TECHNICAL MANUAL
UNIT MAINTENANCE

TRUCK, UTILITY: CARGO/TROOP CARRIER, 1-1/4 TON, 4X4, M998
(2320-01-107-7155) (EIC: BBF); M998A1 (2320-01-371-9577) (EIC: BBN);

TRUCK, UTILITY: CARGO/TROOP CARRIER 1-1/4 TON; 4X4, W/WINCH, M1038
(2320-01-107-7156) (EIC: BBP); M1038A1 (2320-01-371-9578) (EIC: BBR);

TRUCK, UTILITY: HEAVY VARIANT, 4X4, M1097 (2320-01-346-9317) (EIC: BBM);
M1097A1 (2320-01-371-9583) (EIC: BBU); M1097A2 (2320-01-380-8604) (EIC: BB6);

TRUCK, UTILITY: TOW CARRIER ARMORED, 1-1/4 TON, 4X4,
M966 (2320-01-107-7153) (EIC: BBC); M966A1 (2320-01-372-3932) (EIC: BBX);

TRUCK, UTILITY: TOW CARRIER, ARMORED, 1-1/4 TON, 4X4, W/WINCH,
M1036 (2320-01-107-7154) (EIC: BBH);

TRUCK, UTILITY: TOW CARRIER, W/SUPPLEMENTAL ARMOR, 1-1/4 TON, 4X4,
M1045 (2320-01-146-7191); M1045A1 (2320-01-371-9580) (EIC: BBR);
M1045A2 (2320-01-380-8229) (EIC: BB5);

TRUCK, UTILITY: TOW CARRIER, W/SUPPLEMENTAL ARMOR, 1-1/4 TON, 4X4,
W/WINCH, M1046 (2320-01-146-7188); M1046A1 (2320-01-371-9582) (EIC: BBT);

TRUCK, UTILITY: ARMAMENT CARRIER, ARMORED, 1-1/4 TON, 4X4,
M1025 (2320-01-128-9551) (EIC: BBF); M1025A1 (2320-01-371-9584) (EIC: BBV);
M1025A2 (2320-01-380-8233) (EIC: BB3);

TRUCK, UTILITY: ARMAMENT CARRIER, ARMORED, 1-1/4 TON, 4X4, W/WINCH,
M1026 (2320-01-128-9552) (EIC: BBG); M1026A1 (2320-01-371-9579) (EIC: BBQ);

TRUCK, UTILITY: ARMAMENT CARRIER, W/SUPPLEMENTAL ARMOR, 1-1/4 TON, 4X4,
M1043 (2320-01-146-7190); M1043A1 (2320-01-372-3933);
M1043A2 (2320-01-380-8213) (EIC: BB4);

TRUCK, UTILITY: ARMAMENT CARRIER, W/SUPPLEMENTAL ARMOR, 1-1/4 TON, 4X4,
W/WINCH, M1044 (2320-01-146-7189); M1044A1 (2320-01-371-9581);

TRUCK, UTILITY: SHELTER CARRIER, 4X4, M1037 (2320-01-146-7193) (EIC: BBK);

TRUCK, UTILITY: SHELTER CARRIER, 4X4, W/WINCH, M1042 (2320-01-146-7187);

TRUCK, AMBULANCE, 2-LITTER, ARMORED, 4X4, M996 (2310-01-111-2275)
(EIC: BB8); M996A1 (2310-01-372-3935) (EIC: BB2);

TRUCK, AMBULANCE, 4-LITTER, ARMORED, 4X4, M997 (2310-01-111-2274)(EIC: BBA);
M997A1 (2310-01-372-3934) (EIC BB2);
M997A2 (2310-01-380-8225) (EIC: BB8);

TRUCK AMBULANCE, 2-LITTER, SOFT TOP, 4X4, M1035 (2310-01-146-7194);

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DEPARTMENTS OF THE ARMY, THE AIR FORCE,
AND HEADQUARTERS, MARINE CORPS

JANUARY 1996
TM 9-2320-280-20-2, dated 31 January 1996, is changed as follows:

1. Remove old pages and insert new pages as indicated below.

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

Remove pages Insert pages
4-13 and 4-14 4-13 through 4-14.2

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By Order of the Secretary of the Army:

DENNIS J. REIMER  
General, United States Army  
Chief of Staff

Official:  
JOEL B. HUDSON  
Administrative Assistant to the  
Secretary of the Army  
05163

By Order of the Marine Corps:

M. K. HAYDEN  
Colonel, United States Marine Corps  
Director, Program Support  
Marine Corps Systems Command

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WARNING

EXHAUST GASES CAN KILL

Brain damage or death can result from heavy exposure. Precautions must be followed to ensure crew safety when the personnel heater, main, or auxiliary engine of any vehicle is operated for any purpose.

1. Do not operate your vehicle engine in enclosed areas.
2. Do not idle vehicle engine with vehicle windows closed.
3. Be alert at all times for exhaust odors.
4. Be alert for exhaust poisoning symptoms. They are:
   - Headache
   - Dizziness
   - Sleepiness
   - Loss of muscular control
5. If you see another person with exhaust poisoning symptoms:
   - Remove person from area
   - Expose to open air
   - Keep person warm
   - Do not permit physical exercise
   - Administer artificial respiration, if necessary*
   - Notify a medic
   *
   *For artificial respiration, refer to FM 21-11.
6. BE AWARE, the field protective mask for nuclear, biological or chemical (NBC) protection will not protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST EXHAUST POISONING IS ADEQUATE VENTILATION.
WARNING SUMMARY

- Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.
- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).
- Diesel fuel is highly flammable. Do not perform any procedure near fire, flames, or sparks. Severe injury or death will result.
- Do not touch hot exhaust system components with bare hands. Severe injury will result.
- Do not remove surge tank filler cap before releasing internal pressure when engine temperature is above 190°F (88°C). Steam or hot coolant under pressure will cause injury.
- Do not drain oil when engine is hot. Severe injury to personnel will result.
- Always wear eye protection when bleeding brakes. Failure to do this may cause injury if brake fluid comes in contact with eyes.
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery terminal, a direct short will result, causing injury to personnel, or damage to equipment.
- Keep hands and arms away from fan blade and drive belts while engine is running, or serious injury may result.
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts eyes or skin.
- When removing battery cable clamps, disconnect ground cable first. Ensure all switches are in OFF position before disconnecting ground cable. Do not allow tools to come in contact with vehicle when disconnecting cable clamps. A direct short can result, causing instant heating of tools, tool damage, battery damage, or battery explosion.
- Allow transmission/transfer case to cool before performing maintenance. Failure to do this may cause injury.
- Always apply parking brake and chock opposite wheel before removing wheel. Avoid removing wheel when vehicle is on sloping terrain. Injury to personnel or damage to equipment may result.
WARNING SUMMARY (Cont'd)

- Hydraulic jacks are used for raising and lowering, and are not used to support vehicle. Never work under vehicle unless wheels are blocked and it is properly supported. Injury or damage to equipment may result if vehicle suddenly shifts or moves.

- Remove only the inner group of nuts when removing a wheel from the vehicle. Removing the outer nuts which hold the rim together while the assembly is inflated could result in serious injury or death.

- In all disassembly of the wheel assembly operations, ensure the tire is totally deflated before removing wheel nuts. Failure to follow proper safety precautions could cause serious injury or death.

- Never inflate a wheel assembly with the wheel locknuts removed in an attempt to separate inner and outer rim halves. The assembly will separate under pressure resulting in serious injury or death.

- Never use wheel assemblies with studs which are damaged, loose, or have damaged threads. Damaged studs can cause improper assembly, which could cause individual fasteners to fail. Any of these situations could cause serious injury or death.

- Never use tubes in wheel assemblies. Use of a tube defeats built-in-safety features, and could allow the wheel to come apart under pressure, resulting in serious injury or death.

- Use only replacement parts specified in TM 9-2320-280-24P. Wheels assembled with components which do not meet specifications could cause the assembly to separate under pressure, resulting in serious injury or death.

- Never inflate a wheel assembly without having checked wheel locknut torques to ensure the wheel locknuts are tightened to specifications. An assembly with improperly tightened locknuts could separate under pressure resulting in injury or death.

- Always use a tire inflation cage for inflation purposes. Stand on one side of cage, during inflation, never directly in front. Keep hands out of the cage during inflation. Inflate assembly to recommended pressure, using a clip-on air chuck. Do not exceed 30 psi (207 kPa) cold inflation pressure. Failure to follow these instructions may result in serious injury or death.

- Radial tires and bias ply tires should not be mixed on the same vehicle. Injury to personnel or damage to equipment may result.

- Never install radial tire on eight bolt wheel. Damage to equipment may result, causing injury to personnel.
**UNIT MAINTENANCE**

<table>
<thead>
<tr>
<th>Truck Type</th>
<th>Model</th>
<th>EIC Code</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck, Utility: Cargo/Troop Carrier, 1-1/4 Ton, 4x4</td>
<td>M998</td>
<td>EIC: BBD</td>
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<tr>
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<td>M1038</td>
<td>EIC: BBE</td>
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<tr>
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<td>M1097</td>
<td>EIC: BBM</td>
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<td>EIC: BBX</td>
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<td>EIC: BBH</td>
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<td>EIC: BBV</td>
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<td>M1046</td>
<td>EIC: BBY</td>
<td></td>
</tr>
<tr>
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<td>EIC: BBJ</td>
<td></td>
</tr>
<tr>
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<td>EIC: BBL</td>
<td></td>
</tr>
<tr>
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<td>M1043</td>
<td>EIC: BBM</td>
<td></td>
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<td>M1044</td>
<td>EIC: BBN</td>
<td></td>
</tr>
<tr>
<td>Truck, Utility: S250 Shelter Carrier, 4x4</td>
<td>M1037</td>
<td>EIC: BBO</td>
<td></td>
</tr>
<tr>
<td>Truck, Utility: S250 Shelter Carrier, 4x4, W/Winch</td>
<td>M1042</td>
<td>EIC: BBR</td>
<td></td>
</tr>
<tr>
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<td>M996</td>
<td>EIC: BBS</td>
<td></td>
</tr>
<tr>
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<td>M997</td>
<td>EIC: BBT</td>
<td></td>
</tr>
<tr>
<td>Truck, Ambulance, 2-Litter, Soft Top, 4x4</td>
<td>M1035</td>
<td>EIC: BBU</td>
<td></td>
</tr>
</tbody>
</table>

Approved for public release; distribution is unlimited.
<table>
<thead>
<tr>
<th>CHAPTER 3</th>
<th>ENGINE SYSTEMS MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section I.</td>
<td>Lubrication System Maintenance</td>
</tr>
<tr>
<td>II.</td>
<td>Fuel System Maintenance</td>
</tr>
<tr>
<td>III.</td>
<td>Accelerator System Maintenance</td>
</tr>
<tr>
<td>IV.</td>
<td>Exhaust System Maintenance</td>
</tr>
<tr>
<td>V.</td>
<td>Cooling System Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 4</th>
<th>ELECTRICAL SYSTEM MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section I.</td>
<td>Generating and Protective Control Box System Maintenance</td>
</tr>
<tr>
<td>II.</td>
<td>Starter and Starting Control System Maintenance</td>
</tr>
<tr>
<td>III.</td>
<td>Instruments, Sending Units, Switches, and Horn Maintenance</td>
</tr>
<tr>
<td>IV.</td>
<td>Transfer Case and Transmission Electrical Maintenance</td>
</tr>
<tr>
<td>V.</td>
<td>Lighting System Maintenance</td>
</tr>
<tr>
<td>VI.</td>
<td>Battery System Maintenance</td>
</tr>
<tr>
<td>VII.</td>
<td>Ambulance Electrical System Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 5</th>
<th>TRANSMISSION AND TRANSFER CASE MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section I.</td>
<td>Transmission Maintenance</td>
</tr>
<tr>
<td>II.</td>
<td>Transfer Case Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 6</th>
<th>PROPELLER SHAFTS, AXLES, AND SUSPENSION MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section I.</td>
<td>Propeller Shafts Maintenance</td>
</tr>
<tr>
<td>II.</td>
<td>Front and Rear Axles Maintenance</td>
</tr>
<tr>
<td>III.</td>
<td>Suspension Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 7</th>
<th>BRAKE SYSTEM MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section I.</td>
<td>Parking Brake System Maintenance</td>
</tr>
<tr>
<td>II.</td>
<td>Service Brake System Maintenance</td>
</tr>
<tr>
<td>III.</td>
<td>Rear Dual Service/Parking Brake System Maintenance</td>
</tr>
</tbody>
</table>
### CHAPTER 8

**WHEELS AND STEERING MAINTENANCE**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Wheel and Runflat System Maintenance</td>
<td>8-1</td>
</tr>
<tr>
<td>II. Steering Components Maintenance</td>
<td>8-43</td>
</tr>
</tbody>
</table>

### CHAPTER 9

**FRAME MAINTENANCE**

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-1</td>
</tr>
</tbody>
</table>

**INDEX**

<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index 1</td>
</tr>
</tbody>
</table>
CHAPTER 3
ENGINE SYSTEMS MAINTENANCE

Section I. LUBRICATION SYSTEM MAINTENANCE

3-1. LUBRICATION SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-2</td>
<td>Engine Oil Dipstick Tube Replacement</td>
<td>3-2</td>
</tr>
<tr>
<td>3-3</td>
<td>Engine Oil Filler Tube Replacement</td>
<td>3-4</td>
</tr>
<tr>
<td>3-4</td>
<td>Engine Oil Filter Adapter Replacement</td>
<td>3-5</td>
</tr>
<tr>
<td>3-5</td>
<td>Engine Oil Service</td>
<td>3-6</td>
</tr>
<tr>
<td>3-6</td>
<td>Oil Pan Replacement</td>
<td>3-8</td>
</tr>
<tr>
<td>3-7</td>
<td>Engine Oil Cooler Supply and Return Lines Replacement</td>
<td>3-10</td>
</tr>
<tr>
<td>3-8</td>
<td>Engine and Transmission Oil Cooler Assembly Maintenance</td>
<td>3-12</td>
</tr>
<tr>
<td>3-9</td>
<td>Crankcase Depression Regulator (CDR) Valve and Bracket Maintenance</td>
<td>3-14</td>
</tr>
<tr>
<td>3-10</td>
<td>CDR Valve Hoses Replacement</td>
<td>3-18</td>
</tr>
</tbody>
</table>
3-2. ENGINE OIL DIPSTICK TUBE REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- Manual References
  - General mechanic’s tool kit: TM 9-2320-280-10
  - automotive (Appendix B, Item 1)
- Special Tools
  - Hex head driver, 8 mm (Appendix B, Item 156)
- Equipment Condition
  - Hood raised and secured (TM 9-2320-280-10)
- Manual References
  - TM 9-2320-280-24P

**Materials/Parts**
- O-ring seal (Appendix G, Item 154)
- Nut and lockwasher assembly (Appendix G, Item 144)
- Sealant (Appendix C, Item 38)

### a. Removal

1. Remove oil dipstick (5) from oil dipstick tube (4).
2. Remove nut and lockwasher assembly (3) and capscrew (13) from harness clamp (2) and upper dipstick tube bracket (6). Discard nut and lockwasher assembly (3).
3. Using hex head driver, remove socket head screw (8) and washer (7) from lower dipstick tube bracket (12) and exhaust manifold (11).
4. Remove two screw-assembled washers (1) from upper dipstick tube bracket (6) and fuel line bracket (14).
5. Remove oil dipstick tube (4) from engine oil pan (10). Remove and discard O-ring seal (9).

### b. Installation

1. Apply RTV sealant to O-ring seal (9) and install O-ring seal (9) on oil dipstick tube (4).
2. Install oil dipstick tube (4) in engine oil pan (10).
3. Using hex head driver, secure lower dipstick tube bracket (12) to exhaust manifold (11) with washer (7) and socket head screw (8). Tighten socket head screw (8) to 25-33 lb-ft (34-45 N·m).
4. Secure upper dipstick tube bracket (6) to fuel line bracket (14) with two screw-assembled washers (1). Tighten screw-assembled washer (1) to 3 to 4 lb-ft (45 N·m).
5. Secure harness clamp (2) to upper dipstick tube bracket (6) with capscrew (13) and nut and lockwasher assembly (3).
6. Install oil dipstick (5) into oil dipstick tube (4).
FOLLOW-ON TASKS:
- Start engine (TM 9-2320-280-10) and check for oil leaks.
- Lower and secure hood (TM 9-2320-280-10)
3-3. ENGINE OIL FILLER TUBE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**

- General mechanic's tool kit automotive (Appendix B, Item 1)
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Manual References**

**Materials/Parts**

- Lubricating oil (Appendix C, Item 31)

**Equipment Condition**

- Hood raised and secured [TM 9-2320-280-10]

### a. Removal

1. Loosen clamp (2) and disconnect CDR valve hose (1) from engine oil filler tube (3).
2. Remove two nuts (4), washers (5), and engine oil filler tube (3) from timing chain cover (7) and studs (8).
3. Inspect grommet (6) for breaks or cracks. Replace if defective.

### b. Installation

1. Coat grommet (6) with lubricating oil.
2. Install engine oil filler tube (3) into timing chain cover (7) with two washers (5) and nuts (4). Tighten nuts (4) to 13-20 lb-ft (18-27 N·m).
3. Connect CDR valve hose (1) to engine oil filler tube (3) and tighten clamp (2).

FOLLOW-ON TASK: Lower and secure hood [TM 9-2320-280-10]
3-4. ENGINE OIL FILTER ADAPTER REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
General mechanic’s tool kit
automotive (Appendix B, Item 1)

**Materials/Parts**
Seal (Appendix G, Item 212)
Two O-ring seals (Appendix G, Item 155)
Adapter seal (Appendix G, Item 2)

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Engine oil filter removed [para. 3-5].

---

**a. Removal**

1. Remove adapter bolt (6), gasket (5), two O-ring seals (4), engine oil filter adapter (3), and adapter seal (1) from cylinder block (2). Discard adapter seal (1), two O-ring seals (4), and gasket (5).

2. Remove reducer boss (7) from oil adapter (3).

3. Inspect reducer boss (7) for damaged threads or cracks. Replace if defective.

**b. Installation**

1. Install reducer boss (7) into oil filter adapter (3) and tighten to 25 lb-ft (34 N·m).

2. Install engine oil filter adapter (3) and adapter seal (1) on cylinder block (2) with two O-ring seals (4), seal (5), and adapter bolt (6). Tighten adapter bolt (6) to 50 lb-ft (68 N·m).

---

**FOLLOW-ON TASK:** Install engine oil filter [para. 3-5].
3-5. ENGINE OIL SERVICE

This task covers:

- a. Draining Oil
- b. Removing Filter
- c. Installing Filter
- d. Replenishing Oil

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)
- Oil filter removal tool (Appendix B, Item 2)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)

**Materials/Parts**
- Oil filter (Appendix G, Item 153)
- Lubricating oil (Appendix C, Item 31)

**General Safety Instructions**
- Do not drain oil when engine is hot.

---

**a. Draining Oil**

**WARNING**

Do not drain oil when engine is hot. Severe injury to personnel will result.

**NOTE**
- Park vehicle on a firm, level surface.
- Have drainage container ready to catch oil.

1. Remove drainplug (5) and gasket (4) from oil pan (3). Allow oil to drain completely.
2. Install gasket (4) and drainplug (5). Tighten drainplug (5) to 20 lb-ft (27 N·m).

---

**b. Removing Filter**

**NOTE**
- Have drainage container ready to catch oil.

Remove oil filter (1) from filter adapter (2). Discard filter (1).

---

**c. Installing Filter**

1. Apply a light coat of oil to filter gasket prior to installation.
2. Install oil filter (1) on oil filter adapter (2) and tighten by hand until gasket contacts filter adapter (2). Tighten additional 1/2-3/4 turn by hand.

---

**d. Replenishing Oil**

**CAUTION**

Install a non-vented filler cap only. An incorrect filler cap will not seal properly, causing water to enter and damage engine.

1. Remove filler cap (6) from filler tube (7). Fill with oil according to TM 9-2320-280-10.
2. Install filler cap (6) on filler tube (7).
FOLLOW-ON TASKS:
- Lower and secure hood (TM 9-2320-280-10)
- Start engine (TM 9-2320-280-10) and inspect for leaks at oil filter and drainplug.
3-6. OIL PAN REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

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<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
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<td>General mechanic's tool kit: Starter removed (para. 4-8).</td>
<td>• Starter removed (para. 4-8).</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>• Oil dipstick tube removed (para. 3-2).</td>
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</table>

<table>
<thead>
<tr>
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<th>General Safety Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal (Appendix G, Item 213)</td>
<td>Do not drain oil when engine is hot.</td>
</tr>
<tr>
<td>Two lockwashers (Appendix G, Item 110)</td>
<td></td>
</tr>
<tr>
<td>Oil pan gasket (Appendix G, Item 52)</td>
<td></td>
</tr>
<tr>
<td>(optional)</td>
<td></td>
</tr>
<tr>
<td>Sealant (Appendix C, Item 38)</td>
<td></td>
</tr>
</tbody>
</table>

Manual References

<table>
<thead>
<tr>
<th>TM 9-2320-280-10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TM 9-2320-280-24P</th>
</tr>
</thead>
</table>

a. Removal

WARNING

Do not drain oil when engine is hot. Severe injury to personnel will result.

NOTE

Have drainage container ready to catch oil.

1. Remove oil drainplug (8) and gasket (7) and drain oil. Install gasket (7) and oil drainplug (8) after oil is drained.
2. Remove two nuts (9), lockwashers (10), and starter cable support bracket (11) from studs (14). Discard lockwashers (10).
3. Remove twenty capscrews (6), two large capscrews (13), studs (14), oil pan gasket (4) (if installed), and oil pan (12) from cylinder block (2). Remove any sealant remains.
4. Remove oil pan rear seal (15) from rear main cap (1). Discard oil pan rear seal (15).

b. Installation

1. Apply a bead of sealant to each end of seal (15) and install oil pan rear seal (15) on rear main cap (1).

NOTE

Perform step 2 for optional oil pan gasket. Perform step 3 for applying sealant.

Immediately install oil pan after application of sealant.

2. Install oil pan gasket (4) on lip of oil pan (12) and align with bolt holes.
3. Apply a 3/16 in. (5mm) bead of sealant around two large holes (3) on cylinder block (2). Apply a 3/16 in. (5mm) bead of sealant around oil pan sealing surface (5) following sealant diagram shown.
4. Install oil pan (12) on cylinder block (2) with twenty capscrews (6), two large capscrews (13), and studs (14). Tighten capscrews (6) and studs (14) to 4-10 lb-ft (5-14 N·m). Tighten large capscrews (13) to 13-20 lb-ft (18-27 N·m).
5. Install starter cable support bracket (11) on studs (14) with two lockwashers (10) and nuts (9).
6. Tighten oil drainplug (8) to 20 lb-ft (27 N·m).
FOLLOW-ON TASKS:
- Replenish engine oil [TM 9-2320-280-10].
- Install oil dipstick tube [para. 3-2].
- Install starter [para. 4-8].
3-7. ENGINE OIL COOLER SUPPLY AND RETURN LINES MAINTENANCE

This task covers:

a. Supply Line Removal
b. Inspection
c. Supply Line Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Engine left splash shield removed automotive (Appendix B, Item 1) (para. 10-17).
- Engine access cover removed (para. 10-15).

**Materials/Parts**
- Tiedown strap (Appendix G, Item 239)
- Lockwasher (Appendix G, Item 108)
- Locknut (Appendix G, Item 58)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Engine left splash shield removed (para. 10-17).
- Engine access cover removed (para. 10-15).

**General Safety Instructions**
- Do not drain oil when engine is hot.

---

### a. Removal

**WARNING**
Do not drain oil when engine is hot. Severe injury to personnel will result.

**CAUTION**
Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
- Engine oil cooler supply and return lines are replaced basically the same. This procedure covers supply line replacement.
- Have drainage container ready to catch oil.
- Left splash shield can be modified to add engine access cover. Refer to appendix D, Figs. D-86 and D-87 for installation.

1. Disconnect supply line connector (5) from adapter (4) and allow oil to drain.
2. Disconnect supply line connector (16) born oil cooler port (17).
3. Remove locknut (3), washer (2), capscrew (15), and washer (2) horn supply line clamp (14), brake line clamp (1), and frame bracket (13). Discard locknut (3).
4. Remove capscrew (7), lockwasher (8), and clamp (9) horn supply line (12) and engine mount bracket (10). Discard lockwasher (8).
5. Remove tiedown strap (11) from supply line (12) and return line (6). Discard tiedown strap (11).

### b. Inspection

Inspect adapter (4) for damaged threads or cracks. Replace if defective.

### c. Installation

1. Position supply line (12) in approximate mounting location along frame.
2. Install supply line clamp (14) and brake line clamp (1) on frame bracket (13) with washer (2), capscrew (15), washer (2), and locknut (3). Tighten locknut (3) to 6 lb-ft (8 \( \text{N} \cdot \text{m} \)).
3. Connect supply line connector (16) to oil cooler port (17).
3-7. ENGINE OIL COOLER SUPPLY AND RETURN LINES REPLACEMENT (Cont'd)

4. Connect supply line connector (5) to adapter (4).
5. Secure supply line (12) to engine mount bracket (10) with clamp (9), lockwasher (8), and capscrew (7).
6. Secure supply line (12) to return line (6) with tiedown strap (11).

FOLLOW-ON TASKS: • Install engine left splash shield (para. 10-17).
• Fill oil to proper level [TM 9-2320-280-10].
• Start engine (TM 9-2320-280-10) and inspect for leaks at engine oil cooler, supply and return lines.
• Install engine access cover (para. 10-15).
This task covers:

- a. Removal
- b. Installation
- c. Cleaning and Inspection

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Engine left splash shield removed (para. 10-17).
- Power steering cooler removed (para. 8-28).

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**General Safety Instructions**
- Do not drain oil when engine is hot.
- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa).

**CAUTION**
- Do not bend transmission oil cooler fins. Damaged fins reduce cooling efficiency, which may damage engine and/or transmission.

### a. Removal

**WARNING**
- Do not drain oil when engine is hot. Severe injury to personnel will result.

**CAUTION**
- Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
- Have drainage container ready to catch oil.
- Note position of hoses for installation.

1. Disconnect two engine oil cooler supply and return lines (7) from engine oil cooler ports (9).
2. Loosen two hose clamps (2) and disconnect two transmission oil cooler line connector hoses (1) from transmission oil cooler ports (3).
3. Remove four socket-head screw and washer assemblies (5), washers (6) and oil cooler (4) from radiator (8).

### b. Installation

1. Install oil cooler (4) on radiator (8) with four washers (6) and socket-head screw and washer assemblies (5).
2. Connect two transmission oil cooler line connector hoses (1) to transmission oil cooler ports (3) and tighten two hose clamps (2). Tighten clamps (2) to 10-20 lb-in. (1-2 N·m).
3. Connect two engine oil cooler supply and return lines (7) to engine oil cooler ports (9).

### c. Cleaning and Inspection

1. Remove four socket-head screw and washer assemblies (5) and washers (6) securing oil cooler (4) to radiator (8).
2. Make four two-by-four wood blocks, 2-1/2 inches (63 mm) long. Raise oil cooler (4) 1-1/2 inches (38 mm) and place one block under each corner between oil cooler (4) and radiator (8).
3-8. ENGINE AND TRANSMISSION OIL COOLER ASSEMBLY MAINTENANCE (Cont'd)

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

3. Using water and compressed air, remove dirt, trash, and insects embedded in oil cooler (4) and radiator fins (8).
4. Inspect oil cooler (4) for breaks, punctures, cracks, and splits. Replace oil cooler (4), if damaged.
5. Remove four wood blocks.
6. Install oil cooler (4) on radiator (8) with four washers (6) and socket-head screw and washer assemblies (5).

FOLLOW-ON TASKS:
- Install power steering cooler [para. 8-28].
- Fill transmission oil to proper level (TM 9-2320-280-10).
- Fill engine oil to proper level (TM 9-2320-280-10).
- Install engine left splash shield (para. 10-17).
- Start engine (TM 9-2320-280-10) and check for leaks.
3-9. CRANKCASE DEPRESSION REGULATOR (CDR) VALVE AND BRACKET
MAINTENANCE

This task covers:

a. Testing
b. Removal
c. Cleaning and Inspection
d. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>TM 9-2320-280-10</td>
<td>• Hood raised and secured (TM 9-2320-280-10)</td>
</tr>
<tr>
<td>(Appendix B, Section IV, Item L)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| a. Testing |

1. Remove engine oil dipstick from oil dipstick tube (para. 3-2).
2. Install manometer in dipstick tube.
3. Connect STE/ICE-R unit to DCA connector.

NOTE
To read manometer, add amount the water column travels above zero to the amount the water column travels below zero.

4. Start engine and let idle; record water pressure. Pressure should be zero inches of water or a slight vacuum.
5. Increase engine speed to 2,000 rpm; record water pressure. Pressure should be 2-5 inches.
6. If pressures are not within specifications listed in steps 4 and 5, replace CDR valve (9) and repeat test.
7. Install oil dipstick in engine oil dipstick tube (para. 3-2).

b. Removal

NOTE
CDR valves on vehicles equipped with deep water fording kit contain two additional vent lines.

1. Loosen clamp (7) and disconnect CDR valve oil fill tube hose (8) from CDR valve (9).
2. Loosen clamp (6) on CDR valve intake manifold hose (5).
3. Remove two screws (1), washers (2), CDR valve (9), and heater control cable clamp (3) horn CDR valve bracket (4).
4. Remove two nuts (10) from CDR valve bracket (4) and two intake manifold studs (11).
5. Remove two nuts (13) and CDR valve bracket (4) from two valve cover studs (12).
3-9. CRANKCASE DEPRESSION REGULATOR (CDR) VALVE AND BRACKET MAINTENANCE (Cont'd)
3-9. CRANKCASE DEPRESSION REGULATOR (CDR) VALVE AND BRACKET
MAINTENANCE (Cont'd)

**c Cleaning and Inspection**

**CAUTION**

Do not clean CDR valve with drycleaning solvent. Drycleaning solvent will damage the diaphragm inside the CDR valve.

1. Clean oil and carbon deposits from the CDR valve (9) with a clean, lint-free cloth.
2. Inspect the CDR valve (9) and lines for leaks, cracks, and restrictions. Replace if damaged.

**d. Installation**

1. Install CDR valve bracket (4) on two intake manifold studs (12) and two valve cover studs (13).
2. Secure CDR valve bracket (4) to intake manifold (11) with two nuts (10). Tighten nuts (10) to 15 lb-ft (20 N·m).
3. Secure CDR valve bracket (4) to valve cover studs (13) with two nuts (14). Tighten nuts (14) to 10 lb-ft (14 N·m).
4. Connect CDR valve (9) to intake manifold hose (5) and tighten clamp (6).
5. Install CDR valve (9) and heater control cable clamp (3) on CDR valve bracket (4) with two washers (2) and screws (1). Tighten screws (1) to 15 lb-ft (20 N·m).
6. Connect CDR valve oil fill tube hose (8) to CDR valve (9) and tighten clamp (7).
FOLLOW-ON TASKS:  

- Lower and secure hood (TM 9-2320-280-10)
- Install engine access cover (para. 10-15).
3-10. CDR VALVE HOSES REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**

- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**

- Hood raised and secured (TM 9-2320-280-10)
- Engine access cover removed (para. 10-15)
- CDR valve and bracket removed (para. 3-9)

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

a. **Removal**

1. Loosen clamp (2) and disconnect CDR valve intake manifold hose (1) from intake manifold (7).
2. Inspect adapter (3) for breaks or cracks. Replace if defective.
3. Loosen clamp (5) and disconnect CDR valve oil fill tube hose (4) from oil fill tube (6).

b. **Installation**

1. Connect CDR valve oil fill tube hose (4) to oil fill tube (6) and tighten clamp (5).
2. Connect to CDR valve intake manifold hose (1) to intake manifold (7) and tighten clamp (2).

**FOLLOW-ON TASKS:**

- Install CDR valve and bracket (para. 3-9)
- Lower and secure hood (TM 9-2320-280-10)
- Install engine access cover (para. 10-15)
### Section II. FUEL SYSTEM MAINTENANCE

#### 3-11. FUEL SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-12</td>
<td>Air Cleaner Assembly and Dust Unloader Maintenance</td>
<td>3-20</td>
</tr>
<tr>
<td>3-13</td>
<td>Air Cleaner Filter Element Servicing</td>
<td>3-22</td>
</tr>
<tr>
<td>3-14</td>
<td>Air Horn Replacement</td>
<td>3-26</td>
</tr>
<tr>
<td>3-15</td>
<td>Air Horn to Air Cleaner Elbow Replacement</td>
<td>3-28</td>
</tr>
<tr>
<td>3-16</td>
<td>Air Horn Support Bracket Replacement</td>
<td>3-29</td>
</tr>
<tr>
<td>3-17</td>
<td>Air Restriction Gauge Replacement</td>
<td>3-30</td>
</tr>
<tr>
<td>3-18</td>
<td>Weathercap Replacement</td>
<td>3-31</td>
</tr>
<tr>
<td>3-19</td>
<td>Air Restriction Gauge Hose Replacement</td>
<td>3-32</td>
</tr>
<tr>
<td>3-20</td>
<td>Air Intake and Fuel Pump Vent Lines Replacement</td>
<td>3-33</td>
</tr>
<tr>
<td>3-21</td>
<td>Drainage Bracket Replacement</td>
<td>3-34</td>
</tr>
<tr>
<td>3-22</td>
<td>Fuel Injection Pump Boot Replacement</td>
<td>3-35</td>
</tr>
<tr>
<td>3-23</td>
<td>Fuel Pump Replacement</td>
<td>3-36</td>
</tr>
<tr>
<td>3-24</td>
<td>Fuel Tank Maintenance</td>
<td>3-38</td>
</tr>
<tr>
<td>3-25</td>
<td>Fuel Tank Supply and Return Lines Replacement</td>
<td>3-48</td>
</tr>
<tr>
<td>3-26</td>
<td>Auxiliary Fuel Pickup and Return Lines Replacement</td>
<td>3-50</td>
</tr>
<tr>
<td>3-27</td>
<td>Fuel Tank Vent Line and Filter Replacement</td>
<td>3-52</td>
</tr>
<tr>
<td>3-28</td>
<td>Fuel Tank Filler Cap and Spout Maintenance</td>
<td>3-54</td>
</tr>
<tr>
<td>3-29</td>
<td>Fuel Tank Filler Spout Vent Line Replacement</td>
<td>3-56</td>
</tr>
<tr>
<td>3-30</td>
<td>Filler Spout Hose Replacement</td>
<td>3-58</td>
</tr>
<tr>
<td>3-31</td>
<td>Fuel Tank Hangers Replacement</td>
<td>3-59</td>
</tr>
<tr>
<td>3-32</td>
<td>Fuel Filter Maintenance</td>
<td>3-60</td>
</tr>
<tr>
<td>3-33</td>
<td>Fuel Filter Element Maintenance</td>
<td>3-62</td>
</tr>
<tr>
<td>3-34</td>
<td>Fuel Filter Drain Hose and Valve Replacement</td>
<td>3-64</td>
</tr>
<tr>
<td>3-35</td>
<td>Fuel Injection Pump Return Hose Check Valve Maintenance</td>
<td>3-66</td>
</tr>
<tr>
<td>3-36</td>
<td>Fuel Injection Return Hoses Replacement</td>
<td>3-68</td>
</tr>
<tr>
<td>3-37</td>
<td>Fuel Drain Back Tube Replacement</td>
<td>3-72</td>
</tr>
<tr>
<td>3-38</td>
<td>Glow Plug Replacement</td>
<td>3-74</td>
</tr>
<tr>
<td>3-39</td>
<td>Right Fuel Injection Lines Bracket Replacement</td>
<td>3-75</td>
</tr>
<tr>
<td>3-40</td>
<td>Left Fuel Injection Lines Bracket Replacement</td>
<td>3-76</td>
</tr>
</tbody>
</table>
3-12. AIR CLEANER ASSEMBLY AND DUST UNLOADER MAINTENANCE

This task covers:

- a. Removal
- b. Inspection
- c. Installation

INITIAL SETUP:

**Tools**

- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)

**Equipment Condition**

- Hood raised and secured (TM 9-2320-280-10)

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**NOTE**

For dust unloader replacement, perform steps 1 and 2 only.

### a. Removal

1. Remove four screws (18) and dust unloader cover (17) from support brackets (4).
2. Loosen clamp (15) and remove dust unloader (16) from air cleaner assembly (9).
3. Loosen clamp (5) and disconnect elbow (6) from air cleaner assembly (9).
4. Disconnect air restriction gauge hose (7) from fitting (8).
5. Remove outer strap clamps (10) and (12) securing air cleaner assembly (9) to support brackets (4).
6. Disconnect vent line (3) from elbow (2).
7. Remove air cleaner assembly (9) from support bracket (4).
8. Remove elbow (2) from air cleaner assembly (9).
9. Remove adapter (14) and tube (13) from air cleaner assembly (9).
10. Remove fitting (8) from air cleaner assembly (9).
11. Remove clamp (11) from air cleaner assembly (9).

### b. Inspection

1. Inspect gasket (1) for cracks or brakes. Replace gasket (1) if defective.
2. Inspect elbow (2), fitting (8), and adapter (14) for damaged threads or cracks. Replace if defective.

### c. Installation

**NOTE**

For dust unloader replacement, perform steps 10 and 11 only.

1. Install clamp (11) on air cleaner assembly (9).
2. Install fitting (8) on air cleaner assembly (9).
3. Install tube (13) on adapter (14).
4. Install tube (13) and adapter (14) on air cleaner assembly (9).
5. Install elbow (2) to air cleaner assembly (9).
6. Install air cleaner assembly (9) on support brackets (4) with strap clamps (10) and (12). Tighten the following clamps in sequence as follows: (10), (11), and (12).
7. Connect elbow (6) to air cleaner assembly (9) and tighten clamp (5).
8. Connect air restriction gauge hose (7) to fitting (8).
9. Connect vent line (3) to elbow (2).
10. Install dust unloader (16) on air cleaner assembly (9) and tighten clamp (15) to 45-50 lb-in. (5-6 N·m).

11. Install dust unloader cover (17) on support brackets (4) with four screws (18).

FOLLOW-ON TASK: Lower and secure hood [TM 9-2320-280-10]
3-13. AIR CLEANER FILTER ELEMENT SERVICING

This task covers:

a. Removal  
b. Inspection  
c. Emergency Cleaning  
d. Cleaning  
e. Installation

INITIAL SETUP:

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1))

**Equipment Condition**
Hood raised and secured [TM 9-2320-280-10]

**General Safety Instructions**

- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa).
- If NBC contamination is suspected, consult NBC officer or NBC NCO for appropriate handling instructions.

**Materials/Parts**
Detergent (Appendix C, Item 17)

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**WARNING**

- Improper cleaning methods and use of unauthorized cleaning liquids can injure personnel and cause damage to equipment. Do not use anything other than compressed air, water, and detergent to clean elements.
- If NBC contamination is suspected, consult NBC officer or NBC NCO for appropriate handling instructions.

---

**a. Removal**

1. Loosen bolt (8), and remove ring clamp (1), cover (2), and gasket (3) from air cleaner assembly (6).
2. Remove nut and washer assembly (7) and filter element (4) from stud (5) and cleaner assembly (6).
3. Cover housing opening with screen or rag to prevent contaminants from entering the air intake system and damaging your engine.

---

**b. Inspection**

1. Check gasket (3) for dents, tears, rips, and other damage. Make sure the gasket has not taken a set. Make sure there are no hard dirt ridges on the sealing surfaces.
2. Inspect filter element (4) for holes and tears by looking through the element toward a bright light. If pinpoints of light shine through, replace the element. Holes that are large enough to let light through are large enough to let contaminants through. Another way to check for leaks or damage is to look for uneven dirt patterns. Make sure there is no rust or flaking paint on metal parts of the filter. If the filter has already been cleaned three times, or if you find damage, replace it.
3. Check air cleaner assembly (6) for holes, dents, rust, or any other damage that will interfere with proper sealing and allow unfiltered air to enter and destroy engine.

---

**c. Emergency Cleaning**

**CAUTION**

Do not strike ends of filter element on hard surface or damage to filter element may result.

Remove dust or sand from filter element (4) by holding it so neither end faces ground. Gently tap around filter element (4) to free dust and sand.
3-13. AIR CLEANER FILTER ELEMENT SERVICING (Cont'd)

[Diagram showing parts of the air cleaner filter element]

[Diagram showing the process of cleaning the filter element]

3-23
3-13. AIR CLEANER FILTER ELEMENT SERVICING (Cont'd)

**WARNING**

Compressed air used for cleaning purpose will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personnel protective equipment (goggles/shield, gloves, etc.).

d. **Cleaning**

1. Hold nozzle at least one inch away from element (1) and direct compressed air against clean side of element (1) (in direction opposite to normal air flow). Move air stream up and down length of pleats until you can not see dust being blown out.

2. Prepare a solution of five gallons warm water (80-110° F (26.7-43.3° C)) and approximately one cup of non-sudsing detergent in a container large enough to submerge the element (1). Never use gasoline or solvents of any kind to clean elements.

3. Immerse the element (1) completely in the cleaning solution. Swish for two minutes. Soak the element in the cleaning solution for 15 to 20 minutes, then swish it around again to remove contaminants.

4. Remove the element (1) from the solution and let it drain.

5. Rinse the element with cool water (35-80° F (1.7-26.7° C)) from clean side to dirty side (in direction opposite to normal air flow) with a gentle stream of water (no more than 40 psi (275.8 kpa)). If the clean side was contaminated during the soak cycle, rinse the element from both sides.

6. Air dry the element (1) at normal room temperature until completely dry. Usually overnight is adequate, but temperature and humidity will effect drying time. If you use circulating air, do not exceed 180° F (82.2° C). Do not use compressed air to speed drying time, you will damage your element.

7. Reinspect the element (1) and discard if damaged. If it checks out O.K., mark the date of cleaning on it.

e. **Installation**

1. Remove screen or rag from housing opening.

2. Install filter element (1) into air cleaner assembly (6) and on stud (5) with nut and washer assembly (7). Tighten nut and washer assembly (7) to 20-40 lb-in (2-4 N·m).

   **CAUTION**

   When cover clamp is secured to end of filter body assembly, ensure the clamp bolt is between the three and six o'clock position to prevent damaging hood when hood is closed.

3. Install cover (3) and gasket (4) on air cleaner assembly (6) with ring clamp (2) as shown. Tighten bolt (8) to 35-40 lb-in (3-4 N·m).
3-13. AIR CLEANER FILTER ELEMENT SERVICING (Cont'd)

FOLLOW-ON TASKS:
- Lower and secure hood (TM 9-2320-280-10).
- Start engine (TM 9-2320-280-10) and ensure air restriction gauge on instrument panel does not show red.
3-14. AIR HORN REPLACEMENT

This task covers:

a. Removal  

b. Installation

INITIAL SETUP:

Tools
- General mechanic’s tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

Materials/Parts
- Two rubber washers (Appendix G, Item 203)
- Gasket (Appendix G, Item 38)
- Sealing compound (Appendix C, Item 40)

Equipment Condition
- Hood raised and secured (TM 9-2320-280-10).

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

a. Removal

1. Remove two screws (2), washers (3), and rubber washers (4) securing air horn (5) to intake manifold (7). Discard rubber washers (4).
2. Loosen clamp (10) and disconnect air intake elbow (9) from air horn (5).
   
   **CAUTION**

   Cover opening of intake manifold to prevent foreign material from entering engine.
3. Loosen clamp (1) securing air horn (5) to engine lift bracket (8) and slide clamp (1) from engine lift bracket (8). Remove air horn (5) from intake manifold (7).
4. Remove gasket (6) from intake manifold (7). Discard gasket (6).
5. Remove clamp (1) from air horn (5).

b. Installation

1. Install clamp (1) on air horn (5).
2. Install gasket (6) on intake manifold (7).
3. Coat threads of screws (2) with sealing compound. Install air horn (5) on intake manifold (7) with two rubber washers (4), washers (3), and screws (2). Tighten screws (2) to 40-45 lb-in. (5 N•m).
4. Connect elbow (9) to air horn (5) and tighten clamp (10) to 45-50 lb-in. (5-6 N•m).
5. Slide clamp (1) on engine lift bracket (8) and air horn (5) and tighten clamp (1) to 40-45 lb-in. (5 N•m).
3-14. AIR HORN REPLACEMENT (Cont’d)

FOLLOW-ON TASK: Lower and secure hood [TM 9-2320-280-10]
3-17. AIR RESTRICTION GAUGE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**

General mechanic's tool kit: TM 9-2320-280-24P
automotive (NSN 5180-00-177-7033)

**Manual References**

<table>
<thead>
<tr>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

**a. Removal**

1. Remove two screws (2) securing air restriction gauge (3) to bezel (1) and pull gauge (3) from behind dash panel (5).
2. Disconnect, air restriction gauge hose (4) from gauge (3) and remove gauge (3).

**b. Installation**

1. Connect hose (4) to gauge (3).
2. Install gauge (3) behind dash panel (5) on bezel (1) with two screws (2).

FOLLOW-ON TASK: Start engine (TM 9-2320-280-10) and check operation of air restriction gauge.
3-16. AIR HORN SUPPORT BRACKET REPLACEMENT

This task covers:
   a. Removal
   b. Installation

INITIAL SETUP:

Applicable Models
All models except M997, M997A1, M997A2, M1036, M1037, M1042

Manual References
TM 9-2320-280-24P

Equipment Condition
Air horn removed (para. 3-14)

Tools
General mechanic's tool kit:
   automotive (Appendix B, Item 1)

Materials/Parts
Lockwasher (Appendix G, Item 110)

---

a. Removal

1. Remove nut (5), lockwasher (4), two clamps (3), and stud (2) from air horn support bracket (1) and cylinder head (7). Discard lockwasher (4).
2. Remove capscrew (6) and support bracket (1) from cylinder head (7).

---

b. Installation

1. Install air horn support bracket (1) on cylinder head (7) with stud (2).
2. Secure air horn support bracket (1) to cylinder head (7) with capscrew (6). Tighten capscrew (6) and stud (2) to 40 lb-ft (54 N-m).
3. Install two clamps (3) on stud (2) with lockwasher (4) and nut (5).

---

FOLLOW-ON TASK: Install air horn (para. 3-14).
3-17. AIR RESTRICTION GAUGE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Manual References

Tools
General mechanic's tool kit:
automotive (NSN 5180-00-177-7033)

a. Removal

1. Remove two screws (2) securing air restriction gauge (3) to bezel (1) and pull gauge (3) from behind dash panel (5).
2. Disconnect air restriction gauge hose (4) from gauge (3) and remove gauge (3).

b. Installation

1. Connect hose (4) to gauge (3).
2. Install gauge (3), behind dash panel (5), on bezel (1) with two screws (2).

FOLLOW-ON TASK: Start engine (TM 9-2320-280-10) and check operation of air restriction gauge.
3-18. WEATHERCAP REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**

- General mechanic's tool kit
- automotive (Appendix B, Item 1)

**Manual References**

- TM 9-2320-280-24P

---

**a. Removal**

Loosen clamp (2) and remove weathercap (1) from air intake duct (3).

**b. Installation**

Install weathercap (1) on air intake duct (3) with clamp (2). Tighten clamp (2) to 45-50 lb-in. (5-6 N·m).
3-19. AIR RESTRICTION GAUGE HOSE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)

**Equipment Condition**
- Engine access cover removed (para. 10-15).
- Hood raised and secured (TM 9-2320-280-10)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

### a. Removal

1. Loosen three clamps (2) from air restriction gauge hose (6) and “A” beam (1).
2. Disconnect hose (6) from air cleaner assembly (7).
3. Disconnect hose (6) from air restriction gauge (4) located behind instrument panel (5).
4. Remove hose (6) by routing out from three clamps (2) through two grommets (3) in “A” beam (1).

### b. Installation

1. Route hose (6) through three clamps (2) and two grommets (3) in “A” beam (1) to air cleaner assembly (7) and gauge (4).
2. Connect hose (6) to air cleaner assembly (7).
3. Connect hose (6) to gauge (4).
4. Tighten three clamps (2) on hose (6) and “A” beam (1).

FOLLOW-ON TASKS:
- Install engine access cover (para. 10-15).
- Lower and secure hood (TM 9-2320-280-10)
3-20. AIR INTAKE AND FUEL PUMP VENT LINES REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:  
automotive (Appendix B, Item 1)

**Equipment Condition**
Hood raised and secured (TM 9-2320-280-10)

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**NOTE**

For fuel pump vent line replacement, perform steps 2, 3, and 4 only.

**a. Removal**

1. Remove vent line (2) from air cleaner fitting (1) and tee fitting (7).
2. Loosen clamp (3) and disconnect vent line (4) from fuel pump (6).
3. Loosen clamp (3) and remove vent line (4) from tee fitting (5).
4. Remove two clamps (3) from vent line (4).

**b. Installation**

**NOTE**

For fuel pump vent line replacement, perform steps 2 and 3.

1. Connect vent line (2) to tee fitting (7) and air cleaner fitting (1).
2. Install two clamps (3) to vent line (4).
3. Install vent line (4) on tee fitting (5) and fuel pump (6) and tighten two clamps (3).

FOLLOW-ON TASK: Lower and secure hood (TM 9-2320-280-10)
3-21. DRAINAGE BRACKET REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Air cleaner assembly removed (para. 3-12).

**a. Removal**

Remove three screws (2) and drainage bracket (3) from body (1).

**b. Installation**

Install drainage bracket (3) on body (1) with three screws (2).

FOLLOW-ON TASK: Install air cleaner assembly (para. 3-12).
3-22. FUEL INJECTION PUMP BOOT REPLACEMENT

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Removal**

Remove clamp (3) and boot (2) from injection pump (1).

**b. Installation**

Install boot (2) on injection pump (1) with clamp (3).

---

FOLLOW-ON TASK: Lower and secure hood (TM 9-2320-280-10)
3-23. FUEL PUMP REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Mounting plate gasket (Appendix G, Item 142)
- Fuel pump gasket (Appendix G, Item 35)
- Grease (Appendix C, Item 22)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

**General Safety Instructions**
- Do not perform this procedure near fire, flames, or sparks.

**WARNING**
- Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**a. Removal**

**CAUTION**
- Cover or plug all open hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
- Have drainage container ready to catch fuel.

1. Loosen clamp (14) and disconnect fuel inlet line (13) from fuel pump (2) and allow fuel to drain into container.
2. Disconnect fuel outlet line (12) from fuel pump (2) and allow fuel to drain into container.
3. Loosen clamp (3) and disconnect vent line (4) from fuel pump (2).
4. Remove two capscrews (1), fuel pump (2) and gasket (6) from fuel pump mounting plate (7). Discard gasket (6).
5. Remove two capscrews (11), fuel pump mounting plate (7) and gasket (8) from cylinder block (10). Discard gasket (8).
6. Remove pushrod (9) from cylinder block (10).

**b. Installation**

**NOTE**
- Place GAA grease on pushrod to retain in cylinder block during installation.

1. Insert pushrod (9) into cylinder block (10).
2. Install gasket (8) and mounting plate (7) into block (10) with two capscrews (1) for alignment of pump (2) to cylinder block (10).
3. Secure gasket (8) and mounting plate (7) to cylinder block (10) with two capscrews (11). Tighten capscrews (11) to 4-7 lb-ft (5-10 N·m) then remove two capscrews (1).
3-23. FUEL PUMP REPLACEMENT (Cont’d)

4. Install gasket (6) and fuel pump (2) on fuel pump mounting plate (7) and block (10), ensuring alignment of lever (5) to pushrod (9) with two capscrews (1). Tighten capscrews (1) to 20-30 lb-ft (27-41 N•m).

5. Connect vent line (4) to fuel pump (2) and tighten clamp (3) to 10-20 lb-in. (1-2 N•m).

6. Connect fuel outlet line (12) to fuel pump (2).

7. Connect fuel inlet line (13) to fuel pump (2) and tighten clamp (14).

FOLLOW-ON TASKS:
• Connect battery ground cable [para 4-73].
• Start engine [TM 9-2320-280-10] and check fuel pump and hoses for fuel leaks.
3-24. FUEL TANK MAINTENANCE

This task covers:

a. Draining
b. Removal
c. Disassembly
d. Cleaning and Inspection
e. Assembly
f. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)

**Materials/Parts**
- Access cover gasket (Appendix G, Item 1)
- Fourteen locknuts (Appendix G, Item 58)
- Adhesive (Appendix C, Item 1)
- Sealing compound (Appendix C, Item 46)
- Dry cleaning solvent (appendix C, Item 18)

**Personnel Required**
- One mechanic
- One assistant

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)
- Rear propeller shaft removed (para. 6-4)

**General Safety Instructions**
- Do not perform this procedure near fire, flames, or sparks.
- Cleaning will be done in a well-ventilated area and a fire extinguisher will be kept nearby when solvent is used.

**WARNING**
Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**NOTE**
Have drainage container ready to catch fuel.

### a. Draining

1. Remove fuel tank filler cap (1).
2. Remove drainplug (3) from fuel tank (2). Allow fuel to completely drain into container.

**CAUTION**
Do not overtighten drainplug. Drainplug must not turn in hole. Sharp edge of hole may cut rubber.

3. Install drainplug (3) flush with bottom of fuel tank (2) and tighten.

### b. Removal

1. Disconnect large vent line (4) from filler spout (5).
2. Remove locknut (15), washer (12), capscrew (11), washer (12), and clamp (13) from vent line (4) and body (14). Discard locknut (15).
3. Remove locknut (16), washer (7), capscrew (8), washer (7) and clamp (6) from filler spout (5). Discard locknut (16).
4. Loosen clamp (9) and remove hose (10) from spout (5).
5. Remove two nuts (15), washers (14), and capscrews (7) from fuel tank support straps (6) and (12) and remove lower straps (13).
6. Loosen two clamps (3) and disconnect fuel supply hoses (1) and (2) from fuel return line (4) and supply line (5).

**NOTE**
Perform step 7 if vehicle is equipped with an arctic heater and/or troop/cargo wintenzation kit.

7. Loosen clamp (17) and disconnect fuel supply hose (18) from arctic heater and/or troop/cargo heater fuel supply line (16).
8. Disconnect vent line (20) from tee (19).
9. Remove capscrew (22) and clamp (23) securing vent line (20) to body (24).
10. Remove locknut (8), washer (9), capscrew (10) and rear strap (12) from strap bracket (11). Discard locknut (8).
11. Lower fuel tank (21) for access to vent line (29) and clamp (28).
12. Disconnect vent line (20) from fitting (25) on fuel tank (21).
13. Remove locknut (26) and washer (27) securing clamp (28) and vent line (29) to fuel tank (21). Discard locknut (26).
14. Disconnect vent line (29) from vent line housing (30).

**NOTE**
Prior to removal, tag leads for installation.

15. Disconnect jumper leads 58J (33) and 28B (35) from body wiring harness (34).
16. Bend clamp (32) down and remove jumper harness (31).
17. Remove fuel tank (21) from vehicle.
3-24 FUEL TANK MAINTENANCE (Cont'd)

c. Disassembly

1. Thoroughly clean outside of tank (18) to prevent dirt contamination.
2. Disconnect fuel supply line (27) from fuel supply tube (12) and fuel return line (26) from fuel return tube (30).

   **NOTE**
   Perform step 3 if vehicle is equipped with an arctic heater and/or troop/cargo winterization kit.
3. Disconnect arctic heater and/or troop cargo heater fuel supply line (21) from arctic heater and/or troop/ cargo heater fuel supply tube (13).
4. Remove capscrew (23), clamp (25), fuel supply line (27), and fuel return line (26) from shield (22) and fuel tank (18). Remove arctic heater and/or troop/cargo heater fuel supply line (21) and clamp (24) if installed.
5. Remove two locknuts (7) and washers (8) securing two clamps (6) and jumper harness (5) to access cover (11). Discard locknuts (7).

   **NOTE**
   Prior to removal, tag leads for installation.
6. Disconnect jumper harness leads 28B (1) and 58J (2) from fuel level sender (31) and remove jumper harness (5).
7. Remove nine locknuts (9) and washers (10) securing access cover (11), gasket (15), and retainer (29) to fuel tank (18). Discard locknuts (9).
8. Remove access cover (11), gasket (15), and retainer (29) from fuel tank (18). Discard gasket (15).
9. Match mark position of elbow fittings on access cover (11).

   **NOTE**
   Note position of fuel strainer for installation.
10. Remove fuel strainer (14) from fuel supply tube (12).
11. Remove fuel supply tube (12) from access cover (11).
12. Remove fuel return tube (30) from access cover (11).

   **NOTE**
   - Perform step 13 if vehicle is equipped with an arctic heater and/or troop/cargo winterization kit.
   - Vehicles not equipped with an arctic heater and/or troop/cargo winterization kit will have a plug instead of an arctic heater and/or troop/cargo heater fuel supply tube.
13. Remove arctic heater and/or troop/cargo heater fuel supply tube (13) from access cover (11).
14. Remove vent valve (4) and grommet (3) from access cover (11).
15. Remove vent line (19) from tee (20).
16. Loosen clamp (16) and remove filler spout hose (17) from tank 18.

d. Cleaning and Inspection

   **WARNING**
   Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel or damage to equipment.
1. Use drycleaning solvent to clean access cover (11), fuel supply line (27), fuel return line (26), arctic heater and/or troop/cargo heater fuel supply line (21), fuel supply tube (12), fuel return tube (30), arctic heater and/or troop/cargo heater fuel supply tube (13), and inside fuel tank (18).
2. Inspect access cover (11), fuel supply line (27), fuel return line (26), fuel supply tube (12), fuel return tube (30), strainer (14), tee (20), fitting (28), vent line housing (4), and grommet (3) for cracks, wear, and breaks. Replace if cracked, worn, or broken.

3. Inspect arctic heater and/or troop/cargo heater fuel supply line (21) and arctic heater and/or troop/cargo heater fuel supply tube (13) for cracks, wear, and breaks, if installed. Replace if cracked, worn, or broken.

4. Inspect sending unit (31) for damage. Replace if damaged.
3-24. FUEL TANK MAINTENANCE (Cont'd)

e. Assembly

NOTE

- Use pipe sealant on all vent line and fuel line connector threads before installation.
- Use fittings from old tank if installing new tank.

1. Install vent line (19) on tee fitting (20).
2. Install filler spout hose (17) on tank (18) and tighten clamp (16).
3. Apply sealing compound to threads of fuel supply tube (12). Install and align fuel supply tube (12) on access cover (11).
4. Apply sealing compound to threads of fuel return tube (29). Install and align fuel return tube (29) on access cover (11).

NOTE
Perform step 5 if vehicle is equipped with an arctic heater and/or troop/cargo winterization kit.

5. Apply sealing compound to threads of arctic heater and/or troop/cargo heater fuel supply tube (13). Install and align arctic heater and/or troop/cargo heater fuel supply tube (13) on access cover (11).
6. Install grommet (3) and vent valve (4) to access cover (11).
7. Install fuel strainer (14) on fuel supply tube (12).
8. Apply adhesive to threads of nine locknuts (9). Install retainer (28), gasket (15), and access cover (11) to fuel tank (18) with nine washers (10) and locknuts (9). Tighten locknuts (9) to 72 lb-in. (8 N·m).
9. Connect jumper harness leads 28B (1) and 58J (2) to fuel level sender (30).
10. Apply adhesive to threads of two locknuts (7) and install jumper harness (5) to fuel tank (18) with two clamps (6), washers (8), and locknuts (7). Tighten locknuts (7) to 72 lb-in. (8 N·m).
11. Connect fuel supply line (27) to fuel supply tube (12), and fuel return line (26) to fuel return tube (29).

NOTE
Perform step 12 if vehicle is equipped with an arctic heater and/or troop/cargo winterization kit.

12. Connect arctic heater and/or troop/cargo heater fuel supply line (21) to arctic heater and/or troop/cargo heater fuel supply tube (13).
13. Secure shield (22), return line (26), supply line (27), clamp (25), arctic heater and/or troop/cargo heater fuel supply line (21) and clamp (24) if installed, to fuel tank (18) with capscrew (23).
3-24. FUEL TANK MAINTENANCE (Cont'd)

f. Installation

1. Position fuel tank (5) under vehicle.
2. Install jumper harness (6) on clamp (7) and bend clamp (7) up.
3. Connect jumper harness leads 58J (8) and 28B (10) to body wiring harness (9).
   
   **NOTE**
   Use sealing compound on all vent line connector threads before installation.

4. Connect vent line (4) to fuel tank (5) with clamp (3), washer (2), and locknut (1). Tighten locknut (1) to 6 lb-ft (8 N·m).
5. Connect vent line (12) on fitting (11) on fuel tank (5).
   
   **NOTE**
   Apply adhesive to threads of capscrews.

6. Install rear strap (23) on strap bracket (22) with capscrew (21), washer (20), and locknut (19). Tighten locknut (19) to 37 lb-ft (50 N·m).
   
   **NOTE**
   Ensure front straps are flush with fuel tank and to right side of dimple in slot.

7. Raise fuel tank (5) and install two support straps (24) to straps (17) and (23) with two capscrews (18), washers (25), and locknuts (26). Do not tighten locknuts (26).
8. Connect vent line (12) to tee (31) on vent line (38).
9. Secure vent line (12) to body (34) with clamp (33) and screw (32).
10. Connect fuel supply hoses (13) and (30) to fuel return and supply lines (16) and (15) and secure with clamps (14).
    
