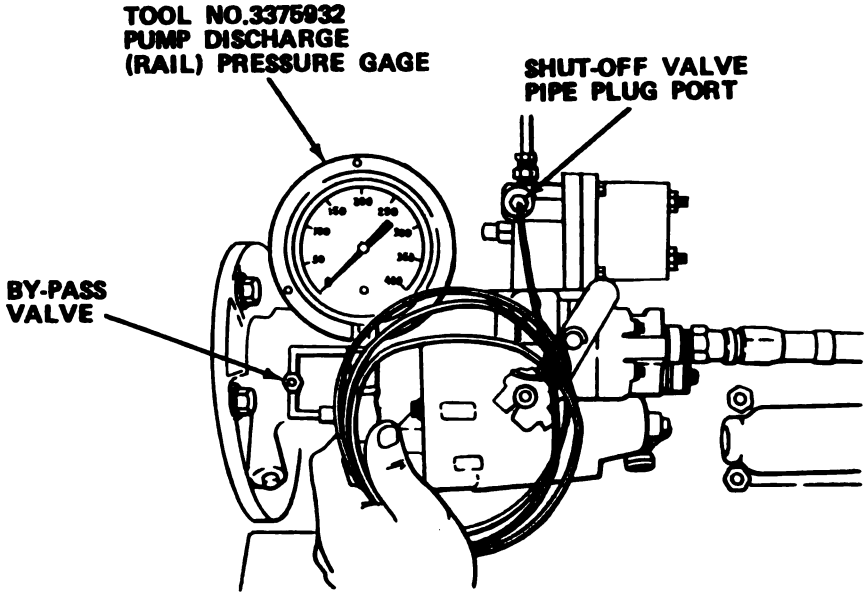
(e) Secure ST-774 hand tachometer to tachometer drive on pump.

(f) Check that manual override knob on fuel pump shutoff valve is in closed position (shaft out).

(g) Check all fuel line connectors to ensure security.

(h) Check AFC line connectors to ensure security.

(i) Remove capscrew, washer, and nut securing acceleration linkage to pump throttle lever (if attached).



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(j) Remove pipe plug from fuel shutoff valve.

(k) Install Tool No. 3375932 pump discharge (rail) pressure gage into shutoff valve.

(l) Open bypass valve on gage.

(2) Check idle speed.

NOTE

If fuel pump is properly calibrated, hardly any adjustment is required.

(a) Start engine (TM 9-2320-281-10) and observe sight gage in fuel filter inlet line. Cycle throttle forwards and back to remove air from system.

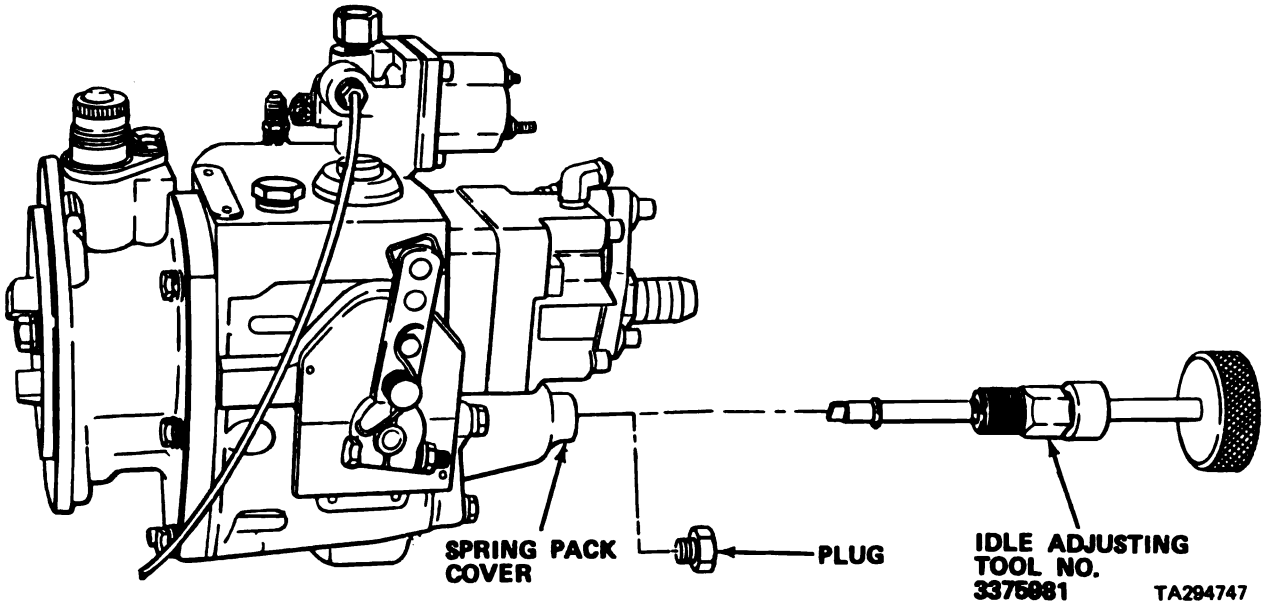
(b) Allow engine to warm up until oil temperature is 165°F (74°C) or higher.

NOTE

Idle speed adjustment must not be made on cold engine. As oil warms up, internal friction is reduced which changes engine speed. Too low idle rpm can create sluggish movement of heavy loads from stopped position. Too high idle rpm creates abrupt shifting when transmission shift lever is moved from neutral to drive range, and causes excessive fuel consumption.

(c) Check tachometer for idle speed of 575 - 600 rpm.

(d) If idle speed too high or low, cool for 3 to 5 minutes and shut down engine (TM 9-2320-281-10).



(e) Remove plug from spring pack cover.

(f) Install Tool No. 3375981 idle adjusting tool into housing.

(g) Restart engine (TM 9-2320-281-10).

(h) While observing hand held tachometer, turn adjustment screw in to increase or out to decrease rpm.

(i) Leave tool installed until all adjustments are complete.

(3) Check cutoff speed setting.

NOTE

Correct method of checking governor setting is to load engine with chassis or test stand dynamometer.

Maximum speed is adjusted by adding or removing shims under high speed governor spring in spring pack housing.

This adjustment is normally made on fuel pump test stand during calibration. Usually does not need to be reset on engine.

(a) Place throttle in full open position.

(b) Increase load until speed is pulled down to 2000 rpm.

(c) Gradually decrease load allowing rpm to increase.

(d) Continue decreasing load until fuel pump discharge pressure gage reaches its highest point and then drops 1 or 2 psi (6.9 to 13.8 kPa). This is the point where maximum speed governor kicks in and begins reducing rpm. This "governor break" or cutoff point occurs when speed is between 20 to 50 rpm higher than rated speed.

(e) If cutoff rpm is lower than 2120 rpm or higher than 2150 rpm, shut down engine.

(f) Remove spring pack cover housing and remove or add shims behind governor high-speed spring ((TM 9-2815-226-34).

(g) Reinstall cover housing, and recheck cutoff setting.

(4) Check fuel pump discharge (rail) pressure (Method A).

NOTE

Two methods can be used to check rail pressure. Rail pressure may be checked using either chassis or test stand dynamometer. An accurate tachometer must be used.

(a) Check governor cutoff speed setting (para (3) above).

(b) Run engine at full throttle position.

(c) Increase load until engine drops to 2100 rpm.

(d) Read rail pressure on pump discharge gage.

(e) Gage pressure must be within 146 - 162 psi (1007.4 - 1117.8 kPa).

CAUTION

NEVER ADJUST PRESSURE ABOVE SPECIFICATION. THIS WILL VOID ENGINE WARRANTY AND VIOLATE EPA STANDARDS.

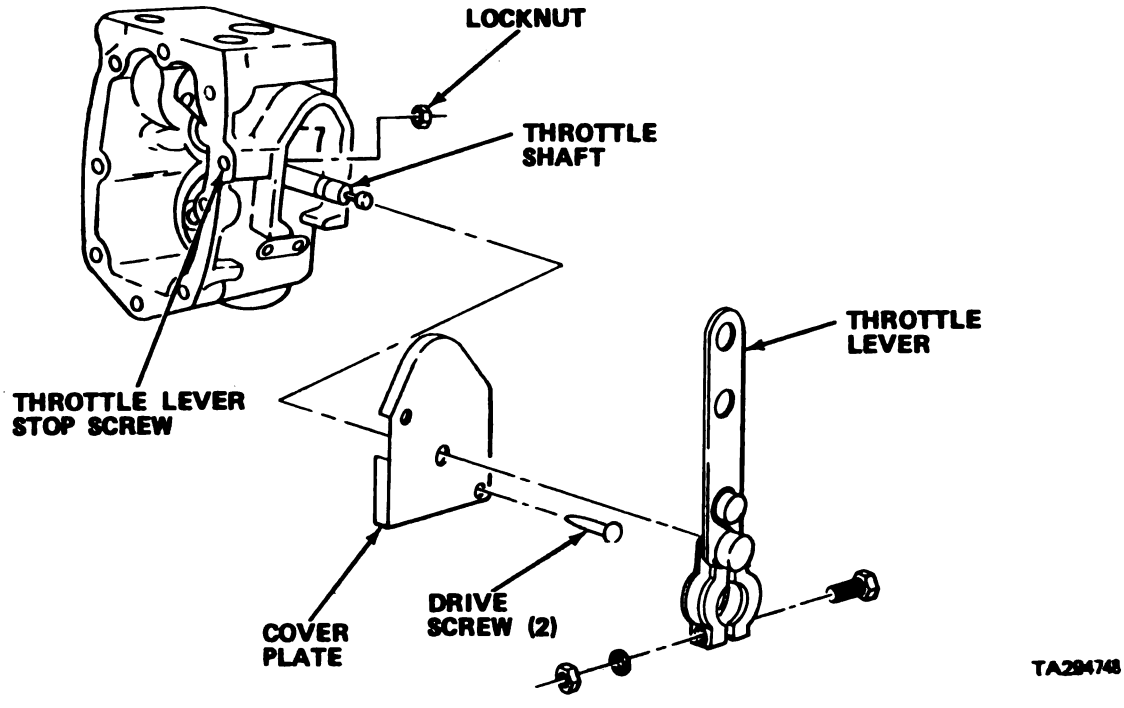
DO NOT TURN ADJUSTMENT SCREW OUT BEYOND MAXIMUM THROTTLE TRAVEL. FUEL HOLE IN THROTTLE SHAFT WILL BEGIN TO CLOSE AND REDUCE FUEL FLOW.

NOTE

It should not be necessary to adjust fuel rail pressure on a new or calibrated pump more than +2 psi (+13.8 kPa). If greater adjustment is required, check test stand for defects or engine for problems.

(f) If adjustment is required, cool and shut down engine.

(g) To raise rail pressure:



1 Match mark throttle lever to throttle shaft.

2 Remove lever retaining bolt and nut and slide throttle lever off shaft.

3 Remove cover plate screws by pulling out or chiseling off heads.

NOTE

Rail pressure cannot be lowered using forward throttle lever stop screw; pressure can only be raised.

4 While holding forward throttle travel stopscrew, loosen locknut.

5 Turn stopscrew out one full turn and tighten locknut.

6 Temporarily reinstall throttle lever alining match marks. Secure lever.

7 Recheck rail pressure and adjust stopscrew as required.

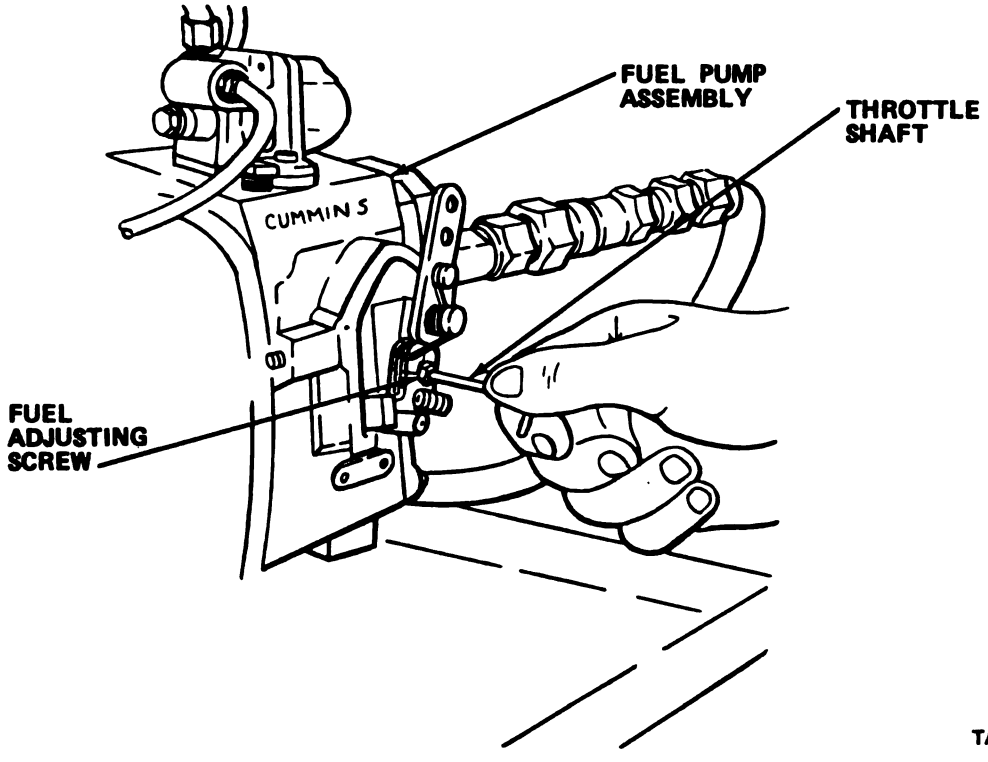
CAUTION

BE CAREFUL NOT TO DAMAGE THROTTLE SHAFT WHEN DRILLING OUT SOFT STEEL BALL. DAMAGE TO SHAFT COULD OCCUR.

NOTE

An alternate means of adjusting rail pressure is provided by fuel adjusting screw in center of throttle shaft. If this adjustment is used, proceed with steps 8 through 11.

8 With 1/4 in. (6.35 mm) drill bit and drill, carefully drill out soft steel ball in center of throttle shaft.



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9 Rotate fuel adjusting screw to right one complete turn.

10 Recheck rail pressure and adjust screw as required.

11 With Tool No. 3375204, install new steel ball in throttle shaft.

(h) To Lower pressure:

NOTE

Pressure cannot be lowered by adjusting forward throttle lever travel stopscrew.

1 Rotate adjusting screw in throttle shaft to left one complete turn.

2 Recheck rail pressure and adjust screw as required.

3 Leave cover plate off to allow access to no-air adjusting screw located above throttle shaft.

(5) Check fuel pump discharge (rail) pressure (Method B) - no chassis dynamometer used.

(a) Secure rail pressure gage in clear sight of observer in cab.

(b) Operate vehicle pulling load until truck in high range and engine speed is at 2100 rpm.

(c) Observe rail gage pressure. Must be within specifications as noted in Method A.

(d) Adjust pump as noted in Method A to establish required pressure.

(6) Perform no-air rail pressure check.

NOTE

This procedure checks the accuracy of AFCS adjustment in pump. An improper adjustment could result in excess exhaust smoke below turbocharger cut-in speed (1600 rpm under load). This violates EPA standards. Slow engine acceleration could also occur.

(a) Close bypass valve on rail pressure gage. This traps pressure in gage for accurate reading.

(b) Disconnect AFC line from aftercooler fitting and cap fitting. Leave line open.

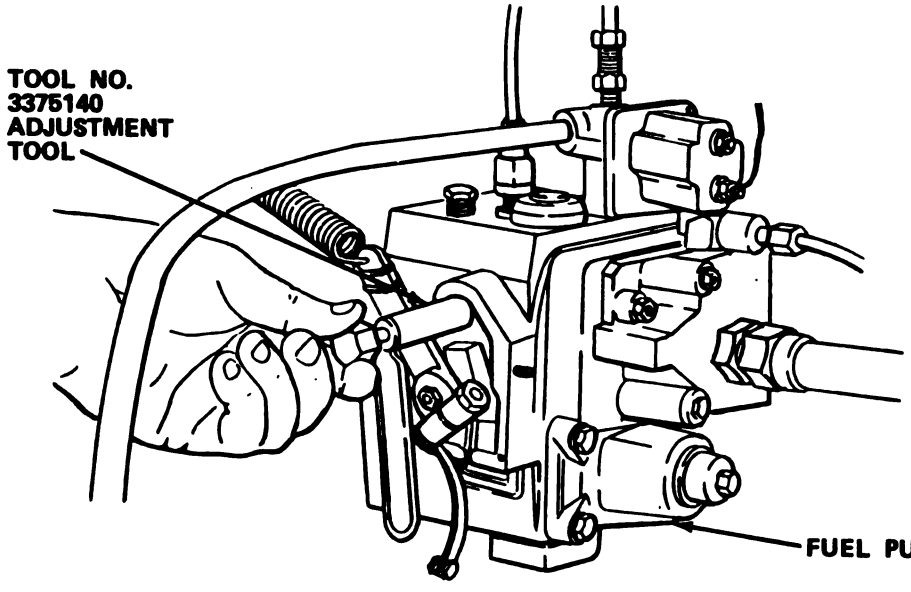
(c) Run engine to 1600 rpm and apply maximum load with dynamometer.

(d) Take rail pressure. Pressure must be 41 to 43 psi (283 to 296 kPa).

(e) Open gage bypass valve to dump pressure in gage and hose, then reclose valve.

(f) If rail pressure is not correct, adjust no-air needle valve.

1 With 3375140 fuel pump AFC no-air adjusting tool, loosen needle valve locknut.



2 Rotate no-air needle valve to left to reduce pressure and right to increase. Tighten locknut.

3 Accelerate engine to 1600 rpm with load applied, and recheck rail pressure.

4 Remove load and decelerate to idle rpm.

5 Remove cap on aftercooler fitting and reconnect AFC line.

(7) Perform fuel rate check.

NOTE

Engine fuel rate (fuel consumed) in lbs/hr is measured with ST-1190 flow measuring instrument.

Engine test stand or chassis dynamometer must be used. Accurate fuel pump discharge (rail) pressure and tachometer readings must be taken.

(a) Apply load to engine with throttle full open until engine speed drops to 2100 rpm.

(b) Check governor cutoff speed (para (3) above) while load is on engine.

(c) Check rail pressure while at rated speed. Must read 146 - 162 psi (1007.4 - 1117.8 kPa).

(d) Hold speed and load long enough for flowmeter to stabilize.

(e) Record flow rate. Should be 141 to 147 lbs/hr.

(8) Perform throttle leakage check.

NOTE

The purpose of throttle leakage is to keep fuel lines and supply drillings and injector drillings full of fuel during closed throttle engine motoring.

Throttle leakage prevents engine response hesitation when throttle is opened after downgrade closed throttle motoring and prevents the engine from stalling when it decelerates to idle.

Excessive throttle leakage will cause engine to decelerate too slowly, where too little leakage will cause engine hesitation after closed throttle motoring and possible stalling after deceleration to idle.

If throttle leakage is adjusted correctly on fuel pump test stand, adjustment after pump installation on engine should not be required.

(a) Remove fuel pump discharge (rail) pressure gage and reinstall shutoff valve pipe plug.

(b) Place transmission in neutral position.

(c) Move throttle lever to open position.

(d) Run engine at high-idle (maximum speed) with no load applied.

(e) Set stop watch or suitable timer to zero.

(f) Quickly release throttle and actuate stop watch at same time.

(g) Stop the watch when engine reaches 1000 rpm and note deceleration time.

(h) Repeat deceleration check several times.

(i) If engine begins to stall (too rapid deceleration) throttle leakage is not high enough and must be increased. This can only be done on fuel pump test stand.

(j) Remove pump and check and adjust leakage on test stand (TM 9-2815-226-34).

(k) Normal deceleration time is 3 - 5 seconds.

(l) If engine takes more than 9 seconds to decelerate, throttle leakage may have to be decreased. This can be done with pump installed on engine.

(m) Before decreasing throttle leakage, ensure that it is required as follows:

1 Run engine to high-idle speed with no load applied.

CAUTION

RESTART ENGINE AS SOON AS POSSIBLE TO PREVENT TURBO-CHARGER DAMAGE AND COOLANT FROM BOILING.

2 Turn off ignition key (this closes fuel shutoff valve) and start the stop watch.

3 Stop the watch when engine reaches 1000 rpm and note deceleration time.

4 If deceleration time is not faster, throttle leakage is not the problem.

5 If deceleration time is faster, throttle leakage must be reduced.

6 Restart engine, cool, and shut down.

(n) Reduce throttle leakage.

1 While holding leakage adjusting screw, loosen locknut.

2 Rotate adjusting screw to left one complete turn.

3 Tighten locknut.

4 Recheck deceleration time.

NOTE

Recheck deceleration time after final tightening of locknut.

5 Adjust screw as necessary to set deceleration to 3 - 5 seconds.

6 Check idle rpm and readjust as necessary.

7 Cool and shut down engine.

8 Remove throttle lever.

9 Install throttle shaft cover and secure cover with new drive screws.

(9) Check fuel filter restriction.

(a) Run engine at full speed and load.

(b) If restriction on ST-434 vacuum gage reads 8 in. (203.2 mm) or more, change fuel filter element (TM 9-2320-281-20).

(c) Check ST-998 sight gage for air bubbles.

(d) Correct any air leaks.

(10) Engine power check. Engine power can only be accurately set on an engine test stand dynamometer. No other method is authorized.

(11) Seal spring pack cover and plug.

NOTE

Only spring pack cover and plug must be sealed. AFC cover is sealed during calibration of fuel pump or test stand.

(a) Remove idle adjusting tool and install plug (with wire hole) in spring pack cover.

(b) Run lockwire through spring pack plug and one lower capscrew securing spring pack cover to pump.

(c) Twist wire ends together until wire is tight.

(d) Bend twisted end of lockwire into bottom half of seal and press top and bottom halves of seal together.

(12) Remove test apparatus from pump.

(a) Remove sight gage and vacuum gage from fuel filter inlet.

(b) Apply thread sealant to inlet fitting and attach inlet fuel line to fitting.

(c) Remove flow measuring instrument. Apply thread sealant and reconnect fuel lines.

(d) Remove hand tachometer and reinstall tachometer cable to pump. Apply grease to grease fittings (LO 9-2320-281-12).

(e) Check all fuel line connectors for security.

(13) Install acceleration linkage.

(a) Position acceleration linkage rod to throttle lever on pump.

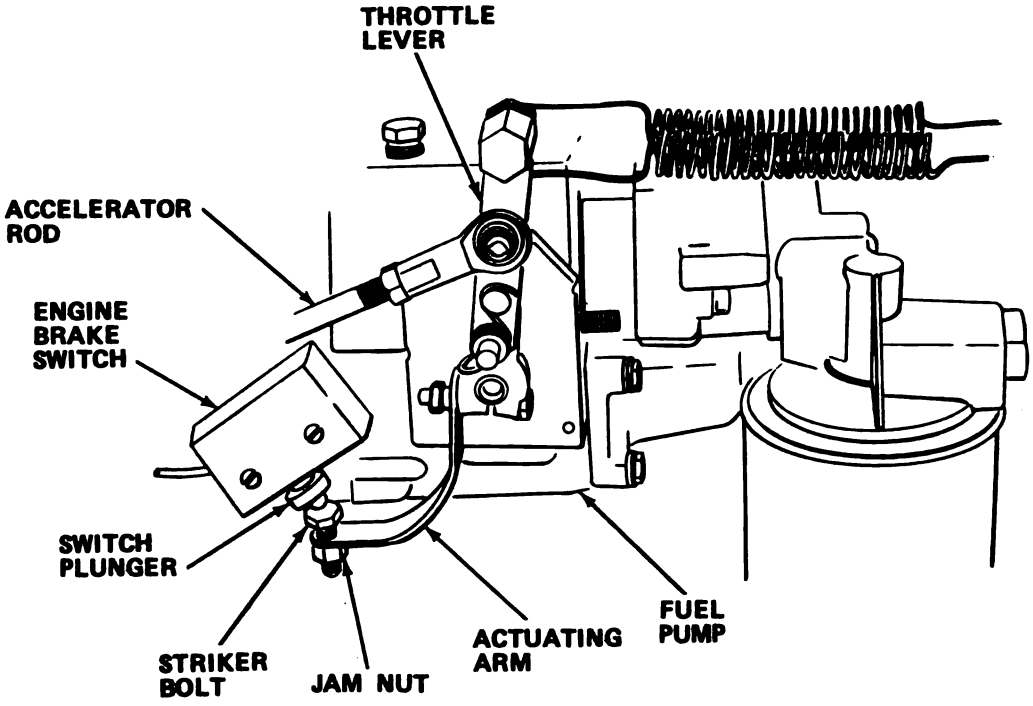
(b) Secure rod with capscrew, lockwasher, and nut.

(c) Check that full rear throttle lever travel is obtained. Vehicle linkage must be adjusted so that pump throttle lever fully contacts rear internal stop (throttle leakage screw) when accelerator is released.

(d) Check that full forward throttle lever travel is obtained. Accelerator pedal travel should stop when full forward travel of throttle lever is obtained. This prevents excess stress on linkage and/or possible damage to pump throttle shaft.

(e) Check linkage for binding or interference with hoses, lines, etc. Apply general purpose rust preventive lubricant to all linkage swivel points to ensure free and smooth movement. Wipe away excess.

(f) Apply spray lubricant to accelerator pedal swivel points. Wipe away excess.



(g) Check that throttle lever actuating arm striker bolt has engine brake switch plunger pushed in when throttle lever is in idle (rearward) position.

(h) If switch plunger not fully depressed, adjust arm striker bolt as necessary.

(14) Start engine and perform final operational and leak check (TM 9-2320-281-10).

(15) Road test vehicle (TM 9-2320-281-20).

(16) Check operation of engine brake. Adjust arm striker bolt as necessary.

CHAPTER 5

COOLING SYSTEM REPAIR

-1. **INTRODUCTION.** This chapter provides maintenance instructions for the fol-owing cooling system components:

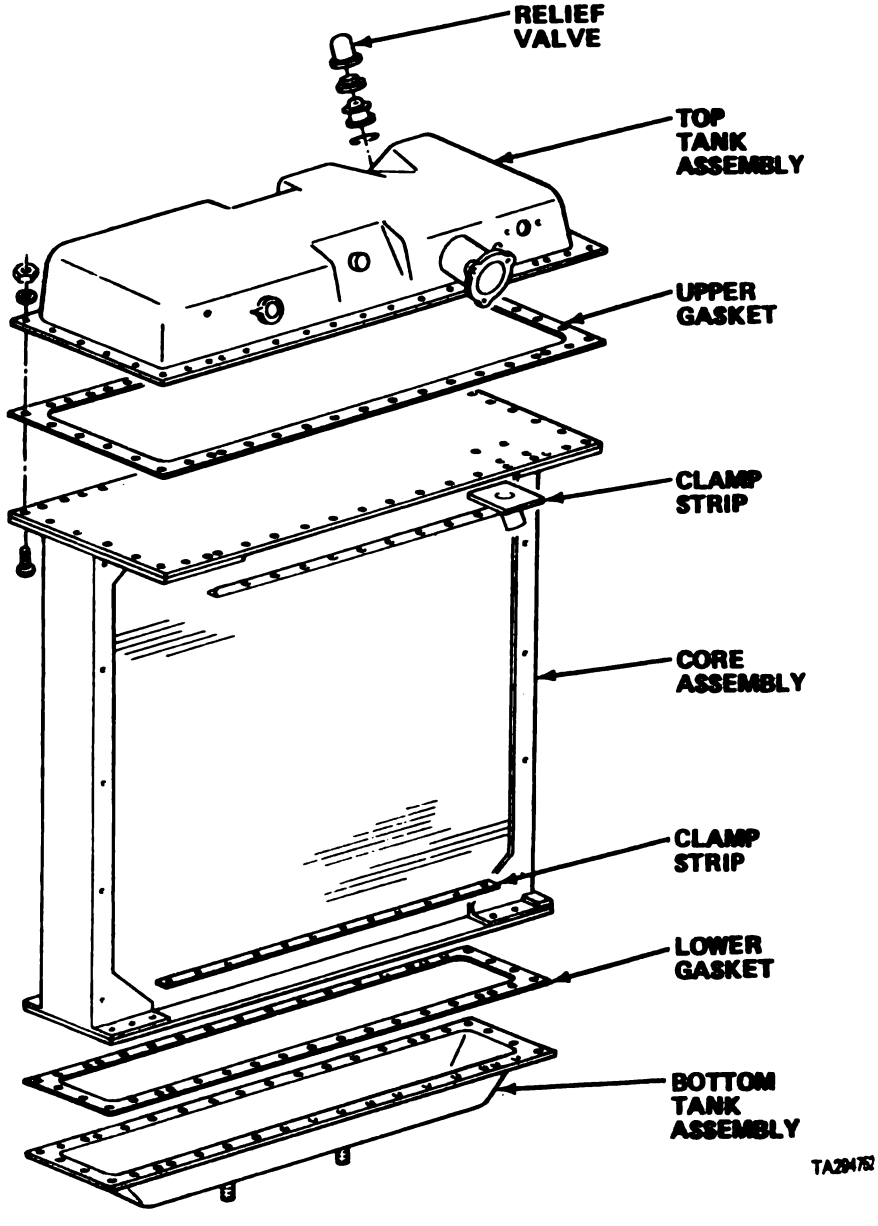
a. Radiator (Section I).

b. Water Manifolds and Thermostat Housing (Section II).

ll other cooling system repairs are covered in organizational technical manual M 9-2320-281-20 and engine technical manual TM 9-2815-226-34.

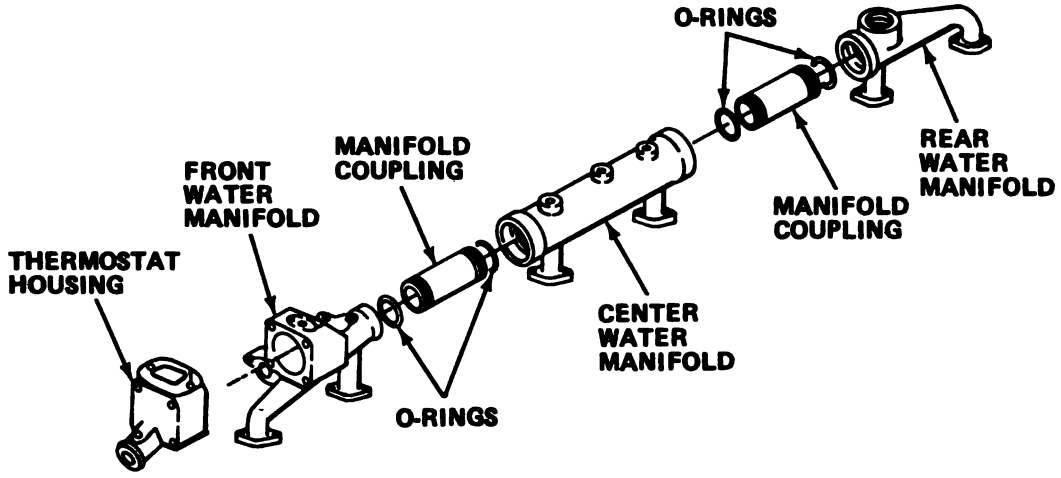
Section I. RADIATOR

5-2. RADIATOR REPAIRS. Perform all repairs in accordance with FM 43-2, Metal Body Repair and Related Operation, and TM 9-237, Operator's Manual for Welding Theory and Application.



Section II. WATER MANIFOLDS AND THERMOSTAT HOUSING

5-3. INSPECT WATER MANIFOLDS AND THERMOSTAT HOUSING



a. Separate front, center, and rear manifolds.

b. Remove both manifold couplings and discard coupling O-rings.

WARNING

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).

c. Steam clean manifolds and dry with compressed air.

d. Direct compressed air through all ports to remove foreign matter.

e. Inspect manifolds for cracks and distortions. Replace if defective.

f. Check O-ring sealing bores for defects. Replace manifolds if defective.

g. Check threaded holes for thread distortion. Mark for repair if threads distorted.

h. Check manifold couplings for burrs and nicks in O-ring grooves. Mark for repair if burrs and/or nicks found.

i. Inspect water transfer tube for dents, cracks, or distortions. Replace if defective.

j. Inspect thermostat housing and thermostat.

5-4. REPAIR WATER MANIFOLDS AND THERMOSTAT HOUSING

NOTE

Repair of water manifolds is limited to rethreading of threaded holes and removal of nicks and burrs from couplings.

a. Select appropriate size tap and retap holes.

WARNING

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).

b. Blow out holes with compressed air.

c. With fine emery cloth, remove nicks and burrs from couplings.

d. Wipe manifolds and thermostat housing clean.

CHAPTER 6

ELECTRICAL SYSTEM REPAIR

6-1. **INTRODUCTION.** This chapter provides repair instructions for the following electrical system components:

a. Alternator Assembly (Section I).

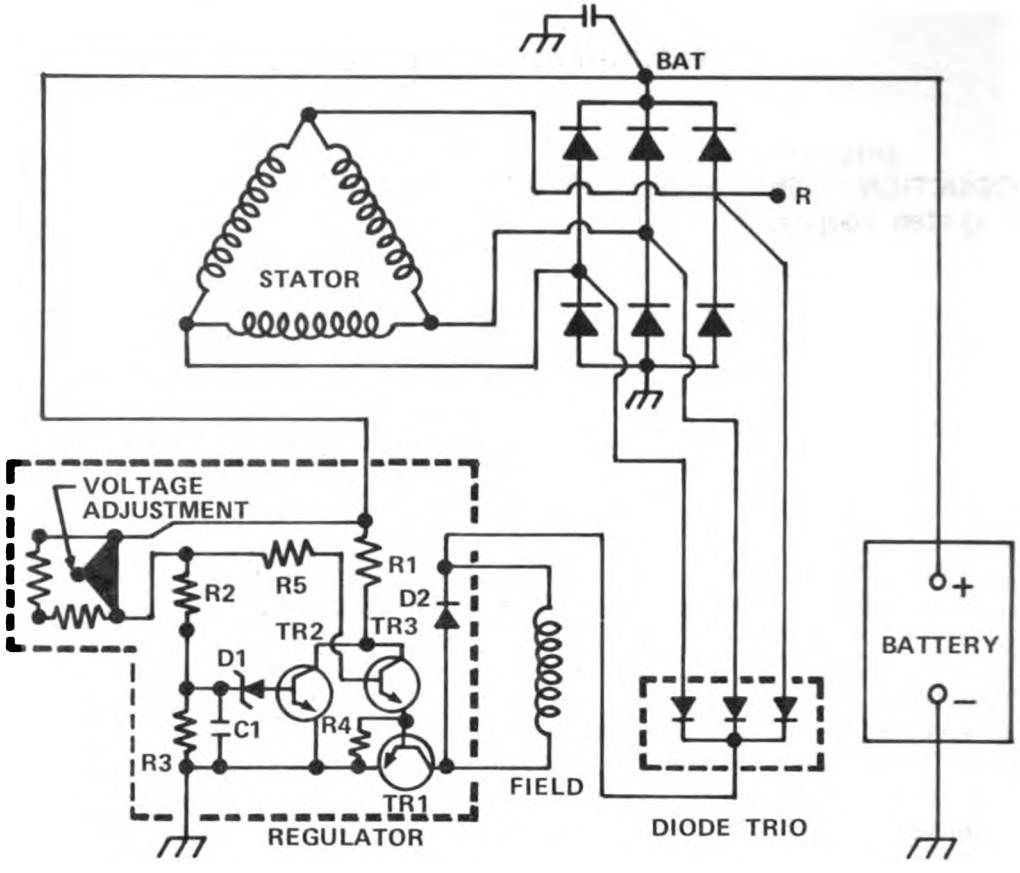
b. Starter Motor Assembly (Section II).

c. Blackout Switch (Section III).

Section I. ALTERNATOR ASSEMBLY

6-2. **DESCRIPTION.** The Delco-Remy Model 30-S1 charging system or alternator has a solid state regulator that is mounted inside the end frame. The regulator voltage setting can be adjusted externally by repositioning a voltage adjustment cap in the rectifier end frame. The alternator uses one wire with an adequate ground return to charge the vehicle battery in the usual manner. The rated output of the alternator is 90 amperes at 14 volts dc. For a full explanation of the truck chassis alternator/battery charging system, refer to TM 9-2320-281-20.

The operating principles of the alternator are explained as follows:



a. The base-emitter of transistors TR3 and TR1 is connected to the battery through resistor R5, thus turning these transistors on. Also, resistors R2 and R3 are connected to the battery through the voltage adjustment, but the discharge current of the battery is very low because of the resistance values of R2, R3, R5, TR1, and TR3.

b. With the generator operating, ac voltages initially are generated in the stator windings by residual magnetism in the rotor. The diodes in the rectifier bridge change the stator ac voltages to a dc voltage which appears between the ground and the "BAT" terminal. As speed increases, current is provided for charging the battery and operating electrical accessories.

c. The stator also supplies dc field current through the diode trio, the field, TR1, and then through the diodes in the rectifier bridge back to the stator.

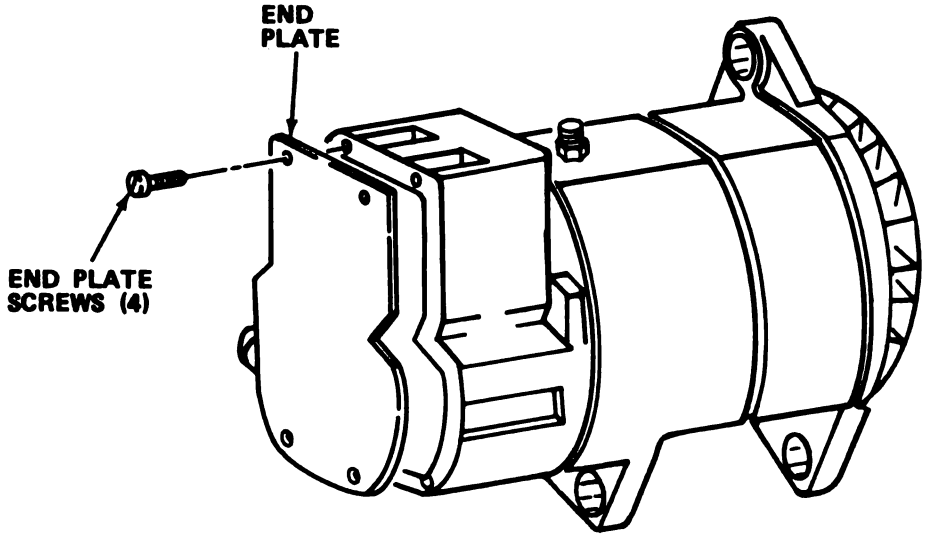
d. As the speed and voltage increase, the voltage between R2 and R3 increases to the value where zener diode D1 conducts. Transistor TR2 then turns on and TR1 and TR3 turn off. With TR1 off, the field current and system voltage decrease and D1 then blocks current flow causing TR1 and TR3 to turn back on. The field current and system voltage increase and this cycle then repeats many times per second to limit the voltage to the adjusted value.

e. If the voltage adjustment cube should become open-circuit, TR3 and TR1 will turn off, thus preventing high system voltage.

f. Capacitor C1 smooths out the voltage across R3; resistor R4 prevents excessive current through TR1 at high temperatures; and diode D2 prevents high-induced voltages in the field windings when TR1 turns off.

3. REPAIR ALTERNATOR ASSEMBLY

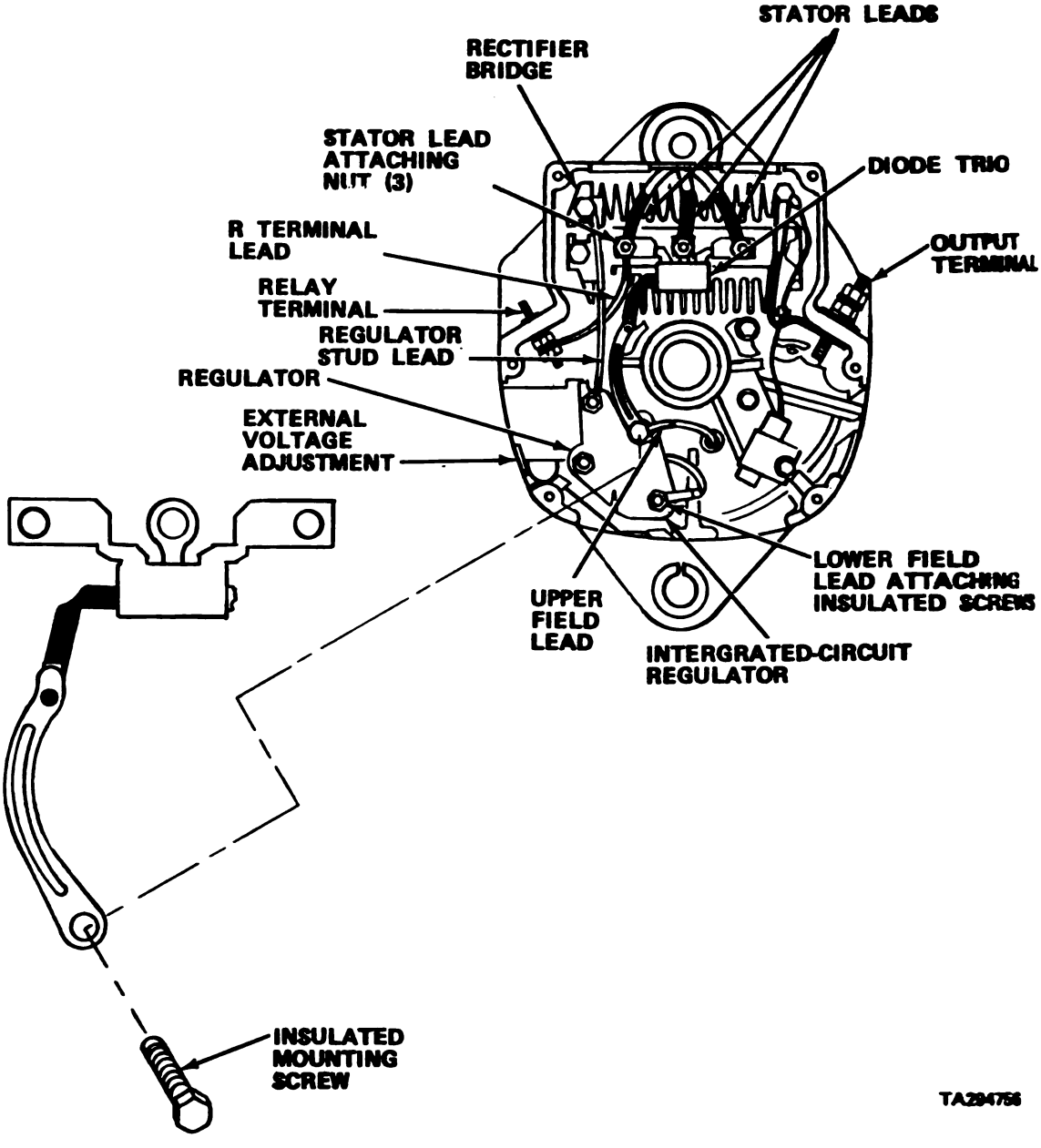
a. Disassemble alternator assembly.



TA294755

(1) Remove end plate screws and end plate.

(2) Tag all leads in end frame.



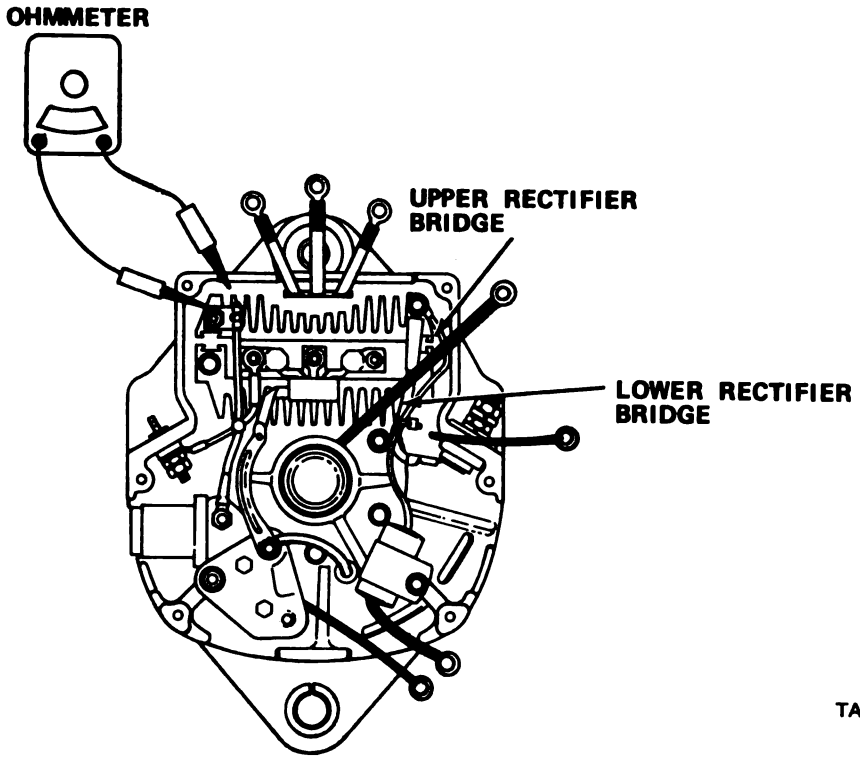
(3) Remove three nuts securing stator leads, diode trio, and R terminal leads to end frame connector studs.

(4) Detach stator and R terminal leads from connector studs.

(5) Remove insulated mounting screw securing diode trio and upper field lead to regulator.

(6) Remove insulated mounting screw securing lower field lead to regulator.

(7) Remove screw securing regulator stud lead to rectifier bridge.



(8) Connect ohmmeter to upper rectifier bridge (anode) and one of the three terminals as shown.

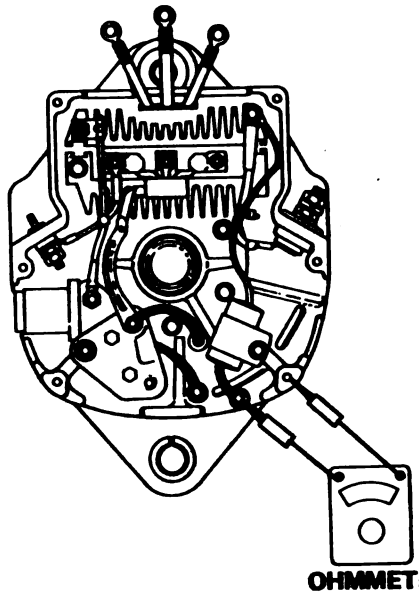
(9) Record ohmmeter reading.

(10) Reverse leads at same heat bridge and terminal.

(11) If both readings are same, replace rectifier bridge. A good bridge will give one high and one low reading.

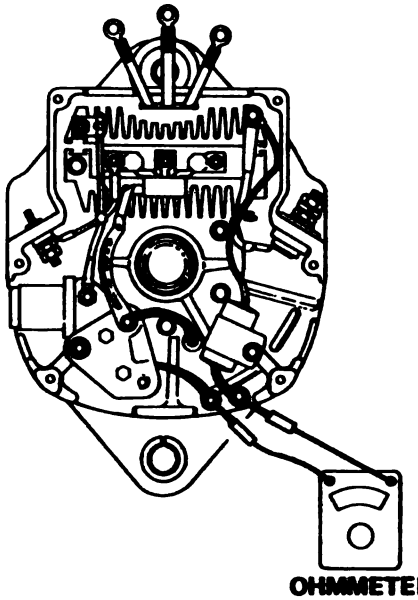
(12) Repeat same test between same rectifier bridge and other two terminals.

(13) With ohmmeter attached to lower rectifier bridge (cathode), repeat same test between that bridge and each of the three terminals.



TA294758

(14) Check for grounds by connecting ohmmeter to one field lead and to end frame as shown. If ohmmeter reading is low, field coil is grounded. Replace field coil.



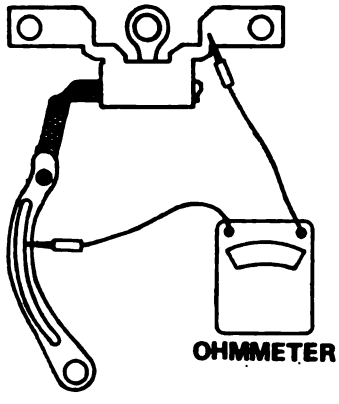
TA294759

(15) To check field coil for opens, connect an ohmmeter to the two field coil leads as shown. If ohmmeter reading is high (infinite), field coil is open, replace field coil.

(16) Check field windings for shorts by connecting a battery and ammeter in series with field coil and refer to Table 6-1. Ammeter reading above specified value indicates a shorted winding.

Table 6-1. ALTERNATOR SPECIFICATIONS

Field Output (80°F [27°C]) mps Volts	COLD OUTPUT				Related Hot Output Amps
	Specified Voltage	Amps	Approx RPM	Amps	
.6-4.3 12	13	72	2500	90	90



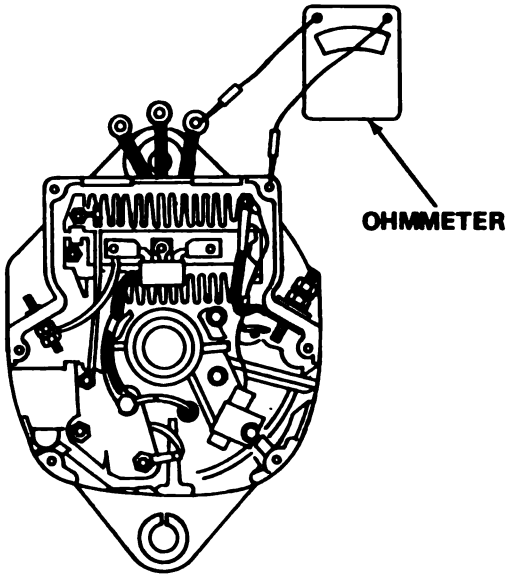
TA294760

(17) With diode trio removed from end frame, connect an ohmmeter (having a 1-1/2 volt cell and using lowest range scale) to single connector and one of the three connectors as shown.

(18) Observe reading then reverse meter leads to same two connectors. If both readings are same, replace diode trio. A good diode trio will give one high and one low reading.

(19) Repeat same test between single connector and each of the other two connectors.

(20) Replace diode trio if defects noted.



TA294761

(21) Check stator for grounds by connecting ohmmeter between any one stator lead and ground. If reading other than infinite, replace stator.

(22) Mount alternator on test stand and attach stand electrical leads.

(23) Start stand and set alternator at 4000 rpm.

(24) Check voltage and current output for 13 to 15 vdc, 90 amperes.

TA294762

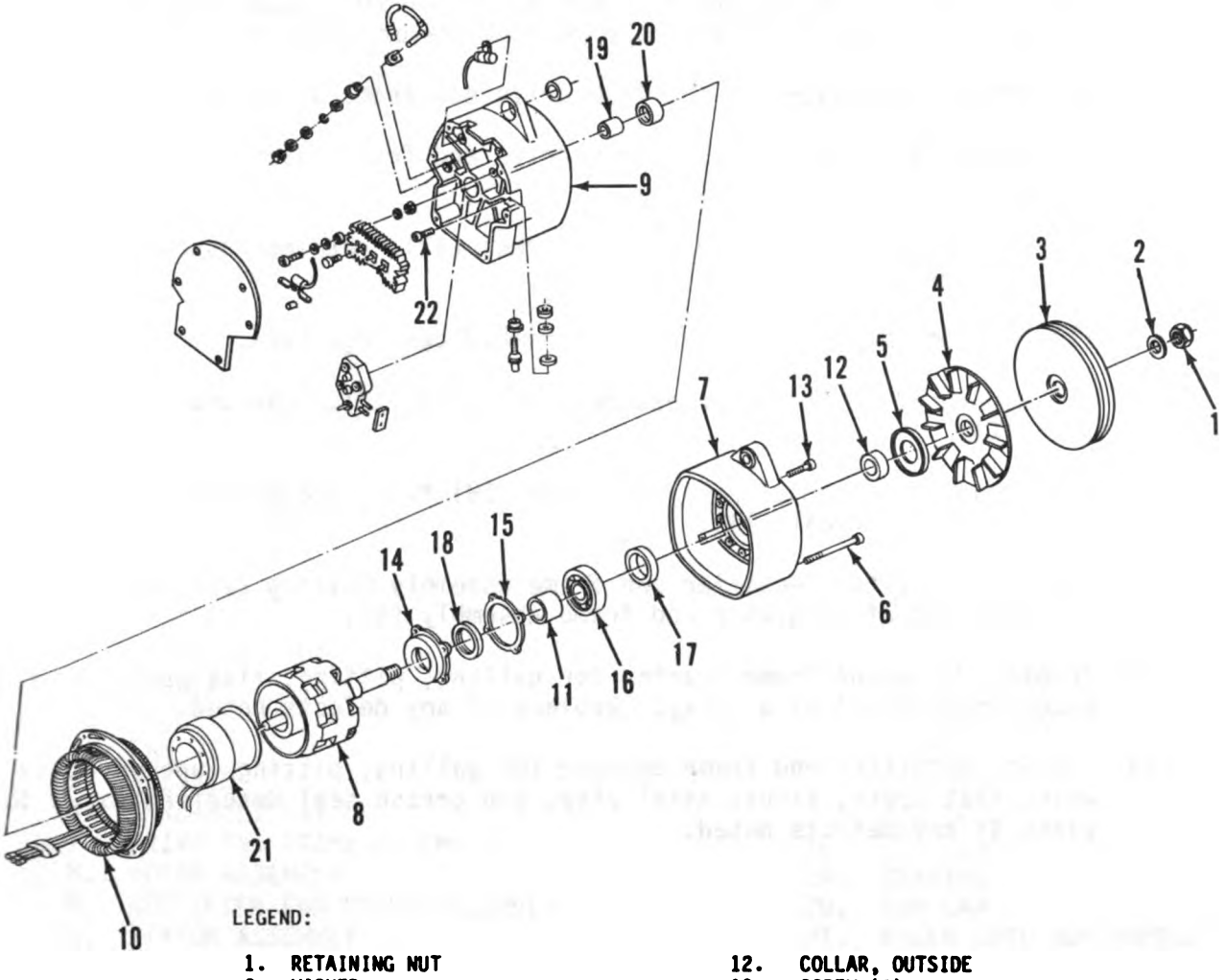
(25) If voltage is low, pull out on adjustment cap and rotate to a position raising output voltage to 13 to 15 vdc.

(26) Push cap back into frame.

NOTE

If voltage cannot be attained with cap in HI position, perform individual components check, e.g., field coils, diodes, etc. If over voltage is found and adjustment is in LO position, perform individual component checks. If current output is less than 80 amperes, perform individual component checks.

(27) Remove alternator bearings as follows:



LEGEND:

1.	RETAINING NUT	12.	COLLAR, OUTSIDE
2.	WASHER	13.	SCREW (4)
3.	PULLEY	14.	RETAINER ASSEMBLY
4.	FAN	15.	GASKET
5.	SLINGER	16.	BEARING
6.	THRU-BOLT (4)	17.	OIL SEAL
7.	DRIVE END FRAME ASSEMBLY	18.	OIL SEAL
8.	ROTOR ASSEMBLY	19.	BEARING
9.	RECTIFIER END FRAME ASSEMBLY	20.	END CAP
10.	STATOR ASSEMBLY	21.	FIELD COIL AND SUPPORT
11.	COLLAR, INNER	22.	SCREW (8)

TA294763

(a) Remove pulley retaining nut (1) and washer (2).

(b) Remove pulley (3).

(c) Remove fan (4).

(d) Remove slinger (5).

(e) Scribe mark drive end frame (7) and rectifier end frame assembly (9).

(f) Remove four thru-bolts (6).

(g) Separate drive end frame assembly (7) and rotor assembly (8) from rectifier end frame assembly (9) and stator assembly (10).

(h) Press rotor assembly (8) from drive end frame assembly (7).

(i) Remove inner collar (11) from drive end frame assembly and outside collar (12) from shaft.

(j) Remove four retainer assembly screws (13), retainer assembly (14), and gasket (15). Discard gasket.

(k) Push on bearing inner race and remove bearings (16).

(l) Remove drive end frame assembly oil seal (17). Discard oil seal (17).

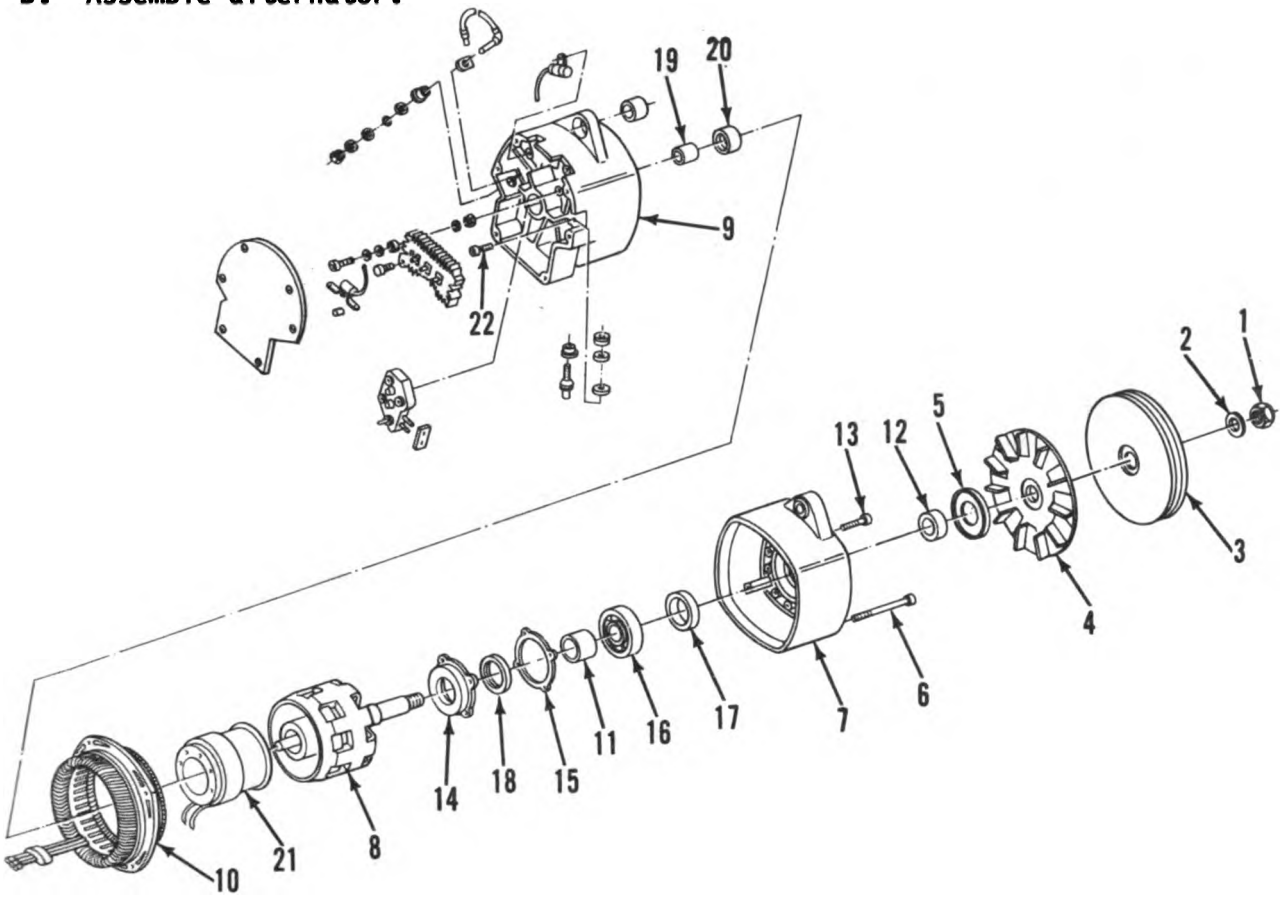
(m) Remove retainer assembly oil seal (18) from retainer assembly (14). Discard oil seal (18).

(n) Carefully tap rectifier end frame assembly bearing (19) and end cap (20) out of rectifier end frame assembly (9).

(28) Inspect drive end frame bearing for galling, pitting, flat spots, and excess radial and axial play. Replace if any defects noted.

(29) Inspect rectifier end frame bearing for galling, pitting, uneven roller wear, flat spots, excess axial play, and grease seal deterioration. Replace if any defects noted.

b. Assemble alternator.



LEGEND:

1. RETAINING NUT
2. WASHER
3. PULLEY
4. FAN
5. SLINGER
6. THRU-BOLT (4)
7. DRIVE END FRAME ASSEMBLY
8. ROTOR ASSEMBLY
9. RECTIFIER END FRAME ASSEMBLY
10. STATOR ASSEMBLY
11. COLLAR, INNER
12. COLLAR, OUTSIDE
13. SCREW (4)
14. RETAINER ASSEMBLY
15. GASKET
16. BEARING
17. OIL SEAL
18. OIL SEAL
19. BEARING
20. END CAP
21. FIELD COIL AND SUPPORT
22. SCREW (8)

TA294764

NOTE

When installing rectifier end frame assembly bearing (19) into rectifier end frame assembly (9), tap bearing into assembly far enough to allow for installation of end cap (20).

(1) Tap rectifier end frame assembly bearing (19) and end cap (20) into rectifier end frame assembly (9).

(2) Press new drive end frame assembly oil seal (17) into drive end frame assembly (7) with lip facing towards bearing (16).

(3) Press in new retainer assembly oil seal (18) into retainer assembly (14) with lip facing toward bearing (16).

(4) Press new bearing (16) into drive end frame assembly (7) by pushing against outer race.

(5) Fill retainer cavity half full with electric motor high temperature grease conforming to MIL-L-15719 or equivalent, so that some lubricant will touch bearing when retainer assembly (14) is attached to drive end frame assembly (7).

(6) With new gasket (15) in position, secure retainer assembly (14) to drive end frame assembly (7).

(7) Install inner collar (11) over rotor assembly (8) shaft.

(8) Press rotor assembly (8) into drive end frame assembly (7).

