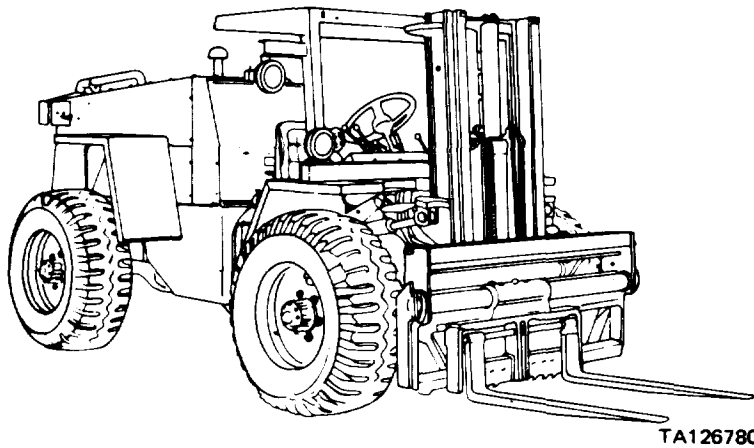


TECHNICAL MANUAL  
ORGANIZATIONAL, DIRECT  
SUPPORT AND GENERAL SUPPORT MAIN-  
TENANCE MANUAL (INCLUDING REPAIR  
PARTS AND SPECIAL TOOLS LIST)



TRUCK, FORKLIFT, DED,  
PNEUMATIC TIRE, ARTICULATED  
FRAME STEER, 4,000 LB. CAPACITY  
ROUGH TERRAIN, ARMY MODEL MHE 237  
(J. 1. CASE MODEL M4K)  
(NSN 3930-01-076-4237)

This copy is a reprint which includes current  
pages from Changes 1 through 5.

**HOW TO USE THIS MANUAL** PAGE iii

**INTRODUCTION** PAGE 1-1

**EQUIPMENT DESCRIPTION  
AND DATA** PAGE 1-3

**ORGANIZATIONAL MAINTENANCE  
PROCEDURES** PAGE 2-1

**(ORGANIZATIONAL) PREVENTIVE  
MAINTENANCE CHECKS AND  
SERVICES (PMCS)** PAGE 2-3

**TROUBLESHOOTING INDEX** PAGE 2-7

**DIRECT SUPPORT MAINTENANCE  
PROCEDURES** PAGE 3-1

**GENERAL SUPPORT MAINTENANCE  
PROCEDURES** PAGE 4-1

**REFERENCES** PAGE A-1

**MAINTENANCE ALLOCATION CHART** PAGE B-1

**EXPENDABLE SUPPLIES AND  
MATERIALS LIST** PAGE D-1

**TORQUE LIMITS** PAGE E-1

**ELECTRICAL AND HYDRAULIC  
DIAGRAMS** PAGE F-1

**GLOSSARY** PAGE G-1

**ILLUSTRATED LIST OF  
MANUFACTURED ITEMS** PAGE H-1

**ALPHABETICAL INDEX** INDEX 1

**WARNING**  
**FIRE HAZARD**

Diesel fuel and combustible materials are used in operation and maintenance of this equipment. Do not smoke or allow open flames or sparks into areas where diesel fuel and combustible materials are used or stored.

**DEATH**  
or severe injury may result if personnel fail to observe this precaution. If you are burned, seek medical aid immediately.

---

**WARNING**  
**OIL UNDER PRESSURE**

**2500 PSI PRESSURE**

is used to operate this equipment, NEVER disconnect any hydraulic lines or fittings without checking manual to see how to drop the pressure to zero. Failure to follow this procedure could cause SEVERE INJURY. Should you be struck by a high pressure oil stream, seek medical help immediately.

---

**WARNING**  
**ELECTRICAL SHOCK HAZARD**

Always disconnect battery ground cable before working on electrical components of this equipment.

**DEATH**  
or severe injury may result if you fail to observe this precaution. If you receive an electrical shock, seek medical help immediately.

---

**WARNING**  
**FALLING EQUIPMENT HAZARD**

Never crawl under equipment when performing maintenance unless equipment is blocked securely. Keep clear of equipment when it is raised or lowered. Do not allow heavy components to swing while suspended by lifting device. Exercise extreme caution when working near a cable or chain under tension.

**DEATH**  
or severe injury may result if personnel fail to observe this safety precaution. If you are hurt by a falling object or chain or cable under tension, seek medical aid.

---

**WARNING**  
**TIRE INFLATION**

Observe caution when inflating tires. Be sure tires are properly seated on rims before inflating.

**DEATH**  
or serious injury may result if you do not observe this precaution. Improperly seated tires can burst with explosive force sufficient to cause death.

---

**WARNING**  
**TIRE DEFLATION**

Deflate tire completely before removing wheel from rim. Refer to the manual to completely deflate tire. Failure to follow this procedure could cause SERIOUS INJURY. Should you be injured by not completely deflating the tire, seek medical help immediately.

---

**WARNING**  
**HIGH VELOCITY AIR**

Compressed air, used for cleaning purposes, will not exceed 30 psi. Safety glasses must be used when cleaning parts with compressed air. Failure to do so could cause SERIOUS INJURY to your EYES and possible BLINDNESS. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
*Washington D.C., 13 February 1992*

**ORGANIZATIONAL, DIRECT SUPPORT AND  
GENERAL SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)**

**TRUCK, FORKLIFT, DED, PNEUMATIC TIRE,  
ARTICULATED FRAME STEER, 4,000 LB. CAPACITY  
ROUGH TERRAIN, ARMY MODEL MHE 237  
(J.I. CASE MODEL M4K) (NSN 3930-01-076-4237)**

TM 10-3930-638-24&P, 1 October 1980, is changed as follows:

1. Change to narrative material is indicated by a vertical bar in outside margin of the page.
2. Remove old pages and insert new pages.

**Remove Pages**

Pages A thru D  
Pages 1-5 thru 1-8  
Pages 2-1 thru 2-4  
Pages 2-11 and 2-12  
Pages 2-15 thru 2-18  
Pages 2-23 and 2-24  
Pages 2-31 thru 2-36  
Pages 2-45 thru 2-48

**Insert Pages**

Pages A thru D  
Pages 1-5 thru 1-8  
Pages 2-1 thru 2-4  
Pages 2-11 and 2-12  
Pages 2-15 thru 2-18  
Pages 2-23 and 2-24  
Pages 3-31 thru 2-36  
Pages 2-45 thru 2-48

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

**Approved for public release; distribution is unlimited.**

**CHANGE**

**Changes in Force 1,2,3,4,5**

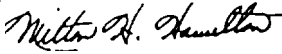
**TM 10-3930-638-24&P**

**C5**

**NO. 5**

By Order of the Secretary of the Army:

Official:



MILTON H. HAMILTON  
*Administrative Assistant to the  
Secretary of the Army*

00610

GORDON R. SULLIVAN  
*General, United States Army  
Chief of Staff*

Distribution:

To be distributed in accordance with DA Form 12-25-E, Block 2162, Unit, Direct and General Support maintenance requirements for TM 10-3930-636-24&P



CHANGE

NO. 4

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington D. C., 12 March 1990

**ORGANIZATIONAL, DIRECT SUPPORT  
AND GENERAL SUPPORT MAINTENANCE MANUAL**

**TRUCK, FORKLIFT, DED, PNEUMATIC TIRE,  
ARTICULATED FRAME STEER,  
4,000-LB, CAPACITY, ROUGH TERRAIN,  
ARMY MODEL MHE 237  
(NSN 3930-01-076-4237)**

TM 10-3930-638-24&P, 1 October 1980, is changed as follows:

1. Remove old pages and insert new pages.
2. New or changed material is indicated by a vertical bar in the margin of the page and by a vertical bar adjacent to the TA number.

**Remove Pages**

*i and ii*  
*1-1 and 1-2*  
*2-277 and 2-278*  
*2-281 and 2-282*  
*2-285 and 2-286*  
*2-325 through 2-328*  
*A-1 and A-2*  
*B-11 and B-12*  
*Appendix C*

**Insert Pages**

*i and ii*  
*1-1 and 1-2*  
*2-277 and 2-278*  
*2-281 and 2-282*  
*2-285 and 2-286*  
*2-325 through 2-328*  
*A-1 and A-2*  
*B-11 and B-12*  
*None*

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

\*The Repair Parts and Special Tools List is deleted from this manual; refer to TM 10-3930-638-24P

By Order of the Secretary of the Army:

CARL E. VUONO  
General, United States Army  
Chief of Staff

Official:

WILLIAM J. MEEHAN II  
Brigadier General, United States Army  
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25F (Block No. 2161,2162,2163) Unit, Direct Support/General Support maintenance requirements for Fork Lift, 4000 LB Capacity, Rough Terrain, Pneumatic Tire, Articulated Frame Steer (Model MHE-237).

Changes in Force 1, 2, 3

CHANGE

NO. 3

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D. C., 11 March 1988

**ORGANIZATIONAL DIRECT SUPPORT AND  
GENERAL SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)**

**TRUCK FORKLIFT, DED, PNEUMATIC TIRE,  
ARTICULATED FRAME STEER, 4,000 LB. CAPACITY  
ROUGH TERRAIN, ARMY MODEL MHE 237  
(J.I. CASE MODEL M4K) (NSN 3930-01 -076-4237)**

TM 10-3930-638-24&P, 1 October 1980, with change 1, 25 June 1982, and change 2, 21 February 1986, is changed as follows:

1. Change to narrative material is indicated by a vertical bar in the outside margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.
2. Remove old pages and insert new pages as indicated below.
3. File this change sheet in front of the publication for reference purposes.

Remove Pages	Insert Pages
2-3 and 2-4 .....	2-3 and 2-4
2-5 .....	2-5
2-251 thru 2.258 .....	2.251 thru 2-258
2-281 and 2-282 .....	2-281 and 2-282
2-285 and 2-286 .....	2-285 thru 2-286.1
2-287 and 2-288 .....	2-287 and 2-288
2-289 and 2-290 .....	2-289 and 2-290
2-291 and 2-292 .....	2-291 and 2-292
2-295 and 2-296 .....	2-295 and 2-296
68-1 and 69-1 .....	68-1 and 69-1
Kits-5 and 6 .....	Kits-5 and 6

\*This change supersedes TM 10-3930-638-24&P, I01, 28 Feb 1987.

By Order of the Secretary of the Army:

CARL E. VUONO  
*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 12-25 F, Unit, Direct Support and General Support Maintenance Manual Requirements for: Forklift, 4,000 lb. capacity, Rough Terrain, pneumatic Tire, Articulated Frame Steer (Model MHE 237).

CHANGE

NO. 2

**ORGANIZATIONAL, DIRECT SUPPORT AND  
GENERAL SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)**

**TRUCK FORKLIFT, DED, PNEUMATIC TIRE,  
ARTICULATED FRAME STEER 4,000 LB. CAPACITY  
ROUGH TERRAIN, ARMY MODEL MHE 237  
(J.I. CASE MODEL M4K) (NSN 3930-01-076-4237)**

TM 10-3930-638-24&P, 1 October 1980, with change 1, 25 June 1982, is changed as follows:

1. Change to narrative material is indicated by a vertical bar in the outside margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.
2. Remove old pages and insert new pages as indicated below.
3. File this change sheet in front of the publication for reference purposes.

Remove pages

Insert pages

i and ii . . . . .	i and ii
2-3 thru 2-6 . . . . .	2-3 thru 2-6
2-41 thru 2-44 . . . . .	2-41 thru 2-44
2-55 and 2-56 . . . . .	2-55 and 2-56
2-93 and 2-94 . . . . .	2-93 and 2-94
2-133 and 2-134 . . . . .	2-133 and 2-134
2-145 and 2-146 . . . . .	2-145 and 2-146
2-167 and 2-168 . . . . .	2-167 and 2-168
2-191 and 2-192 . . . . .	2-191 and 2-192
2-267 and 2-268 . . . . .	2-267 and 2-268
2-295 thru 2-300 . . . . .	2-295 thru 2-300
2-345 thru 2-350 . . . . .	2-345 thru 2-350
2-355 thru 2-358 . . . . .	2-355 thru 2-358
2-393 and 2-394 . . . . .	2-393 and 2-394
2-403 thru 2-406 . . . . .	2-403 thru 2-406
2-409 and 2-410 . . . . .	2-409 and 2-410
2-429 and 2-430 . . . . .	2-429 and 2-430
2-439 and 2-440 . . . . .	2-439 and 2-440M
3-179 thru 3-184 . . . . .	3-179 thru 3-184
3-239 thru 3-248 . . . . .	3-239 thru 3-248
4-237 thru 4-242 . . . . .	4-237 thru 4-242
A-1 and A-2 . . . . .	A-1 and A-2
B-3 thru B-17 . . . . .	B-3 thru B-17
C-i thru C-vi . . . . .	C-i thru C-iii
(C-vii blank) C-viii thru C283/287 . . . . .	C-1 thru 1-75
D-1 and D-2 . . . . .	D-1 and D-2

By Order of the Secretary of the Army:

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

Official:

MILDRED E. HEDBERG  
*Brigadier General, United States Army*  
*The Adjutant General*

Distribution:

To be distributed in accordance with DA Form 12-34B requirements for Storage Facilities-Storage Depots and Ammunition and Explosive Standards; DA Form 12-38, Organizational Maintenance requirements for Truck, Tractor, Diesel, Yard Type, 4x2, M878; Truck, Tractor, Line Haul, 6x4, 50,000 GVWR, M915A1 and Truck, Tractor, 10-Ton, 8x8, M1001, M1002, M1013, M1014 and DA Form 12-39, Organizational Maintenance requirements for Semitrailer, Refrigerator, KECO Model F9000RG; Semitrailer, Refrigerator, 7½-Ton, Models RGP-9000, RGP-9000 MOD, RGEP-9000; Semitrailer, Refrigerator, 7½-Ton, LEAR-SIEGLER Model 1348 and Semitrailer, Stake, 12-Ton, 4-Wheel, M127, M127A1, M127A1C; Semitrailer, Van, Cargo, 12-Ton, 4-Wheel, M128A1, M128A1C, M128A2C; and Semitrailer, Van, Supply, M129A1, M129A1C, M129A2C. (3 copies per account)

CHANGE

NO. 1

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, DC, 25 June 1982

ORGANIZATIONAL DIRECT SUPPORT AND  
GENERAL SUPPORT MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)  
TRUCK, FORKLIFT, DED, PNEUMATIC TIRE,  
ARTICULATED FRAME STEER, 4,000 LB. CAPACITY  
ROUGH TERRAIN, ARMY MODEL MHE 237  
(J.I. CASE MODEL M4K) (NSN 3930-01-076-4237)

TM 10-3930-638-24&P, 1 October 1980, is changed as follows:

1. Change to narrative material is indicated by a vertical bar in the outside margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.
2. Remove old pages and insert new pages as indicated below.

Remove pages

Insert pages

i and ii . . . . .	i and ii
1-1 and 1-2 . . . . .	1-1 and 1-2
2-113 and 2-114 . . . . .	2-113 and 2-114
2-137 and 2-138 . . . . .	2-137 and 2-138
2-251 through 2-254 . . . . .	2-251 through 2-254
2-277 and 2-278 . . . . .	2-277 and 2-278
2-281 and 2-282 . . . . .	2-281 and 2-282
2-393 and 2-394 . . . . .	2-393 and 2-394
3-31 and 3-32 . . . . .	3-31 and 3-32
3-43 through 3-46 . . . . .	3-43 through 3-46
3-61 through 3-66 . . . . .	3-61 through 3-66
3-71 and 3-72 . . . . .	3-71 and 3-72
3-79 and 3-80 . . . . .	3-79 and 3-80
3-107 and 3-108 . . . . .	3-107 and 3-108
3-171 and 3-172 . . . . .	3-171 and 3-172
3-251 and 3-252 . . . . .	3-251 and 3-252
4-1 through 4-4 . . . . .	4-1 through 4-4
4-19 and 4-20 . . . . .	4-19 and 4-20
4-23 through 4-26 . . . . .	4-23 through 4-26
4-43 and 4-44 . . . . .	4-43 and 4-44
4-59 through 4-70 . . . . .	4-59 through 4-70
4-75 and 4-76 . . . . .	4-75 and 4-76
4-133 through 4-140 . . . . .	4-133 through 4-140
4-149 through 4-156 . . . . .	4-149 through 4-156
4-161 through 4-170 . . . . .	4-161 through 4-170
4-173 and 4-174 . . . . .	4-173 and 4-174
4-179 and 4-180 . . . . .	4-179 and 4-180
4-183 through 4-196 . . . . .	4-183 through 4-196
4-199 through 4-208 . . . . .	4-199 through 4-208
4-211 through 4-216 . . . . .	4-211 through 4-216
4-219 through 4-222 . . . . .	4-219 through 4-222
4-225 through 4-228 . . . . .	4-225 through 4-228
4-231 through 4-238 . . . . .	4-231 through 4-238
4-247 and 4-248 . . . . .	4-247 and 4-248
(C-vii blank)C-viii through 287 . . . . .	C-vii through C-283/287

**TM 10-3930-638-24&P**

**C 1**

By Order of the Secretary of the Army:

Official:

**ROBERT M. JOYCE**  
Brigadier General, United States Army  
The Adjutant General

**E.C. MEYER**  
General, United States Army  
Chief of Staff

Distribution:

To be distributed in accordance with DA Form 12-25A, Organizational Maintenance Requirements for Truck, Forklift, Rough Terrain.



**WARNING**  
**JACKING VEHICLE**

Make sure that vehicle will not roll or shift and that shipping lock pin is installed when jacking as instructed in this manual. Secure with chock blocks.

**DEATH**

or serious injury may result by your failure to follow this procedure due to vehicle turning and slipping off jack or jack stands. If injured, obtain medical aid immediately.

---

**WARNING**  
**TOXIC/FLAMMABLE**

Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and

use only in a well ventilated area. ,avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury.

if you become dizzy while using cleaning solvent, get fresh air immediately. and get medical attention. if contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made. wash with water immdiately, and obtain medical aid immediately.

---

**WARNING**  
**EXHAUST GASES CAN BE DEADLY**

Exhaust gases can produce symptoms of headache, dizziness, loss of muscular control, or coma. Permanent brain damage or death can result from severe exposure.

You can insure your safety by following these rules:

DON'T operate the heater or engine in an enclosed area unless it is properly ventilated

DON'T drive with any of the truck's inspection plates, cover plates, or the hood off unless necessary for maintenance.

If you notice exhaust odors or exposure symptoms, IMMEDIATELY VENTILATE the area.

If the symptoms persist, remove the affected people and treat them:

- Expose them to fresh air.
- If necessary, give artificial respiration.
- Keep them warm.
- DON'T permit physical exercise.

Refer to FM 21 -11, First aid for Soldiers, for first aid treatment of injured personnel.

---

**WARNING**  
**NOISE HAZARD**

Excessive noise levels are present any time the equipment is in operation. Wear hearing protection while operating or when working around equipment while it i ruining. Failure to do so could result in damage to your ears such as high frequency hearing loss. seek medical aid should you suspect a hearing problem.

---

**WARNING**  
**AIR FILTER - DANGEROUS CHEMICAL**

If NBC is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.

---

**WARNING**  
**STEAM UNDER PRESSURE**

Remove radiator cap slowly to relieve pressure before completely removing when engine is hot. Failure to follow this procedure could cause SEVERE INJURY. Should you be scalded by steam, seek medical aid immediately. seek medical aid immediately.

---

---

**WARNING**

Keep hands and feet clear of steering cylinder assembly while checking for hydraulic leakage when engine is running. SEVERE INJURY may result by your failure to follow this procedure. If you are injured, obtain medical aid immediately.

---

**WARNING**

Be sure that steering bypass valve is closed (fully clockwise) and that shipping lock pin removed before operating vehicle.  
Failure to do so will cause loss of steering control, which may result in death or serious injury.

---

**WARNING**

When welding hydraulic reservoir, partially fill it with water. DEATH or severe injury may result if you fail to observe this safety precaution. If you

---

**WARNING**

When bleeding air from cylinder assembly, don't look directly down at bleed fitting. Hydraulic oil is under pressure. SEVERE INJURY may result by your failure to follow this precaution. If you are injured, seek medical attention immediately.

---

**WARNING**

If both tilt cylinders are to be removed from mast assembly, support mast assembly using a chain hoist.  
DEATH  
or severe injury may result by your failure to follow this procedure due to mast assembly falling forward, striking personnel standing/working in front of unit. If you are injured by falling equipment, obtain medical aid.

---

**WARNING**

Some procedures in this manual require that parts be heated prior to reassemble. Wear insulated gloves or use tongs when handling parts that have been heated. SEVERE BURNS may result if you fail to follow this precaution. If you burn your hands, seek medical aid.

---

**WARNING**

When testing fuel injectors, always direct fuel injector tip away from you. Fuel from spray orifices can penetrate clothing and skin. Failure to do so could cause SERIOUS INFECTION. Be sure injector tip is enclosed in a receptacle to contain spray. If skin is broken by fuel injector spray, seek medical aid.

---

**WARNING**

Exercise care when using alkali cleaners to avoid coming in contact with cleaner or breathing vapors. Wear rubber apron to prevent clothes from coming in contact with cleaner and use cleaner in a well ventilated area. Failure to follow this precaution may cause SEVERE INJURY and/or skin rashes. If alkali cleaner is splashed on clothes or skin, flood area with large amounts of water and seek medical attention.

---

**WARNING**

Blue Vitriol solution, used to check cylinder sleeves, contains acid. Wear safety glasses to protect eyes from accidental splashing and avoid splashing solution on your skin. Failure to do so could cause SEVERE BURNS to your eyes and skin. If solution is splashed in your eyes or on your skin, wash off immediately and seek medical aid.

---

**WARNING**

When testing fuel injectors, always direct fuel injector tip away from you. Fuel from spray orifices can penetrate clothing and skin. Failure to do so could cause **SERIOUS INFECTION**. Be sure injector tip is enclosed in a receptacle to contain spray. If skin is broken by fuel injector spray, seek medical aid.

---

**WARNING**

Exercise care when using alkali cleaners to avoid coming in contact with cleaner or breathing vapors. Wear rubber apron to prevent clothes from coming in contact with cleaner and use cleaner in a well ventilated area. Failure to follow this precaution may cause **SEVERE INJURY** and/or skin rashes. If alkali cleaner is splashed on clothes or skin, flood area with large amounts of water and seek medical attention.



ORGANIZATIONAL, DIRECT SUPPORT  
AND GENERAL SUPPORT MAINTENANCE MANUAL

TRUCK, FORKLIFT, DED, PNEUMATIC TIRE, ARTICULATED FRAME STEER,  
4,000-LB. CAPACITY, ROUGH TERRAIN,  
ARMY MODEL MHE 237  
(NSN 3930-01-076-4237)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

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

	<u>HOW TO USE THIS MANUAL</u> .....	iii
CHAPTER 1	<u>INTRODUCTION</u> .....	1-1
Section I	Chapter Overview .....	1-1
	General Information .....	1-1
II	<u>Equipment Description and Data</u> .....	1-3
III	Principles of Operation .....	1-7
CHAPTER 2	<u>ORGANIZATIONAL MAINTENANCE PROCEDURES</u> .....	2-1
	Chapter Overview .....	2-1
Section I	Service Upon Receipt .....	2-1
II	<u>Preventive Maintenance Checks and Services (PMCS)</u> .....	2-3
III	<u>Troubleshooting Index</u> .....	2-7
IV	Engine, Fuel, Exhaust and Cooling Systems and Gages Maintenance .....	2-11
V	Electrical System Maintenance .....	2-98
VI	Power Train Maintenance .....	2-194
VII	Brake System Maintenance .....	2-259
VIII	Wheels and Steering Maintenance .....	2-319
IX	Body, Cab, and Roll Over Protective Structure Maintenance .....	2-352
X	Hydraulic Lift System Maintenance .....	2-389
CHAPTER 3	<u>DIRECT SUPPORT MAINTENANCE PROCEDURES</u> .....	3-1
	Chapter Overview .....	3-1
Section I	Engine, Fuel and Cooling Systems Maintenance .....	3-1
II	Electrical System Maintenance .....	3-88
III	Power Train Maintenance .....	3-123
IV	Steering System Maintenance .....	3-152
V	Chassis Maintenance .....	3-190
VI	Hydraulic Lift System Maintenance .....	3-194

\* The Repair Parts and Special Tools List is deleted from this manual; refer to TM 10-3930-638-24P

		Page
CHAPTER 4	<b>GENERAL SUPPORT MAINTENANCE PROCEDURES</b> .....	4-1
	Chapter Overview .....	4-1
Section I	Engine and Fuel System Maintenance .....	4- 1
II	Power Train Maintenance .....	4-132
III	Chassis Maintenance .....	4-251
APPENDIX A	<b>REFERENCES</b> .....	A- 1
B	<b>Maintenance ALLOCATION CHART</b> .....	B-1
C	<b>REPAIR PARTS AND SPECIAL TOOLS LIST</b> (Refer to TM 10-3930-638-24P)	
D	<b>EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST</b> .....	D-1
E	<b>TORQUE LIMITS</b> .....	E- 1
F	<b>ELECTRICAL AND HYDRAULIC DIAGRAMS</b> .....	F-1
G	<b>GLOSSARY</b> .....	G-1
H	<b>ILLUSTRATED LIST OF MANUFACTURED ITEMS</b> .....	H-1
I	<b>ALPHABETICAL INDEX</b> .....	Index 1

HOW TO USE THIS MANUAL

This manual is designed to help you maintain the M HE 237 forklift truck. It's divided into chapters, sections and appendices. The chapters contain organizational, direct support, and general support maintenance procedures. The chapters are divided into sections containing maintenance procedures for the various systems which comprise the forklift truck.

The appendices contain supplemental information which you require to maintain the M HE 237 forklift truck. Included in the appendices is the repair parts and special tools list (Appendix C) which contains exploded view illustrations keyed to a parts listing.

To use the repair parts and special tools list:

1. Refer to the repair parts and special tools list table of contents located in appendix C to determine the functional group within which the repair part you are trying to locate belongs, This is necessary since illustrations are prepared for functional groups and part listings are divided into the same groups.
2. Find the illustration covering the functional group to which the repair part belongs.
3. Identify the repair part on the illustration and note the figure and item number of the repair part.
4. Using the repair parts listing, find the figure and item number noted on the illustration to determine the SMR code, National Stock Number, Part Number and FSCM.

The maintenance procedures contained in this manual tell you several things:

- . . . . . what tools you need to do the job
- . . . . . materials or parts required
- . . . . . what condition the vehicle is to be in before work is started

In addition to the text, you'll have either an assembled view or an exploded view illustration of the associated parts. Sometimes, the illustration will be keyed by an arrow to an overall view of the vehicle to help you determine the approximate location of the parts. The illustration is keyed to the text by numbers and shows you how to take the part off and put it on. The following problem will show some of the features of this manual.

**PROBLEM**

An operator brings his M HE 237 forklift truck into the shop with an engine problem: The engine stalls frequently or doesn't develop full power. The best way to solve his problem is by using your manual. This is what you do:

1. How do you start?  
 Look at the cover of the manual.  
 On the cover you'll find a listing for TROUBLESHOOTING INDEX. It tells you to go to page 2-7. To find page 2-7 fast, open the manual by using the black tab that lines up with the listing on the cover.
2. What kind of problem do you have?  
 Find it in the symptom index.  
 The symptom index is a list of problems covered by the section. It tells you that your problem, "engine stalls frequently or doesn't develop full power" is covered in paragraph 2-9, MALFUNCTION entry number 5.
3. How do you determine what is pausing the problem?  
 Go to paragraph 2-9, MALFUNCTION entry number 5.  
 There you'll find the troubleshooting procedures you'll need. The procedure has columns with the headings: MALFUNCTION, TEST OR INSPECTION, and CORRECTIVE ACTION. Starting at step 1, read the procedure. Each step tells you what to do and what to look for. Follow the steps, in order, until you find your problem. When you find the problem, the CORRECTIVE ACTION column will tell you how to fix it.

---

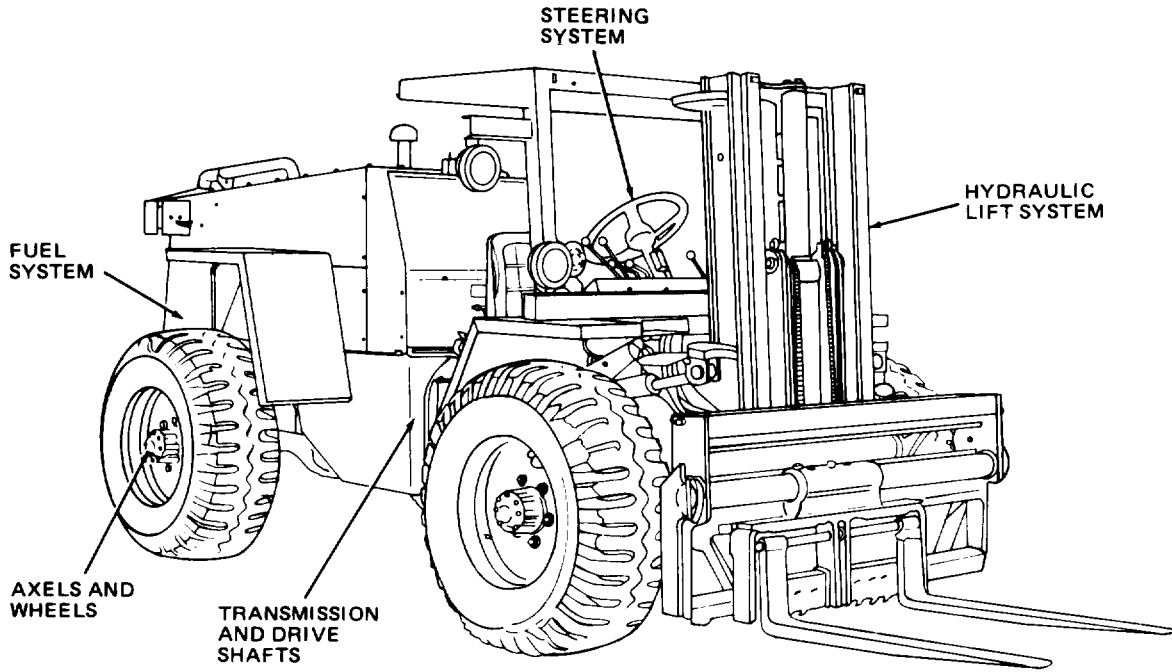
HOW TO USE THIS MANUAL (cont)

---

4. Let's assume you've found that the electric fuel pump is bad. The replacement procedure is in paragraph 2-15b. The procedure contains all the information you'll need to replace the electric fuel pump. First check the introductory material. It tells you what you'll need before you start the job. Below the introductory material is an assembled view of the vehicle showing the approximate location of the electric fuel pump and an exploded-view illustration which shows you how to take it out and put it back in. The text which follows the illustration tells you how to do the job.
5. If on the other hand, you know what the problem is and its cause, refer to the alphabetical index located at the rear of this manual and find the name of the part to be replaced and the paragraph number in which maintenance procedures will be found. For example, the engine is overheating, on filling the radiator with water you see that water is pouring out of the hoses indicating that the hose requires replacement. Referring to the alphabetical index under the listing hoses, cooling system, paragraph 2-17b is referenced, Turn to this paragraph for hose removal and installation procedures.

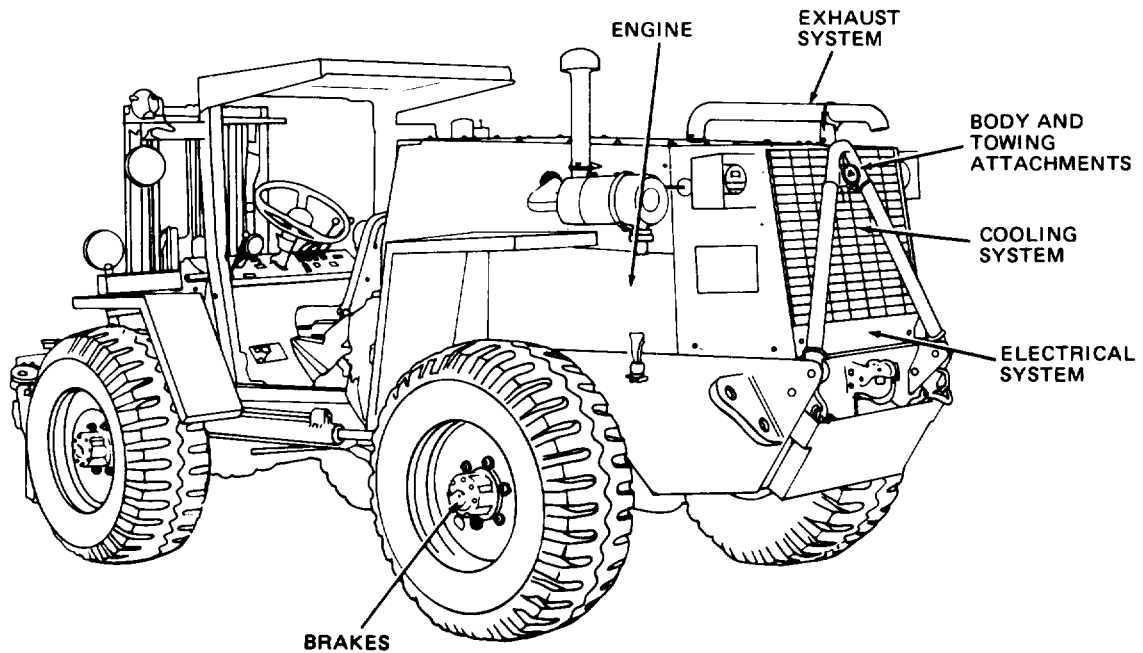






RIGHT FRONT VIEW

TA127506



LEFT REAR VIEW

TA127507

*MHE 237 forklift truck*

# CHAPTER 1 INTRODUCTION

**CHAPTER OVERVIEW**

The purpose of this chapter is to give your standard data required in all manuals, to familiarize you with the purpose and capabilities of the forklift truck and to give you a brief description of the different systems and components of the forklift truck.

## Index

Section	Title	Page
I	General information . . . . .	1-1
II	Equipment Description and Data . . . . .	1-3
III	Principles of Operation . . . . .	1-7

## Section I. GENERAL INFORMATION

	Para		Para
Scope . . . . .	1-1	Warranty Information . . . . .	1-6
Maintenance Forms, Records and Reports . . . . .	1-2	Orientation . . . . .	1-7
Destruction of Army Material to Prevent Enemy Use . . . . .	1-3	Common Tools and Equipment . . . . .	1-8
Administrative Storage . . . . .	1-4	Repair Parts . . . . .	1-9
Reporting of Errors . . . . .	1-5	List of Abbreviations . . . . .	1-10

### 1-1. SCOPE

*a. Type of Manual.* Organizational, Direct Support, and General Support Maintenance Manual, including Repair Parts and Special Tools list.

*b. Model Number and Equipment Name.* MHE 237 Rough Terrain 4,000 Pound Capacity, Articulated Frame Steer, Pneumatic Tire, Diesel Engine Driven Forklift Truck.

*c. Purpose of Equipment.* Handle, transport, and stack materials on various types of terrain. The forklift truck has a capacity of 4,000 pounds at 24-inch load center and can lift the load to a maximum height of 100-inches.

### 1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System.

### 1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

Refer to TM 750-244-6.

### 1-4. ADMINISTRATIVE STORAGE

Refer to TM 74&93-1.

### 1-5. REPORTING OF ERRORS

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, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

### 1-6. WARRANTY INFORMATION

Refer to TB 102300-295-15-18 for warranty information.

### 1-7. ORIENTATION

The lifting forks are mounted on the front of the vehicle and the engine faces the rear. Controls for operating the lifting forks (tilting, rotating, lowering, side shifting of the lifting forks) are located to the right when you're sitting in the operator's seat.

---

**1-8. COMMON TOOLS AND EQUIPMENT**

For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

---

**1-9. REPAIR PARTS**

Repair parts are listed/illustrated in TM 10-3930-638-24P.

---

**1-10. LIST OF ABBREVIATIONS**

Refer to the Glossary, Appendix G, for a list of abbreviations used in this publication.

**Section II. EQUIPMENT DESCRIPTION AND DATA**

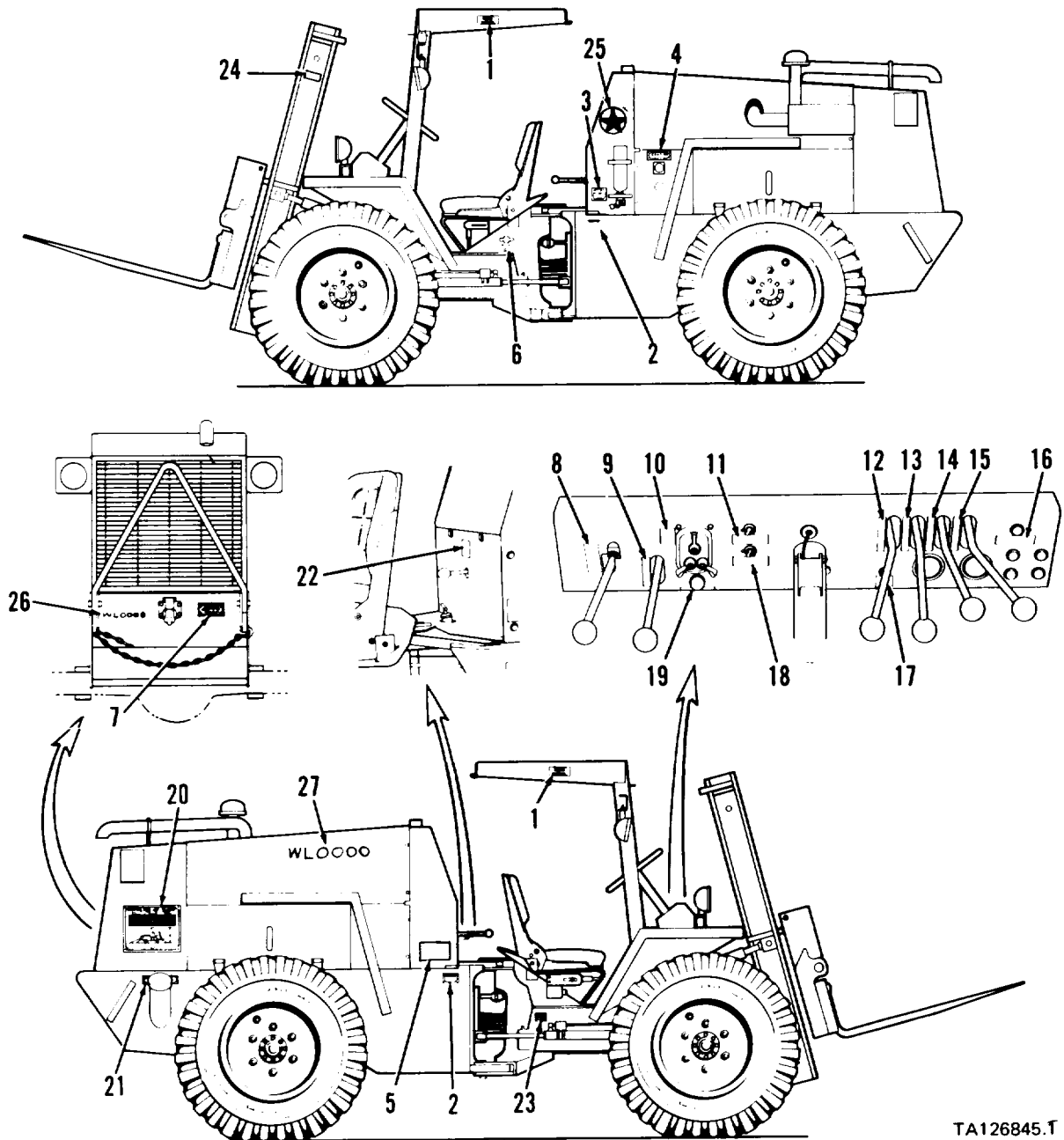
	Para
Tabulated Data .....	1-11
Data, Instruction and Warranty Plates .....	1-12
Equipment Data .....	1-13

**1-11. TABULATED DATA**

Refer to the separate Operator's Manual, TM 10-3930-638-10, for the following tabulated data: Equipment Purpose, Capabilities and Features; Location

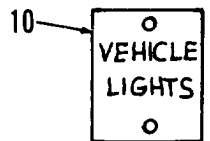
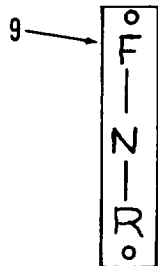
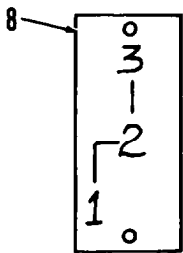
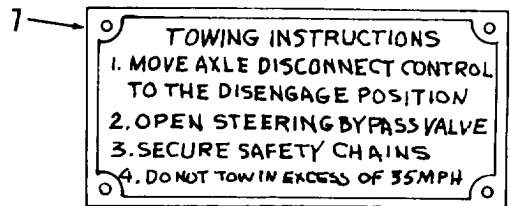
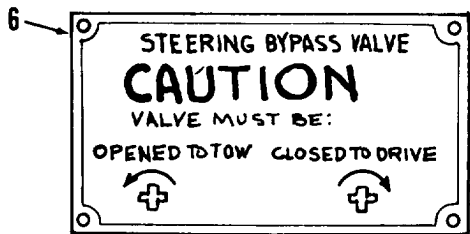
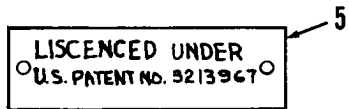
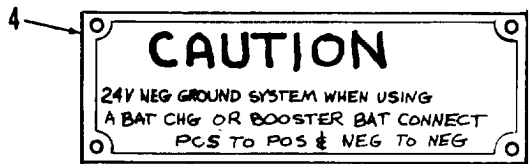
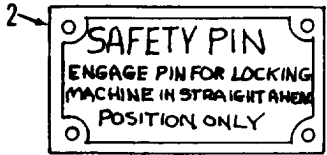
and Description of Major Components; and Performance Data (including capacities, dimensions and weight).

**1-12. DATA, INSTRUCTION AND WARRANTY PLATES**



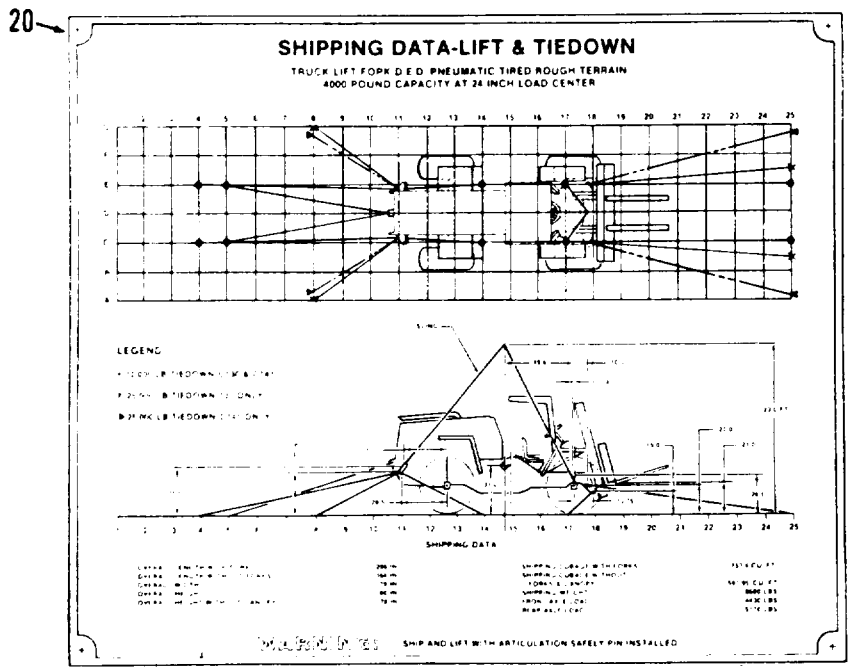
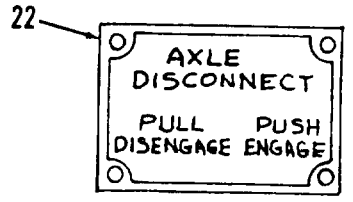
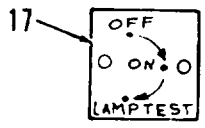
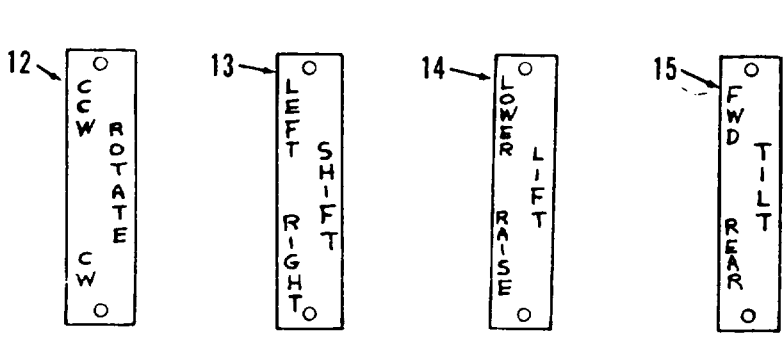
TA126845.T

1-12. DATA, INSPECTION AND WARRANTY PLATES (cont)



TA126845.2

1-12. DATA, INSPECTION AND WARRANTY PLATES (cont)




WLO000

WLO000

**1-13. EQUIPMENT DATA**

Engine		Model	
Manufacturer . . . . .	Case	Front . . . . .	D-140-FSHX18
Model number . . . . .	G207D	Rear . . . . .	D-140-FSHX18
Type . . . . .	4 stroke compression ignition diesel	Final axle ratio . . . . .	6.80:1
Fuel system . . . . .	Fuel injected	Tires	
Horsepower (maximum bhp at 2200 RPM) . . . . .	60	Size . . . . .	15x19,5
Horsepower (SAE net at 2200 RPM) . . . . .	55	Type . . . . .	8 ply non-directional duplex
Number of cylinders . . . . .	4	Normal tire pressure . . . . .	45 PSI
Bore . . . . .	4.0 inches	Hydraulic pump	
Stroke . . . . .	4-1/8 inches	Manufacturer . . . . .	Cessna
Compression ratio . . . . .	16.5 to 1	Model . . . . .	X24501-RAC
Total displacement -cubic inches .	207	Type . . . . .	Gear
Firing order -right hand rotation .	1-3-4-2	Flow (at 2000 RPM) at 2000 PSI . .	11.4 GPM
Number of main bearing s.....	5	Pressure . . . . .	2500 PSI
Oil filter . . . . .	Full flow	Steering Gear	
Fan . . . . .	17-inch, 6 blade, pusher	Manufacturer, . . . . .	TRW
Governor . . . . .	Centrifugal, variable speed	Model . . . . .	HGA-32
Starter		Type . . . . .	Hydrostatic
Manufacturer . . . . .	Delco Remy	Hydraulic control valve	
Model number . . . . .	1109051	Manufacturer . . . . .	Gresen
Clutch . . . . .	Sprag type	Model . . . . .	V20-546-A
Alternator		Type . . . . .	Open center, parallel circuit
Manufacturer . . . . .	Delco Remy	Relief setting . . . . .	N/A
Model number . . . . .	1103123	Hydraulic cylinders	
Rating . . . . .	40 amp	Tilt . . . . .	3 inch diameter x 12.17 inch stroke x 1.5 inch rod
Air Cleaner		Lift . . . . .	2 stage
Manufacturer . . . . .	Donaldson	Steering . . . . .	2.12 inch diameter x 15 inch stroke x 1.25 inch rod
Model number . . . . .	FWG06-5131	Side shift (mast) . . . . .	2.5 inch diameter x 22.12 inch stroke x 1.25 inch rod
Type . . . . .	Dry	Rotation (fork carrier). . . . .	2.5 inch diameter x 7.2 inch stroke x 1 inch rod
Transmission		Electrical system	
Manufacturer . . . . .	Clark	Voltage . . . . .	24
Model . . . . .	11.2 HR18340	Ground . . . . .	Neg
Type . . . . .	Full power shift	Batteries . . . . .	2-12 volt
Ratio		Number of headlights, standard and blackout . . . . .	5
1st, forward and reverse . . . . .	10.81:1	Number rear floodlights . . . . .	2
2nd . . . . .	4.73:1	Type headlights, blackout headlights and rear floodlights . . . . .	Sealed beam
3rd . . . . .	1.58:1	Number of taillights (combination tail, blackout and stoplight) . . . . .	4(2 Service, 2 Blackout)
Torque converter (Integral with transmission)			
Manufacturer . . . . .	Clark		
Model . . . . .	11.2 Integral		
Stall ratio . . . . .	2.6:1		
Axles			
Manufacturer . . . . .	Rockwell		



Section III. PRINCIPLES OF OPERATION

	Para		Para
Forklift Truck .....	1-14	Transmission and Drive Shafts .....	1-20
Engine .....	1-15	Axles and Wheels .....	1-21
Fuel System .....	1-16	Brakes .....	1-22
Exhaust System .....	1-17	Steering System .....	1-23
Cooling System .....	1-18	Body and Towing Attachments .....	1-24
Electrical System .....	1-19	Hydraulic Lift System .....	1-25

**1-14. FORKLIFT TRUCK**

*a. Engine.* The diesel engine is an internal combustion power unit in which the heat of diesel fuel is converted into work in the engine cylinders. The engine relies on the heat of compressed air to ignite the fuel. Fuel flow and engine speed are controlled by the fuel injection pump governor and fuel injectors.

*b. Fuel System.* Fuel is drawn from fuel tank by electric fuel pump through an in-line fuel filter, filtered by primary and final fuel filters, routed to fuel injection pump and then applied to fuel injectors where the fuel is injected into the engine cylinders.

*c. Exhaust System.* Engine combustion by-products are channeled through the exhaust manifold, muffler and exhaust pipe. The muffler aids in quieting engine noise.

*d. Cooling System.* Provides cooling water to engine. Water is circulated through engine by water pump which is belt driven by crankshaft pulley. Transmission oil cooler is located in front of radiator. Radiator is equipped with coolant recovery system.

*e. Electrical System.* 24 Volt system with negative ground. Power provided by two batteries. Alternators mounted on, and driven by engine. Ignition switch controls application of power to main light switch and starter motor.

*f. Transmission and Drive Shafts.* Three speeds in both forward and reverse, has declutch feature which permits neutralizing transmission. equipped with axle disconnect. Three drive shafts used to transmit power to front and rear axles.

*g. Axles and Wheels.* Single reduction type axles; pneumatic tires. Front axle is rigidly mounted; rear axle is trunnion mounted.

*h. Brakes.* Service brakes consist of drum and shoe hydraulic wheel brakes on front and rear wheels for stopping the truck. A hydraulic brake valve is mounted under the front chassis and provides power assist for service brakes. Parking brake is mounted on output shaft of transmission.

*i. Steering System.* Consists of hydraulic steering gear, steering wheel, and two steering cylinders one mounted on each side of truck. Power assist provided by hydraulic pump mounted on, and driven by, transmission.

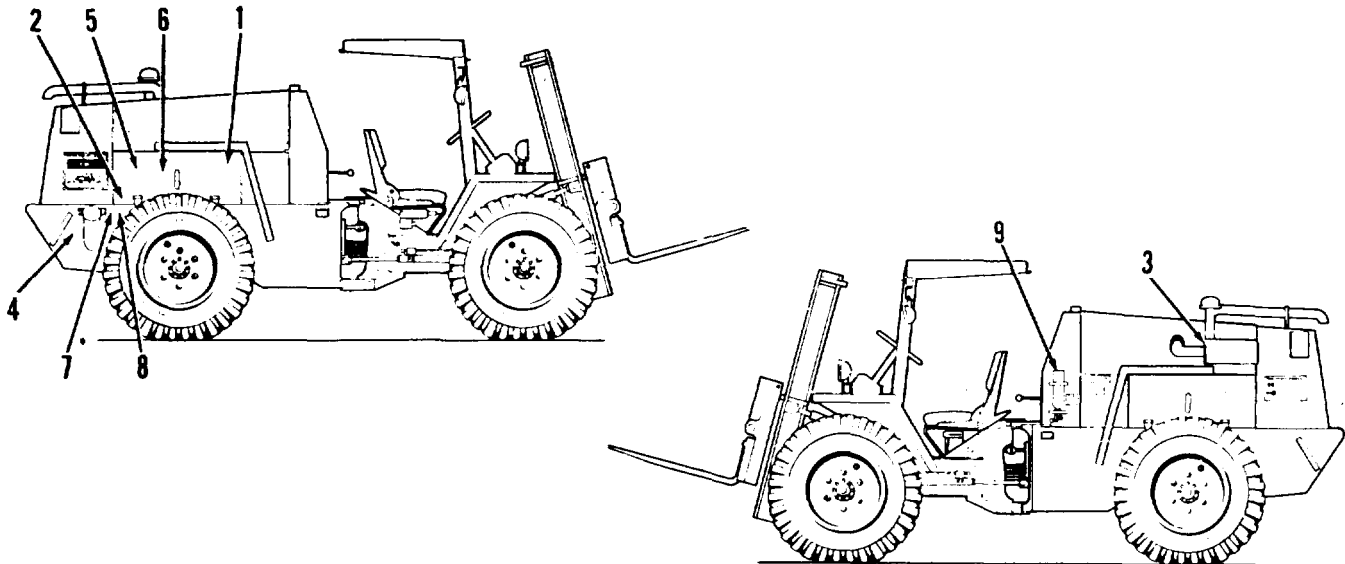
*j. Body and Towing Attachments.* Chassis is comprised of front chassis and rear chassis connected together by pivot pins. This enables steering to be accomplished by pivoting of front and rear chassis on pins by means of a steering cylinder mounted on each side of chassis to front and rear chassis. Pintle hook, and tow bar and chains, all located at rear enable towing to be accomplished.

*k. Hydraulic Lift System.* Hydraulic power supplied by hydraulic pump mounted on, and driven by, transmission. Hydraulic oil routed through hoses to control valve which controls flow of oil to lift cylinder, and to and from tilt cylinders. side shift cylinder, and rotation cylinder.

**1-15. ENGINE**

The engine is a four cylinder, in-line, four-stroke-cycle, valve-in-head diesel engine. Air enters the intake manifold through a dry-type air cleaner. An ether injection arrangement is connected to the intake manifold for quick starting of the engine during cold weather.

**1-16. FUEL SYSTEM**



- 1. FUEL INJECTORS, Four used; closed end, differential pressure, hydraulically operated. hole type injector.
- 2. ELECTRIC FUEL PUMP. Operates on 24 Volts; pumps fuel from fuel tank through in-line fuel filter, and to fuel injection pump through primary and final fuel filters.

**WARNING**

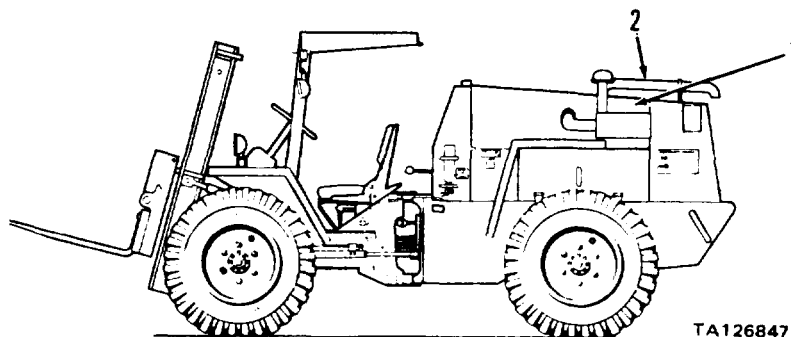
**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.**

- 3. AIR CLEANER. Dry type air cleaner. Filters air before air is applied to intake manifold.
- 4. FUEL TANK. 27 gallon capacity; part of rear chassis.

- 5. FUEL INJECTION PUMP. Fuel from primary and final fuel filters is routed to fuel injection pump where fuel is metered accurately and applied to each cylinder at high pressure through fuel injector nozzles at precisely timed intervals. Fuel metering is controlled by the throttle shaft lever, which is connected by cable to operator's accelerator pedal. Speed regulating governor mounted at top of fuel injection pump. Equipped with electrical solenoid for positive fuel shut-off.

- 6. FUEL FILTERS. Primary and final fuel filters remove fuel oil impurities which may damage fuel injection pump and/or fuel injectors.
- 7. FUEL STRAINER. Located at fuel tank. Blocks passage of sediment to electric fuel pump.
- 8. IN-LINE FUEL FILTER. Filter injection arrangement for cold starting of engine. Connected by tube to intake manifold.

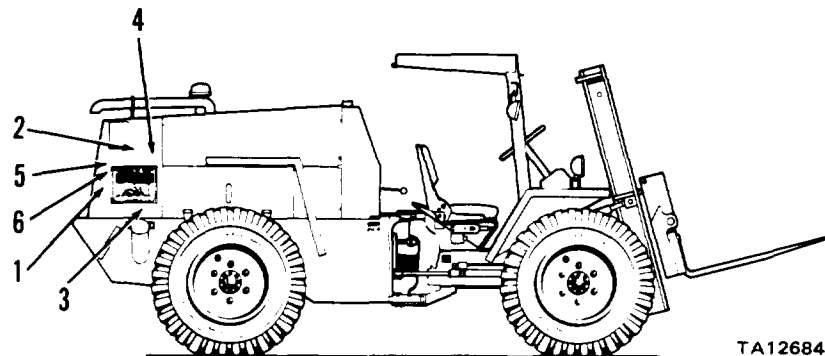
**1-17. EXHAUST SYSTEM**



TA126847

- 1. MUFFLER. Muffles engine noise. Mounted on top of engine.
- 2. EXHAUST PIPE. Channels engine exhaust smoke/combustion by-products from engine to rear of truck.

**1-18. COOLING SYSTEM**

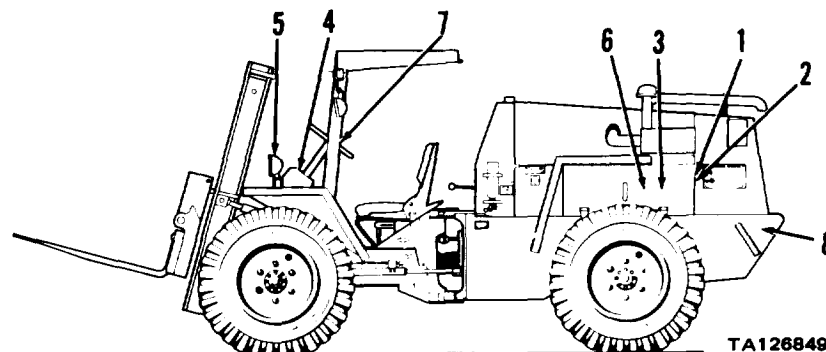


TA126848

- 1. RADIATOR. Mounted at rear of truck; cools engine coolant. Includes a coolant recovery system.
- 2. THERMOSTAT AND HOUSING. Mounted on front of engine at rear of truck. Thermostat opens at 180 degrees F.
- 3. HOSES. Two hoses route coolant to and from radiator; one hose connected between top of radiator to top of water pump; other hose connected from bottom of radiator to side of water pump.

- 4. WATER PUMP. Driven by belt from crankshaft pulley.
- 5. FAN. Mounted on water pump pulley; located behind radiator.
- 6. DRIVE BELT. Installed between engine crankshaft, water pump pulley and alternator pulley; drives water pump and alternator.

**1-19. ELECTRICAL SYSTEM**

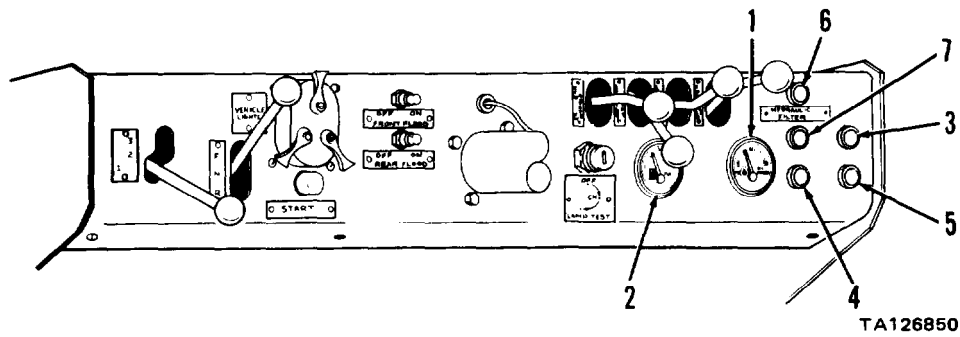


TA126849

- 1. ALTERNATOR. 40 ampere; charges batteries and supplies current for additional electrical power.
- 2. DRIVE BELT. Drives alternator through engine crankshaft pulley.
- 3. STARTER MOTOR. Electric motor with an over running clutch. Solenoid is mounted on starter with an enclosed shifting mechanism.
- 4. INSTRUMENT PANEL. Refer to paragraphs 1-19a and 1-19b for a description of gages, lights, and switches mounted on instrument panel.
- 5. LIGHTS. Mounted at rear of truck are two flood lights, two stop and tail lights, and two blackout stop and tail lights. Mounted at front of truck are four flood lights

- and one blackout light. Operation of all lights is controlled by VEHICLE LIGHTS switch mounted on instrument panel plus front and rear flood lights have individual switches.
- 6. SENDING UNITS. Includes oil pressure sending unit mounted on right of engine and fuel level sending unit mounted in fuel tank.
- 7. HORN AND SWITCH. Electric horn operates from 24 Volts and is mounted at front of truck; horn switch located in steering wheel horn button applies 24 Volts to horn when depressed.
- 8. BATTERIES. Two 12 Volt batteries connected in series giving a 24 Volt electrical power supply.

a. Instrument Panel Gages and Indicators.



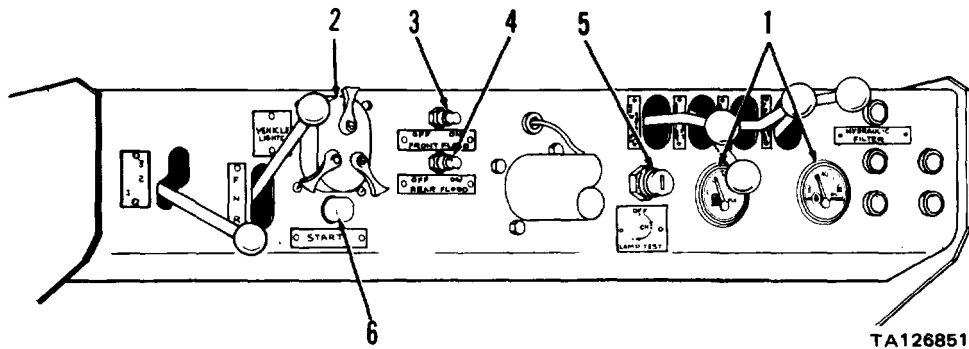
1. OIL PRESSURE GAGE. indicates engine oil pressure and is electrically connected to engine oil pressure sender located on right side of engine.
2. FUEL GAGE. Indicates quantity of fuel in fuel tank; electrically connected to fuel level sender located on top of fuel tank.
3. ENGINE OIL PRESSURE INDICATOR. Illuminates indicating low oil pressure; electrically connected to engine oil pressure switch located on right side of engine near fuel filters. Indicator illuminates when switch closes at decreasing pressure of  $8 \pm 2.5$  PSI.
4. ENGINE WATER TEMPERATURE INDICATOR. Illuminates indicating engine is overheated; electrically connected to engine temperature switch located in cylinder head. Indicator illuminates when switch closes at 205 degrees F.
5. ALTERNATOR INDICATOR. Illuminates indicating battery is not recharging; connected to terminal I of alternator.

6. HYDRAULIC FILTER INDICATOR. Illuminates indicating hydraulic filter is clogged and requires replacement; electrically connected to hydraulic filter switch located in filter head, Indicator illuminates when switch closes at  $20 \pm 3$  PSI increasing pressure.
7. TRANSMISSION TEMPERATURE INDICATOR. Illuminates indicating transmission is overheated; electrically connected to transmission temperature switch located in right side of transmission. Indicator illuminates when switch closes at 265 degrees F.

NOTE

HYDRAULIC FILTER, transmission temperature, and engine temperature indicators will illuminate when ignition switch is placed in LAMP TEST position.

b. Instrument Panel Switches and Gage Lights.



1. GAGE LIGHTS. Provide illumination of oil pressure and fuel gages; lamps are contained within these gages and are controlled by VEHICLE LIGHTS switch.
2. VEHICLE LIGHTS SWITCH. Consists of three separate sections: main switch, auxiliary switch, and mechanical lock. Main switch controls application of power to black out tail and stop light, stop light switch, service tail light, and front and rear flood light switches.

3. FRONT FLOOD LIGHTS SWITCH. Applies power to illuminate front flood lights.
4. REAR FLOOD LIGHTS SWITCH. Applies power to illuminate rear flood lights.

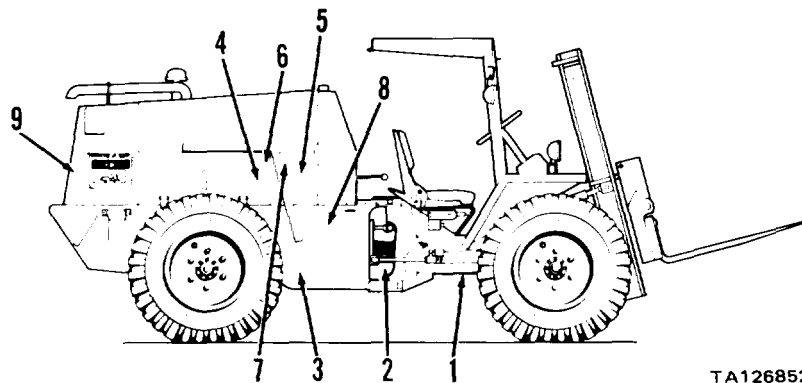
*b. Instrument Panel Switches and Gage Lights (cont).*

5. **IGNITION SWITCH.** Four position key switch; unmarked position (key turned to left) applies power to VEHICLE LIGHTS switch enabling lights to be turned on; OFF position disconnects power from ignition and light system; ON position applies power to VEHICLE LIGHTS switch, gages, indicators (oil pressure and alternator lamps will illuminate), fuel pump, fuel injection pump, back-up

alarm switch, and START switch; LAMP TEST position applies power to illuminate HYDRAULIC FILTER, transmission temperature, and engine temperature indicators.

6. **START SWITCH.** Applies power to energize starter relay by means of lockout relay and neutral start switch. With starter relay energized, starter solenoid energizes, in turn, cranking starter motor to start engine.

**1-20. TRANSMISSION AND DRIVE SHAFTS**



TA126852

1. **FRONT DRIVE SHAFT.** Connected between center drive shaft and front axle; connected to front axle yoke by universal joint and to center drive shaft by a yoke with internal splines. Rear of front drive shaft is supported by a bearing.

2. **CENTER DRIVE SHAFT.** Connected between transmission output shaft and front drive shaft. Connection accomplished by universal joints.

3. **REAR DRIVE SHAFT.** Connected between transmission output shaft and rear axle by universal joints.

4. **TORQUE CONVERTER.** Integral part of transmission; multiplies engine power.

5. **TRANSMISSION.** Consists of torque converter, transmission, charging pump and filter, control valve assembly, modulation valve, and parking brake. Includes declutch feature which neutralizes transmission. This accomplished by declutch valve spool in control valve assembly. Flow of hydraulic oil to declutch valve spool is

controlled by declutch valve, which is mechanically linked to operator's declutch pedal.

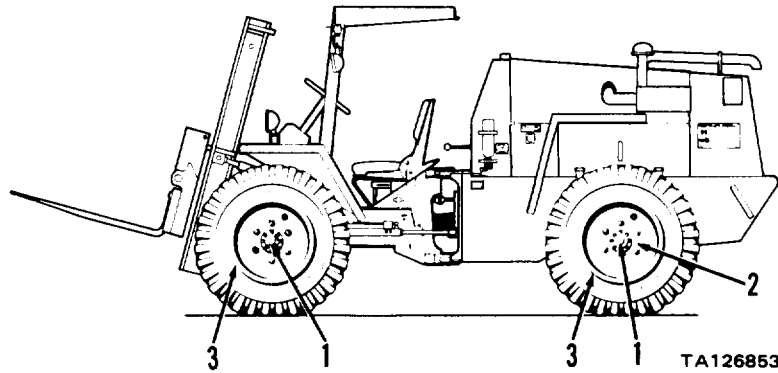
6. **CHARGING PUMP AND FILTER.** Draws oil from transmission sump through oil suction screen and directs the oil through pressure regulating valve and filter. Filter removes impurities from oil.

7. **CONTROL VALVE ASSEMBLY.** Directs oil under pressure to the desired directional and speed clutch. Directional and speed control valves connected by push-pull type cables to operator's transmission direction and speed selector levers.

8. **AXLE DISCONNECT.** Controls engagement and disengagement of transmission drive to front and rear axles. Pulling lever outward disconnects drive to front and rear axles; pushing lever inward engages drive. This is used only when the truck is to be towed to a new location.

9. **TRANSMISSION OIL COOLER.** Mounted at rear of truck, in front of radiator; cools transmission hydraulic oil.

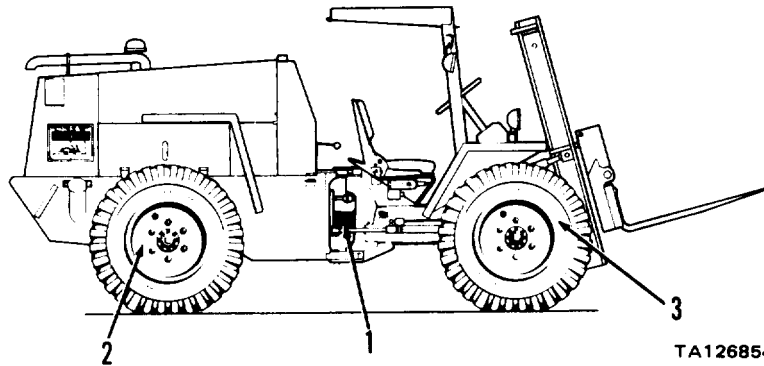
**1-21. AXLES AND WHEELS**



1. FRONT AND REAR AXLES. Single reduction type driven by propeller shafts; front axle is rigidly mounted; rear axle is trunnion mounted. Axle includes differential carrier and drum type brakes on each wheel.

2. DIFFERENTIAL CARRIER. Integral part of axle; single reduction unit employs a heavy duty spiral bevel gear.  
3. RIMS AND TIRES. Heavy duty steel rims; pneumatic tires, 15 by 19.5, 8 ply tubeless.

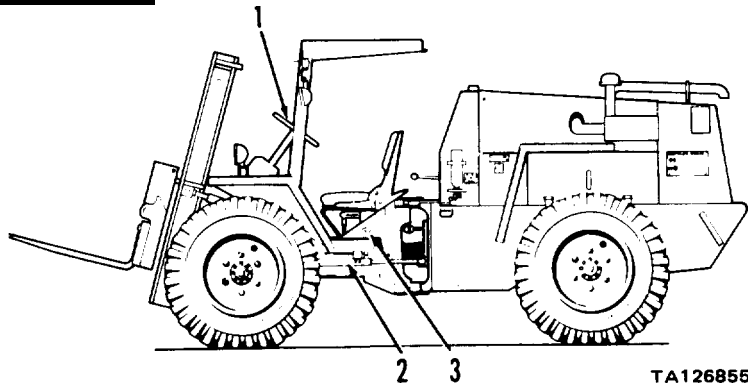
**1-22. BRAKES**



1. PARKING BRAKE. Located on transmission output shaft; drum and shoe type brake. Actuated by lever located next to operator's seat and connected by cable to parking brake actuating lever.  
2. SERVICE BRAKES. Floating shoe and drum hydraulic brake located on each wheel. Actuation of the

brakes permits brake shoes to center themselves in brake drum.  
3. HYDRAULIC BRAKE VALVE. Consists of power section (provides power assist to service brakes) and master cylinder section. Power assist section connected by plunger to service brake pedal.

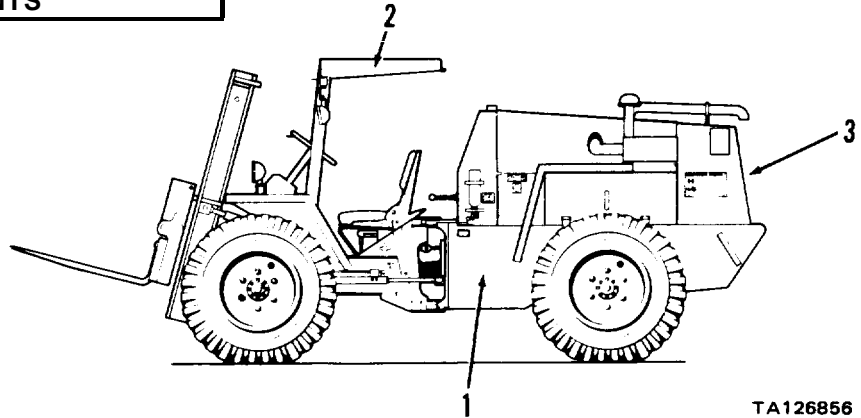
**1-23. STEERING SYSTEM**



1. **STEERING GEAR ASSEMBLY.** Consists of steering column and rotary hydrostatic valve; has four hydraulic connections. Operated by moving steering wheel attached to shaft of steering column. When turned, steering gear controls flow of hydraulic oil to and from steering cylinders. Connections for pump pressure line, return line, and right and left turn oil flow to steering cylinders. Lines from right and left ports connect to tees; lines from tees to steering cylinders are cross-connected so that steering

cylinders move in opposite directions when pressure is applied.  
 2. **STEERING CYLINDERS.** Two used, one mounted on each side of truck. Each end of cylinder attached to front and rear chassis.  
 3. **STEERING BYPASS VALVE.** When open, allows hydraulic oil to be transferred from one steering cylinder to the other for towing forklift truck.

**1-24. BODY AND TOWING ATTACHMENTS**

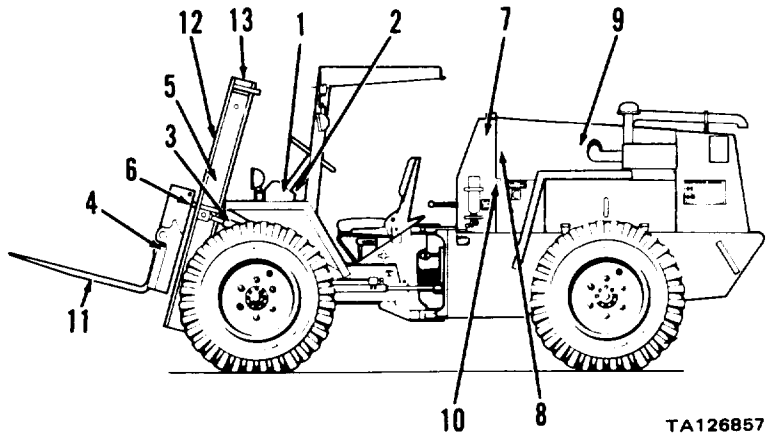


TA126856

1. **BODY.** Constructed of heavy duty steel; consists of front and rear chassis to which are bolted front and rear fenders, engine hood and panels, and radiator shroud.  
 2. **ROLL OVER PROTECTIVE STRUCTURE.** Constructed of heavy duty steel; bolted to front chassis.

Protects operator from falling material and injuries due to truck rolling over.  
 3. **PINTLE AND TOW BAR.** Located at rear of truck. Pintle hook, tow bar and chains used for towing truck or other vehicles.

**1-25. HYDRAULIC LIFT SYSTEM**



TA126857

1. **CONTROL VALVE.** Controls hydraulic oil flow to lift, tilt, rotation, and side shift cylinders. Consists of an inlet and outlet section, four spool (working) sections and an end section. Each spool section controls a cylinder or pair of cylinders to move forks and mast.  
 2. **CONTROL LEVERS.** Positions control valve spools, in turn, allowing high pressure hydraulic oil to activate cylinders.

3. **TILT CYLINDERS.** Two used. Activated by control valve; tilts mast assembly forward or rearward. Minimum forward tilt is 11 degrees; minimum rearward tilt is 22 degrees.  
 4. **SIDE SHIFT CYLINDER.** One used. Activated by control valve; shifts fork carriage side-to-side.  
 5. **LIFT CYLINDER.** One used. Activated by control valve. Two stage cylinder; raises or lowers fork carriage.

---

**1-25. HYDRAULIC LIFT SYSTEM (cont)**

---

Includes fitting at top for bleeding air from system.

6. ROTATION CYLINDER. One used. Activated by control valve. Rotates forks 10 degrees minimum clockwise and counterclockwise from horizontal position.

7. HYDRAULIC RESERVOIR. Integral part of rear chassis; capacity is approximately 40 quarts. Located to rear of operator's seat; return oil filtered by 10 micron filter. Breather and oil tiller located at top of reservoir; oil screen located at bottom of reservoir in oil suction line.

8. HYDRAULIC PUMP. Mounted on rear of, and driven by, transmission; also provides hydraulic power for steering system and service brakes. 11.4 gallon-per-minute capacity. 2500 PSI relief valve provided in hydraulic system to limit pump.

9. HYDRAULIC FILTER. Ten micron filter; filters return oil. Located at rear of hydraulic reservoir. When

clogged, HYDRAULIC FILTER indicator on instrument panel illuminates. Equipped with automatic bypass; opens at not less than 2 PSI and permits full flow at 3.5 PSI.

10. HYDRAULIC SCREEN. Located at bottom of hydraulic reservoir in hydraulic pump suction line. Filters hydraulic oil before it reaches hydraulic pump.

11. LIFTING FORKS. Two used; 40 inch forks. Constructed of heavy-duty steel.

12. LIFT CHAINS. Two used; connected at one end to inner mast, reeved over chain rollers and connected at other end to carriage. Chains raise carriage.

13. MAST ASSEMBLY. Raises and lowers carriage by means of lift chains. Free lift height (height of forks without increased mast height) is not less than 48 inches. Consists of outer and inner mast. Includes mast latch pin used to latch outer and inner mast between zero to 12 inches height of lifting forks; disengages at over 12 inches height of lifting forks. Ensures free lift travel of not less than 48 inches.



## CHAPTER 2

### ORGANIZATIONAL MAINTENANCE PROCEDURES

**CHAPTER OVERVIEW**

The purpose of this chapter is to provide you with all needed instructions and additional information to help you at the organizational level keep the equipment in good repair.

**Index**

**2-1. CHAPTER INDEX**

Section	Title	Page
I	Service Upon Receipt .....	2-1
II	(Organizational) Preventive Maintenance Checks and Services PMCS) .....	2-3
III	Troubleshooting index .....	2-7
IV	Engine Fuel, Exhaust and Cooling Systems and Gages Maintenance .....	2-11
V	Electrical System Maintenance .....	2-98
VI	Power Train Maintenance .....	2-194
VII	Brake System Maintenance .....	2-259
VIII	Wheels and Steering Maintenance .....	2-319
IX	Body, Cab and Roll Over Protective Structure Maintenance .....	2-352
X	Hydraulic Lift System Maintenance .....	2-389

**Section I. SERVICE UPON RECEIPT**

	Para		Para
Handling New Equipment .....	2-2	Initial Checkout and Adjustment .....	24
Servicing New Equipment .....	2-3	Movement to New Site .....	2-5

**2-2. HANDLING NEW EQUIPMENT**

*a. Unloading Instructions.* Vehicle is shipped unboxed and mobile on railcar with tiedowns over front and rear axles.

- (1) Remove blocking from front, rear, slid sides of vehicle.
- (2) Perform paragraphs 2-2b, 2-3c and 2-4b(1).
- (3) Remove tiedowns and remove vehicle from railcar.

*b. Unpacking.* Remove tape, banding, paper and other packing materials. If necessary, remove tape from exhaust pipe.

**2-3. SERVICING NEW EQUIPMENT**

**WARNING**

Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.

**2-3. SERVICING NEW EQUIPMENT  
(cont)**

a. *Removal of Protective Compounds.* Remove preservative compounds from metal surfaces with cleaning solvent P-D-680. Check and ensure that all fill opening are clear.

b. *Cleaning.* Clean all dust and dirt from seat, instrument panel, wiring, engine, and radiator

c. *Lubrication.* Lubricate vehicle in accordance with LO 10-3930-638-12.

**2-4. INITIAL CHECKOUT AND ADJUSTMENT**

a. *Inspection.*

(1) Inspect equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report (refer to DA PAM 700-3 for instructions on preparation of DD Form 6).

(2) Check equipment against packing slip to see if shipment is complete. Report all discrepancies in accordance with instructions of TM 38-750.

(3) Check to see whether equipment has been modified.

**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.**

(4) Check air cleaner for damage.

(5) Check gages and instruments on instrument panel for broken glass or other damage.

(6) Check control levers for bent or broken condition.

(7) Check engine accessories for loose connections and insecure mounting.

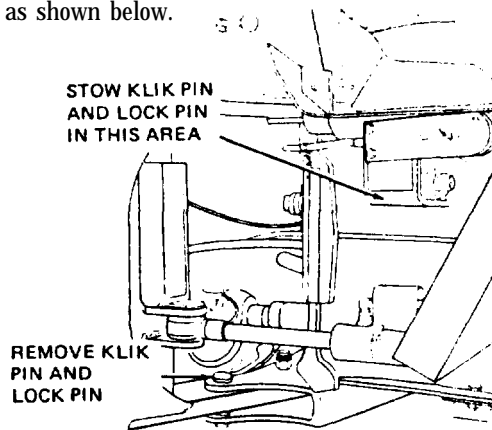
(8) Check wiring for loose connections, damaged insulation. and broken wires.

(9) Check fittings, lines, and hoses for cracks, loose connections, and broken or missing parts.

(10) Check that all drain plugs are securely tightened.

b. *Service Check.*

(1) Remove shipping klik pin and shipping lock pin from holes in front and rear chassis and stow in storage area as shown below.



(2) Perform before operation PMCS (refer to the separate Operator's Manual, TM 10-3930-638-10).

**2-5. MOVEMENT TO NEW SITE**

a. *Driving.* The vehicle may be moved under its own power without any special preparation or may be transported on a suitable truck and flat bed trailer. If transported on a flat bed trailer:

**WARNING**

**Be sure ramp is securely fastened to flat bed trailer to prevent personnel injury and damage to equipment.**

(1) Place ramps between flat bed trailer and ground.

**NOTE**

Ramps shall not provide a grade of more than 40 percent.

(2) Drive vehicle up ramps and position on flat bed trailer. Turn engine off and apply parking brake.

(3) Install blocking at front, rear, and sides of vehicle.

(4) Install tiedowns at front and rear axles (refer to plate 20, paragraph 1-1 2).

b. *Towing.* Vehicle is towed rearward using tow bar and chains located on rear. special procedures shall be performed prior to towing operation. Refer to preparation for movement, Operator's Manual, TM 10-3930-638-10, for these procedures.

## Section II. (ORGANIZATIONAL) PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

### 2-6. GENERAL

To insure that the forklift is ready for operation at all times, it must be inspected within designated intervals so that defects may be discovered and corrected before they result in serious damage or failure. All deficiencies and shortcomings will be recorded as well as the corrective action taken on DA Form 2404 at the earliest possible opportunity.

### 2-7. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

a. The item numbers of the table indicate the sequence of the PMCS. Perform at the intervals shown below:

(1) Do your (W) PREVENTIVE MAINTENANCE weekly.

(2) Do your (Q) PREVENTIVE MAINTENANCE Quarterly (every three months).

(3) Do your (S) PREVENTIVE MAINTENANCE semiannually (every six months).

(4) Do your (A) PREVENTIVE MAINTENANCE annually (once every year).

b. If something doesn't work, troubleshoot it with the instructions in this manual or notify your supervisor.

c. Always do your preventive maintenance in the same order, so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.

d. If anything looks wrong and you can't fix it, write down on your DA Form 2404. If you find something seriously wrong, report it to direct support as soon as possible.

### WARNING

**Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat. If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with skin or clothing is made, flush with water. If contact with eyes is made, wash your eyes with water and get medical aid immediately.**

### WARNING

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

(1) Keep it clean: Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (P-D-680) to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

(2) Bolts, nuts and screws: Check that they are not loose, missing, bent or broken. You can't try them all with a tool, of course, but look for chipped paint, bare metal or rust around bolt heads. Tighten any that you find loose.

(3) Weld: look for loose or chipped paint, rust or gaps, where parts are welded together. If you find a bad weld, report it to direct support.

(4) Electric wires and connectors: Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition.

(5) Hoses and fluid lines: Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, of course, but a stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, either correct it or report it to direct support (refer to MAC chart)

e. It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER- When in doubt, notify your supervisor.

Leakage definitions for Organizational PMCS

- |           |   |
|-----------|---|
| Class I   | Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.                               |
| Class II  | Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected. |
| Class III | Leakage of fluid great enough to form drops that fall from the item being checked/inspected.                              |

**2-7. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (cont)**

Legend

W - Weekly

S - Semiannually

Q - Quarterly

A - Annually

Item No.	Interval				ITEM TO BE INSPECTED PROCEDURE
	W	Q	S	A	
1					<p>PERFORM OPERATOR/CREW PMCS PRIOR TO OR IN CONJUNCTION WITH ORGANIZATIONAL PMCS IF:</p> <p>a. There is any delay between the daily operation of the equipment and the organizational PMCS.</p> <p>b. Regular operator is not assisting/participating.</p> <p><b>AIR CLEANER</b></p> <p style="text-align: center;"><b>WARNING</b></p> <p><b>If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.</b></p>
2		●			<p>Remove element and blow from inside out with low pressure air, replace if defective. Reset contamination indicator.</p>
3		●			<p><b>PARKING BRAKE LINKAGE</b></p> <p>Check linkage for loose or missing hardware. If adjusting knob does not tighten enough, adjust linkage.</p>
4		●			<p><b>SERVICE BRAKE</b></p> <p>Inspect brake pads, if 3/32 inches or less, or contaminated, replace. Reference page 2-282, para 2-43a.</p> <p>Check that brake pedal has 1/4 -1 inch free travel and is at least two inches from floor when fully applied.</p> <p>Inspect the wheel cylinders for cracks, leaks, or broken end; inspect the brake shoe for cracks, and inspect backing plates for bends, cracks and loose rivets. Ref. page 2-282, para 2-43a. Inspect entire hydraulic brake system for leaks, cracked lines and worn hoses. Ref. page 2-290, para 2-43b. Replace all defective parts as required.</p> <p>Adjust service brake assembly. Reference page 2-286.1, para 2-43a.</p>
5		●			<p><b>AXLES</b></p> <p style="text-align: center;"><b>WARNING</b></p> <p><b>DRY CLEANING SOLVENT (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</b></p> <p>Service breathers. Remove and immerse in solvent (P-D-680); dry with compressed air.</p>
6		●			<p><b>CHASSIS</b></p> <p>Check chassis, brackets, and mounting and ensure that they are in good condition and secure.</p>
7		●			<p><b>SIDE SHIFT FRAME</b></p> <p>Check that chain pulleys are securely fastened. Check side shift bars for excessive wear, deformation, and bent condition.</p>
		●			<p><b>SPARK ARRESTING MUFFLER</b></p> <p>Blow carbon and soot from muffler (para. 2- 16)</p>

**2-7. ORGANIZATIONAL Preventive Maintenance CHECKS AND SERVICES (cont)**

Legend

W-Weekly  
Q-Quarterly

S-Semiannually  
A- Annually

Item no.	Interval				ITEM TO BE INSPECTED Procedure
	W	Q	S	A	
8			•		FUEL FILTERS Replace in-line, primary, secondary, and injection pump inlet filters.
9			•		FUEL STRAINER Remove strainer from fuel tank. clean. inspect. and replace if clogged, torn, or deformed.
10			•		COOLING SYSTEM Drain, flush, and refill radiator in accordance with TB 750-651.
11			•		PARKING BRAKE ASSEMBLY Check linings. If 1/8 inch or less, replace.
12	•	•			BRAKE MASTER CYLINDER Check fluid level Add silicone brake fluid to within 1/2 inch of fill plug opening. Check interior of master cylinder cap for rust. Clean as necessary and coat with silicone brake fluid.
13			•		BATTERIES  <b><u>WARNING</u></b>  DO NOT SMOKE OR ALLOW ANY FLAME OR SPARK IN THE VICINITY WHILE CHECKING OR FILLING BATTERY. THE BATTERY GENERATES HYDROGEN, HIGHLY EXPLOSIVE GAS.  <b><u>CAUTION</u></b>  IN COLD WEATHER OPERATIONS, CHARGE BATTERY IMMEDIATELY AFTER ADDING WATER TO COMBINE THE WATER WITH BATTERY ELECTROLYTE TO PREVENT FREEZING. BE CAREFUL NOT TO OVERFILL WHEN SERVICING BATTERIES.  a. Test battery to determine cell condition (Ref TM 9-6140-200-14 b. Clean battery top and terminals. Insure all connections are tight.



Section III. TROUBLESHOOTING INDEX

This section contains a complete index of all troubleshooting data located within the manual. Included in the index is the paragraph/malfunction and page where the detailed troubleshooting procedure will be found.

	Para/Malfunction	Page
ENGINE		
Engine hard to start or will not start . . . . .	2-9/1,3-3/1	2-12,3-2
Engine hard to start or will not start (exhaust smoke) . . . . .	2-9/2,3-3/2	2-15,3-2
Engine starts but will not run. . . . .	2-9/3, 3-3/3	2-15,3-2
Engine misfires . . . . .	2-9/4, 3-3/4	2-17,3-3
Engine stalls frequently or does not develop full power . . . . .	2-9/5, 3-3/5	2-18,3-4
Engine cranks but does not start when quick start is activated . . . . .	2-9/6	2-21
Excessive oil consumption . . . . .	2-9/7	2-21
Low engine oil pressure . . . . .	2-9/8	2-22
Engine will not shut down. . . . .	2-9/9	2-22
Engine knocks . . . . .	3-3/6	3-4
Engine compression test. . . . .	3-3/7	3-5
FUEL SYSTEM		
Low fuel pressure . . . . .	2-10/1	2-23
Excessive fuel usage . . . . .	2-10/2	2-24
Engine idle speed incorrect . . . . .	3-4/1	3-6
Engine no-load governed speed incorrect . . . . .	3-4/2	3-6
Engine hard to start . . . . .	3-4/3	3-7
Engine starts and stops.. . . . .	3-4/4	3-9
Erratic engine operation (surge, misfiring, poor governor regulation) . . . . .	3-4/5	3-10
Engine idles imperfectly . . . . .	3-4/6	3-13
Engine does not develop full power or speed . . . . .	3-4/7	3-15
Engine smokes black . . . . .	3-4/8	3-18
Engine smokes blue or white.. . . . .	3-4/9	3-19
Fuel not reaching fuel injection pump . . . . .	3-4/10	3-19
Fuel delivered from transfer pump but not to fuel injectors . . . . .	3-4/11	3-20
Fuel reaching fuel injectors but engine will not start . . . . .	3-4/12	3-22
EXHAUST SYSTEM		
Excessive exhaust noise.... . . . .	2-11/1	2-24
Excessive exhaust smoke.... . . . .	2-11/2	2-25
COOLING SYSTEM		
Engine overheats . . . . .	2-12/1	2-25
Engine does not reach operating temperature . . . . .	2-12/2	2-26
Cooling system nonpressurized . . . . .	2-12/3	2-26
CHARGING SYSTEM		
Abnormal alternator light operation . . . . .	2-22/1	2-103
Alternator output low, unsteady, or zero . . . . .	2-22/ 2	2-104

Section III. TROUBLESHOOTING INDEX (cont)

	Para/Malfunction	Page
ALTERNATOR		
Improper output voltage . . . . .	3-9/1	3-89
Improper output current . . . . .	3-9/2	3-90
STARTING SYSTEM		
Starter cranks too slowly . . . . .	2-21/1	2-100
Starter fails to crank . . . . .	2-21/2	2-101
Starter cranks continuously . . . . .	2-21/3	2-103
STARTER AND SOLENOID		
Starter troubleshooting . . . . .	3-10/1	3-90
Starter fails to crank . . . . .	3-10/2	3-91
INSTRUMENT PANEL		
Warning lights inoperative . . . . .	2-25/1	2-112
Warning lights, back-up alarm, and electric fuel pump inoperative . . . . .	2-25/2	2-113
LIGHT SYSTEMS		
Front flood lights inoperative.. . . . .	2-24/1	2-107
Front black out light inoperative . . . . .	2-24/2	2-107
Black out tail lights inoperative . . . . .	2-24/3	2-108
Service tail lights inoperative . . . . .	2-24/4	2-109
Black out stop lights inoperative. . . . .	2-24/5	2-109
Service stop lights inoperative . . . . .	2-24/6	2-110
Rear flood lights inoperative.. . . . .	2-24/7	2-110
Gage lights inoperative . . . . .	2-24/8	2-111
HORN SYSTEM		
Horn does not sound . . . . .	2-23/1	2-105
Back-up alarm does not sound.. . . . .	2-23/2	2-106
BATTERY SYSTEM		
All electrical systems are weak . . . . .	2-20/1	2-99
Batteries are hot or use excessive water . . . . .	2-20/2	2-100
WIRING HARNESS		
Major portion of electrical system inoperative . . . . .	3-11/1	3-92
One electrical circuit inoperative . . . . .	3-11/2	3-93
TRANSMISSION		
Foamy Oil . . . . .	2-36/1	2-194
Slow or erratic transmission shifting , . . . . .	2-36/2	2-195
High transmission oil temperature . . . . .	2-36/3, 3-17/1	2-196,3-123
Loss of drive in all ranges . . . . .	2-36/4, 3-17/2	2-197,3-123
Loss of power . . . . .	2-36/5	2-198
Loss of power and/or loss of drive in any one range . . . . .	3-17/3	3-124
DRIVE SHAFT ASSEMBLIES		
Excessive noise or vibration in drive shaft assemblies . . . . .	2-37/5	2-200
AXLES		
Lubricant leaking from differential breather . . . . .	2-37/1	2-199
Continuous axle or wheel noise . . . . .	2-37/2, 3-18/1	2-199,3-125
Differential carrier assembly overheating . . . . .	2-37/3	2-200
Lubricant leaking from differential carrier assembly . . . . .	2-37/4, 3-18/2	2-200,3-125



Section III. TROUBLESHOOTING INDEX (cont)

	Para/Malfunction	Page
<b>BRAKE SYSTEM</b>		
Parking brake does not apply (will not hold) . . . . .	2-41/1	2-259
Uneven or erratic service brakes . . . . .	2-41/2	2-261
Service brakes spongy. . . . .	2-41/3	2-262
Service brakes grab . . . . .	2-41/4	2-263
Service brakes squeak . . . . .	2-41/5	2-264
Service brakes overheat . . . . .	2-41/6	2-264
Excessive service brake pedal travel . . . . .	2-41/7	2-265
Excessive service brake pedal effort required . . . . .	2-41/8	2-266
Service brakes groan at end of stop . . . . .	2-41/9	2-269
Scraping noise from service brakes when applied . . . . .	2-41/10	2-269
Stop light inoperative . . . . .	2-41/11	2-270
Declutch pedal does not neutralize transmission . . . . .	2-41/12	2-270
<b>WHEELS AND TIRES</b>		
Tire wearing unevenly . . . . .	2-45/1	2-319
Noisy or bumping sound while traveling . . . . .	2-45/2	2-320
<b>STEERING SYSTEM</b>		
Vehicle will not turn when steering wheel is turned . . . . .	2-46/1	2-321
Vehicle turns correctly in one direction but not in other direction . . . . .	2-46/2	2-322
Steering wheel turns hard or vehicle turns too slow . . . . .	2-46/3	2-323
Effort to turn in one direction is more than required in other direction . . . . .	2-46/4	2-324
<b>HYDRAULIC PUMP</b>		
Vehicle will not turn when steering wheel is turned . . . . .	3-22/1	3-152
Hydraulic oil foaming . . . . .	3-22/2	3-153
Excessive hydraulic pump noise . . . . .	3-22/3	3-153
<b>STEERING COLUMN AND CYLINDER</b>		
Effort to turn in one direction is more than required in other direction . . . . .	3-23/1	3-154
Steering wheel turns hard in both directions . . . . .	3-23/2	3-154
<b>FRAME AND TOWING ATTACHMENTS</b>		
Pintle hook stuck . . . . .	2-50/1	2-352
Loud clunk heard when vehicle turns . . . . .	2-50/2	2-352
Tow bar does not pivot or latch. . . . .	2-50/3	2-353
<b>BODY, CAB AND HOOD</b>		
Side panel does not latch . . . . .	2-51/1	2-353
Seat will not adjust . . . . .	2-51/2	2-354
<b>CHASSIS</b>		
Excessive noise at chassis pivot point when turning . . . . .	3-26/1	3-190
Excessive play at chassis pivot point when turning . . . . .	3-26/2	3-190
<b>HYDRAULIC LIFT SYSTEM</b>		
Load lowers too fast . . . . .	2-55/1	2-389
Load creeps downward . . . . .	2-55/2	2-390
Unable to lift, tilt, shift or rotate load . . . . .	2-55/3	2-390
Lift, tilt, shift or rotate too slow . . . . .	2-55/4	2-392
Load creeps while tilting . . . . .	2-55/5	2-392
Unable to lift a load (all other functions normal) . . . . .	3-29/1	3-194
Load drifts down . . . . .	3-29/2	3-197
Unable to sideshift load (all other functions normal) . . . . .	3-29/3	3-197

Section III. TROUBLESHOOTING INDEX (cont)

	Para/Malfunction	Page
Sideshift cylinder assembly operation sluggish . . . . .	3-29/4	3-198
Unable to tilt load (all other functions normal) . . . . .	3-29/5	3-199
Tilt cylinder assemblies operation sluggish . . . . .	3-29/6	3-201
Unable to rotate load (all other functions normal) . . . . .	3-29/7	3-201
Rotation operation sluggish. . . . .	3-29/8	3-202
 GAGES		
Engine oil pressure gage does not indicate correct pressure . .	2-13/1	2-27
Fuel gage does not register . . . . .	2-13/2	2-28
Fuel gage does not indicate correct fuel level . . . . .	2-13/3	2-28

**Section IV. ENGINE, FUEL, EXHAUST, AND COOLING SYSTEMS  
AND  
GAGES MAINTENANCE**

This section contains the information you need to maintain the engine's:

- Cooling system
- Exhaust system
- Fuel system
- Quick start system
- Gages

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of organizational maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	2-8	In-Line Fuel Filter . . . . .	2-15e
Engine Troubleshooting . . . . .	2-9	Fuel Filter Assembly . . . . .	2-15f
Fuel System Troubleshooting . . . . .	2-10	Fuel Strainer . . . . .	2-15g
Exhaust System Troubleshooting . . . . .	2-11	Quick Start Kit . . . . .	2-15h
Cooling System Troubleshooting . . . . .	2-12	Accelerator/Throttle Control . . . . .	2-15i
Gages Troubleshooting . . . . .	2-13	Spark Arresting Muffler and Exhaust Pipe Maintenance . . . . .	2-16
Engine Maintenance . . . . .	2-14	Cooling System Maintenance . . . . .	2-17
Flywheel . . . . .	2-14a	Radiator Servicing . . . . .	2-17a
Draining and Refilling Engine Crankcase . . . . .	2-14b	Hosts . . . . .	2-17b
Oil Filter . . . . .	2-14c	Radiator and Shroud . . . . .	2-17c
Intake Manifold . . . . .	2-14d	Thermostat and Housing . . . . .	2-17d
Exhaust Manifold . . . . .	2-14e	Water Pump Assembly . . . . .	2-17e
Fuel System Maintenance . . . . .	2-15	Fan and Belt . . . . .	2-17f
Fuel injection Pump . . . . .	2-15a	Gages Maintenance . . . . .	2-18
Electric Fuel Pump and Lines . . . . .	2-15b	Gage Bulb Replacement . . . . .	2-18a
Air Cleaner . . . . .	2-15c	Gages Replacement . . . . .	2-18b
Fuel Tank Lines and Fittings . . . . .	2-15d		

**2-8. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>ENGINE</b>		
Engine hard to start or will not start . . . . .	2-9/1	2-12
Engine hard to start or will not start (exhaust smoke) . . . . .	2-9/2	2-15
Engine starts but will not run . . . . .	2-9/3	2-15
Engine misfires . . . . .	2-9/4	2-17
Engine stalls frequently or does not develop full power . . . . .	2-9/5	2-18
Engine cranks but does not start when quick start is activated . . . . .	2-9/6	2-21
Excessive oil consumption . . . . .	2-9/7	2-21
Low engine oil pressure . . . . .	2-9/8	2-22
Engine will not shut down . . . . .	2-9/9	2-22
<b>FUEL SYSTEM</b>		
Low fuel pressure . . . . .	2-10/1	2-23
Excessive fuel usage . . . . .	2-10/2	2-24
<b>EXHAUST SYSTEM</b>		
Excessive exhaust noise . . . . .	2-1 1/1	2-24
Excessive exhaust smoke . . . . .	2-1 1/2	2-25

	Para/Malfunction	Page
<b>COOLING SYSTEM</b>		
Engine overheats	2-12/1	2-25
Engine does not reach operating temperature	2-12/2	2-26
Cooling system not pressurized	2-12/3	2-26
<b>GAGES</b>		
Engine oil pressure gage does not indicate correct pressure	2-13/1	2-27
Fuel gage does not register	2-13/2	2-28
Fuel gage does not indicate correct fuel level	2-13/3	2-28

**2-9. ENGINE TROUBLESHOOTING**

**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

**1. ENGINE HARD TO START OR WILL NOT START**

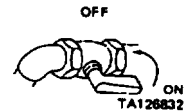
**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.**

Step 1. Check if sir cleaner indicator red flag is in view.

- a. If in view, depress reset button on tip of indicator and check that red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in para 2-15c). Crank engine and check if red flag is in view; if red flag is in view, service sir cleaner (para 2-15c).
- b. If red flag is not in view, proceed to step 2 below.

Step 2. Check if fuel shut-off valve is in closed position.



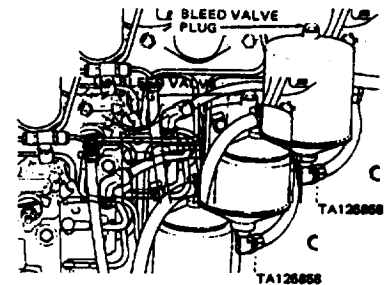
- a. If fuel shut-off valve is in closed position, place in open position as shown.
- b. If fuel shut-off valve is in open position, proceed to step 3 below.

Step 3. Check if there is fuel in fuel tank.

- a. If no fuel in fuel tank, fill tank.
- b. If fuel in fuel tank, proceed to step 4 below.

Step 4. Check for air in fuel system.

- a. Place ignition switch in ON position. Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Place ignition switch in OFF position.
- b. If no air in fuel system, proceed to step 5 below.



**2-9. ENGINE TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 1. ENGINE HARD TO START OR WILL NOT START (cont)

Step 5. Check for leaks at fittings between fuel tank and fuel injection pump.

- a. If leaks are observed, tighten or replace fittings (para 2-15d (2)).
- b. If leaks are not observed, proceed to step 6 below.

Step 6. Disconnect fuel line at fuel filter head.  
Place ignition switch in ON position and check if a slight buzz can be heard at electric fuel pump and if fuel is pumped out of disconnected line.

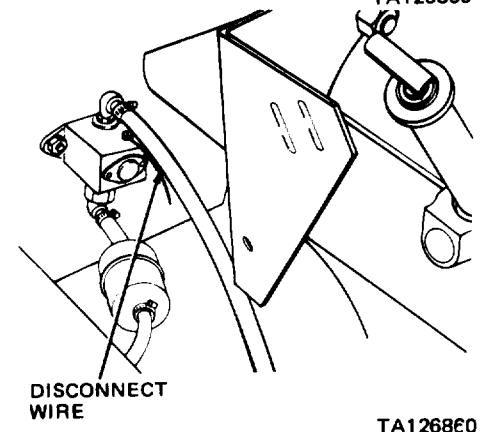
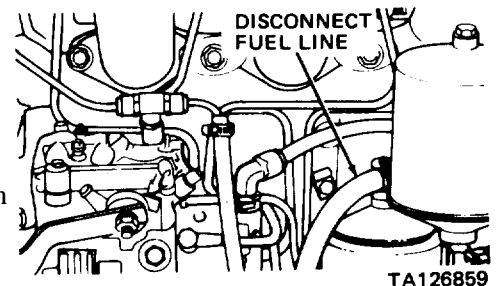
- a. If slight buzz indicating electric fuel pump operation is not heard, disconnect wire at terminal on electric fuel pump and check for +24 Vdc between wire and chassis ground.

- (1) If +24 Vdc is not obtained, troubleshoot electrical system (para 2-19).

- (2) If +24 Vdc is obtained, replace electric fuel pump (para 2-15b).

- b. If fuel is not pumped out of disconnected fuel line, remove lines and fittings between fuel tank and fuel filter head and clean/replace lines, in-line fuel filter, and/or fuel strainer (para 2-15).

- c. If fuel is pumped out of disconnected fuel line, proceed to step 7 below.



Step 7. Check for clogged fuel filters by disconnecting fuel line between fuel filter head and fuel injection pump at fuel injection pump.

Place ignition switch in ON position and crank engine.  
Fuel should be pumped out of disconnected line.

- a. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (para 2-15e and 2-15 f).
- b. If fuel is pumped out of disconnected line, reconnect fuel line and proceed to step 8 below.

**2-9. ENGINE TROUBLESHOOTING (cont)**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

1. ENGINE HARD TO START OR WILL NOT START (cont)

Step 8. Disconnect wire at fuel injection pump terminal. With ignition switch in ON position, check for +24 Vdc between wire and chassis ground.

- a. If +24 Vdc is obtained, reconnect wire to terminal and crack (open) a fuel injection line at fuel injection pump. Crank engine and check if fuel is pumped through fuel injection pump.

- (1) If fuel is pumped, proceed to step 9 below.
- (2) If fuel is not pumped, replace fuel injection pump (notify direct support maintenance).

- b. If +24 Vdc is not obtained, troubleshoot electrical system (para 2-19).

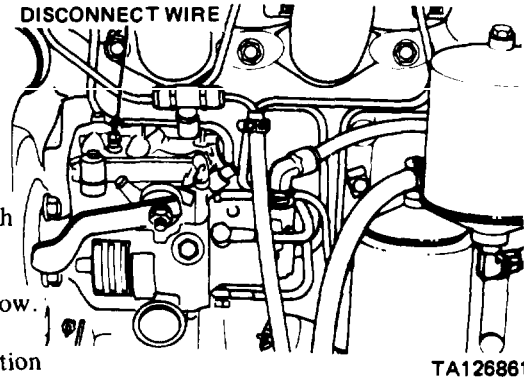
Step 9. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white coloring).

- a. If fuel is contaminated, drain fuel tank, clean and fill with correct fuel (para 2-15d (1) and replace fuel filters (para 2- 15e and 2- 15f). (Refer to current lubrication order for correct fuel.)

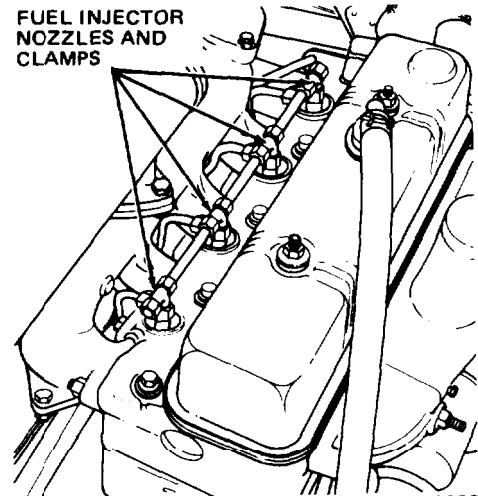
- b. If fuel is not contaminated, proceed to step 10 below.

Step 10. Check for loose fuel injector nozzle.

- a. If a fuel injector nozzle is loose, tighten clamp.
- b. If fuel injector nozzles are not loose, proceed to step 11 below.



TA126861



TA126862

Step 11. Check for damaged fuel injector nozzle seal or damaged nozzle (notify direct support maintenance).

- a. If fuel injector nozzle seal or nozzle is damaged. replace (para 3-6b; notify direct support maintenance).
- b. If fuel injector nozzle seal and nozzle check okay, proceed to step 12.

**2-9. ENGINE TROUBLESHOOTING (cont)**

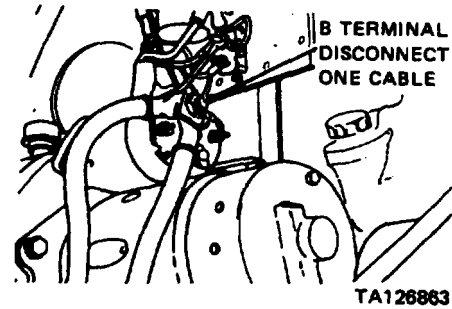
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. ENGINE HARD TO START OR WILL NOT START (cont)

Step 12. Disconnect ground cable from battery. Disconnect positive cable from starter B terminal and connect to ammeter. Connect a test cable from ammeter to starter B terminal. Correct ground cable to battery. Place ignition switch in ON position and depress START pushbutton while observing ammeter. Ammeter should indicate 75 to 95 amperes.



- a. If ammeter reading is higher than 95 amperes, replace starter (para 2-27a).
- b. If ammeter reading is less than 75 amperes, check battery (para 2-20, MALFUNCTION 1, step 3). If battery checks good, replace battery cables (para 2-33b).
- c. If ammeter reading is between 75 to 95 amperes, notify direct support maintenance.

2. ENGINE HARD TO START OR WILL NOT START (EXHAUST SMOKE)

**NOTE**

Also refer to MALFUNCTION 1, steps 1,2,7 through 9, and 11.

Step 1. Check for fuel leaks at fuel injector lines.

- a. If fuel leaks are observed, tighten or replace lines (para 3-6a; notify direct support maintenance).
- b. If fuel lines are okay, proceed to step 2 below.

Step 2. Remove radiator cap and observe coolant for gas bubbles while cranking engine.

If gas bubbles rising in coolant are observed, replace cylinder head gasket (para 3-5g notify direct support maintenance).

3. ENGINE STARTS BUT WILL NOT RUN

**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC or NBC NCO for appropriate handling or disposal procedures.**

Step 1. Check if air cleaner red flag is in view.

- a. If in view, depress reset button on top of indicator and check that red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in para 2-15c).
- b. If red flag is not in view, proceed to step 2 below.

Step 2. Check if there is fuel in fuel tank.

- a. Fill fuel tank if no fuel in fuel tank
- b. If fuel in fuel tank, proceed to step 3 below.

**2-9. ENGINE TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

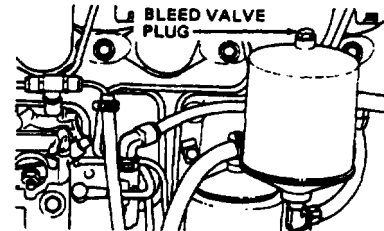
3. ENGINE STARTS BUT WILL NOT RUN (cont)

**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures**

Step 3. Check for air in fuel system.

- a. Place ignition switch in on position. Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Turn ignition switch off



- b. If no air in fuel system, proceed to step 4 below.

Step 4. Check for clogged fuel filters by disconnecting fuel line between fuel filter head and fuel injection pump at fuel injection pump. Place ignition switch in ON position and crank engine. Fuel should be pumped out of disconnected line.

- a. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (para 2-15e and 2-15f).
- b. If fuel is pumped out of disconnected line reconnect line and proceed to step 5 below.

Step 5. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white coloring).

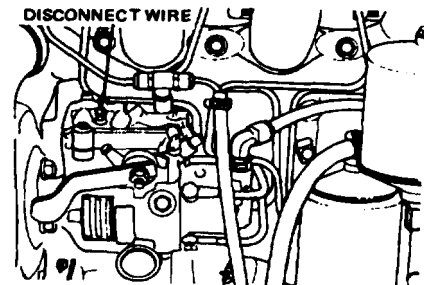
- a. If fuel is contaminated, drain fuel tank, clean fill with correct fuel (para 2-1 5d (1)) and replace fuel filters (para 2-15e and 2-15f).  
(Refer to current lubrication order for correct fuel.)
- b. If fuel is not contaminated, proceed to step 6 below.

Step 6. Check throttle cable movement as an assistant depresses and releases accelerator.

- a. If movement is not observed, repair or replace throttle/accelerator pedal linkage (pars 2- 15i)
- b. If movement is observed, proceed to step 7 below.

Step 7. Disconnect wire at fuel injection pump terminal. With ignition switch in ON position, check for +24 Vdc between wire and chassis ground.

- a. If +24 Vdc is obtained, reconnect wire to terminal and crack (open) a fuel injector line at fuel injector pump Crank engine and check if fuel is pumped through fuel injection pump.





<b>2-9. ENGINE TROUBLESHOOTING (cont)</b>
---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 3. ENGINE STARTS BUT WILL NOT RUN (cont)

## Step 7. (cont)

(1) If fuel is pumped through injection pump, proceed to step 8.

(2) If fuel is not pumped through fuel injection pump, replace it (notify direct support maintenance).

b. If +24 Vdc is not obtained, troubleshoot electrical system (para 2-19).

c. If fuel is pumped out of disconnected fuel line, proceed to step 8 below.

## Step 8. Check for fuel leaks at fuel injector lines.

a. If fuel leaks are observed, tighten or replace lines (para 3-6a; notify direct support maintenance)

b. If fuel lines are okay, proceed to step 9 below.

## Step 9. Remove radiator cap, start engine, and observe coolant for gas bubbles.

If gas bubbles rising in coolant are observed, replace cylinder head gasket (para 3-5g; notify direct support maintenance).

## 4. ENGINE MISFIRES

Step 1. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white appearance).

a. If fuel is contaminated, drain fuel tank, clean and fill with correct fuel (para 2- 15d (1)) and replace fuel filters (para 2-15e and 2-1 5f).

b. If fuel is not contaminated, proceed to step 2 below.

## Step 2. Operate engine for 15 minutes at idle speed.

Carefully and slowly remove radiator cap.

Check coolant temperature using a thermometer be sure that thermometer does not touch any metal parts of radiator.

Coolant temperature shall be between 175 to 200 degrees F.

a. If coolant temperature is not between 175 to 200 degrees F, remove and test thermostat.

b. If coolant temperature is between 175 to 200 degrees F, proceed to step 3 below.

## Step 3. Check for fuel leaks at fuel injector lines.

a. If fuel leaks are observed, tighten or replace lines (para 3-6a; notify direct support maintenance)

b. If fuel lines are okay, proceed to step 4 below.

**12-9. ENGINE TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. ENGINE MISFIRES (cont)

Step 4. Check for loose fuel injector nozzle.

- a. If a fuel injector nozzle is loose, tighten clamp.
- b. If fuel injector nozzles are not loose proceed to step 5 below.

Step 5. Disconnect wire at fuel injection pump terminal.

With ignition switch in ON position, check for +24 Vdc between wire and chassis ground.

- a. If +24 Vdc is obtained, reconnect wire to terminal and crack (open) a fuel injector line at fuel injector pump. Crank engine and check if fuel is pumped through fuel injection pump.

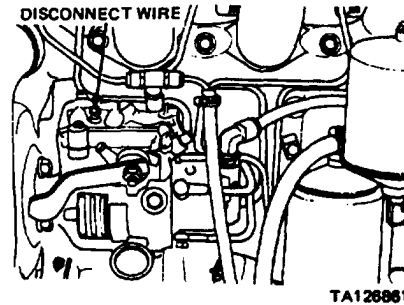
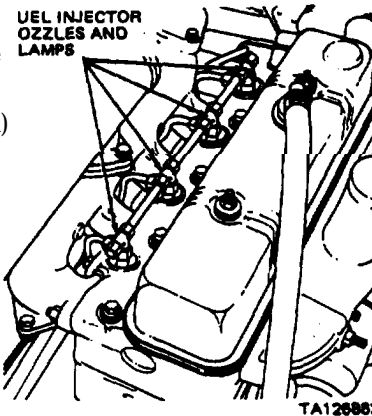
- (1) If fuel is pumped through injection pump, notify direct support maintenance.
- (2) If fuel is not pumped through fuel injection pump, replace it (notify direct support maintenance)

- b. If +24 Vdc is not obtained, troubleshoot electrical system (para 2-19).

5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER

**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedure.**



Step 1. Check if air cleaner indicator red flag is in view.

- a. If in view, depress reset button on top of indicator and check that red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in para 2-15c.) Crank engine and check if red flag is in view; if in view, service air cleaner (pars 2-15c).
- b. If red flag is not in view. proceed to step 2 below.

**12-9. ENGINE TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER (cont)

Step 2. With engine operating at idle speed, squirt small amount of fuel on intake manifold where it contacts cylinder head.  
Check if oil is drawn into intake manifold indicating intake manifold gasket is damaged.

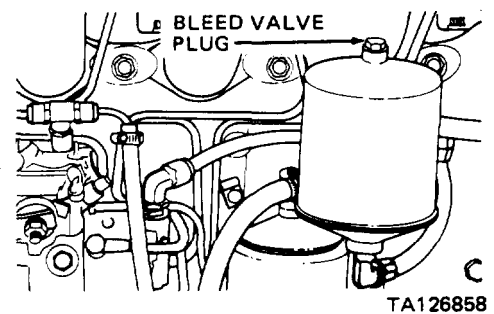
- a. If oil is drawn into intake manifold, remove and replace intake manifold gasket (para 2-14d).
- b. If oil is not drawn into intake manifold, proceed to step 3 below.

Step 3. Check engine oil level dipstick for over filled engine crankcase.

- a. If engine crankcase is overfilled as indicated by dipstick, drain excess oil until level is just below FULL mark on dipstick (para 2-14b).
- b. If engine oil level is okay, proceed to step 4 below.

Step 4. Check for air in fuel system.

- a. Place ignition switch in ON position.  
Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters.  
When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel.  
Turn ignition switch off.



- b. If no air in fuel system, proceed to step 5 below.

Step 5. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white coloring).

- a. If fuel is contaminated, drain fuel tank, clean and fill with correct fuel (para 2-15d(1)) and replace fuel filters (para 2-15e and 2-15f).  
(Refer to current lubrication order for correct fuel.)
- b. If fuel is not contaminated, proceed to step 6 below.

Step 6. Check for clogged fuel filters by disconnecting fuel line between fuel filter head and fuel injection pump at fuel injection pump.

Place ignition switch in ON position and crank engine.  
Fuel should be pumped out of disconnected line.

- a. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (para 2-15e and 2-15 f).
- b. If fuel is pumped out of disconnected line, reconnect fuel line and proceed to step 7 below.

**12-9. ENGINE TROUBLESHOOTING (cont)**

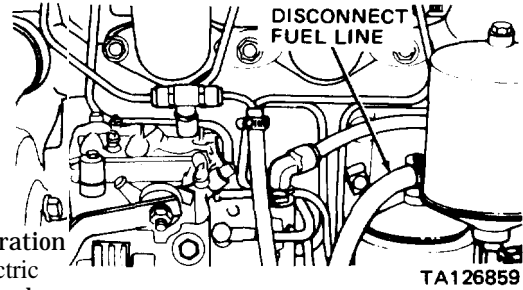
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER (cont)

Step 7. Disconnect fuel line at fuel filter head. Place ignition switch in ON position and check if a slight buzz can be heard at electric fuel pump and if fuel is pumped out of disconnected line.



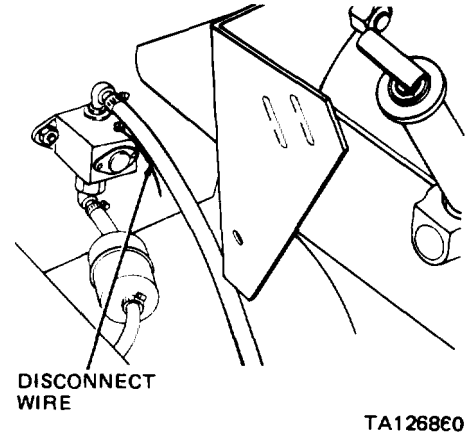
a. If slight buzz indicating electric fuel pump operation is not heard, disconnect wire at terminal on electric fuel pump and check for +24 Vdc between wire and chassis ground.

(1) If +24 Vdc is not obtained, troubleshoot electrical system (para 2-19).

(2) If +24 Vdc is obtained, replace electric fuel pump (para 2-15b).

b. If fuel is not pumped out of disconnected fuel line, remove lines and fittings between fuel tank and fuel filter head and clean/replace lines, in-line fuel filter, and/or fuel strainer (para 2-1 5).

c. If fuel is pumped out of line, reconnect line and proceed to step 8.



Step 8. Operate engine for 15 minutes at idle speed. Carefully and slowly remove radiator cap. Check coolant temperature using a thermometer; be sure thermometer does not touch any metal parts of radiator. Coolant temperature shall be between 175 to 200 degrees F.

a. If coolant temperature is not between 175 to 200 degrees, remove and test thermostat (para 2-17d).

b. If coolant temperature is between 175 to 200 degrees F, proceed to step 9 below.

Step 9. Check for correct adjustment of accelerator/throttle control (para 2-15i).

a. If adjustment of accelerator/throttle control is not correct, adjust (para 2-15i).

b. If accelerator/throttle control adjustment is okay, proceed to step 10 below.

Step 10. Remove drive belt from engine water pump (para 2-17f). Start engine and operate at idle speed for five minutes maximum. Check if engine power increases.

If engine power increases, replace water pump assembly (para 2-17e) and reinstall drive belt on water pump.

**2-9. ENGINE TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 6. ENGINE CRANKS BUT DOES NOT START WHEN QUICK START IS ACTIVATED

Step 1. Check that quick start cylinder is hand tight.

- a. If cylinder is not hand tight, tighten.
- b. If cylinder is hand tight, proceed to step 2 below.

Step 2. Check ether supply; press lever against valve and listen for hissing.

- a. If hissing sound is not heard, replace empty cylinder (para 2-15h).
- b. If hissing sound is heard, proceed to step 3 below.

Step 3. Check tubing for leaks or damage; listen for hissing sound when lever is pressed against valve.

- a. If hissing sound is heard, replace tubing (para 2-15h).
- b. If hissing sound is not heard, proceed to step 4 below.

Step 4. Check valve for damage.

Replace valve (para 2-15h).

## 7. EXCESSIVE OIL CONSUMPTION

Step 1. Check for engine oil leaks at cylinder head cover gasket, oil pan gasket, timing gear cover gasket, engine oil filter, and oil drain plug gasket.

- a. If oil leaks are observed by engine oil filter and oil drain plug, tighten oil filter and replace oil drain plug gasket (para 2-14b).  
If leaks are observed at other areas, notify direct support maintenance.
- b. If oil leaks are not observed, proceed to step 2 below.

Step 2. Check if too light an engine oil is used

- a. If engine oil is too light, drain engine oil and replace engine oil filter (para 2-14c).  
(Refer to current lubrication order for correct weight engine oil.)
- b. If engine oil is okay, proceed to step 3 below.

Step 3. With engine operating, check oil pressure gage for excessively high pressure indication (normal oil pressure indication is between 50 to 70 PSI).

If oil pressure gage indication is excessively high, notify direct support maintenance.

## **12-9. ENGINE TROUBLESHOOTING (cont)**

### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 8. LOW ENGINE OIL PRESSURE

Step 1. Check for engine oil leaks at engine oil filter and oil pan drain plug.

- a. If leaks are observed, tighten oil filter; replace oil pan drain plug gasket.
- b. If no leaks are observed, proceed to step 2 below.

Step 2. Check engine oil for dirty condition.

Remove dipstick wipe it between thumb and forefinger and note if oil feels gritty and looks dirty.

- a. If oil feels gritty and looks dirty, drain engine oil and replace engine oil filter (para 2-14c).  
(Refer to current lubrication order for correct weight oil.)
- b. If oil is okay, proceed to step 3 below.

Step 3. Check if too light an engine oil is used.

- a. If engine oil is too light, drain engine oil and replace engine oil filter (para 2-14c).  
(Refer to current lubrication order for correct weight oil.)
- b. If engine oil is not too light, proceed to step 4 below.

Step 4. Check if oil pressure indicator light is illuminated when oil pressure gage indicates low oil pressure.

- a. If oil pressure indicator is illuminated, notify direct support maintenance.
- b. If oil pressure indicator is not illuminated, refer to gages troubleshooting (para 2-13).

Step 5. Check if oil pressure gage indicates normal oil pressure when oil pressure indicator is illuminated.

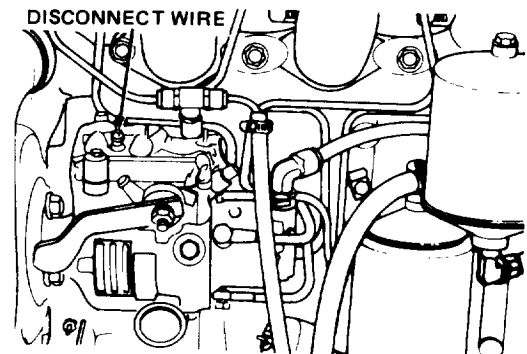
- a. If oil pressure gage indicates normal oil pressure, troubleshoot electrical system (para 2-13).
- b. If oil pressure gage indicates low oil pressure, notify direct support maintenance.

### 9. ENGINE WILL NOT SHUT DOWN

Place IGNITION switch in OFF position.

Disconnect wire at fuel injection pump terminal.

- a. If engine stops, replace IGNITION switch.
- b. If engine does not stop, place fuel shutoff valve in OFF position and replace fuel injection pump (notify direct support maintenance)



TA126861

## **2-10. FUEL SYSTEM TROUBLESHOOTING**

### MALFUNCTION

#### TEST OR INSPECTION

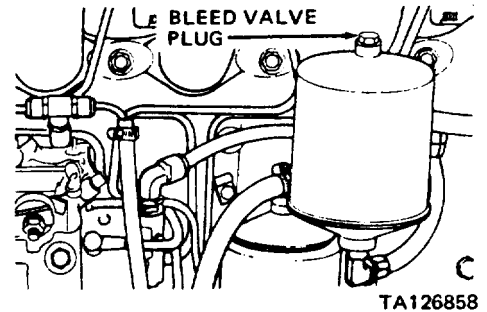
#### CORRECTIVE ACTION

### 1. LOW FUEL PRESSURE

Step 1. Check for air in fuel system

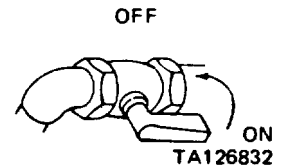
- a. Place ignition switch in ON position.  
Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Turn ignition switch off.

- b. If no air in fuel system, proceed to step 2 below.



Step 2. Check if fuel shut-off valve is in closed position.

- a. If in closed position, place in full on position as shown.
- b. If in open position, proceed to step 3 below.



Step 3. Check for leaks at fittings between fuel tank and fuel injection pump.

- a. If leaks are observed, tighten or replace fittings (para 2-15d(2)).
- b. If leaks are not observed, proceed to step 4 below.

Step 4. Check fuel tank strainer, in-line fuel filter, and/or lines for clogged condition (para 2-15)

- a. If strainer, fuel filter and/or lines are clogged, replace the part (para 2-1 5).
- b. If strainer, fuel filter, and lines are okay, proceed to step 5 below.

Step 5. Check for clogged fuel filters by disconnecting line between fuel filter head and fuel injection pump at fuel injection pump.

Place ignition switch in ON position and crank engine.  
Fuel should be pumped out of disconnected line.

- a. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (para 2-15e and 2-15f).
- b. If fuel is pumped out of disconnected line, reconnect fuel line and proceed to step 6 below.

Step 6. Disconnect fuel line at fuel filter head and connect to a tee fitting.  
Connect a hose between other end of tee fitting and fuel filter head.  
Connect pressure gage to tee fitting.  
Place IGNITION switch in ON position.  
Pressure gage shall indicate 4.5 to 6 PSI.

If pressure gage does not indicate 4.5 to 6 PSI, replace electric fuel pump (para 2-15b).

#### NOTE

If fuel injection pump is suspected to be cause of problem, perform paragraph 2-15a.

**2-9. ENGINE TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

2. EXCESSIVE FUEL USAGE

- Step 1. Check fuel lines for leakage or damage.
  - a. If fuel lines are leaking or damaged, repair or replace (para 2-15d(2)).
  - b. If fuel lines are okay, proceed to step 2 below.
- Step 2. Check fuel tank for leakage or damage.
  - a. If fuel tank leaks or is damaged, notify direct support maintenance.
  - b. If fuel tank is okay, proceed to step 3 below.

**WARNING**

**If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal procedures.**

- Step 3. Check if air cleaner indicator red flag is in view.
  - a. If in view, depress reset button on top of indicator and check that red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in para 2-15c.) Crank engine and check if red flag is in view; if red flag is in view, service air cleaner (para 2-15c).
  - b. If red flag is not in view, notify direct support maintenance.

**2-11. EXHAUST SYSTEM TROUBLESHOOTING**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. EXCESSIVE EXHAUST NOISE

- Step 1. Check muffler and exhaust pipe for cracks and holes.
  - a. If muffler or exhaust pipe are cracked or holes are observed, replace (para 2-16).
  - b. If muffler and exhaust pipe check okay, proceed to step 2 below.
- Step 2. Squirt small amount of oil on muffler gasket area where muffler connects to exhaust manifold. With engine idling, check if air bubbles can be seen, indicating damaged gasket.
  - a. If air bubbles are seen, replace gasket (para 2-16).
  - b. If air bubbles are not seen, proceed to step 3 below.
- Step 3. Squirt small amount of oil on exhaust manifold in gasket area where exhaust manifold is mounted to cylinder head.  
With engine idling, check if air bubbles can be seen, indicating damaged gasket.
  - a. If air bubbles are seen, replace gasket (para 2-14e).
  - b. If muffler and exhaust pipe check okay, proceed to step 4 below.
- Step 4. Check exhaust manifold for cracks or holes.  
Replace exhaust manifold (Para 2-14e).



---

**12-11. EXHAUST SYSTEM TROUBLESHOOTING (cont)**


---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

**2. EXCESSIVE EXHAUST SMOKE**

Check if muffler requires cleaning.

Clean (para 2-16).

**NOTE**

If problem is not corrected, notify direct support maintenance.

---

**12-12. COOLING SYSTEM TROUBLESHOOTING**


---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

**1. ENGINE OVERHEATS**

Step 1. Check fan belt for proper tension.

Depress fan belt midway between fan pulley and crankshaft pulley.  
Fan belt should be deflected approximately 1/2 inch.

- a. If fan belt does not deflect 1/2 inch approximately, adjust it (para 2-17f)
- b. If fan belt deflects 1/2 inch approximately, proceed to step 2 below.

Step 2. Inspect fan belt for damage, wear, oil covered, or riding deeply in pulley groove.

- a. If any of the above conditions are observed, replace fan belt (para 2-17f).
- b. If none of the above conditions are observed, proceed to step 3 below

Step 3. With engine idling, remove radiator cap and observe coolant to see if it moves indicating water pump is operating.

- a. If coolant movement is not observed, replace water pump (para 2-17e).
- b. If coolant movement is observed, proceed to step 4 below.

Step 4. Check radiator and hoses for leakage or damage.

- a. If radiator and/or hoses are leaking or damaged, replace (para 2-17C and 2-17b, respectively).
- b. If radiator and hoses are okay, proceed to step 5 below.

Step 5. Check fan blade assembly for damage.

- a. If fan blade assembly is damaged, replace (para 2-17 f).
- b. If fan blade assembly checks okay, proceed to step 6 below.

**12-12. COOLING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. ENGINE OVERHEATS (cont)

Step 6. Check thermostat (para 2-17d).

Replace thermostat (para 2-17d).

2. ENGINE DOES NOT REACH OPERATING TEMPERATURE

Check thermostat (para 2-17d).

Replace thermostat (para 2-17d).

3. COOLING SYSTEM NOT PRESSURIZED

**NOTE**

With engine at normal operating temperature, run engine at high speed for two minutes and return to idle speed. Carefully cover radiator cap with a cloth and rotate counterclockwise to first detent. A hissing noise from cap and filler neck indicates that system is pressurized.

Step 1. Allow engine to cool and remove radiator cap (para 2-17a).  
Rinse radiator cap with clear water and install on cap adapter and pressure tester as shown.

**NOTE**

It may be necessary to reinstall radiator cap several times to ensure tight seal.

Operate pressure tester pump and observe meter reading at its highest point. Cap release pressure should be 6 to 9 pounds, and should remain steady for at least 30 seconds.

a. If radiator cap pressure is 6 to 9 pounds, and remains steady for at least 30 seconds before dropping, proceed to step 2 below.

b. If radiator cap pressure is not 6 to 9 pounds, or if pressure drops rapidly, replace radiator cap

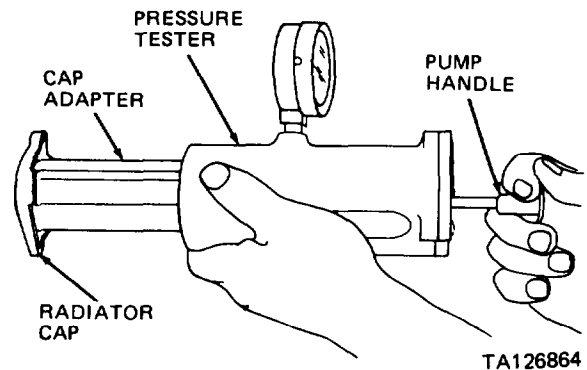
Step 2. Disconnect cap adapter from pressure tester.

Attach pressure tester to radiator filler neck, with locking ears in line with entrance notches of filler neck.

Press down on tester and rotate clockwise until locking ears are stopped by stop lugs on radiator filler neck.

Clamp radiator inlet and outlet hoses, or block hose flanges.

Operate pressure tester pump until meter indicates 9 pounds pressure, and observe meter.



TA126864

**2-12. COOLING SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 3. COOLING SYSTEM NOT PRESSURIZED (cont)

## Step 2. (cont)

- a. If pressure drops quickly, radiator has serious leakage. Replace radiator (para 2-17c).
- b. If pressure holds steady for two or more minutes, radiator check is satisfactory
- c. If pressure drops slowly, radiator has seepage or slight leakage. Replace radiator (para 2-17c).

**2-13. GAGES TROUBLESHOOTING**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 1. ENGINE OIL PRESSURE GAGE DOES NOT INDICATE CORRECT PRESSURE

## Step 1. Place IGNITION switch in ON position.

Oil pressure gage should indicate zero.

- a. If zero indication not obtained, proceed to step 2.
- b. If zero indication obtained, proceed to step 3.

## Step 2. Disconnect wire from oil pressure sender.

Oil pressure gage should indicate zero.

- a. If oil pressure gage indicates 80 (full scale), repair or replace short circuited wire between oil pressure sender and oil pressure gage.
- b. If oil pressure gage indicates zero, replace oil pressure sender.
- c. If oil pressure gage indicates other than zero or 80 (full scale), replace oil pressure gage.

## Step 3. Temporarily connect jumper wire between oil pressure gage SENDER terminal and chassis ground.

Place IGNITION switch in ON position.

Oil pressure gage should indicate 80 (full scale).

- a. If 80 (full scale) indication not obtained, proceed to step 4.
- b. If 80 (full scale) indication obtained, disconnect wire and proceed to step 5.

## Step 4. Check for +24 Vdc between oil pressure gage IGN terminal and ground (IGNITION switch in ON position).

- a. If +24 Vdc not obtained, troubleshoot electrical system (para 2-19).
- b. If +24 Vdc obtained, disconnect jumper wire between oil pressure gage SENDER terminal and ground, and replace oil pressure gage (para 2-18b).

**12-13. GAGES TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. ENGINE OIL PRESSURE GAGE DOES NOT INDICATE CORRECT PRESSURE (cont)

- Step 5. Disconnect wire from oil pressure sending unit.  
Temporarily ground wire while assistant observes oil pressure gage,  
Oil pressure gage shall indicate 80 (full scale).

Repair or replace broken wire (notify direct support maintenance).

2. FUEL GAGE DOES NOT REGISTER

- Step 1. If fuel gage indicates E, disconnect wire at fuel gage sender and ground wire to chassis.  
Place IGNITION switch in ON position.  
Fuel gage should indicate F.

- a. If fuel gage indicates F, replace fuel gage sender (para 2-31a).
- b. If fuel gage indicates E, proceed to step 2.
- c. If fuel gage indicates other than F or E, replace it (para 2-18b).

- Step 2. Check for +24 Vdc at fuel gage IGN terminal (IGNITION switch in ON position),

- a. If +24 Vdc not obtained, troubleshoot electrical system (para 2-19).
- b. If +24 Vdc obtained, replace fuel gage (para 2-18b).

- Step 3. If fuel gage indicates F, disconnect wire at fuel gage sender.  
Fuel gage should indicate E (IGNITION switch ON).

- a. If fuel gage indicates E, replace fuel gage sender.
- b. If fuel gage indicates F, repair short circuited wire (notify direct support maintenance)
- c. If fuel gage indicates other than F or E, replace it (para 2-18b).

3. FUEL GAGE DOES NOT INDICATE CORRECT FUEL LEVEL

Disconnect wire at fuel gage SENDER terminal and connect a two foot length of no. 22 AWG insulated wire to this terminal.

Obtain a 1K ohm variable resistor and connect one end to other end of wire connected to fuel gage SENDER terminal.

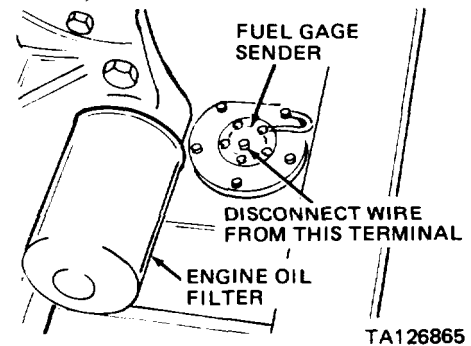
Connect center terminal of 1K ohm variable resistor to ground.

Place IGNITION switch in ON position

Adjust variable resistor until fuel gage indicates 1/4 E, turn IGNITION switch OFF, and measure and note resistance of variable resistor using an ohmmeter.

Turn IGNITION switch ON and repeat this procedure for 1/2 and 3/4 F fuel gage indications.

- a. Replace fuel gage if resistance readings are not within  $22 \pm 2$ ,  $44 \pm 4$ , and  $66 \pm 6$  ohms for 1/4 E, 1/2, and 3/4 fuel gage indications.
- b. Replace fuel gage sender if resistance readings are within above values.



TA126865

**2-14. ENGINE MAINTENANCE**

*a. Flywheel.*

This task covers flywheel inspection.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Engine off.

2-53c

Left side panel removed.

MATERIALS/PARTS

None

STEP	LOCATION	ITEM	ACTION	REMARKS
1.	Flywheel housing	Dust cover	Relocate	Away from access hole
2.	Flywheel housing access hole	Ring gear	Inspect	Notify general support maintenance if gear teeth are missing or broken.
<p><b>NOTE</b></p> <p>Use screwdriver inserted in access hole and engaging ring gear teeth to crank engine to check all gear teeth.</p>				
3.	Flywheel housing	Dust Cover	Relocate	Over access hole

**2-14. ENGINE MAINTENANCE (cont)**

*b. Draining and Refilling Engine Crankcase.*

This task covers draining and refilling engine crankcase.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

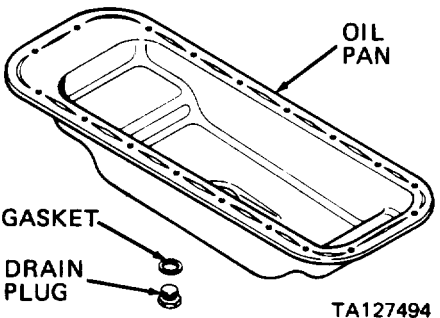
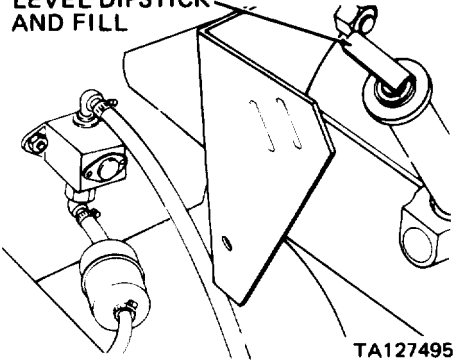
Engine off, oil hot from engine operation.

MATERIALS/PARTS

2-53c

Left side panel removed.

Seven quarts engine oil (refer to current lubrication order)

STEP	LOCATION	ITEM	ACTION	REMARKS
1.	Engine oil pan	Drain plug	Remove	Drain oil into two gallon container  
2	Engine oil pan	Drain plug	Install	Tighten securely
3	Engine, right side	a. Engine oil level dipstick b. Engine oil fill	Remove  Fill	<b>ENGINE OIL LEVEL DIPSTICK AND FILL</b>   With engine oil (refer to current lubrication order), Start engine, run for several minutes and then check for oil leak at drain plug
<b>NOTE</b>				
Change engine oil filter as described in paragraph 2-14c.				

**2-14. ENGINE MAINTENANCE (cont)**

*c. Oil Filter.*

This task covers oil filter replacement.

INITIAL SETUP

TOOLS

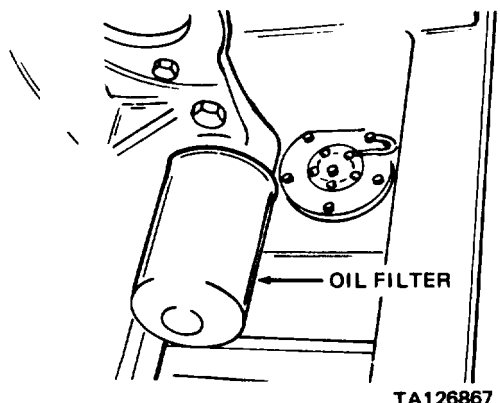
Clamping Type Oil Filter Wrench

EQUIPMENT CONDITION

Paragraph 2-14b Condition Description  
Engine crankcase drained.

MATERIALS/PARTS

Oil filter

STEP	LOCATION	ITEM	ACTION	REMARKS
1.	Engine, left side, rear	Oil filter	Remove	Use filter wrench; turn counterclockwise to remove
2.	Engine, left side, rear	Oil filter	Install	Apply thin coat of clean oil to gasket of new oil filter. Install until gasket contacts base, then turn one-half to three-quarters of a turn to obtain proper seal.
				
3.	Engine oil pan	Drain plug	Install	Tighten securely
4.	Engine, right side, rear	a. Engine oil level dipstick	Remove	
		b. Engine oil fill	Fill	With engine oil (refer to current lubrication order). Start engine and run for several minutes to charge lubrication system. Check for oil leaks at oil filter base.

**2-14. ENGINE MAINTENANCE (cont)**

*d. Intake Manifold.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

Condition Description

Air cleaner hose disconnected from air cleaner.

Left side panel removed.

Left fender removed.

Left hood panel removed.

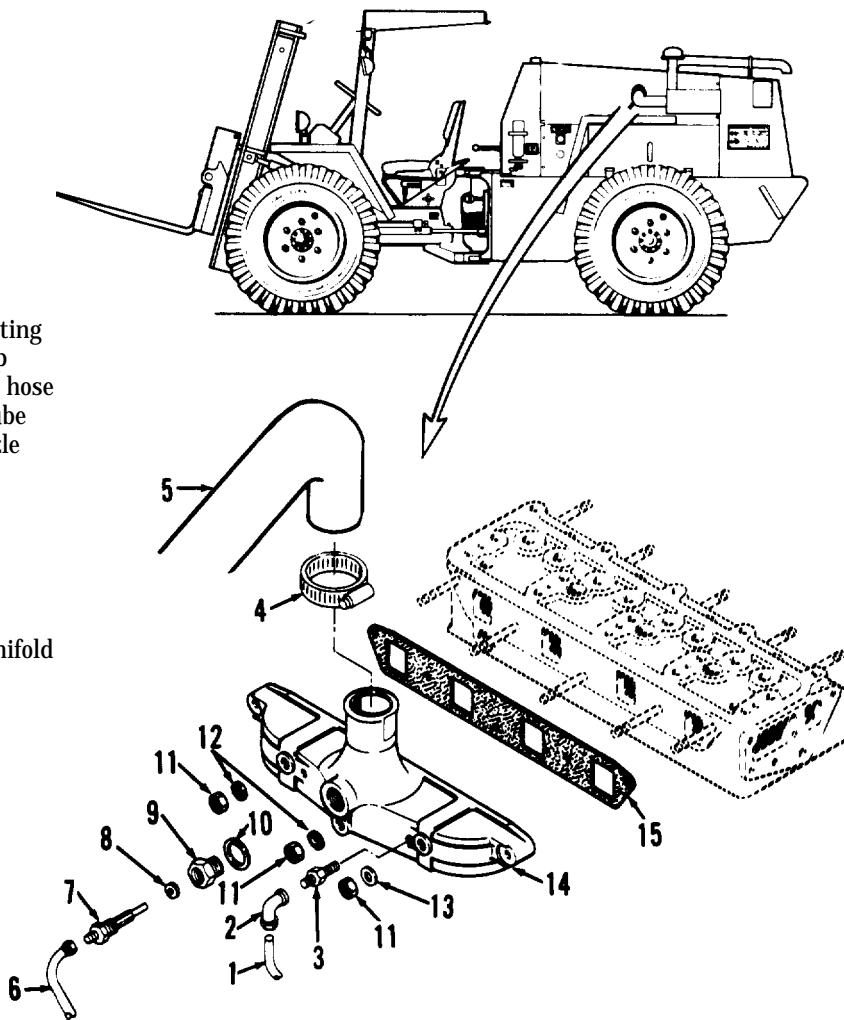
**MATERIALS/PARTS**

Cleaning solvent P-D-680

Intake manifold gasket

**KEY**

1. Tube
2. Elbow
3. Filtered fitting
4. Hose clamp
5. Air cleaner hose
6. Delivery tube
7. Spray nozzle
8. Washer
9. Adapter
10. Gasket
11. Nuts
12. Washers
13. Washers
14. Intake manifold
15. Gasket



TA126868



**2-14. ENGINE MAINTENANCE (cont)**

*d. Intake Manifold (cont)*

STEP	LOCATION	ITEM	ACTION	REMARK
<b>REMOVAL</b>				
1.	Engine, left side	a Tube (1) b. Elbow (2) c. Filter fitting (3) d. Hose clamp (4)	Disconnect Remove Remove Loosen	From elbow (2)
<b>WARNING</b>				
<b>If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.</b>				
		e. Air cleaner hose (5) f. Delivery tube (6) g. Spray nozzle (7) h. Washer (8) i. Adapter (9) j. Gasket (10) k. Five nuts (11) l. Three washers (12) m. Two washers (13)	Disconnect and remove Disconnect and remove Disconnect and remove Remove Remove Remove Remove Remove Remove	Remove hose clamp (4) From spray nozzle (7) Support intake manifold (14)
2	Cylinder	a Intake manifold (14) b. Gasket (15)	Remove Remove and Discard	
<b>CLEANING</b>				
<b>WARNING</b>				
<b>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</b>				
<b>WARNING</b>				
<b>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</b>				
		All parts	clean	Use cleaning solvent P-D-680 Dry thoroughly with compressed air

**12-14. ENGINE MAINTENANCE (cont)**

*d. Intake ManfoId (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		Intake manifold	Clean	Use wire brush remove all rust, carbon, and oxidized material. Ensure that all traces of gasket material are removed.
<b>CAUTION</b>				
When removing gasket (15) ensure that gasket material does not fall into cylinder head ports. Damage to engine may result from foreign material falling into ports.				
5		Cylinder head	Clean	Mating surface and studs with cleaning solvent P-D-680. Remove all traces of gasket material.
INSPECTION				
6		Intake manifold (14)	Inspect	Replace if cracked or damaged.
7		Adapter (9)	Inspect	Replace if internal threads are damaged.
8		Cylinder head studs	Inspect	If studs are broken or have damaged threads notify direct support maintenance
<b>WARNING</b>				
If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.				
9		Air cleaner hose (5)	Inspect	Replace if cracked or worn
10		All other parts	Inspect	Replace if cracked or worn
INSTALLATION/REPLACEMENT				
11	Cylinder head	a. Gasket (15)	Install	
		b. intake manifold (14)	Position	

**2-14. ENGINE MAINTENANCE (cont)**

*d. Intake Manifold (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION/REPLACEMENT (cont)				
12	Intake manifold	a. Two washers (13)	Position	
		b. Three washers (12)	Position	
		c. Five nuts (11)	Install	Tighten to 30-35 pounds foot torque
		d. Gasket (10)	Install	
		e. Adapter(9)	Install	In intake manifold adapter (9)
		f. Washer (8)	Install	
		g. Spray Nozzle (7)	Install	To spray nozzle (7)
		h. Delivery tube (6)	Connect	
<p><b>WARNING</b></p> <p><b>If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.</b></p>				
		i. Hose clamp (4)	Position	On air cleaner hose (5)
		j. Air cleaner hose (5)	Connect	Tighten hose clamp (4)
		k. Filtered fitting (3)	Install	
		l. Elbow (2)	Install	In filtered fitting (3)
		m. Tube(1)	Connect	To elbow fitting (2)

**2-14. ENGINE MAINTENANCE (cont)**

*e. Exhaust Manifold*

This task covers: a. Removal  
 b. Disassembly  
 c. Cleaning

d. Inspection  
 e. Reassembly  
 f. Installation/Replacement

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit.

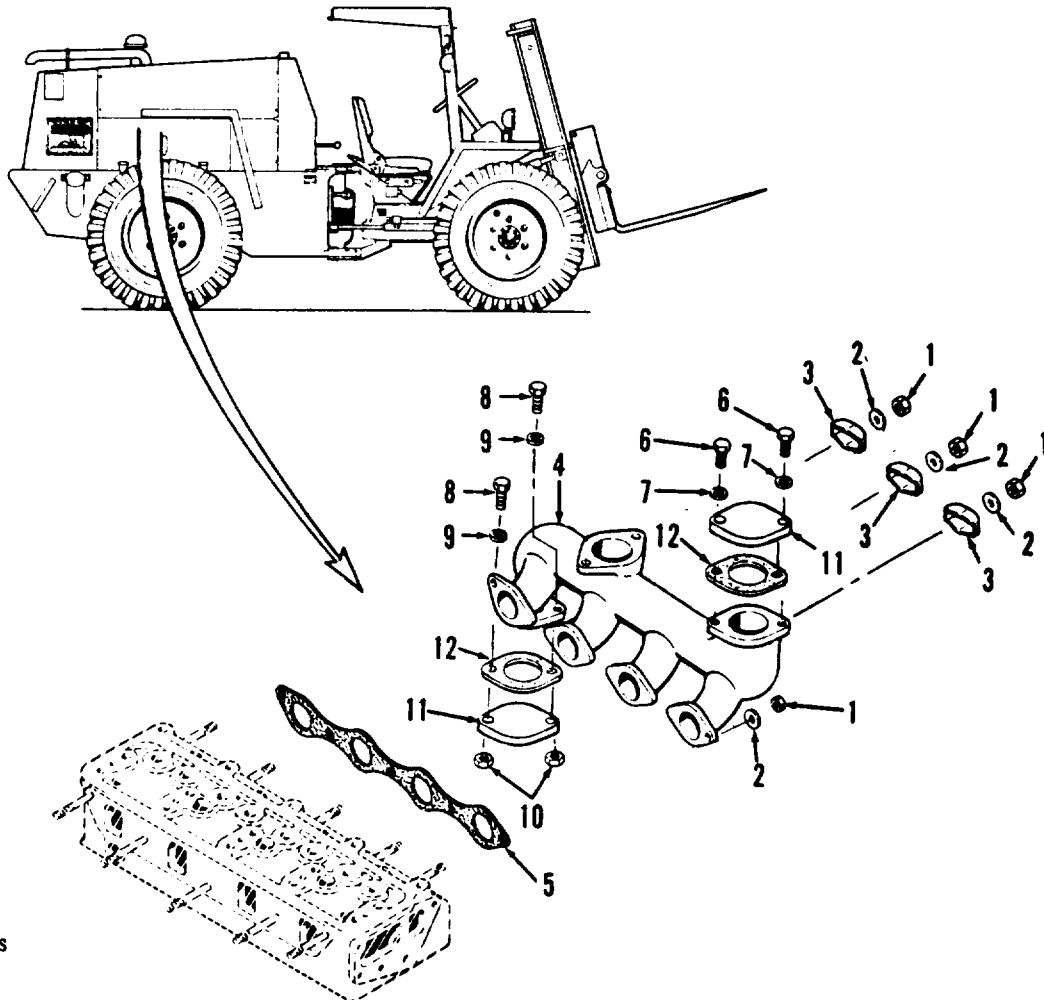
NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph	Condition	Description
2-53c	Right side panel removed.	
2-53b	Right fender removed.	
2-53e	Left hood panel removed.	
2-16	Spark arresting muffler removed.	

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Clean cloths  
 Exhaust manifold gasket



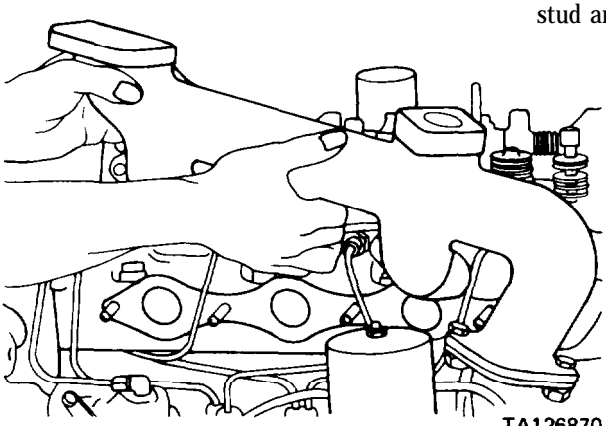
**KEY**

- 1. Nuts
- 2. Washers
- 3. Clamps
- 4. Exhaust manifold
- 5. Gasket
- 6. Cap screws
- 7. Washers
- 8. Cap screws
- 9. Washers
- 10. Nuts
- 11. Outlet cover plates
- 12. Gaskets

TA126869

**2-14. ENGINE MAINTENANCE (cont)**

*e. Exhaust Manifold (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1.	Engine, left side	a. Five nuts (1) b. Five washers (2) c. Three clamps (3)	Remove Remove Remove	
2	Cylinder head	a. Exhaust manifold (4)	Remove	Pull front of exhaust manifold from front cylinder head stud, swing manifold upward and pull off of rear cylinder head stud and away from engine as shown
 <p style="text-align: right;">TA126870</p>				
<b>DISASSEMBLY</b>				
3	Exhaust manifold (4)	a. Four cap screws (6, 8) b. Four washers (7, 9) c. Two nuts (10) d. Two outlet cover plates (11) e. Two gaskets (12)	Remove Remove Remove Remove Remove	Remove and discard     Discard
<b>CLEANING</b>				
4		Exhaust manifold (4)	Clean	Use wire brush. Remove all rust, carbon, oxidized material, and gasket material

**2-14. ENGINE MAINTENANCE (cont)**

*e. Exhaust Manifold (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b>WARNING</b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b>WARNING</b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
5		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
6		Cylinder head	Clean	Mating surface and studs with cleaning solvent P-D-680. Ensure that all traces of gasket material removed.
INSPECTION				
7		Exhaust manifold (4)	Inspect	Replace if cracked, or damaged or if threads damaged
8		All other parts	Inspect	Replace if cracked, damaged or worn or if threads damaged
REASSEMBLY				
9	Exhaust manifold	a. Two gaskets (12) b. Two outlet cover plates (11) c. Two nuts (10) d. Four washers (9, 7) e. Four cap screws (8, 6)	Install Install Position Position Install	On four cap screws (8,6)

**2-14. ENGINE MAINTENANCE (cont)**

*e. Exhaust Manifold (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT				
10	Cylinder head	a. Gasket (5) b. Exhaust manifold (4)	Install Install	Hold front of manifold in raised position and install rear of manifold on rear cylinder head stud. Lower front of manifold and install on cylinder head front stud
11	Exhaust manifold	a. Three manifold clamps (3) b. Five washers (2) c. Five nuts (1)	Install Install Install	Tighten to 25-30 pounds foot

**2 - 15. FUEL SYSTEM MAINTENANCE**

*a. Fuel Injection Pump.*

This task covers testing of the fuel injection pump.

**PERSONNEL REQUIRED**

Two maintenance technicians

**INITIAL SETUP**

**TOOLS**

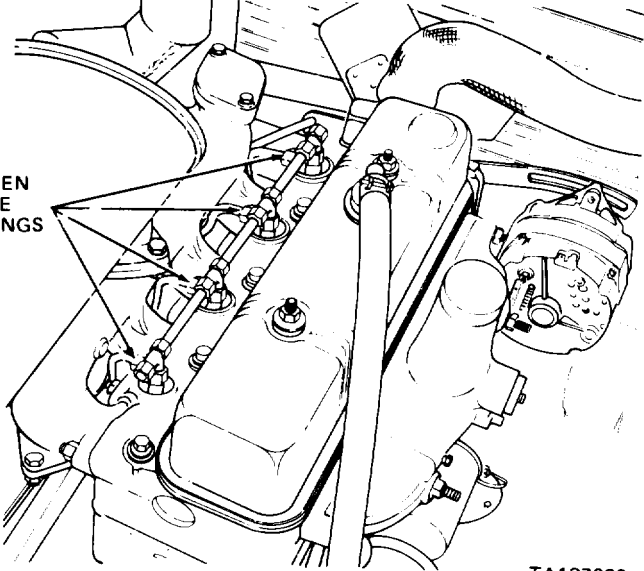
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph Condition Description  
 Vehicle parked on level surface, engine off, transmission direction selector-in N (neutral) position, and parking brake applied.  
 2-53c Right side panel removed.

**MATERIALS/PARTS**

None

STEP	LOCATION	ITEM	ACTION	REMARKS
1.	Engine compartment	Fuel injector nozzle fittings	Loosen	
2.	Operator's compartment	a. IGNITION switch	Place in ON position	
				
		b. START switch	Depress	While engine is cranking, check that fuel is pumped out of fuel injection nozzle fittings loosened in step 1 above
		c. IGNITION switch	Place in OFF position	
3	Engine compartment	Fuel injector nozzle fittings	Tighten	Wipe any fuel from engine using clean cloth

TA127399



**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*b. Electric Fuel Pump and Lines.*

This task covers: a. Removal  
b. Cleaning  
c. Inspection

d. Installation/Replacement  
e. Testing

**PERSONNEL REQUIRED**

Two maintenance technicians

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

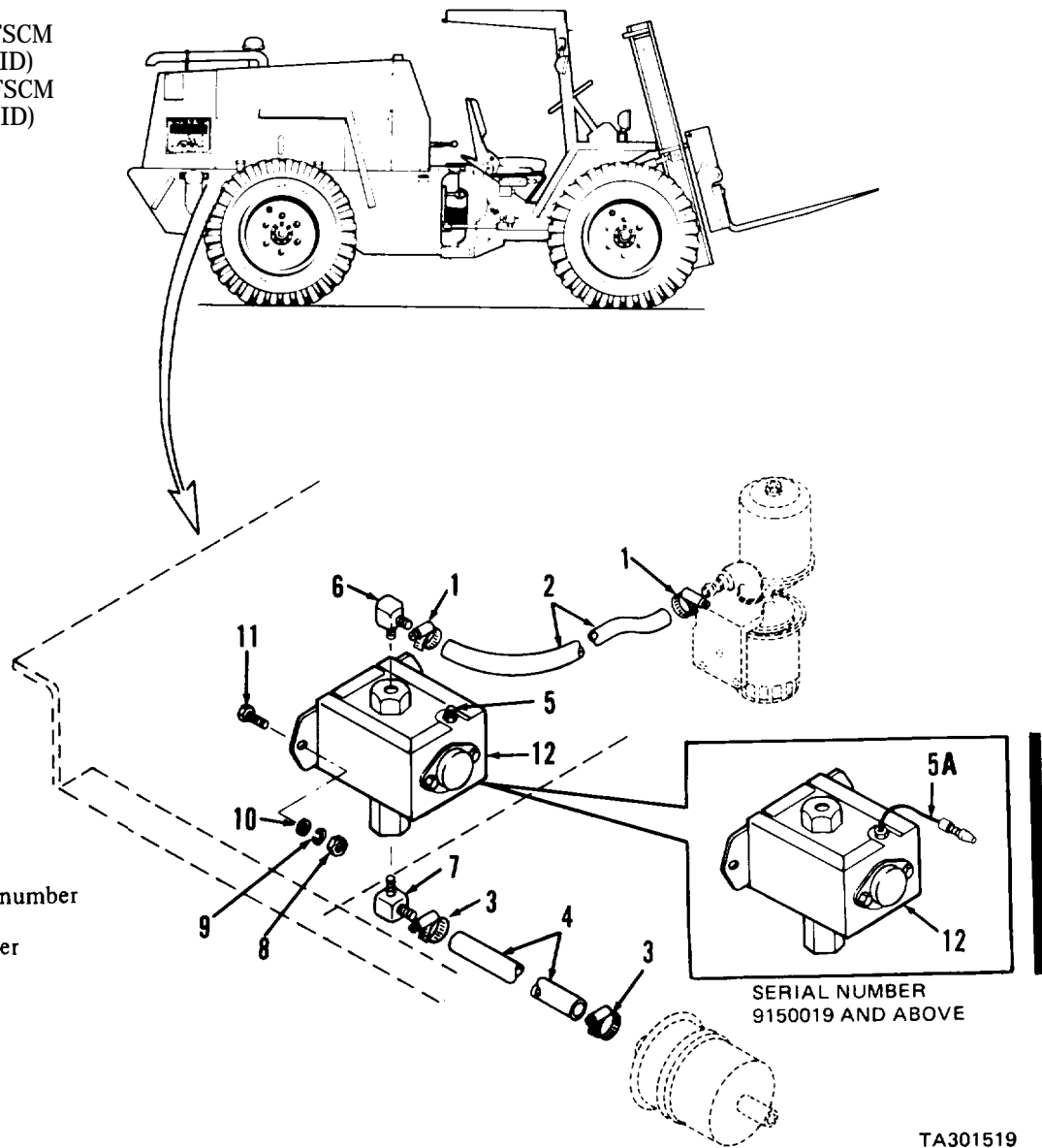
NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph	Condition	Description
2-53c	Engine off.	Right side panel removed.

**MATERIALS/PARTS**

- Hose, 31 ±0.2 inches long (FSCM 81343, P/N SAE30R1-14ID)
- Hose, 3 ±0.12 inches long (FSCM 81343, P/N SAE30R3-14ID)
- Cleaning solvent P-D-680



**KEY**

- 1. Hose clamps
- 2. Filter supply hose
- 3. Hose clamps
- 4. Fuel filter hose
- 5. Screw terminal (serial number 9150018 and below)
- 5A. Wire lead (serial number 9150019 and above)
- 6. Hose barb
- 7. Hose barb
- 8. Nuts
- 9. Lock washers
- 10. Washers
- 11. Cap screws
- 12. Electric fuel pump

SERIAL NUMBER  
9150019 AND ABOVE

TA301519

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*b. Electric Fuel Pump and Lines (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, right rear	a. Screw terminal (5) aa. Wire lead (5A)  b. Two hose clamps (1) c. Filter supply hose (2) d. Two hose clamps (3) e. Fuel filter hose (4) f. Two hose barbs (6 and 7) g. Two nuts (8), lock washers (9), washers (10) and cap screws (11) h. Electric fuel pump (12)	Loosen  Disconnect  Loosen  Disconnect  Loosen  Disconnect  Remove  Remove  Remove	Disconnect wire (serial number 9150018 and below) From wiring harness lead (serial number 9150019 and above)  Remove hose clamp (1)  Remove hose clamp (3)
<b>CLEANING</b>				
2		Filter supply hose (2) and fuel filter hose (4)	Clean	Use clean diesel fuel
<b>WARNING</b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable, Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		All other parts	Clean	Use cleaning solvent P-D-680; dry thoroughly
<b>INSPECTION</b>				
4		Hose clamps (1 and 3)	Inspect	Replace if damaged
5		Filter supply hose (2) and fuel filter hose (4)	Inspect	Replace if cracked or split

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*b. Electric Fuel Pump and Lines (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
6		Hose barbs (6 and 7)	Inspect	Replace if cracked or threads damaged
7		All other parts	Inspect	Replace if threads damaged
INSTALLATION/REPLACEMENT				
8	Engine compartment, right rear	a. Electric fuel pump (12)	Position	
		b. Two cap screws (11)	Position	
		c. Two washers (10), lock washers (9) and nuts (8)	Position and install	Tighten two nuts (8) securely
		d. Two hose barbs (6 and 7)	Install	
		e. Two hose clamps (3)	Position	On hose (4)
		f. Fuel filter hose (4)	Connect	If necessary, make from bulk hose (FSCM 81343, P/N SAE30R3-14ID); cut to 3 ±0.12 inches long. Tighten two hose clamps (3)
		g. Two hose clamps (1)	Position	On hose (2)
		h. Filter supply hose (2)	Connect	If necessary, make from bulk hose (FSCM 81343, P/N SAE30R1-14ID); cut to 31 + 0.2 inches long. Tighten two hose clamps (1).
		i. Screw terminal (5)	Connect wire and tighten	Serial number 9150018 and below
		j. Wire lead (5A)	Connect to wiring harness	Serial number 9150019 and over
				Place ignition switch in ON position and open bleed valve on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles starts to flow, close bleed valve and wipe parts free of fuel, Turn ignition switch off.
TESTING				
9	Engine compartment, right rear	a. Hose clamp (1) b. Filter supply hose (2)	Loosen Disconnect	At fuel filter head At fuel filter head; place end of hose into a gallon container
10	Operator's compartment	Ignition switch	Place in ON position	
11	Engine compartment	a. Electric fuel pump b. Gallon container	Listen for slight buzz Observe hose (2)	Fuel should be pumped out of hose (2) into container

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*b. Electric Fuel Pump and Lines (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
12	Operator's compartment	Ignition switch	Place in OFF position	
13	Engine compartment	Filter supply hose (2)	Remove from container	Install tee fitting in disconnected end of hose. Connect hose between tee fitting and fuel filter head. Connect pressure gage to tee fitting
14	Operator's compartment	Ignition switch	Place in ON position	
15	Engine compartment	a. Pressure gage	Read	Gage should indicate 4.5 to 6 PSI; turn ignition switch OFF; disconnect test set-up
		b. Filter supply hose (2)	Connect	To fuel filter head
		c. Hose clamp (1)	Position and tighten	
<b>NOTE</b>				
<p>If fuel is not pumped out of electric fuel pump in step 11 above or if pressure indication obtained in step 15 is not 4.5 to 6 PSI, replace electric fuel pump.</p>				

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*c. Aircleaner.*

- |                   |                        |                             |
|-------------------|------------------------|-----------------------------|
| This task covers: | a. Removal             | d. Inspection               |
|                   | b. Disassembly         | e. Reassembly               |
|                   | c. Cleaning/Serviceing | f. Installation/Replacement |

**INITIAL SETUP**

**TOOLS**

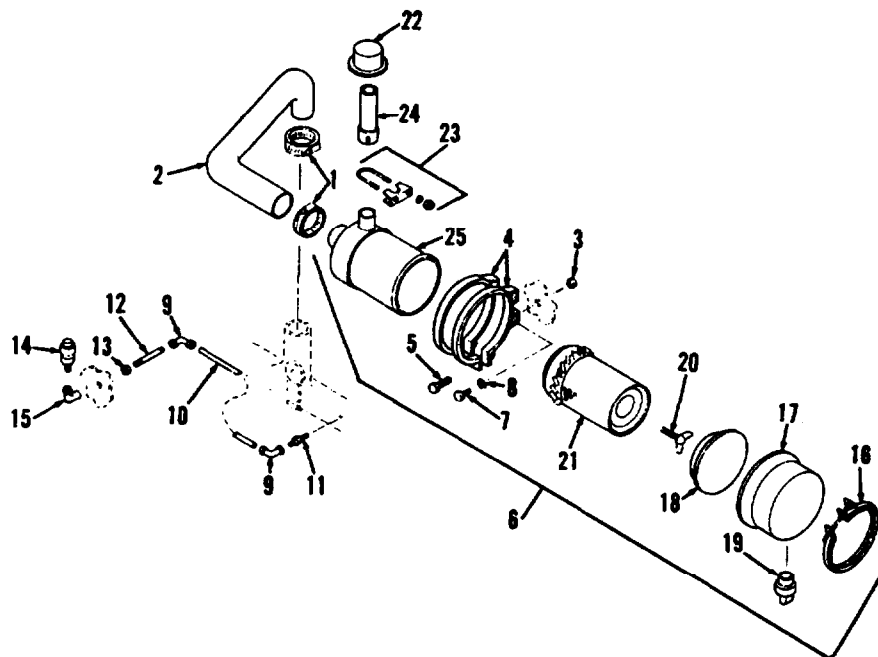
No. I Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph	Condition	Description
	Engine off.	
2-53c	Left side panel removed	
2 4 3 f	Front cover panel removed.	

**MATERIALS/PARTS**

Warm water  
 Cleaning solvent P-D-680  
 clean cloths



**KEY**

- |                         |                      |                    |
|-------------------------|----------------------|--------------------|
| 1. Hose clamps          | 10. Tube             | 19. Evaluator      |
| 2. Hose                 | 11. Filtered fitting | 20. wing nut       |
| 3. Nuts                 | 12. Pipe nipple      | 21. Filter element |
| 4. Mounting clamps      | 13. Nut              | 22. cap            |
| 5. Screws               | 14. indicator        | 23. clamp          |
| 6. Air cleaner assembly | 15. Elbow            | 24. Tube           |
| 7. Capscrews.           | 16. clamp            | 25. Body           |
| 8. Lock washers         | 17. Dust cap         |                    |
| 9. Elbows               | 18. Baffle           |                    |

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

C. Air Cleaner (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
<b>WARNING</b>				
If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.				
1	Air Cleaner assembly (6)	a. Two hose clamps (1) b. Hose (2) c. Two hose clamps (1)	Loosen Disconnect and remove Remove	
2	Left hood Panel	a. Four nuts (3) b. Two mounting clamps (4)	Remove Remove	Reach inside, behind hood panel Air cleaner assembly (6), four caps screws (7), two screws (5) and four lock washers (8) will be removed with mounting clamp
3	Mounting clamp (4)	a. Two screws (5) b. Air cleaner assembly (6) c. Four cap screws (7) d. Four lock washers (8)	Remove Remove Remove Remove	
4	Left hood panel	a. Elbows (9) b. Tube (10) c. Two elbows (9) d. Filtered fitting (11) e. Pipe nipple (12) f. Nut (13) g. Indicator (14) h. Elbow (15)	Loosen nut Remove Remove Remove Remove Remove Remove Remove	Reach inside engine compartment, behind hood panel From intake manifold Support indicator
<b>DISASSEMBLY</b>				
5	Air cleaner assembly (6)	a. Clamp (16) b. Dust cup (17)	Loosen Remove	
6	Dust cup (17)	a. Baffle (18) b. Evaluator (19)	Remove Remove	
7	Body (25)	a. Wing nut (20) b. Filter element (21) c. Cap (22) d. Clamps (23) e. Tube (24)	Remove Remove Remove Remove Remove	

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

c. *Au Cleaner* (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING/SERVICING				
<b>WARNING</b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
8		Filter element (21)	Clean and wash	Use compressed air directed inside element
9		Baffle (18) and evaluator (19)	Clean	Rinse with water. Dry thoroughly with compressed air
<b>WARNING</b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
10		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
11		Filter element (21)	Inspect	Place light inside filter element. Replace element if clogged, damaged, torn, has holes or if gasket on end of element is damaged
12		All other parts	Inspect	Replace if damaged, cracked, dented worn, distorted or clogged
REASSEMBLY				
13	Tube (24)	Cap (22)	Install	
14	Body (25)	a. Tube (24) b. Clamp (23) c. Filter element (21)	Install Install Install	Insert open end first

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*c. Air Cleaner (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
(cont)		d. Wing nut (20)	Install and tighten	
15	Dust cup (17)	a. Evaluator (19)	Install	
		b. Baffle (18)	Install	
16	Body (25)	a. Dust cup (17)	Position	
		b. Clamp (16)	Tighten	
INSTALLATION/REPLACEMENT				
17	Left hood panel	a. Elbow (15)	Install	On indicator (14)
		b. Indicator (14)	Install	
		c. Nut (13)	Install	On pipe nipple (12)
		d. Pipe nipple (12)	Install	
		e. Filtered fitting (11)	Install	On intake manifold
		f. Two elbows (9)	Install	On filtered fitting (11) and pipe nipple (12)
		g. Tube (10)	Install	
		h. Two elbows (9)	Tighten nut	To secure tube (10)
18	Mounting	a. Four lock washers (8)	Install	On four cap screws (7)
		b. Four cap screws (7)	Position	
<b>WARNING</b>				
If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.				
		c. Air cleaner assembly (6)	Position	
		d. Two screws (5)	Install	
19	Left hood	a. Two mounting clamps (4)	Position	
		b. Four nuts (3)	Install	
20	Air cleaner assembly (6)	a. Two hose clamps (1)	Position	On hose (2)
		b. Hose (2)		Connect
		c. Two hose clamps (1)	Tighten	



**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*d. Fuel Tank, Lines and Fittings.*

(1) Fuel Tank.

This task covers draining, cleaning, inspection, and filling (servicing).

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

Condition Description

2-53c

Engine off.

2-31a

Left side panel removed.

Fuel gage sending unit removed.

**MATERIALS/PARTS**

Cleaning solvent P-D-680

Clean cloths

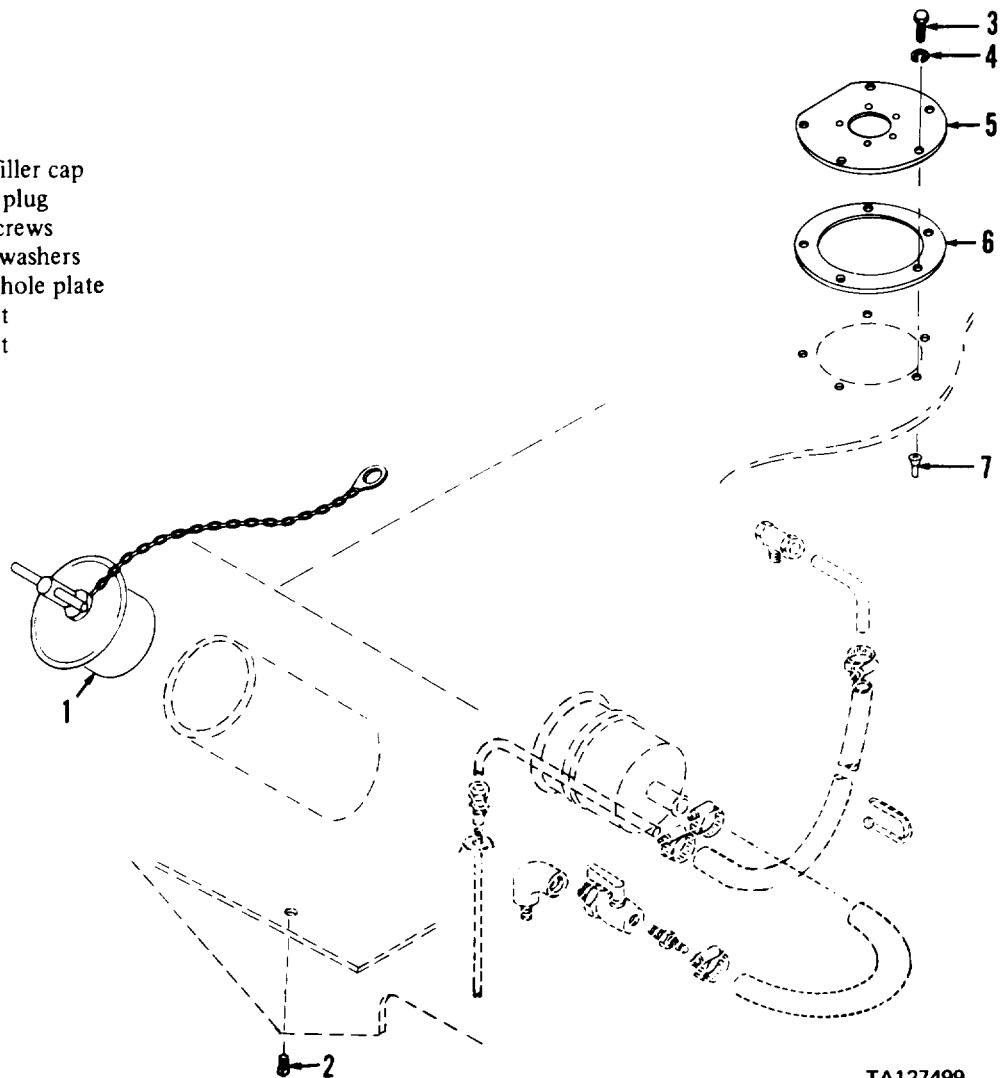
Gasket

Tie strap

Container, 30 gallon capacity

**KEY**

- 1. Fuel filler cap
- 2. Drain plug
- 3. Cap screws
- 4. Lock washers
- 5. Hand hole plate
- 6. Gasket
- 7. Rivnut



TA127499

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*d. Fuel Tank, Lines and Fittings (cont),*

(1) Fuel Tank (cont)

STEP	LOCATION	ITEM	ACTION	REMARKS
DRAINING				
1	Right rear of vehicle	Fuel filler cap (1)	Remove	
<b><u>WARNING</u></b>				
Diesel fuel is highly combustible. When performing the following step, do not smoke or allow open flames or sparks into the area. Death or severe injury may result if personnel fail to observe this precaution. If you are burned, obtain medical attention immediately.				
2	Fuel tank, bottom, middle	a. Container b. Drain plug (2)	Position Remove	Under drain plug Drain fuel into 30 gallon container
3	Fuel tank, top right	a. Five cap screws (3) and lock washers (4) b. Hand hole plate (5) c. Gasket (6)	Remove Remove Remove	
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use new open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
4		Fuel tank, interior	Clean	Use clean cloth moistened with cleaning solvent P-D-680. Dry thoroughly.
5		All other parts	Clean	Use cleaning solvent P-D-680: Dry thoroughly
INSPECTION				
6		All parts	Inspect	Replace if cracked, bent, or if threads damaged

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*d. Fuel Tank, Lines and Fittings (cont).*

(1) Fuel Tank (cont)

STEP	LOCATION	ITEM	ACTION	REMARKS
FILLING				
7	Fuel tank, top left	a. Gasket (6) b. Hand hole plate (5) c. Five cap screws (3) and lock washers (4)	Position Install Install	In fuel tank Be sure to attach fuel gage sending unit ground wire
8	Fuel tank, bottom middle	Drain plug (2)	Install	
9	Right rear of vehicle	a. Fuel filler tube b. Fuel filler cap (1)	Fill Install	With fuel (refer to current lubrication order)

**[2-15. FUEL SYSTEM MAINTENANCE (cont)]**

*d. Fuel Tank, Lines and Fittings (cont)*

(2) Lines and Fittings.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

Condition Description

2-53c

Engine off.  
Right side panel removed.

**MATERIALS/PARTS**

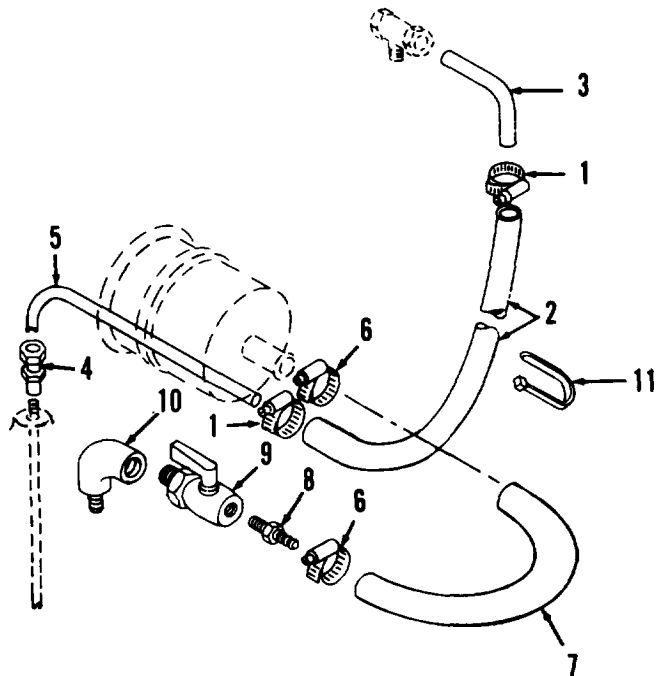
Cleaning solvent P-D-680

Clean cloths

Hose, 31 ±0.2 inches long (FSCM 81343 P/N SAE 30R3-1-4ID)

Hose, 10 ±1/4 inches long (FSCM 81343 P/N SAE 30R3-1-4ID)

Tie strap



TA126872

**KEY**

- 1. Hose clamps
- 2. Fuel return hose
- 3. Fuel return tube
- 4. Compression fitting
- 5. Tube
- 6. Hose clamps
- 7. Fuel filter hose
- 8. Hose barb
- 9. Fuel shut-off valve
- 10. Elbow
- 11. Tie strap

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*d. Fuel Tank, Lines and Fittings (cont).*

(2) Lines and Fittings (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, right side	a. Two hose clamps (1)	Loosen	
		b. Fuel return hose (2)	Remove	Cut tie strap (11) and discard
		c. Two hose clamps (1)	Remove	
		d. Fuel return tube (3)	Remove	Loosen nut on compression fitting located on fuel injection pump to remove
		e. Compression fitting (4)	Loosen nut	
		f. Tube (5)	Remove	
		g. Compression fitting (4)	Remove	
		h. Two hose clamps (6)	Loosen	
		i. Fuel filter hose (7)	Remove	
		j. Two hose clamps (6)	Remove	
		k. Hose barb (8)	Remove	
		l. Fuel shut-off valve (9)	Remove	
		m. Elbow (10)	Remove	
<b>CLEANING</b>				
2		Hoses (2 and 7)	Clean	Use clean diesel fuel; dry thoroughly
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
3		All other parts	Clean	Use cleaning solvent P-D-680; dry thoroughly

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*d. Fuel Tank, Lines and Fittings (cont).*

(2) Lines and Fittings (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
4		Hoses (2 and 7)	Inspect	Replace if cracked, split, or holes are apparent. Check inside diameter for blockage; remove blockage or replace hose
5		Tubes (3 and 5)	Inspect	Replace if cracked or dented. Replace if inside diameter is blocked with dirt or foreign matter
6		All others parts	Inspect	Replace if damaged or cracked, or if threads are damaged
INSTALLATION				
7	Engine compartment, right side	a. Elbow (10) b. Fuel shutoff valve (9) c. Hose barb (8) d. Fuel filter hose (7)  e. Two hose clamps (6) f. Compression fitting (4) g. Tube (5) h. Fuel return tube (3) i. Fuel return hose (2)  j. Two hose clamps (1) k. Tie strap (11)	Install Install Install Install  Install and tighten Install Install and tighten nut Install Install  Install and tighten Install	If necessary, make hose (7) from bulk hose (FSCM 81343, P/N SAE 30R3-1 - 4ID); cut to 10 ±1/4 inches long     In compression fitting In compression fitting on fuel injector pump; tighten nut on compression fitting If necessary, make hose (2) from bulk hose (FSCM 81343, P/N SAE 30R1-14ID); cut to 31 ±0.2 inches long  Secures fuel injection pump wire to hose (2)

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*e. In-Line Fuel Filter.*

This task covers removal/servicing and replacement.

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

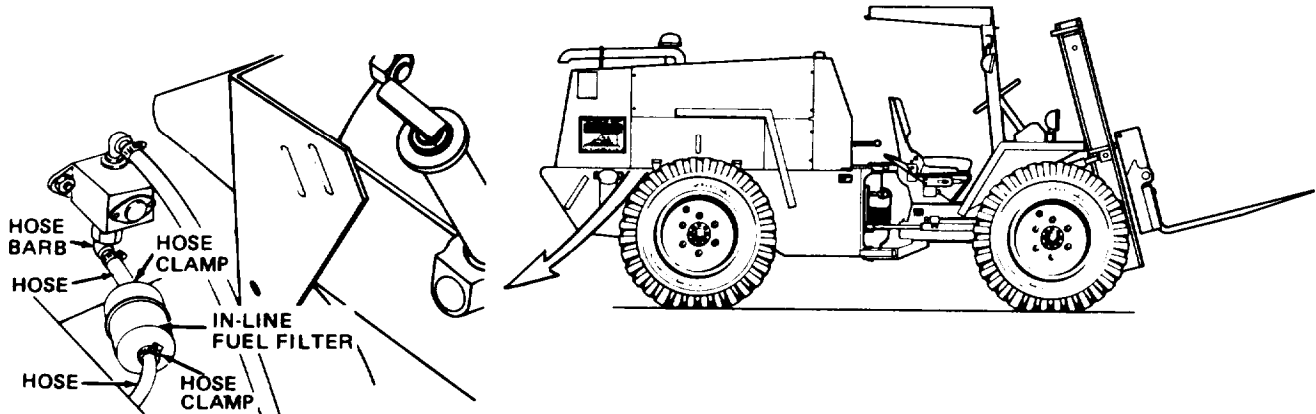
Condition Description

2-53c

Engine off.  
Right side panel removed.

**MATERIALS/PARTS**

In-line fuel filter



TA126874

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL/SERVICING</b>				
1	Engine compartment, right rear	a. Two hose clamps b. Two hoses c. In-line fuel filter	Loosen Disconnect Discard	
<b>REPLACEMENT</b>				
2	Engine compartment, right rear	a. Two hoses b. Two hose clamps c. Fuel filter assembly	Connect Install and tighten Bleed air from system	To in-line fuel filter; if necessary, reposition hose barb  Para 2-15f, step 5

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*f. Fuel Filter Assembly.*

This task covers: a. Removal/Serviceing  
 b. Cleaning  
 c. Inspection

d. Installation  
 e. Bleeding air  
 f. Draining moisture

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit  
 Clamping Type Oil Filter Wrench

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

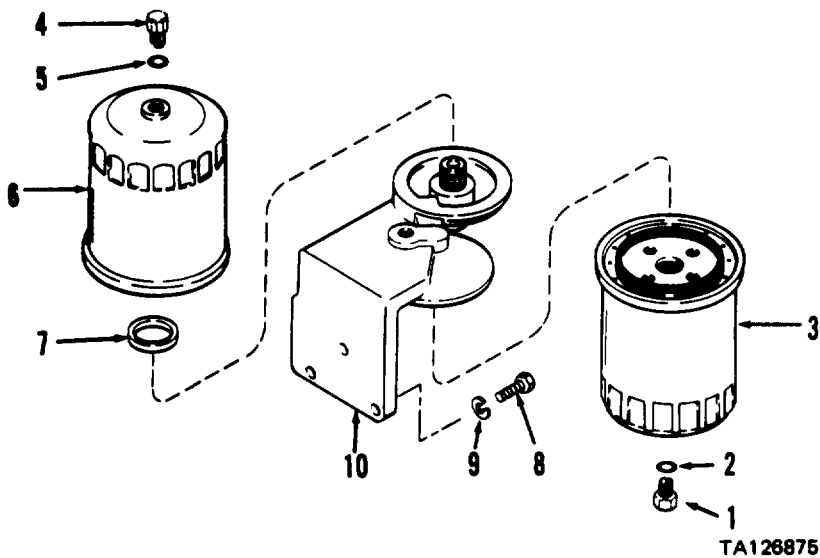
Paragraph	Condition Description
2-53c	Engine off. Right side panel removed. Fuel tank shut-off valve closed.

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Clean cloths  
 Fuel filter kit  
 Container, 1 gallon capacity

**KEY**

- 1. Drain plug
- 2. O-ring
- 3. Primary filter
- 4. Bleed valve plug
- 5. O-ring
- 6. Secondary filter
- 7. Stud gasket
- 8. Cap screws
- 9. Lock washers
- 10. Filter head

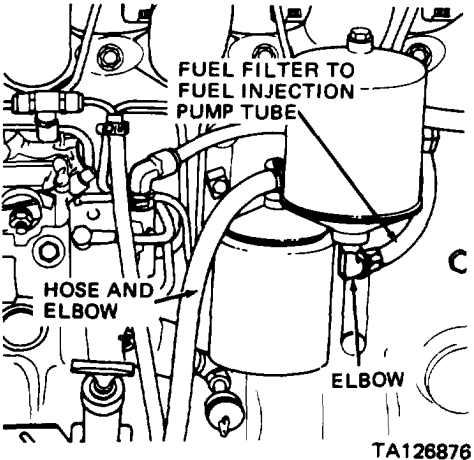


STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL/SERVICING</b>				
1	Engine compartment, right side	a. Drain plug (1) b. O-ring (2)  c. Primary falter (3) d. Bleed valve plug (4) e. O-ring (5)	Remove Remove and discard  Remove and discard Remove  Remove and discard	Place container under drain plug to drain fuel into  Use filter wrench



**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*f. Fuel Filter Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL/SERVICING (cont)</b>				
1 (cont)		f. Secondary filter (6)	Remove and discard	
		g. Stud gasket (7)	Remove and discard	
		h. Three cap screws (8) and lock washers (9)		
		i. Hose clamp, filter supply hose, and elbow	Remove	
		j. Fuel filter to injection pump tube	Disconnect	
		k. Elbow	Remove	
<b>CLEANING</b>				
		1. Filter head (10)	Remove	
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		Filter head	Clean	Use cleaning solvent P-D-680; dry thoroughly
<b>INSPECTION</b>				
3		Filter head	Inspect	Replace if cracked or threads damaged
<b>INSTALLATION</b>				
4	Engine, right side	a. Filter head	Position	On engine cylinder block

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*f. Fuel Filter Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
4 (cont)		b. Elbow c. Fuel filter to fuel injection pump tube d. Elbow, filter supply hose, and hose clamp e. Three lock washers (9) and cap screws (8) f. Stud gasket (7) g. Secondary filter (6)  h. Primary filter (3)  i. O-ring (5) j. Bleed valve plug (4) k. O-ring (2) l. Drain plug (1) m. Fuel tank shut-off valve	Install Connect  Install  Install  Position Apply clean oil to gasket then install  Apply clean oil to gasket then install  Install Install Install Install Open	In bottom hole of filter head To elbow    On filter head stud Tighten filter until gasket contacts filter head then tighten 1/2 turn. Loosen filter and retighten 1/2 to 3/4 turn to obtain proper seal Tighten filter until gasket contacts filter head then tighten 1/2 turn. Loosen filter and retighten 1/2 to 3/4 turn to obtain proper seal On bleed valve plug (4) In secondary filter (6)  On drain plug (1) In primary filter (3)
BLEEDING AIR				
5	Secondary filter (6)	Bleed valve plug (4)	Loosen	Place ignition switch in ON position and allow air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Place ignition switch in OFF position
DRAINING MOISTURE				
6	Primary filter (3)	Drain plug (1)	Loosen	Allow fuel to drain until free of water. Bleed air from filters as described above.

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*g. Fuel Strainer.*

This task covers: a. Removal/Serviceing  
b. Cleaning

c. Inspection  
d. Installation/Replacement

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph  
2-53C

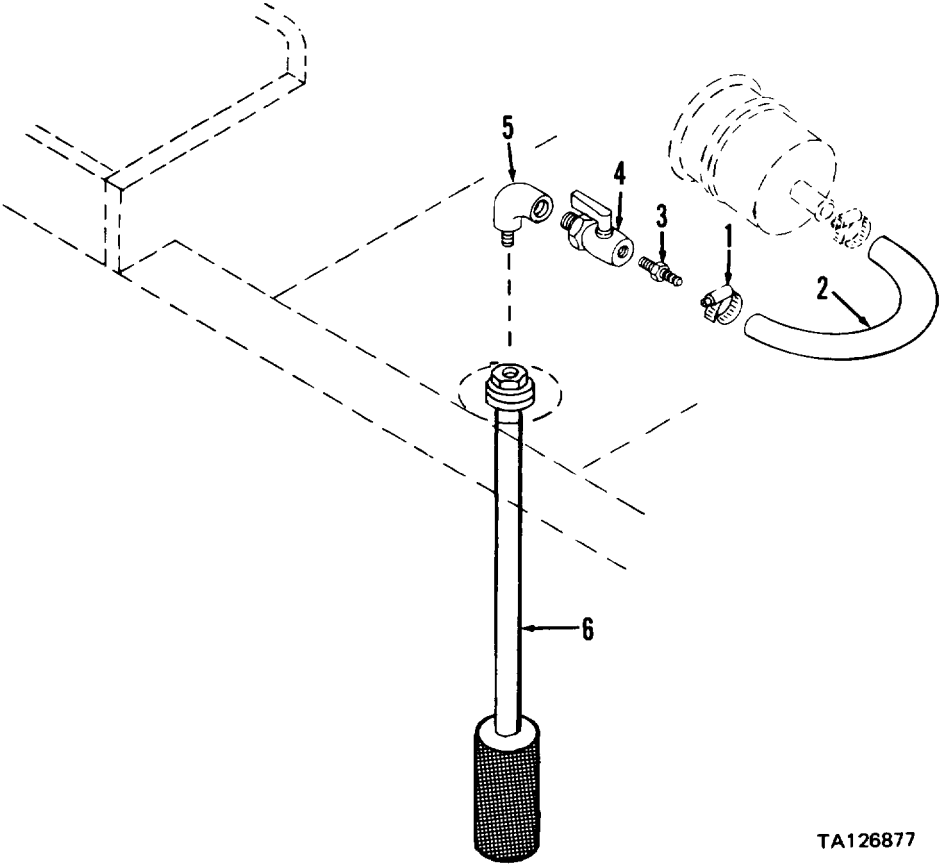
Condition Description  
Engine off.  
Right side panel removed.  
Fuel shut-off valve closed.

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
Clean cloths

**KEY**

- 1. Hose clamp
- 2. Fuel filter hose
- 3. Hose barb
- 4. Fuel shut-off valve
- 5. Elbow
- 6. Fuel strainer



TA126877

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*g. Fuel Strainer (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL/SERVICING</b>				
1.	Engine compartment, left side	a. Hose clamp (1) b. Fuel filter hose (2) c. Hose barb (3) d. Fuel shut-off valve (4) e. Elbow (5) f. Fuel strainer (6)	Remove Disconnect and cap Remove Remove Remove Remove	From hose barb (3)      From fuel tank
<b>CLEANING</b>				
<p><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water, If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<p><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
2		Fuel shut-off valve (4) and fuel strainer (6)	Clean	Use cleaning solvent P-D-680. Immerse and move slowly up and down until all foreign material is dissolved. Dry thoroughly with compressed air
3		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*g. Fuel Strainer (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
4		Fuel strainer (6)	Inspect	Replace if damaged, cracked, distorted, damaged or missing threads, or if screen is torn or deformed
5		Fuel shutoff valve (4)	Inspect	Replace if damaged, cracked, bent, distorted, missing or damaged threads or if lever rotation is difficult
6		All other parts	Inspect	Replace if damaged, cracked, worn or distorted
INSTALLATION/REPLACEMENT				
7	Engine compartment, left side	a. Fuel strainer (6)	Install	In fuel tank
		b. Elbow (5)	Install	
		c. Fuel shut-off valve (4)	Install	
		d. Hose barb (3)	Install	
		e. Fuel filler hose (2)	Uncap and connect	
		f. Hose clamp (1)	install	

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*h. Quick Start Kit.*

This task covers: a. Removal  
 b. Disassembly/Repair  
 c. Cleaning

d. Inspection  
 e. Reassembly  
 f. Installation/Replacement

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

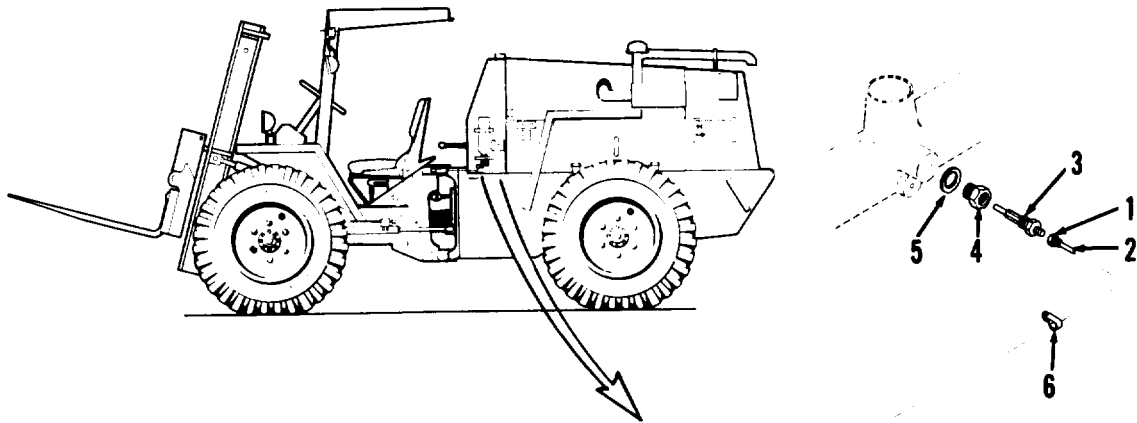
Condition Description

2-53c  
 2-53f

Engine off.  
 Left side panel removed  
 Front cover panel removed.

**MATERIALS/PARTS**

Quick start kit



**KEY**

- |                 |                      |
|-----------------|----------------------|
| 1. Nut          | 14. Cotter pin       |
| 2. Tube         | 15. Valve            |
| 3. Spray nozzle | 16. Connector        |
| 4. Adapter      | 17. Nuts             |
| 5. Washer       | 18. Lock washers     |
| 6. Clamps       | 19. Studs            |
| 7. Nut          | 20. Lock washers     |
| 8. Wing nuts    | 21. Nuts             |
| 9. Lock washers | 22. Bracket          |
| 10. Clamp       | 23. Nuts             |
| 11. Cylinder    | 24. Lock washers     |
| 12. Cap screws  | 25. Cap screws       |
| 13. Clamp       | 26. Mounting bracket |

TA126878

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*h. Quick Start Kit (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL/DISASSEMBLY/REPAIR				
1	Engine compartment, intake manifold	a. Nut (1) b. Tube (2) c. Spray nozzle (3) d. Adapter (4) e. Washer (5)	Loosen Disconnect Remove Remove Remove	
2	Engine compartment	Two clamps (6)	Remove	
3	Quick start kit	a. Nut (7) b. Tube (2) c. Two wing nuts (8) and lock washers (9) d. Clamp (10) e. Cylinder (11)	Loosen Remove Remove Remove Unscrew and remove	
<b><u>WARNING</u></b>				
Cylinder (11) contains starting fluid which is highly flammable and under pressure. Do not puncture cylinder (11) or discard in an open fire. Failure to follow this precaution could cause severe injury.				
		f. Two cap screws (12)	Remove	
		g. Clamp (13)	Remove	
		h. Cotter pin (14)	Remove	
		i. Valve (15)	Remove	
		j. Connector (16)	Unscrew and remove	
		k. Two nuts (17) and lock washers (18)	Remove	
		l. Two studs (19)	Remove	
		m. Two lock washers (20)	Remove	
		n. Two nuts (21)	Unscrew and remove from stud	
		o. Bracket (22)	Remove	
		p. Two nuts (23), lock washers (24) and cap screws (25)	Remove	
		q. Mounting bracket (26)	Remove	

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*h. Quick Start Kit (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
4		All parts	Clean	Use cleaning solvent P-D-680; dry thoroughly
INSPECTION				
5		Clamps (6, 10, and 13) and brackets (22 and 26)	Inspect	Replace if damaged
6		Tube (2)	Inspect	Replace if cracked or crushed
7		Spray nozzle (3), adapter (4), valve (15), and connector (16)	Inspect	Replace if cracked or threads damaged
8		Cylinder (11)	Inspect	Replace if cracked or dented
9		All other parts	Inspect	Replace if bent, cracked, or threads damaged
INSTALLATION/REASSEMBLY/REPLACEMENT				
10	Left side of vehicle	a. Mounting bracket (26) b. Two cap screws (25), lock washers (24) and nuts (23) c. Two nuts (21) d. Two lock washers (20) e. Bracket (22) f. Two lock washers (18) and nuts (17) g. Connector (16)	Position  Install  Install Position  Position Install  Install	   On two studs (19) On two studs ( 19)     On valve (15)



**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*h. Quick Start Kit (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REASSEMBLY/REPLACEMENT (cont)				
10 (cont)		h. Valve (15)	Position	
		i. Clamp(13)	Position	
		j. Two cap screws (12)	Install	
		k. Cotter pin (14)	Install	
		l. Cylinder (11)	Screw into valve (15)	
		m. Clamp (10)	Position	
		n. Two lock washers (9) and wing nuts (8)	Install	
		o. Tube (2)	Connect	To connector ( 16)
		p. Nut (7)	Tighten	
11	Engine compartment	a. Two clamps (6)	Install	On tube (7)
		b. Washer (5) and adapter (4)	Install	In intake manifold
		c. Spray nozzle (3)	Install	In plug (4)
		d. Tube (2)	Connect	To spray nozzle
		e. Nut (1)	Tighten	

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*i. Accelerator//Throttle Control.*

This task covers: a. Removal  
b. Cleaning  
c. Inspection

d. Installation/Replacement  
e. Adjustment

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

2-53c

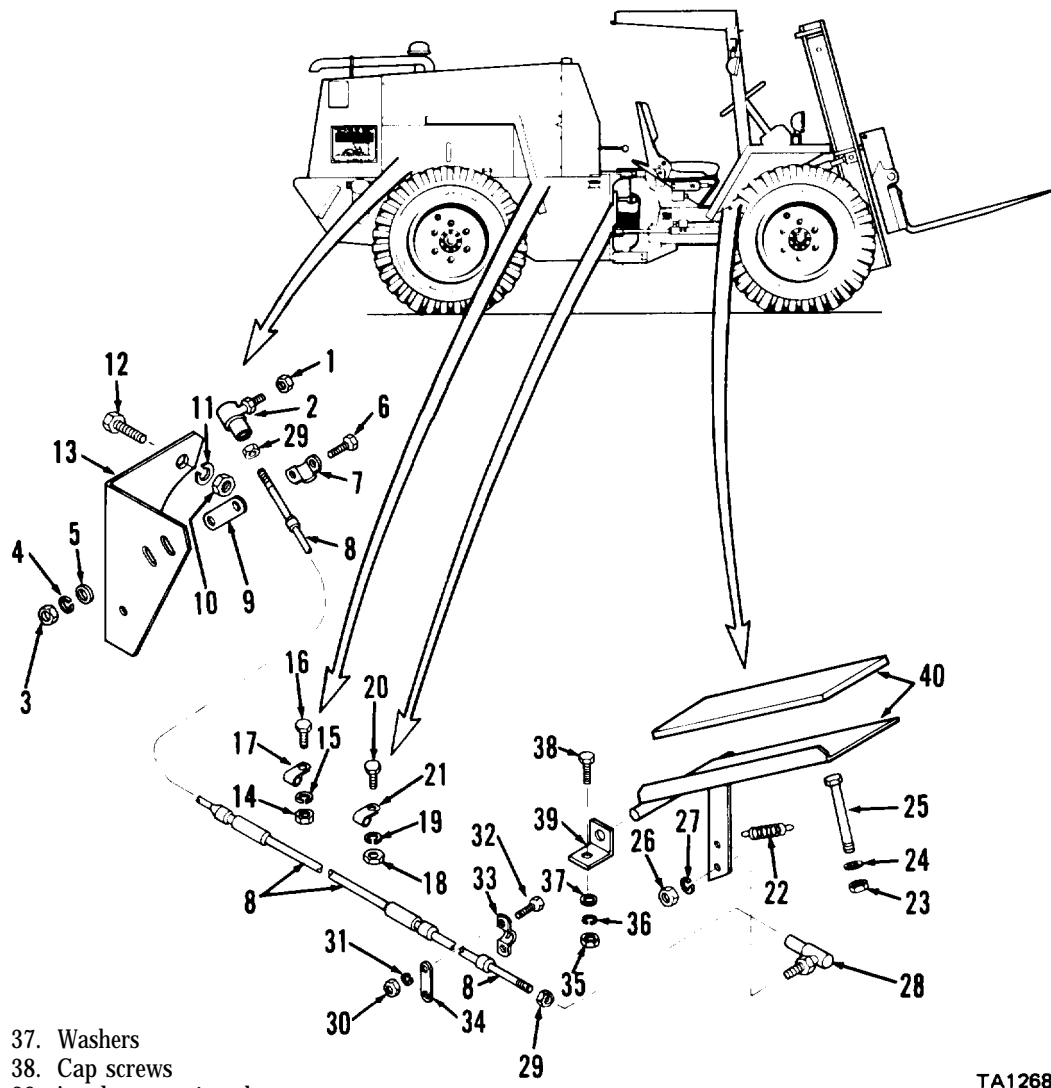
Engine off and parking brake applied.  
Left side panel removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

KEY

- 1. Nut
- 2. Ball joint
- 3. Nuts
- 4. Lock washers
- 5. Washers
- 6. Cap screws
- 7. Clamp
- 8. Accelerator cable
- 9. Spacer
- 10. Nuts
- 11. Lock washers
- 12. Cap screws
- 13. Bracket
- 14. Nut
- 15. Lock washers
- 16. Cap screw
- 17. Clamp
- 18. Nut
- 19. Lock washer
- 20. Cap screw
- 21. clamp
- 22. Throttle return spring
- 23. Nut
- 24. Washer
- 25. Cap screw
- 26. Nuts
- 27. Lock washer
- 28. Ball joint
- 29. Nut
- 30. Nuts
- 31. Lock washers
- 32. Cap screws
- 33. Clamp
- 34. Spacer
- 35. Nuts
- 36. Lock washers
- 37. Washers
- 38. Cap screws
- 39. Accelerator pivot bases
- 40. Accelerator pedal



TA126879

**2-15. FUEL SYSTEM MAINTENANCE (cont)***i. Accelerator/Throttle Control (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Engine compartment	a. Nut (1)	Remove	From fuel injection pump throttle lever
		b. Ball joint (2)	Disconnect and remove	
		c. Two nuts (3), lock washers (4), washers (5), and cap screws (6)	Remove	
		d. Clamp (7)	Remove	From clamp (7)
		e. Accelerator cable (8)	Disengage	
		f. Spacer (9)	Remove	
		g. Four nuts (10), lock washers (11), and cap screws (12)	Remove	
		h. Bracket (13)	Remove	
		i. Nut (14), lock washer (15), and cap screw (16)	Remove	
		j. Clamp (17)	Remove	
		k. Nut (18), lock washer (19), and cap screw (20)	Remove	
		l. Clamp (21)	Remove	
2	Front floor plate, bottom	Throttle return spring (22)	Remove	
3	Front floor plate	Nut (23), washer (24) and cap screw (25)	Remove	From front floor plate
4	Operator's compartment, bottom	a. Two nuts (26) and lock washer (27)	Remove	
		b. Ball joint (28)	Disconnect and remove	
		c. Nut (29)	Remove	
		d. Two nuts (30), lock washers (31), and cap screws (32)	Remove	
		e. Clamp (33) and spacer (34)	Remove	

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*i. Accelerator/Throttle Control (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
4 (cont)			<b>NOTE</b>	
		Accelerator cable (8) can now be removed from vehicle.		
		f. Two nuts (35), lock washers (36), washers (37) and cap screws (38)	Remove	
		g. Two accelerator pivot bases (39)	Remove	
		h. Accelerator pedal (40)	Remove	
CLEANING				
5		Accelerator cable (8)	Clean	Use clean diesel fuel
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
6		All other parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
7		Accelerator cable (8)	Inspect	Replace if cracked, split, damaged, worn or threads damaged
8		Throttle return spring (22)	Inspect	Replace if deformed or permanently set
9		All other parts	Inspect	Replace if cracked, damaged, worn or threads damaged
INSTALLATION/REPLACEMENT				
10	Operator's compartment	a. Accelerator pedal (40)	Position	

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*i. Accelerator/Throttle Control (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
10 (cont)		b. Two accelerator pivot bases (39)	Position	One on each end of pedal (40)
		c. Two cap screws (38), washers (37), lock washers (36), and nuts (35)	Install	
		d. Clamp (33)	Position	On accelerator cable (8)
		Two cap screws (32)	Position	On clamp (33)
		f. Spacer (34)	Position and install	On two cap screws (32)
		g. Two lock washers (31) and nuts (30)	Install	
		h. Nut (29)	Install	
		i. Ball joint (28)	Install and connect	Thread onto cable (8); connect to pedal (40)
		j. Lock washer (27) and two nuts (26)	Install	
		k. Washer (24) and nut (23)	Install	On cap screw (25)
11	Front floor plate	Cap screw (25)	Install	Install so cap screw projects 1-inch from top of plate
12	Front floor plate, bottom	Throttle return spring (22)	Install	Hook one end of spring (22) on accelerator pedal (40) and other end on spring attachment plate on floor plate
13	Engine compartment	a. Two clamps (17 and 21)	Position	On accelerator cable (8)
		b. Two cap screws (16 and 20), lock washers (15 and 19), and nuts (14 and 18)	Install	
		c. Bracket (13)	Position	
		d. Four cap screws (12), lock washers (11) and nuts (10)	Install	
		e. Clamp (7)	Position	On accelerator cable (8)
		f. Two cap screws (6)	Position	On clamp (7)
		g. Spacer (9)	Position and install	On two cap screws (6)

**2-15. FUEL SYSTEM MAINTENANCE (cont)**

*i. Accelerator/Throttle Control (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
13 (cont)		h. Two washers (5), lock washers (4), and nuts (3)	Install	
		i. Ball joint (2)	Install	On accelerator cable (8) then connect to fuel injection pump throttle lever
		j. Nut (1)	Install	
adjustment				
4	Engine compartment	a. Nut(1) b. Ball joint (2) c. Ball joint (2)	Remove Disconnect Adjust and connect	From fuel injection pump throttle lever Adjust for minimum slack in accelerator cable by threading further onto cable (8); increase slack by threading out of accelerator cable. Tighten nut (29)
<b>NOTE</b>				
When connecting ball joint (2) to throttle lever be sure you don't move throttle lever.				
Connect to throttle lever; if all slack in cable has been removed, reinstall nut (1)				
<b>NOTE</b>				
If too much or not enough slack in accelerator cable, perform step 15.				
5	Operator's compartment	a. Two nuts (26) and lock washer (27) b. Ball joint (28) c. Ball joint (28)	Remove  Disconnect Adjust and connect	From accelerator pedal (40) Adjust for minimum slack in accelerator cable by threading further onto cable (8); increase slack by threading out of accelerator cable. Tighten nut (29)
<b>NOTE</b>				
When connecting ball joint (28) to accelerator lever, be sure you don't move throttle lever.				
Connect to accelerator pedal and check slack; if too much or too little slack, repeat above adjustment. Reinstall two nuts (26) and lock washer (27). Repeat step 14 if necessary.				

**2-16. SPARK ARRESTING MUFFLER AND EXHAUST PIPE MAINTENANCE**

This task covers: a. Periodic cleaning  
 b. Removal  
 c. Cleaning

d. Inspection  
 e. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION  
 Paragraph

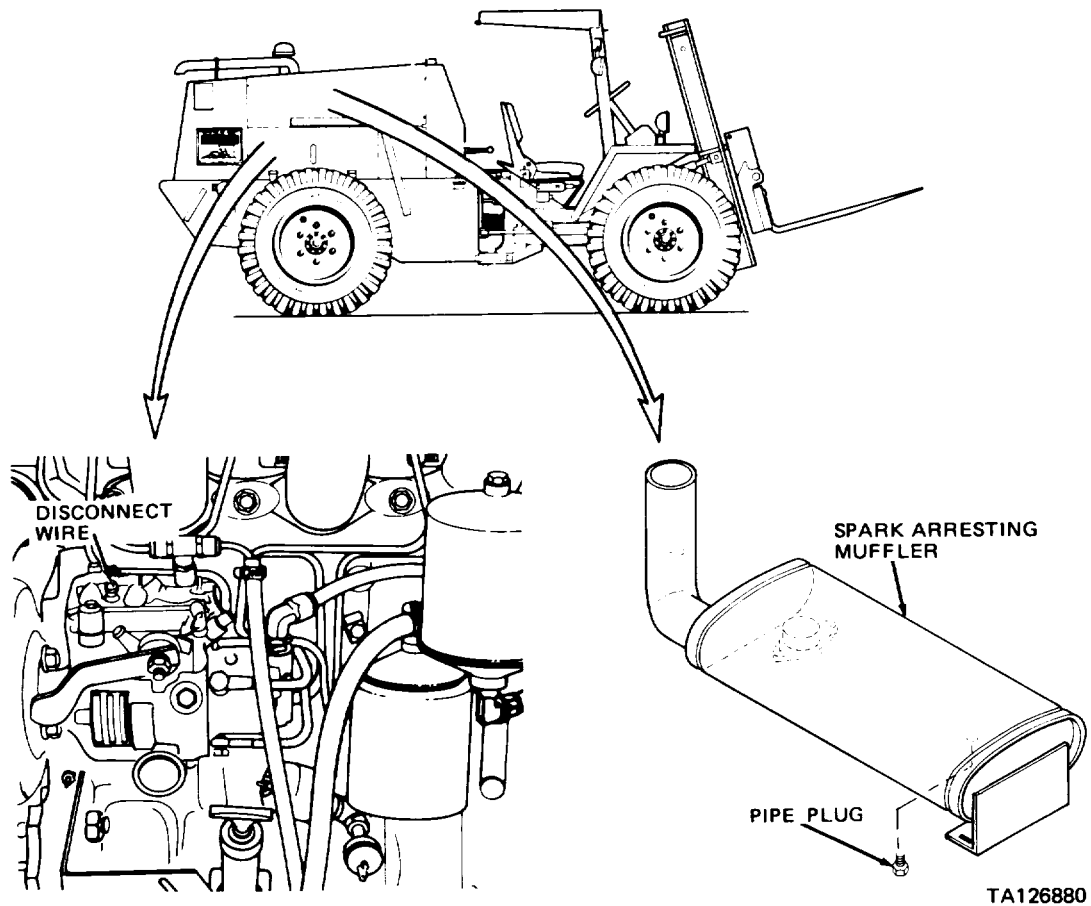
Condition Description  
 Engine off, parking brake set, and transmission direction selector in N position.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Tarpaulin  
 Gasket

2-53c

Right side panel removed.

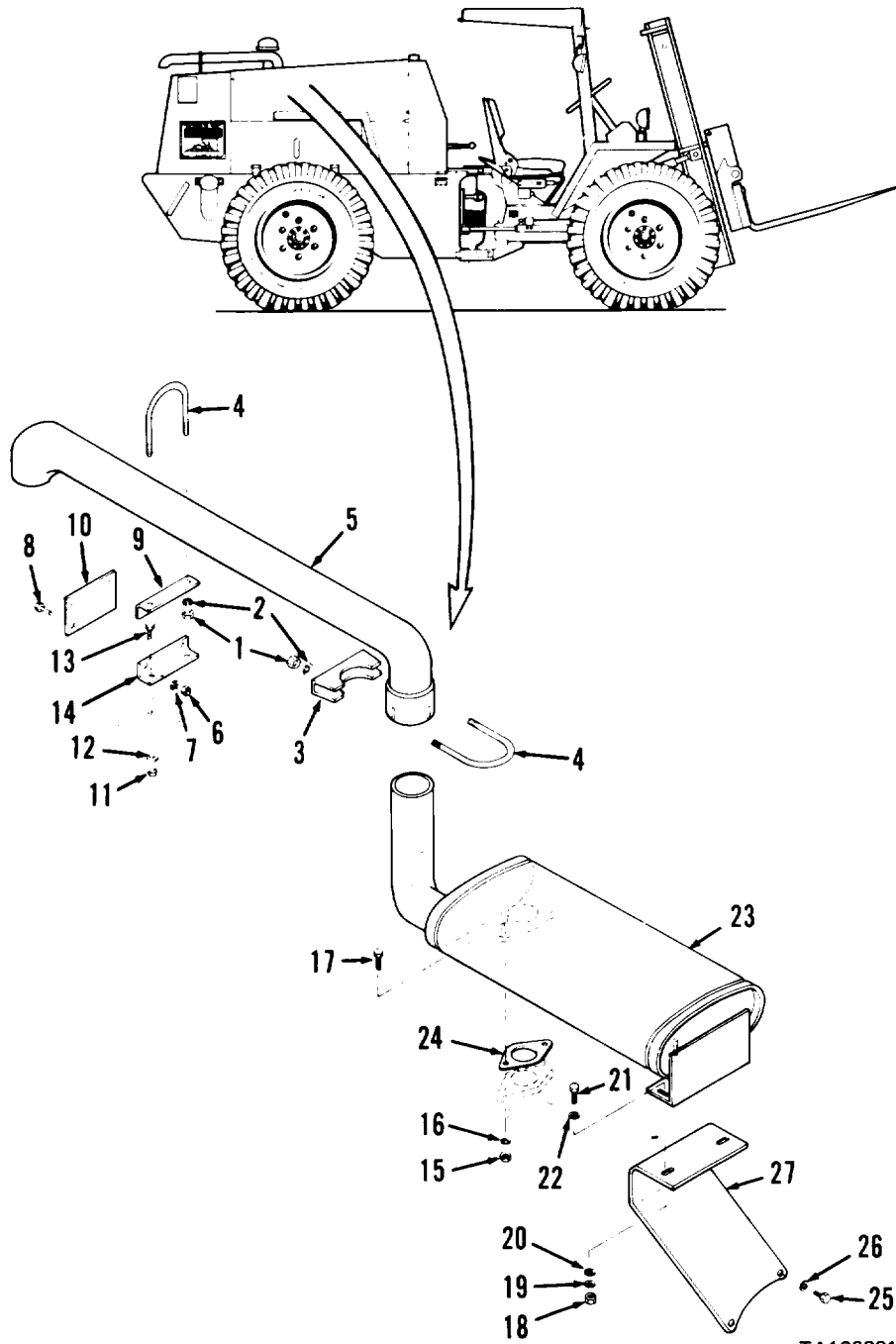


**2-16. SPARK ARRESTING MUFFLER AND EXHAUST PIPE MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
PERIODIC CLEANING				
1	Engine compartment	a. Pipe plug b. Fuel injection pump terminal wire	Remove Disconnect	
2	Rear of vehicle	Flat piece of wood	Hold	Against exhaust pipe outlet; remove after step 3 is completed
3	Operator's compartment	a. IGNITION switch	Place in ON position	
<b>NOTE</b>				
Place tarpaulin on engine to protect it from soot in following step. Be sure tarpaulin is not interfering with fan blades.				
<b><u>WARNING</u></b>				
Be sure you have applied parking brake and placed transmission direction selector in N position to prevent injury to personnel.				
		b. START pushbutton	Depress and hold for 30 seconds	Loose soot will be expelled through pipe hole in bottom of muffler
		c. IGNITION switch	Place in OFF position	
4	Engine compartment	a. Fuel injection pump terminal wire b. Pipe plug	Connect Reinstall	
REMOVAL				
5	Top of vehicle	a. Four nuts(1) and lock washers (2) b. Two clamps (3) C. Two U bolts (4) d. Exhaust pipe (5) e. Top hood	Remove Remove Remove Remove Remove	Para 2-53d
6	Radiator shroud, top	a. Four nuts (6) b. Four lock washers (7)	Remove Remove	



**2-16. SPARK ABRESTING MUFFLER AND EXHAUST PIPE MAINTENANCE (cont)**



**KEY**

- 1. Nuts
- 2. Lock washers
- 3. Clamps
- 4. U bolts
- 5. Exhaust pipe
- 6. Nuts
- 7. Lock washers
- 8. Cap screws
- 9. Bracket
- 10. support
- 11. Nuts
- 12. Lock washers
- 13. Cap screws
- 14. Bracket
- 15. Nuts
- 16. Lock washers
- 17. Cap screws
- 18. Nuts
- 19. Lock washers
- 20. Washers
- 21. Cap screws
- 22. Washers
- 23. Muffler
- 24. Gasket
- 25. Cap screws
- 26. Lock washers
- 27. Bracket

TA126881

**2-16. SPARK ARRESTING MUFFLER AND EXHAUST PIPE MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
6 (cont)		c. Four cap screws (8)	Remove	
		d. Bracket (9)	Remove	
		e. Support (10)	Remove	
		f. Two nuts (11), lock washers (12), and cap screws (13)	Remove	
		g. Bracket (14)	Remove	
7	Engine compartment	a. Two nuts (15) and lock washers (16)	Remove	
		b. Two cap screws (17)	Remove	
		c. Two nuts (18), lock washers (19) and washers (20)	Remove	
		d. Two cap screws (21) and washers (22)	Remove	
		e. Muffler (23)	Remove	
		f. Gasket (24)	Remove and discard	
		g. Two cap screws (25) and lock washers (26)	Remove	
		h. Bracket (27)	Remove	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

**2-16. SPARK ARRESTING MUFFLER AND EXHAUST PIPE MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
8		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air. Remove rust with stiff wire brush
INSPECTION				
9		All parts	Inspect	Replace if cracked, damaged, worn, dented, or threads damaged
INSTALLATION/REPLACEMENT				
10	Engine compartment	a. Bracket (27) b. Two lock washers (26) and cap screws (25) c. Gasket (24) d. Muffler (23) e. Two washers (22) and cap screws (21) f. Two washers (20), lock washers (19) and nuts (18) g. Two cap screws (17), lock washers (16) and nuts (15)	Position Install  Position Position Install  Install  Install	
11	Radiator shroud, top	a. Bracket ( 14) b. Two cap screws (13), lock washers (1 2), and nuts (11) c. Support (10) and bracket (9) d. Four cap screws (8), lock washers (7), and nuts (6)	Position Install  Position  Install	
12	Top of vehicle	a. Top hood b. Exhaust pipe (5) c. Two U bolts (4) d. Two clamps (3) e. Four lock washers (2) and nuts (1)	Install Install  Position Position Install	Para 2-53d

**2-17. COOLING SYSTEM MAINTENANCE**

*a. Radiator Servicing.*

This task covers radiator servicing.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle on level surface, parking brake applied, engine warm, and turned off. Left and right side panels removed.

MATERIALS/PARTS

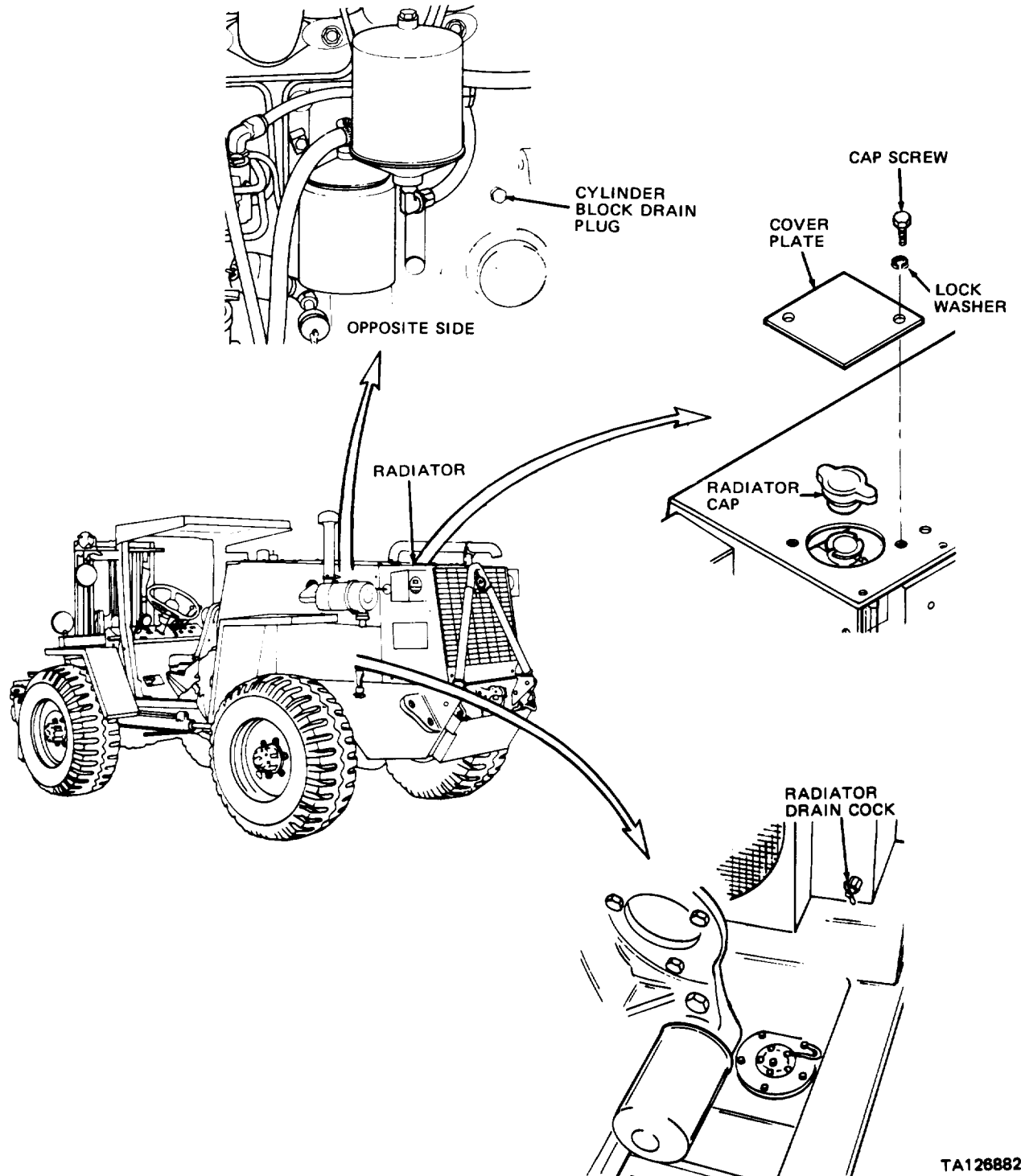
Two gallons ethylene glycol

2-53c

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>SERVICING</b>				
1	Top, rear of vehicle	a. Two cap screws, lock washers and cover plate	Remove	
<b><u>WARNING</u></b>				
Remove radiator cap slowly to release pressure before completely removing when engine is hot.				
		b. Radiator cap	Remove	
2	Engine compartment left, rear	Radiator drain cock	Open, drain coolant; then close	
3	Engine compartment, plug right, middle	Cylinder block drain plug	Remove, drain coolant, then reinstall	
4	Top, rear of vehicle	a. Radiator	a. Fill and flush cooling system	Use clean water or chemical cooling system cleaner
<b>NOTE</b>				
To flush with water, fill radiator with water and operate engine for 15 minutes. Drain system completely. Close radiator drain cock and reinstall cylinder block drain plug.				

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*a. Radiator Servicing (cont)*



**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*a. Radiator Servicing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
SERVICING (cont)				
4 (cont)	<b><u>WARNING</u></b>			
		Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.		
			b. Clean	Use compressed air to clean exterior and to remove foreign matter obstructing passage of air through radiator
			c. Fill	Use solution of 50 percent water and 50 percent ethylene glycol. Capacity is 16 quarts. Fill with coolant solution to two inches below level of radiator cap opening
	b. Radiator cap		a. Install	Operate engine for 15 minutes. Check for coolant leaks at drain plug and drain cock; tighten if necessary
			b. Remove and reinstall	Check coolant level, add if necessary
	c. Coolant recovery tank		a. Remove cap	Fill recovery tank half full with solution of 50 percent water and 50 percent ethylene glycol
			b. Install cap Position Install and tighten	On radiator shroud Until cover plate is securely mounted
	d. Cover plate e. Two lock washers and cap screws			

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*b. Hoses.*

This task covers: a. Removal

b. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

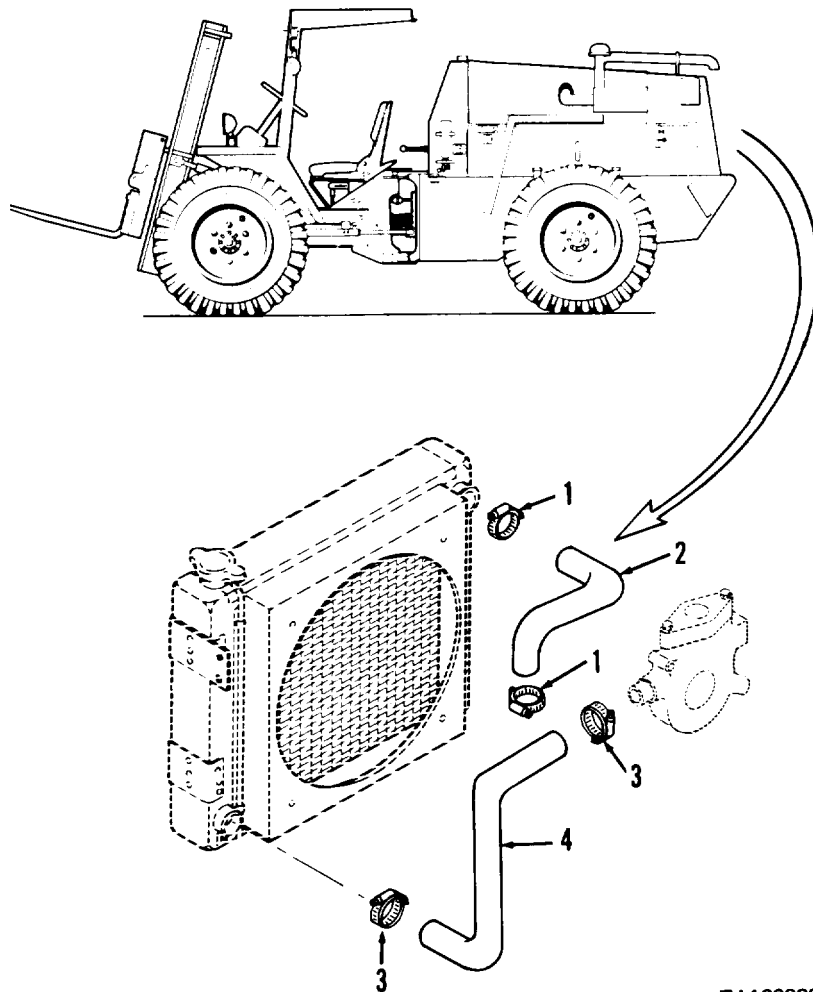
Vehicle on level surface and parking brake applied.

MATERIALS/PARTS

Two gallons ethylene glycol

2-17a

Radiator drained.



KEY

- 1. Hose clamps
- 2. Upper radiator hose
- 3. Hose clamps
- 4. Lower radiator hose

TA126883

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*b. Hoses (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment rear, left side of vehicle	a. Two hose clamps (1) b. Upper radiator hose (2)	Loosen Remove	Both ends
2	Engine compartment rear, right side of vehicle	a. Two hose clamps (3) b. Lower radiator hose (4)	Loosen Remove	Both ends
<b>INSTALLATION/REPLACEMENT</b>				
3	Engine compartment rear, right side of vehicle	a. Two hose clamps (3) b. Lower radiator hose (4) c. Two hose clamps (3)	Position Install Tighten	Both ends of hose (4) Both ends Both ends
4	Engine compartment rear, left side of vehicle	a. Two hose clamps (1) b. Upper radiator hose (2) c. Two hose clamps (1)	Position Install Tighten	Both ends of hose (2) Both ends Both ends



**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*c. Radiator and Shroud*

This task covers: a. Removal  
b. Disassembly  
c. Cleaning

d. Inspection  
e. Reassembly  
f. Installation/Replacement

**PERSONNEL REQUIRED**

Two maintenance technicians

**INITIAL SETUP**

**TOOLS**

Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

**EQUIPMENT CONDITION**

Paragraph Condition Description

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
Clean cloths  
Radiator mounts

2-17a Cover plate and radiator cap removed, and radiator and engine drained.  
2-17b Radiator hoses removed.  
2-38g Transmission oil cooler removed

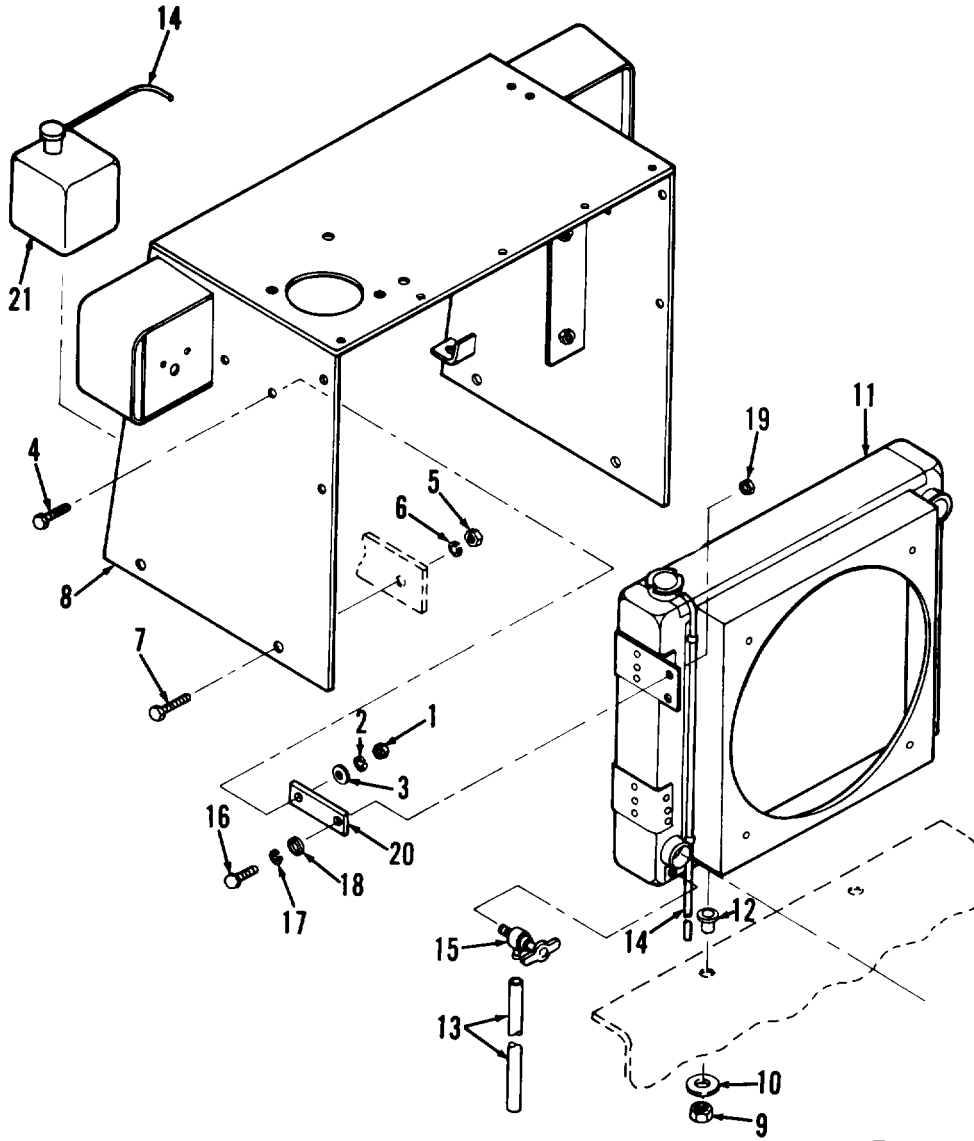
**NOTE**

Removal of fan (para 2-17f) may be necessary.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Rear chassis	a. Two rear black-out lights	Tag and disconnect leads from wiring harness	
		b. Overflow hose (14)	Disconnect	From reservoir (21)
		c. Coolant reservoir (21)	Remove	Lift from vehicle
		d. Two nuts (1), lock washers (2), washers (3) and cap screws (4)	Loosen and remove	
		e. Four nuts (5), lock washers (6) and cap screws (7)	Loosen and remove	
		f. Two cap screws, nuts, lock washers, and harness clamps	Remove	Located at top of shroud
		g. Radiator shroud (8)	Remove	Use sling and hoist to lift from vehicle
		h. Two nuts (9) and snubbing washers (10)	Loosen and remove	Support radiator

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*c. Radiator and Shroud (cont).*



TA126884

**KEY**

- |                 |                      |                       |
|-----------------|----------------------|-----------------------|
| 1. Nuts         | 8. Radiator shroud   | 15. Drain valve       |
| 2. Lock washers | 9. Nuts              | 16. Cap screws        |
| 3. Washers      | 10. Snubbing washers | 17. Lock washers      |
| 4. Cap screws   | 11. Radiator         | 18. Washers           |
| 5. Nuts         | 12. Mounts           | 19. Nuts              |
| 6. Lock washers | 13. Drain hose       | 20. Straps            |
| 7. Cap screws   | 14. Overflow hose    | 21. Coolant reservoir |

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*c. Radiator and Shroud (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<b><u>CAUTION</u></b>				
1 (Cont)		Exercise care when removing radiator (11). Do not allow radiator fins to be damaged by engine fan or other parts during removal.		
		i. Radiator (11) j. Two mounts(12)	Remove Remove and discard as required	Carefully lift from vehicle
DISASSEMBLY				
2	Radiator (11)	a. Drain hose (13) b. Overflow hose (14)	Remove Remove	Pull from valve (15) Unclip from radiator and pull from fitting at filler neck
<b><u>NOTE</u></b>				
Disassemble remaining parts only if required for replacement.				
		c. Drain valve (15) d. Two cap screws (16), washers (17 and 18) and nuts (19) e. Two straps (20)	Loosen and remove Loosen and remove Remove	Support strap (20)
CLEANING				
3		Hoses (13 and 14) and coolant reservoir (21)	Clean	Wipe with clean, damp cloth
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*c. Radiator and Shroud (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3 (Cont)			<b><u>WARNING</u></b>	
				Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.
4		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
INSPECTION				
5		Radiator shroud (8)	Inspect	Repair broken welds and cracks by welding (notify direct support maintenance)
6		Hoses (13 and 14) and reservoir (21)	Inspect	Replace if cracked, split or deteriorated
7		Straps (20)	Inspect	Replace if cracked or distorted
8		Drain valve (15)	Inspect	Replace if threads damaged, or if valve obstructed or damaged
9		All hardware	Inspect	Replace if worn, or if threads damaged
10		Radiator (11)	Inspect cooling fins and core	Straighten bent fins, using care not to damage core. Repair leaking core tubes by soldering (notify direct support maintenance)
REASSEMBLY				
11	Radiator (11)	a. Strap (20) b. Nut (19), cap screw (16) and washers (17 and 18) c. Drain valve(15) d. Overflow hose (14) e. Drain hose (13)	Position Install and tighten  Install and tighten Install Install	Tighten hand-tight only  Until valve opening faces bottom of radiator (11) Push on filler neck fitting and clips Push on valve opening
INSTALLATION/REPLACEMENT				
12	Rear chassis	a. Two new mounts (12)	Install	In top of radiator mounting holes when required

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*c. Radiator and Shroud (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
12 (cont)	<b><u>CAUTION</u></b>			
Exercise care when installing radiator (11). Do not allow radiator fins to be damaged by engine fan or other parts during installation.				
		b. Radiator (11)	Install	Carefully lower onto mounts (12)
		c. Two snubbing washers (10) and nuts (9)	Install and tighten	Tighten nut (9) until mount (12) expands equally at top and bottom of frame member
		d. Radiator shroud (8)	Position	Use sling and hoist to lower onto vehicle
		e. Four cap screws (7), lock washers (6) and nuts (5)	Install and tighten	Until radiator guard is securely mounted
		f. Two cap screws (4), washers (3), lock washers (2) and nuts (1)	Install and tighten	Tighten to 20-30 pounds foot torque
		g. Two cap screws (16) and nuts (19)	Tighten	Tighten to 20-30 pounds foot torque
		h. Coolant reservoir (21)	Install	
		i. Overflow hose (14)	Install	Push on reservoir cap fitting
		j. Two cap screws, nuts, lock washers, and harness clamps	Install	Located at top of shroud
		k. Two rear black-out lights	Connect	To wiring harness
		l. Fan	Install if removed	Para 2-17f

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*d. Thermostat and Housing.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Testing  
 e. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

2-53c

Side panels removed.

2-17a

Radiator drained.

2-17b

Upper radiator hose removed.