    **NOTE**
    Perform step 11 if vehicle is equipped with an arctic heater and/or troop/cargo winterization kit.

11. Connect fuel supply hose (29) to arctic heater ardor troop/cargo heater fuel supply line (27) and secure with clamp (28).
    
    **NOTE**
    Ensure upper and lower straps are 1/2 in. (12 mm) apart after tightening nuts. Straps should not touch when properly installed. Straps must be replaced if upper or lower straps touch.

12. Tighten locknuts (26) to 23-27 lb-in (3-5 N·m).
13. Connect vent line (38) to filler spout (39).
14. Secure vent line (38) to body (34) with clamp (35), washer (36), capscrew (47), washer (36), and
15. Install filler spout (39) into hose (46) and tighten clamp (45).

16. Install filler spout (39) to body (34) with clamp (42), washer (43), capscrew (44), washer (41), and locknut (40). Tighten locknut (40) to 6 lb-ft (8 N·m).

FOLLOW-ON TASKS: • Install rear propeller shaft [para. 6-4].
    • Connect battery ground cable [para. 4-73].
    • Fill fuel tank [TM 9-2320-280-10] and check for leaks.
3-25. FUEL TANK SUPPLY AND RETURN LINES REPLACEMENT

This task covers:

| a. Removal       | b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Two locknuts (Appendix G, Item 58)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Engine right splash shield removed (para. 10-20).

**General Safety Instructions**
- Do not perform this procedure near fire, flames, or sparks.

**WARNING**
- Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**a. Removal**

**CAUTION**
- Cover or plug all open hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
- Have drainage container ready to catch fuel.

1. Loosen clamps (7) and disconnect hoses (6) from fuel tank return and supply lines (8).
2. Remove two locknuts (1), capscrews (5), washers (4), clamps (3) and return and supply lines (8) from front body bracket (2) and rear body bracket (10). Discard locknuts (1).
3. Remove three clips (9) securing lines together.

**b. Installation**

1. Install return and supply lines (8) on front body bracket (2) and rear body bracket (10) with two clamps (3), washers (4), capscrews (5), and locknuts (1).
2. Connect supply and return lines (8) to hoses (6) and tighten clamps (7).
3. Secure fuel supply and return lines (8) together with three clips (9).
FOLLOW-ON TASKS:  
- Install engine right splash shield (para. 10-20).  
- Fill fuel tank [TM 9-2320-280-10] and check for fuel leaks.
3-26. AUXILIARY FUEL PICKUP AND RETURN LINES REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1097, M1097A1, M1097A2</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>Fuel tank removed (para. 3-24)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>General Safety Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sealing compound (Appendix C, Item 44)</td>
<td>Do not perform this procedure near fire, flames, or sparks</td>
</tr>
</tbody>
</table>

**WARNING**

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**a. Removal**

**CAUTION**

Cover or plug all open hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

Have drainage container ready to catch fuel.

1. Remove screw (5) and clamp (7), securing fuel return line (6) and fuel pickup line (4) to fuel line clamp (8).
2. Remove fuel pickup line (4) from supply tube (3) on fuel tank (1).
3. Remove fuel return line (6) from supply tube (2).

**b. Installation**

1. Apply sealing compound to threads of fuel return line (6) and fuel pickup line (4).
2. Install fuel return line (6) to supply tube (2) on fuel tank (1).
3. Install fuel pickup line (4) to supply tube (3).
4. Install clamp (7) on fuel return line (6) and fuel pickup line (4) and secure to fuel line clamp (8) with screw (5).
FOLLOW-ON TASK: Install fuel tank (para. 3-24).
3-27. FUEL TANK VENT LINE AND FILTER REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td><strong>TM 9-2320-280-10</strong></td>
<td>• Fuel tank removed</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td><strong>TM 9-2320-280-24P</strong></td>
<td>• Hood raised and secured (TM 9-2320-280-10)</td>
</tr>
<tr>
<td><strong>Materials/Parts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiedown strap (Appendix G, Item 239)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locknut (Appendix G, Item 58)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CAUTION**

Cover or plug all open hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

For fuel tank vent line filter replacement, perform steps 5, 8, and 9 only.

### a. Removal

1. Remove clip (9) securing fuel tank vent line (3) to vent line (6).
2. Remove two capscrews (2) securing clamps (1) and (7) and vent lines (3) and (6) to brackets (8).
3. Remove tiedown strap (4) securing vent line (6) and fuel line (5). Discard tiedown strap (4).
4. Disconnect vent line (3) from elbow (16).
5. Loosen two clamps (14) and remove vent line (15) from vent line filter (13) and elbow (16).
6. Remove two clamps (14) from vent line (15).
7. Remove two clamps (1) from vent line (3).

**NOTE**

Perform step 8 only when deep water fording kit is installed.

8. Disconnect deep water fording vent line (19) from vent line filter (13).
9. Remove capscrew (18), washer (11), locknut (12) clamp (10) and vent line filter (13) from body bracket (17). Discard locknut (12).

### b. Installation

**NOTE**

For fuel tank vent line filter replacement, perform steps 1, 2, and 5 only.

1. Install clamp (10) and vent line filter (13) to body bracket (17) with washer (11), capscrew (18), and locknut (12).

**NOTE**

Perform step 2 only when deep water fording kit is installed.

2. Connect deep water fording vent line (19) to vent line filter (13).
3-27. FUEL TANK VENT LINE AND FILTER REPLACEMENT (Cont'd)

3. Install two clamps (1) on vent line (3).
4. Install two clamps (14) on vent line (15).
5. Install vent line (15) to vent line filter (13) and elbow (16) and tighten two clamps (14).
6. Connect vent line (3) to elbow (16).
7. Install vent line (3) to vent line (6) and fuel lines (5) with tiedown strap (4).
8. Install vent lines (3) and (6) and two clamps (1) and (7) to brackets (8) with two capscrews (2).
9. Secure vent line (3) to vent line (6) with clip (9).

FOLLOW-ON TASKS:
- Install fuel tank (para. 3-24).
- Lower and secure hood (TM 9-2320-280-10)
3-28. FUEL TANK FILLER CAP AND SPOUT MAINTENANCE

This task covers:

a. Removal
b. Inspection
c. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit: automotive (Appendix B, Item 1)</td>
<td>Fuel tank drained (para. 3-24).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>General Safety Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four locknuts (Appendix G, Item 58)</td>
<td>Do not perform this procedure near fire, flames, or sparks.</td>
</tr>
<tr>
<td>Sealing compound (Appendix C, Item 44)</td>
<td></td>
</tr>
</tbody>
</table>

Manual References:

- TM 9-2320-280-10
- TM 9-2320-280-24P

WARNING

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

a. Removal

1. Unscrew filler cap “T” handle (7) and remove filler cap (6) from filler spout (12).
2. Detach cap chain clip (8) from filler spout (12) and remove filler cap (6).
3. Disconnect vent line (1) from fitting (2).
4. Remove three locknuts (3), washers (4), capscrews (5), and washers (4) from spout mounting ring (9). Discard locknuts (3).
5. Loosen clamp (17) securing filler spout (12) to hose (18).
6. Remove locknut (13), washer (14), capscrew (16), washer (14) and clamp (15) from filler spout (12). Discard locknut (13).
7. Push filler spout (12) out of spout mounting ring (9) and remove filler spout (12) from hose (18).
8. Remove fitting (2) from filler spout (12).
9. Using handle (10), remove screen (11) from filler spout (12).

b. Inspection

Inspect screen (11) for damage, debris, or blockage. Replace if damaged or if debris or blockage is detected.

c. Installation

1. Apply sealing compound to fitting (2) and install fitting (2) on filler spout (12).
2. Align filler spout (12) with hose (18) and push filler spout (12) into hose (18).
3. Install filler spout mounting ring (9) to body with three washers (4), capscrews (5), washers (4), and locknuts (3).
4. Secure hose (18) to filler spout (12) and tighten clamp (17).
5. Secure filler spout (12) to body with clamp (15), washer (14), capscrew (16), washer (14), and locknut (13). Tighten locknut (13) to 6 lb-ft (8 N·m).
6. Apply sealing compound to fitting (2) and connect vent line (1) to fitting (2).
7. Using handle (10), install screen (11) in filler spout (12).
8. Attach filler cap chain clip (8) to filler spout (12).
9. Install filler cap (6) to filler spout (12) and secure with “T” handle (7).
FOLLOW-ON TASK: Fill fuel tank (TM 9-2320-280-10) and check filler spout for fuel leaks.
3-29. FUEL TANK FILLER SPOUT VENT LINE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Rear propeller shaft removed (para 6-4)

**Materials/Parts**
- Locknut (Appendix G, Item 58)
- Adhesive (Appendix C, Item 1)
- Sealing compound (Appendix C, Item 46)

**a. Removal**

1. Disconnect vent line (2) from fuel filler spout elbow (3).
2. Remove locknut (7), washer (5), capscrew (4), and washer (5) securing vent line (2) and clamp (6) to body (1). Discard locknut (7).
3. Disconnect and remove vent line (2) from tee (12).
4. Disconnect vent line (10) from tee (12).
5. Remove capscrew (15) securing vent line (10) and clamp (11) to body (1).
6. Loosen two nuts (13) to allow access to elbow (8).
7. Disconnect vent line (10) from elbow (8) on fuel tank (9), cut vent line (10), and remove vent line (10) from crossmember (14).

**b. Installation**

**NOTE**
- Use sealing compound on all vent line connector threads before installation.

1. Install vent line (10) and connect to elbow (8) on fuel tank (9).

**NOTE**
- Upper and lower straps should be approximately 1/2 in. (12 mm) apart after tightening locknuts. Straps should not touch when properly installed. Straps must be replaced if upper and lower straps touch.

2. Apply adhesive to threads of nuts (13) and tighten nuts (13) to 23-27 lb-in (3-5 N·m).
3. Install clamp (11) and vent line (10) to body (1) with capscrew (15).
4. Route vent line (10) through crossmember (14).
5. Connect vent line (10) to tee (12).
6. Install vent line (2) and connect to tee (12).
7. Install vent line (2) and clamp (6) on body (1) with washer (5), capscrew (4), washer (5), and locknut (7). Tighten locknut (7) to 6 lb-ft (8 N·m).
8. Connect vent line (2) to fuel filler spout elbow (3).
FOLLOW-ON TASK: Install rear propeller shaft [para. 6-4].
3-30. FILLER SPOUT HOSE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
Fuel tank drained (para. 3-24).

**Manual References**
- [TM 9-2320-280-10](#)
- [TM 9-2320-280-24P](#)

**General Safety Instructions**
Do not perform this procedure near fire, flames, or sparks.

---

**WARNING**

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

---

**a. Removal**

1. Loosen clamps (4) and (3) securing hose (1) to fuel tank (5) and to filler spout (2).
2. Slide hose (1) on to filler spout (2) until disconnected from fuel tank (5). Remove hose (1) from filler spout (2).

---

**b. Installation**

**NOTE**
Position clamps attaching filler hose to fuel tank as shown.

1. Install hose (1) on filler spout (2) and slide on filler spout (2) until the hose (1) clears fuel tank (5).
2. Connect hose (1) to fuel tank (5) and tighten clamps (3) and (4).

---

**FOLLOW-ON TASK:** Fill fuel tank ([TM 9-2320-280-10](#)) and check for leaks.
3-31. FUEL TANK HANGERS REPLACEMENT

This task covers:

| a. Removal | b. Installation |

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Fuel tank removed (para. 3-24)

**Materials/Parts**
- Two locknuts (Appendix G, Item 106)
- Adhesive (Appendix C, Item 1)

**a. Removal**

1. Remove two locknuts (3), washers (4), screws (5), and rear hangers (7) from supports (6). Discard locknuts (3).

2. Twist two front hangers (9) until tee handles (2) clear slots (11) in supports (1) and remove front hangers (9).

   **NOTE**
   Perform step 3 for "A2" vehicles only.

3. Inspect four insulators (8) on front and rear hangers (9) and (7). Remove insulators (8) if damaged.

**b. Installation**

   **NOTE**
   Perform step 1 for "A2" vehicles only.

1. Install four insulators (8) on front and rear hangers (9) and (7) (if removed.)

2. Install two front hangers (9) by inserting tee handles (2) up through slots (11) in supports (1). Twist hangers (9) so that tee handles (2) are resting across slots (11) against side of ridge (10).

   **NOTE**
   Apply adhesive to threads of screws.

3. Install two rear hangers (7) on supports (6) with screws (5), washers (4), and locknuts (3).

   Tighten locknuts (3) to 37 lb-ft (50 N·m).

FOLLOW-ON TASK: Install fuel tank (para. 3-24).
3-32. FUEL FILTER MAINTENANCE

This task covers:

a. Removal
b. Installation

c. Bleeding

INITIAL SETUP:

Tools
General mechanic’s tool kit:
- automotive (Appendix B, Item 1)

Equipment Condition
- Hood raised and secured (TM 9-2320-280-10).
- Engine access cover removed (para. 10-15).
- Fuel pressure transducer removed (para. 4-26).

Materials/Parts
- Two lockwashers (Appendix G, Item 109)
- Sealing compound (Appendix C, Item 44)
- Fuel filter bleeder tool (Appendix D, Figure D-63) (optional)

General Safety Instructions
- Do not perform this procedure near fire, flames, or sparks.

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

WARNING
Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

CAUTION
Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

a. Removal

NOTE
- Have drainage container ready to catch fuel.

1. Loosen two hose clamps (2) and disconnect fuel inlet hose (1) and fuel outlet hose (13) from fuel filter (8).
2. Loosen hose clamp (9) and disconnect fuel filter drain hose (10) from fuel filter (8).
3. Pull back insulation to allow access to capscrews (3) and remove two capscrews (3), lockwashers (4), and fuel filter bracket (11) from body (12). Discard lockwashers (4).
4. Loosen capscrew (7) and remove fuel filter (8) from fuel filter bracket (11).
5. Remove three fittings (5) from fuel filter (8).

b. Installation

1. Apply sealing compound to threads of three fittings (5). Install three fittings (5) to fuel filter (8).
2. Install fuel filter (8) in fuel filter bracket (11) and tighten capscrew (7).
3. Install fuel filter bracket (11) on body (12) with two capscrews (3) and lockwashers (4). Tighten capscrews (3) to 15 lb-ft (20 N·m).
4. Connect drain hose (10) to fuel filter (8) and tighten clamp (9) to 10-20 lb-in. (1-2 N·m).
5. Connect fuel inlet hose (1) and fuel outlet hose (13) to fuel filter (8) with two hose clamps (2). Tighten clamps (2) to 10-20 lb-in. (1-2 N·m).
3-32. FUEL FILTER MAINTENANCE (Cont’d)
c. Bleeding

NOTE
The bleeder tool described in 2, 3, and 5 is optional. The tool prevents fuel spilling on engine.

1. Install fuel pressure transducer (para. 4-26).
2. Remove fuel filter bleed screw (6) and install bleeder tool into the hole.
3. Place open end of bleeder tool hose in clean, clear container.
4. Disconnect lead 54A (14) from solenoid (15).

CAUTION
Do not operate starter continuously for more than 20 seconds, wait 10 to 15 seconds between periods of operation. Failure to do this will result in damage to the starter.

5. Crank engine and watch fuel. When air bubbles stop coming through the line, remove bleeder tool and replace bleed screw (6). Dispose of fuel in accordance with local SOP.
6. Tighten bleed screw (6) to 40-50 lb-in. (4-6 N·m).
7. Connect lead 54A (14) to fuel solenoid (15).

FOLLOW-ON TASKS: 
• Start engine (TM 9-2320-280-10) and check for fuel leaks.
• Lower and secure hood (TM 9-2320-280-10)
• Install engine access cover (para. 10-15).
3-33. FUEL FILTER ELEMENT MAINTENANCE

This task covers:

a. Element Removal
b. Cleaning and Inspection
c. Element Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)

**Materials/Parts**
- Filter element kit
  (Appendix G, Item 33)

**Manual References**
- TM 9-2320-280-24P

---

**WARNING**

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**CAUTION**

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

---

**a. Element Removal**

1. Loosen two hose clamps (2), and disconnect fuel inlet hose (1) and fuel outlet hose (15) from fuel filter cover (3).
2. Loosen hose clamp (7) and disconnect fuel filter drain hose (8) from filter housing (6).
3. Remove capscrew (9), nut (11), and filter housing (6) from fuel filter bracket (10).
4. Remove three capscrews (4) washers (5) and cover (3) from filter housing (6).
5. Remove O-ring seal (14) from filter housing (6). Discard O-ring seal (14).
6. Remove filter element (12) and separator (13) from filter housing (6).

---

**b. Cleaning and Inspection**

**WARNING**

Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

1. Use drycleaning solvent to clean all metallic parts.
2. Inspect filter housing (6) and cover (3) for distortion or damage. Replace if damaged.
3. Inspect separator (13) for dirt, contamination, or damage. Replace if dirty, contaminated, or damaged.
3-33. FUEL FILTER ELEMENT MAINTENANCE (Cont’d)

c. Element Installation

1. Install filter element (12) into filter housing (6).
2. Install separator (13) on filter element (12).
3. Install O-ring seal (14) into filter housing (6).
4. Install cover (3) on filter housing (6) with three washers (5) and capscrews (4). Tighten capscrews (4) to 50-60 lb-in. (6-7 N·m).
5. Install filter housing (6) in fuel filter bracket (10) with capscrew (9) and nut (11).
6. Connect fuel filter drain hose (8) to filter housing (6) and tighten clamp (7) to 10-20 lb-in. (1-2 N·m).
7. Connect fuel inlet hose (1) and fuel outlet hose (15) to fuel filter cover (3) and tighten clamps (2) to 10-20 lb-in. (1-2 N·m).

FOLLOW-ON TASK: Bleed fuel filter (para. 3-32).
3-34. FUEL FILTER DRAIN HOSE AND VALVE REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: One mechanic automotive (Appendix B, Item 1)

**Personnel Required**
- One mechanic
- One assistant

**Materials/Parts**
- Locknut (Appendix G, Item 58)

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**WARNING**
Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**CAUTION**
Cover or plug all open hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
- For fuel filter drain valve replacement, perform steps 5 and 6 only.
- Have drainage container ready to catch fuel.

1. Loosen clamp (2) and disconnect fuel filter drain hose (8) from fuel filter assembly (1).
2. Loosen clamp (7) and disconnect drain hose (8) from fuel filter drain valve (6).
3. Remove locknut (5), capscrew (11), clamp (4) and drain hose (8) from cowl panel (3). Discard locknut (5).
4. Remove capscrew (10), drain hose (8) and clamp (9) from panel (3).
5. Remove nut (13) and fuel filter drain valve (6) from bracket (12).

**b. Installation**

For fuel filter drain valve replacement, perform steps 5 and 6 only.

1. Install drain hose (8) and clamp (4) to cowl panel (3) with capscrew (11) and locknut (5).
2. Install clamp (9) and drain hose (8) to panel (3) with capscrew (10).
3. Connect drain hose (8) to fuel filter drain valve (6) with clamp (7).
4. Connect drain hose (8) to fuel filter assembly (1) with clamp (2).
5. Install fuel filter drain valve (6) to bracket (12) with nut (13).
FOLLOW-ON TASKS: • Start engine (TM 9-2320-280-10) and check for oil leaks.
• Lower and secure hood (TM 9-2320-280-10)
3-35. FUEL INJECTION PUMP RETURN HOSE CHECK VALVE MAINTENANCE

This task covers:

a. Removal  
b. Cleaning and Inspection  
c. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:    
automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-10  
TM 9-2320-280-24P

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)  
- Air horn removed (para. 3-14).

**General Safety Instructions**
- Do not perform this procedure near fire, flames, or sparks.  
- Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa).

---

**WARNING**
Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**CAUTION**
Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**a. Removal**

1. Loosen clamp (2) and disconnect hose (1) from injection pump check valve (3).
2. Remove check valve (3) from injection pump (4).

---

**WARNING**
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc).

**b. Cleaning and Inspection**

Examine the lower end of the check valve (3) where the ball seats for evidence of debris. If debris is present, blow compressed air through the check valve. Replace check valve (3) if debris remains or if check valve (3) fails to function properly.

**c. Installation**

1. Install check valve (3) on injection pump (4).
2. Connect hose (1) on check valve (3) with clamp (2).
3-35. FUEL INJECTION PUMP RETURN HOSE CHECK VALVE MAINTENANCE (Cont’d)

FOLLOW-ON TASKS:  
- Install air horn assembly (para. 3-14).
- Lower and secure hood (TM 9-2320-280-10)
3-36. FUEL INJECTION RETURN HOSES REPLACEMENT

This task covers:

a. Fuel Drain Back Hose Removal
b. Fuel Drain Back Hose Installation
c. Tube to Nozzle Hose Removal
d. Tube to Nozzle Hose Installation
e. Nozzle to Nozzle Hose Removal
f. Nozzle to Nozzle Hose Installation
g. Nozzle Cap Removal
h. Nozzle Cap Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: Engine access cover removed (para. 10-15).
- Automotive (Appendix B, Item 1) Air horn removed (para. 3-14).

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Engine access cover removed (para. 10-15).
- Air horn removed (para. 3-14).

**General Safety Instructions**
- Do not perform this procedure near fire, flames, or sparks.

---

**WARNING**

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**CAUTION**

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

Have drainage container ready to catch fuel.

---

**a. Fuel Drain Back Hose Removal**

1. Loosen two clamps (2) and remove hose (3) from injection pump (4) and fuel drain back tube (1).
2. Remove two clamps (2) from hose (3).

---

**b. Fuel Drain Back Hose Installation**

1. Install two clamps (2) to hose (3).
2. Connect hose (3) to injection pump (4) and fuel drain back tube (1) with two clamps (2).

---

**c. Tube to Nozzle Hose Removal**

1. Loosen two clamps (5) and remove hose (6) from nozzle (7) and fuel drain back tube (1).
2. Remove two clamps (5) from hose (6).

---

**d. Tube to Nozzle Hose Installation**

1. Install two clamps (5) to hose (6).
2. Connect hose (6) to nozzle (7) and fuel drain back tube (1) with two clamps (5).
3-36. FUEL INJECTION RETURN HOSES REPLACEMENT (Cont’d)

e. Nozzle to Nozzle Hose Removal

1. Loosen two clamps (5) and disconnect hose (6) from two nozzles (4).
2. Remove two clamps (5) from hose (6).

f. Nozzle to Nozzle Hose Installation

1. Install two clamps (5) to hose (6).
2. Connect hose (6) to two nozzles (4) with two clamps (5).

g. Nozzle Cap Removal

Loosen clamp (2) and remove cap (1) from rear nozzle nipple (3).

h. Nozzle Cap Installation

Install cap (1) on rear nozzle nipple (3) with clamp (2).
FOLLOW-ON TASKS:  
- Install air horn (para. 3-14).  
- Install engine access cover (para. 10-15).  
- Start engine ([TM 9-2320-280-10]) and check for fuel leaks.
3-37. FUEL DRAIN BACK TUBE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Equipment Condition**

Air horn removed (para. 3-14).

**General Safety Instructions**

Do not perform this procedure near fire, flames, or sparks.

**Tools**

General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**

Lockwasher (Appendix G, Item 109)

**Manual References**

TM 9-2320-280-10  
TM 9-2320-280-24P

---

**WARNING**

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

**CAUTION**

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to reconnection.

---

**a. Removal**

1. Remove nut (17), lockwasher (18), and engine wiring harness clamp (15) from stud (19). Discard lockwasher (18).
2. Remove stud (19) fuel drain back tube (5), clamp (20) fuel supply line (14), and clamp (16) from cylinder head (23).
3. Loosen two clamps (10) and disconnect two hoses (11) from fuel drain back tube (5).
4. Loosen clamp (22) and disconnect fuel return hose (21) from fuel drain back tube (5).
5. Loosen clamp (4) and disconnect fuel drain back hose (3) from fuel drain back tube (5).
6. Remove nut (7), washer (8), clamp (9), and fuel drain back tube (5) from valve cover stud (6).
7. Remove capscrew (1), washer (24), and clamp (12) from front engine cover (13).
8. Remove drain back tube (5).

**b. Installation**

1. Position fuel drain back tube (5) in front of injection pump (2).
2. Connect fuel return hose (21) to fuel drain back tube (5) with clamp (22).
3. Connect two hoses (11) to fuel drain back tube (5) with two clamps (10).
4. Connect fuel drain back hose (3) to fuel drain back tube (5) with clamp (4).
5. Install fuel drain back tube (5) on valve cover stud (6) with clamp (9), washer (8), and nut (7). Tighten nut (7) to 13-20 lb-ft (18-27 N•m).
6. Install fuel drain back tube (5) on front engine cover (13) with clamp (12), washer (24), and capscrew (1). Tighten capscrew (1) to 40 lb-ft (54 N•m).
7. Install fuel supply line (14), clamp (16), fuel drain back tube (5), and clamp (20) on cylinder head (23) with stud (19).
8. Install wiring harness clamp (15) on stud (19) with lockwasher (18) and nut (17).
FOLLOW-ON TASKS:

- Install air horn (para. 3-14).
- Start engine (TM 9-2320-280-10) and check for fuel leaks.
3-38. GLOW PLUG REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

**Special Tools**
- Socket, 3/8 in. (Appendix B, Item 155)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

---

### a. Removal

1. Disconnect electrical lead 575 (3) from glow plug (2).

**NOTE**

If glow plug is damaged or broken, notify unit commander.

*Damaged or broken glow plugs are removed at DS maintenance.*

2. Remove glow plug (2) from cylinder head (1).

---

### b. Installation

**NOTE**

HMMWV glow plugs have bullet-shaped tips, not flat tips.

1. Install glow plug (2) in cylinder head (1). Tighten glow plug (2) to 8-12 lb-ft (11-16 N·m).

2. Connect electrical lead 575 (3) to glow plug (2).

---

**FOLLOW-ON TASKS:**
- Connect battery ground cable (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10)
3-39. RIGHT FUEL INJECTION LINES BRACKET REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Engine access cover removed (para. 10-15).
- Air horn removed (para. 3-14).

**Manual References**
TM 9-2320-280-24P

---

**a. Removal**

1. Remove two screw-assembled washers (6), clamps (5), and clamp (7) from bracket (1).
2. Remove two clamps (5) and inspect for cracks or breaks. Replace if defective.
3. Remove two nuts (3), washers (2), and bracket (1) from valve cover studs (4).

**b. Installation**

1. Install bracket (1) to valve cover studs (4) with two washers (2) and nuts (3). Tighten nuts (3) to 13-20 lb-ft (18-27 N•m).
2. Install two clamps (5) and clamp (7) to bracket (1) with two screw-assembled washers (6). Tighten screw-assembled washers (6) to 3-4 lb-ft (4-5 N•m).

FOLLOW-ON TASKS:
- Install air horn (para. 3-14).
- Install engine access cover (para. 10-15).
3-40. LEFT FUEL INJECTION LINES BRACKET REPLACEMENT

This task covers:

   a. Removal
   b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Hood raised and secured (TM 9-2320-280-10).
- Automotive (Appendix B, Item 1) Engine access cover removed (para. 10-15).

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)
- Engine access cover removed (para. 10-15).

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

### a. Removal

1. Remove screw-assembled washer (2) and clamp (1) from bracket (5).
2. Remove screw-assembled washer (8) and clamp (9) from bracket (5).
3. Remove two screw-assembled washers (3) and oil dipstick tube (4) from bracket (5).
4. Remove two nuts (6), washers (7) and bracket (5) from valve cover studs (10).

### b. Installation

1. Install bracket (5) to valve cover studs (10) with two washers (7) and nuts (6). Tighten nuts (6) to 13-20 lb-ft (18-27 N·m).
2. Secure oil dipstick tube (4) to bracket (5) with two screw-assembled washers (3). Tighten screw-assembled washers (3) to 3-4 lb-ft (4-5 N·m).
3. Install clamp (9) to bracket (5) with screw-assembled washer (8). Tighten screw-assembled washer (8) to 3-4 lb-ft (4-5 N·m).
4. Install clamp (1) to bracket (5) with screw-assembled washer (2). Tighten screw-assembled washer (2) to 3-4 lb-ft (4-5 N·m).

FOLLOW-ON TASKS:   Install engine access cover (para. 10-15).
- Lower and secure hood [TM 9-2320-280-10].
### 3-41. ACCELERATOR SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-42</td>
<td>Accelerator Linkage Maintenance</td>
<td>3-78</td>
</tr>
<tr>
<td>3-43</td>
<td>Accelerator Pedal Replacement</td>
<td>3-82</td>
</tr>
<tr>
<td>3-44</td>
<td>Engine Idle Speed Adjustment</td>
<td>3-83</td>
</tr>
<tr>
<td>3-45</td>
<td>Hand Throttle Control Cable and Bracket Replacement</td>
<td>3-84</td>
</tr>
</tbody>
</table>
3-42. ACCELERATOR LINKAGE MAINTENANCE

This task covers:

a. Removal  c. Installation
b. Inspection  d. Adjustment

INITIAL SETUP:

<table>
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<tr>
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<th>Personnel Required</th>
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<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
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<td>One assistant</td>
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<thead>
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<th>Materials/Parts</th>
<th>Manual References</th>
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<tbody>
<tr>
<td>Four locknuts (Appendix G, Item 58)</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td>Cotter pin (Appendix G, Item 16)</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>Nut and lockwasher assembly (Appendix G, Item 144)</td>
<td></td>
</tr>
<tr>
<td>Lubricating oil, seasonal grade of OE (Appendix C, Item 32)</td>
<td></td>
</tr>
</tbody>
</table>

Equipment Condition

- Hood raised and secured (TM 9-2320-280-10)
- Engine access cover removed (para. 10-15)

a. Removal

1. Remove cotter pin (15) and washer (16) and disconnect accelerator cable clevis (18) from accelerator pedal rod (14). Discard cotter pin (15).
2. Remove hitch pin (1) and washer (2) and disconnect hand throttle clevis (3) from accelerator pedal rod (14).
3. Remove nut and lockwasher assembly (19) and harness clamp (21) from lower capscrew (25). Discard nut and lockwasher assembly (19).
4. Remove three locknuts (22), washers (23), capscrews (25), washers (23) and accelerator rod retainers (24) from cowl (20). Discard locknuts (22).

**NOTE**

Bushing halvea may detach from accelerator pedal rod during removal.

5. Pull accelerator pedal rod (14) forward through gasket (5) in cowl (20) and remove accelerator pedal rod (14).
6. Remove accelerator rod retainers (24) and bushing halves (4) from accelerator pedal rod (14).
7. Remove gasket (5) from cowl (20).
8. Remove locknut (11), washer (12), capscrew (17), and accelerator cable clevis (18) from body bracket (13). Discard locknut (11).
9. Remove nut (10), capscrew (7), and clamps (6) and (9) from A-beam (8).
10. Loosen two nuts (27) and disconnect accelerator cable (28) from engine bracket (31).
11. Disconnect throttle return spring (29) from engine bracket (31).
12. Remove accelerator cable clip (26) and accelerator cable (28) from injection pump throttle shaft (30).
3-42. ACCELERATOR LINKAGE MAINTENANCE (Cont’d)

b. Inspection

Inspect throttle return spring (29) for damage. Replace if defective.
3-42. ACCELERATOR LINKAGE MAINTENANCE (Cont’d)

c. Installation

1. Connect accelerator cable (3) to injection pump throttle shaft (6).
2. Position throttle shaft lever (5) to full throttle position and install accelerator cable (3) with accelerator cable clip (1) to injection pump throttle shaft (6).
3. Connect throttle return spring (4) to engine bracket (7).
4. Install cable assembly (3) to engine bracket (7) and tighten two nuts (2).
5. Install clamp (17) to cable assembly (3) and install clamps (14) and (17) to “A” beam (16) with cap screw (15) and nut (18).
6. Install accelerator cable clevis (26) to body bracket (21) with cap screw (25), washer (20), and nut (19).
7. Position gasket (13) to cowl (28).
8. Lubricate accelerator bushing halves (12) and accelerator pedal rod (22) at accelerator rod retainer (32) with lubricating oil.
9. Position accelerator rod retainers (32) and bushing halves (12) onto accelerator pedal rod (22) ensuring retainers (32) are properly seated over bushing halves (12).
10. Install accelerator rod retainers (32), accelerator pedal rod (22), and gasket (13) to cowl (28) with three capscrews (33), washers (31), washers (31), and lock nuts (30). Install clamp (29) to bottom capscrew (33) with nut and lock washer assembly (27).
11. Connect hand throttle clevis (11) to accelerator pedal rod (22) with washer (10) and hitch pin (9).
12. Connect accelerator cable clevis (26) to accelerator pedal rod (22) with washer (24) and cotter pin (23).

d. Adjustment

1. Loosen accelerator cable nuts (2) on engine bracket (7).
2. Fully depress accelerator pedal.
3. Hold throttle shaft lever (5) in full throttle position.
4. Adjust accelerator cable nuts (2) up or down so cable end (8) holds throttle shaft lever (5) in full throttle position.
5. Tighten nuts (2) securing accelerator cable (3) to engine bracket (7).
6. Release accelerator pedal and ensure throttle shaft lever (5) returns all the way to idle position.
FOLLOW-ON TASKS:
- Install engine access cover (para. 10-15).
- Lower and secure hood (TM 9-2320-280-10).
- Start engine (TM 9-2320-280-10) and check for proper accelerator operation.
3-43. ACCELERATOR PEDAL REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Cotter pin (Appendix G, Item 16)

---

**a. Removal**

Remove cotter pin (5), washer (6), and pin (3) from accelerator rod (1), and remove accelerator pedal (4) and spring (2). Discard cotter pin (5).

**b. Installation**

Install accelerator pedal (4) and spring (2) on accelerator rod (1) with pin (3), washer (6), and cotter pin (5).

---

FOLLOW-ON TASK: Start engine (TM 9-2320-280-10) and check for proper accelerator operation.
3-44. ENGINE IDLE SPEED ADJUSTMENT

This task covers:

Engine Idle Speed Adjustment

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Test Equipment**
- STE/ICE-R

**Manual References**
- TM 9-2320-280-10

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)

**General Safety Instructions**
- Keep hands and arms away from fan blade and drivebelts while engine is running.

---

**Engine Idle Speed Adjustment**

1. Start engine (TM 9-2320-280-10) and bring engine to operating temperature.
2. Note idle speed and disconnect lead 569D (2) from injection pump (4). If change in idle sped noted, refer to para. 2-22, Fuel System Tests. If no change in idle speed is noted, connect lead 569D (2) to injection pump (4) and proceed to step 3.

**WARNING**

Keep hands and arms away from fan blade and drivebelts while engine is running or serious injury may result.

3. Set engine idle speed to 650 rpm (± 25 rpm) for the 6.2L engine or 750 rpm (± 25 rpm) for the 6.5L engine by turning idle speed adjusting screw (1) on throttle shaft lever (3).

**FOLLOW-ON TASK:** Lower and secure hood (TM 9-2320-280-10).
3-45. HAND THROTTLE CONTROL CABLE AND BRACKET REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>One mechanic</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>One assistant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four locknuts (Appendix G, Item 58)</td>
</tr>
<tr>
<td>O-ring seal (Appendix G, Item 156)</td>
</tr>
<tr>
<td>Lockwasher (Appendix G, Item 120)</td>
</tr>
</tbody>
</table>

a. Removal

1. Remove four screws (6) and instrument cluster (7) from instrument panel (3) and pull instrument cluster (7) away to allow access to speedometer cable (4).
2. Loosen nut (5) and disconnect speedometer cable (4) from speedometer (1).
3. Remove hitch pin (19) and washer (18) and disconnect hand throttle clevis (16) from accelerator rod (17).
4. Remove locknut (8), washer (9), screw (10), washer (9), and hand throttle cable (11) from bracket (12). Discard locknut (8).
5. Remove two locknuts (13), washers (14), capscrews (20), washers (14), and bracket (12) from cowl (15). Discard locknuts (13).
6. Loosen nut (25) and hand throttle cable (11) from bracket (23).
7. Remove locknut (21), washer (28), capscrew (27), and washer (28) from bracket (23) and instrument panel (3). Discard locknut (21).
8. Remove nut (22), screw (24), and bracket (23) from instrument panel (3).
9. Remove setscrew (30) and handle (31) from hand throttle cable (11).
10. Remove nut (25), lockwasher (32), O-ring (33), and nut (26) from hand throttle cable (11). Discard O-ring (33) and lockwasher (32).
b. Installation

1. Install nut (26), O-ring (33), lockwasher (32), and nut (25) on hand throttle cable (11).
2. Install handle (31) on hand throttle cable (11) with setscrew (30).
3. Install bracket (23) on instrument panel (3) with screw (24) and nut (22). Do not tighten.
4. Align holes in bracket (23), instrument panel (3), and steering column bracket (29) with washer (28), capscrew (27), washer (28) and locknut (21).
5. Tighten screw (24) and nut (22).
6. Install hand throttle cable (11) on bracket (23) with nut (25).
7. Install bracket (12) on cowl (15) with two washers (14), capscrews (20), washers (14), and locknuts (13).
8. Install hand throttle cable (11) on bracket (12) with washer (9), screw (10), washer (9), and locknut (8).
9. Connect clevis (16) to accelerator rod (17) with washer (18) and hitch pin (19).
10. Connect speedometer cable (4) to speedometer (1), ensuring core (2) engages with square hole in speedometer (1), and tighten nut (5).
11. Install instrument cluster (7) in instrument panel (3) with four screws (6).
Section IV. EXHAUST SYSTEM MAINTENANCE

3-46. EXHAUST SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-47</td>
<td>Tailpipe Replacement</td>
<td>3-86</td>
</tr>
<tr>
<td>3-48</td>
<td>Muffler and Insulator Replacement (All models except “A2” vehicles)</td>
<td>3-88</td>
</tr>
<tr>
<td>3-49</td>
<td>Muffler and Catalytic Converter Replacement (“A2” vehicles only)</td>
<td>3-90</td>
</tr>
<tr>
<td>3-50</td>
<td>Crossover Pipe Replacement</td>
<td>3-92</td>
</tr>
<tr>
<td>3-51</td>
<td>Tailpipe Hanger Replacement</td>
<td>3-94</td>
</tr>
<tr>
<td>3-52</td>
<td>Tailpipe Insulator Replacement</td>
<td>3-95</td>
</tr>
<tr>
<td>3-53</td>
<td>Muffler Support Bracket Maintenance</td>
<td>3-96</td>
</tr>
<tr>
<td>3-54</td>
<td>Right Exhaust Manifold Rear Heat Shield Replacement</td>
<td>3-98</td>
</tr>
<tr>
<td>3-55</td>
<td>Right Exhaust Manifold Heat Shield Replacement</td>
<td>3-100</td>
</tr>
<tr>
<td>3-56</td>
<td>Left Exhaust Manifold Replacement</td>
<td>3-102</td>
</tr>
<tr>
<td>3-57</td>
<td>Right Exhaust Manifold Replacement</td>
<td>3-104</td>
</tr>
<tr>
<td>3-58</td>
<td>Muffler Hanger Replacement</td>
<td>3-106</td>
</tr>
</tbody>
</table>

3-47. TAILPIPE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-24P
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Gasket (Appendix G, Item 37)
- Three locknuts (Appendix G, Item 106)
- Two lockwashers (Appendix G, Item 108)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**General Safety Instructions**
- Do not touch hot exhaust system components with bare hands.

**WARNING**

Do not touch hot exhaust system components with bare hands. Severe injury will result.

**a. Removal**

1. Remove three locknuts (9), washers (6), capscrews (5), and washers (6) from tailpipe (1) and muffler (7). Discard locknuts (9).
2. Remove two nuts (3), lockwashers (4), and U-bolt (10) from tailpipe (1) and hanger (2). Discard lockwashers (4).
3. Remove tailpipe (1) and gasket (8) from muffler (7). Discard gasket (8).
3-47. TAILPIPE REPLACEMENT (Cont'd)

b. Installation

1. Install gasket (8) and tailpipe (1) on muffler (7) with three washers (6), capscrews (5), washers (6), and locknuts (9). Tighten locknuts (9) to 26 lb-ft (35 N·m).
2. Install tailpipe (1) on hanger (2) with U-bolt (10), two washers (4), and nuts (3).

FOLLOW-ON TASK: Start engine [TM 9-2320-280-10] and check for exhaust leaks.
3-48. MUFFLER AND INSULATOR REPLACEMENT (ALL MODELS EXCEPT "A2" VEHICLES)

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models

All except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References

TM 9-2320-280-24P

Equipment Condition

Tailpipe removed (para. 3-47).

General Safety Instructions

Do not touch hot exhaust system components with bare hands. Severe injury will result.

a. Removal

1. Remove three locknuts (10), washers (9), capscrews (12), and washers (9) from muffler (7) and crossover pipe (8). Discard locknuts (10).

2. Remove two nuts (16), lockwashers (15), and U-bolt (13) from muffler (7) and support bracket (14). Discard lockwashers (15).

3. Remove gasket (11) by pulling muffler (7) towards rear of vehicle. Discard gasket (11).

   NOTE

   It may be necessary to lower rear propeller shaft (para. 6-5) to gain access to locknuts on muffler hanger.

4. Remove four locknuts (3), washers (2), capscrews (6), and washers (2) securing insulator (4) and retaining plates (5) to muffler hanger (1) and remove muffler (7). Discard locknuts (3).

5. Remove two locknuts (17), washers (18), capscrews (20), washers (18), insulator (4), and retaining plate (19) from muffler (7). Discard locknuts (17).

b. Installation

1. Install insulator (4) and retaining plate (19) to muffler (7) with two washers (18), capscrews (20), washers (18), and locknuts (17). Tighten locknuts (17) to 10 lb-ft (14 N·m).

2. Install muffler (7), insulator (4), and retaining plates (5) to muffler hanger (1) with four washers (2), capscrews (6), washers (2), and locknuts (3).

3. Install muffler (7) on bracket (14) with U-bolt (13), two lockwashers (15), and nuts (16).

4. Install gasket (11) and muffler (7) on crossover pipe (8) with three washers (9), capscrews (12), washers (9), and locknuts (10). Tighten locknuts (10) to 26 lb-ft (35 N·m).
3-48. MUFFLER AND INSULATOR REPLACEMENT (Cont’d) (ALL MODELS EXCEPT "A2" VEHICLES)

FOLLOW-ON TASK: Install tailpipe (para. 3-47).

3-89
This task covers:

**a. Removal**

**b. Installation**

### INITIAL SETUP:

**Applicable Models**
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**
- General mechanic's tool kit: Tailpipe removed (para. 3-47).
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Nine locknuts (Appendix G, Item 106)
- Gasket (Appendix G, Item 37)
- Six lockwashers (Appendix G, Item 108)

### General Safety Instructions

**WARNING**

Do not touch hot exhaust system components with bare hands. Severe injury will result.

**CAUTION**

Support muffler and catalytic converter during replacement. Failure to do so may result in damage to equipment.

1. Remove two clamps (12) and heat shield (13) from crossover pipe (14).
2. Remove four nuts (7), two lockwashers (6), washers (5), and U-bolt (25) from heat shield (11), support bracket (24), and muffler (26). Discard lockwashers (6).
3. Loosen clamp (8) and remove heat shield (11) from catalytic converter (18).
4. Remove two nuts (10), lockwashers (6), washers (9), and heat shield (4) from muffler (26). Discard lockwashers (6).
5. Remove three locknuts (16), washers (15), capscrews (23), and washers (15) from catalytic converter (18) and crossover pipe (14). Discard locknuts (16).
6. Remove two nuts (21), lockwashers (20), and U-bolt (17) from catalytic converter (18) and support bracket (19). Discard lockwashers (20).
7. Remove gasket (22) by pulling catalytic converter (18) towards rear of vehicle. Discard gasket (22).

**NOTE**

It may be necessary to lower rear propeller shaft (para. 6-5) to gain access to locknuts on muffler hanger.

8. Remove four locknuts (2), washers (3), capscrews (27), washers (3), two retaining plates (28), and muffler (26) from muffler hanger (1). Discard locknuts (2).
9. Remove two locknuts (34), washers (31), capscrews (32), washers (31) insulator (29), retaining plate (33), and bracket (30) from muffler (26). Discard locknuts (34).

### Installation

1. Install bracket (30), insulator (29) and retaining plate (33) on muffler (26) with two washers (31), capscrews (32), washers (31), and locknuts (34). Tighten locknuts (34) to 10 lb-ft (14 N·m).
2. Install muffler (26) and two retaining plates (28) on muffler hanger (1) with four washers (3), capscrews (27), washers (3), and locknuts (2).
3. Install catalytic converter (18) on bracket (19) with U-bolt (17), two lockwashers (20), and nuts (21).
4. Install gasket (22) and catalytic converter (18) on crossover pipe (14) with three washers (15), capscrews (23), washers (15), and locknuts (16). Tighten locknuts (16) to 26 lb-ft (35 N·m).
5. Install heat shield (4) on muffler (26) with two washers (9), lockwashers (6), and nuts (10).
6. Install heat shield (11) on catalytic converter (18) with clamp (8).
7. Install heat shield (11) on bracket (24) and muffler (26) with U-bolt (25), two washers (5), lockwashers (6), and four nuts (7).
8. Install heat shield (13) on crossover pipe (14) with two clamps (12).

FOLLOW-ON TASK: Install tailpipe [para. 3-47].
3-50. CROSSOVER PIPE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit
- Automotive (Appendix B, Item 1)

**Equipment Condition**
- Engine access cover removed (para. 10-15).
- Right exhaust manifold rear heat shield removed (para. 3-54).

**Materials/Parts**
- Nine locknuts (Appendix G, Item 106)
- Two gaskets (Appendix G, Item 38)
- Gasket (Appendix G, Item 37)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**WARNING**
Do not touch hot exhaust system components with bare hands. Severe injury will result.

**a. Removal**

1. Remove three locknuts (1), washers (2), capscrews (4), washers (2), and crossover pipe (3) from right exhaust manifold (5). Discard locknuts (1).
2. Remove three locknuts (14), washers (13), capscrews (16), washers (13), and crossover pipe (3) from muffler (12). Discard locknuts (14).
3. Remove three locknuts (10), washers (8), capscrews (7), washers (8), and crossover pipe (3) from left exhaust manifold (9). Discard locknuts (10).
4. Remove and discard three gaskets (6), (11), and (15).

**b. Installation**

1. Install gasket (11) and crossover pipe (3) on left exhaust manifold (9) with three washers (8), capscrews (7), washers (8), and locknuts (10).
2. Install gasket (15) and crossover pipe (3) on muffler (12) with three washers (13), capscrew (16), washers (13), and locknuts (14).
3. Install gasket (6) and crossover pipe (3) on right exhaust manifold (5) with three washers (2), capscrews (4), washers (2), and locknuts (1).
4. Tighten locknuts (1), (10), and (14) to 26 lb-ft (35 N•m).
FOLLOW-ON TASKS:  
- Start engine (TM 9-2320-280-10) and check for exhaust leaks.  
- Install right exhaust manifold rear heat shield (para. 3-54).  
- Install engine access cover (para. 10-15).
3-51. TAILPIPE HANGER REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit:  
  automotive (Appendix B, Item 1)

**Materials/Parts**
- Six locknuts (Appendix G, Item 106)

**Manual References**
- TM 9-2320-280-24P

**General Safety Instructions**
- Do not touch hot exhaust system components with bare hands.

---

**a. Removal**

**WARNING**
- Do not touch hot exhaust system components with bare hands.  
  Severe injury will result.

1. Remove four locknuts (5), washers (4), capscrews (9), washers (4) two insulator reinforcement plates (10) and insulator (8) from tailpipe hanger (6). Discard locknuts (5).
2. Remove two locknuts (1), washers (2), capscrews (7), washers (2) and tailpipe hanger (6) from frame (3). Discard locknuts (1).

---

**b. Installation**

1. Install insulator (8) and insulator reinforcement plates (10) to tailpipe hanger (6) with four washers (4), capscrews (9), washers (4), and locknuts (5).
2. Install tailpipe hanger (6) to frame (3) with two washers (2), capscrews (7), washers (2), and locknuts (1). Tighten capscrews (7) to 26 lb-ft (35 N·m).
3-52. TAILPIPE INSULATOR REPLACEMENT

This task covers:

a. Removal  b. Installation

INITIAL SETUP:

Tools  
General mechanic's tool kit: 
automotive (Appendix B, Item 1)

Materials/Parts  
Four locknuts (Appendix G, Item 106)  
Two lockwashers (Appendix G, Item 108)

General Safety Instructions  
Do not touch hot exhaust system components with bare hands.

WARNING  
Do not touch hot exhaust system components with bare hands. Severe injury will result.

a. Removal

1. Remove four locknuts (5), washers (6), capscrews (9), washers (8) reinforcement plates (7) and insulator (11) from tailpipe hanger (4). Discard locknuts (5).

2. Remove two capscrews (3), lockwashers (2), reinforcement plate (1) and U-bolt clamp (10) from insulator (11). Discard lockwashers (2).

b. Installation

1. Install reinforcement plate (1) and U-bolt clamp (10) to insulator (11) with two lockwashers (2) and capscrews (3). Tighten capscrews (3) to 10 lb-ft (14 N·m).

2. Install insulator (11) and reinforcement plate (7) to tailpipe hanger (4) with four washers (8), capscrews (9), washers (6), and locknuts (5). Tighten locknuts (5) to 10 lb-ft (14 N·m).

FOLLOW-ON TASK: Install tailpipe (para. 3-47).
3-53. MUFFLER SUPPORT BRACKET MAINTENANCE

This task covers:

- a. Removal
- b. Disassemble
- c. Assembly
- d. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P
- automotive (Appendix B, Item 1)

**Materials/Parts**
- Four locknuts (Appendix G, Item 106)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Muffler and insulator removed (para. 3-48).
- Muffler and catalytic converter removed ("A2" vehicles only) (para. 3-49).

**NOTE**
- Hold bolt heads on transfer case secure to prevent changing torque or damaging transfer case seal.

Remove two locknuts (1), washers (2), and support bracket assembly (3) from transfer case (4). Discard locknuts (1).

**b. Disassembly**

1. Remove two locknuts (9), washers (8), capscrews (5), washers (6), mounting bracket (11), and washers (6) from support plate (10). Discard locknuts (9).
2. Remove two insulators (7) from mounting plate (11).

**c. Assembly**

1. Install two insulators (7) in mounting bracket (11).
2. Install two washers (6) between mounting bracket (11) and support plate (10) with two washers (6), capscrews (5), washers (8), and locknuts (9). Tighten locknuts (9) to 15 lb-ft (20 N·m).

**d. Installation**

- **NOTE**
  - Hold bolt heads on transfer case secure to prevent changing torque or damaging transfer case seal.

Install support bracket assembly (3) to transfer case (4) with two washers (2) and locknuts (1). Tighten locknuts (1) to 15 lb-ft (20 N·m).
FOLLOW-ON TASK:  
- Install muffler and catalytic converter ("A2" vehicles only) (para. 3-49).
- Install muffler and insulator (para. 3-48).
3-54. RIGHT EXHAUST MANIFOLD REAR HEAT SHIELD REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Engine access cover removed (para. 10-15).
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- LockWasher (Appendix G, Item 110)

**Manual References**
- TM 9-2320-280-24P

---

**WARNING**

Do not touch hot exhaust system components with bare hands.
Severe injury will result.

---

**a. Removal**

1. Remove nut (7), lockwasher (8), washer (3), capscrew (2), washer (3) and clamp (1) from rear heat shield (9) and transmission dipstick tube (4). Discard lockwasher (8).

2. Remove capscrew (6) and rear heat shield (9) from heat shield (5).

---

**b. Installation**

1. Install rear heat shield (9) on heat shield (5) with capscrew (6).

2. Install clamp (1) and rear heat shield (9) to transmission dipstick tube (4) with washer (3), capscrew (2), washer (3), lockwasher (8), and nut (7).
FOLLOW-ON TASK: Install engine access cover (para. 10-15).
3-55. RIGHT EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit: 
automotive (Appendix B, Item 1)

**Special Tools**
Hex-head driver, 8mm (Appendix B, Item 156)

**Materials/Parts**
Locknut (Appendix G, Item 58)

**Personnel Required**
One mechanic
One assistant

**Manual References**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM 9-2320-280-10</td>
<td></td>
</tr>
<tr>
<td>TM 9-2320-280-24P</td>
<td></td>
</tr>
</tbody>
</table>

**Equipment Condition**

- Right exhaust manifold rear heat shield removed (para. 3-54).
- Hood raised and secured (TM 9-2320-280-10).
- Engine access cover removed (para. 10-15).

**General Safety Instructions**

Do not touch hot exhaust system components with bare hands.

**WARNING**

Do not touch hot exhaust system components with bare hands. Severe injury will result.

**a. Removal**

1. Using hex-head driver, loosen three socket head screws (3) on heat shield (4), exhaust manifold (2), and cylinder head (1).
2. Remove locknut (7), washer (6), capscrew (5), washer (6) and heat shield (4) from crossover pipe (8) and exhaust manifold (2). Discard locknut (7).

**b. Installation**

1. Position heat shield (4) on exhaust manifold (2) and crossover pipe (8).
2. Using hex-head driver, secure heat shield (4) and exhaust manifold (2) to cylinder head (1) with three socket-head screws (3). Tighten socket-head screws (3) to 25-33 lb-ft (34-45 N·m).
3. Install heat shield (4) on exhaust manifold (2) and crossover pipe (8) with washer (6), capscrew (5), washer (6), and locknut (7). Tighten locknut (7) to 37 lb-ft (50 N·m).
3-55. RIGHT EXHAUST MANIFOLD HEAT SHIELD REPLACEMENT (Cont’d)

FOLLOW-ON TASK:
- Install right exhaust manifold rear heat shield (para. 3-54).
- Install engine access cover (para. 10-15).
- Start engine (TM 9-2320-280-10) and check for exhaust leaks.
- Lower and secure hood (TM 9-2320-280-10).
3-56. LEFT EXHAUST MANIFOLD REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
General mechanic's tool kit:
automotive (Appendix B, Item 1)

**Special Tools**
Hex-head driver, 8mm, (Appendix B, Item 156)

**Materials/Parts**
Gasket (Appendix G, Item 45)
Four locknuts (Appendix G, Item 106)
Gasket (Appendix G, Item 37)

**Manual References**
TM 9-2820-280-24P

**Equipment Condition**
- Engine access cover removed (para. 10-15).
- Oil-dipstick tube removed (para. 3-2).
- 60 ampere alternator removed (para. 4-2).
- 100 ampere alternator removed (para. 12-23 or 12-24).
- 200 ampere alternator removed (para. 4-109 or 4-110).

**General Safety Instructions**
- Do not touch hot exhaust system components with bare hands.
- Place used gaskets in a plastic, leakproof, sealed bag or container.

**WARNING**
Do not touch hot exhaust system components with bare hands.
Severe injury will result.

**a. Removal**

1. Remove three locknuts (8), washers (9), capscrews (11), and washers (9) from crossover pipe (7) and exhaust manifold (4). Discard locknuts (8).

**NOTE**
Some vehicles may have a socket-head screw in place of stud to secure alternator support bracket and exhaust manifold to cylinder head.

2. Remove locknut (14), washer (15) and alternator support bracket (1) from exhaust manifold (4) and stud (2). Discard locknut (14).

3. Remove stud (2) and washer (3) from exhaust manifold (4) and cylinder head (6).

4. Using hex-head driver, remove seven socket-head screws (12) and washers (13) from exhaust manifold (4) and cylinder head (6).

**WARNING**
- Vehicles with serial numbers USBL Eff. 1 through 118767 have manifold gaskets containing asbestos fibers. When performing manifold maintenance, place used gaskets in a plastic, leakproof, sealed bag or container and contact the local health and safety department for further disposal instructions.
- Failure to observe above warning may result in an environmental hazard.

5. Remove exhaust manifold (4) and gaskets (5) and (10). Discard gaskets (5) and (10).
3-56. LEFT EXHAUST MANIFOLD REPLACEMENT (Cont’d)

b. Installation

**NOTE**
Ensure replacement gaskets have a silver, shiny surface, not a dull, dark surface, which is characteristic of a gasket containing asbestos.

1. Install gasket (5) and exhaust manifold (4) on cylinder head (6) with seven washers (13), socket-head screws (12), washer (3), and stud (2).

2. Using hex-head driver, tighten seven socket-head screws (12) and stud (2) to 25-33 lb-ft (34-45 N·m).

3. Install alternator support bracket (1) on exhaust manifold (4) and stud (2) with washer (15) and locknut (14). Tighten locknut (14) to 31-39 lb-ft (42-53 N·m).

4. Install gasket (10) and crossover pipe (7) on exhaust manifold (4) with three washers (9), capscrews (11), washer; (9), and locknuts (8). Tighten locknuts (8) to 37 lb-ft (50 N·m).

FOLLOW-ON TASKS:

- Install 200 ampere alternator (para. 4-109 or 4-110).
- Install 100 ampere alternator (para. 12-23 or 12-24).
- Install 60 ampere alternator (para. 4-2).
- Install oil dipstick tube (para. 3-2).
- Install engine access cover (para. 10-15).
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:
automotive (Appendix B, Item 1)

**Special Tools**
Hex head driver, 8mm, (Appendix B, Item 156)

**Materials/Parts**
Gasket (Appendix G, Item 49)
Three locknuts (Appendix G, Item 106)
Gasket (Appendix G, Item 37)

**Manual References**
TM 9-2820-280-24P

---

**Equipment Condition**
- Air horn and elbow removed [para. 3-14].
- Right exhaust manifold heat shield removed [para. 3-55].

**General Safety Instructions**
- Do not touch hot exhaust system components with bare hands.
- Place used gaskets in a plastic, leakproof, sealed bag or container.

---

**WARNING**

Do not touch hot exhaust system components with bare hands.
Severe injury will result.

---

**a. Removal**

1. Remove three locknuts (10), washers (7), capscrews (6), and washers (7) from exhaust manifold (3) and crossover pipe (9). Discard locknuts (10).
2. Using hex head driver, remove eight socket-head screws (5) and washers (4) from exhaust manifold (3) and cylinder head (1).

**WARNING**
- Vehicles with serial numbers USBL Eff. 1 through 118767 have manifold gaskets containing asbestos fibers. When performing manifold maintenance, place used gaskets in a plastic, leakproof sealed bag or container and contact the local health and safety department for further disposal instructions.
- Failure to observe above warning may result in an environmental hazard.

3. Remove exhaust manifold (3) and gaskets (2) and (8). Discard gaskets (2) and (8).

---

**b. Installation**

**NOTE**
Ensure replacement gasket have a silver, shiny surface, not a dull, dark surface, which is characteristic of a gasket containing asbestos.

1. Install gasket (2) and exhaust manifold (3) to cylinder head (1) with eight socket-head screws (5) and washers (4). Tighten socket-head screws (5) to 25-33 lb-ft (34-45 N·m).
2. Install exhaust manifold (3) to crossover pipe (9) with gasket (8), three washers (7), capscrews (6), washers (7), and locknuts (10). Tighten locknuts (10) to 37 lb-ft (50 N·m).
FOLLOW-ON TASKS:

- Install air horn and elbow (para. 3-14).
- Install right exhaust manifold heat shield (para. 3-55).
3-58. MUFFLER HANGER REPLACEMENT

This task covers:

- **a. Removal**
- **b. Installation**

**INITIAL SETUP:**

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Muffler and insulator removed (para. 3-48).

**Materials/Parts**
- Three locknuts (Appendix G, Item 106)

### a. Removal

Remove three locknuts (4), washers (3), and muffler hanger (1) from frame rail (2) Discard locknuts (4).

### b. Installation

Install muffler hanger (1) to frame rail (2) with three washers (3) and locknuts (4). Tighten locknuts (4) to 75 lb-ft (102 N·m).