(9) Install outside collar (12) on rotor assembly (8) shaft. Insure collar (12) is against bearing (16) inner race.

(10) Fill rectifier end frame assembly (9) grease cavity half full with electric motor high temperature grease conforming to MIL-L-15719 or equivalent, so that a portion will touch bearing when assembled.

(11) Replace field coil and support (21) (if determined faulty) by removing screws (22).

(12) Install new field coil and support (21) and secure with screws (22). Torque screws to 55 in. lbs (6.22 N•m).

(13) Mate rectifier end frame assembly (9) with drive end frame assembly (7) insuring that scribe marks aline. Secure together with four thru-bolts (6).

(14) Install slinger (5) and fan (4) on rotor assembly (8) shaft.

(15) Position pulley (3) on rotor assembly (8) shaft and secure with washer (2) and retaining nut (1). Torque nut to 70 - 80 ft lbs (95 - 108 N•m).

(16) Check that all electrical components are secure and all leads are properly attached.

(17) Secure rectifier end frame cover plate with four screws.

(18) Mount alternator on test stand and check for 13 - 15 vdc output voltage and 80 - 90 amperes output current at 4000 rpm.

Section II. STARTER MOTOR ASSEMBLY

6-4. DESCRIPTION. The Delco-Remy heavy duty starter motor has a shift lever and solenoid plunger that are totally enclosed to protect them from dirt, ice, and splash. Positive lubrication is provided to bronze bushings by oil-saturated wicks that project through the bushings and contact the armature shaft. Oil can be added to each wick by removing a pipe plug which is accessible on the outside of the motor. The starter incorporates a Positork drive. As the starter solenoid switch is activated, the linkage secured to the solenoid coil moves the entire Positork drive along its straight-splined armature shaft until the pinion is in mesh with the engine disk and ring gear assembly. As the solenoid completes the gear engagement, the starter motor is energized. This ensures that the starter drive is fully engaged with the engine before the starter motor rotates. For a full explanation of the truck chassis starting system refer to TM 9-2320-281-20.

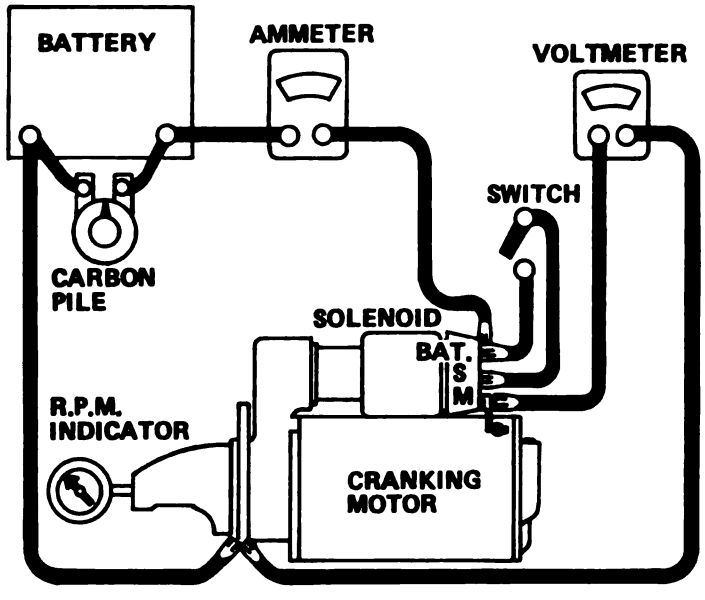
6-5. REPAIR STARTER MOTOR ASSEMBLY

CAUTION

TAKE CARE NOT TO DAMAGE DRIVER HOUSING OR PINION WITH SCREWDRIVER.

a. Check armature for freedom of rotation by turning drive pinion with screwdriver. If armature does not turn freely, disassemble and repair as necessary (para c below).

b. Perform starter no-load test as follows:



TA294765

(1) Connect a voltmeter from M (motor) terminal (lower) to motor frame and use test stand rpm indicator to measure armature speed.

h. Clean drive, armature, and field.

CAUTION

DO NOT CLEAN STARTER PARTS WITH DEGREASING SOLUTION OR GREASE DISSOLVING SOLUTION SINCE THESE WOULD DAMAGE INSULATION IN ARMATURE AND FIELD COILS.

(1) Clean all parts except clutch assembly with mineral spirits and a soft brush.

(2) Wipe dry with lint-free cloth.

(3) Clean commutator with no. 600 sandpaper.

i. Inspect commutator for wear, out-of-round, or high insulation. No undercutting of insulation is authorized. Replace armature rotor if defects noted.

j. Assemble starter solenoid switch assembly.

(1) Install contact disk (15) in solenoid switch assembly housing (9).

(2) Install contact disk spring (14) on contact disk (15).

(3) Insert long terminal (3) and short terminal (4) through terminal support plate (13) and terminal plate (5).

(4) Install terminal insulators (7) on long and short terminals (3 and 4).

(5) Secure terminals (3 and 4) plate washers (6), lockwashers (2), and nuts (1).

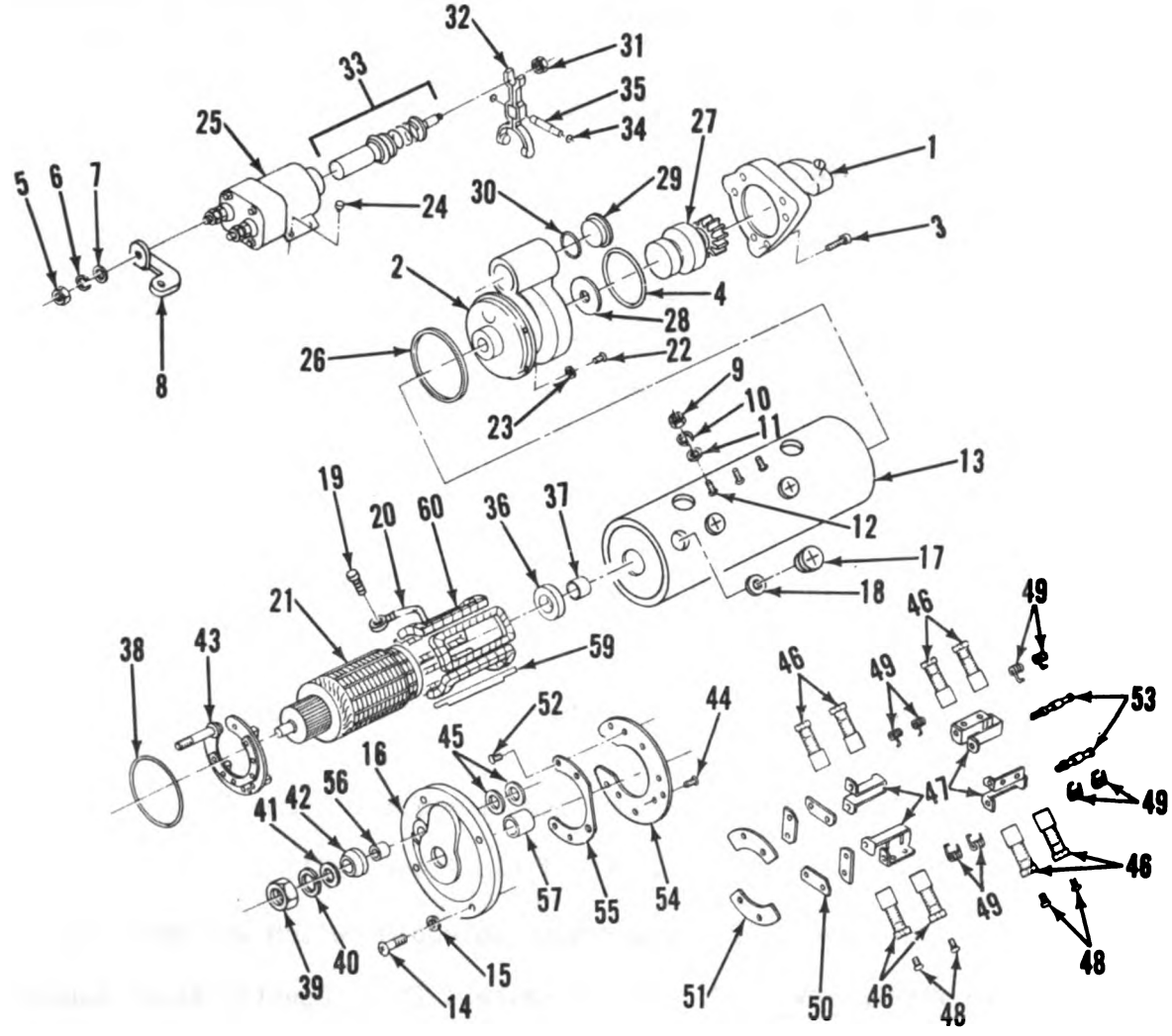
(6) Position new gasket (12) on solenoid switch assembly housing (9).

(7) Secure electrical lead (11) to short terminal (4) with screw (10).

(8) Mate terminal plate (5) to gasket (12) and solenoid switch assembly housing (9).

(9) Secure terminal plate (5) and gasket (12) to solenoid switch assembly housing (9) with four captive washer screws (8).

c. Disassemble starter motor:



LEGEND:

1. Nose Housing
2. Lever Housing
3. Screw (6)
4. Gasket
5. Nut
6. Lockwasher
7. Flat Washer
8. Strap
9. Nut
10. Lockwasher
11. Flat Washer
12. Field Frame Terminal
13. Field Frame Assembly
14. Screw (4)
15. Lockwasher (4)
16. Commutator End Frame
17. Brush Inspection Cover (2)
18. Gasket (18)
19. Screw (2)
20. Electrical Lead (2)
21. Armature rotor (21)
22. Screw (5)
23. Lockwasher (5)
24. Screw (4)
25. Solenoid Switch Assy
26. O-ring
27. Clutch Assy
28. Fiber Washer
29. Inspection Plug
30. Gasket
31. Adjustment Locknut
32. Lever
33. Plunger Assy
34. Retaining Ring
35. Lever Shaft
36. Oil Seal
37. Rotor Bushing
38. O-Ring
39. Nut
40. Lockwasher
41. Flat Washer
42. Insulator
43. Ground Terminal and Plate Assy
44. Captive Washer Screws (3).
45. Fiber Washer (2)
46. Brush (8)
47. Brush Holder (4)
48. Screw (6)
49. Brush Loding Spring (49)
50. Metal Spacer (4)
51. Fiber Insulator (2)
52. Screw (4)
53. Pin (4)
54. Brush Holder Support
55. Interconnect Strap
56. Ruber Insulator
57. Rotor Bushing
58. Screw (8)
59. Pole Shoe (4)
60. Field Winding

TA294766

(1) Match mark nose housing (1) to lever housing assembly (2) to ensure proper alinement upon reassembly.

(2) Remove nose housing screws (3) and separate nose housing (1) from lever housing assembly (2). Discard gasket (4).

1. Assemble commutator end frame (16).

(1) Press armature rotor bushing (57) into commutator end frame (16) until bushing is flush with frame.

(2) Install rubber insulator (56) into commutator end frame (16).

CAUTION

TWO BRUSH HOLDERS (47) HAVE METAL SPACERS (50) AND FIBER INSULATORS (51) AT THEIR BASES. THE REMAINING TWO BRUSH HOLDERS HAVE METAL SPACERS (50) BUT DO NOT HAVE FIBER INSULATORS AT THEIR BASES. BE SURE THAT BRUSH HOLDERS ARE PROPERLY INSTALLED TO PREVENT POSSIBLE DAMAGE TO THE STARTER MOTOR.

(3) Secure brush holder (47), spacer (50) and fiber insulator (51) (where required), brush holder support (54) and interconnect strap (55) with screw (52).

(4) Slide brush loading springs (49) onto pin (53) and secure pin to brush holder (47).

(5) Lift up brush loading spring (49) and install brush (46).

NOTE

Do not install screws (19) which secure the two brushes which aline with field frame brush inspection cover ports.

(6) Secure brush electrical lead to brush holder (47) with screw (48).

(7) Install two fiber washers (45) on ground terminal and plate assembly (43).

(8) Secure ground terminal and plate assembly (43) to commutator end frame (16) with three captive washer screws (44).

(9) Install insulator (42), flat washer (41), and lockwasher (40) on ground terminal and plate assembly (43) and secure with nut (39).

(10) Lubricate and install new O-ring (38) in groove of commutator end frame (16).

m. Assemble lever housing assembly (2).

(1) Press armature rotor bushing (37) into lever housing assembly (2) until bushing is deep enough in lever housing assembly to allow for installation of oil seal (36).

(2) Carefully tap oil seal (36) into lever housing assembly (2) until seal is flush with lever housing assembly.

(3) Position lever (32) in lever housing assembly (2) and secure lever with lever shaft (35).

(4) Secure lever shaft (35) with retaining ring (34).

(5) Insert plunger assembly (33) into hole in lever (32) and secure plunger to lever with adjustment locknut (31).

(6) Install gasket (30) on lever housing inspection plug (29) and install plug in lever housing assembly (2). Leave plug loose at this time.

(7) Position fiber washer (28) and clutch assembly (27) in lever housing assembly (2).

(8) Lubricate new O-ring (4) and install in groove of lever housing assembly (2).

(9) Lubricate new O-ring (26) and install in groove of lever housing assembly (2).

n. Assemble starter motor.

(1) Aline match marks and secure lever housing assembly (2) to field frame (13) with five screws (22) and lockwashers (23).

(2) Slide plunger assembly (33) into solenoid switch assembly (25) and secure switch assembly to field frame with four screws (24).

(3) Install armature rotor (21) into field frame (13) with rotor commutator end facing toward commutator end frame (16) end of field frame.

(4) Lift brushes (46) out of their holders (47) to allow easy installation of commutator end frame (16).

(5) Install new O-ring (38) in groove of commutator end frame (16).

(6) Aline match marks and carefully install commutator end frame (16) into field frame (13). Leave brushes (46) partially exposed.

(7) Seat brushes (46) and their loading springs (49) then fully seat commutator end frame (16).

(8) Secure commutator end frame with four screws (14) and lockwashers (15).

(9) Working through brush inspection cover ports secure two electrical leads (20) to their brush holders (47).

(10) Install gaskets (18) on brush inspection covers (17) and install covers into field frame (13).

(11) Position strap (8) on solenoid switch assembly (25) MTR terminal (short) and field frame terminal (12) on field frame (13).

(12) Secure strap (8) to MTR terminal with flat washer (7), lockwasher (6), and nut (5).

(13) Secure strap (8) to field frame terminal (12) with flat washer (11), lockwasher (10), and nut (9).

(14) Aline match marks and secure nose housing (1) to lever housing assembly (2) with six socket head screws (3).

o. Check pinion clearance as follows:

(1) Disconnect motor field coil connector from solenoid M terminal. This keeps motor from turning.

(2) Connect a 12 V battery positive lead to solenoid S terminal.

(3) Momentarily flash a jumper lead from solenoid M terminal to ground. Drive shift to crank position until ground is disconnected.

(4) Push pinion back towards commutator to eliminate slack movement.

(5) Measure distance between drive and drive stop. Clearance of 23/64 in. + 1/32 in. (9.1281 mm + .7937 mm) must be attained.

(6) If adjustment is required, turn plunger shaft nut to right to reduce clearance. Turn to left to increase clearance.

(7) Reinstall gasket and plug on lever housing.

(8) Remove two wick plugs and service starter with SAE 10 oil. Reinstall plugs.

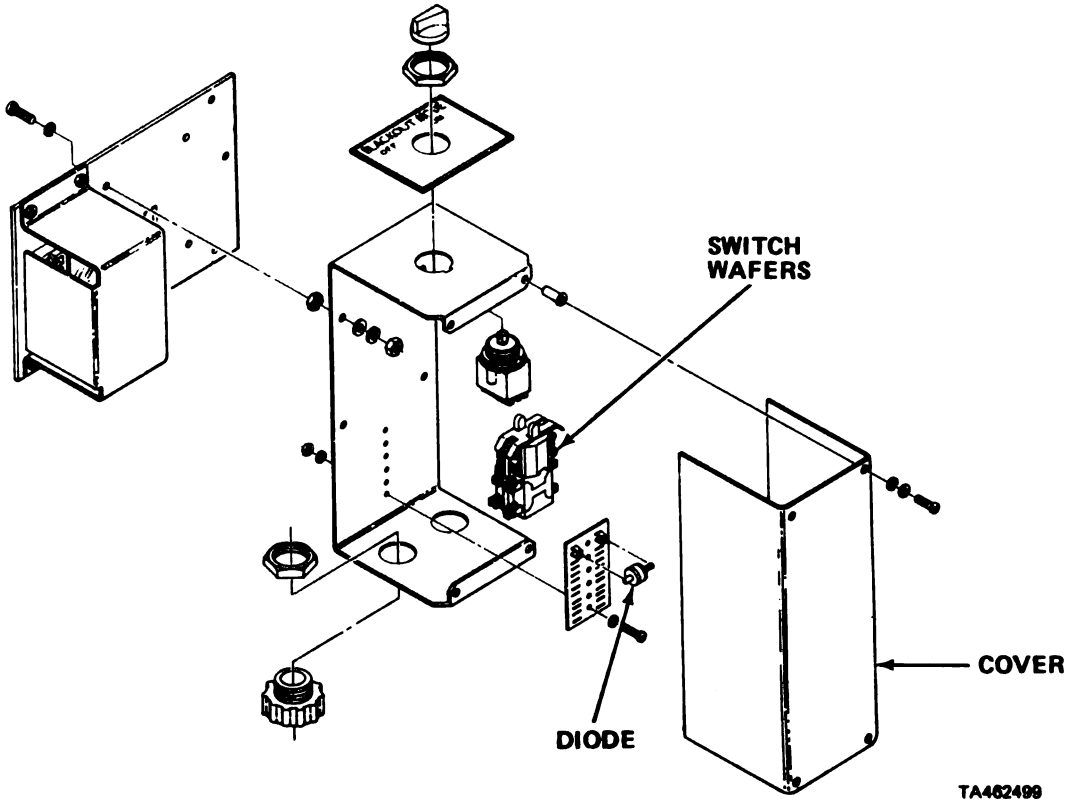
p. Install starter on test stand and perform starter no load test (para b above).

Section III. BLACKOUT SWITCH

6-6. REPAIR BLACKOUT MODE SWITCH.

a. Remove driver's seat (TM 9-2320-281-20).

b. Disconnect batteries (TM 9-2320-281-20).



c. Remove screws which secure switch cover. Remove cover.

d. Replace diode.

(1) Note polarity and pry diode from panel.

(2) Snap new diode in place, observing same polarity.

e. Replace switch wafer.

(1) Tag and disconnect wires from wafer to be replaced.

(2) Loosen screws which hold wafers together.

(3) Install new wafer and assemble wafers together with screws.

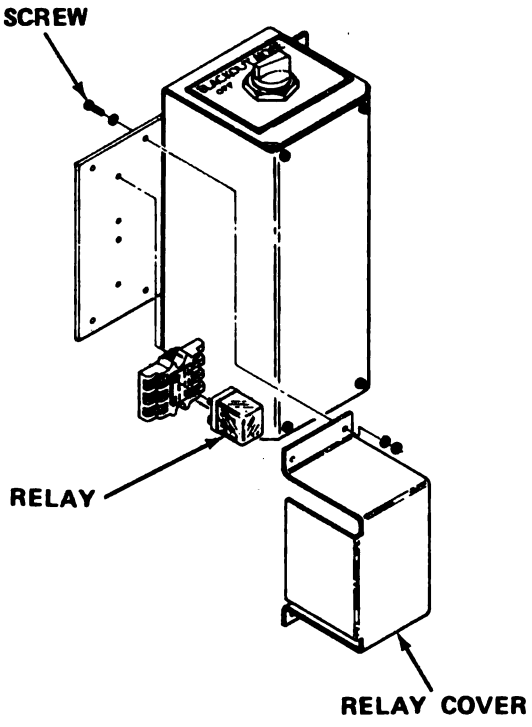
(4) Connect wires to wafer.

f. Replace switch cover and secure with screws.

g. Reconnect batteries (TM 9-2320-281-20).

h. Replace driver's seat (TM 9-2320-281-20).

6-7. REPLACE TRAILER BLACKOUT LIGHT RELAYS.



a. Remove screws which secure relay cover. Remove cover.

b. Unplug old relay. Plug in new relay.

c. Replace cover and secure with screws.

CHAPTER 7

TRANSMISSION SYSTEM REPAIR

7-1. INTRODUCTION. This chapter provides repair instructions for the following transmission system components:

a. Transmission Assembly (Section I).

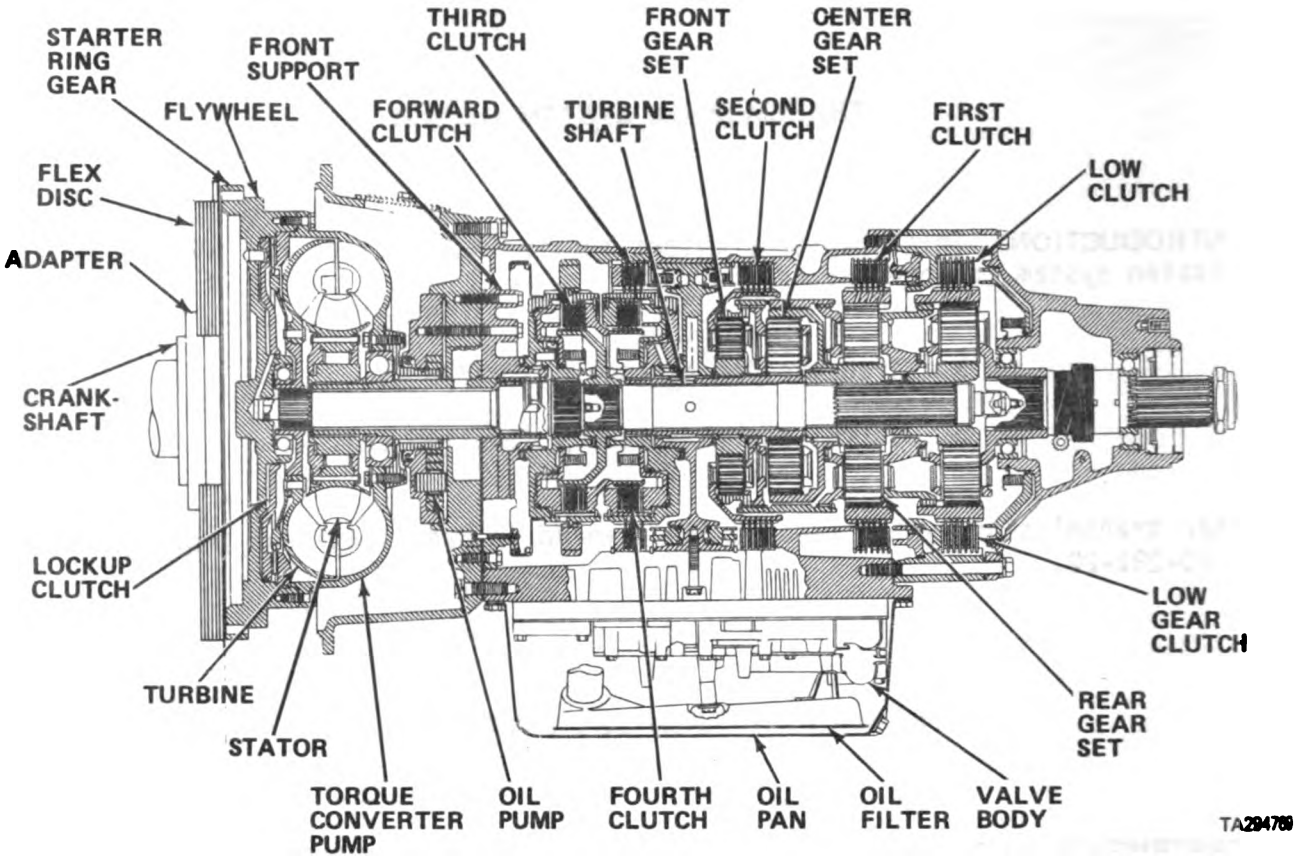
b. Shift Control Assembly (Section II).

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

Section I. TRANSMISSION ASSEMBLY

7-2. DESCRIPTION AND SUBASSEMBLIES

a. GENERAL. The Detroit Diesel Allison Model HT 754CRD transmission is a 5-speed forward automatic drive transmission with one reverse speed. When starting the vehicle from a stop, the transmission torque converter automatically engages as the engine rpm increases. The operator initiates the gear ratio selection by moving the lever of the ratio selector in the cab. The shift in the transmission is controlled by hydraulic pressure acting on clutches in the transmission.



b. SUBASSEMBLIES. The transmission consists of the following major components:

(1) Input Drive: A steel laminated flex disk assembly connects the engine crankshaft and flywheel assembly. The inner circumference of the flex plate bolts to an adapter which, in turn, bolts to the engine crankshaft. The plate's outer circumference bolts to the flywheel. The flywheel is bolted to the torque converter pump. The starter ring gear is an integral part of the flex disk assembly.

(2) Torque Converter/Lockup Clutch: The torque converter consists of 3 elements - pump, turbine, and stator. The pump is the input element and is driven by the engine through the flywheel. The turbine is the output element and is splined to the forward clutch and turbine shaft assembly. The stator is the reaction (torque multiplying) element. The force of hydraulic fluid in the torque converter causes the elements to rotate together as engine rpm increases. The lockup clutch provides a direct mechanical link between the flywheel and the converter turbine. The lockup clutch is activated by hydraulic pressure and is engaged once a predetermined rpm is reached.

(3) Oil Pump Assembly: The oil pump is contained within the torque converter housing and driven by the torque converter pump. It provides hydraulic oil under pressure to the hydraulic system.

(4) Front Support and Valve Assembly: The front support and valve assembly is connected to the rear of the torque converter housing. It provides support for the forward clutch and turbine shaft. Contained within the support assembly are three valves - main pressure regulator valve assembly, lockup shift valve, and converter bypass valve.

(5) Forward Clutch and Turbine Shaft: The forward clutch has multiple functions. When engaged with the low clutch, the forward clutch produces first gear. When engaged with first, second, third, or fourth clutch, it produces second, third, fourth, or fifth gear, in that sequence. The forward clutch consists of a clutch housing with turbine shaft attached, ten clutch plates, a piston, a forward clutch hub, and a fourth clutch driving hub.

(6) Fourth Clutch: The fourth clutch has a dual function. Engaged with the forward clutch, it produces fifth gear. Engaged with low clutch, it produces reverse gear. It consists of five internally splined and five externally tanged clutch plates, a clutch piston housing, and a piston.

(7) Second, Third Clutches, and Center Support: The second and third clutches perform only one function. When engaged with forward clutch, the second clutch produces third gear while the third clutch produces fourth gear. The second and third clutches are composed of two identical pistons, twenty-one clutch plates (13 in second clutch, 8 in third clutch) and a center support.

(8) First Clutch: The first clutch has a single function. Engaged with the forward clutch, it produces second gear. If consists of six internally spined and seven externally tanged clutch plates, and a piston.

(9) Low Clutch: The low clutch has a dual function. When engages with the forward clutch, it produces first gear. When engaged with the fourth clutch, it produces reverse gear. It consists of six internally spined and seven externally tanged clutch plates, and a piston.

(10) Planetary Gearing: The planetary gearing is composed of a gear unit and main shaft assembly, the low planetary carrier assembly, and its sun gear and ring gear. The gear unit and main shaft assembly contains three planetaries called front, center, and rear, so designated because of their location in relation to each other in the gear unit. Each of the three planetaries has a sun gear and a ring gear, which are interconnected by the main transmission shaft and a connecting drum. The low planetary gear set is located behind the gear unit and main shaft assembly. It contains a sun gear, a carrier assembly, and a ring gear. The sun gear is splined to the main shaft, and the rear carrier is splined to the low ring gear, thereby interconnecting the four planetary systems. This interconnection of the planetary input, reaction, and output elements - and connections with the forward and fourth clutches - produces five forward speeds and one reverse speed.

(11) Valve Bodies: Provide pressure and flow control of oil in hydraulic system. Pressurized oil from the oil pump enters the valve bodies and is either directed to the clutches or bypassed by regulators to the oil pan.

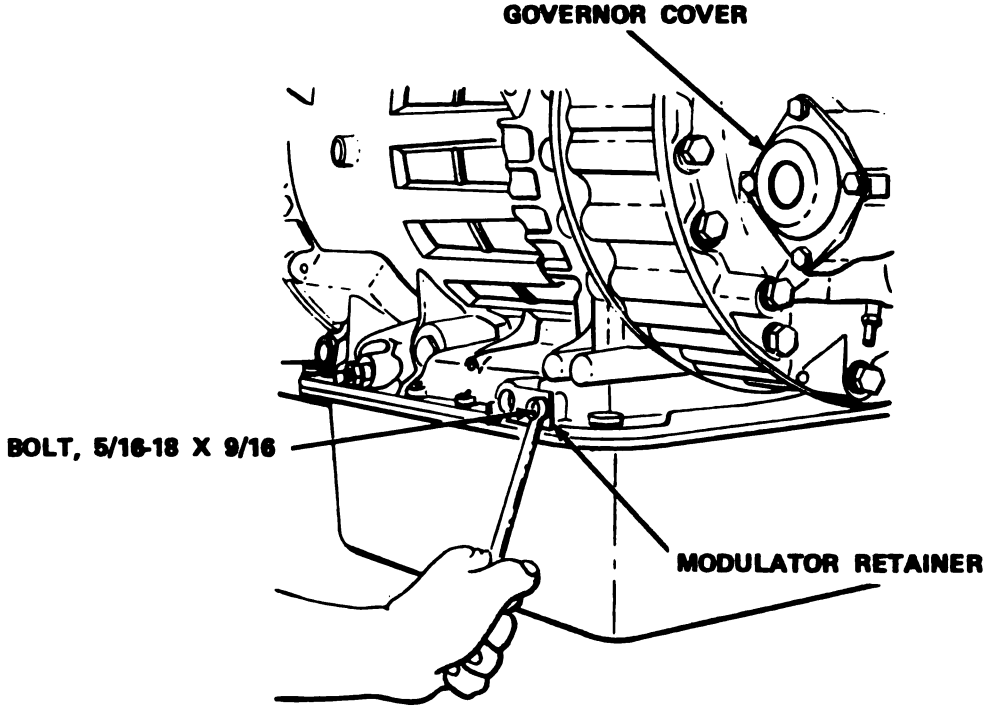
(12) Oil Pan: The pressed steel pan is the reservoir for the hydraulic system. A wire mesh filter is contained within the pan and strains the oil prior to entering the hydraulic system.

7-3. DISASSEMBLE TRANSMISSION ASSEMBLY

a. Remove external components.

(1) Remove self-locking retaining nut and output flange.

(2) Remove inspection cover on top of converter housing.



(3) Remove governor cover and gasket.

(4) Remove governor by rotating clockwise while carefully pulling outwards.

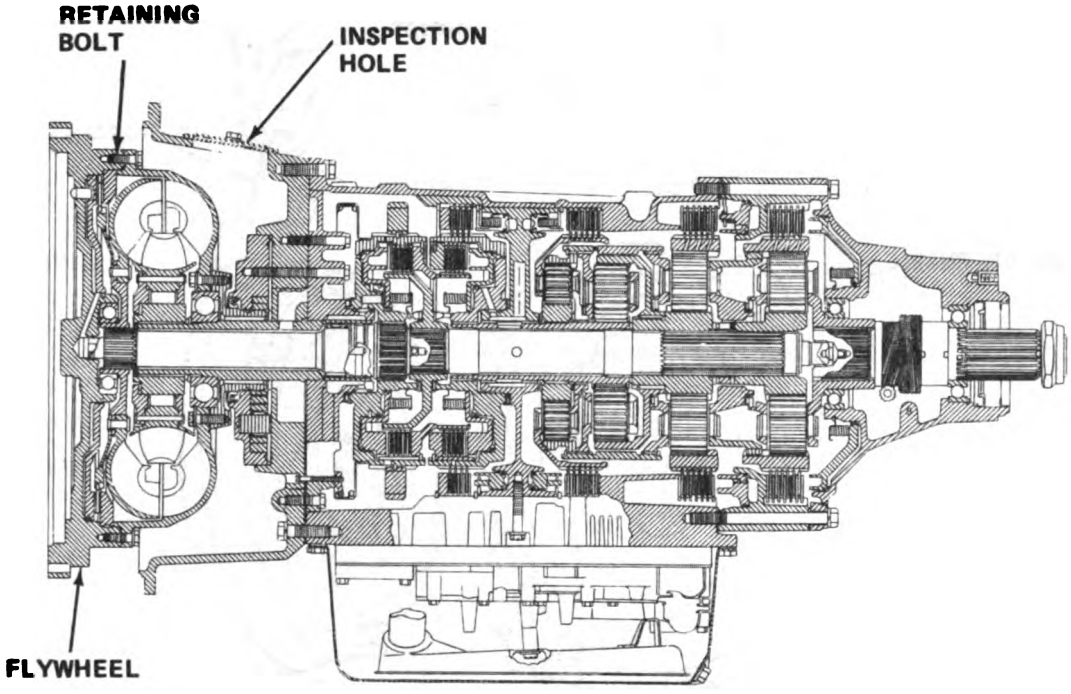
(5) Remove bolt and modulator retainer.

(6) Remove external oil filter assembly.

b. Remove flywheel, turbine, and lockup clutch.

NOTE

Position transmission horizontally.



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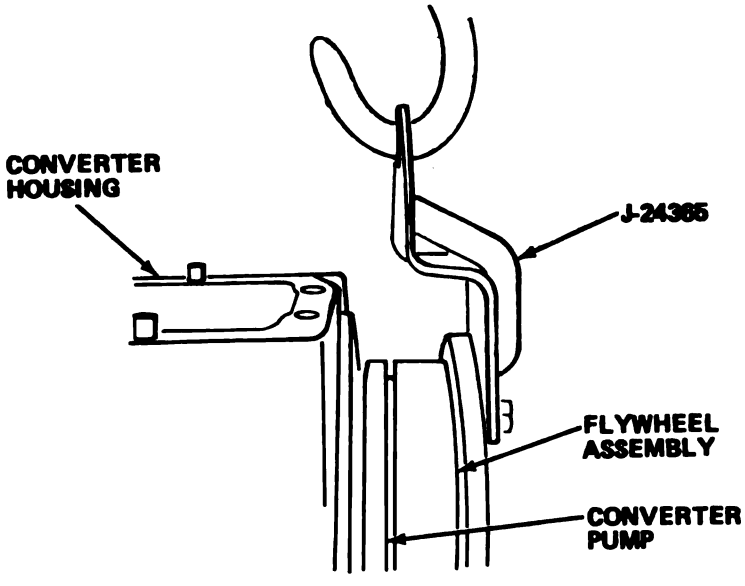
(1) Remove twenty-nine of thirty flywheel retaining bolts by working through inspection hole.



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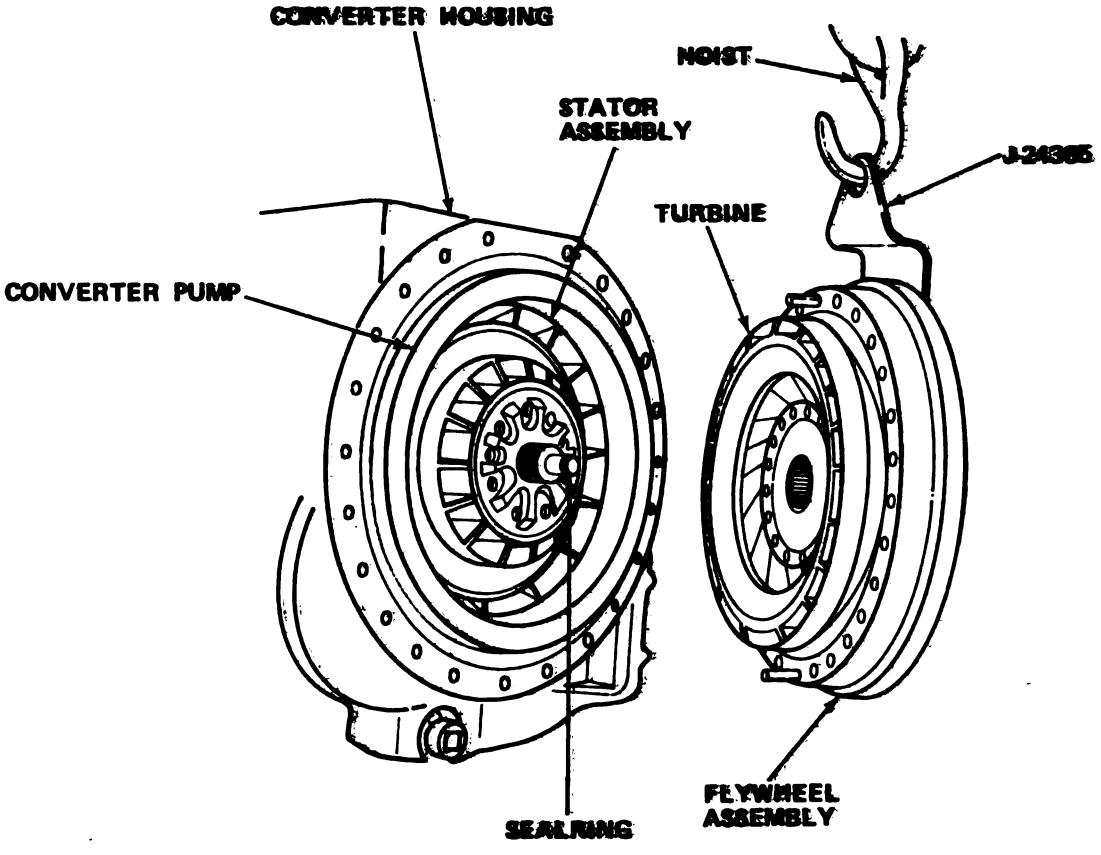
(2) Install lifting tool J-24365 onto flywheel.

(3) Attach a hoist to lifting tool to support weight of flywheel during removal.



CAUTION

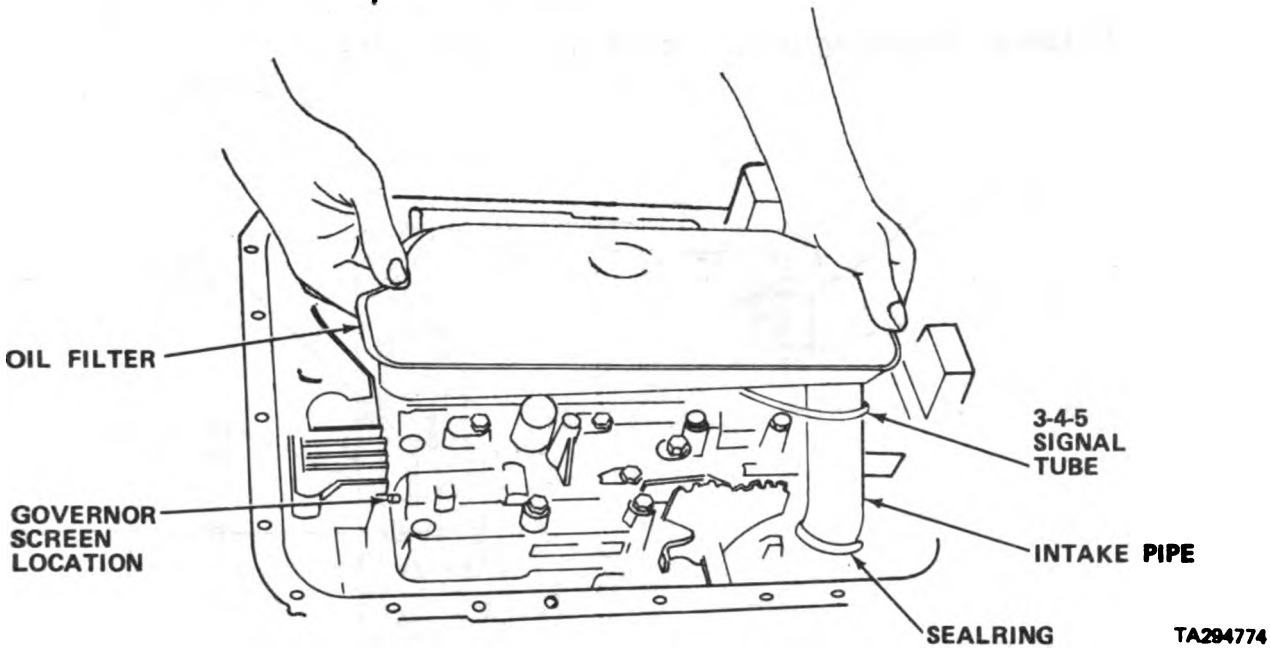
USE CARE WHEN REMOVING FLYWHEEL ASSEMBLY TO PREVENT TURBINE FROM FALLING OFF, OR SEVERE DAMAGE WILL RESULT.

(4) Remove remaining bolt and carefully separate flywheel assembly from converter housing.

(5) Remove turbine from flywheel assembly (para 7-4a).

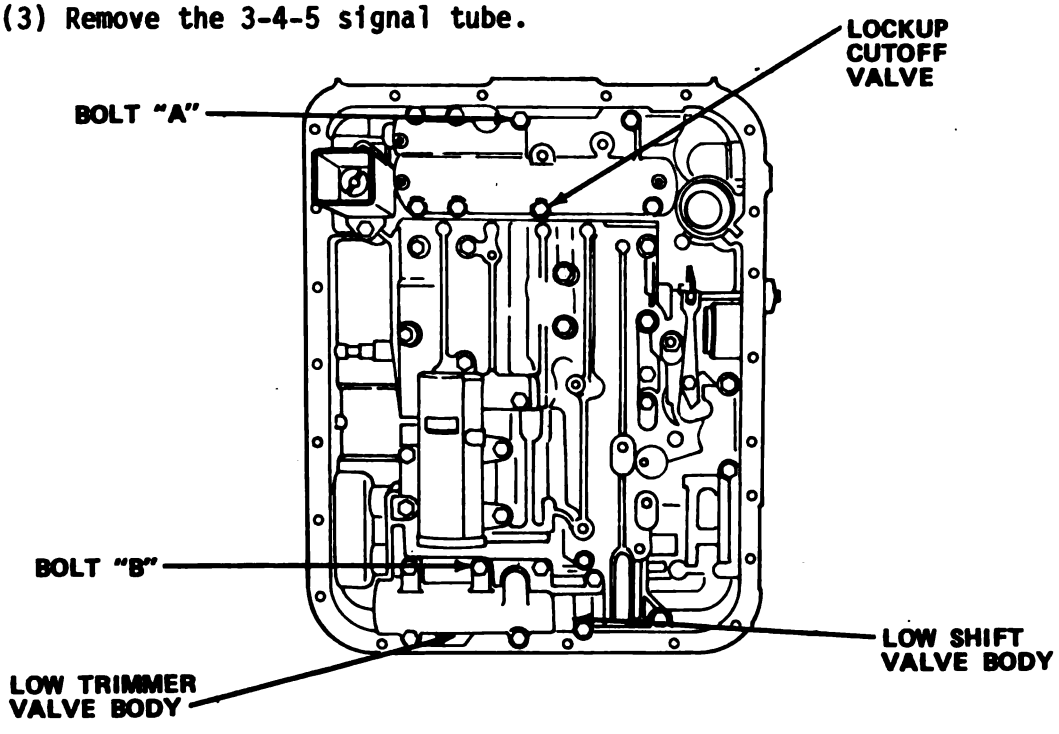
c. Remove oil pan, filter, and valve body.

(1) Position transmission vertically, front converter housing end upwards, and remove oil pan.



(2) Remove oil filter, seal ring, and spacer.

(3) Remove the 3-4-5 signal tube.

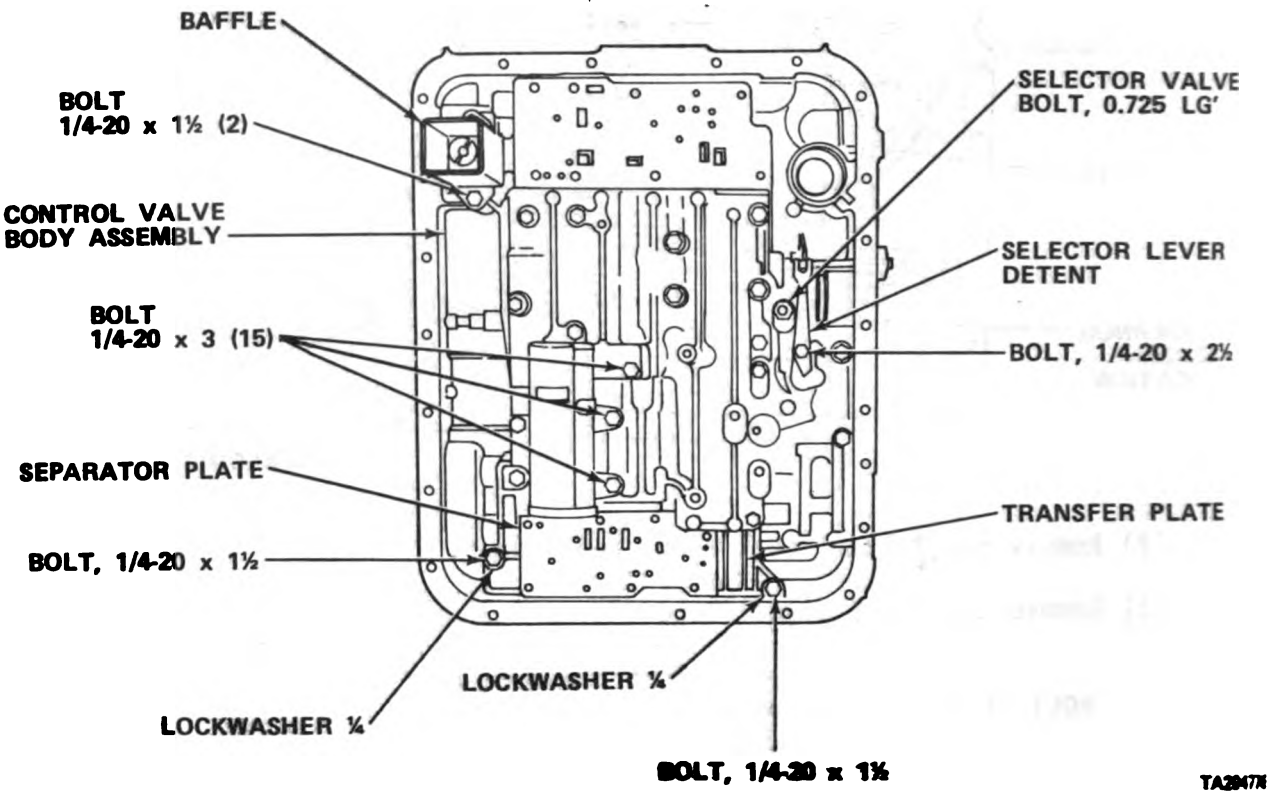


(4) Remove bolts "A" and "B" from valve body and install two J-24315-3 guide bolts.

(5) Remove remaining retaining bolts and remove low trimmer valve body.

(6) Remove retaining bolt and remove low shift valve body.

(7) Remove retaining bolts and lockup cutoff valve.



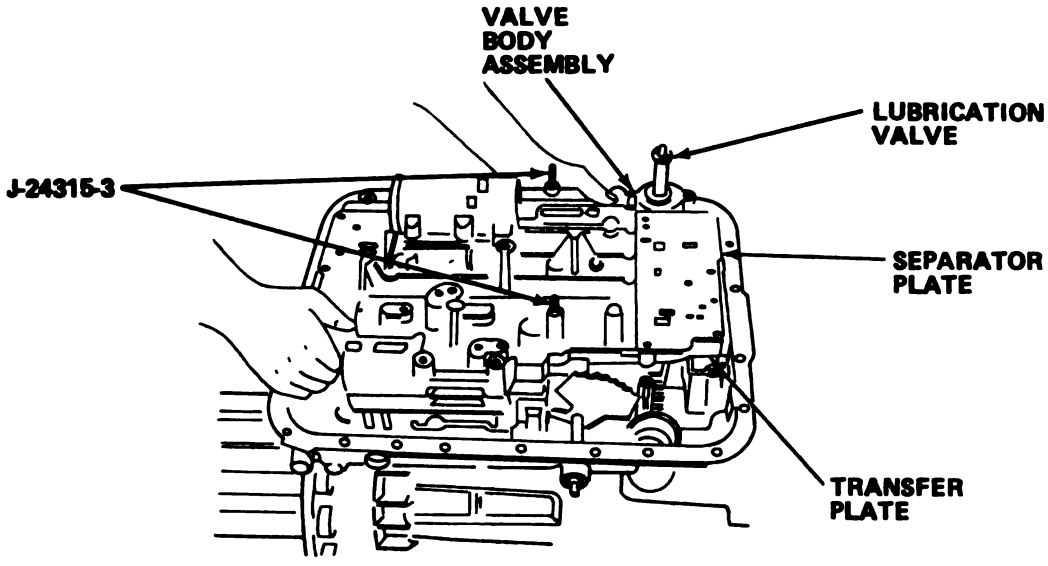
NOTE

Do not remove selector valve retaining bolt.

(8) Remove retaining bolt and selector lever detent.

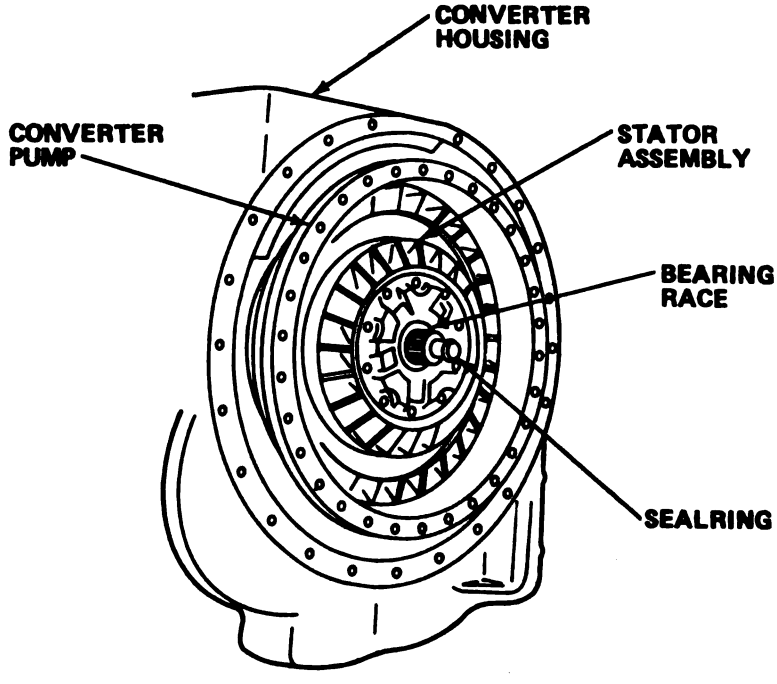
(9) Remove retaining bolts and lubrication valve baffle.

(10) Remove remaining retaining bolts.

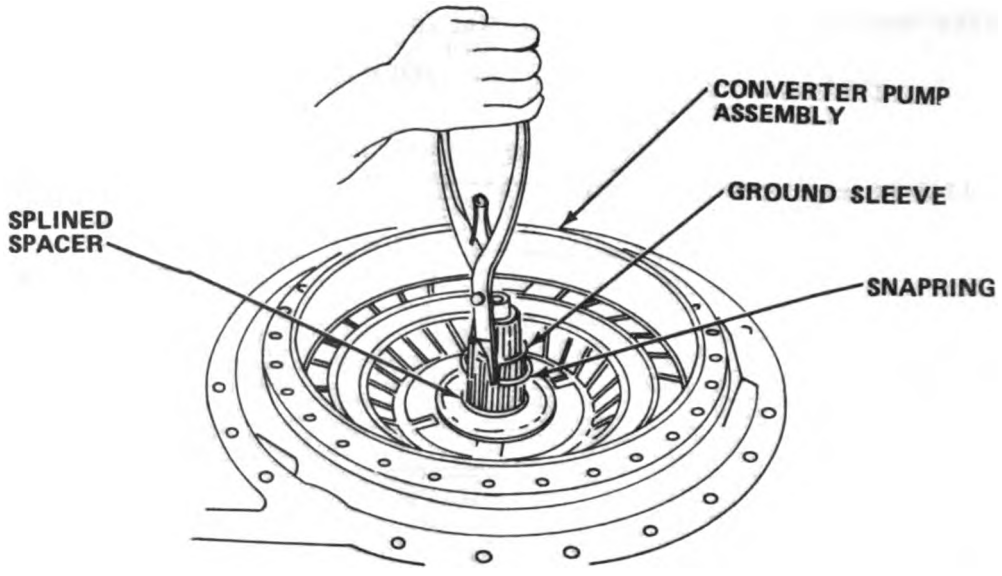


(11) Remove control valve body, separator plate, and transfer plate as a unit.

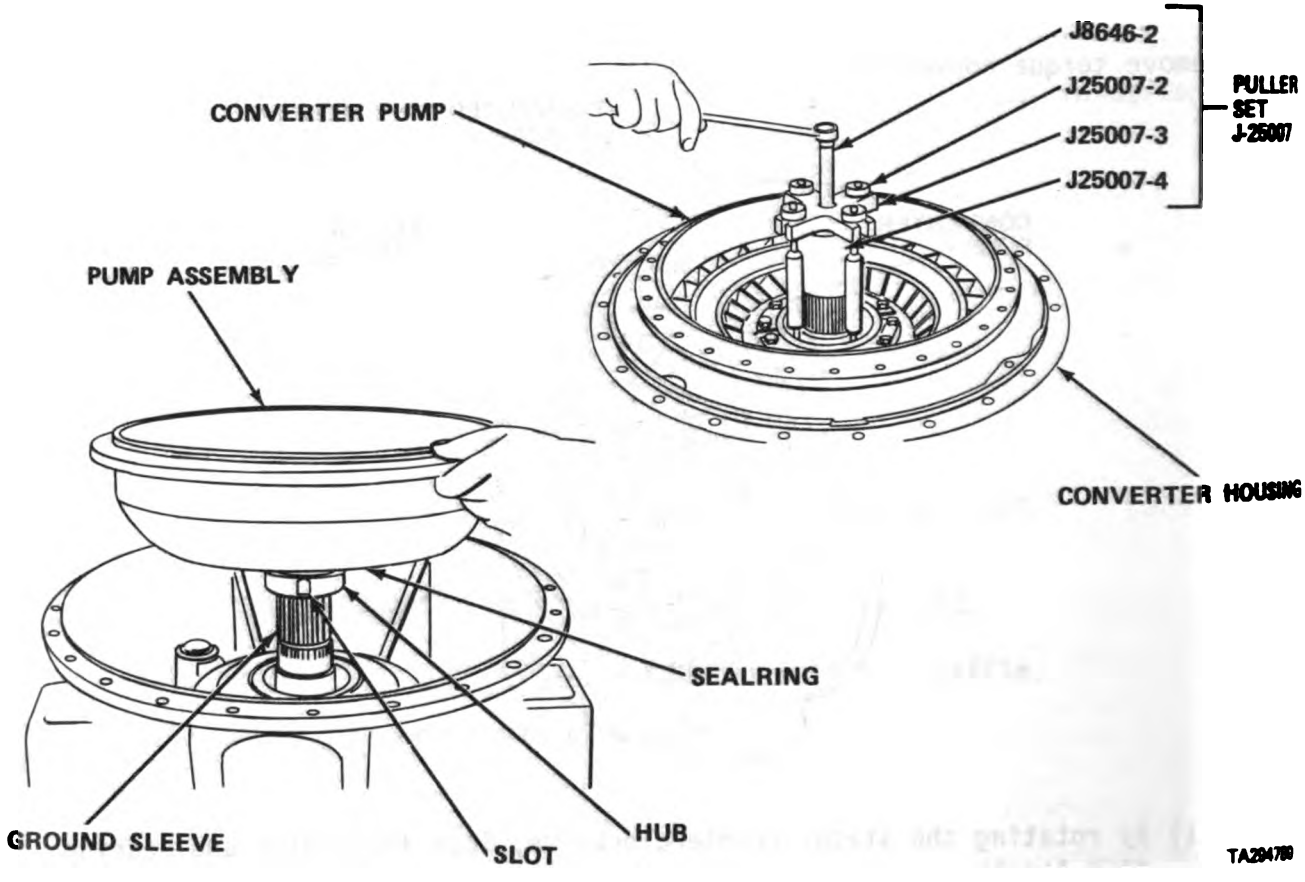
d. Remove torque converter.



(1) By rotating the stator counterclockwise, lock the stator and bearing race together and remove.

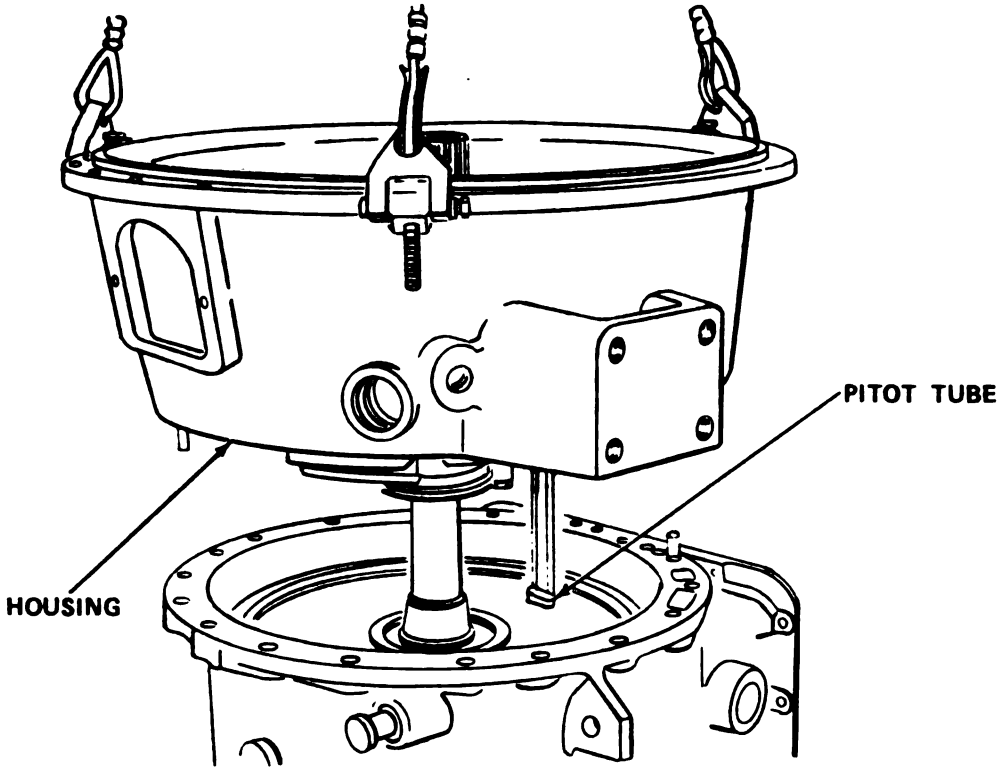


(2) Remove snapring and splined spacer from converter ground sleeve.



(3) Using puller set J-25007, remove converter pump and bearing from converter ground sleeve.

e. Remove converter housing.



NOTE

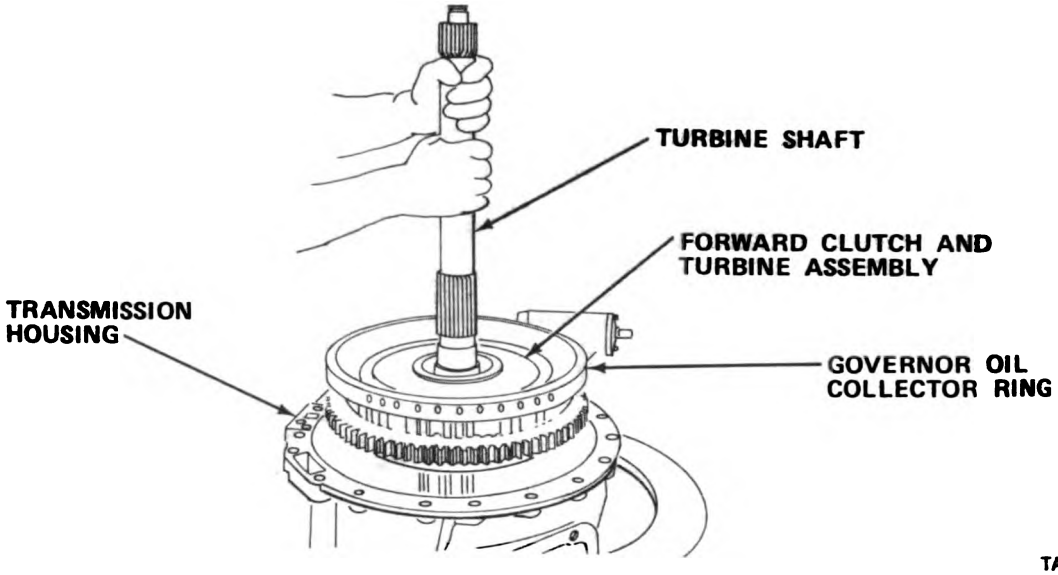
If a rebuild stand will be used, four of the converter housing bolts must be removed first, as they cannot be removed after the stand is attached.

(1) From inside converter housing, remove pitot tube retaining screws.

(2) Remove inside and outside retaining bolts and lift converter housing off transmission.