MATERIAL/PARTS

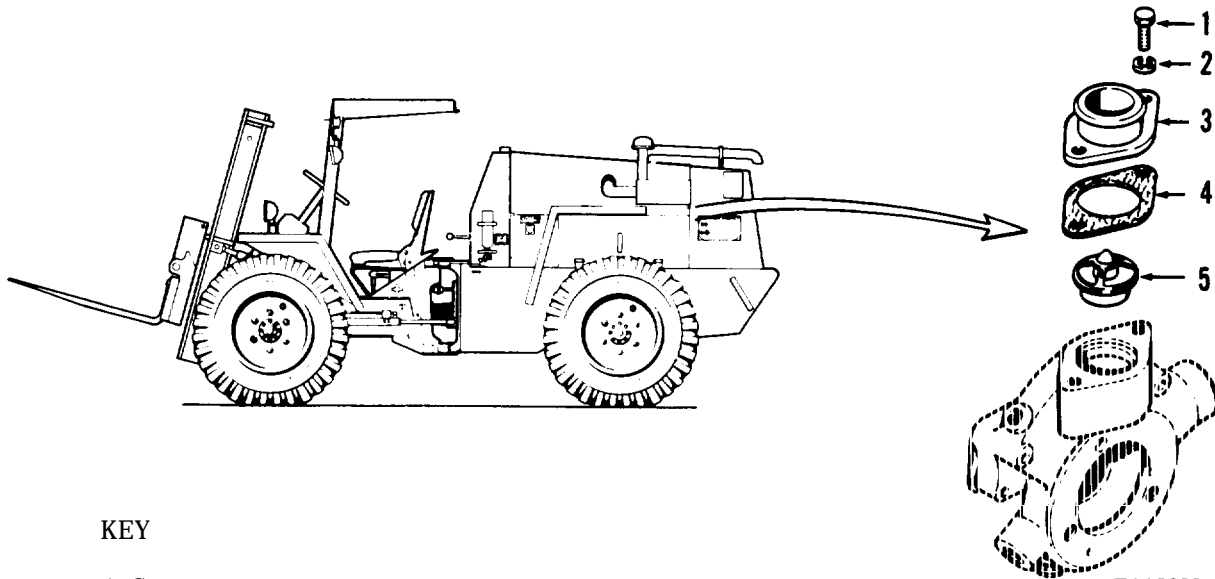
Cleaning solvent P-D-680

Hot water

Glass container

Thermometer

Gasket



KEY

- 1. Cap screws
- 2. Lock washers
- 3. Housing
- 4. Gasket
- 5. Thermostat

TA126885

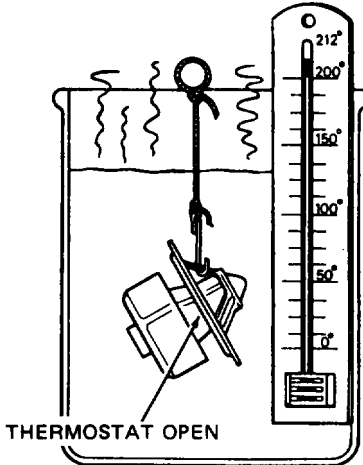
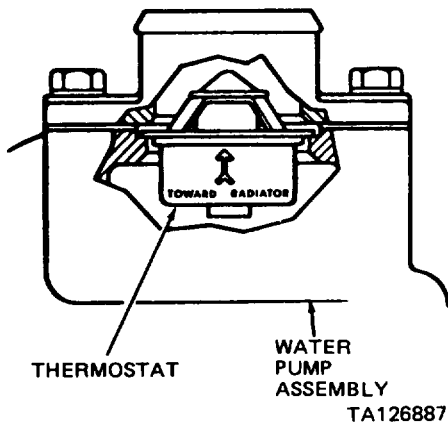
**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*d. Thermostat and Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment	a. Two cap screws (1) and lock washers (2)	Remove	
		b. Housing (3)	Remove	
		c. Gasket (4)	Remove and discard	
		d. Thermostat (5)	Lift out and remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air. Remove all gasket material from housing and water pump mating surfaces
<b>INSPECTION</b>				
3		All parts	Inspect	Replace if cracked, damaged, or damaged threads
<b>TESTING</b>				
4		Thermostat (5)	Test	Submerge in hot (175°) water with thermometer. Heat water. Thermostat shall just start to open between 175-182 degrees F and be completely open at 202 degrees F. Remove and dry with compressed air. Replace thermostat if it does not meet specification

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*d. Thermostat and Housing (cont)*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
4 (Cont)				
INSTALLATION/REPLACEMENT				
5		a. Thermostat (5)	Install	
		b. Gasket (4) c. Housing (3) d. Two lock washers (2) and cap screws (1)	Install Position Install	Tighten to 35-42 pounds foot torque



**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*e. Water Pump Assembly.*

This task covers: a. Removal

b. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

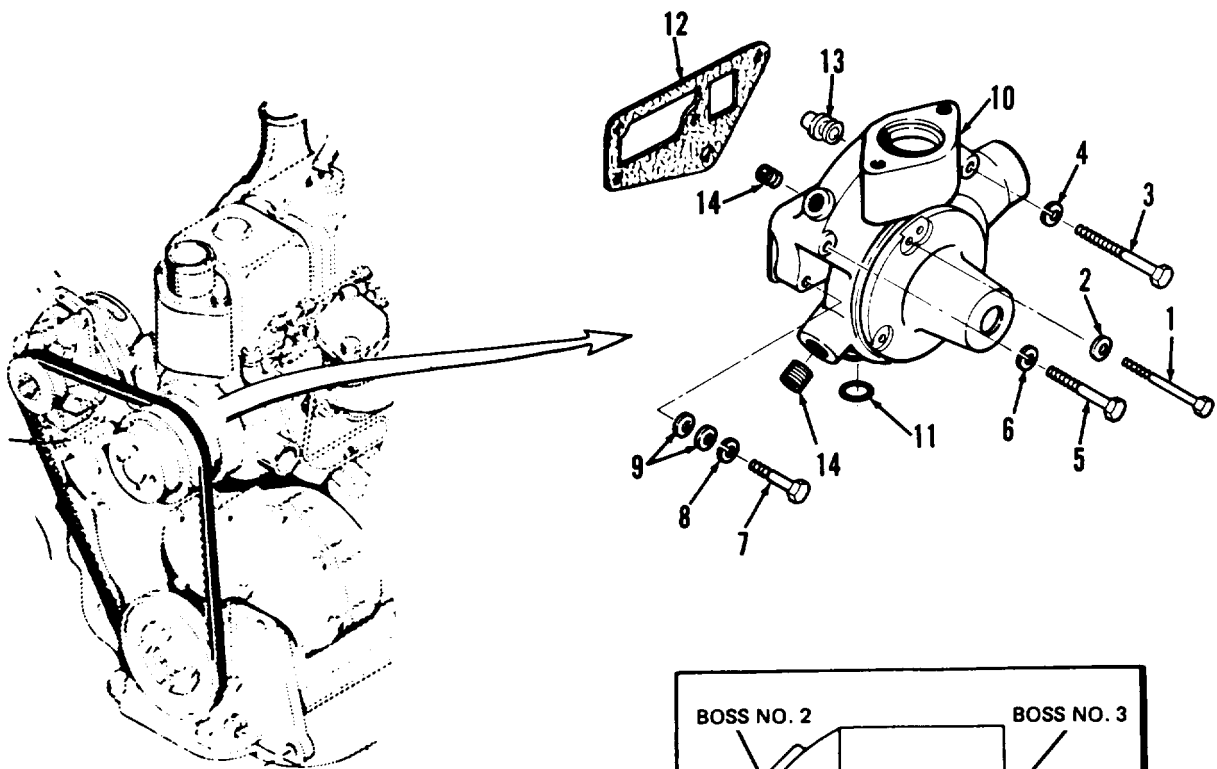
NSN 4910-00-754-0654

MATERIALS/PARTS

Gasket  
O-ring  
Lubriplate

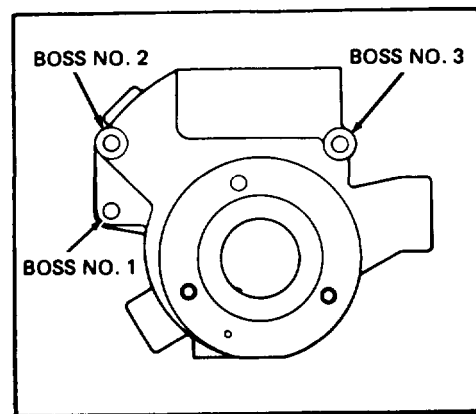
EQUIPMENT CONDITION

Paragraph	Condition Description
2-53c	Side panels removed.
2-17a	Radiator drained
2-17b	Hoses disconnected and removed.
2-17d	Thermostat and housing removed.
2-17f	Fan and drive belt removed.



KEY

- |                   |                         |
|-------------------|-------------------------|
| 1. Cap screw      | 8. Lock washer          |
| 2. Sealing washer | 9. Washers              |
| 3. Cap screw      | 10. Water pump assembly |
| 4. Lock washer    | 11. O-ring              |
| 5. Cap screw      | 12. Gasket              |
| 6. Lock washer    | 13. Inlet fitting       |
| 7. Cap screw      | 14. Pipe plugs          |

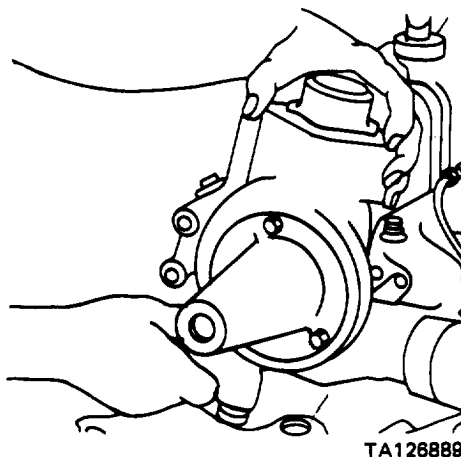


TA126888

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

e. *Water Pump Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine, rear	a. Cap screw (1) and sealing washer (2)	Remove	
		b. Cap screw (3) and lock washer (4)	Remove	
		c. Cap screw (5) and lock washer (6)	Remove	Move alternator mounting strap out of way
		d. Cap screw (7), lock washer (8) and two washers (9)	Remove	
		e. Water pump assembly (10)	Remove	
		f. O-ring(11)	Remove	Discard
		g. Gasket (12)	Remove	Discard
		h. Inlet fitting (13)	Loosen and remove	If required for replacement
		i. Two pipe plugs (14)	Loosen and remove	If required for replacement
		<b>INSTALLATION/REPLACEMENT</b>		
2	Engine, rear	a. Two pipe plugs (14)	Install and tighten	If removed
		b. Inlet fitting (13)	Install and tighten	If removed
		c. Gasket (12)	Install	Be sure all old gasket material is removed from mounting surface



**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*e. Water Pump Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
2 (cont)		d. O-ring (11)	Install	
		e. Water pump assembly (10)	Position	On cylinder head and timing gear housing
		f. Two washers (9) lock washer (8), and cap screw (7) (2-1/4 inches long)	Install	In boss no. 1
		g. Lock washer (6) and cap screw (5) (3 inches long)	Install	Position alternator mounting strap, then install in boss no. 2
		h. Lock washer (4) and cap screw (3) (2-3/4 inches long)	Install	In boss no. 3
		i. Cap screws (3, 5, and 7)	Tighten	To 35-42 pounds foot torque
		j. Sealing washer (2) and cap screw (1)	Install	Tighten to 35-42 pounds foot torque

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*f. Fan and Belt.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Installation/Replacement  
 e. Adjustment

INITIAL SETUP

TOOLS

No. 1 Common Organization-  
 al Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph  
 2-53c

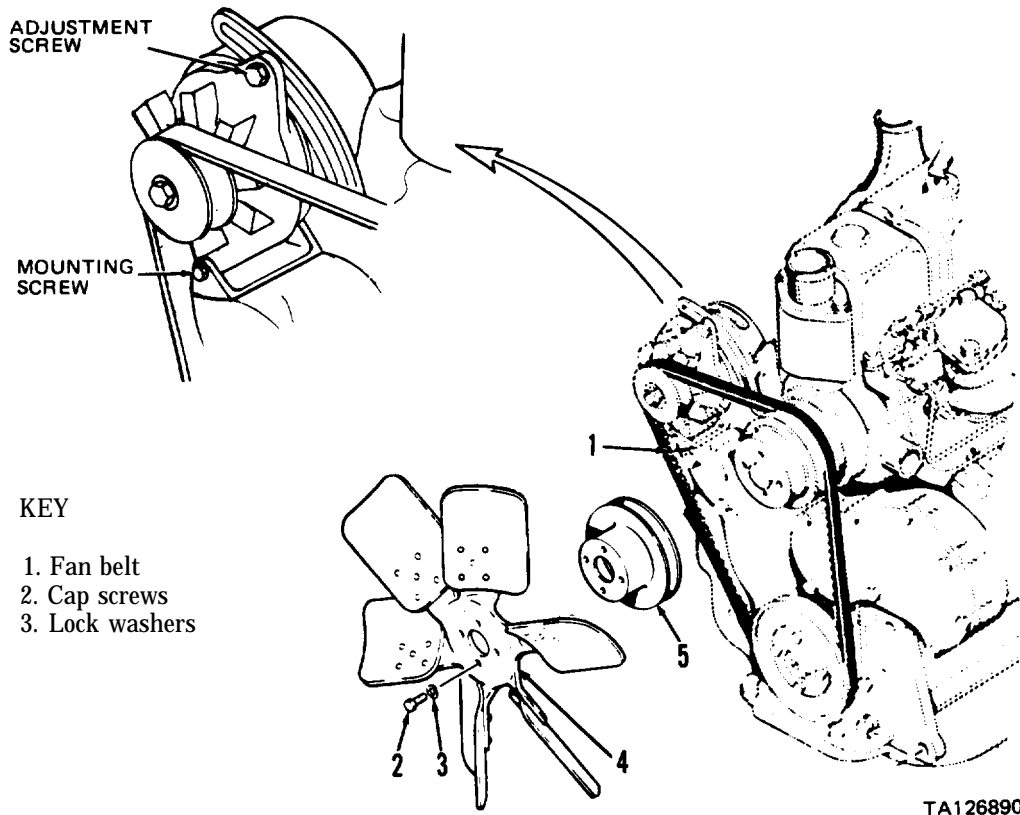
Condition Description  
 Side panels removed

MATERIALS/PARTS

None

NOTE

Removal or adjustment of fan belt requires removal of left side panel only.



TA126890

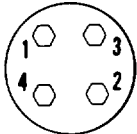
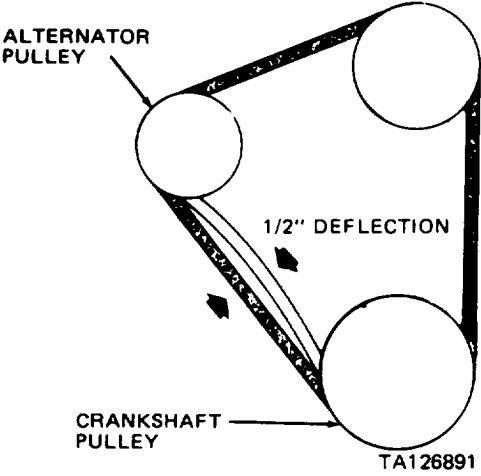
**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*f. Fan and Belt (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Alternator	a. Adjustment screw and mounting screw	Remove	
		b. Alternator	Remove	
		c. Fan belt (1)	Remove	
2	Engine	a. Four cap screws (2) and lock washers (3)	Remove	
		b. Fan blade assembly (4)	Remove	
		c. Water pump pulley (5)	Remove	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
3		All parts	Clean	Use cleaning solvent P-D-680; dry thoroughly
INSPECTION				
4		Fan belt (1)	Inspect	Replace if cracked, ruptured, or worn
5		Fan blade assembly (4)	Inspect	Replace if blades are cracked, bent or broken
6		Water pump pulley (5)	Inspect	Replace if bent, cracked, or mounting holes damaged
INSTALLATION/REPLACEMENT				
7	Engine	a. Water pump pulley (5)	Position	On water pump assembly
		b. Fan blade assembly (4)	Position	On water pump pulley

**2-17. COOLING SYSTEM MAINTENANCE (cont)**

*f. Fan and Belt (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
7 (cont)		c. Four lock washers (3) and cap screws (2)	Install	Tighten in sequence shown below  
		d. Fan belt(l)	Install	TA301520
8	Alternator	a. Alternator b. Adjustment screw and mounting screw	Install Install	
FAN BELT ADJUSTMENT				
9	Engine	Fan belt (1)	Depress	Belt should deflect 1/2 inch as shown  
10	Alternator	a. Adjustment screw and mounting screw	Loosen	
		b. Alternator	Position	Move toward engine to loosen fan belt or away from engine to tighten; use pry bar if necessary
		c. Adjustment screw and mounting screw	Tighten	When proper deflection of fan belt is obtained (step 9 above)

**2-18. GAGES MAINTENANCE**

*a. Gage Bulb Replacement.*

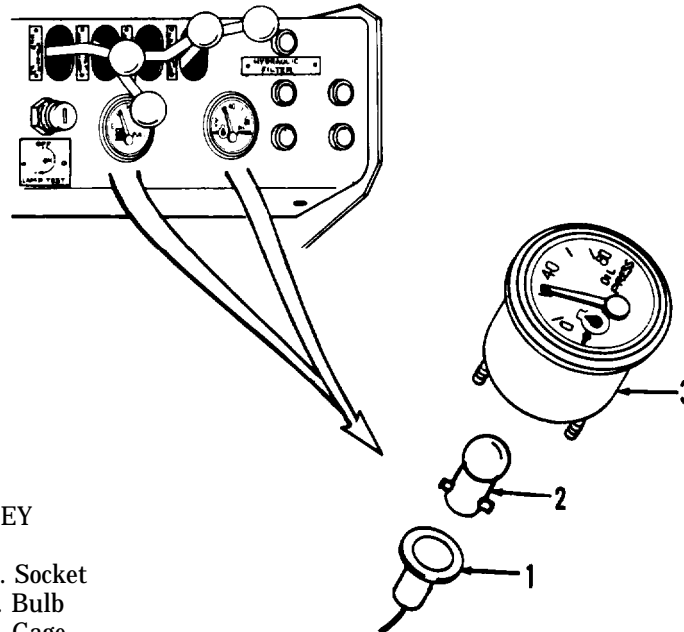
This task covers replacement of fuel level gage and oil pressure gage bulbs.

INITIAL SETUP

TOOLS  
None

MATERIALS/PARTS  
Replacement bulb

EQUIPMENT CONDITION  
Paragraph                      Condition Description  
2-53h                              IGNITION switch in OFF position and key removed.  
Noise baffle mat rod removed and mat pulled up and over instrument panel for access to bottom of instrument panel.



STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Instrument panel, bottom	a. Socket (1) b Bulb (2)	Remove Remove	Grasp and pull out Discard
<b>INSTALLATION</b>				
2	Instrument panel, bottom	a. Bulb (2) b. Socket (1)	Install Install	Push in until it snaps into position

**2-18. GAGES MAINTENANCE (cont)**

*b. Gages Replacement.*

This task covers replacement of fuel level and oil pressure gages.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

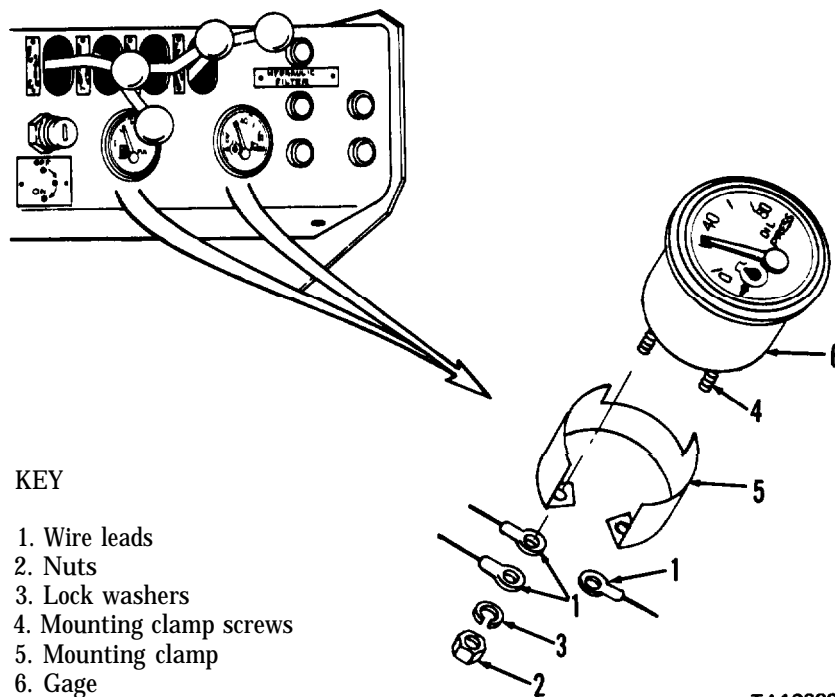
EQUIPMENT CONDITION

Paragraph 2-18a

Condition Description  
Gage socket and bulb removed.

MATERIALS/PARTS

Replacement gage



TA126893



**2-18. GAGES MAINTENANCE (cont)**

*b. Gages Replacement (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Instrument panel, bottom	a. Two nuts (2) and lock washers (3) b. Three wire leads (1) c. Two mounting clamp screws (4) d. Mounting clamp (5)	Remove  Tag and disconnect Loosen both evenly Remove	  Loosen and remove mounting clamp (5)
2	Instrument panel, top	Gage (6)	Remove	
INSTALLATION				
3	Instrument panel, top	Gage (6)	Position	
4	Instrument panel, bottom	a. Mounting clamp (5) b. Two mounting clamp screws (4) c. Three wire leads (1) d. Two lock washers (3) and nuts (2) e. Socket and bulb	Position Tighten both evenly Connect Install Install	On mounting clamp screws (4) Until gage is securely mounted Note tags for correct connection Para 2-18a

**Section V. ELECTRICAL SYSTEM MAINTENANCE**

This section contains the information you'll need to maintain the:

- Batteries
- Starting system
- Charging system
- Lights
- Horn

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of organizational maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	2-19	Light Systems Maintenance . . . . .	2-30
Battery System Troubleshooting . . . . .	2-20	Flood Lights . . . . .	2-30a
Starting System Troubleshooting . . . . .	2-21	Front Blackout Light . . . . .	2-30b
Charging System Troubleshooting . . . . .	2-22	Rear Blackout Lights . . . . .	2-30c
Horn and Back-up Alarm Troubleshooting . . . . .	2-23	Stop and Tail Light . . . . .	2-30d
Light Systems Troubleshooting . . . . .	2-24	Sending Units and Switches Maintenance . . . . .	2-31
Instrument Panel Troubleshooting . . . . .	2-25	Fuel Gage Sending Unit . . . . .	2-31a
Alternator Maintenance . . . . .	2-26	Neutral Start and Back-up Alarm Switches . . . . .	2-31b
Starting System Maintenance . . . . .	2-27	Engine and Transmission Temperature Switches . . . . .	2-31c
Starter . . . . .	2-27a	Engine Oil Pressure Switch and Sending Unit . . . . .	2-31d
Starter Relay and 25 AMP Circuit Breaker . . . . .	2-27b	Stop Light and Hydraulic Filter Switches . . . . .	2-31e
Instrument Panel Maintenance . . . . .	2-28	Horn and Back-up Alarm Maintenance . . . . .	2-32
Flood Light Switches and Circuit Breakers . . . . .	2-28a	Horn . . . . .	2-32a
START Switch and VEHICLE LIGHTS Switch . . . . .	2-28b	Horn Switch . . . . .	2-32b
Ignition Switch and Circuit Breaker . . . . .	2-28c	Back-up Alarm . . . . .	2-32c
Lockout Relay . . . . .	2-28d	Battery System Maintenance . . . . .	2-33
Warning Lights and Diodes . . . . .	2-28e	Battery Cover . . . . .	2-33a
Auxiliary Panel Maintenance . . . . .	2-29	Battery Cables and Batteries . . . . .	2-33b
Slave Receptacle . . . . .	2-29a	Wiring Harness Maintenance . . . . .	2-34
Hourmeter . . . . .	2-29b	Front Wiring Harness . . . . .	2-34a
		Rear Wiring Harness . . . . .	2-34b

**2-19. TROUBLESHOOTING SYMPTOM INDEX**

**NOTE**

An electrical system wiring schematic is located at the back of this manual in appendix F.

	Para/Malfunction	Page
<b>BATTERY SYSTEM</b>		
All electrical systems are weak . . . . .	2-20/1	2-99
Batteries are hot or use excessive water . . . . .	2-20/2	2-100
<b>STARTING SYSTEM</b>		
Starter cranks too slowly . . . . .	2-21/1	2-100
Starter fails to crank . . . . .	2-21/2	2-101
Starter cranks continuously . . . . .	2-21/3	2-103

**2-19. TROUBLESHOOTING SYMPTOM INDEX (cont)**

	Para/Malfunction	Page
<b>CHARGING SYSTEM</b>		
Abnormal alternator light operation . . . . .	2-22/1	2-103
Alternator output low, unsteady, or zero . . . . .	2-22/2	2-104
<b>HORN SYSTEM</b>		
Horn does not sound . . . . .	2-23/1	2-105
Back-up alarm does not sound. . . . .	2-23/2	2-106
<b>LIGHT SYSTEMS</b>		
Front floodlights inoperative. . . . .	2-24/1	2-107
Front black out light inoperative . . . . .	2-24/2	2-107
Black out tail lights inoperative. . . . .	2-24/3	2-108
Service taillights inoperative. . . . .	2-24/4	2-109
Black out stoplights inoperative . . . . .	2-24/5	2-109
Service stoplights inoperative. . . . .	2-24/6	2-110
Rear flood lights inoperative . . . . .	2-24/7	2-110
Gage lights inoperative . . . . .	2-24/8	2-111
<b>INSTRUMENT PANEL</b>		
Warning lights inoperative . . . . .	2-25/ 1	2-112
Warning lights, back-up alarm, and electric fuel pump inoperative . . . . .	2-25/2	2-113

**2-20. BATTERY SYSTEM TROUBLESHOOTING**

**MALFUNCTION**

TEST OR INSPECTION  
CORRECTIVE ACTION

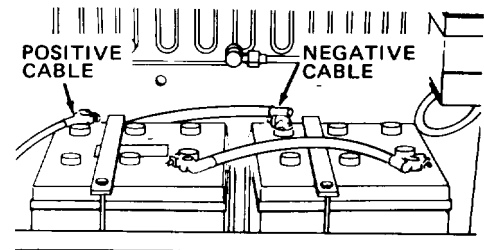
**1. ALL ELECTRICAL SYSTEMS ARE WEAK**

Step 1. Connect voltmeter leads to connectors of negative battery cable at battery post and starter ground.  
Note voltmeter indication while an assistant cranks engine.

- a. If voltmeter indicates less than 0.5 Vdc, proceed to step 2.
- b. If voltmeter indicates more than 0.5 Vdc, replace the negative battery cable (para 2-33b)

Step 2. Connect voltmeter leads to connectors of positive battery cable at battery post and starter B terminal.  
Note voltmeter indication while an assistant cranks engine.

- a. If voltmeter indicates less than 0.5 Vdc, proceed to step 3.
- b. If voltmeter indicates more than 0.5 Vdc, replace the positive battery cable (para 2-33 b).



TA126894

**2-20. BATTERY SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

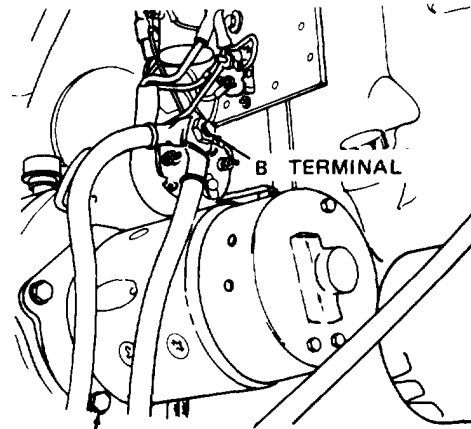
TEST OR INSPECTION

CORRECTIVE ACTION

1. ALL ELECTRICAL SYSTEMS ARE WEAK (cont)

Step 3. Connect voltmeter leads to positive and negative posts of one battery. Note voltmeter indication while an assistant cranks engine. Repeat for remaining battery.

If voltmeter indicates less than 9.6 Vdc, check the specific gravity of each battery cell. If there is more than 25 points variation (0.025) between individual cells, replace battery (para 2-33b).



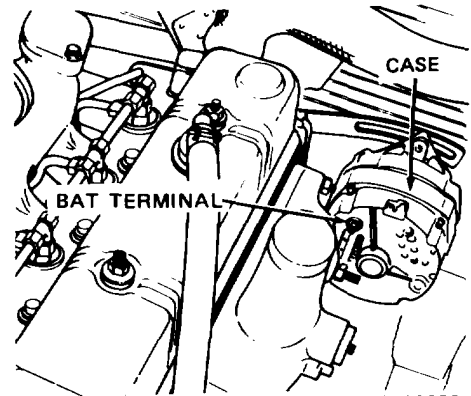
STARTER GROUND

TA126895

2. BATTERIES ARE HOT OR USE EXCESSIVE WATER

Connect voltmeter leads to alternator BAT terminal and case (ground). With all accessories turned off, operate engine at 1800 rpm and note voltmeter indication.

If voltmeter indicates more than 31 Vdc, replace alternator (para 2-26).



BAT TERMINAL

TA126896

**2-21. STARTING SYSTEM TROUBLESHOOTING**

MALFUNCTION

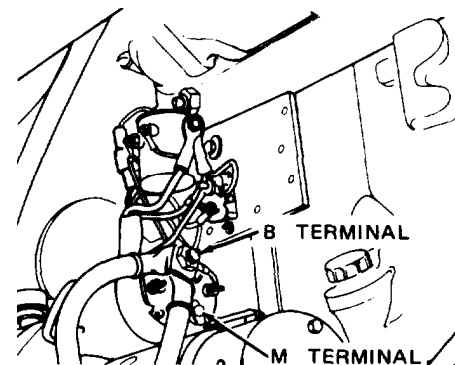
TEST OR INSPECTION

CORRECTIVE ACTION

1. STARTER CRANKS TOO SLOWLY

Step 1. Connect positive voltmeter lead to solenoid B terminal and negative voltmeter lead to solenoid M terminal. Note voltmeter indication while assistant cranks engine.

- a. If voltmeter indicates less than 0.3 Vdc, proceed to step 2.
- b. If voltmeter indicates more than 0.3 Vdc, replace starter assembly (para 2-27a).



B TERMINAL

M TERMINAL

TA126897

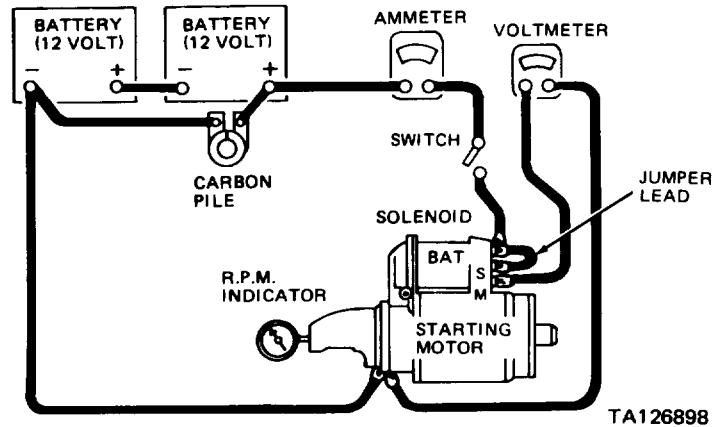
**2-21. STARTING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

**1. STARTER CRANKS TOO SLOWLY (cont)**

Step 2. Remove starter assembly from engine (para 2-27a).  
 Connect no-load test setup to starter as illustrated, and adjust carbon pile for 20 Vdc indication on voltmeter.

- a. If ammeter indicates 52 to 90 amperes and rpm indicator indicates 8000 to 13,000 rpm, disconnect starter from test setup and reinstall on engine (para 2-27a).

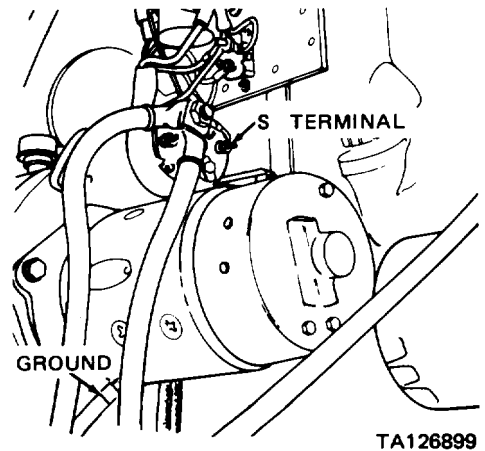


- b. If ammeter does not indicate 52 to 90 amperes, or rpm indicator does not indicate 8000 to 13,000 rpm, record voltage, current and rpm, and replace starter assembly (para 2-27a). Forward test results to direct support maintenance with defective starter.

**2. STARTER FAILS TO CRANK**

Step 1. Connect voltmeter leads to S terminal of starter solenoid and ground.  
 Note voltmeter indication while an assistant depresses START switch.

- a. If voltmeter indicates 24 Vdc, replace starter assembly para 2-27a).
- b. If voltmeter indicates less than 24 Vdc, or zero, proceed to step 2.



**2-21. STARTING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

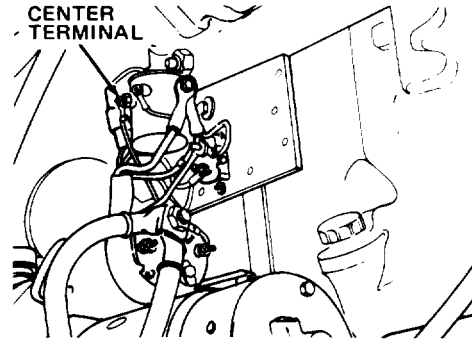
TEST OR INSPECTION

CORRECTIVE ACTION

2. STARTER FAILS TO CRANK (cont)

Step 2. Connect voltmeter leads to center terminal of starter relay and ground. Note voltmeter indication while an assistant depresses START switch.

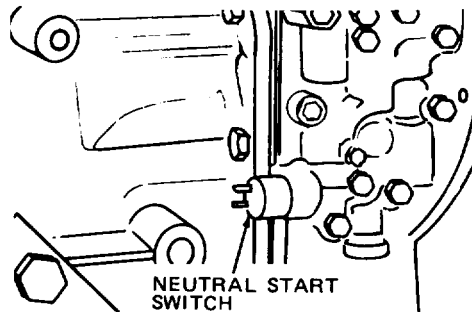
- a. If voltmeter indicates 24 Vdc, replace starter relay (para 2-27b).
- b. If voltmeter indicates zero volts, proceed to step 3.



TA126900

Step 3. Connect voltmeter leads to terminals of neutral start switch. Note voltmeter indication while an assistant depresses START switch.

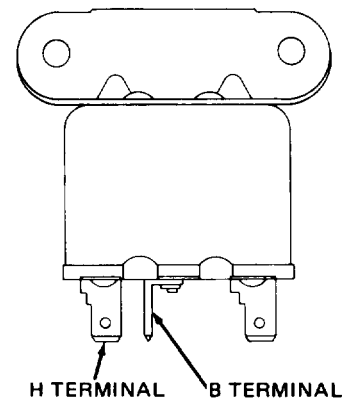
- a. If voltmeter indication is a constant 24 Vdc, replace neutral start switch (para 2-31b).
- b. If voltmeter indication is a constant zero volts, proceed to step 4.



TA126901

Step 4. Tag and disconnect wires from lockout relay located at bottom center of instrument panel. Connect ohmmeter leads to B and H terminals of lockout relay.

- a. If ohmmeter indicates more than 0.1 ohm, replace lockout relay (para 2-28d).
- b. If ohmmeter indicates less than 0.1 ohm, reconnect wires to lockout relay and proceed to step 5.



TA126902

Step 5. Connect voltmeter leads to IGN and GRD terminals of IGNITION switch. With IGNITION switch set at ON, voltmeter should indicate 24 Vdc.

- a. If voltmeter does not indicate 24 Vdc, proceed to step 6.
- b. If voltmeter indicates 24 Vdc, proceed to step 7.

**2-21. STARTING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

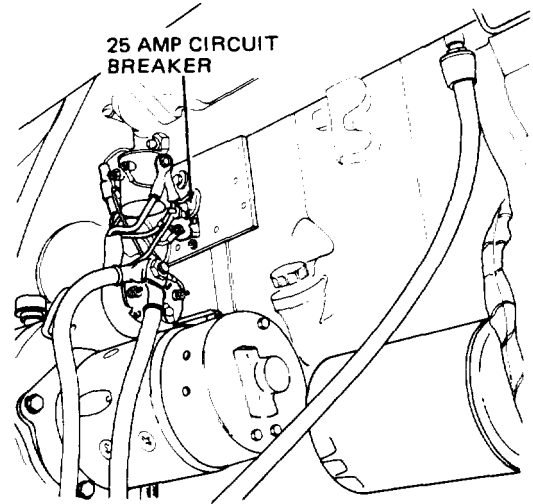
2. STARTER FAILS TO CRANK (cont)

Step 6. Turn IGNITION switch to OFF and remove key. Connect ohmmeter leads to terminals of 25 ampere circuit breaker and note ohmmeter indication.

If ohmmeter indicates more than 0.1 ohm, replace 25 ampere circuit breaker (para 2-27b).

Step 7. Tag and disconnect wires from START switch located at left of steering column. Connect ohmmeter leads to terminals of START switch, and note ohmmeter indication while depressing START switch.

If ohmmeter indicates more than 0.1 ohm, replace START switch (para 2-28 b).



TA126903

3. STARTER CRANKS CONTINUOUSLY

Step 1. Connect voltmeter leads to S terminal of starter solenoid and ground, and turn IGNITION switch to ON.

- a. If voltmeter indicates zero volts, replace starter assembly (para 2-27a).
- b. If voltmeter indicates 24 Vdc, proceed to step 2.

Step 2. Connect voltmeter leads to terminal 1 of starter relay and ground, and turn IGNITION switch to ON.

- a. If voltmeter indicates 24 Vdc, replace START switch (para 2-28b).
- b. If voltmeter does not indicate 24 Vdc, replace starter relay (para 2-27b).

**2-22. CHARGING SYSTEM TROUBLESHOOTING**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. ABNORMAL ALTERNATOR LIGHT OPERATION

Step 1. Place IGNITION switch to OFF. ALTERNATOR light should be off.

- a. If ALTERNATOR light is off, proceed to step 2.

**2-22. CHARGING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

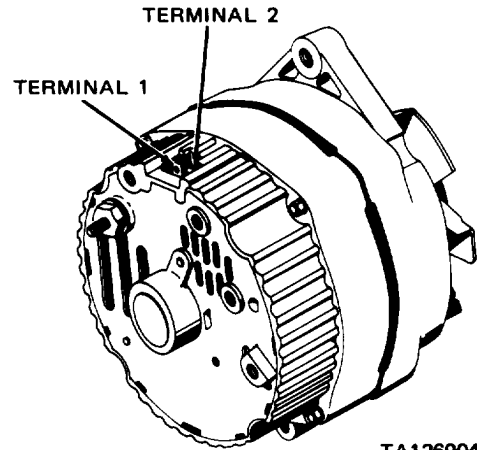
TEST OR INSPECTION

CORRECTIVE ACTION

1. ABNORMAL ALTERNATOR LIGHT OPERATION (cont)

STEP 1. (cont)

- b. If ALTERNATOR light is on, grasp and pull connector from alternator terminals 1 and 2. If the ALTERNATOR light goes out, replace the alternator (para 2-26). If the light stays on, check for a short between these wires, then install connector on alternator terminals 1 and 2.



TA126904

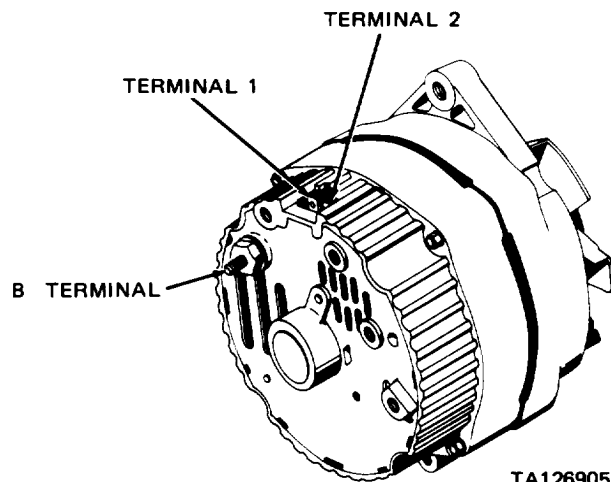
Step 2. Place IGNITION switch to ON with engine stopped. ALTERNATOR light should be on. With engine running, ALTERNATOR light should be off.

- a. If ALTERNATOR light is off with engine stopped, or on with engine running, check for an open circuit between alternator terminal 1 and ALTERNATOR light. Use an ohmmeter to check diode and 40 ohm resistor in ALTERNATOR light circuit.
- b. If circuit tests are satisfactory, troubleshoot alternator (MALFUNCTION 2 below).

2. ALTERNATOR OUTPUT LOW, UNSTEADY OR ZERO

Step 1. Turn IGNITION switch to ON and alternately connect voltmeter leads from ground to alternator terminal 1, terminal 2 and B terminal.

- a. If voltmeter indicates 24 Vdc at all three terminals, proceed to step 2.
- b. If voltmeter does not indicate 24 Vdc at one or more terminals, check for an open circuit between battery positive post and affected alternator terminal.



TA126905

Step 2. Disconnect battery ground cable and connect an ammeter between alternator B terminal and starter relay terminal 3. Reconnect battery ground cable, and connect a carbon pile across batteries. Turn all vehicle lights on to increase load on batteries, and operate engine at 1800 rpm.

- a. If ammeter indicates 27 to 47 amperes, but ALTERNATOR light stays on, check for open circuit from alternator terminal 1 in wiring, diode, and 40 ohm resistor.
- b. If ammeter does not indicate 27 to 47 amperes, replace alternator (para 2-26).



**2-23. HORN AND BACK-UP ALARM SYSTEM TROUBLESHOOTING**

MALFUNCTION

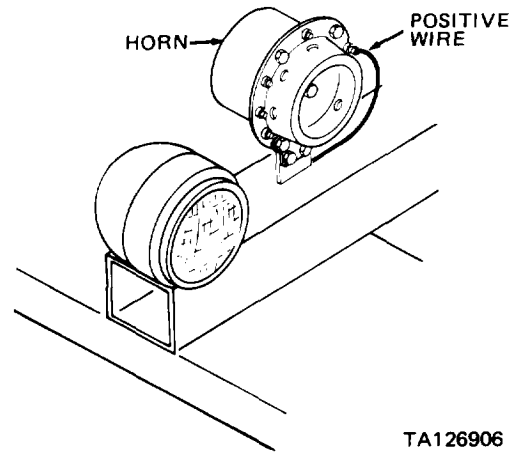
TEST OR INSPECTION

CORRECTIVE ACTION

1. HORN DOES NOT SOUND

Step 1. Disconnect positive wire from side of horn. Connect positive voltmeter lead to connector on positive wire, and negative voltmeter lead to vehicle ground.

- a. If voltmeter indicates 24 Vdc, reconnect positive wire to side of horn and proceed to step 2.
- b. If voltmeter does not indicate 24 Vdc, troubleshoot 25 ampere circuit breaker (para 2-21, malfunction entry 2, step 6). If 25 ampere circuit breaker test is satisfactory, check for open circuit in wiring between battery positive post and connector on horn positive wire.

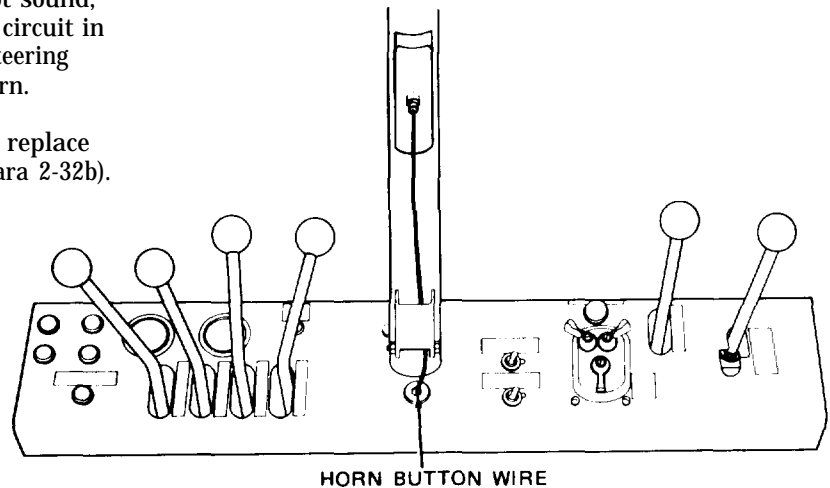


Step 2. Disconnect horn button wire from bottom of horn. Temporarily connect jumper wire from terminal on bottom of horn to vehicle ground.

- a. If horn sounds, reconnect horn button wire to bottom of horn and proceed to step 3.
- b. If horn does not sound, replace horn (para 2-32a).

Step 3. Disconnect horn button wire from terminal on steering column. Temporarily connect jumper wire from connector on horn button wire to vehicle ground.

- a. If horn does not sound, check for open circuit in wire between steering column and horn.
- b. If horn sounds, replace horn switch (para 2-32b).



**2-23. HORN AND BACK-UP ALARM SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

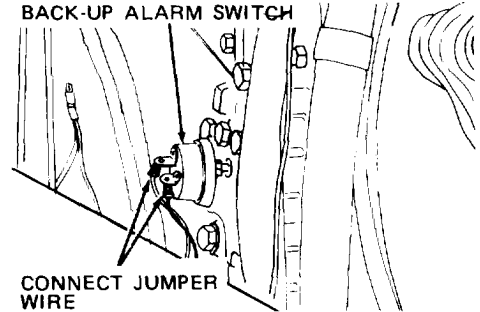
TEST OR INSPECTION

CORRECTIVE ACTION

2. BACK-UP ALARM DOES NOT SOUND

Step 1. Turn IGNITION switch key to ON position and temporarily connect a jumper wire to terminals of back-up alarm switch.

- a. If back-up alarm sounds, replace back-up alarm switch (para 2-31b).
- b. If back-up alarm does not sound, proceed to step 2.

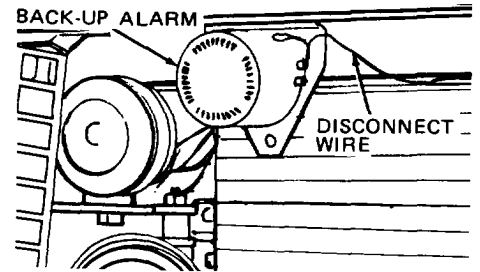


TA126908

Step 2. Disconnect wire from positive terminals of back-up alarm.

Temporarily connect a jumper wire between positive battery cable and positive terminal of back-up alarm.

- a. If back-up alarm sounds, reconnect wire to positive alarm terminal and proceed to step 3.
- b. If back-up alarm does not sound, connect a jumper wire to vehicle ground and back-up alarm negative terminal. If alarm does not sound with ground jumper at negative terminal and battery positive jumper at positive terminal, replace back-up alarm (para 2-32c).



TA126909

Step 3. Turn and hold IGNITION switch key at LAMP TEST position.

- a. If at least one warning indicator (TRANSMISSION TEMPERATURE, HYDRAULIC FILTER, or ENGINE TEMPERATURE) is on, check for open circuit in wiring between back-up alarm, back-up alarm switch, and 6 ampere circuit breaker.
- b. If at least one warning indicator is not on, turn IGNITION switch key to ON position and check if a slight buzz can be heard at electric fuel pump. If slight buzz indicating electric fuel pump operation is not heard, troubleshoot IGNITION switch (para 2-25). If slight buzz is heard, troubleshoot warning indicators (para 2-25).

**NOTE**

If flood lights, tail lights, stop lights and gage lights are all inoperative, turn IGNITION switch key to OFF position. Connect positive voltmeter lead to terminal F of VEHICLE LIGHTS switch cable connector and negative voltmeter lead to vehicle ground. If voltmeter does not indicate 24 Vdc with IGNITION switch key set at ON position, check for open circuit in wiring between terminal F of cable connector and IGNITION switch. If wiring check is satisfactory, replace IGNITION switch (para 2-28c).

## 2-24. LIGHT SYSTEMS TROUBLESHOOTING

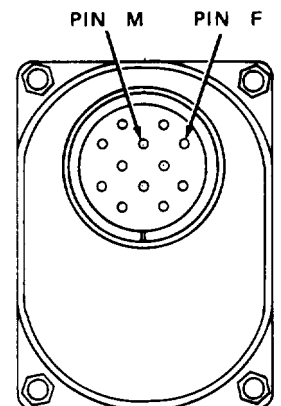
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

### 1. FRONT FLOOD LIGHTS INOPERATIVE

#### NOTE

If one or more front flood light operates normally, replace bulb in affected flood light (para 2-30a). If flood light is still inoperative, check for open circuit in wire between inoperative flood light and FRONT FLOOD switch.

- Step 1. Turn IGNITION switch to OFF and remove key.  
Disconnect 10 ampere circuit breaker wire from terminal on FRONT FLOOD switch.  
Connect ohmmeter leads to leads of 10 ampere circuit breaker.
- If ohmmeter indicates less than 0.1 ohm, proceed to step 2.
  - If ohmmeter indicates more than 0.1 ohm, connect ohmmeter leads to vehicle ground and 4-wire terminal of FRONT FLOOD switch. If ohmmeter indicates less than 2 ohms, check for short in wiring between FRONT FLOOD switch and front flood lights. Replace 10 ampere circuit breaker after short is removed (para 2-28a).
- Step 2. Connect ohmmeter leads to terminals of FRONT FLOOD switch and set FRONT FLOOD switch at ON position.
- If ohmmeter indicates less than 0.1 ohm, reconnect lead of 10 ampere circuit breaker to terminal of FRONT FLOOD switch and proceed to step 3.
  - If ohmmeter indicates more than 0.1 ohm, replace FRONT FLOOD switch (para 2-28a).
- Step 3. Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch.  
Place main switch lever on VEHICLE LIGHTS switch in SER. DRIVE position.  
Connect ohmmeter leads to pins F and M of VEHICLE LIGHTS switch.
- If ohmmeter indicates more than 0.1 ohm, replace VEHICLE LIGHTS switch (para 2-28b).



TA126910

### 2. FRONT BLACK OUT LIGHT INOPERATIVE

- Step 1. Unplug wire connector from front black out terminal. Set IGNITION switch to ON position and place main switch lever on VEHICLE LIGHTS switch in B.O. DRIVE position.  
Connect positive voltmeter lead to vehicle ground.
- If voltmeter indicates 24 Vdc, place IGNITION switch and VEHICLE LIGHTS switch in OFF position and place bulb in front black out light (para 2-30b).
  - If voltmeter does not indicate 24 Vdc, place IGNITION switch in OFF position. reconnect wire connector to terminal on front black out light, and proceed to step 2.

**2-24. LIGHT SYSTEMS TROUBLESHOOTING (cont)**

MALFUNCTION

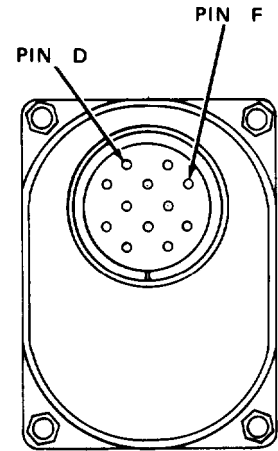
TEST OR INSPECTION

CORRECTIVE ACTION

2. FRONT BLACK OUT LIGHT INOPERATIVE (cont)

Step 2. Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch. With main switch lever on VEHICLE LIGHTS switch in B.O. DRIVE position, connect ohmmeter leads to pins D and F of VEHICLE LIGHTS switch.

- a. If ohmmeter indicates more than 0.1 ohm, replace VEHICLE LIGHTS switch (para 2-28b).
- b. If ohmmeter indicates less than 0.1 ohm, check for open circuit in wire between terminal D of cable connector and front black out light.



3. BLACK OUT TAIL LIGHTS INOPERATIVE

**NOTE**

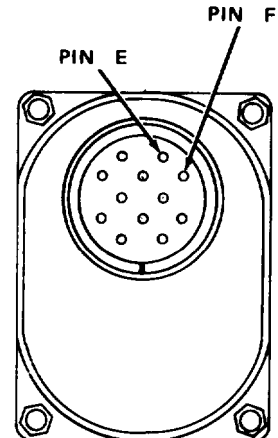
If one black out tail light operates normally, replace bulb in affected tail light (para 2-30c). If tail light is still inoperative, check for open circuit in wire between inoperative tail light and operating tail light.

Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch.

Place main switch lever on VEHICLE LIGHTS switch in SER. DRIVE position.

Connect ohmmeter leads to pins E and F of VEHICLE LIGHTS switch.

- a. If ohmmeter indicates more than 0.1 ohm, replace VEHICLE LIGHTS switch (para 2-28b).
- b. If ohmmeter indicates less than 0.1 ohm, check for open circuit in wire between terminal E of cable connector and black out tail lights.



**2-24. LIGHT SYSTEMS TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 4. SERVICE TAIL LIGHTS INOPERATIVE

**NOTE**

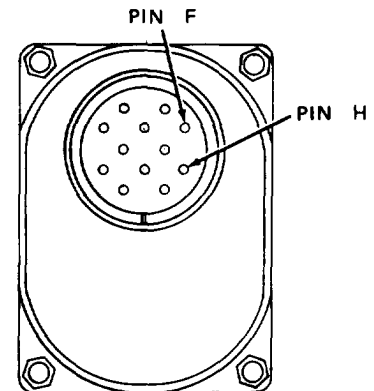
If one service tail light operates normally, replace bulb in affected tail light (para 2-30d). If tail light is still inoperative, check for open circuit in wire between inoperative tail light and operating tail light.

Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch.

Place main switch lever on VEHICLE LIGHTS switch in SER. DRIVE position.

Connect ohmmeter leads to pins H and F of VEHICLE LIGHTS switch.

- a. If ohmmeter indicates more than 0.1 ohm, replace VEHICLE LIGHTS switch (para 2-28b).
- b. If ohmmeter indicates less than 0.1 ohm, check for open circuit in wire between terminal H of cable connector and service tail lights.



TA126913

## 5. BLACK OUT STOP LIGHTS INOPERATIVE

**NOTE**

If one stop light operates normally, replace bulb in affected stop light (para 2-30c). If stop light is still inoperative, check for open circuit in wire between inoperative stop light and operating stop light.

Step 1. Place IGNITION switch in ON position, VEHICLE LIGHTS switch in SER. DRIVE position, and depress brake pedal.

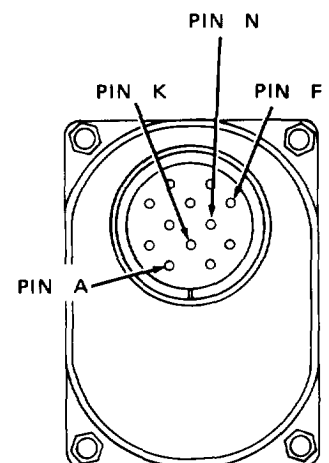
- a. If service brake lights operate normally, turn IGNITION switch and VEHICLE LIGHTS switch to OFF position and proceed to step 2.
- b. If service brake lights are inoperative, troubleshoot stop light switch (para 2-24, MALFUNCTION 6).

Step 2. Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch.

Place main switch lever on VEHICLE LIGHTS switch in B.O. MARKER or B.O. DRIVE position.

Connect ohmmeter leads to pins A and F of VEHICLE LIGHTS switch and check for less than 0.1 ohm, then connect ohmmeter leads to pins K and N and check for less than 0.1 ohm.

- a. If ohmmeter indicates more than 0.1 ohm for either test, replace VEHICLE LIGHTS switch (para 2-28b).



TA126914

## 2-24. LIGHT SYSTEMS TROUBLESHOOTING (cont)

### MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION

#### 5. BLACK OUT STOP LIGHTS INOPERATIVE (cont)

Step 2. (cont)

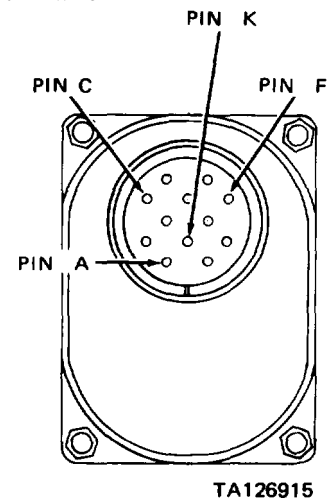
- b. If ohmmeter indicates less than 0.1 ohm for both tests, check for open circuit in wire between terminal N of cable connector and black out stop lights.

#### 6. SERVICE STOP LIGHTS INOPERATIVE

### NOTE

If one stop light operates normally, replace bulb in affected stop light (para 2-30d). If stop light is still inoperative, check for open circuit in wire between inoperative stop light and operating stop light.

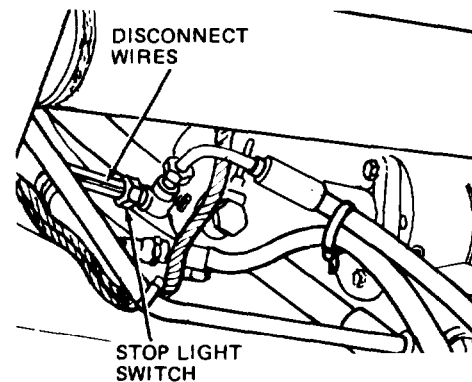
- Step 1. Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch. Place main switch lever on VEHICLE LIGHTS switch in STOP LIGHT or SER. DRIVE position. Connect ohmmeter leads to pins A and F of VEHICLE LIGHTS switch and check for less than 0.1 ohm, then connect ohmmeter leads to pins K and C and check for less than 0.1 ohm.



- a. If ohmmeter indicates more than 0.1 ohm for either test, replace VEHICLE LIGHTS switch (para 2-28b).
- b. If ohmmeter indicates less than 0.1 ohm for both tests, check for open circuit in wire between terminal C of cable connector and service stop lights. If continuity test of wire is satisfactory, proceed to step 2.

- Step 2. Disconnect wires from stop light switch and connect ohmmeter leads to terminals of stop light switch. Note ohmmeter indication while an assistant depresses brake pedal.

- a. If ohmmeter does not indicate less than 0.2 ohm, replace stop light switch (para 2-31e(2)).
- b. If ohmmeter indicates less than 0.2 ohm with brake pedal depressed, check for open circuit in wiring between stop light switch and terminals A and K of cable connector.



#### 7. REAR FLOOD LIGHTS INOPERATIVE

### NOTE

If one rear flood light operates normally, replace bulb in affected flood light (para 2-30a). If flood light is still inoperative, check for open circuit in wire between inoperative flood light and REAR FLOOD switch.

**2-24. LIGHT SYSTEMS TROUBLESHOOTING (cont)**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**7. REAR FLOOD LIGHTS INOPERATIVE (cont)**

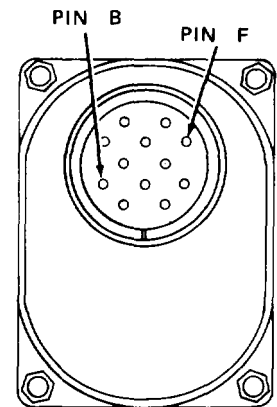
- Step 1. Turn IGNITION switch to OFF and remove key.  
 Disconnect 6 ampere circuit breaker wire from terminal on REAR FLOOD switch.  
 Connect ohmmeter leads to leads of 6 ampere circuit breaker.
- If ohmmeter indicates less than 0.1 ohm, proceed to step 2.
  - If ohmmeter indicates more than 0.1 ohm, connect ohmmeter leads to vehicle ground and wire on terminal of REAR FLOOD switch. If ohmmeter indicates less than 4.5 ohms, check for short in wiring between REAR FLOOD switch and rear flood lights. Replace 6 ampere circuit breaker after short is removed (para 2-28a).
- Step 2. Connect ohmmeter leads to terminals of REAR FLOOD switch and set REAR FLOOD switch at ON position.
- If ohmmeter indicates less than 0.1 ohm, reconnect lead of 6 ampere circuit breaker to terminal of REAR FLOOD switch and troubleshoot VEHICLE LIGHTS switch (para 2-24, MALFUNCTION 1).
  - If ohmmeter indicates more than 0.1 ohm, replace REAR FLOOD switch (para 2-28a).

**8. GAGE LIGHTS INOPERATIVE****NOTE**

If one gage light operates normally, replace bulb in affected gage light (para 2-18a). If gage light is still inoperative, check for open circuit in wire between inoperative gage light and operating gage light.

Unscrew and remove cable connector from bottom of VEHICLE LIGHTS switch.  
 Place main switch lever in any position other than OFF, and place auxiliary switch lever in PARK or DIM position.  
 Connect ohmmeter leads to pins B and F of VEHICLE LIGHTS switch and check for 20 to 30 ohms indication on ohmmeter, then place auxiliary switch lever in PANEL BRT. position and check for less than 0.1 ohm indication on ohmmeter.

- If ohmmeter indicates more than 0.1 ohm in PANEL BRT. position, or does not indicate 20 to 30 ohms in PARK and DIM positions, replace VEHICLE LIGHTS switch (para 2-28b).
- If VEHICLE LIGHTS switch resistance tests are satisfactory, check for open circuit in wire or 40 ohm resistor between terminal B of cable connector and gage lights.



TA126917

**2-25. INSTRUMENT PANEL TROUBLESHOOTING**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**NOTE**

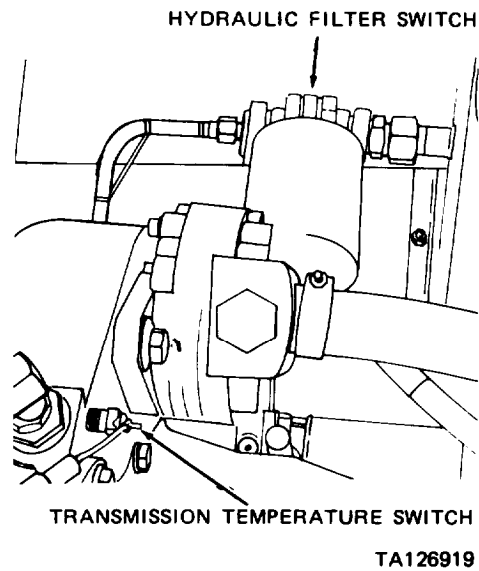
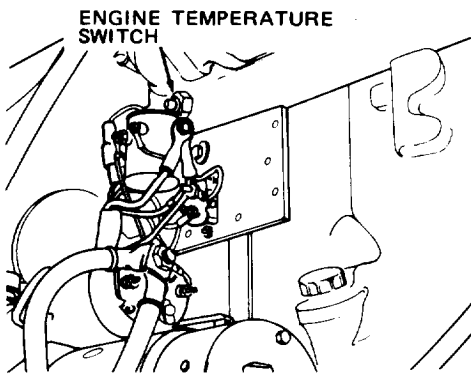
Refer to paragraph 2-13 for OIL PRESSURE gage and FUEL LEVEL gage troubleshooting, and paragraph 2-22 for ALTERNATOR warning light troubleshooting. Other switches and lights are covered in the paragraphs that cover the systems of which they are a part.

**1. WARNING LIGHTS INOPERATIVE**

Step 1. Turn and hold IGNITION switch key at LAMP TEST position.

- a. If at least one warning indicator (ENGINE TEMPERATURE, TRANSMISSION TEMPERATURE, or HYDRAULIC FILTER) is on, check for open circuit in wiring, connector, or isolation diode between inoperative warning light and IGNITION switch. If circuit check is satisfactory, replace warning light (para 2-28e).
- b. If at least one warning indicator is not on, turn IGNITION switch key to ON position and check if a slight buzz can be heard at electric fuel pump. If slight buzz indicating electric fuel pump operation is not heard, troubleshoot IGNITION switch (para 2-25, MALFUNCTION 2). If slight buzz is heard, check for open circuit in wiring between TRANSMISSION TEMPERATURE warning light and 6 ampere circuit breaker. If circuit check is satisfactory, proceed to step 2.

Step 2. Disconnect wires from engine temperature, transmission temperature, oil pressure and hydraulic filter switches.  
 Temporarily connect a jumper from each wire to vehicle ground and turn IGNITION switch key to ON position.  
 ENGINE TEMPERATURE, TRANSMISSION TEMPERATURE, OIL PRESSURE and HYDRAULIC FILTER warning lights should be on.





**2-25. INSTRUMENT PANEL TROUBLESHOOTING (cont)**

## MALFUNCTION

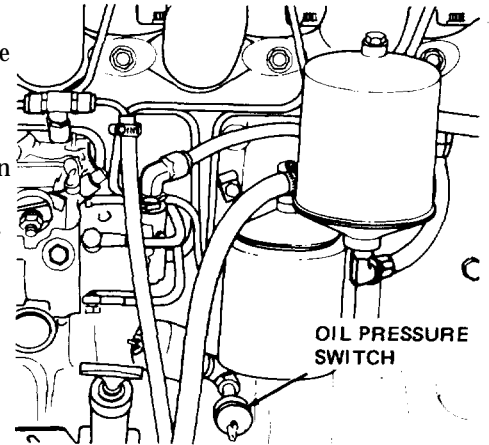
## TEST OR INSPECTION

## CORRECTIVE ACTION

## 1. WARNING LIGHTS INOPERATIVE (cont)

## Step 2. (cont)

- a. If warning light is on during test, and inoperative during high temperature or low oil pressure vehicle operation, replace associated warning light switch (para 2-28e).
- b. If warning light is not on, check for open circuit in wiring or 40 ohm resistor between inoperative warning light and associated warning light switch.



TA126920

## 2. WARNING LIGHTS, BACK-UP ALARM AND ELECTRIC FUEL PUMP INOPERATIVE

Turn IGNITION switch key to ON position and depress START switch.

- a. If starter cranks engine, replace 6 ampere circuit breaker at IGN terminal of IGNITION switch.
- b. If starter does not crank engine, connect voltmeter leads to BATT terminal of IGNITION switch and vehicle ground. If voltmeter indicates 24 Vdc, replace IGNITION switch (para 2-28c). If voltmeter does not indicate 24 Vdc, check for open circuit in wiring between IGNITION switch BATT terminal and 25 ampere circuit breaker.

**2-26. ALTERNATOR MAINTENANCE**

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Installation/Replacement  
 e. Testing

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

MATERIALS/PARTS

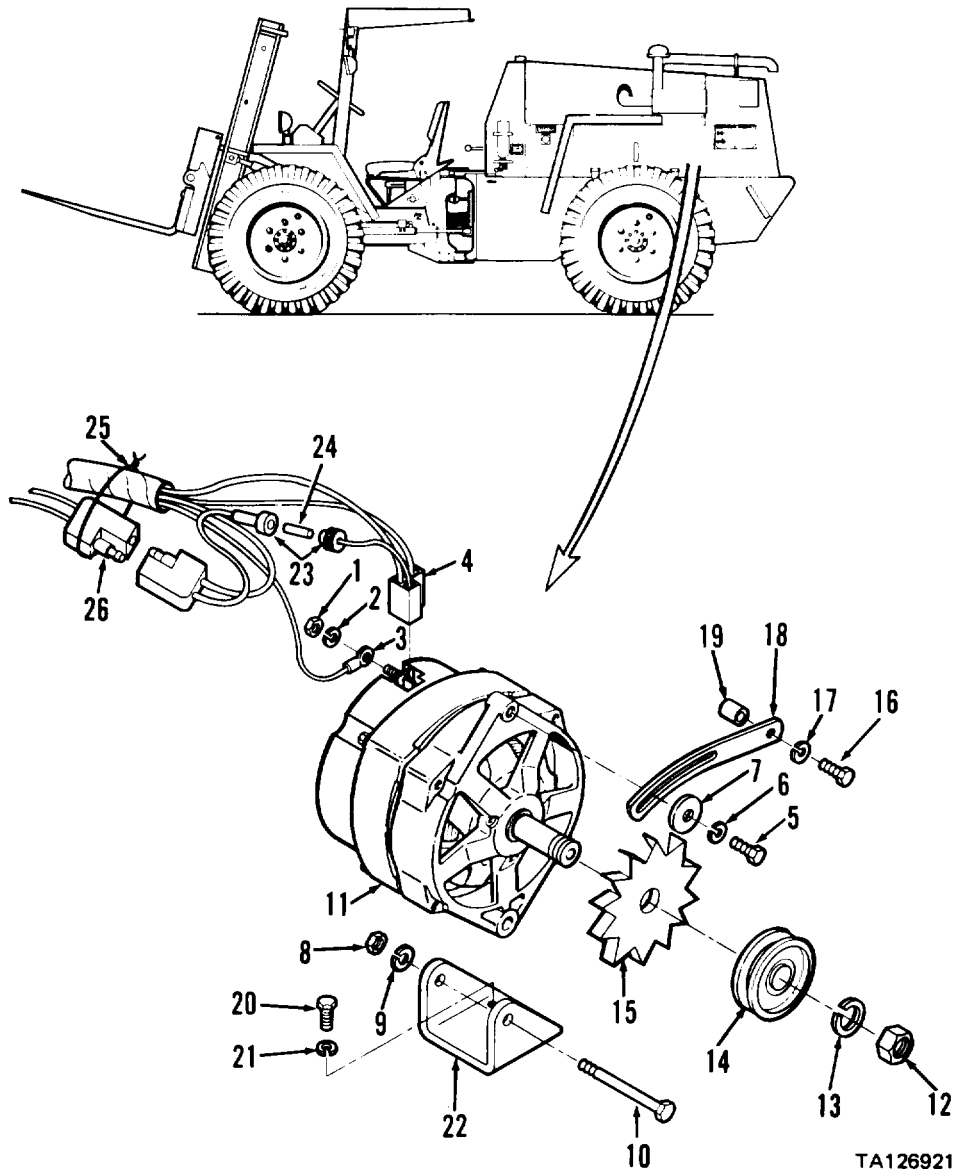
Cleaning solvent P-D-680  
 Silicone-rubber sealer  
 Clean cloths  
 Wire tie

EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off.
2-53c	Left side panel removed.
2-17f	Alternator belt removed.
2-33b	Battery ground cable disconnected.

Key

1. Nut
2. Lock washer
3. Wire lead
4. Connector
5. Cap screw
6. Lock washer
7. Washer
8. Nut
9. Lock washer
10. Cap screw
11. Alternator
12. Nut
13. Lock washer
14. Pulley
15. Fan
16. Cap screw
17. Lock washer
18. Strap
19. Spacer
20. Cap screw
21. Lock washer
22. Bracket
23. In-line retainer
24. Resistor
25. Tie strap
26. Diode



TA126921

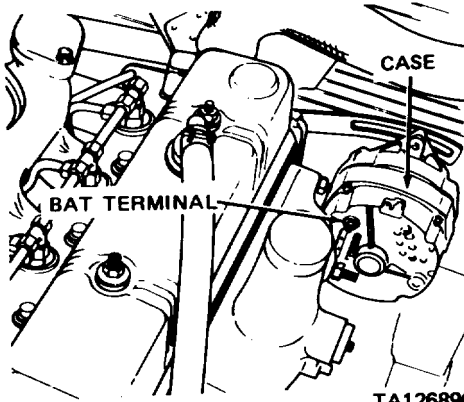
**2-26. ALTERNATOR MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment rear, left side of vehicle	a. Nut (1), lock washer(2) and wire lead (3) b. Push-on connector (4) c. Cap screw (5), lock washer (6) and washer (7) d. Nut (8), lock washer (9) and cap screw (10) e. Alternator (11)	Remove Grasp and disconnect Remove Remove Remove	From BATT terminal From terminals 1, 2 and R Support alternator (11)
2	Alternator	Nut (12), lock washer (13), pulley (14) and fan (15)	Remove	Use pulley puller
3	Engine compartment rear left side of vehicle	a. Cap screw (16), lock washer (17), strap (18) and spacer (19) b. Cap screw (20), lock washer (21) and bracket (22) c. Retainer halves (23) d. Tie strap (25) e. Diode (26)	Remove Remove Push together, turn and separate Cut and remove Unplug and remove	From engine From engine Remove resistor (24) From harness and diode (26)
<b>CLEANING</b>				
<p><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				

**2-26. ALTERNATOR MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4		Pulley (14), fan (15), strap (18), and bracket (22)	Clean	Use cleaning solvent P-D-680 and stiff bristled brush. Dry thoroughly with compressed air
5		All hard ware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
6		Fan (15)	Inspect	Replace if cracked or damaged, or if fins bent or broken
7		Pulley (14), strap (18) and bracket (22)	Inspect	Replace if cracked, damaged or worn
8		All hardware	Inspect	Replace if worn, or if threads damaged
9		Diode (26)	Test	Set ohmmeter to lowest resistance range, and connect leads to terminals of diode. Note reading, then reverse leads and note reading. There should be one low and one high reading. Replace if readings are both low, both high, or identical
INSTALLATION/REPLACEMENT				
10	Alternator	a. Fan (15) and pulley (14)	Position	On shaft
		b. Lock washer (13) and nut (12)	Install	Tighten to 40-60 pounds foot torque
11	Engine compartment rear, left side of vehicle	a. Diode (26)	Plug in	Around harness and diode (26)
		b. Tie strap (25)	Loop and tie	On engine
		c. Bracket (22)	Position	
		d. Lock washer (21) and cap screw (20)	Install and tighten	
		e. Spacer (19) and strap (18)	Position	On engine
		f. Leek washer (17) and cap screw (16)	Install	Tighten hand-tight only
		g. Alternator (11)	Position	On bracket (22)

**2-26. ALTERNATOR MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
11 (cont)		h. Cap screw (10), lock washer (9) and nut (8)	Install	Tighten hand-tight only
		i. Cap screw (5), lock washer (6) and washer (7)	Install	Tighten hand-tight only
		j. Alternator and fan belt	Adjust	Para 2-17f
		k. Cap screw (5), nut (8) and cap screw (16)	Tighten	When proper adjustment of alternator and fan belt is obtained
		l. Wire lead (3), lock washer (2) and nut (1)	Install	On BATT terminal of alternator
		m. Push-on connector (4)	Connect	To alternator terminals 1, 2 and R
		n. BATT terminal of alternator	Seal	Use silicone rubber sealer
		o. Resistor (24) p. Retainer halves (23)	Position Push together and turn clockwise	In retainer halves (23) To secure resistor (24)
TESTING				
12	Engine compartment, rear, left side of vehicle	Voltmeter	Connect	To alternator BAT terminal and case ground
 <p style="text-align: center;">TA126896</p>				
13	Operator's compartment	a. IGNITION switch b. START switch	place in ON position Depress and start engine	Operate engine at 1800 RPM with all accessories Off
14	Engine compartment	Voltmeter	Observe	Voltmeter should indicate no more than 31 Vdc with engine operating at 1800 RPM; if indication is more than 31 Vdc, replace alternator

**2-26. ALTERNATOR MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
15	Operator's compartment	IGNITION switch	Place in OFF position	
16	Battery compartment, rear of vehicle	Battery ground cable	Disconnect	Paragraph 2-33b
17	Engine compartment	Ammeter	Connect	Between alternator BAT terminal and starter relay terminal 3
18	Battery compartment, rear of vehicle	a. Battery ground cable	Connect	Paragraph 2-33b
		b. Carbon pile	Connect	Across batteries
19	Operator's compartment	a. IGNITION switch	Place in ON position	Start and operate engine at 1800 RPM; turn all vehicle lights on to increase load on batteries
		b. START switch	Depress	
20	Engine compartment	Ammeter	Observe	Ammeter should indicate 27 to 47 amperes with engine operating at 1800 RPM; if ammeter does not indicate 27 to 40 amperes, replace alternator
21	Operator's compartment	IGNITION switch	Place in OFF position	Turn all vehicle lights off
22	Battery compartment, rear of vehicle	a. Battery ground cable	Disconnect	Paragraph 2-33b
		b. Carbon pile	Disconnect	From batteries
23	Engine compartment	Ammeter	Disconnect	
24	Battery compartment, rear of vehicle	Battery ground cable	Connect	Paragraph 2-33b

## 2-27. STARTING SYSTEM MAINTENANCE

a. Starter.

This task covers: a. Removal  
b. Cleaning  
c. Inspection

d. Testing  
e. Installation/Replacement

### INITIAL SETUP

#### TOOLS

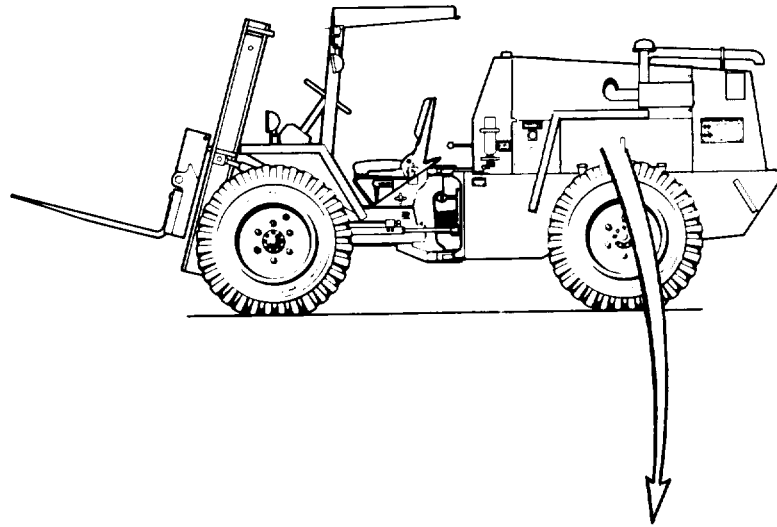
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

#### MATERIALS/ PARTS

Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer

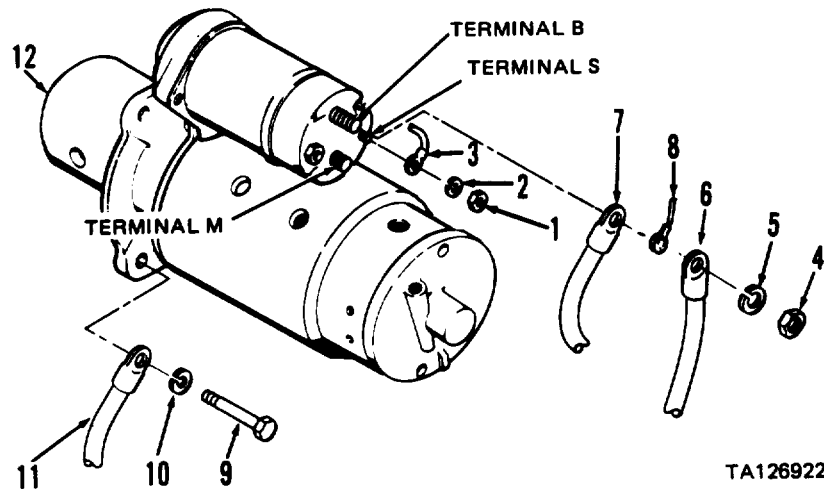
#### EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off.
2-53c	Left side panel removed.
2-33b	Battery ground cable disconnected.



#### KEY

1. Nut
2. Lock washer
3. Wire
4. Nut
5. Lock washer
6. Cable
7. Cable
8. Wire
9. Cap screws
10. Lock washers
11. Ground cable
12. Starter



**2-27. STARTING SYSTEM MAINTENANCE (cont)**

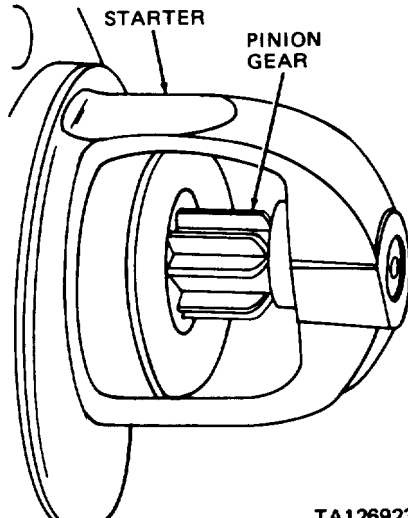
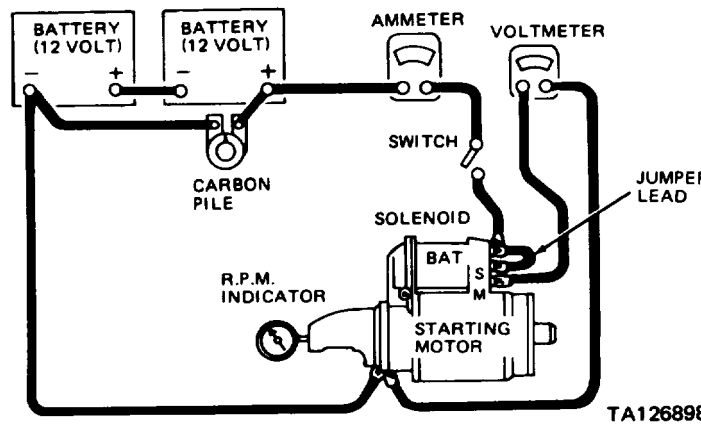
a. Starter (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment rear, left side of vehicle	a. Nut (1), lock washer (2) and wire (3)	Remove	From solenoid switch S terminal
		b. Nut (4), lock washer (5), two cables (6 and 7) and wire (8)	Remove	From solenoid switch B terminal
		c. Three cap screws (9), lock washers (10) and ground cable (11)	Remove	Support starter (12)
		d. Starter (12)	Remove	From engine
<b>CLEANING</b>				
2		Starter (12)	Clean	Wipe exterior with clean, dry cloth
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		Wires (3 and 8) and cables (6, 7 and 11)	Clean	Use cleaning solvent P-D-680 on connectors only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4		All hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
<b>INSPECTION</b>				
5		All hardware	Inspect	Replace if worn, or if threads damaged
6		Wires (3 and 8) and cables (6, 7 and 11)	Inspect	Replace if insulation frayed, or if conductors broken



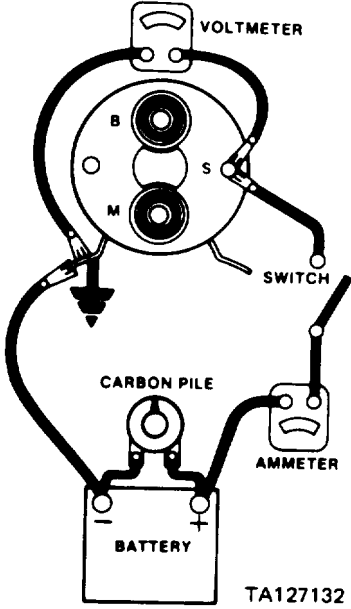
**2-27. STARTING SYSTEM MAINTENANCE (cont)**

a. Starter (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
7		Starter (12)	Inspect	Replace if pinion gear teeth chipped, damaged or excessively worn
				
TESTING				
8	Test bench	a. Starter	Connect to test setup as shown	
				
b. Carbon Pile		Adjust for 20 Vdc indication on voltmeter		
c. Ammeter		Observe indication Ammeter indicates 52 to 90 amperes		

**2-27. STARTING SYSTEM MAINTENANCE (cont)**

a. Starter (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
(cont)		d. RPM indicator	Observe indication	RPM indicator indicates 8000 to 13,000 RPM
<b>NOTE</b>				
<p>If ammeter does not indicate 52 to 90 amperes, or RPM indicator does not indicate 8000 to 13,000 RPM, record voltage, current and RPM, and forward test results with defective starter to direct support maintenance. If ammeter indicates 52 to 90 amperes and RPM indicator indicates 8000 to 13,000 RPM, proceed to step 8e.</p>				
		e. Starter	<p>a. Disconnect from test set-up                      b. Disconnect and tape field coil lead at solenoid M terminal                      c. Connect solenoid terminals to test setup as shown</p>	
	f. Switch g. Carbon pile	<p>Close Adjust for 9 Vdc indication on voltmeter</p>		
	h. Ammeter	Observe indication	Ammeter indicates 6.5 to 7.0 amperes	
<b>NOTE</b>				
<p>If ammeter does not indicate 6.5 to 7.0 amperes, record test results and forward to direct support maintenance with defective starter (solenoid switch defective).</p>				

**2-27. STARTING SYSTEM MAINTENANCE (cont)**

a. Starter (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
8 (cont)		i. Starter	Disconnect from test setup; connect field coil lead to solenoid M terminal and install starter (step 9 below)	
INSTALLATION/REPLACEMENT				
9	Engine compartment rear, left side of vehicle	a. Starter (12) and ground cable (11) b. Three lock washers (10) and cap screws (9) c. Two cables (6 and 7), wire (8), lock washer (5) and nut (4) d. Wire (3), lock washer (2) and nut (1) e. Terminals B, M, and S Seal of solenoid switch	Position  Install and tighten  Install and tighten  Install and tighten	   On terminal B of solenoid switch  On terminal S of solenoid switch  Use silicone rubber sealer

**2-27. STARTING SYSTEM MAINTENANCE (cont)**

*b. Starter Relay and 25 AMP Circuit Breaker.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

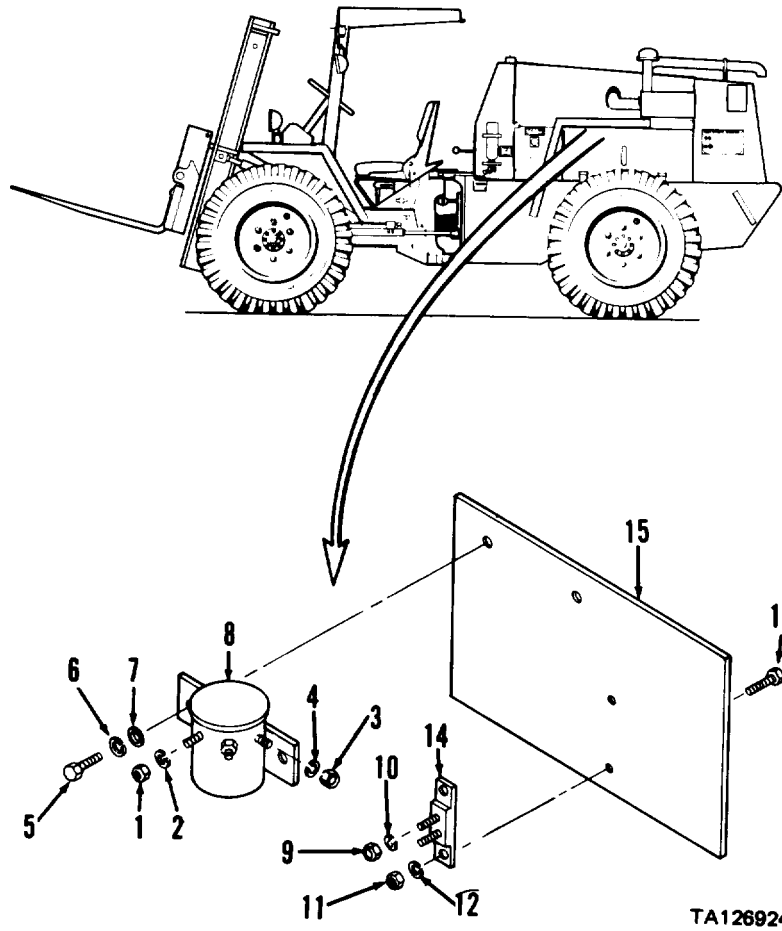
Paragraph	Condition Description
	Engine off.
2-53c	Left side panel removed.
2-33b	Battery ground cable disconnect.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer

KEY

1. Nut
2. Lock washer
3. Nuts
4. Lock washers
5. Cap screws
6. Lock washers
7. Flat washers
8. Starter relay
9. Nuts
10. Lock washers
11. Nuts
12. Lock washers
13. Screws
14. Circuit breaker (25 amp)
15. Mounting plate



TA126924

**2-27. STARTING SYSTEM MAINTENANCE (cont)**

b. Starter Relay and 25 AMP Circuit Breaker (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment rear, left side of vehicle	a. Nut (1), lock washer (2) and wire b. Two nuts (3), lock washers (4) and four wires c. Two cap screws (5), lock washers (6) and flat washers (7) d. Starter relay (8) e. Two nuts (9), lock washers (10) and three wires f. Two nuts (11), lock washers (12) and screws (13) g. Circuit breaker (14) and mounting plate (15)	Tag and remove Tag and remove Remove Remove Tag and remove Remove Separate	From relay center terminals From relay end terminals Support relay (8) and mounting plate (15) From mounting plate (15) From circuit breaker terminals Support circuit breaker (14) and mounting plate (15)
<b>CLEANING</b>				
2		Starter relay (8) and circuit breaker (14)	Clean	Wipe exterior with clean, dry cloth
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		Wire connectors and terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**2-27. STARTING SYSTEM MAINTENANCE (cont)**

*b. Starter Relay and 25 AMP Circuit Breaker (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		All hardware and mounting plate	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air.
INSPECTION				
5		All hardware	Inspect	Replace if worn, or if threads damaged
6		Wire	Inspect	Replace if insulation frayed, or if conductors broken
7		Mounting plate (15)	Inspect	Replace if cracked or damaged
INSTALLATION				
8	Engine compartment rear, left side of vehicle	a. Circuit breaker (14) b. Two screws (13), lock washers (12) and nuts (11) c. Mounting plate (15) and relay (8) d. Two flat washers (7), lock washers (6) and cap screws (5) e. Three wires, two lock washers (10) and nuts (9) f. Four wires, two lock washers (4) and nuts (3) g. Wire, lock washer (2) and nut (1) h. Relay and circuit breaker terminals	Position Install and tighten Position Install and tighten Install and tighten Install and tighten Install and tighten Seal	On mounting plate (15)  On engine  On circuit breaker terminals  On relay end terminals  On relay center terminal Use silicone rubber sealer

**2-28. INSTRUMENT PANEL MAINTENANCE**

a. Flood Light Switches and Circuit Breakers.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

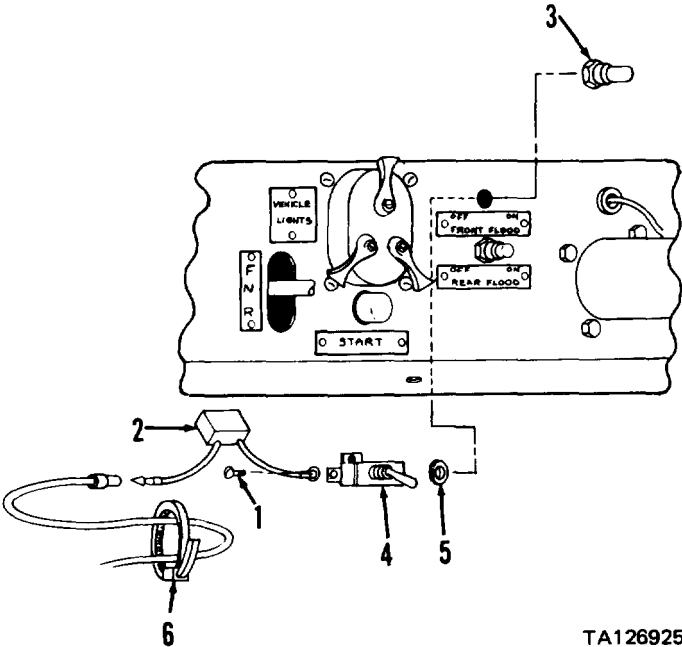
Condition Description

Engine off.  
IGNITION switch in OFF position and key removed.  
Noise baffle mat removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Tie strap  
Silicone rubber sealer

2-53h



TA126925

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

a. Flood Light Switches and Circuit Breakers (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>NOTE</b>				
6 ampere circuit breaker connects to REAR FLOOD switch. 10 ampere circuit breaker connects to FRONT FLOOD switch.				
<b>REMOVAL</b>				
1	Instrument panel, left of steering column	a. Wire leads b. Two screws (1) and wire leads c. Circuit breaker (2) d. Rubber boot (3) e. Switch (4) and washer (5) f. Tie strap (6)	Tag Remove Unplug and remove Unscrew and remove Lower and remove Cut and remove	On switch (4) From switch From harness lead Support switch (4) From instrument panel From harness wire
<b>CLEANING</b>				
2		Switch (4), rubber boot (3) and circuit breaker (2)	Clean	Wipe with clean, dry cloth
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		Switch terminals and wire connectors	Clean	Use cleaning solvent P-D-680 on terminals and connectors only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				



**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

*a. Flood Light Switches and Circuit Breakers (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		Screws (1)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
5		Rubber boot (3)	Inspect	Replace if threads damaged, or if boot cracked or deteriorated
6		Harness and circuit breaker wires	Inspect	Replace if insulation frayed, or if conductors broken
7		Switch (4)	Inspect	Replace if threads or terminals damaged
INSTALLATION				
8	Instrument panel, left of steering column	a. Circuit breaker lead, wire leads and two screws (1)	Install and tighten	Note tags for connection
		b. Switch (4) and washer (5)	Position	In instrument panel
		c. Rubber boot (3)	Install and tighten	Until switch (4) is securely mounted
		d. Circuit breaker lead	Push in	Harness lead
		e. Tie strap (6)	Loop and tie	Around harness wire (to prevent circuit breaker from hanging)
		f. Wire leads and switch terminals	Seal	Use silicone rubber sealer

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

b. *START Switch and VEHICLE LIGHTS Switch.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

MATERIALS/PARTS

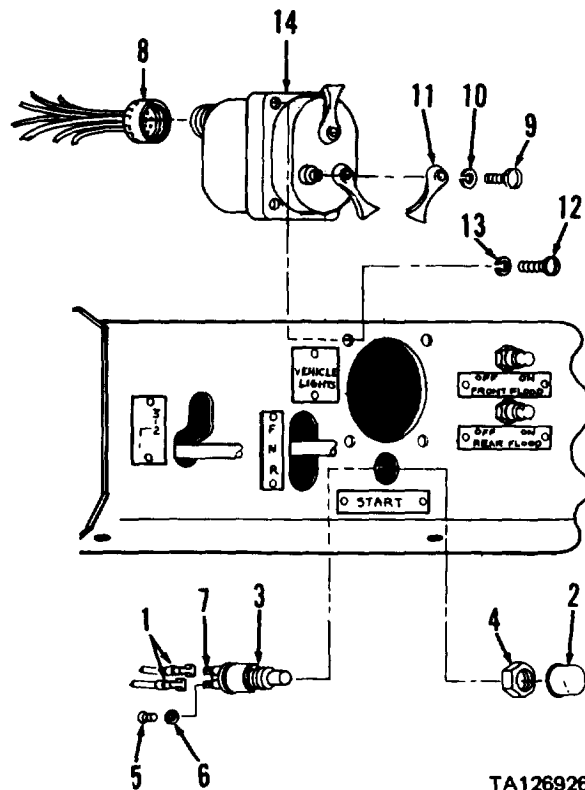
Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer

EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off.
	IGNITION switch in OFF position and key removed.
2-53h	Noise baffle mat removed.

KEY

1. Wire leads
2. Boot
3. START switch
4. Nut
5. Screws
6. Washers
7. Terminal blades
8. Harness connector
9. Screws
10. Lock washers
11. Levers
12. Screws
13. Lock washers
14. VEHICLE LIGHTS switch



**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

*b. START Switch and VEHICLE LIGHTS Switch (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Instrument panel, left of steering column	a. Wire leads (1)	Grasp and disconnect	From START switch
		b. Rubber boot (2)	Unscrew and remove	Support START switch
		c. START switch (3)	Lower and remove	From instrument panel
		d. Nut (4), two screws (5), washers (6) and terminals (7)	Remove	From START switch
		e. Harness connector (8)	Unscrew and disconnect	From VEHICLE LIGHTS switch
		f. Three screws (9), lock washers (10) and lever (11)	Remove	
		g. Four screws (12) and lock washers (13)	Remove	Support VEHICLE LIGHTS switch
		h. VEHICLE LIGHTS switch (14)	Lower and remove	From instrument panel
<b>CLEANING</b>				
2		Switches (3 and 14), rubber boot (2) and harness connector (8)	Clean	Wipe with clean, dry cloth
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		Switch terminals and wire connectors	Clean	Use cleaning solvent P-D-680 on terminals and connectors only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

*b. START Switch and VEHICLE LIGHTS Switch (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		All hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
5		Rubber boot (2)	Inspect	Replace if threads damaged, or if boot cracked or deteriorated
6		Harness and START SWITCH wires	Inspect	Replace if insulation frayed, or if conductors broken
7		Switches (3 and 14)	Inspect	Replace if threads or terminals damaged
8		Terminal blades (7)	Inspect	Replace if broken or corroded
9		All hard ware	Inspect	Replace if worn, or if threads damaged
INSTALLATION				
10	Instrument panel, left of steering column	a. VEHICLE LIGHTS switch (14) b. Four screws (12) and lock washers (13) c. Three levers (11) d. Three screws (9) and lock washers (10) e. Harness connector (8) f. Hex nut (4) g. Two screws (5), washers (6) and terminals (7) h. START switch (3) i. Rubber boot (2) j. Wire leads (1) k. Wire leads (1), terminals (7) and harness connector (8)	Position Install and tighten Position Install and tighten Install and tighten Install and position Install and tighten Position Install and tighten Push on Seal	In instrument panel Until VEHICLE LIGHTS switch (14) is securely mounted On shafts of VEHICLE LIGHTS switch (14) Until levers (11) are securely mounted On VEHICLE LIGHTS switch (14) For 1/8 inch of START switch threads above instrument panel On START switch (3) In instrument panel Until START switch (3) is securely mounted To terminals (7) Use silicone rubber sealer

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

c. Ignition Switch and Circuit Breaker.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

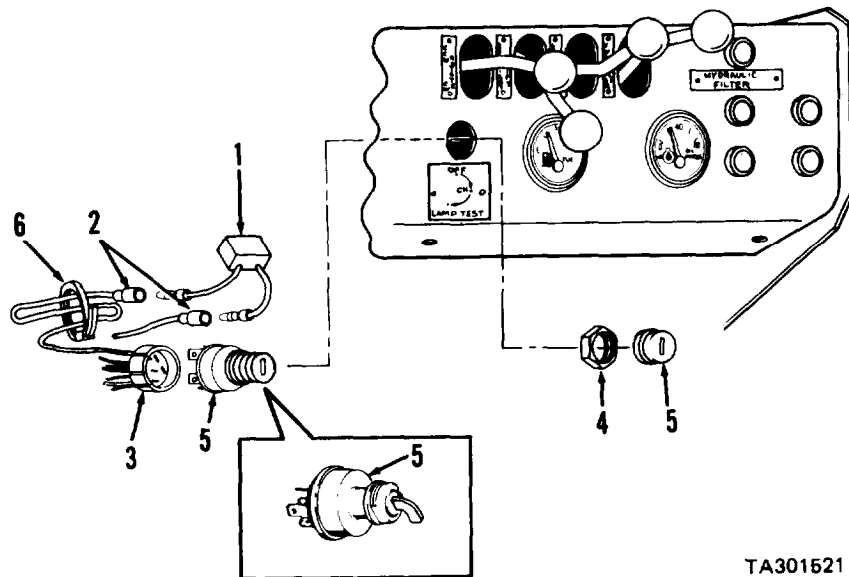
Paragraph Condition Description  
2-33b Engine off.  
2-53h Battery ground cable disconnected.  
Noise baffle mat removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Tie strap

KEY

- 1. Circuit breaker
- 2. Wire leads
- 3. Harness connector
- 4. Hex nut
- 5. IGNITION switch
- 6. Tie strap



SERIAL NUMBER  
9150573 AND ABOVE

TA301621

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Instrument panel, a. right of steering column	a. Circuit breaker (1)	Unplug and remove	From wire leads (2)
		b. Harness connector (3)	Grasp and pull	From IGNITION switch (5)
		c. Hex nut (4)	Unscrew and remove	Support IGNITION switch (5)
		d. IGNITION switch (5)	Lower and remove	From instrument panel
		e. Tie strap (6)	Cut and remove	From harness wire

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

*c. Ignition Switch and Circuit Breaker (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
2		IGNITION switch (5)	Clean	Wipe with clean, dry cloth
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		Switch terminals and wire connectors	Clean	Use cleaning solvent P-D-680 on terminals and connectors only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4		Hex nut (4)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air.
INSPECTION				
5		Hex nut (4)	Inspect	Replace if threads damaged
6		Harness and circuit breaker wires	Inspect	Replace if insulation frayed, or if conductors broken
7		IGNITION switch (5)	Inspect	Replace if threads or terminals damaged
INSTALLATION				
8	Instrument panel, right of steering column	a. IGNITION switch (5) b. Hex nut (4) c. Harness connector (3) d. Circuit breaker (1) leads e. Tie strap (6)	Position Install and tighten Push on Push in Loop and tie	In instrument panel Until IGNITION switch (5) is securely mounted IGNITION switch terminals Wire leads (2) Around wire (to prevent circuit breaker from hanging)

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

d. Lockout Relay.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

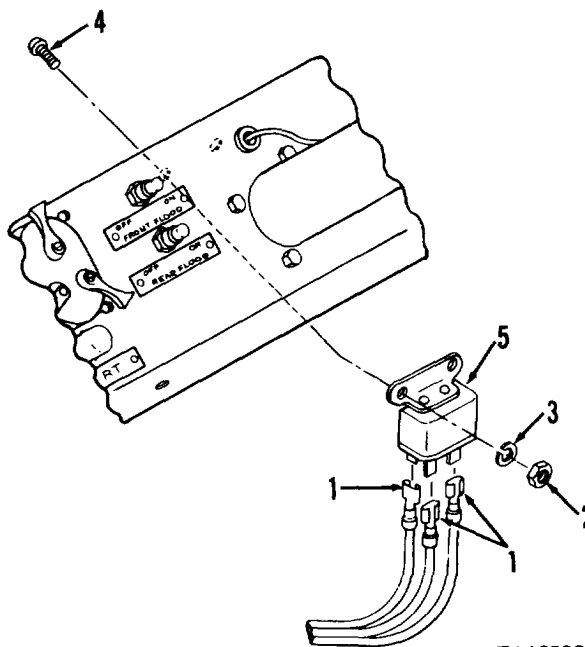
Paragraph Condition Description  
Engine off.  
IGNITION switch in OFF position and key removed.  
2-53h Noise baffle mat removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

KEY

- 1. Wire leads
- 2. Nuts
- 3. Lock washers
- 4. Cap screws
- 5. Lockout relay



STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Instrument panel, bottom center	a. Wire leads (1) b. Wire leads (1) c. Two nuts (2), lock washers (3) and cap screws (4) d. Lockout relay (5)	Tag Grasp and pull Remove  Lower and remove	From relay terminals Support relay (5)  From instrument panel

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

*d. Lockout Relay (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes, seek medical attention immediately.</p>				
2		All hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connectors and relay terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
INSPECTION				
4		Nut (2) and screw (4)	Inspect	Replace if threads damaged
5		Harness wires	Inspect	Replace if insulation frayed, or if conductors broken
6		Relay (5)	Inspect	Replace if terminals damaged
INSTALLATION				
7	Instrument panel, bottom center	a. Lockout relay (5) b. Two screws (4), lock washers (3) and nuts (2) c. Wire leads (1)	Position Install and tighten  Push on	Against instrument panel Until lockout relay (5) is securely mounted  Relay terminals (note tags for correct connection)



**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

e. *Warning Lights and Diodes.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Testing  
 e. Installation

INITIAL SETUP

TOOLS  
 None

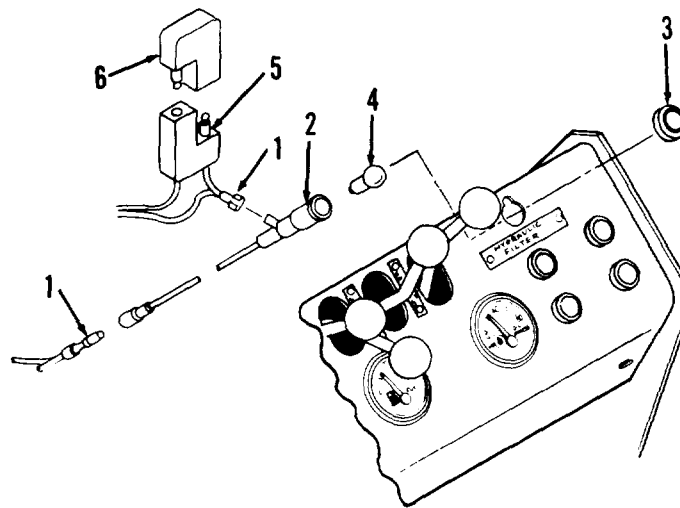
EQUIPMENT CONDITION  
 Paragraph Condition Description

MATERIALS/PARTS  
 Cleaning solvent P-D-680  
 Clean cloths

Engine off.  
 IGNITION switch in OFF position and key removed.  
 2-53h Noise baffle mat removed.

KEY

- 1. Wire leads
- 2. Socket
- 3. Lens
- 4. Bulb
- 5. Connector
- 6. Diode



TA126929

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>NOTE</b>				
<p>All five warning light assemblies are identical except for legend marked on lens (3). Isolation diode (6) for ALTERNATOR warning light is located in engine compartment (see para 2-26). Isolation diode (6) not used with OIL PRESSURE warning light.</p>				
<b>REMOVAL</b>				
1	Instrument panel, far right side	a. Wire leads (1) b. Socket (2) c. Lens (3) d. Socket (2) e. Bulb (4) f. Isolation diode (6)	Grasp and pull Push Rotate 1/4 turn Lower and remove Remove Grasp and pull	From warning light terminals Against instrument panel Support socket (2) From instrument panel From instrument panel From connector (5)

**2-28. INSTRUMENT PANEL MAINTENANCE (cont)**

*e. Warning Lights and Diodes (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Electrical connectors and terminals (1, 2, 5 and 6)	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
3		Lens (3)	Clean	Use clean, dry cloth
INSPECTION				
4		Harness, connector and light assembly wires	Inspect	Replace if insulation frayed, or if conductors broken
TESTING				
5		Isolation diode (6)	Test	Set ohmmeter to lowest resistance range, and connect leads to terminals of diode (6). Note reading, then reverse leads and note reading. There should be one low and one high reading. Replace diode if readings are both low, both high, or identical
INSTALLATION				
6	Instrument panel, far right side	a. Isolation diode (6) b. Bulb (4) c. Socket (2) d. Lens (3) e. Socket (2) and lens (3) f. Wire leads (1)	Push on Install Position Position Push together Push on	Connector (5) In socket (2) From below instrument panel On instrument panel top While rotating lens 1/4 turn to secure socket (2) Warning light terminals

**2-29. AUXILIARY PANEL MAINTENANCE**

a. *Slave Receptacle.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/ Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

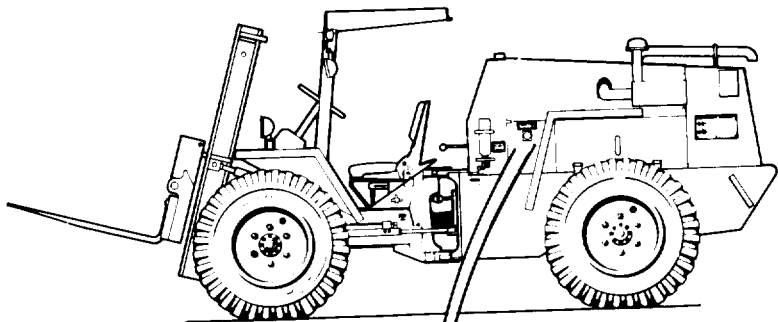
NSN 4910-00-754-0654

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer

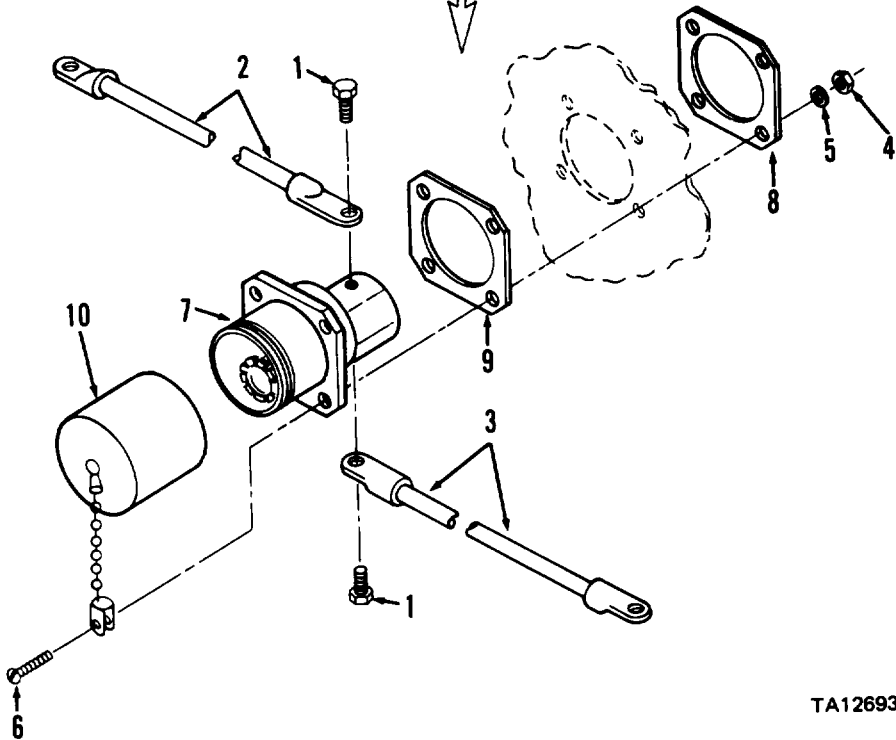
EQUIPMENT CONDITION

paragraph	Condition Description
	Engine off.
2-33b	Battery ground cable disconnected.
2-53c	Left side panel removed.
2-53e	Left hood support plate removed.



KEY

- 1. Cap screws
- 2. Negative cable
- 3. Positive cable
- 4. Nuts
- 5. Flat washers
- 6. Screws
- 7. Slave receptacle
- 8. Rubber insulator
- 9. Rubber insulator
- 10. Cover



TA126930

**2-29. AUXILIARY PANEL MAINTENANCE (cont)**

a. Slave Receptacle (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Left hood support plate, top	a. Two cap screws (1) and cables (2 and 3)	Remove	From slave receptacle (7)
		b. Four nuts (4), flat washers (5) and screws (6)	Remove	Support receptacle (7)
		c. Receptacle (7) and rubber insulators (8 and 9)	Remove	From left side panel
		d. Cover (10)	Unscrew and remove	From receptacle (7)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		Cable connectors and receptacle terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
3		Cover (10) and all hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air

**2-29. AUXILIARY PANEL MAINTENANCE (cont)**

a. *Slave Receptacle (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
4		All hardware	Inspect	Replace if worn, or if threads damaged
5		Cables (2 and 3)	Inspect	Replace if insulation frayed, or if conductors broken
6		Receptacle (7) and cover (10)	Inspect	Replace if threads damaged, or if receptacle terminals damaged
7		Rubber insulators (8 and 9)	Inspect	Replace if cracked or deteriorated
<b>INSTALLATION/ REPLACEMENT</b>				
8	Left hood support plate, top	a. Cover (10) b. Rubber insulators (8 and 9) and receptacle (7) c. Four screws (6) flat washers (5) and nuts (4) d. Cables (2 and 3) and two cap screws (1) e. Cable connectors and cap screws (1)	Install Position  Install and tighten  Install and tighten Seal	On receptacle (7) On left side panel    On receptacle (7) Use silicone rubber sealer

**2-29. AUXILIARY PANEL MAINTENANCE (cont)**

b. Hourmeter.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation Replacement

INITIAL SETUP

TOOLS

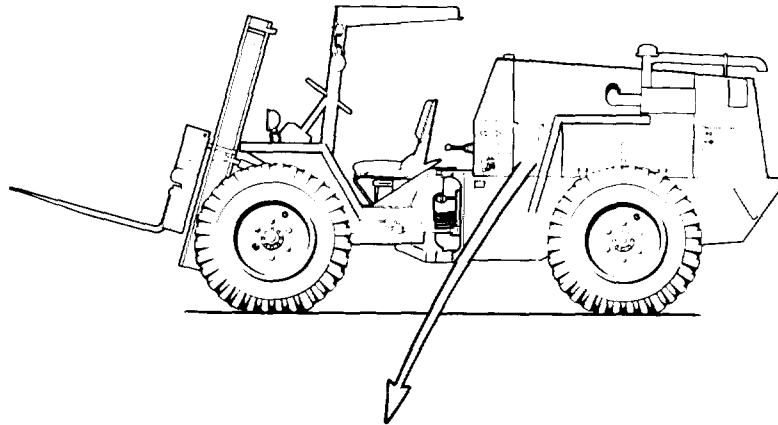
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph Condition Description  
2-53c Engine off. IGNITION switch in OFF position and key removed. Left side panel removed.

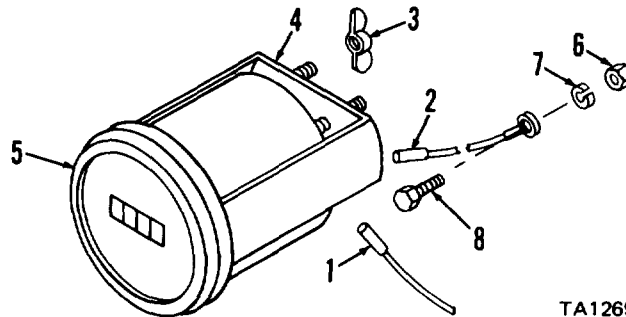
MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer



KEY

- 1. Positive wire lead
- 2. Ground wire lead
- 3. Wing nuts
- 4. Bracket
- 5. Hourmeter
- 6. Nut
- 7. Lock washer
- 8. Cap screw



TA126931

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Left hood support plate, bottom	a. Wire leads (1 and 2) b. Two wing nuts (3) and bracket (4) c. Hourmeter (5) d. Nut (6), lock washer (7) and cap screw (8) e. Ground wire and lead (2)	Tag and disconnect Remove Remove Remove Remove	From hourmeter (5) Support hourmeter (5) From left side panel From left side fender

**2-29. AUXILIARY PANEL MAINTENANCE (cont)**

b. Hourmeter (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Wire connectors and hourmeter terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
3		Bracket (4) and all hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
4		All hardware	Inspect	Replace if worn, or if threads damaged
5		Positive wire and ground wire	Inspect	Replace if insulation frayed, or if conductors broken
6		Hourmeter	Inspect	Replace if threads damaged, or if receptacle terminals damaged
7		Bracket (4)	Inspect	Replace hourmeter if bracket (4) cracked or damaged
INSTALLATION/REPLACEMENT				
8	Left hood support plate, bottom	a. Ground wire and lead (2) b. Cap screw (8), lock washer (7) and nut (6) c. Hourmeter (5) d. Bracket (4) e. Two wing nuts (3) f. Wire leads (1 and 2) g. All leads and terminals	Position Install and tighten Position Position Tighten both evenly Push on Seal	Inside left fender bolt hole  On left side panel On hourmeter studs Until hourmeter is securely mounted  Note tags for correct connection Use silicone rubber sealer

## 2-30. LIGHT SYSTEMS MAINTENANCE

### a. Flood Lights.

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Installation/Replacement  
 e. Testing

### INITIAL SETUP

#### TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

#### MATERIALS/PARTS

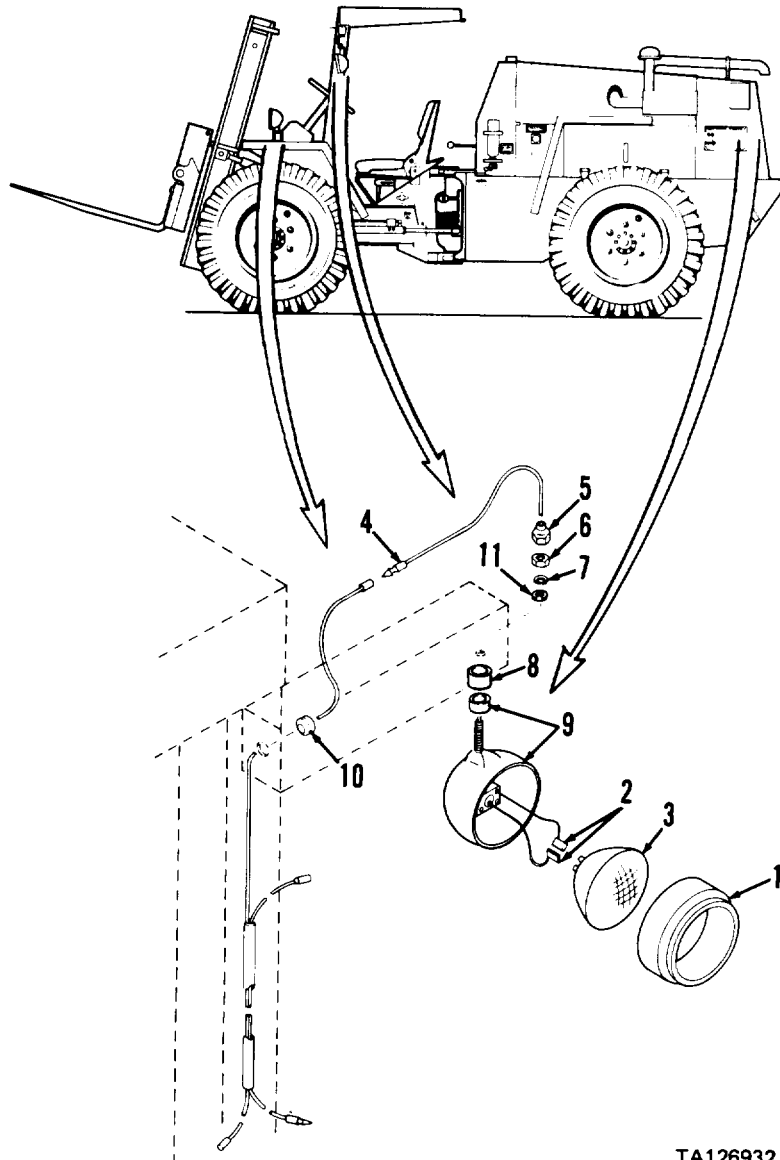
Cleaning solvent P-D-680  
 Clean cloths

#### EQUIPMENT CONDITION

Paragraph	Condition	Description
	Engine off.	
	IGNITION switch in OFF position and key removed.	
2-52c	Tow bar lowered to ground and grille open.	

#### KEY

1. Rubber gasket
2. Wire leads
3. Lamp
4. Male connector
5. Seal (used on ROPS mounted flood lights only)
6. Nut
7. Lock washer
8. Seal (not used on instrument panel mounted flood lights)
9. Housing and spacer
10. Grommet (used on ROPS mounted flood lights only)
11. Washer



TA126932



**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

a. Flood Lights (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front or rear	a. Rubber gasket (1) b. Rubber gasket (1) c. Wire leads (2)  d. Connector (4) e. Seal (5)  f. Nut (6), lock washer (7) and washer (11) g. Housing and spacer (9) and seal (8) h. Grommet (10)	Pull inserts Pull and remove Tag, grasp and pull Grasp and pull Grasp and pull from nut (6) Remove Remove Remove	From cut outs in housing (9) From housing (9) and lamp (3) From lamp (3); set lamp (3) aside  From harness lead Not used on instrument panel-mounted flood lights or rear flood lights Support housing (9)  Seal (8) not used on instrument panel-mounted flood lights From ROPS
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Wire connectors and terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
3		Gasket (1), seals (5 and 8) and grommet (10)	Clean	Wipe with a clean, dry cloth
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4		Housing (9) and hardware (6, 7 and 11)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
<b>INSPECTION</b>				
5		All hardware	Inspect	Replace if worn, or if threads damaged

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*a. Flood Lights (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION (cont)</b>				
6		All wiring	Inspect	Replace if insulation frayed, or if conductors broken
7		Rubber gasket (1), seals (5 and 8) and grommet (10)	Inspect	Replace if cracked or deteriorated
8		Housing (9)	Inspect	Replace if cracked or if threads damaged
<b>INSTALLATION/ REPLACEMENT</b>				
9	Front or rear	a. Grommet (10)	Slide over harness lead and install	On ROPS only
<b>NOTE</b>				
Mark a spot for a drain hole on bottom of housing (9). Using 1/4 inch drill bit, drill hole at mark. Apply paint around hole to stop rust and corrosion.				
		b. Seal (8) and housing and spacer (9)	Position on vehicle	Seal (8) not used on instrument panel-mounted flood lights
		c. Washer (11), lock washer (7), nut (6) and seal (5)	Slide over connector (4) and tighten	Until flood light housing (9) is securely mounted. Seal (5) used on ROPS mounted flood lights only
		d. Connector (4)	Push in	Harness lead
		e. Rubber gasket (1)	Pull over lamp (3)	
		f. Wire leads (2)	Push on	Lamp terminals
		g. Rubber tangs of gasket (1)	Push into cutouts in housing (9)	Use a screwdriver to fully position tangs if necessary
<b>TESTING</b>				
10	Instrument panel	a. IGNITION switch	Place in ON position	
		b. VEHICLE LIGHTS switch	Place in SER. DRIVE position	
		c. FRONT FLOOD switch or REAR FLOOD switch as appropriate	Place in ON position	
11	Front or rear	Flood lights	Check	Front or rear flood lights should be on; if flood lights are on, place IGNITION, FRONT FLOOD or REAR FLOOD, and VEHICLE LIGHTS switches in OFF positions
<b>NOTE</b>				
If flood lights are not on, refer to troubleshooting, paragraph 2-24 and troubleshoot light systems.				

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*b. Front Blackout Light.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Installation/Replacement  
 e. Testing

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

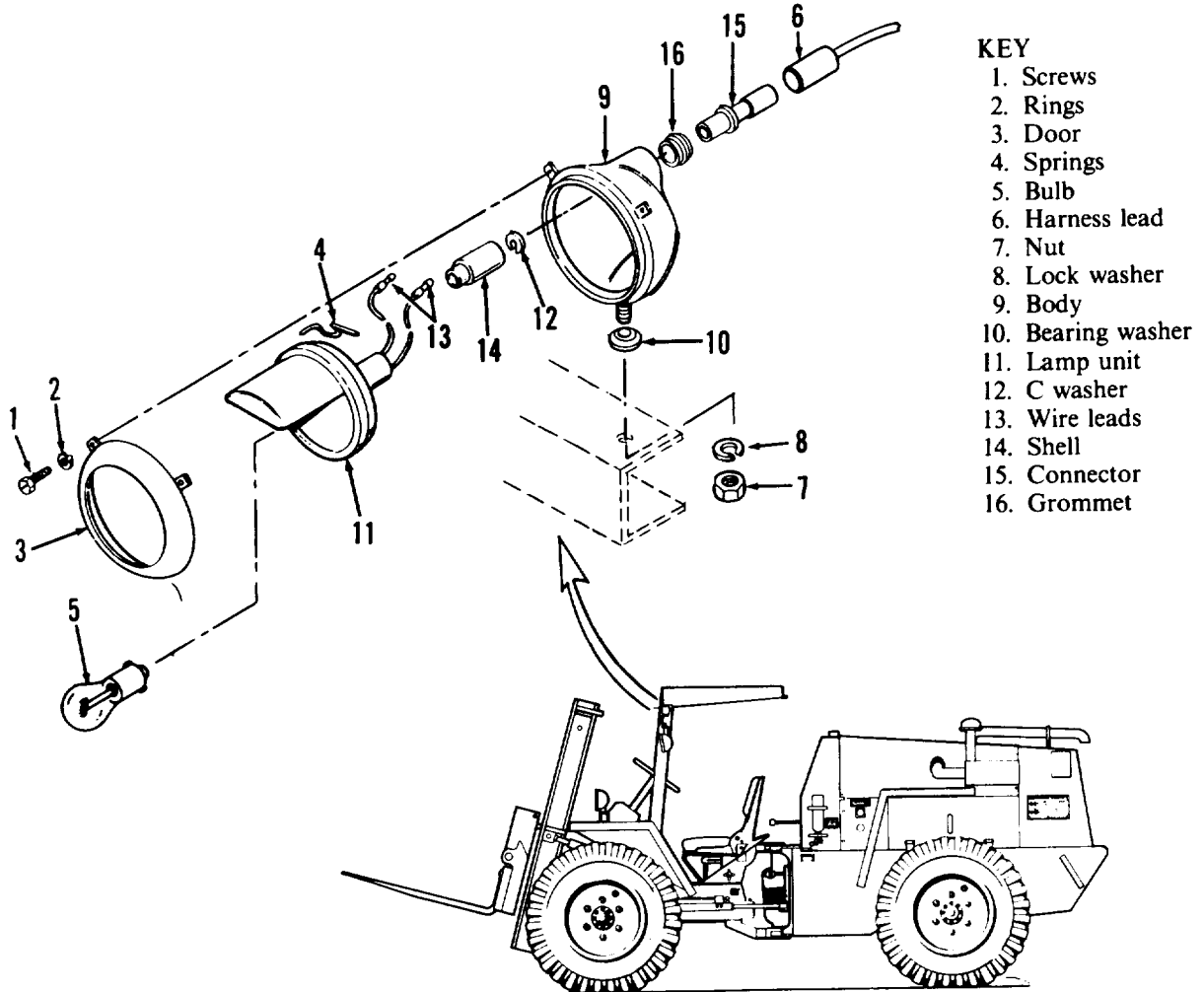
Engine off.  
 IGNITION switch in OFF position and key removed.

MATERIALS PARTS

Cleaning solvent P-D-680  
 Clean cloths

**NOTE**

Two different blackout lights are used; one type uses bulb (5), the other type uses lamp unit (11).



TA126933

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*b. Front Blackout Light (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	ROPS, top left side	a. Three screws (1) b. Door (3) c. Bulb (5)  d. Three springs (4) and lamp unit (11) e. Harness lead (6) f. Nut and lock washer (8) g. Body (9) h. Connector (15) and grommet (16)	Loosen Remove Depress, turn counterclockwise and remove Remove Grasp and pull Remove Lift and remove Remove	From body (9)   From connector (15) From ROPS From body (9)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Wire connectors	Clean	Use cleaning solvent P-D-680 on connectors only
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
3		Door (3), lamp unit (11), body (9) and hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
4		Shell (14) and grommet (16)	Clean	Wipe with a clean, dry cloth

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*b. Front Blackout Light (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
5		All hardware	Inspect	Replace if worn, or if threads damaged
6		All wiring	Inspect	Replace if insulation frayed, or if conductors broken
7		Door (3), body (9) and lamp unit (11)	Inspect	Replace if cracked or damaged
8		Shell (14), connector (15) and grommet (16)	Inspect	Replace if cracked, damaged or deteriorated
<b>INSTALLATION/REPLACEMENT</b>				
9	ROPS, top left side	a. Grommet (16) and connector (15)	Install	In body (9)
		b. Body (9) and washer (10)	Position	On ROPS
		c. Lock washer (8) and nut (7)	Install and tighten	Until blackout light is securely mounted
		d. Harness lead (6)	Push on	Connector (15)
		e. Shell (14) and washer (12)	Install	On wire lead (13)
		f. Lamp unit (11) and three springs (4)	Install	
		g. Bulb (5)	Install	Push bulb in, turn clockwise and release
		h. Door (3)	Position	On body (9)
		i. Three screws (1)	Tighten	Until door (3) is securely mounted
<b>TESTING</b>				
10	Instrument panel	a. IGNITION switch	Place in ON position	
		b. VEHICLE LIGHTS switch	Place in B.O. DRIVE position	
11	Front of vehicle	Front blackout light	Check	Front blackout light should be on; if on, place IGNITION and VEHICLE LIGHTS switches in OFF positions
<b>NOTE</b>				
If front blackout light is not on, refer to troubleshooting, paragraph 2-24 and troubleshoot light systems.				

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*c. Rear. Blackout Lights.*

This task covers: a. Removal  
b. Cleaning  
c. Inspection

d. Installation/ Replacement  
e. Testing

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph Condition Description  
Engine off.  
IGNITION switch in OFF position and key removed.  
Tow bar lowered to ground and grille open.

MATERIALS/PARTS

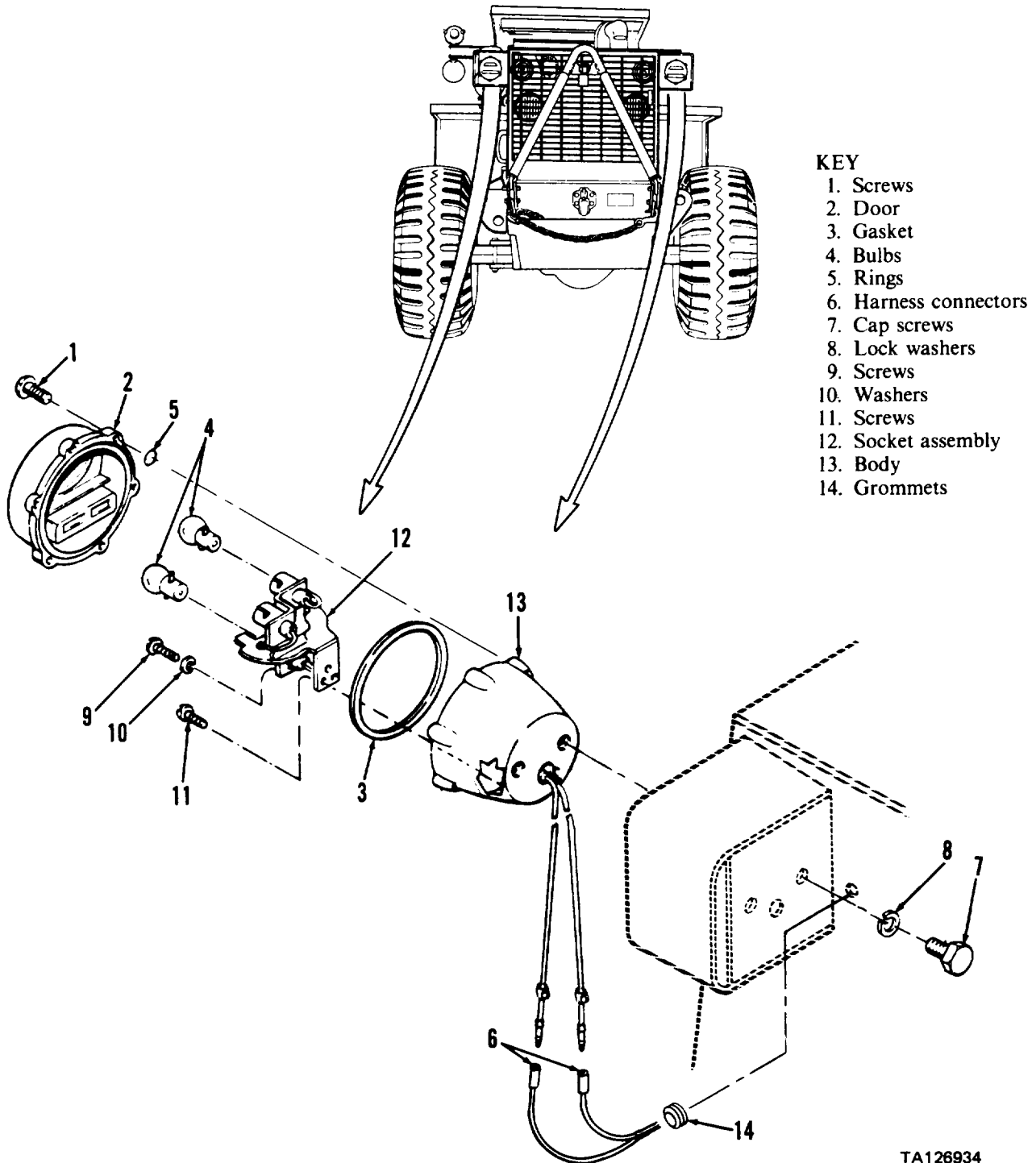
Cleaning solvent P-D-680  
Clean cloths

2-52c

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Rear of vehicle	a. Six screws (1) b. Door (2) and gasket (3) c. Two bulbs (4)	Loosen Remove Depress, turn counterclockwise and remove	
		d. Two harness connectors (6)	Grasp and pull	From light assembly leads
		e. Two cap screws (7) and lock washers (8)	Remove	Support body (13)
		f. Body (13)	Remove	
		g. Five screws (9 and 11) and two washers (10)	Remove	Support socket assembly (12)
		h. Socket assembly (12)	Remove	From body (13)
		i. Six rings (5)	Remove	From screws (1)
		j. Six screws (1)	Remove	From door (2)
		k. Grommet (14)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*c. Rear Blackout Lights (cont).*



TA126934

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*c. Rear Blackout Lights (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Body (13) and all hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connectors	Clean	Use cleaning solvent P-D-680 on connectors only
4		Door (2), gasket (3) and socket assembly (12)	Clean	Wipe with a clean, dry cloth
INSPECTION				
5		All hardware	Inspect	Replace if worn, or if threads damaged
6		All wiring	Inspect	Replace if insulation frayed, or if conductors broken
7		Body (13)	Inspect	Replace if cracked, damaged, or if threads damaged
8		Door (2) and socket assembly (12)	Inspect	Replace if cracked or damaged
9		Gasket (3) and grommet (14)	Inspect	Replace if cracked or deteriorated
INSTALLATION/REPLACEMENT				
10	Rear of vehicle	a. Grommet (14) b. Six screws (1) c. Six rings (5) d. Socket assembly (12) e. Five screws (9 and 11) and two washers (10) f. Body (13) g. Two lock washers (8) and cap screws (7)	Install Position Install Position Install and tighten Position Install and tighten	In door (2) On screws (1) In body (13) Until socket assembly (12) is securely mounted Until body (13) is securely mounted



**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*c. Rear Blackout Lights (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT (cont)</b>				
10 (cont)		h. Two harness connectors (6)	Push on	Light assembly leads
		i. Two bulbs (4)	Install	Push bulb in, turn 1/4 turn clockwise and release
		j. Gasket (3) and door (2)	Position	On body (13)
		k. Six screws (1)	Tighten	Until door (2) is securely mounted
<b>TESTING</b>				
11	Instrument panel	a. IGNITION switch	Place in ON position	
		b. VEHICLE LIGHTS switch	Place in B.O. DRIVE position	
12	Rear of vehicle	Blackout lights	Check	Rear blackout lights should be on; have an assistant depress service brake and check that stop light is on. If on, place IGNITION and VEHICLE LIGHTS switches in OFF positions
<b>NOTE</b>				
If rear blackout lights and/or stop lights are not on, refer to troubleshooting, paragraph 2-24 and troubleshoot light systems.				

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*d. Stop and Tail light.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Installation/Replacement  
 e. Testing

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

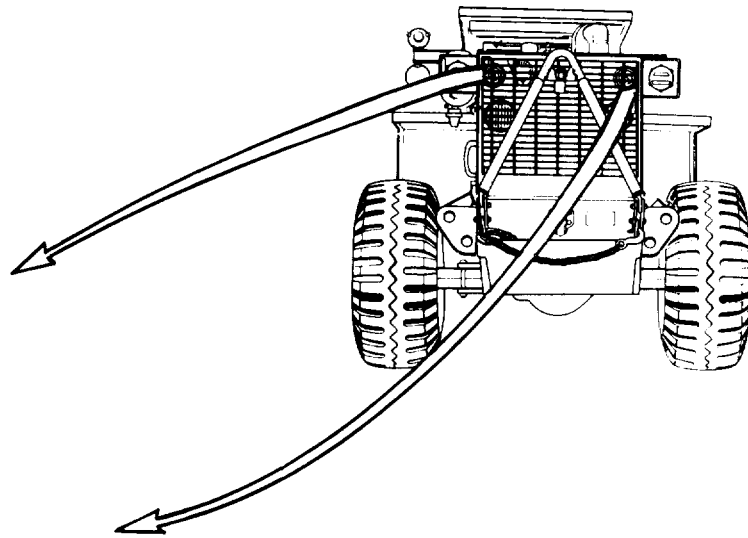
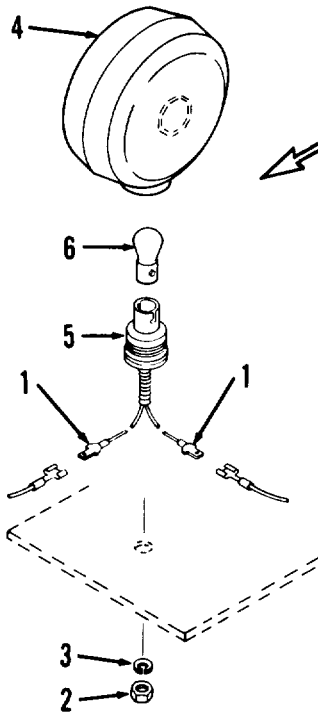
MATERIALS/PARTS  
 Cleaning solvent P-D-680  
 Clean cloths

EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off. IGNITION switch in OFF position and key removed.
2-52c	Tow bar lowered to ground and grille open.

KEY

- 1. Wire leads
- 2. Nut
- 3. Lock washer
- 4. Lens
- 5. Socket assembly
- 6. Lamp



TA126935

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*d. Stop and Tail Light (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Light brackets at rear of vehicle	a. Two wire leads (1)	Tag, grasp and pull	From harness leads
		b. Nut (2) and lock washer (3)	Remove	
		c. Lens (4) and socket assembly (5)	Lift and remove	From light bracket
		d. Lens (4)	Unscrew and remove	Turn counterclockwise and lift from socket assembly (5)
		e. Lamp (6)	Depress, turn counterclockwise and lift	From socket assembly (5)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Socket assembly (5), wire terminals and connectors, and hardware	Clean	Use cleaning solvent P-D-680 on metal parts only
3		Lens (4)	Clean	Wipe with a clean dry cloth
<b>INSPECTION</b>				
4		All hardware	Inspect	Replace if worn, or threads damaged
5		All wiring	Inspect	Replace if insulation frayed, or if conductors broken
6		Lens (4)	Inspect	Replace if cracked or deteriorated
7		Socket assembly (5)	Inspect	Replace if wires, connectors or socket damaged

**2-30. LIGHT SYSTEMS MAINTENANCE (cont)**

*d. Stop and Tail Light (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT (cont)</b>				
8	Light brackets at rear of vehicle	a. Lamp (6)	Install	Push lamp in socket assembly (5), turn clockwise and release
		b. Lens (4)	Install	Turn clockwise on socket assembly (5) hand-tight only
		c. Lens (4) and socket assembly (5)	Position	On light bracket
		d. Lock washer (3) and nut (2)	Install and tighten	Until stop and tail light is securely mounted
		e. Two wire leads (1)	Push on	Harness connectors
<b>TESTING</b>				
9	Instrument panel	a. IGNITION switch	Place in ON position	
		b. VEHICLE LIGHTS switch	Place in SER DRIVE position	
10	Rear of vehicle	Stop and tail lights	Check	Tail lights should be on; have an assistant depress service brake and check that stop light is on; if lights are on, place IGNITION and VEHICLE LIGHTS switches in OFF positions
<b>NOTE</b>				
If stop and/or tail lights are not on, refer to troubleshooting, paragraph 2-24 and troubleshoot light systems.				

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE**

*a. Fuel Gage Sending Unit.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

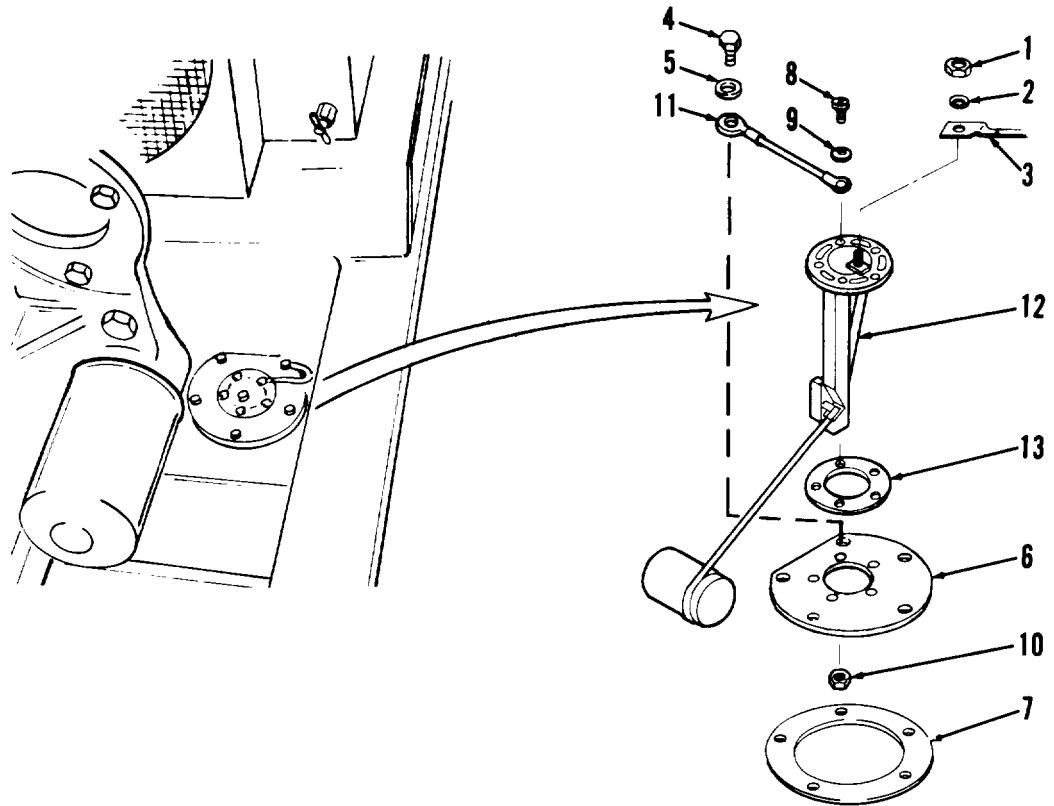
Paragraph	Condition Description
	Engine off. IGNITION switch in OFF position and key removed.
2-53c	Left side panel removed.

MATERIALS PARTS

Cleaning solvent P-D-680  
Clean cloths  
Gaskets

KEY

- 1. Nut
- 2. Lock washer
- 3. Harness lead
- 4. Cap screws
- 5. Lock washers
- 6. Plate
- 7. Gasket
- 8. Screws
- 9. Washers
- 10. Lock nuts
- 11. Ground strap
- 12. Sending unit
- 13. Gasket



TA126936

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

a. Fuel Gage Sending Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment rear left side of vehicle	a. Nut (1), lock washer (2) and harness lead (3) b. Five cap screws (4) and lock washers, (5) c. Plate (6) and sending unit (12) d. Gasket (7) e. Five screws (8), washers (9), and lock nuts (10) and ground strap (11) f. Plate (6) and sending unit (12) g. Gasket (13)	Remove Remove Lift and remove Remove and discard Remove Separate Remove and discard	From sending unit terminal From fuel tank
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Plate (6) and all hardware	Clean	Use cleaning solvent P-D-680. Dry parts thoroughly with compressed air
3		Wire connectors and terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

a. Fuel Gage Sending Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
4		Hardware	Inspect	Replace if worn, or if threads damaged
5		All wires	Inspect	Replace if insulation frayed, or if conductors broken
6		Plate (6)	Inspect	Replace if bent, cracked or otherwise damaged
<b>INSTALLATION</b>				
7	Engine compartment rear, left side of vehicle	a. New gasket (13)	Position	On sending unit (12)
<b>NOTE</b>				
In following step, be sure terminal at top of sending unit is directly opposite flat on side of plate (6).				
		b. Sending unit (12) and gasket (13)	Position	On plate (6)
		c. Five screws (8), washers (9), and lock nuts (10) and ground strap (11)	Install and tighten	Until sending unit (12) is securely mounted
		d. New gasket (7)	Position	On fuel tank
		e. Plate (6) and sending unit (12)	Position	On gasket (7)
		f. Five cap screws (4) and lock washers (5), and ground strap (11)	Install and tighten	Until plate (6) is securely mounted
		g. Harness lead (3), lock washer (2) and nut (1)	Install and tighten	Until harness lead (3) is securely attached to terminal

## 2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)

*b. Neutral Start and Back-up Alarm Switches.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

### INITIAL SETUP

#### TOOLS

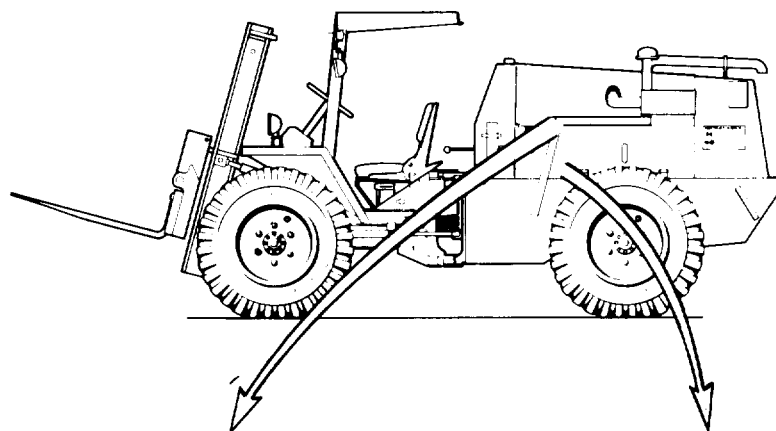
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

#### EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off.
	IGNITION switch in OFF position and key removed.
2-53c	Left side panel removed.

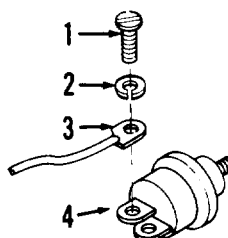
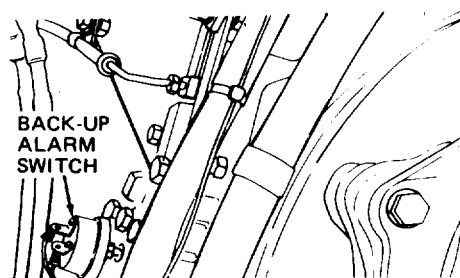
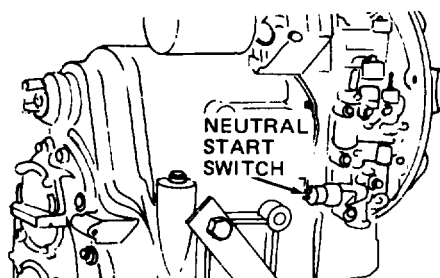
#### MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer



#### KEY

1. Screws
2. Lock washers
3. Wire leads
4. Switch



TA126937



**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

b. Neutral Start and Back-up Alarm Switches (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment front, left side of vehicle	a. Two screws (1), lock washers (2) and wire leads (3) b. Switch (4)	Remove  Remove	From switch terminals  Turn counterclockwise and pull from transmission
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Screws (1) and lock washers (2)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connectors and switch terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
<b>INSPECTION</b>				
4		Screws (1) and lock washers (2)	Inspect	Replace if worn, or if threads damaged
5		Harness wires	Inspect	Replace if insulation frayed, or if conductors broken
<b>INSTALLATION</b>				
6	Engine compartment front left side of vehicle	a. Switch (4) b. Two wire leads (3), lock washers (2) and screws (1) c. Wire leads (3) and switch terminals	Install and tighten Install and tighten Seal	Turn clockwise until securely mounted to transmission Until wire leads (3) are securely mounted to switch terminals Use silicone rubber sealer

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*c. Engine and Transmission Temperature Switches.*

*This task covers:* a. Removal  
 b. Cleaning  
 c. Inspection

d. Testing  
 e. Installation/Replacement

**INITIAL SETUP**

**TOOLS**

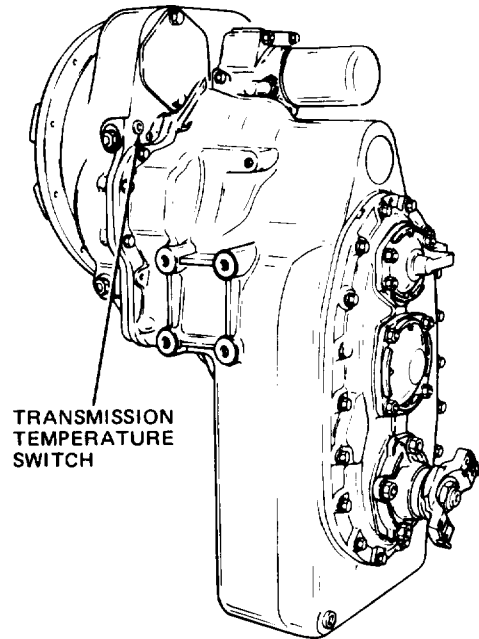
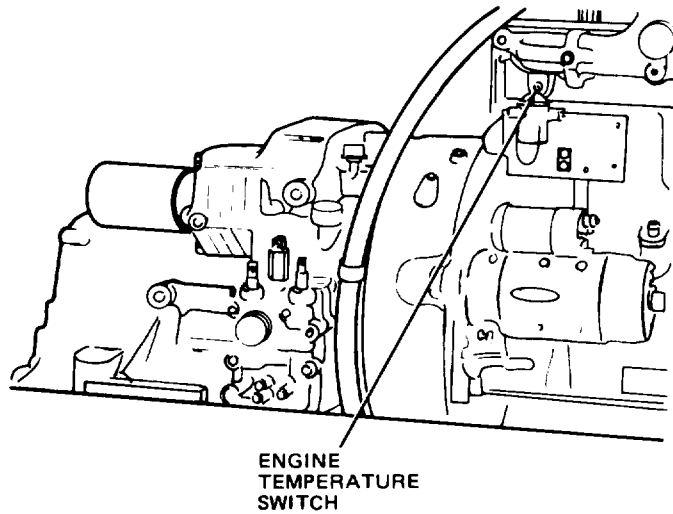
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Clean cloths  
 Silicone rubber sealer

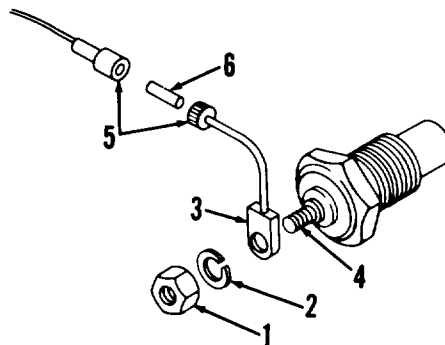
**EQUIPMENT CONDITION**

Paragraph	Condition	Description
	Engine off.	IGNITION switch in OFF position and key removed.
2-53c	Left side panel removed (engine temperature switch).	
2-53c	Right side panel removed (transmission temperature switch).	
2-27b	Starter relay removed (for engine temperature switch removal).	



**KEY**

- 1. Nut
- 2. Lock washer
- 3. Wire lead
- 4. Switch
- 5. In-line retainer
- 6. Resistor



TA126938

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*c. Engine and Transmission Temperature Switches (cont).*

(1) Engine Temperature Switch.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment front, left side of vehicle	a. Nut (1), lock washer (2) and wire lead (3) b. Temperature switch (4) c. Retainer halves (5)	Remove Remove Push together, turn and separate	From switch terminal Turn counterclockwise and pull from engine Remove resistor (6)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Nut (1) and lock washer (2)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connector and switch terminal	Clean	Use cleaning solvent P-D-680 on connector and terminal only
<b>INSPECTION</b>				
4		Nut (1) and lock washer (2)	Inspect	Replace if worn, or if threads damaged
5		Harness wire	Inspect	Replace if insulation frayed, or if conductor broken

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*c. Engine and Transmission Temperature Switches (cont).*

(1) Engine Temperature Switch (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>TESTING</b>				
6		Engine temperature switch	a. Fill container with water b. Suspend threaded portion of switch in water c. Connect ohmmeter between terminal and body of switch d. Slowly heat water to 220 degrees while observing ohmmeter	Ohmmeter should indicate infinity  Ohmmeter should indicate zero ohms when temperature of water is between 198 to 212 degrees
<b>NOTE</b>				
Replace engine temperature switch if proper indication is not obtained in step 6d above.				
<div style="text-align: right; margin-right: 100px;">                         e. Remove switch from water and disconnect ohmmeter leads                     </div>				
<b>INSTALLATION/REPLACEMENT</b>				
7	Engine compartment front, left side of vehicle	a. Temperature switch (4) b. Wire lead (3), lock washer (2) and nut (1) c. Wire lead (3) and switch terminal d. Resistor (6) e. Retainer halves (5)	Install and tighten Install and tighten Seal Position Push together and turn clockwise	Turn clockwise until securely mounted to engine Until wire lead (3) is securely mounted to switch terminal Use silicone rubber sealer  In retainer halves (5) To secure resistor (6)

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

c. Engine and Transmission Temperature Switches (cont).

(2) Transmission Temperature Switch.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment front, right side of vehicle	a. Nut (1), lock washer (2) and wire lead (3) b. Temperature switch (4) c. Retainer halves (5)	Remove Remove Push together, turn counterclockwise and separate	From switch terminal Turn counterclockwise and pull from transmission Remove resistor (6)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Nut (1) and lock washer (2)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connector and switch terminal	Clean	Use cleaning solvent P-D-680 on connector and terminal only
<b>INSPECTION</b>				
4		Nut (1) and lock washer (2)	Inspect	Replace if worn, or if threads damaged
5		Harness wire	Inspect	Replace if insulation frayed, or if conductor broken

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*c. Engine and Transmission Temperature Switches (cont).*

(2) Transmission Temperature switch (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>TESTING</b>				
6		Transmission temperature switch	a. Fill container with water b. Suspend threaded portion of switch in water c. Connect ohm-meter between switch terminal and body d. Slowly heat water to 280 degrees while observing ohmmeter	Ohmmeter should indicate infinity Ohmmeter should indicate zero ohm when temperature of water is between 285-272 degrees
<b>NOTE</b>				
Replace transmission temperature switch if proper indication is not obtained in step 6 above.				
e. Remove switch from water and disconnect ohm-meter leads				
<b>INSTALLATION/REPLACEMENT</b>				
7	Engine compartment front, right side of vehicle	a. Temperature switch (4) b. Wire lead (3), lock washer (2) and nut (1) c. Wire lead (3) and switch terminal d. Resistor (6) e. Retainer halves (5)	Install and tighten Install and tighten Seal Position Push together and turn clockwise	Turn clockwise until securely mounted to transmission Until wire lead (3) is securely mounted to switch terminal Use silicone rubber sealer In retainer halves (5) To secure resistor (6)

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*d. Engine Oil Pressure Switch and Sending Unit.*

This task covers: a. Removal  
b. Cleaning  
c. Inspection

d. Installation/Replacement  
e. Testing

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-(0754-0654

MATERIALS/PARTS

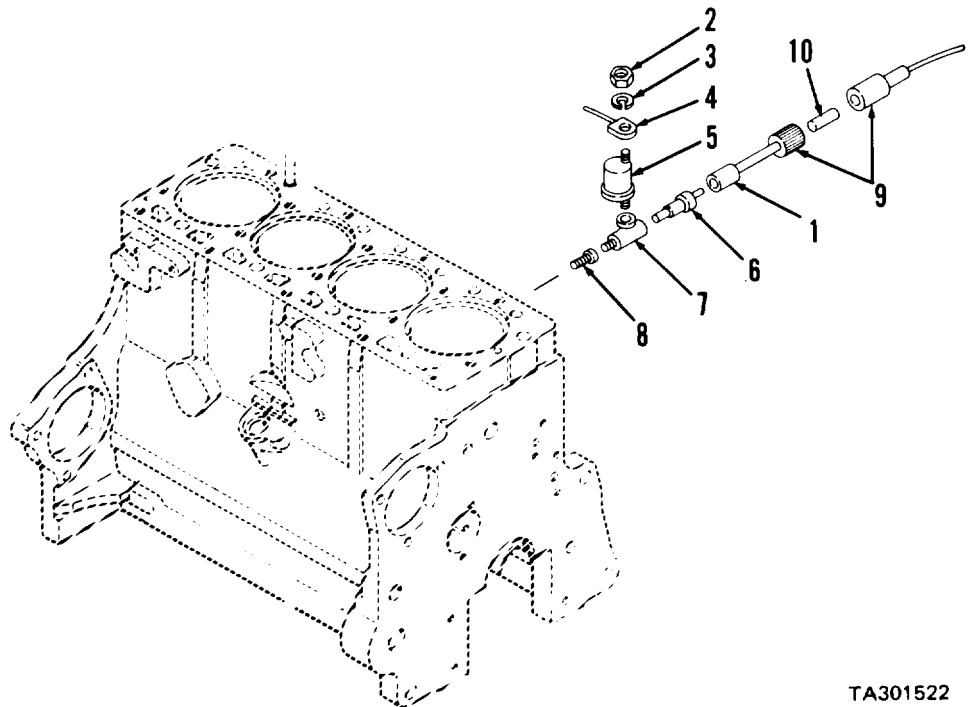
Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer

EQUIPMENT CONDITION

Paragraph	Condition Description
2-53c	Engine off. IGNITION switch in OFF position and key removed. Right side panel removed.

KEY

1. Harness connector
2. Nut
3. Lock washer
4. Wire lead
5. Oil pressure sender
6. Oil pressure switch
7. Tee
8. Fitting
9. In-line retainer
10. Resistor



TA301522

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*d. Engine Oil Pressure Switch and Sending Unit (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment rear, right side of vehicle	a. Harness connector (1)	Grasp and pull	From terminal on switch (6)
		b. Nut (2), lock washer (3) and wire lead (4)	Remove	From terminal on sender (5)
		c. Sender (5) and switch (6)	Remove	Turn counterclockwise and pull from tee (7)
		d. Tee (7) and fitting (8)	Remove	Turn counterclockwise and pull from engine block
		e. Retainer halves (9)	Push together, turn counterclockwise and separate	Remove resistor (10)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Nut (2), lock washer (3), tee (7) and fitting (8)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connectors and switch terminals	Clean	Use cleaning solvent P-D-680 on connectors and terminals only
<b>INSPECTION</b>				
4		Nut (2), lock washer (3), tee (7) and fitting (8)	Inspect	Replace if worn or cracked, or if threads damaged
5		Harness wires	Inspect	Replace if insulation frayed, or if conductor broken



**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*d. Engine Oil Pressure. Switch and Sending Unit (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT</b>				
6	Engine compartment rear, right side of vehicle	a. Fitting (8) and tee (7) b. Sender (5) and switch (6) c. Wire lead (4), lock washer (3) and nut (2) d. Harness connector (1) e. Wire leads (1 and 4) and terminals f. Resistor (10) g. Retainer halves (9)	Install and tighten Install and tighten Install and tighten Push on Seal  Position Push together, turn clockwise and release	Until securely mounted on engine block Until securely mounted to tee (7) Until wire lead (4) is securely mounted to terminal of sender (5) Terminal of switch (6) Use silicone rubber sealer  In retainer halves (9) To secure resistor (10)
<b>TESTING (OIL PRESSURE SENDER)</b>				
7	Engine compartment rear, right side of vehicle	a. Nut (2) and lock washer (3) b. Wire lead (4) c. Ohmmeter	Remove  Disconnect Connect	From oil pressure sender Between oil pressure sender terminal and engine block; set ohmmeter to X1 scale. Ohmmeter should indicate 1 ohm or less
8	Operator's compartment	IGNITION switch	Place in ON position	Start and operate engine
9	Engine compartment rear, right side of vehicle	a. Ohmmeter	Observe	With engine idling, resistance should be over 13.5 ohms; increase engine speed. Resistance indicated on ohmmeter should increase
<b>NOTE</b>				
If ohmmeter indicates more than 1 ohm in step 7 above, or if resistance is not over 13.5 ohms or does not increase when engine speed increases in step 9 above, replace oil pressure sender.				
10	Operator's compartment	IGNITION switch	Place in OFF position	
11	Engine compartment rear, right side of vehicle	a. Ohmmeter b. Wire lead (4) c. Lock washer (3) and nut (2)	Disconnect Connect Install and tighten	From oil pressure sender terminal and engine block To oil pressure sender terminal

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*e. Stop Light and Hydraulic Fiber Switches.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

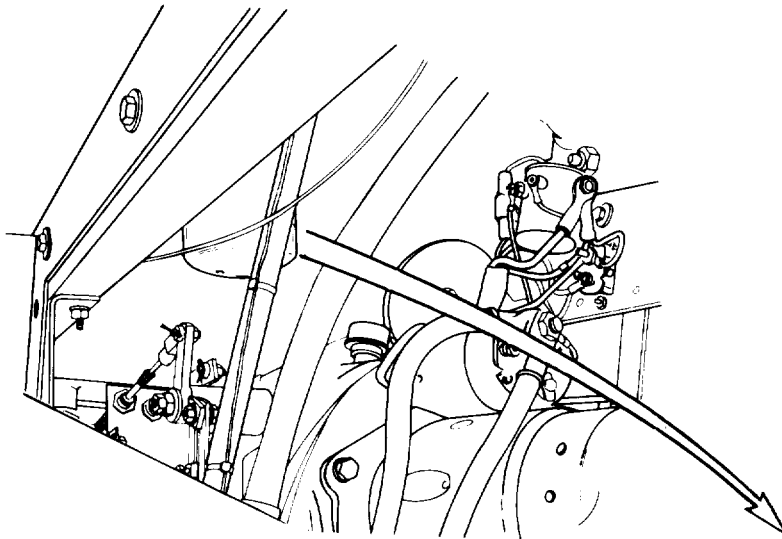
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Silicone rubber sealer

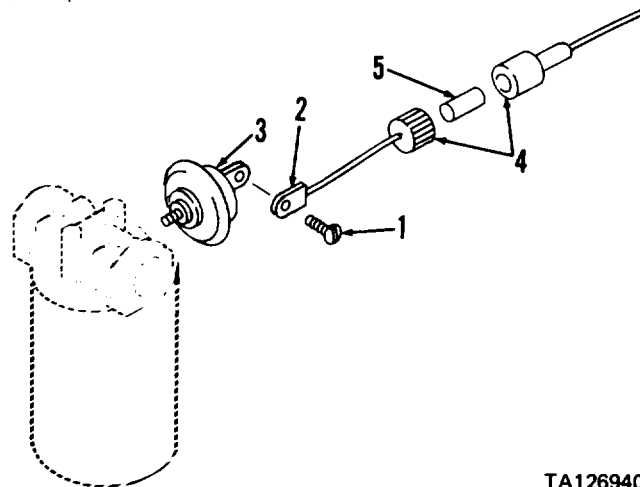
EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off. IGNITION switch in OFF position and key removed.
2-53c	Left side panel removed (hydraulic filter switch).
2-53i	Chassis guard removed.



KEY

- 1. Screw
- 2. Wire lead
- 3. Switch
- 4. In-line retainer
- 5. Resistor



TA126940

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*e. Stop Light and Hydraulic Filter Snitches (cont).*

## (1) Hydraulic Filter Restriction Switch.

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Engine compartment front, left side of vehicle	a. Screw (1) and wire lead (2)	Remove	From terminal on switch (3)
		b. Switch (3)	Remove	Turn counterclockwise and pull from filter head
		c. Retainer halves (4)	Push together, turn counterclockwise and separate	Remove resistor (5)
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Screw (1)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire lead and terminal	Clean	Use cleaning solvent P-D-680 on connector and terminal only
INSPECTION				
4		Screw (1) and switch (3)	Inspect	Replace if worn or cracked, or if threads damaged
5		Wires	Inspect	Replace if insulation frayed, or if conductor broken

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*e. Stop Light and Hydraulic Fiber Switches (cont).*

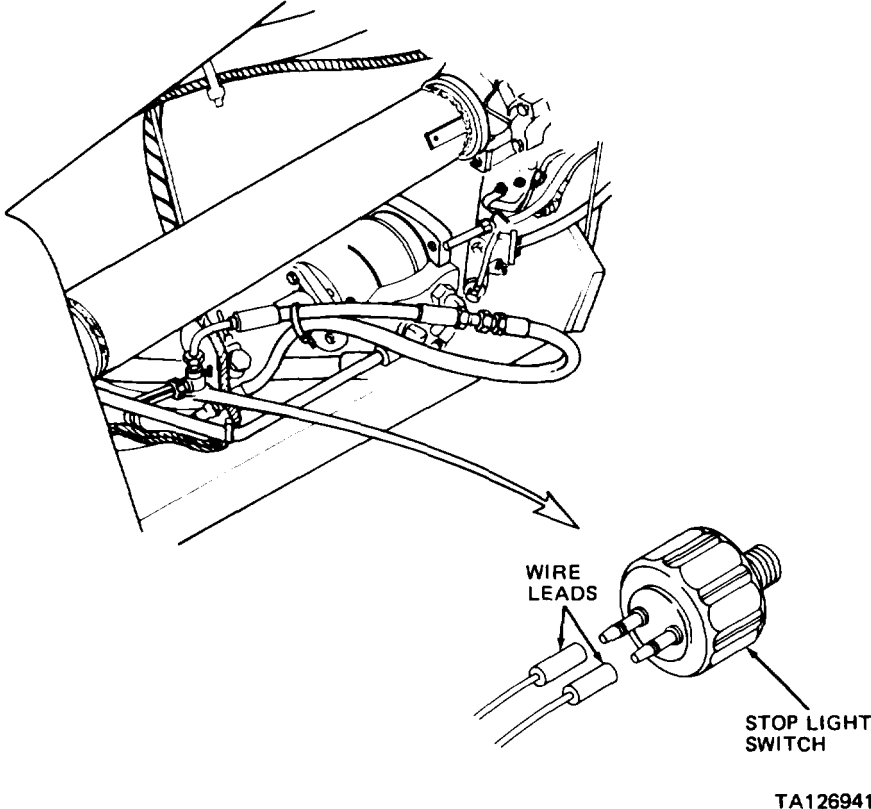
(1) Hydraulic Filter Restriction Switch (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION				
6	Engine compartment front, left side of vehicle	a. Resistor (5) b. Retainer halves (4)  c. Switch (3)  d. Wire lead (2) and screw (1) e. Wire lead (2) and terminal	Position Push together, turn clockwise and release Install and tighten Install and tighten Seal	In retainer halves (4) To secure resistor (5)  Turn clockwise until securely mounted to filter head Until wire lead (2) is securely mounted to terminal of switch (3) Use silicone rubber sealer

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

e. Stop Light and Hydraulic Filter Switches (cont).

(2) Stop Light Switch.

STEP	LOCATION	ITEM	ACTION	REMARKS
				
REMOVAL				
1	Hydraulic brake valve, bottom rear of vehicle	a. Two wire leads b. Stop light switch	Grasp and pull Remove	From stop light switch Turn counterclockwise and pull from hydraulic brake valve
CLEANING				
<p><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				

**2-31. SENDING UNITS AND SWITCHES MAINTENANCE (cont)**

*e. Stop Light and Hydraulic Filter Swtitches (cont)*

(2) Stop Light Switch (cont)

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
2		Wire leads and switch terminals	Clean	Use cleaning solvent P-D-680 on terminals and connectors only
INSPECTION				
3		Wires	Inspect	Replace if insulation frayed, or if conductors broken
INSTALLATION				
4	Hydraulic brake valve, bottom rear of vehicle	a. Stop light switch b. Two wire leads c. Two wire leads and terminals	Install and tighten Install Seal	Turn clockwise until securely mounted to hydraulic brake valve Push on switch terminals Use silicone rubber seal

**2-32. HORN AND BACK-UP ALARM MAINTENANCE**

a. Horn.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-(0754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

2-33b

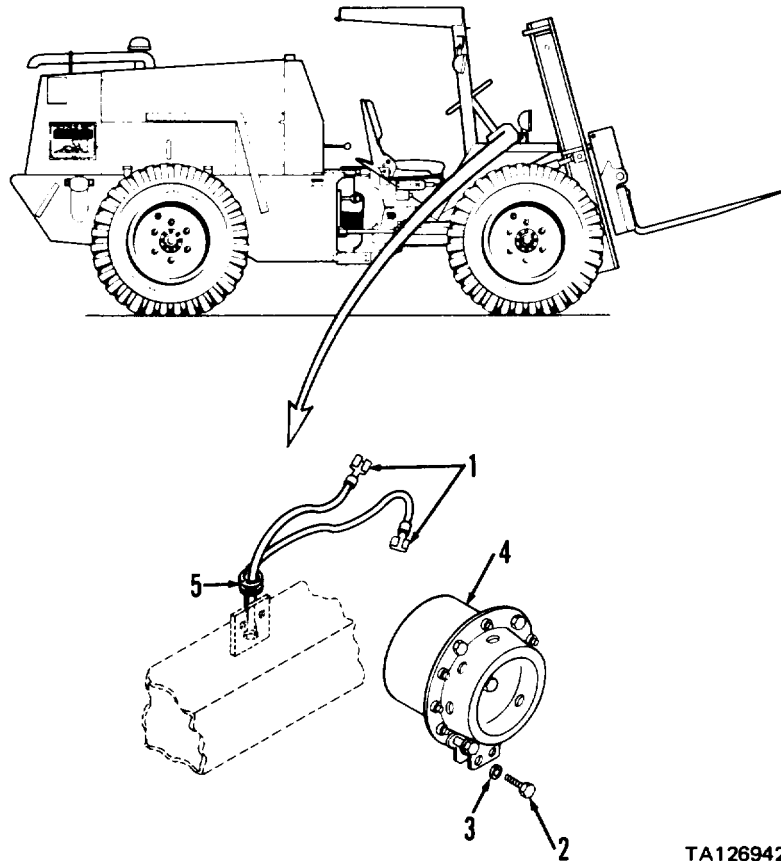
Engine off.

Battery ground cable disconnected.

MATERIALS/PARTS

Cleaning solvent P-D-680

Clean cloths



TA126942

**2-32. HORN AND BACK-UP ALARM MAINTENANCE (cont)**

a. Horn (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Top of right fender support, front of vehicle	a. Two wire leads (1) b. Two cap screws (2) and washers (3) c. Horn (4) d. Grommet (5)	Tag and disconnect Remove Remove Remove	Grasp and pull from terminals of horn (4) Support horn (4) Lift from fender support
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Horn (4)	Clean	Wipe exterior with cloth moistened in cleaning solvent P-D-680 and dry thoroughly
3		Wire leads and terminals	Clean	Use cleaning solvent P-D-680 on terminals and connectors only
<b>INSPECTION</b>				
4		Cap screws (2) and washers (3)	Inspect	Replace if worn, or if threads damaged
5		Grommet (5)	Inspect	Replace if worn, cracked or deteriorated
<b>INSTALLATION/REPLACEMENT</b>				
6	Top of right fender support, front of vehicle	a. Grommet (5) b. Horn (4) c. Two cap screws (2) and washers (3) d. Two wire leads (1)	Install Position Install and tighten Push on horn terminals	On bracket of fender support Until horn (4) is securely mounted Note tags for correct connection



**2-32. HORN AND BACK-UP ALARM MAINTENANCE (cont)**

*b. Horn Switch.*

- This task covers: a. Removal  
 b. Cleaning  
 c. Inspection  
 d. Testing  
 e. Installation/Replacement

INITIAL SETUP

TOOLS

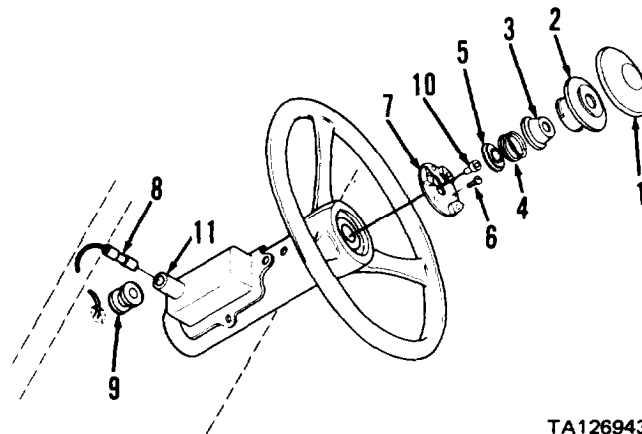
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph 2-33b Condition Description  
 Engine off.  
 Battery ground cable disconnected.

MATERIALS PARTS

Cleaning Solvent P-D-680  
 Clean cloths



KEY

- 1. Cover
- 2. Horn button
- 3. Contact cup
- 4. Spring
- 5. Spring contact
- 6. Tapping screws
- 7. Base plate
- 8. Harness connector
- 9. Grommet
- 10. Ferrule
- 11. Column terminal

TA126943

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Steering column and wheel	a. Cover (1) and button (2) b. Contact cup (3), spring (4) and spring contact (5) c. Three tapping screws (6) and base plate (7) d. Harness connector (8) e. Grommet (9)	Remove Remove Remove Grasp and pull Remove	Depress and rotate counterclockwise to release from tabs on base plate (7)   From column terminal (11) From instrument panel
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

**2-32. HORN AND BACK-UP ALARM MAINTENANCE (cont)**

*b. Horn Switch (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
LEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		Contacts (3 and 5), spring (4) and screws (6)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Cover (1), button (2) and base plate (7)	Clean	Wipe with a clean, dry cloth
4		Connector (8) and terminal (11)	Clean	Use cleaning solvent P-D-680 on terminal and connector only
INSPECTION				
5		Spring (4)	Inspect	Replace if coils bent or broken
6		Contacts (3 and 5)	Inspect	Replace if cracked, corroded or damaged
7		Cover (1), horn button (2) and base plate (7)	Inspect	Replace if cracked, worn or damaged
8		Grommet (9)	Inspect	Replace if worn or deteriorated
TESTING				
9		Horn wire in steering column	Test	Set ohmmeter to lowest resistance range and connect leads to horn wire at ferrule (10) and terminal (11). Replace horn wire if ohmmeter indicates more than 0.5 ohm (notify direct support maintenance).
INSTALLATION/REPLACEMENT				
10	Steering column and wheel	a. Grommet (9) b. Harness connector (8) c. Base plate (7) d. Three tapping screws (6) e. Spring contact (5), spring (4) and contact cup (3) f. Horn button (2) and cover (1)	Install Push in Position Install and tighten Position  Install	Column terminal (11) On steering wheel Until base-plate (7) is securely mounted  On base plate (7)  Depress and rotate clockwise to lock tabs on base plate (7); then release

**2-32. HORN AND BACK-UP-ALARM MAINTENANCE (cont)**

*c. Back-up Alarm.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

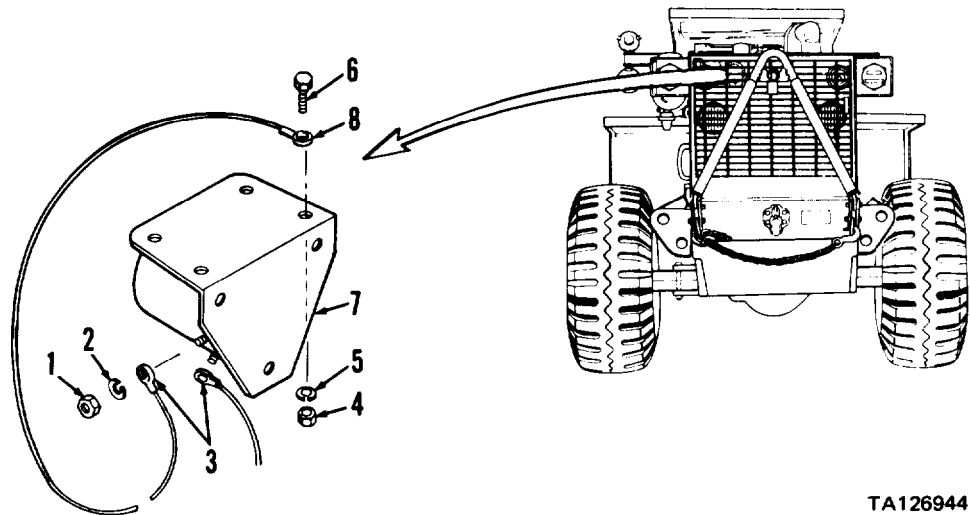
Paragraph	Condition Description
	Engine off.
	IGNITION switch in OFF position and key removed.
2-52c	Tow bar lowered to ground and grille open.

MATERIALS PARTS

Cleaning solvent P-D-680  
Clean cloths

KEY

- 1. Nuts
- 2. Lock washers
- 3. Wire leads
- 4. Nuts
- 5. Lock washers
- 6. Cap screws
- 7. Back-up alarm
- 8. Ground wire



TA126944

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Top left rear of vehicle	a. Wire leads b. Two nuts (1), lock washers (2) and wire leads (3) c. Two nuts (4); lock washers (5) and cap screws (6) d. Back-up alarm (7) and ground wire (8)	Tag Remove Remove	Tag wire leads, then remove from alarm terminals Support alarm (7) and wire (8)

**2-32. HORN AND BACK-UP ALARM MAINTENANCE (cont)**

c. Back-up Alarm (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		All hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Wire connectors and alarm terminals	Clean	Use cleaning solvent P-D-680 on terminals and connectors only
INSPECTION				
4		Hardware	Inspect	Replace if worn, or if threads damaged
5		Harness wire and ground wire (8)	Inspect	Replace if insulation frayed, or if conductors broken
INSTALLATION				
6	Top left rear of vehicle	a. Back-up alarm (7) b. Wire (8), two cap screws (6), lock washers (5) and nuts (4) c. Two wire leads (3) d. Two lock washers (2) and nuts (1)	Position Install and tighten  Position  Install and tighten	On mounting bracket Until alarm (7) and ground wire (8) are securely mounted  On alarm terminals, Note tags for correct connection Until leads (3) are securely mounted

**2-33. BATTERY SYSTEM MAINTENANCE**

a. Battery Cover.

This task covers: a. Removal  
 b. Disassembly  
 c. Cleaning

d. Inspection  
 e. Reassembly  
 f. Installation

INITIAL SETUP

TOOLS

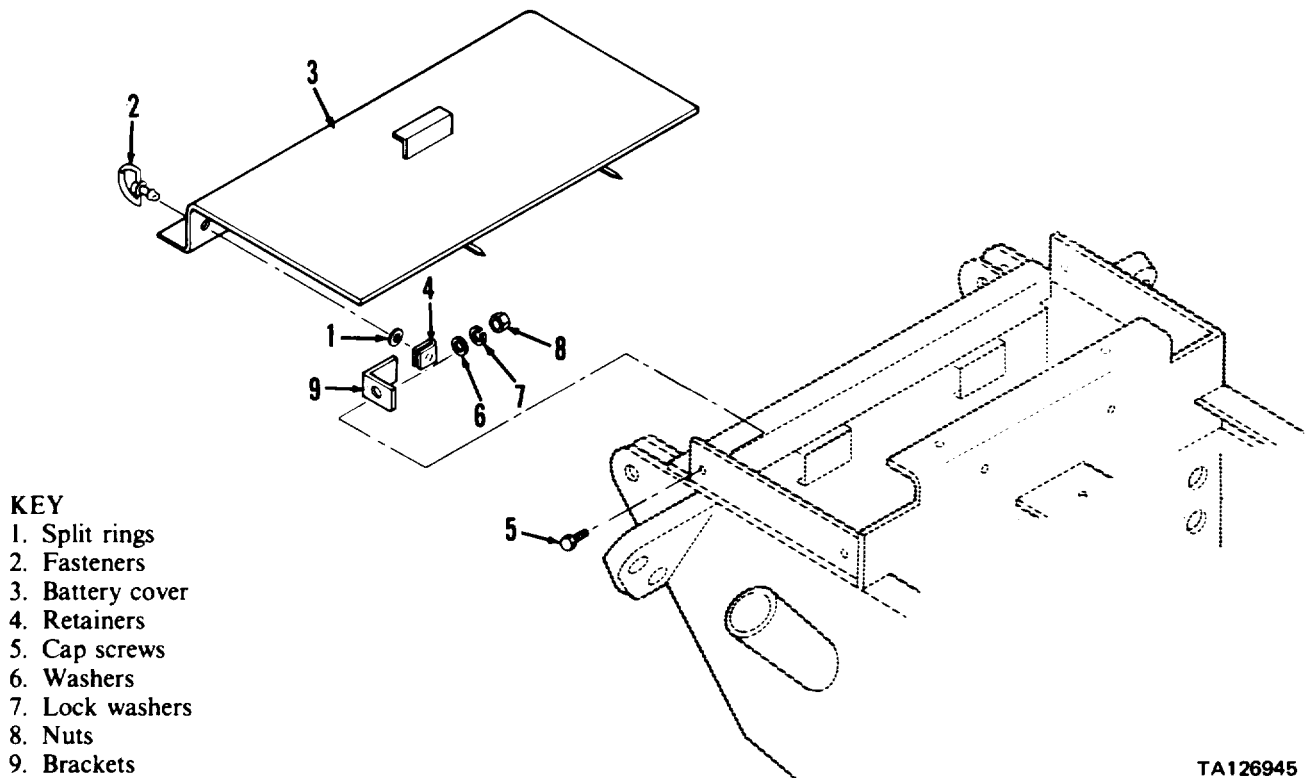
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths

EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off, IGNITION switch in OFF position and key removed.
2-52c	Tow bar lowered to ground and grille open.



KEY

- 1. Split rings
- 2. Fasteners
- 3. Battery cover
- 4. Retainers
- 5. Cap screws
- 6. Washers
- 7. Lock washers
- 8. Nuts
- 9. Brackets

TA126945

**2-33. BATTERY SYSTEM MAINTENANCE (cont)**

*a. Battery Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1				
<p>A. DEPRESS AND TURN FASTENERS 1/4 TURN COUNTER-CLOCKWISE TO RELEASE</p> <p>B. GRASP HANDLE, PULL COVER STRAIGHT BACK AND REMOVE FROM VEHICLE</p> <p>TA126946</p>				
DISASSEMBLY				
2		<ul style="list-style-type: none"> <li>a. Two split rings (1)</li> <li>b. Two fasteners (2)</li> <li>c. Two retainers (4)</li> <li>d. Two cap screws (5), washers (6), lock washers (7), nuts (8) and brackets (9)</li> </ul>	<ul style="list-style-type: none"> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> </ul>	<ul style="list-style-type: none"> <li>From fasteners (2)</li> <li>From cover (3)</li> <li>Grasp and pull from brackets (9)</li> <li>From vehicle</li> </ul>
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

**2-33. BATTERY SYSTEM MAINTENANCE (cont)**

a. Battery Cover (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
4		Battery cover (3) and brackets (9)	Inspect	Replace if cracked or broken
5		All hardware	Inspect	Replace if worn, or if threads damaged
REASSEMBLY				
6		a. Two brackets (9) b. Two cap screws (5), washers (6), lock washers (7) and nuts (8) c. Two retainers (4) d. Two fasteners (2) e. Two split rings (1)	Position Install and tighten  Install Position Install	On vehicle Until bracket (9) is securely mounted  Push onto bracket (9) Through hole in cover On fasteners (2)
INSTALLATION				
7		a. Cover (3)  b. Two fasteners (2)	Position  Turn and latch	Grasp cover handle, position cover over batteries, and slide cover toward radiator  Depress and turn 1/4 turn clockwise to latch; then release

**2-33. BATTERY SYSTEM MAINTENANCE (cont)**

*b. Battery Cables and Batteries.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Engine off.  
IGNITION switch in OFF position and key removed.

2-52c

Tow bar lowered to ground and radiator grille open.

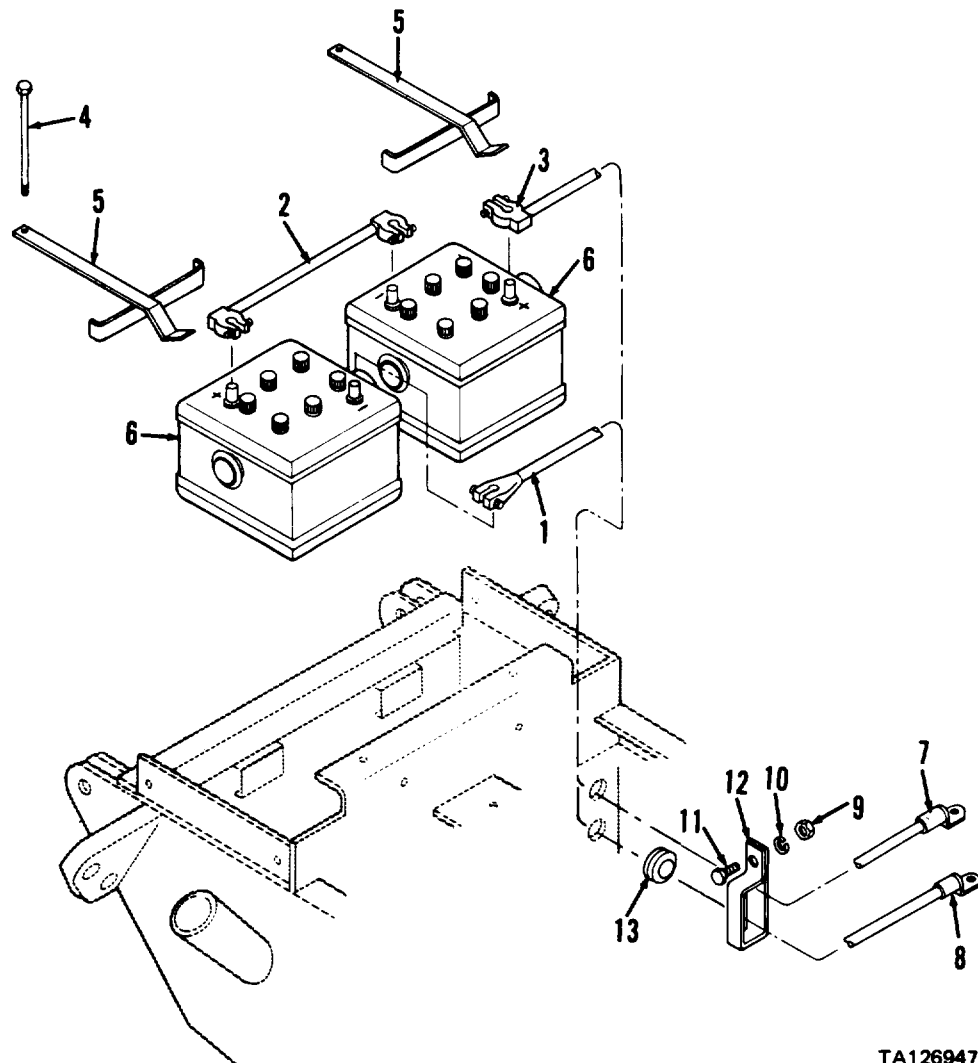
2-33a

Battery cover removed.

MATERIALS/PARTS

Cleaning solvent P-D-680

Clean cloths



KEY

- 1. Ground cable clamp
- 2. Battery cable
- 3. Positive cable clamp
- 4. Cap screw
- 5. Hold-down strap
- 6. Battery
- 7. Positive cable terminal
- 8. Ground cable terminal
- 9. Nut
- 10. Lock washer
- 11. Cap screw
- 12. Clamp
- 13. Grommet

TA126947



**2-33. BATTERY SYSTEM MAINTENANCE (cont)**

*h. Battery Cables and Batteries (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Battery compartment, rear of vehicle	a. Ground cable clamp (1)	Remove from battery post	Loosen clamp nut, spread clamp terminal and lift from battery post
		b. Battery cable clamps (3) and positive cable (2)	Remove from battery posts	Loosen clamp nuts, spread clamp terminals and lift from battery posts
		c. Two cap screws (4)	Loosen and remove	
		d. Two hold-down straps (5)	Remove	Lift from batteries
		e. Two batteries (6)	Remove	Lift from battery compartment
		f. Positive cable terminal (7)	Remove	From starter solenoid B terminal (para 2-27a)
		g. Ground cable terminal (8)	Remove	From starter housing (para 2-27a)
		h. Nut (9), lock washer (10) and cap screw (11)	Remove	From clamp (12)
		i. Clamp (12)	Remove	Spread and lift from harness and battery cables
		j. Two grommets (13) and cables (1 and 3)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
2		Straps (5), clamp (12) and hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Cables (1, 2 and 3) and grommet (13)	Clean	Wipe with a clean, dry cloth

**2-33. BATTERY SYSTEM MAINTENANCE (cont)**

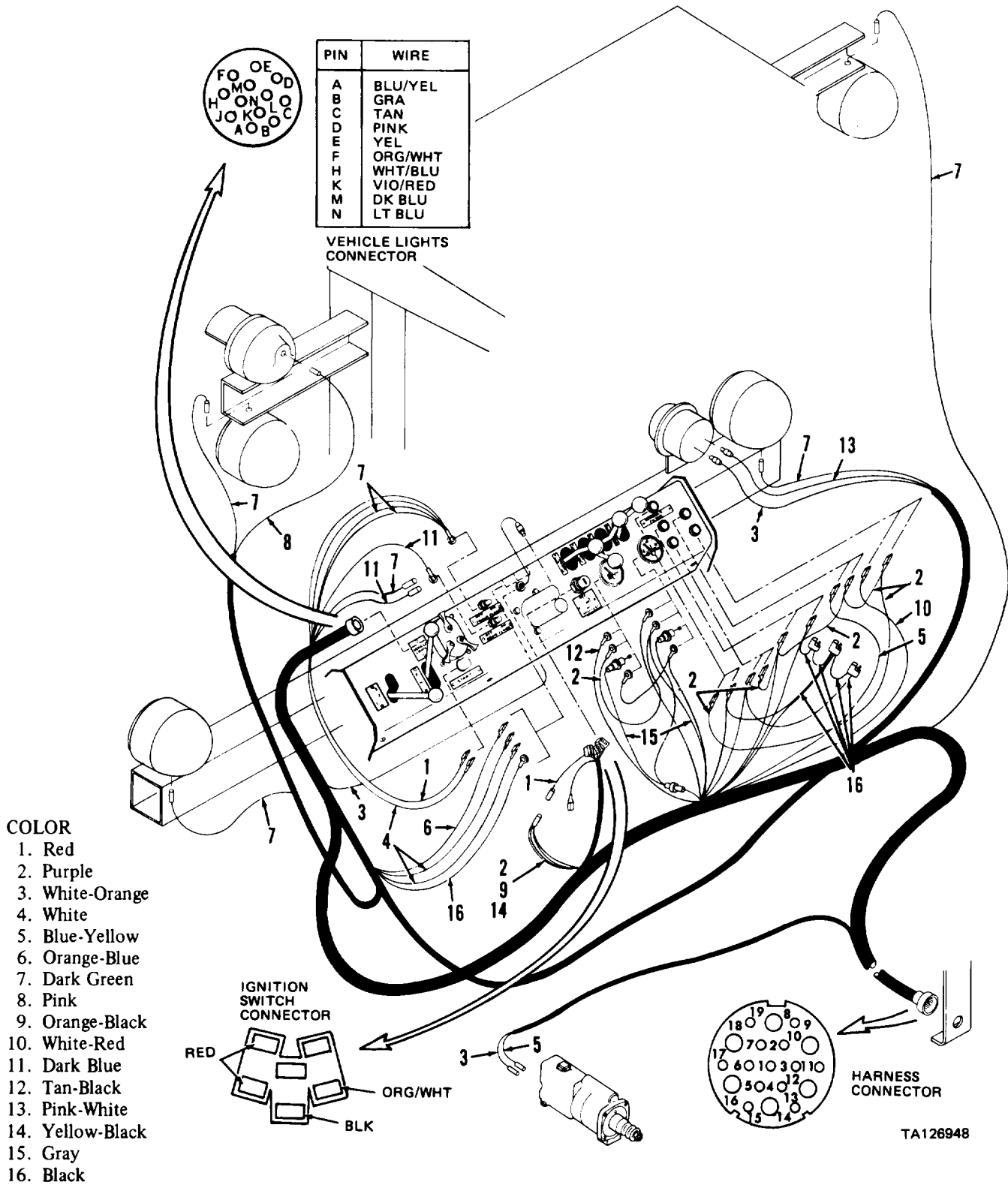
*b. Battery Cables and Batteries (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		Batteries (6)	Clean	Use clean water on exterior only
5		Battery posts and cable clamps (1, 2 and 3)	Clean	Use a wire brush or crocus cloth to remove deposits
6		Cable terminals (7 and 8)	Clean	Use cleaning solvent P-D-680 on terminals only
INSPECTION				
7		All hardware	Inspect	Replace if worn, or corroded, or if threads damaged
8		Battery cables	Inspect	Replace if insulation frayed, conductors broken, or clamps and terminals damaged
9		Batteries (6)	Inspect	Replace if case cracked or posts damaged
10		Hold-down straps (5)	Inspect	Replace if cracked or corroded
11		Grommet (13)	Inspect	Replace if worn or deteriorated
INSTALLATION/REPLACEMENT				
12	Battery compartment, rear of vehicle	a. Two grommets (13) b. Cables (1 and 3) c. Cable terminals (7 and 8) d. Clamp (12) e. Cap screw (11), lock washer (10) and nut (9) f. Two batteries (6) g. Two hold-down straps (5)	Install Position Install Position Install and tighten Install Position	Connect to starter on solenoid B terminal (para 2-27a) Around harness and battery cables Until clamp (12) is securely mounted Lower into battery compartment with posts positioned as shown On batteries (6)
<b><u>CAUTION</u></b>				
Do not over-tighten cap screws (4). Excessive tightening will deform battery case and damage battery.				
		h. Two cap screw (4)	Install and tighten	Until strap (5) is snug against top of battery
		i. Cable clamps (2 and 3)	Install	Position clamp over battery post and tighten clamp nut
		j. Ground cable clamp (1)	Install	Position clamp over negative battery post and tighten clamp nut



**2-34. WIRING HARNESS MAINTENANCE (cont)**

a. Front Wiring Harness (cont).



**COLOR**

- 1. Red
- 2. Purple
- 3. White-Orange
- 4. White
- 5. Blue-Yellow
- 6. Orange-Blue
- 7. Dark Green
- 8. Pink
- 9. Orange-Black
- 10. White-Red
- 11. Dark Blue
- 12. Tan-Black
- 13. Pink-White
- 14. Yellow-Black
- 15. Gray
- 16. Black

**2-34. WIRING HARNESS MAINTENANCE (cont)**

*a. Front Wiring Harness (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
4		Harness connector	Disconnect and inspect	Disconnect and remove as shown. Replace harness if connector is defective (refer to direct support maintenance)
<p style="text-align: center;">DEPRESS NUT, TURN COUNTER- CLOCKWISE AND DISCONNECT</p> <p style="text-align: center;">FRONT HARNESS CONNECTOR      REAR HARNESS CONNECTOR</p>				
5		Other connectors and terminals	Inspect	Replace bent, damaged or missing terminals and connectors
REPAIR				
6		Wiring harness and wires	Tape	Wrap insulating tape over frayed insulation
<b>NOTE</b>				
Gage of replacement wire must be greater than or equal to gage of defective wire.				
7		Wiring harness and wires	Replace wire	If defective wire is accessible, cut a length of same gage wire and splice using insulating splice connector. If wire is not accessible, replace wire harness (notify direct support maintenance)
8		Wire terminals and connectors	Replace	Cut wire close to defective terminal, strip insulation to depth of terminal well, and crimp wire to new terminal or connector

**2-34. WIRING HARNESS MAINTENANCE (cont)**

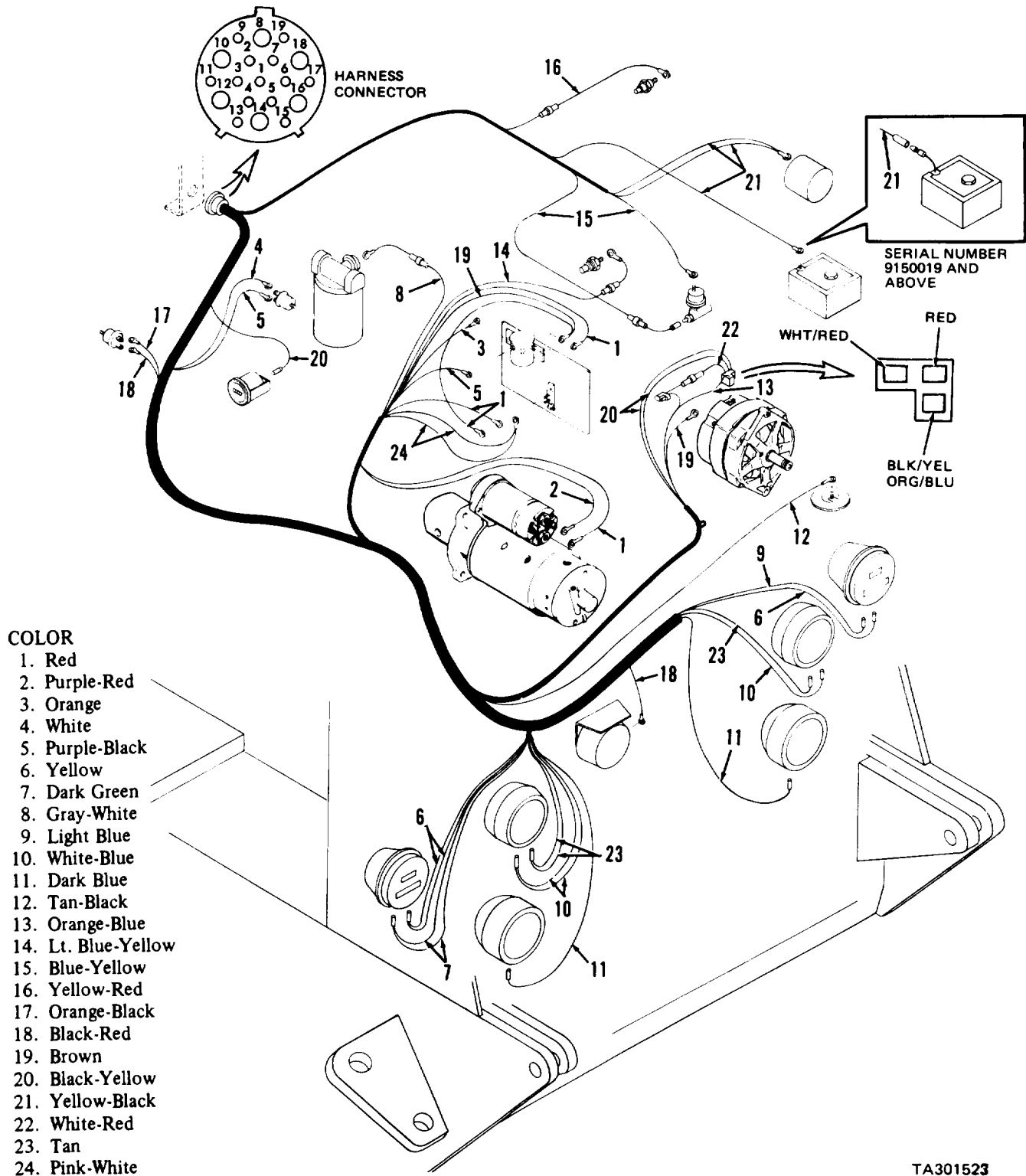
*a. Front Wiring Harness (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<p>TESTING</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Testing of the front wiring harness consists of starting the engine, turning on all lights, depressing the service brake pedal, and observing that all lights/ indicators/ gages are operating. If any abnormal indications are observed, refer to the troubleshooting procedures in this section. To perform a continuity test of the front wiring harness using an ohmmeter, refer to the electrical system wiring schematic located in appendix F.</p>				



**2-34. WIRING HARNESS MAINTENANCE (cont)**

*b. Rear Wiring Harness (cont).*

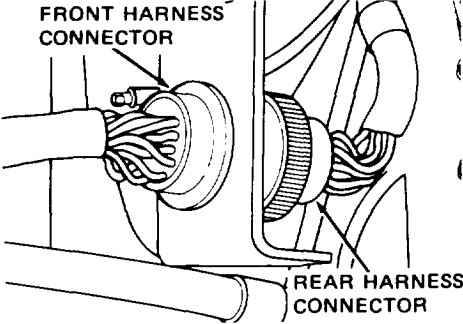


TA301523



**2-34. WIRING HARNESS MAINTENANCE (cont)**

*b. Rear Wiring Harness (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
4		Harness connector	Disconnect and inspect	Disconnect front harness connector (para 2-34a). Replace harness if connector is defective (notify direct support maintenance)
 <p style="text-align: center;">TA126951</p>				
5		Other connectors and terminals	Inspect	Replace bent, damaged or missing terminals and connectors
REPAIR				
6		Wiring harness and wires	Tape	Wrap insulating tape over frayed insulation
<b>NOTE</b>				
Gage of replacement wire must be greater than or equal to gage of defective wire.				
7		Wiring harness and wires	Replace wire	If defective wire is accessible, cut a length of same gage wire and splice using insulated splice connector. If wire is not accessible, replace wiring harness (refer to direct support maintenance)
8		Wire terminals and connectors	Replace	Cut wire close to defective terminal, strip insulation to depth of terminal well, and crimp wire to new terminal or connector
TESTING				
<b>NOTE</b>				
Testing of the rear wiring harness consists of starting the engine, turning on all lights, depressing the service brake pedal, and observing that all lights/indicators/gages are operating. If any abnormal indications are observed, refer to the troubleshooting procedures in this section. To perform a continuity test of the rear wiring harness using an ohmmeter, refer to the electrical system wiring schematic located in appendix F.				

**Section VI. POWER TRAIN MAINTENANCE**

This section contains the information you'll need to maintain the:

- Transmission
- Drive shaft assemblies and universal joints
- Front and rear axles

It gives you instructions on how to troubleshoot problems, and repair or replace the components that are within the scope of organizational maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	2-35	Transmission Hoses, Lines and Fittings . . . . .	2-38f
Transmission Troubleshooting . . . . .	2-36	Transmission Oil Cooler . . . . .	2-38g
Axles and Drive Shaft Assemblies Troubleshooting . . . . .	2-37	Axles and Drive Shaft Assemblies Maintenance . . . . .	2-39
Transmission Maintenance . . . . .	2-38	Front Drive Shaft Assembly and Support Bearing . . . . .	2-39a
Transmission Servicing and Inspection . . . . .	2-38a	Center Drive Shaft Assembly . . . . .	2-39b
Transmission Linkage Controls . . . . .	2-38b	Rear Drive Shaft Assembly . . . . .	2-39c
Axle Disconnect Lever . . . . .	2-38c	Front and Rear Axle Assemblies . . . . .	2-39d
Dipstick Tube Assembly . . . . .	2-38d	Axle Breathers . . . . .	2-39e
Control Valve . . . . .	2-38e	Front and Rear Axle Shafts and Bearings . . . . .	2-39f

**2-35. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>TRANSMISSION</b>		
Foamy Oil . . . . .	2-36/1	2-194
Slow or erratic transmission shifting. . . . .	2-36/2	2-195
High transmission oil temperature. . . . .	2-36/3	2-196
Loss of drive in all ranges . . . . .	2-36/4	2-197
Loss of power . . . . .	2-36/5	2-198
<b>AXLES AND DRIVE SHAFT ASSEMBLES</b>		
Lubricant leaking from differential breather . . . . .	2-37/1	2-199
Continuous axle or wheel noise. . . . .	2-37/2	2-199
Differential carrier assembly overheating . . . . .	2-37/3	2-200
Lubricant leaking from differential carrier assembly . . . . .	2-37/4	2-200
Excessive noise or vibration in drive shaft assemblies . . . . .	2-37/5	2-200

**2-36. TRANSMISSION TROUBLESHOOTING**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**1. FOAMY OIL**

- Step 1. Check oil level with transmission at operating temperature and engine operating.
- a. If oil level is not between FULL and ADD marks, add oil (refer to current lubrication order).
  - b. If oil level is between FULL and ADD marks, proceed to step 2.
- Step 2. Check source of oil and ensure that oil is correct grade and type.
- a. If oil is not correct grade and type, drain oil, replace oil filter, and add new oil (para 2-38a) (refer to current lubrication order).
  - b. If oil is correct grade and type, proceed to step 3.

---

## 2-36. TRANSMISSION TROUBLESHOOTING (cont)

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 1. FOAMY OIL (cont)

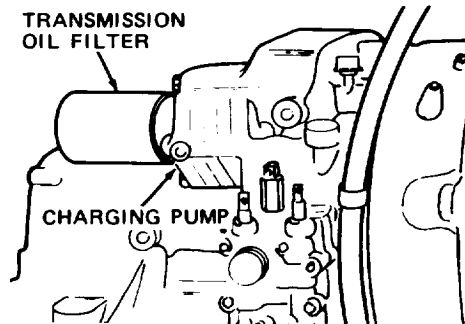
Step 3. Remove transmission oil level dipstick and check for water on dipstick.

a. If water is on dipstick, drain oil, replace oil filter, and add new oil (para 2-38a) (refer to current lubrication order).

b. If water is not on dipstick, proceed to step 4.

Step 4. Check if charging pump mounting bolts are loose.

If charging pump mounting bolts are loose, tighten them.



TA126952

## 2. SLOW OR ERRATIC TRANSMISSION SHIFTING

Step 1. Check oil level with transmission at operating temperature and engine operating.

a. If oil level is not between FULL and ADD marks, add oil (refer to current lubrication order).

b. If oil level is between FULL and ADD marks, proceed to step 2.

Step 2. Check oil filter for leakage and/or damage.

a. If oil filter is leaking, tighten; if damaged, replace (para 2-38a).

b. If oil filter is not leaking or damaged, proceed to step 3.

Step 3. Remove screen assembly and check if dirty or damaged (para 2-38a).

a. If screen assembly is dirty, clean; if damaged, replace (para 2-38a).

b. If screen assembly checks okay, proceed to step 4.

**2-36. TRANSMISSION TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

2. SLOW OR ERRATIC TRANSMISSION SHIFTING (cont)

Step 4. Check transmission linkage for proper adjustment or damage (para 2-38 b).

- a. If transmission linkage is not adjusted properly, adjust; if damaged, repair by replacing the damaged part or parts (para 2-38b).
- b. If transmission linkage is okay, check speed control cable for damage; replace if necessary (para 2-38b).

3. HIGH TRANSMISSION OIL TEMPERATURE

step 1. Check oil level with transmission at operating temperature and engine operating.

- a. If oil level is not between FULL and ADD marks, add oil (refer to current lubrication order).
- b. If oil level is between FULL and ADD marks, proceed to step 2.

Step 2. Check transmission oil cooler for clogged fins or obstruction, leakage, or damage.

- a. If oil cooler fins are clogged, clean; if fins are obstructed, remove obstructions. If oil cooler is leaking or damaged, replace oil cooler (para 2-38g).
- b. If oil cooler is okay, proceed to step 3.

Step 3. Check hoses and lines between transmission and oil cooler for leakage or damage.

- a. If hoses and lines between transmission and oil cooler are leaking or damaged, replace (para 2-38f).
- b. If hoses and lines between transmission and oil cooler are okay, proceed to step 4.

Step 4. Check transmission temperature indicator and switch (electrical system) (para 2-25 and 2-31c, respectively).

- a. If transmission temperature indicator is defective, replace it (para 2-28e); if transmission temperature switch is defective, replace it (para 2-31c).
- b., If transmission temperature indicator and switch are okay, proceed to step 6.

Step 5. Check oil filter for leakage or damage.

- a. If oil filter is leaking, tighten it; if damaged, replace it (para 2-38a).
- b. If oil filter is okay, remove screen assembly (para 2-38a) and check it for damage or clogged condition. Replace screen assembly if damaged; clean if clogged (para 2-38a).

**2-36. TRANSMISSION TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. LOSS OF DRIVE IN ALL RANGES

Step 1. Check oil level with transmission at operating temperature and engine operating.

- a. If oil level is not between FULL and ADD marks, add oil (refer to current lubrication order).
- b. If oil level is between FULL and ADD marks, proceed to step 2.

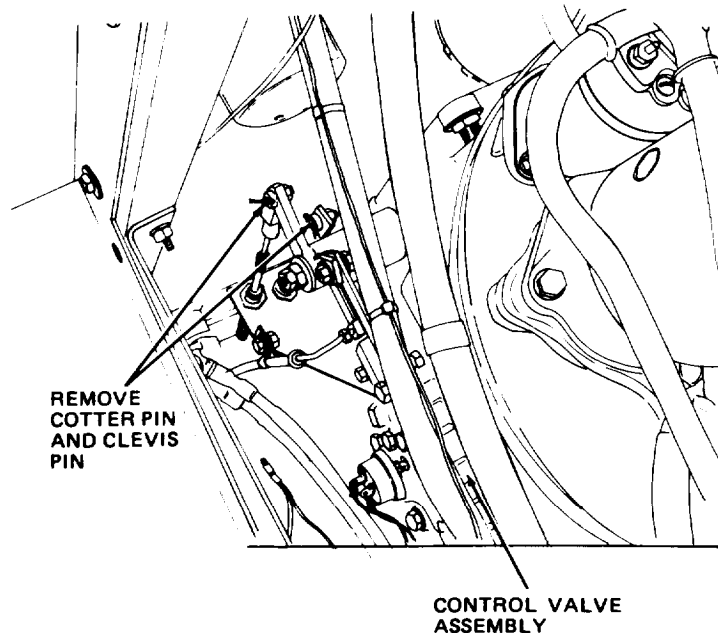
Step 2. Check if axle disconnect lever is in disengaged position (pulled outward).

- a. If axle disconnect lever is in disengaged position (pulled outward), place in engaged position.
- b. If axle disconnect lever is in engaged position, proceed to step 3.

Step 3. Observe control valve assembly linkage while an assistant moves direction selector and speed selector through their entire range. Movement of control valve assembly forward and reverse and speed selector spools should be observed.

- a. If movement is not observed, replace/repair cables/linkages (para 2-38b).
- b. If movement is observed, proceed to step 4.

Step 4. Disconnect linkage at control valve assembly valve spools. Start engine, operate at idle speed, and set parking brake.



TA126953

**NOTE**

Do not depress service brake pedal. Depressing service brake pedal activates declutch valve in turn neutralizing transmission.

**2-36. TRANSMISSION TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. LESS OF DRIVE IN ALL RANGES (cont)

Step 4. (cont)

With an assistant in operator's seat, move control valve assembly direction selector spool and speed selector spool slowly through their entire range of travel. Movement of vehicle should be observed.

- a. If vehicle moves, adjust transmission linkage controls (para 2-38 b).
- b. If vehicle does not move, proceed to step 5.

Step 5. Disconnect and cap hose connected to control valve assembly hydraulic actuator assembly.

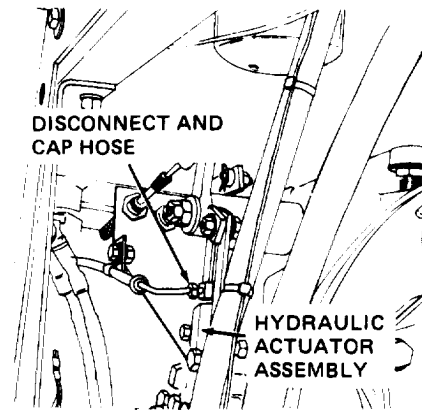
Start engine and operate at idle speed and set parking brake.

With an assistant in operator's seat, move control valve assembly direction selector spool and speed selector spool slowly through their entire range of travel.

Movement of vehicle should be observed.

- a. If vehicle does not move, replace control valve assembly (notify direct support maintenance)

- b. If vehicle moves, replace or adjust declutch valve (para 2-43d).



TA126954

5. LOSS OF POWER

Step 1. Check for foamy oil (para 2-36, MALFUNCTION 1).

Refer to paragraph 2-36, MALFUNCTION 1.

Step 2. Remove parking brake drum (para 2-42b) and check for locked parking brake linings.

- a. If linings are locked in position, disassemble parking brake and inspect parts (para 2-42b); replace defective parts (para 2-42b).
- b. If linings tire not locked in position. reinstall parking brake drum (para 2-42b) and proceed to step 3.

Step 3. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Install shipping lock pin (para 2-4b(1)). Ensure that parking brake lever is in released position.

## 2-36. TRANSMISSION TROUBLESHOOTING (cont)

### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 5. LOSS OF POWER (cont)

#### Step 3. (cont)

#### WARNING

Before raising wheel off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle off ground.

Rotate wheel by hand and check that wheel rotates freely without excessive drag.

Repeat for remaining wheel.

Repeat for remaining axle.

- a. If a wheel does not rotate freely without excessive drag or is locked, adjust brakes (para 2-43a).
- b. If wheels rotate freely, lower axle to ground, remove shipping lock pin and blocks. Check drive shafts and universal joints for damage (para 2-39); repair or replace as necessary (para 2-39).

## 2-37. AXLES AND DRIVE SHAFT ASSEMBLIES TROUBLESHOOTING

### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 1. LUBRICANT LEAKING FROM DIFFERENTIAL BREATHER

Check oil level (para 2-39d).

Drain to proper level (para 2-39d).

### 2. CONTINUOUS AXLE OR WHEEL NOISE

Step 1. Check lubricant level (para 2-39d).

- a. If lubricant level is below fill plug opening, add lubricant (refer to current lubrication order) to fill plug opening then reinstall fill plug.
- b. If lubricant level is okay, proceed to step 2.

#### WARNING

Before raising wheel from ground, install shipping lock pin (para 2-4b(1)).

- Step 2. Check wheel bearing for proper adjustment (raise wheel and use pry bar to check for any noticeable end play) or damage.  
Repeat for other wheels.

---

## 2-37. AXLES AND DRIVE SHAFT ASSEMBLIES TROUBLESHOOTING (cont)

---

### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 2. CONTINUOUS AXLE OR WHEEL NOISE (cont)

#### Step 2. (cont)

- a. If end play is noticeable, adjust or replace wheel bearing (para 2-39f).
- b. If end play is okay, proceed to step 3.

#### Step 3. Check axle shafts for damage (para 2-39f).

- a. If axle shafts damaged, replace (para 2-39f).
- b. If axle shafts are not damaged, notify direct support maintenance.

### 3. DIFFERENTIAL CARRIER ASSEMBLY OVERHEATING

Check lubricant level (para 2-39d).

Add lubricant (para 2-39d)

### 4. LUBRICANT LEAKING FROM DIFFERENTIAL CARRIER ASSEMBLY

Check axle breather for damage or clogged condition (para 2-39e).

- a. If axle breather is damaged or clogged. clean or replace it (para 2-39e).
- b. If axle breather is okay, notify direct support maintenance.

### 5. EXCESSIVE NOISE OR VIBRATION IN DRIVE SHAFT ASSEMBLIES

Step 1. Check for loose universal joint mounting bolts (para 2-39a, b and c).

- a. If universal joint mounting bolts are loose, tighten (para 2-39a, b and c).
- b. If universal joint mounting bolts are tight, proceed to step 2.

Step 2. Check drive shaft assemblies for insufficient lubrication, wear or damage (indicated by excessive movement between universal joint and drive shaft assembly in any direction).

- a. If drive shaft assemblies are insufficiently lubricated, lubricate (para 2-39a, b and c); if worn or damaged, repair or replace drive shaft assembly (para 2-39a, b and c).
- b. If drive shaft assemblies are lubricated and are not worn or damaged, check for a bent drive shaft assembly (para 2-39a, b and c). Replace a bent drive shaft assembly (para 2-39a, b and c).



**2-38. TRANSMISSION MAINTENANCE**

*a. Transmission Servicing and Inspection.*

(1) Draining and Refilling Transmission Oil. This task covers draining and refilling transmission oil.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

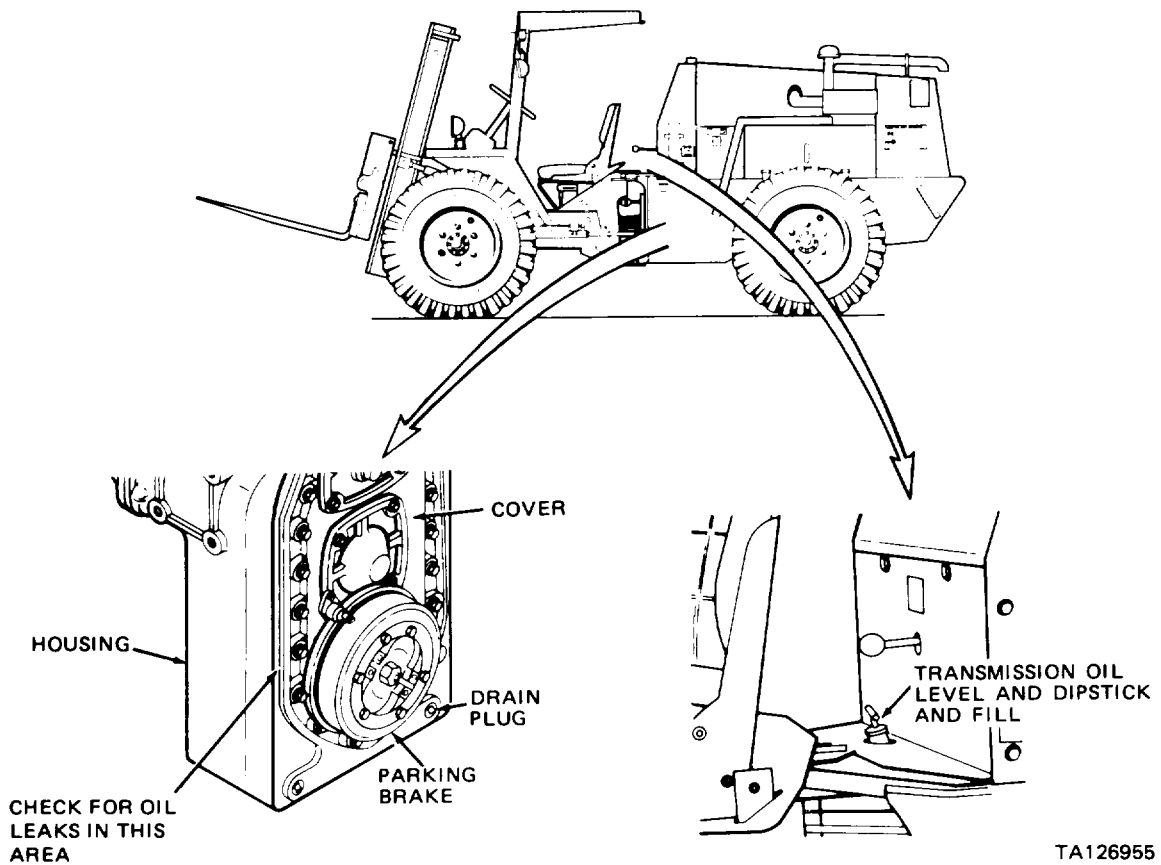
Engine operated for 15 minutes immediately prior to draining oil. Engine off, vehicle parked on level surface and parking brake applied.

MATERIALS/PARTS

Transmission oil (refer to current lubrication order)

2-53c

Left and right side panels removed.



**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(1) *Draining and Refilling Transmission Oil (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
1	Transmission	a. Transmission oil drain plug	Remove	Position 7 gallon container under drain plug before removing
		b. Transmission oil	Drain	
		c. Screen assembly	Remove and clean	Para 2-38a(2)
		d. Air breather	Remove and clean	Para 2-38a(3)
		e. Oil filter	Remove and discard	Para 2-38a(4)
		f. Transmission oil drain plug	Install	
2	Operator's compartment, rear	a. New oil filter	Install	Para 2-38a(4)
		b. Air breather	Install	Para 2-38a(3)
		c. Screen assembly	Install	Para 2-38a(2)
		d. Transmission oil fill	Fill to dipstick LOW mark	Refer to current lubrication order
		e. Engine	Start and idle	
		f. Transmission oil level dipstick and fill	Check oil level with engine at idle speed	Add oil to reach low mark if necessary. When oil is hot, recheck oil level. Add oil to reach FULL mark on dipstick, if necessary

**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(2) Screen Assembly. This task covers removal, cleaning, and installation of screen assembly.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

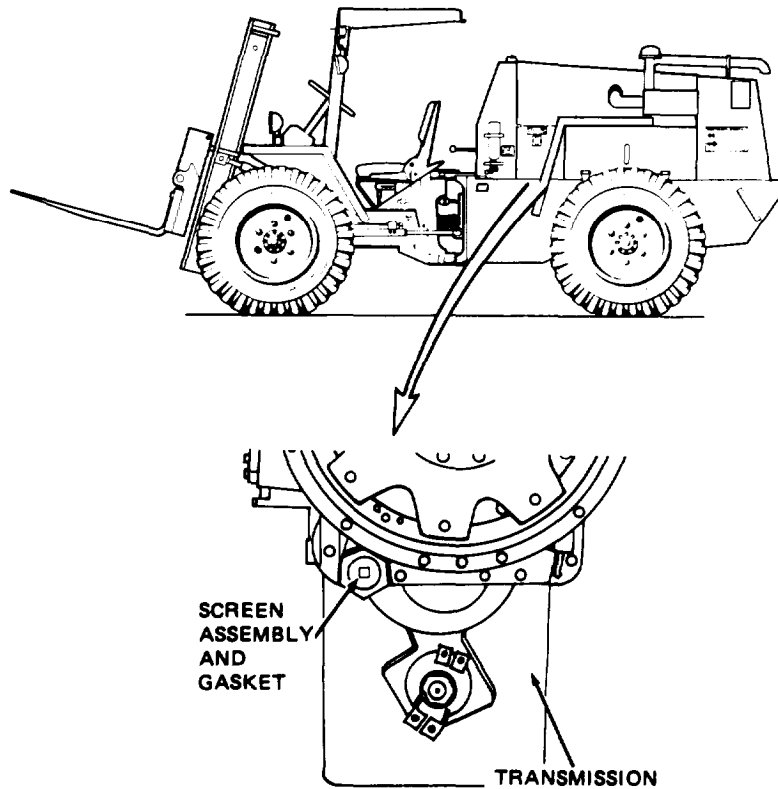
Paragraph 2-38a(1)

Condition Description  
Transmission oil drained.

MATERIALS/PARTS

Cleaning solvent P-D-680

Gasket



TA126956

**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(2) Screen Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission	a. Screen assembly b. Gasket	Remove Remove and discard	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		Screen assembly	Clean	Use cleaning solvent P-D-680
<b>INSPECTION</b>				
3		Screen assembly	Inspect	Replace if torn, broken or dented
<b>INSTALLATION</b>				
4	Transmission	a. Gasket b. Screen	Position Install	Tighten to 10 to 15 pounds foot torque
<b>NOTE</b>				
Fill transmission with oil (para 2-38a(1), step 2).				

**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(3) Air Breather. This task covers removal, cleaning, inspection, and installation of air breather.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

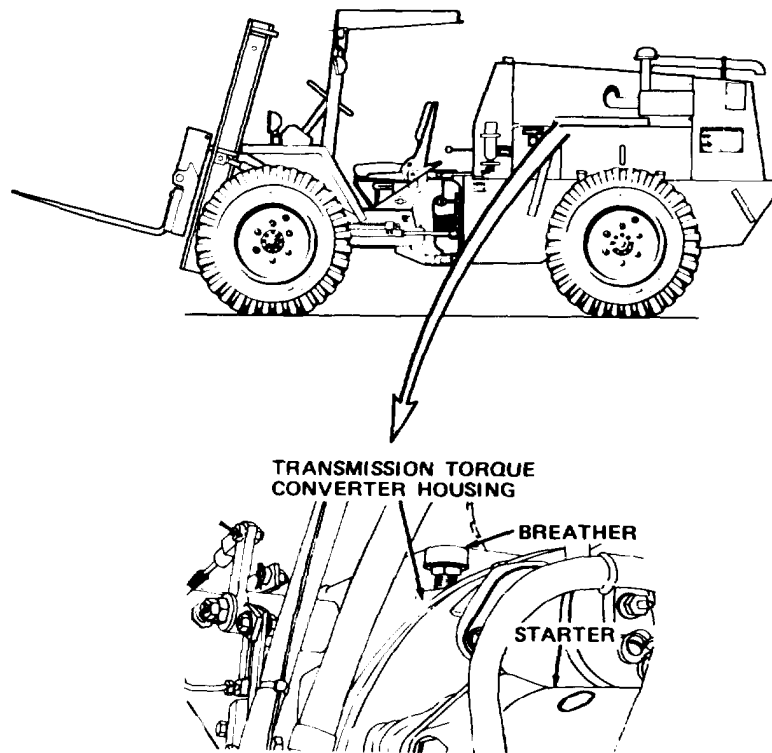
Condition Description

2-53c

Engine off.  
Left side panel removed.

MATERIALS/PARTS

Cleaning solvent P-D-680



TA126957

**2-38. TRANSMISSION MAINTENANCE (cont)**

*a. Transmission Servicing and Inspection (cont).*

(3) Air Breather (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission torque converter housing, top	Air breather	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately. and obtain medical aid immediately.</p>				
2		Air breather	Clean	Use cleaning solvent P-D-680
<b>INSPECTION</b>				
3		Air breather	Inspect	Replace if damaged or clogged
<b>INSTALLATION</b>				
4	Transmission torque converter housing, top	Air breather	Install	

**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(4) Oil Filter. This task covers replacement of transmission oil filter.

INITIAL SETUP

TOOLS

Clamping Type Oil Filter Wrench

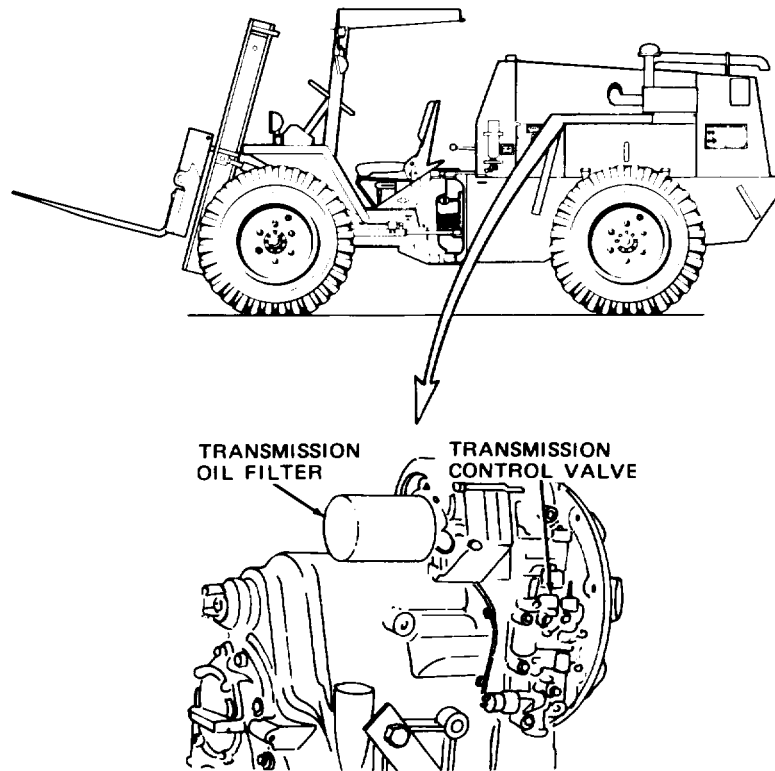
EQUIPMENT CONDITION

Paragraph	Condition Description
2-38a(1)	Transmission oil drained.

MATERIALS/PARTS

Clean transmission oil (refer to current lubrication order)

Oil filter



TA127502

**2-38. TRANSMISSION MAINTENANCE (cont)**

*a. Transmission Servicing and Inspection (cont).*

(4) Oil Filter (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission	Oil filter	Remove and discard	Use clamp type wrench
<b>INSTALLATION</b>				
2	Transmission	Oil filter gasket	Coat	Use clean transmission oil
3	Transmission	Oil filter	Install	Install until gasket contacts base. Then, tighten oil filter one-half to three-quarters of a turn to obtain proper seal
<b>NOTE</b>				
Fill transmission with oil (para 2-38a(1), step 2).				



**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(5) Inspection. This task covers inspection of the transmission.

INITIAL SETUP

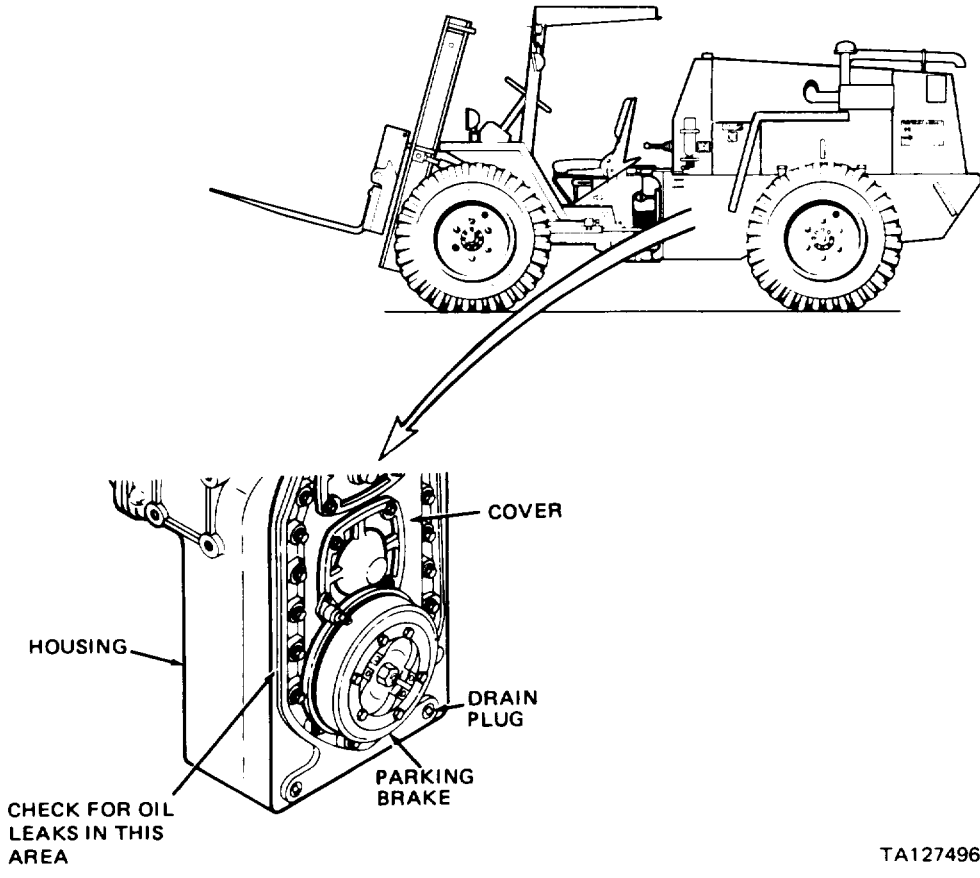
TOOLS  
None

EQUIPMENT CONDITION  
Paragraph

Condition Description  
Engine off, vehicle parked on level surface and parking brake applied.  
Left and right side panels removed.

MATERIALS/PARTS  
None

2-53c

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
1	Transmission, front	a. Drain plug b. Transmission cover	Inspect for oil leakage Inspect for oil leakage between cover and housing	Tighten if oil leakage is observed Notify direct support maintenance if oil leakage observed
<div style="text-align: center;">  </div>				
				TA127496

**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(5) Inspection (cont).

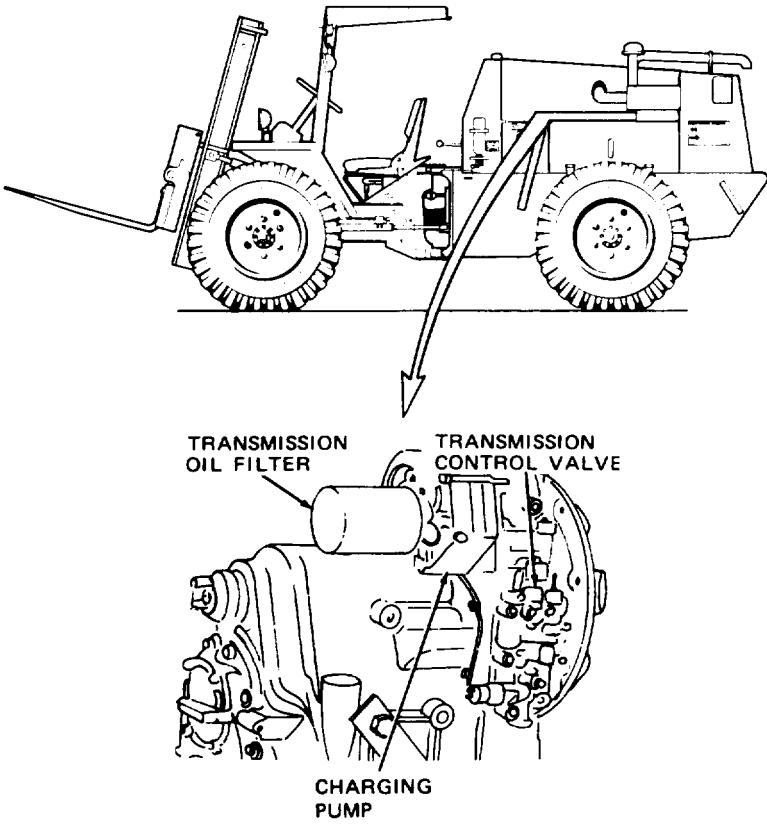
STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
2	Transmission, top	a. Breather	Inspect for dirty condition, oil leakage	Clean if dirty (para 2-38a(3)); tighten if oil leakage is observed
		b. Torque converter housing	Inspect for oil leakage between converter housing and transmission housing	Notify direct support maintenance if leakage is observed
		c. Control valve linkage	Inspect for missing or loose parts	While an assistant moves transmission levers through their entire range, check that spools move. If parts are missing or loose or if spools do not move, repair (para 2-38b)
		d. Control valve	Inspect for oil leakage between control valve and mounting surface and at top of control valve	Notify direct support maintenance if oil leakage is observed.

TA127497

**2-38. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Servicing and Inspection (cont).*

(5) Inspection (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
2 (cont)		e. Oil filter	Inspect for oil leakage at base	Tighten oil filter if leakage is observed
		f. Charging pump	Inspect for oil leakage between pump and mounting surface	If oil leakage is observed, tighten pump mounting bolts; if bolts are tight, notify direct support maintenance
 <p style="text-align: right;">TA126958</p>				

**2-38. TRANSMISSION MAINTENANCE (cont)**

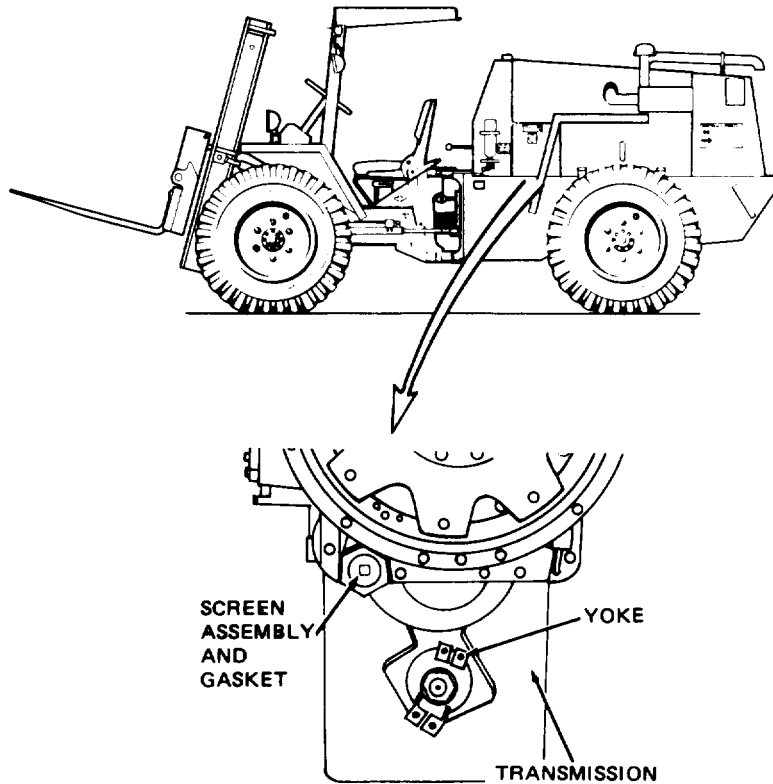
a. *Transmission Servicing and Inspection (cont).*

(5) inspection (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
------	----------	------	--------	---------

INSPECTION (cont)

3	Transmission, bottom, rear	a. Screen assembly	Inspect for oil leakage	Tighten screen assembly to 10-15 pounds foot torque if oil leakage is observed; if screen assembly is tight, replace gasket (para 2-38a(2))
		b. Yoke area	Inspect for oil leakage	Notify direct support maintenance if oil leakage is observed



TA127503

**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls.*

This task covers: a. Removal  
b. Cleaning  
c. Inspection/Repair

d. Installation/Replacement  
e. Adjustment

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Engine off and parking brake applied.  
Left side panel removed.

2-53c

Left hood support plate removed.

2-53e

Noise baffle mat removed.

2-53h

Chassis guard removed.