FOLLOW-ON TASK: Install muffler and insulator (para. 3-48).
### 3-59. COOLING SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-60</td>
<td>Cooling System Servicing</td>
<td>3-108</td>
</tr>
<tr>
<td>3-61</td>
<td>Radiator and Fan Shroud Assembly Maintenance</td>
<td>3-110</td>
</tr>
<tr>
<td>3-62</td>
<td>Airlift to Shroud Shield Assembly Replacement</td>
<td>3-116</td>
</tr>
<tr>
<td>3-63</td>
<td>Radiator Support Replacement</td>
<td>3-117</td>
</tr>
<tr>
<td>3-64</td>
<td>Surge Tank Replacement</td>
<td>3-118</td>
</tr>
<tr>
<td>3-65</td>
<td>Surge Tank-to-Radiator Vent Hose Replacement</td>
<td>3-119</td>
</tr>
<tr>
<td>3-66</td>
<td>Surge Tank-to-Water Crossover Vent Hose Replacement</td>
<td>3-120</td>
</tr>
<tr>
<td>3-67</td>
<td>Thermostat Bypass Hose Replacement</td>
<td>3-121</td>
</tr>
<tr>
<td>3-68</td>
<td>Fan Drive Hose and Quick-Disconnect Replacement</td>
<td>3-122</td>
</tr>
<tr>
<td>3-69</td>
<td>Radiator Inlet Hose Replacement</td>
<td>3-124</td>
</tr>
<tr>
<td>3-70</td>
<td>Radiator Lower Tube Assembly Replacement</td>
<td>3-125</td>
</tr>
<tr>
<td>3-71</td>
<td>Lower Radiator Hose Replacement</td>
<td>3-126</td>
</tr>
<tr>
<td>3-72</td>
<td>Water Pump Inlet Hose Replacement</td>
<td>3-127</td>
</tr>
<tr>
<td>3-73</td>
<td>Surge Tank-to-Lower Radiator Tube Hose Replacement</td>
<td>3-128</td>
</tr>
<tr>
<td>3-74</td>
<td>Surge Tank Overflow Hose Replacement</td>
<td>3-129</td>
</tr>
<tr>
<td>3-75</td>
<td>Thermostat Replacement</td>
<td>3-130</td>
</tr>
<tr>
<td>3-76</td>
<td>Water Pump Pulley Replacement</td>
<td>3-131</td>
</tr>
<tr>
<td>3-77</td>
<td>Water Crossover Maintenance</td>
<td>3-132</td>
</tr>
<tr>
<td>3-78</td>
<td>Fan Drive and Fan Blade Maintenance</td>
<td>3-134</td>
</tr>
<tr>
<td>3-79</td>
<td>Fan Drive Friction Lining Replacement</td>
<td>3-136</td>
</tr>
<tr>
<td>3-80</td>
<td>Power Steering Drivebelt Set Replacement</td>
<td>3-137</td>
</tr>
<tr>
<td>3-81</td>
<td>Alternator Drivebelt Set Replacement</td>
<td>3-138</td>
</tr>
<tr>
<td>3-82</td>
<td>Drivebelts Adjustment</td>
<td>3-140</td>
</tr>
<tr>
<td>3-83</td>
<td>Serpentine Drivebelt Replacement</td>
<td>3-142</td>
</tr>
<tr>
<td>3-84</td>
<td>Tensioner, Idler Pulleys, and Mounting Hardware Replacement</td>
<td>3-144</td>
</tr>
</tbody>
</table>
3-60. COOLING SYSTEM SERVICING

This task covers:

a. Depressurizing  c. Preventive Cleaning
b. Draining System  d. Filling System

INITIAL SETUP:

**Tools**
General mechanic’s tool kit: TM 9-2320-280-10
automotive (Appendix B, Item 1)

**Test Equipment**
Radiator tester (Appendix B, Item 66)

**Materials/Parts**
Antifreeze (Appendix C, Item 12)

**Manual References**
TM 9-2320-280-10
TM 9-2320-280-24P
TM 750-254
TB 750-651

**Equipment Condition**
Hood raised and secured (TM 9-2320-280-10)

**General Safety Instructions**
Do not remove surge tank filler cap before releasing internal pressure.

---

### a. Depressurizing

**WARNING**
Do not remove surge tank filler cap before depressurizing system when engine temperature is above 190°F (88°C). Steam or hot coolant under pressure will cause severe burns.

1. If engine is hot, remove surge tank filler cap (1) by placing a thick cloth over cap (1). Press down and turn counterclockwise to its first stop to release internal pressure.
2. After pressure has escaped, press down and turn cap (1) counterclockwise again and remove.

### b. Draining System

1. If engine is hot, repressurize system (see a. of this task).

**NOTE**
Have drainage container ready to catch coolant.

2. Open draincock (4) and allow system to drain.
3. Close draincock (4).

### c. Preventive Cleaning

1. For preventive cleaning, refer to TB 750-651.
2. Test surge tank filler cap (1), refer to TM 750-254.

### d. Filling System

**NOTE**
The cooling system for the vehicles covered in this manual has a 26 qt (25 l) capacity. Continue filling and allow air to escape. Ensure surge tank coolant level is 3/4 full before securing filler cap.

1. Ensure radiator draincock (4) is closed and heater control valve (3) is open (pull “TEMP” knob on dash to “MAX” position).
2. Fill system with proper antifreeze solution. See table 3-1 for preparation of antifreeze solutions.
3. Secure filler cap (1) to surge tank (2).
4. Run engine at fast idle (approximately 1500 rpm) until engine temperature reaches 190°F (88°C), opening thermostat to circulate coolant.
5. Depressurize system (see a. of this task).
6. Fill with proper antifreeze solution until surge tank (2) is 3/4 full. See Table 3-1 for preparation of antifreeze solutions.
7. Secure filler cap (1) to surge tank (2).
8. Run engine at fast idle (approximately 1500 rpm) until temperature reaches 190°F (88°C), opening thermostat, and stop engine.
9. Depressurize system (see task a. of this paragraph). Use tester to ensure proper coolant protection is provided.
10. Secure filler cap (1) to surge tank (2).

Table 3-1. Guide for Preparation of Antifreeze Solutions.

<table>
<thead>
<tr>
<th>ETHYLENE-GLYCOL INHIBITED MIL-A-46153</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOWEST EXPECTED AMBIENT TEMPERATURE</strong></td>
</tr>
<tr>
<td>°F</td>
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<tr>
<td>+20</td>
</tr>
<tr>
<td>+10</td>
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<td>-50</td>
</tr>
<tr>
<td>-55</td>
</tr>
<tr>
<td>Below -60</td>
</tr>
</tbody>
</table>

**CAUTION**
Freezing point of -90°F (-67.7°C). Issued ready for use and must not be mixed with any other liquid.

FOLLOW-ON TASKS:
• Start engine (TM 9-2320-280-10) and check cooling system for leaks.
• Lower and secure hood (TM 9-2320-280-10).
3-61. RADIATOR AND FAN SHROUD ASSEMBLY MAINTENANCE

This task covers:

a. Removal  
b. Cleaning and Inspection  
c. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit: TM 9-2320-280-10  
automotive (Appendix B, Item 1)

**Materials/Parts**
Seven locknuts (Appendix G, Item 106)  
Eight lockwashers (Appendix G, Item 110)  
Rivet (Appendix G, Item 179) (optional)  
Repair kit (Appendix C, Item 37) (optional)

**Personnel Required**
One mechanic  
One assistant

**Manual References**
TM 9-2320-280-10  
TM 9-2320-280-24P

**Equipment Condition**
- Hood removed (para. 10-5).  
- Cooling system drained (para. 3-60).  
- Oil cooler removed (para. 3-8).

**General Safety Instructions**
Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa).

**CAUTION**
Do not bend transmission oil cooler fins. Damaged fins reduce cooling efficiency, which may damage engine.

**a. Removal**

**NOTE**
The radiator and fan shroud are removed as a unit.

1. Loosen clamp (2) and disconnect radiator inlet hose (1) from radiator (3).
2. Loosen clamp (6) and disconnect surge tank-to-radiator vent hose (5) from adapter (7).
3. Loosen clamp (16) and disconnect control valve hose (15) from shroud bulkhead adapter (17).
   **NOTE**
   “A2” vehicles have a quick-disconnect on fan drive hose.
4. Disconnect fan drive hose (18) from fan drive (19).
5. Loosen clamp (10) and disconnect lower radiator front hose (11) from radiator (3).
6. Remove strap (4) securing fan shroud (33) to radiator (3).
7. Remove locknut (24), washer (25), capscrew (29), large washer (28), washer (25); and lower mount (26) from radiator (3) and frame bracket (27). Discard locknut (24).
8. Remove four locknuts (14), washers (13), and capscrews (12) from two rear support brackets (9) and airlift brackets (8). Discard locknuts (14).
9. Lift radiator (3) up and remove from vehicle.
10. Remove eight capscrews (30), lockwashers, (31), two retaining strips (32) and fan shroud (33) from radiator (3). Discard lockwashers (31).
11. Remove two locknuts (20), washers (21), large washers (22), insulators (23), and brackets (9) from radiator (3). Discard locknuts (20).
3-61. RADIATOR AND FAN SHROUD ASSEMBLY MAINTENANCE (Cont'd)

b. Cleaning and Inspection

**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc).

1. Remove dirt, trash, and insects embedded in radiator fins, using water and compressed air.
2. Inspect radiator adapter (19) for damage. Replace adapter (19) if damaged.
3. Inspect radiator (6) for breaks, punctures, cracks, and splits. Replace radiator (6) if broken, punctured, cracked, or split.
4. Inspect shroud bulkhead adapter (20) for damage. Replace bulkhead adapter (20) if damaged.

**NOTE**
For on vehicle fan shroud repair only, use repair kit listed in Appendix C.

5. Inspect fan shroud (16) for cracks, splits, and breaks. Repair fan shroud (16) if cracked, split, or broken. Replace fan shroud if damaged beyond repair.
6. Inspect fan drive hose (21) for cracks or damage. Replace if defective.

c. Installation

**CAUTION**
To ensure proper cooling of engine, upper edge of shroud must align with radiator top tank seam or damage to equipment may result.

1. Install fan shroud (16) to radiator (6) so fan shroud edge (17) aligns with tank seam (18) and secure with two retaining strips (15), eight washers (14), and capscrews (13). Tighten capscrews (13) to 6 lb-ft (8 N·m).
2. Install two support brackets (4) and insulators (5) to radiator (6) with two large washers (3), washers (2), and locknuts (1). Tighten locknuts (1) to 20 lb-ft (27 N·m).
3. Align radiator (6) to frame bracket (10), and align rear support brackets (4) to airlift brackets (22).
4. Install rear support brackets (4) to airlift brackets (22) with four capscrews (25), washers (24), and locknuts (23). Do not tighten locknuts (23).
5. Install radiator (6) and mount (9) on frame bracket (10) with large washer (11), washer (8), capscrew (12), washer (8), and locknut (7). Do not tighten capscrew (12).
3-61. RADIATOR AND FAN SHROUD ASSEMBLY MAINTENANCE (Cont’d)
3-61. RADIATOR AND FAN SHROUD ASSEMBLY MAINTENANCE (Cont’d)

NOTE
- Fan shroud should be aligned so the following dimensions are maintained. Adjustments may be made by sliding the radiator/shroud assembly. Distance “A” from the edge of shroud ring and rear edge of fan must be 1-1/2 ± 1/8 in. (38.1 ± 3 mm). Measure distance “A” at the 2, 4, 8, and 10 o’clock positions.
- Fan blade to fan shroud clearance, the distance between the top of the fan blade and fan shroud, must not be less than 1/4 in. (6 mm) at any position.

6. Tighten locknuts (12) to 26 lb-ft (35 N•m). Tighten capscrew (9) to 30 lb-ft (41N•m).

NOTE
To secure strap to shroud, use of rivet is optional.

7. Secure radiator (3) to shroud (13) with strap (5). Secure strap (5) to shroud (13) with rivet (4).
8. Connect lower radiator front hose (11) to radiator (3) with clamp (10).

NOTE
- “A2” vehicles have a quick-disconnect on fan drive hose.
- The fan drive hose may be modified to add the quick-disconnect. Refer to appendix D, Fig. D-94 for installation.

9. Connect fan drive hose (17) to fan drive (18).
10. Connect control valve hose (14) to bulkhead adapter (16) with clamp (15).

NOTE
For vehicles equipped with a 200 amp alternator, it is recommended that the inlet hose be installed with the hose twisted counterclockwise, and upward until a kink in the hose starts to form.

11. Connect radiator inlet hose (1) to radiator (3) with clamp (2).
12. Connect surge tank-to-radiator vent hose (6) to adapter (8) with clamp (7).
FOLLOW-ON TASKS:

- Fill cooling system (para. 3-60).
- Install oil cooler (para. 3-8).
- Start engine (TM 9-2320-280-10) and check cooling system for leaks.
- Install hood (para. 10-5).
- Bleed power steering system (para. 8-29).
3-62. AIRLIFT TO SHROUD SHIELD ASSEMBLY REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P
- automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Radiator and fan shroud removed (para. 3-61).

---

**a. Removal**

Remove three screws (3) and shield assembly (2) from airlift bracket (1).

**b. Installation**

Install shield assembly (2) on airlift bracket (1) with three screws (3).

---

FOLLOW-ON TASK: Install radiator and fan shroud (para. 3-61).
This task covers:
   a. Removal  
   b. Installation

**INITIAL SETUP:**

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-24P (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Left splash shield removed (para. 10-17).
- Right splash shield removed (para. 10-20).

**Materials/Parts**
- Three locknuts (Appendix G, Item 106)

---

**a. Removal**

1. Remove locknut (1), washer (2), large washer (3), radiator support (4), and insulator (5) from radiator (6). Discard locknut (1).
2. Remove two locknuts (10), washers (8), capscrews (7), and support (4) from airlift bracket (9). Discard locknuts (10).

**b. Installation**

1. Install support (4) on airlift bracket (9) with two capscrews (7), washers (8), and locknuts (10).
2. Install insulator (5) and support (4) on radiator (6) with large washer (3), washer (2), and locknut (1). Tighten locknut (1) to 26 lb-ft (35 N·m).
3. Tighten locknuts (10) to 26 lb-ft (35 N·m).

---

FOLLOW-ON TASKS:
- Install left splash shield (para. 10-17).
- Install right splash shield (para. 10-20).
3-64. SURGE TANK REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>TM 9-2320-280-20-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>Manual References</td>
</tr>
<tr>
<td>Equipment Condition</td>
<td></td>
</tr>
<tr>
<td>Cooling system drained as required (para. 3-60).</td>
<td></td>
</tr>
</tbody>
</table>

NOTE

- Tag hoses prior to disconnection.
- When current stocks of the four-quart surge tank (12340062) are exhausted, the four and one-half quart surge tank (12340061) will be provided in its place. When replacing the four-quart surge tank (12340062) with the four and one-half quart surge tank (12340061), the existing surge-tank-to-lower-radiator tube hose (12339163) can be used by cutting approximately four inches from surge tank end of hose.

a. Removal

1. Loosen clamp (3) and disconnect surge tank-to-radiator vent hose (6) from surge tank (2).
2. Loosen clamp (4) and disconnect surge tank-to-water crossover vent hose (5) from surge tank (2).
3. Loosen clamp (9) and disconnect surge tank-to-lower radiator hose (8) from surge tank (2).
4. Open two clamps (1) on surge tank (2) and bracket (10).
5. Disconnect surge tank overflow hose (7) and remove surge tank (2).

b. Installation

1. Install surge tank (2) on bracket (10) with two clamps (1).
2. Connect surge tank-to-lower radiator hose (8) to surge tank (2) with clamp (9).
3. Connect surge tank-to-water crossover vent hose (5) to surge tank (2) with clamp (4). Tighten clamp (4) to 10-20 lb-in. (1-2 N·m).
4. Connect surge tank-to-radiator vent hose (6) to surge tank (2) with clamp (3). Tighten clamp (3) to 10-20 lb-in. (1-2 N·m).
5. Connect surge tank overflow hose (7) to surge tank (2).

FOLLOW-ON TASK Fill cooling system (para. 3-60).
3-65. SURGE TANK-TO-RADIATOR VENT HOSE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**

- General mechanic's tool kit:
  - Cooling system depressurized (para. 3-60).

**Equipment Condition**

- Cooling system depressurized (para. 3-60).

**Manual References**

- TM 9-2320-280-24P

---

**a. Removal**

1. Loosen two clamps (2) and remove vent hose (3) from radiator (4) and surge tank (1).
2. Remove two clamps (2) from vent hose (3).

**b. Installation**

1. Install two clamps (2) on vent hose (3).
2. Install vent hose (3) on surge tank (1) and radiator (4) with two clamps (2). Tighten clamps to 10-20 lb-in. (1-2 N·m).

---

FOLLOW-ON TASK: Tighten coolant filler cap (para. 3-60).
3-66. SURGE TANK-TO-WATER CROSSOVER VENT HOSE REPLACEMENT

This task covers:
   a. Removal                          b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit: Cooling system depressurized (para. 3-60).
automotive (Appendix B, Item 1)

**Equipment Condition**
Cooling system depressurized (para. 3-60).

**Manual References**
TM 9-2320-280-24P

---

**a. Removal**
1. Loosen two clamps (2) and remove vent hose (3) from water crossover (4) and surge tank (1).
2. Remove two clamps (2) from vent hose (3).

**b. Installation**
1. Install two clamps (2) to vent hose (3).
2. Install vent hose (3) on surge tank (1) and water crossover (4) with two clamps (2). Tighten clamps to 10-20 lb in. (1-2 N·m).

FOLLOW-ON TASK: Tighten coolant filler cap (para. 3-60).
3-67. THERMOSTAT BYPASS HOSE REPLACEMENT

This task covers:
- a. Removal
- b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit:
- automotive (Appendix B, Item 1)

Equipment Condition
- Cooling system drained as required (para. 3-60).

Manual References
- TM 9-2320-280-24P

a. Removal

1. Loosen two clamps (2) and remove hose (3) from water pump (4) and water crossover (1).
2. Remove two clamps (2) from hose (3).

b. Installation

1. Install two clamps (2) on hose (3).
2. Install hose (3) on water pump (4) and water crossover (1) with two clamps (2).

FOLLOW-ON TASK: Fill cooling system (para. 3-60).
3-68. FAN DRIVE HOSE AND QUICK-DISCONNECT REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Personnel Required
One mechanic
One assistant

Tools
General mechanic's tool kit: TM 9-2320-280-24P

Equipment Condition
Hood raised and secured (TM 9-2320-280-10)

Material/Parts
Sealing compound (Appendix C, Item 44)

a. Removal

NOTE
Have container ready to catch fluid.

1. Loosen clamp (10) and remove control valve hose (9) from bulkhead adapter (5).
2. Remove bulkhead adapter (5) from bulkhead adapter bushing (8).
3. Remove nut (6), washer (7), bulkhead adapter bushing (8) and bulkhead adapter (11) from shroud (4).
4. Release fan drive hose quick-disconnect (2) and remove hose (1) from fan drive (3).
5. Remove bulkhead adapter bushing (8) from bulkhead adapter (11).
6. Remove bulkhead adapter (11) from fan drive hose (1).
7. Remove female end of quick-disconnect (2) from fan drive hose (1).
8. Remove male end of quick-disconnect (12) from fan drive (3).

b. Installation

NOTE
Apply sealing compound to all pipe threads during installation.

1. Install male end of quick-disconnect (12) on fan drive (3).
2. Install female end of quick-disconnect (2) on fan drive hose (1).
3. Install bulkhead adapter (11) on fan drive hose (1)
4. Install bulkhead adapter bushing (8) on bulkhead adapter (11).
5. Install bulkhead adapter (11) and bulkhead adapter bushing (8) on shroud (4) with washer (7) and nut (6).
6. Install hose (1) and fan drive hose quick-disconnect (2) on fan drive (3).
7. Install bulkhead adapter (5) on bulkhead adapter bushing (8).
8. Install control valve hose (9) on bulkhead adapter (5) with clamp (10).
FOLLOW-ON TASK: Lower and secure hood (TM 9-2320-280-10).
3-69. RADIATOR INLET HOSE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:
- automotive (Appendix B, Item 1

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
Cooling system depressurized (para. 3-60).

---

### a. Removal

1. Loosen two clamps (2) and remove hose (3) from radiator (1) and water crossover (4).
2. Remove two clamps (2) from hose (3).

### b. Installation

1. Install two clamps (2) to hose (3).

   **NOTE**
   For vehicles equipped with a 200 amp alternator, it is recommended that the inlet hose be installed with the hose twisted counterclockwise and upward until a kink in the hose starts to form.

2. Install hose (3) on water crossover (4) and radiator (1) with two clamps (2).

---

FOLLOW-ON TASK: Tighten coolant filler cap (para. 3-60).

---

3-124
3-70. RADIATOR LOWER TUBE ASSEMBLY REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Tools
- General mechanic’s tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

Manual References
- TM 9-2320-280-24P

Equipment Condition
- Cooling system drained (para. 3-60).

Materials/Parts
- Two locknuts (Appendix G, Item 58)
- Tape (Appendix C, Item 50)

a. Removal

1. Remove draincock (11) from radiator lower tube assembly (10).
2. Remove two locknuts (5), washers (3), capscrews (2), and washers (3) from radiator lower tube assembly (10) and frame bracket (4). Discard locknuts (5).
3. Loosen clamp (7) and disconnect water pump inlet hose (6) from radiator lower tube assembly (10).
4. Loosen clamp (8) and disconnect surge tank to lower radiator hose (9) from radiator lower tube assembly (10).
5. Loosen clamp (12) and disconnect lower radiator hose (1) from radiator lower tube assembly (10).
6. Remove radiator lower tube assembly (10).

b. Installation

1. Install radiator lower tube assembly (10) on frame bracket (4) with two washers (3), capscrews (2), washers (3), and locknuts (5). Tighten locknuts (5) to 6 lb-ft (8 N·m).
2. Connect lower radiator hose (6) to radiator lower tube assembly (10) with clamp (7).
3. Connect surge tank to lower radiator hose (9) to radiator lower tube assembly (10) with clamp (8).
4. Connect water pump inlet hose (1) to radiator lower tube assembly (10) with clamp (12).
5. Apply sealant type tape to threads of draincock (11) and install draincock (11) on radiator lower tube assembly (10).

FOLLOW-ON TASK: Fill cooling system (para. 3-60).

3-125
## 3-71. LOWER RADIATOR HOSE REPLACEMENT

This task covers:

- **a. Removal**
- **b. Installation**

### INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>Cooling system drained (para. 3-60).</td>
</tr>
</tbody>
</table>

**Manual References**

TM 9-2320-280-24P

### a. Removal

1. Loosen two clamps (2) and remove lower radiator hose (3) from radiator (1) and lower tube assembly (4).
2. Remove two clamps (2) from hose (3).

### b. Installation

1. Install two clamps (2) to hose (3).
2. Install lower radiator hose (3) on lower tube assembly (4) and radiator (1) with two clamps (2).

**FOLLOW-ON TASK:** Fill cooling system (para. 3-60).
3-72. WATER PUMP INLET HOSE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Cooling system drained (para. 3-60).
- Automotive (Appendix B, Item 1)

**Equipment Condition**
- Cooling system drained (para. 3-60).

**Manual References**
- TM 9-2320-280-24P

---

**a. Removal**

1. Loosen two clamps (2) and remove water pump inlet hose (3) from water pump (1) and lower tube assembly (4).
2. Remove two clamps (2) from hose (3).

**b. Installation**

1. Install two clamps (2) to hose (3).
2. Install water pump inlet hose (3) on lower tube assembly (4) and water pump (1) with two clamps (2).

---

FOLLOW-ON TASK: Fill cooling system (para. 3-60).
3-73. SURGE TANK-TO-LOWER RADIATOR TUBE HOSE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: Cooling system drained (para. 3-60).

**Equipment Condition**
- Automotives (Appendix B, Item 1)
- Cooling system drained (para. 3-60).

**Manual References**
- TM 9-2320-280-24P

**NOTE**

If the vehicle is equipped with surge tank (12340061) and surge tank-to-lower-radiator tube hose (12339163) is received, cut approximately four inches from surge tank end of hose prior to installation.

**a. Removal**

1. Loosen two clamps (2) and remove hose (3) from surge tank (1) and tube assembly (4).
2. Remove two clamps (2) from hose (3).

1. Install two clamps (2) on hose (3).
2. Install hose (3) on surge tank (1) and tube assembly (4) with two clamps (2).

**FOLLOW-ON TASK:** Fill cooling system (para. 3-60).
3-74. SURGE TANK OVERFLOW HOSE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Hood raised and secured (TM 9-2320-280-10)
- Automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**

**a. Removal**

1. Remove overflow hose (2) from surge tank filler neck (1).
2. Loosen clamp (3) and remove hose (2) from body (4).

**b. Installation**

1. Connect hose (2) to surge tank filler neck (1).
2. Install hose (2) on body (4) with clamp (3).

FOLLOW-ON TASK: Lower and secure hood (TM 9-2320-280-10)
3-75. THERMOSTAT REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**

General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

**Manual References**

Equipment Condition

Cooling system drained as required (para. 3-60).

**Materials/Parts**

Gasket (Appendix G, Item 42)

Sealing compound (Appendix C, Item 44)

**a. Removal**

1. Remove capscrew (5), stud (4), thermostat housing (3), thermostat (2), and gasket (6) from water crossover (1). Discard gasket (6).

2. Clean gasket surface on water crossover (1) and thermostat housing (3).

**b. Installation**

1. Install thermostat (2) into water crossover (1) ensuring valve sensor (7) points toward crossover (1).

2. Position gasket (6) on thermostat housing (3). Apply sealing compound to fastener threads and insert capscrew (5) and stud (4) to align gasket (6).

3. Install thermostat housing (3) over thermostat (2) on water crossover (1) with capscrew (5) and stud (4). Tighten capscrew (5) and stud (4) to align gasket (6).

FOLLOW-ON TASK: Fill cooling system (para. 3-60).
3-76. WATER PUMP PULLEY REPLACEMENT

This task covers:

a. Removal  

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

**Special Tools**
- Hex head driver, 6 mm  
  (Appendix B, Item 157)

**Materials/Parts**
- Sealing compound (Appendix C, Item 44)

### a. Removal

Remove four socket-head screws (1) and water pump pulley (2) from water pump (3).

### b. Installation

1. Apply sealing compound to four socket-head screws (1).
2. Install water pump pulley (2) on water pump (3) with four socket-head screws (1). Tighten Socket-head screws (1) to 15-20 lb-ft (20-27 N·m).

**FOLLOW-ON TASKS:**
- Install serpentine belt (“A2” vehicles) [para. 3-83].
- Install fan drive and fan blade [para. 3-78].
- Install power steering drivebelt set [para. 3-80].
This task covers:

a. Removal
b. Inspection
c. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit: TM 9-2320-280-24P, automotive (Appendix B, Item 1)

Materials/Parts
Two gaskets (Appendix G, Item 42)

Manual References
TM 9-2320-280-24P

Equipment Condition
- Cooling system drained (para. 3-60).
- Fan temperature switch removed (para. 4-30).
- Glow plug controller removed (para. 4-29).
- Thermostat removed (para. 3-75).

a. Removal

1. Loosen three clamps (2) and disconnect hoses (1) from water crossover (4).
2. Remove four capscrews (6) from water crossover (4) and cylinder head (8).
3. Remove water crossover (4) and two gaskets (7). Discard gaskets (7).
4. Clean gasket surface on water crossover (4) and cylinder head (8).

b. Inspection

Inspect thermostat by-pass nipple (3), surge tank hose nipple (5) and water pump hose adapter (9) for cracks or breaks. Replace if defective.

c. Installation

1. Install two gaskets (7) and water crossover (4) on cylinder head (8).
2. Secure water crossover (4) to cylinder head (8) with four capscrews (6). Tighten capscrews (6) to 25-35 lb-ft (34-50 N•m).
3. Connect three hoses (1) to water crossover (4) with clamps (2).
FOLLOW-ON TASKS:

- Install thermostat [para. 3-75].
- Install glow plug controller [para. 4-29].
- Install fan temperature switch [para. 4-30].
- Fill cooling system [para. 3-60].
3-78. FAN DRIVE AND FAN BLADE MAINTENANCE

This task covers:

a. Removal  
b. Inspection  
c. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Four lockwashers (Appendix G, Item 108)
- Automotive (Appendix B, Item 1)
- Sealing compound (Appendix C, Item 45)

**Special Tools**
- Hex head driver, 8 mm (Appendix B, Item 156)

**Materials/Parts**
- Four lockwashers (Appendix G, Item 108)
- Sealing compound (Appendix C, Item 45)

**Manual References**
- TM 9-2320-280-20-24P

**Equipment Condition**
- Radiator and shroud removed [(para. 3-61)]

### a. Removal

**NOTE**
- Mark position of fan blade for installation.
- It may be necessary to apply compressed air to clutch adapter. This disengages fan drive clutch to allow access to socket head screws.
- The fan drive hose may be modified to add a quick-disconnect at commander's discretion. Refer to appendix D, Fig. D-94 for installation.

1. Using hex head driver, remove four socket-head screws (1) and fan drive assembly (3) from water pump pulley (2).
2. Remove four nuts (5), lockwashers (6) and fan blade (7) from fan drive (8). Discard lockwashers (6).

### b. Inspection

Inspect clutch adapter (4) and fan blade (7) for damaged threads, cracks, bent blades, or breaks. Replace if defective.

### c. Installation

1. Align fan blade (7) onto fan drive (8) with four lockwashers (6) and nuts (5). Tighten nuts to 26 lb-ft (35 N•m).
2. Apply sealing compound to four socket-head screws (1) and install fan drive assembly (3) to water pump (2). Tighten socket-head screws (1) to 45 lb-ft (61 N•m).
FOLLOW-ON TASK: Install radiator and shroud (para. 3-61).
3-79. FAN DRIVE FRICTION LINING REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
General mechanic’s tool kit:
automotive (Appendix B, Item 1

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Disconnect battery ground cable (para. 4-73).

---

**WARNING**
Prior to loosening screws on fan drive retaining plates, disconnect fan drive hose from fan drive. Failure to do so may result in injury to personnel or damage to equipment.

**NOTE**
- It may be necessary to apply compressed air to clutch adapter. This disengages fan drive clutch to allow access to friction lining screws.
- The fan drive hose may be modified to add the quick-disconnect. Refer to Appendix D, Fig. D-94 for installation.

1. Remove six screws (1) and three retaining plates (2) from fan drive (3).
2. Remove friction lining (4) from fan drive (3).

---

**b. Installation**

1. Install friction lining (4) on fan drive (3).
2. Install three retaining plates (2) on fan drive (3) with six screws (1). Tighten screws 1) to 22 lb-in. (2.5 N·m).

---

FOLLOW ON TASK: Connect battery ground cable (para. 4-73).

---

3-136
3-80. POWER STEERING DRIVEBELT SET REPLACEMENT

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

**Applicable Models**
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Alternator drivebelts removed (para. 3-81).

**NOTE**
Replace power steering drivebelts in matched sets only.

**a. Removal**

1. Loosen three capscrews (6) from power steering pump mounting bracket (7) and support brackets.
2. Push power steering pump (1) towards engine and remove drivebelts (4) from power steering pump pulley (2), water pump pulley (5) and crankshaft pulley (3).

**b. Installation**

Feed belt set (4) into grooves on crankshaft pulley (3), water pump pulley (5), and power steering pump pulley (2).

FOLLOW-ON TASK: Install alternator drivebelts (para. 3-81).
3-81. ALTERNATOR DRIVEBELT SET REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
[TM 9-2320-280-10]
[TM 9-2320-280-24P]

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Equipment Condition
- Hood raised and secured (TM 9-2320-280-10)
- Battery ground cable disconnected (para. 4-73)

NOTE
Replace alternator drivebelts in matched sets only,

a. Removal

1. Loosen two capscrews (8) securing alternator (2) to bottom mounting bracket (9).
2. Loosen adjusting bracket capscrew (1) and push alternator (2) toward engine

NOTE
Some vehicles have a quick-disconnect on fan drive hose.

3. Disconnect fan drive hose assembly (11) from fan drive assembly (10).
4. Remove belt set (5) from power steering pump pulley (4), alternator pulley (3), water pump pulley (7), and crankshaft pulley (6).

b. Installation

1. Feed belt set (5) into grooves on crankshaft pulley (6), water pump pulley (7), alternator pulley (3), and power steering pump pulley (4).

NOTE
Some vehicles have a quick-disconnect on fan drive hose.

2. Connect fan drive hose assembly (11) to fan drive assembly (10).
3-81. ALTERNATOR DRIVEBELT SET REPLACEMENT (Cont'd)

FOLLOW-ON TASK: Adjust drivebelts (para. 3-82).
3-82. DRIVEBELTS ADJUSTMENT

This task covers:

a. Power Steering Belt Adjustment  
b. Alternator Belt Adjustment

INITIAL SETUP:

Applicable Models:
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Special Tools
Belt tension gauge (Appendix B, Item 67)

Materials/Parts
Locknut (Appendix G, Item 58)

Personnel Required
One mechanic  
One assistant

Manual References
TM 9-2320-280-10  
TM 9-2320-280-24P

Equipment Condition
Hood raised and secured (TM 9-2320-280-10).  
Battery ground cable disconnected (para. 4-73).

NOTE
Prior to making any belt adjustments, check belt tension with belt tension gage. Drivebelt adjustment should only be done if belt tension is below 70 lbs (32 kg). Check alternator belts from above engine; power steering belts from under vehicle. Adjusting power steering belts can affect alternator belt tension. Always check alternator belt tension after adjusting power steering belts. To adjust air-conditioning belt, refer to para. 11-202.

a. Power Steering Belt Adjustment

1. Remove locknut (5), washer (6), capscrew (2), spacer (4), and two clamps (3) from return and control valve hoses (7) and (8) and alternator bracket (1). Discard locknut (5).
2. Loosen three capscrews (15) from power steering pump bracket (16) and support brackets.
   CAUTION
   Do not pry against power steering pump housing with pry bar when adjusting belt tension. Pump could be damaged.
   NOTE
   There are two square holes in the power steering pump bracket, one in front, accessible from above; and one in back, accessible from under the vehicle. Either can be used to adjust belt tension.
3. Adjust power steering belt set (9) using 1/2-inch breaker bar in square hole of power steering bracket (16). Apply force until belt set (9) appears tight and tighten capscrews (15).
4. Using belt tension gauge, check each belt individually for proper tension, refer to Table 3-2, Belt Tension Requirements.
5. If belt set (9) tension is correct, tighten three capscrews (15) on power steering pump bracket (16) to 40 lb-ft (54 N-m). If not, repeat steps 2 through 5. If tension cannot be properly adjusted, replace belt set (9) (para. 3-81).
6. Install return and control valve hoses (7) and (8) to alternator bracket (1) with spacer (4), two clamps (3), capscrew (2), washer (6), and locknut (5). Tighten locknut (5) to 8 lb-ft (11 N-m).

b. Alternator Belt Adjustment

1. Loosen three capscrews (11) from alternator (13) and alternator bracket (14).
2. Adjust alternator belt set (10) by inserting 1/2-inch drive ratchet and extension in square hole (12). Turn until belt set (10) appears tight, and tighten three capscrews (11) securing alternator (13).

3. Using belt tension gauge, check each belt of belt set (10) individually for proper tension. Refer to [table 3-2] Belt Tension Requirements.

4. If belt set (10) tension is correct, tighten three capscrews (11) to 40 lb-ft (54 N.m). If not, repeat steps 2 through 4. If tension cannot be properly adjusted, replace belt set (10) [(para. 3-80)].

**Table 3-2. Belt Tension Requirements**

<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>NEW BELT</th>
<th>USED BELT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All belts</td>
<td>105 ± 5 lbs (467 ± 22 N)</td>
<td>90 ± 5 lbs (400 ± 22 N)</td>
</tr>
</tbody>
</table>

**NOTE**

A used belt is one that has been run at least 15 min. or 15 mi. (24 km.). Tension variance of not more than 20 lbs (90 N) between belts of the same set is acceptable.

**FOLLOW-ON TASKS:**
- Connect battery ground cable [(para. 4-73)]
- Lower and secure hood [(TM 9-2320-280-10)]

---

**BELT TENSION GAUGE**
3-83. SERPENTINE DRIVEBELT REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**

| M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2 |

**Personnel Required**

| One mechanic |
| One assistant |

**Tools**

| General mechanic’s tool kit: automotive (Appendix B, Item 1) |
| Breaker bar, 3/8 in. (Appendix B, Item 2) |
| Breaker bar, 1/2 in. (Appendix B, Item 2) |

**Manual References**

| TM 9-2320-280-10 |

**Equipment Condition**

| Hood raised and secured (TM 9-2320-280-10) |

---

### a. Removal

1. Position 3/8 inch breaker bar on belt tensioner (9) and move tensioner (9) clockwise to loosen belt (11).
2. Remove belt (11) from power steering pump pulley (5), alternator pulley (3), water pump pulley (6), crankshaft pulley (7), air conditioning compressor or idler pulley (10), two upper idler pulleys (1), and tensioner pulley (8). Release belt tensioner (9).

### b. Installation

**NOTE**

- If belt was missing from vehicle, perform steps 1 through 4. If belt was removed from vehicle, perform steps 2 and 3.
- Mark location of capscrew on bracket for installation if performing step 1.

1. Loosen capscrew (2) and push alternator (4) towards engine.
2. Position 3/8 inch breaker bar on belt tensioner (9) and move tensioner (9) clockwise to allow installation of belt (11).
3. Feed belt (11) into grooves on crankshaft pulley (7), air conditioning compressor or idler pulley (10), alternator pulley (3), power steering pump pulley (5), two upper idler pulleys (1), water pump pulley (6), and tensioner pulley (8). Release belt tensioner (9).
4. Using 1/2-inch breaker bar in square hole, pull alternator (4) back to original position and tighten capscrew (2).
3-83. SERPENTINE DRIVEBELT REPLACEMENT (Cont'd)

FOLLOW-ON TASK: Lower and secure hood (TM 9-2320-280-10)
3-84. TENSIONER, IDLER PULLEYS, AND MOUNTING HARDWARE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2  
M1045A2, M1097A2

Materials/Parts
Two lockwashers (Appendix G, Item 140.1)  
Three lockwashers (Appendix G, Item 140.2)

Tools
General mechanic's tool kit:  
automotive (Appendix B, Item 1)

Equipment Condition
- Fan drive and fan blade removed (para. 3-78)  
- Serpentine drivebelt removed (para. 3-83)

a. Removal

1. Remove capscrew (10) and tensioner (9) from mounting bracket (5).

   NOTE
   On M997A2 vehicles equipped with A/C, the compressor pulley is in place of the lower idler pulley.

2. Remove two nuts (4), lockwashers (3), capscrews (1), and idler pulleys (2) from mounting bracket (5). Discard lockwashers (3).

3. Remove three capscrews (8), lockwashers (7), and mounting bracket (5) from water pump (6). Discard lockwashers (7).

b. Installation

1. Install mounting bracket (5) on water pump (6) with three lockwashers (7) and capscrews (8).

   NOTE
   On M997A2 vehicles equipped with A/C, the compressor pulley is in place of the lower idler pulley.

2. Install two idler pulleys (2) on mounting bracket (5) with two capscrews (1), lockwashers (3), and nuts (4).

3. Install tensioner (9) on mounting bracket (5) with capscrew (10).
FOLLOW-ON TASKS:  • Install serpentine drivebelt (para. 3-83).
• Install fan drive and fan blade (para. 3-78).
# CHAPTER 4
## ELECTRICAL SYSTEM MAINTENANCE

### Section I. GENERATING AND PROTECTIVE CONTROL BOX SYSTEM MAINTENANCE

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-2</td>
<td>60 Ampere Alternator Maintenance</td>
<td>4-2</td>
</tr>
<tr>
<td>4-3</td>
<td>Alternator Pulley Replacement</td>
<td>4-8</td>
</tr>
<tr>
<td>4-4</td>
<td>Alternator Mounting Brackets Replacement</td>
<td>4-10</td>
</tr>
<tr>
<td>4-5</td>
<td>Protective Control Box Replacement</td>
<td>4-12</td>
</tr>
</tbody>
</table>
4-2. 60 AMPERE ALTERNATOR MAINTENANCE

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)
- Special Tools: Hex head driver, 3/16 in. (Appendix B, Item 163)

**Materials/Parts**
- Ten lockwashers (Appendix G, Item 116)
- Sealing compound (Appendix C, Item 44)
- Adhesive sealant (Appendix C, Item 3)

**Personnel Required**
- One mechanic
- One assistant

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

**General Safety Instructions**
- Alternator must be supported during removal and installation.

**NOTE**

Prior to removal, tag leads for installation.

**a. Removal**

**NOTE**

In some cases, a thru-bolt and nut may be present on mounting bracket instead of standard capscrews and washers.

1. Loosen capscrew (1) on alternator adjusting bracket (2) and two capscrews (18) on alternator mounting bracket (21) and support bracket (19).
2. Remove two drivebelts (3) from alternator pulley (4).
3. Remove two screws (8), lockwashers (9), wire retaining strap (10), spacer (11), and washer (12) from alternator (20). Discard lockwashers (9).
4. Remove two screws (5) and lockwashers (6) from terminal cover (7). Discard lockwashers (6).
5. Pry cover (7) away from waterproofing adhesive and remove cover (7).
6. Remove waterproofing adhesive around terminals (22).
7. Disconnect lead 568A (17) at engine wiring harness (16).
8. Remove capscrew (14) and lockwasher (15) and disconnect ground 3B (13) from alternator (20). Discard lockwasher (15).
4-2. 60 AMPERE ALTERNATOR MAINTENANCE (Cont'd)

9. Remove nut (4), lockwasher (3), and washer (2) and disconnect lead 5A (1) from alternator (9). Discard lockwasher (3).

10. Remove nut (5), lockwasher (6), and washer (7) and disconnect lead 2A (8) from alternator (9). Discard lockwasher (6).

**WARNING**
Alternator must be supported during removal and installation. Failure to support alternator may cause injury to personnel or damage to equipment.

11. Remove capscrew (13), lockwasher (12), and washer (11) from alternator (9) and adjusting bracket (10). Discard lockwasher (12).

**NOTE**
Perform step 13 for vehicles with new alternator support bracket configuration.

12. Remove two capscrews (14), lockwashers (15), and washers (16) from alternator (9), support bracket (17) and mounting bracket (18). Discard lockwashers (15).

13. Remove two capscrews (14), lockwashers (15), washer (16), spacer (21), power steering lines bracket (20), and support bracket (17) from mounting bracket (18). Discard lockwashers (15).

14. Remove alternator (9).

15. Remove alternator pulley (19). (para. 4-3).

**b. Installation**

1. Install alternator pulley (19). (para. 4-3).

**NOTE**
- Perform step 3 for vehicles with new alternator support bracket configuration.
- In some cases, a thru-bolt and nut may be present on mounting bracket instead of standard capscrews and washers.

2. Position alternator (9) on mounting bracket (18) with support bracket (17) between mounting bracket (18) and alternator (9) and install two washers (16), lockwashers (15), and capscrews (14).

3. Position alternator (9) on mounting bracket (18) with support bracket (17) and power steering lines bracket (20) on the outside of alternator mounting flange (19) and install spacer (21), washer (16), two lockwashers (15), and capscrews (14).

4. Align alternator (9) with adjusting bracket (10) and install washer (11), lockwasher (12), and capscrew (13).

**NOTE**
Ensure terminals are clean before connections are made.

5. Connect lead 2A (8) on alternator (9) with washer (7), lockwasher (6), and nut (5). Tighten nut (5) to 20-25 lb-in. (2-3 N•m).

6. Connect lead 5A (1) on alternator (9) with washer (2), lockwasher (3), and nut (4). Tighten nut (4) to 45-55 lb-in. (5-6 N•m).
4-2. 60 AMPERE ALTERNATOR MAINTENANCE (Cont’d)
4-2. 60 AMPERE Alternator MAINTENANCE (Cont’d)

7. Connect ground 3B (13) to alternator (17) with lockwasher (3) and capscrew (4). Tighten capscrew (4) to 82-102 lb-in. (9-12 N·m).
8. Connect lead 568A (16) to engine wiring harness (15).
9. Install washer (12) spacer (11) and wire retainer strap (10) to alternator (17) with two lockwashers (9) and screws (8). Tighten screws (8) to 30-35 lb-in. (3-4 N·m).
10. Install two drivebelts (1) to alternator pulley (2).
11. Adjust drivebelts (1) (para. 3-82).
12. Connect battery ground cable (para. 4-73).
13. Check alternator (17) for correct output voltage adjustment (para. 4-2.c).

**c. Adjustment**

NOTE

Battery ground cable must be removed (para. 4-73). Remove terminal cover. Connect battery ground cable (para. 4-73).

1. Using hex head driver, remove pipe plug (14).
2. Start engine (TM 9-2320-280-10).
3. Raise engine speed above idle.
4. Put a load on the alternator by operating driving lights (TM 9-2320-280-10).
5. Using a multimeter, check alternator (17) output voltage. Connect black test lead to ground lead 3B (13). Connect red test lead to lead 5A (18). Output voltage should be 28 volts ± volts. If adjustment is required, go to next step. If no adjustment is required, go to step 7.
6. Turn adjusting screw (19) counterclockwise to increase voltage or clockwise to decrease voltage.
7. Turn off driving lights (TM 9-2320-280-10).
8. Return engine to idle.
10. Apply sealing compound to pipe plug (14) threads. Using hex head driver, install pipe plug (14) and tighten to 30-40 lb-in. (3-4 N·m).
11. Remove ground cable (para. 4-73).
12. Seal terminal connections using adhesive sealant.
13. Install terminal cover (7) to alternator (17) and secure with two lockwashers (5) and screws (6).
FOLLOW-ON TASKS:  • Connect battery ground cable (para. 4-73).
   • Lower and secure hood (TM 9-2320-280-10)
4-3. ALTERNATOR PULLEY REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P
- Automotive (Appendix B, Item 1)
- Mechanical puller (Appendix B, Item 167)
- Vise inserts (Appendix B, Item 170)

**Materials/Parts**
- Locknut (Appendix G, Item 59)
- Woodruff key (Appendix G, Item 245)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- 60 amp alternator removed (para. 4-2)
- 100 amp alternator removed (para. 12-23 or 12-24)
- 200 amp alternator removed (para. 4-108 or 4-110)

**NOTE**
The removal and installation procedure for 60 amp, 100 amp, and 200 amp pulleys are identical.

**a. Removal**

1. Clamp alternator pulley (2) in a soft-jawed vise.
2. Remove locknut (4) and washer (3) from alternator shaft (6). Discard locknut (4).
3. Remove alternator (1) and pulley (2) from soft-jawed vise.
4. Using a mechanical puller, remove pulley (2) and woodruff key (5) from alternator (1). Discard woodruff key (5).

**b. Installation**

1. Position woodruff key (5) in alternator shaft (6) with flat side up.
2. Align pulley keyway (7) with woodruff key (5) in alternator shaft (6) and tap pulley (2) onto shaft (6).
3. Install washer (3) and locknut (4) on shaft (6). Tighten locknut (4) finger tight.
4. Clamp pulley (2) in soft-jawed vise.

**NOTE**
For 200 amp alternators (12338796-1), tighten locknut to 115-125 lb-ft (156-169 N·m).

5. Tighten locknut (4) to 95 ± 5 lb-ft (129 ± 7 N·m).
6. Remove pulley (2) and alternator (1) from vise.
4-3. ALTERNATOR PULLEY REPLACEMENT (Cont'd)

FOLLOW-ON TASKS:
- Install 60 amp alternator [para. 4-2].
- Install 100 amp alternator (para. 12-23 or 12-24).
- Install 200 amp alternator (para. 4-105 or 4-110).
4-4. ALTERNATOR MOUNTING BRACKETS REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Tools

- General mechanic's tool kit: TM 9-2320-280-24P
- Automotive (Appendix B, Item 1)

Equipment Condition

- 60 ampere alternator removed (para. 4-2).
- 100 ampere alternator removed (para. 12-23 or 12-24).
- 200 ampere alternator removed (para. 4-109 or 4-110).

Materials/Parts

- Four lockwashers (Appendix G, Item 108)
- Two capscrews (Appendix G, Item 9)
- Bolt (Appendix G, Item 5)

a. Removal

1. Remove capscrew (4), lockwasher (5), washer (6), and alternator adjusting bracket (7) from alternator mounting bracket (9). Discard lockwasher (5).

2. Remove flanged head bolt (1) and lockwasher (2) from power steering bracket (3), alternator mounting bracket (9) and engine (21). Discard lockwasher (2) and bolt (1).

3. Remove capscrew (12), lockwasher (11), and washer (10) from alternator mounting bracket (9) and power steering bracket (3). Discard lockwasher (11).

4. Remove capscrew (25), lockwasher (24), washer (23), and swing power steering pump (22) down. Discard lockwasher (24).

5. Remove two flanged head capscrews (8) and alternator mounting bracket (9) from engine (21). Discard capscrews (8).

NOTE

Perform steps 8 and 9 for vehicles with new alternator support bracket configuration.

6. Remove nut (20), washer (19), capscrew (13), spacer (17), and clamps (18) from support bracket (14).

7. Remove socket head screw (16), washer (15), and support bracket (14) from engine (21).

8. Remove nut (20), two washers (19), capscrew (13), power steering lines bracket (17), and harness clamp (26) from clamps (18).

9. Remove nut (16), washer (15), and support bracket (14) from engine (21).

b. Installation

NOTE

Perform steps 3 and 4 for vehicles with new alternator support bracket configuration.

1. Install support bracket (14) on engine (21) with washer (15) and socket head screw (16). Tighten socket head screw (16) to 25-33 lb-ft (34-45 N·m).

2. Install spacer (17) and clamps (18) on support bracket (14) with capscrew (13), washer (19), and nut (20).

3. Install support bracket (14) on engine with washer (15) and nut (16). Tighten nut to 35 lb-ft (47 N·m).

4. Install power steering lines bracket (17) and harness clamp (26) on clamps (18) with capscrew (13), two washers (19), and nut (20).
4-4. ALTERNATOR MOUNTING BRACKETS REPLACEMENT (Cont'd)

5. Install alternator mounting bracket (9) on engine (21) with two flanged head capscrews (8). Tighten capscrews (8) to 48 lb-ft (65 N·m).

6. Install power steering bracket (3) on alternator mounting bracket (9) with washer (10), lockwasher (11), and capscrew (12). Tighten capscrew (12) finger tight.

7. Secure power steering bracket (3) on alternator mounting bracket (9) and engine (21) with lockwasher (2) and flanged head bolt (1). Tighten bolt (1) to 48 lb-ft (65 N·m).

8. Install alternator adjusting bracket (7) on alternator mounting bracket (9) with washer (6), lockwasher (5), and capscrew (4).

9. Install washer (23), lockwasher (24), and capscrew (25) in power steering bracket (3). Tighten capscrew (25) finger tight.

FOLLOW-ON TASKS: • Install alternator, 60 ampere (para. 4-2).
• Install alternator, 100 ampere (para. 12-23 or 12-24).
• Install alternator, 200 ampere [para. 4-109 or 4-110].
# 4-5. PROTECTIVE CONTROL BOX REPLACEMENT

This task covers:

a. Removal

b. Installation

## INITIAL SETUP:

<table>
<thead>
<tr>
<th><strong>Tools</strong></th>
<th><strong>Manual References</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td></td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Materials/Parts</strong></th>
<th><strong>Equipment Condition</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Four nut and lockwasher assemblies (Appendix G, Item 144)</td>
<td>• Battery ground cable disconnected (para. 4-73).</td>
</tr>
<tr>
<td>Silicone compound (Appendix C, Item 48)</td>
<td>• Hood raised and secured (TM 9-2320-280-10).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Personnel Required</strong></th>
<th><strong>Personnel Required</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>One mechanic</td>
<td></td>
</tr>
<tr>
<td>One assistant</td>
<td></td>
</tr>
</tbody>
</table>

## CAUTION

The control box must be supported from inside the vehicle during removal and installation. Damage to protective control box may result.

### a. Removal

1. From inside the vehicle, disconnect body wiring harness cannon plug (3) from control box (5).
2. Working under hood, disconnect engine wiring harness cannon plug (6) from control box (5).
3. Remove four nut and lockwasher assemblies (1) and control box (5) from cowl (2). Discard nut and lockwasher assemblies (1).

### b. Installation

1. Position control box (5) under instrument panel (4) against cowl (2).
2. From under hood, install control box (5) on cowl (2) with four nut and lockwasher assemblies (1). Tighten nut and lockwasher assemblies (1) to 6 lb-ft (8 N•m).
3. Fill cannon plug (6) and control box connection (5) to capacity with silicone.
4. Connect engine wiring harness cannon plug (6) to control box (5).
5. From inside vehicle, connect body wiring harness cannon plug (3) to control box (5).
4-5. PROTECTIVE CONTROL BOX REPLACEMENT (Cont'd)

FOLLOW-ON TASKS:  
- Lower and secure hood (TM 9-280-10).  
- Connect battery ground cable (para. 4-73).
4-5.1 DISTRIBUTION BOX REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIAL SETUP:</td>
<td>Manual References</td>
</tr>
<tr>
<td>Tools</td>
<td>[TM 9-2320-280-10]</td>
</tr>
<tr>
<td>General Mechanic’s tool kit</td>
<td>TM 9-2320-280-20-2</td>
</tr>
<tr>
<td>1¼ inch hole saw</td>
<td></td>
</tr>
<tr>
<td>Drill motor</td>
<td></td>
</tr>
<tr>
<td>Materials/Parts</td>
<td>Equipment Condition</td>
</tr>
<tr>
<td>Distribution Box 6110-01-446-7125</td>
<td>- Battery ground cable disconnected (para. 4-73)</td>
</tr>
<tr>
<td>Personnel Required</td>
<td>- Hood raised and secured (TM 9-2320-280-10)</td>
</tr>
<tr>
<td>One mechanic</td>
<td>- Protective control box removed (para. 4-5)</td>
</tr>
<tr>
<td>One assistant</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION

- Basic and A1 model HMMWV’s equipped with 100 amp alternator must have the enclosed change to the wiring harness applied prior to installation of the distribution box. Failure to do this will result in damage to the distribution box.
- The distribution box must be supported from inside the vehicle during removal and installation. Damage to distribution box may result.

a. Removal

1. From inside the vehicle, disconnect body wiring harness cannon plug (3) from distribution box (5).
2. From under hood disconnect engine wiring harness cannon plug (7) and glow plug wiring harness cannon plug (8) from distribution box (5).
3. Remove four bolts (1) and lockwashers (6) and distribution box (5) from cowl (2). Discard lockwashers (6).

b. Installation

NOTE

- Perform step one for vehicles serial number 0 through 44161.
- Perform steps two and three only if vehicle has not been previously equipped with a distribution box.

1. Remove cowl insulation (11), than locate and remove two rivets securing front insulation retainer (9). Discard insulation and retainer.
2. Using the supplied template (10) locate mark and drill the 1½ in. hole in vehicle left cowl (2).
3. Disconnect the glow plug harness leads at the glow plugs and secure them out of harms way.
4. Position distribution box (5) under instrument panel (4) against cowl (2).
5. From under hood, install distribution box (5) on cowl (2) with four bolts (1) lockwashers (6). Tighten bolts to 6 lb-ft (8N•m).
6. Connect engine wiring harness cannon plug (7) to distribution box (5).
7. Connect glow plug wiring harness cannon plug (8) to distribution box (5). Route the four long glow plug harness leads along the fire wall and connect them to the four glow plugs on the right side of the engine. Route the four short glow plug harness leads to the left side of the engine and connect them to the glow plugs.
4-5.1 DISTRIBUTION BOX REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:  
- Lower and secure hod [TM 9-2320-280-10]  
- Connect battery ground cable [para. 4-73]
Section. STARTER AND STARTING CONTROL SYSTEM MAINTENANCE

### 4-6. STARTER AND STARTING CONTROL SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA</th>
<th>PROCEDURES</th>
<th>PAGE No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-7.</td>
<td>Rotary Switch Replacement</td>
<td>4-14</td>
</tr>
<tr>
<td>4-8.</td>
<td>Starter Replacement</td>
<td>4-16</td>
</tr>
<tr>
<td>4-9.</td>
<td>Circuit Breaker Replacement</td>
<td>4-20</td>
</tr>
</tbody>
</table>

### 4-7. ROTARY SWITCH REPLACEMENT

This Task Covers:

- a Removal
- b Installation

**INITIAL SETUP:**

**Tools**  
General mechanic's tool kit: TM 9-2320-280-10  
automotive (Appendix B, Item 1)  

**Manual References**  
TM 9-2320-280-10  
TM 9-2320-280-24P

**Materials/Parts**  
Two lockwashers (Appendix G, Item 111)

**Equipment Condition**  
Battery ground cable disconnected [para. 4-73]

**NOTE**

Prior to removal, flag leads and note position of lever for installation.

#### a. Removal

1. Remove screw (8), lockwasher (7) and switch lever (6) from switch shaft (9). Discard lockwasher (7).
2. Remove nut (5) and lockwasher (4) from switch (2) and instrument panel (3). Discard lockwasher (4).
3. Push switch (2) out of hole in panel (3).
4. Disconnect three electrical leads 11A (1), 14A (10), and 29A (11) from switch (2) and remove switch (2).

#### b. Installation

1. Connect three electrical leads 11A (1), 14A (10), and 29A (11) on switch (2).
2. Install switch (2) into hole in panel (3).
3. Install lockwasher (4) and nut (5) on switch (2).
4. Place switch lever (6) on switch shaft (9) to indicate "ENGINE STOP" position.
5. Secure lever (6) on switch shaft (9) with lockwasher (7) and screw (8).
FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Check rotary switch operation (TM 9-2320-280-10).
4-8. STARTER REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Special Tools**
- Crowfoot, 9/16 in. (Appendix B, Item 150)
- Torque adapter, 3/4 in. (Appendix B, Item 145)
- Socket adapter, 3/8 - 1/2 in. drive (Appendix B, Item 146)

**Materials/Parts**
- Lockwasher (Appendix G, Item 108)
- Lockwasher (Appendix G, Item 112)
- Locknut (Appendix G, Item 105)
- Adhesive sealant (Appendix C, Item 10)
- Sealing compound (Appendix C, Item 45)

**Personnel Required**
- One mechanic
- One assistant

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)
- Converter housing cover removed (para. 5-19)
- Sealed upper converter housing cover removed (para. 5-18)

**General Safety Instructions**
- Starter must be supported during removal and installation.

**WARNING**

Starter must be supported during removal and installation. Failure to support starter may cause injury to personnel or damage to equipment.

**NOTE**
- Illustration shown is a cutaway of the right side of vehicle.
- Prior to removal, tag leads for installation.

**a. Removal**

1. Remove nut (18), lockwasher (19), lead 3D (20), and negative cable 7A (23) from starter (5). Discard lockwasher (19).

2. Remove adhesive sealant from positive terminal (21) on starter (5).

   **NOTE**
   - Perform step 3 for all vehicles except “A2” series vehicles. Perform step 4 for “A2” series vehicles only.

3. Remove nut (16), lockwasher (15), leads 81A (11) and 81B (17), and positive cable 6A (4) from starter (5). Discard lockwasher (15).

4. Remove nut (16), lockwasher (15), and lead 81B (17) from starter (5). Discard lockwasher (15).

5. Remove screw (14), clip (13), and leads 74B (12) and 74A (10) from solenoid (6).

6. Remove screw (22), two clamps (3), negative cable 7A (23), and positive cable 6A (4) from starter (5).

7. Loosen locknut (8) and washer (7) (if installed) on stud connecting starter (5) to bracket (9). Discard locknut (8).

8. While supporting starter (5) from under vehicle, remove two capscrews (25) and washers (24) from starter (5) and engine (1).

9. Remove starter (5) and shim (2) from engine (1).
4-8. STARTER REPLACEMENT (Cont’d)

b. Installation

1. Install a .08 in. (2 mm) shim (2) on starter (5).
2. Position shim (2) and starter (5) to flywheel housing with solenoid (6) facing outward.
3. Slide front stud on starter (5) in bracket (9).

NOTE
Some capscrews have sealing compound pre-applied. Additional sealing compound is not required.

4. Apply sealing compound to capscrews (25). Install two washers (24) and capscrews (25) on starter (5) and engine (1). Tighten capscrews (25) to 30-40 lb-ft (41-54 N·m).

5. Secure starter (5) on bracket (9) with locknut (8). Using crowfoot, tighten locknut (8) to 15-19 lb-ft (20-26 N·m).

6. Install two clamps (3) negative cable 7A (23) and positive cable 6A (4) on starter (5) with screw (22).
7. Connect leads 74A (10) and 74B (12) to solenoid (6) with clip (13) and screw (14). Tighten screw (14) to 20 lb-in. (2 N·m).

NOTE

8. Connect positive cable 6A (4) and leads 81A (11) and 81B (17) to starter (5) with lockwasher (15) and nut (16). Using torque adapter, tighten nut (16) to 25-30 lb-ft (34-41 N·m).

9. Connect lead 81B (17) to starter (5) with lockwasher (15) and nut (16). Tighten nut (16) to 25-30 lb-ft (34-41 N·m).

10. Seal positive terminal (21), leads 81B (17) and 81A (11), and positive cable 6A (4) with adhesive sealant. Apply sealant at least 1.8 in. (3.175 mm) thick, covering all exposed metal attached to the positive terminal (21).

11. Connect negative cable 7A (23) and lead 3D (20) to starter (5) with lockwasher (19) and nut (18). Using torque adapter, tighten nut (18) to 15-20 lb-ft (20-27 N·m).
FOLLOW-ON TASKS: 
- Install converter housing cover (para. 5-19).
- Sealed upper converter housing cover (para. 5-18).
- Connect battery ground cable (para. 4-73).
- Start engine (TM 9-2320-280-10) and check for smooth starter engagement.
4-9. CIRCUIT BREAKER REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Tools
General mechanic’s tool kit: automotive (Appendix B, Item 1)

Materials/Parts
Two lockwashers (Appendix G, Item 111)

Equipment Condition
Battery ground cable disconnected (para. 4-73).

NOTE

• All circuit breakers are removed and installed basically the same.
• This procedure covers the instrument gauge circuit breaker.
• Prior to removal, tag leads for installation.

a. Removal

1. Loosen nut (1) and lower steering column (2).
2. Disconnect lead 29B (8) and 29D (9) from circuit breaker (6).
3. Remove two nuts (4), lockwashers (5), screws (7), and circuit breaker (6) from column bracket (3).
   Discard lockwasher (5).

b. Installation

1. Install circuit breaker (6) on column bracket (3) with two screws (7), lockwashers (5) and nuts (4).
2. Connect leads 29B (8) and 29D (9) to circuit breaker (6).
3. Raise steering column (2) and tighten nut (1) to 31 lb-ft (42 N·m).
FOLLOW-ON TASKS:  • Connect battery ground cable (para. 4-73).
• Check operation of circuit breaker (TM 9-2320-280-10)
## Instrument Cluster Replacement

- Instrument Cluster Replacement
- Instrument Panel Replacement
- Electrical Gauge Replacement
- Speedometer/Odometer Replacement
- Speedometer Flexible Driveshaft and Core (12338428) Replacement
- Speedometer Cable and Core (12338428-2) Replacement
- Instrument Cluster Light Replacement
- Wait-to-Start Lamp Replacement
- High Beam Lamp Replacement
- Parking Brake Switch Replacement
- Horn Switch Replacement
- Horn Control Brush Replacement
- Horn Replacement
- Horn Mounting Bracket Replacement
- Engine Temperature Sending Unit Replacement
- Oil Pressure Sending Unit Replacement
- Fuel Pressure Transducer Replacement
- Cold Advance Switch Replacement
- Fuel Level Sending Unit Replacement
- Glow Plug Controller Replacement
- Fan Temperature Switch Replacement
- Time Delay Module Replacement
- RPM Sensor Replacement
- Engine RPM Sensor Replacement
- Backup Light Switch Replacement
4-11. INSTRUMENT CLUSTER REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Five lockwashers (Appendix G, Item 109)
- Antiseize compound (Appendix C, Item 13)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)

**NOTE**
- Prior to removal, tag leads for installation.

### a. Removal

1. Remove four capscrews (6) from instrument cluster (7) and instrument panel (3). Pull instrument cluster (7) away from instrument panel (3) to allow access to speedometer cable (4).