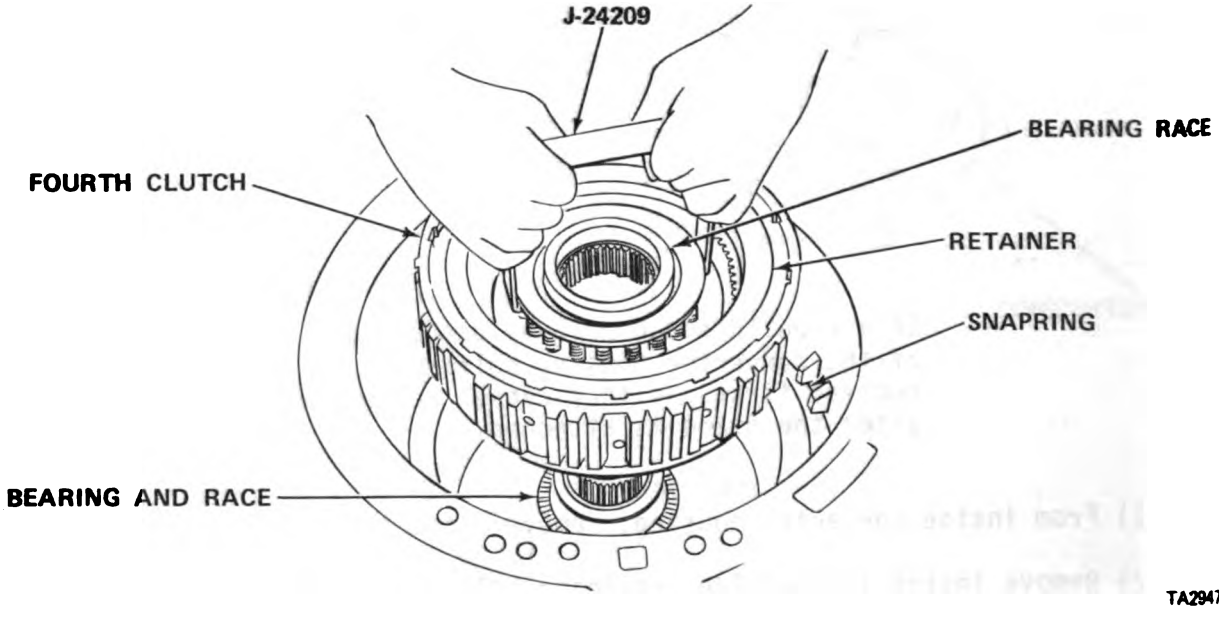
(3) Remove pitot tube freed in step 1.

f. Remove forward, fourth, and third clutches.



(1) Grasp turbine shaft and lift forward clutch and turbine assembly out of transmission housing.

(2) Remove outer race, bearing, and inner race located behind forward clutch.



(3) Using tool J-24209, remove fourth clutch assembly from housing.

(4) Remove bearing races on either side of fourth clutch assembly and retain with assembly in their correct positions.

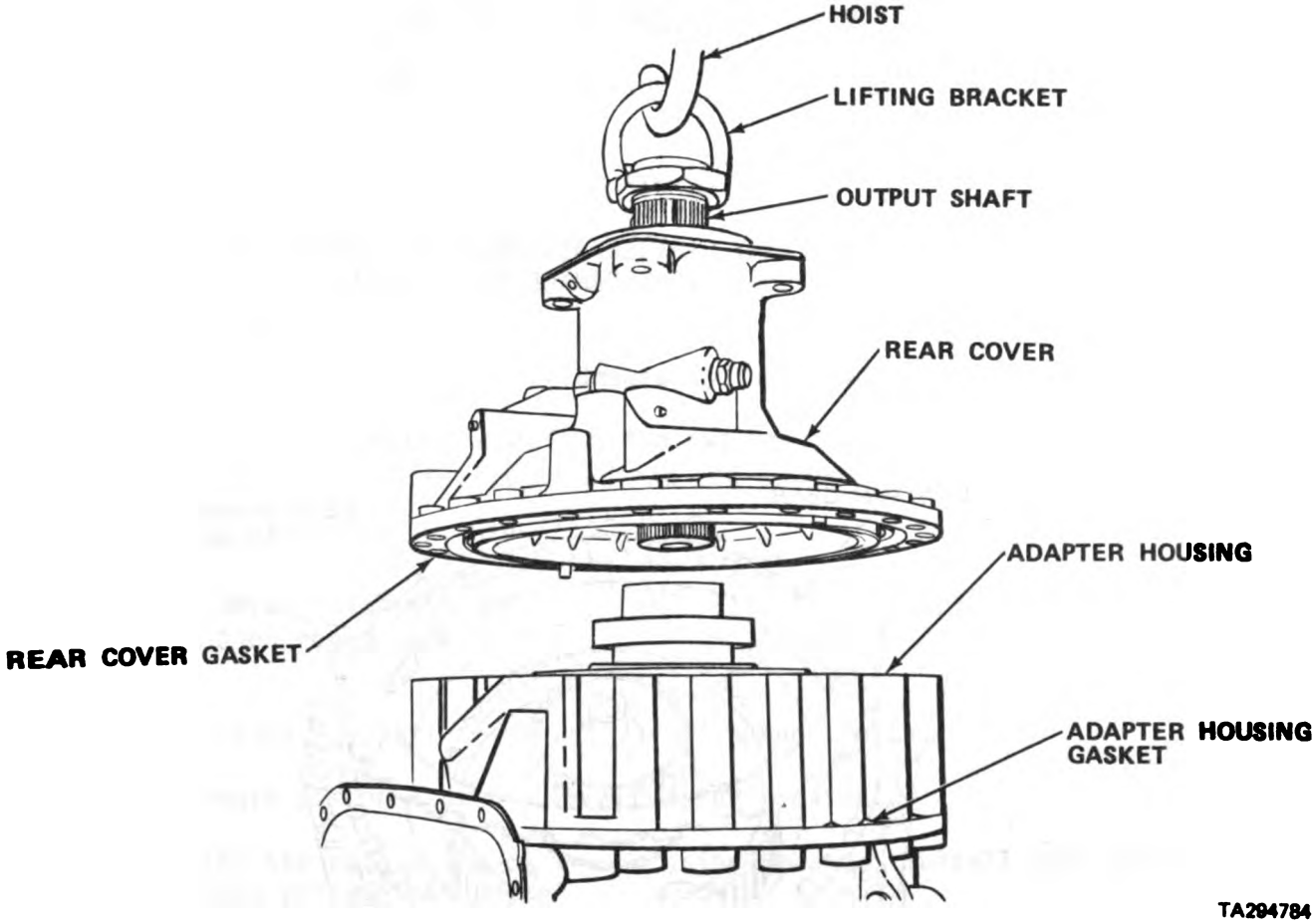
(5) Remove snapring and third clutch back plate.

NOTE

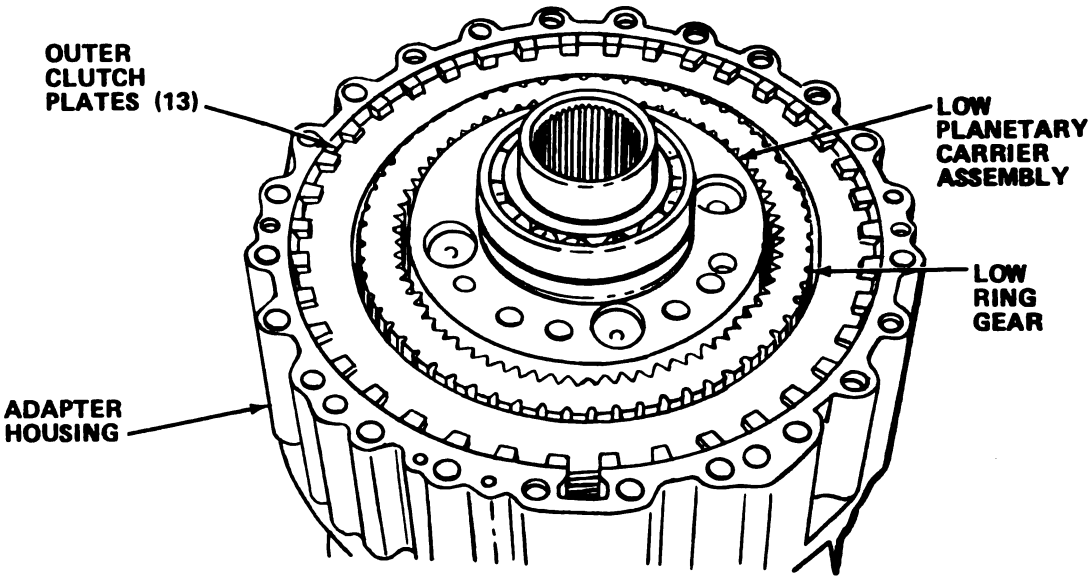
Tie third clutch plates together and label to insure proper reassembly.

(6) Remove eight third-clutch plates. Tie plates together and label.

g. Remove rear components.



(1) Remove retaining bolts and rear cover.

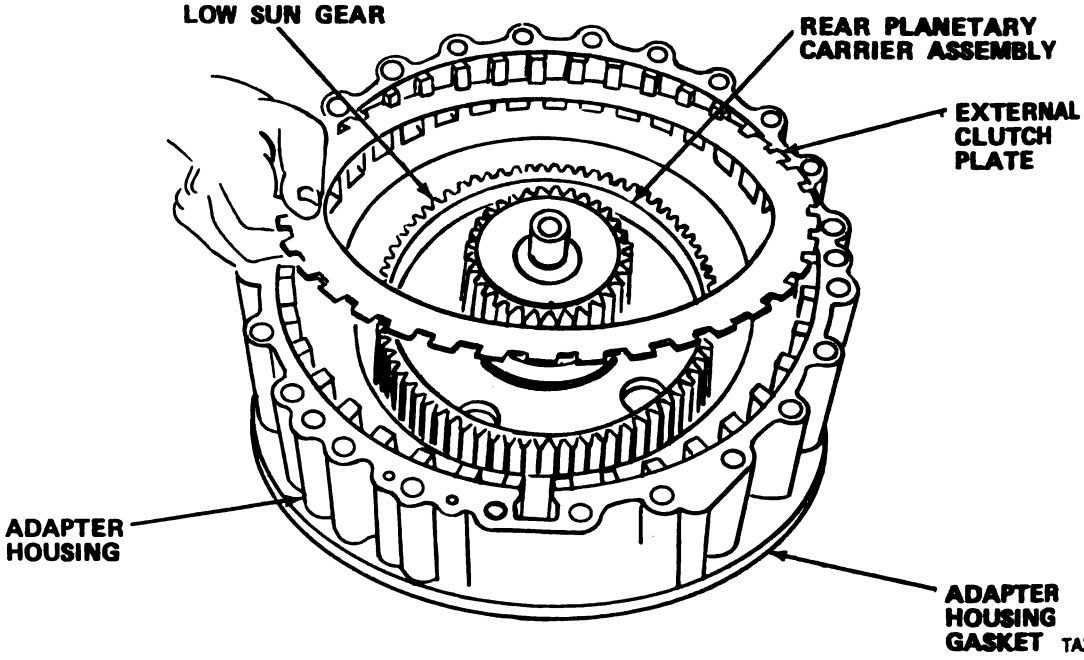


CAUTION

DO NOT LIFT PLANETARY CARRIER ASSEMBLY BY BEARING OR IT MAY SLIP OFF, AND SEVERE DAMAGE MAY RESULT.

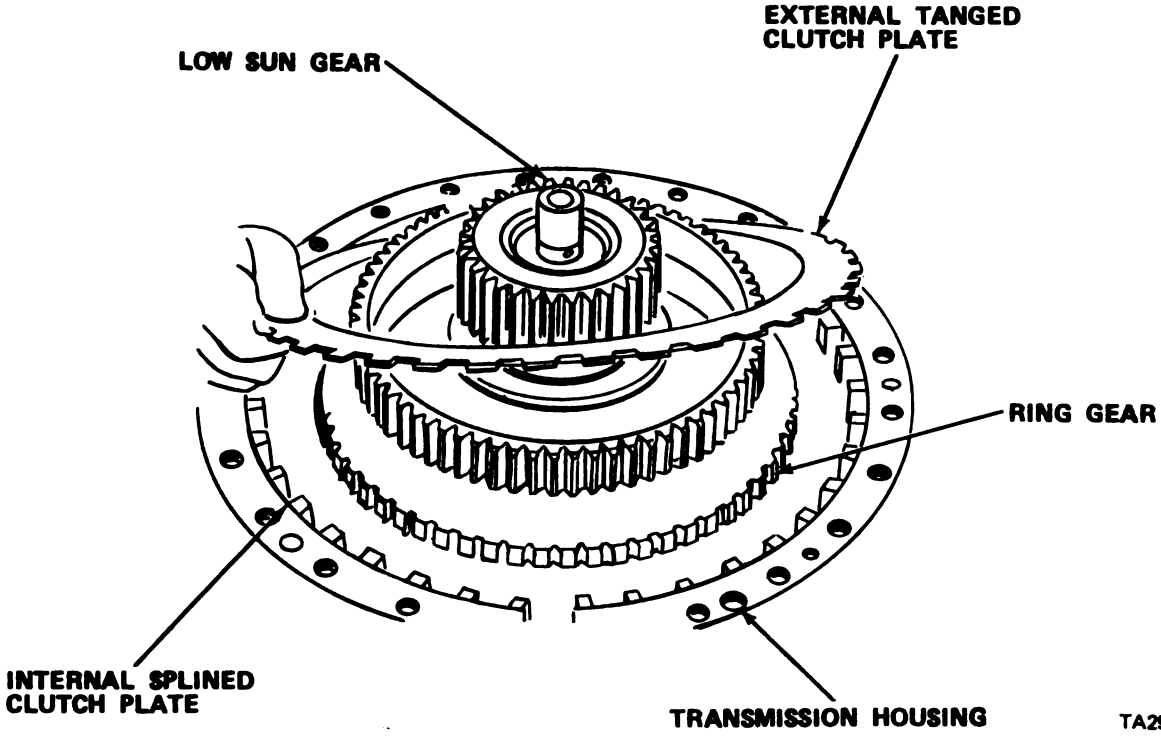
(2) Remove low planetary carrier assembly.

(3) Remove low ring gear and two outer clutch plates.



(4) Remove remaining clutch plates. Tie plates together and label to insure proper reassembly.

(5) Remove adapter housing and gasket.



(6) Remove one internal-splined and one external-tanged clutch plate.

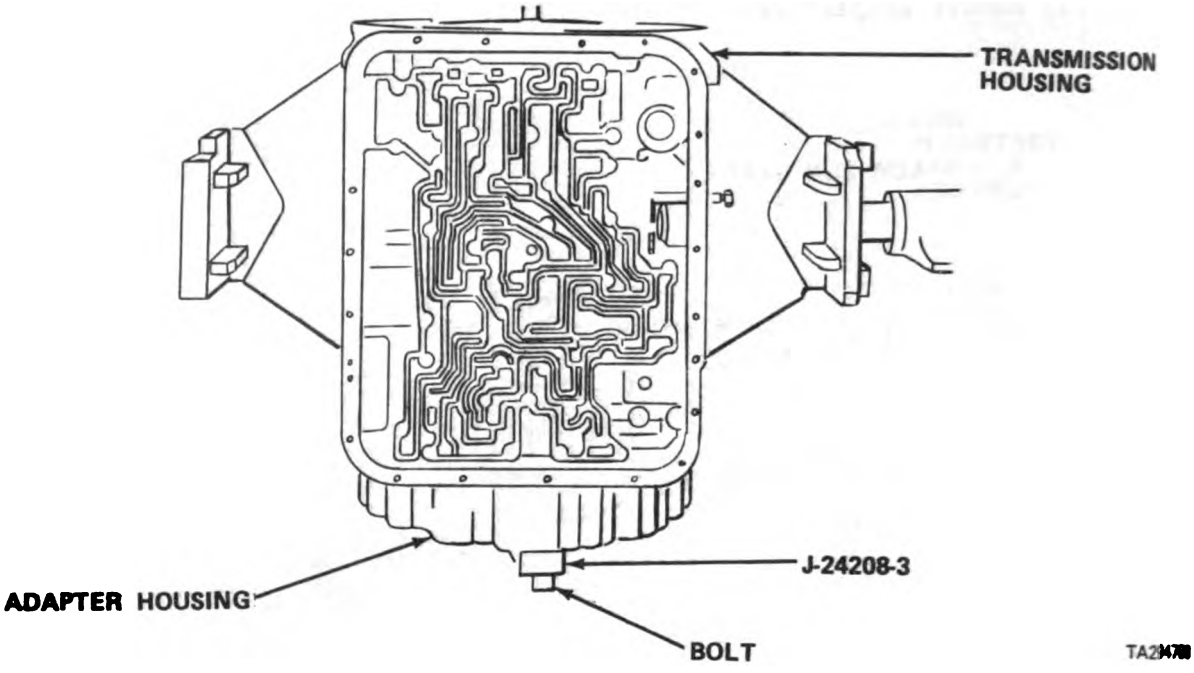
(7) Remove ring gear.

(8) Remove remaining clutch plates. Tie plates together and label to insure proper reassembly.

h. Remove center support, gear unit, and second clutch.

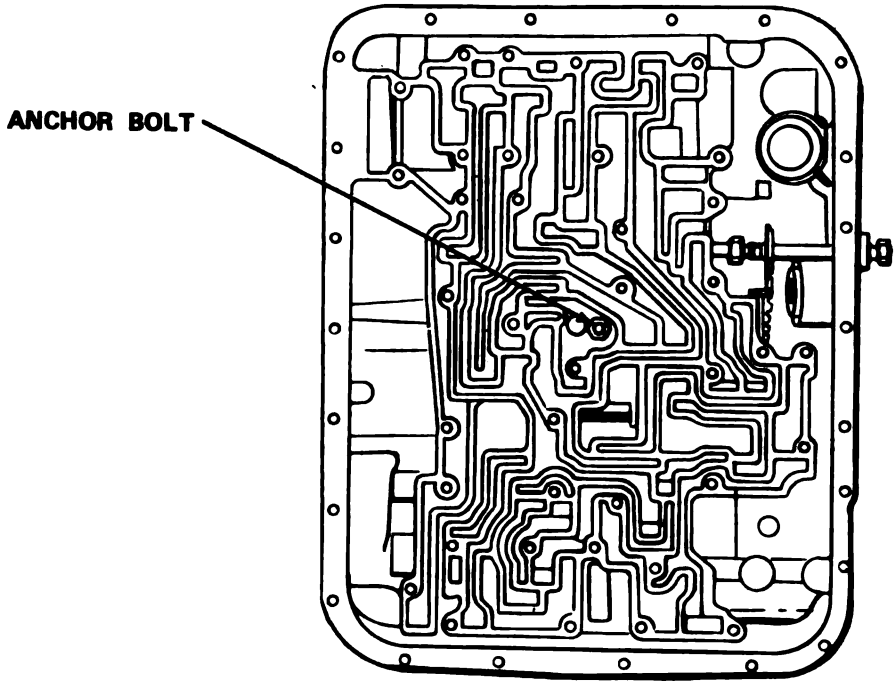
(1) Remove piston assembly from adapter housing.

(2) With the output end of transmission upwards, install the adapter housing (less piston) and gasket.

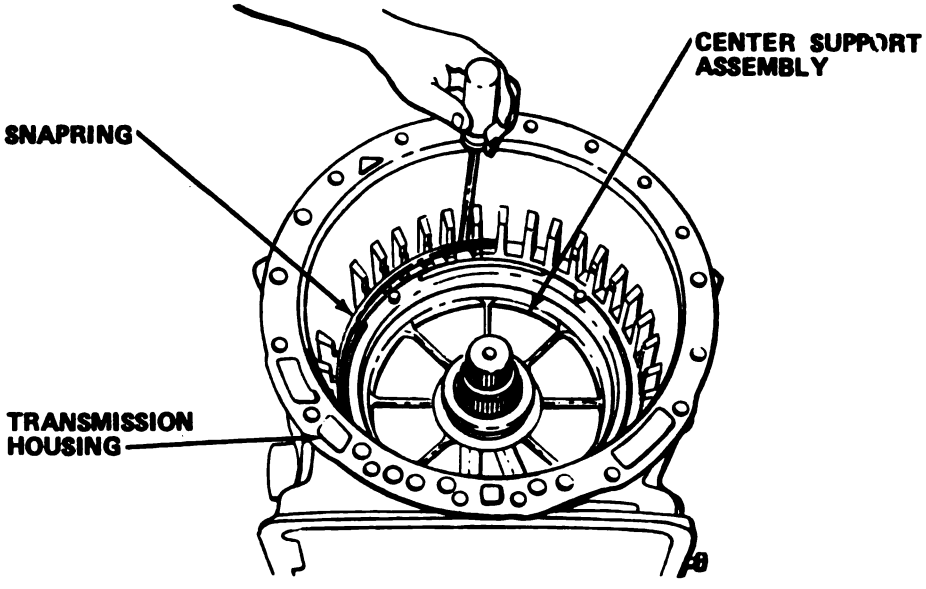


(3) Install center support compressor bar J-24208-3 across rear of adapter housing so center hole in bar engages main shaft.

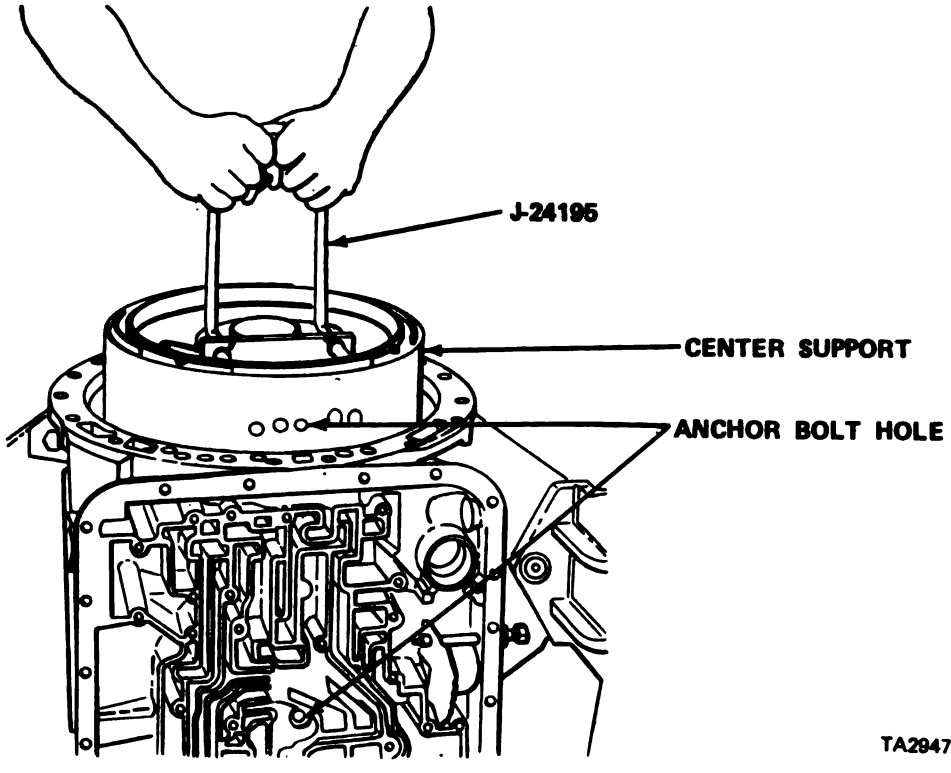
(4) Install two bolts to retain tool and adapter housing to transmission housing.



(5) Invert the transmission, input end upwards, and remove the center support anchor bolt.



(6) Remove the selective thickness snapring that retains the center support assembly.



(7) Install center support lifting bracket J-24195 into recess between the step joint seal rings on center support hub.

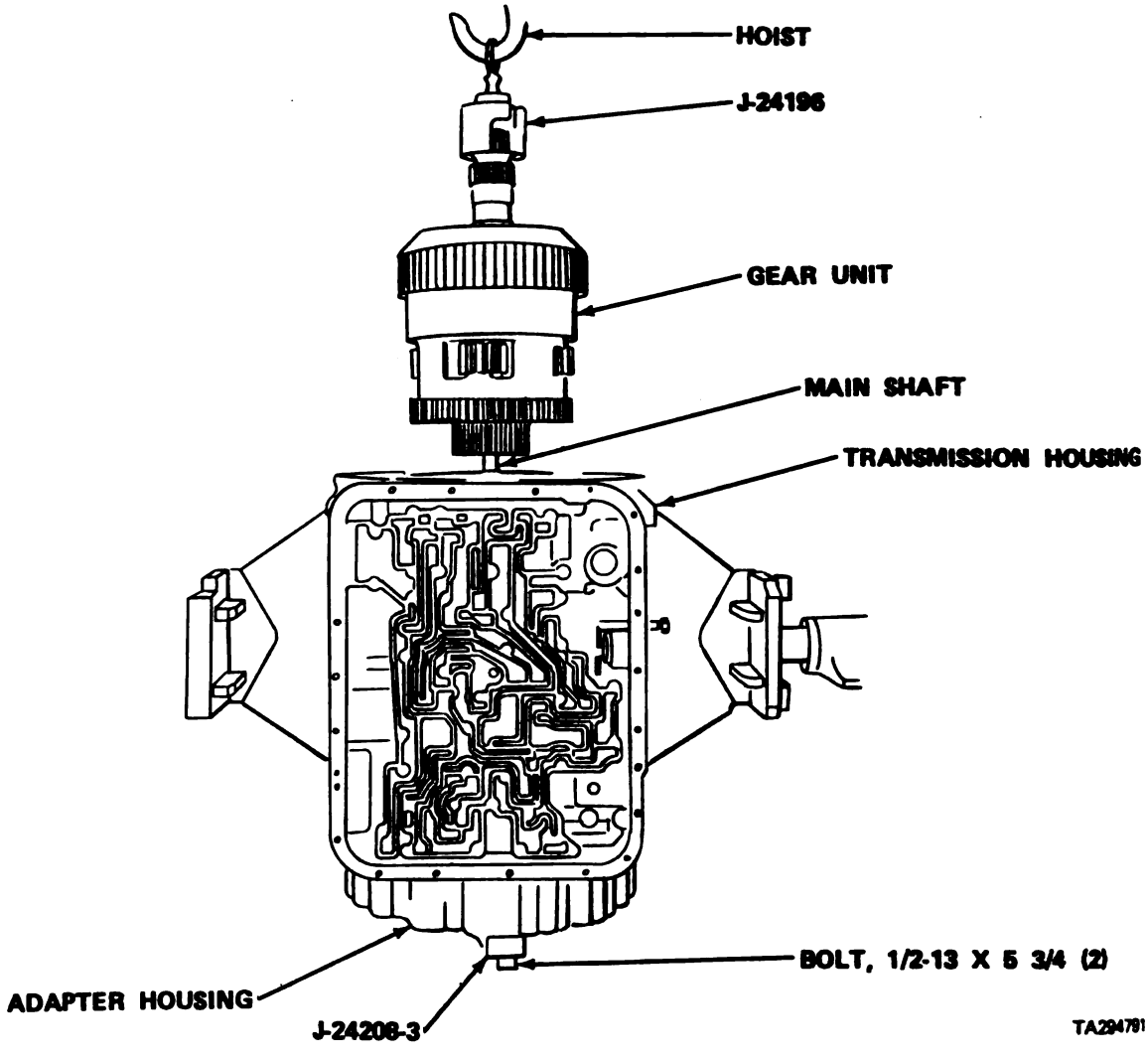
CAUTION

DO NOT USE A TORCH TO HEAT CASE. EXCESS HEAT MAY DISTORT CASE.

NOTE

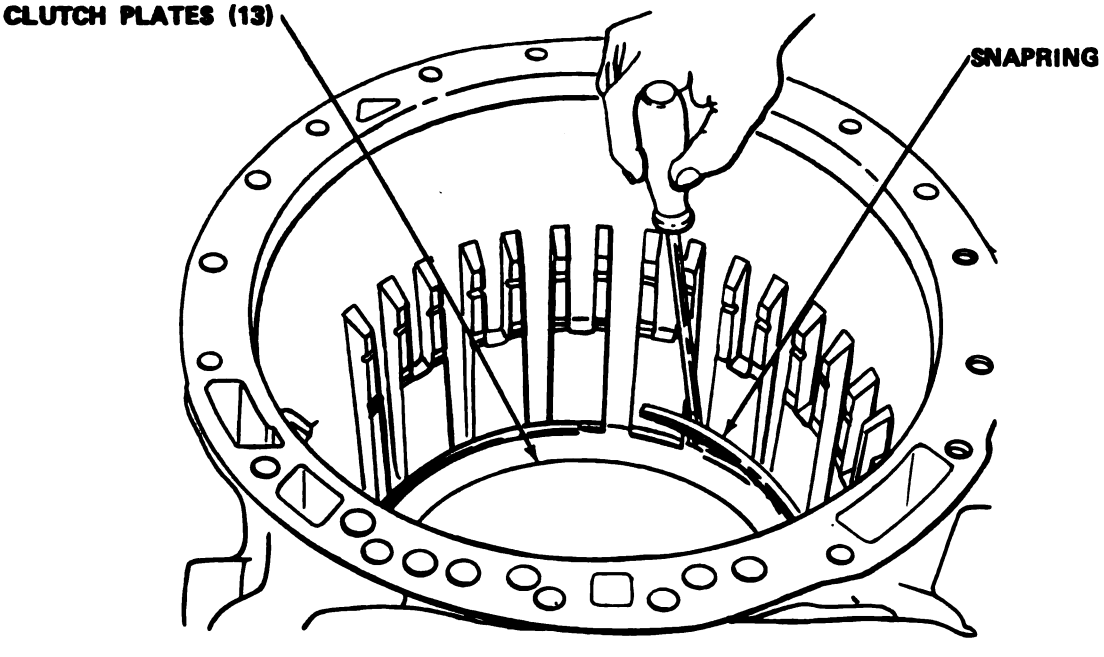
Because of close tolerances, it may be necessary to heat case with a heat lamp before removal.

(8) Lift carefully straight upwards on lifting bracket and remove center support assembly.



(9) Attach lifting bracket J-24196 to main shaft of gear unit assembly.

(10) Attach hoist to lifting bracket and remove gear unit assembly from transmission housing.



(11) Remove the second clutch plates retaining snapring.

NOTE

Tie clutch plates together and label to insure proper reassembly.

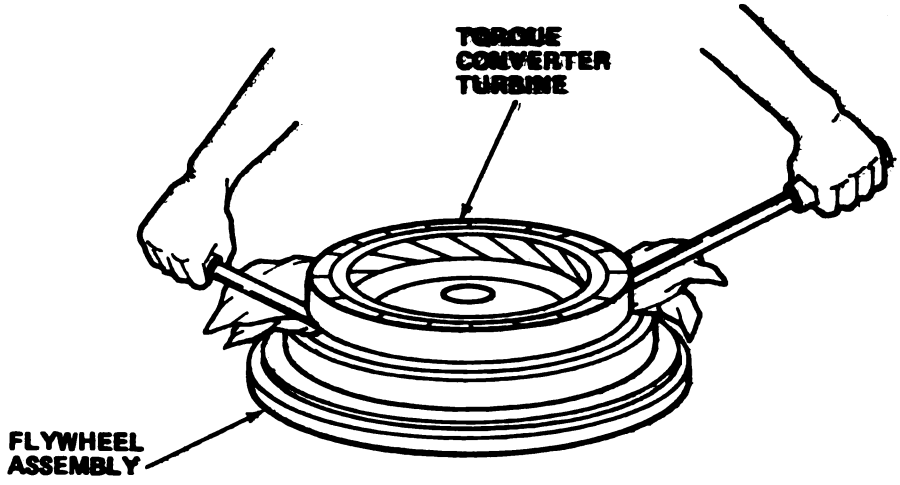
(12) Remove thirteen second clutch plates, tie together and identify.

(13) Remove center support compressor bar, adapter housing and gasket.

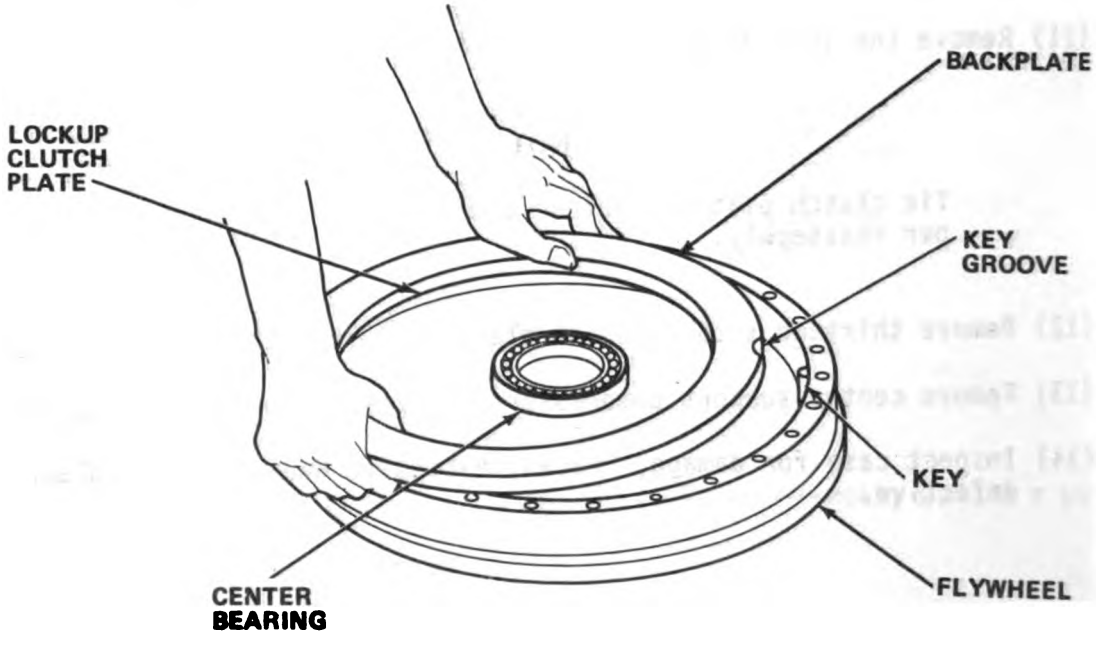
(14) Inspect case for damage, cracks, excessive wear, etc. Replace if defective.

7-4. REPAIR SUBASSEMBLIES

a. Repair flywheel and lockup clutch.

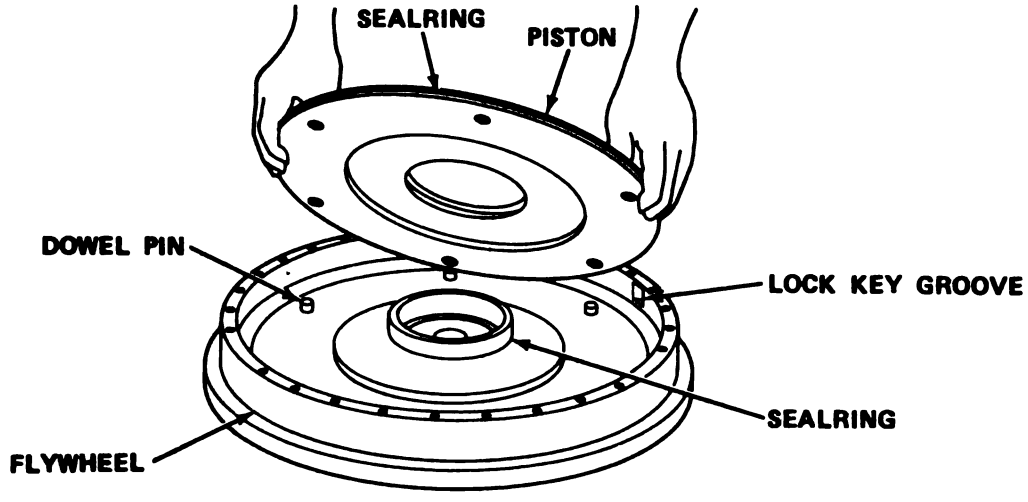


(1) With flywheel assembly face down on table, remove torque converter turbine with two cushioned pry bars.



(2) Remove center bearing, lockup clutch back plate, and key from flywheel.

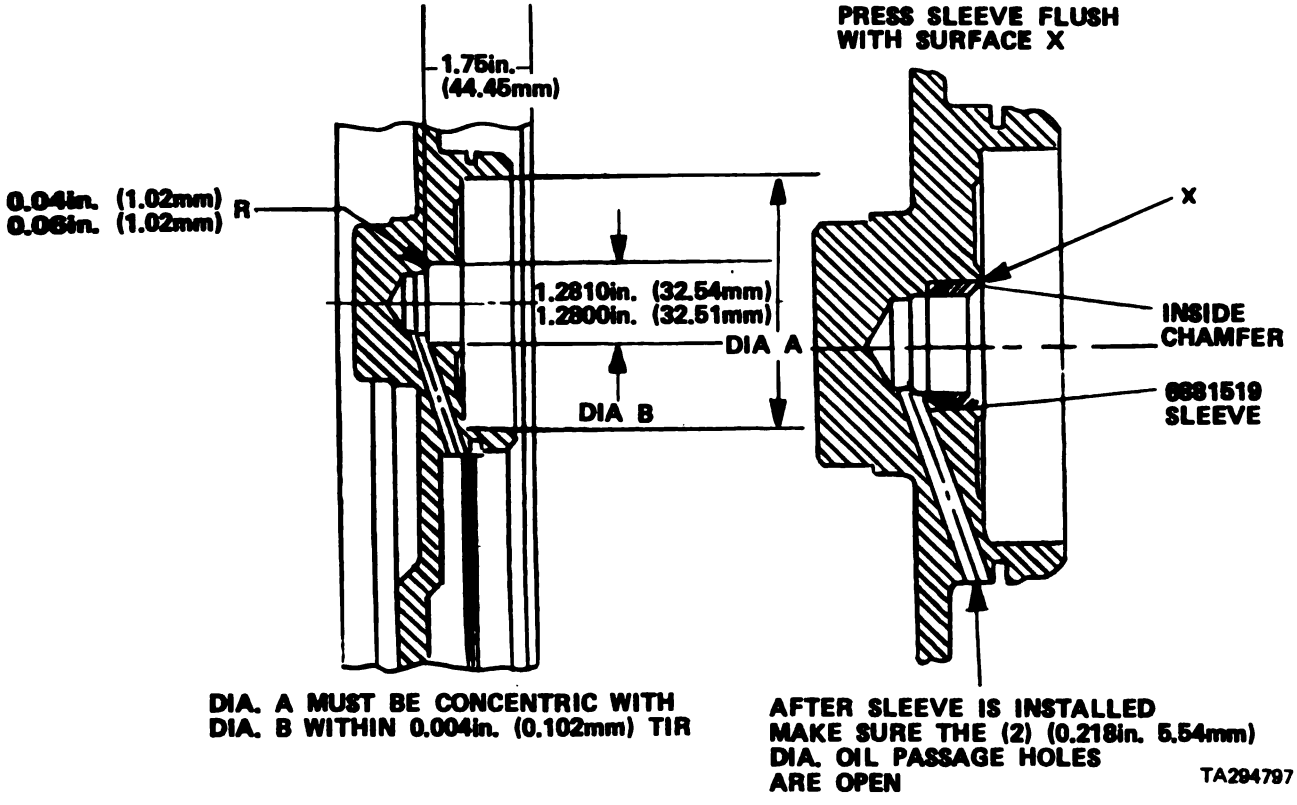
(3) Remove lockup clutch plate.



(4) Remove lockup clutch piston. Remove seal ring from piston outer groove.

(5) Remove seal ring from inner flywheel hub.

(6) Measure inside diameter of flywheel bore seal ring surface. If diameter exceeds 1.007 in. (25.578 mm), bore must be reworked as follows:



(a) Remachine flywheel bore to a diameter of 1.280 to 1.281 in. (32.512 to 32.537 mm) and to a depth of 1.75 in. (44.45 mm) from converter pump mounting flange of flywheel.

(b) Machine a radii of 0.04 to 0.06 in. (1.02 to 1.52 mm) at the back of the bore.

(c) Cool sleeve (part no. 6881519) in dry ice for 30 min before installing.

CAUTION

PROPER ALINEMENT OF SLEEVE IS NECESSARY TO PREVENT DAMAGE.

(d) Coat outside of sleeve with sleeve retaining compound.

(e) With chamfer outward, press sleeve flush with face X of flywheel.

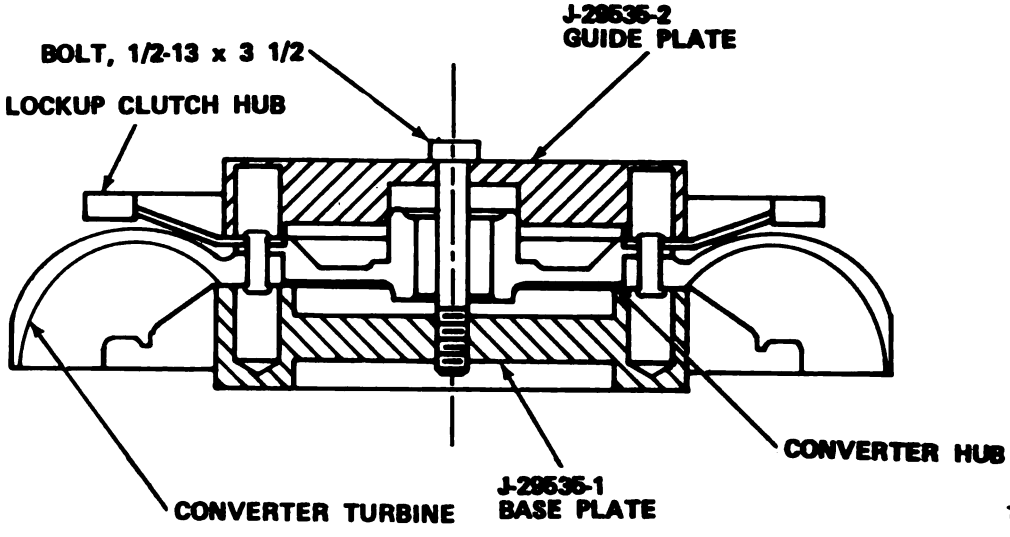
(f) After sleeve is installed, be sure oil passage holes are open.

b. Repair converter turbine.

NOTE

Do not disassemble turbine unless drive gear or turbine hub must be replaced. If converter turbine is damaged, replace entire assembly.

(1) Punch mark relationship of lockup clutch hub and turbine.

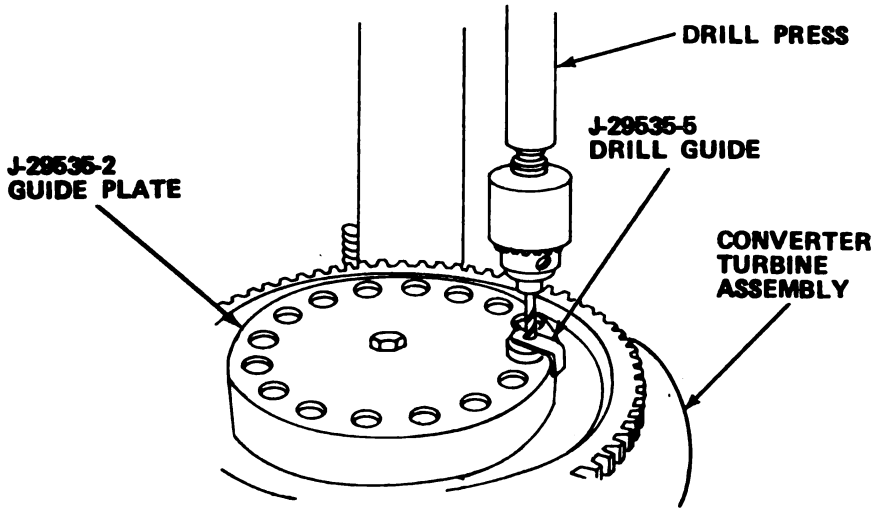


(2) Place base plate J-29535-1 on work bench, hole side up.

(3) Place converter turbine, hub side up on base plate alining rivets with base plate holes.

(4) Place guide plate J-29535-2 on top of converter turbine hub while centering rivets in guide plate holes.

(5) Install clamping bolt to retain guide plate, converter turbine, and base plate together. Torque bolt to 50 ft lbs (68 N•m).

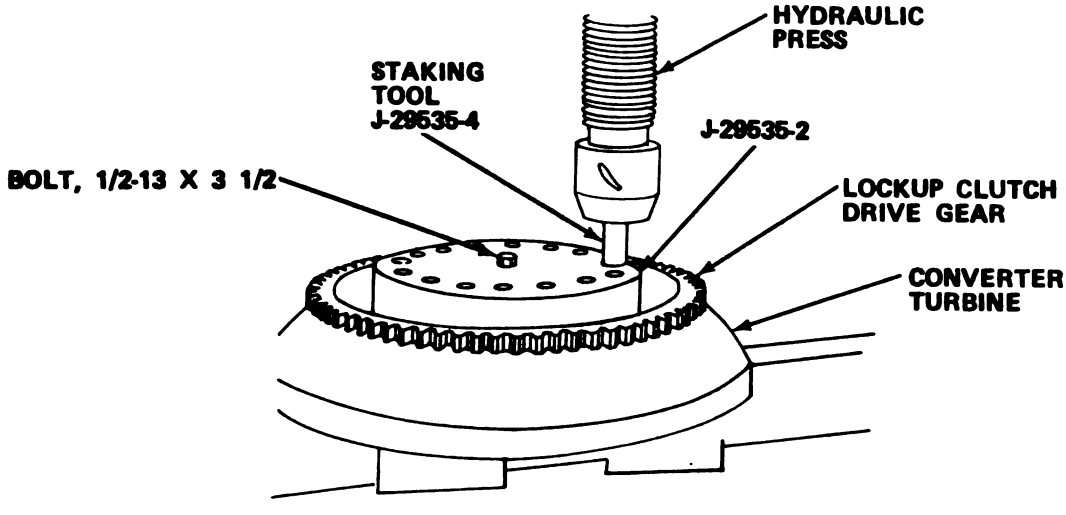


(6) Place drill guide J-29535-5 into guide plate hole.

(7) Using a 0.25 in. (6.35 mm) drill in a drill press, drill approximately 0.19 in. (4.82 mm) deep into rivet. Drill each rivet using guide.

CAUTION

USE ONLY A HYDRAULIC PRESS TO REMOVE RIVETS OR DAMAGE MAY RESULT.



(8) Install rivet removing tool J-29535-3 into guide plate and press each rivet out with hydraulic press.

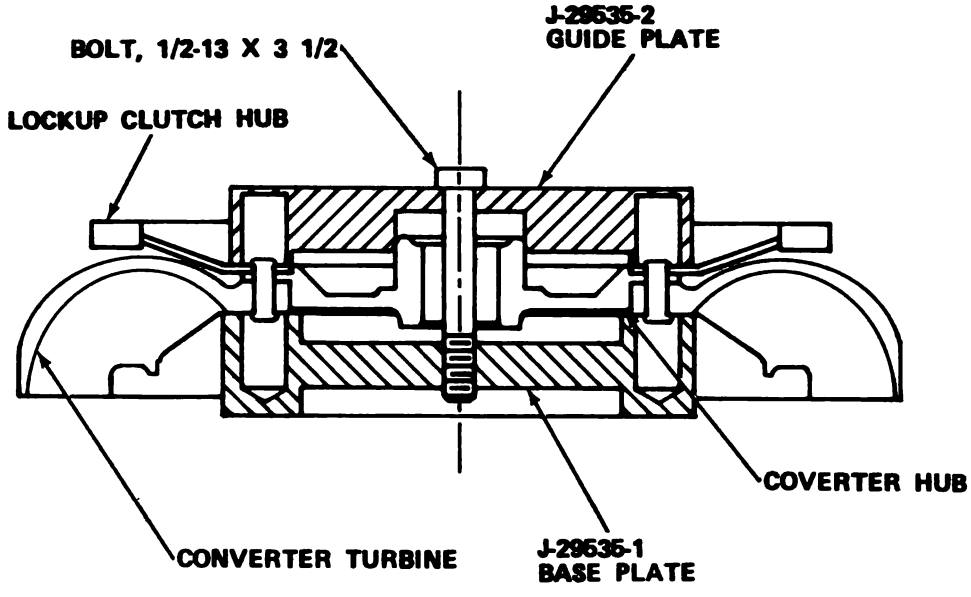
(9) Remove retaining bolt and guide plate.

(10) Remove turbine hub and lockup clutch drive gear.

(11) Inspect turbine for cracks, distortion, or abrasions. Replace if defective.

(12) Inspect rivet holes for burrs or swelling. Deburr as necessary.

(13) Inspect lockup clutch drive gear and turbine hub for cracks, distortion, abrasion, or broken teeth. Replace if defective.

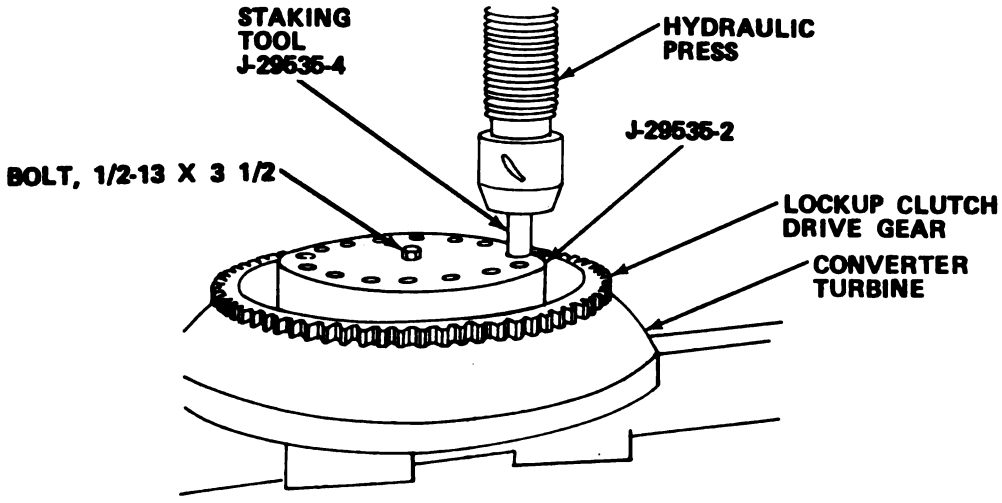


(14) Index punchmarks and reassemble converter turbine, lockup clutch drive gear, and turbine hub.

(15) Install new rivets through turbine, turbine hub, and lockup clutch drive gear.

(16) Place base plate J-29535-1 under assembly, flat side against rivet heads.

(17) Place guide plate J-29535-2 on top of turbine. Centrally locate rivets in holes. Install retaining bolt and torque to 50 ft lbs (68 N·m).

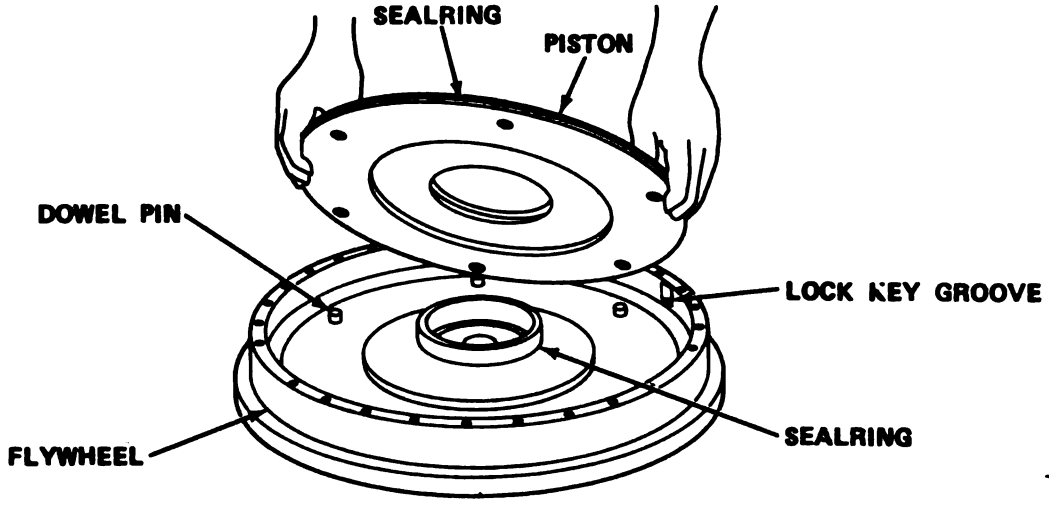


NOTE

A hydraulic press with a minimum capacity of 10 tons (900 kg) and a pressure gage to determine staking load must be used.

(18) Place turbine and fixture in hydraulic press. Insert staking tool J-29535-4 into top plate and alternately swage each rivet.

(19) Balance converter turbine assembly to within 1.0 inch ounce by rotating type static balance method.

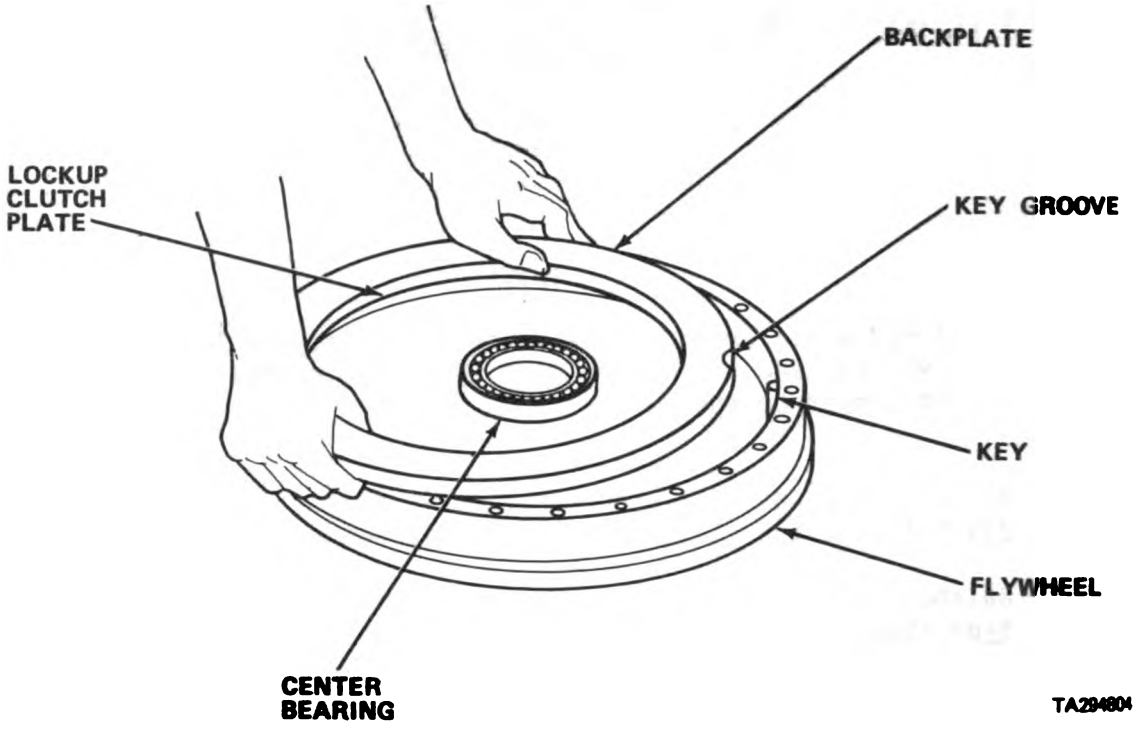


(20) Install seal ring onto flywheel hub and lubricate with oil-soluble grease.

(21) Install seal ring onto outside of lockup clutch piston. Lubricate seal ring.

(22) Mark lockup clutch piston opposite a dowel pin hole. Mark flywheel opposite dowel pin.

(23) Aline marks and reinstall lockup clutch piston into flywheel while insuring recesses in piston engage dowels on flywheel.



(24) Reinstall key into key groove of flywheel. Retain with oil-soluble grease.

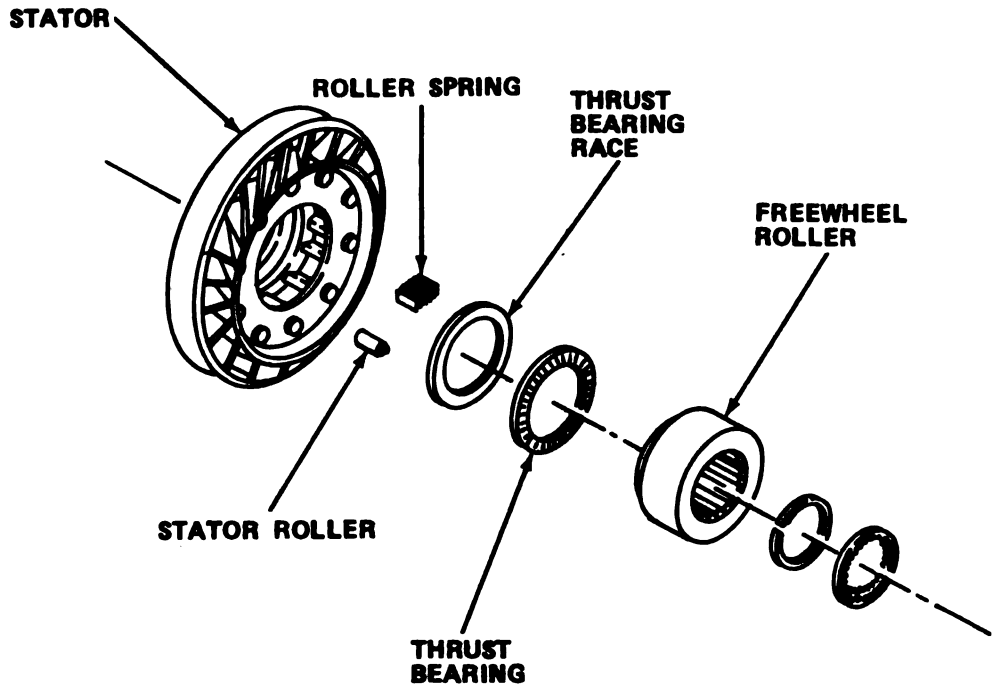
(25) Reinstall lockup clutch plate.

(26) Reinstall lockup clutch back plate, flat side first, engaging notch in plate with flywheel key.

(27) Press new ball bearing into flywheel recess.

(28) Reinstall converter turbine, engaging lockup clutch drive gear with internal splines of lockup clutch plate.

c. Stator repair.



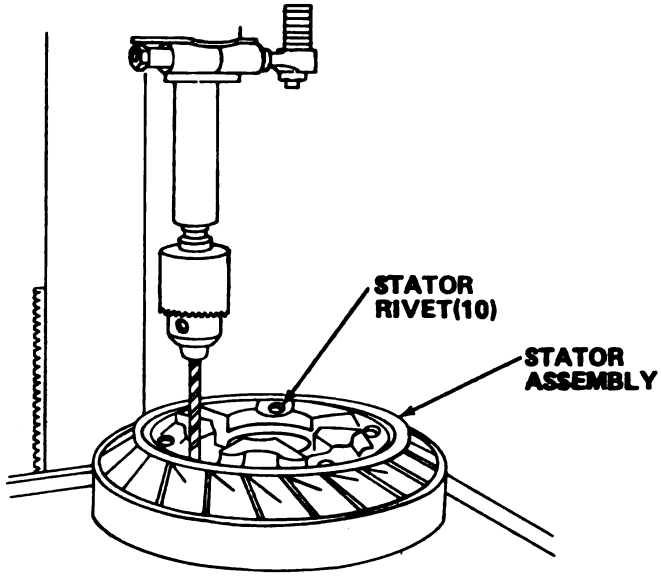
(1) Rotate stator freewheel roller clockwise and remove.

(2) Remove thrust bearing and thrust bearing race from rear of freewheel roller.

(3) Remove stator rollers and roller springs.

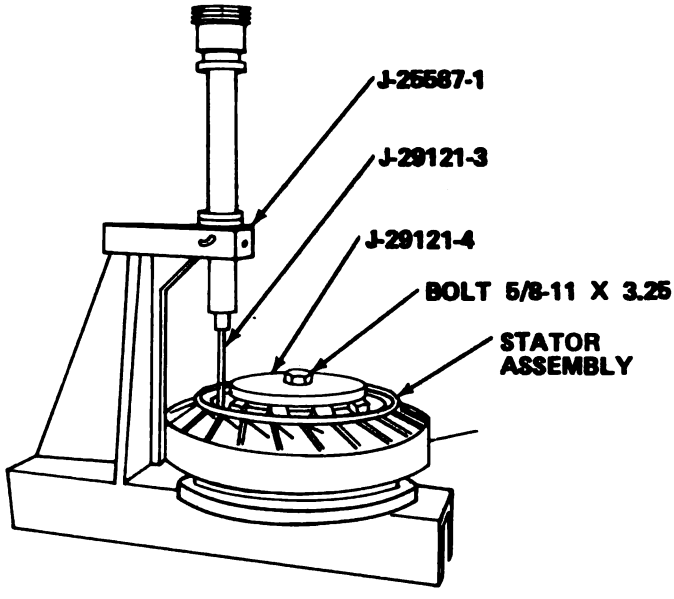
NOTE

Do not disassemble the stator assembly unless replacement of stator thrust washer, side plate washer, or of rivets is necessary. If stator or cam is damaged, replace entire stator assembly.



TA294806

(4) Place stator assembly in drill press. Using a 0.375 in. (9.525 mm) drill, aline and drill formed rivet head, removing formed head.



TA294807

(5) Place base plate J-29121-2 under stator assembly, alining holes with rivet heads.

(6) Place top plate J-29121-4 on top of stator.

(7) Retain base plate, stator, and top plate together with bolt. Torque bolt to 60 ft lbs (81 N•m).

NOTE

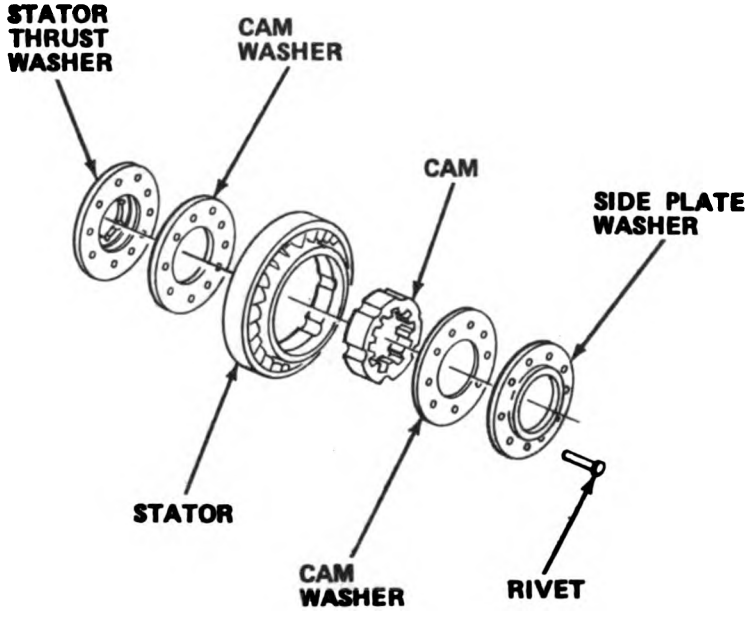
A hydraulic press having a minimum capacity of five tons and a pressure gage to determine load is required for proper removal and installation of rivets.