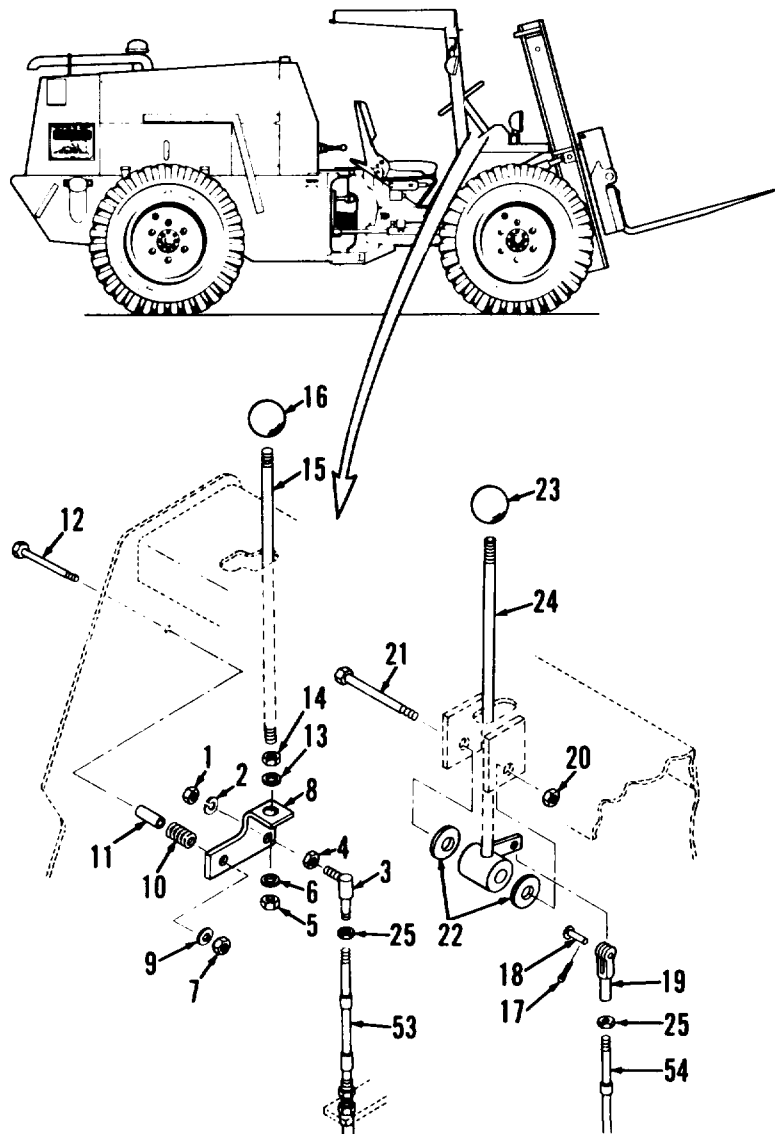
2-53i

MATERIALS/PARTS

Clean diesel fuel  
Cleaning solvent P-D-680

KEY

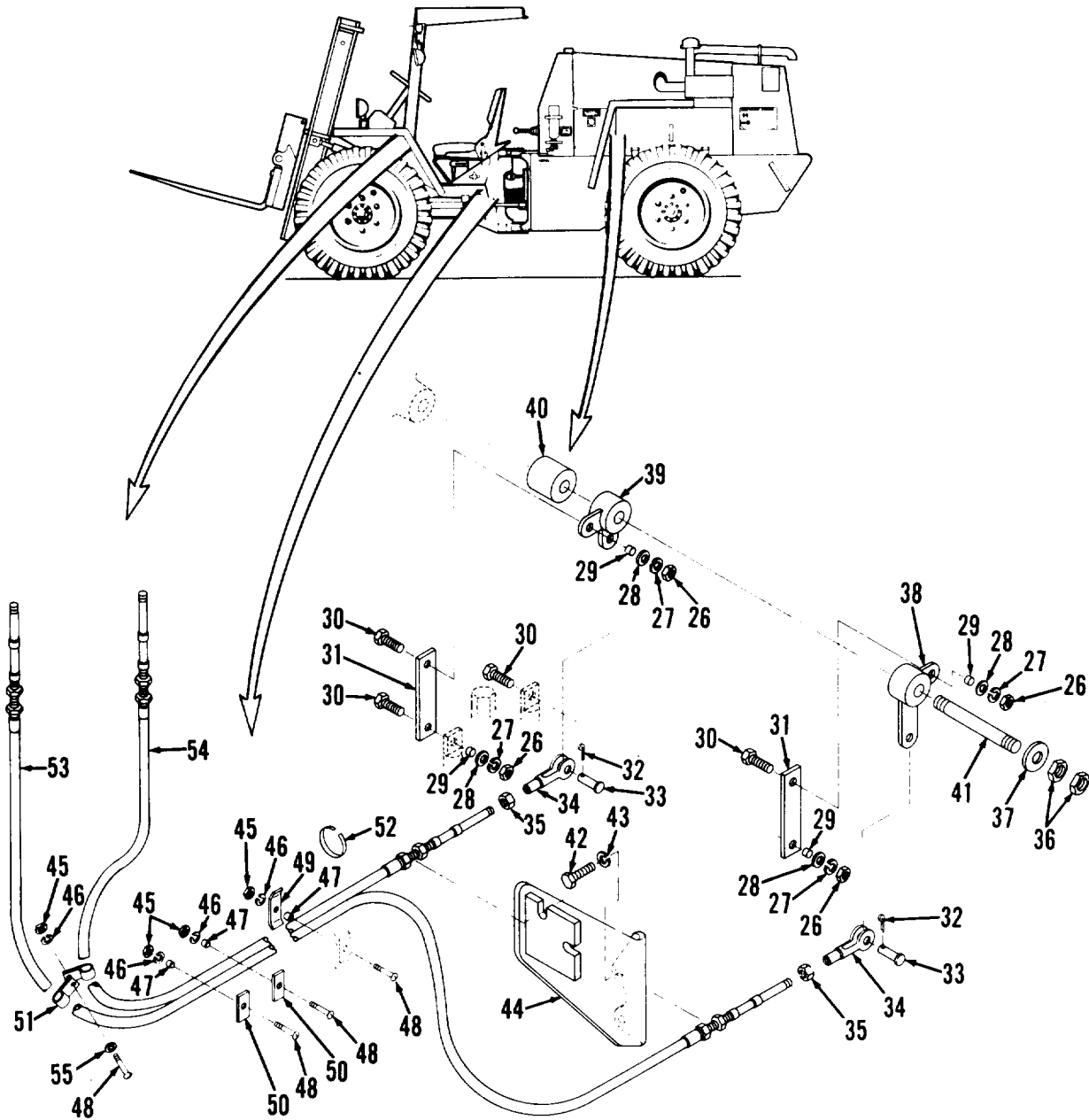
1. Nut
2. Lock washer
3. Ball joint
4. Nut
5. Nut
6. Washer
7. Nut
8. Bracket
9. Washer
10. Spring
11. Spacer
12. Cap screw
13. Washer
14. Nut
15. Speed control lever
16. Control lever knob
17. Cotter pin
18. Clevis pin
19. Clevis
20. Nut
21. Cap screw
22. Washers
23. Control lever knob
24. Direction control lever
25. Nuts



TA126959

**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*



**KEY**

TA126960

- |                  |                     |                   |                            |
|------------------|---------------------|-------------------|----------------------------|
| 26. Nuts         | 34. Clevises        | 42. Cap screws    | 50. Cable hold down plates |
| 27. Lock washers | 35. Nuts            | 43. Lock washers  | 51. Cable clamps           |
| 28. Washers      | 36. Nuts            | 44. Cable bracket | 52. Tie straps             |
| 29. Spacers      | 37. Washer          | 45. Nuts          | 53. Cable                  |
| 30. Cap screws   | 38. Outer bellcrank | 46. Lock washers  | 54. Cable                  |
| 31. Links        | 39. Inner bellcrank | 47. Spacers       | 55. Washer                 |
| 32. Cotter pins  | 40. Spacer          | 48. Cap screws    |                            |
| 33. Clevis pins  | 41. Stud            | 49. Clamp         |                            |

**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
1	Instrument panel, bottom, transmission control levers	a. Speed control lever	Inspect for loose or missing parts	Tighten loose parts; replace missing parts
		b. Direction control lever	Inspect for loose or missing parts	Tighten loose parts; replace missing parts
2	Engine compartment	Linkage (at control valve)	a. Inspect for loose or missing parts b. Check that when levers are moved, linkage causes control valve spools to move	Tighten loose parts; replace missing parts If necessary, disassemble and inspect parts if control valve spools do not move
<b>REMOVAL</b>				
1	Instrument panel, bottom, speed control lever	a. Nut (1)	Remove	
		b. Lock washer (2)	Remove	
		c. Ball joint (3)	Detach and remove	From cable (53)
		d. Nut (4)	Remove from ball joint (3)	
		e. Nut (5)	Remove	
		f. Two washers (6 and 13)	Remove	
		g. Nut (7)	Remove and support bracket (8)	
		h. Washer (9)	Remove	
		i. Bracket (8)	Remove	
		j. Spring (10)	Remove	
		k. Spacer (11)	Remove	
		l. Cap screw (12)	Remove	
		m. Nut (14)	Remove	
		n. Speed control lever (15)	Remove	
		o. Control lever knob (16)	Remove	
2		Instrument panel, bottom, direction control lever	a. Cotter pin (17)	Remove
	b. Clevis pin (18)		Remove	
	c. Clevis (19)		Detach and remove from cable (54)	
	d. Nut (20)		Remove	
	e. Cap screw (21)		Remove	
	f. Two washers (22)		Remove	
	g. Control lever knob (23)		Remove	
	h. Direction control lever (24)		Remove	
	i. Two nuts (25)		Remove	
	j. Two cables (53 and 54)		Loosen nuts, detach from bracket and mark for proper installation	

**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
3	Engine compartment	Cables (53, 54)	Mark for proper installation	
4	Link (31)	a. Four nuts (26) b. Four lock washers (27) c. Four washers (28) d. Four spacers (29) e. Four cap screws (30)	Remove Remove Remove Remove Remove	
<b>NOTE</b>				
Remove four nuts (26), lock washers (27), washers (28), spacers (29) and cap screws (30) from two links (31).				
5	Outer bellcrank (38), inner bellcrank (39)	a. Two links (31) b. Two cotter pins (32) c. Two clevis pins (33) d. Two clevises (34) e. Two nuts (35)	Remove Remove Remove Slide off and remove Remove	
6	Transmission	a. Two nuts (36) b. Washer (37) c. Outer bellcrank (38) d. Inner bellcrank (39) e. Spacer (40) f. Stud (41) g. Two cap screws (42) h. Two lock washers (43) i. Cable bracket (44)	Remove Remove Remove Remove Remove Remove Remove Remove Remove	
7	Operator's compartment, under floor panel	a. Four nuts (45) b. Four lock washers (46) c. Three spacers (47) d. Four cap screws (48) e. Washer (55) f. Clamp (49) g. Two cable hold down plates (50) h. Two cable clamps (51) i. Two tie straps (52) j. Two cables (53 and 54)	Remove Remove Remove Remove Remove Remove Remove Remove Remove Remove	



**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
8		Cables (53, 54) and control lever balls (16, 23)	Clean	Use clean diesel fuel. Dry thoroughly
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
9		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly
INSPECTION/REPAIR				
10		Cables (53, 54)	Inspect	Replace if cracked, worn, damaged, twisted or distorted
11		Spring (10)	Inspect	Replace if cracked, worn, damaged, distorted or permanently set
12		All other parts	Inspect	Replace if cracked, worn, damaged, distorted, or missing or damaged threads
INSTALLATION/REPLACEMENT				
13	Operator's compartment, under floor panel	a. Two cables (53, 54) b. Two tie straps (52) c. Two cable clamps (51) d. Two cable hold down plates (50) e. Three spacers (47) f. Clamp (49) g. Washer (55) h. Four cap screws (48) i. Four lock washers (46) j. Four nuts (45)	Position Install Position Position Install Position Position Install Install Install	
14	Transmission	a. Cable bracket (44) b. Two lock washers (43) c. Two cap screws (42) d. Stud (41) e. Spacer (40)	Position Position Install Install Position	

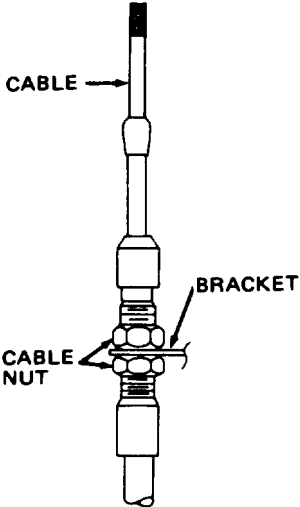
**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
14 (Cont)		f. Inner bellcrank (39)	Position	
		g. Outer bellcrank (38)	Position	
		h. Washer (37)	Position	
		i. Two nuts (36)	Install	
15	Outer bellcrank (38), inner bellcrank (39)	a. Two nuts (35)	Install on cables (53,54)	
		b. Two clevises (34)	Install and position	
		c. Two clevis pins (33)	Install	
		d. Two cotter pins (32)	Install	
		e. Two links (31)	Position	
16	Link (31)	a. Four cap screws (30)	Install	
		b. Four spacers (29)	Install	
		c. Four washers (28)	Install	
		d. Four lock washers (27)	Install	
		e. Four nuts (26)	Install	
<b>NOTE</b>				
Install four cap screws (30), spacers (29), washers (28), lock washers (27) and nuts (26) to attach links (31) to control valve spools, outer bellcrank (38) and inner bellcrank (39).				
17	Instrument panel	a. Two cables (53, 54)	Attach to bracket and tighten cable nuts	
		b. Two nuts (25)	Install on cables (53, 54)	
		c. Control lever (24)	Install	
		d. Control lever knob (23)	Install	
		e. Control lever (24)	Position between two brackets	
		f. Two washers (22)	Position	
		g. Cap screw (21)	Install	
		h. Nut (20)	Install	
		i. Clevis (19)	Install in cable (54) and position lever (24) tab	
		j. Clevis pin (18)	Install	
		k. Cotter pin (17)	Install	
		l. Control lever knob (16)	Install	
		m. Speed control lever (15)	Install	
		n. Nut (14)	Install on speed control lever (15)	
		o. Cap screw (12)	Install	
		p. Spacer (11)	Install	
		q. Spring (10)	Install	
		r. Bracket (8)	Install	
		s. Washer (9)	Install	

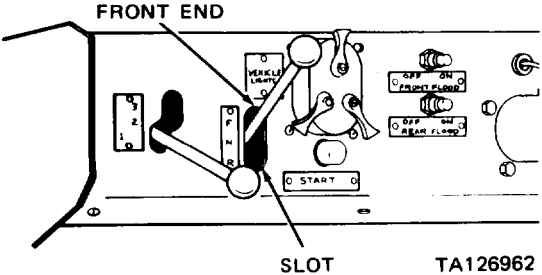
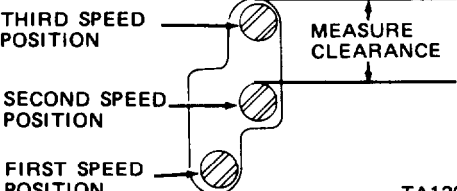
**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
18	Instrument panel, speed control lever area	a. Nut (7) b. Speed control lever (15) c. Two washers (6 and 13) d. Nut (5) e. Nut (4) f. Ball joint (3) g. Lock washer (2) h. Nut(1)	Install Position in bracket (8) Install Install Install on ball joint (3) Install on cable (53) and position in bracket (8) Install Install	
ADJUSTMENT				
19	Instrument panel, bottom	Cables (53, 54)	Loosen cable nuts, center threaded portion of cable in bracket, and retighten nuts	
20	Engine compartment, bracket (44)	Cables (53, 54)	Loosen cable nuts, center threaded portion of cable in bracket, and retighten nuts	

**2-38. TRANSMISSION MAINTENANCE (Cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENT (cont)				
21	Instrument panel	a. Direction control lever (24)	a. Move into forward (F) position b. Measure clearance between lever and front end of slot. Clearance must be 0.5-0.7 inch. Adjust if necessary.	
c. Adjust as follows: <ol style="list-style-type: none"> <li>(1) Remove cotter pin (17) and clevis pin (18)</li> <li>(2) Disconnect clevis (19)</li> <li>(3) Loosen nut (25)</li> <li>(4) Adjust clevis (19) by threading onto or out of cable (54)</li> <li>(5) Tighten nut (25)</li> <li>(6) Connect clevis (19) to lever (24) tab</li> <li>(7) Install clevis pin (18) and cotter pin (17)</li> <li>(8) Measure clearance (step b above)</li> </ol>				
d. Move into reverse (R) position. e. Measure clearance between lever and back end of slot. Clearance must be 0.5-0.7 inch. Adjust as necessary (step c above)				
b. Speed control lever (15) <ol style="list-style-type: none"> <li>a. Move into second (2) speed position.</li> <li>b. Measure clearance between lever and top of slot as indicated. Clearance must be 0.9-1.1 inch. Adjust as necessary</li> </ol>				
				

**2-38. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Linkage Controls (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENT (cont)				
21 (cont)			c. Adjust as follows:	
			(1) Remove nut (1) and lock washer (2)	
			(2) Detach ball joint (3)	
			(3) Loosen nut (25)	
			(4) Adjust ball joint (3) by threading onto or out of cable (53)	
			(5) Tighten nut (25)	
			(6) Install ball joint (3)	
			(7) install lock washer (2) and nut (1)	
			(8) Measure clearance (step b above)	
			d. Move lever into first (1) and third (3) speed positions.	
			Full detent shall be achieved.	

**2-38. TRANSMISSION MAINTENANCE (cont)**

c. Axle Disconnect Lever.

This task covers: a. Removal  
b. Cleaning  
c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
Torque Wrench, zero to 50 pounds foot range  
Thread Cutting Die

NSN 4910-00-754-0654

EQUIPMENT CONDITION

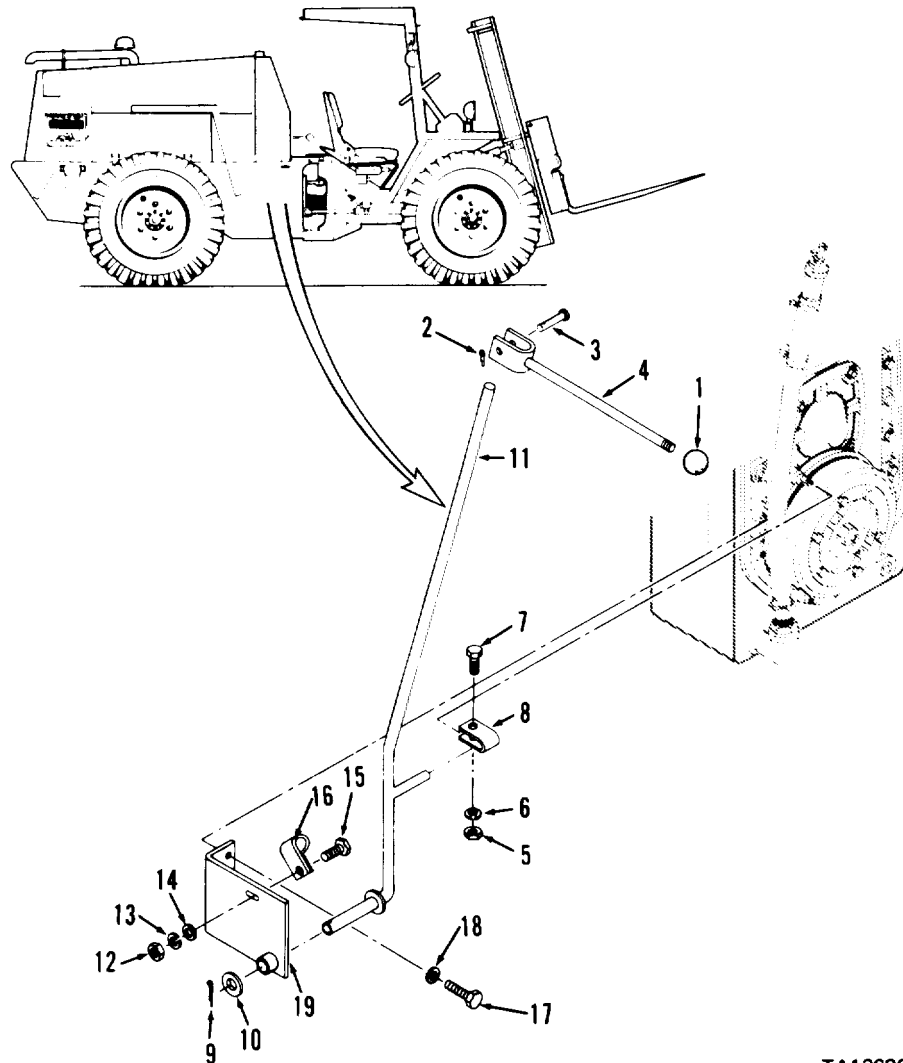
Paragraph  
2-53f  
Condition Description  
Vehicle turned (articulated) to left, engine off, and parking brake applied. Front cover panel removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Cotter pins

KEY

1. Knob
2. Cotter pin
3. Pin
4. Upper lever
5. Nut
6. Lock washer
7. Cap screw
8. Clamp
9. Cotter pin
10. Washer
11. Rod
12. Nut
13. Lock washer
14. Washer
15. Cap screw
16. Clamp
17. Cap screws
18. Lock washers
19. Bracket



TA126964

**2-38. TRANSMISSION MAINTENANCE (cont)**

*c. Axle Disconnect Lever (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment, rear	a. Knob (1) b. Cotter pin (2) c. Pin (3) d. Upper lever (4)	Remove Remove and discard Remove Remove	
2	Transmission	a. Nut (5), lock washer (6), and cap screw (7) b. Clamp (8) c. Cotter pin (9) d. Washer (10) e. Rod (11)	Remove Remove Remove and discard Remove Remove	
<b>NOTE</b>				
Perform steps f through i only if bracket (19) requires replacement.				
		f. Nut (12), lock washer (13), washer (14), and cap screw (15) g. Clamp (16) h. Two cap screws (17) and lock washers (18) i. Bracket (19)	Remove Remove Remove Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		All parts	Clean	Use cleaning solvent P-D-680; dry thoroughly

**2-38. TRANSMISSION MAINTENANCE (cont)**

*c. Axle Disconnect Lever (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
4		Upper lever (4) and rod (11)	Inspect	Replace if bent or cracked; repair threads by chasing with proper size die
5		Knob (1)	Inspect	Replace if cracked, chipped or threads damaged
6		Pin (3)	Inspect	Replace if bent or cracked
7		Clamps (8 and 16)	Inspect	Replace if cracked
8		Bracket (19)	Inspect	Replace if bent, cracked, or spacer damaged
<b>INSTALLATION</b>				
9	Transmission	a. Bracket b. Two lock washers (18) and cap screws (17) c. Clamp (16) d. Cap screw (15) e. Washer (14), lock washer (13), and nut (12) f. Rod (11) g. Washer (10) h. Cotter pin (9) i. Clamp (8) j. Cap screw (7) k. Lock washer (6) and nut (5)	Position Install Position Position Install Position Position Install Position Position Install Install	Tighten to 37-41 pounds foot torque On dipstick assembly Secures clamp (16) to bracket (19) In bracket(19) On rod (11) Bend over On rod (11); line up holes in clamp with holes in shift rod
10	Operator's compartment, rear	a. Upper lever (4) b. Pin (3) c. Cotter pin (2) d. Knob (1) e. Front cover panel	Position Install Install Install Install	On rod (11) Bend over Para 2-53f



**2-38. TRANSMISSION MAINTENANCE (cont)**

*d. Dipstick Tube Assembly.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle turned (articulated) to left, engine off, and parking brake applied. Front cover panel removed. Transmission oil drained.

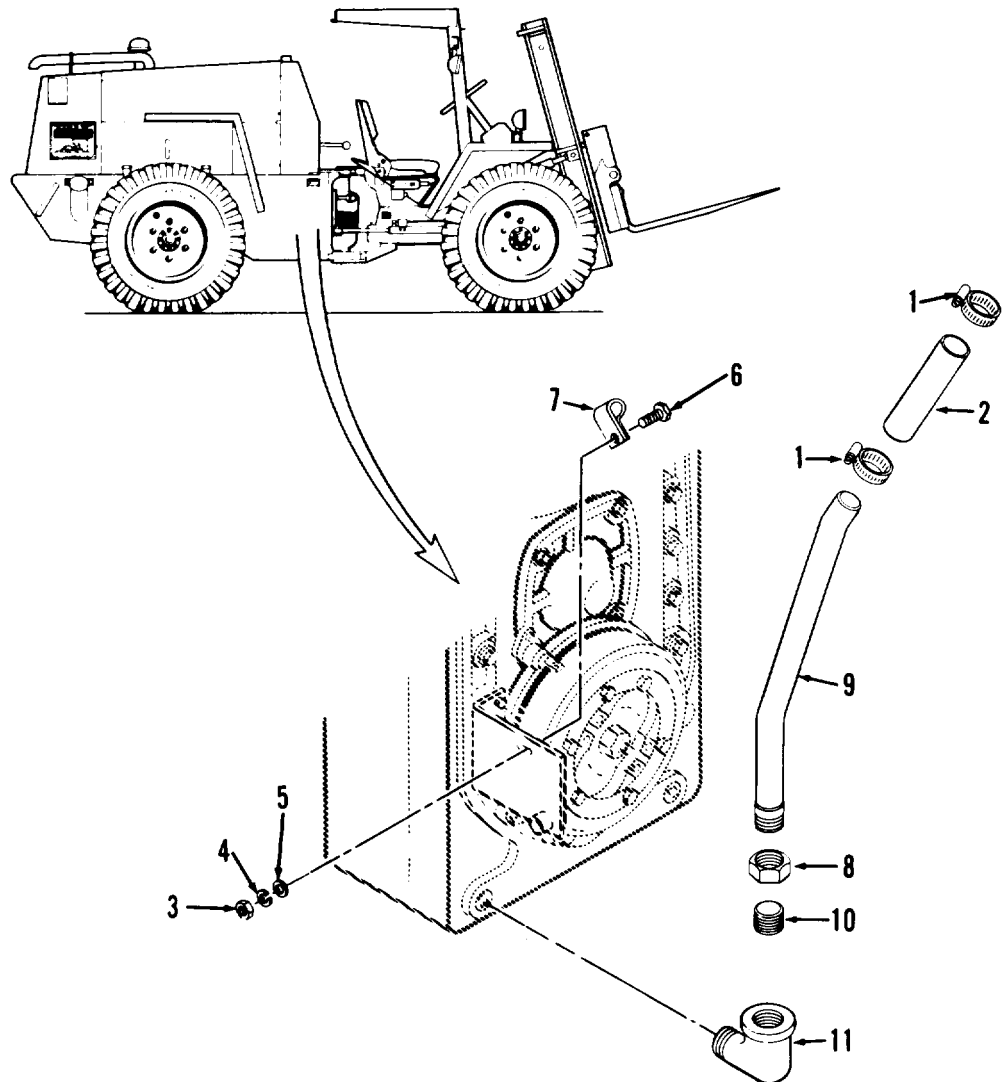
MATERIALS/PARTS

Clean diesel fuel  
Cleaning solvent P-D-680  
Clean cloths  
Replacement dipstick tube assembly

2-53f  
2-38a(1)

KEY

1. Hose clamps
2. Dipstick hose
3. Nut
4. Lock washer
5. Flat washer
6. Cap screw
7. Clamp
8. Nut
9. Dipstick tube assembly
10. Straight connector
11. Elbow



NOTE : AXLE DISCONNECT LEVER NOT SHOWN FOR CLARITY.

TA126965

**2-38. TRANSMISSION MAINTENANCE (cont)**

*d. Dipstick Tube Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment, rear	a. Two hose clamps(1) b. Dipstick hose (2)	Loosen Remove	
2	Transmission	a. Nut (3), lock washer (4), washer (5), and cap screw (6) b. Clamp (7) c. Nut (8) d. Dipstick tube assembly (9)	Remove Remove Loosen Remove	
<b>NOTE</b>				
Don't remove straight connector (10) or elbow (11) unless replacement is necessary.				
		e. Straight connector (10)	Remove	
		f. Elbow (11)	Remove	
<b>CLEANING</b>				
3		Dipstick hose (2)	Clean	Use clean diesel fuel
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
4		All other parts	Clean	Use cleaning solvent P-D-680
<b>INSPECTION</b>				
5		Hose clamps (1)	Inspect	Replace if damaged
6		Dipstick hose (2)	Inspect	Replace if cracked, cut, or torn
7		Straight connector (10) and elbow (11)	Inspect	Replace if cracked, distorted, or threads damaged

**2-38. TRANSMISSION MAINTENANCE (cont)**

*d. Dipstick Tube Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION</b>				
8	Transmission	a. Elbow (11) b. Straight connector (10) c. Dipstick tube assembly (9) d. Nut (8) e. Clamp (7)  f. Cap screw (6) g. Washer (5), lock washer (4), and nut (3)	Install Install Position Tighten Position  Position Install	  Carefully slip over dipstick tube assembly (9) Secures clamp (7)
9	Operator's compartment, rear	a. Hose clamp (1) b. Dipstick hose (2) c. Two hose clamps (1) d. Front cover panel	Position Position Tighten Install	On dipstick hose (2)  Bottom clamp only Para 2-53f
<b>NOTE</b>				
Fill transmission with oil (para 2-38a(1), step 2).				

**2-38. TRANSMISSION MAINTENANCE (cont)**

e. *Control Valve.* This task covers inspection of the control valve.

INITIAL SETUP

TOOLS

None

EQUIPMENT CONDITION

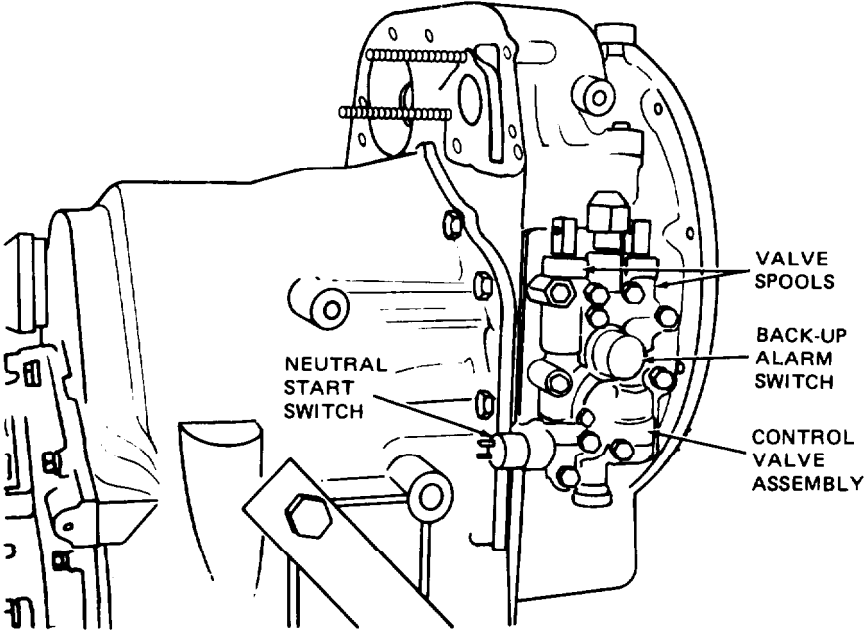
Paragraph

Condition Description  
 Engine off, vehicle parked on level surface and parking brake applied.  
 Left side panel removed.

MATERIALS/PARTS

None

2-53c

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
1	Transmission, left side	a. Valve spools b. Back-up alarm switch c. Neutral start switch d. Control valve	Inspect for oil leakage Inspect for oil leakage at mounting area Inspect for oil leakage at mounting area Inspect for oil leakage at mounting area	Notify direct support maintenance if oil leakage is observed Notify direct support maintenance if oil leakage is observed Notify direct support maintenance if oil leakage is observed Notify direct support maintenance if oil leakage is observed
 <p style="text-align: right;">TA127498</p>				

**2-38. TRANSMISSION MAINTENANCE (cont)**

*f. Transmission Hoses, Lines and Fittings.*

This task covers:    a. Removal  
                               b. Cleaning  
                               c. Inspection  
                               d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

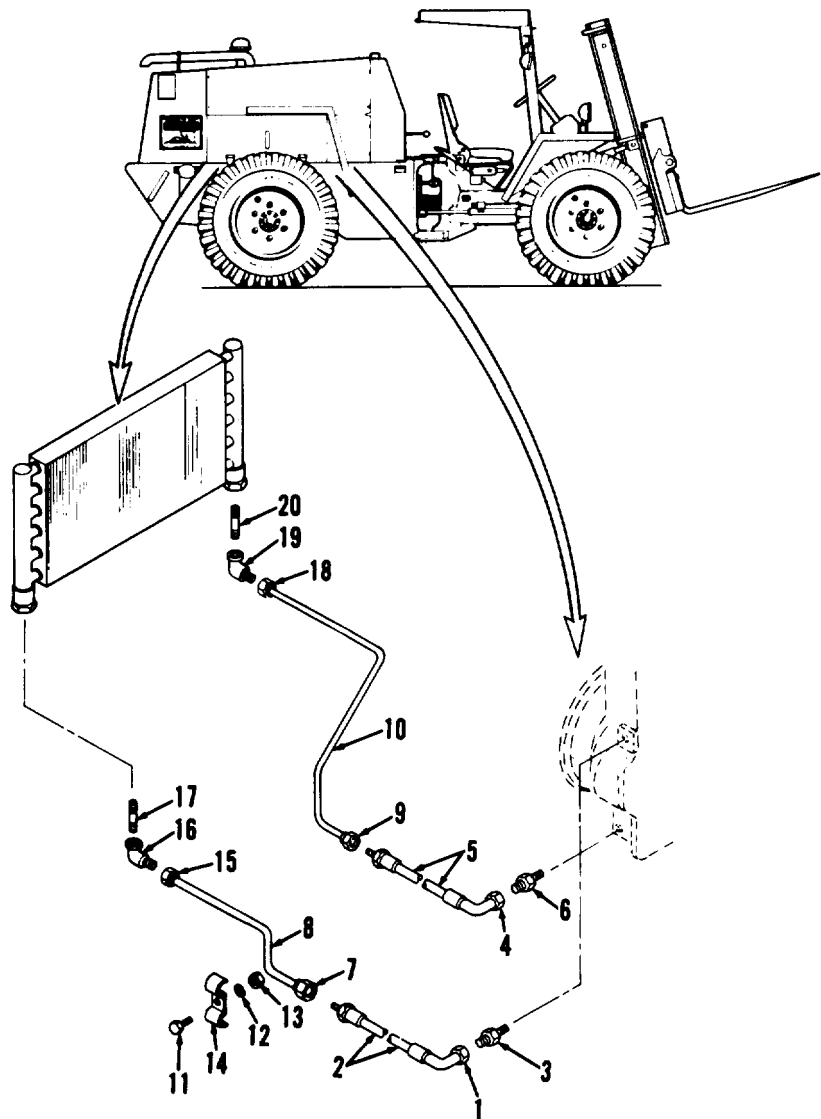
Engine off and parking brake applied.  
 Right side panel removed.  
 Tow bar lowered and grille opened.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean diesel fuel  
 Clean cloths

KEY

1. Nut
2. Transmission to cooler hose
3. Straight connector
4. Nut
5. Cooler to transmission hose
6. Straight connector
7. Nut
8. Transmission to cooler tube assembly
9. Nut
10. Cooler to transmission tube assembly
11. Cap screw
12. Lock washer
13. Nut
14. Hose clamp
15. Nut
16. Elbow
17. Pipe nipple
18. Nut
19. Elbow
20. Pipe nipple



TA126966

**2-38. TRANSMISSION MAINTENANCE (cont)**

*f. Transmission Hoses, Lines and Fittings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment	a. Nut (1)	Loosen	
		b. Transmission to cooler hose (2)	Disconnect and cap	
		c. Straight connector (3)	Remove	Plug transmission hole
		d. Nut (4)	Loosen	
		e. Cooler to transmission hose (5)	Disconnect and cap	
		f. Straight connector (6)	Remove	Plug transmission hole
		g. Nut (7)	Loosen	
		h. Transmission to cooler hose (2)	Disconnect and remove	Plug transmission to cooler tube assembly (8)
		i. Nut (9)	Loosen	
		j. Cooler to transmission hose (5)	Disconnect and remove	Plug cooler to transmission tube assembly (10)
		k. Cap screw (11), lock washer (12), and nut (13)	Remove	
l. Hose clamp (14)	Remove			
2	Transmission cooler, bottom	a. Nut (15)	Loosen	
		b. Transmission to cooler tube assembly (8)	Disconnect and remove	Plug cooler hole
		c. Elbow (16)	Remove	
		d. Pipe nipple (17)	Remove	
		e. Nut (18)	Loosen	
		f. Cooler to transmission tube assembly (10)	Disconnect and remove	Plug cooler hole
		g. Elbow (19)	Remove	
		h. Pipe nipple (20)	Remove	
<b>CLEANING</b>				
3		Hoses (2 and 5)	Clean	Use clean diesel fuel and dry thoroughly
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes-with water immediately, and obtain medical aid immediately.</p>				

**2-38. TRANSMISSION MAINTENANCE (cont)***f. Transmission Hoses, Lines and Fittings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		All other parts	Clean	Use cleaning solvent P-D-680 and dry thoroughly
INSPECTION				
5		Hoses (2 and 5)	Inspect	Replace if cracked, split, or fittings damaged
6		Tube assemblies (8 and 10)	Inspect	Replace if cracked, dented, or fittings damaged
7		All other parts	Inspect	Replace if cracked, damaged or threads worn
INSTALLATION				
8	Transmission cooler, bottom	a. Pipe nipple (17 and 20) b. Elbow (16 and 19) c. Cooler to transmission tube assembly (10) d. Nut (18) e. Transmission to cooler tube assembly (8) f. Nut (15)	Install Install Position and connect Tighten Position and connect Tighten	To elbow (19)  To elbow (16)
9	Engine compartment	a. Hose clamp (14) b. Nut (13), lock washer (12), and cap screw (11) c. Cooler to transmission hose (5) d. Nut (9) e. Transmission to cooler hose (2) f. Straight connector (3 and 6) g. Cooler to transmission hose (5) h. Nut (4) i. Transmission to cooler hose (2) j. Nut (1)	Position Install Position and connect Tighten Position and Install Connect Tighten Connect Tighten	On tube assemblies (8 and 10)  To tube assembly (10)  To tube assembly (8)  To straight connector (6)  To straight connector (3)

**2-38. TRANSMISSION MAINTENANCE (cont)**

g. Transmission Oil Cooler.

This task covers oil cooler replacement.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off, and parking brake applied.  
 Grille removed.  
 Rear flood lights removed.  
 Stop and tail light removed.  
 Radiator coolant reservoir removed.  
 Side panels removed.  
 Transmission to cooler and cooler to transmission tube assemblies disconnected at transmission oil cooler and capped to prevent entry of foreign material. Elbows and pipe nipples removed from transmission oil cooler.  
 Back-up alarm removed.

2-53a  
 2-30a  
 2-30d  
 2-17c  
 2-53c  
 2-38f  
  
 2-32c

MATERIALS/PARTS

Clean hydraulic oil (refer to current lubrication order)

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission oil cooler, sides	a. Four cap screws (1) and lock washers (2)	Remove	
		b. Four clamps (3)	Remove	
		c. Transmission oil cooler (4)	Remove	
<b>INSTALLATION</b>				
2	Radiator shroud	a. Transmission oil cooler (4)	Position	
		b. Four clamps (3)	Position	
		c. Four lock washers (2) and cap screws (1)	Install and tighten	

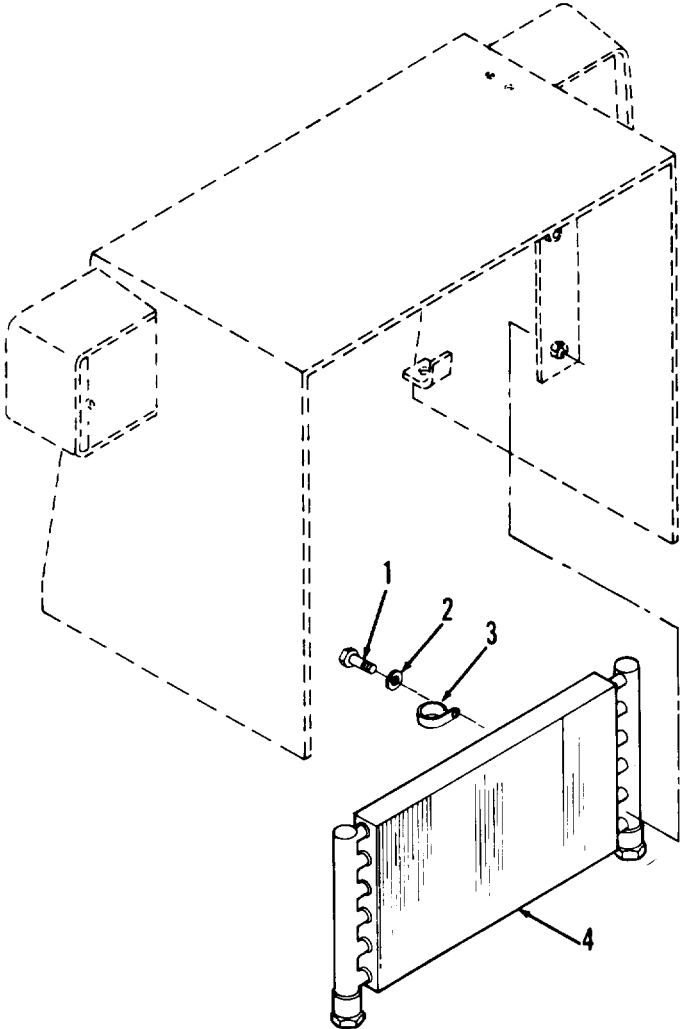


**2-38. TRANSMISSION MAINTENANCE (cont)**

*g. Transmission Oil Cooler (cont)*

**KEY**

- 1. Cap screws
- 2. Lock washers
- 3. Clamps
- 4. Transmission oil cooler



TA126967

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE**

*a. Front Drive Shaft Assembly and Support Bearing.*

- This task covers:
- a. Servicing
  - b. Removal
  - c. Disassembly
  - d. Cleaning
  - e. Inspection
  - f. Reassembly/Repair
  - g. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, parking brake applied, and engine off.  
Chassis guard removed.  
Vehicle turned either left or right.

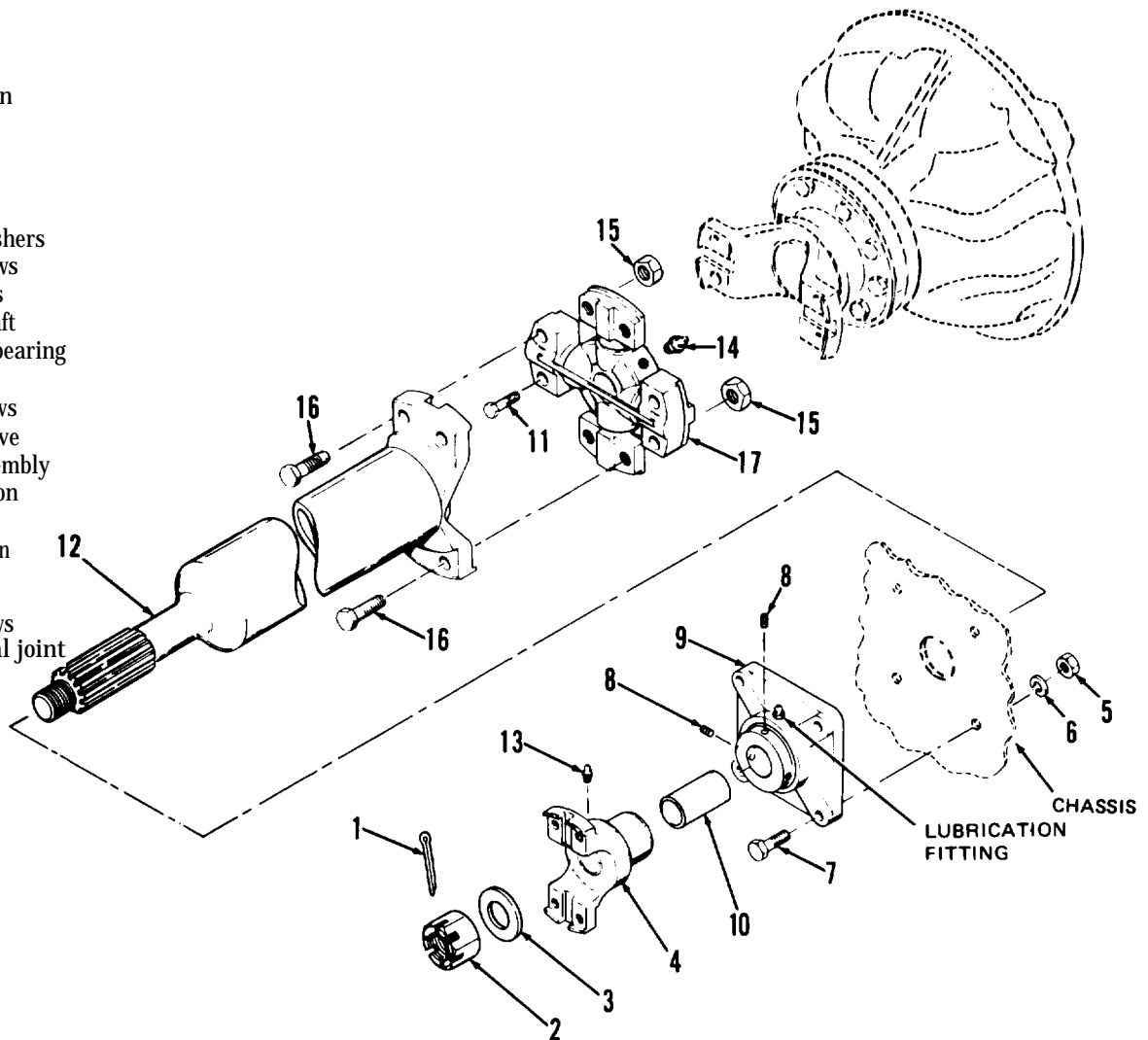
MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

2-53i

KEY

- 1. Cotter pin
- 2. Nut
- 3. Washer
- 4. Yoke
- 5. Nuts
- 6. Lock washers
- 7. Cap screws
- 8. Setscrews
- 9. Drive shaft support bearing
- 10. Collar
- 11. Cap screws
- 12. Front drive shaft assembly
- 13. Lubrication fitting
- 14. Lubrication fitting
- 15. Nuts
- 16. Cap screws
- 17. Universal joint



TA126968

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

a. Front Drive Shaft Assembly and Support Bearing (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>SERVICING</b>				
1	Drive shaft support bearing (9)	Lubrication fitting	a. Clean b. Lubricate	Use clean cloth and remove dirt and grease Refer to current lubrication order; lubricate until grease oozes out of bearing
<b><u>CAUTION</u></b>				
Don't use a high pressure grease gun to apply lubricant to lubrication fitting (14). Use of a high pressure grease gun will cause seals to rupture.				
2	Universal joint (17) and yoke (4)	Lubrication fitting (14) and (13)	a. Clean b. Lubricate	Use clean cloth and remove dirt and grease Refer to current lubrication order; lubricate until grease oozes out of fitting
<b>REMOVAL</b>				
3	Drive shaft support bearing	a. Center drive shaft b. Cotter pin (1) c. Nut (2) and washer (3) d. Yoke (4) e. Four nuts (5), lock washers (6), and cap screws (7) f. Two setscrews (8) g. Drive shaft support bearing (9)	Disconnect from front drive shaft yoke (4) Remove Remove Remove Remove Remove Remove	Para 2-39b, step 2  Use puller
4	Front axle differential companion yoke	a. Four cap screws (11) b. Front drive shaft assembly (12)  c. Collar (10)	Remove Remove by moving towards rear, dropping it downward and pulling forward Remove	
<b>DISASSEMBLY</b>				
5	Yoke (4)	Lubrication fitting (13)	Remove	
6	Front drive shaft assembly	a. Lubrication fitting (14) b. Four nuts (15) and cap screws (16) c. Universal joint (17)	Remove Remove Remove	

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

a. Front Drive Shaft Assembly and Support Bearing (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
7		Drive shaft support bearing (9) and universal joint (17)	Clean	Use clean cloth moistened with cleaning solvent P-D-680
8		All other parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
9		Drive shaft support bearing (9), universal joint (17)	Inspect	Replace if cracked, threads damaged, or otherwise damaged
10		Drive shaft (12)	Inspect	Replace if cracked, bent, or twisted
11		All other parts	Inspect	Replace if cracked, bent, or threads damaged
REASSEMBLY/REPAIR				
12	Front drive shaft assembly	a. Universal joint (17) b. Four cap screws(16) and nuts (15) c. Lubrication fitting (14)	Position Install Install	
13	Yoke (4)	Lubrication fitting (13)	Install	

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

a. Front Drive Shaft Assembly and Support Bearing (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
14	Front axle differential companion yoke	a. Mounting surfaces b. Front drive shaft assembly (12) c. Four cap screws (11)	Clean Position and align universal joint mounting holes with mounting holes on companion yoke Install	Use clean cloth moistened with cleaning solvent P-D-680  Tighten to 40-50 pounds foot torque
15	Rear chassis, front	a. Drive shaft support bearing (9) and collar (10) b. Two setscrews (8) c. Four cap screws (7), lock washers (6), and nuts (5) d. Yoke (4)  e. Washer (3) f. Nut (2) g. Cotter pin (1) h. Center drive shaft	Position Install Install Position on front drive shaft assembly, splined end Position Install Install Connect to front drive shaft assembly yoke (4)	Be sure yoke is lined up with yoke on front end of drive shaft  Tighten to 300400 pounds foot torque Para 2-39b, step 10
16	Front drive shaft assembly, support bearing and yoke	Lubrication fittings	Service	Refer to step 1 above

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

b. Center Drive Shaft Assembly.

- This task covers:
- a. Servicing
  - b. Removal
  - c. Disassembly
  - d. Cleaning
  - e. Inspection
  - f. Reassembly/Repair
  - g. installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

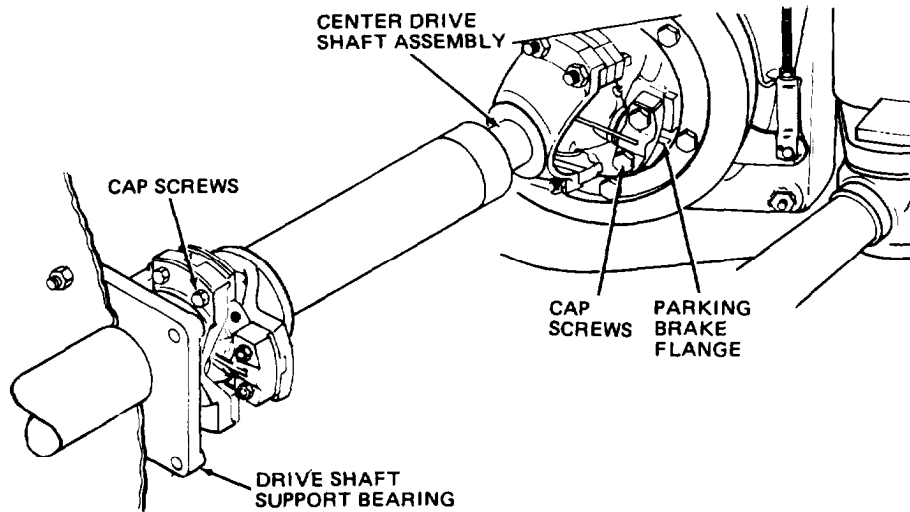
EQUIPMENT CONDITION

Paragraph

Condition Description  
Vehicle parked on level surface, parking brake applied, and engine off.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Soft honing stone  
Crows cloth  
Seal shaft kit



TA126969

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*b. Center Drive Shaft Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>SERVICING</b>				
1	Universal joints (3) and slip yoke (10)	Three lubrication fittings (4 and 5)	a. Clean	Use clean cloth and remove dirt and grease
<b><u>CAUTION</u></b>				
Don't use a high pressure grease gun to apply lubricant to grease fittings (4). Use of a high pressure grease gun will cause seals to rupture.				
			b. Lubricate	Refer to current lubrication order; lubricate until grease oozes out of fitting
<b>REMOVAL</b>				
2	Transmission parking brake flange	Four cap screws	Remove	
3	Drive shaft support bearing	s. Four cap screws b. Center drive shaft assembly	Remove Push two sections of center drive shaft together, then remove	
<b>DISASSEMBLY</b>				
4	Center drive shaft assembly	a. Eight nuts (1) and cap screws (2) b. Two universal joints (3) c. Two lubrication fittings (4) d. Lubrication fitting (5) e. Cap (6) f. Washer (7 and 8) g. Splined yoke (9)	Remove Remove Remove Remove Loosen and slide back on splined yoke (9) Slide back on splined yoke (9) Remove; then remove and discard washers (7 and 8) and cap (6)	

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*b. Center Drive Shaft Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
KEY				
<ol style="list-style-type: none"> <li>1. Nuts</li> <li>2. Cap screws</li> <li>3. Universal joints</li> <li>4. Lubrication fittings</li> <li>5. Lubrication fitting</li> <li>6. Cap</li> <li>7. Washer</li> <li>8. Washer</li> <li>9. Splined yoke</li> <li>10. Slip yoke</li> </ol>				
TA126970				



**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*b. Center Drive Shaft Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, find obtain medical aid immediately.</p>				
5		Universal joint (3)	Clean	Use clean cloth moistened with cleaning solvent P-D-680
6		All other parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
7		Universal joint (3), splined yoke (9), and slip yoke (10)	Inspect	Replace if cracked, threads damaged, splines twisted, teeth broken, bent, or otherwise damaged. Remove burrs with soft honing stone or crocus cloth
8		All other parts	Inspect	Replace if cracked or threads damaged
REASSEMBLY/REPAIR				
9	Center drive shaft assembly	a. Cap (6), washers (7 and 8) b. Splined yoke (9) c. Washers (7 and 8) and cap (6) d. Lubrication fittings (4 and 5) e. Two universal joints (3) f. Eight cap screws (2) and nuts (3)	Position on splined yoke (9) Insert into slip yoke (10) Position against slip yoke (10); tighten cap (6) Install Position Install Install	

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

b. Center Drive Shaft Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
10	Drive shaft support bearing	a. Mounting surfaces b. Slip yoke (10) c. Four cap screws	Clean  Position and align universal joint mounting holes with front drive shaft yoke mounting holes	Use clean cloth moistened with cleaning solvent P-D-680  Tighten to 40-50 pounds foot torque
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
11	Transmission parking brake flange	a. Mounting surfaces b. Splined yoke (9) c. Four cap screws	Clean  Position; push/pull two sections of drive shaft then align universal joint mounting holes with brake flange mounting holes	Use clean cloth moistened with cleaning solvent P-D-680  Tighten to 40-50 pounds foot torque
12	Center drive shaft assembly	Lubrication fittings	Service	Refer to step 1 above

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*c. Rear Drive Shaft Assembly.*

- This task covers:
- a. Servicing
  - b. Removal
  - c. Disassembly
  - d. Cleaning
  - e. Inspection
  - f. Reassembly/Repair
  - g. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

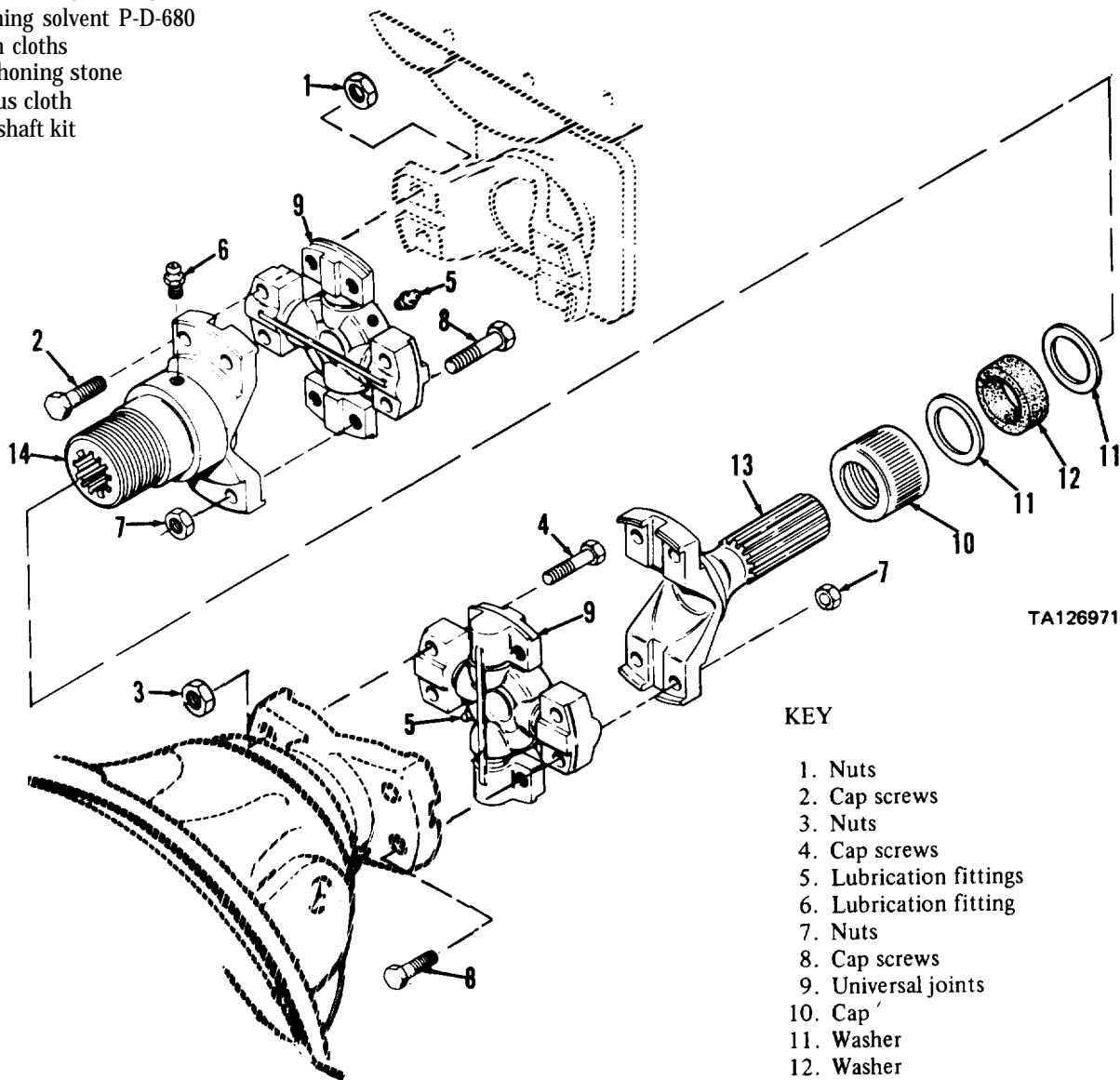
NSN 4910-00-754-0654

EQUIPMENT CONDITION  
Paragraph

Condition Description  
Vehicle parked on level surface, parking brake applied, and engine off.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Soft honing stone  
Crocus cloth  
Seal shaft kit



TA126971

KEY

- 1. Nuts
- 2. Cap screws
- 3. Nuts
- 4. Cap screws
- 5. Lubrication fittings
- 6. Lubrication fitting
- 7. Nuts
- 8. Cap screws
- 9. Universal joints
- 10. Cap
- 11. Washer
- 12. Washer
- 13. Splined yoke
- 14. Slip yoke

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*c. Rear Drive Shaft Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>SERVICING</b>				
1	Universal joints (9) and slip yoke (14)	Lubrication fittings (5 and 6)	a. Clean	Use clean cloth and remove dirt and grease
<b><u>CAUTION</u></b>				
Don't use a high pressure grease gun to apply lubricant to grease fittings (5). Use of a high pressure grease gun will cause seals to rupture.				
			b. Lubricate	Refer to current lubrication order; lubricate until grease oozes out of fitting
<b>REMOVAL</b>				
2	Transmission output flange	Four nuts (1) and cap screws (2)	Remove	
3	Rear axle differential companion yoke	a. Four nuts (3) and cap screws (4) b. Rear drive shaft assembly	Remove Push two sections together, then remove	
<b>DISASSEMBLY</b>				
4	Rear drive shaft assembly	a. Lubrication fittings (5 and 6) b. Eight nuts (7) and cap screws (8) c. Universal joints (9) d. Cap (10)  e. Washers(11 and 12)  f. Splined yoke (13)	Remove Remove Remove Loosen and slide back on splined yoke (13) Slide back on splined yoke (13) Remove; then remove and discard washers (11 and 12) and cap (10)	

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*c. Rear Drive Shaft Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<p><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
5		Universal joint (9)	Clean	Use clean cloth moistened with cleaning solvent P-D-680
6		All other parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
7		Universal joint (9), splined yoke (13), and slip yoke (14)	Inspect	Replace if cracked, threads damaged, splines twisted, teeth broken, bent, or otherwise damaged. Remove burrs with soft honing stone or crocus cloth
8		All other parts	Inspect	Replace if cracked, bent, or threads damaged
REASSEMBLY/REPAIR				
9	Rear drive shaft assembly	a. Cap (10), and washers (11 and 12) b. Splined yoke (13) c. Washers (11 and 12), and cap (10) d. Two universal joints (9) e. Eight cap screws (8) and nuts (7) f. Lubrication fittings (5 and 6)	Position on splined yoke (13) Insert into slip yoke (14) Position against slip yoke (14); tighten cap (10) Position Install Install	

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*c. Rear Drive Shaft Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
10	Rear axle differential companion yoke	<p>a. Mounting surface</p> <p>b. Rear drive shaft assembly, slip yoke (14) end</p> <p>c. Four cap screws (4) and nuts (3)</p>	<p>Clean</p> <p>Position and align universal joint mounting holes with companion yoke mounting holes</p> <p>Install</p>	<p>Use clean cloth moistened with cleaning solvent P-D-680</p> <p>Tighten to 40-50 pounds foot torque</p>
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
11	Transmission output flange	<p>a. Mounting surface</p> <p>b. Rear drive shaft assembly, splined yoke (13)</p> <p>c. Four cap screws (2) and nuts (1)</p>	<p>Clean</p> <p>Position and align universal joint mounting holes with output flange mounting holes</p> <p>Install</p>	<p>Use clean cloth moistened with cleaning solvent P-D-680</p> <p>Tighten to 40-50 pounds foot torque</p>
12	Rear drive shaft assembly	Lubrication fittings	Service	Refer to step 1 above

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*d. Front and Rear Axle Assemblies.* This task covers inspection and servicing of the front and rear axle assemblies including the associated differential carrier assembly.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910430-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

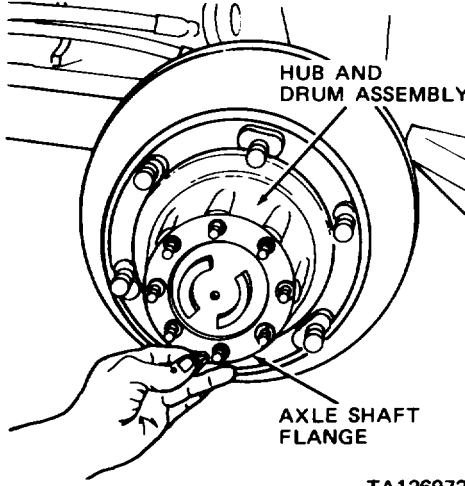
Engine off and parking brake applied.

MATERIALS/PARTS

Cleaning solvent P-D-680

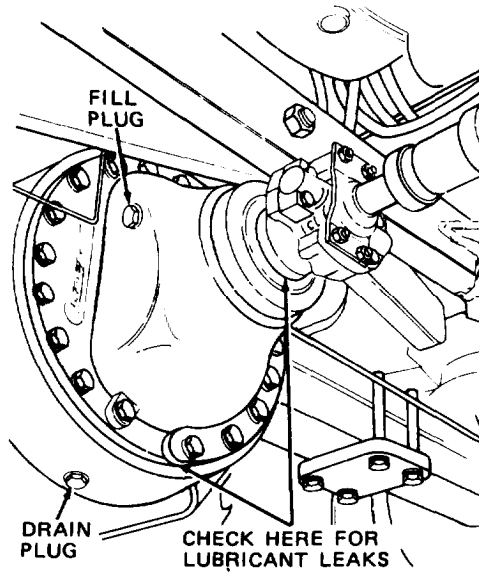
Clean cloths

Gear lubricant (refer to current lubrication order)

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
<b>NOTE</b>				
If lubrication leaks are observed, notify direct support maintenance.				
1	Wheels	Axle shaft flange	Inspect	Check for lubricant leaks at flange and hub and drum assembly
 <p style="text-align: center;">TA126972</p>				
2	Axles	Differential carrier assembly	Inspect	Check for lubricant leaks at differential carrier assembly and axle housing

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*d. Front and Rear Axle Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
3	Differential carrier assembly	a. Pinion shaft b. Drain and fill plugs	Inspect Inspect	Check for lubricant leaks Check for lubricant leaks; tighten drain and/or fill plug if leaks observed
 <p style="text-align: center;">TA126973</p>				
SERVICING				
<b>NOTE</b>				
Drive vehicle for 10 minutes to warm axle lubricant, park vehicle on level surface, apply parking brake, and turn engine off.				
<b>NOTE</b>				
Clean drain and fill plugs and surrounding area before removing.				
4	Axle housing	Drain plug	Remove	Place 5 gallon container under drain plug to drain lubricant into
5	Differential carrier assembly housing	Fill plug	Remove	
6	Axle housing	Drain plug	Install	
7	Differential carrier assembly housing	a. Fill plug opening b. Fill plug	Fill	With axle lubricant (refer to current lubrication order) to fill plug opening

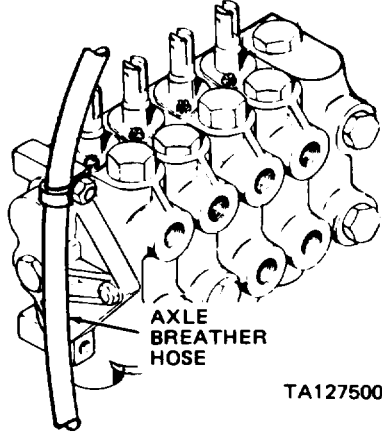




**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*e. Axle Breathers (cont).*

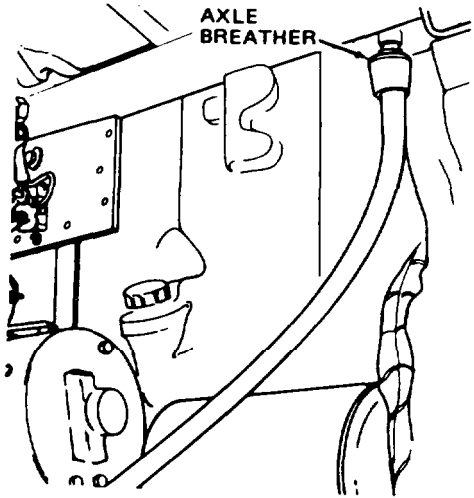
(1) Front Axle Breather.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Hydraulic control valve, right side	Axle breather	Remove	Unscrew from hose fitting
				
<b>CLEANING</b>				
<p><b>WARNING</b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		Axle breather	Clean	Immerse in cleaning solvent P-D-680
<b>INSPECTION</b>				
3		Axle breather	Inspect	Replace if dented or clogged
4		Axle breather hose	Inspect	Replace if cracked or deteriorated
<b>INSTALLATION</b>				
5	Hydraulic control valve, right side	Axle breather	Install	Screw into hose fitting

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*e. Axle Breathers (cont).*

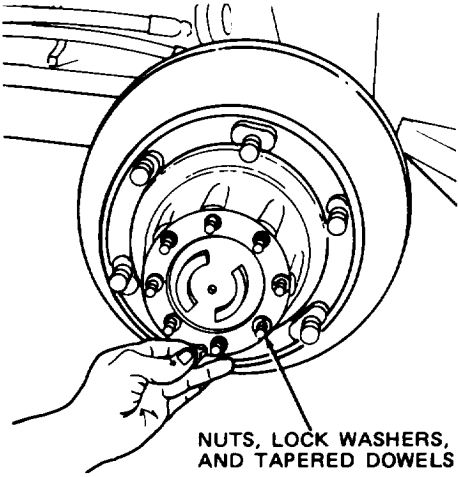
*(2) Rear Axle Breather.*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Left side of vehicle	Left side panel	Remove	Para 2-53c
2	Engine compartment	Axle breather	Remove	Unscrew from hose fitting
				
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
3		Axle breather	Clean	Immerse in cleaning solvent P-D-680
<b>INSPECTION</b>				
4		Axle breather	Inspect	Replace if dented or clogged
5		Axle breather hose	Inspect	Replace if cracked or deteriorated
<b>INSTALLATION</b>				
6	Engine compartment	a. Axle breather b. Left side panel	Install Install	Screw into hose fitting Para 2-53c



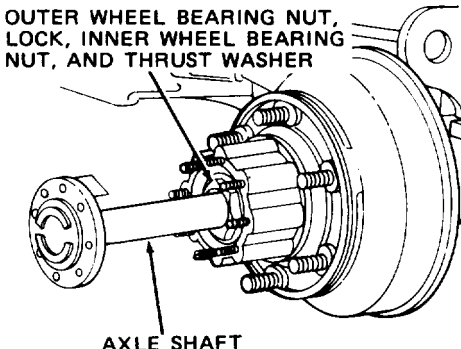
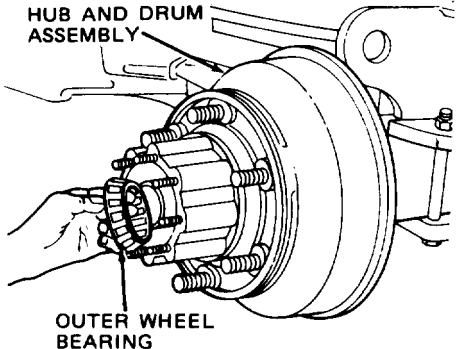
**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*f. Front and Rear Axle Shafts and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<b><u>WARNING</u></b>				
<p>Before raising vehicle from ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jacks or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.</p>				
<p>Tire and wheel assembly must be removed before removing axle shaft and hub and drum assembly to avoid damaging axle oil seal. Damage to seal can result in contamination of brake linings and brake failure.</p>				
1	Front or rear axle	a. Tire and wheel b. Eight nuts (1), lock washers (2), and tapered dowels (3)	Remove  Remove	Para 2-47
 <p>NUTS, LOCK WASHERS, AND TAPERED DOWELS TA126976</p>				

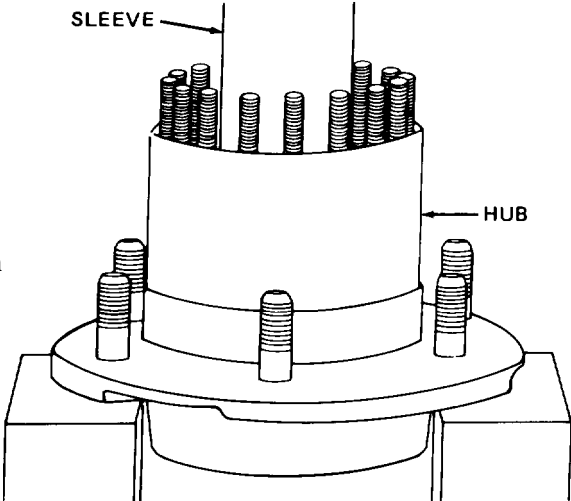
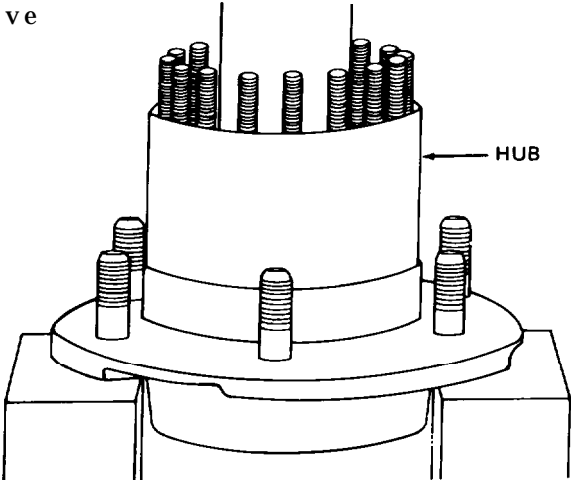
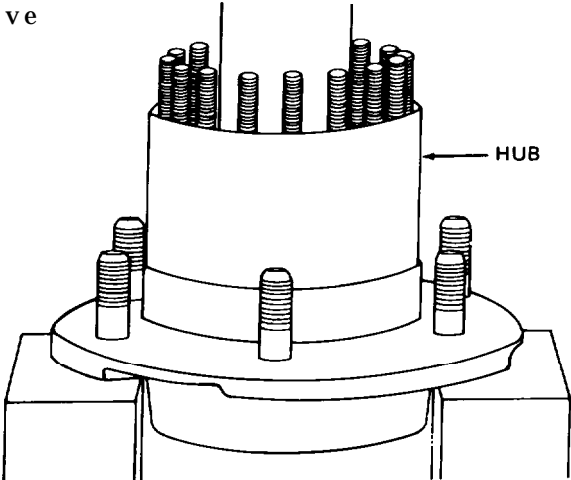
**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*f. Front and Rear Axle Shafts and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
1 (cont)	<p><b>NOTE</b></p> <p>Left and right axle shafts are different lengths; mark axle shafts before removing.</p>			
		c. Axle shaft (4)	Remove	If necessary, use hammer to loosen
		d. Gasket (5)	Remove and discard	
		e. Outer wheel bearing nut (6)	Bend tab of lock (7) back then remove nut	 <p>OUTER WHEEL BEARING NUT, LOCK, INNER WHEEL BEARING NUT, AND THRUST WASHER</p> <p>AXLE SHAFT</p> <p>TA126977</p>
		f. Lock (7)	Remove	
		g. Inner wheel bearing nut (8)	Remove	
		h. Thrust washer (9)	Remove	
		i. Outer wheel bearing (10)	Remove	
		j. Hub and drum assembly (11)	Remove	 <p>HUB AND DRUM ASSEMBLY</p> <p>OUTER WHEEL BEARING</p> <p>TA126978</p>
		<b>NOTE</b>		
		If hub and drum assembly (11) is exceedingly hard to remove, back off brake shoe adjustment (para 2-43a).		
		k. Oil seal (15)	Remove and discard	

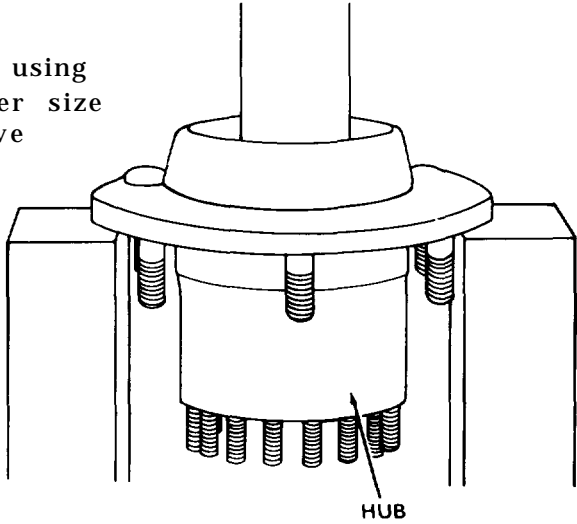
**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*f. Front and Rear Axle Shafts and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY OF HUB AND DRUM ASSEMBLY</b>				
2	Hub and drum assembly	a. Six nuts (12) and lock washers (13)	Remove	 <p style="text-align: right;">TA126979</p>
		b. Brake drum (14)	Remove	
3	Hub	a. Hub (21)	Place on press	 <p style="text-align: right;">TA126980</p>
		b. Inner wheel bearing (16)	Remove	
<b>NOTE</b>				
<p>Don't perform following steps unless bearing cups (17 or 18), or hub (21) requires replacement.</p>				
		c. Inner bearing cup (17)	Remove using proper size sleeve	 <p style="text-align: right;">TA126980</p>

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

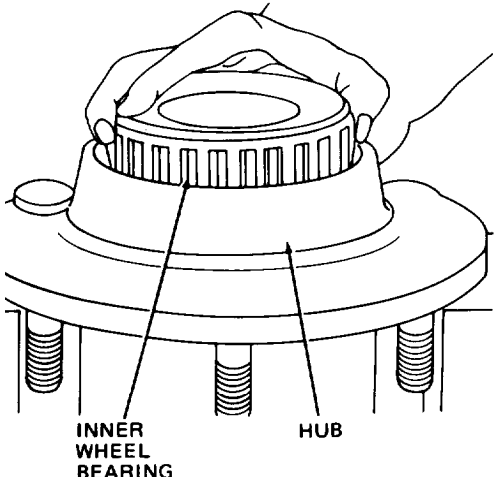
*f. Front and Rear Axle Shafts and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY OF HUB AND DRUM ASSEMBLY (cont)</b>				
3 (cont)		d. Outer bearing cup (18)	Remove using proper size sleeve	 <p style="text-align: right;">HUB</p> <p style="text-align: right;">TA126981</p>
		e. Six wheel studs (19)	Remove by tapping out	
		f. Eight studs (20)	Remove	Only if replacement required
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
4		Bearings (10 and 16)	Clean	Use cleaning solvent P-D-680; air dry. Don't spin bearings with compressed air
5		All other parts	Clean	Use cleaning solvent P-D-680



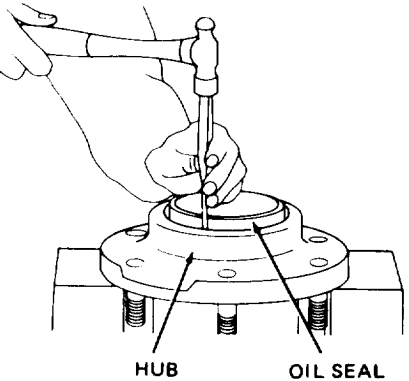
**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*f. Front and Rear Axle Shafts and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
6		Bearings (10 and 16)	Inspect	Replace if worn, chipped, or nicked. If bearing is to be replaced, replace mating bearing cup (17 or 18). Dip bearing in light oil after inspection
7		Axle shaft (4)	Inspect	Replace if bent, twisted, splines worn or damaged, or flange distorted
8		Brake drum (14)	Inspect	Replace if worn, scored, or cracked
9		Hub (21)	Inspect	Replace if cracked; be sure all grease and dirt is removed inside hub
10		All other parts	Inspect	Replace if damaged, bent, or distorted
REASSEMBLY OF HUB AND DRUM ASSEMBLY				
11		a. Eight studs (20) b. Six wheel studs (19) c. Outer bearing cup (18) d. Inner bearing cup (17) e. Inner wheel bearing (16)  f. Brake drum (14)  g. Six lock washers (13) and nuts (12)	Install if removed Install if removed Install if removed Install if removed Apply grease, automotive and artillery (GAA), then install  Position  Install	 <p style="text-align: right;">TA126982</p>

**2-39. AXLES AND DRIVE SHAFT ASSEMBLIES MAINTENANCE (cont)**

*f. Front and Rear Axle Shafts and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION AND ADJUSTMENT				
12	Front or rear axle	a. Oil seal (15)  b. Hub and drum assembly (11) c. Outer wheel bearing (10) d. Thrust washer (9) e. Inner wheel bearing nut (8) f. Lock (7) g. Outer wheel bearing nut (6) h. Lock (7) i. Gasket (5) j. Axle shaft (4) k. Eight tapered dowels (3), lock washers (2) and nuts (1) l. Tire and wheel	Install; use hammer and punch as shown  Install  Apply grease, automotive and artillery (GAA), then install  Install  Install; tighten to 50 pounds foot torque. Turn hub several revolutions to right then to left. Tighten nut again and back-off 1/6 to 1/4 turn  Install  Install; tighten to 250-400 pounds foot torque  Bend tab over flat of nut (6)  Install  Install  Install	 <p style="text-align: right;">TA126983</p> <p style="text-align: right;">Para 2-47</p>
<p><b>NOTE</b></p> <p>Remove remaining axle shafts and bearings in the same manner as above.</p>				

**Section VII. BRAKE SYSTEM MAINTENANCE**

This section contains the information you'll need to maintain the parking brake and service brake systems. It gives you instructions on how to troubleshoot problems, and repair or replace the components that are within the scope of organizational maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	2-40	Service Brake Maintenance . . . . .	243
Brake System Troubleshooting . . . . .	2-41	Service Brake Assembly . . . . .	2-43a
Parking Brake Maintenance . . . . .	2-42	Brake Hoses, Lines and Fittings . . . . .	2-43b
Parking Brake Linkage . . . . .	2-42a	Hydraulic Brake Valve . . . . .	2-43c
Parking Brake Assembly . . . . .	2-42b	Declutch Valve . . . . .	2-43d
		Brake Pedal and Declutch Pedal . . . . .	2-43e

**2-40. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>BRAKE SYSTEM</b>		
Parking brake does not apply (will not hold) . . . . .	241/1	2-259
Uneven or erratic service brakes . . . . .	2-41/2	2-261
Service brakes spongy . . . . .	2-41/3	2-262
Service brakes grab . . . . .	2-41/4	2-263
Service brakes squeak . . . . .	241/5	2-264
Service brakes overheat . . . . .	241/6	2-264
Excessive service brake pedal travel . . . . .	241/7	2-265
Excessive service brake pedal effort required . . . . .	2-41/8	2-266
Service brakes groan at end of stop . . . . .	241/9	2-269
Scraping noise from service brakes when applied . . . . .	2-41/10	2-269
Stop light inoperative . . . . .	241/11	2-270
Declutch pedal does not neutralize transmission . . . . .	241/12	2-270

**2-41. BRAKE SYSTEM TROUBLESHOOTING**

**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

**1. PARKING BRAKE DOES NOT APPLY (WILL NOT HOLD)**

- Step 1. Release parking brake lever and turn knob on top of lever clockwise to adjust cable. Pull parking brake lever up while observing actuating lever. Actuating lever should move.
  - a. If actuating lever moves, proceed to step 3.
  - b. If actuating lever does not move, proceed to step 2.

**2-40. TROUBLESHOOTING SYMPTOM INDEX**

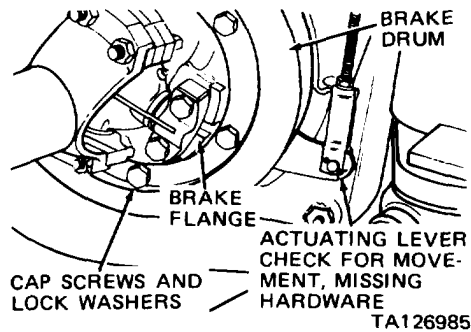
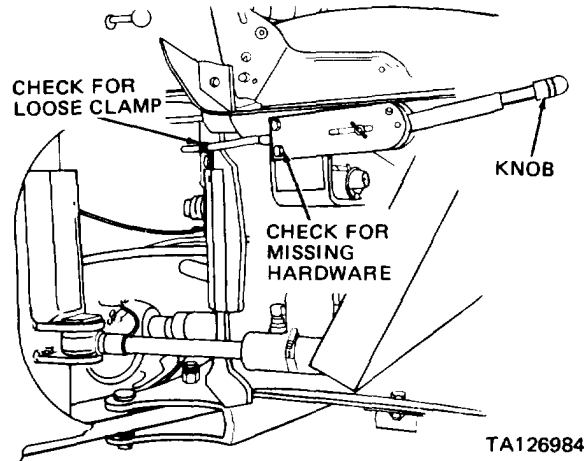
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. PARKING BRAKE DOES NOT APPLY (WILL NOT HOLD) (cont)

Step 1. (cont)



Step 2. Check for missing or loose clamps, and missing hardware at parking brake cable connections to parking brake lever and actuating lever (para 2-42a).

- a. Install missing parts, tighten loose parts, and/or adjust parking brake linkage (para 2-42a).
- b. If parts are not missing, loose or require adjustment, replace parking brake cable (para 2-42a).

Step 3. Remove six cap screws and lock washers securing brake drum to brake flange (para 2-42b). Inspect brake linings for worn condition and actuating lever for damage (para 2-42b).

Replace worn brake linings and/or damaged actuating lever (para 2-42b).

<b>2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)</b>
--

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 2. UNEVEN OR ERRATIC SERVICE BRAKES

Step 1. Check if air pressure is the same in each tire (should be 45 PSI).

- a. If air pressure in each tire is not 45 PSI, adjust tire pressure.
- b. If air pressure is okay, proceed to step 2.

Step 2. Check hydraulic brake valve for leaking condition (para 2-43c).

- a. If hydraulic brake valve is leaking, replace it (para 2-43c).
- b. If hydraulic brake valve is okay, proceed to step 3.

Step 3. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is applied.

**WARNING**

Before raising wheel off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jacks or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels from ground.

Remove both wheel axle shafts and hub and drum assemblies (para 2-39f).

Check wheel cylinders for leaking condition or sticking piston (para 243a, step 1)

Repeat for other axle and wheels.

- a. If wheel cylinder is leaking or piston is sticking, replace wheel cylinder (para 2-43a).
- b. If wheel cylinder is okay, proceed to step 4.

Step 4. Check brake linings for wear, uneven wear, glaze, brake fluid or lubricant contamination, or excessive dust.

- a. Replace brake linings if worn, glazed, or contaminated; remove excessive dust (para 243a).
- b. If brake linings are okay, proceed to step 5.

Step 5. Check hub and drum assemblies for scored or cracked condition (para 2-39f).

- a. Replace brake drums if scored or cracked (para 2-39f).
- b. If hub and drum assemblies are okay, proceed to step 6.

Step 6. Check for loose, missing, or damaged brake shoe mounting hardware (para 243a).

Replace missing or damaged brake shoe mounting hardware; install new hardware if missing.

---

**2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

3. SERVICE BRAKES SPONGY

**NOTE**

If service brakes are spongy, bleed air from brake system as described in paragraph 2-43a. If brakes are still spongy, then proceed to step 1 below.

- Step 1. Check brake lines and connections between hydraulic brake valve and wheel cylinders for brake fluid leaks (para 2-43b).
- a. If connections are leaking fluid, tighten; if brake lines are leaking fluid, replace (para 2-43b).
  - b. If brake lines and connections are okay, proceed to step 2.
- Step 2. Check hydraulic brake valve for leaking condition (para 2-43c).
- a. If hydraulic brake valve master cylinder is leaking fluid, replace it (para 2-43c).
  - b. If hydraulic brake valve is okay, proceed to step 3.
- Step 3. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is applied.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels from ground.  
Remove both wheel axle shafts and hub and drum assemblies (para 2-39f).  
Check wheel cylinders for leaking condition or sticking piston (para 2-43a, step 1).  
Repeat for other axle and wheels.

- a. If wheel cylinder is leaking or piston is sticking, replace wheel cylinder (para 243a).
- b. If wheel cylinder is okay, reinstall hub and drum assemblies and axle shafts (para 2-39 f), lower axle and wheels to ground, remove shipping lock pin (store under operator's seat) and remove blocks from wheels. Replace or repair hydraulic brake valve master cylinder (para 2-43c(1)).

---

**2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**


---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 4. SERVICE BRAKES GRAB

- Step 1. Check source of brake fluid to ensure that brake fluid is correct; also check for contaminated brake fluid.
- a. If incorrect brake fluid was used or if brake fluid is contaminated, drain brake system of brake fluid and refill using correct brake fluid (refer to current lubrication order) (para 2-43a).
  - b. If brake fluid is okay, proceed to step 2.
- Step 2. Check brake pedal/return spring linkage for binding, interference, missing parts, or damage (para 2-43e).
- a. If brake pedal/return spring linkage is binding, has interference, is missing parts or damaged, repair or replace (para 2-43e).
  - b. If brake pedal/return spring are okay, proceed to step 3.
- Step 3. Check hydraulic brake valve for damage/leaking condition (para 2-43c).
- a. If hydraulic brake valve is damaged or leaking, repair or replace it (para 2-43c).
  - b. If hydraulic brake valve is okay, proceed to step 4.
- Step 4. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is in released position.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels off ground.  
 Rotate wheel by hand; there should be a very slight drag on wheel.  
 Repeat above for remaining wheel and axle.

- a. If there is a very slight drag on wheels, proceed to step 5.
  - b. If there is excessive drag on wheels, adjust brakes (para 2-43a).
- Step 5. Remove axle shafts and hub and drum assemblies from one axle (para 2-39f). Check brake shoe return spring (para 2-43a). Repeat above for remaining axle.
- a. If brake shoe return spring is permanently set, replace (para 2-43a).
  - b. If brake shoe return spring is okay, proceed to step 6.

**2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. SERVICE BRAKES GRAB (cont)

Step 6. Check wheel cylinders for leaking condition or sticking piston (para 2-43a, step 1).

- a. If wheel cylinder is leaking or piston is sticking, replace wheel cylinder (para 2-43a).
- b. If wheel cylinder is okay, reinstall hub and drum assemblies and axle shafts (para 2-39f), lower axle and wheels to ground, remove shipping lock pin (store under operator's seat) and remove blocks from wheels. Replace or repair hydraulic brake valve (para 2-43c).

5. SERVICE BRAKES SQUEAK

Step 1. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is in applied position.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels off ground.

Remove axle shafts and hub drum assemblies (para 2-39f).

Check brake linings for wear, uneven wear, glaze, brake fluid or lubricant contamination, and/or excessive dust.

Repeat for other axle and wheels.

- a. Replace brake linings that are worn, glazed or contaminated; remove excessive dust (para 2-43a).
- b. If brake linings are okay and there is no excessive dust, proceed to step 2.

Step 2. Check hub and drum assembly for scored condition (para 2-39f).

- a. If hub and drum assembly is scored, replace brake drum (para 2-39f).
- b. If hub and drum assembly is okay, check for damaged brake shoe return spring (para 2-43a); replace brake shoe return spring (para 2-43a).

6. SERVICE BRAKES OVERHEAT

Step 1. Check brake pedal/return spring linkage for binding, interference, missing parts, or damage (para 2-43e).

- a. If brake pedal/return spring linkage is binding, has interference, is missing parts or damaged, repair or replace (para 2-43e).
- b. If brake pedal/return spring are okay, proceed to step 2.



**2-41. BRAKE SYSTEM TROUBLESHOOTING (cont.)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 6. SERVICE BRAKES OVERHEAT (cont)

- Step 2. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is in released position.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury *or* death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels off ground.  
Rotate wheel by hand: there should be a very slight drag wheel.  
Repeat above for remaining wheel and axle.

- a. If there is a very slight drag on wheels, proceed to step 3.
- b. If there is excessive drag wheels, adjust brakes (para 2-43a).

- Step 3. Remove axle shafts and hub and drum assemblies from one axle (para 2-39f).  
Check brake shoe return spring (para 2-43a).  
Repeat above for remaining axle.

- a. If brake shoe return spring is permanently set, replace (para 2-43a).
- b. If brake shoe return spring is okay, proceed to step 4.

- Step 4. Check wheel cylinders for leaking condition or sticking piston (para 2-43a, step 1).

If wheel cylinder is leaking or piston is sticking, replace wheel cylinder (para 2-43a).

## 7. EXCESSIVE SERVICE BRAKE PEDAL TRAVEL

**NOTE**

If there is excessive brake pedal travel, add brake fluid to master cylinder (para 2-43c(1)) and bleed air from brake system as described in paragraph 2-43a. If brake pedal travel is still excessive proceed to step 1 below.

- Step 1. Check adjustment of service brake pedal free travel (para 2-43e).

- a. If service brake pedal is not adjusted properly, adjust (para 2-43e).
- b. If adjustment is okay, proceed to step 2.

---

## **2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

### 7. EXCESSIVE SERVICE BRAKE PEDAL TRAVEL (cont)

Step 2. Check hydraulic brake valve for damage/leaking condition (para 2-43c).

- a. If hydraulic brake valve is damaged or leaking, repair or replace it (para 2-43c).
- b. If hydraulic brake valve is okay, proceed to step 3.

Step 3. Check brake lines and connections between hydraulic brake valve and wheel cylinders for brake fluid leaks (para 2-43b).

- a. If connections are leaking fluid, tighten; if brake lines are leaking fluid, replace (para 2-43b).
- b. If brake lines and connections are okay, proceed to step 4.

Step 4. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is applied.

### **WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels from ground.

Remove both axle shafts and hub and drum assemblies (para 2-39f).

Check wheel cylinders for leaking condition or sticking piston (para 2-43a, step 1).

Repeat for other axle and wheels.

- a. If wheel cylinder is leaking or piston is sticking, replace wheel cylinder (para 2-43a).
- b. If wheel cylinder is okay, proceed to step 5.

Step 5. Check brake linings for excessive wear (para 2-43a).

- a. If brake linings are worn excessively, replace (para 2-43a).
- b. If brake linings are not worn excessively, adjust brakes (para 2-43a).

### 8. EXCESSIVE SERVICE BRAKE PEDAL EFFORT REQUIRED

Step 1. Check brake lines and connections between hydraulic brake valve and wheel cylinders for brake fluid leaks (para 2-43b).

- a. If connections are leaking fluid, tighten; if brake lines are leaking fluid, replace (para 2-43b).
- b. If brake lines and connections are okay, proceed to step 2.

---

## **2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

**8. EXCESSIVE SERVICE BRAKE PEDAL EFFORT REQUIRED (cont)**

Step 2. Check brake pedal/return spring linkage for binding, interference, missing parts, or damage (para 2-43e).

- a. If brake pedal/return spring linkage is binding, has interference, is missing parts or damaged, repair or replace (para 2-43e).
- b. If brake pedal/return are okay, proceed to step 3.

Step 3. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is applied.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels from ground.  
Remove both axle shafts and hub and drum assemblies (para 2-39f).  
Check wheel cylinders for leaking condition or sticking piston (para 2-43a, step 1).  
Repeat for other axle and wheels.

- a. If wheel cylinder is leaking or piston is sticking, replace wheel cylinder (para 2-43a).
- b. If wheel cylinder is okay, proceed to step 4.

Step 4. Check brake linings for wear, glaze, and excessive dust (para 2-43a).

- a. Replace brake linings if worn, or glazed; remove excessive dust (para 2-43a).
- b. If brake linings are okay, reinstall hub and drum assemblies, axle shafts (para 2-39f), lower axle and wheels to ground, remove shipping lock pin (store under operator's seat) and remove blocks from wheels. Proceed to step 5.

Step 5. Operate all control levers several times with engine off to relieve hydraulic pressure. Depress service brake pedal and note pedal effort required. Start engine, depress service brake pedal and note pedal effort required.

- a. If required pedal effort is the same with engine off or on, proceed to step 6.
- b. If less pedal effort is required with engine running, proceed to step 7.

**2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

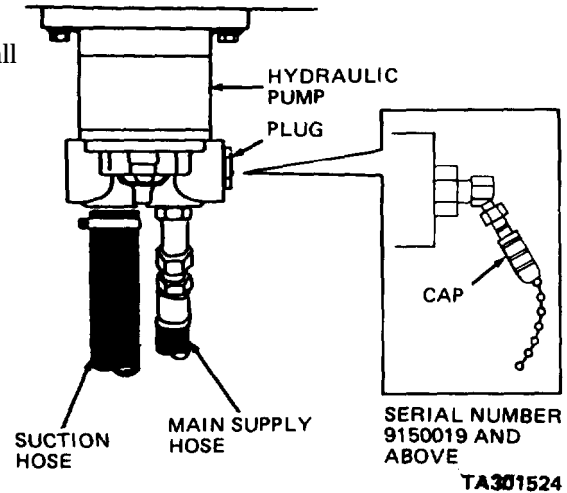
8. EXCESSIVE SERVICE BRAKE PEDAL EFFORT REQUIRED (cont)

Step 6. Operate lift control lever with engine at full throttle.  
Check that mast assembly operates normally.

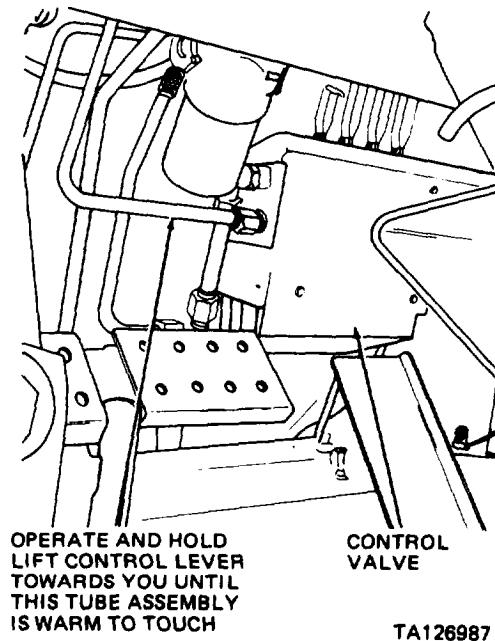
a. If mast assembly operates normally, proceed to step 7.

b. If mast assembly does not operate normally, troubleshoot hydraulic system (para 2-46, MALFUNCTION 1).

Step 7. Operate all levers several times with engine off.  
Remove plug or cap from hydraulic pump and install  
0-3000 PSI pressure gage.



Start engine and, with transmission in neutral, operate at fast idle.  
Operate and hold lift control lever toward you until tube assembly is warm to touch (mast assembly will be at full height).



---

## **2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

**8. EXCESSIVE SERVICE BRAKE PEDAL EFFORT REQUIRED (cont)****Step 7. (cont)**

Operate engine at 1700 to 1900 RPM. With lift control lever held towards you, note and record pressure gage reading; then pump service brake pedal several times.

Depress service brake pedal and record new pressure gage reading.

Compare difference between pressure gage readings (relief pressure).

If difference between pressure gage readings is not 245 to 255 PSI replace or repair power assist unit (para 2-43c(2)).

**9. SERVICE BRAKES GROAN AT END OF STOP**

- Step 1.** Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is applied.

**WARNING**

Before raising wheel off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels from ground.

Remove both axle shafts and hub and drum assemblies (para 2-39f).

Check brake linings for wear, uneven wear, brake fluid/lubricant contamination, or excessive dust (para 2-43a).

Repeat for other axle.

- a. Replace brake linings if worn or contaminated: remove excessive dust (para 2-43a).

- b. If brake linings are okay, proceed to step 2.

- Step 2.** Check hub and drum assemblies for scored or cracked condition (para 2-39f).

- a. Replace brake drums if scored or cracked (para 2-39f).

- b. If hub and drum assemblies are okay, proceed to step 3.

- Step 3.** Check for loose, missing, or damaged brake shoe mounting hardware (para 2-43a).

Replace missing or damaged brake shoe mounting hardware; install new hardware if missing.

**10. SCRAPING NOISE FROM SERVICE BRAKES WHEN APPLIED**

- Step 1.** Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b(1)) and install in chassis. Ensure that parking brake is applied.

---

## **2-41. BRAKE SYSTEM TROUBLESHOOTING (cont)**

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

### 10. SCRAPING NOISE FROM SERVICE BRAKES WHEN APPLIED (cont)

#### Step 1. (cont)

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels off ground.

Remove both axle shafts and hub and drum assemblies (para 2-39f).

Check brake linings for wear, uneven wear, brake fluid/lubricant contamination (para 2-43a).

Repeat for other axle.

a. Replace brake linings if worn or contaminated (para 2-43a).

b. If brake linings are okay, proceed to step 2.

#### Step 2. Check brake shoe return springs for damage (para 2-43a).

a. Replace spring if damaged (para 2-43a).

b. If spring is okay, check brake assemblies for loose or missing brake shoe mounting hardware; tighten/replace brake shoe mounting hardware (para 2-43a).

### 11. STOP LIGHT INOPERATIVE

Refer to paragraph 2-24, MALFUNCTION 4 for troubleshooting procedures.

### 12. DECLUTCH PEDAL DOES NOT NEUTRALIZE TRANSMISSION

Disconnect center propeller shaft from brake flange (para 2-39). Block wheels, lightly apply parking brake, and idle engine. Observe transmission output shaft (brake flange) while an assistant depresses service brake pedal.

a. If brake flange stops rotating, check adjustment of declutch valve (para 2-43d). If adjustment is correct, replace declutch valve (para 2-43d).

b. If brake flange does not stop rotating, replace transmission control valve assembly (notify direct support maintenance).

## 2-42. PARKING BRAKE MAINTENANCE

### a. Parking Brake Linkage.

This task covers: a. Inspection  
b. Removal  
c. Cleaning

d. Inspection/Repair  
e. Installation/Replacement  
f. Adjustment

#### INITIAL SETUP

#### TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION  
Paragraph

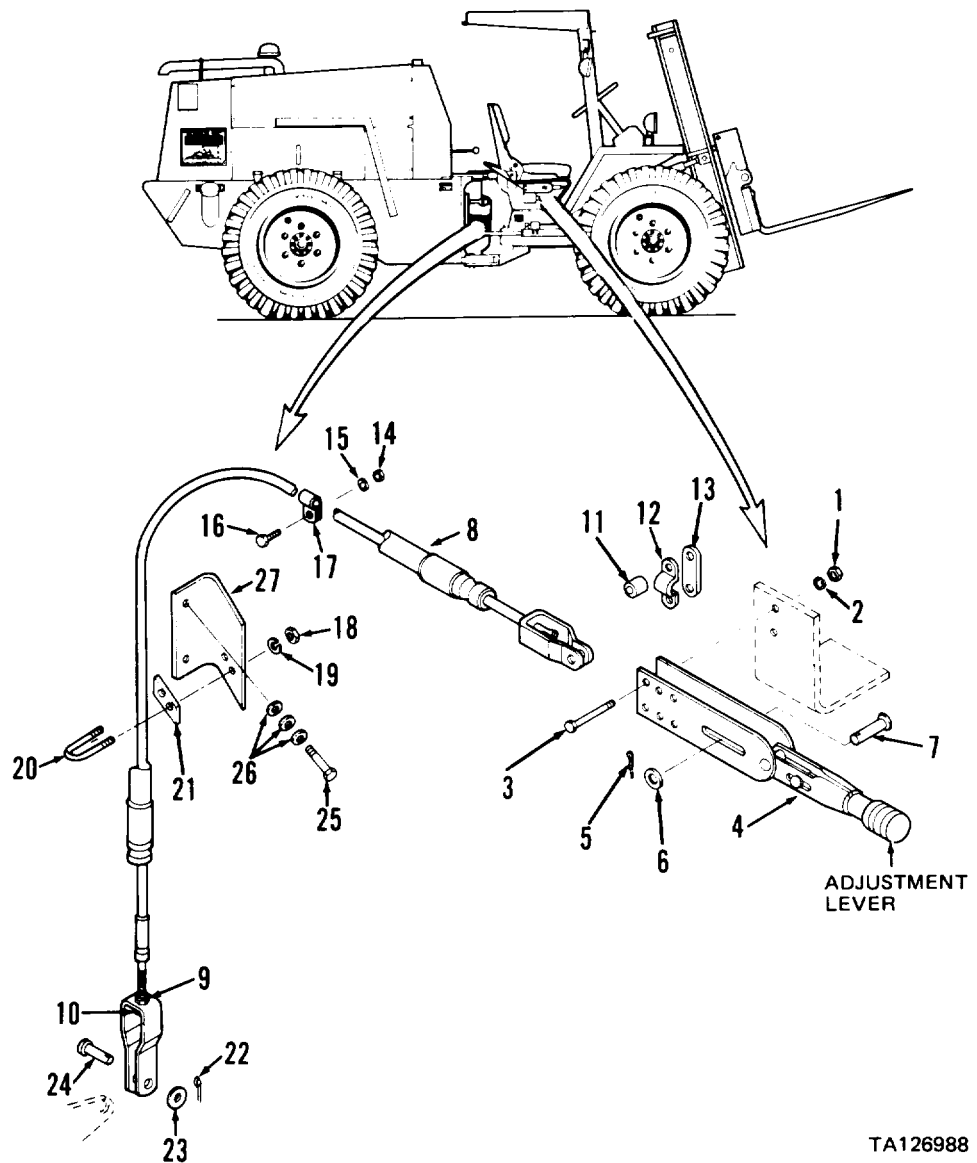
Condition Description  
Vehicle parked on level surface, turned (articulated) left, engine off, and parking brake lever released.

#### MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Clean diesel fuel

#### KEY

1. Nuts
2. Lock washers
3. Cap screws
4. Parking brake lever
5. Cotter pin
6. Washer
7. Pin
8. Parking brake cable
9. Adjusting nut
10. Adjusting nut
11. Spacers
12. Clamp
13. Clamp spacer
14. Nut
15. Lock washer
16. Cap screw
17. Clamp
18. Nuts
19. Lock washers
20. U bolt
21. Plate
22. Cotter pin
23. Washer
24. Clevis pin
25. Cap screws
26. Washers
27. Bracket



TA126988

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*a. Parking Brake Linkage (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
1	Operator's compartment	a. Parking brake lever (4)	Inspect for loose or missing hardware	Tighten loose hardware; replace missing hardware
		b. Parking brake cable (8)	Inspect for loose or missing hardware	Tighten loose hardware; replace missing hardware
		c. Parking brake lever (4)	Apply	If linkage seems too loose as indicated by lever moving too freely, adjust as described in step 19 below
<b>REMOVAL</b>				
2	Operator's compartment	a. Two nuts (1) and lock washers (2)	Remove	Disconnects parking brake cable (8) clevis from lever (4) From lever (4)
		b. Two cap screws (3)	Remove	
		c. Parking brake lever (4)	Remove	
		d. Cotter pin (5)	Remove	
		e. Washer (6)	Remove	
		f. Pin (7)	Remove	
		g. Parking brake cable (8)	Disengage	
		h. Two spacers(11)	Remove	
		i. Clamp (12)	Remove	
		j. Clamp spacer(13)	Remove	
3	Operator's compartment, rear	a. Nut (14) and lock washer (15)	Remove	
		b. Capscrew(16)	Remove	
		c. Clamp (17)	Remove	
4	Transmission, left side above parking brake	a. Two nuts (18) and lock washers (19)	Remove	Away from bracket (27)
		b. U bolt (20)	Remove	
		c. Parking brake cable (8)	Relocate	
		d. Plate (21)	Remove	
5	Parking brake actuating lever	a. Cotter pin (22)	Remove	Disconnects parking brake cable clevis from actuating lever
		b. Washer (23)	Remove	
		c. Clevis pin (24)	Remove	
		d. Parking brake cable (8)	Remove	



**2-42. PARKING BRAKE MAINTENANCE (cont)**

a. *Parking Brake Linkage (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<b>NOTE</b>				
Don't perform following step unless bracket (27) requires replacement.				
6	Transmission, left side, above parking brake	a. Two cap screws (25) and six washers (26) b. Bracket (27)	Remove Remove	
CLEANING				
7		Parking brake cable (8)	Clean	Use clean diesel fuel
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
8		All other parts	Clean	Use cleaning solvent P-D-680
inspection/REPAIR				
9		Parking brake lever (4)	Inspect	Replace if dented, bent, or lever action is rough
10		Parking brake cable (8)	Inspect	Replace if clevis mounting holes elongated, or if cable kinked or threads damaged
11		All other parts	Inspect	Replace if damaged, worn, bent, distorted, or threads damaged
INSTALLATION/REPLACEMENT				
12	Transmission, left side, above parking brake	a. Bracket (27) b. Six washers (26) and two cap screws (25)	Position Install	On transmission rear cover Place three washers (26) on cap screw (25); tighten to 37-41 pounds foot torque

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*a. Parking Brake Linkage (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
13	Parking brake cable (8)	a. Adjusting nut (10) b. Adjusting nut (9)	Loosen Adjust	Until just held onto cable by three or four threads Until just touches top of clevis
14	Parking brake actuating lever	a. Parking brake cable (8) b. Clevis pin (24) c. Washer (23) d. Cotter pin (22)	Position clevis on actuating lever; align holes Install Position Install	Clevis on threaded end of cable (8) connects to actuating lever Connect parking brake cable (8) clevis to actuating lever Bend over end
15	Transmission, left side, above parking brake	a. Plate (21) b. U bolt (20) c. Two lock washers (19) and nuts (18)	Position Install Install	Between parking brake cable (8) and bracket (27) Secures parking brake cable (8) and plate (21)
16	Operator's compartment, rear	a. Clamp (17) b. Cap screw (16) c. Lock washer (15) and nut (14)	Install and position Install Install	On parking brake cable (8) Secures clamp (17) to rear chassis
17	Parking brake lever (4)	a. Parking brake cable (8) clevis b. Pin (7) c. Washer (6) d. Cotter pin (5) e. Cap screw (3) f. Two spacers (11) g. Clamp (12) and clamp spacer (13)	Position Install Position Install Position Position Position and install	In lever (4); align holes in clevis and lever Connects clevis and lever (4) Bend over end In parking brake lever just far enough to install spacers (11) on cap screw On cap screw (3) On parking brake cable (8), then install in parking brake lever (4) threading screw through spacer (11), clamp (12) and clamp spacer (13)
18	Operator's compartment	a. Parking brake lever (4) b. Two lock washers (2), cap screws (3) and nuts (1)	Position Install	

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*a. Parking Brake Linkage (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>ADJUSTMENT</b>				
19	Operator's compartment	Parking brake lever (4)	Adjust	With lever in released position, turn adjustment knob located on top of lever fully counterclockwise until it no longer can be turned
<b>NOTE</b>				
Be sure you don't have parking brake lever in applied position (horizontal) when performing following step.				
20	Transmission parking brake actuating lever	a. Adjusting nut (9) b. Adjusting nut (10) c. Adjusting nut (9)	Adjust Adjust upwards Tighten	Thread all the way up Until all slack is removed from parking brake cable (8) Against parking brake cable (8) clevis
21	Operator's compartment	Parking brake lever (4)	Adjust	Turn knob located on top of lever (4) clockwise. Apply parking brake; if considerable force is required to pull lever up, back-off parking brake lever adjustment knob

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*b. Parking Brake Assembly.*

- This task covers:
- a. Inspection
  - b. Removal
  - c. Cleaning
  - d. Inspection (after removal)
  - e. Repair
  - f. Installation/Replacement

INITIAL SETUP

TOOLS	EQUIPMENT	CONDITION
No. 1 Common Organizational Maintenance Tool Kit	Paragraph	Condition Description
Hand Vacuum Cleaner		Engine off.
Hard Wooden Blocks (2), 6 by 6 by 18 inches		Vehicle parked on level surface with wheels blocked.
		Transmission DIRECTION SELECTOR lever in neutral (N) position.
MATERIALS/PARTS	2-42a	Parking brake linkage disconnected from parking brake lever cam.
Cleaning solvent P-D-680		Center drive shaft assembly removed.
Clean cloths	2-39b	
Seal		
Brake lining and rivet kit	(FSCM 12603 P/N 801214)	

**NOTE**

To perform inspection procedure, it is not necessary to disconnect parking brake linkage or remove center drive shaft assembly,

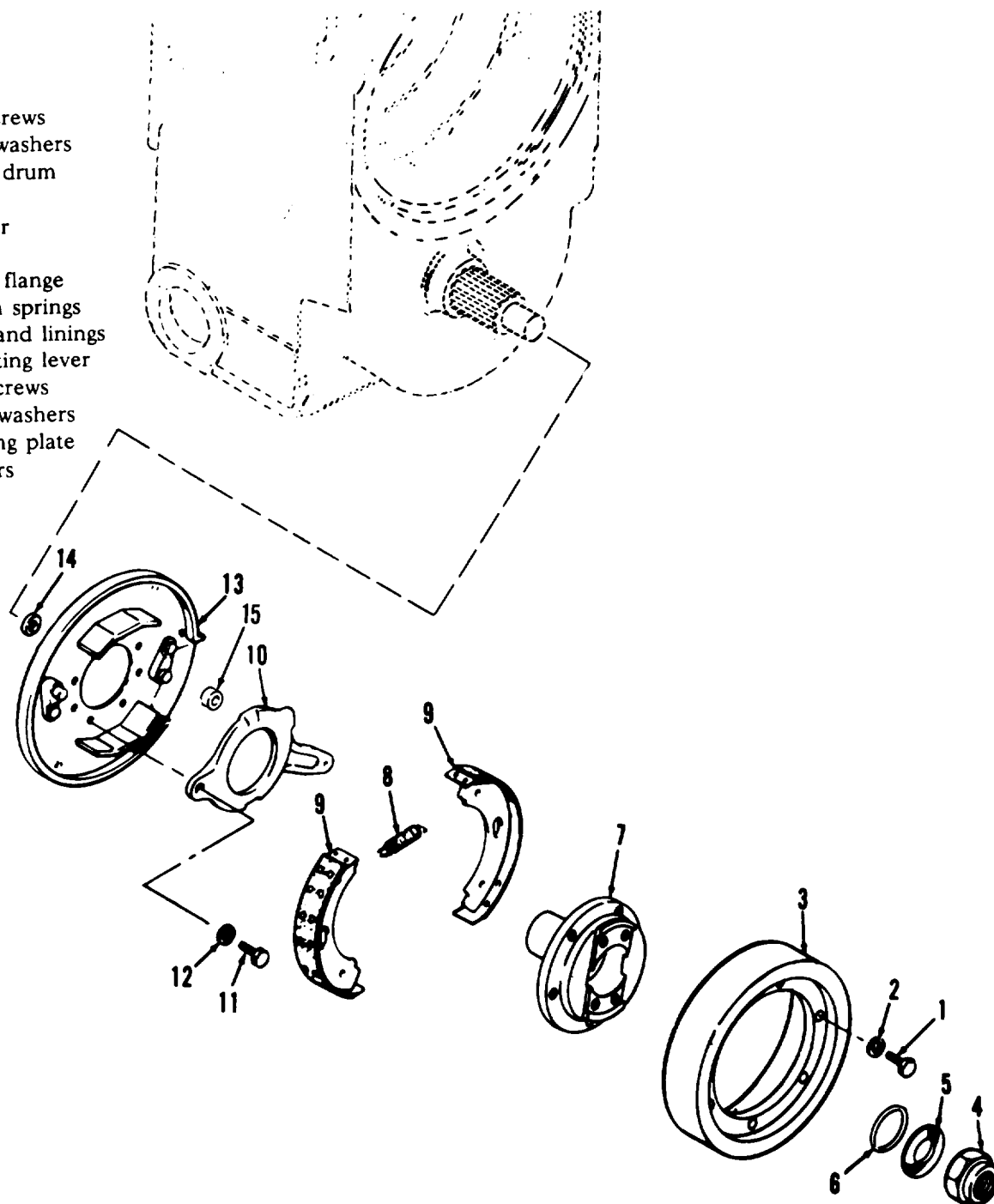
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
1	Transmission, rear	a. Six cap screws (1) and lock washers (2)	Remove	Support brake drum (3)
		b. Brake drum (3)	Move out of position	Over center drive shaft
		c. Shoe and lining (9)	Inspect	Replace if less than 1/8 inch thick in any area
		d. Brake drum (3)	Inspect	Replace if cracked or scored
<b>NOTE</b>				
If shoe and lining, or brake drum require replacement, remove center drive shaft (para 2-39b) and disconnect linkage from parking brake lever cam (para 2-42a). Proceed to step 2c below. If shoe and lining and brake drum are okay, proceed to step 1e below.				
		e. Brake drum (3)	Position	On brake flange
		f. Six lock washers (2) and cap screws (1)	Install	Tighten to 41-49 pounds foot torque

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*b. Parking Brake Assembly (cont).*

**KEY**

1. Cap screws
2. Lock washers
3. Brake drum
4. Nut
5. Washer
6. Seal
7. Brake flange
8. Return springs
9. Shoe and linings
10. Actuating lever
11. Cap screws
12. Lock washers
13. Backing plate
14. Spacers
15. Roller



TA502381 ■

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*b. Parking Brake Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
2	Transmission rear	a. Six cap screws (1) and lock washers (2)	Remove	Support brake drum (3)
		b. Brake drum (3)	Pull and remove	From brake flange (7)
		c. Nut (4), washer (5) and seal (6)	Remove	Use impact wrench. If impact wrench is not available, use ret airier bar to prevent flange from turning while loosening nut (4). Discard seal (6)
		d. Brake flange (7)	Pull and remove	From transmission output shaft
		e. Two return springs (8)	Remove	Support brake shoes (9)
		f. Shoe and lining (9) and actuating lever (10)	Pull and remove	From backing plate (13)
<b>NOTE</b>				
Remove cap screws (11), lock washers (12) and backing plate (13) only if necessary for replacement.				
		g. Four cap screws (11) and lock washers (12)	Remove	Support backing plate (13)
		h. Backing plate (13)	Remove	
		i. Four spacers (14)	Remove	
<b>CLEANING</b>				
3		Brake drum (3), shoe and lining (9) and backing plate (13)	Clean	Use hand vacuum cleaner to remove dust
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

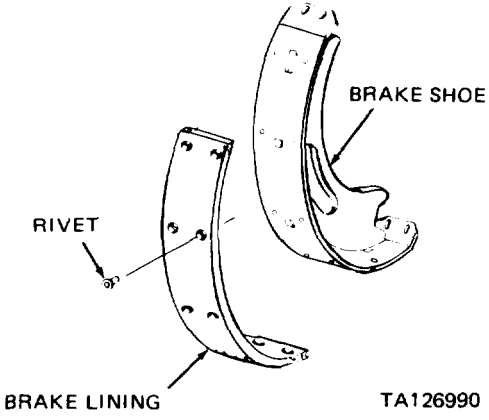
**2-42. PARKING BRAKE MAINTENANCE (cont)**

*b. Parking Brake Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3 (cont)	<p><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>			
4		Brake drum (3), flange (7), spring (8), actuating lever (10), backing plate (13) and all hardware	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
5		Brake drum (3)	Inspect	Replace if cracked, scored or excessively worn
6		Shoe and lining (9)	Inspect	Repair if linings scored, cracked, deteriorated or excessively worn. Replace if brake shoe cracked, or if pawl holes or lever contact areas excessively worn
7		Return springs (8)	Inspect	Replace if coils broken, or if distorted or stretched
8		Brake flange (7)	Inspect	Replace if cracked, or if spline teeth burred, chipped or excessively worn
9		Actuating lever (10)	Inspect	Replace if cracked or distorted, or if roller out-of-round or excessively worn
10		Backing plate (13)	Inspect	Replace if cracked, or if pivot points (pawls) excessively worn
11		All hardware	Inspect	Replace if cracked, worn, or if threads damaged

**2-42. PARKING BRAKE MAINTENANCE (cont)**

*b. Parking Brake Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REPAIR</b>				
12	Brake shoe and lining (9)	a. Ten rivets	Remove	Cut or drill from brake lining and shoe
 <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
		b. Brake shoe	Remove and clean	Use cleaning solvent P-D-680 on shoe contact face. Dry thoroughly with compressed air
		c. New brake lining	Position and clamp	Clamp lining to shoe with C clamps so rivet holes are in alignment
		d. Ten new rivets	Install	Drive squarely into rivet holes with flat head drift



**2-42. PARKING BRAKE MAINTENANCE (cont)**

*b. Parking Brake Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REPAIR (cont)</b>				
<b>NOTE</b>				
12 (cont)		Make certain lining is firmly clamped to brake shoe, locating C-clamps as close to rivet holes as possible.		
		e. Rivet heads	Form	Use rivet set, starting on center rivets and moving outwards toward sides and ends of lining
<b>INSTALLATION/REPLACEMENT</b>				
13	Transmission rear	a. Four spacers (14) b. Backing plate (13) c. Four lock washers (12) and cap screws (11) d. Actuating lever (10) e. Shoe and lining (9) f. Two return springs (8)	Position Position Install and tighten Position Position Install	On backing plate (13) On transmission Tighten to 81-97 pounds foot torque  On backing plate pawl On backing plate pawls On brake shoes; top spring in inner holes on shoes; bottom spring in center holes on shoes. Transmission output shaft
		g. Brake flange (7)	Push on	
<b>NOTE</b>				
Use impact wrench to tighten nut (4). If impact wrench is not available, temporarily install two bolts in brake flange (7), and insert retainer bar between bolts to prevent flange from turning while tightening nut (4).				
		h. New seal (6), washer (5) and nut (4)	Install and tighten	Tighten nut to 600-700 pounds foot torque
		i. Brake drum (3)	Position	On brake flange (7)
		j. Six lock washers (2) and cap screws (1)	Install and tighten	Tighten to 41-49 pounds foot torque
		k. Parking brake linkage	Reconnect and adjust	Para 2-42a

**2-43. SERVICE BRAKE MAINTENANCE**

*a. Service Brake Assembly.*

- This task covers:
- a. Inspection
  - b. Removal
  - c. Cleaning
  - d. Inspection (after removal)
  - e. Repair
  - f. Installation/Replacement
  - g. Adjustment
  - h. Bleeding brakes

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Shop Vacuum Cleaner  
 Hard Wooden Blocks (2), 6 by 6 by 18 inches

EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off.
	Vehicle parked on level surface, wheels blocked and parking brake applied.
2-47	Wheel removed.

**WARNING**

Tire and wheel assembly must be removed before removing axle shaft and hub and drum assembly to avoid damaging axle oil seal. Damage to seal can result in contamination of brake linings and brake failure.

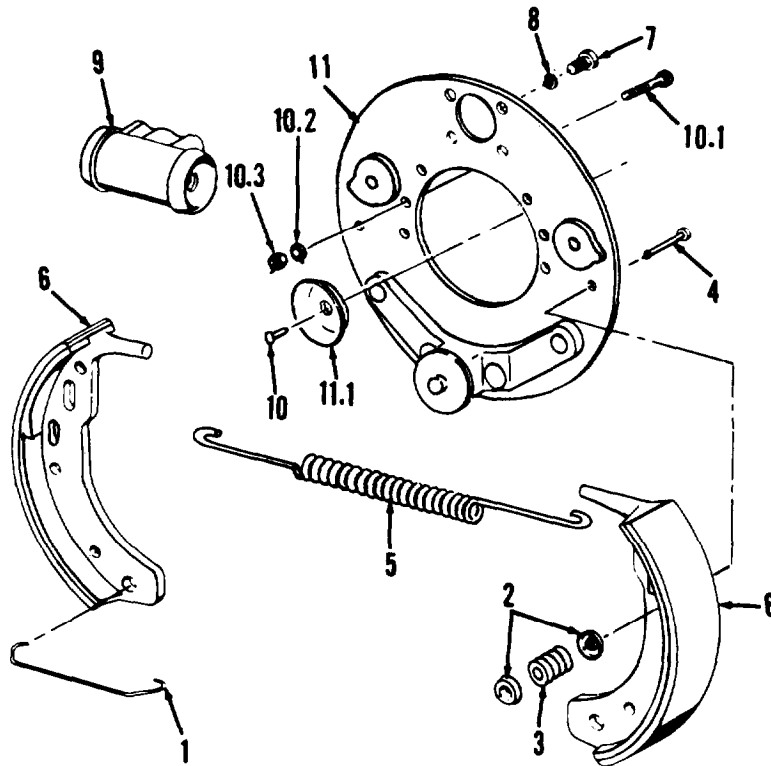
MATERIAL/PARTS

Brake fluid, silicone (MIL-B-46176)  
 Cleaning solvent P-D-680

2-39f Axle shaft and hub and drum assembly removed.

KEY

- 1. Retainer spring
- 2. Hold-down retainers
- 3. Hold-down springs
- 4. Anti-rattle rods
- 6. Shoe and linings
- 7. Cap screws
- 8. Lock washers
- 9. Wheel cylinder
- 10. Rivets
- 10.1. Cap screws
- 10.2. Washers
- 10.3. Nuts
- 11. Backing plate and cam bolt assembly
- 11.1. Oil slinger



TA502382

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*a. Service Brake Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
1	Front axle, right side	a. Shoe and linings (6)	Inspect for wear and signs of overheating and lubricant contamination	Replace if worn to 3/32 inch or less; or if contaminated by lubricant or brake fluid
<b>CAUTION</b>				
Don't depress brake pedal completely in following step; depress pedal only enough to check that brake shoes expand.				
		b. Wheel cylinder (9)	Inspect for fluid leakage at boots. Depress brake pedal and check that brake shoes expand. Release brake pedal and check that brake shoes retract	Replace if necessary
<b>NOTE</b>				
If brake shoes don't expand or retract in the above step, this indicates that wheel cylinder piston is sticking.				
		c. Retaining hardware	Inspect for missing parts	Replace missing parts
<b>NOTE</b>				
If brake shoes, wheel cylinder, or retaining hardware are okay, reinstall axle shaft and hub assembly (para 2-39f) and wheel assembly and perform above procedures on remaining wheel and axle. If brake shoes, wheel cylinder, or retaining hardware are not okay or other problems are observed, proceed to step 2 below.				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

a. Service Brake Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS	
<b>REMOVAL</b>					
2	Front axle, right side	a. Retainer spring (1)	Remove	Use brake spring pliers	
		b. Head of two anti-rattle rods (4)	Hold	From turning	
		c. Two outer retainers (2)	Depress and turn	Use pliers, turn 1/4 turn, slowly release spring pressure, and remove	
		d. Two springs (3) and inside retainers (2)	Remove	From two rods (4)	
		e. Two rods (4)	Remove	Pull from shoe assembly (6) and backing plate (11)	
		f. Return spring (5)	Remove	Use brake spring pliers	
		g. Two shoe and lining assemblies (6)	Remove	From backing plate (11)	
3	Front axle backing plate, right side	<b>NOTE</b>			
		Remove cap screws (7), lock washers (8) and wheel cylinder (9) only if required for replacement.			
		a. Brake tube and fitting	Remove	From wheel cylinder (para 2-43b)	
		b. Two cap screws (7) and lock washers (8)	Remove	Support wheel cylinder (9)	
		c. Wheel cylinder (9)	Remove	From backing plate (11)	
<b>CLEANING</b>					
4		Brake lining (6) and wheel cylinder (9)	Clean	Wipe with a clean, dry cloth only	
<b><u>WARNING</u></b>					
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.					

**2-43. SERVICE BRAKE MAINTENANCE (cont)**a. *Service Brake Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4 (cont)			<b><u>WARNING</u></b>	
		Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.		
5		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
6		Shoe and lining (6)	Inspect	Replace if lining glazed, scored, cracked, deteriorated, worn to 3/32 inch or less, or if brake shoe or pawl holes worn
7		Springs (1, 3, and 5)	Inspect	Replace if bent, cracked, distorted or stretched
8		Retainer (2) and rod (4)	Inspect	Replace if cracked, bent or corroded
9		Cap screws (7) and lock washers (8)	Inspect	Replace if worn, or if threads damaged
<b>NOTE</b>				
Inspect under wheel cylinder (9) rubber boots for damage.				
10		Wheel cylinder (9)	Inspect	Replace if leaking, cracked, chipped, threads damaged, or rubber boots deteriorated.
11		Backing plate (11)	Inspect	Replace if worn, distorted or damaged, or if rivets loose or sheared (see step 12)
11.1		Oil slinger (11. 1)	Inspect	Replace if damaged or distorted (see step 12).

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

a. Service Brake Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REPAIR</b>				
12	Front axle backing plate, right side	a. Six rivets (10) or six cap screws (10.1), washers (10.2), and nuts (10.3)	Remove	Drill and press rivets (10), if used, from plate (11), oil slinger (11. 1), and axle housing. If cap screws (10.1), washers (10.2), and nuts (10.3) are used, remove these parts. Support plate (11) and oil slinger (11.1).
		b. Backing plate assembly (11) and oil slinger (11.1)	Remove	Pull from axle housing
		c. New backing plate assembly (11) and oil slinger (11.1)	Position	Clamp backing plate to axle housing with C clmps so rivet holes are in alignment
<b>NOTE</b>				
Be sure wheel cylinder mounting holes in backing plate are at top of axle housing.				
		d. Six capscrews (10.1), washers (10.2), and nuts (10.3)	Install	
<b>INSTALLATION/REPLACEMENT</b>				
13	Front axle backing plate, right side	a. Wheel cylinder (9)	Position	On backing plate (11)
		b. Two lock washers (8) and cap screws (7)	Install and tighten	Until wheel cylinder is securely mounted
		c. Fitting and brake tube	Install and tighten	Until securely mounted to wheel cylinder
14	Front axle, right side	a. Two shoe and lining assemblies (6)	Position and install	Insert push rod end of shoe in wheel cylinder, and position shoe against backing plate adjustment cam and bottom pawl
		b. Two anti-rattle rods (4)	Position	Insert through hole in backing plate and brake shoe

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

a. Service Brake Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
14 (cont)		c. Two retainers (2) and springs (3)	Position and install	Guide one retainer and spring over rod (4), then push head of rod and outside retainer to compress spring. Rotate outside retainer 1/4 turn and release
		d. Retainer spring (1) and return spring (5)	Install	Use brake spring pliers
		e. Hub and drum assembly and axle shaft	Install	Para 2-39f
<b>NOTE</b>				
Perform adjustment (step 15) before lowering vehicle wheel to ground.				
		f. Wheel	Install	Para 2-47
ADJUSTMENT				
15	Front axle backing plate, back (axle housing) side, right side of vehicle			
<b>NOTE</b>				
If brake line was disconnected from wheel cylinder, bleed brakes (step 16) before adjusting brake lining-to-drum clearance.				





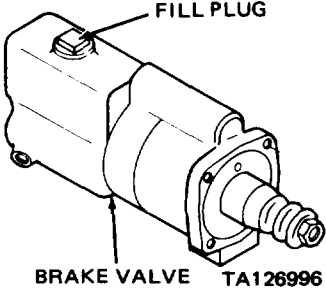
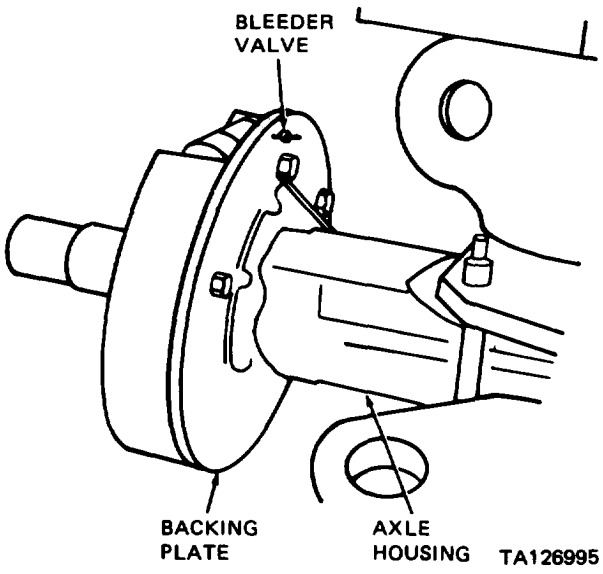
**2-43. SERVICE BRAKE MAINTENANCE (cont)**

a. Service Brake Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENT (cont)				
15 (cont)		a. Brake pedal b. Two cam adjusting bolts	Actuate Turn as shown	To center brake shoe and lining assemblies in drum To expand brake shoes until slight drag can be felt while drum is rotating
		c. Two cam adjusting bolts	Turn as shown	To contract brake shoes until drum rotates freely (no drag)
<b>NOTE</b>				
After adjustment, repeat steps 1 through 15 above for remaining brake assemblies.				

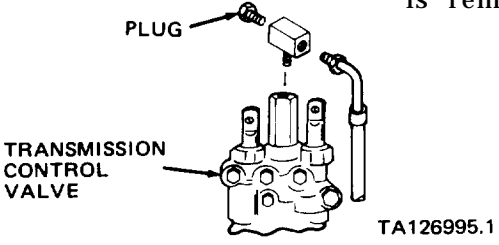
**2-43. SERVICE BRAKE MAINTENANCE (cont)**

a. Service Brake Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS	
<b>BLEEDING BRAKES</b>					
16	Operator's compartment	a. Brake valve fill plug	Remove		
		b. Brake valve	Fill		With silicone brake fluid, MIL-B-46176, to within 1/2 inch of fill plug opening.
		c. Fill plug	Install		
<b>NOTE</b>					
When bleeding brakes, slip hose over bleeder valve with opposite end of hose in clear container. Place small amount of brake fluid in container so that bubbles can be seen when bleeding brakes. Pressure bleeder may be used for bleeding brakes. Always bleed brakes with brake drum installed.					
17	Rear axle backing plate, right side	a. Bleeder valve	Close	Turn clockwise	
					
		b. Brake pedal	Pump and hold down	Use assistant	

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

a. Service Brake Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>BLEEDING BRAKES (cont)</b>				
17 (cont)		c. Bleeder valve	Momentarily open	Turn counterclockwise until brake pedal nears bottom of travel then turn clockwise to close
<b>NOTE</b>				
Repeat steps b and c above until a steady stream of brake fluid flows from open bleeder valve when brake pedal is depressed.				
18	Operator-s compartment	a. Brake valve fill plug	Remove	
		b. Brake valve	Refill	With silicone brake fluid, MIL-B-46176, to within ½ inch of fill plug opening.
		f. Fill plug	Install	
<b>NOTE</b>				
Repeat steps 17 and 18 above at remaining bleeder valves in following order:				
Left rear Right front Left front				
19	Transmission control valve	a. Plug b. Declutch pedal c. Plug	Tighten Hold down Momentarily open	Use assistant  Turn counterclockwise then clockwise to close when air is removed from line
				
<b>NOTE</b>				
Repeat steps b and c above until a steady stream of brake fluid flows from loosened plug.				
Repeat step 18 above to fill brake valve with brake fluid.				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*b. Brake Hoses, Lines and Fittings.*

- This task covers:
- a. Leak Inspection
  - b. Removal
  - c. Cleaning
  - d. Inspection
  - e. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

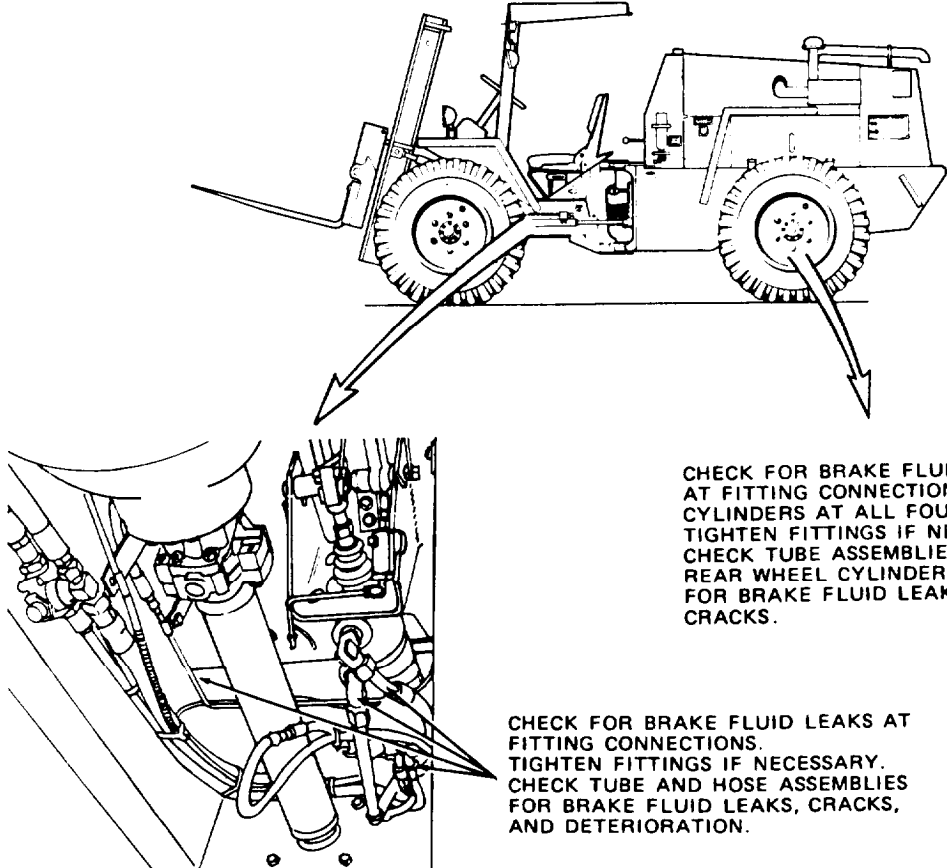
EQUIPMENT CONDITION

Paragraph      Condition Description  
 Vehicle parked on level surface, engine off, and parking brake applied.  
 2-53c      Left side panel removed.  
 2-53i      Chassis guard removed.

MATERIALS/PARTS

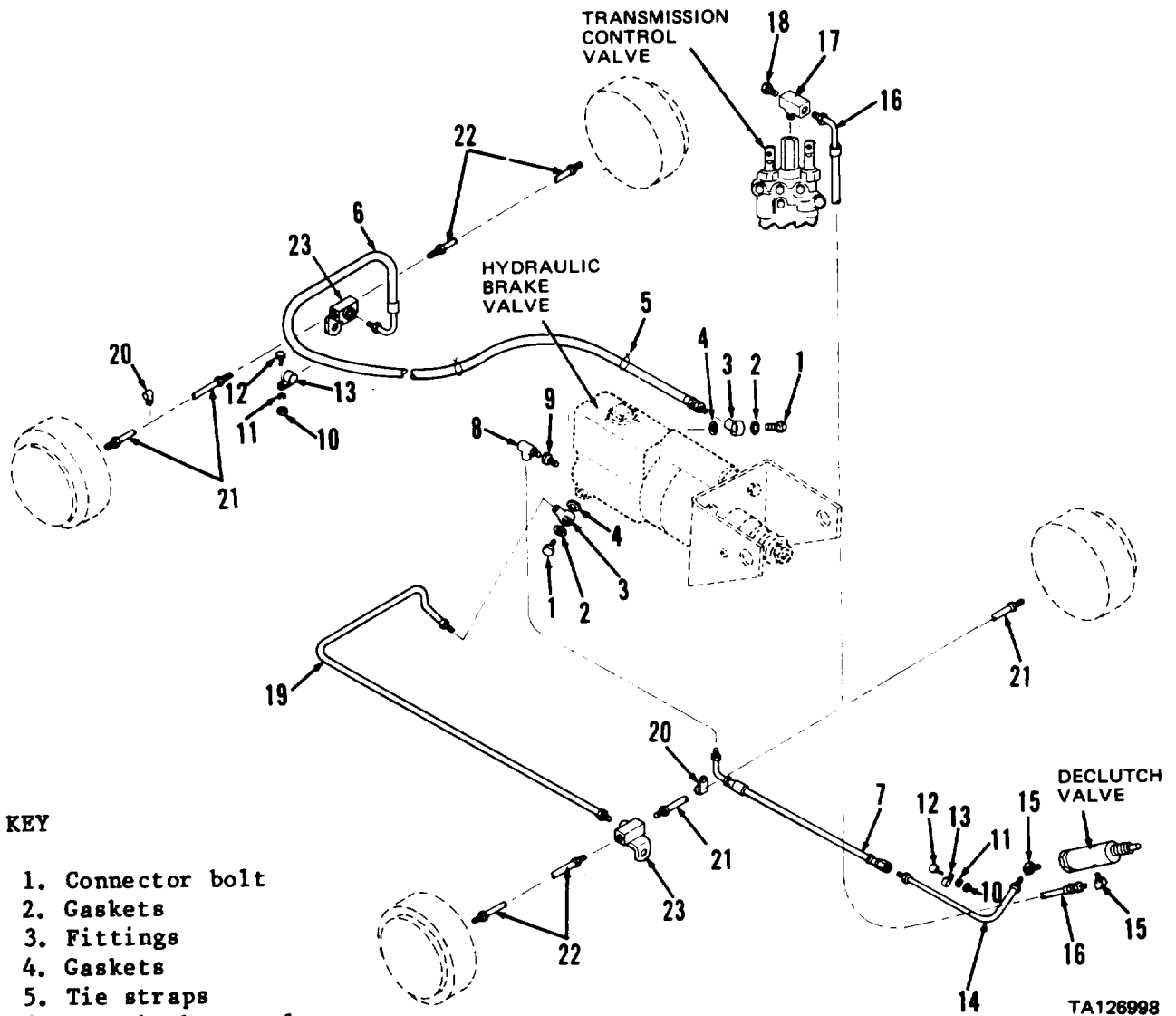
Cleaning solvent P-D-680  
 Clean cloths

Gaskets  
 Brake fluid (SAE J1703C)  
 Tie straps

STEP	LOCATION	ITEM	ACTION	REMARKS
<p><b>LEAK INSPECTION</b></p> <div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="width: 45%;"> <p><b>CHECK FOR BRAKE FLUID LEAKS AT FITTING CONNECTION TO WHEEL CYLINDERS AT ALL FOUR WHEELS. TIGHTEN FITTINGS IF NECESSARY. CHECK TUBE ASSEMBLIES BETWEEN REAR WHEEL CYLINDERS AND TEE FOR BRAKE FLUID LEAKS AND CRACKS.</b></p> </div> <div style="width: 45%;"> <p><b>CHECK FOR BRAKE FLUID LEAKS AT FITTING CONNECTIONS. TIGHTEN FITTINGS IF NECESSARY. CHECK TUBE AND HOSE ASSEMBLIES FOR BRAKE FLUID LEAKS, CRACKS, AND DETERIORATION.</b></p> </div> </div> <p style="text-align: right; margin-top: 20px;">TA126997</p>				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*a. Brake Hoses, Lines, and Fittings (cont).*



**KEY**

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Connector bolt             | 16. Declutch valve outlet hose |
| 2. Gaskets                    | 17. Tee                        |
| 3. Fittings                   | 18. Plug                       |
| 4. Gaskets                    | 19. Front brake supply tube    |
| 5. Tie straps                 | 20. Tube clamp                 |
| 6. Rear brake supply hose     | 21. Long brake tube            |
| 7. Declutch valve inlet hose  | 22. Short brake tube           |
| 8. Tee                        | 23. Strap tees                 |
| 9. Fitting                    |                                |
| 10. Nuts                      |                                |
| 11. Lock washers              |                                |
| 12. Cap screws                |                                |
| 13. Clamps                    |                                |
| 14. Declutch valve inlet tube |                                |
| 15. Fittings                  |                                |

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*b. Brake Hoses, Lines and Fittings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front chassis, bottom left side	a. Two connector bolts (1) b. Two fittings (3) and four gaskets (2 and 4)	Loosen and remove Remove	From hydraulic brake valve
2	Rear chassis, bottom center	a. Nine tie straps (5) b. Brake hose (6)	Cut and remove Loosen and remove	From hoses (6 and 16)
3	Front chassis, bottom left side	a. Hose (7), tee (8) and fitting (9) b. Nut (10), lock washer (11) and cap screw (12) c. Clamp (13) d. Tube (14), two fittings (15) and hose (16)	Loosen and remove Remove Spread and remove Loosen and remove	From clamp (13) From tube (14) From declutch valve
4	Engine compartment, left front	a. Hose (16) b. Tee (17) and plug (18)	Loosen and disconnect Remove	From tee (17) From transmission control valve
5	Front chassis, bottom left and center	a. Brake tube (19) b. Tube clamp (20) c. Brake tubes (21 and 22) and strap tee (23)	Loosen and disconnect Remove Remove	
6	Rear chassis, bottom center	a. Nut (10), lock washer (11) and cap screw (12) b. Clamps(13 and 20) c. Hose (6) and brake tubes (21 and 22) d. Strap tee (23)	Remove Spread and remove Remove Remove	From clamp (13) From hose (6) and tube (21)

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*b. Brake Hoses, Lines and Fittings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
7		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
8		Hoses, fittings, and tubes	Flush	After cleaning, flush interior with clean brake fluid to remove all traces of cleaning solvent
INSPECTION				
9		Clamps (13 and 20)	Inspect	Replace if damaged
10		All fittings	Inspect	Replace if cracked, or if threads damaged
11		Hoses (6, 7, and 16)	Inspect	Replace if cracked, split or deteriorated, or if fitting threads damaged
INSTALLATION				
12	Rear chassis, bottom center	a. Strap tee (23)	Position and install	On rear axle
		b. Hose (6) and brake tubes (21 and 22)	Install and tighten	
		c. Two clamps (13 and 20)	Position	On hose (6) and brake tube (21)
		d. Cap screw (12), lock washer (11) and nut (10)	Install and tighten	Until clamp (13) is securely mounted

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*b. Brake Hoses, Lines and Fittings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
13	Engine compartment, left front	a. Tee (17) and plug (18) b. Hose (16) c. Nine tie straps (5)	Install and tighten Connect to tee (17) and tighten Loop and tie	Until securely mounted to transmission Around hoses (6 and 16)
14	Front chassis, bottom left and center	a. Strap tee (23) b. Brake tubes (21 and 22) c. Clamp (20) d. Supply tube (19) e. Two fittings (15), hose (16) and tube (14) f. Clamp(13) g. Cap screw (12), lock washer (11) and nut (10) h. Fitting (9), tee (8) and hose (7) i. Two fittings (3) j. Two fittings (3), four new gaskets (2 and 4) and connector bolts (1) k. Inlet hose (7) l. Brake lines m. Brake pedal	Position and install Install and tighten Position and install Connect to tee (23) and tighten Connect to declutch valve and tighten Position Install and tighten Connect to hydraulic brake valve and tighten Connect to hose (6) and tube (19) and tighten Connect to hydraulic brake valve and tighten Connect to tube (14) and tighten Bleed Depress	On front axle On tube (21) and tighten Connect to declutch valve and tighten On tube (14) Until clamp (13) is securely mounted Para 2-43a With engine running. Check for proper brake operation



**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*a. Hydraulic Brake Valve (cont).*

(1) Brake Master Cylinder (cont).

- This task covers:
- a. Leak Inspection
  - b. Cleaning
  - c. Inspection
  - d. Removal
  - e. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Hard Wooden Blocks (2), 6 by 6 by 18 inches

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Brake fluid, silicone (MIL-B-46176)  
 Grease (MIL-G-10924)

EQUIPMENT CONDITION

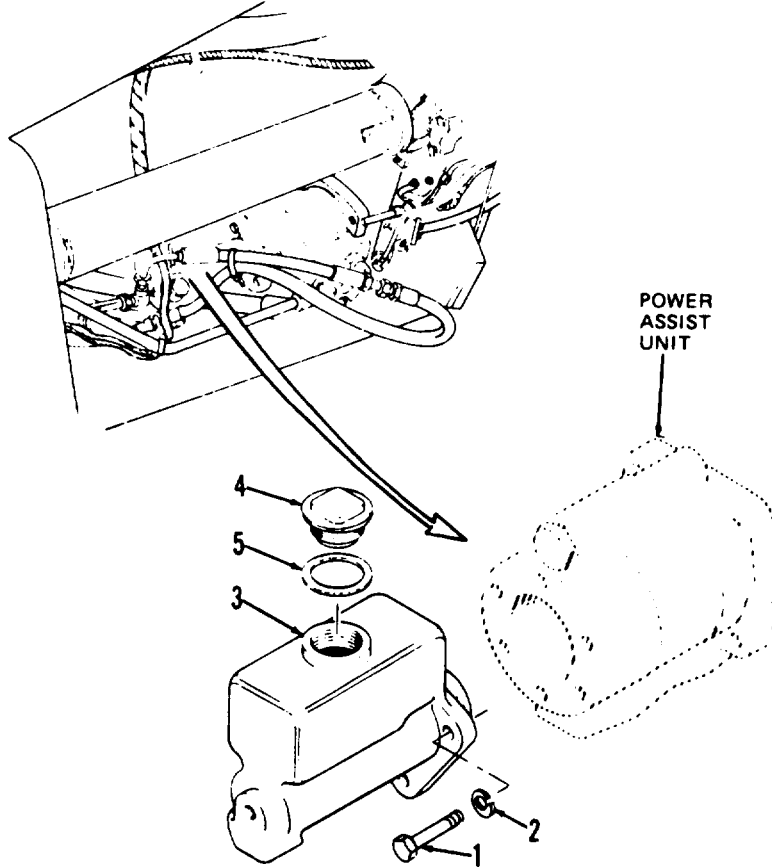
Paragraph	Condition Description
	Engine off. Vehicle parked on level surface, wheels blocked, parking brake applied.
2-31e(2)	Stop light switch removed.
2-43b	Brake hoses, lines and fittings disconnected from hydraulic brake valve.
2-53i	Chassis guard removed.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>LEAK INSPECTION</b>				
				<p>CHECK FOR OIL/FLUID LEAKAGE AT THESE POINTS. TIGHTEN FITTINGS/CAP SCREWS; IF LEAKAGE DOES NOT STOP, REPAIR OR REPLACE HYDRAULIC BRAKE VALVE</p> <p>CHECK FOR OIL/FLUID LEAKAGE AT THESE POINTS. TIGHTEN FITTINGS/CAP SCREWS; IF LEAKAGE DOES NOT STOP, REPAIR OR REPLACE HYDRAULIC BRAKE VALVE.</p> <p>POWER ASSIST SECTION</p> <p>BRAKE CYLINDER SECTION</p> <p>TA126999</p>

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. *Hydraulic Brake Valve (cont).*

(1) Brake Master Cylinder (cont).



TA127000

**KEY**

- 1. Cap screws
- 2. Lock washers
- 3. Body
- 4. Fill plug
- 5. Gasket



**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

(1) Brake Master Cylinder (cont).

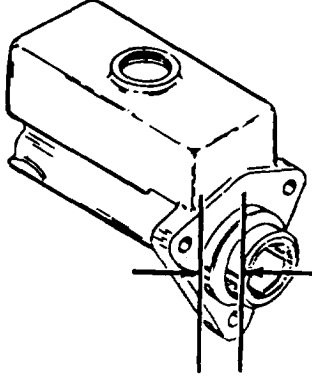
STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
1		Master cylinder  External only	Clean	Use cleaning solvent and dry with clean cloth
INSPECTION				
2		Cap screw (1), lock washer (2) and fill plug (4)	Inspect	Replace if worn, or if threads damaged
3		Body (3)	Inspect	Replace master cylinder assembly if cracked, threads damaged,
REMOVAL				
4	Front chassis, bottom left side	a. Three cap screws (1) and lock washers (2)  b. Brake master cylinder body (3)	Loosen and remove  Pull and remove	Support master cylinder body (3)  From power assist unit



**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

(1) Brake Mastor Cylinder (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT</b>				
5	Front chassis, bottom left side	a. Mating surface on body (3)	Lubricate	Lightly coat exterior area shown with grease
				
TA127004				
		b. Brake master cylinder (3)	Position	Against power assist unit, with fill plug opening facing upward
		c. Lock washers (2) and cap screws (1)	Install and tighten	Until brake master cylinder is securely mounted
		d. Brake hoses, lines and fittings	Connect to hydraulic brake valve and tighten	Para 2-43b
		e. Stop light switch	Install on hydraulic brake valve	Para 2-31e(2)
		f. Brake master cylinder (3)	Fill	Add clean brake fluid to within 1/2 inch of fill opening
		g. Brake lines	Bleed	Para 2-43a
		h. Brake pedal	Depress	With engine running. Check for proper brake operation

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*c. Hydraulic Brake Valve (cont).*

(1) Brake Master Cylinder (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
9 (cont)		e. Stop light switch	Install on hydraulic brake valve	Para 2-31e(2)
		f. Brake master cylinder (3)	Fill	Add clean brake fluid to within 1/2 inch of fill opening
		g. Brake lines	Bleed	Para 2-43a
		h. Brake pedal	Depress	With engine running. Check for proper brake operation

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*c. Hydraulic Brake Valve (cont).*

(2) Power Assist Unit.

- |                   |   |  |
|-------------------|---|--|
| This task covers: | <ul style="list-style-type: none"> <li>a. Removal</li> <li>b. Disassembly</li> <li>c. Cleaning</li> </ul> | <ul style="list-style-type: none"> <li>d. Inspection</li> <li>e. Reassembly/Repair</li> <li>f. Installation/Replacement</li> </ul> |
|-------------------|---|--|

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Hard Wooden Blocks (2),  
 6 by 6 by 18 inches

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph	Condition Description
	Engine off, Vehicle parked on level surface, wheels blocked, and parking brake applied.
2-43c(1)	Brake master cylinder removed.
2-48b(2)	Hydraulic lines and fittings disconnected from power assist unit.
2-43e	Brake pedal and declutch pedal removed.

MATERIALS/PARTS

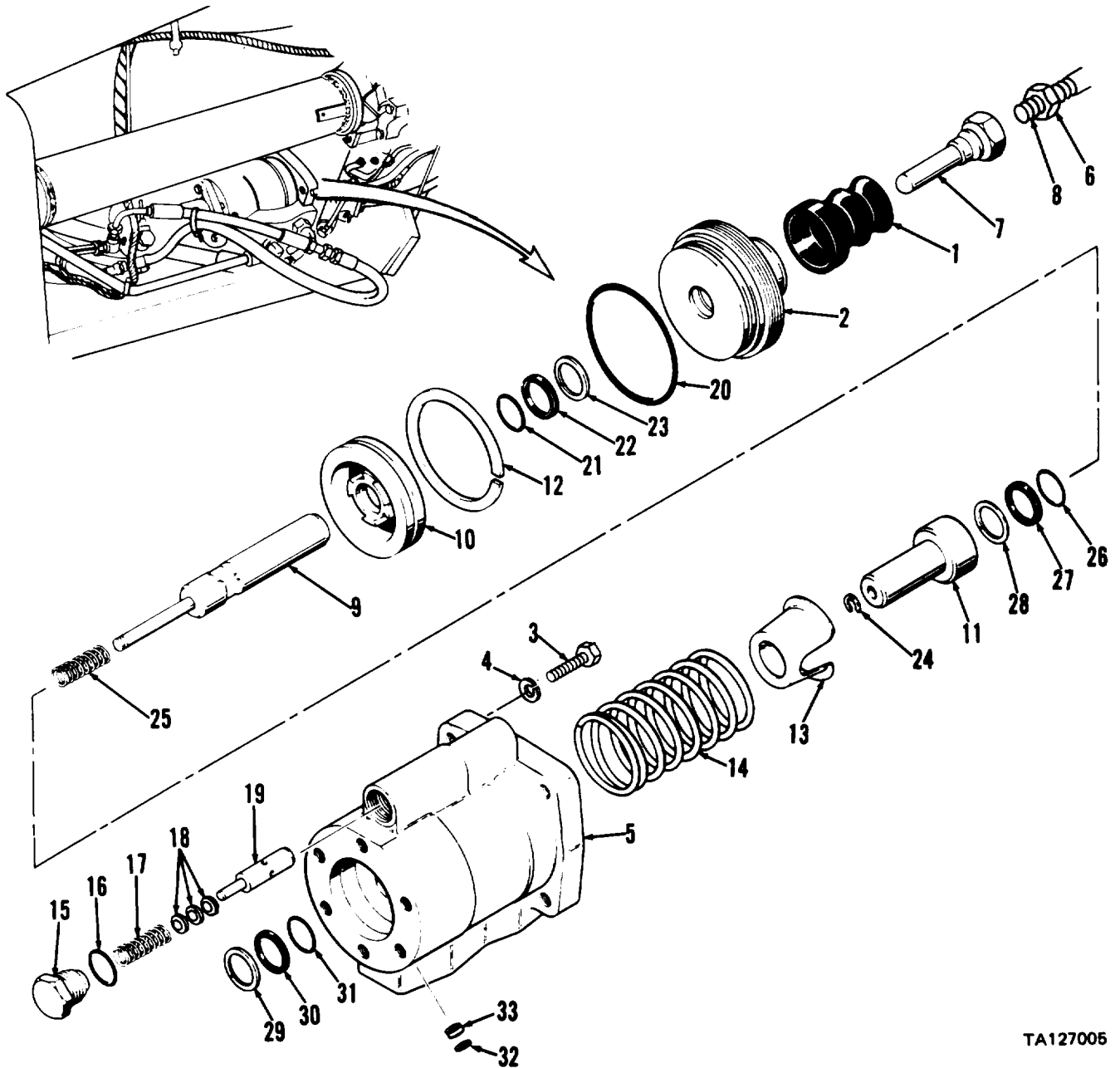
Cleaning solvent P-D-680  
 Clean cloths  
 Power assist unit repair kit



**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

(2) Power Assist Unit (cont).



TA127005

- |                     |                     |                    |                     |
|---------------------|---------------------|--------------------|---------------------|
| 1. Rubber cover     | 10. Piston          | 19. Poppet         | 28. Backup ring     |
| 2. Gland            | 11. Spool cap       | 20. O-ring         | 29. Backup ring     |
| 3. Cap screws       | 12. Piston ring     | 21. O-ring         | 30. U-cup seal      |
| 4. Lock washers     | 13. Spring retainer | 22. U-cup seal     | 31. O-ring          |
| 5. Body             | 14. Spring          | 23. Backup ring    | 32. Retaining ring  |
| 6. Lock nut         | 15. End plug        | 24. Retaining ring | 33. Breather filter |
| 7. Push rod         | 16. O-ring          | 25. Spring         |                     |
| 8. Brake pedal yoke | 17. Spring          | 26. O-ring         |                     |
| 9. Spool            | 18. Shim(s)         | 27. U-cup seal     |                     |

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

(2) Power Assist Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front chassis, bottom left side	a. Rubber cover (1) b. Four cap screws (3) and lock washers (4) c. Power assist unit body (5) d. Rubber cover (1)	Grasp and pull Loosen and remove Remove Remove and discard	From gland (2) Support body (5) Pull straight from bracket until clear of push rod (7); then lower and remove from vehicle From push rod (7)
<b>DISASSEMBLY</b>				
2	Power assist unit	a. Body (5)	Position and clamp	In vise, with gland (2) facing upward
<b><u>WARNING</u></b>				
Exercise care when removing gland (2). There will be spring tension against the gland. Failure to do so may cause gland to fly into your eyes.				
		b. Gland (2)	Loosen and remove	Turn counterclockwise using spanner wrench or chain wrench and pull from body (5)
		c. Spool (9), piston (10) and spool cap (11)	Remove	Pull from body (5)
		d. Piston (10)	Remove	From spool (9)
		e. Piston ring (12)	Remove and discard	Use piston ring pliers
		f. Spring retainer(13) and spring (14)	Remove	Pull from body (5)
		g. Body (5)	Reposition and clamp	In vise, with gland end facing down
		h. End plug(15)	Remove	From body (5)
		i. O-ring ( 16)	Remove and discard	
		j. Spring (17), shim(s) (18) and poppet (19)	Remove	From body (5)
<b>NOTE</b>				
Spring (17) and shim(s) (18) are matched set. Retain shim(s) for reassembly with original spring (17).				
3	Gland (2)	a. O-ring (20) b. O-ring (21), U-cup seal (22) and backup ring (23)	Remove and discard Remove and discard	From gland (2) From bore in gland (2)

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

(2) Power Assist Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
4	Spool (9) and cap (11)	a. Spool (9)	Position and clamp	In soft-jawed vise, with retaining ring (24) facing upward
<b><u>WARNING</u></b>				
Exercise care when removing retaining ring (24). There will be spring tension against the spool cap (11). Failure to do so may cause injury to your eyes by spool cap.				
		b. Retaining ring (24)	Expand and remove	Use retaining ring pliers. Discard ring (24)
		c. Spool cap (11) and spring (25)	Lift and remove	From spool (9)
		d. O-ring (26), U-cup seal (27) and backup ring (28)	Remove and discard	From bore in spool cap(11 )
5	Body (5)	a. Backup ring (29), U-cup seal (30) and O-ring (31)	Remove and discard	From bore in body (5)
		b. Retaining ring (32) and filter (33)	Remove	From breather hole in body (5)
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*c. Hydraulic Brake Valve (cont).*

(2) Power Assist Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
6		All parts	Clean	Use cleaning solvent P-D-680. Dry parts except breather filter (33), with compressed air
7		Internal metal parts	Flush	After cleaning, remove all traces of cleaning solvent by flushing with clean hydraulic oil
INSPECTION				
8		Springs (14 and 25)	Inspect	Replace if cracked, distorted or broken
9		Spring (17) and shim(s) (18)	Inspect	Replace power assist unit if cracked or damaged
10		Cap screws (3), lock washers (4), body (5), end plug (15) and gland (2)	Inspect	Replace if cracked, worn, or threads damaged, or body bore scored, pitted or burred
11		Push rod (7), spool (9), piston (10), spool cap (11) and poppet (19)	Inspect	Replace if cracked, scored, pitted or burred
REASSEMBLY/REPAIR				
12	Body (5)	a. Breather filter (33) b. Retaining ring (32)  c. Body (5)  d. O-ring (31) e. U-cup seal (30) and O-ring (31) f. Backup ring (29)	Install Install  Lubricate  Install Install Install	In breather hole of body (5) Push into breather hole until ring (32) is against shoulder of hole  Lightly coat bore at rear of body with hydraulic oil In seal (30) In groove of bore at rear of body (5), with lips of seal (30) facing body Push against flat side of U-cup seal (30) in body bore
13	Spool (9) and cap(11)	a. O-ring (26) b. Spool cap (11)  c. Backup ring (28)	Install Lubricate  Install	In U-cup seal (27) Lightly coat open end of bore with hydraulic oil Push against flat side of seal (27) in spool cap bore

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

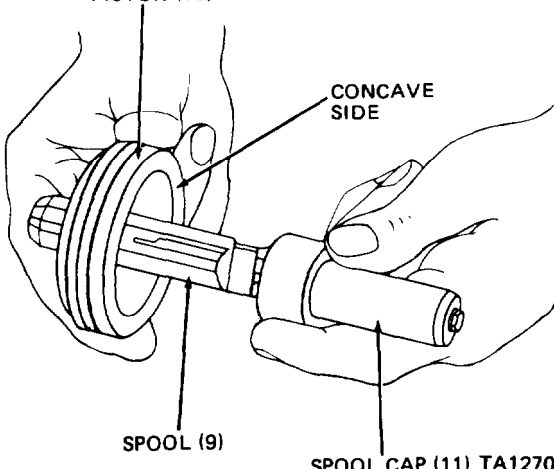
(2) Power Assist Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY/REPAIR (cont)				
13 (cont)		d. U-cup seal (27) and O-ring (26)	Install	In groove of spool cap bore, with lips of seal (27) facing open end of bore
		e. Spool (9)	Position and clamp	In soft-jawed vise, with narrow end of spool facing up
		f. Spring (25)	Install	Slide over narrow end of spool (9)
<b><u>CAUTION</u></b>				
Exercise care when installing spool cap (11) so as not to damage U-cup seal (27).				
		g. Spool cap (11)	Install	Push wide end of spool cap (11) down over spool (9) and against pressure of spring (25)
		h. Retaining ring (24)	Install	Push into groove at end of spool cap, and close with pliers until ring is tight in groove
14	Gland (2)	a. O-ring (21)	Install	In U-cup seal (22)
		b. Gland (2)	Lubricate	Lightly coat bore with hydraulic oil
		c. Backup ring (23)	Install	Push against flat side of seal (22) in gland bore
		d. U-cup seal (22) and O-ring (21)	Install	In groove of gland bore, with lips of seal (22) toward inner face of gland
		e. O-ring (20)	Install	In groove at outside diameter of gland (2)
15	Power assist unit	a. Body (5)	Position and clamp	In vise, with gland end facing down
		b. Poppet (19)	Lubricate	Lightly coat with hydraulic oil
<b><u>CAUTION</u></b>				
Exercise care so as not to scratch or damage poppet (19) during installation.				
		c. Poppet (19)	Install	In relief valve bore of body (5), with narrow end of poppet facing up. Be sure poppet goes all the way down to the seat
<b><u>NOTE</u></b>				
Spring (17) and shim(s) (18) are matched for proper relief pressure. Reassemble power assist unit using original spring and shim(s) only.				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont)

(2) Power Assist Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY/REPAIR (cont)				
15 (cont)		d. Shim(s) (18)	Install	If used, slide over narrow end of poppet onto shoulder
		e. Spring (17)	Install	On poppet (19)
		f. O-ring (16)	Install	Over threaded end of plug (15)
		g. End plug (15)	Install and tighten	Push over spring (17) and turn clockwise until securely mounted to body (5)
		h. Body (5)	Reposition and clamp	In vise, with gland end facing up
		i. Spring (14) and retainer (13)	Install	In body bore
		j. Piston ring (12)	Install on piston (10)	Use piston ring pliers
		k. Spool (9)	Lubricate	Lightly coat piston end of spool with hydraulic oil
		l. Piston (10)	Install as shown	PISTON (10)
		m. Piston (10) and piston ring (12)	Lubricate	Lightly coat outer surface with hydraulic oil
	n. Spool cap (11), spool (9) and piston (10)	Install	Position spool cap (11) into bore of body; then lower spool, cap and piston assembly onto spring (14)	
	o. O-ring (20) and U-cup seals (22 and 30)	Lubricate	Lightly coat with hydraulic oil	
				
<b>CAUTION</b>				
Exercise care so as not to damage U-cup seals (22 and 30) when installing gland (2).				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

c. Hydraulic Brake Valve (cont).

(2) Power Assist Unit (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY/REPAIR (cont)</b>				
15 (cont)		p. Gland (2)	Install	Carefully push onto spool (9); then push gland down against pressure of spring (14) and screw several turns into body (5)
		q. Spool (9)	Push down	To verify that spool cap (11) moves smoothly through bore
		r. Gland (2)	Tighten	Use spanner wrench or chain wrench
		s. Rubber cover (1)	Install	Push large end of cover onto groove around outside of gland (2)
		t. Body (5)	Remove	From vise
<b>INSTALLATION/REPLACEMENT</b>				
16	Front chassis, bottom left side	a. Push rod (7)	Install	Screw clockwise onto yoke (8)
		b. Power assist unit	Position	Slide rubber cover (1) over push rod (7). Position bracket, with hydraulic ports in body facing down
		c. Four lock washers (4) and cap screws (3)	Install through bracket and tighten	Until power assist unit is securely mounted
		d. Hydraulic lines and fittings	Connect to ports on body (5) and tighten	Para 2-48b(2)
		e. Brake master cylinder	Install	Para 2-43c(1)
		f. Brake pedal	Adjust free travel	Para 2-43e
		g. Power assist unit	Test relief pressure	Para 2-41, MALFUNCTION 8, step 7
		h. Brake pedal	Depress	With engine running. Check for proper brake operation

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*d. Declutch Valve.*

- |                   |                |                 |
|-------------------|----------------|-----------------|
| This task covers: | a. Removal     | e. Reassembly   |
|                   | b. Disassembly | f. Installation |
|                   | c. Cleaning    | g. Adjustment   |
|                   | d. Inspection  |                 |

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

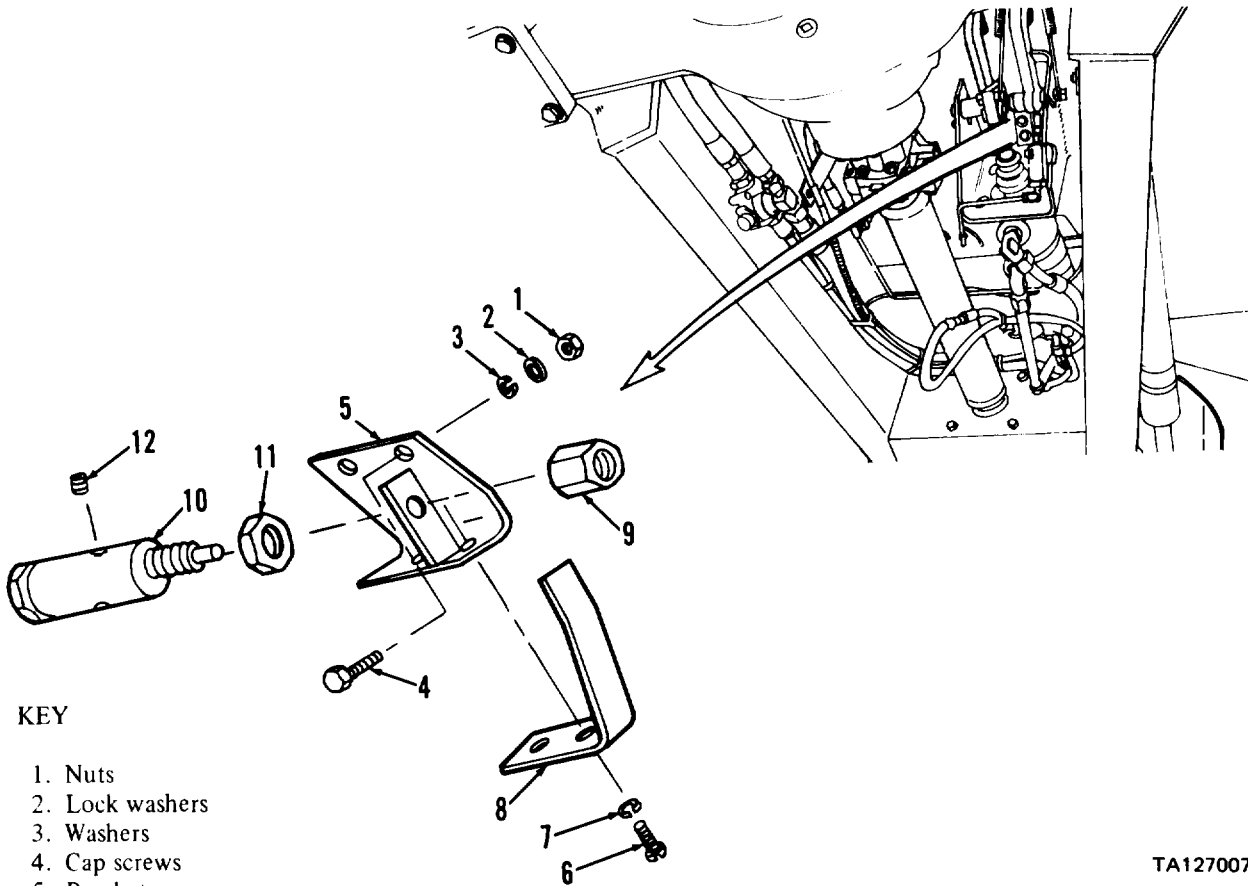
Condition Description

Engine off.  
Vehicle parked on level surface, wheels blocked, and parking brake applied.  
Brake hoses, lines and fittings disconnected from declutch valve

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

2-43b



KEY

1. Nuts
2. Lock washers
3. Washers
4. Cap screws
5. Bracket
6. Screws
7. Lock washers
8. Flat spring
9. Nut
10. Declutch valve
11. Lock nut
12. Pipe plug

TA127007



**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*d. Declutch Valve (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front chassis, bottom left side	a. Two nuts (1), lock washers (2), flat washers (3) and cap screws (4)	Loosen and remove	Support bracket (5)
		b. Bracket (5) and valve (10)	Remove	Lower from pedal bracket
<b>DISASSEMBLY</b>				
2	Declutch valve (10)	a. Two screws (6) and lock washers (7)	Remove	From spring (8) and bracket (5)
		b. Flat spring (8)	Remove	From bracket (5)
		c. Nut (9)	Loosen and remove	From valve (10)
		d. Declutch valve (10)	Remove	From bracket (5)
		e. Lock nut (11) and pipe plug (12)	Loosen and remove	From valve (10)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
3		Declutch valve (10)	Clean	Wipe exterior and shaft with cloth moistened in cleaning solvent P-D-680
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
4		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air

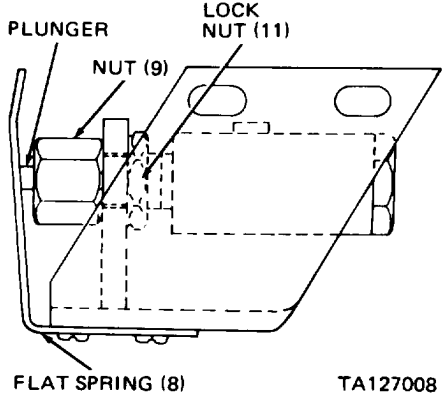
**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*d. Declutch Valve (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
5		Spring (8)	Inspect	Replace if cracked, distorted or damaged
6		All other parts	Inspect	Replace if cracked, worn, or threads damaged
<b>REASSEMBLY</b>				
7	Declutch valve (10)		<b>NOTE</b>	
Remove and discard bleeder valve and washer supplied with new declutch valve (10).				
		a. Pipe plug (12)	Install and tighten	Until securely mounted on valve (10)
		b. Lock nut (11)	Install	On shaft of valve (10)
		c. Declutch valve (10)	Position	On bracket (5)
		d. Nut (9)	Install	On shaft of valve (10). Do not tighten nuts (9 and 11) at this time.
		e. Flat spring (8)	Position	On bracket (5)
		f. Two lock washers (7) and screws (6)	Install and tighten	Until spring (8) is securely mounted
<b>INSTALLATION</b>				
8	Front chassis, bottom left	a. Bracket (5) and valve (10)	Position	On pedal bracket
		b. Two cap screws (4), washers (3), lock washers (2) and nuts (1)	Install	On pedal bracket and valve bracket (5). Do not tighten at this time
		c. Brake hoses, lines and fittings	Reconnect to valve (10) and tighten	Para 2-43b
<b>NOTE</b>				
Be sure to bleed brake system (para 2-43a, step 16).				

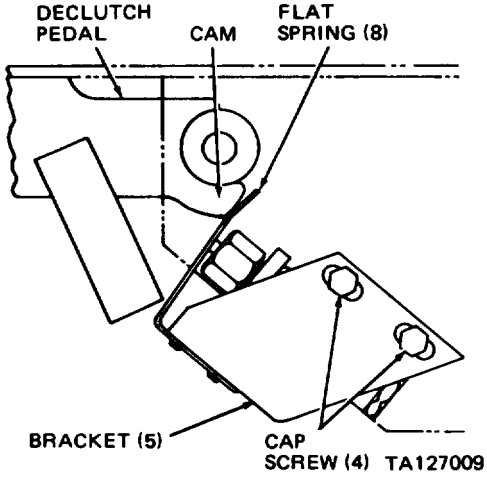
**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*d. Declutch Valve (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>ADJUSTMENT</b>				
9	Declutch valve (10)	a. Declutch valve (10)	Position	On bracket (5) so that valve plunger just makes contact with flat spring
 <p>The diagram shows a side view of the declutch valve assembly. A vertical plunger is mounted on a bracket. A nut (9) is threaded onto the plunger, and a lock nut (11) is threaded onto the bracket. A flat spring (8) is positioned at the bottom of the plunger's travel. The diagram is labeled TA127008.</p>				
<p>b. Nuts (9 and 11)                      Tighten against bracket (5)                      To secure adjustment</p>				
<p>c. Flat spring (8)                      Gently pull from plunger and release                      To check adjustment. When released, spring (8) should contact valve plunger without depressing plunger</p>				
<b>NOTE</b>				
<p>If necessary, repeat steps a and b above, and recheck adjustment (step c above) before proceeding.</p>				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*d. Declutch Valve (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENT (cont)				
10	Bracket (5)	a. Bracket (5)	Position	On pedal bracket, so that flat spring (8) just makes contact with cam on declutch pedal without depressing valve plunger
				
		b. Two cap screws (4)	Tighten	To secure adjustment

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*e. Brake Pedal and Declutch Pedal.*

- |                   |                |                 |
|-------------------|----------------|-----------------|
| This task covers: | a. Removal     | e. Reassembly   |
|                   | b. Disassembly | f. Installation |
|                   | c. Cleaning    | g. Adjustment   |
|                   | d. Inspection  |                 |

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit  
 Hard Wooden Blocks (2), 6 by 6 by 18 inches

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

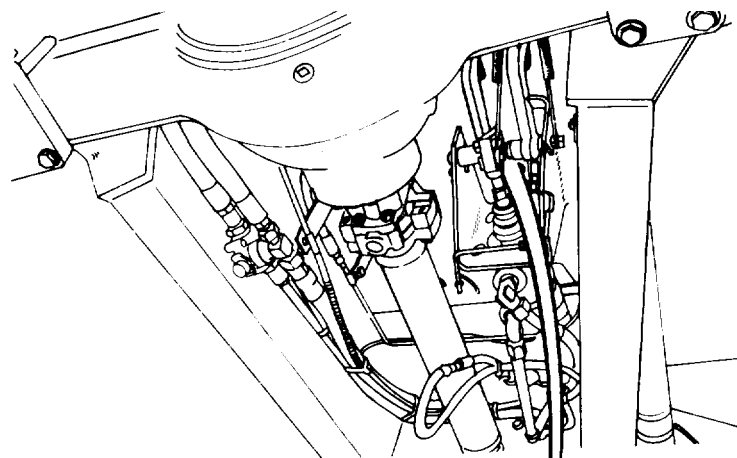
Condition Description

2-53i

Engine off.  
 Vehicle parked on level surface, wheels blocked, and parking brake applied.  
 Chassis floor plate removed.

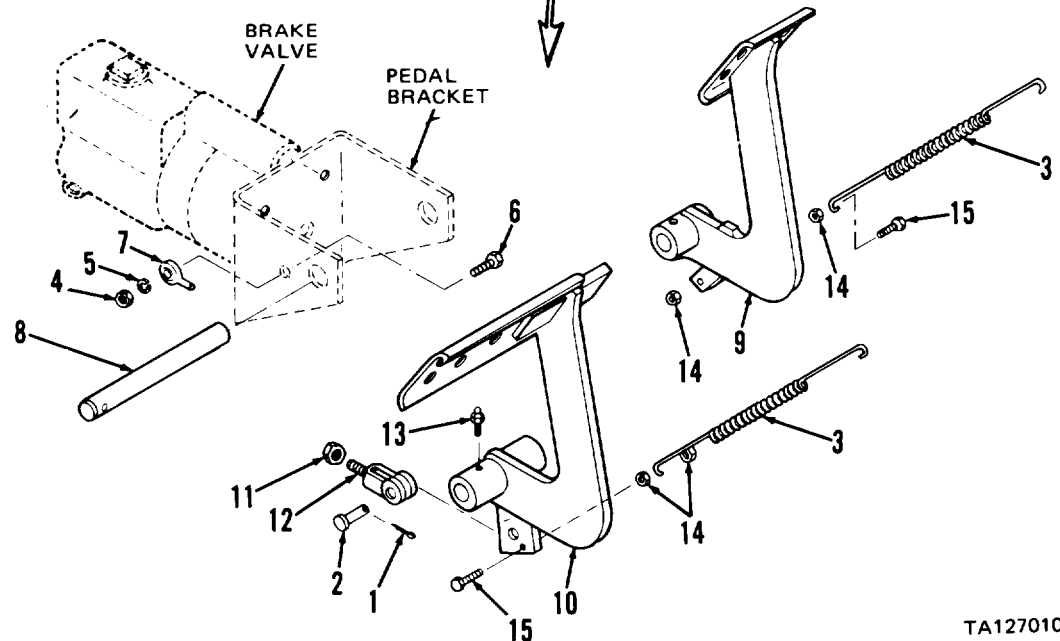
**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Clean cloths  
 Grease (MIL-G-10924)



**KEY**

1. Cotter pin
2. Clevis pin
3. Return springs
4. Nut
5. Lock washer
6. Cap screw
7. Eye rod
8. Pivot pin
9. Declutch pedal
10. Brake pedal
11. Lock nut
12. Brake pedal yoke
13. Grease fittings
14. Lock nuts
15. Cap screws



TA127010

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*c. Brake Pedal and Declutch Pedal (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front chassis, bottom left side	a. Cotter pin (1) and clevis pin (2) b. Two springs (3) c. Nut (4), lock washer (5) and cap screw (6) d. Eye rod (7) e. Pivot pin (8) f. Declutch pedal (9) and brake pedal (10) g. Lock nut (11) h. Brake pedal yoke (12)	Remove Unhook and remove Loosen and remove Pull and remove Pull and remove Lower and remove Loosen Remove	Use pliers Support eye rod (7) From pivot pin (8) Support pedals (9 and 10) From vehicle Unscrew from nut on brake valve push rod Unscrew from brake valve push rod
<b>DISASSEMBLY</b>				
2	Pedals (9 and 10)	a. Two grease fittings (13) b. Two lock nuts (14) and cap screws (15)	Remove Loosen and remove	From pedals From pedals
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*e. Brake Pedal and Declutch Pedal (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
4		Springs (3)	Inspect	Replace if cracked, distorted, or coil broken
5		Pivot pin (8), declutch pedal (9), brake pedal (10), yoke (12) and pins (1 and 2)	Inspect	Replace if worn, pitted, burred or damaged
6		All hardware	Inspect	Replace if worn, or if threads damaged
REASSEMBLY				
7	Pedals (9 and 10)	a. Cap screws (15) b. Two lock nuts (14)	Position Install and tighten	On pedal spring bracket. Until screw (15) is securely mounted
		c. Two lock nuts (14)	Install	On end of cap screw (15). Do not tighten against inside lock nut (14) or spring bracket on pedal
		d. Two grease fittings (13)	Install and tighten	Until fitting (13) is securely mounted
INSTALLATION				
8	Front chassis, bottom left side	a. Lock nut (11) b. Brake pedal yoke (12)	Install Install	On brake pedal yoke (12) Turn clockwise into brake valve push rod
<b>NOTE</b>				
Do not tighten lock nut (11) against brake valve push rod at this time.				
		c. Pedals (9 and 10) and pivot pin (8)	Position and install	On pedal bracket
		d. Eye rod (7)	Push in	Pivot pin (8)
		e. Cap screw (6), lock washer (5) and nut (4)	Install and tighten	Until eye rod (7) is securely mounted
		f. Two springs (3)	Install	
		g. Brake pedal yoke (12)	Position	On brake pedal (10)

**2-43. SERVICE BRAKE MAINTENANCE (cont)**

*e. Brake Pedal and Declutch Pedal (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
(cont)		h. Clevis pin (2) and cotter pin (1)	Install	On yoke (12) and brake pedal (10)
ADJUSTMENT				
9	Declutch valve	Declutch valve and bracket	Adjust	Para 2-43d
10	Brake pedal (10) and yoke (12)	a. Rubber cover	Remove	Pull cover from gland on hydraulic brake valve
		b. Push rod	Adjust	Turn push rod in or out until free travel of brake pedal is 1/2 to 7/8 inch as shown
		c. Lock nut (11)	Tighten against push rod	To secure adjustment
		d. Rubber cover	Install	Push large end of cover over groove at brake unit gland



**Section VIII. WHEELS AND STEERING MAINTENANCE**

This section contains the information you'll need to maintain the:

- Wheels and tires
- Steering system

It gives you instructions on how to troubleshoot problems, and repair or replace the components that are within the scope of organizational maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	2-44	Steering System Maintenance . . . . .	2-48
Wheels and Tires Troubleshooting . . . . .	2-45	Hydraulic Pump . . . . .	2-48a
Steering System Troubleshooting . . . . .	2-46	Hoses, Lines and Fittings . . . . .	2-48b
Wheels and Tires Maintenance . . . . .	2-47	Steering Cylinder Assembly . . . . .	2-48c

**2-44. TROUBLESHOOTING SYMPTOM INDEX**

NOTE

A hydraulic system schematic is located at the back of this manual in appendix F.

	Para/Malfunction	Page
<b>WHEELS AND TIRES</b>		
Tires wearing unevenly . . . . .	2-45/1	2-319
Noisy or bumping sound while traveling . . . . .	2-45/2	2-320
<b>STEERING SYSTEM</b>		
Vehicle will not turn when steering wheel is turned . . . . .	2-46/1	2-321
Vehicle turns correctly in one direction but not in other direction . . . . .	2-46/2	2-322
Steering wheel turns hard or vehicle turns too slow . . . . .	2-46/3	2-323
Effort to turn in one direction is more than required in other direction . . . . .	2-46/4	2-324

**2-45. WHEELS AND TIRES TROUBLESHOOTING**

**MALFUNCTION**

**TEST OR INSPECTION**

**CORRECTIVE ACTION**

**1. TIRE WEARING UNEVENLY**

- Step 1. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving.  
 Remove shipping lock pin from storage area under operator's seat (para 2-4b (1)) and install in chassis.  
 Ensure that parking brake is in released position.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

- Raise one axle and wheels off ground.  
 Rotate wheel by hand; there should be a very slight drag on wheel.  
 Repeat above for remaining wheel and axle.

<p><b>2-45. WHEELS AND TIRES TROUBLESHOOTING (cont)</b></p>
---

<p>MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION</p>
---

1. TIRE WEARING UNEVENLY (cont)

Step 1. (cont)

- a. If there is excessive drag on wheels, adjust brakes (para 2-43a).
- b. If there is a very slight drag on wheels, proceed to step 2.

Step 2. With wheel off ground (step 1 above), check wheel bearing adjustment (use pry bar to check for any noticeable end play).

- a. If there is any noticeable end play, adjust wheel bearing (para 2-39f).
- b. If there is no noticeable end play, remove axle shaft (para 2-39f) and check that wheel bearing is lubricated. If wheel bearing is lubricated, check it for damage (para 2-39f); replace wheel bearing if necessary.

2. NOISY OR BUMPING SOUND WHILE TRAVELING

Step 1. Check wheel lug nuts for tightness (should be tightened to 240-260 pounds foot torque).

- a. If lug nuts are loose, tighten to 240-260 pounds foot torque.
- b. If lug nuts are tight, proceed to step 2.

Step 2. Place blocks (6 by 6 by 18 inches wood blocks) at each wheel to prevent vehicle from moving. Remove shipping lock pin from storage area under operator's seat (para 2-4b (1)) and install in chassis. Ensure that parking brake is in released position.

**WARNING**

Before raising axle off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Raise one axle and wheels off ground.  
Rotate wheel by hand while listening for a rumbling or grinding sound within axle.  
Repeat for other wheel and axle.

- a. If rumbling or grinding sound is heard, replace axle shaft (para 2-39f).
- b. If rumbling or grinding sound is not heard, proceed to step 3.

Step 3. With wheel off ground (step 2 above), check wheel bearing adjustment (use pry bar to check for any noticeable end play).

- a. If there is noticeable end play, adjust wheel bearing (para 2-39f).
- b. If there is no noticeable end play, proceed to step 4 below.

---

## 2-45. WHEELS AND TIRES TROUBLESHOOTING (cont)

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 2. NOISY OR BUMPING SOUND WHILE TRAVELING (cont)

Step 4. Remove axle shaft (para 2-39f) and check wheel bearing for damage and insufficient lubricant (para 2-39f).

- a. If insufficient lubricant, lubricate wheel bearing (para 2-39f); if wheel bearing is damaged, replace (para 2-39f).
- b. If wheel bearing is okay, reinstall hub and drum assembly and axle shaft (para 2-39f), and remove wheels and tires (para 2-47). Disassemble tire from wheel and check for foreign material or damage (para 2-47); remove foreign material or replace tire if damaged (para 2-47).

---

## 2-46. STEERING SYSTEM TROUBLESHOOTING

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 1. VEHICLE WILL NOT TURN WHEN STEERING WHEEL IS TURNED

Step 1. Check oil level in hydraulic reservoir.

Oil level should be between FULL and ADD marks with mast lowered.

- a. If oil level is not between FULL and ADD marks on dipstick with mast lowered, add oil (refer to current lubrication order).
- b. If oil level is okay, proceed to step 2 below.

Step 2. Check that steering bypass valve is closed (extreme clockwise position).

- a. If steering bypass valve is not in closed position, turn to the extreme clockwise position.
- b. If steering bypass valve is closed, proceed to step 3.

Step 3. Check for oil leaks at connections to steering cylinders.

- a. If oil leaks are observed, tighten fittings or replace hoses (para 2-48b (1)).
- b. If oil leaks are not observed, proceed to step 4.

Step 4. Start engine and operate at full throttle.

Operate lift control lever, tilt control lever, and shift control lever.

Check that mast assembly operates normally when levers are actuated.

- a. If mast assembly does not operate normally, proceed to step 5.
- b. If mast operates normally, replace steering gear (notify direct support maintenance).

**2-46. STEERING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. VEHICLE WILL NOT TURN WHEN STEERING WHEEL IS TURNED (cont)

Step 5. Check setting of relief valve (para 2-48b (2), step 22).

- a. If pressure indication is not 2500-2550 PSI. adjust relief valve (para 2-48b (2). step 23).
- b. If pressure indication is 2500-2550 PSI, replace steering gear (notify direct support maintenance).

2. VEHICLE TURNS CORRECTLY IN ONE DIRECTION BUT NOT IN OTHER DIRECTION

Step 1. Check hoses, lines and fittings between steering gear and steering cylinders for oil leaks (para 2-48b).

- a. If oil leaks are observed, tighten fittings or replace hoses (para 2-48b).
- b. If oil leaks are not observed, proceed to step 2.

Step 2. Check steering cylinders for oil leaks at rod end.

- a. If oil leaks are observed, replace steering cylinder.
- b. If oil leaks are not observed, proceed to step 3.

Step 3. Check steering gear for oil leaks at fittings.

- a. If oil leaks are observed, tighten fittings.
- b. If oil leaks are not observed, proceed to step 4.

Step 4. Rotate steering wheel until vehicle is fully turned (articulated) to the left.

With engine off, loosen two clamps and slide cylinder guard toward front of vehicle, and disconnect hose from elbow as shown.

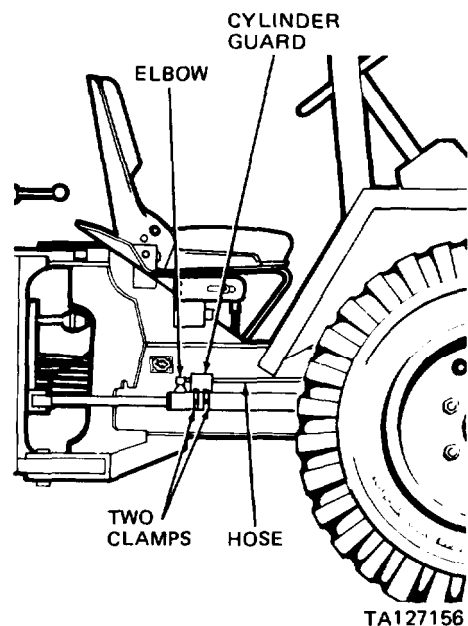
**WARNING**

Keep hands and feet clear of steering cylinder assembly while checking for leakage. Failure to do so may cause serious injury.

Start engine and hold steering wheel at the full left turn position.

Check for hydraulic oil leakage from the open steering cylinder elbow, then stop engine.

- a. Hydraulic oil coming from open steering cylinder elbow indicates internal steering cylinder leakage. Replace steering cylinder assembly (para 2-48c).
- b. If hydraulic oil does not leak from open steering cylinder elbow, reconnect hose to elbow, reinstall clamps and cylinder guard and proceed to step 5.



TA127156

**2-46. STEERING SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

**2. VEHICLE TURNS CORRECTLY IN ONE DIRECTION BUT NOT IN OTHER DIRECTION (cont)**

Step 5. Rotate steering wheel until vehicle is fully turned (articulated) to the right.  
With engine off, loosen two clamps and slide cylinder guard toward front of vehicle, and disconnect hose from elbow as shown.

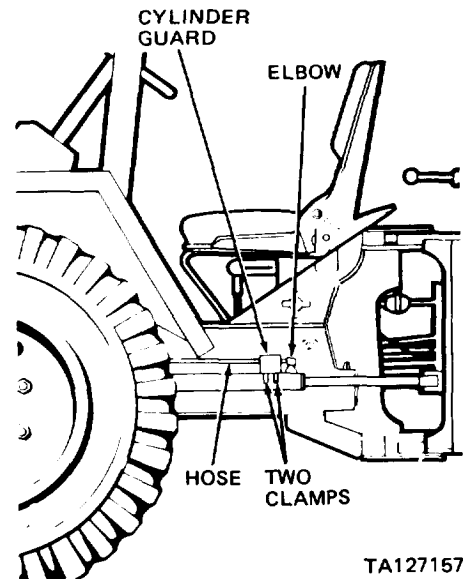
**WARNING**

Keep hands and feet clear of steering cylinder assembly while checking for leakage. Failure to do so may cause serious injury.

Start engine and hold steering wheel at the full right turn position.

Check for hydraulic oil leakage from the open steering cylinder elbow, then stop engine.

- a. Hydraulic oil coming from open steering cylinder indicates internal steering cylinder leakage. Replace steering cylinder assembly (para 2-48c).
- b. If hydraulic oil does not leak from open steering cylinder elbow, replace steering gear (notify direct support maintenance).

**3. STEERING WHEEL TURNS HARD OR VEHICLE TURNS TOO SLOW**

Step 1. Check pressure in all tires (should be 45 PSI).

- a. If tire pressure is not 45 PSI in all tires, adjust to 45 PSI.
- b. If tire pressure is okay in all tires, proceed to step 2.

Step 2. Check oil level in hydraulic reservoir.  
oil level should be between FULL and ADD marks with mast lowered.

- a. If oil level is not between FULL and ADD marks on dipstick with mast lowered, add oil (refer to current lubrication order).
- b. If oil level is okay, proceed to step 3 below.

Step 3. Check steering cylinders for oil leaks at rod end.

- a. If oil leaks are observed, replace steering cylinder.
- b. If oil leaks are not observed, proceed to step 4.

**2-46. STEERING SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

.3. STEERING WHEEL TURNS HARD OR VEHICLE TURNS TOO SLOW (cont)

Step 4. Perform step 4 of paragraph 246, MALFUNCTION 2.

a. If hydraulic oil leaks from open steering cylinder elbow, replace steering cylinder assembly (para 2-48c).

b. If hydraulic oil does not leak from open steering cylinder elbow, proceed to step 5.

Step 5. Perform step 5 of paragraph 2-46, MALFUNCTION 2.

a. If hydraulic oil leaks from open steering cylinder elbow, replace steering cylinder assembly (para 2-48c).

b. if hydraulic oil does not leak from open steering cylinder elbow. proceed to step 6.

Step 6. Check pressure setting of relief valve (para 2-48b (2), step 22).

a. If pressure indication is not 2500-2550 PSI, adjust relief valve (para 2-48b (2), step 23).

b. If pressure indication is 2500-2550 PSI, replace steering gear (notify direct support maintenance).

4. EFFORT TO TURN IN ONE DIRECTION IS MORE THAN REQUIRED IN OTHER DIRECTION

Check steering gear for internal wear/damage (notify direct support maintenance).

Replace steering gear (notify direct support maintenance).

**2-47. WHEELS AND TIRES MAINTENANCE**

This task covers: a. Removal  
 b. Disassembly  
 c. Cleaning

d. Inspection  
 e. Reassembly  
 f. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00754-0654  
 Hard Wooden Blocks (2), 6 by 6 by 18 inches

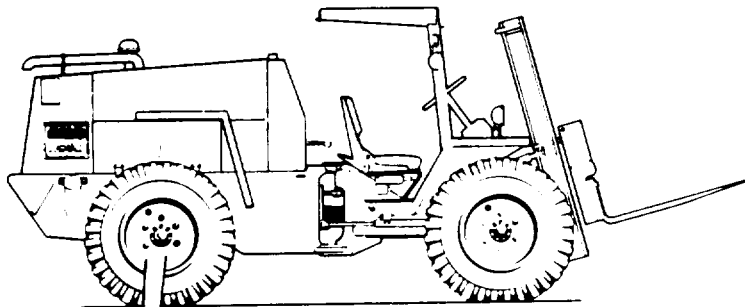
EQUIPMENT CONDITION

Paragraph Condition Description

**WARNING**

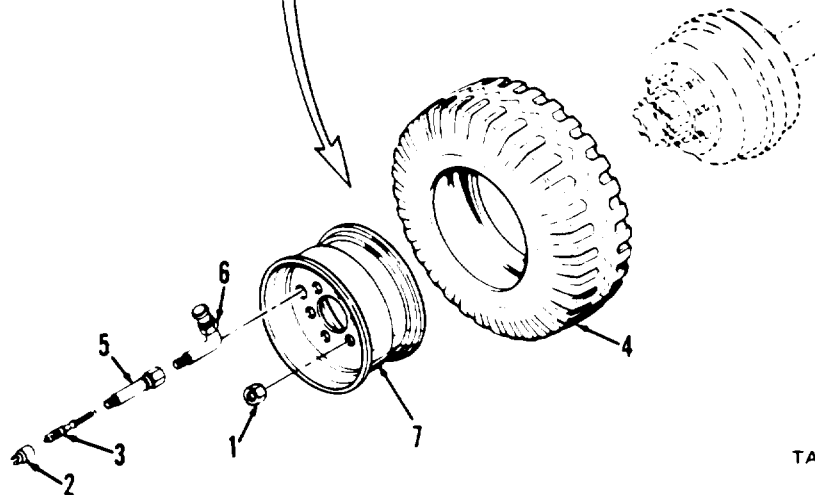
Before raising wheel off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and dip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

24b(1) Shipping lock pin installed. Vehicle parked on level surface, engine off, parking brake applied, wheels not being removed blocked, and wheel and tire to be removed raised off ground.



KEY

- 1. Stud nuts
- 2. Valve cap
- 3. Valve core
- 4. Tire
- 5. Extension valve
- 6. Air valve
- 7. Wheel



TA127012

**2-47. WHEELS AND TIRES MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Tire and wheel to be removed	a. Six stud nuts ( 1 b. Tire and wheel	Remove Remove to work area	
<b>DISASSEMBLY</b>				
2		a. Valve cap (2) b. Valve core (3) c. Tire (4)  d. Extension valve (5) e. Air valve (6)	Remove Remove Deflate and remove Remove Remove	To deflate fire Refer to TM 9-2610-200-24 for remounting procedures.
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680). used to clean parts is toxic and flammable. Wear projective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious Injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		Wheel (7)	Clean	Use cleasning solvent P-D-680; use wire brush to remove rust, corrosion or old rubber
<b>INSPECTION</b>				
4		Stud nuts (1)	Inspect	Replace if cracked, distorted, or threads damaged
5		Air valve (6), valve cap (2), extension valve (5), and valve core (3)	Inspect	Replace if bent, distorted, cracked, or threads damaged
6		Tire (4)	Inspect inside of tire	Replace if casing damaged or fabric and cord damaged. Remove foreign material
7		Wheel (7)	Inspect	Replace if cracked, bent, or damaged



**2-47. WHEELS AND TIRES MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
reassembly				
8		a. Air valve (6) b. Extension valve (5) c. Valve core (3)	Install in wheel (7) Install on air valve (6) Install	
<b><u>WARNING</u></b>				
Don't overinflate tire: serious injury or death could result				
		d. Tire (4)	Install on wheel (7) and inflate	Inflate to 45 PSI. Refer to TM 9-2610-200-24 for mounting procedures.
		e. Valve cap (2)	Install	
INSTALLATION REPLACEMENT				
9		a. Tire and wheel b. Six stud nuts (1)	Position on axle end Install	Tighten to 240260 pounds foot torque

**2-48. STEERING SYSTEM MAINTENANCE**

*a. Hydraulic Pump.*

This task covers: a. Removal  
 b. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition	Description
	Vehicle parked on level surface. engine off. and parking brake applied.
2-16	Exhaust pipe removed.
2-53d	Top hood removed.
2-53c	Right side panel removed.

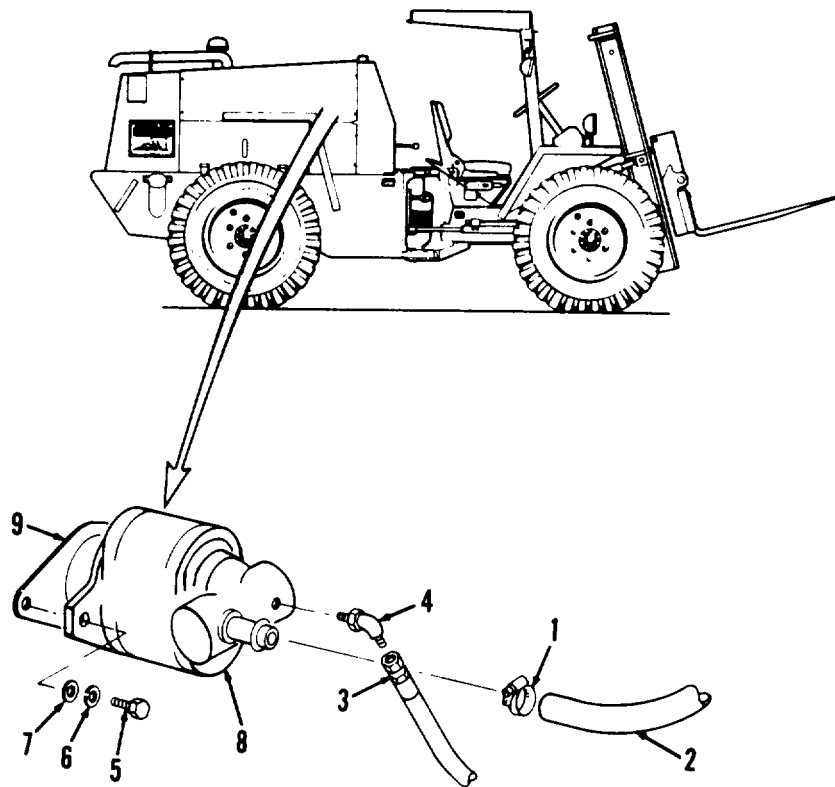
MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Gasket

2-16  
 2-53d  
 2-53c

KEY

- 1. Hose clamp
- 2. Suction hose
- 3. Supply hose fitting
- 4. Connector
- 5. Cap screws
- 6. Lock washers
- 7. Washers
- 8. Hydraulic pump
- 9. Gasket



TA127013

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

a. Hydraulic Pump (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
1	Engine compartment	a. Hydraulic pump (8) and hydraulic connections	Clean	Use cleaning solvent P-D-680
		b. Hose clamp (1)	Loosen	
<b>NOTE</b>				
When disconnecting suction hose in following step, be ready to plug it immediately to prevent loss of oil.				
		c. Suction hose (2)	Disconnect and plug both hose and pump inlet	Prevents intrusion of dirt
		d. Supply hose fitting (3)	Disconnect and plug	Prevents intrusion of dirt
		e. Connector (4)	Remove and plug pump outlet	Prevent intrusion of dirt
		f. Two cap screws (5) and two lock washers (6) and washers (7)	Remove	Support hydraulic pump (8)
		g. Hydraulic pump (8)	Remove	
		h., Gasket (9)	Remove and discard	Clean all traces of gasket material from transmission mating surface
<b>INSTALLATION REPLACEMENT</b>				
2	Engine compartment	a. Gasket (9)	Position on transmission	
		b. Hydraulic pump (8)	Position	
		c. Two washers (7), lock washers (6), and cap screws (5)	Install	
		d. Connector (4)	Install in pump outlet	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*a. Hydraulic Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION REPLACEMENT (cont)				
2 (cont)		e. Supply hose fitting (3)	Connect and tighten	
		f. Suction hose (2)	Connect to pump inlet	
		g. Hose clamp 1)	Position and tighten	
3	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate shift control lever to shift forks right and left several times c. Idle engine and check for oil leaks at hydraulic pump and connections d. Turn engine off	
4	Hydraulic reservoir	Oil level dipstick and fill	Check oil level; add oil if necessary	Refer to current lubrication order

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Installation/Replacement  
 e. Adjustment

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654  
 Pressure Gage (3000 PSI maximum range)

MATERIALS/PARTS

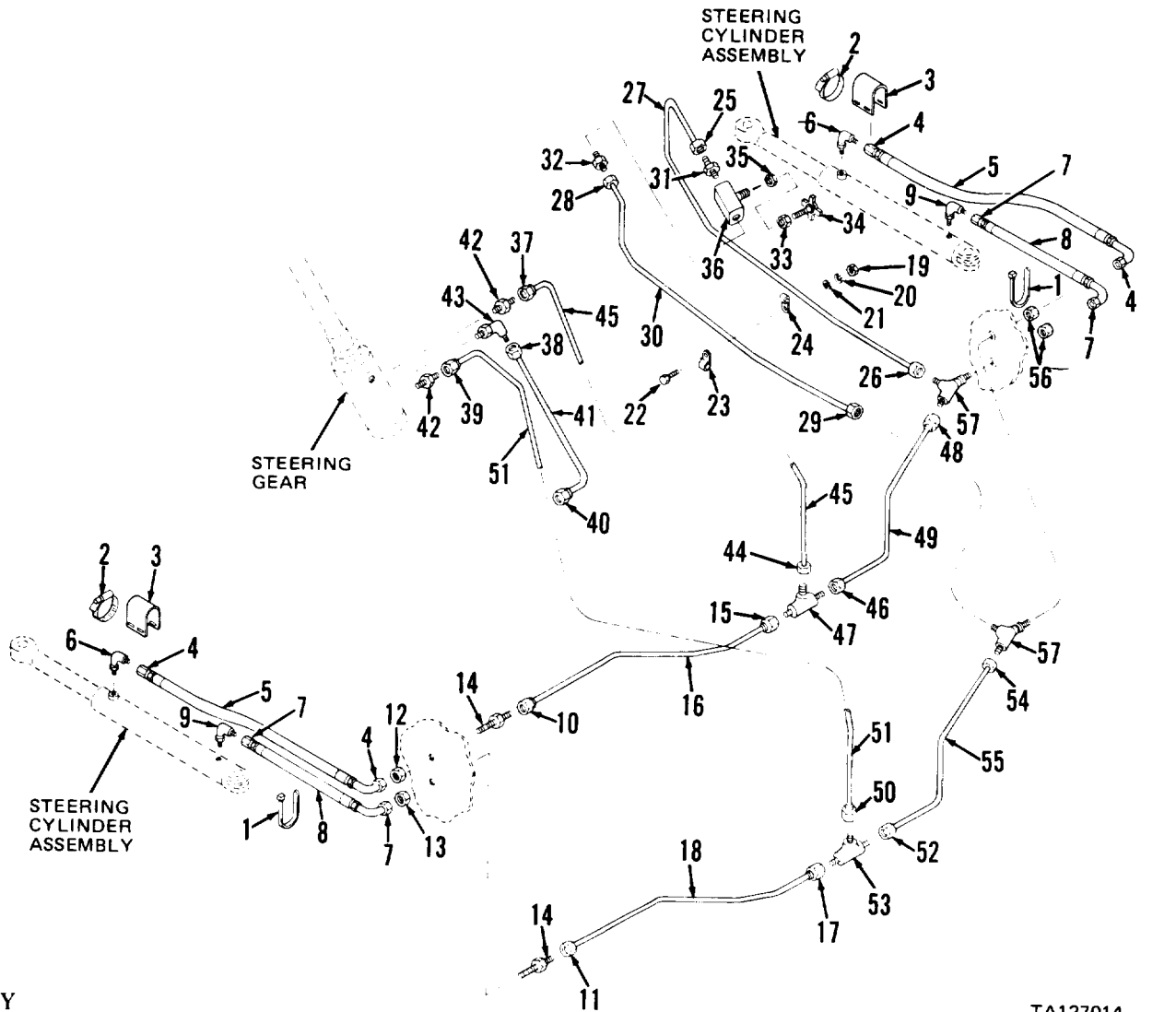
Cleaning solvent P-D-680  
 Clean cloths  
 Oil (MIL-L-2104, SAE 10)  
 Hose, 23 inches long (FSCM 24161 PIN 24 VW)  
 Tie straps (2)

EQUIPMENT CONDITION

Paragraph	Condition Description
	Vehicle parked on level surface, engine off, and parking brake applied.
2-53c	Side panels removed.
2-53h	Noise baffle mat removed.

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*



TA127014

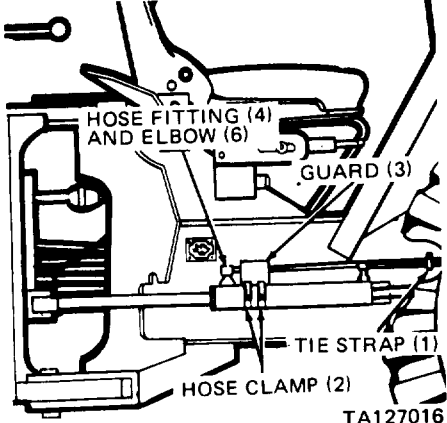
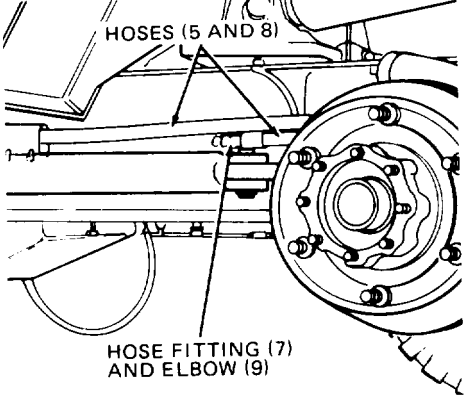
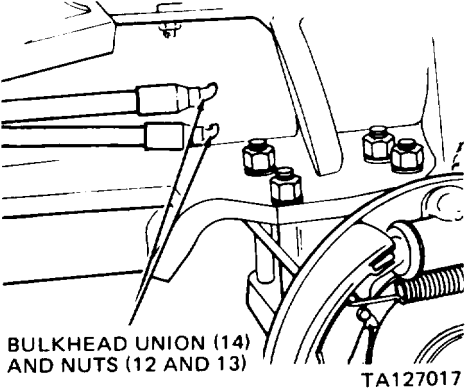
**KEY**

- |                             |                                   |                                   |                                   |
|-----------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. Tie straps               | 17. Tube fitting                  | 31. Connector                     | 45. Steering supply tube assembly |
| 2. Hose clamps              | 18. Steering tube assembly        | 32. Connector                     | 46. Tube fitting                  |
| 3. Steering cylinder guards | 19. Nut                           | 33. Stem nut                      | 47. Steering tube tee             |
| 4. Hose fittings            | 20. Lock washer                   | 34. Valve stem                    | 48. Tube fitting                  |
| 5. Steering supply hoses    | 21. Washer                        | 35. Nut                           | 49. Steering tube assembly        |
| 6. Elbows                   | 22. Cap screw                     | 36. Valve body                    | 50. Tube fitting                  |
| 7. Hose fittings            | 23. Clamp                         | 37. Tube fitting                  | 51. Steering supply tube assembly |
| 8. Steering supply hoses    | 24. Clamp                         | 38. Tube fitting                  | 52. Tube fitting                  |
| 9. Elbows                   | 25. Tube fitting                  | 39. Tube fitting                  | 53. Steering tube tee             |
| 10. Tube fitting            | 26. Tube fitting                  | 40. Tube fitting                  | 54. Tube fitting                  |
| 11. Tube fitting            | 27. Steering bypass tube assembly | 41. Steering return tube assembly | 55. Steering tube assembly        |
| 12. Nut                     | 28. Tube fitting                  | 42. Connectors                    | 56. Nuts                          |
| 13. Nut                     | 29. Tube fitting                  | 43. Adapter                       | 57. Bulkhead unions               |
| 14. Bulkhead unions         | 30. Steering bypass tube assembly | 44. Tube fitting                  |                                   |
| 15. Tube fitting            |                                   |                                   |                                   |
| 16. Steering tube assembly  |                                   |                                   |                                   |

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b Hoses, Lines and Fittings (cont)..*

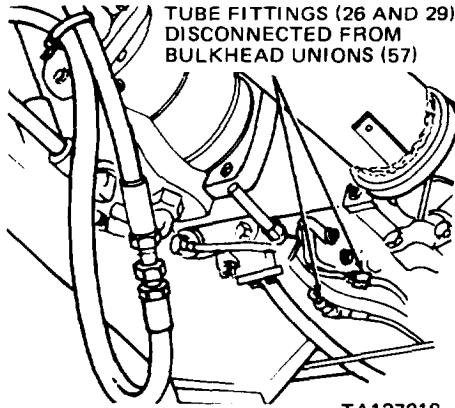
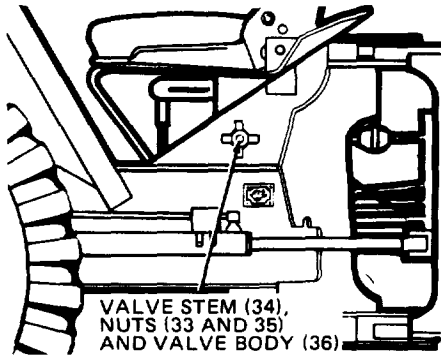
(1) Steering Gear to Steering Cylinder Assemblies.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front chassis side	a. Two tie straps (1)	Remove	 <p>TA127016</p>
		b. Four hose clamps (2)	Remove	
		c. Two steering cylinder guards (3)	Remove	
		d. Two hose fittings (4)	Loosen and disconnect	
		e. Two steering supply hoses (5)	Remove	
		f. Two elbows (6)	Remove	
		g. Four hose fittings (7)	Loosen and disconnect	
		h. Two steering supply hoses (8)	Remove	
		i. Two elbows (9)	Remove	
2	Front chassis, bottom, right side	a. Tube fitting (10)	Loosen and disconnect	 <p>TA127015</p>
		b. Tube fitting (11)	Loosen and disconnect	
3	Front chassis, right side	Nuts (12 and 13)	Remove	 <p>TA127017</p>
4	Front chassis, bottom right side	Two bulkhead unions (14)	Remove	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*h. Hoses, Lines and Fittings (cont).*

(1) Steering Gear-to Steering Cylinder Assemblies front).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
5	Front chassis, bottom center	a. Tube fitting (15) b. Steering tube assembly (16) c. Tube fitting (17) d. Steering tube assembly (18)	Loosen and disconnect Remove Loosen and disconnect Remove	
6	Front chassis, bottom left side	a. Nut (19), lock washer (20), washer (21), and cap screw (22) b. Clamps (23 and 24) c. Tube fittings (25 and 26) d. Steering bypass tube assembly (27) e. Tube fittings (28 and 29) f. Steering bypass tube assembly (30) g. Connectors (31 and 32)	Remove Remove Loosen and disconnect Remove Loosen and disconnect Remove Remove	 <p>TUBE FITTINGS (26 AND 29) DISCONNECTED FROM BULKHEAD UNIONS (57)</p> <p>TA127018</p>
7	Steering bypass valve	a. Stem nut (33) b. Valve stem (34) c. Nut (35) d. Valve body (36)	Loosen while opening valve Remove Support valve body (36) and remove Remove	 <p>VALVE STEM (34), NUTS (33 AND 35) AND VALVE BODY (36)</p> <p>TA127019</p>



**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, tines and Fittings (cont).*

(1) Steering Gear to Steering Cylinder Assemblies (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
8	Operator's compartment, steering gear	Tube fittings (37, 38, and 39)	Loosen and disconnect	
9	Operator's compartment, near control valve	a. Tube fitting (40) b. Steering return tube assembly (41)	Loosen and disconnect Remove	
10	Operator's compartment, steering gear	a. Two connectors (42) b. Adapter (43)	Remove Remove	
1	Front chassis, bottom left side	a. Tube fitting (44) b. Steering supply tube assembly (45) c. Tube fitting (46) d. Steering tube tee (47) e. Tube fitting (48) f. Steering tube assembly (49) g. Tube fitting (50) h. Steering supply tube assembly (51) i. Tube fitting (52) j. Steering tube tee (53) k. Tube fitting (54) l. Steering tube assembly (55) m. Two nuts (56) n. Two bulkhead unions (57)	Loosen and disconnect Remove Loosen and disconnect Remove Loosen and disconnect Remove Loosen and disconnect Remove Loosen and disconnect Remove Loosen and disconnect Remove Remove Remove Remove	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*h. Hoses, Lines and Fittings (cont).*

(1) Steering Gear to Steering Cylinder Assemblies (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<p><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680). used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
12		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
13		Hose clamp (2)	Inspect	Replace if damaged
14		Hose fittings (4 and 7)	Inspect	Replace hose assembly (5 or 8) if damaged
15		Hoses (5 and 8)	Inspect	Replace if cracked, split, or fitting threads damaged
16		Elbow (6 and 9)	Inspect	Replace if cracked, distorted, or threads damaged
17		Tube fittings (10, 11, 15, 17, 25,26,28,29,37 through 40,44,46,48,50,52, and 54)	Inspect	Replace tube assembly (16, 18,27,30,41,45, 49, 51 or 55) if threads damaged
18		Bulkhead unions (14 and 57), connectors (31 ,32, 42), adapter (43), and steering tube tee (47)	Inspect	Replace if cracked, distorted, or threads damaged
19		Tube assemblies ( 16,18, 27,30,41,45,49,51, and 55)	Inspect	Replace if cracked, kinked, dented, twisted, or fitting threads damaged
20		Clamps (23 and 24)	Inspect	Replace if bent or cracked
21		Valve stem (34)	Inspect	Replace if bent, cracked, or twisted
22		Valve body (36)	Inspect	Replace if cracked or threads are damaged

**2-48. STEERING SYSTEM MAINTENANCE (cont)***h. Hoses, Lines and Fittings (cont).***(1) Steering Gear to Steering Cylinder Assemblies (cont).**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT</b>				
23	Front chassis, bottom left side	a. Two bulkhead unions (57) b. Two nuts (56) c. Steering tube assembly (55) d. Tube fitting (54)  e. Steering tube tee (53) f. Tube fitting (52) g. Steering supply tube assembly (51) h. Tube fitting (50) i. Steering tube assembly (49) j. Tube fitting (48)  k. Steering tube tee (47) l. Tube fitting (46) m. Steering supply tube assembly (45) n. Tube fitting (44)	Position on chassis Install Position  Connect to bulkhead union (57) and tighten Position on tube (55) Connect to tee (53) and tighten Position Connect to tee (53) and tighten Position  Connect to bottom union (57) and tighten Position Connect to tee (47) and tighten Position Connect to tee (47) and tighten	
24	Operator's compartment, steering, gear	a. Adapter (43) b. Two connectors (42)	Install Install	
25	Operator's compartment, near control valve	a. Steering return tube assembly (41) b. Tube fitting (40)	Position Connect to tee and tighten	
26	Operator's compartment, steering gear	a. Tube fitting (37)  b. Tube fitting (38)  c. Tube fitting (39)	Connect to top connector (42) and tighten Connect to adapter (43) and tighten Connect to bottom connec- tor (42) and tighten	

**2-48 STEERING SYSTEM MAINTENANCE (cont)**

*h. Hoses, Lines and Fittings (cont).*

(1) Steering Gear to Steering Cylinder Assemblies (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT (cont)</b>				
27	Operator's compartment, just beneath seat	a. Valve body (36) b. Nut (35) c. Valve stem (34) d. Stem nut (33)	Position Install on valve body and tighten Install in body (36) Tighten while closing valve (34)	
28	Front chassis, bottom left side	a. Connectors (31 and 32) b. Steering bypass tube assembly (30) c. Tube fitting (29) d. Tube fitting (28) e. Steering bypass tube assembly (27) f. Tube fitting (25) g. Tube fitting (26) h. Clamps (23 and 24) i. Cap screw (22) j. Washer (21) lock washer (20), and nut (19)	Install in valve body (36) Position Connect to top bulkhead union (57) and tighten Connect to connector (32) and tighten Position Connect to connector (31) and tighten Connect to bottom bulkhead union (57) and tighten Position Install Install	
29	Front chassis, bottom center	a. Steering tube assembly (18) b. Tube fitting (17) c. Steering tube assembly (16) d. Tube fitting (15)	Position Connect to tee (53) and tighten Position Connect to tee (47) and tighten	
30	Front chassis, bottom right side	a. Two bulkhead unions (14) b. Nuts (12 and 13)	Position on side of chassis Install	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

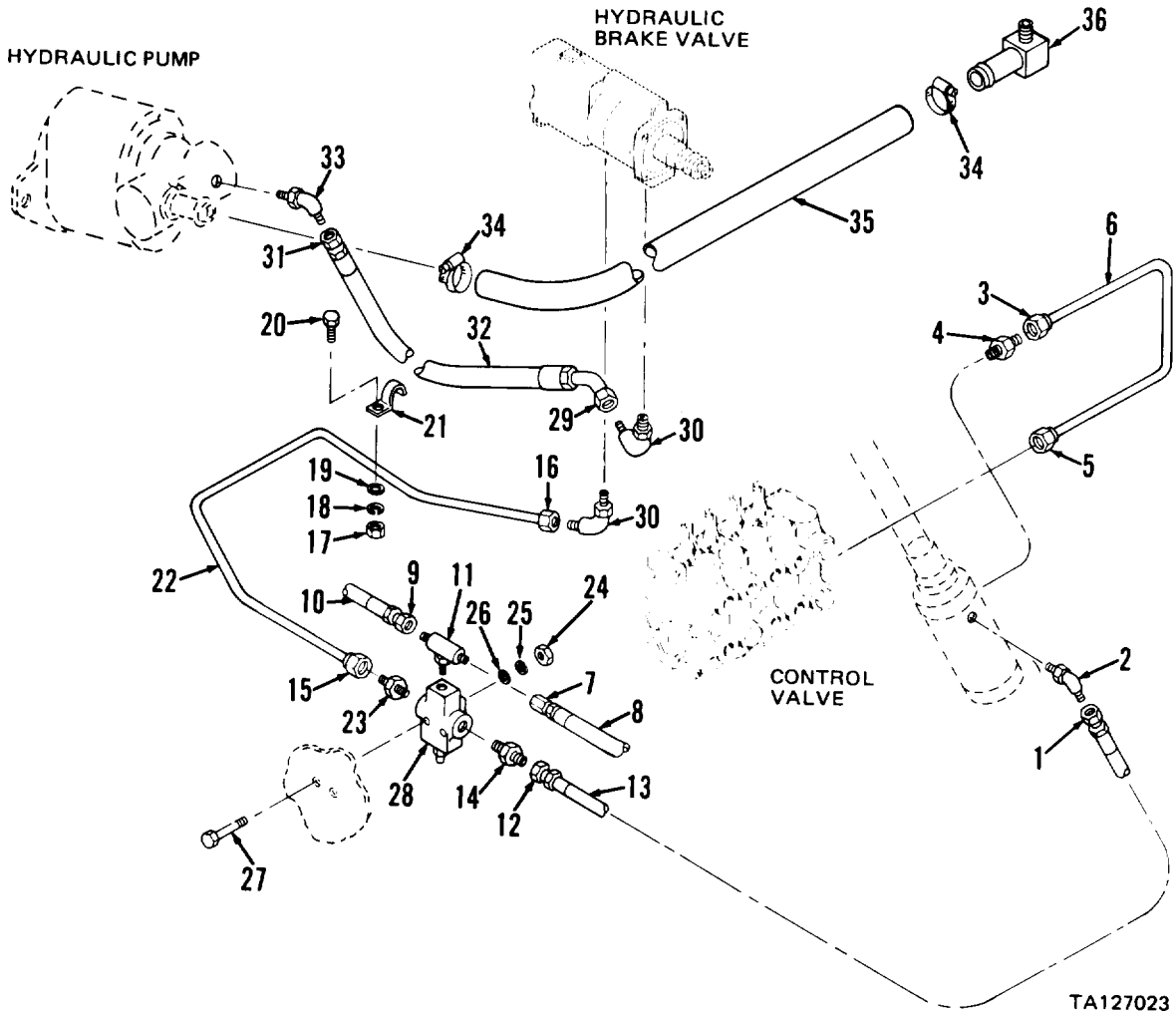
(1) Steering Gear to Steering Cylinder Assemblies (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT (cont)</b>				
30 (cont)		c. Tube fitting (11)	Connect to bottom union (14) and tighten	
		d. Tube fitting ( 10)	Connect to top union (14) and tighten	
31	Front chassis. sides	a. Two elbows (9)	Install	
		b. Two steering supply hoses (8)	Position	
		c. Four hose fittings (7)	Connect to bottom union (14 and 57) and elbow (9); tighten	
		d. Two elbows (6)	Install	
		e. Two steering supply hoses (5)	Position	
		f. Four hose fittings (4)	Connect to elbow (6) and top union (14 and 57); tighten	
		g. Two steering cylinder guards (3)	Position	
		h. Four hose clamps (2)	Thread through guard (3) and around cylinder; tighten	
		i. Two tie straps ( 1 )	Install around hoses (5 and 8) and tie	
32	Hydraulic reservoir	Oil level dipstick and fill	Check level and add if necessary	
33	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate shift control lever to shift forks right and left several times c. Operate engine at idle speed and check for oil leaks at connections d. Turn engine off e. Check hydraulic reservoir oil level (step 32)	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*h. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear.



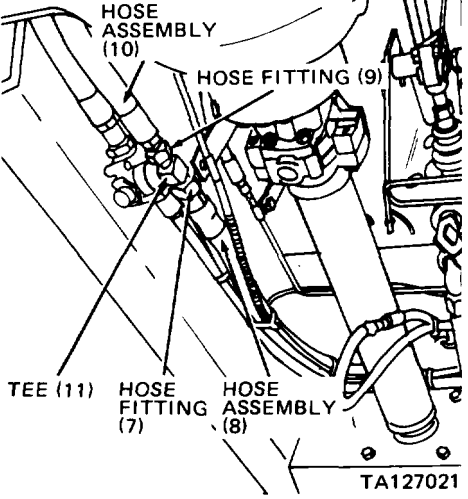
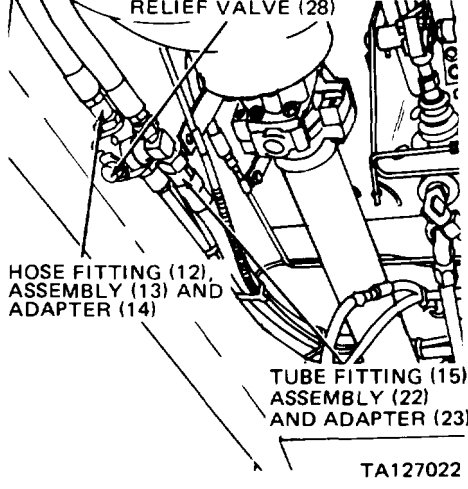
**KEY**

- |                   |                   |                   |
|-------------------|-------------------|-------------------|
| 1. Hose fitting   | 13. Hose assembly | 25. Lock washers  |
| 2. Adapter        | 14. Adapter       | 26. Washers       |
| 3. Tube fitting   | 15. Tube fitting  | 27. Cap screws    |
| 4. Connector      | 16. Tube fitting  | 28. Relief valve  |
| 5. Tube fitting   | 17. Nut           | 29. Hose fitting  |
| 6. Tube assembly  | 18. Lock washer   | 30. Elbow         |
| 7. Hose fitting   | 19. Washer        | 31. Hose fitting  |
| 8. Hose assembly  | 20. Cap screw     | 32. Hose assembly |
| 9. Hose fitting   | 21. Clamp         | 33. Connector     |
| 10. Hose assembly | 22. Tube assembly | 34. Hose clamps   |
| 11. Tee           | 23. Adapter       | 35. Hose          |
| 12. Hose fitting  | 24. Nuts          | 36. Elbow         |

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment, steering gear	a. Hose fitting (1) b. Adapter (2) c. Tube fitting (3) d. Connector (4)	Loosen and disconnect Remove Loosen and disconnect Remove	
2	Operator's compartment, control valve	a. Tube fitting (5) b. Tube assembly (6)	Loosen and disconnect Remove	
3	Front chassis, bottom right side	a. Hose fitting (7) b. Hose fitting (9) c. Tee(11)	Loosen, disconnect and cap; reposition hose assembly (8) Loosen, disconnect and cap; reposition hose assembly (10) Remove	 <p>HOSE ASSEMBLY (10) HOSE FITTING (9) TEE (11) HOSE FITTING (7) HOSE ASSEMBLY (8) TA127021</p>
		d. Hose fitting (12) e. Hose assembly (13) f. Adapter (14) g. Tube fittings (15 and 16) h. Nut (17), lock washer (18), washer (19), and cap screw (20) i. Clamp (21) j. Tube assembly (22) k. Adapter (23)	Loosen and disconnect Remove Remove Loosen and disconnect Remove Remove Remove Remove	 <p>RELIEF VALVE (28) HOSE FITTING (12), ASSEMBLY (13) AND ADAPTER (14) TUBE FITTING (15) ASSEMBLY (22) AND ADAPTER (23) TA127022</p>

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS	
<b>REMOVAL (cont)</b>					
3 (cont)		1. Two nuts (24), lock washers (25), washers (26), and cap screws (27) m. Relief valve (28) n. Hose fitting (29)	Remove  Remove Loosen and disconnect Remove	<p style="text-align: right;">TA127024</p>	
4	Engine compartment, hydraulic pump	a. How fitting (31) b. Hose assembly (32) c. Connector (33)	Loosen and disconnect Remove Remove		
<b>NOTE</b>					
If hose (35) requires replacement, drain hydraulic reservoir before removing hose.					
		d. Two hose clamps (34) e. Hose (35) f. Elbow (36)	Loosen Remove Remove	<p style="text-align: right;">TA127025</p>	
<b>CLEANING</b>					
<b><u>WARNING</u></b>					
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.					



**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
5		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
6		Hose fittings ( 1,7,9,12,29, and 31)	Inspect	Replace hose assembly (8. 10,13 or 31) if damaged
7		Tube fittings (3,5, 15 and 16)	Inspect	Replace tube assembly (6 and 22) if damaged
8		Hose assemblies (8, 10,13 and 32) and hose (35)	Inspect	Replace if cracked, split, or fitting threads damaged. If necessary, make hose (35) from FSCM 24161 PIN 24 VW; cut to 23 inches long
9		Adapters (2, 14, and 23) connectors (4 and 33), tee (11 ), and elbows (30 and 36)	Inspect	Replace if cracked, distorted, or threads damaged
10		Tube assemblies (6 and 22)	Inspect	Replace if cracked, kinked, dented, twisted, or fitting threads damaged
11		Clamp (21)	Inspect	Replace if bent or cracked
12		Relief valve (28)	Inspect	Replace if cracked or threads damaged
13		Hose clamps (34)	Inspect	Replace if damaged
INSTALLATION/REPLACEMENT				
14	Engine compartment	a. Elbow (36) b. Two hose clamps (34) c. Hose (35) d. Hose clamps (34) e. Connector (33) f. Hose assembly (32) g. Hose fitting (31)	Install in hydraulic reservoir Position on both ends of hose (35) Install Tighten both Install in hydraulic pump Position Connect and tighten	
15	Front chassis, bottom right side	a. Elbow (30)	Install in brake valve ports	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear (cont).

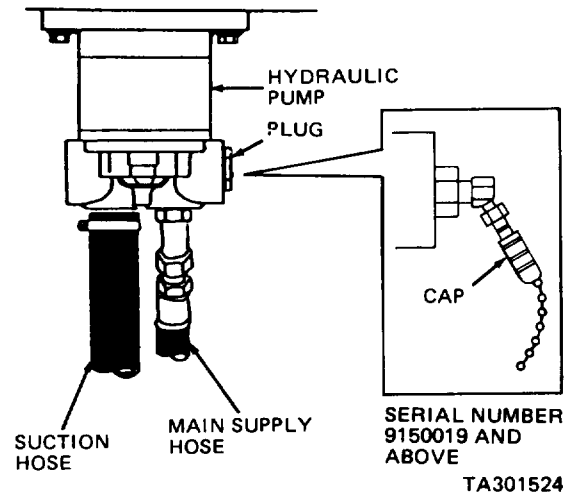
STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
15 (cont)		b. Hose fitting (29)	Connect and tighten	
		c. Relief valve (28)	Position on chassis	
		d. Two cap screws (27)	Install	
		e. Two washers (26). lock washers (25), and nuts (24)	Install	
		f. Adapter (23)	Install	
		g. Tube assembly (22)	Position	
		h. Clamp (21)	Position on tube assembly (22)	
		i. Cap screw (20)	Install	
		j. Washer ( 19), lock washer (18), and nut (17)	Install	
		k. Tube fitting (16)	Connect to elbow (30) and tighten	
		l. Tube fitting (15)	Connect to adapter (23) and tighten	
		m. Adapter (14)	Install in relief valve (28)	
		n. Hose assembly (13)	Position	
		o. Hose fitting ( 12)	Connect and tighten	
	p. Tee(n)	Install		
	q. Hose fitting (7)	Connect and tighten		
	r. Hose fitting (9)	Connect and tighten		
16	Operator's compartment, control valve	a. Tube assembly (6) b. Tube fitting (5)	Position Connect and tighten	
17	Operator's compartment, steering gear	a. Adapter (4)	Install	
		b. Tube fitting (3)	Connect and tighten	
		c. Adapter (2)	Install	
		d. Tube fitting (1)	Connect	
18	Hydraulic reservoir	Oil level dipstick and fill	Fill with oil	Para 2-56g(1)

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear (cont).

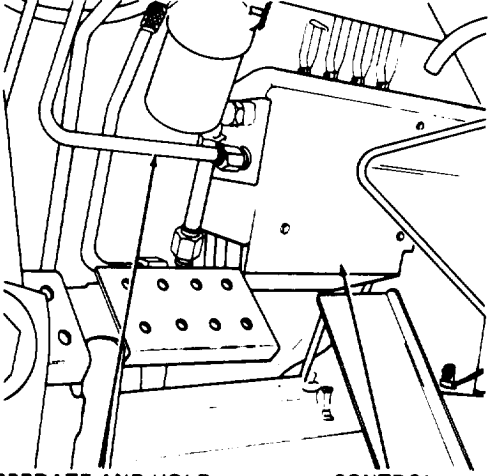
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION REPLACEMENT (cont)</b>				
19	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate shift control lever to shift forks right and left several times c. Operate engine at idle speed and check for oil leaks at connections d. Turn engine off e. Check hydraulic reservoir oil level (step 18)	
<b>ADJUSTMENT</b>				
20	Operator's compartment	Control valve	Operate all control levers several times with engine off	Relieves hydraulic pressure
21	Engine compartment	Hydraulic pump	Remove plug or cap and install pressure gage	



**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hose, Lines and Fittings (cont).*

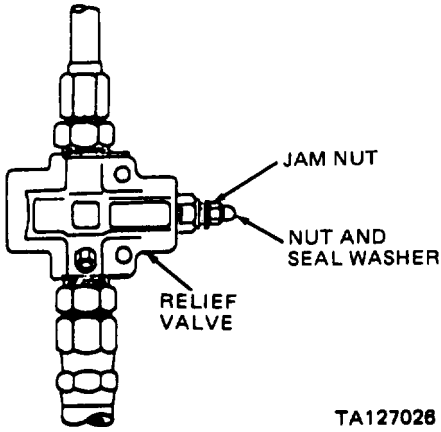
(2) Hydraulic Pump to Steering Gear (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENT (cont)				
22	Operator's compartment	Control valve	a. Operate and hold lift control lever towards you until tube assembly is warm to touch	Warms hydraulic oil
<div style="text-align: center;">  <p>OPERATE AND HOLD LIFT CONTROL LEVER TOWARDS YOU UNTIL THIS TUBE ASSEMBLY IS WARM TO TOUCH</p> <p>CONTROL VALVE</p> <p>TA126987</p> </div>				
b. Operate engine at full throttle, operate and hold lift control lever towards you and observe pressure gage reading. Gage shall indicate 2500-2550 PSI at 2200 ±50 RPM. If necessary, perform step 23 below to adjust relief valve				

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*b. Hoses, Lines and Fittings (cont).*

(2) Hydraulic Pump to Steering Gear (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENT (cont)				
23	Front chassis, bottom right side	Relief valve	<ol style="list-style-type: none"> <li>a. Remove nut and seal washer</li> <li>b. Loosen jam nut</li> <li>c. Perform step 22 above</li> <li>d. Operate engine at full throttle, observe pressure gage, and adjust relief valve adjusting screw until 2500-2550 PSI indication is obtained</li> <li>e. Tighten jam nut</li> <li>f. Reinstall seal washer and nut on relief valve</li> <li>g. Turn engine off and perform step 20 above</li> </ol>	 <p style="text-align: right;">TA127026</p>
24	Engine compartment	Hydraulic pump	<ol style="list-style-type: none"> <li>a. Remove pressure gage</li> <li>b. Install plug or cap</li> <li>c. Perform step 19 above</li> </ol>	

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*c. Steering Cylinder Assembly.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

INITIAL SETUP

TOOLS

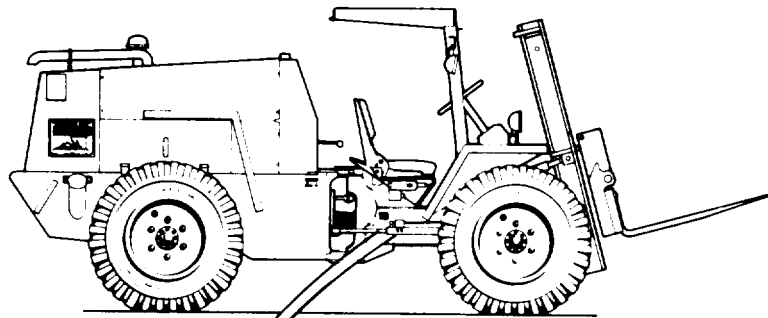
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654  
Chain Hoist, 1/4 ton capacity  
Thread Cutting Tap, 9/16-18 NSN 5136-00-580-7186

EQUIPMENT CONDITION

Paragraph Condition Description  
Vehicle parked straight on level surface, engine off, and parking brake applied. Shipping lock pin installed.

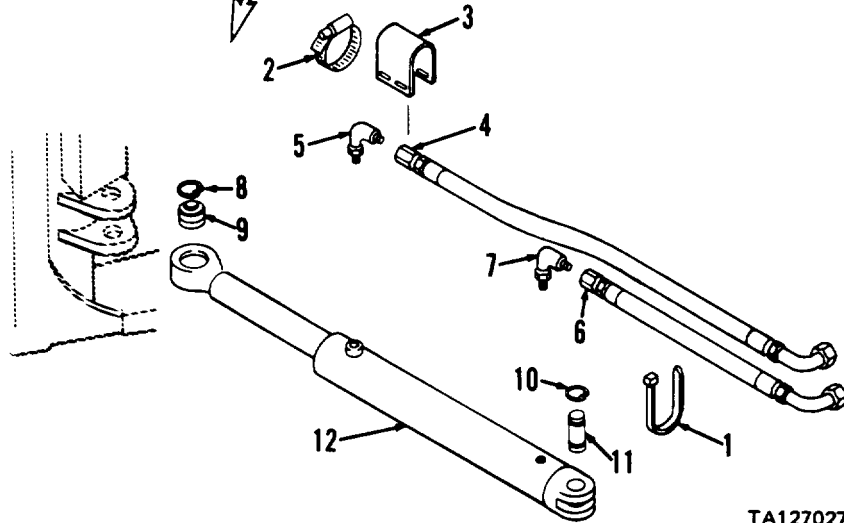
MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Tie straps (2)



KEY

- 1. Tie strap
- 2. Hose clamps
- 3. Steering cylinder guard
- 4. Hose fitting
- 5. Elbow
- 6. Hose fitting
- 7. Elbow
- 8. Retaining ring
- 9. Pin
- 10. Retaining ring
- 11. Pin
- 12. Steering cylinder assembly



TA127027

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*c. Steering Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<b>NOTE</b>				
Removal of either steering cylinder assembly is the same.				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
1	Side of vehicle	<ul style="list-style-type: none"> <li>a. Steering cylinder assembly ( 12) and hydraulic connections</li> <li>b. Tie strap (1)</li> <li>c. Two hose clamps (2)</li> <li>d. Steering cylinder guard (3)</li> <li>e. Hose fitting (4)</li> <li>f. Elbow (5)</li> <li>g. Hose fitting (6)</li> <li>h. Elbow (7)</li> <li>i. Steering cylinder assembly (12)</li> <li>j. Retaining ring (8)</li> <li>k. Pin (9)</li> <li>l. Retaining ring (10)</li> <li>m. Pin (11)</li> <li>n. Steering cylinder assembly (12)</li> </ul>	<ul style="list-style-type: none"> <li>Clean</li> <li>Remove</li> <li>Loosen and remove</li> <li>Remove</li> <li>Disconnect and plug</li> <li>Remove and plug opening in cylinder ( 12)</li> <li>Disconnect and plug</li> <li>Remove and plug</li> <li>Support with chain hoist, or jack stand or appropriate block</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove to clean work area</li> </ul>	<ul style="list-style-type: none"> <li>Use cleaning solvent P-D-680</li> <li></li> <li></li> <li></li> <li>Prevents intrusion of dirt</li> <li>Prevents intrusion of dirt</li> <li>Prevents intrusion of dirt</li> <li>Prevents intrusion of dirt</li> <li></li> <li></li> <li></li> <li></li> <li></li> </ul>

**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*c. Steering Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
3		Hose clamps (2) and steering cylinder guard (3)	Inspect	Replace if damaged
4		Hose fittings (4 and 6)	Inspect	Replace hose assembly if threads damaged
5		Elbows (5 and 7)	Inspect	Replace if cracked, distorted, or threads damaged
6		Retaining rings (8 and 10) and pins (9 and 11)	Inspect	Replace if cracked, bent, or distorted
7		Steering cylinder assembly (12)	Inspect	Replace if cracked or distorted. Check internal threads for damage; chase using 9/16-18 UNF tap
INSTALLATION/REPLACEMENT				
8	Side of vehicle	a. Steering cylinder assembly (12)	Position	
		b. Pin (11)	Install	
		c. Retaining ring (10)	Install	
		d. Pin (9)	Install	
		e. Retaining ring (8)	Install	
		f. Elbow (7)	Install	
		g. Hose fitting (6)	Connect and tighten	
		h. Elbow (5)	Install	



**2-48. STEERING SYSTEM MAINTENANCE (cont)**

*c. Steering Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
8 (cont)		i. Hose fitting (4)	Connect and tighten	
		j. Steering cylinder guard (3)	Position above hose fitting (4)	
		k. Two hose clamps (2)	Thread through guard (3) and round cylinder (12). Tighten	
		l. Tie strap (1)	Install around hoses and tie	
9	Operator's compartment		Start engine and turn steering wheel to extreme right and left several times to expel air	
10	Hydraulic reservoir	Oil level dipstick and fill	Check oil level; add oil necessary	Refer to current lubrication order

**Section IX. BODY, CAB AND ROLL OVER PROTECTIVE STRUCTURE MAINTENANCE**

This section contains the information you need to maintain the

- Body
- Cab
- Pintle hook
- Roll over protective structure (ROPS)

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of organizational maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	2-49	Body, Cab and Hood Maintenance . . . . .	2-53
Frame and Towing Attachments		Grille . . . . .	2-53a
Troubleshooting . . . . .	2-50	Fenders . . . . .	2-53b
Body, Cab and Hood Troubleshooting . . . . .	2-51	Side Panels . . . . .	2-53c
Frame and Towing Attachments		Top Hood . . . . .	2-53d
Maintenance . . . . .	2-52	Hood Panels and Support Plates , , . . . . .	2-53e
Roll Over Protective Structure . . . . .	2-52a	Front Cover Panel . . . . .	2-53f
Chassis Stop Bumper . . . . .	2-52b	Operator's Seat . . . . .	2-53g
Tow Bar, Tow Chains and		Noise Baffle Mat. . . . .	2-53h
Pintle Hook . . . . .	2-52c	Chassis Floor Plate and Guard . . . . .	2-53i

**2-49. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>FRAME AND TOWING ATTACHMENTS</b>		
Pintle hook stuck . . . . .	2-50/1	3-352
Loud clunk heard when vehicle turns . . . . .	2-50/2	3-352
Tow bar does not pivot or latch . . . . .	2-50/3	3-353
<b>BODY, CAB AND HOOD</b>		
Side panel does not latch . . . . .	2-51/1	3-353
Seat will not adjust . . . . .	2-51/2	3-354

**2-50. FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**1. PINTLE HOOK STUCK**

Check pintle hook for obstruction, damage or wear.

Replace pintle hook (para 2-52c).

**2. LOUD CLUNK HEARD WHEN VEHICLE TURNS**

Inspect chassis stop bumper for damage or wear.

Replace chassis stop bumper (para 2-52b).

---

**2-50. FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING (cont)**

---

## MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION**3. TOW BAR DOES NOT PIVOT OR LATCH**

Step 1. Check chassis where tow bar is attached for obstructions.

- a. If obstructed, remove obstruction.
- b. If not obstructed, proceed to step 2

Step 2. Check chassis, tow bar, and mounting hardware for cracks or dents.

- a. If tow bar is dented or cracked, replace (para 2-52c).
- b. If tow bar is okay, proceed to step 3.

Step 3. Check tow bar bracket for loose mounting, dents, or cracks.

Tighten mounting hardware; replace bracket if cracked or dented (para 2-52c).

---

**2-51. BODY, CAB AND HOOD TROUBLESHOOTING**

---

## MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION**1. SIDE PANEL DOES NOT LATCH**Step 1. Inspect hood panel lock bracket on chassis for damage, dents or missing condition.  
Check for loose mounting hardware.

- a. Replace hood panel lock bracket (para 2-53c), if damaged or dented; tighten loose mounting hardware.
- b. If bracket is okay and hardware is tight, proceed to step 2

Step 2. Check hood panel hook for damage, cracks, or missing condition.  
Check hook for unrestricted movement.

- a. If hood panel hook is damaged, cracked or missing, replace (para 2-53c).
- b. If hood panel hook is okay, proceed to step 3 below.

Step 3. Check side panels for damage or dents.

Replace side panels if damaged or dented.

---

**2-51. BODY. CAB AND HOOD TROUBLESHOOTING (cont)**

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

2. SEAT WILL NOT ADJUST

Step 1. Check seat adjuster and immediate area for obstructions.

- a. If obstructions are present, remove
- b. If no obstructions are present, proceed to step 2.

Step 2. Inspect adjuster lever and spring for cracks, damage, or missing condition.

- a. If adjuster lever and spring are cracked, missing, or damaged, replace (para 2-53g).
- b. If adjuster lever and spring are okay, proceed to step 3.

Step 3. Inspect seat adjusters for distortion, damage or misalignment.

- a. Replace if distorted, damaged or misaligned (para 2-53g).
- b. If seat adjusters are okay, check seat adjuster mounting hardware for looseness or missing condition. Tighten or replace mounting hardware (para 2-53g).

**2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE**

a. *Roll Over Protective Structure.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
Hoist, 1/2 ton capacity

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

2-30a	Engine off and parking brake applied.
2-30b	Front flood lights removed.
2-53h	Front blackout light removed.
	Noise baffle mat removed.

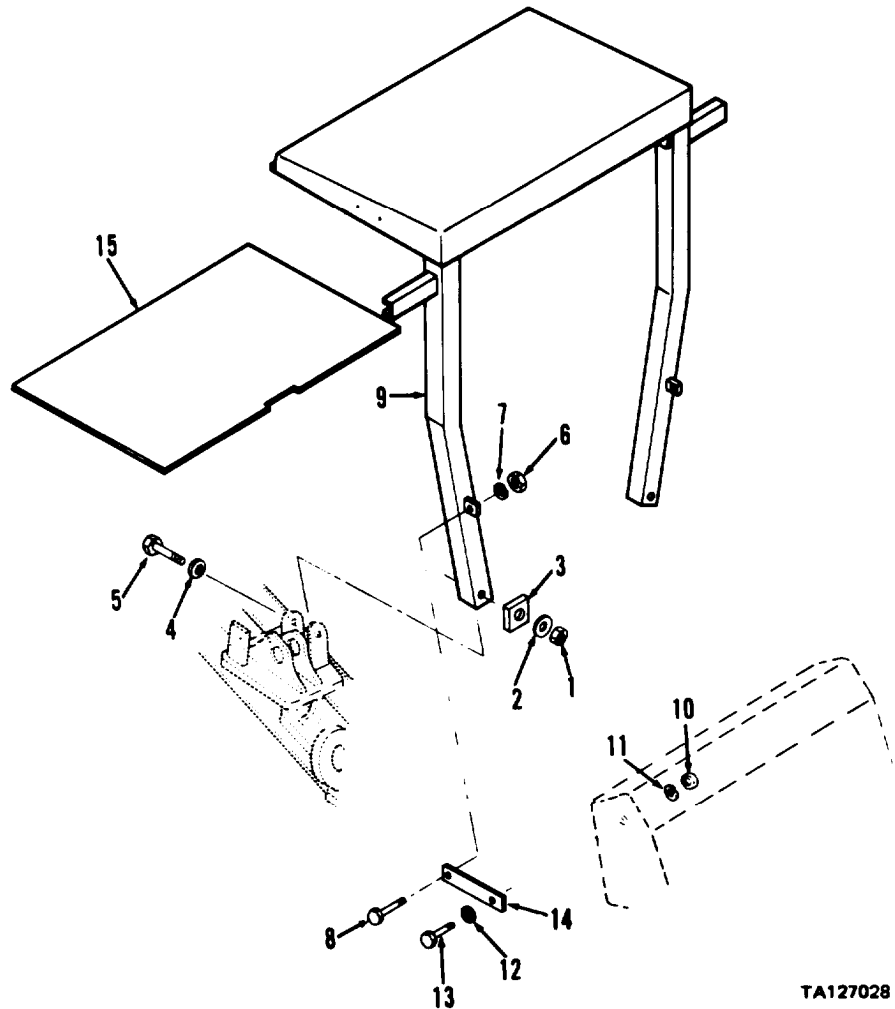
MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Vinyl adhesive, one pint can

(FSCM 13842 P/N 1099)

KEY

- 1. Nuts
- 2. Washers
- 3. Reinforcing plates
- 4. Washers
- 5. Cap screws
- 6. Nuts
- 7. Lock washers
- 8. Cap screws
- 9. Roll over protective structure
- 10. Nuts
- 11. Lock washers
- 12. Washers
- 13. Cap screws
- 14. Brackets
- 15. Canopy headlining



TA127028

**2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE (cont)**

a. Roll Over Protective Structure (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment	a. Three wire leads b. Roll over protective structure (9) c. Two nuts (1), washers (2), reinforcing plates (3), washers (4), and cap screws (5) d. Two nuts (6), lock washers (7), and cap screws (8) e. Roll over protective structure (9) f. Two nuts (10), lock washers (11), washers (12), and cap screws (13) g. Two brackets (14)	Tag and disconnect Secure Remove Remove Remove Remove Remove	Located at bottom of ROPS, two on left, one on right Attach hoist Use hoist
<b>NOTE</b>				
Don't perform following step unless inspection indicates re - placement of canopy headlining (15) is necessary.				
		h. Canopy headlining (15)	Remove only if damaged	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		ALL parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly

**2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE (cont)**

*a. Roll Over Protective Structure (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION/REPAIR</b>				
3		Roll over protective structure (9)	Inspect	ROPS must be replaced if damaged, bent, broken, or welds show cracks or breaks. No repair authorized.
4		All other parts	Inspect	Replace if cracked, damaged, bent, broken, distorted or damaged threads
<b>INSTALLATION/REPLACEMENT</b>				
5	Operator's compartment	a. Canopy headlining (15) b. Two brackets (14) c. Two cap screws (13), washers (12), lock washers (11), and nuts (10) d. Roll over protective structure (9) e. Two cap screws (8), lock washers (7), and nuts (6) f. Two cap screws (5), washers (4), reinforcing plates (3), washers (2), and nuts (1)	Apply adhesive and position Install Position Install Install	Use adhesive FSCM 13842 P/N 1099 Use hoist Tighten to 290-300 pounds foot torque Tighten to 290-300 pounds foot torque. Remove hoist

**2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE (cont)**

*b. Chassis Stop Bumper.*

This task covers: a. Removal  
b. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

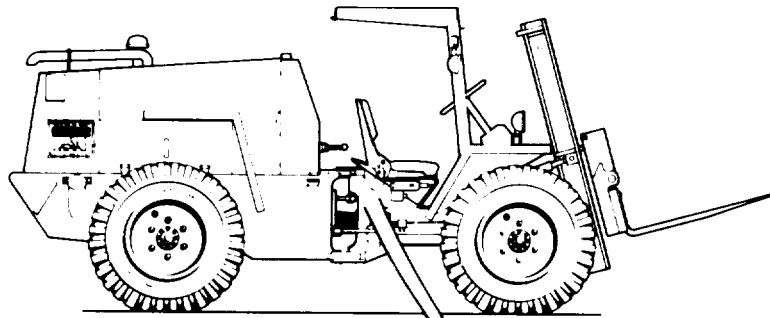
EQUIPMENT CONDITION

Paragraph

Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.