2. Loosen nut (5) and disconnect speedometer cable (4) from speedometer (1).

3. Disconnect harness lead 27J (8), 28A (9), 40B (13), 27H (14), 36A (15), 57L (19), 17B (20), 27G (21), 33A (22), 40C (17), and 567A (18), from instrument cluster (7).

4. Remove five nuts (12), lockwashers (11) and harness ground leads 58H (10), 58G (25), 58E (23), 58F (24), and 57G (16) from instrument cluster (7) and remove instrument cluster (7). Discard lockwashers (11).
4-11. INSTRUMENT CLUSTER REPLACEMENT (Cont’d)

b. Installation

1. Apply antiseize compound to harness ground leads 58H (10), 58G (25), 58E (23), 58F (24), and 57G (16) and install on instrument cluster (7) with five lockwashers (11) and nuts (12).

2. Connect harness leads 27J (8), 28A (9), 40B (13), 27H (14), 36A (15) 57L (19), 17B (20), 27G (21), 33A (22), 40C (17), and 567A (18) to instrument cluster (7).

3. Connect speedometer cable (4) to speedometer (1) ensuring core (2) engages with square hole in speedometer (1) and secure with nut (5).

4. Install instrument cluster (7) in panel (3) with four capscrews (6).

FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Check operation of instrument cluster components (TM 9-2320-280-10)
4-12. INSTRUMENT PANEL REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
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</table>

INITIAL SETUP:

**Tools**

- General mechanic's tool kit:
  - Instrument cluster removed (para. 4-11).
  - Heater control cables remove (para. 10-89).

**Equipment Condition**

- Instrument cluster removed (para. 4-11).
- Heater control cables remove (para. 10-89).

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**NOTE**

Prior to removal, tag leads for installation.

### a. Removal

1. Loosen nut (9) and lower steering column (3).
2. Remove cannon plug (11) from main light switch (10).
3. Remove two cap screws (12), washers (13), nuts (14), and washers (13) from instrument panel (2) and body (1).
4. Remove nut (16) and screw (17) from hand throttle bracket (15) and instrument panel (2).
5. Remove nut (4), washer (5), cap screw (7), washer (5) and hand throttle bracket (15) from steering column bracket (8) and instrument panel (2).
6. Remove screw (6) from instrument panel (2) and body (1).
7. Pull instrument panel (2) away from body (1).
8. Disconnect two harness leads 11A (28), 14A (29), and 27A (27) from rotary switch (26).
9. Disconnect two harness leads 27F (32) and 571A (31) at wait-to-start indicator light (24).
10. Disconnect two harness leads 27L (30) and 67D (33) at brake warning indicator light (22).
11. Disconnect harness lead 400D (18) from resistor (21).
12. Disconnect harness lead 27E (19) from blower switch (20) and remove instrument panel (2).

### b. Installation

1. Connect hose (25) to air restriction gage (23).
2. Connect harness lead 27E (19) to blower switch (20).
3. Connect harness lead 400D (18) to resistor (21).
4. Connect two harness leads 27L (30) and 67D (33) to brake warning indicator light (22).
5. Connect two harness leads 27F (32) and 571A (31) to wait-to-start indicator light (24).
6. Connect three harness leads 11A (28), 14A (29), and 27A (27) to rotary switch (26).
7. Install instrument panel (2) on body (1) with screw (6).
8. Install instrument panel (2) and hand throttle bracket (15) to steering column bracket (8) with washer (5), cap screw (7), washer (5), and nut (4).
9. Install hand throttle bracket (15) to instrument panel (2) with screw (17) and nut (16).
10. Install instrument panel (2) to body (1) with two washers (13), cap screws (12), and washers (13), and nuts (14).
11. Install cannon plug (11) to main light switch (10).
12. Raise steering column (3) and tighten nut (9) to 31 lb-ft (42 N·m).
4-12. INSTRUMENT PANEL REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Install heater cables (para. 10-89).
- Install instrument cluster (para. 4-11).
- Check operation of instrument panel components (TM 9-2320-280-10)
4-13. ELECTRICAL GAUGE REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
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</table>

INITIAL SETUP:

**Tools**
General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-24P

**Materials/Parts**
Two lockwashers (Appendix G, Item 111)

**Equipment Condition**
Battery ground cable disconnected (para. 4-73).

**NOTE**
- All electrical gauges are removed and installed basically the same. This procedure covers the temperature gauge.
- Prior to removal, tag all leads for installation.

**a. Removal**

1. Remove four capscrews (8) from instrument cluster (1) and instrument panel (6).
2. Pull instrument cluster (1) away from panel (6).
3. Disconnect leads (4) and (5) from gauge (9).
4. Remove two nuts (3), lockwashers (7), gauge retaining bracket (2), and gauge (9) from instrument cluster (1). Discard lockwashers (7).

**b. Installation**

1. Install gauge (9) and retaining bracket (2) on instrument cluster (1) with two lockwashers (7) and nuts (3). Tighten nuts (3) to 8 lb-in. (1 N·m).
2. Connect leads (4) and (5) to gauge (9).
3. Install instrument cluster (1) to panel (6) with four capscrews (8).
FOLLOW-ON Tasks:

- Connect battery ground cable (para. 4-73).
- Start engine and check operation of gauge (TM 9-2320-280-10).
4-14. SPEEDOMETER/ODOMETER REPLACEMENT

This task covers:
a. Removal
b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

a. Removal

1. Remove four capscrews (9) from instrument cluster (4) and instrument panel (8).
2. Pull instrument cluster (4) away from panel (8).
3. Loosen large nut (2) on flex drive shaft (7) and pull cable end out of speedometer (3).
4. Remove two nuts (6), speedometer retaining bracket (5), and speedometer (3) from instrument cluster (4).

b. Installation

1. Install speedometer (3) and speedometer retaining bracket (5) on instrument cluster (4) with two nuts (6). Tighten nuts (6) to 8 lb-in. (1 N·m).
2. Install flex drive shaft (7) into back of speedometer (3) ensuring core (1) engages in square hole in speedometer (3) and tighten cable nut (2).
3. Install instrument cluster (4) to panel (8) with four capscrews (9).
4-14. SPEEDOMETER/ODOMETER REPLACEMENT (Cont'd)

FOLLOW-ON TASK: Check operation of speedometer (TM9-2320-280-10)
4-15. SPEEDOMETER FLEXIBLE DRIVESHAFT AND CORE (12338428) REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1) TM 9-2320-280-24P

**Materials/Parts**
- Locknut (Appendix G, Item 85)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10).
- Engine access cover removed (para. 10-15).

**a. Removal**

NOTE
If vehicle is equipped with speedometer cable (12338428-2), refer to para. 4-15.1

1. Remove four capscrews (12) from instrument cluster (11) and instrument panel (10) and pull instrument cluster (11) away to gain access to back of speedometer (3).
2. Remove speedometer driveshaft nut (2) from speedometer (3).
3. Push flex driveshaft (5) and rubber grommet (4) through body (8).
4. Remove screw (9) and locknut (6) from clamp (7) on body (8). Remove clamp (7) from flex driveshaft (5). Discard locknut (6).
5. Working under vehicle, remove screw (14) and clamp (13) from side of transmission (15). Remove clamp (13) from flex driveshaft (5).
6. Remove speedometer driveshaft nut (18) and flex driveshaft (5) from adapter (16) on transfer case (17) and remove flex driveshaft (5).

**b. Installation**

1. Install flex driveshaft (5) into adapter (16) ensuring core (1) engages in square hole in adapter (16) and tighten speedometer driveshaft nut (18).
2. Install flex driveshaft (5) and clamp (13) on side of transmission (15) with screw (14).
3. Secure flex driveshaft (5) and clamp (7) on body (8) with screw (9) and locknut (6).
4. Install flex driveshaft (5) and grommet (4) on body (8).
5. Install flex driveshaft (5) into back of speedometer (3) ensuring core (1) engages in square hole in speedometer (3) and tighten speedometer driveshaft nut (2).
6. Install instrument cluster (11) on panel (10) with four capscrews (12).
FOLLOW-ON TASKS:  • Lower and secure [TM 9-2320-280-10]  • Install engine access cover (para. 10-15).
# 4-15.1. SPEEDOMETER CABLE AND CORE (12338428-2) REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
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</table>

## INITIAL SETUP:

### Applicable Models
- All models except “A2” series vehicles

### Tools
- General mechanic's tool kit: automotive (Appendix B, Item 1)

### Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

### Materials/Parts
- Locknut (Appendix G, Item 85)
- Tiedown strap (Appendix G, Item 239)

### Equipment Condition
- Hood raised and secured (TM 9-2320-280-10)
- Engine access cover removed (para. 10-15)
- Battery ground cable disconnected (para. 4-73)
- Fuel filter drain hose removed (para. 3-34)
- Left splash shield removed (para. 10-17)

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**NOTE**

If vehicle is equipped with speedometer cable (12338428), refer to para. 4-15

### a. Removal

1. Remove tiedown strap (4) from speedometer cable (1) and wiring harness (3) behind instrument panel (2). Discard tiedown strap (4).
2. Remove four capscrews (11) and pull instrument cluster (10) away to gain access to back of speedometer (12).
3. Loosen nut (5) and remove speedometer cable (1) from speedometer (12).
4. Remove locknut (7), clamp (6), screw (9), and speedometer cable (1) from body (8). Discard locknut (7).
5. Push speedometer cable (1) and grommet (13) through cowl (14).
6. Remove two nuts (18), screws (24), clamps (19), and speedometer cable (1) from two speedometer cable support braces (20) located in front of solenoid control valve (16) and behind alternator (15).
7. Remove nut (23), screw (21), and speedometer cable support brace (20) from two clamps (22) on hydraulic hoses (17) located in front of solenoid control valve (16).
8. Remove nut (23), screw (21), and speedometer cable support brace (20) from two clamps (22) on hydraulic hoses (17) located behind alternator (15).
9. Remove speedometer cable (1) from under alternator (15).
4-15.1. SPEEDOMETER CABLE AND CORE (12338428-2) REPLACEMENT (Cont’d)
4-15.1. SPEEDOMETER CABLE AND CORE (12338428-2) REPLACEMENT (Cont’d)

10. Remove screw (4), clamp (1), and speedometer cable (2) from transmission (3).
11. Remove speedometer cable (2) from standoff bracket (8) on transfer case (6).
12. Loosen nut (7) and remove speedometer cable (2) from adapter (5) on transfer case (6).

b. Installation

1. Install speedometer cable (2) into adapter (5) on transfer case (6) and tighten nut (7) to 90-110 lb-in (10-12 N•m).
2. Install speedometer cable (2) through standoff bracket (8) on transfer case (6).
3. Install speedometer cable (2) on transmission (3) with clamp (1) and screw (4).
4-15.1. SPEEDOMETER CABLE AND CORE (12338428-2) REPLACEMENT (Cont'd)

NOTE

If installing speedometer cable (12338428-2) for the first time, perform steps 4 and 5. If not go to step 6.

4. Install plug (9) in existing hole (10) located in left inner cowl (11).
5. Locate, mark, and drill 1.00-in. (25.4 mm) diameter hole (12) in front of cowl (11).
6. Install speedometer cable (4) on body (6) with clamp (3), screw (7), and locknut (5).
7. Route speedometer cable (4) under alternator (11) next to hydraulic hoses (13).
8. Install speedometer cable support brace (16) on two clamps (18) and hydraulic hoses (13) located behind alternator (11) with screw (17) and nut (19).
9. Install speedometer cable (4) and clamp (15) on speedometer cable support brace (16) with screw (20) and nut (14).
10. Install speedometer cable support brace (16) on two clamps (18) and hydraulic hoses (13) located in front of solenoid control valve (12) with screw (17) and nut (19).
11. Install speedometer cable (4) and clamp (15) on speedometer cable support brace (16) with screw (20) and nut (14).
12. Install speedometer cable (4) and grommet (21) into cowl (22).
13. Install speedometer cable (4) on speedometer (1).
14. Install instrument cluster (9) on instrument panel (8) with four capscrews (10).
15. Install tiedown strap (24) on speedometer cable (4) and wiring harness (23) behind instrument panel (8).
4-15.1. SPEEDOMETER CABLE AND CORE (12338428-2) REPLACEMENT (Cont’d)

FOLLOW-ON-TASK:
- Install left splash shield (para. 10-17).
- Connect battery ground cable (para. 4-73).
- Install fuel filler drain hose (para. 3-34).
- Install engine access cover (para. 10-15).
- Lower and secure hood (TM 9-2320-280-10).
4-16. INSTRUMENT CLUSTER LIGHT REPLACEMENT

This task covers:

a. Lamp Removal
b. Lamp Installation
c. Light Assembly Removal
d. Light Assembly Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Battery ground cable disconnected (para. 4-73).

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

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**a. Lamp Removal**

1. Remove light lens (1) and gasket (2) from light assembly (4).
2. Remove lamp (3) from light assembly (4).

**b. Lamp Installation**

1. Install lamp (3) into light assembly (4).
2. Install gasket (2) and lens (1) to light assembly (4).
4-16. INSTRUMENT CLUSTER LIGHT REPLACEMENT (Cont'd)

**c. Light Assembly Removal**

1. Remove two light lenses (1) and gaskets (2) from light assemblies (4).
2. Remove lamp (3) from light assembly (4) being replaced.
3. Remove all electrical gauges (para. 4-13) and speedometer/odometer (para. 4-14).
4. Separate instrument cluster (8) from backing panel (6).
5. Disconnect harness lead 40B (5) from light assembly (4).
6. Remove two screws (7) and light assembly (4) from backing panel (6).

**d. Light Assembly Installation**

1. Install light assembly (4) to backing panel (6) with two screws (7).
2. Install backing panel (6) to instrument cluster (8).
3. Install all electrical gauges (para. 4-13) and speedometer/odometer (para. 4-14).
4. Connect harness lead 40B (5) to light assembly (4).
5. Install lamp (3) into light assembly (4).
6. Install two gaskets (2) and light lenses (1) on light assemblies (4).

FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
4-17. WAIT-TO-START LAMP REPLACEMENT

This task covers:

a. Removal  

b. Installation

INITIAL SETUP:

**Tools**

- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**

- Battery ground cable disconnected (para. 4-73).
- Instrument cluster removed (para. 4-11).

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**NOTE**

- The procedure to remove and install the wait-to-start light and the brake warning light is basically the same. This procedure is for the wait-to-start light.
- Prior to removal, tag leads and note position for installation.

**a. Removal**

1. Loosen nut (14) and lower steering column (7).
2. Remove cannon plug (16) from main light switch (15).
3. Remove two capscrews (17), washers (18), nuts (20), and washers (18) from instrument panel (6) and body (19).
4. Remove nut (22) and screw (23) from hand throttle bracket (21) and instrument panel (6).
5. Remove nut (13), washer (11), capscrew (10), and washer (11) from instrument panel (6) hand throttle bracket (21) and steering column bracket (12).
6. Remove screw (8) from instrument panel (6) and cowl (9).
7. Pull instrument panel (6) away from body (19).
8. Remove two screws (5) from wait-to-start lamp (4) and instrument panel (6).
9. Disconnect lead 571 (2) and 27 (3) from wiring harness (1).
10. Remove wait-to-start lamp (4).

**b. Installation**

1. Connect lead 571 (2) and 27 (3) to wiring harness (1).
2. Install lamp (4) on panel (6) with two screws (5).
3. Install instrument panel (6) on cowl (9) with screw (8).
4. Install instrument panel (6) and hand throttle bracket (21) on steering column bracket (12) with capscrew (10), washer (11), nut (13), and washer (11).
5. Install hand throttle bracket (21) to instrument panel (6) with screw (23) and nut (22).
6. Install instrument panel (6) to body (19) with two capscrews (17), washers (18), nuts (20), and washers (18).
7. Install cannon plug (16) on main light switch (15).
8. Raise steering column (7) and tighten nut (14) to 31 lb-ft (42 N·m).
4-17. WAIT-TO-START LAMP REPLACEMENT (Cont'd)

FOLLOW-ON TASKS:
- Install instrument cluster [para. 4-11].
- Connect battery ground cable [para. 4-73].
- Start engine [TM 9-2320-280-10] and check wait-to-start lamp assembly for operation.
4-18. HIGH BEAM LAMP REPLACEMENT

This Task Covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item

**Equipment Condition**
- Electrical gauges removed [para. 4-13].
- Speedometer/odometer removed [para. 4-14].

**Manual References**
- TM 9-2320-280-24P

**NOTE**
- Prior to removal, tag leads for installation.

a. Removal

1. Remove two light lenses (7) from instrument cluster back panel (4).
2. Remove instrument cluster (6) from instrument cluster back panel (4).
3. Disconnect harness lead 57L (1) and lead 17B (2) from high beam lamp (5).
4. Remove two screws (3) and high beam lamp (5) from instrument cluster back panel (4).

b. Installation

1. Install high beam lamp (5) on instrument cluster back panel (4) with two screws (3).
2. Connect harness lead 57L (1) and lead 17B (2) to high beam lamp (5).
3. Install instrument cluster (6) on instrument cluster back panel (4).
4. Install two light lenses (7) on instrument cluster back panel (4).

FOLLOW-ON TASKS:
- Install speedometer/odometer [para. 4-14].
- Install electrical gauges [para. 4-13].
4-19. PARKING BRAKE SWITCH REPLACEMENT

This Task Covers:

\[ a. \text{ Removal} \quad b. \text{ Installation} \]

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>General mechanic’s tool kit: automotive (Appendix B, Item 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Condition</td>
<td>Battery ground cable disconnected (para. 4-73).</td>
</tr>
</tbody>
</table>

Manual References

TM 9-2320-280-24P

NOTE

Prior to removal, tag leads for installation.

\[ \text{a. Removal} \]

1. Disconnect parking brake switch lead 67C (1) and 67 (2) from wiring harness leads 67B (3) and 67E (4).
2. Remove parking brake switch (5) from parking brake lever (6).

\[ \text{b. Installation} \]

1. Install parking brake switch (5) to parking brake lever (6).
2. Connect lead 67C (1) and 67 (2) to wiring harness leads 67B (3) and 67E (4).

FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Check parking brake switch operation (TM 9-2320-280-10)

4-39
4-20. HORN SWITCH REPLACEMENT

This Task Covers:
  a. Removal
  b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1) TM 9-2320-280-24P

**Materials/Parts**
- Sealing compound (Appendix C, Item 46)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

### a. Removal

1. Remove snapring (5) from horn switch (4) and steering wheel (1).
2. Pull horn switch (4) out and disconnect from lead 25A (3) in steering shaft (2).

### b. Installation

1. Apply sealing compound to bushing (6).
2. Connect lead 25A (3) to horn switch (4) and push into steering shaft (2).
3. Install snapring (5) on horn switch (4) and steering wheel (1).

**FOLLOW-ON TASKS:**
- Connect battery ground cable (para. 4-73).
- Test horn for operation (TM 9-2320-280-10)
4-21. HORN CONTROL BRUSH REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Sealant (Appendix C, Item 38)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

---

**a. Lamp Removal**

1. Loosen nut (1) and lower steering column (5).
2. Disconnect lead 25A (3) from horn control brush (4).
3. Remove two screws (2) from horn control brush (4) and steering column (5).
4. Pry horn control brush (4) out of steering column (5).
5. Clean sealant from steering column (5).

**b. Installation**

1. Apply sealing to bottom of horn control brush (4).
2. Install horn control brush (4) into steering column (5) with two screws (2).
3. Connect lead 25A (3) to horn control brush (4).
4. Raise steering column (5) and tighten nut (1) to 31 lb-ft (42 N·m).

---

**FOLLOW-ON TASKS:**
- Connect battery ground cable (para. 4-73).
- Check horn for proper operation (TM 9-2320-280-10).
This task covers:

a. Removal  

b. Installation

INITIAL SETUP:

**Tools**  
General mechanic’s tool kit: TM 9-2320-280-10  
automotive (Appendix B, Item 1)

**Manual References**  
**TM 9-2320-280-10**  
**TM 9-2320-280-24P**

**Materials/Parts**  
Two lockwashers (Appendix G, Item 108)

**Equipment Condition**  
- Battery ground cable disconnected (para. 4-73).  
- Hood raised and secured (TM 9-2320-280-10).

**NOTE**  
Prior to removal, tag leads for installation.

**a. Removal**

1. Remove two capscrews (4), lockwashers (5) and horn (2) from bracket (3). Discard lockwashers (5).
2. Disconnect lead 25A (1) and 26A (6) from horn (2).

**b. Installation**

1. Connect leads 25A (1) and 26A (6) to horn (2).
2. Install horn (2) on bracket (3) with two lockwashers (5) and capscrews (4).

FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).  
- Lower and secure hood (TM 9-2320-280-10).  
- Check horn for proper operation (TM 9-2320-280-10).
This Task Covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Two lockwashers (Appendix G, Item 108)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Horn removed (para. 4-22).

---

### a. Removal

Remove two nuts (1), lockwashers (5), capscrews (4) and horn mounting bracket (2) from front crossmember (3). Discard lockwashers (5).

### b. Installation

Install horn mounting bracket (2) on front crossmember (3) with two capscrews (4), lockwashers (5), and nuts (1). Tighten nuts (1) to 10 lb-ft (14 N·m).

---

FOLLOW-ON TASK: Install horn (para. 4-22).
4-24. ENGINE TEMPERATURE SENDING UNIT REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit automotive (Appendix B, Item 1)

**Materials/Parts**
- Sealing compound (Appendix C, Item 44)

**Manual References**
- TM 9-2320-280-24P
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)
- Hood raised and secured (TM 9-2320-280-10)

**NOTE**
The engine temperature sending unit is located left front of engine.

### a. Removal

1. Disconnect lead 33B (1) from engine temperature sending unit (2).
2. Remove engine temperature sending unit (2) from engine (3).

### b. Installation

1. Apply sealing compound to threads of engine temperature sending unit (2).
2. Install engine temperature sending unit (2) to engine (3).
3. Connect lead 33B (1) to engine temperature sending unit (2).

**FOLLOW-ON TASKS:**
- Connect battery ground cable (para. 4-73)
- Start engine and check sending unit for leaks (TM 9-2320-280-10)
- Lower and secure hood (TM 9-230-280-10)
4-25. OIL PRESSURE SENDING UNIT REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1) TM 9-2320-280-24P

**Materials/Parts**
- Sealing compound (Appendix C, Item 44)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)
- Engine access cover removed (para. 10-15)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**NOTE**
The oil pressure sending unit is located left rear of engine.

**a. Removal**

1. Disconnect lead 36 A (1) from oil pressure sending unit (2).
2. Remove oil pressure sending unit (2) from elbow (3).
3. Inspect elbow (3) for damage. Replace if damaged. Apply sealing compound to threads of elbow (3) before installing on engine.

**b. Installation**

1. Apply sealing compound to threads of oil pressure sending unit (2).
2. Install oil pressure sending unit (2) to elbow (3).
3. Connect lead 36A (1) to oil pressure sending unit (2).

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Start engine (TM 9-2320-280-10) and check sending unit for leaks.
- Install engine access cover (para. 10-15).
4-26. FUEL PRESSURE TRANSDUCER REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Tools
- General mechanic’s tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

Materials/Parts
- Sealing compound (Appendix C, Item 44)

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnected (para. 4-73)
- Hood raised and secured (TM 9-2320-280-10)

NOTE
The fuel pressure transducer is a sensor unit for diagnostic testing. It is mounted on top of the fuel filter on the firewall of the vehicle.

a. Removal

1. Disconnect multiple connector (2) from STE/ICE-R wiring harness (3).
2. Remove fuel pressure transducer (1) from fuel filter (4).

b. Installation

1. Apply sealing compound to threads of fuel pressure transducer (1).
2. Install fuel pressure transducer (1) to fuel filter (4).
3. Connect multiple connector (2) to STE/ICE-R wiring harness (3).

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Start engine (TM 9-2320-280-10) and check fuel pressure transducer for leaks.
- Lower and secure hood (TM 9-2320-280-10)
4-27. COLD ADVANCE SWITCH REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>TM 9-2320-280-24P</td>
<td>• Battery ground cable disconnected</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td></td>
<td>(para. 4-73)</td>
</tr>
<tr>
<td>Sealing compound (Appendix C, Item 44)</td>
<td></td>
<td>• Engine coolant drained as necessary (para. 3-60)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Engine access cover removed (para. 10-15)</td>
</tr>
</tbody>
</table>

NOTE

- The cold advance switch is located in the right cylinder head water jacket at the rear of the cylinder head just above the exhaust manifold.
- Prior to removal, tag leads for installation.

a. Removal

1. Disconnect leads 569G (1) and 569B (3) from engine harness (2).
2. Remove cold advance switch (5) from engine (4).

b. Installation

1. Apply sealing compound to threads of cold advance switch (5). Install cold advance switch (5) in engine (4).
2. Connect leads 569G (1) and 569B (3) to engine harness (2).

FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Fill cooling system (para. 3-60).
- Install engine access cover (para. 10-15).
4-28. FUEL LEVEL SENDING UNIT REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools
- General mechanic's tool kit: Fuel tank removed (para. 3-24).
- Automotive (Appendix B, Item 1)

Materials/Parts
- Five lockwashers (Appendix G, Item 113)
- Gasket (Appendix G, Item 43)

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

Equipment Condition
- Fuel tank removed (para. 3-24).

General Safety Instructions
- Do not perform this procedure near fire, flames, or sparks.

WARNING

Diesel fuel is highly flammable. Do not perform this procedure near fire, flames, or sparks. Severe injury or death will result.

a. Removal

1. Remove five screws (1) and lockwashers (2) from fuel level sending unit (3) and fuel tank (6). Discard lockwashers (2).
2. Remove fuel level sending unit (3) from inside of fuel tank (6).
3. Remove and discard gasket (4).

b. Installation

1. Place gasket (4) on fuel level sending unit (3).
2. Install fuel level sending unit (3) into fuel tank (6) ensuring not to bend float arm (8).
3. Align holes of fuel level sending unit (3) to tank (6) so float (7) is pointed in same direction that tank filler neck (5) points.
4. Secure fuel level sending unit (3) with five lockwashers (2) and screws (1). Tighten screws (1) to 32 lb-in. (4 N•m).
FOLLOW-ON TASKS:
- Install fuel tank (para. 3-24).
- Check fuel gauge for proper operation (TM 9-2320-280-10).
4-29. GLOW PLUG CONTROLLER REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td>TM 9-2320-280-24P</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grease (Appendix C, Item 25)</td>
<td>Battery ground cable disconnected (para. 4-73)</td>
</tr>
<tr>
<td>Sealing compound (Appendix C, Item 44)</td>
<td>Hood raised and secured (TM 9-2320-280-10)</td>
</tr>
</tbody>
</table>

NOTE
It may be necessary to clamp surge tank-to-lower radiator tube to prevent loss of coolant.

a. Removal

1. Disconnect multiple connector (2) from glow plug controller (1).
2. Remove glow plug controller (1) from water crossover (3).

b. Installation

CAUTION
- Do not attempt to start engine unless controller is mounted in engine for a minimum of 10 minutes or if all glow plugs are disconnected. Damage to glow plugs may result.
- Do not overtighten controller. Damage to crossover will result.

1. Apply sealing compound to threads of glow plug controller (1). Install glow plug controller (1) on water crossover (3). Tighten controller (1) to 14-20 lb-ft (19-27 N·m).
2. Apply grease to pins (4) of glow plug controller (1).
3. Connect multiple connector (2) to glow plug controller (1).
FOLLOW-ON TASKS: • Connect battery ground cable [para. 4-73].
• Lower and secure hood [TM 9-2320-280-10].
4-30. FAN TEMPERATURE SWITCH REPLACEMENT

This task covers:

a. Removal  b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 (Appendix B, Item 1)
- Automotive TM 9-2320-280-24P

**Materials/Parts**
- Sealing compound (Appendix C, Item 44)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).  
- Hood raised and secured (TM 9-2320-280-10)

**NOTE**
- The engine temperature switch is located on the top front side of the engine in the water crossover.  
- Prior to removal, tag leads for installation.

**a. Removal**

1. Disconnect engine harness leads 458A (4) and 458B (3) from fan temperature switch (1).
2. Remove fan temperature switch (1) from water crossover (2).

**b. Installation**

1. Apply sealing compound to threads of fan temperature switch (1). Install fan temperature switch (1) to water crossover (2).
2. Connect engine harness leads 458A (4) and 458B (3) to fan temperature switch (1).

**FOLLOW-ON TASKS:**
- Connect battery ground cable (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10)
4-31. TIME DELAY MODULE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Battery ground cable disconnected (para. 4-73), automotive (Appendix B, Item 1)

**Equipment Condition**
- Battery ground cable disconnected [para. 4-73]
- Hood raised and secured [TM 9-2320-280-10]

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Removal**

1. Disconnect connector plug (3) from control valve connector (5).
2. Disconnect connector plug (2) from engine harness (4).
3. Remove two screws (1) and time delay module (7) from cowl (6).

**b. Installation**

1. Install time delay module (7) on cowl (6) with two screws (1).
2. Connect connector plug (2) to engine harness (4).
3. Connect connector plug (3) to control valve connector (5).

---

**FOLLOW-ON TASKS:**
- Connect battery ground cable [para. 4-73]
- Lower and secure hood [TM 9-2320-280-10]
4-32. RPM SENSOR REPLACEMENT

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

**Applicable Models**
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Engine access cover removed (para. 10-15).

---

**a. Removal**

1. Disconnect harness connector (5) from RPM sensor connector (4).
2. Loosen nut (2) and remove RPM sensor (1) from oil pump drive (6).

**b. Installation**

1. Align tab (3) on RPM sensor (1) with slot (7) in oil pump drive (6). Install RPM sensor (1) on oil pump drive (6) with nut (2).
2. Connect RPM sensor connector (4) to harness connector (5).

---

FOLLOW-ON TASK: Install engine access cover (para. 10-15).
This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Applicable Models**
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

**Tools**
General mechanic's tool kit:  
avtomotive (Appendix B, Item 1)

### a. Removal

1. Disconnect engine harness leads (1) from RPM sensor leads (2).
2. Remove capscrew (3) and RPM sensor (4) from front cover (5).

### b. Installation

1. Install RPM sensor (4) in front cover (5) with capscrew (3).
2. Connector RPM sensor leads (2) to engine harness leads (1).

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10).
4-34. BACKUP LIGHT SWITCH REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Applicable Models**
M996, M996A1, M997, M997A1, M997A2, M1035, M1035A1, M1035A2

**Material/Parts**
Sealing compound (Appendix C, Item 44)

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Shift controls housing removed (para. 5-7 or 5-11).

---

**a. Removal**

1. Remove boot (4) from shift control housing assembly (1).

   **NOTE**

2. Remove backup light switch (3) from shift control housing assembly (1).

3. Remove two screws (6) and lockwashers (7) from backup light switch (8) and housing (1). Discard lockwashers (7).

4. Remove tiedown strap (10) and backup light switch (8) from neutral start switch (9).

---

**b. Installation**

1. Install backup light switch (8) on shift controls housing (1) with two lockwashers (7) and screws (6).

2. Install tiedown strap (10) on leads from backup light switch (8) and neutral start switch (9).

3. Position neutral start switch (9) leads and backup light switch (8) leads through boot (4) and install boot (4) on housing (1).

4. Apply sealing compound to threads of backup light switch (3), and install backup light switch on shift control assembly (1).

5. Position leads from neutral start switch (2), backup light switch (3), and shift selector indicator (5) through boot (4) and install boot (4) on shift control housing assembly (1).
4-34. BACKUP LIGHT SWITCH REPLACEMENT (Cont’d)

FOLLOW-ON TASK: Install shift controls housing (para. 5-7 or 5-11).
## Section IV. TRANSFER CASE AND TRANSMISSION ELECTRICAL MAINTENANCE

### 4-35. TRANSFER CASE AND TRANSMISSION ELECTRICAL MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-36</td>
<td>Transfer Case Indicator Switch Replacement</td>
<td>4-59</td>
</tr>
<tr>
<td>4-37</td>
<td>Transfer Case Indicator Lamp Cable Assembly Replacement</td>
<td>4-60</td>
</tr>
<tr>
<td>4-38</td>
<td>Transfer Case Indicator Lamp Assembly Replacement</td>
<td>4-62</td>
</tr>
<tr>
<td>4-39</td>
<td>Transmission Indicator Lamp Assembly Replacement (4L80-E)</td>
<td>4-63</td>
</tr>
<tr>
<td>4-40</td>
<td>Transmission Circuit Breakers and Jumper Leads Replacement (4L80-E)</td>
<td>4-64</td>
</tr>
<tr>
<td>4-41</td>
<td>Transmission Relay Replacement (4L80-E)</td>
<td>4-66</td>
</tr>
<tr>
<td>4-42</td>
<td>Transmission Control Module (TCM) Replacement (4L80-E)</td>
<td>4-67</td>
</tr>
<tr>
<td>4-43</td>
<td>Kick-Down Switch Maintenance (3L80)</td>
<td>4-68</td>
</tr>
<tr>
<td>4-44</td>
<td>Fan Cut-Off Switch Replacement (4L80-E)</td>
<td>4-70</td>
</tr>
<tr>
<td>4-45</td>
<td>Throttle Position (TP) Sensor Maintenance (4L80-E)</td>
<td>4-72</td>
</tr>
<tr>
<td>4-46</td>
<td>Transmission Input Speed Sensor (TISS) and Output Speed Sensor (TOSS)</td>
<td>4-74</td>
</tr>
</tbody>
</table>
4-36. TRANSFER CASE INDICATOR SWITCH REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INITIAL SETUP:

**Applicable Models**
- M1097, “A1” and “A2” series

**Equipment Condition**
- Battery ground cable disconnected [para. 4-73].

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**a. Removal**

1. Disconnect leads 511A (4) and 511B (5) from indicator switch leads (3) on transfer case (1).
2. Remove indicator switch (2) from transfer case (1).

**b. Installation**

1. Install indicator switch (2) on transfer case (1).
2. Connect leads 511A (4) and 511B (5) to indicator switch leads (3).

FOLLOW-ON TASK: Connect battery ground cable [para. 4-73].
4-37. TRANSFER CASE INDICATOR LAMP CABLE ASSEMBLY REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M1097, “A1” and “A2” series

Manual References
TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnected (para. 4-73).
- Engine access cover removed (para. 10-15).

Tools
General mechanic’s tool kit: Battery ground cable disconnected (para. 4-73).
- Automotive (Appendix B, Item 1) Engine access cover removed (para. 10-15).

Materials/Parts
Four tiedown straps (Appendix G, Item 242)

a. Removal

1. Disconnect leads 511A (6) and 511B (7) from indicator switch leads (5) on transfer case (3).
2. Remove four tiedown straps (2) from cable assembly (1) and flex driveshaft (4). Discard tiedown straps (2).
3. Disconnect lead 511A (8) from lamp assembly lead (9).
4. Disconnect leads 458B (12) and 458C (11) from fan temperature switch lead (13) and engine wiring harness lead 458A (10) and remove cable assembly (1) from vehicle.

b. Installation

1. Position cable assembly (1) in approximate mounting location on vehicle.
2. Connect leads 458B (12) and 458C (11) to fan temperature switch lead (13) and engine wiring harness lead 458A (10).
3. Connect lead 511A (8) to lamp assembly lead (9).
4. Connect leads 511B (7) and 511A (6) to indicator switch leads (5) on transfer case (3).
5. Install cable assembly (1) to flex driveshaft (4) with four tiedown straps (2).
FOLLOW-ON TASKS:
- Install engine access cover (para. 10-15).
- Connect battery ground cable [para. 4-73].
4-38. TRANSFER CASE INDICATOR LAMP ASSEMBLY REPLACEMENT

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

**Applicable Models**
M1097, "A1" and "A2" series

**Manual References**
TM 9-2320-280-24P

**Tools**
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Engine access cover removed (para. 10-15).

---

**a. Removal**

1. Disconnect lead 511A (5) from lamp assembly lead (4).
2. Remove screw (3) and ground lead (2) from engine (8).
3. Remove two screws (6) and lamp assembly (7) from body (1).

---

**b. Installation**

1. Install lamp assembly (7) to body (1) with two screws (6).
2. Install ground lead (2) to engine (8) with screw (3).
3. Connect lead 511A (5) to lamp assembly lead (4).

---

**FOLLOW-ON TASKS:**
- Install engine access cover (para. 10-15).
- Connect battery ground cable (para. 4-73).
4-39. TRANSMISSION INDICATOR LAMP ASSEMBLY REPLACEMENT (4L80-E)

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnected \(\text{(para. 4-73)}\).
- Engine access cover removed \(\text{(para. 10-15)}\).

### Tools
- General mechanic's tool kit: automotive (Appendix B, Item 1)

#### a. Removal

1. Disconnect lead 657 (4) from lamp assembly lead (3).
2. Remove two screws (2) and lamp assembly (5) from body (1).

#### b. Installation

1. Install lamp assembly (5) to body (1) with two screws (2).
2. Connect lead 657 (4) to lamp assembly lead (3).

FOLLOW-ON TASKS:
- Install engine access cover \(\text{(para. 10-15)}\).
- Connect battery ground cables \(\text{(para. 4-73)}\).
4-40. TRANSMISSION CIRCUIT BREAKERS AND JUMPER LEADS REPLACEMENT (4L80-E)

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-24P

Equipment Condition
Battery ground cables disconnected (para. 4-73).

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

NOTE
Prior to removal, tag leads for installation.

a. Removal

1. Remove nut (6), capscrew (1), cable (2), three circuit breaker-to-battery leads (3) and cable (4) from terminal clamp (5).

    NOTE
    The coverplate on M1025A2 and M1043A2 vehicles has four capscrews and washers.

2. Remove five capscrews (8), two washers (10), and coverplate (7) from “B” pillar (9).
3. Remove three screws (20) and circuit breaker-to-battery leads (3) from circuit breakers (21), (16), and (15).
4. Remove two screws (12) and circuit breaker-to-relay leads (13) from circuit breakers (16) and (21).
5. Disconnect leads (13) from relay lead (19) and remove leads (13).
6. Remove screw (12) and circuit breaker-to-harness lead (14) from circuit breaker (15).
7. Remove two nuts (11), capscrews (18), washers (17) and circuit breaker (21) from coverplate (7).
   Repeat step 7 for circuit breakers (15) and (16).

b. Installation

1. Install circuit breaker (21) on coverplate (7) with two washers (17), capscrews (18), and nuts (11).
   Repeat step 1 for circuit breakers (15) and (16).
2. Install circuit breaker-to-harness lead (14) on circuit breaker (15) with screw (12).
3. Connect leads (13) to relay lead (19).
4. Install two circuit breaker-to-relay leads (13) to circuit breakers (16) and (21) with screws (12).
5. Install three circuit breaker-to-battery leads (3) on circuit breakers (15) (16), and (21) with screws (20).
6. Install coverplate (7) to “B” pillar (9) with two washers (10) and five capscrews (8).
7. Install cable (4), three circuit breaker-to-battery leads (3) and cable (2) to terminal clamp (5) with capscrew (1) and nut (6).
FOLLOW-ON TASK: Connect battery ground cables (para. 4-73).
4-41. TRANSMISSION RELAY REPLACEMENT (4L80-E)

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-24P

Equipment Condition
Battery ground cables disconnected (para. 4-73).

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

NOTE
Prior to removal, tag leads for installation.
M1025A2 and M1043A2 vehicles have four capscrews and washers on coverplate.

a. Removal

1. Remove five capscrews (2), two washers (4) and coverplate (1) from “B” beam (3).
2. Disconnect four leads (5) from relay leads (6).
3. Remove two nuts (9), washers (10), capscrews (7), and relay (8) from coverplate (1).

b. Installation

1. Install relay (8) on coverplate (1) with two capscrews (7), washers (10), and nuts (9).
2. Connect four relay leads (6) to leads (5).
3. Install coverplate (1) to “B” beam (3) with two washers (4) and five capscrews (2).

FOLLOW-ON TASK: Connect battery ground cables (para. 4-73).
4-42. TRANSMISSION CONTROL MODULE (TCM) REPLACEMENT (4L80-E)

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-24P

Equipment Condition
- Battery ground cables disconnected (para. 4-73).
- Left rear seat compartment cover removed (para. 10-43).

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Personnel Required
One mechanic
One assistant

a. Removal

CAUTION
Ensure that ignition switch is OFF before disconnecting or reconnecting the transmission control module (TCM). Failure to do this may cause internal damage to TCM.

1. Disconnect harness connector (1) from TCM (2).
2. Remove four nuts (4), washers (3) and TCM (2) from body (5).

b. Installation

1. Install TCM (2) on body (5) with four washers (3) and nuts (4).
2. Connect harness connector (1) to TCM (2).

FOLLOW-ON TASKS:
- Connect battery ground cables (para. 4-73)
- Install left rear seat compartment cover (para. 10-43).
4-43. KICK-DOWN SWITCH MAINTENANCE (3L80)

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

Applicable Models
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Equipment Condition
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

Test Equipment
Multimeter (Appendix B, Item 166)

a. Removal

1. Disconnect engine harness leads 315A (5) and 315B (4) from kick-down switch (3).
2. Remove two capscrews (1) and switch (3) from fuel injection pump (2).

b. Installation

1. Install kick-down switch (3) on injection pump (2) with two capscrews (1).
2. Connect leads 315A (5) and 315B (4) to kick-down switch (3).

c. Adjustment

1. Disconnect throttle return spring (6) from throttle shaft lever (7) and accelerator cable bracket (9).
2. Disconnect engine harness leads 315A (5) and 315B (4) from kick-down switch (3).
3. Connect multimeter to leads on kick-down switch (3) to read continuity.
4. Loosen two capscrews (1) to allow movement of kick-down switch (3).
5. Position feeler gauge set at 0.295 in. (7.493 mm) between throttle shaft lever (7) and injection pump (2) ensuring feeler gauge does not touch screw (8).
6. Move throttle shaft lever (7) to wide open position so throttle shaft lever (7) rests on feeler gauge.
7. Rotate kick-down switch (3) slowly until multimeter reads continuity through kick-down switch (3) and tighten capscrews (1).
8. Position feeler gauge set at 0.310 in. (7.874 mm) between throttle shaft lever (7) and injection pump (2) ensuring feeler gauge does not touch screw (8).
9. Move throttle shaft lever (7) to wide open position so throttle shaft lever (7) rests on feeler gauge.
    Note multimeter, no continuity should be present. If continuity is present, repeat steps 3 through 8.
10. Connect leads 315A (5) and 315B (4) to kick-down switch (3).
11. Connect throttle return spring (6) to accelerator cable bracket (9) and throttle shaft lever (7).

NOTE
Kick-down switch must be adjusted whenever it is replaced or when injection pump is replaced.
FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
  • Lower and secure hood (TM 9-2320-0280-10).
4-44. FAN CUT-OFF SWITCH REPLACEMENT (4L80-E)

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Applicable Models**
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Two lockwashers (Appendix G, Item 110)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Engine access cover removed (para. 10-15).
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10)

---

**a. Removal**

NOTE
Prior to removal, tag leads for installation.

1. Slide rod (1) forward and disconnect from fuel injection pump (2).
2. Remove rod (1) from switch (11).
3. Disconnect harness leads 315A/315B (10) from leads 315 (9).
4. Remove two nuts (13), lockwashers (12), washers (8), capscrews (7), washers (8), and switch (11) from bracket (5). Discard lockwashers (12).
5. Remove two capscrews (3), leads (4), and bracket (5) from engine (6).

**b. Installation**

1. Install switch (11) on bracket (5) with two washers (8), capscrews (7), washers (8), lockwashers and nuts (13). Do not tighten nuts (13).
2. Slide rod (1) forward and connect to fuel injection pump (2).
3. Install rod (1) on switch (11).
4. Install bracket (5) and two leads (4) on engine (6) with capscrews (3).
5. Position rod (1) at wide open throttle and position switch (11) to close. Tighten nuts (13).
6. Connect harness leads 315A/315B (10) to leads 315 (9).
FOLLOW-ON TASKS:
- Install engine access cover (para. 10-15).
- Connect battery ground cable (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10).
4-45. THROTTLE POSITION (TP) SENSOR MAINTENANCE (4L80-E)

This task covers:
- a. Removal
- b. Installation
- c. Adjustment

INITIAL SETUP:

Applicable Models
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
- General mechanic's tool kit: automotive (Appendix B, Item 1)
- Throttle lever gauge (Appendix B, Item 63)

Special Tools
- Jumper wire (Appendix B, Item 93.1)

Test Equipment
- Multimeter (Appendix B, Item 166)

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

Equipment Condition
- Hood raised and secured (TM 9-2320-280-10).
- Battery ground cable disconnected (para. 4-73).

CAUTION

The TP sensor is an electrical component and must not be soaked in any liquid cleaner or solvent, as damage may result.

1. Disconnect engine wiring harness connector (3) from TP sensor connector (4).
2. Remove two screws (7) and washers (6) securing TP sensor (5) to fuel injection pump (1).
3. Remove TP sensor (5) from fuel injection pump (1).

b. Installation

1. Ensure throttle is closed, and place TP sensor (5) on throttle shaft (2) of fuel injection pump (1).
2. Rotate TP sensor (5) counterclockwise to align screw holes in sensor with holes in injection pump (1).
3. Secure TP sensor (5) with two washers (6) and screws (7). Do not tighten screws (7).
4. Adjust TP sensor (5) (para. 4-45.c).

c. Adjustment

1. Install jumper wires between the TP sensor connector (4) and body wiring harness connection (3). (See View A).
2. Rotate the ignition switch to the RUN position.
3. Using a digital multimeter, measure the voltage between terminals A and C of TP sensor connector (4). This voltage should be between 5.8 to 4.5 volts. Multiply by 0.33 to obtain the desired TP sensor voltage, and use this figure to adjust TP sensor.

   NOTE
   For example 5.00 volts x 0.33 = 1.65 volts (±1% or 0.02 volts tolerance).
4. Install throttle lever gauge between the injection pump throttle lever stop screw (8) and the casting boss (9) on the injection pump (1). (See View B).
5. Rotate the injection pump throttle lever (10) so that the maximum speed stop screw (8) holds the gauge block against the housing boss (9).
4-45. THROTTLE POSITION (TP) SENSOR MAINTENANCE (4L80-E) (Cont’d)

NOTE
Keep the throttle lever in this position during the remainder of the adjustment steps.

6. Measure the voltage between terminals B and C of the TP sensor connector (4):
   a. If the measured voltage is within the calculated specification, as indicated in step 3, connect
      the TP sensor connector (4) to harness connector (3).
   b. If the voltage is not within the calculated specification, go to the next step.

7. Loosen the TP sensor mounting screws (7) and rotate it toward the rear of the vehicle (counter-
   clockwise direction).

8. With the voltmeter connected to terminals B and C of the TP sensor connector (4), rotate the TP
   sensor (5) slowly toward the front of the vehicle (clockwise direction) until the voltmeter indicates
   voltage as determined in step 3.

9. Tighten the TP sensor mounting screws (7) and confirm that the adjustment did not change.

10. Remove the jumper wires.

11. Remove the throttle lever gauge.

12. Connect body wiring harness connector (3) to TP sensor connector (4).

FOLLOW-ON TASK:  • Lower and secure hood (TM 9-2320-280-10)
                 • Connect battery ground cable (para. 4-73).
4-46. TRANSMISSION INPUT SPEED SENSOR (TISS) AND OUTPUT SPEED SENSOR (TOSS) MAINTENANCE (4L80-E)

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>c. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**

| M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2 |

**Manual References**

| TM 9-2320-280-10  |
| TM 9-2320-280-24P |

**Tools**

| General mechanic's tool kit: automotive (Appendix B, Item 1) |

**Equipment Conditions**

| Battery ground cable disconnected (para. 4-73) |

**Materials/Parts**

| O-ring seal (Appendix G, Item 165)  |
| Hydraulic Fluid (Appendix C, Item 27) |

### a. Removal

**NOTE**

Both the input and output speed sensors are replaced basically the same.

1. Disconnect speed sensor harness connector (3) from sensor (5).
2. Remove capscrew (7) from sensor (5) and transmission (1). Slide bracket (6) off sensor (5).
3. Remove harness clip (2) from sensor bracket (6).
4. Using a twisting motion, remove sensor (5) from transmission (1).

### b. Inspection

Inspect O-ring (4), and replace if damaged.

### c. Installation

1. Lubricate O-ring seal (4) with hydraulic fluid and install on sensor (5) if removed.
2. Install harness clip (2) on sensor bracket (6).
3. Using a twisting motion, install sensor (5) in transmission (1).
4. Slide bracket (6) over sensor (5) and install capscrew (7).
5. Install connector (3) on sensor (5).
FOLLOW-ON TASK:
- Connect battery ground cable (para. 4-73).
- Start engine (TM 9-2320-280-10) and check operation of transmission.
Section V. LIGHTING SYSTEM MAINTENANCE

### 4-47. LIGHTING SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-48</td>
<td>Service Headlight Lamp Maintenance</td>
<td>4-78</td>
</tr>
<tr>
<td>4-49</td>
<td>Service Headlight Assembly Replacement</td>
<td>4-80</td>
</tr>
<tr>
<td>4-50</td>
<td>Blackout Drive Light Assembly Replacement</td>
<td>4-82</td>
</tr>
<tr>
<td>4-51</td>
<td>Blackout Drive Light Lamp Replacement</td>
<td>4-84</td>
</tr>
<tr>
<td>4-52</td>
<td>Front Composite Light Assembly Replacement</td>
<td>4-86</td>
</tr>
<tr>
<td>4-53</td>
<td>Front Composite Light Lamp Replacement</td>
<td>4-88</td>
</tr>
<tr>
<td>4-54</td>
<td>Side Marker Light Lens and Lamp Replacement</td>
<td>4-89</td>
</tr>
<tr>
<td>4-55</td>
<td>Side Marker Light Assembly Replacement</td>
<td>4-90</td>
</tr>
<tr>
<td>4-56</td>
<td>Rear Composite Light Assembly Replacement</td>
<td>4-92</td>
</tr>
<tr>
<td>4-57</td>
<td>Rear Composite Light Lamp Replacement</td>
<td>4-94</td>
</tr>
<tr>
<td>4-58</td>
<td>Headlight Beam Selector Switch Replacement</td>
<td>4-95</td>
</tr>
<tr>
<td>4-59</td>
<td>Main Light Switch Replacement</td>
<td>4-96</td>
</tr>
<tr>
<td>4-60</td>
<td>Stoplight Switch (11663279) Maintenance</td>
<td>4-98</td>
</tr>
<tr>
<td>4-61</td>
<td>Stoplight Switch (RCSK17810) Maintenance</td>
<td>4-100</td>
</tr>
<tr>
<td>4-62</td>
<td>Directional Signal Flasher Replacement</td>
<td>4-102</td>
</tr>
<tr>
<td>4-63</td>
<td>Directional Signal Control Indicator Lamp Replacement</td>
<td>4-103</td>
</tr>
<tr>
<td>4-64</td>
<td>Directional Signal Control Maintenance</td>
<td>4-104</td>
</tr>
<tr>
<td>4-65</td>
<td>Directional Signal Control Replacement (“A2” Series Vehicles)</td>
<td>4-106</td>
</tr>
<tr>
<td>4-66</td>
<td>Directional Signal Control Canceling Ring Replacement</td>
<td>4-107</td>
</tr>
<tr>
<td>4-67</td>
<td>Service Headlight and Blackout Drive Light Electrical Connector and Grommet Replacement</td>
<td>4-108</td>
</tr>
<tr>
<td>4-68</td>
<td>Backup Light Lamp Replacement</td>
<td>4-109</td>
</tr>
<tr>
<td>4-69</td>
<td>Backup Light Assembly Replacement</td>
<td>4-110</td>
</tr>
<tr>
<td>4-70</td>
<td>Backup Light Bracket Replacement</td>
<td>4-112</td>
</tr>
</tbody>
</table>
4-48. SERVICE HEADLIGHT LAMP MAINTENANCE

This task covers:

a. Removal
b. Installation

c. Adjustment

INITIAL SETUP:

**Tools**

General mechanic’s tool kit: TM 9-2320-280-10
automotive (Appendix B, Item 1)

**Personnel Required**

One mechanic

Once assistant

**Equipment Condition**

Battery ground cable disconnected (para. 4-73)

**Manual References**

TM 9-2320-280-10
TM 9-2320-280-24P

NOTE

Prior to removal, tag leads for installation.

**a. Removal**

1. Loosen three retaining right screws (1).
2. Remove retaining ring (2).
3. Disconnect leads 17 (4), 18 (6), and 91 (7) from headlight housing (5) and remove lamp (3).

**b. Installation**

NOTE

Circuit numbers are marked on housing.

1. Connect leads 17 (4), 18 (6), and 91 (7) to headlight housing (5).
2. Install lamp (3) to housing (5) and secure with retaining ring (2) and three screws (1).
3. Connect battery ground cable (para. 4-73).
c. Adjustment

1. With vehicle loaded and tires properly inflated, place vehicle on a level floor 25 feet from, and facing perpendicular to, a wall.
2. Mark two points equal distance from the vehicle center line extended to the wall as far apart as the headlamps and one-twelfth lower than center of the headlamps to the ground.
3. Block off beam from one lamp (3).
4. Adjust other lamp (3) using two adjusting screws (8). On low beam, the center of the hot spot of the headlamp beam should be on the corresponding point on the wall.
5. Repeat steps 3 and 4 for other headlamp beam.

FOLLOW-ON TASK: Check headlight lamp for proper operation (TM 9-2320-280-10).
This task covets:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Material/Parts**
- Three lockwashers (Appendix G, Item 110)

**Manual References**

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-2801-10).

NOTE

- Prior to removal, tag leads for installation.
- Note position of circuit 91 for installation.

**a. Removal**

1. Remove three nuts (4) and lockwashers (5) from headlight assembly (1) and hood (6). Discard lockwashers (5).
2. Remove leads 17 (2), 18 (3), and 91 (7) from headlight assembly (1).
3. Remove headlight assembly (1) from hood (6).

**b. Installation**

**NOTE**
Circuit numbers are marked on headlight next to respective connector.

1. Connect leads 17 (2), 18 (3), and 91 (7) to headlight assembly (1).
2. Install headlight assembly (1) to hood (6) with three lockwashers (5) and nuts (4).
FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10).
- Check adjustment of headlight lamp (para. 4-48).
4-50. BLACKOUT DRIVE LIGHT ASSEMBLY REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Lockwasher (Appendix G, Item 108)
- Four nut and lockwasher assemblies (Appendix G, Item 144)
- Antiseize compound (Appendix C, Item 13)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

### a. Removal

1. Remove nut (5), lockwasher (6), and special washer (7) from blackout drive light (1) and hood (9). Discard lockwasher (6).

2. Disconnect lead 198 (4) from blackout drive light (1).

3. Remove blackout drive light (1) and coned mounting washer (2) from swivel bracket (11).

4. Disconnect lead 92C (3) from blackout drive light (1).

**NOTE**

Some vehicles may have screws in place of studs securing bracket and plate to hood.

5. Remove four nut and lockwasher assemblies (8), swivel bracket (11), and plate (10) from hood (9). Discard nut and lockwasher assemblies (8).

### b. Installation

**NOTE**

Some vehicles may have screws in place of studs securing bracket and plate to hood.

1. Install swivel bracket (11) to outside of hood (9), and plate (10) to inside of hood (9) with four nut and lockwasher assemblies (8). Tighten nut and lockwasher assemblies (8) to 16-30 lb-in. (1-3 N·m).

2. Connect lead 92C (3) to blackout drive light (1).

3. Place blackout drive light (1) and coned mounting washer (2) through hole in swivel bracket (11).

4. Connect lead 198 (4) to blackout drive light (1).

5. Install blackout drive light (1) on hood (9) with special washer (7), lockwasher (6), and nut (5).
FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73). 
- Lower and secure hood (TM 9-2320-280-10). 
- Check blackout drive light for proper operation (TM 9-2320-280-10).
This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- automotive (Appendix B, Item 1)

**Materials/Parts**
- Gasket (Appendix G, Item 44)
- Adhesive sealant (Appendix C, Item 10)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

---

### a. Removal

1. Loosen three retaining screws (2) from light door (6).
2. Remove light door (6) and gasket (3) from light body (5). Discard gasket (3).
3. Remove lamp (4).
4. Clean mating surface on light door (6) and light body (5). Remove sealant.

### b. Installation

1. Install lamp (4).
2. Install gasket (3) and light door (6) to light body (5) with lens hood (1) at top.
   
   **NOTE**
   To prevent moisture from entering light assembly, tighten all screws evenly.

3. Secure light door (6) by tightening three screws (2).
4. Apply thin coat of sealant to seam between light body (5) and light door (6).
FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).
- Check blackout drive light for proper operation (TM 9-2320-280-10).
4-52. FRONT COMPOSITE LIGHT ASSEMBLY REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

**Materials/Parts**
- Two lockwashers (Appendix G, Item 110)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

**NOTE**
- The procedure to remove and install right and left composite light assemblies is basically the same except left side has four screws securing close-off cover and right side has three screws. This procedure covers the left composite light.
- Prior to removal, tag leads for installation.

**a. Removal**

1. Remove four screws (1), washers (2), and close-off cover (3) from hood (4).
2. Disconnect leads 20 (5), 461 (12), and 491 (11) from hood wiring harness (6).
3. Remove two capscrews (9), lockwashers (8), ground 92 (7), bus bar (10), and composite light (13) from hood (4). Discard lockwashers (8).

**b. Installation**

1. Install composite light (13), bus bar (10), and ground 92 (7) on hood (4) with two lockwashers (8) and capscrews (9).
2. Connect lead 20 (5), 461 (12), and 491 (11) to hood wiring harness (6).
3. Install close-off cover (3) to hood (4) with four washers (2) and screws (1).
FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10).
- Check front composite light for proper operation (TM 9-2320-280-10).
4-53. FRONT COMPOSITE LIGHT LAMP REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit: TM 9-2320-280-10</td>
<td></td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1) TM 9-2320-280-24P</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing (Appendix G, Item 166)</td>
<td>Battery ground cable disconnect (para. 4-73).</td>
</tr>
<tr>
<td>Adhesive sealant (Appendix C, Item 10)</td>
<td></td>
</tr>
</tbody>
</table>

a. Removal

1. Loosen five retaining screws (1) and remove light door (2) and packing (5) from light body (3). Discard packing (5).
2. Remove lamp (4).
3. Clean mating surface on light door (2) and light body (3). Remove sealant.

b. Installation

1. Install lamp (4).

NOTE

To prevent moisture from entering light assembly, tighten all screws evenly.

2. Install packing (5) and light door (2) on light body (3) with five retaining screws (1).
3. Apply thin coat of sealant to seam between light body (3) and light door (2).

FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Check front composite light for-proper operation (TM 9-2320-280-10)
This task covers:

a. Lens and Lamp Removal

b. Lens and Lamp Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:
automotive (Appendix B, Item 1)

**Equipment Condition**
Battery ground cable disconnect (para. 4-73)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Lens and Lamp Removal**

1. Remove two screws (5), door (4) and lens (3) from light body (1).
2. Remove lamp (2).

**b. Lens and Lamp Installation**

1. Install lamp (4).
2. Install lens (3) and door (4) on light body (1) with two screws (5).

---

**FOLLOW-ON TASKS:**
- Connect battery ground cable (para. 4-73).
- Check side marker light for proper operation (TM 9-2320-280-10)
4-55. SIDE MARKER LIGHT ASSEMBLY REPLACEMENT

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1) TM 9-2320-280-24P

**Materials/Parts**
- Four locknuts (Appendix G, Item 60)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnect [para. 4-73].
- Hood raised and secured (front side marker only) [TM 9-2320-280-10].

**NOTE**

Procedures to remove and install the front and rear side marker light assemblies are basically the same. This procedure is for the left front side marker.

**a. Removal**

1. Remove four screws (1), washers (2), and close-off cover (3) from hood (4).
2. Disconnect lead 489 (14) from hood wiring harness (15).
3. Remove two screws (13), lens (11), and door (12) from side marker light (9).
4. Remove four screws (10), washers (6), locknuts (5), ground 92 (7), gasket (8), and side marker light (9) from hood (4). Discard locknuts (5).