(8) Place press fixture stand J-25587-1 on hydraulic press and install rivet removing tool J-29121-3 into fixture head. Tighten retaining thumbscrew.

(9) Place stator assembly, drilled rivet side up, onto fixture stand.

(10) Aline rivet removing tool with drilled rivet and press each rivet from stator assembly.

(11) Remove retaining bolt and separate top plate and base plate from stator assembly.



TA294808

(12) Separate stator thrust washer, side plate washer, two cam washers, and cam from stator.

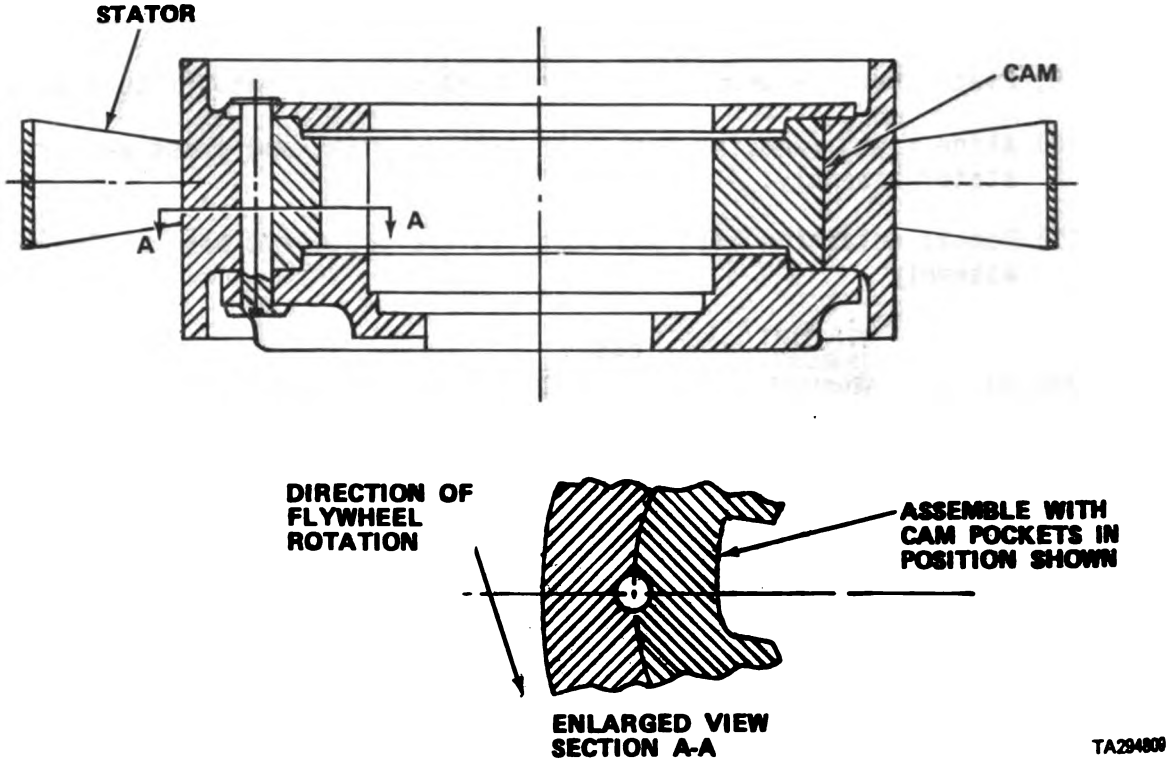
NOTE

If cam or stator is cracked or distorted, replace entire stator assembly.

(13) Inspect cam and stator for cracks or distortion.

(14) Inspect rivet holes for burrs or swelling. Deburr as necessary.

(15) Inspect stator thrust washers, side plate washer, and cam washers for excessive wear or defects. Replace defective components.

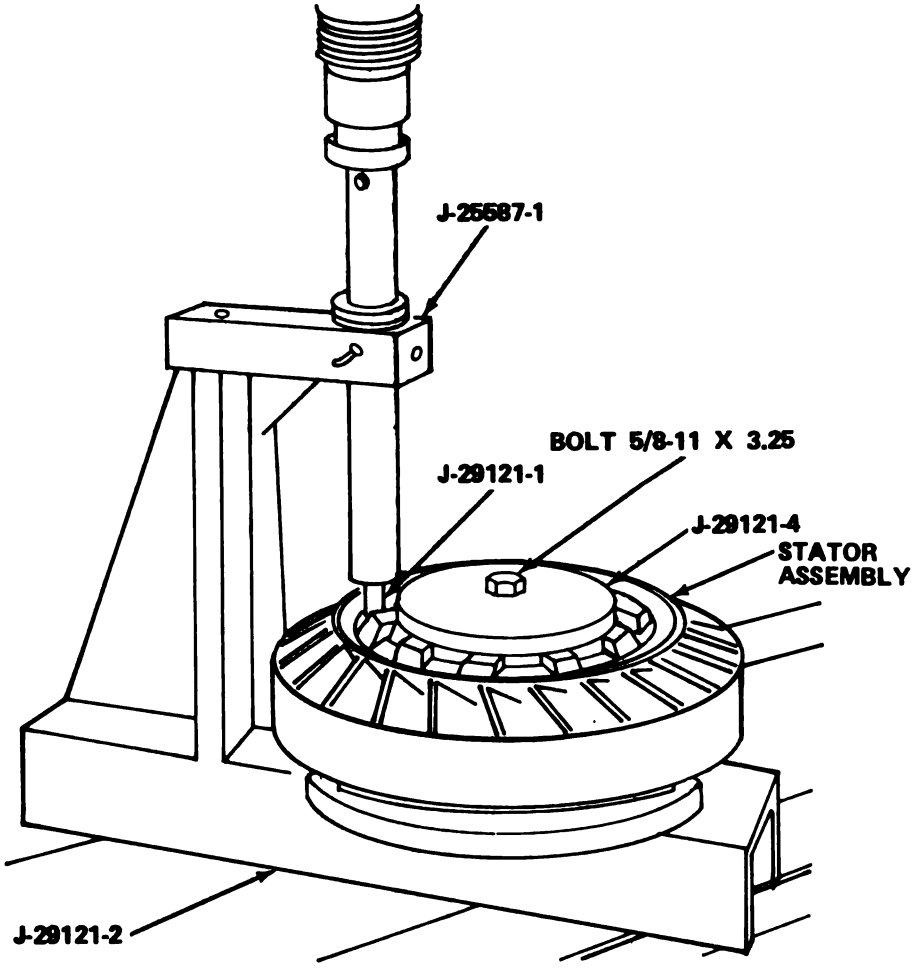


(16) Assemble cam and stator with roller pockets in proper position.

(17) Install cam washers on each side of stator.

(18) Install stator thrust washer and side plate washer.

(19) Aline rivet holes and insert ten new rivets from rear to front of stator assembly.



(20) Place base plate J-29121-2 under stator assembly so the rivet heads rest between clearance holes.

(21) Install top plate J-29121-4 to stator assembly and retain to bottom plate with bolt.

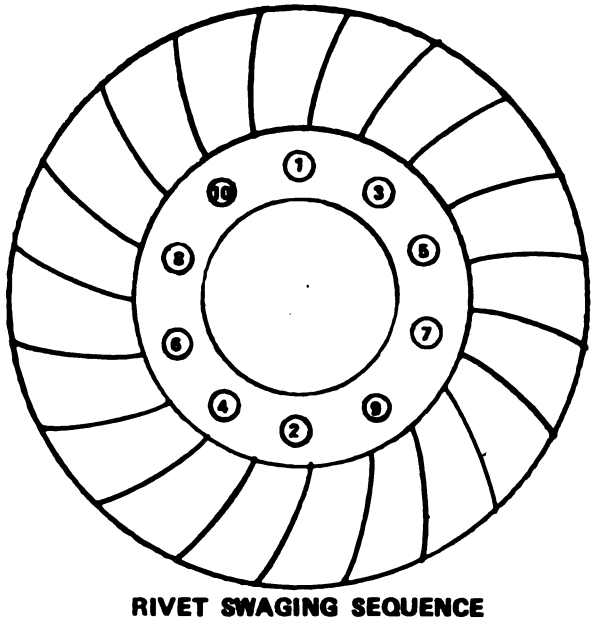
NOTE

Strike top plate with rubber mallet to seat components.

(22) Torque retaining bolt to 60 ft lbs (81 Nom).

(23) Place stator assembly onto press fixture stand J-25587-1.

(24) Insert rivet staking tool J-29121-1 into fixture stand.



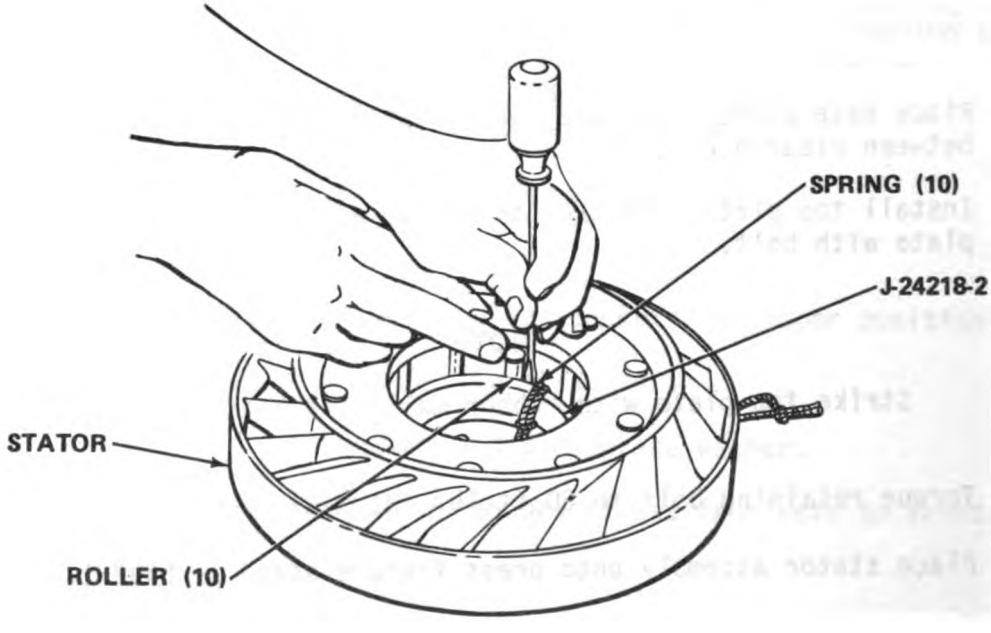
RIVET SWAGING SEQUENCE TA294811

(25) Apply an 8000 lb (3629 kg) load to swage each rivet. Swage each rivet in proper sequence as shown in illustration.

(26) Remove retaining bolt and top and bottom plates from stator assembly.

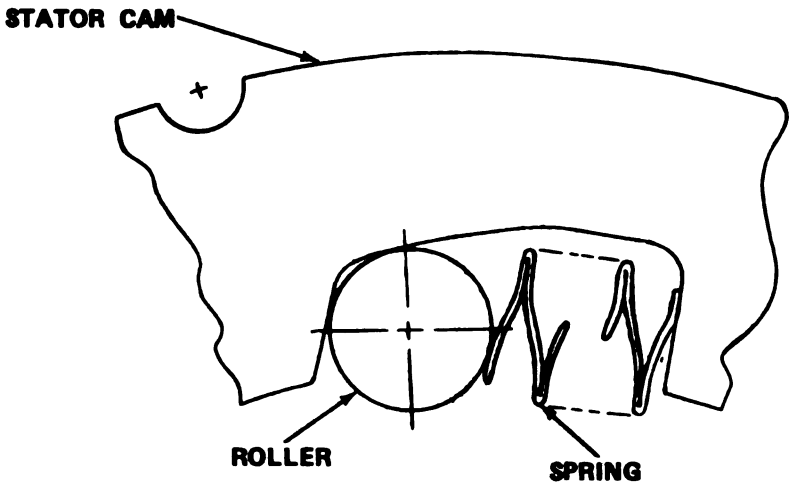
(27) Place stator on work bench, rear side upwards. Install thrust bearing race into stator.

(28) Coat the stator pockets, stator springs, and stator rollers with oil-soluble grease.



TA294812

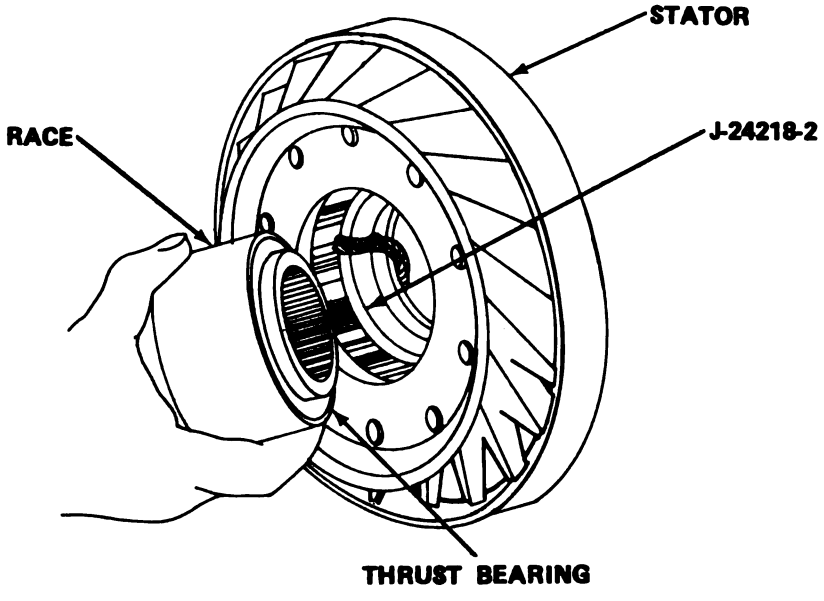
(29) Install stator roller holder J-24218-2 into stator against thrust bearing race.



TA294813

(30) Install ten stator roller springs into cam pockets.

(31) Install stator rollers into pockets.



TA294814

(32) Install thrust bearing onto roller race.

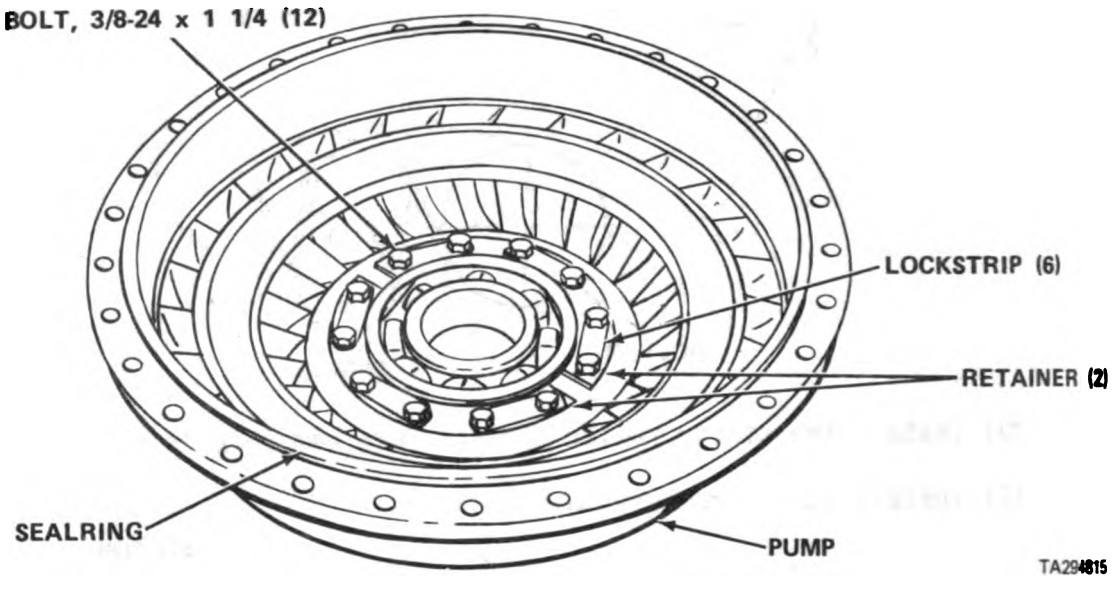
(33) With stator on its side, insert roller race while rotating clockwise until thrust bearing is against roller holder J-24218-2.

(34) Pull thong and remove roller holder.

(35) Push roller race inward until roller race and thrust bearing seat against thrust bearing race.

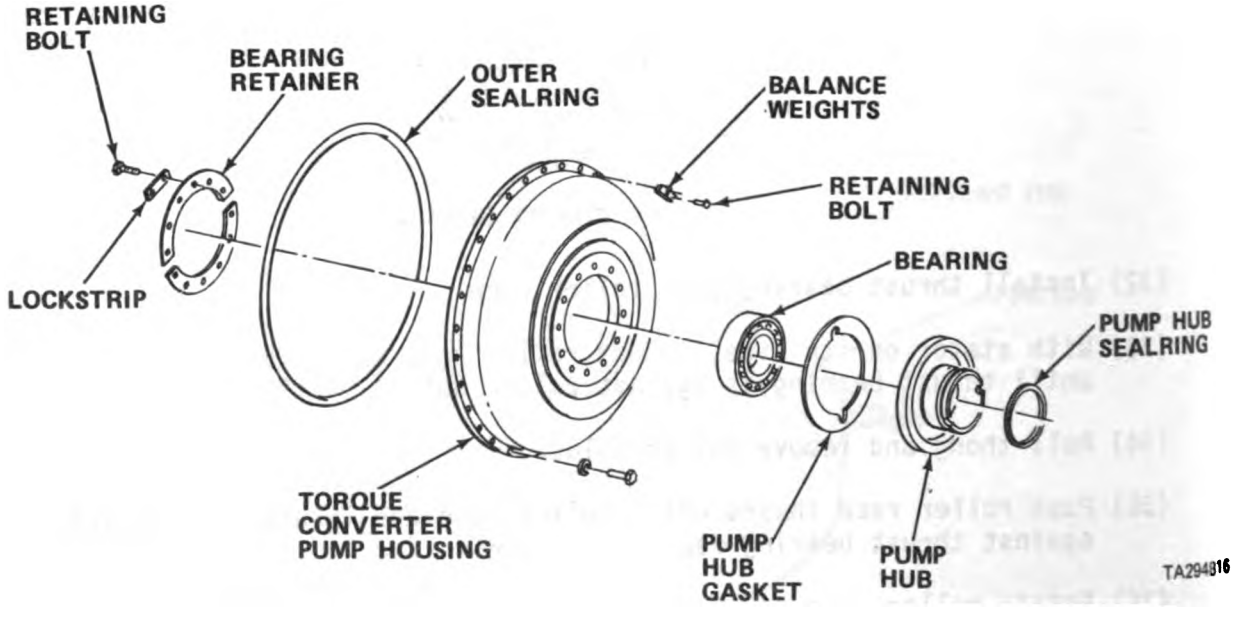
(36) Rotate roller race counterclockwise until it locks in place.

d. Torque converter pump repair.



(1) Flatten lockstrips and remove converter pump bolts.

(2) Remove lockstrips and bearing retainer.



(3) Remove pump hub and gasket. Remove pump hub sealring.

(4) Remove bearing from converter pump.

(5) Remove outer sealring from converter pump.

CAUTION

REPLACEMENT OF BALANCE WEIGHTS REQUIRES REBALANCING OF CONVERTER PUMP ASSEMBLY, OR SEVERE DAMAGE WILL RESULT.

(6) Remove retaining bolt and balance weights only if replacement is necessary.

(7) Install bearing, ungrooved end first, into pump housing.

(8) Install pump hub gasket and pump hub to converter pump housing. Install pump hub sealring.

(9) Install bearing retainer.

CAUTION

DO NOT REUSE LOCKSTRIPS, OR DAMAGE WILL RESULT.

(10) Install new lockstrips and retaining bolts. Torque bolts to 33 - 40 ft lbs (45 - 54 N•m).

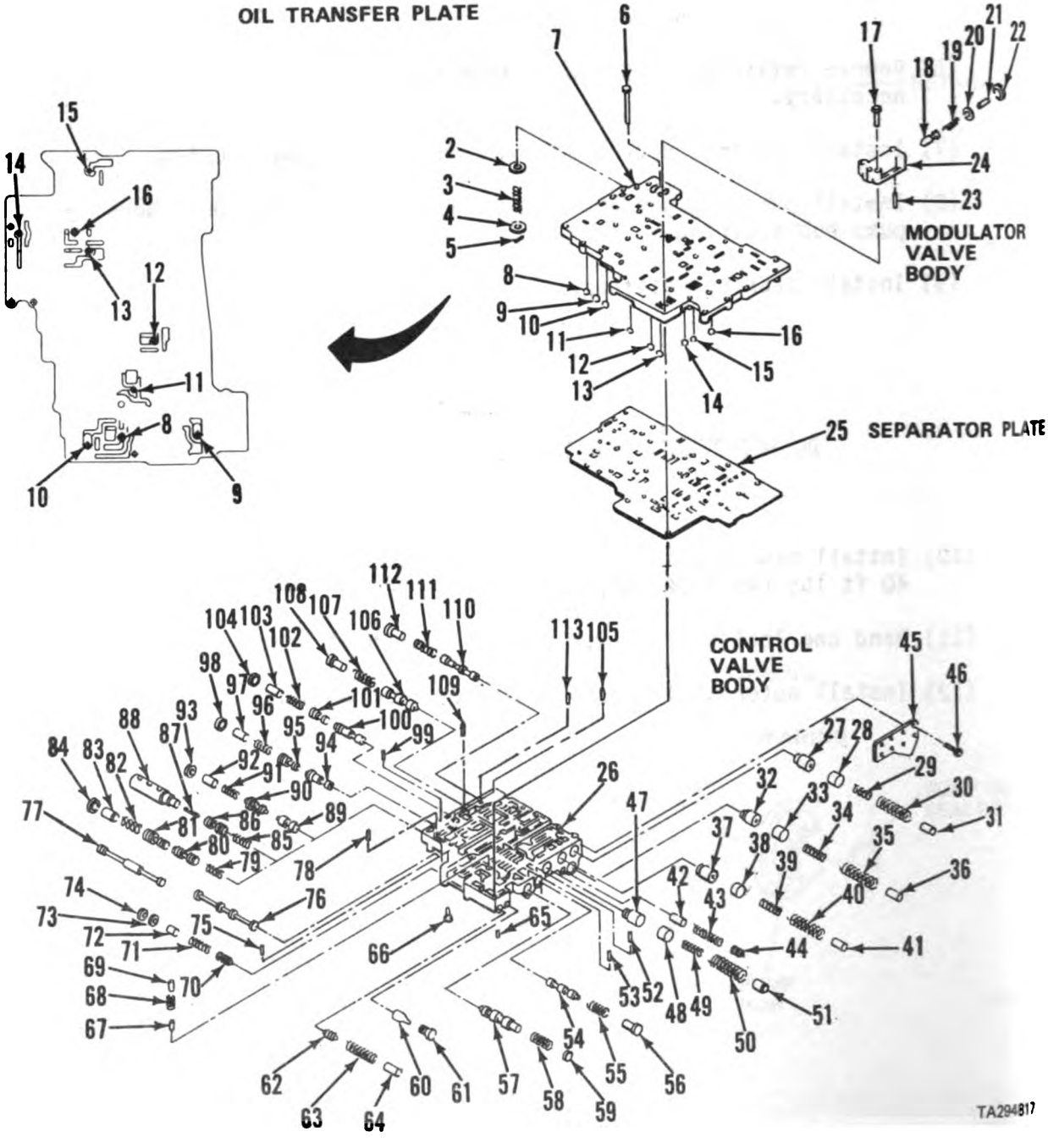
(11) Bend one lockstrip corner against each bolt head.

(12) Install outer sealring to converter pump housing.

e. Control valve body assembly repair.

CAUTION

LABEL ALL COMPONENTS UPON REMOVAL TO INSURE PROPER REASSEMBLY. MANY COMPONENTS ARE SIMILAR AND MAY BE MISTAKENLY INTERCHANGED, CAUSING IMPROPER OPERATION.



(1) Remove retaining bolt (66) and manual selector valve (76).

(2) Remove retaining bolts (17) from modulator valve body (24). Remove modulator valve body while holding oil transfer plate (7) and separator plate (25) together.

CAUTION

DO NOT SEPARATE OIL TRANSFER AND SEPARATOR PLATES UNLESS INVERTED TO PREVENT LOSING CHECK BALLS.

(3) Lift off and invert oil transfer and separator plates while holding them firmly together.

(4) Lift separator plate (25) off oil transfer plate (7).

(5) Compare check ball locations with illustration.

(6) Remove check balls and label.

(7) Depress cup washer (4) and remove pin (5).

(8) Remove cup washer (4), spring (3), and regulator valve (2). Remove valve pin (6).

CAUTION

BEFORE REMOVING PINS (23), (75), (78), (99), AND (105), MAKE A NOTE OR SKETCH SHOWING THE POSITIONS OF ADJUSTING RINGS (22), (74), (84), (93), (98), AND (104) IN RESPECT TO THEIR RETAINING PINS. IF VALVE BODY IS REASSEMBLED WITH THE SAME SPRINGS AND ADJUSTING RINGS ARE IN THEIR ORIGINAL POSITIONS, THE ORIGINAL CALIBRATION OF THE VALVE BODY IS MAINTAINED.

(9) Disassemble modulator valve as follows:

(a) Press adjusting ring (22) inward and remove retaining pin (23).

(b) Remove adjusting ring (22), valve stop (21), washer (20), spring (19), and valve (18).

(10) Remove priority valve (69), spring (68), and valve stop (67) from control valve body (26).

(11) Remove plug (61) and screen assembly (60).

(12) While holding trimmer cover (45) against spring pressure, remove bolts (46). Slowly remove cover.

(13) Remove valve stop (31), springs (29, 30), trimmer plug (28), and trimmer valve (27).

(14) Remove stop (36), springs (34, 35), plug (33), and valve (32).

(15) Remove stop (41), springs (39, 40), plug (38), and valve (37).

(16) Remove valve (44), spring (43), and stop (42).

(17) Remove stop (51), springs (49, 50), plug (48), and valve (47).

NOTE

In the following steps, 18 through 26, the components in each bore are spring-loaded and must be compressed while removing retaining pins.

(18) Remove retainer pin (52), valve stop (56), spring (55), and valve (54).

(19) Remove retainer pin (53), spring spacer (59), spring (58), and valve (57).

(20) Remove retainer pin (65), stop (64), spring (63), and valve (62).

(21) Remove retainer pin (75), adjusting ring (74), spring washer (73), valve stop (72), spring (71), and valve (70).

(22) Remove retainer pin (78), adjusting ring (93), stop (92), spring (91), modulator valve (90), and 1-2 shift valve (89).

(23) Remove retainer pin (99), adjusting ring (98), valve stop (97), spring (96), and valves (95, 94).

(24) Remove retainer pin (105), adjusting ring (104), valve stop (103), spring (102), and valves (101, 100).

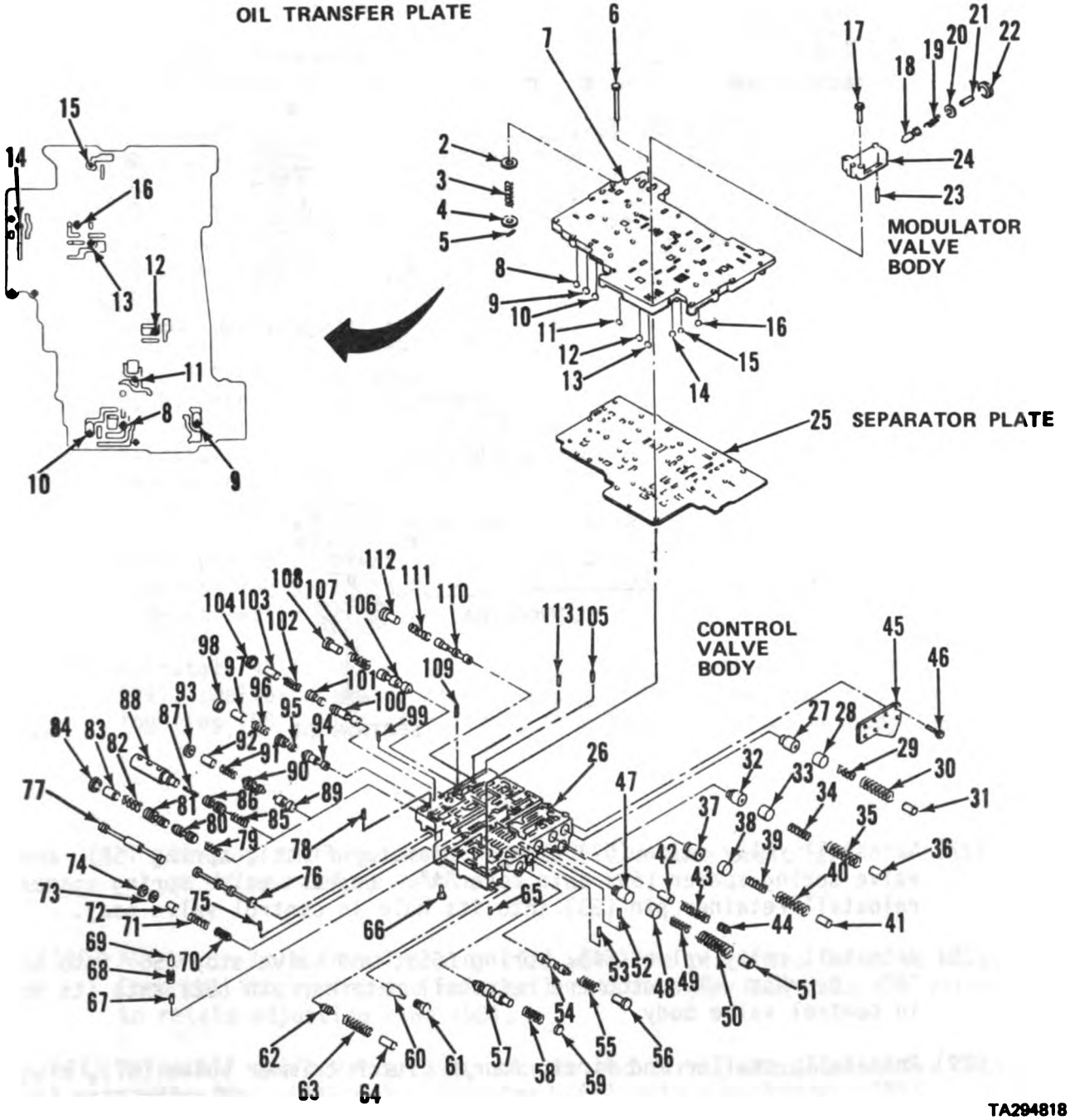
(25) Remove retainer pin (109), valve stop (108), spring (107), and valve (106).

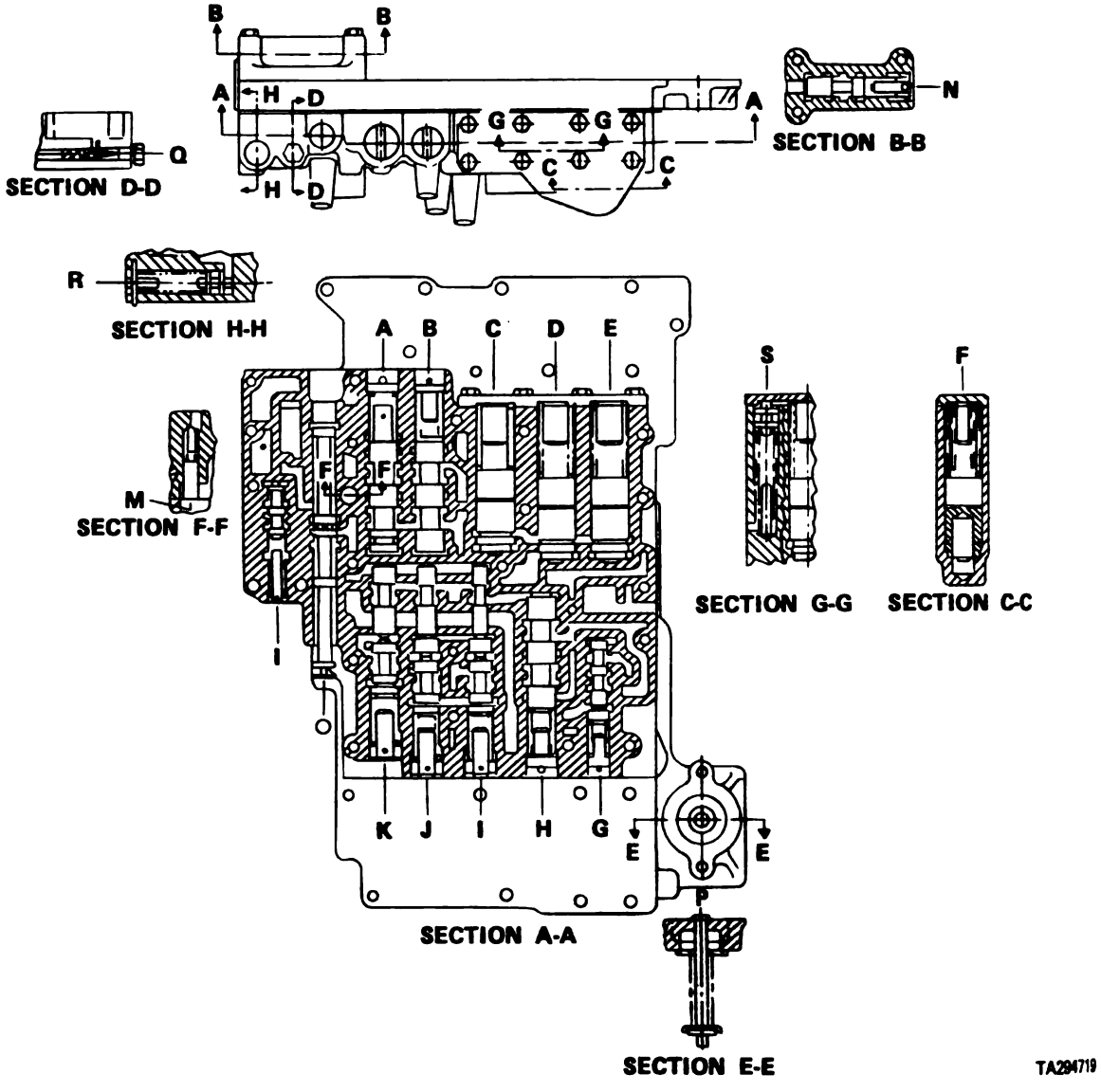
(26) Remove retainer pin (113), valve stop (112), spring (111), and valve (110).

NOTE

Check the position of all components, configuration of all valves and plugs, and identification of all springs before installation.

All valves, when dry, should move freely in their bores by their own weight.





(27) Reinstall relay valve (57) (larger diameter first), spring (58), and valve spring spacer (59) into bore "A". Depress valve spring spacer and reinstall retainer pin (53) into its hole in control valve body.

(28) Reinstall relay valve (54), spring (55), and valve stop (56) into bore "B". Depress valve stop and reinstall retainer pin (52) into its hole in control valve body.

(29) Reinstall, smaller end first, fourth clutch trimmer valve (47), plug (48), secondary spring (49), primary spring (50), and valve stop (51) into bore "C" of valve body.

(30) Reinstall, smaller end first, second clutch trimmer valve (37), plug (38), secondary spring (39), primary spring (40), and valve stop (41) into bore "D" of valve body.

(31) Reinstall, smaller end first, third clutch trimmer valve (27), plug (28), secondary spring (29), primary spring (30), and valve stop (31) into bore "E" of valve body.

(32) Reinstall, smaller end first, first clutch trimmer valve (32), plug (33), secondary spring (34), primary spring (35), and valve stop (36) into bore "F" of valve body.

(33) Reinstall trimmmer boost accumulator stop (42), spring (43), and trimmer boost accumulator valve (44) into bore "S" of valve body.

(34) Reinstall trimmer valve cover to valve body. Compress springs and retain with bolts. Torque bolts to 9 - 11 ft lbs (12 - 15 Nm).

(35) Reinstall, smaller end first, trimmer regulator valve (110), spring (111) and valve stop (112) into bore "G" of valve body. Depress valve stop and reinstall retainer pin (113) into its hole in control valve body.

(36) Reinstall relay valve (106), spring (107), and valve stop (108) into bore "H" of valve body. Depress valve stop and reinstall retainer pin (109) into its hole at front of valve bore.

(37) Reinstall shift valve (100), smaller end first, modulator valve (101), smaller end first, springs (102), valve stop (103) and adjusting ring (104), flat side first, into bore "T" of valve body (26).

(38) Aline pin hole in valve stop (103) with the pin holes in the valve body. Compress the spring, and reinstall retainer pin (105) into the valve body to retain adjusting pin (104).

(39) Reinstall shift valve (94), smaller diameter first, modulator valve (95), smaller diameter first, spring (96), valve stop (97), and adjusting ring (98), flat side first, into bore "J" of valve body (26).

NOTE

Be sure the adjusting ring is in the same position as it was before removal.

(40) Aline pin hole in valve stop (97) with the pin holes in valve body. Compress the spring and reinstall retainer pin (99) into the valve body to retain adjusting ring (98).

(41) Reinstall shift valve (89), shorter end first, modulator valve (90), spring (91), valve stop (92), and adjusting ring (93), flat side first, into bore "K" of valve body (26).

NOTE

Be sure the adjusting ring is in the same position as it was before removal.

(42) Aline pin hole in valve stop (92) with the pin holes in valve body. Compress the spring and reinstall retainer pin (78) into the valve body to retain adjusting ring (93).

(43) Reinstall hold regulator (70), spring (71), valve stop (72), washer (73), and adjusting ring (74), flat side first, into bore "L" of valve body.

NOTE

Be sure the adjusting ring is in the same position as it was before removal.

(44) Aline pin hole in valve stop (72) with the pin holes in valve body. Compress the spring and reinstall retainer pin (75) into the valve body to retain adjusting ring (74).

(45) Reinstall priority valve stop (67), spring (68), and priority valve (69) into bore "M" of valve body (26).

(46) Reinstall modulator valve (18), longer end first, spring (19), retainer washer (20), valve stop (21), and adjusting ring (22), flat side first, into bore "N" of valve body.

NOTE

Be sure the adjusting ring is in the same position as it was before removal.

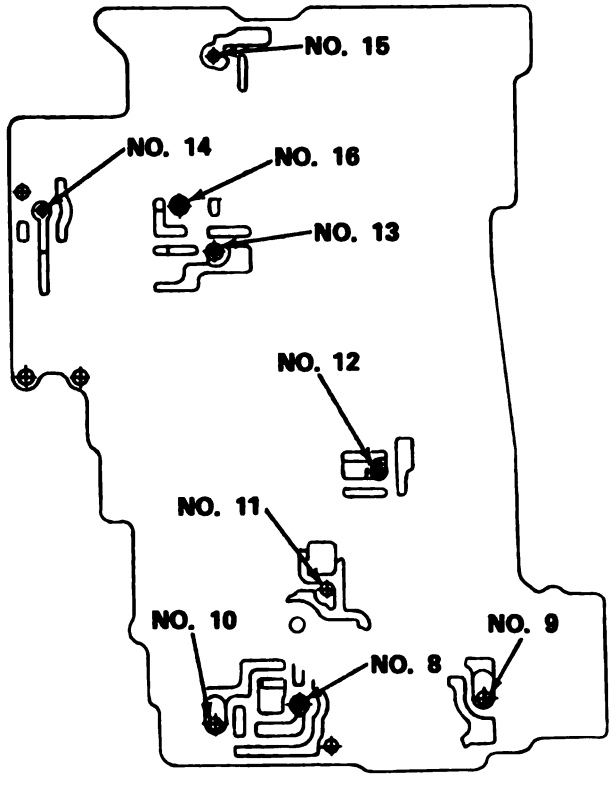
(47) Aline pin hole in valve stop (21) with the pin holes in valve body. Compress the spring and reinstall retainer pin (23) into the valve body to retain adjusting ring (22).

(48) Reinstall governor accumulator valve (62), spring (63), and valve stop (64) into bore "R" of valve body. Aline stop (64) and valve body for correct retainer pin installation. Compress spring (63) and reinstall retainer pin (65).

(49) Reinstall governor screen assembly (60), open end first, into bore "Q". Retain the screen assembly with plug (61). Torque to 51 - 61 ft lbs (69 - 83 Nom).

(50) Reinstall check valve pin (6), smaller end first, through the top side of oil transfer plate (7). Reinstall lubrication valve (2), spring (3), and cup washer (4) onto pin (6), from bottom side of plate (7). Depress cup washer (4) and reinstall retainer pin (5).

(51) Position oil transfer plate (7), channeled side upward, on the work table.



TA294819

CAUTION

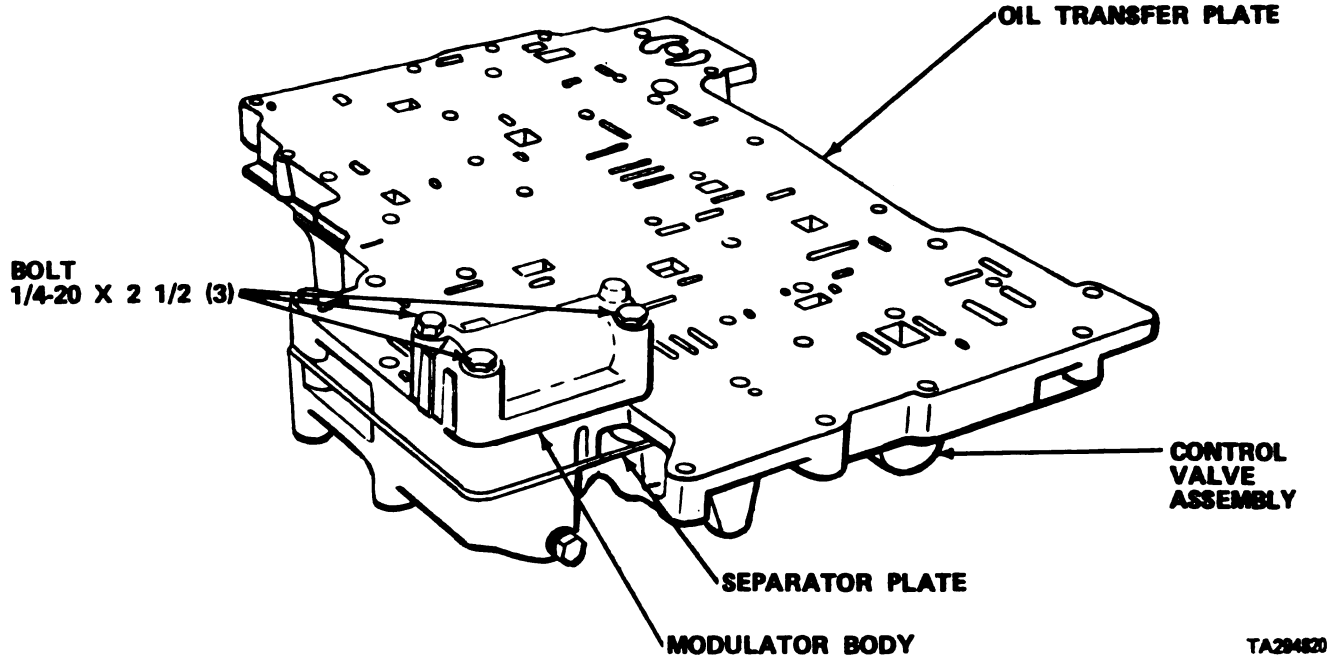
FAILURE TO RETAIN THE BALLS WITH OIL-SOLUBLE GREASE MAY RESULT IN BALLS BEING ACCIDENTALLY MISPLACED DURING SUBSEQUENT ASSEMBLY STEPS.

(52) Using the figure as a guide and the notes referring to ball locations during disassembly, install the correct number of check valve balls in their proper positions. Retain each ball with a small quantity of oil-soluble grease.

CAUTION

DO NOT SEPARATE THE OIL TRANSFER PLATE AND THE SEPARATOR PLATE DURING HANDLING. A SLIGHT SEPARATION COULD DISLOCATE THE CHECK VALVE BALLS AND CAUSE MALFUNCTION OF THE TRANSMISSION.

(53) Place separator plate onto the oil transfer plate so that their bolts aline. Grasp the two plates together, invert them, and position them on the assembled control valve body so that priority valve (69) is compressed against spring (68) into its bore in valve body.

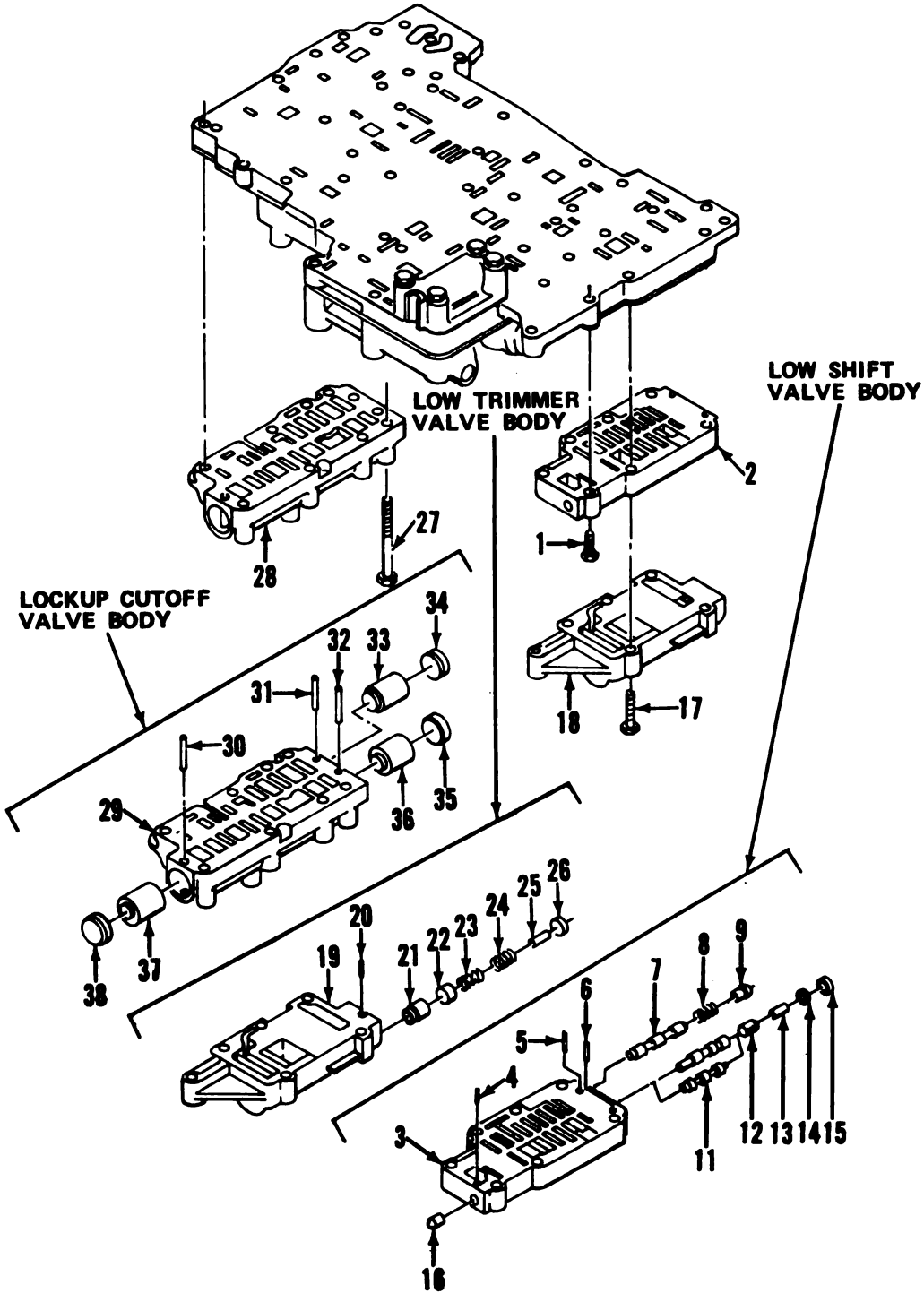


(54) Reinstall the assembled modulator valve onto the oil transfer plate. Reinstall bolts to retain the modulator body, oil transfer plate, separator plate, and control valve body assembly as a unit. Do not tighten the bolts at this time.

(55) Aline the bolt holes in the control valve assembly with those in the separator plate and oil transfer plate. When all bolts are alined, torque the bolts to 9 - 11 ft lbs (12 - 15 N·m).

(56) Reinstall manual selector valve (76) into bore "O" of control valve body (26). Valve (76) may be retained by tape or soft wire temporarily until the valve assembly is installed onto the transmission.

f. Low trimmer, low shift, and lockup cut-off valve body assemblies repair.



(1) To disassemble low trimmer valve body, press inward on retainer plug (26), and remove retainer pin (20).

(2) Release pressure and remove retainer plug (26), springs (23, 24), valve stop (25), trimmer plug (22), and trimmer valve (21).

(3) Inspect components for wear or other damage. Replace defective components.

NOTE

When installed dry, the valves should move freely by their own weight.

(4) Reinstall trimmer valve (21), recessed end first, into valve body (19).

(5) Reinstall trimmer plug (22), springs (23, 24), valve stop (25), and retainer plug (26).

(6) Compress springs and reinstall retainer pin (20) to secure retainer plug (26).

(7) To disassemble low shift body valve, depress valve stop (9) against its spring and remove retainer pin (5).

(8) Release spring pressure and remove valve stop (9), spring (8), and relay valve (7).

NOTE

Note or sketch position of adjusting ring in relation to retainer pin before removal.

(9) Depress adjusting ring (15) against its spring and remove retainer pin (6).

(10) Remove adjusting ring (15), washer (14), valve stop (13), spring (12), and valve (11).

(11) Remove retainer pin (4) and plug valve (16).

(12) Inspect all components for wear or other damage. Replace defective components.

(13) Reinstall plug valve (16) and retainer pin (4).

(14) Reinstall valve (11), spring (12), valve stop (13), washer (14), and adjusting ring (15). Aline the hole in valve stop (13) with pin hole in valve body (3).

(15) Position adjusting ring (15) in same position as it was before removal (refer to step (9) above).

(16) Press inward against adjusting ring (15) and reinstall retainer pin (6).

(17) Reinstall relay valve (7), spring (8), and valve stop (9).

(18) Press inward against valve stop (9) and reinstall retainer pin (5).

(19) To disassemble lockup cut off valve body, remove retainer pins (30, 31, 32) from valve body (29).

CAUTION

NOTE POSITION OF EACH VALVE TO INSURE PROPER REASSEMBLY.

(20) Remove valve plugs (34, 35, 38) and valves (33, 36, 37) from their bores.

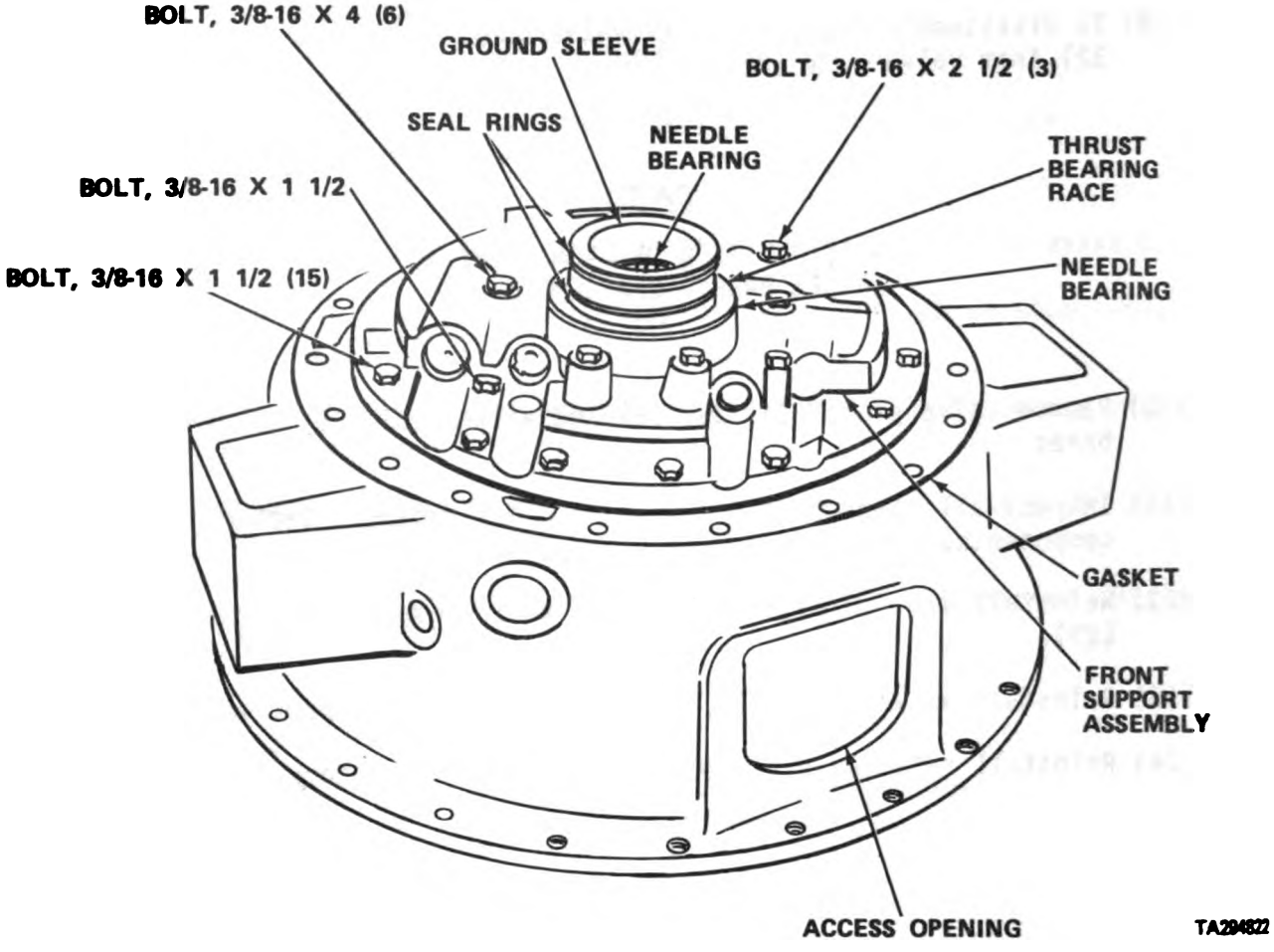
(21) Inspect all components for wear or other damage. Replace defective components.

(22) Reinstall valves (33, 36, 37) into their respective bores in valve body (29).

(23) Reinstall valve plugs (34, 35, 38) into their respective bores.

(24) Reinstall retainer pins (30, 31, 32) into valve body.

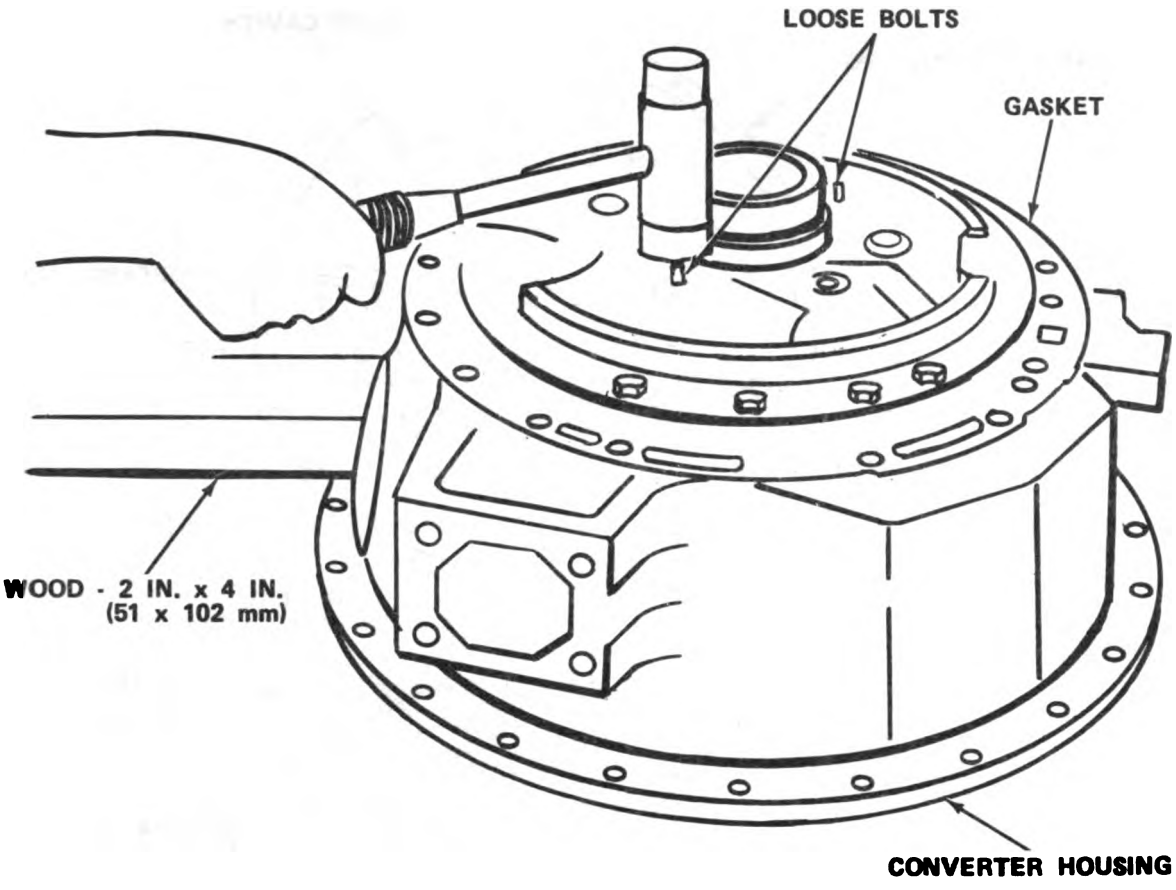
g. Converter housing, front support, and oil pump repair.



(1) With converter housing front downward, remove two sealrings, needle bearing, and bearing race from front support hub.

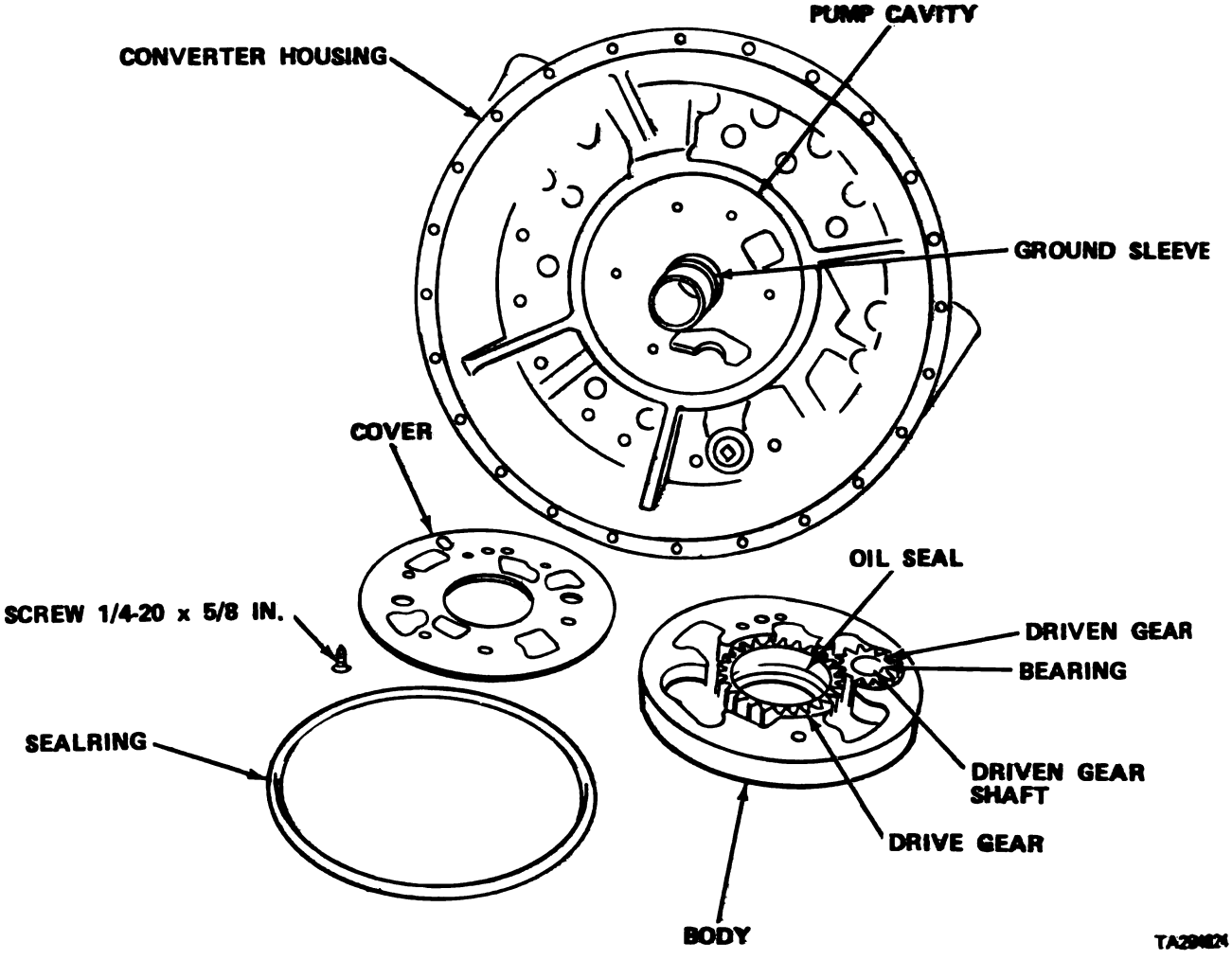
(2) Place a piece of wood 2 X 4 in. (51 X 102 mm) through converter housing access opening, about 14 in. (356 mm) into housing.