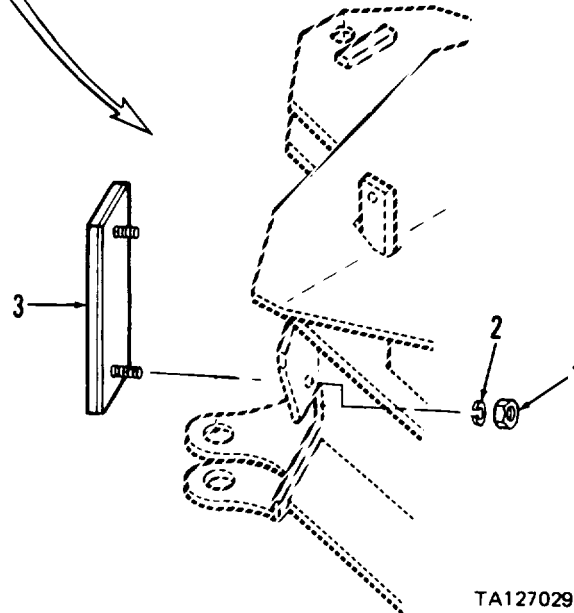
MATERIALS/PARTS

Chassis stop bumper



KEY

- 1. Nuts
- 2. Lock washers
- 3. Chassis stop bumper



TA127029



<b>2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE (cont)</b>
--

a. Chassis Stop Bumper (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment, rear	a. Two nuts (1) and lock washers (2)	Remove	
		b. Chassis stop bumper (3)	Remove and discard	
<b>INSTALLATION</b>				
2	Operator's compartment, rear	a. Chassis stop bumper (3)	Position	
		b. Two lock washers (2) and nuts (1)	Install	



**2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE (cont)**

*c. Tow Bar, Tow Chains and Pintle Hook (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Rear of vehicle	a. Pin	Remove	Lower tow bar to ground
		b. Two nuts (1), washers (2), cap screws (3), and washers (4)	Remove	
		c. Tow bar (5)	Remove	Lay chains on ground
		d. Two chains (8)	Unhook	
		e. Two nuts (6) and cap screws (7)	Remove	
		f. Two chains (8)	Remove	
		g. Grille latch knob	Move to left and swing grille outward	
		h. Battery cover	Remove	Loosen fasteners (one each side of cover) and pull cover straight out
		i. Four nuts (9), cap screws (10), and lock washers (11)	Remove	Support pintle hook (12)
		j. Pintle hook (12)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area, Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		All parts	Clean	Use cleaning solvent P-D-680; dry thoroughly
<b>INSPECTION</b>				
3		All parts	Inspect	Replace if cracked, damaged, bent, worn or distorted

**2-52. FRAME AND TOWING ATTACHMENTS MAINTENANCE (cont)**

*c. Tow Bar, Tow Chains and Pintle Hook (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION</b>				
4	Rear of vehicle	a. Pintle hook (12)	Position	
		b. Four cap screws (10), lock washers (11), and nuts (9)	Install	
		c. Battery cover	Install	
		d. Radiator grille	Close	
		e. Two chains (8)	Position	
		f. Two cap screws (7) and nuts (6)	Install	
		g. Tow bar (5)	Position	
		h. Two cap screws (3), washers (2 and 4) and nuts (1)	Install	
		i. Two chains (8)	Latch onto opposite sides	
		j. Tow bar (5)	Raise into stored position	
		k. Pin	Install	Secures tow bar in raised position

**2-53. BODY, CAB AND HOOD MAINTENANCE**

a. *Grille.*

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning
  - d. Inspection
  - e. Reassembly/Repair
  - f. Installation/Replacement

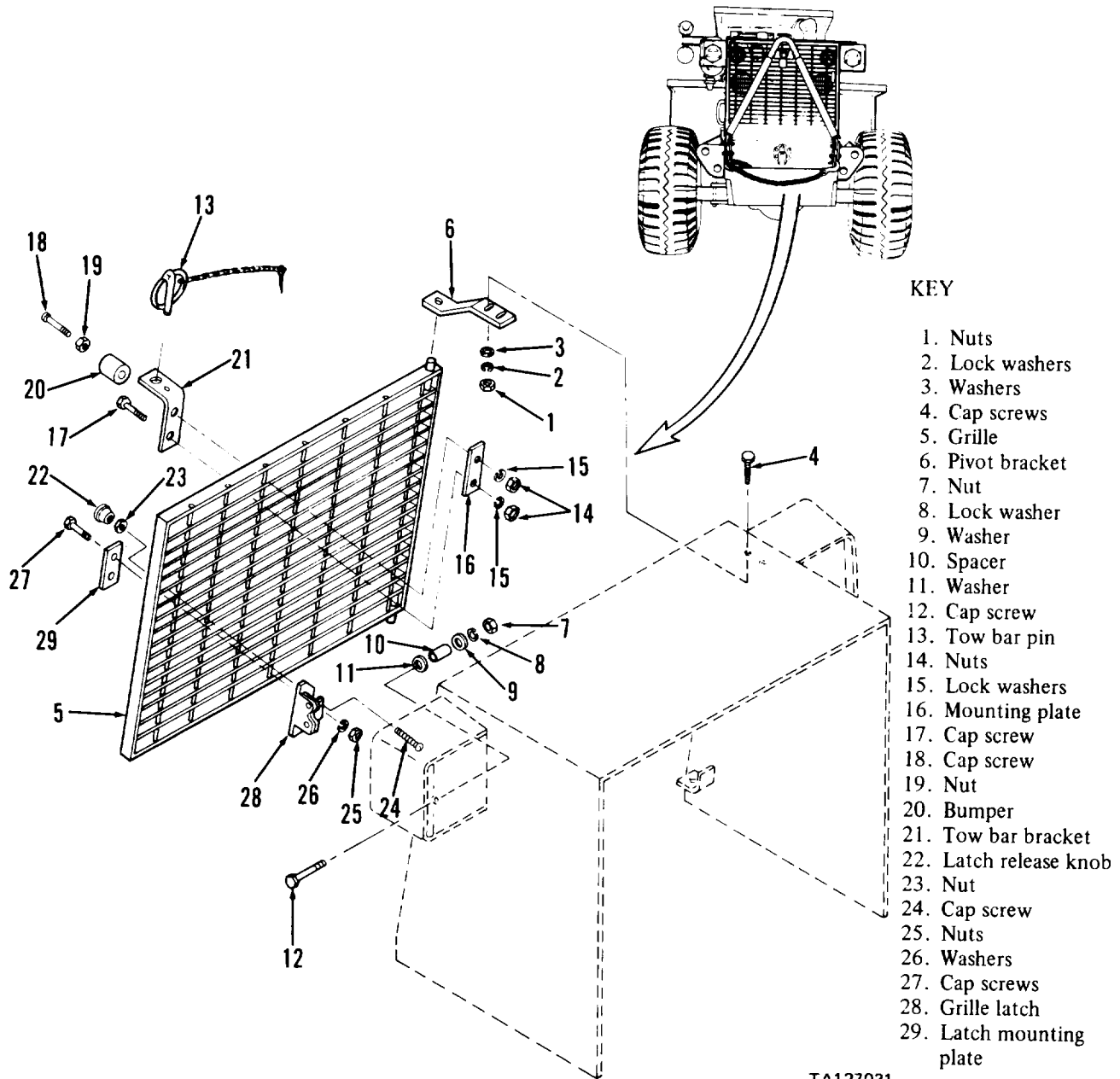
INITIAL SETUP

<p><b>TOOLS</b> No. 1 Common Organizational Maintenance Tool Kit</p> <p><b>MATERIALS/PARTS</b> Cleaning solvent P-D-680 Clean diesel fuel Clean cloths</p>	<p>NSN 4910-00-754-0654</p>	<p><b>EQUIPMENT CONDITION</b> Paragraph</p> <p>2-52c</p>	<p><b>Condition Description</b> Vehicle parked on level surface, engine off, and parking brake applied. Tow bar lowered to ground and grille open.</p>
--	-----------------------------	--	--

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Rear of vehicle	a. Two nuts (1), lock washers (2), washers (3), and cap screws (4)	Remove	
		b. Grille (5)	Remove	
		c. Pivot bracket (6)	Remove	
		d. Nut (7), lock washer (8), washer (9), spacer (10), washer (11), and cap screw (12)	Remove	
<b>DISASSEMBLY</b>				
2	Grille (5)	a. Tow bar pin (13)	Remove	Straighten cotter pin (part of tow bar pin) to remove
		b. Two nuts (14) and lock washers (15)	Remove	
		c. Mounting plate (16)	Remove	
		d. Cap screw (17)	Remove	
		e. Cap screw (18), nut (19), and bumper (20)	Remove	From tow bar bracket (21)
		f. Tow bar bracket (21)	Remove	
		g. Latch release knob (22)	Remove	
		h. Nut (23) and cap screw (24)	Remove	
		i. Two nuts (25), washers (26), and cap screws (27)	Remove	
		j. Grille latch (28)	Remove	
		k. Latch mounting plate (29)	Remove	

2-53. BODY, CAB AND HOOD MAINTENANCE (cont)

a. Grille (cont).



- KEY
1. Nuts
  2. Lock washers
  3. Washers
  4. Cap screws
  5. Grille
  6. Pivot bracket
  7. Nut
  8. Lock washer
  9. Washer
  10. Spacer
  11. Washer
  12. Cap screw
  13. Tow bar pin
  14. Nuts
  15. Lock washers
  16. Mounting plate
  17. Cap screw
  18. Cap screw
  19. Nut
  20. Bumper
  21. Tow bar bracket
  22. Latch release knob
  23. Nut
  24. Cap screw
  25. Nuts
  26. Washers
  27. Cap screws
  28. Grille latch
  29. Latch mounting plate

TA127031

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

a. Grille (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>CLEANING</b>				
3		Bumper (20)	Clean	Use clean diesel fuel. Dry thoroughly
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
4		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly
<b>INSPECTION</b>				
5		Grille latch (28)	Inspect	Replace if cracked, damaged, or latch malfunctions
6		All other parts	Inspect	Replace if cracked, damaged, worn or distorted
<b>REASSEMBLY/REPAIR</b>				
7	Grille (5)	a. Latch mounting plate (29)	Position	
		b. Grille latch (28)	Position	
		c. Two cap screws (27), washers (26), and nuts (25)	Install	
		d. Cap screw (24) and nut (23)	Install	
		e. Latch release knob (22)	Install	
		f. Nut (19)	Install on cap screw (18)	
		g. Bumper (20)	Install on cap screw (18)	
		h. Tow bar bracket (21)	Position on grille	
		i. Cap screw (18)	Position	

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

a. Grille (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY/REPAIR				
(cont)	Grille (5) (cont)	j. Mounting plate (16)	Position	
		k. Cap screw (17), two lock washers (15) and nuts (14)	Install	
		1. Tow bar pin (13)	Install	Bend cotter pin (part of tow bar pin)
INSTALLATION/REPLACEMENT				
8	Rear of vehicle	a. Cap screw (1 2), washer (11), spacer (10), washer (9), lock washer (8), and nut (7)	Install	
		b. Pivot bracket (6)	Position	On grille
		c. Grille (5)	Install	In radiator shroud stops
		d. Two cap screws (4), washers (3), lock washers (2), and nuts (1)	Install	



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

b. Fenders.

This task covers: a. Removal c. Inspection  
 b. Cleaning d. Installation

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool fit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

Condition Description

Vehicle parked on level surface, engine off, and parking brake applied. Side panels removed.

**MATERIALS/PARTS**

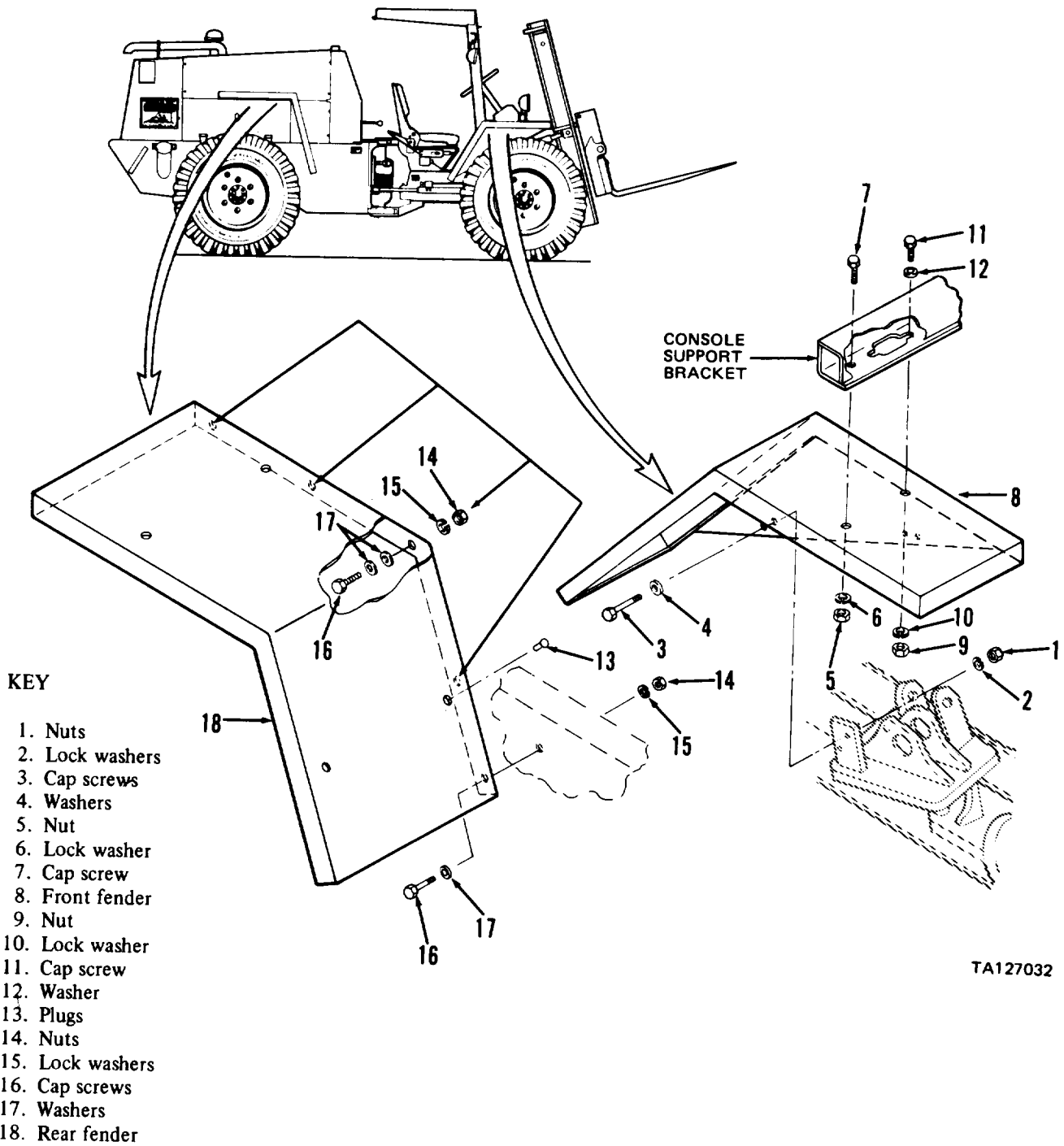
Cleaning solvent P-D-680  
 Clean cloths  
 Stiff wire brush

2-53c

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Chassis front left or right side	a. Two nuts(1) b. Two lock washers (2) c. Two cap screws (3) d. Two washers (4)	Remove Remove Remove Remove	
2	Console support bracket, left or right side	a. Nut (5), lock washer (6), and cap screw (7) b. Nut (9) c. Fender (8)	Remove Loosen Pull out slightly and remove	Cap screw (11), washer (12), lock washer (10) and nut (9) will disengage from slot in console support bracket
3	Left or right front fender (8)	a. Nut (9), lock washer (10), cap screw(11), and washer (12) b. Two plugs (13)	Remove Remove	
4	Engine compartment, rear, left or right side	a. Five nuts (14), lock washers (15), cap screws (16), and nine washers (17) b. Fender (18)	Remove Remove	Disconnect hourmeter ground wire when removing rear left fender

2-53. BODY, CAB AND HOOD MAINTENANCE (cont)

b. Fenders (cot).



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*b. Fenders (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
5		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly. Remove rust using stiff wire brush
<b>INSPECTION</b>				
6		All parts	Inspect	Replace if cracked, damaged, bent, broken, distorted or threads damaged
<b>INSTALLATION</b>				
7	Engine compartment, rear left or right side	a. Fender (18) b. Nine washers (17), five cap screws ( 16), lock washers (15), and nuts (14)	Position Install	Connect ground wire when installing rear left fender
8	Left or right front fender (8)	a. Two plugs (13) b. Washer (12), cap screw (11), lock washer (10), and nut (9)	Install Install	Do not tighten; loosely install in fender
9	Console support bracket, left or right side	a. Fender (8)  b. Nut (9) c. Cap screw (7), lock washer (6), and nut (5)	Position  Tighten Install	Position assembled cap screw (11), and washer (12), in slot in console support bracket
10	Chassis, front left or right side	a. Two washers (4) b. Two cap screws (3) c. Two lock washers (2) d. Two nuts (1)	Install Install Install Install	

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*c. Side Panels.*

This task covers:

- a. Removal
- b. Disassembly
- c. Cleaning

- d. Inspection
- e. Reassembly
- f. Installation

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

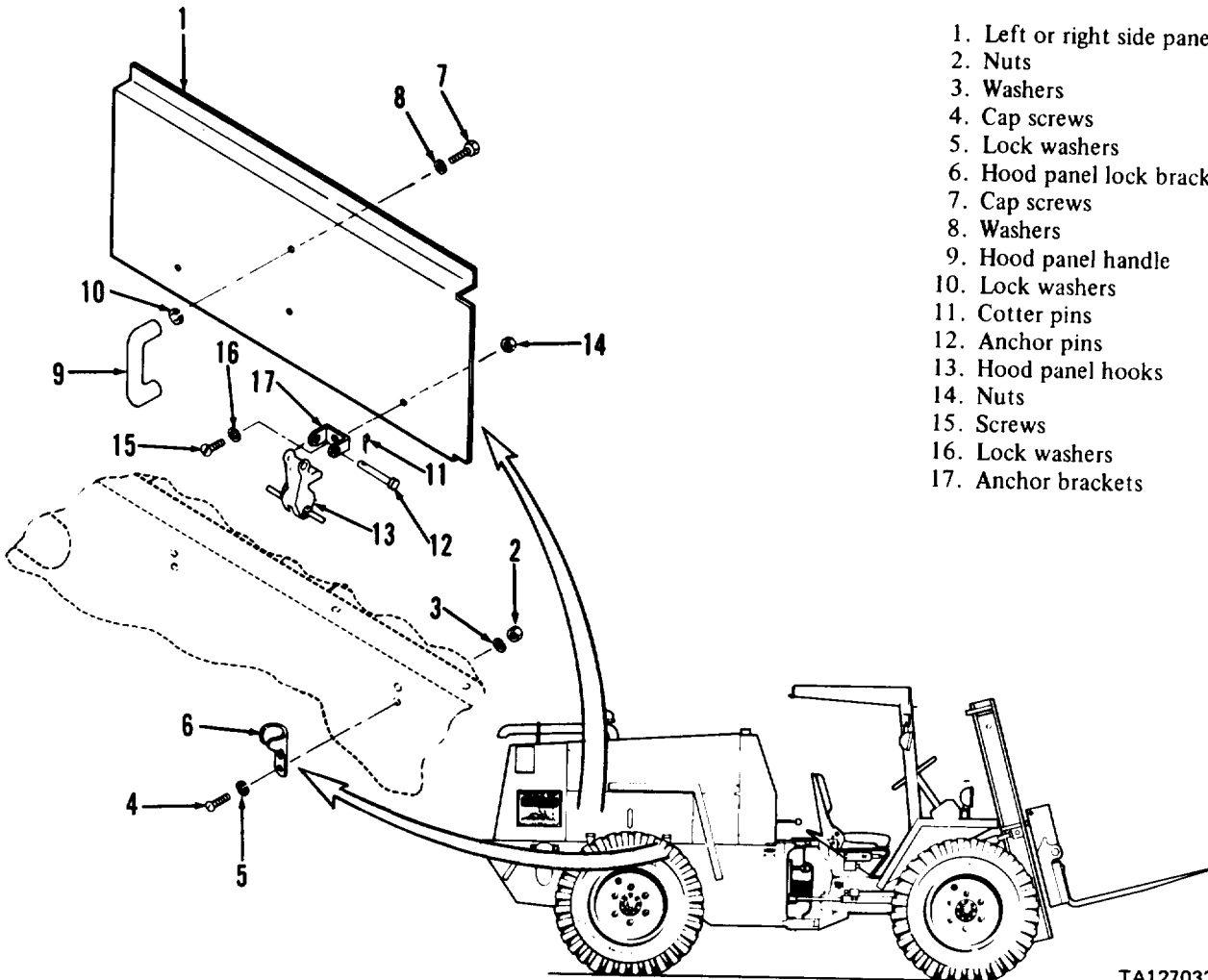
Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
Clean cloths

**KEY**

- 1. Left or right side panel
- 2. Nuts
- 3. Washers
- 4. Cap screws
- 5. Lock washers
- 6. Hood panel lock brackets
- 7. Cap screws
- 8. Washers
- 9. Hood panel handle
- 10. Lock washers
- 11. Cotter pins
- 12. Anchor pins
- 13. Hood panel hooks
- 14. Nuts
- 15. Screws
- 16. Lock washers
- 17. Anchor brackets



TA127033

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*c. Side Panels (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Engine compartment, left or right side	a. Hood panel hook (13) b. Hood panel handle (9) c. Side panel (1)	Push down and release from lock bracket (6) Grasp Remove	Pull outward on handle
NOTE				
Perform following steps only if inspection indicates replacement of bracket (6) is necessary.				
2	Left or right side of vehicle, chassis	a. Four nuts (2), washers (3), cap screws (4), and lock washers (5) b. Two hood panel lock brackets (6)	Remove  Remove	
DISASSEMBLY				
3	Left or right side panel (1)	a. Two cap screws (7) and washers (8) b. Hood panel handle (9) and two lock washers (10) c. Two cotter pins(11) d. Two anchor pins(12) e. Two hood panel hooks (13) f. Two nuts (14), screws (15), and lock washers (16) g. Two anchor brackets (17)	Remove Remove Remove Remove Remove Remove	

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*c. Side Panels (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
4		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly
INSPECTION				
5		All parts	Inspect	Replace if damaged, cracked, bent, distorted or threads damaged
REASSEMBLY				
6	Left or right side	a. Two anchor brackets (17) b. Two lock washers (16), Install screws (15), and nuts (14) c. Two hood panel hooks (13) d. Two anchor pins (12) e. Two cotter pins (11) f. Two lock washers (10) and hood panel handle (9) g. Two washers (8) and cap screws (7)	Position  Install Install Install  Install	
INSTALLATION				
7	Left or right side of vehicle, chassis	a. Two hood panel lock brackets (6) b. Four lock washers (5), cap screws (4), washers (3), and nuts (2)	Position  Install	
8	Engine compartment, left or right side	a. Side panel (1) b. Hood panel hook (13)	Install Pull down and engage in lock bracket (6)	Force into position



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*d. Top Hood (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment	a. 18 cap screws ( 1 and 2), Remove washers (3), and lock washers (4) b. Top hood (5)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately. and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly. Remove any rust with stiff wire brush
<b>INSPECTION</b>				
3		All parts	Inspect	Replace if cracked, damaged, bent, distorted or threads damaged
<b>INSTALLATION</b>				
4	Engine compartment, top	a. Top hood (5) b. 18 lock washers (4), washers (3), and cap screws (2 and 1) c. Exhaust pipe	Position install  Install	Para 2-16



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*e. Hood Panels and Hood Support Plates.*

This task covers: a. Removal c. Inspection  
 b. Cleaning d. Installation

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

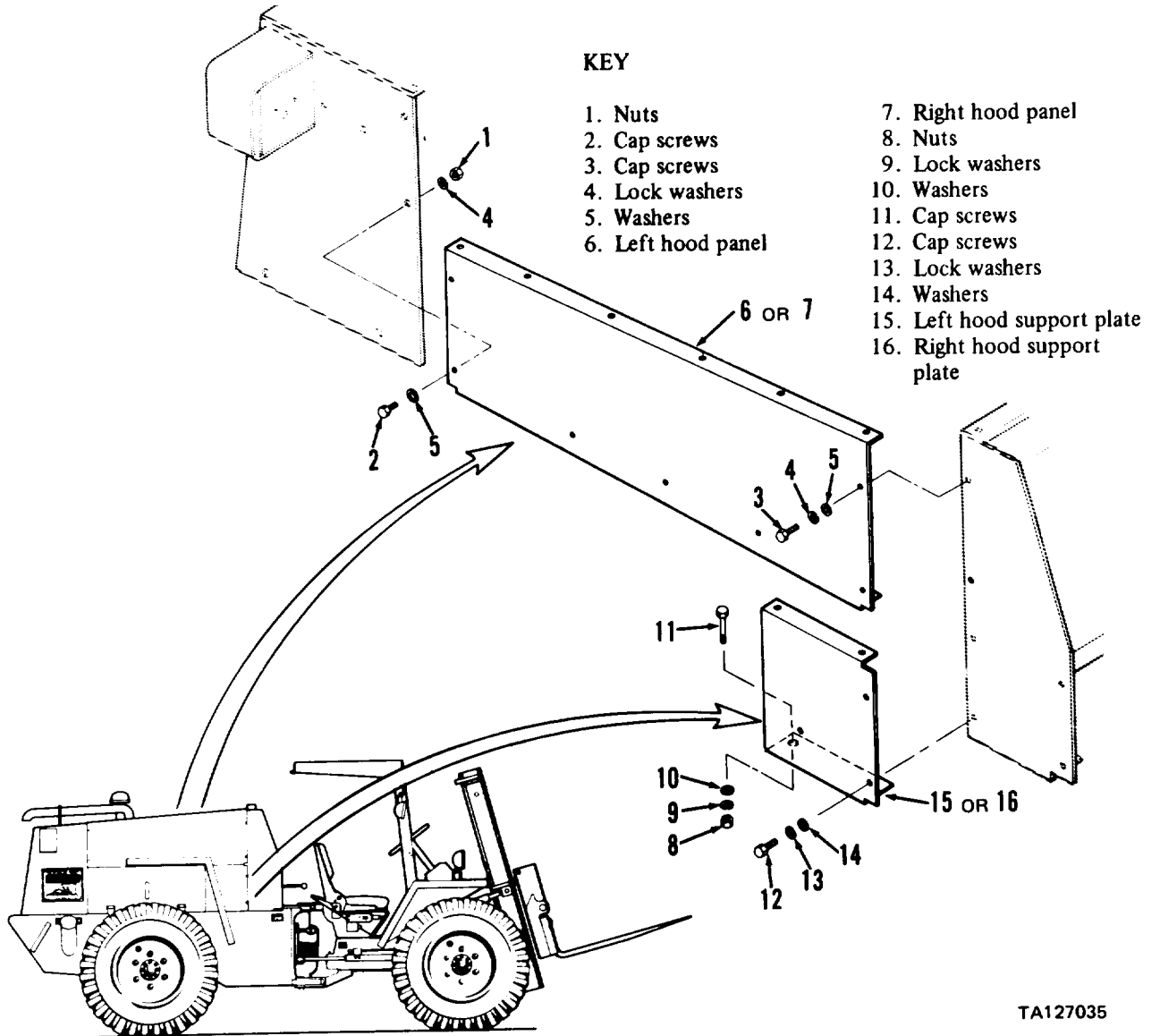
NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph	Condition Description
	Vehicle parked on level surface, engine off, and parking brake applied.
2-15c	Air cleaner removed (left hood panel removal only)
2-29a	Slave receptacle removed.
2-29b	Hourmeter removed.
2-53b	Rear fenders removed.

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Stiff wire brush  
 Clean cloths



TA127035

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*e. Hood Panels and Hood Support Plates (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, upper left or right side	a. Two nuts (1), four cap screws (2 and 3), lock washers (4), and washers (5) b. Hood panel (6 or 7)	Remove  Remove	
<b>NOTE</b>				
If top hood is not removed (para 2-53d) you must remove six cap screws, washers and lock washers.				
2	Engine compartment, left or right side	a. Three nuts (8), lock washers (9), washers (10), and cap screws (11) b. Two cap screws (12), lock washers (13), and washers (14) c. Hood support plate (15 or 16)	Remove  Remove  Remove	Disconnect ground cable and remove ground cable washer if left hood support plate (15) is being removed
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
3		All parts	Clean	Use cleaning solvent P-D-680, Dry thoroughly. Remove rust with stiff wire brush
<b>INSPECTION</b>				
4		All parts	Inspect	Replace if cracked, damaged, broken, bent, distorted, or threads damaged

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

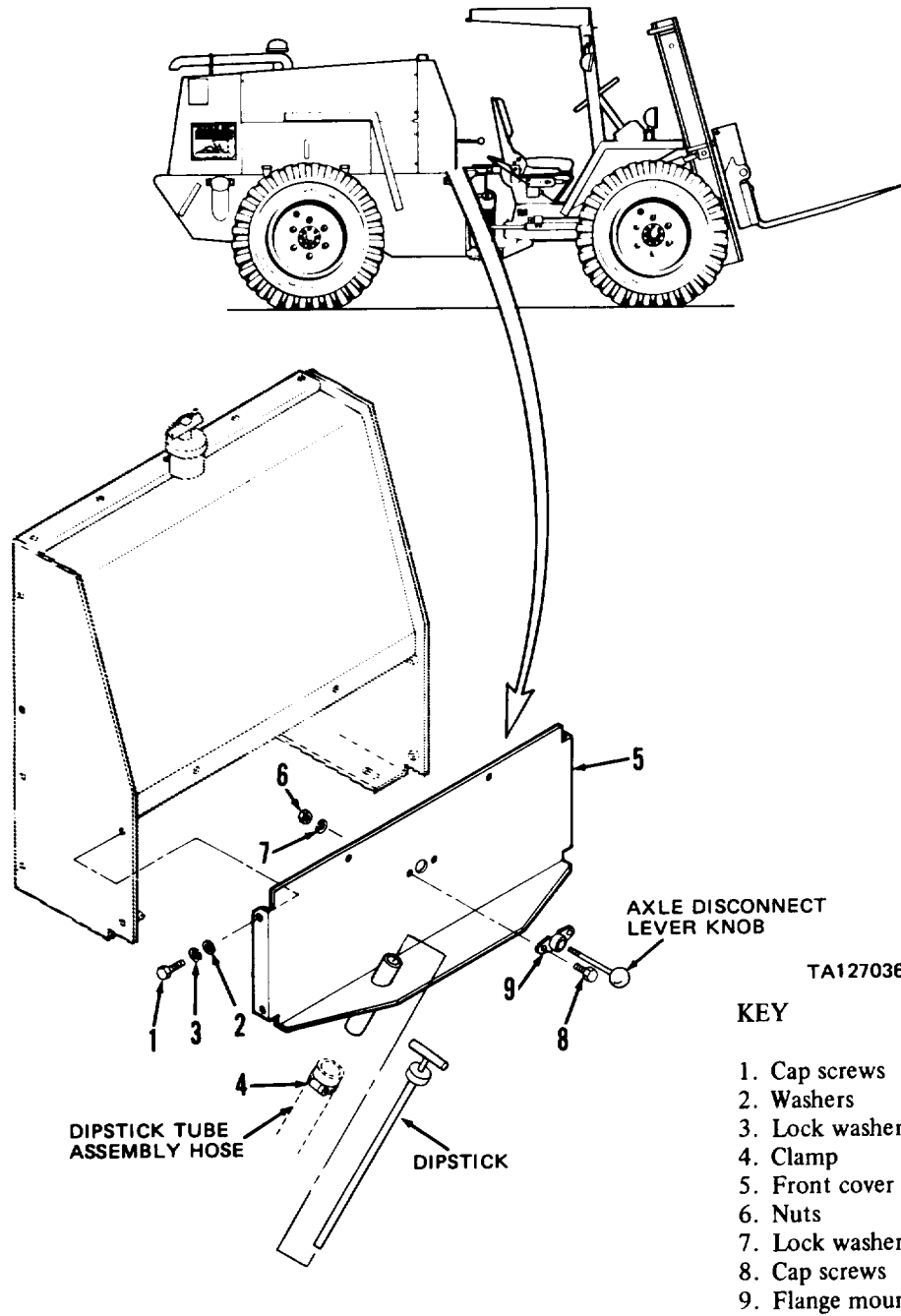
*e. Hood Panels and Hood Support Plates (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION				
5	Engine compartment, left or right side	a. Hood support plate (15 or 16) b. Two washers (14), lock washers (13), and cap screws (12) c. Three cap screws (1 1), washers (10), lock washers (9) and nuts (8)	Position  Install  Install	Connect ground cable and ground cable washer only if left hood support plate (15) is being installed  Be sure clamp securing cold start tube and air cleaner indicator tube is installed
6	Engine compartment, upper left or right side	a. Hood panel (6 or 7) b. Four washers (5), lock washers (4), cap screws (3 and 2), and two nuts (1)	Position Install	



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*f. Front Cover Panel (cont).*



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*f. Front Cover Panel (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<u><b>WARNING</b></u>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly. Remove rust using stiff wire brush
INSPECTION				
3		All parts	Inspect	Replace if cracked, damaged, broken, bent, distorted, missing or damaged threads
INSTALLATION				
4	Operator's compartment	<ul style="list-style-type: none"> <li>a. Flange mounted bearing (9)</li> <li>b. Two cap screws (8), lock washers (7), and nuts (6)</li> <li>c. Front cover panel (5)</li> <li>d. Dipstick tube assembly hose</li> <li>e. Clamp (4)</li> <li>f. Six washers (3), lock washers (2), and cap screws (1)</li> <li>g. Dipstick</li> <li>h. Axle disconnect lever knob</li> </ul>	<ul style="list-style-type: none"> <li>Position on panel (5)</li> <li>Install</li> <li>Position</li> <li>Connect to panel (5) tube</li> <li>Tighten</li> <li>Install</li> <li>Install</li> <li>Install</li> </ul>	

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*g. Operator's Seat.*

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning
  - d. Inspection
  - e. Reassembly
  - f. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.

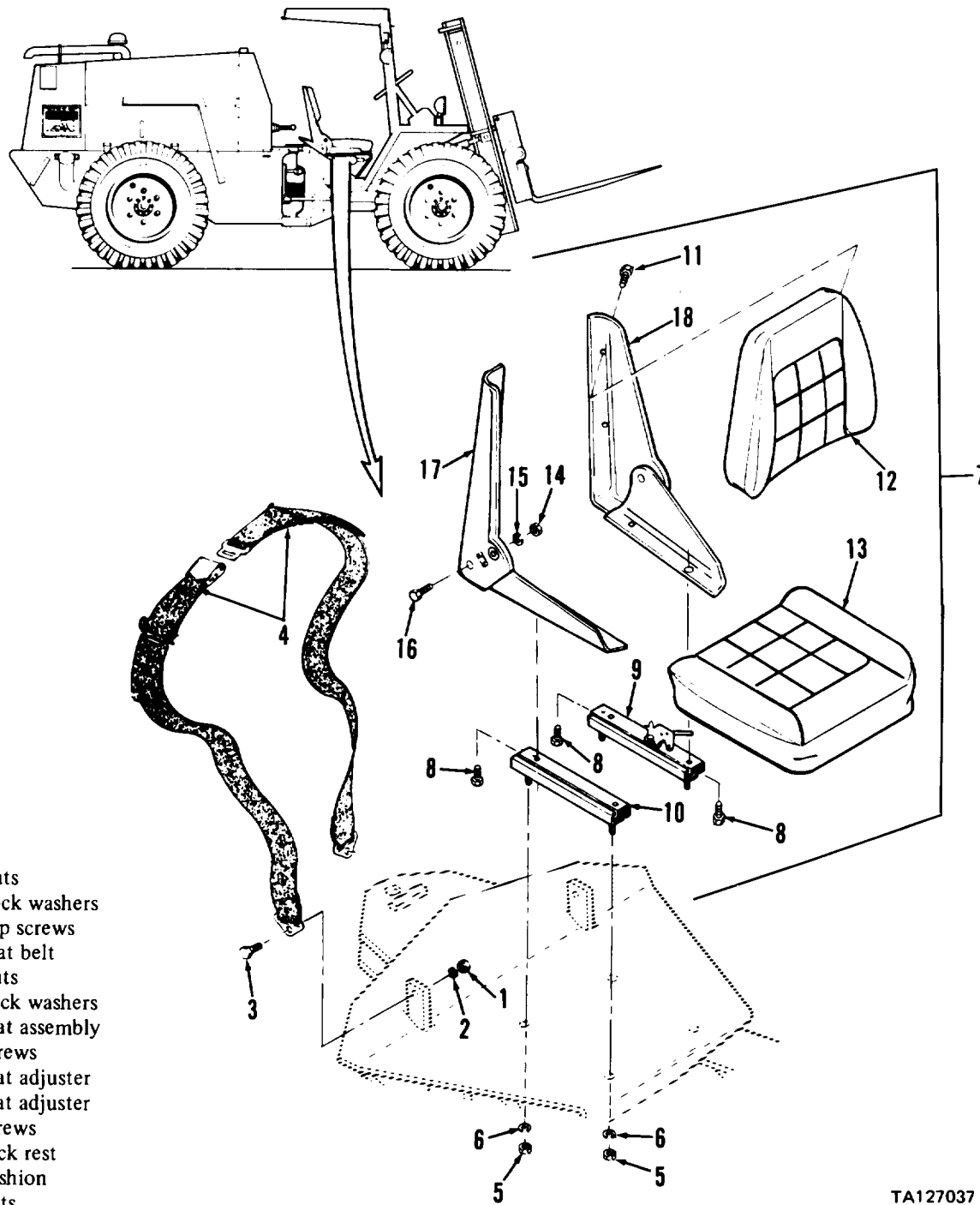
MATERIALS/PARTS

Mild detergent  
Water  
Cleaning solvent P-D-680  
Clean cloths

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment	a. Two nuts (1), lock washers (2), and cap screws (3) b. Seat belt (4) c. Four nuts (5), and lock washers (6) d. Operator's seat assembly (7)	Remove Remove Remove Remove	
<b>DISASSEMBLY</b>				
2	Right rail (17), and left rail (18)	a. Seat adjustment (9 and 10) b. Four screws (8) c. Seat adjusters (9 and 10) d. Eight screws(11) e. Back rest (12) f. Cushion (13) g. Two nuts (14), lock washers (15), and screws (16)	Extend Remove Remove Remove Remove Remove Remove	
<b>CLEANING</b>				
3		Back rest (12), cushion seat belt (4)	Clean	Use mild detergent and water. Dry thoroughly

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*g. Operator's Seat (cont).*



**KEY**

- 1. Nuts
- 2. Lock washers
- 3. Cap screws
- 4. Seat belt
- 5. Nuts
- 6. Lock washers
- 7. Seat assembly
- 8. Screws
- 9. Seat adjuster
- 10. Seat adjuster
- 11. Screws
- 12. Back rest
- 13. Cushion
- 14. Nuts
- 15. Lock washers
- 16. Screws
- 17. Right rail
- 18. Left rail

TA127037



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)***g. Operator's Seat (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
4		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly
INSPECTION				
5		Back rest (12), and cushion (13)	Inspect	Replace if damaged, worn, cracked or slit
6		Seat belt (4)	Inspect	Replace if damaged, worn, slit or buckles damaged
7		Seat adjusters (10 and 9)	Inspect	Replace if damaged, worn, cracked, distorted or does not slide freely
8		All other parts	Inspect	Replace if damaged, worn, tracked, distorted or threads damaged
REASSEMBLY				
9	Left rail (18), and right rail (17)	a. Two screws (16), lock washers (15), and nuts (14) b. Cushion(13) c. Back rest (12) d. Eight screws(11) e. Seat adjusters (10 and 9)  f. Four screws (8)	Install  Position Position Install Position  Install	Extend adjuster. Line up screw hole with rail holes
INSTALLATION/REPLACEMENT				
10	Operator's compartment	a. Seat assembly (7) b. Four lock washers (6) and nuts (5) c. Seat belt (4) d, Two cap screws (3), lock washers (2), and nuts (1)	Position Install Position Install	

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*h. Noise Baffle Mat.*

This task covers: a. Removal  
b. Installation

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

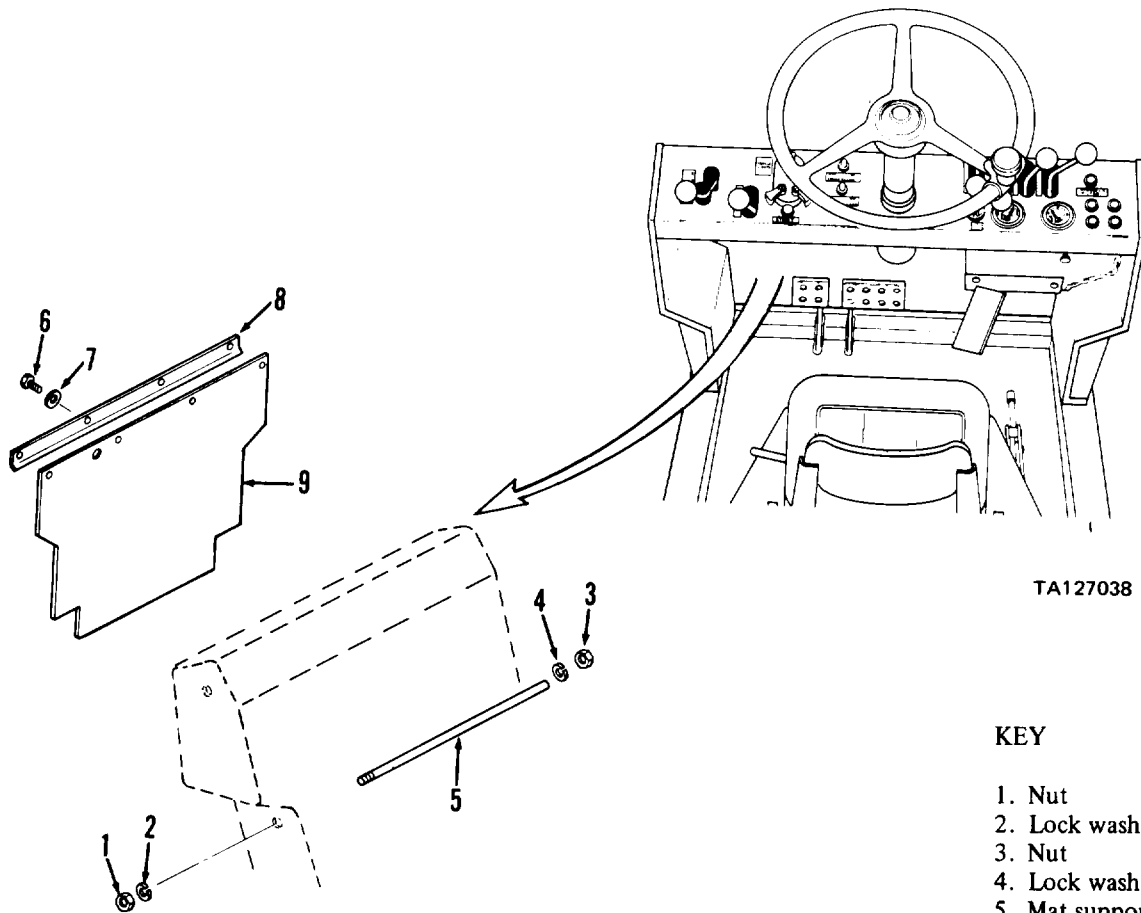
**EQUIPMENT CONDITION**

Paragraph

Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.

**MATERIALS/PARTS**

Replacement noise baffle mat



TA127038

**KEY**

- 1. Nut
- 2. Lock washer
- 3. Nut
- 4. Lock washer
- 5. Mat support rod
- 6. Cap screws
- 7. Washers
- 8. Mounting strap
- 9. Noise baffle mat

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*h. Noise Baffle Mat (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Operator's compartment	a. Nut (1) and lock washer (2)	Remove	
		b. Mat support rod (5)	Remove from opposite side of instrument panel	
		c. Nut (3) and lock washer (4)	Remove	
		d. Four cap screws (6) and washers (7)	Remove	
		e. Mounting strap (8)	Remove	
		f. Noise baffle mat (9)	Remove	
INSTALLATION				
2	Operator's compartment	a. Noise baffle mat (9)	Position on edge of instrument panel	
		b. Mounting strap (8)	Position on noise baffle mat (9)	
		c. Four washers (7) and cap screws (6)	Install	
		d. Lock washer (4) and nut (3)	Position on end of mat support rod (5)	
		e. Mat support rod (5)	Install from one side of instrument panel	
		f. Lock washer (2) and nut (1)	Install	



**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*i. Chassis floor Plate and Guard (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Bottom of front chassis	a. Four nuts (1), washers (2 and 3) and cap screws (4) b. Guard (5)	Loosen and remove  Remove	Support guard (5)  Grasp handles and lower from vehicle
2	Operator's compartment floor	a. Six cap screws (6), lock washers (7), and washers (8) b. Chassis floor plate (9)	Loosen and remove  Remove	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
3		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air

**2-53. BODY, CAB AND HOOD MAINTENANCE (cont)**

*i. Chassis Floor Plate and Guard (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
4		Cap screws (4 and 6), hex nuts (1), and washers (2, 3, 7 and 8)	Inspect	Replace if worn, or if threads damaged
5		Guard (5) and floor plate (9)	Inspect	Repair small cracks by welding. Replace if severely cracked or damaged
INSTALLATION				
6	Operator's compartment floor	a. Chassis floor plate (9) b. Six washers (8), lock washers (7), and cap screws (6)	Position  Install and tighten	Guide slots on floor plate over pedals and lower onto chassis Until floor plate is securely mounted
7	Bottom of front chassis	a. Guard (5) b. Four cap screws (4), washers (3), lock washers (2), and hex nuts (1)	Position  Install and tighten	Use hydraulic jack, blocks or assistants to hold guard against bottom of chassis Until guard is securely mounted

**Section X. HYDRAULIC LIFT SYSTEM MAINTENANCE**

This section contains the information you'll need to maintain the hydraulic lift system. It gives you instructions on how to troubleshoot problems, and repair or replace components that are within the scope of organizational maintenance.

	Para	Para
Troubleshooting Symptom Index . . . . .	2-54	
Hydraulic Lift System Troubleshooting . . . . .	2-55	
Hydraulic Lift System Maintenance . . . . .	2-56	
Operational Test . . . . .	2-56a	
Control Levers and Linkages . . . . .	2-56b	
		Lifting Forks . . . . . 2-56c
		Lift Chains and Pulleys . . . . . 2-56d
		Sideshift Chains and Pulleys . . . . . 2-56e
		Hoses, Lines and Fittings . . . . . 2-56f
		Hydraulic Reservoir . . . . . 2-56g

**2-54. TROUBLESHOOTING SYMPTOM INDEX**

**NOTE**

A hydraulic system schematic is located at the back of this manual in appendix F.

	Para/Malfunction	Page
<b>HYDRAULIC LIFT SYSTEM</b>		
Load lowers too fast . . . . .	2-55/1	3-289
Load creeps downward . . . . .	2-55/2	3-290
Unable to lift, tilt, shift, or rotate load . . . . .	2-55/3	3-290
Lift, tilt, shift, or rotate too slow. . . . .	2-55/4	3-291
Load creeps while tilting . . . . .	2-55/5	3-291

**2-55. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**NOTE**

Also refer to paragraph 2-56a, operational test, for additional troubleshooting data.

**1. LOAD LOWERS TOO FAST**

Step 1. Check hoses, lines and fittings between control valve and lift cylinder assembly for oil leaks.

- a. If oil leakage is observed, tighten fittings; if hoses or lines are damaged, replace (para 2-56 f(l)).
- b. If oil leakage is not observed, proceed to step 2.

## 2-55. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)

### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 1. LOAD LOWERS TOO FAST (cont)

#### Step 2. Lower mast assembly to ground.

Turn engine off and relieve hydraulic pressure by operating control levers several times.

Place container under lift cylinder to catch hydraulic oil.

Loosen and disconnect fitting at lift cylinder port; remove elbow.

Check that restrictor is properly installed: FLOW arrow marked on restrictor pointing towards lift cylinder assembly.

- a. If restrictor is not installed properly, install properly.
- b. If restrictor is installed properly and problem still exists, replace restrictor.

### 2. LOAD CREEPS DOWNWARD

#### Step 1. Check hoses, lines and fittings between control valve and lift cylinder assembly for oil leaks.

- a. If oil leakage is observed, tighten fittings; if hoses or lines are damaged, replace (para 2-56f(1)).
- b. If oil leakage is not observed, proceed to step 2.

#### Step 2. Check if lift cylinder assembly requires bleeding of air (para 2-56f(1), step 27).

- a. Bleed air from lift cylinder assembly (para 2-56f(1), step 27).
- b. If lift cylinder does not require bleeding of air, proceed to step 3.

#### Step 3. Perform step 2 of MALFUNCTION 1 above.

Same as step 2 of MALFUNCTION 1 above.

### 3. UNABLE TO LIFT, TILT, SHIFT OR ROTATE LOAD

#### Step 1. Check hydraulic reservoir oil level

- a. If oil level is not between FULL and ADD marks on dipstick with mast lowered, add hydraulic oil (refer to current lubrication order).
- b. If oil level is okay, proceed to step 2.

#### Step 2. Start engine and operate control levers while observing HYDRAULIC FILTER indicator light on instrument panel.

- a. If HYDRAULIC FILTER indicator is lit, replace hydraulic oil filter (para 2-56g(2)).
- b. If HYDRAULIC FILTER indicator is not lit, turn engine off, place IGNITION switch in LAMP TEST position and check that HYDRAULIC FILTER indicator is on. If HYDRAULIC FILTER indicator is on, proceed to step 3. If HYDRAULIC FILTER indicator is not on, replace bulb (para 2-28e), and repeat this step.



**2-55. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 3. UNABLE TO LIFT, TILT, SHIFT OR ROTATE LOAD (cont)

Step 3. Remove strainer from hydraulic reservoir and check for blockage (para 2-56g(3)).

- a. If hydraulic reservoir strainer is clogged, clean (para 2-56g(3)).
- b. If hydraulic reservoir strainer is okay, proceed to step 4.

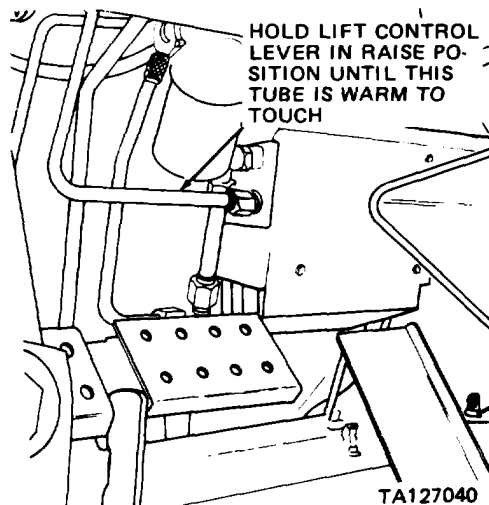
Step 4. Check setting of relief valve (para 248b(2), step 20).

- a. Adjust pressure relief valve if setting is not 2500-2550 PSI (para 248 b(2), step 23).
- b. If pressure relief valve setting is okay, proceed to step 5.

Step 5. Check for contaminated oil.

Start engine and operate at idle speed.

Place lift control lever in RAISE position and hold until tube located as shown below feels warm to touch (mast will be at full height).



Remove hydraulic reservoir oil filler and take an oil sample:

If hydraulic oil is contaminated as indicated by oil feeling gritty, milky color, or oil is dark and thick or smells scorched, drain and flush hydraulic system, clean strainer, and replace oil filter (para 2-56g).

**2-55. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. LIFT, TILT, SHIFT, OR ROTATE TOO SLOW

Step 1. Check hoses, lines and fittings between hydraulic reservoir, pump, and control valve for oil leaks.

a. If oil leakage is observed, tighten fittings; if hoses or lines are damaged, replace (para 2-56f(1)).

b. If oil leakage is not observed, proceed to step 2.

Step 2. Check setting of relief valve (para 2-48 b(2), step 20).

a. Adjust pressure relief valve if setting is not 2500-2550 PSI (para 2-48b(2), step 23).

b. If pressure relief valve setting is okay, proceed to step 3.

Step 3. Check hydraulic reservoir oil level.

a. If oil level is not between FULL and ADD marks on dipstick with mast lowered, add hydraulic oil (refer to current lubrication order).

b. If oil level is okay, proceed to step 4.

Step 4. Perform paragraph 2-56a.

Same as in paragraph 2-56a.

5. LOAD CREEPS WHILE TILTING

Step 1. Check hoses, lines and fittings between control valve and tilt cylinder assembly for oil leaks.

a. If oil leakage is observed, tighten fittings; if hoses or lines are damaged, replace (para 2-56f(1)).

b. If oil leakage is not observed, proceed to step 2.

Step 2. Perform step 4 of paragraph 2.56a.

Same as steps 5 and 6 of paragraph 2-56a.

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE**

*a. Operational Test.*

This procedure provides an operational test of the control valve, associated cylinder (lift, tilt, rotation, and sideshift) assemblies, and hoses, lines and fittings. This procedure may also be used to quickly troubleshoot the mast assembly to determine what components are defective.

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

Condition Description  
Vehicle parked on level surface, parking brake applied and engine off.

**MATERIALS/PARTS**

None

STEP	PROCEDURE/ACTION	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	Check hydraulic reservoir – oil level; add hydraulic oil if oil level is not between FULL and ADD marks on dipstick with mast lowered (refer to current lubrication order)		–	–
2	Start engine and operate – at idle speed		–	–
3	Place lift control lever in RAISE position; release lever when mast reaches full height	Mast moves upward smoothly	Proceed to step 4	Check hoses, lines and fittings between control valve and lift cylinder assembly for oil leaks. Tighten loose fittings/replace leaking hose (para 2-56f). Check lift chains and pulleys for wear or damage; replace as necessary (para 2-56d). If hoses, lines, fittings, lift chains and pulleys okay, notify direct support maintenance
4	Place tilt control lever in FWD position; release when mast is in full forward position	Mast moves forward smoothly	Proceed to step 7	Proceed to step 5
5	With mast in full forward position, disconnect fitting at rod end of tilt cylinder assemblies and plug fitting. Place tilt control lever in FWD position and hold	No oil leakage at tilt cylinder assemblies port where fitting disconnected	Reconnect fitting to tilt cylinder assemblies. Proceed to step 6	Notify direct support maintenance (tilt cylinder assembly requires replacement)
6	Check hoses, lines and fittings between control valve and tilt cylinder assemblies for oil leaks	No oil leaks	Notify direct support maintenance 2-56f(1) (control valve requires replacement)	Tighten fittings; replace leaking hoses (para 2-56f(1))

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. *Operational Test (cont)*

STEP	PROCEDURE/ACTION	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
7	Place tilt control lever in REAR position; release when mast is in full rearward position	Mast moves rearward smoothly	Proceed to step 8	Proceed to step 5
8	Place tilt control lever in FWD position; release lever when mast is in vertical position			
9	Place lift control lever in LOWER position; release when forks are touching ground	Mast moves downward smoothly	Proceed to step 10	Replace restrictor (para 2-56f(1))
10	Position vehicle to pickup a 4000 pound load, Place lift control lever in RAISE position; release when mast is at full height, Allow mast to remain at full height for two minutes	Downward drift of mast shall not exceed one inch.	Proceed to step 11	Bleed air from lift cylinder assembly (para 2-56 f(1), step 27)
11	Place lift control lever in LOWER position; release lever when forks are three feet from ground, Then place shift control lever in RIGHT position until forks are at extreme right position	Forks shift load to right smoothly	Proceed to step 14	Check sideshift chains and pulleys for wear or damage; replace as necessary (para 2-56e). Proceed to step 12
12	Place lift control lever in LOWER position until load is resting on ground. Disconnect fitting at rod end of sideshift cylinder assembly and plug fitting. Place shift control lever in RIGHT position and hold	No oil leakage at sideshift cylinder assembly port where fitting disconnected	Reconnect fitting to sideshift cylinder assembly. Proceed to step 13	Notify direct support maintenance (sideshift cylinder requires replacement)
13	Check hoses, lines and fittings between control valve and sideshift cylinder assembly for oil leaks	No oil leaks	Notify direct support maintenance (control valve requires replacement)	Tighten fittings; replace leaking hoses (para 2-56f)

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. *Operational Test (cont).*

STEP	PROCEDURE/ACTION	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
14	Place shift control lever in LEFT position until forks are at extreme left position	Forks shift load to left smoothly	Proceed to step 15	Check sideshift chains and pulleys for wear or damage; replace as necessary (para 2-56e)
15	Place lift control lever in LOWER position until load is resting on ground. Back vehicle away from load. Place lift control lever in RAISE position until forks are three feet from ground. Then, place rotate control lever in CW position until forks are rotated fully clockwise	Forks rotate clockwise smoothly	Proceed to step 18	<p>Proceed to step 16</p> <p><b>NOTE</b></p> <p>If binding or loud noise is heard, grease lubrication fitting on rotation bearing (refer to current lubrication order) and repeat this step. If above condition still exists, notify direct support maintenance (rotation bearing requires replacement)</p>
16	With forks in extreme clockwise position, disconnect fitting at rod end of rotation cylinder and plug fitting. Place rotate control lever in CW position and hold	No oil leakage at rotation cylinder port where fitting disconnected	Reconnect fitting to rotation cylinder and proceed to step 17	Notify direct support maintenance (rotation cylinder requires replacement)
17	Check hoses, lines and fittings between control valve and rotation cylinder assembly for oil leaks	No oil leaks	Notify direct support maintenance (control valve requires replacement)	Tighten fittings; replace leaking hoses (para 2-56f)
18	Place rotate control lever in CCW position until forks are rotated fully counterclockwise	Forks rotate counterclockwise smoothly	Proceed to step 19	<p>Proceed to step 16</p> <p><b>NOTE</b></p> <p>If binding or loud noise is heard, grease lubrication fitting on rotation bearing (refer to current lubrication order) and repeat this step. If above condition still exists, notify direct support maintenance (rotation bearing requires replacement)</p>
19	Turn engine off and check – hydraulic reservoir oil level; add hydraulic oil if necessary (refer to current lubrication order)		Operational test complete	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Control Levers and Linkages.*

- This task covers:
- a. Removal
  - b. Cleaning
  - c. Inspection
  - d. Repair
  - e. Installation/Replacement

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit  
 Bore Gage, zero to one inch range

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

Condition Description  
 Vehicle parked on level surface, forks lowered and resting on ground, mast vertical, engine off, and parking brake applied.  
 Noise baffle mat removed.

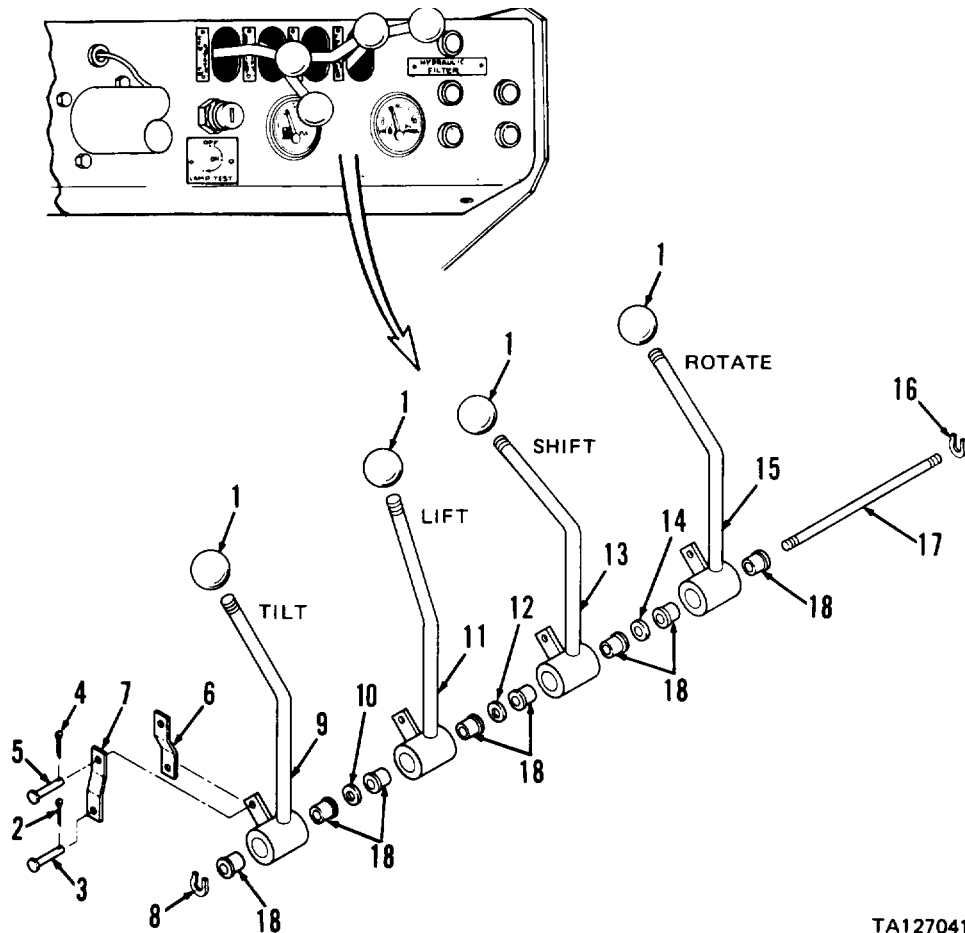
**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Clean cloths  
 Fine crocus cloth

2-53h

**KEY**

1. Knobs
2. Cotter pins
3. Clevis pins
4. Cotter pins
5. Clevis pins
6. Valve links
7. Valve links
8. Retaining ring
9. Tilt control lever
10. Washer
11. Lift control lever
12. Washer
13. Shift control lever
14. Washer
15. Rotate control lever
16. Retaining ring
17. Pivot shaft
18. Bearings



TA127041

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. cControl Levers and Linkages (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Operator's compartment, instrument panel, top	Four knobs (1)	Remove	Unscrew from levers
2	Operator's compartment, instrument panel, bottom	a. Four cotter pins (2) b. Four clevis pins (3) c. Assembled control levers	Remove from control valve spools Remove Remove as an assembly from bottom of instrument panel	Place on work bench
3	Assembled control levers	a. Four cotter pins (4) b. Four clevis pins (5) c. Eight valve links (6 and 7) d. Retaining ring (8) e. Tilt control lever (9) f. Washer (10) g. Lift control lever (11) h. Washer (12) i. Shift control lever (13) j. Washer (14) k. Rotate control lever (15) l. Retaining ring (16)	Remove Remove Remove Remove Remove Remove Remove Remove Remove Remove Remove	Used as required Used as required Used as required
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
4		All parts	Clean	Use cleaning solvent P-D-680

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Control Levers and Link-ages (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
5		Knobs (1)	Inspect	Replace if cracked, nicked, or internal threads damaged
6		Clevis pins (3 and 5)	Inspect	Replace if bent, cracked, or holes elongated
7		Valve links (6 and 7)	Inspect	Replace if bent, cracked, deformed, or mounting hole elongated
8		Retaining rings (8 and 16)	Inspect	Replace if cracked, damaged or spring action lost
9		Washers (10, 12 and 14)	Inspect	Replace if damaged or holes elongated
10		Pivot shaft (17)	Inspect	Replace if bent or damaged. Remove nicks or scratches with fine crocus cloth
11		Control levers (9, 11, 13, and 15)	Inspect	Replace if cracked or broken
12		Bearings (18)	Inspect	Use bore gage and measure inside diameter; replace (step 13 below) if inside diameter is greater than 0.690 inch
REPAIR				
13	Control lever (9,11, 13, and 15)	a. Two bearings (18) b. Two bearings(18)	Remove Install; position and tap into lever tube until shoulder just touches end of tube	Use punch and drive out from opposite end Use soft hammer
INSTALLATION/REPLACEMENT				
14	Pivot shaft (17)	a. Retaining ring (16) b. Rotate control lever (15) c. Washer (14) d. Shift control lever ( 13) e. Washer (12)	Install on one end of shaft (17) Install on shaft Install on shaft Install on shaft Install on shaft	Use as required to position control lever in instrument panel slot Use as required to position control lever in instrument panel slot



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Control Levers and Linkages (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
(cont)		f. Lift control lever (11 ) g. Washer (10)  h. Tilt control lever (9) i. Retaining ring (8) j. Eight valve links (6 and 7) k. Four clevis pins (5) l. Four cotter pins (4)	Install on shaft Install on shaft  Install on shaft Install on shaft Position on tab of levers Install Install and bend end over	Use as required to position control lever in instrument panel slot     Secure valve links to tab on levers Secure clevis pins
15	Operator's compartment, instrument panel, bottom	a. Assembled control levers  b. Four clevis pins (3)  c. Four cotter pins (2)	Position from beneath instrument panel Install in valve links and control valve spools Install in clevis pins and bend end over	
16	Operator's compartment, instrument panel, top	Four knobs (1)	Install	
17	Operator's compartment		a. Start engine and operate at idle speed b. Operate control levers and check that levers operate properly c. Turn engine off	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*c. Lifting Forks.*

This task covers: a. Removal  
b. Installation/Replacement

**PERSONNEL REQUIRED**

Two maintenance technicians

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit  
Bar, 1-1/2 inch diameter by 18 inches long  
Hard Wooden Blocks (2), 6 by 6 by 30 inches

NSN 4910-00-754-0654

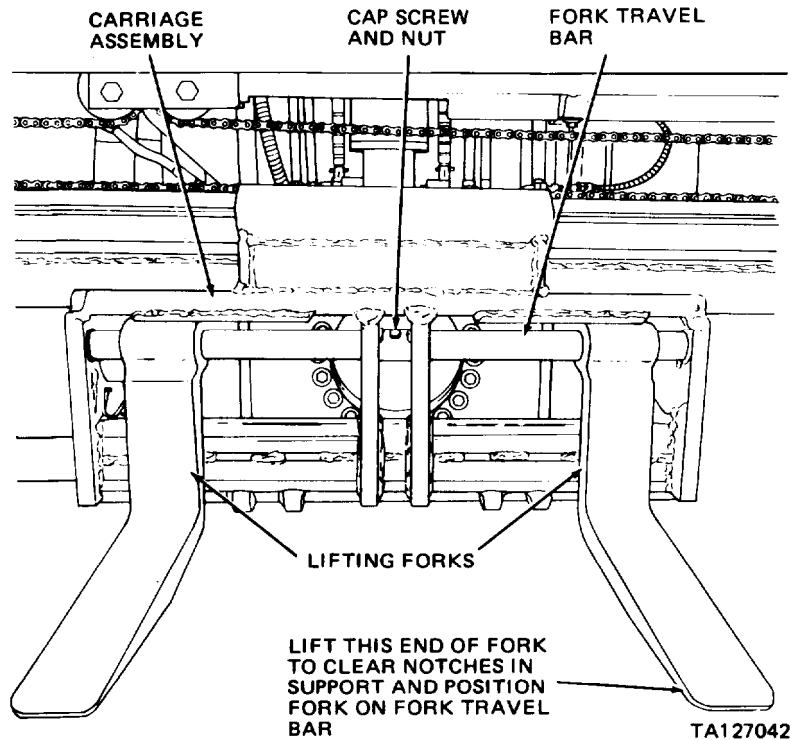
**EQUIPMENT CONDITION**

Paragraph

Condition Description  
Vehicle parked on level surface, lifting forks raised waist high (approximately 3-1/2 feet from ground), carriage assembly blocked so it will not fall, engine off, parking brake applied, and placard placed on control valve levers indicating levers are not to be operated.  
Lifting forks positioned approximately six inches from ends of carriage assembly.

**MATERIALS/PARTS**

Lifting forks



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)***c. Lifting Forks (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Carriage assembly, center	Cap screw and nut	Remove	
2	Carriage assembly, left side	Fork travel bar	Position	Use 1-1/2 inch diameter bar and hammer to drive bar far enough through bore on opposite side of carriage to remove fork
3	Carriage assembly, front	Lifting fork	Lift end of fork to disengage from notch in support and slide fork from bar	
4	Carriage assembly, right side	Fork travel bar	Same as step 2 above	
5	Carriage assembly, front	Lifting fork	Same as step 3 above	
INSTALLATION/REPLACEMENT				
6	Carriage assembly, front right	Lifting fork	Install on fork travel bar	If necessary perform step 2 above to position bar. Be sure you lift end of fork to clear notches in support
7	Carriage assembly, left side	Fork travel bar	Position	Use 1 -1/2 inch diameter bar and hammer to drive bar into its bore on opposite side of carriage. Continue driving bar far enough through bore until remaining fork can be installed
8	Carriage assembly, left front	Lifting fork	Install on fork travel bar	Be sure you lift end of fork to clear notches in support
9	Carriage assembly, right side	Fork travel bar	Position	Drive bar into its bore on opposite side of carriage until holes in bar and center of carriage are aligned
10	Carriage assembly, middle	Cap screw and nut	Install	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Lift Chains and Pulleys.*

- This task covers:
- a. Removal
  - b. Cleaning
  - c. Inspection
  - d. Installation/Replacement
  - e. Adjustment

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit  
Sleeve, 13/ 16 inch diameter by 12 inches long  
Sleeve, 2-7/32 inches diameter by 12 inches long  
Arbor Press  
Bore Gage, 2 inches capacity

NSN 4910-00-754-0654

**EQUIPMENT CONDITION**

Paragraph

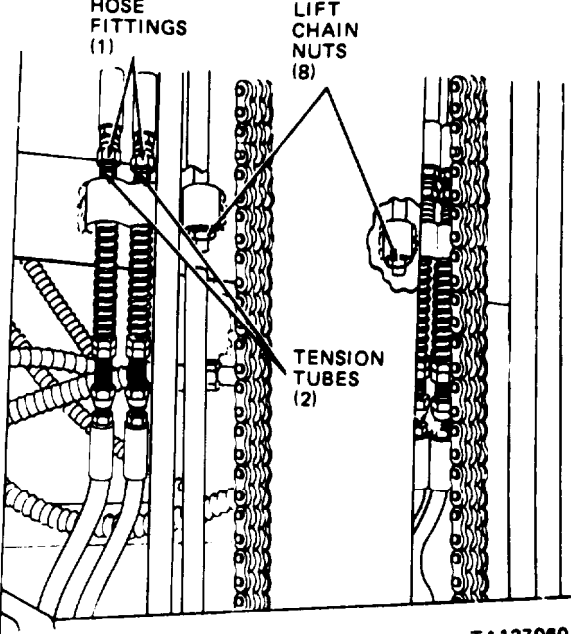
Condition Description  
Vehicle parked on level surface, engine off, parking brake applied, mast vertical, and forks resting on ground. Control valve control levers operated several times to relieve hydraulic pressure.

**MATERIALS/PARTS**

Cleaning solvent P-D-680  
Clean cloths  
SAE 10 motor oil

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Lift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<p><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
1	Mast assembly, inner mast	<p>a. Four hose fittings (1)</p> <p>b. Four tension tubes (2)</p>	<p>Tag, clean, loosen, disconnect and cap</p> <p>Install 1/4-20 nuts</p> <p>Hold tension tubes in position</p>	
 <p>The diagram shows a cross-section of a mast assembly. On the left, two hose fittings are labeled 'HOSE FITTINGS (1)'. In the center, a vertical lift chain is shown with several nuts labeled 'LIFT CHAIN NUTS (8)'. On the right, two tension tubes are labeled 'TENSION TUBES (2)'. The diagram illustrates the assembly and removal of these components.</p> <p style="text-align: right;">TA127060</p>				

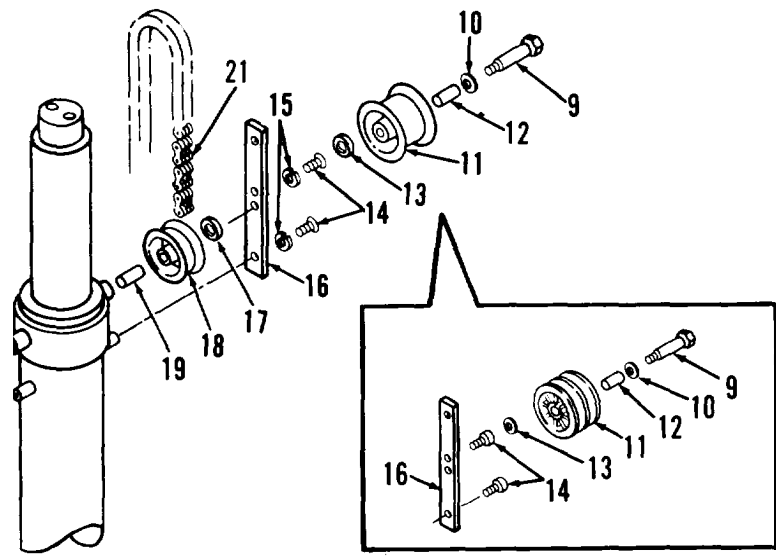
**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Lift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
2	Lift cylinder assembly	a. Two nuts (3), lock washers (3A) and cap screws (4) b. Four hose bumpers (5), and two hose separators (6) c. Four hose assemblies (7) d. Two lift chain nuts (8) e. Two lift chains (21)	Remove  Remove  Position out of way  Slowly loosen and remove  Position out of way	Hose separators (6) used on serial number 9150572 and below
SERIAL NUMBER 9150572 AND BELOW			SERIAL NUMBER 9150573 AND ABOVE	
TA127061			TA301525	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

d. Lift Chains and Pulleys (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
(cont)				<p>KEY</p> <ul style="list-style-type: none"> <li>9. Step bolts</li> <li>10. Washers</li> <li>11. Hose pulleys</li> <li>12. Bushings</li> <li>13. Washers</li> <li>14. Cap screws</li> <li>15. Lock washers</li> <li>16. Pulley bar</li> <li>17. Washer</li> <li>18. Chain pulley</li> <li>19. Bearing</li> <li>21. Lift chain</li> </ul> <p>SERIAL NUMBER 9150573 AND ABOVE</p> <p>TA301526</p>
		<p>f. Two step bolts (9) g. Four washers (10) h. Two hose pulleys (11)</p>	<p>Remove Remove Remove</p>	
		<b>NOTE</b>		
		<p>Don't perform following step unless inspection indicates bushing (12) requires replacement.</p>		
		<p>i. Bushing (12) j. Six washers(13) k. Four cap screws (14) and lock washers (15) l. Pulley bar (16) m. Washer (17) n. Chain pulley (18)</p>	<p>Remove; use 13/16 inch diameter sleeve Remove Remove Remove Remove Remove</p>	<p>Lock washers (15) used on serial number 9150572 and below</p>
		<b>NOTE</b>		
		<p>Don't perform following step unless inspection indicates bearing (19) requires replacement.</p>		
		<p>o. Bearing (19)</p>	<p>Remove; use 2-7/32 inch diameter sleeve</p>	

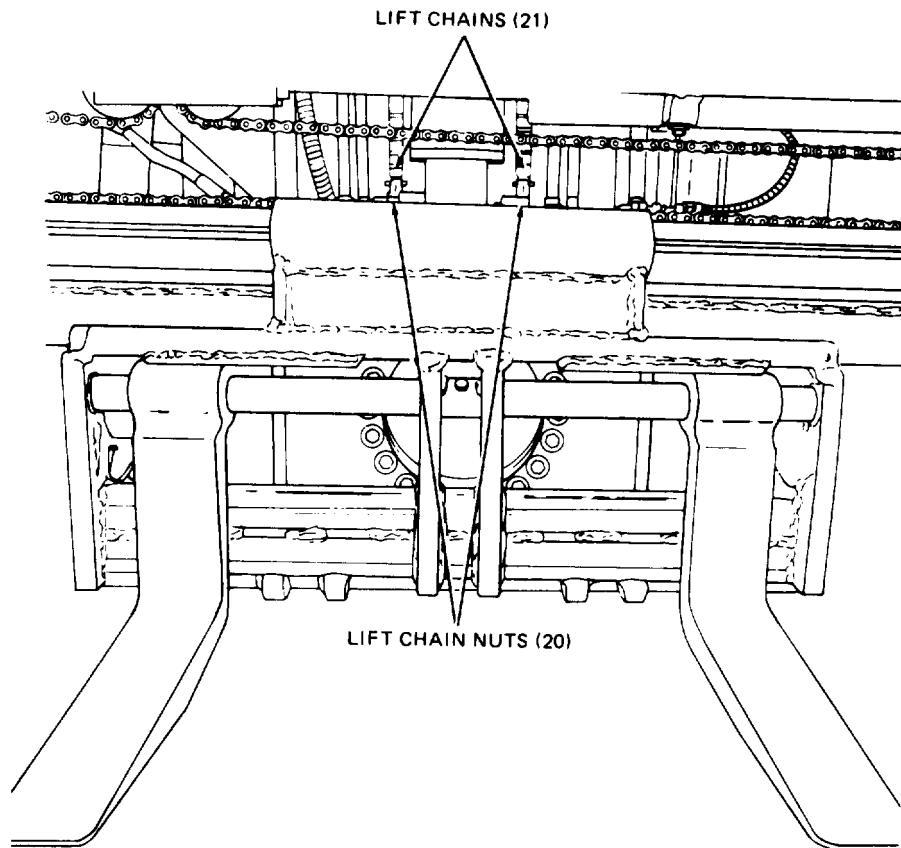
**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Lift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
------	----------	------	--------	---------

REMOVAL (cont)

- |   |                             |  |                      |  |
|---|-----------------------------|--|----------------------|--|
| 3 | Carriage bearing plate, top | a. Two lift chain nuts (20)<br>b. Two lift chains (21) | Remove<br><br>Remove |  |
|---|-----------------------------|--|----------------------|--|



TA127063

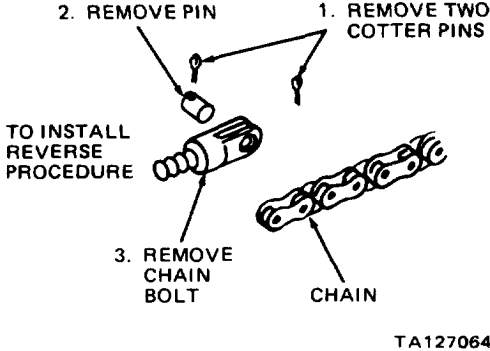
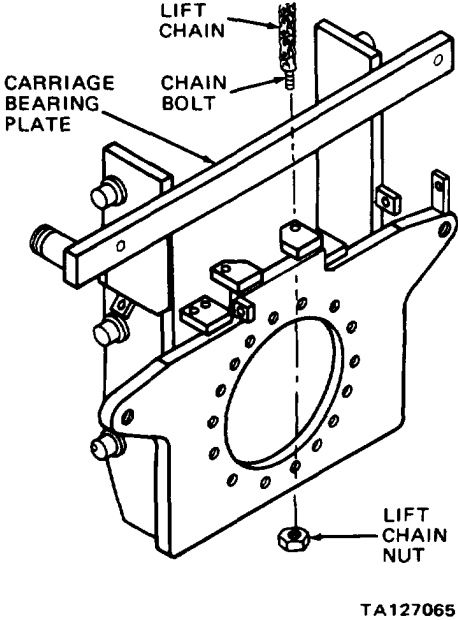


**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)***d. Lift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
4		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
5		Hose bumpers (5)	Inspect	Replace if cracked, chipped or mounting hole enlarged
6		Step bolts (9)	Inspect	Replace if body is worn or cracked or if threads are damaged
7		Hose pulleys (11) and bushings (12)	Inspect	Replace as an assembly if pulley is cracked, bent or damaged. Replace bushing(12) (step 2i above) if inside diameter is 0.79 inch or more (use bore gage to measure)
8		Pulley bar (16)	Inspect	Replace if bent or cracked; chase outer threaded hole with 1/4-20 tap; chase inner threaded hole with 7/16-1 4 tap
9		Chain pulleys (18) and bearing (19)	Inspect	Replace as an assembly if pulley is cracked, bent or damaged. Replace bearing (19) (step 20 above) if rolling action is rough or if inside diameter is 1.24 inches or more (use bore gage to measure)

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

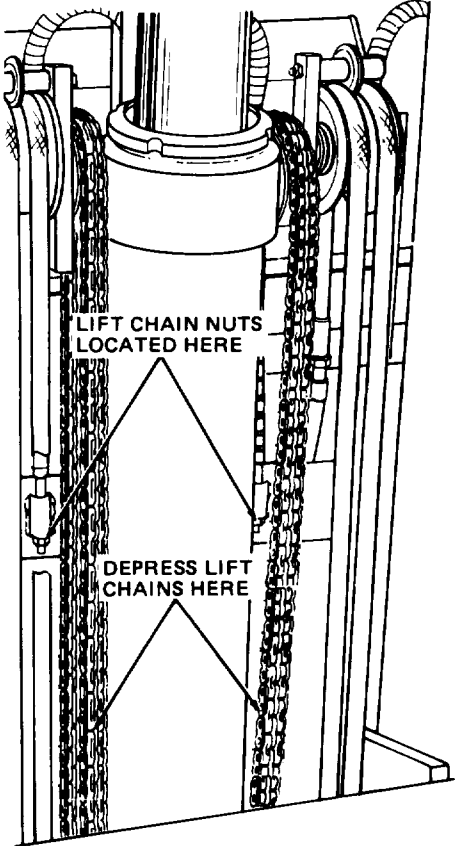
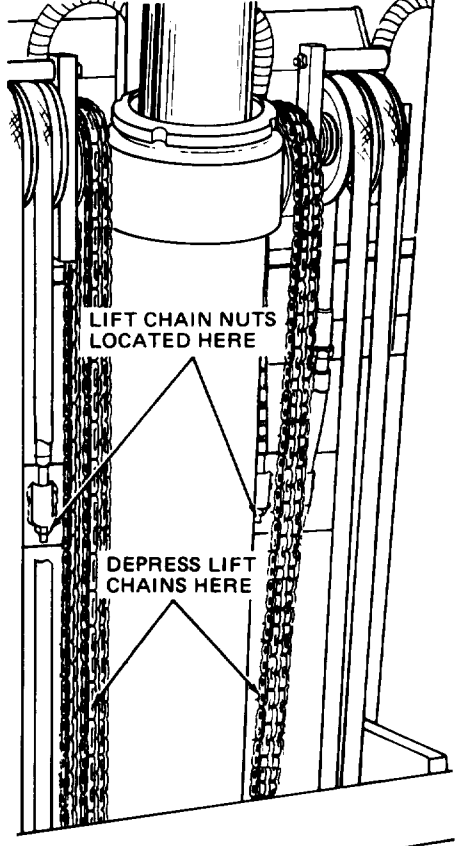
d. Lift #rains and Pulleys (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
10		Lift chains (21)  	Inspect	Replace chain if any link is broken or cracked. Replace chain bolt if threads damaged; replace pin if cracked or bent. See illustration for replacement of these parts
INSTALLATION/REPLACEMENT				
11	Carriage bearing plate, top	a. Two lift chains (21)  b. Two lift chain nuts (20)	Soak chain in SAE 10 motor oil. Position, install chain bolt in carriage bracket supports  Install	
12	Chain pulley (18) Bearing (19)		Install; press into chain pulley hub until centered	Use 2-7/32 inch diameter sleeve
13	Hose pulley (11) Bushing (12)		Install; press into hose pulley hub until centered	Use 13/16 inch diameter sleeve



2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)

d. Lift Chains and Pulleys(cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
adjustment				
16	Mast assembly	a. Lift chains b. Lift chain nut		Depress in middle Chain deflects 1/2 inch approximately Tighten or loosen as required to obtain 1/2 inch deflection when chain is depressed in middle.
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;">  <p>LIFT CHAIN NUTS LOCATED HERE ON CARRIAGE BEARING PLATE</p> <p>SERIAL NUMBER 9150572 AND BELOW</p> <p>TA127066</p> </div> <div style="width: 45%;">  <p>LIFT CHAIN NUTS LOCATED HERE ON CARRIAGE BEARING PLATE</p> <p>SERIAL NUMBER 9150573 AND ABOVE</p> <p>TA301527</p> </div> </div>				

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Sideshift Chains and Pulleys.*

- This task covers:
- a. Removal
  - b. Cleaning
  - c. Inspection
  - d. Installation/Replacement
  - e. Adjustment

**INITIAL SETUP**

**TOOLS**

No. 1 Common Organizational Maintenance Tool Kit  
 Sleeve, 2-7/32 inch diameter by 12 inches long  
 Arbor Press  
 Bore Gage, 2 inch capacity

NSN 4910-00-754-0654

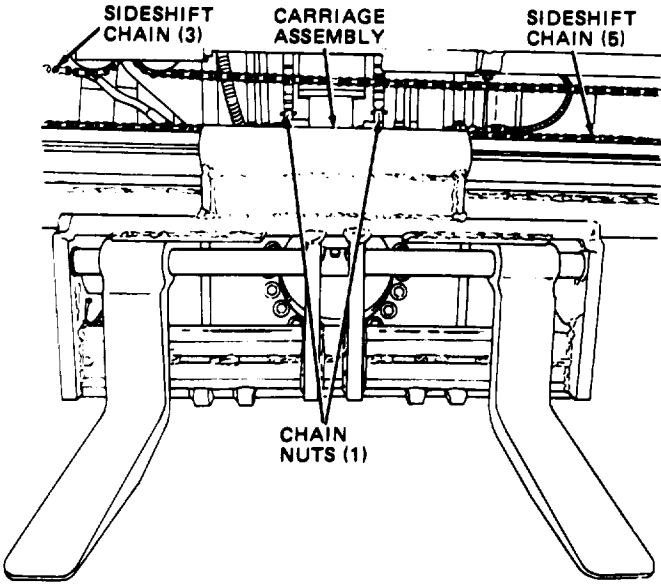
**EQUIPMENT CONDITION**

Paragraph

**Condition Description**  
 Vehicle parked on level surface, engine off, parking brake applied, mast vertical, and forks resting on ground. Control valve control levers operated several times to relieve hydraulic pressure.

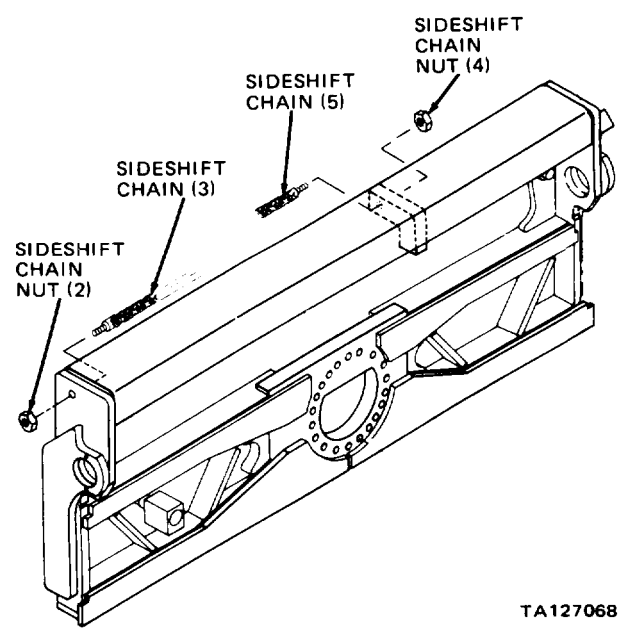
**MATERIALS/PARTS**

Cleaning solvent P-D-680  
 Clean cloths  
 SAE 10 motor oil

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Carriage assembly	Two sideshift chain nuts (1)	Remove	
				

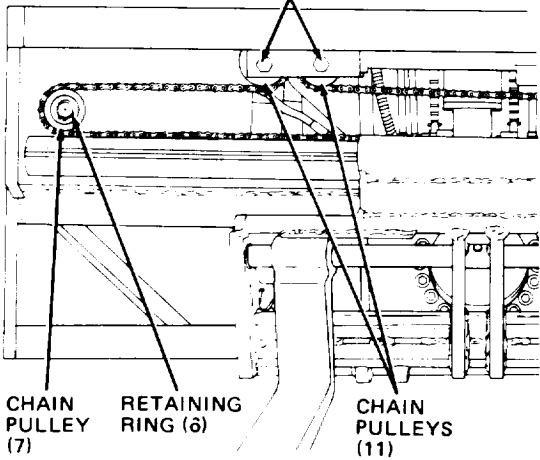
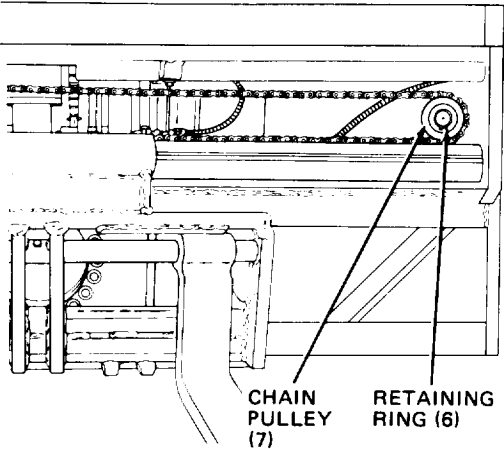
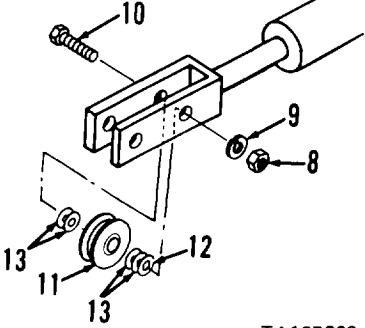
**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Sideshift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
 <p style="text-align: right;">TA127068</p>				
2	Sideshift assembly	a. Sideshift chain nut (2) b. Sideshift chain (3) c. Sideshift chain nut (4) d. Sideshift chain (5)	Remove Remove Remove Remove	

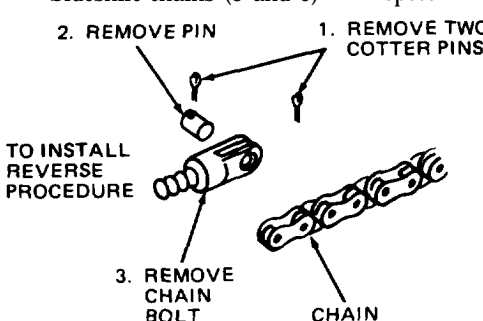
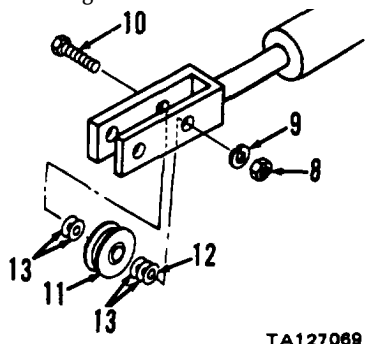
**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Sideshift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>TA127070</p> </div> <div style="text-align: center;">  <p>TA127071</p> </div> </div>				
2 (cont)		<ul style="list-style-type: none"> <li>c. Two retaining rings (6)</li> <li>f. Two chain pulleys (7)</li> <li>g. Two nuts (8), lock washers (9), and cap screws (10)</li> <li>h. Two chain pulleys (11)</li> <li>i. Two spacers (12) and eight washers (13)</li> </ul>	<ul style="list-style-type: none"> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> </ul>	 <p>TA127069</p>
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
3		All parts	Clean	Use cleaning solvent P-D-680

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Sideshift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
4		Chain pulleys (7 and 11)	Inspect	Replace complete assembly if pulley cracked, bent, or damaged. Replace bearing if rolling action is rough or race is chipped or damaged 'or if inside diameter is 0.79 inch or more (use bore gage to measure). Press bearing out of pulley hub using 2-7/32 inch diameter sleeve. Press new bearing into hub until centered in hub using same sleeve
5		Sideshift chains (3 and 5) 	Inspect	Replace chains if any link is broken or cracked. Replace chain bolt if threads damaged; replace pin if bent or cracked. See illustration for replacement of these parts
6		All other parts	Inspect	Replace if cracked, bent or threads damaged
INSTALLATION/REPLACEMENT				
7	Sideshift assembly	a. Two spacers (12) and eight washers (13) b. Two chain pulleys ( 11 ) c. Two cap screws (10), lock washers (9), and nuts (8) d. Two chain pulleys (7) e. Two retaining rings (6)	Position as shown Position Install Position on pulley supports Install	 Be sure rings are seated in groove



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Sideshift Chains and Pulleys (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT (cont)</b>				
7 (Cont)		f. Sideshift chain (5) g. Sideshift chain nut (4) h. Sideshift chain (3) i. Sideshift chain nut (2) j. Sideshift chain (5)	Soak chain in SAE 10 motor oil, then position. Insert chain bolt in sideshift cylinder support hole Install Soak chain in SAE 10 motor oil, then position. Insert chain bolt in hole on right side of sideshift assembly Install Route chain around and down inner pulley mounted in sideshift cylinder rod fork, to pulley on left of side shift assembly, around and down pulley to carriage assembly. Insert chain bolt in chain mounting lug on carriage assembly Route chain around and down outer pulley mounted in sideshift cylinder rod fork, to pulley on right of sideshift assembly around and down pulley to carriage assembly. Insert chain bolt in chain mounting lug on carriage assembly	
8	Carriage assembly	Two sideshift chain nuts (1)	Install; tighten until chain deflects 1/2 inch when depressed in middle	
<b>ADJUSTMENT</b>				
9	Carriage assembly	a. Sideshift chains b. Sideshift chain nuts	Depress in middle Chain deflects 1/2 inch approximately Tighten or loosen as required to obtain 1/2 inch deflection when chain is depressed in middle	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings.*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly. This task covers:

- a. Removal
- b. Cleaning
- c. Inspection
- d. Installation/Replacement
- e. Bleeding air

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph	Condition	Description
		Vehicle parked on level surface, mast tilted forward, forks resting on ground, engine off, and parking brake applied.
2-53c		Left side panel removed.
2-53h		Noise baffle mat removed.
		All control levers on control valve operated several times to relieve hydraulic pressure.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Hydraulic oil (refer to current lubrication order)

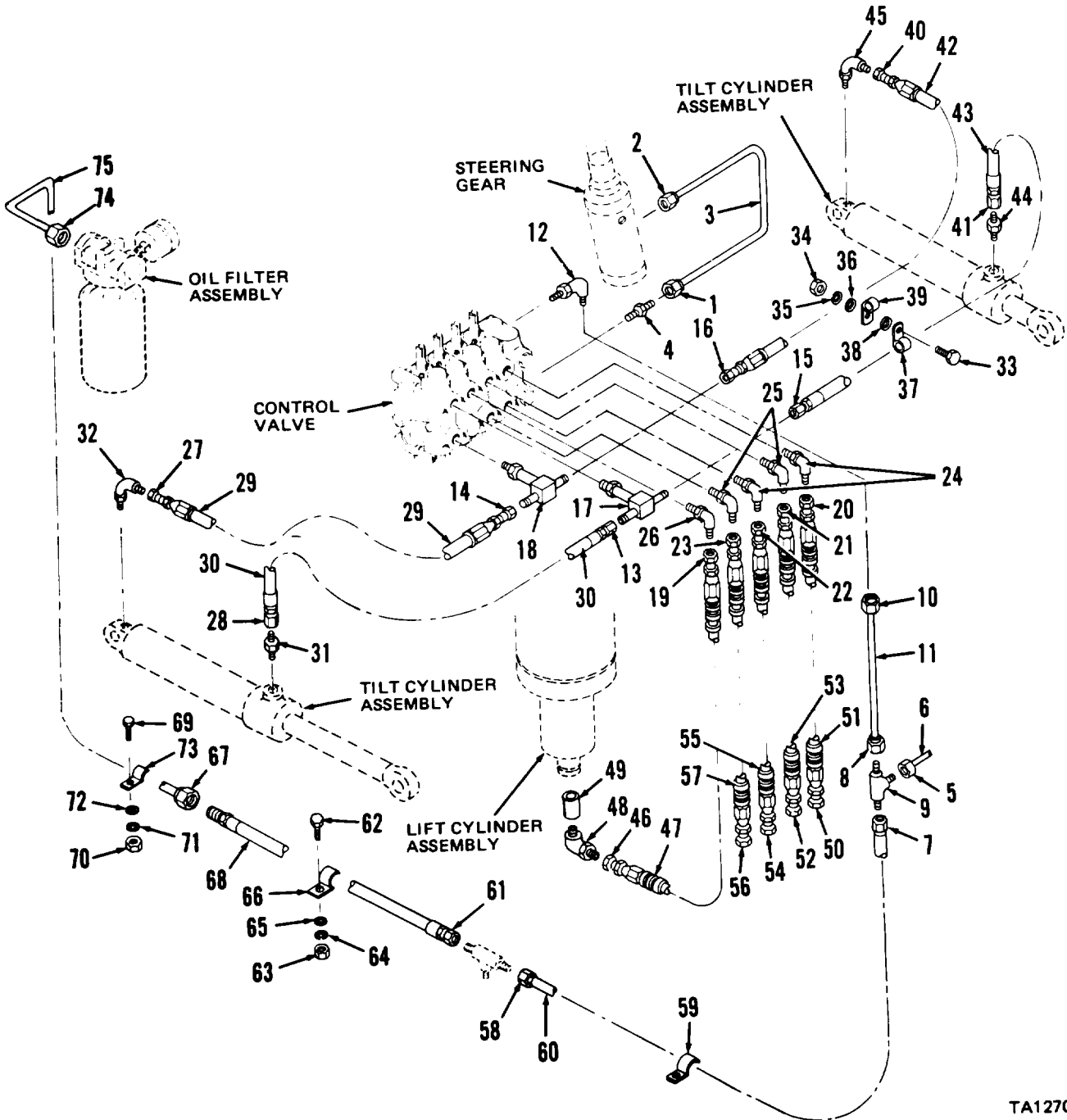
KEY

- |                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| 1. Tube fitting   | 20. Hose fitting  | 39. Clamp         | 58. Hose fitting  |
| 2. Tube fitting   | 21. Hose fitting  | 40. Hose fitting  | 59. Clamp         |
| 3. Tube assembly  | 22. Hose fitting  | 41. Hose fitting  | 60. Hose assembly |
| 4. Connector      | 23. Hose fitting  | 42. Hose assembly | 61. Hose fitting  |
| 5. Tube fitting   | 24. Elbows        | 43. Hose assembly | 62. Cap screw     |
| 6. Tube assembly  | 25. Elbows        | 44. Adapter       | 63. Nut           |
| 7. Hose fitting   | 26. Elbow         | 45. Elbow         | 64. Lock washer   |
| 8. Tube fitting   | 27. Hose fitting  | 46. Hose fitting  | 65. Washer        |
| 9. Tee            | 28. Hose fitting  | 47. Hose assembly | 66. Clamp         |
| 10. Tube fitting  | 29. Hose assembly | 48. Elbow         | 67. Tube fitting  |
| 11. Tube assembly | 30. Hose assembly | 49. Restrictor    | 68. Hose assembly |
| 12. Adapter       | 31. Adapter       | 50. Hose fitting  | 69. Cap screw     |
| 13. Hose fitting  | 32. Elbow         | 51. Hose assembly | 70. Nut           |
| 14. Hose fitting  | 33. Cap screw     | 52. Hose fitting  | 71. Lock washer   |
| 15. Hose fitting  | 34. Nut           | 53. Hose assembly | 72. Washer        |
| 16. Hose fitting  | 35. Lock washer   | 54. Hose fitting  | 73. Clamp         |
| 17. Tee           | 36. Washer        | 55. Hose assembly | 74. Tube fitting  |
| 18. Tee           | 37. Clamp         | 56. Hose fitting  | 75. Tube assembly |
| 19. Hose fitting  | 38. Spacer        | 57. Hose assembly |                   |

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

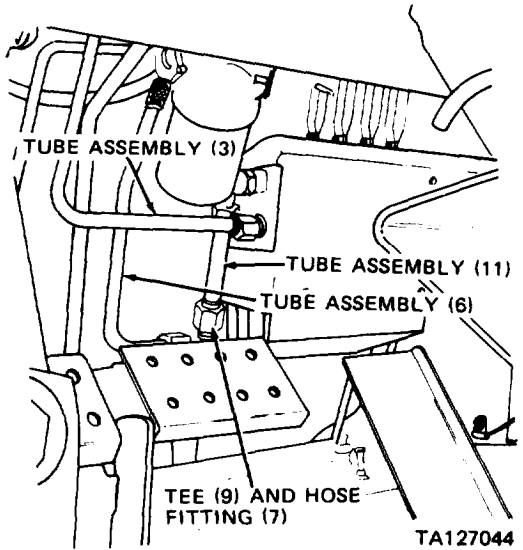


TA127043

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

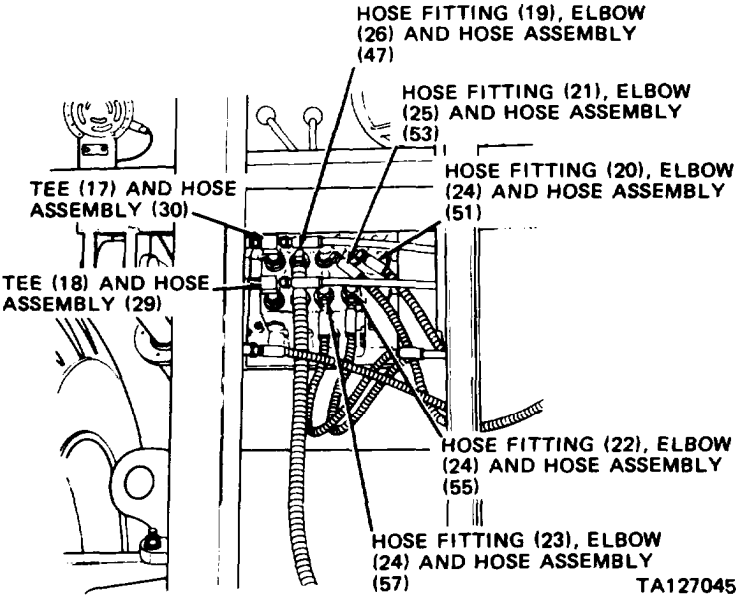
(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<b>NOTE</b>				
Tag all hose and tube assemblies before disconnecting and removing.				
				
1	Operator's compartment	a. Tube fittings (1 and 2) b. Tube assembly (3) c. Connector (4) d. Tube fitting (5) e. Tube assembly (6) f. Hose fitting (7) g. Tube fitting (8) h. Tube fitting (10) i. Tube assembly (11) j. Adapter (12)	Loosen and disconnect Remove Remove Loosen and disconnect Position away from tee (9) Loosen and disconnect from tee (9) Loosen then remove tee (9) Loosen and disconnect Remove Remove from control valve	Plug tube assembly (3) Plug port in steering gear Plug port in control valve Plug tube assembly (6) Plug end of hose assembly (60)

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

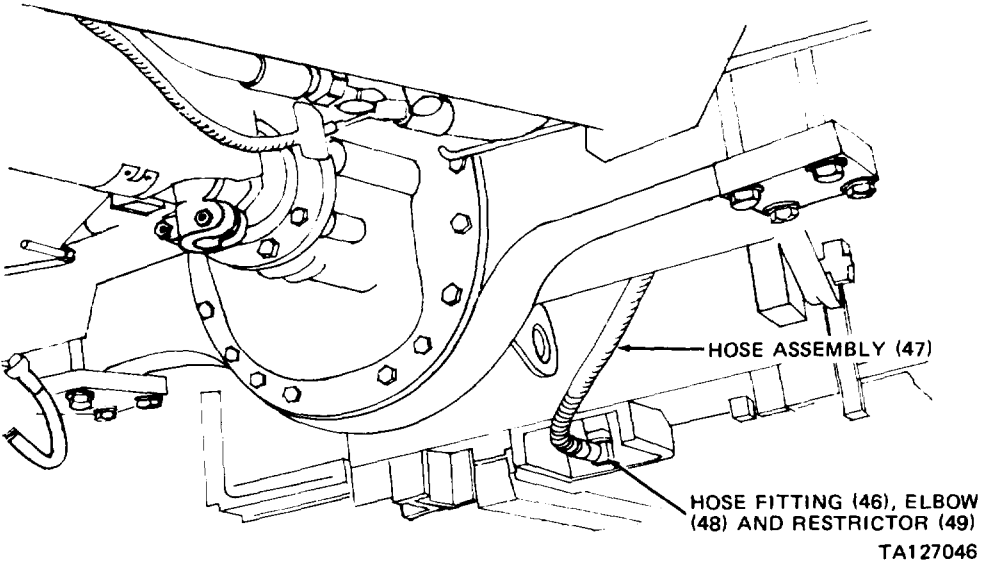
(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
				
2	Front of vehicle, control valve	<ul style="list-style-type: none"> <li>a. Hose fittings ( 13 and 14)</li> <li>b. Hose fittings (15 and 16)</li> <li>c. Tees (17 and 18)</li> <li>d. Hose fitting (19)</li> <li>e. Hose fittings (20 and 21)</li> <li>f. Hose fittings (22 and 23)</li> </ul>	<ul style="list-style-type: none"> <li>Loosen and disconnect</li> <li>Loosen and disconnect</li> <li>Remove</li> <li>Loosen and disconnect</li> <li>Loosen and disconnect</li> <li>Loosen and disconnect</li> </ul>	<ul style="list-style-type: none"> <li>Plug end of hose assemblies (29 and 30)</li> <li>Plug end of hose assemblies (42 and 43)</li> <li>Plug control valve ports</li> <li>Plug end of hose assembly (47)</li> <li>Plug end of hose assemblies (51 and 53)</li> <li>Plug end of hose assemblies (55 and 57)</li> </ul>
<b>NOTE</b>				
Elbows (24, 25, and 26) are adjustable; if necessary, loosen nut (part of elbow) and extend elbow to obtain clearance to remove it.				
		<ul style="list-style-type: none"> <li>g. Elbows (24 and 25)</li> <li>h. Elbow (26)</li> </ul>	<ul style="list-style-type: none"> <li>Remove</li> <li>Remove</li> </ul>	<ul style="list-style-type: none"> <li>Plug control valve ports</li> </ul>
3	Right side of vehicle; tilt cylinder assemblies	<ul style="list-style-type: none"> <li>a. Hose fittings (27 and 28)</li> <li>b. Hose assembly (29)</li> <li>c. Hose assembly (30)</li> <li>d. Adapter (31)</li> <li>e. Elbow (32)</li> </ul>	<ul style="list-style-type: none"> <li>Loosen and disconnect</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> </ul>	<ul style="list-style-type: none"> <li>Plug end of hose assemblies (29 and 30)</li> <li>Plug tilt cylinder assembly port</li> <li>Plug tilt cylinder assembly port</li> </ul>

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

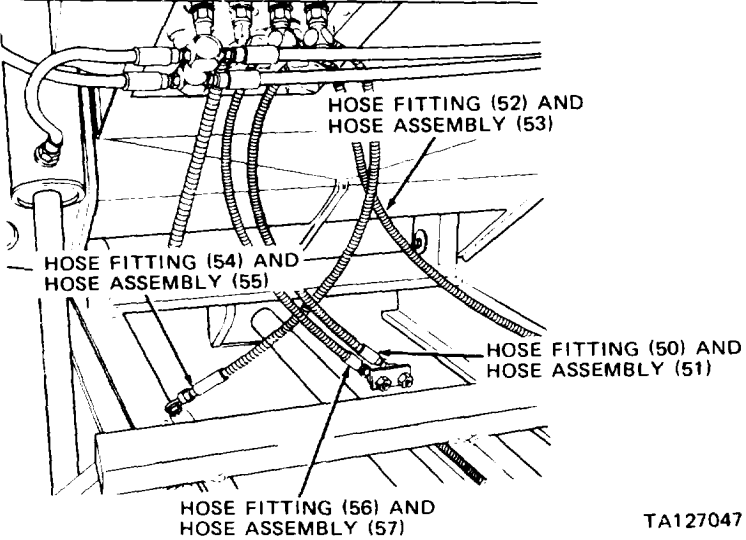
(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
4	Front of vehicle	a. Cap screw (33), nut (34), lock washer (35), and washer (36) b. Clamp (37) c. Spacer (38) d. Clamp (39)	Remove  Remove Remove Remove	
5	Left side of vehicle, tilt cylinder assembly	a. Hose fittings (40 and 41) b. Hose assembly (42) c. Hose assembly (43) d. Adapter (44) e. Elbow (45)	Loosen and disconnect Remove Remove Remove Remove	Plug end of hose assemblies (42 and 43)  Plug tilt cylinder assembly port Plug tilt cylinder assembly port
				
6	Mast assembly, lift cylinder assembly bottom	a. 12 gallon container	Place under hose fitting (46)	Drain hydraulic oil into

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

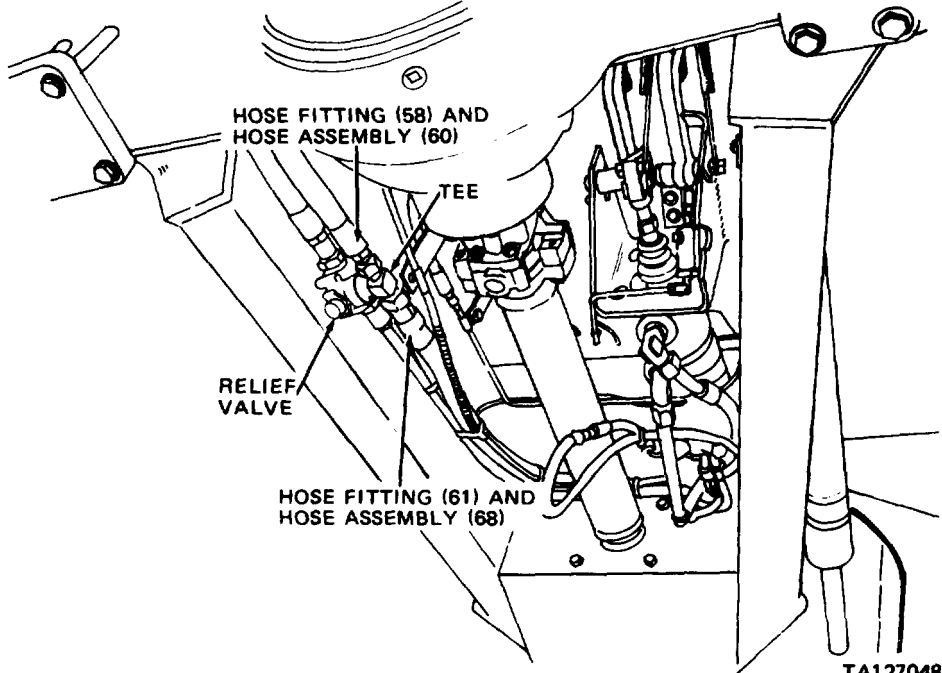
(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS												
REMOVAL (cont)																
6 (cont)																
<p style="text-align: center;"><b>NOTE</b></p> <p>When performing following step, slowly loosen fitting (46) to relieve hydraulic pressure slowly.</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">b. Hose fitting (46)</td> <td style="width: 30%;">Loosen and disconnect</td> <td style="width: 40%;">Plug end of how assembly (47)</td> </tr> <tr> <td>c. Hose assembly (47)</td> <td>Remove</td> <td></td> </tr> <tr> <td>d. Elbow (48)</td> <td>Remove</td> <td></td> </tr> <tr> <td>e. Restrictor (49)</td> <td>Remove</td> <td>Plug lift cylinder assembly port</td> </tr> </table>					b. Hose fitting (46)	Loosen and disconnect	Plug end of how assembly (47)	c. Hose assembly (47)	Remove		d. Elbow (48)	Remove		e. Restrictor (49)	Remove	Plug lift cylinder assembly port
b. Hose fitting (46)	Loosen and disconnect	Plug end of how assembly (47)														
c. Hose assembly (47)	Remove															
d. Elbow (48)	Remove															
e. Restrictor (49)	Remove	Plug lift cylinder assembly port														
<div style="text-align: center;">  <p style="text-align: right;">TA127047</p> </div>																
7	Mast assembly, outer mast	<p>a. Hose fitting (50)</p> <p>b. Hose assembly (51)</p> <p>c. Hose fitting (52)</p> <p>d. Hose assembly (53)</p> <p>e. Hose fitting (54)</p> <p>f. Hose assembly (55)</p> <p>g. Hose fitting (56)</p> <p>h. Hose assembly (57)</p>	<p>Loosen and disconnect</p> <p>Remove</p> <p>Loosen and disconnect</p> <p>Remove</p> <p>Loosen and disconnect</p> <p>Remove</p> <p>Loosen and disconnect</p> <p>Remove</p>	<p>Plug end of hose assembly (51)</p> <p>Plug outer mast port</p> <p>Plug end of hose assembly (53)</p> <p>Plug outer mast port</p> <p>Plug end of hose assembly (55)</p> <p>Plug outer mast port</p> <p>Plug end of hose assembly (57)</p> <p>Plug outer mast port</p>												

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

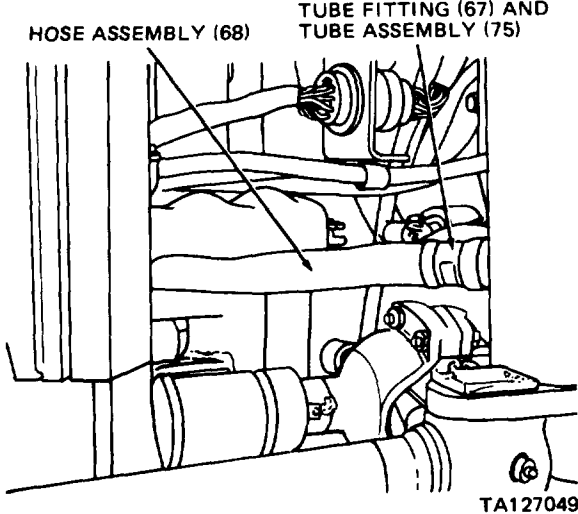
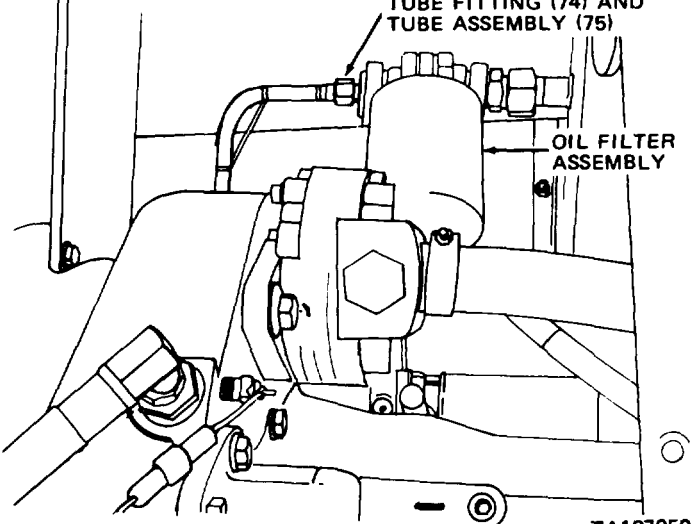
STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
				
8	Front chassis bottom right side	<ul style="list-style-type: none"> <li>a. Hose fitting (58)</li> <li>b. Clamp (59)</li> <li>c. Hose assembly (60)</li> <li>d. Hose fitting (61)</li> <li>e. Cap screw (62), nut (63), lock washer (64), and washer (65)</li> <li>f. Clamp (66)</li> </ul>	<ul style="list-style-type: none"> <li>Loosen and disconnect</li> <li>Remove hardware securing clamp (59) to right side of accelerator pivot base</li> <li>Remove</li> <li>Loosen and disconnect</li> <li>Remove</li> <li>Remove</li> </ul>	<ul style="list-style-type: none"> <li>Plug tee connection and end of hose assembly (60)</li> <li>Plug end of hose assembly (68) and tee connection</li> </ul>



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
 <p style="text-align: right;">TA127049</p>				
9	Rear chassis, front	a. Tube fitting (67) b. Hose assembly (68) c. Cap screw (69), nut (70), lock washer (71), and washer (72) d. Clamp (73)	Loosen and disconnect Remove Remove Remove	Plug end of tube and hose assemblies (75 and 68)
 <p style="text-align: right;">TA127050</p>				

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont)

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
10	Engine compartment, front	a. Tube fitting (74) b. Tube assembly (75)	Loosen and disconnect Remove	Plug end of tube assembly (75) and port on oil filter assembly
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe the vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
11		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
12		Tube assemblies (3, 6, 11, and 75)	Inspect	Replace if cracked, kinked, dented, twisted, or fitting threads damaged
13		Connector (4), tees (9, 17, and 18), adapters (12,31, and 44), and elbows (24, 25, 26, 32, 45, and 48)	Inspect	Replace if cracked, distorted. or threads damaged
14		Hose assemblies (29, 30, 42,43,47,51,53,55, 57,60, and 68)	Inspect	Replace if cracked, split, or fitting threads damaged
15		Clamps (37, 39,59,66, and 73)	Inspect	Replace if bent or cracked
16		Restrictor (49)	Inspect	Replace if cracked, damaged, or threads damaged
INSTALLATION/REPLACEMENT				
<b>NOTE</b>				
Remove plugs/caps from tube and hose assemblies and cylinders as connections are made.				

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
17	Engine compartment, front	a. Tube assembly (75)	Position between oil filter head and front of rear chassis	
		b. Tube fitting (74)	Connect to oil filter head and tighten	
18	Rear chassis, front	a. Clamp (73)	Position on tube assembly (75)	Secures clamp (73) to chassis
		b. Cap screw (69)	Install	Secures screw and clamp to chassis
		c. Washer (72), lock washer (71), and nut (70)	Install	
		d. Hose assembly (68)	Position between tube assembly (75) and tee located on relief valve	
		e. Tube fitting (67)	Connect to hose (68) and tighten	
19	Front chassis, bottom right side	a. Clamp (66)	Position on hose assembly (68)	Secures clamp (66) to chassis Secures screw and clamp to chassis
		b. Cap screw (62)	Install	
		c. Washer (65), lock washer (64), and nut (63)	Install	
		d. Hose fitting	Connect to tee located on relief valve. Tighten	
		e. Hose assembly (60)	Position between tee located on relief valve and operator's compartment	
		f. Clamp (59)	Position on hose (60) and secure to right side of accelerator pivot base	
		g. Hose fitting (58)	Connect to tee located on relief valve and tighten	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
20	Mast assembly, outer mast	a. Hose assembly (57) b. Hose fitting (56)  c. Hose assembly (55) d. Hose fitting (54)  e. Hose assembly (53) f. Hose fitting (52)  g. Hose assembly (51) h. Hose fitting (50)	Position Connect to fitting on outer mast, left side and tighten Position Connect to fitting on outer mast, center mounting bracket, right side and tighten Position Connect to fitting on outer mast, right side and tighten Position Connect to fitting on outer mast, center mounting bracket, left side and tighten	
21	Mast assembly, lift cylinder assembly, bottom	a. Restrictor (49) b. Elbow (48) c. Hose assembly (47) d. Hose fitting (46)	Install in lift cylinder port Install Position Connect to elbow (48) and tighten	
22	Left side of vehicle, tilt cylinder assembly	a. Elbow (45) b. Adapter (44) c. Hose assembly (43)  d. Hose fitting  e. Hose assembly (42)  f. Hose fitting (40)	Install Install Position between cylinder and control valve Connect to adapter (44) and tighten Position between cylinder and control valve Connect to elbow (45) and tighten	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
23	Front of vehicle	a. Clamp (39)	Position on hose (42)	Secures clamps (37 and 39) and spacer (38)
		b. Clamp (37)	Position on hose (43) and place on cap screw (33)	
		c. Spacer (38)	Install on cap screw (33)	
		d. Clamp (39)	Install on cap screw (33)	
		e. Cap screw (33)	Position	
		f. Washer (36), lock washer (35), and nut (34)	Install	
24	Right side of vehicle, tilt cylinder assembly	a. Elbow (32)	Install	
		b. Adapter (31)	Install	
		c. Hose assembly (30)	Position between cylinder and control valve	
		d. Hose fitting (28)	Connect to adapter (31) and tighten	
		e. Hose assembly (29)	Position between cylinder and control valve	
		f. Hose fitting (27)	Connect to elbow (32) and tighten	
25	Front of vehicle, control valve	a. Elbow (26)	Install	
		b. Elbows (25 and 24)	Install	
		<b>NOTE</b>		
		Elbows (24, 25, and 26) are adjustable; if necessary, loosen nut (part of elbow) and extend or compress elbow as required to install it. After installation be sure you tighten elbow nut to prevent hydraulic oil leakage.		
		c. Hose fittings (23 and 22)	Connect and tighten	
		d. Hose fittings (21 and 20)	Connect and tighten	
		e. Hose fitting (19)	Connect and tighten	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

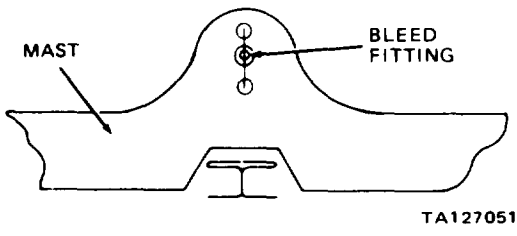
(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT (cont)</b>				
25 (cont)		f. Tees (17 and 18) g. Hose fittings (16 and 15) h. Hose fittings (14 and 13)	Install Connect and tighten Connect and tighten	
26	Operator's compartment	a. Adapter (12) b. Tube assembly (11) c. Tube fitting (10)  d. Tee (9)  e. Hose fitting (7) f. Tube assembly (6) g. Tube fitting (5) h. Connector (4) i. Tube assembly (3)  j. Tube fitting (2)  k. Tube fitting (1)	Install in control valve Position Connect to adapter (12) and tighten Connect to fitting (8) and tighten fitting Connect to tee and tighten Position Connect to tee (9) and tighten install in control valve Position between control valve and steering gear Connect to steering gear and tighten Connect to connector (4) and tighten	Fitting (7) part of hose assembly (60)
<b>BLEEDING AIR FROM LIFT CYLINDER ASSEMBLY</b>				
27	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate control valve levers (lift, rotate, shift, and tilt control levers) several times c. Operate engine at idle speed and check for oil leaks at connections. Tighten fittings if necessary d. Turn engine off e. Check hydraulic oil reservoir oil level; add oil if necessary (refer to current lubrication order) f. Start engine, operate at idle speed, and operate lift control lever to raise forks five feet from ground. Turn engine off	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(1) Hydraulic Oil Filter Assembly to Control Valve to Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
BLEEDING AIR FROM LIFT CYLINDER ASSEMBLY (cont)				
<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 45%;">  <p style="text-align: right; margin-top: 10px;">TA127051</p> </div> <div style="width: 50%;"> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>When performing following step, don't look directly clown at bleed fitting; hydraulic oil is under pressure and may cause serious injury.</p> <p>g. Mount carriage assembly and slowly open bleed fitting located at top of lift cylinder assembly to bleed air; when carriage assembly almost touches ground, close bleed fitting</p> <p>h. Repeat steps e, f, and g, until all air is expelled from lift cylinder assembly</p> </div> </div>				

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly. This task covers:

- |             |                             |
|-------------|-----------------------------|
| a. Removal  | c. Inspection               |
| b. Cleaning | d. Installation/Replacement |

INITIAL SETUP

APPLICABLE SERIAL NUMBERS

9150572 and below

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, mast tilted forward, forks resting on ground, engine off, and parking brake applied. All control levers on control valve operated several times to relieve hydraulic pressure.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

KEY

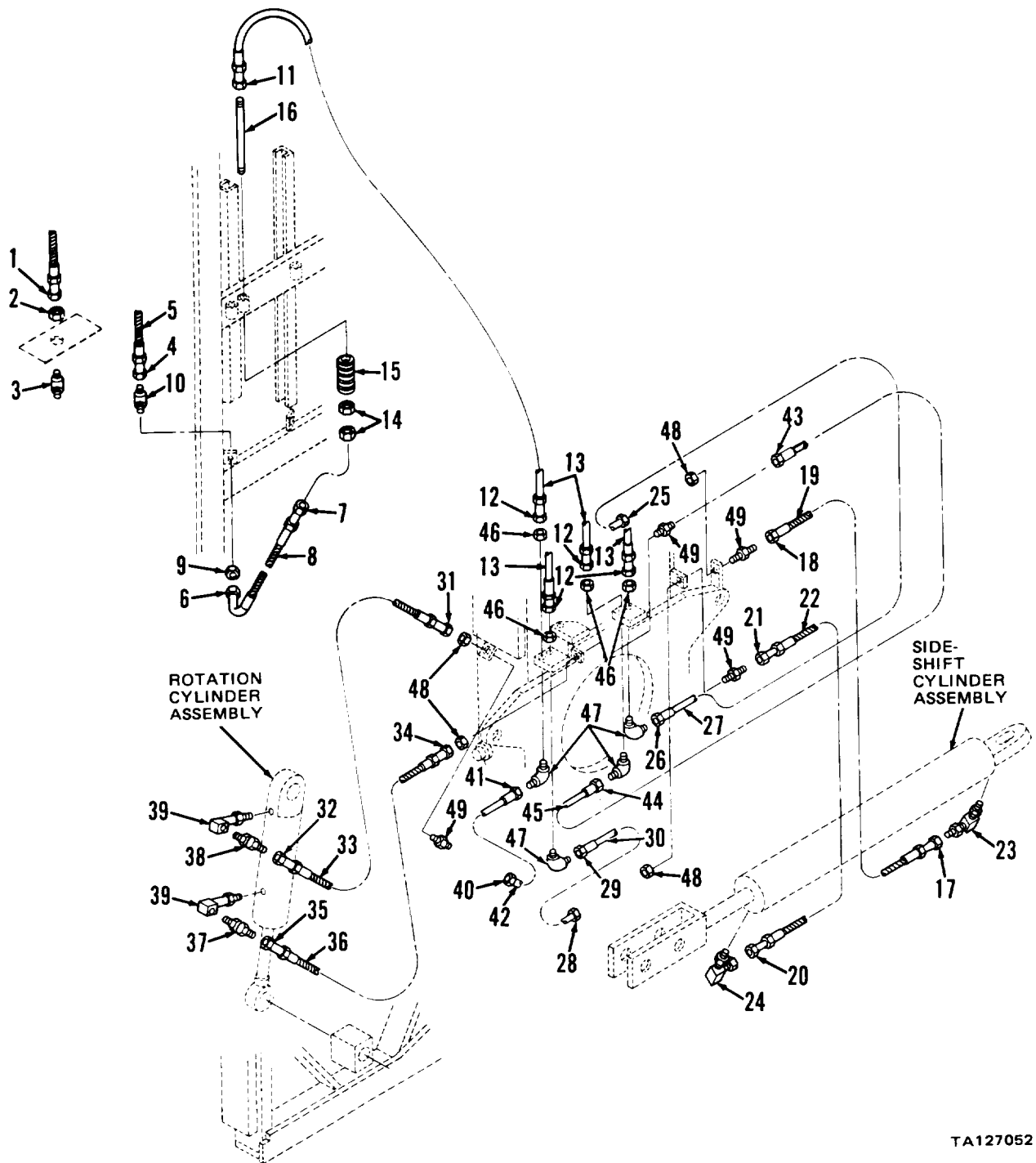
- |                     |                   |                        |
|---------------------|-------------------|------------------------|
| 1. Hose fittings    | 18. Hose fitting  | 35. Hose fitting       |
| 2. Nuts             | 19. Hose assembly | 36. Hose assembly      |
| 3. Elbow fittings   | 20. Hose fitting  | 37. 45 degree fitting  |
| 4. Hose fittings    | 21. Hose fitting  | 38. 90 degree fitting  |
| 5. Hose assemblies  | 22. Hose assembly | 39. 90 degree fittings |
| 6. Hose fittings    | 23. Elbow fitting | 40. Tube fitting       |
| 7. Hose fittings    | 24. Elbow fitting | 41. Tube fitting       |
| 8. Hose assemblies  | 25. Tube fitting  | 42. Tube assembly      |
| 9. Nuts             | 26. Tube fitting  | 43. Tube fitting       |
| 10. Elbow fittings  | 27. Tube assembly | 44. Tube fitting       |
| 11. Hose fittings   | 28. Tube fitting  | 45. Tube assembly      |
| 12. Hose fittings   | 29. Tube fitting  | 46. Nuts               |
| 13. Hose assemblies | 30. Tube assembly | 47. Elbow fittings     |
| 14. Nuts            | 31. Hose fitting  | 48. Nuts               |
| 15. Hose springs    | 32. Hose fitting  | 49. Fittings           |
| 16. Tension tubes   | 33. Hose assembly |                        |
| 17. Hose fitting    | 34. Hose fitting  |                        |



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly (cont).



TA127052

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

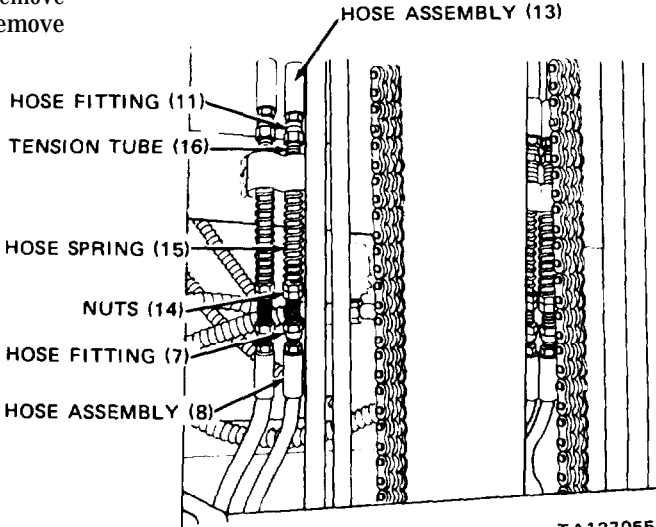
(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
<b>NOTE</b>				
<p>Plug or cap all tube and hose assemblies after removal to prevent entry of dirt/other foreign matter. Tag all hose and tube assemblies before removing.</p>				
<p>DISCONNECT HOSE FITTINGS (PARA 2-56f (1), STEP 7). HOSE FITTINGS (1), NUTS (2) AND ELBOW FITTINGS (3) LOCATED HERE</p>				
1	Mast assembly, outer mast	<p>a. Hose fitting                      b. Four hose fittings (1)                      c. Four nuts (2)                      d. Four elbow fittings (3)</p>	<p>Loosen and disconnect                      Loosen and disconnect                      Remove                      Remove</p>	Para 2-56d(1), step 7
TA127054				

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly (cont).

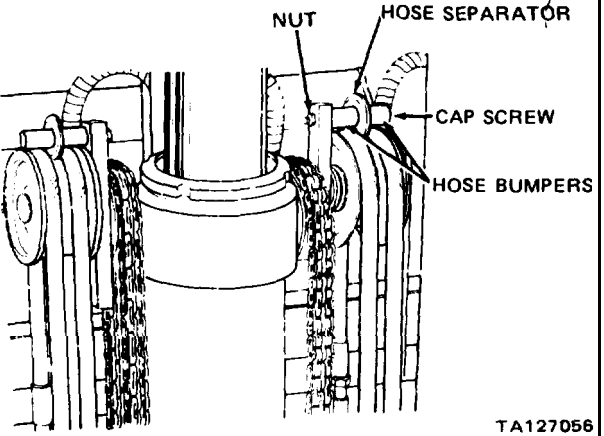
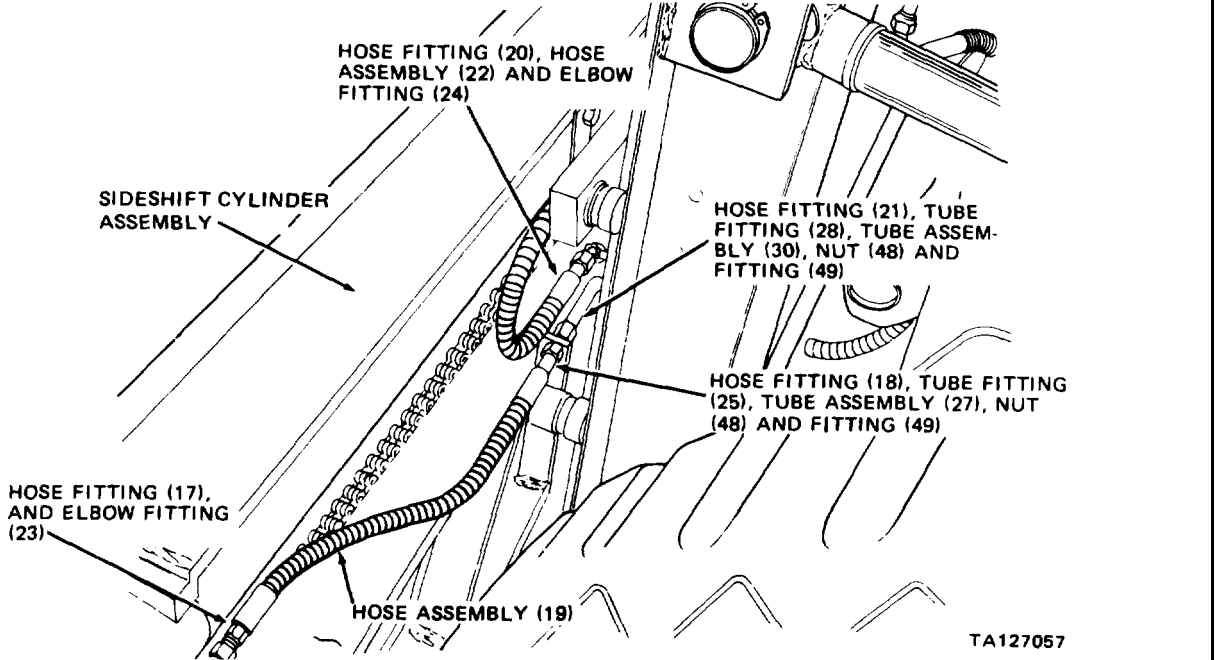
STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
2	inner mast, bottom	a. Four hose fittings (4) b. Four hose assemblies (5) c. Four hose fittings (6) d. Four hose fittings (7) e. Four hose assemblies (8) f. Four nuts (9) g. Four elbow fittings (10)	Loosen and disconnect Remove Loosen and disconnect Loosen and disconnect Remove Remove Remove	
		h. Four hose fittings (11)	Loosen and disconnect	
		i. Four hose fittings (12) (page 2-431)	Loosen and disconnect	

TA127055

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
2 (cont)		j. Two cap screws and nuts k. Four hose bumpers l. Two hose separators m. Four hose assemblies (13) n. Eight nuts (14) o. Four hose springs (15) p. Four tension tubes (16)	Remove  Remove Remove Remove  Remove Remove Remove	 <p style="text-align: right;">TA127056</p>
				 <p style="text-align: right;">TA127057</p>

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
3	Carriage assembly	a. Hose fitting (17 and 18)	Loosen and disconnect	<p>Diagram showing the mast assembly with labels: ROTATION CYLINDER ASSEMBLY, HOSE FITTING (31), HOSE ASSEMBLY (33), FITTING (38) AND FITTING (39), HOSE FITTING (35), HOSE ASSEMBLY (36), FITTING (37) AND FITTING (39).</p>
		b. Hose assembly (19)	Remove	
		c. Hose fitting (20 and 21)	Loosen and disconnect	
		d. Hose assembly (22)	Remove	
		e. Elbow fitting (23 and 24)	Remove	
		f. Tube fittings (25 and 26)	Loosen and disconnect	
		g. Tube assembly (27)	Remove	
		h. Tube fittings (28 and 29)	Loosen and disconnect	
		i. Tube assembly (30)	Remove:	
		j. Hose fittings (31 and 32)	Loosen and disconnect	
		k. Hose assembly (33)	Remove	
		l. Hose fittings (34 and 35)	Loosen and disconnect	
		m. Hose assembly (36)	Remove	
		n. 45 degree fitting (37)	Remove	
		o. 90 degree fitting (38)	Remove	
		p. Two 90 degree fittings (39)	Remove	
		q. Tube fittings (40 and 41)	Loosen and disconnect	
		r. Tube assembly (42)	Remove	

TA127058

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
3 (cont)		s. Tube fittings (43 and 44)	Loosen and disconnect	
		t. Tube assembly (45)	Remove	
		u. Four nuts (46)	Remove	
		v. Four elbow fittings (47)	Remove	
		w. Four nuts (48)	Remove	
		x. Four fittings (49)	Remove	
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
4		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
5		Elbow fittings (3, 10,23, 24, and 47), 45 degree fitting (37), 90 degree fittings (38 and 39), and fitting (49)	Inspect	Replace if cracked, distorted, or threads damaged
6		Hose assemblies (5, 8, 13,22, 33, and 36)	Inspect	Replace if cracked, split, or fitting threads damaged
7		Tube assemblies (27, 30, 42, and 45), and tension tubes (16)	Inspect	Replace if cracked, kinked, dented, twisted, or fitting threads damaged
8		Hose springs (15)	Inspect	Replace if cracked or damaged or evidence of permanent set is obvious

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

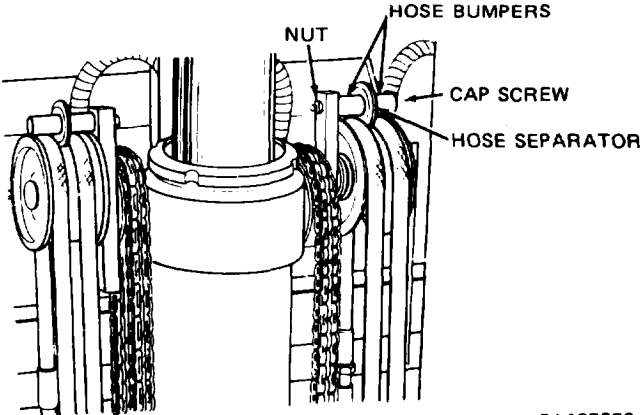
(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION/REPLACEMENT</b>				
<b>NOTE</b>				
Remove plugs/caps from tube and hose assemblies and cylinders as connections are made.				
9	Carriage assembly	a. Four fittings (49)	Position	
		b. Four nuts (48)	Install	Secure fittings (49)
		c. Four elbow fittings (47)	Position	
		d. Four nuts (46)	Install	Secure elbow fittings (47)
		e. Tube assembly (45)	Position	
		f. Tube fittings (44 and 43)	Connect and tighten	Completes installation of tube assembly (45)
		g. Tube assembly (42)	Position	
		h. Tube fittings (41 and 40)	Connect and tighten	Completes installation of tube assembly (42)
		i. Two 90 degree fittings (39)	Install	
		j. 90 degree fitting (38)	Install	
		k. 45 degree fitting (37)	Install	
		l. Hose assembly (36)	Position	
		m. Hose fittings (35 and 34)	Connect and tighten	Completes installation of hose assembly (36)
		n. Hose assembly (33)	Position	
		o. Hose fittings (32 and 31)	Connect and tighten	Completes installation of hose assembly (33)
		p. Tube assembly (30)	Position	
		q. Tube fittings (29 and 28)	Connect and tighten	Completes installation of tube assembly (30)
		r. Tube assembly (27)	Position	
		s. Tube fittings (26 and 25)	Connect and tighten	Completes installation of tube assembly (27)
		t. Elbow fittings (24 and 23)	Install	
		u. Hose assembly (22)	Position	
		v. Hose fittings (21 and 20)	Connect and tighten	Completes installation of hose assembly (22)
		w. Hose assembly (19)	Position	
		x. Hose fittings (18 and 17)	Connect and tighten	Completes installation of hose assembly (19)

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont)*

(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS		
INSTALLATION/REPLACEMENT (cont)						
10	Inner mast, bottom	a. Tension tube (16)	Position with short threaded end towards fitting (11)			
		b. Hose spring (15)	Position on tension tube (16)			
		c. Nuts (14)	Install			
		d. Hose assembly (13)	Position			
						
						TA127056
		e. Hose bumper and hose separator	Position on cap screw			
		f. Cap screw and nut	Install; position hose assemblies (13) on each side of separator			
		g. Hose fitting (11)	Connect and tighten			
		h. Hose fitting (12)	Connect and tighten	Completes installation of hose assembly (13)		
		i. Elbow fitting (10)	Position			
		j. Nut (9)	Install	Secure elbow fitting (10)		
		k. Hose assembly (8)	Position			
		l. Hose fittings (7 and 6)	Connect and tighten	Completes installation of hose assembly (8)		
m. Hose assembly (5)	Position					
n. Hose fitting (4)	Connect and tighten					



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(2) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT				
11	Mast assembly, outer mast	a. Elbow fitting (3) b. Nut (2) c. Hose fitting (1)  f. Hose fitting	Position Install Connect and tighten Connect and tighten	Completes installation of hose assembly (5) Para 2-56f (1), step 20
12	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate control valve levers (lift, rotate, shift, and tilt control levers) several times c. Operate engine at idle speed and check for oil leaks at connections. Tighten fittings if necessary d. Turn engine off e. Check hydraulic reservoir oil level; add oil if necessary (refer to current lubrication order) f. Repeat steps a through e	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly This task covers:

- a. Removal
- b. Cleaning
- c. Inspection
- d. Installation/Replacement

INITIAL SETUP

APPLICABLE SERIAL NUMBERS

9150573 and above

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, mast tilted forward, forks resting on ground, engine off, and parking brake applied. All control levers on control valve operated several times to relieve hydraulic pressure.

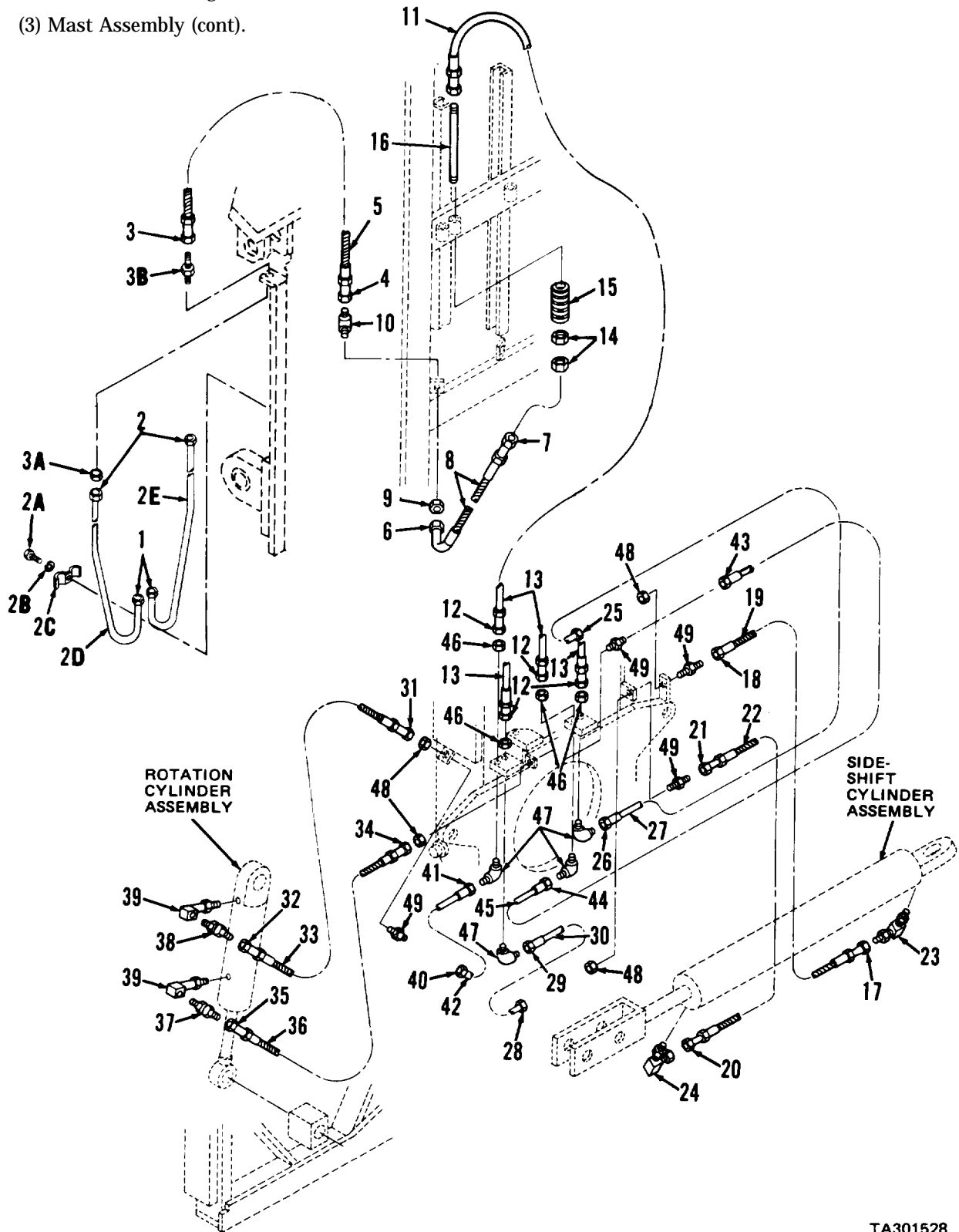
KEY

- |                     |                     |                        |
|---------------------|---------------------|------------------------|
| 1. Tube fittings    | 13. Hose assemblies | 32. Hose fitting       |
| 2. Tube fittings    | 14. Nuts            | 33. Hose assembly      |
| 2A. Cap screws      | 15. Hose springs    | 34. Hose fitting       |
| 2B. Lock washers    | 16. Tension tubes   | 35. Hose fitting       |
| 2C. Clamps          | 17. Hose fitting    | 36. Hose assembly      |
| 2D. Tube assemblies | 18. Hose fitting    | 37. 45 degree fitting  |
| 2E. Tube assemblies | 19. Hose assembly   | 38. 90 degree fitting  |
| 3. Hose fittings    | 20. Hose fitting    | 39. 90 degree fittings |
| 3A. Nuts            | 21. Hose fitting    | 40. Tube fitting       |
| 3B. Fittings        | 22. Hose assembly   | 41. Tube fitting       |
| 4. Hose fittings    | 23. Elbow fitting   | 42. Tube assembly      |
| 5. Hose assemblies  | 24. Elbow fitting   | 43. Tube fitting       |
| 6. Hose fittings    | 25. Tube fitting    | 44. Tube fitting       |
| 7. Hose fittings    | 26. Tube fitting    | 45. Tube assembly      |
| 8. Hose assemblies  | 27. Tube assembly   | 46. Nuts               |
| 9. Nuts             | 28. Tube fitting    | 47. Elbow fittings     |
| 10. Elbow fittings  | 29. Tube fitting    | 48. Nuts               |
| 11. Hose fittings   | 30. Tube assembly   | 49. Fittings           |
| 12. Hose fittings   | 31. Hose fitting    |                        |

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).



TA301528

Change 2 2-440A

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<b><u>WARNING</u></b>				
<p>Hydraulic system is under pressure. Before disconnecting any hoses, lines, or fittings, operate all hydraulic control levers to relieve hydraulic system pressure. Failure to do so could cause serious injury or death. If you are injured obtain medical assistance immediately.</p>				
<b>NOTE</b>				
<p>Plug or cap all tube and hose assemblies after removal to prevent entry of dirt or other foreign matter. Tag all hose and tube assemblies before removing.</p>				
1	Mast assembly, outer mast	<p>a. Four hoses b. Four tube fittings (1) c. Four tube fittings (2)</p>	<p>Identify and tag Loosen and disconnect Loosen and disconnect</p>	From control valve hoses
<p>The diagram shows a cross-section of a mast assembly. At the top, four tube fittings are labeled 'TUBE FITTINGS (2)'. Below them, four hoses are shown, labeled 'HOSES FROM CONTROL VALVE'. At the bottom, four tube fittings are labeled 'TUBE FITTINGS (1)'. The hoses are connected to the tube fittings (1) at the bottom and to the tube fittings (2) at the top. The diagram is used to illustrate the removal of these components.</p>				
TA301529				

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

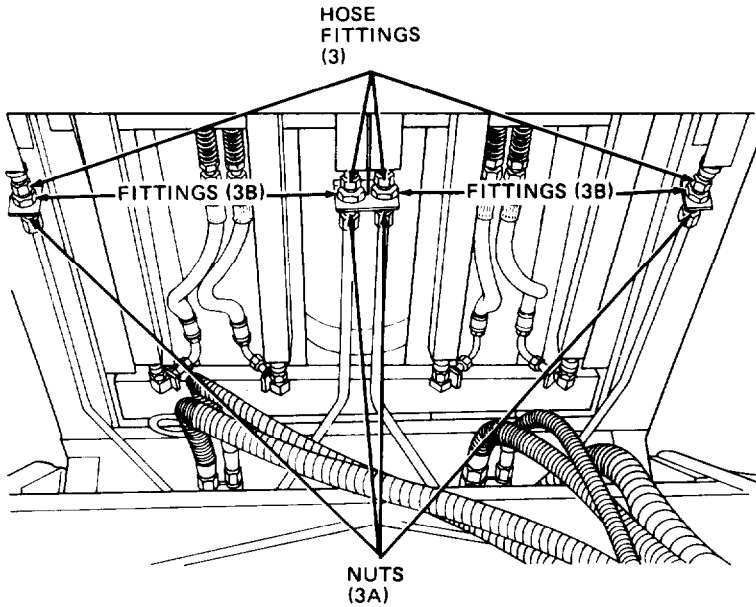
(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<p>The diagram shows a cross-section of a mast assembly with several hydraulic lines. Labels point to 'TUBE ASSEMBLY (2D)' on the left and right sides, 'TUBE ASSEMBLIES (2E)' in the center, and 'CAP SCREWS (2A), LOCK WASHERS (2B), AND CLAMPS (2C)' at the bottom where the lines are secured to the mast.</p>				
TA301530				
1 (cont)		d. Two cap screws (2A), lock washers (2B) and clamps (2C)	Loosen and remove	
		e. Two tube assemblies (2D and 2E)	Remove	
		f. Four hose fittings (3)	Loosen and disconnect	
		g. Four nuts (3A)	Loosen and remove	
		h. Four fittings (3B)	Remove	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

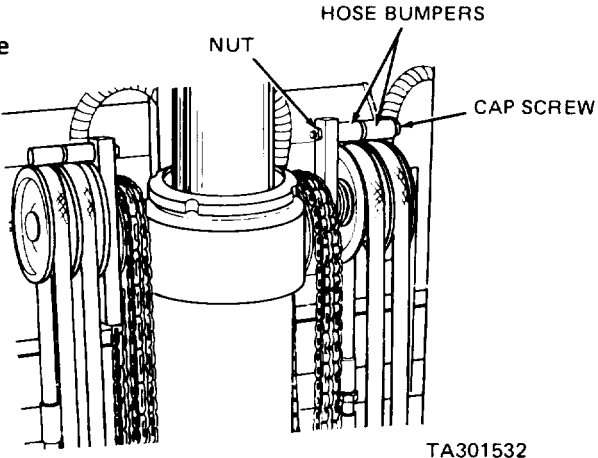
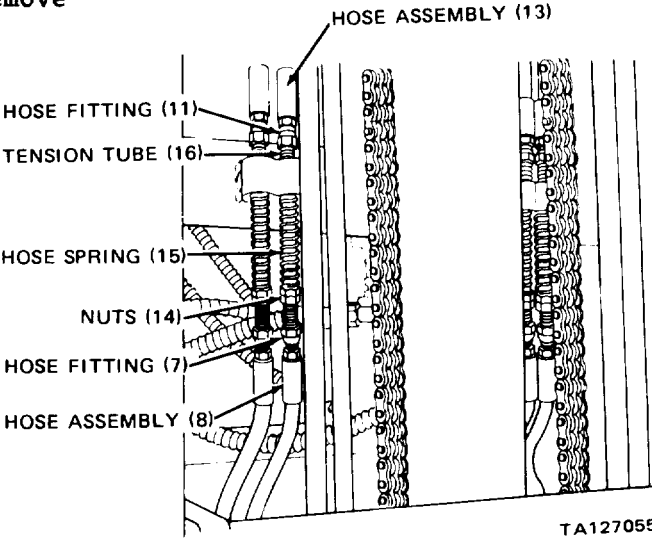
(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<div style="text-align: center;">  <p>The diagram shows a perspective view of a hydraulic lift system's mast assembly. It features a central vertical mast with four diagonal support struts. At the top, there are three hose fittings labeled 'HOSE FITTINGS (3)'. On the sides, there are four sets of hose fittings labeled 'FITTINGS (3B)'. At the base of the mast, there are four nuts labeled 'NUTS (3A)'. The entire assembly is connected to a network of hoses and elbow fittings.</p> </div> <p style="text-align: right;">TA301531</p>				
2	Inner mast, bottom	<ul style="list-style-type: none"> <li>a. Four hose fittings (4)</li> <li>b. Four hose assemblies (5)</li> <li>c. Four hose fittings (6)</li> <li>d. Four hose fittings (7)</li> <li>e. Four hose assemblies (8)</li> <li>f. Four nuts (9)</li> <li>g. Four elbow fittings (10)</li> <li>h. Four hose fittings (11)</li> <li>i. Four hose fittings (12) (page 2-431)</li> </ul>	<ul style="list-style-type: none"> <li>Loosen and disconnect</li> <li>Remove</li> <li>Loosen and disconnect</li> <li>Loosen and disconnect</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Loosen and disconnect</li> <li>Loosen and disconnect</li> </ul>	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
2 (cont)		j. Two cap screws and nuts k. Four hose bumpers	Remove  Remove	 <p>TA301532</p>
		l. Four hose assemblies (13) m. Eight nuts (14) n. Four hose springs (15) o. Four tension tubes (16)	Remove  Remove  Remove  Remove	 <p>TA127055</p>

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

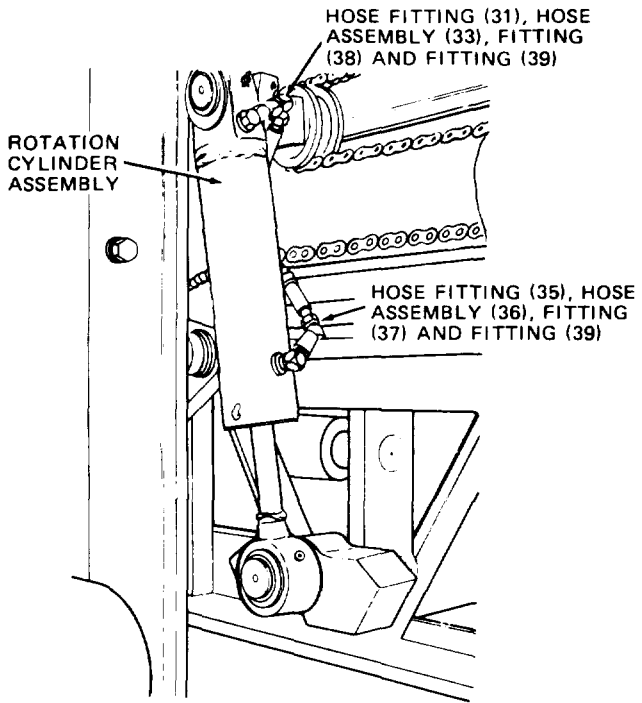
STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
3	Carriage assembly	<ul style="list-style-type: none"> <li>a. Hose fitting (17 and 18)</li> <li>b. Hose assembly (19)</li> <li>co Hose fitting (20 and 21)</li> <li>d. Hose assembly (22)</li> <li>e. Elbow fitting (23 and 24)</li> <li>f. Tube fittings (25 and 26)</li> <li>g. Tube assembly (27)</li> <li>h. Tube fittings (28 and 29)</li> </ul>	<ul style="list-style-type: none"> <li>Loosen and disconnect</li> <li>Remove</li> <li>Loosen and disconnect</li> <li>Remove</li> <li>Remove</li> <li>Loosen and disconnect</li> <li>Remove</li> <li>Loosen and disconnect</li> </ul>	



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
 <p style="text-align: right;">TA127058</p>				
3 (cont)		i. Tube assembly (30)	Remove	
		j. Hose fittings (31 and 32)	Loosen and disconnect	
		k. Hose assembly (33)	Remove	
		l. Hose fittings (34 and 35)	Loosen and disconnect	
		m. Hose assembly (36)	Remove	
		n. 45 degree fitting (37)	Remove	
		o. 90 degree fitting (38)	Remove	
		p. Two 90 degree fittings (39)	Remove	
		q. Tube fittings (40 and 41)	Loosen and disconnect	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
3 (cont)		r. Tube assembly (42)	Remove	
		s. Tube fittings (43 and 44)	Loosen and disconnect	
		t. Tube assembly (45)	Remove	
		u. Four nuts (46)	Remove	
		v. Four elbow fittings (47)	Remove	
		w. Four nuts (48)	Remove	
		x. Four fittings (49)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent P-D-680 used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don-t smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air and medical attention immediately. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water and get medical aid immediately.</p>				
4		All parts	Clean	Use cleaning solvent P-D-680
<b>INSPECTION</b>				
5		Elbow fittings (3, 10, 23, 24, and 47), 45 degree fitting (37), 90 degree fittings (38 and 39), and fitting (3B and 49)	Inspect	Replace if cracked, distorted or threads damaged

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont)*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
6		Hose assemblies (5, 8, 13, 22, 33, and 36)	Inspect	Replace if cracked, split, or fitting threads damaged
7		Tube assemblies (2D, 2E, 27, 30, 42, and 45) and ten- sion tubes (16)	Inspect	Replace if cracked, kinked, dented, twisted, or fitting threads damaged
8		Hose springs (15)	Inspect	Replace if cracked or damaged or evidence of permanent set is obvious
INSTALLATION/REPLACEMENT				
<b>NOTE</b>				
Remove plugs/caps from tube and hose assemblies and cylinders as connection are made.				
9	Carriage assembly	a. Four fittings (49)	Position	
		b. Four nuts (48)	Install	Secure fittings (49)
		c. Four elbow fittings (47)	Position	
		d. Four nuts (46)	Install	Secure elbow fittings (47)
		e. Tube assembly (45)	Position	
		f. Tube fittings (44 and 43)	Connect and tighten	Completes installation of tube assembly (45)
		g. Tube assembly (42)	Position	
		h. Tube fittings (41 and 40)	Connect and tighten	Completes installation of tube assembly (42)
		i. Two 90 degree fittings (39)	Install	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f, Hoses, Lines and Fittings (cont).*

**(3) Mast Assembly (cont).**

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
9 (cont)		j. 90 degree fitting (38)	Install	
		k. 45 degree fitting (37)	Install	
		l. Hose assembly (36)	Position	
		m. Hose fittings (35 and 34)	Connect and tighten	Completes installation of hose assembly (36)
		n. Hose assembly (33)	Position	
		o. Hose fittings (32 and 31)	Connect and tighten	Completes installation of hose assembly (33)
		p. Tube assembly (30)	Position	
		q. Tube fittings (29 and 28)	Connect and tighten	Completes installation of tube assembly (30)
		r. Tube assembly (27)	Position	
		s. Tube fittings (26 and 25)	Connect and tighten	Completes installation of tube assembly (27)
		t. Elbow fittings (24 and 23)	Install	
		u. Hose assembly (22)	Position	
		v. Hose fittings (21 and 20)	Connect and tighten	Completes installation of hose assembly (22)
		w. Hose assembly (19)	Position	
		x. Hose assembly (18 and 17)	Connect and tighten	Completes installation of hose assembly (19)
10	Inner mast, bottom	a. Tension tube (16)	Position with short threaded end towards fitting (11)	
		b. Hose spring (15)	Position on tension tube (16)	
		c. Nuts (14)	Install	
		d. Hose assembly (13)	Position	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALATION/REPLACEMENT (cont)				
<p>TA301532</p>				
10 (cont)		e. Hose bumper	Position on cap screw	
		f. Cap screw and nut	Install;	position hose assemblies (13) in each pulley groove
		g. Hose fitting (11)	Connect and tighten	
		h. Hose fitting (12)	Connect and tighten	Completes installation of hose assembly (13)
		i. Elbow fitting (10)	Position	
		j. Nut (9)	Install	Secure elbow fitting (10)
		k. Hose assembly (8)	Position	
		l. Hose fittings (7 and 6)	Connect and tighten	Completes installation of hose assembly (8)
		m. Hose assembly (5)	Position	
		n. Hose fitting (4)	Connect and tighten	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*f. Hoses, Lines and Fittings (cont).*

(3) Mast Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
11	Mast assembly, outer mast	a. Four fittings (3B) b. Four nuts (3A) c. Four hose fittings (3) d. Two tube assemblies (2E and 2D) e. Two clamps (2C), lock washers (2B) and cap screws (2A) f. Four tube fittings (2) g. Four tube fittings (1)	Install  Install and tighten  Connect and tighten  Position  Position, install, and tighten  Connect and tighten  Connect and tighten	To fittings (3B); completes installation of hose assemblies (5)  On outer mast  Secures tube assemblies (2E and 2D)  To fittings (3B)  To control valve hoses as indicated by tags applied in step 1a above
12	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate control valve levers (lift, rotate, shift, and tilt control levers) several times c. Operate engine at idle speed and check for oil leaks at connections. Tighten fittings if necessary d. Turn engine off e. Check hydraulic reservoir oil level; add oil if necessary (refer to current lubrication order) f. Repeat steps a through e	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir.*

(1) Draining, Cleaning, and Refilling. This task covers servicing which consists of draining, cleaning, and refilling the hydraulic reservoir.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit Container, 18 gallon capacity

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph Condition Description  
 Vehicle parked on level surface, engine off, and parking brake applied.  
 2-53c Right side panel removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 O-rings  
 Replacement hydraulic oil filter  
 Replacement air breather

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DRAINING</b>				
1	Hydraulic reservoir, bottom	a. Dipstick b. 18 gallon container c. Magnetic drain plug (1) d. Magnetic drain plug (1)	Remove Position Remove and drain oil Clean and reinstall	Under magnetic drain plug (1)
<b>CLEANING</b>				
2	Hydraulic reservoir, rear	a. Cap screw (2) b. O-ring (3)	Loosen, then remove cover (7) and attached parts as an assembly Remove and discard	
<b><u>WARNING</u></b>				
Dry cleaning solvent (T-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

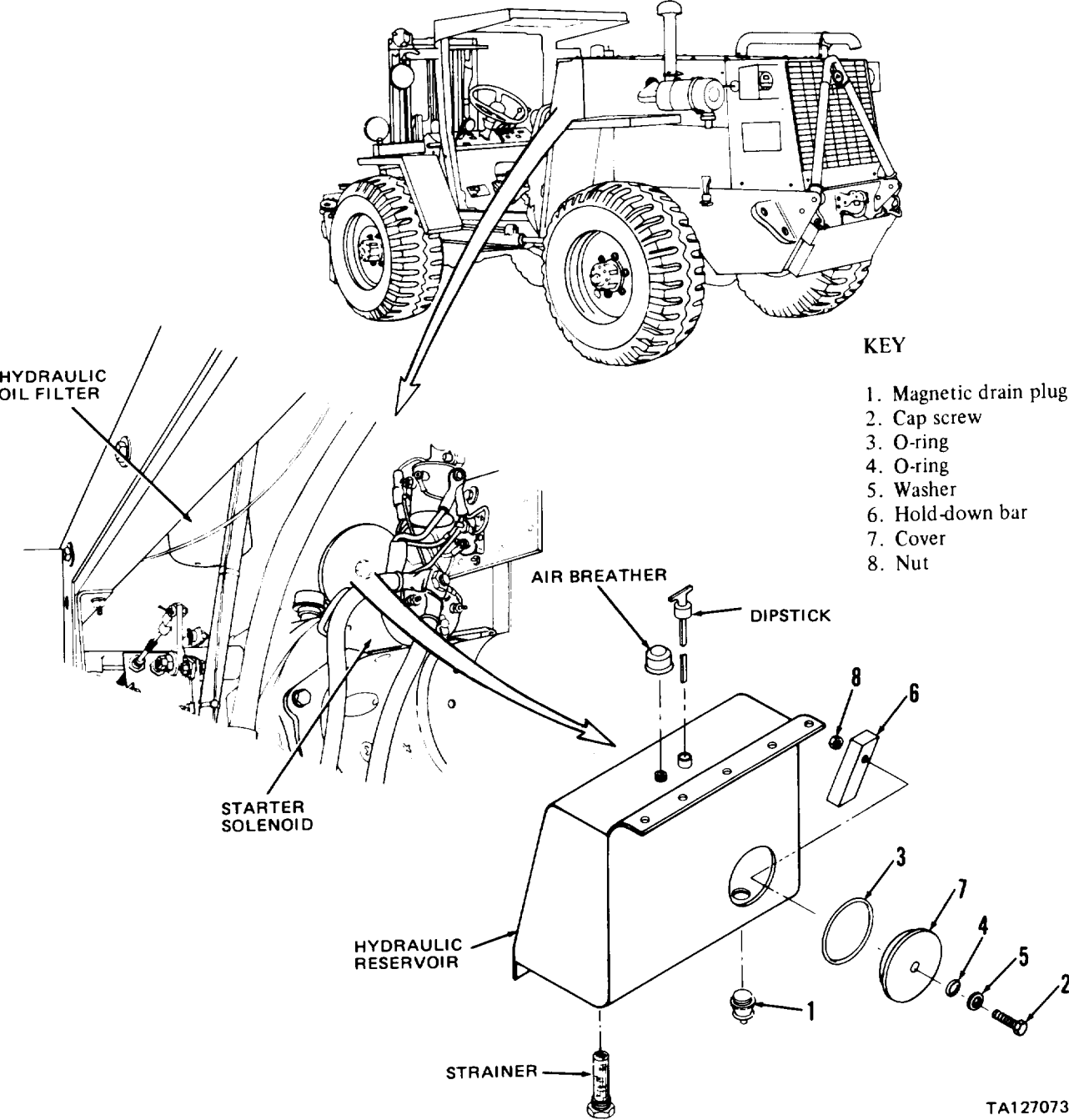




**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(1) Draining, Cleaning, and Refilling (cont).



TA127073

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(1) Draining, Cleaning, and Refilling (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
2 (Cont)		c. Hydraulic reservoir interior	Clean interior	Use clean cloth moistened with cleaning solvent P-D-680; wipe dry with clean cloth
		d. Cap screw (2), O-ring (4), washer (5), and nut (8)	Remove; discard O-ring (4)	
		e. Hold-down bar (6)	Remove and clean	Use clean cloth moistened with cleaning solvent P-D-680
		f. Cover (7)	Clean	Use clean cloth moistened with cleaning solvent P-D-680
		g. Hold-down bar (6)	Position on cover (7)	
		h. Washer (5), O-ring (4)	Position on cap screw (2)	
		i. Cap screw (2)	Install loosely in cover (7) and hold-down bar (6)	
		j. Nut (8)	Install on cap screw (2)	
		k. O-ring (3)	Position on cover (7)	
		l. Cover (7)	Install	
		m. Cap screw (2)	Tighten to draw cover tight	
		n. Oil filter	Replace	Para 2-56g(2)
		o. Strainer	Clean	Para 2-56g(3)
		p. Air breather	Replace	Para 2-56g(4)
REFILLING				
3	Hydraulic reservoir	a. Hydraulic reservoir fill	Fill with oil to between FULL and ADD marks on dipstick	Refer to current lubrication order
		b. Dipstick	Install	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (tent).*

(2) Hydraulic Oil Filter Assembly. This procedure covers removal, cleaning, inspection and installation of the hydraulic oil filter, and filter head assembly.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
Clamp Type Oil Filter Wrench

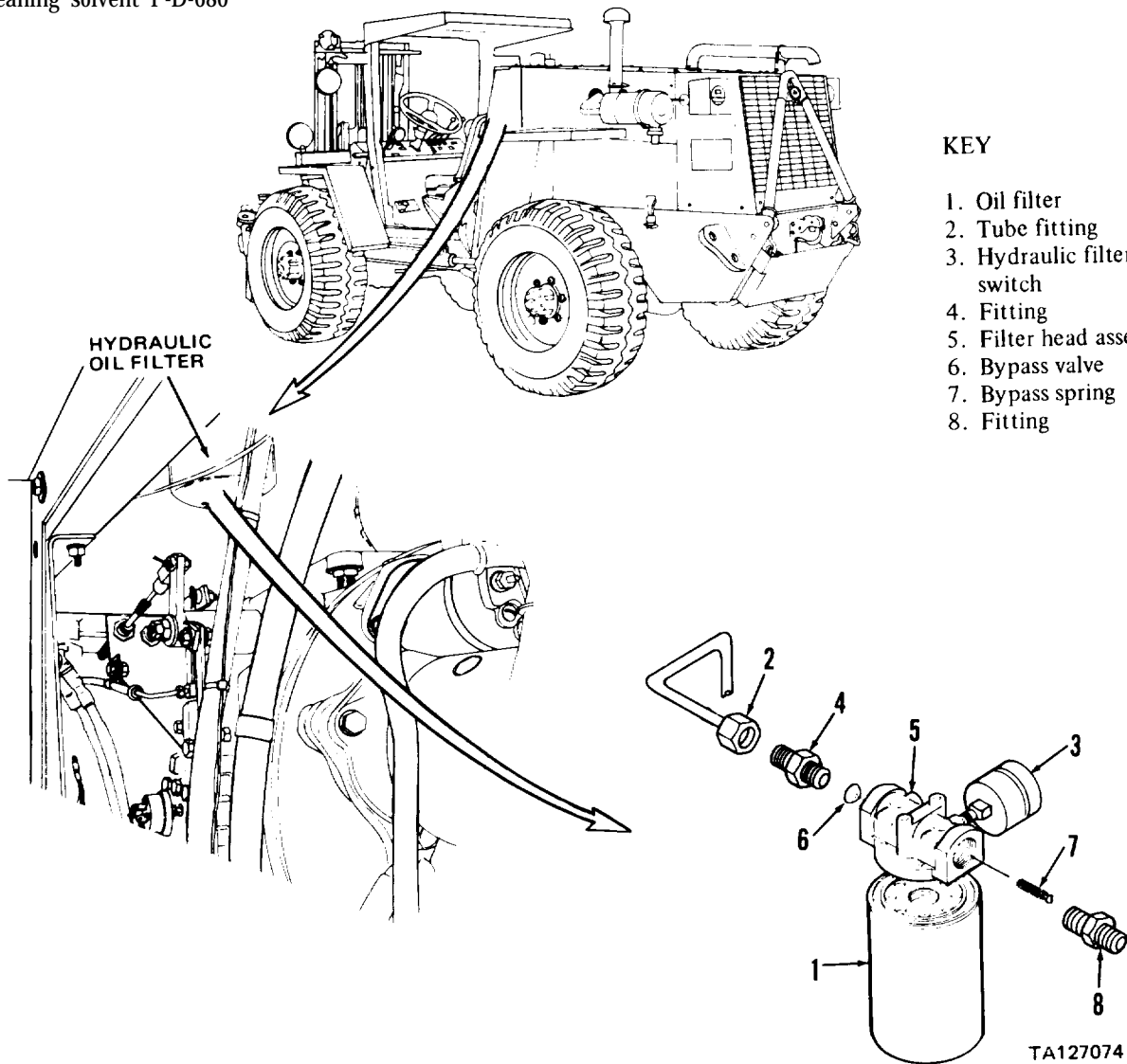
NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph	Condition Description
2-53c	Left side panel removed.
2-56g(1)	Hydraulic reservoir oil drained.

MATERIALS/PARTS

Oil filter  
Cleaning solvent P-D-680



KEY

- 1. Oil filter
- 2. Tube fitting
- 3. Hydraulic filter restriction switch
- 4. Fitting
- 5. Filter head assembly
- 6. Bypass valve
- 7. Bypass spring
- 8. Fitting

TA127074

**2-56. HYDRALIC LIFY SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(2) Hydraulic Oil Filter Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, front	a. Hydraulic oil filter (1)	Remove	Use clamp type filter wrench
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
		b. Filter head assembly (5)	Clean	Use clean cloth moistened with cleaning solvent P-D-680
<b><u>NOTE</u></b>				
<p>Don't perform following steps unless filter head assembly, bypass valve, or bypass spring has been damaged and replacement is necessary.</p>				
		c. Tube fitting (2)	Loosen and disconnect	
		d. Hydraulic filter restriction switch (3)	Remove	Para 2-31e(1)
		e. Fitting (4)	Remove	
		f. Filter head assembly (5)	Remove	Turn off fitting by rotating counter-clockwise
		g. Bypass valve (6)	Remove	
		h. Bypass spring (7)	Remove	
		i. Fitting (8)	Remove from hydraulic reservoir	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(2) Hydraulic Oil Filter Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		All parts	Clean	Use cleaning solvent P-D-680
INSPECTION				
3		Fittings (4 and 8)	Inspect	Replace if threads damaged
4		Filter head assembly (5)	Inspect	Replace if cracked, distorted, or threads damaged
5		Bypass valve (6)	Inspect	Replace if damaged
6		Bypass spring (7)	Inspect	Replace if deformed, damaged, or permanently set
INSTALLATION				
7	Engine compartment, front	a. Fitting (8)	Install	
		b. Bypass spring (7)	Install in filter head assembly (5)	
		c. Bypass valve (6)	Install in filter head assembly (5)	
		d. Filter head assembly (5)	Install on fitting (8)	Rotate clockwise to install
		e. Fitting (4)	Install in filter head assembly (5)	
		f. Hydraulic filter restriction switch (3)	Install	Para 2-31e(1)

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

*(2) Hydraulic Oil Filter Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
7 (cont )		g. Tube fitting (2) h. Hydraulic oil filter (1)	Connect and tighten Install until gasket contacts base. Then tighten one-half to three quarter turn	
8	Hydraulic reservoir	Hydraulic reservoir fill	Fill with oil to between FULL and ADD marks on dipstick	Refer to current lubrication order
9	Operator's com- partment		a. Start engine and operate at idle speed b. Check for oil leaks at oil filter; tighten if necessary c. Turn engine off	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(3) Strainer. This procedure covers removal, cleaning, and installation of the hydraulic reservoir strainer.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

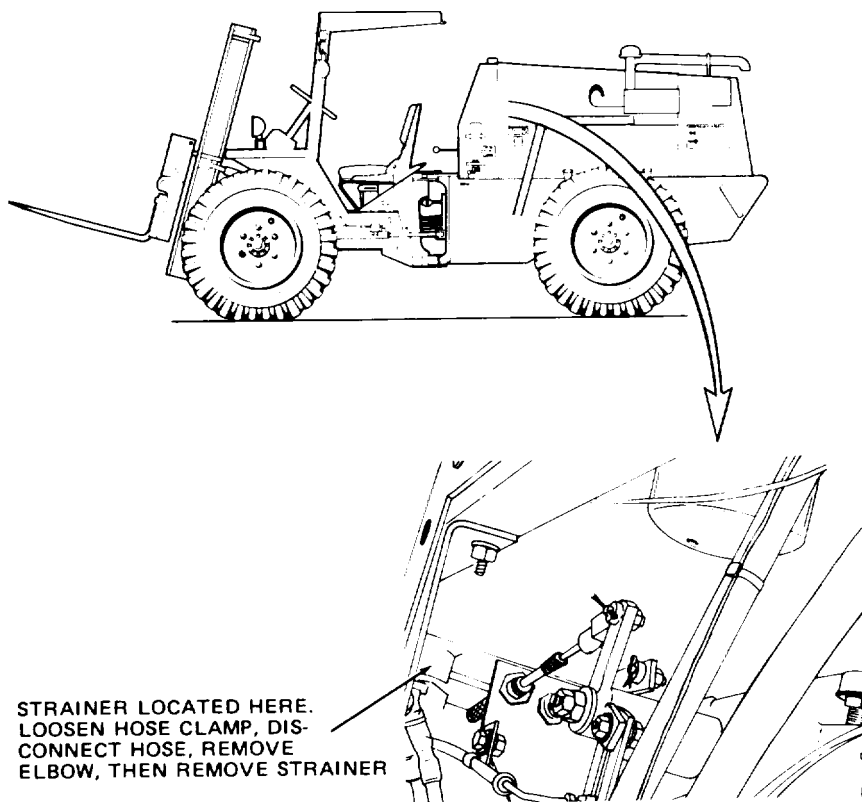
NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph	Condition Description
2-53c	Left side panel removed.
2-56g(1)	Hydraulic reservoir oil drained.
2-53f	Front cover panel removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths



TA127075

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(3) Strainer (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, front	a. Hose clamp b. Hose c. Elbow d. Strainer	Loosen Disconnect from elbow and cap Remove from strainer Remove	Prevents entry of dirt
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
		Strainer	Clean by immersing in cleaning solvent P-D-680 and dry using clean cloth	
<b>INSTALLATION</b>				
3	Engine compartment	a. Strainer b. Elbow c. Hose d. Hose clamp	Install Install in strainer Connect to elbow Tighten	
4	Hydraulic reservoir	Hydraulic reservoir fill	Fill with oil to between FULL and ADD marks on dipstick	Refer to current lubrication order



**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(3) Strainer (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
5	Operator's compartment		a. Start engine and operate at idle speed while turning steering wheel to extreme right and left several times b. Increase engine speed and operate shift control lever to shift forks right and left several times c. Operate engine at idle speed and check for oil leaks at connections d. Turn engine off e. Check hydraulic reservoir oil level (step 4 above)	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(4) Air Breather. This task covers removal and installation of the hydraulic reservoir air breather.

INITIAL SETUP

TOOLS  
None

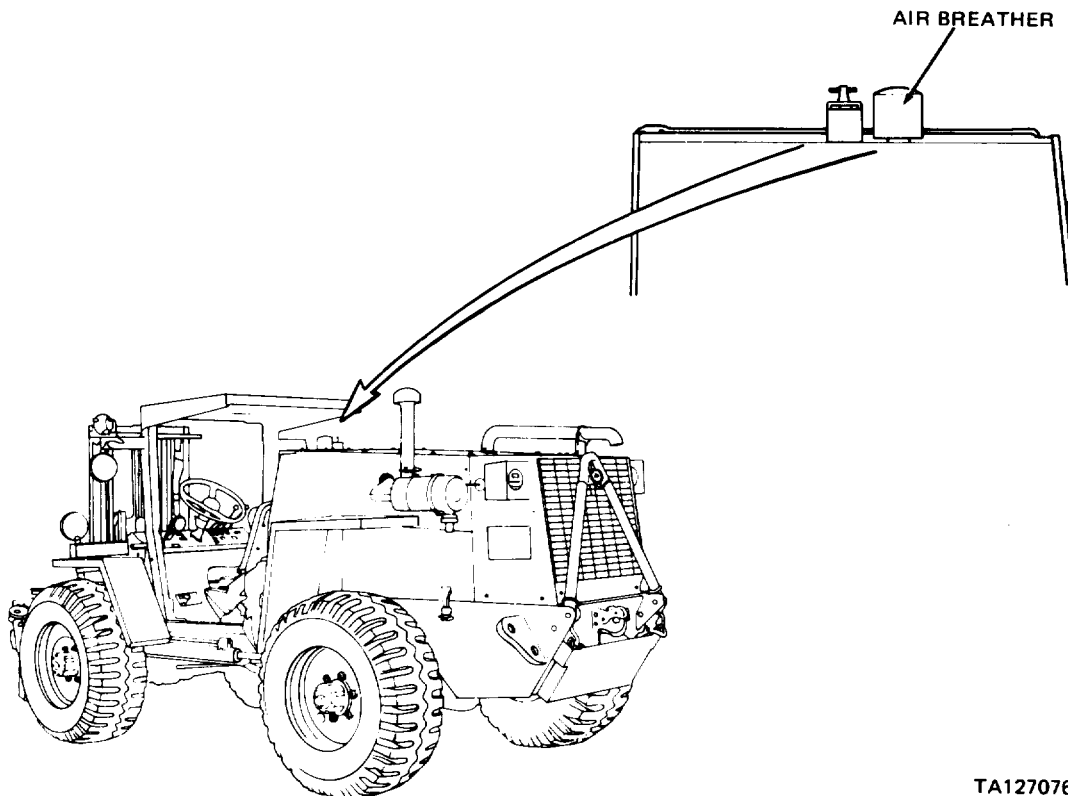
EQUIPMENT CONDITION  
Paragraph

Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.

MATERIALS/PARTS  
Air breather

REMOVAL: Turn counterclockwise and discard

INSTALLATION: Turn clockwise



TA127076

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(5) Removal and Installation. This task covers removal, cleaning, inspection, and installation/replacement of the hydraulic reservoir.

INITIAL SETUP

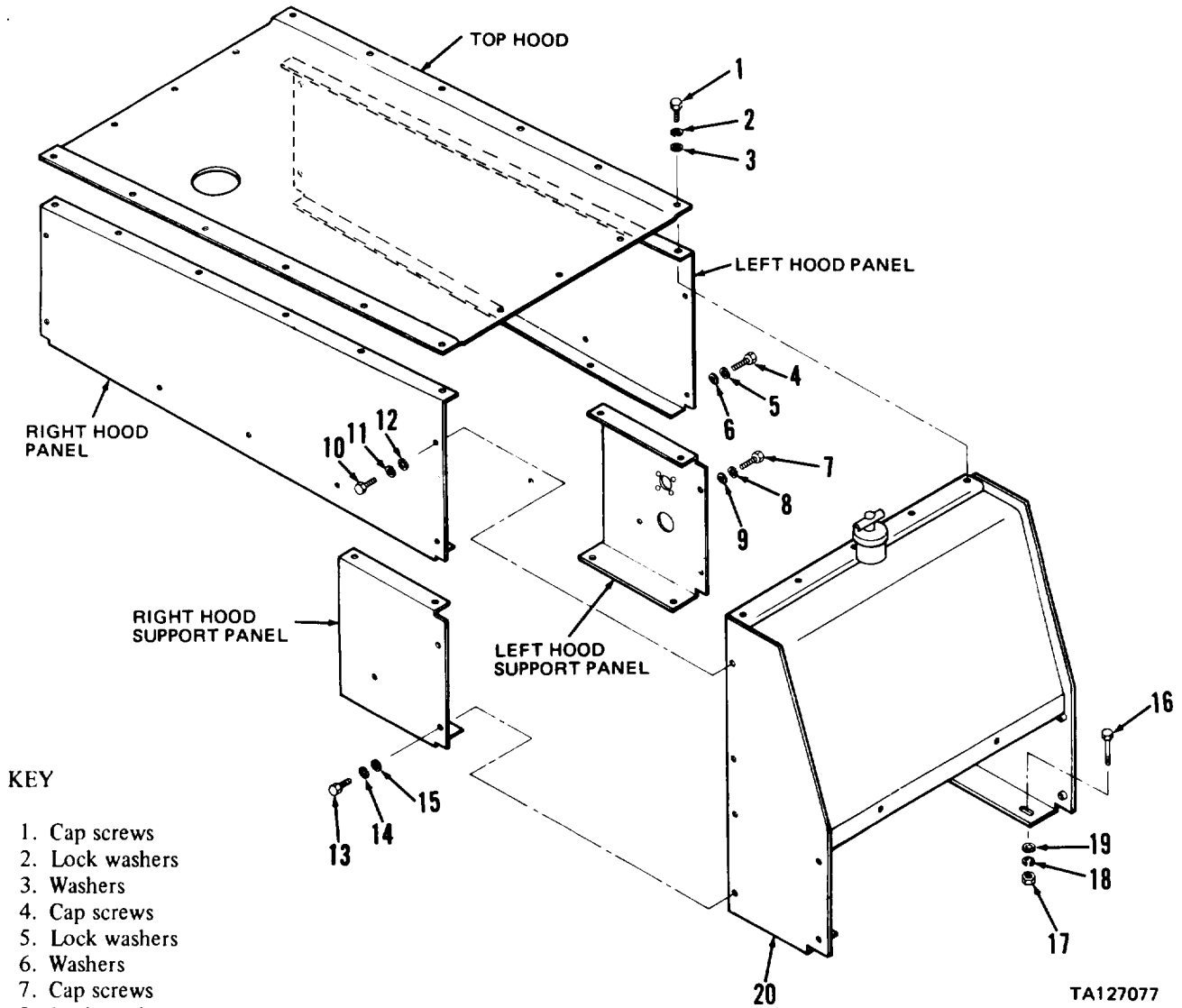
TOOLS		EQUIPMENT	CONDITION
No. 1 Common Organizational Maintenance Tool Kit	NSN 4910-00-754-0654	Paragraph	Condition Description
Chain Hoist, 1/4 ton capacity			Vehicle parked on level surface, engine off and parking brake applied.
Shop Equipment, Welding	NSN 3740-00-357-7268	2-56g(1)	Hydraulic reservoir drained and cover removed.
Steam Cleaning Equipment		2-56g(2)	Hydraulic oil filter assembly removed.
		2-56g(3)	Hydraulic reservoir strainer removed.
		2-56g(4)	Air breather and dipstick removed.
MATERIALS/PARTS		2-53f	Front cover plate removed.
Cleaning solvent P-D-680		2-15h, step 3	Quick start kit removed.
Clean cloths		2-15c, step 4	Air cleaner indicator removed.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Hydraulic reservoir, top	Five cap screws (1), lock washers (2), and washers (3)	Remove	
2	Hydraulic reservoir, left side	a. Two cap screws (4), lock washers (5), and washers (6)	Remove	
		b. Two cap screws (7), lock washers (8), and washers (9)	Remove	
3	Hydraulic reservoir, right side	a. Two cap screws (10), lock washers (11), and washers (12)	Remove	
		b. Two cap screws (13) lock washers (14), and washers (15)	Remove	
4	Hydraulic reservoir. bottom	a. Four cap screws (16), nuts (17), lock washers (18), and washers (19) b. Hydraulic reservoir (20)	Remove Remove	Pull hydraulic reservoir out just enough to attach chain hoist to it; then remove hydraulic reservoir

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(5) Removal and Installation (cont).



TA127077

**KEY**

- 1. Cap screws
- 2. Lock washers
- 3. Washers
- 4. Cap screws
- 5. Lock washers
- 6. Washers
- 7. Cap screws
- 8. Lock washers
- 9. Washers
- 10. Cap screws
- 11. Lock washers
- 12. Washers
- 13. Cap screws
- 14. Lock washers
- 15. Washers
- 16. Cap screws
- 17. Nuts
- 18. Lock washers
- 19. Washers
- 20. Hydraulic reservoir

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(5) Removal and Installation (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680). used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
5	Hydraulic reservoir (20)		Clean exterior	Use cleaning solvent P-D-680
6	Hydraulic reservoir (20)		Clean interior	Use steam
INSPECTION				
7	Hydraulic reservoir (20)		Inspect	Check for cracks, breaks, dents and corrosion
8	Hydraulic reservoir	a. Dents	Hammer out	
<b><u>WARNING</u></b>				
<p>When welding hydraulic reservoir, partially fill it with water. Failure to do so may cause serious injury or death.</p>				
		b. Cracks, breaks, leaks, or corrosion damage	Weld	
INSTALLATION/REPLACEMENT				
9	Rear chassis, front	Hydraulic reservoir (20)	position, remove chain hoist. Slide into position until mounting holes are aligned	

**2-56. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*g. Hydraulic Reservoir (cont).*

(5) Removal and Installation (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
10	Hydraulic reservoir, bottom	Four cap screws (16), lock washers (18), washers (19), and nuts (17)	Install	Secures hydraulic reservoir
11	Hydraulic reservoir, right side	a. Two washers (15), lock washers (14), and cap screws (13)	Install	Secure right hood support panel
		b. Two washers (12), lock washers (11), and cap screws (10)	Install	Secures right hood panel
12	Hydraulic reservoir, left side	a. Two washers (9), lock washers (8), and cap screws (7)	Install	Secures left hood support plate
		b. Two washers (6), lock washers (5), and cap screws (4)	Install	Secures left hood panel
13	Hydraulic reservoir, top	Five washers (3), lock washers (2), and cap screws (1)	Install	Secures top hood

## CHAPTER 3

### DIRECT SUPPORT MAINTENANCE PROCEDURES

**CHAPTER OVERVIEW**

The purpose of this chapter is to provide you with all needed instructions and additional information to help you at the direct support level keep the equipment in good repair.

#### **3-1. CHAPTER INDEX**

Section	Title	Page
I	Engine, Fuel and Cooling Systems Maintenance .....	3-1
II	Electrical System Maintenance .....	3-88
III	Power Train Maintenance .....	3-123
IV	Steering System Maintenance.....	3-152
V	Chassis Maintenance .....	3-190
VI	Hydraulic Lift System Maintenance .....	3-194

#### **Section I. ENGINE, FUEL AND COOLING SYSTEMS MAINTENANCE**

This section contains the information you need to maintain the:

- Engine
- Fuel system
- Radiator and shroud

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of direct support maintenance.

	Para		Para
Troubleshooting Symptom Index .....	3-2	Cylinder Head .....	3-5g
Engine Troubleshooting .....	3-3	Flywheel Housing .....	3-5h
Fuel System Troubleshooting .....	3-4	Rocker Arm Cover .....	3-5i
Engine Maintenance .....	3-5	Rocker Arm Assembly .....	3-5j
Engine Tune-Up .....	3-5a	Oil Pan .....	3-5k
Engine Mount .....	3-5b	Fuel System Maintenance .....	3-6
Power Pack .....	3-5c	Fuel Injection Lines and Fittings .....	3-6a
Separation of Engine and Transmission .....	3-5d	Fuel Injector .....	3-6b
Cylinder Block .....	3-5e	Fuel Injection Pump .....	3-6c
Tachometer Drive .....	3-5f	Radiator and Shroud Maintenance .....	3-7

#### **3-2. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>ENGINE TROUBLESHOOTING</b>		
Engine hard to start or will not start .....	3-3/1	3-2
Engine hard to start or will not start (exhaust smoke) .....	3-3/2	3-2
Engine starts but will not run. ....	3-3/3	3-2
Engine misfires .....	3-3/4	3-3
Engine stalls frequently or does not develop full power .....	3-3/5	3-4
Engine knocks .....	3-3/6	3-4
Engine compression test .....	3-3/7	3-5
<b>FUEL SYSTEM TROUBLESHOOTING</b>		
Engine idle speed incorrect .....	3-4/1	3-6
Engine no-load governed speed incorrect .....	3-4/2	3-6
Engine hard to start .....	3-4/3	3-7
Engine starts and stops .....	3-4/4	3-9

**3-2. TROUBLESHOOTING SYMPTOM INDEX (cont)**

	Para/Malfunction Page	
FUEL SYSTEM TROUBLESHOOTING (cont)		
Erratic engine operation (surge, misfiring, poor governor regulation) . . . . .	3-4/5	3-10
Engine idles imperfectly . . . . .	3-4/6	3-13
Engine does not develop full power or speed . . . . .	3-4/7	3-15
Engine smokes black . . . . .	3-4/8	3-18
Engine smokes blue or white. . . . .	3-4/9	3-19
Fuel not reaching fuel injection pump . . . . .	3-4/10	3-19
Fuel delivered from transfer pump but not to fuel injectors . . . . .	3-4/11	3-20
Fuel reaching fuel injectors but engine will not start . . . . .	3-4/12	3-22

**3-3. ENGINE TROUBLESHOOTING**

**MALFUNCTION**

TEST OR INSPECTION  
CORRECTIVE ACTION

**1. ENGINE HARD TO START OR WILL NOT START**

Step 1. Check for correct valve timing in reference to crankshaft timing marks with dial indicator (para 3-5a(1), step 2).

- a. If valve timing is correct, proceed to step 2.
- b. If valve timing is not correct, check for sheared key in the cam drive gear or a broken camshaft (notify general support maintenance) (para 4-2g).

Step 2. Perform compression test of each cylinder (para 3-3, MALFUNCTION 7).

If compression test is satisfactory, check for sheared roll pin on fuel injection pump drive shaft (para 3-6c) or defective fuel injection pump (notify general support maintenance) (para 4-3b).

**2. ENGINE HARD TO START OR WILL NOT START (EXHAUST SMOKE)**

Step 1. Check for proper engine timing (para 3-5a).

- a. If engine timing is correct, proceed to step 2.
- b. If engine timing is not correct, adjust timing (para 3-5a).

Step 2. Perform compression test of each cylinder (para 3-3, MALFUNCTION 7).

If compression test is satisfactory, test fuel injector nozzles before reinstalling on engine (notify general support maintenance) (para 4-3a). If fuel injector test is satisfactory, proceed to step 3.

Step 3. Start engine and listen for excessive valve tappet noise.

If excessive valve tappet noise is heard, stop engine and check for bent push rods (para 3-5j).

**3. ENGINE STARTS BUT WILL NOT RUN**

Step 1. Check for proper fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing (para 3-5a(3)).
- b. If fuel injection pump timing is okay, proceed to step 2.



---

### **3-3. ENGINE TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

**3. ENGINE STARTS BUT WILL NOT RUN (cont)**

Step 2. Check for correct valve timing in reference to crankshaft timing marks with dial indicator (para 3-5a(1), step 2).

- a. If correct valve timing in reference to crankshaft timing marks is not obtained, check for sheared key in cam drive gear or broken cam shaft (notify general support maintenance) (para 4-2g).
- b. If correct valve timing in reference to crankshaft timing marks is obtained, proceed to step 3.

Step 3. Perform compression test of each cylinder (para 3-3, MALFUNCTION 7).

If compression test is satisfactory, test fuel injector nozzles before reinstalling on engine (notify general support maintenance) (para 4-3b). If fuel injector test is satisfactory, proceed to step 4.

Step 4. Start engine and listen for excessive valve tappet noise.

If excessive valve tappet noise is heard, stop engine and check for bent push rods (para 3-5j).

**4. ENGINE MISFIRES**

Step 1. Remove fuel injectors (para 3-6b) and check for damaged fuel injector nozzle seal.

- a. If fuel injector nozzle seal is damaged, replace (notify general support maintenance) (para 4-3a).
- b. If fuel injection seals are okay, proceed to step 2.

Step 2. Check for proper fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing (para 3-5a(3)).
- b. If fuel injection pump timing is okay, proceed to step 3.

Step 3. Check for correct valve timing in reference to crankshaft timing marks with dial indicator (para 3-5a(1), step 2).

- a. If correct valve timing in reference to crankshaft timing marks is not obtained, check for sheared key in cam drive gear or a broken cam shaft (notify general support maintenance) (para 4-2g).
- b. If correct valve timing in reference to crankshaft timing marks is obtained, proceed to step 4.

Step 4. Perform compression test of each cylinder (para 3-3, MALFUNCTION 7).

If compression test is satisfactory, test fuel injector nozzle before reinstalling on engine (notify general support maintenance) (para 4-3a). If fuel injector test is satisfactory, proceed to step 5.

Step 5. Start engine and listen for excessive valve tappet noise.

If excessive valve tappet noise is heard, stop engine and check for bent push rods (para 3-5j).

---

### **3-3. ENGINE TROUBLESHOOTING (cont)**

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

#### 5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER

Step 1. Check for proper engine timing and valve tappet clearance adjustment (para 3-5a).

- a. If engine timing and valve tappet clearance adjustment is not okay, adjust (para 3-5a).
- b. If engine timing and valve tappet clearance adjustment is okay, proceed to step 2.

Step 2. Check fuel injection pump timing and speed adjustments (para 3-5a(3)).

- a. If fuel injection pump timing and speed adjustments are not okay, adjust as described in paragraph 3-5a(3).
- b. If fuel injection pump timing and speed adjustments are okay, proceed to step 3.

Step 3. Perform compression test of each cylinder (para 3-3 MALFUNCTION 7).

If compression test is satisfactory, test fuel injector nozzles before reinstalling on engine (notify general support maintenance) (para 4-3a). If fuel injector test is satisfactory, check for camshaft installed one tooth out of time or a defective fuel injection pump (notify general support maintenance) (para 4-2g or 4-3b).

#### 6. ENGINE KNOCKS

Step 1. Start engine and listen for chucking or pounding sound at low speed, which disappears as engine speed is increased.

- a. If chucking or pounding sound is heard at low speed and disappears as engine speed is increased, check flywheel for looseness or damage (notify general support maintenance) (para 4-2e).
- b. If chucking or pounding sound is not heard, proceed to step 2.

Step 2. Start engine and listen for a sharp metallic sound which increases as engine speed increases. Crack (open) the injector line to each cylinder, one at a time, to check if the knock stops or decreases.

- a. If the knock stops or decreases, check for defective rod bearing on affected cylinder (notify general support maintenance) (para 4-2f).
- b. If the knock increases, check for defective piston pin (notify general support maintenance) (para 4-3).
- c. If knock is not heard, proceed to step 3.

Step 3. Start engine and listen for a thudding sound which increases as engine speed increases.

- a. If thudding sound is heard which increases as engine speed increases, check main bearings for wear or damage (notify general support maintenance) (para 4-2d).
- b. If thudding sound is not heard, proceed to step 4.

Step 4. Start engine and listen for one thudding sound when increasing engine speed and one thud when decreasing speed.

Check camshaft and crankshaft for excessive end play (notify general support maintenance) (para 4-2g and 4-2d).

**3-3. ENGINE TROUBLESHOOTING (cont)**

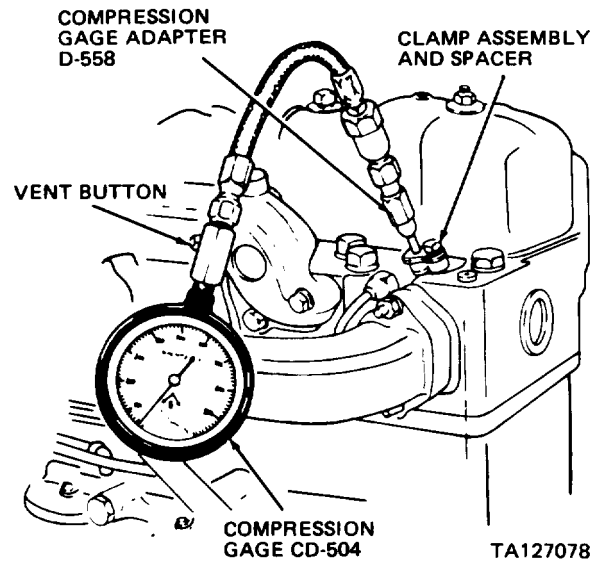
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

7. ENGINE COMPRESSION TEST

Remove fuel injectors, and clean fuel injector bores in cylinder head (para 3-6b).  
 Install D-558 compression gage adapter (FSCM 05083 P/N 70-314) in fuel injector bore at No. 4 cylinder, and secure with clamp assembly and spacer as shown.  
 Connect compression gage (FSCM 10988 P/N CD-504) to adapter, crank engine with starter, and record gage reading.  
 Depress vent button to relieve gage pressure and repeat test.



**NOTE**

Engine cranking speed must be approximately 200 RPM for reliable test results. If necessary, charge batteries to maintain proper cranking speed.

Disconnect compression gage and adapter from No. 4 cylinder and repeat above test at remaining three cylinders.

The gage reading for any one cylinder at a given altitude above sea level must not be less than the minimum listed in the chart below.

In addition, the difference between gage readings for the highest and lowest cylinders should not exceed 25 PSIG.

**CYLINDER COMPRESSION TEST CHART**

Minimum Compression Pressure at 200 RPM (PSIG)	Altitude Above Sea Level (Feet)
400	0
384	1,000
360	2,500
320	5,000
280	7,500
240	10,000

---

### **3-3. ENGINE TROUBLESHOOTING (cont)**

---

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

#### 7. ENGINE COMPRESSION TEST (cont)

- a. If compression is high, remove cylinder head and check for carbon deposits on cylinder head and piston crown (para 3-5g). Also, check (use micrometer) if too much material was removed from resurfaced cylinder head (cylinder head minimum thickness is 3.968 inches) (notify general support maintenance) (para 4-2b).
- b. If compression is low, squirt a teaspoon of engine oil into the affected cylinder and repeat compression test. If compression gage reading increases to near normal, remove cylinder head (para 3-5g) and check piston rings and sleeves (notify general support maintenance) (para 4-2f and 4-2a).
- c. If compression gage reading remains low after squirting oil in cylinder, remove cylinder head (para 3-5g) and check for blown head gasket. If gasket is not damaged, check for burned or damaged valves and valve seats (notify general support maintenance) (para 4-2b).
- d. If compression is low, and items in steps b and c above check satisfactorily, check for head gasket leakage due to excessive piston sleeve protrusion (notify general support maintenance) (para 4-2a).

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING**

---

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

#### 1. ENGINE IDLE SPEED INCORRECT

Perform fuel injection pump timing and idle speed adjustments (para 3-5a(3)).

- a. If idle speed screw on injection pump does not vary engine speed, replace fuel injection pump (para 3-6c).
- b. If idle speed screw on injection pump changes engine speed, but will not adjust to correct value, check accelerator linkage (para 2-15i). If accelerator linkage checks satisfactory, check fuel pressure (para 2-10) and fuel injectors (para 3-6b). If above checks are satisfactory, replace fuel injection pump (para 3-6c).

#### 2. ENGINE NO-LOAD GOVERNED SPEED INCORRECT

Perform fuel injection pump timing and no-load governed speed adjustments (para 3-5a(3)).

- a. If high speed screw on injection pump does not vary engine speed, replace fuel injection pump (para 3-6c).
- b. If high speed screw on injection pump varies engine speed, but will not reduce speed to correct value (no-load speed too high), replace fuel injection pump (para 3-6c).
- c. If high speed screw on injection pump varies engine speed, but will not increase speed to correct value (no-load speed too low), check accelerator linkage (para 2-15i), fuel pressure (para 2-10) and fuel injectors para 3-6b). If above checks are satisfactory, replace fuel injection pump (para 3-6c).

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

#### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 3. ENGINE HARD TO START

Step 1. Check fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).
- b. If fuel injection pump timing is okay, proceed to step 2.

Step 2. Disconnect fuel lines from fuel injection pump at fuel injectors (para 3-6a) one at a time, crank engine and check that fuel is pumped out of disconnected line.

- a. If fuel is not pumped out of any one disconnected line when engine is cranked, replace associated connector screw (para 4-3b; notify general support maintenance). If fuel is not pumped out of any line when disconnected, replace/ clean inlet strainer (para 4-3b; notify general support maintenance).
- b. If fuel is cranked out of all lines when disconnected, proceed to step 3.

Step 3. Disassemble fuel injection pump and check transfer pump blades for wear or damage (para 4-3b notify general support maintenance).

- a. If transfer pump blades are worn or damaged, replace (para 4-3b).
- b. If transfer pump blades check okay, proceed to step 4.

Step 4. Disassemble fuel injection pump and check transfer pump parts for wear or damage (para 4-3b; notify general support maintenance).

- a. If transfer pump parts are worn or damaged, replace (para 4-3 b).
- b. If transfer pump parts check okay, proceed to step 5.

Step 5. Disassemble fuel injection pump and check end plate regulating piston and sleeve and inspect for burrs, corrosion, or varnishes (para 4-3b; notify general support maintenance).

- a. If regulating piston and sleeve are burred, corroded, or varnish accumulation present, replace (para 4-3b).
- b. If regulating piston and sleeve check okay, proceed to step 6.

Step 6. Disassemble fuel injection pump and check governor linkage for binding, foreign matter, and burrs; check metering valve for sticking condition (para 4-3b; notify general support maintenance).

- a. If linkage is binding or burred, replace (para 4-3b); if foreign matter is present, remove; if metering valve is sticking, replace (para 4-3b).
- b. If linkage and metering valve check okay and no foreign matter present, proceed to step 7.

Step 7. Check governor linkage for proper adjustment (para 4-3b; notify general support maintenance).

- a. Adjust governor linkage (para 4-3b).

**3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

3. ENGINE HARD TO START (cont)

Step 7. (cont)

b. If governor linkage adjustment is okay, proceed to step 8.

Step 8. Check governor linkage hook for proper adjustment (para 4-3b notify general support maintenance).

a. If governor hook is not properly adjusted, adjust (para 4-3b).

b. If governor hook is properly adjusted, proceed to step 9.

Step 9. Disassemble fuel injection pump and check governor parts and linkage for wear, sticking condition, or binding (para 4-3b; notify-general support maintenance).

a. If governor parts and linkage are worn, sticking, or binding replace (para 4-3b).

b. If governor parts and linkage are okay, proceed to step 10.

Step 10. Check fuel injection pump maximum fuel setting on test set-up (para 4-3b; notify general support maintenance).

a. If fuel injection pump maximum fuel setting is not correct. adjust (para 4-3b).

b. If fuel injection pump maximum fuel setting is okay, proceed to step 11.

Step 11. Remove delivery valve and inspect for dirt or improper installation (para 4-3b; notify general support maintenance).

a. If delivery valve is dirty, clean or replace it; if improperly installed, install correctly (para 4-3b).

b. If delivery valve is clean and properly installed, proceed to step 12.

Step 12. Remove cam, shoes, and rollers and inspect for wear (para 4-3b; notify general support maintenance).

a. If cam, shoes, or rollers are worn, replace (para 4-3b).

b. If cam, shoes, and rollers are okay, proceed to step 13.

Step 13. Remove plungers and inspect for burrs, corrosion or varnishes (para 4-3b; notify general support maintenance).

a. If plungers are burred, corroded, or varnish accumulation is present, replace (para 4-3b).

b. If plungers are okay, proceed to step 14.

Step 14. Check rotor and hydraulic head assembly (in plunger area) for wear (para 4-3b; notify general support maintenance).

a. If rotor and hydraulic head are worn in plunger area, replace (para 4-3b).

b. If rotor and hydraulic head are okay proceed to step 15.

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

#### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

#### 3. ENGINE HARD TO START (cont)

Step 15. Check adjustment of torque screw (para 4-3b; notify general support maintenance).

- a. If torque screw out of adjustment, adjust (para 4-3b).
- b. If torque screw adjustment is okay, proceed to step 16.

Step 16. Disassemble automatic advance components and inspect (para 4-3b; notify general support maintenance).

- a. If automatic advance components are worn or damaged, replace and adjust (para 4-3b).
- b. If automatic advance components are okay, proceed to step 17.

Step 17. Check delivery valve screw for tightness (para 4-3b; notify general support maintenance).

- a. If delivery valve screw is loose, tighten (para 4-3b).
- b. If delivery valve screw is tight, remove it. Then, remove delivery valve and inspect seat for erosion (para 4-3b).
  - 1) If seat is eroded, replace delivery valve (para 4-3b).
  - 2) If seat is okay, reinstall, tighten delivery valve screw (para 4-3b) and proceed to step 18.

Step 18. Check rotor for scores (para 4-3b; notify general support maintenance).

Replace rotor (para 4-3b).

#### 4. ENGINE STARTS AND STOPS

Step 1. Check fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).
- b. If fuel injection pump timing is okay, proceed to step 2.

Step 2. Disconnect fuel lines from fuel injection pump at fuel injectors (para 3-6a) one at a time, crank engine and check that fuel is pumped out of disconnected line.

- a. If fuel is not pumped out of any one disconnected fuel line when engine is cranked, replace associated connector screw (para 4-3b; notify general support maintenance). If fuel is not pumped out of any and all lines when disconnected, replace/clean inlet strainer (para 4-3b; notify general support maintenance).
- b. If fuel is cranked out of all lines when disconnected, proceed to step 3.

Step 3. Remove governor control cover (para 4-3b; notify general support maintenance) and check solenoid frame and arm assembly for cracks and swelling in encapsulated material and looseness of screw terminals. Check continuity using an ohmmeter (para 4-3b; notify general support maintenance).

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

#### 4. ENGINE STARTS AND STOPS (cont)

##### Step 3. (cont)

- a. If cracks, swelling or loose screw terminals are observed, replace solenoid frame and arm assembly (para 4-3 b); if continuity not obtained, replace solenoid frame and arm assembly (para 4-3b).
- b. If solenoid frame and arm assembly checks okay, proceed to step 4.

Step 4. Disassemble fuel injection pump and check governor linkage for binding, foreign matter, and burrs; check metering valve for sticking condition (para 4-3b; notify general support maintenance).

- a. If linkage is binding or burred, replace (para 4-3b); if foreign matter is present, remove; if metering valve is sticking, replace (para 4-3b).
- b. If linkage and metering valve check okay and no foreign matter present, proceed to step 5.

Step 5. Disassemble fuel injection pump and check transfer pump parts for wear or damage (para 4-3b; notify general support maintenance).

- a. If transfer pump parts are worn or damaged, replace (para 4-3b).
- b. If transfer pump parts check okay, proceed to step 6.

Step 6. Disassemble fuel injection pump and check cam roller shoes for burrs; also check for freedom of rotation, chipping, and abrasive wear patterns (para 4-3b; notify general support maintenance).

- a. Replace cam roller shoes if burred, sticking, chipped, or abrasive wear pattern observed (para 4-3b).
- b. If cam roller shoes check okay, proceed to step 7.

Step 7. Remove plungers and inspect for burrs, corrosion, or varnishes (para 4-3b; notify general support maintenance).

If plungers are burred, corroded, or varnish accumulation is present, replace (para 4-3b).

#### 5. ERRATIC ENGINE OPERATION (SURGE, MISFIRING, POOR GOVERNOR REGULATION)

Step 1. Check fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing as described in para 3-5a(3).
- b. If fuel injection pump timing is okay, proceed to step 2.

Step 2. Remove inlet strainer and check for clogged condition (para 4-3b; notify general support maintenance).

- a. If inlet strainer is clogged, either clean or replace strainer (para 4-3b).
- b. If inlet strainer is not clogged, proceed to step 3.



---

**3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 5. ERRATIC ENGINE OPERATION (SURGE, MISFIRING, POOR GOVERNOR REGULATION) (cont)

Step 3. Disconnect and remove fuel injector return lines (para 3-6a).  
Check return lines for clogged condition.

- a. If fuel injector return lines are clogged, clean as described in paragraph 3-6a. After cleaning return lines, recheck to ensure that all foreign matter has been removed, then reinstall (para 3-6a).
- b. If fuel injector return lines are not clogged, proceed to step 4.

Step 4. Disassemble fuel injection pump and check automatic advance components (para 4-3b; notify general support maintenance).

- a. If automatic advance components are worn or damaged, replace and adjust (para 4-3b).
- b. If automatic advance components are okay, proceed to step 5.

Step 5. Disassemble fuel injection pump and check governor linkage for binding, foreign matter, and burrs; check metering valve for sticking condition (para 4-3b; notify general support maintenance).

- a. If linkage is binding or burred, replace (para 4-3b); if foreign matter is present, remove; if metering valve is sticking, replace (para 4-3b).
- b. If linkage and metering valve check okay and no foreign matter present, proceed to step 6.

Step 6. Check that metering valve spring shim is installed (para 4-3b; notify general support maintenance).

- a. If metering valve spring shim is not installed, install (para 4-3b).
- b. If metering valve spring shim is installed, proceed to step 7.

Step 7. Disassemble fuel injection pump and check governor parts and linkage for wear, sticking condition, or binding (para 4-3b; notify general support maintenance).

- a. If governor parts and linkage are worn, sticking, or binding replace (para 4-3b).
- b. If governor parts and linkage are okay, proceed to step 8.

Step 8. Remove governor spring and inspect (para 4-3b; notify general support maintenance).

- a. If governor spring is broken or permanently set, replace (para 4-3b).
- b. If governor spring checks okay, proceed to step 9.

Step 9. Check governor linkage hook for correct adjustment (para 4-3b; notify general support maintenance).

- a. If governor linkage hook is not adjusted properly, adjust as described in para 4-3b.
- b. If governor linkage hook is adjusted properly, proceed to step 10.

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

5. ERRATIC ENGINE OPERATION (SURGE, MISFIRING, POOR GOVERNOR REGULATION) (cont)

Step 10. Remove and inspect idle spring (para 4-3b; notify general maintenance).

- a. If idle spring is broken or permanently set, replace (para 4-3b).
- b. If idle spring is okay, proceed to step 11.

Step 11. Remove governor thrust sleeve and check for burrs and dirt (para 4-3b; notify general support maintenance).

- a. Remove burrs using crocus cloth; clean governor thrust sleeve as described in paragraph 4-3b.
- b. If governor thrust sleeve checks okay, proceed to step 12.

Step 12. Check transfer pump parts for wear or damage (para 4-3b; notify general support maintenance).

- a. If transfer pump parts are worn or damaged, replace (para 4-3b).
- b. If transfer pump parts check okay, proceed to step 13.

Step 13. Remove fuel injection pump regulating piston and sleeve and inspect for burrs, corrosion, and varnish accumulation (para 4-3b; notify general support maintenance).

- a. If piston and sleeve are burred, corroded, or varnish accumulation is present, replace (para 4-3b).
- b. If piston and sleeve check okay, proceed to step 14.

Step 14. Check delivery valve screw for tightness (para 4-3b; notify general support maintenance).

- a. If delivery valve screw is loose, tighten (para 4-3b).
- b. If delivery valve screw is tight, remove it. Then, remove delivery valve and inspect seat for erosion (para 4-3b).
  - 1) If seat is eroded, replace delivery valve (para 4-3b).
  - 2) If seat is okay, reinstall and tighten delivery valve screw (para 4-3b) and proceed to step 15.

Step 15. Check delivery valve for cleanliness or improper installation (para 4-3b; notify general support maintenance).

- a. If delivery valve is dirty, clean or replace it (para 4-3b); if improperly installed, install correctly (para 4-3 b).
- b. If delivery valve is clean and properly installed, proceed to step 16.

Step 16. Disassemble fuel injection pump and check cam roller shoes for burrs; also check for freedom of rotation, chipping, and abrasive wear patterns (para 4-3b; notify general support maintenance).

- a. Replace cam roller shoes if burred, sticking, chipped or abrasive wear pattern observed (para 4-3b).

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 5. ERRATIC ENGINE OPERATION (SURGE, MISFIRING, POOR GOVERNOR REGULATION) (cont)

## Step 16. (cont)

b. If cam roller shoes check okay, proceed to step 17.

Step 17. Check that hydraulic head screws are tight or are not missing (para 4-3b; notify general support maintenance).

a. If hydraulic head screws are not tight or are missing, tighten and/or install (para 4-3b).

b. If hydraulic head screws are tight and not missing, proceed to step 18.

Step 18. Remove plungers and inspect for burrs, corrosion or varnishes (para 4-3b; notify general support maintenance).

a. If plungers are burred, corroded, or varnish accumulation is present, replace (para 4-3b).

b. If plungers are okay, proceed to step 19.

Step 19. Check drive shaft tang dimension (should be not less than 0.305 inch) (para 4-3b; notify general support maintenance).

a. If drive shaft tang measures less than 0.305 inch, replace drive shaft (para 4-3b).

b. If drive shaft tang measures more than 0.305 inch, replace head and rotor assembly (para 4-3b).

## 6. ENGINE IDLES IMPERFECTLY

Step 1. Check fuel injection pump timing (para 3-5a(3)).

a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).

b. If fuel injection pump timing is okay, proceed to step 2.

Step 2. Disassemble fuel injection pump and check transfer pump parts for wear or damage (para 4-3b; notify general support maintenance).

a. If transfer pump parts are worn or damaged, replace (para 4-3b).

b. If transfer pump parts check okay, proceed to step 3.

Step 3. Disassemble fuel injection pump and check governor parts and linkage for wear, sticking condition, or binding (para 4-3b; notify general support maintenance).

a. If governor parts and linkage are worn, sticking, or binding, replace (para 4-3b).

b. If governor parts and linkage are okay, proceed to step 4.

Step 4. Disassemble fuel injection pump and check governor linkage and metering valve for binding, foreign matter and burrs; check metering valve for sticking condition (para 4-3b; notify general support maintenance).

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

#### 6. ENGINE IDLES IMPERFECTLY (cont)

Step 4. (cont)

- a. If linkage is binding or burred, replace (para 4-3b); if foreign matter is present, remove; if metering valve is sticking, replace (para 4-3b).
- b. If linkage and metering valve check okay, proceed to step 5.

Step 5. Check that metering valve spring shim is installed (para 4-3b; notify general support maintenance).

- a. If metering valve spring shim is not installed, install (para 4-3b).
- b. If metering valve spring shim is installed, proceed to step 6.

Step 6. Remove and inspect idle spring (para 4-3b; notify general support maintenance).

- a. If idle spring is broken or permanently set, replace (para 4-3b).
- b. If idle spring is okay, proceed to step 7.

Step 7. Check governor linkage hook for proper adjustment (para 4-3b; notify general support maintenance).

- a. If governor hook is not properly adjusted, adjust (para 4-3b).
- b. If governor hook is properly adjusted, proceed to step 8.

Step 8. Disassemble automatic advance components and inspect (para 4-3b; notify general support maintenance).

- a. If automatic advance components are worn or damaged, replace and adjust (para 4-3b).
- b. If automatic advance components are okay, proceed to step 9.

Step 9. Remove fuel injection pump regulating piston and sleeve and inspect for burrs, corrosion, and varnish accumulation (para 4-3b; notify general support maintenance).

- a. If piston and sleeve are burred, corroded, or varnish accumulation is present, replace (para 4-3b).
- b. If piston and sleeve check okay, proceed to step 10.

Step 10. Remove governor spring and inspect (para 4-3b; notify general support maintenance).

- a. If governor spring is broken or permanently set, replace (para 4-3b).
- b. If governor spring checks okay, proceed to step 11.

Step 11. Inspect governor linkage for breaks or cracks (para 4-3b; notify general support maintenance).

- a. If governor linkage is broken or cracked, replace and adjust para 4-3b).
- b. If governor linkage checks okay, proceed to step 12.

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 6. ENGINE IDLES IMPERFECTLY (cont)

Step 12. Check that hydraulic head screws are tight or are not missing (para 4-3b; notify general support maintenance).

- a. If hydraulic head screws are not tight or are missing, tighten and/or install (para 4-3b).
- b. If hydraulic head screws are tight and not missing, proceed to step 13.

Step 13. Check rotor and hydraulic head assembly (in plunger area) for wear (para 4-3b; notify general support maintenance).

- a. If rotor and hydraulic head are worn in plunger area, replace (para 4-3b).
- b. If rotor and head are okay, proceed to step 14.

Step 14. Remove delivery valve and inspect for dirt or improper installation (para 4-3b; notify general support maintenance).

- a. If delivery valve is dirty, clean or replace it; if improperly installed, install correctly (para 4-3b).
- b. If delivery valve is clean and properly installed, proceed to step 15.

Step 15. Remove plungers and inspect for burrs, corrosion or varnish accumulation (para 4-3b; notify general support maintenance).

Replace plungers if burred, corroded, or varnish accumulation is present (para 4-3b).

## 7. ENGINE DOES NOT DEVELOP FULL POWER OR SPEED

Step 1. Check throttle arm installation and adjustment (para 2-15i).

- a. If throttle arm installation is not correct or if adjustment is not correct, correct installation and adjust as described in paragraph 2-15i.
- b. If throttle arm installation is correct and if adjustment is correct, proceed to step 2.

Step 2. Check governor linkage for proper adjustment (para 4-3b; notify general support maintenance).

- a. Adjust governor linkage (para 4-3b).
- b. If governor linkage adjustment is okay, proceed to step 3.

Step 3. Check governor no-load governed speed for proper adjustment (para 3-5a).

- a. If governor no-load governed speed is not adjusted properly, adjust as described in paragraph 3-5a.
- b. If governor no-load governed speed is adjusted properly, proceed to step 4.

Step 4. Remove inlet strainer and check for clogged condition (para 4-3b; notify general support maintenance).

- a. If inlet strainer is clogged, either clean or replace strainer (para 4-3b).
- b. If inlet strainer is not clogged, proceed to step 5.

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

#### 7. ENGINE DOES NOT DEVELOP FULL POWER OR SPEED (cont)

Step 5. Check fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).
- b. If fuel injection pump timing is okay, proceed to step 6.

Step 6. Disconnect and remove fuel injector return lines (para 3-6a).

Check return lines for clogged condition.

- a. If fuel injector return lines are clogged, clean as described in paragraph 3-6a. After cleaning return lines, recheck to ensure that all foreign matter has been removed, then reinstall (para 3-6a).
- b. If fuel injector return lines are not clogged, proceed to step 7.

Step 7. Disconnect fuel lines from fuel injection pump at fuel injectors (para 3-6a) one at a time, crank engine and check that fuel is pumped out of disconnected fuel line.

- a. If fuel is not pumped out of disconnected fuel line when engine is cranked, replace associated connector screw (para 4-3b; notify general support maintenance).
- b. If fuel is pumped out of disconnected fuel line, proceed to step 8.

Step 8. Disassemble fuel injection pump and check governor parts and linkage for wear, sticking condition, or binding (para 4-3b; notify general support maintenance).

- a. If governor parts and linkage are worn, sticking, or binding replace (para 4-3b).
- b. If governor parts and linkage are okay, proceed to step 9.

Step 9. Disassemble fuel injection pump and check governor linkage and metering valve for binding, foreign matter and burrs; check metering valve for sticking condition (para 4-3b, notify general support maintenance).

- a. If linkage is binding or burred, replace (para 4-3b); if foreign matter is present, remove; if metering valve is sticking, replace (para 4-3b).
- b. If linkage and metering valve check okay, proceed to step 10.

Step 10. Check governor linkage hook for proper adjustment (para 4-3b; notify general support maintenance).

- a. If governor hook is not properly adjusted, adjust (para 4-3b).
- b. If governor hook is properly adjusted, proceed to step 11.

Step 11. Disassemble automatic advance components and inspect (para 4-3b; notify general support maintenance).

- a. If automatic advance components are worn or damaged, replace and adjust (para 4-3b).
- b. If automatic advance components are okay, proceed to step 12.

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 7. ENGINE DOES NOT DEVELOP FULL POWER OR SPEED (cont)

- Step 12. Disassemble fuel injection pump and check transfer pump parts for wear or damage (para 4-3b; notify general support maintenance).
- a. If transfer pump parts are worn or damaged, replace (para 4-3b).
  - b. If transfer pump parts check okay, proceed to step 13.
- Step 13. Check fuel injection pump maximum fuel setting on test set-up (para 4-3b; notify general support maintenance).
- a. If fuel injection pump maximum fuel setting is not correct, adjust (para 4-3b).
  - b. If fuel injection pump maximum fuel setting is okay, proceed to step 14.
- Step 14. Remove delivery valve and inspect for dirt or improper installation (para 4-3b; notify general support maintenance).
- a. If delivery valve is dirty, clean or replace it; if improperly installed, install correctly (para 4-3b).
  - b. If delivery valve is clean and properly installed, proceed to step 15.
- Step 15. Remove cam, shoes, and rollers and inspect for wear (para 4-3b; notify general support maintenance).
- a. If cam, shoes, or rollers are worn, replace (para 4-3b).
  - b. If cam, shoes, and rollers are okay, proceed to step 16.
- Step 16. Remove plungers and inspect for burrs, corrosion or varnishes (para 4-3b; notify general support maintenance).
- a. If plungers are burred, corroded, or varnish accumulation is present, replace (para 4-3b).
  - b. If plungers are okay, proceed to step 17.
- Step 17. Check rotor and hydraulic head assembly (in plunger area) for wear (para 4-3b; notify general support maintenance).
- a. If rotor and hydraulic head are worn in plunger area, replace (para 4-3b).
  - b. If rotor and hydraulic head are okay, proceed to step 18.
- Step 18. Check drive shaft tang dimension (should be not less than 0.305 inch) (para 4-3b; notify general support maintenance).
- a. If drive shaft tang measures less than 0.305 inch, replace drive shaft (para 4-3b).
  - b. If drive shaft tang measures more than 0.305 inch, proceed to step 19.

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

#### 7. ENGINE DOES NOT DEVELOP FULL POWER OR SPEED (cont)

- Step 19. Check that hydraulic head screws are tight or are not missing (para 4-3b; notify general support maintenance).
- a. If hydraulic head screws are not tight or are missing, tighten and/or install (para 4-3b).
  - b. If hydraulic head screws are tight and not missing, proceed to step 20.
- Step 20. Check rotor for scores (para 4-3b; notify general support maintenance).
- a. If rotor is scored, replace it (para 4-3b).
  - b. If rotor is okay, proceed to step 21.
- Step 21. Check delivery valve screw for tightness (para 4-3b notify general support maintenance).
- a. If delivery valve screw is loose, tighten (para 4-3b).
  - b. If delivery valve screw is tight, remove it. Then, remove delivery valve and inspect seat for erosion (para 4-3b).
    - 1) If seat is eroded, replace delivery valve (para 4-3b).
    - 2) If seat is okay, reinstall, tighten delivery valve screw (para 4-3b) and proceed to step 22.
- Step 22. Check adjustment of torque screw (para 4-3b; notify general support maintenance).
- a. If torque screw out of adjustment, adjust (para 4-3b).
  - b. If torque screw adjustment is okay, proceed to step 23.
- Step 23. Check if hydraulic vent head wires are missing (para 4-3b; notify general support maintenance).  
Install vent head wires (para 4-3b).

#### 8. ENGINE SMOKES BLACK

- Step 1. Check fuel injection pump timing (para 3-5a(3)).
- a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).
  - b. If fuel injection pump timing is okay, proceed to step 2.
- Step 2. Disassemble automatic advance components and inspect (para 4-3b; notify general support maintenance).
- a. If automatic advance components are worn or damaged, replace and adjust para 4-3b).
  - b. If automatic advance components are okay, proceed to step 3.
- Step 3. Remove cam, shoes, and rollers and inspect for wear (para 4-3b; notify general support maintenance).



---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 8. ENGINE SMOKES BLACK (cont)

## Step 3. (cont)

- a. If cam, shoes, or rollers are worn, replace (para 4-3b).
- b. If cam, shoes, and rollers are okay, adjust torque screw (para 4-3b).

## 9. ENGINE SMOKES BLUE OR WHITE

## Step 1. Check fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).
- b. If fuel injection pump timing is okay, proceed to step 2.

## Step 2. Disassemble automatic advance components and inspect (para 4-3b; notify general support maintenance).

- a. If automatic advance components are worn or damaged, replace and adjust (para 4-3b).
- b. If automatic advance components are okay, proceed to step 3.

## Step 3. Check rotor for scores (para 4-3b; notify general support maintenance).

Replace rotor (para 4-3b).

## 10. FUEL NOT REACHING FUEL INJECTION PUMP

## Step 1. Disassemble fuel injection pump and check for cause of seizure of rotor assembly (para 4-3b; notify general support maintenance).

- a. Replace hydraulic head and rotor assembly (para 4-3b).
- a. If hydraulic head and rotor assembly are okay, proceed to step 2.

## Step 2. Remove inlet strainer and check for clogged condition (para 4-3b; notify general support maintenance).

- a. If inlet strainer is clogged, either clean or replace strainer (para 4-3b).
- b. If strainer is not clogged, proceed to step 3.

## Step 3. Disassemble transfer pump and check that transfer pump liner locating pin is in correct hole (para 4-3b; notify general support maintenance).

- a. If locating pin is in wrong hole, remove and install in correct hole (para 4-3b).
- b. If locating pin is in correct hole, proceed to step 4.

## Step 4. Disassemble fuel injection pump and check transfer pump parts for wear or damage (para 4-3b; notify general support maintenance).

- a. If transfer pump parts are worn or damaged, replace (para 4-3b).
- b. If transfer pump parts check okay, replace end plate regulating piston and sleeve (para 4-3b).

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

11. FUEL DELIVERED FROM TRANSFER PUMP BUT NOT TO FUEL INJECTORS

- Step 1. Remove governor control cover (para 4-3b; notify general support maintenance) and check solenoid frame and arm assembly for cracks and swelling in encapsulated material and looseness of screw terminals. Check continuity using an ohmmeter (para 4-3b; notify general support maintenance).
- a. If cracks, swelling or loose screw terminals are observed, replace solenoid frame and arm assembly (para 4-3b); if continuity not obtained, replace solenoid frame and arm assembly (para 4-3b).
  - b. If solenoid frame and arm assembly checks okay, proceed to step 2.
- Step 2. Disconnect fuel lines from fuel injection pump at fuel injectors (para 3-6a) one at a time, crank engine and check that fuel is pumped out of disconnected fuel line.
- a. If fuel is not pumped out of disconnected fuel line when engine is cranked, replace associated connector screw (para 4-3b; notify general support maintenance).
  - b. If fuel is pumped out of disconnected fuel line, proceed to step 3.
- Step 3. Disassemble fuel injection pump and check governor linkage for binding, foreign matter, and burrs; check metering valve for sticking condition (para 4-3b notify general support maintenance).
- a. If linkage is binding or burred, replace (para 4-3b); if foreign matter is present, remove; if metering valve is sticking, replace (para 4-3b).
  - b. If linkage and metering valve check okay and no foreign matter present, proceed to step 4.
- Step 4. Remove plungers and inspect for burrs, corrosion or varnishes (para 4-3b; notify general support maintenance).
- a. If plungers are burred, corroded, or varnish accumulation is present, replace (para 4-3b).
  - b. If plungers are okay, proceed to step 5.
- Step 5. Inspect governor linkage for breaks or cracks (para 4-3b; notify general support maintenance).
- a. If governor linkage is broken or cracked, replace and adjust (para 4-3b).
  - b. If governor linkage checks okay, proceed to step 6
- Step 6. Disassemble fuel injection pump and check governor parts and linkage for wear, sticking condition, or binding (para 4-3b; notify general support maintenance).
- a. If governor parts and linkage are worn, sticking, or binding replace (para 4-3b).
  - b. If governor parts and linkage are okay, proceed to step 7.
- Step 7. Check adjustment of torque screw (para 4-3b; notify general support maintenance).
- a. If torque screw out of adjustment, adjust (para 4-3b).
  - b. If torque screw adjustment is okay, proceed to step 8.

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 11. FUEL DELIVERED FROM TRANSFER PUMP BUT NOT TO FUEL INJECTORS (cont)

- Step 8. Disassemble fuel injection pump and check that metering valve is assembled correctly to metering valve arm (para 4-3b; notify general support maintenance).
- a. If metering valve is incorrectly assembled to metering valve arm, remove and install correctly (para 4-3b).
  - b. If metering valve is correctly assembled to metering valve arm, proceed to step 9.
- Step 9. Disassemble fuel injection pump and check that cam is not installed backwards (para 4-3b; notify general support maintenance).
- a. If cam is installed backwards, remove and install properly (para 4-3b).
  - b. If cam is installed correctly, proceed to step 10.
- Step 10. Disassemble fuel injection pump and check cam roller shoes for burrs; also check for freedom of rotation, chipping, and abrasive wear patterns (para 4-3b; notify general support maintenance).
- a. Replace cam roller shoes if burred, sticking, chipped, or abrasive wear pattern observed (para 4-3b).
  - b. If cam roller shoes check okay, proceed to step 11.
- Step 11. Check that thrust plunger is installed (para 4-3b; notify general support maintenance).
- a. If thrust plunger is missing, install (para 4-3b).
  - b. If thrust plunger is installed, proceed to step 12.
- Step 12. Disassemble fuel injection pump and check transfer pump blades for wear or damage (para 4-3b; notify general support maintenance).
- a. If transfer pump blades are worn or damaged, replace (para 4-3b).
  - b. If transfer pump blades check okay, proceed to step 13.
- Step 13. Disassemble fuel injection pump and check for foreign matter in passage from transfer pump to metering valve (para 4-3b; notify general support maintenance).
- a. Remove foreign matter (para 4-3b).
  - b. If no foreign matter is present, proceed to step 14.
- Step 14. Check rotor for scores (para 4-3b notify general support maintenance).
- a. If rotor is scored, replace it (para 4-3b).
  - b. If rotor is not scored, proceed to step 15.
- Step 15. Check that hydraulic head screws are tight or are not missing (para 4-3b; notify general support maintenance).

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

11. FUEL DELIVERED FROM TRANSFER PUMP BUT NOT TO FUEL INJECTORS (cont)

Step 15. (cont)

- a. If hydraulic head screws are not tight or are missing, tighten and/or install (para 4-3b).
- b. If hydraulic head screws are tight and not missing, proceed to step 16.

Step 16. Check if hydraulic head vent wires are missing (para 4-3b; notify general support maintenance).

- a. If vent wires are missing, install (para 4-3b).
- b. If vent wires are installed, check and replace metering valve spring shim (para 4-3b).

12. FUEL REACHING FUEL INJECTORS BUT ENGINE WILL NOT START

Step 1. Check fuel injection pump timing (para 3-5a(3)).

- a. If fuel injection pump timing is not correct, adjust timing as described in paragraph 3-5a(3).
- b. If fuel injection pump timing is okay, proceed to step 2.

Step 2. Check throttle arm installation and adjustment (para 2-15i).

- a. If throttle arm installation is not correct or if adjustment is not correct, correct installation and adjust as described in paragraph 2-15i.
- b. If throttle arm installation is correct and if adjustment is correct, proceed to step 3.

Step 3. Check governor linkage for proper adjustment (para 4-3b; notify general support maintenance).

- a. Adjust governor linkage (para 4-3b).
- b. If governor linkage adjustment is okay, proceed to step 4.

Step 4. Check adjustment of torque screw (para 4-3b; notify general support maintenance).

- a. If torque screw out of adjustment, adjust (para 4-3b).
- b. If torque screw adjustment is okay, proceed to step 5.

Step 5. Disassemble automatic advance components and inspect (para 4-3b; notify general support maintenance).

- a. If automatic advance components are worn or damaged, replace and adjust (para 4-3b).
- b. If automatic advance components are okay, proceed to step 6.

Step 6. Check fuel injection pump maximum fuel setting on test set-up (para 4-3b; notify general support maintenance).

- a. If fuel injection pump maximum fuel setting is not correct, adjust (para 4-3b).
- b. If fuel injection pump maximum fuel setting is okay, proceed to step 7.

---

### **3-4. FUEL SYSTEM TROUBLESHOOTING (cont)**

---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 12. FUEL REACHING FUEL INJECTORS BUT ENGINE WILL NOT START (cont)

Step 7. Remove cam, shoes, and rollers and inspect for wear (para 4-3b; notify general support maintenance).

a. If cam, shoes, or rollers are worn, replace (para 4-3b).

b. If cam, shoes, and rollers are okay, proceed to step 8.

Step 8. Check rotor and hydraulic head assembly (in plunger area) for wear (para 4-3b; notify general support maintenance).

a. If rotor and hydraulic head are worn in plunger area, replace (para 4-3b).

b. If rotor and hydraulic head are okay, proceed to step 9.

Step 9. Check that hydraulic head screws are tight or are not missing (para 4-3b; notify general support maintenance).

a. If hydraulic head screws are not tight or are missing, tighten and/or install (para 4-3b).

b. If hydraulic head screws are tight and not missing, proceed to step 10.

Step 10. Check rotor for scores (para 4-3b notify general support maintenance).

Replace rotor (para 4-3b).

**3-5. ENGINE MAINTENANCE**

*a. Engine Tune-up.*

(1) Locating Top Dead Center.

This task covers locating top dead center position for No. 1 cylinder.

INITIAL SETUP

TOOLS

Automotive Mechanic's  
Tool Kit

NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off, and parking brake applied.

MATERIALS/ PARTS

None

2-53c

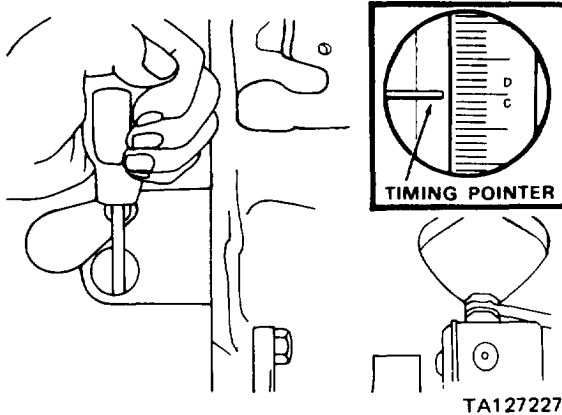
3-5h

3-5i

Left side panel removed.

Flywheel housing timing hole cover open.

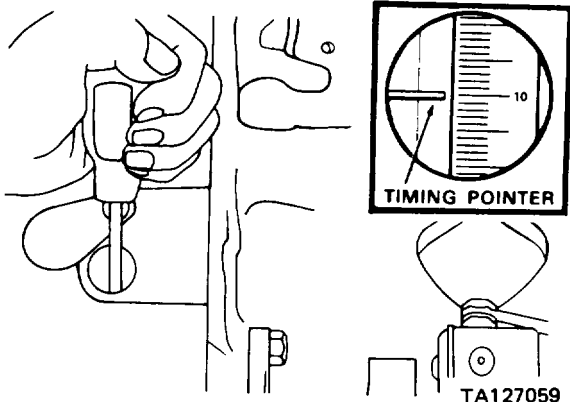
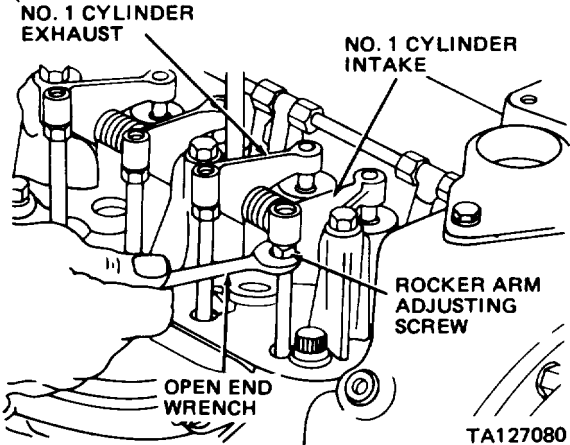
Rocker arm cover removed.

STEP	LOCATION	ITEM	ACTION	REMARKS
1	Flywheel housing, left side engine compartment	a. Engine flywheel	Rotate clockwise	Engage flywheel ring gear teeth with blade of screwdriver as shown. Rotate engine until pointer in timing hole is in line with TDC mark on flywheel
				
		b. Push rods for No. 1 cylinder	Check for looseness	If push rods are loose, engine is at TDC position for No. 1 cylinder. If push rods are not loose, rotate engine one complete revolution from position in step a above, and recheck push rods of No. 1 cylinder for looseness
2	Cylinder head, engine compartment top	<p><b>NOTE</b></p> <p>Perform the following steps only if accuracy of flywheel timing pointer is in doubt.</p>		

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

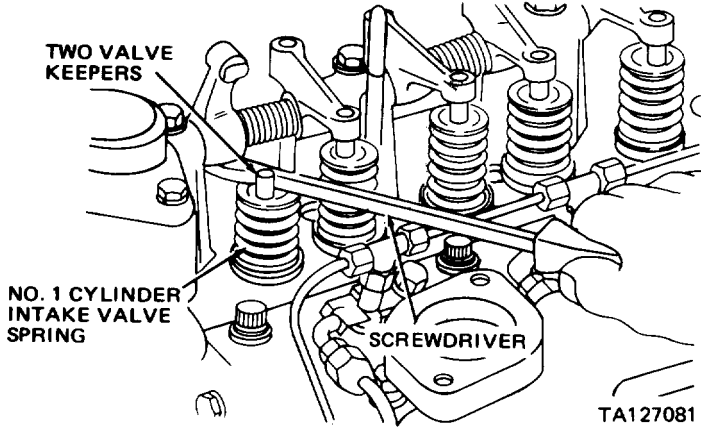
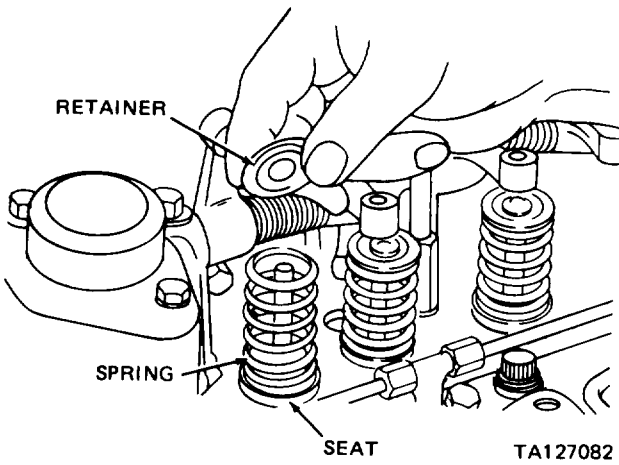
(1) Locating Top Dead Center (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
2 cont)		a. Engine flywheel	Rotate clockwise	Engage flywheel ring gear teeth with blade of screwdriver as shown. Rotate engine until pointer in timing hole is in line with the 10° BTDC mark on flywheel
				
		b. Rocker arm adjusting screw for No. 1 cylinder intake valve	Turn counter-clockwise	Use wrench to rotate adjusting screw inwards to take pressure off push rod
				
		c. Rocker arm for No. 1 cylinder intake valve	Reposition	Push rocker arm down against valve spring and push rearwards off valve and push rod
		d. Push rod for No. 1 cylinder intake valve	Remove	Lift from cylinder head
		e. Two keepers for No. 1 cylinder intake valve	Remove	Compress valve spring using screwdriver as shown, remove valve keepers, and slowly release screwdriver

**3-5. ENGINE MAINTENANCE (cont)**

*a. Engine Tune-up (cont).*

(1) Locating Top Dead Center (cont).