**b. Installation**

1. Install gasket (8), side marker light (9), and ground 92 (7) on hood (4) with four screws (10), washers (6), and locknuts (5) ensuring ground 92 (7) is under washers (6).
2. Install lens (11) and door (12) on side marker light (9) with two screws (13).
3. Connect lead 489 (14) to hood wiring harness (15).
4. Install close-off cover (3) to hood (4) with four washers (2) and screws (1).
FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Lower and secure hood (front side marker only) [TM 9-2320-280-10].
- Check side marker light for proper operation [TM 9-2320-280-10].
4-56. REAR COMPOSITE LIGHT ASSEMBLY REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td><a href="TM_9-2320-280-10">TM 9-2320-280-10</a></td>
</tr>
<tr>
<td></td>
<td><a href="TM_9-2320-280-24P">TM 9-2320-280-24P</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four lockwashers (Appendix G, Item 111)</td>
<td>Battery ground cable disconnect (para. 4-73).</td>
</tr>
</tbody>
</table>

NOTE
Prior to removal, tag leads for installation.

**a. Removal**

1. Remove two capscrews (3), lockwashers (4), ground 95B (5), and ground strap (6) from housing (17). Discard lockwashers (4).
2. Remove two capscrews (15) and lockwashers (16) and pull shield (1) away from “D” beam (14). Discard lockwashers (16).
3. Remove screw (2), nut (12) and clamp (11) from shield (1).
4. Disconnect leads 21 (7), 23 (8), 24 (9), and 22-461 (10) from body harness (13).
5. Remove composite light (18) from housing (17).

**b. Installation**

1. Install composite light (18) on housing (17).
2. Connect leads 21 (7), 23 (8), 24 (9), and 22-461 (10) to body harness (13).
3. Install clamp (11) on shield (1) with screw (2) and nut (12).
4. Install shield (1) on “D” beam (14) with two capscrews (15) and lockwashers (16).
5. Install ground strap (6) and ground 95B (5) on housing (17) with two lockwashers (4) and capscrews (3).
4-56. REAR COMPOSITE LIGHT ASSEMBLY REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Check rear composite light for proper operation (TM 9-2320-280-10).
4-57. REAR COMPOSITE LIGHT LAMP REPLACEMENT

This task covers:

a. Removal  b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit: TM 9-2320-280-10
automotive (Appendix B, Item 1)

Materials/Parts
Packing (Appendix G, Item 167)
Adhesive sealant (Appendix C, Item 10)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
Battery ground cable disconnect (para. 4-73).

a. Removal

1. Loosen six retaining screws (3) and remove composite light door (4) and packing (5) from composite light (1). Discard packing (5).
2. Remove lamp (2).
3. Clean mating surface on light door (4) and composite light (1). Remove sealant.

b. Installation

1. Install lamp (2).

NOTE
To prevent moisture from entering light assembly, tighten all screws evenly.

2. Install packing (5) and composite light door (4) on composite light (1) with six screws (3).
3. Apply a thin coat of sealant to seam between composite light (1) and composite light door (4).

FOLLOW-ON TASKS:
• Connect battery ground cable (para. 4-73).
• Check front composite light for proper operation (TM 9-2320-280-10).
4-58. HEADLIGHT BEAM SELECTOR SWITCH REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Tools
- General mechanic's tool kit: automotive (Appendix B, Item 1)

Material/Parts
- Three lockwashers (Appendix G, Item 112)

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnect (para. 4-73).

a. Removal

NOTE
Prior to removal, tag leads for installation.

1. Remove three screws (7), lockwashers (6), switch (3) and shield (5) from bracket (4). Discard lockwashers (6).
2. Disconnect leads 16A (2), 17A (1) and 18A (8) from switch (3).

b. Installation

1. Connect leads 16A (2), 17A (1), and 18A (8) to switch (3).
2. Install switch (3) and shield (5) to bracket (4) with three lockwashers (6) and screws (7).

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Check headlight beam selection switch for proper operation (TM 9-2320-280-10).
4-59. MAIN LIGHT SWITCH REPLACEMENT

This task covers:

| a. Removal | b. Installation |

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1) TM 9-2320-280-24P

**Materials/Parts**
- Lockwashers (Appendix G, Item 108)

**Equipment Condition**
- Battery ground cable disconnect (para. 4-73)

### a. Removal

1. Remove cannon plug (1) from main light switch (8).
2. Remove screw (6), lockwasher (5), top single position lever (4) and washer (7) from switch (8).
   
   **NOTE**
   Lower right lever must be raised to remove screw.

3. Remove four screws (3) from switch (8) and instrument panel (2).
4. Remove switch (8) from behind instrument panel (2).

### b. Installation

1. With single position lever shaft (9) at top of switch (8), install switch (8) into hole in instrument panel (2) with four screws (3).

2. Install washer (7) and top single position lever (4) to switch (8) with lockwasher (5) and screw (6).

3. Install cannon plug (1) to rear of switch (8).
FOLLOW ON TASKS:
- Connect battery ground cable (para. 4-73).
- Check main light switch for proper operation (TM 9-2320-280-10).
4-60. STOPLIGHT SWITCH (11663279) MAINTENANCE

This task covers:
  a. Removal
  b. Installation
  c. Adjustment

INITIAL SETUP:

Applicable Models
All vehicles except M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
General mechanic's tool kit:
  automotive (Appendix B, Item 1)

Test Equipment
Multimeter (Appendix B, Item 166)

Materials/Parts
Pushnut (Appendix G, Item 170)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
Battery ground cable disconnected (para. 4-73).

NOTE
Prior to removal, tag leads for installation.

a. Removal
1. Remove pushnut (10) from rod connecting switch arm (5) and brake pedal arm (9). Discard pushnut (10).
2. Remove two nuts (6), washers (1), capscrews (2), washers (1), and stoplight switch (3) from support (4).
3. Disconnect leads 75A (7) and 75B (8) from stoplight switch (3).

b. Installation
1. Install stoplight switch (3) on support (4) with two washers (1), capscrews (2), washers (1), and nuts (6).
2. Install switch arm (5) into brake pedal arm (9) with pushnut (10).
3. Connect leads 75B (8) and 75A (7) to stoplight switch (3).
4. Adjust stoplight switch (3) (para. 4-60c).

C. Adjustment
1. Disconnect leads 75A (7) and 75B (8) from stoplight switch (3) and connect multimeter to leads on stoplight switch (3) to check continuity. Multimeter should indicate open. Depress brake pedal, multimeter should indicate continuity within approximately 1/2 in. (12 mm) of pedal travel. If not, go to step 2.
2. Loosen two capscrews (2) to allow movement of stoplight switch (3).
3. Position stoplight switch (3) so that continuity is present when installed. Slide stoplight switch forward until no continuity (open) is indicated (approximately 1/8 to 1/4 in. (3 to 6 mm)).
4. Tighten two capscrews (2).
5. Connect leads 75A (7) and 75B (8) to stoplight switch (3).
6. Connect battery ground cable (para. 4-73).
7. Turn selector lever to service drive; stoplights should not illuminate. Depress brake pedal; stoplights should illuminate within 1/2 in. (12 mm) of pedal travel.
4-61. STOPLIGHT SWITCH (RCSK17810) MAINTENANCE

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Material/Parts
Two locknuts (Appendix G, Item 58)
Two locknuts (Appendix G, Item 62)
Sealing compound (Appendix C, Item 45)

Tools
General mechanic’s tool kit: automotive (Appendix B, Item 1)

Equipment Condition
Battery ground cables disconnected (para. 4-73)

Test Equipment
Multimeter (Appendix B, Item 166)

NOTE
Prior to removal, tag leads for installation.

a. Removal

1. Remove locknuts (10) and (12), capscrews (8) and (13), and washer (9) from stoplight switch arm (11) and brace (7). Discard locknuts (10) and (12).
2. Disconnect leads 75A (16), 75B (15), and connector 810N810B (14) from stoplight switch leads (1).
3. Remove two locknuts (5), washers (3), capscrews (4), washers (3), and stoplight switch (2) from mounting bracket (6). Discard locknuts (5).

b. Installation

1. Install stoplight switch (2) on mounting bracket (6) with two washers (3), capscrews (4), washers (3), and locknuts (5).
2. Connect leads 75A (16), 75B (15), and connector 810A/810B (14) to stoplight switch leads (1).
3. Install stoplight switch arm (11) on brace (7) with washer (9), capscrews (8) and (13), and locknuts (10) and (12).

c. Adjustment

1. Disconnect leads 75A (16), 75B (15), and connector 810A/810B (14) from stoplight switch leads (1) and connect multimeter to leads on stoplight switch (2) to check continuity. Multimeter should indicate open.
2. Depress brake pedal; multimeter should indicate continuity within approximately 1/4 in. (6 mm) of pedal travel. If not, go to step 2.
3. Loosen two capscrews (4) to allow movement of stoplight switch (2).
4. Position stoplight switch (2) so that continuity is present when installed. Slide stoplight switch forward until no continuity (open) is indicated (approximately 1/4 in. (6 mm)).
5. Tighten two capscrews (4).
6. Connect leads 75B (16), 75A (15), and connector 810N810B (14) to stoplight switch leads (1).
7. Connect battery ground cable (para. 4-73).
8. Turn selector lever to service drive stoplights should not illuminate. Depress brake pedal; stoplights should illuminate within 1/4 in. (6 mm) of pedal travel.
4-61. STOP LIGHT SWITCH (RCSK17810) MAINTENANCE (Cont’d)
4-62. DIRECTIONAL SIGNAL FLASHER REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Two lockwashers (Appendix G, Item 112)
- Silicone compound (Appendix C, Item 48)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

NOTE
The flasher is located under the instrument panel to the left of the steering column.

**a. Removal**

1. Remove cannon plug (1) from main light switch (2).
2. Remove connector plug (7) from flasher (5).
3. Remove two nuts (3), lockwashers (4), screws (6), and flasher (5) from instrument panel (8). Discard lockwashers (4).

**b. Installation**

1. Install flasher (5) on instrument panel (8) with two screws (6), lockwashers (4) and nuts (3).
2. Apply silicone compound to threads of connector plug (7). Install connector plug (7) on flasher (5).
3. Connect cannon plug (1) to main light switch (2).

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Check directional signal flasher for proper operation (TM 9-2320-280-10).
4-63. DIRECTIONAL SIGNAL CONTROL INDICATOR LAMP REPLACEMENT

This task covers:
   a. Removal
   b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:
   automotive (Appendix B, Item 1)

**Equipment Condition**
Battery ground cable disconnected \[(para. 4-73)\].

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Removal**

1. Push turn signal indicator lever (1) in the four-way flasher position [TM 9-2320-280-10].
2. Remove light lens (3) from directional control unit (4).
3. Remove lamp (2) from directional control unit (4).

---

**b. Installation**

1. Install lamp (2) into directional control unit (4).
2. Install light lens (3) into directional control unit (4).

---

**FOLLOW-ON TASKS:**
- Connect battery ground cable \[(para. 4-73)\].
- Check directional signal control lamp for proper operation [TM 9-2320-280-10].
4-64. DIRECTIONAL SIGNAL CONTROL MAINTENANCE

This task covers:

a. Removal  
b. Cleaning  
c. Installation

INITIAL SETUP:

**Applicable Models**
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
Battery ground cable disconnected (para. 4-73).

**Materials/Parts**
Spray lubricant cleaner (Appendix C, Item 16)

---

### a. Removal

1. Loosen connector nut (4) and remove connector plug (5) from directional signal control (3).
2. Remove four screws (2) and directional signal control (3) from clamp (1).

### b. Cleaning

**NOTE**
It is recommended that you clean the signal control before replacing it. After you clean it, install it and try it again before replacing it.

1. Remove four screws (7) and signal arm plate (6) from signal control (3).

**CAUTION**
Do not sand contacts with sandpaper or an emery board which removes the protective coating that fights corrosion. Damage to the switch will result.

**NOTE**
The cleaner has an alcohol base that dries quickly.

2. Spray the signal control contacts (8) with spray lubricant cleaner.
3. Install signal arm plate (6) on signal control (3) with four screws (7).

### c. Installation

1. Install directional signal control (3) on clamp (1) with four screws (2).
2. Install connector plug (5) on directional signal control (3) and tighten connector nut (4).
4-64. DIRECTIONAL SIGNAL CONTROL MAINTENANCE (Cont’d)

FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Check directional signal control for proper operation (TM 9-2320-280-10)
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Applicable Models**

M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**

General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**

TM 9-2320-280-10

**Equipment Condition**

Battery ground cables disconnected (para. 4-73).

**a. Removal**

1. Loosen connector nut (6) and remove connector plug (7) from directional signal control (4).
2. Remove four screws (2) and directional signal control (4) from bracket (1).

**b. Installation**

1. Place handle (5) in hazard position.
2. Install directional signal control (4) on bracket (1) with four screws (2). Do not tighten screws (2).
3. Rotate steering wheel ensuring pin (3) mates with directional signal control (4) and tighten screws (2).
4. Install connector plug (7) on directional signal control (4) and tighten connector nut (6).

FOLLOW-ON TASKS:

- Connect battery ground cables (para. 4-73).
- Check directional signal control lamp for proper operation (TM 9-2320-280-10).
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-24P

a. Removal

Remove three screws (4) and canceling ring (2) from steering wheel (1).

b. Installation

WARNING
Canceling pin must be positioned 90° ± 5° from turn signal switch when vehicle front wheels are directed straight ahead. Failure to position pin properly could prevent proper rotation of steering wheel causing injury or damage to equipment.

1. Install canceling ring (2) on steering wheel (1) with pin (3) 90° ± 5° from turn signal switch (6).
2. Rotate steering wheel ensuring pin (3) mates with directional signal control (6) and secure cancelling ring (2) on steering wheel (1) with three screws (4).
3. Cut gauge posts (5) off within 1/4 in. (6 mm) of base.

FOLLOW-ON TASK: Check directional signal control for proper operation (TM 9-2320-280-10)
This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Service headlight lamp removed (para. 4-48).
- automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Service headlight lamp removed (para. 4-48).

**NOTE**

The procedure to remove and install the connector and grommet from service headlight and blackout drive light is basically the same. The following procedure is for the service headlight.

**a. Removal**

Remove connector (3) from grommet (1) and remove grommet (1) from headlight housing (2).

**b. Installation**

Install grommet (1) to headlight housing (2) and install connector (3) to grommet (1).

FOLLOW-ON TASK: Install service headlight lamp (para. 4-48).
4-68. BACKUP LIGHT LAMP REPLACEMENT

This task covers:

a. Removal  b. Installation

INITIAL SETUP:

Applicable Models
M1035, M1035A1, M1035A2

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Materials Parts
Gasket (Appendix G, Item 45)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
Battery ground cable disconnected (para. 4-73).

a. Removal

1. Remove two screws (5) bezel (4), lens (3), and gasket (2) from housing (1). Discard gasket (2).
2. Remove lamp (6) from housing (1).

b. Installation

1. Install lamp (6) in housing (1).
2. Install gasket (2), lens (3), and bezel (4) on housing (1 with two screws (5).

FOLLOW-ON TASKS:
• Connect battery ground cable (para. 4-73).
• Check backup light for proper operation (TM 9-2320-280-10)
4-69. BACKUP LIGHT ASSEMBLY REPLACEMENT

This task covers:

- **a. Removal**
- **b. Installation**

**INITIAL SETUP:**

**Applicable Models**
M1035, M1035A1, M1035A2

**Tools**
General mechanic's tool kit:
autovive (Appendix B, Item 1)

**Materials Parts**
Two lockwashers (Appendix G, Item 114)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
Battery ground cable disconnected [para. 4-73]

---

**a. Removal**

1. Disconnect lead 467F (1) from lamp assembly (3).
2. Remove two nuts (6), lockwashers (5), lead 95H (4), and lamp assembly (3) from bracket (2). Discard lockwashers (5).

**b. Installation**

1. Install lamp assembly (3) and lead 95H (4) on bracket (2) with two lockwashers (5) and nuts (6).
2. Connect lead 467F (1) to lamp assembly (3).
FOLLOW-ON TASKS:

- Connect battery ground cable [para. 4-73].
- Check backup light for proper operation [(TM 9-2320-280-10)].
This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
M1035, M1035A1, M1035A2

**Tools**
- General mechanic’s tool kit: Backup light assembly removed (para. 4-69).
- Automotive (Appendix B, Item 1)

**Materials Parts**
- Two lockwashers (Appendix G, Item 108)

---

**a. Removal**

Remove two nuts (5), lockwashers (4), washers (3), capscrews (1) and bracket (6) from “D” beam (2). Discard lockwashers (4).

**b. Installation**

Install bracket (6) on “D” beam (2) with two capscrews (1), washers (3), lockwashers (4), and nuts (5).

FOLLOW-ON TASK: Install backup light assembly (para. 4-69).
## Section VI. BATTERY SYSTEM MAINTENANCE

### 4-71. BATTERY SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-72</td>
<td>Battery Cable Terminal Clamp Replacement</td>
<td>4-114</td>
</tr>
<tr>
<td>4-73</td>
<td>Battery Cable Maintenance</td>
<td>4-116</td>
</tr>
<tr>
<td>4-74</td>
<td>Power Feed Through Stud Replacement</td>
<td>4-122</td>
</tr>
<tr>
<td>4-75</td>
<td>12 Volt Alternator Cable Replacement</td>
<td>4-124</td>
</tr>
<tr>
<td>4-76</td>
<td>Buss Bar Replacement</td>
<td>4-127</td>
</tr>
<tr>
<td>4-77</td>
<td>Starter Power Cables Replacement</td>
<td>4-128</td>
</tr>
<tr>
<td>4-78</td>
<td>Battery Holddown Replacement</td>
<td>4-132</td>
</tr>
<tr>
<td>4-79</td>
<td>Battery Replacement and Servicing</td>
<td>4-134</td>
</tr>
<tr>
<td>4-80</td>
<td>Battery Tray Maintenance</td>
<td>4-136</td>
</tr>
<tr>
<td>4-81</td>
<td>Slave Receptacle and Cable Replacement</td>
<td>4-138</td>
</tr>
<tr>
<td>4-82</td>
<td>Winch Power Cable Replacement</td>
<td>4-142</td>
</tr>
<tr>
<td>4-83</td>
<td>Shunt Replacement</td>
<td>4-144</td>
</tr>
<tr>
<td>4-84</td>
<td>Hood Wiring Harness Replacement</td>
<td>4-146</td>
</tr>
<tr>
<td>4-85</td>
<td>Wiring Harness Connector Repair</td>
<td>4-154</td>
</tr>
</tbody>
</table>

4-113
4-72. BATTERY CABLE TERMINAL CLAMP REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Lubricating oil (Appendix C, Item 33)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery box cover removed (para. 10-35).

**General Safety Instructions**
- Wear safety goggles and rubber gloves and do not smoke when performing battery maintenance.
- Remove all jewelry.
- When removing battery cable clamps, disconnect ground cable first.

**WARNING**
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing battery maintenance. Severe injury will result if acid contacts eyes or skin.
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery terminal, a direct short can result, causing instant heating of tools, severe injury to personnel, or damage to equipment.
- When removing battery cable clamps, disconnect ground cable first. Do not allow tools to come in contact with vehicle when disconnecting cable clamps. A direct short can result, causing instant heating of tools, tool damage, battery damage, or battery explosion.

**a. Removal**

NOTE

The procedure for removing and installing all four battery cable terminal clamps are basically the same. This procedure covers one battery cable terminal clamp.

1. Remove cap (4) from battery terminal boot (8).
2. Clean lubricating oil from battery terminal boot (8).
3. Loosen screw (6), nut (7), and remove terminal clamp (3) from terminal post (9).
4. Remove screw (2) and nut (5) from cable (1) and terminal clamp (3).
5. Remove cable (1) from terminal clamp (3) and battery terminal boot (8).
6. Remove terminal clamp (3) from battery terminal boot (8).

**b. Installation**

1. Push battery terminal boot (8) onto cable (1).
2. Place terminal clamp (3) into battery terminal boot (8) and install cable (1) on terminal clamp (3) with screw (2) and nut (5).
3. Apply lubricating oil to battery post pad (10). Do not allow lubricating oil to coat terminal post (9).
4. Secure terminal clamp (3) to terminal post (9) by tightening screw (6) and nut (7).
5. Apply lubricating oil to terminal clamp (3).
6. Install cap (4) to battery terminal boot (8).
FOLLOW-ON TASK: Install battery box cover (para. 10-35).
4-73. BATTERY CABLE MAINTENANCE

This task covers:

- a. Cleaning and Inspection
- b. Ground Cables Disconnection
- c. Ground Cables Reconnection
- d. Ground Cable Removal
- e. Ground Cable Installation
- f. Interconnecting Cable Removal
- g. Interconnecting Cable Installation
- h. Positive Cable Removal
- i. Positive Cable Installation

INITIAL SETUP:

**Tools**

General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**

- Two lockwashers (Appendix G, Item 115)
- Sodium bicarbonate (Appendix C, Item 49)
- Lubricating oil (Appendix C, Item 33)
- Silicone compound (Appendix C, Item 48)

**Manual References**

TM 9-2320-280-20-2

**Equipment Condition**

Battery box cover removed (para. 10-35).

**General Safety Instructions**

- Wear safety goggles and rubber gloves and do not smoke when performing battery maintenance.
- Remove all jewelry.
- When removing battery cables, disconnect ground cable first. Ensure all switches are in OFF position before disconnecting.

**WARNING**

- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing battery maintenance. Severe injury will result if acid contacts eyes or skin.
- Remove all jewelry such as rings, dogtags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery terminal, a direct short can result, causing instant heating of tools, severe injury to personnel, or damage to equipment.
- Always disconnect both ground cables when performing battery maintenance on the “A2” series vehicles. The “A2” series vehicles have a 12 volt cable connected to the positive terminal, which keeps the electrical system charged when only one ground cable is disconnected. Failure to do this may cause injury to personnel, or damage to equipment.
- When removing battery cable clamps, disconnect both ground cables first. Ensure all switches are in OFF position before disconnecting. Do not allow tools to come in contact with vehicle when disconnecting cable clamps. A direct short can result, causing instant heating of tools, tool damage, battery damage, or battery explosion.

**NOTE**

- Secure all cables to head side of mounting capscrews.
- Use this procedure for disconnecting all battery cables.
- The following procedure covers disconnection and connection of the ground cable.

**a. Cleaning and Inspection**

1. Inspect cables (1), (2), and (11) for corrosion and cracks.
2. Remove defective cables (1), (2), and (11), or clean with wire brush and baking soda solution.
4-73. BATTERY CABLE MAINTENANCE (Cont'd)

b. Ground Cables Disconnection

NOTE
Perform steps 1 through 6 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform step 7 for all other vehicles.

1. Remove nut (12), leads (13) and (14), screw (16), and ground cable (1) from terminal clamp (15).
2. Remove cap (5) from battery terminal boot (8).
3. Clean lubricating oil from battery terminal boot (8).
4. Loosen nut (7) and remove terminal clamp (4) from terminal (9).
5. Remove nut (3) and screw (6) from cable (2) and terminal clamp (4).
6. Remove cable (2) from terminal clamp (4) and battery terminal boot (8).
7. Remove nut (12), screw (16), and ground cable (1) from terminal clamp (15).

c. Ground Cables Reconnection

NOTE
Perform steps 1 through 6 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform step 7 for all other vehicles.

1. Push battery terminal boot (8) onto cable (2) and secure cable (2) to terminal clamp (4) with screw (6) and nut (3).
2. Apply a 1/16 in. (1.6mm) bead of lubricating oil to battery post pad (10). Do not allow oil to coat terminal post (9).
3. Install terminal clamp (4) to terminal (9) and tighten nut (7).
4. Fill battery terminal boot (8) with lubricating oil.
5. Install cap (5) to battery terminal boot (8).
6. Install ground cable (1) and leads (14) and (13) on terminal clamp (15) with screw (16) and nut (12).
7. Install ground cable (1) on terminal clamp (15) with screw (16) and nut (12).
d. Ground Cable Removal

NOTE
Perform step 1 for M997A2, M1025A22, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform step 2 for all other vehicles.

1. Remove nut (5), leads (6) and (7), screw (9), and ground cable (4) from terminal clamp (8).
2. Remove nut (5), screw (9), and ground cable (4) from terminal clamp.
3. Remove capscrew (3), lockwasher (2), and ground cable (4) from shunt (1).

e. Ground Cable Installation

1. Position ground cable (4) in approximate mounting location and install ground cable (4) to shunt (1) with lockwasher (2) and capscrew (3).

NOTE
Perform step 2 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform step 3 for all other vehicles.

2. Install ground cable (4) on terminal clamp (8) with screw (9), leads (7) and (6), and nut (5).
3. Install ground cable (4) on terminal clamp (8) with screw (9) and nut (5).

f. Interconnecting Cable Removal

NOTE
All vehicles except M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles have two caps and boots.

1. Remove cap (19) from battery terminal boot (20).
2. Clean lubricating oil from battery terminal boot (20).
4-73. BATTERY CABLE MAINTENANCE (Cont’d)

NOTE
Perform steps 3 through 5 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform steps 6 and 7 for all other vehicles.

3. Loosen two nuts (12) and remove terminal clamps (17) from terminals (11).
4. Remove nut (18), capscrew (14), cable (13), leads (15) and cable (16) from terminal clamp (17).
5. Remove nut (18) and screw (14) from cable (16) and terminal clamps (17).
6. Loosen two nuts (12) and remove terminal clamps (17) from terminals (11).
7. Remove two screws (14), nuts (18), and cable (16) from terminal clamps (17).
8. Remove cable (16) from terminal clamps (17) and battery terminal boot (20).

g. Interconnecting Cable Installation

NOTE
All vehicles except M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles have two caps and boots.

1. Push battery terminal boot (20) onto cable (16) and install cable (16) on terminal clamp (17) with screw (14) and nut (18).
2. Apply a 1/16 in. (1.6mm) bead of lubricating oil to battery post pads (10). Do not allow oil to coat terminal posts (11).

NOTE
Perform steps 3 and 4 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform steps 5 and 6 for all other vehicles.

3. Install cable (16), leads (15), and cable (13) to terminal clamp (17) with screw (14) and nut (18).
4. Install two terminal clamps (17) on terminals (11) and tighten nuts (12).
5. Install cable (16) on terminal clamp (17) with capscrew (14) and nut (18).
6. Install two terminal clamps (17) on terminal posts (11) and tighten nuts (12).
7. Fill battery terminal boot (20) with lubricating oil.
8. Install cap (19) to battery terminal boot (20).
4-73. BATTERY CABLE MAINTENANCE (Cont’d)

h. Positive Cable Removal

1. Disconnect ground cable (para. 4-73.b).
2. Remove cap (8) from battery terminal boot (12).
3. Clean lubricating oil from battery terminal boot (12).
4. Loosen nut (11) and remove terminal clamp (7) from terminal (14).
5. Remove screw (6), nut (9), and cable (2) from terminal clamp (7) and battery terminal boot (12).

NOTE

Perform step 6 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform step 7 for all other vehicles.

6. Remove nut (5), lockwasher (4), washer (3), and battery positive cable (2) from buss bar (1). Discard lockwasher (4).
7. Remove nut (5), lockwasher (4), washer (3), slave receptacle positive cable (15), and battery positive cable (2) from power stud (16). Discard lockwasher (4).

i. Positive Cable Installation

NOTE

Perform step 1 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform step 2 for all other vehicles.

1. Install positive battery cable (2) on buss bar (1) with washer (3), lockwasher (4), and nut (5). Apply silicone compound on cable (15) so that all exposed metallic surfaces are coated.
2. Install positive battery cable (2) and slave receptacle positive cable (15) on power stud (16) with washer (3), lockwasher (4), and nut (5). Tighten nut (5) to 26 lb-ft (35 N·m).
3. Push battery terminal boot (12) onto cable (2) and install cable (2) on terminal clamp (7) with screw (6) and nut (9).
4. Apply a 1/16 in. (1.6mm) bead of lubricating oil to battery post pad (13). Do not allow oil to coat terminal post (14).
5. Secure terminal clamp (7) to terminal post (14) and tighten nut (11).
6. Fill battery terminal boot (12) with lubricating oil.
7. Install cap (8) on battery terminal boot (12).
8. Connect battery ground cable (para. 4-73.c).
FOLLOW-ON TASK: Install battery box cover (para. 10-35).
4-74. POWER FEED THROUGH STUD REPLACEMENT

This task covers:
   a. Removal
   b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Two lockwashers (Appendix G, Item 115)
- Locknut (Appendix G, Item 61)
- Silicone compound (Appendix C, Item 48)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Buss bar removed (para. 4-76).
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 only.

### a. Removal

1. Remove nut (1), lockwasher (2), washer (3), leads 6B/6C (4), and starter cable (5), from stud (8).
   Discard lockwasher (2).

   **NOTE**
   Step 2 applies to all vehicles except M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2.

2. Remove nut (12), lockwasher (11), washer (10), and battery cables (9) from stud (8). Discard lockwasher (11).

3. Remove locknut (6) and stud (8) from battery box (7).

### b. Installation

1. Install stud (8) on battery box (7) with locknut (6).

   **NOTE**
   Step 2 applies to all vehicles except M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles.

2. Connect battery cables (9) to stud (8) with washer (10), lockwasher (11), and nut (12). Tighten nut (12) to 26 lb-ft (35 N·m).

3. Install starter cable (5) and leads 6B/6C (4) to stud (8) with washer (3), lockwasher (2), and nut (1). Tighten nut (1) to 18-22 lb-ft (24-30 N·m).

4. Apply silicone compound to stud (8), cables (9) and (5), and leads (4), so that all exposed metallic surfaces are coated.
FOLLOW-ON TASK: • Install buss bar (para. 4-76).
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2.
• Connect battery ground cables (para. 4-73).
4-75. 12 VOLT ALTERNATOR CABLE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-10  
TM 9-2320-280-24P

Tools
General mechanic's tool kit: Battery ground cables disconnected (para. 4-73).

Equipment Condition
• Battery ground cables disconnected (para. 4-73).
• Hood raised and secured (TM 9-2320-280-10).
• Engine access cover removed (para. 10-15).

Material/Parts
Two tiedown straps (Appendix G, Item 243)

NOTE
Prior to removal, tag leads for installation.

a. Removal

1. Slide back rubber boot (9) and remove nut (8), washer (7), and cable (1) from regulator (6).
2. Remove capscrew (3) securing clamp (4) and cable (1) to bracket (2).
3. Remove two tiedown straps (10) from cable (1). Discard tiedown straps (10).
4. Remove nut (15), screw (11), cable (1), leads (12), and cable (13) from terminal clamp (14) and remove cable (1) from battery box (16) and engine (5).
4-75. 12 VOLT ALTERNATOR CABLE REPLACEMENT (Cont'd)
b. Installation

1. Position cable (1) in approximate mounting location on engine (5) and through hole in battery box (16).
2. Install cable (13), leads (12), and cable (1) on terminal clamp (14) with screw (11) and nut (15).
3. Install two tiedown straps (10) on cable (1).
4. Install cable (1) and clamp (4) on bracket (2) with capscrew (3).
5. Install cable (1) on regulator (6) with washer (7) and nut (8). Tighten nut (8) to 18-22 lb-in. (2.0-2.5 N·m). Slide rubber boot (9) over nut (8).

FOLLOW-ON TASKS:
- Lower and secure hood [TM 9-2320-280-10]
- Connect battery ground cables (para. 4-73).
- Install engine access cover (para. 10-15).
This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Materials/Parts
Six lockwashers (Appendix G, Item 115)
Silicone compound (Appendix C, Item 48)

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Equipment Condition
Battery removed (para. 4-79).

a. Removal

1. Remove five nuts (9), lockwashers (8), and washers (7), engine harness cable (6), alternator cable (10), battery cable (11), umbilical power cable (12) (M1097A2 vehicles only), and slave receptacle cable (13) from buss bar (2). Discard lockwashers (8).

2. Remove nut (5), lockwasher (4), washer (3), and buss bar (2) from power feed through stud (1). Discard lockwasher (4).

b. Installation

1. Install buss bar (2) to power feed through stud (1) with washer (3), lockwasher (4), and nut (5).

2. Install engine harness cable (6), alternator cable (10), battery cable (11), umbilical power cable (12) (M1097A2 vehicles only), and slave receptacle cable (13) on buss bar (2) with five washers (7), lockwashers (8), and nuts (9).

3. Apply silicone compound to buss bar (2), so that all exposed metallic surfaces are coated.

FOLLOW-ON TASK: Install battery (para. 4-79).
4-77. STARTER POWER CABLES REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Four lockwashers (Appendix G, Item 115)
- Nut and lockwasher assembly (Appendix G, Item 144)
- Tiedown strap (Appendix G, Item 239)
- Adhesive sealant (Appendix C, Item 10)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)
- Raise and secure hood (TM 9-2320-280-10)

**NOTE**
Prior to removal, tag all leads for installation.

**a. Removal**

1. Slide back rubber boot (1) on positive cable (3) for access to nut (8). Remove nut (8), lockwasher (9), washer (10), lead 6B/6C (11), and positive cable (3) from power stud (2). Discard lockwasher (9).
2. Remove nut (7), lockwasher (6), and ground cable (5) from ground stud (4). Discard lockwasher (6).
3. Remove screw (30), two clamps (32), positive cable (3), and ground cable (5) from starter (23) and remove clamps (32) from cables (3) and (5).
4. Remove nut (33), lockwasher (34), ground cable (5), lead 7C (36) (winch vehicles only), and STE/ICE-R lead 3C (35) from negative post (37) on starter (23). Discard lockwasher (34).

**NOTE**
Perform step 5 for all vehicles except “A2” vehicle series vehicles.
Perform steps 6 and 7 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

5. Remove nut (28), lockwasher (27), positive cable (3), positive accessory cable (26) (vehicles with winch or 200 amp alternator only), and STE/ICE-R leads 81A (25) and 81B (43) from positive post (24). Discard lockwasher (27)
6. Remove nut (28), lockwasher (27) and lead 81B (43) from positive post (24). Discard lockwasher (27).
7. Remove two nuts (44), lockwashers (45), washers (46), positive cable (48), and positive accessory cable (47) (vehicles with winch or 200 amp alternator only) from buss bar (49). Discard lockwasher (45).
8. Remove screw (38), clip (39), and leads 74A (41) and 74B (40) from solenoid (42).

**NOTE**

9. Remove nut (18), lockwasher (17), clamp (15), and compressor harness (16) from capscrew (14). Discard lockwasher (17).
10. Disconnect compressor harness lead (13) from compressor leads (12).
11. Remove nut and lockwasher assembly (20), clamp (19), and compressor harness (16) from cable bracket screw (21). Discard nut and lockwasher assembly (20).
12. Remove tiedown strap (22) and compressor harness (16) from alternator cable (26) and lead 81A (25). Discard tiedown strap (22).

13. Remove coil (31), positive cable (3), and ground cable (5) slowly while routing STE/ICE-R harness (29) and compressor harness (16) (M997 and M997A1 vehicles only) through coil (31).
4-77. STARTER POWER CABLES REPLACEMENT (Cont’d)

b. Installation

1. Install coil (16) on positive cable (11) and grommet cable (20). Route STE/ICE-R harness (14) and compressor harness (1) (M997 and M997A1 vehicles only) through coil (16), and place cables (11) and (20), STE/ICE-R harness (14), and compressor harness (1) (M997 and M997A1 vehicles only) in approximate mounting locations.

2. Install positive cable (11) and lead 6B/6C (37) on power stud (30) with washer (36), lockwasher (35), and nut (34). Tighten nut (34) to 26 lb-ft (35 N-m). Slide rubber boot (29) over power stud (30).

3. Install ground cable (20) on ground stud (31) with lockwasher (32) and nut (33). Tighten nut (33) to 75 lb-ft (102 N-m).

NOTE
Perform step 4 for all vehicles except “A2” series vehicles. Perform steps 5 and 6 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

4. Install STE/ICE-R leads 81B (8) and 81A (9), positive accessory cable (10), and positive cable (11), (vehicles with winch or 200 amp alternator only) on positive post (7) with lockwasher (12) and nut (13). Tighten nut (13) in 25-30 lb-ft (34-41 N-m).

5. Install lead 81B (8) on positive post (7) with lockwasher (12) and nut (13). Tighten nut (13) to 25-30 lb-ft (34-41 N-m).

6. Install positive accessory cable (49) and positive cable (48) (vehicles with winch or 200 amp alternator only) on buss bar (44) with two washers (47), lockwashers (46), and nuts (45). Tighten nuts (45) to 25-30 lb-ft (34-41 N-m).

7. Apply sealant to positive post (7) and cable terminals so that all exposed metallic surfaces are coated. The sealant should be evenly applied with a minimum thickness of .12 in. (3 mm).

8. Install lead 7C (22) (winch vehicles only), STE/ICE-R 3C lead (21), and ground cable (20) on negative post (23) with lockwasher (19) and nut (18). Tighten nut (18) to 15-20 lb-ft (20-27 N-m).

9. Install leads 74A (27) and 74B (26) on solenoid (28) with dip (25) and screw (24).

10. Install two clamps (17) on positive cable (11) and ground cable (20) and secure to starter (6) with screws (15).

NOTE
Perform steps 11 through 14 for M997, M997A1, and M997A2 vehicles only.

11. Connect compressor harness leads (39) to compressor leads (38).

12. Install clamp (41) on compressor harness (1) and capscrew (40) with lockwasher (42) and nut (43).

13. Install clamp (2) on compressor harness (1) and cable bracket screw (4) with nut and lockwasher assembly (3).

14. Install compressor harness (1) on alternator cable (10) and lead 81A (9) with tiedown strap (5).
4-77. STARTER POWER CABLES REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73)  
- Lower and secure hood (TM 9-2320-280-10)  

"A2" series vehicles
4-78. BATTERY HOLDDOWN REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
- Battery box cover removed (para. 10-35).
- Battery ground cable disconnected (para. 4-73).
- Battery interconnecting cable and positive cable disconnected (para. 4-73).

General Safety Instructions
- Wear safety goggles and rubber gloves, and do not smoke when performing battery maintenance.
- Remove all jewelry.

WARNING
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing battery maintenance. Severe injury will result if acid contacts eyes or skin.
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery terminal, a direct short can result, causing instant heating of tools, severe injury to personnel, or damage to equipment.

a. Removal

1. Remove nut (8), screw (6), and interconnecting cable (4) from battery terminal clamp (5) and terminal post (7).
2. Remove four nuts (2) and holddown rods (1) from battery holddown (3), battery box (10) and brackets (9).
3. Remove battery holddown (3).

b. Installation

1. Install battery holddown (3) on batteries (11), battery box (10), and brackets (9) with four holddown rods (1) and nuts (2).
2. Install interconnecting cable (4) on battery terminal clamp (5) at terminal post (7) with screw (6) and nut (8).
4-78. BATTERY HOLDDOWN REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Connect battery interconnecting cable and positive cable \((\text{para. 4-73})\)
- Connect battery ground cable \((\text{para. 4-73})\)
- Install battery box cover \((\text{para. 10-35})\)
4-79. BATTERY REPLACEMENT AND SERVICING

This task covers:

a. Removal  
b. Servicing  
c. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit: Battery holddown removed (para. 4-78).
automotive (Appendix B, Item 1)

Equipment Condition
Battery holddown removed (para. 4-78).

Manual References
TM 9-6140-200-14
TM 9-2320-280-24P

General Safety Instructions
- Wear safety goggles and rubber gloves, and do not smoke when performing battery maintenance.
- Remove all jewelry.

WARNING
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing battery maintenance. Severe injury will result if acid contacts eyes or skin.
- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery terminal, a direct short can result, causing instant heating of tools, severe injury to personnel, or damage to equipment.

a. Removal
1. Loosen four screws (4) and nuts (2) from four battery terminal clamps (3) and terminals (1).
2. Using battery clamp puller, remove four battery terminal clamps (3) from terminals (1).
3. Place cables (6) in a position to prevent arcing with batteries.
4. Remove batteries (5) from battery box (7).

b. Servicing

NOTE
For battery testing and servicing instructions refer to TM 9-6140-200-14.

c. Installation
1. Position batteries (5) in box (7).
2. Ensure negative (1) terminal posts are correctly located. Cables must reach their respective terminals without stretching.
3. Install four battery terminal clamps (3) to battery terminals (1).
4. Tighten four nuts (2) and screws (4) on battery terminal clamps (3) and battery terminals (1).
4-79. BATTERY REPLACEMENT AND SERVICING (Cont'd)

FOLLOW-ON TASK: Install battery holddown (para. 4-78).
4-80. BATTERY TRAY MAINTENANCE

This task covers:

a. Removal
b. Cleaning and Inspection
c. Preventive Modification
d. Installation

INITIAL SETUP:

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Manual References
TM 9-6140-200-14
TM 9-2320-280-24P

Materials/Parts
Four locknuts (Appendix G, Item 58)
Sodium bicarbonate (Appendix C, Item 49)

Equipment Condition
Battery holddown removed (para. 4-78).

a. Removal

Remove four locknuts (6), washers (2), capscrews (1), washers (2), and battery tray (3) from battery box (5). Discard locknuts (6).

b. Cleaning and Inspection

NOTE
For additional information on battery box tray cleaning, refer to TM 9-6140-200-14.

1. Clean battery tray (3) with baking soda solution.
2. Inspect battery tray (3) for damage. Replace if damaged.
3. Inspect battery cable protectors (4) and battery compartment seals (7) for damage. Replace if damaged.

c. Preventive Modification

NOTE

• The following step will prevent water from accumulating in the battery tray.
• Refer to hole diagram for location of holes.

Locate, mark, and drill four 1/2 inch holes in battery tray (3).

d. Installation

Install battery tray (3) on battery box (5) with four washers (2), capscrews (1), washers (2), and locknuts (6). Tighten locknuts (6) to 6 lb-ft (8 N·m).
FOLLOW-ON TASK: Install battery holddown (para. 4-78).
4-81. SLAVE RECEPTACLE AND CABLE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools

General mechanic's tool kit:
automotive (Appendix B, Item 1)

Equipment Condition

Manual References
TM 9-2320-280-24P

Materials/Parts

Battery tray removed (para. 4-80).
Four lockwashers (Appendix G, Item 108)
Four nut and lockwasher assemblies (Appendix G, Item 145)
Grease (Appendix C, Item 24)

a. Removal

NOTE
Perform steps 5 through 9 for vehicles with kits 5705623 and
5705624 installed, and for vehicles with serial numbers 100,000
and above. Perform steps 1 through 10 for all other vehicles.
Prior to removal, tag leads for installation.
Refer to old configuration artwork for steps 1 through 4.

1. Slide rubber boot (2) back to allow access to slave receptacle connections.

NOTE
Remove tow wiring harness from slave receptacle, M966, M966A1,
M1036, M1045, M1045A1, M1045A2, M1046, and M1046A1
vehicles only.

2. Remove capscrew (11), lockwasher (10), and slave negative cable (9) from receptacle (8). Discard lockwasher (10).

3. Remove capscrew (5), lockwasher (4), and slave positive cable (3) from receptacle (8). Discard lockwasher (4).

4. Remove rubber boot (2). Inspect for tears. Replace if torn.

NOTE
Remove tow wiring harness from power feed stud and shunt on M966,
M966A1, M1036, M1045, M1045A1, M1045A2, M1046, and M1046A1
vehicles only, with kits 5705623 and 5705624 installed for vehicles
with serial numbers 100,000 and above.

5. Remove capscrew (18), lockwasher (19), slave negative cable (9), and battery negative cable (20) from shunt (12). Discard lockwasher (19).

NOTE
Remove slave positive cable from buss bar for M997A2, M1025A2,
M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

6. Remove nut (17), lockwasher (16), washer (15), battery positive cable (14), and slave Positive cable (3) from power feed stud (13). Discard lockwasher (16).

NOTE
Refer to new configuration artwork for steps 7 and 8.

7. Remove four nut and lockwasher assemblies (1), capscrews (7), receptacle (8), and cover (6) from battery box (21). Discard nut and lockwasher assemblies (1).
4-81. SLAVE RECEPTACLE AND CABLE REPLACEMENT (Cont'd)

NOTE

Cover and/or receptacle do not require replacement if dust cover cable is broken. To replace dust cover cable, crimp a terminal ring NSN 5940-00-143-4794 to each end of a 9 inch (22.9 cm) piece of nylon cord NSN 4020-00-246-0688.

8. Inspect cover (6) for breaks and cracks. Replace if damaged.

9. Inspect cables (3) and (9) for damage. Repair if damaged (refer to para. 4-85).
b. Installation

NOTE
- Perform steps 1, 2, and 3 only, for vehicles with kits 5705623 and 5705624 installed, and for vehicles with serial numbers 100,000 and above. Perform steps 1 through 8 for all other vehicles.
- Slave receptacle cover cord is secured under upper left capscrew.
- Refer to new configuration artwork for step 1.

1. Install receptacle (8) and cover (6) on battery box (21) with four capscrews (7) and nut and lockwasher assemblies (1).

NOTE
- Install tow wiring harness on power feed stud and stunt, M966, M966A1, M1036, M1045, M1045A1, M1046, and M1046A1 vehicles only, with kits 5705623 and 5705624 installed, and for vehicles with serial numbers 100,000 and above.
- Install slave positive cable on buss bar for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

2. Install slave positive cable (3) and battery positive cable (14) on power feed stud (13) with washer (15), lockwasher (16), and nut (17). Tighten nut (17) to 26 lb-ft (35 N·m).

3. Install battery negative cable (20) and slave negative cable (9) on shunt (12) with lockwasher (19) and capscrew (18). Tighten capscrew (18) to 8 lb-ft (11 N·m).

CAUTION
When making electrical connections ensure hookup of positive (+) cable to positive electrode and negative (-) cable to negative electrode of the receptacle.

NOTE
- Install the cables so that proper clearance between the cable lugs is obtained.
- Install tow wiring harness on slave receptacle M966, M966A1, M1036, M1045, M1045A1, M1046, and M1046A1 vehicles only.
- Refer to old configuration artwork for steps 4 through 8.

4. Install slave positive cable (3) through rubber boot (2) on receptacle (8) with lockwasher (4) and capscrew (5).
5. Slide slave negative cable (9) through rubber boot (2).
6. Install slave negative cable (9) on receptacle (8) with lockwasher (10) and capscrew (11).
7. Using grease, coat receptacle (8) terminals, all exposed metal on rear of receptacle (8), and area under cover (6) on front of receptacle (8).
8. Slide rubber boot (2) to cover slave receptacle connections.
4-81. SLAVE RECEPTACLE AND CABLE REPLACEMENT (Cont’d)

OLD CONFIGURATION

SLAVE RECEPTACLE

SLAVE RECEPTACLE

WRONG

RIGHT

NEW CONFIGURATION

FOLLOW-ON TASK: Install battery tray (para. 4-80).
4-82. WINCH POWER CABLE REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

**INITIAL SETUP:**

**Applicable Models**
- M1026, M1026A1, M1036, M1038, M1038A1, M1042, M1044, M1044A1, M1046, M1046A1

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Lockwasher (Appendix G, Item 108)
- Three tiedown straps (Appendix G, Item 239)
- Nut and Lockwasher Assembly (Appendix G, Item 144)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

### a. Removal

1. Remove three tiedown straps (2) from ventline (8), lead 7 (4), and lead 6 (6). Discard tiedown straps (2).
2. Remove cap screw (5) from lead 7 (4) and winch (9).
3. Remove nut (7) from lead 6 (6) and solenoid (3).
4. Remove two screws (1) and clamps (10) from lead 7 (4), lead 6 (6), and winch (9).
5. Remove screw (14), lockwasher (12), nut (11), and clamp (13) from lead 7 (4), lead 6 (6), and bracket (15). Discard lockwasher (12).
6. Remove two screws (16) and clamps (17) from lead 7 (4), lead 6 (6), and airlift bracket (18).
7. Remove nut and lockwasher assembly (19), cap screw (21), and clamp (22) from lead 7 (4), lead 6 (6) and bracket (20). Discard nut and lockwasher assembly (19).
8. Remove nut (25) and lead 7 (4) from starter negative stud (26).
9. Remove nut (23) and lead 6 (6) from starter positive stud (24).

### b. Installation

1. Install lead 6 (6) on starter positive stud (24) with nut (23). Tighten nut (23) to 25-30 lb-ft (34-41 N·m).
2. Install lead 7 (4) on starter negative stud (25) with nut (26). Tighten nut (26) to 15-20 lb-ft (20-27 N·m).
3. Install lead 7 (4) and lead 6 (6) on bracket (20) with cap screw (21), nut and lockwasher assembly (19), and clamp (22).
4. Install lead 7 (4) and lead 6 (6) on airlift bracket (18) with two screws (16) and clamps (17).
5. Install lead (7) (4) and lead 6 (6) on bracket (15) with screw (14), lockwasher (12), nut (11), and clamp (13).
6. Install lead 7 (4) and lead 6 (6) on winch (9) with two clamps (10) and screws (1).
7. Install lead 6 (6) on solenoid (3) with nut (7).
8. Install lead 7 (4) on winch (6) with cap screw (5).
9. Install lead 6 (6) and lead 7 (4) on vent line (8) with three tiedown straps (2).
FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Test winch for proper operation (TM 9-2320-280-10).
4-83. **SHUNT REPLACEMENT**

This task covers:

a. **Removal**

b. **Installation**

**INITIAL SETUP:**

<table>
<thead>
<tr>
<th><strong>Tools</strong></th>
<th><strong>Manual References</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Materials/Parts</strong></th>
<th><strong>Equipment Condition</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Five lockwashers (Appendix G, Item 116)</td>
<td>Batteries removed (para. 4-79).</td>
</tr>
<tr>
<td>Two nut and lockwasher assemblies (Appendix G, Item 144)</td>
<td></td>
</tr>
</tbody>
</table>

**Personnel Required**

One mechanic
One assistant

**NOTE**

Prior to removal, tag leads for installation.

**a. Removal**

1. Remove two screws (10) and lockwashers (8) and disconnect leads 9A (15), 8A (6), 7B and 7D (14) from shunt (16). Discard lockwashers.
2. Remove nut (1) and lockwasher (2) securing starter cable (3) to capscrew (9) and disconnect starter cable (3). Discard lockwasher (2).
3. Remove nut (18), lockwasher (17), and capscrew (9) from shunt (16). Discard lockwasher (17).
4. Remove capscrew (11), lockwasher (12), and negative cables (13) from shunt (16). Discard lockwasher (12).
5. Remove two nut and lockwasher assemblies (7), washers (5), capscrews (4), washers (5), and shunt (16) from battery box (19). Discard two nut and lockwasher assemblies (7).

**b. Installation**

1. Install shunt (16) to battery box (19) with two washers (5), capscrews (4), washers (5), and nut and lockwasher assemblies (7). Tighten nut and lockwasher assemblies (7) to 8 lb-ft (11 N·m).
2. Install negative cables (13) to shunt (16) with lockwasher (12) and capscrew (11). Tighten capscrew (11) to 8 lb-ft (11 N·m).
3. Install capscrew (9) to shunt (16) with lockwasher (17) and nut (18). Tighten nut (18) to 75 lb-ft (102 N·m).
4. Connect starter cable (3) to capscrew (9) with lockwasher (2) and nut (1). Tighten nut (1) to 18 to 22 lb-ft (24-30 N·m).
5. Install leads 9A (15), 8A (6), 7B, and 7D (14) on shunt (16) with two lockwashers (8) and screws (10).
FOLLOW-ON TASK: Install batteries (para. 4-79).
4-84. HOOD WIRING HARNESS REPLACEMENT

This task covers:

- a. Removal
- c. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Two locknuts (Appendix G, Item 60)
- Two lockwashers (Appendix G, Item 110)
- Antiseize compound (Appendix C, Item 13)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Blackout drive light assembly removed (para. 4-50).
- Side marker light lenses and lamp removed (para. 4-54).

---

**NOTE**

Prior to removal, tag leads for installation.

### a. Removal

1. Disconnect connector plug (2) from connector receptacle (1).
2. Remove four capscrews (7) and washers (6) from left cover plate (5) and hood (3).
3. Remove two clips (4) from cover plate (5) and remove cover plate (5).
4. Disconnect harness leads 489C (16) from left side marker light terminal (15).
5. Disconnect harness leads 20E (9), 461B (20), and 491C (19) from three left composite light terminals (8).
6. Remove locknut (12), screw (11), and left side marker light ground 92C (10) from hood (3). Discard locknut (12).
7. Remove capscrew (14), lockwasher (13), and left composite light ground 92B (17) from bus bar (18). Discard lockwasher (13).
4-84. HOOD WIRING HARNESS REPLACEMENT (Cont’d)

8. Remove three capscrews (1) and washers (2) from right cover plate (3) and hood (5).
9. Remove two clips (4) from cover plate (3) and remove cover plate (3).
10. Disconnect harness lead 489D (6) at right side marker light terminal (7).
11. Disconnect harness leads 20F (14), 460B (15), and 491D (16) at right composite light terminals (13).
12. Remove locknut (10), screw (12), and right side marker light ground 92D (11) from hood (5). Discard locknut (10).
13. Remove capscrew (9), lockwasher (8), and right composite light ground 92A (18) from bus bar (17). Discard lockwasher (8).

14. Disconnect harness leads 17E (22), 18C (23), and 91D (25) at left headlight connectors (26).
15. Disconnect harness leads 17F (22), 18D (23), and 91C (25) at right headlight connectors (26).
16. Remove three capscrews (27), clamps (28), washera (29), and harness (21) from hood (5).
17. Remove two screw and washer assemblies (19), clamps (20), and harness (21) from hood (5).

CAUTION

Use care when removing harness. Failure to do so will cause damage to harness.

18. Remove grommets (24) and harness (21) from hood (5).
b. Installation

1. Position harness (21) on hood (5) in approximate mounting position.

   **CAUTION**

   Use care when routing harness. Failure to do so will cause damage to harness.

2. Insert harness (21) and grommets (24) through opening in hood (5).
3. Connect harness leads 17E (22), 18C (23), and 91D (25) at left headlight connectors (26).
4. Connect harness leads 17F (22), 18D (23), and 91C (25) at right headlight connectors (26).
5. Secure harness (21) to hood (5) with three washers (29), clamps (28), and screws (27). Finger tighten screws (27).
6. Secure harness (21) to hood (5) with two screw and washer assemblies (19) and clamps (20). Finger tighten screw and washer assemblies (19).
7. Apply antiseize compound to left composite light ground 92B (10) and install on bus bar (11) with lockwasher (6) and capscrew (7).

8. Apply antiseize compound to left side marker light ground 92C (3) and install on hood (16) with locknut (5) and screw (4).

9. Connect harness leads 20E (2), 461B (15), and 491B (14) at left composite light terminals (1).

10. Connect harness lead 489C (9) at left side marker light terminal (8).

11. Insert harness lead 19B (12) and harness lead 92E (13) through opening in hood (16).

12. Install leads (12) and (13) with two clips (17) on left cover plate (18).

13. Install left cover plate (18) with four washers (19) and capscrews (20).
4-84. HOOD WIRING HARNESS REPLACEMENT (Cont'd)
14. Apply antiseize compound to right composite light ground 92A (13) and install on bus bar (12) with lockwasher (3) and capscrew (4).

15. Apply antiseize compound to right side marker light ground 92C (6) and install on hood (14) with screw (7) and locknut (5).

16. Connect harness leads 20F (9), 460B (10), and 491D (11) at right composite light terminals (8).

17. Connect harness lead 489D (1) at right side marker light terminal (2).

18. Secure leads with two clips (18) and install clips (18) on right cover plate (17).

19. Install right cover plate (17) to hood (14) with three washers (16) and capscrews (15).

20. Connect connector plug (20) to connector receptacle (19).

21. Tighten all clamps securing harness.
4-84. HOOD WIRING HARNESS REPLACEMENT (Cont’d)

FOLLOW-ON TASKS: • Install side marker light lenses and lamp (para. 4-50).
• Install drive blackout light (para. 4-50).
• Check front lights for proper operation (TM 9-2320-280-10)

4-153
4-85. WIRING HARNESS CONNECTOR REPAIR

This task covers:

a. Terminal-Type Cable Connector Repair
b. Male Cable Connector Repair
c. Female Cable Connector Repair
d. Connector Assembly Repair
e. Receptacle Assembly Repair
f. Protective Control Box Lower Cannon Plug Assembly Repair

INITIAL SETUP:

Tools
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)
  - Connector repair kit (Appendix B, Item 165)

Equipment Condition
- Battery ground cable disconnected (para. 4-73).

Manual References
- TB SIG-222
- TM 9-2320-280-24P

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery terminal, a direct short can result, causing instant heating of tools, severe injury to personnel, or damage to equipment.

a. Terminal-Type Connector Repair

1. Strip cable insulation (1) from cable (2) to equal depth of terminal well (4).
2. Slide insulator (3) over cable insulation (1).
3. Insert cable (2) into terminal well (4) and crimp.
4. Slide insulator (3) over crimped end of terminal (5).

b. Male Cable Connector Repair

1. Strip cable insulation (6) from cable (7) to equal depth of terminal well (10).
2. Slide shell (8) over cable insulation (6).
3. Insert cable (7) into terminal well (10) and crimp.
4. Place slotted washer (9) over crimped junction at terminal (11).
5. Slide shell (8) over slotted washer (9) and terminal (11).
4-85. WIRING HARNESS CONNECTOR REPAIR (Cont’d)

c. Female Cable Connector Repair

1. Strip cable insulation (12) from cable (13) to equal depth of terminal well (16).
2. Slide shell (14) and sleeve (15) over cable insulation (12).
3. Insert cable (13) into terminal well (16) and crimp.
4. Slide shell (14) and sleeve (15) over terminal (17).

![Diagram of female cable connector repair]

NOTE

Refer to TB SIG-222 for soldering instructions.

1. Strip cable insulation (18) to depth of solder wells (21) on inserts (22).
2. Slide cable ends (25) through grommet retaining nut (19) and grommet (20).
3. Place cable ends (25) into solder wells (21) and solder.
4. Slide grommet (20) over inserts (22) and press into shell assembly (23) and coupling nut (24) until seated.
5. Screw grommet retaining nut (19) into shell assembly (23) until seated.

![Diagram of connector assembly repair]
4-85. WIRING HARNESS CONNECTOR REPAIR (Cont’d)

e. Receptacle Assembly Repair

NOTE
Refer to TB SIG-222 for soldering instructions.

1. Strip cable insulation (1) to depth of solder wells (5) on inserts (6).
2. Slide cable ends (3) through grommet retaining nut (2) and grommet (4).
3. Place cable ends (3) into solder wells (5) and solder.
4. Slide grommet (4) over inserts (5) and press into receptacle (7) until seated.
5. Screw grommet retaining nut (2) into receptacle (7) until seated.

f. Protective Control Box Lower Cannon Plug Assembly Repair

1. Strip cable insulation (8) to depth of solder wells (16) on inserts (14).
2. Slide cable ends (10) through grommet retaining nut (9) and grommet (11).
3. Slide insulation sleeving (17) over lead 67A (18).
4. Place cable ends (10) into solder wells (16) and solder.

NOTE
Ensure insulation sleeving passes through grommet to provide a watertight fit.

5. Slide insulation sleeving (17) up to solder well end (15), and heat shrink insulation sleeving (17).
6. Slide grommet (11) over inserts (14) and press into shell assembly (12) and coupling nut (13) until seated.
7. Screw grommet retaining nut (9) into shell assembly (12) until seated.

FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
## 4-86. ELECTRICAL SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-87</td>
<td>Ceiling Light Assembly Maintenance</td>
<td>4-158</td>
</tr>
<tr>
<td>4-88</td>
<td>Spotlight Assembly Maintenance</td>
<td>4-160</td>
</tr>
<tr>
<td>4-89</td>
<td>Spotlight Socket Maintenance</td>
<td>4-162</td>
</tr>
<tr>
<td>4-90</td>
<td>Electrical Outlet/Bracket Maintenance</td>
<td>4-164</td>
</tr>
<tr>
<td>4-91</td>
<td>Rear Steps Blackout Switch Bracket Replacement</td>
<td>4-166</td>
</tr>
<tr>
<td>4-92</td>
<td>Rear Steps Blackout Switch Replacement</td>
<td>4-168</td>
</tr>
<tr>
<td>4-93</td>
<td>Rear Door Blackout Switch/Bracket Maintenance</td>
<td>4-170</td>
</tr>
<tr>
<td>4-94</td>
<td>Bulkhead Door Blackout Switch and Bracket Maintenance</td>
<td>4-172</td>
</tr>
<tr>
<td>4-95</td>
<td>Backup Light Assembly Maintenance (M996, M996A1, M997, M997A1, M9997A2)</td>
<td>4-174</td>
</tr>
<tr>
<td>4-96</td>
<td>Control Box Assembly Replacement (M997, M997A1, M997A2)</td>
<td>4-176</td>
</tr>
<tr>
<td>4-97</td>
<td>Control Box Assembly Replacement (M996, M996A1)</td>
<td>4-182</td>
</tr>
<tr>
<td>4-98</td>
<td>Control Box Power Cables Replacement</td>
<td>4-188</td>
</tr>
<tr>
<td>4-99</td>
<td>NBC Control Box and Wiring Harness Replacement (M996, M996A1)</td>
<td>4-194</td>
</tr>
<tr>
<td>4-100</td>
<td>NBC Control Box and Wiring Harness Replacement (M997, M997A1, M997A2)</td>
<td>4-202</td>
</tr>
<tr>
<td>4-101</td>
<td>Interior Lighting Harness Assembly Replacement (M997, M997A1, M997A2)</td>
<td>4-212</td>
</tr>
<tr>
<td>4-102</td>
<td>Interior Lighting Harness Assembly Replacement (M996, M996A1)</td>
<td>4-222</td>
</tr>
<tr>
<td>4-103</td>
<td>Wiring Harness Duct Assembly Replacement</td>
<td>4-232</td>
</tr>
<tr>
<td>4-104</td>
<td>Resuscitator/Aspirator Cable Replacement</td>
<td>4-234</td>
</tr>
<tr>
<td>4-105</td>
<td>Antenna Cables Replacement (M996, M996A1)</td>
<td>4-236</td>
</tr>
<tr>
<td>4-106</td>
<td>Antenna Cables Replacement M997, M997A1, M997A2)</td>
<td>4-238</td>
</tr>
<tr>
<td>4-107</td>
<td>Intercom Cable Replacement (M996, M996A1)</td>
<td>4-242</td>
</tr>
<tr>
<td>4-108</td>
<td>Intercom Cable Replacement (M997, M997A1, M997A2)</td>
<td>4-248</td>
</tr>
<tr>
<td>4-109</td>
<td>200 Ampere Alternator (A0013036AA) Replacement</td>
<td>4-254</td>
</tr>
<tr>
<td>4-110</td>
<td>(6.2 L) 200 Ampere Alternator (12338796-1) Replacement</td>
<td>4-258</td>
</tr>
<tr>
<td>4-110.1</td>
<td>(6.5 L) 200 Ampere Alternator (12338796-1) Replacement</td>
<td>4-260.2</td>
</tr>
<tr>
<td>4-111</td>
<td>200 Ampere Alternator Cable (12448621-2) Replacement</td>
<td>4-262</td>
</tr>
<tr>
<td>4-112</td>
<td>200 Ampere Alternator Cable (12339317) Replacement</td>
<td>4-264</td>
</tr>
<tr>
<td>4-113</td>
<td>200 Ampere Umbilical Power Cable Replacement</td>
<td>4-266</td>
</tr>
<tr>
<td>4-114</td>
<td>200 Ampere Regulator (A0013036AA) Replacement</td>
<td>4-270</td>
</tr>
<tr>
<td>4-115</td>
<td>200 Ampere Regulator (12338796-1, S-311) Replacement</td>
<td>4-272</td>
</tr>
<tr>
<td>4-116</td>
<td>Control Box Terminal Block and Mounting Buss Replacement</td>
<td>4-274</td>
</tr>
<tr>
<td>4-117</td>
<td>Control Box Fuse Block and Relay Socket Replacement</td>
<td>4-276</td>
</tr>
</tbody>
</table>

4-157
4-86. ELECTRICAL SYSTEM MAINTENANCE TASK SUMMARY (Cont’d)

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-118</td>
<td>Control Box Light Switch Replacement</td>
<td>4-278</td>
</tr>
<tr>
<td>4-119</td>
<td>Control Box Electrical Plug and Receptacle Replacement</td>
<td>4-280</td>
</tr>
<tr>
<td>4-120</td>
<td>Control Box Relay Replacement</td>
<td>4-282</td>
</tr>
<tr>
<td>4-121</td>
<td>Condenser Fan/Pressure Switch Wiring Harness Replacement (M997, M997A1, M997A2)</td>
<td>4-284</td>
</tr>
<tr>
<td>4-122</td>
<td>Compressor/Heater Fuel Pump Wiring Harness Replacement (M997, M997A1, M997A2)</td>
<td>4-286</td>
</tr>
<tr>
<td>4-123</td>
<td>Heater/Vent System Control Box and Wiring Harness Replacement</td>
<td>4-292</td>
</tr>
<tr>
<td>4-124</td>
<td>NBC Control Panel Replacement</td>
<td>4-298</td>
</tr>
<tr>
<td>4-125</td>
<td>Heat/Vent Control Panel Removal (M996, M996A1)</td>
<td>4-308</td>
</tr>
<tr>
<td>4-126</td>
<td>Heat/Vent Control Panel Relay and Switch Maintenance (M996, M996A1)</td>
<td>4-310</td>
</tr>
<tr>
<td>4-127</td>
<td>Heat/Air-Conditioning Control Panel Relay and Switch Maintenance (M997, M997A1, M997A2)</td>
<td>4-319</td>
</tr>
</tbody>
</table>

4-87. CEILING LIGHT ASSEMBLY MAINTENANCE

This task covers:

a. Removal                       b. Installation

INITIAL SETUP:

**Applicable Models**
M996, M996A1, M997, M997A1, M997A2

**Materials/Parts**
Four rivets (Appendix G, Item 178)

**Tools**
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-10
TM 9-2320-280-24P

**NOTE**
Dome and blackout light assemblies are removed and installed basically the same. This procedure covers the dome light assembly.
4-87. CEILING LIGHT ASSEMBLY MAINTENANCE (Cont'd)

a. Removal

1. Remove two screws (5) and lens (6) from light assembly (4).

   NOTE
   For removal and installation of rivets, refer to para. 10-66.

2. Remove four rivets (7) from light assembly (4) and duct (1). Pull light assembly (4) away from duct (1) to allow access to leads.

3. Disconnect two leads (3) from harness connectors (2). Remove light assembly (4).

b. Installation

1. Connect two leads (3) to harness connectors (2).

2. Install light assembly (4) to duct (1) with four rivets (7).

3. Install lens (6) to light assembly (4) with two screws (5).

FOLLOW-ON TASK: Check operation of ceiling light (TM 9-2320-280-10)
4-88. SPOTLIGHT ASSEMBLY MAINTENANCE

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Tools
General mechanic’s tool kit:
  automotive (Appendix B, Item 1)

Equipment Condition
Battery ground cable disconnected (para. 4-73)

Materials/Parts
Nut and lockwasher assembly
(Appendix G, Item 144)

NOTE

M996, M996A1, M997, M997A1, and M997A2 spotlight replacements are basically the same. This procedure covers the M996 and M996A1.

a. Removal

1. Remove four screws (8) and duct (7) from ceiling (1) and pull duct (7) away for access to clamp (5).
2. Remove screw (6), nut and lockwasher assembly (4), and clamp (5) from duct (7). Remove duct (7).
   Discard nut and lockwasher assembly (4).
3. Disconnect spotlight leads (3) from harness leads (2). Remove light assembly (9) from quick disconnect base (10).

b. Installation

1. Install light assembly (9) on quick disconnect base (10) and connect spotlight leads (3) to harness leads (2).
2. Install clamp (5) on light assembly (9) and duct (7) with screw (6) and nut and lockwasher assembly (4).
3. Install duct (7) on ceiling (1) with four screws (8).
FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Check operation of spotlight (TM 9-2320-280-10)
4-89. SPOTLIGHT SOCKET MAINTENANCE

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Manual References
TM 9-2320-280-24P

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

a. Removal

1. Pull spotlight (5) from socket (2).
2. Remove two screws (1) and socket (2) from body (4).

b. Installation

1. Install socket (2) on body (4) with two screws (1).
2. Install spotlight (5) into socket (2).

c. Adjustment

Adjust detent screw (3) for proper positioning of spotlight (5).
4-90. ELECTRICAL OUTLET/BRACKET MAINTENANCE

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>M996, M996A1, M997, M997A1, M997A2</td>
<td>Battery ground cable disconnected (para. 4-73).</td>
</tr>
<tr>
<td></td>
<td>Rear doors opened (TM 9-2320-280-10)</td>
</tr>
</tbody>
</table>

Tools

General mechanic's tool kit:
- automotive (Appendix B, Item 1)

Manual References

- TM 9-2320-280-10
- TM 9-2320-280-24P

NOTE

Prior to removal, tag leads for installation.

**a. Removal**

1. Slide rubber boot (1) away from outlet (4).
2. Remove two screws (3) and pull outlet (4) away from bracket (2).
3. Loosen screw (8) and move shield (9) away from screws (7).
4. Remove two screws (7), disconnect harness leads 714B (11) and 790A (10) and remove outlet (4).
   
   **NOTE**
   
   Perform step 5 only if removing bracket.

5. Remove three screws (6) and bracket (2) from body (5).

**b. Installation**

1. Install bracket (2) on body (5) with three screws (6).
2. Connect leads 714B (11) and 790A (10) to outlet (4) with two screws (7).
3. Position shield (9) over screws (7) and tighten screw (8).
4. Install outlet (4) on bracket (2) with two screws (3).
5. Slide boot (1) over back of outlet (4).
4-90. ELECTRICAL OUTLET/BRACKET MAINTENANCE (Cont'd)
4-91. REAR STEPS BLACKOUT SWITCH BRACKET REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Manual References
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Equipment Condition
Blackout switch removed (para. 4-93).

Materials/Parts
Two rivets (Appendix G, Item 177)

NOTE
For instructions on replacement of rivets, refer to para. 10-66.

a. Removal
Remove two rivets (1) and switch bracket (2) from body (3).

b. Installation
Install bracket (2) on body (3) with two rivets (1).
FOLLOW-ON TASK: Install blackout switch (para. 4-93).
4-92. REAR STEPS BLACKOUT SWITCH REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
- M996, M996A1, M997, M997A1, M997A2

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Rear steps lowered (TM 9-2320-280-10)
- Battery ground cable disconnected (para. 4-73)

**Materials/Parts**
- Lockwasher (Appendix G, Item 111)

**NOTE**
Prior to removal, tag leads for installation.

**a. Removal**

1. Remove three screws (1) and cover (2) from body (3) and bracket (5).
2. Remove grommet (4) from body (3).
3. Remove nut (11), lockwasher (10), and light switch (6) from bracket (5) and remove adjusting nut (12). Discard lockwasher (10).
4. Pull light switch leads (7) through hole in body (3).
5. Disconnect light switch leads (7) from harness leads 791C (8) and 791D (9). Remove light switch (6).

**b. Installation**

1. Connect light switch leads (7) to harness leads 791C (8) and 791D (9). Push through body (3).
2. Install grommet (4) in body (3).
3. Position adjusting nut (12) on switch (6) about halfway out on threads. Install switch (6) to bracket (5) with lockwasher (10) and nut (11).
4. Slowly raise rear steps to latched position while listening for switch (6) to “click”. If necessary, adjust switch (6) in or out to ensure switch (6) clicks (closed) when steps are in raised and latched position.
5. Install cover (2) to body (3) and bracket (5) with three screws (1).
FOLLOW-ON TASK: Connect battery ground cable [para. 4-73].
4-93. REAR DOOR LACKOUT SWITCH/BRACKET MAINTENANCE

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Material/Parts
Nut and lockwasher assembly
(Appendix G, Item 146)
Two lockwashers (Appendix G, Item 111)
Two locknuts (Appendix G, Item 62)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnected
(paragraph 4-73).
- Rear doors lowered (TM 9-2320-280-10)

---

a. Removal

1. Remove two locknuts (6), washers (2), capscrews (3), and washers (2) from bracket (1) and bracket (7). Discard locknuts (6).

   NOTE
   Prior to removal, tag leads for installation.

2. Disconnect two leads (4) from leads (5). Remove bracket (1).

3. Remove two screws (18), lockwashers (17), and leads (14) and (16) from switch (15). Discard lockwashers (17).

4. Remove two nuts (13), washers (12), screws (9), switch (15), switch lever (11), and spacer plate (10) from bracket (1).

   NOTE
   Perform step 5 only if wiring harness is damaged.

5. Remove nut and lockwasher assembly (20) screw (8), clamp (19) and wiring harness (21) from bracket (1). Discard nut and lockwasher assembly (20).

---

b. Installation

NOTE
Perform step 1, only if wiring harness was removed.

1. Install clamp (19) and wiring harness (21) on bracket (1) with screw (8) and nut and lockwasher assembly (20).

2. Install spacer plate (10), switch lever (11), and switch (15) on bracket (1) with two screws (9), washers (12), and nuts (13).

3. Install leads (14) and (16) on switch (15) with two lockwashers (17) and screws (18).

4. Connect two leads (4) to leads (5).

5. Install bracket (1) on brackets (7) with two washers (2), capscrews (3), washers (2), and locknuts (6).
4-93. REAR DOOR BLACKOUT SWITCH/BRACKET MAINTENANCE (Cont'd)

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Check operation of interior blackout lights (TM 9-2320-280-10).
4-94. BULKHEAD DOOR BLACKOUT SWITCH AND BRACKET MAINTENANCE

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
- M996, M996A1, M997, M997A1, M997A2

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73)

**Materials/Parts**
- Four lockwashers (Appendix G, Item 111)

---

### a. Removal

1. Remove two screws (5) and washers (6) from switch cover (7) and bracket (4). Slide cover (7) away from switch (14) to allow access to switch (14).

   **NOTE**
   Prior to removal, tag leads for installation.

2. Remove two screws (10), lockwashers (11), and two leads (12) and (13) from switch (14). Discard lockwashers (11).

3. Remove cover (7) and grommet (9) from wiring harness (8).

4. Remove two nuts (1), lockwashers (2), screws (16), switch (14), and switch lever (15) from bracket (4). Discard lockwashers (2).

5. Remove two screws (3) and bracket (4) from body (17).

### b. Installation

1. Install bracket (4) on body (17) with two screws (3).

2. Install switch (14) and switch lever (15) on bracket (4) with two screws (16), lockwashers (2), and nuts (1).

3. Install cover (7) and grommet (9) on wiring harness (8).

4. Connect two leads (12) and (13) to switch (14) with two lockwashers (11) and screws (10).

5. Slide cover (7) over switch (14) on bracket (4) with two washers (6) and screws (5).
FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Check operation of interior blackout light (TM 9-2320-280-10).
This task covers:

<table>
<thead>
<tr>
<th>a. Light Assembly Removal</th>
<th>b. Light Assembly Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>M996, M996A1, M997, M997A1, M997A2</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td></td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>Battery ground cable disconnected (para. 4-73)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Six lockwashers (Appendix G, Item 113)</td>
<td></td>
</tr>
</tbody>
</table>

**a. Light Assembly Removal**

1. Remove four screws (3) and lockwashers (2) from plate (6) and body (1). Pull plate (6) away from body (1) to allow access to connections. Discard lockwashers (2).
2. Remove two nuts (9), lockwashers (8), housing (5), and lead (7) from plate (6). Discard lockwashers (8).
3. Disconnect lead (10) from lead (4). Remove housing (5).
4. Inspect speed nuts (11) for damage. Replace if damaged.

**b. Light Assembly Installation**

1. Install housing (5) and lead (7) on plate (6) with two lockwashers (8) and nuts (9).
2. Connect lead (4) to lead (10).
3. Install plate (6) on body (1) with four lockwashers (2) and screws (3).
4-95. BACKUP LIGHT ASSEMBLY MAINTENANCE (M996, M996A1, M997, M997A1, M997A2) (Cont’d)

FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).  
- Check backup light operation (TM 9-2320-280-10).
4-96. CONTROL BOX ASSEMBLY REPLACEMENT (M997, M997A1, M997A2)

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M997, M997A1, M997A2

Manual References
TM 9-2320-280-24P

Tools
General mechanic's tool kit: Battery ground cable disconnected (para. 4-73).

Equipment Condition
Automotive (NSN 5180-00-177-7033)

Materials/Parts
Six lockwashers (Appendix G, Item 110)
Two nut and lockwasher assemblies
(Appendix G, Item 146)
Three screw-assembled lockwashers
(Appendix G, Item 210)
Two tiedown straps (Appendix G, Item 241)

a. Removal

1. Remove four screws (7), lockwashers (8), and cover (6) from control box (5). Discard lockwashers (8).
   
   NOTE
   Prior to removal, tag leads for installation.

2. Remove eight screws (4) and light harness leads (3) from terminal block (9) and mounting buss (10).

3. Disconnect light harness lead 791B (12) from NBC harness lead 791A (11).
   
   NOTE
   Grommet must be removed through top of control box (5).

4. Remove grommet (2) and light harness (1) from control box (5).

5. Remove four screws (14) and four heating ventilating air conditioning leads (13) from mounting buss (10) and terminal block (9).

6. Remove nut and lockwasher assembly (15), clamp (16), and heating ventilating air conditioning harness (17) from screw (18). Discard nut and lockwasher assembly (15).

7. Remove nut (21), lockwasher (20), and ground cable (19) from ground stud (35). Discard lockwasher (20).

8. Remove nut (24), lockwasher (23), washer (22), positive cable (27), and NBC cable (32) from power stud (34). Discard lockwasher (23).

9. Remove two screws (25) and NBC leads (26) from mounting buss (10).

10. Remove nut and lockwasher assembly (29), NBC harness clamp (31), and power harness clamp (28) from stud (33). Discard nut and lockwasher assembly (29).
11. Remove two tiedown straps (14) and lead (12) from NBC harness (13). Discard tiedown straps (14).
12. Disconnect NBC harness leads 784A (5) and 784B (12) from heater leads (4).
13. Remove four capscrews (2) and washers (1) from NBC heater mounting plate (16) and body (15) and pull mounting plate (16) away for access to two capscrews (8).
14. Remove two nuts (6), capscrews (8), and ground terminals (7) from NBC heaters (3).
15. Remove screw (9), clamp (10), NBC harness (13), and A/C control box (11) from body (15).
16. Push grommet (40) down through hole in control box (17) and remove NBC harness (13) from control box (17).
17. Remove three screw-assembled lockwashers (19), washers (18), and control box (17) from body (37). Discard screw-assembled lockwashers (19).
b. Installation

1. Install control box (17) on body (37) with three washers (18) and screw-assembled lockwashers (19).
2. Install NBC harness (13) with grommet (40) up through hole in control box (17).
3. Install two ground terminals (7) from NBC harness (13) on heaters (3) with two capscrews (8) and nuts (6).
4. Install leads 791 and 794 (26) and 793 (29) on control box (17) with two capscrews (28).
5. Install NBC heater mounting plate (16) on body (15) with four washers (1) and capscrews (2).
6. Connect NBC harness leads 784A (5) and 784B (12) to heater leads (4).
7. Install lead (12) on NBC harness (13) with two tiedown straps (14).
8. Install NBC harness (13), power harness (32), and clamp (33) on screw (36) with nut and lockwasher assembly (31). Connect NBC harness lead 791A (35) to light harness lead 791B (38).
9. Install positive cable (27) and NBC cable (34) on power stud (39) with washer (23), lockwasher (24), and nut (25).
10. Install ground cable (20) on ground stud (41) with lockwasher (21) and nut (22).
11. Install heating ventilating air conditioning harness (5) on screw (6) with clamp (4) and nut and lockwasher assembly (3).
12. Install four control box leads (1) to mounting buss (7) and terminal block (8) with four screws (2).
13. Install light harness (9) down through hole in top of control box (13) and install grommet (10) in control box (13).
14. Connect light harness lead 791A (18) to NBC harness lead 791B (17).
15. Install eight light harness leads (11) on terminal block (8) and mounting buss (7) with eight screws (12).
16. Install cover (14) on control box (13) with four lockwashers (16) and screws (15).
FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
4-97. CONTROL BOX ASSEMBLY REPLACEMENT (M996, M996A1)

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
- M996, M996A1

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Six lockwashers (Appendix G, Item 110)
- Two nut and lockwasher assemblies (Appendix G, Item 146)
- Three screw-assembled lockwashers (Appendix G, Item 210)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

---

### a. Removal

1. Remove four screws (7), lockwashers (8), and cover (6) from control box (5). Discard lockwashers (8).

   **NOTE**
   Prior to removal, tag leads for installation.

2. Remove seven screws (4) and seven light harness leads (3) from terminal block (9).

3. Disconnect light harness lead 791B (11) from NBC harness lead 791A (10).

   **NOTE**
   Grommet must be removed through top of control box.

4. Remove grommet (2) and light harness (1) from control box (5).

5. Remove nut and lockwasher assembly (16), clamp (17), and heater harness (15) from mounting buss screw (18). Discard nut and lockwasher assembly (16).

6. Remove three screws (14) and heater harness leads (13) from terminal block (9) and mounting buss (12).
7. Remove nut (12), lockwasher (13), washer (11), NBC harness lead (10), and power cable (9) from positive stud (2). Discard lockwasher (13).

8. Remove two screws (6) and two NBC harness leads (7) from mounting buss (8).

9. Remove nut and lockwasher assembly (15), clamp (14), and NBC harness leads (7) and (10) from control box stud (17). Discard nut and lockwasher assembly (15).

10. Remove nut (18), lockwasher (19) and negative cable (20) from mounting buss capscrew (3). Discard lockwasher (19).

11. Remove power cable (9) from power stud (2) and clamp (16) from control box stud (17).

12. Remove three screw-assembled lockwashers (5), washers (4), and control box (1) from body (21). Discard screw-assembled lockwashers (5).

b. Installation

1. Install control box (1) on body (21) with three washers (4) and screw-assembled lockwashers (5).

2. Install negative cable (20) on mounting buss capscrew (3) with lockwasher (19) and nut (18).

3. Install power cable (9) and NBC harness lead (10) on power stud (2) with washer (11), lockwasher (13), and nut (12).

4. Install two NBC harness leads (7) on mounting buss (8) with two screws (6).

5. Install clamp (16) power cable (9), negative cable (20), clamp (14), and NBC harness leads (7) and (10), on control box stud (17) with nut and lockwasher assembly (15).
4-97. CONTROL BOX ASSEMBLY REPLACEMENT (M996, M996A1) (Cont’d)

6. Install three heater harness leads (3) to terminal block (2) and mounting buss (1) with three screws (4).
7. Install clamp (7) securing heater harness (6) to mounting buss screw (8) with nut and lockwasher assembly (5).
8. Route light harness leads (11) and (18) through top of control box (13) and install grommet (9) and light harness (10) in control box (13).
9. Connect light harness lead 791B (18) to NBC harness lead 791A (17).
10. Install seven light harness leads (11) on terminal block (2) with seven screws (12).
11. Install cover (14) on control box (13) with four lockwashers (16) and screws (15).
FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).
- Check operation of spotlight (TM 9-2320-280-10).
4-98. CONTROL BOX POWER CABLES REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**

M996, M996A1, M997, M997A1, M997A2

**Tools**

General mechanic's tool kit:
automotive (Appendix B, Item 1)

**Materials/Parts**

Eight lockwashers (Appendix G, Item 110)
Nut and lockwasher assembly
(Appendix G, Item 146)

**Manual References**

TM 9-2320-280-10
TM 9-2320-280-24P

**Equipment Condition**

Battery ground cable disconnected (para. 4-73).

**NOTE**

Replacement of the control box power cables is basically the same for M996, M996A1, M997, M997A1, and M997A2 vehicles.

### a. Removal

1. Remove four screws (6), lockwashers (5), and cover (7) from control box (1). Discard lockwashers (5).
2. Remove nut (4), lockwasher (3), and ground cable (2) from ground stud (18). Discard lockwasher (3).
3. Remove nut (12), lockwasher (13), washer (14), NBC harness cable (15) and positive cable (11) from power stud (17). Discard lockwasher (13).
4. Remove nut and lockwasher assembly (9) two clamps (10), power harness (8) and NBC harness (22) from screw (16). Discard nut and lockwasher assembly (9).

**NOTE**

Step 5 is for M997, M997A1, and M997A2 vehicles only.

5. Remove two screws (20) two clamps (19) and power harness (8) from body (21) and remove clamps (19) from harness (8).

**NOTE**

Steps 6 thru 8 apply to M996 and M996A1 vehicles only.

6. Remove four screws (20), five clamps (19), and power harness (8) from body (21). Remove clamps (19) from harness (8).
4-98. CONTROL BOX POWER CABLES REPLACEMENT (Cont’d)

7. Remove two screws (1) and three clamps (3) from power harness (8), resuscitator harness (2) and body (6).
8. Remove screw (1) and clamps (3) and (7) from body (6) and power harness (8).
9. Remove grommets (4) and (9), power harness (8), and resuscitator harness (2) from floor (5) and body (6).
10. Remove grommet (23) from battery box (20).
11. Remove capscrew (10), lockwasher (11), ground cable (13), and two cables (12) from shunt (16). Discard lockwasher (11).
12. Remove two screws (14), clamps (17), and positive cable (15) from battery box (20).
13. Remove nut (22), lockwasher (21), two battery cables (19), and positive cable (15) from power stud (18). Discard lockwasher (21).
14. Remove power harness (8) from vehicle.

b. Installation

1. Route power harness (8) in approximate mounting location in vehicle.
2. Install positive cable (15) and two battery cables (19) on power stud (18) with lockwasher (21) and nut (22).
3. Install two clamps (17) on positive cable (15) and battery box (20) with two screws (14).
4. Install ground cable (13) and two cables (12) on shunt (16) with lockwasher (11) and capscrew (10).
5. Install grommet (23) on power harness (8) in battery box (20).

NOTE
Steps 6 thru 8 apply to M996 and M996A1 vehicles only.

6. Install clamp (7), power harness (8), and resuscitator harness clamp (3) on body (6) with screw (1).
7. Install three clamps (3), power harness (8), resuscitator harness (2), on body (6) with two screws (1).
8. Install power harness (8) and resuscitator harness (2) with two grommets (4) and (9) in floor (5) and body (6).
4-98. CONTROL BOX POWER CABLES REPLACEMENT (Cont'd)

9. Install positive cable (15) and NBC harness cable (16) on control box power stud (18) with washer (8), lockwasher (9), and nut (10).

10. Install ground cable (2) on ground stud (19) with lockwasher (3) and (4).

11. Install two clamp (11), power harness (13), and NBC harness (14) on screw (17) with nut and lockwasher assembly (12).

12. Install cover (7) on control box (1) with four lockwashers (5) and screws (6).

13. Install two clamps (22) and power harness (13) on body (21) with two screws (20).

NOTE

Step 14 applies to M996 and M996A1 vehicles only.

14. Install five clamps (22) and power harness (13) on body (21) with four screws (20).
FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Check control box operation ([TM 9-2320-280-10])
This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIAL SETUP:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Applicable Models</strong></td>
<td><strong>Manual References</strong></td>
</tr>
<tr>
<td>M996, M996A1</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td><strong>Tools</strong></td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>General mechanic’s kit:</td>
<td><strong>Equipment Condition</strong></td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>NBC control panel removed (para. 4-124)</td>
</tr>
<tr>
<td><strong>Materials/Parts</strong></td>
<td></td>
</tr>
<tr>
<td>Eight lockwashers (Appendix G, Item 110)</td>
<td></td>
</tr>
<tr>
<td>Nut and lockwasher assembly</td>
<td></td>
</tr>
<tr>
<td>(Appendix G, Item 146)</td>
<td></td>
</tr>
<tr>
<td>Five tiedown straps (Appendix G, Item 241)</td>
<td></td>
</tr>
</tbody>
</table>

### 4-99. NBC CONTROL BOX AND WIRING HARNESS REPLACEMENT (M996, M996A1)

#### a. Removal

1. Remove four screws (11), lockwashers (10), and cover (9) from control box (1). Discard lockwashers (10).

   **NOTE**
   
   Prior to removal, tag all leads for installation.

2. Remove nut (12), lockwasher (3), washer (2), and positive cable lead 782 (22) from positive stud (25). Discard lockwasher (3).

3. Remove two screws (13) and NBC harness leads (14) from mounting buss (26).

4. Disconnect lead 791A (23) from light harness lead 791B (24).

5. Remove nut and lockwasher assembly (18), clamp (20), and NBC harness (4) from control box stud (21). Discard nut and lockwasher assembly (18).

6. Remove four screws (8), clamps (7), NBC harness (4), and heater harness (6) from body (5).

7. Remove two screws (15), washers (16) retainer (17) and grommet (19) from body (5) and remove retainer (17) and grommet (19) from NBC harness (4).
8. Remove four screws (4) and harness channel (5) from body (6). Pull channel (5) away from body (6).
9. Remove three tiedown straps (8). Discard tiedown straps (8).
10. Disconnect lead 785B (9), lead 785A (10), and lead 786A (19) from NBC heaters (7).
11. Remove three capscrews (17), lockwashers (16), and ground leads (18) from NBC heaters (7). Discard lockwashers (16).
12. Remove screw (1), clamp (2), and harness (3) from body (6).
13. Remove two screws (14), washers (13), grommet (11), retainer (15), and intercom cable (12) from body (6).
14. Remove three screws (25), clamps (26), and harness (3) from body (27). Remove clamps (26).
15. Remove locknut (24), washer (21), capscrew (20), washer (21), clamp (22), and harness (3) from body (27).
16. Remove two locknuts (32), washer (33), capscrew (35), washer (33), and leads 795B (36) and 795C (34) from body (27).
17. Remove screw (31) and ground (29) from NBC heaters and filter assembly (28).
18. Disconnect connector (30) from NBC heater and filter assembly (28).
19. Remove grommet (23) and harness (3) from body (27).
20. Remove two tiedown straps (11) from leads (12) and (13) and harness (8). Discard tiedown straps (11).
21. Disconnect leads 787A (12) and 786B (13) from NBC heaters (10).
22. Remove screw (15), clamp (14), and harness (8) from body (9).
23. Remove two screws (5) and cover (6) from bracket (16).
24. Pull cover (6) away from switch (1) to allow access to leads.
25. Remove two screws (3) and leads (2) and (4) from switch (1).
26. Pull leads (2) and (4) through grommet (7) in cover (6).

**CAUTION**
Use care when removing harness. Failure to do so will cause damage to harness.

27. Remove harness (8) from vehicle.

**b. Installation**

**CAUTION**
Use care when routing harness. Failure to do so will cause damage to harness.

1. Route leads (2) and (4) through grommet (7) in cover (6).
2. Route harness (8) in approximate mounting location.
3. Connect leads (2) and (4) to switch (1) with two screws (3).
4. Install cover (6) to bracket (16) with two screws (5).
5. Install clamp (14) and harness (8) on body (25) with screw (15).
6. Connect leads 787A (12) and 786B (13) to NBC heaters (10).
7. Install two tiedown straps (11) on leads (12) and (13) and harness (8).
8. Install grommet (22) on harness (8) in body (25).
9. Install clamp (20) and harness (8) on body (25) with washer (19), capscrew (18), washer (19), and nut (21).
10. Install leads 795B (17) and 795C (32) on body (25) with two washers (31), capscrews (33), washers (31), and nuts (30).
11. Install three clamps (24) on harness (8) to body (25) with three screws (23).
12. Install ground (27) on NBC heater and filter assembly (26) with screw (29).
13. Connect harness (28) to NBC heater and filter assembly (26).
4-99. NBC CONTROL BOX AND WIRING HARNESS REPLACEMENT (M996, M996A1) Cont'd
14. Install grommet (12), retainer (11), harness (3), and intercom cable (13) to body (7) with two washers (14) and screws (15).
15. Install clamp (2) and harness (3) on body (7) with screw (1).
16. Install ground leads (16) on three NBC heaters (6) and body (7) with three lockwashers (17) and capscrews (18).
17. Connect lead 785A (9), lead 785B (10), and lead 786A (19) to NBC heaters (6).
18. Install three tiedown straps (8) on leads (9), (10), and (19), and harness (3).
19. Install harness channel (4) over harness (3) on body (7) with four screws (5).
20. Install four clamps (25) on harness (3) and heater harness (24) on body (23) with four screws (26).
21. Install positive lead 782 (40) on power stud (43) with washer (21), lockwasher (22), and nut (30).
22. Install two NBC harness leads (32) on mounting buss (44) with two screws (31).
23. Connect lead 791A (41) to light harness lead 791B (42).
24. Install clamp (38) on NBC harness (3) and control box stud (39) with nut and lockwasher assembly (36).
25. Install grommet (37) and retainer (35) on NBC harness (3) and body (23) with two washers (34) and screws (33).
26. Install cover (27) on control box (20) with four lockwashers (28) and screws (29).
FOLLOW-ON TASK: NBC control panel installed (para. 4-124).
4-100. NBC CONTROL BOX AND WRING HARNESS REPLACEMENT (M997, M997A1, M997A2)

This task covers:
   a. Removal
   b. Installation

INITIAL SETUP:

**Applicable Models**
M997, M997A1, M997A2

**Tools**
General mechanic's tool kit:
   automotive (Appendix B, Item 1)

**Materials/Parts**
Two locknuts (Appendix G, Item 63)
Twelve lockwashers (Appendix G, Item 110)
Eight nut and lockwasher assemblies
   (Appendix G, Item 146)
Nine tiedown straps (Appendix G, Item 241)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Control panel removed (para. 4-124).
- Front cover panel removed (para. 11-187).

**CAUTION**
Use care when removing harness. Failure to do so will cause damage to harness.

**a. Removal**

1. Remove four screws (8) lockwashers (7) and cover (6) from control box (1). Discard lockwashers (7).
2. Remove nut and lockwasher assembly (11) clamp (12) and NBC harness (13) from control box stud (16). Discard nut and lockwasher assembly (11).
3. Remove nut (5), lockwasher (4), washer (3) and lead 782 (2) from power stud (20). Discard lockwasher (4).
4. Disconnect NBC harness lead 791A (17) from light harness lead 791B (18).
5. Remove two screws (9) and NBC harness leads (10) from mounting buss (19).
6. Remove grommet (21) by pushing down through top of control box (1).
7. Remove grommet (14) and NBC harness (13) from body (15).

**NOTE**
Prior to removal, tag leads for installation.
4-100. NBC CONTROL BOX AND WIRING HARNESS REPLACEMENT (M997, M997A1, M997A2) (Cont'd)
8. Remove two tiedown straps (6). Disconnect leads 784A (4) and 784B (12) from NBC heaters (1). Discard tiedown straps (6).
9. Remove four capscrews (3), washers (2), and mounting bracket (16) from body (14). Pull bracket (16) and NBC heaters (1) away from body (14) to allow access to ground leads (5) hardware.
10. Remove nut (13), capscrew (15), and ground terminals (5) from NBC heaters (1).
11. Remove screw (9), lockwasher (10), clamp (11), and harness (7) from A/C control box (8) and body (14). Remove clamp (11). Discard lockwasher (10).
12. Route harness (7) through body (14) into cab.
13. Remove two screws (26), clamps (25) and harness (7) from body (21).
14. Disconnect harness lead 785A (35) from NBC heater lead (36).
15. Remove locknut (29), washer (30), capscrew (32), washer (30), and leads 796 and 796A (31) from NBC heater (33). Discard locknut (29).
16. Remove five screws (27), clamps (28), harness (7), and intercom cable (24) from body (21). Remove clamps (28).
17. Remove tiedown straps (19) and (34). Disconnect harness lead 786A (40) from NBC heater lead (41). Discard tiedown straps (19) and (34).
18. Remove locknut (43), washer (17), capscrew (18), washer (17), and leads 796B and 796A (42) from NBC heater (44). Discard locknut (43).
19. Remove two nut and lockwasher assemblies (20), capscrews (37), washers (38), clamp (39), grommet (22), retainer (23), harness (7), and intercom cable (24) from body (21). Discard nut and lockwasher assemblies (20).
4-100. NBC CONTROL BOX AND WIRING HARNESS REPLACEMENT (M997, M997A1, M997A2) (Cont’d)
20. Remove three nut and lockwasher assemblies (19), screws (13), and cover (18) from body (14). Discard nut and lockwasher assemblies (19).
21. Remove two screws (20), clamps (21), harness (11), and intercom cable (12) from body (14).
22. Remove screw (7) and lead (9) from heater and filter assembly (10).
23. Remove two nut and lockwasher assemblies (17), screws (15), clamps (16), harness (11), and intercom cable (12) from body (14). Discard nut and lockwasher assemblies (17).
24. Disconnect connector (8) from heater and filter assembly (10).
25. Remove grommet (23) and harness (11) from body (14).
26. Remove screw (25), clamp (24), and harness (11) from body (14).
27. Remove two screws (5) and cover (26) from bracket (4). Pull cover (26) away from switch (3) to allow access to leads.
28. Remove two screws (27), lockwashers (1), and leads (2) and (6) from switch (3). Discard lockwashers (1).
29. Remove harness (11) from grommet (22) and route harness (11) through opening in body (14).
30. Remove two screws (39), washers (38), retainer (37), grommet (36), harness (11), and intercom cable (12) from body (14).
31. Remove six tiedown straps (40) from NBC heater leads (34) and harness (11). Discard tiedownstraps (40).
32. Disconnect leads 786B (45), 787A (44), and 787B (41) from NBC connectors (42).
33. Remove four screws (28), lockwashers (29), washers (30), and mounting bracket (31) from brackets (32). Pull bracket (31) away from body (14) to allow access to ground leads hardware. Discard lockwashers (29).
34. Loosen three hose clamps (49) and pull heaters (47) from fittings (48).
35. Remove three nuts (35) and ground leads (34), (43), and (46) from capscrews (33).
36. Remove harness (11) from vehicle.

b. Installation

CAUTION
Use care when routing harness. Failure to do so will cause damage to harness.

1. Route harness (11) through vehicle in approximate mounting location.
2. Install leads (34), (43), and (46) on three capscrews (33) with nuts (35).
3. Connect three heaters (47) to fittings (48) and tighten clamps (49).
4. Install mounting bracket (31) to brackets (32) with four washers (30), lockwashers (29), and screws (28).
5. Connect leads 786B (45), 787A (44), and 787B (41) to NBC heater connectors (42).
6. Install six tiedown straps (40) on NBC heater leads (34) and harness (11).
7. Install grommet (36), retainer (37), harness (11), and intercom cable (12) on body (14) with washers (38) and screws (39).
8. Route harness (11) through grommet (22) and opening in body (14).
9. Install leads (2) and (6) on switch (3) with two lockwashers (1) and screws (27).
10. Install cover (26) over switch (3) on bracket (4) with two screws (5).
11. Install clamp (24) and harness (11) on body (14) with screw (25).
12. Install grommet (23) and harness (11) in body (14).
13. Connect connector (8) on heater and filter assembly (10).
14. Install lead (9) to heater and filter assembly (10) with screw (7).
15. Install two clamps (16), harness (11), and intercom cable (12) to body (14) with two screws (15) and nut and lockwasher assemblies (17).
16. Install two clamps (21), harness (11), and intercom cable (12), on body (14) with two screws (20).
17. Install cover (18) over harness (11) and intercom cable (12), and to body (14) with three screws (13) and nut and lockwasher assemblies (19).
18. Install grommet (6), retainer (7), harness (9), and intercom cable (8) on body (5) with clamp (24), two washers (23), capscrews (22), and nut and lockwasher assemblies (4).
19. Install leads 796B and 796A (27) on NBC heater (29) with washer (1), capscrew (2), washer (1), and locknut (28).
20. Connect harness lead 786A (25) to NBC heater lead (26).
21. Install five clamps (13), harness (9), and intercom cable (8) on body (5) with five screws (12).
22. Install leads 796 and 796A (16) on NBC heater (18) with washer (15), capscrew (17), washer (15), and locknut (14).
23. Connect harness lead 785A (21) on NBC heater lead (20).
24. Install two clamps (10) on harness (9) and body (5) with three screws (11).
25. Install tiedown straps (3) and (19) securing heater leads together.
26. Install clamp (42) and harness (9) on A/C control box (40) and body (47) with lockwasher (41) and screw (38).
27. Install two ground terminals (37) on NBC heaters (30) and bracket (48) with capscrews (39) and (49) and nuts (35) and (46).
28. Install bracket (48) and NBC heaters (30) on body (47) with four washers (31) and capscrews (32).
29. Connect leads 784A (36) and 784B (44) on NBC heater leads (34) and (43).
30. Install two tiedown straps (45) on harness (9) and leads.
4-100. NBC CONTROL BOX AND WIRING HARNESS REPLACEMENT (M997, M997A1, M997A2) (Cont’d)
31. Install grommet (21) through top of control box (1) to secure NBC harness (13).
32. Install lead 782 (2) on power stud (20) with washer (3), lockwasher (4), and nut (5).
33. Connect NBC harness lead 791A (17) to light harness lead 791B (18).
34. Install two NBC harness leads (10) on mounting buss (19) with two screws (9).
35. Install clamp (12) and NBC harness (13) on control box stud (16) with nut and lockwasher assembly (11).
36. Install cover (6) on control box (1) with four lockwashers (7) and screws (8).
37. Install grommet (14) in body (15) to secure NBC harness (13).
FOLLOW-ON TASKS:

- Install control panel (para. 4-124).
- Install front cover panel (para. 11-187).
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2)

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Applicable Models**

M997, M997A1, M997A2

**Tools**

General mechanic's tool kit:
automotive (Appendix B, Item 1)

**Materials/Parts**

Eight lockwashers (Appendix G, Item 110)
Four nut and lockwasher assemblies
(Appendix G, Item 146)

**Manual References**

TM 9-2320-280-10
TM 9-2320-280-24P

**Equipment Condition**

- Battery ground cable disconnected [para. 4-73].
- Rear door blackout switch removed [para. 4-93].
- Electrical outlet/bracket removed [para. 4-90].

**a. Removal**

1. Remove four screws (4), lockwashers (5), and cover (3) from control box (6). Discard lockwasher (5).

   NOTE
   Prior to removal, tag leads for installation.

2. Remove eight screws (2) and lighting harness leads (1) from terminal block (7) and mounting buss (9).

3. Remove two screws (13), clamps (14), and lighting harness (12) from duct (15).

4. Disconnect lead 791B (10) from NBC harness lead 791A (8).

5. Remove grommet (11) and harness (12) from control box (6).

6. Remove screw (31), clamp (16), and harness (12) from body (20).

7. Remove four screws (29) and channel (30) from body (20) and pull channel (30) away for access to clamp (26).

8. Remove nut and lockwasher assembly (22), screw (27), clamp (26), and light harness (23) from cover (30). Discard nut and lockwasher assembly (22).

9. Remove ten screws (24) and cover (28) from body (20). Lower cover (28) to allow access to harness (12).

10. Disconnect six harness leads (19) from light leads (25). Remove harness cover (28) and grommet (17) from cover (28).

11. Disconnect four harness leads (18) from light leads (21).
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2) (Cont'd)
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2) (Cont’d)

12. Remove seven screws (1) and clamps (2) from harness (3) and body (4).
13. Remove two screws (15) and clamps (14) from harness (3) and body (4).
14. Remove two grommets (13) from harness (3) and body (4).
15. Remove four screws (19) and lockwashers (18) from backup light cover (17) and body (16). Pull cover (17) away from body (16) to allow access to harness (3). Discard lockwashers (18).
17. Remove grommet (12) and harness (3) from body (4).
18. Remove screw (5) and clamp (11) from harness (3) and body (4).
19. Remove two nut and lockwasher assemblies (8), screws (6), and clamps (7) from harness (3) and body (4). Discard nut and lockwasher assemblies (8).
20. Disconnect two harness leads (10) from blackout switch leads (9).
21. Remove six screws (23) and clamps (22) from harness (3) and body (24).
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2 (Cont'd)
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2) (Cont’d)

22. Remove four screws (7) from cover (6) and body (15).
23. Remove nut and lockwasher assembly (3), screw (10), and cover (6) from clamp (11) and light harness (14). Discard nut and lockwasher assembly (3).
24. Disconnect four harness leads (5) from light leads (4).
25. Remove ten screws (13) from cover (8) and body (15). Lower cover (8) to allow access to harness (1).
26. Disconnect six harness leads (2) from light harness leads (12). Remove grommet (9) and harness cover (8).

CAUTION
Use care when removing harness. Failure to do so will cause damage to harness.

27. Remove harness (1) from body (15).

b. Installation

CAUTION
Use care when routing harness. Failure to do so will cause damage to harness.

1. Route harness (1) through vehicle in approximate mounting location.
2. Position harness cover (8) over harness (1) and connect six harness leads (2) to light harness leads (12). Install grommet (9) and cover (8) to body (15) with ten screws (13).
3. Connect four harness leads (5) to light leads (4).
4. Install clamp (11) and light harness (14) on cover (6) with screw (10) and nut and lockwasher assembly (3).
5. Install cover (6) on body (15) with four screws (7).
6. Install six clamps (16) on harness (1) and body (18) with six screws (17).
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2) (Cont'd)
7. Connect two harness leads (9) to blackout switch leads (8).
8. Install two clamps (10) on harness (3) and body (4) with two screws (6) and nut and lockwasher assemblies (7).
9. Install clamp (11) on harness (3) and body (4) with screw (5).
10. Install grommet (12) and harness (3) in body (4).
11. Connect harness lead 24H (21) to lead 21G (20).
12. Install backup light cover (17) on body (16) with four lockwashers (18) and screws (19).
13. Install two grommets (13) on harness (3) and body (4).
14. Install two clamps (14) on harness (3) and body (4) with two screws (15).
15. Install seven clamps (2) on harness (3) and body (4) with seven screws (1).
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2) (Cont'd)
16. Connect four harness leads (4) to light harness leads (6).
17. Install grommet (3) on cover (14) and connect six harness leads (1) and (5) to light leads (17) and (11).
18. Install cover (14) on body (8) with ten screws (10).
19. Install clamp (12) on light harness (9) and cover (16) with screw (13) and nut and lockwasher assembly (7).
20. Install cover (16) on body (8) with four screws (15).
21. Install clamp (19) on harness (2) and body (8) with screw (18).
22. Install two clamps (21) on harness (2) and duct (20) with two screws (22).
23. Connect lead 791B (32) to NBC harness lead 791A (30).
24. Install eight leads (23) on terminal block (29) and ground buss (31) with eight screws (24).
25. Install grommet (33) on control box (28).
26. Install cover (25) on control box (28) with four screws (26) and lockwashers (27).
4-101. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M997, M997A1, M997A2) (Cont'd)

FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Check operation of interior dome lights (TM 9-2320-280-10).
• Install rear door blackout switch (para. 4-93).
• Install electrical outlet/bracket (para. 4-90).


<table>
<thead>
<tr>
<th>This task covers:</th>
<th>a. Removal</th>
</tr>
</thead>
</table>

**INITIAL SETUP:**

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>M996, M996A1</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's kit: automotive (Appendix B, Item 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eight lockwashers (Appendix G, Item 110)</td>
</tr>
<tr>
<td>Three nut and lockwasher assemblies (Appendix G, Item 146)</td>
</tr>
</tbody>
</table>

**Manual References**

| TM 9-2320-280-10 |
| TM 9-2320-280-24P |

**Equipment Condition**

- Battery ground cable disconnected (para. 4-73).
- Rear door blackout switch/bracket removed (para. 4-93).
- Rear close out panel removed (para. 11-182).
- Electrical outlet/bracket removed (para. 4-90).

### a. Removal

1. Remove four screws (4), lockwashers (5), and cover (3) from control box (6). Discard lockwasher (5).

   **NOTE**

   Prior to removal, tag leads for installation.

2. Remove eight screws (2) and lighting harness leads (1) from terminal block (7) and mounting buss (9).
3. Disconnect lead 791B (10) from NBC harness lead 791A (8).
4. Remove grommet (12) and harness (11) from control box (6).
5. Remove four screws (14) and cover (13) from body (15) and harness (11).
6. Remove grommet (16) from harness (11).
7. Remove four screws (18) and cover (17) from body (15).
8. Remove four screws (30) from channel (31) and body (15).
9. Remove nut and lockwasher assembly (23), screw (28), clamp (27), and light harness (24) from cover (31). Discard nut and lockwasher assembly (23).
10. Remove grommet (19) from cover (29).
11. Remove ten screws (25) from cover (29) and body (15). Lower cover (29) to allow access to harness (11).
12. Disconnect six harness leads (21) from light leads (26). Remove harness cover (29).
13. Disconnect two harness leads (20) from light leads (22).
4-102. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M996, M996A1) (Cont’d)

14. Remove seven screws (1) and clamps (3) from harness (2) and body (4).
15. Remove two screws (15) and clamps (14) from harness (2) and body (4).
16. Remove two grommets (13) from harness (2) and body (4).
17. Remove four screws (19) and lockwashers (18) from backup light cover (17) and body (16). Pull cover (17) away from body (16) to allow access to harness (2). Discard lockwashers (18).
19. Remove grommet (12) from harness (2) and body (4).
20. Remove screw (5) and clamp (6) from harness (2) and body (4).
21. Remove nut and lockwasher assembly (11), screw (8), and clamp (7) from harness (2) and body (4). Discard nut and lockwasher assembly (11).
22. Disconnect two harness leads (10) from blackout switch leads (9).
23. Remove six screws (23) and clamps (22) from harness (2) and body (24).
4-102. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M996, M996A1) (Cont’d)

24. Remove four screws (7) from cover (6) and body (15).
25. Remove nut and lockwasher assembly (3), screw (10), clamp (11), and cover (6) from light harness (14). Discard nut and lockwasher assembly (3).
26. Remove grommet (9) from cover (8).
27. Disconnect two harness leads (5) from light leads (4).
28. Remove ten screws (13) from cover (8) and body (15). Lower cover (8) to allow access to harness (1).
29. Disconnect six harness leads (2) from light harness leads (12). Remove harness cover (8).

**CAUTION**
Use care when removing harness. Failure to do so will cause damage to harness.

30. Remove harness (1) from body (15).

b. **Installation**

**CAUTION**
Use care when routing harness. Failure to do so will cause damage to harness.

1. Route harness (1) through vehicle in approximate mounting location.
2. Position harness cover (8) over harness (1) and connect six harness leads (2) to light harness leads (12). Install cover (8) on body (15) with ten screws (13).
3. Connect two harness leads (5) to light leads (4).
4. Install grommet (9) on cover (8).
5. Install clamp (11) and light harness (14) on cover (6) with screw (10) and nut and lockwasher assembly (3).
6. Install cover (6) on body (15) with four screws (7).
7. Install six clamps (16) and harness (1) on body (18) with six screws (17).
8. Connect two harness leads (10) to blackout switch leads (9).
9. Install clamp (7) and harness (2) on body (4) with screw (8) and nut and lockwasher assembly (11).
10. Install clamp (6) and harness (2) on body (4) with screw (5).
11. Install grommet (12) on harness (2) and body (4).
12. Connect harness lead 24H (21) to lead 21G (20).
13. Install backup light cover (17) on body (16) with four lockwashers (18) and screws (19).
14. Install grommet (13) on harness (2) and body (4).
15. Install two clamps (14) and harness (2) on body (4) with two screws (15).
16. Install seven clamps (3) and harness (2) on body (4) with seven screws (1).
4-102. INTERIOR LIGHTING HARNESS ASSEMBLY REPLACEMENT (M996, M996A1) (Cont'd)
17. Connect two harness leads (3) on light harness leads (4).
18. Install grommet (2) on cover (11).
19. Position cover (11) and connect six harness leads (1) to light leads (14).
20. Install cover (11) on body (6) with ten screws (8).
21. Install clamp (9) on light harness (7) and cover (13) with screw (10) and nut and lockwasher assembly (5).
22. Install cover (13) on body (6) with four screws (12).
23. Install grommet (15) on harness (16).
24. Position grommet (19) and harness (16) in control box (25).
25. Install cover (17) on body (6) with four screws (18).
26. Connect lead 791B (29) to NBC harness lead 791A (27).
27. Install eight leads (20) on terminal block (26) and ground buss (28) with eight screws (21).
28. Install cover (22) on control box (25) with four screws (23) and lockwashers (24).
FOLLOW-ON TASKS:  
- Install rear close out panel (para. 11-182)  
- Connect battery ground cable (para. 4-73)  
- Check operation of interior dome lights (TM 9-2320-280-10)  
- Install rear door blackout switch/bracket (para. 4-93)  
- Install electrical outlet/bracket (para. 4-90).
This task covers:

a. Spotlight Branch Duct Removal
b. Main Duct Removal
c. Main Duct Installation
d. Spotlight Branch Duct Installation

INITIAL SETUP:

**Applicable Models**
- M996, M996A1, M997, M997A1, M997A2

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)

**Materials/Parts**
- Nut and lockwasher assembly
  - (Appendix G, Item 147)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).

**NOTE**
Harness duct replacement for M996, M996A1, M997, M997A1, and M997A2 are basically the same. This procedure covers M996 and M996A1 models only.

### a. Spotlight Branch Duct Removal

1. Remove four screws (12) from duct (2) and ceiling (4) and pull duct (2) away from ceiling (4) for access to spotlight harness clamp (5).
2. Remove screw (11), nut and lockwasher assembly (6) and spotlight wiring clamp (5) from duct (2). Discard nut and lockwasher assembly (6).

### b. Main Duct Removal

**NOTE**
- Spotlight branch duct must be removed before removing main duct.
- Main duct must be installed before installing spotlight branch duct.
- Prior to removal, tag leads for installation.

1. Remove ten screws (8) from duct (7) and ceiling (4) and pull duct (7) away for access to wiring harness leads (1).
2. Disconnect six light assembly leads (9) from wiring harness leads (1) and remove duct (7).
3. Remove two ceiling lights (10) and blackout light (13) (para. 4-87).
4. Inspect grommet (3) for damage. Replace if damaged.

### c. Main Duct Installation

1. Install two ceiling lights (10) and blackout light (13) (para. 4-87).
2. Connect six light assembly leads (9) to wiring harness leads (1).
3. Install duct (7) on ceiling (4) with ten screws (8)

### d. Spotlight Branch Duct Installation

1. Install spotlight harness clamp (5) on duct (2) with screw (11) and nut and lockwasher assembly (6).
2. Install duct (2) on ceiling (4) with four screws (12).
FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Check operation of interior lights (TM 9-2320-280-10).
4-104. RESUSCITATOR/ASPIRATOR CABLE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Manual References
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

NOTE

- Replacement of resuscitator/aspirator cable is basically the same for M996, M996A1, M997, M997A1, and M997A2 vehicles. This procedure covers M997, M997A1, and M997A2 vehicles.
- For instructions on replacement of rivets, refer to para. 10-66.

a. Removal

1. Remove two screws (3), clamps (7), and cable (1) from body (2) and floor (6).
2. Remove nine rivets (4) from cable duct (5) and floor (6) and slide duct (5) left to remove.
3. Remove two screws (9), clamps (10), cable (1), and power harness clamp (8) from body (2).
4. Remove grommet (11) from floor (6) and remove cable (1) through hole in floor (6).

b. Installation

1. Install grommet (11) in floor (6).
2. Route cable (1) through grommet (11) in floor (6) and position in approximate mounting location.
3. Connect cable (1) to resuscitator and power source. (Leave slack at each end of cable before clamping to connect resuscitation equipment if not installed.)
4. Install two clamps (7) and cable (1) on body (2) and floor (6) with two screws (3).
5. Install cable duct (5) over cable (1) and slide to right under heat duct to mounting position.
6. Install cable duct (5) on floor (6) with nine rivets (4).
7. Install two clamps (10), cable (1), and power harness clamp (8) on body (2) with two screws (9).
4-105. ANTENNA CABLES REPLACEMENT (M996, M996A1)

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models

M996, M996A1

Manual References

TM 9-2320-280-24P

Tools

General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Equipment Condition

Battery ground cable disconnected (para. 4-73).

Materials/Parts

Two tiedown straps (Appendix G, Item 240)

a. Removal

1. Remove two tiedown straps (6) from antenna cables (8), power cable (2), and intercom cable (7). Discard tiedown straps (6).
2. Remove capscrew (3), washer (4), clamp (5), two antenna cables (8), and intercom cable (7) from radio rack (1).
3. Remove three screws (11), clamps (10), two antenna cables (8) and intercom cable (7) from windshield (12).
4. Remove capscrew (14), washer (13), clamp (9), two antenna cables (8) and intercom cable (7) from plate (15) and windshield (12).
5. Remove two antenna cables (8) from antenna (16).

b. Installation

1. Install antenna cables (8) on antenna (16).
2. Install clamp (9) two antenna cables (8) and intercom cable (7) on plate (15) and windshield (12) with washer (13) and capscrew (14). Tighten capscrew (14) 6 lb-ft (8 \text{ N·m}).
3. Install three clamps (10), two antenna cables (8) and intercom cable (7) on windshield (12) with three screws (11).
4. Install clamp (5), two antenna cables (8) and intercom cable (7) on radio rack (1) with washer (4) and capscrew (3). Tighten capscrew (3) 6 lb-ft (8 \text{ N·m}).
5. Install two antenna cables (8) on intercom cable (7) and power cable (2) with two tiedown straps (6).
4-105. ANTENNA CABLES REPLACEMENT (M996, M996A1) (Cont’d)

FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Applicable Models**

M997, M997A1, M997A2

**Manual References**

TM 9-2320-280-10

**Tools**

General mechanic’s tool kit:

- automotive (Appendix B, Item 1)

**Equipment Condition**

- NBC door opened [TM 9-2320-280-10]
- Battery ground cable disconnected [para. 4-73]

**Materials/Parts**

- Lockwasher (Appendix G, Item 113)
- Two nut and lockwasher assemblies (Appendix G, Item 148)
- Two tiedown straps (Appendix G, Item 241)

---

**a. Removal**

1. Remove two tiedown straps (5) from antenna cables (7), power cable (8), and intercom cable (6). Discard tiedown straps (5).
2. Remove capscrew (1), washer (2), clamp (3), two antenna cables (7), and intercom cable (6) from radio rack (4).
3. Remove three screws (10), clamps (11), two antenna cables (7), and intercom cable (6) from windshield (12).
4. Remove capscrew (13), washer (14), clamp (9), two antenna cables (7), and intercom cable (6) from windshield (12) and plate (15).
5. Remove three screws (25), clamps (24), two antenna cables (7), intercom cable (6), and harness (23) from windshield (12).
6. Remove nut and lockwasher assembly (26), capscrew (31), washer (30), clamp (29), and two antenna cables (7) from retainer (27), grommet (28), and body (22). Discard nut and lockwasher assembly (26).
7. Remove nut and lockwasher assembly (16), screw (18), clamp (17), and two antenna cables (7) from body (22). Discard nut and lockwasher assembly (16).
8. Remove capscrew (32), lockwasher (33), clamp (19), ground strap (20), and two antenna cables (7) from body (22). Discard lockwasher (33).
9. Remove two antenna cables (7) from antenna (21).
4-106. ANTENNA CABLES REPLACEMENT (M997, M997A1, M997A2) (Cont’d)
4-106. ANTENNA CABLES REPLACEMENT (M997, M997A1, M997A2) (Cont’d)

b. Installation

1. Install two antenna cables (4) on antenna (7).
2. Install clamp (5) (over yellow locator tape (22)), two antenna cables (4), and ground strap (6) on body (8) with lockwasher (21) and capscrew (20). Tighten capscrew (20) 26 lb-ft (35 N·m).
3. Install clamp (2) and two antenna cables (4) on body (8) with screw (3) and nut and lockwasher assembly (1).
4. Install clamp (17) and two antenna cables (4) on grommet (15), retainer (14), and body (8) with capscrew (19), washer (18), and nut and lockwasher assembly (13).
5. Install three clamps (11), two antenna cables (4), intercom cable (16) and harness (9) on windshield (10) with three screws (12).
6. Install clamp (26), two antenna cables (4), and intercom cable (16) on plate (25) with washer (24) and capscrew (23). Tighten capscrew (23) 6 lb-ft (8 N·m).
7. Install three clamps (28), two antenna cables (4), and intercom cable (16) on windshield (10) with three screws (27).
8. Install clamp (32), two antenna cables (4), and intercom cable (16) on radio rack (33) with washer (31) and capscrew (30). Tighten capscrew (30) 6 lb-ft (8 N·m).
9. Install two tiedown straps (34) on two antenna cables (4), intercom cable (16), and power cable (29).
FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).  
- Close NBC door [TM 9-2320-280-10]
4-107. INTERCOM CABLE REPLACEMENT (M996, M996A1)

This task covers:

a. Removal  b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Materials/Parts
Lockwasher (Appendix G, Item 110)
Four nut and lockwasher assemblies
(Appendix G, Item 148)
Two tiedown straps (Appendix G, Item 241)

Personnel Required
One mechanic
One assistant

Manual References
TM 9-2320-280-24P

Equipment Condition
Battery ground cable disconnected (para. 4-73).

a. Removal

1. Remove two tiedown straps (3) from intercom cable (4), power cable (7) and two antenna cables (6). Discard tiedown straps (3).
2. Remove capscrew (8), washer (1), clamp (2), two antenna cables (6), and intercom cable (4) from radio rack (5).
3. Remove three screws (13), clamps (14), two antenna cables (6), and intercom cable (4) from windshield (15).
4. Remove capscrew (9), washer (10), clamp (12), intercom cable (4), and two antenna cables (6) from plate (11).
5. Remove two screws (22), clamps (23), and intercom cable (4) from body (17).
6. Remove two nut and lockwasher assemblies (16), capscrews (21), washers (20), grommet (18), retainer (19), and intercom cable (4) from body (17). Discard nut and lockwasher assemblies (16).
7. Loosen two clamps (12) and remove hose assemblies (11) from filter canisters (10).
8. Disconnect electrical harness lead (20) from precleaned (3).
9. Remove screw (1) and ground wire (2) from precleaned (3).
10. Disconnect latch (7) and remove precleaned (3) from bracket (4).
11. Remove four capscrews (15), washers (14), large washers (13), nut and washer assemblies (9) and bracket (4) from body (8).
12. Remove two nut and lockwasher assemblies (16), screws (19), clamps (17), and intercom cable (18) from body (8). Discard nut and lockwasher assemblies (16).
13. Remove three screws (5), clamps (6), and intercom cable (18) from body (8).
14. Remove two screws (25), washers (24), retainer (27), grommet (26), intercom cable (18), and harness (21) from body (8).
15. Remove capscrew (30), lockwasher (29), clamp (28), and intercom cable (18) from NBC heater (31). Discard lockwasher (29).
16. Remove screw (32), clamp (33), and intercom cable (18) from body (8).
17. Disconnect intercom cable (18) from intercom (34). Remove intercom cable (18) from vehicle while ensuring proper alignment of intercom cable connector (37) to avoid damage to wiring harness (35) as intercom cable (18) passes through hole (22) in bulkhead wall (36).

b. Installation

1. Ensure proper alignment of intercom cable connector (37) to avoid damage to wiring harness (35) as intercom cable (18) passes through hole (22) in bulkhead wall (36). Route intercom cable (18) through vehicle in approximate mounting location. Ensure yellow tape (23) is located in hole (22).
2. Connect intercom cable (18) to intercom (34).
3. Install clamp (33) and intercom cable (18) on body (8) with screw (32).
4. Install clamp (28) and intercom cable (18) on NBC heater (31) with lockwasher (29) and capscrew (30).
5. Install grommet (26), retainer (27), (over yellow tape (23)) intercom cable (18), and harness (21) in body (8) with two washers (24) and screws (25).
6. Install three clamps (6) and intercom cable (18) on body (8) with three screws (5).
7. Install two clamps (17) and intercom cable (18) on body (8) with two screws (19) and nut and lockwasher assemblies (16).
8. Install bracket (4) on body (8) with four capscrews (15), washers (14), large washers (13), and nut and washer assemblies (9).
9. Install precleaned (3) on bracket (4) with latch (7).
10. Install ground wire (2) on precleaned (3) with screw (1).
11. Connect electrical harness lead (20) to precleaned (3).
12. Install two hose assemblies (11) to filter canisters (10) with two clamps (12).
13. Install grommet (3), retainer (4), and intercom cable (7) on body (2) with two washers (5), cap-screws (6), and nut and lockwasher assemblies (1).
14. Install two clamps (9) and intercom cable (7) on body (2) with two screws (8).
15. Install clamp (13), intercom cable (7), and two antenna cables (16) on plate (12) and windshield (17) with washer (11) and capscrew (10). Tighten capscrew (10) to 6 lb-ft (8 N·m).
16. Install three clamps (15), intercom cable (7), and two antenna cables (16) on windshield (17) with three screws (14).
17. Install clamp (19), intercom cable (7), and two antenna cables (16) on radio rack (21) with washer (18) and capscrew (23). Tighten capscrew (23) to 6 lb-ft (8 N·m).
18. Install intercom cable (7) on antenna cables (16) and power cable (22) with two tiedown straps (20).
FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Test NBC system operation (TM 9-2320-280-10)
This task covers:

**a. Removal**

**b. Installation**

**INITIAL SETUP:**

**Applicable Models**
M997, M997A1, M997A2

**Manual References**
TM 9-2320-280-10
TM 9-2320-280-24P

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- NBC door opened (TM 9-2320-280-10)

**Materials/Parts**
- Two tiedown straps (Appendix G, Item 241)
- Five nut and lockwasher assemblies (Appendix G, Item 148)

---

**a. Removal**

1. Remove two tiedown straps (3) from intercom cable (4), power cable (7), and two antenna cables (6). Discard tiedown straps (3).