(3) Remove four of six oil pump assembly retaining bolts.



(4) Loosen remaining two retaining bolts, leaving about four turns of threads engaged.

(5) Press down on 2 X 4 board and alternately tap each loosened retaining bolt until oil pump is dislodged.

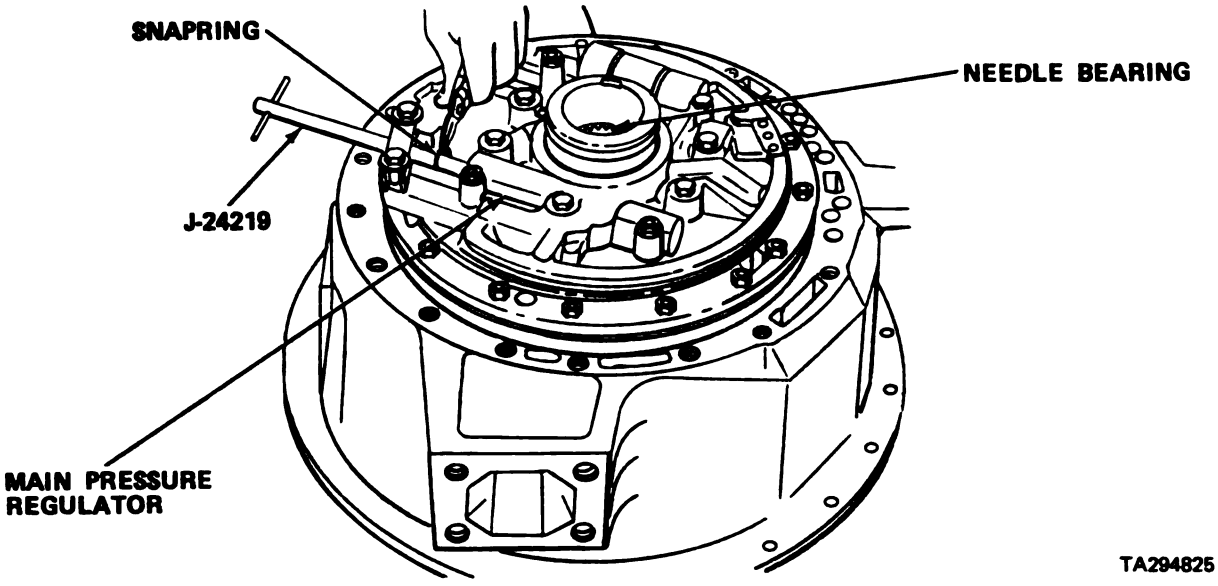


(6) Remove remaining retaining bolts and oil pump. Remove sealring from outer circumference of pump.

(7) Remove retaining screw, oil pump cover, drive gear, and driven gear.

(8) Remove bearing from driven gear.

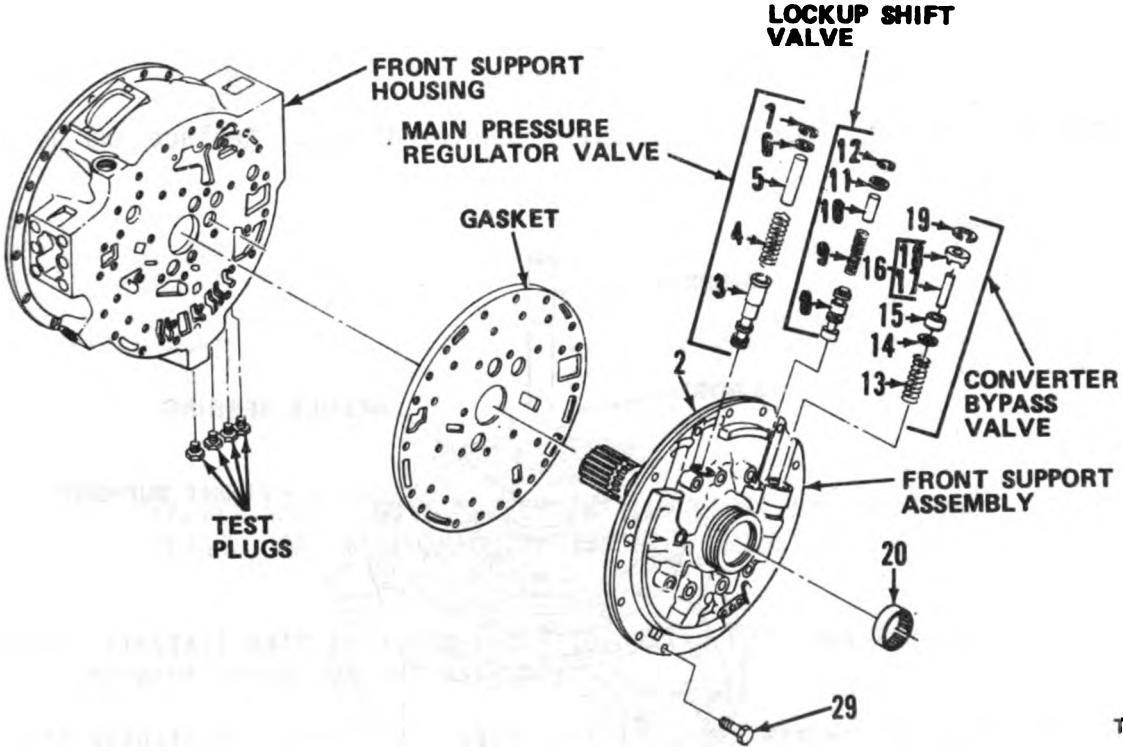
(9) Remove oil seal from pump assembly.



(10) Install spring compressor J-24219 to front support main pressure regulator with bolts.

(11) Depress main pressure regulator valve spring and remove snapring.

(12) Release spring pressure and remove spring compressor.



(13) Remove washer (6), valve stop (5), spring (4), and main pressure regulator valve (3).

(14) Install spring compressor J-24219 with bolts to front support lockup shift valve.

(15) Depress lockup shift valve spring (9) and remove snapring (12).

(16) Release spring pressure and remove spring compressor.

(17) Remove washer (11), valve stop (10), spring (9), and lockup shift valve (8).

(18) Press inward against valve support assembly (16) and remove snapring (19).

(19) Remove valve support assembly (16), seat (15), converter bypass valve (14), and spring (13).

(20) Remove retaining bolts (29) and separate front support assembly, gasket, and front support housing.

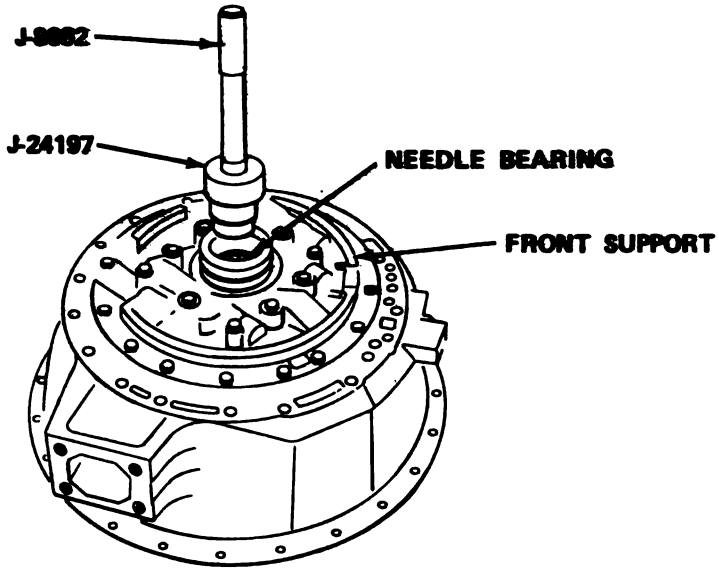
(21) Remove needle bearing (20) from bore of front support hub.

(22) Remove test plugs from housing.

NOTE

Do not remove ground sleeve from front support. If there is evidence of movement or damage, replace the front support and ground sleeve.

(23) Inspect all parts for excessive wear or damage. Replace any defective components.

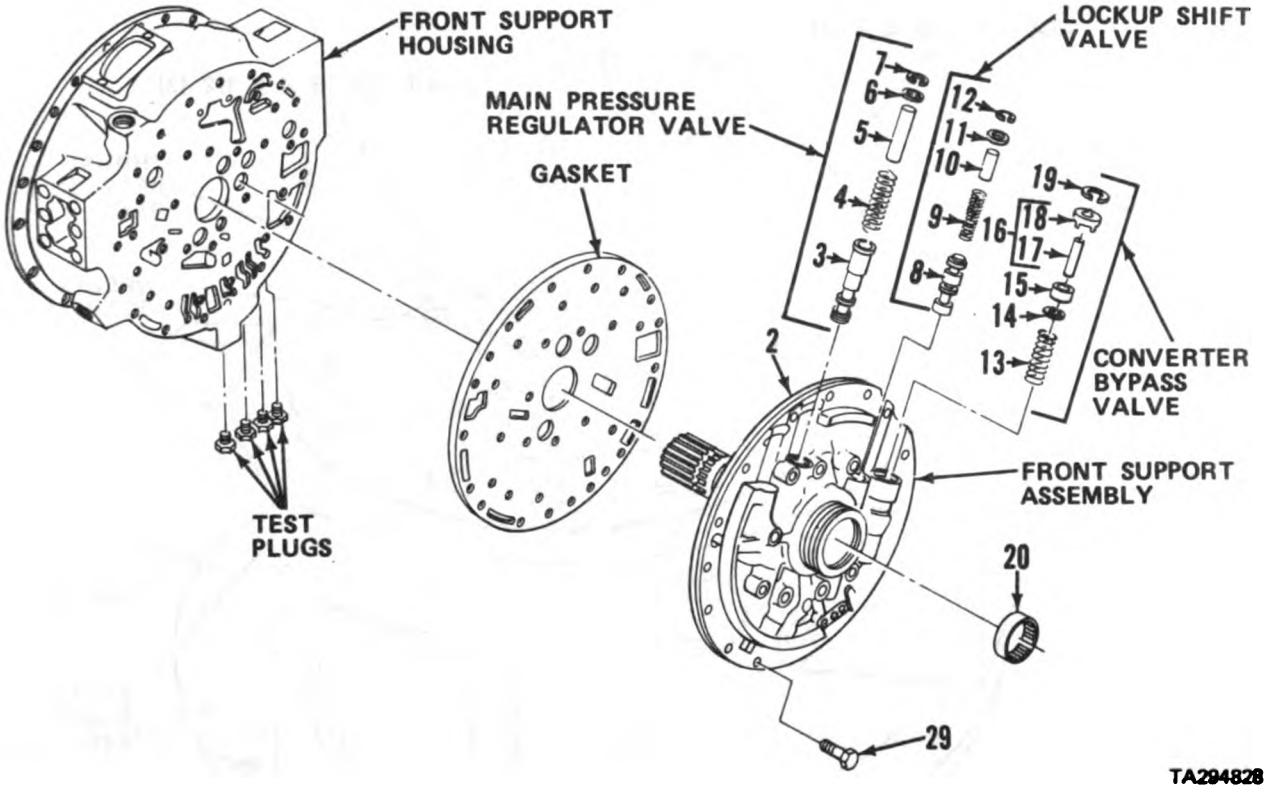


(24) Reinstall front support and gasket to front support housing. Reinstall retaining bolts and torque to 36 - 43 ft lbs (49 - 58 N•m).

NOTE

Proper installation depth of bearing is 1.26 - 1.28 in. (32.00 - 32.50 mm) from rear of hub to rear of bearing.

(25) Reinstall needle bearing, numbered side upwards, to front support with J-24197 installation tool and J-8092 handle.



CAUTION

VALVES SHOULD MOVE FREELY IN THEIR BORE BY THEIR OWN WEIGHT, OR IMPROPER OPERATION WILL RESULT.

(26) Reinstall main pressure regulator valve (3), smaller end first, into bore of front support assembly.

(27) Reinstall spring (4), valve stop (5), and washer (6) into front support.

(28) Install spring compressor J-24219, compress regulator spring, and install snapring (7). Remove compressor.

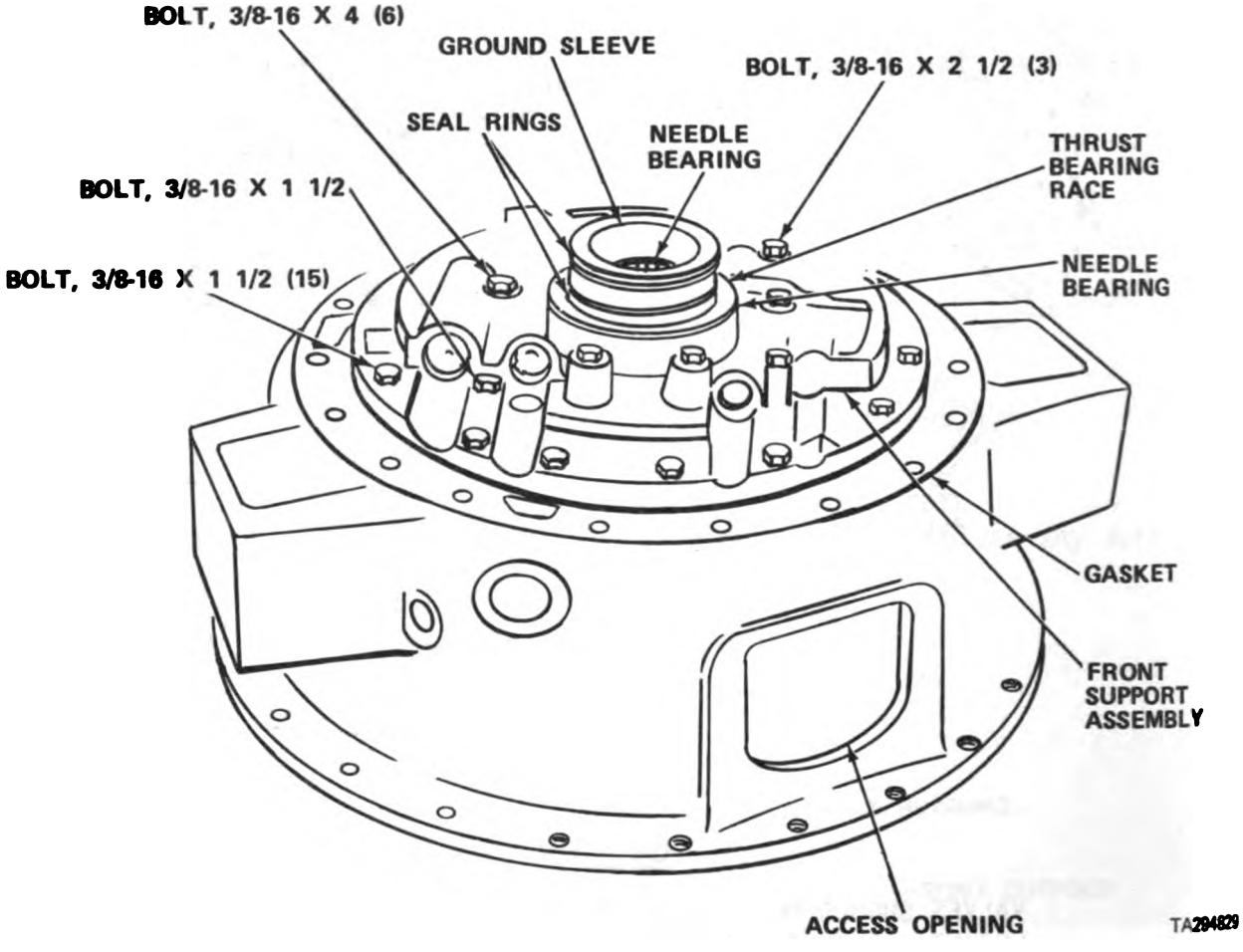
(29) Reinstall lockup shift valve (8), smaller end first, into bore of front support assembly.

(30) Reinstall spring (9), valve stop (10), and washer (11) into front support.

(31) Reinstall spring compressor J-24219, compress lockup valve spring, and install snapring (12). Remove compressor.

(32) Reinstall spring (13), converter bypass valve (14), valve seat (15), and support assembly (16).

(33) Press support assembly (16) inwards and reinstall snapring (19).

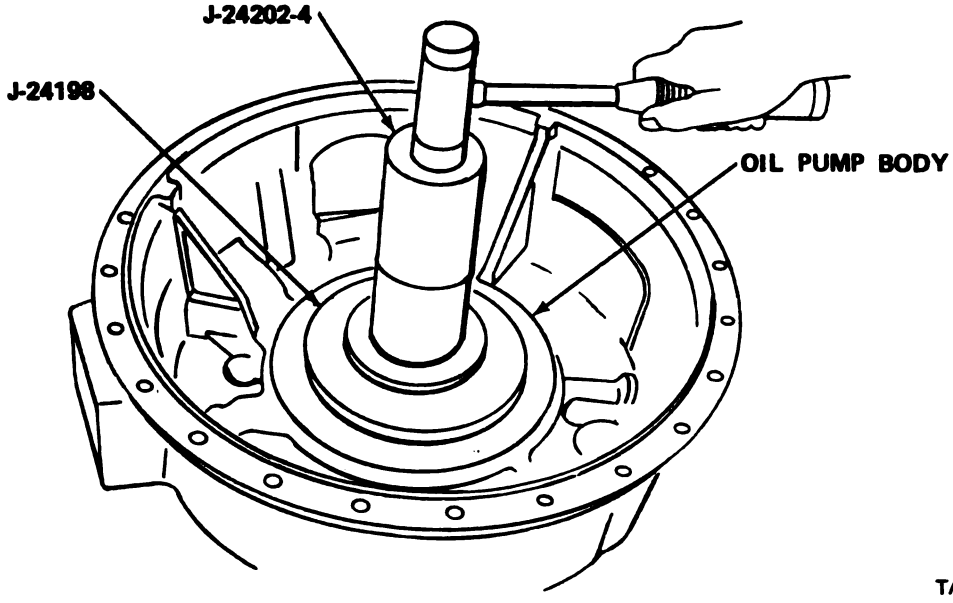


NOTE

Use oil-soluble grease to retain bearing and bearing race.

(34) Reinstall bearing race, flat side first, onto the front support hub.

(35) Reinstall needle bearing onto the race.



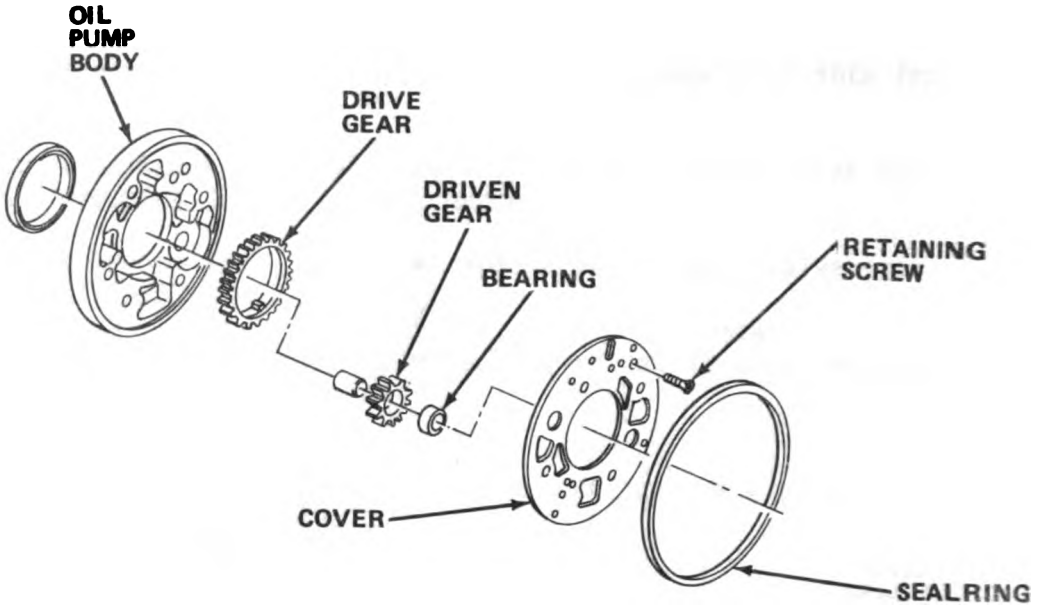
CAUTION

DO NOT ALLOW EXCESS RETAINING COMPOUND TO GET ON MOVING PARTS OR BEARING SURFACES. SEVERE DAMAGE MAY RESULT.

(36) Apply retaining compound to pump body oil seal bore.

(37) Place oil seal into pump body bore with seal lip facing inward (towards rear of transmission).

(38) Install seal into pump body with seal installer J-24198 and driver handle J-24202-4. Press seal inward until outer edge is flush with pump body.

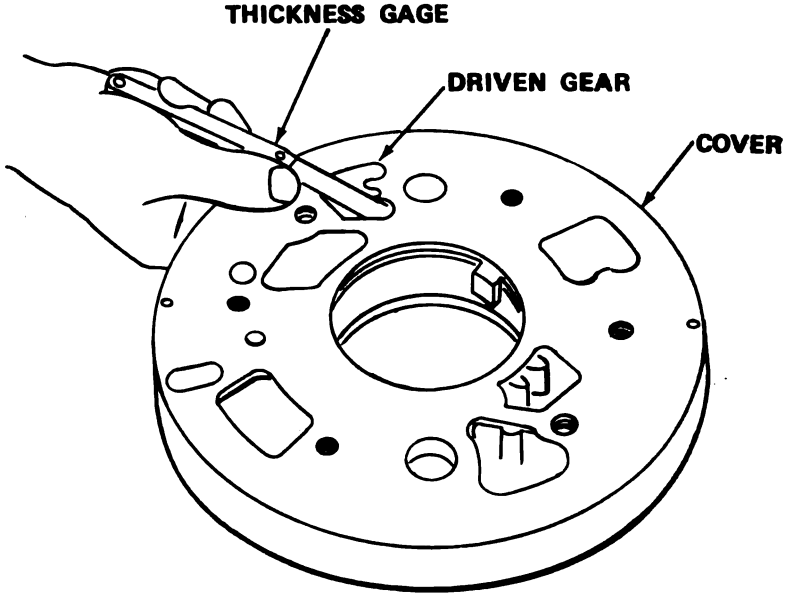


TA294831

(39) Drive bearing, on numbered end, into driven gear using bearing driver J-28646.

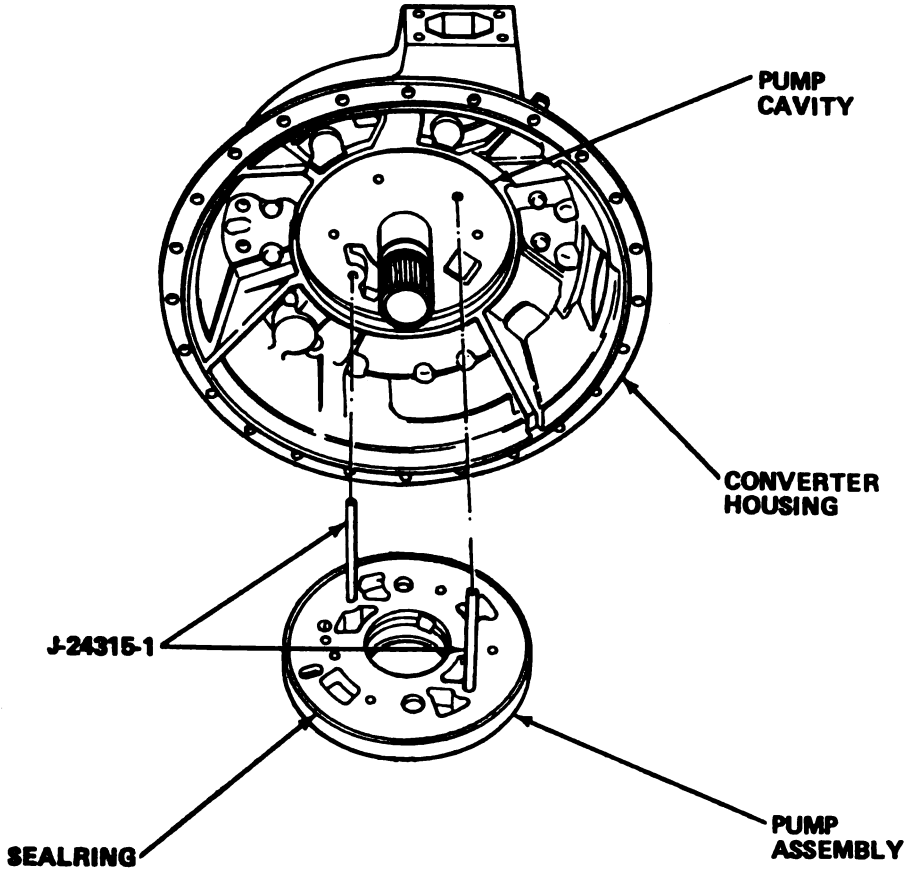
(40) Reinstall drive gear and driven gear into pump body.

(41) Reinstall cover and retaining screw. Torque screw to 9 - 11 ft lbs (12 - 15 Nom).



TA294832

(42) Check oil pump and driven gear to cover clearance. If clearance exceeds maximum of 0.006 in. (0.152 mm), replace gear.



(43) Install sealring to outer circumference of oil pump.

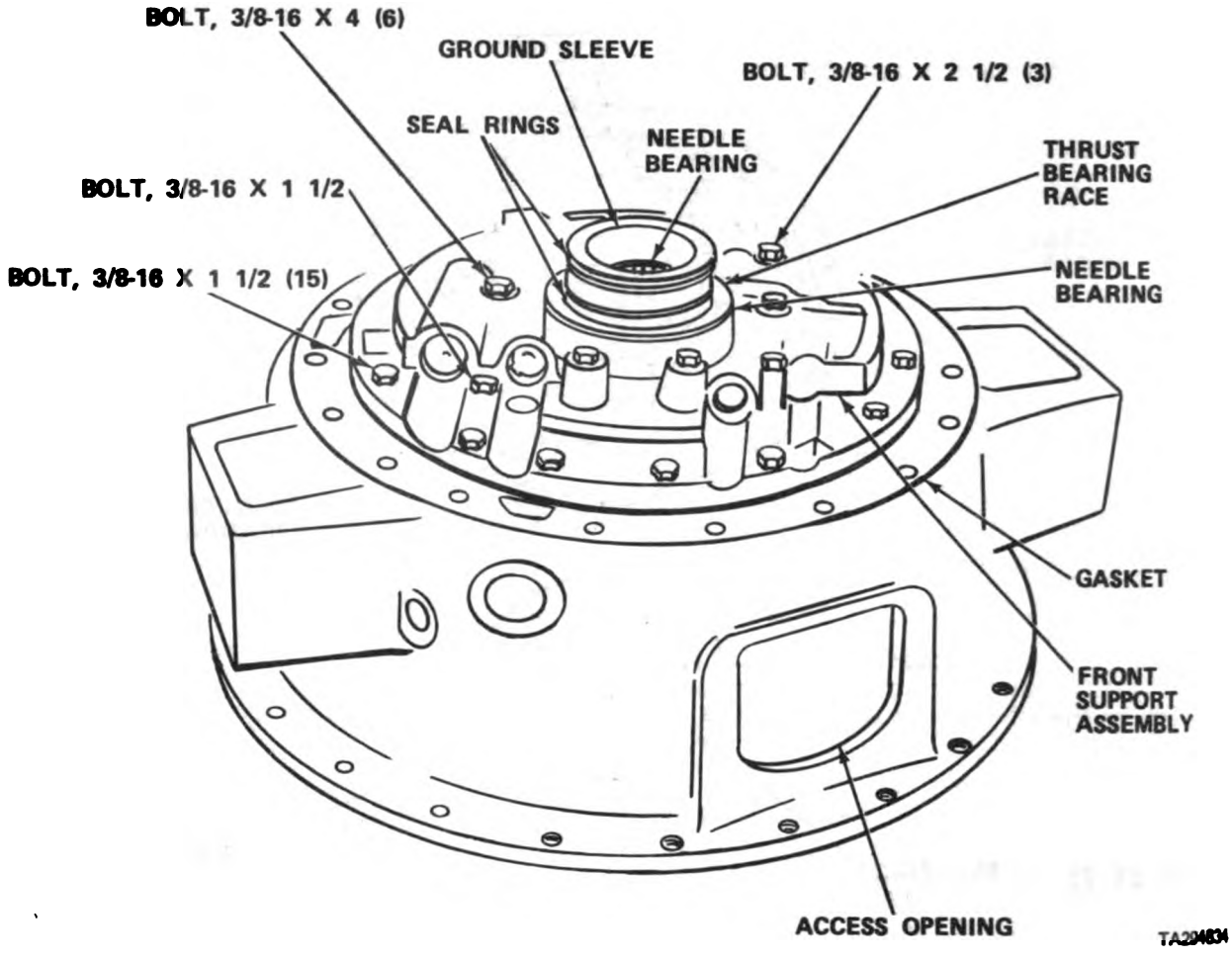
(44) Install two guide screws J-24315-1 into pump assembly retaining bolts holes.

(45) Lubricate sealring and pump cavity with oil-soluble grease.

(46) Reinstall pump assembly to front support, guiding the screws through holes indicated.

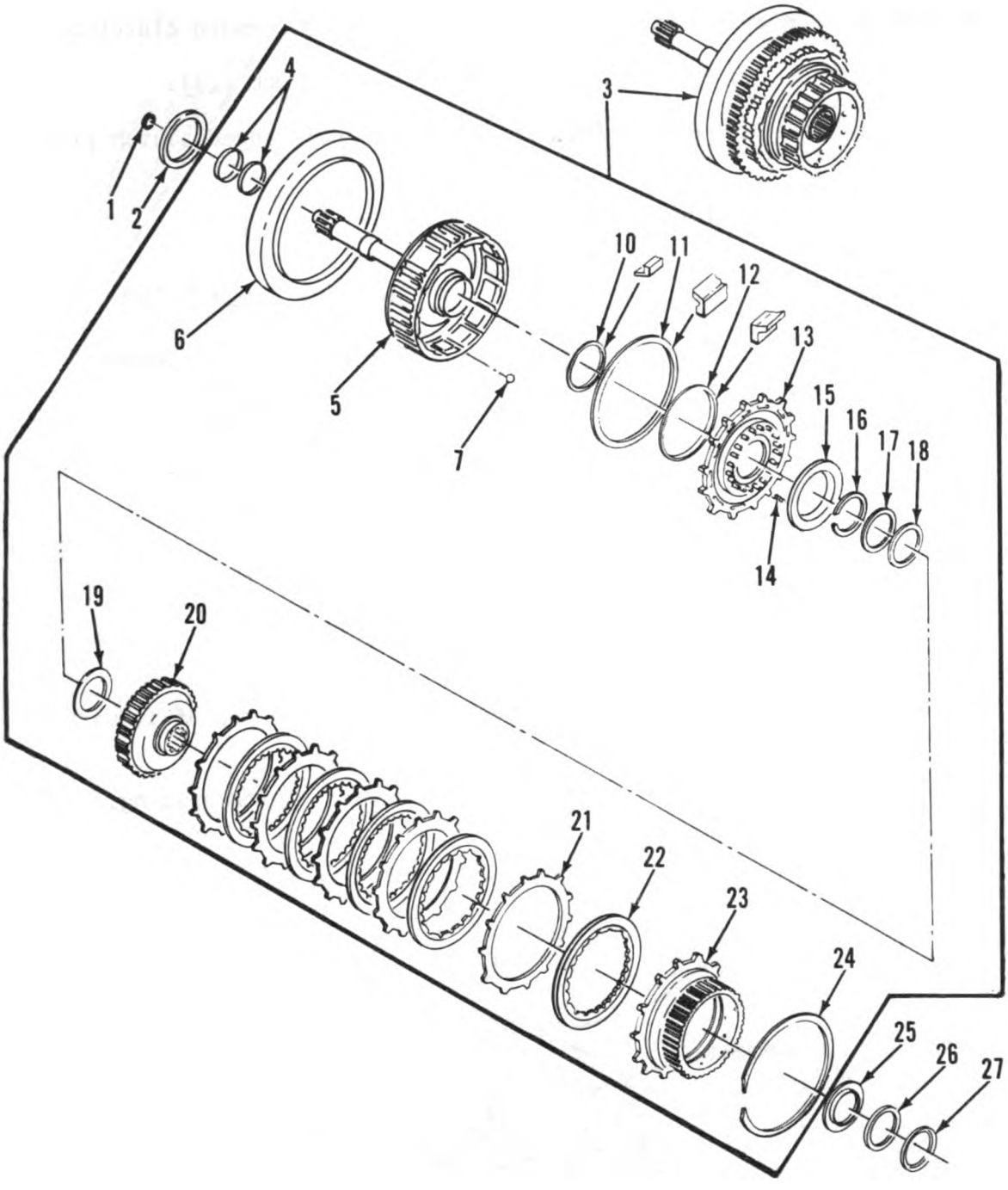
(47) Reinstall six retaining bolts. Remove guide screws and reinstall two remaining bolts. Torque bolts to 36 - 43 ft lbs (49 - 58 Nem).

(48) Coat threads with sealant and reinstall test plugs into bottom of converter housing. Torque plugs to 4 - 5 ft lbs (5.4 - 6.8 Nem).



(49) Lubricate sealrings wth oil-soluble grease and install into grooves in front support hub.

h. Forward clutch repair.



TA294835

(1) Remove hook-type sealring (1) from front of turbine shaft.

(2) Remove bearing race (2) from hub of forward clutch housing assembly (5).

(3) Remove two hook-type sealrings (4) from turbine shaft.

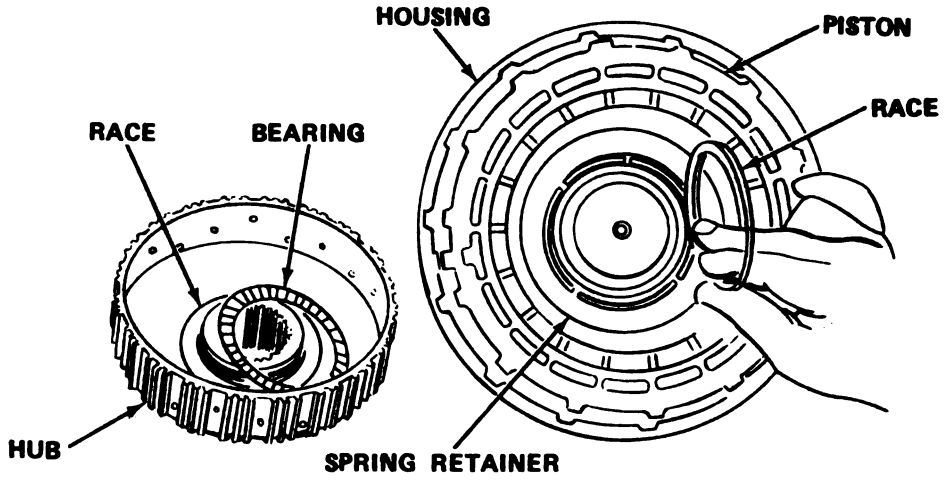
(4) Position forward clutch assembly (3) on a work table, turbine shaft down.

(5) Remove bearing race (25) and bearing (26) from forward clutch hub (20).

(6) Remove snapring (24) and fourth-clutch driving hub (23).

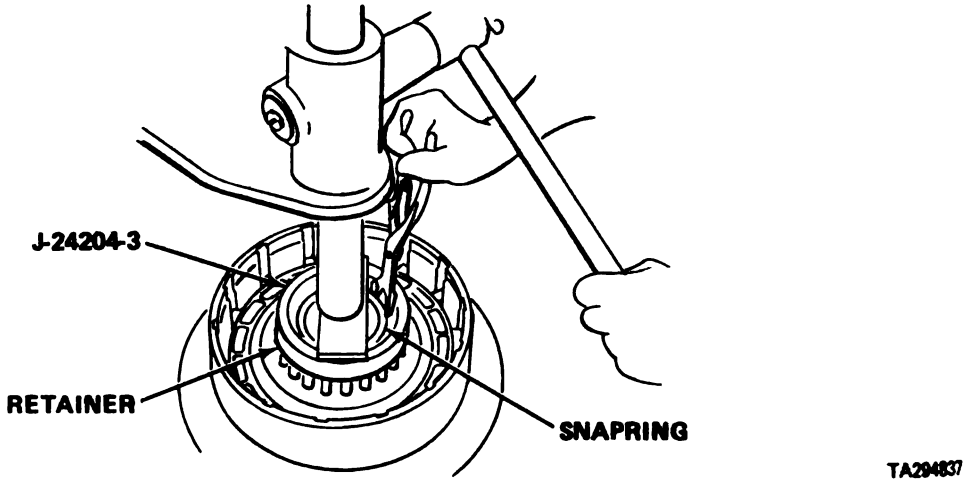
(7) Remove five internal-splined and five external-tanged clutch plates (21, 22).

(8) Remove forward clutch hub (20).



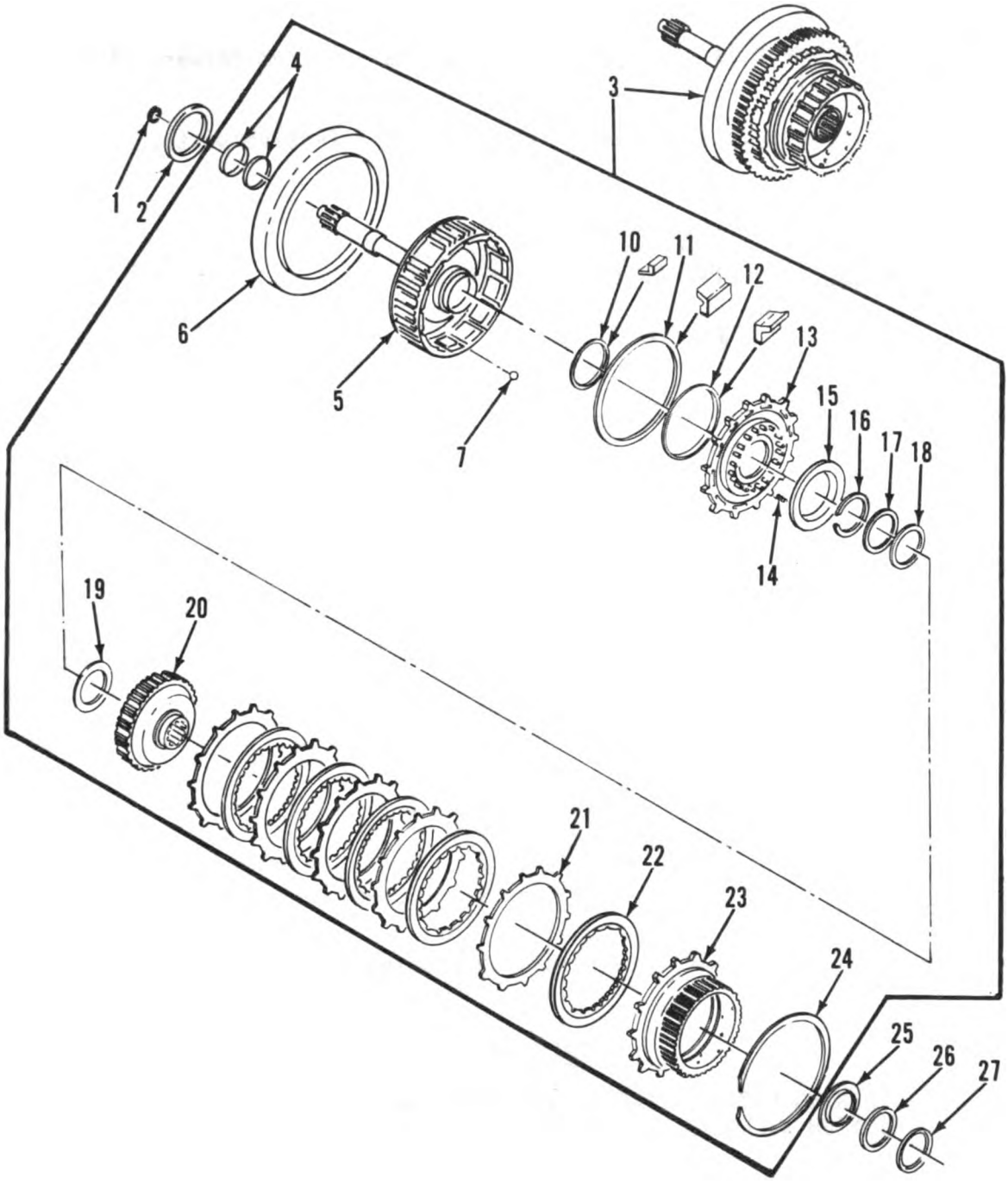
(9) Remove bearing race and needle bearing from inner hub of forward clutch hub.

(10) Remove bearing race from inner hub of forward clutch housing.



(11) Using spring compressor J-24204-3, compress spring retainer. Remove snapring.

(12) Carefully remove pressure from spring retainer. Remove spring retainer.



TA294838

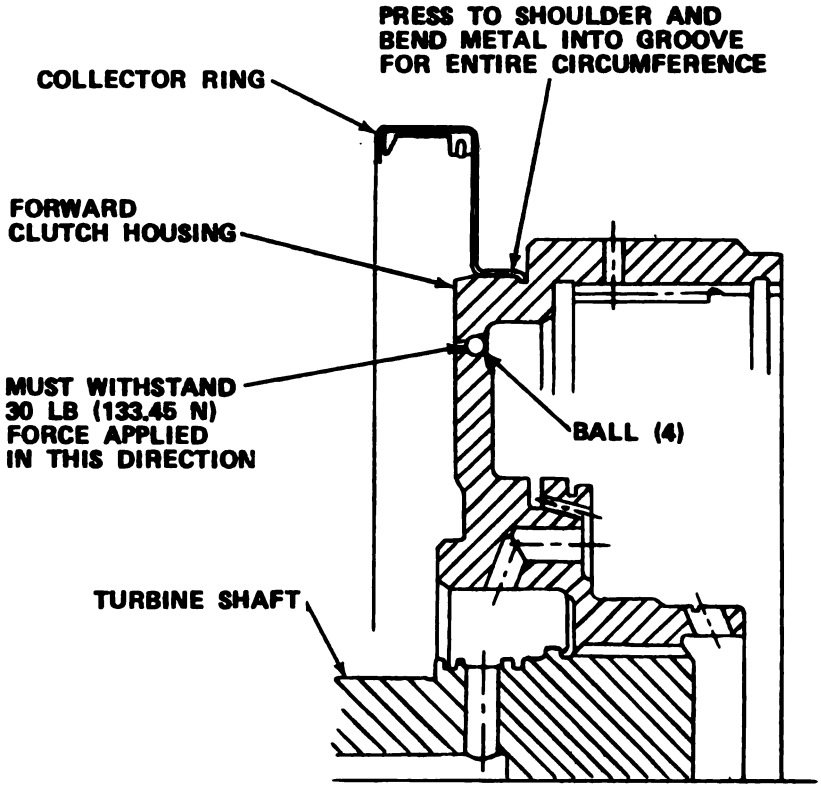
(13) Remove 20 piston return springs (14). Inspect spring pressures.

(14) Remove forward clutch piston (13) and sealrings (10, 11, 12). If piston is replaced, be sure identification (A, B, or C) for new piston is identical to that of piston replaced.

(15) Remove oil collector ring (6) from clutch housing (5) by supporting inner circumference of ring and pressing forward clutch housing and input shaft assembly free.

(16) If replacement is necessary, remove balls (7) from forward clutch housing (5).

(17) Inspect components for damage and replace defective parts.



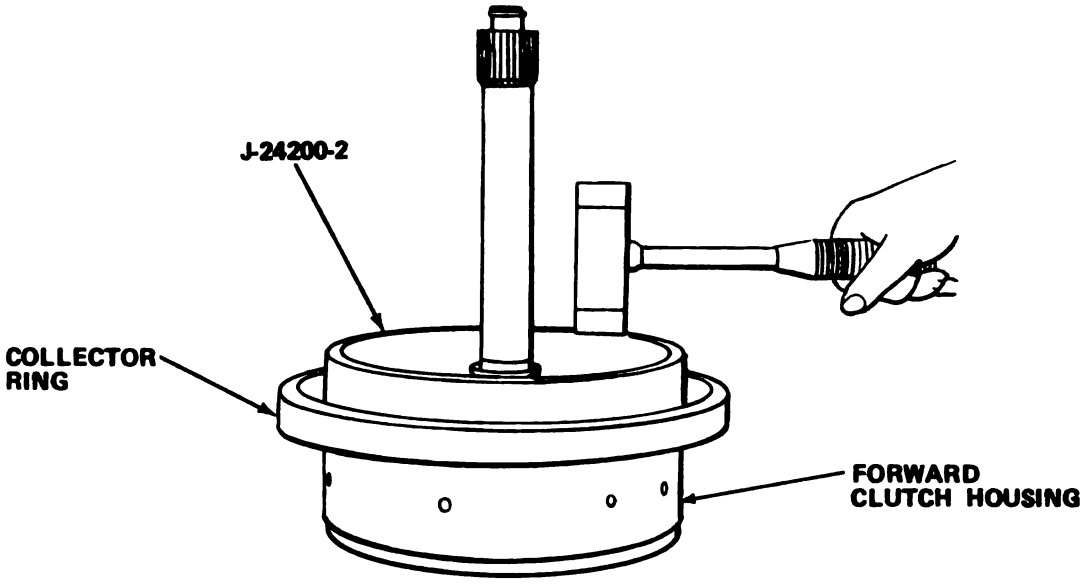
(18) Reinstall balls into forward clutch housing.

CAUTION

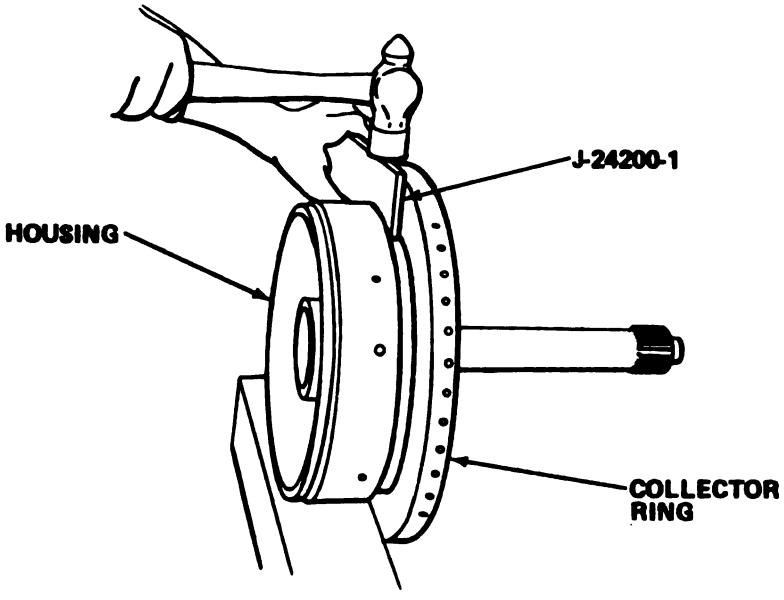
SEALRING LIP MUST FACE UPWARD (REARWARD) OR TRANSMISSION WILL SHIFT ROUGHLY.

(19) Grease sealring with oil-soluble grease and reinstall into sealring groove in forward clutch housing.

(20) Apply retaining compound onto collar of oil collector ring.

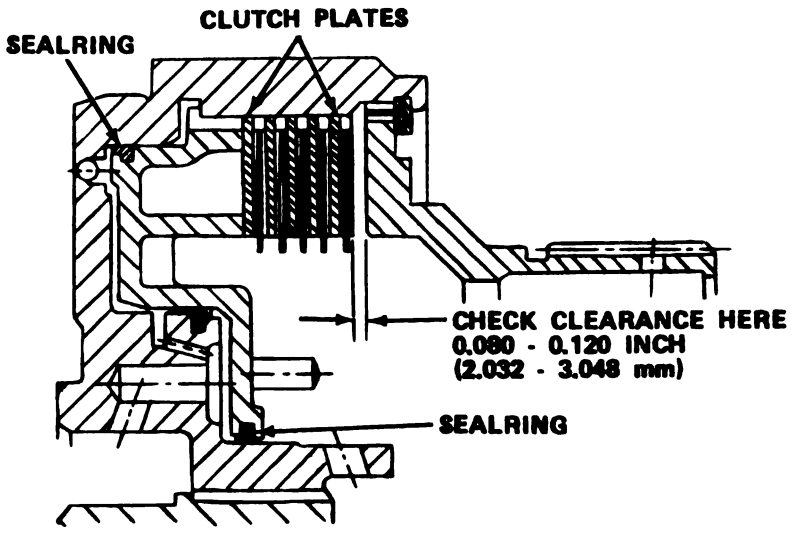


(21) Using installer J-24200-2, reinstall oil collector ring onto clutch housing.



(22) Using staking tool J-24200-1, bend edge of oil collector ring into groove of clutch housing.

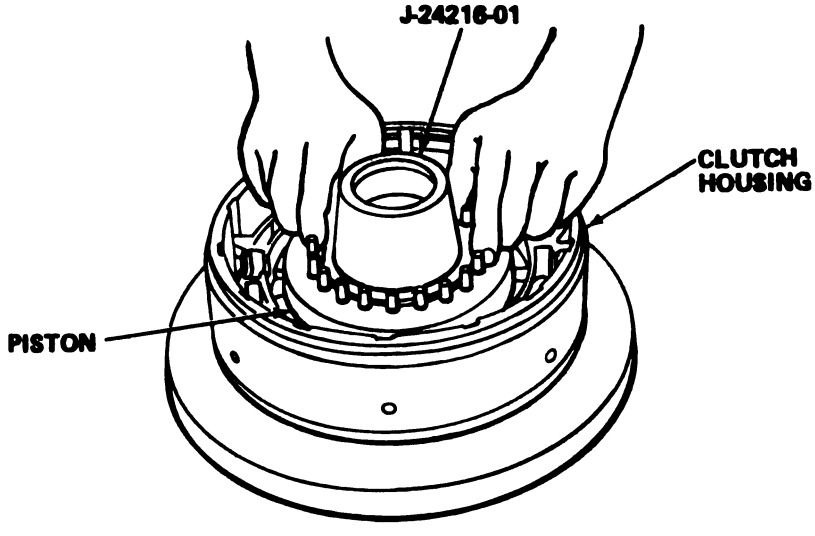
(23) Inspect clutch plates. Replace any damaged plates.



CAUTION

IF EITHER THE FORWARD CLUTCH HOUSING OR PISTON IS REPLACED, BE SURE IDENTIFICATION LETTERS (A, B, OR C) MATCH, OR TRANSMISSION WILL NOT OPERATE PROPERLY.

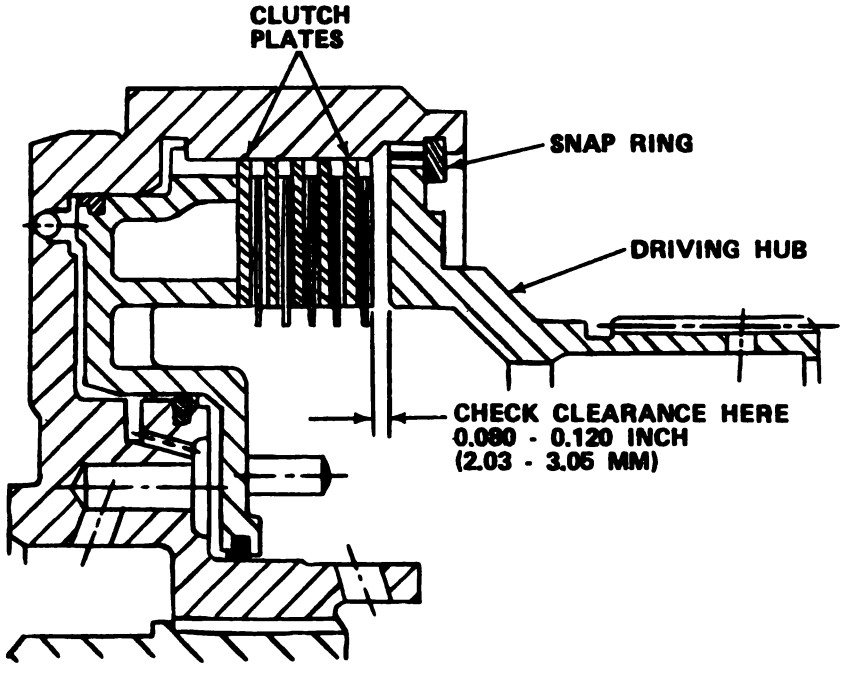
(24) Grease sealrings with oil-soluble grease and install onto clutch piston, lips facing forward (opposite return spring bosses).



NOTE

Be sure sealrings face the bottom of the piston cavity.

(25) Install seal protector J-24216-01 onto forward clutch housing and reinstall piston into cavity. Remove seal protector.



(26) Beginning with an external-tanged clutch plate, alternately reinstall five external-tanged clutch plates and five internal-splined clutch plates into forward clutch housing.

(27) Reinstall driving hub into forward clutch housing.

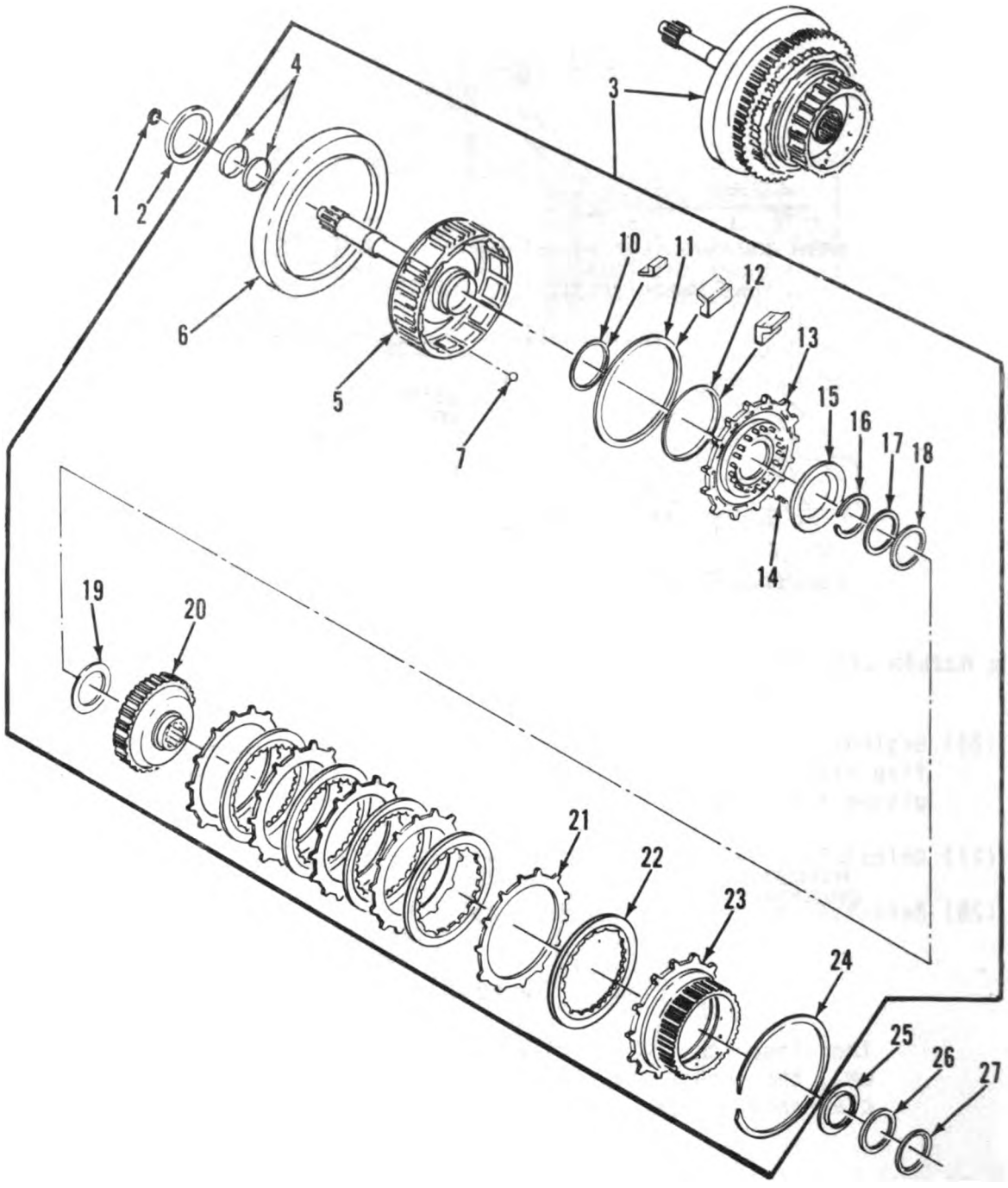
(28) Reinstall snapring to retain driving hub to forward clutch housing.

NOTE

The closer the clutch clearance is to 0.08 in. (2.03 mm), the longer the clutch will maintain satisfactory clearance.

(29) While holding driving hub firmly against snapring, measure the clearance between the driving hub and clutch plates. Clearance should be 0.08 - 0.12 in. (2.03 - 3.05 mm).

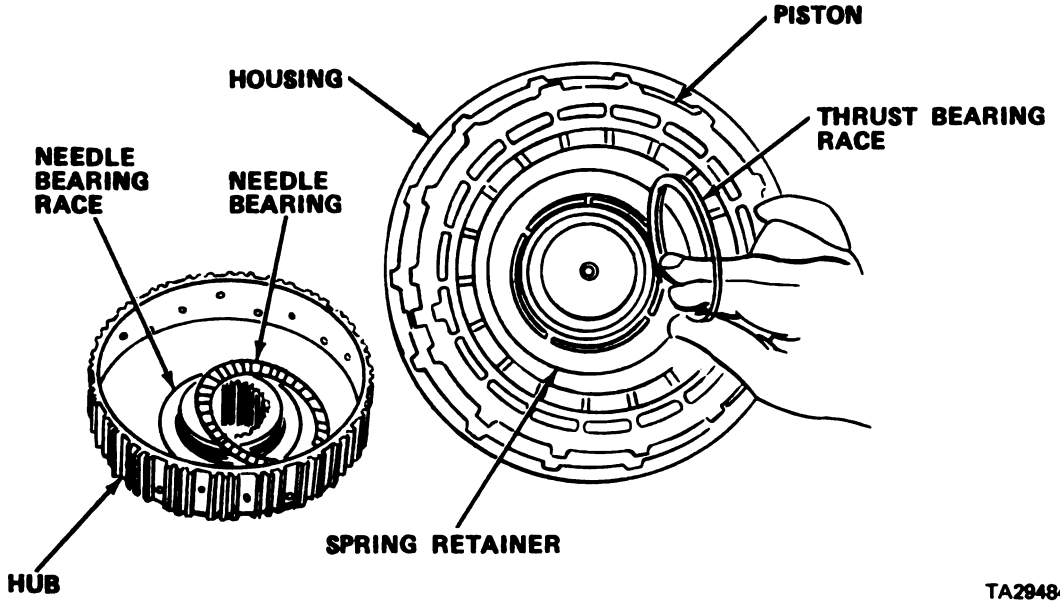
(30) If clutch clearance is not within specified limits, remove clutch plates and inspect plates for exceeding wear limits.



TA294845

(31) With clutch clearance established, install 20 piston return springs (14) onto spring guide bosses of piston (13).

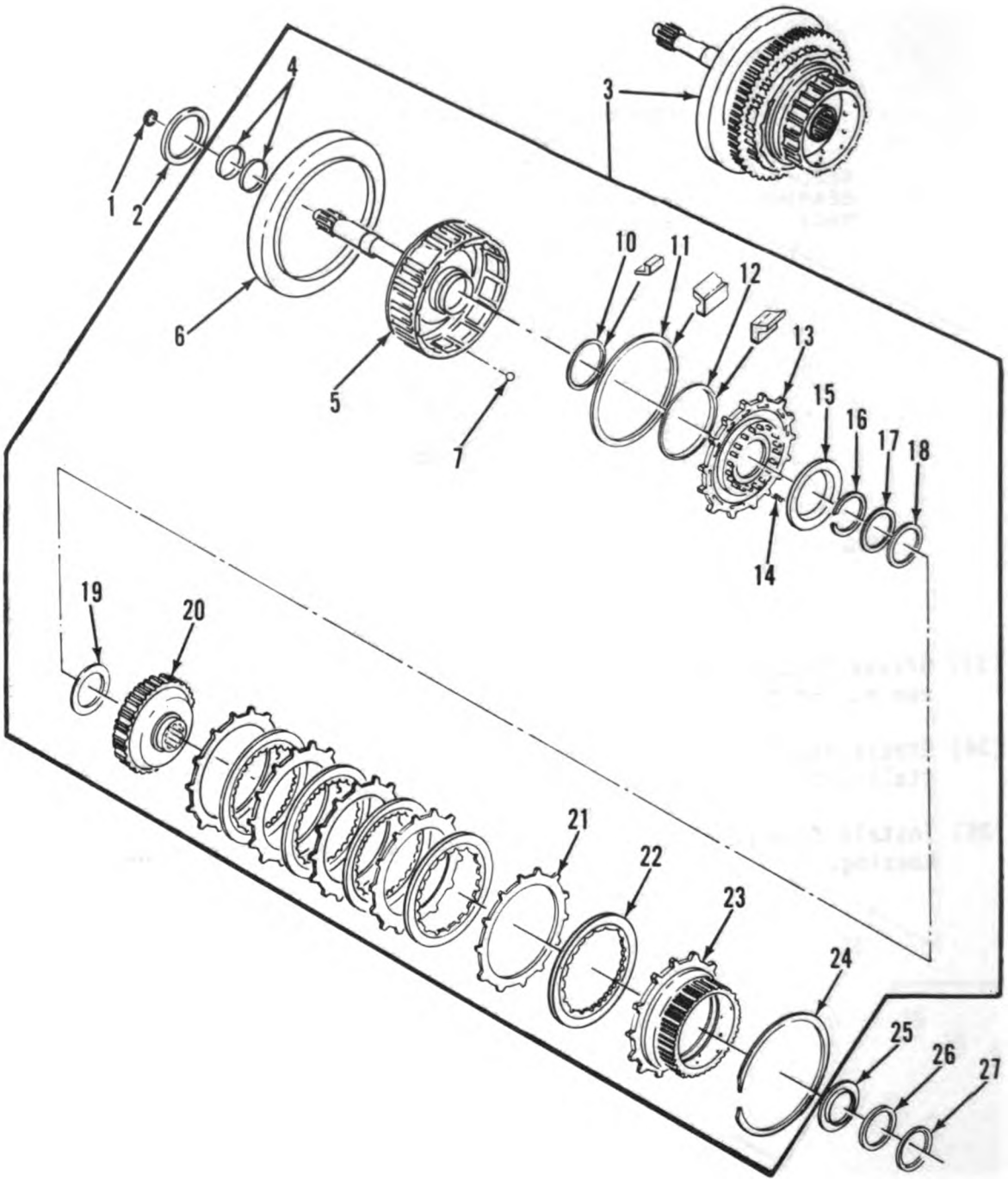
(32) Place spring retainer (15) on top of springs (14). Compress spring retainer and install snapring (16) into groove.