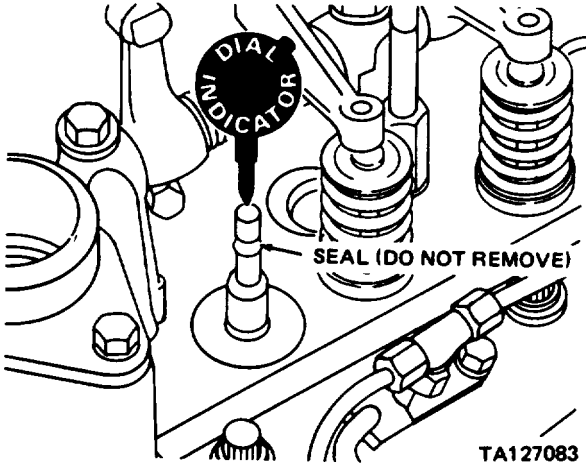
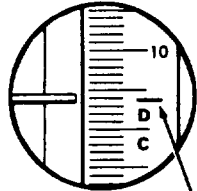
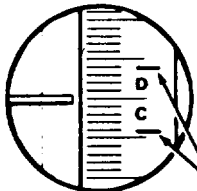
STEP	LOCATION	ITEM	ACTION	REMARKS
<p>2 (cont)</p>				
		<p>f. Retainer, valve spring, and seat for No. 1 cylinder intake valve</p>	<p>Remove</p>	<p>Lift from cylinder head</p>
				
		<p><b>NOTE</b></p> <p>Do not remove seal from valve stem. If seal is removed, valve may fall through valve guide if piston is moved too far, requiring removal of cylinder head.</p>		
		<p>g. Dial indicator</p>	<p>Position</p>	<p>On end of valve stem, with valve resting on top of No. 1 piston</p>



**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(1) Locating Top Dead Center (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
2 cont)		 <p>h. Dial indicator</p> <p>i. Engine flywheel</p>	<p>Zero</p> <p>Rotate clockwise</p>	<p>Rotate engine flywheel clockwise until dial indicator hand stops moving, then reset dial indicator to read zero</p> <p>Until dial indicator reads 0.010 inch. Scribe a mark on flywheel in line with timing pointer as shown</p>  <p>SCRIBE MARK</p> <p>TA127084</p> <p>j. Engine flywheel</p> <p>Rotate counter-clockwise</p> <p>Past dial indicator zero, until dial indicator reads 0.010 inch. Scribe another mark on flywheel in line with timing pointer. Half the distance between these two scribe marks is TDC for No. 1 cylinder</p>  <p>SCRIBE MARKS</p> <p>TA127085</p>

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(1) Locating Top Dead Center (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
2 cont)		k. Seal l. Seat, valve spring and retainer	Remove Install	From valve stem Position spring with closed damping coil end on top of cylinder head as shown
		m. Two valve keepers and new seal	Install	Compress valve spring using screwdriver as shown, install new seal in lower groove of valve stem, install two keepers in upper groove of valve stem, and slowly release screwdriver. Gently tap end of valve stem to seat keepers
		n. Push rod for No. 1 cylinder intake valve	Install	Push rocker arm down against valve spring and push rearwards off valve stem, lower push rod into bore in cylinder head, release rocker arm, and position push rod beneath rocker arm adjusting screw
		o. No. 1 cylinder intake valve	Adjust tappet clearance	Para 3-5a(2)

**3-5. ENGINE-MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(2) Valve Tappet Clearance Adjustment.

This task covers adjustment of tappet clearance for engine intake and exhaust valves.

INITIAL SETUP

TOOLS

Automotive Mechanic's  
Tool Kit  
Extension Wrench

NSN 5180-00-754-0641  
FSCM 10988 P/N M20419

MATERIALS/PARTS

No. 30 engine oil  
Rocker arm cover gasket

EQUIPMENT CONDITION

Paragraph	Condition	Description
		Vehicle parked on level surface, engine off, and parking brake applied.
2-53c		Left side panel removed.
2-53d		Top hood removed.
3-5a(1)		Engine positioned at TDC for No. 1 cylinder.
3-5i		Rocker arm cover removed.

STEP	LOCATION	ITEM	ACTION	REMARKS
TAPPET ADJUSTMENT — COLD SETTING				
1				
<b>NOTE</b>				
The cold setting valve tappet clearance must be adjusted whenever arms or push rods have been removed. Do not attempt to start engine until cold setting tappet clearance adjustment has been performed.				
a.	Rocker arm adjusting screw for No. 1 cylinder intake valve	Adjust	Loosen adjusting screw until a 0.012 inch feeler gage can be placed between rocker arm and valve stem as shown, then turn adjusting screw clockwise until rocker arm-to-valve stem clearance is 0.012 inch	

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

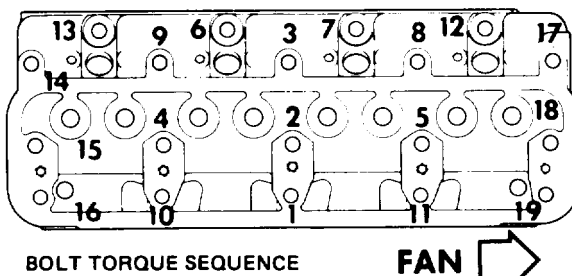

(2) Valve Tappet Clearance Adjustment (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>TAPPET ADJUSTMENT — COLD SETTING</b>				
1 cont)		b. Rocker arm adjusting screws	Adjust	Repeat step a above to adjust intake and exhaust valves as pointed out by arrows below
<p>TAPPET CLEARANCE — INTAKE VALVES 0.012 INCH EXHAUST VALVES 0.014 INCH</p>				
<p>NO. 1 TDC COMPRESSION STROKE TA127088</p>				
		c. Engine flywheel	Rotate clockwise	Rotate engine one complete revolution until pointer in timing hole is in line with TDC mark on flywheel (TDC position for No. 4 cylinder)
		d. Rocker arm adjusting screws	Adjust	Repeat step a above to adjust intake and exhaust valves as pointed out by the arrows below
<p>TAPPET CLEARANCE — INTAKE VALVES 0.012 INCH EXHAUST VALVES 0.014 INCH</p>				
<p>NO. 4 TDC COMPRESSION STROKE TA127089</p>				
		e. Valve stems	Lubricate	Squirt oil through valve springs to lubricate stems before starting engine

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(2) Valve Tappet Clearance Adjustment (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>TAPPET ADJUSTMENT — COLD SETTING (cont)</b>				
1 (cont)		f. Oil pressure	Check	Start engine and check OIL PRESSURE gage for normal indication. Visually check rocker arms to insure that they are receiving oil, then stop engine Proceed to step 2 below
		g. Valve tappet clearance- hot setting	Adjust	
<b>TAPPET ADJUSTMENT — HOT SETTING</b>				
2		a. Rocker arm cover	Install	Para 3-5i Start engine and operate (under load if possible) approximately one hour; then stop engine Para 3-5i
		b. Engine	Warm-up	
		c. Rocker arm cover	Remove	
<b>NOTE</b>				
Engine must heat normal operating temperature for each of the following steps. If necessary, restart and run engine to maintain normal operating temperature.				
		d. Cylinder head nuts and bolts	Retorque	Loosen bolt shown in position 1 approximately 1/4 turn, then tighten to 110-115 pounds foot torque. Using same procedure, retorque each cylinder head nut and bolt in sequence shown
<b>NOTE</b>				
Use extension wrench to torque nuts in positions 4 and 5.				
 <p style="text-align: center;"><b>BOLT TORQUE SEQUENCE</b>      <b>FAN</b> </p>				
TA127090				
		e. Recker arm bracket bolts	Retorque	Para 3-5j
		f. Recker arm adjusting screws	Adjust	Repeat step 1 with engine at normal operating temperature
		g. Rocker arm cover	Install	Para 3-5i

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(3) Fuel Injection Pump Adjustments.

This task covers adjustment of fuel injection pump timing, engine idle speed, and no-load governed speed.

INITIAL SETUP

TOOLS

Automotive Mechanic's  
Tool Kit

NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off,  
and parking brake applied.

MATERIALS/PARTS

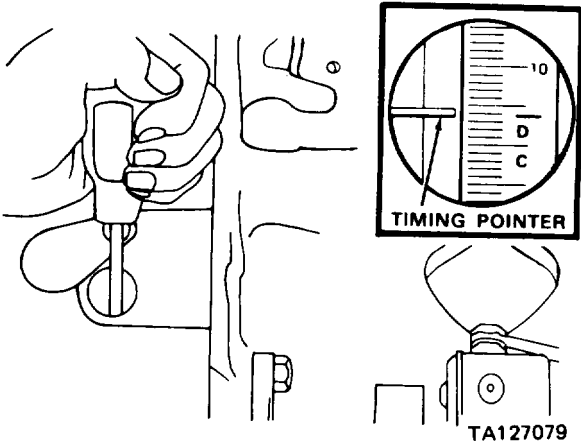
Wire seal  
Timing window gasket

2-53c

Left and right side panels removed.

3-5f

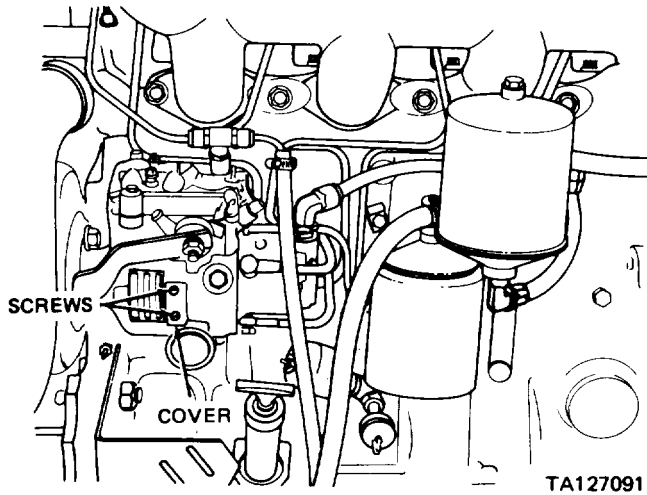
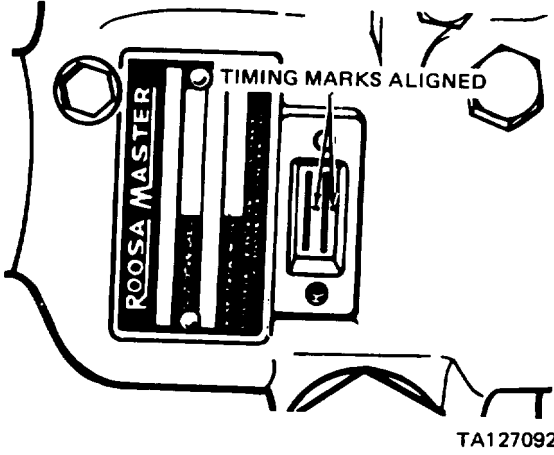
Tachometer drive cover removed.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INJECTION PUMP — TIMING ADJUSTMENT</b>				
	Engine compartment	a. Engine flywheel	Rotate	Engage flywheel ring gear teeth with blade of screwdriver as shown. Rotate engine counterclockwise until pointer in timing hole is past 8° BTDC mark on flywheel; then rotate engine clockwise until pointer is in line with 8° BTDC mark on flywheel
				
<p>b. Timing window screws, Remove cover and gasket</p>				

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

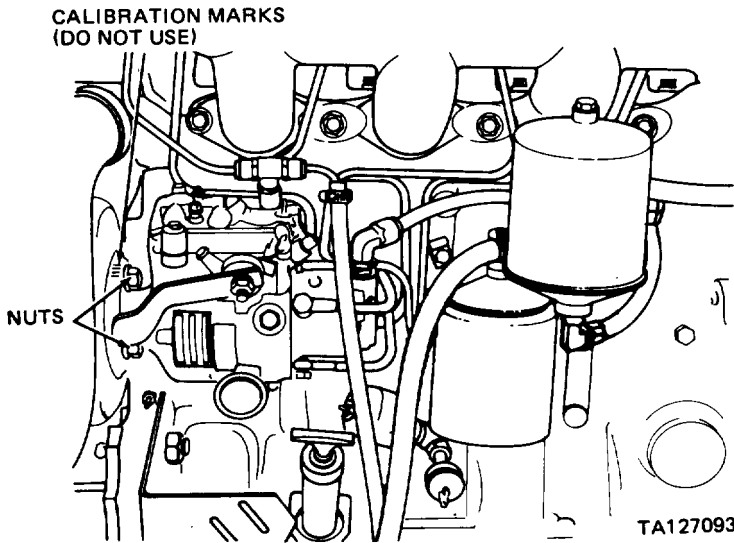
(3) Fuel Injection Pump Adjustments (cont).

STEP	EDCATION	ITEM	ACTION	REMARKS
INJECTION PUMP — TIMING ADJUSTMENT (cont)				
1 (cont)				
<b>NOTE</b>				
<p>If both timing marks are not visible in the following step, rotate engine one complete revolution and rpeat step a above.</p>				
	c. Injection pump timing marks	Check		<p>If timing marks are aligned as shown, proceed to step h. If marks are not aligned, proceed to step d</p>
				
	d. Three pump mounting nuts	Loosen		

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(3) Fuel Injection Pump Adjustments (cont).

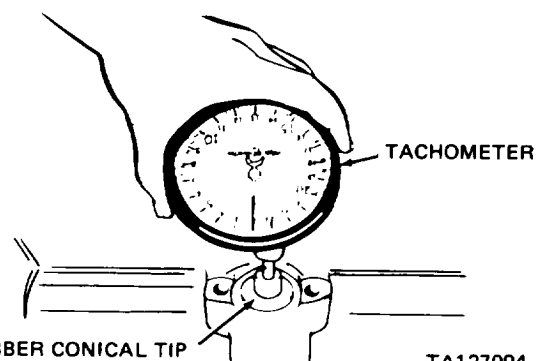
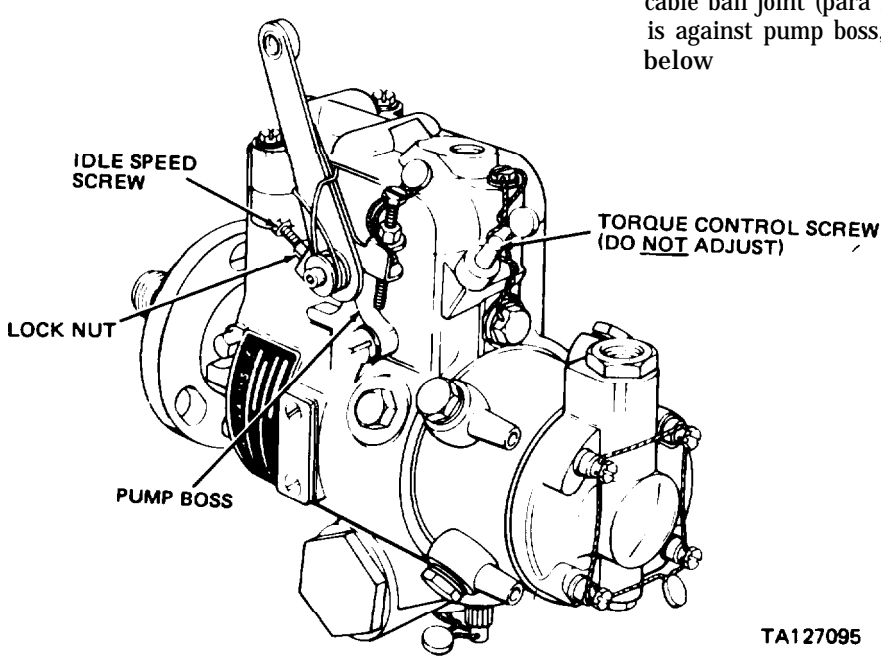
STEP	LOCATION	ITEM	ACTION	REMARKS
INJECTION PUMP — TIMING ADJUSTMENT (cont)				
1 (cont)				 <p><b>NOTE</b></p> <p>Do not use calibration marks in the following step. Use marks in injection pump timing window only.</p> <p>e. Injection pump                      Rotate                      Until timing marks in timing window are in line</p> <p><b>NOTE</b></p> <p>To advance timing, rotate top of pump away from engine. To retard timing, rotate top of pump toward engine.</p> <p>                     f. Three pump mounting nuts                      Tighten                      Torque to 35-42 pounds foot torque                      g. Injection pump timing                      Recheck                      Repeat steps a and c above until timing marks are in line                      h. Timing window cover and new gasket                      Position                      On injection pump                      i. Cover screws                      Install and tighten                      Until timing window cover is securely mounted                 </p>
ENGINE IDLE SPEED ADJUSTMENT				
2	Fuel injection pump	a. Engine b. Tachometer	Warm-up Position	Start engine and operate until normal operating temperature is reached With engine idling, press conical tip against tachometer drive shaft on engine until tachometer hand stops moving, then note reading



**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

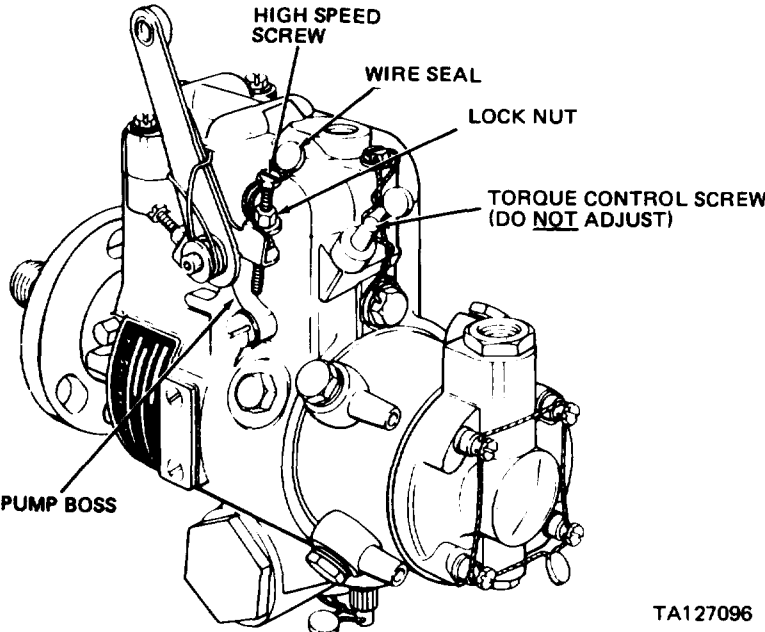
(3) Fuel Injection Pump Adjustments (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ENGINE IDLE SPEED ADJUSTMENT (cont)				
2 (cont)	<p style="text-align: center;"><b>NOTE</b></p> <p>Tachometer drive shaft operates at one half engine speed. Double tachometer reading to obtain engine RPM.</p>			
<div style="text-align: center;">  <p style="text-align: right;">TA127094</p> </div>				
	c. Engine idle speed		Measure	Repeat step b above to recheck idle speed. If engine idle speed is 825-850 RPM, proceed to step 3. If idle speed is not correct, proceed to step d.
	d. Idle speed screw		Check position	With accelerator pedal at idle position, check if idle speed screw is against the injection pump boss. M screw is not against pump boss, adjust accelerator cable ball joint (para 2-15i). If idle screw is against pump boss, proceed to step e below
<div style="text-align: center;">  <p style="text-align: right;">TA127095</p> </div>				

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(3) Fuel Injection Pump Adjustments (cont).

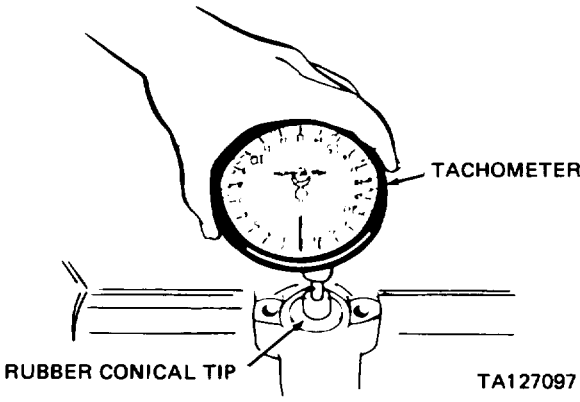
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>ENGINE IDLE SPEED ADJUSTMENT (cont)</b>				
2 (cont)		e. Idle speed screw wire seal	Cut and remove	
		f. Lock nut	Loosen	
		g. Idle speed screw	Adjust	Adjust 1/2 turn at a time and recheck engine idle speed. Repeat until engine idles at 825-850 RPM
<b>NOTE</b>				
Turn idle speed screw out (counterclockwise) to decrease engine speed. Turn idle speed screw in (clockwise) to increase engine idle speed.				
		h. Lock nut	Tighten	While holding idle speed screw
		i. New wire seal	Install and seal	On idle speed screw
<b>ENGINE NO-LOAD GOVERNED SPEED ADJUSTMENT</b>				
3	Fuel injection pump	a. High speed screw	Check	Check if high speed screw is against the injection pump boss while an assistant fully depresses the accelerator pedal. If screw is not against pump boss, adjust accelerator cable ball joint (para 2-15i)
				
		b. Engine	Warm-up	Start engine and operate until normal operating temperature is reached

TA127096

**3-5. ENGINE MAINTENANCE (cont)**

a. Engine Tune-up (cont).

(3) Fuel Injection Pump Adjustments (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ENGINE NO-LOAD GOVERNED SPEED ADJUSTMENT (cont)				
3 (cont)		c. Tachometer	Position	With accelerator pedal fully depressed, press conical tip against tachometer drive shaft on engine until tachometer hand stops moving, then note reading
<p><b>NOTE</b></p> <p>Tachometer drive shaft operates at one half engine speed. Double tachometer reading to obtain engine RPM.</p>				
				
<p><b>NOTE</b></p> <p>Turn high speed screw out (counterclockwise) to increase engine speed. Turn high speed screw in (clockwise) to decrease engine no-load governed speed.</p>				

**3-5. ENGINE MAINTENANCE (cont)**

*b. Engine Mount.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

INITIAL SETUP

TOOLS

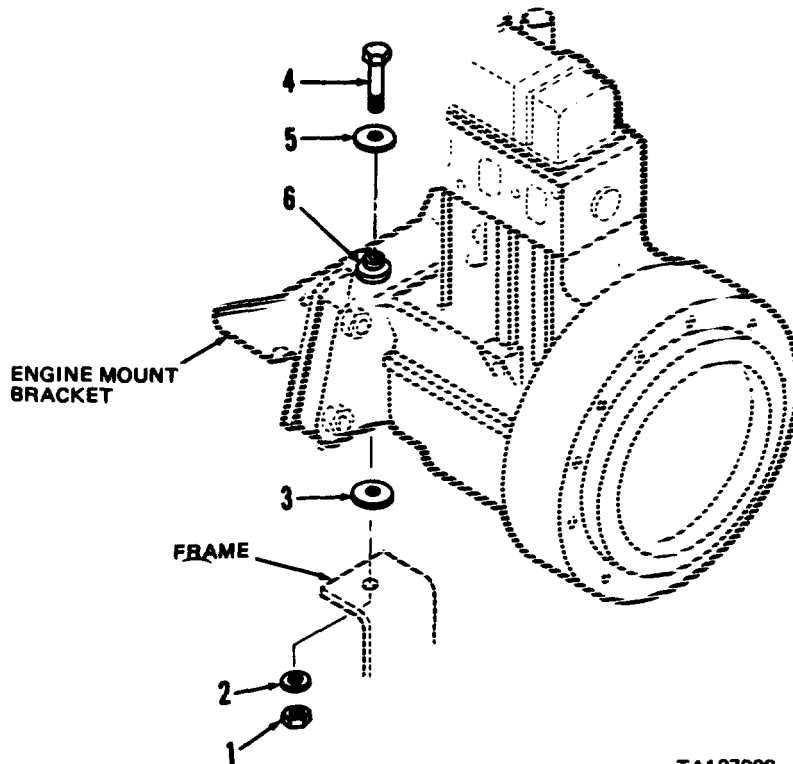
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654  
One-ton Sling and Hoist  
Sleeve, 1-1/2 inches diameter by 1 inch long  
5/8-1 INC hex nut

EQUIPMENT CONDITION

Paragraph	Condition	Description
2-17c	Radiator shroud (with radiator and oil cooler still attached) removed.	

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Rubber mount  
Lock nut



KEY

- 1. Lock nut
- 2. Washer
- 3. Washer
- 4. Cap screw
- 5. Washer
- 6. Mount

TA127098

**3-5. ENGINE MAINTENANCE (cont)**

*b. Engine Mount (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
1	Engine, rear	Engine mount (6)	Inspect	Replace if cracked, chipped, or split
<b>REMOVAL</b>				
2	Engine, rear	a. Lock nut (1) and washer (2)	Loosen and remove	Discard lock nut (1)
<b><u>WARNING</u></b>				
Keep hands and body clear while engine is being raised. Failure to do so could cause serious injury or death due to engine falling. When engine mount bracket is clear of frame, support engine using blocks to prevent engine from falling while replacing mount (6).				
<b>NOTE</b>				
Loosen two transmission mounts mounting bolts before performing following step.				
	b. Rear of engine		Lift	Using sling and hoist. Lift until mount (6) will clear frame and engine mount bracket
	c. Cap screw (4) and washers (3 and 5)		Remove	
	d. Rubber mount (6)		Remove and discard	From engine mount bracket
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**3-5. ENGINE MAINTENANCE (cont)**

*b. Engine Mount (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3		Washers (2, 3 and 5) cap screw (4) and engine mount bracket	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air or clean cloths
INSPECTION				
4		Washers (2, 3 and 5) and cap screw (4)	Inspect	Replace if worn, or if threads damaged
INSTALLATION/REPLACEMENT				
5	Engine, rear	a. New mount (6) and hole in engine mount bracket	Lubricate	Use rubber lubricant or liquid soap
<p><b><u>CAUTION</u></b></p> <p>Do not attempt to install mount (6) using hammer. Driving mount into engine mount bracket may damage rubber.</p>				
		b. Mount (6)	Install	Using hardware shown below, pull mount until it is seated against engine mount bracket, then remove hardware

**3-5. ENGINE MAINTENANCE (Cont)**

*b. Engine Mount (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
5 (cont)		c. Washer (3)	Position	On frame, with holes aligned
<p><b><u>WARNING</u></b></p> <p>Keep hands and body clear while engine is being lowered. Failure to do so could cause serious injury or death due to engine falling.</p>				
		d. Rear of engine	Lower	Remove support blocks and lower using hoist. Be sure mount (6), washer (3) and frame holes are aligned
		e. Washers (2 and 5), cap screw (4) and new lock nut (1)	Install and tighten	
		f. Two transmission mounts mounting bolts	Tighten	
		g. Radiator shroud, with radiator and oil cooler	Install	Para 2-17c

**3-5. ENGINE MAINTENANCE (cont)**

*c. Power Pack.*

This task covers power pack (engine/transmission) removal and installation.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
One-ton Sling and Hoist

NSN 4910-00-754-0654

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Drain pans  
Lock nuts

EQUIPMENT CONDITION

Location	Paragraph	Condition Description
----------	-----------	-----------------------

**NOTE**

Prepare equipment for power pack removal in the following order.

Rear chassis, grille and battery compartment	2-53a 2-33b	Tow bar lowered and grille removed. Battery ground cable disconnected.
--	----------------	---

**WARNING**

Disconnect battery ground cable before proceeding.

Rear chassis, top and sides	2-53c 2-16 2-53d 2-15d 2-53b 2-53e	Side panels removed. Exhaust pipe removed. Top hood removed. Air cleaner removed. Fenders removed. Hood panels removed.
Rear chassis, front	2-53f 2-56g(1)	Front cover panel removed. Hydraulic reservoir drained.
Engine compartment, rear	2-17a 2-17b 2-38f 2-17C  2-56g(5)	Radiator and engine coolant drained. Radiator hoses removed. Oil cooler hoses disconnected from oil cooler. Radiator shroud (with radiator and oil cooler still attached) removed. Hydraulic reservoir removed.
Transmission, front	2-42a 2-39b 2-39c	Parking brake cable disconnected. Center drive shaft assembly disconnected. Rear drive shaft assembly disconnected.
Transmission, left side	2-31b  2-38b 2-43d	Neutral start switch and back-up alarm switch leads disconnected. Transmission linkage cables disconnected. Declutch valve outlet hose disconnected.
Engine, left side	2-26 2-27a  2-27b  2-31c(1)	Alternator leads disconnected. Battery cables, slave receptacle cables and harness leads disconnected from starter and solenoid switch. Starter relay and 25 AMP circuit breaker leads disconnected. Engine temperature switch lead disconnected.



**3-5. ENGINE MAINTENANCE (cont)**

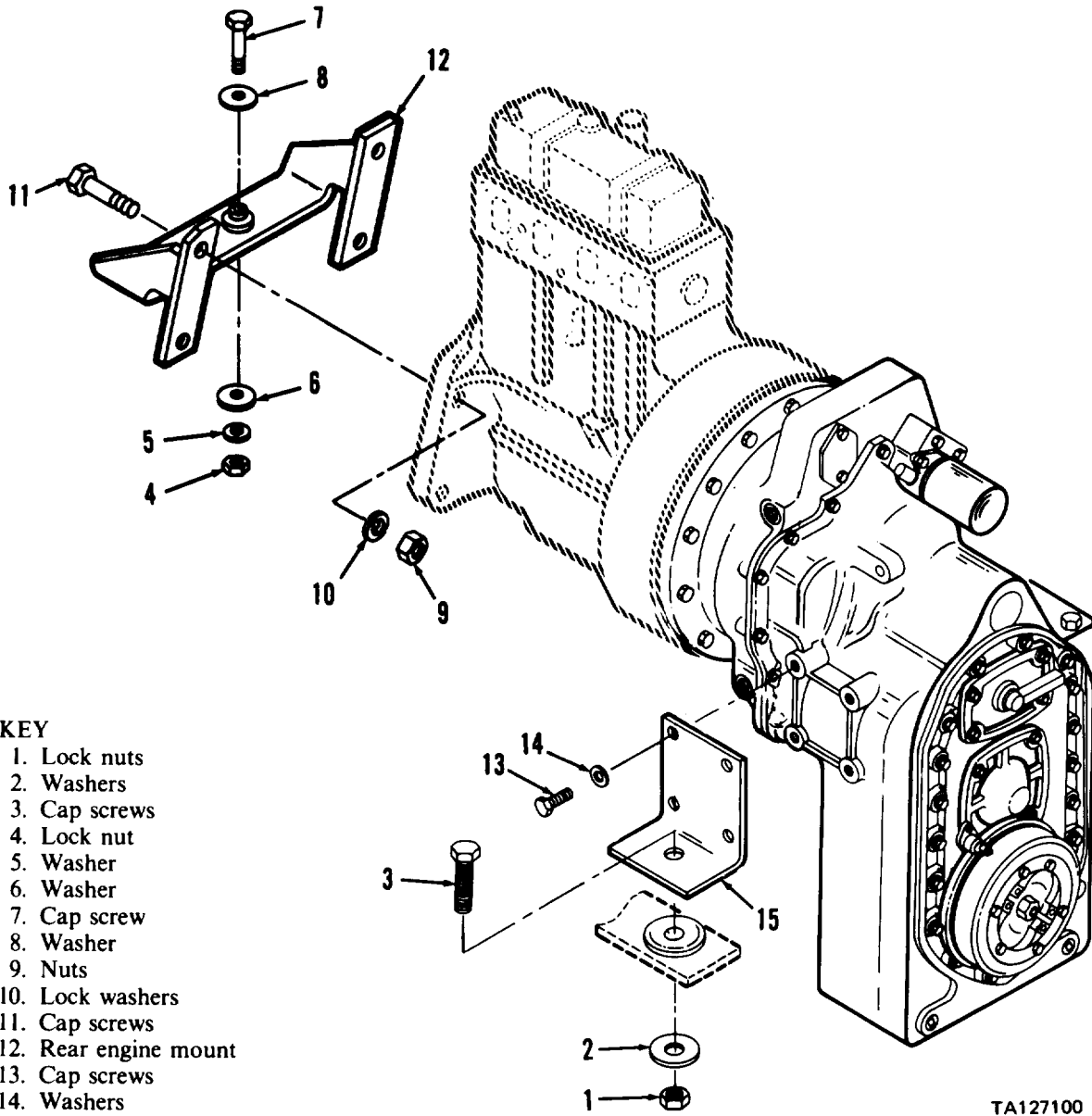
*c. Power Pack (cont).*

Engine compartment, left side	2-56g(2)	Hydraulic oil filter and filler head removed.
Engine compartment, right side		Fuel tank shut-off valve closed.
Transmission, right side	2-31c(2) 2-38f 2-48b(2)	Transmission temperature switch lead disconnected. Oil cooler hoses disconnected. Hydraulic pump hoses disconnected.
Engine, right side	2-15b, 2-15c(2) 2-15c(1) 2-15d, 2-15h  2-15i  2-16 2-31d  2-39e(2)	Fuel lines disconnected from fuel filters. Fuel return line disconnected from fuel injector tee fitting. Restriction indicator and cold start kit lines disconnected from intake manifold. Accelerator ball joint and cable disconnected from fuel injection pump. Muffler and muffler bracket removed. Engine oil pressure switch and sending unit leads disconnected. Rear axle breather removed.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment	a. One-ton sling and hoist b. Two lock nuts (1) and washers (2) c. Two cap screws (3)  d. Lock nut (4) and washers (5 and 6) e. Cap screw (7) and washer (8) f. Rubber motor mount (16) g. Eight cap screws (13) and washers (14) h. Two transmission mounts (15)	Connect Loosen and remove Lift and remove  Loosen and remove Lift and remove Remove Remove Remove	To engine and transmission; take up slack Discard lock nut (1)  If necessary, gently tap threaded end of cap screw using hammer Discard lock nut (4)  If necessary, gently tap threaded end of cap screw using hammer
<b><u>WARNING</u></b>				
Keep clear of engine and transmission during power pack removal. Never place hands or body under power pack. Failure to do so may cause serious bodily injury or death due to power pack falling.				
<b><u>CAUTION</u></b>				
Check that all hoses, lines and wires are disconnected as the power pack is lifted from vehicle. If necessary, lower power pack onto mounts and disconnect remaining hoses, lines or wires.				
		h. Power pack	Slowly lift and remove	From rear chassis

**3-5. ENGINE MAINTENANCE (cont)**

*c. Power Pack (cont).*



- KEY**
- 1. Lock nuts
  - 2. Washers
  - 3. Cap screws
  - 4. Lock nut
  - 5. Washer
  - 6. Washer
  - 7. Cap screw
  - 8. Washer
  - 9. Nuts
  - 10. Lock washers
  - 11. Cap screws
  - 12. Rear engine mount
  - 13. Cap screws
  - 14. Washers
  - 15. Transmission mounts

TA127100

**3-5. ENGINE MAINTENANCE (cont)**

*c. Power Pack (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
2	Engine, rear	<b>NOTE</b>		
Perform the following steps only if rear engine mount (12) requires replacement.				
		a. Four nuts (9), lock washers (10) and cap screws (11)	Loosen and remove	Support engine mount (I 2)
		b. Engine mount (12)	Remove	
<b>INSTALLATION</b>				
3	Engine, rear	a. Rear engine mount (12)	Position	
		b. Four cap sinews (11), lock washers (10) and nuts (9)	Install and tighten	Tighten to 150-180 ft. lb. torque.
4	Engine compartment	<b><u>WARNING</u></b>		
Keep clear of engine and transmission during power pack installation. Never place hands or body under power pack. Failure to do so may cause serious injury or death due to power pack falling.				
<b><u>CAUTION</u></b>				
Check that all hoses, lines and wires are clear as power pack is slowly lowered into vehicle. If necessary, reposition hoses, lines or wires before installing power pack.				
		a. Power pack	Slowly lower and install	Into rear chassis, with mounting holes aligned
		b. Two transmission mounts (15)	Position	
		c. Eight washers (14) and cap screws (13)	Install	
		d. Rubber motor mounts (16)	Install	
		e. Washer (8) and cap screw (7)	Install	
		f. Washers (6 and 5) and new lock nut (4)	Install and tighten	Until bottom of rubber engine mount (16) expands to same diameter as washer (6)
		g. Two cap screws (3), washers (2) and new lock nuts (1)	Install and tighten	Until bottom of rubber mounts expand to same diameter as washers (2)

**3-5. ENGINE MAINTENANCE (cont)**

*d. Separation of Engine and Transmission.*

This task covers: a. Removal of transmission from engine  
 b. Installation of transmission on engine

INITIAL SETUP

TOOLS

Automotive Mechanic's  
 Tool Kit

NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph  
 3-5 c

Condition Description  
 Power pack (engine/transmission)  
 removed from vehicle.

MATERIALS/PARTS

One 3/ 8-24 N F by 4 inches  
 guide stud

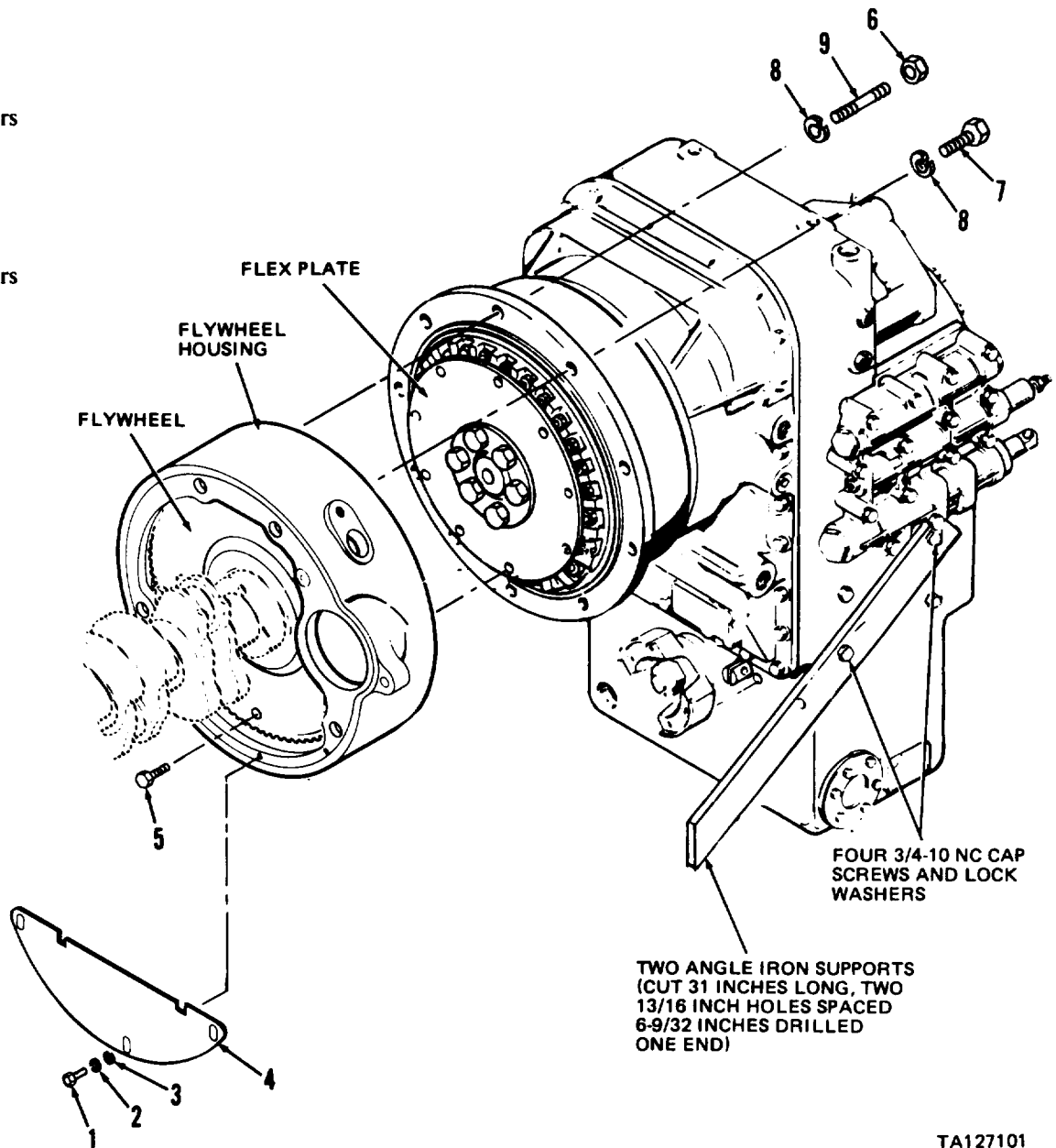
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission	Transmission supports	Install as shown	To support transmission in upright position after removal from engine
2	Engine flywheel housing	a. Three cap screws (1), lock washers (2) and washers (3) b. Dust cover (4) c. Eight cap screws (5)	Remove  Remove Loosen and remove	Support dust cover (4)  Reach in flywheel housing opening and remove screws (5) securing flex plate to flywheel. Rotate flywheel at crankshaft pulley as required, to reach all eight cap screws. Hold crankshaft pulley stationary (use 1 /2" drive wrench) while removing cap screws (5).
3.	Transmission	a. Sling and hoist b. Ten-cap screws (7) and lock washers (8) c. Two nuts (6) and lock washers (8) d. Transmission	Connect Remove  Remove Remove	To transmission Support transmission with hoist  From left side of transmission  Slide rearward from flywheel housing until flex plate clears housing, then lift and remove
<b>NOTE</b>				
Remove studs (9) only if required for replacement.				

**3-5. ENGINE MAINTENANCE (cont)**

*d. Separation of Engine and Transmission (cont).*

**KEY**

- 1. Cap screws
- 2. Lock washers
- 3. Washers
- 4. Dust cover
- 5. Cap screws
- 6. Nuts
- 7. Cap screws
- 8. Lock washers
- 9. Studs



TA127101

**3-5. ENGINE MAINTENANCE (cont)**

*d. Separation of Engine and Transmission (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
[INSTALLATION				
4	Transmission	a. One guide stud b. Flex plate	Install Rotate	In a lower flex plate nut Until guide stud is at bottom center of transmission
5	Flywheel housing	a. Flywheel b. Two studs (9) c. Transmission d. Two lock washers (8) and nuts (6) e. Ten lock washers (8) and cap screws (7) f. Eight cap screws (5) g. Nuts (6) and cap screws (7) h. Dust cover (4) i. Three washers (3), lock washers (2) and cap screws (1) j. Transmission supports and hard ware	Rotate Install and tighten Position Install Install Install and tighten Tighten Position Install and tighten Remove	Until flex plate cap screw hole is aligned with guide stud at bottom of transmission If removed Against engine flywheel housing. Align guide stud with flywheel, and studs (9) and transmission housing Rotate flywheel and flex plate and install at least one cap screw before removing guide stud. After all eight cap screws are snug, rotate flywheel and flex plate and tighten to 25-30 pounds foot torque Until transmission is securely mounted On flywheel housing Until cover (4) is securely mounted From transmission

**3-5. ENGINE MAINTENANCE (cont)**

*e. Cylinder Block.*

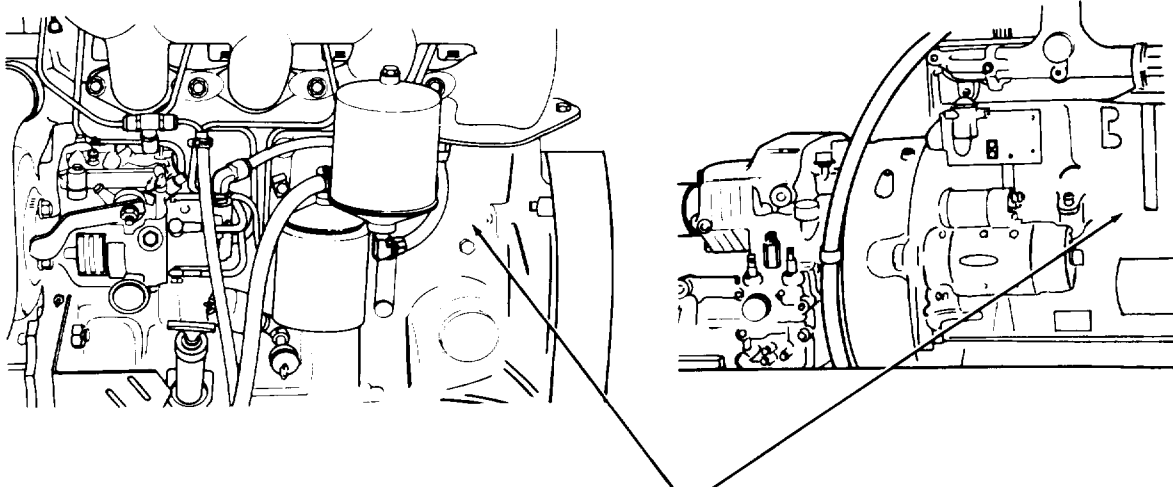
This task covers cylinder block inspection.

INITIAL SETUP

TOOLS  
Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

EQUIPMENT CONDITION  
Paragraph Condition Description  
2-53c Vehicle parked on level surface, engine off, and parking brake applied. Side panels removed.

MATERIALS/PARTS  
None

STEP	LOCATION	ITEM	ACTION	REMARKS
1	Engine compartment	Cylinder block	Inspect	<p>Notify general support maintenance if expansion plug eroded, or if cylinder block is cracked, damaged, or shows signs of wear or strain</p>  <p style="text-align: center;">CYLINDER BLOCK</p> <p style="text-align: right;">TA127102</p>

**3-5. ENGINE MAINTENANCE (cont)**

*f. Tachometer Drive.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

EQUIPMENT CONDITION

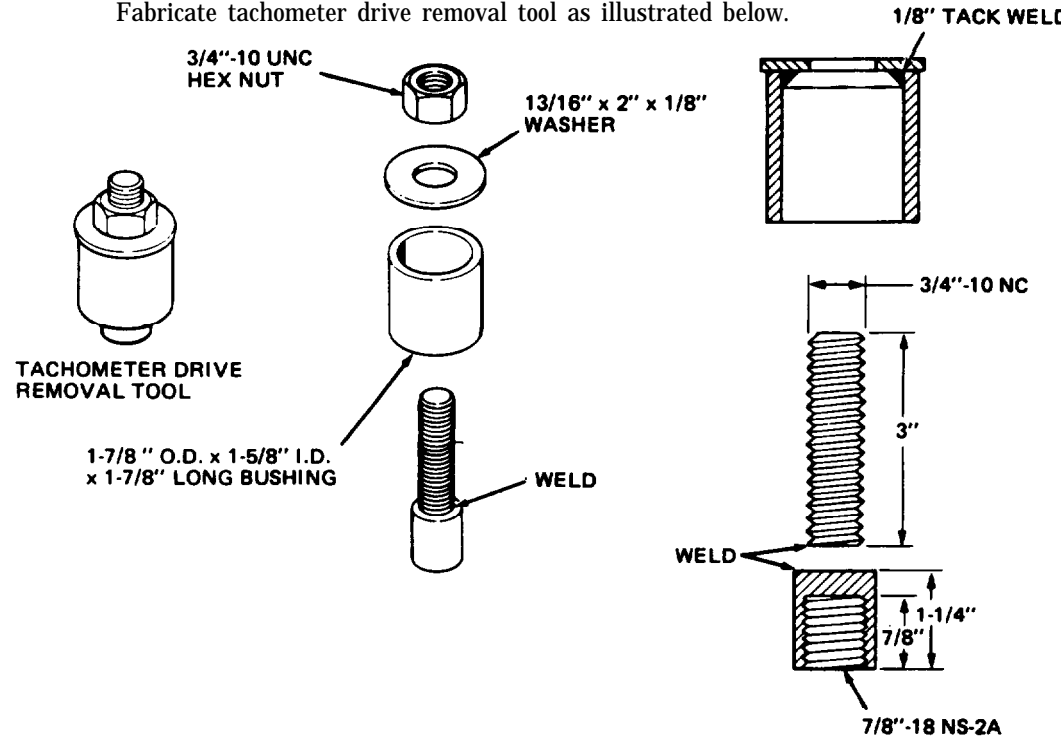
Paragraph Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.  
2-53c Left side panel removed.

SPECIAL TOOLS

Tachometer drive removal tool See removal note

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

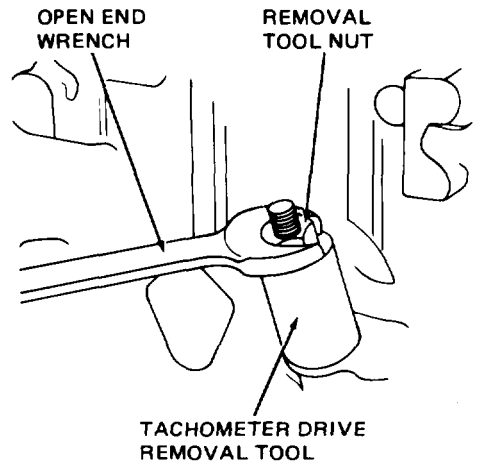
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, left side	<p align="center"><b>NOTE</b></p> <p align="center">Fabricate tachometer drive removal tool as illustrated below.</p>  <p>3/4''-10 UNC HEX NUT</p> <p>13/16'' x 2'' x 1/8'' WASHER</p> <p>1-7/8'' O.D. x 1-5/8'' I.D. x 1-7/8'' LONG BUSHING</p> <p>WELD</p> <p>1/8'' TACK WELD</p> <p>3/4''-10 NC</p> <p>3''</p> <p>WELD</p> <p>1-1/4''</p> <p>7/8''</p> <p>7/8''-18 NS-2A</p>		

TA127103



**3-5. ENGINE MAINTENANCE (cont)**

*f. Tachometer Drive (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
1 (cont)		a. Tachometer drive cover b. Tachometer drive removal tool c. Removal tool nut	Remove Install Tighten	Turn counterclockwise and lift from tachometer drive Turn clockwise on tachometer drive threads Use open end wrench. Turn nut clockwise as shown until tachometer drive is pulled from engine
<div style="text-align: center;">  <p>OPEN END WRENCH</p> <p>REMOVAL TOOL NUT</p> <p>TACHOMETER DRIVE REMOVAL TOOL</p> <p>TA127104</p> </div>				
		d. Tachometer drive removal tool	Remove	Turn counterclockwise and lift from tachometer drive
<b>CLEANING</b>				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				

**3-5. ENGINE MAINTENANCE (cont)**

*f. Tachometer (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
1 (cont)	<p><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>			
2		Tachometer drive	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
3		Tachometer drive	Inspect	Replace if body cracked or threads damaged, drive gear teeth chipped or broken, or if drive shaft or bushings excessively worn
INSTALLATION				
4	Engine compartment, left side	a. Tachometer drive b. Tachometer drive  c. Tachometer drive cover	Position Install  Install	In engine block hole Carefully tap with soft-faced hammer until top of body is flush with engine block Turn clockwise on tachometer drive threads until hand-tight

**3-5. ENGINE MAINTENANCE (cont)**

*g. Cylinder Head.*

This task covers cylinder head inspection, replacement and repair.

INITIAL SETUP

TOOLS

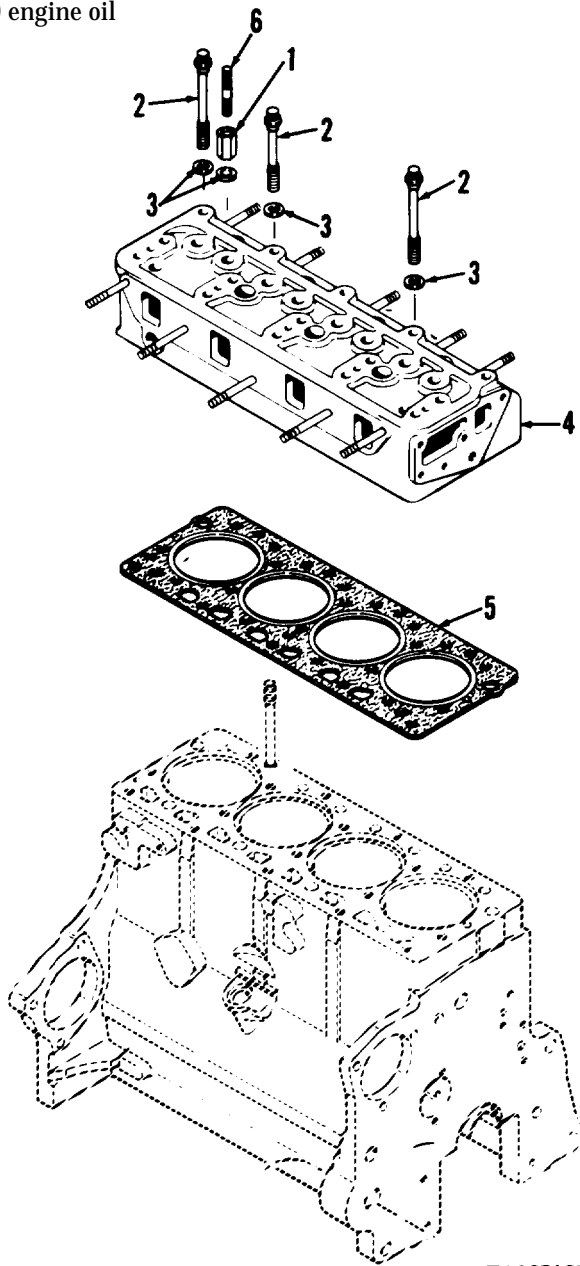
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0650  
 Extension Wrench FSCM 10988 P/N M20419

MATERIALS/PARTS

Clean cloths  
 No. 30 engine oil  
 Gasket

EQUIPMENT CONDITION

Paragraph	Condition Description
	Vehicle parked on level surface, engine off, and parking brake applied.
2-53c	Side panels removed.
2-53d	Top hood removed.
2-16	Spark arresting muffler removed.
2-14d	Intake manifold removed.
2-14e	Exhaust manifold removed.
2-17e	Water pump removed.
2-31c(1)	Engine temperature switch removed.
3-5i	Rocker arm cover removed.
3-5j	Rocker arm assembly removed.
3-6b	Fuel injectors removed.



KEY

- 1. Stud nuts
- 2. Bolts
- 3. Washers
- 4. Cylinder head
- 5. Gasket
- 6. Rocker arm cover studs

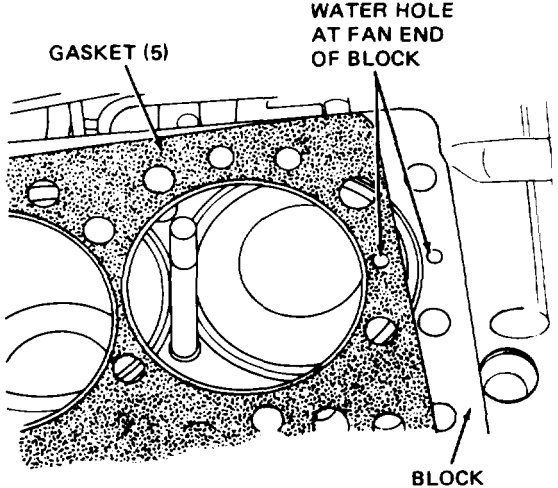
**3-5. ENGINE MAINTENANCE (cont)**

*g. Cylinder Head (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Cylinder head (4) top	a. Two stud nuts (1) b. 17 bolts (2) c. 19 washers (3) d. Cylinder head (4) e. Gasket (5) f. Two studs (6)	Loosen and remove Loosen and remove Remove Remove Remove and discard Remove from nut (1)	Remove nut (1) and stud (6) as an assembly  From cylinder head (4) Lift from engine block Clean all gasket residue from cylinder head and engine block Remove only if required for replacement
<b>INSPECTION/REPAIR</b>				
2		Nuts (1), bolts (2), washers (3) and studs (6)	Inspect	Replace if worn, or if threads damaged
3		Pistons	Inspect	Replace if cracked, damaged, scored, and clean carbon deposits (notify general support maintenance)
4		Cylinder block sleeves	Inspect	Check taper and out-of-roundness with bore gage. Replace sleeves if taper is more than 0.002 inch or if out-of-roundness is more than 0.001 inch (notify general support maintenance)
5		Cylinder block top surface	Inspect and measure	Measure top surface using straight edge and feeler gage. Replace block if top surface varies more than 0.002 inch, or if block is cracked, damaged or eroded (notify general support maintenance)
6		Cylinder head (4)	Inspect	Replace if expansion plugs eroded, head cracked, or valves burned or damaged
7		Cylinder head bottom surface	Check warpage	Lay straight edge diagonally from corner to corner and try to get a 0.006 inch feeler gage under straight edge. Check at several points. Reposition straight edge at opposite corners and repeat checks. Resurface cylinder head if warpage exceeds 0.006 inch (notify general support maintenance)

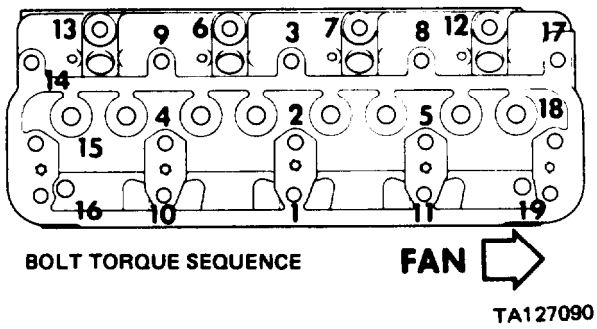
**3-5. ENGINE MAINTENANCE (cont)**

g. Cylinder Head (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION</b>				
8	Cylinder block, top	a. New gasket (5)	Position	On cylinder block, with water hole on gasket aligned with water hole at fan end of block as shown
<div style="text-align: center;">  <p>TA127106</p> </div>				
		b. Cylinder head (4)	Position	Slide cylinder head over the cylinder block and studs, and lower onto aligning dowels until resting on cylinder block
		c. Two nuts (1), 17 bolts (2) and two studs (6)	Lubricate	Lightly coat with oil
		d. Two studs (6)	Install and tighten	Until securely mounted to nuts (1)
		e. Two washers (3) and nuts (1)	Install	On cylinder block studs
		f. 17 washers (3) and bolts (2)	Install	
<b>NOTE</b>				
In the following steps, use extension wrench to torque nuts (1) located at positions 4 and 5.				
		g. Two nuts (1) and 17 bolts (2)	Tighten	Tighten to 55 pounds foot torque in sequence shown

**3-5. ENGINE MAINTENANCE (cont)**

*g. Cylinder Head (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
8 (cont)				
	h. Two nuts (1) and 17 bolts (2)	Retighten	Using same sequence, tighten to 110-115 pounds foot torque	

**3-5. ENGINE MAINTENANCE (cont)**

*h. Flywheel Housing.*

This task covers flywheel housing inspection.

INITIAL SETUP

TOOLS

Automotive Mechanic's  
Tool Kit

NSN 5180-00754-0641

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off, and parking brake applied.

2-53c

Side panels removed.

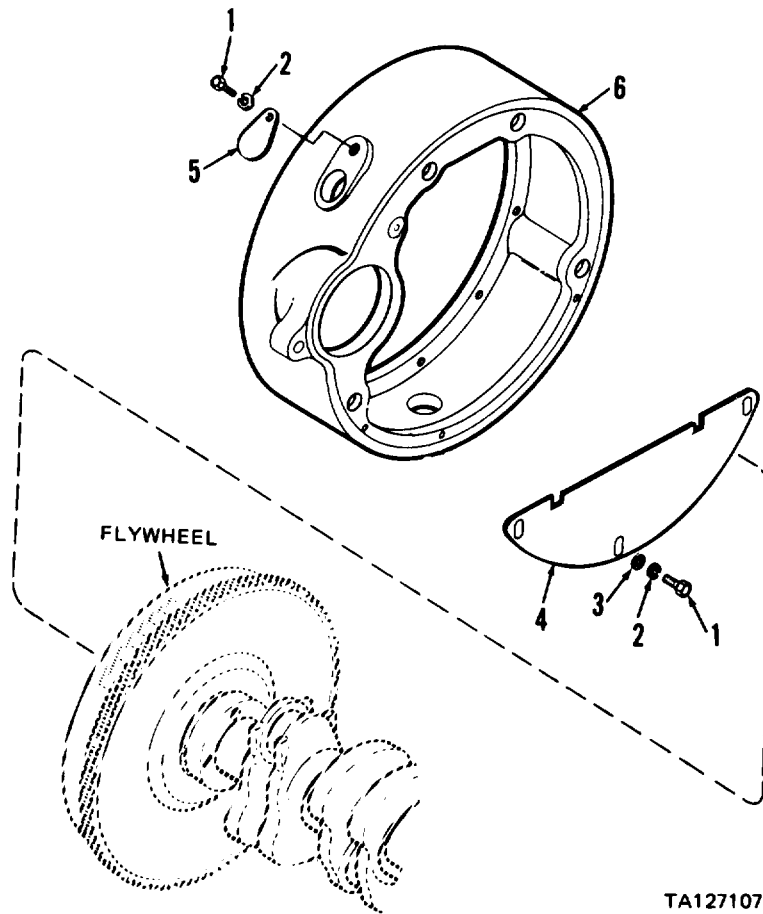
MATERIALS/PARTS

None

STEP	LOCATION	ITEM	ACTION	REMARKS
1	Flywheel housing	Timing hole cover (5)	Relocate	Loosen screw (1) and relocate cover (5) away from timing hole
2		Covers (4 and 5)	Inspect	Notify general support maintenance if cover is missing or broken
3		Cap screws (1), lock washers (2) and flat washers (3)	Inspect	Notify general support maintenance if hard ware is missing or damaged
4		Flywheel housing (6)	Inspect	Notify general support maintenance if cracked, distorted or otherwise damaged
5		Timing hole cover (5)	Relocate	Over timing hole. Secure with screw (1)

**3-5. ENGINE MAINTENANCE (cont)**

*h. Flywheel Housing (cont).*



TA127107

**KEY**

- 1. Cap screws
- 2. Lock washers
- 3. Washers
- 4. Dust cover
- 5. Timing hole cover
- 6. Flywheel housing



**3-5. ENGINE MAINTENANCE (cont)**

*i. Rocker Arm Cover.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Repair  
 e. Installation

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph	Condition Description
2-53d	Vehicle parked on level surface, engine off, and parking brake applied. Top hood removed.

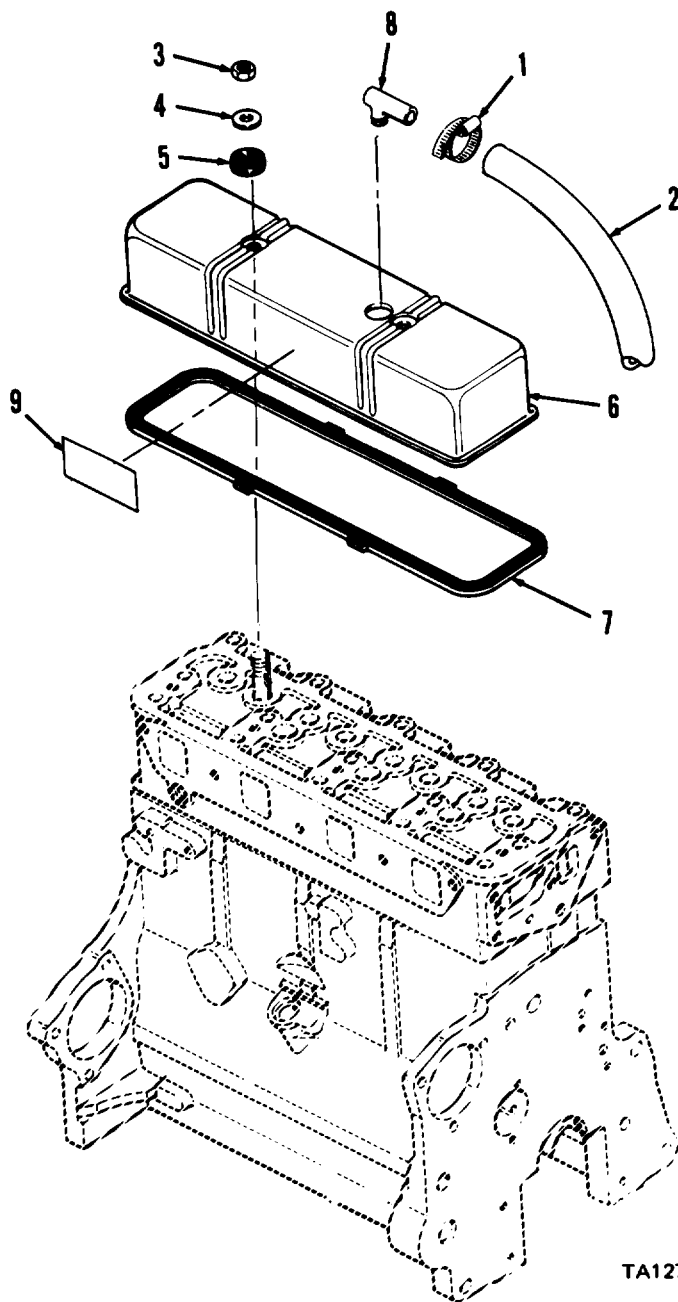
MATERIALS PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Gasket  
 Hose, 44 ±0.5 inches long  
 (FSCM 24161 P/N  
 IFBRBRDLPBLKSYNRBRHYDHSE3-4ID)

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, top	a. Clamp (1) b. Breather hose (2) d. Two nuts (3), washers (4) and grommets (5) d. Rocker arm cover (6) e. Gasket (7)	Loosen Disconnect Remove  Lift and remove Remove and discard	From elbow (8)   From engine cylinder head
2	Rocker arm cover (6)	Breather elbow (8)	Remove	From rocker arm cover (6)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**3-5. ENGINE MAINTENANCE (cont)**

*i. Rocker Arm Cover (cont).*



**KEY**

- 1. Clamp
- 2. Breather hose
- 3. Nuts
- 4. Washers
- 5. Grommets
- 6. Rocker arm cover
- 7. Gasket
- 8. Breather elbow
- 9. Decal

TA127108

**3-5. ENGINE MAINTENANCE (cont)**

*i. Rocker Arm Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3		Clamp (1), nuts (3), washers (4), rocker arm cover (6) and breather elbow (8)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
4		Rocker arm cover (6) and cylinder head	Clean	Scrape all gasket residue from mating surfaces
INSPECTION				
5		Rocker arm cover (6)	Inspect	Repair if dented. Replace if cracked or damaged so as to cause leakage
6		All other parts	Inspect	Replace if cracked, worn or threads damaged, if necessary, make hose (2) from FSCM 24161 P/N IFBRBRDLPBLKSYNRBRHYDHSE 3-4ID; cut to 44±0.5 inches long
REPAIR				
7		Rocker arm cover (6)	Pound out small dents	Use a hammer and wooden backing block to remove dents from rocker arm cover. Be sure that gasket mating surface on rocker arm cover is not deformed
INSTALLATION				
8	Reeker arm cover	Breather elbow (8)	Install	
<b>NOTE</b>				
If new rocker arm cover is used, install engine data decal (9) on new rocker arm cover (6).				
9	Engine compartment, top	a. New gasket (7) b. Rocker arm cover (6) c. Two grommets (5), washers (4) and nuts (3) d. Clamp (1) e. Breather hose (2) f. Clamp (1) g. Top hood	Position Position Install and tighten Position Connect Position and tighten Install	On engine cylinder head On engine cylinder head Tighten to 4-6 pounds foot torque  Over breather hose (2) To elbow (8) Until breather hose (2) is securely fastened to elbow (8) Para 2-53d

**3-5. ENGINE MAINTENANCE (cont)**

*j. Rocker Arm Assembly.*

This task covers: a. Removal  
 b. Disassembly  
 c. Cleaning

d. Inspection/Repair  
 e. Reassembly and Installation/Replacement  
 f. Adjustment

INITIAL SETUP

TOOLS

No. 2 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0650  
 Micrometer, zero to 5 inches  
 Bore gage, zero to I inch  
 Spring tester FSCM 45225  
 P/N CAS-10418

EQUIPMENT CONDITION

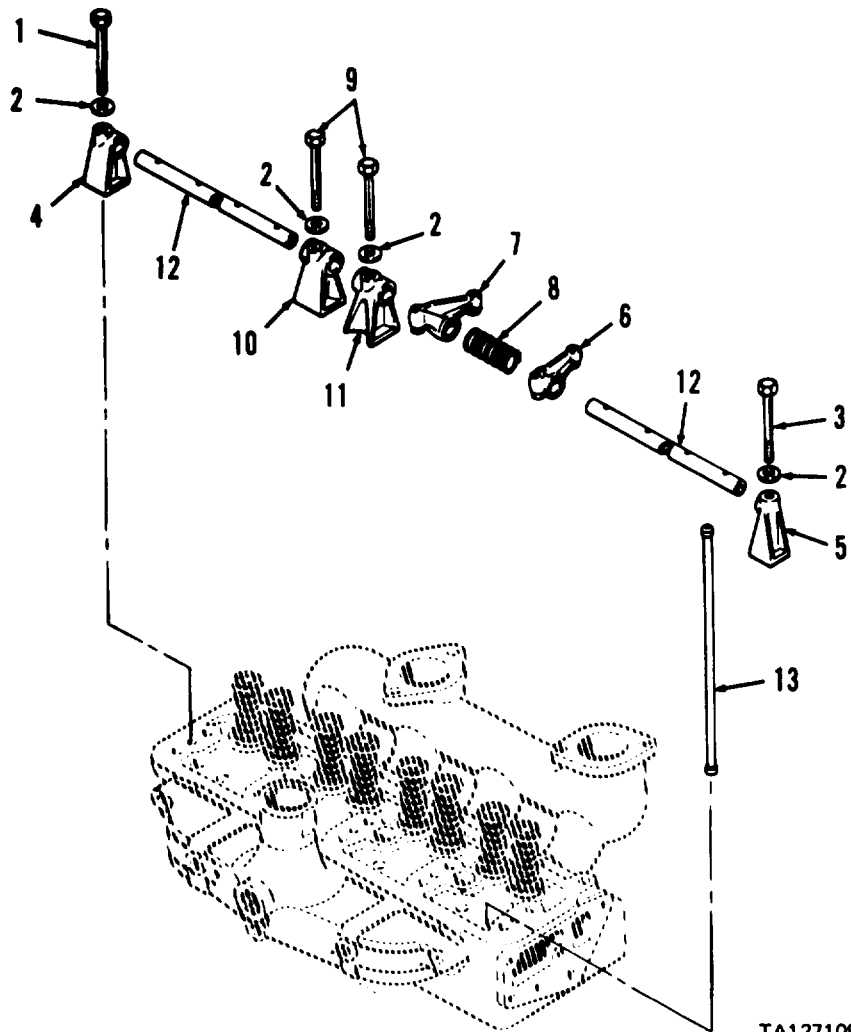
Paragraph	Condition Description
3-5i	Vehicle parked on level surface, engine off, and parking brake applied. Rocker arm cover removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 No. 30 engine oil

KEY

- 1. Drilled bolt
- 2. Washers
- 3. Cap screws
- 4. Rear bracket
- 5. Front bracket
- 6. Right hand rocker arms
- 7. Left hand rocker arms
- 8. Springs
- 9. Cap screws
- 10. Center bracket
- 11. Intermediate brackets
- 12. Shafts
- 13. Push rods



TA127109

**3-5. ENGINE MAINTENANCE (cont)**

*j. Rocker Arm Assembly (cont)*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine cylinder head	a. Drilled bolt (1), cap screw (3) and two washers (2)	Loosen and remove	
		b. Rear bracket (4) and front bracket (5)	Remove	Support end rocker arm (6 and 7) and springs (8)
		c. Three cap screws (9) and washers (2)	Loosen	
		d. Rocker arms (6 and 7) and two springs (8)	Remove	Pull from front and rear end of shafts (12)
		e. Rocker arm assembly	Lift from cylinder head	Grasp ends of shafts (12), push together, and remove assembly from cylinder head
		f. Eight push rods (13)	Remove	Lift from cylinder head
		<b>DISASSEMBLY</b>		
2	Rocker arm assembly	a. Two shafts (12)	Remove	Pull from center bracket (10)
		b. Rocker arms (6 and 7) and springs (8)	Remove	Pull from shafts (12)
		c. Intermediate brackets (11)	Remove	Pull from shafts (12)
<b>CLEANING</b>				
<b><u>CAUTION</u></b>				
Be careful not to scratch push rods or shafts in following step.				
3		Shafts (12) and push rods (13)	Clean	Remove carbon and varnish deposits with a fine, power driven wire brush
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

**3-5. ENGINE MAINTENANCE (cont)**

*j. Rocker Arm Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
<b>NOTE</b>				
Flush rocker arm shafts (12) and drilled bolt (1) to remove residual material. Use compressed air to check oil holes for obstruction.				
INSPECTION/REPAIR				
5		Drilled bolt (1), washers (2) and cap screws (3)	Inspect	Replace if worn, or if threads damaged
6		Rocker arm shafts (12)	Inspect	Measure outside diameter with micrometer at worn spots on bottom of shaft. Replace shaft if outer diameter is less than 0.622 inch, or if shaft is corroded, pitted, cracked or scored
7		Springs (8)	Inspect	Install in spring tester. Check that force to compress spring to 1.75 inch is 7.5 to 8.5 pounds. Replace spring if required force is not 7.5 to 8.5 pounds
8		Rocker arms (6 and 7) and brackets (4, 5, 10 and 11)	Inspect	Use bore gage and check inside diameter. Measure bore gage with micrometer. Replace if inside diameter is greater than 0.626 inch, if pitted, scored or cracked, or if rocker arm adjusting screw threads damaged
9		Eight push rods (13)	Inspect	Replace if bent (place rod on flat surface and roll over surface; rod should roll smoothly indicating it is not bent), cracked, pitted or excessively worn

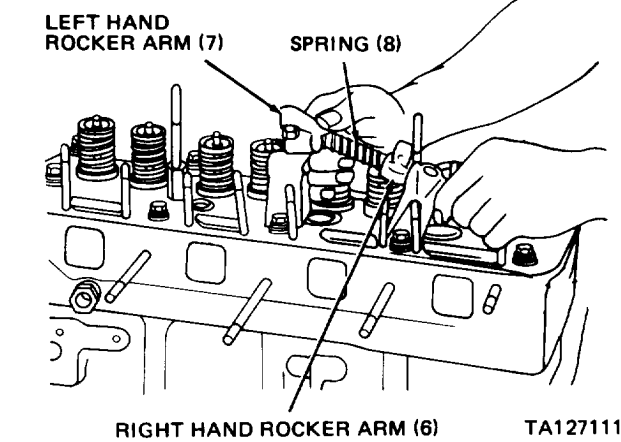
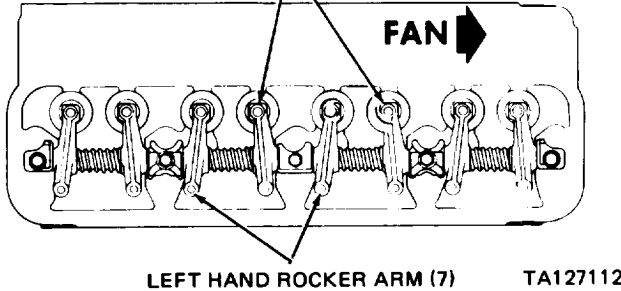
**3-5. ENGINE MAINTENANCE (cont)**

*j. Rocker Arm Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>reassembly AND INSTALLATION/REPLACEMENT</b>				
10	Engine cylinder head	a. All parts b. Eight push rods c. Center bracket (10) d. Washer (2) and cap screw (9)	Lubricate Install Position Install and tighten	Lightly coat with oil In cylinder head bores On cylinder head Hand-tighten only, to secure center bracket (10)
<b>NOTE</b>				
Intermediate brackets (11) are installed on cylinder head with slanted side toward pushrods.				
		e. Intermediate brackets (11)	Install	On shafts (12). Front shaft is installed with short end of shaft (as measured from shaft cut-out) toward fan end of engine, Rear shaft is installed with short end of shaft toward starter end of engine
<p style="text-align: right;">TA127110</p>				
		f. Spring (8) and rocker arms (6 and 7)	Install	Push on long end of shafts (12). Be sure slant of rocker arms is correct as shown

**3-5. ENGINE MAINTENANCE (cont)**

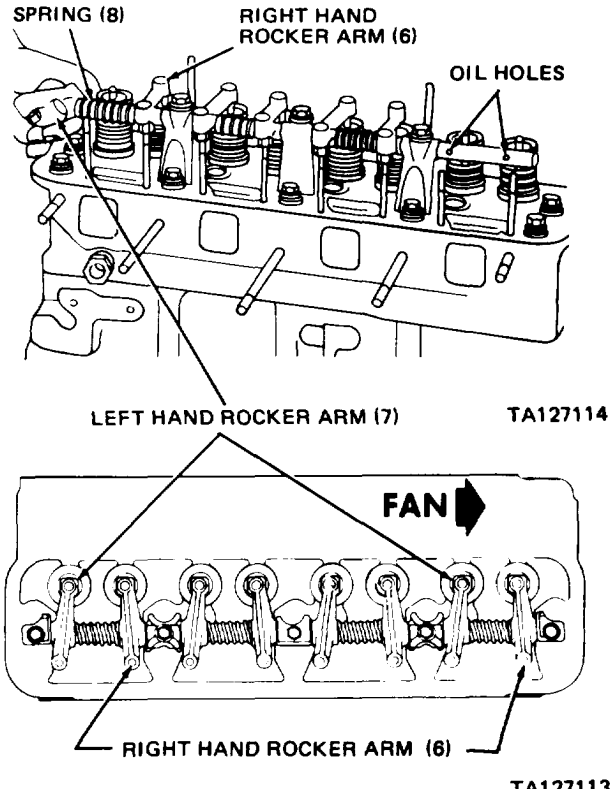
*j. Rocker Arm Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY AND INSTALLATION) REPLACEMENT (cont)</b>				
10 (cont)				
				
		g. Rocker arm shafts (12)	Install	Insert long end of shafts into center bracket (10); then position intermediate brackets (11) on cylinder head
		h. Two washers (2) and cap screws (9)	Install and tighten	Hand-tighten only, to secure intermediate brackets (11)
		<b>NOTE</b>		
		Check that oil holes in shafts (12) are positioned horizontally as shown in the following step.		
		i. Spring (8) and rocker arms (6 and 7)	Install	Push on short end of shafts (12). Be sure slant of rocker arms is correct as shown



**3-5. ENGINE MAINTENANCE (cont)**

*j. Rocker Arm Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY AND INSTALLATION/REPLACEMENT (cont)</b>				
10 (cont)				
		<p>j. Rear bracket (4) and front bracket (5)                      k. Washer (2) and cap screw (3)                      l. Drilled bolt (1) and washer (2)                      m. Rocker arm bracket bolts (1, 3 and 9)</p>	<p>Position                      Install and tighten                      Install and tighten                      Tighten</p>	<p>Push shaft (12) against tension of spring (8)                      Hand-tighten only, to secure front bracket (5)                      Hand-tighten only, to secure rear bracket (4)                      Tighten to 25-30 pounds foot torque</p>
<b>ADJUSTMENT</b>				
11		Valve tappet clearance	Adjust	Para 3-5a(2)

**3-5. ENGINE MAINTENANCE (cont)**

*k. Oil Part.*

This task covers: a. Removal  
 b. Cleaning  
 c. Inspection

d. Repair  
 e. Installation/Replacement

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph 3-5c Condition Description Engine removed from vehicle.

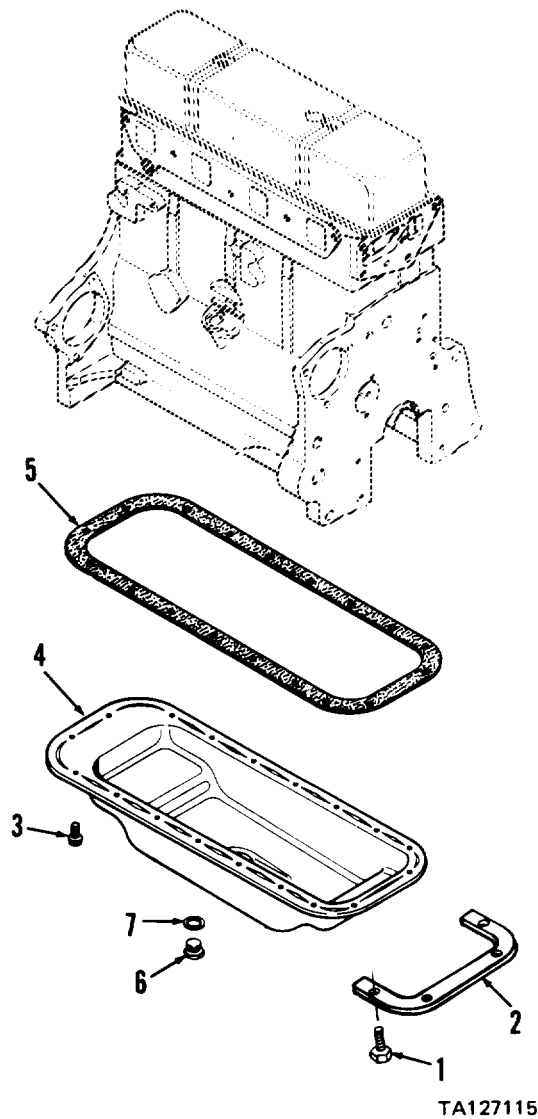
MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Gasket  
 Permatex 2 NSN 8030-00-873-4792

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine bottom	a. Four long bolts (1)	Loosen and remove	Support reinforcement strip (2)
		b. Reinforcement strip (2)	Lower and remove	From engine
		c. Fourteen short bolts (3)	Loosen and remove	Support oil pan (4)
		d. Oil pan (4)	Pull and remove	From engine
		e. Gasket (5)	Pull and remove	From engine or oil pan (4). Discard gasket (5)
		f. Drain plug (6)	Loosen and remove	
		g. Gasket (7)	Pull and remove	From plug (6)
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**3-5. ENGINE MAINTENANCE (cont)**

*k. Oil Pan (cont).*



**KEY**

- 1. Long bolts
- 2. Reinforcement strip
- 3. Short bolts
- 4. Oil pan
- 5. Gasket
- 6. Drain plug
- 7. Gasket

**3-5. ENGINE MAINTENANCE (cont)**

*k. Oil Pan (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
3		Oil pan (4) and engine crankcase	Clean	Scrape all gasket residue from mating surfaces
INSPECTION				
4		Bolts (1 and 3) and drain plug (6)	Inspect	Replace if worn, or if threads damaged
5		Gasket (7)	Inspect	Replace if worn, cracked or deteriorated
6		Oil pan (4)	Inspect	Repair if dented. Replace if cracked or damaged so as to cause leakage
7		Reinforcement strip (2)	Inspect	Replace if cracked, distorted or damaged
REPAIR				
8		Oil pan (4)	Pound out small dents	Use a hammer and wooden backing block to remove dents from oil pan. Be sure that gasket mating surface on oil pan is not deformed
INSTALLATION/REPLACEMENT				
9	Engine bottom	a. New gasket (5)	Coat and position	Apply Permatex 2 on both sides of gasket at front and rear portions only. Position gasket on mating surface of oil pan (4)
		b. Oil pan (4)	Position	On engine, with gasket holes in alignment
		c. Fourteen short bolts (3)	Install and tighten	Alternately tighten to 10-12 pounds foot torque
		d. Reinforcement strip (2)	Position	On oil pan (4)
		e. Four long bolts (1)	Install and tighten	Tighten to 15-20 pounds foot torque
		f. Gasket (7) and drain plug (6)	Install	Tighten drain plug to 29-31 pounds foot torque
10	Engine compartment	Engine	Install	Para 3-5c

**3-6. FUEL SYSTEM MAINTENANCE**

a. Fuel Injection Lines and Fittings.

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation/Replacement

INITIAL SETUP

TOOLS  
Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

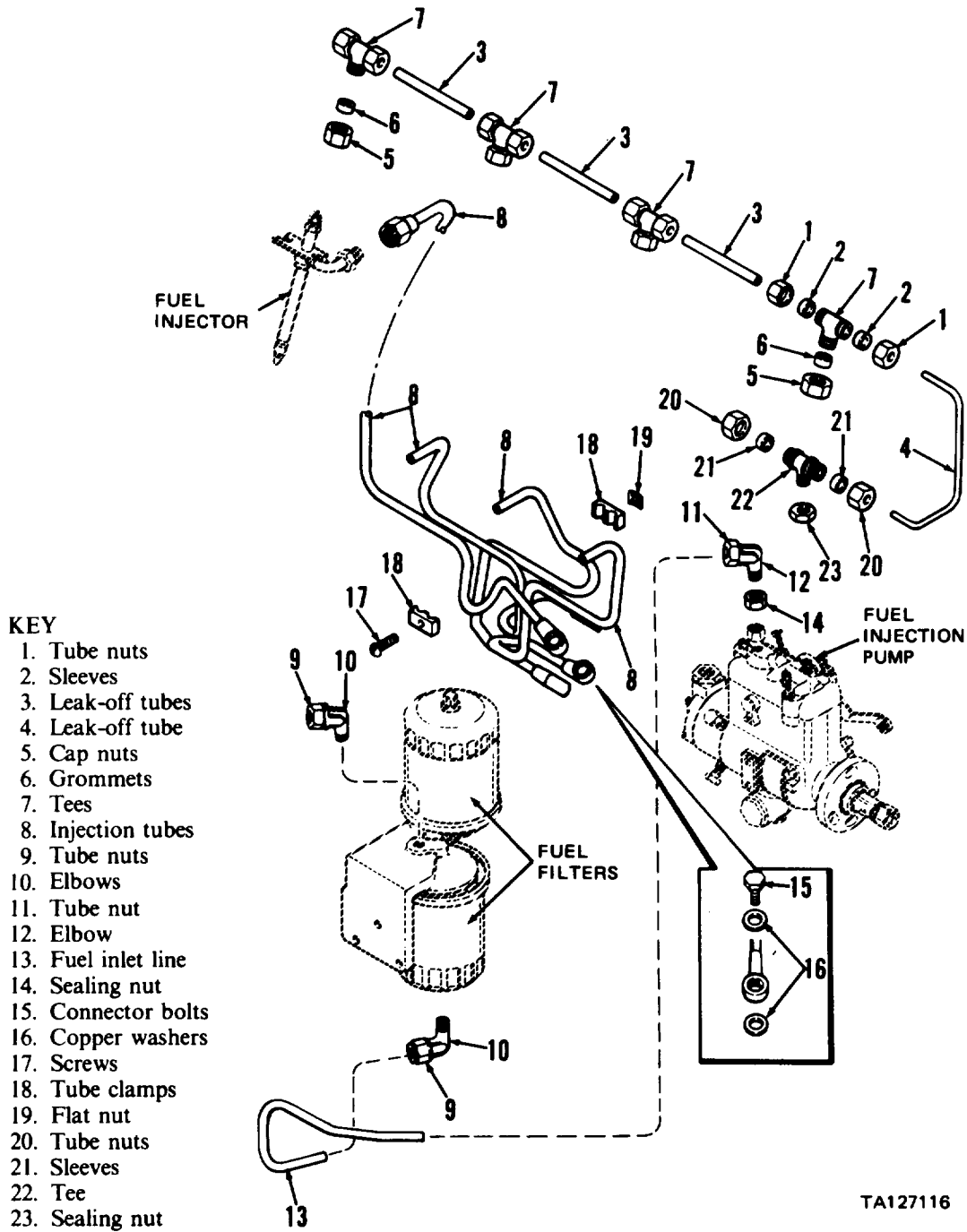
EQUIPMENT CONDITION  
Paragraph Condition Description  
Vehicle parked on level surface, engine off, and parking brake applied.  
2-53c Side panels removed.  
Fuel tank shut-off valve closed.  
2-15d(1) Fuel return line disconnected from fuel injector tee fitting.

MATERIALS/PARTS  
Cleaning solvent P-D-680  
Clean cloths  
Copper washers

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
<b>NOTE</b>				
Thoroughly steam clean area around fuel injectors, fuel filters, fuel injection pump, and fuel lines before starting removal.				
1	Leak-off tube tees at fuel injectors	a. Tube nut (1) and sleeve (2) b. Leak-off tube (3) c. Leak-off tube (4) d. Cap nut (5) and grommet (6) e. Leak-off tee (7)	Loosen and disconnect Remove Remove Disconnect Loosen and disconnect	From tee (7)  From tee (7) From tee (7) and fuel injector
2	Fuel injector inlet fittings	Inlet fitting on injection tube (8)	Loosen and disconnect	Use one hand, two wrench method as shown to minimize possibility of damage to fitting or injector

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injection Lines and Fittings (cont).*



**3-6. FUEL SYSTEM MAINTENANCE (cont)**

a. Fuel Injection Lines and Fittings (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
3	Fuel filters	a. Tube nut (9)	Loosen and disconnect	
		b. Elbow (10)	Loosen and remove	From filter head
4	Fuel injection pump	a. Tube nut (11)	Loosen and disconnect	
		b. Elbow (12) and sealing nut (14)	Loosen and remove	From injection pump
		c. Fuel inlet line (13)	Remove	
		d. Four connector bolts (Is)	Loosen and remove	
		e. Copper washers (16)	Remove and discard	
		f. Screws (17) and tube clamps (18)	Remove	
<b>NOTE</b>				
Remove flat nut (19) from clamp (18) only if necessary for replacement.				
		g. Injection tube (8)	Remove	From engine and injection pump
		h. Tube nut (20) and sleeve (21)	Loosen and disconnect	From tee (22)
		i. Leak-off tube (4)	Remove	
		j. Tee (22) and sealing nut (23)	Loosen and remove	From injection pump
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
5		All parts	Clean	Use cleaning solvent P-D-680

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injection Lines and Fittings (cont).*

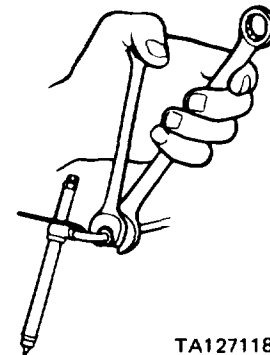
STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
6		All tubes, lines and fittings	Flush	Flush with clean diesel fuel to remove all traces of cleaning solvent. Dry thoroughly with compressed air
INSPECTION				
7		Tube assemblies (3, 4, 8 and 13)	Inspect	Replace if cracked, kinked, dented, split, or if inlet fittings damaged
8		All other parts	Inspect	Replace if cracked, damaged, or threads worn
INSTALLATION/ REPLACEMENT				
9	Fuel injection pump	a. Sealing nut (23) and tee (22) b. Leak-off tube (4) c. Sleeve (21) and tube nut (20) d. Injection tube (8)	Install and tighten Position Install and tighten Position	Tighten sealing nut (23) to 20 pounds foot torque On tee (22)  On injection pump and fuel injector
10	Fuel injector	Inlet fitting on injection tube (8)	Connect and tighten	Tighten hand-tight only
11	Fuel injection pump			
<b><u>CAUTION</u></b>				
Do not tighten connector bolts (15) unless copper washers (16) are in place. If copper washers are not used, pump seizure could result due to connector bolt going too deep into pump body.				
		a. Connector bolt (15) and two new copper washers (16) b. Sealing nut (14) and elbow (12) c. Tube clamps (18), nuts (19) and screws (17) d. Fuel inlet line (13) e. Tube nut (11)	Install and tighten Install and tighten Install Position Install and tighten	Tighten to 35 pounds foot torque Tighten sealing nut (14) to 20 pounds foot torque To secure tubes (8) On fuel filter and injection pump To secure line (13)



**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injection Lines and Fittings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/ REPLACEMENT (cont)				
12	Fuel filters	a. Elbow (10) b. Tube nut (9)	Install and tighten Connect and tighten	To secure line (13)
13	Fuel injector	a. Cap nut (5), grommet (6) and tee (7) b. Leak-off tubes (3 and 4) c. Sleeve (2) and tube nut (1)	Connect and tighten Position Connect and tighten	To fuel injector On tees (7) To secure tubes (3 and 4)
LEAK TEST				
14		a. Fuel tank shut-off valve b. Engine c. Inlet fitting on injection tube	Open Crank with starter Tighten	Until fuel flows from inlet fitting on injection tube (8) Use one hand, two wrench method as shown
		d. Engine	Start and check for leaks	



TA127118

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injector.*

This task covers fuel injector replacement consisting of removal, cleaning, and installation.

INITIAL SETUP

TOOLS

Automotive Mechanic's  
Tool Kit  
Nozzle Puller  
Bore Cleaner

NSN 5180-00-754-0641

FSCM 10988 P/N A43278

FSCM 10988 P/N A43277

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off,  
and parking brake applied.

2-53c

Side panels removed.

3-6a

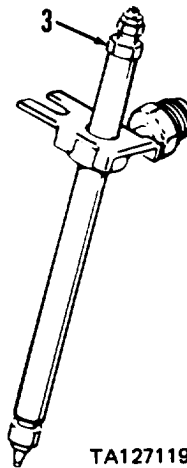
Fuel injector leak-off and injection tubes  
disconnected.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths

KEY

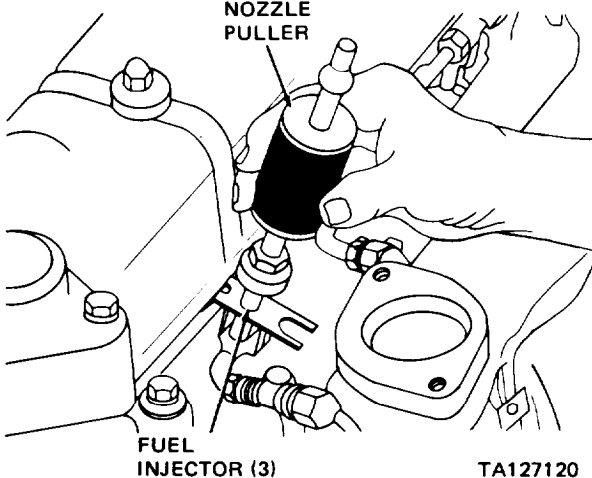
- 1. Clamp assembly
- 2. Spacer
- 3. Fuel injector



STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Fuel injector at cylinder head	a. Clamp assembly (1) and spacer (2)	Loosen and remove	
<b><u>CAUTION</u></b>				
Do not attempt to remove fuel injector (3) by prying with screwdriver or similar tool. Prying with screwdriver will distort and damage fuel injector.				
		b. Fuel injector (3)	Pull upward, turn and remove	From engine. If injector cannot be easily removed by hand, use nozzle puller tool as shown

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
				
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2		Cylinder head fuel injector seal surfaces	Clean	Use cleaning solvent P-D-680 and dry thoroughly. Remove all dirt and burrs which could cause distortion of fuel injector when clamping in place
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injector (cont)*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
3		Cylinder head fuel injector bore	Clean	Use bore cleaning tool as shown. Gradually turn tool into bore using clockwise rotation; then remove tool and blow out bore with compressed air
INSTALLATION				
4	Cylinder head, fuel injector bore	a. Fuel injector (3) b. Spacer (2) and clamp assembly (1) c. Clamp assembly (1)	Install Position  Tighten	Into bore, using a twisting motion On fuel injector lock plate  Tighten bolt to 18-22 pounds foot torque
5	Fuel injector	Leak-off and injection tubes	Connect and tighten	Para 3-6a

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*c. Fuel Injection Pump.*

This task covers: a. Removal  
b. Cleaning

c. Inspection  
d. Installation

INITIAL SETUP

TOOLS

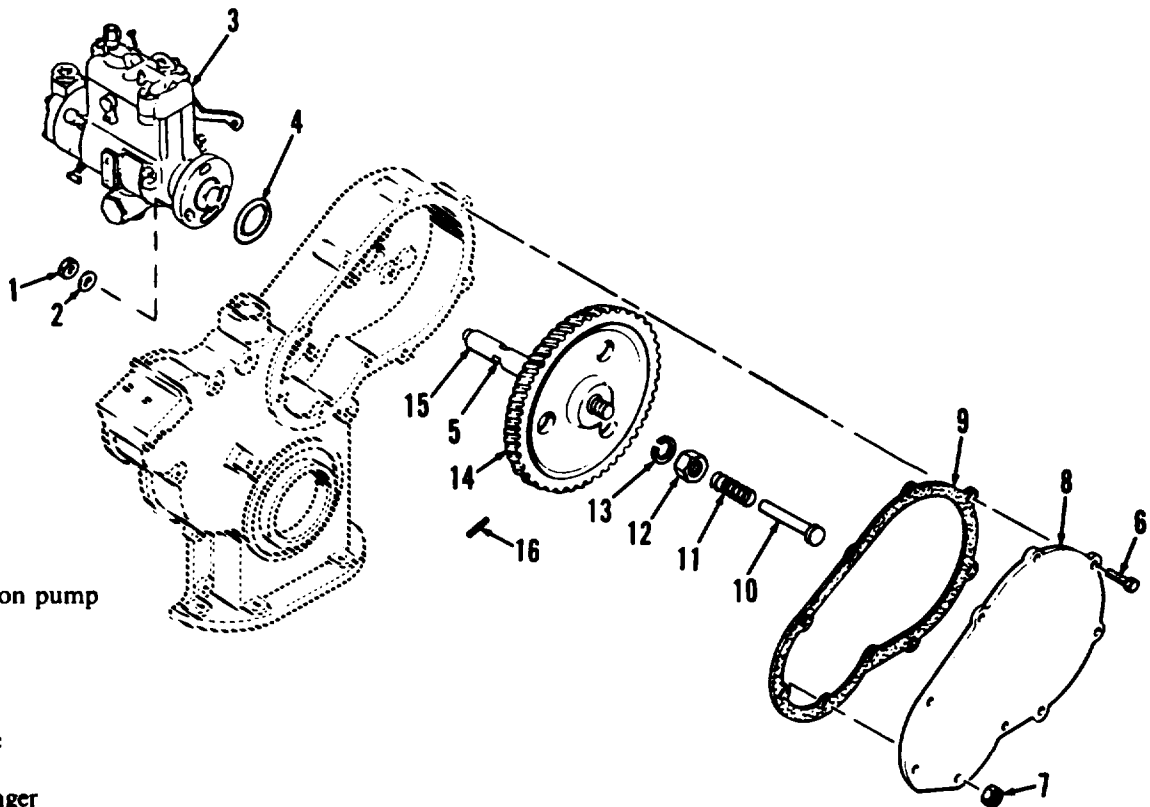
Automotive Mechanic's Spring Tester	NSN 5180-00-754-0641
Tool Kit	FSCM 42225 P/N CAS-10418
Dial Indicator	
Sleeve Tool	FSCM 10988 P/N CD322
Seal Compression Tool	FSCM 10988 P/N CD331

EQUIPMENT CONDITION

Paragraph	Condition Description
	Vehicle parked on level surface, engine off, and parking brake applied.
2-53c	Side panels removed.
2-15f	Fuel tank shut-off valve closed.
3-6a	Fuel filters and falter head removed. Injection pump fuel lines and fittings disconnected.
3-5a(1)	Engine positioned at TDC for No. 1 cylinder.
2-15i	Accelerator ball joint and cable disconnected from fuel injection pump.

MATERIALS/PARTS

- cleaning solvent P-D-680
- Clean cloths
- Pump drive shaft seals
- Injection pump O-ring
- Pump window cover gasket
- Gear housing cover plate gasket
- Lubriplate



KEY

- 1. Nuts
- 2. Washers
- 3. Fuel injection pump
- 4. O-ring
- 5. Seals
- 6. Cap screws
- 7. Nuts
- 8. Cover plate
- 9. Gasket
- 10. Thrust plunger
- 11. Spring
- 12. Nut
- 13. Lock washer
- 14. Drive gear
- 15. Drive shaft
- 16. Roll pin

TA127122

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*c. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Fuel injection pump (3)			
<b>NOTE</b>				
If the same injection pump is to be reinstalled, scribe small match marks on injection pump flange and timing gear housing to aid in installation.				
		a. Three nuts (1) and washers (2) b. Injection pump (3) c. O-ring (4)	Loosen and remove Remove Remove and discard	Support pump (3) Carefully pull off of drive shaft (15)
2	Timing gear housing	a. Two seals (5)	Remove and discard	
<b>NOTE</b>				
The following steps cover removal of drive shaft (15) and drive gear (14). If injection pump is to be replaced, drive shaft (15) must be forwarded to general support maintenance with defective pump. If only O-ring (4) and seals (5) require replacement, proceed to step 14.				
		b. Seven cap screws (6) and two nuts (7) c. Cover plate (8) d. Gasket (9) e. Thrust plunger (10) and spring (11) f. Nut (12) and lock washer (13) g. Drive gear (14)	Loosen and remove Remove Remove and discard Pull and remove Loosen and remove Remove	From engine timing gear housing Remove all gasket residue from timing gear housing and cover plate (8) From drive shaft (15)
<b>NOTE</b>				
Replacement drive shaft (15) includes roll pin (16). Perform the following step only if roll pin (16) is sheared and drive shaft (15) is not damaged.				
		h. Roll pin (16)	Remove	From drive shaft (15). Use 3/32 inch drift or carbide tipped drill bit

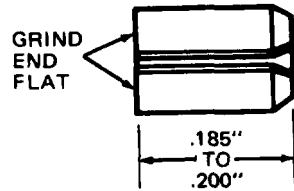
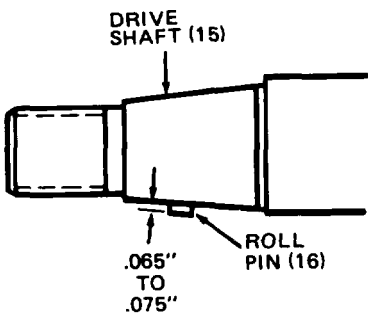
**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*c. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
3		Exterior of injection pump (3)	Clean	Wipe using cloth moistened with cleaning solvent P-D-680
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
4		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
INSPECTION				
5		Drive shaft (15)	Inspect	Replace if bent, pitted, distorted or excessively worn
6		Drive gear (14)	Inspect	Replace if damaged or distorted, or if gear teeth missing, broken, pitted or excessively worn
7		Nuts (1, 7, and 12), washers (2 and 13) and cap screws (6)	Inspect	Replace if worn, or if threads damaged
8		Spring (11)	Inspect	Install in spring tester. Check that force to compress spring to 0.95 inch is 6 pounds, 4 ounces, and that free length is 1.22 inches. Replace spring if above specifications are not met, or if coils distorted or broken

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

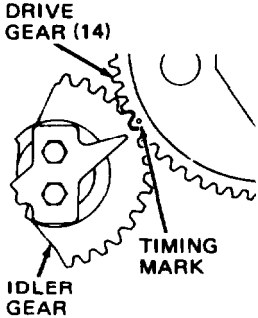
*c. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
9		Thrust plunger (10)	Inspect	Replace if cracked, bent or excessively worn
10		Cover plate (8)	Inspect	Replace if cracked, distorted, or damaged
11		Injection pump flange and mating surface on timing gear housing	Inspect	Use fine stone or crocus cloth to remove any nicks or burrs from mating surfaces
INSTALLATION				
12	Drive shaft (15)			
<b>NOTE</b>				
Replacement drive shaft (15) includes roll pin (16). Perform steps a and b below only if roll pin (16) requires replacement.				
a. Roll pin (16)	Fabricate	Use 10988 P/N 138-275 roll pin and grind flat on one end to the overall length shown		
				
TA127123				
b. Roll pin (16)	Install	Press into drive shaft (15), chamfered end first, to the dimension shown below		
				
TA127124				



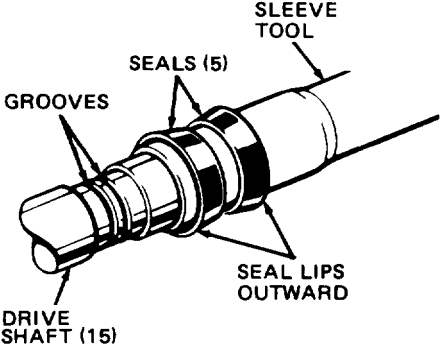
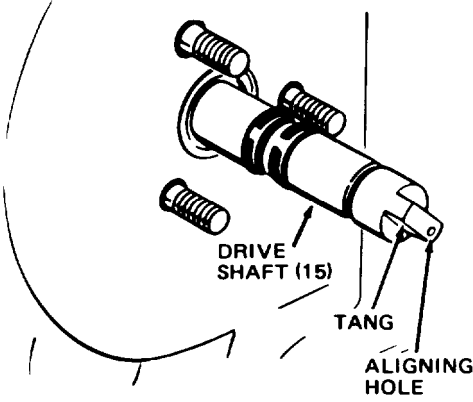
**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*c. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
13	Timing gear housing	a. Drive shaft (15) b. Drive gear (14) and shaft (15)	Install Position	On large hub side of drive gear (14) In timing gear housing. Align timing mark on drive gear (14) with timing pointer on idler gear as shown below
 <p>DRIVE GEAR (14)</p> <p>IDLER GEAR</p> <p>TIMING MARK</p> <p>TA12712:</p>				
		c. Lock washer (13) and nut (12) d. Drive gear (14)	Install and tighten Check backlash	Tighten nut (12) to 40-50 pounds foot torque Using dial indicator on one tooth of drive gear (14), measure drive gear-to-idler gear backlash. If backlash exceeds 0.007 inch, install new drive gear (14) and recheck. [f backlash still exceeds 0.007 inch, replace idler gear (notify general support maintenance)
		e. Spring (11) and thrust plunger (10)	Install	In bore of drive shaft (15). Make sure plunger (10) is free to move in bore of drive shaft
		f. Cover plate (8) and new gasket (9)	Position	On timing gear housing
		g. Seven cap screws (6) and two nuts (7)	Install and tighten	Tighten to 25-30 pounds foot torque
4	Drive shaft (15)	Two new seals (5)	Install	Generously lubricate seals with lubriplate. Install seals on sleeve tool with lips of seals outward (seals back-to-back as shown below); then slide sleeve tool over drive shaft (15) and position seals in grooves of drive shaft

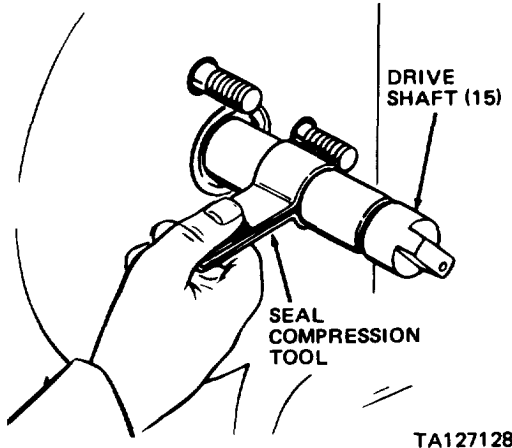
**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*c. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<p>INSTALLATION (cont)</p>				
<p>14 cont)</p>	<div style="text-align: center;">  <p>TA127126</p> <p><b>NOTE</b></p> <p>If engine has been cranked after removing fuel injection pump, reposition engine at TDC for No. 1 cylinder (para 3-5a(1)).</p> </div>			
<p>15</p>	<p>Fuel injection pump (3) and drive shaft (15)</p>	<p>a. New O-ring (4) b. Two timing window screws, cover and gasket c. Pump rotor</p>	<p>Position Remove  Position</p>	<p>On injection pump flange</p> <p>Using a clean, wide bladed screwdriver at drive end of injection pump, rotate pump rotor to approximate position of aligning hole of tang on drive shaft (15) as shown below. Then rotate pump rotor until timing lines in pump window are aligned</p>
<p style="text-align: center;"><b>NOTE</b></p>				
<p style="text-align: center;">If holes on drive shaft tang and pump rotor are not aligned, pump will be 180 degrees out of time.</p>				
<div style="text-align: center;">  </div>				

**3-6. FUEL SYSTEM MAINTENANCE (cont)**

*c. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION (cont)</b>				
15 cont)		d. Two seals (5)	Compress	Use seal compression tool as shown below
				
		e. Fuel injection pump (3)	Install	While still compressing seals (5) with compression tool, slide injection pump onto drive shaft (15) and over seals (5); then remove compression tool and slide pump against timing gear housing. After compression tool is removed, it may be necessary to rotate pump body slightly to permit tang of drive shaft (15) to engage slot in injection pump
<b>NOTE</b>				
If rear seal (5) is rolled over on drive shaft (15) during installation, remove injection pump (3) and replace rear seal (5) even though no visual damage is apparent.				
		f. Three washers (2) and nuts (1)	Install and tighten	Tighten hand-tight only
		g. Injection pump fuel lines and fittings	Reconnect	Para 3-6a
		h. Fuel injection pump (3)	Check and adjust timing, engine idle speed, and no-load governed speed	Para 3-5a(3)

**3-7. RADIATOR AND SHROUD MAINTENANCE**

- This task covers: a. Cleaning  
 b. Inspection  
 c. Repair

INITIAL SETUP

TOOLS

Automotive Mechanic's  
 Tool Kit

NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph 2-17c Condition Description  
 Radiator and shroud removed.

MATERIALS/PARTS

Cleaning compound  
 Cleaning solvent P-D-680  
 Clean cloths

NSN 6850-00-598-7328

STEP	LOCATION	ITEM	ACTION	REMARKS					
<p>CLEANING</p> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Use alkaline cleaning compound only in a well ventilated area. Avoid inhaling of fumes or contact with skin. Failure to do so could cause serious injury. If you inhale fumes, get fresh air immediately. If contact with skin or clothes is made, flush with large amounts of water and obtain medical aid immediately.</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 10%; vertical-align: top;">1</td> <td style="width: 15%;"></td> <td style="width: 20%; vertical-align: top;">Radiator</td> <td style="width: 15%; vertical-align: top;">Clean</td> <td style="width: 40%; vertical-align: top;">Use alkaline immersion process with cleaning compound. After cleaning, thoroughly rinse with water to remove all traces of cleaning compound</td> </tr> </table> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Radiator exterior and cooling fins may also be cleaned using cleaning solvent P-D-680. Dry thoroughly, and rinse with clear water to remove all traces of cleaning solvent.</p>					1		Radiator	Clean	Use alkaline immersion process with cleaning compound. After cleaning, thoroughly rinse with water to remove all traces of cleaning compound
1		Radiator	Clean	Use alkaline immersion process with cleaning compound. After cleaning, thoroughly rinse with water to remove all traces of cleaning compound					

**3-7. RADIATOR AND SHROUD MAINTENANCE (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION AND REPAIR</b>				
2		Radiator shroud	Inspect	Repair broken welds and cracks by welding. Replace shroud if beyond economical repair
3		Radiator	a. Inspect cooling fins and core b. Inspect interior and core c. Inspect tanks, filler neck, brackets and hose flanges	Straighten bent fins, using care not to damage core. Repair leaking core tubes by soldering, using minimum amount of solder to prevent clogging tubes Repeat cleaning (step 1) as necessary to remove all scale deposits Repair cracked or leaking areas by soldering, using minimum amount of solder to prevent clogging radiator
<b>NOTE</b>				
After soldering radiator, perform radiator pressure test (para 2-12, MALFUNCTION 3) to check for leakage. Replace radiator if excessively clogged with scale deposits, or if unable to repair by soldering.				
			d. Paint	As soon as possible after pressure test, paint repaired areas using dull black radiator paint

**Section II. ELECTRICAL SYSTEM MAINTENANCE**

This section contains the information you'll need to maintain the:

- Engine starter and solenoid
- Alternator
- Wiring Harnesses

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of direct support maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	3-8	Starter and Solenoid Repair . . . . .	3-13
Alternator Troubleshooting . . . . .	3-9	Instrument Panel Replacement . . . . .	3-14
Starter and Solenoid Troubleshooting . . . . .	3-10	Wiring Harness Replacement . . . . .	3-15
Wiring Harness Troubleshooting . . . . .	3-11	Front Wiring Harness . . . . .	3-15a
Alternator Repair . . . . .	3-12	Rear Wiring Harness . . . . .	3-15b

**3-8. TROUBLESHOOTING SYMPTOM INDEX**

**NOTE**

An electrical system wiring diagram is located at the back of this manual in appendix F.

	Para/Malfunction	Page
<b>ALTERNATOR TROUBLESHOOTING</b>		
Improper output voltage . . . . .	3-9/1	3-89
Improper output current . . . . .	3-9/2	3-90
<b>STARTER AND SOLENOID TROUBLESHOOTING</b>		
Starter troubleshooting . . . . .	3-10/1	3-90
Starter fails to crank . . . . .	3-10/2	3-91
<b>WIRING HARNESS TROUBLESHOOTING</b>		
Major portion of electrical system inoperative . . . . .	3-11/1	3-92
One electrical circuit inoperative . . . . .	3-11/2	3-92

**3-9. ALTERNATOR TROUBLESHOOTING**

MALFUNCTION

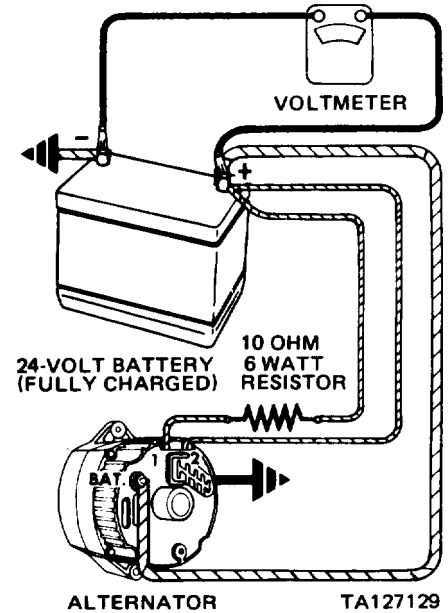
TEST OR INSPECTION

CORRECTIVE ACTION

1. IMPROPER OUTPUT VOLTAGE

Step 1. Connect test set-up to alternator as illustrated. Slowly increase alternator speed and observe voltmeter reading.

- a. If voltmeter reading is uncontrolled with speed, and increases above 31 Vdc, check alternator field winding and regulator (para 3-12).
- b. If voltmeter indicates battery voltage (no increase in voltage), proceed to step 2.
- c. If voltmeter reading increases (greater than battery voltage and less than 31 Vdc), proceed to MALFUNCTION 2 (IMPROPER OUTPUT CURRENT).



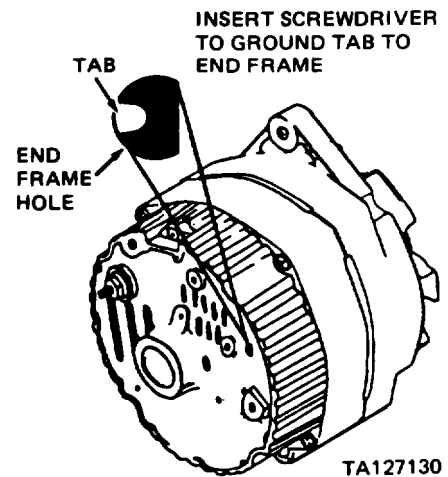
Step 2.

**CAUTION**

Tab is within 3/4 inch of casting surface. Do not force screwdriver deeper than one inch into alternator end frame.

Insert screwdriver into test hole in end frame and ground tab as shown; then repeat step 1.

- a. If voltmeter indicates battery voltage (no increase in voltage), check rotor, stator, diode trio, rectifier bridge, and regulator mounting screws (para 3-12).
- b. If voltmeter reading increases, replace the regulator (para 3-12).



**3-9. ALTERNATOR TROUBLESHOOTING (cont)**

MALFUNCTION

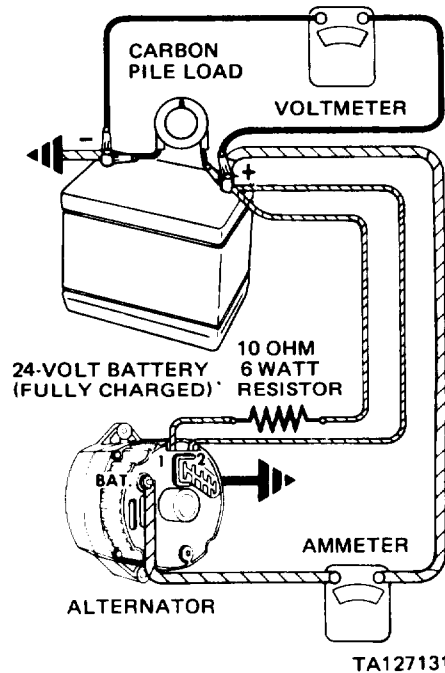
TEST OR INSPECTION

CORRECTIVE ACTION

2. IMPROPER OUTPUT CURRENT

Step 1. Connect test set-up to alternator as illustrated. Operate alternator at moderate speed and adjust carbon pile for maximum indication on ammeter. Note ammeter indication.

- a. If ammeter indicates 27 to 47 amperes, and voltmeter indicates less than 31 Vdc, alternator operation is normal.
- b. If ammeter does not indicate 27 to 47 amperes, proceed to step 2.



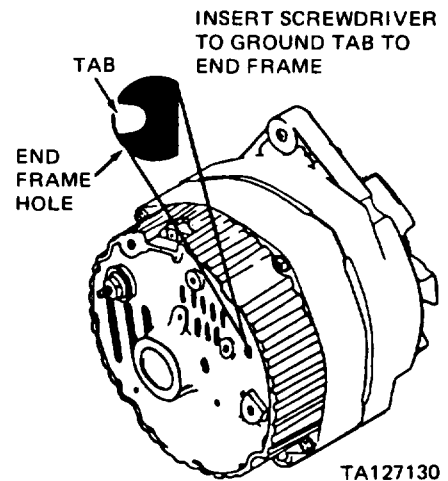
Step 2.

**CAUTION**

Tab is within 3/4 inch of casting surface. Do not force screwdriver deeper than one inch into alternator end frame.

Insert screwdriver into test hole in end frame and ground tab as shown; then repeat step 1.

- a. If ammeter indicates 27 to 47 amperes, check field winding and regulator (para 3-12).
- b. If ammeter does not indicate 27 to 47 amperes, check the alternator field winding, diode trio, rectifier bridge and stator (para 3-12).



**3-10. STARTER AND SOLENOID TROUBLESHOOTING**

1. STARTER TROUBLESHOOTING

**NOTE**

Compare results of starter no-load test (STARTER CRANKS TOO SLOWLY, para 2-21) with the following chart and then refer to paragraph 3-13:



**3-10. STARTER AND SOLENOID TROUBLESHOOTING (cont)**

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

Armature Speed	Current Draw	Probable cause	Inspection Data
Zero	Zero	Open field circuit. Open armature coils. Poor brush contact.	Check internal connections and field coils for open condition. Inspect commutator for badly burned bars after disassembly. Check for broken brush springs, worn brushes, and high insulation between commutator bars.
Zero	High	Grounded terminals or fields. Frozen bearings.	Disconnect field coil ground connections and check for grounded condition. Rotate armature by prying pinion with a screwdriver.
Low	Low	High internal resistance.	Check for poor connections, defective leads, and dirty commutator.
Low	High	Excessive friction. Shorted armature. Grounded field coils or armature.	Check for tight, dirty, or worn bearings, bent armature shaft or loose pole shoes allowing armature to drag. Check armature in a growler after disassembly. Disconnect field coil ground connections and check for grounded condition.
High	High	Shorted field coils.	Replace field coils and repeat bench test.

2. STARTER FAILS TO CRANK

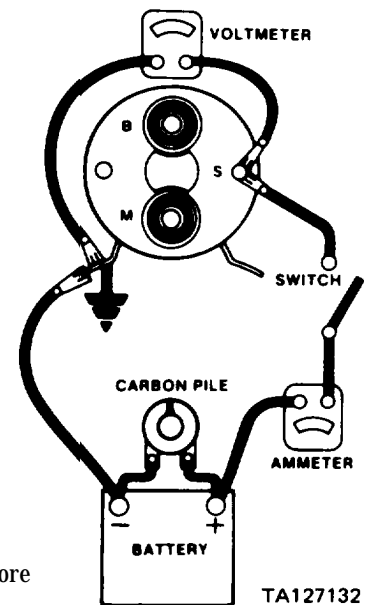
Step 1. Disconnect and tape field coil lead at solenoid M terminal. Connect solenoid terminals to test set-up as shown. Close switch, adjust carbon pile for 9 Vdc indication on voltmeter, and note ammeter reading.

- a. If ammeter indicates 6.5 to 7.0 amperes, proceed to step 2.
- b. If ammeter does not indicate 6.5 to 7.0 amperes, replace solenoid switch (para 3-13).

Step 2. Reconnect solenoid terminals to pull-in winding test set-up as shown on following page.

**CAUTION**

To prevent overheating solenoid, do not close switch for more than 15 seconds at a time.



Close the switch and adjust carbon pile for 20 Vdc indication on voltmeter. Note ammeter reading and open switch.

### 3-10. STARTER AND SOLENOID TROUBLESHOOTING (cont)

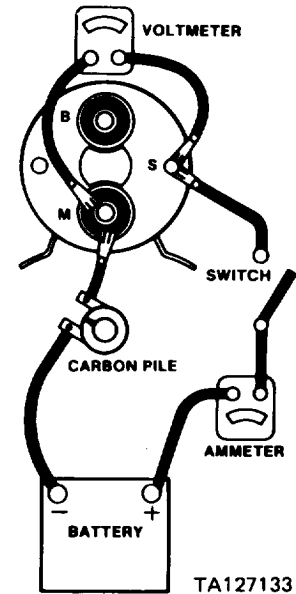
MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION

2. STARTER FAILS TO CRANK (cont)

Step 2. (cont)

- a. If ammeter indicates 6.5 to 7.0 amperes, remove solenoid (para 3-13) and check for binding plunger or defective spring.
- b. If ammeter indicates more than 7.0 amperes, winding is shorted or grounded. Replace solenoid (para 3-13).
- c. If ammeter indicates less than 6.5 amperes, winding has excessive resistance. Clean solenoid terminals and repeat pull-in winding test. If ammeter still indicates less than 6.5 amperes, replace solenoid (para 3-13).



### 3-11. WIRING HARNESS TROUBLESHOOTING

NOTE

Refer to electrical system wiring schematic (appendix F), front wiring harness illustration (para 3-15a), and rear wiring harness illustration (para 3-15b).

MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION

1. MAJOR PORTION OF ELECTRICAL SYSTEM INOPERATIVE

Check for improper connection or defective connectors between front and rear wiring harnesses, IGNITION switch and connector, and VEHICLE LIGHTS switch and connector.

If connections are correct, replace front wiring harness (para 3-15a) or rear wiring harness (para 3-15b).

2. ONE ELECTRICAL CIRCUIT INOPERATIVE

Step 1. Disconnect harness lead(s) from affected component, and use an ohmmeter to check for open circuit caused by breaks in wiring or faulty connectors.

- a. If harness wire is broken, and wire is not accessible, replace wiring harness (para 3-15).
- b. If harness wire is not broken, proceed to step 2.

**3-11. WIRING HARNESS TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

2. ONE ELECTRICAL CIRCUIT INOPERATIVE (cont)

Step 2. Use an ohmmeter to check for short circuit caused by damaged insulation, screw driven through the wire, or wires from different circuits making contact.

- a. If harness wire is shorted or grounded, and not accessible for repair, replace wiring harness (para 3-15).
- b. If harness wire is not shorted, test electrical component in affected circuit (refer to organizational maintenance).

**3-12. ALTERNATOR REPAIR**

This task covers: a. Disassembly  
 b. Cleaning  
 c. Inspection  
 d. Testing  
 e. Reassembly

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Valve guide installer  
 Front cover seal installer  
 Camshaft gear remover

NSN 4910-00-754-0654  
 FSCM 72582 P/N J5158-2  
 FSCM 72582 P/N J7584-1  
 FSCM 72582 P/N J8810

EQUIPMENT CONDITION

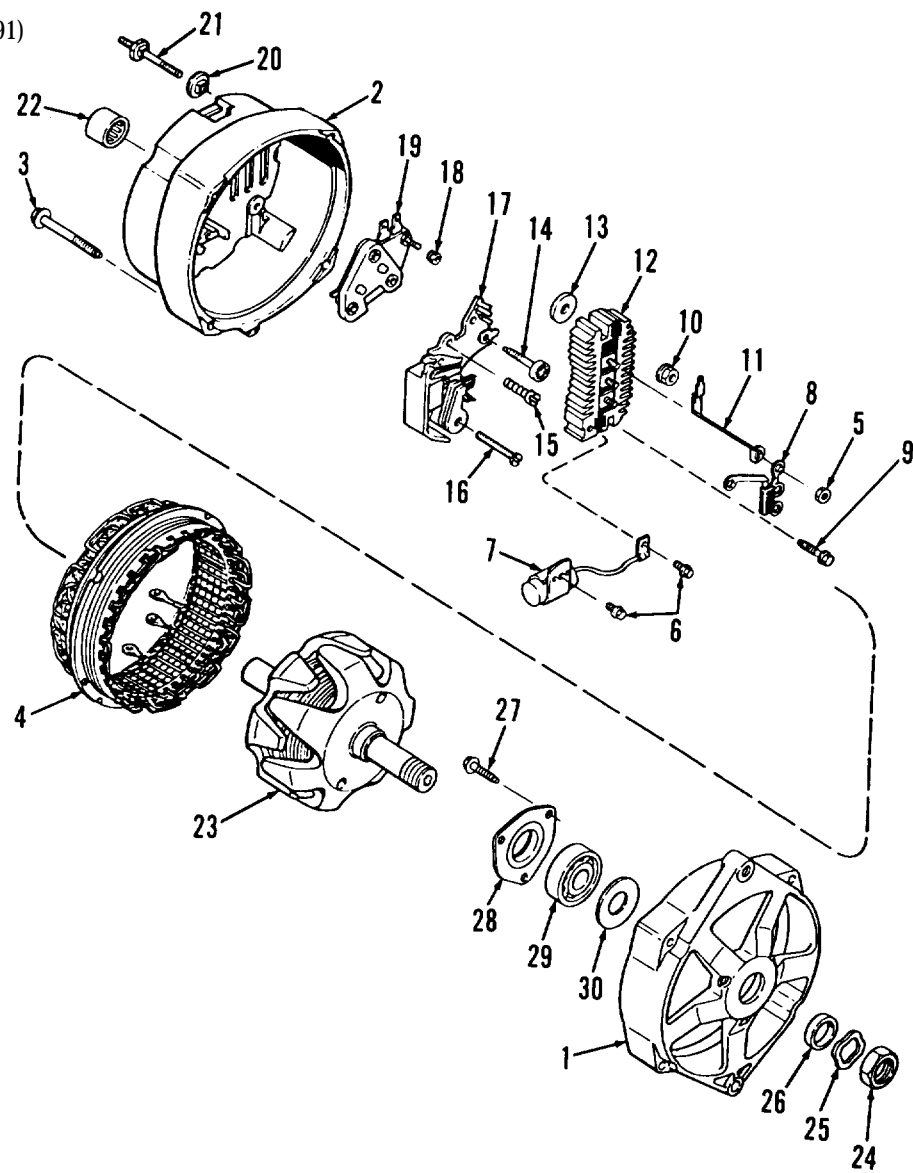
Paragraph 2-26  
 Condition Description  
 Alternator removed from vehicle.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Lubricant (FSCM 16764 P/N 1948791)  
 Lock washer

KEY

1. Drive end frame
2. Slip ring end frame
3. Thru bolts
4. Stator
5. Nuts
6. Screws
7. Capacitor
8. Diode trio
9. Screws
10. Nut
11. Relay terminal
12. Rectifier bridge assembly
13. Insulator, terminal stud
14. Screws
15. Screw
16. Screw
17. Brush holder
18. Nut
19. Voltage regulator
20. Outer terminal stud
21. Stud terminal
22. Roller bearing
23. Rotor
24. Shaft nut
25. Lock washer
26. Shaft collar
27. Screws
28. Ball bearing retainer plate
29. Ball bearing
30. Grease slinger washer



TA127134

**3-12. ALTERNATOR REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY				
1	Alternator assembly (31)	a. Drive end frame (1) and slip ring end frame (2)	Match mark	Scribe positioning marks on frames for correct reassembly
		b. Four thru bolts (3)	Loosen and remove	
<b><u>CAUTION</u></b>				
Use extreme care not to touch stator winding when inserting screwdriver blades and prying frames apart. Don't use hammer to drive frames apart.				
		c. Drive end frame (1) and stator and slip ring end frame (2)	Separate	Insert two screwdriver blades in slip ring end
NOTE				
When separating, work evenly around circumference of frame.				
		d. Drive end frame(1)	Remove	
2	Slip ring end frame (2)	a. Three nuts(5)	Remove	
<b><u>CAUTION</u></b>				
Use care when removing to avoid damaging stator.				
		b. Stator (4)	Disconnect and remove	Tag stator leads for reassembly
		c. Two screws (6)	Remove	
		d. Capacitor (7)	Remove	
		e. Diode trio (8)	Remove	
		f. Two screws (9)	Remove	
		g. Nut (10)	Remove	
		h. Relay terminal (11)	Remove	
		i. Rectifier bridge assembly (12)	Remove	
		j. Terminal stud insulator (13)	Remove	
		k. Two screws (14)	Remove	
		l. Screw (15)	Remove	
		m. Screw (16)	Remove	
		n. Brush holder (17)	Remove	
		o. Nut (18)	Remove	
		p. Voltage regulator (19)	Remove	

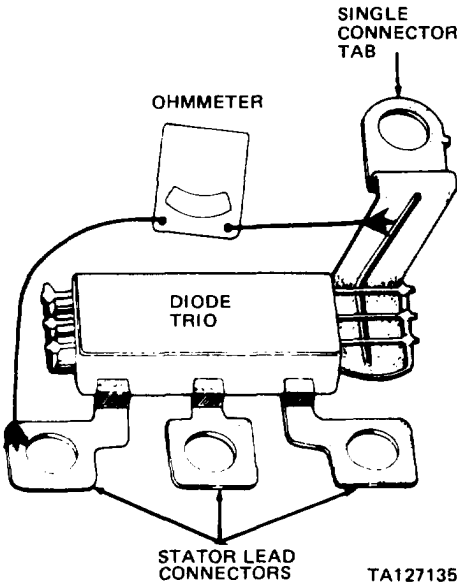
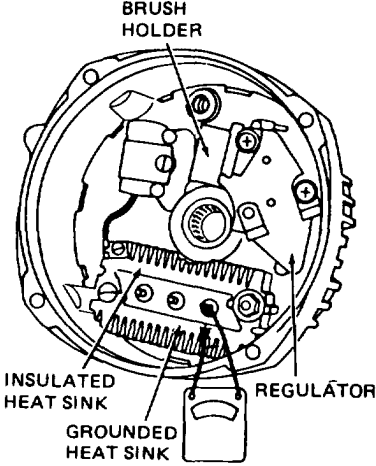
**3-12. ALTERNATOR REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
2 (cont)		q. Outer terminal stud insulator (20)	Remove	
		r. Stud terminal (21)	Remove	
		s. Slip ring end frame (2)	Position	On open jaws of vise, so jaws support area around bearings
<b>NOTE</b>				
Remove bearing (22) if worn, cracked, pitted or damaged, or if grease supply is exhausted.				
		t. Bearing (22)	Remove and discard	Use valve guide installer tool and press out of end frame (2)
3	Drive end frame (1)			
<b><u>CAUTION</u></b>				
Do not overtighten vise. Over tightening may distort and damage rotor.				
		a. Rotor (23)	Mount	Use vise
		b. Shaft nut (24)	Remove	
		c. Lock washer (25)	Remove and discard	
		d. Shaft collar (26)	Remove	
		e. Drive end frame (1)	Remove	From rotor (23)
		f. Three screws (27)	Remove	
		g. Ball bearing retainer plate (28)	Remove	
		h. Bearing housing on drive end frame (1)	Back up	Use front cover seal installer tool
		i. Ball bearing (29)	Remove	Use valve guide installer tool and press bearing out of end frame (1)
		j. Grease slinger washer (30)	Remove and discard	
CLEANING				
<b><u>CAUTION</u></b>				
Do not clean stator or rotor with cleaning solvent.				
4		Stator (4) and rotor (23)	Clean	Wipe with clean, soft, absorbent, lintfree cloth

**3-12. ALTERNATOR REPAIR (cont)**

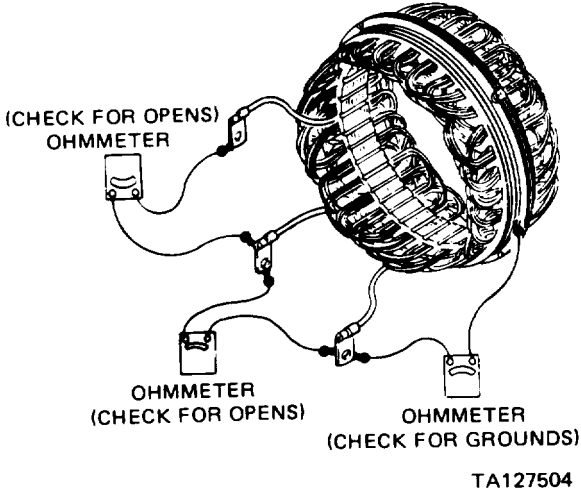
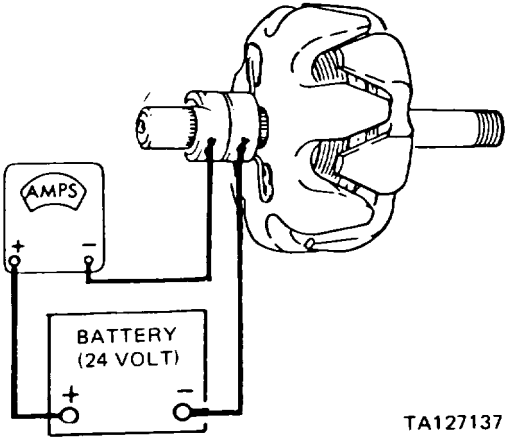
STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
5		All other parts	Clean	Use clean, soft, absorbent, lintfree cloth moistened with cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
6		Drive end frame (1) and slip ring end frame (2)	Inspect	Replace if cracked, worn, damaged or distorted
7		Stator (4)	Inspect	Replace if worn, damaged, discolored, unwound or evidence of over-heating
8		Bearings (22 and 29)	Inspect	Replace if worn, cracked, pitted or damaged
9		Ball bearing retainer plate (28)	Inspect	Replace if retainer plate felt is hard or worn
10		Rotor (23)	Inspect	Replace if worn, damaged, cracked, distorted, damaged threads or slip rings damaged or scored
11		All other parts	Inspect	Replace if worn, cracked, damaged or distorted

**3-12. ALTERNATOR REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING				
<b>CAUTION</b>				
Do not use 110 volt test lamp to test diode trio.				
12		Diode trio (8)		<p>Set ohmmeter to lowest resistance range. Connect ohmmeter leads to single connector tab and one of three stator lead connectors as shown. Observe reading. Reverse ohmmeter leads and observe reading. Repeat procedure with each of two remaining stator lead connectors. Readings should not be identical in each test. There should be one low and one high reading for each test. If readings are either both high or low, replace the diode trio</p>
 <p style="text-align: center;">OHMMETER SINGLE CONNECTOR TAB DIODE TRIO STATOR LEAD CONNECTORS TA127135</p>				
13		Rectifier bridge assembly (12)	Test	<p>Use ohmmeter. Connect prod to grounded heat sink and the base of one of the three terminals as shown. Observe reading. Reverse prods. Observe reading. If readings are identical, replace bridge. Repeat procedure with remaining two terminals. Connect prods to insulated heat sink and one of three terminals. Observe reading. Reverse prods. Observe reading. If readings are identical, replace rectifier bridge assembly. Repeat procedure with each of two remaining terminals</p>
 <p style="text-align: center;">BRUSH HOLDER INSULATED HEAT SINK GROUNDED HEAT SINK REGULATOR OHMMETER TA127136</p>				



**3-12. ALTERNATOR REPAIR (cont)**

STEP	LOCATION-	ITEM	ACTION	REMARKS
TESTING (cont)				
14	Stator (4)	Test		Use an ohmmeter to check. Connect test prods as shown. If meter reading is low when connected to any stator lead and frame, the windings are grounded. If the meter reading is high when connected between each pair of stator leads, the windings are open. If stator winding is grounded or open or if evidence of short is observed, replace stator
				
15	Rotor (23)	Test		Use 110 volt test lamp. Connect test lamp from rotor slip ring to rotor shaft. If lamp lights, the field windings are grounded. Connect test lamp leads to each rotor slip ring. If lamp fails to light, field windings are open. Connect ammeter and battery to rotor as shown. If ammeter indicates more than 4.0 to 4.5 amperes, rotor field windings are shorted. If field windings are grounded, open or have shorted, replace rotor
				
REASSEMBLY				
16	Drive end frame (1)	<ul style="list-style-type: none"> <li>a. Grease slinger washer (30)</li> <li>b. Inside of bearing area on end frame (1)</li> <li>c. Ball bearing (29)</li> <li>d. Ball bearing retainer plate (28)</li> <li>e. Three screws (27)</li> </ul>	<ul style="list-style-type: none"> <li>Install</li> <li>Back up</li> <li>Install</li> <li>install</li> <li>Install and tighten</li> </ul>	<ul style="list-style-type: none"> <li>Use camshaft gear remover tool</li> <li>Press on closed end of bearing until flush with end frame housing</li> <li>Use valve guide installer tool until retainer seats against bearing (29)</li> <li>Until retainer (28) is securely mounted</li> </ul>



**3-12. ALTERNATOR REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
18 (cont)		v. Four thru bolts (3)	Install and tighten	Tighten alternately until end frames are securely fastened

**3-13. STARTER AND SOLENOID REPAIR**

- This task covers:
- a. Disassembly
  - b. Cleaning
  - c. Inspection
  - d. Testing
  - e. Reassembly

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

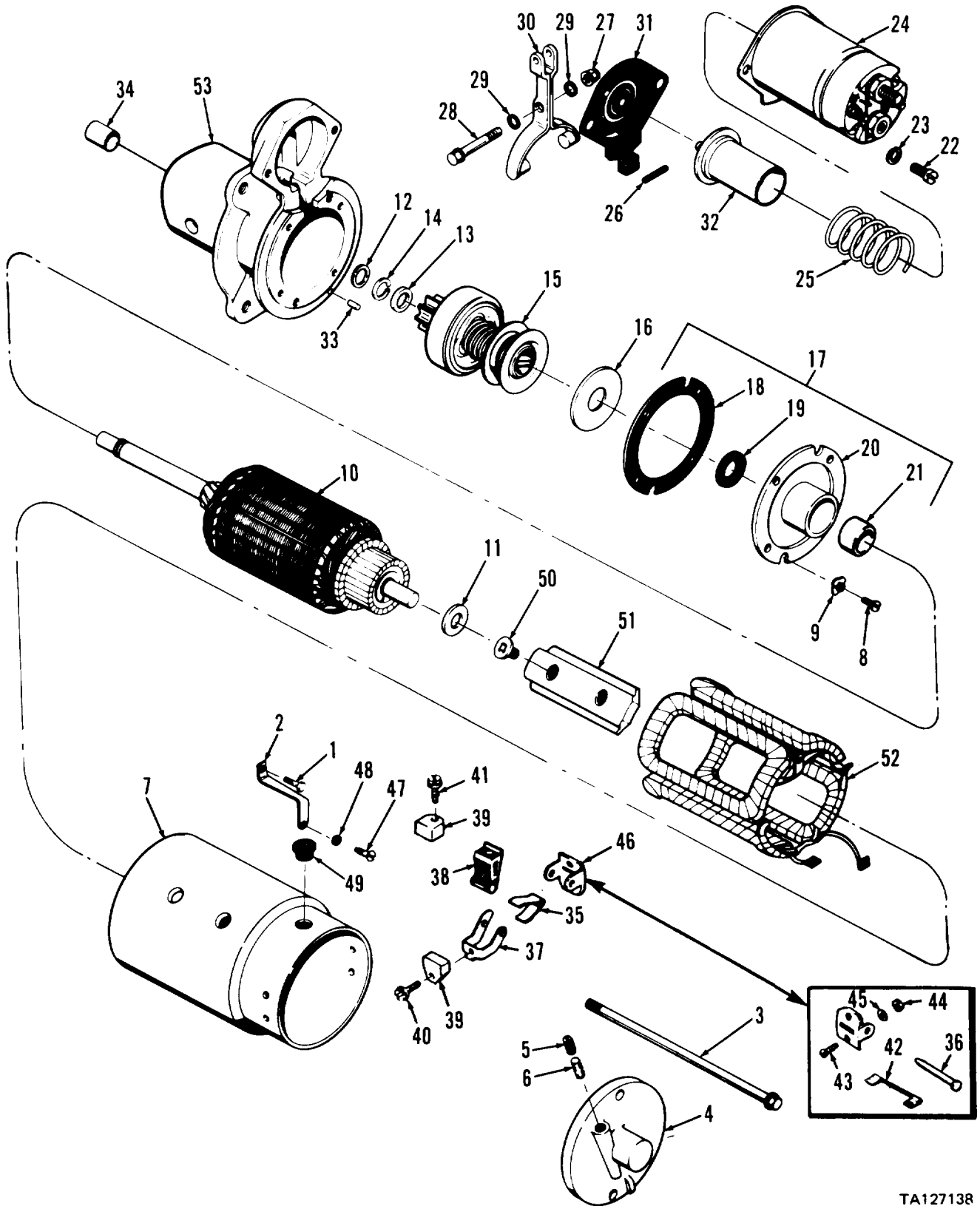
Paragraph 2-27a Condition Description Starter and solenoid removed from vehicle.

MATERIALS/PARTS

- Cleaning solvent P-D-680
- Clean cloths
- Gasket
- Oil seal
- Lubricant (FSCM 16764 P/N 1960954)
- Engine oil (MIL-L-2104, SAE grade 10)
- Sealer (FSCM 16764 P/N1050026)

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Drive housing (53)	a. Screw (1)	Remove	
		b. Connector (2)	Detach	From solenoid (24)
		c. Two through bolts (3)	Remove	
		d. End frame (4)	Remove	
		e. Pipe plug (5) and wick (6)	Remove	From end frame (4)
		f. Two screws (8) and lock washers (9)	Remove	
		g. Armature (10)	Remove	
2	Armature (10) and drive assembly (15)	a. Washer (11)	Remove and discard	
		b. Washer (12)	Remove and discard	
		c. Stop collar (13)	Press forward	Use a 1/2 inch pipe coupling, or an old pinion, to press collar toward armature to expose retaining ring (14)
		d. Retaining ring (14)	Remove	Use pliers
		e. Stop collar (13)	Remove	
		f. Drive assembly (15)	Remove	From armature shaft
		g. Washer (16)	Remove and discard	
		h. Center bearing assembly (17)	Remove	

**3-13. STARTER AND SOLENOID REPAIR (cont)**



TA127138

**3-13. STARTER AND SOLENOID REPAIR (cont)**

KEY

- |                             |                         |
|-----------------------------|-------------------------|
| 1. Screw                    | 28. Screw               |
| 2. Connector                | 29. Seal washers        |
| 3. Through bolts            | 30. Shift lever         |
| 4. End frame                | 31. Boot                |
| 5. Pipe plug                | 32. Plunger             |
| 6. Wick                     | 33. Pin                 |
| 7. Field frame              | 34. Sleeve bearing      |
| 8. Screws                   | 35. Brush springs       |
| 9. Lock washers             | 36. Brush support pins  |
| 10. Armature                | 37. Brush holder        |
| 11. Washer                  | 38. Brush holder        |
| 12. Washer                  | 39. Brushes             |
| 13. Stop collar             | 40. Screws              |
| 14. Retaining ring          | 41. Screws              |
| 15. Drive assembly          | 42. Ground brush leads  |
| 16. Washer                  | 43. Screws              |
| 17. Center bearing assembly | 44. Nuts                |
| 18. Gasket                  | 45. Lock washers        |
| 19. Oil seal                | 46. Control assemblies  |
| 20. Center bearing          | 47. Screw               |
| 21. Sleeve bearing          | 48. Lock washer         |
| 22. Screws                  | 49. Grommet             |
| 23. Lock washers            | 50. Screws              |
| 24. Solenoid switch         | 51. Pole shoes          |
| 25. Plunger spring          | 52. Field coil assembly |
| 26. Spring pin              | 53. Drive housing       |
| 27. Nut                     |                         |

**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
3	Center bearing (20)	a. Gasket (18) b. Oil seal (19)	Remove and discard Remove and discard	
<b>NOTE</b>				
Do not remove sleeve bearing (21) unless replacement is required.				
4	Drive housing (53)	a. Two screws (22) and lock washers (23) b. Solenoid switch (24) c. Plunger spring (25) d. Spring pin (26) e. Nut (27) f. Screw (28) g. Two seal washers (29) h. Shift lever (30) i. Boot (31) j. Plunger (32) k. Pin (33)	Remove Remove Remove Remove Remove Remove Remove Remove Remove Remove Remove	Pull straight out from drive housing (53) From plunger (32)
<b>NOTE</b>				
Do not remove sleeve bearing (34) unless replacement is required as per inspection.				
5	Field frame (7)	1. Sleeve bearing (34) a. Two brush springs (35) b. Two brush support pins (36) c. Two brush holders (37, 38), two brushes (39), four screws (40, 41), and two brush springs (35) d. Two ground brush leads (42) e. Two screws (40) f. Two screws (41) g. Two brush holders (37, 38), brushes (39) and brush springs (35)	Remove Release Remove Remove Disconnect and remove Remove Remove Disassemble and separate	Remove as one assembly

**3-13. STARTER AND SOLENOID REPAIR (cont)**

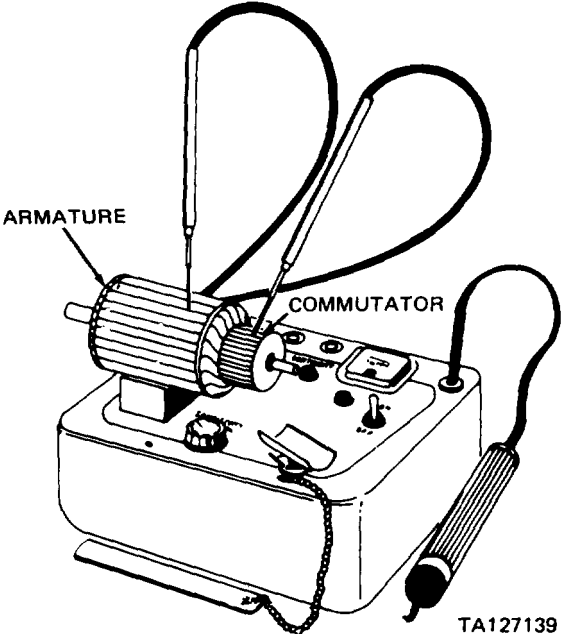
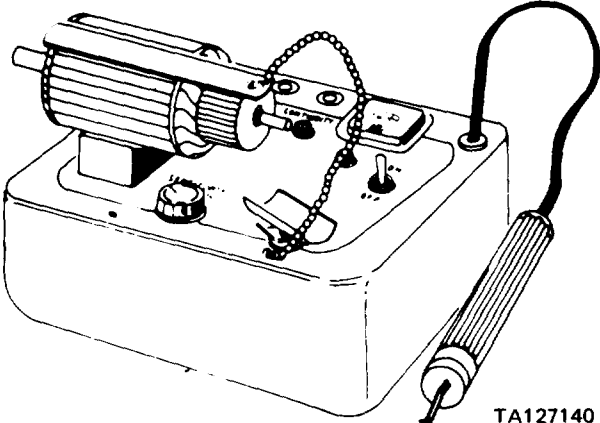
STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
5 (cont)		h. Four screws (43) i. Four nuts (44) j. Four lock washers (45) k. Two control assemblies (46)	Remove Remove Remove and discard Remove	
NOTE				
Do not remove screw (47), lock washer (48), connector (2) or grommet (49) unless replacement is required.				
		l. Screw (47) m. Lock washer (48) n. Connector (2) o. Grommet (49)	Remove Remove Remove Remove	
NOTE				
Do not remove field coil assembly (52), pole shoes (51) or screws (50) unless parts need replacement.				
		p. Eight screws (50) q. Four pole shoes (51) r. Field coil assembly (52)	Remove Remove Remove and release	
CLEANING				
6		Armature (10), drive assembly (15), solenoid switch (24), brushes (39), grommet (49) and coil assembly (52)	Clean	Wipe with a clean, dry, lint-free cloth only. Do not use cleaning solvent
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				



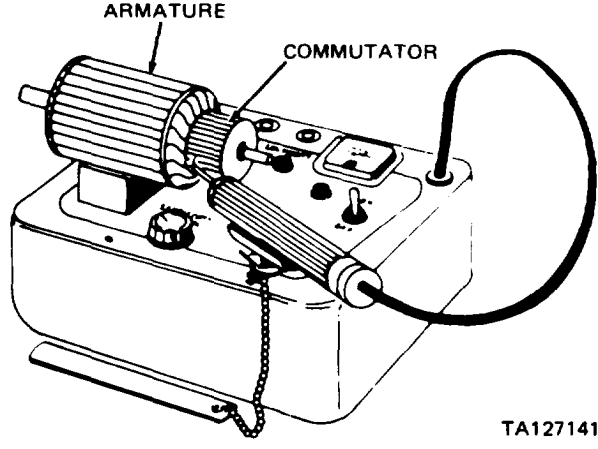
**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
6 (cont)	<b><u>WARNING</u></b>			
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
7	All other parts		Clean	Use clean cloth moistened with cleaning solvent P-D-680. Dry thoroughly with compressed air
INSPECTION				
8	Brushes (39)		Inspect	Replace if cracked, crazed, distorted, or if brush wear exceeds one half of new brush length
9	Brush holder (37, 38)		Inspect	Replace if cracked, worn or distorted, or if brush does not move freely in holder
10	Brush springs (35)		Inspect	Inspect for wear, cracks, distortion or discoloration. Check brush spring tension to check that brushes are held firmly. If tension is weak or if any other condition is observed, replace spring
11	Sleeve bearings (21, 34)		Inspect	Replace if worn, cracked, pitted or burred
12	Drive assembly (15)		Inspect	Replace if worn, damaged, distorted, or pinion teeth cracked, chipped, worn or damaged, or pinion does-not turn freely in over-running direction
13	Armature (10)		Inspect	Replace if cracked, worn, damaged or distorted or commutator rough or out of round
14	Solenoid switch (24)		Inspect	Replace if cracked, worn, damaged or distorted
15	All other parts		Inspect	Replace if worn, cracked, damaged or distorted

**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING				
16		a. Armature (10)	Test for grounded winding	Place armature in growler and turn power on. Touch one test probe to armature core, the other probe to commutator, as shown. If test lamp glows, the armature winding, or commutator is grounded
				
		b. Armature (10)	Test for shorted winding	Position armature in growler. Turn on power. Use steel blade provided with tester. Hold blade parallel with and touching the armature core segment, as shown
				

**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
16 (cont)		 <p style="text-align: center;">TA127141</p>		<p>Rotate armature slowly one or more revolutions. If the armature is shorted, the steel blade will vibrate. Turn power off .</p> <p>Position armature in growler, as shown. Turn power on</p>
		c. Armature (10)	Test commutator bars	<p>Follow directions supplied with growler and test commutator bars for abnormal readings. Abnormal readings will indicate a short, open or poor connection. If testing indicates commutator is grounded, the armature is shorted or commutator readings indicate a short, or an open or poor connection, replace armature</p>
17		Field coil assembly (52)	Test	<p>Disconnect field coil ground connection. Use test lamp. Connect one test probe of the test lamp to the connector (2) and the other probe to the frame (7). If the test lamp lights, the field coils (52) are grounded. If coils are grounded, remove and replace coils. Touch test probes to each end of the field coil windings. If the test lamp does not light, the field coils are open. If coils are open, replace coil assembly (52)</p>
REASSEMBLY				
18	Field frame (7)	a. Field coil assembly (52)	Assemble and position	If removed
		b. Four pole shoes (51)	Position	
		c. Eight screws (50)	Install	
		d. Grommet (49)	Install	If removed

**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
18 (cont)		e. Connector (2) f. Lock washer (48) and screw (47)	Position Install and tighten	
<b>NOTE</b>				
Always replace brushes and springs as a set.				
19	Brush holder (37, 38)	a. Two brushes (39) b. Four screws (40 and 41) c. Two brush springs (35)	Install Install and tighten Install	Assemble with holders (37, 38)
20	Field frame (7)	a. Two control assem- blies (46) b. Four screws (43) c. Four lock washers (45) d. Four nuts (44) e. Two brush support pins (36) f. Two brush holder assemblies (37, 38)  g. Two ground brush leads (42)	Position  Install  Install Install  Position and install  Connect	Place in control assembly (46). Push holders and spring to bottom of control assembly and rotate spring to engage the slot in the assembly
21	Center bear- ing (20)	a. Sleeve bearing (21) b. Oil seal (19) c. Gasket (18)	Install Install Install	If removed
22	Armature (10)	a. Center bearing as- sembly (17) b. Washer (16) c. Drive assembly ( 15) and armature (10) shaft  d. Stop collar (13)  e. Armature (10)  f. Retaining ring (14)	Install Install Lubricate and position  Position  Position  Install	Apply light coat & lubricant to drive end of armature shaft. Slide drive assembly onto shaft with pinion away from armature Face cupped surface of collar away from armature Stand on a wood block with commutator down Tap into place with small block of wood and a hammer

**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
22 (cont)		g. Stop collar (13)	Install	Force stop collar over retaining ring. Place a suitable washer over retaining ring. Squeeze collar and washer together using pliers. Remove and discard washer
		h. Washer (12)	Install	
		i. Washer (1 1)	Install	
23	Drive housing (53)	a. Sleeve bearing (34)	Install	If removed
		b. Pin (33)	Install	
		c. Armature (10)	Install	
		d. Two lock washers (9)	Position	
		e. Two screws (8)	Install	
		f. Shift lever (30)	Install	Engage with drive assembly
		g. Two seal washers (29)	Position	
		h. Screw (28)	Install	
		i. Nut (27)	Install	
		j. Boot (31)	Seal and position	Apply sealer to drive housing frame
		k. Plunger (32)	Position	On shift lever (30)
		l. Spring pin (26)	Install	Press on plunger (32) and shift lever (30)
		m. plunger spring (25)	Position	Over plunger (32)
		n. Solenoid switch (24)	Position	Against drive housing (53)
		o. Two lock washers (23) and screws (22)	Install and tighten	Until solenoid (24) is securely mounted
		p. Field frame (7)	Position	Over armature (10)
<b><u>CAUTION</u></b>				
Use care to not damage brushes when positioning frame over armature.				
		q. Field frame (7) and solenoid switch (24)	seal	Apply sealer between frame, solenoid flange and solenoid junction

**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
	End frame	a. Wick (6) b. Pipe plug (5)	Lubricate and install Install	Saturate with engine oil before installing
	Drive housing (53)	a. End frame (4)  b. Two through bolts (3) c. Field coil connector (2) d. Starter and solenoid	Lubricate and position  Install and tighten Insulate Connect	Apply light coat of lubricant to frame bushing; then slide on armature shaft and push against field frame (7)  Until end frame (4) is securely mounted Wrap with electrical tape To test circuit as shown
<b><u>CAUTION</u></b>				
		e. Jumper lead	Momentarily connect	From solenoid M terminal to starter case (to shift pinion into cranking position)

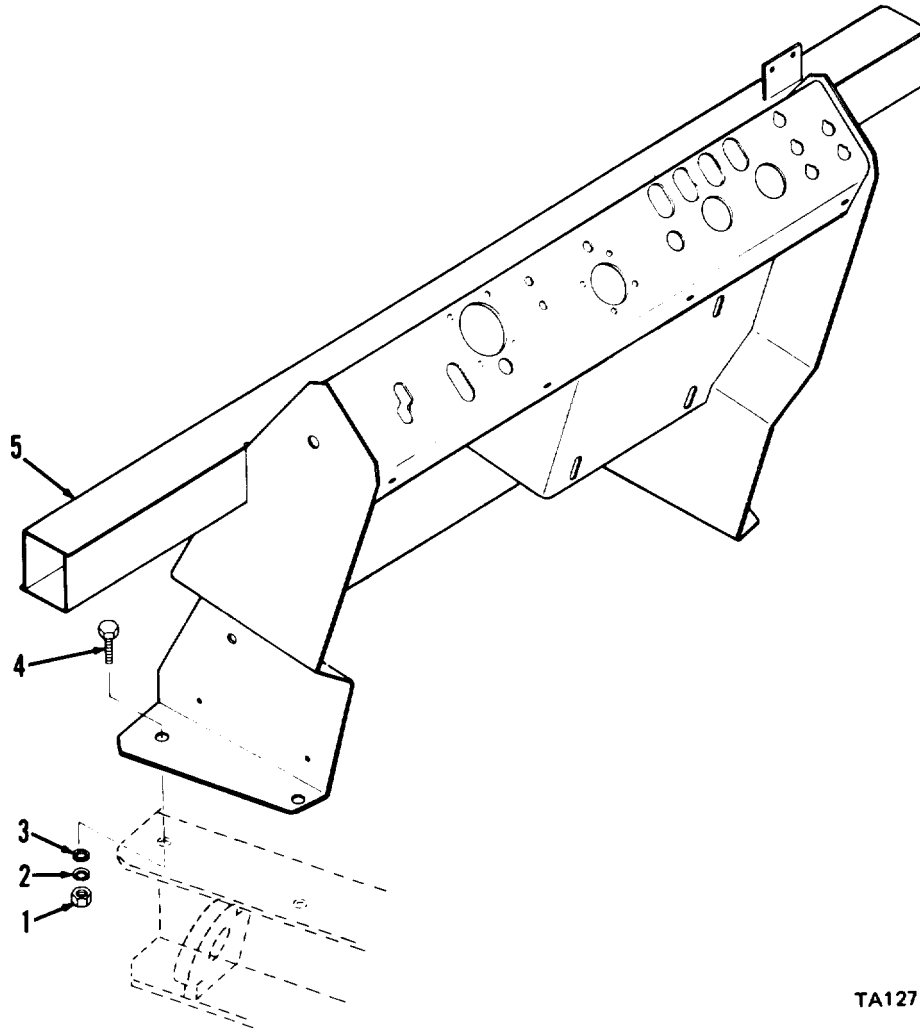
**3-13. STARTER AND SOLENOID REPAIR (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
ASSEMBLY (cont)				
5 (cont)		f. Drive assembly (15) pinion	Check clearance	Push clutch back as far as possible toward armature, and check clearance as shown
<b>NOTE</b>				
<p>Pinion clearance must measure between 0.010 and 0.140 inch to prevent buttons on the shift lever yoke (30) from rubbing on the clutch collar during cranking. If clearance does not fall within limits, recheck for proper assembly and replace all worn parts.</p>				
<p>g. Starter and solenoid</p>				
<p>h. Field coil connector (2)</p>				
<p>i. Screw (1)</p>				
			Disconnect	From pinion clearance test set-up
			Remove tape and position	On M terminal of solenoid switch (24)
			Install and tighten	Until field coil connector (2) is securely mounted





**3-14. INSTRUMENT PANEL REPLACEMENT (cont)**



TA127146

**KEY**

- 1. Nuts
- 2. Lock washers
- 3. Washers
- 4. Cap screws
- 5. Instrument panel

**3-14. INSTRUMENT PANEL REPLACEMENT (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Operator's compartment	a. Four nuts (1), lock washers (2) and washers (3) b. Four cap screws (4) c. Instrument panel (5)	Loosen and remove  Lift and remove Lift and remove	Use sling and hoist
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with compressed air
<b>INSPECTION</b>				
3		Nuts (1), washers (2 and 3) and cap screws (4)	Inspect	Replace if worn, or if threads damaged
4		Instrument panel (5)	Inspect	Repair broken welds or cracks by welding. Replace if severely cracked or damaged
<b>INSTALLATION</b>				
5	Operator's compartment	a. Instrument panel (5)  b. Four cap screws (4) washers (3), lock washers (2) and nuts (1)	Position  Install and tighten	In operator's compartment, with frame and instrument panel mounting holes aligned  Until instrument panel is securely mounted

**3-15. WIRING HARNESS REPLACEMENT**

*a. Front Wiring Harness*

This task covers a. Removal  
b. Installation

INITIAL SETUP

TOOLS  
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

MATERIALS/PARTS	EQUIPMENT Paragraph	CONDITION	Condition Description
Front wiring harness	2-33b	Engine off.	Battery ground cable disconnected.
Tie strap	2-34a		Front wiring harness connector disconnected.
	2-53h		Noise baffle mat rod removed and mat pulled up and over instrument panel for access to bottom of instrument panel.

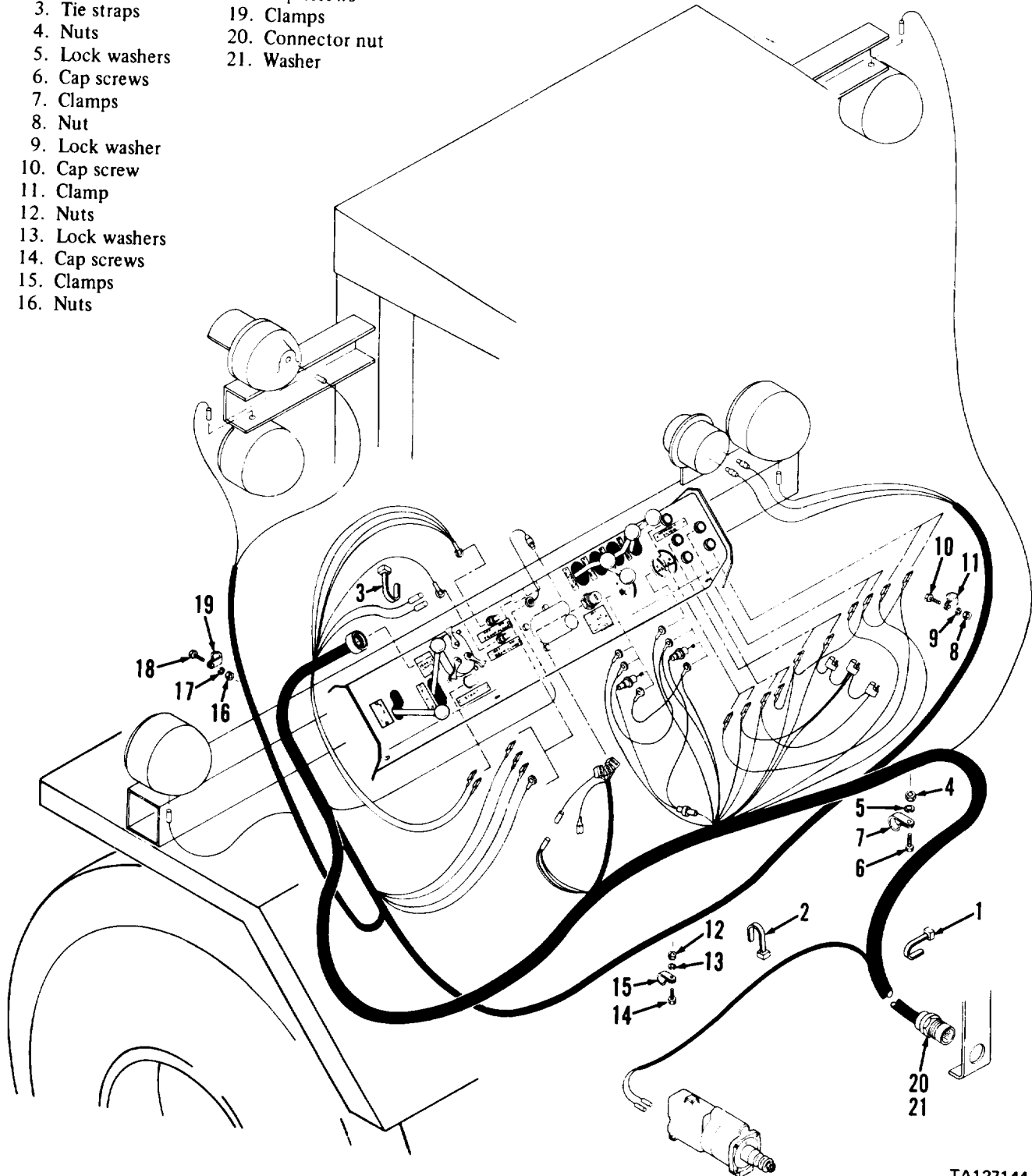
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Instrument panel bottom, stop light switch, and ROPS posts	All harness connectors	Tag and disconnect	Tag terminals of all electrical components and disconnect harness leads
2	Rear of transmission	a. Four tie straps (1)	Cut and discard	Cut and remove from harness and hydraulic return hose
		b. Connector nut (20) and washer (21)	Remove	Turn counterclockwise and remove from harness connector and bracket
3	Brake tube under floor	Two tie straps (2)	Cut and discard	Cut and remove from harness to stop light switch and brake tube
4	Harness loops at 6 and 10 ampere circuit breakers, bottom of instrument panel	Two tie straps (3)	Cut and discard	Cut and remove from loops in harness wire
5	Instrument panel rear and right hand side panel	a. Three nuts (4), lock washers (5), and cap screws (6)	Remove	From clamps (7) and instrument panel
		b. Clamps (7)	Spread and remove	From harness

**3-15. WIRING HARNESS REPLACEMENT (cont)**

*a. Front Wiring Harness (cont).*

**KEY**

- |                  |                   |
|------------------|-------------------|
| 1. Tie straps    | 17. Lock washers  |
| 2. Tie straps    | 18. Cap screws    |
| 3. Tie straps    | 19. Clamps        |
| 4. Nuts          | 20. Connector nut |
| 5. Lock washers  | 21. Washer        |
| 6. Cap screws    |                   |
| 7. Clamps        |                   |
| 8. Nut           |                   |
| 9. Lock washer   |                   |
| 10. Cap screw    |                   |
| 11. Clamp        |                   |
| 12. Nuts         |                   |
| 13. Lock washers |                   |
| 14. Cap screws   |                   |
| 15. Clamps       |                   |
| 16. Nuts         |                   |



TA127144

**3-15. WIRING HARNESS REPLACEMENT (cont)***a. Front Wiring Harness (cont)*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
6	Right hand instrument end panel	a. Nut (8), lock washer (9) and cap screw (10) b. Clamp (11)	Remove  Spread and remove	From clamp (11 ) and end panel  From harness wire
7	Instrument panel front	a. Three nuts (12), lock washers (13) and cap screws (14)	Remove	From clamps (15) and instrument panel
8	Left hand instrument side panel	a. Three nuts (16), lock washers (17) and cap screws (18)	Remove	From clamps (19) and side panel
9	Front wiring harness	a. Front wiring harness b. Warning light diodes	Remove Grasp and pull	From vehicle From harness (para 2-28e)
INSTALLATION				
10		New front wiring harness	Position	On vehicle
11	Instrument panel	a. Clamps (7, 11, 15 and 19) b. Cap screws (6, 10, 14 and 18), lock washers (5, 9, 13, and 17) and nuts (4,8, 12 and 16)	Position  Install and tighten	Over harness and against instrument pane mounting holes Until clamps (7, 11, 15 and 19) are securely mounted
12		a. New tie straps (1, 2 and 3) b. All harness leads  c. Warning light diodes d. All electrical systems	Loop and tie  Connect  Push on Check	Around harness, hydraulic return hose and brake tube To electrical components. Observe tags on component terminals for correct connection Harness connectors (para 2-28e) For proper operation

**3-15. WIRING HARNESS REPLACEMENT (cont)**

*b. Rear Wiring Harness.*

This task covers: a. Removal  
b. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

MATERIALS/PARTS

Rear wiring harness

Tie strap

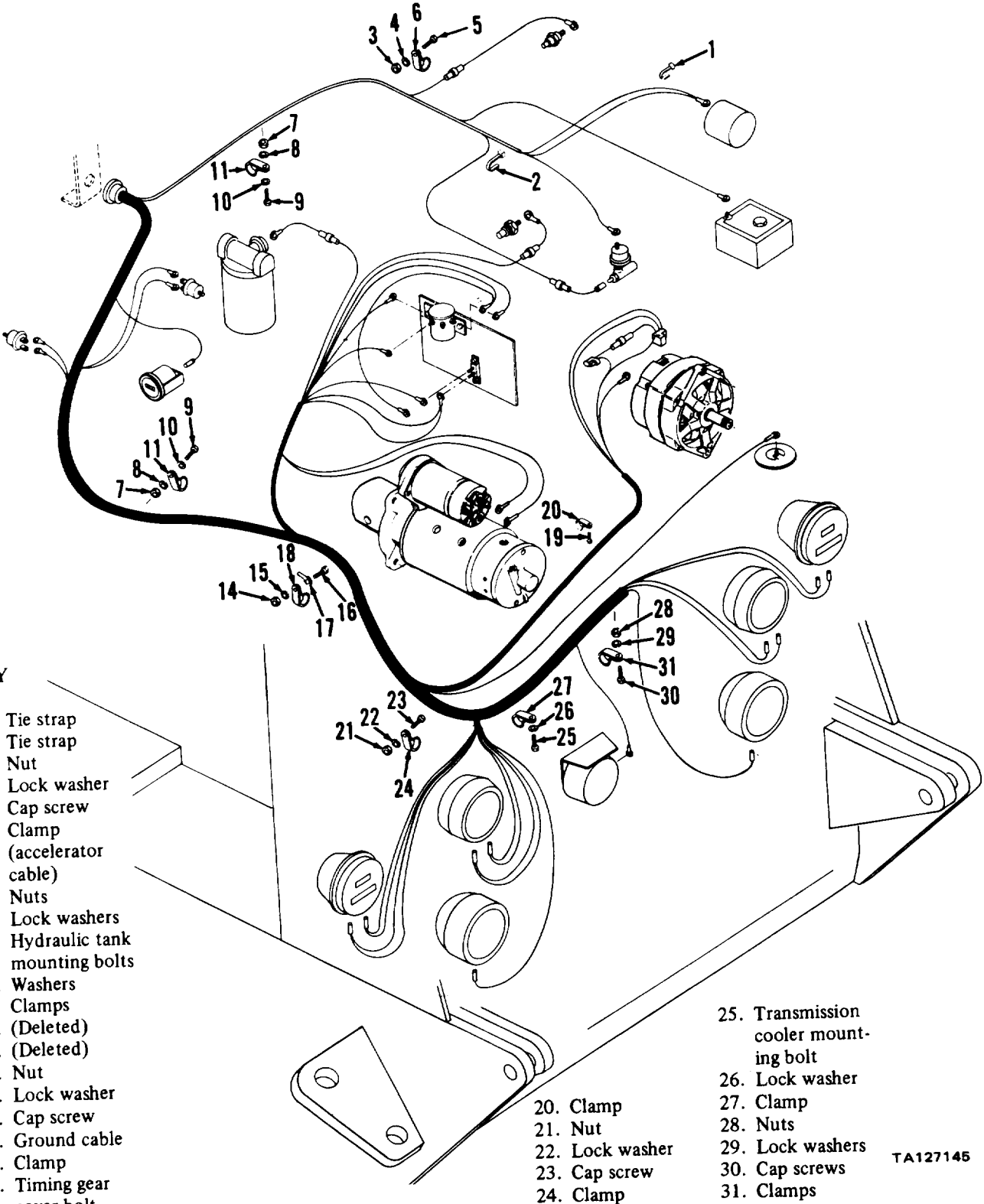
EQUIPMENT CONDITION

Paragraph	Condition	Description
	Engine off.	
2-33b	Battery ground cable disconnected.	
2-34a	Front wiring harness connector disconnected.	
	Radiator grille open.	
2-53c	Side panels removed.	

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1		All harness connectors and leads	Tag and disconnect	Tag terminals of all electrical components and disconnect harness leads
2	Engine dipstick tube	Tie strap (1)	Cut and discard	Cut and remove from harness and dipstick tube
3	Transmission cooler hose	Tie strap (2)	Cut and discard	Cut and remove from harness and transmission cooler hose
4	Accelerator cable	a. Nut (3), lock washer (4) and cap screw (5)	Remove	From clamp (6)
		b. Clamp (6)	Spread and remove	From harness and accelerator cable
5	Hydraulic tank, front	a. Two nuts (7) lock washers (8), bolts (9) and washers (10)	Remove	From clamps (11) and hydraulic tank
		b. Clamps (11)	Spread and remove	From harness
6	Left hood support plate and rear frame	a. Nut (14), lock washer (15), cap screw (16) and ground cable (17)	Remove	From clamp (18)
		b. Clamp (18)	Spread and remove	From harness

3-15. WIRING HARNESS REPLACEMENT (cont)

b. Rear Wiring Harness (cont).



KEY

- 1. Tie strap
- 2. Tie strap
- 3. Nut
- 4. Lock washer
- 5. Cap screw
- 6. Clamp (accelerator cable)
- 7. Nuts
- 8. Lock washers
- 9. Hydraulic tank mounting bolts
- 10. Washers
- 11. Clamps
- 12. (Deleted)
- 13. (Deleted)
- 14. Nut
- 15. Lock washer
- 16. Cap screw
- 17. Ground cable
- 18. Clamp
- 19. Timing gear cover bolt

- 20. Clamp
- 21. Nut
- 22. Lock washer
- 23. Cap screw
- 24. Clamp

- 25. Transmission cooler mounting bolt
- 26. Lock washer
- 27. Clamp
- 28. Nuts
- 29. Lock washers
- 30. Cap screws
- 31. Clamps

TA127145

**3-15. WIRING HARNESS REPLACEMENT (cont)**

*b. Rear Wiring Harness (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
7	Engine timing gear cover	a. Cover bolt (19) b. Clamp (20)	Remove Spread and remove	From clamp (20) and timing gear cover From harness
8	Left chassis side plate	a. Nut (21), lock washer (22) and cap screw (23) b. Clamp (24)	Remove Spread and remove	From clamp (24) and chassis side plate From harness and battery cables
9	Transmission cooler, lower left	a. Bolt (25) and lock washer (26) b. Clamp (27)	Remove Spread and remove	From clamp (27) and transmission cooler From harness
10	Top of radiator baffle	a. Two nuts (28), lock washers (29), and cap screws (30) b. Two clamps (31)	Remove Spread and remove	From clamps (31) and radiator baffle From harness
11	Rear wiring harness	a. Alternator warning light diode b. Rear wiring harness	Grasp and pull Remove	From harness (para 2-26) From vehicle
INSTALLATION				
12		New rear wiring harness	Position	On vehicle
13		a. Harness clamps (6, 11, 18,24,27 and 31) b. Clamp mounting hardware (3, 4, 5, 7, 8, 9, 10,14, 15, 16, 19, 21,22,23,25,26, 28,29 and 30)	Position Install and tighten	Over harness and against mounting holes Until clamps are securely mounted; be sure ground cable (17) terminal is placed on cap screw (16)
14		a. New tie straps (1 and 2) b. All harness leads c. Alternator warning light diode d. All electrical systems	Loop and tie Connect Push on Check	Around harness, engine dipstick tube, and transmission cooler hose To electrical components. Observe tags on component terminals for correct <b>connection</b> Harness connector (para 2-26) For proper operation



**Section III. POWER TRAIN MAINTENANCE**

This section contains the information you'll need to maintain the:

- Transmission
- Front and rear axles

It gives you instructions on how to troubleshoot problems, and repair or replace the components that are within the scope of direct support maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	3-16	Charging Pump Assembly . . . . .	3-19e
Transmission Troubleshooting . . . . .	3-17	Transmission Oil Cooler . . . . .	3-19f
Axles and Differential Carrier Assemblies		Axles and Differential Carrier Assemblies	
Troubleshooting . . . . .	3-18	Maintenance . . . . .	3-20
Transmission Maintenance . . . . .	3-19	Front Axle Assembly . . . . .	3-20a
Transmission Pressure Checks. . . . .	3-19a	Rear Axle Assembly . . . . .	3-20b
Transmission Mounts . . . . .	3-19b	Front Axle Differential Carrier	
Transmission Removal . . . . .	3-19c	Assembly . . . . .	3-20c
Control Valve and Modulation Valve		Rear Axle Differential Carrier	
Assemblies . . . . .	3-19d	Assembly . . . . .	3-20d

**3-16. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>TRANSMISSION TROUBLESHOOTING</b>		
High transmission oil temperature. . . . .	3-17/1	3-123
Loss of drive in all ranges . . . . .	3-17/2	3-123
Loss of power and/or loss of drive in any one range . . . . .	3-17/3	3-124
<b>AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES TROUBLESHOOTING</b>		
Continuous axle or wheel noise. . . . .	3-18/1	3-125
Lubricant leaking from differential carrier assembly . . . . .	3-18/2	3-125

**3-17. TRANSMISSION TROUBLESHOOTING**

**MALFUNCTION**

TEST OR INSPECTION  
CORRECTIVE ACTION

**1. HIGH TRANSMISSION OIL TEMPERATURE**

Check transmission lube pressure at lube pressure port (para 3-19a, steps 6 through 8).

- a. If lube pressure is low, replace charging pump assembly (para 3-19e).
- b. If lube pressure is normal, replace transmission (para 3-19c) (torque converter oil sealing rings worn and require replacement) and notify general support maintenance.

**2. LOSS OF DRIVE IN ALL RANGES**

Step 1. Perform step 5 of paragraph 2-36, MALFUNCTION 4.

Replace control valve assembly (para 3-19d); if replacement of control valve does not help, proceed to step 2 below.

---

### **3-17. TRANSMISSION TROUBLESHOOTING (cont)**

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

#### 2. LOSS OF DRIVE IN ALL RANGES (cont)

Step 2. Perform steps 1, 3, 4, and 5a through 5f of paragraph 3-19a.

a. If pressure gage indication is abnormal, proceed to step 3 below

b. If pressure gage indication is normal, proceed to step 3 below.

Step 3. Perform steps 6 through 8 of paragraph 3-19a.

If lube pressure indication is abnormal, replace charging pump assembly (para 3-19e) and repeat step 2 above. If pressure gage indication obtained in step 2 above is still abnormal, replace transmission (para 3-19c) (torque converter oil sealing rings worn and require replacement) and notify general support maintenance.

#### 3. LOSS OF POWER AND/OR LOSS OF DRIVE IN ANY ONE RANGE

Step 1. Perform steps 1,3,4, and 5a through 5f of paragraph 3-19a.

a. If pressure gage indication is abnormal, proceed to step 2 below

b. If pressure gage indication is normal, proceed to step 3 below.

Step 2. Perform steps 6 through 8 of paragraph 3-19a.

If lube pressure indication is abnormal, replace charging pump assembly (para 3-19e) and repeat step 1 above. If pressure gage indication obtained in step 1 is still abnormal, replace transmission (para 3-19c) (torque converter oil sealing rings worn and require replacement) and notify general support maintenance,

Step 3. Perform steps 1, 3, 4, and 5 of paragraph 3-19a.

a. If pressure indications normal in F (forward) but abnormal in R (reverse), replace transmission (para 3-19c) (reverse and second clutch group require repair) and notify general support maintenance.

b. If pressure indications normal in R (reverse) but abnormal in F (forward), replace transmission (para 3-19c) (forward clutch group requires repair) and notify general support maintenance.

c. If pressure indication in any one position of speed selector varies more than 5 PSI from other indications, replace transmission (para 3-19c) (clutch group associated with speed selector position in which pressure indication varied more than 5 PSI requires repair) and notify general support maintenance.

---

**3-18. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES TROUBLESHOOTING**


---

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 1. CONTINUOUS AXLE OR WHEEL NOISE

**WARNING**

Before raising wheel off ground, be sure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jack or jack stands causing serious injury or death. If you are injured by falling equipment, obtain medical aid immediately.

Check axle shafts for damage (para 2-39f).

If axle shafts are not damaged, replace differential carrier assembly (para 3-20c or 3-20d) and notify general support maintenance.

## 2. LUBRICANT LEAKING FROM DIFFERENTIAL CARRIER ASSEMBLY

Step 1. Check if lubricant is leaking between axle housing and differential carrier assembly.

- a. If lubricant is leaking between axle housing and differential carrier assembly, remove differential carrier assembly, clean mating surfaces, apply sealer, and reinstall (para 3-20c or 3-20d).
- b. If lubricant is not leaking between axle housing and differential carrier assembly, proceed to step 2 below.

Step 2. Check if lubricant is leaking from differential carrier assembly housing (indicating cracked housing) or from area near yoke.

Remove and replace differential carrier assembly (para 3-20c or 3-20d) and notify general support maintenance (housing, oil slinger, or shims may require replacement).

**3-19. TRANSMISSION MAINTENANCE**

*a. Transmission Pressure Checks.*

This task covers checking the transmission pressure.

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Pressure Gage, zero to 300 PSI range  
 Hard Wooden Blocks (2), 6 by 6 by 18 inches

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph 2-53c  
 Condition Description  
 Side panels removed.

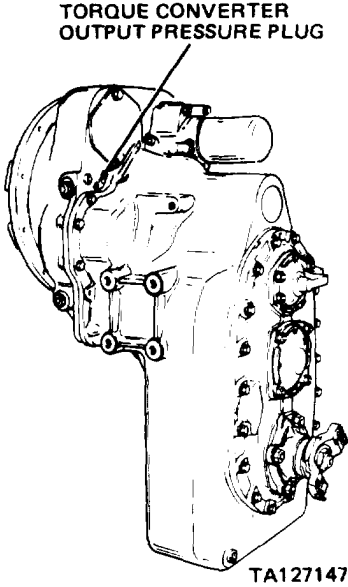
MATERIALS/ PARTS

None

PROCEDURE				NORMAL INDICATION	REMARKS
STEP	LOCATION	ITEM	ACTION		
<b>NOTE</b>					
If vehicle cannot be driven to warm-up transmission oil, block wheels and proceed to step 2; otherwise, disregard step 2.					
1	Operator's compartment	a. Ignition switch b. START switch c. Parking brake d. Direction selector e. Speed selector  f. Ignition switch	ON Depress Release F 3  OFF	Engine starts	Drive vehicle for 15 minutes to warm transmission oil
2	Operator's compartment	a. Ignition switch b. START switch c. Parking brake	ON Depress Apply	Engine starts	
<b><u>WARNING</u></b>					
Don't allow anyone to stand in front of vehicle during following steps. Vehicle could move, causing serious injury or death to anyone standing in front of vehicle.					
<b>NOTE</b>					
Apply service brakes as required during following steps.					
		d. Direction selector e. Speed selector f. Accelerator pedal  g. Ignition switch	F 3 Depress half to three quarters OFF		Until transmission oil temperature is 180 to 200 degrees F

**3-19. TRANSMISSION MAINTENANCE (cont)**

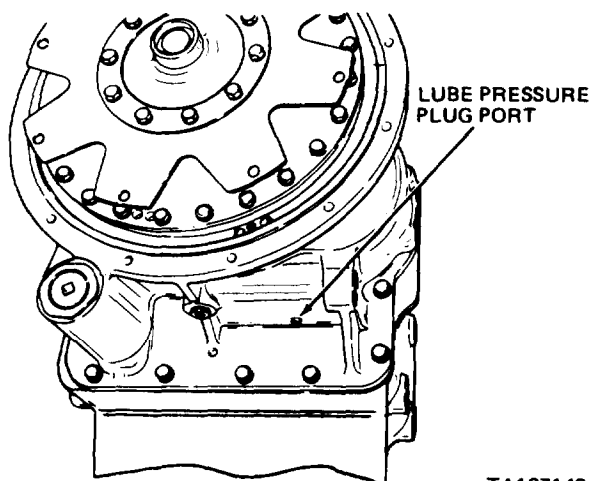
*a. Transmission Pressure Check (cont).*

PROCEDURE				NORMAL INDICATION	REMARKS
STEP	LOCATION	ITEM	ACTION		
3	Engine compartment, transmission	a. Torque converter output pressure plug	Remove		
		b. Zero to 300 PSI pressure gage	Connect		
4	Wheels	Wheel chocks	Position		Block wheels
5	Operator's compartment	a. Ignition switch	ON	Engine starts	Para 3-17, LOSS OF DRIVE IN ALL RANGES, step 2, and LOSS OF POWER AND/OR LOSS OF DRIVE IN ANY ONE RANGE, step 1
		b. START switch	Depress		
		c. Parking brake	Apply	Pressure gage indicates 25 PSI minimum to 70 PSI maximum at 2000 RPM engine speed	
		d. Direction selector	N		
		e. Accelerator pedal	Depress		
		f. Accelerator pedal	Release		

**3-19. TRANSMISSION MAINTENANCE (cont)**

*a. Transmission Pressure Checks (cont).*

PROCEDURE				NORMAL INDICATION	REMARKS
STEP	LOCATION	ITEM	ACTION		
<b>WARNING</b>					
5 cent) Don't allow anyone in front or rear of vehicle during following steps.					
<b>NOTE</b>					
Apply service brakes as required during following checks.					
g. Direction selector F					
		h. Speed selector	Shift thru 1, 2, and 3 while observing pressure gage	Pressure gage indicates 180-220 PSI with engine at idle (400 to 600 RPM). Clutch pressures must be within 5 PSI	Para 3-17, LOSS OF POWER AND/OR LOSS OF DRIVE IN ANY ONE RANGE, step 3
i. Direction selector R					
		j. Speed selector	Shift thru 1, 2, and 3 while observing pressure gage	Pressure gage indicates 180-220 PSI with engine at idle (400 to 600 RPM). Clutch pressures must be within 5 PSI	Para 3-17, LOSS OF POWER AND/OR LOSS OF DRIVE IN ANY ONE RANGE, step 3
k. Ignition switch OFF					
6	Engine compartment, transmission	a. Pressure gage	Disconnect		From torque converter output pressure port
		b. Pressure plug	Reinstall		In torque converter
		c. Lube pressure port plug	Remove		
		d. Zero to 300 PSI pressure gage	Connect		To lube pressure port



TA127148

**3-19. TRANSMISSION MAINTENANCE (cont)**

a. *Transmission Pressure Checks (cont).*

PROCEDURE				NORMAL INDICATION	REMARKS
STEP	LOCATION	ITEM	ACTION		
7	Operator's compartment	a. Ignition switch	ON	Engine starts  Pressure gage indicates between 15 to 25 PSI at 2000 RPM engine speed	Para 3-17, HIGH TRANSMISSION OIL TEMPERATURE; LOSS OF DRIVE IN ALL RANGES, step 3; LOSS OF POWER AND/OR LOSS OF DRIVE IN ANY ONE RANGE, step 2
		b. START switch	Depress		
		c. Direction selector	N		
		d. Accelerator pedal	Depress		
		e. Ignition switch	OFF		
8	Engine compartment, transmission	a. Pressure gage	Disconnect	From transmission lube pressure port In transmission lube pressure port	
		b. Lube pressure port plug	Reinstall		
9	Wheels	Wheel chocks	Remove	Checks completed	





**3-19. TRANSMISSION MAINTENANCE (cont)**

b. Transmission Mounts (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Engine compartment, front	<b>NOTE</b>		
		Remove and reinstall transmission mount on one side only; then repeat procedure for remaining mount.		
		a. Lock nut (1) and washer (2)	Loosen and remove	Discard lock nut (1)
		b. Cap screw (3)	Lift and remove	If necessary, gently tap threaded end of cap screw using hammer
		c. Transmission housing	Lift	Place jack under transmission housing on same side as mount being removed.
		d. Transmission mount (4)	Remove and discard	Raise transmission and bracket (7) to relieve pressure on mount (4)
				Pry and lift from vehicle frame
<b>NOTE</b>				
Remove the following parts only if required for replacement.				
		e. Four cap screws (5) and washers (6)	Loosen and remove	Support bracket (7)
		f. Mount bracket (7)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**3-19. TRANSMISSION MAINTENANCE (cont)**

*b. Transmission Mounts (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
INSPECTION				
3		Mount bracket (7)	Inspect	Replace if cracked, distorted or worn
4		All other parts	Inspect	Replace if worn, or if threads damaged
INSTALLATION				
5	Engine compartment, front	a. Mount bracket (7) b. Four washers (6) and cap screws (5) c. New mount (4) d. Transmission housing	Position Install and tighten Install Lower	Against transmission Until bracket (7) is securely mounted From top of vehicle frame Lower jack until bracket (7) rests on mount (4)
		e. Cap screw (3), washer (2), and new lock nut (1)	Install and tighten	Until bottom of mount (4) expands to same diameter as washer (2)
<b>NOTE</b>				
Repeat preceding steps to replace remaining transmission mount.				

**3-19. TRANSMISSION MAINTENANCE (cont)**

*c. Transmission Removal.*

**NOTE**

Refer to paragraph 3-5d for separation of transmission from engine.

*d. Control Valve and Modulation Valve Assemblies.*

This task covers:     a. Removal  
                              b. Installation

**INITIAL SETUP**

**TOOLS**  
No. 1 Common Organizational Maintenance Tool Kit

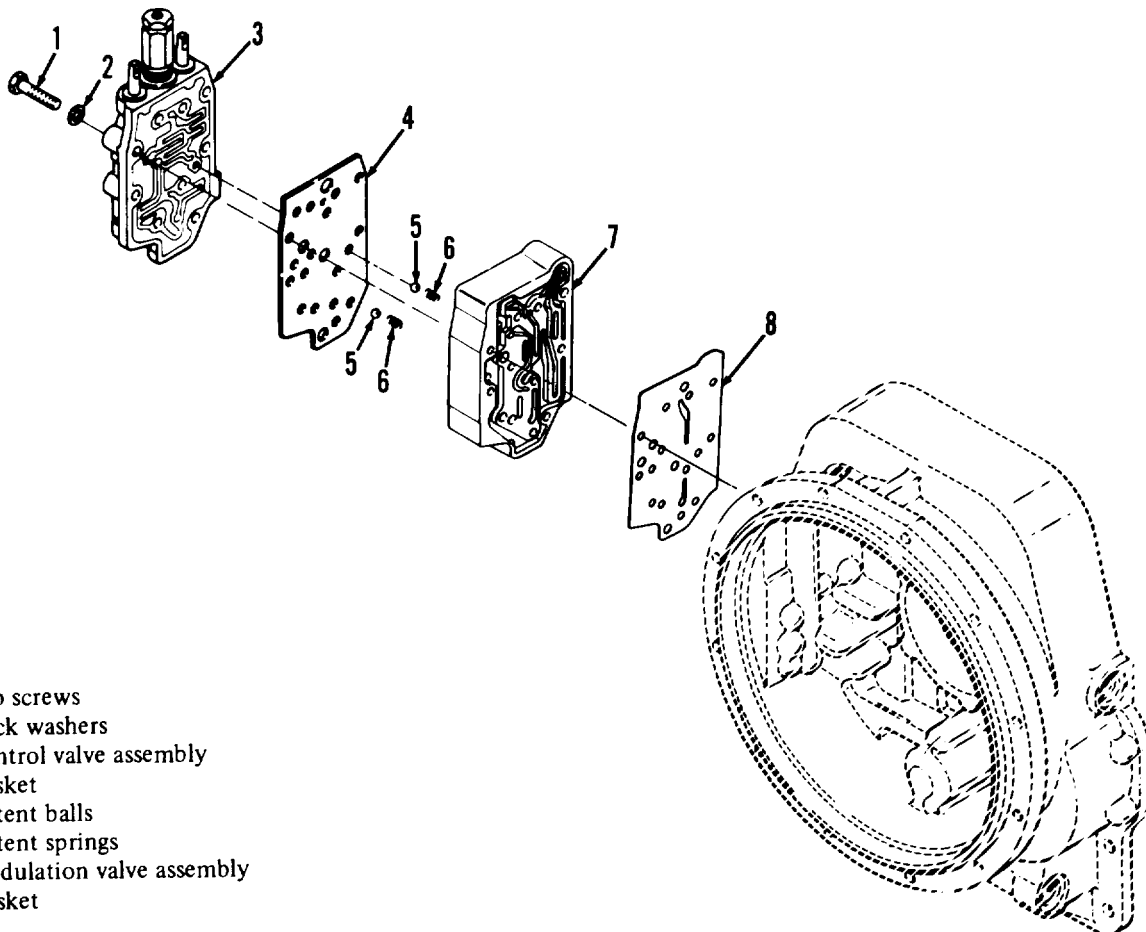
NSN 4910-00-754-0654

**EQUIPMENT CONDITION**  
Paragraph

**Condition Description**  
Vehicle parked on level surface, engine off and parking brake applied.  
Left side panel removed.  
Control valve linkage disconnected.

**MATERIALS/PARTS**  
Gaskets  
Cleaning solvent P-D-680  
Clean cloths

2-53c  
2-38b



**KEY**

- 1. Cap screws
- 2. Lock washers
- 3. Control valve assembly
- 4. Gasket
- 5. Detent balls
- 6. Detent springs
- 7. Modulation valve assembly
- 8. Gasket

TA127150

**3-19. TRANSMISSION MAINTENANCE (cont)**

*d. Control Valve and Modulation Valve Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission, left side	a. Nine cap screws (1) and lock washers (2)	Remove	Support control valve (3) and modulation valve (7)
<b><u>CAUTION</u></b>				
When performing following step, be careful not to lose detent balls (5) or springs (6).				
		b. Control valve (3) and modulation valve (7)	Remove	
		c. Two detent balls (5) and springs (6)	Remove	From control valve assembly (3)
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
		d. Gaskets (4 and 8)	Remove and discard	Clean all traces of gasket material from mounting surfaces with cleaning solvent P-D-680
<b>INSTALLATION</b>				
2	Transmission, left side	a. Two detent springs (6)	Install	
		b. Two detent balls (5)	Install	
		c. New gaskets (4 and 8)	Position	On modulation valve assembly (7)
		d. Control valve assembly (3)	Position	On modulation valve assembly (7)
		e. Nine cap screws (1) and lock washers (2)	Install	Through control valve (3), modulation valve (7), and gaskets (4 and 8)
		f. Valves (3 and 7) with cap screws (1), lock washers (2), and gaskets (4 and 8)	Position	Against transmission, with mounting holes aligned
		g. Nine cap screws (1)	Install and tighten	To 23-25 pounds foot torque

**3-19. TRANSMISSION MAINTENANCE (cont)**

*e. Charging Pump Assembly.*

This task covers:   a. Removal  
                          b. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
Clamping Type Filter Wrench  
Container, 4 gallon capacity

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

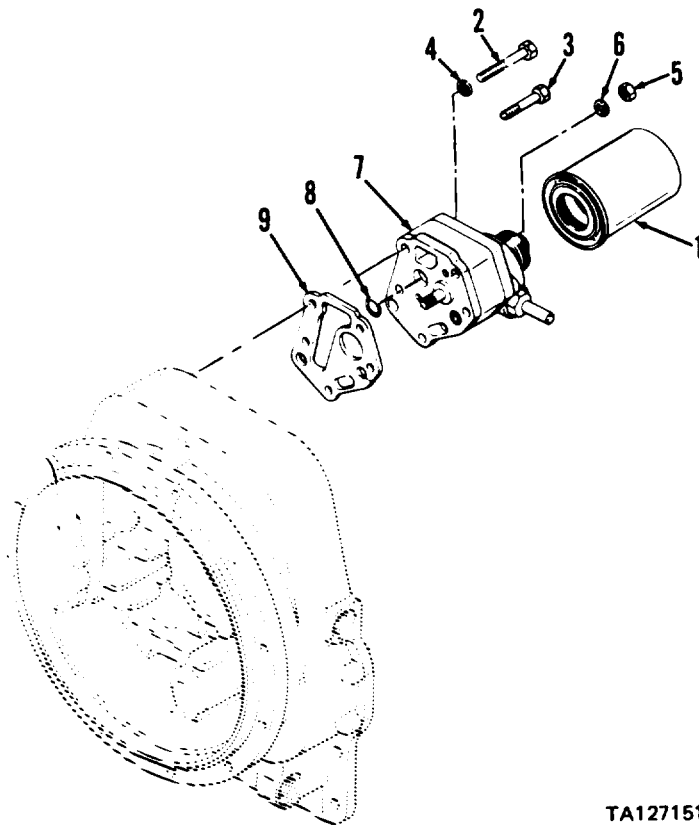
2-53c

Equipment Condition

Vehicle parked on level surface, engine off and parking brake applied.  
Left side panel removed.

MATERIALS/PARTS

Filter assembly  
O-ring  
Gasket  
Cleaning solvent P-D-680  
Clean cloths



KEY

- 1. Filter assembly
- 2. Cap screw
- 3. Cap screws
- 4. Lock washer
- 5. Nuts
- 6. Lock washers
- 7. Charging pump assembly
- 8. O-ring
- 9. Gasket

TA127151

**3-19. TRANSMISSION MAINTENANCE (cont)**

*e. Charging Pump Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Transmission, rear	a. Filter assembly (1)	Loosen and remove	Place 4 gallon capacity container under filter assembly to catch hydraulic oil
		b. Cap screw (2) and lock washer (4)	Remove	
		c. Two cap screws (3), nuts (5), and lock washers (6)	Remove	
		d. Charging pump assembly (7)	Remove	
		e. O-ring (8)	Remove and discard	
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
		f. Gasket (9)	Remove and discard	Clean all traces of gasket material from mounting surface with cleaning solvent P-D-680
<b>INSTALLATION</b>				
2	Transmission, rear	a. Gasket (9)	Position	
		b. O-ring (8)	Position	
		c. Charging pump assembly (7)	Position on mounting studs	
		d. Two nuts (5) and lock washers (6)	Install	Tighten to 41-45 pounds foot torque
		e. Three cap screws (2 and 3) and lock washer (4)	Install	Tighten to 37-41 pounds foot torque
		f. Filter assembly (1)	Apply light film of oil to gasket then install	Tighten to 20-25 pounds foot torque

**3-19. TRANSMISSION MAINTENANCE (cont)**

*f. Transmission Oil Cooler.*

- This task covers: a. Cleaning  
b. Inspection and Repair

INITIAL SETUP

TOOLS		EQUIPMENT CONDITION
Shop Equipment, Welding	NSN 3740-00-357-7268	Paragraph 2-38g
		Condition Description Transmission oil cooler removed.

- MATERIALS/PARTS  
Clean hydraulic oil (refer to current lubrication order)  
Cleaning solvent P-D-680  
Clean cloths

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
1		Transmission oil cooler	a. Clean exterior	Use cleaning solvent P-D-680
<b><u>CAUTION</u></b>				
Don't use flushing compounds in following step.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
			b. Clean interior by back flushing with clean hydraulic oil and compressed air until all foreign material removed; then steam clean interior	
INSPECTION AND REPAIR				
2		Transmission oil cooler	Inspect for broken welds and brazed joints. Repair by welding and brazing broken joints. If not feasible to repair, replace transmission oil cooler	

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE**

*a. Front Axle Assembly.*

This task covers: a. Removal  
b. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
Jack Stands, 4 ton capacity (2)  
Chain Hoist, 10 ton capacity  
Roller Jack, one ton capacity  
Hard Wooden Block (2),  
6 by 6 by 18 inches

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off, rear wheels blocked, and parking brake applied.

2-4b(1)

Shipping lock pin installed.

2-39a

Front drive shaft assembly disconnected from front axle assembly differential companion yoke.

MATERIALS/PARTS

Hose (FSCM 81343 P/N SAE30R2TYPE1-1-41D)

2-47

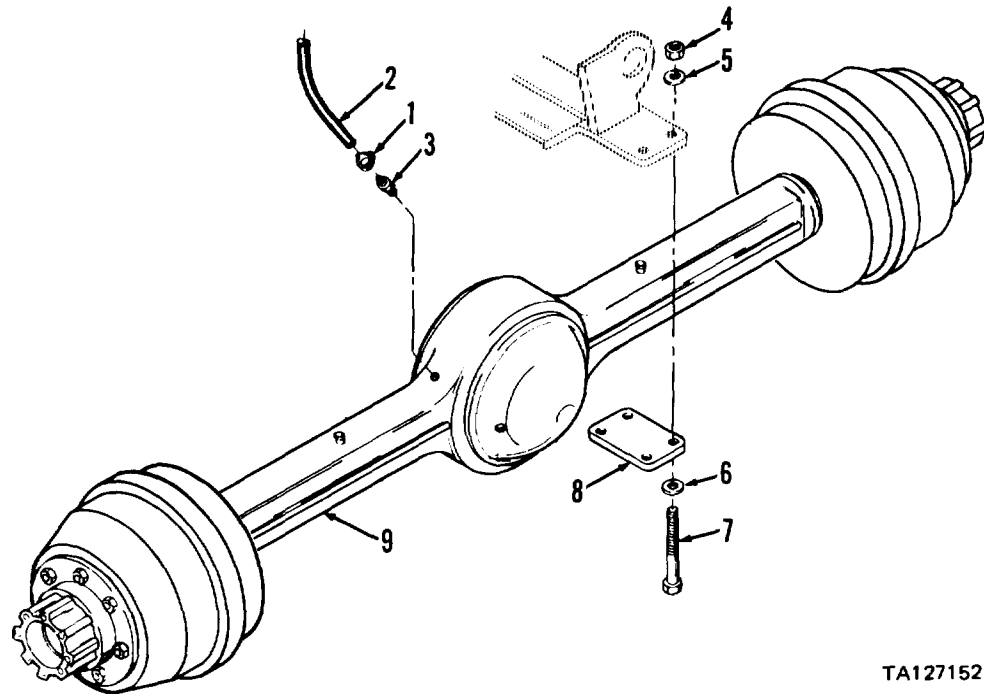
Front chassis raised (use chain hoist) and securely blocked (use jack stands).

2-43b

Front wheels and tires removed.  
Brake hoses, lines and fittings disconnected from front axle assembly housing and wheel cylinders.

KEY

- 1. Clamp
- 2. Vent hose
- 3. Connector
- 4. Nuts
- 5. Washers
- 6. Washers
- 7. Cap screws
- 8. Axle support plates
- 9. Front axle assembly



TA127152



**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*a. Front Axle Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Axle housing	a. Roller jack b. Clamp (1) c. Vent hose (2) d. Connector (3)	Position under axle assembly Loosen Disconnect Remove; plug port in axle housing	
2	Bottom front of vehicle	a. Eight nuts (4), washers (5 and 6), and cap screws (7) b. Two axle support plates (8) c. Front axle assembly (9)	Remove  Remove  Lower roller jack, move out of position and remove to work area	
<b>INSTALLATION/REPLACEMENT</b>				
3	Bottom front of vehicle	a. Front axle assembly (9) b. Two axle support plates (8) c. Eight cap screws (7), washers (6 and 5), and nuts (4)	Using roller jack, move into position and raise Position Install	
4	Axle housing	a. Connector (3) b. Clamp (1) c. Vent hose (2)  d. Clamp (1) e. Axle assembly fill plug	Install Position Connect to connector  Tighten Check lubricant level and add if necessary	On vent hose (2) If necessary, make hose from FSCM 81343 P/N SAE30R2type 1-1-41D; cut to 27 inches long  Para 2-39d, step 4

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*b. Rear Axle Assembly.*

This task covers: a. Removal  
b. installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
Jack Stands, 4 ton capacity (2)  
Chain Hoist, 10 ton capacity  
Roller Jack, one ton capacity  
Hard Wooden Blocks (2),  
6 by 6 by 18 inches

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off, front wheels blocked, and parking brake applied.

2-4b(1)  
2-39c

Shipping lock pin installed.  
Rear drive shaft assembly disconnected from rear axle assembly differential companion yoke.

MATERIALS/PARTS

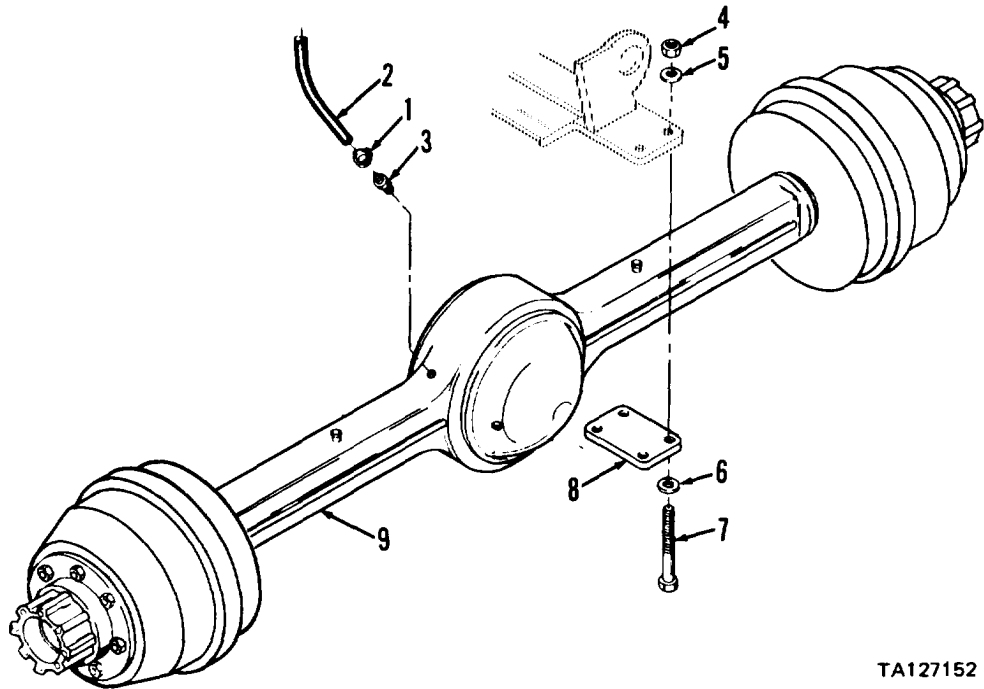
Hose (FSCM 81343 P/N SAE30R2TYPE1-1-41D)

2-47  
2-43b

Rear chassis raised (use chain hoist) and securely blocked (use jack stands).  
Rear wheels and tires removed.  
Brake hoses, lines and fittings disconnected from rear axle assembly housing and wheel cylinders.

KEY

- 1. Clamp
- 2. Vent hose
- 3. Connector
- 4. Nuts
- 5. Washers
- 6. Washers
- 7. Cap screws
- 8. Axle support plates
- 9. Rear axle assembly



TA127152

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*b. Rear Axle Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Axle housing	a. Roller jack b. Clamp (1) c. Vent hose (2) d. Connector (3)	Position under axle assembly Loosen Disconnect Remove	
2	Bottom rear of vehicle	a. Eight nuts (4), washers (5 and 6), and cap screws (7) b. Two axle support plates (8) c. Rear axle assembly (9)	Remove Remove Lower roller jack, move out of position and remove to work area	
<b>INSTALLATION</b>				
3	Bottom rear of vehicle	a. Rear axle assembly (9) b. Two axle support plates (8) c. Eight cap screws (7), washers (6 and 5), and nuts (4)	Using roller jack, move into position and raise Position Install	
4	Axle housing	a. Connector (3) b. Clamp (1) c. Vent hose (2)  d. Clamp (1) e. Axle assembly fill plug	Install Position Connect to connector (3)  Tighten Check lubricant level and add if necessary	On vent hose (2) If necessary, make hose from FSCM 81343 P/N SAE30R2TYPE1-141D; cut to 32 inches long  Para 2-39d, step 4



**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*c. Front Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
2	Side of vehicle	Two axle shafts	Remove	Para 2-39f, step 1b and 1c
3	Axle housing, bottom	a. Roller jack b. Two cap screws  c. 14 cap screws and washers d. Differential carrier assembly  e. Two cap screws and washers	Position as shown Loosen cap screws Remove Loosen by striking with rawhide mallet Remove	Prevents assembly from falling after remaining cap screws are removed and assembly broken loose from housing
		f. Differential carrier assembly	Remove to clean work area	Use small pinch bar with rounded end to straighten assembly in housing bore

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*c. Front Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
AXLE HOUSING CLEANING				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air, Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
4	Axle housing	Differential carrier bore	Remove accumulation of dirt, grit, or gum from axle housing bowl. Clean with cleaning solvent P-D-680; dry with moisture free compressed air. Remove all traces of sealer from mounting surface	
AXLE HOUSING INSPECTION				
5	Axle housing	Differential carrier bore	Inspect for cracks, nicks and burrs at machined surface. Remove nicks and burrs with soft stone or crocus cloth	
INSTALLATION				
6	Axle housing, differential bore	a. Differential carrier assembly b. Housing bore c. Differential carrier assembly	Place on roller jack and roll into position Apply sealer around mounting surface Position in housing bore	

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*c. Front Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
6 (cont)	<b>NOTE</b>			
Be sure you install correct size cap screw in mounting hole as shown in illustration in following step.				
d.	Four cap screws and washers	Install equally spaced and tighten alternately to draw assembly into housing bore		
e.	12 cap screws and washers	Install as shown	TA127155	
<b>NOTE</b>				
Tighten 7/16-14 cap screws to 70-80 pounds foot torque; tighten 1/2-13 cap screws to 110-130 pounds foot torque.				
f.	Roller jack	Remove from under axle housing		
g.	Drain plug	Install		

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*c. Front Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
7	Side of vehicle	Two axle shafts	Install	Para 2-39f, steps 12i and 12j
8	Axle assembly	Differential carrier assembly	Fill with lubricant	Para 2-39d, steps 2 and 4
9	Differential carrier assembly	Front drive shaft assembly	Connect to differential companion yoke	Para 2-39a, step 12
10	Transmission rear output flange	Rear drive shaft assembly	Disconnect	Para 2-39c, step 1
11	Front axle	Tires and wheels	Raise off ground, place jack stands under axle housing	
<b><u>WARNING</u></b>				
Don't allow anyone to stand in front of vehicle during following step; be sure front axle is securely blocked. Vehicle could slip off jack stands and hit anyone standing in front causing serious injury or death.				
12	Operator's compartment		a. Start engine and operate at idle speed b. Place transmission direction selector in F (forward) position and place speed selector in 3 (third) position c. Disengage parking brake and operate vehicle for five minutes at full throttle to assure satisfactory lubrication of differential carrier assembly parts d. Turn engine off and apply parking brake	
13	Front axle	Tires and wheels	Remove jack stands; lower to ground	
14	Transmission rear output flange	Rear drive shaft assembly	Connect	Para 2-39c, step 10



**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*d. Rear Axle Differential Carrier Assembly.*

This task covers: a. Removal c. Axle housing inspection  
 b. Axle housing cleaning d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Roller Jack, 1/4 ton capacity  
 Jack Stands, 4 ton capacity  
 Container, 4 gallon capacity  
 Hard Wooden Blocks (2), 6 by 6 by 18 inches

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, engine off, wheels blocked, and parking brake applied.

2-4b(1)

Shipping lock pin installed.

2-39c

Rear drive shaft assembly disconnected from rear axle assembly differential companion yoke.

2-43b, step 6

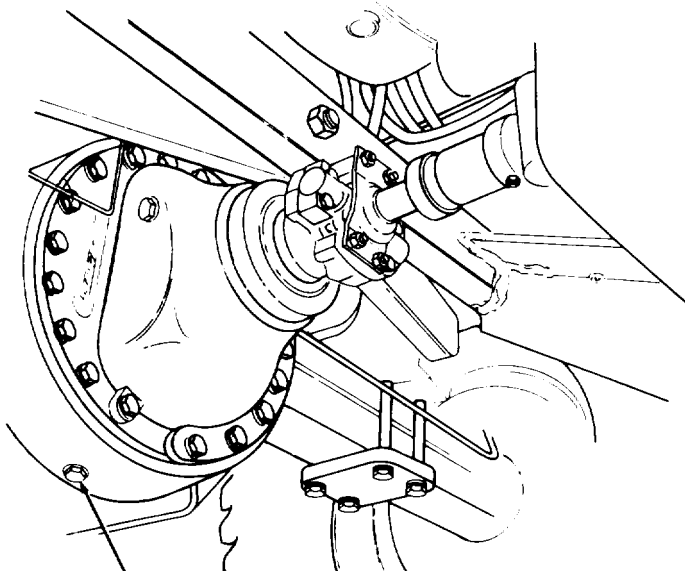
Brake line removed.

3-20b

Rear axle assembly mounting hardware removed and rear chassis raised 12 inches above rear axle assembly and blocked.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Sealer (FSCM 78500 P/N 1199Q2981)  
 Moisture free compressed air  
 Crocus cloth

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Axle housing, bottom	a. Container b. Drain plug	Place under drain plug Remove and drain lubricant	Drain lubricant into 4 gallon container
				
		c. Container	Remove	Discard lubricant

TA127153

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*d. Rear Axle Differential Carrier Assembly (cont).*

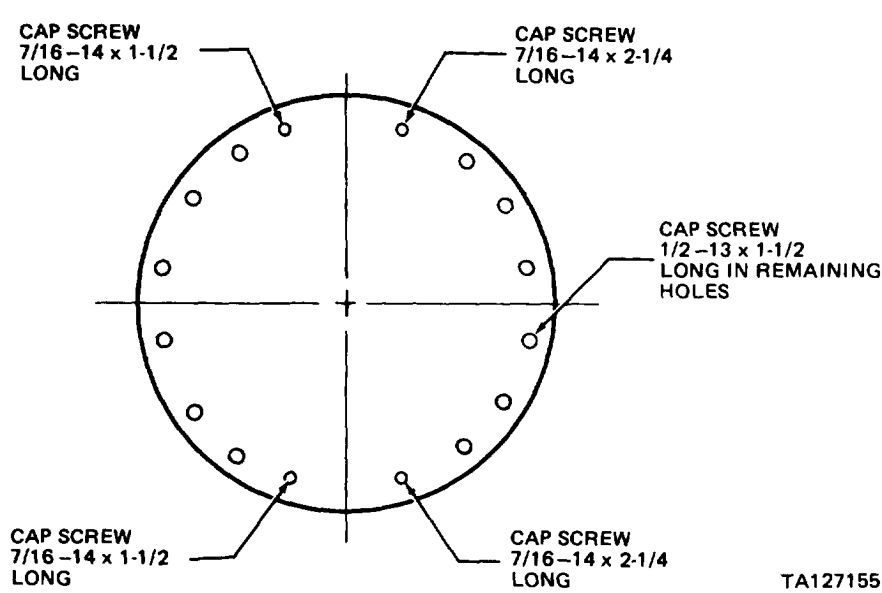
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
2	Side of vehicle	Two axle shafts	Remove	Para 2-39f, steps 1 b and 1 c
3	Axle housing, bottom	a. Roller jack	Position as shown	
		b. Two cap screws	Loosen cap screws shown	Prevents assembly from falling after remaining cap screws are removed and assembly broken loose from housing
		c. 14 cap screws and washers	Remove	
		d. Differential carrier assembly	Loosen by striking with rawhide mallet	
		e. Two cap screws and washers	Remove	
<p style="text-align: center;"> <b>LOOSEN THESE CAP SCREWS. REMOVE AFTER ASSEMBLY IS BROKEN LOOSE FROM AXLE HOUSING</b> </p>				
		f. Differential carrier assembly	Remove to clean work area	Use small pinch bar with rounded end to straighten assembly in housing bore

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)***d. Rear Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
AXLE HOUSING CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4	Axle housing	Differential carrier bore	Remove accumulation of dirt, grit, or gum from axle housing bowl. Clean with cleaning solvent P-D-680; dry with moisture free compressed air. Remove all traces of sealer from mounting surface	
AXLE HOUSING INSPECTION				
5	Axle housing	Differential carrier bore	Inspect for cracks, nicks and burrs at machined surface. Remove nicks and burrs with soft stone or crocus cloth	
INSTALLATION				
6	Axle housing, differential bore	a. Differential carrier assembly b. Housing bore c. Differential carrier assembly	Place on roller jack and roll into position Apply sealer around mounting surface Position in housing bore	

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)**

*d. Rear Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
6 (cont)	<b>NOTE</b>			
Be sure you install correct size cap screw in mounting hole as shown in illustration in following step.				
d. Four cap screws and washers		Install equally spaced and tighten alternately to draw assembly into housing bore		
 <p style="text-align: right;">TA127155</p>				
e. 12 cap screws and washers		Install as shown		
<b>NOTE</b>				
Tighten 7/16-14 cap screws to 70-80 pounds foot torque; tighten 1/2-13 cap screws to 110-130 pounds foot torque.				
f. Roller jack		Remove from under axle housing		
g. Drain plug		Install		

**3-20. AXLES AND DIFFERENTIAL CARRIER ASSEMBLIES MAINTENANCE (cont)***d. Rear Axle Differential Carrier Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
7	Side of vehicle	Two axle shafts	Install	Para 2-39f, steps 12i and 12j
8	Axle assembly	Differential carrier assembly	Fill with lubricant	Para 2-39d, steps 2 and 4
9	Differential carrier assembly	Rear drive shaft assembly	Connect to differential companion yoke	Para 2-39c, step 9
10	Transmission parking brake flange	Center drive shaft assembly	Disconnect	Para 2-39b, step 1
11	Rear axle	Tires and wheels	Raise off ground, place jack stands under axle housing	
<b><u>WARNING</u></b>				
Don't allow anyone to stand in front of vehicle during following step; be sure front axle is securely blocked. Vehicle could slip off jack stands and hit personnel standing in front causing serious injury or death.				
12	Operator's compartment		a. Start engine and operate at idle speed b. Place transmission direction selector in F (forward) position and place speed selector in 3 (third) position c. Disengage parking brake and operate vehicle for five minutes at full throttle to assure satisfactory lubrication of differential carrier assembly parts d. Turn engine off and apply parking brake	
13	Rear axle	Tires and wheels	Remove jack stands; lower to ground	
14	Transmission parking brake flange	Center drive shaft assembly	Connect	Para 2-39b, step 10

**Section IV. STEERING SYSTEM MAINTENANCE**

This section contains the information you'll need to maintain the:

- Steering wheel and column
- Steering gear
- Hydraulic pump
- Steering cylinder assemblies

It gives you instructions on how to troubleshoot problems and repair or replace the component that are within the scope of direct support maintenance.

	Para		Para
Troubleshooting Symptom Index . . . . .	3-21	Steering System Maintenance. . . . .	3-24
Hydraulic Pump Troubleshooting , . . . . .	3-22	Steering Wheel and Column . . . . .	3-24a
Steering Column and Cylinder		Steering Gear . . . . .	3-24b
Troubleshooting . . . . .	3-23	Hydraulic Pump Repair . . . . .	3-24c
		Steering Cylinder Assembly Repair . . . . .	3-24d

**3-21. TROUBLESHOOTING SYMPTOM INDEX**

HYDRAULIC PUMP	Para/Malfunction	Page
Vehicle will not turn when steering wheel is turned . . . . .	3-22/1	3-152
Hydraulic oil foaming . . . . .	3-22/2	3-153
Excessive hydraulic pump noise.. . . . .	3-22/3	3-153
<b>STEERING COLUMN AND CYLINDER</b>		
Effort to turn in one direction is more than required in other direction . . . . .	3-23/1	3-154
Steering wheel turns hard in both directions . . . . .	3-23/2	3-154

**3-22. HYDRAULIC PUMP TROUBLESHOOTING**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**1. VEHICLE WILL NOT TURN WHEN STEERING WHEEL IS TURNED**

- Step 1. Check that steering bypass valve is closed (extreme clockwise position) and hydraulic reservoir is filled with oil (refer to current lubrication order).  
 Start engine and run at full throttle while operating lift and tilt control levers.  
 Check that mast assembly operates normally when levers are actuated; then stop engine.
- a. If mast assembly does not operate normally, proceed to step 2.
  - b. If mast assembly operates normally, proceed to MALFUNCTION 2, HYDRAULIC OIL FOAMING.

## **3-22. HYDRAULIC PUMP TROUBLESHOOTING (cont)**

### MALFUNCTION

#### TEST OR INSPECTION

#### CORRECTIVE ACTION

### 1. VEHICLE WILL NOT TURN WHEN STEERING WHEEL IS TURNED (cont)

Step 2. Check setting of hydraulic relief valve (para 2-48b(2), step 20).

- a. If pressure indication is 2500 to 2550 PSI, proceed to MALFUNCTION 2, HYDRAULIC OIL FOAMING
- b. If pressure indication is not 2500 to 2550 PSI, adjust relief valve (para 2-48b(2), step 23).  
If adjusting relief valve does not change pressure indication, replace relief valve (para 2-48b(2)).  
If adjusting relief valve changes pressure indication, but will not adjust to 2500 to 2550 PSI, repair hydraulic pump (para 3-24c).

### 2. HYDRAULIC OIL FOAMING

Check for air leakage in suction hose, clamps and fittings to hydraulic pump.

- a. If air is leaking into suction hose, tighten clamps or replace fittings or hose (para 2-48b(2)).
- b. If air is not leaking into suction hose, proceed to MALFUNCTION 3, EXCESSIVE HYDRAULIC PUMP NOISE.

### 3. EXCESSIVE HYDRAULIC PUMP NOISE

Step 1. Check for illuminated HYDRAULIC FILTER indicator light.

- a. If HYDRAULIC FILTER light is on, replace hydraulic oil filter (para 2-56g(2)). If HYDRAULIC FILTER light remains on after changing oil filter, check for clogged hoses and fittings.
- b. If HYDRAULIC FILTER indicator light is not on, proceed to step 2.

Step 2. Check for plugged hydraulic reservoir strainer (para 2-56g(3)).

- a. Clean strainer to remove obstructions (para 2-56g(3)).
- b. If strainer is clean, and hydraulic pump operation is still noisy, proceed to step 3.

Step 3. Check for plugged suction hose and fittings (para 2-48b(2)).

- a. Replace obstructed suction hose and fittings (para 2-48b(2)).
- b. If suction hose and fittings are not obstructed, repair hydraulic pump (para 3-24c).

### 3-23. STEERING COLUMN AND CYLINDER TROUBLESHOOTING

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. EFFORT TO TURN IN ONE DIRECTION IS MORE THAN REQUIRED IN OTHER DIRECTION

Disconnect horn switch (para 2-32b) to gain access to steering wheel retaining nut.  
 Park vehicle on dry pavement and center steering wheel.  
 Start engine and operate at a fast idle.  
 Using a torque wrench on steering wheel retaining nut, measure and record effort required to turn steering wheel to the right.  
 Then, center steering wheel and measure and record effort required to turn steering wheel to the left.  
 The difference between the two torque readings should be less than 2 pound inches.

If the difference between torque readings for left turn and right turn is more than 2 pound inches, steering gear is damaged or has incorrect shims installed. Repair steering gear (para 3-24b).

2. STEERING WHEEL TURNS HARD IN BOTH DIRECTIONS

- Step 1. Park vehicle on dry pavement with engine off.  
 Turn steering wheel in both directions and check for binding or unusual noises at the steering column.
- a. If binding or unusual noises are detected, repair steering column (para 3-24a).
  - b. If steering wheel turns smoothly, without binding or unusual noises, proceed to step 2.

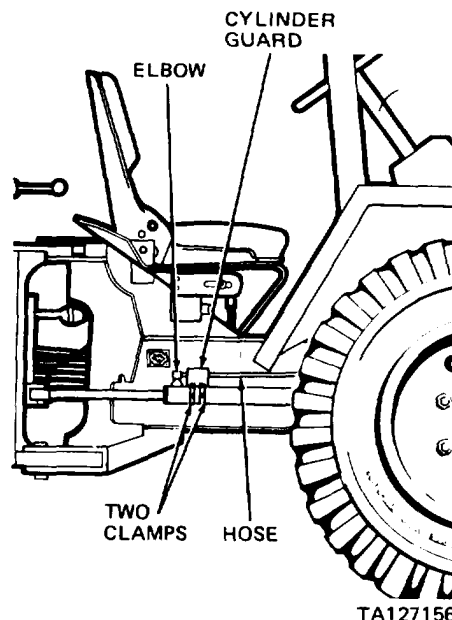
- Step 2. Rotate steering wheel until vehicle is fully turned (articulated) to the left.  
 With engine off, loosen two clamps and slide cylinder guard toward front of vehicle, and disconnect hose from elbow as shown.

**WARNING**

Keep hands and feet clear of steering cylinder assembly while checking for leakage. Failure to do so could cause bodily injury.

Start engine and hold steering wheel at the full left turn position.  
 Check for hydraulic oil leakage from the open steering cylinder elbow, then stop engine.

- a. Hydraulic oil coming from open steering cylinder elbow indicates internal steering cylinder leakage. Repair steering cylinder assembly (para 3-24d).
- b. If hydraulic oil does not leak from open steering cylinder elbow, proceed to step 3.





### 3-23. STEERING COLUMN AND CYLINDER TROUBLESHOOTING (cont)

#### MALFUNCTION

TEST OR INSPECTION  
CORRECTIVE ACTION

#### 2. STEERING WHEEL TURNS HARD IN BOTH DIRECTIONS (cont)

- Step 3. Rotate steering wheel until vehicle is fully turned (articulated) to the right. With engine off, loosen two clmps and slide cylinder guard toward front of vehicle, and disconnect hose from elbow as shown.

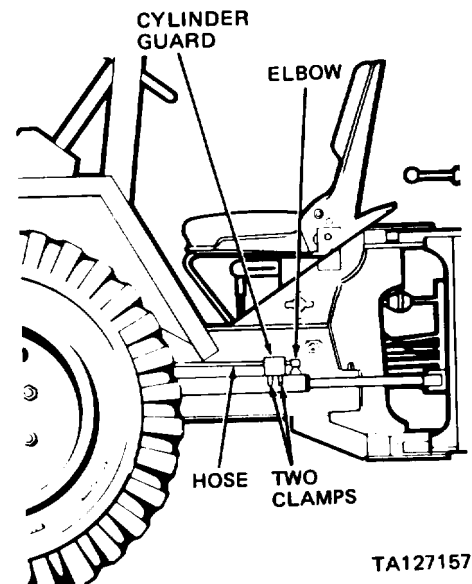
#### **WARNING**

Keep hands and feet clear of steering cylinder assembly while checking for leakage. Failure to do so could cause bodily injury.

Start engine and hold steering wheel at the full right turn position.

Check for hydraulic oil leakage from the open steering cylinder elbow, then stop engine.

- a. Hydraulic oil coming from open steering cylinder elbow indicates internal steering cylinder leakage. Repair steering cylinder assembly (para 3-24d).
- b. If hydraulic oil does not leak from open steering cylinder elbow, repair steering gear (para 3-24b).



**3-24. STEERING SYSTEM MAINTENANCE**

*a. Steering Wheel and Column.*

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning
  - d. Inspection/Repair
  - e. Reassembly
  - f. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description  
Vehicle parked on level surface and engine off.

2-32b

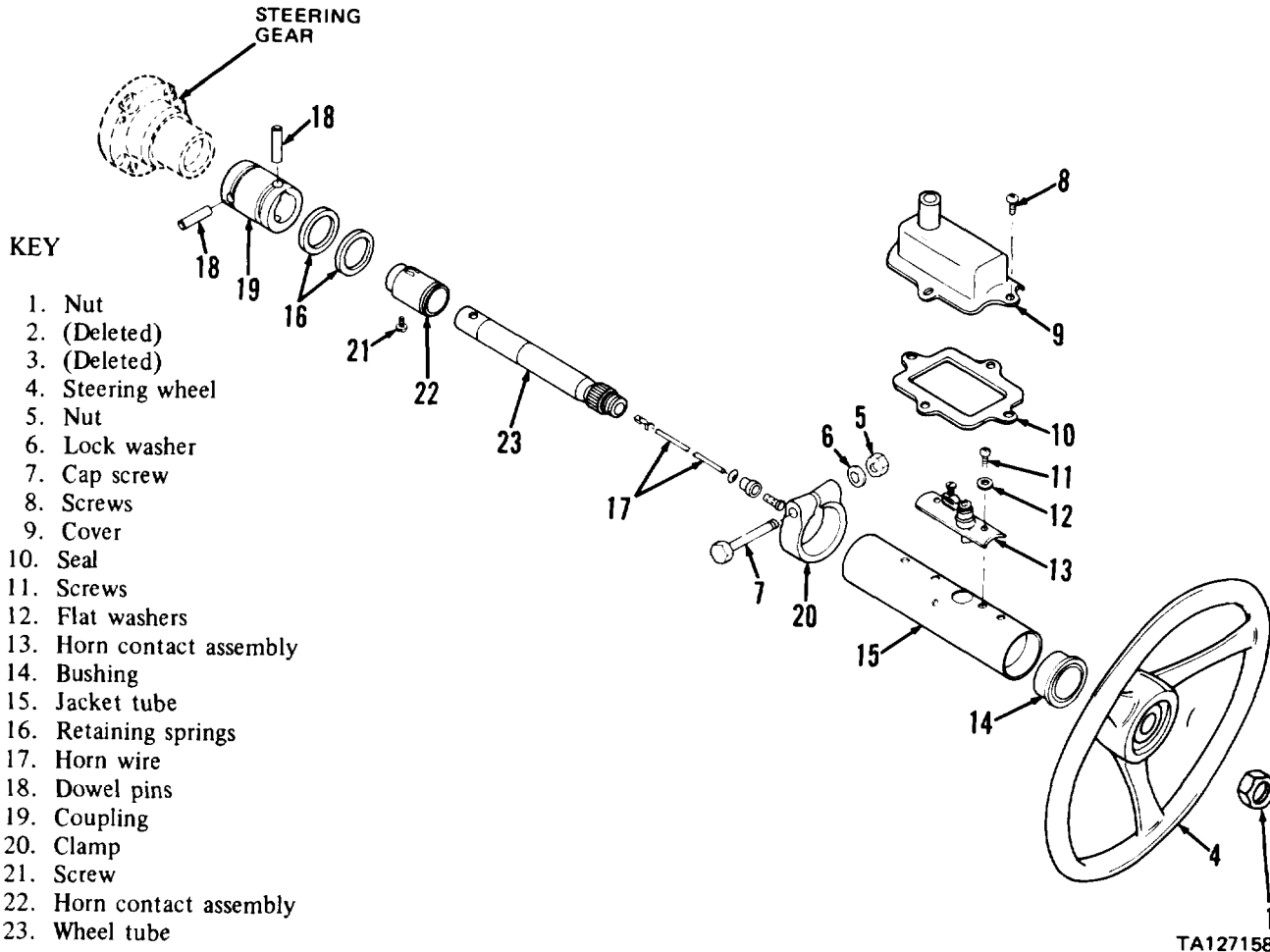
Horn switch removed from steering wheel.

MATERIALS/PARTS

Cleaning solvent P-D-680

Clean cloths

Lubricant (FSCM 77640 P/N 045096)



### **3-24. STEERING SYSTEM MAINTENANCE (cont)**

#### *a. Steering Wheel and Column (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS		
<b>REMOVAL</b>						
1	Steering wheel	a. Nut (1)	Loosen and remove			
		b. Steering wheel (4)	Lift and remove	Use suitable wheel puller if necessary		
<b>DISASSEMBLY</b>						
2	Steering column	a. Nut (5), lock washer (6) and cap screw (7)	Loosen and remove			
		b. Four screws (8)	Loosen and remove			
		c. Cover (9) and seal (10)	Remove	Remove all seal residue from cover (9) and jacket tube (15). Discard seal (10)		
		d. Two screws (11) and flat washers (12)	Loosen and remove			
		e. Horn contact assembly (13)	Lift and remove			
		f. Jacket tube (15) with bushing (14)	Lift and remove			
		g. Bushing (14)	Remove from jacket tube (15)	If necessary for replacement		
		h. Two springs (16)	Lift and remove			
		i. Horn wire (17)	Pull and remove	From top of wheel tube (23)		
		<b><u>CAUTION</u></b>				
		Do not strike pins (18) with heavy hammer blows in the following step. Heavy hammer blows may damage bearing in steering gear.				
		j. Two dowel pins (18)	Remove and discard	Lightly tap out using 5/16 inch brass rod and hammer		
		k. Coupling (19) and wheel tube (23)	Remove and separate			
		l. Clamp (20)	Remove	From upper cover of steering gear		
		m. Screw (21)	Loosen and remove			
		n. Horn contact assembly (22)	Pull and remove	From smooth end of wheel tube (23)		

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*a. Steering Wheel and Column (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>CLEANING</b>				
3		Cover (9), horn contact assembly (13), bushing (14), horn wire (17) and horn contact assembly (22)	Clean	Wipe with a clean, dry cloth
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
4		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
<b>INSPECTION/REPAIR</b>				
5		Horn contact assembly (13 and 22)	Inspect	Replace if cracked, pitted or scored, or if insulating paper cracked, torn or damaged
6		Retaining springs (16)	Inspect	Replace if cracked or distorted
7		Coupling (19) and wheel tube (23)	Inspect	Replace if pitted, scored or worn, or if counterbores for dowel pins (18) elongated. Replace wheel tube (23) if serrations chipped, broken or missing, or if threads damaged
8		Horn wire (17)	Inspect	Replace if insulation frayed, or conductor or terminals broken

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*a. Steering Wheel and Column (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION/REPAIR (cont)				
9		Nuts (1 and 5) and screws (7, 8, 11 and 21)	Inspect	Replace if worn, or if threads damaged
10		Steering wheel (4)	Inspect	Replace if cracked, or if serrations chipped, broken or missing
11		Jacket tube (15)	Inspect	Replace if cracked, distorted or out-of-round, or if threads damaged
12		Bushing (14)	Inspect	Replace if worn, damaged or deteriorated
13		All other parts	Inspect	Replace if worn or damaged
REASSEMBLY				
14	Steering column	a. Clamp (20) b. Horn-contact assembly (22) c. Horn wire (17) d. Screw (21) e. Coupling (19) f. Dowel pin (18)	Position Position Install Install and tighten Position Install	On Upper cover of steering gear On wheel tube (23) Until horn contact assembly (22) is securely mounted On wheel tube (23), with slot in coupling aligned with terminal on horn contact assembly (22) Use 5/16 inch brass rod. Press or tap in until centered in coupling (19)
<b>NOTE</b>				
Perform the following step only if bushing (14) was removed.				
		g. Bushing (14)	Install	Using soft plastic hammer, lightly tap until flush with top of jacket tube (15)
		h. Coupling (19) with wheel tube (23)	Position	On steering gear input shaft
<b>CAUTION</b>				
Do not strike dowel pins (18) with heavy hammer blows in the following step. Heavy hammer blows may damage bearing in steering gear.				
		i. Two dowel pins (18)	Install	Lightly tap in using 5/16 inch brass rod and hammer. Be sure dowel pins are centered in coupling (19)

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*a. Steering Wheel and Column (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
14 (cont)		j. Two retaining springs (16) k. Jacket tube (15) with bushing (14)	Install Position	In grooves of coupling (19) Apply lubricant (FSCM 77640, P/N 045096) to inside of bushing. Slide over wheel tube (23), through clamp (20) and onto upper cover of steering gear
		l. Cap screw (7), lock washer (6) and nut (5)	Install and tighten	Tighten to 15-20 pounds foot torque
		m. Horn contact assem- bly (13)	Position	On jacket tube (15)
		n. Two flat washers (12) and screws (11)	Install and tighten	Until horn contact assembly (13) is securely mounted
		o. Cover (9) and new seal (10)	Position	On jacket tube (15)
		p. Four screws (8)	Install and tighten	Until cover (9) is securely mounted
<b>INSTALLATION/REPLACEMENT</b>				
15	Steering wheel	a. Steering wheel (4)	Position	Slide over horn wire (17) and onto wheel tube serrations
		b. Nut (1)	Install and tighten	Tighten to 10-15 pounds foot torque

### **3-24. STEERING SYSTEM MAINTENANCE (cont)**

#### *b. Steering Gear.*

This task covers:

a. Removal	e. Repair
b. Disassembly	f. Reassembly
c. Cleaning	g. Installation/Replacement
d. Inspection	

#### INITIAL SETUP

#### TOOLS

No. 1 Common Organizational Maintenance Tool Kit      NSN 4910-00-754-0654

#### MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Grease (FSCM 77640 P/N 045113)  
 4 inch worm drive hose clamp (FSCM 66295 P/N 64H)  
 Two guide studs, 5/16-18UNC by 3-3/4 inch  
 Cellophane tape  
 O-rings  
 Rotor seal  
 Back-up washer  
 Seal  
 Dirt seal  
 600 grit abrasive cloth

#### EQUIPMENT CONDITION

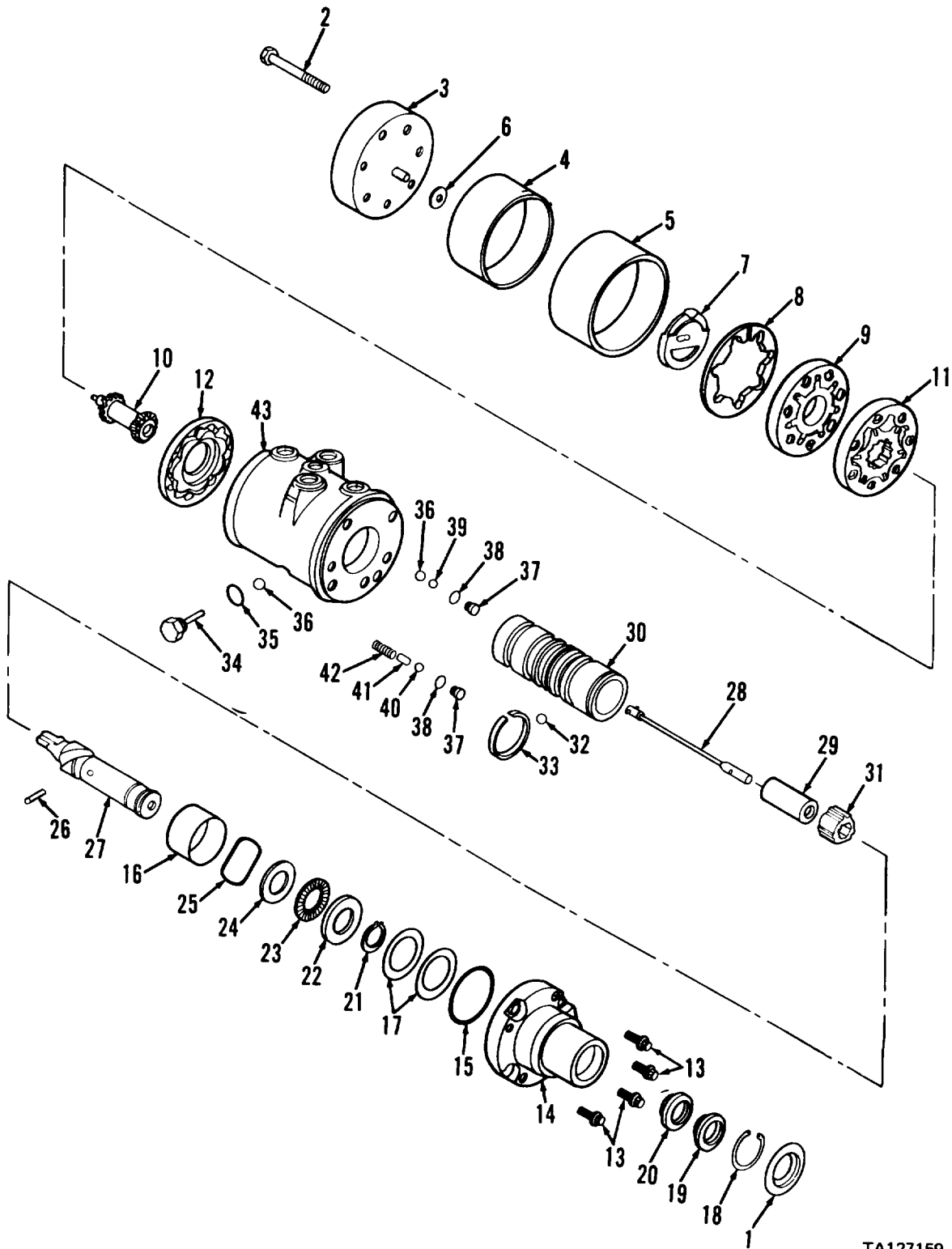
Paragraph	Condition Description
3-24a	Steering wheel and column removed.
2-48b(2)	Hoses and fittings disconnected from steering gear.