2. Remove capscrew (8), washer (1), clamp (2), two antenna cables (6), power cable (7), and intercom cable (4) from radio rack (5).

3. Remove three screws (13), clamps (14), two antenna cables (6), and intercom cable (4) from windshield (15).

4. Remove capscrew (9), washer (10), clamp (12), intercom cable (4), and two antenna cables (6) from plate (11) and windshield (15).

5. Remove three screws (25), clamps (24), intercom cable (4), two antenna cables (6), and wiring harness (23) from body (19).

6. Remove two nut and lockwasher assemblies (16), capscrews (21), washers (20), grommet (17), retainer (18), intercom cable (4), wiring harness (23), two antenna cables (6), and clamp (22) from body (19). Discard nut and lockwasher assemblies (16).
4-108. INTERCOM CABLE REPLACEMENT (M997, M997A1, M997A2) Cont’d

[Diagram showing various labeled parts of the intercom cable system, with labels 1 through 25, demonstrating the connections and layout of the cable replacement process.]
7. Remove three nut and lockwasher assemblies (3), screws (7), and cover (2) from body (6). Discard nut and lockwasher assemblies (3).
8. Remove two screws (4), clamps (5), intercom cable (1), and wiring harness (8) from body (6).
9. Remove two screws (13), washers (12), grommet (10), retainer (11), intercom cable (1), and wiring harness (8) from body (6).
10. Remove intercom cable (1) from intercom (14) and vehicle.

b. Installation

1. Install intercom cable (1) on intercom (14).
2. Route intercom cable (1) in vehicle in approximate mounting location.
3. Install grommet (10), retainer (11), wiring harness (8) (over yellow tape (9)) and intercom cable (1) on body (6) with two washers (12) and screws (13).
4. Install two clamps (5), intercom cable (1), and wiring harness (8) on body (6) with two screws (4).
5. Install cover (2), intercom cable (1), and wiring harness (8) on body (6) with three screws (7) and nut and lockwasher assemblies (3).
4-108. INTERCOM CABLE REPLACEMENT (M997, M997A1, M997A2) Cont’d)
6. Install grommet (3), retainer (4), intercom cable (2), wiring harness (10), and two cables (6) on body (5) with two capscrews (8), washers (7), clamp (9), and two nut and lockwasher assemblies (1).

7. Install intercom cable (2), two antenna cables (6), and wiring harness (10) on windshield (11) with three clamps (12) and screws (13).

8. Install intercom cable (2) and two antenna cables (6) on plate (16) and windshield (11) with clamp (17), washer (15), and screw (14). Tighten screw (14) to 6 lb-ft (8 N·m).

9. Install intercom cable (2) and two antenna cables (6) on body (5) with three clamps (19) and screws (18).

10. Install intercom cable (2), two antenna cables (6), and radio rack (23) with washer (20) and capscrew (25). Tighten capscrew (25) to 6 lb-ft (8 N·m).

11. Install intercom cable (2) on antenna cables (6) and power cable (24) with two tiedown straps (22).
4-108. INTERCOM CABLE REPLACEMENT (M997, M997A1, M997A2) Cont’d

FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73)
- NBC door closed (TM 9-2320-280-10)
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1

Tools
General mechanic’s tool kit: automotive (Appendix B, Item 1)

Materials/Parts
Eleven lockwashers (Appendix G, Item 108)
Tiedown strap (Appendix G, Item 241)
Adhesive sealant (Appendix C, Item 9)

Personnel Required
One mechanic
One assistant

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
- Battery ground cable removed (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

General Safety Instructions
Alternator must be supported during removal and installation.

a. Removal

1. Remove four screws (1), lockwashers (21), cover (2), and gasket (3) from regulator (4). Discard lockwashers (21).

   NOTE
   Prior to removal, tag leads for installation.

2. Remove nut (13), lockwasher (12), and lead 2A (11) from stud (10). Discard lockwasher (12).

3. Remove nut (15), lockwasher (16), and lead 5A (14) from stud (5). Discard lockwasher (16).

4. Remove rubber wedge (17) from opening in regulator (4).

5. Disconnect lead 568A (19) from harness lead (20).

6. Remove tiedown strap (18) and lead 568A (19) from leads 5A (14) and 2A (11). Discard tiedown strap (18).

   NOTE
   In some cases, a thru-bolt and nut maybe present on mounting bracket instead of standard capscrews and washers.

7. Loosen capscrews (9) on alternator adjusting bracket (6) and two capscrews (38) on alternator (41), alternator mounting bracket (40), and support bracket (39).

8. Remove three drivebelts (7) from alternator pulley (8).

9. Slide back rubber boot (27) and remove nut (23), lockwasher (24), washer (25), fuse (26), insulator (22), alternator positive cable (28), and bushing (29) from positive stud (30). Discard lockwasher (24).

10. Remove nut (35), lockwasher (34), lead 3B (31), and ground strap (33) from ground stud (32). Discard lockwasher (34).

   WARNING
   Alternator must be supported during removal and installation.
   If failure to support alternator may cause injury to personnel or damage to equipment.

11. Remove capscrew (9), lockwasher (36), and washer (37) from alternator (41) and adjusting bracket (6). Discard lockwasher (36).
NOTE
Perform step 13 for vehicles with new alternator support bracket configuration.

12. Remove two capscrews (41), lockwashers (42), and washers (43) from alternator (46), support bracket (44), and mounting bracket (45). Discard lockwashers (42).

13. Remove two capscrews (41), lockwashers (42), washer (48), spacer (50), and alternator (46), from power steering lines bracket (49), support bracket (44), and mounting bracket (45). Discard lockwashers (42).

14. Remove five screws (38), washers (39), and guard (40) from alternator (46).

15. Remove alternator pulley (8) (para. 4-3).

b. Installation

1. Install alternator pulley (8) (para. 4-3).

2. Install guard (40) on alternator (46) with five washers (39) and screws (38).

NOTE
• Perform step 4 for vehicles with new alternator support bracket configuration.
• In some cases, a thru-bolt and nut may be present on mounting bracket instead of standard capscrews and washers.

3. Position alternator (46) on mounting bracket (45) with support bracket (44) between mounting bracket (45) and alternator (46) and install two washers (43), lockwashers (42), and capscrews (41). Do not tighten capscrews (41).

4. Position alternator (46) on mounting bracket (45) with support bracket (44) and power steering lines bracket (49) on the outside of alternator mounting flange (47) and install spacer (50), washer (48), two lockwashers (42), and capscrews (41).

5. Align alternator (46) with adjusting bracket (6) and install washer (37), lockwasher (36), and capscrew (9). Do not tighten capscrew (9).

NOTE
Ensure terminals are clean before connections are made.

6. Install ground strap (33) and lead 3B (31) on ground stud (32) with lockwasher (34) and nut (35). Tighten nut (35) to 8-12 lb-ft (11-16 N·m).

7. Install insulator (22) in fuse (26).

8. Install bushing (29), positive cable (28), fuse (26), and insulator (22) on positive stud (30) with washer (25), lockwasher (24), and nut (23). Tighten nut (23) to 10-15 lb-ft (14-20 N·m). Slide rubber boot (27) over nut (23).

NOTE
For vehicles equipped with deep water fording kits, perform step 9.

9. Apply sealant to positive stud (30) and positive cable (28) so that all exposed metallic surfaces are coated. The sealant should be evenly applied with a minimum thickness of .06 in. (1.5 mm).

10. Install three drivebelts (7) on alternator pulley (8).

11. Install lead 5A (14) on stud (5) with lockwasher (16) and nut (15).

12. Install lead 2A (11) on stud (10) with lockwasher (12) and nut (13).

13. Install rubber wedge (17) in opening in regulator (4).

14. Install gasket (3) and cover (2) on regulator (4) with four lockwashers (21) and screws (1).

15. Connect lead 568A (19) on harness lead (20) and leads 2A (11) and 5A (14) using tiedown straps (18).
FOLLOW-ON TASKS:

- Adjust alternator belts (para. 3-82).
- Battery ground cable installed (para. 4-73).
- Lower and secure hood (TM 9-2320-280-10).
4-110. (6.2 L) 200 AMPERE ALTERNATOR (12338796-1) REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Applicable Models**
M996A1, M997A1, M1097, M1097A1

**Tools**
General mechanic's tool kit:
- automotive (Appendix B, Item 1)

**Materials/Parts**
- Lockwasher (Appendix G, Item 108)
- Two lockwashers (Appendix G, Item 138)
- Lockwasher (Appendix G, Item 136)
- Lockwasher (Appendix G, Item 137)

**Personnel Required**
- One mechanic
- One assistant

### a. Removal

**NOTE**
Prior to removal, tag leads for installation.

1. Remove nut (25), lockwasher (24), washer (23), lead 3B (22), and ground strap (21) from ground stud (20). Discard lockwasher (24).

2. Slide back rubber boot (26) and remove nut (1), lockwasher (2), washer (3), fuse link (4), insulator washer (27), alternator positive cable (5), and washer (6) from positive stud (7). Discard lockwasher (2).

**NOTE**
In some cases, a thru-bolt and nut maybe present on mounting bracket instead of standard capscrews and washers.

3. Loosen capscrews (12) and (14) on alternator adjusting bracket (9) and two capscrews (15) securing alternator (18) to alternator mounting bracket (17) and support bracket (16).

4. Remove three drivebelts (8) from alternator pulley (19).

**WARNING**
Alternator must be supported during removal and installation.
Failure to support alternator may cause injury to personnel or damage to equipment.

5. Remove capscrew (12), lockwasher (11), and washer (10) securing alternator (18) to adjusting bracket (9). Discard lockwasher (11).

6. Remove capscrew (14), washer (13), and alternator adjusting bracket (9) from mounting bracket (17).
4-110. (6.2 L) 200 AMPERE ALTERNATOR (12338796-1) REPLACEMENT (Cont’d)
NOTE
Perform step 8 for vehicles with new alternator support bracket configuration.

7. Remove two capscrews (18), lockwashers (19), and washers (20) securing alternator (24) to support bracket (21) and mounting bracket (23). Discard lockwashers (19).

8. Remove two capscrews (18), lockwashers (19), washers (20), and spacer (27) securing alternator (24), power steering lines bracket (25), and support bracket (21) to mounting bracket (23). Discard lockwashers (19).


10. Remove three capscrews (15), washers (16), bushings (22), and fan guard assembly (17) from alternator (24).

11. Remove alternator pulley (28) [para. 4-3].

b. Installation

1. Install alternator pulley (28) [para. 4-3].

2. Install fan guard assembly (17) on alternator (24) with three bushings (22), washers (16), and capscrews (15).

WARNING
Alternator must be supported during removal and installation. Failure to support alternator may cause injury to personnel or damage to equipment.

NOTE
• Perform step 4 for vehicles with new alternator support bracket configuration.
• In some cases, a thru-bolt and nut may be present on mounting bracket instead of standard capscrews and washers.

3. Position alternator (24) on mounting bracket (23) with support bracket (21) between mounting bracket (23) and alternator (24) and install two washers (20), lockwashers (19), and capscrews (18). Do not tighten capscrews (18).

4. Position alternator (24) on mounting bracket (23) with support bracket (21) and power steering lines bracket (25) on the outside of alternator mounting flange (26) and install spacer (27), two washers (20), lockwashers (19), and capscrews (18).

5. Position alternator adjusting bracket (9) and install washer (10), lockwasher (11), and capscrew (12). Do not tighten capscrew (12).

6. Align alternator (24) with adjusting bracket (9) and install washer (13) and capscrew (14). Do not tighten capscrew (14).

NOTE
Ensure terminals are clean before connections are made.

7. Install insulator washer (36) in fuse link (4).

8. Install washer (6), positive cable (5) fuse link (4) and insulator washer (36) on positive stud (7) with washer (3), lockwasher (2), and nut (1). Tighten nut (1) to 10-15 lb-ft (14-20 N·m).

9. Install ground strap (30) and lead 3B (31) to ground stud (29) with washer (32), lockwasher (33), and nut (34). Tighten nut (34) to 8-12 lb-ft (11-16 N·m).

10. Install three drivebelts (8) on alternator pulley (28).

11. Install rubber boot (35) over stud (7).
FOLLOW-ON TASKS:  
- Install voltage regulator [para. 4-115].
- Adjust alternator belts [para. 3-81].
4-110.1. (6.5 L) 200 AMPERE ALTERNATOR (12338796-1) REPLACEMENT

This task covers:

| a. Removal | b. Installation |

INITIAL SETUP:

**Applicable Models**
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)
  - Breaker bar, 3/8 in (Appendix B, Item 2)

**Materials/Parts**
- Lockwasher (Appendix G, Item 108)
- Two lockwashers (Appendix G, Item 138)
- Lockwasher (Appendix G, Item 136)

**Personnel Required**
- One mechanic
- One assistant

---

**a. Removal**

**NOTE**
Prior to removal, tag leads for installation.

1. Remove nut (23), lockwasher (22), washer (21), lead 3B (20), and ground strap (19) from ground stud (17). Discard lockwasher (22).
2. Slide back rubber boot (24) and remove nut (1), lockwasher (2), washer (3), fuse link (4), insulator washer (25), alternator positive cable (5), and washer (6) from positive stud (7). Discard lockwasher (2).
3. Position 3/8-inch breaker bar on belt tensioner (26), move tensioner (26) clockwise, and remove serpentine drivebelt (8) from alternator pulley (16).

**WARNING**
Alternator must be supported during removal and installation. Failure to support alternator may cause injury to personnel or damage to equipment.

4. Remove capscrew (12), lockwasher (11), and washer (10) securing alternator (34) to adjusting bracket (9). Discard lockwasher (11).
5. Remove capscrew (14), washer (13), plate (15), and alternator adjusting bracket (9) from mounting bracket (18).
6. Remove nut (37), lockwasher (36), washer (31), thru-bolt (32), washer (31), and alternator (34) from support bracket (33) and alternator mounting bracket (35). Discard lockwasher (36).
7. Remove three capscrews (28), washers (29), bushings (27), and fan guard assembly (30) from alternator (34).
8. Remove alternator pulley (16) (para. 4-3).
4-110.1. (6.5 L) 200 AMPERE ALTERNATOR (12338796-1) REPLACEMENT (Cont’d)

b. Installation

1. Install alternator pulley (27) (para. 4-3).
2. Install fan guard assembly (4) on alternator (8) with three bushings (1), washers (3), and capscrews (2).

**WARNING**
Alternator must be supported during removal and installation.
Failure to support alternator may cause injury to personnel or damage to equipment.

3. Position alternator (8) on mounting bracket (9) with support bracket (7) on outside of alternator (8) and install washer (5), thru-bolt (6), washer (5), lockwasher (10), and nut (11).
4. Position adjusting bracket (20) on alternator (8), and install washer (21), lockwasher (22), and capscrew (23). Tighten capscrew (23) to 40 lb-ft (54 N·m).
5. Install alternator (8) with adjusting bracket (20 on suport bracket (29) with plate (26), washer (24), and capscrew (25). Tighten capscrew (25) to 40 lb-ft (54 N·m).

**NOTE**
Ensure terminals are clean before connections are made.

6. Install insulator washer (36) in fuse link (15).
7. Install washer (17), positive cable (16), fuse link (15), and insulator washer (36) on positive stud (18) with washer (14), lockwasher (13), and nut (12). Tighten nut (12) to 10-15 lb-ft (14-20 N·m).
8. Slide rubber boot (35) over stud (18).
9. Install mound strap (30) and lead 3B (31) on ground stud (28) with washer (32), lockwasher (33), and nut (34). Tighten nut (34) to 8-12 lb-ft (11-16 N·m).
FOLLOW-ON TASK: Install voltage regulator (para. 4-115).
4-111. 200 AMPERE ALTERNATOR CABLE (12448621-2) REPLACEMENT

This task covers

| a. Removal | b. Installation |

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>M997A2, M1097A2</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td></td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit: automotive (Appendix B, Item 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two lockwashers (Appendix G, Item 108)</td>
</tr>
<tr>
<td>Adhesive sealant (Appendix C, Item 9)</td>
</tr>
</tbody>
</table>

Equipment Condition

- Battery ground cables disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).
- Engine access cover removed (para. 10-15).

NOTE

Prior to removal, tag leads for installation.

### a. Removal

1. Slide back rubber boot (1) and remove nut (3), lockwasher (4), washer (5), fuse (2), insulator (6), cable (7), and bushing (8) from positive stud (9). Discard lockwasher (4).
2. Remove capscrew (11), clamp (12), and cable (7) from bracket (10).
3. Remove nut (17), lockwasher (16), washer (15), and cable (7) from buss bar (14) and remove cable (7) from battery box (13). Discard lockwasher (16).

### b. Installation

NOTE

Ensure terminals are clean before connections are made.

1. Route cable (7) through grommet (18) in battery box (13), and install cable (7) on buss bar (14) with washer (15), lockwasher (16), and nut (17).
2. Route cable (7) in approximate mounting location over heat shield, and secure cable (7) and clamp (12) on bracket (10) with capscrew (11).
3. Apply sealant to positive stud (9) and cable (7) so all exposed metallic surfaces are coated.
4. Install bushing (8), cable (7), fuse (2), and insulator (6) on positive stud (9) with washer (5), lockwasher (4), and nut (3). Tighten nut (3) to 10-15 lb-ft (14-20 N·m). Slide rubber boot (1) over nut (3).
FOLLOW-ON TASKS:

- Install engine access cover (para. 10-15).
- Lower and secure hood (TM 9-2320-280-10).
- Connect battery ground cables (para. 4-73).
- Start engine and check operation of voltmeter gauge (TM 9-2320-280-10).
4-112. 200 AMPERE ALTERNATOR CABLE (12339317) REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**

- M996, M996A1, M997, M997A1, M1097, M1097A1

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**Tools**

- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**

- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

**Materials/Parts**

- Six lockwashers (Appendix G, Item 108)
- Tiedown strap (Appendix G, Item 241)
- Adhesive sealant (Appendix C, Item 9)

**NOTE**

- Prior to removal, tag leads for installation.

**a. Removal**

1. Remove tiedown strap (30), nut (31), lockwasher (32), and 200 ampere cable (8) from starter positive post (33). Discard tiedown strap (30).

**NOTE**

- Step 2 applies to M997 and M997A1 vehicles only. Step 3 applies to M996, M996A1, M1097, and M1097A1 vehicles only.

2. Remove two nuts (24), lockwashers (23), bolt (29), cable (8), and clamps (28), (25), and (27) from oil pan bracket (26). Discard lockwashers (23).

3. Remove nut (24), lockwasher (23), bolt (29), cable (8), and clamp (28) from oil pan bracket (26). Discard lockwasher (23).

4. Remove nut (19), lockwasher (20), clamps (21), and (22), and cable (8) from compressor (18). Discard lockwasher (20).

5. Remove nut (15), lockwasher (16), cable (8), and clamp (17) from engine lift bracket (1). Discard lockwasher (16).

6. Remove nut (11), lockwasher (12), cable (8), and clamp (13) from water crossover stud (14). Discard lockwasher (12).

7. Slide back rubber boot (2) and remove nut (4), lockwasher (5), washer (6), fuse (3), insulator (7), cable (8), and bushing (9) from positive stud (10). Discard lockwasher (5).

8. Remove cable (8) from vehicle.

**b. Installation**

**NOTE**

- Ensure terminals are clean before connections are made.

1. Install bushing (9), cable (8), fuse (3), and insulator (7) on positive stud (10) with washer (6), lockwasher (5), and nut (4). Tighten nut (4) to 10-15 lb-ft (14-20 N·m). Slide rubber boot (2) over nut (4).

**NOTE**

- For vehicles equipped with deep water fording kits, perform step 2.

2. Apply sealant to positive stud (10) and cable (8) so all exposed metallic surfaces are coated. The sealant should be evenly applied with a minimum thickness of .06 in. (1.5 mm).
4-112. 200 AMPERE ALTERNATOR CABLE (12339317) REPLACEMENT (Cont'd)

3. Install clamp (13) and cable (8) on water crossover stud (14) with lockwasher (12) and nut (11).
4. Install clamp (17) on cable (8) and engine lift bracket (1) with lockwasher (16) and nut (15).
5. Install clamp (22) on cable (8) and secure clamp (21) to compressor (18) with lockwasher (20) and nut (19).

NOTE
Step 6 applies to M997 and M997A1 vehicles only. Step 7 applies to M996 and M996A1 vehicles only.

6. Install clamps (28), (27), and (25) on cable (8) and oil pan bracket (26) with bolt (29), lockwasher (23), and nut (24).
7. Install clamp (28) on cable (8) and oil pan bracket (26) with bolt (29), lockwasher (23), and nut (24).
8. Install cable (8) on starter positive post (33) with lockwasher (32) and nut (31). Connect tiedown strap (30).
9. Apply sealant to starter positive post (33) and cable (8) so that all exposed metallic surfaces are coated. The sealant should be evenly applied with a minimum thickness of .12 in. (3 mm).

FOLLOW-ON TASKS: • Lower and secure hood (TM 9-2320-280-10)
• Connect battery ground cable (para. 4-73).
• Start engine and check operation of voltmeter gauge (TM 9-2320-280-10)
4-113. 200 AMPERE UMBILICAL POWER CABLE REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
- M1097, M1097A1, M1097A2

**Personnel Required**
- One mechanic
- One assistant

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Batteries removed (para. 4-79).
- Fixed rear door removed (para. 10-14).

**Materials/Parts**
- Five lockwashers (Appendix G, Item 118)
- Silicone compound (Appendix C, Item 48)

### a. Removal

**NOTE**
- Prior to removal, tag leads for installation.
- Perform step 1 for M1097A2 vehicles only. Perform step 2 for M1097 and M1097A1 vehicles.

1. Remove nut (5), lockwasher (6), washer (11), and positive power cable (7) from buss bar (10). Discard lockwasher (6).
2. Remove nut (5), lockwasher (6), and positive power cable (7) from power stud (8). Discard lockwasher (6).
3. Remove capscrew (1), lockwasher (2), negative power cable (3), and two cables (4) from shunt (9). Discard lockwasher (2).

**NOTE**
- Perform step 4 for M1097A2 vehicles only. Perform steps 5 and 6 for M1097 and M1097A1 vehicles only.
4. Remove five capscrews (35), two washers, (34), and coverplate (33) from “B” beam (13).
5. Remove three capscrews (32) from coverplate (20) and “B” beam (13).
6. Remove three nuts (18), lockwashers (17), capscrews (21), and coverplate (20) from cargo floor (19). Discard lockwashers (17).
7. Remove two nuts (16), washers (15), capscrews (27), washers (28), and mounting bracket (25) from coverplate (20).
8. Remove nut (29) and screw (24) from cover chain (22) and mounting bracket (25).
9. Remove cover (23) and cover chain (22) from umbilical power cable assembly (30).
10. Remove four nuts (31), screws (26), and mounting bracket (25) from umbilical power cable assembly (30).
11. Pull umbilical power cable assembly (30) through grommet (12) and coverplate (20) and remove from vehicle.
12. Remove grommet (12) from battery box (14).
4-113. 200 AMPERE UMBILICAL POWER CABLE REPLACEMENT (Cont’d)
4-113. 200 AMPERE UMBILICAL POWER CABLE REPLACEMENT (Cont’d)

b. Installation

1. Install grommet (12) on battery box (14).
2. Route umbilical power cable assembly (30) through coverplate (20) and grommet (12) and position in approximate mounting location.
3. Install umbilical power cable assembly (30) on mounting bracket (25) with three screws (24) and nuts (31).
4. Install cover (23) on umbilical power cable assembly (30).
5. Install cover chain (22) on mounting bracket (25) with screw (24) and nut (29).

   NOTE
   Perform step 6 for M1097A2 vehicles only. Perform steps 7 and 8 for M1097 and M1097A1 vehicles.

6. Install coverplate (33) on “B” beam (13) with two washers (34) and five capscrews (35).
7. Install mounting bracket (25) on coverplate (20) with two washers (28), capscrews (27), washers (15), and nuts (16).
8. Install coverplate (20) on “B” beam (13) with three capscrews (32).
9. Install coverplate (20) to cargo floor (19) with three capscrews (21), lockwashers (17), and nuts (18).
   Tighten nuts (18) to 65 lb-ft (88 N·m).
10. Install two cables (4) and negative power cable (3) on shunt (9) with lockwasher (2) and capscrew (1).

   NOTE

11. Install positive power cable (7) on buss bar (10) with washer (11), lockwasher (6), and nut (5).
12. Install positive power cable (7) on power stud (8) with lockwasher (6) and nut (5).
13. Apply silicone compound to cable (7) so that all exposed metallic surfaces are coated.
FOLLOW-ON TASKS:
- Install fixed rear door (para. 10-14).
- Install batteries (para. 4-79).
This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Applicable Models**
M996, M996A1, M997, M997A1

**Tools**
General mechanic's tool kit:
automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

**Materials/Parts**
- Five lockwashers (Appendix G, Item 118)
- Eight lockwashers (Appendix G, Item 113)
- Three lockwashers (Appendix G, Item 117)

### a. Removal

1. Remove four screws (1), lockwashers (2), cover (3), and gasket (4) from regulator (5). Discard lockwashers (2).

   **NOTE**
   Prior to removal, tag leads for installation.

2. Remove nut (13), lockwasher (12), and lead 2A (11) from stud (9). Discard lockwasher (12).

3. Remove nut (15), lockwasher (16), and lead 5A (14) from stud (10). Discard lockwasher (16).

4. Remove rubber wedge (17) from opening in regulator (5).

5. Remove four screws (6) and lockwashers (7) from regulator (5) and alternator (8) and pull regulator (5) away for access to leads (21). Discard lockwashers (7).

6. Remove five screws (23), lockwashers (22), leads (21), and regulator (5) from alternator (8). Discard lockwashers (22).

7. Remove nut (19), lockwasher (18), and lead 568A (20) from stud (10). Discard lockwasher (18).

### b. Installation

1. Install lead 568A (20) on stud (10) with lockwasher (18) and nut (19).

2. Install five leads (21) on regulator (5) with five lockwashers (22) and screws (23).

3. Install regulator (5) on alternator (8) with four lockwashers (7) and screws (6).

4. Install lead 5A (14) on stud (10) with lockwasher (16) and nut (15).

5. Install lead 2A (11) on stud (9) with lockwasher (12) and nut (13).

6. Install rubber wedge (17) in opening in regulator (5).

7. Install gasket (4) and cover (3) on regulator (5) with four lockwashers (2) and screws (1).
FOLLOW-ON TASKS:

- Lower and secure hood (TM 9-2320-280-10)
- Connect battery ground cable (para. 4-73)
# 4-115. 200 AMPERE REGULATOR (12338796-1, S-311) REPLACEMENT

## This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

### INITIAL SETUP:

#### Applicable Models
- M997A2, M1025A2, M11035A2, M1043A2, M1045A2, M1097, M1097A1, M1097A2

#### Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

#### Tools
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

#### Equipment Condition
- Battery ground cables disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10)

#### Materials/Parts
- Two lockwashers (Appendix G, Item 134)
- Lockwasher (Appendix G, Item 135)
- Sealing Compound (Appendix C, Item 45)

### a. Removal

**NOTE**

Prior to removal, tag leads for installation.

1. Disconnect regulator plug (13) from voltage regulator (12).
2. Slide back rubber boot (4) and remove nut (3), lead 5A (2), and washer (1) from red (energize) terminal (26).
3. Slide back rubber boot (5) and remove nut (6), lead 2A (7), and washer (8) from yellow (AC) terminal (9).

**NOTE**

Perform steps 4 and 5 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

4. Slide back rubber boot (22) and remove nut (23), lead (21), and washer (24) from terminal (25).
5. Disconnect regulator connector (17) from alternator connector (16).
6. Remove two screws (20), lockwashers (19), and washers (18) from voltage regulator (12) and alternator (15). Discard lockwashers (19).
7. Remove capscrew (10), lockwasher (11), spacer (14), and voltage regulator (12) from alternator (15). Discard lockwasher (11).

### b. Installation

1. Apply sealing compound to threads of capscrew (10).
2. Install spacer (14) and voltage regulator (12) on alternator (15) with lockwasher (11) and capscrew (10). Tighten capscrew (10) to 88-94 lb-in. (10-11 N·m).
3. Install two washers (18), lockwashers (19) and screws (20) on voltage regulator (12) and alternator (15). Tighten screws (20) to 30-34 lb-in. (3-4 N·m).
1. Install washer (24), lead (21), and nut (23) on terminal (25). Tighten nut (23) to 18-22 lb-in. (2.0-2.5 N·m). Slide rubber boot (22) over terminal (25).
2. Connect regulator connector (17) to alternator connector (16).
3. Install washer (1), lead 5A (2), and nut (3) on red (energize) terminal (26). Tighten nut (3) to 23-27 lb-in. (2.6-3.0 N·m). Slide rubber boot (4) over terminal (26).
4. Install washer (8), lead 2A (7), and nut (6) on yellow (AC) terminal (9). Tighten nut (6) to 18-22 lb-in. (2.0-2.5 N·m). Slide rubber boot (5) over terminal (9).
5. Connect regulator plug (13) to voltage regulator (12).

**FOLLOW-ON TASK:**
- Lower and secure hood (TM 9-2320-280-10)
- Connect battery ground cables (para. 4-73)
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Manual References
TM 9-2320-280-24P

Equipment Condition
Control box removed (para. 4-96 or 4-97).

Tools
General mechanic's tool kit: Control box removed (para. 4-96 or 4-97).

Materials/Parts
Ten nut and lockwasher assemblies
(Appendix G, Items 146)

Prior to removal, tag leads for installation.
M996 and M996A1 require only nine screws and leads.

a. Removal

1. Remove ten screws (6) and leads (5) from terminal block (8).
2. Remove two nut and lockwasher assemblies (3), two leads 790 (2) and 797 and 797A (11) from screws (12). Discard nut and lockwasher assemblies (3).
3. Remove four nut and lockwasher assemblies (1), screws (12), terminal (8), and mounting buss (9) from control box (4). Discard four nut and lockwasher assemblies (1).
4. Remove four nut and lockwasher assemblies (10), screws (7), and terminal block (8) from mounting buss (9). Discard nut and lockwasher assemblies (10).

b. Installation

1. Install terminal block (8) on mounting buss (9) with four screws (7) and nut and lockwasher assemblies (10).
2. Install mounting buss (9) on control box (4) with four screws (12) and nut and lockwasher assemblies (1).
3. Install two leads 790 (2) and 797 and 797A (11) with two screws (12) and nut and lockwasher assemblies (3).
4. Install ten leads (5) to terminal block (8) with ten screws (6).
FOLLOW-ON TASK: Install control box (para. 4-96 or 4-97).
4-117. CONTROL BOX FUSE BLOCK AND RELAY SOCKET REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Equipment Condition
• Control box removed (para. 4-96 or 4-97).
• If replacing a fuse block remove fuses (TM 9-2320-280-10).
• If replacing relay socket: remove relays (para. 4-120).

Materials/Parts
Two nut and lockwasher assemblies (Appendix G, Item 146)
Two tiedown straps (Appendix G, Item 241)

NOTE
Procedures for replacing the upper fuse block, and relay socket are basically the same. This procedure covers replacement of the lower fuse block.

a. Removal

1. Remove two tiedown straps (3) from fuse block leads (7). Discard tiedown straps (3).
2. Remove two nut and lockwasher assemblies (6), washers (5), and screws (2) from fuse block (4) and control box (1) and pull fuse block (4) away for access to leads (7). Discard nut and lockwasher assemblies (6).

NOTE
Prior to removal, tag leads for installation.

3. Disconnect six leads (7) from fuse block (4) and remove fuse block (4).

b. Installation

1. Connect six leads (7) to fuse block (4).
2. Install fuse block (4) on control box (1) with two screws (2), washers (5), and nut and lockwasher assemblies (6).
3. Install fuse block leads (7) with two tiedown straps (3).
FOLLOW-ON TASKS:

- If relay socket was replaced: install relays (para. 4-120).
- If fuse block was replaced: install fuses (TM 9-2320-280-10).
- Install control box (para. 4-96 or 4-97).
4-118. CONTROL BOX LIGHT SWITCH REPLACEMENT

This task covers:

a. Removal b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Equipment Condition
Battery ground cable disconnected (para. 4-73).

Materials/Parts
Four lockwashers (Appendix G, Item 110)
Nut and lockwasher assembly
(Appendix G, Item 146)

a. Removal

1. Remove four screws (9), lockwashers (8), and cover (7) from control box (2). Discard lockwashers (8).

   NOTE
   Prior to removal, tag leads for installation.

2. Remove nut and lockwasher assembly (6) and lead 797/797A (5) from control box screw (3). Discard nut and lockwasher assembly (6).
3. Remove nut (4) from switch (10) and top panel (1) and pull switch (10) out from under panel (1) for access to leads (12).
4. Remove five screws (14) and washers (13) from leads (12) and switch terminals (11) and remove switch (10).

b. Installation

1. Install five leads (12) on switch terminals (11) with five washers (13) and screws (14).
2. Install switch (10) on top panel (1) with nut (4).
3. Install lead 797/797A (5) on control box screw (3) with nut and lockwasher assembly (6).
4. Install cover (7) to control box (2) with four lockwashers (8) and screws (9).
FOLLOW-ON TASKS:

- Connect battery ground cable (para. 4-73).
- Check operation of ambulance compartment lights (TM 9-2320-280-10).
4-119. CONTROL BOX ELECTRICAL PLUG AND RECEPTACLE REPLACEMENT

This task covers:
   a. Plug Removal
   b. Plug Installation
   c. Receptacle Removal
   d. Receptacle Installation

INITIAL SETUP:

Applicable Models

M996, M996A1, M997, M997A1, M997A2

Tools

General mechanic’s tool kit:
   automotive (Appendix B, Item 1)

Equipment Condition

Battery ground cable disconnected (para. 4-73) (receptacle only).

Manual References

TM 9-2320-280-24P

a. Plug Removal

1. Turn and pull plug (4) from receptacle (3).
2. Remove two screws (5) from plug (4). Open plug (4) and ensure positive (10), negative (12), and ground (11) leads for plug (4) are properly installed.

b. Plug Installation

1. Close plug (4) and install two screws (5) on plug (4).
2. Insert plug (4) on receptacle (3).

c. Receptacle Removal

NOTE

For instructions on replacement of rivets, refer to para. 10-66.

1. Remove two rivets (6) and receptacle (3) from control box (1). Pull receptacle (3) away for access to leads (2).

   NOTE

   Prior to removal, tag leads for installation.

2. Loosen screw (8) and push shield (9) away for access to leads (2).
3. Remove two screws (7), and leads (2) from receptacle (3).

d. Receptacle Installation

1. Install two leads (2) on receptacle (3) with two screws (7). Position shield (9) over screws (7) and tighten screw (8).
2. Install receptacle (3) on control box (1) with two rivets (6).
FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
4-120. CONTROL BOX RELAY REPLACEMENT

This task covers:

a. Removal b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Materials/Parts
Four lockwashers (Appendix G, Item 110)

Manual References
TM 9-2320-280-24P

Equipment Condition
Battery ground cable disconnected (para. 4-73).
(receptacle only).

NOTE
Prior to removal, tag leads for installation.

1. Remove four screws (3), lockwashers (4), and cover (2) from control box (1). Discard lockwashers (4).

2. Remove relay (6) from relay socket (5).

b. Installation

1. Install relay (6) in relay socket (5).

2. Install cover (2) on control box (1) with four lockwashers (4) and screws (3).
FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
4-121. CONDENSER FAN/PRESSURE SWITCH WIRING HARNESS REPLACEMENT (M997, M997A1, M997A2)

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
M997, M997A1, M997A2

Manual References
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Equipment Condition
- Battery ground cable disconnected (para. 4-73).
- Air intake compartment panels removed (para. 11-184).

Materials/Parts
Lockwasher (Appendix G, Item 110)

NOTE
Prior to removal, tag leads for installation.

a. Removal

1. Disconnect leads 436A (12) and 436B (13) from low pressure switch leads (11).
2. Remove nut (5), washer (4), capscrew (19), lockwasher (18), washer (17), and clamp (3) from harness (2) and dryer panel (20). Discard lockwasher (18).
3. Disconnect leads 436A (7), 436C (8), 799J (9), and 437A (10) from control box leads (6).
4. Disconnect leads 436B (15) and 436C (16) from high pressure switch leads (14).
5. Disconnect leads 437C (25), 799L (26), 437B (23), and 799K (24) from condenser fan leads (27) and (1).
6. Remove grommet (21) from condenser panel (22) and remove harness (2).

b. Installation

1. Install leads 799L (26), 437C (25), 437B (23), and 799K (24) through condenser panel (22) and connect to condenser fan leads (1) and (27).
2. Install grommet (21) on harness (2) and condenser panel (22).
3. Connect leads 436A (7), 436C (8), 799J (9), and 437A (10) to control box leads (6).
4. Connect leads 436B (15) and 436C (16) to high pressure switch leads (14).
5. Connect leads 436A (12) and 436B (13) to low pressure switch leads (11).
6. Install clamp (3) on harness (2) and dryer panel (20) with washer (17), lockwasher (18), capscrew (19), washer (4), and nut (5).
FOLLOW-ON TASKS:

- Install air intake compartment panels (para. 11-184).
- Connect battery ground cable (para. 4-73).
4-122. COMPRESSOR/HEATER FUEL PUMP WIRING HARNESS REPLACEMENT
(M997, M997A1, M997A2)

This task covers:

<table>
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<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
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</table>

INITIAL SETUP:

**Applicable Models**

M997, M997A1, M997A2

**Tools**

General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**

Three lockwashers (Appendix G, Item 110)
Two locknuts (Appendix G, Item 74)
Two nut and lockwasher assemblies (Appendix G, Item 148)
Three tiedown straps (Appendix G, Item 241)

**Manual References**

TM 9-2320-280-24P

**Equipment Condition**

- Passenger seat back removed (para. 10-45).
- Heater fuel pump removed (para. 11-194).

**NOTE**

Prior to removal, tag leads for installation.

1. Disconnect harness leads (1) from control box leads 436D (3) and 723B (2).
2. Remove capscrew (4), lockwasher (5), washer (6), and clamp (7) from AC line clamp (8) and body (9). Discard lockwasher (5).
3. Remove six screws (10), clamps (11), and harness (12) from body (9) and “B” beam (13).
4. Remove tiedown strap (14) from harness (12) and drain tube (15). Discard tiedown strap (14).
5. Remove grommet (16) from harness (12) and tunnel (17).
6. Remove locknut (32), washer (31), screw (27), and clamp (28) from fuel line clamp (29), body bracket (30) and harness. Discard locknut (32).
7. Remove locknut (22), washer (23), capscrew (33), and washer (23) from harness Wound (34) and fuel pump (26). Discard locknut (22).
8. Remove nut (21) and lockwasher (20), and ground terminal (19) from ground stud (18). Discard lockwasher (20).
9. Disconnect harness lead (24) from fuel pump lead (25).
10. Remove screw (35) and clamp (36) from harness (12) and body (9).
11. Remove nut and lockwasher assembly (2) and clamp (3) from harness (4) and starter cable bracket screw (1). Discard nut and lockwasher assembly (2).

12. Remove tiedown strap (6) from harness (4) and starter positive cable (5). Discard tiedown strap (6).

13. Remove screw (18) and nut and lockwasher assembly (15) and clamp (17) from harness (4) and compressor bracket (16). Discard nut and lockwasher assembly (15).

14. Remove nut (11), lockwasher (12), washer (19), capscrew (20), and clamp (13) from harness (4) and compressor (14). Discard lockwasher (12).

15. Disconnect harness leads (10) from leads (21).

16. Remove tiedown strap (9) from inside protective shield (8). Discard tiedown strap (9).

17. Remove harness (4) by routing through tunnel (7) and starter cable protective shield (8).

**b. Installation**

1. Route harness (4) through protective shield (8) and tunnel (7), and place in approximate mounting location.

2. Secure harness (4) with tiedown strap (9) inside of protective shield (8).

3. Connect harness leads (10) to leads (21).

4. Install clamp (13) on harness (4) and compressor (14) with washer (19), capscrew (20), lockwasher (12), and nut (11).

5. Install clamp (17) on harness (4) and compressor bracket (16) with screw (18) and nut and lockwasher assembly (15).

6. Install clamp (3) on harness (4) and starter cable bracket screw (1) with nut and lockwasher assembly (2).

7. Secure harness (4) to starter positive cable (5) with tiedown strap (6).
4-122. COMPRESSOR/HEATER FUEL PUMP WIRING HARNESS REPLACEMENT (M997, M997A1, M997A2) (Cont’d)
8. Install clamp (21) on harness (17) and body rail (7) with screw (20).
9. Connect harness lead (8) to fuel pump lead (9).
10. Install harness ground terminal (2) on ground stud (1) with lockwasher (3) and nut (4).
11. Install harness ground (19) on fuel pump (10) with washer (6), capscrew (18), washer (6), and locknut (5).
12. Install clamp (12) on harness (17) and install clamp (12) and fuel line clamp (13) on body bracket (14) with screw (11), washer (15), and locknut (16).
13. Connect harness leads (22) to control box leads 436D (24) and 723B (23).
14. Install six clamps (31) on harness (17) and body (7) with six screws (30).
15. Install clamp (28) on harness (17), AC line clamp (29), and body (7) with washer (27), lockwasher (26), and capscrew (25).
16. Secure harness (17) to drain tube (33) with tiedown strap (32).
17. Install grommet (34) on tunnel (35) and harness (17).
FOLLOW-ON TASKS: • Install passenger seatback (para. 10-45).
• Install heater fuel pump (para. 11-194).
4-123. HEATER/VENT SYSTEM CONTROL BOX AND WIRING HARNESS REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Applicable Models**

M996, M996A1

**Tools**

General mechanic's tool kit: 
automotive (Appendix B, Item 1)

**Manual References**

TM 9-2320-280-24P

**Equipment Condition**

Blower assembly removed (para. 11-212).

**Materials/Parts**

Two locknuts (Appendix G, Item 63)  
Nut and lockwasher assembly  
(Appendix G, Item 148)  
Pushnut (Appendix G, Item 170)  
Four lockwashers (Appendix G, Item 110)  
Tiedown strap (Appendix G, Item 241)

**NOTE**

Prior to removal, tag leads for installation.

1. Remove locknut (1), washer (2), capscrew (8), washer (7), ground terminal (6), and capacitor (5) from fuel pump (16) and bracket (17). Discard locknut (1).
2. Disconnect control box lead (3) from fuel pump lead (4).
3. Remove locknut (15), washer (14), capscrew (11), and clamp (9) from control box harness (10), fuel line clamp (13), and body bracket (12). Discard locknut (15).
4. Remove grommet (18) from tunnel (26) and harness (10) and route harness (10) through hole in tunnel (26) and battery box grommet (25) into stowage compartment.
5. Remove two screws (22) and clamps (19) from harness (10), resuscitator harness (23), and body (21).
6. Remove tiedown strap (24) from harness (10) and resuscitator harness (23). Discard tiedown strap (24).
7. Route harness (10) up through grommet (20) into patient compartment.
8. Remove three screws (20), clamps (21), harness (2), and battery cable harness (22) from body (5).
9. Remove four screws (19), lockwashers (18), and cover (17) from circuit box (4). Discard
lockwashers (18).
10. Remove nut and lockwasher assembly (16) and clamp (15) from harness (2) and screw (24). Discard
nut and lockwasher assembly (16).
11. Remove three screws (14) from harness leads (13) and terminal block (25).
12. Remove three screws (12), clamps (11), and harness (2) from NBC harness (10) and body (5).
13. Remove two screws (9), washers (8), retainer (7) and grommet (6) from body (5) and harness (2).
14. Route harness (2) through grommet (6) hole in body (5).
15. Remove five screws (28) and clamps (29) from harness (2) and body (5).
16. Remove three nuts (33), lockwashers (34), capscrews (36), and clamps (35) from harness (2) and body (5).
Discard lockwashers (34).
17. Disconnect plug (27) from heater receptacle (26).
18. Remove pushnut (30) and control lever linkage (31) from duct door arm (32). Discard pushnut (30).
19. Remove four screws (23), control box (1), and harness (2) from body (5).

b. Installation

1. Route harness (2) through control box opening (3) in body (5) and install control box (1) on body (5)
with four screws (23).
2. Attach control lever linkage (31) to duct door arm (32) with pushnut (30).
3. Install three clamps (35) on harness (2) and body (5) with capscrews (36), lockwashers (34), and nuts (33).
4. Connect control box plug (27) to heater receptacle (26).
5. Route harness (2) through grommet (6) hole in body (5).
6. Install five clamps (29) on harness (2) and body (5) with five screws (28).
7. Install three harness leads (13) to terminal block (25) with three screws (14).
8. Install clamp (15) on harness (2) and screw (24) with nut and lockwasher assembly (16).
9. Install grommet (6) and retainer (7) on harness (2) and body (5) with two washers (8) and screws (9).
10. Install harness (2) in three clamps (11) with NBC harness (10), on body (5) with three screws (12).
11. Install cover (17) on circuit box (4) with four lockwashers (18) and screws (19).
12. Install harness (2) in three clamps (21) with battery cable harness (22), on body (5) with three
screws (20).
4-123. HEATER/VENT SYSTEM CONTROL BOX AND WIRING HARNESS REPLACEMENT (Cont’d)
13. Route harness (21) down through grommet (20) into body (22) through battery box grommet (26) and through hole in tunnel (27).
14. Connect control box lead (3) to fuel pump lead (4).
15. Install fuel pump (16), capacitor (5), and ground terminal (6) on bracket (17) with washer (7), capscrew (8), washer (2), and locknut (1).
16. Install clamp (9) on harness (10) and install clamp (9) and clamp (13) on body bracket (12) with capscrew (11), washer (14), and locknut (15).
17. Install grommet (18) on harness (21) and into tunnel (27).
18. Install harness (21) in two clamps (19) on body (22) with two screws (23).
19. Install harness (21) on resuscitator harness (24) with tiedown strap (25).
FOLLOW-ON TASK: Blower assembly installed (para. 11-212).
**4-124. NBC CONTROL PANEL REPLACEMENT**

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
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</thead>
</table>

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Manual References</th>
</tr>
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<td>TM 9-2320-280-24P</td>
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<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>• Battery ground cable disconnected (para. 4-73).</td>
</tr>
<tr>
<td></td>
<td>• NBC control panel fuses removed (TM 9-2320-280-10)</td>
</tr>
<tr>
<td></td>
<td>• NBC wiring harness removed: M996 and M996A1 (para. 4-99), M997, M997A1 and M997A2 (para. 4-100).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Five lockwashers (Appendix G, Item 110)</td>
<td></td>
</tr>
<tr>
<td>Two nut and lockwasher assemblies (Appendix G, Item 148)</td>
<td></td>
</tr>
</tbody>
</table>

### a. Removal

**NOTE**

M996 ambulance will not have cushioned wire clamp on ceiling.

1. Remove screw (3) from cushioned wire clamp (4) and passenger ceiling (2).
2. Remove six screws (1) from NBC control panel (5) and ambulance body (6).
3. Remove two nut and lockwasher assemblies (8) and screws (7) from two cushioned wire clamps (9). Discard nut and lockwasher assemblies (8).

**NOTE**

Prior to removal, tag all leads for installation.

4. Remove two screws (10), lockwashers (11), and leads 783 (13) and 783A (12) from NBC control panel ON/OFF toggle switch (14). Discard lockwashers (11).
4-124. NBC CONTROL PANEL REPLACEMENT (Cont’d)
5. Remove two screws (12), lockwashers (13), and leads 782A (14) and 783 (16) from NBC control panel circuit breaker (15). Discard lockwashers (13).

6. Remove nut and lockwasher assembly (11), diode (24), and leads 783A (17) and 783B (18) from NBC control panel relay (19). Discard nut and lockwasher assembly (11).

**NOTE**

M996 and M996A1 ambulances have three leads, 785, 786, and 787, on NBC control panel relay.

7. Remove nut (5), lockwasher (6), and leads 784 (7), 787 (8), 785 (9), and 786 (10) from NBC control panel relay (19). Discard lockwasher (6).

8. Remove nut (22), lockwasher (23), and leads 782 (21) and 782A (20) from NBC control panel relay (19). Discard lockwasher (23).

9. Remove nut and lockwasher assembly (25), leads 795 (3), 796 (4), and 793 (2), and diode (24) from NBC control panel relay ground (1). Discard nut and lockwasher assembly (25).

**CAUTION**

Use care when removing lead clips from NBC control panel fuse block to prevent damage to leads, wire clips, and/or fuse block.

**NOTE**

- For M997, M997A1 and M997A2 ambulances, perform steps 10 through 16 for removal of leads from NBC fuse block.
- For M996 and M996A1 ambulances, perform steps 17 through 21 for removal of leads from NBC fuse block.
- Leads 787, 784, and 786 have two way jumpers connecting fuses for heaters 4 & 5, 6 & 7, and 2 & 3 respectively.

10. Remove leads 787B (26) and 787 (8) from NBC fuse block (31) for heater fuse #4.

11. Remove lead 787A (27) from NBC fuse block (31) for heater fuse #5.

12. Remove leads 784 (30) and 784B (28) from NBC fuse block (31) for heater fuse #6.

13. Remove lead 784A (29) from NBC fuse block (31) for heater fuse #7.

14. Remove leads 785A (9) and 785 (34) from NBC fuse block (31) for heater fuse #1.

15. Remove lead 786A (33) from NBC fuse block (31) for heater fuse #2.

16. Remove lead 786 (32) and lead 786B (10) from NBC fuse block (31) for heater fuse #3.
Leads 785 and 786 have two way jumpers connecting fuses for heaters 1 & 2 and 3 & 4 respectively.

17. Remove leads 785 (3) and 785A (9) from NBC fuse block (5) for heater fuse #1.
18. Remove lead 785B (8) from NBC fuse block (5) for heater fuse #2.
19. Remove leads 786 (4) and 786A (7) from NBC fuse block (5) for heater fuse #3.
20. Remove lead 786B (6) from NBC fuse block (5) for heater fuse #4.
21. Remove leads 787 (1) and 787A (2) from NBC fuse block (5) for heater fuse #5.
4-124. NBC CONTROL PANEL REPLACEMENT (Cont'd)
b. Installation

**WARNING**

Use care when installing leads to NBC control panel fuse block. Ensure lead clips lock into place. Failure to do so may cause damage to equipment and/or injury to personnel.

1. Install two cushioned wire clamps (17) with wire harness (14) in place onto NBC control panel (12) with screws (15) and nut and lockwasher assemblies (16).

**NOTE**

- For M997, M997A1 and M997A2 ambulances, perform steps 8 through 14 for installation of leads to NBC fuse block.
- For M996 and M996A1 ambulances, perform steps 15 through 19 for installation of leads to NBC fuse block.
- Leads 787, 784, and 786 have two way jumpers connecting fuses for heaters 4 & 5, 6 & 7, and 2 & 3 respectively.

2. Install leads 795 (3), 796 (4) and lead 793 (2), and diode (28) onto NBC control panel relay ground (1) with nut and lockwasher assembly (29).

**NOTE**

M996 and M996A1 ambulances have three leads, 785, 786, and 787, secured to NBC control panel relay.

3. Install leads 784 (7), 787 (8), and leads 785 (9), 786 (10) onto NBC control panel relay (24) with nut (5) and lockwasher (6).

4. Install leads 783A (22) and 783B (23) and remaining lead from diode (28) onto NBC control panel relay (24) with nut and lockwasher assembly (11).

5. Install leads 782 (25) and 782A (20) onto NBC control panel relay (24) with nut (26) and lockwasher (27).

6. Install leads 782A (20) and 783 (21) onto NBC control panel circuit breaker (13) with two screws (18) and lockwashers (19).

7. Install leads 783 (21) and 783A (22) onto NBC control panel ON/OFF toggle switch (35) with two screws (33) and lockwashers (34).

8. Install leads 787B (30) and 787 (8) into NBC fuse block (40) for heater fuse #4.

9. Install lead 787A (31) into NBC fuse block (40) for heater fuse #5.

10. Install lead 784B (32) into NBC fuse block (40) for heater fuse #6.

11. Install lead 784A (36) and 784 (7) into NBC fuse block (40) for heater fuse #7.

12. Install leads 785 (9) and 785A (39) into NBC fuse block (40) for heater fuse #1.

13. Install leads 786 (10) and 786B (38) into NBC fuse block (40) for heater fuse #2.

14. Install lead 786A (37) into NBC fuse block (40) for heater fuse #3.
4-124. NBC CONTROL PANEL REPLACEMENT (Cont’d)
Leads 785 and 786 have two way jumpers connecting fuses for heaters 1 & 2 and 3 & 4 respectively.

15. Install leads 787 (1) and 787A (2) on NBC fuse block (5) for heater fuse #5.
16. Install lead 786B (6) on NBC fuse block (5) for heater fuse #4.
17. Install leads 786 (4) and 786A (7) on NBC fuse block (5) for heater fuse #3.
18. Install lead 785A (9) on NBC fuse block (5) for heater fuse #2.
19. Install leads 785 (3) and 785B (8) on NBC fuse block (5) for heater fuse #1.
20. Install NBC control panel (13) on ambulance body (14) with six screws (15).

**NOTE**
M996 and M996A1 ambulances will not have cushioned wire clamp on ceiling.

21. Install cushioned wire clamp (12) on passenger ceiling (10) with screw (11).

**FOLLOW-ON TASKS:**
- Install NBC wiring harness: M996 and M996A1 (para. 4-99) M997, M997A1 and M997A2 (para. 4-100).
- Install NBC control panel fuses (TM 9-2320-280-10).
- Install battery ground cable to battery (para. 4-73).
This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Applicable Models**
M996, M996A1

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Heater compartment panel removal (para. 11-204).

**Tools**
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

**Materials/Parts**
Pushnut (Appendix G, Item 170)

---

**a. Removal**

1. Remove pushnut (1) from control arm (2) and blower duct arm (5). Discard pushnut (1).
2. Disconnect vent door control arm (3) from switch lever assembly (4).
3. Remove four screws (7), control panel (8), and control arm (2) from body (6).

**b. Installation**

1. Connect control arm (2) to switch lever assembly (4) and install control panel (8) on body (6) with four screws (7).
2. Connect vent door control arm (3) to switch lever assembly (4).
3. Install control arm (2) on blower duct arm (5) with pushnut (1).
FOLLOW-ON TASKS:
- Connect battery ground cable (para. 4-73).
- Install heater compartment panel (para. 11-204).
4-126. HEAT/VENT CONTROL PANEL RELAY AND SWITCH MAINTENANCE
(M996, M996A1)

This task covers:

a. Heater Run-Start Switch Removal
b. Heater Run-Start Switch Installation
c. 24-Volt Relay Removal
d. 24-Volt Relay Installation
e. Relay Socket Removal
f. Relay Socket Installation
g. Heat On Light Removal
h. Heat On Light Installation
i. Spot Vent Switch Removal
j. Spot Vent Switch Installation
k. Fuel Hi-Low Switch Removal
l. Fuel Hi-Low Switch Installation
m. Fan Hi-Low Switch Removal
n. Fan Hi-Low Switch Installation
o. Rollover Switch Removal
p. Rollover Switch Installation

INITIAL SETUP:

Applicable Models
M996, M996A1

Manual References
TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnected (para. 4-73).
- Heater compartment panel removed (para. 11-204).
- Heat/vent control panel removed (para. 4-125).

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Materials/Parts
Twenty-one lockwashers
(Appendix G, Item 110)
Two nut and lockwasher assemblies
(Appendix G, Item 146)

NOTE
Prior to removal, tag leads for installation.

a. Heater Run-Start Switch Removal
   1. Remove nut (8), switch (4), washer (6), and nut (5) from panel (7).
   2. Remove six screws (1), lockwashers (3), and seven terminals (2) from switch (4). Discard lockwashers (3).

b. Heater Run-Start Switch Installation
   1. Install seven terminals (2) on switch (4) with six lockwashers (3) and screws (1).
   2. Install nut (5), washer (6), and switch (4) on panel (7) with nut (8).
4-126. HEAT/VENT CONTROL PANEL RELAY AND SWITCH MAINTENANCE (M996, M996A1) (Cont'd)
c. 24-Volt Relay Removal

Remove 24-volt relay (1) from relay mounting socket (2).

d. 24-Volt Relay Installation

Install 24-volt relay (1) on relay mounting socket (2).
4-126. HEAT/VENT CONTROL PANEL RELAY AND SWITCH MAINTENANCE (M996, M996A1) (Cont’d)

e. Relay Socket Removal

1. Remove screw (8), washer (7), nut (3), lockwasher (2), and relay mounting socket (4) from mounting bracket (6). Discard lockwasher (2).
2. Remove 24-volt relay (1) and five terminals (5) from relay mounting socket (4).

f. Relay Socket Installation

1. Install five terminals (5) and 24-volt relay (1) on relay mounting socket (4).
2. Install relay mounting socket (4) on bracket (6) with screw (8), washer (7), lockwasher (2), and nut (3).
g. Heat On Light Removal

1. Remove screw (7), lockwasher (8), terminal (9), and light terminal (6) from heater HI-LOW switch (10). Discard lockwasher (8).
2. Disconnect light lead (2) from relay lead (5). Remove two screws (4) and light (1) from panel (3).

h. Heat On Light Installation

1. Install light (1) on panel (3) with two screws (4). Connect relay lead (5) to light lead (2).
2. Install light terminal (6) and terminal (9) on HI-LOW switch (10) with lockwasher (8) and screw (7).
4-126. HEAT/VENT CONTROL PANEL RELAY AND SWITCH MAINTENANCE (M996, M996A1) (Cont’d)

i. Spot Vent Switch Removal

1. Remove two screws (6), nut and lockwasher assemblies (3), and switch (4) from lever bracket (7). Discard nut and lockwasher assemblies (3).
2. Remove four screws (1), lockwashers (2), and terminals (5) from switch (4). Discard lockwashers (2).

j. Spot Vent Switch Installation

1. Install four terminals (5) on switch (4) with lockwashers (2) and screws (1).
2. Install switch (4) on lever bracket (7) with two screws (6) and nut and lockwasher assemblies (3).
4-126. HEAT/VENT CONTROL PANEL RELAY AND SWITCH MAINTENANCE (M996, M996A1) (Cont’d)

k. Fuel Hi-Low Switch Removal
1. Remove nut (5), switch (1) washer (3) and nut (2) from panel (4).
2. Remove two screws (7), lockwashers (8) and three terminals (6) from switch (1). Discard lockwashers (8).

l. Fuel Hi-Low Switch Installation
1. Install three terminals (6) on switch (1) with two lockwashers (8) and screws (7).
2. Install nut (2), washer (3), and switch (1) on panel (4) with nut (5).
m. Fan Hi-Low Switch Removal

1. Remove nut (5), switch (4), washer (7), and nut (8) from panel (6).
2. Remove six screws (3), lockwashers (1) and six terminals (2) from switch (4). Discard lockwashers (1).

n. Fan Hi-Low Switch Installation

1. Install six terminals (2) on switch (4) with six lockwashers (1) and screws (3).
2. Install nut (8), washer (7), and switch (4) on panel (6) with nut (5).
4-126. HEAT/VENT CONTROL PANEL, RELAY AND SWITCH MAINTENANCE (M996, M996A1) (Cont’d)

o. Rollover Switch Removal

1. Disconnect rollover switch lead (7) from harness lead (8).
2. Remove screw (4) and lockwasher (3) from two terminals (2) and heater RUN-START switch (5) and remove rollover switch (1). Discard lockwasher (3).

p. Rollover Switch Installation

1. Install two terminals (2) on heater RUN-START switch (5) with lockwasher (3) and screw (4).
2. Connect harness lead (8) to rollover switch lead (7) and snap in rollover switch (1) in switch bracket (6).