(33) Grease thrust bearing race with oil-soluble grease and install onto inner hub of forward clutch housing.

(34) Grease needle bearing and bearing race with oil-soluble grease and install onto inner hub of forward clutch hub.

(35) Install forward clutch hub, outer splines first, onto forward clutch housing.



TA284847

(36) Install fourth-clutch driving hub (23) and retain with snapring (24).

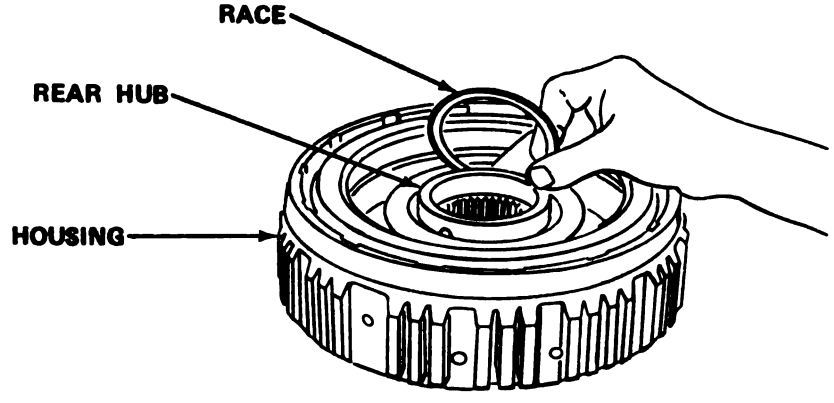
(37) Grease with oil-soluble grease and install two new sealrings (4) onto forward clutch housing.

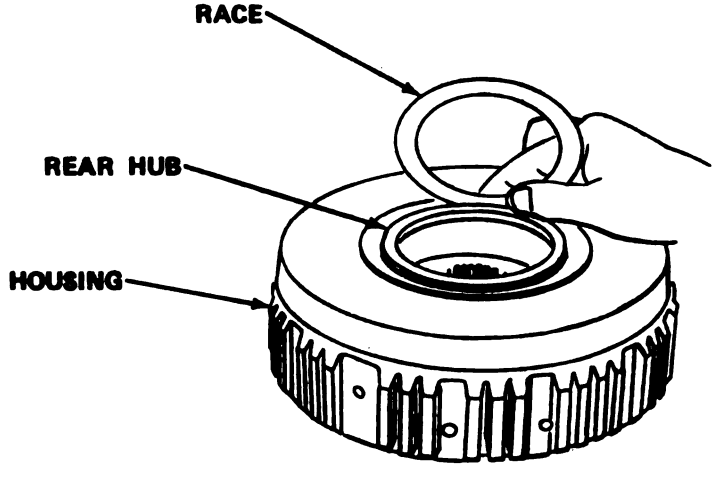
(38) Install new sealring (1) onto front of turbine shaft of forward clutch housing.

(39) Install thrust bearing race (2), cupped side first, onto front of forward clutch housing (5).

(40) Grease with oil-soluble grease and install bearing race (25), flat side first, and needle bearing (26) onto rear of forward clutch hub (20).

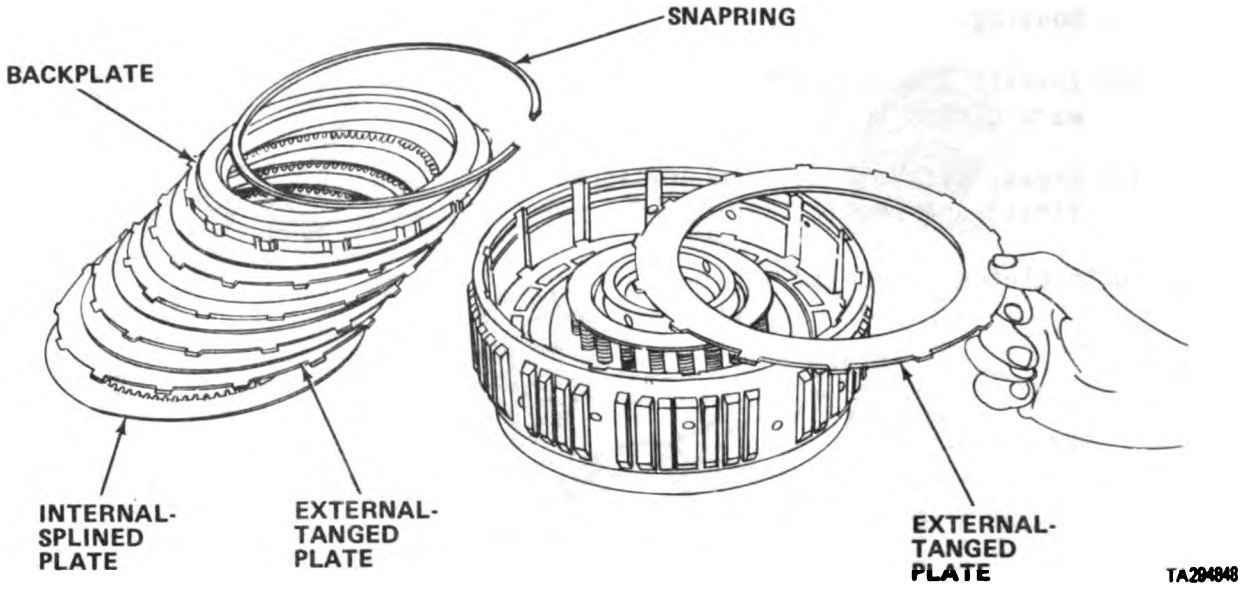
i. Fourth clutch assembly repair.





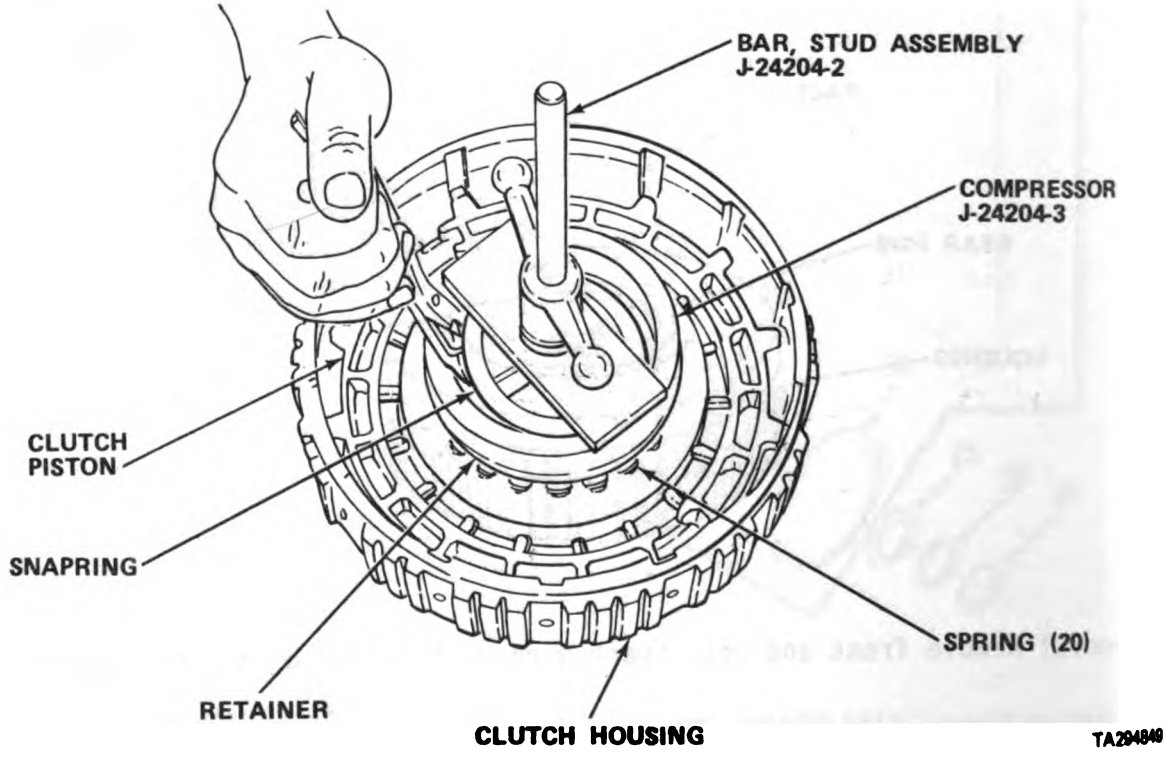
TA294847

(1) Remove front and rear bearing races from hub of fourth clutch housing.



(2) Remove large snapring and backplate.

(3) Remove five external-tanged clutch plates and five internal-splined clutch plates. Keep clutch plates in removal order and bundle together.

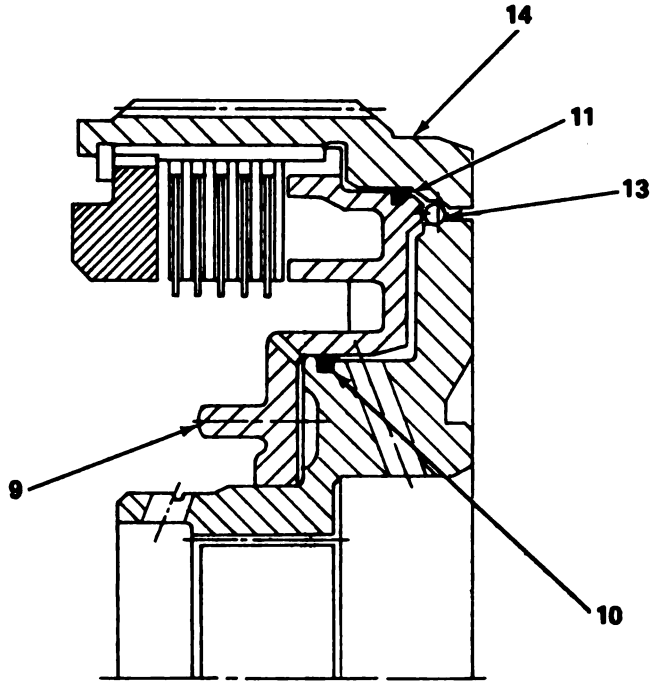


(4) Using tools J-24204-2 and J-24204-3, compress spring retainer and remove snapring.

(5) Carefully release spring retainer and remove.

(6) Remove 20 piston return springs and inspect spring pressures.

(7) Remove clutch piston from clutch housing.



TA294850

(8) Remove sealrings (10, 11).

(9) Check eight steel balls (13) in fourth clutch housing (14). Make sure they are securely staked in clutch housing and are free to move without restriction.

(10) Inspect all parts for wear or defects. Replace any damaged components.

NOTE

Be sure lip of sealring is facing bottom of piston cavity.

(11) Grease with oil-soluble grease and install new sealring (11) into clutch housing (14).

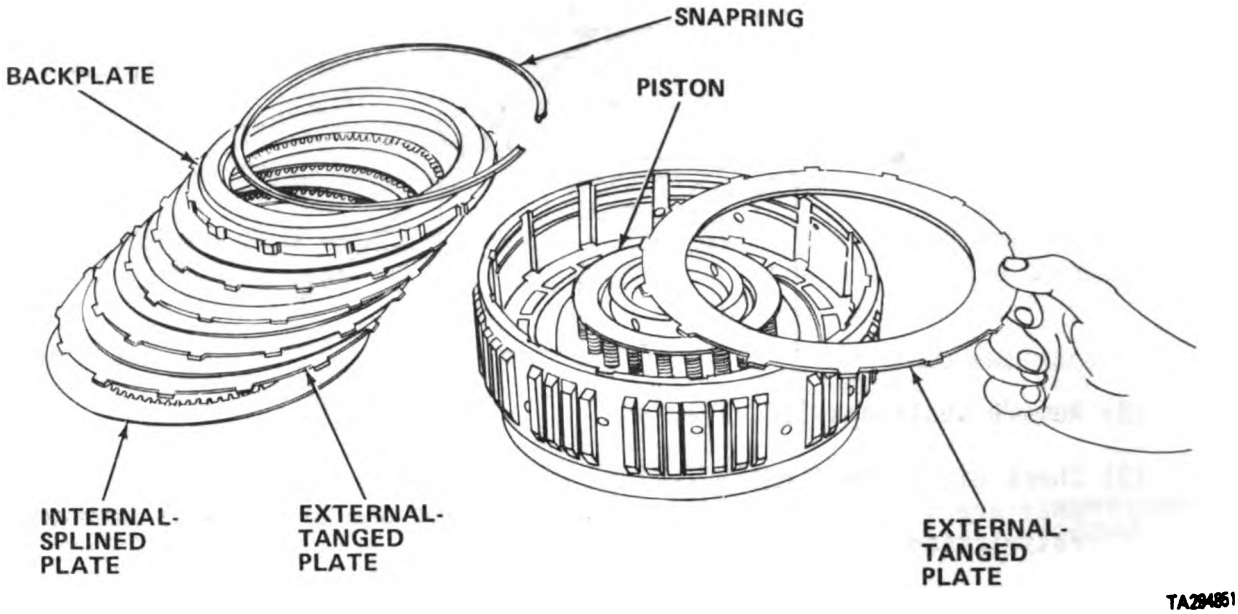
(12) Place fourth clutch piston (9) onto work table, spring bosses side up.

(13) Grease with oil-soluble grease and install new sealring (10), lip downward, into outside groove of piston.

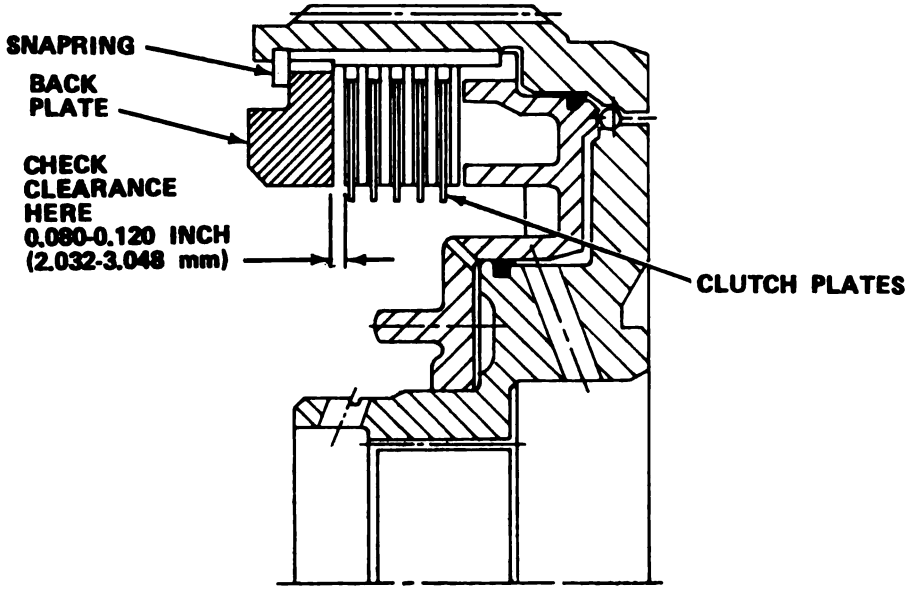
CAUTION

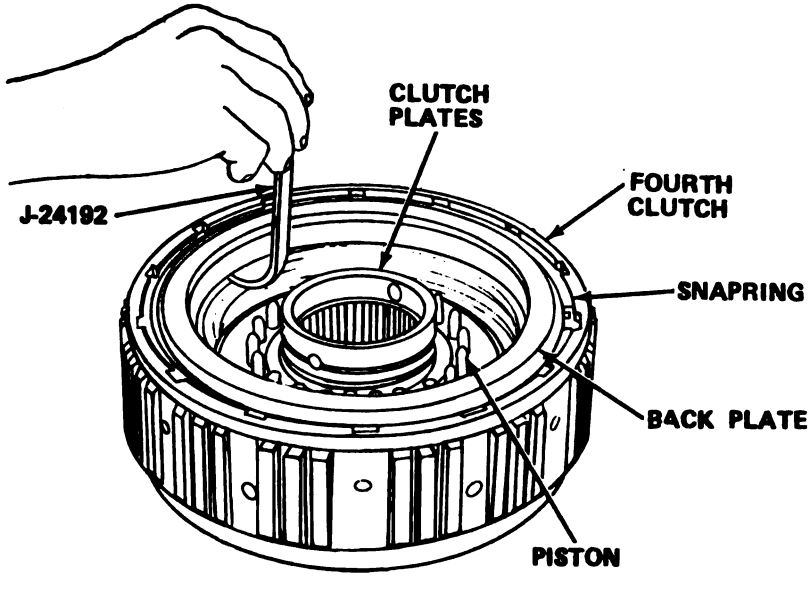
IF FOURTH CLUTCH HOUSING IS REPLACED, SELECTION OF A PROPER PISTON (M, S, OR T) IS IMPERATIVE BEFORE SEALRING INSTALLATION. IF THE FOURTH CLUTCH HOUSING IS NOT REPLACED AND A NEW PISTON IS REQUIRED, MAKE SURE IDENTIFICATION LETTER STAMPED ON NEW PISTON IS IDENTICAL TO THAT ON OLD PISTON.

(14) Install piston into clutch housing using seal protector J-24216-01.



(15) Beginning with an external-tanged plate, alternately install five external-tanged clutch plates and five internal-splined clutch plates into fourth clutch housing.





(16) Reinstall backplate and snapring.

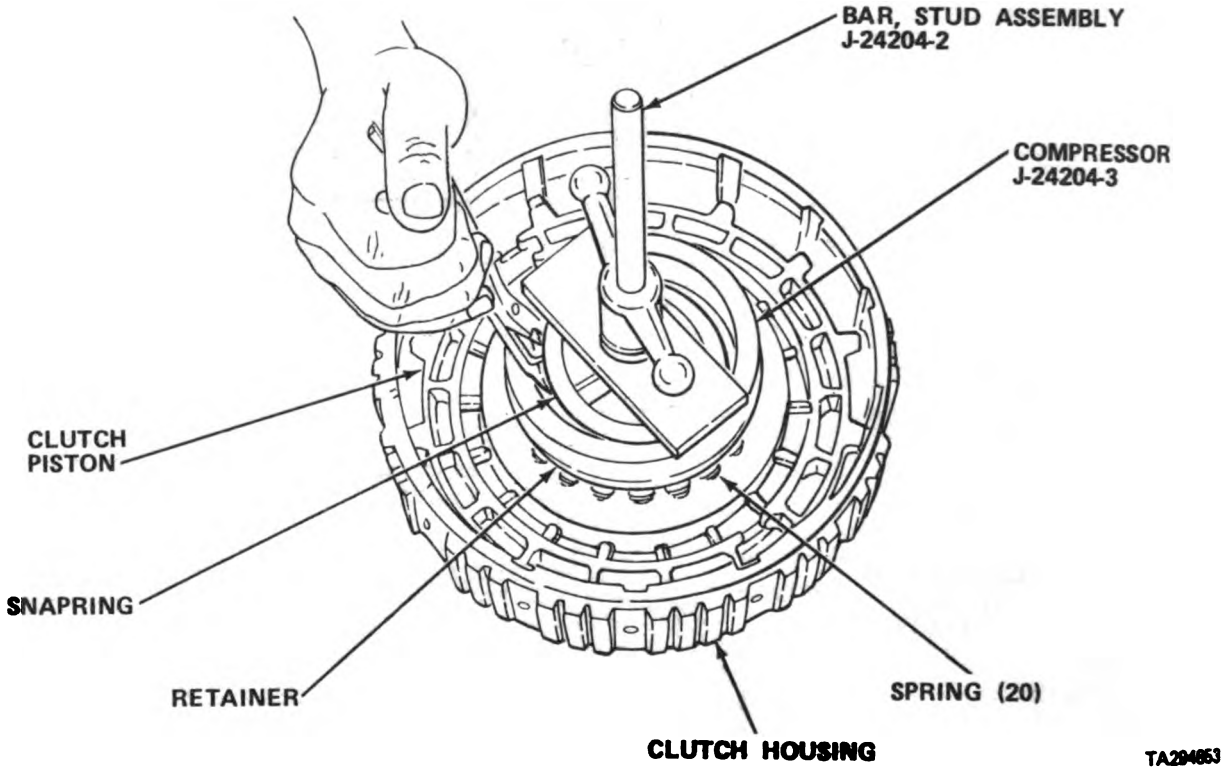
(17) Hold backplate firmly against snapring. Measure clearance between backplate and clutch plate. Clearance should be within 0.08 - 0.12 in. (2.03 - 3.05 mm).

NOTE

Any clearance measurement within its range is satisfactory, but the nearer to .080 in. (2.03 mm) that can be attained, the longer the clutch will maintain satisfactory clearance.

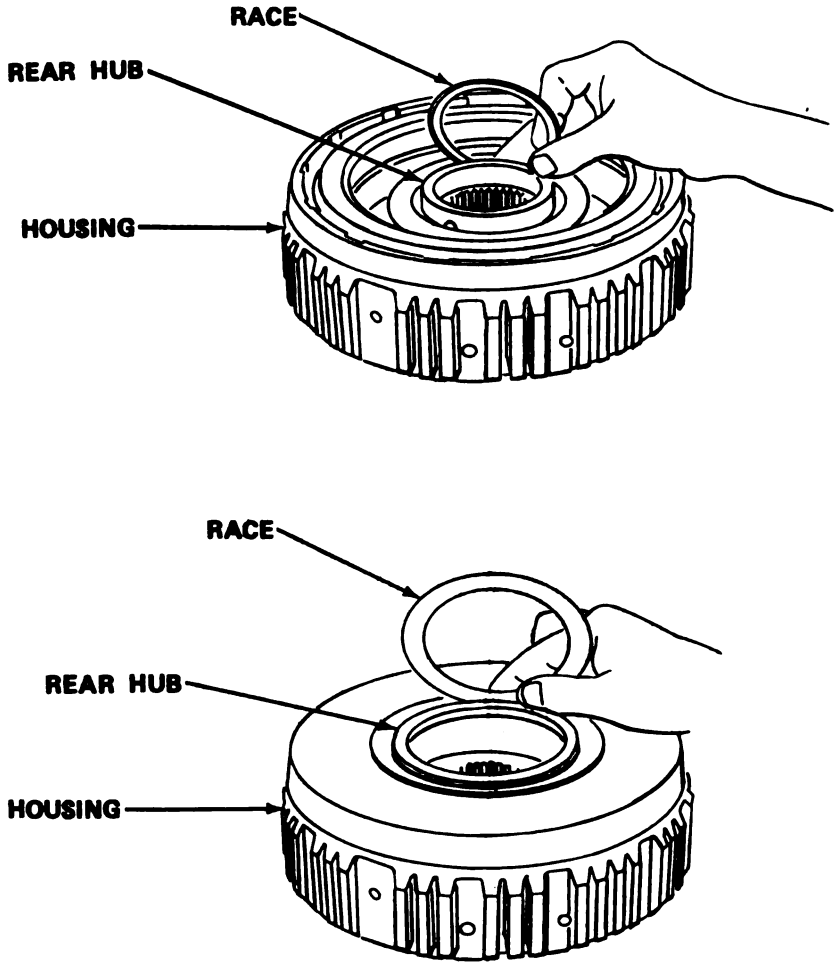
(18) If clutch clearance is not within specified limits, remove clutch plates and inspect plates for exceeding wear limits.

(19) With clutch clearances established, reinstall 20 piston release springs onto bosses of fourth clutch piston.



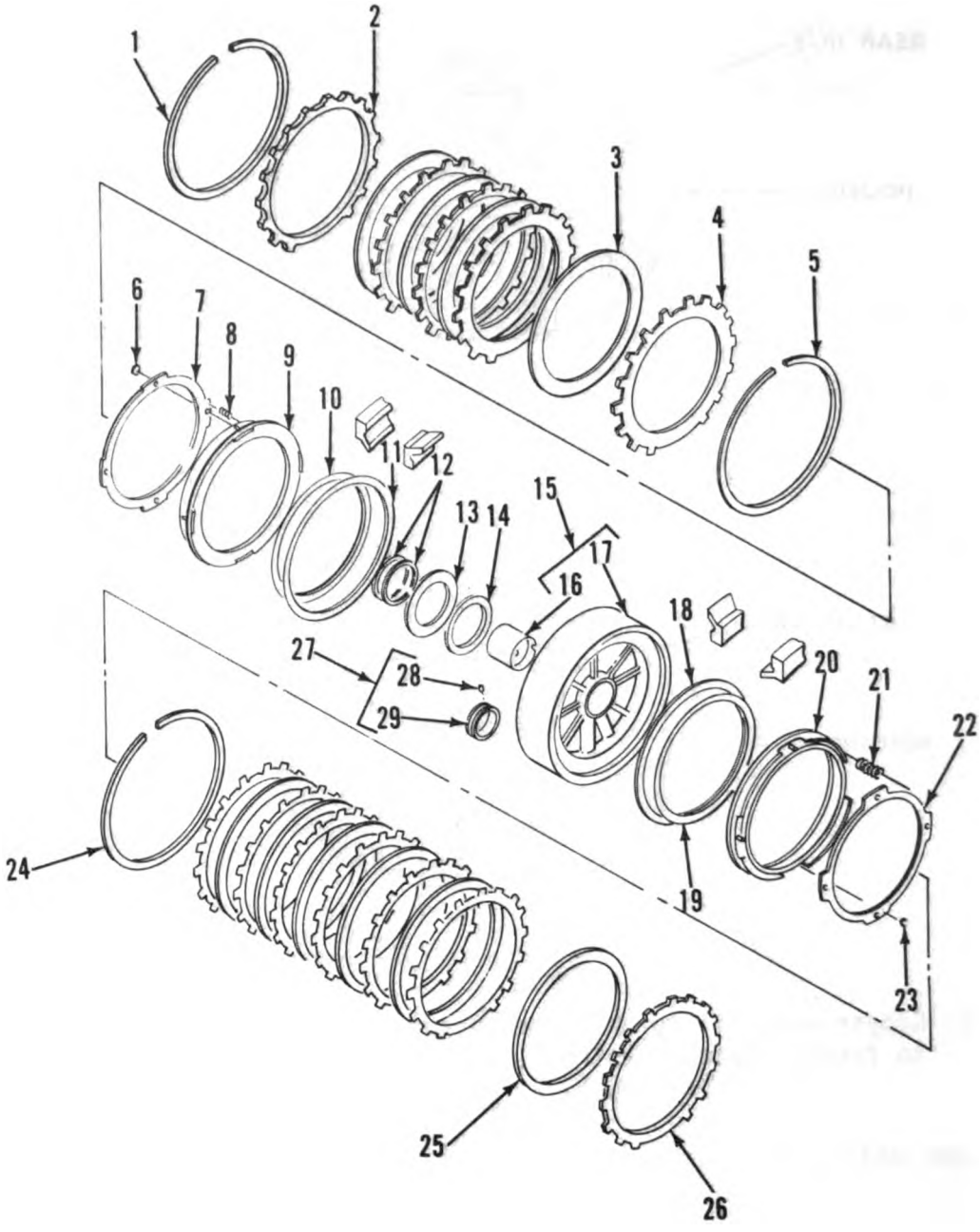
(20) Reinstall spring retainer, recessed side down, onto piston return springs.

(21) Using tools J-24204-2 and J-24204-3, compress spring retainer and install snapring into groove.



(22) Grease with oil-soluble grease and install front and rear bearing races to fourth clutch housing.

j. Center support assembly repair.



(1) With center support assembly (15) vertical, remove pistons (9, 20) with attached parts.

(2) Remove inner sealrings (10, 19) and outer sealrings (11, 18) from pistons (9, 20).

(3) Cut retainer rings (6, 23) with wire cutters and remove from piston assemblies.

(4) Remove spring retainers (7, 22) and springs (8, 21) from pistons (9, 20).

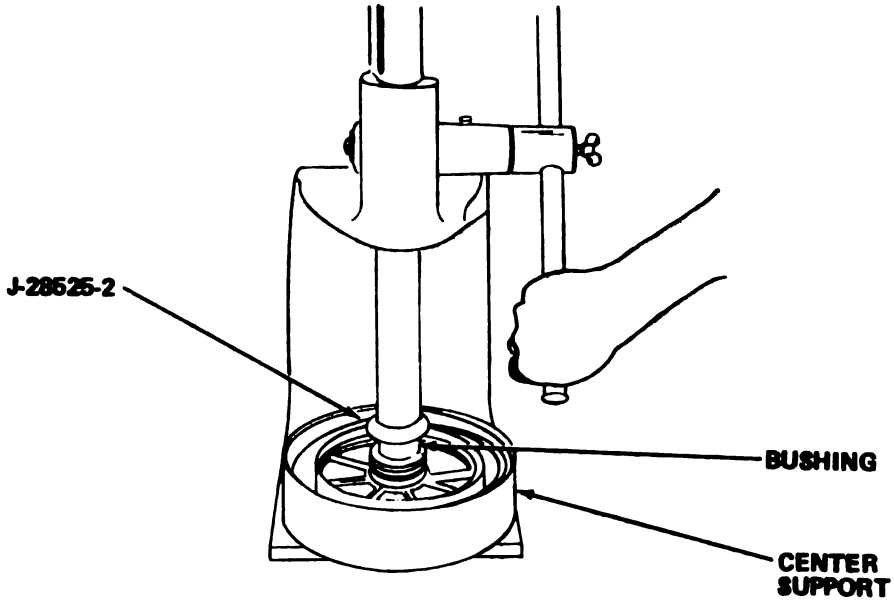
(5) Remove sealrings (12), thrust bearing race (14), and needle bearing (13) from hub of center support housing (17).

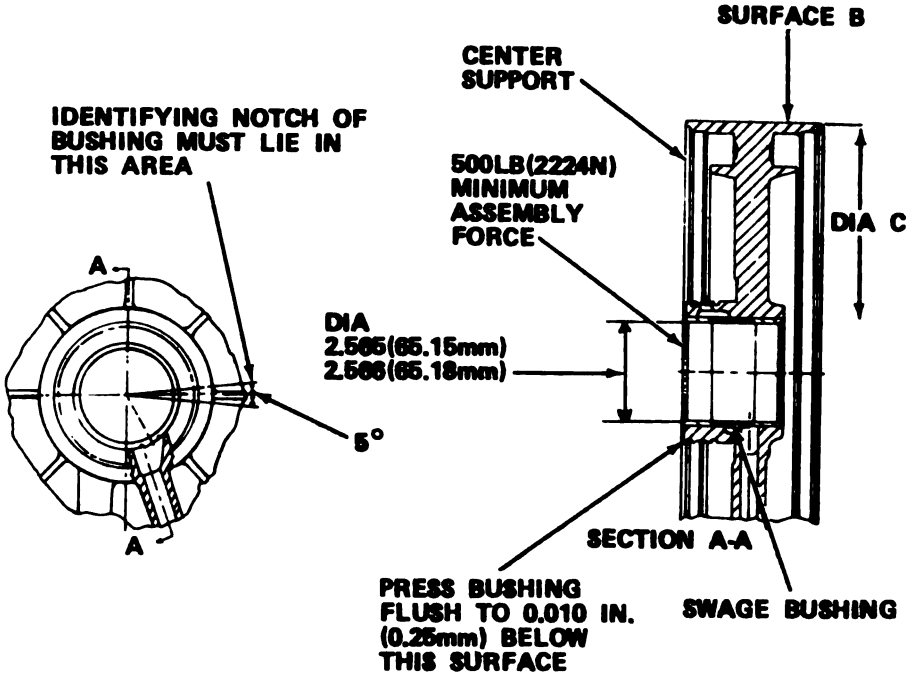
NOTE

A damaged or worn center support hub can be salvaged with guidance from the instruction sheet in the sleeve and pin kit. The kit contains one unfinished support sleeve, one sleeve retainer pin, and one machining and installation instruction sheet.

(6) If replacement is necessary, collapse bushing (16) at its seam with a small, half-round chisel.

(7) Inspect all components for damage or wear. Replace any defective components.



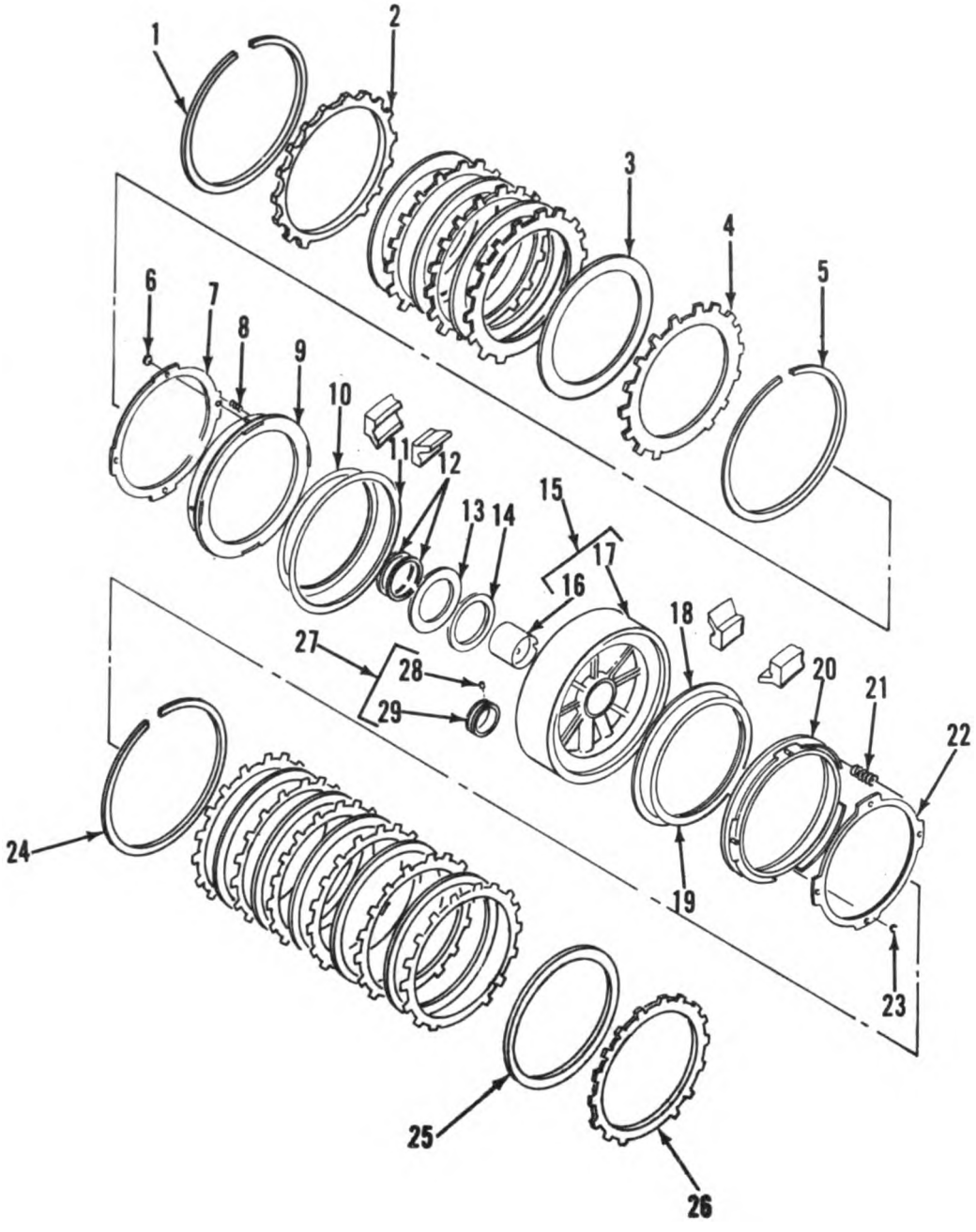


CAUTION

BE SURE TO ALINE OIL HOLE IN BUSHING WITH OIL HOLE IN CENTER SUPPORT OR IMPROPER OPERATION WILL RESULT.

(8) Using tool J-28525-2, press bushing into hub of center support.

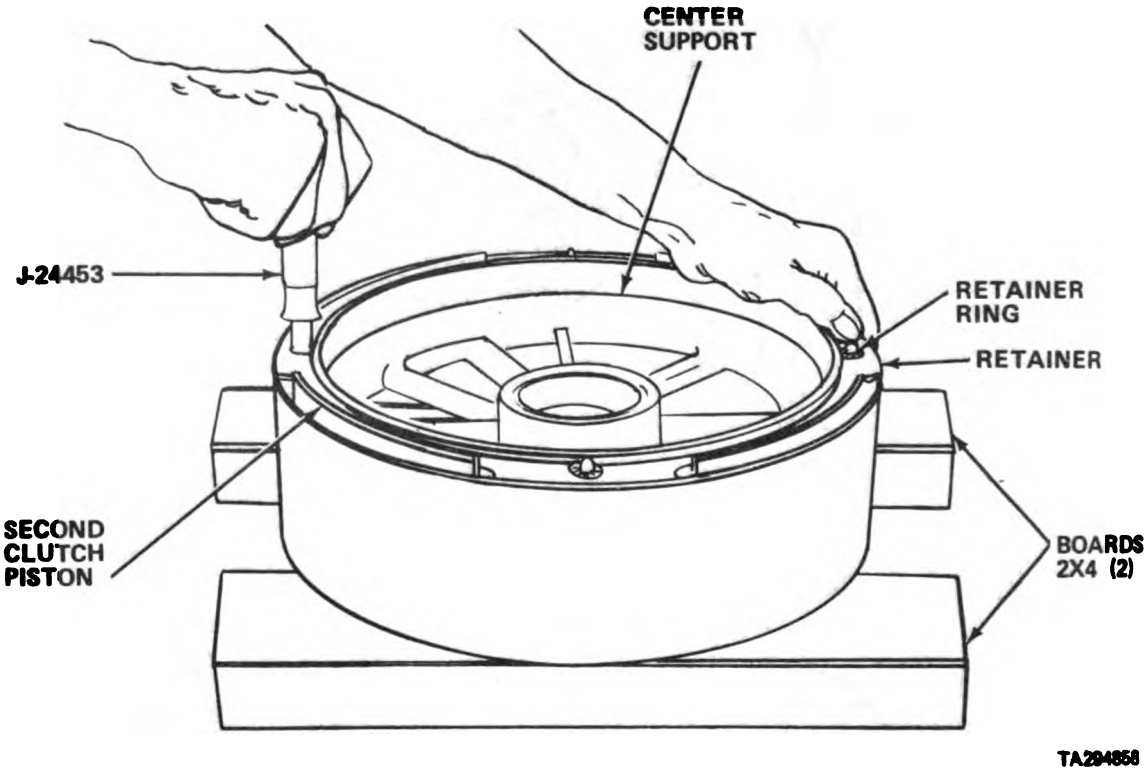
(9) Using tool J-28525-1, swage bushing into center support housing.



TA294857

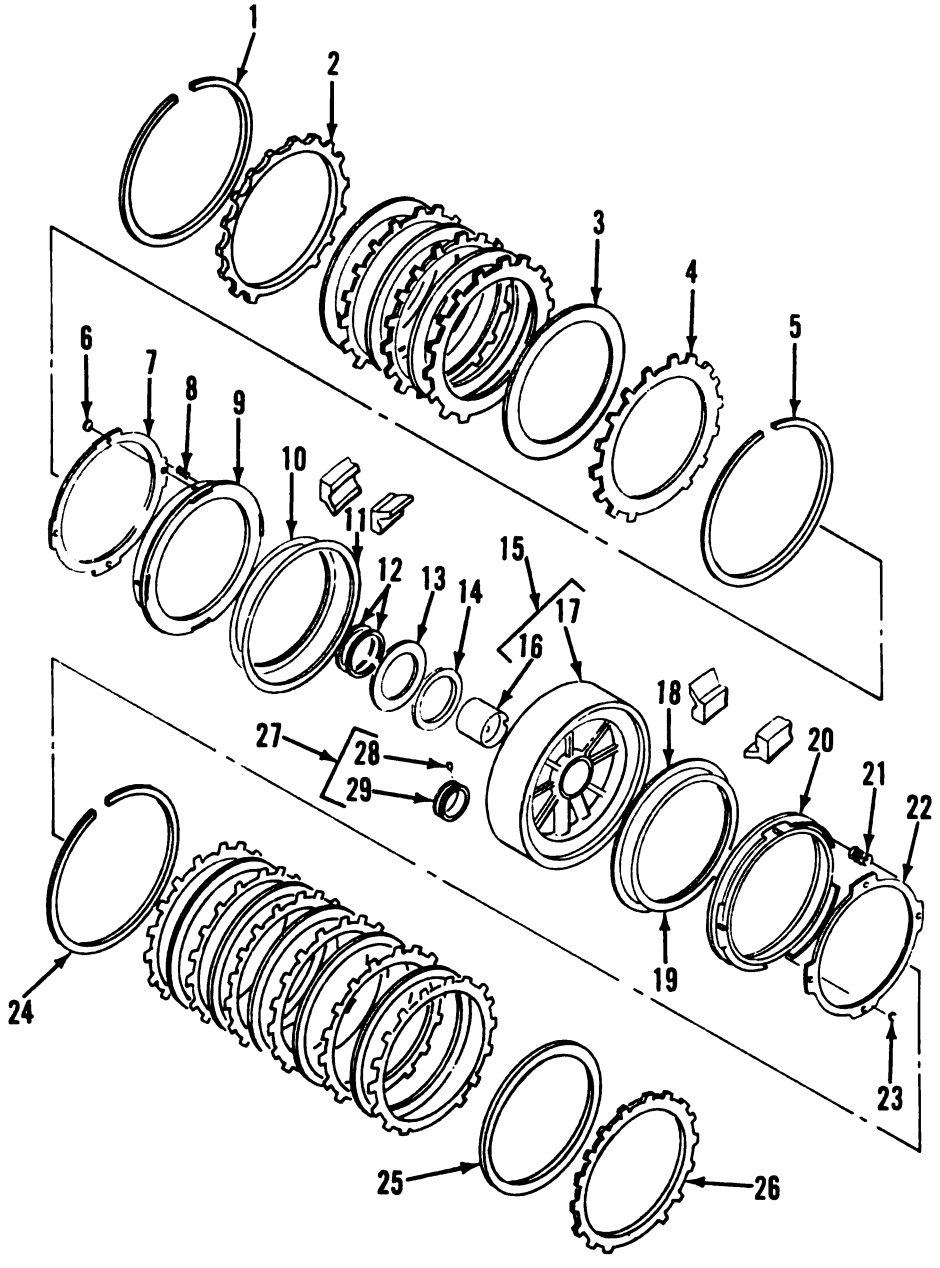
(10) Temporarily place third clutch piston (9) in front piston cavity of center support housing (17).

(11) Reinstall 20 springs (8) into pockets of piston (9).



(12) Aline spring retainer onto ejector pin bosses. Compress retainer and install four new retainer rings using tool J-24453.

(13) Repeat steps 10 - 12 for installation of second clutch.



TA294859

CAUTION

BE SURE LIPS OF ALL SEALRINGS FACE TOWARD PISTON CAVITIES OF CENTER SUPPORT.

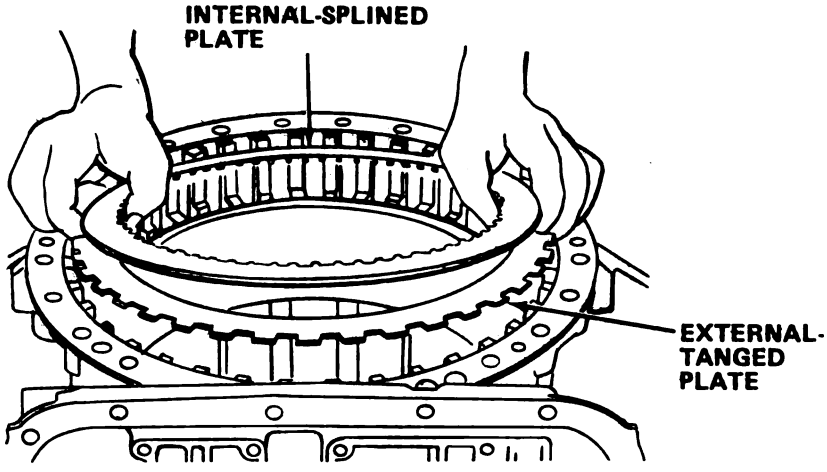
(14) Grease with oil-soluble grease and install inner sealrings (10, 19) and outer sealrings (11, 18) onto pistons (9, 20).

(15) Grease with oil-soluble grease and install bearing race (14), flat side first, and needle bearing (13) onto front hub of center support (17).

7-5. REASSEMBLE TRANSMISSION ASSEMBLY

a. Establishing clutch clearances and selecting center support snapring.

(1) Low and first clutch clearances.

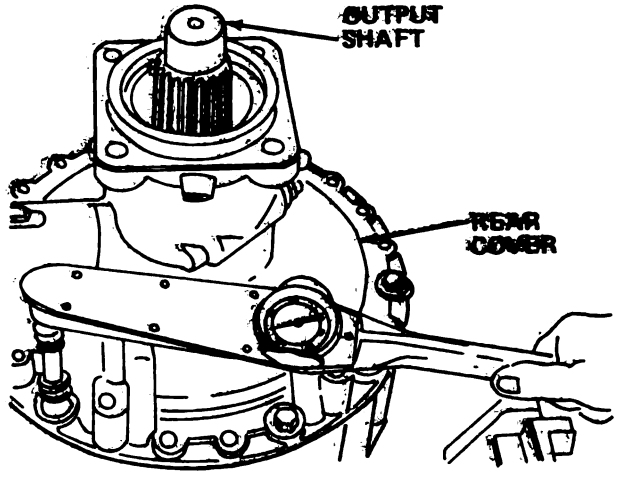


(a) Place transmission housing in a vertical position, rear upward.

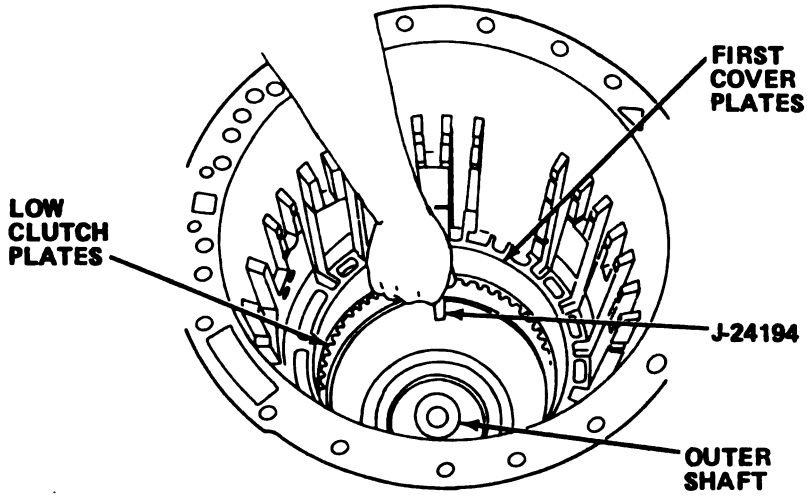
(b) Beginning with an external-tanged clutch plate, alternately install seven external-tanged and six internal-splined first clutch plates.

(c) Install adapter housing assembly and gasket.

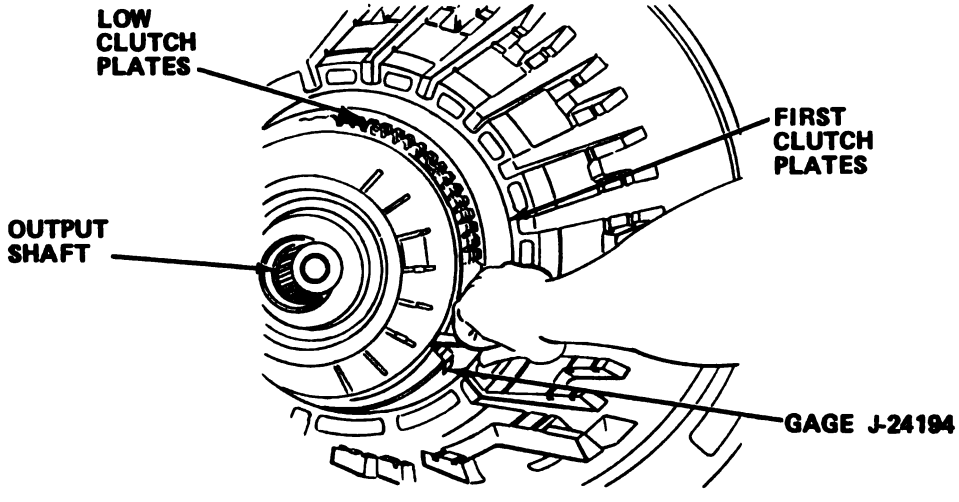
(d) Beginning with an external-tanged clutch plate, alternately install seven external-tanged and six internal-splined low clutch plates.



(e) Install rear cover assembly and gasket onto rear of transmission housing and secure it with six 1/2-13 bolts and flat washers, evenly spaced. Torque bolts to 30 ft lbs (41 Nem).

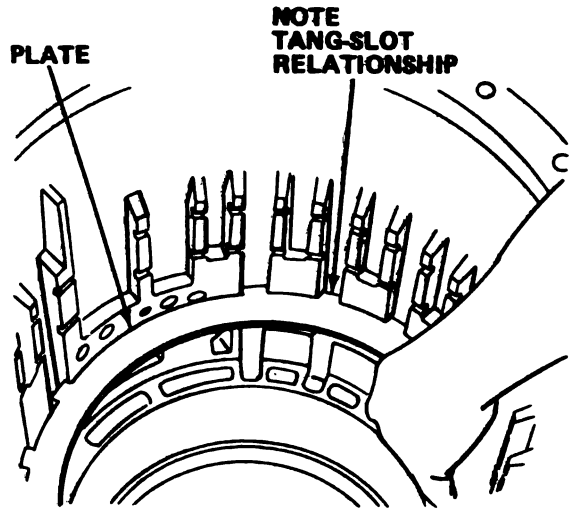


(f) Invert transmission, front upward. Using gage J-24194, check clearance between low clutch plates. It is recommended gage be placed between adapter housing wall and first steel plate. Prescribed clearance is 0.095 to 0.145 in. (2.413 to 3.683 mm). Any dimension within 0.095 to 0.145 in. is satisfactory. However, the closer clearance is to 0.095 in., the longer the interval between clutch plate replacements will be. Replace worn clutch plates with new plates to establish desired clearance. Recheck the clearance as described above.



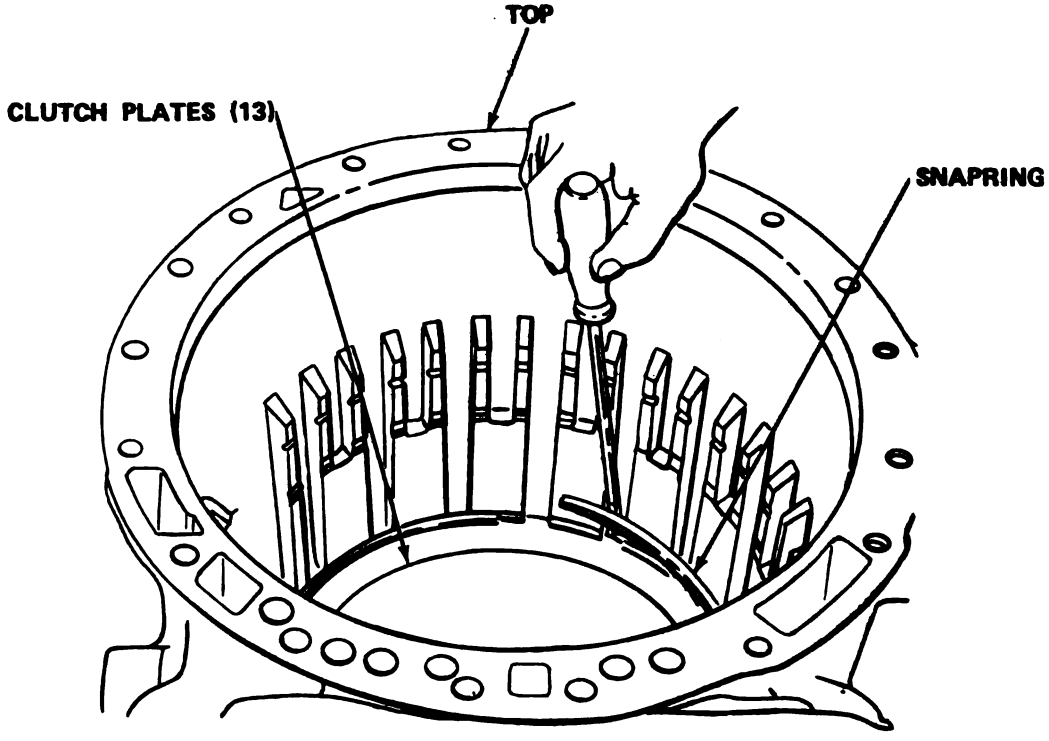
(g) Using gage J-24194, check clearance between first clutch plates. It is recommended gage be placed between transmission housing and first steel plate. Prescribed clearance is 0.095 to 0.145 in. (2.413 to 3.683 mm). Any dimension within 0.095 to 0.145 in. is satisfactory. However, the closer the clearance is to 0.095 in., the longer the interval between clutch plate replacements will be. Replace worn clutch plates with new plates to establish desired clearance. Recheck the clearance as described above.

(2) Selecting center support snapring.



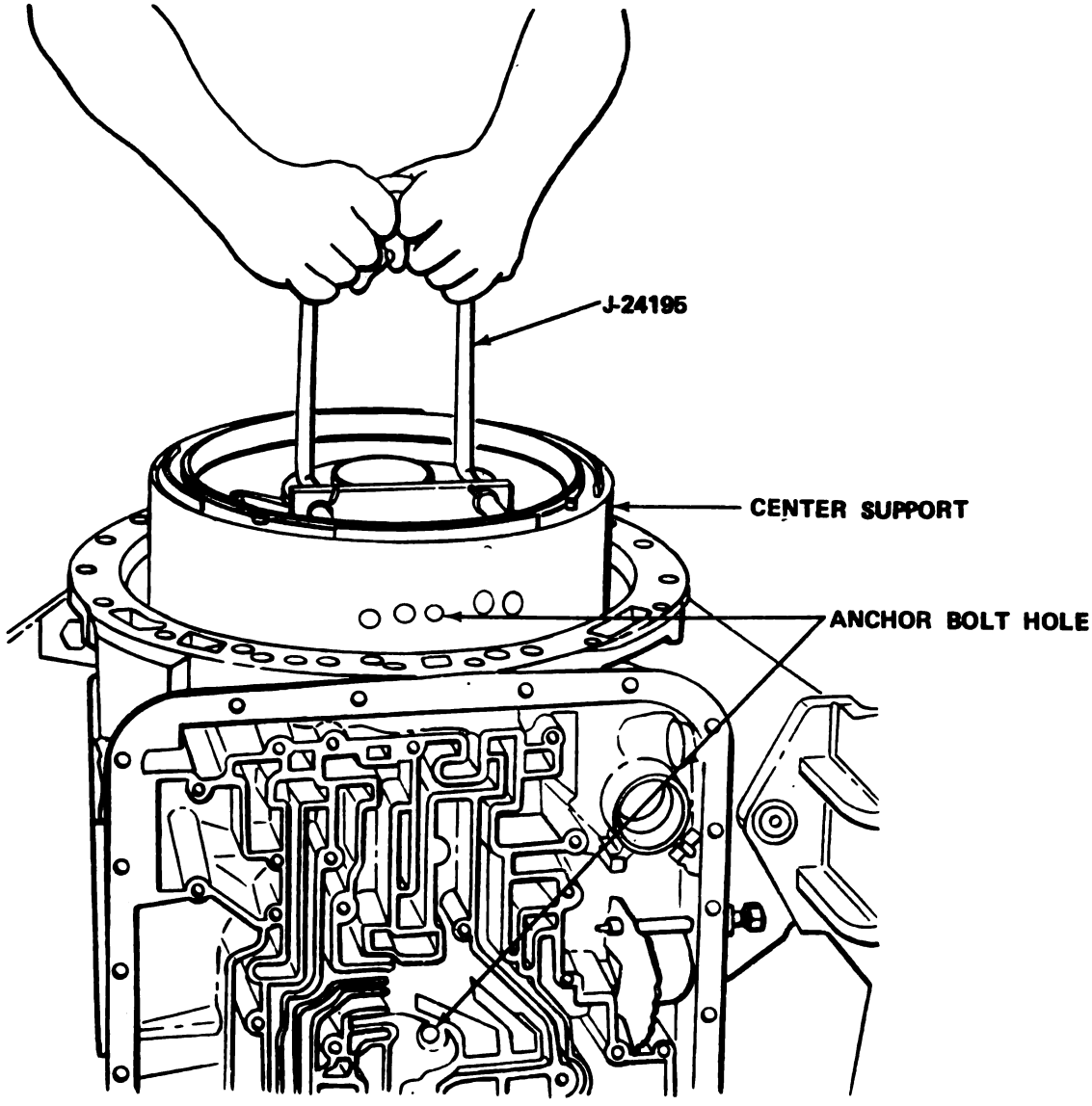
TA294864

(a) Install 13 second clutch plates, beginning with an external-tanged plate. Alternately install seven external-tanged plates and six internal-splined plates.



TA294865

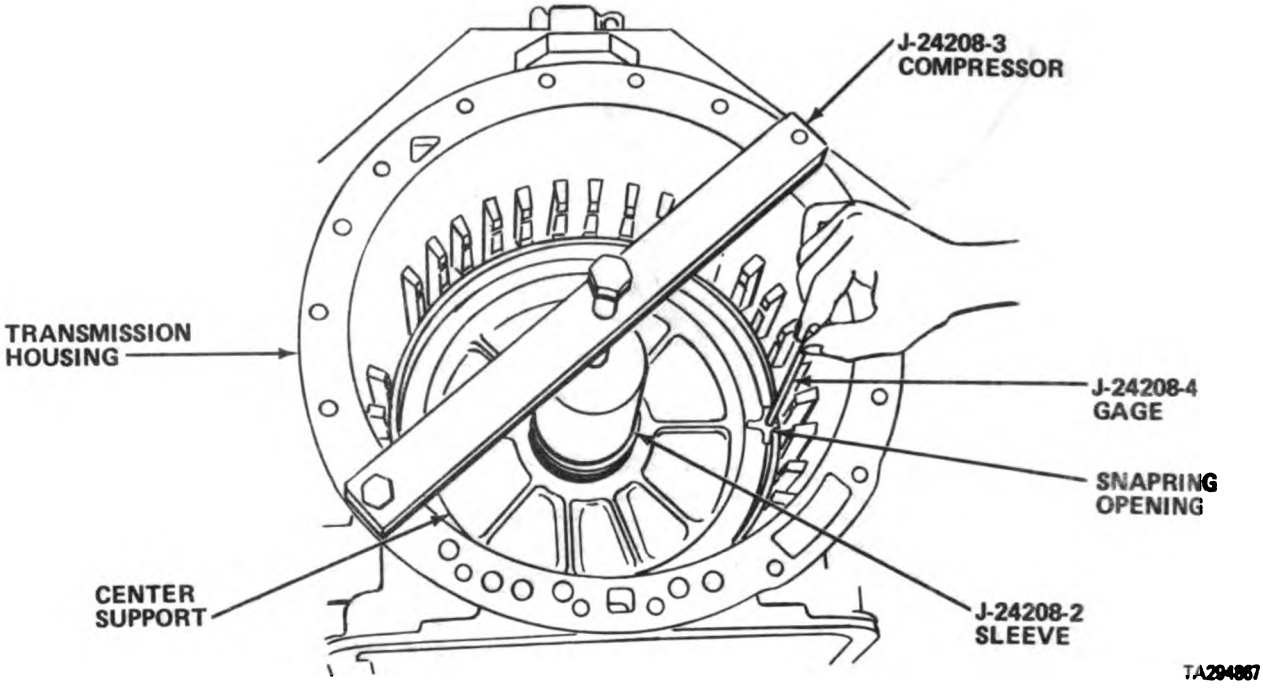
(b) Install clutch plate retaining snapring. Be sure snapring gap is at top of transmission housing, regardless of its position when removed.



(c) Remove third-clutch piston from center support assembly (if not previously removed). Install bracket J-24195 into recess between step-joint sealrings on center support hub.

(d) Install center support into transmission housing. Be sure tapped hole in support is alined with anchor bolt hole in bottom of housing.

(e) Remove lifting bracket J-24195 from center support. Install special 3/8-16 X 2-1/4 in. anchor bolt into support through anchor bolt hole in bottom of housing. Tighten bolt finger tight.



(f) Place compressor sleeve J-24208-2 on hub of center support.

(g) Place compressor J-24208-3 across the transmission housing. Retain compressor bar with two bolts.

(h) Compress center support by applying torque of 5 ft lbs (6.78 Nem) to center screw of compressor.

(i) Determine width of snapring groove using gage J-24208-4 (fig. 7-6). Lugs of gage are color-coded to match the snapring colors.

(j) Select one of the snaprings listed in Table 7-1. Select the thickest snapring that can be put into the groove.