#### KEY

- |                    |                     |
|--------------------|---------------------|
| 1. Dirt seal       | 23. Thrust bearing  |
| 2. Hex bolts       | 24. Thrust washer   |
| 3. End cover       | 25. Spring washer   |
| 4. Rotor seal      | 26. Needle roller   |
| 5. Seal retainer   | 27. Input shaft     |
| 6. Wear washer     | 28. Torsion bar     |
| 7. Commutator      | 29. Spacer          |
| 8. Commutator ring | 30. Spool           |
| 9. Manifold        | 31. Drive ring      |
| 10. Drive link     | 32. Actuator ball   |
| 11. Rotor set      | 33. Retainer spring |
| 12. Spacer         | 34. Plug            |
| 13. Cap screws     | 35. O-ring          |
| 14. Upper cover    | 36. Balls, 1/4 inch |
| 15. O-ring         | 37. Plugs           |
| 16. Spacer         | 38. O-rings         |
| 17. Shim(s)        | 39. Ball, 7/32 inch |
| 18. Retaining ring | 40. Ball, 9/32 inch |
| 19. Back-up washer | 41. Needle roller   |
| 20. Seal           | 42. Spring          |
| 21. Retaining ring | 43. Housing         |
| 22. Thrust washer  |                     |

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

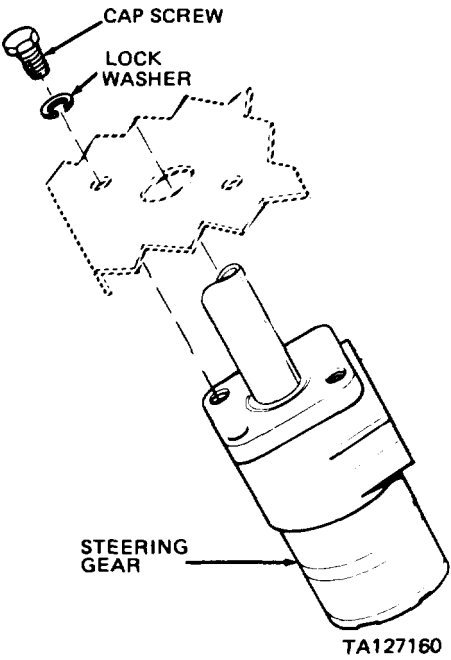


TA127159



**3-24. STEERING SYSTEM MAINTENANCE (cont)**

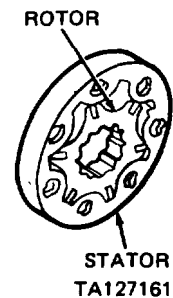
*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Instrument panel center	a. Four cap screws and lock washers b. Steering gear	Loosen and remove Lower and remove	Support steering gear
				
<b>DISASSEMBLY</b>				
2	Steering gear	a. Dirt seal (1)	Remove and discard	
<b><u>CAUTION</u></b>				
To prevent distortion of steering gear, do not clamp vise jaws directly on steering gear housing (43).				
		b. Steering gear	Position and clamp	Install O-ring tube fitting, with tube nut or fitting cap attached, into one of the four threaded ports in housing (43). Clamp the O-ring fitting in vise so that end cover (3) faces upward

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
2 (cont)		c. Seven hex bolts (2)	Loosen and remove	
<p><b>CAUTION</b></p> <p>Do not attempt to remove guide pin from inside center of end cover (3). Guide pin is press fit in the end cover and is not serviceable separately.</p>				
		d. End cover (3)	Loosen and remove	Lightly tap sides with soft hammer to loosen from rotor seal (4) and seal retainer (5). Washer (6) and commutator (7) may be removed with end cover (3)
3	Housing (43)	a. Rotor seal (4) and seal retainer (5)	Remove	Loosen seal retainer (5) by bumping sideways with a soft hammer, and remove seal (4) and retainer (5). Discard seal (4) From housing (43) or end cover (3)
		b. Wear washer (6) and commutator (7)	Remove	
		c. Commutator ring (8)	Remove from manifold (9)	Remove with a sliding and lifting motion
		d. Manifold (9)	Remove from rotor set (11)	Remove with a sliding and lifting motion
<p><b>CAUTION</b></p> <p>Rotor set (11) requires special attention in handling to avoid nicks and scratching. When handling rotor set, apply pressure to rotor by grasping rotor and urging into contact with stator.</p>				
		e. Rotor set (11), spacer (12) and drive link (10)	Remove as an assembly	Grasp spacer (12) and remove assembly with a sliding and lifting motion



**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
4	Rotor set (11)	a. Drive link (10) b. Spacer (12) c. Rotor set (11)	Remove Separate Carefully set aside	Slide rotor set (11) on spacer (12), allowing drive link teeth to clear spacer hole. From rotor set (11) To protect against damage to side faces of rotor and stator
5	Housing (43)	<b><u>CAUTION</u></b>		
		To prevent distortion of steering gear, do not clamp vise jaws directly on steering gear housing (43).		
		a. Housing (43)	Reposition and clamp	Clamp O-ring fitting in vise so that input shaft (27) faces upward
		b. Upper cover (14) and housing (43)	Match mark	Use center punch and hammer
		c. Four cap screws (13)	Loosen and remove	Use 5/16 inch 12 point socket
		<b><u>CAUTION</u></b>		
		Do not use excessive force to remove spool (30) from housing (43). Avoid applying side forces to input shaft (27) which would cause binding of spool (30).		
		d. Upper cover (14), input shaft (27) and, spool (30)	Remove from housing (43)	Grasp input shaft (27) and, with a smooth upward motion, remove as an assembly
		e. O-ring (15)	Remove and discard	
6	Upper cover (14)	a. Input shaft (27)	Remove	
		b. Shims (17)	Remove from cover (14) or face of thrust washer (22)	Retain shims for use at reassembly
		c. Spacer (16)	Remove	
		d. Retaining ring (18)	Remove	Use snap ring pliers
		e. Back-up washer (19) and seal (20)	Remove and discard	
7	Input shaft (27)	a. Retaining ring (21) b. Thrust washers (22 and 24), bearing (23) and spring washer (25)	Remove Pull and remove	

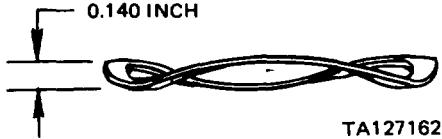
**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
7 (cont)		c. Needle roller (26)	Remove	Place input shaft (27) on a block of wood to prevent damage. Lightly tap out needle roller (26) using 0.120 inch pin punch and hammer
8	Spool (30)	a. Torsion bar (28) and spacer (29)	Remove	Invert spool (30) and catch free falling parts
<b>NOTE</b>				
Do not attempt to remove pin from end of torsion bar (28). Pin is press fit in torsion bar and is not serviceable separately.				
		b. Drive ring (31)	Remove	Place end of spool (30) on a table surface, and rotate input shaft (27) to extremes of travel until drive ring (31) falls free
		c. Input shaft (27) and actuator ball (32)	Remove	With end of spool (30) on a table surface, rotate input shaft clockwise until ball (32) disengages from helical groove in shaft. Carefully lift out input shaft and catch actuator ball
<b>NOTE</b>				
Remove retainer spring (33) only if required for replacement.				
		d. Retainer spring (33)	Remove from spool (30)	Grasp flattened end of retainer spring with pliers. Carefully pry flattened end over shoulder on spool with pliers and a screwdriver. Continue pulling motion, to progressively remove retainer spring, and avoid scratching or nicking spool
9	Housing (43)			<b>NOTE</b>
In the following steps, exercise care to prevent loss of small parts. If necessary, shake housing (43) to remove balls (36, 39 and 40).				
		a. Plug (34)	Loosen and remove	
		b. O-ring (35)	Remove and discard	
		c. Ball (36)	Remove	
		d. Two plugs (37)	Loosen and remove	

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
9 (cont)		e. Two O-rings (38)	Remove and discard	
		f. Balls (39,36 and 40)	Remove	
		g. Needle roller (41) and spring (42)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
10		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
<b>NOTE</b>				
Do not use cloths to dry internal parts.				
<b>INSPECTION</b>				
11		Spring washer (25)	Inspect	Replace if thickness is less than 0.140 inch as shown, or if cracked or distorted
				

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
12		Spring (42)	Inspect	Install in spring tester. Check that force to compress spring to 0.830 inch is 12.5 to 14.5 pounds. Replace spring if force is not 12.5 to 14.5 pounds
13		Torsion bar (28) and pin	Inspect	Use micrometer to measure diameter of pin on both sides, Diameter must not vary more than 0.001 inch. Replace torsion bar if scored, bent or worn, or if pin diameter varies more than 0.001 inch
14		Thrust washers (22 and 24), thrust bearing (23), and wear washer (6)	Inspect	Replace if pitted, scored or excessively worn
15		Input shaft (27)	Inspect	Replace if cracked or bent, if seal area is pitted, corroded or worn, or if helical groove is chipped or pitted
<b>NOTE</b>				
Light polishing of shaft due to seal contact is normal and is not cause for shaft replacement.				
16		Needle roller (26)	Inspect	Replace if cracked or damaged
17		Balls (32, 36, 39 and 40)	Inspect	Replace if pitted, scored, out-of-round or damaged
18		Retaining rings (18 and 21) and spring (33)	Inspect	Replace if cracked or broken
19		Screws (2 and 13) and plugs (34 and 37)	Inspect	Replace if worn, or if threads damaged
20		Drive link (10)	Inspect	Replace if cracked, or if teeth chipped, broken or excessively worn

**3-24. STEERING SYSTEM MAINTENANCE (cont)***b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
20 (cont)				<b>NOTE</b> Spool (30) is not serviced separately. Replace steering gear assembly if spool is defective.
21		spool (30)	Inspect	Replace steering gear assembly if splines chipped or broken, or if outside diameter or control edges scored, worn or damaged
22		End cover (3)	Inspect	Replace if pin damaged, or if lapped face nicked, burred, or scored
23		Upper cover (14)	Inspect	Replace if cracked or broken, or if end nicked or burred
24		Drive ring (31)	Inspect	Replace if splines chipped or damaged
<b>NOTE</b>				
				Housing (43) is not serviced separately. Replace steering gear assembly if housing is defective.
25		Housing (43)	Inspect	Replace steering gear assembly if threads damaged, or if bore or ends nicked, burred or scored
<b>NOTE</b>				
				Replace commutator (7) and commutator ring (8) as a matched set. Commutator and ring are not serviced separately.
26		Commutator (7) and commutator ring (8)	Inspect	Measure side clearance between commutator and ring. Replace commutator and ring if either is scored, pitted or burred, or if side clearance is more than 0.0015 inch
27		Manifold (9) and spacer (12)	Inspect	Replace if nicked, burred or scored

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

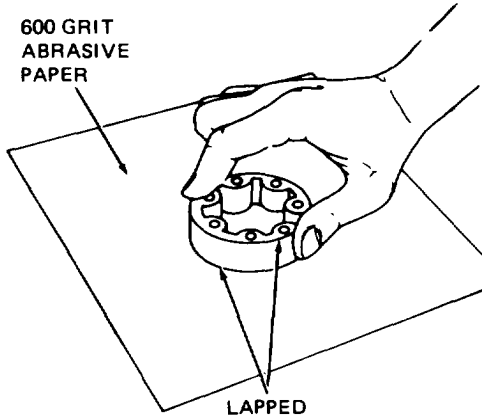
*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
28		Rotor set (11)	Inspect	Inspect lobes and faces of rotor and stator for scratches, burrs and scoring. Inspect splines in rotor for chipping, damage or excessive wear. Use micrometer to measure thickness (face-to-face) of rotor and stator. Replace rotor set (11) if lobes, faces or splines damaged, or if thickness difference between rotor and stator is more than 0.002 inch
29		Rotor set (11)	Check clearance	Place rotor set face down on the lapped face of the end cover (3). Use a tapered feeler gage to measure clearance between rotor and stator at each lobe. Replace rotor set if clearance is more than 0.007 inch
REPAIR				
30	<b>NOTE</b>			
If abrasive paper is new, it should be rubbed down with a piece of steel to remove sharp grit which would produce scratches.				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				



**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REPAIR</b>				
30 (cont)		Upper cover (14), housing (43), commutator ring (8), manifold (9) and spacer (12)	Clean up	Place 600 grit abrasive paper on an extremely flat surface. Hold each part so that contact with abrasive paper is as flat as possible, and lightly stroke 6 to 10 times across paper as shown. Check lapped face of each part for small bright areas which indicate burrs. Replace parts which cannot be cleaned up. After lapped surfaces are clean, wash parts with cleaning solvent P-D-680 and dry thoroughly with moisture free compressed air
<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;">  <p>600 GRIT ABRASIVE PAPER</p> <p>LAPPED FACES</p> </div> <div style="margin-left: 20px;"> <p>TA127163</p> </div> </div>				
<b>REASSEMBLY</b>				
31	Housing (43)	<b>NOTE</b>		
Do not lubricate parts unless instructed to do so.				
		a. Spring (42), needle roller (41), and ball (40)	Position	In cavity of housing (43)
		b. New O-ring (38) and plug (37)	Install and tighten	Until plug (37) is securely mounted
		c. Two steel balls (36 and 39)	Position	In cavity of housing (43)
		d. Plug (37) and new O-ring (38)	Install and tighten	Until plug (37) is securely mounted
		e. Steel ball (36)	Position	In side cavity of housing (43)
		f. Plug (34) and new O-ring (35)	Install and tighten	Tighten to 10-14 pounds foot torque
32	Input shaft (27) and spool (30)	a. Thrust bearing (23) and washers (22 and 24)	Position	On input shaft
		b. Retaining ring (21)	Install	Use snap ring pliers

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
32 (cont)	<b>NOTE</b>			
		Perform the following step only if retainer spring (33) has been removed.		
		c. New retainer spring (33)	Install	Carefully insert into groove on spool to avoid scratching or nicking spool
		d. Spring washer (25)	Position	Over thrust washer (24) and bearing (23)
		e. Actuator ball (32)	Position	In ball seat located inside spool (30)
		f. Input shaft (27)	Install in spool (30)	Hold input shaft and spool in a horizontal position. Insert input shaft into spool, engaging the helix and actuator ball with a counter-clockwise motion
		g. Torsion bar (28)	Position	Use mid-section of torsion bar as a gage, and insert torsion bar between spool end and thrust washer (24) as shown
		h. Input shaft (27) with spool (30)	Position vertically	Keeping torsion bar between spool end and thrust washer, place shaft and spool in a vertical position, with shaft end on a table surface
		i. Drive ring (31)	Position and install	Position drive ring in end of spool. Visually align an internal space on drive ring with a tooth on input shaft spline, and allow drive ring to drop to limit of its travel. Rotate input shaft slightly to allow drive ring to fully engage

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS	
<b>REASSEMBLY (cont)</b>					
32 (cont)		j. Torsion bar (28)	Remove		
<p><b>NOTE</b></p> <p>If new torsion bar (28) is used, check color code on pin end of torsion bar. Do not install unless torsion bar is color coded orange.</p>					
		k. Torsion bar (28) and spacer (29)	Install	Slide spacer (29) over cross-hole end of torsion bar (28); then insert torsion bar cross-hole end into end of spool (30)	
		l. Torsion bar (28)	Position	To align cross-hole with cross-hole in the input shaft. Insert a 0.120 inch diameter pin punch into cross-holes to maintain alignment	
		m. Needle roller (26)	Install	Insert needle roller into cross-hole in input shaft while withdrawing pin punch. Remove pin punch when needle roller engages cross-hole in torsion bar. Place cross-hole of input shaft over drive hole of a 1/2 inch drive socket. Using a hammer and 0.120 inch diameter pin punch, lightly tap needle roller to approximately 1/32 inch below outside diameter of input shaft.	
33	Upper cover (14) and housing (43)	<b><u>CAUTION</u></b>			
		To prevent distortion of steering gear, do not clamp vise jaws directly on steering gear housing (43).			
		a. Housing (43)	Position and clamp	Install O-ring tube fitting, with tube nut or fitting cap attached, into one of the four threaded ports in housing (43). Clamp the O-ring fitting in vise so that upper cover end of housing faces upward Over spool (30)	
		b. Spacer (16)	Position		
<b><u>CAUTION</u></b>					
In the following step, avoid applying side forces to the spool (30) which would cause binding and damage.					
		c. Spool (30) with input shaft (27)	Install	Slide spool end into bore of housing (43)	

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
33 (cont)	<p><b>NOTE</b></p> <p>Use original shims (17) unless cracked or damaged. Replace a defective shim with a new shim of equal thickness.</p>			
		d. Shims (17) e. New O-ring(15)	Install Lubricate and install	Place on tip of thrust washer (22) Coat with clean grease and insert in counterbore of upper cover
<p><b>NOTE</b></p> <p>If original upper cover (14) is used, align match marks on upper cover and housing (43). If a new upper cover is used, disregard match mark on housing.</p>				
		f. Upper cover (14) g. Four cap screws (13)	Position Install and tighten	Over input shaft (27) and onto housing (43) Tighten hand-tight only
		h. Upper cover (14) and housing (43)	Align	Position worm type hose clamp around flange of upper cover (14) and outside diameter pilot of housing (43). Tighten clamp to achieve upper cover and housing alignment
		i. Four cap screws (13)	Tighten	Alternately tighten to 18-22 pounds foot torque
<p><b>CAUTION</b></p> <p>To prevent distortion of steering gear, do not clamp vise jaws directly on steering gear housing (43).</p>				
		j. Housing (43)	Reposition and clamp	Clamp O-ring fitting in vise so that input shaft (27) faces downward
		k. Drive link (10)	Install	Pull input shaft (27) downward and prevent rotation, engage splines on drive link (10) in spool (30), and rotate drive link to position spool end flush with end of housing (43). Remove drive link, reposition to allow drive link slot to engage pin on torsion bar, and insert drive link

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
33 (cont)	<b>NOTE</b>			
Perform steps 1 through q only if input shaft (27) and/or upper cover (14) have been replaced.				
		1. spool (30)	Measure protrusion	While pulling input shaft (27) downward, measure relationship of spool end to end of housing using feeler gage. (Measure from end nearest outside diameter of spool to end nearest inside diameter of body.) If spool end is within 0.0025 inch of being flush, proceed to step 34. If not within 0.0025 inch of being flush, proceed to step m.
		m. Drive link (10) n. Housing (43)	Remove Reposition and clamp	Clamp O-ring fitting in vise so that input shaft (27) faces upward
		o. Four cap screws (13)	Loosen and remove	
		p. Upper cover ( 14) with O-ring (15)	Remove	
		q. Shims (17)	Add or remove	Add or remove shims to satisfy requirement of step 1, and repeat steps e through i until spool is flush with end of housing within 0.0025 inch
34	End cover (3) and housing (43)	a. Two 5/16-18UNC by 3-3/4 inch guide studs	Install	In two of seven threaded holes at end of housing (43)
		b. Spacer (12)	Position and install	Position plain side of spacer away from housing (43), and lower spacer over guide studs and onto housing
<b>NOTE</b>				
One of the seven holes in the stator of the rotor set (11) is smaller than the other six holes. In the following step, position this smaller hole over one of the guide studs.				
		c. Rotor set (11) d. Manifold (9)	Install Position and install	Lower over guide studs and onto spacer (12) Position circular slot side of manifold away from housing (43) and lower manifold over guide studs and onto rotor set (11)

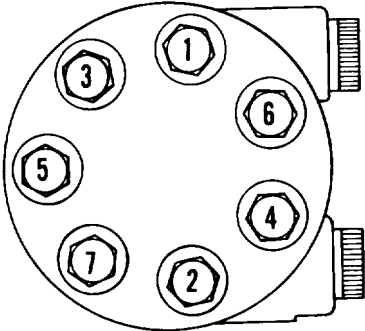
**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
34 (cont)		e. Commutator ring (8)	Position and install	Position slot side of commutator ring toward housing (43), and lower over guide studs and onto manifold (9)
		f. Seal retainer (5) and new rotor seal (4)	Install	Assemble over rotor set (11) and down against housing (43)
		g. Commutator (7)	Position and install	Position counterbore side of commutator away from housing (43), and engage slotted hole in commutator with nose of drive link (10). Center commutator in commutator ring to achieve equal spacing as shown
<p>The diagram shows a top-down view of the commutator assembly. It features an outer ring labeled 'COMMUTATOR RING (8)' and an inner component labeled 'COMMUTATOR (7)'. Several 'GUIDE STUDS' are positioned around the inner component. The commutator (7) has a central slot and is labeled with the part number 'TA127165'.</p>				
		h. Wear washer (6)	Install	Apply a small amount of grease to one side of washer (6) and place washer over pin on end cover (3). Grease should hold washer in place when end cover is inverted
		i. End cover (3) with wear washer (6)	Position and install	Lower end cover (3) over guide studs and onto commutator ring (8)
		j. Five hex bolts (2)	Install and tighten	Tighten hand-tight only
		k. Two guide studs	Remove	
		l. Two hex bolts (2)	Install and tighten	Tighten hand-tight only

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

b. Steering Gear (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
34 (cont)	<b>CAUTION</b>			
Tighten seven hex bolts (2) according to steps m and n only. Do not over tighten bolts to avoid damage to steering gear.				
		m. Seven hex bolts (2)	Tighten (initial)	Using 5/16 inch 12 point socket, tighten in sequence shown to initial torque of 2-3 pounds foot
 <p style="text-align: center;">TA127166</p>				
		n. Seven hex bolts (2)	Tighten (final)	Using same sequence, tighten to 15-19 pounds foot torque
35	Upper cover (14) and input shaft (27)	a. Housing (43)	Reposition and clamp	Clamp O-ring fitting in vise so that input shaft (27) faces upward
<b>NOTE</b>				
Cover end of input shaft (27) with cellophane tape to protect new seal (20) from sharp edges of shaft.				
		b. New seal (20)	Lubricate and install	Coat seal with grease and install over input shaft lip side first
		c. New back-up washer (19)	Install	Position small end toward input shaft; then slide onto shaft and against seal (20)
		d. Seal (20) and back-up washer (19)	Position	Using a 7/8 inch deep well socket, gently push back-up washer and seal down into upper cover (14)
		e. Retaining ring (18)	Install	Position rounded edge of retaining ring toward upper cover. Slide retaining ring over input shaft, and install in groove in upper cover using snap ring pliers

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*b. Steering Gear (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
35 (cont)		f. New dirt seal (1)	Install	In counterbore of upper cover (14)
<b>NOTE</b>				
<p>If steering gear is to be stored, plug two cylinder ports and fill inlet port with clean hydraulic oil (refer to current lubrication order). Rotate input shaft (27) until hydraulic oil appears at outlet port, and plug inlet and outlet port.</p>				
<b>INSTALLATION/REPLACEMENT</b>				
36	Instrument panel center	a. Steering gear b. Four cap screws and lock washers	Position Install and tighten	From bottom of instrument panel Until steering gear is securely mounted
<b>NOTE</b>				
<p>Remove O-ring tube fitting or plugs from cylinder, inlet, or outlet ports as necessary.</p>				
		c. Hoses and fittings d. Steering column and wheel	Reconnect Install	Para 2-48b(2) Para 3-24a
<b>NOTE</b>				
<p>If input shaft (27) and/or upper cover (14) have been replaced, check difference in torque required for left turn and right turn (para 3-22, MALFUNCTION 3). If torque difference is more than 2 pound inches, remove steering gear and add or remove shims. (Add shims to increase effort in left turn. Remove shims to increase steering effort in right turn).</p>				



**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*c. Hydraulic Pump Repair.*

This task covers: a. Disassembly  
b. Cleaning

c. Inspection  
d. Reassembly

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
5 inch micrometer  
1-15/16 inch seal driver

NSN 4910-00-754-0654

EQUIPMENT CONDITION  
Paragraph 2-48a

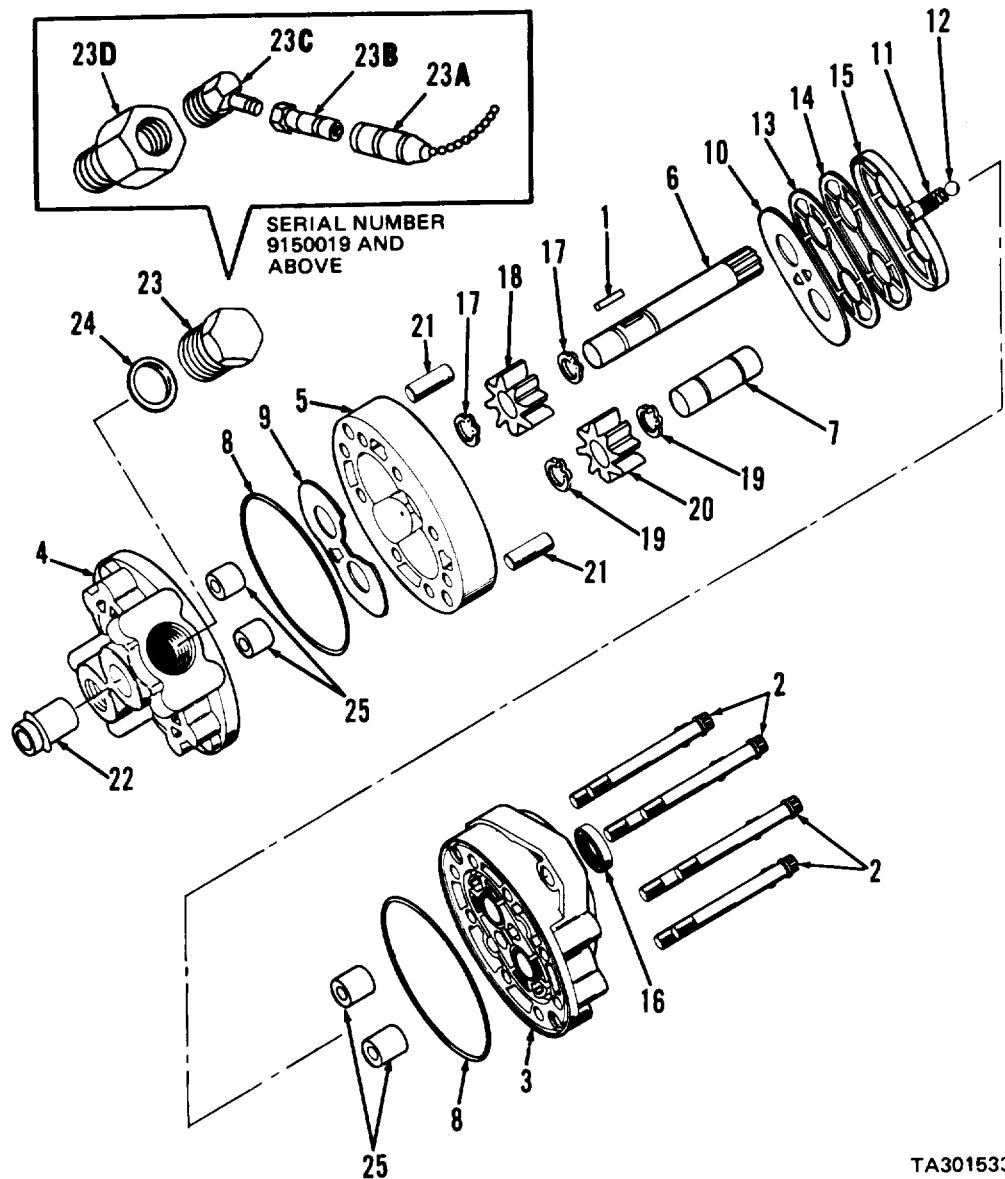
CONDITION  
Condition Description  
Hydraulic pump removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
Clean cloths  
Seal repair kit (FSCM 27007 P/N 24500-930)  
Cellophane tape

KEY

- 1. Key
- 2. Cap screws
- 3. Front plate
- 4. Back plate
- 5. Body
- 6. Drive shaft
- 7. Idler shaft
- 8. O-rings
- 9. Thrust plate
- 10. Diaphragm
- 11. Springs
- 12. Balls
- 13. Back-up gasket
- 14. Protector gasket
- 15. Seal
- 16. Shaft seal
- 17. Retaining rings
- 18. Drive gear
- 19. Retaining rings
- 20. Idler gear
- 21. Dowel pins
- 22. Intake tube
- 23. Plug
- 23A. Cap
- 23B. Coupler
- 23C. Fitting
- 23D. Connector
- 24. O-ring
- 25. Bushings



TA301533

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Hydraulic pump	a. Hydraulic pump	Position and clamp	In vise, with drive shaft (6) facing up
		b. Back plate (4), body (5) and front plate (3)	Match mark	Use center punch and hammer
		c. Eight cap screws (2)	Loosen and remove	
		d. Hydraulic pump	Remove	From vise
<b><u>CAUTION</u></b>				
Do not attempt to pry front plate and back plate apart. Prying sections apart will damage machined surfaces.				
		e. Front plate (3) and back plate (4)	Separate	Holding pump in both hands, bump drive shaft (6) against a wooden block to separate front and back plate
		f. Drive shaft (6) and idler shaft (7)	Remove	Pull from bushing (25) in front plate (3) or back plate (4)
		g. Body (5)	Remove	Place drive shaft (6) in bushing (25) of section attached to body (5). Lightly tap drive shaft (6) with plastic hammer until body separates from front plate (3) or back plate (4)
2	Back plate (4)	a. O-ring (8)	Remove and discard	Pull from groove
		b. Thrust plate (9)	Remove and discard	Pull from machined surface
3	Front plate (3)	a. O-ring (8)	Remove and discard	Pull from groove
<b><u>CAUTION</u></b>				
in the following step, be careful not to scratch or damage machined surface of front plate (3).				
		b. Diaphragm (10)	Remove and discard	Slip a sharp instrument under diaphragm and pry loose from front plate (3)
		c. Two springs (11) and steel balls (12)	Remove and discard	
		d. Back-up gasket (13) protector gasket (14) and seal (15)	Remove and discard	

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
3 (cont)		e. Shaft seal (16)	Remove and discard	
<b>NOTE</b>				
Remove retaining rings (17 and 19) and key (1) only if necessary for replacement. Shafts (6 and 7) and gears (18 and 20) are not serviceable separately.				
4	Shafts (6 and 7), body (5) and back plate (4)	a. Retaining rings (17 and 19) b. Key (1)	Remove Remove	Use snap ring pliers
<b>CAUTION</b>				
In the following step, be careful not to scratch or damage machined surface of body (5).				
		c. Two dowel pins (21)	Pull and remove	If necessary for replacement
		d. Intake tube (22)	Pull and remove	If necessary for replacement
		e. Plug (23)	Loosen and remove	Serial number 9150018 and below
		f. Cap (23A), coupler (23B), and fitting (23C)	Remove	Serial number 9150019 and above
		g. Connector (23D)	Loosen and remove	Serial number 9150019 and above
		h. O-ring (24)	Remove and discard	
<b>NOTE</b>				
Do not attempt to remove bushings (25) from front plate (3) or back plate (4). Bushings are not serviceable separately.				

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent P-D-680 used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air and medical attention immediately. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water and get medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
5		All Parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air.
INSPECTION				
6		Drive shaft (6)	Inspect	Replace drive shaft and gear (18) if shaft keyway is broken, splines chipped or damaged, or if shaft nicked, burred, or worn to less than 0.873 inch diameter in bushing areas
7		Idler shaft (7)	Inspect	Replace idler shaft and gear (20) if shaft nicked, burred or worn to less than 0.0873 inch diameter in bushing areas
8		Gears (18 and 20)	Inspect	Replace gear (18 or 20) and shaft (6 or 7) if gear teeth chipped or broken, gear ends scored or worn, or if gear width is less than 0.732 inch. Break sharp edges of gear teeth with emery cloth

**3-24. STEERING SYSTEM MAINTENANCE (cont)***c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
9		Retaining rings (17 and 19)	Inspect	Replace if cracked, worn or damaged
10		Cap screws (2), plug (23), cap (23A), coupler (23B), fitting (23C), and connector (23D)	Inspect	Replace, if worn, or if threads damaged
11		Bushings (25)	Inspect	Replace front plate (3) or back plate (4) if bushings scored or pitted, if oil grooves damaged, front plate bushing not flush with islands in groove pattern, or if bushing worn to less than 0.0879 inch inside diameter
12		Key (1)	Inspect	Replace if cracked or worn, or if loosely fitting in keyway of drive shaft (6)
13		Dowel pins (21) and intake tube (22)	Inspect	Replace if cracked or excessively worn
14		Front plate (3)	Inspect	Replace if machined face scored, pitted or eroded

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
15		Back plate (4)	Inspect	Replace if machined face scored, pitted or eroded, or if threads damaged
16		Body (5)	Inspect	Replace if machined faces scored, pitted or eroded, or if inside diameter of gear pocket scored, pitted, or worn to less than 2.107 inches
REASSEMBLY				
17	Front plate (3)	a. New O-ring (8) b. New seal (15) c. New gaskets (14 and 13) d. Two new balls (12) and springs (11)	Install Position and install Install Position	In groove of front plate With open part of "V" section down, tuck seal (15) into grooves in front plate Press into seal (15) In bores of front plate
<b><u>CAUTION</u></b>				
In the following step, be sure that diaphragm (10) fits inside rim of seal (15). Also make sure that coils of springs (11) are not wedged between diaphragm (10) and front plate (3).				
18	Shafts (6 and 7)	e. Diaphragm (10) a. Key (1) b. Gears (18 and 20) c. Retaining rings (17 and 19) d. Shafts (6 and 7)	Position and install Position Lubricate and position Install Lubricate and install	Position bronze face up, and press into raised rim of seal (15) and against back-up gasket (13) in keyway on shaft (6) Dip gears in clean hydraulic oil and position on shafts (6 and 7) Use snap ring pliers Dip bushing area of shafts in clean hydraulic oil and position in bushings (25) of front plate (3)
19	Body (5)	a. Two dowel pins (21) b. Body (5)	Install Lubricate and install	Apply thin coat of heavy grease to both machined faces of body (5). Position body with small drilled hole in one of the cavities toward pressure side of pump, and with half moon port cavities facing away from front plate (3). Slip body over gears (18 and 20) and onto front plate (3)

**3-24. STEERING SYSTEM MAINTENANCE (cont)***c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
19 (cont)		c. Thrust plate (9)	Install	Position bronze face towards gears, and side with mid-section cut away toward suction side of pump. Slip thrust plate (9) over gears (18 and 20) and into gear pockets of body (5)
20	Hydraulic pump	a. Intake tube (22)	Install	Place machined surface of back plate (4) on a block of wood. Drive intake tube into back plate bore using a plastic hammer
		b. New O-ring (8)	Install	In groove of back plate (4)
		c. Back plate (4)	Install	Slide over shafts (6 and 7) and against body (5) until dowel pins are engaged
		d. Eight cap screws (2)	Install and tighten	Tighten evenly to 40 pounds foot torque
		e. New O-ring (24)	Position	On plug (23) or connector (23D)
		f. Plug (23)	Install and tighten	Until securely mounted
		g. Connector (23D)	Install and tighten	Serial number 9150019 and above
		h. Fitting (23C)	Install and tighten	Serial number 9150019 and above
		i. Coupler (23B)	Install and tighten	Serial number 9150019 and above
		j. Cap (23A)	Install and tighten	Serial number 9150019 and above
<b>NOTE</b>				
Cover end of drive shaft (6) with cellophane tape to protect new shaft seal (16) from sharp edges of shaft.				
		k. New shaft seal (16)	Install	Dip shaft seal in clean hydraulic oil and slip over drive shaft (6). Seat seal into front plate (3) using 1-15/16 inch seal driver and hammer

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*c. Hydraulic Pump Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
20 (cont)		1. Drive shaft (6)	Check for binding	Using a wrench or similar tool, rotate drive shaft ten revolutions. The drive shaft should be almost free enough to rotate by hand. If drive shaft binds, dis- assemble pump and determine cause



### 3-24. STEERING SYSTEM MAINTENANCE (cont)

*d. Steering Cylinder Assembly Repair.*

This task covers:    a. Disassembly  
                               b. Cleaning  
                               c. Inspection  
                               d. Reassembly

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Spanner Wrench

NSN 4910-00-754-0654  
 FSCM 10988 P/N D44113

EQUIPMENT CONDITION  
 Paragraph 2-48c

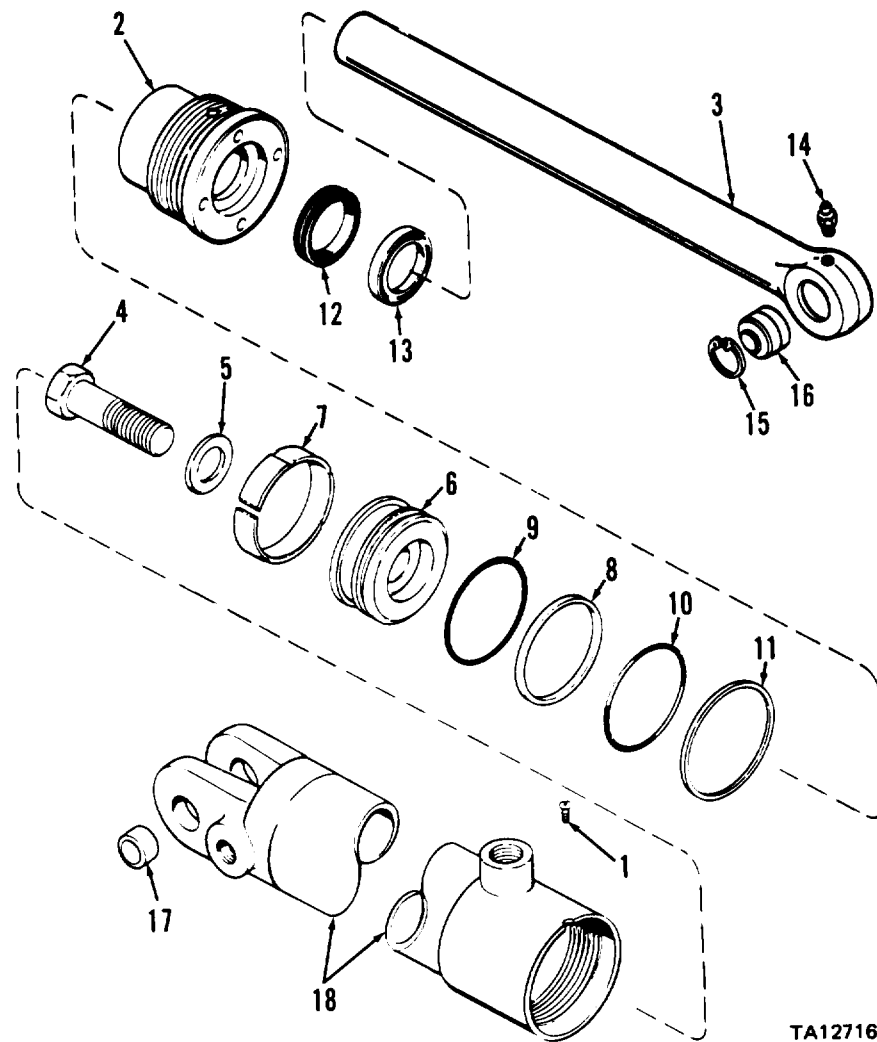
Condition Description  
 Steering cylinder assembly removed.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Seal repair kit (FSCM 10988 P/N G34819)

KEY

1. Screw
2. Gland
3. Piston rod
4. Cap screw
5. Flat washer
6. Piston
7. Wear ring
8. Seal ring
9. O-ring
10. O-ring
11. Back-up ring
12. Wiper
13. Rod seal
14. Grease fitting
15. Retaining rings
16. Bushing
17. Bushings
18. Cylinder



TA127168

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*d. Steering Cylinder Assembly Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Cylinder (18)	a. Screw (1)	Loosen and remove	
		b. Gland (2)	Loosen	Loosen using spanner wrench (FSCM 10988 P/N D44113)
		c. Piston rod (3) with gland (2)	Pull and remove	From cylinder (18)
2	Piston rod (3)	a. Cap screw (4) and washer (5)	Loosen and remove	
		b. Piston (6)	Pull and remove	From piston rod (3)
		c. Gland (2)	Pull and remove	From piston rod (3)
<b>NOTE</b>				
Remove grease fitting (14), retaining ring (15) and bushing (16) only if necessary for replacement.				
		d. Grease fitting (14)	Loosen and remove	
		e. Two retaining rings (15)	Remove	Use snap ring pliers
		f. Bushing (16)	Remove	From piston rod eye
3	Piston (6)	a. Wear ring (7)	Remove and discard	
		b. Seal ring (8) and O-ring (9)	Remove and discard	
4	Gland (2)	a. O-ring (10) and back-up ring (11)	Remove and discard	
		b. Wiper (12) and rod seal (13)	Remove and discard	Use a fine wire to hook wiper and rod seal and pull out of gland
5	Cylinder (18)	Two bushings (17)	Remove	If necessary for replacement

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*d. Steering Cylinder Assembly Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
6		All parts except bushings (16 and 17)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
INSPECTION				
7		Screw (1 and 4) and grease fitting (14)	Inspect	Replace if worn, or if threads damaged
8		Gland (2)	Inspect	Replace if cracked or broken, or if threads damaged
9		Piston (6), washer (5) and retaining ring (15)	Inspect	Replace if cracked or damaged
10		Piston rod (3)	Inspect	Repair nicks or scratches with medium grit emery cloth, polishing with a rotary motion. Replace if cracked or bent, if deeply grooved or scored, or if threads damaged
11		Bushings (16 and 17)	Inspect	Replace if cracked or deteriorated

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*d. Steering Cylinder Assembly Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
12		Cylinder (18)	Inspect	Repair nicks or scratches in cylinder with medium grit emery cloth, polishing with a rotary motion. Replace if cracked or dented, if deeply grooved or scored, or if threads damaged
REASSEMBLY				
13	Gland (2)	a. New rod seal (13) b. New wiper (12) c. New back-up ring (11) and O-ring (10) d. Gland (2)	Install Install Install Install	With seal lip facing piston side of gland Position with wiper lip away from gland, and press into gland until seated  Coat bore of gland with clean hydraulic oil and slide gland onto piston rod (3)
14	Piston (6)	a. New O-ring (9)	Install	In narrow groove of piston (6)
<b><u>CAUTION</u></b>				
Make certain O-ring (9) and seal ring (8) are not rolled when seated.				
		b. New seal ring (8) c. New wear ring (7) d. Piston (6)	Install Install Install	Over O-ring (9) In wide groove of piston Position recess in piston toward piston rod (3), and slide assembled piston onto piston rod
15	Piston rod (3)	a. Piston rod (3) b. Flat washer (5) c. Cap screw (4) with washer (5) d. Piston seals and rings (7, 8 and 9)	Piston and clamp Install Install and tighten Lubricate	In soft jawed vise  On cap screw (4) Tighten to 150-180 pounds foot torque  Coat with clean hydraulic oil
<b><u>CAUTION</u></b>				
Be careful not to cut or damage O-rings and seals in the following step.				
		e. Piston (6) with piston rod (3)	Install	Remove piston rod from vise and carefully guide piston and rod into cylinder (18)

**3-24. STEERING SYSTEM MAINTENANCE (cont)**

*d. Steering Cylinder Assembly Repair (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
16	Cylinder (18)	a. Cylinder (18)	Position and clamp	In soft jawed vise
		b. Gland (2)	Install and tighten	Use spanner wrench (FSCM 10988 P/N D44113)
		c. Screw (1)	Install and tighten	To retain gland
		d. Grease fitting (14)	Install and tighten	Until securely mounted
		e. Bushings (16 and 17)	Position and install	
		f. Two retaining rings (15)	Install	Use snap ring pliers

## Section V. CHASSIS MAINTENANCE

This section contains the information you'll need to maintain the front and rear chassis pivot components. It gives you instructions on how to troubleshoot problems, and repair or replace the components that are within the scope of direct support maintenance.

	Para
Troubleshooting Symptom Index . . . . .	3-25
Chassis Troubleshooting . . . . .	3-26
Separation of Front and Rear Chassis. . . . .	3-27

### 3-25. TROUBLESHOOTING SYMPTOM INDEX

CHASSIS	Para/Malfunction	Page
Excessive noise at chassis pivot point when turning . . . . .	3-26/1	3-190
Excessive play at chassis pivot point when turning . . . . .	3-26/2	3-190

### 3-26. CHASSIS TROUBLESHOOTING

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

**1. EXCESSIVE NOISE AT CHASSIS PIVOT POINT WHEN TURNING**

Lubricate two grease fittings at chassis pivot points (refer to current lubrication order).

If lubrication does not reduce noise at pivot points, remove and check grease fittings for damage (para 3-27).

**2. EXCESSIVE PLAY AT CHASSIS PIVOT POINT WHEN TURNING**

Carefully observe chassis pivot points while an assistant slowly drives vehicle over rough terrain.

If excessive play is observed at chassis pivot points, replace pivot bushing, bearing or pin (para 3-27).

### 3-27. SEPARATION OF FRONT AND REAR CHASSIS

This task covers separation and installation of front and rear chassis.

#### INITIAL SETUP

#### TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Hard Wooden Blocks (2),  
 12 by 12 by 30 inches

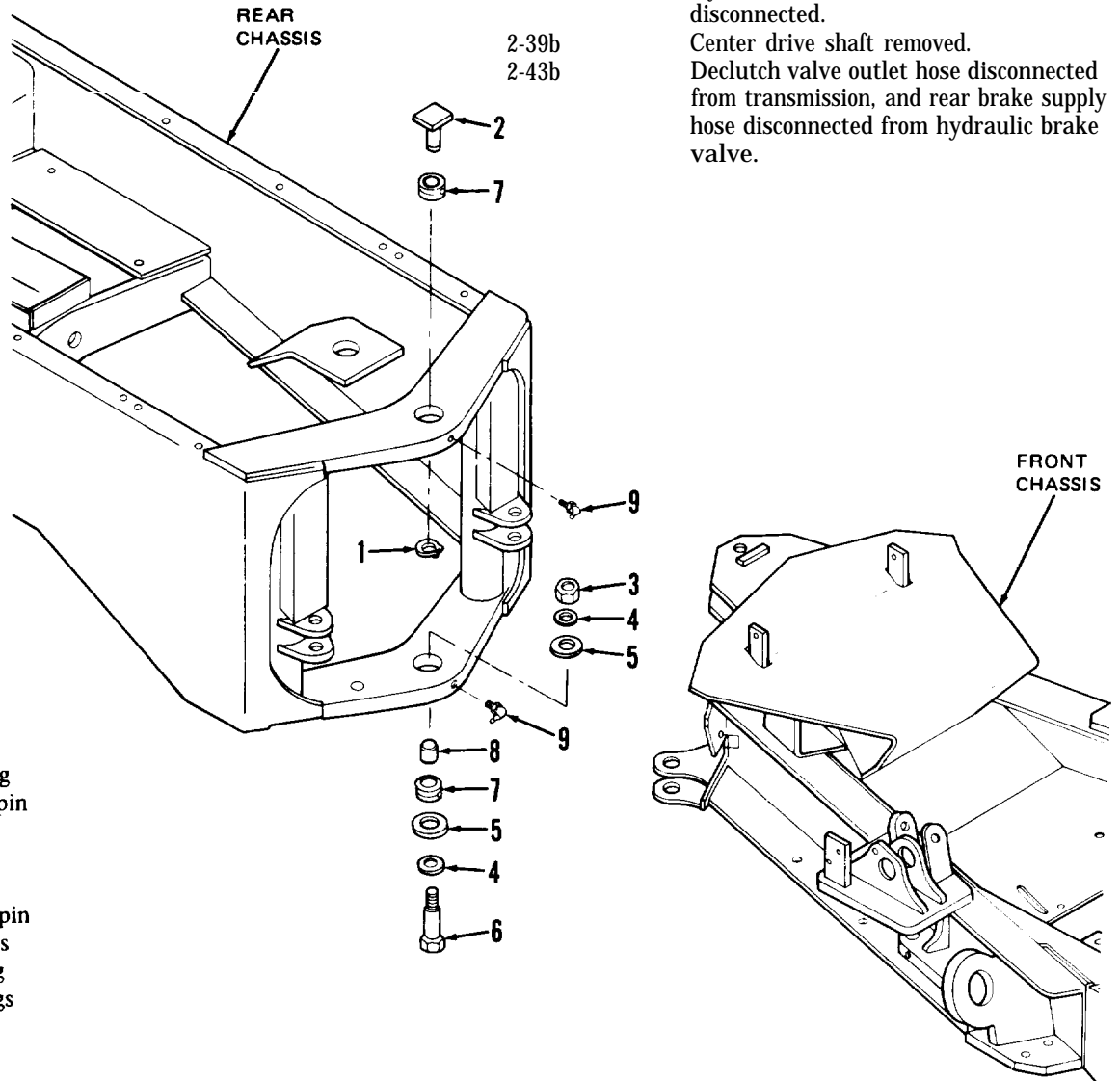
#### MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths

NSN 4910-00-754-0654

#### EQUIPMENT CONDITION

Paragraph	Condition Description
2-33b	Battery ground cable disconnected.
2-15i	Accelerator cable disconnected.
2-34a	Main wiring harness connector unplugged.
2-38b	Transmission linkage cables disconnected.
2-42a	Parking brake linkage disconnected from transmission parking brake.
2-48b(2)	Hydraulic pump hoses disconnected.
2-48c	Steering cylinder rods disconnected from rear chassis.
2-56f(1)	Hydraulic oil filter-to-control valve hose disconnected.
2-39b	Center drive shaft removed.
2-43b	Declutch valve outlet hose disconnected from transmission, and rear brake supply hose disconnected from hydraulic brake valve.



#### KEY

1. Retaining ring
2. Upper pivot pin
3. Lock nut
4. Washers
5. Spacers
6. Lower pivot pin
7. Pivot bearings
8. Pivot bushing
9. Grease fittings

TA127169

**3-27. SEPARATION OF FRONT AND REAR CHASSIS (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Front chassis	Front chassis	Support	Use hoist or other lifting device attached to ROPS side supports to prevent front chassis from tipping when pulled from rear chassis
2	Rear chassis	a. Wheels and frame	Block	To prevent rear chassis from moving or tipping when front chassis is removed
		b. Retaining ring (1) c. Upper pivot pin (2)	Remove Lift and remove	Use snap ring pliers If necessary, tap bottom of pivot pin using drift and hammer
<b><u>WARNING</u></b>				
Front chassis and rear chassis are extremely heavy. Do not proceed unless chassis are secured to prevent movement and tipping. Failure to do so could cause serious injury or death.				
3	Front chassis	d. Lock nut (3), two washers (4), two spacers (5), and lower pivot pin (6)	Loosen and remove	If necessary, tap top of pivot pin using drift and hammer
		Front chassis	Remove	Pull from rear chassis
4	Rear chassis	a. Two pivot bearings (7)	Remove	From lower pivot bearing (7) If necessary for replacement
		b. Pivot bushing (8)	Remove	
		c. Two grease fittings (9)	Loosen and remove	
<b>CLEANING</b>				
5		Two pivot bearings (7)	Clean	Wipe with clean cloth only
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				



**3-27. SEPARATION OF FRONT AND REAR CHASSIS (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
5 (cont)			<b><u>WARNING</u></b>	
		Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.		
6		All other parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
INSPECTION				
7		Two pivot bearings (7)	Inspect	Replace if cracked, worn or deteriorated
8		All other parts	Inspect	Replace if worn, or if threads damaged
INSTALLATION				
9	Rear chassis	a. Two grease fittings (9) b. Pivot bushing (8) c. Two pivot bearings (7)	Install and tighten Install Install	Until securely mounted, with fitting inlet facing left or right side of vehicle Press into lower pivot bearing (7) Press into pivot bores in rear chassis
10	Front chassis	Front chassis	Position	Push against rear chassis until upper and lower pivot bores are aligned
11	Rear chassis	a. Upper pivot pin (2) b. Retaining ring (1) c. Lower pivot pin (6), with washer (4), and spacer (5) d. Spacer (5), washer (4), and lock nut (3)	Install Install Install Install and tighten	If necessary, gently tap into bearing (7) using hammer Use snap ring pliers If necessary, gently tap into bushing (8) using hammer Tighten lock nut (3) and lower pivot pin (6) to 340-360 pounds foot torque

**Section VI. HYDRAULIC LIFT SYSTEM MAINTENANCE**

This section contains the information you'll need to maintain the:

- Control valve
- Hydraulic cylinders
- Mast and carriage assembly

It gives you instructions on how to troubleshoot problems and repair or replace the components that are within the scope of direct support maintenance.

	Para		Para
Troubleshooting Index . . . . .	3-28	Rotation Cylinder Assembly . . . . .	3-30d
Hydraulic Lift System Troubleshooting . . . . .	3-29	Lift Cylinder Assembly . . . . .	3-30e
Hydraulic Lift System Maintenance . . . . .	3-30	Mast Assembly Maintenance . . . . .	3-31
Control Valve . . . . .	3-30a	Carriage Assembly . . . . .	3-31a
Tilt Cylinder Assemblies . . . . .	3-30b	Side Shifter Frame and Rotation Bearing . . . . .	3-31b
Sideshift Cylinder Assembly . . . . .	3-30c	Inner and Outer Mast . . . . .	3-31c

**3-28. TROUBLESHOOTING SYMPTOM INDEX**

	Para/Malfunction	Page
<b>HYDRAULIC LIFT SYSTEM</b>		
Unable to lift a load (all other functions normal) . . . . .	3-29/1	3-194
Load drifts down . . . . .	3-29/2	3-197
Unable to sideshift load (all other functions normal) . . . . .	3-29/3	3-197
Sideshift cylinder assembly operation sluggish . . . . .	3-29/4	3-198
Unable to tilt load (another functions normal) . . . . .	3-29/5	3-199
Tilt cylinder assemblies operation sluggish . . . . .	3-29/6	3-201
Unable to rotate load (another functions normal) . . . . .	3-29/7	3-201
Rotation operation sluggish . . . . .	3-29/8	3-202

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

1. UNABLE TO LIFT A LOAD (ALL OTHER FUNCTIONS NORMAL)

**NOTE**

After completion of each check, lower forks until resting on ground.  
 Then, turn engine off.

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. UNABLE TO LIFT A LOAD (ALL OTHER FUNCTIONS NORMAL) (cont)

Step 1. Start engine and operate at idle speed.

**NOTE**

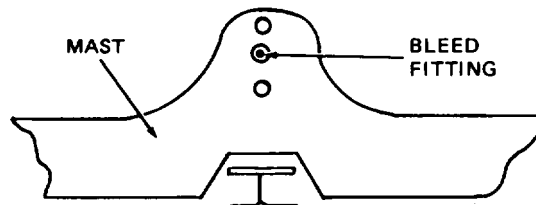
Increase engine speed as necessary in following steps to prevent engine stall.

With no load on forks, place LIFT control lever in RAISE position until tube assembly shown is warm to touch (mast assembly will be at full height).

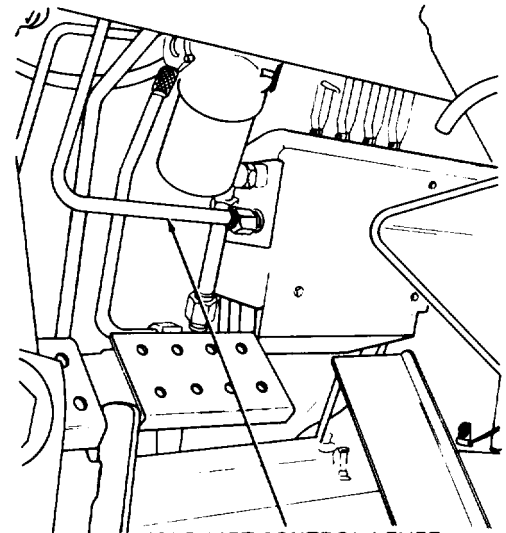
**WARNING**

Don't look directly down at fitting when performing following steps; hydraulic oil is under pressure. Serious injury may result.

Loosen bleed fitting at top of lift cylinder assembly.



TA127051



HOLD LIFT CONTROL LEVER IN RAISE POSITION UNTIL THIS TUBE ASSEMBLY IS WARM TO TOUCH

TA127040

While an assistant places LIFT control lever in RAISE position, observe fitting at top of lift cylinder assembly for hydraulic oil leakage. (Slight weeping of oil is permissible.)

- a. If hydraulic oil leakage (other than slight weeping) is observed, remove lift cylinder assembly (para 3-30e) and check piston assembly and wear rings (para 3-30e); repair/replace as necessary.
- b. If hydraulic oil leakage is not observed, tighten bleed fitting and proceed to step 2.

Step 2. With engine operating at idle speed and LIFT control lever in RAISE position (mast assembly will be at full height), check for hydraulic oil leakage at end cap assembly (located at top of lift cylinder assembly) and at gland assembly (located at top of lift cylinder body).

**NOTE**

Increase engine speed as necessary to prevent engine stall.

- a. If hydraulic oil leakage is observed, remove lift cylinder assembly (para 3-30e), and repair or replace gland assembly or end cap assembly (para 3-30e).
- b. If hydraulic oil leakage is not observed, proceed to step 3.

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. UNABLE TO LIFT A LOAD (ALL OTHER FUNCTIONS NORMAL) (cont)

Step 3. With engine at idle speed and LIFT control lever in RAISE position (mast assembly will be at full height), check for hydraulic oil leakage at gland assembly (located at bottom of lift cylinder assembly) and at ring assembly (located at bottom of lift cylinder body).

- a. If hydraulic oil leakage is observed, remove lift cylinder assembly (para 3-30e), and repair or replace gland assembly or ring assembly (para 3-30e).
- b. If hydraulic oil leakage is not observed, proceed to step 4.

Step 4. Start engine and operate at idle speed.

**NOTE**

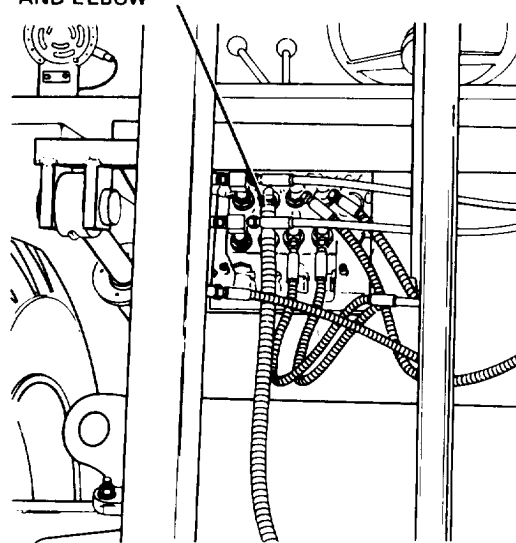
Increase engine speed as necessary to prevent engine stall.

Place LIFT control lever in RAISE position and hold (mast assembly will be at full height). Check control valve for hydraulic oil leakage.

- a. Replace or repair control valve (para 3-30a) if hydraulic oil leakage is observed.
- b. If hydraulic oil leakage is not observed, proceed to step 5.

Step 5. With engine off, operate control levers several times to relieve hydraulic pressure. Disconnect hose assembly connected between control valve and lift cylinder assembly at control valve (refer to illustration). Connect a 3000 PSI pressure gage between elbow on control valve and hose assembly.

**DISCONNECT HOSE ASSEMBLY.  
CONNECT PRESSURE GAGE  
BETWEEN HOSE ASSEMBLY  
AND ELBOW**



**NOTE**

Increase engine speed as necessary to prevent engine stall.

Start engine and place LIFT control lever in RAISE position until mast assembly is at full height; continue to hold lever in RAISE position. Pressure gage shall indicate 2500-2550 PSI with engine at full throttle.

- a. If pressure gage indication is above or below 2500-2550 PSI, adjust pressure relief valve (para 2-48 b(2), step 23).
- b. If pressure gage indication is between 2500-2550 PSI, remove and repair lift cylinder assembly (para 3-30e).

TA127170

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 2. LOAD DRIFTS DOWN

**NOTE**

After completion of each check, lower forks until resting on ground. Then, turn engine off.

With engine off, operate control levers several times to relieve hydraulic pressure. Disconnect hose assembly connected between control valve and lift cylinder assembly at control valve (refer to illustration).

**NOTE**

Increase engine speed as necessary to prevent engine stall.

Connect a 3000 PSI pressure gage between elbow on control valve and hose assembly.

Start engine and place LIFT control lever in RAISE position until mast assembly is at full height; continue to hold lever in RAISE position until pressure gage indicates 2500-2550 PSI with engine at full throttle. With LIFT control lever in neutral position, observe pressure gage and mast assembly.

- a. If mast assembly drifts down and pressure gage indication does not decrease, remove and repair lift cylinder assembly (para 3-30e).
- b. If pressure gage indication decreases, replace or repair control valve (para 3-30a).

## 3. UNABLE TO SIDESHIFT LOAD (ALL OTHER FUNCTIONS NORMAL)

**NOTE**

After completion of each check, turn engine off.

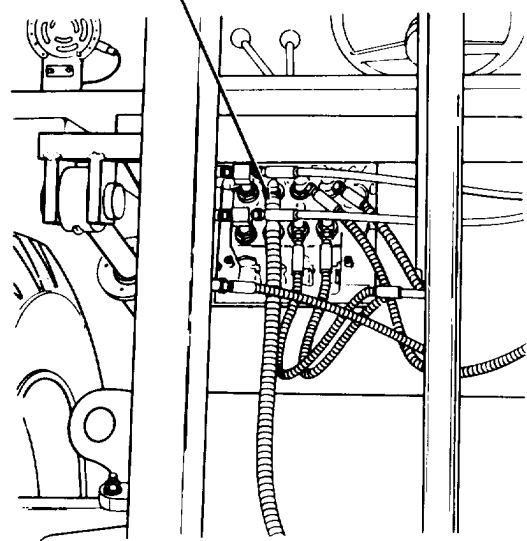
Step 1. Check sideshift cylinder assembly for hydraulic oil leakage.

- a. If hydraulic oil leakage is observed, remove and repair sideshift cylinder assembly (para 3-30c).
- b. If hydraulic oil leakage is not observed, proceed to step 2.

Step 2. Check hose assemblies between side shift cylinder assembly and control valve for hydraulic oil leakage.

- a. If hydraulic oil leakage is observed at hose assemblies, replace leaking hose assembly (para 2-56 f).
- b. If hydraulic oil leakage is not observed at hose assemblies, proceed to step 3.

DISCONNECT HOSE ASSEMBLY.  
CONNECT PRESSURE GAGE  
BETWEEN HOSE ASSEMBLY  
AND ELBOW



TA127170

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

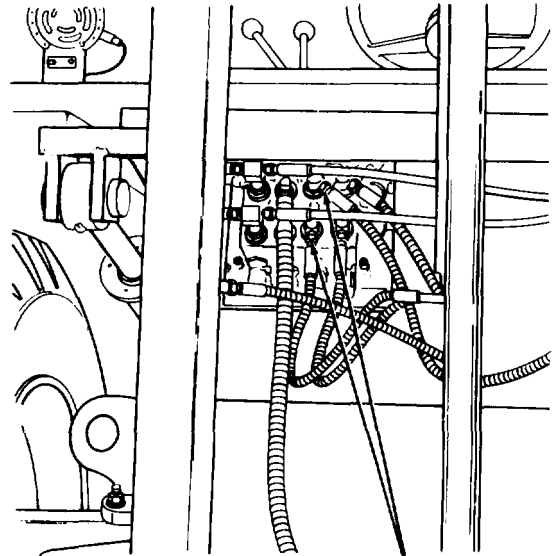
3. UNABLE TO SIDESHIFT LOAD (ALL OTHER FUNCTIONS NORMAL) (cont)

Step 3. Check control valve for hydraulic oil leakage.

- a. If hydraulic oil leakage is observed at control valve, remove and repair it (para 3-30a).
- b. If hydraulic oil leakage is not observed at control valve, proceed to step 4.

Step 4. Crack (loosen) fittings shown at side. Start engine and operate at idle speed, Place SHIFT control lever in LEFT position and check if hydraulic oil flows from fittings; place SHIFT control lever in RIGHT position and check if hydraulic oil flows from fittings.

- a. If hydraulic oil does not flow from fittings, replace control valve (para 3-30a).
- b. If hydraulic oil flows from fittings, remove and repair sideshift cylinder assembly (para 3-30c) (tighten fittings).



LOOSEN THESE TWO HOSE FITTINGS (TIGHTEN AFTER COMPLETION OF CHECKS)

TA127171

4. SIDESHIFT CYLINDER ASSEMBLY OPERATION SLUGGISH

NOTE

After completion of each check, turn engine off.

Step 1. Check pressure relief valve setting (para 2-48b(2), steps 20 through 22).

- a. If pressure relief valve setting is not correct, adjust for proper setting (para 2-48b(2), step 23).
- b. If pressure relief valve setting is okay, proceed to step 2.

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 4. SIDESHIFT CYLINDER ASSEMBLY OPERATION SLUGGISH (cont)

## Step 2. Start engine and operate at idle speed.

Place SHIFT control lever in LEFT position until forks are in extreme left position.  
Turn engine off and operate control levers several times to relieve hydraulic pressure.  
Disconnect and cap hose fitting connected to rod end of sideshift cylinder assembly.

**CAUTION**

Don't place SHIFT control lever in RIGHT position in following steps; hydraulic oil will flow out of disconnected hose fitting.

Start engine and operate at idle speed.

Place SHIFT control lever in LEFT position and hold while an assistant checks for hydraulic oil leakage at side shift cylinder assembly port from which fitting was disconnected.

- a. Remove sideshift cylinder assembly and repair piston assembly (para 3-30c) if hydraulic oil leakage is observed.
- b. If hydraulic oil leakage is not observed at side shift cylinder assembly port, remove and repair control valve (para 3-30a).

## 5. UNABLE TO TILT LOAD (ALL OTHER FUNCTIONS NORMAL)

**NOTE**

After completion of each check, turn engine off.

## Step 1. Check tilt cylinder assemblies for hydraulic oil leakage.

- a. If hydraulic oil leakage at tilt cylinder assemblies is observed, remove and repair it (para 3-30b).
- b. If hydraulic oil leakage is not observed at tilt cylinder assemblies, proceed to step 2.

## Step 2. Check hose assemblies between tilt cylinder assemblies and control valve for hydraulic oil leakage.

- a. If hydraulic oil leakage is observed at hose assemblies, replace leaking hose assemblies (para 2-56f).
- b. If hydraulic oil leakage is not observed, proceed to step 3.

## Step 3. Check control valve for hydraulic oil leakage.

- a. If hydraulic oil leakage is observed at control valve, remove and repair it (para 3-30a).
- b. If hydraulic oil leakage is not observed, proceed to step 4.

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

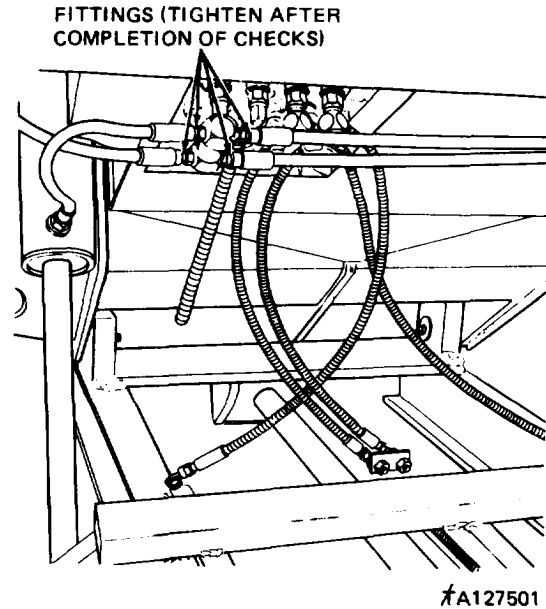
TEST OR INSPECTION  
CORRECTIVE ACTION

5. UNABLE TO TILT LOAD (ALL OTHER FUNCTIONS NORMAL) (cont)

Step 4. Crack (loosen) fittings shown at side.  
Start engine and operate at idle speed.  
Place LIFT control lever in RAISE position until forks are three feet from ground.  
Place TILT control lever in FWD position and check if hydraulic oil flows from loosened fittings; place TILT control lever in REAR position and check if hydraulic oil flows from loosened fittings,

- a. If hydraulic oil does not flow from loosened fittings, replace control valve (para 3-30a).
- b. If hydraulic oil flows from fittings, proceed to step 5 (tighten fittings loosened above).

Step 5. Start engine and operate at idle speed.  
Place TILT control lever in FWD position until mast assembly is tilted fully forward.  
Turn engine off and operate control levers several times to relieve hydraulic pressure.  
Disconnect and cap hose fitting connected to rod end of tilt cylinder assembly.



**CAUTION**

Don't place TILT control lever in REAR position in following steps. Hydraulic oil will flow out of disconnected hose fitting.

Start engine and operate at idle speed.  
Place TILT control lever in FWD position and hold while an assistant checks for hydraulic oil leakage at tilt cylinder assembly port from which fitting was disconnected.  
Repeat the above for other tilt cylinder assembly.

- a. Remove tilt cylinder assembly and repair piston assembly (para 3-30b) if hydraulic oil leakage is observed.
- b. If hydraulic oil leakage is not observed, remove and repair control valve (para 3-30a).



**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 6. TILT CYLINDER ASSEMBLIES OPERATION SLUGGISH

**NOTE**

After completion of each check, turn engine off.

Step 1. Check pressure relief valve setting (para 2-48b(2), steps 20 through 22).

- a. If pressure relief valve setting is not correct, adjust for proper setting (para 2-48b(2), step 23).
- b. If pressure relief valve setting is okay, proceed to step 2.

Step 2. Perform step 5 of MALFUNCTION entry 5 above.

Same as step 5 of MALFUNCTION entry 5 above,

## 7. UNABLE TO ROTATE LOAD (ALL OTHER FUNCTIONS NORMAL)

**NOTE**

After completion of each check, turn engine off.

Step 1. Check rotation cylinder assembly for hydraulic oil leakage.

- a. If rotation cylinder assembly is leaking hydraulic oil, remove and repair it (para 3-30d).
- b. If rotation cylinder assembly is not leaking hydraulic oil, proceed to step 2.

Step 2. Check hose assemblies between rotation cylinder assembly and control valve for hydraulic oil leakage.

- a. If hose assemblies are leaking hydraulic oil, replace (para 2-56f).
- b. If hose assemblies are okay, proceed to step 3.

Step 3. Check control valve for hydraulic oil leakage.

- a. If control valve is leaking hydraulic oil, remove and repair it (para 3-30a).
- b. If control valve is okay, proceed to step 4.

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

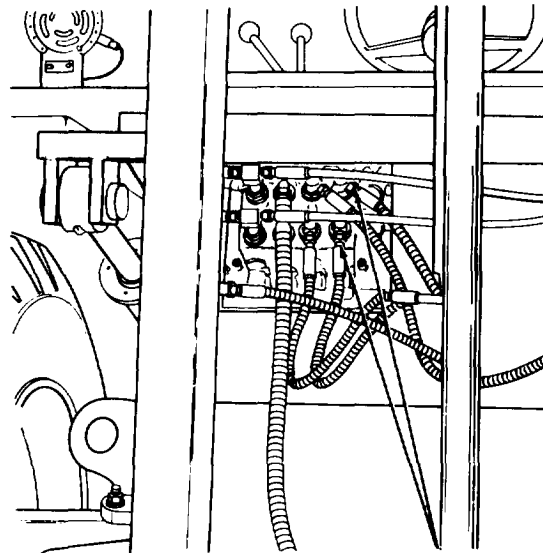
7. UNABLE TO ROTATE LOAD (ALL OTHER FUNCTIONS NORMAL) (cont)

Step 4. Crack (loosen) fittings shown below.

Start engine and operate at idle speed.

Place LIFT control lever in RAISE position until forks are three feet from ground.

Place ROTATE control lever in CCW position and check if hydraulic oil flows from fittings; place ROTATE control lever in CW position and check if hydraulic oil flows from fittings.



LOOSEN THESE TWO HOSE FITTINGS (TIGHTEN AFTER COMPLETION OF CHECKS)

TA127172

- a. If hydraulic oil does not flow from fittings, remove and repair control valve (para 3-30a).
- b. If hydraulic oil flows from fitting, remove and repair rotation cylinder assembly (para 3-30d) (tighten fittings loosened above).

8. ROTATION OPERATION SLUGGISH

**NOTE**

After completion of each check, lower forks until resting on ground.  
Then, turn engine off.

Step 1. Check pressure relief valve setting (para 2-48b(2), steps 20 through 22).

- a. If pressure relief valve setting is not correct, adjust for proper setting (para 2-48b(2), step 23).
- b. If pressure relief valve setting is okay, proceed to step 2.

**3-29. HYDRAULIC LIFT SYSTEM TROUBLESHOOTING (cont)**

## MALFUNCTION

## TEST OR INSPECTION

## CORRECTIVE ACTION

## 8. ROTATION OPERATION SLUGGISH (cont)

Step 2. Start engine and operate at idle speed.

Place LIFT control lever in RAISE position until forks are three feet from ground.

Place ROTATE control lever in CCW position until forks are in extreme CCW position.

Turn engine off and operate control levers several times to relieve hydraulic pressure.

Disconnect and cap hose fitting connected to rod end of rotation cylinder assembly.

**CAUTION**

Don't place ROTATE control lever in CW position in following steps; hydraulic oil will flow out of disconnected hose fitting.

Start engine and operate at idle speed.

Place ROTATE control lever in CCW position and hold while an assistant checks for hydraulic oil leakage at rotation cylinder assembly port from which fitting was disconnected.

- a. Remove and repair rotation cylinder assembly (repair or replace piston assembly) (para 3-30d) if hydraulic oil leakage is observed.
- b. If hydraulic oil leakage is not observed, remove and repair control valve (para 3-30a).

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE**

*a. Control Valve.*

- |                   |                |                             |
|-------------------|----------------|-----------------------------|
| This task covers: | a. Removal     | d. Inspection/Repair        |
|                   | b. Disassembly | e. Reassembly               |
|                   | c. Cleaning    | f. Installation/Replacement |

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph

Condition Description

Vehicle parked on level surface, mast tilted forward, forks resting on ground, engine off, and parking brake applied.

2-53h

Noise baffle mat removed.

All control levers on control valve operated several times to relieve hydraulic pressure.

2-56g(1)

Hydraulic reservoir drained.

MATERIALS/PARTS

Cleaning solvent P-D-680

Clean cloths

Clean hydraulic oil (refer to current lubrication order)

Seal kit

Spool positioner kit

Spool seal retainer kit

Load check plug kit

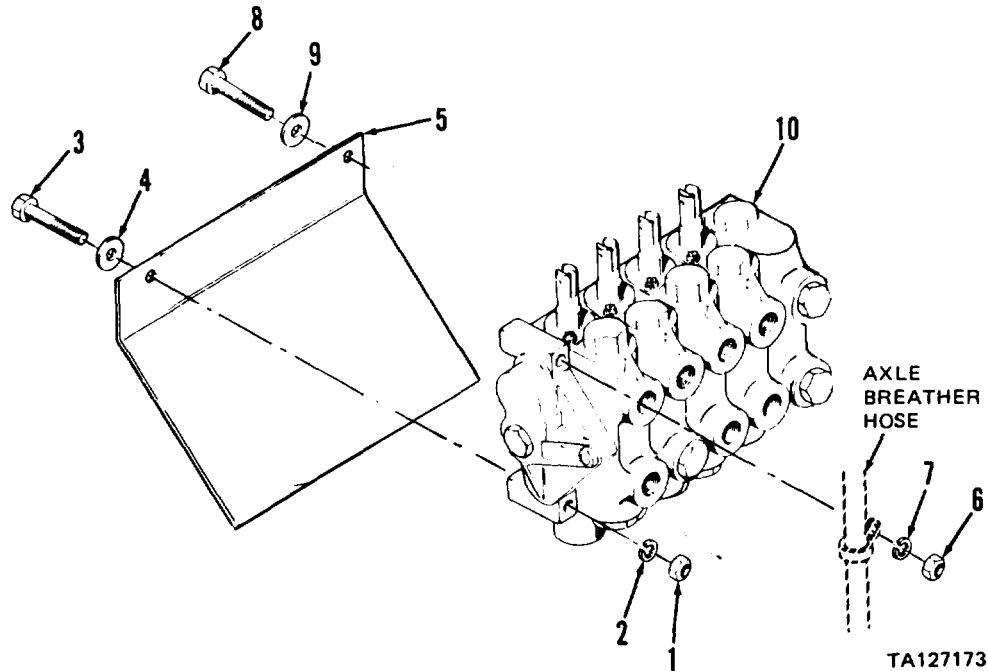
Load check plug seal kit

Relief plug kit

Relief plug seal kit

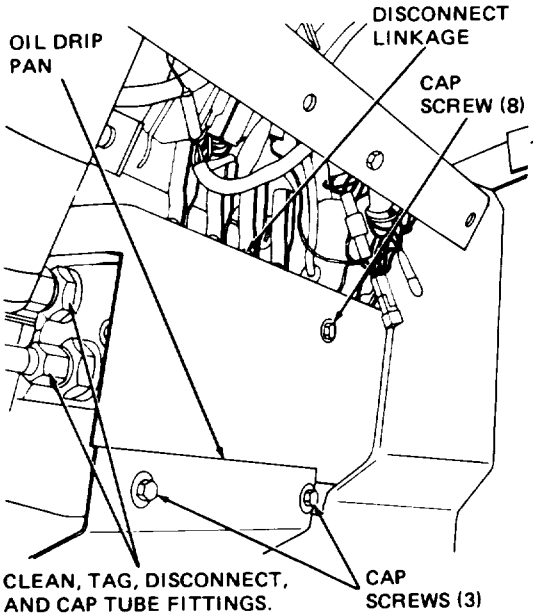
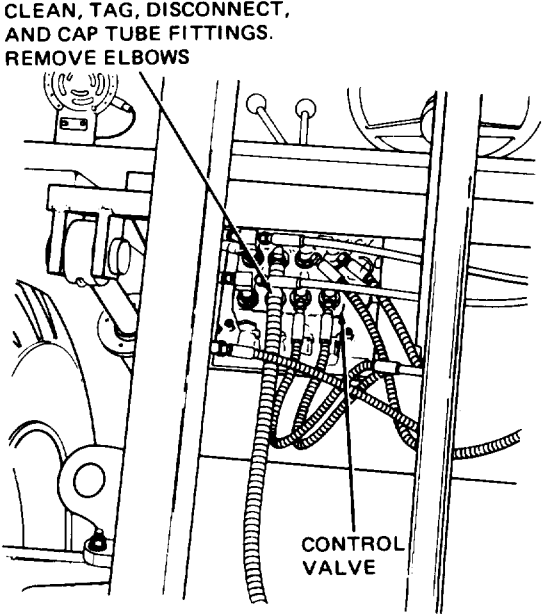
KEY

1. Nuts
2. Lock washers
3. Cap screws
4. Washers
5. Oil drip pan
6. Nut
7. Lock washer
8. Cap screw
9. Washer
10. Control valve



**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
1	Operator's compartment, control valve	a. Control valve linkage	Disconnect	Para 2-56b, step 2
<b>WARNING</b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
		b. Tube fittings	Clean	Use clean cloth moistened with cleaning solvent P-D-680 and remove all dirt and grease
		c. Tube fittings	Tag, disconnect and cap	Para 2-56f(1), steps 1a, 1c, 1h, and 1j
 <p>OIL DRIP PAN</p> <p>DISCONNECT LINKAGE</p> <p>CAP SCREW (8)</p> <p>CAP SCREWS (3)</p>		 <p>CLEAN, TAG, DISCONNECT, AND CAP TUBE FITTINGS. REMOVE ELBOWS</p> <p>CONTROL VALVE</p>		
<p>CLEAN, TAG, DISCONNECT, AND CAP TUBE FITTINGS. REMOVE CONNECTOR AND ADAPTER</p>		TA127174		
		TA127175		

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2	Front of vehicle, control valve	a. Tube fittings	Clean	Use clean cloth moistened with cleaning solvent P-D-680 and remove all dirt and grease
		b. Tube fittings	Tag, disconnect and cap	Para 2-56f(1), steps 2a through 2f
		c. Elbows	Remove	Para 2-56f(1), steps 2g through 2h
3	Operator's compartment, control valve	a. Two nuts (1), lock washers (2), cap screws (3), and washers (4)	Remove	
		b. Oil drip pan (5)	Remove	
<b><u>CAUTION</u></b>				
Support control valve when performing following step to prevent it from falling.				
		c. Nut (6), lock washer (7), cap screw (8), and washer (9)	Remove	Move axle breather hose and clamp away
		d. Control valve (10)	Remove	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY INTO SECTIONS				
<p>KEY</p> <ol style="list-style-type: none"> <li>1. Nuts</li> <li>2. Right cover plate</li> <li>3. O-rings</li> <li>4. O-rings</li> <li>5. Tilt valve section</li> <li>6. Lift valve section</li> <li>7. Shift valve section</li> <li>8. Cap screws</li> <li>9. Rotate valve section</li> <li>10. Left cover plate</li> <li>11. Plug</li> <li>12. O-ring</li> </ol>				
4	Right cover plate (2)	Three nuts (1)	Remove	
5		a. Right cover plate (2) b. O-rings (3 and 4)	Remove Remove	Lift off cap screws (8)
<b>NOTE</b>				
O-rings (3 and 4) are located between valve sections and cover plates. Remove as valve sections and cover plates are removed.				
		c. Tilt valve section (5) d. Lift valve section (6) e. Shift valve section (7) f. Three cap screws (8) g. Rotate valve section (9) Separate and left cover plate (10)	Remove Remove Remove Remove	Lift off cap screws (8) Lift off cap screws (8) Lift off cap screws (8)

TA127176

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS	
DISASSEMBLY INTO SECTIONS (cont)					
6	Right cover plate (2)	a. Plug(n) b. O-ring(12)	Remove Remove		
LEFT COVER PLATE DISASSEMBLY					
7	Top	a. Relief plug assembly (1) b. Back-up washer (2) c. O-ring (3) d. Back-up washer (4) e. O-ring (5)	Remove Remove Remove Remove Remove		
8	Rear	a. Two plugs (7) b. Two O-rings (8)	Remove Remove		
<p>KEY</p> <ol style="list-style-type: none"> <li>1. Relief plug assembly</li> <li>2. Back-up washer</li> <li>3. O-ring</li> <li>4. Back-up washer</li> <li>5. O-ring</li> <li>6. Relief plug</li> <li>7. Plugs</li> <li>8. O-rings</li> <li>9. Left end cover plate</li> </ol>					
<p>TA127177</p>					
ROTATE, SIDESHIFT, AND TILT VALVE SECTIONS DISASSEMBLY					
9	Top	a. Two screws (1) b. Seal plate (2)	Remove Remove		
10	Bottom	a. Two screws (3) b. Bonnet (4)	Remove Remove		
11	Top	Spool (8)	Remove	Use rod inserted in pin hole to remove. Don't use wrench or pliers	



**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*a. Control Valve (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<p>ROTATE, SIDESHIFT, AND TILT VALVE SECTIONS DISASSEMBLY (cont)</p>				
KEY				
<ol style="list-style-type: none"> <li>1. Screws</li> <li>2. Seal plate</li> <li>3. Screws</li> <li>4. Bonnet</li> <li>5. Seal retainer plates</li> <li>6. Back-up rings</li> <li>7. O-rings</li> <li>8. Spool</li> <li>9. Screw</li> <li>10. Lock washer</li> <li>11. Spool collar</li> <li>12. Spring collar</li> <li>13. Return spring</li> <li>14. Spring collar</li> <li>15. Load check plug assemblies</li> <li>16. Load check poppets</li> <li>17. Poppet springs</li> <li>18. Back-up rings</li> <li>19. O-rings</li> <li>20. Back-up rings</li> <li>21. O-rings</li> <li>22. Back-up rings</li> <li>23. O-rings</li> <li>24. Check plugs</li> <li>25. Housing</li> </ol>				

TA127178

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ROTATE, SIDESHIFT, AND TILT VALVE SECTIONS DISASSEMBLY (cont)				
12	Spool (8)	a. Two seal retainer plates (5)	Remove	
		b. Two back-up rings (6)	Remove	
		c. Two O-rings (7)	Remove	
13	Bottom	a. Screw (9) and lock washer (10)	Remove	
		b. Spool collar(11)	Remove	
		c. Spring collar (12)	Remove	
		d. Return spring (13)	Remove	
		e. Spring collar (14)	Remove	
14	Bottom and top	Two load check plug assemblies (15)	Remove	
15	Load check plug assemblies (15)	a. Two load check poppets (16)	Remove	
		b. Two poppet springs (17)	Remove	
		c. Two back-up rings (18)	Remove	
		d. Two O-rings (19)	Remove	
		e. Two back-up rings (20)	Remove	
		f. Two O-rings (21)	Remove	
		g. Two back-up rings (22)	Remove	
		h. Two O-rings (23)	Remove	
LIFT VALVE SECTION DISASSEMBLY				
16	Top	a. Two screws (1)	Remove	
		b. Seal plate (2)	Remove	
17	Bottom	a. Two screws (3)	Remove	
		b. Bonnet (4)	Remove	
1,8	Top	Spool (8)	Remove	Use rod inserted in pin hole to remove. Don't use wrench or pliers
19	Spool (8)	a. Two seal retainer plates (5)	Remove	
		b. Two back-up rings (6)	Remove	
		c. Two O-rings (7)	Remove	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
LIFT VALVE SECTION DISASSEMBLY (cont)				
KEY				
<ol style="list-style-type: none"> <li>1. Screws</li> <li>2. Seal plate</li> <li>3. Screws</li> <li>4. Bonnet</li> <li>5. Seal retainer plates</li> <li>6. Back-up rings</li> <li>7. O-rings</li> <li>8. Spool</li> <li>9. Screw</li> <li>10. Lock washer</li> <li>11. Spool collar</li> <li>12. Spring collar</li> <li>13. Return spring</li> <li>14. Spring collar</li> <li>15. Load check plug assembly</li> <li>16. Load check poppet</li> <li>17. Poppet spring</li> <li>18. Back-up ring</li> <li>19. O-ring</li> <li>20. Back-up ring</li> <li>21. O-ring</li> <li>22. Back-up ring</li> <li>23. O-ring</li> <li>24. Check plug</li> <li>25. Plug</li> <li>26. O-ring</li> <li>27. Conversion plug assembly</li> <li>28. Plug</li> <li>29. Back-up ring</li> <li>30. O-ring</li> <li>31. Back-up ring</li> <li>32. O-ring</li> <li>33. Back-up ring</li> <li>34. O-ring</li> <li>35. Check plug</li> <li>36. Housing</li> </ol>				
TA127179				

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
LIFT VALVE SECTION DISASSEMBLY (cont)				
20	Bottom	a. Screw (9) and lock washer (10)	Remove	
		b. Spool collar (11)	Remove	
		c. Spring collar (12)	Remove	
		d. Return spring (13)	Remove	
		e. Spring collar (14)	Remove	
21	Top	Load check plug assembly (15)	Remove	
22	Load check plug assembly (15)	a. Load check poppet (16)	Remove	
		b. Poppet spring (17)	Remove	
		c. Back-up ring (18)	Remove	
		d. O-ring (19)	Remove	
		e. Back-up ring (20)	Remove	
		f. O-ring (21)	Remove	
		g. Back-up ring (22)	Remove	
		h. O-ring (23)	Remove	
23	Side	a. Plug (25)	Remove	
		b. O-ring (26)	Remove	
24	Bottom	Conversion plug assembly (27)	Remove	
25	Conversion plug assembly (27)	a. Plug (28)	Remove	
		b. Back-up ring (29)	Remove	
		c. O-ring (30)	Remove	
		d. Back-up ring (31)	Remove	
		e. O-ring (32)	Remove	
		f. Back-up ring (33)	Remove	
		g. O-ring (34)	Remove	
<b>NOTE</b>				
Discard all O-rings; these will be replaced at reassembly.				

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
26		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly. Be sure that bores in housings are thoroughly clean
INSPECTION/REPAIR				
27		Springs	Inspect	Replace if distorted, cracked or fatigue signs are evident
28		spools	Inspect	Replace if finish is damaged or if bent or damaged
29		Screws and plugs	Inspect	Replace if threads damaged in any way, or corroded.
30		Housings	Inspect	Replace if bores damaged, cracked, internal threads damaged, or internal wear is evident
31		All other parts	Inspect	Replace if damaged, cracked, or distorted
LEFT COVER PLATE REASSEMBLY				
<b>NOTE</b>				
<p>Lubricate all O-rings before reassembly with clean hydraulic oil (refer to current lubrication order).</p>				
32	Relief plug (6)	a. O-ring (5) b. Back-up washer (4) c. O-ring (3) d. Back-up washer (2)	Install Install Install Install	On plug (6)

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
LEFT COVER PLATE REASSEMBLY (cont)				
33	Plugs (7)	O-rings (8)	Install	On plugs (7)
34	Top	Relief plug assembly (1)	Install	In cover plate (9)
35	Rear	Plugs (7) with O-rings (8)	Install	In cover plate (9)
ROTATE, SIDESHIFT, AND TILT VALVE SECTIONS REASSEMBLY				
36	Check plugs (24)	a. Two O-rings (23) b. Two back-up rings (22) c. Two O-rings (21) d. Two back-up rings (20) e. Two O-rings (19) f. Two back-up rings (18) g. Two poppet springs (17) h. Two load check poppets (16)	Install Install Install Install Install Install Install Install	On check plugs (24)
37	Housing (25), top and bottom	Two check plug assemblies(15)	Install	
38	Spool (8)	a. Two O-rings (7) b. Two back-up rings (6) c. Two seal retainer plates (5)	Install Install Install	On spool (8)
39	Housing (25), top	a. Spool (8) b. Seal plate (2) c. Two screws (1)	Install Position Install	In housing bore
40	Housing (25), bottom	a. Spring collar (14) b. Return spring (13) c. Spring collar (12) d. Spool collar (11) e. Lock washer (10) and screw (9) f. Bonnet (4) g. Two screws (3)	Install Install Install Install Install Position Install	
LIFT VALVE SECTION REASSEMBLY				
41	Check plug (35)	a. O-ring (34) b. Back-up ring (33) c. O-ring (32)	Install Install Install	On check plug (35)

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*a. Control Valve (cont)*

STEP	LOCATION	ITEM	ACTION	REMARKS
LIFT VALVE SECTION REASSEMBLY (cont)				
(cont)		d. Back-up ring (31)	Install	
		e. O-ring (30)	Install	
		f. Back-up ring (29)	Install	
		g. Plug (28)	Install	
42	Housing (36), bottom	Conversion plug assembly (27)	Install	
43	Housing (36), rear	a. O-ring (26) b. Plug (25)	Position Install	On plug (25)
44	Check plug (24)	a. O-ring (23) b. Back-up ring (22) c. O-ring (21) d. Back-up ring (20) e. O-ring (19) f. Back-up ring (18) g. Poppet spring (17) h. Load check poppet (16)	Install Install Install Install Install Install Install	On check plug (24)
45	Housing (36), top	Load check plug assembly (15)	Install	
46	Spool (8)	a. Two O-rings (7) b. Two back-up rings (6) c. Two seal retainer plates (5)	Install Install Install	On spool (8)
47	Housing (36), top	a. Spool (8) b. Seal plate (2) c. Two screws (1)	Install Position Install	
48	Housing (36), bottom	a. Spring collar (14) b. Return spring (13) c. Spring collar (12) d. Spool collar (11) e. Lock washer (10) and screw (9) f. Bonnet (4) g. Two screws (3)	Install Install Install Install Install Position Install	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

a. Control Valve (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
FINAL REASSEMBLY				
49	Left cover plate (10)	a. Three cap screws (8) b. O-rings (3 and 4) c. Rotate valve section (9)	Install Position Position	In cover plate (10). Place cover plate on bench In cover plate (10) bores On cover plate. Be sure O-rings are seated in bores
50	Rotate valve section (9)	a. O-rings (3 and 4) b. Shift valve section (7)	Position Position	In rotate valve section bores On rotate valve section. Be sure O-rings are seated in bores
51	Shift valve section (7)	a. O-rings (3 and 4) b. Lift valve section (6)	Position Position	In shift valve bores On rotate valve section. Be sure O-rings are seated in bores
52	Lift valve section (6)	a. O-rings (3 and 4) b. Tilt valve section (5)	Position Position	In lift valve section bores On lift valve section. Be sure O-rings are seated in bores
53	Tilt valve section (5)	a. O-rings (3 and 4) b. Right cover plate (2)	Position Position	In tilt valve section bores On tilt valve section. Be sure O-rings are seated in bores
54	Right cover plate (2)	a. Three nuts (1) b. O-ring (12) c. Plug(n)	Install Position Install	Tighten to 18-22 pounds foot torque On plug (11)
INSTALLATION/REPLACEMENT				
55	Operator's compartment, control valve mounting area	a. Control valve (10) b. Washer (9) and cap screw (8) c. Lock washer (7) and nut (6) d. Oil drip pan (5) e. Two washers (4) and cap screws (3) f. Two lock washers (2) and nuts (1) g. Adapter and connector h. Tube fittings i. Control valve linkage	Position Install Install and tighten Position Install Install and tighten Install Remove caps, connect to control valve and tighten Connect	Position axle breather hose clamp on cap screw (8)       Para 2-56f(1), steps 26a and 26h Para 2-56f(1), steps 26c and 26k  Para 2-56b, step 1



**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*a Control Valve (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
56	Front of vehicle, control valve	Elbows and hose fittings	Install, remove caps, connect to control valve and tighten	Para 2-56f(1), step 25
57		Hydraulic reservoir	Fill with hydraulic oil	Para 2-56g(1)
58	Operator's compartment		Perform paragraph 2-56f(1), step 27	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Tilt Cylinder Assemblies.*

- |                   |   |  |
|-------------------|---|--|
| This task covers: | <ul style="list-style-type: none"> <li>a. Removal</li> <li>b. Disassembly</li> <li>c. Cleaning</li> </ul> | <ul style="list-style-type: none"> <li>d. Inspection/Repair</li> <li>e. Reassembly</li> <li>f. Installation/Replacement</li> </ul> |
|-------------------|---|--|

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Chain Hoist, 1/2 ton capacity  
 Sleeve, 1-1/2 inches diameter  
 Sleeve, 1-9/16 inches diameter

NSN 4910-00-7544654

EQUIPMENT CONDITION

Paragraph	Condition Description
	Vehicle parked on level surface, engine off, parking brake applied, mast vertical and forks lowered and resting on ground. Control valve control levers operated several times to relieve hydraulic pressure.

MATERIALS/PARTS

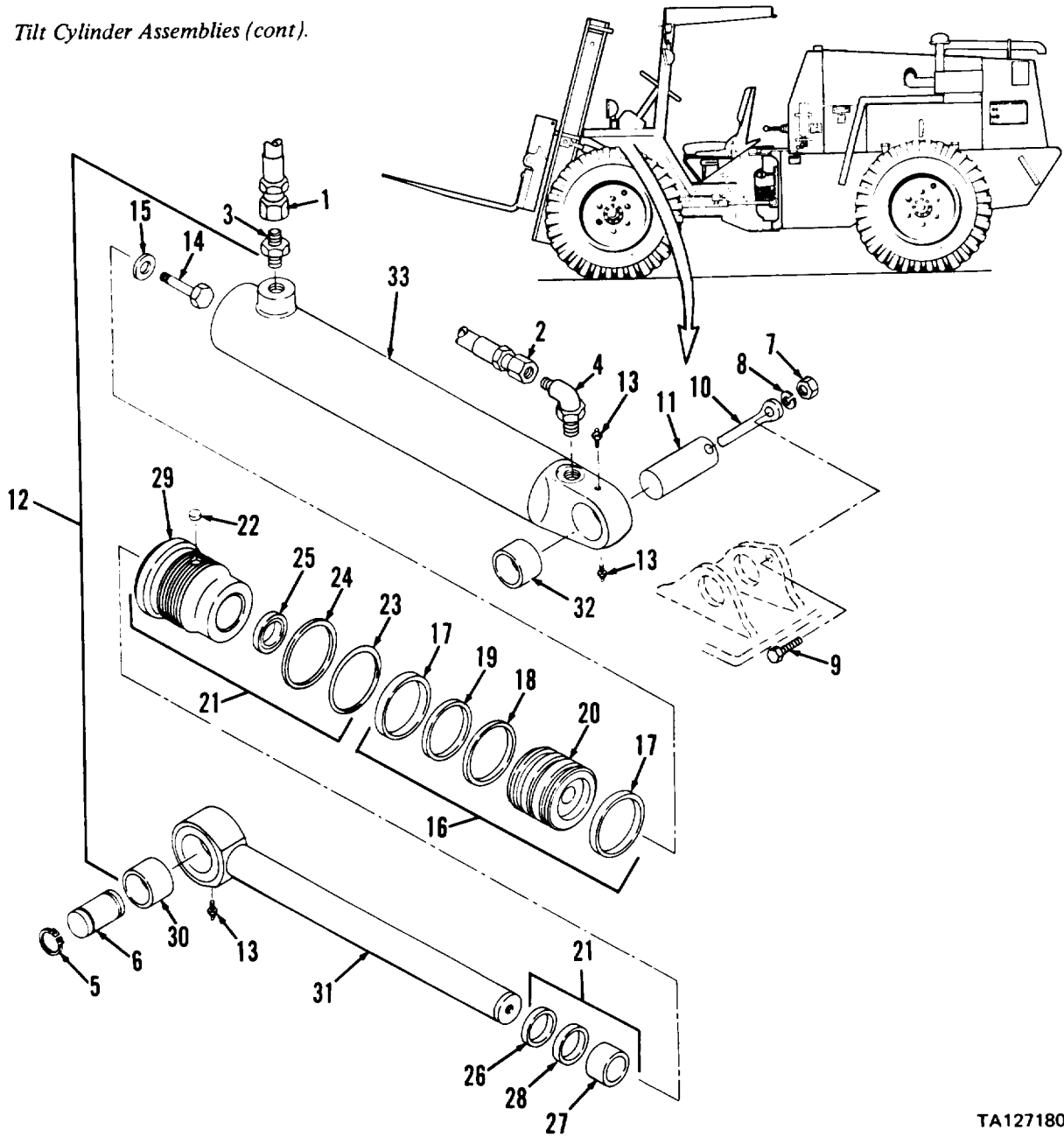
Cleaning solvent P-D-680  
 Clean cloths  
 Seal repair kit  
 Clean hydraulic oil (refer to current lubrication order)  
 Medium grit emery cloth

**WARNING**

If both tilt cylinder assemblies are to be removed, support mast assembly using chain hoist attached to top of mast assembly. Failure to do so may cause mast assembly to fall forward, striking personnel standing/working in front of unit. This could cause serious injury or death.

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Tilt Cylinder Assemblies (cont).*



TA127180

- |                    |                            |                    |
|--------------------|----------------------------|--------------------|
| 1. Hose fitting    | 12. Tilt cylinder assembly | 23. O-ring         |
| 2. Hose fitting    | 13. Lubrication fittings   | 24. Back-up ring   |
| 3. Adapter         | 14. Cap screw              | 25. Seal           |
| 4. Elbow           | 15. Washer                 | 26. Wiper          |
| 5. Retaining rings | 16. Piston assembly        | 27. Bearing        |
| 6. Pin             | 17. Wear rings             | 28. Retaining ring |
| 7. Nut             | 18. Seal                   | 29. Gland          |
| 8. Lock washer     | 19. Seal loader ring       | 30. Bushing        |
| 9. Cap screw       | 20. Piston                 | 31. Rod            |
| 10. Rod            | 21. Gland assembly         | 32. Bushing        |
| 11. Pin            | 22. Plug                   | 33. Cylinder       |

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Tilt Cylinder Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
1	Vehicle side, left or right	<ul style="list-style-type: none"> <li>a. Hose fitting (1 and 2)</li> <li>b. Adapter (3)</li> <li>c. Elbow (4)</li> <li>d. Two retaining rings (5)</li> <li>e. Pin (6)</li> <li>f. Nut (7), lock washer (8), and cap screw (9)</li> <li>g. Rod (10)</li> <li>h. Pin(n)</li> <li>i. Tilt cylinder assembly (12)</li> </ul>	<ul style="list-style-type: none"> <li>Clean, loosen, disconnect and cap</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> <li>Remove to clean work area</li> </ul>	<ul style="list-style-type: none"> <li>Use clean cloth moistened with cleaning solvent P-D-680</li> <li>Cap tilt cylinder port</li> <li>Cap tilt cylinder port</li> </ul>
<b>DISASSEMBLY</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2	Tilt cylinder assembly (12)	<ul style="list-style-type: none"> <li>a. Tilt cylinder assembly (12)</li> <li>b. Three lubrication fittings (13)</li> </ul>	<ul style="list-style-type: none"> <li>Clean all exterior surfaces</li> <li>Remove</li> </ul>	Use cleaning solvent P-D-680

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)***b. Tilt Cylinder Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
2 cont)		c. Gland assembly (21)	Loosen	
		d. Rod (31), gland assembly (21), and piston assembly (16)	Remove as an assembly	
		e. Cap screw (14) and washer (15)	Remove	
		f. Piston assembly (16)	Remove	
		g. Gland assembly (21)	Remove	
3	Piston assembly (16)	a. Two wear rings (17)	Remove and discard	
		b. Seal (18)	Remove and discard	
		c. Seal loader ring (19)	Remove and discard	
4	Gland assembly (21)	a. Plug (22)	Remove only if damaged	
		b. O-ring (23)	Remove and discard	
		c. Back-up ring (24)	Remove and discard	
		d. Seal (25)	Remove and discard	
		e. Wiper (26)	Remove and discard	
		f. Bearing (27)	Remove and discard	Use 1-1/2 inches diameter sleeve; remove from rod end. Bearing (27) and ring (28) will both be removed
		g. Retaining ring (28)	Remove	
5	Rod (31)	Bushing (30)	Remove only if worn or damaged	Use 1-9/16 inches diameter sleeve
6	Cylinder (33)	Bushing (32)	Remove only if worn or damaged	Use 1-9/16 inches diameter sleeve

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Tilt Cylinder Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
7		All parts	Clean	Use cleaning solvent P-D-680; dry with compressed air
INSPECTION/REPAIR				
8		Rod (31)	Inspect	Replace if bent, deeply grooved, or scored. Remove nicks or scratches with medium grit emery cloth polishing with a rotary motion
9		Cylinder (33)	Inspect	Replace if deeply grooved, scored, or damaged, Remove nicks or scratches inside cylinder with medium grit emery cloth polishing with a rotary motion
10		Bushing (30 and 32)	Inspect	Replace if worn, cracked or split
11		All other parts	Inspect	Replace if damaged, cracked, split, grooved or scored
REASSEMBLY				
12	Cylinder (33)	Bushing (32)	Install	Use 1-9/16 inches diameter sleeve; install until flush
13	Rod (31)	Bushing (30)	Install	Use 1-9/16 inches diameter sleeve; install until flush

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Tilt Cylinder Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
14	Gland (29)	a. Bearing (27)	Install from rod end	Butt against shoulder of gland (29)
		b. Retaining ring (28)	Install from rod end; chamfer towards bearing (27)	Butt against bearing (27)
		c. Wiper (26)	Install	Grooved side towards rod end
		d. Seal (25)	Install	Seal lip towards cylinder
		e. Back-up ring (24)	Install	Curved side towards O-ring (23)
		f. O-ring (23)	Install	
		g. Plug (22)	Install	
15	Piston (20)	a. Seal loader ring (19)	Install	On seal loader ring (19)
		b. Seal (18)	Install	
		c. Two wear rings (17)	Install	
<b><u>CAUTION</u></b>				
Use extreme care when performing following step not to damage wiper, seal, back-up rings or O-ring.				
16	Rod (31)	a. Gland assembly (21)	Lubricate and slide on rod (31)	Use clean hydraulic oil (refer to current lubrication order)
		b. Piston assembly (16)	Slide on rod (31)	Small diameter recess towards rod (31)
		c. Washer (15) and cap screw (14)	Install	Tighten to 200-220 pounds foot torque
		d. Seal (18)	Lubricate	Use clean hydraulic oil (refer to current lubrication order)
<b><u>CAUTION</u></b>				
Use extreme care not to damage rings or seals when performing following step.				
17	Cylinder (33)	a. Rod (31), gland assembly (21), and piston assembly (16)	Install as an assembly	
		b. Gland assembly (21)	Position and tighten	Tighten to 150-200 pounds foot torque
		c. Three lubrication fittings (13)	Install	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*b. Tilt Cylinder Assemblies (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT				
18	Vehicle side, left or right	a. Tilt cylinder assembly (12) b. Pin (11) C. Rod (10) d. Cap screw (9), lock washer (8), and nut (7) e. Pin (6) f. Two retaining rings (5) g. Elbow (4) h. Adapter (3) i. Hose fitting (1 and 2)	Position  Install Install Install  Install Install Install Install Remove caps, connect and tighten	
19	Operator's compartment		Perform paragraph 2-56f(2), step 12	
20	Tilt cylinder assembly	Three lubrication fittings	Lubricate	Refer to current lubrication order



**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*c. Sideshift Cylinder Assembly.*

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning
  - d. Inspection/Repair
  - e. Reassembly
  - f. Testing
  - g. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Hydraulic Pump (used for testing)

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph Condition Description  
 Vehicle parked on level surface, engine off, parking brake applied, mast vertical, and forks resting on ground.  
 Control valve control levers operated several times to relieve hydraulic pressure.  
 Forks shifted to extreme right.  
 One end of sideshift chains disconnected from carriage and pulleys removed from side shift cylinder assembly.

MATERIALS/PARTS

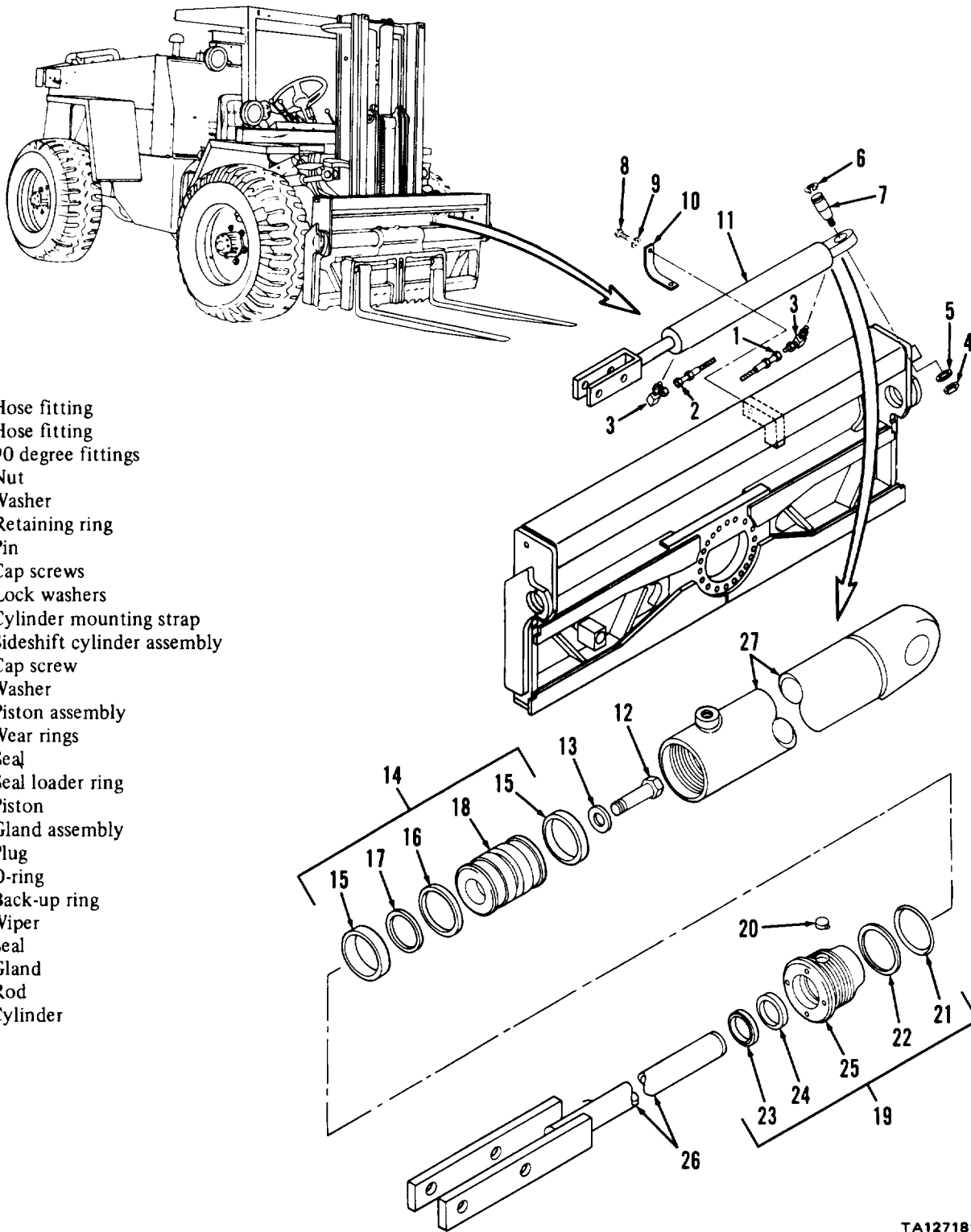
Cleaning solvent P-D-680  
 Clean cloths  
 Seal repair kit  
 Clean hydraulic oil (refer to current lubrication order)  
 Medium grit emery cloth

2-56e

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
1	Mast assembly, front	a. Hose fitting (1 and 2) b. Two 90 degree fittings (3) c. Nut (4), washer (5), and retaining ring (6) d. Pin (7)	Clean, loosen, disconnect and cap Remove Remove Remove	Use cleaning solvent P-D-680

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Sideshift Cylinder Assembly (cont).*



TA127181

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

c. Sideshift Clinder Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
1 (cont)			<b><u>CAUTION</u></b>	
		Support sideshift cylinder assembly while performing following step to prevent it from falling.		
		e. Two cap screws (8) and lock washers (9)	Remove	
		f. Cylinder mounting strap (10)	Remove	
		g. Sideshift cylinder assembly (11)	Remove by pulling out from side of carriage assembly	
DISASSEMBLY				
			<b><u>WARNING</u></b>	
		Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.		
2	Sideshift cylinder assembly (11)	a. Sideshift cylinder assembly (11)	Clean all exterior surfaces	Use cleaning solvent P-D-680
		b. Gland assembly (19)	Loosen	
		c. Rod (26), gland assembly (19), and piston assembly (14)	Remove as an assembly	
		d. Cap screw (12) and washer (13)	Remove	
		e. Piston assembly (14)	Remove	
		f. Gland assembly (19)	Remove	
3	Piston assembly (14)	a. Two wear rings(15)	Remove and discard	
		b. Seal (16)	Remove	
		c. Seal loader ring (17)	Remove and discard	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*c. Sideshift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
4	Gland assembly (19)	a. Plug (20)	Remove only if damaged	
		b. O-ring(21)	Remove and discard	
		c. Back-up ring (22)	Remove and discard	
		d. Wiper (23)	Remove and discard	
		e. Seal (24)	Remove and discard	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680, used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
5		AH parts	Clean	Use cleaning solvent P-D-680; dry with compressed air
INSPECTION/REPAIR				
6		Rod (26)	Inspect	Replace if bent, deeply grooved, or scored. Remove nicks or scratches with medium grit emery cloth polishing with a rotary motion
7		Cylinder (27)	Inspect	Replace if deeply grooved, scored or nicked, or damaged. Remove nicks or scratches inside cylinder with medium grit emery cloth polishing with a rotary motion

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

c. Sideshift Cylinder Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION/REPAIR (cont)				
8		All other parts	Inspect	Replace if damaged, cracked, split, grooved or scored
REASSEMBLY				
9	Gland (25)	a. Seal (24) b. Wiper (23) c. Back-up ring (22) d. O-ring (21) e. Plug (20)	Install Install Install Install Install	Seal lip towards cylinder Lip towards rod Curved side towards O-ring (21)
10	Piston (18)	a. Seal loader ring (17) b. Seal (16) c. Two wear rings (15)	Install Install Install	On seal loader ring(17)
<b><u>CAUTION</u></b>				
Use care when performing following step not to damage seal or wiper.				
11	Rod (26)	a. Gland assembly (19) b. Piston assembly (14) c. Washer (13) and cap screw (12) d. Seal (16)	Lubricate and slide on rod (26) Slide on rod (26) Install Lubricate	Use clean hydraulic oil (refer to current lubrication order) Small diameter recess towards rod (26) Tighten to 200-220 pounds foot torque Use clean hydraulic oil (refer to current lubrication order)
<b><u>CAUTION</u></b>				
Use extreme care not to damage rings or seals when performing following step.				
12	Cylinder (27)	a. Rod (26), gland assembly (19), and piston assembly (14) b. Gland assembly (19)	Install as an assembly Position and tighten	Tighten to 150-200 pounds foot torque
TESTING				
13	Sideshift cylinder assembly	Cylinder port (port opposite rod end)	a. Connect hydraulic hose to port (hose must have a 7/16-20 fitting on end) b. Connect other end of hose to test hydraulic pump	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*c. Sideshift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
14	Test hydraulic pump		a. Start pump and apply hydraulic oil under pressure (2000 Psi) to sideshift cylinder assembly b. Continue operating pump until rod is completely extended from cylinder; hold until step 15 below is completed	Rod should extend smoothly from cylinder
15	Sideshift cylinder assembly	a. Rod end port b. Rod end packing	Check for hydraulic oil leakage Check for hydraulic oil leakage	Slight weepage of oil is permissible; if leakage is too great, disassemble cylinder and check piston assembly (14) for damage If leakage is observed, disassemble cylinder and check gland assembly (19) for damage
16	Test hydraulic pump		Shut pump down	
17	Sideshift cylinder assembly	a. Cylinder port (port opposite rod end) b. Both cylinder ports	Disconnect hydraulic hose and drain oil from cylinder Cap	Push rod into cylinder Prevents intrusion of dirt
INSTALLATION/REPLACEMENT				
18	Mast assembly, front	a. Sideshift cylinder assembly (11) b. Cylinder mounting strap (10) c. Two cap screws (8) and lock washers (9) d. Pin (7) e. Retaining ring (6), washer (5), and nut (4)	Position on carriage Position Install Install Install	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*c. Sideshift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
18 (cont)		f. Two 90 degree fittings (3) g. Hose fittings (1 and 2)	Install  Remove caps, connect and tighten	
19	Operator's compartment			Perform paragraph 2-56f(2), step 12

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly.*

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning
  - d. Inspection/Repair
  - e. Reassembly
  - f. Testing
  - g. Installation/Replacement

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit  
 Chain Hoist, 1/2 ton capacity  
 Sleeve, 1-5/8 inches diameter  
 Hydraulic Pump (used for testing)

NSN 4910-00-754-0654

EQUIPMENT CONDITION  
 Paragraph

Condition Description  
 Vehicle parked on level surface, engine off, parking brake applied, mast vertical, and forks resting on ground.  
 Control valve control levers operated several times to relieve hydraulic pressure

MATERIALS/PARTS

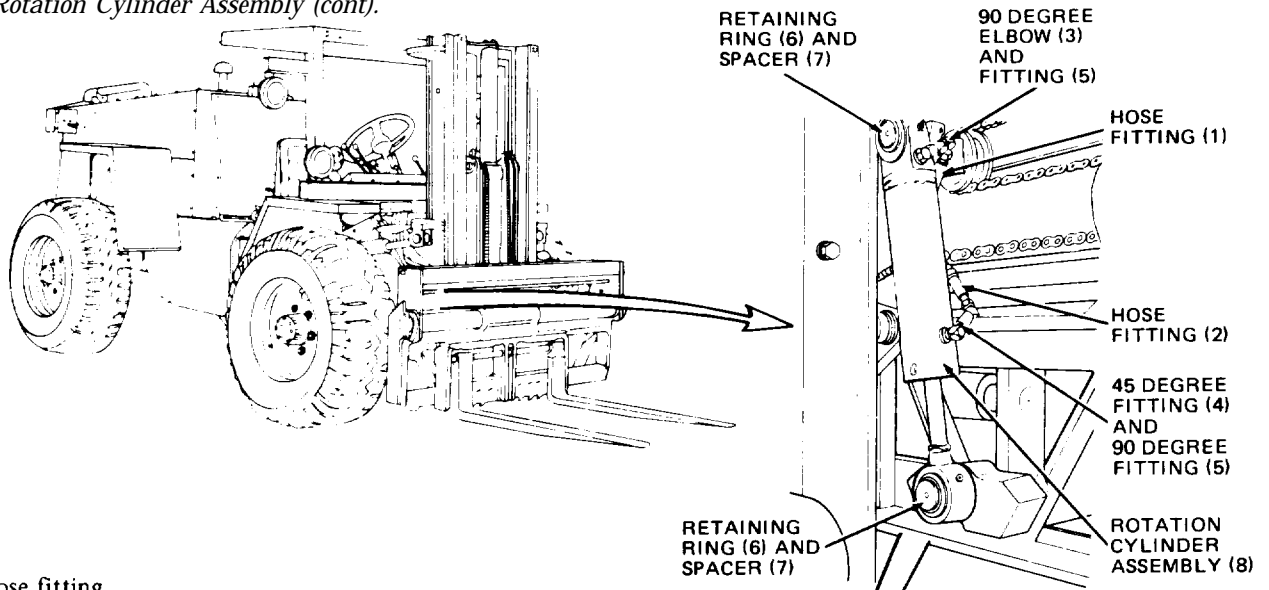
Cleaning solvent P-D-680  
 Clean cloths  
 Seal repair kit  
 Clean hydraulic oil (refer to current lubrication order)  
 Medium grit emery cloth

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL		<b><u>WARNING</u></b>		
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
1	Mast assembly, rear	a. Hose fitting (1 and 2)	Clean, loosen, disconnect and cap	Use cleaning solvent P-D-680
		b. 90 degree elbow (3)	Remove	
		c. 45 degree fitting (4)	Remove	
		d. Two 90 degree fittings (5)	Remove	Plug rotation cylinder assembly ports
		e. Two retaining rings (6) and spacers (7)	Remove	
		f. Rotation cylinder assembly (8)	Remove to clean work area	



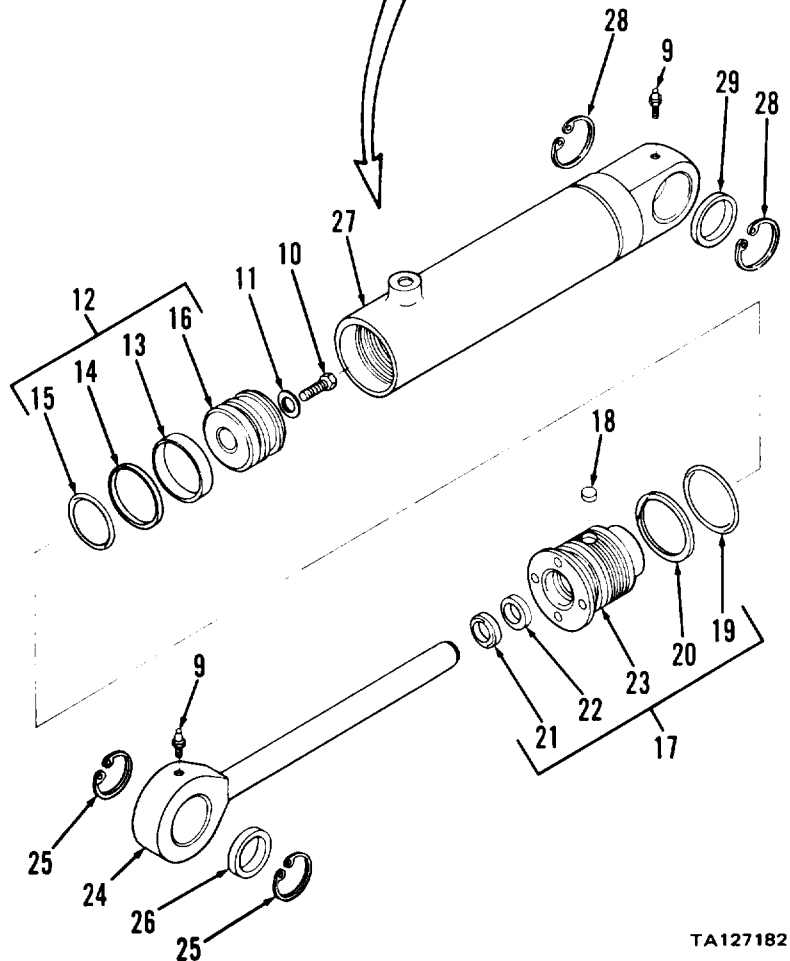
**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly (cont).*



**KEY**

1. Hose fitting
2. Hose fitting
3. 90 degree elbow
4. 45 degree fitting
5. 90 degree fittings
6. Retaining rings
7. Spacers
8. Rotation cylinder assembly
9. Lubrication fittings
10. Cap screw
11. Washer
12. Piston assembly
13. Wear ring
14. Sealing ring
15. O-ring
16. Piston
17. Gland assembly
18. Plug
19. O-ring
20. Back-up ring
21. Wiper
22. Seal
23. Gland
24. Rod
25. Retaining rings
26. Bushing
27. Cylinder
28. Retaining rings
29. Bushing



TA127182

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
2	Rotation cylinder assembly (8)	<ul style="list-style-type: none"> <li>a. Rotation cylinder assembly (8)</li> <li>b. Two lubrication fittings (9)</li> <li>c. Gland assembly (17)</li> <li>d. Rod (24), gland assembly (17), and piston assembly (12)</li> <li>e. Cap screw (10) and washer (11)</li> <li>f. Piston assembly (12)</li> <li>g. Gland assembly (17)</li> </ul>	<ul style="list-style-type: none"> <li>Clean all exterior surfaces</li> <li>Remove</li> <li>Loosen</li> <li>Remove as an assembly</li> <li>Remove</li> <li>Remove</li> <li>Remove</li> </ul>	Use cleaning solvent P-D-680
3	Piston assembly (12)	<ul style="list-style-type: none"> <li>a. Wear ring (13)</li> <li>b. Sealing ring (14)</li> <li>c. O-ring (15)</li> </ul>	<ul style="list-style-type: none"> <li>Remove and discard</li> <li>Remove and discard</li> <li>Remove and discard</li> </ul>	
4	Gland assembly (17)	<ul style="list-style-type: none"> <li>a. Plug (18)</li> <li>b. O-ring (19)</li> <li>c. Back-up ring (20)</li> <li>d. Wiper(21)</li> <li>e. Seal (22)</li> </ul>	<ul style="list-style-type: none"> <li>Remove only if damaged</li> <li>Remove and discard</li> <li>Remove and discard</li> <li>Remove and discard</li> <li>Remove and discard</li> </ul>	

**3-30. DRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
<b>NOTE</b>				
Perform following steps only if inspection indicates replacement of bushings (26 and 29) is necessary.				
5	Rod (24)	a. Two retaining rings (25)	Remove	
		b. Bushing (26)	Remove	Use 1-5/8 inches diameter sleeve
6	Cylinder (27)	a. Two retaining rings (28)	Remove	
		b. Bushing (29)	Remove	Use 1-5/8 inches diameter sleeve
CLEANING				
<b>WARNING</b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b>WARNING</b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
7		All parts	Clean	Use cleaning solvent P-D-680; dry with compressed air
INSPECTION/REPAIR				
8		Rod (24)	Inspect	Replace if bent, deeply grooved, or scored. Remove nicks or scratches with medium grit emery cloth polishing with a rotary motion

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION/REPAIR (cont)				
9		Cylinder (27)	Inspect	Replace if deeply grooved, scored or nicked, or damaged. Remove nicks or scratches inside cylinder with medium grit emery cloth polishing with a rotary motion
10		Bushing (26 and 29)	Inspect	Replace if damaged, worn, cracked, or split
11		All other parts	Inspect	Replace if damaged, cracked, split, grooved or scored
REASSEMBLY				
12	Cylinder (27)	a. Bushing (29) b. Two retaining rings (28)	Install Install	Use 1-5/8 inches diameter sleeve; install until centered
13	Rod (24)	a. Bushing (26) b. Two retaining rings (25)	Install Install	Use 1-5/8 inches diameter sleeve; install until centered
14	Gland (23)	a. Seal (22) b. Wiper (21) c. Back-up ring (20) d. O-ring (19) e. Plug (18)	Install Install Install Install Install	Seal lip towards cylinder Lip towards rod Curved side towards O-ring (19)
15	Piston (16)	a. O-ring (15) b. Sealing ring (14) c. Wear ring (13)	Install Install Install	On O-ring (15)
<b><u>CAUTION</u></b>				
Use care when performing following step not to damage parts.				
16	Rod (24)	a. Gland assembly (17) b. Piston assembly (12) c. Washer (11) and cap screw (10) d. Sealing ring (14)	Lubricate and slide on rod Slide on rod Install Lubricate	Use clean hydraulic oil (refer to current lubrication order) Small diameter recess towards rod (24) Tighten to 90-100 pounds foot torque Use clean hydraulic oil (refer to current lubrication order)

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
<b><u>CAUTION</u></b>				
Use extreme care not to damage rings or seals when performing following step.				
17	Cylinder (27)	a. Rod (24), gland assembly (17) and piston assembly (12) b. Gland assembly (17)	Install as an assembly  Position and tighten	Tighten to 100-150 pounds foot torque
18	Rotation cylinder assembly (8)	Two lubrication fittings (9)	Install	
TESTING				
19	Rotation cylinder assembly	Cylinder port (port opposite rod end)	a. Connect hydraulic hose to port (hose must have a 7/16-20 fitting on end) b. Connect other end of hose to test hydraulic pump	
20	Test hydraulic pump		a. Start pump and Rod should extend smoothly from cylinder apply hydraulic oil under pressure (2000 PSI) to rotation cylinder assembly b. Continue operating pump until rod is completely extended from cylinder; hold until step 21 below is completed	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*d. Rotation Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
21	Steering cylinder assembly	a. Rod end port	Check for hydraulic oil leakage	Slight weepage of oil is permissible; if leakage is too great, disassemble cylinder and check piston assembly (12) for damage
		b. Rod end packing	Check for hydraulic oil leakage	If leakage is observed, disassemble cylinder and check gland assembly (17) for damage
22	Test hydraulic pump			Shut pump down
23	Steering cylinder assembly	a. Cylinder port (port opposite rod end)	Disconnect hydraulic hose and drain oil from cylinder	Push rod into cylinder
		b. Both cylinder ports	Cap	Prevents intrusion of dirt
<b>INSTALLATION/REPLACEMENT</b>				
24	Mast assembly, rear	a. Rotation cylinder assembly (8)	Position on carriage mounting pins	
		b. Two spacers (7) and retaining rings (6)	Install	
		c. Two 90 degree fittings (5)	Install	
		d. 45 degree fitting (4)	Install	
		e. 90 degree elbow (3)	Install	
		f. Hose fitting (1 and 2)	Remove caps, connect and tighten	
25	Operator's compartment		Perform paragraph 2-56f(2), step 12	
26	Rotation cylinder	Two lubrication fittings	Lubricate	Refer to current lubrication order

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly*

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning
  - d. Inspection/Repair
  - e. Reassembly
  - f. Installation/Replacement

PERSONNEL REQUIRED

Two maintenance technicians

INITIAL SETUP

TOOLS

- No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654
- Chain Hoists, two, 1/2 ton capacity each
- Brass jaw vise and support stand
- Hard Wooden Blocks (2), 6 by 6 by 12 inches
- Container, six gallon capacity
- Insertion sleeve, external taper (FSCM 45225 P/N CAS1704-1)
- Insertion sleeve, internal taper (FSCM 45225 P/N CAS1704-2)
- Spanner Wrench NSN 5120-00-277-9077 , NSN 5120-00-277-9076

MATERIALS/PARTS

- Cleaning solvent P-D-680
- Clean cloths
- Seal repair kit
- Clean hydraulic oil (refer to current lubrication order)
- Medium grit emery cloth

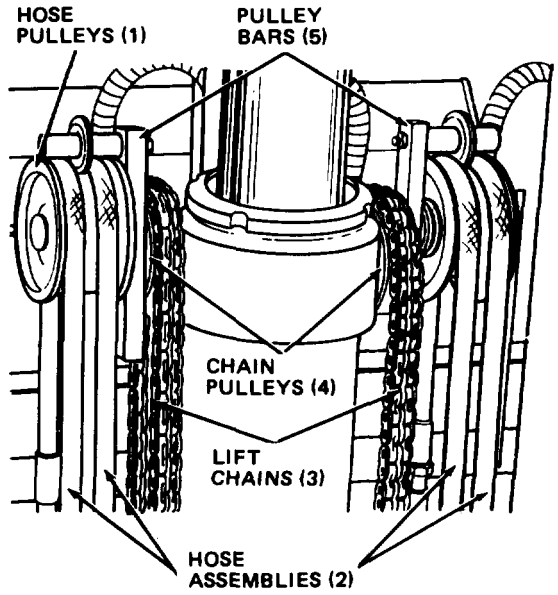
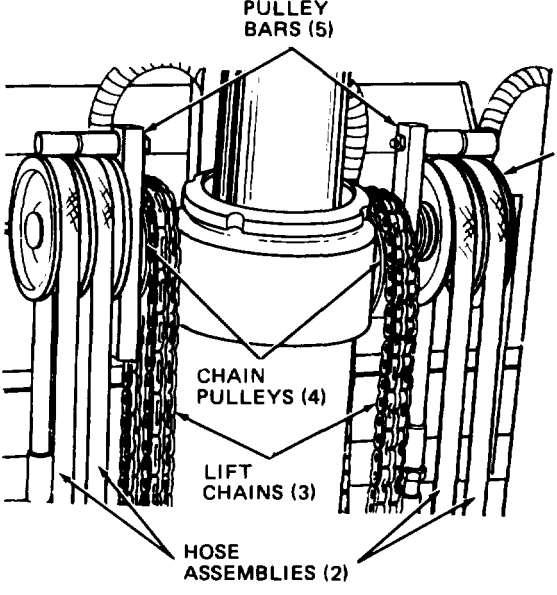
EQUIPMENT CONDITION

Paragraph Condition Description  
 Vehicle parked on level surface, engine off, parking brake applied, mast vertical, and carriage assembly raised one foot from ground and securely blocked. Control valve control levers operated several times to relieve hydraulic pressure.

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL				
<b><u>WARNING</u></b>				
Hydraulic system is under pressure. Before disconnecting any hoses, lines, or fittings, operate all hydraulic lift control levers to relieve hydraulic system pressure. Failure to do so could cause serious injury or death.				
1	Lift cylinder	a. Two hose pulleys (1) b. Four hose assemblies (2)	Remove  Position out of way	Para 2-56d, steps 2f thru 2j

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (con t )				
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>SERIAL NUMBER 9150572 AND BELOW TA127183</p> </div> <div style="text-align: center;">  <p>SERIAL NUMBER 9150573 AND ABOVE TA301534</p> </div> </div>				
1 (cont)		c. Two lift chains (3) d. Two chain pulleys (4) and pulley bars (5)	Position out of way Remove	Para 2-56d, steps 2k thru 2n
2	Mast assembly top	a. Safety wire (6) b. Two cap screws (7), washers (8), spacers (9), and washers (10)	Remove and discard Remove	
3	Inner mast	Chain hoist	a. Attach to top of inner mast b. Raise inner mast 20 inches	
4	Lift cylinder assembly (11)	Chain hoist	Attach to lift cylinder assembly under chain trunnion roller spacers using nylon straps	



**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
<b>KEY</b>				
	6. Safety wire	11B. Lock washers		
	7. Cap screws	11C. Washers		
	8. Washers	11D. Guard		
	9. Spacers	12. Hose fitting		
	10. Washers	13. Elbow		
	11. Lift cylinder assembly	14. Restrictor		
	11A. Cap screws	15. Retaining ring		
5	Mast assembly, a. Four cap screws (11A), lock washers (11B), and washers (11C) b. Guard (11D)	Loosen and remove  Remove	Serial numbers 9150573 and above  Serial numbers 9150573 and above	

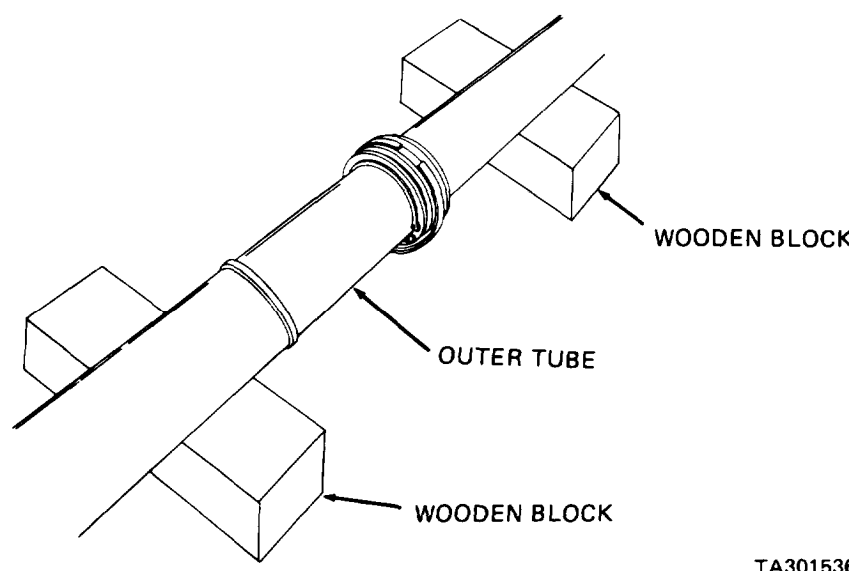
**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
5 (cont)		c. Six gallon container	Place under hose fitting (12)	
		d. Hose fitting (12)	Clean, slowly loosen, disconnect and cap	
		e. Elbow (13)	Remove	
		f. Restrictor (14)	Remove	Install plug in lift cylinder assembly port
<b><u>WARNING</u></b>				
Wear protective goggles when performing the following step. Failure to do so could cause blindness or serious injury due to retaining ring flying off its groove and striking your eye.				
		g. Retaining ring (15)	Remove	
<b><u>WARNING</u></b>				
Keep clear of carriage assembly and lift cylinder assembly when performing following step. Don't place any part of your body between carriage and mast assemblies or beneath lift cylinder. To do so could cause serious injury or death due to jack stand falling.				
Be sure lift cylinder assembly is securely fastened to chain hoist. Keep clear of carriage assembly and lift cylinder assembly. Failure to do so could cause lift cylinder assembly to fall, striking personnel and causing serious injury or death.				
<b>NOTE</b>				
After lift cylinder assembly has cleared bottom portion of inner mast in following step, hold a clean cloth under lift cylinder assembly to prevent inner tube from extending out of lift cylinder assembly.				
		h. Lift cylinder assembly (11)	Slowly raise	Check that inner tube of lift cylinder assembly is not extending out from bottom of lift cylinder assembly. If inner tube of lift cylinder assembly is extending out from bottom of lift cylinder assembly, use suitable device or tool to compress it

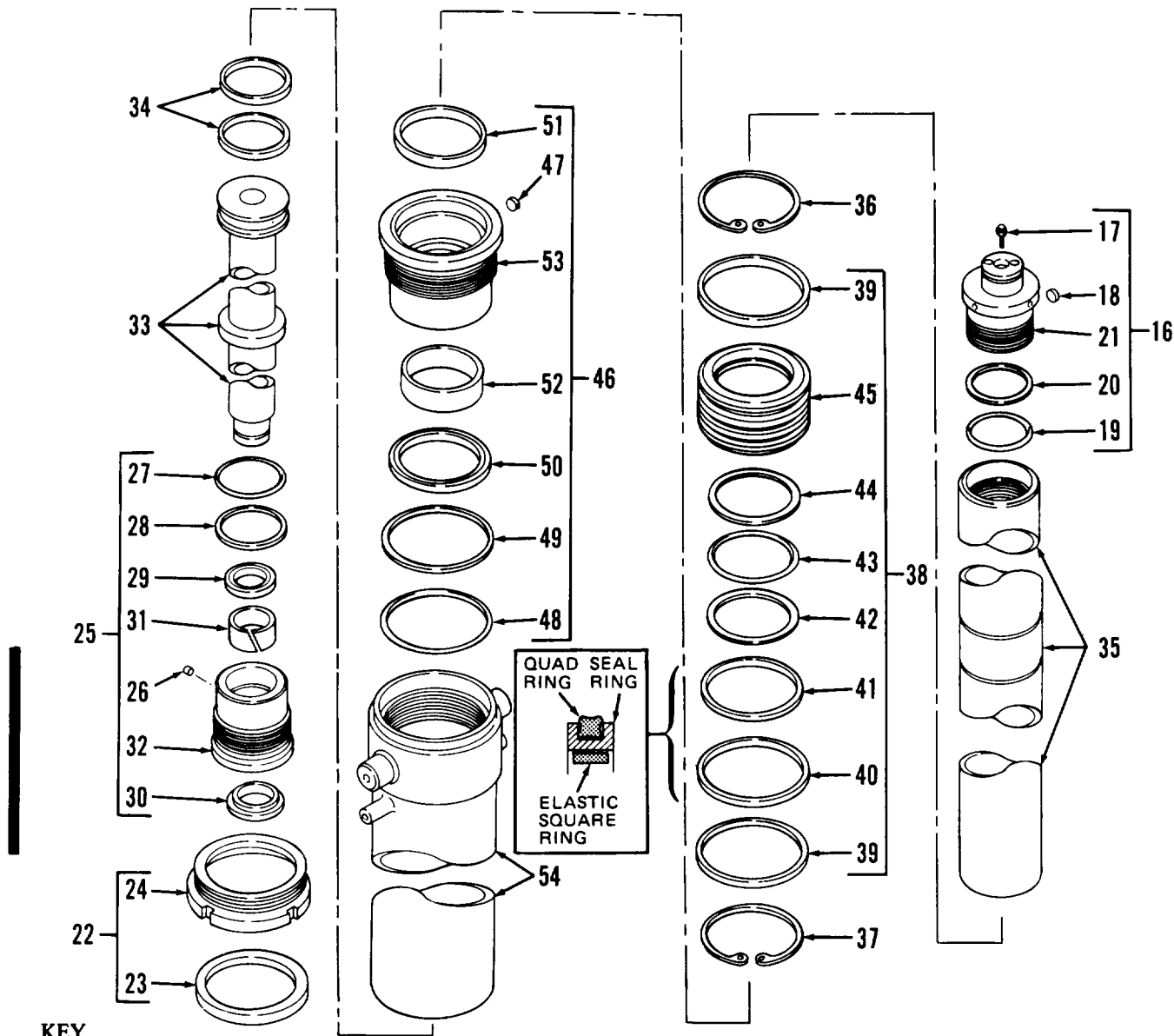
**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY				
<b>NOTE</b>				
Position outer tube (35) in brass jaw vise (or use wood blocks between vise jaws and outer tube); support other end of lift cylinder assembly.				
6	Lift cylinder assembly (11)	a. End cap assembly (16) b. Ring assembly (22) c. Gland assembly (25) d. inner tube (33) e. Gland assembly (46) f. Outer tube (35), retaining rings (36 and 37) and piston assembly (38)	Position container beneath, then remove Use Spanner Wrench NSN 5120-00-277-9076 Remove Remove Use Spanner Wrench NSN 5120-00-277-9077 Pull out from bottom of cylinder (54) and remove Remove Remove as an assembly from top of cylinder (54) and place on wooden blocks	
 <p style="text-align: right;">TA301536</p>				

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont)*



KEY

- 16. End cap assembly
- 17. Bleed screw
- 18. Plug
- 19. O-ring
- 20. Back-up ring
- 21. End cap
- 22. Ring assembly
- 23. Wiper
- 24. Ring
- 25. Gland assembly

- 26. Plug
- 27. O-ring
- 28. Back-up ring
- 29. Seal
- 30. Wiper
- 31. Bearing
- 32. Gland
- 33. Inner tube
- 34. Wear rings
- 35. Outer tube

- 36. Retaining ring
- 37. Retaining ring
- 38. Piston assembly
- 39. Wear rings
- 40. Seal
- 41. Loader ring
- 42. Back-up ring
- 43. O-ring
- 44. Back-up ring
- 45. Piston

- 46. Gland assembly
- 47. Plug
- 48. O-ring
- 49. Back-up ring
- 50. Seal
- 51. Wiper
- 52. Bearing
- 53. Gland
- 54. Cylinder

TA301537

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)***e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
7	End cap assembly (16)	a. Bleed screw (17)	Remove	
		b. Plug (18)	Remove	Only if damaged
		c. O-ring (19)	Remove and discard	
		d. Back-up ring (20)	Remove and discard	
8	Ring assembly (22)	Wiper (23)	Remove and discard	
9	Gland assembly (25)	a. Plug (26)	Remove and discard	
		b. O-ring (27)	Remove and discard	
		c. Back-up ring (28)	Remove and discard	
		d. Seal (29)	Remove and discard	
		e. Wiper (30)	Remove and discard	
		f. Bearing (31)	Remove and discard	
10	inner tube (33)	Two wear rings (34)	Remove and discard	
11	Outer tube (35)	a. Retaining rings (36 and 37)	Remove	
		b. Piston assembly (38)	Remove	
12	Piston assembly (38)	a. Two wear rings (39)	Remove and discard	
		b. Seal (40)	Remove and discard	
		c. Loader ring (41)	Remove and discard	
		d. Back-up ring (42)	Remove and discard	
		e. O-ring (43)	Remove and discard	
		f. Back-up ring (44)	Remove and discard	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (CONT)				
13	Gland assembly (46)	a. Plug (47)	Remove and discard	
		b. O-ring (48)	Remove and discard	
		c. Back-up ring (49)	Remove and discard	
		d. Seal (50)	Remove and discard	
		e. Wiper (51)	Remove and discard	
		f. Bearing (52)	Remove and discard	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent P-D-680 used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air and medical attention immediately. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water and get medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
14		All parts	Clean	Use cleaning solvent P-D-680; dry with compressed air

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION/REPAIR				
15		Tubes (33 and 35)	Inspect	Replace if bent, deformed, deeply grooved, or scored. Remove nicks or scratches with medium grit emery cloth polishing with a rotary motion
16		Cylinder (54)	Inspect	Replace if cracked, or deeply grooved or scored. Remove nicks or scratches with medium grit emery cloth polishing with a rotary motion
17		All other parts	Inspect	Replace if damaged, cracked, split, grooved or scored
reassembly				
18	Gland (53)	a. Bearing (52)	Install	Lip outwards Lip outwards Curved side towards O-ring (48)
		b. Wiper (51)	Install	
		c. Seal (50)	Install	
		d. Back-up ring (49)	Install	
		e. O-ring (48)	Install	
		f. Plug (47)	Install	
19	Piston (45)	a. Back-up ring (44)	Install	
		b. O-ring (43)	Install	
		c. Back-up ring (42)	Install	
<b>NOTE</b>				
Loader ring (41) is not used when seal repair kit is installed. Loader ring is replaced by three-piece seal (40) supplied with seal repair kit.				
		d. Two wear rings (39?)	Install	
20	Gland (32)	a. Bearing (31)	Install	Lip outwards
		b. Wiper (30)	Install	

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

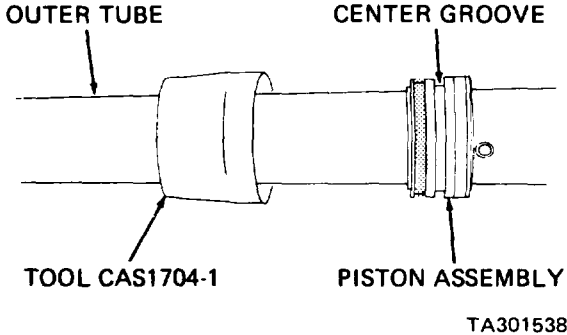
*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
20 (cont)		c. Seal (29)	Install	Lip outwards
		d. Back-up ring (28)	Install	Curved side towards O-ring (27)
		e. O-ring (27)	Install	
		f. Plug (26)	Install	
21	Inner tube (33)	Two wear rings (34)	Install	Side-by-side in groove
22	Ring (24)	Wiper (23)	Install	Lip outwards
23	End cap (21)	a. Back-up ring (20)	Install	Curved side towards O-ring (19)
		b. O-ring (19)	Install	
		c. Plug (18)	Install	
		d. Bleed screw (17)	Install	
24	Outer tube (35)	a. Retaining ring (37)	Install	Be sure ring is seated in its groove
<b><u>CAUTION</u></b>				
Be careful not to damage back-up rings (42 and 44) or O-ring (43) when performing the following step. Exercise extreme care when using tools CAS1704-1 and CAS1704-2; they are fragile.				
		b. Piston assembly (38)	Lubricate and slide on tube (35)	Use clean hydraulic oil (refer to current lubrication order)
		c. Retaining ring (36)	Install	Be sure ring is seated in its groove
		d. Tool CAS1704-1	a. Apply hydraulic oil to all surfaces	
<b><u>NOTE</u></b>				
It may be necessary to remove bottom wear ring (39) when performing following step.				
		b.	Install on outer tube (35) as shown. Large end of tool positioned over piston assembly (38). Rotate tool until small notch inside of tool covers ears of retaining ring (37): tool should then be flush with center groove of piston assembly (38)	



**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
<div style="text-align: center;">  <p>TA301538</p> </div>				
24 (cont)		e. New seal (40)	Separate elastic square ring from seal ring if not already separated	
		f. Elastic square ring	a. Liberally apply hydraulic oil b. Slide over tool CAS1704-1	
			c. Install in center groove of piston assembly (38). Use finger tips and slow, even pressure to pull ring over tool until ring falls into position in center groove	
		g. Seal ring	a. Liberally apply hydraulic oil b. Slide over tool CAS1704-1	
			c. Install in center groove of piston assembly (38). Use finger tips and slow, even pressure to pull seal ring over tool until ring falls into position in center groove over elastic square ring	
		h. Tool CAS1704-1	Remove	From outer tube (35)
		i. Bottom wear ring (39)	Install	If removed
24A Outer tube (35)		a. Inner tube (33)	Lubricate and install	Use clean hydraulic oil (refer to current lubrication order)
		b. Gland assembly (25)	Lubricate, slide on inner tube (33), connect to outer tube (35) and tighten	Use clean hydraulic oil (refer to current lubrication order). Tighten after metal-to-metal contact

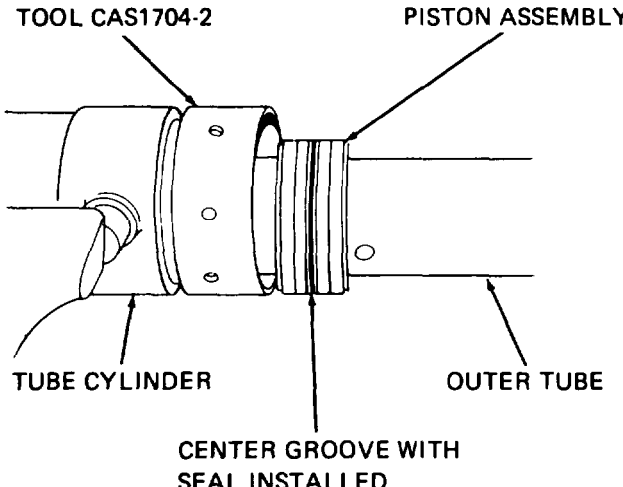
**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cent )				
24A (cent)		c. End cap assembly (16)	Lubricate, and install	Use clean hydraulic oil (refer to current lubrication order). Tighten after metal-to-metal contact
25	Cylinder (54)	a. Tool CAS1704-2	a. Install in tube cylinder and hand tighten	use of spanner wrench may be necessary
<b>NOTE</b>				
If tool CAS1704-2 cannot be completely installed in cylinder (54), cylinder may be distorted due to too much pressure exerted by vise. Loosen vise grip on cylinder then repeat step 25a above.				
b. Lubricate Use clean hydraulic oil (refer to current lubrication order)				
b. Inner tube (33) Pull completely out of outer tube (35) until it bottoms in outer tube				
<b><u>CAUTION</u></b>				
When performing following steps, be careful not to damage parts.				
c. Inner tube (33) and outer tube (35) a. With an assistant, slowly install through tool CAS1704-2 and top of cylinder (54) until piston assembly is inside tool CAS1704-2				

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
 <p style="text-align: right;">TA301540</p>				
25 (cont)		<p>c. Inner tube (33) and outer tube (35) (cont)</p> <p>d. Tool CAS1704-2</p> <p>e. Ring assembly (22)</p> <p>f. Gland assembly (46)</p>	<p>b. Hold outer tube (35) firmly while assistant pushes inner tube (33) into outer tube approximately 12 inches. Hold outer tube so that piston assembly (38) is centered in tool while assistant pulls inner tube in and out in short strokes as if using a slide hammer to pull piston assembly into cylinder (54) past tool CAS1704-2</p> <p>Remove</p> <p>Lubricate, slide over outer tube (35), connect to cylinder (54) and tighten</p> <p>Lubricate and install</p>	<p>Use clean hydraulic oil (refer to current lubrication order). Tighten after metal-to-metal contact</p> <p>Use clean hydraulic oil (refer to current lubrication order). Tighten after metal-to-metal contact</p>

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT				
<b><u>WARNING</u></b>				
<p>Be sure lift cylinder assembly is securely fastened to chain hoist. Failure to do so could cause lift cylinder assembly to fall, striking personnel and causing serious injury or death.</p>				
<b><u>CAUTION</u></b>				
<p>Remove bleed screw (17) to prevent damaging it when performing following step.</p>				
<b><u>NOTE</u></b>				
<p>Lift cylinder assembly chain trunnion roller spacers are offset from center; when installing lift cylinder assembly, be sure chain trunnion roller spacers are towards front of vehicle.</p>				
26	Mast assembly	a. Lift cylinder assembly (11) b. Retaining ring (15) c. Restrictor (14) d. Elbow (13) e. Hose fitting (12)	Position upright using chain hoist and lower into channel pocket; if necessary, remove plug from port at bottom of cylinder Install with square edge facing downwards and rounded edge facing upwards towards lift cylinder assembly Install with arrow pointing downwards, away from lift cylinder assembly Install Remove cap, connect and tighten	
<b><u>WARNING</u></b>				
<p>Keep hands and fingers clear of top of lift cylinder assembly when performing following step. Failure to do so could cause your fingers or hands to be caught between inner mast and lift cylinder assembly. You could lose a hand or finger.</p>				
		f. Guard (11D)	Position	At bottom of outer mast (serial number 9150573 and above)

**3-30. HYDRAULIC LIFT SYSTEM MAINTENANCE (cont)**

*e. Lift Cylinder Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
26 (cont)		g. Four washers (11C), lock washers (11B), and cap screws (11A)	Install and tighten	Serial number 9150573 and above
		h. Chain hoist	Lower inner mast while guiding top of lift cylinder assembly into position at top of mast	
27	Mast assembly, top	a. Two washers (10), spacers (9), washers (8) and cap screws (7)	Install	Tighten to 180-200 pounds foot torque
		b. Safety wire (6)	Install through head of cap screws; then twist ends together	
		c. Bleed screw (17)	Install	
28	Mast assembly, inner mast	a. Two chain pulleys (4) and pulley bars (5)	Install	Para 2-56d, steps 14a thru e
		b. Two lift chains (3)	Position over pulleys (4)	
		c. Four hose assemblies (2)	Position	
		d. Two hose pulleys (1)	Install	Para 2-56d, steps 14h thru k
29	Operator's compartment		Perform paragraph 2-56f(1), step 27	
<b>NOTE</b>				
To prevent damage to tools CAS1704-1 and CAS1704-2, store in shipping container immediately after each use.				

**3-31. MAST ASSEMBLY MAINTENANCE**

*a. Carriage Assembly.*

This task covers: a. Removal  
b. Disassembly  
c. Cleaning

d. Inspection/Repair  
e. Reassembly  
f. Installation/Replacement

PERSONNEL REQUIRED  
Two maintenance technicians

INITIAL SETUP

TOOLS

- Chain Hoist, 1/2 ton capacity
- Bar, 2 inches diameter
- Bar, 1-1/2 inches diameter
- Bore Gage, zero to 4 inches
- Micrometer, zero to four inches
- Automotive Mechanic's Tool Kit NSN 5180-00-754-0641
- Hard Wooden Blocks (2), 4 by 4 by 12 inches

EQUIPMENT CONDITION

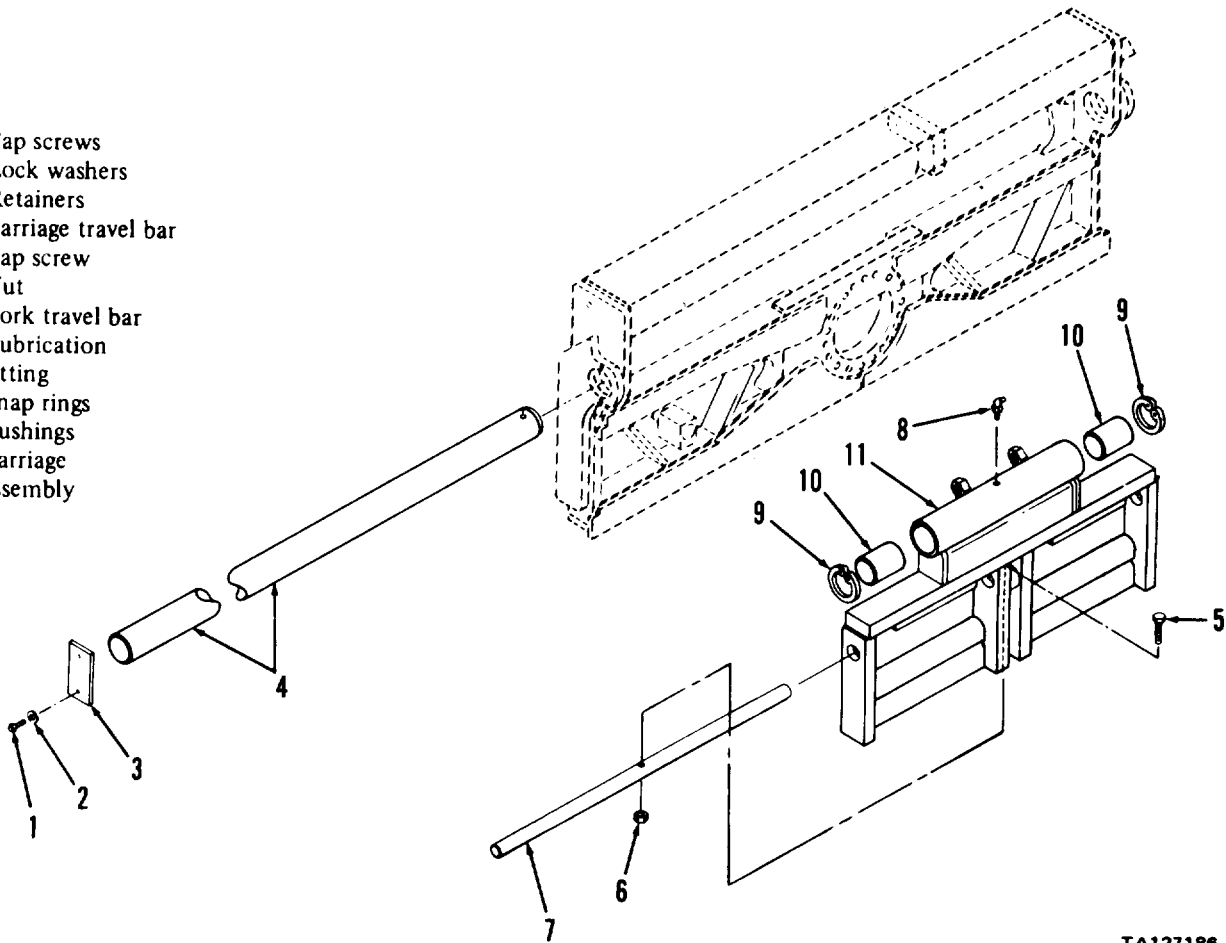
Paragraph Condition Description  
Engine off, parking brake applied, and carriage assembly raised four inches (approximately) from ground and securely blocked.  
Forks removed.  
Side shift chains disconnected from carriage assembly.

MATERIALS/PARTS

- Cleaning solvent P-D-680
- Clean cloths

KEY

- 1. Cap screws
- 2. Lock washers
- 3. Retainers
- 4. Carriage travel bar
- 5. Cap screw
- 6. Nut
- 7. Fork travel bar
- 8. Lubrication fitting
- 9. Snap rings
- 10. Bushings
- 11. Carriage assembly



TA127186

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

a. Carriage Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Side shifter frame	a. Four cap screws(1) and lock washers (2)	Remove	
		b. Two retainers (3)	Remove	
<u>CAUTION</u>				
Use chain hoist to support weight of carriage assembly (11) to prevent damaging carriage travel bar (4).				
<u>WARNING</u>				
Carriage travel bar weighs 134 pounds, be careful not to injure yourself by travel bar falling on your feet or striking your legs.				
		c. Carriage travel bar (4)	Remove	Use 2 inches diameter bar and hammer to drive from side shifter
		d. Carriage assembly (11)	Remove	Use chain hoist
<b>DISASSEMBLY</b>				
2	Carriage assembly, center	Cap screw (5) and nut (6)	Remove	
3	Carriage assembly, sides	a. Fork travel bar (7)	Position and remove	Use 1-1/2 inches diameter bar and hammer to drive bar from carriage
		b. Lubrication fitting (8)	Remove	
<b>NOTE</b>				
Don't remove snap rings (9) or bushings (10) unless inspection indicates replacement is necessary.				
		c. Two snap rings (9)	Remove	
		d. Two bushings (10)	Remove	
<u>WARNING</u>				
<b>CLEANING</b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

a. Carriage Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4		All parts	Clean	Use cleaning solvent P-D-680; dry thoroughly
INSPECTION/REPAIR				
5		Carriage travel bar (4)	Inspect	Replace if excessively worn in one area, bent, or deformed
6		Fork travel bar (7)	Inspect	Replace if excessively worn in one area, bent, deformed, or cracked
7	Carriage assembly	a. Overall	Inspect	Replace or repair by welding if cracked, broken, or structurally damaged
		b. Bushings (10)	Inspect	Replace if worn; use bore gage and measure inside diameter. Replace if measurement is more than 3 inches
8		All other parts	Inspect	Replace if damaged, cracked, or worn
REASSEMBLY				
9	Carriage assembly, sides	a. Two bushings (10)	Install	Until seated
		b. Two snap rings (9)	Install	In ring groove
		c. Fork travel bar (7)	Position and install	In bore. Use 1-1/2 inches diameter bar and drive into carriage
		d. Lubrication fitting (8)	Install	
10	Carriage assembly, center	Cap screw (5) and nut (6)	Install	If holes are not aligned, tap bar (7) until holes line up
INSTALLATION/REPLACEMENT				
11	Side shifter frame	a. Carriage assembly (11)	Position	Use chain hoist to move into position and align with side shifter frame
		b. Carriage travel bar (4)	Position and install	In bore. Use 2 inches diameter bar and drive into side shifter frame and then into carriage assembly (11) bore. Be sure bores align
		c. Two retainers (3)	Position	
		d. Four cap screws (1) and lock washers (2)	Install	
<b>NOTE</b>				
Remove wood blocks and lower forks to ground.				



**3-31 MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing.*

This task covers: a. Removal c. Inspection/Repair  
 b. Cleaning d. Installation/Replacement

PERSONNEL REQUIRED  
 Two maintenance technicians

INITIAL SETUP

TOOLS

Chain Hoist, 1/2 ton capacity  
 Automotive Mechanic's Tool Kit NSN 5180-00-754-0641  
 Tap, 5/8-11 UNC 2B  
 Steel Horses (2)

EQUIPMENT CONDITION

Paragraph Condition Description  
 2-56f(1) Fork assembly grounded; mast assembly in vertical position. Hoses, lines, and fittings between control valve and mast assembly, disconnected at mast assembly and lift cylinder assembly.  
 2-47 Front axle tires and wheels removed  
 3-31a Carriage assembly removed.

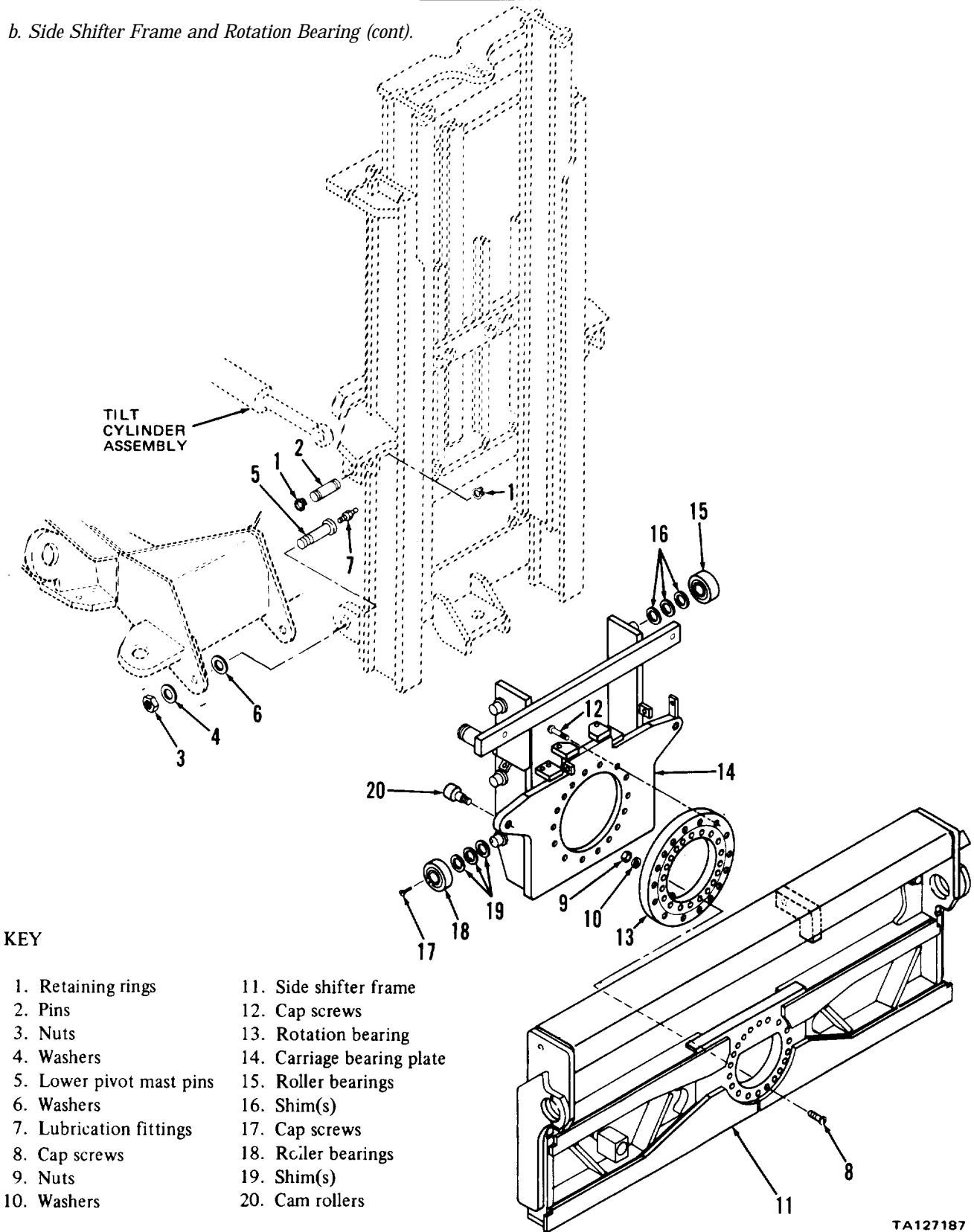
MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Inner mast	Chain hoist	Attach	To top of inner mast; take up all slack
<b><u>WARNING</u></b>				
Before performing following steps, be sure mast assembly is securely supported by chain hoist. Failure to do so will cause mast assembly to pivot forward on pivot mast pin which could result in bodily injury.				
2	Mast assembly, sides	a. Four retaining rings (1) b. Two pins (2) c. Tilt cylinder assemblies d. Two nuts (3) e. Two lower pivot mast pins (5) f. Two nuts (3) g. Two washers (4) h. Two lower pivot mast pins (5) i. Two washers (6) j. Two lubrication fittings (7)	Remove Remove Reposition out of way Loosen Tap to loosen Remove Remove Remove Remove Remove	Use ten pound hammer

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont).*



**KEY**

- |                          |                            |
|--------------------------|----------------------------|
| 1. Retaining rings       | 11. Side shifter frame     |
| 2. Pins                  | 12. Cap screws             |
| 3. Nuts                  | 13. Rotation bearing       |
| 4. Washers               | 14. Carriage bearing plate |
| 5. Lower pivot mast pins | 15. Roller bearings        |
| 6. Washers               | 16. Shim(s)                |
| 7. Lubrication fittings  | 17. Cap screws             |
| 8. Cap screws            | 18. Roller bearings        |
| 9. Nuts                  | 19. Shim(s)                |
| 10. Washers              | 20. Cam rollers            |

TA127187

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
3	Mast assembly	a. Mast assembly	Remove	Use chain hoist and move to work area. Position mast on two steel horses with side shifter frame facing up Para 3-30d
		b. Rotation cylinder assembly	Remove	
		c. Sideshift cylinder assembly	Remove	
4	Side shifter frame (11), front	Two sideshift chains and pulleys	Remove	Para 2-56e
5	Side shifter frame (11), center	a. 20 cap screws (8), nuts (9) and washers (10)	Remove	To side shifter frame
		b. Chain hoist	Secure	
<b><u>WARNING</u></b>				
Be sure chain hoist is securely attached to side shifter frame (11) before performing following step. Failure to do so could cause frame (11) to fall causing serious bodily injury.				
6	Carriage bearing plate (14)	c. Side shifter frame (11)	Remove	If cap screws (12) are difficult to remove in above step, heat cap screws then remove and discard.
		a. 16 cap screws (12)	Remove	
<b>NOTE</b>				
6	Carriage bearing plate (14)	b. Rotation bearing (13)	Remove	Para 2-56f(2) Para 2-56f(2) Para 2-56d
		c. Four-hose assemblies	Remove	
		d. Four tube assemblies	Remove	
		e. Two lift chains	Disconnect ends connected to carriage bearing plate	
		f. Carriage bearing plate (14)	Move half-way out of inner mast	
		g. Sling hoist	Secure to carriage bearing plate (14)	

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<b><u>WARNING</u></b>				
6 (cont)		Be sure sling hoist is securely fastened to carriage bearing plate before performing following step. Failure to do so could cause serious bodily injury.		
<b><u>CAUTION</u></b>				
Roller bearings (15) and shims (16) may fall off carriage bearing plate in following step.				
		h. Carriage bearing plate (14)	Remove	Use sling hoist
		i. Two roller bearings (15)	Remove	
		j. Shims(16)	Remove	
		k. Two cap screws (17)	Remove	
		l. Two roller bearings (18)	Remove	
		m. Shims (19)	Remove	
		n. Two cam rollers (20)	Remove	
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
7		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
7 (cont)			<b>NOTE</b>	
		Don't immerse roller bearings (15 and 18) or rotation bearing (13) in cleaning solvent.		
INSPECTION/REPAIR				
8		Lower pivot mast pin (5)	Inspect	Replace if bent or distorted, threads damaged, or worn
9		Roller bearings (15 and 18) and cam roller (20)	Inspect	Replace if out of round, scored, burred, sharp edged, or worn
10		Side shifter frame (11) and carriage bearing plate (14)	Inspect	Replace or repair by welding if cracked, broken, or structurally damaged. Replace if bent or warped
11		Rotation bearing (13)	Inspect	Replace if out of round, scored, burred, worn, or distorted. Repair damaged threads by chasing with 5/8-11 UNC 2B tap
12		All other parts	Inspect	Replace if damaged, worn, cracked, or distorted
INSTALLATION/REPLACEMENT				
13	Carriage bearing plate (14)	a. Two cam rollers (20)	Install	
		b. Shims (19)	Install	
		c. Four roller bearings (18)	Install	
		d. Two cap screws (17)	Install	On two bottom roller bearings
		e. Shims (16)	Install	
		f. Two roller bearings (15)	Install	
		g. Sling hoist	Secure to carriage bearing plate (14)	

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
13 (cont)	<b><u>WARNING</u></b>			
Be sure sling hoist is securely fastened to carriage bearing plate before performing following step. Failure to do so could cause serious bodily injury.				
<b><u>CAUTION</u></b>				
Roller bearings (15) and shims (16) may fall off carriage bearing plate (14) when performing following step.				
		h. Carriage bearing plate (14)	Install	Use sling hoist. Depress locking pin and position half way into inner mast then remove sling hoist
		i. Carriage bearing plate (14)	Move into full position	
		j. Two lift chains	Connect ends to carriage bearing plate (14)	Para 2-56d
		k. Four tube assemblies	Install	Para 2-56f(2)
		l. Four hose assemblies	Install	Para 2-56f(2)
		m. Rotation bearing (13)	Position	On carriage bearing plate (14)
		n. 16 cap screws (12)	Install	
14	Side shifter frame (11 )	a. Chain hoist	Secure to side shifter frame	
<b><u>WARNING</u></b>				
Be sure chain hoist is securely attached to side shifter frame before performing following step. Failure to do so could cause serious bodily injury.				
		b. Side shifter frame(11)	Position; align holes in side shifter frame with holes in rotation bearing (13)	On rotation bearing (13)

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont),*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
(cont)		c. 20 cap screws (8), washers (10) and nuts (9)	Install	
		d. Chain hoist	Remove	From side shifter frame
		e. Sideshift cylinder assembly	Install	Para 3-30c
		f. Two sideshift chains and pulleys	Install	Para 2-56e
15	Mast assembly	a. Rotation cylinder assembly	Install	Para 3-30d
		b. Carriage assembly	Install	Para 3-31a, step 11
		c. Chain hoist	Attach	To top of inner mast
<b><u>WARNING</u></b>				
Be sure chain hoist is securely fastened to top of inner mast before performing the following step. Failure to do so may cause serious bodily injury.				
		d. Mast assembly	Position; align mounting holes	In front of vehicle
16	Mast assembly, sides	a. Two washers (6)	Install	
<b>NOTE</b>				
Use chassis grease to hold washers (6) in position if necessary.				
		d. Two lower pivot mast pins (5)	Install	
		c. Two washers (4)	Install	
		d. Two nuts (3)	Install	
		e. Two lubrication fittings (7)	Install	
		f. Tilt cylinder assemblies	Position eye on rod end between brackets on outer mast sides	

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*b. Side Shifter Frame and Rotation Bearing (cont).*

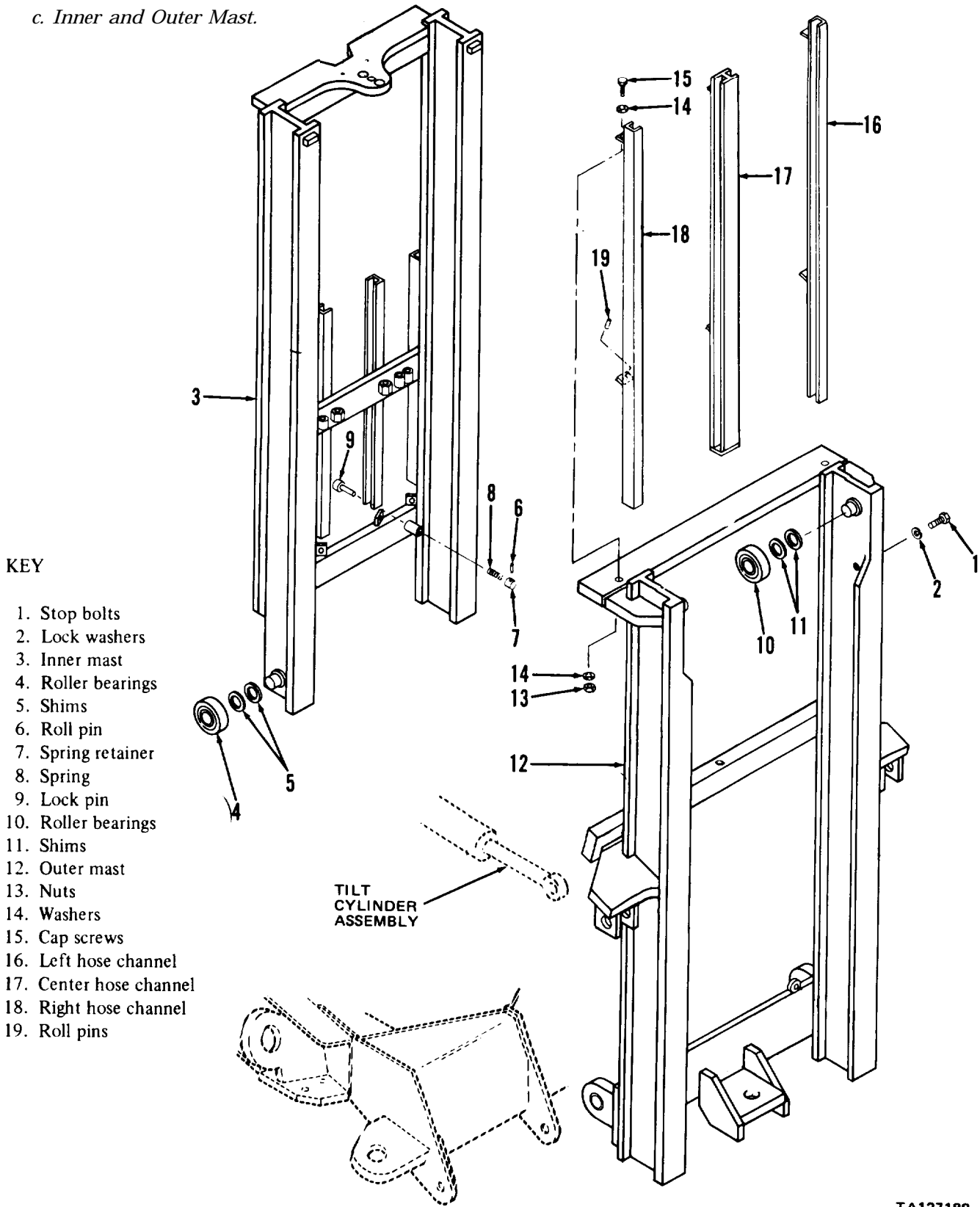
STEP	LOCATION	ITEM	ACTION	REMARKS
iNSTALLATION/REPLACEMENT (cont)				
(cont)		g. Two pins (2)	Install	Secures tilt cylinder assemblies rod to outer mast
		h. Four retaining rings (1)	Install	
		i. Lift chains	Adjust	Para 2-56d
		j. Hoses, lines and fittings	Connect	Para 2-56f(1)
		k. Front axle tires and wheels	Install	Para 2-47
		l. Lubrication fittings (7) and rotation bearing (13)	Lubricate	Refer to current lubrication order
		m. Forks	Install	Para 2-56c





**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*c. Inner and Outer Mast.*



**KEY**

- 1. Stop bolts
- 2. Lock washers
- 3. Inner mast
- 4. Roller bearings
- 5. Shims
- 6. Roll pin
- 7. Spring retainer
- 8. Spring
- 9. Lock pin
- 10. Roller bearings
- 11. Shims
- 12. Outer mast
- 13. Nuts
- 14. Washers
- 15. Cap screws
- 16. Left hose channel
- 17. Center hose channel
- 18. Right hose channel
- 19. Roll pins

TILT  
CYLINDER  
ASSEMBLY

TA127188

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*c. Inner and Outer Mast (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
2 (cont)		d. Two roller bearings (4) and shims (5)	Remove	
		e. Roll pin (6)	Remove	
		f. Spring retainer (7)	Remove	
		g. Spring (8)	Remove	
		h. Lock pin (9)	Remove	
3	Outer mast (12)	a. Two roller bearings (10)	Remove	
		b. Shims (11)	Remove	
		c. Three nuts (13) six washers (14) and three cap screws (15)	Remove	
		d. Left hose channel (16)	Remove	
		e. Center hose channel (17)	Remove	
		f. Right hose channel (18)	Remove	
		g. Three roll pins (19)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
4		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly
<b>NOTE</b>				
<p>Don't immerse roller bearings (4 and 10) in cleaning solvent.</p>				

3-31. MAST ASSEMBLY MAINTENANCE (cont)

*c. Inner and Outer Mast (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION/REPAIR</b>				
5		Inner mast (3) outer mast (12), and hose channels (16, 17, and 18)	Inspect	Replace or repair by welding if cracked, broken, or structurally damaged. Replace if twisted or bent out of shape and if roller bearing posts are out of round or worn
6		Roller bearings (4 and 10)	Inspect	Replace if out of round (inside and outside diameters), worn, or damaged
7		Roll pins (6 and 19)	Inspect	Replace if bent
8		Spring retainer (7) and lock pin (9)	Inspect	Replace if damaged, bent or worn
9		Spring (8)	Inspect	Replace if damaged, distorted, or permanent set is noticed
10		All other parts	Inspect	Replace if damaged, worn, or threads damaged
<b>INSTALLATION/REPLACEMENT</b>				
11	Outer mast (12)	a. Three roll pins (19) b. Three hose channels (18, 17 and 16) c. Three cap screws (15), six washers (14) and three nuts (13) d. Shims (11) e. Two roller bearings (10)	Install Position Install Position Position	On roller bearing posts
12	Inner mast (3)	a. Lock pin (9) b. Spring (8) c. Spring retainer (7) d. Roll pin (6) e. Shims (5) f. Two roller bearings (4) g. Chain hoist	Position Position Position Install Install Install Attach	On roller bearing posts  To approximate center of inner mast

**3-31. MAST ASSEMBLY MAINTENANCE (cont)**

*c. Inner and Outer Mast (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION/REPLACEMENT (cont)				
<b><u>WARNING</u></b>				
Be sure chain hoist is securely fastened to inner mast before performing the following step. Failure to do so could cause serious bodily injury.				
		h. Inner mast (3)	Install	Position so that roller bearings are in line with cut-outs in side of outer mast. Lift top of inner mast to slip roller bearings into channel of outer mast while lowering inner mast. Push inner mast into outer mast half way
		i. Chain hoist j. Inner mast (3)	Remove Position completely in outer mast	
13	Outer mast, sides	Two lock washers (2) and stop bolts (1)	Install	
14	Mast	a. Lift cylinder assembly	Install	Para 3-30e
		b. Lift chains and pulleys	Install	Para 2-56d
		c. Hose and tube assemblies	Install	Para 2-56f(2)
		d. Side shifter frame and rotation bearing	Install	Para 3-31b



## CHAPTER 4

### GENERAL SUPPORT MAINTENANCE PROCEDURES

**CHAPTER OVERVIEW**

The purpose of this chapter is to provide you with all needed instructions and additional information to help you at the general support level keep the equipment in good repair.

#### **4-1. CHAPTER INDEX**

Section	Page
I. Engine and Fuel System Maintenance Procedures .....	4-1
II. Power Train Maintenance .....	4-132
III. Chassis Maintenance .....	4-251

#### **Section I. ENGINE AND FUEL SYSTEM MAINTENANCE PROCEDURES**

This section contains maintenance procedures for the engine, fuel injectors, and fuel injection pump.

	Para		Para
Engine Maintenance .....	4-2	Camshaft and Bearings .....	4-2g
Cylinder Block Assembly .....	4-2a	Timing Gear Cover .....	4-2h
Cylinder Head and Valves .....	4-2b	Oil Pump .....	4-2i
Crankshaft Oil Seal Retainer Assembly .....	4-2c	Fuel System Maintenance .....	4-3
Crankshaft and Main Bearings .....	4-2d	Fuel Injector .....	4-3a
Flywheel and Flywheel Housing .....	4-2e	Fuel Injection Pump .....	4-3b
Pistons and Connecting Rods .....	4-2f		

**4-2. ENGINE MAINTENANCE**

*a. Cylinder Block Assembly.*

This task covers repair of the cylinder block assembly consisting of:

- a. Disassembly
- b. Cleaning
- c. Inspection
- d. Reassembly

INITIAL SETUP

TOOLS

- Brass Wire Probe
- Wire, .020 inch diameter
- Thickness Gage NSN 5210-00-221-1999
- Steel Straight Edge FSCM 45225  
P/N CAS-1369A
- Micrometer, zero to 5 inches
- Industrial Goggles NSN 4240-00-269-7912
- Bore Gage, zero to 5 inches
- Plasti gage
- No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654
- Sleeve, 3-3/16 inches diameter
- Sleeve, 3/4 inch diameter
- Sleeve, 1 inch diameter

EQUIPMENT CONDITION

- | Paragraph | Condition Description                  |
|-----------|--|
| 3-5g      | Cylinder head assembly removed.        |
| 3-5k      | Oil Dan removed.                       |
| 4-2h      | Timing gear cover removed.             |
| 4-2i      | Oil pump removed.                      |
| 4-2e      | Flywheel and flywheel housing removed. |
| 4-2c      | Crankshaft oil seal retainer removed.  |
| 4-2d      | Crankshaft and main bearings removed.  |
| 4-2f      | Pistons and connecting rod removed.    |
| 4-2g      | Camshaft and bearings removed.         |

SPECIAL TOOLS

- Clamping Bar FSCM 10988 P/N A40682
- Ball FSCM 10988 P/N A28312
- Clamping Disc FSCM 10988 P/N A142802

MATERIALS/PARTS

- Paint
- Cleaning solvent P-D-680
- Clean cloths
- Blue Vitriol solution
- O-rings
- Oil, No. 30
- Dry ice

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
<b>NOTE</b>				
Remove cylinder sleeves only if inspection indicates removal/ replacement is necessary.				
1	Cylinder block (1 9), top	a. Cylinder sleeve (1)	a. Identify	Number and mark for position in relation to block if sleeves may be reinstalled. Use paint

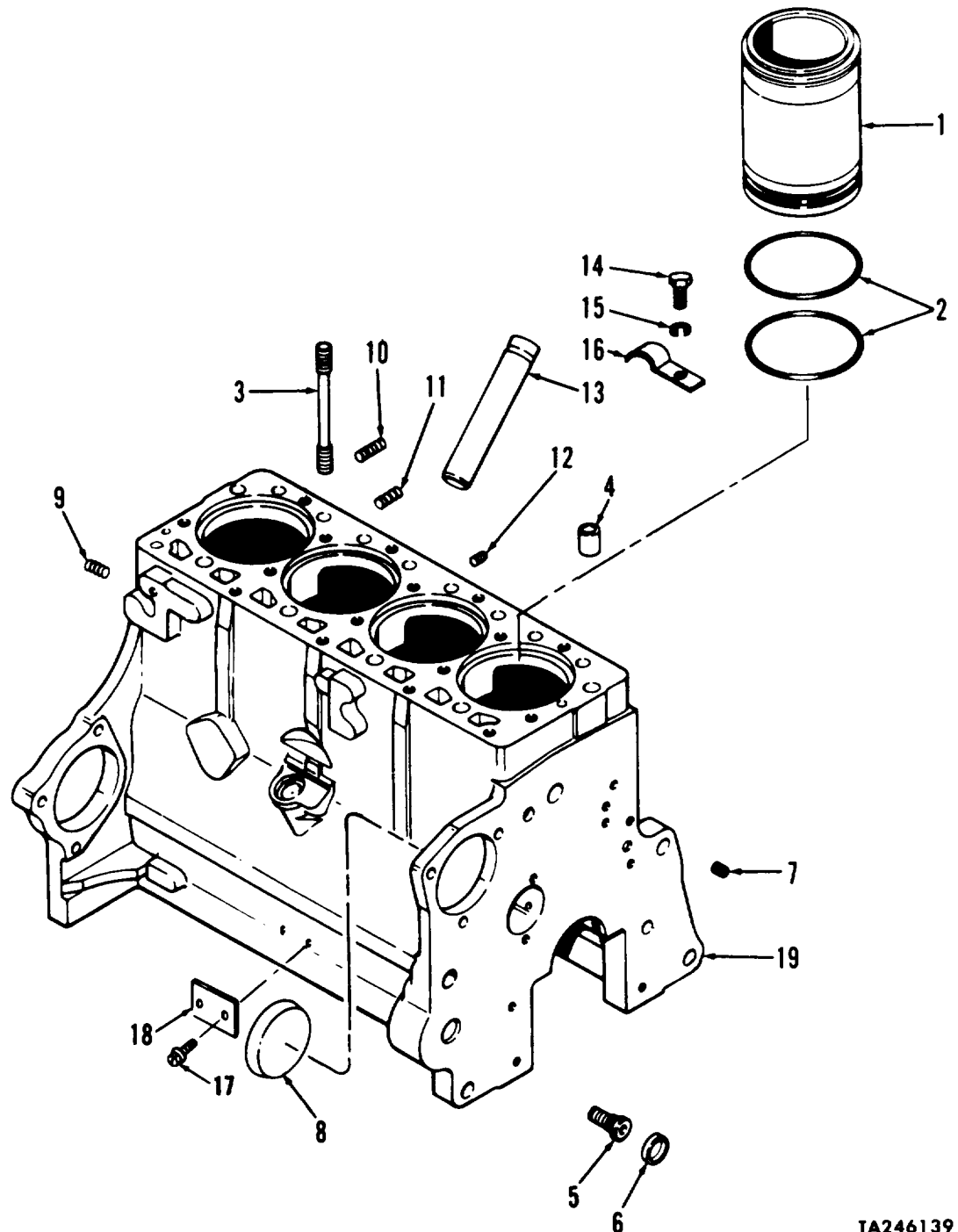


**4-2. ENGINE MAINTENANCE (cont)**

*a. Cylinder Block Assembly (cont).*

**KEY**

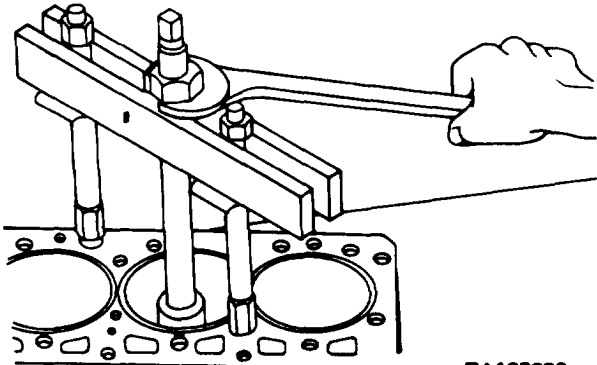
- 1. Cylinder sleeve
- 2. O-rings
- 3. Stud
- 4. Dowel ring
- 5. Oil filter to block adapter
- 6. Plug
- 7. Oil gallery plug
- 8. Cup plug
- 9. Plug
- 10. Plug
- 11. Plug
- 12. Plug
- 13. Dipstick tube
- 14. Screw
- 15. Lock washer
- 16. Clip
- 17. Screw
- 18. Plate
- 19. Cylinder block



TA246139

**4-2. ENGINE MAINTENANCE (cont)**

*a. Cylinder Block Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
1 (cont)	<p style="text-align: center;"><b><u>CAUTION</u></b></p> <p>If crankshaft and main bearing were not removed, cover them before performing following step.</p> <p style="text-align: center;">b. Remove</p>  <p style="text-align: right;"><b>TA127253</b></p>			
		b. Two O-rings (2)	Remove and discard	
		c. Stud (3)	Remove	
		d. Dowel ring (4)	Remove	Only if necessary
2	Cylinder block (19), front	a. Oil filter to block adapter (5) and plug (6)	Remove	Only if inspection indicates replacement required. Use hammer and tap adapter out. Plug will be forced out of block with adapter.
		b. Oil gallery plug (7)	Remove	
		c. Cup plug (8)	Remove	Only if necessary; use sleeve (3-3/16 inches diameter) to remove
3	Cylinder block (19), rear	Plug (9)	Remove	
4	Cylinder block (19), side	a. Plugs (10, 11, and 12)	Remove	
		b. Dipstick tube(13)	Remove	Only if inspection indicates replacement necessary. Use wrench or other device to twist out of block
		c. Screw (14) and lock washer (15)	Remove	
		d. Clip (16)	Remove	
		e. Two screws (17)	Remove	
		f. Plate (18)	Remove	

**4-2. ENGINE MAINTENANCE (cont)**

*a. Cylinder Block Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
5		Cylinder block (19)	Clean	Clean cylinder and crankcase oil passages thoroughly using moisture-free compressed air and brass wire probe. Clean exterior with live steam. Clean upper and lower cylinder grooves, oil galleries and drain openings thoroughly. Clean camshaft bushing bores thoroughly. Use 0.020 inch wire to clean camshaft bushing bore jets. Dry thoroughly with moisture free compressed air.
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
6		Cylinder sleeves (1)	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air or clean cloths
7		All other parts	Clean	Immerse in cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air or clean cloths
INSPECTION				
8		Cylinder block (19)	<p>a. Inspect</p> <p>b. Measure top surface</p>	<p>Replace if cracked, damaged, worn, eroded, or distorted or if grooves and lands pitted or eroded</p> <p>Use straight edge and feeler gauge. If surface varies more than 0.002 inch replace block</p>

**4-2. ENGINE MAINTENANCE (cont)**

*a. Cylinder Block Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
8 (cont)			c. Measure cylinder sleeve bores	Check taper and out-of-roundness with bore gauge. If taper or out-of-roundness exceeds 0.002 inch, replace block
9		Cylinder sleeve (1)	a. Inspect	Replace if smooth, shiny surface along complete length or heavy vertical lines fringed by metal transferring from one spot to another are observed
<p><b><u>WARNING</u></b></p> <p>Blue Vitriol solution contains acid. Wear safety glasses to protect eyes from accidental splashing and avoid splashing solution on skin. If solution is splashed on your skin or in your eyes, wash off immediately with water and get medical aid.</p>				
			b. Check chrome plating	Wet inside of sleeve with cotton swab saturated with Blue Vitriol solution. If bright copper color is observed, replace sleeve. Rinse tested surfaces with water after check
<p><b>NOTE</b></p> <p>If Blue Vitriol solution cannot be obtained from druggist, a satisfactory solution can be made from copper sulfate crystals available at hobby stores or pharmacies. To prepare solution: add one tablespoon fresh battery acid to one cup water; add 1/2 level teaspoon copper sulfate crystals to solution; stir with plastic spoon until crystals are dissolved.</p>				
			c. Check sleeve inside diameter for taper	Use inside micrometer or bore gage. Check below top ring location and at several points down length. Replace if taper is more than 0.002 inch
			d. Check sleeve out-of-roundness	Use bore gage. Measure lengthwise just below top ring location at four points 90 degrees from each other. Replace if out-of-roundness exceeds 0.001 inch. (Use micrometer to check bore gage.)
10		Oil falter to block adapter (5) and stud (3)	Inspect	Replace if bent or threads damaged

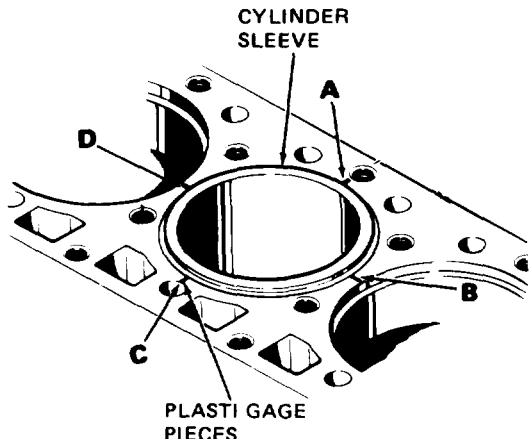
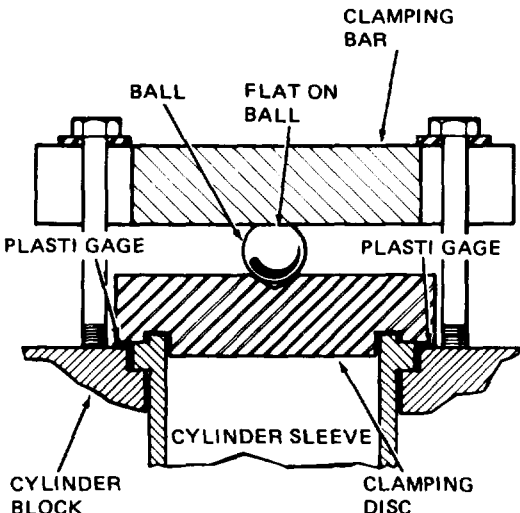
**4-2. ENGINE MAINTENANCE (cont)**

*a. Cylinder Block Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
11		Dipstick tube (13)	Inspect	Replace if bent, cracked, or dented
12		Dowel ring (4)	Inspect	Replace if deformed or nicked
13		All other parts	Inspect	Replace if threads are damaged
REASSEMBLY				
14	Cylinder block (19), side	a. Plate (18) b. Screw (17) c. Clip (16) d. Lock washer (15) and screw (14) e. Dipstick tube (13)  f. Plugs (10, 11, and 12)	Position Install Position Install  Install  Install	     If removed. Chill in dry ice and install smooth end in block until firmly seated
15	Cylinder block (19), rear	Plug (9)	Install	
16	Cylinder block (19), front	a. Cup plug (8) b. Oil gallery plug (7) c. Oil filter to block adapter (5)  d. Plug (6)  e. Dowel ring (4)	Install Install Install  Install  Install	Install from rear until flush with front of block  If removed. Install from front of block. Use 3/4 inch diameter sleeve and install until firmly seated If removed. Install with lip towards front of block; use 1 inch diameter sleeve and install until firmly seated If removed. Cool in dry ice. Install until firmly seated
17	Cylinder sleeve (1)	O-ring (2)	a. Install b. Lubricate	In cylinder sleeve bottom grooves Use No. 30 oil
18	Cylinder block (19), top	a. Cylinder sleeve bore	Clean	Upper and lower grooves
			<b>NOTE</b>	
		If old sleeves are being reinstalled, install in same location and position as they were prior to removal.		
		b. Cylinder sleeve (1)	a. Install	Don't rotate sleeve during installation and be careful not to damage O-rings. Use hand pressure to install

4-2. ENGINE MAINTENANCE (cont)

a. Cylinder Block Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
18 (cont)		CYLINDER SLEEVE	b. Measure sleeve protrusion	Position plasti gage at four points shown. Plasti gage must not protrude onto sleeve flange. Install clamping disc tool carefully over sleeve as shown. Install 1 inch ball and clamping bar. Tighten hold dew] bolts evenly to 50 pounds foot torque. Then, remove clamping bolts, bar and ball. Carefully remove clamping disc so as not to disturb plasti gage. Flattened plasti gage will be on clamping disc or block. Measure plasti gage. If sleeve protrusion varies more than 0.005 inch around circumference, replace that sleeve and recheck
				
				
			TA127254	

**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves.*

This task covers overhaul of the cylinder head and replacement/repair of the valves consisting of:

- a. Removal
- b. Cleaning
- c. Inspection and Repair
- d. Valves and Valve Seat Refacing
- e. Installation

INITIAL SETUP

TOOLS

- Expandable Bore Gage, zero to 1/2 inch
- Fine Rotary Wire Brush
- Micrometer, zero to 5 inches
- Feeler Gage NSN 5210-00-221-1999
- Precision Seat Grinder
- Valve Refacing Machine
- 45 degree Grinding Stone
- 60 degree Grinding Stone
- 30 degree Grinding Stone
- Valve Spring Compressor Tool
- Steel Straight Edge
- Power Driven Fine Wire Brush
- Valve Seat Removal Tool
- Vee Block Holder
- Spring Tester NSN 4910-00-754-0650
- No. 2 Common Organizational Maintenance Tool Kit

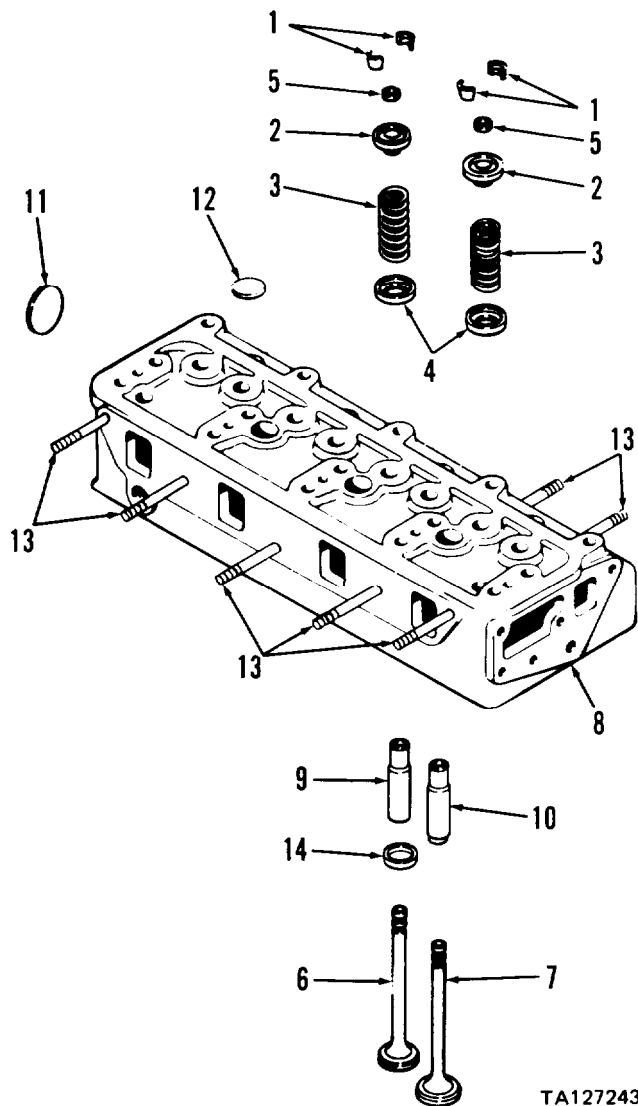
SPECIAL TOOLS

- Reamer FSCM 10988 P/N A43112

MATERIALS/PARTS

- Cleaning Solvent P-D-680 Oil, No. 30
- Clean cloths Valve keepers
- Dry ice Emery cloth, medium grit

EQUIPMENT	CONDITION
Paragraph	Condition Description
3-5j	Rocker arm assembly removed.
3-5g	Cylinder head assembly removed.



TA127243

**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Cylinder head (8), top	a. Valve spring (3) b. Two valve keepers (1) c. Valve spring (3)  d. Spring retainer (2) e. Valve spring (3) f. Spring seat (4) g. Valve stem seal (5)	Compress Remove and discard Release  Remove Remove Remove Remove	Use valve spring compressor tool  Carefully release pressure on valve spring compressor tool
<b>NOTE</b>				
Identify (number) valves (6 and 7) and respective bores for reference during installation.				
2	Cylinder head (8), bottom	a. Exhaust valve (6) b. Intake valve (7)	Remove Remove	
<b>CLEANING</b>				
<b>CAUTION</b>				
In following step be careful not to scratch valve stems.				
3		Four exhaust valves (6) and intake valves (7)	Clean	Use fine power driven wire brush
<b>WARNING</b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				



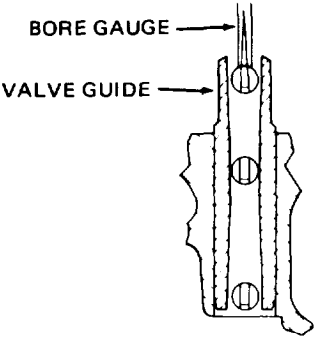
**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
4	Cylinder head (8)	a. Overall	Clean	Use cleaning solvent P-D-680. Dry with moisture free compressed air or clean cloth
		b. Valve ports	Clean	Use fine rotary wire brush
		c. Machined surface areas	Clean	Use medium grit emery cloth carefully to remove all gasket material, carbon and rust
5		All other parts	Clean	Use cleaning solvent P-D-680. Dry with moisture free compressed air
INSPECTION AND REPAIR				
6		Valve spring (3)	Inspect	Install in spring tester. Check that force to compress spring to 1.521 inch is 110 to 118 pounds; force to compress spring to 1.875 inch is 53 to 59 pounds. Replace spring if force is less than these values
7	Cylinder head (8)	a. Bottom surface	Check warpage	Lay straight edge diagonally from corner to corner and try to get a 0.006 inch feeler gage under straight edge. Check at several points. Reposition straight edge at opposite corners and repeat checks. If warpage is greater than 0.006 inch resurface or replace cylinder head
<b>NOTE</b>				
If cylinder head is resurfaced, maintain a minimum thickness of 3.968 inches.				
		b. Valve guides (9 and 10)	Check inside diameter	Use bore gage and check in three places as shown below. Measure bore gage with micrometer. If greater than 0.3449 inch at any point replace valve guides

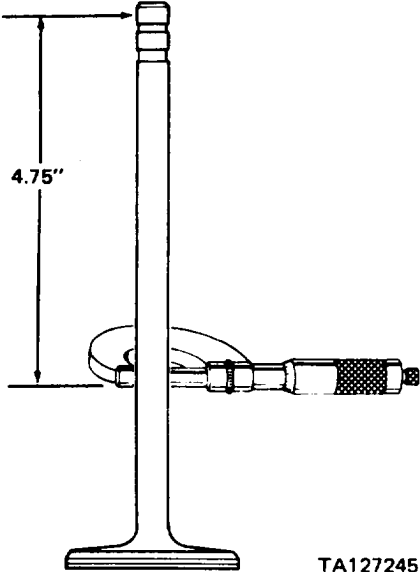
**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS																					
INSPECTION AND REPAIR (cont)																									
7 (cont)	<div style="text-align: center;">  <p>TA127244</p> </div> <p><b>NOTE</b></p> <p>If valve guides (9 and 10) require replacement, perform c below; otherwise proceed to d.</p> <table border="0"> <tr> <td>c. Valve guides (9 and 10)</td> <td>a. Remove</td> <td>Use hydraulic press and press guides from top, through cylinder head</td> </tr> <tr> <td></td> <td>b. Position and install</td> <td>On top of cylinder head, Use hydraulic press and push into head until valve guide protrudes 0,875 inch above top of head</td> </tr> <tr> <td></td> <td>c. Ream</td> <td>Use A43112 reamer. Ream to 0.3429-0.3439 inch</td> </tr> <tr> <td>d. Plugs (11 and 12)</td> <td>Inspect</td> <td>Check for damage and looseness. If plugs are damaged or loose, replace</td> </tr> </table> <p><b>NOTE</b></p> <p>If plugs (11 and 12) require replacement, perform e, f, and g below; otherwise proceed to h.</p> <table border="0"> <tr> <td>e. Plugs (11 and 12)</td> <td>Remove</td> <td>Drill and pry out</td> </tr> <tr> <td>f. Plug (11)</td> <td>Install</td> <td>Until seated, then strike with hammer to expand</td> </tr> <tr> <td>g. Plug (12)</td> <td>Install</td> <td>To 0.370 inch depth</td> </tr> </table>				c. Valve guides (9 and 10)	a. Remove	Use hydraulic press and press guides from top, through cylinder head		b. Position and install	On top of cylinder head, Use hydraulic press and push into head until valve guide protrudes 0,875 inch above top of head		c. Ream	Use A43112 reamer. Ream to 0.3429-0.3439 inch	d. Plugs (11 and 12)	Inspect	Check for damage and looseness. If plugs are damaged or loose, replace	e. Plugs (11 and 12)	Remove	Drill and pry out	f. Plug (11)	Install	Until seated, then strike with hammer to expand	g. Plug (12)	Install	To 0.370 inch depth
c. Valve guides (9 and 10)	a. Remove	Use hydraulic press and press guides from top, through cylinder head																							
	b. Position and install	On top of cylinder head, Use hydraulic press and push into head until valve guide protrudes 0,875 inch above top of head																							
	c. Ream	Use A43112 reamer. Ream to 0.3429-0.3439 inch																							
d. Plugs (11 and 12)	Inspect	Check for damage and looseness. If plugs are damaged or loose, replace																							
e. Plugs (11 and 12)	Remove	Drill and pry out																							
f. Plug (11)	Install	Until seated, then strike with hammer to expand																							
g. Plug (12)	Install	To 0.370 inch depth																							

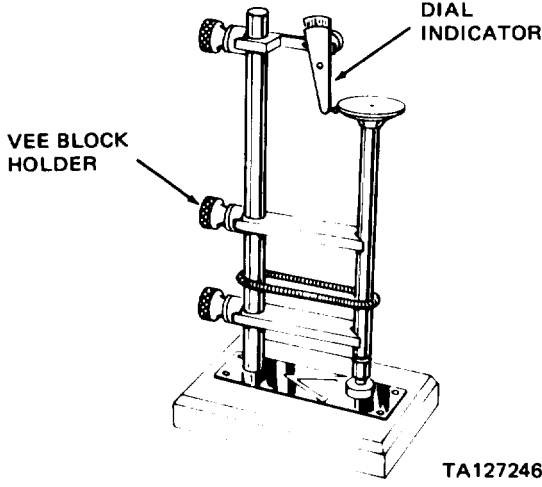
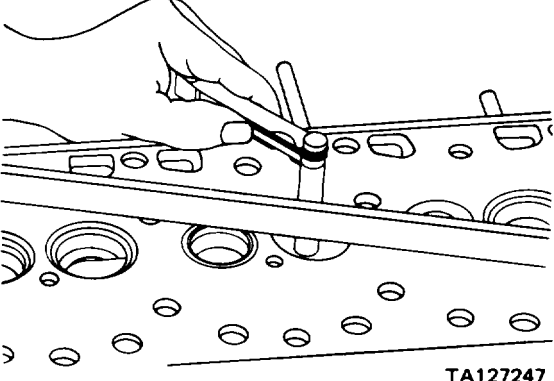
**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION AND REPAIR (cont)				
7 (cont)		h. Studs (13)	Inspect	Inspect for bent condition and damaged threads. If bent or threads damaged, replace. Replace by unscrewing stud and screwing new stud into cylinder head
8	Exhaust valve (6) and intake valve (7)	a. Overall  b. Ret airier groove c. Stem diameter	Inspect  Inspect Measure stem diameter	Replace if valve stem is nicked, valve face grooved, heavy carbon and/or varnish deposits, rust or pitting on valve stem or valve face, burned valve face, or dished valve head. Fine pitting on surface of valve face or seat is normal  Replace if worn or if stem tip is worn Three places as shown. Replace exhaust valve (6) if less than 0.3389 inch. Replace intake valve (7) if less than 0.3399 inch
<div style="text-align: center;">  <p>The diagram shows a vertical valve stem with a horizontal detail view of its tip. A vertical dimension line on the left indicates a length of 4.75 inches from the base of the stem to the top of the detail. The detail view shows a cylindrical stem with a chamfered end and a small groove. The callout TA127245 points to this detail.</p> </div>				

**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION AND REPAIR (cont)				
8 (cont)		d. Valve face and stem runout	Measure	Check as shown below. If runout exceeds 0.002 inch, replace valve
<div style="text-align: center;">  <p style="text-align: right;">DIAL INDICATOR</p> <p style="text-align: left;">VEE BLOCK HOLDER</p> <p style="text-align: right;">TA127246</p> </div>				
9	Cylinder head (8)	a. Intake valve (7) and exhaust valve (6)	Install and check valve recession	Check as shown below. If exhaust valve recession is more than 0.005 inch, replace valve or valve seat insert. If intake valve recession is more than 0.005 inch, replace intake valve and recheck recession. If recession is still more than 0.005 inch, replace or resurface cylinder head (minimum cylinder head thickness of 3.968 inches must be maintained)
<div style="text-align: center;">  <p style="text-align: right;">TA127247</p> </div>				

**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION AND REPAIR (cont)				
9 (cont)	<b>NOTE</b>			
If valve seat inserts (14) require replacement perform steps b and c below; otherwise proceed to step d below.				
<b>CAUTION</b>				
Don't remove valve seat inserts (14) with punch, chisel or pry bar as damage to cylinder head will result.				
		b. Valve seat insert (14)	Remove	Use seat removal tool or machine inserts out of cylinder head
		c. Valve seat insert (14)	Cool and install	Clean valve seat insert recesses in cylinder head. Place new inserts in dry ice to shrink them, then install by pressing into cylinder block until bottomed in recess. Check as shown below. If protrusion is more than 0.005 inch, valve and seat must be ground. Refer to intake and exhaust valves and valve seat refacing following
		d. Intake valve (7) and exhaust valve (6)	Install and check valve protrusion	
TA127248				






**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>VALVES AND VALVE SEAT REFACING</b>				
10	Refacing machine	a. Protractor b. Chuck c. Grinding wheel	Set Clean Dress	At 44 degree angle
11		Valves (6 and 7)	Grind lightly	Grinding angle is 44 degrees
<b>NOTE</b>				
Replace any valve that has a thin margin or edge. If margin on ground valve is less than half margin on new valve, replace that valve.				
12		Valve seats and inserts (14)	Grind lightly	Grinding angle as shown. Use precision seat grinder. Take very light cuts to remove just enough metal to obtain a smooth seat finish.
TA127249				
13		Valves (6 and 7)	a. Apply valve bluing b. Install c. Remove	Use Prussian Blue. Apply to valve face  In cylinder head (8). Rotate valve in seat. Check contact area on valve face and seat. Bluing will be removed from valve face where contact was made with seat. Correct and incorrect indications along with remedial procedures are shown below

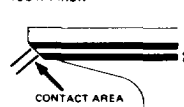

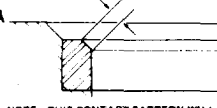
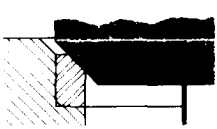



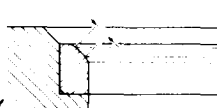


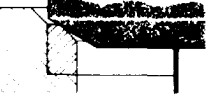
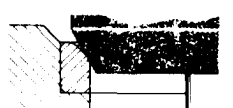
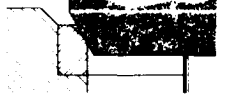
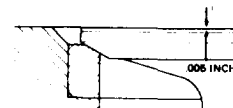
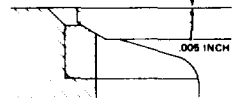
**4-2. ENGINE MAINTENANCE (cont)**

*b. Winder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS		
VALVES AND VALVE SEAT REFACING (cont)						
13 (cont)						
CORRECT SEAT CONTROL AREA ON VALVE		CORRECT EXHAUST VALVE CONTACT AREA ON SEAT WILL PROVIDE A SEAT WIDTH OF .0808" TO .0882"	CORRECT INTAKE VALVE CONTACT AREA WILL PROVIDE A SEAT WIDTH OF .0704" TO .1067"	1° INTERFERENCE ANGLE	CORRECT REFACING OF INTAKE AND EXHAUST VALVES AND VALVE SEATS WILL PROVIDE A 1° INTERFERENCE ANGLE. THIS ANGLE IS IMPORTANT SINCE IT AIDS IN CUTTING CARBON AND HELPS SEAT VALVES.	
SEAT CONTACT AREA ON VALVE TOO LOW		IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS (PREVIOUSLY GROUND SEAT)	USE A 45° STONE TO RAISE AND WIDEN CONTACT AREA.	USE A 80° NARROWING STONE TO NARROW LOWER CONTACT AREA INCREASED BY 45° STONE.	CHECK THAT VALVE HEAD HAS NOT RECEDED MORE THAN .006 INCH BELOW CYLINDER HEAD SURFACE.	
SEAT CONTACT AREA ON VALVE TOO LOW		IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS	USE A 45° STONE TO RAISE CONTACT AREA.	USE A 80° NARROWING STONE TO RAISE AND NARROW LOWER CONTACT AREA.	CHECK THAT VALVE HEAD HAS NOT RECEDED MORE THAN .006 INCH BELOW CYLINDER HEAD SURFACE.	
NOTE: THIS CONTACT PATTERN WILL ALSO BE FOUND ON INTAKE VALVES WITHOUT REPLACEABLE SEATS.					.006 INCH	
SEAT CONTACT AREA ON VALVE TOO HIGH		IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS (PREVIOUSLY GROUND SEAT)	USE A 45° STONE TO LOWER AND WIDEN CONTACT AREA.	USE A 30° NARROWING STONE TO NARROW UPPER CONTACT AREA INCREASED BY 45° STONE.	CHECK THAT VALVE HEAD HAS NOT RECEDED MORE THAN .006 INCH BELOW CYLINDER HEAD SURFACE.	
SEAT CONTACT AREA ON VALVE TOO HIGH		IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS	THE VALVE AND VALVE SEAT MUST BE REPLACED SINCE ADDITIONAL GRINDING WILL NOT ALTER THE LOWER CONTACT POINT.			.006 INCH
NOTE: THIS CONTACT PATTERN WILL ALSO BE FOUND ON INTAKE VALVES WITHOUT REPLACEABLE SEATS.					TA127250	

**4-2. ENGINE MAINTENANCE (cont)**

*b. Winder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<p>VALVES AND VALVE SEAT REFACING (cont)</p>				
<p>13 (cont)</p>				
<p>SEAT CONTACT AREA ON VALVE TOO NARROW</p>  <p>CONTACT AREA</p>	<p>IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS (PREVIOUSLY GROUND SEAT)</p>  <p>IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS</p>  <p>NOTE: THIS CONTACT PATTERN WILL ALSO BE FOUND ON INTAKE VALVES WITHOUT REPLACEABLE SEATS.</p>	<p>→ USE A 45° STONE TO INCREASE CONTACT AREA.</p>  <p>→ VALVE AND VALVE SEAT MUST BE REPLACED SINCE ADDITIONAL GRINDING WILL NOT ALTER LOWER CONTACT POINT.</p> 	<p>→ CHECK THAT VALVE HEAD HAS NOT RECEDED MORE THAN .006 INCH BELOW CYLINDER HEAD SURFACE.</p>  <p>.006 INCH</p>	
<p>SEAT CONTACT AREA ON VALVE TOO WIDE.</p>  <p>CONTACT AREA</p>	<p>IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS (PREVIOUSLY GROUND SEAT)</p>  <p>IF VALVE CONTACT AREA ON SEAT LOOKS LIKE THIS</p>  <p>NOTE: THIS CONTACT PATTERN WILL ALSO BE FOUND ON INTAKE VALVES WITHOUT REPLACEABLE SEATS.</p>	<p>→ USE A 30° NARROWING STONE TO LOWER UPPER CONTACT AREA.</p>  <p>→ USE A 30° NARROWING STONE TO LOWER UPPER CONTACT AREA.</p> 	<p>→ USE A 80° NARROWING STONE TO RAISE LOWER CONTACT AREA.</p>  <p>→ USE A 80° NARROWING STONE TO RAISE LOWER CONTACT AREA.</p>  <p>→ CHECK THAT VALVE HEAD HAS NOT RECEDED MORE THAN .006 INCH BELOW CYLINDER HEAD SURFACE.</p>  <p>.006 INCH</p> <p>→ CHECK THAT VALVE HEAD HAS NOT RECEDED MORE THAN .006 INCH BELOW CYLINDER HEAD SURFACE.</p>  <p>.006 INCH</p>	

TA127251



**4-2. ENGINE MAINTENANCE (cont)**

*b. Cylinder Head and Valves (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
VALVES AND VALVE SEAT REFACING (cont)				
13 (cont)	<p><b>NOTE</b></p> <p>After valves and valve seat are ground, valve recession and protrusion must be rechecked (step 9a and d, respectively, of inspection and repair).</p>			
INSTALLATION				
14	Cylinder head, (8) bottom	Valves (6 and 7)	a. Lubricate valve stems b. Install	Use No. 30 oil  In proper bore
15	Cylinder head, (8) top	a. Spring seat (4) b. Valve spring (3)	Install Install	With closed damping coil end towards cylinder head
		c. Spring retainer (2) d. Valve stem seal (5)	Install Install	Use valve spring compressor tool and compress spring. Install in lower stem groove
		e. Two valve keepers (1)	Install	On top valve stem groove. Remove valve spring compressor tool care fully and tap valve stem to seat valve keepers

**4-2. ENGINE MAINTENANCE (cont)**

*c. Crankshaft Oil Seal Retainer Assembly.*

This task covers:

- a. Removal
- b. Cleaning

- c. Inspection
- d. Installation

INITIAL SETUP

TOOLS

No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654  
 Sleeve, 2-7/8 inches diameter  
 Arbor press

EQUIPMENT CONDITION

Paragraph 4-2e Condition Description  
 Flywheel and flywheel housing removed.

SPECIAL TOOLS

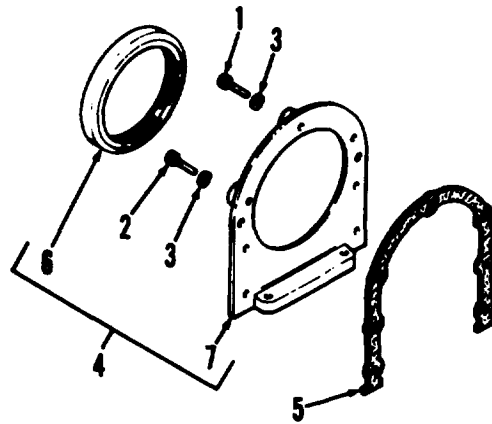
Sleeve Tool FSCM 10988 P/N G15028  
 Aligning Tool FSCM 10988 P/N G13506

MATERIALS/PARTS

Cleaning solvent P-D-680 Oil, No. 30  
 Clean cloths Oil seal  
 Permatex 2 NSN 8030-00-873-4792 Gasket

KEY

- 1. Cap screws
- 2. Cap screws
- 3. Lock washers
- 4. Crankshaft oil seal retainer assembly
- 5. Gasket
- 6. Oil seal
- 7. Rear oil seal retainer



TA127191

**4-2. ENGINE MAINTENANCE (cont)**

*c.Crankshaft Oil Seal Retainer Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
<b>NOTE</b>				
Note cap screws (1 and 2) positioning for installation.				
1	Cylinder block, rear	a. Seven cap screws (1 and 2) and lock washers (3)	Remove	
		b. Crankshaft oil seal retainer assembly (4)	Remove	
		c. Gasket(5)	Remove and discard	
2	Crankshaft oil seal retainer assembly (4)	Oil seal (6)	Remove and discard	Use 2-7/8 inches diameter sleeve
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680). used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
3		All parts	Clean	Use cleaning solvent P-D-680. Dry with moisture free compressed air or clean cloth

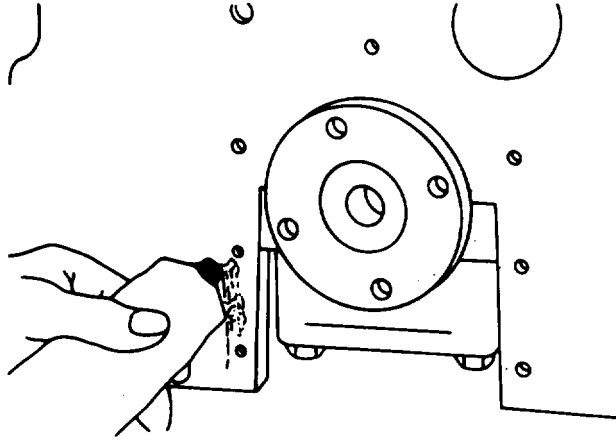
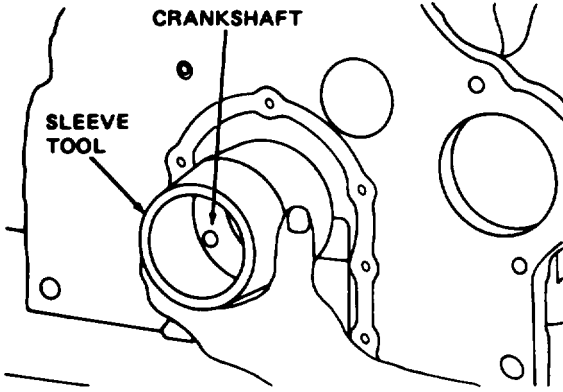
**4-2. ENGINE MAINTENANCE (cont)**

*c. Crankshaft Oil Seal Retainer Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
4	Cylinder block, rear	Gasket (5) area	Clean	Remove traces of gasket using cleaning solvent P-D-680. Dry with moisture free compressed air
INSPECTION				
5		All parts	Inspect	Check for cracks, damage and distortion. Replace part if any of these conditions observed
6	Cylinder block, rear	Gasket (5) area	Inspect	Check that all traces of gasket (5) removed
INSTALLATION				
7	Crankshaft oil seal retainer assembly	a. Rear oil seal retainer (7)	Position	On press
		b. Oil seal (6)	Install	Press into retainer until seal is flush with rear of retainer
8	Cylinder block, rear	a. Gasket (5) area	Coat	Apply Permatex 2 from lower screw holes to bottom of block

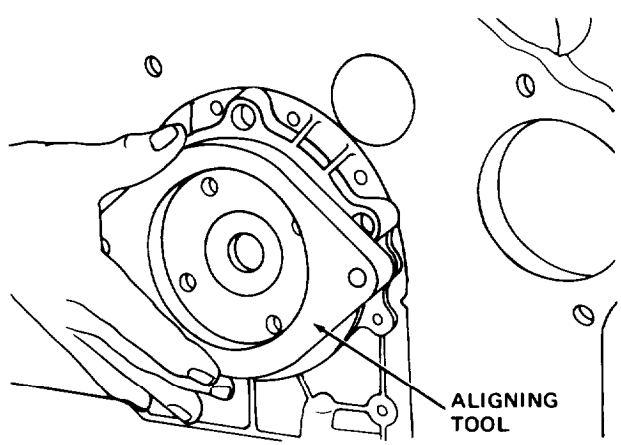
**4-2. ENGINE MAINTENANCE (cont)**

*c. Crankshaft Oil Seal Retainer Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
8 (cont)	 <p style="text-align: right;"><b>TA127193</b></p>			
		b. Gasket (5)	Install and coat	Apply Permatex 2 from lower screw holes to bottom of gasket.
		c. Sleeve tool	Install	
	 <p style="text-align: right;"><b>TA127194</b></p>			
		d. Oil seal (6)	Lubricate	Use No. 30 oil Slide oil seal on sleeve until retainer assembly is against gasket (5), then trim excess gasket material.
		e. Crankshaft oil seal retainer assembly (4)	Position	
		f. Sleeve tool	Remove	

**4-2. ENGINE MAINTENANCE (cont)**

*c. Crankshaft Oil Seal Retainer Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS																
INSTALLATION (cont)																				
(cont)		g. Aligning tool	Install	With tool pins in aligning holes of retainer assembly (4) and over crankshaft flange																
 <p style="text-align: center;">ALIGNING TOOL TA127195</p>																				
<table border="0" style="width: 100%;"> <tr> <td style="width: 20%;"></td> <td style="width: 20%;">h. Three cap screws (2) and lock washers (3)</td> <td style="width: 20%;">Install</td> <td style="width: 40%;">In top and two bottom holes. Tighten until retainer assembly (4) and gasket press firmly against cylinder block</td> </tr> <tr> <td></td> <td>i. Aligning tool</td> <td>Remove</td> <td></td> </tr> <tr> <td></td> <td>j. Four cap screws (1) and lock washers (3)</td> <td>Install</td> <td>Tighten to 12-15 pounds foot torque</td> </tr> <tr> <td></td> <td>k. Three cap screws (2)</td> <td>Tighten</td> <td>Tighten to 12-15 pounds foot torque</td> </tr> </table>						h. Three cap screws (2) and lock washers (3)	Install	In top and two bottom holes. Tighten until retainer assembly (4) and gasket press firmly against cylinder block		i. Aligning tool	Remove			j. Four cap screws (1) and lock washers (3)	Install	Tighten to 12-15 pounds foot torque		k. Three cap screws (2)	Tighten	Tighten to 12-15 pounds foot torque
	h. Three cap screws (2) and lock washers (3)	Install	In top and two bottom holes. Tighten until retainer assembly (4) and gasket press firmly against cylinder block																	
	i. Aligning tool	Remove																		
	j. Four cap screws (1) and lock washers (3)	Install	Tighten to 12-15 pounds foot torque																	
	k. Three cap screws (2)	Tighten	Tighten to 12-15 pounds foot torque																	

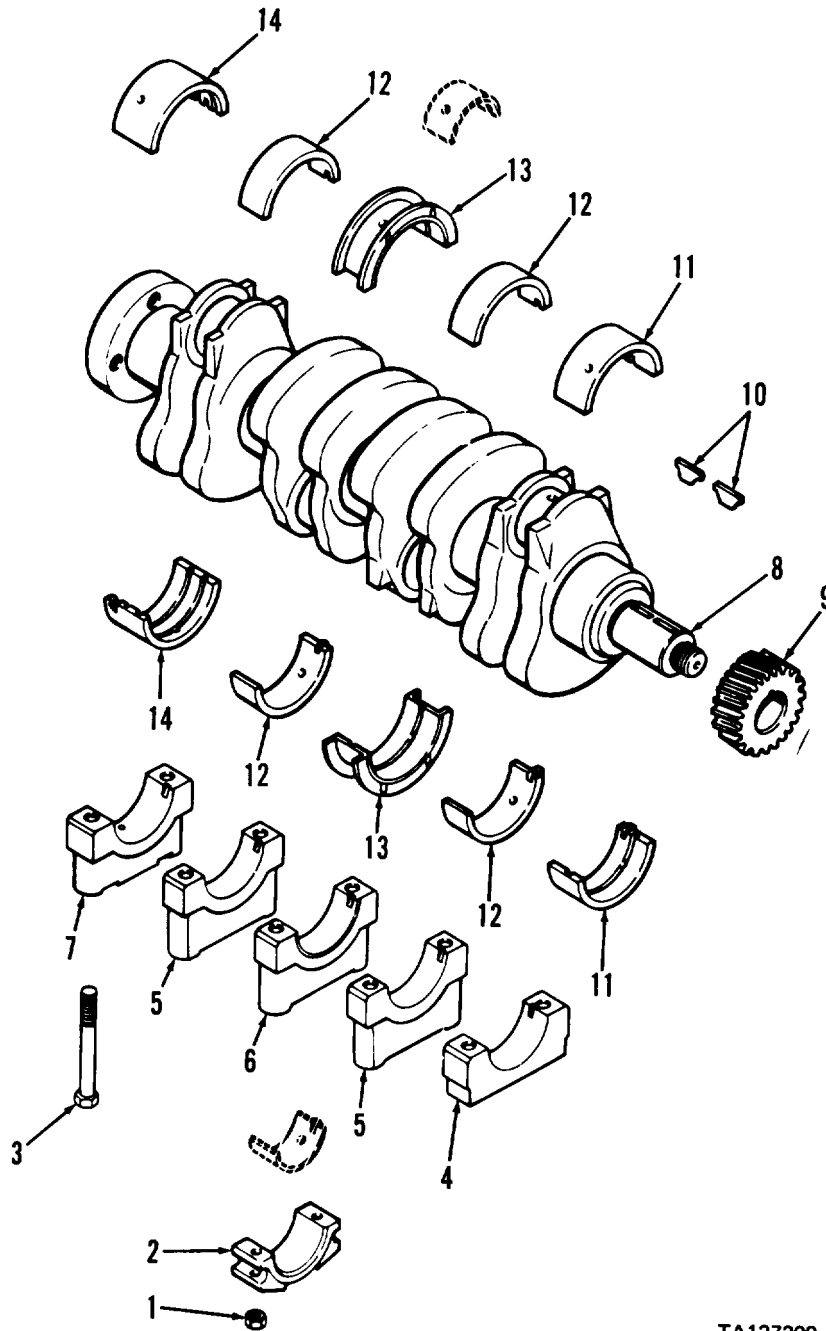


**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

**KEY**

- 1. Connecting rod nuts
- 2. Connecting rod bearing caps
- 3. Cap screws
- 4. Front main bearing cap
- 5. Intermediate main bearing caps
- 6. Center main bearing cap
- 7. Rear main bearing cap
- 8. Crankshaft
- 9. Crankshaft gear
- 10. Key
- 11. Front main bearing liner
- 12. Intermediate main bearing liners
- 13. Center main bearing liner
- 14. Rear main bearing liner



TA127209



**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
1 (cont)		f. Center main bearing cap (6) g. Rear main bearing cap (7) h. Crankshaft (8)	Remove and set aside Remove and set aside Lift out	
<b>TA127210</b>				
		i. Main bearing liners (11, 12, 13 and 14)	Remove	From cylinder block
2	Crankshaft (8)	a. Crankshaft gear (9) b. Key (10)	Remove Remove	Use puller
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				

**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
3		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air or clean cloths
INSPECTION				
4		Key (10)	Inspect	Inspect for cracks, damage and wear. Replace if cracked, damaged or worn
5	Crankshaft (8)	a. Crankshaft overall	Inspect	Inspect surfaces for rough or grooved condition. Inspect for scoring, pits, cracks, damage, and evidence of overheating. If any of these conditions observed, replace crankshaft
		b. Crankshaft main bearing journals	Measure	Use micrometer. Measure front and rear of each journal. If diameters are smaller than 2.8730 inches use undersize bearing liners (0.002 inch)
<b>NOTE</b>				
When main bearing journals are worn more than 0.002 inch, grind undersize to following dimensions:				
		Outer Diameter Undersize (inch)		Grind to (inches)
		0.002		2.2460 to 2.2470
		0.010		2.2380 to 2.2390
		0.020		2.2280 to 2.2290
		0.030		2.2180 to 2.2190
If one or more journals are to be ground, then grind all journals.				
		c. Crankshaft main bearing journals	Measure	Measure 90 degrees from first measurement for out-of-roundness. If out-of-roundness exceeds 0.0005 inch, regrind journal and use undersize liners.
		d. Crankshaft connecting rod journals	Measure	Use micrometer. Measure front and rear of each journal, checking taper. If taper exceeds 0.001 inch, regrind journal

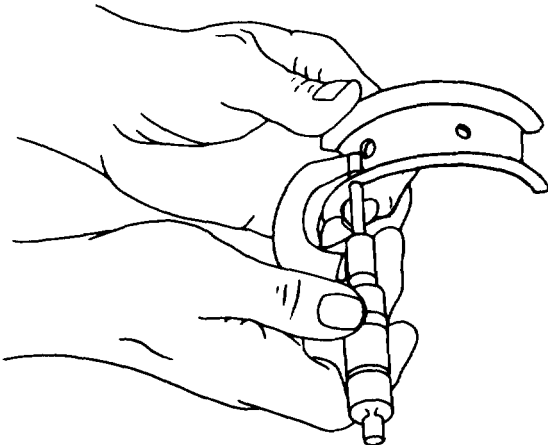
**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS										
INSPECTION (cont)														
5 (cont)	<b>NOTE</b>													
When connecting rod journals are worn more than 0.002 inch, grind undersize to following dimensions:														
<table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: center; width: 50%;">Outer Diameter Undersize (inch)</th> <th style="text-align: center; width: 50%;">Grind to (inches)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0.002</td> <td style="text-align: center;">2.2460 to 2.2470</td> </tr> <tr> <td style="text-align: center;">0.010</td> <td style="text-align: center;">2.2380 to 2.2390</td> </tr> <tr> <td style="text-align: center;">0.020</td> <td style="text-align: center;">2.2280 to 2.2290</td> </tr> <tr> <td style="text-align: center;">0.030</td> <td style="text-align: center;">2.2180 to 2.2190</td> </tr> </tbody> </table>					Outer Diameter Undersize (inch)	Grind to (inches)	0.002	2.2460 to 2.2470	0.010	2.2380 to 2.2390	0.020	2.2280 to 2.2290	0.030	2.2180 to 2.2190
Outer Diameter Undersize (inch)	Grind to (inches)													
0.002	2.2460 to 2.2470													
0.010	2.2380 to 2.2390													
0.020	2.2280 to 2.2290													
0.030	2.2180 to 2.2190													
If one or more journals are to be ground, then grind all journals.														
e. Crankshaft connecting rod journals		Measure	Measure 90 degrees from first measurement for out-of-roundness. If out-of-roundness exceeds 0.0005 inch, regrind journal											
<b>NOTE</b>														
If crankshaft was reground, repeat step 5 of inspection.														
6	Crankshaft gear (9)		Inspect	Inspect for cracks, damage, missing or broken teeth, scoring, pits and wear. If any of these conditions observed, replace gear										
7	Center main bearing cap (6)	Center main bearing liners (13)	a. Remove  b. Inspect  c. Measure thrust surface thickness	Slide out  Inspect for cracks, scoring, pitting, flaking, or signs of overheating. Check liner back for bright spots. Replace if any of these conditions observed  Use micrometer. Replace if thickness less than 0.1025 inch										

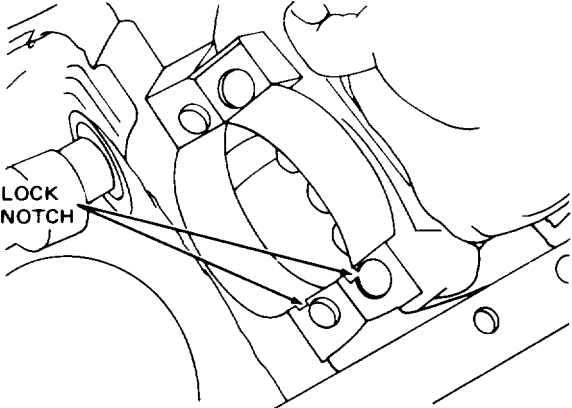
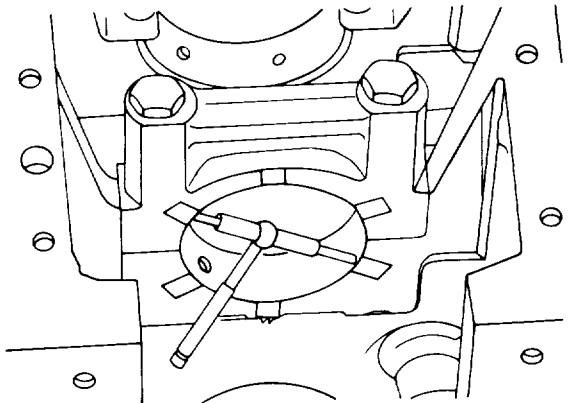
**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearing (cont).*

STEP	LOCATION	ITEM	ACTION -	REMARKS
INSPECTION (cont)				
7 (cont)				<p style="text-align: right;"><b>TA127211</b></p>
8	Main bearing caps (4, 5, and 7)	Main bearing liners (11, 12, and 14)	a. Remove b. Inspect	Slide out Inspect for cracks, scoring, pitting, flaking, or signs of overheating. Check liner back for bright spots. Replace if any of these conditions observed
9		Main bearing caps (4, 5,6 and 7)	Inspect	Check for cracks, damage, wear, scoring, and pitting. Replace if any of these conditions observed
<b>NOTE</b>				
Perform step 10 for each main bearing cap (4, 5,6, or 7) requiring replacement. Proceed to installation (step 11) if original main bearing caps (4, 5,6 or 7) are being installed.				
10	Cylinder block, bottom	a. Replacement main bearing cap (4, 5, 6, or 7)	Position	In correct location. Be sure lock notches are on same side as shown

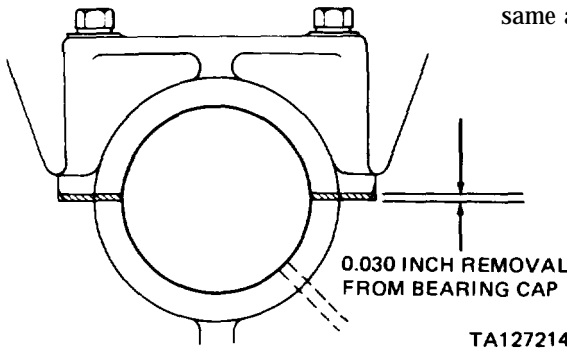
**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (Cont)				
10 cont)				
				
		b. Two cap screws (3) c. Replacement main bearing cap (4, 5, 6, or 7)	Install Check bore diameter	Tighten to 90-100 pounds foot torque At three angular locations as shown. Diameter shall be 3.066 to 3.067 inches
				
				If bore diameter is out of tolerance or main bearing cap is shifted side wise, perform d, below; otherwise proceed to f below.
		d. Two cap screws (3)	Remove	

**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
10 (cont)		e. Replacement main bearing cap (4, 5,6, or 7)	Remove and rework	Rework by removing 0.030 inch stock from mating surface. Then, bore out to meet tolerance specified in c above. If 0.039 inch stock is removed, machine same amount from lock groove
 <p style="text-align: center;">NOTE</p> <p style="text-align: center;">Machine new mounting surface flat so main bearing cap will set solid without wobbling in cylinder block.</p>				
		f. Two cap screws (3) and replacement main bearing cap (4, 5,6, or 7)	Remove	
INSTALLATION				
11	Crankshaft (8)	a. Key (10)	Position	On crankshaft
<b><u>WARNING</u></b>				
Wear asbestos gloves to prevent burning your hands when performing following step. If you burn your hands, obtain medical aid immediately.				
		b. Crankshaft gear (9)	Heat and install	Use gear and bearing heater. Timing mark on gear must be outward
12	Cylinder	a. Bearing liner bore	Clean	Remove all dust, dirt or grease. Dirt left behind bearing liners will interfere with lubrication cooling resulting in hot spots and premature failure of liners

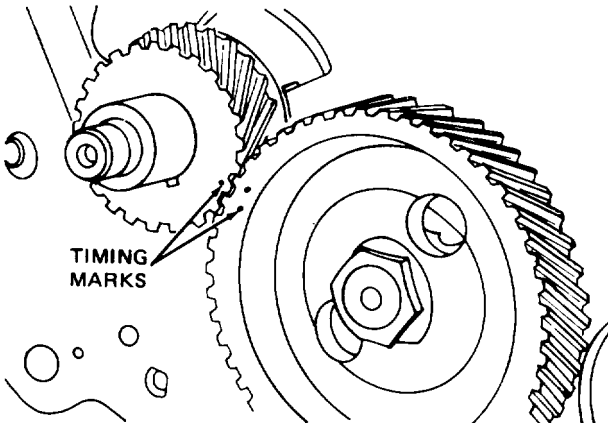
**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION (cont)</b>				
12 (cont)		b. Main bearing liners (11, 12, 13, and 14)	Install	In cylinder block, with liner lock engaging lock groove in block. Slide liners in position
		c. Crankshaft (8)	Install and clean	Clean main bearing journals using clean, lintless cloth
		d. Plasti gage	Position	Crosswise on crankshaft main bearing journals
<b>NOTE</b>				
Install main bearing caps in proper numbered position with num- bered side of cap toward camshaft.				
		e. Main bearing liners (11, 12, 13, and 14)	Install	In respective main bearing caps (4, 5, 6, 7). Slide into position; don't press on center of liners. Be sure liner lock aligns with lock groove in main bearing cap
		f. 10 cap screws (3)	Install and remove	Tighten to 90-100 pounds foot torque, then remove
		g. Main bearing cap and liner (4, 5, 6, and 7)	Remove	
		h. Plasti gage	Measure	Flattened plasti gage located on bearing cap liner or crankshaft. Measure widest point. Bearing oil clearance shall be 0.0012 to 0.0042 inch. If necessary, in- stall undersize bearing liner kit or grind crankshaft (inspection, step 5)

**4-2. ENGINE MAINTENANCE (cont)**

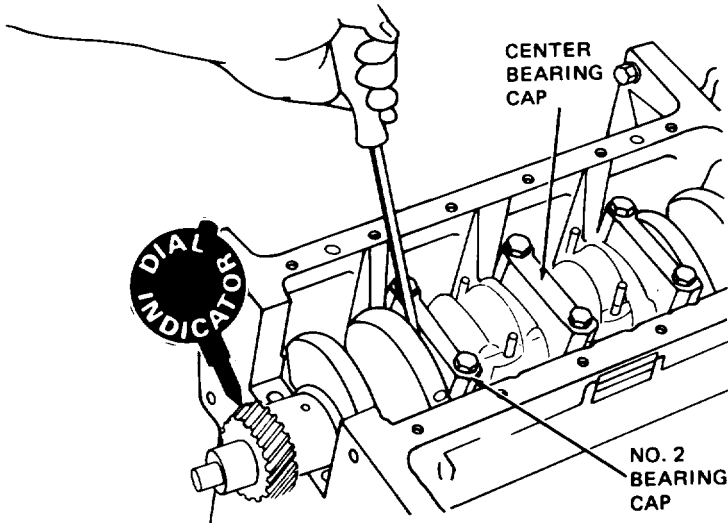
*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
12 (cont)		i. Crankshaft (8) j. Bearing liner	Lift out Lubricate	Located in cylinder block bearing bores; use No. 30 oil
		k. Crankshaft (8) l. Crankshaft gear (9)	Install Check	
				
13	Main bearing cap (4, 5, 6, and 7)	Bearing liner	Lubricate	Located in bore of bearing cap; use No. 30 oil
14	Crankshaft (8)	Main bearing journals	Lubricate	Use No. 30 oil
15	Cylinder block	a. Main bearing cap and liner (5, 6, and 7) b. Eight cap screws (3) c. Crankshaft (8)	Position  Install Check end play	Tighten to 90-100 pounds foot torque Place dial indicator on crankshaft gear (9). Using pry bar between crank throw and bearing cap (6) take up all end play and check dial indicator reading. Maximum end play is 0.015 inch



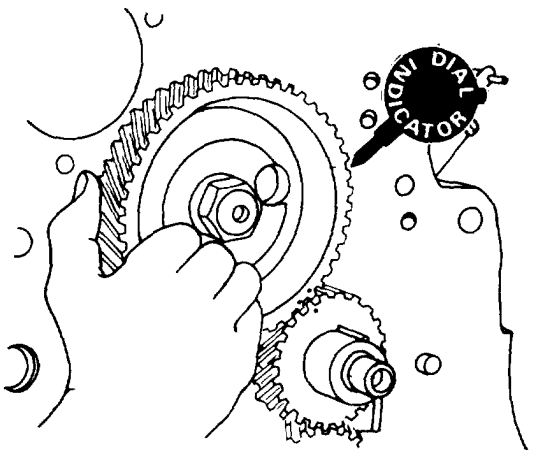
**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
5 (cont)				<p>If end play is greater than this dimension, replace center main bearing liners and recheck end play. If end play is still greater than 0.015 inch, replace crankshaft (8)</p>  <p style="text-align: center;">TA127217</p>
16	Connecting rod bearing cap and liner (2)	Plasti gage	Position	Clean bearing liner with clean, lintless cloth; position plasti gage crosswise on liner
17	Cylinder block	a. Crankshaft (8) connecting rod journals	Clean	Use clean, lintless cloth
<b>NOTE</b>				
Install connecting rod bearing caps in proper numbered position with numbered side of cap towards camshaft.				
	b. Four connecting rod bearing caps (2)		Position	
	c. Eight connecting rod nuts (1)		Install and remove	Tighten to 45-50 pounds foot torque; then remove
	d. Four connecting rod bearing caps (2)		Remove	

**4-2. ENGINE MAINTENANCE (cont)**

*d. Crankshaft and Main Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
17 cont)		e. Plasti gage	Measure	Flattened plasti gage located on bearing cap liner or crankshaft journal. Measure widest point. Oil clearance shall be 0.0010 to 0.0040 inch. If necessary, install undersize bearing liners to obtain this dimension
18	Connecting rod bearing cap (2)	Bearing liner	Lubricate	Located in bore of bearing caps; use No. 30 oil
19	Crankshaft (8)	Connecting rod journals	Lubricate	Use No. 30 oil
20	Cylinder block	a. Four connecting rod bearing caps (2)	Position	
		b. Eight connecting rod nuts (1)	Install	Tighten to 45-50 pounds foot torque
		c. Front main bearing cap (4)	Position	
		d. Oil pump	Install	Para 4-2i
		e. Crankshaft gear (9) and camshaft gear	Check backlash	Place dial indicator on camshaft gear. Backlash between gear (9) and camshaft gear shall be 0.0002 to 0.006 inch. If backlash exceeds 0.006 inch, replace gears
<p><b>NOTE</b></p> <p>Excessive backlash may also be caused by worn camshaft bushings.</p>				
 <p>TA127218</p>				

**4-2. ENGINE MAINTENANCE (cont)**

e. Flywheel and Flywheel Housing

This task covers repair and replacement of the flywheel and flywheel housing consisting of:

- a. Removal
- b. Cleaning
- c. Inspection
- d. Installation

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN 5180-00-754-0641  
 Oven or hot oil  
 Asbestos Gloves

EQUIPMENT CONDITION

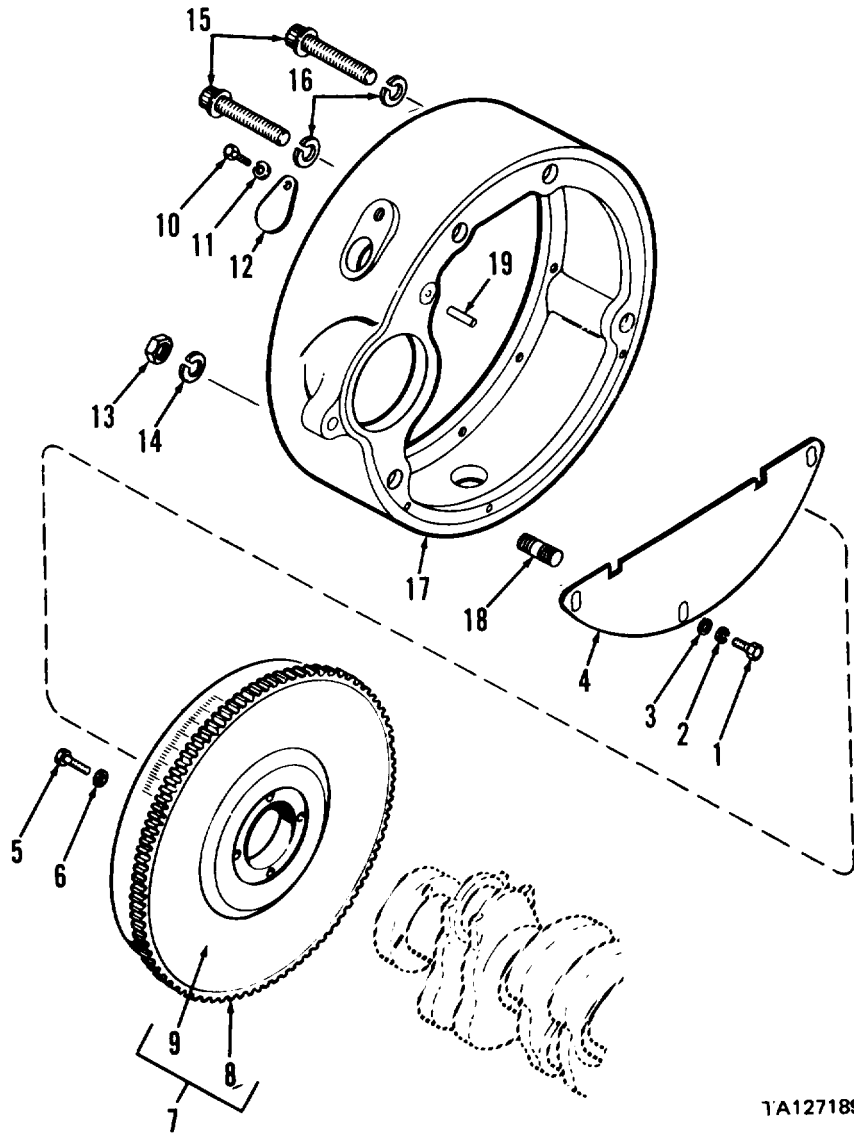
Paragraph Condition Description  
 2-27a Starter removed from engine.  
 3-5d Transmission separated from engine.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths

KEY

- 1. Cap screws
- 2. Lock washers
- 3. Washers
- 4. Dust cover
- 5. Cap screws
- 6. Washers
- 7. Flywheel assembly
- 8. Ring gear
- 9. Flywheel
- 10. Cap screw
- 11. Lock washer
- 12. Cover
- 13. Nuts
- 14. Lock washers
- 15. Cap screws
- 16. Lock washers
- 17. Flywheel housing
- 18. Studs
- 19. Roll pin



1A127189

**4-2. ENGINE MAINTENANCE (cont)**

*e. Flywheel and Flywheel Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Flywheel housing (17), front	a. Three cap screws (1) lock washers (2) and washers (3)	Remove	If necessary
		b. Dust cover (4)	Remove	If necessary
2	Flywheel assembly (7)	a. Ring gear (8)	Align timing mark with roll pin (19)	Insert screwdriver into timing hole in flywheel housing and engage ring gear teeth to move gear to align
		b. Four cap screws (5) and washers (6)	Remove	
		c. Flywheel assembly (7)	Remove	
		d. Ring gear (8)	Remove	Use drift to drive off fly wheel (9) only if gear requires replacement
3	Flywheel housing (17), top	a. Cap screw (10) and lock washer (11)	Remove	
		b. Cover (12)	Remove	
4	Flywheel housing (17), rear	a. Two nuts (13) and lock washers (14)	Remove	
		b. Two cap screws (15) and lock washers (16)	Remove	
		c. Flywheel housing (17)	Remove	Use chain hoist securely fastened to flywheel housing
5	Cylinder block	Two studs (18)	Remove	Only if damaged
6	Flywheel housing (17), timing hole	Roll pin (19)	Remove	Only if damaged
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				

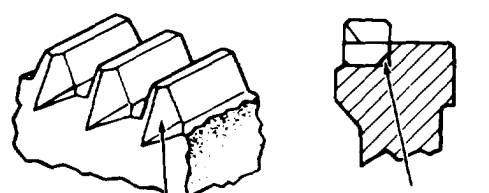
**4-2. ENGINE MAINTENANCE (cont)**

e. Fly wheel and Flywheel Housing (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
7		All parts	Clean	Use cleaning solvent P-D-680. Dry with moisture free compressed air or clean cloth
INSPECTION				
8		Ring gear (8)	Inspect	Check for missing or chipped gear teeth or cracks; replace if any of these conditions observed
9		Flywheel (9)	Inspect	Check for damage, wear, and elongated mounting holes; replace if any of these conditions observed
10		Flywheel housing (17)	Inspect	Check for cracks or other damage. Replace if cracked or damaged
11	Flywheel housing (17)	Roll pin (19)	Inspect	Check for bent condition; replace if bent. Tap new roll pin into position until seated in bottom of hole
12	Cylinder block	Studs (18)	Inspect	Check for bent condition and deformed or damaged threads; replace if bent or threads damaged
INSTALLATION				
13	Cylinder block	Flywheel housing (17)	Position	Use chain hoist
14	Flywheel housing (17), rear	a. Two cap screws (15) and lock washers (16)	Install	
		b. Two nuts (13) and lock washers (14)	Install	
15	Flywheel housing (17), top	a. Cover (12)	Position	
		b. Cap screw (10) and lock washer (11)	Install	

**4-2. ENGINE MAINTENANCE (cont)**

*e. Flywheel and Flywheel Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS						
INSTALLATION (cont)										
<b><u>CAUTION</u></b>										
In following step don't use torch to preheat ring gear.										
<b><u>WARNING</u></b>										
Wear asbestos gloves to prevent burning your hands when handling heated parts.										
16	Flywheel assembly	a. Flywheel (9) b. Ring gear (8)	Position Preheat and install	On work bench Use oven or hot oil; heat to 400-450 degrees F. Install on flywheel (9) with chamfer side of gear teeth outward and larger inside diameter chamfer toward flywheel						
 <p>TOOTH CHAMFER</p> <p>I.D. CHAMFER</p> <p>TA127190</p>										
<table border="0" style="width: 100%;"> <tr> <td>c. Flywheel assembly (7)</td> <td>Position</td> <td>On crankshaft; same position of timing mark as noted during disassembly</td> </tr> <tr> <td>d. Four cap screws (5) and washers (6)</td> <td>Install</td> <td>Tighten to 65-70 pounds foot torque</td> </tr> </table>					c. Flywheel assembly (7)	Position	On crankshaft; same position of timing mark as noted during disassembly	d. Four cap screws (5) and washers (6)	Install	Tighten to 65-70 pounds foot torque
c. Flywheel assembly (7)	Position	On crankshaft; same position of timing mark as noted during disassembly								
d. Four cap screws (5) and washers (6)	Install	Tighten to 65-70 pounds foot torque								
17	Flywheel housing (17), front	a. Dust cover (4) b. Three cap screws (1) lock washers (2) and washers (3)	Position Install							

**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods.*

This task covers repair and replacement of pistons and connecting rods consisting of:

- |                |                 |
|----------------|-----------------|
| a. Removal     | d. Inspection   |
| b. Disassembly | e. Reassembly   |
| c. Cleaning    | f. Installation |

INITIAL SETUP

TOOLS

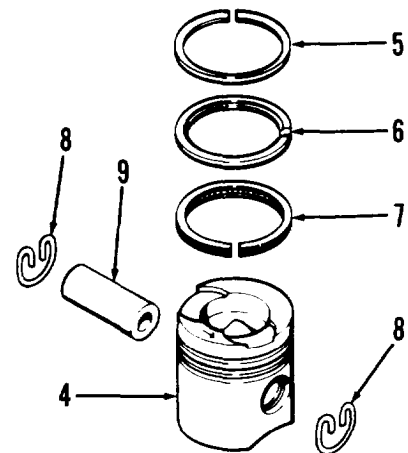
- |  |                      |
|--|----------------------|
| Piston Ring Expander                             |                      |
| Thickness Gage                                   | NSN 5120-00-221-1999 |
| Plastic Scraper                                  |                      |
| Wood Dowel, 1 inch diameter                      |                      |
| Reamer   |                      |
| Bore Gage, zero to 5 inches                      |                      |
| Micrometer, zero to 5 inches                     |                      |
| Piston Ring Compressor                           |                      |
| Plasti Gage                                      |                      |
| No. 1 Common Organizational Maintenance Tool Kit | NSN 4910-00-754-0654 |
| Sleeve, 1-5/16 inches diameter                   |                      |
| Groove Cleaning Tool                             |                      |

MATERIALS/PARTS

- |   |                       |
|---|-----------------------|
| Capscrew, 1/2-13 UNC, grade 5, 1-1/4 inches long            | FSCM 10988 P/N 13-820 |
| Flat washer, 9/16 inch ID, 1-3/8 inches OD, 7/64 inch thick | FSCM 10988 P/N 95-8   |
| Cleaning solvent P-D-680                                    |                       |
| Clean cloths  |                       |
| Oil, No. 30   |                       |
| Piston rings  |                       |

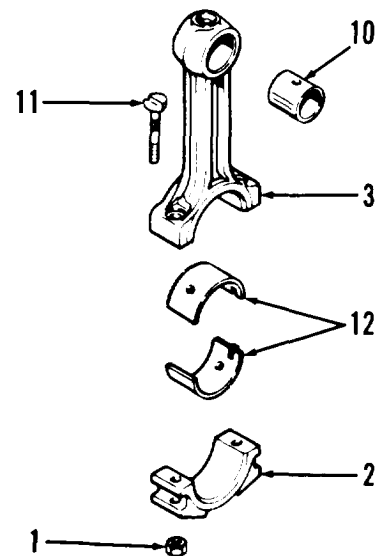
EQUIPMENT CONDITION

- |           |                                 |
|-----------|---------------------------------|
| Paragraph | Condition Description           |
| 3-5k      | Oil pan removed.                |
| 3-5g      | Cylinder head assembly removed. |



KEY

1. Connecting rod nuts
2. Connecting rod cap
3. Connecting rod
4. Piston
5. Top piston ring
6. Second piston ring
7. Piston oil ring
8. Retaining rings
9. Piston pin
10. Piston pin bushing
11. Screws
12. Bearing liners



TA127219

**4-2. ENGINE MAINTENANCE (cont)**

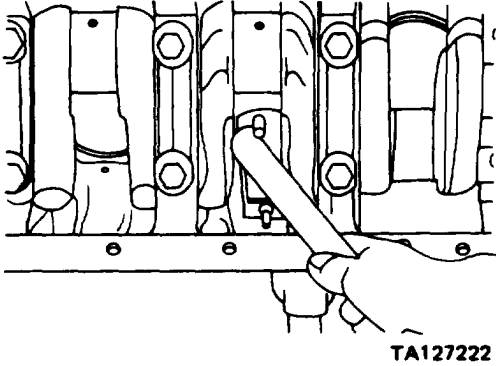
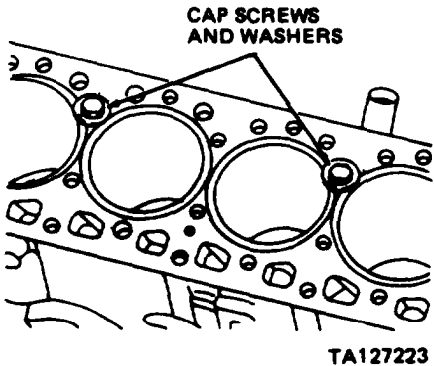
*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Cylinder block, bottom	Four connecting rods (3)	Check side clearance	Use feeler gauge. If clearance exceeds 0.011 inch, replace connecting rod
2	Cylinder block, top	Four piston sleeves	Check	Inspect for carbon or metal ridge at top of ring travel. Use plastic scraper to remove carbon ridge. If a metal ridge has formed replace piston sleeve (para 4-2a)
<b><u>CAUTION</u></b>				
Don't use sharp instruments to remove carbon ridge.				
3	Cylinder block, bottom	a. Connecting rod (3) and connecting rod cap (2)	Check	Check connecting rods and caps for numbers as to location in cylinder block. If not, number rods and caps for reinstallation in original location



**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
3 (cont)		b. Two connecting rod nuts (1) c. Connecting rod cap (2) d. Connecting rod (3)	Remove  Remove and set aside Push up	Turn crankshaft to gain access to connecting rod caps (2)  Use wooden dowel to push connecting rod up through block
 <p>TA127222</p>				
4	Cylinder block, top	a. Piston (4) and connecting rod (3) b. Connecting rod cap (2) and two nuts (1) c. Piston sleeve	Remove  Install  Secure	On corresponding connecting rod to avoid mixing caps (2)  Install cap screw (FSCM 10988 P/N 13-820) and washer (FSCM 10988 P/N 95-8) in cylinder block to hold sleeve in position
<b>NOTE</b>				
Repeat steps 3 and 4 above for three remaining connecting rods (3).				
 <p>CAP SCREWS AND WASHERS</p> <p>TA127223</p>				

**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
<b><u>CAUTION</u></b>				
Use piston ring expander to remove rings to avoid damaging piston and ring.				
5	Piston (4)	a. Top piston ring (5)	Remove and discard	Use piston ring expander
		b. Second piston ring (6)	Remove and discard	
		c. Piston ring (7)	Remove and discard	
		d. Two retaining rings (8)	Remove	Use needle nose pliers
		e. Piston pin (9)	Remove and set aside	
		f. Connecting rod (3)	Remove and set aside	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
------	----------	------	--------	---------

CLEANING (cont)

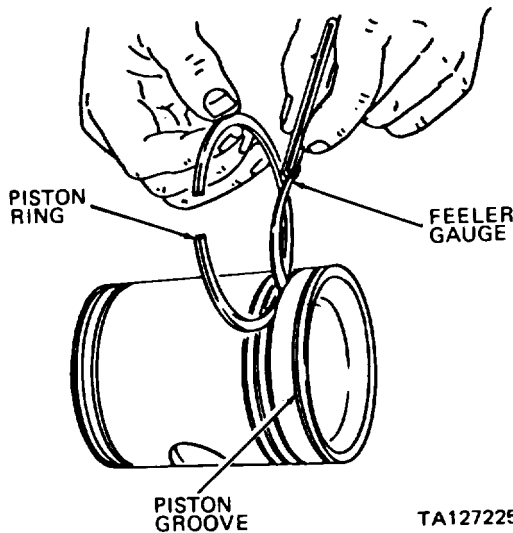
**WARNING**

Wear safety glasses when drying parts with compressed air, Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.