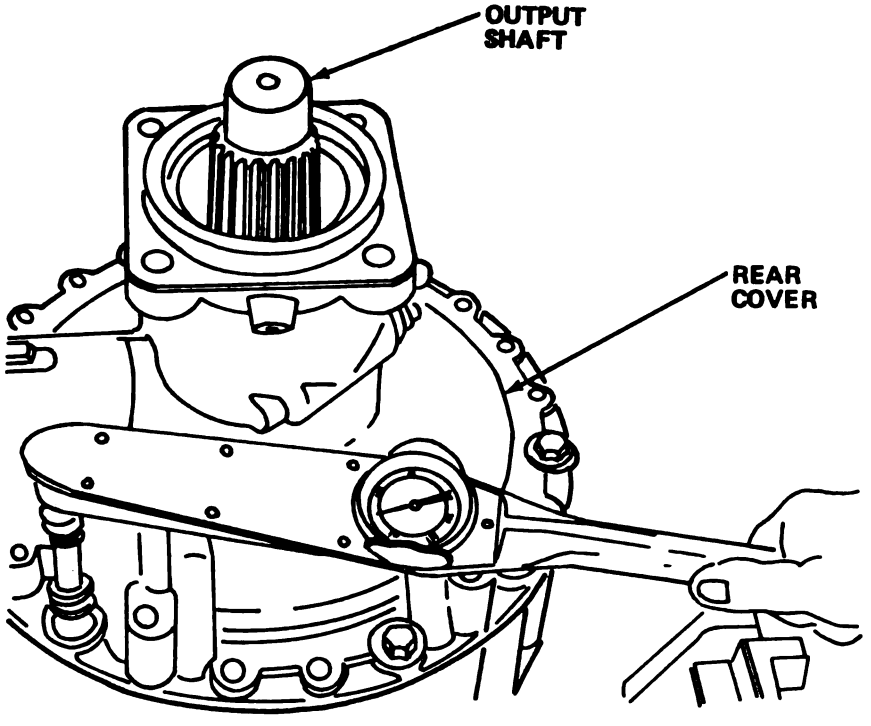
Table 7-1. SNAPRINGS

Color Code	Thickness
Blue	0.148 - 0.150 in. (3.759 - 3.810 mm)
Yellow	0.152 - 0.154 in. (3.860 - 3.911 mm)
White	0.155 - 0.157 in. (3.937 - 3.987 mm)
Red	0.158 - 0.160 in. (4.013 - 4.064 mm)

(k) Install snapring to retain center support selected in (j) above. Be sure snapring gap is at top of transmission housing, regardless of its position when removed.

(3) Second clutch clearance.

(a) Invert transmission housing, rear cover upward.



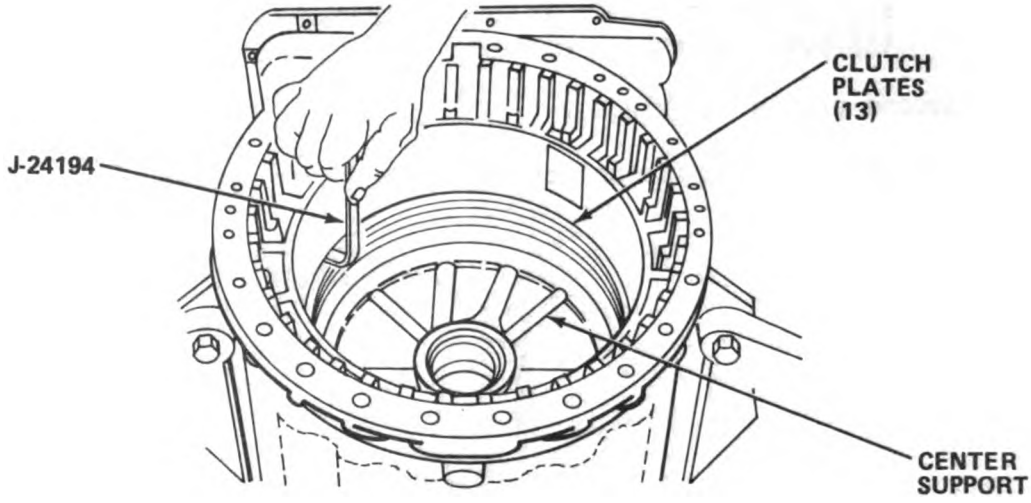
TA294868

(b) Remove six bolts and washers that temporarily retained rear cover to transmission housing. Remove rear cover and gasket.

(c) Remove 13 low clutch plates from adapter housing. Since these plates are preset for low clutch clearance, they should be maintained in a package form so they cannot be intermixed with other plates.

(d) Remove adapter housing and gasket from transmission housing.

(e) Remove 13 first clutch plates from transmission housing. These plates were preset for proper clearance and should be maintained as a package for final installation.



TA294869

(f) Using gage J-24194, check second clutch plate clearance. It is recommended gage be placed between transmission housing and first steel plate. Prescribed clearance is 0.095 to 0.145 in. (2.413 to 3.683 mm). Any dimension within 0.095 to 0.145 in. is satisfactory. However, the closer clearance is to 0.095 in., the longer the interval between clutch plate replacements will be. Replace worn plates with new plates to establish desired clearance. Recheck the clearance as described above.

NOTE

Leave second clutch and center support in the transmission housing until housing is again positioned front end upward. Begin assembly of transmission.

b. Installing first clutch, gear unit, second clutch, and center support.

(1) First clutch, and rear planetary ring gear.

(a) Place rear planetary ring gear, short splines (rear) downward, on a bench. Install 10 plates from the clutch pack removed in 3 (e) above, or from first clutch components selected by stack method, as follows. Lay aside first three plates from piston end of pack. Starting with fourth plate in pack (internal-splined), alternately install five internal-splined and five external-tanged plates on ring gear.

(b) Aline external tangs of plate pack. Carefully invert ring gear and plate pack, and install assembled parts into rear of transmission housing.

CAUTION

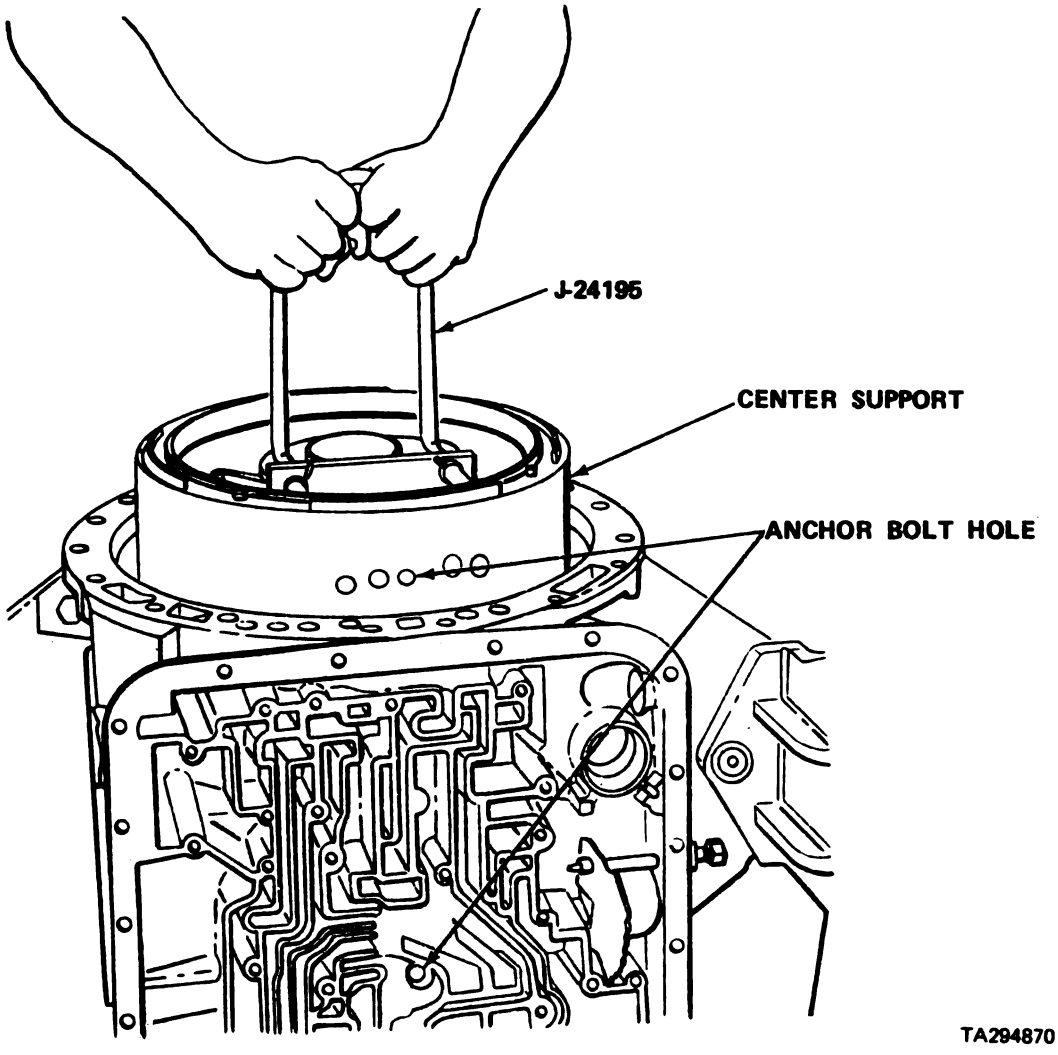
LAST PLATE INSTALLED MUST BE BE A THICK PLATE OR DAMAGE WILL RESULT.

(c) Install three remaining plates of pack (external-tanged, internal-splined, external-tanged sequence).

(d) Place adapter housing with piston (front) downward onto transmission housing.

(e) Install compressor bar J-24208-3 onto adapter housing. Retain it with two 1/2 X 5-3/4 in. bolts.

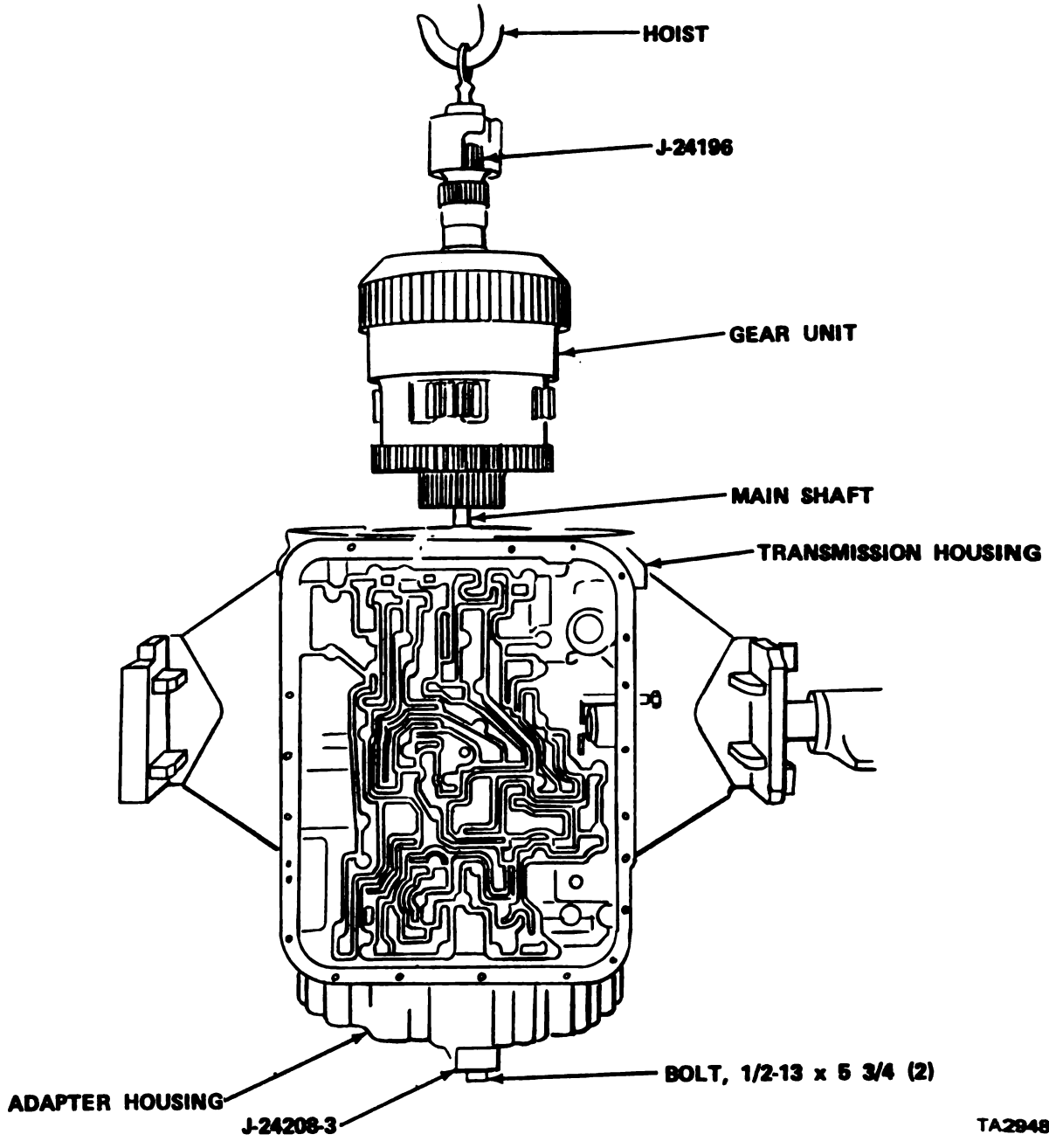
(f) Position transmission with front upward.



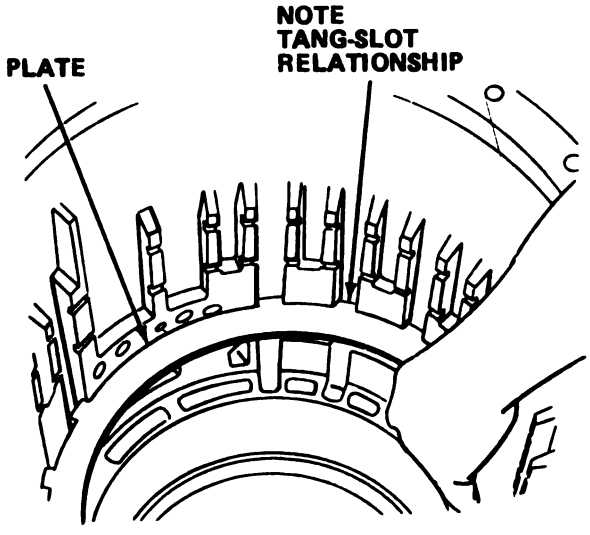
(g) Remove center support snapring and anchor bolt. Attach bracket J-24195 to center support, and remove support assembly.

(h) Remove snapring. Remove second clutch plates (except when plates were selected by stack method). These plates are now preset for proper clearance and should be retained as a pack for final installation.

(2) Gear unit, second clutch, and center support.

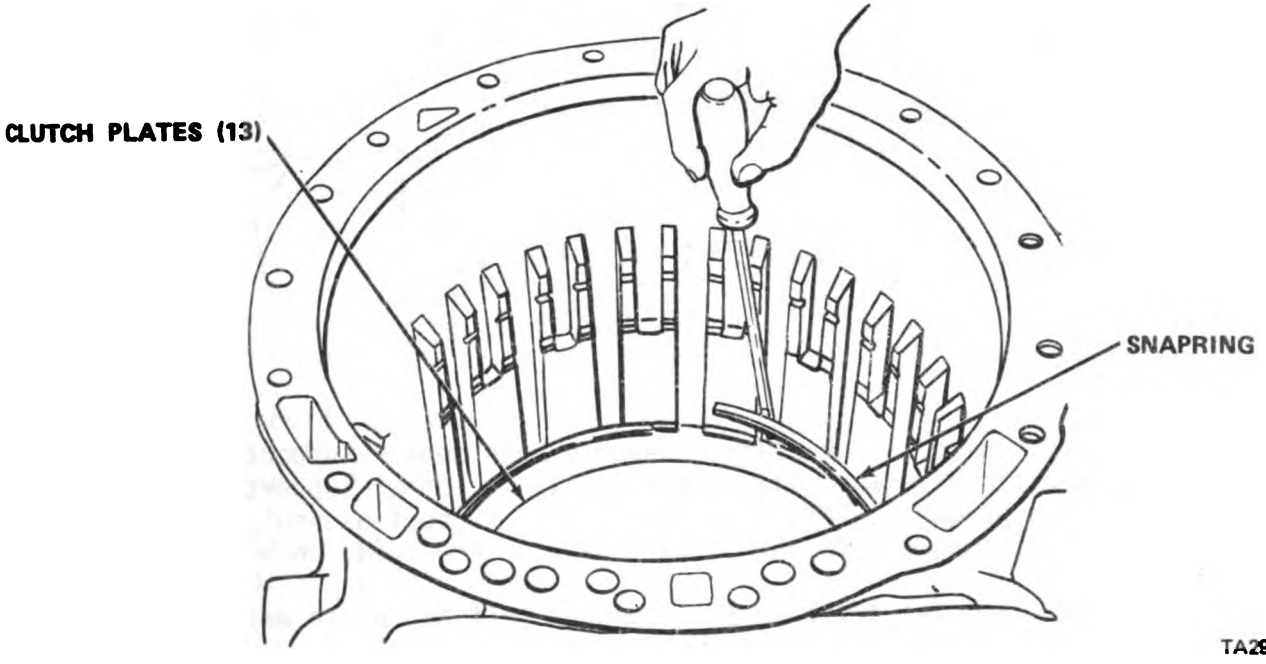


(a) Attach lifting bracket J-24196 to assembled gear unit. Carefully lower gear unit alining pinions of the rear planetary to mesh with rear planetary ring gear.



TA294872

(b) Install second clutch plate pack removed in (2)(a) above (or plate pack selected by stack method). The thinner external-tanged plates should be installed toward rear of the transmission housing. Begin with an external-tanged plate and alternately install seven external-tanged and six internal-splined plates.

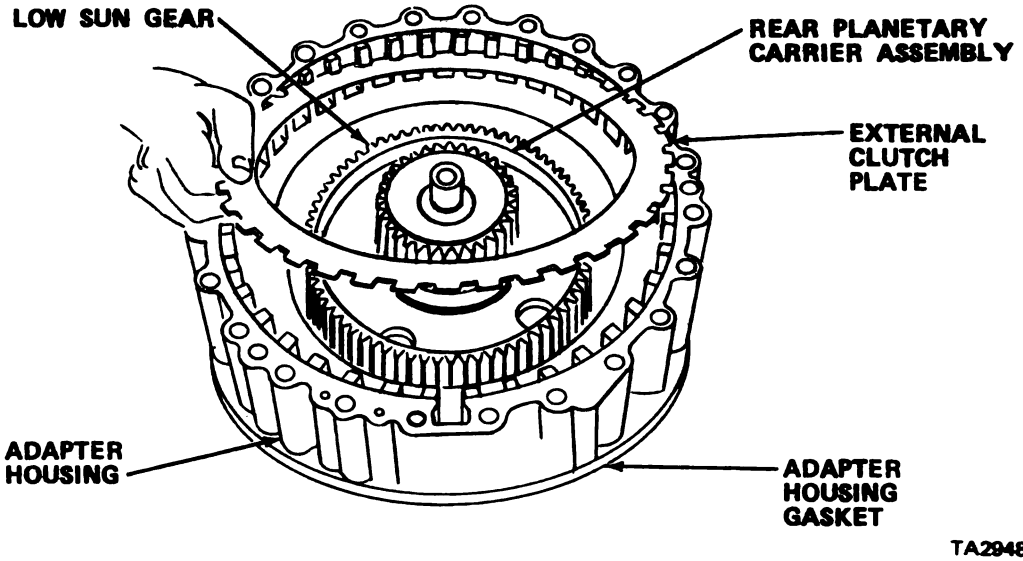


TA294873

(c) Install snapring that retains second clutch pack.

(e) Grasp assembled adapter housing, ring gear, and clutch plates. Invert assembly and install it onto rear of the transmission housing as follows:

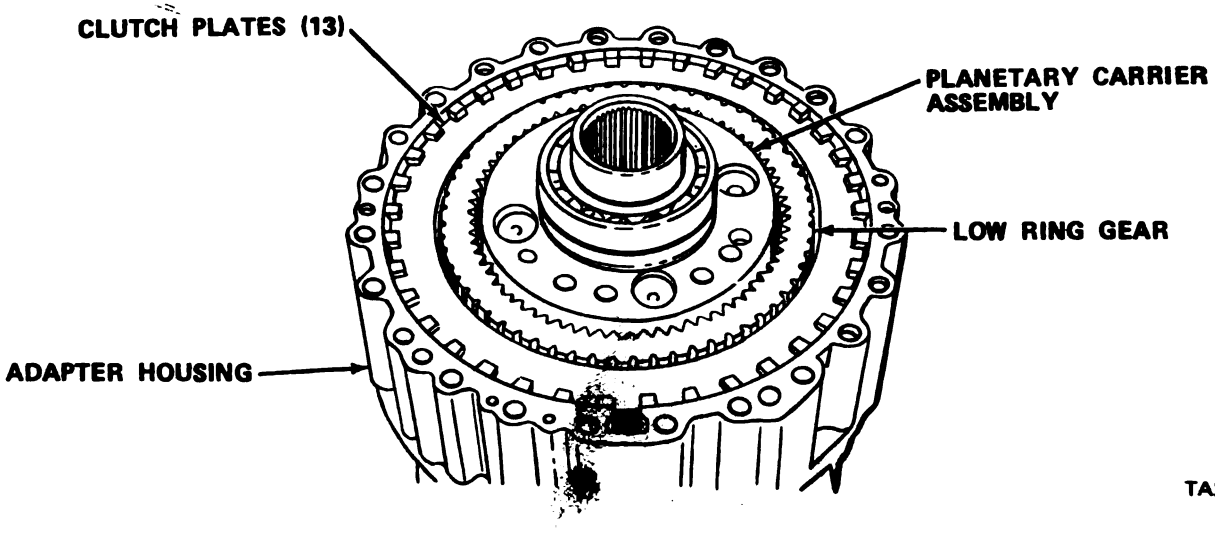
(f) Aline adapter housing dowel pins with proper holes in transmission housing. Lower adapter housing until the internal teeth of low ring gear begin to mesh with splines on rear planetary carrier hub. Support adapter housing while meshing low ring gear by tapping with a soft mallet. When mesh is complete, seat adapter housing.



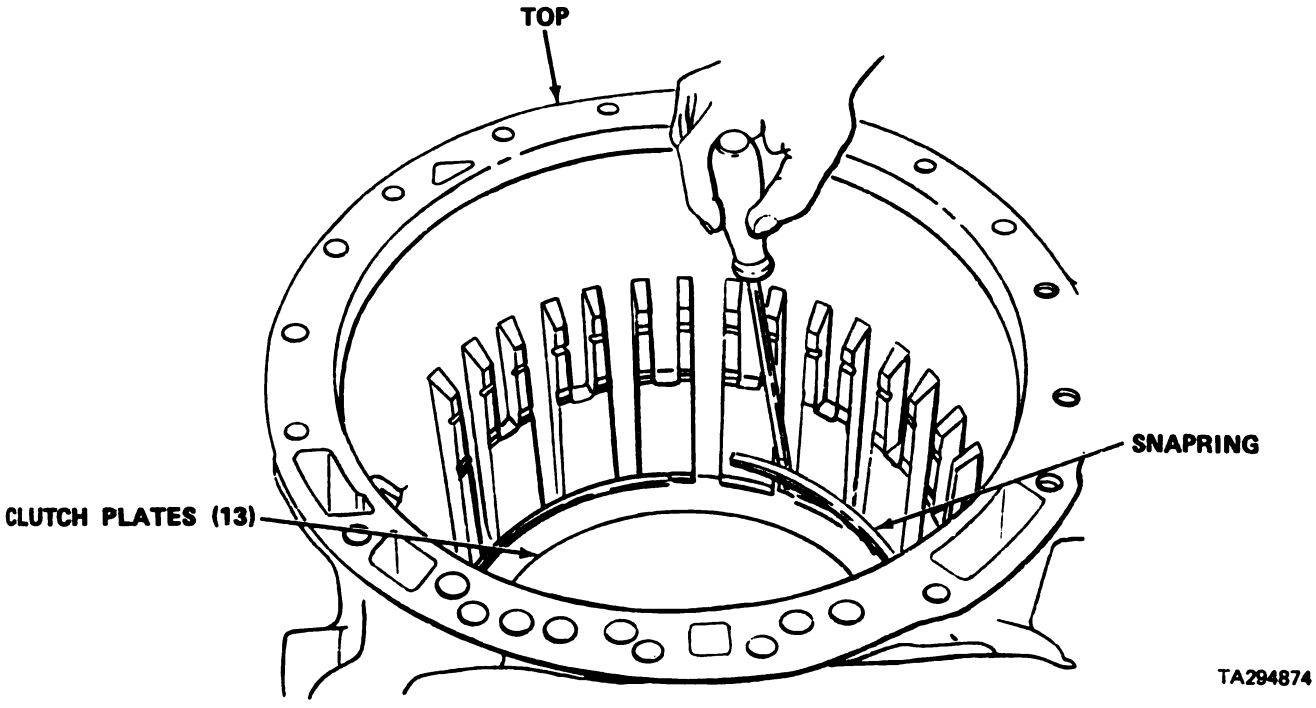
TA294876

(g) Install three remaining low clutch plates (laid aside in (a) above). Install plates in external-tanged, internal-splined, external-tanged sequence.

(2) Low planetary and rear cover assembly.



TA294877



(f) Install snapring (Table 7-1) that retains center support assembly. Gap of snapring should be toward the top of transmission regardless of its position when removed.

(g) Position transmission, rear upward, and remove two bolts and compressor bar from adapter housing.

c. Installing rear components.

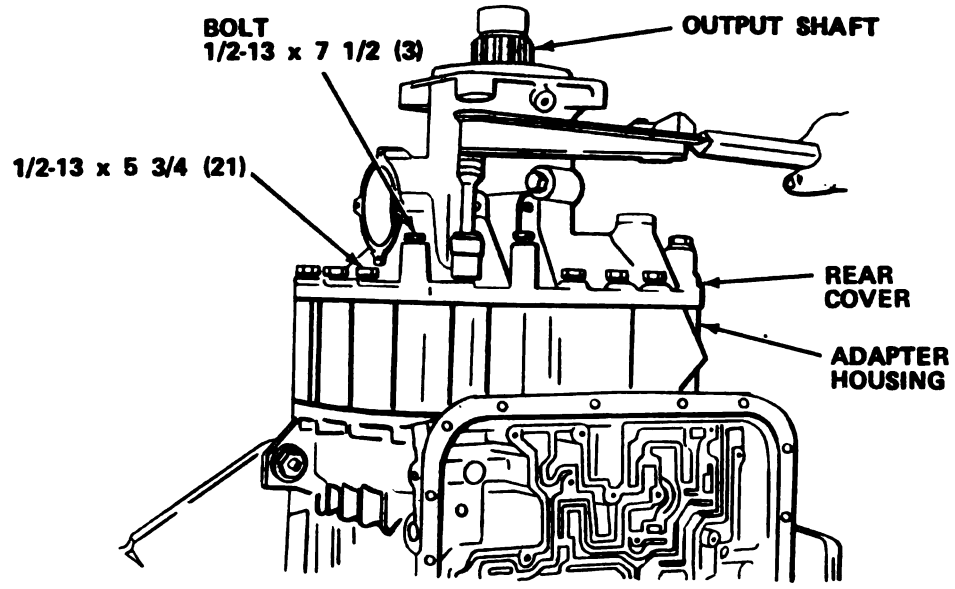
(1) Adapter housing, low clutch, and low ring gear.

(a) Place low ring gear, flat side (rear) downward on a bench. Install 10 plates of low clutch pack removed in para (3)(c) as follows: Lay aside first three plates from piston end of pack. Plates laid aside should include two thick external-tanged plates. Beginning with fourth plate in pack (internal-splined), alternately install five internal-splined and five external-tanged plates onto ring gear.

(b) Remove adapter housing from transmission housing. Do not drop first clutch piston.

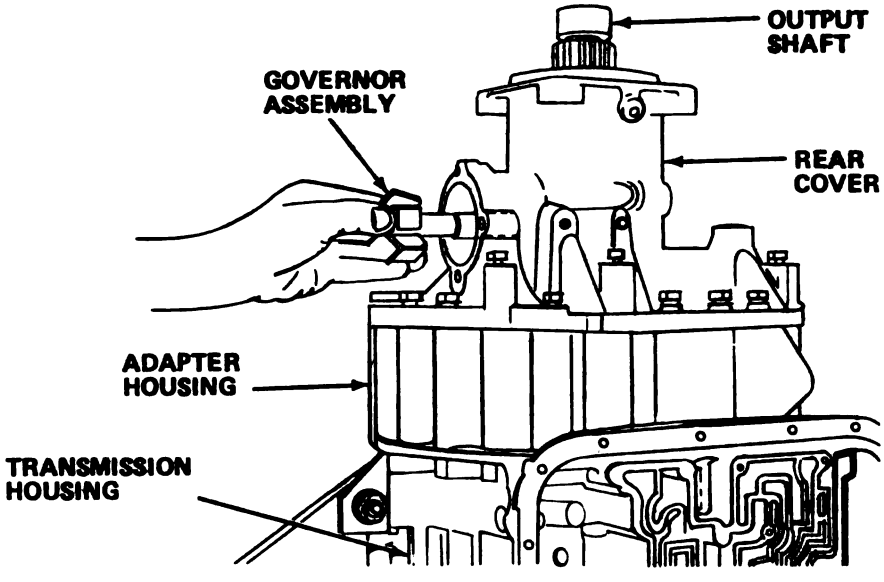
(c) Place adapter housing, with piston upward, over assembled low ring gear and clutch plates.

(d) Install adapter housing gasket onto adapter housing, alining holes in gasket with those in housing. Retain gasket with oil-soluble grease.



TA294879

(d) Install twenty-one 1/2-13 X 5-3/4 in. bolts and three 1/2-13 X 7-1/4 in. bolts and washers, to retain rear cover. Torque bolts to 67 - 80 ft lbs (91 - 108 N•m).



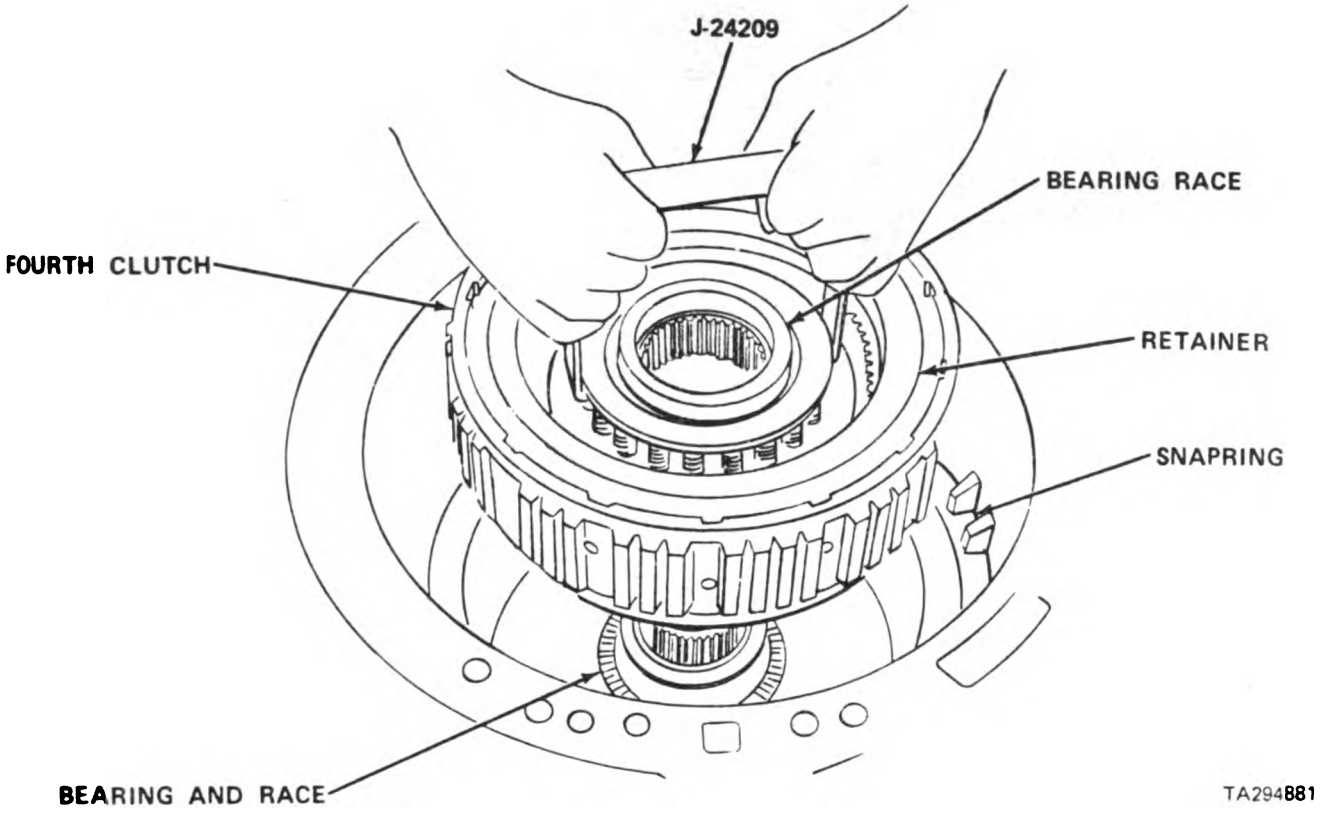
TA294880

(e) Install governor assembly into rear cover by rotating it counter-clockwise.

(f) Install governor cover gasket and cover, and retain with four 5/16-18 X 9/16 in. bolts. Torque bolts to 10 - 13 ft lbs (14 - 18 N•m).

d. Installing fourth, third, and forward clutches.

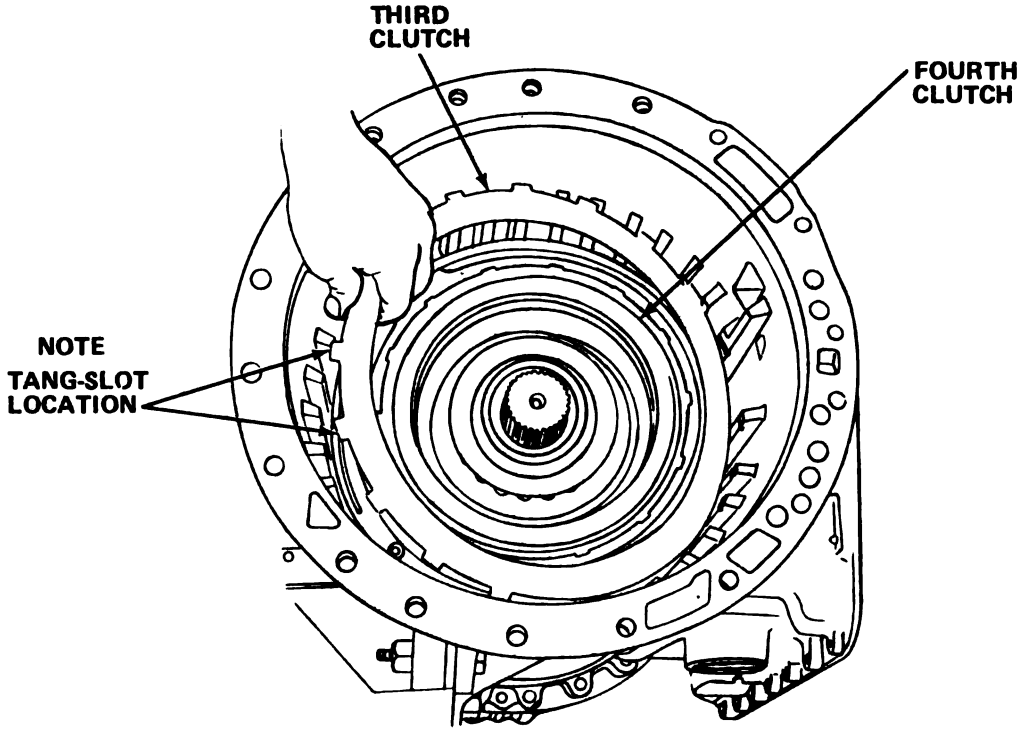
(1) Fourth clutch, and third clutch.



(a) Prior to installation of fourth-clutch assembly, be sure bearing races at both front and back are in place. Grease with oil-soluble grease and install two sealrings into grooves of center support hub.

(b) Place lifting bracket J-24209 under spring retainer of fourth-clutch assembly. Carefully lower fourth clutch into transmission. Engage internal splines with splines on center sun gear shaft.

(c) Be sure bearing race at top (front) of clutch is in place. If not, lubricate it with oil-soluble grease and install.



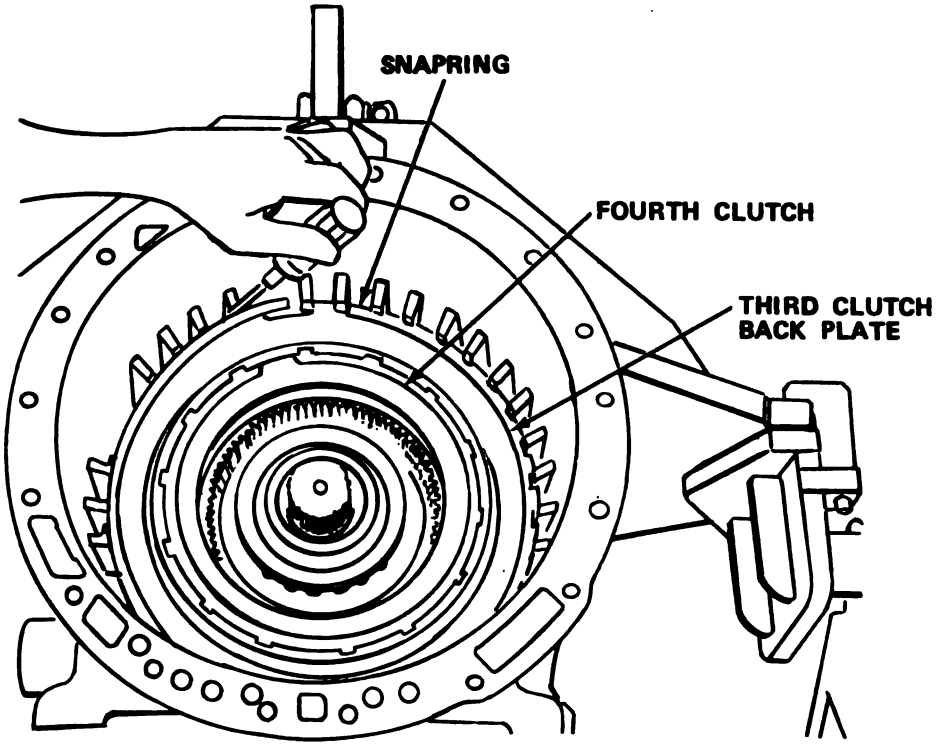
(d) When installing third clutch plates, external-tanged clutch plates must have a definite tang-to-slot relationship. Tangs must be installed into shorter, narrower slots. The wider slots are longer and extend to second clutch plates.

(e) Install eight third-clutch plates, beginning with a thick external-tanged plate and alternately installing four external-tanged plates and four internal-splined plates.

CAUTION

BE SURE CLUTCH PLATE NEXT TO PISTON IS A THICK PLATE, OR DAMAGE CAN RESULT.

(f) Install back plate.



TA294883

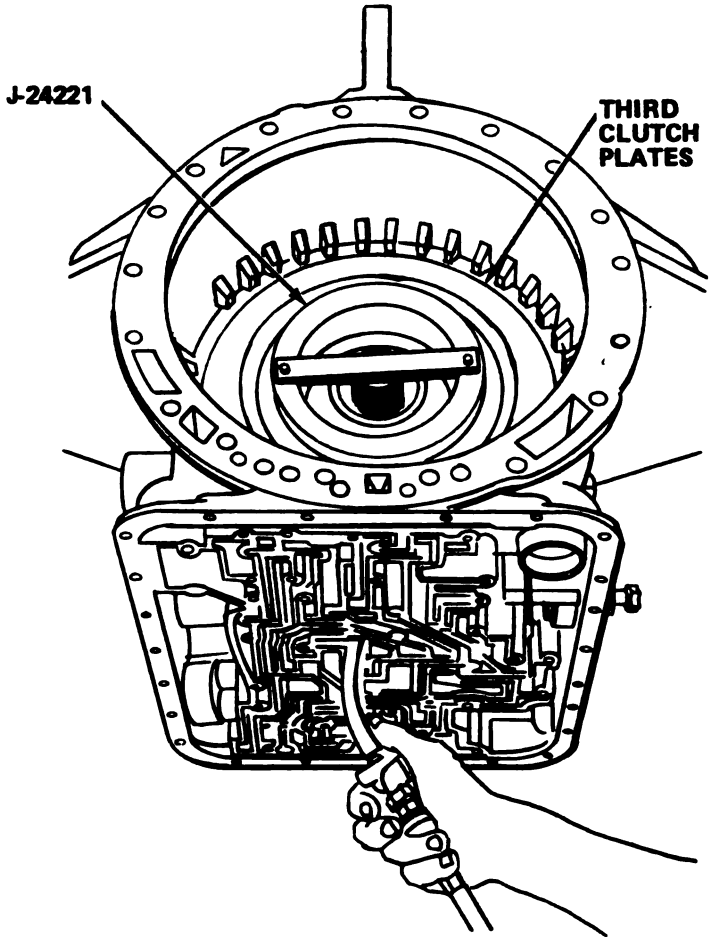
(g) Install third clutch snapring. Be sure gap of snapring is at top of transmission housing, regardless of its position when removed.

(h) Check third clutch clearance by inserting gage J-24193 between snapring and back plate of third clutch. Clearance should be 0.060 to 0.120 in. (1.52 to 3.05 mm). Any dimension between 0.060 to 0.120 in. is satisfactory. However, the closer clearance is to 0.060 in., the longer interval between clutch plate replacements will be. Replace worn plates with new plates to establish desired clearance. If assembly is satisfactory, continue assembly with (2) below.

(i) If clearance is not satisfactory, remove fourth clutch assembly and replace plates in third clutch as required to obtain a satisfactory clearance. Reinstall fourth clutch assembly and reassemble third clutch when clearance is satisfactory.

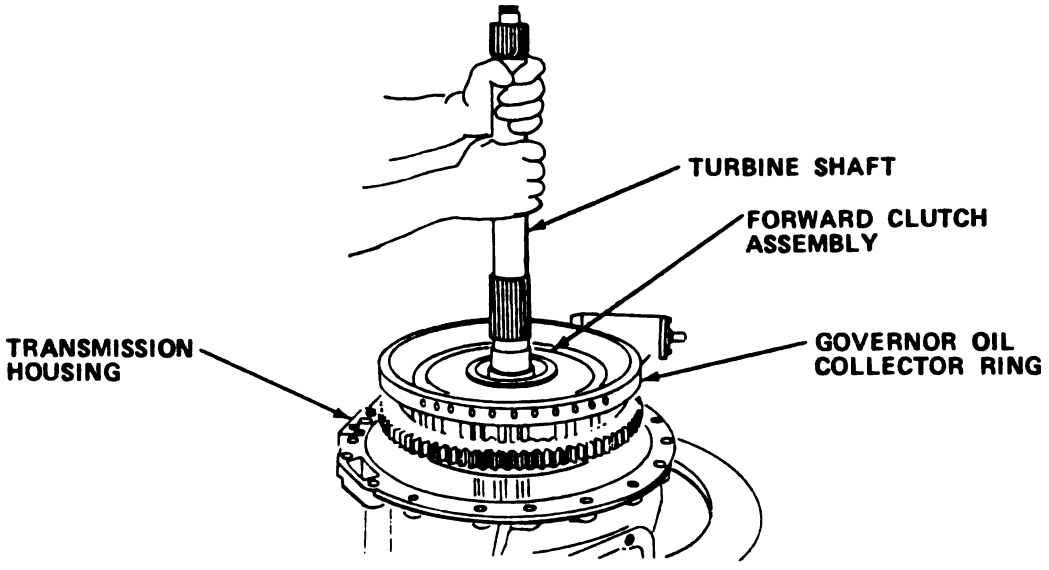
(2) Forward clutch.

(a) Prior to installation of forward clutch assembly, make sure thrust bearing race and thrust bearing have been installed at rear of clutch assembly. Install thrust race, cup side first, onto forward clutch hub. Install needle bearing onto race. Retain bearing and race with oil-soluble grease.



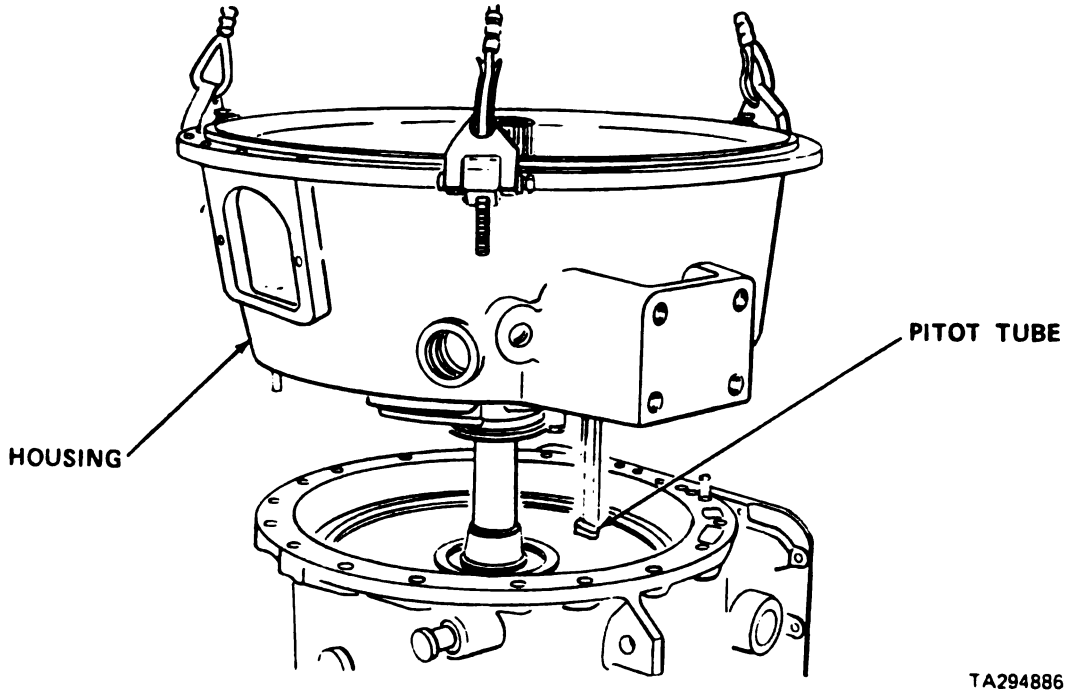
TA204884

(b) Install alinement fixture J-24221. Engage fourth-clutch plates by applying air pressure to fourth-clutch piston. If all plates do not engage tool J-24221, fixture will rise slightly when air pressure is applied.



(c) Hold air pressure in clutch and remove fixture. Continue holding air pressure, and install forward clutch assembly (with race and bearing).

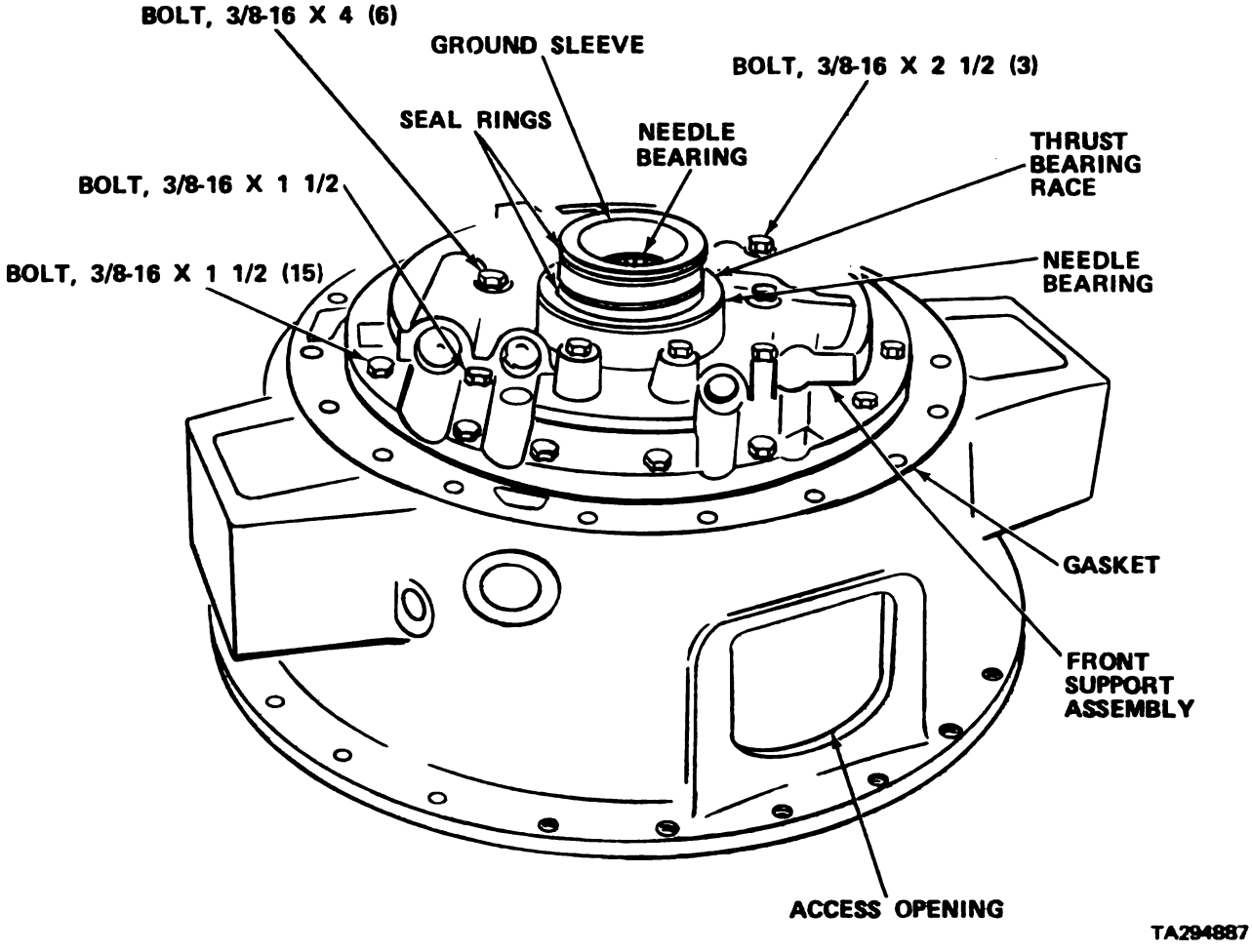
(d) Release air pressure when forward clutch is fully seated. Forward clutch will fall slightly when air is released if clutch is not fully seated.



(e) Make sure thrust bearing race on front of forward clutch assembly is installed. If not, apply oil-soluble grease to race and install it. Lubricate sealrings with oil-soluble grease and install into grooves in front support hub.

e. Installing torque converter housing.

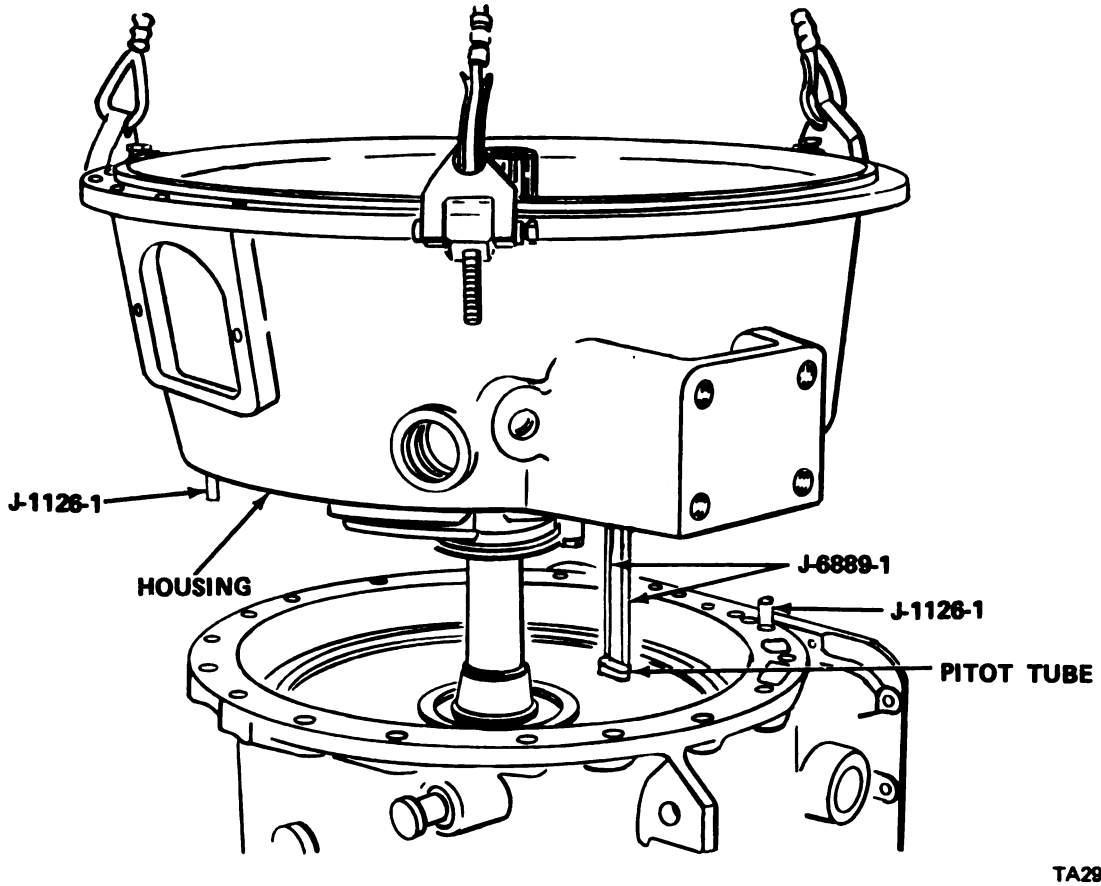
(1) Place converter housing assembly on work table, so that both front and rear are accessible.



(2) Make sure that thrust bearing race, needle bearing, and two sealrings have been installed at rear of converter housing.

NOTE

If assembly includes front pitot blocker, it may be installed now. Torque screws to 30 - 48 in. lbs (3.4 - 5.4 Nom). If installed, disregard steps (5) and (8) below.

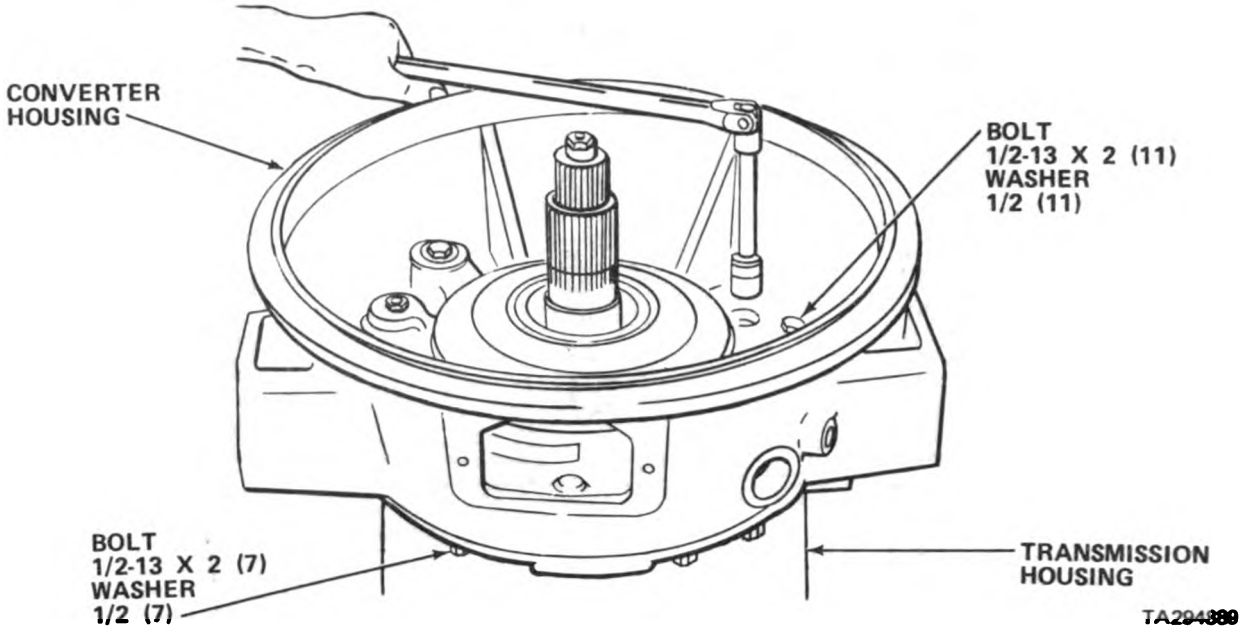


(3) Attach a lifting sling to converter housing. Raise the converter housing assembly above transmission.

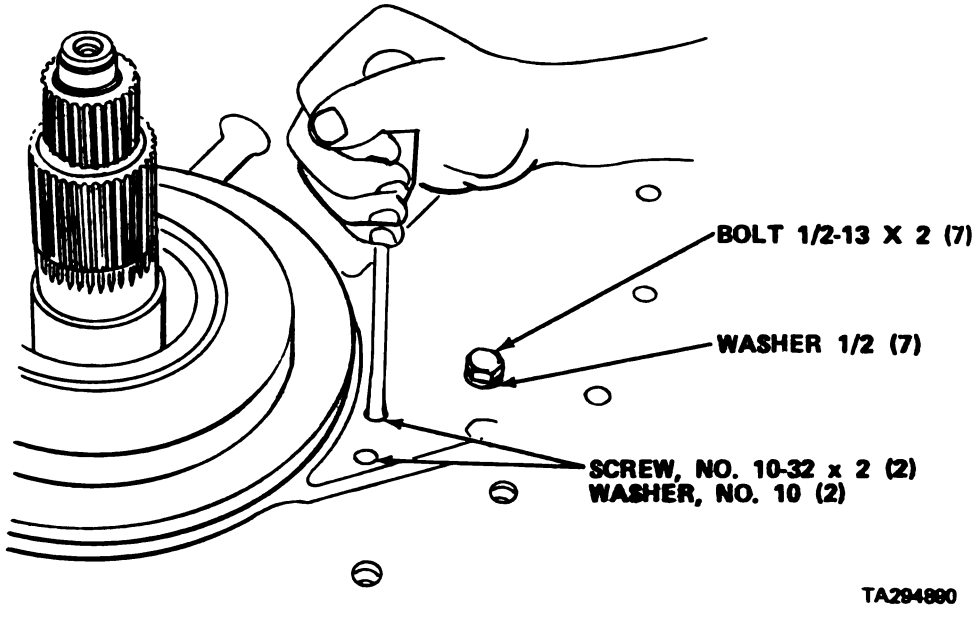
(4) Install two 1/2-13 X 2-3/8 in. guide screws J-1126-1, one in converter housing and one in transmission housing.

(5) Install two no. 10-32 X 6 in. guide screws J-6889-1 into pitot tube. Exit port of pitot tube must face toward guide bolts. Install pitot tube and guide bolts so that guide bolts enter screw holes in converter housing, and entrance port of pitot tube faces outward (toward pitot collector ring).

(6) Install converter housing onto transmission housing, using care to avoid damage to pitot tube and collector ring.

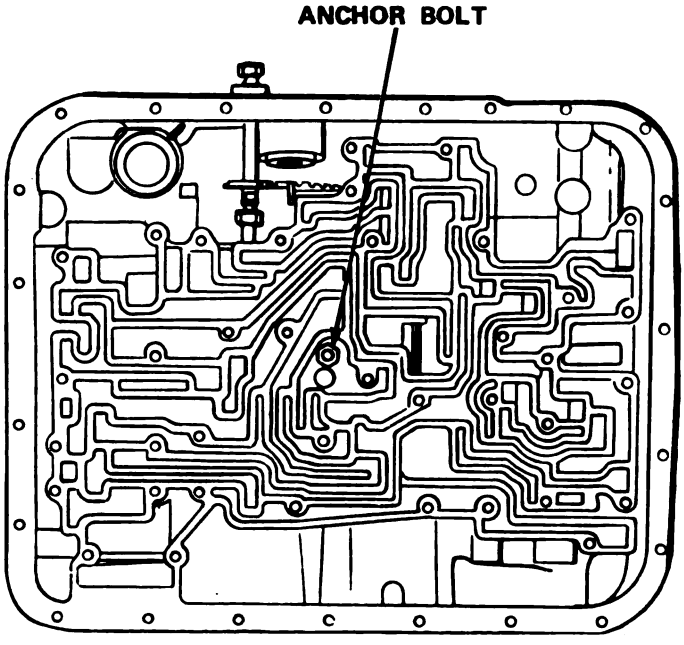


(7) Install seven 1/2-13 X 2 in. bolts and washers at inside of converter housing. Torque bolts 67 - 80 ft lbs (91 - 108 N•m).



(8) Install pitot tube screws and washers as each guide bolt is removed. Torque screws to 30 - 48 in. lbs (3.4 - 5.4 N•m).

(9) Install nine 1/2-13 X 2 in. bolts with washers through transmission housing into converter housing. The two remaining bolts and washers cannot be installed until mounting bracket is removed. Torque bolts to 67 - 80 ft lbs (91 - 108 N•m).