6		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air or clean cloth
7	Piston (4)	a. Overall	Clean	Remove carbon from piston using care not to scratch piston
		b. Piston ring groove	Clean	Use groove cleaning tool
		c. Piston oil hole	Clean	Use small drill or fine wire

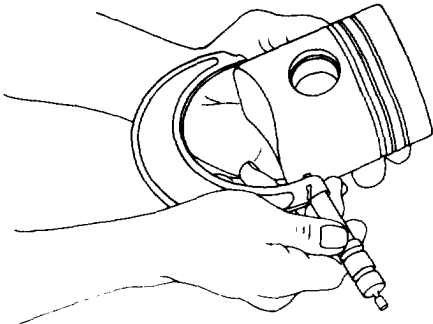
INSPECTION

8	Piston(4)	a. Overall	Inspect	Inspect for cracks, damage, scoring, evidence of overheating and damaged ring grooves. If any of these conditions observed, replace piston
		b. Piston pin bore diameter	Measure	Use bore gage and measure two places, 90 degrees apart. Replace piston if diameter is greater than 1.2508 inches
		c. Oil ring side clearance	Measure	Use feeler gauge. If measurement exceed: 0.005 inch, replace piston



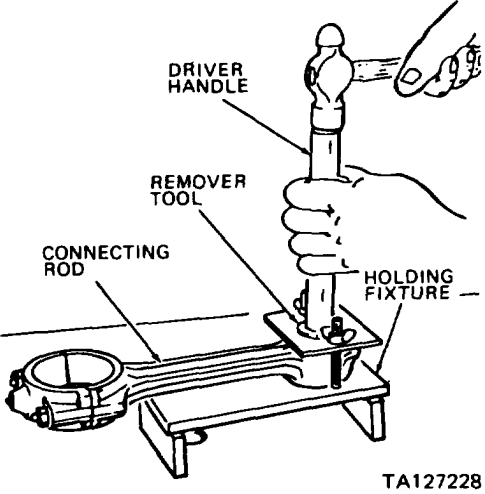
**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
8 (cont)		d. Second piston ring side clearance	Measure	Use feeler gauge. If measurement exceeds 0.008 inch, replace piston
<p><b>NOTE</b></p> <p>Top piston ring clearance cannot be checked.</p>				
		e. Piston diameter	Measure	Use micrometer. Measure across thrust face at bottom of piston, perpendicular to piston pin holes, as shown. If piston diameter is less than 3.9940 inches, replace piston
 <p>TA127226</p>				
9	Piston pin (9)	Outside diameter	Measure	Use micrometer. Replace if measurement is less than 1.2495 inches
10		Retaining ring (8)	Inspect	Check for damage and loss of resiliency. Replace if damaged or resiliency is lost
<p><b>NOTE</b></p> <p>Replace connecting rod as an assembly if side clearance check, performed in step 1 of removal, exceeded 0.011 inch.</p>				

**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
11		Connecting rod (3) and connecting rod cap (2)	Inspect	Check for cracks, damage, wear, scoring, and pitting. If any of these conditions observed, replace as an assembly
12	Connecting rod (3)	a. Piston pin bushing (10)	Measure inside diameter	Use bore gage, then measure bore gage with micrometer. Replace if measurement is greater than 1.2510 inches
<b>NOTE</b>				
Perform following step only if piston pin bushing requires replacement.				
		b. Piston pin bushing (10)	Replace	Use 1-5/16 inches diameter sleeve or rod to press from connecting rod. Align oil hole in replacement bushing with oil hole in connecting rod before pressing bushing in. Press until flush with rod. Ream bushing to 1.2502-1.2504 inches if new piston pin is to be installed; if old piston pin is used, ream bushing 0.0004 to 0.0015 inch larger than piston pin diameter
 <p style="text-align: right;">TA127228</p>				

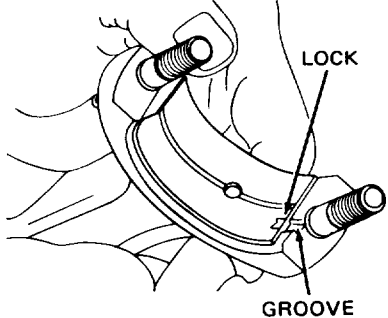
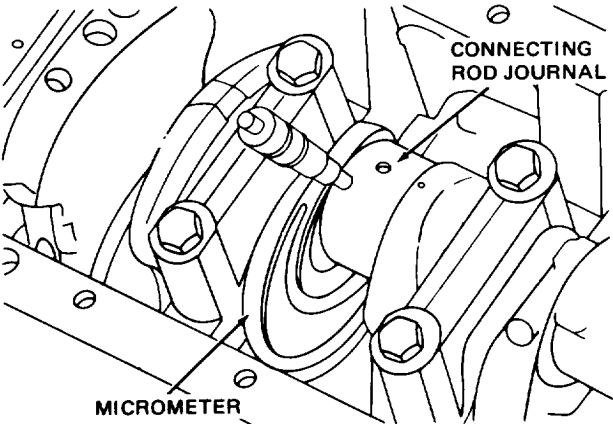
**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
12 (cont)	<b>NOTE</b>			
Avoid mixing liners (12), connecting rods (3), and connecting rod caps (2). Inspect one group at a time.				
		c. Connecting rod nuts (1) and screws (11)	Remove	Check for damaged threads and distortion; if distorted or threads damaged replace part
		d. Bearing liners (12)	Remove and inspect	Slide liners out. Check for scoring, pitting, flaking, cracking, or signs of overheating. Replace if any of these conditions observed
		e. Connecting rod cap (2), screws (11), and nuts (1)	Install	On corresponding connecting rod (3) to avoid mixing caps (2)
REASSEMBLY				
13	Piston (4)	a. Connecting rod (3)	Position	In piston, Numbered side of rod facing toward arrow side of piston
		b. Piston pin (9)	Install	Use hand pressure
		c. Two retaining rings (8)	Install	Use needle nose pliers
<b><u>CAUTION</u></b>				
Use piston ring expander to install piston rings to prevent damaging rings or piston.				
		d. Piston oil ring (7)	Install	In piston third groove
		e. Second piston ring (6)	Install	in piston second groove
		f. Top piston ring (5)	Install	In piston first groove
		g. Piston rings (5, 6, and 7)	Position	Rotate so that ring end gaps are 120 degrees apart
		h. Two connecting rod nuts (1)	Remove	
		i. Connecting rod cap (2)	Remove	

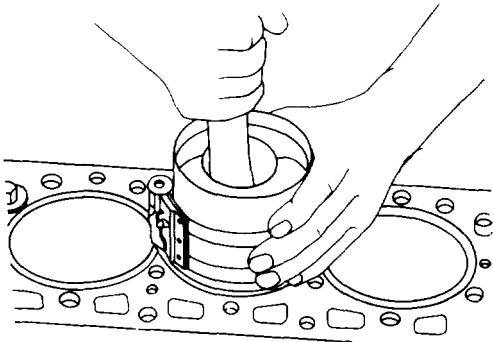
**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
14	Connecting rod (3)	Bearing liner (12)	Install	Slide liner (12) into position, don't push in on center of liner. Be sure liner lock engages connecting rod lock groove
<div style="text-align: center;">  <p>LOCK</p> <p>GROOVE</p> <p>TA127229</p> </div>				
INSTALLATION				
15	Cylinder block, bottom	Crankshaft	a. Measure connecting rod journals taper b. Measure connecting rod journals	Measure front and rear to check taper. Refinish journals if taper exceeds 0.001 inch (para 4-2d) Measure 90 degrees from above check points. If out-of-roundness exceeds 0.0005 inch refinish journals (para 4-2d)
<div style="text-align: center;">  <p>CONNECTING ROD JOURNAL</p> <p>MICROMETER</p> <p>TA127230</p> </div>				
16	Piston (4)	Piston rings (5, 6, 7), and piston (4)	Lubricate	Use No. 30 oil
17	Cylinder block, top	a. Cylinder sleeves	Lubricate	Use No. 30 oil

**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
17 (cont)	<p style="text-align: center;"><b>NOTE</b></p> <p>Check that stamped arrow on top of piston (4) is pointed towards front of engine and numbers on bearing end of connecting rods (3) face camshaft when performing following step.</p>			
		b. Piston (4) and connecting rod (3)	Position	In cylinder bore, halfway in
<p style="text-align: center;"><b>NOTE</b></p> <p>Check that piston rings (5, 6, and 7) are fully seated in piston (4) grooves.</p>				
		c. Piston ring compressor tool	Install and tighten	On piston (4). Tighten a little at a time, making sure piston rings are free to compress
		d. Piston (4)	Install	Gently tap down into cylinder block bore using wooden dowel
		e. Piston ring compressor tool	Remove	
 <p style="text-align: right;"><b>TA127231</b></p>				
18	Connecting rod cap (2)	Bearing liner (12)	Install	Use sliding movement to install; don't press on center of liner. Be sure bearing liner lock is aligned with cap (2) lock groove
19	Cylinder block, bottom	a. Crankshaft b. Plasti gage	Clean Position	Connecting rod journals; use clean cloth Crosswise on connecting rod cap liner (12)



**4-2. ENGINE MAINTENANCE (cont)**

*f. Pistons and Connecting Rods (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
19 (cont)	<b>NOTE</b>			
In following step, be sure number on connecting rod cap (2) matches number on connecting rod (3).				
c. Connecting rod cap (2) and bearing liner (12) Position				
d. Two connecting rod nuts (1) Install and remove				
e. Connecting rod cap (2) Remove				
f. Plasti gage Measure Flattened plasti gage located on bearing liner (12) or crankshaft connecting rod journal. Clearance shall be between 0.0010 to 0.0040 inch. Install undersize bearing liner kit and regrind crankshaft journals (para 4-2d) if clearance exceeds 0.0040 inch				
g. Crankshaft connecting rod journals Lubricate Use No. 30 oil				
h. Connecting rod cap (2), bearing liners (12) Lubricate and position cap Use No. 30 oil; be sure numbers on caps (2) and connecting rod (3) match				
i. Two connecting rod nuts (1) Install Tighten to 45-50 pounds foot torque				
20	Cylinder block, top	Cylinder liner retaining cap screws and washers	Remove	Installed in step 4c of removal

**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings.*

This task covers replacement of the camshaft and bearings consisting of:

- |                |                          |
|----------------|--------------------------|
| a. Removal     | d. Inspection and Repair |
| b. Disassembly | e. Reassembly            |
| c. Cleaning    | f. Installation          |

INITIAL SETUP

TOOLS

- Metal Rod, 1/2 inch diameter by 4 feet long
- Clothespins
- Wooden Dowels, 3/8 inch diameter by 12 inches long (eight required)
- Micrometer, zero to 5 inches
- Bore Gage, zero to 5 inches
- Asbestos Gloves
- Dial Indicator
- Gear and Bearing Heater
- No. 1 Common Organizational Maintenance Tool Kit

NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph	Condition Description
2-14e	Exhaust manifold removed.
2-17e	Water pump removed.
3-6a	Fuel injector fittings disconnected.
3-5j	Rocker arm assembly removed.
3-5f	Tachometer drive removed.
3-5k	Oil pan removed.
4-2h	Timing gear cover removed.
4-2e	Flywheel and flywheel housing removed.
4-2d	Crankshaft removed.

SPECIAL TOOLS

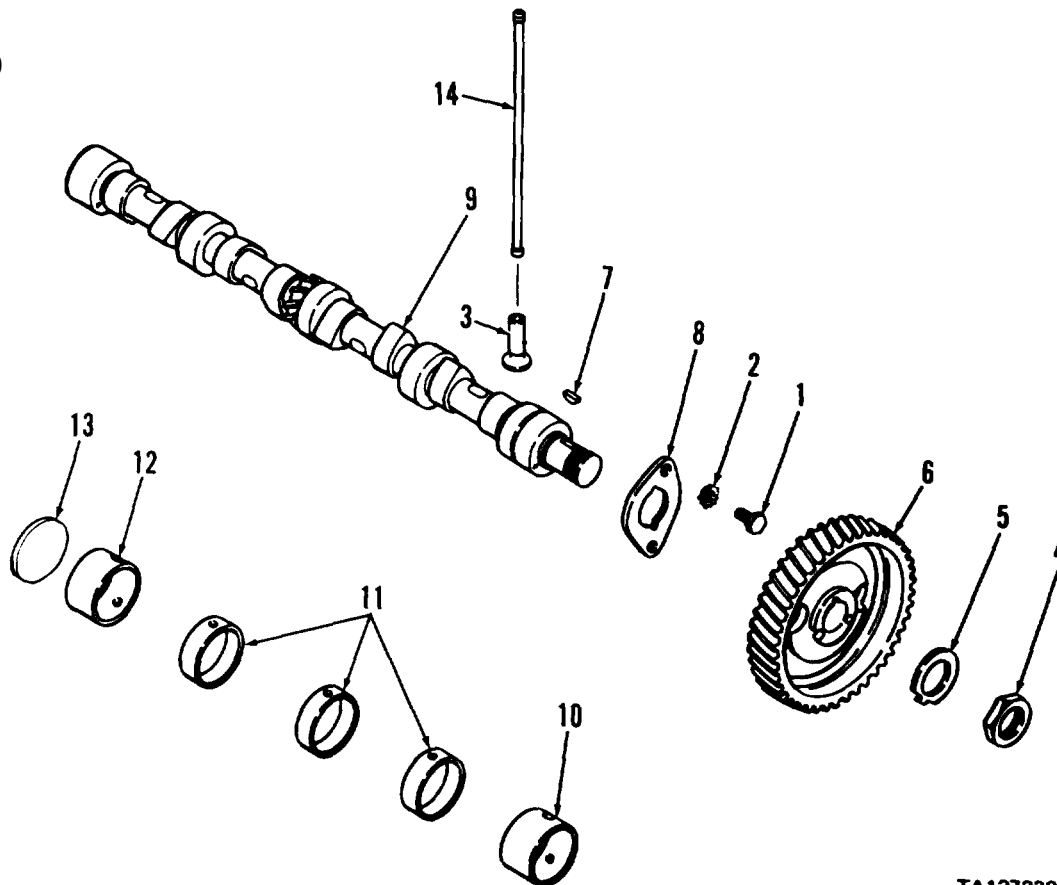
- Camshaft Bushing Tool Kit FSCM 10988 P/NA41 103

MATERIALS/PARTS

- Cleaning solvent P-D-680
- Clean cloths
- Oil, No. 30

KEY

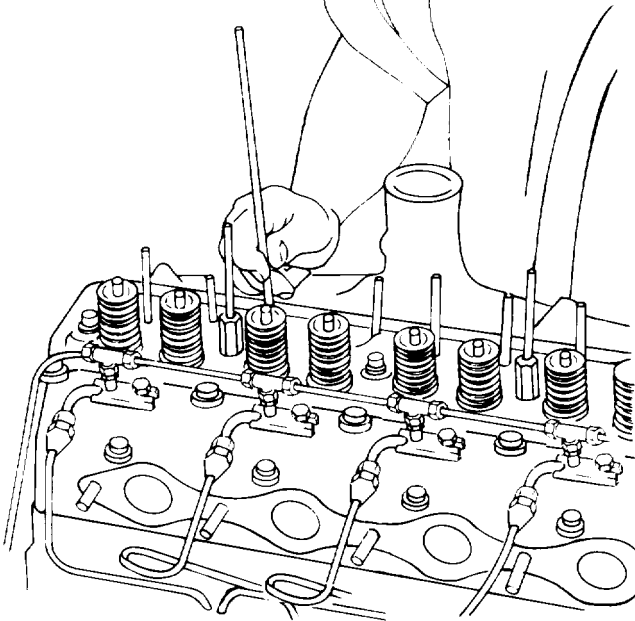
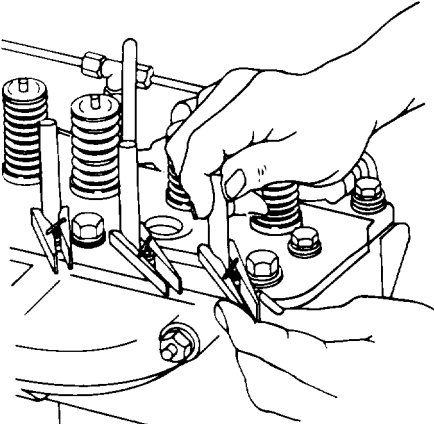
1. Thrust plate bolts
2. Lock washers
3. Valve tappet
4. Camshaft nut
5. Lock
6. Camshaft gear
7. Key
8. Camshaft thrust plate
9. Camshaft
10. Front camshaft bushing
11. Center and intermediate camshaft bushings
12. Rear camshaft bushing
13. Cup plug
14. Push rods



TA127232

**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Cylinder head, top	a. Eight push rods (14)	Remove	
				
		b. Eight valve tappets (3)	Lift and retain	<p><b>TA127233</b></p> <p>Insert 3/8 inch diameter by 12 inches long wood dowels (eight) in push rod opening and push into valve tappets hole. Raise valve tappets with dowels and retain in position with clothespins</p>
				
				<b>TA127234</b>

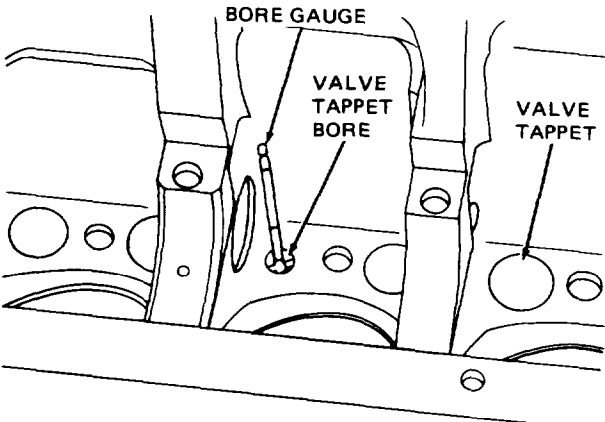
**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL (cont)</b>				
2	Cylinder block, front	a. Two thrust plate bolts (1) and lock washers (2)	Remove	Align holes in camshaft gear with bolts (1) by installing crankshaft pulley nut on crankshaft. Then, using socket and handle turn crankshaft gear until holes and bolts are aligned
<b><u>CAUTION</u></b>				
Be careful when removing camshaft (9) so that you don't damage bushings (10, 11, and 12)				
		b. Camshaft (9) and camshaft gear (6)	Remove	
		c. Eight valve tappets (3)	Number and remove	Number tappets (3) and their respective holes in cylinder block to ensure correct reinstallation
<b>DISASSEMBLY</b>				
3		Camshaft nut (4) and lock (5)	Remove	Bend tab of lock up, away from nut (4)
4		Camshaft gear (6)	Remove	Use puller
5		Key (7)	Remove	
6		Camshaft thrust plate (8)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors, Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
7		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly

**4-2. ENGINE MAINTENANCE (cont)**

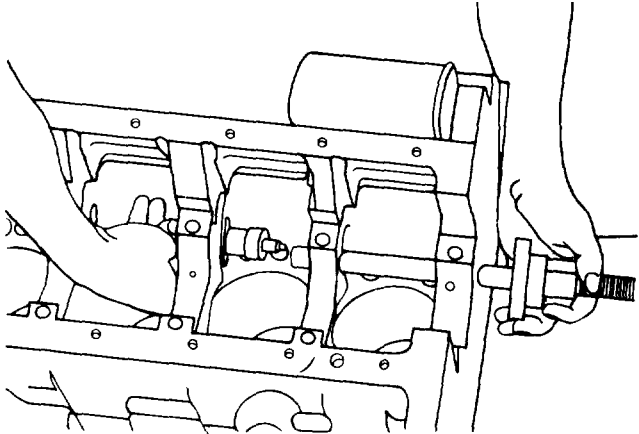
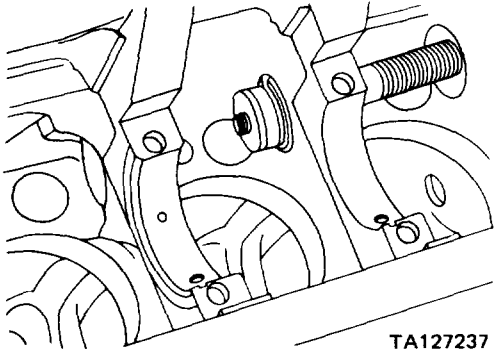
*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION AND REPAIR</b>				
8	Camshaft (9)	a. Overall	Inspect	Check surfaces for wear, damage, and scoring. If any of these conditions observed, replace camshaft
		b. Bearing surfaces	Measure front and rear	Use micrometer. Measure each bearing surface in four places. Measure front and rear surfaces again, 90 degrees from first measurement. If outer diameter of any bearing surface is less than 1.748 inches, replace camshaft.
9	Camshaft thrust plate (8)	a. Overall	Inspect	Replace if cracked, damaged or worn
		b. Thickness	Measure	Use micrometer. Replace if thickness is less than 0.147 inches
10		Camshaft gear (6)	Inspect	Replace if cracked, or if teeth damaged or missing
11	Valve tappet (3)	a. Overall	Inspect	Replace if cracked, damaged or worn
		b. Stem	Measure outer diameter	Replace if less than 0.5605 inch
12	Cylinder block, bottom	a. Valve tappet bores	Measure inside diameter	Use bore gage. Replace cylinder block if greater than 0.5650 inch
				
		b. Camshaft bushings (10, 11, and 12)	Measure inside diameter	Use bore gage and measure in two places, 90 degrees apart. Replace if greater than 1.755 inches

TA127235

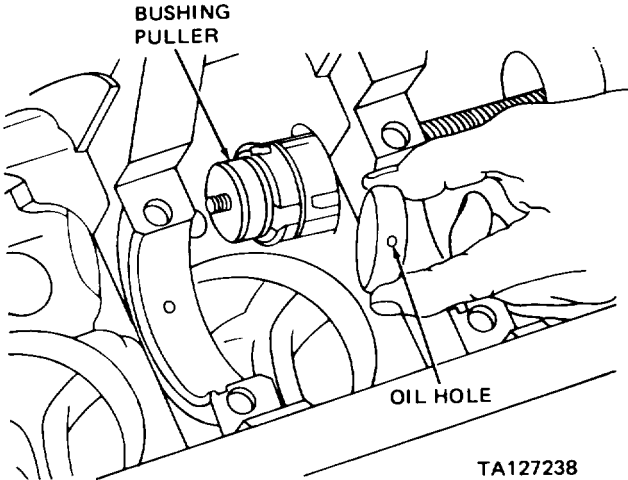
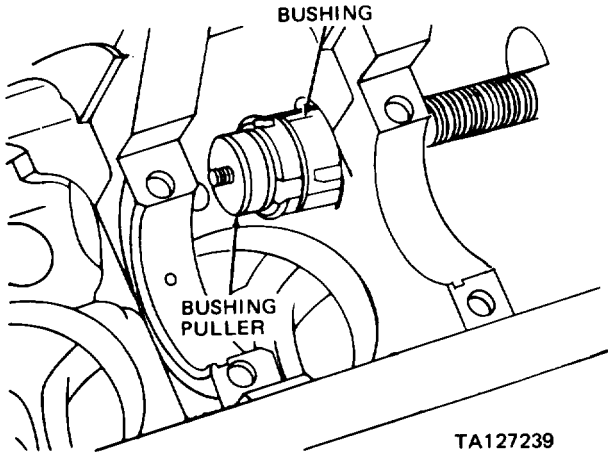
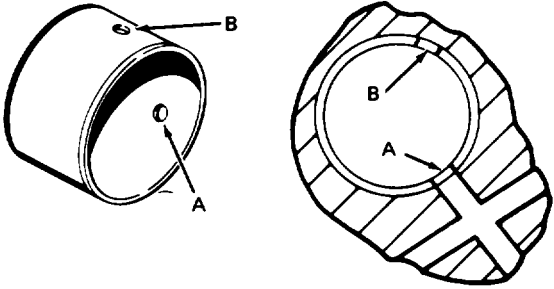
**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION AND REPAIR (cont)				
12 (cont)	<p style="text-align: center;"><b>NOTE</b></p> <p>If camshaft bushings (10, 11 and 12) require replacement, perform steps 13, 14 and 15 below, otherwise proceed to reassembly.</p>			
13	Cylinder block, rear	cup plug (13)	Remove	Insert rod into block through camshaft bushings and tap plug out; discard plug
14	Cylinder block, bottom	a. Intermediate and center camshaft bushings (11)	Remove	Insert bushing puller tool into cylinder block to remove. Use open end adjustable wrench to turn nut and draw bushing out. See illustration below
<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;">TA127236</p>				
b. Rear and front camshaft bushings (10 and 12)			Remove	Use bushing puller tool
c. Intermediate and center camshaft bushing (11)			Install	Place 1/2 inch wide bushing on puller tool with offset oil hole in bushing toward front of block and bushing oil hole aligned with oil hole in block. Use open end adjustable wrench and pull bushing into block until flush with forward face of block

**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION AND REPAIR (cont)</b>				
14 (Cont)				
	<p>TA127238</p>	 <p>TA127239</p>		
d. Front camshaft bushing (10)		Install	<p>Place 1-7/32 inches wide bushing on tool with offset oil holes towards front of block and oil hole A aligned with oil hole in block. Use open end adjustable wrench and pull bushing into block until 1/32 inch below front face of block</p>	
	<p>TA127240</p>	<p>Install</p>	<p>Place 1-7/32 inches wide bushing on tool with offset oil holes towards front of block and slided with oil holes in block. Use open end adjustable wrench and pull bushing into block until 5/16 inch below rear face of block</p>	
e. Rear camshaft bushing (12)				

**4-2. ENGINE MAINTENANCE (cont)**

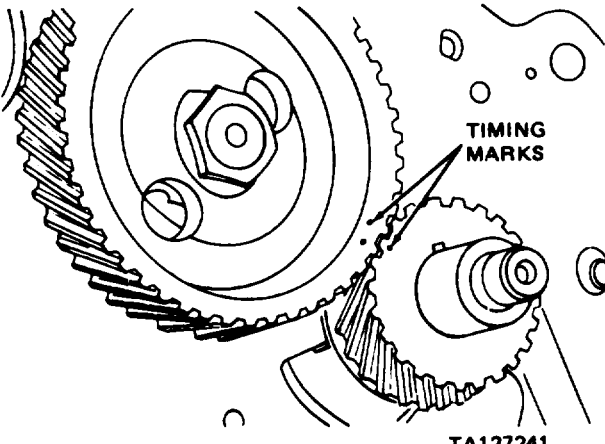
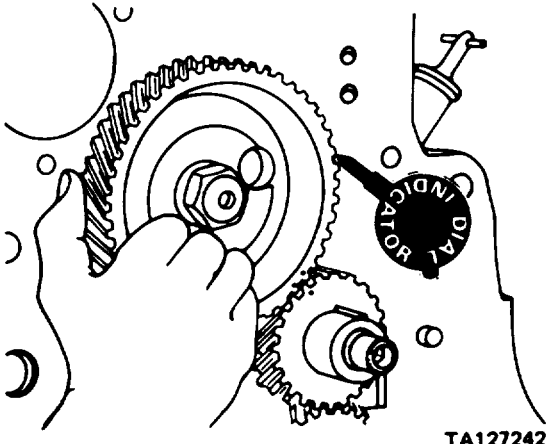
*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION AND REPAIR (cont)				
15	Cylinder block, rear	Plug cup (13)	Install	Apply permatex No. 2 to outer diameter and tap into position until it bottoms against seat
REASSEMBLY				
16		Camshaft thrust plate (8)	Install	On camshaft (9)
17		Key (7)	Install	In camshaft (9) slot
<b><u>WARNING</u></b>				
Wear asbestos gloves when performing following steps to prevent burning your hands.				
18		Camshaft gear (6)	Heat and install	Use gear and bearing heater. Be sure gear timing marks are outward
19		Lock (5)	Position	On camshaft (9)
20		Camshaft nut (4)	Install	Tighten to 80-90 pounds foot torque
21		Lock (5)	Bend	Over one flat of nut (4)
INSTALLATION				
<b>NOTE</b>				
Install tappets (3) in same locations as originally installed.				
22	Cylinder block, bottom	Eight valve tappets (3)	Lubricate, install, and secure	Use No. 30 oil. Insert wood dowels (3/8 inch diameter by 12 inches long) into push rod openings in top of cylinder head and push into stem of valve tappets. Lift dowels and valve tappets and retain dowels with clothespins
23	Cylinder block, front	a. Camshaft gear (6) and camshaft (9)	Lubricate, install and align	Use No. 30 oil and lubricate camshaft thrust plate (8), all bearing surfaces and lifter cams. Align holes in camshaft gear with holes in thrust plate (8)
		b. Two lock washers (2) and thrust plate bolts (1)	Install	



**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION (cont)</b>				
23 (cont)		c. Camshaft gear (6)	Align timing marks	
				
<p>d. Two thrust plate bolts (1)</p>				
<p>e. Camshaft gear (6)</p>				
			Tighten	To 17-20 pounds foot torque
			Check backlash	Use dial indicator as shown. Backlash must be 0.002 to 0.006 inches. If backlash exceeds 0.006 inch, replace gears
<p><b>NOTE</b></p>				
<p>Excessive backlash may also be caused by worn camshaft bushings.</p>				
				

**4-2. ENGINE MAINTENANCE (cont)**

*g. Camshaft and Bearings (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
24	Cylinder head, top	a. Clothes pins and dowels b. Eight push rods (14)	Remove Install	

**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover.*

This task covers replacement of the timing gear cover consisting of:

- a. Removal
- b. Cleaning
- c. Inspection
- a. Installation

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN 5180-00-7544641  
 Micrometer, zero to 5 inches  
 Dial Indicator FSCM 45225 P/N CAS 10066A  
 Bore Gage, zero to 5 inches  
 Universal Gear Puller NSN 5120-00-378-4298  
 Torque Wrench NSN 5120-00-221-7983  
 Feeler Gauge

EQUIPMENT CONDITION

Paragraph	Condition Description
2-17e	Water pump removed.
3-6c	Fuel injection pump removed.
3-5k	Oil pan removed.

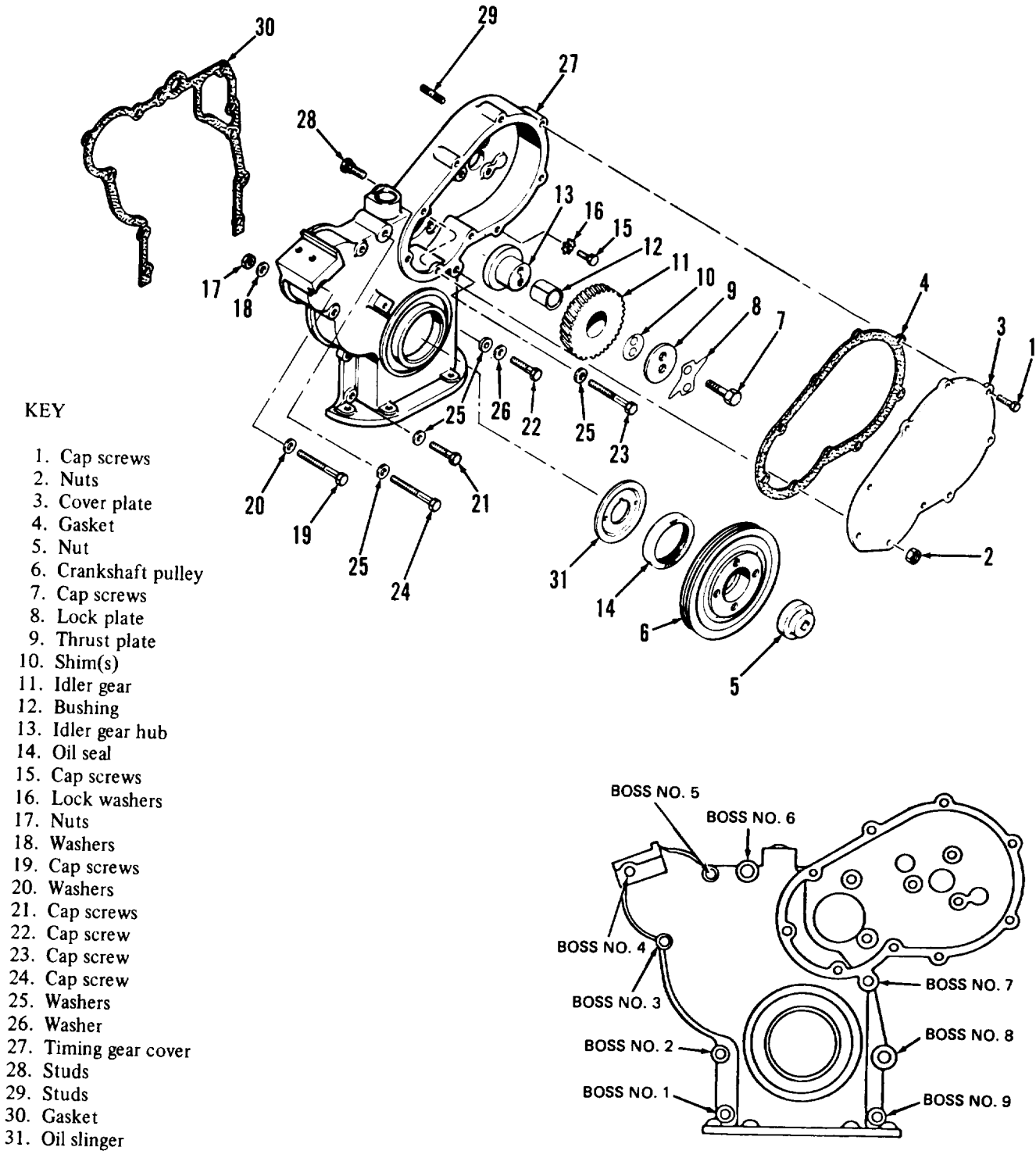
MATERIALS/PARTS

Sleeve, 2 inch diameter  
 Cleaning solvent P-D-680  
 Permatex 2 NSN 8030-00-873-4792  
 Oil No. 30 NSN 5120-00-378-4293  
 Timing gear cover plate gasket  
 Timing gear cover gasket

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Timing gear cover plate (3)	a. Seven cap screws (1) b. Two nuts (2) c. Timing gear cover plate (3) d. Gasket (4)	Remove Remove Remove Remove and discard	
2	Crankshaft pulley (6)	a. Nut (5) b. Crankshaft pulley (6)	Remove Remove	Use gear puller
3	Idler gear (11)	a. Lock plate (8) b. Two cap screws (7) c. Lock plate (8) d. Thrust plate (9) e. shim(s) (10) f. Idler gear (11) and bushing (12)	Straighten tabs Remove Remove Remove Remove Remove	Use punch and hammer to straighten tabs, releasing cap screws (7)  Do not separate bushing (12) from gear (11) unless inspection requires replacement

**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover (cont).*



TA127196

**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
<b>NOTE</b>				
Do not damage aluminum wall of timing gear cover (27) while separating oil seal (14) in the following step.				
5	Timing gear cover (27)	a. Oil Seal (14) b. Timing gear cover (27) with Idler gear hub (13) c. Gasket (30)	Drive deeper onto shaft Remove Remove and discard	Use 2" diameter sleeve Use care not to damage aluminum Timing gear cover (27)
<b>NOTE</b>				
Idler gear hub (13) is press fitted in aluminum. Do not perform next step (d.) unless inspection requires replacement.				
		d. Idler gear hub (13) e. Two studs (28) f. Three studs (29)	Remove Remove Remove	Push out from rear (engine side) of timing gear cover (27) Only if necessary Only if necessary
5	Crankshaft	a. Oil seal (14) b. Oil slinger (31)	Remove and discard Remove	
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

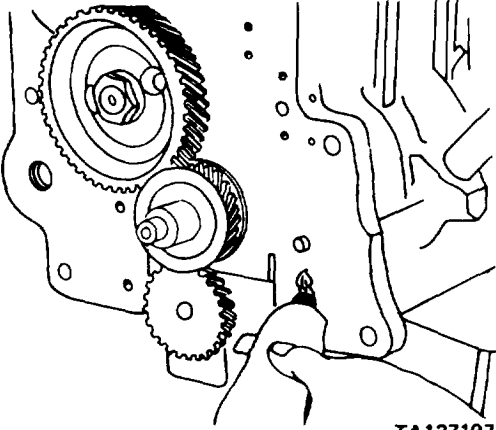
**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
6		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air or clean cloth
7		Idler gear (11) and bushing (12)	Inspect	Inspect gear for damage, distortion, and missing or broken teeth. Check gear teeth for pitting. If any of these conditions observed replace gear and bushing as an assembly. Use bore gage and measure inside diameter of idler gear bushing. Measure bore gage using micrometer. If bushing inside diameter is more than 1.377 inches, replace gear and bushing as an assembly
8		Idler gear hub (13)	Inspect	Inspect for cracks, pitting, and distortion. Replace if any of these conditions observed. Use micrometer and measure outside diameter of hub shaft. Diameter must be not less than 1.3740 inches; replace part if diameter is less than this dimension
9		Timing gear cover (27)	Inspect	Inspect for cracks and distortion; replace if cracked or distorted. Check threads on studs (28 and 29) for damage; if threads are damaged or if studs bent replace studs. Replace stud (28) by driving it out of cover using soft hammer, insert new stud in cover, install 3/8-16 nut, and tighten nut to draw stud into mounting hole. Remove nut. Replace stud (29) by unscrewing it and installing new stud
10		All other parts	Inspect	Check for cracks, damage, and distortion; replace part if any of these conditions observed
INSTALLATION				
11	Crankshaft	Oil slinger (31)	Install	On end of crankshaft. Cupped surface toward crankshaft gear. Align notch on oil slinger with keyway on crankshaft

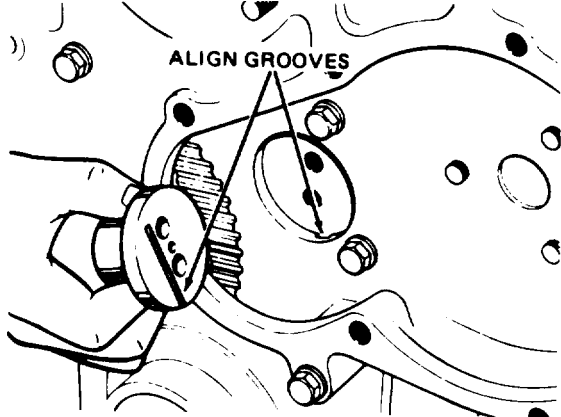
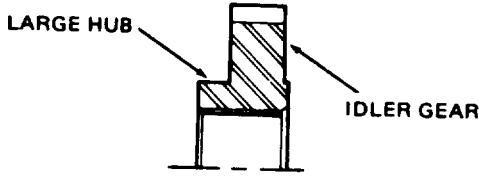
**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
12	Cylinder block	a. Cylinder block	Coat	Apply Permatex 2 on both sides of cylinder block from lower mounting hole, downwards
				
		b. Gasket (30)	Install and coat	Apply Permatex 2 to open face of gasket from lower mounting hole, downwards
13	Cylinder block	Timing gear cover (27)	Position	
14	Timing gear cover (27)	a. Cap screw (21) and washer (25)	Install	1-1/4 inch long cap screw; install in cover boss 1, 2, and 9. Tighten to 25-30 pounds foot torque
		b. Three cap screws (19), washers (20), washers (18), and nuts (17)	Install	3-1/4 inch long cap screw; install in cover boss 3, 4, and 5. Tighten to 25-30 pounds foot torque
		c. Cap screw (22) and two washers (25 and 26)	Install	1-1/2 inch long cap screw; install in cover boss 8. Tighten to 25-30 pounds foot torque
		d. Cap screw (23) and washer (25)	Install	2-3/4 inch long cap screw; install in cover boss 7. Tighten to 25-30 pounds foot torque
		e. Cap screw (24) and washer (25)	Install	3 inch long cap screw; install in cover boss 6. Tighten to 25-30 pounds foot torque
		f. Two cap screws (15) and lock washers (16)	Install	Tighten to 25-30 pounds foot torque
		g. Gasket (30)	Trim	Cut off any protruding gasket from bottom of cylinder block. Gasket must be flush with cylinder block

**4-2. ENGINE MAINTENANCE (cont)**

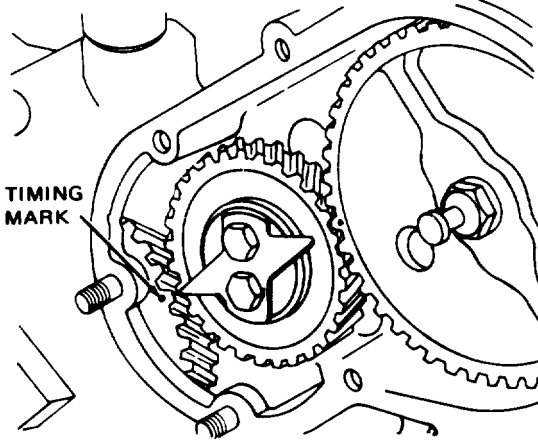
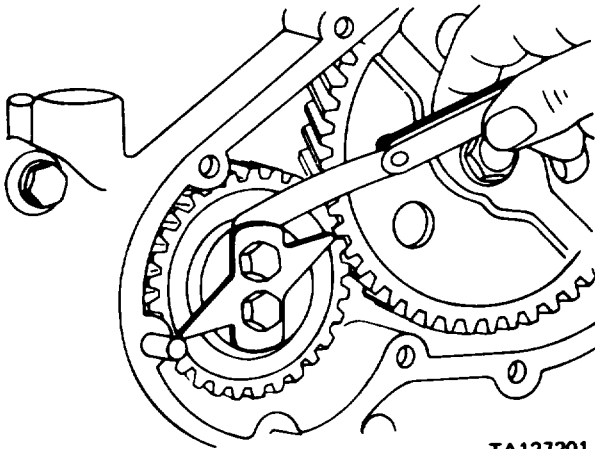
*h. Timing Gear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSTALLATION (cont)</b>				
15	Idler	a. Idler gear hub (13)	Align and install	Align hub oil groove with groove in cylinder block
 <p style="text-align: center;">TA127198</p>				
		b. Idler gear (11) and bushing (12)	Lubricate and install	Use clean engine oil. Face large hub side toward cylinder block
 <p style="text-align: center;">TA127199</p>				
16	Lock plate (8)	a. Cap screw (7) b. Thrust plate (9) c. Shim(s) (10)	Install Install Install	In lock plate On lock plate Install enough shims on thrust plate to maintain a running clearance of 0.003 inch between thrust plate (9) and idler gear (11)
17	Idler gear hub (13)	a. Lock plate (8), thrust plate (9), shim(s) (10), and cap screw (7) b. Lock plate (8)	Install Align	With engine on top dead center and number one cylinder on compression stroke, lock plate point must be aligned with timing mark on camshaft gear



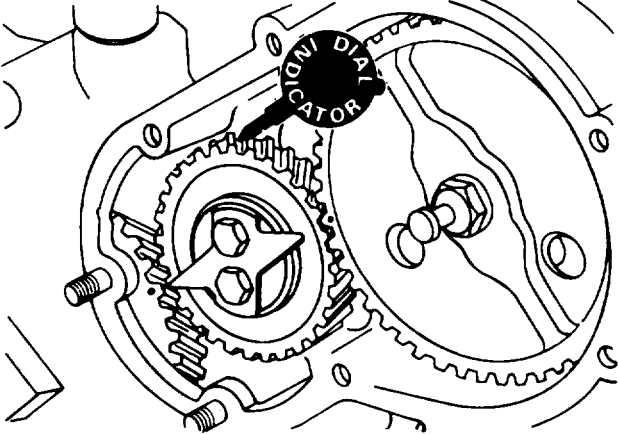
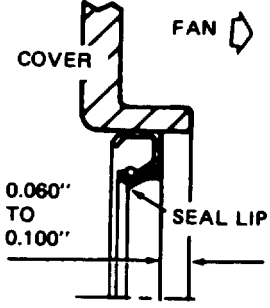
**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
17 (cont)		 <p>TA127200</p>		
		c. Two cap screws (7) d. Thrust plate (9)	Tighten Check	<p>Tighten to 3542 pounds foot torque Use feeler gauge to check running clearance between thrust plate (9) and idler gear (11). Clearance must be 0.003 inch. If clearance is not 0.003 inch remove cap screws (7), shim(s) (10), thrust plate (9), and lock plate (8) as an assembly. Remove and measure thickness of shim(s) using micrometer. Add or remove shim(s) as necessary to obtain correct clearance. Install shim(s), thrust plate, lock plate and cap screws as an assembly. Tighten cap screws to 3542 pounds foot torque</p>
		 <p>TA127201</p>		
		e. Lock plate (8)	Bend	<p>Bend tabs on lock plate to lock cap screws (7)</p>
18	Idler gear 11)	a. Cam gear b. Idler gear (11)	Hold Check back- lash	<p>Use screwdriver Use dial indicator installed to check backlash. Backlash shall not exceed 0.006 inch; if backlash exceeds this dimension, replace gear (11)</p>

**4-2. ENGINE MAINTENANCE (cont)**

*h. Timing Gear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
18 (cont)	 <p style="text-align: right;">TA127202</p>			
19	Crankshaft	a. Oil seal (14)	Install and lubricate	Using depth gage, install oil seal with seal lip inward to depth shown below. After installation apply NO. 30 oil to seal.
 <p style="text-align: center;">TA127203</p>				
		b. Crankshaft pulley (6) c. Nut (5)	Lubricate and install Install	Use No. 30 oil and apply to shaft of crankshaft pulley Tighten to 125-135 pounds foot torque
20	Timing gear cover	a. Gasket (4) b. Timing gear cover plate (3) c. Two nuts (2) d. Seven cap screws (1)	Install Install Install Install	Tighten to 25-30 pounds foot torque

**4-2. ENGINE MAINTENANCE (cont)**

*i. Oil Pump.*

This task includes repair and replacement of the oil pump consisting of

- a. Removal
- b. Disassembly
- c. Cleaning
- d. Inspection
- e. Reassembly
- f. Installation

INITIAL SETUP

TOOLS

Dial Indicator  
 No. 1 Common Organizational Maintenance Tool Kit  
 Thickness Gage  
 Plasti Gage

EQUIPMENT CONDITION

Paragraph 3-5k Condition Description  
 Oil pan removed.

MATERIAL/PARTS

Cleaning solvent P-D680  
 Clean cloths  
 Engine oil (refer to current lubrication order)  
 Gasket  
 O-ring

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Oil Pump screen	Two cap screws (2) and washers (3)	Remove	
2	Oil pump body (4)	Two cap screws (1)	Remove	
3	Cylinder block	a. Oil pump (4) b. Shim(s) (5)	Remove Remove	

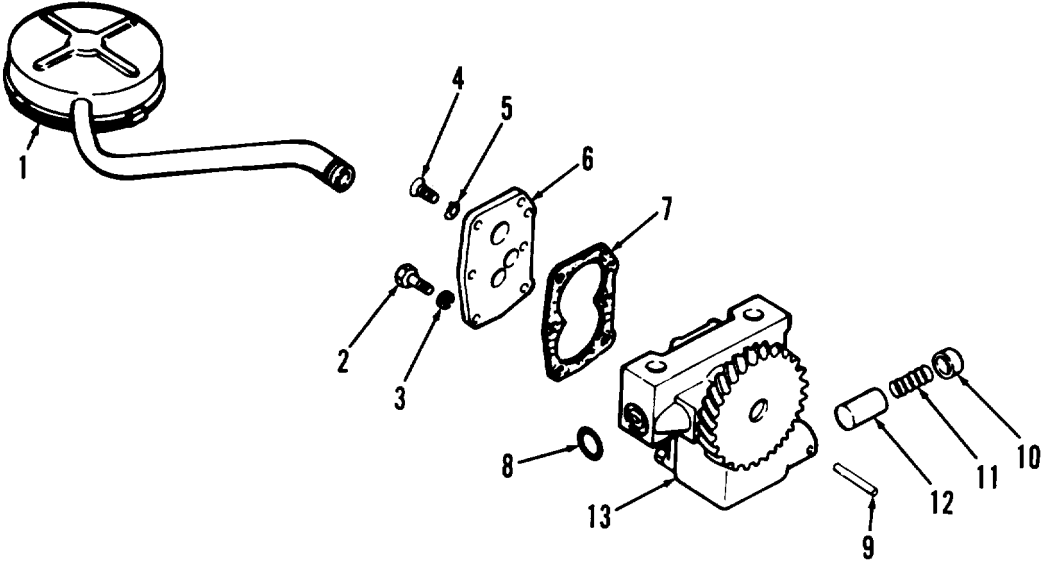
**KEY**

- 1. Cap screws
- 2. Cap screws
- 3. Washers
- 4. Oil pump
- 5. Shim(s)

TA127204

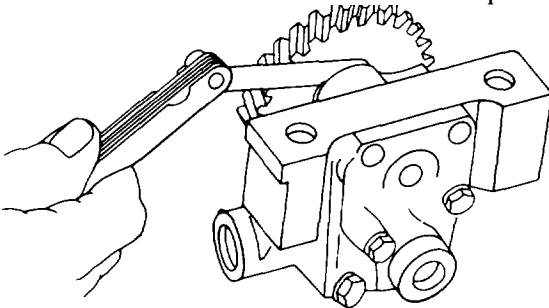
**4-2. ENGINE MAINTENANCE (cont)**

*i. Oil Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<p><b>KEY</b></p>  <p>1. Oil pump screen                  2. Cap screws                  3. Lock washers                  4. Screw                  5. Lock washer                  6. Cover assembly                  7. Gasket                  8. O-ring                  9. Cotter pin                  10. Spring retainer                  11. Relief valve spring                  12. Relief valve                  13. Oil pump body</p> <p style="text-align: right;">TA127205</p>				
<p><b>DISASSEMBLY</b></p>				
4	Oil pump screen (1)	Oil pump screen (1)	Remove	Unscrew from oil pump body
5	Oil pump body (13)	a. Three cap screws (2) and lock washers (3)	Remove	
		b. Screw (4) and lock washer (5)	Remove	
		c. Cover assembly (6)	Remove	
		d. Gasket (7)	Remove and discard	
		e. O-ring (8)	Remove and discard	
		f. Cotter pin (9)	Remove	
		g. Spring retainer (10)	Remove	
		h. Relief valve spring (11)	Remove	
		i. Relief valve (12)	Remove	

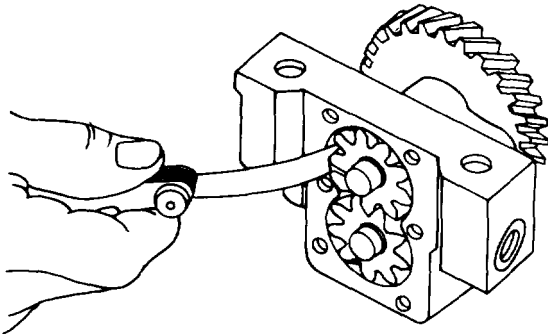
**4-2. ENGINE MAINTENANCE (cont)**

*i. Oil Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
6		Oil pump screen (1)	Clean	Immerse in cleaning solvent P-D-680. Clean all solidified lubricant/sludge from screen and inside suction tube. Dry with moisture free compressed air
7		All other parts	Clean	Use cleaning solvent P-D-680; dry with moisture free compressed air or clean cloths
INSPECTION				
8	Oil pump body (13)	a. Pump drive gear	Check	Use feeler gage as shown and check pump drive gear to oil pump body clearance. Clearance shall not exceed 0.010 inch; if clearance exceeds this dimension, replace oil pump
 <p style="text-align: right;">TA127206</p>				

**4-2. ENGINE MAINTENANCE (cont)**

*i. Oil Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
8 (Cont)		b. Pump gears	Check	Use feeler gage as shown and check pump gears to body radial clearance. Clearance shall not exceed 0.008 inch. Replace oil pump if clearance exceeds this dimension
				
TA127207				
		c. Pump gears	Check	Place plasti gage on pump gear. Install gasket (7), cover assembly (6), cap screw (2), and lock washer (3), Tighten cap screws to 6-8 pounds foot torque. Remove cover assembly and measure plasti gage to obtain gear to cover clearance. Clearance shall not exceed 0.008 inch. Replace oil pump if clearance is greater than this dimension
9		Relief valve spring (11)	Inspect	Check that free length is 2.125 inches and that load required to compress spring to 1.44 inches is 18-19 pounds. Replace if none of these conditions are met
10		Oil pump screen (1)	Inspect	Replace if screen torn, or if suction tube bent, dented or cracked
11		Relief valve (12) and spring retainer (10)	Inspect	Replace if damaged or distorted
REASSEMBLY				
12	Oil pump body (13)	a. Relief valve (12)	Install	Closed end toward oil pump
		b. Relief valve spring (11)	Install	
		c. Spring retainer (10)	Install	Closed end outward

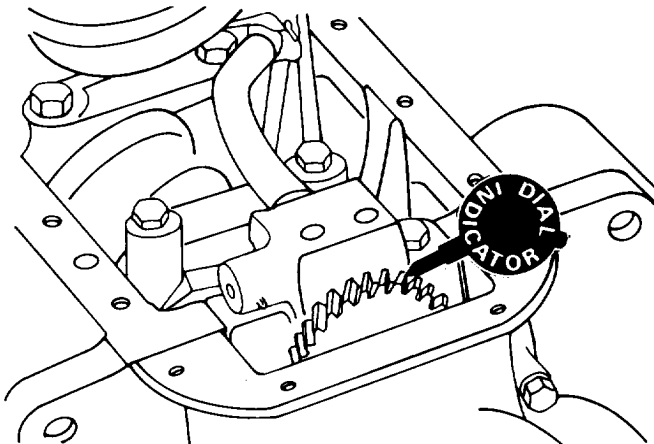
**4-2. ENGINE MAINTENANCE (cont)**

*i. Oil Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
12 (cont)		d. Cotter pin (9)	Install	Compress spring (11) and retainer (10) until retainer is below cotter pin hole. Use new cotter pin and bend it to retain in place
		e. Gasket (7)	Position	Use new gasket
		f. Cover assembly (6)	Position	
<b>NOTE</b>				
While tightening screw (4) and cap screw (2) position cover assembly to provide free rotation of oil pump gears.				
		g. Screw (4) and lock washer (5)	Install	Tighten to 6-8 pounds foot torque
		h. Three cap screws (2) and lock washers (3)	Install	Tighten to 6-8 pounds foot torque
		i. O-ring (8)	Install and lubricate	Use new O-ring. Use clean engine oil (refer to current lubrication order)
13	Oil pump screen (1)	Oil pump screen (1)	Install	On oil pump body
<b>INSTALLATION</b>				
14	Cylinder block	a. Shim(s) (5)	Position	On top of front main bearing cap
<b>NOTE</b>				
Install a shim pack with 0.015 inch minimum thickness to ensure that pump gear and crankshaft gear are not jammed together.				
<b>CAUTION</b>				
In following step be careful you don't cut O-ring on sharp edge of cylinder block when you install oil pump				
		b. Oil pump assembly (4)	Position	On top of shim(s) (5) and front main bearing cap
		c. Two cap screws (1)	Install	Tighten to 90-100 pounds foot torque
15	Oil pump screen	Two cap screws (2) and washers (3)	Install	Tighten to 90-100 pounds foot torque

**4-2. ENGINE MAINTENANCE (cont)**

*i. Oil Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
16	Oil pump assembly	Oil pump drive gear	Check backlash	Use dial indicator placed on drive gear as shown. Check backlash between oil pump drive gear and crankshaft gear. Backlash shall be between 0.002 and 0.008 inch. Add shims (5) to increase or remove shims to decrease backlash
 <p style="text-align: right;">TA127208</p>				



**4-3. FUEL SYSTEM MAINTENANCE**

*a. Fuel Injector.*

This task covers:

- a. Testing
- b. Disassembly
- c. Cleaning and inspection
- d. Reconditioning/Overhaul
- e. Reassembly
- f. Adjusting

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit	NSN 5180-00-754-0641
Sharpening Stone	NSN 5345-00-198-8050

EQUIPMENT CONDITION

Paragraph 3-6b	Condition Description Fuel injector removed from engine.
-------------------	---

SPECIAL TOOLS

Brass Wire Brush	Commercially available
Fuel Injector Test Stand with Compression Gage Adapter	FSCM 10988 P/N M20322
Valve Retractor	FSCM 05083 P/N 66-0148
Cleaning Wires	FSCM 05083 P/N 66-0036
Tip Seat Scraper	FSCM 05083 P/N 66-0149
Sac Hole Drill	FSCM 05083 P/N 66-0151
Carbon Seal Tool	FSCM 10988 P/N A42499
Torque Wrench Adapter Wrench	FSCM 05083 P/N 66-0146 FSCM 81348 P/N AN9508-6

MATERIALS/PARTS

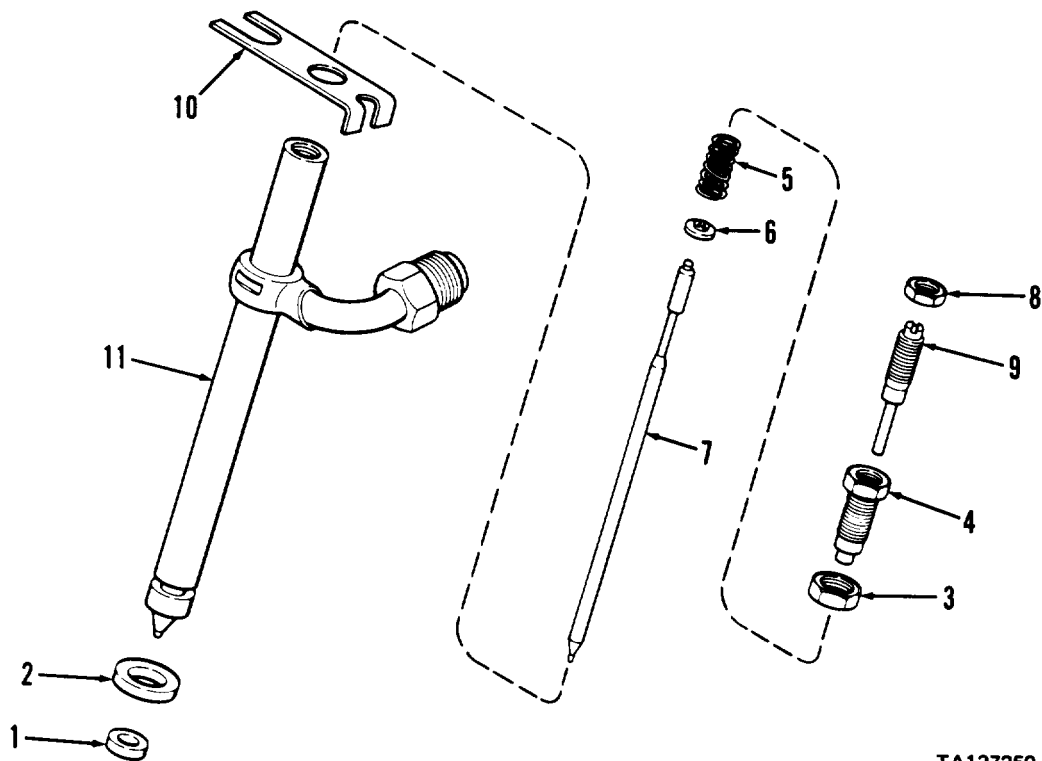
Cleaning solvent P-D-680	
Carbon dam seal	
Compression seal	
Lapping compound	(FSCM 05083 P/N 66-0145)
Clean diesel fuel	

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

**KEY**

1. Carbon dam seal
2. Compression seal
3. Pressure adjusting screw locknut
4. Pressure adjusting screw
5. Spring
6. Spring seat
7. Valve
8. Lift adjusting screw locknut
9. Lift adjusting screw
10. Locating plate
11. Injector body



TA127259

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>NOTE</b>				
Always test performance of a fuel injector before disassembling. If fuel injector tests are satisfactory, there is no need to disassemble or adjust.				
TESTING				
1			<b><u>CAUTION</u></b>	
Don't use motorized equipment or steel wire brushes for cleaning as orifices in body will be destroyed.				
<b>NOTE</b>				
Don't scrape or brush Teflon coating above carbon steel groove.				
		Fuel injector	Clean	Remove loose carbon from tip, carbon seal groove and body below groove using brass wire brush as shown
2		Fuel injector	Install on test stand	Don't attempt to connect fuel injector inlet fitting directly to standard Ermetro or 60 degree swaged type as damage to tubing can result. Use suitable adapter
<b><u>WARNING</u></b>				
Always direct injector tip away from you. Fuel from spray orifices can penetrate clothing and skin causing serious infection. Always be sure injector tip is enclosed in a receptacle (preferably transparent) to contain spray. If skin is broken by fuel injector spray, get medical attention immediately.				

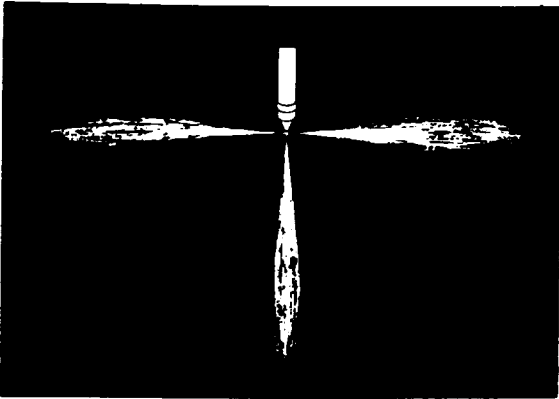
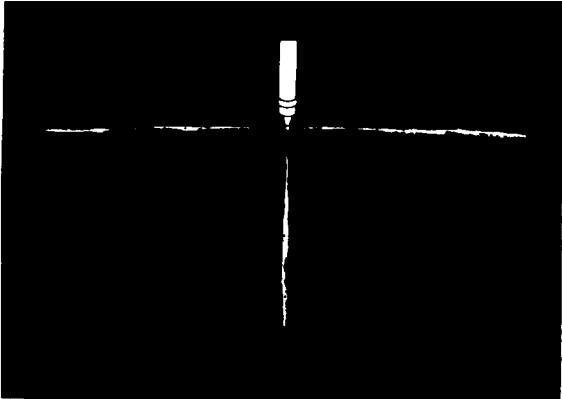
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
3		Opening pressure check	a. Close pressure gage valve and flush fuel injector by operating test pump rapidly  <b>NOTE</b>  When testing more than one fuel injector out of engine, there must not be more than 100 PSI difference between any injectors in that engine  b. Open gage and raise pressure slowly until injector valve opens. (Gage reading will drop sharply at this point)	Opening pressure for new fuel injectors shall be 3150 to 3250 PSI; for used injectors 2950 to 3050 PSI. Note and record opening pressure If injectors are not within 3150 to 3250 PSI (new injectors) or 2950 to 3050 PSI (used injectors) opening pressure: a. Adjust new fuel injectors (see adjustments) b. Valve lift screw may require adjustment (see adjustments) c. Disassemble and clean used fuel injectors (see disassembly) d. Check for broken or weak opening pressure control spring (see inspection)
4		Seat leakage check	a. Point injector tip down b. Operate test pump rapidly to seat valve firmly c. Raise pressure at fuel injector 200 to 300 PSI under recorded opening pressure	A drop should not form on injector tip within 10 seconds. Slight dampness is permissible with a used injector. If drops form on injector tip: a. Disassemble and clean fuel injector (see disassembly)

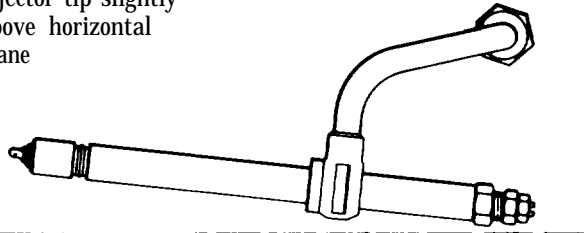
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
4 (cont)				b. Valve is not free free guide, lap valve to tip seat (see reconditioning) c. Inspect for pitted or cracked valve tip, eroded valve seat or pitted and distorted body These conditions require replacement of complete fuel retractor
5		Spray pattern check	a. Close pressure gage b. Operate tester at 60 strokes per minute and observe spray pattern	Fuel shall be finely atomized and not a solid irregular spray pattern
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>FINE ATOMIZED SPRAY PATTERN</p> <p>TA127256</p> </div> <div style="text-align: center;">  <p>SOLID IRREGULAR SPRAY PATTERN</p> <p>TA127257</p> </div> </div>				
<p>                         Injector will chatter when tester is operated rapidly Chatter is an indication of valve freedom and will improve atomization Chatter also indicates good seat width and interference angle conditions                     </p> <p>                         If fuel injector produces a solid irregular spray pattern                     </p> <ol style="list-style-type: none"> <li>a. Check for clogged, eroded, or chipped orifices</li> <li>b. Disassemble and clean fuel retractor (see disassembly)</li> <li>c. Lap valve to guide area (see reconditioning)</li> </ol>				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

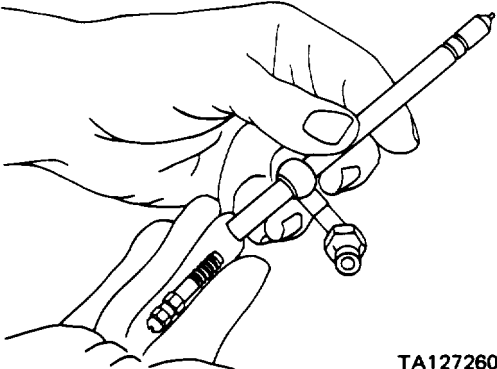
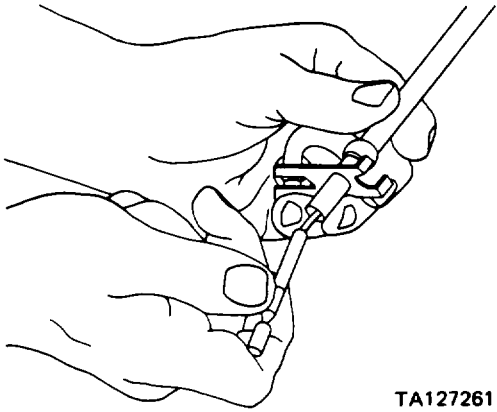
*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
5 (cont)				d. Check for pitted or eroded valve or seat, valve interference angle worn, bent valve and distorted body. These conditions require replacement of complete fuel injector
6		Injector leak-off check	<p>a. Loosen connector nuts and reposition injector tip slightly above horizontal plane</p>  <p>(HORIZONTAL PLANE)</p> <p>b. Tighten connector nuts and raise pressure to 1500 PSI</p> <p>c. Observe leakage from return end of fuel injector</p>	<p>After one drop falls, leak-off must be 3 to 10 drops in 30 seconds with No. 2 diesel fuel at room temperature (65 to 75 degrees)</p> <p>If proper leak-off is not obtained:</p> <p>a. If leak-off is excessive, replace fuel injector</p> <p>b. If leak-off is low, disassemble and clean fuel injector (see disassembly)</p> <p>c. Lap valve to guide area to increase leak-off (see reconditioning)</p>
DISASSEMBLY				
<b>NOTE</b>				
Fuel injector contains precision ground and lap fitted parts; exercise care in keeping your work area and tools clean. Handle parts carefully to avoid damaging them.				
7		Carbon dam seal (1)	Remove	Use long nose pliers

TA127258

**4-3. SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
8		Compression seal (2)	Remove	Use long nose pliers
9		Pressure adjusting screw locknut (3)	Loosen	If a holding tool is available, place fuel injector in holding tool and secure tool in vise; then loosen locknut
10		Pressure adjusting screw (4)	Remove	Hold injector body in one hand, invert it and back out pressure adjusting screw, allowing spring (5) and spring seat (6) to fall into your other hand as shown
11		Spring (5)	Remove	 <p style="text-align: right;">TA127260</p>
12		Spring seat (6)	Remove	
13		Valve (7)	Remove	 <p style="text-align: right;">TA127261</p> <p>Valve may slide out of body at this time and must be handled carefully by its stem. If valve does not slide freely from body, use valve retractor P/N 66-0148 to remove. To prevent bending the valve, bottom it in body with retractor. Push down on retractor body to mount collet. Turn knurled nut counterclockwise to secure collet and withdraw valve as shown</p>
14		Lift adjusting screw locknut (8)	Remove	

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
15		Lift adjusting screw (9)	Remove	
CLEANING AND INSPECTION				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
16		All parts	Place in solvent	Use cleaning solvent P-D-680
17		Injector body (11)	Clean	Use brass wire brush to clean tip of body and exterior of body
18		Injector body (11) spray orifices	Clean	<p>Use cleaning wires P/N 66-0036 in 0.011 in diameter, Secure wire in pin vise with end of wire protruding 1/32 inch. A longer length of wire will bottom on opposite wall or sac hole and tends to easily break Use a stone to remove cutting burrs from end of wire. If a small flat is stoned on o side of wire, it will facilitate cutting carbon from orifice. Insert cleaning wire and rotate it until it is free. Flush body and inspect tip. If any orifices are chipped at edges or eroded to an extent that spray pattern is affected, replace fuel injector</p>
TA127262				



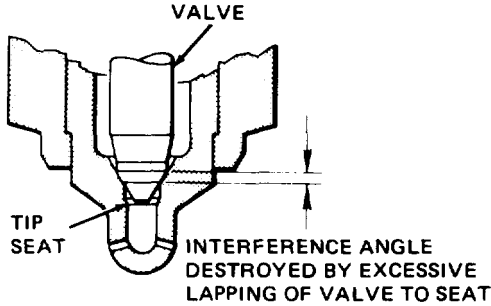
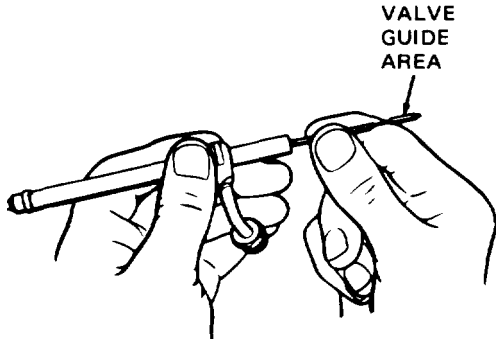
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

**a. Fuel Injector (cont).**

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING AND INSPECTION (cont)				
19		Injector body (11) seat area	Clean	Use tip seat scraper P/N 66-0149 as shown
20		Injector body (11) sac hole	Clean	Use sac hole drill P/N 66-0151 and rotate it to clean deposits from sac hole. Repeat orifice cleaning (step 18 above)
21		Valve (7)	Clean	Use brush to remove deposits from seat areas, remove varnish with a solvent and felt cleaning pad. Inspect valve for pitting or erosion which could cause leakage

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

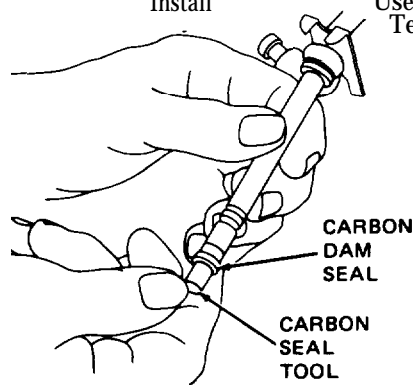
*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING AND INSPECTION (cont)				
22		Adjusting screw (4, 9)	Inspect	Replace if worn, or if threads damaged
23		Spring (5)	Inspect	Check that free length of spring is 0.563 inch and compressed length is 0.478 inch at 29 pounds
RECONDITIONING/OVERHAUL				
24		Injector body (11) tip seat	Lap valve and tip seat	Use lapping compound FSCM 05083 P/N 66-0145. Place small amount of lapping compound on valve seat and insert valve in injector body. Grip top of valve with valve retractor P/N 66-0148 and rotate valve by hand, first clockwise then counterclockwise for a total of 3 to 5 revolutions. Flush injector body thoroughly; wash valve and reassemble injector and retest. If valve and seat are worn, seat may be tight, but chatter may have been lost in the lapping process. In such an instance replace fuel injector
<b>CAUTION</b>				
Excessive lapping will destroy interference angle between seat and valve causing loss of chatter with poor atomization resulting in replacement of fuel injector.				
				
TA127265				
25		Injector body (11) valve guide	Lap valve guide	Use lapping compound FSCM 05083 P/N 66-0145. Place small amount on guide area of valve. Bottom valve in body and grasp with valve retractor P/N 66-0148. Rotate valve 10 revolutions while raising and lowering it very slightly. Flush and wash compound from both parts, assemble fuel injector and recheck fuel leak-off. If leak-off is still low, lap guide until correct leak-off is obtained. Flush fuel injector thoroughly after lapping
				
TA127266				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY				
26		All parts	Wash and flush	Wet all parts and hands with clean diesel fuel during assembly
27		Valve (7)	Install	Handle valve by its shank and slide it partially into body (11)
28		Locating plate (10)	Install	
29		Lift adjusting screw (9)	Install in pressure adjusting screw (4)	
30		Pressure adjusting screw locknut (3)	Install	On screw (4)
31		Lift adjusting screw locknut (8)	Install	On screw (9)
32		Spring (5) and spring seat (6)	Install	Install on lift and pressure adjusting screw assembly. Tilt injector body and with spring seat contacting valve top, push valve and spring components into body. Exercise care not to dislodge spring seat during reassembly. Thread pressure adjusting screw into body by hand until spring is compressed enough to hold all parts in place
33		Compression seal (2)	Install	
34		Carbon dam seal (1)	Install	Use carbon seal tool P/N A42499 as shown Test and adjust fuel injector



TA127267

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*a. Fuel Injector (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENTS				
35		Opening pressure adjustment	<ul style="list-style-type: none"> <li>a. Loosen pressure adjusting screw locknut (3)</li> <li>b. Loosen lift adjusting screw locknut (8)</li> <li>c. Install fuel injector with tip downward in test stand</li> <li>d. Back out lift adjusting screw (9) one full turn</li> <li>e. Pump fuel through fuel injector and note opening pressure</li> <li>f. Turn pressure adjusting screw (4) while holding lift adjusting screw (9) until correct opening pressure is obtained. Don't tighten pressure adjusting screw locknut (3) at this time</li> <li>g. Perform valve lift adjustment</li> </ul>	<p>Hold pressure adjusting screw locknut (3) while loosening</p> <p>Opening pressure shall be 3150 to 3250 PSI for new fuel injectors or 2950 to 3050 PSI for used fuel injectors</p> <p>Turn clockwise to increase opening pressure or counterclockwise to decrease opening pressure (gage reading will drop sharply at point that fuel injector valve opens)</p>

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

a. Fuel Injector (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENTS (cont)				
<b><u>CAUTION</u></b>				
In following step, don't manually bottom valve using excessive force as bending of valve can result requiring fuel injector replacement.				
36		Valve lift adjustment	<p>a. Pump fuel through fuel injector, hold pressure adjusting screw and slowly turn lift adjusting screw clockwise until valve ceases to open</p> <p>b. Raise pressure 200 to 500 PSI over fuel injector opening pressure</p> <p>c. To set lift, turn lift adjusting screw (9) counter-clockwise 1/2 turn</p> <p>d. Hold lift adjusting screw and tighten lift adjusting screw locknut</p> <p>e. Recheck opening pressure adjustment and readjust if necessary</p> <p>f. Test fuel injector</p> <p>g. Remove fuel injector from test stand</p>	<p>Opening pressure for new fuel injectors is 3150 to 3250 PSI; for used fuel injectors 2950 to 3050 PSI. Some fuel may collect on injector tip; however a rapid dribble must not be apparent</p> <p>Turning screw (9) 1/2 turn sets valve lift 0.009 inch off valve seat</p> <p>Use tool P/N AN9508-6; tighten to 40-45 pounds-inch torque</p>

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

a. Fuel Injector (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENTS (cont)				
36 (cont)			<b>NOTE</b>	
				in following step, don't allow pressure adjusting screw to turn while tightening pressure adjusting screw locknut.
			h. Tighten pressure adjusting screw locknut (3)	Use torque wrench adapter P/N 66-0146; tighten to 70-75 pounds-inch torque
			i. Recheck opening pressure	

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel injection Pump.*

This task covers repair of the fuel injection pump consisting of:

- a. Disassembly
- b. Cleaning
- c. Inspection
- d. Reassembly
- e. Testing

INITIAL SETUP

TOOLS

Automotive Mechanic's  
Tool Kit NSN 5180-00-754-0641  
Micrometer, zero to 2 inches

EQUIPMENT CONDITION

Paragraph 3-6c  
Condition Description  
Fuel injection pump removed from engine.

SPECIAL TOOLS

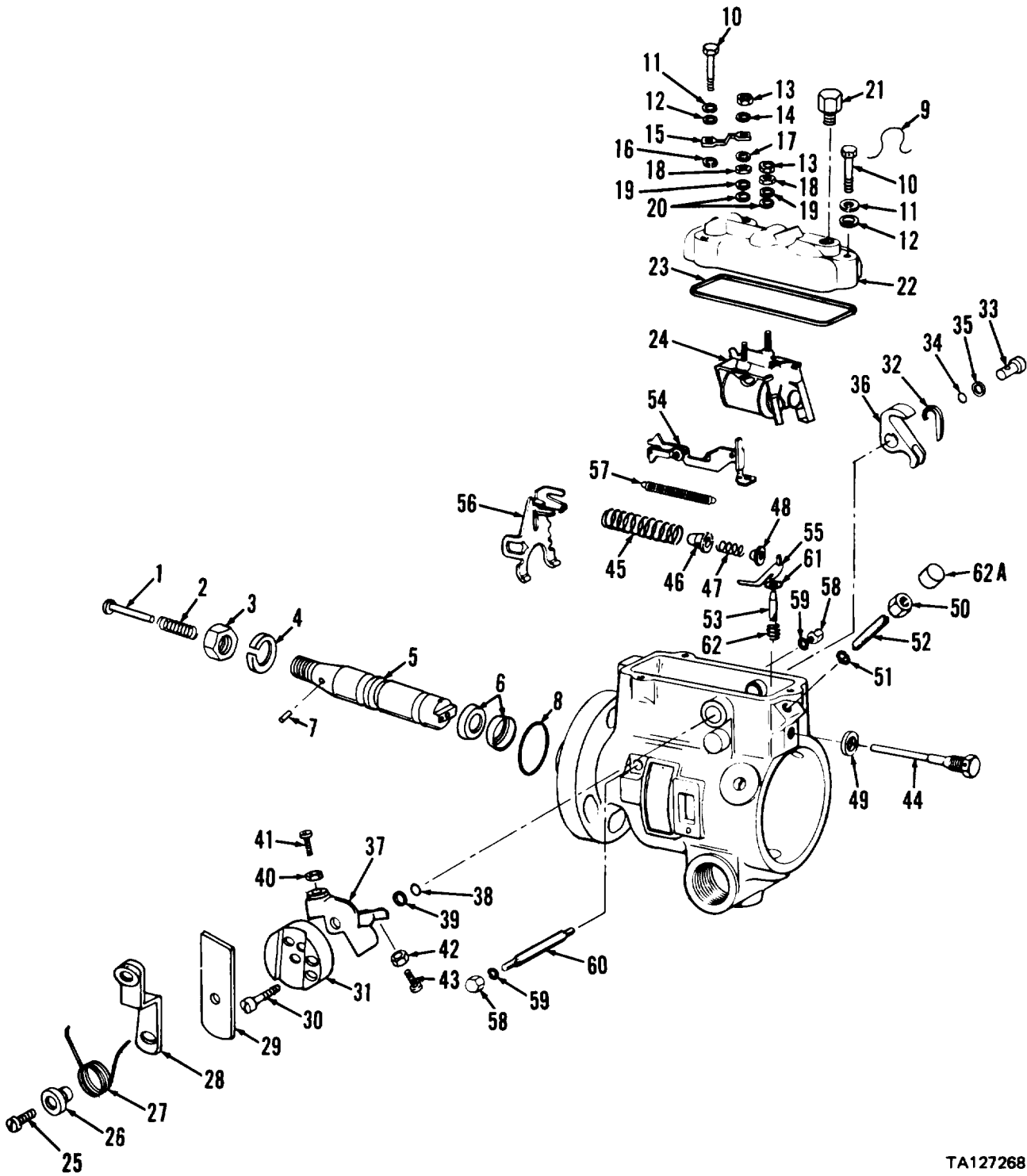
Holding Fixture FSCM 84760 P/N 20029  
Holding Fixture FSCM 84760 P/N 19965  
Fixture FSCM 84760 P/N 19969  
Extractor FSCM 84760 P/N 13383  
Extractor FSCM 84760 P/N 13301  
Bristol Socket Cam  
Advance Screw Wrench FSCM 84760 P/N 15499  
Cam Advance Screw Bushing FSCM 84760 P/N 15500  
Advance Plug Tool FSCM 84760 P/N 14490  
Piston Ring Compressor FSCM 84760 P/N 16199  
Advance Window FSCM 84760 P/N 19918  
Adapter FSCM 84760 P/N 21900  
Snap Ring Pliers FSCM 84760 P/N 13337  
Leaf Spring Adjusting  
Screwdriver FSCM 84760 P/N 13336  
Shutoff Cam Removal Tool FSCM 84760 P/N 13339  
Holding Fixture Bracket Kit FSCM 84760 P/N 19930  
Socket Setscrew Wrench FSCM 84760 P/N 13316  
Vent Wire Extractor FSCM 84760 P/N 18264  
Rotor Retaining Ring  
Installation Tool FSCM 84760 P/N 13375  
Linkage Hook  
Adjustment Gauge FSCM 84760 P/N 18914  
Linkage Hook Wrench FSCM 84760 P/N 13379

MATERIALS/PARTS

Gasket Kit  
Governor control cover and solenoid frame assembly service assembly  
Cleaning solvent P-D-680

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*



TA127268



### 4-3. FUEL SYSTEM MAINTENANCE (cont)

#### *b. Fuel Injection Pump.*

#### KEY

- |                                     |                               |
|-------------------------------------|-------------------------------|
| 1. Thrust plunger                   | 32. Shaft retainer clip       |
| 2. Spring                           | 33. Shut-off shaft            |
| 3. Nut                              | 34. Seal                      |
| 4. Lock washer                      | 35. Washer                    |
| 5. Drive shaft                      | 36. Throttle shaft lever      |
| 6. Seals                            | 37. Throttle shaft assembly   |
| 7. Roll pin                         | 38. Seal                      |
| 8. Pilot tube seal                  | 39. Washer                    |
| 9. Safety wire                      | 40. Nut                       |
| 10. Screws                          | 41. Low idle adjusting screw  |
| 11. Lock washers                    | 42. Nut                       |
| 12. Washers                         | 43. High idle adjusting screw |
| 13. Nuts                            | 44. Guide stud                |
| 14. Washer                          | 45. Governor spring           |
| 15. Grounding strap                 | 46. Spring ret airier         |
| 16. Lock washer                     | 47. Idling spring             |
| 17. Lock washer                     | 48. Idling spring guide       |
| 18. Nuts                            | 49. Washer                    |
| 19. Washers                         | 50. Nut                       |
| 20. Insulating washers              | 51. Seal                      |
| 21. Connector                       | 52. Torque screw              |
| 22. Governor control cover          | 53. Metering valve            |
| 23. Gasket                          | 54. Linkage hook              |
| 24. Solenoid frame and arm assembly | 55. Metering valve arm        |
| 25. Screw                           | 56. Governor arm              |
| 26. Spring retainer                 | 57. Linkage spring            |
| 27. Throttle lever spring           | 58. Pivot shaft nuts          |
| 28. Throttle lever assembly         | 59. Seals                     |
| 29. Spacer adjusting arm            | 60. Governor arm pivot shaft  |
| 30. Screw                           | 61. Shim                      |
| 31. Spacer                          | 62. Spring                    |
|                                     | 62A. Cap                      |

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

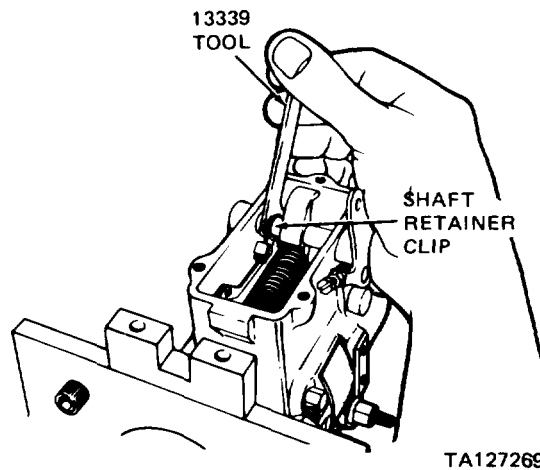
*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY				
<b>NOTE</b>				
<p>Before starting disassembly of fuel injection pump, cover inlet and outlet ports, wash pump with clean diesel fuel to remove all external grease and dirt, and dry with filtered, compressed air. Work space, tools, and hands must be clean during following task.</p>				
<p>Use a clean pan to place parts into during disassembly; a pan of clean diesel fuel or calibrating oil must be available in which parts may be flushed. These should be deep pans with rounded corners to lessen chances of dirt pockets.</p>				
1	Front of pump	a. Thrust plunger (1) and spring (2)	Pull and remove	
		b. Nut (3) and lock washer (4)	Remove	
		c. Drive shaft (5)	Remove	
		d. Two seals (6)	Remove and discard	
<b>NOTE</b>				
Don't remove roll pin (7) unless damaged.				
		e. Roll pin (7)	Remove only if sheared or damaged	Use 5/64 inch easy out extractor or 3/32 inch carbide tipped drill
		f. Pilot tube seal (8)	Remove	Use screwdriver and pry out
2		Fuel injector pump	Mount	In holding fixture P/N 20029
3	Housing	a. Safety wire (9)	Cut, remove and discard	
		b. Three screws (10), lock washers (11) and washers (12)	Remove	
		c. Governor control cover (22) and solenoid frame and arm assembly (24)	Remove	
		d. Gasket (23)	Remove and discard	

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

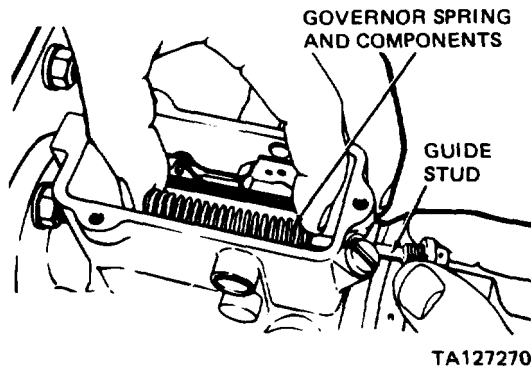
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
4	Governor control cover (22)	a. Two nuts (13)	Remove	Support solenoid frame and arm assembly (24)
		b. Washer (14), grounding strap (15), and lock washers (16 and 17)	Remove	
		c. Two nuts (18), washers (19), and insulating washers (20)	Remove	
		d. Solenoid frame and arm assembly (24)	Remove	
		e. Connector (21)	Remove	
5	Housing, top	a. Screw (25) and spring retainer (26)	Remove	Rotate shut-off shaft to full shut-off position (clip horizontal). Use tool P/N 13339 placed between housing and governor linkage hook as shown, pry gently sliding clip out of its groove and off throttle shaft
		b. Throttle lever spring (27)	Disengage and remove	
		c. Throttle lever assembly (28)	Remove	
		d. Spacer adjusting arm (29)	Remove	
		e. Screw (30)	Remove	
		f. Spacer (31)	Remove	
		g. Shaft retainer clip (32)	Remove	



**4-3. FUEL SYSTEM MAINTENANCE (cont)**

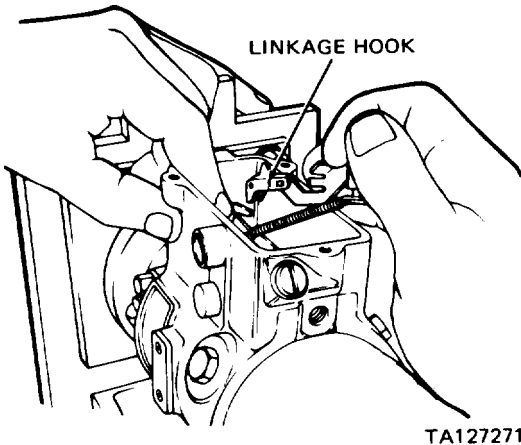
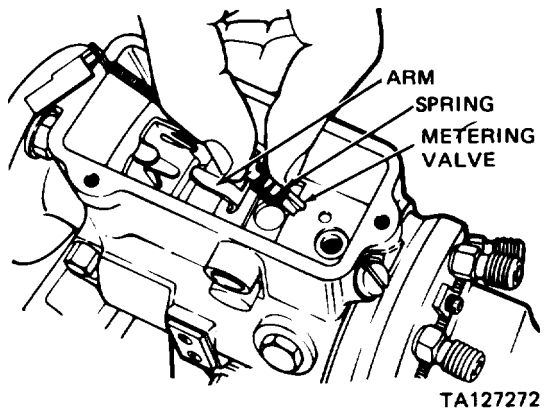
*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
5 (cont)		h. Shut-off shaft (33)	Withdraw and remove	
		i. Seal (34) and washer (35)	Remove	
		j. Throttle shaft lever (36)	Remove	Slide off throttle shaft assembly (37)
		k. Throttle shaft assembly (37)	Withdraw and remove	
		l. Seal (38) and washer (39)	Remove	
		m. Nut (40)	Loosen	
		n. Low idle adjusting screw (41)	Remove	
		o. Nut (42)	Loosen	
		p. High idle adjusting screw (43)	Remove	
		q. Guide stud (44)	Loosen	
		r. Governor spring (45)	Grasp securely	
		s. Guide stud (44)	Remove	While grasping governor spring (45) securely
		t. Governor spring (45), spring retainer (46), idling spring (47), and idling spring guide (48)	Remove	
		u. Washer (49)	Remove	
		v. Cap (62A), nut (50) and seal (51)	Remove	
		w. Torque screw (52)	Remove	
		x. Metering valve (53)	Depress	
		y. Governor linkage hook assembly (54)	Raise while depressing metering valve (53)	Raise from metering valve arm (55) pin
		z. Governor arm (56)	Hold forward	



**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
5 (cont)		aa. Linkage hook (54)	Disengage from governor arm (56) and place over side of housing	Don't disengage linkage spring (57)
				
		ab. Two pivot nuts (58) and seals (59)	Remove	
		ac. Governor arm pivot shaft (60)	Withdraw and remove	
		ad. Governor arm (56), linkage hook (54) and linkage spring (57)	Remove	
		ae. Metering valve (53), metering valve arm (55), shim (61) and spring (62)	Remove	
				

---

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

---

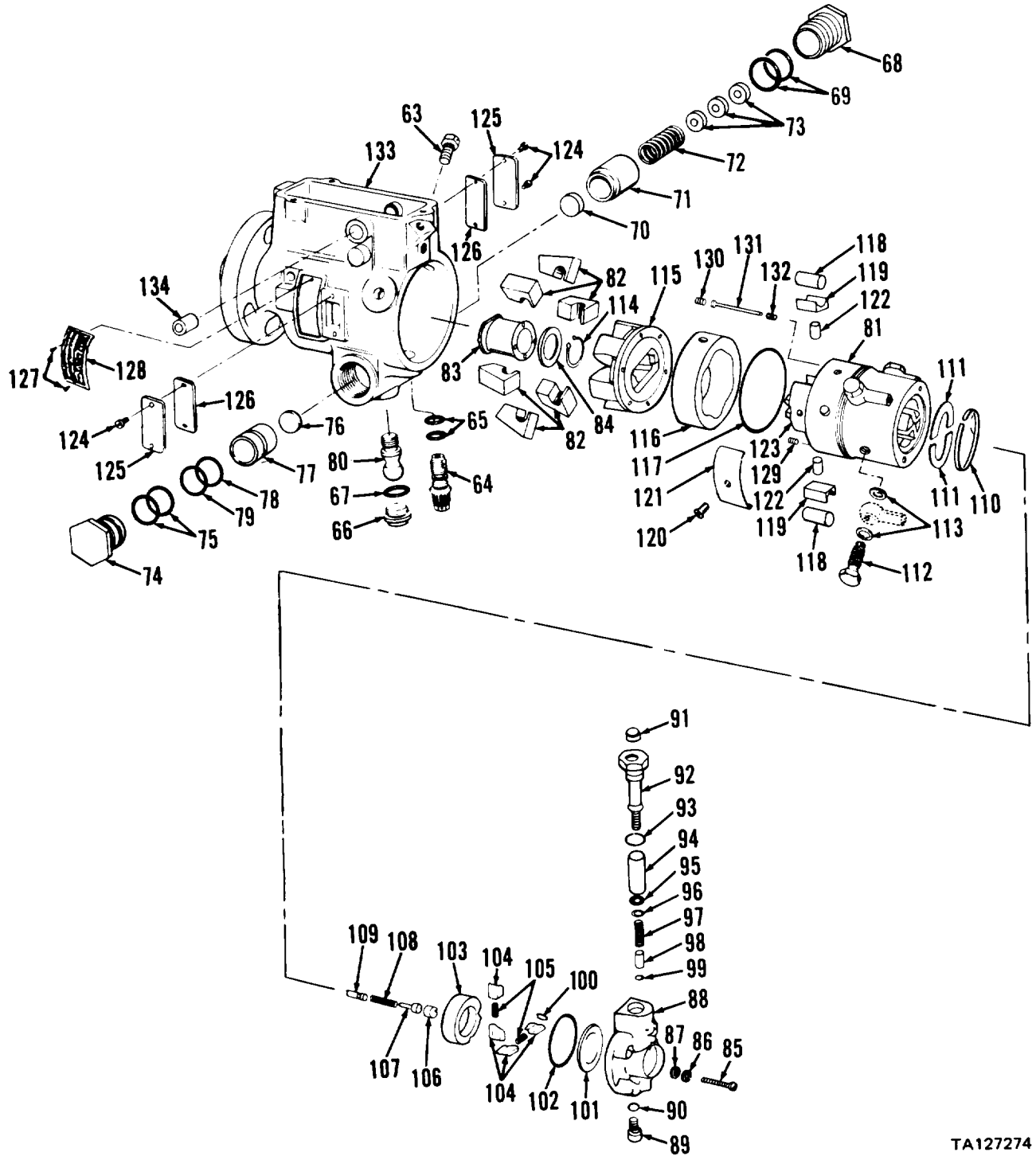
*b. Fuel Injection Pump (cont).*

KEY

- |                                 |                                    |
|---------------------------------|------------------------------------|
| 63. Head locking screws         | 98. Regulating piston              |
| 64. Head locating screw         | 99. Seal                           |
| 65. Seals                       | 100. Rollpin                       |
| 66. Advance screw hole<br>plug  | 101. Thrust plate                  |
| 67. Seal                        | 102. Seal                          |
| 68. Advance piston hole<br>plug | 103. Liner                         |
| 69. Seals                       | 104. Pump blades                   |
| 70. Slide washer                | 105. Springs                       |
| 71. Piston                      | 106. Delivery valve<br>screw       |
| 72. Advance adjusting<br>spring | 107. Stop                          |
| 73. Shim                        | 108. Spring                        |
| 74. Power piston hole<br>plug   | 109. Delivery valve                |
| 75. Seals                       | 110. Snap ring                     |
| 76. Slide washer                | 111. Rotor retainers               |
| 77. Power piston                | 112. Fuel line connector<br>screws |
| 78. Seal                        | 113. Washers                       |
| 79. Piston ring                 | 114. Retaining ring                |
| 80. Cam advance screw           | 115. Governor<br>weight retainer   |
| 81. Hydraulic head              | 116. Cam ring                      |
| 82. Governor weights            | 117. Seal                          |
| 83. Thrust sleeve               | 118. Cam rollers                   |
| 84. Thrust washer               | 119. Cam roller shoes              |
| 85. Screws                      | 120. Adjusting screw               |
| 86. Lock washers                | 121. Leaf spring                   |
| 87. Washers                     | 122. Pumping plungers              |
| 88. End plate                   | 123. Rotor                         |
| 89. Plug                        | 124. Screws                        |
| 90. Seal                        | 125. Timing line covers            |
| 91. Plug                        | 126. Gaskets                       |
| 92. Sleeve                      | 127. Screws                        |
| 93. Seal                        | 128. Nameplate                     |
| 94. Filter element              | 129. Plug screw                    |
| 95. Seal                        | 130. Plug screws                   |
| 96. O-ring                      | 131. Vent wire retainer            |
| 97. Regulator spring            | 132. Vent wire                     |
|                                 | 133. Housing                       |
|                                 | 134. Bushings                      |

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

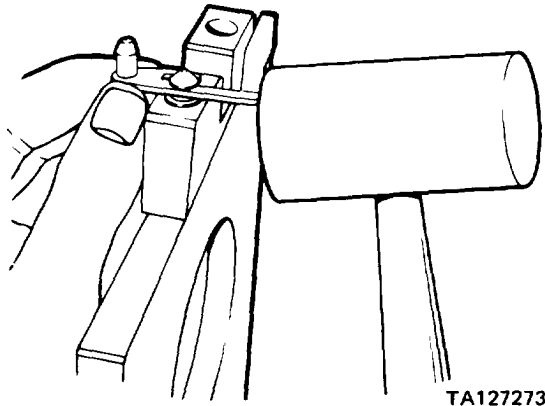
*b. Fuel Injection Pump (cont).*



TA127274

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

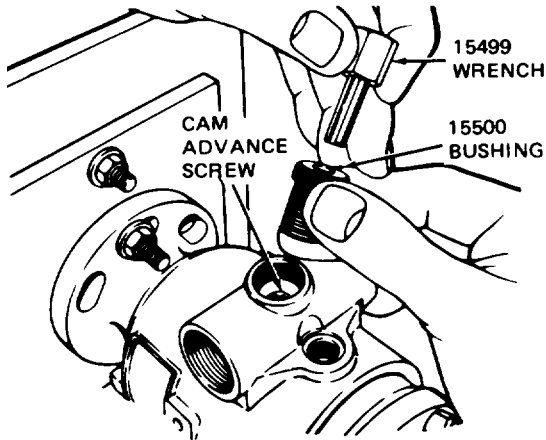
STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
(cont)		af. Metering valve arm (55) and shim (61)	Remove	From metering valve (53) as shown below
				
6	Housing, sides	a. Two head locking screws (63) b. Fuel injection pump and holding fixture	Loosen; remove one  Invert in vise	
7	Automatic advance group (sides and bottom of housing)	a. Head locating screw (64) b. Two seals (65) c. Advance screw hole plug (66) d. Advance screw hole plug (66) e. Seal (67)	Remove  Remove and discard Loosen  Remove  Remove and discard	Use 7/16 inch deep well socket   Tap gently with hammer  Use tool P/N 14490
<b>NOTE</b>				
Power side piston is located on side of housing marked with letters CC (just above advance boss).				
		f. Spring side advance piston hole plug (68)	Remove	Remove plug (68), piston (71), spring (72), and slide washer (70) as an assembly.



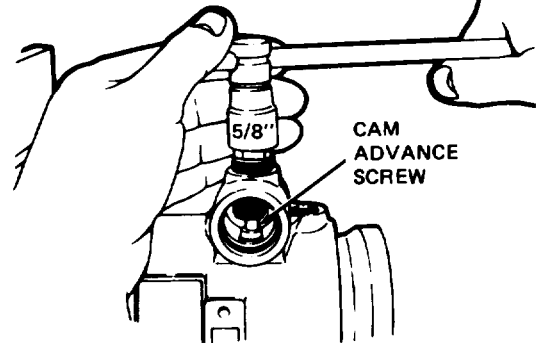
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
7 (cont)		g. Two seals (69)	Remove	Invert spring side piston hole plug and let piston (71), spring (72), and shim (73) fall into your hand
		h. Slide washer (70)	Remove	
		i. Piston (71)	Remove	
		j. Advance adjusting spring (72)	Remove	
		k. Shim (73)	Remove	
		l. Power side piston hole plug (74)	Remove	Hold plug (74) in one hand and rap sharply into palm of your other hand. Piston (77) will slide cut
		m. Two seals (75) and slide washer (76)	Remove	
		n. Power piston (77)	Remove	
		o. Seal (78)	Remove	Assemble tools P/N 15499 and P/N 15500 into advance screw plug hole to remove (see below). Use 5/8 inch socket on P/N 15499 tool
		p. Piston ring (79)	Remove	
	q. Cam advance screw (80)	Remove		



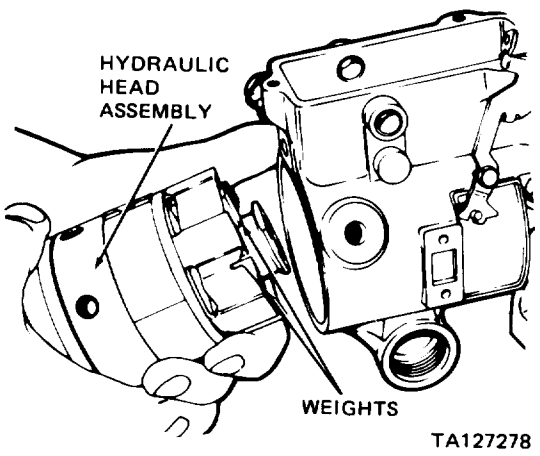
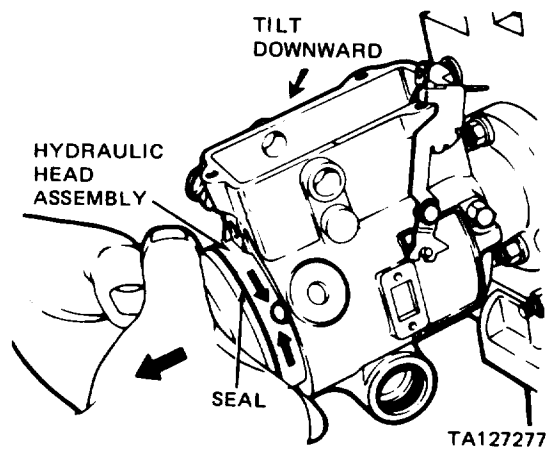
TA127275



TA127276

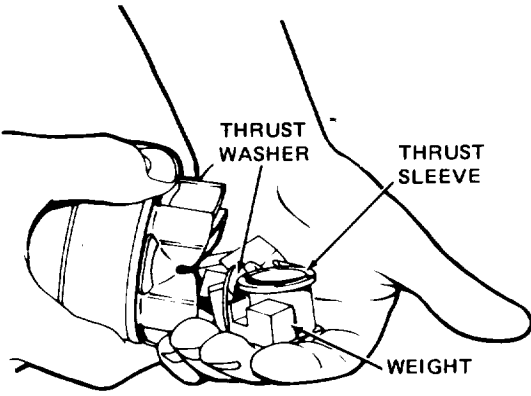
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
8		Fuel injector pump and holding fixture	Position in vise with rear of pump tilted slightly downward	
9	Housing	a. Head locking screw (63)	Remove	
<b>CAUTION</b>				
Be careful when performing following step not to drop governor weights.				
		b. Hydraulic head (81)	Remove	Grasp with both hands and withdraw using a slight rotary motion
				
				
10	Hydraulic head (81)	a. Six governor weights (82)	Remove	Invert hydraulic head and let governor weights (82), thrust sleeve (83) and thrust washer (84) fall into your hand

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
10 (cont)		b. Thrust sleeve (83) c. Thrust washer (84)	Remove Remove	
 <p style="text-align: right;">TA127279</p>				
		d. Hydraulic head (81)  e. Four screws (85), lock washers (86), and washers (87) f. End plate (88) g. Plug (89) h. Seal (90)	Position on holding fixture P/N 19930 so that governor weight engages bar on fixture Remove Remove Remove Remove and discard	
11	End plate (88)	a. Plug (91) b. Sleeve (92)  c. Seal (93) d. Filter element (94) e. Seal (95) f. O-ring (96)	Remove Remove  Remove and discard Remove Remove and discard Remove and discard	Remove sleeve (92), seal (93), filter element (94), seal (95), O-ring (96), regulator spring (97), piston (98), and seal (99) as an assembly

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
11 (cont)		g. Regulator spring (97)	Remove	
		h. Regulating piston (98)	Remove	
		i. Seal (99)	Remove and discard	
<b>NOTE</b>				
Don't remove rollpin (100) in following step unless replacement is required.				
		j. Rollpin (100)	Remove	Use long nosed pliers or proper size drill
		k. Seal (102)	Remove and discard	
		l. Thrust plate (101)	Remove	
12	Hydraulic head (81)	a. Liner (103), four transfer pump blades (104), and two springs (105)	Lift out and remove	
		b. Delivery valve screw (106)	Remove	Use socket setscrew wrench tool P/N 13316
		c. Stop (107), spring (108), and delivery valve (109)	Remove	Lift hydraulic head and shake parts into your hand; if necessary use tool P/N 13383 to remove delivery valve
<b>NOTE</b>				
If delivery valve (109) sticks in its bore in following step, use tool P/N 13383 to remove.				
		d. Rotor retainer snap ring (110)	Remove	Use small blade screwdriver or dull scribe
		e. Two rotor retainers (111)	Remove	Move outward as far as possible to clear rotor and lift hydraulic head until rotor is flush with inner face of hydraulic head; then, remove rotor retainers

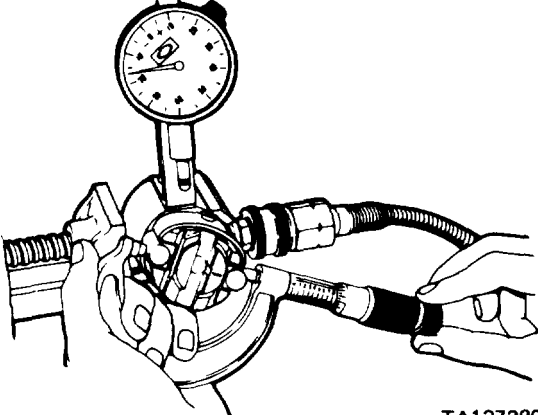
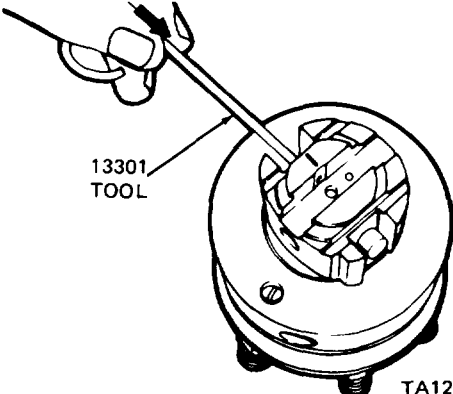
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
12 cont)	<b><u>CAUTION</u></b>			
Rotor is no longer retained in hydraulic head. Don't let them slip apart when performing the following step.				
		f. Hydraulic head (81)	Place in holding fixture P/N 19965	
		g. Four fuel line connector screws (112) and eight washers (113)	Remove	
		h. Retaining ring (114)	Remove	Use snap ring pliers tool P/N 13337
		i. Governor weight retainer (115)	Lift off and remove	
		j. Cam ring (116)	Lift off and remove	
		k. Seal (117)	Remove and discard	
		l. Cam rollers (118)	Check and record roller-to-roller dimension:	
<p>a. Install fixture P/N 19969 in vise                      b. Assemble 1/4-18 NPT fitting to fixture air inlet                      c. Adapt fitting to a 30- 100 PSI source of clean, dry air</p>				
<b><u>CAUTION</u></b>				
Handle hydraulic head carefully in following step and hold cam rollers (118) and shoes (119) in their slots to prevent rotor, cam rollers, and shoes from falling.				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
12 (cont)				<p>d. Install hydraulic head (81) in fixture on air inlet side of fixture</p> <p>e. Rotate rotor until cam rollers (118) are pushed to their extreme outward position by air pressure</p> <p>f. Use a two inch micrometer and measure cam roller-to-cam roller dimension as shown</p> <p>g. Dimension shall be <math>1.965 \pm .0015</math> inch. Record the dimension obtained</p> <p>h. Remove hydraulic head from fixture and install in fixture P/N 19965</p>
<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>TA127280</p> <p>m. Adjusting screw (120)</p> <p>n. Leaf spring (121)</p> </div> </div>				
<p>m. Adjusting screw (120)</p> <p>n. Leaf spring (121)</p>			<p>Remove</p> <p>Remove</p>	<p>Use tool P/N 13336</p>
NOTE				
<p>Handle following parts (118, 119, 122, and 123) carefully; hands must be clean and wet with clean diesel fuel.</p>				
<p>o. Two cam rollers (118)</p> <p>p. Two cam roller shoes (119)</p> <p>q. Two pumping plungers (122)</p>			<p>Remove</p> <p>Remove</p> <p>Remove</p>	<p>Use extractor P/N 13301 as shown</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>13301 TOOL</p> <p>TA127281</p> </div> </div>

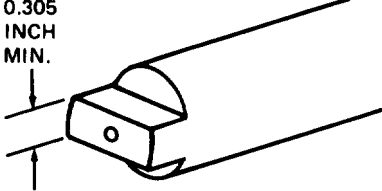
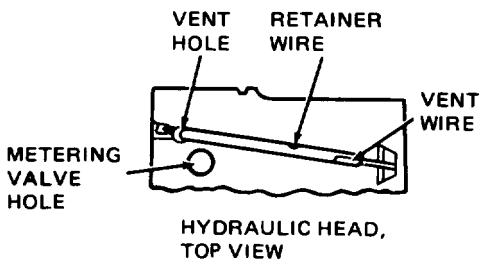
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
12 (cont)			<b><u>CAUTION</u></b>	
			In following step, don't handle rotor shank.	
		r. Rotor (123)	Remove	
13	Housing (133)	a. Four screws (124)	Remove	
		b. Two timing line covers (125)	Remove	
		c. Two timing line cover gaskets (126)	Remove and discard	
		d. Two screws (127)	Remove	If necessary
		e. Nameplate (128)	Remove	If necessary
14	Hydraulic head (81)		<b><u>NOTE</u></b>	
			Don't perform following steps unless vent wire and retainer are damaged.	
		a. Plug screw (129)	Remove	If damaged
		b. Two plug screws (130)	Remove	If damaged
		c. Vent wire retainer (131)	Remove	If damaged. Grasp hydraulic head in your hand and shake vent retainer into other hand
		d. Vent wire (1 32)	Remove	Use tool P/N 18264
15	Housing (133)	Two bushings (134)	Remove only if damaged	Use proper size sleeve
CLEANING				
			<b><u>WARNING</u></b>	
			Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.	
16		All parts	Clean	Use cleaning solvent P-D-680

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

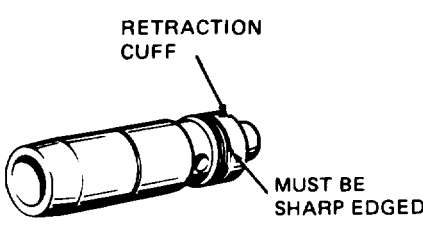
*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR								SPECIFICALLY INSPECT
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS	DISTORTION	
INSPECTION											
17	Housing	a. Housing (133)	X	X	X	X		X	X	X	Seal seats, bores and threads
		b. Drive shaft (5)	X	X	X	X		X	X	X	Measure distance across flats of drive tang (see below); distance must not be less than 0.305 inch. Shaft diameter in drive shaft seal area must be free of nicks and scratches. Moderate shaft wear from the seal lips is normal
			 <p style="text-align: center;">0.305 INCH MIN.</p> <p style="text-align: right;">TA127282</p>								
18	Hydraulic head (81)	a. Hydraulic head (81)	X	X	X	X	X	X	X	X	Central and metering valve bores and ports Check vent wire for freedom of movement. If wire is free, flush head and blow out all passages with clean, dry air (see below). If wire is stuck in screw remove and replace after a thorough cleaning of the unit and hydraulic head passage
		b. Vent wire (132) and retainer (131)		X			X				
			 <p style="text-align: center;">METERING VALVE HOLE    VENT HOLE    RETAINER WIRE    VENT WIRE</p> <p style="text-align: center;">HYDRAULIC HEAD, TOP VIEW</p> <p style="text-align: right;">TA127283</p>								



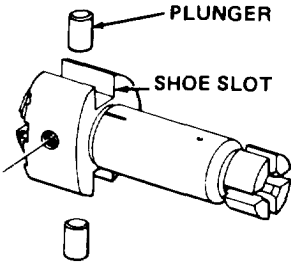
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR							SPECIFICALLY INSPECT
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS	
INSPECTION (cont)										
18 (cont)		c. Rotor	X	X	X	X	X			Check radii contacted by leaf spring and tang slot for excessive wear. Check all slots, charging and discharge ports for chipping of edges or dirt and the rotor shank for scratches. If damage or excessive wear is apparent replace head and rotor as a (matched) unit
		d. Delivery valve (109) and spring (108)	X	X	X	X	X		X	Check retraction cuff for chipping or erosion of edges (see below)
<p><b>CAUTION</b></p> <p>Don't force plungers into the bores and don't handle rotor shank.</p>										
 <p>RETRACTION CUFF</p> <p>MUST BE SHARP EDGED</p>										
TA127284										

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

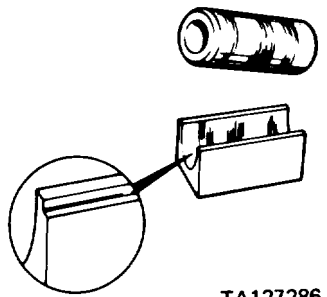
*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR							SPECIFICALLY INSPECT	
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS		DISTORTION
INSPECTION (cont)											
18 cont)			<b><u>WARNING</u></b>								
			<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>								
		e. Pumping plungers (122)	X	X	X	X	X				
											
											<p>Hold rotor under clean oil and insert plungers into their bore. With your thumb and forefinger over shoe slots, tilt from side to side several times to determine complete freedom of movement. Reversing or interchanging initial positions may be necessary as these are matched parts. If plungers are sticking, but not visibly damaged, clean both plungers and bore with a soft brush and cleaning solvent P-D-680</p>
			TA127285								

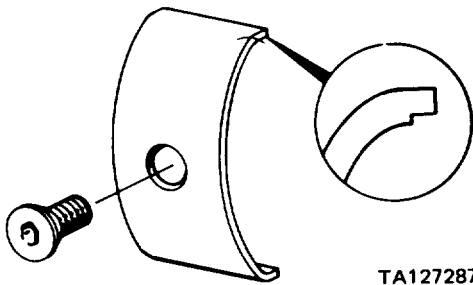
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR							SPECIFICALLY INSPECT		
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS		DISTORTION	
INSPECTION (cont)												
18 (cont)		f. Cam rollers and shoes (118 and 119)									Check each roller in its shoe for freedom of rotation. Inspect top edge of each shoe, where retained by leaf spring, for chipping or excessive wear. Inspect for abrasive wear patterns as shown	
		g. Leaf spring and screws (120 and 121)	X	X	X				X	X	X	Check for excessive wear at points where spring contacts the radii on rotor and along steps that retain roller shoes (see illustration). Check adjusting screw for tightness in rotor



TA127286

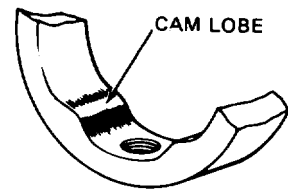


TA127287

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel injection Pump (cont).*

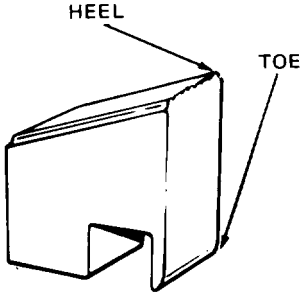
STEP	LOCATION	ITEM	EXAMINE FOR							SPECIFICALLY INSPECT	
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS		DISTORTION
INSPECTION (cont)											
18 cent)		h. Cam ring (116)	X	X	X	X			X	X	Tool marks between lobes should not be considered damage. Mottled appearance of cam is from heat treatment, not from operation. Inspect cam lobes and edges of all flat surfaces. If evidence of spalling or flaking out, replace (see below)
		i. Governor weight retainer (115)	X	X	X				X	X	Weight pivot area and ring area for wear



TA127288

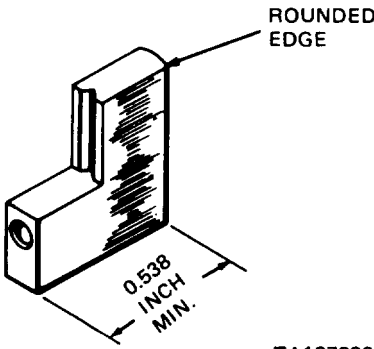
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR							SPECIFICALLY INSPECT	
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS		DISTORTION
INSPECTION (cont)											
18 (cont)		j. Governor weights (82)	X	X	X		X		X	Check pivot points (heel and toe) for excessive wear (see below)	
										 <p>TA127289</p>	
		k. Governor thrust washer (84)	X	X	X	X			X	X	Contact area for excessive wear
		1. Governor thrust sleeve (83)	X	X	X	X			X	X	Points of contact with governor arm for excessive wear

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR								SPECIFICALLY INSPECT
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS	DISTORTION	
INSPECTION (cont)											
19	Transfer pump	a. Blades (104)	X		X	X				X	<p>Check for chipping on all edges, including spring bore edges for pitting, imbedded foreign particles or scoring on rounded edges. Determine blade wear by measuring length (0.538 inch minimum). Inspect flat surfaces visually for deep scores (see illustration). If any discrepancies are noted, replace blade sets and spring</p>
 <p style="text-align: right;">TA127290</p>											
		b. Liner (103)	X	X	X	X					Inside diameter in low pressure area for wear
20	Governor	a. Pivot shaft (60)	X	X	X			X		X	Chipped or worn knife edge
		b. Arm (56)	X	X	X					X X	Points of contact with thrust sleeve and pivot shaft for excessive wear

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR								SPECIFICALLY INSPECT	
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS	DISTORTION		
INSPECTION (cont)												
20 (cont)		c. Metering valve (53)	X	X	X	X	X		X		Contact area of body for excessive wear	
		d. Metering valve arm (55)	X	X	X	X			X	X	Pin for wear or looseness	
		e. Linkage hook (54)	X	X	X				X	X	X	Metering valve pin hole
21	Advance	a. Piston (71 and 77)	X	X	X	X	X					
		b. Cam advance screw (80)	X	X	X	X	X	X	X	X		
		c. Plugs (66, 68, and 74)	X	X	X	X	X	X	X	X	X	Bore for excessive wear
		d. Head locating screw (64)		X	X	X			X	X		Orifice
22	End plate (88)	a. Sleeve (92)		X								Bypass port for clogging
		b. Regulating piston (98)	X	X	X	X	X					Upper end
		c. End plate (88)	X	X		X			X	X		For wear from transfer pump end thrust

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	EXAMINE FOR								SPECIFICALLY INSPECT	
			EXCESSIVE WEAR	FOREIGN MATERIAL OR RUST	NICKS OR CHIPPING	SCRATCHES OR SCORES	FREEDOM OF MOVEMENT	THREAD DAMAGE	CRACKS	DISTORTION		
INSPECTION (cont)												
22 (cont)		d. End plate plug (89) e. Regulator spring	X						X		Bottom surface	
										X	Free length of 0.633 to 0.667 inch, rate of compression 10 pounds per inch	
23	Governor control cover (22)	Solenoid frame and arm assembly (24)								X	X	For cracks and swelling in encapsulating material and looseness of screw terminals. Use ohmmeter and check for continuity. Replace if any defects observed or if continuity not obtained



**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY</b>				
<b>NOTE</b>				
All parts must be flushed in clean diesel fuel as they are assembled.				
24	Hydraulic head (81)	a. Vent wire (132)	Install in vent wire retainer (131)	In hydraulic head (81)
		b. Vent wire retainer (131)	Install	
		c. Two plug screws (130)	Install	
		d. Plug screw (129)	Install	
25	Housing (133)	a. Nameplate (128)	Position	Use soft hammer
		b. Two screws (127)	Install	
		c. Two bushings (134)	Install	
26	End plate (88)	a. Seal (93)	Install	On sleeve (92)
		b. Filter element (94)	Install	On sleeve (92)
		c. Seal (95)	Install	On sleeve (92)
		d. O-ring (96)	Install	On sleeve (92)
		e. Regulator spring (97)	Install	In sleeve (92)
		f. Regulating piston (98)	Install	On sleeve (92)
		g. Seal (99)	Install	On regulating piston (98)
		h. Sleeve (92)	Install	In end plate (88); be careful not to disturb parts assembled to sleeve. Finger tighten sleeve
		i. Plug (91)	Install	In sleeve (92)
		j. Seal (90)	Install	On plug (89)
		k. Plug (89)	Install	
27	Hydraulic head (81)	<b>NOTE</b>		
		Pumping plungers are graded in four sizes A through D in either standard or oversize. The correct grading letter is etched on the rotor (123) base; if a "- 2" is also etched on rotor base, this indicates an oversize pumping plunger is required. Absence of a "-2" indicates a standard size plunger in either size A through D, as etched on rotor base, is required.		

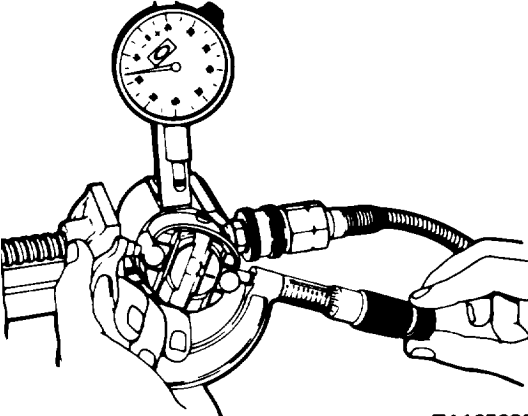
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
27 (cont)		a. Two pumping plungers (122)	Install in rotor bores	Chamfer inward
		b. Rotor (123)	Flush thoroughly in clean diesel fuel	Don't handle rotor shank; keep your fingers over plungers to stop them from falling out
		c. Hydraulic head (81)	Flush thoroughly in clean diesel fuel	
		d. Rotor (123)	Install using slight rotary motion	In hydraulic head, while both are immersed in clean diesel fuel
		e. Hydraulic head (81) and rotor (123)	Install in holding fixture P/N 19965	
		f. Leaf spring (121)	Position	
		g. Adjusting screw (1 20)	Install	Use tool P/N 13336
		h. Two cam roller shoes (119) and cam rollers (118)	Install	In rotor (1 23), then check for freedom of movement
		i. Cam rollers (118)	Check and adjust roller-to-roller dimension:  a. Install fixture P/N 19969 in vise b. Assemble 1/4-18 NPT fitting to fixture air inlet c. Adapt fitting to a 30-100 PSI source of clean, dry air	
<b><u>CAUTION</u></b>				
Handle hydraulic head carefully in following step and hold cam rollers (118) and shoes (119) in their slots to prevent rotor, cam rollers, and shoes from falling.				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
27 (cont)			<p>d. Install hydraulic head (81) in fixture on air inlet side of fixture</p> <p>e. Rotate rotor until cam rollers (118) are pushed to their extreme outward position by air pressure</p> <p>f. Use a two inch micrometer and measure cam roller-to-cam roller dimension as shown</p> <p>g. Dimension shall be 1.965±0.0015 inch; if necessary, turn adjusting screw (120) clockwise to decrease travel</p> <p>h. Remove hydraulic head from fixture and install in fixture P/N 19965</p>	
			<p>j. Cam ring (116)</p> <p>k. Governor weight retainer (115)</p> <p>l. Retaining ring (114)</p> <p>m. Hydraulic head (81)</p>	<p>Position</p> <p>Install</p> <p>Install</p> <p>Invert in holding fixture</p>
<b>NOTE</b>				
<p>Delivery valves are supplied in standard size and oversize; size used is etched on rotor.</p>				
		<p>n. Delivery valve (109)</p> <p>o. Spring (108)</p> <p>p. New stop (107)</p> <p>q. Delivery valve screw (106)</p> <p>r. Two rotor retainers (111)</p> <p>s. Snap ring (1 10)</p> <p>t. Liner (103)</p>	<p>Install</p> <p>Install</p> <p>Install</p> <p>Install</p> <p>Install</p> <p>Install</p> <p>Install</p>	<p>Be sure it operates freely in its bore</p> <p>Relieved end facing down; use tool P/N 13383 and tighten to 85-90 pounds inch torque</p> <p>Lift hydraulic head up until inside face of head is flush with rotor end, then position with outer sleeve of rotor retaining ring installation tool P/N 13375</p> <p>Install so that large slot is in line with head locating screw hole and marking indicating pump rotation is facing upward</p>

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
27 (cont)	<b>NOTE</b>			
Some rotors (123) have oversized blade slots (0.001 inch wider than normal). Pump blades (104) are furnished in standard size and oversize. Always install oversized pump blades first; if oversized pump blades fit any of the slots, they should be used in those slots. Both oversize and standard size pump blades may be used in the same rotor.				
		u. Four pump blades (104) and two springs (105)	Install in rotor (123)	Rotate liner several times to check for binding; remove and reinstall blades and springs if binding is detected. Position liner in correct position as indicated above
		v. Seal (102)	Install	
		w. Thrust plate (101)	Install	
28	End plate (88)	Roll pin (100)	Install	If removed
29	Hydraulic head (81)	a. End plate (88)	Position	
<b>NOTE</b>				
If rollpin (100) in end plate (88) and locating slot in liner (103) are 180 degrees out of alignment, check that rollpin is installed in its proper location as to pump rotation (C and CC are marked on outside of end plate).				
		b. Four washers (87), lock washers (86) and screws (85)	Install	Tighten to 25-30 pounds inch torque
		c. Hydraulic head and rotor	Position with drive end up	
		d. Six governor weights (82)	Install in sockets	Position so that slots face bore of hydraulic head and rotor assembly
		e. Thrust washer (84)	Position	Against thrust sleeve with chamfered edge facing sleeve
		f. Thrust sleeve (83)	Install with tab facing upward	Insert your forefinger into bore of sleeve (83) and washer (84) to hold them together and insert into slots of governor weights (82) by tilting weights back slightly

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (Cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
29 (cont)		g. Six governor weights (82)	Check	Sight across tops of assembled weights to check positioning. One weight higher than others indicates incorrect assembly of thrust washer (84). Disassemble and repeat steps d through g above
30	Housing (133)	a. Governor arm (56)	Position	Fork for linkage hook (54) facing end plate (88)
		b. Governor arm pivot shaft (60)	Install	With knife edge facing end plate (88)
		c. Two seals (59) and pivot shaft nuts (58)	Install	Tighten to 20-25 pounds inch torque
		d. New seal (117)	Position	On hydraulic head (81)
<b><u>CAUTION</u></b>				
If during following step, the hydraulic head and rotor should cock during installation, withdraw it and start over. Failure to do so could cause particles of metal to be shaved off and left in the housing causing serious damage during operation. Be careful not to insert hydraulic head too far into housing; seal may be damaged and result in leakage.				
		e. Hydraulic head (81) and rotor (123)	Apply light film of clean grease around inside edge of housing (133) then install	Rotate cam ring (116) so that unthreaded hole is in line with metering valve bore in housing. Grasp head firmly in both hands and insert into housing bore with a slight rotary motion. Don't force this operation.
		f. Hydraulic head (81)	Align head locking screw holes in head and housing	Align by rotating hydraulic head (81)
		g. Two head locking screws (63)	Install finger tight	
<b>NOTE</b>				
To prevent governor weights from dislodging, install drive shaft (5) in pump.				

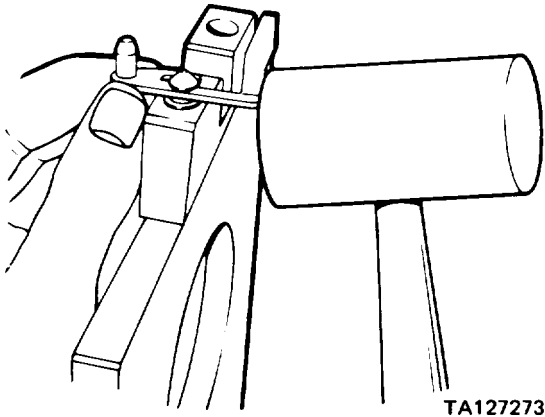
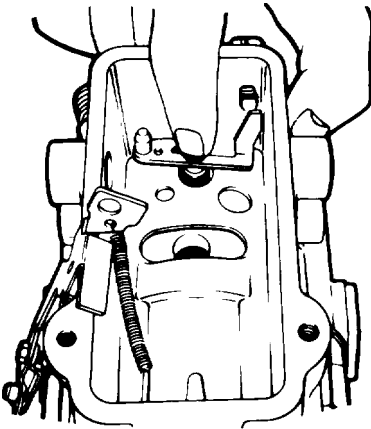
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
30 (cont)		h. Pump and fixture	Invert in vise so bottom faces upward	
		i. Two seals (65)	Install	On head locating screw (64)
		j. Head locating screw (64)	Install	Tighten to 180-220 pounds inch torque
		k. Cam advance screw (80)	Install	Use tools P/N 15499 and 15500; tighten to 440-460 pounds inch torque
		l. Seal (78)	Assemble	Into groove of power piston (77)
		m. Piston ring (79)	Assemble	Into groove of power piston (77)
		n. Two seals (69)	Assemble	Into grooves of advance piston hole plug (68)
		o. Two seals (75)	Assemble	Into grooves on power piston hole plug (74)
		p. Shim (73)	Assemble	On spring (72); use small amount of grease to hold in position
		q. Advance adjusting spring (72)	Install	In piston (71)
		r. Piston (71)	Assemble	To advance piston hole plug (68)
		s. Slide washer (70)	Install	On piston (71); use small amount of grease applied to piston end to keep slide washer in position
		t. Advance piston hole plug (68)	Install	Finger tighten
		u. Power piston (77)	Assemble	To power piston hole plug (74); use tool P/N 16199
		v. Slide washer (76)	Assemble	To power piston (77); use small amount of grease applied to piston end to keep slide washer in position
		w. Power piston hole plug (74)	Install	Finger tight
<b>NOTE</b>				
Power piston (77) is installed in side of housing marked C for a clockwise rotating pump.				
		x. New seal (67)	Install	On advance screw hole plug (66)
		y. Advance screw hole plug (66)	Install	Tighten to 180-220 pounds inch torque using tool P/N 14490
		z. Advance piston hole plug (68) and power piston hole plug (74)	Tighten	Tighten to 215-265 pounds inch torque

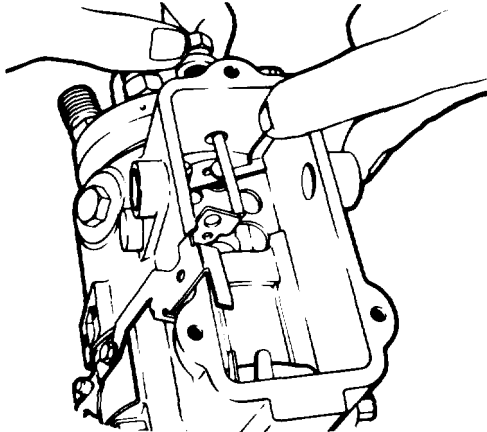
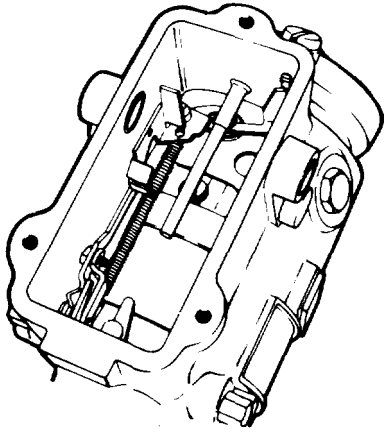
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
31	Metering valve (53)	a. Shim (61)	Position	On metering valve (53)
<p style="text-align: center;"><b>NOTE</b></p> <p>Metering valve is furnished in two sizes: A and B. If original valve has a ring groove cut just below shouldered top crown, order size B for replacement; otherwise order size A.</p>				
		b. Metering valve arm (55)	Install	On metering valve (53) as shown; use soft hammer
<div style="text-align: center;">  <p style="text-align: right;">TA127273</p> </div>				
32	Housing, top	a. Spring (62) b. Metering valve (53), shim (61), metering valve arm (55) and spring (62)	Install Install in its bore	On metering valve (53) Depress and rotate several times to ensure freedom of movement. If valve sticks, lap it with clean diesel fuel
<div style="text-align: center;">  <p style="text-align: right;">TA127291</p> </div>				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

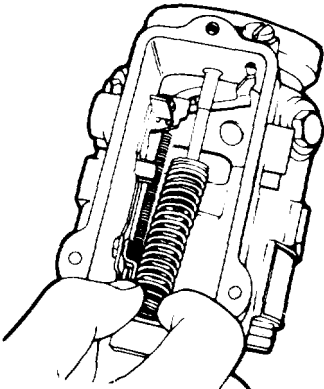
*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
32 (cont)		c. Washer (49) d. Guide stud (44)	Install Install	On guide stud (44) Depress metering valve (53) then install as shown; finger tighten
				
TA127292				
		e. Linkage hook (54) and linkage spring (57)	Install	Pull back linkage hook stretching spring (57) just enough to assemble hook correctly to fork on governor arm (56). Position opposite end of hook over pin on metering valve arm (55). Check all parts for freedom of movement
		f. Governor arm (56)	Install	
				
TA127293				



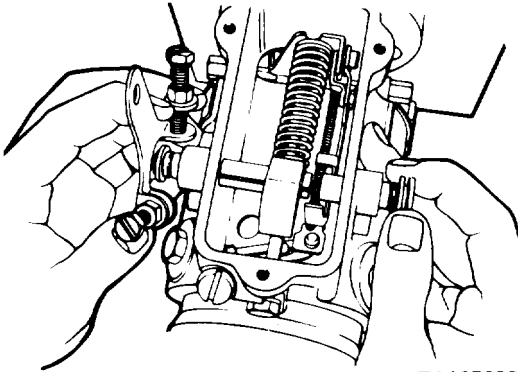
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
32 (cont)			<b>NOTE</b>	
		In following steps where grease is used to keep parts together to ease assembly, use grease sparingly as it can plug return fitting and pump will not bleed air from housing during start-up.		
		g. Governor spring (45)	Assemble	Assemble these four parts on bench. Apply a small amount of grease to these parts to keep them in place while assembling. Loosen guide stud and withdraw it just enough to install these parts on it. Tighten guide stud to 110-115 pounds inch torque
		h. Spring retainer (46)	Assemble	
		i. Idle spring (47)	Assemble	
		j. Idling spring guide (48)	Assemble	
				
			TA127294	
		k. Two washers (35 and 39) and seals (34 and 38)	Install	On throttle shaft assembly (37) and shutoff shaft (33). Apply a light film of grease to each seal
		l. Throttle shaft assembly (37)	Install	Partially through its bore
		m. Throttle shaft lever (36)	Install	Slide over throttle shaft assembly (37) so that projection in lever (36) bore engages keyway in shaft (37). Position forked end of lever (36) so that it straddles guide stud (44)

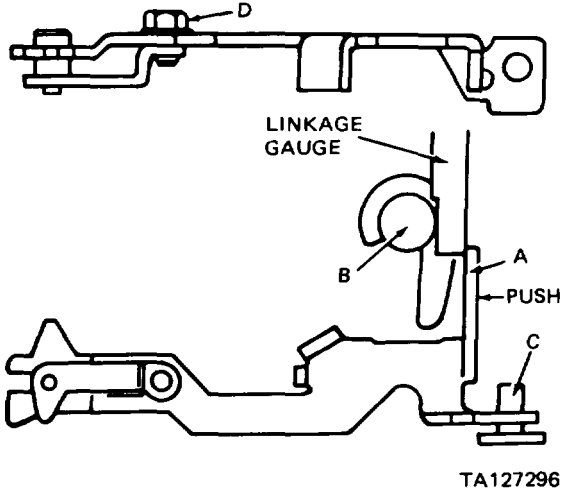
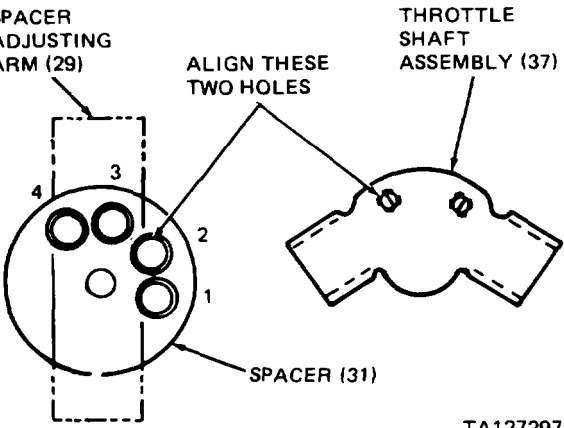
**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
32 cont)		n. Shutoff shaft (33)	Install	With slight rotary motion so as not to damage seal (34). If throttle shaft lever is installed properly, rotating throttle shaft assembly will cause spring (45) to compress (see illustration below)
				
		o. Shaft retainer clip (32)	Install	
		p. Torque screw (52)	Install	
		q. Seal (51)	Install	In nut (50)
		r. Nut (50) and cap (62A)	Install	On torque screw (52)
		S. Nut (40)	Install	On low idle adjusting screw (41)
		t. Low idle adjusting screw (41 )	Install	In throttle shaft assembly (37)
		U. Nut (42)	Install	On high idle adjusting screw (43)
		v. High idle adjusting screw (43)	Install	In throttle shaft assembly (37)

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
(cont)	w. Linkage		Adjust linkage gap to 0.125-0.165 inch as follows:	<p>a. Loosen nut (50) and back out torque screw (52)</p> <p>b. Hold throttle shaft lever (36) in wide open position</p> <p>c. Using tool P/N 18914, measure clearance between rear of shutoff shaft (point B, illustration) and vertical tab (point A) on linkage hook (54)</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Adjustment is accomplished by changing the effective length of linkage hook (54) using linkage hook wrench tool P/N 13379.</p> <p>d. With linkage adjusting screw (point D) tight, apply a slight pressure to vertical tab (point A). At the same time, rotate pump one or two revolutions to ensure that linkage is in full forward position</p> <p>e. Loosen linkage adjusting screw (point D) and slide linkage to maximum open length</p> <p>f. Insert tool P/N 18914 between vertical tab (point A) and shutoff shaft (point B) and slide linkage hook together from rear until face of tab is flush against gauge</p> <p>g. Tighten linkage adjusting screw (point D)</p> <p>h. Check adjustment and reset if necessary</p>
33	Housing, side	a. Spacer (31)	Position; line up holes shown	 <p style="text-align: center;">TA127296</p>  <p style="text-align: center;">TA127297</p>

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
(cont)		b. Screw (30)	Install	
		c. Spring retainer (26)	Install	On screw (25)
		d. Throttle lever spring (27)	Position	On screw (25)
		e. Spacer adjusting arm (29)	Position	On spacer, in recess
		f. Throttle lever assembly (28)	Position	On spacer adjusting arm (29)
		g. Screw (25), spring retainer (26), and throttle lever spring (27)	Install	Finger tight
		h. Throttle lever spring (27)	Position; cross ends over each other to clamp throttle lever (28) and arm (29) together	
		i. Screw (25)	Tighten	To 35-40 pounds inch torque
34	Governor control cover (22)	a. Solenoid frame and arm assembly (24)	Position	On governor control cover (22)
		b. Two insulating washers (20) and washers (19)	Install	
		c. Two nuts(18)	Install	Tighten to 20-25 pounds inch torque
35	Housing, top	a. Gasket (23)	Position	
<b><u>CAUTION</u></b>				
<p>Exercise extreme care in the following step when installing governor control cover. It is possible to locate solenoid shutoff arm on the wrong side of linkage hook (54) tab, thus locking linkage hook in full run position, blocking all governor action. If this condition exists, engine may accelerate to dangerously high speeds when started.</p>				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
(cont)		b. Governor control cover (22)	Install	Back-out low idle screw (41 ) and push throttle lever (36) into shutoff position. Move cover (22) down toward pump in a position further toward drive shaft end than normal. Just before cover (22) touches housing, slide cover into alignment with housing
		c. Two lock washers (16 and 17)	Position	
		d. Grounding strap (15)	Position	
		e. Three washers (12), lock washers (11) and screws (10)	Install	Tighten to 3545 pounds inch torque
		f. Washer (14) and two nuts (13)	Install	
		g. Connector (21)	Install	Tighten to 200 pounds inch torque
		h. Throttle shaft assembly (37)	Wire in wide open position	
		i. Drive shaft (5)	Remove	
		j. Pilot tube seal (8)	Install	
36	Drive shaft (5)	Roll pin (7)	Install	
<b>NOTE</b>				
Place two new seals (6), drive shaft (5), lock washer (4), nut (3), spring (2), and thrust plunger (1) in a small cloth bag; these parts will be assembled when fuel injection pump is installed. Attach bag to fuel injection pump securely.				
37	Housing, sides	a. Two gaskets (126)	Position	
		b. Two timing line covers (125)	Position	
		c. Four screws (124)	Install	Tighten to 15-20 pounds inch torque
		d. Eight washers (113) and four fuel line connector screws (112)	Install	
		e. Two head locking screws (63)	Tighten	To 360 pounds inch torque

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING				
<b>NOTE</b>				
Test bench must use calibrating nozzles type DN12SD12 (opening pressure 2500 psi) and injection lines shall be 3/32 inch ID by 20 inches long; holder BKB50SD and 0.5 MM plate and lines 1/16 inch ID by 25 inches long; Mobil Velocite No. 3 calibrating oil and calibrating oil temperature at 110-115 degrees F. Test stand coupling should be of the self-aligning zero backlash type. Mount and drive the pump according to the test bench manufacturer's instructions.				
38	Transfer pump (end plate (88))	a. Plug (91) b. Sleeve (92)	Remove Install pump inlet connector	Use two wrenches so pump outlet fitting does not move at the same time. Install transfer pressure gauge adapter P/N 21900, then a shutoff valve to isolate gauge when not in use. Connect pressure gauge to adapter P/N 21900
39	Housing	a. Four screws (124) b. Two timing line covers (125)	Remove Remove	Install P/N 19918 advance windows in place of timing line covers
<b>NOTE</b>				
Pump rotation is counterclockwise as viewed from drive shaft end of pump,				
Connect a +24 Vdc battery and switch to solenoid terminals at top of governor control cover (22)				
		c. Switch connected to battery d. Pump throttle shaft assembly (37)	Place in on position Move to full load position	When transfer pump is primed, bleed fuel for several seconds by loosening injection line nuts at fuel nozzles; then tighten nuts securely
<b>NOTE</b>				
1 to 3 PSI supply pressure is required at pump inlet.				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
40	Test stand	Pump	Operate pump at 1000 RPM wide open throttle for 10 minutes	Dry pump off completely with compressed air. Check for leaks and correct if necessary
41	Housing	a. Low idle adjusting screw (41)	Back out	Transfer pump must create a vacuum of at least 18 inches of mercury. If not, check for air leaks between pump inlet and shut-off valve or deficiencies in transfer pump components
		b. High idle adjusting screw (43)	Back out	
		c. Torque screw (52)	Back out	
		d. Vacuum check	a. Close shutoff valve in fuel supply line b. Operate pump at 400 RPM	
		e. Return oil check	a. Fill graduates to bleed air from test stand and to wet graduates b. Operate pump at 2100±10 RPM	
<b>CAUTION</b>				
Under no circumstances exceed 130 PSI when performing the following.				
		f. Transfer pump pressure check	Operate pump at 2100±10 RPM	Transfer pump pressure shall be 67-71 PSI
<b>NOTE</b>				
Transfer pump pressure gauge must be isolated by the shutoff valve at injection pump when checking fuel delivery and advance movement.				

**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
41 [cont)		g. Minimum delivery check	Operate pump at 150±10 RPM	Minimum delivery shall be 25 cubic MM/stroke
		h. High speed delivery check	Operate pump at 2300±10 RPM	High speed delivery shall be 11-14 cubic MM/stroke; if necessary adjust high idle screw (43) to obtain correct delivery. Repeat pressure check above
		i. Low idle delivery check	Operate pump at 750±10 RPM	Low idle delivery shall be 10-13 cubic MM/stroke. If necessary adjust low idle screw (41 ) to obtain correct delivery
		j. Automatic advance check	a. Observe advance window	Each line on advance window equals two pump degrees; cam (116) has a line etched on it which is observed at window
			b. Operate pump at 650-950 RPM	Cam movement shall be 1 degree
			c. Operate pump at 1250-1450 RPM	Cam movement shall be 5 degrees
			d. Operate pump at 1700-1900 RPM	Full advance (8 -0 + 1 degrees)
			e. Set test stand for zero RPM at pump	Check that cam returns to its initial position. Recheck transfer pump pressure
		k. Fuel delivery	a. Operate pump at 1400 ±10 RPM	Fuel delivery shall be 61±1.5 cubic MM/stroke
			b. Operate pump at 150 ±10 RPM	Fuel delivery shall be 25 cubic MM/stroke minimum
			c. Operate pump at 2300 ±10PRM	Fuel delivery shall be 11-14 cubic MM/stroke



**4-3. FUEL SYSTEM MAINTENANCE (cont)**

*b. Fuel Injection Pump (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
TESTING (cont)				
41 (cont)			d. Operate pump at 750 ±10 RPM	Fuel delivery shall be 10-13 cubic MM/stroke
		1. Torque screw adjustment	a. Operate pump at 2100 ±10RPM	Adjust torque screw (52) until fuel delivery of 58-60 cubic MM/stroke is obtained
			b. Operate pump at 150±10 RPM	Fuel delivery shall be 25 cubic MM/stroke
		m. Governor cut-off check	Operate pump at 2350 10± RPM	Fuel delivery shall be 5 cubic MM/stroke maximum
		n. Shutoff check	Operate pump at 2100±10 RPM	Disconnect + 24 Vdc from solenoid; fuel delivery shall be 3 cubic MM/stroke maximum
		o. Nut (40, 42)	Tighten	25-30 pounds inch torque
		p. Nut (50)	Tighten	25-30 pounds inch torque
		q. Two advance windows	Remove	Install timing line covers (125) in its place. Tighten four screws (1 24) to 15-20 pounds inch torque
		r. Throttle	Lock wire in wide open throttle position	
		s. Pump	Remove from test stand	
42	End plate (88)	Four screws (85)	Thread lock wire through head of each screw	
43	Governor control cover (22)	Rear screw (10) and torque screw (52)	Lock wire together	
44	Throttle shaft assembly (37)	Screws (41 and 43)	Lock wire individually to lever	

**Section II. POWER TRAIN MAINTENANCE**

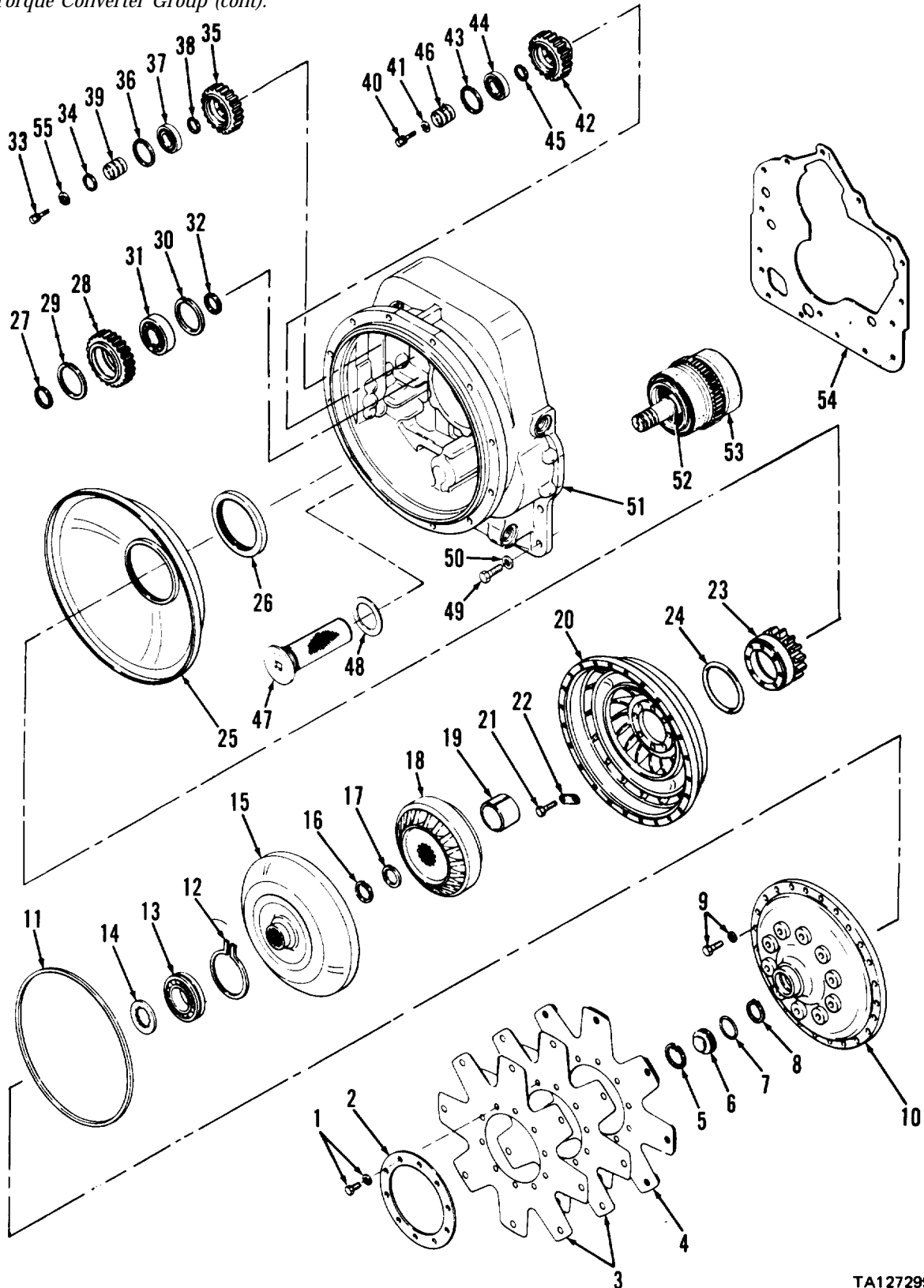
This section contains maintenance procedures for the transmission and the front and rear differential assemblies.

Transmission Maintenance . . . . .	Para 4-4	Third Clutch Assembly . . . . .	Para 4-4h
Torque Converter Group . . . . .	4-4a	Forward Clutch Assembly . . . . .	4-4i
Converter Housing . . . . .	4-4b	Control Valve Assembly . . . . .	4-4j
Transmission Rear Cover . . . . .	4-4c	Modulation Valve Assembly . . . . .	4-4k
Gear and Clutch Group . . . . .	4-4d	Axle Maintenance . . . . .	4-5
Transmission Housing . . . . .	4-4e	Differential Carrier . . . . .	4-5a
Reverse and Second Clutch Assembly . . . . .	4-4f	Differential Case and Gear Assembly . . . . .	4-5b
Low Clutch Assembly . . . . .	4-4g		



**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*



TA127299

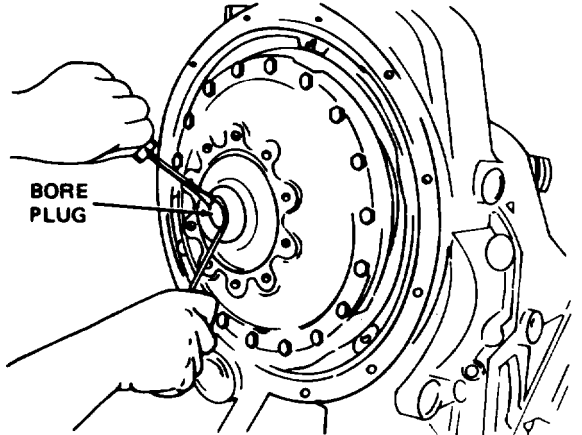
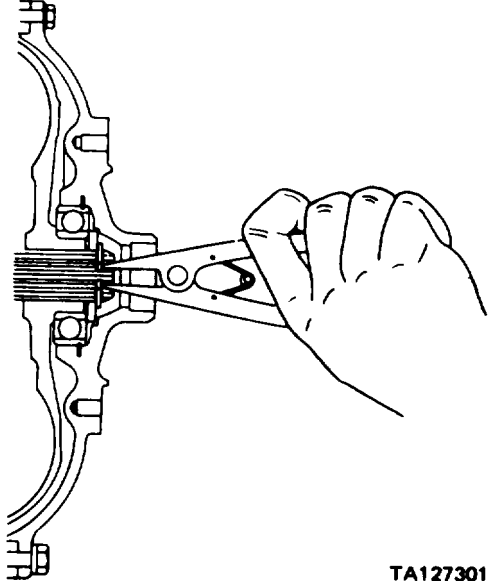
**4-4. TRANSMISSION MAINTENANCE (cont)***a. Torque Converter Group (cont).*

## KEY

- |                            |   |
|----------------------------|---|
| 1. Screws and lock washers | 29. Retaining ring                        |
| 2. Backing ring            | 30. Retaining ring                        |
| 3. Drive plates            | 31. Bearing                               |
| 4. Drive plate assembly    | 32. Locating ring                         |
| 5. Retaining ring          | 33. Screws                                |
| 6. Bore plug               | 34. Locating ring                         |
| 7. O-ring                  | 35. Pump drive gear                       |
| 8. Turbine retaining ring  | 36. Retaining ring                        |
| 9. Screws and lock washers | 37. Bearing                               |
| 10. Impeller cover         | 38. Locating ring                         |
| 11. O-ring                 | 39. Bearing support                       |
| 12. Retaining ring         | 40. Screws                                |
| 13. Bearing                | 41. Lock washers                          |
| 14. Retaining washer       | 42. Auxiliary pump drive gear             |
| 15. Turbine                | 43. Retaining ring                        |
| 16. Locating ring          | 44. Bearing                               |
| 17. Retaining ring         | 45. Locating ring                         |
| 18. Reaction member        | 46. Bearing support                       |
| 19. Bearing spacer         | 47. Screen assembly                       |
| 20. Impeller               | 48. Gasket                                |
| 21. Screws                 | 49. Screws                                |
| 22. Lock tab               | 50. Lock washers                          |
| 23. Impeller hub gear      | 51. Converter housing                     |
| 24. O-ring                 | 52. Retaining ring                        |
| 25. Oil baffle             | 53. Reverse and second clutch<br>assembly |
| 26. Oil seal               | 54. Gasket                                |
| 27. Locating ring          | 55. Lock washers                          |
| 28. Idler gear             |   |

**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Front of transmission	a. 10 screws and lock washers (1) b. Backing ring (2) c. Two drive plates (3) d. Drive plate assembly (4) e. Retaining ring (5) f. Bore plug (6) and O-ring (7)	Remove  Remove Remove Remove  Remove Remove	Use two small screwdrivers as shown to remove bore plug
				
		g. Turbine retaining ring (8)	Remove	TA127300 Remove through bore plug hole as shown
				
		h. 18 screws and lock washers (9)	Remove	

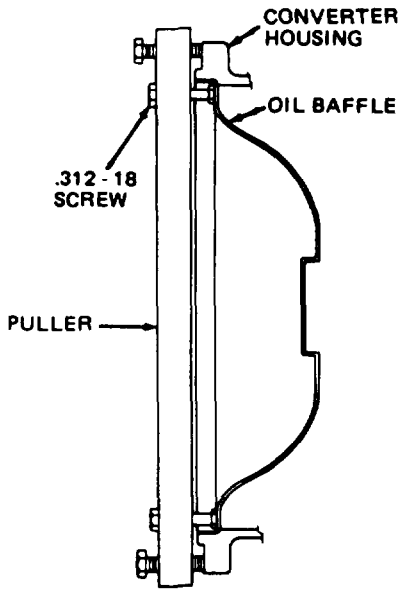
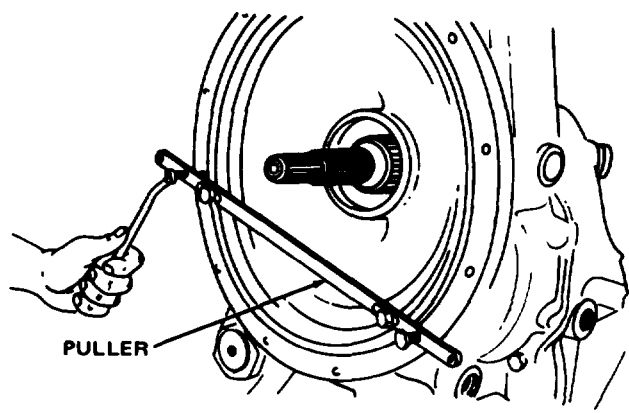
**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
<b>NOTE</b>				
(cont) In the following step, turbine (15) may remain in impeller cover bearing (13) and come off with impeller cover (10).  Before performing the next step place container under converter housing to catch oil.				
i. Impeller cover (10) Remove				
<p style="text-align: right;">TA127302</p>				
2	Impeller cover	a. O-ring(11)  b. Retaining ring (12) c. Bearing (13) d. Retaining washer (14)	Remove and discard  Remove and discard Remove Remove	If turbine (15) remained in impeller cover (10) bearing, remove turbine using a puller if necessary  Press using proper size sleeve
3	Transmission, front	a. Turbine (15) b. Locating ring (16) c. Retaining ring ( 17) d. Reaction member (18) e. Bearing spacer (19) f. Impeller (20)	Remove Remove and discard Remove and discard Remove Remove Remove	Remove impeller (20) and hub gear (23) as an assembly

**4-4. TRANSMISSION MAINTENANCE (cont)**

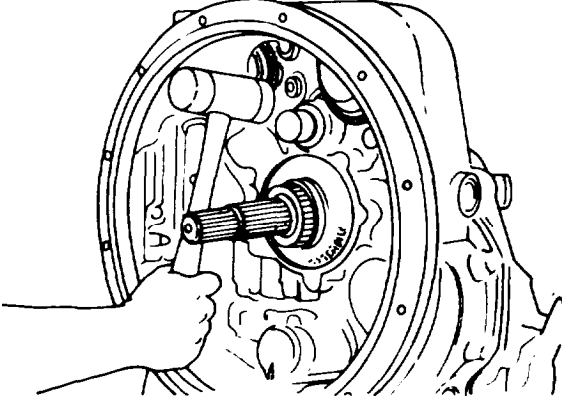
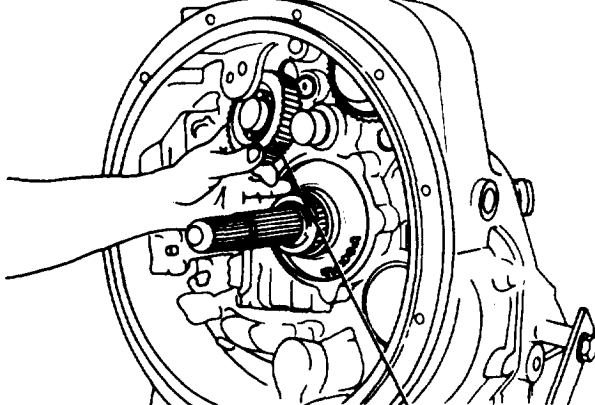
a. Torque Converter Group (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
4	Impeller	a. Eight screws(21) b. Lock tab (22) c. Impeller hub gear (23) d. O-ring (24)	Remove Remove Remove Remove and discard	
5	Transmission, front	Oil baffle (25)	Remove	Use oil baffle puller holes as shown to remove
	 <p style="text-align: center;"><b>TA127304</b></p>		 <p style="text-align: right;"><b>TA127303</b></p>	
6	Oil baffle	Oil seal (26)	Remove	
7	Idler gear	a. Locating ring (27) b. Idler gear (28) c. Retaining ring (29 and 30) d. Bearing(31) e. locating ring (32)	Remove and discard Remove Remove and discard Remove Remove and discard	Remove idler gear (28) and bearing (31) as an assembly  Press from idler gear (28) using proper size sleeve
8	Pump drive gear	a. Two screws (33) and lock washers (55)	Remove	



**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
(cont)		b. Pump drive gear (35)	Remove	Use a soft hammer and tap pump drive gear (35) and bearing support (39) from housing as shown below then remove as an assembly
		c. Locating ring (34)	Remove and discard	
				 <p style="text-align: center;">TA127305</p>
				 <p style="text-align: center;">PUMP DRIVE GEAR AND BEARING SUPPORT TA127306</p>
		d. Retaining ring (36)	Remove and discard	
		e. Bearing (37)	Remove	
		f. Locating ring (38)	Remove and discard	
		g. Bearing support (39)	Remove	
9	Auxiliary pump drive gear	a. Two screws (40)	Remove	Use soft hammer and tap auxiliary pump drive gear (42) and bearing support (46) from housing
		b. Two lock washers(41)	Remove	
		c. Auxiliary pump drive gear (42)	Remove	
		d. Retaining ring (43)	Remove and discard	
		e. Bearing (44)	Remove	
		f. Locating ring (45)	Remove and discard	
		g. Bearing support (46)	Remove	

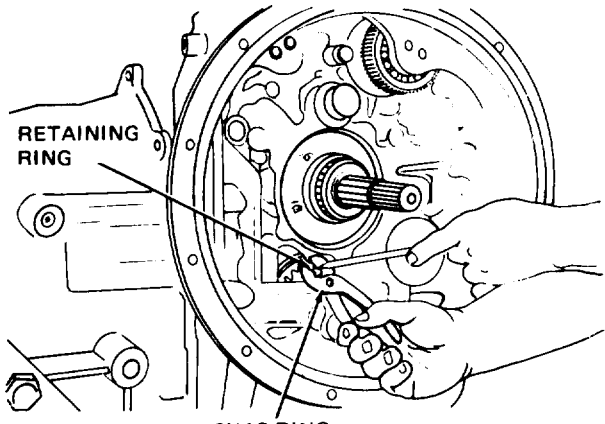
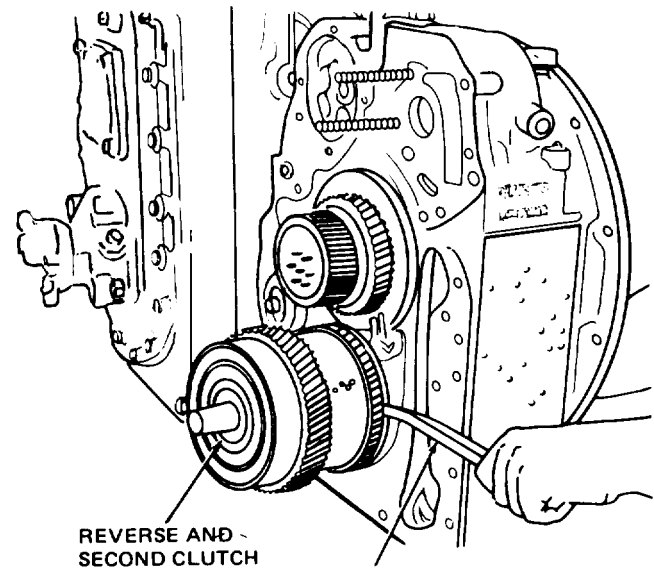
**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
<b>NOTE</b>				
Before performing next step, position container under screen assembly (47) to catch hydraulic fluid.				
10	Transmission, front	a. Screen assembly (47) b. Gasket (48)  c. 16 screws (49) and lock washers (50)	Remove Remove and discard Remove	Remove all traces of gasket material from converter housing (51) Remove all screws and lock washers except one securing converter housing to transmission
<b>NOTE</b>				
In following step, reverse and second clutch assembly will remain in converter housing.				
		d. Converter housing(51 ) Remove		Support converter housing with a chain hoist as shown below, then remove remaining screw (49) and lock washer (50) and separate converter housing from transmission

**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converted Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
11	Converter housing	Retaining ring (52)	Spread ears	<p>Use spreading type snap ring pliers to spread ears on reverse and second clutch assembly front bearing retaining ring as shown</p>  <p style="text-align: right;">TA127309</p>
12	<p>Converter housing, rear</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Refer to paragraph 4-4f for repair of reverse and second clutch assembly.</p>	a. Reverse and second clutch assembly (53)	Remove	<p>Hold retaining ring (52) open and pry reverse and second clutch assembly from converter housing</p>  <p style="text-align: right;">TA127310</p>
b. Gasket (54)			Remove and discard	

**4-4. TRANSMISSION MAINTENANCE (cont)**

a. Torque Converter Group (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
13		All parts except bearings (13,31,37, and 44), converter housing (51) and reverse and second clutch assembly (53)	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move up and down slowly until all old lubricant and foreign material is dissolved. Dry parts thoroughly after removal from cleaning solvent with moisture free compressed air or clean cloths
14		Bearings	Clean	Use cleaning solvent P-D-680. Immerse bearings in cleaning solvent and slowly move up and down. Remove bearings from cleaning solvent and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning solvent and repeat above operation until bearings are thoroughly clean. Dry using moisture free compressed air. Direct air stream across bearing to avoid spinning. Don't spin bearings when drying them; bearings may be rotated slowly by hand to facilitate drying

**4-4. TRANSMISSION MAINTENANCE (cont)***a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
15		Converter housing (51 )	Clean	Use clean cloths moistened with cleaning solvent P-D-680. Dry with moisture free compressed air
16		Reverse and second clutch assembly (53)	Clean	Use clean cloths moistened with cleaning solvent P-D-680. Dry with moisture free compressed air
INSPECTION				
17		Bearings	Inspect	Inspect for wear, chipping, or nicks. Don't replace a bearing cone or cup individually without replacing mating cup or cone at same time. After inspection, dip bearings in clean, light oil and wrap in clean lintless cloth or paper for protection until installed.
18		Gears and shafts	Inspect	Inspect gear teeth for wear, pitting, chipping, nicks, cracks or scores; replace if these defects are observed. If gear teeth show spots where case hardening is worn through or cracked, replace gear. Remove small nicks with suitable hone. Inspect shafts for bent, sprung, or twisted condition; replace if necessary
19		O-rings, metal sealing rings, gaskets, retaining rings, and locating rings	Discard	Use new parts
20		Remaining parts	Inspect	Check for wear, cracks, bent condition, or distortion. If any of these conditions are noted, replace part
REASSEMBLY				
<b>NOTE</b>				
Lubricate all seals and O-rings with automatic transmission fluid (refer to current lubrication order) prior to reassembly.				

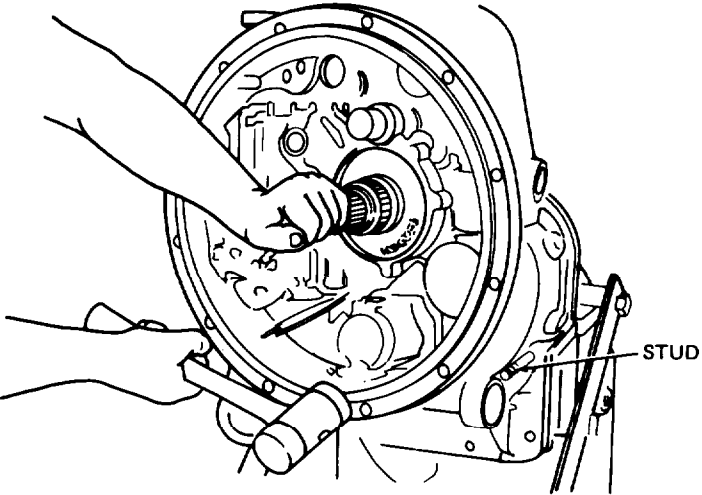
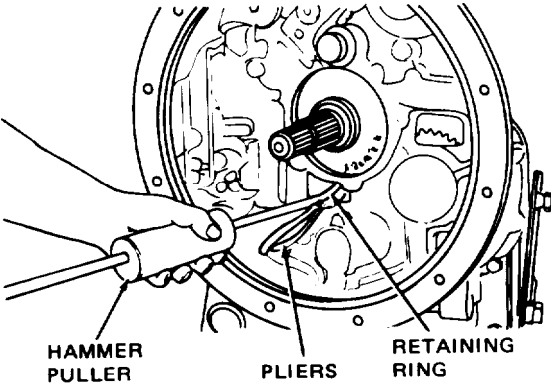
**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
21	Transmission	a. Reverse and second clutch assembly (53)	Position	On disc hub. Be sure you align splines of disc hub with internal teeth of second clutch friction discs. Disc hub must be in full position with friction discs. Don't force this operation; see illustration below
		b. Gasket (54)	Position	<p><b>TA127311</b></p> <p>Place new gasket on front of transmission housing; apply a thin coat of chassis grease to hold gasket in place</p>
		c. Retaining ring (52)	Spread ears	Use spreading type snap ring pliers to spread ears. Lock pliers open to hold retaining ring open
<b><u>CAUTION</u></b>				
When performing following step, take care not to damage reverse clutch front piston ring.				
		d. Converter housing(51)	Position	Install a stud in any one mounting hole in transmission housing to aid in installing converter housing. Then using a chain hoist, position converter housing on transmission and tap converter housing in place as shown below

**4-4 TRANSMISSION MAINTENANCE (cont)**

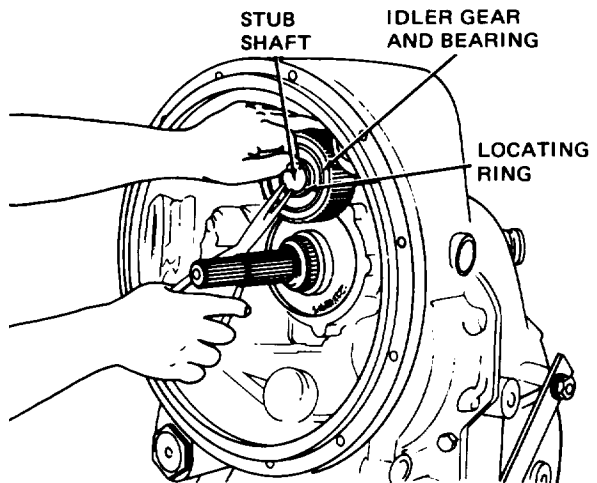
*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
21 (cont)				 <p style="text-align: right;">TA127312</p>
22	Converter housing, front	a. Screws (49) and lock washers (50)	Install	 <p style="text-align: center;">TA127313</p> <p>Install one screw and lock washer in front and one in rear. Use a slide type hammer puller as shown, and pull reverse clutch gear toward front of converter housing to move reverse and second clutch assembly forward to align retaining ring groove in bearing with retaining ring (52) in housing. Be sure retaining ring (52) is in full position in ring groove before removing pliers. Remove aligning stud and install screws (49) and lock washers (50); tighten screws to 37-41 pounds foot torque</p>
		b. Gasket (48) and screen assembly (47)	Install	Position new gasket on screen assembly; install screen assembly and tighten to 10-15 pounds foot torque

**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
23	Auxiliary pump drive gear	a. Bearing (44) b. Retaining ring (43)	Install Install	
24	Bearing support	a. Locating ring (45) b. Pump drive gear (42)	Install Install	
25	Converter housing	a. Bearing support (46) and auxiliary pump drive gear (42) b. Two screws (40) and lock washers (41)	Install Install	Snug screws to hold bearing support in place, then tighten to 23-25 pounds foot torque
26	Pump drive gear	a. Bearing (37) b. Retaining ring (36)	Install Install	
27	Bearing support (39)	s. Locating ring (38) b. Pump drive gear (35) c. Locating ring (34)	Install Install Install	Install until gear shoulders on locating ring
28	Converter housing	a. Bearing support (39) and pump drive gear (35) b. Three screws (33) and lock washers (55)	Position Install	Snug screws to hold bearing support and gear in place, then tighten to 23-25 pounds foot torque
29	Idler gear	a. Locating ring (32) b. Bearing (31) c. Retaining ring (29 and 30) d. Idler gear (28) and bearing (31) e. Locating ring (27)	Install Install Install Position Install	On stub shaft


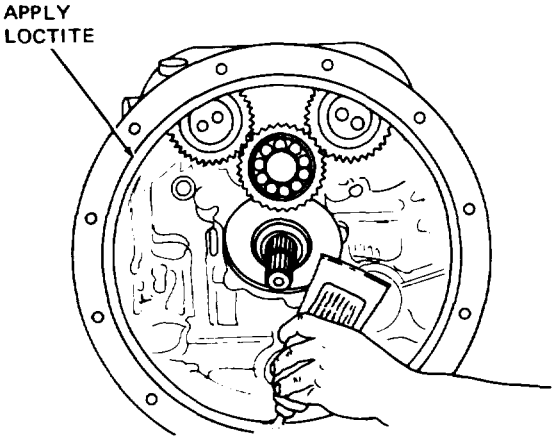
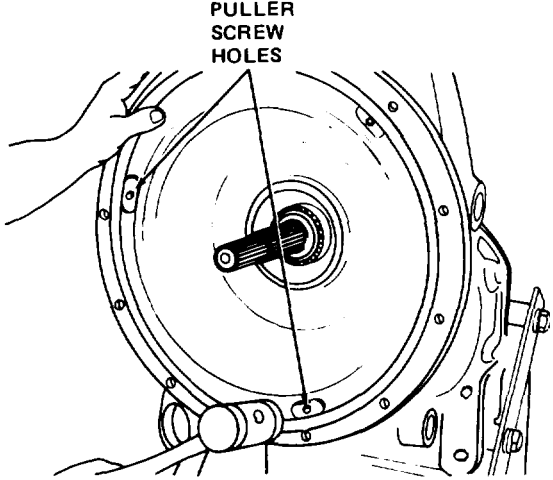


TA127314



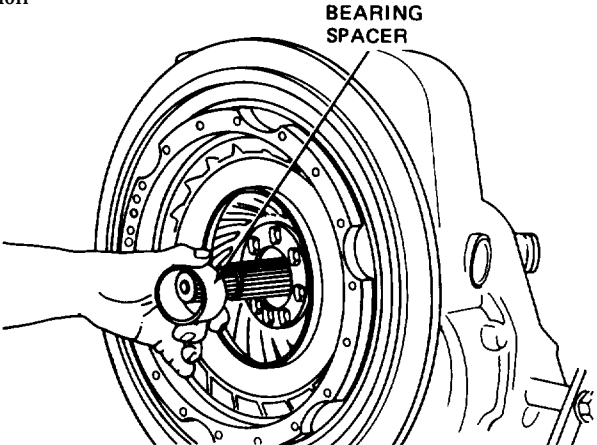
**4-4. TRANSMISSION MAINTENANCE (cont)**

*a Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
30	Oil baffle	Oil seal (26)	Install	Install with lip of seal positioned as shown 
31	Converter housing	Oil baffle (25)	Install	Apply a light coat of thread sealant to outer diameter of oil baffle of counter bore in converter housing as shown. Immediately remove any excess sealant that could enter oil circuit. Position oil baffle puller screw holes 15 to 30 degrees either side of vertical center line. Tap baffle (on outside diameter only) into position until baffle shoulders in converter housing; see illustration below  
32	Impeller	a. O-ring (24) b. Impeller hub gear (23) c. Lock tab (22) d. Eight screws (21)	Install Install Position Install	Bend lock tabs (22) over head of screws
<b><u>CAUTION</u></b>				
In following step, take care not to damage oil baffle oil seal (26)				
33	Converter housing	a. Impeller (20)	Install	

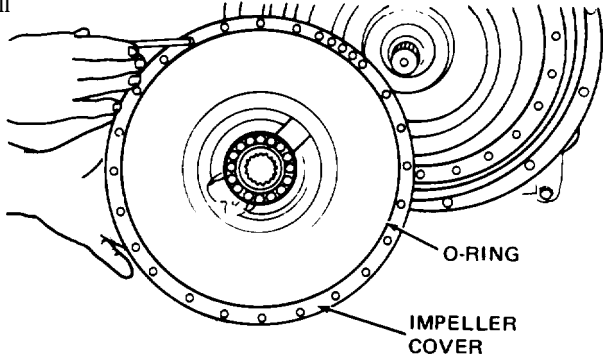
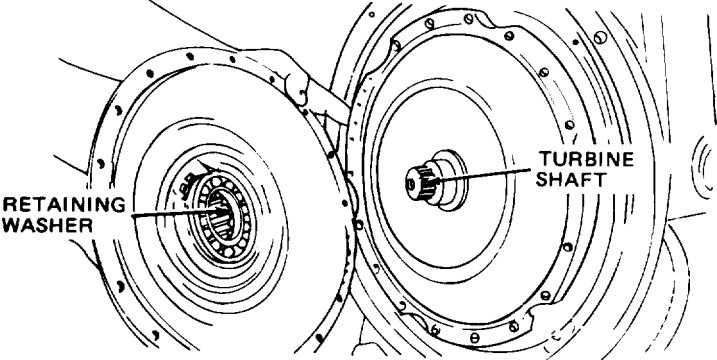
**4-4. TRANSMISSION MAINTENANCE (cont)**

a. Torque Converter Group (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
33 (cont)		b. Bearing spacer (19)	Position	 <p style="text-align: right;">TA127317</p>
		c. Reaction member (18)	Install	
		d. Retaining ring(17)	Install	
		e. Locating ring (16)	Install	
		f. Turbine(15)	Install	
<b><u>WARNING</u></b>				
<p>In following steps (34a through 34d), wear insulated gloves or use tongs to handle impeller cover (10). Failure to do so could cause you to burn your hands. Get medical aid if you burn your hands.</p>				
34	Impeller cover	a. Impeller cover (10) b. Retaining ring (12) c. Retaining washer (14) d. Bearing (13)	Heat Position Install Install	<p>To 200-250 degrees F                      In groove in impeller cover (10)</p> <p>While impeller cover (10) is hot, press bearing into position while spreading ears on retaining ring (12). Align ring groove in bearing with retaining ring (12) then release retaining ring. Check retaining ring to be sure it is in full position in groove</p>

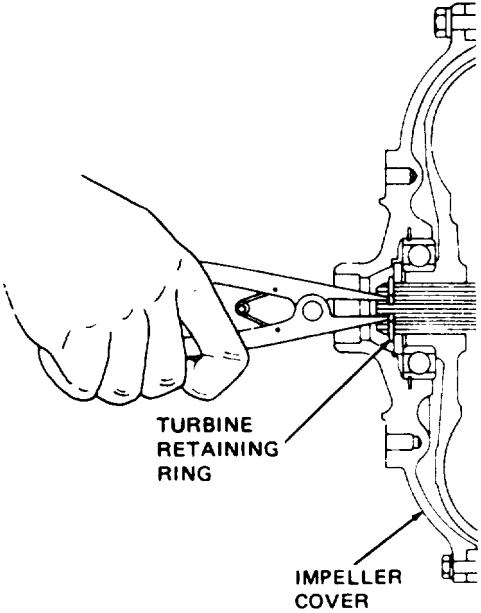
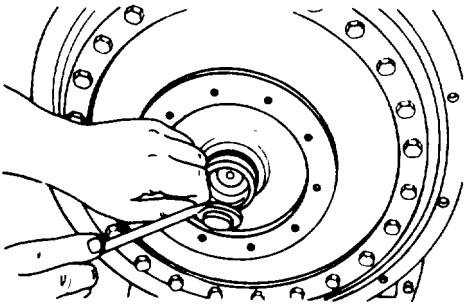
**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
34 (cont)		e. O-ring (11)	Install	 <p style="text-align: right;">TA127318</p>
<b><u>CAUTION</u></b>				
Be careful when you install assembled impeller cover (10) not to damage O-ring (11).				
35	Converter housing	a. Assembled impeller cover (10)	Install	<p>Install in impeller (20). Be sure you align retaining washer (14) with turbine shaft (see illustration below)</p>  <p style="text-align: right;">TA127319</p>
		b. 18 screws and lock washers (9)	Install	<p>Tighten 11 inch impeller cover screws to 12-16 pounds foot torque; tighten 12 inch impeller cover screws to 23-25 pounds foot torque</p>

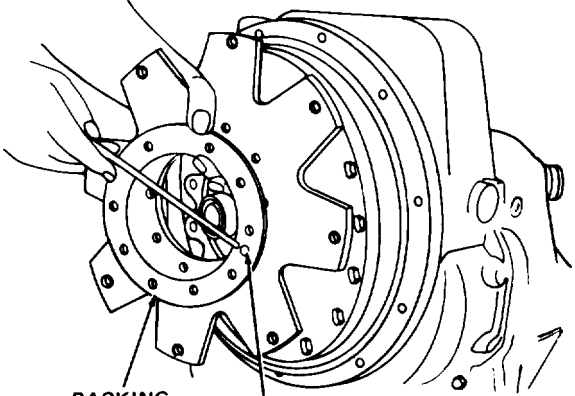
**4-4. TRANSMISSION MAINTENANCE (cont)**

*a Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
35 cont)		c. Turbine retaining ring (8)	Install	 <p style="text-align: right;">TA127320</p>
		d. O-ring (7) and bore plug (6)	Position and lubricate	<p>Lubricate new O-ring with OE10 (refer to current lubrication order), and place on bore plug, then install plug as shown.</p>  <p style="text-align: right;">TA127321</p>
		e. Retaining ring (5)	Install	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*a. Torque Converter Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
35 (cont)		<p style="text-align: center;"><b>NOTE</b></p> <p>In following step, two dimples 180 degrees apart in backing ring must be facing outward (toward engine flywheel).</p> <p>f. Drive plate assembly (4), two drive plates (3), and backing ring (2)</p>	<p style="text-align: center;"><b>Position</b></p>	
		g. 10 screws and lock washers (1)	Install	Tighten to 23-25 pounds foot torque
		h. Control valve and modulation valve assemblies	Install	Para 3-19d
		i. Charging pump assembly	Install	Para 3-19e

TA127322

**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing.*

This task covers: a. Disassembly  
 b. Cleaning  
 c. Inspection  
 d. Reassembly

INITIAL SETUP

TOOLS

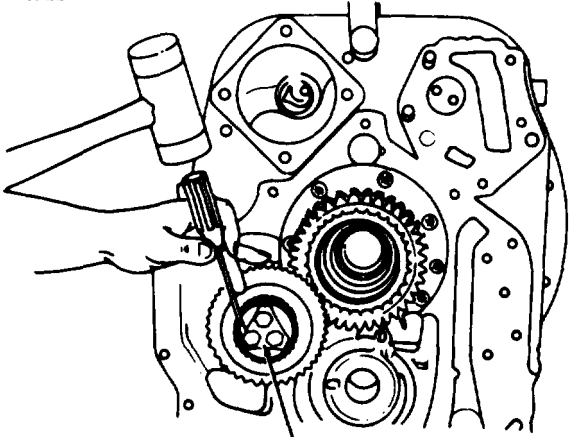
Hot Solution Tank with Mild Alkali Solution  
 Sleeve, 2 inches diameter  
 Sleeve, 2-1/8 inches diameter  
 No. 1 Common Organizational Maintenance Tool Kit  
 Collar Type Bearing Puller  
 Soft Hone  
 Mechanical puller NSN 5120-00-423-1596  
 NSN 4910-00-754-0654

EQUIPMENT CONDITION

Paragraph 44a  
 Condition Description  
 Torque converter group disassembled.

MATERIALS/PARTS

Cleaning solvent P-D-680  
 Clean cloths  
 Retaining rings  
 Piston rings  
 Light oil

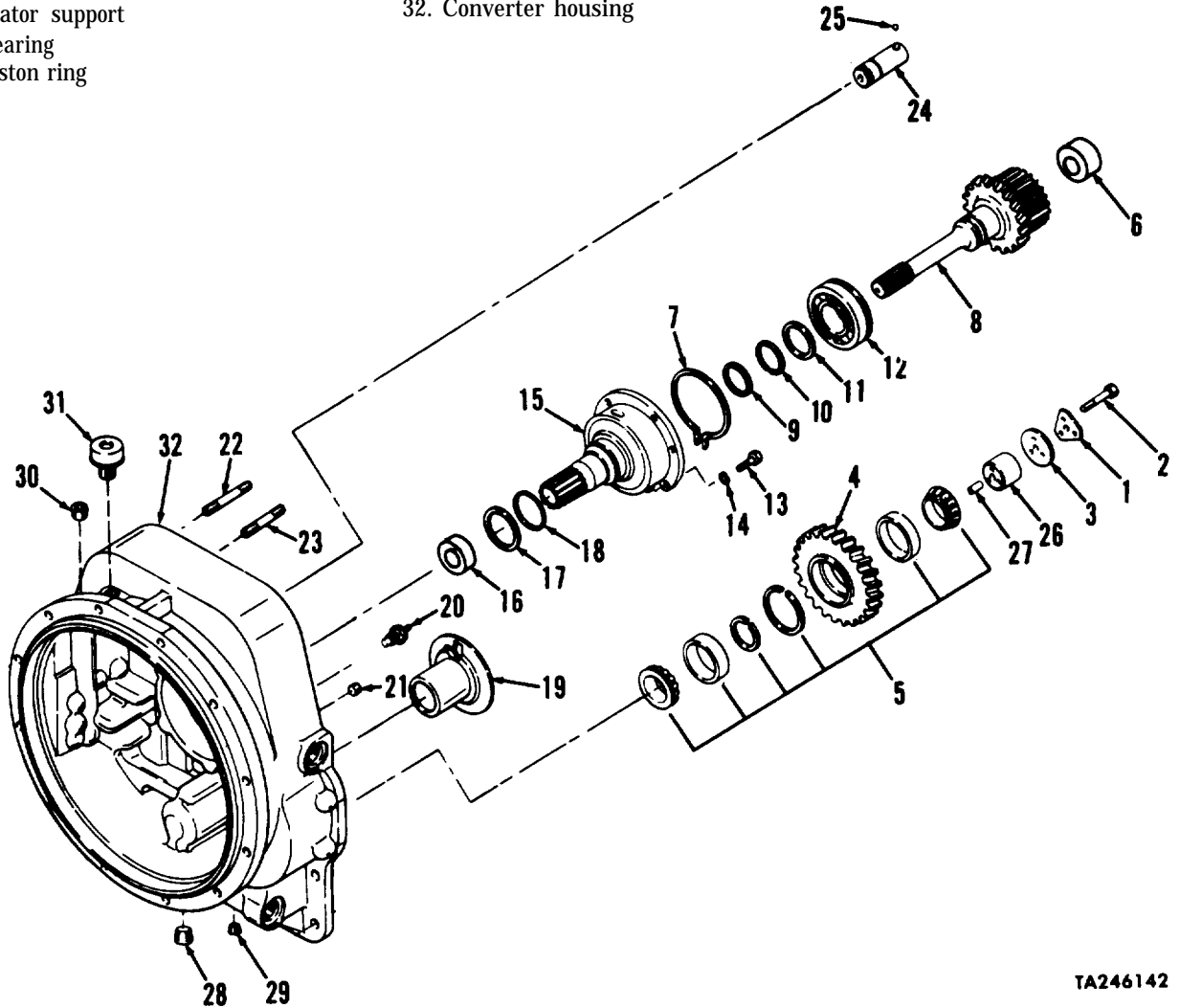
STEP	LOCATION	ITEM	ACTION	REMARKS	
<b>DISASSEMBLY</b>					
1	Converter housing rear	a. Lockplate (1)	Straighten tabs		
		b. Three screws (2)	Remove		
		c. Bearing retainer plate (3)	Remove		
		d. Reverse idler gear (4)	Remove		Use puller
		e. Bearing assembly (5)	Remove		Use puller

**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing:*

KEY

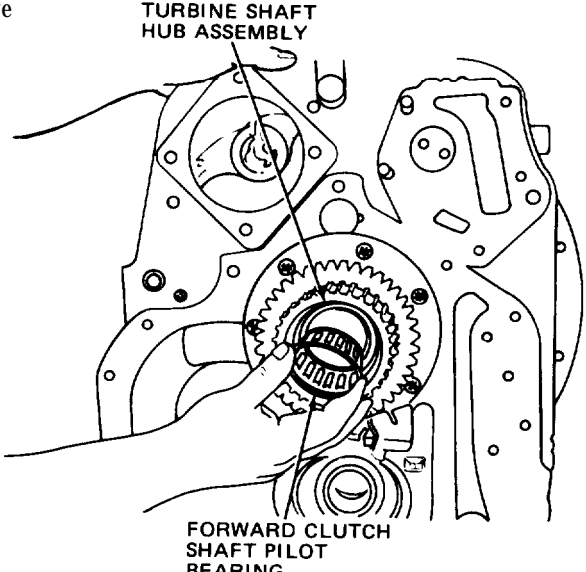
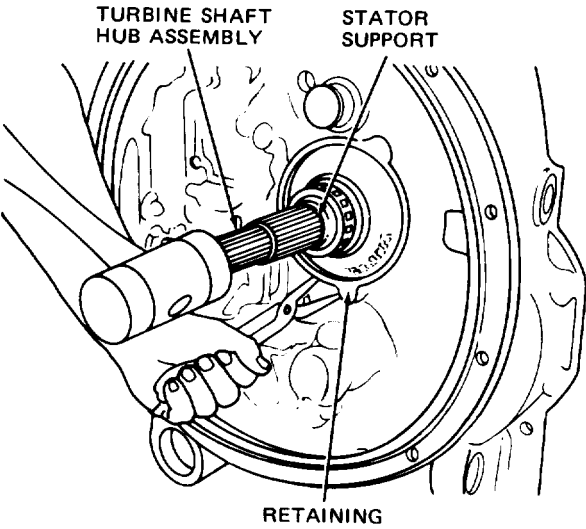
- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| 1. Lockplate                          | 18. Expander spring                 |
| 2. Screws                             | 19. Converter housing sleeve        |
| 3. Bearing retainer plate             | 20. Transmission temperature switch |
| 4. Reverse idler gear                 | 21. Pipe plug                       |
| 5. Bearing assembly                   | 22. Stud                            |
| 6. Forward clutch shaft pilot bearing | 23. Stud                            |
| 7. Retaining ring                     | 24. Idler gear shaft                |
| 8. Turbine shaft hub assembly         | 25. Lockball                        |
| 9. Piston ring                        | 26. Reverse idler gear shaft        |
| 10. Retaining ring                    | 27. Pin                             |
| 11. Locating washer                   | 28. Pipe plug                       |
| 12. Bearing                           | 29. Pipe plug                       |
| 13. Screws                            | 30. Pipe plug                       |
| 14. Link washers                      | 31. Breather                        |
| 15. Stator support                    | 32. Converter housing               |
| 16. Bearing                           |                                     |
| 17. Piston ring                       |                                     |



TA246142

**4-4. TRANSMISSION MAINTENANCE (cont)**

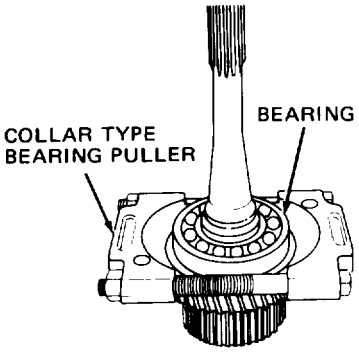
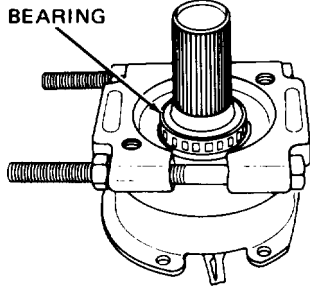
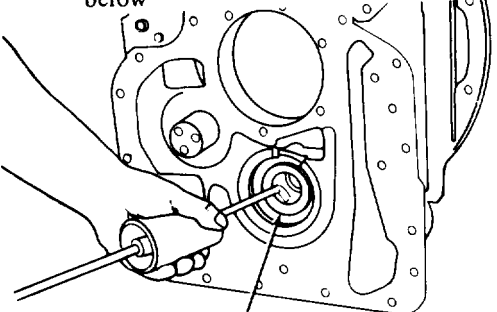
*b. Converter Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
(cont)		f Forward clutch shaft pilot bearing (6)	Remove	 <p>TURBINE SHAFT HUB ASSEMBLY</p> <p>FORWARD CLUTCH SHAFT PILOT BEARING</p>
2	Converter housing front	a. Retaining ring (7) b. Turbine shaft hub assembly (8)	Spread ears Remove	<p>TA127325</p> <p>Use spreader type ring pliers Hold retaining ring (7) ears open and tap assembly (8) from converter housing as shown</p>  <p>TURBINE SHAFT HUB ASSEMBLY</p> <p>STATOR SUPPORT</p> <p>RETAINING RING</p> <p>TA127326</p>



**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
3	Turbine shaft hub assembly	a. Piston ring (9) b. Retaining ring (10) c. Locating washer (11) d. Bearing	Remove and discard Remove and discard Remove Remove	 <p>COLLAR TYPE BEARING PULLER</p> <p>BEARING</p> <p>TA127327</p>
4	Converter housing rear	a. Six screws (13) and lock washers (14) b. Stator support(15)	Remove Remove	Tap at front and remove from converter housing at rear
5	Stator support	a. Bearing (16) b. Piston ring (17) c. Expander spring (18)	Remove Remove and discard Remove	 <p>BEARING</p> <p>TA127328</p>
6	Converter housing rear	a. Converter housing sleeve (19)	Remove	Use slide type hammer puller as shown below  <p>CONVERTER HOUSING SLEEVE</p> <p>TA127329</p>

**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
(cont)		b. Transmission temperature switch (20)	Remove	
		c. Plug (21)	Remove	
		d. Stud (22 and 23)	Remove	Remove only if damaged and replacement is required.
<b>NOTE</b>				
Perform steps e, f and g only if parts are damaged and require replacement.				
		e. Idler gear shaft (24) and lockball (25)	Remove	Tap at front and remove from rear
		f. Reverse idler gear shaft (26)	Remove	Pry from converter housing
		g. Pin (27)	Remove	
7	Converter housing	a. Pipe plug (28, 29, and 30)	Remove	
		b. Breather(31)	Remove	
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**4-4. TRANSMISSION MAINTENANCE (cont)**

b. Converter Housing (cont)

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
8		All parts except bearings (4, 6, 12, and 16), converter housing (32) and switch (20)	Clean	Use cleaning solvent P-D-680. Immerse parts and move up and down slowly until all lubricant and foreign material is dissolved. Dry parts thoroughly after removal from cleaning solvent with moisture free compressed air or clean cloths
9		bearings (4, 6, 12, and 16)	Clean	Use cleaning solvent P-D-680. Immerse bearings and slowly move up and down. Remove bearings from cleaning solvent and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant, Immerse again in cleaning solvent and repeat above procedure until bearings are thoroughly clean. Dry bearings using moisture free compressed air. Be sure you direct air stream across bearing to avoid spinning. Don't spin bearing when drying them; bearings may be rotated slowly by hand to facilitate drying
<b><u>WARNING</u></b>				
Exercise care when using alkali cleaners to avoid coming in contact with cleaner or breathing vapors to prevent skin rashes and bodily harm. Wear a rubber apron to prevent clothes from coming in contact with cleaner and use cleaner in a well ventilated area. If alkali cleaner is splashed on clothes or skin, flood area with large amounts of water and get immediate medical attention.				
10		Converter housing (32)	Clean	Clean exterior and interior thoroughly with cleaning solvent P-D-680, or clean in hot solution tank with mild alkali solution. Part must remain in solution long enough to be thoroughly cleaned and heated. Rinse with clean water to remove all traces of alkali. Cast portions may be steam cleaned. Thoroughly dry immediately using moisture free compressed air or clean cloths
11		Transmission temperature switch (20)	Clean	Clean exterior of switch with clean cloth moistened with cleaning solvent; dry using clean cloth

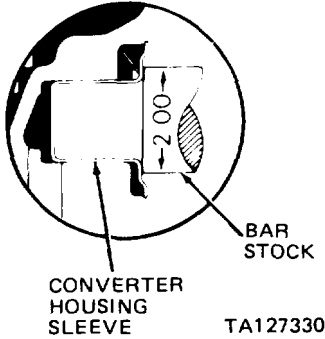
4-4. TRANSMISSION MAINTENANCE (cont)

b. Converter Housing (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION				
12		Bearings	Inspect	Inspect for wear, chipping, or nicks. Don't replace a bearing cone or cup without replacing mating cup or cone at same time. After inspection dip bearings in clean, light oil and wrap in clean, lintless cloth or paper for protection until installed.
13		Gears and shafts	Inspect	Inspect gear teeth for wear, pitting, chipping, nicks, cracks or scores; replace if these defects are noted. If gear teeth show spot where case hardening is worn through, or cracked, replace gear. Remove small nicks with suitable hone. Inspect shafts for bent, sprung, or twisted condition; replace if necessary. Inspect splines for wear or nicks; remove small nicks with a suitable hone.
14		Metal sealing rings, retaining rings, locating rings, and piston rings	Replace	Use new parts
15		Studs	Inspect	Replace if bent, or if threads damaged
16		Converter housing	Inspect	Check that housing is thoroughly cleaned, and that mating surfaces and bearing bores are free from nicks or burrs. Clean up using a soft hone. Check for evidence of cracks; if cracks are observed, replace housing.
17		Transmission temperature switch (20)	Inspect	Inspect body for damage and check for loose terminal; if any of these conditions are observed, replace switch.
18		Remaining parts	Inspect	Inspect for wear, cracks, bent condition, or distortion. If any of these conditions are observed, replace the part.
REASSEMBLY				
19	Converter housing	a. Breather (31) b. Pipe plug (28, 29, and 30)	Install Install	

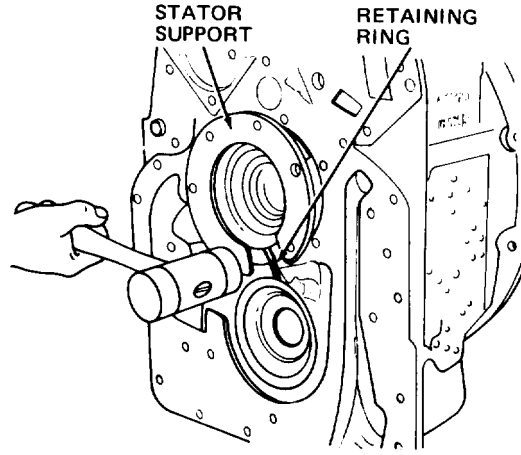
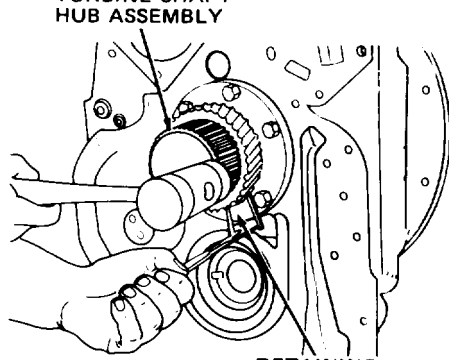
**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing (cont)*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
20	Converter housing, rear	a. Pin (27) and reverse idler gear shaft (26)	Install	Tap in position with soft hammer
		b. Idler gear shaft (24) and lockball (25)	Install	Place lockball (25) in position on gear shaft (24), then, insert gear shaft through its hole in rear of housing and tap into position with soft hammer
		c. Stud (22 and 23)	Install	Apply loctite to threads
		d. Transmission temperature switch (20) and lock washer (33)	Install	
		e. Pipe plug (21)	Install	
		f. Converter housing sleeve { 19 )	Position	Position sleeve with tab aligned with cast slot in converter housing. Press sleeve into housing until it shoulders in housing as shown. Use two inches diameter bar stock
				
	Stator support	a. Expander spring (18)	Install	Expander spring gap must be 180 degrees from piston ring hook joint
		b. Piston ring (17)	Install	
NOTE				
In the following step, part number etched on bearing must be up.				
	Stator support	c. Bearing	Install	Press using suitable size sleeve
		d. Retaining ring (7)	Install	
22	Converter housing, rear	a. Stator support (15)	Position	Align holes in support with converter housing holes, then tap support into position as shown

**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
22 (cont)		b. Six screws (13) and lock washers (14)	Install	 <p style="text-align: right;">TA127331</p> Tighten to 23-25 pounds foot torque
<b>NOTE</b>				
In the following step, slot in bearing must be downward (opposite splined end of shaft).				
23	Turbine shaft hub assembly	a. Bearing (12) b. Locating washer (11) c. Retaining ring (10) d. Piston ring (9)	Install Install Install Install	Press using suitable size sleeve
24	Converter housing, rear	Turbine shaft hub assembly (8)	Position	While spreading ears on retaining ring (7) tap turbine shaft (8) into position. Be sure retaining ring (7) is fully engaged in slot of bearing (12)
 <p style="text-align: center;">HUB ASSEMBLY</p> <p style="text-align: center;">RETAINING RING TA127332</p>				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*b. Converter Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
25	Reverse idler gear shaft	a. Bearing assembly (5)	Position	Place inner bearing, then bearing spacer on shaft
		b. Reverse idler gear (4)	Position	Place gear, long hub out, on shaft then install outer taper bearing (part of bearing assembly) in gear
		c. Bearing retainer plate (3)	Position	
		d. Lockplate (1)	Position	
		e. Three screws (2)	Install	Tighten screws to 37-41 pounds foot torque, then bend lockplate tabs over head of each screw
26	Transmission forward clutch shaft	Pilot bearing (6)	Position	
27	Converter housing	Torque converter group	Assemble	Para 4-4a

**4-4. TRANSMISSION MAINTENANCE (cont)**

*c. Transmission Rear Cover.*

- This task covers: a. Removal  
 b. Cleaning  
 c. Inspection  
 d. Installation

INITIAL SETUP

TOOLS

- Pry Bars (2)  
 Hot Solution Tank with Mild Alkali Solution  
 Soft Hone  
 No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

EQUIPMENT CONDITION

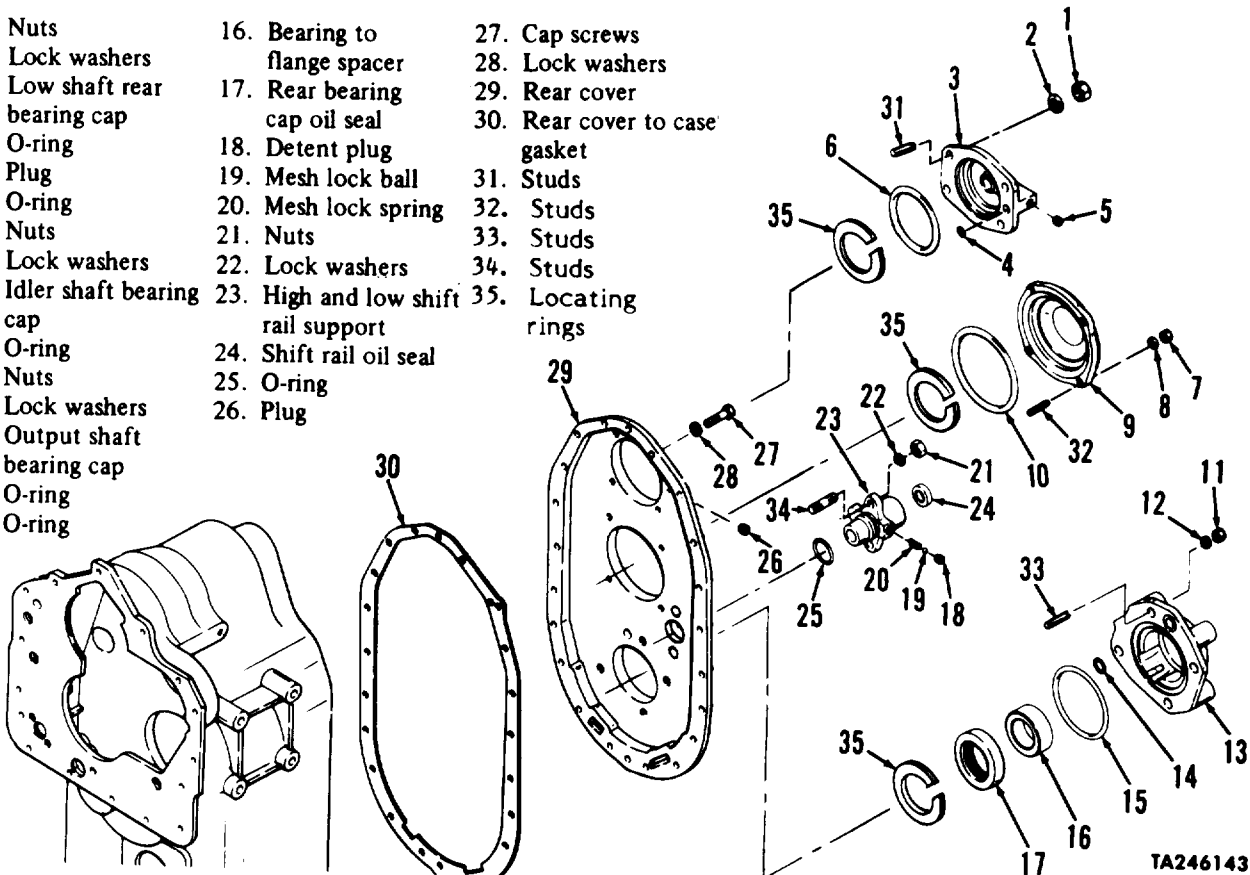
- | Paragraph | Condition Description               |
|-----------|-------------------------------------|
| 2-42b     | Parking brake removed.              |
| 3-5d      | Transmission separated from engine. |

MATERIALS/PARTS

- O-rings  
 Oil seals  
 Gasket  
 Clean cloths  
 Chassis grease  
 Permatex 2 NSN 80304)0S734792  
 Automatic transmission fluid (refer to current lubrication order)

KEY

- |                               |                                     |                               |
|-------------------------------|-------------------------------------|-------------------------------|
| 1. Nuts                       | 16. Bearing to flange spacer        | 27. Cap screws                |
| 2. Lock washers               | 17. Rear bearing cap oil seal       | 28. Lock washers              |
| 3. Low shaft rear bearing cap | 18. Detent plug                     | 29. Rear cover                |
| 4. O-ring                     | 19. Mesh lock ball                  | 30. Rear cover to case gasket |
| 5. Plug                       | 20. Mesh lock spring                | 31. Studs                     |
| 6. O-ring                     | 21. Nuts                            | 32. Studs                     |
| 7. Nuts                       | 22. Lock washers                    | 33. Studs                     |
| 8. Lock washers               | 23. High and low shift rail support | 34. Studs                     |
| 9. Idler shaft bearing cap    | 24. Shift rail oil seal             | 35. Locating rings            |
| 10. O-ring                    | 25. O-ring                          |                               |
| 11. Nuts                      | 26. Plug                            |                               |
| 12. Lock washers              |                                     |                               |
| 13. Output shaft bearing cap  |                                     |                               |
| 14. O-ring                    |                                     |                               |
| 15. O-ring                    |                                     |                               |



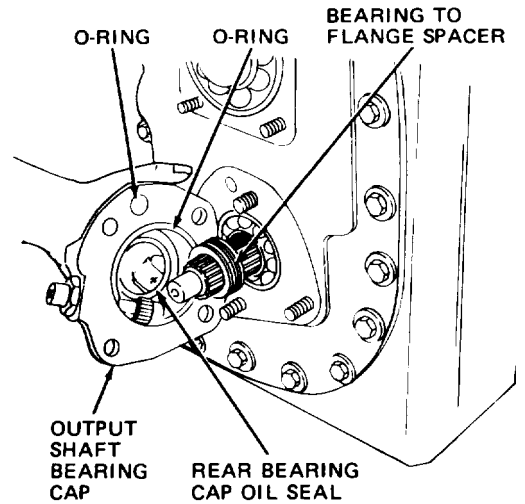
TA246143



**4-4. TRANSMISSION MAINTENANCE (cont)**

c. *Transmission Rear Cover (cont).*

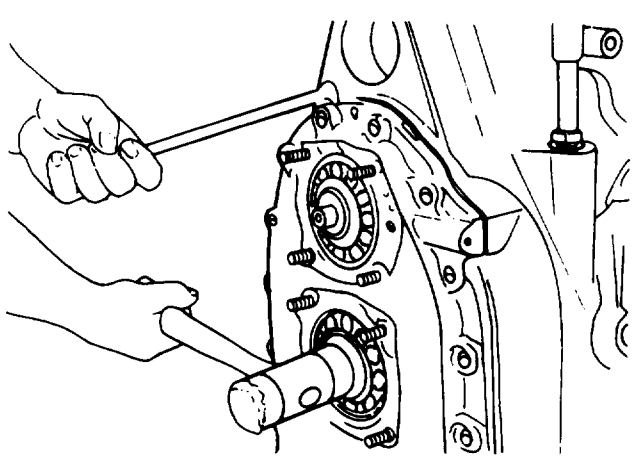
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1		Four nuts (1)	Remove	If necessary, plug (5) may be removed
2		Four lock washers (2)	Remove	
3		Low shaft rear bearing cap (3)	Remove	
4		O-ring (4)	Remove and discard	
5		O-ring (6)	Remove and discard	
6		Four nuts (7)	Remove	
7		Four lock washers (8)	Remove	
8		Idler shaft bearing cap (9)	Remove	
9		O-ring (10)	Remove and discard	
10		Four nuts (11)	Remove	
11		Four lock washers (12)	Remove	
12		Output shaft bearing cap (13)	Remove	
13		O-ring (14)	Remove and discard	
14		O-ring (15)	Remove and discard	
15		Bearing to flange spacer (16)	Remove	
16		Rear bearing cap oil seal (17)	Remove and discard	
17		Detent plug (18), mesh lock ball (19), and mesh lock spring (20)	Remove	Remove only if necessary



TA127334

**4-4. TRANSMISSION MAINTENANCE (cont)**

c. *Transmission Rear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REMOVAL (cont)				
18		Two nuts (21)	Remove	
19		Two lock washers (22)	Remove	
20		High and low shift rail support (23)	Remove	
21		Shift rail oil seal (24)	Remove and discard	
22		O-ring (25)	Remove and discard	
23		Plug (26)	Remove	Remove only if necessary
24		20 cap screws (27)	Remove	
25		20 lock washers (28)	Remove	
26		Three locating rings (35)	Remove	
27		Rear cover (29)	Remove	Use pry slots provided and pry rear cover from transmission housing. Use a soft hammer to tap on low clutch, idler, and output shafts to prevent rear cover from binding
 <p style="text-align: center;"><b>TA127335</b></p>				
28		Rear cover to case gasket (30)	Remove and discard	Clean all traces of gasket from transmission case

**4-4. TRANSMISSION MAINTENANCE (cont)**

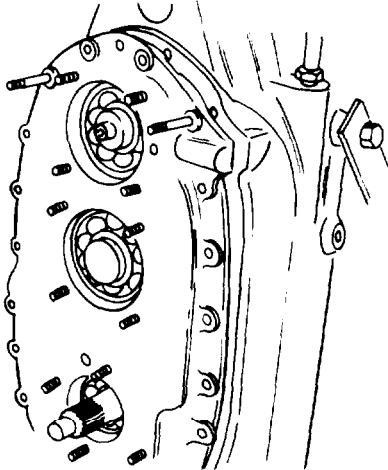
c. *Transmission Rear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
Exercise care when using alkali cleaners to avoid coming in contact with cleaner or breathing vapors to prevent skin rashes and bodily harm. Wear a rubber apron to prevent clothes from coming in contact with cleaner and use cleaner in a well ventilated area. If alkali cleaner is splashed on clothes or skin, flood area with large amounts of water and get immediate medical attention.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
29		All parts	Clean	Clean interior and exterior of parts in hot solution tank with a mild alkali solution. Allow parts to remain in solution long enough to be cleaned and heated. Thoroughly rinse parts with clean water to remove all traces of alkali. Dry parts thoroughly immediately using moisture free compressed air or clean cloths
INSPECTION				
30	Rear cover (29)	Studs (31, 32,33, and 34)	Inspect	Check for damaged threads and bent condition. Repair damaged threads by chasing with proper size die; replace bent studs
31		Rear cover (29), bearing caps (3, 9, and 13), and high and low shift rail support (23)	Inspect	Check that all traces of gasket (30) is removed from mating surface of rear cover. Check that mating surfaces and bores are free from nicks or burrs and cracks are not evident. Remove burrs with a soft hone; if nicks or cracks are observed, replace part
32		Bearing to flange spacer (16)	Inspect	Replace if surfaces worn or deformed
33		Mesh lock ball (19)	Inspect	Replace if deformed or damaged

**4-4. TRANSMISSION MAINTENANCE (cont)**

*c. Transmission Rear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSPECTION (cont)				
34		Mesh lock spring (20)	Inspect	Replace if cracked, broken, deformed or permanently set
INSTALLATION				
35	Transmission housing, rear	a. Rear cover to case gasket (30)	Position	Install two aligning studs in transmission housing to facilitate positioning of gasket and installation of rear cover (29). Apply thin coat of GAA to hold gasket in place.
<b>NOTE</b>				
Before performing next step, move forward range shift hub on output shaft (see below). Pulling on high and low shift rail may cause hub to fall off.				
		b. Rear cover (29)	Position	Tap rear cover in place aligning shaft bearings with bearing bores in cover
		c. 20 lock washers (28) and cap screws (27)	Install	Remove two aligning studs after several lock washers and cap screws are installed; tighten cap screws to 37-41 pounds foot torque
		d. Locating rings (35)	Install	



TA127336

**4-4. TRANSMISSION MAINTENANCE (cont)**

*c. Transmission Rear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
36	High and low shift rail support (23)	a. shift rail oil seal (24)	Install and lubricate	Apply thin coat of Permatex 2 on outer diameter of oil seal then press into support with lip of oil seal toward rear cover. Lubricate oil seal with OE10 (refer to current lubrication order) Lubricate with GAA (refer to current lubrication order); position on shift rail support (23)
		b. O-ring (25)	Lubricate and install	
37	Rear Cover (29)	a. Mesh lock spring (20)	Install	Apply GAA grease to mesh lock spring and ball (19) before installing
		b. Mesh lock ball (19)	Install	
		c. High and low shift rail support (23)	Install	Place small diameter long screw through high and low shift rail support (23) to hold ball (19) in depressed position, against spring (20). Place high and low shift rail support (23) on high and low shift rail with screw upward, until flat of shift rail catches ball (19). Then remove small diameter long screw from support (23). Push high and low shift rail support (23) while also turning it, until support is against rear cover (29)
		d. Two lock washers (22) and nuts (21)	Install	
e. Detent plug (18)	Install	Tighten to 41-45 pounds foot torque		
38	Output shaft bearing cap (13)	a. Rear bearing cap oil seal (17)	Install and lubricate	Apply thin coat of Permatex 2 on outer diameter of oil seal then press into bearing cap with lip of seal toward bearing side of cap. Lubricate oil seal with OE10 (refer to current lubrication order) Lubricate with OE10 (refer to current lubrication order); position on bearing cap(13)
		b. O-rings (14 and 15)	Lubricate and position	
39	Rear cover (29)	a. Bearing to flange spacer (16)	Position	On output shaft
		b. Output shaft bearing cap (13)	Position	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*c. Transmission Rear Cover (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
INSTALLATION (cont)				
		c. Four lock washers (12) and nuts (11)	Install	Tighten to 91-100 pounds foot torque
40	Idler shaft bearing cap (9)	O-ring (10)	Lubricate and position	Lubricate with OE10 (refer to current lubrication order) position on bearing cap (9)
41	Rear cover (29)	a. Idler shaft bearing cap (9) b. Four lock washers (8) and nuts (7)	Position Install	Tighten to 41-45 pounds foot torque
42	Low shaft rear bearing cap (3)	a. Plug(5) b. O-rings (4 and 6)	Install Lubricate and position	Lubricate with OE10 (refer to current lubrication order); position on bearing cap (3)
43	Rear cover (29)	a. Low shaft rear bearing cap (3) b. Four lock washers (2) and nuts(1) C. plug (26) d. Parking brake	Position Install Install install	Tighten to 4145 pounds foot torque  Para 2-42b

**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group.*

This task covers: a. Disassembly  
b. Cleaning  
c. Inspection  
d. Reassembly

INITIAL SETUP

TOOLS

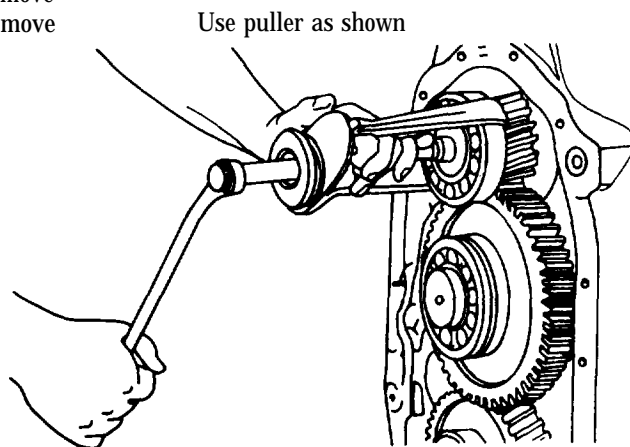
Mechanical Puller NSN 5120-00423-1596  
Impact Wrench NSN 5130-00-596-9821  
Soft Hone  
Soft Bar, 18 inches long, 2 inches outside diameter  
Arbor press, 1/2 ton capacity  
Snap Ring Pliers, Contracting Type NSN 5120-00-293-0046  
No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00754-0654

EQUIPMENT CONDITION

Paragraph	Condition Description
44a	Torque converter group disassembled.
4-4c	Transmission rear cover removed.

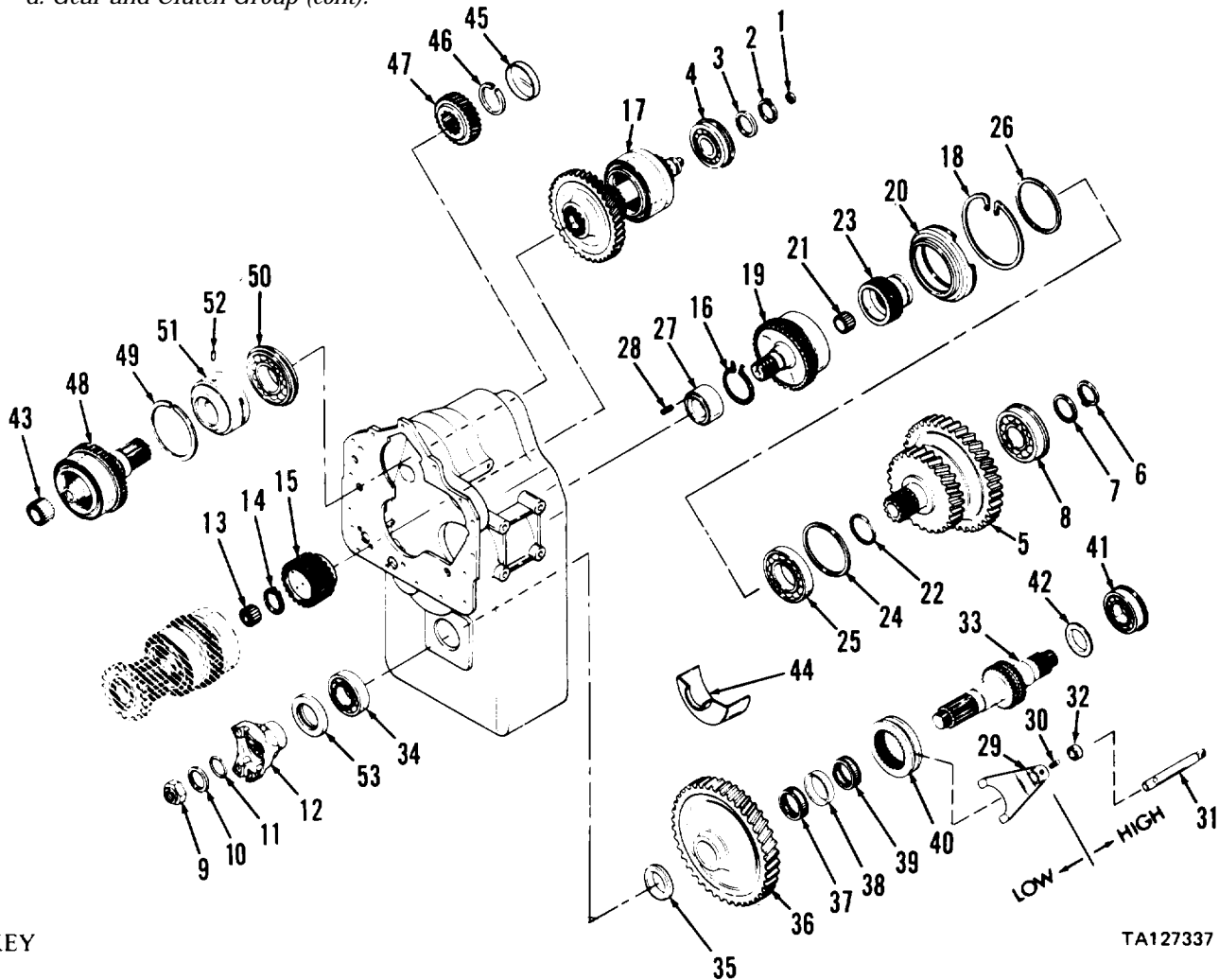
MATERIALS/PARTS

Clean cloths  
Permatex 2 NSN 8030-00-8734792  
OE10 (refer to current lubrication order)  
Cleaning solvent P-D-680  
Light oil  
Retaining rings  
O-rings  
Piston rings  
Locating rings  
Oil seals  
Flange nut

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Transmission housing, rear	a. Low shaft piston ring(1) b. Retaining ring(2) c. Support washer (3) d. Low speed shaft rear bearing (4)	Remove Remove and discard Remove Remove	 <p>Use puller as shown</p> <p>TA127338</p>

**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*



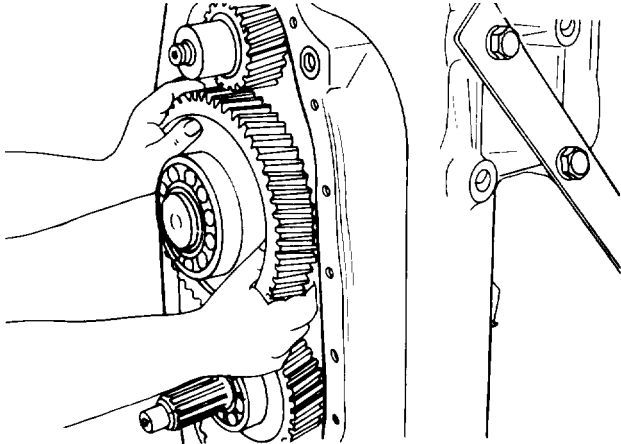
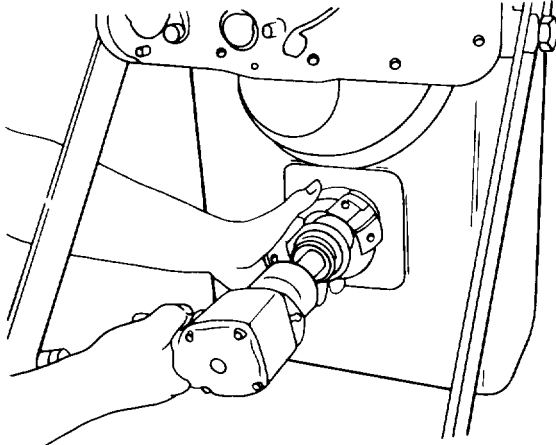
**KEY**

- |  |  |                                |                                 |
|--|--|--------------------------------|---------------------------------|
| 1. Low shaft piston ring                   | 15. Second clutch disc hub                   | 27. Piston ring outer race     | 42. Gear thrust washer          |
| 2. Retaining ring                          | 16. Third clutch front bearing locating ring | 28. Roll pin                   | 43. Forward shaft pilot bearing |
| 3. Support washer                          | 17. Low clutch assembly                      | 29. High and low shift fork    | 44. Oil baffle                  |
| 4. Low speed shaft rear bearing            | 18. Bearing carrier locating ring            | 30. Lock screw                 | 45. Bore plug                   |
| 5. Idler shaft and gear                    | 19. Third clutch assembly                    | 31. High and low shift rail    | 46. Retaining ring              |
| 6. Retaining ring                          | 20. Bearing carrier                          | 32. Spacer                     | 47. Forward shaft gear          |
| 7. Support washer                          | 21. Third clutch shaft pilot bearing         | 33. Output shaft               | 48. Forward clutch assembly     |
| 8. Idler shaft rear bearing                | 22. Retaining ring                           | 34. Output shaft front bearing | 49. Retaining ring              |
| 9. Flange nut                              | 23. Third clutch disc hub                    | 35. Thrust washer              | 50. Forward shaft rear bearing  |
| 10. Flange washer                          | 24. Retaining ring                           | 36. Low range gear             | 51. Piston ring sleeve          |
| 11. O-ring                                 | 25. Third clutch disc hub bearing            | 37. Low gear bearing           | 52. Roll pin                    |
| 12. Output flange                          | 26. Locating ring                            | 38. Bearing spacer             | 53. Output shaft oil seal       |
| 13. Reverse and second clutch rear bearing |  | 39. Low gear bearing           |                                 |
| 14. Retaining ring                         |  | 40. Range shift hub            |                                 |
|  |  | 41. Output shaft rear bearing  |                                 |



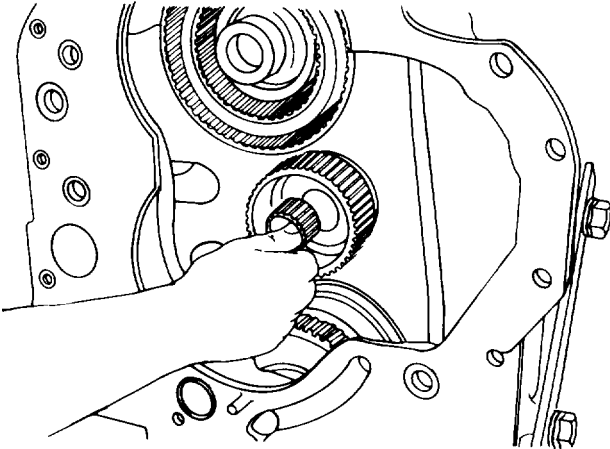
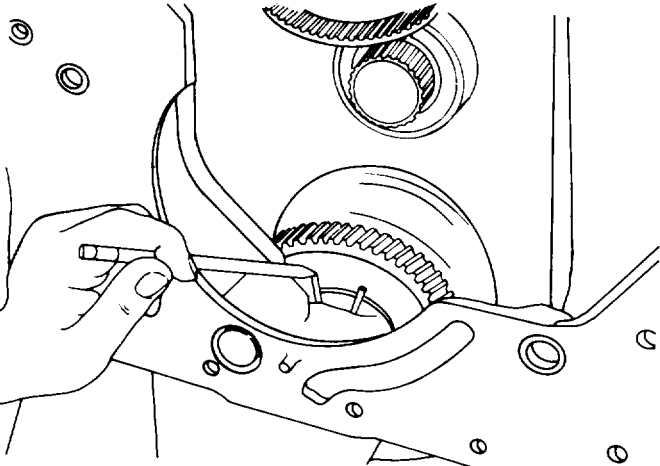
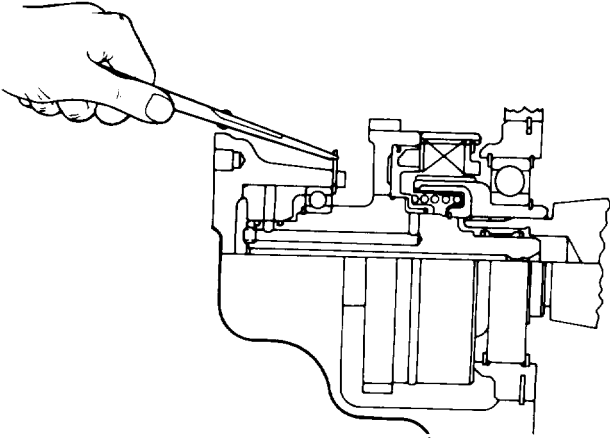
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
1 (cont)		e. Idler shaft and gear (5)	Remove	Remove idler shaft and gear and associated parts (6 through 8) as an assembly
				
TA127339				
2	Idler shaft and gear (5)	a. Retaining ring (6) b. Support washer (7) c. Idler shaft rear bearing (8)	Remove and discard Remove Remove	Use puller
3	Transmission housing, front, output shaft	a. Flange nut (9) b. Flange washer (10) c. O-ring(11)	Remove Remove and discard	Use impact wrench; if unavailable, use a bar to hold output flange (12)
				
TA127340				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
(cont)		d. Output flange (12)	Remove	Use puller
4	Transmission housing, front, reverse and second clutch assembly bore	a. Reverse and second clutch rear bearing (13)	Remove	
				
		b. Retaining ring (14)	Remove and discard	
		c. Second clutch disc hub (15)	Remove	
5	Transmission housing, front, third clutch	Third clutch front bearing locating ring (16)	Compress and detach	Compress protruding ends of locating ring and remove ring from ring groove. Don't remove ring from third clutch assembly
				
				

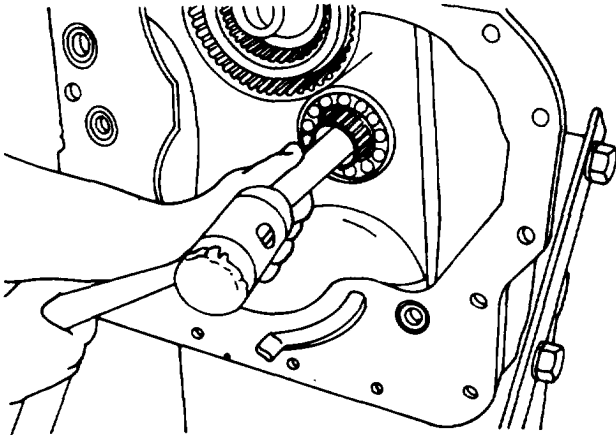
TA127341

TA127342

TA127343

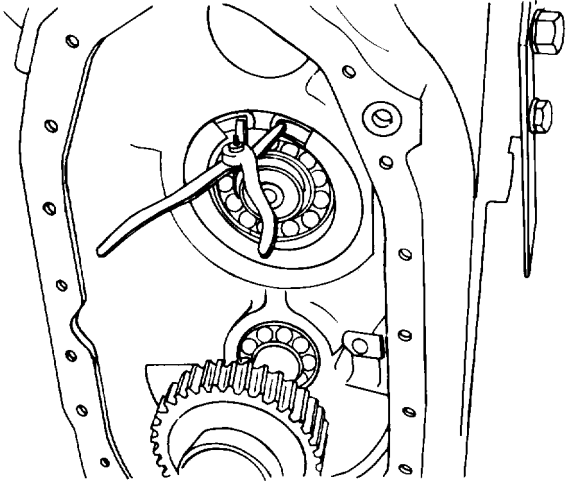
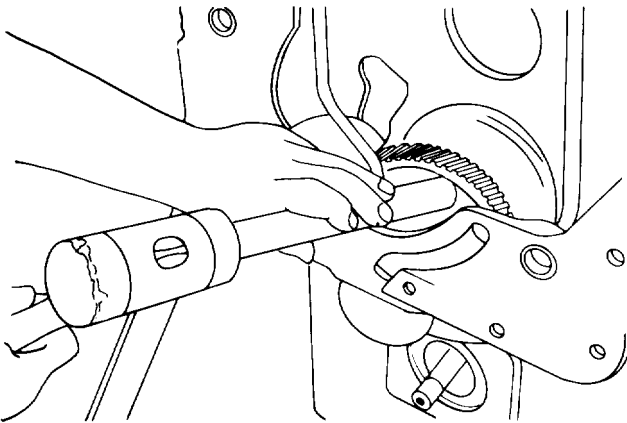
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
<b>CAUTION</b>				
In following step, have an assistant hold low clutch assembly on opposite side of housing to prevent assembly from dropping out of housing.				
6	Transmission housing, front	Low clutch assembly (17)	Remove	Use soft bar to tap from housing. Remove from rear
<b>NOTE</b>				
Refer to paragraph 4-4g to disassemble low clutch assembly.				
				