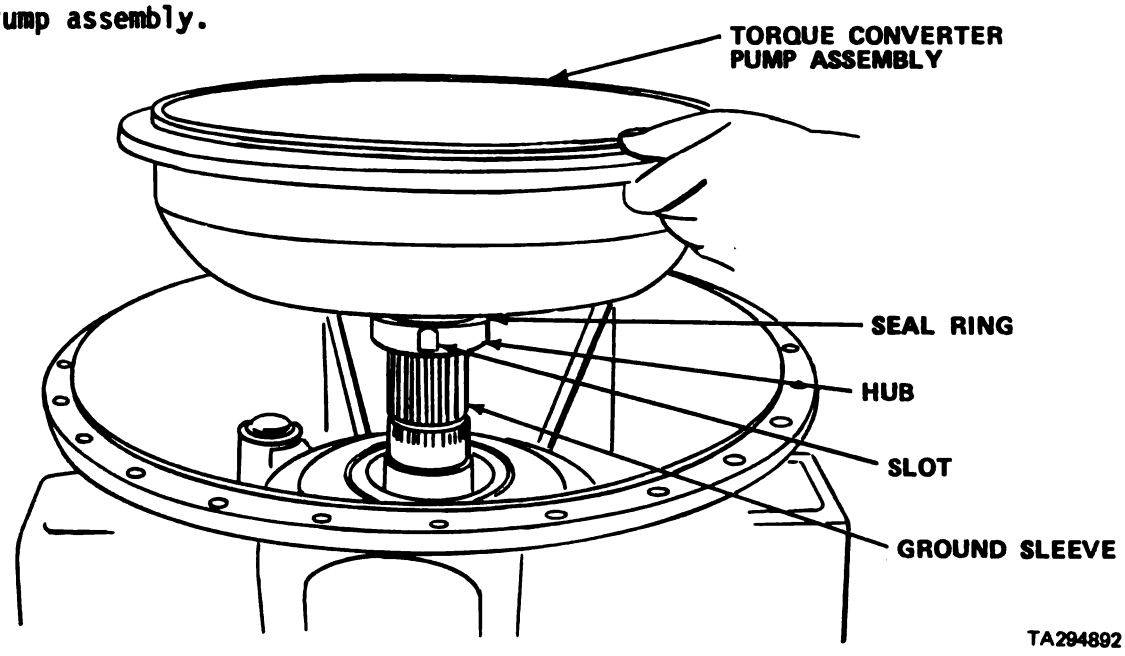


TA294891

(10) Torque center support anchor bolt to 39 - 46 ft lbs (53 - 62 N•m).

f. Installing torque converter pump and stator assemblies.

(1) Pump assembly.



TA294892

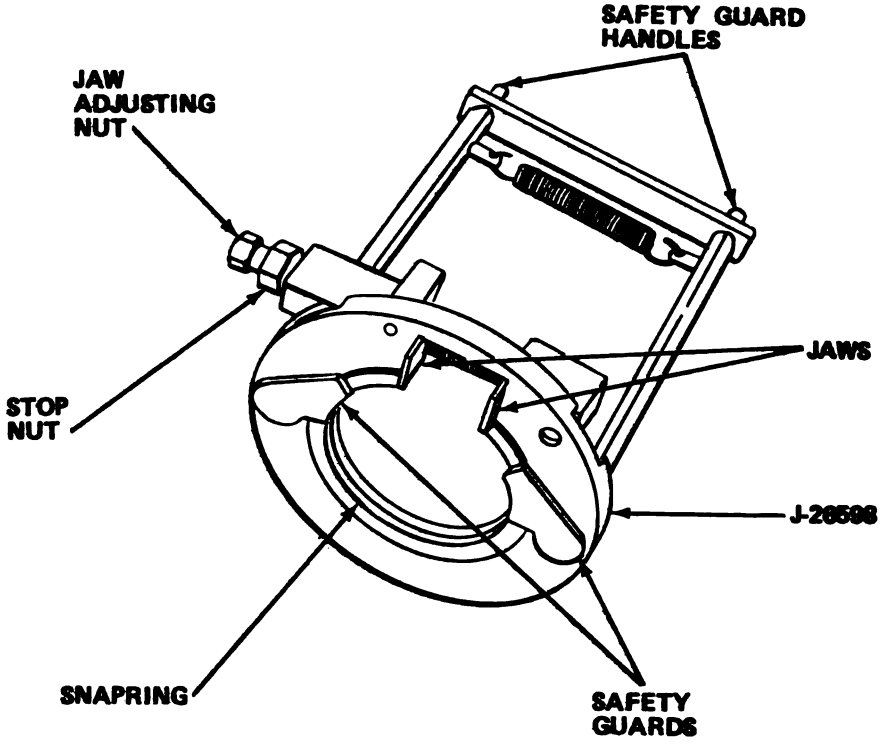
(a) Install torque converter pump assembly onto ground sleeve. Check sealring on hub.

NOTE

After transmission S/N 2081, pump bearing is a press fit on ground sleeve. It may be necessary to heat hub and bearing area of pump assembly to 300°F (149°C) with heated oil before installation.

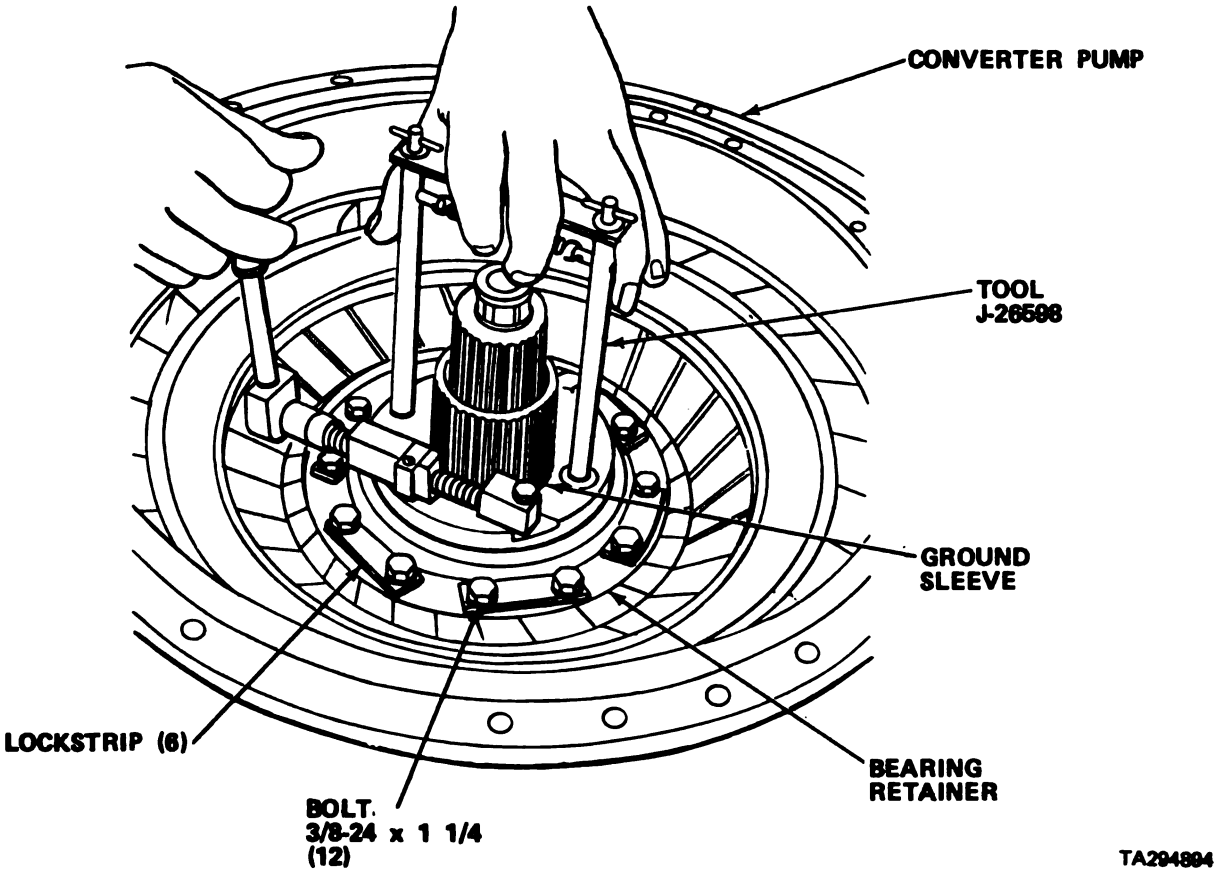
(b) Aline slots in pump hub with tangs in oil pump drive gear as pump is being installed.

(c) Install spacer onto converter ground sleeve.



TA294893

(d) Place snapring into tool J-26598 as follows. Close jaws of tool by rotating adjusting nut. Place snapring in tool, under safety guards. Position jaws of tool in snapring gap. Open jaws of tool by rotating adjusting nut to stop nut.



(e) Place fixture, with snapring, over ground sleeve. Open safety guards to position snapring.

(f) Close jaws and set snapring in its bore in ground sleeve. Remove tool.

(g) Install sealring near outer bolt holes of the pump.

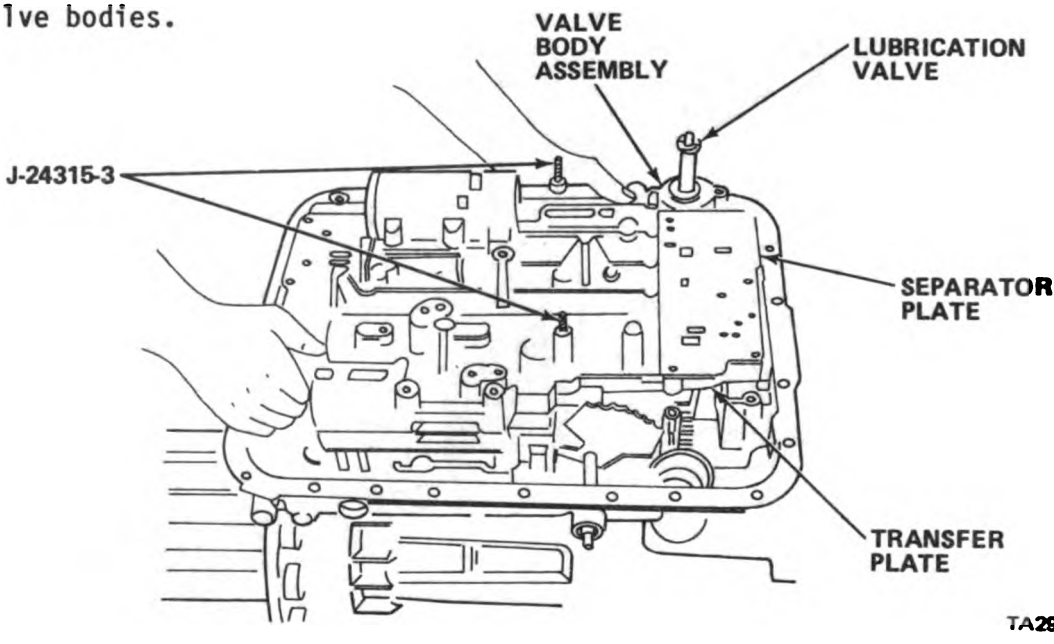
(2) Stator assembly.

(a) Install freewheel to roller race and stator assembly.

(b) Rotate stator clockwise to check for freedom of rotation. Stator should lock if counterclockwise rotation is attempted.

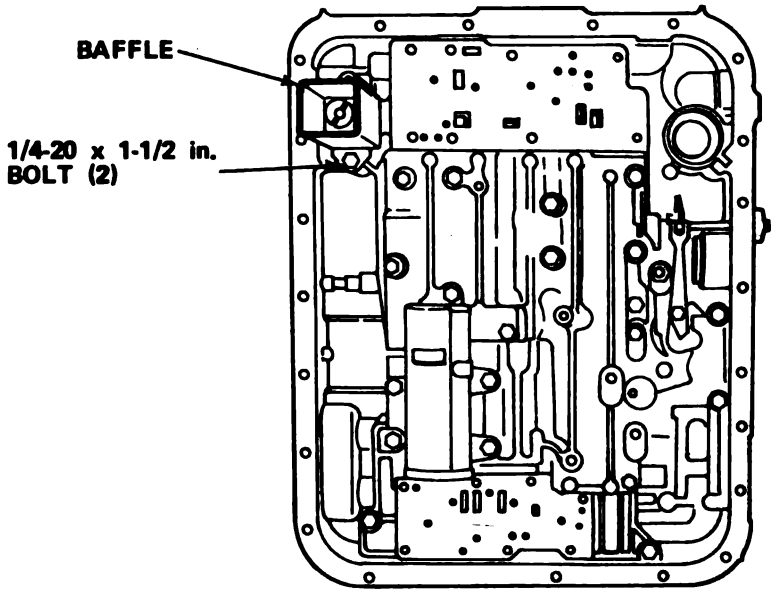
g. Installing valve bodies, oil filter, and oil pan.

(1) Valve bodies.

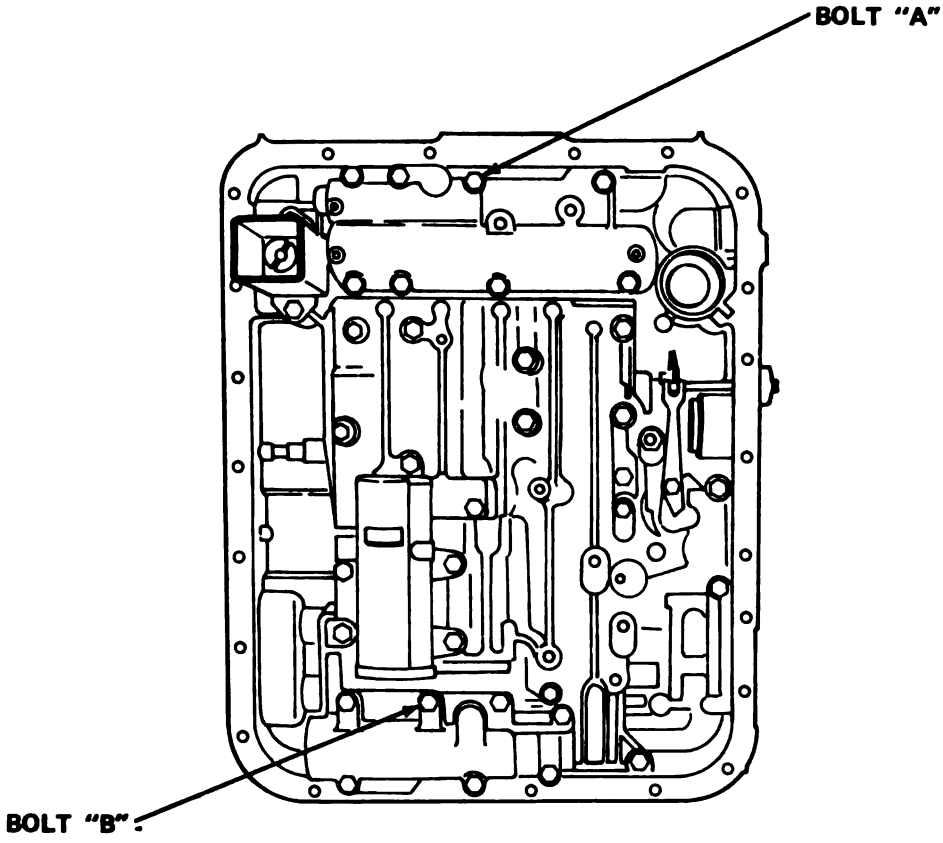


(a) Install two guide screws J-24315-3 into opposite holes in transmission housing.

(b) Install control valve assembly, using guide screws as support, onto transmission. Groove in the selector valve must engage pin on detent lever.

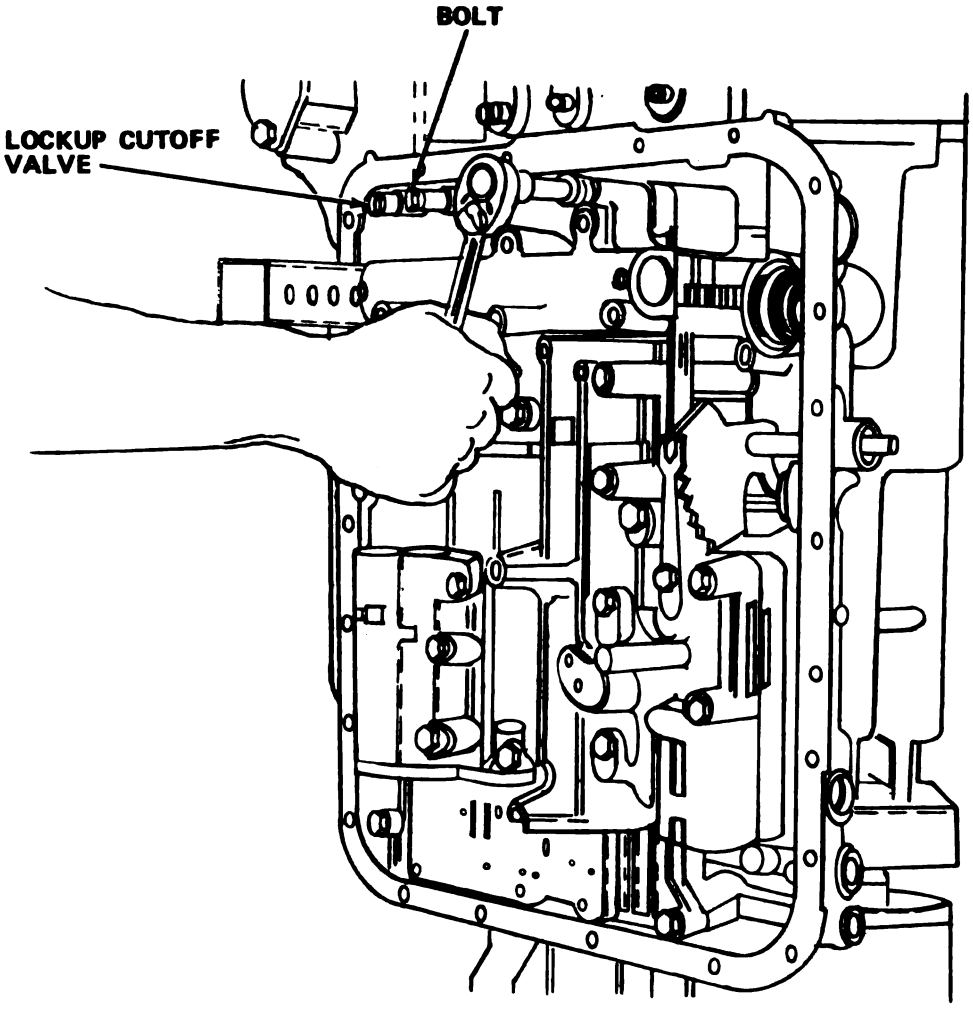


(c) Install lubrication check valve baffle and retain with two 1/4-20 X 1-1/2 in. bolts.



(d) Install two 1/4-20 X 1-1/2 in. bolts "B" and two 1/4 in. washers through oil transfer plate and into transmission housing. Bolts "A" and "B" retain oil transfer plate, separator plate, and control valve assembly to transmission housing.

(e) Install thirteen 1/4-20 X 3 in. bolts "C" through valve body assembly into housing. Remove two guide screws J-24315-3 and install two remaining 1/4-20 X 3 in. bolts. Install selector detent and retain with a 1/4-20 X 2-1/2 in. bolt "E".

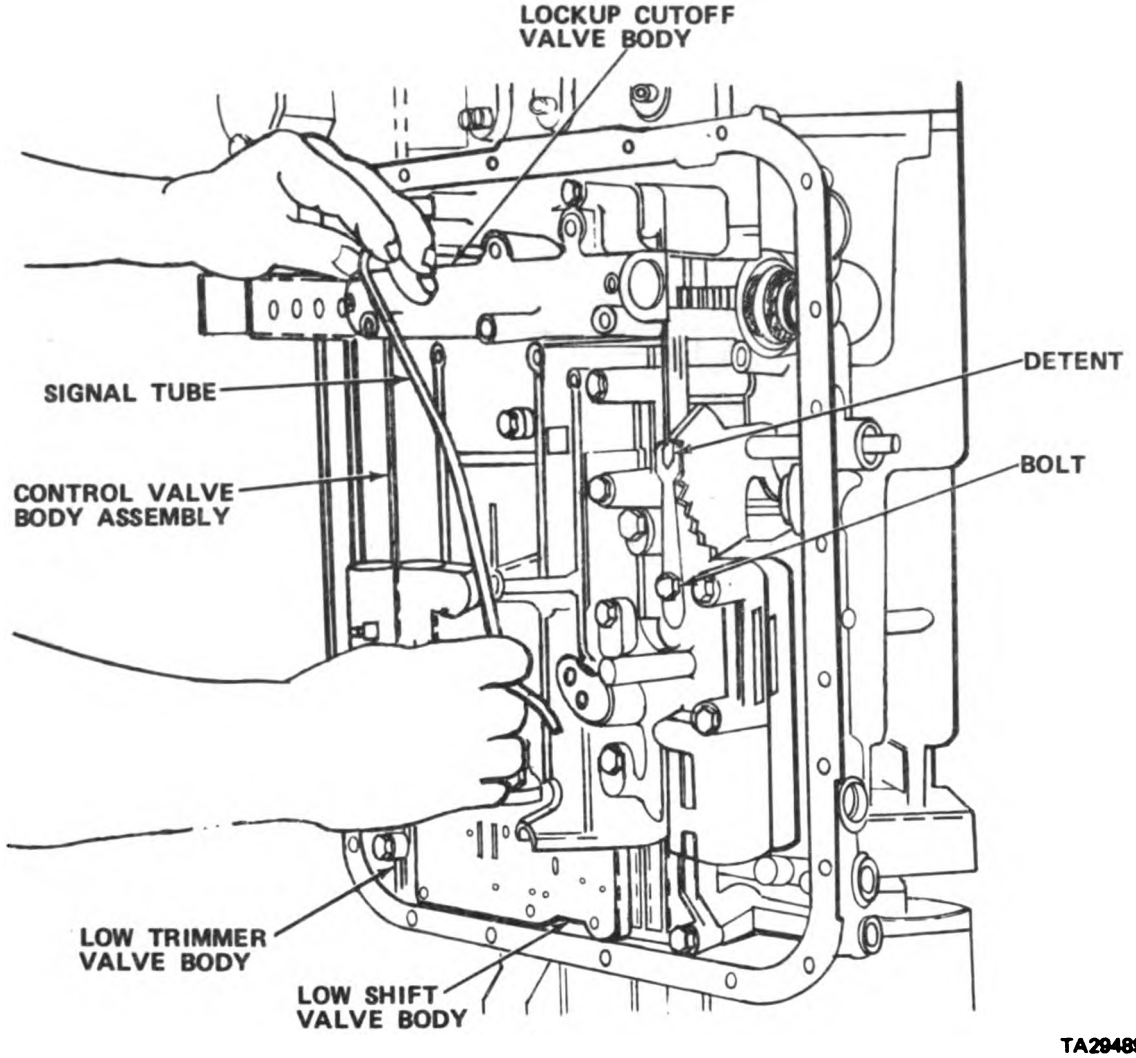


TA294897

CAUTION

ON MODELS THAT INCLUDE A LOCKUP CUT-OFF VALVE BODY ASSEMBLY, SIGNAL TUBE MUST BE INSTALLED INTO HOLE NEARER THE CENTER OF VALVE BODY. HOLE NEAR END OF VALVE BODY MUST REMAIN OPEN, OR DAMAGE MAY RESULT.

(f) Install lockup cut-off valve body assembly. Retain it with eight 1/4-20 X 3 in. bolts. Torque all bolts to 9 - 11 ft lbs (12.2 - 14.9 Nom).



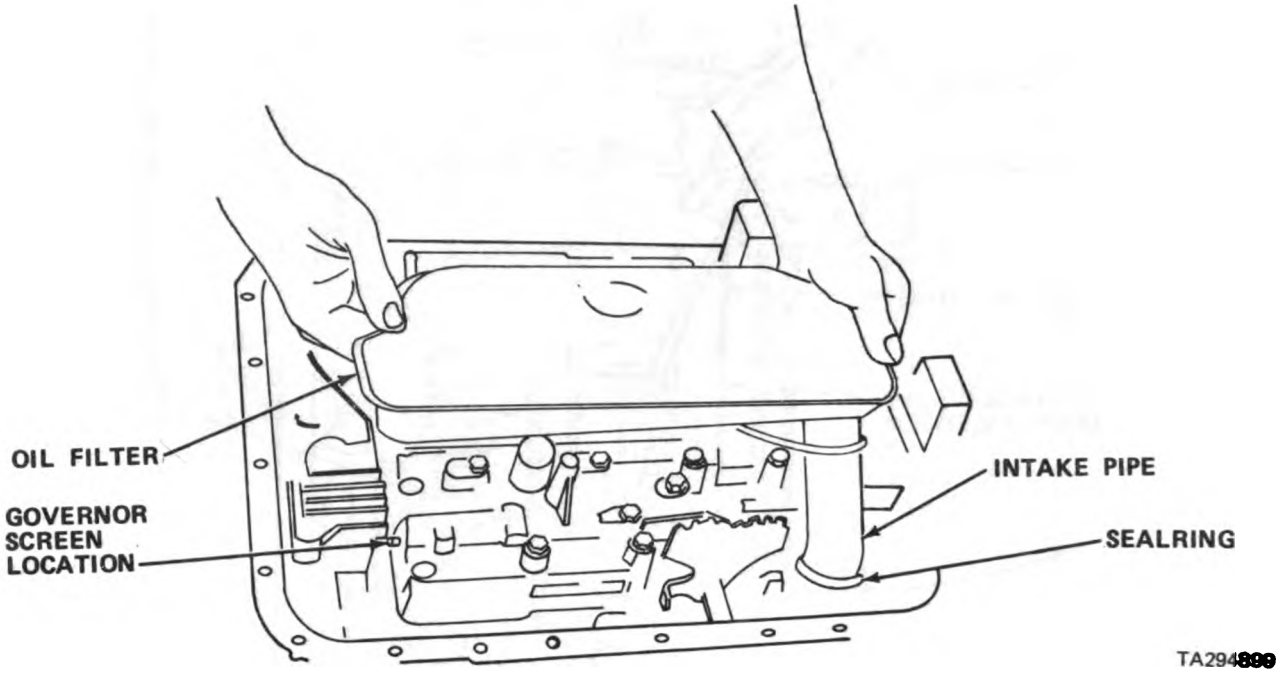
(g) Install low shift valve body onto lower guide screw. Retain body with one 1/4-20 X 2-3/4 in. bolt.

(h) Install low trimmer valve. Install six 1/4-20 X 4 in. bolts to retain trimmer valve.

(i) Hold detent in alinement over detent lever while 2-1/2 in. bolt is torqued to 9 - 11 ft lbs (12.2 - 14.9 Nom). Torque all 38 bolts to 9 - 11 ft lbs (12.2 - 14.9 Nom).

(j) Install signal tube.

(2) Oil filter and oil pan.

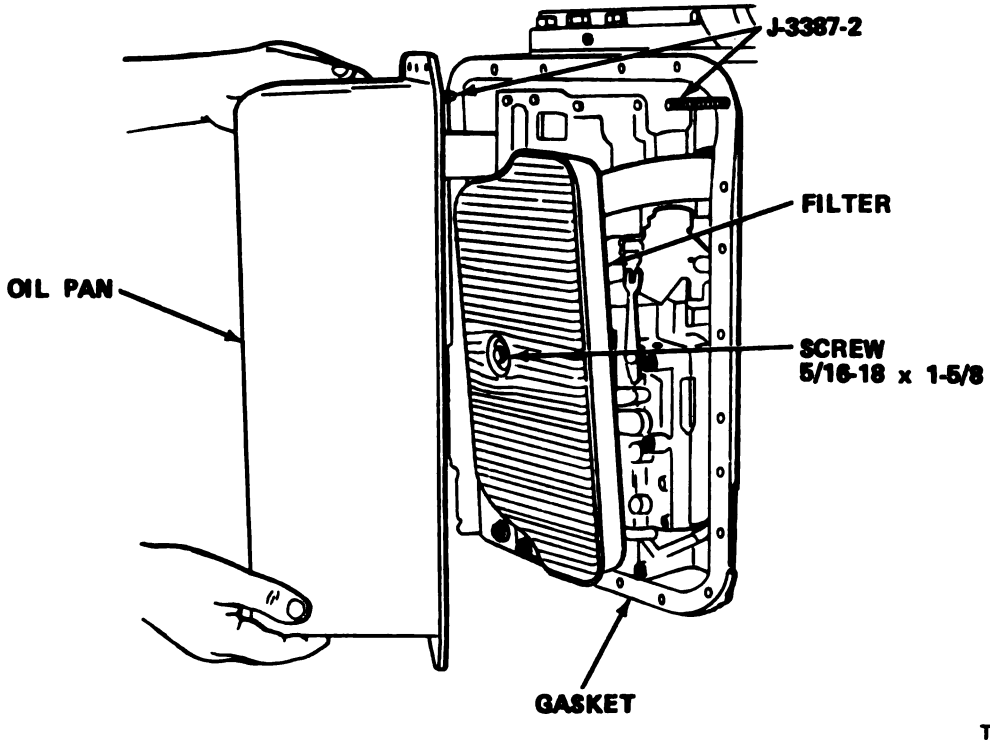


(a) Install sealring onto oil intake pipe. Lubricate sealring with oil-soluble grease.

(b) Install oil filter making sure intake pipe fits snugly into housing. Do not twist oil filter during installation, push straight inward.

NOTE

Six, seven, and eight and one-half inch deep oil pans are available for transmission. Each pan requires a different oil filter, and each filter is retained to the transmission differently. Refer to item (c) below for installation of the filter with a six-inch deep oil pan; item (d) for a seven-inch deep pan; and item (e) for an eight and one-half inch deep pan.



TA294900

(c) Retain oil filter with one 5/16-18 X 1-5/8 in. washer-head screw. Later models use one 5/16-18 X 1-5/8 in. screw and one spacer located on bolt between oil filter and valve body. Torque screw to 10 - 13 ft lbs (14 - 18 Nom).

(d) Install two 5/16-18 X 3 in. guide screws J-3387-2 into transmission housing.

(e) Install a new oil pan gasket over guide screw. Aline all holes in gasket with those in housing.

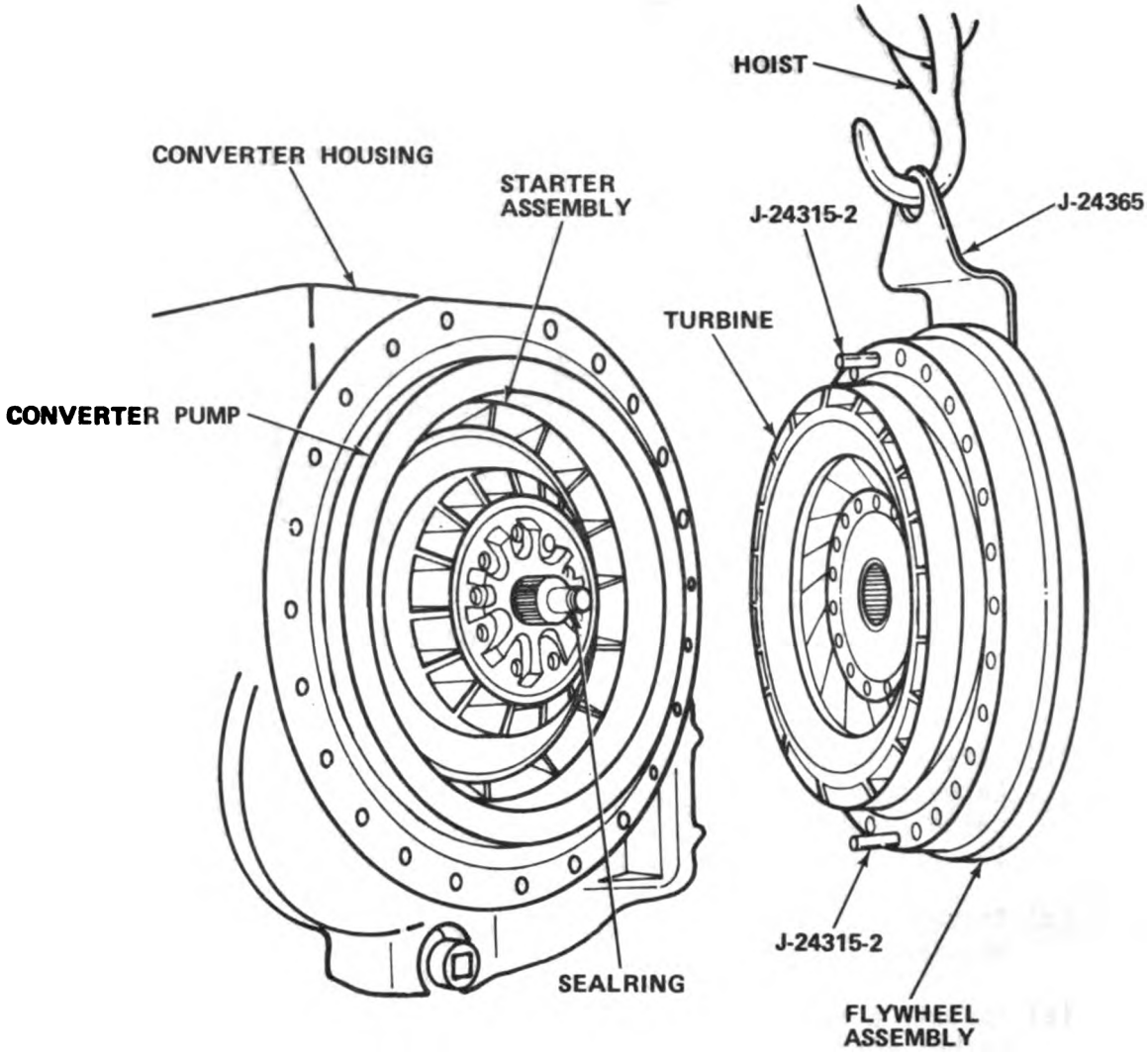
CAUTION

DO NOT APPLY GREASE TO A CORK GASKET OR DAMAGE WILL RESULT. A CEMENT OR SEALER MAY BE APPLIED ONLY IN AREA OUTSIDE RAISED BEAD ON OIL PAN FLANGE.

(f) Install oil pan. Install twenty-three 5/16-18 X 5/8 in. washer-head screws to retain oil pan. Torque screws evenly to 10 - 13 ft lbs (14 - 18 Nom).

h. Installing flywheel, lockup clutch, and torque converter turbine.

(1) Aline flywheel for installation.



(a) Position transmission horizontally.

(b) Place flywheel assembly on work table, front face down. Install two 3/8-24 X 2 in. guide screws J-24315-2 into flywheel mounting holes. Be sure sealring on end of input shaft is in place.

(c) Carefully lift flywheel to vertical position and attach lifting bracket J-24365 opposite to guide screw. Retain bracket with 1/2-20 in. bolts.

(d) Attach hoist to lifting bracket. Aline flywheel assembly with transmission.

(2) Installation.

(a) Push flywheel assembly straight onto transmission, alining guide screw J-24315-2 with one bolt hole in converter pump. Engage turbine splines with forward clutch shaft splines.

(b) Using access hole at top of converter housing, install one 3/8-24 X 1-1/4 in. bolt and one 3/8 in. flat washer through converter housing into flywheel assembly.

(c) Release hoist and remove lifting bracket.

(d) Install remaining 29 bolts and flat washers. Prior to installing last two bolts and washers, remove J-24315-2 guide screws.

(e) Torque bolts to 41 - 49 ft lbs (56 - 66 Nem).

i. Installing external components.

(1) Install modulator pressure valve actuator rod. Retain rod with a plastic cup plug.

(2) Install modulator valve retainer and secure it with one 5/16-18 X 9/16 in. bolt. Do not tighten bolt at this time. Modulator actuator will be installed when transmission is installed in vehicle.

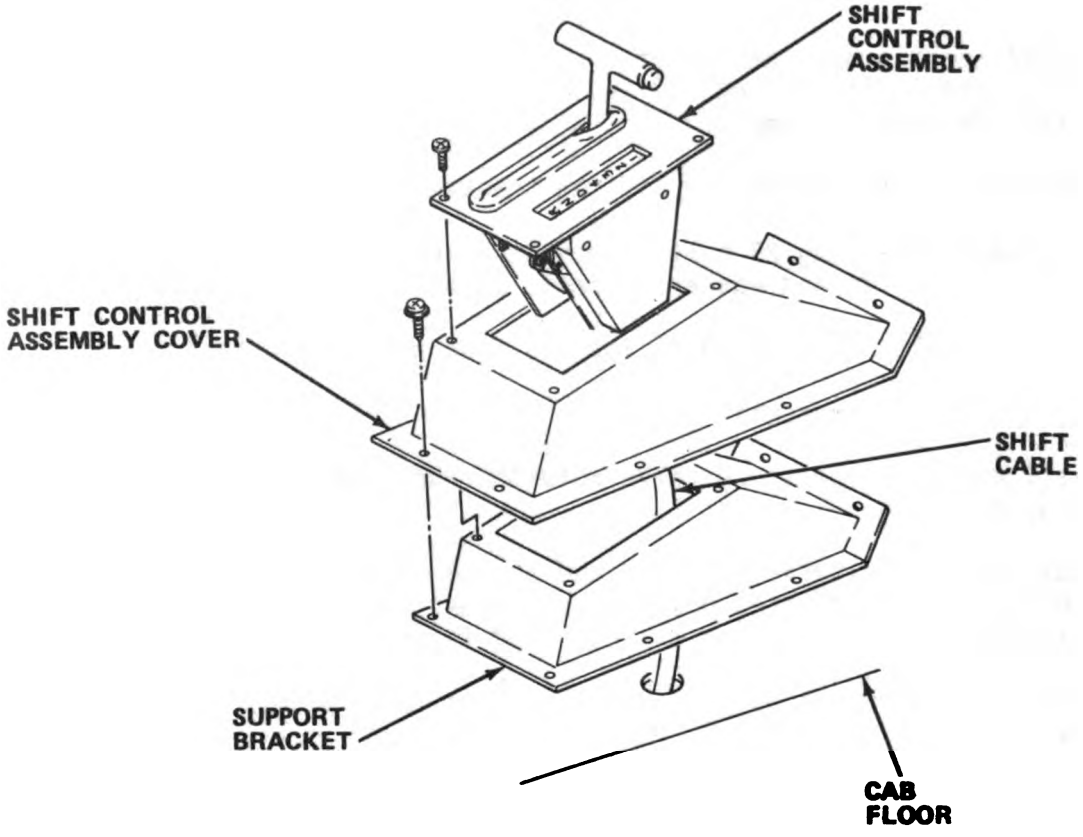
(3) Install top cover and gasket. Torque bolts to 26 - 32 ft lbs (35 - 43 Nem).

Section II. SHIFT CONTROL ASSEMBLY

7-6. **DESCRIPTION.** The shift control assembly is in the truck cab and is connected to the transmission by a one piece cable. A button on the shift control lever (T-handle) must be depressed in order to move T-handle. An illuminated lever position indicator provides the operation and indication of gear range selected.

7-7. REPLACE SHIFT CONTROL ASSEMBLY

a. Remove shift control assembly.



(1) Remove screws securing shift control assembly to cover and support bracket.

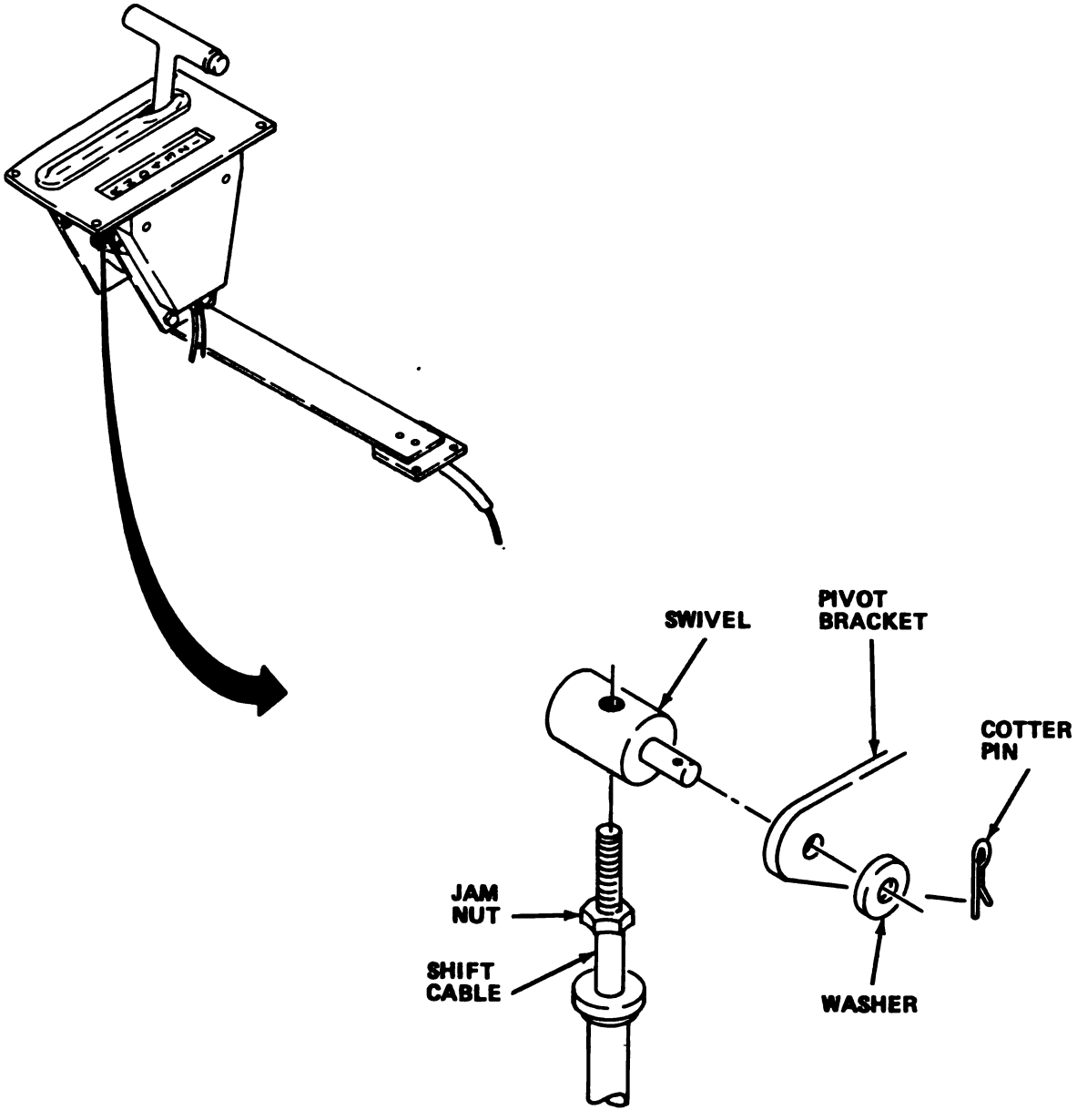
(2) Remove screws securing cover and support bracket to cab floor.

NOTE

Shift control assembly can be lifted out of cover and support bracket to make disconnects.

(3) Lift shift control assembly to expose shift cable swivel.

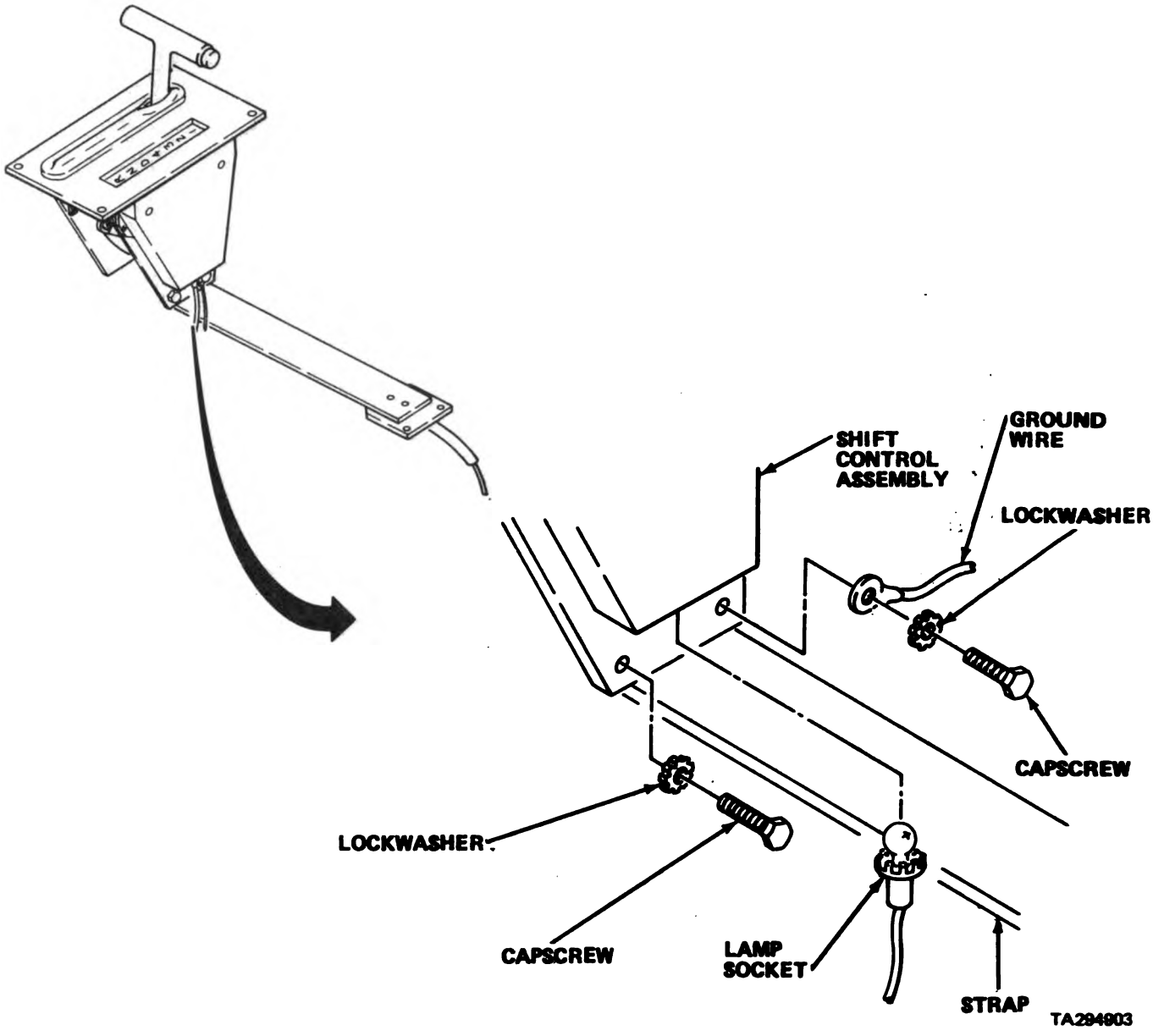
(4) Place control T-handle in 1st gear position.



(5) Remove cotter pin and washer from swivel.

(6) Push swivel out of pivot bracket.

(7) Loosen cable jam nut and unscrew swivel from shift cable.



(8) Remove capscrews and lockwashers securing strap and ground wire to shift control assembly.

(9) Remove lamp socket from shift control assembly.

(10) Remove shift control assembly.

b. Install shift control assembly.

(1) Secure strap and ground wire to shift control assembly with lockwashers and capscrews.

(2) Install lamp socket in shift control assembly. Ensure socket is fully seated.

(3) Screw swivel on end of shift cable down to jam nut.

(4) Slide swivel into pivot bracket hole and secure with washer and cotter pin.

(5) Tighten jam nut.

(6) Secure support bracket and cover to cab floor with screws. Leave screws loose at this time.

(7) Secure shift control assembly to cover and support bracket with screws.

(8) Tighten cover and support bracket-to-cab floor screws.

7-8. REPAIR SHIFT CONTROL ASSEMBLY

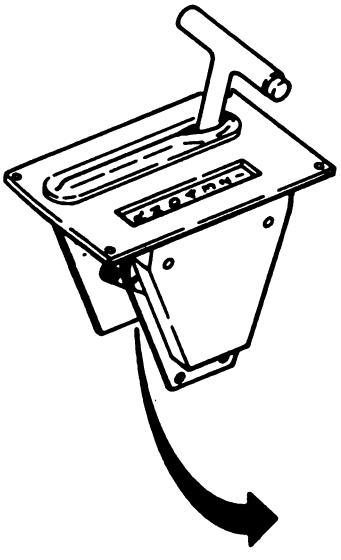
a. Remove shift control assembly (para 7-7).

b. Replace lamp socket.

(1) Cut lamp socket electrical lead and remove defective socket.

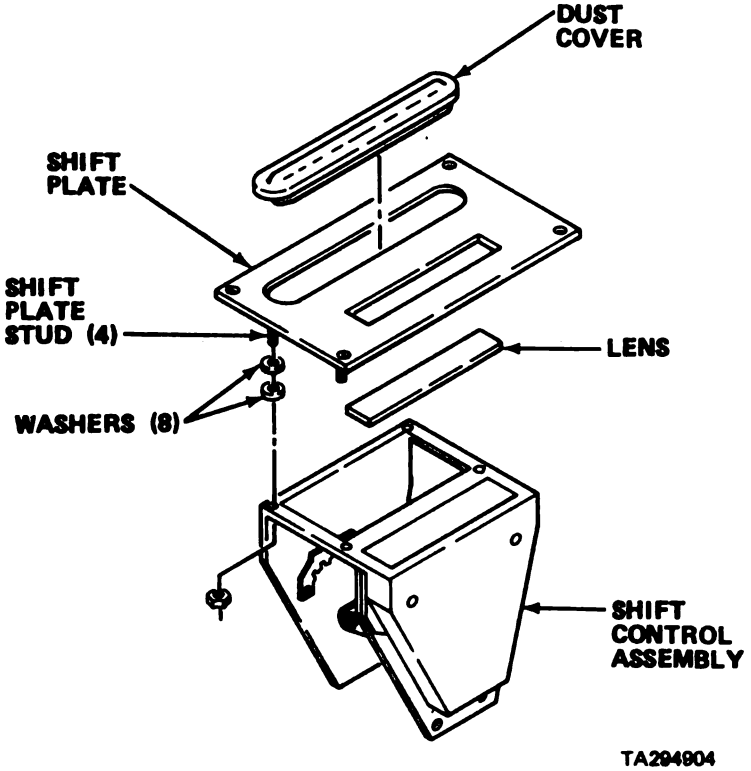
(2) Splice new socket electrical lead to cab lead with butt connector and tape connector.

c. Replace lens or dust cover.



NOTE:

SHIFT T-HANDLE NOT SHOWN FOR CLARITY



(1) Remove locknuts securing shift plate to shift control assembly.

NOTE

Two washers on each plate stud act as spacers.

(2) Lift shift plate and remove washers from shift plate studs.

NOTE

Lens sits in cavity of shift control assembly.

(3) Remove defective lens.

(4) Install new lens in shift control assembly cavity. Ensure that R on lens faces forward.

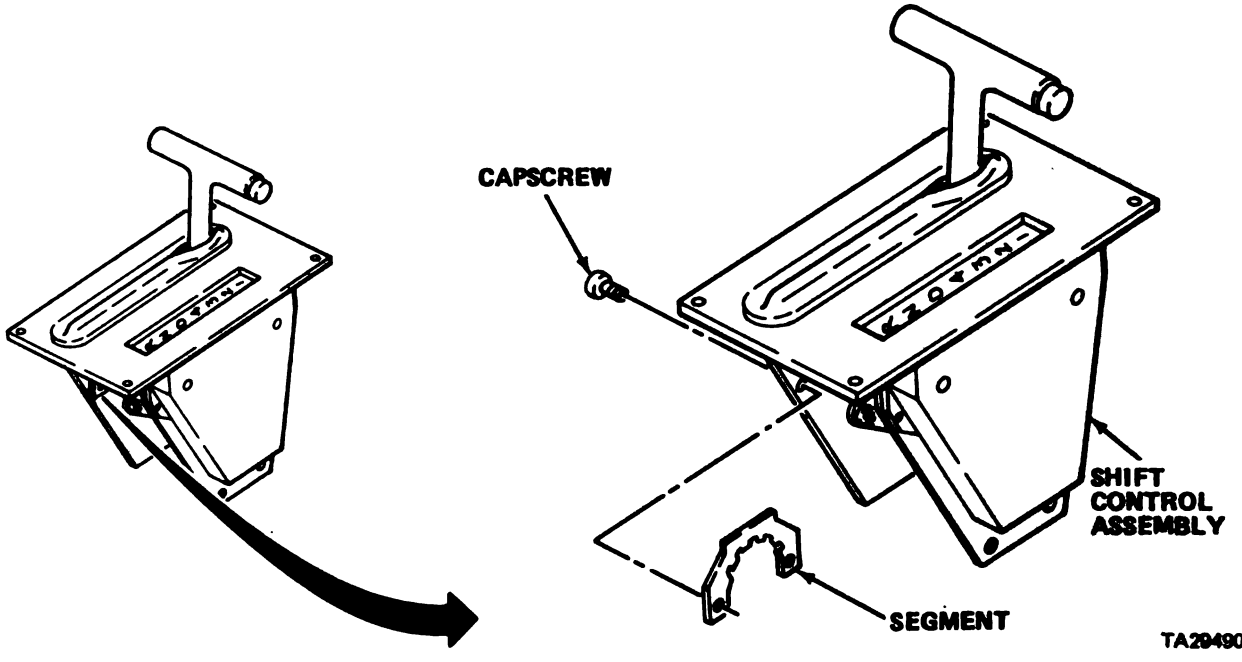
(5) To remove rubber dust cover, pull cover out of groove in shift plate and slide off of T-handle.

(6) Push new dust cover into T-handle engaging groove in dust cover with shift control assembly.

(7) Place two washers on each shift plate stud and install shift plate on shift control assembly.

(8) Secure shift plate with locknuts.

d. Replace segment.



(1) Remove screws securing segment to shift control assembly.

(2) Push in button on T-handle to release segment and remove segment.

(3) Push in button on T-handle and slide segment into position.

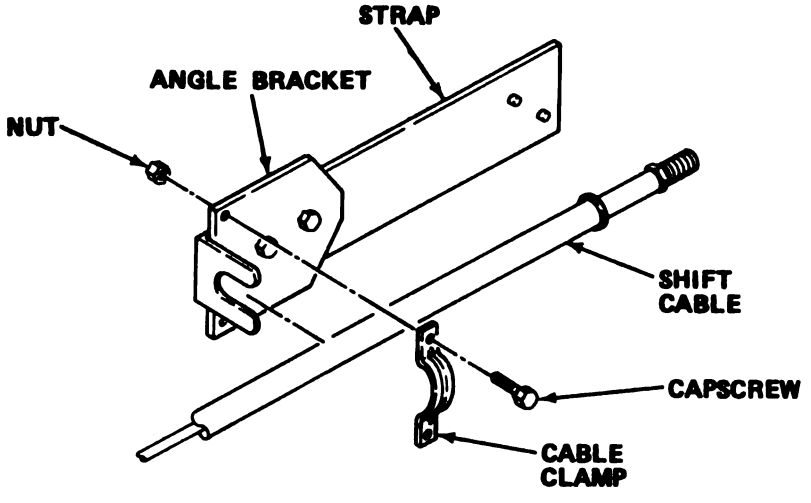
(4) Secure segment with screws.

(5) Apply small amount of grease to segment teeth.

7-9. REPLACE SHIFT CABLE

a. Remove shift cable.

(1) Remove shift control assembly (para 7-7).



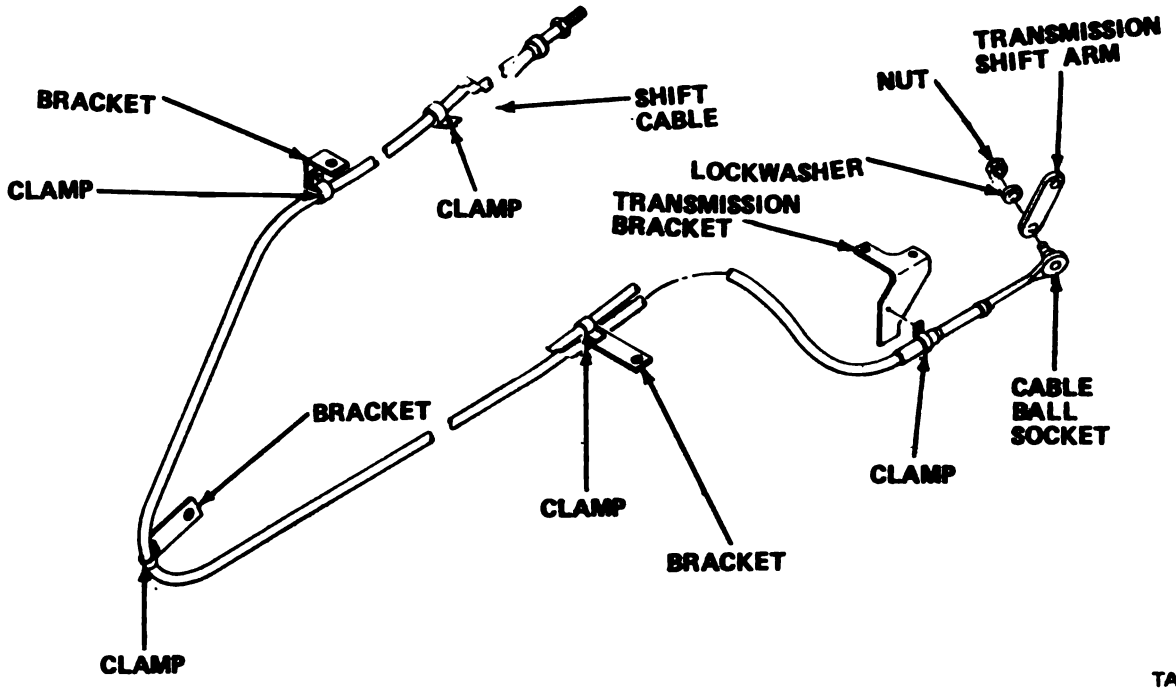
TA294906

NOTE:

AS VIEWED FROM PASSENGER SIDE OF SHIFT CABLE IN CAB

(2) Remove capscrews and nuts securing shift cable clamp to angle bracket. Cable is now free from shift control assembly strap and angle bracket.

(3) Raise cab (TM 9-2320-281-10).



(4) Remove cable clamps from brackets.

(5) Remove nut and lockwasher securing cable ball socket to transmission shift arm.

(6) Disconnect cable ball socket from cable shift arm.

(7) Remove shift cable.

b. Install shift cable.

(1) Secure shift cable to transmission bracket with clamp.

(2) Secure cable ball socket to transmission shift arm with lockwasher and nut.

(3) Insert cable through cab floor.

(4) Secure cable to remaining cab and frame brackets.

(5) Lower cab (TM 9-2320-281-10).

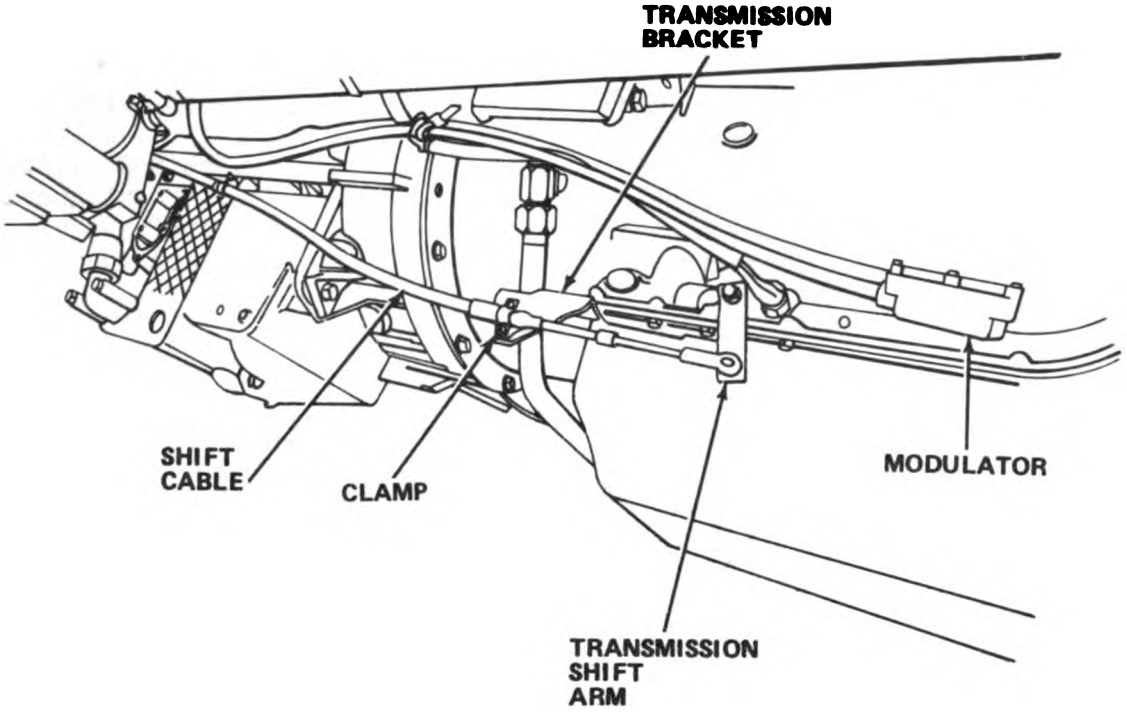
(6) Secure cable to shift control assembly angle bracket and strap with cable clamp.

(7) Install shift control assembly (para 7-7).

(8) Adjust shift cable (para 7-10).

7-10. ADJUST SHIFT CONTROL ASSEMBLY

a. Place shift T-handle in most forward (reverse) position.



TA294908

b. Loosen bolts securing shift cable clamp to transmission bracket.

c. Press transmission shift arm and cable to its most forward position. Tighten bolts securing cable clamp to transmission bracket.

d. Test shift cable for proper operation in all transmission ranges.

ALPHABETICAL INDEX

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General, United States Army
Chief of Staff

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 9-2320-281-34-1	16 Oct 85	DS AND GS MAINTENANCE MANUAL, TRUCK CHASSIS, TOPOGRAPHIC SUPPORT SYSTEM (TSS)

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P S --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

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 Megagram = 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. Inch
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Mile

CUBIC MEASURE

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

TEMPERATURE

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celcius
9/5 (°C + 32) = °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