<b>TA127344</b>				

**4.4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
7	Transmission housing, rear	Bearing carrier locating ring(18)	Contract and hold	Use contracting type snap ring pliers; lock in position shown
				
<p><b>NOTE</b> <span style="float: right;">TA127345</span></p>				
<p>If third clutch assembly is difficult to remove, recheck front and rear locating rings to be sure they are clear of ring groove.</p>				
8	Transmission housing, front	a. Third clutch assembly (19)	Tap	Use soft bar to tap third clutch assembly from housing
				
<p>TA127346</p>				

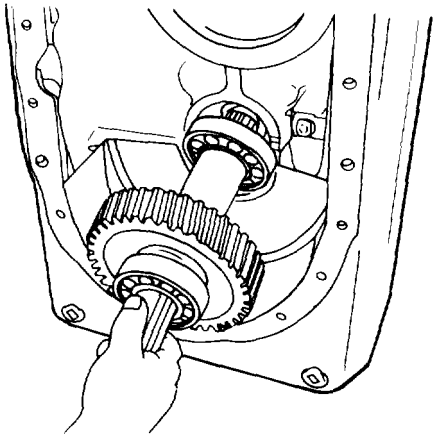
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
8 (cont)		b. Bearing carrier (20)	Remove	Locating ring, bearing carrier, and associated parts (21 through 26) are removed as an assembly
9	Bearing carrier (20)	a. Bearing carrier locating ring (18)	Remove and discard	
		b. Third clutch shaft pilot bearing (21)	Remove	
		c. Retaining ring (22)	Remove and discard	
		d. Third clutch disc hub (23)	Remove	Use sleeve to remove
		e. Retaining ring (24)	Remove and discard	
		f. Third clutch disc hub bearing (25)	Remove	Use sleeve to remove
		g. Locating ring (26)	Remove and discard	
10	Transmission housing, rear	a. Third clutch assembly (19)	Remove	
<b>NOTE</b>				
Refer to paragraph 4-4h to repair third clutch assembly				
		b. Piston ring outer race (27)	Remove	
		c. Roll pin (28)	Remove	
		d. High and low shift fork (29)	Remove	Remove high and low shift fork and associated parts (30 through 32) as an assembly; disengage from range shift hub (40)

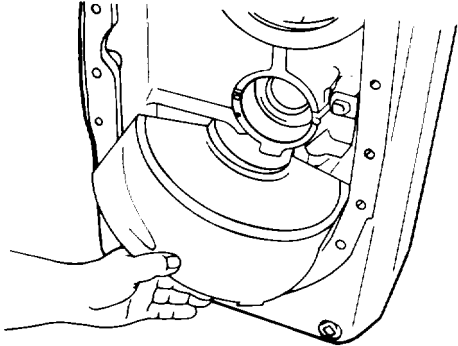
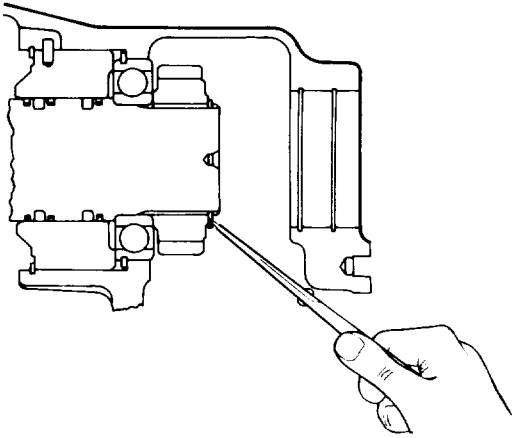
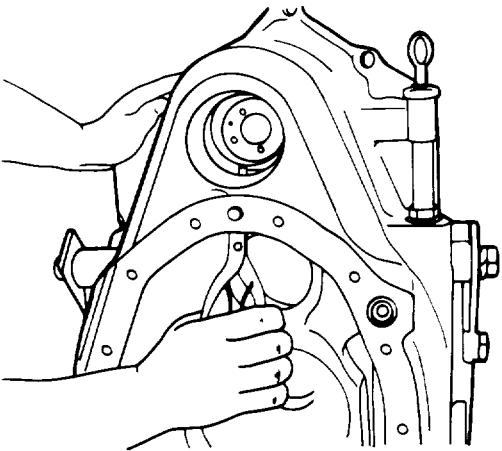
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
11	High and low shift fork (29)	a. Lock screw (30) b. High and low shift rail (31) c. Spacer (32)	Remove Remove Remove	
12	Transmission housing, rear	Output shaft (33)	Remove	Remove output shaft and associated parts (34 through 42) as an assembly
				
13	Output shaft (33)	a. Output shaft front bearing (34) b. Thrust washer (35) c. Low range gear (36) d. Low gear bearing (37) e. Bearing spacer (38) f. Low gear bearing (39) g. Range shift hub (40) h. Output shaft rear bearing (41) i. Gear thrust washer (42)	Remove Remove Remove Remove Remove Remove Remove Remove Remove	Use puller  Use puller If bearings (37 and 39) and spacer (38) remain in gear, use sleeve to remove  Use puller
14	Transmission housing, front	Forward shaft pilot bearing (43)	Remove	TA127348

**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
15	Transmission housing, rear	a. Oil baffle (44)	Remove	 <p style="text-align: right;">TA127349</p>
<p><b><u>CAUTION</u></b></p> <p>In following step, take care not to damage bore in housing.</p>				
		b. Bore plug (45) c. Retaining ring (46)	Remove Remove and discard	<p style="text-align: center;">Carefully pry out</p>  <p style="text-align: right;">TA127351</p>
				 <p style="text-align: center;">TA127350</p>

**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
15 (cont)		d. Forward shaft gear (47)	Remove	
		e. Forward clutch assembly (48)	Remove	Tap from housing using soft bar and remove from front of housing
<p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: right;">TA127352</p>				
<p style="text-align: center;">Refer to paragraph 4-4i for repair of forward clutch assembly.</p>				
16	Transmission housing, front	a. Retaining ring (49)	Remove and discard	
		b. Forward shaft rear bearing (50)	Remove	Use soft bar and tap out from rear of housing
		c. Piston ring sleeve (51)	Remove	
		d. Roil pin (52)	Remove	
		e. Output shaft oil seal (53)	Remove and discard	Use sleeve and tap out from front of housing
<p style="text-align: center;"><b>NOTE</b></p>				
<p style="text-align: center;">Discard all retaining rings, piston rings, locating rings, O-rings, and oil seals; these parts will be replaced with new parts during reassembly.</p>				



**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
17		Bearings (4, 8, 13, 21, 25, 34, 37, 39, 41, 43, and 50)	Clean	Use cleaning solvent P-D-680. Immerse bearings in cleaning solvent and move slowly up and down. Remove bearings. Strike larger side of cone against block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning solvent. Repeat process until bearings are thoroughly clean. Dry using moisture-free compressed air, Direct air stream across bearing. Do not spin bearings when drying. Rotate bearings slowly by hand to facilitate drying
<b>NOTE</b>				
<p>If low clutch assembly (17), third clutch assembly (19), and forward clutch assembly (48) have been repaired don't perform following step.</p>				
<b><u>CAUTION</u></b>				
<p>Don't immerse low clutch assembly (17), third clutch assembly (19), and forward clutch assembly (48) in cleaning solvent.</p>				

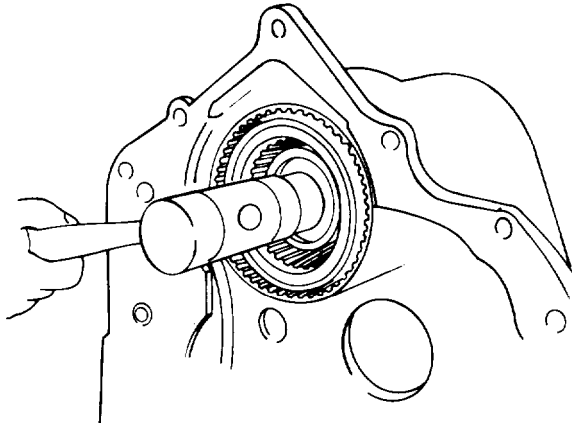
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
18		Low clutch assembly (17), third clutch assembly (19), and forward clutch assembly (48)	Clean	Use clean cloths moistened with cleaning solvent P-D-680 to remove exterior oil and/or dirt, then dry with clean cloths
19		AU other parts	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry thoroughly using moisture-free compressed air or clean cloths
20		Bearings (4, 8, 13, 21, 25, 34, 37, 39, 41, 43 and 50)	Inspect	Inspect all rollers, cages and cups for wear, chips, nicks, cracks, damage, and distortion. If any of these conditions are observed, replace bearing. After inspection, immerse in clean light oil and wrap in clean lintless cloth or paper
21		Idler shaft and gear (5), low range gear (36), forward shaft gear (47)	Inspect	Inspect teeth on gears for wear, pits, nicks, cracks and scores. Remove small nicks with hone. Inspect overall for damage, distortion, and cracks. If any of these conditions observed, replace gear
22		Output shaft (33)	Inspect	Check for bent condition. Check that splines are not twisted or chipped. If shaft is worn or any of the above conditions observed, replace it
23		Output flange (12), and range shift hub (40)	Inspect	Check for bent or worn condition. Check that internal splines are not bent or chipped; if any of the above conditions observed, replace part
24		All other parts	Inspect	Inspect for wear, cracks, distortion, pits, nicks, scores and damage. If any of these conditions observed, replace part
REASSEMBLY				
25	Transmission housing, front, forward clutch bore	a. Output shaft oil seal (53)	Lubricate and install	Lubricate with OE10 (refer to current lubrication order); then apply thin coat of Permatex 2 on outer diameter of oil seal. Install oil seal using sleeve. Oil seal is properly installed when seal is flush with front of housing

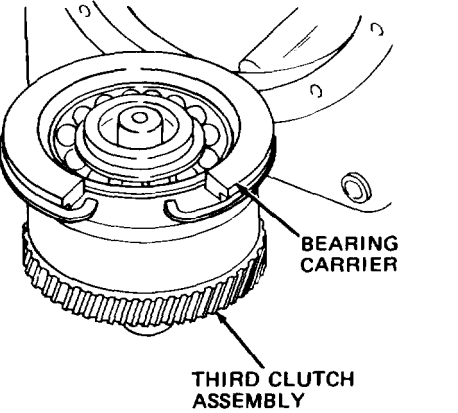
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
25 (cont)		b. Forward shaft rear bearing (50)	Tap in	Bearing snap ring groove faces front of housing
		c. Roll pin (52)	Install	In sleeve (51)
		d. Piston ring sleeve (51)	Position	Align pin (52) in sleeve with groove in housing, then tap sleeve into position
		e. Retaining ring (49)	Install	
		<b><u>CAUTION</u></b>		
In following step, don't damage forward shaft piston rings.				
		f. Forward clutch assembly (48)	Position and install	Use soft hammer and tap into position
				
<b>TA127353</b>				
		g. Forward shaft pilot bearing (43)	Install	
26	Transmission housing, rear, forward clutch bore	a. Forward shaft gear (47)	Position	
		b. Retaining ring (46)	Install	Use retaining ring pliers Tap into position until flush with outside of housing
		c. Bore plug (45)	Install	
27	Bearing carrier (20)	a. Locating ring (26)	Install	In bearing carrier
		b. Third clutch disc hub bearing (25)	Install	Press into bearing carrier against locating ring, (26)
		c. Retaining ring (24)	Install	Secures bearing (25)
		d. Third clutch disc hub (23)	Install	Press into bearing (25)
		e. Retaining ring (22)	Install	Secures disc hub (23)

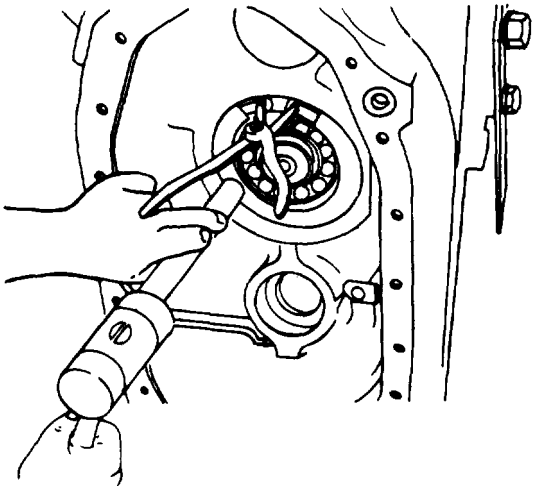
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
27 (cont)		f. Bearing carrier locating ring (18)	Install	In bearing carrier (20)
		g. Third clutch shaft pilot bearing (21)	Install	
<p><b><u>CAUTION</u></b></p> <p>Don't force operation in next step.</p>				
28	Third clutch assembly (19)	a. Bearing carrier (20)	Position	Align disc hub (23) splines with internal teeth of disc in third clutch assembly (19). Disc hub splines must be in full position with internal teeth of all discs
				
		b. Third clutch front bearing locating ring (16)	Position	On clutch assembly (19)
		c. Outer race roll pin (28)	Install	In outer race (27)
		d. Piston ring outer race (27)	Install	
		e. Bearing carrier locating ring (18)	Contract	Use contracting type snap ring pliers. Lock pliers to hold ring in position

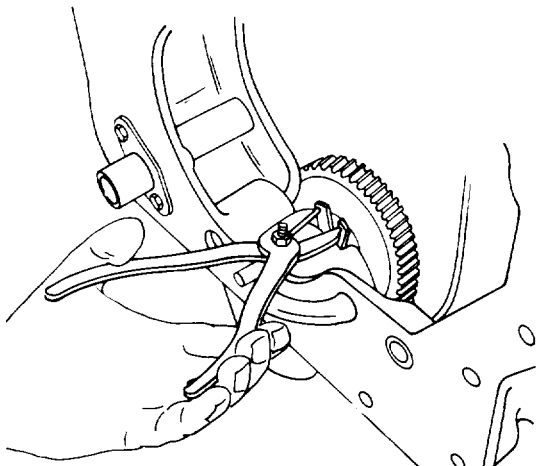
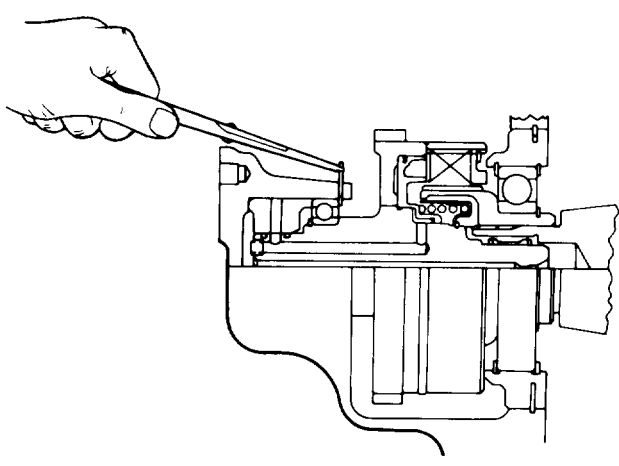
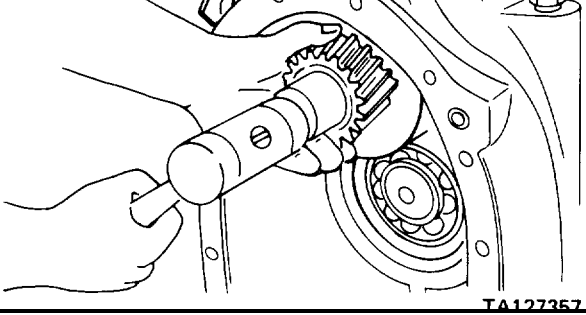
**4-4. TRANSMISSION MAINTENANCE (cont)**

d. Gear and Clutch Group (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
29	Transmission housing, rear	a. Third clutch assembly (19) and bearing carrier (20)	Position and tap in	Tap assembly into housing until ring groove in housing is aligned with locating ring (18). Remove pliers
				
				<b>TA127355</b>
30	Low range gear (36)	b. Bearing carrier locating ring (18)	Check	Ring in full position in ring groove
		c. Oil baffle (44)	Install	
		a. Low gear bearing (37)	Install	Use soft hammer to install until flush with gear (36) hub
		b. Bearing spacer (38)	Install	Use soft hammer to install until flush with bearing (37)
		c. Low gear bearing (39)	Install	Use soft hammer to install until flush with gear (36) hub
31	Output shaft (33)	a. Range shift hub (40)	Install	On output shaft (33)
		b. Gear thrust washer (42)	Install	Bevel towards rear cover
		c. Output shaft rear bearing (41)	Install	Press onto output shaft until bearing shoulders on washer (42)
		d. Low range gear (36)	Install	Press onto output shaft
		e. Thrust washer (35)	Install	
		f. Output shaft front bearing (34)	Install	Press onto output shaft until bearing shoulders on thrust washer (35)
32	Transmission housing, rear	Output shaft (33)	Install	

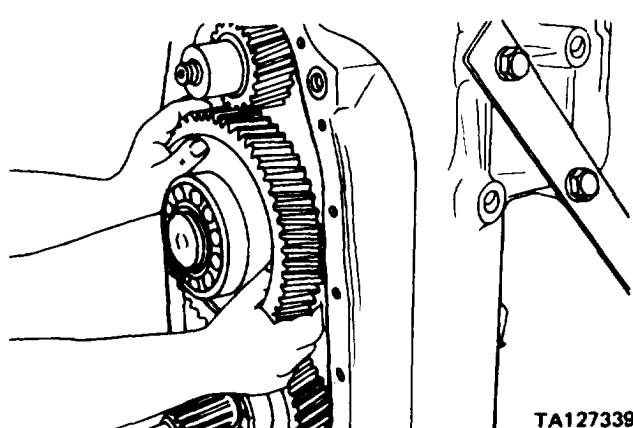
**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
33	High and low shift fork (29)	a. Spacer (32) b. High and low shift rail (31) c. Lock screw (30)	Install Install Install	On high and low shift rail (31) In high and low shift fork (29) Secures spacer (32) and high and low shift rail (31) to high and low shift fork (29)
34	Transmission housing, rear	High and low shift fork (29)	Install	Engage forks in range shift hub (40) race
35	Transmission housing, front	Third clutch front bearing locating ring (16)	Install	Into ring groove
<div style="display: flex; justify-content: space-around;">   </div>				
<b>NOTE</b>				
Be certain locating ring (16) is in full position in ring groove				
36	Transmission housing, rear, low clutch bore	Low clutch assembly (17)	Install	Tap into position
				

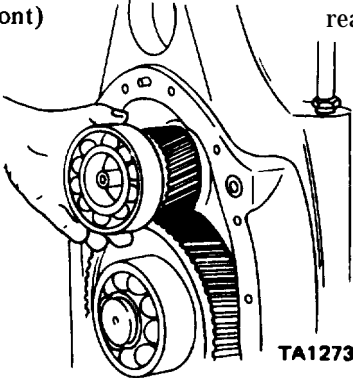
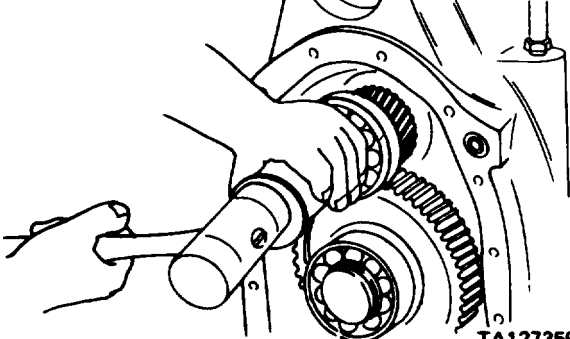
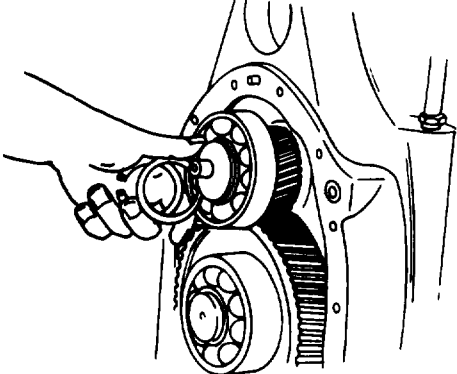
**4-4. TRANSMISSION MAINTENANCE (Cont)**

*d. Gear and Clutch Group (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
37	Transmission housing, front	a. Second clutch disc hub (15)	Install	On low clutch shaft
		b. Retaining ring (14)	Install	
		c. Reverse and second clutch rear bearing (13)	Install	
		d. Output flange (12)	Install	
		e. O-ring(11)	Install	Lubricate with OE10 (Refer to current lubrication order)
		f. Flange washer (10)	Install	
		g. New flange nut (9)	Install	Tighten to 200-250 pounds foot torque
38	Idler shaft and gear (5)	a. Idler shaft rear bearing (8)	Install	Press into idler shaft and gear
		b. Support washer (7)	Install	
		c. Retaining ring (6)	Install	
<b>NOTE</b>				
In the following step carefully align splines of idler shaft and gear (5) with splines of third clutch assembly.				
39	Transmission housing, rear	a. Idler shaft and gear (5)	Install	In end of third clutch assembly
 <p style="text-align: right;">TA127339</p>				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*d. Gear and Clutch Group (cont).*

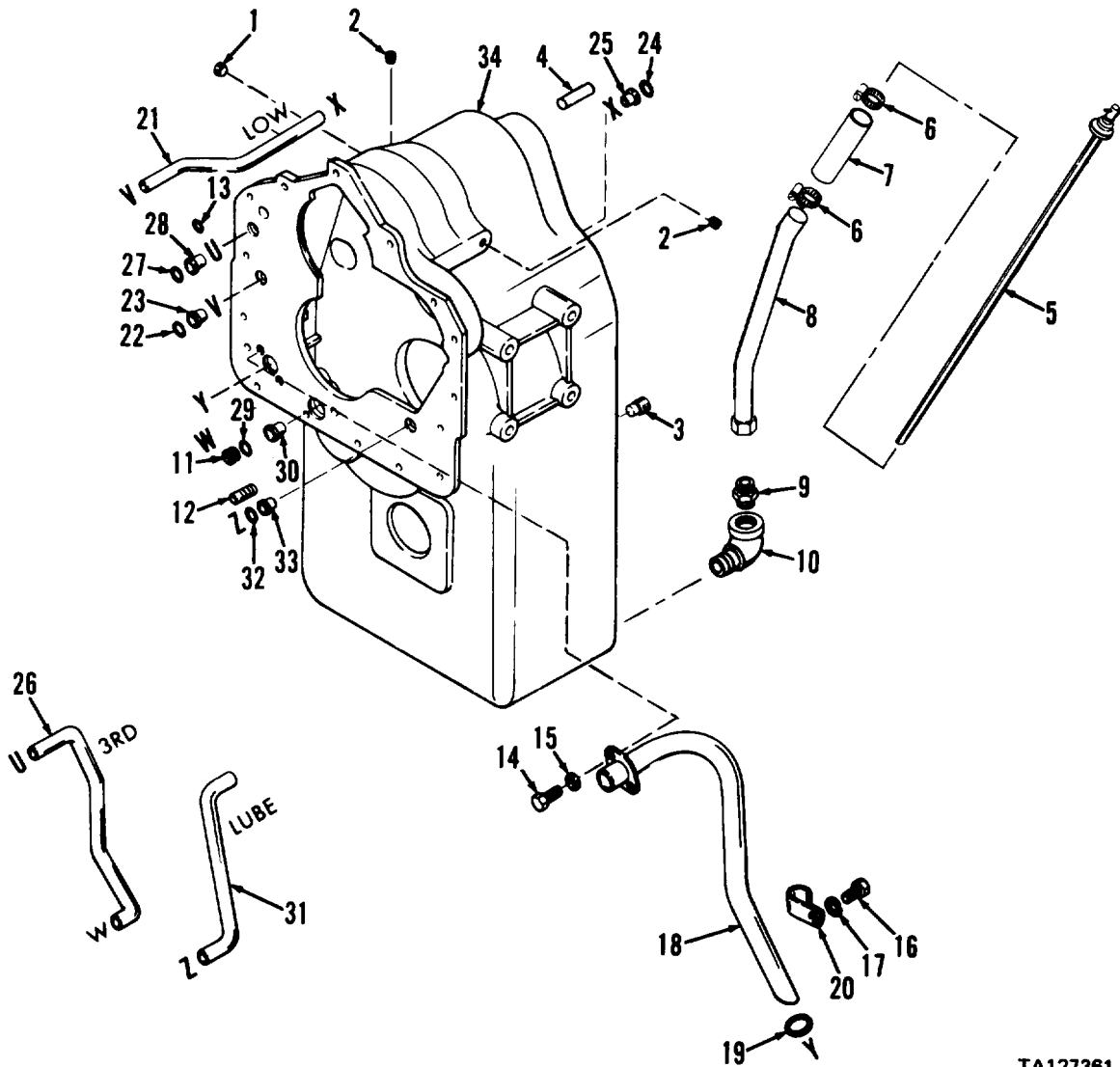
STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
39 (cont)	 <p>TA127358</p>	b. Low speed shaft rear bearing (4)	Install	<p>Position on low clutch shaft with ring groove out and tap into position</p>  <p>TA127359</p>
		c. Bearing support washer (3)	Install	 <p>TA127360</p>
		d. Retaining ring (2)	Install	Secures low speed shaft rear bearing (4)
		e. Low shaft piston ring (1)	Install	On low clutch shaft
		f. Rear cover	Install	Para 4-4c
		g. Torque converter group	Reassemble	Para 44a





**4-4. TRANSMISSION MAINTENANCE (cont)**

*e. Transrission Housing (cont).*



**KEY**

- |                               |                                    |                             |
|-------------------------------|------------------------------------|-----------------------------|
| 1. Plug                       | 13. O-ring                         | 25. Tube sleeve             |
| 2. Plugs                      | 14. Cap screws                     | 26. Third speed tube        |
| 3. Magnetic drain plug        | 15. Lock washers                   | 27. O-ring                  |
| 4. Dowel pins                 | 16. Cap screw                      | 28. Tube sleeve             |
| 5. Dipstick                   | 17. Lock washer                    | 29. O-ring                  |
| 6. Hose clamps                | 18. Suction tube assembly          | 30. Tube sleeve             |
| 7. Dipstick hose              | 19. O-ring                         | 31. Lubrication clutch tube |
| 8. Dipstick tube              | 20. Suction tube clip              | 32. O-ring                  |
| 9. Connector                  | 21. Low speed clutch pressure tube | 33. Tube sleeve             |
| 10. Elbow                     | 22. O-ring                         | 34. Transmission housing    |
| 11. Third speed pressure plug | 23. Tube sleeve                    |                             |
| 12. Stud                      | 24. O-ring                         |                             |

TA127361

**4-4. TRANSMISSION MAINTENANCE (cont)**

*e. Transmission Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
4	Transmission housing (34)	a. Two cap screws (14) b. Two lock washers (15) c. Cap screw (16) d. Lock washer (17) e. Suction tube assembly (18) f. O-ring(19) g. Suction tube clip (20)	Remove Remove Remove Remove Withdraw Remove and discard Remove	From transmission housing
NOTE				
To drill out tube ends, use drill bit with same diameter of tubes at sleeves.				
		h. Low speed clutch pressure tube (21) i. O-rings (22 and 24) j. Tube sleeves (23 and 25) k. Third speed tube (26) l. O-rings (27 and 29) m. Tube sleeves (28 and 30) n. Lubrication clutch tube (31) o. O-ring (32) p. Tube sleeve (33)	Remove and discard Remove and discard Remove and discard Remove Remove and discard Remove and discard Remove Remove and discard Remove and discard	Drill out tube ends at points V and X   Drill out tube ends at points U and W   Drill out tube end at point Z
CLEANING				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*e. Transmission Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
5		Transmission housing (34)	Clean	Use cleaning solvent P-D-680. Thoroughly clean interior and exterior of housing. Dry thoroughly using moisture free compressed air or clean cloths
6		AU other parts	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry thoroughly using moisture free compressed sir or clean cloths
INSPECTION				
7		Transmission housing (34)	Inspect	Inspect tubes for cracks, damage, wear or evidence of leaking condition. If any of these conditions are observed, remove and replace tubes. Inspect housing for cracks, damage, wear, pits, nicks and distortion. if any of these conditions are observed, replace housing
8		All other parts	inspect	Inspect for cracks, pits, wear, distortion, and damaged condition. If any of these conditions are observed, replace part
REASSEMBLY				
9	Transmission housing (34)	a. Lubrication clutch tube (31) b. Tube sleeve (33)	Position Position and press	Over forward end of clutch tube (3 1). Press firmly into bore of housing
<b>NOTE</b>				
Tube ends must remain flush with face of housing.				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*e. Transmission Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
9 (cont)		c. Tube sleeve (33) lubrication clutch tube (31)	Install	<p>You must use an expander tool to install tube sleeves and tubes. Pull mandrel shaft out of tool as far as possible and insert expander in tube. Turn mandrel by hand until tool is firmly seated. Use a wrench to turn mandrel as far as possible. Back off mandrel and remove tool</p>
<p style="text-align: right;"><b>TA127362</b></p>				
		d. O-ring (32)	Install	Lubricate with OE10 (refer to current lubrication order)
		e. Third speed tube (26)	Position	
		f. Tube sleeves (28 and 30)	Position and press	Over ends of tube (26). Press firmly into bore of housing
<b>NOTE</b>				
Tube ends must remain flush with face of housing.				
		g. Third speed tube (26)	Install	Use expander tool
		h. O-rings (27 and 29)	Install	Lubricate with OE10 (refer to current lubrication order)
		i. Low speed clutch pressure tube (21)	Position	
		j. Tube sleeves (23 and 25)	Position and press	Over ends of tube (21). Press firmly into bore of housing
<b>NOTE</b>				
Tube ends must remain flush with face of housing.				
		k. Low speed clutch pressure tube (21)	Install	Use expander tool

**4-4. TRANSMISSION MAINTENANCE (cont)**

*e. Transmission Housing (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
9 cont)		1. O-rings (22 and 24)	Install	Lubricate with OE10 (refer to current lubrication order) On suction tube assembly (18) Lubricate with OE10 (refer to current lubrication order)
		m. Suction tube clip (20)	Position	
		n. O-ring(19)	Install	
		o. Suction tube assembly (18)	Position	
		p. Lock washer (17)	Install	
		q. Cap screw (16)	Install	
		r. Two lock washers (15)	Install	
		s. Two cap screws (14)	Install	
<b><u>WARNING</u></b>				
Dry cleaning solvent P-D-680 used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air and medical attention immediately. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water and get medical aid immediately.				
10	Transmission housing (34), front	t. Transmission housing (34)	Clean	Use solvent type cleaning fluid. Thoroughly clean housing and tubes using clean, soft, absorbent, lintless cloth moistened with cleaning fluid. Dry thoroughly with clean, soft absorbent, lintless cloth
		a. O-ring(13)	Install	Lubricate with OE10 (refer to current lubrication order)
		b. Stud (12) c. Third speed pressure plug(11)	install Install	
11	Transmission housing (34), rear	a. Elbow (10)	Install	In elbow
		b. Connector (9)	Install	
		c. Dipstick tube (8)	Install	On dipstick tube
		d. Dipstick hose (7)	Install	
		e. Two hose clamps (6)	Install	
		f. Dipstick (5)	Install	
		g. Two dowel pins (4)	Install	
		h. Magnetic drain plug (3)	Install	
12	Transmission housing (34), left side	a. Two plugs (2)	Install	
		b. Plug (1)	Install	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly.*

- This task covers:
- a. Disassembly
  - b. Cleaning
  - c. Inspection
  - d. Reassembly

**INITIAL SETUP**

**TOOLS**

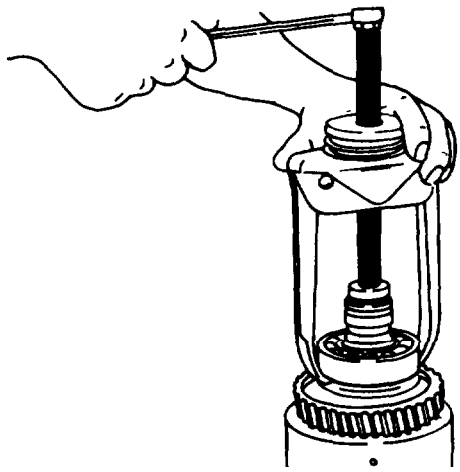
- Pry Bars (2)
- Sleeve, 6 inches long, 3-1/4 inches outside diameter, 2-3/4 inches inside diameter with a 1-1/2 inch by 1 inch opening
- Arbor press, 1/2 ton capacity
- Rod, 6 inches long by 3/8 inch diameter
- Sleeve, 6 inches long, 2-3/4 inches inside diameter
- No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654

**MATERIALS/PARTS**

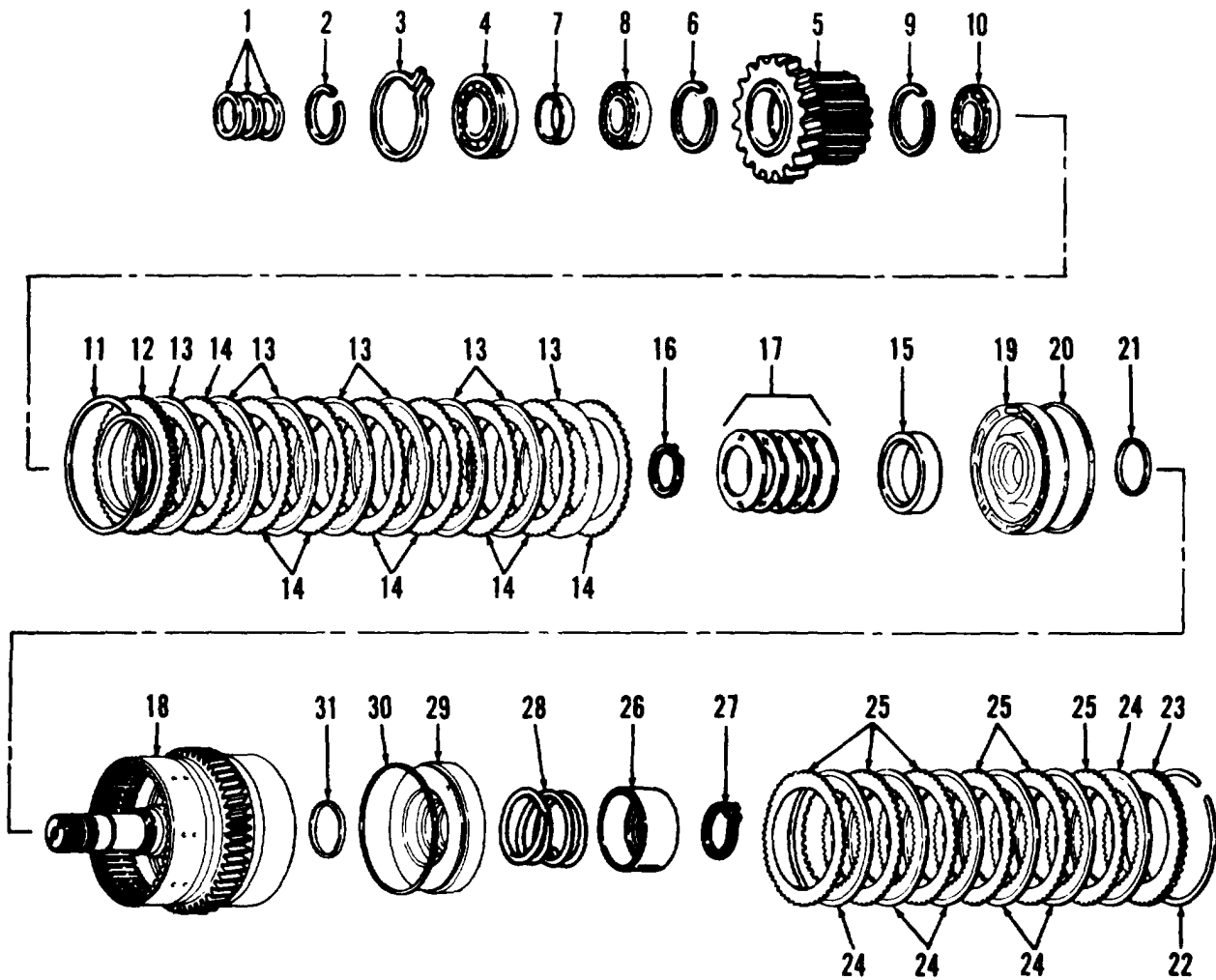
- Cleaning solvent P-D-680
- Clean cloths
- Light oil
- Retaining rings
- Piston rings
- Piston seals
- OE10 (refer to current lubrication order)

**EQUIPMENT CONDITION**

Paragraph	Condition Description
4-4a	Reverse and second clutch assembly removed from transmission.

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Reverse clutch side	a. Three reverse and second shaft piston rings (1)	Remove	
		b. Retaining ring (2)	Remove and discard	
		c. Retaining ring (3)	Remove and discard	
		d. Reverse and second shaft bearing (4)	Remove	
				Use puller as shown
				
				TA127384

4-4. TRANSMISSION MAINTENANCE (CONT)



TA246144

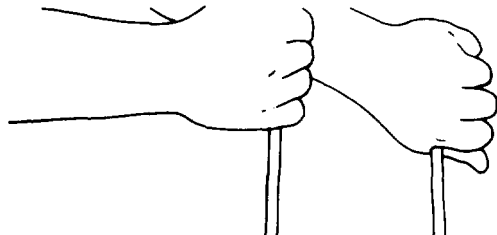
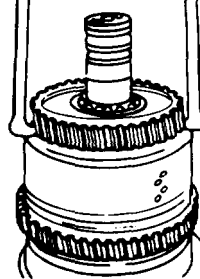
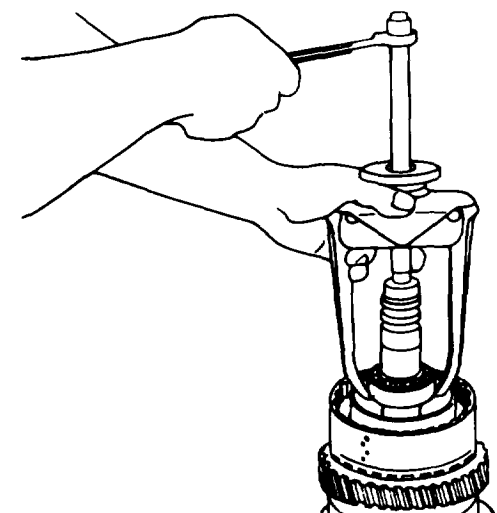
**KEY**

- |  |   |                               |
|--|---|-------------------------------|
| 1. Reverse and second shaft piston rings | 10. Clutch driven gear bearing                      | 21. Inner clutch piston seal  |
| 2. Retaining ring                        | 11. Retaining ring                                  | 22. Retaining ring            |
| 3. Retaining ring                        | 12. Clutch disc backing plate                       | 23. Clutch disc backing plate |
| 4. Reverse and second shaft bearing      | 13. Inner clutch discs                              | 24. Inner clutch discs        |
| 5. Reverse clutch gear and hub assembly  | 14. Outer clutch discs                              | 25. Outer clutch discs        |
| 6. Retaining ring                        | 15. Piston return spring spacer                     | 26. Spring retainer           |
| 7. Bearing spacer                        | 16. Retaining ring                                  | 27. Retaining ring            |
| 8. Clutch gear bearing                   | 17. Piston return springs                           | 28. Piston spring             |
| 9. Retaining ring                        | 18. Reverse and second shaft drum and plug assembly | 29. Clutch piston             |
|  | 19. Clutch piston                                   | 30. Outer clutch piston seal  |
|  | 20. Outer clutch piston seal                        | 31. Inner clutch piston seal  |



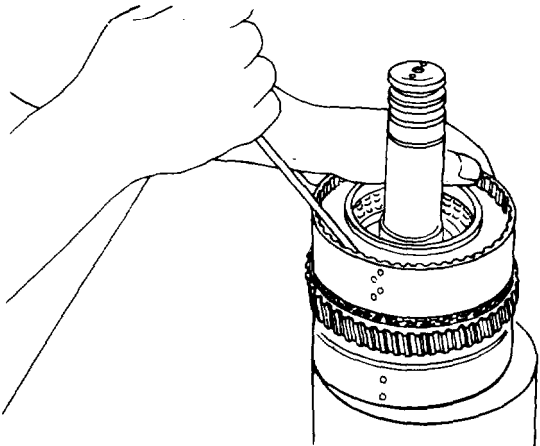
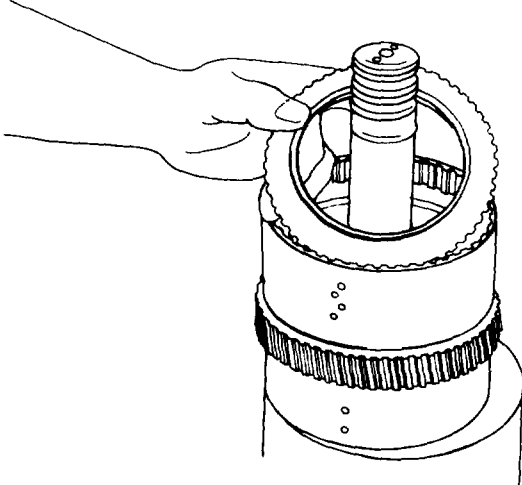
**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
1 (cont)		e. Reverse clutch gear and hub assembly (5)	Pry up and remove	Pry reverse clutch gear and hub assembly from clutch assembly using pry bars as shown. Pry far enough to install gear puller then remove gear and hub assembly
		f. Retaining ring (6)	Remove and discard	Use puller
		g. Bearing spacer (7)	Remove	
		h. Clutch gear bearing (8)	Remove	
		i. Retaining ring (9)	Remove and discard	
		j. Clutch driven gear bearing (10)	Remove	Use puller
				 
				TA127365
				
				TA127366

**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
1 (cont)		k. Retaining ring (11)	Remove and discard	Use a screwdriver and remove carefully  TA127367
		l. Clutch disc backing plate (12)	Remove	 TA127368
		m. Eight inner clutch discs (13)	Remove	
		n. Eight outer clutch discs (J 4)	Remove	

**4-4. TRANSMISSION MAINTENANCE (cont)**

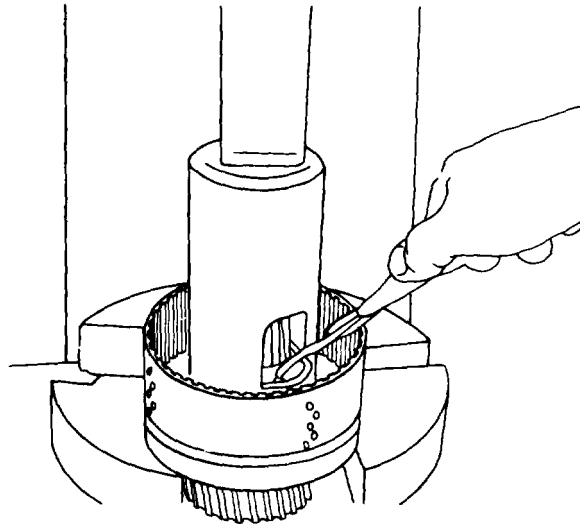
*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS																																			
<b>DISASSEMBLY (cont)</b>																																							
1 cont)		o. Piston return spring spacer (15)	Compress	Use sleeve (with portion removed) installed in press, for removing retaining ring (16), piston return spring spacer (15), and piston return springs (17)																																			
TA127369																																							
<table border="0" style="width: 100%;"> <tr> <td></td> <td></td> <td>p. Retaining ring (16)</td> <td>Remove and discard</td> <td>Through opening in sleeve</td> </tr> <tr> <td colspan="2"></td> <td>q. Piston return spring spacer (15)</td> <td>Release and remove</td> <td>Carefully and slowly release pressure on sleeve</td> </tr> <tr> <td colspan="2"></td> <td>r. Five piston return springs (17)</td> <td>Remove</td> <td></td> </tr> <tr> <td colspan="2"></td> <td>s. Reverse and second shaft drum and plug assembly (18)</td> <td>Invert</td> <td></td> </tr> <tr> <td colspan="2"></td> <td>t. Clutch piston (19)</td> <td>Remove</td> <td>Tap reverse and second shaft drum and plug assembly (18) on block of wood to remove</td> </tr> <tr> <td colspan="2"></td> <td>u. Outer clutch piston seal (20)</td> <td>Remove and discard</td> <td></td> </tr> <tr> <td colspan="2"></td> <td>v. Inner clutch piston seal (21)</td> <td>Remove and discard</td> <td></td> </tr> </table>							p. Retaining ring (16)	Remove and discard	Through opening in sleeve			q. Piston return spring spacer (15)	Release and remove	Carefully and slowly release pressure on sleeve			r. Five piston return springs (17)	Remove				s. Reverse and second shaft drum and plug assembly (18)	Invert				t. Clutch piston (19)	Remove	Tap reverse and second shaft drum and plug assembly (18) on block of wood to remove			u. Outer clutch piston seal (20)	Remove and discard				v. Inner clutch piston seal (21)	Remove and discard	
		p. Retaining ring (16)	Remove and discard	Through opening in sleeve																																			
		q. Piston return spring spacer (15)	Release and remove	Carefully and slowly release pressure on sleeve																																			
		r. Five piston return springs (17)	Remove																																				
		s. Reverse and second shaft drum and plug assembly (18)	Invert																																				
		t. Clutch piston (19)	Remove	Tap reverse and second shaft drum and plug assembly (18) on block of wood to remove																																			
		u. Outer clutch piston seal (20)	Remove and discard																																				
		v. Inner clutch piston seal (21)	Remove and discard																																				
2	Second clutch side	a. Retaining ring (22)	Remove and discard																																				
		b. Clutch disc backing plate (23)	Remove																																				
		c. Six inner clutch discs (24)	Remove																																				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
2 (cont)		d. Six outer clutch discs (25)	Remove	
		e. Spring retainer (26)	Compress	Use sleeve with portion removed for removing spring retainer (26), retaining ring (27) and piston spring (28)
		f. Retaining ring (27)	Remove and discard	Through opening in sleeve
		g. Spring retainer (26)	Release and remove	Carefully and slowly release pressure on sleeve
		h. Piston spring (28)	Remove	
		i. Reverse and second shaft drum and plug assembly (18)	Invert	
		j. Clutch piston (29)	Remove	Tap reverse and second shaft drum and plug assembly on block of wood to remove clutch piston
		k. Outer clutch piston seal (30)	Remove and discard	
		l. Inner clutch piston seal (31)	Remove and discard	



TA127369

**4-4. TRANSMISSION MAINTENANCE (cont)**

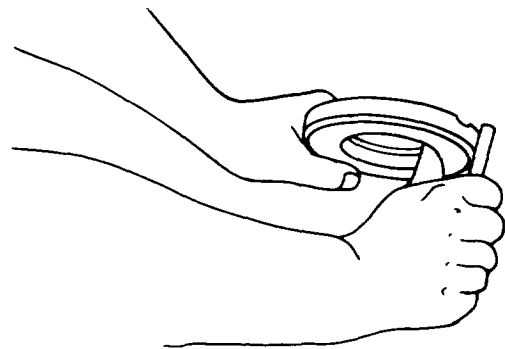
*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
3		Bearings (4, 8, 10)	Clean	<p>Use cleaning solvent P-D-680. Immerse bearings in cleaning solvent and move slowly up and down. Remove bearings. Strike larger side of cone against block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning solvent. Repeat this process until bearings are thoroughly clean. Dry bearings with moisture-free compressed air. Direct air stream across bearing. Do not spin the bearings when drying. Rotate bearings slowly by hand to facilitate drying.</p>
4		All other parts	Clean	<p>Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry parts thoroughly using moisture-free compressed air or clean cloths</p>

**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

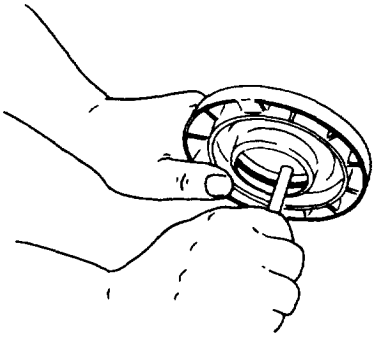
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
5		Reverse and second shaft drum and plug assembly (18)	Inspect	Inspect teeth for wear, pits, cracks, nicks and scores. Inspect shaft and quills to make certain they are not sprung, bent or have twisted splines, and that shafts are true. Inspect overall for wear, cracks, distortion and damage. If any of these conditions are observed, replace reverse and second shaft drum and plug assembly
6		Inner clutch discs (13, 24), outer clutch discs (14, 25)	Inspect	Inspect each disc for wear, cracks, damage and breaks. If any of these conditions are observed, replace disc
7		Piston return springs (17), piston spring (28)	Inspect	Inspect for cracks, distortion, broken condition, wear and evidence of permanent set. If any of these conditions are observed, replace spring
8		Bearings (4, 8, 10)	Inspect	Inspect rollers and cages for wear, chips, nicks and damage. [f any of these conditions are observed, replace bearing. Dip bearings in clean light oil and wrap in clean lintless cloth or paper
9		All other parts	Inspect	Inspect for wear, damage, cracks and distortion. If any of these conditions are observed, replace part
<b>REASSEMBLY</b>				
10	Clutch piston (29)	a. Outer clutch piston seal (30)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston



TA127370

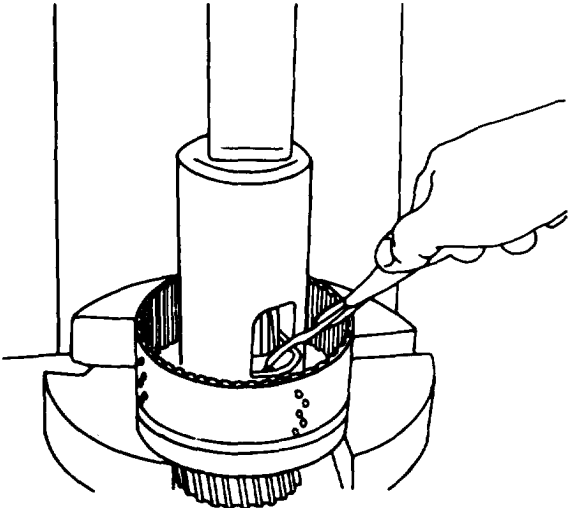
**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
(cont)		b. Inner clutch piston seal (31)	Install and size	<p>Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston</p>  <p style="text-align: right;"><b>TA127371</b></p> <p style="text-align: center;"><b>NOTE</b></p> <p>Seals must be sized before installing clutch piston in drum and plug assembly (18).</p> <p style="text-align: center;"><b>CAUTION</b></p> <p>Use care to not damage inner and outer seals.</p>
11	Second clutch side	a. Clutch piston (29)	Install	
		b. Piston spring (28)	Position	
		c. Spring retainer (26)	Position	
		d. Retaining ring (27)	Position	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
11 (cont)		e. Spring retainer (26), piston spring (28)	Compress	Use sleeve installed in press
				
		f. Retaining ring (27)	Install	Install retaining ring through opening in sleeve; remove sleeve
		g. Outer clutch disc (25)	Install	Install one, after applying light film of OE10 (refer to current lubrication order)
		h. Inner clutch disc (24)	Install	Install one, after applying light film of EO10 (refer to current lubrication order)
		i. Outer clutch disc (25), inner clutch disc (24)	Install	Coat each disc lightly with OE10 grease (refer to current lubrication order). Position an outer disc (25) next to an inner disc (24) until all discs are installed. Last disc is an inner disc
		j. Clutch backing plate (23)	Install	
		k. Retaining ring (22)	Install	
	Clutch piston (19)	a. Outer clutch piston seal (20)	Install and size	Size seal as described in step 10 above
		b. Inner clutch piston seal (21)	Install and size	Size seal as described in step 10 above
			<b>NOTE</b>	
		Seals must be sized before installing clutch piston in drum and plug assembly.		

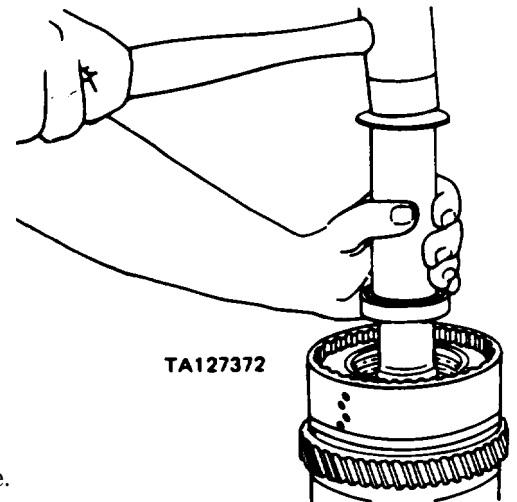
TA127369



**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
<b><u>CAUTION</u></b>				
Use care to not damage inner and outer seals.				
13	Reverse clutch side	a. Clutch piston (19)	Install	
		b. Piston return spring spacer (15)	position	
		c. Five piston return springs (17)	Install	Position first piston return spring with curved side up, then alternate remaining piston return springs
		d. Retaining ring (16)	Position	On drum and plug assembly (18)
		e. Piston return spring spacer (15)	Compress	Use sleeve installed in press
		f. Retaining ring (16)	Install	Install retaining ring through opening in sleeve; remove sleeve after installation
		g. outer clutch disc (14)	Install	Install one outer clutch disc
		h. Inner clutch disc (13)	Install	Install one
		i. Outer clutch disc (14), inner clutch disc (13)	Install	Install remaining discs, alternating between outer clutch discs and inner clutch discs. The last disc installed is inner clutch disc
		j. Clutch disc backing plate (12)	Install	
		k. Retaining ring (11)	Install	
		l. Clutch driven gear bearing (10)	Install	Use mallet and sleeve
		m. Retaining ring (9)	Install	
		n. Bearing spacer (7)	Install	
o. Retaining ring (6)	Install			
<b><u>CAUTION</u></b>				
Do not force this procedure.				
		p. Reverse clutch gear and hub assembly (5)	Install	Align splines on hub with internal teeth of discs. Tap hub gently into position. Hub splines must be in full position with internal teeth of all discs



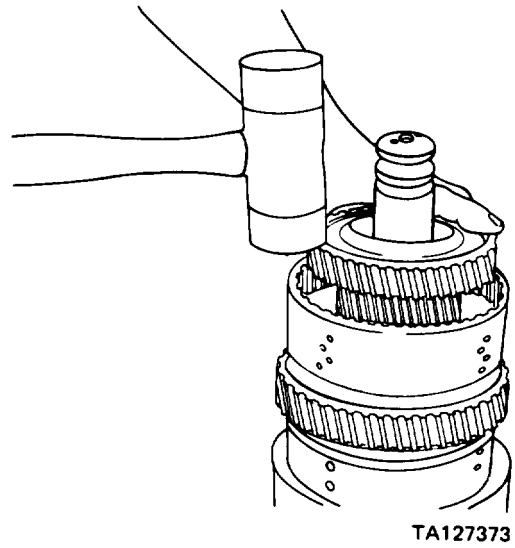
**4-4 TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
------	----------	------	--------	---------

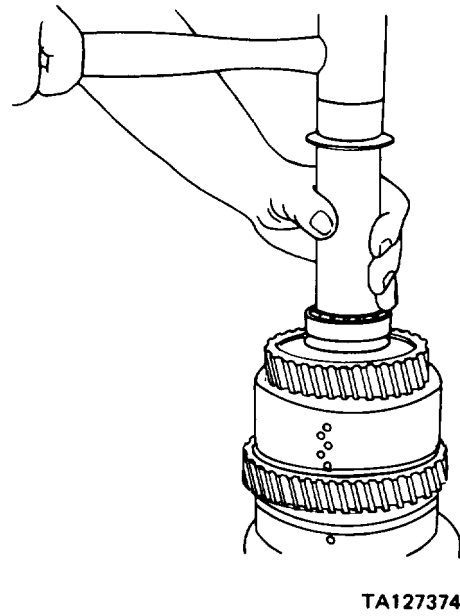
REASSEMBLY (cont)

13  
(cont)



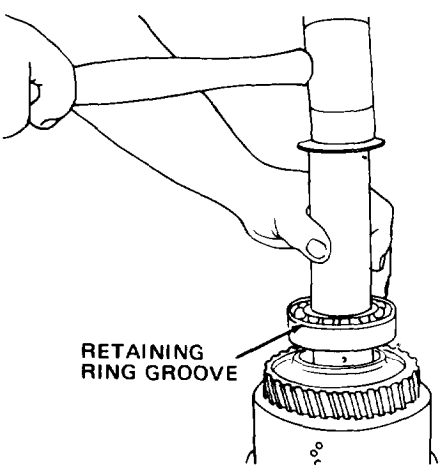
q. Clutch gear bearing (8) Install

Use mallet and sleeve



**4-4. TRANSMISSION MAINTENANCE (cont)**

*f. Reverse and Second Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
13 (cont)		r. Reverse and second shaft bearing (4)	Install	<p>Use mallet and sleeve</p>  <p style="text-align: right;">TA127375</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Install reverse and second shaft bearing (4) with retaining ring groove at top.</p>
		s. Retaining ring (3)	Install	Into reverse and second shaft bearing groove
		t. Retaining ring (2)	Install	
		u. Three reverse and second shaft piston rings (1)	Install	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly.*

- This task covers:    a. Disassembly  
                               b. Cleaning  
                               c. Inspection  
                               d. Reassembly

INITIAL SETUP

TOOLS

- Sleeve, 6 inches long, 3-1/4 inches outside diameter, 2-3/4 inches inside diameter with a 1-1/2 inch opening
- Arbor press, 1/2 ton capacity
- Rod, 6 inches long by 3/8 inch diameter
- Sleeve, 6 inches long, 2-3/4 inches inside diameter
- No. 1 Common Organizational Maintenance Tool Kit      NSN 4910-00-754-0654

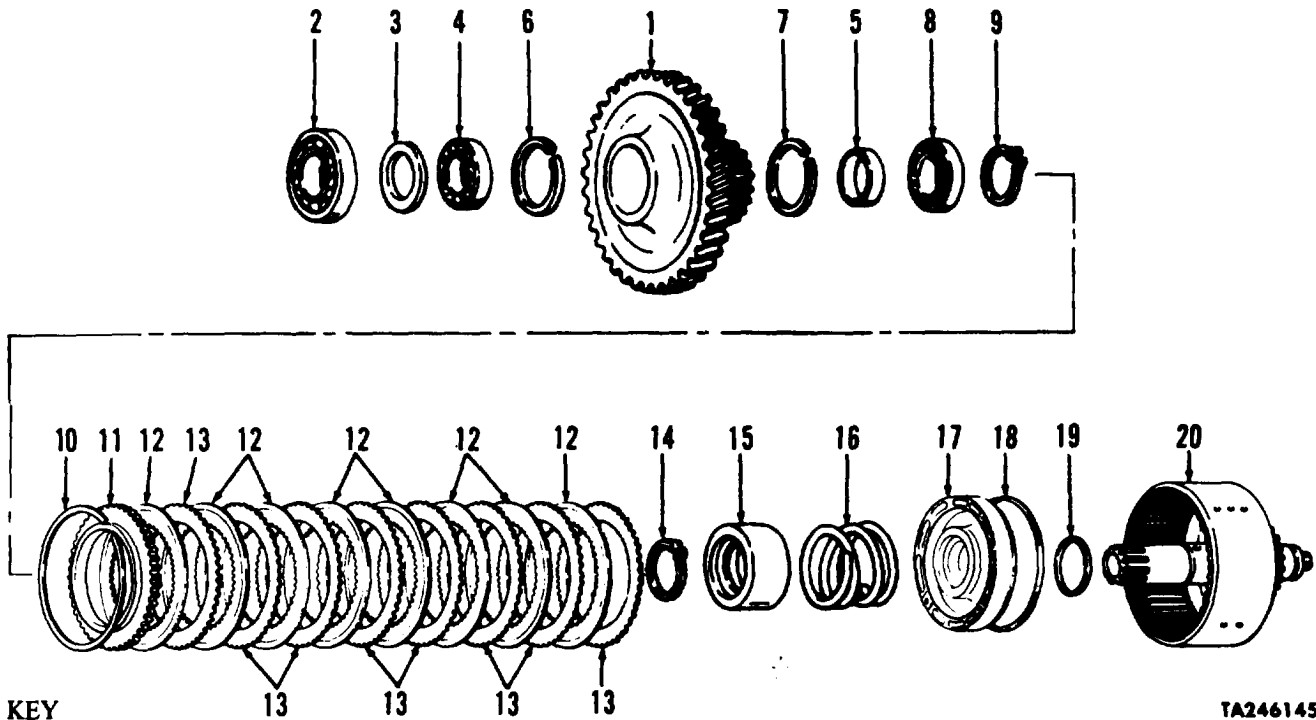
MATERIALS/PARTS

- Light oil
- Cleaning solvent P-D-680
- Clean cloths
- Locating rings
- Retaining rings
- Piston seals
- OE10 (refer to current lubrication order)

NSN 8030-00-873-4792

EQUIPMENT CONDITION

Paragraph	Condition Description
4-4d	Low clutch assembly removed from transmission.



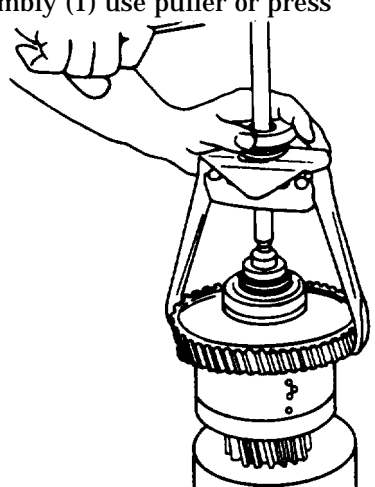
KEY

TA246145

- |                                    |                                     |                              |  |
|------------------------------------|-------------------------------------|------------------------------|--|
| 1. Low shaft gear and hub assembly | 7. Bearing locating ring            | 12. Inner clutch discs       | 19. Inner clutch piston seal                       |
| 2. Front bearing                   | 8. Low speed gear bearing           | 13. Outer clutch discs       | 20. Low clutch shaft drum and bleed valve assembly |
| 3. Spacer                          | 9. Low speed bearing retaining ring | 14. Retaining ring           |  |
| 4. Low speed gear bearing          | 10. Retaining ring                  | 15. Spring retainer          |  |
| 5. Low speed gear spacer           | 11. Clutch disc backing plate       | 16. Piston return spring     |  |
| 6. Bearing locating ring           |                                     | 17. Clutch piston            |  |
|                                    |                                     | 18. Outer clutch piston seal |  |

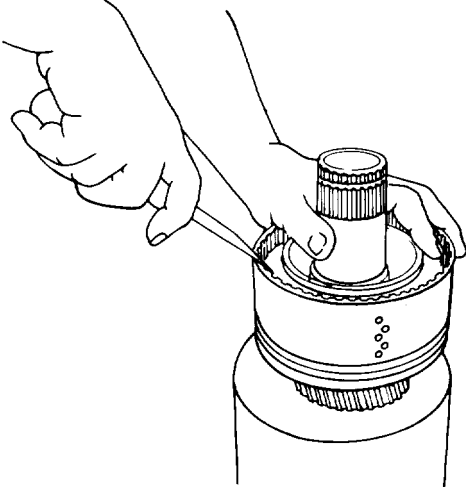
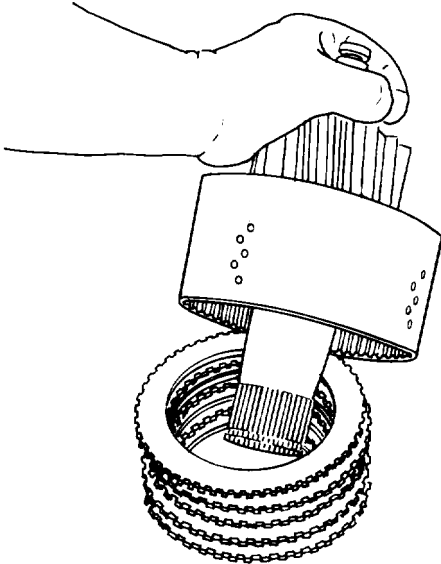
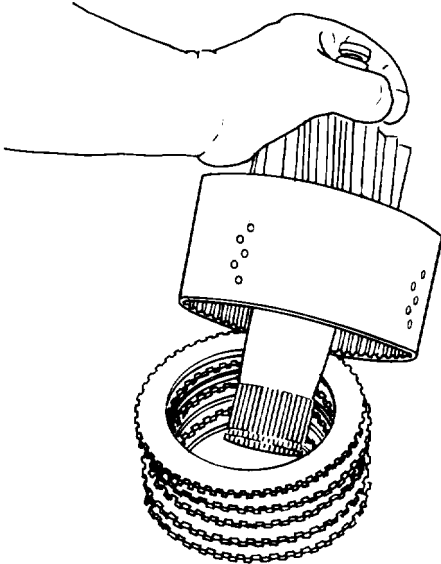
**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1		Front bearing (1)	Remove	Use puller
2		Spacer (2)	Remove	
3		Low shaft gear and hub assembly (3)	Remove	As shown below using puller
4		Low speed gear bearing (4)	Remove	To remove from gear and hub assembly (1) use puller or press
5		Low speed gear spacer (S)	Remove	 <p style="text-align: right;">TA127377</p>
6		Bearing locating ring (6 and 7)	Remove and discard	
7		Low speed gear bearing (8)	Remove	
8		Low speed bearing retaining ring (9)	Remove and discard	

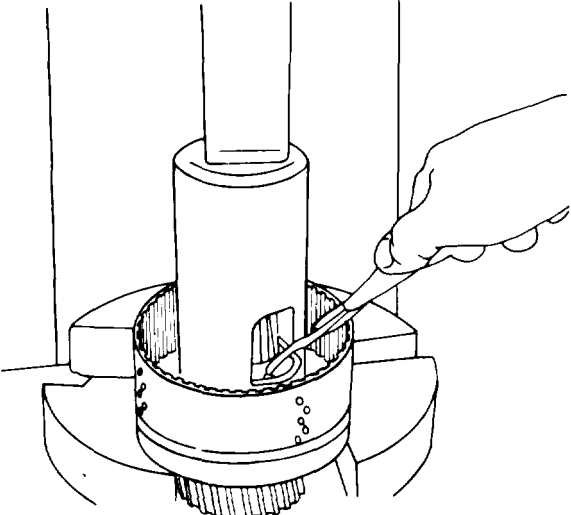
**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
9		Retaining ring (10)	Remove and discard	
10		Clutch disc backing plate (11)	Remove	 <p style="text-align: right;">TA127379</p>
11		Eight inner clutch discs (12) and outer clutch discs (13)	Remove	<p>Turn low clutch shaft drum and bleed valve assembly over to remove as shown below</p>  <p style="text-align: right;">TA127380</p>

**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
12		Retaining ring (14)	Remove and discard	Install sleeve in press; place low clutch assembly on press and compress spring retainer (15). Remove retaining ring through opening in sleeve as shown. Carefully and slowly release pressure on spring retainer
<div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>TA127369</p> </div> </div>				
13		Spring retainer (15)	Remove	
14		Piston return spring (16)	Remove	
15		Clutch piston (17)	Remove	Turn low clutch shaft drum and bleed valve assembly over and tap on block of wood to remove
16		Outer clutch piston seal (18)	Remove and discard	
17		Inner clutch piston seal (19)	Remove and discard	

**4-4. TRANSMISSION MAINTENANCE (cont)**

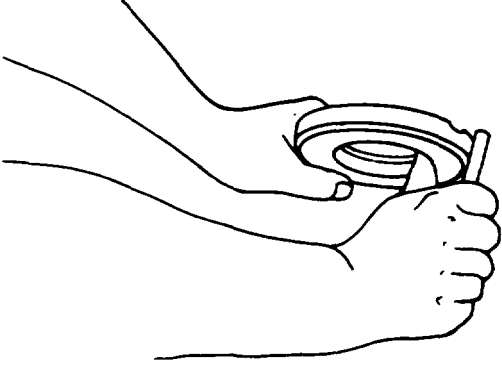
*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				
18		Earrings (2,4,8)	Clean	Use cleaning solvent P-D-680. Immerse bearings in cleaning solvent and move slowly up and down. Remove bearings. Strike larger side of cone against block of wood to dislodge solidified particles of lubricant, Immerse again in cleaning solvent. Repeat this process until bearings are thoroughly clean, Dry bearings with moisture-free compressed air. Direct air stream across bearing. Do not spin the bearings when drying. Rotate bearings slowly by hand to facilitate drying
19		All parts	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry parts thoroughly using compressed air or clean cloths



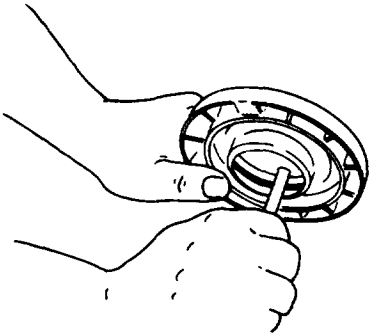
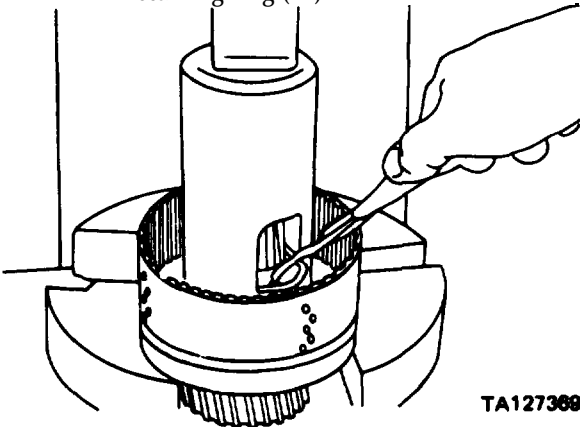
**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
20		Low clutch shaft drum and bleed valve assembly (20)	inspect	Inspect teeth for wear, pits, cracks, chips, nicks and scores. Inspect body for cracks, wear, distortion and damage. If any of these conditions are observed, replace drum and bleed valve assembly
21		Inner clutch discs (12), outer clutch discs (13)	Inspect	Replace disc if worn, cracked, damaged or broken
22		Piston return spring (16)	Inspect	Replace if cracked, worn, distorted, broken or permanently set
23		Bearings (2, 4, 8)	Inspect	Inspect rollers and cages for wear, chips, nicks and damage. Replace if any of these conditions are observed. Dip bearings in clean light oil and wrap in clean lintless cloth or paper
24		All other parts	Inspect	Inspect for wear, damage, cracks and distortion. If any of these conditions are observed, replace part
<b>REASSEMBLY</b>				
25		Outer clutch piston seal (18)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston
				
TA127270				

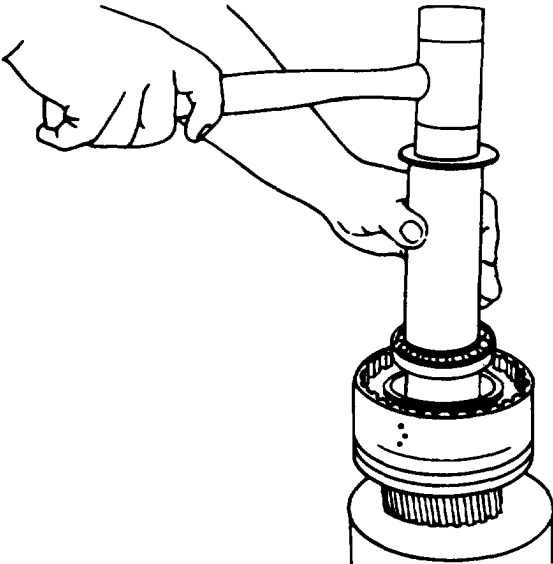
**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
26		Inner clutch piston seal (19)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston
				
<b>TA127371</b>				
<b>NOTE</b>				
Seals must be sized before installing clutch piston in low clutch shaft drum and bleed valve assembly (20).				
<b>CAUTION</b>				
Don't damage inner or outer seals.				
27		Clutch piston (17)	Install	
28		Piston return spring (16)	Position	
29		Spring retainer (15)	Position	
30		Retaining ring (14)	Position	Install sleeve in press; place low clutch assembly on press and compress spring retainer. Install retaining ring through opening in sleeve as shown. Remove low clutch assembly and sleeve from press
				
<b>TA127369</b>				

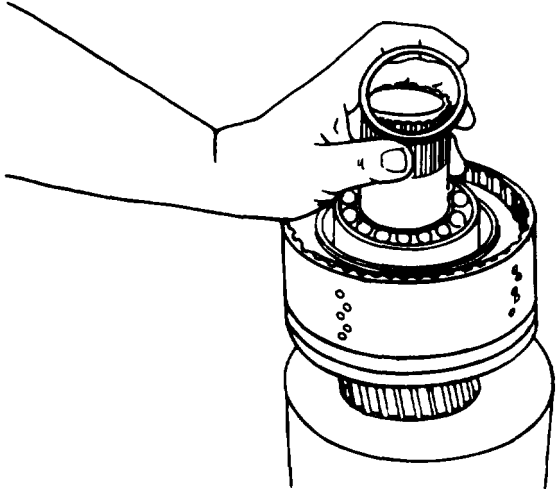
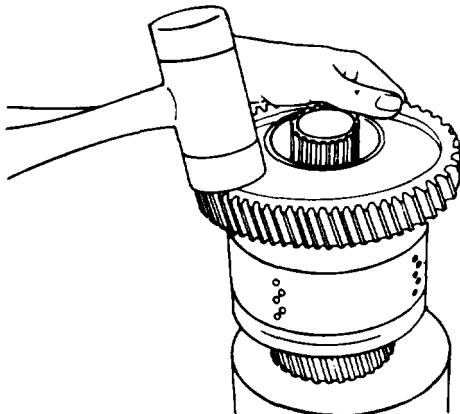
**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
31		Low speed bearing retaining ring (9)	Install	
32		Outer clutch disc (steel) (13)	Install	Install one disc, after applying light film of OE10 (refer to current lubrication order)
33		Inner clutch disc (friction) (12)	Install	Install one disc, after applying light film of OE10 (refer to current lubrication order)
34		Outer clutch discs (13) and inner clutch discs (12)	Install	Coat each disc lightly with OE10 grease (refer to current lubrication order). Position outer (steel) disc (13) next to an inner (friction) disc (12) until all discs are installed. The last disc installed is an inner disc. Align teeth of all discs
35		Clutch disc backing plate (11)	Install	
36		Retaining ring (10)	Install	
37		Low speed gear bearing (8)	Install	
				 <p style="text-align: right;">TA127381</p>
38		Bearing locating ring (7)	Install	

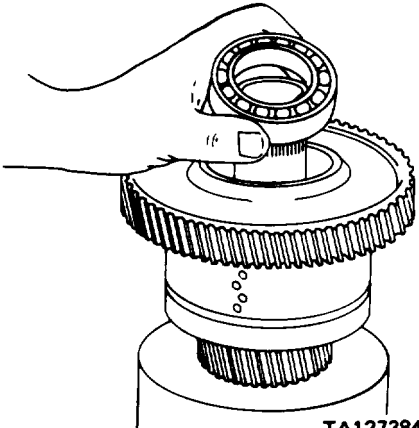
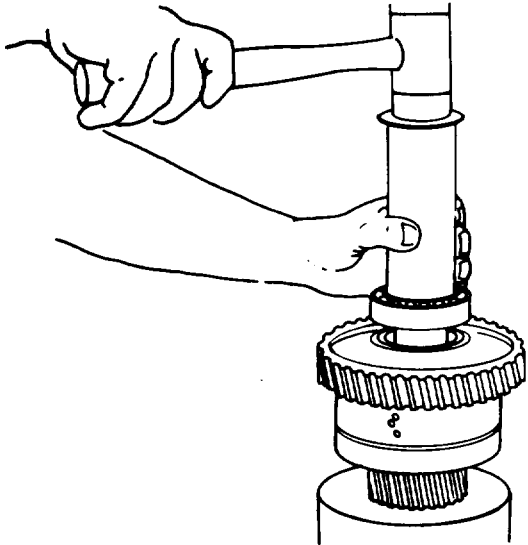
**4-4. TRANSMISSION MAINTENANCE (cont)**

*g. Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
39		Low speed gear spacer (5)	Install	 <p style="text-align: right;">TA127382</p>
40		Low shaft gear and hub assembly (1)	Install	<p>Align splines on clutch hub with internal teeth of friction discs. Don't force installation. Gear splines must mesh with internal teeth of all friction discs</p>  <p style="text-align: right;">TA127383</p>
41		Bearing locating ring (6)	Install	

**4-4. TRANSMISSION MAINTENANCE (cont)**

g. *Low Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
42		Low speed gear bearing (4)	Install	 <p>TA127384</p>
43		Spacer (3)	Install	
44		Front bearing (2)	Install	 <p>TA127385</p>

**4-4. TRANSMISSION MAINTENANCE (cont)**

*h. Third Clutch Assembly.*

- This task covers:
- a. Disassembly
  - b. Cleaning
  - c. Inspection
  - d. Reassembly

INITIAL SETUP

TOOLS

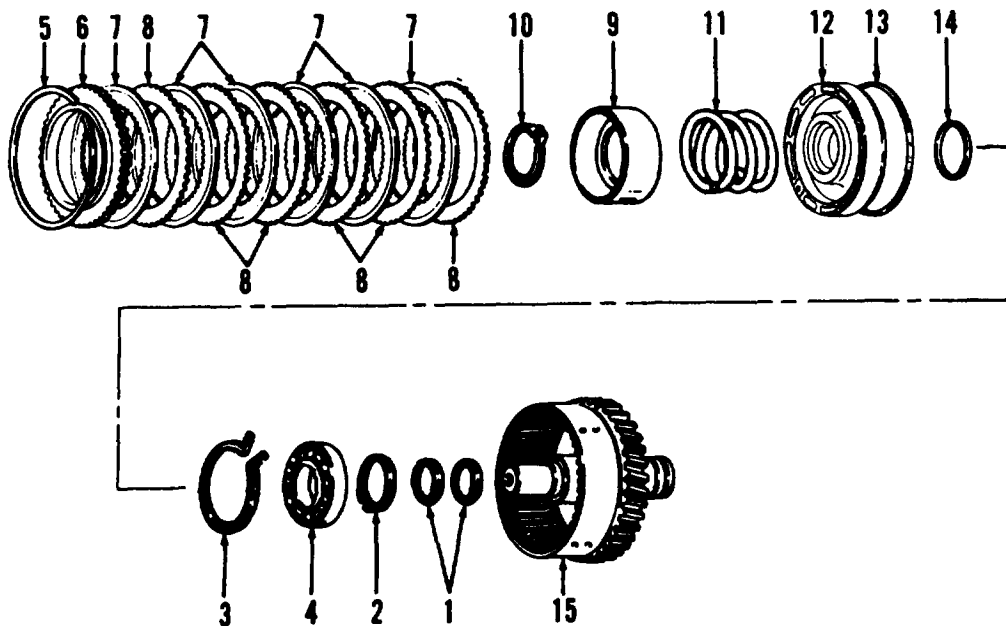
- Sleeve, 6 inches long, 3-1/4 inches outside diameter, 2-3/4 inches inside diameter with a 1-1/2 inch by 1 inch opening
- Arbor press, 1/2 ton capacity
- Rod, 6 inches long by 3/8 inch diameter
- Sleeve, 6 inches long, 2-3/4 inches inside diameter
- No. 1 Common Organizational Maintenance Tool Kit (NSN 49104)0754-0654

MATERIALS/PARTS

- Cleaning solvent P-D-680
- Clean cloths
- Light oil
- Retaining rings
- Piston rings
- Piston seals
- Locating rings
- OE10 (refer to current lubrication order)

EQUIPMENT CONDITION

Paragraph	Condition Description
4-4d	Third clutch assembly removed from transmission.



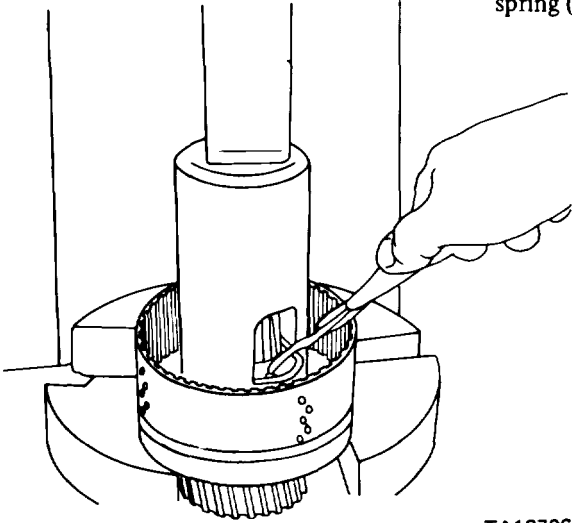
KEY

- |   |   |  |
|---|---|--|
| <ul style="list-style-type: none"> <li>1. Third clutch shaft piston rings</li> <li>2. Retaining ring</li> <li>3. Third clutch shaft front bearing locating ring</li> <li>4. Third clutch shaft front bearing</li> </ul> | <ul style="list-style-type: none"> <li>5. Retaining ring</li> <li>6. Clutch disc backing plate</li> <li>7. Inner clutch discs</li> <li>8. Outer clutch discs</li> <li>9. Spring retainer</li> <li>10. Retaining ring</li> <li>11. Piston return spring</li> </ul> | <ul style="list-style-type: none"> <li>12. Clutch piston</li> <li>13. Outer clutch piston seal</li> <li>14. Inner clutch piston seal</li> <li>15. Third clutch shaft drum and plug assembly</li> </ul> |
|---|---|--|

TA127386

**4-4. TRANSMISSION MAINTENANCE (cont)**

*h. Third Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY				
1		Two third clutch shaft piston rings (1)	Remove and discard	
2		Retaining ring (2)	Remove and discard	
3		Third clutch shaft front bearing locating ring (3)	Remove and discard	
4		Third clutch shaft front bearing (4)	Remove	Use puller
5		Retaining ring (5)	Remove and discard	
6		Clutch disc backing plate (6)	Remove	
7		Six inner clutch discs (7)	Remove	
8		Six outer clutch discs (8)	Remove	
9		Spring retainer (9)	Compress	Use sleeve (with portion removed) installed in press, for removing retaining ring (10), spring retainer (9) and piston return spring (11)
 <p>TA127369</p>				

**4-4. TRANSMISSION MAINTENANCE (cont)**

*h. Third Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
10		Retaining ring (1,0)	Remove and discard	Remove through opening in sleeve; carefully and slowly release pressure on spring; then remove sleeve
11		Spring retainer (9)	Remove	
12		Piston return spring (11)	Remove	
13		Third clutch shaft drum and plug assembly (15)	Invert	
14		Clutch piston (12)	Remove	Tap third clutch shaft drum and plug assembly on block of wood to remove
15		Outer clutch piston seal (13)	Remove and discard	
16		Inner clutch piston seal (14)	Remove and discard	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

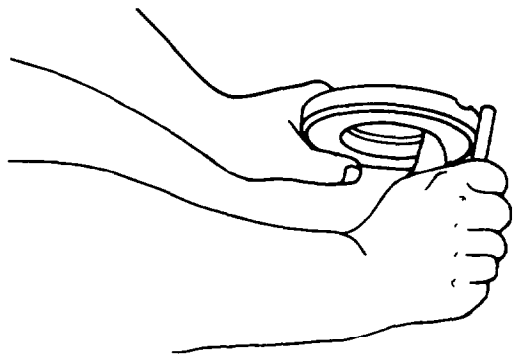
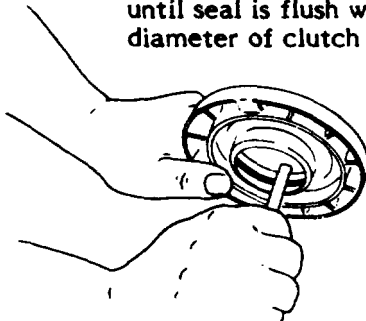


**4-4. TRANSMISSION MAINTENANCE (cont)***h. Third Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
17		Third clutch shaft front bearing (4)	Clean	Use cleaning solvent P-D-680. Immerse bearing in cleaning solvent and move slowly up and down. Remove bearing. Strike larger side of cone against block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid. Repeat this process until bearings are thoroughly clean. Dry with moisture-free compressed air. Direct air stream across bearing. Do not spin bearings when drying. Rotate bearings slowly by hand to facilitate drying
18		All other parts	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry parts thoroughly using compressed air or clean cloths
INSPECTION				
19		Third clutch shaft drum and plug assembly (15)	Inspect	Inspect teeth for wear, pits, cracks, nicks and scores. Inspect shaft and quills to make certain they are not sprung, bent or have twisted splines, and that shafts are true. Inspect overall for wear, cracks, distortion and damage. If any of these conditions are observed, replace part
20		Inner clutch discs (7), outer clutch discs (8)	Inspect	Replace disc if worn, cracked, damaged or broken
21		Piston return spring (11)	Inspect	Replace if cracked, worn, distorted, broken or permanently set
22		Third clutch shaft bearing (4)	Inspect	Inspect rollers and cages for wear, chips, nicks and damage. If any of these conditions are observed, replace bearing. Dip bearing in clean light oil and wrap in clean lintless cloth or paper
23		All other parts	Inspect	Inspect for damage, wear, cracks and distortion. If any of these conditions are observed, replace part

**4-4. TRANSMISSION MAINTENANCE (cont)**

*h. Third Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY</b>				
24	Clutch piston (12)	a. Outer clutch piston seal (13)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston.
				<b>TA127370</b>
		b. Inner clutch piston seal (14)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston
				
<b>NOTE</b>				
Seals must be sized before installing clutch piston into drum and plug assembly (15).				
<b>CAUTION</b>				
Use care to not damage inner and outer seals.				
25	Third clutch shaft drum and plug assembly (15)	a. Clutch piston (12) b. Piston return spring (11) c. Spring retainer (9)	Install Position Position	

**4-4. TRANSMISSION MAINTENANCE (cont)**

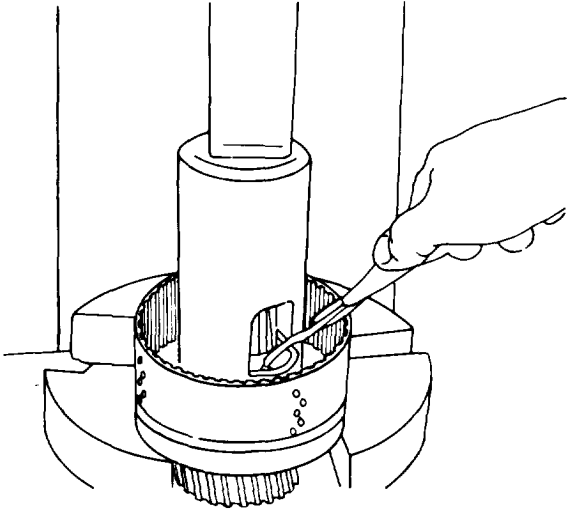
*h. Third Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
		d. Retaining ring (10)	Position	
		e. Spring retainer (9)	Compress	Use sleeve installed in press
		f. Retaining ring (10)	Install	Install retaining ring through opening in sleeve; remove sleeve
<p style="text-align: right;">TA127369</p>				
		g. Outer clutch disc (8)	Install	Install one only, coated lightly with OE10 (refer to current lubrication order)
		h. Inner clutch disc (7)	Install	Install one only, coated lightly with OE10 (refer to current lubrication order)
		i. Outer clutch discs (8), inner clutch discs (7)	Install	Coat remaining discs lightly with OE10 (refer to current lubrication order). Alternate outer and inner disc until all are installed. The last disc installed is inner clutch disc
		j. Clutch disc backing plate (6)	Install	
		k. Retaining ring (5)	Install	
		l. Third clutch shaft drum and plug assembly (15)	Invert	
		m. Third clutch shaft front bearing (4)	Install	Use sleeve and mallet to install
		n. Third clutch shaft front bearing locating ring (3)	Install	
		o. Retaining ring (2)	Install	
		p. Two third clutch shaft piston rings (1)	Install	



**4-4. TRANSMISSION MAINTENANCE (cont)**

*i. Forward Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1		Three forward shaft piston rings (1)	Remove and discard	
2		Retaining ring (2)	Remove and discard	Use pliers
3		Clutch disc backing plate (3)	Remove	
4		Eight inner clutch discs (4)	Remove	
5		Eight outer clutch discs (5)	Remove	
NOTE				
The outer clutch disc next to the clutch piston will have a backing ring on it.				
6		Piston return spring spacer (7)	Compress	Use sleeve (with portion removed) installed in press, for removing retaining ring (6), spring spacer (7), and piston return springs (8)
				
TA127369				

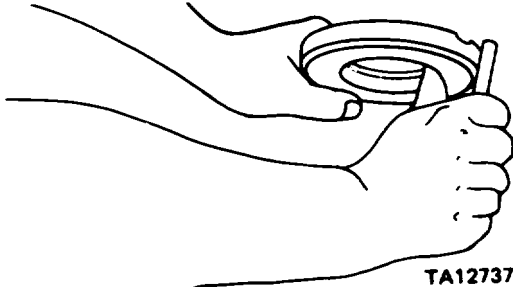
**4-4. TRANSMISSION MAINTENANCE (cont)**

*i. Forwrd Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
7		Retaining ring (6)	Remove and discard	Remove through opening in sleeve
8		Piston return spring spacer (7)	Release and remove	Carefully and slowly release pressure on spring, then remove sleeve
9		Five piston return springs (8)	Remove	
10		Forward shaft drum and plug assembly (12)	Invert	
11		Clutch piston (9)	Remove	Tap forward shaft drum and plug assembly on block of wood to remove clutch piston
12		Outer clutch piston seal (10)	Remove and discard	
13		Inner clutch piston seal (11)	Remove and discard	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

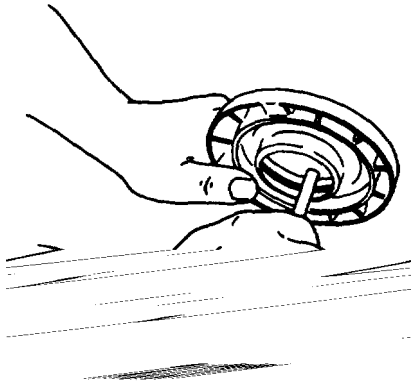
**4-4. TRANSMISSION MAINTENANCE (cont)**

*i. Forward Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
LEANING (cont)				
14		All parts	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry parts thoroughly using compressed air or clean cloths
INSPECTION				
15		Forward shaft drum and plug assembly (12)	Inspect	Inspect teeth for wear, pits, cracks, nick and scores. Inspect shaft and quills to make certain they are not sprung, bent or have twisted splines and that shafts are true. Inspect overall for wear, cracks, distortion and damage. If any of these conditions are observed, replace forward shaft drum and plug assembly
16		Inner clutch discs (4), outer clutch discs (5)	Inspect	Replace disc if worn, cracked, damaged or broken
17		Piston return springs (8)	Inspect	Replace if cracked, worn, distorted, broken or permanently set
18		All other parts	Inspect	Inspect for wear, cracks, distortion and damage. If any of these conditions are observed, replace part
REASSEMBLY				
19	Clutch piston (9)	a. Outer clutch piston seal (10)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston
 <p>TA127370</p>				

**4-4. TRANSMISSION MAINTENANCE (cont)**

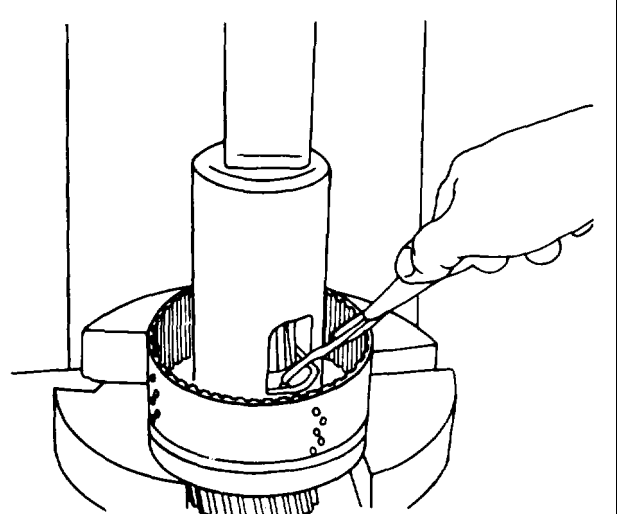
*i. Forward Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
19 (cont)		b. Inner clutch piston seal (11)	Install and size	Lubricate oil seal with OE10 (refer to current lubrication order). To size seal, rotate clutch piston while holding a round object against new seal as shown. Rotate clutch piston until seal is flush with outer diameter of clutch piston
				
<b>NOTE</b>				
Seals must be sized before installing clutch piston into drum and plug.				
<b>CAUTION</b>				
Use care to not damage inner and outer seals.				
20	Forward shaft drum and plug assembly (12)	a. Clutch piston (9) b. Five piston return springs (8)  c. Piston return spring spacer (7) d. Retaining ring (6)	Install Position  Position Position	Install first piston return spring with curved side up, then alternate the remaining piston return springs



**4-4. TRANSMISSION MAINTENANCE (cont)**

*i. Forward Clutch Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
20 (cont)		e. Piston return spring spacer (7)	Compress	Use sleeve (with cut out) installed in press
				
TA127369				
f. Retaining ring (6)			Install	Install retaining ring through opening in sleeve, remove sleeve
g. Outer clutch disc (5)			Install	Apply light film of OE10 (refer to current lubrication order), then install outer clutch disc with backing ring only
h. Inner clutch disc (4)			Install	Install one only after coating lightly with OE10 (refer to current lubrication order)
i. Outer clutch discs (5), inner clutch discs (4)			Install	Coat remaining discs lightly with OE10 (refer to current lubrication order). Install discs by alternating outer and inner discs until all are installed. The last disc installed is inner clutch disc
j. Clutch disc backing plate (3)			Install	
k. Retaining ring (2)			Install	
l. Three forward shaft piston rings (1)			Install	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*j. Control Valve Assembly.*

This task covers repair of the control valve assembly consisting of:

- a. Disassembly
- b. Cleaning
- c. Inspection
- d. Reassembly

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN 5180-00-754-0641

EQUIPMENT CONDITION

Paragraph 3-19d  
 Condition Description  
 Control valve assembly removed from transmission.

MATERIALS/PARTS

- Cleaning solvent P-D-680
- Clean cloths
- OE10 (refer to current lubrication order)
- Permatex 2 NSN 8030-00-873-4792
- O-rings
- Oil seals
- Seal

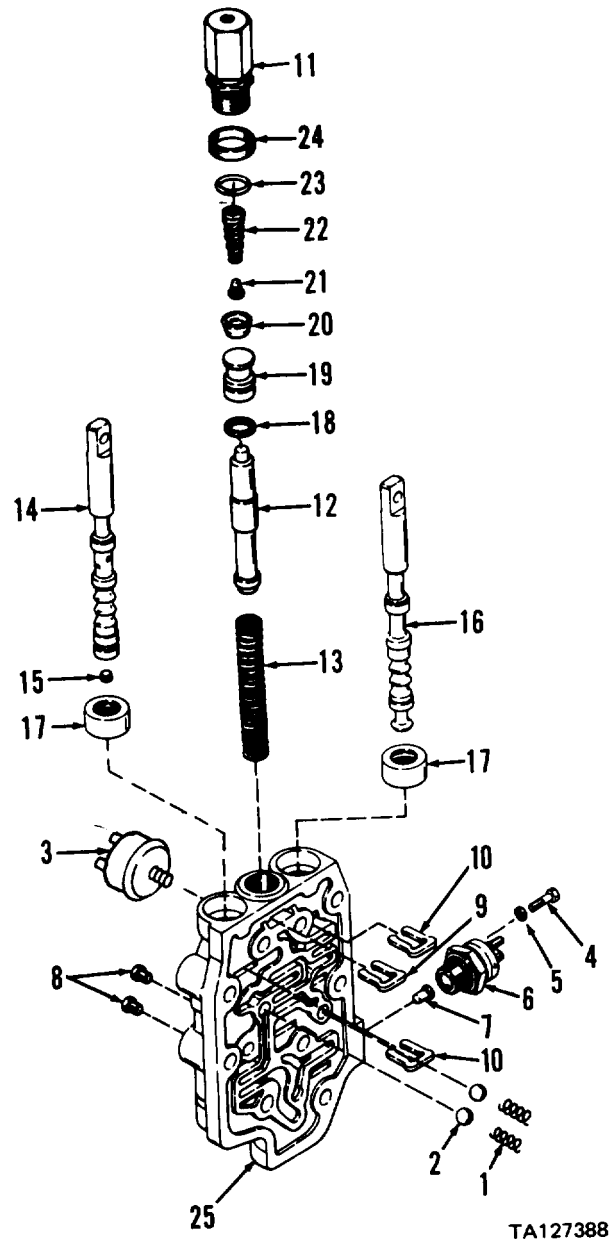
STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1		Two detent springs (1) and detent balls (2)	Remove	
2		Back-up alarm switch (3)	Remove	
3		Two screws (4) and lock washers (5)	Remove	From neutral start switch
4		Neutral start switch (6) and actuating pin (7)	Remove	
5		Two pipe plugs (8)	Remove	
6		Three valve spool stops (9 and 10)	Remove	
7		Hydraulic actuator assembly (11)	Remove	
8		Declutch valve spool (12)	Remove	
9		Valve spool spring (13)	Remove	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*j. Control Valve Assembly (cont).*

**KEY**

1. Detent springs
2. Detent balls
3. Back-up alarm switch
4. Screws
5. Lock washers
6. Neutral start switch
7. Actuating pin
8. Pipe plugs
9. Valve spool stop
10. Valve spool stops
11. Hydraulic actuator assembly
12. Declutch valve spool
13. Valve spool spring
14. Speed selector spool and plug assembly
15. Plug
16. Forward and reverse spool
17. Oil seals
18. Glyd ring
19. Inching piston
20. Piston seal
21. Spring retainer pin
22. Balance spring
23. O-ring
24. Band seal
25. Control valve housing assembly



**4-4. TRANSMISSION MAINTENANCE (cont)**

*j. Control Valve Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (cont)				
10		Speed selector spool and plug assembly (14)	Remove	
11		Plug (15)	Remove	From speed selector spool and plug assembly
12		Forward and reverse spool (16)	Remove	
13		Two oil seals (17)	Remove and discard	Carefully pry from control valve housing
14	Hydraulic actuator assembly (11)	a. Glyd ring (18) b. Inching piston (19) c. Piston seal (20)  d. Spring retainer pin (21) e. Balance spring (22) f. O-ring (23) g. Seal (24)	Remove Remove Remove and discard Remove Remove Remove and discard Remove and discard	
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
<b><u>WARNING</u></b>				
<p>Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.</p>				

**4-4. TRANSMISSION MAINTENANCE (cont)***j. Control Valve Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
15		All parts	Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry parts thoroughly using compressed air or clean cloths
INSPECTION				
16		Control valve housing assembly (25)	Inspect	Inspect seats and spool bores for cracks and wear, damage and distortion. If any of these conditions are observed, replace part
17		Declutch valve spool (12), speed selector spool (14), and forward and reverse spool (16)	Inspect	Inspect for wear, damage, bent or broken condition and distortion; if any of these conditions are observed replace part
18		Detent balls (2)	Inspect	Inspect for flat or out of round condition, cracks, or other damage. Replace if any of these conditions are observed
19		Detent springs (1) and balance spring (22)	Inspect	Replace if cracked, worn, distorted, broken or permanently set
20		Back-up alarm switch (3)	Inspect	Check for cracked insulating material around body or terminals. Check for loose, missing, or corroded terminals. Replace if any of these conditions are observed
21		Neutral start switch (6)	Inspect	Check for cracked body and corrosion in terminal contact area; replace if any of these conditions are observed
22		All other parts	Inspect	Inspect for wear, damage, cracks, and distortion; replace part if any of these conditions are observed

**4-4. TRANSMISSION MAINTENANCE (cont)**

*j. Control Valve Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY</b>				
<b>NOTE</b>				
Immerse all parts in OE10 (refer to current lubrication order) before reassembling parts.				
23	Hydraulic actuator assembly (11)	a. Seal (24)	Install	Apply light coat of Permatex 2 around outer diameter
		b. O-ring (23)	Install	
		c. Balance spring (22)	Install	
		d. Spring retainer pin (21)	Install	
		e. Piston seal (20)	Install	Apply light coat of Permatex 2 around outer diameter of seal
		f. Inching piston (19)	Install	
		g. Glyd ring (18)	Install	
24	Control valve housing assembly (25)	a. Two oil seals (17)	Install	Apply light coat of Permatex 2 around outer diameter of seal. Seal is properly installed when flush with top of housing assembly
<b>CAUTION</b>				
When installing spools in housing assembly, be careful not to damage oil seals (17).				
		b. Forward and reverse spool (16)	Install	In speed selector spool (14)
		c. Plug (15)	Install	
		d. Speed selector spool and plug assembly (14)	Install	
		e. Two valve spool stops (10)	Install	
		f. Valve spool spring (13)	Install	
		g. Declutch valve spool (12)	Install	
		h. Hydraulic actuator assembly (11)	Install	
		i. Valve spool stop (9)	Install	
		j. Two pipe plugs (8)	Install	
		k. Actuating pin (7)	Install	
		l. Neutral start switch (6)	Install	

**4-4. TRANSMISSION MAINTENANCE (cont)***j. Control Valve Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (cont)				
24 (cont)	<b>NOTE</b>			
	If neutral start switch has been replaced, perform following step, otherwise proceed to step n.			
		m. Neutral start switch (6)	Modify	Carefully remove two terminal studs by unscrewing them
		n. Two screws (4) and lock washers (5)	Install	In neutral start switch screw terminal holes
		o. Back-up alarm switch (3)	Install	
		p. Two detent balls (2) and detent springs (1)	Install	

**4-4. TRANSMISSION MAINTENANCE (cont)**

*k. Modulation Valve Assembly.*

- a. Disassembly
- b. Cleaning

- c. Inspection
- d. Reassembly

INITIAL SETUP

TOOLS

Automotive Mechanic's Tool Kit NSN5180-00-754-0641

EQUIPMENT CONDITION

Paragraph  
3-19d

Condition Description  
Modulation valve assembly removed  
from transmission.

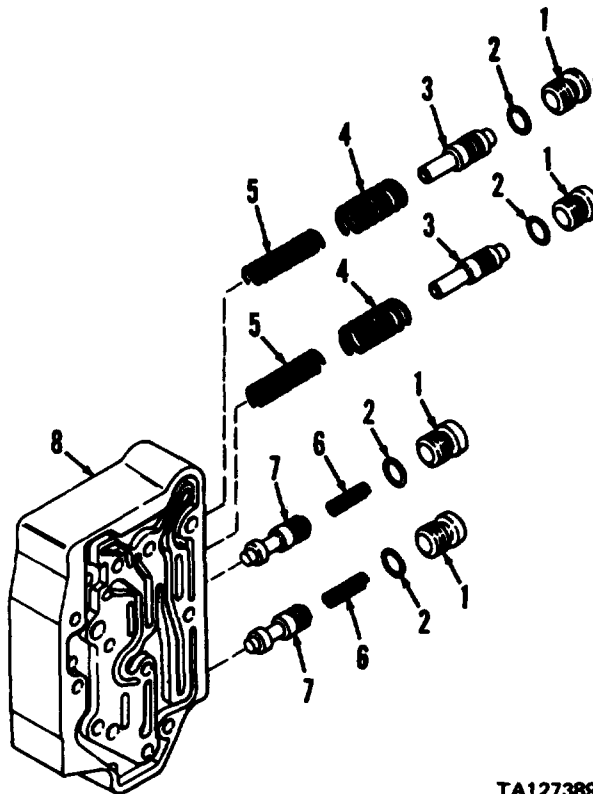
MATERIALS/PARTS

Cleaning solvent P-D-680

Clean cloths

OE10 (refer to current lubrication order)

O-rings



KEY

- 1. Piston seals
- 2. O-rings
- 3. Accumulator valves
- 4. Outer accumulator springs
- 5. Inner accumulator springs
- 6. Regulator springs
- 7. Regulator spools
- 8. Modulation valve body

TA127389



**4-4. TRANSMISSION MAINTENANCE (cont)**

k. Modulation Valve Assembly (cont).

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Modulation valve body (8)	a. Four piston seals (1) b. Four O-rings (2) c. Two accumulator valves (3) d. Two outer accumulator springs (4) e. Two inner accumulator springs (5) f. Two regulator springs (6) g. Two regulator spools (7)	Remove Remove and discard Remove Remove Remove Remove Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				
2	AH parts		Clean	Use cleaning solvent P-D-680. Immerse parts in cleaning solvent and move slowly up and down until parts are thoroughly cleaned. Dry parts thoroughly using compressed air or clean cloths
<b>INSPECTION</b>				
3	Modulation valve body (8)		Inspect	Replace if worn, damaged or distorted, or if spool bores cracked or worn

**4-4. TRANSMISSION MAINTENANCE (cont)**

*k. Modulation Valve Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION (cont)</b>				
4		Accumulator valves (3) and regulator spools (7)	Inspect	Replace if damaged, cracked, worn or distorted
5		Piston seals (1)	Inspect	Replace if worn, damaged "or distorted, or if threads cracked or pitted
6		Outer accumulator springs (4), inner accumulator springs (5), regulator Springs (6)	Inspect	Replace if worn, damaged, cracked, distorted or permanently set
<b>REASSEMBLY</b>				
7	Modulation valve body (8)	a. Two regulator spools (7)	Install	
		b. Two regulator springs (6)	Install	
		c. Two inner accumulator springs (5)	Install	
		d. Two outer accumulator springs (4)	Install	
		e. Two accumulator valves (3)	Install	
		f. Four O-rings (2)	Install	Lubricate with OE10 (refer to current lubrication order)
		g. Four piston seals (1)	Install	

**4-5. AXLE MAINTENANCE**

*a. Differential Carrier.*

This task covers repair of the differential carrier consisting of:

- a. Disassembly
- b. Cleaning
- c. Inspection
- d. Reassembly
- e. Adjustment

INITIAL SETUP

TOOLS

- Field Maintenance Supplemental Tool Set No. 2  
NSN 4910-00-754-0707
- Shop Equip Machine Shop, Field Maint, Basic  
NSN 3470-00-754-0708
- Bar, two inches diameter, 6 feet long
- Yoke Holding Tool
- Arbor press, 1/2 ton capacity
- Automotive Mechanic's Tool Kit      NSN 5180-00-754-0641
- No. 1 Common Organizational Maintenance Tool Kit      NSN 4910-00-754-0654

MATERIALS/PARTS

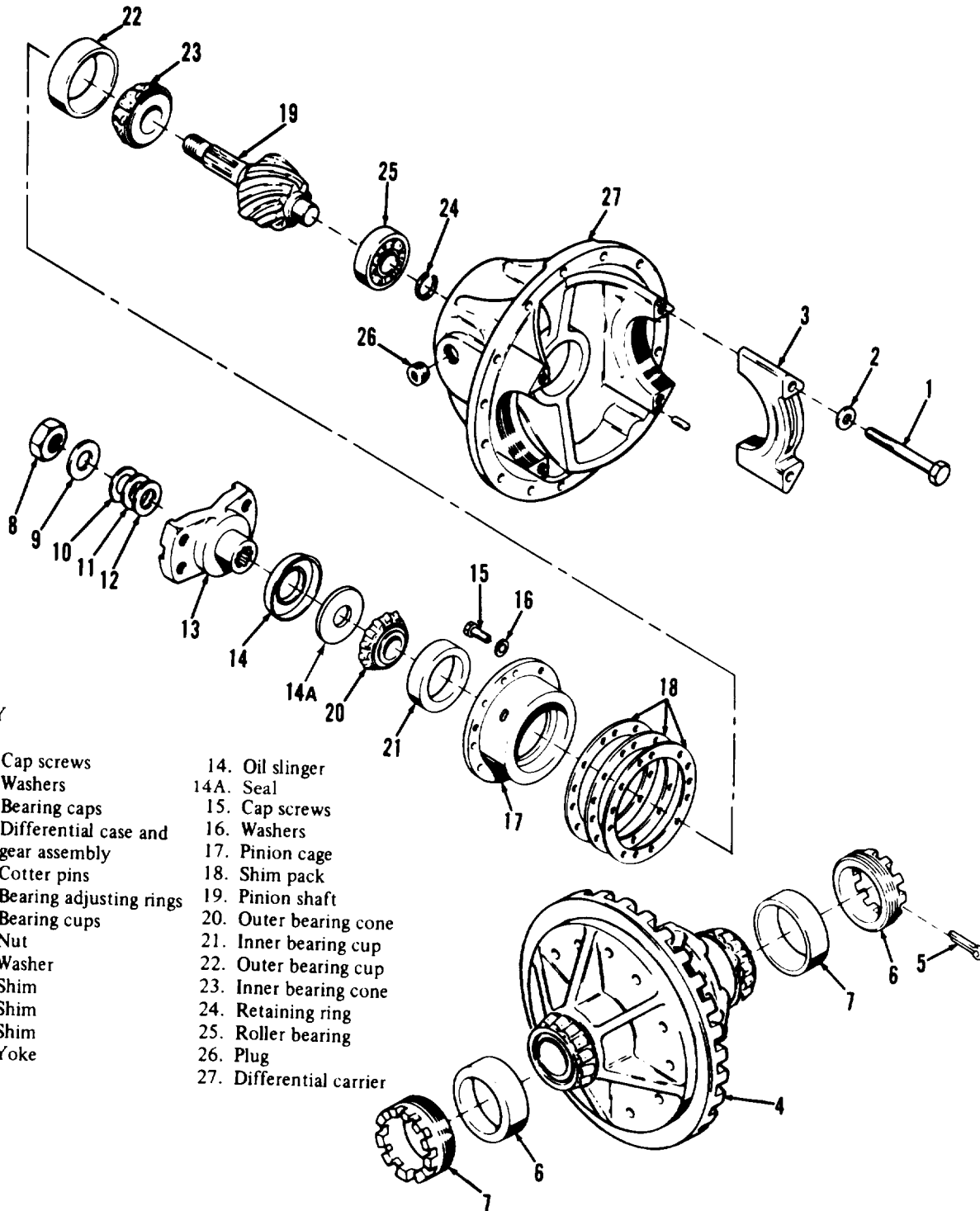
- Crocus cloth
- Two 3/8-16 X 2 NC cap screws
- Cleaning solvent P-D-680
- Clean cloths
- Red lead (NSN 8010-00-243-9265)
- Linseed oil
- Light oil

EQUIPMENT CONDITION

Paragraph	Condition Description
3-20c, 3-20d	Differential carrier removed from axle. Differential carrier mounted in carrier repair stand.

### 4-5. AXLE MAINTENANCE (cont)

a. Differential Carrier (cont).



KEY

- 1. Cap screws
- 2. Washers
- 3. Bearing caps
- 4. Differential case and gear assembly
- 5. Cotter pins
- 6. Bearing adjusting rings
- 7. Bearing cups
- 8. Nut
- 9. Washer
- 10. Shim
- 11. Shim
- 12. Shim
- 13. Yoke
- 14. Oil slinger
- 14A. Seal
- 15. Cap screws
- 16. Washers
- 17. Pinion cage
- 18. Shim pack
- 19. Pinion shaft
- 20. Outer bearing cone
- 21. Inner bearing cup
- 22. Outer bearing cup
- 23. Inner bearing cone
- 24. Retaining ring
- 25. Roller bearing
- 26. Plug
- 27. Differential carrier

TA326466

**4-5. AXLE MAINTENANCE (cont)**

a. *Differential Carrier (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS	
<b>DISASSEMBLY</b>					
1	Differential case and gear assembly (4)	Ring gear	Measure backlash	Record for reassembly; refer to adjustments, step 25	
2	Differential carrier (27)	a. Bearing cap (3)	Mark	Center punch bearing cap (3) and one differential carrier leg for reference at reassembly	
		b. Four cap screws (1) and washers (2)	Remove		
		c. Two bearing caps (3)	Remove	Insert bar through differential case and gear assembly (4) to remove; lift unit out	
		d. Differential case and gear assembly (4)	Remove		
		e. Two cotter pins (5)	Remove		
		f. Two bearing adjusting rings (6)	Remove		
		g. Two bearing cups (7)	Remove		
<b>NOTE</b>					
To repair differential case and gear assembly, refer to paragraph 4-5b.					
3	Pinion shaft (19)	a. Nut (8)	Remove	Use tool to hold yoke	
		b. Washer (9)	Remove		
		c. Shims (10, 11, and 12)	Remove		
4	Yoke (13)	Oil slinger (14)	Remove		
5	Pinion cage (17)	a. Eight cap screws (15) and washers (16)	Remove	Install two 3/8-16 X 2 NC cap screws in pinion cage puller holes. Turn each screw equally to prevent damage to differential carrier, pinion shaft, or bearings Wire shims together Tap pinion shaft out of pinion cage (17) using soft mallet or press from pinion cage From pinion cage	
		b. Pinion cage (17)	Remove		
		c. Shim pack (18)	Remove		
		d. Pinion shaft (19)	Remove		
		e. Outer bearing cone and seal (14A)	Remove		
		f. Inner bearing cup (21)	Remove		Press from pinion cage
		g. Outer bearing cup (22)	Remove		Press from pinion cage

**4-5. AXLE MAINTENANCE (cont)**

a. *Differential Carrier (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY (cont)</b>				
6	Pinion shaft (19)	a. Inner bearing cone (23)	Remove	Use puller to remove from pinion shaft
		b. Retaining ring (24)	Remove	
		c. Roller bearing (25)	Remove	Use puller to remove from pinion shaft
7	Differential carrier (27)	Plug (26)	Remove	
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
8		Bearings (20, 23, and 25)	Clean	Use cleaning solvent P-D-680; soak in cleaning solvent then remove and strike flat of bearing against block of wood to dislodge solidified lubricant particles. Dry with clean, soft, lintless, absorbent cloths. Don't use compressed air to dry bearings
<b><u>CAUTION</u></b>				
<p>Don't immerse differential case and gear assembly (4) in cleaning solvent.</p>				
<b><u>NOTE</u></b>				
<p>If differential case and gear assembly has been repaired as described in paragraph 4-5b don't perform following step.</p>				
9		Differential case and gear assembly (4)	Clean	Use clean, soft, lintless, absorbent cloth moistened with cleaning solvent P-D-680 to remove dirt and lubricant

**4-5. AXLE MAINTENANCE (cont)**

a. *Differential Carrier (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
10		All other parts		Use cleaning solvent P-D-680. Dry with clean, soft, lintless, absorbent cloths
INSPECTION				
11		Bearings (20, 23, and 25), bearing cups (7, 21, and 22)	Inspect	Check for wear, pitting, or damage; replace part if any of these conditions are observed
12		Pinion shaft (19)	Inspect	Check gear teeth and splines for nicked, cracked, broken, scored, or worn condition. Remove burrs or nicks with soft hone or crocus cloth. Replace badly damaged or worn part
<b>NOTE</b>				
Pinion shaft (19) and ring gear (para 4-5b, key number 16) shall be replaced as a matched set.				
13		Bearing adjusting ring (6)	Inspect	Check for wear, damage and nicks. Check threads for damage. If any of these conditions are observed, replace part
14		Pinion cage (17) and differential carrier (27)	Inspect	Check for cracks, breaks, burrs, and damage to machined surfaces. Remove burrs and minor surface irregularities with soft hone or crocus cloth. Replace cracked or damaged parts
15		Yoke (13)	Inspect	Check for cracks, burrs, twisted splines, and other damage. Remove burrs with soft hone or crocus cloth. Replace part if cracked or splines badly twisted
16		All other parts	Inspect	Check for damage and wear; replace part if damaged or worn
<b>NOTE</b>				
Immediately after performing inspection, coat all parts with light oil to prevent corrosion.				

**4-5. AXLE MAINTENANCE (cont)**

a. *Differential Carrier (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY				
17	Differential carrier (27)	Plug (26)	Install	
18	Pinion shaft (19)	a. Roller bearing (25) b. Retaining ring (24) c. Inner bearing cone (23)	Install Install Install	Press onto pinion shaft (19) Secures roller bearing Press onto pinion shaft
19	Pinion cage (17)	a. Outer bearing cup (22) b. Inner bearing cup (21) c. Pinion shaft (19) d. Outer bearing cone and seal (14A)	Install Install Position Install	Press firmly against pinion cage shoulder. Lubricate with light oil Press firmly against pinion cage shoulder. Lubricate with light oil In pinion cage Press onto pinion shaft (19)
20	Differential carrier (27)	a. Shim pack (18) b. Pinion cage (17) c. Eight washers (16) and cap screws (15)	Position Position Install	Use original shim pack or equivalent thickness On differential carrier Tighten to 60-75 pounds foot torque
21	Yoke (13)	Oil slinger (14)	Install	On yoke (13)
22	Pinion shaft (19)	a. Yoke (13) b. Shims (10, 11, and 12) c. Washer (9) d. Nut (8)	Position Install Position Install	Tighten to 300-400 pounds foot torque
23	Differential carrier (27)	a. Pinion shaft (19)  b. Two bearing caps (3) c. Four washers (2) and cap screws (1) d. Two bearing cups (7)	Check preload  Position Install Check	Use inch-pound torque wrench at nut (8) to check bearing preload. Correct bearing preload is 5 to 15 pounds inch. If torque is not within these limits, remove pinion cage (17) and add shims (18) to decrease preload or remove shims to increase preload  Tighten to 160-190 pounds foot torque  Check that bearing cups can be pushed in bores by hand; if necessary, rework bores using emery cloth until hand push fit is obtained. After hand push fit is obtained, remove cap screws (1) and bearing cap (3)



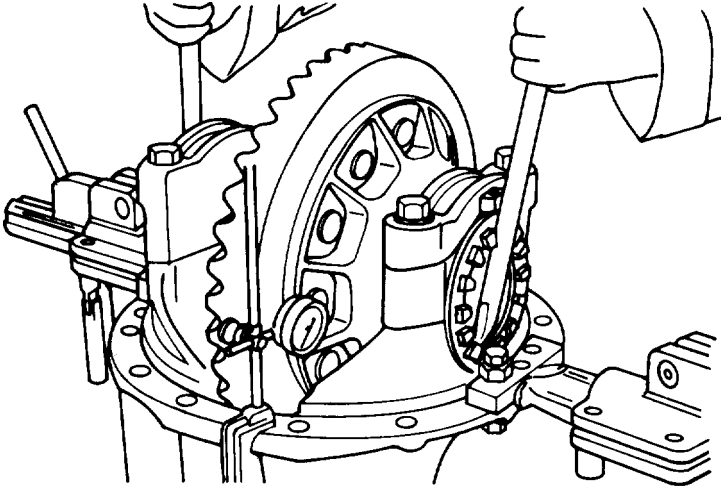
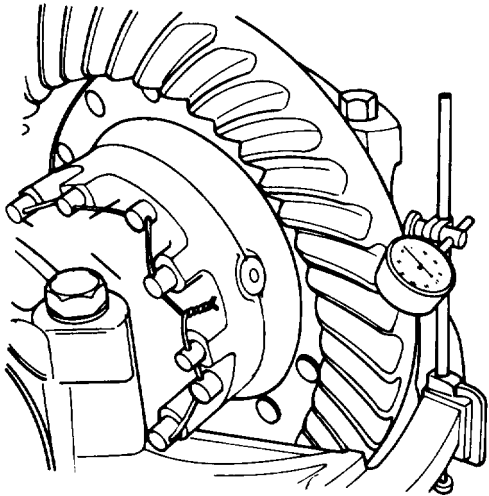
**4-5. AXLE MAINTENANCE (cont)**

a. *Differential Carrier (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REASSEMBLY (cont)</b>				
23 cont)		e. Differential case and gear assembly (4)	Position	Position differential carrier (27) to accept unit; insert bar through differential case and gear assembly and position it onto differential carrier
		f. Two bearing cups (7)	Position	On lift bar
		g. Two bearing adjusting rings (6)	Position	On lift bar; raise bar to install bearing cup (7) and adjusting ring on differential case and gear assembly (4)
<b><u>CAUTION</u></b>				
In following step, be careful not to cross thread bearing adjusting rings (6).				
		h. Two bearing caps (3)	Position	Align match marks on cap and carrier (27) leg
		i. Four washers (2) and cap screws (1)	Install	Tighten snugly; don't torque
		j. Two cotter pins (5)	Install	After performance of steps 24 through 26 of adjustments
		k. Four cap screws (1)	Tighten	To 160-190 pounds foot torque after performance of steps 24 through 26 of adjustments
<b>ADJUSTMENTS</b>				
24	Differential bearing preload	a. Bearing adjusting ring (6)	Tighten	Mount dial indicator as shown below. Loosen ring (6) on opposite side of gear only sufficient to notice end play on dial indicator. Then, tighten same ring only sufficiently to obtain zero end play
		b. Ring gear	Check runout	If runout exceeds 0.008 inch, remove differential case and gear assembly (4) and check cause
		c. Bearing adjusting ring (6)	Tighten	Tighten both rings one notch each from zero end play to preload differential bearings

**4-5. AXLE MAINTENANCE (cont)**

a. *Differential Carrier (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENTS (cont)				
24 (cont)				 <p style="text-align: right;">TA127392</p>
25	Ring gear backlash check	a. Ring gear	Check backlash	<p>Mount dial indicator as shown. Ring gear backlash shall be as recorded in step 1 of disassembly. If necessary adjust as described below</p>  <p style="text-align: right;">TA032289</p>

**4-5. AXLE MAINTENANCE (cont)**

a. Differential Carrier (cont).

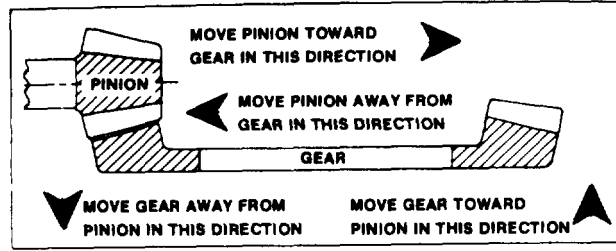
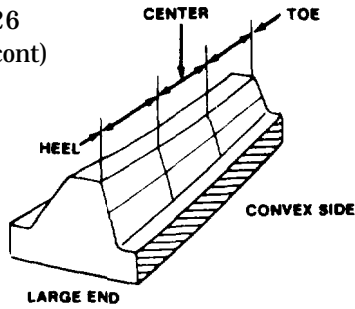
STEP	LOCATION	ITEM	ACTION	REMARKS
ADJUSTMENTS (cont)				
25 (cont)	<b>NOTE</b>			
In following step, be sure to move each bearing adjusting ring (6) same distance to maintain bearing end play adjustment.				
	b. Bearing adjusting ring (6)	Loosen	Adjust backlash by backing off one adjusting ring (6) and advancing opposite ring same amount	
<b>NOTE</b>				
For new ring gear and pinion shaft, adjust backlash to 0.010 inch.				
26	Gear tooth contact check	Ring gear teeth	Paint	Use mixture of red lead and linseed oil. Rotate ring gear through one complete revolution in each direction. Compare tooth pattern against following. Adjust backlash to move ring gear or adjust pinion cage shim pack (18) to move pinion shaft as necessary to obtain correct tooth contact pattern

**4-5. AXLE MAINTENANCE (cont)**

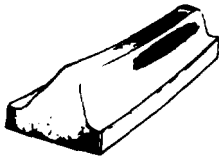
a. Differential Carrier (cont).

ADJUSTMENTS (cont)

26  
(cont)



ALL CONTACT BEARINGS SHOWN BELOW ARE ON RIGHT HAND SPIRAL RING GEAR - THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.



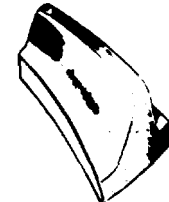
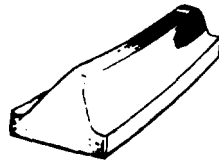
CONDITION 1

TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD



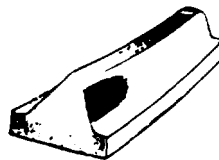
CONDITION 2

TOE BEARING ON BOTH SIDES OF TOOTH-GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.



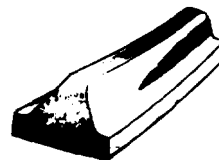
CONDITION 3

HEEL BEARING ON BOTH SIDES OF TOOTH-GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION.



CONDITION 4

LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR. INCREASE MOUNTING DISTANCE BY ADDING SHIMS BETWEEN BEARING CAGE AND DIFFERENTIAL HOUSING.



CONDITION 5

HIGH BEARING ON GEAR AND LOW BEARING ON PINION, CORRECT BY MOVING PINION IN TOWARD GEAR. DECREASE MOUNTING DISTANCE BY REMOVING SHIMS FROM BETWEEN BEARING CAGE AND DIFFERENTIAL HOUSING.



BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL.

TA127394

## 4-5. AXLE MAINTENANCE (cont)

### b. Differential Case and Gear Assembly.

This task covers repair of the differential case and gear assembly consisting of:

- |                |               |
|----------------|---------------|
| a. Disassembly | c. Inspection |
| b. Cleaning    | d. Reassembly |

#### INITIAL SETUP

#### TOOLS

Electric Portable Drill	NSN 5130-00-889-9004
Arbor press 1/2 ton capacity	
No. 1 Common Organizational Maintenance Tool Kit	NSN 4910-00-754-0654

#### EQUIPMENT CONDITION

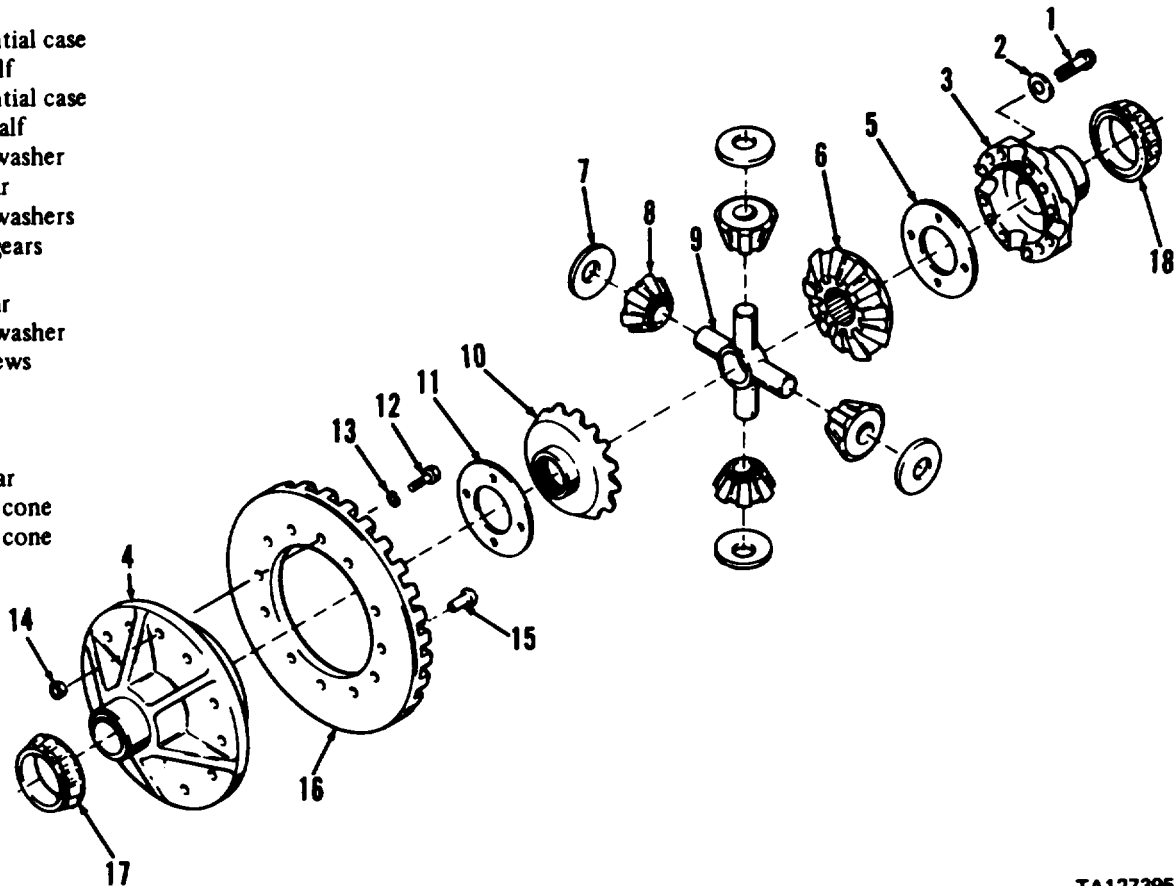
Paragraph	Condition Description
4-5a	Differential case and gear assembly removed from carrier.

#### MATERIALS/PARTS

Cleaning solvent P-D-680	Axle lubricant (refer to current lubrication order)
Clean cloths	
Light oil	

#### KEY

1. Cap screws
2. Washers
3. Differential case plain half
4. Differential case flange half
5. Thrust washer
6. Side gear
7. Thrust washers
8. Pinion gears
9. Spider
10. Side gear
11. Thrust washer
12. Cap screws
13. Washers
14. Nuts
15. Rivets
16. Ring gear
17. Bearing cone
18. Bearing cone



TA127395

**4-5. AXLE MAINTENANCE (cont)**

*b. Differential Case and Gear Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>DISASSEMBLY</b>				
1	Differential case and gear assembly	a. Case halves (3 and 4) b. Eight cap screws (1) and washers (2) c. Differential case plain half (3), and flange half (4) d. Thrust washer (5) e. Side gear (6) f. Four thrust washers (7) g. Four pinion gears (8) h. Spider (9) i. Side gear (10) j. Thrust washer (11)	Mark Remove Separate Remove Remove Remove Remove Remove Remove Remove	Use punch or chisel to mark for correct alignment during reassembly
<b>NOTE</b>				
If rivets (15) are used to secure ring gear (16) and differential case flange half (4), proceed to step b below; otherwise perform step a and disregard step b.				
2	Differential case flange half (4)	a. 12 cap screws (12), washers (13), and nuts (14) b. 12 rivets (15)  c. Ring gear (16) d. Bearing cone (17)	Remove Drill out  Remove Remove	Center punch rivets in center of head, Use drill bit 1/32 inch smaller than body of rivet and drill through head. Carefully press out rivets  Use puller
3	Differential case plain half (3)	Bearing cone (18)	Remove	Use puller

**4-5. AXLE MAINTENANCE (cont)**

*b. Differential Case and Gear Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING				
<b><u>WARNING</u></b>				
<p>Dry cleaning solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.</p>				
4		Bearings (17 and 18)	Clean	Use cleaning solvent P-D-680; soak in cleaning solvent then remove and strike flat of bearing against block of wood to dislodge solidified lubricant particles. Dry with clean, soft, lintless absorbent cloths. Don't use compressed air to dry bearings
5		All other parts	Clean	Use cleaning solvent P-D-680. Dry with clean cloths
6		Ring gear (16), side gear (6 and 10), and pinion gears (8)	Inspect	Inspect for wear, damage, cracks, pits and scoring. Inspect gear teeth for wear, cracks and damage. If any of these conditions are observed replace part
<b>NOTE</b>				
<p>Ring gear (16) and pinion shaft (paragraph 4-5a, key number 19) shall be replaced as a matched set. Pinion gear (8) and side gear (6 and 10) shall be replaced as a set.</p>				
7		Case halves (3 and 4), spider (9), and thrust washers (5, 7, and 11)	Inspect	Inspect for wear, cracks, pits, scoring, damage and distortion. If any of these conditions are observed, replace part
<b>NOTE</b>				
<p>Replace thrust washers (5 and 11) and thrust washer (7) in sets; combination of old and new thrust washers will result in premature failure.</p>				

**4-5. AXLE MAINTENANCE (cont)**

*b. Differential Case and Gear Assembly (cont).*

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>INSPECTION</b>				
8		All other parts	Inspect	Inspect for wear, damage, cracks, pits and distortion. If any of these conditions are observed, replace part
<b>NOTE</b>				
Immediately after performing inspection, coat all parts with light oil oil to prevent corrosion.				
<b>REASSEMBLY</b>				
<b>NOTE</b>				
Lubricate all parts and differential case (3 and 4) inner walls with axle lubricant (refer to current lubrication order).				
9	Differential case flange half (4)	a. Ring gear (16)	Position	
<b>NOTE</b>				
If rivets were used to secure ring gear and differential case flange half, use cap screw (12), washer (13) and nut (14) instead.				
		b. 12 washers (13), cap screws (12), and nuts (14)	Install	Tighten to 90-120 pounds foot torque
		c. Thrust washer (11)	Install	[n case flange half (4)
		d. Side gear (10)	Install	In case flange half (4)
10	Spider (9)	a. Four pinion gears (8)	Install	On spider
		b. Four thrust washers (7)	Install	On pinion gears
11	Differential case flange half (4)	a. Spider (9), pinion gears (8), thrust washers (7)	Install	
		b. Side gear (6)	Install	
		c. Thrust washer (5)	Install	
		d. Differential case plain half (3)	Position	Align match marks
		e. Eight washers (2) and cap screws (1)	Install	Install four equally spaced and draw assembly together; check for free rotation of gears and correct if necessary. Install remaining cap screws (1) and washers (2). Tighten to 90-120 pounds foot torque
		f. Bearing cone (17)	Install	Press squarely and firmly
12	Differential case plain half (3)	Bearing cone (18)	Install	Press squarely and firmly



### Section III. CHASSIS MAINTENANCE

This section contains general support maintenance procedures for the rear axle trunnion.

#### **4-6. REAR AXLE TRUNNION**

- This task covers:
- a. Removal
  - b. Cleaning
  - c. Inspection
  - d. Installation

**INITIAL SETUP**

**TOOLS**

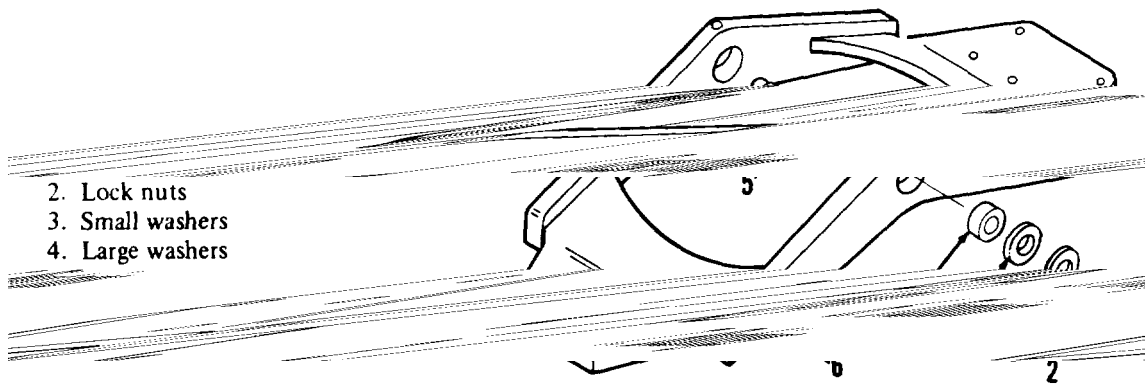
- No. 1 Common Organizational Maintenance Tool Kit NSN 4910-00-754-0654
- Hard Wooden Blocks (2), 6 by 6 by 18 inches

**MATERIALS/PARTS**

- Cleaning solvent P-D-680
- Clean cloths

**EQUIPMENT CONDITION**

Paragraph	Condition Description
	Vehicle parked on level surface, engine off, and front wheels blocked
2-4b(1)	Shipping lock pin installed.
2-39c	Rear drive shaft assembly disconnected from rear axle assembly differential companion yoke.
	Rear chassis raised (use chain hoist) and securely blocked.
2-47	Rear wheels and tires removed.
2-43b	Brake hoses and lines disconnected from rear axle housing and rear wheel cylinders.
3-20b	Rear axle housing removed from vehicle.



TA127396

**4-6. REAR AXLE TRUNNION (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
<b>REMOVAL</b>				
1	Rear axle trunnion	a. Two grease fittings (1) b. Trunnion (6)	Loosen and remove Support	Use chain hoist with eyebolts to raise trunnion ends and relieve force on pivot pins (5)
<b><u>WARNING</u></b>				
Be sure vehicle is securely blocked and chain hoist is securely attached to trunnion before performing following steps. Failure to do so could cause serious injury or death by equipment falling on you.				
		c. Two lock nuts (2), small washers (3) and large washers (4)	Loosen and remove	If necessary, use chain wrench or pipe wrench on grease fitting end of pivot pin (5) to prevent pin from turning. Discard lock nuts (2)
		d. Two pivot pins (5)	Remove	Tap threaded end of pivot pin using brass drift and hammer
		e. Trunnion (6)	Lower and remove	
<b><u>NOTE</u></b>				
Remove bushings (7) only if necessary for replacement.				
		f. Two bushings (7)	Remove	Press from trunnion using rod that will contact outer race of bushing
<b>CLEANING</b>				
<b><u>WARNING</u></b>				
Dry clear-ring solvent (P-D-680), used to clean parts is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat and don't smoke when using it. Failure to do so could cause serious injury. If you become dizzy while using cleaning solvent, get fresh air immediately, and get medical attention. If contact with skin or clothes is made, flush with large amounts of water. If contact with eyes is made, wash eyes with water immediately, and obtain medical aid immediately.				
<b><u>WARNING</u></b>				
Wear safety glasses when drying parts with compressed air. Failure to do so could cause serious injury to eyes and possible blindness. If you hurt your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.				

**4-6. REAR AXLE TRUNNION (cont)**

STEP	LOCATION	ITEM	ACTION	REMARKS
CLEANING (cont)				
2		All parts	Clean	Use cleaning solvent P-D-680. Dry thoroughly with moisture free compressed air
INSPECTION				
3		Grease fittings (1) and pivot pins (5)	Inspect	Replace if cracked or broken, or if threads damaged
4		Washers (3 and 4) and bushings (7)	Inspect	Replace if scored, worn or damaged
5		Trunnion (6)	Inspect	Repair by welding if cracked or if welds broken. Replace if severely cracked or otherwise damaged
INSTALLATION				
6	Rear axle trunnion	a. Two bushings (7)	Install	Use rod that will contact outer race of bushing, and press bushing into pivot bore of trunnion until flush with surface of trunnion
		b. Trunnion (6)	Position	Use chain hoist with eye bolts to raise trunnion until holes in vehicle frame and trunnion are aligned
<b><u>WARNING</u></b>				
Be sure vehicle is securely blocked and chain hoist is securely attached to trunnion before performing following steps. Failure to do so could cause serious injury or death by equipment falling on you.				
<b><u>NOTE</u></b>				
Make sure pivot pins (5) are clean and free of grease or oil before installation.				
		c. Pivot pins (5)	Install	From inside of trunnion, insert pins through trunnion and frame
		d. Two large washers (4), small washers (3) and new lock nuts (2)	Install and tighten	Use chain wrench or pipe wrench on grease fitting end of pivot pin to prevent pin from turning. Tighten lock nuts (2) to 460-500 pounds foot torque
		e. Two grease fittings (1)	Install and tighten	Until securely mounted
		f. Two grease fittings (1)	Lubricate	Refer to current lubrication order



## APPENDIX A REFERENCES

### **A-1. Publication Indexes and General References**

Indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this publication.

*a. Military Publication Indexes.*

Consolidated Index of Army Publications and Blank Forms . . . . . DA Pam 25-30

*b. General References.*

Dictionary of United States Army Terms . . . . . AR 310-25  
 Authorized Abbreviations and Brevity Codes . . . . . AR 310-50  
 Training in Units . . . . . FM 25-3  
 Operational Terms and Symbols . . . . . FM 101-5-1

### **A-2. Other Publications**

The following publications contain information pertinent to the major item materiel and associated equipment.

*a. Vehicle.*

Truck, Forklift, DED, Pneumatic Tire, Articulated Frame Steer,  
 4,000 lb. Capacity, Rough Terrain, Army Model MHE 237  
 (J. I. Case Model M4K) . . . . . LO 10-3930-638-12

*b. Camouflage.*

Camouflage . . . . . FM 5-20

*c. Decontamination.*

NBC Decontamination . . . . . FM 3-5

*d. General.*

Accident Reporting and Records . . . . . AR 385-40  
 Basic Cold Weather Manual . . . . . FM 31-70  
 Cooling Systems: Tactical Vehicles . . . . . TM 750-254  
 Manual for Wheeled Vehicle Driver . . . . . FM 21-305  
 Driver Selection and Training (Wheeled Vehicles) . . . . . FM 55-30  
 Mountain Operations . . . . . FM 90-6  
 Northern Operations . . . . . FM 31-71  
 Operation and Maintenance of Ordnance Materiel in Cold Weather (0°F. to -65°F) . . . . . FM 9-207  
 Principles of Automotive Vehicles . . . . . TM 9-8000  
 Prevention of Motor Vehicle Accidents . . . . . AR 385-55  
 Procedures for Destruction of Tank Automotive Equipment to Prevent Enemy Use . . . . . TM 750-244-6

*e. Maintenance and Repair.*

Organizational, Direct Support and General Support Care, Maintenance, and  
 Repair of Pneumatic Tires and Inner Tubes . . . . . TM 9-2610-200-24  
 Description, Use, Bonding Techniques, and Properties of Adhesives . . . . . TB ORD 1032  
 Inspection, Care, and Maintenance of Antifriction Bearings . . . . . TM 9-214  
 Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Materiel  
 and Related Materiel Including Chemicals . . . . . TM 9-247  
 Metal Body Repair and Related Operations . . . . . FM 43-2

**A-2. OTHER PUBLICATIONS (cont)**

Operation and Organizational, Maintenance Manual for Lead-Acid  
Storage Batteries . . . . . TM 9-6140-200-14

■ Army Materiel Maintenance Policies . . . . . AR 750-1

Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling System . . . . . TB 750-651

Welding Theory and Application . . . . . TM 9-237

Color, Marking, and Camouflage Painting of Military Vehicles Construction  
Equipment, and Materials Handling Equipment . . . . . TB 43-0209

*f. Shipment and Limited Storage.*

■ Administrativc Storage of Equipment . . . . . TM 740-90-1

Packaging of Army Materiel for Shipment and Storage . . . . . AR 746-1

The Army Maintenance Management Systems (TAMMS) . . . . . DA PAM 738-750

*g. Army Oil Analysis Program*

Army Oil Analysis Sampling Valves . . . . . TM9-2300-422-23&P

## APPENDIX B

### MAINTENANCE ALLOCATION CHART

---

#### Section I. INTRODUCTION

##### **B-1. GENERAL**

*a.* This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

*b.* The Maintenance Allocation Chart (MAC) in section II designates overall responsibility for the performance of maintenance functions on the identified component or assembly. The implementation of the maintenance functions upon the component or assembly will be consistent with the assigned maintenance functions,

*c.* Section III lists the special tools and test equipment requirement for each maintenance function as referred from section II.

*d.* Section IV contains supplemental instructions or explanatory notes for a particular maintenance function.

##### **B-2. MAINTENANCE FUNCTIONS**

*a. Inspect.* To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

*b. Test.* To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

*c. Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate); to preserve; to drain; to paint; or to replenish fuel, lubricants, or hydraulic fluid.

*d. Adjust.* To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

*e. Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

*f. Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

*g. Install.* The act of emplacing, setting, or fixing into position an item, component, or assembly in a manner to allow the proper functioning of an equipment or system.

*h. Replace.* The act of substituting a serviceable-like part, subassembly, or module (component or assembly) for an unserviceable counterpart.

*i. Repair.* The application of maintenance services<sup>1</sup> or other maintenance actions<sup>2</sup> to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

*j. Overhaul.* That maintenance effort (service/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

*k. Rebuild.* Consist of those services{ actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipments/components.

##### **B-3. COLUMN ENTRIES USED IN THE MAC**

*a. Column 1, Group Number.* Column 1 lists group numbers, the purpose of which is to identify components, assemblies, and modules with the next higher assembly.

*b. Column 2, Component/Assembly.* Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

*c. Column 3, Maintenance Function.* Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see para B-2.)

*d. Column 4, Maintenance Category.* Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance functions at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different levels, appropriate "work time" figures will be shown for each level. The number of man-hours specified by the "work time" figures represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition. This time includes preparation time, troubleshooting time, and quality assurance/

<sup>1</sup>Service – Inspect, test, service, adjust, align, calibrate, or replace.

<sup>2</sup>Action – Welding, grinding, riveting, straightening, facing, remachining, or resurfacing.

**B-3 COLUMN ENTRIES USED IN THE MAC (cont)**

quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart.

The symbol designations for the various maintenance levels are:

- C..... Operator or crew
- O.....Organizational maintenance
- F..... Direct support maintenance
- H.....General support maintenance
- D..... Depot maintenance

*e. Column 5, Tools and Equipment.* Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

*f. Column 6, Remarks.* This column shall contain a letter code in alphabetic order which shall be keyed to the remarks contained in section IV.

**B-4. COLUMN ENTRIES USED IN THE TOOL AND TEST EQUIPMENT REQUIREMENTS**

*a. Column 1, Tool or Test Equipment Reference Code.*

The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

*b. Column 2, Maintenance Category.* The lowest level of maintenance authorized to use the tool or test equipment.

*c. Column 3, Nomenclature.* Name or identification of the tool or test equipment.

*d. Column 4, National/NATO Stock Number.* The National or NATO stock number of the tool or test equipment.

*e. Column 5, Tool Number.* The manufacturer's part number.

**B-5. EXPLANATION OF COLUMNS IN SECTION IV**

*a. Reference Code.* The code scheme recorded in column 6, section II.

*b. Remarks.* This column lists information pertinent to the maintenance function being performed as indicated on the MAC section II.



**Section II. MAINTENANCE ALLOCATION CHART**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
01	ENGINE								
0100	Engine Assembly								
	Engine Assembly	Inspect	0.1						1-3
		Service	0.5	1.5					3, 4
		Adjust			2.0				3, 4
		Replace			8.0				3, 4
		Repair				2.0			3, 4, 11, 12
		Overhaul					50.0		
	Engine Mounts	Inspect			0.1				
		Replace			2.0				3, 4
0101	Crankcase, Block								
	Cylinder Head	Inspect			0.1				3, 4
	Cylinder Block	Replace				50.0			3, 4
		Repair				8.0			3, 4, 11, 12
	Cylinder Head Assy	Inspect			0.1				3, 4
		Replace			1.5				3, 4
		Repair			4.0				3, 4, 11, 12
		Overhaul				4.0			
0102	Crankshaft	Inspect				0.3			3, 4
		Replace				20.0			3, 4
		Repair				8.0			3-4, 11, 12
	Bearings, Main	Inspect				1.0			3, 4
		Replace				6.0			3, 4
0103	Flywheel Assy								
	Flywheel	Inspect		1.0					3, 4
		Replace				8.0			3, 4
		Repair				2.5			3, 4, 11, 12
	Flywheel Housing	Inspect			0.5				3, 4
		Replace				8.0			3, 4
		Repair				2.0			3, 4, 11, 12

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0104	Piston & Connecting Rods								
	Piston	Replace Repair				16.0 3.0	3, 4 3, 4, 11, 12		
	Connecting Rod	Replace Repair				16.0 3.0	3, 4 3, 4, 11, 12		
	Bearings, Connecting Rod	Inspect Replace				1.0 2.0	3, 4 3, 4		
0105	Valves, Camshaft & Timing System								
	Rocker Arm Assy	Adjust Replace Repair			1.0 2.0 2.0		3, 4 3, 4 3, 4, 11, 12		
	Valves	Replace Repair				8.0 8.0	3, 4 3, 4, 11, 12		
	Camshaft	Replace				2.0	3, 4		
	Timing Gears	Replace				2.0	3, 4		
0106	Engine Lubrication System								
	Oil Pan	Replace Repair			3.0 1.0		3, 4 3, 4		
	Engine Oil Pump	Replace Repair				6.0 1.0	3, 4 3, 4		
	Oil Filter	Replace							
0108	Manifolds	Replace		0.5			1-3		
	Manifolds, Intake & Exhaust	Inspect Replace	0.1	0.7			1-3		

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
03	Spark Arrester	Replace		0.5				1-3	
	FUEL SYSTEM								
0301	Fuel Injector	Test				1.0		9	
		Replace			2.5			1, 4, 7, 8	
0302	Fuel Injector	Repair				1.5		3, 4, 7, 8	
	Fuel Injector Lines	Inspect	0.2						
0302	Fuel Injector Lines	Replace			1.0			1, 4, 7, 8	
	Fuel Pump & Lines								
0302	Fuel Injection Pump	Test		0.5				1, 4, 7, 8	
		Replace			1.0				
0302	Fuel Injection Pump	Repair				2.0		1, 2, 4, 7, 8	
	Fuel Lines	Inspect	0.5						
0302	Fuel Lines	Replace		1.0				1, 2	
	Electric Fuel Pump	Test		0.5					
0304	Electric Fuel Pump	Replace		1.0				1-3	
	Air Cleaner								
0304	Air Cleaner	Service		0.5				1, 2	
	Air Cleaner	Replace		0.5				1, 2	
0306	Tank, Lines, Fittings								
0309	Fuel Tank	Inspect	0.1						
	Fuel Tank	Service		0.3				1, 2	
0309	Fuel Filter								
	Fuel Filter	Service		0.5				1, 2	
0309	Fuel Filter	Replace		0.7				1, 2	
	Fuel Strainer	Inspect	0.1						
0309	Fuel Strainer	Service		1.0				1, 2	
	Fuel Strainer	Replace		1.5				1, 2	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
0311	Engine Starting Aids								
	Cold Start Kit	Inspect Replace Repair	0.1	1.0 0.5				1-3 1-3	
0312	Accelerator, Throttle Control								
	Throttle Control	Inspect Adjust Replace	0.1	0.5 0.5				1-3 1-3	
04	EXHAUST SYSTEM								
0401	Muffler and Pipe								
	Muffler and Pipe	Inspect Replace	0.1	1.0				1-3	
05	COOLING SYSTEM								
0501	Radiator								
	Radiator Assy	Inspect Service Replace Repair	0.1	0.2 2.0	3.0			1-3 1-3 3,4	
0503	Water Manifold, Headers, Gasket								
	Thermostat & Housing	Test Replace		0.1 0.5				1-3 1-3	
	Hoses, Lines & Fittings	Inspect Replace	0.1	0.3				1-3	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0504	Water Pump								
	Pump Assy	Inspect Replace	0.1	0.5				1-3	
	Belt Drive	Inspect Adjust Replace	0.1	0.3 0.5				1-3 1-3	
0505	Fan Assembly								
	Fan	Inspect Replace	0.1	1.0					
	Belt Drive	Inspect Adjust Replace	0.1	0.3 1.5				1-3 1-3	
06	ELECTRICAL SYSTEM								
0601	Alternator	Inspect	0.1						
		Test		0.5				1-3	
		Replace Repair		1.5	1.0			1-3 1-3, 7, 8	
	Alternator Connections	Inspect	0.1						
		Test		0.5				1-3	
		Replace Repair		1.5	1.0			1-3 3, 4, 7, 8	
	Drive Belt	Inspect	0.1						
		Adjust		0.3					
		Replace		0.5					
0603	Starting Motor								
		Starter		0.2					
		Inspect Test Replace Repair		0.5 0.5	1.0			1-3 1-3 1, 7, 8	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
0607	Solenoid	Inspect Test Repair		0.1 0.5	0.5			1-3 3, 4, 7, 8	
	Instrument or Engine Control Panel								
	Instrument Panel	Inspect Repair	0.1	0.5				1-3	
0609	Hourmeter	Inspect Replace	0.1	0.5				1-3	
	Lights								
	Front Floodlights	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	
0610	Blackout Lights	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	
	Taillights	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	
	Blackout Taillights	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	
0610	Rear Floodlights	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	
	Sending Units & Warning Switches								
	Sending Unit Oil Pressure	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0611	Sending Unit Engine Temperature	Inspect Test Replace	0.1	0.1 0.5				1, 2 1-3	
	Horn								
	Horn	Test Replace	0.1	0.5				1, 2	
0612	Horn Switch	Test Replace	0.1	0.5				1, 2	
	Batteries, Storage								
	Batteries	Inspect Test Service Replace	0.1 0.3 0.3	1.0				1, 2	
0613	Battery Cables	Inspect Replace Repair	0.1	0.3 0.5				1-3 1-3	
	Hull or Chassis Wiring Harness								
	Wiring Harness	Inspect Test Replace Repair	0.1	0.5 1.0	2.5			1-3 3, 4, 7, 8 2, 3, 7, 8	
07	TRANSMISSION								
0708	Torque Converter or Fluid Coupling								
	Hose, Line & Fittings	Inspect Replace		0.1 0.5				1, 2 1-3	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS	
			C	O	F	H	D			
0710	Transmission Assy									
	Transmission	Test			0.5				3, 4	
		Inspect		0.2					1-3	
		Service		0.5					1-3	
		Replace			8.0				3-5	
0721	Coolers. Pumps. Motors	Repair				8.0			3-5	
		Overhaul					40.0			
		Transmission Linkage Controls	Inspect		0.1					1, 2
			Adjust		0.5					1-3
			Replace		1.0					1-3
	Repair			0.5					1-3	
	Oil Pump	Replace			1.0				3, 4, 12	
		Repair				1.0			4, 5, 12	
	Control Valve	Inspect		0.1					1-3	
		Replace			1.0				3, 4	
		Repair				2.0			3, 4	
	Oil Filter	Service		0.3					1-3	
		Replace		0.5					1-3	
	Oil Cooler (Torque Converter)	Inspect	0.1							
		Replace		2.0					1-3	
Repair				3.0				3, 4		
09	PROPELLER AND PROPELLER SHAFTS									
0900	Propeller Shafts	Front Drive Shaft		0.1					1, 2	
		Service		1.0					1-3	
		Replace		1.0					1-3	



**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)	
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS	
			C	O	F	H	D			
10 1000	Center Drive Shaft	Service Replace Repair		0.1 1.0 1.0					1, 2 1-3 1-3	
	Rear Drive Shaft	Service Replace Repair		0.1 1.0 1.0					1, 2 1-3 1-3	
	FRONT AXLE									
	Front Axle Assy									
	Front Axle	Inspect Service Replace Repair Overhaul		0.1 0.3		8.0	4.0		8.0	1, 2 1-3 3, 4 3, 4, 12, 18, 19
	Differential Assy									
1002	Differential Carrier Assy	Service Replace Repair Overhaul		0.5	4.0	4.0		8.0	1-3 3, 4 3, 4, 11, 18, 19	
11	REAR AXLE									
1100	Rear Axle Assy									
	Rear Axle	inspect Service Replace Repair Overhaul		0.1 0.3		8.0	4.0		8.0	1, 2 1-3 3, 4, 5 3, 4, 5, 12, 18, 19
1102	Differential Assy									
	Differential Carrier Assy	Service Replace Repair Overhaul		0.5	4.0	4.0		8.0	1-3 3, 4 3, 4, 5, 12, 18, 19	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
12	BRAKES								
1201	Hand Brake								
	Linkage	Inspect		0.5				1, 2	
		Adjust		0.5				1-3	
		Replace		1.0				1-3	
		Repair		1.0				1-3	
	Brake Assy	Inspect		0.5				1, 2	
		Replace		2.0				1-3	
		Repair		2.0				1-3	
1202	Service Brake	Inspect		0.5				1, 2	
		Replace		0.8				1-3	
1204	Hydraulic Brake System								
	Hydraulic Brake Valve	Inspect		0.1				1, 2	
		Replace		1.0				1-3	
		Repair		0.5				1-3	
	Lines, Fittings & Hoses	Inspect		0.1				1, 2	
		Replace		1.0				1-3	
13	WHEELS								
1311	Wheel Assembly	Inspect	0.1						
		Replace		0.8				1-3	
	Tires	Inspect	0.1						
		Service	0.3						
		Replace		1.0				1-3	
		Repair		1.0				1-3	
14	STEERING								
1407	Power Steering Gear Assembly (& Steering Column)	Replace			2.0			3, 4	
		Repair			3.0			3, 4	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
1410	Hydraulic Pump or Fluid Motor Assy								
	Hydraulic Pump	Replace Repair		1.0	2.0			1-3 3, 4, 10	
1411	Hoses, Lines & Fittings								
	Hoses, Lines & Fittings	Inspect Replace Repair	0.1	0.5 0.5				1-3 1-3	
1412	Hydraulic Cylinders								
	Steering Cylinder	Inspect Replace Repair	0.1	1.0	1.0			1-3 3, 4, 10	
15	FRAME & TOWING ATTACHMENTS								
1501	Frame Assembly								
	Roll Over Protective Structure	Inspect Replace	0.1	1.0 1.0				1-3	
1503	Pintle and Towbar	Inspect Repair		0.1 2.0				1, 2 1-3	
18	BODY, CAB, HOOD AND HULL								
1801	Body, Cab & Hood								
	Body	Inspect Repair	0.1		2.0			3, 4, 13, 14	
	Hood	Inspect Replace Repair	0.1	0.7	2.0			1-3 3, 4, 13, 14	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
1806	Upholstery Seats & Carpets  Seat	Adjust Inspect Replace	0.1 0.2	0.5				1-3	
24	HYDRAULIC LIFT COMPONENTS								
2402	Manifold and/or Control Valves  Control Valve	Test Replace Repair		0.2	1.5 4.0			1-3 3, 4 3, 4	
2403	Hydraulic Controls and/or Manual Controls  Controls, Levers & Linkages	Inspect Replace Repair	0.1	0.5 0.5				1-3 1-3	
2404	Tilt Cylinders and Tilt Crank  Cylinder Hydraulic Tilt	Inspect Test Replace Repair	0.1	0.2	1.0 1.5			3, 4 3, 4, 10, 11, 12	
2405	Mast Column  Lifting Forks  Lift Chains	Inspect Replace  Adjustment Removal Replace	0.1	0.5	0.5 0.5 0.5			1  1-3 1-3 1-3	

**Section II. MAINTENANCE ALLOCATION CHART (cont)**

(1)	(2)	(3)	(4)					(5)	(6)
GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY					TOOLS AND EQUIPMENT	REMARKS
			C	O	F	H	D		
2406	Mast Assembly	Replace Repair			2.0 4.0			3, 4 3, 4, 11, 12, 13	
	Side Shift Cylinder	Test			0.2				
		Inspect		0.1				3, 4, 10	
		Replace Repair			1.0 1.5			3, 4 3, 4, 10	
	Hydraulic Lift Cylinder	Inspect	0.1						
Test			0.2				1-3, 10		
Replace				1.5			3, 4		
Repair				2.0			3; 4, 10, 12, 15	A	
2407	Strainers, Filters, Lines and Fittings	Inspect	0.1						
		Replace		0.5				1-3	
		Repair		0.5				1-3	
2408	Hydraulic Cylinders	Test			0.2			3, 4, 10	
		Inspect	0.1						
		Replace			1.0			3, 4	
		Repair			1.5			3, 4, 10	
47	Liquid Tanks or Reservoirs	Inspect	0.1						
		Service		0.1				1-3	
		Replace		1.0				1-3	
		Repair		2.0				1-3	
4702	GAGES (ELECTRIC)	Inspect	0.1						
	Gages, Fuel Level and oil-pressure	Replace		0.5					

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST  
EQUIPMENT  
REFERENCE  
CODE

MAINTENANCE  
CATEGORY

NOMENCLATURE

NATIONAL/NATO  
STOCK NUMBER

TOOL  
NUMBER

UNLESS OTHERWISE NOTED, ALL MAINTENANCE  
FUNCTIONS CAN BE ACCOMPLISHED WITH THE TOOLS  
CONTAINED IN THE FOLLOWING COMMON TOOL SETS

1	O,F,H	TOOL KIT AUTO MAINT: ORG MAINT COMMON #1	4910-00-754-0654	LIN W32593
2	O,F,H	TOOL KIT AUTO MAINT: ORG MAINT COMMON #2	4910-00-754-0650	LIN W32730
3	O,F,H	TOOL KIT AUTO MECH: LIGHT WEIGHT	5180-00-177-7033	LIN W33004
4	F,H	SHOP EQUIP, AUTO MAINT: FIELD MAINT, BASIC (SC 4910-95-CL-A31)	4910-00-754-0705	TZ4660
5	F,H	TOOL KIT MASTER MECH: EQUIP MAINT & REPAIR	5180-00-699-5273	LIN W45060
6	F,H	WRENCH SET SOCKET: 3/4" DRIVE HEX TYPE	5130-00-357-5135	LIN Y75239
7	F,H	TOOL KIT AUTOMOTIVE FUEL & ELEC SYS REPAIR	4910-00-754-0655	LIN W32456
8	F,H	SHOP EQUIP FUEL & ELEC SYS ENGINE	4910-00-754-0714	T30414
9	F,H	TEST SET DSL INJ	4910-00-317-8265	V73742
18	F,H	FIELD MAINTENANCE SUPPLEMENTAL TOOL SET NO. 2	4910-00-754-0707	LIN T25756
19	F,H	SHOP EQUIP MACHINE SHOP, FIELD MAINT, BASIC	3470-00-754-0708	LIN T15644
10		GAUGE, HYDRAULIC PRESSURE 0-3000 PS:	6685-00-983-8326	

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS (cont)**

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
11	F, H	Shop Equip Machine Shop	3740-00-754-0708	T15644
12	F, H	Tool Kit Machinist	5280-00-511-1950	W44512
13	F,H	Shop Equip Welding	3740-00-357-7268	T16714
14	F, H	Tool Kit Body & Fender Repair	5180-00-754-0643	W33680
15	F	Kit, Seal Installing P/N Cas 1704		
16	F	Spanner Wrench	5120-00-277-9076	
17	F	spanner Wrench	5120-00-277-9077	

**Section IV. REMARKS**

Reference Code	Remarks
A	Kit, Seal Installing, P/N 1704 (special tool) required to install seal, P/N L36272, part of parts kit, Linear, P/N G107912





## APPENDIX D

## EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

## Section I. INTRODUCTION

**D-1. SCOPE**

This appendix lists expendable consumable maintenance supplies you will need to operate and maintain the Forklift Truck MHE 237. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

**D-2. EXPLANATION OF COLUMNS**

*a. Column 1-Item Number.* This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 11, App. D").

*b. Column 2-Level.* This column identifies the lowest level of maintenance that requires the listed item.

C- Operator/Crew

O- Organizational Maintenance

F -Direct Support Maintenance

H- General Support Maintenance

*c. Column 3-National Stock Number.* This is the National stock number assigned to the item; use it to request or requisition the item.

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

*e. Column 5 Unit of Measure (U/M).* Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
			GAA, GREASE, AUTOMOTIVE AND ARTILLERY MIL-G-10924 (81349)	
1	O	9150-00-065-0029	2-1/4 OZ TUBE	EA
2	O	9150-00-935-1017	14 OZ CARTRIDGE	EA
3	O	9150-00-190-0904	1 LB CAN	EA
4	O	9150-00-190-0905	5 LB CAN	EA
5	O	9510-00-190-0907	35 LB PAIL	EA
6	O	9150-00-186-6689	OIL, LUBRICATING, ENGINE MIL-L-2104 (81349) 1 QT CAN	EA
7	O	9150-01-035-5393	OIL, HYPOID, SAE 90 MIL-L-2104 (81349) 5 GAL CAN	EA
8	O	7920-00-291-5815	CLEANING EQUIPMENT BRUSH, WIRE: SCRATCH, S-WIRE, CURVED HDL, WIRE LG OUTSIDE BLOCK: 1 1/8 TO 1 1/4 IN. 4 ROWS WIDE, 18 ROWS LG, 14 IN LG	
9	O	7920-00-205-1711	RAGS, COTTON: WIPING	BL
10	O	6850-00-264-9038	SOLVENT: DRY CLEANING, FED SPEC PD-680, A GAL CAN MAINTENANCE SUPPLIES ADHESIVE, RUBBER BASE GENERAL PURPOSE MIL-A-5092B TYPE 1	EA
11	O	8040-00-262-9025	4 OZ TUBE	EA
12	O	8040-00-262-9028	1 PT CAN	EA
13	O	8040-00-262-9031	1 QT CAN	EA
14	O	8020-00-559-0389	BRUSH, PAINT: 2 IN. WIDE	EA
15	O	5350-00-221-0872	CLOTH, ABRASIVE: CROCUS, FERRIC OXIDE AND QUARTX, JEAN- CLOTH-BACKING, EXPOSED COAT, 9 X 11 SH, 50-SH SHEAVE (81348) P-C-458A, 42-C-20420-50 CLOTH, ABRASIVE: AL-OXIDE, JEAN-CLOTH-BACKING, CLOSED COAT, 9 X 11 SH. 50-SH SHEAVE P-C-451A, TYPE A, CLASS 1	
16	F	5350-00-192-5047	GRIT NO. 80 (GR 1/0)	EA
17	F	5350-00-192-5049	GRIT NO. 120 (GR 3/0)	EA
18	F	5350-00-092-5051	GRIT NO. 180 (GR 5/0)	EA
19	H	8030-00-833-9116	COMPOUND, SEALING: GRADE AV (RED) MIL-S-22473 6 OZ. TUBE	EA
20	H	8030-01-014-5869	THREAD SEALANT: MIL-STD-46163 (81349) 50 CC BOTTLE	EA
21	F	8030-00-873-4792	PERMATEX 2 (79225) 1 QT CONTAINER	EA
22	F	6850-00-598-7328	CLEANING COMPOUND MIL-C-10597 (81349)	EA
23	O	9150-01-102-9455	BRAKE FLUID, SILICONE, AUTOMOTIVE, MIL-B-46176, PLASTIC CONTAINER	1 GALLON

**APPENDIX E**  
**TORQUE LIMITS**

**E-1. GENERAL**

This section provides general torque limits for fasteners. Special torque values are indicated in the maintenance procedures for applicable components. The general torque values given in this appendix shall be used when specific torque values are not indicated in the maintenance procedures.

**E-2. TORQUE LIMITS**

Torque limits are listed in table E-1 for dry fasteners and in table E-2 for wet fasteners. Dry fasteners are defined as fasteners on which no lubricants are applied to the threads; wet fasteners are defined as fasteners on which special graphited or moly-disulphide greases or other extreme pressure lubricants are applied to the threads.

*Table E-1. Torque Limits for Dry Fasteners*

SIZE		TORQUE					
		SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 8	
INCHES	MILLIMETERS	POUNDS FOOT	NEWTON METERS	POUNDS FOOT	NEWTON METERS	POUNDS FOOT	NEWTON METERS
1/4	6.35	5-6	6.8- 8.13	9-11	12.2- 14.9	12-15	16.3- 20.3
5/16	7.94	10-12	13.6- 16.3	17-20.5	23.1- 27.8	24-29	32.5- 39.3
3/8	9.53	20- 23	27.1- 31.2	35-42	47.5- 57.0	45-54	61.0- 73.2
7/16	11.11	30- 35	40.7- 47.4	54-64	73.2- 86.8	70-84	94.9- 113.9
1/2	12.70	45- 52	61.0- 70.5	80-96	108.5- 130.2	110-132	149.2- 179.0
9/16	14.29	65- 75	88.1 -101.6	110-132	149.2- 179.0	160-192	217.0- 260.4
5/8	15.88	95-105	128.7 -142.3	150- 180	203.4- 244.1	220- 264	298.3- 358.0
3/4	19.05	150-185	203.3 -250.7	270- 324	366.1- 439.3	380-456	515.3- 518.3
7/8	22.23	160-200	216.8-271.0	400- 480	542.4- 650.9	600- 720	813.6- 976.3
1	25.40	250-300	338.8-406.5	580- 696	786.5- 943.8	900-1080	1220.4 -1464.5
1-1/8	25.58	-	-	800- 880	1084.8-1193.3	1280-1440	1735.7 -1952.8
1-1/4	31.75	-	-	1120-1240	1518.7 -1681.4	1820-2000	2467.9-2712.0
1-3/8	34.93	-	-	1460-1680	1979.8 -2278.1	2380-2720	3227.3-3688.3
1-1/2	38.10	-	-	1940-2200	2630.6-2983.2	3160-3560	4285.0-4827.4

*Table E-2. Torque Limits for Wet Fasteners*

SIZE		TORQUE					
		SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 8	
INCHES	MILLI-METERS	POUNDS FOOT	NEWTON METERS	POUNDS FOOT	NEWTON METERS	POUNDS FOOT	NEWTON METERS
1/4	6.35	4.5- 5.5	6.1- 7.5	8 - 10	10.8- 13.6	11 - 13.5	14.9- 18.3
5/16	7.94	9 - 11	12.2- 14.9	15 - 18.5	20.4- 25.1	21.5- 26	29.2- 35.3
3/8	9.53	18 - 20.5	24.4- 27.8	31.5- 38	42.8- 51.6	40.5- 48.5	55 - 65.9
7/16	11.11	27 - 31.5	36.7- 42.8	48.5- 57.5	65.9- 78.2	63 - 75.5	85.6- 102.6
1/2	12.70	40.5- 47	55 - 63.9	72 - 86.5	97.9- 117.6	99 - 119	134.6- 161.8
9/16	14.29	58.5- 67.5	79.5- 91.8	99 - 119.0	134.6- 161.8	144 - 173	195.8- 235.2
5/8	15.88	85.5- 94.5	116.2-128.5	135 - 162	183.6- 220.3	198 - 237.5	269.2- 323
3/4	19.05	135 -166.5	183.6-226.4	243 - 291.5	330.4- 396.4	342 - 410	465.1- 557.6
7/8	22.23	144 -180	195.8-224.8	360 - 432	489.6- 587.5	540 - 648	734.4- 881.2
1	25.40	225 -270	306 -367.2	522 -626	709.9- 851.3	810 - 972	1101.6-1321.9
1-1/8	25.58	-	-	720 - 792	979.2-1077.1	1152 -1296	1566.7-1762.5
1-1/4	31.75	-	-	1008 -1116	1370.8-1517.7	1638 -1800	2227.6-2448
1-3/8	34.93	-	-	1314 -1512	1787 -2056.3	2142 -2448	2430.3-3329.2
1-1/2	38.10	-	-	1746 -1980	2374.5-2692.8	2844 -3204	3867.8-4357.4

## APPENDIX F

### ELECTRICAL AND HYDRAULIC DIAGRAMS

---

#### Section I. INTRODUCTION

##### F-1 GENERAL

This appendix contains an electrical diagram and an hydraulic diagram. Also included in this appendix is a description of how to use the electrical diagram as an aid to troubleshooting (section 11). Section 111 contains the diagrams (figures F-3 through F-5).

##### F-2. DIAGRAMS

The hydraulic diagram is located in figures F-3 and F-4 and the electrical diagram is located in figure F-5. Figure F-3 shows the hydraulic oil flow when the various controls are in the neutral position. Figure F-4 shows the hydraulic oil flow when the controls are activated.

#### Section II. HOW TO USE ELECTRICAL SCHEMATIC AS AN AID TO TROUBLESHOOTING

##### F-3. OVERVIEW

a. Figure F-5, your Electrical Diagram, is designed to help you understand the electrical circuits associated with this vehicle. It is generally referred to as a "schematic" and uses "symbols" to represent real components. It is not drawn to scale (as in a blueprint) nor does the location of the symbols represent actual location of components in the vehicle. It is a simple "picture" of how the circuits and components are connected together.

b. To quickly find a malfunction or trouble in the electrical system and repair it requires an understanding of how the system operates and a method for checking it out. "Troubleshooting" provides the "method" for check out procedures and your technical manual (Troubleshooting tables and schematics) provides the "operating principles".

##### F-4. TROUBLESHOOTING

Troubleshooting is the systematic (step-by-step) isolation of a malfunction or trouble to the faulty component, harness connector/wire. It is a guide that helps develop a routine or "way" of finding troubles in any electrical system or circuit. As you become more familiar with this vehicle and gain experience, you will find ways to shorten these procedures and decrease down time. BEFORE you attempt to make any repairs or checks, do the following:

a. Find out how the system works under normal conditions and how to operate it.

b. Make sure the malfunction or trouble reported to you "really" exists. ("Dead batteries" could end up as a "failure to start" because of a faulty neutral start switch or

the transmission shift lever not fully engaged in park or neutral.) Try to duplicate the trouble so you can be sure you're on the right track.

c. Check troubleshooting index for most likely cause, then identify the circuit that is malfunctioning.

d. Study the electrical schematic to learn which components, harnesses, or wires could contribute to or cause the malfunction.

##### NOTE

Remember, when tracing circuits on the electrical schematic, that you should always start at the positive (+) side of the battery. Current will flow outward from that point through the circuits and return to the negative (-) side of the battery by way of ground wires and the vehicle frame.

e. Make necessary tests and checks to isolate circuit or component as outlined in the troubleshooting section of this technical manual.

f. Make repairs, if you're sure. If not, continue to isolate the malfunction, or ask for help from your foreman or supervisor.

g. After repairs, make sure everything has been re-connected and tightened.

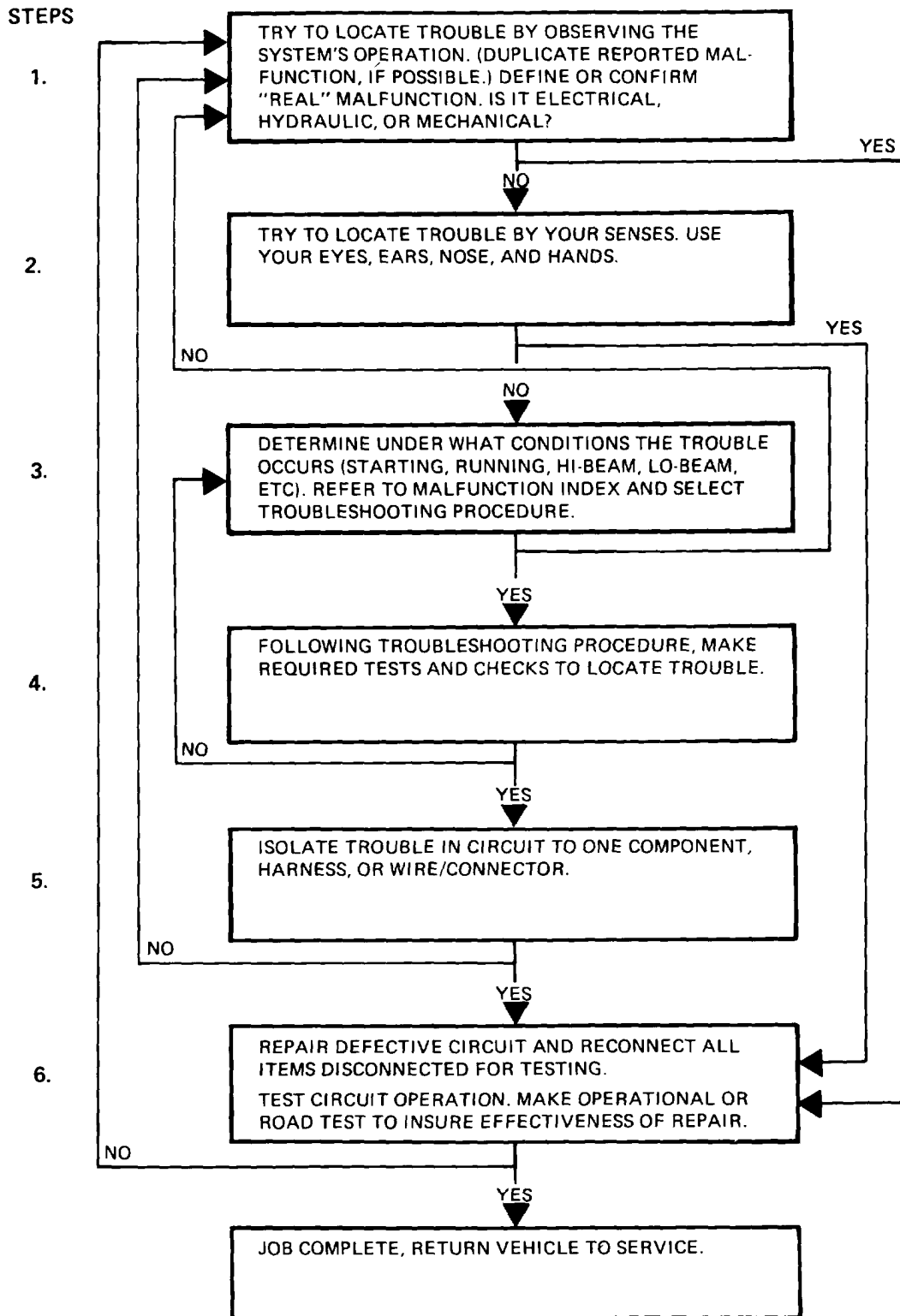
h. Make operational checks to verify that the system/circuit is functioning properly again.

**F-5. TROUBLESHOOTING LOGIC  
TREE**

Figure F-1 is a Troubleshooting logic tree. It is designed to help you develop a quick logical way of approaching an electrical troubleshooting problem.

**F-6. ELECTRICAL SYMBOLS**

Figure F-2 shows you the basic electrical symbols used with most schematics. They will help you read and understand the electrical circuits.



TA127509

Figure F-1. Logic Tree Troubleshooting Technique.

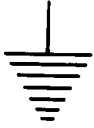

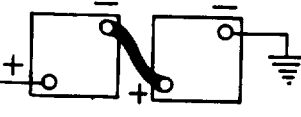
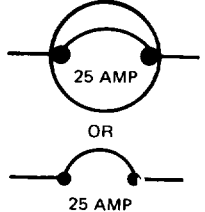
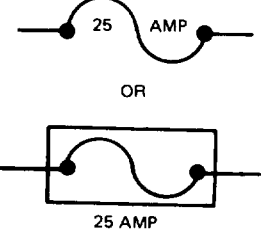
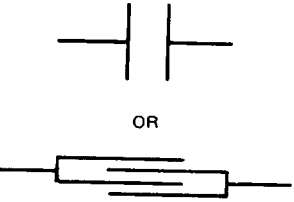

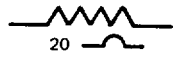

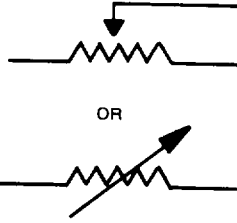


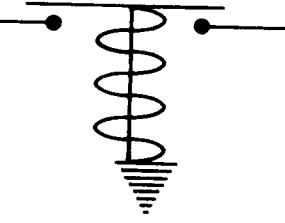
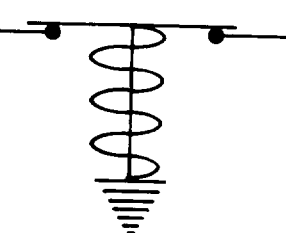
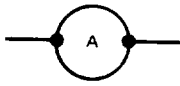

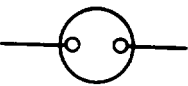
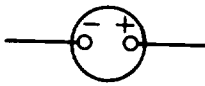
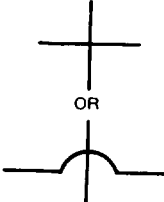
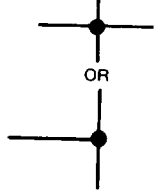


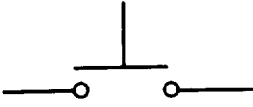
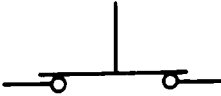
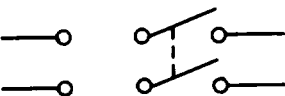
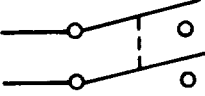
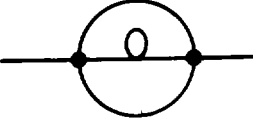
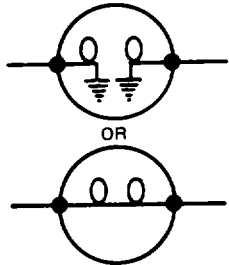
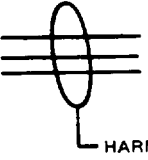
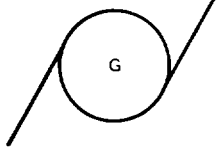
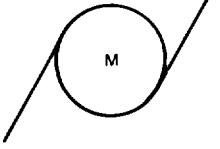
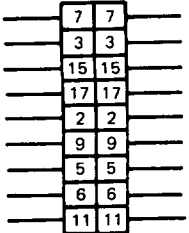

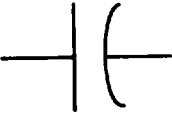
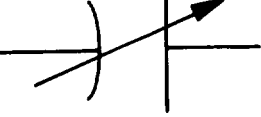
<p>GROUND</p> 	<p>BATTERY (12 VOLT)</p> 	<p>BATTERIES IN SERIES HOOK-UP (24 VOLT CAPACITY)</p>  <p>12 VOLT 12 VOLT</p>	<p>CIRCUIT BREAKER (AUTOMATIC RESET)</p> 
<p>FUSE</p> 	<p>CONDENSER</p> 	<p>OHMS:</p> 	<p>FIXED RESISTOR</p> 
<p>POTENTIOMETER</p> 	<p>VARIABLE RESISTOR</p> 	<p>DIODE/RECTIFIER (CURRENT FLOWS IN THE DIRECTION OF THE ARROW)</p> 	<p>RHEOSTAT</p> 
<p>NORMALLY OPEN RELAY (N.O.)</p> 	<p>NORMALLY CLOSED RELAY (N.C.)</p> 	<p>AMMETER</p>  <p>INDICATES TEST METER (NOT INSTRUMENT PANEL GAGE)</p>	<p>VOLT METER</p>  <p>INDICATOR TEST METER (NOT INSTRUMENT PANEL GAGE)</p>
<p>TYPICAL GAGE</p>  <p>TYPE/USE WILL BE LABELED ON WIRING DIAGRAM.</p>	<p>SLAVE OUTLET</p> 	<p>WIRES CROSS (NOT CONNECTED)</p>  <p>OR</p> <p>NO CURRENT FLOW FROM ONE WIRE TO ANOTHER (NO PHYSICAL CONNECTION)</p>	<p>WIRES JOINED TOGETHER CONNECTED</p>  <p>OR</p> <p>CURRENT FLOWS FROM ONE WIRE TO ANOTHER (PHYSICAL CONNECTION)</p>

Figure F-2. Electrical Symbols (Sheet 1 of 2).

TA127510.1

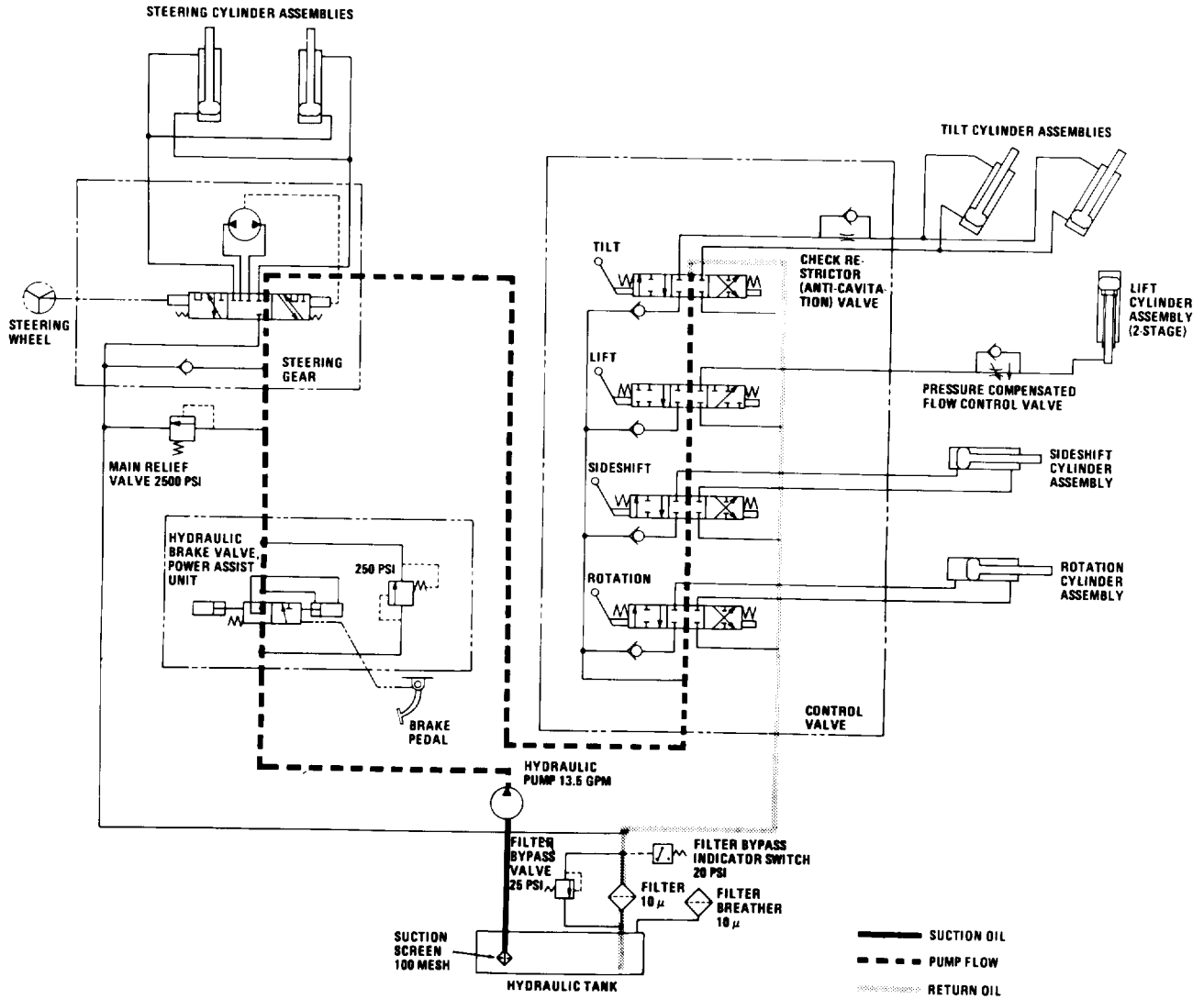


<p>SINGLE POLE SINGLE THROW (SPST)</p> 	<p>SINGLE POLE DOUBLE THROW (SPDT)</p> 	<p>NORMALLY OPEN MICRO SWITCH (N.O.) GENERALLY STENCILLED OR STAMPED ON SWITCH</p> 	<p>NORMALLY CLOSED MICRO SWITCH (N.C.) GENERALLY STENCILLED OR STAMPED ON SWITCH</p> 
<p>DOUBLE POLE DOUBLE THROW (DPDT)</p> 	<p>DOUBLE POLE SINGLE THROW (DPST)</p> 	<p>SINGLE FILAMENT LAMP</p> 	<p>DOUBLE FILAMENT LAMP</p> 
<p>HARNESS ASSY.</p>  <p>HARNESS ASSY.</p>	<p>GENERATOR</p>  <p>G</p>	<p>MOTOR</p>  <p>M</p>	 <p>HARNESS/CABLE CONNECTOR</p>
 <p>DIRECTIONAL FLOW (CURRENT) ARROW</p>	 <p>CAPACITOR, FIXED</p>	 <p>CAPACITOR, VARIABLE</p>	

TA127510.2

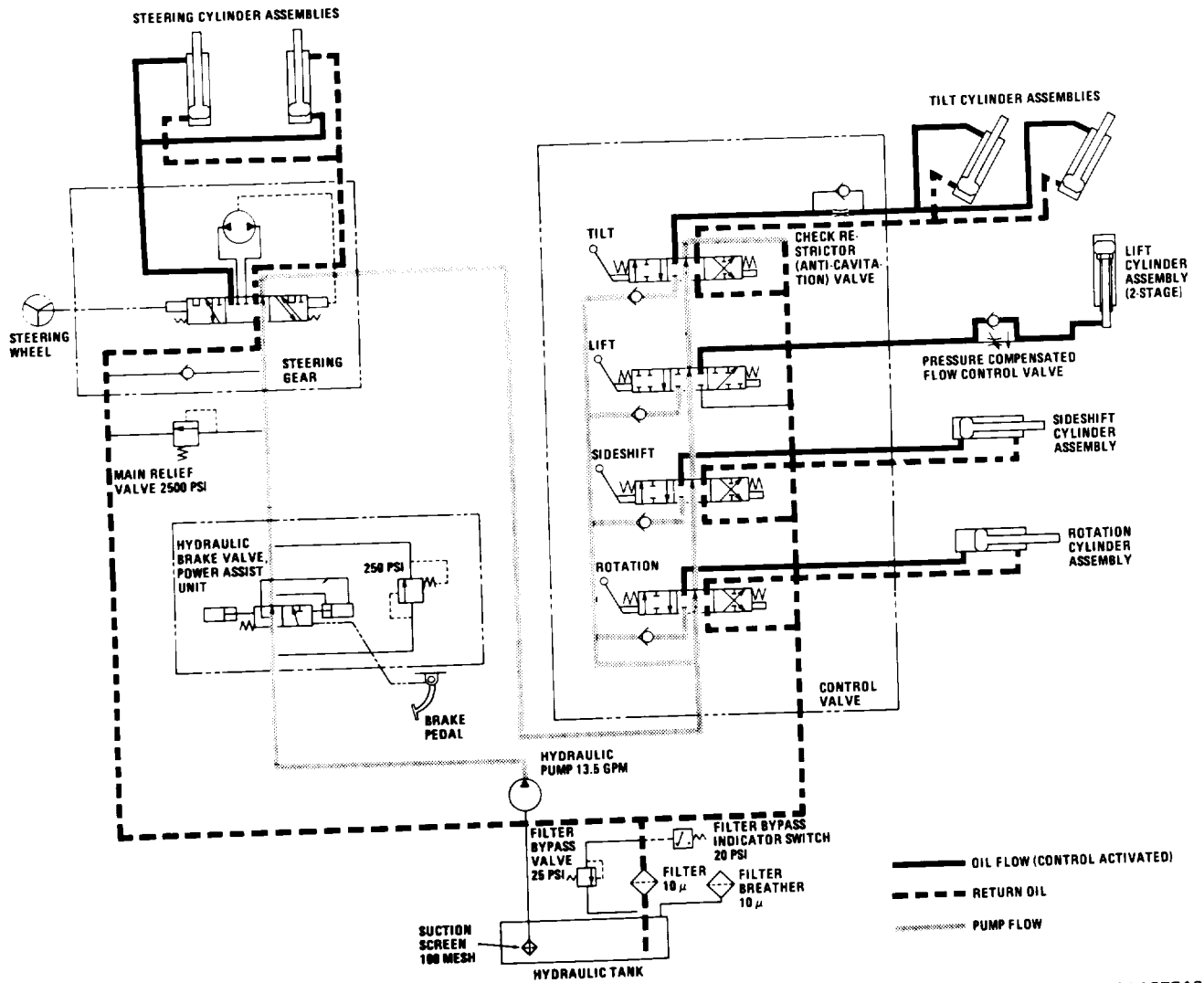
Figure F-2. Electrical Symbols (Sheet 2 of 2).

Section III. DIAGRAMS



TA127512

Figure F-3. Hydraulic Diagram (Oil Flow with Controls in Neutral Position).



TA127513

Figure F-4. Hydraulic Diagram (Oil Flow with Controls Activated).



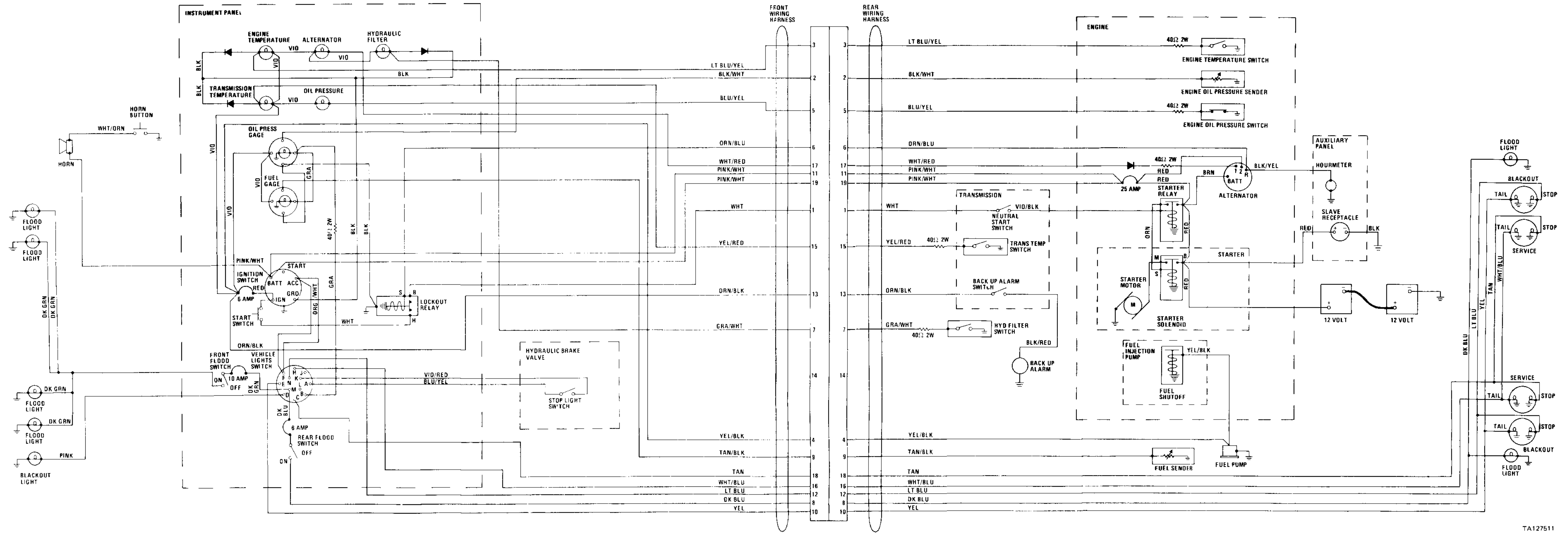


Figure F-5. Electrical Diagram

TA127511

APPENDIX G

GLOSSARY

ABBREVIATIONS

A	Annually
AMDF	Army Master Data File
AMP	Ampere
AR	Army regulation
ASSY	Assembly
ATTN	Attention
B	Biennially
BAT	Battery
BHP	Brake horsepower
BLK	Black
BLU	Blue
B.O.	Blackout
BOI	Basis of issue
BRN	Brown
BRT	Bright
BTDC	Before top dead center
CONT	Continued
CC	Cubic centimeter
CCW	Counterclockwise
CW	Clockwise
DA	Department of the Army
db(A)	Decibel
D.C.	District of Columbia
DD	Department of Defense
DED	Diesel engine driven
DK	Dark
DMWR	Depot maintenance work requirements
DSL INJ	Diesel fuel injector
E	Empty
EA	Each
EQUIP	Equipment
F	Fahrenheit
FED SPEC	Federal Specification
FM	Field Manual
FSCM	Federal Supply Code for Manufacturers
FWD	Forward
GAA	Grease, Automotive and Artillery
GAL	Gallon
GEN PURP	General purpose
GPM	Gallons per minute
GRA	Gray
GRD	Ground
H	Hours
I.D.	Inside diameter
IGN	Ignition
K	Thousand
LB	Pound
LG	Long
LIN	Line item number

ABBREVIATIONS (cont)

LO	. . . . .	.Lubrication order
LT	. . . . .	Light
LIN	. . . . .	Line item number
M	. . . . .	Motor
MAC	: . . . . .	Maintenance Allocation Chart
MAX	. . . . .	Maximum
MECH	. . . . .	Mechanic
MHE	. . . . .	Material Handling Equipment
MI	. . . . .	Miles
MIN	. . . . .	Minimum
MM	. . . . .	Millimeter
MPH	. . . . .	Miles per hour
MTOE	. . . . .	Modified table of organization and equipment
MWO	. . . . .	Modification work order
N	. . . . .	Neutral
NC	. . . . .	National coarse thread
NEG	. . . . .	Negative
NF	. . . . .	National fine thread
No.	. . . . .	Number
NSN	. . . . .	National stock number
O.D.	. . . . .	Outside diameter
ORG	. . . . .	Organizational
OZ	. . . . .	Ounce
PARA	. . . . .	Paragraph
PMCS	. . . . .	Preventive maintenance checks and services
P/N	. . . . .	Part Number
POS	. . . . .	Positive
PRESS	. . . . .	Pressure
PSI	. . . . .	Pounds per square inch
P T	. . . . .	Pint
Q	. . . . .	Quarterly
Q T	. . . . .	Quart
QTY	. . . . .	Quantity
R	. . . . .	Reverse
ROPS	. . . . .	Roll over protective structure
RPM	. . . . .	Revolutions per minute
RPSTL	. . . . .	Repair parts and special tools list
S	. . . . .	Semiannually
SAE	. . . . .	Society of Automotive Engineers
S B	. . . . .	Service bulletin
SER.	. . . . .	Service
SMR	. . . . .	Source, Maintenance, and Recoverability Codes
SYS	. . . . .	Systems
TAMMS	. . . . .	The Army Maintenance Management System
TARCOM	. . . . .	U.S. Army Tank-Automotive Material Readiness Command
TB	. . . . .	Technical Bulletin
T D C	. . . . .	Top dead center
TM	. . . . .	Technical Manual
T M D E	. . . . .	Special Test, Measurement, and Diagnostic Equipment
U / M	. . . . .	Unit of measure
UNC	. . . . .	Unified National coarse thread
UNF	. . . . .	Unified National fine thread
V	. . . . .	volt

**ABBREVIATIONS (cont)**

Vdc	. . . . .	Volt (direct-current)
VIO	. . . . .	Violet
WD	. . . . .	. Wide
WHT	. . . . .	White
WSDC	. . . . .	Weapons System Designator
YEL	. . . . .	. Yellow





**APPENDIX H**  
**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

**H-1. INTRODUCTION**

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at organizational maintenance. A part number index in alpha-numeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria. All bulk materials needed for manufacture of an item are listed by NSN in a tabular list on the illustration.

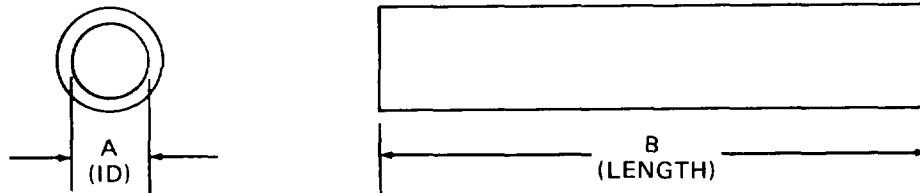
**H-2. MANUFACTURED ITEMS PART NUMBER INDEX**

PART NUMBER	FIGURE
D64267	H-1
L102543	H-1
L102913	H-1

PART NUMBER	FIGURE
L60451	H-1
L60515	H-1
L78902	H-1
L79326	H-1

**H-3. MANUFACTURED ITEMS ILLUSTRATIONS**

Figure H-1, a simplified line drawing, illustrates all items authorized to be manufactured/fabricated by organizational maintenance personnel. Included thereon are all dimensions and information necessary for the manufacture. The Part Number column of the table lists the part numbers of the items to be manufactured, and the Description column describes the items. The Dimension and Materials columns provide information on the size of each item and the material from which it shall be manufactured.



TA127505

Part Number	Description	Dimension (Inches)		NSN
		A	B	
D64267	Hose, Filter Supply	1/4	31 (±0.2)	4720-00-007-9424
D64267	Hose, Return	1/4	31 (±0.2)	4720-00-007-9424
L102543	Hose, Fuel	1/4	10 (±0.2)	4720-00-374-8125
L102913	Hose, Suction	1-1/4	23	
L60451	Hose, Vent	1/4	27	4720-00-460-2477
L60515	Hose, Vent	1/4	32	4720-00-460-2477
L78902	Hose, Breather	3/4	44 (±0.5)	
L79326	Hose, Fuel Filter	1/4	81343	4720-00-374-8125

*Figure H-1. Manufactured Items*



## ALPHABETICAL INDEX

Subject, Para

## A

Abbreviations, list of, 1-10  
 Accelerator/Throttle Control: removal, 2-15i  
 Adjustment:  
   brake pedal and declutch pedal, 2-43e  
   declutch valve, 2-43d  
   differential carrier, 4-5a  
   fan belt, 2-17f  
   front and rear axle wheel bearings, 2-39f  
   fuel injectors, 4-3a  
   lift chains, 2-56d  
   parking brake linkage, 2-42a  
   relief valve, 2-48b(2)  
   rocker arm, 3-5j  
   service brake assembly, 2-43a  
   sideshift chains, 2-56e  
   transmission linkage controls, 2-38b  
   valve tappet clearance, 3-5a  
 Administrative Storage, 1-4  
 Air Breather:  
   Hydraulic Reservoir Servicing: removal, 2-56g(4)  
   Transmission Servicing:  
     removal, 2-38a(3)  
     preventive maintenance, 2-7  
   Axle, 2-39e  
 Air Cleaner:  
   maintenance, 2-15c  
   preventive maintenance, 2-7  
   principles of operation, 1-16  
 Air Cleaner Indicator: preventive maintenance, 2-7  
 Alarm, Back-up, 2-32c  
 Alternator:  
   principles of operation, 1-19  
   removal, 2-26  
   repair, 3-12  
   troubleshooting, 3-9  
 Alternator Indicator: principles of operation, 1-19  
 Auxiliary Panel Maintenance, 2-29  
 Axle Assembly:  
   front: removal, 3-20a  
   front and rear:  
     preventive maintenance, 2-7  
     principles of operation, 1-21  
     servicing, 2-39d  
   maintenance, 4-5  
   rear: removal, 3-20b  
 Axle Breathers:  
   maintenance, 2-29e  
   preventive maintenance, 2-7

Subject, Para

## A (cont)

Axle Differential Carrier Assembly:  
   direct support  
     front: removal, 3-20c  
     rear: removal, 3-20d  
   general support: repair, 4-5a  
 Axle Disconnect: principles of operation, 1-20  
 Axle Disconnect Lever: maintenance, 2-38c  
 Axle Shafts, and Bearings, front and rear axles:  
   maintenance, 2-39f  
 Axle Trunnion, Rear: maintenance, 4-6  
 Axles and Differential Carrier Assemblies:  
   direct support:  
     maintenance, 3-20  
     troubleshooting, 3-18  
   organizational:  
     maintenance, 2-39d  
     troubleshooting, 2-37  
 Axles and Wheels: principles of operation, 1-21

## B

Back-up Alarm: maintenance, 2-32c  
 Back-up Alarm and Horn: 2-32  
 Back-up Alarm Switch, Neutral Start Switch and:  
   maintenance, 2-31 b  
 Batteries and Battery Cables:  
   maintenance, 2-33b  
   principles of operation, 1-19  
 Battery Cover: maintenance, 2-33a  
 Battery System:  
   maintenance, 2-33  
   troubleshooting, 2-20  
 Bearings, Camshaft and: maintenance, 4-2g  
 Bearings, Main and Crankshaft, 4-2d  
 Bearings, Pivot:  
   maintenance, 3-27  
   troubleshooting, 3-26  
 Bearing, Rotation: maintenance, 3-3 lb  
 Belt, Fan and:  
   maintenance, 2-17f  
   principles of operation, 1-18  
 Blackout Light:  
   front: maintenance, 2-30b  
     testing, 2-30b  
   rear: maintenance, 2-30c  
     testing, 2-30c  
 Block Assembly, Cylinder:  
   inspection, 3-5e  
   maintenance, 4.2a

**ALPHABETICAL INDEX (cont)**

Subject, Para

**B (cont)**

Body, Cab and Hood:  
 maintenance, 2-53  
 troubleshooting, 2-51  
 Body and Towing Attachments: principles of operation, 1-24  
 Brake, Parking – see Parking Brake  
 Brake, Service – see Service Brake  
 Brake Hoses, Lines and Fittings: maintenance, 2-43b  
 Brake Linkage, Parking – see Parking Brake Linkage  
 Brake Pedal:  
 maintenance, 2-43e  
 troubleshooting, 2-41  
 Brakes: principles of operation, 1-22  
 Brake System: maintenance, 2-42, 2-43  
 troubleshooting, 2-41  
 Brake Valve, Hydraulic:  
 maintenance, 2-43c  
 brake master cylinder, 2-43c(1)  
 power assist unit, 2-43c(2)  
 principles of operation, 1-22  
 Breather, Air – see Air Breather  
 Breathers, Axle: maintenance, 2-39e  
 Bulb, Gage: replacement, 2-18a  
 Bumper, Chassis Stop: maintenance, 2-52b

**C**

Cab – see Body, Cab and Hood  
 Cables, Battery: maintenance, 2-33b  
 Camshaft and Bearings: maintenance, 4-2g  
 Carriage Assembly, Mast: maintenance, 3-31a  
 Carrier, Axle Differential – see Differential Case and Gear Assembly  
 Chains, Lift – see Lift Chains  
 Chains, Sideshift – see Sideshift Chains  
 Chains, Tow – see Tow Bar, Tow Chains and Pintle Hook  
 Chapter Index:  
 direct support, 3-1  
 general support, 4-1  
 organizational maintenance, 2-1  
 Charging Pump Assembly:  
 maintenance, 3-19e  
 principles of operation, 1-20  
 Charging System – see Alternator  
 Chassis:  
 separation of front and rear, 3-27  
 troubleshooting, 3-26  
 Chassis Floor Plate and Guard: maintenance, 2-53i  
 Chassis Stop Bumper: maintenance, 2-52b  
 Circuit Breakers, Flood Light Switches and:  
 maintenance, 2-28a

Subject, Para

**C (cont)**

Circuit Breaker, Ignition Switch and: maintenance, 2-28c  
 Clutch Assembly:  
 forward: maintenance, 4-4i  
 low: maintenance, 4-4g  
 reverse and second: maintenance, 4-4f  
 third: maintenance, 4-4h  
 Clutch Group, Gear and: maintenance, 4-4d  
 Common Tools and Equipment: 1-8  
 Connecting Rods, Pistons and: maintenance, 4-2f  
 Control Levers and Linkages, Hydraulic Lift System –  
 see Lift System Control Levers and Linkages, Hydraulic  
 Controls, Transmission Linkage: maintenance, 2-38b  
 Control Valve, Hydraulic Lift System – see Lift System  
 Control Valve, Hydraulic  
 Control Valve Assembly and Modulation Valve Assembly:  
 inspection, 2-38e  
 principles of operation, 1-20  
 removal, 3-19d  
 repair, 4-4j  
 Converter Group, Torque:  
 maintenance, 4-4a  
 principles of operation, 1-20  
 Converter Housing: maintenance, 4-4b  
 Cooling system:  
 direct support: maintenance, 3-7  
 organizational maintenance:  
 maintenance, 2-17  
 preventive maintenance, 2-7  
 troubleshooting, 2-12  
 Cover, Battery: maintenance, 2-33a  
 Cover, Transmission Rear: maintenance, 4-4c  
 Crankcase, Engine: draining and refilling, 2-14b  
 Crankshaft and Main Bearings: maintenance, 4-d  
 Crankshaft Oil Seal Retainer Assembly: maintenance, 4-2c  
 Cylinder Block:  
 direct support: inspection, 3-5e  
 Cylinder, Hydraulic Brake Valve Master – see Brake  
 Valve, Hydraulic  
 Cylinder Assembly:  
 see Lift Cylinder Assembly  
 see Rotation Cylinder Assembly  
 see Sideshift Cylinder Assembly  
 see Steering Cylinder Assembly  
 see Tilt Cylinder Assembly  
 Cylinder Block: inspection, 3-5e  
 Cylinder Block Assembly: maintenance, 4-2a  
 Cylinder Head:  
 maintenance, direct support, 3-5g  
 maintenance, general support, 4-2b

## ALPHABETICAL INDEX (cont)

Subject, Para

## C (cont)

Cylinder Head and Valves:  
 maintenance, 4-2b  
 valve seat refacing, 4-2b

## D

Data:  
 equipment, 1-13  
 instruction and warranty plates, 1-12  
 tabulated, 1-11  
 Declutch Pedal, Brake Pedal and: maintenance, 2-43e  
 Declutch Valve: maintenance, 2-43d  
 Destruction of Army Material to Prevent Enemy Use, 1-3  
 Differential Carrier Assemblies, Axles and:  
 front axle: removal, 3-20c  
 principles of operation, 1-21  
 rear axle: removal, 3-20d  
 repair: 4-5a  
 Differential Case and Gear Assembly: maintenance, 4-5b  
 Diodes, Warning Lights and: maintenance, 2-28e  
 Dipstick Tube Assembly; Transmission: maintenance, 2-38d  
 Disconnect, Axle: principles of operation, 1-20  
 Disconnect Lever, Axle – see Axle Disconnect Lever  
 Direct Support Maintenance Chapter Index, 4-1  
 Drive Shaft Assemblies:  
 center:  
 maintenance, 2-39b  
 principles of operation, 1-20  
 front:  
 maintenance, 2-39a  
 principles of operation, 1-20  
 rear:  
 maintenance, 2-39c  
 principles of operation, 1-20  
 troubleshooting, 2-37  
 Drive Shaft Support Bearings —see Drive Shaft Assemblies, front  
 Drive, Tachometer: maintenance, 3-5f

## E

Electrical System:  
 principles of operation, 1-19  
 troubleshooting symptom index – see Troubleshooting Symptom Index  
 Electric Fuel Pump:  
 maintenance, 2-15b  
 testing, 2-15b  
 troubleshooting, 2-10

Subject, Para

## E (cont)

Engine:  
 direct support:  
 maintenance, 3-5  
 troubleshooting, 3-3  
 tune-up, 3-5a  
 general support: maintenance, 4-2  
 organizational maintenance:  
 maintenance, 2-14  
 troubleshooting, 2-9  
 principles of operation, 1-15  
 Engine Crankcase – see Crankcase, Engine  
 Engine Mount: maintenance, 3-5b  
 Engine Oil Pressure Indicator – see Oil Pressure Indicator, Engine  
 Engine Oil Pressure Switch and Sending Unit – see Oil Pressure Switch and Sending Unit, Engine  
 Engine Switches – see Start Switch and Ignition Switch  
 Engine Temperature Switch:  
 maintenance, 2-31c(1)  
 testing, 2-31c(1)  
 Engine/Transmission:  
 power pack: maintenance, 3-5c  
 separation of, 3-5d  
 temperature switches, 2-31c  
 Equipment:  
 data, 1-13  
 data, instruction and warranty plates, 1-12  
 tabulated data, 1-11  
 Equipment, New:  
 cleaning, 2-3b  
 driving, 2-5a  
 handling, 2-2  
 initial check-out and adjustment, 2-4  
 inspection, 2-4a  
 lubrication, 2-3c  
 movement to new site, 2-5  
 removal of protective compounds, 2-3a  
 service check, 2-4b  
 servicing, 2-3  
 towing, 2-5b  
 unloading instructions, 2-2a  
 unpacking, 2-2b  
 Exhaust Manifold: maintenance, 2-14e  
 Exhaust Pipe:  
 maintenance, 2-16  
 principles of operation, 1-17  
 Exhaust Pipe and Spark Arresting Muffler – see Muffler, Spark Arresting and Exhaust Pipe

**ALPHABETICAL INDEX (cont)**

Subject, Para

E (cont)

Exhaust System:  
 principles of operation, 1-17  
 troubleshooting, 2-11

F

Fan and Belt, Cooling System:  
 adjustment, 2-17f  
 maintenance, 2-17f  
 principles of operation, 1-18

Fenders: maintenance, 2-53b

Filter, Fuel – see Fuel Filter

Filter, Hydraulic – see Hydraulic Filter

Filter, In-line Fuel – see Fuel Filter, In-Line

Filter, Oil, Transmission – see Oil Filter, Transmission

Filter Indicator, Hydraulic – see Hydraulic Filter Indicator

Filter Restriction Switches, Hydraulic – see Hydraulic Filter Restriction Switches

Fittings – see Hoses, Lines and Fittings

Flood Lights:  
 maintenance, 2-30a  
 principles of operation, 1-19  
 testing, 2-30a

Flood Light Switches:  
 maintenance, 2-28a  
 principles of operation, 1-19

Floor Plate and Guard, Chassis: maintenance, 2-53i

Flywheel:  
 inspection, 2-14a  
 maintenance, 4-2e

Flywheel Housing:  
 inspection, 3-5h  
 maintenance, 4-2e

Fork Lift Control Lever:  
 see Lift Control Lever  
 see Rotate Control Lever  
 see Shift Control Lever  
 see Tilt Control Lever

Forklift Truck: principles of operation, 1-14

Forks, Lifting:  
 maintenance, 2-56c  
 principles of operation, 1-25

Forward Clutch Assembly, Transmission: maintenance, 4-4i

Frame and Towing Attachments:  
 maintenance, 2-52  
 troubleshooting, 2-50

Front and Rear Axles:  
 axle shafts and bearings maintenance, 2-39f  
 removal, 3-20a, 3-20b

Subject, Para

F (cont)

Front and Rear Chassis: separation, 3-27

Front Axle Differential Carrier Assembly: removal, 3-20c

Front Blackout Light  
 maintenance, 2-30b  
 testing, 2-30b

Front Flood Switch – see Flood Light Switches

Fuel Filter Assembly:  
 maintenance, 2-15f  
 principles of operation, 1-16

Fuel Filter, In-Line:  
 maintenance, 2-15e  
 principles of operation, 1-16

Fuel Gage:  
 maintenance, 2-18  
 principles of operation, 1 -19a  
 troubleshooting, 2-13

Fuel Gage Sending Unit:  
 maintenance, 2-31 a  
 troubleshooting, 2-13

Fuel Injector:  
 principles of operation, 1-16  
 repair, 4-3a  
 replacement 3-6b

Fuel Injection Lines and Fittings: maintenance, 3-6a

Fuel Injection Pump:  
 adjustments, 3-5a(3)  
 principles of operation, 1-16  
 repair, 4-3b  
 replacement, 3-6c  
 testing, 2-15a  
 troubleshooting, 3-4

Fuel Level Gage and Bulb – see Fuel Gage

Fuel Pump and Lines, Electric:  
 maintenance, 2-15b  
 principles of operation, 1-16  
 testing, 2-15b  
 troubleshooting, 2-10

Fuel Strainer:  
 maintenance, 2-15e  
 principles of operation, 1-16  
 troubleshooting, 2-10

Fuel System:  
 direct support:  
 maintenance, 3-6  
 troubleshooting, 34  
 organizational maintenance:  
 maintenance, 2-15  
 troubleshooting, 2-10  
 principles of operation, 1-16

## ALPHABETICAL INDEX (cont)

Subject, Para

## F (cont)

Fuel Tank:  
 maintenance, 2-15d(1)  
 principles of operation, 1-16  
 Fuel Tank, Lines and Fittings: maintenance, 2-15b

## G

Gage Bulb: replacement, 2-1 8a  
 Gage Lights:  
 principles of operation, 1-19b  
 replacement, 2-18a  
 Gages: fuel level gage, and oil pressure gage:  
 maintenance, 2-18  
 principles of operation, 1-19a  
 replacement, 2-18b  
 troubleshooting, 2-13  
 Gages and Indicators: principles of operation, 1-19a  
 Gear Assembly, Differential Case and: maintenance, 4-5b  
 Gear and Clutch Group, Transmission: maintenance, 4-4d  
 Gear Cover, Timing – see Timing Gear Cover  
 Gear, Steering – see Steering Gear  
 Grille: maintenance, 2-53a

## H

Harness, Wiring – see Wiring Harness  
 Head, Cylinder:  
 repair, 4-2b  
 replacement, 3-5g  
 Hood – see Body, Cab and Hood  
 Hood Panels and Hood Support Plates: maintenance, 2-53e  
 Hood, Top: Maintenance, 2-53d  
 Horn:  
 maintenance, 2-32a  
 principles of operation, 1-19  
 Horn and Back-Up Alarm:  
 maintenance, 2-32  
 troubleshooting, 2-33  
 Horn Switch:  
 maintenance, 2-32b  
 testing, 2-32b  
 Housing: Converter: maintenance, 4-4b  
 Flywheel:  
 inspection, 3-5h  
 maintenance, 4-2e  
 Transmission: maintenance, 4-4e  
 Hoses, Cooling System  
 maintenance, 2-17b  
 principles of operation, 1-18

Subject, Para

## H (cont)

Hoses, Lines and Fittings: Brakes– see Brake Hoses, Lines and fittings  
 Hydraulic Lift System – see Lift System Hoses, Lines and Fittings, Hydraulic  
 Steering System – see Steering System Hoses, Lines, and Fittings  
 Transmission – see Transmission Hoses, Lines and Fittings  
 Hourmeter: maintenance, 2-29b  
 Hydraulic Brake Valve – see Brake Valve, Hydraulic  
 Hydraulic Cylinder:  
 see Lift Cylinder Assembly  
 see Rotation Cylinder Assembly  
 see Sideshift Cylinder Assembly  
 see Steering Cylinder Assembly  
 see Tilt Cylinder Assembly  
 Hydraulic Filter:  
 maintenance, 2-56g(2)  
 principles of operation, 1-25  
 Hydraulic Filter Indicator:  
 maintenance, 2-28e  
 principles of operation, 1-19a  
 troubleshooting, 2-25  
 Hydraulic Filter Restriction Switch:  
 maintenance, 2-31e(1)  
 troubleshooting, 2-25  
 Hydraulic Lift System – see Lift System, Hydraulic  
 Hydraulic Pump:  
 principles of operation, 1-25  
 removal, 248a  
 repair, 3-24c  
 troubleshooting, 3-22  
 Hydraulic Reservoir:  
 maintenance, 2-56g(5)  
 principles of operation, 1-25  
 servicing, 2-56g(1)  
 Hydraulic Reservoir Air Breather: maintenance, 2-56g(4)  
 Hydraulic Pump to Steering Gear Hoses, Lines and Fittings – see Steering System Hoses, Lines and Fittings  
 Hydraulic System: principles of operation, 1-25

## I

Ignition Switch:  
 maintenance, 2-28c  
 principles of operation, 1-19b  
 troubleshooting, 2-21  
 Indicators and Gages:  
 principles of operation, 1-19a  
 Injection Lines and Fittings, Fuel: maintenance, 3-6a



**ALPHABETICAL INDEX (cont)**

Subject, Para

I (cont)

Injection Pump, Fuel – see Fuel Injection pump  
 Injector, Fuel – see Fuel Injector  
 In-line Fuel Filter – see Fuel Filter, In-line  
 Instruction, Data and Warranty Plates, 1-12  
 Instrument Panel:  
     principles of operation, 1-19  
     replacement, 3-14  
 Instrument Panel Gages and Indicators:  
     principles of operation, 1-19a  
 Instrument Panel Switches and Gage Lights:  
     principles of operation, 1-19b  
 Intake Manifold: maintenance, 2-14d

K

Klik Pin and Shipping Lock Pin: removal, 2-4b(1)

L

Lever, Axle Disconnect – see Axle Disconnect Lever  
 Lever, Parking Brake - see Parking Brake Lever  
 Lift Chains and Pulleys:  
     maintenance, 2-56e  
     principles of operation, 1-25  
     troubleshooting, 2-55  
 Lift Cylinder Assembly:  
     maintenance, 3-30e  
     principles of operation, 1-25  
     troubleshooting, 3-29  
 Lifting Forks – see Forks, Lifting  
 Lift System, Hydraulic:  
     maintenance, 2-56  
     operational test, 2-56a  
     troubleshooting:  
         direct support, 3-29  
         organizational, 2-55  
 Lift System Control Levers and Linkages, Hydraulic:  
     maintenance, 2-56b  
 Lift System Control Valve, Hydraulic:  
     maintenance, 3-30a  
     principles of operation, 1-25  
     troubleshooting, 3-29  
 Lift System Hoses, Lines and Fittings, Hydraulic:  
     hydraulic oil filter assembly to control valve to mast  
         assembly, 2-56f(1)  
     mast assembly: maintenance, 2-56f(2)  
 Lift System Oil Filter, Hydraulic: maintenance, 2-56g(2)  
 Lift System Suction Screen, Hydraulic: see Strainer,  
     Hydraulic Reservoir  
 Lines and Fittings, Fuel Injection: maintenance, 3-6a

Subject, Para

L (cont)

Linkage and Control Levers, Hydraulic Lift System:  
     maintenance, 2-56b  
 Linkage, Parking Brake: maintenance, 2-42a  
 Linkage Controls, Transmission: maintenance, 2-38b  
 Lights,  
     Blackout:  
         front: maintenance, 2-30b  
         rear: maintenance, 2-30c  
     Flood – see Flood Lights  
     Gage:  
         principles of operation, 1-19b  
         replacement, 2-18b  
     Stop and Tail: maintenance, 2-30d  
     Warning, and Diodes: maintenance, 2-28e  
 Light Systems:  
     maintenance, 2-30  
     troubleshooting, 2-24  
 List of Abbreviations, 1-10  
 Locating Top Dead Center, 3-5a(1)  
 Lock Pin, Shipping: description and use, 24b(1)  
 Lockout Relay:  
     maintenance, 2-28d  
     troubleshooting, 2-21  
 Low Clutch Assembly, Transmission: maintenance, 4-4g  
 Lubrication: servicing new equipment, 2-3c

M

Maintenance Forms, Records, and Reports, 1-2  
 Manifold, Exhaust – see Exhaust Manifold  
 Manifold, Intake – see Intake Manifold  
 Mast, Inner and Outer: maintenance, 3-31c  
 Mast Assembly:  
     maintenance, 3-31  
     principles of operation, 1-25  
 Mast Assembly Hoses, Lines, and Fittings:  
     maintenance, 2-56f(2)  
 Mast Chains – see Lift Chains and Pulleys  
 Mat, Noise Baffle: maintenance, 2-53h  
 Modulation Valve:  
     repair, 4-4k  
     replacement, 3-19d  
 Mount, Engine: maintenance, 3-5b  
 Mounts, Transmission: maintenance, 3-19b  
 Muffler, and Exhaust Pipe, Spark Arresting:  
     maintenance, 2-16  
     principles of operation, 1-17  
     troubleshooting, 2-11

## ALPHABETICAL INDEX (cont)

Subject, Para

## N

Neutral Start and Back-Up Alarm Switches:  
 maintenance, 2-31b  
 New Equipment – see Equipment, New  
 Noise Baffle Mat: maintenance, 2-53h

## O

Oil, Engine: draining and refilling, 2-14b  
 Oil, Hydraulic Reservoir: draining and refilling, 2-56g(1)  
 Oil, Transmission: draining and refilling, 2-38a(l)  
 Oil Cooler, Transmission:  
 maintenance, 2-38g  
 principles of operation, 1-20  
 Oil Filter, Engine: replacement, 2-14c  
 Oil Filter, Hydraulic Lift System: replacement, 2-56g(2)  
 Oil Filter, Transmission: replacement, 2-38a(4)  
 Oil Pan, Engine: maintenance, 3-5k  
 Oil Pressure Gage:  
 maintenance, 2-18  
 principles of operation, 1-19a  
 troubleshooting, 2-13  
 Oil Pressure Gage Bulb: replacement, 2-18a  
 Oil Pressure Indicator, Engine:  
 maintenance, 2-28e  
 principles of operation, 1-19a  
 troubleshooting, 2-25  
 Oil Pressure Switch, Engine:  
 maintenance, 2-31d  
 testing, 2-31d  
 Oil Pump, Engine: maintenance, 4-2i  
 Oil Seal Retainer Assembly, Crankshaft:  
 maintenance, 4-2d  
 Operational Test, Hydraulic Lift System, 2-56a  
 Orientation, 1-7

## P

Pan, Oil, Engine: maintenance, 3-5k  
 Panel,  
 Front Cover: maintenance, 2-53f  
 Hood, and Hood Support Plate,  
 maintenance, 2-53e  
 Side:  
 maintenance, 2-53c  
 troubleshooting, 2-51  
 Panel, Auxiliary: maintenance, 2-29  
 Parking Brake:  
 maintenance, 2-42  
 principles of operation, 1-22  
 troubleshooting, 2-41

Subject, Para

## P (cont)

Parking Brake Linkage:  
 maintenance, 2-42a  
 troubleshooting, 2-41  
 Parts, Repair, 1-9  
 Pedal:  
 see Accelerator Pedal  
 see Brake Pedal  
 see Declutch Pedal  
 Pintle Hook, Tow Bar, Tow Chains and:  
 maintenance, 2-52c  
 principles of operation, 1-24  
 Pipe, Exhaust – see Exhaust Pipe  
 Pistons and Connecting Rods: maintenance, 4-2f  
 Pivot Bearings:  
 maintenance, 3-27  
 troubleshooting, 3-26  
 Power Assist Unit – see Brake Valve, Hydraulic  
 Power Pack:  
 replacement, 3-5c  
 separation of engine/transmission, 3-5d  
 Power Train: troubleshooting 2-36,3-17  
 Pressure Checks, Transmission, 3-19a  
 Preventive Maintenance Checks and Services,  
 (Organizational):  
 general, 2-6  
 organizational maintenance, 2-7  
 Principles of Operation:  
 axles and wheels, 1-21  
 body and towing attachments, 1-24  
 brakes, 1-22  
 cooling system, 1-18  
 electrical system, 1-19  
 engine, 1-15  
 exhaust system, 1-17  
 forklift truck, 1-14  
 fuel system, 1-16  
 hydraulic system, 1-25  
 instrument panel gages and indicators, 1-19a  
 instrument panel switches and gage lights, 1-19b  
 steering system, 1-23  
 towing attachments, 1-24  
 transmission and drive shafts, 1-20  
 wheels, 1-21  
 Pulleys and Chains:  
 lift: maintenance, 2-56d  
 sideshift: maintenance, 2-56e  
 troubleshooting, 2-55  
 Pump:  
 see Charging Pump  
 see Hydraulic Pump  
 see Oil Pump  
 see Water Pump Assembly

**ALPHABETICAL INDEX (cont)**

Subject, Para

P (cont)

Purpose of Equipment, 1-1c

Q

Quick Start Kit:  
 maintenance, 2-15h  
 principles of operation, 1-16  
 troubleshooting, 2-9

R

Radiator:  
 preventive maintenance, 2-7  
 servicing, 2-17a  
 troubleshooting, 2-12  
 Radiator and Shroud:  
 maintenance, 2-17c  
 principles of operation, 1-18  
 Rear Axle Trunnion: maintenance, 4-6  
 Rear Axle Differential Carrier Assembly: removal, 3-20d  
 Rear Axles; Front and:  
 axle shafts and bearings maintenance, 2-39f  
 removal, 3-20a, 3-20b  
 Rear Chassis; Front and: separation, 3-27  
 Receptacle, Slave – see Slave Receptacle  
 Relay, Lockout – see Lockout Relay  
 Repair Parts, 1-9  
 Reservoir, Hydraulic – see Hydraulic Reservoir  
 Reverse and Second Clutch Assembly: maintenance, 4-4f  
 Rims and Tires: principles of operation, 1-21  
 Rocker Arm Assembly: maintenance, 3-5j  
 Rocker Arm Cover: maintenance, 3-5i  
 Rods, Connecting, and Pistons: maintenance, 4-2f  
 Roll Over Protective Structure (ROPS):  
 maintenance, 2-52a  
 principles of operation, 1.24  
 Rotation Bearing, Side Shifter Frame and:  
 maintenance, 3-31b  
 troubleshooting, 3-29  
 Rotation Cylinder Assembly:  
 maintenance, 3-30d  
 principles of operation, 1-25

S

Scope of Manual, 1-1  
 Screen Assembly, Transmission Servicing:  
 maintenance, 2-38a(2)  
 Screen, Hydraulic Oil - see Strainer, Hydraulic Reservoir

Subject, Para

S (cont)

Seat, Operator's:  
 maintenance, 2-53g  
 troubleshooting, 2-51  
 Second Clutch Assembly, Reverse and: maintenance, 4-4f  
 Sending Units and Switches:  
 maintenance, 2.31  
 principles of operation, 1-19  
 Sending Unit, Fuel Gage: maintenance, 2-31a  
 Separation of Engine and Transmission: separation, 3-5d  
 Service Brake Assembly:  
 maintenance, 2-43a  
 preventive maintenance, 2-7  
 principles of operation, 1-22  
 troubleshooting, 2-41  
 Service Brake Pedal – see Brake Pedal  
 Shifter Frame, Side, and Rotation Bearing:  
 maintenance, 3-31b  
 Shroud, Radiator and: see Radiator and Shroud  
 Side Panels: maintenance, 2-53c  
 Side Shifter Frame and Rotation Bearing:  
 maintenance, 3-3 lb  
 Sideshift Chains and Pulleys: maintenance, 2-56e  
 Sideshift Cylinder Assembly:  
 maintenance, 3-30c  
 principles of operation, 1-25  
 Slave Receptacle: maintenance, 2-29a  
 Solenoid Switch and Starter – see Starter and Solenoid  
 Spark Arresting Muffler and Exhaust Pipe – see  
 Muffler, Spark Arresting  
 Starter and Solenoid:  
 repair, 3-13  
 replacement, 2-27a  
 troubleshooting, 2-21  
 Starter Motor:  
 principles of operation, 1-19  
 repair, 3-13  
 testing, 2-27a  
 troubleshooting, 3-10  
 Starter Relay and 25 AMP Circuit Breaker:  
 maintenance, 2-27b  
 troubleshooting, 2.21  
 Start System:  
 maintenance, 2-27  
 troubleshooting, 2-21  
 Start Kit, Quick – see Quick Start Kit  
 Start Switch:  
 maintenance, 2-28b  
 principles of operation, 1-19b  
 troubleshooting, 2-21

## ALPHABETICAL INDEX (cont)

Subject, Para

## S (cont)

Start Switch, Neutral – see Neutral Start Switch  
 Steering Column and Wheel – see Steering Wheel and Column  
 Steering Cylinder Assembly:  
   principles of operation, 1-23  
   repair, 3-24d  
   replacement, 2-48c  
   troubleshooting, 3-23  
 Steering Gear:  
   maintenance, 3-24b  
   principles of operation, 1-23  
   troubleshooting, 3-23  
 Steering System:  
   maintenance, direct support, 3-24  
   maintenance organizational, 2-48  
   principles of operation, 1-23  
   troubleshooting, 2-46  
 Steering System Hoses, Lines and Fittings:  
   maintenance, 2-48b  
 Steering Wheel and Column:  
   maintenance, 3-24a  
   troubleshooting, 3-23  
 Stop Light Switch: maintenance, 2-31e(2)  
 Stop and Tail Light:  
   maintenance, 2-30d  
   testing, 2-30d  
 Storage, Administrative, 1-4  
 Strainer, Fuel – see Fuel Strainer  
 Strainer, Hydraulic Reservoir: maintenance, 2-56g(3)  
 Support Bearing, Front Drive Shaft Assembly and:  
   maintenance, 2-39a  
 Support Plates, Hood: maintenance, 2-53e  
 Switch(es):  
   Back-Up Alarm: maintenance, 2-31b  
   Engine Oil Pressure: maintenance, 2-31d  
   Horn: maintenance, 2-32b  
   Ignition: maintenance, 2-28c  
   Neutral Start and Back-Up Alarm: maintenance, 2-31b  
   Start – see Start Switch  
   Stop Light and Hydraulic Filter: maintenance, 2-31e  
   Temperature, Engine and Transmission:  
     maintenance, 2-31c  
   Vehicle Lights – see Vehicle Lights Switch

## T

Tabulated Data, 1-11  
 Tachometer Drive, 3-5f  
 Tail Light, Stop and:  
   maintenance, 2-30d  
   testing, 2-30d

Subject, Para

## T (cont)

Tank, Fuel – see Fuel Tank  
 Temperature Switches, Engine and Transmission:  
   maintenance, 2-31c  
 Temperature Indicator, Engine Water:  
   principles of operation, 1-19a  
 Temperature Indicator, Transmission:  
   principles of operation, 1-19a  
 Testing:  
   alternator, 2-26a, 3-12  
   electric fuel pump, 2-15b  
   engine temperature switch, 2-31c  
   flood lights, 2-30a  
   front blackout light, 2-30b  
   front wiring harness, 2-34a  
   fuel injection pump, 2-15a, 4-3b  
   fuel injectors, 4-3a  
   horn switch, 2-32b  
   hydraulic lift system, 2-56a  
   rear blackout light, 2-30c  
   rear wiring harness, 2-34b  
   rotation cylinder assembly, 3-30d  
   sideshift cylinder assembly, 3-30c  
   starter, 2-27a, 3-13  
   stop and tail light, 2-30d  
   thermostat and housing, 2-17d  
   transmission temperature switch, 2-31c  
   warning lights and diodes, 2-28e  
 Thermostat and Housing:  
   maintenance, 2-17d  
   principles of operation, 1-18  
   testing, 2-17d  
 Third Clutch Assembly: maintenance, 4-4h  
 Throttle Control; Accelerator, 2-15i  
 Tilt Cylinder Assemblies:  
   maintenance, 3-30b  
   principles of operation, 1-25  
 Timing Gear Cover: maintenance, 4-2h  
 Tires and Rims: principles of operation, 1-21  
 Tires and Wheels – see Wheels and Tires  
 Tools and Equipment, Common, 1-8  
 Top Dead Center, Locating, 3-5a(1)  
 Torque Converter Group:  
   maintenance, 4-4a  
   principles of operation, 1-20  
 Tow Bar, Tow Chains and Pintle Hook:  
   maintenance, 2-52c  
   principles of operation, 1-24  
 Towing Attachments:  
   maintenance, 2-52c  
   principles of operation, 1-24  
   troubleshooting, 2-50

ALPHABETICAL INDEX (cont)

Subject, Para

T (cont)

Transmission:  
 direct support maintenance, 3-19  
 troubleshooting, 3-17  
 general support maintenance, 44  
 inspection, 2-38a(5)  
 organizational maintenance, troubleshooting, 2-36  
 principles of operation, 1-20  
 removal, 3-19c  
 servicing, 2-38a  
 Transmission Air Breather: maintenance, 2-38a(3)  
 Transmission and Drive Shafts: principles of operation, 1-20  
 Transmission/Engine – see Engine/Transmission  
 Transmission Hoses, Lines and Fittings: maintenance, 2-38f  
 Transmission Housing: maintenance, 4-4e  
 Transmission Linkage Controls: maintenance, 2-38b  
 Transmission Mounts: maintenance, 3-19b  
 Transmission Oil – see Oil, Transmission  
 Transmission Oil Cooler:  
 maintenance, 3-19f  
 principles of operation, 1-20  
 Transmission Oil Filter: replacement, 2.38a(4)  
 Transmission Servicing, Oil Filter: replacement, 2-38a(4)  
 Transmission Pressure Checks: checking, 3-19a  
 Transmission Rear Cover: maintenance, 4-4c  
 Transmission Screen Assembly: maintenance, 2-38a(2)  
 Transmission Temperature Indicator:  
 principles of operation, 1-19a  
 Transmission Temperature Switch:  
 maintenance, 2-31c(2)  
 testing, 2-31c(2)  
 Troubleshooting:  
 direct support, 3-2  
 alternator, 3-9  
 axles and differential carrier assemblies, 3-18  
 chassis, 3-26  
 engine, 3-3  
 fuel system, 3-4  
 hydraulic lift system, 3-29  
 hydraulic pump, 3-22  
 starter and solenoid, 3-10  
 steering column and cylinder, 3-23  
 transmission, 3-17  
 wiring harness, 3-11  
 organizational:  
 axles and drive shaft assemblies, 2-37  
 battery system, 2-20  
 body, cab and hood, 2-51  
 brake system, 2-41  
 charging system, 2-22  
 cooling system, 2-12

Subject, Para

T (cont)

Troubleshooting: (cont)  
 organizational: (cont)  
 engine, 2-9  
 exhaust system, 2-11  
 frame and towing attachments, 2-50  
 fuel system, 2-10  
 gages, 2-13  
 horn and back-up alarm, 2-23  
 hydraulic lift system, 2-55  
 instrument panel, 2-25  
 light systems, 2-24  
 power train, 2-36  
 starting system, 2-21  
 steering system, 2-46  
 transmission, 2-36  
 wheels and tires, 2-45  
 Trunnion, Rear Axle: maintenance, 4-6  
 Tune-Up, Engine:  
 locating top dead center, 3-5a(1)  
 valve tappet clearance adjustment, 3-5a(2)  
 fuel injection pump adjustments, 3-5a(3)  
 Type of Manual, 1-1a

V

Valve, Cylinder Head and: maintenance, 4-2b  
 Valve, Declutch – see Declutch Valve  
 Valve, Hydraulic Brake – see Brake Valve, Hydraulic  
 Valve, Hydraulic Lift System; Control:  
 principles of operation, 1-25  
 maintenance, 3-30a  
 Valve Assembly, Control and Modulation:  
 principles of operation, 1-20  
 replacement, 3-19d  
 repair, 4-4j  
 Valve Assembly, Modulation:  
 replacement, 3-19d  
 repair, 4-4k  
 Valve Tappet Clearance Adjustment: adjustment, 3-5a(2)  
 Vehicle Lights Switch:  
 maintenance, 2-28b  
 principles of operation, 1-19b

W

Warning Lights and Diodes:  
 maintenance, 2-28e  
 testing, 2-28e  
 Warranty Plates, Data, Instruction and: 1-12  
 Warranty Information: 1-6

**ALPHABETICAL INDEX (cont)**

Subject; Para

W (cont)

Water Pump Assembly:  
 principles of operation, 1-18  
 replacement, 2-17e  
 Water Temperature Indicator, Engine:  
 see Temperature Indicator, Engine Water  
 Wiring Harness:  
 front  
     replacement, 3-15a  
     repair, 2-34a  
     testing, 2-34a  
 maintenance, 2-34

Subject, Para

W (cont)

rear  
     replacement, 3-15b  
     repair, 2-34b  
     testing, 2-34b  
 replacement, 3-15  
 troubleshooting, 3-11  
 Wheel, Steering – see Steering Wheel  
 Wheels and Tires:  
     maintenance, 2-47  
     principles of operation, 1-21  
     troubleshooting, 2-45



By Order of the Secretary of the Army

E.C. MEYER  
General, United States Army  
Chief of Staff

Official:

J.C. PENNINGTON  
Major General, United States Army  
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Organizational, Direct, and General Support maintenance requirements, for Truck, Forklift, Rough Terrain.

\*U.S. GOVERNMENT PRINTING OFFICE: 1995 - 388-421 (3286)





RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?



THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER  
**TM 10-3930-638-241P**

DATE  
**FEB 80**

TITLE  
**TRUCK, F/L, RT, MHE 237, 4,000LBCAP**

BE EXACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PAGE NO.	PARA GRAPH	FIGURE NO.	TABLE NO.
17	f.	—	—
—	—	FA-1	—

*No details of how transmission! prop shafts work.  
 BATTERY SYMBOL INCORRECT FOR 24 VOLT SYSTEM. SHOULD SHOW 2 12VOLT BATTERIES HOOKED in SERIES*

**SAMPLE**

TEAR ALONG DOTTED LINE

TYPED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE:

FILL IN YOUR  
UNIT'S ADDRESS

FOLD

DEPARTMENT OF THE ARMY

**SAMPLE**

TEAR ALONG PERFORATED LINE

Commander  
U.S. Army Tank-Automotive Command  
ATTN: DRSTA-MB  
Warren, MI 48090

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

**SOMETHING WRONG WITH THIS PUBLICATION?**

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

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

FILL IN YOUR  
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander  
U.S. Army Tank-Automotive Command  
ATTN: DRSTA-MB  
Warren, MI 48090

TEAR ALONG PERFORATED LINE

ECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

**SOMETHING WRONG WITH THIS PUBLICATION?**

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

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:

PRINT NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

FILL IN YOUR  
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

TEAR ALONG PERFORATED LINE

Commander  
U.S. Army Tank-Automotive Command  
ATTN: DRSTA-MB  
Warren, MI 48090

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

**SOMETHING WRONG WITH THIS PUBLICATION?**

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

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 2028-2  
1 JUL 79

PREVIOUS EDITIONS ARE OBSOLETE.

IF YOUR UNIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.



FILL IN YOUR  
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander  
U.S. Army Tank-Automotive Command  
ATTN: DRSTA-MB  
Warren, MI 48090

TEAR ALONG PERFORATED LINE

## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

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

### WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 Lb  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

### LIQUID MEASURE

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

### SQUARE MEASURE

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

### CUBIC MEASURE

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

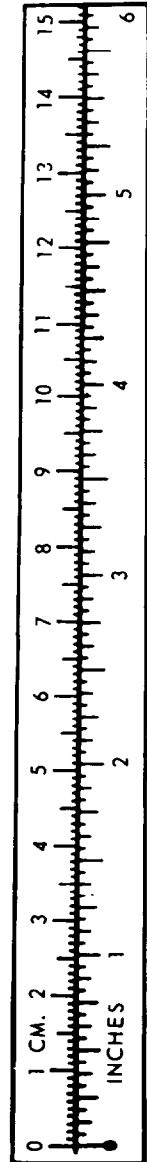
### TEMPERATURE

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

### APPROXIMATE CONVERSION FACTORS

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
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

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
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



TA089991