FOLLOW-ON TASKS:
- Install heat/vent control panel [(para. 4-125)]
- Install heater compartment panel [(para. 11-204)]
- Connect battery ground cable [(para. 4-73)]
### This task covers:

- **a.** Heat A/C Panel Removal  
- **b.** Heat A/C Panel Installation  
- **c.** Heater Run-Start Switch Removal  
- **d.** Heater Run-Start Switch Installation  
- **e.** Heat On Light Removal  
- **f.** Heat On Light Installation  
- **g.** Fuel Hi-Low Switch Removal  
- **h.** Fuel Hi-Low Switch Installation  
- **i.** Fan Hi-Low Switch Removal  
- **j.** Fan Hi-Low Switch Installation  
- **k.** A/C On-Off Switch Removal  
- **l.** A/C On-Off Switch Installation  
- **m.** Rollover Switch Removal  
- **n.** Rollover Switch Installation  

### INITIAL SETUP:

**Applicable Models**  
M997, M997A1, M997A2

**Tools**  
General mechanic's tool kit: Battery ground cable disconnected (para. 4-73).

**Materials/Parts**  
Thirteen lockwashers (Appendix G, Item 113)

**Manual References**  
TM 9-2320-280-24P

**Equipment Condition**  
Battery ground cable disconnected (para. 4-73).

### a. Heat A/C Control Panel Removal

Remove four screws (1), two bolts (6), lockwashers (5) and panel (2) from harness bracket (4) and control box (3). Pull panel (2) away from control box (3). Discard lockwashers (5).

### b. Heat A/C Control Panel Installation

**NOTE**  
Check for loose or disconnected wires before installing panel.

Install panel (2) on harness bracket (4) and control box (3) with two lockwashers (5), bolts (6), and four screws (1).
4-127. HEAT/AIR-CONDITIONING CONTROL PANEL RELAY AND SWITCH
MAINTENANCE (M997, M997A1, M997A2) (Cont’d)

NOTE
Prior to removal, tag leads for installation.

c. Heater Run-Start Switch Removal
1. Remove two screws (1) and switch (6) from panel (2).
2. Remove six screws (4), lockwashers (5), and twelve terminals (3) from switch (6). Discard lockwashers (5).

d. Heater Run-Start Switch Installation
1. Install twelve terminals (3) on switch (6) with six lockwashers (5) and screws (4).
2. Install switch (6) on panel (2) with two screws (1).
4-127. HEAT/AIR-CONDITIONING CONTROL PANEL RELAY AND SWITCH
MAINTENANCE (M997, M997A1, M997A2) (Cont'd)

NOTE
Prior to removal, tag leads for installation.

**e. Heat On Light Removal**

1. Remove screw (9), lockwasher (8), and light terminal (7) from heater run-start switch (6). Discard lockwasher (8).
2. Disconnect light lead (4) from relay lead (5) and remove two screws (1) and light (3) from panel (2).

**f. Heat On Light Installation**

1. Install light (3) on panel (2) with two screws (1) and connect relay lead (5) to light lead (4).
2. Install light terminal (7) on heater run-start switch (6) with lockwasher (8) and screw (9).
g. Fuel Hi-Low Switch Removal

1. Remove nut (1), switch (6), washer (8), and nut (7) from panel (2).
2. Remove two screws (4), lockwashers (5), and terminals (3) from switch (6). Discard lockwashers (5).

h. Fuel Hi-Low Switch Installation

1. Install two terminals (3) on switch (6) with two lockwashers (5) and screws (4).

   NOTE

   Position toggle switch in low position.

2. Install nut (7), washer (8), and switch (6) on panel (2) with nut (1).
4-127. HEAT/AIR-CONDITIONING CONTROL PANEL RELAY AND SWITCH MAINTENANCE (M997, M997A1, M997A2) (Cont’d)

NOTE
Prior to removal, tag leads for installation.

i. Fan Hi-Low Switch Removal
1. Remove nut (1), switch (5), washer (3), and nut (4) from panel (2).
2. Pull four terminals (6) from switch (5) and remove switch (5).

j. Fan Hi-Low Switch Installation
1. Connect four terminals (6) to switch (5).
2. Install nut (4), washer (3), and switch (5) on panel (2) with nut (1).
**NOTE**

Prior to removal, tag leads for installation.

**k. A/C On-Off Switch Removal**

1. Remove nut (1), switch (5), washer (3), and nut (4) from panel (2).
2. Pull four terminals (6) from switch (5) and remove switch (5).

**l. A/C On-Off Switch Installation**

1. Connect four terminals (6) to switch (5).
2. Install nut (4), washer (3), and switch (5) on panel (2) with nut (1).
NOTE
Prior to removal, tag leads for installation.

m. Rollover Switch Removal
Disconnect two rollover switch leads (4) from harness leads (3) and pull rollover switch (2) out of switch bracket (1).

n. Rollover Switch Installation
Connect two harness leads (3) to rollover switch leads (4) and snap in rollover switch (2) into switch bracket (1).

FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
## CHAPTER 5
TRANSMISSION AND TRANSFER CASE MAINTENANCE

### Section I. TRANSMISSION MAINTENANCE

#### 5-1. TRANSMISSION MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-2</td>
<td>Transmission Service</td>
<td>5-2</td>
</tr>
<tr>
<td>5-3</td>
<td>Transmission Oil Cooler Lines Replacement</td>
<td>5-8</td>
</tr>
<tr>
<td>5-4</td>
<td>Transmission Bypass Valve Replacement</td>
<td>5-12</td>
</tr>
<tr>
<td>5-5</td>
<td>Transmission Oil Dipstick Tube Replacement</td>
<td>5-14</td>
</tr>
<tr>
<td>5-6</td>
<td>Neutral Start Switch Replacement</td>
<td>5-16</td>
</tr>
<tr>
<td>5-7</td>
<td>Shift Controls Housing Assembly (SF-5583581) Replacement</td>
<td>5-18</td>
</tr>
<tr>
<td>5-8</td>
<td>Shift Controls Housing Assembly (SF-5583581) Maintenance</td>
<td>5-20</td>
</tr>
<tr>
<td>5-9</td>
<td>Shift Controls Housing Assembly (SF-5583581) Repair</td>
<td>5-22</td>
</tr>
<tr>
<td>5-10</td>
<td>Shift Controls Housing Assembly (EX 3725) Replacement (4L80-E)</td>
<td>5-26</td>
</tr>
<tr>
<td>5-11</td>
<td>Shift Controls Housing Assembly (EX 3725) Maintenance</td>
<td>5-28</td>
</tr>
<tr>
<td>5-12</td>
<td>Transmission Shift Rod Maintenance (3L80)</td>
<td>5-30</td>
</tr>
<tr>
<td>5-13</td>
<td>Transmission Shift Rod Maintenance (4L80-E)</td>
<td>5-32</td>
</tr>
<tr>
<td>5-14</td>
<td>Modulator Assembly Replacement (3L80)</td>
<td>5-34</td>
</tr>
<tr>
<td>5-15</td>
<td>Modulator Link Replacement (3L80)</td>
<td>5-36</td>
</tr>
<tr>
<td>5-16</td>
<td>Transmission Vent Line Replacement</td>
<td>5-38</td>
</tr>
<tr>
<td>5-17</td>
<td>Sealed Lower Converter Housing Cover Maintenance</td>
<td>5-40</td>
</tr>
<tr>
<td>5-18</td>
<td>Sealed Upper Converter Housing Cover (2-Piece) Maintenance</td>
<td>5-42</td>
</tr>
<tr>
<td>5-19</td>
<td>Converter Housing Cover Replacement</td>
<td>5-44</td>
</tr>
<tr>
<td>5-20</td>
<td>Transmission Mount Replacement</td>
<td>5-45</td>
</tr>
<tr>
<td>5-21</td>
<td>Transmission Road Test</td>
<td>5-46</td>
</tr>
</tbody>
</table>
5-2. TRANSMISSION SERVICE

This task covers:

a. Draining Fluid
b. Transmission Filter Removal
c. Transmission Filter Installation
d. Replenishing Fluid

INITIAL SETUP:

Tools

- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

Materials/Parts

- O-ring seal (Appendix G, Item 157)
- Filter assembly (Appendix G, Item 32)
- Transmission oil pan gasket (Appendix G, Item 46)
- Two locknuts (Appendix G, Item 107)
- Transmission fluid (Appendix C, Item 26 or 27)
- Drycleaning solvent (Appendix C, Item 18)

a. Draining Fluid

NOTE

- Transmission service for the 3L80 and 4L80-E transmissions is basically the same. Differences are noted.
- Do not shift through driving gear ranges when warming transmission fluid for removal. Shifting through driving gear ranges is a procedure used only when refilling transmission fluid.
- Transmission should be warm when draining fluid.
- Have drainage container ready to catch fluid.

1. Remove drainplug (1) and gasket (2) from oil pan (3). Allow fluid to drain.

NOTE

Inspect fluid for grit, foaminess, and/or milkiness. If present, notify DS maintenance.

2. Install gasket (2) and drainplug (1) in oil pan (3) and tighten drain plug (1) to 20 lb-ft (27 N·m).

b. Transmission Filter Removal

NOTE

Perform steps 1 through 5 for 3L80 transmissions only.

1. Remove thirteen capscrews (6), oil pan (3), and gasket (5) from transmission (4). Discard gasket (5).
2. Clean gasket (5) material from transmission (4) and oil pan (3) mating surfaces.
3. Remove capscrew (11), oil filter (10), and spacer (9) from transmission (4).
4. Pull suction tube (8) from oil filter (10) and remove O-ring seal (7). Discard O-ring seal (7).

WARNING

Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well ventilated places. Failure to do this may result in injury to personnel and/or damage equipment.

5. Clean suction tube (8) and oil pan (3) thoroughly with drycleaning solvent.
5-2. TRANSMISSION SERVICE (Cont'd)
5-2. TRANSMISSION SERVICE (Cont’d)

NOTE
Perform steps 6 through 9 for 4L80-E transmissions only.

CAUTION
Transfer case must be supported during removal and installation of crossmember for access to oil pan capscrew and to prevent damage to equipment.

6. Place support under transfer case and remove two locknuts (3), washers (2), capscrews (6), and crossmember (4) from support brackets (1) and (5). Discard locknuts (3).

NOTE
Oil pan gasket is reusable. Discard only if damaged.

7. Remove seventeen capscrews (12), oil pan (11), and gasket (10) from transmission (7).

8. Remove magnet (9) from oil pan (11). Remove filter (8) from transmission (7).

WARNING
Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

9. Clean oil pan (11) thoroughly with drycleaning solvent.

c. Transmission Filter Installation

NOTE
Perform steps 1 through 4 for 4L80-E transmissions only.

1. Install filter (8) in transmission (7). Install magnet (9) in oil pan (11).

2. Install gasket (10) and oil pan (11) on transmission (7) with seventeen capscrews (12).

3. Install crossmember (4) on support brackets (1) and (5) with two capscrews (6), washers (2), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N•m).

4. Remove support from transfer case.
5-2. TRANSMISSION SERVICE (Cont'd)
5. Insert end of suction tube (3) marked “filter” into oil filter (5).
6. Install O-ring seal (7) onto upper end of suction tube (3) marked “case” and slide downward.
7. Position oil filter (5) on transmission (1) inserting suction tube (3) into oil input port (2).
8. Install oil filter (5) and spacer (4) on transmission (1) with capscrew (6). Tighten capscrew (6) to 10-15 lb-ft (14-20 N·m).
9. Install gasket (8) and oil pan (9) on transmission (1) with thirteen capscrews (10). Tighten capscrews (10) to 12 lb-ft (16 N·m).
5-2. TRANSMISSION SERVICE (Cont'd)

d. Replenishing Fluid

1. Remove transmission oil dipstick (12) from dipstick tube (11).
2. Check transmission fluid and fill to proper level [TM 9-2320-280-10].
3. Install transmission oil dipstick (12) in dipstick tube (11).

FOLLOW-ON TASK: Operate vehicle [TM 9-2320-280-10] and check for leaks.
5-3. TRANSMISSION OIL COOLER LINES REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Five locknuts (Appendix G, Item 58)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Right splash shield removed (oil cooler lines to oil cooler only) (para. 10-20).
- Left splash shield access cover removed (para. 10-18).

**General Safety Instructions**
- Allow transmission to cool before performing this task.

**WARNING**
- Allow transmission to cool before performing this task. Severe injury to personnel may result.

**NOTE**
- Removal and installation procedures are the same for all lines, regardless of function, size or location. All oil cooler ports should be plugged to prevent contamination. Remove plugs prior to connection.
- Left splash shield can be modified to add engine access cover. Refer to appendix D, Fig. D-86 and D-87 for installation.

### a. Removal

1. Remove retaining clamps (3) from cooler lines (4).
2. Loosen hose clamps (1) on rubber hoses (2) and cooler lines (4)

**NOTE**
- Have drainage container ready to catch fluid.

3. Disconnect cooler lines (4) at each end and allow to drain.

**NOTE**
- Perform step 4 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

4. Disconnect two cooler lines (4) from by-pass valve (5).

**NOTE**
- Perform steps 5 and 6 to allow access only if removing oil cooler lines from oil cooler.

5. Remove four locknuts (8), washers (9), and capscrews (10), from radiator supports (6) and airlift brackets (7). Discard locknuts (8).

6. Remove locknut (11), washer (12), capscrew (16), washer (12), large washer (15), and mount (14) from radiator (13) and front mounting bracket (17). Discard locknut (11).

7. Remove cooler lines (4) and rubber hoses (2) from vehicle.
5-3. TRANSMISSION OIL COOLER LINES REPLACEMENT (Cont’d)

b. Installation

1. Position rubber hoses (2) and cooler lines (4) in proper position.

2. Connect cooler lines (4) at each end.

   **NOTE**
   Perform step 3 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

3. Connect two cooler lines (4) to by-pass valve (5).

4. Tighten hose clamps (1) on rubber hoses (2) to cooler lines (4).

   **NOTE**
   Perform steps 5 and 6 to allow access only if installing oil cooler lines to oil cooler.

5. Install radiator (8) to front mounting bracket (12) with mount (9), large washer (10), washer (7), capscrew (11), washer (7), and locknut (6). Tighten capscrew (11) to 30 lb-ft (41 N·m).

6. Install radiator supports (13) to airlift brackets (14) with four capscrews (17), washers (16), and locknuts (15). Tighten locknuts (15) to 31 lb-ft (42 N·m).

7. Install retaining clamps (3) on cooler lines (4).
5-3. TRANSMISSION OIL COOLER LINES REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Fill transmission to proper level (TM 9-2320-280-10).
- Start engine (TM 9-2320-280-10) and check for leaks.
- Install right splash shield, if removed (para 10-20).
- Install left splash shield access cover, if removed (para. 10-18).
5-4. TRANSMISSION BYPASS VALVE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
General mechanic’s tool kit: automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-24P

General Safety Instructions
Allow transmission to cool before performing this task.

WARNING
Allow transmission to cool before performing this task. Severe injury to personnel may result.

CAUTION
Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

a. Removal

1. Loosen hose clamps (1) and (8) on rubber hoses (2) and (9).

   NOTE
   Have drainage container ready to catch fluid.

2. Disconnect rubber hoses (2) and (9) from bypass valve (3).
3. Remove nut (7), washer (5), capscrew (4), washer (5), and bypass valve (3) from transmission crossmember (6).

b. Installation

1. Install bypass valve (3) on transmission crossmember (6) with washer (5), capscrew (4), washer (5), and nut (7). Tighten nut (7) to 28 lb-ft (38 N·m).
2. Connect hoses (2) and (9) to bypass valve (3) and tighten clamps (1) and (8).
FOLLOW-ON TASKS:  
- Fill transmission to proper level [TM 9-2320-280-10]  
- Start engine [TM 9-2320-280-10] and check for leaks.
5-5. TRANSMISSION OIL DIPSTICK TUBE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10
  - automotive (Appendix B, Item 1)

**Materials/Parts**
- O-ring seal (3L80) (Appendix G, Item 158)
- Seal (4L80-E) (Appendix G, Item 226)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)
- Right exhaust manifold rear heat shield removed (para. 3-54)

**NOTE**
- Plug open transmission port to prevent contamination. Remove plug prior to installation of oil dipstick tube.
- Have drainage container ready to catch fluid.

**a. Removal**

1. Remove transmission oil dipstick (2) from dipstick tube (1).
2. Remove capscrew (7) from dipstick tube (1) and cylinder head (3).
3. Remove dipstick tube (1) from transmission (4).
4. Remove O-ring seal (6) from dipstick tube (1). Discard O-ring seal (6).

**b. Installation**

1. Install O-ring seal (6) on dipstick tube (1).
2. Push dipstick tube (1) into opening (5) in transmission (4).
3. Install dipstick tube (1) on cylinder head (3) with cap screw (7). Tighten capscrew (7) to 25-37 lb-ft (34-50 N·m).
4. Install transmission oil dipstick (2) into dipstick tube (1).
FOLLOW-ON TASKS:  
- Install right exhaust manifold rear heat shield (para. 3-54).  
- Fill transmission to proper level (TM 9-2320-280-10).  
- Lower and secure hood (TM 9-2320-280-10).  
- Start engine (TM 9-2320-280-10) and check for leaks.
5-6. NEUTRAL START SWITCH REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

**Manual References**

**Materials/Parts**
- Tiedown strap (Appendix G, Item 241)
- Sealing compound (Appendix C, Item 44)

**Equipment Condition**
- Shift controls housing removed (para. 5-7 or 5-10).

### a. Removal

**NOTE**

- Prior to removal, tag leads for installation.
- Perform steps 3 through 5 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform steps 1 and 2 for all other vehicles.

1. Remove rubber boot (4) from shift control housing assembly (1).
2. Remove neutral start switch (2) from shift control housing assembly (1).
3. Remove boot (10) from shift controls housing (6).
4. Remove two screws (8) and neutral start switch (7) from housing (6).
5. Remove tiedown strap (11) and neutral start switch leads (9) from backup light switch leads (12). Discard tiedown strap (11).

### b. Installation

**NOTE**

Perform steps 1 through 3 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only. Perform steps 4 and 5 for all other vehicles.

1. Install neutral start switch (7) on shift control housing (6) with two screws (8).
2. Install neutral start switch leads (9) on backup light switch leads (12) with tiedown strap (11).
3. Position neutral start switch leads (9), backup light switch leads (12), and light lead (13) through boot (10), and install boot (10) on housing (6).
4. Apply sealing compound to threads of neutral switch (2), install neutral switch into shift control housing assembly (1). Tighten neutral start switch (2) to 27-30 lb-ft (37-42 N·m).
5. Install leads from neutral start switch (2) and shift selector indicator lead (5) through nipples (3) on rubber boot (4) and install rubber boot (4) on shift control housing assembly (1).
5-6. NEUTRAL START SWITCH REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Install shift controls housing (para. 5-7 or 5-10).
- Check neutral start switch for proper operation (TM 9-2320-280-10).
5-7. SHIFT CONTROLS HOUSING ASSEMBLY (SF-5583581) REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Applicable Models
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Personnel Required
One mechanic
One assistant

Materials/Parts
Two cotter pins (Appendix G, Item 17)
Four locknuts (Appendix G, Item 64)

Equipment Condition
Battery ground cable disconnected (para. 4-73).

NOTE

If shift controls housing assembly is to be reinstalled, tape trunnions to shift rods to prevent loss of adjustment. Shift rod trunnions are removed from shift rods only if damaged or shift rods are replaced.

a. Removal

1. Remove cotter pin (5) and washer (6) from transfer case shift rod trunnion (7) and transfer case bearing and arm assembly (4). Discard cotter pin (5).
2. Disconnect transfer case shift rod trunnion (7) from bearing and arm assembly (4) and remove transfer case shift rod trunnion (7) from transfer case shift rod (8).
3. Remove cotter pin (9) and washer (10) from transmission shift rod trunnion (2) and transmission shift lever arm (3). Discard cotter pin (9).
4. Disconnect transmission shift rod trunnion (2) from transmission shift lever arm (3) and remove transmission shift rod trunnion (2) from transmission shift rod (1).
5. Remove four capscrews (12), locknuts (20), washers (21), and shift control housing assembly (13) from body (23). Discard locknuts (20).

NOTE

- Prior to removal, tag leads for installation.
- Perform step 6 for M1035 and M1035A1 only.

6. Disconnect body harness lead 476C (16) and 476D (17) from backup light switch (15).
7. Disconnect body harness lead 14A (18) and 14B (19) from neutral start switch (14).
8. Disconnect body harness lead 40F (22) from shift selector indicator lead (11).

b. Installation

1. Install shift controls housing assembly (13) in body (23) with transmission lever on right.
2. Connect body harness lead 40F (22) to shift selector indicator lead (11).
3. Connect body harness lead 14A (18) and 14B (19) on neutral start switch (14).
5-7. SHIFT CONTROLS HOUSING ASSEMBLY (SF-5583581) REPLACEMENT (Cont'd)

NOTE
Perform step 4 for M1035 and M1035A1 only.

4. Connect body harness lead 476C (16) and 476D (17) on backup light switch (15).
5. Install shift controls housing assembly (13) on body (23) with four capscrews (12), washers (21), and locknuts (20). Tighten capscrews (12) to 6 lb-ft (8 N·m).
6. Install transfer case shift rod trunnion (7) and transmission shift rod trunnion (2) on shift rods (8) and (1).
7. Install transmission shift rod trunnion (2) on transmission shift lever arm (3) with washer (10) and cotter pin (9).
8. Install transfer case shift rod trunnion (7) to transfer case bearing and arm assembly (4) with washer (6) and cotter pin (5).
9. Adjust transmission and transfer case shift rods (paras. 5-12 and 5-23).

FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Start engine and check shift controls for proper operation (TM 9-2320-280-10).
5-8. SHIFT CONTROLS HOUSING ASSEMBLY (SF-5583581) MAINTENANCE

This task covers:

<table>
<thead>
<tr>
<th>a. Disassembly</th>
<th>b. Assembly</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Shift controls housing assembly removed (para. 5-7).

**Tools**
General mechanic's tool kit:
automotive (Appendix B, Item 1)

### a. Disassembly

1. Remove knob (4) from transfer shift tube (6).
2. Remove button (2) from transmission shift knob (1).
3. Remove knob (1) from transmission shift tube (17).
4. Remove neutral start switch leads (10) from openings (12) in boot (11).
5. Slide rubber boot (11) off shift controls housing assembly (9).
6. Remove two nuts (8), washers (5), and shift selector indicator (3) from bezel (7).

### b. Assembly

1. Install shift selector indicator (3) and two washers (5) on bezel (7) with two nuts (8).
2. Install rubber boot (11) on shift controls housing assembly (9), placing neutral start switch leads (10) through openings (12) in boot (11).
3. Place shift indicator lead (14) through opening (13) in boot (11).
4. Slide rubber boot (11) onto shift controls housing assembly (9). Ensure that mounting screw holes (16) in shift control housing assembly (9) align with holes (15) in boot (11).
5. Install knob (1) on transmission shift tube (17).
6. Install button (2) on transmission shift knob (1).
7. Install knob (4) on transfer shift tube (6).
FOLLOW-ON TASK: Install shift control housing assembly (para. 5-7).
This task covers:

a. Disassembly
b. Cleaning
c. Inspection
d. Assembly

INITIAL SETUP:

Applicable Models
All vehicles except M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Materials/Parts (Cont’d)
Three locknuts (Appendix G, Item 85)
Four lockwashers (Appendix G, Item 110)
Sealing compound (Appendix C, Item 44)

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Materials/Parts
Spring pin (Appendix G, Item 234)
Retaining ring (Appendix G, Item 172)

Manual References
TM 9-2320-280-24P

Equipment Condition
Shift controls housing assembly disassembled (para. 5-8)

a. Disassembly

1. Remove retaining ring (12) from shift control shaft (23) and shift controls housing (7). Discard retaining ring (12).
2. Remove spring pin (16) from spring retaining collar (15) and shaft control (23). Discard spring pin (16).
3. Remove shift control shaft (23), spring retaining collar (15), and shift control compression spring (17) from shift controls housing (7).
4. Remove transfer shift lever (10) by sliding down and out from shift controls housing (7).
5. Remove two nylon flanged bearings (13) from transfer shift lever arm (14).
6. Remove spring pin (11) from transfer shift lever arm (14) and remove transfer shift lever (10) from transfer shift lever arm (14).
7. Remove transmission shift tube (28) by sliding down and out from shift controls housing (7).

NOTE
Note position of transmission shift lever for installation.

8. Remove four nuts (26), lockwashers (27), capscrews (18), washers (19), transmission shift tube (28), shift lever latch spring (24), and transmission shift lever (20) from bracket and shaft assembly (21). Discard lockwashers (27).
9. Remove nylon flanged bearing (22) from bracket and shaft assembly (21).
10. Remove shift lever latch rod (25) by sliding out from transmission shift tube (28).
11. Remove three locknuts (9), washers (8), capscrews (2), washers (3), and bezel (1) from wiper (5) and shift controls housing (7). Discard three locknuts (9).
12. Remove three washers (4) and wiper (5) from shift controls housing (7).
13. Remove bearing (6) from shift controls housing (7).

b. Cleaning

Clean all shift control housing assembly parts in accordance with para. 2-10.
5-9. SHIFT CONTROLS HOUSING ASSEMBLY (SF-5583581) REPAIR (Cont’d)

c. Inspection

1. Inspect shift controls housing (7) for damage. Replace shift controls housing assembly if damaged.
2. Inspect transmission shift tube (28), bracket and shaft assembly (21), transmission shift lever (20), bezel (1), and shift lever latch rod (25) for damage. Replace if damaged.
3. Inspect wiper (5) for tears. Replace if torn.
4. Inspect shift lever latch spring (24) and shift control compression spring (17) for distortion or damage. Replace if distorted or damaged.
5. Inspect nylon flanged bearings (22) and (13) for damage. Replace if damaged.
6. Inspect shift control shaft (23), spring retaining collar (15) and shift lever (14) for damage. Replace if damaged.

d. Assembly

1. Install bearing (6) in shift controls housing (7).
2. Apply thin coat of adhesive between shift controls housing assembly (7) and wiper (5).
3. Position wiper (5) and three washers (4) on shift controls housing (7).
4. Install bezel (1) on shift controls housing (7) with three washers (3), capscrews (2), washers (8), and locknuts (9).
5. Install shift lever latch rod (25) by pushing up into transmission shift tube (28).
6. Position transmission shift lever (20), shift lever latch spring (24), and transmission shift tube (28) to bracket and shaft assembly (21) and secure with four washers (19), capscrews (18), lockwashers (27), and nuts (26).
7. Install transmission shift tube (28) by pushing up through shift controls housing (7) and install nylon flanged bearing (22) into bracket and shaft assembly (21).
8. Install transfer shift lever (10) in transfer shift lever arm (14) with spring pin (11).
9. Install transfer shift lever (10) by pushing up through shift controls housing (7) and install two nylon flanged bearings (13) in transfer shift lever arm (14).
10. Position shift control compression spring (17) and spring collar (15) into shift controls housing (7).
11. Install shift control shaft (23) through shift controls housing (7), bracket and shaft assembly (21), compression spring (17), spring retaining collar (15), transfer shift lever arm (14), and out of shift controls housing (7).
12. Secure shift control shaft (23) in shift controls housing (7) with retaining ring (12).
13. Secure spring retaining collar (15) on shift control shaft (23) with spring pin (16).
FOLLOW-ON TASK: Assemble shift controls housing assembly (para 5-8).
This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Applicable Models**
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Tools**
- General mechanic's tool kit: One mechanic automotive (Appendix B, Item 1)

**Personnel Required**
- One mechanic
- One assistant

**Materials/Parts**
- Two cotter pins (Appendix G, Item 17)
- Four locknuts (Appendix G, Item 64)

**Equipment Condition**
- Battery ground cable disconnected [para. 4-73].

### a. Removal

NOTE
If shift controls housing assembly is to be reinstalled, tape trunnions to shift rods to prevent loss of adjustment. Shift rod trunnions are removed from shift rods only if damaged or shift rods are replaced.

1. Remove cotter pin (5), washer (6), and trunnion (7) from transmission shift lever arm (8). Discard cotter pin (5).
2. Remove cotter pin (3), washer (2), and trunnion (4) from transfer case shift arm (1). Discard cotter pin (3).

   **NOTE**
   Tag leads for installation

3. Disconnect two body harness leads (12) from backup light switch leads (11).
4. Disconnect two body harness leads 14A/14B (14) from neutral start switch leads 14 (19).
5. Disconnect body harness lead (17) from shift selector indicator lead 17J (18).
6. Remove four capscrews (9), locknuts (15), washers (16) and shift controls housing assembly (10) from body (13). Discard locknuts (15).

### b. Installation

1. Position shift controls housing assembly (10) in body (13) with transmission lever on right and install with four capscrews (9), washers (16), and locknuts (15). Tighten locknuts (15) to 6 lb-ft (8 N·m).
2. Connect two body harness leads (12) to backup light switch leads (11).
3. Connect two body harness leads 14A/14B (14) to neutral start switch leads 14 (19).
4. Connect body harness lead (17) to shift selector indicator lead 17J (18).
5. Install trunnion (4) on transfer case shift arm (1) with washer (2) and cotter pin (3).
6. Install trunnion (7) on transmission shift lever arm (8) with washer (6) and cotter pin (5).
7. Start engine [TM 9-2320-280-10] and check shift controls for proper operation. Adjust as needed [paras. 5-13 and 5-23].
FOLLOW-ON-TASK: Connect battery ground cable (para. 4-73).
5-11. SHIFT CONTROLS HOUSING ASSEMBLY (EX 3725) MAINTENANCE

This task covers:

a. Disassembly

b. Assembly

INITIAL SETUP:

**Applicable Models**
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Materials/Parts**
Tiedown strap (Appendix G, Item 233)

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Shift controls housing assembly removed (para. 5-10).

### a. Disassembly

1. Remove pin (4) and knob (3) from transfer case shift tube (2).
2. Remove pin (6) and knob (5) from transmission shift tube (7).
3. Remove neutral start and backup switch leads (10) and (12) from openings in boot (8).
4. Remove shift indicator lead (11) from opening in boot (8).
5. Slide boot (8) off shift controls housing assembly (13).
6. Remove two transmission selector lens covers (1).
7. Remove two fiber optic indicator strips (19) from bulbs (18).
8. Remove two bulbs (18) from sockets (17).
9. Remove four screws (16), cover plate (15), and gasket (14) from shift controls housing assembly (13).
10. Remove tiedown strap (9) from leads (10), (12), and (11). Discard strap (9).

### b. Assembly

1. Install gasket (14) and cover plate (15) on shift controls housing assembly (13) with four screws (16).
2. Install two bulbs (18) in sockets (17).
3. Install two fiber optic indicator strips (19) on bulbs (18).
4. Install two transmission selector lens covers (1).
5. Install boot (8) on shift controls housing assembly (13), placing neutral start, backup light switch, and shift indicator leads (10), (12), and (11) through openings in boot (8).
6. Complete sliding boot (8) onto shift controls housing assembly (13), ensuring mounting screw holes align.
7. Install knob (5) on transmission shift tube (7) with pin (6).
8. Install knob (3) on transfer case shift tube (2) with pin (4).
9. Install tiedown strap (9) on leads (10), (11), and (12).
FOLLOW-ON TASK: Install shift control housing assembly (para. 5-10).
5-12. TRANSMISSION SHIFT ROD MAINTENANCE (3L80)

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Materials/Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2</td>
<td>Two cotter pins (Appendix G, Item 17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
</tr>
</tbody>
</table>

Manual References

- TM 9-2320-280-10
- TM 9-2320-280-24P

a. Removal

1. Place transmission shift lever arm (7) to “N” (neutral) position.
2. Remove cotter pin (9) and washer (8) from shift rod trunnion (6) and shift lever arm (7). Discard cotter pin (9).
3. Remove cotter pin (1) and washer (2) from shift rod trunnion (4) and transmission selector lever (3) and disconnect shift rod (5). Discard cotter pin (1).
4. Remove shift rod trunnion (6) from shift rod (5).

b. Installation

1. Install shift rod trunnion (6) to shift rod (5).
2. Connect shift rod trunnion (4) to transmission selector lever (3) with washer (2) and cotter pin (1).
3. Adjust shift rod (para. c).

c. Adjustment

**CAUTION**

If the manual control linkage arm is not in the proper detent for each transmission selector lever position, transmission will be damaged.

1. Move shifter (10) into “1” position and ensure transmission selector lever (3) is in the forward position, “1”.
2. Turn shift rod trunnion (6) so that it slips easily into hole in the shift lever arm (7).
3. Secure shift rod (5) and trunnion (6) to shift lever arm (7) with washer (8) and cotter pin (9).
FOLLOW-ON TASK: Operate vehicle (TM 9-2320-280-10) and test transmission shift lever for proper operation.
5-13. TRANSMISSION SHIFT ROD MAINTENANCE (4L80-E)

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

**Applicable Models**
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Materials/Parts**
Four cotter pins (Appendix G, Item 17)

**Tools**
General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-10
TM 9-2320-280-24P

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### a. Removal

1. Place transmission shift lever (7) in neutral.
2. Remove cotter pin (5), washer (6), and trunnion (3) from shift arm (4). Discard cotter pin (5).
3. Remove cotter pin (13) and washer (12) from rear trunnion (9). Remove trunnion (9) and shift rod (8) from relay lever (11). Discard cotter pin (13).

   **NOTE**
   Mark positions of trunnions on shift rod for installation.

4. Remove cotter pins (2) and (10) and trunnion (9) from shift (8). Discard pins (2) and (10).

### b. Installation

1. Install trunnion (9) on shift rod (8) on position marked with cotter pins (2) and (10).
2. Install trunnion (9) on relay lever (11) with washer (12) and cotter pin (13). Do not spread cotter pin (13).
3. Install trunnion (3) on shift arm (4) with washer (6) and cotter pin (5). Do not spread cotter pin (5).
4. Check shift rod (8) adjustment (para. c).

### c. Adjustment

**CAUTION**
If the manual control linkage is not in proper detent for selector lever position, transmission will be damaged.

**NOTE**
Proper adjustment makes end of shift rod movement parallel to relay lever movement.

1. Move shifter (7) to “1” position and ensure lever (1) is in forward detent position “1” or LOW. If not, remove cotter pin (5) and washer (6). Turn trunnion (3) until trunnion (3) aligns with shift arm (4).
2. To align shift rod (8), turn trunnion (3) in one direction and trunnion (9) same amount in opposite direction.
3. When adjustment is correct spread both cotter pins (5) and (13).
FOLLOW-ON TASK: Operate vehicle (TM 9-2320-280-10) and test transmission shift lever for proper operation.
5-14. MODULATOR ASSEMBLY REPLACEMENT (3L80)

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models
All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
General mechanic's tool kit: Allow transmission to cool before performing this automotive task.

Materials/Parts
O-ring seal (Appendix G, Item 165)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
- Hood raised and secured (TM 9-2320-280-10)
- Engine access cover removed (para. 10-15).

General Safety Instructions
Allow transmission to cool before performing this task.

WARNING
Allow transmission to cool before performing this task. Failure to do this may cause injury.

1. Pull off cable clip (6) from modulator control rod head (3).
2. Loosen mounting nuts (8) and (4) on cable bracket (1) and remove cable (7) and washer (5) from bracket (1).
3. Underneath vehicle, remove capscrew (11) and modulator retaining clip (12) from transmission (13).

NOTE
Have drainage container ready to catch fluid.

4. Remove modulator (10) and O-ring seal (14) from transmission (13). Discard O-ring seal (14).

b. Installation

1. Install O-ring seal (14) on modulator (10) and install modulator (10) in transmission (13).
2. Install modulator retaining clip (12) on transmission (13) with capscrew (11). Tighten capscrew (11) to 18 lb-ft (24 N•m).

NOTE
Do not tighten mounting nuts.

3. Position modulator cable (7) through cable bracket (1) and install washer (5) and start mounting nut (4).

CAUTION
Ensure cable is clear of exhaust system or other sources of extreme heat to prevent damage to equipment.

4. Pull modulator control rod (2) to the rear until stop is engaged and hold in position.
5. With modulator cable core (9) in idle position (cable core (9) is extended), adjust modulator mounting nuts (4) and (8) until modulator control rod head (3) and cable clip (6) align.
6. Tighten mounting nuts (4) and (8) and recheck alignment. Readjust if alignment has changed.
7. Pull modulator cable core (9) outward and connect cable clip (6) to modulator control rod head (3).
8. Check modulator cable (7) for ease and smoothness of operation and ensure cable core (9) returns to the idle position.

FOLLOW-ON TASKS:
- Install engine access cover (para. 10-15).
- Fill transmission to proper fluid level (TM 9-2320-280-10)
- Lower and secure hood (TM 9-2320-280-10)
- Road test and check for proper operation (para. 5-21).
5-15. MODULATOR LINK REPLACEMENT (3L80)

This task covers:

- **Removal**
- **Installation**

**INITIAL SETUP:**

<table>
<thead>
<tr>
<th>Applicable Models</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit: automotive (Appendix B, Item 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasket (Appendix G, Item 50)</td>
</tr>
</tbody>
</table>

### a. Removal

1. Pull off cable clip (6) from modulator link pin (5).
2. Remove two capscrews (1) and bracket (2) from cylinder head (10).
3. Loosen rear cable nut (8) and remove front cable nut (3), modulator cable (9), and washer (7) from bracket (2).
4. Slide modulator link (4) forward and disconnect from fuel injection pump (11).

**NOTE**

Note orientation of modulator link and bracket for installation.

5. Remove bracket (2), modulator link (4), water jacket cover (12), and gasket (13) from cylinder head (10).
   - Discard gasket (13).
6. Spread slot (14) and remove modulator link (4) from bracket (2).

### b. Installation

1. Install modulator link (4) in bracket (2) and crimp slot (14).
2. Slide modulator link (4) forward and connect to fuel injection pump (11).
3. Install gasket (13), cover (12), modulator link (4), and bracket (2) on cylinder head (10) with two capscrews (1).
4. Position modulator cable (9) through bracket (2), install washer (7), and start front cable nut (3).
5. Pull cable clip (6) out and connect to modulator link pin (5). Tighten rear cable nut (8).
FOLLOW-ON TASKS:  
- Install engine access cover (para. 10-15).  
- Fill cooling system (para. 3-60).
5-16. TRANSMISSION VENT LINE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

**a. Removal**

1. Remove vent line (2) from transmission (3) and tee fitting (1).
2. Remove vent line (12) from tee fittings (1) and (11).
3. Remove capscrew (5), clamp (7), and vent line (10) from engine mount bracket (6).
4. Remove capscrew (4), clamp (8), and vent line (10) from bracket (9).
5. Remove vent line (10) from tee fittings (11) and (13).
6. Remove clamps (7) and (8) from vent line (10).

**b. Installation**

1. Install clamps (7) and (8) on vent line (10).
2. Install vent line (10) on tee fittings (11) and (13).
3. Install vent line (10) and clamp (7) on engine mount bracket (6) with capscrew (5).
4. Install vent line (10) and clamp (8) on bracket (9) with capscrew (4).
5. Install vent line (12) on tee fittings (11) and (1).
6. Install vent line (2) on tee fittings (1) and transmission (3).
5-16. TRANSMISSION VENT LINE REPLACEMENT (Cont’d)
5-17. SEALED LOWER CONVERTER HOUSING COVER MAINTENANCE

This task covers:

a. Removal

b. Inspection

c. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Gasket (Appendix G, Item 39)
- Adhesive (Appendix C, Item 5)
- Drycleaning solvent (Appendix C, Item 18)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Battery ground cable disconnected [para. 4-73].
- Crossover pipe removed [para. 3-50].
- Sealed upper converter housing cover removed [para. 5-18].

**General Safety Instructions**
- Drycleaning solvent is flammable and will not be used near an open flame.

---

**a. Removal**

1. Remove four capscrews (2) and converter housing cover (3) from transmission (1).

2. Remove gasket (4) from converter housing cover (3). Discard gasket (4).

---

**b. Inspection**

**WARNING**

Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

1. Inspect converter housing cover (3) for pitting, cracking, and excessive wear. Replace if pitted, cracked, or excessively worn.

2. Remove gasket material and sealant from converter housing cover (3) with drycleaning solvent.

---

**c. Installation**

1. Apply adhesive to gasket (4) and install on converter housing cover (3).

**NOTE**

Gasket may require bending over edge of converter housing cover to make gasket seat properly.

2. Apply adhesive to converter housing cover gasket (4). Install converter housing cover (3) on transmission (1) with four capscrews (2).
FOLLOW-ON TASKS:  
- Connect battery ground cable (para. 4-73).  
  - Install crossover pipe (para. 3-50).  
  - Install sealed upper converter housing cover (para. 5-18).
5-18. SEALED UPPER CONVERTER HOUSING COVER (2-PIECE) MAINTENANCE

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

INITIAL SETUP:

Tools
   General mechanic's tool kit: Battery ground cable disconnected (para. 4-73).
   Automotive (Appendix B, Item 1)

Materials/Parts
   Gasket (Appendix G, Item 40)
   Adhesive (Appendix C, Item 5)
   Drycleaning solvent (Appendix C, Item 18)

Manual References
   TM 9-2320-280-24P

a. Removal
   1. Remove two capscrews (2) and converter housing cover (3) from transmission (1).
   2. Remove gasket (4) from converter housing cover (3). Discard gasket (4).

b. Inspection
   
   **WARNING**
   Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.
   1. Inspect converter housing cover (3) for pitting, cracking, and excessive wear. Replace if pitted, cracked, or excessively worn.
   2. Remove gasket material and sealant from converter housing cover (3) and transmission (1) with drycleaning solvent.

c. Installation
   1. Apply adhesive to gasket (4) and install on converter housing cover (3).

   **NOTE**
   Gasket may require bending over edge of converter housing cover to make gasket seat properly.
   2. Apply adhesive to converter housing cover gasket (4) and install converter housing cover (3) on transmission (1) with two capscrews (2).
FOLLOW-ON TASK: Connect battery ground cable (para. 4-73).
5-19. CONVERTER HOUSING COVER REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Equipment Condition**
- Battery ground cable disconnected (para. 4-73).
- Crossover pipe removed (para. 3-50).

**Manual References**
- TM 9-2320-280-24P

---

**NOTE**
For two-piece torque converter housing cover replacement, refer to paragraphs 5-17 and 5-18.

---

**a. Removal**

Remove six capscrews (2) and converter housing cover (3) from transmission (1).

**b. Installation**

Install converter housing cover (3) on transmission (1) with six capscrews (2).

---

**FOLLOW-ON TASKS:**
- Install crossover pipe (para. 3-50).
- Connect battery ground cable (para. 4-73).
5-20. TRANSMISSION MOUNT REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit:  
automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-24P

Equipment Condition
Transmission mount crossmember removed (para. 9-15).

Materials/Parts
Two lockwashers (Appendix G, Item 127)

FOLLOW-ON TASK: Install transmission mount crossmember (para. 9-15).

a. Removal

Remove two capscrews (4), lockwashers (3), and transmission mount (2) from adapter (1). Discard lockwashers (3).

b. Installation

Install transmission mount (2) on adapter (1) with two lockwashers (3) and capscrews (4). Tighten capscrews (4) to 65 lb-ft 88 N·m).
5-21. TRANSMISSION ROAD TEST

This task covers:

a. Road Test (3L80)  
b. Road Test (4L80-E)

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit automotive (Appendix B, Item 1)</td>
<td>• Transmission fluid at proper level (para. 5-2).</td>
</tr>
<tr>
<td></td>
<td>• Adjust manual shift linkage (para. 5-12).</td>
</tr>
<tr>
<td></td>
<td>• Adjust modulator cable (para. 5-15).</td>
</tr>
</tbody>
</table>

Manual References

TM 9-2320-280-24P

---

**a. Road Test (3L80)**

1. Position transmission shift lever in “D” (drive) and accelerate vehicle from 0 mph. A 1-2 and 2-3 shift should occur at all throttle openings. Shift points will vary with throttle openings. Allow vehicle to decrease in speed to 0 mph and 3-2 and 2-1 shifts should occur.

2. Position transmission shift lever in “2” (low 2) and accelerate vehicle from 0 mph. A 1-2 shift should occur at all throttle openings (no 2-3 shift can be obtained in this range). The 1-2 shift in “2” (low 2) is somewhat firmer than in “D” (drive). This is normal.

3. Position transmission shift lever in “1” (low 1) and accelerate the vehicle from 0 mph. No upshift should occur in this range.

4. Position transmission shift lever in “D” (drive) and with the vehicle speed at approximately 35 mph, close throttle and move transmission shift lever to “2” (low 2). Transmission should downshift to 2nd gear. An increase in engine rpm and an engine braking effect should be noticed.

5. Position transmission shift lever in “2” (low 2) and with vehicle speed at approximately 25 mph, close throttle and move transmission shift lever to “1” (low 1). Transmission should downshift to 1st gear. An increase in engine rpm and engine braking effect should be noticed.

6. Position transmission shift lever in “R” (reverse) and check for reverse operation.

---

**b. Road Test (4L80-E)**

1. Position shift lever in “D” (overdrive) and accelerate vehicle from 0 mph. A 1-2, 2-3, and 3-4 shift should occur at all throttle openings. Allow vehicle to coast down to about 0 mph and 4-3, 3-2, and 2-1 shifts should occur.

2. Position transmission shift lever in “D” (drive) and accelerate vehicle from 0 mph. A 1-2 and 2-3 shift should occur at all throttle openings. Allow vehicle to coast down to about 0 mph and 3-2 and 2-1 shifts should occur.

3. Position transmission shift lever in “2” (low two) and accelerate vehicle from 0 mph. A 1-2 shift should occur at all throttle openings. No 2-3 shift can be obtained in this range. A 1-2 shift in 2 is somewhat firmer than in “D”. This is normal.

4. Position shift lever in “1” and accelerate the vehicle from 0 mph. No upshifts should occur in this range.

5. Position shift lever in “D” and with the vehicle speed at approximately 45 mph, close throttle and move lever to ‘3’”. Transmission should downshift to 3rd gear. An increase in engine rpm and engine braking effect should be noticed.

6. Position shift lever in “D” and with the vehicle speed at approximately 35 mph, close throttle and move lever to ‘2”’. Transmission should downshift to 2nd gear. An increase in engine rpm and engine braking effect should be noticed.
5-21. TRANSMISSION ROAD TEST (Cont’d)

7. Position shift lever “2” and with the vehicle speed at approximately 25 mph, close the throttle and move lever to “1”. Transmission should downshift to 1st gear. An increase in engine RPM and engine braking effect should be noticed.

8. Position shift lever in “R” and check for reverse operation.

9. Hard shifting may indicate an underfilled or clogged system.

Section II. TRANSFER CASE MAINTENANCE

5-22. TRANSFER CASE MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-23</td>
<td>Transfer Case Shift Rod Maintenance</td>
<td>5-48</td>
</tr>
<tr>
<td>5-24</td>
<td>Speedometer Driven Gear Replacement</td>
<td>5-50</td>
</tr>
<tr>
<td>5-25</td>
<td>Transfer Case Vent Line Replacement</td>
<td>5-52</td>
</tr>
<tr>
<td>5-26</td>
<td>Transfer Case Oil Seals Replacement</td>
<td>5-53</td>
</tr>
</tbody>
</table>
5-23. TRANSFER CASE SHIFT ROD MAINTENANCE

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Two cotter pins (Appendix G, Item 17)

### a. Removal

1. Remove cotter pin (8) and washer (7) from transfer case range rod (5) and transfer case range lever (6). Discard cotter pin (8).
2. Remove cotter pin (3), washer (2), and shift rod trunnion (4) from bearing and arm assembly (1). Discard cotter pin (8).
3. Remove shift rod trunnion (4) from shift rod (5).

### b. Installation

1. Install shift rod trunnion (4) on shift rod (5).
2. Install shift rod (5) into transfer case range lever (6) with washer (7) and cotter pin (8).
3. Adjust shift rod (para. c).

### c. Adjustment

**NOTE**

The shift rod must be adjusted so that the detents of the transfer case lever correspond with the positions on the transfer case name plate.

1. Make sure parking brake lever (9) is engaged and place transmission shift lever (11) in “D” (drive) position.
2. Place transfer case shift lever (12) all the way forward in “HL” (high lock) position.
3. Place long screwdriver in front of parking brake lever (9) and transmission shift lever (11), and behind knob (10) on transfer case shift lever (12) to hold transfer case shift lever (12) forward.
4. Place transfer case range lever (6) in the rearward position, “HL”.
5. Turn shift rod trunnion (4) so that it slips easily into the hole in bearing and arm assembly (1).
6. Secure shift rod trunnion (4) to bearing and arm assembly (1) with washer (2) and cotter pin (3).
7. Remove screwdriver from transfer case shift lever (12) and place transmission shift lever (11) in “N” (neutral) position.
FOLLOW-ON TASK: Operate vehicle [TM 9-2320-280-10] and check for proper shifter operation.
5-24. SPEEDOMETER DRIVEN GEAR REPLACEMENT

This task covers:

- a. Removal
- b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: O-ring seal (Appendix G, Item 159)
- automotive (Appendix B, Item 1)

**Special Tools**
- Mirror, inspection (Appendix B, Item 107)

**Materials/Parts**
- O-ring seal (Appendix G, Item 159)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Removal**

1. Disconnect flex drive shaft (1) from correction adapter (2).
2. Loosen nut (3) and remove correction adapter (2) from pinion adapter (6).
3. Remove screw (4) and clamp (5) from pinion adapter (6) and transfer case (8).
4. Pull pinion adapter (6) out of transfer case (8).
5. Remove O-ring seal (7) from pinion adapter (6). Discard O-ring seal (7).
6. Remove driven gear (9) from transfer case (8).

---

**b. Installation**

1. Install O-ring (7) on pinion adapter (6).
   **NOTE**
   Note number stamped on driven gear.
2. Install driven gear (9) into pinion adapter (6).
   **NOTE**
   Numbers on pinion adapter represent number stamped on driven gear. When installing adapter, numbers on adapter must match with numbers on transfer case housing.
3. Install and align pinion adapter (6) into transfer case (8) with clamp (5) and capscrew (4). Tighten capscrew (4) to 15 lb-ft (20 N·m).
4. Install correction adapter (2) on pinion adapter (6) and tighten nut (3).
5. Connect flex drive shaft (1) to correction adapter (2).
FOLLOW-ON TASK: Operate vehicle (TM 9-2320-280-10) and check speedometer for proper operation.
5-25. TRANSFER CASE VENT LINE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools

General mechanic's tool kit:
automotive (Appendix B, Item 1)

Manual References

TM 9-2320-280-24P

a. Removal

1. Disconnect vent line (2) from elbow (1) on transfer case (10).

   NOTE
   Perform step 2 while holding capscrew head on transfer case securely to prevent changing torque or damaging transfer case seal.

2. Remove capscrew (4), clamp (3) and vent line (2) from bracket (9).

3. Remove capscrew (8) and clamp (5) from transmission (7).

4. Remove vent line (2) from tee fitting (6).

5. Remove clamps (3) and (5) from vent line (2).

b. Installation

1. Install clamps (3) and (5) on vent line (2).

2. Install vent line (2) on tee fitting (6).

3. Install clamp (5) and vent line (2) on transmission (7) with capscrew (8). Tighten capscrew (8) to 16-20 lb-ft (22-27 N.m).

   NOTE
   Perform step 4 while holding capscrew head on transfer case securely to prevent changing torque or damaging transfer case seal.

4. Install clamp (3) and vent line (2) on bracket (9) with capscrew (4).

5. Connect vent line (2) to elbow (1) on transfer case (10).
5-26. TRANSFER CASE OIL SEALS REPLACEMENT

This task covers:

| a. Front Oil Seal Removal | c. Rear Oil Seal Removal |
| b. Front Oil Seal Installation | d. Rear Oil Seal Installation |

INITIAL SETUP:

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)

**Special Tools**
- Yoke seal installer (Model 218) (Appendix B, Item 94)
- Output shaft seal installer (Model 242) (Appendix B, Item 112)
- Seal installer (Model 242) (Appendix B, Item 116.1)

**Special Tools (Cont'd)**
- Seal installer (Model 242) (Appendix B, Item 116.2)
- Drive handle (Model 242) (Appendix B, Item 116.3)

**Materials/Parts**
- Seal washer (Appendix G, Item 225)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Front Oil Seal Removal**

**NOTE**
Removal and installation procedures are basically the same for model 218 front and rear oil seals and model 242 front oil seal. This procedure covers the front oil seal. For replacement of rear oil seal for model 242, refer to para. 5-26.c.

1. Remove four capscrews (4), two straps (3), and front propeller shaft (1) from output yoke (2).
   **NOTE**
   Have drainage container ready to catch fluid.

2. Remove nut (5), seal washer (6), and output yoke (2) from transfer case (8). Discard seal washer (6).

3. Remove output oil seal (7) from transfer case (8).
b. Front Oil Seal Installation

NOTE

- Ensure rubber surface of seal faces yoke seal installer.
- Ensure depth of seal is .07-.10 mm below casting surface.

1. Using seal installer, install oil seal (7) on transfer case (8).
2. Install output yoke (2) and seal washer (6) on transfer case (8) with nut (5). Tighten nut (5) to 110 lb-ft (149 N·m).
3. Connect front propeller shaft (1) to output yoke (2) with two straps (3) and four capscrews (4). Tighten capscrews (4) to 13-18 lb-ft (18-24 N·m).
c. Rear Oil Seal Removal

**NOTE**

The following procedure applies to model 242 transfer case rear oil seal.

1. Remove rear propeller shaft (para. 6-5).
2. Remove oil seal (9) from transfer case extension (10).

**d. Rear Oil Seal Installation**

1. Using output shaft seal installer, install oil seal (9) on transfer case extension (10).
2. Install rear propeller shaft (para. 6-5).

**FOLLOW-ON TASK:** Fill fluid to proper level (TM 9-2320-280-10)
<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-2</td>
<td>Front Propeller Shaft Assembly Maintenance</td>
<td>6-2</td>
</tr>
<tr>
<td>6-3</td>
<td>Front Propeller Shaft Assembly Repair</td>
<td>6-6</td>
</tr>
<tr>
<td>6-4</td>
<td>Rear Propeller Shaft Maintenance</td>
<td>6-8</td>
</tr>
<tr>
<td>6-5</td>
<td>Rear Propeller Shaft Maintenance (1330 series)</td>
<td>6-10</td>
</tr>
<tr>
<td>6-6</td>
<td>Rear Propeller Shaft Repair</td>
<td>6-12</td>
</tr>
<tr>
<td>6-7</td>
<td>Universal Joint Repair</td>
<td>6-14</td>
</tr>
</tbody>
</table>
This task covers:
   a. Removal
   b. Inspection
   c. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

**Manual References**

**Materials/Parts**
- Cotter pin (Appendix G, Item 17)

**NOTE**
Propeller shaft bearing caps should be taped together to prevent loss of bearings.

### a. Removal

1. Remove four capscrews (3) and two bearing straps (2) from front propeller shaft assembly (4) and differential pinion yoke (1).

   **NOTE**
   - Step 2 applies to all vehicles except M1097, “A1” and “A2” series.
   - Step 3 applies to M1097, “A1” and “A2” series.

2. Remove four capscrews (10) and two bearing straps (9) from front propeller shaft assembly (4) and transfer case output yoke (7).

3. Remove four nuts (14), washers (15), and two U-bolts (16) from front propeller shaft assembly (4) and transfer case output yoke (7).

4. Remove cotter pin (13), washer (12), and transfer case shift rod (11) from transfer case shift lever (6). Discard cotter pin (13).

5. Remove two nuts (17), washers (18), capscrews (20), washers (18), and center bearing (19) from engine mount (21).

6. Move front propeller shaft assembly (4) forward, then rearward over top of transfer case (5) and pipe (8), and remove front propeller shaft assembly (4).

### b. Inspection

1. Inspect drive shaft (23) and coupling shaft (24) for cracks and damage. Replace either (para. 6-3) if cracked or damaged.

2. Inspect grease fittings (25) and universal joints (22) for serviceability. Replace universal joints (22) (para. 6-7) or grease fittings (25) if unserviceable.

3. Inspect center bearing (19) for roughness or damage. Replace coupling shaft (24) (para. 6-3) if center bearing (19) is rough or damaged.
6-2. FRONT PROPELLER SHAFT ASSEMBLY MAINTENANCE (Cont’d)

c. Installation

1. Install front propeller shaft assembly (4) over exhaust pipe (8) and over top of transfer case (5).
2. Install front propeller shaft assembly (4) on differential pinion yoke (1) with two bearing straps (2) and four capscrews (3). Tighten capscrews (3) to 13-18 lb-ft (18-24 N·m).
3. Install center bearing (19) on engine mount (21) with two washers (18), capscrews (20), washers (18), and nuts (17). Tighten capscrews (20) to 60 lb-ft (81 N·m).
4. Install transfer case shift rod (11) on transfer case shift lever (6) with washer (12) and cotter pin (13).

NOTE
Step 5 applies to all vehicles except M1097, “A1” and “A2” series.
Step 6 applies to M1097, “A1” and “A2” series.

5. Install front propeller shaft assembly (4) on transfer case output yoke (7) with two bearing straps (9) and four capscrews (10). Tighten capscrews (10) to 13-18 lb-ft (18-24 N·m).
6. Install front propeller shaft assembly (4) on transfer case output yoke (7) with two U-bolts (16), four washers (15), and nuts (14). Tighten nuts (14) to 13-18 lb-ft (18-24 N·m).
FOLLOW-ON TASK: Lubricate propeller shaft assembly (TM 9-2320-280-10)
This task covers:

a. Disassembly
b. Cleaning and Inspection
c. Assembly

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
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<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>Front propeller shaft assembly removed (para. 6-2).</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>General Safety Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust cap (Appendix G, Item 31)</td>
<td>Cleaning will be done in a well-ventilated area and a fire extinguisher will be kept nearby when drycleaning solvent is used.</td>
</tr>
<tr>
<td>Grease (Appendix C, Item 22)</td>
<td></td>
</tr>
<tr>
<td>Drycleaning solvent (Appendix C, Item 18)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manual References</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TM 9-2320-280-24P</td>
<td></td>
</tr>
</tbody>
</table>

### a. Disassembly

**NOTE**

Prior to disassembly, mark slip yoke and coupling shaft for assembly.

1. Place ship yoke (2) in vise.
2. Pry dust cap (3) off slip yoke (2).
3. Pull drive shaft (1) apart from coupling shaft (4). Discard dust cap (3).

### b. Cleaning and Inspection

**WARNING**

Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

**CAUTION**

Do not allow drycleaning solvent to come into contact with U-joint. Damage to equipment will result.

1. Use drycleaning solvent to clean all metallic parts.
2. Inspect drive shaft (1), coupling shaft (4), and slip yoke (2) for cracks or dents. Replace if cracked or dented.
3. Inspect splined end of coupling shaft (4) and slip yoke (2) for damage. Replace either if damaged.
4. Inspect center bearing (5) for looseness, vibration damage, rubber separation from bearing surface, and abnormal wear. If damaged, replace coupling shaft (4).
c. Assembly

NOTE
Ensure grease fitting on dust cap is aligned with wide spline in slip yoke.

1. Install dust cap (3) on coupling shaft (4).
2. Coat splines on coupling shaft (4) and slip yoke (2) with grease.

NOTE
Ensure wide spline on coupling shaft is aligned with grease fitting on slip yoke.

3. Install coupling shaft (4) and dust cap (3) into slip yoke (2).

FOLLOW-ON TASK: Install front propeller shaft assembly (para. 6-2).
6-4. REAR PROPELLER SHAFT MAINTENANCE

This task covers:

a. Removal
b. Inspection
c. Installation

INITIAL SETUP:

Applicable Models
All except M1097, “A1” and “A2” series

Materials/Parts
Eight lockwashers
(Appendix G, Item 109)

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

CAUTION
Prior to towing vehicle, parking brake rotor must be removed.

a. Removal

NOTE
On vehicles with serial numbers USBL Eff. 44825 and above, the propeller shaft is attached to the differential yoke instead of the parking brake rotor.

1. Chock wheels and release parking brake [TM 9-2320-280-10].
2. Remove four nuts (1), lockwashers (2), and two U-bolts (4) from rear propeller shaft (5) and transfer case output yoke (3). Discard lockwashers (2).
3. Remove four capscrews (8), lockwashers (7), and rear propeller shaft (5) from parking brake rotor (6). Discard lockwashers (7).

b. Inspection

1. Inspect propeller shaft (5) for cracks and dents. Replace if cracked or dented.
2. Inspect grease fittings and universal joints for serviceability. Replace universal joints [para. 6-7] or grease fittings if unserviceable.

c. Installation

1. Install rear propeller shaft (5) on parking brake rotor (6) with four lockwashers (7) and capscrews (8). Tighten capscrews (8) to 60 lb.-ft (81 N·m).
2. Install rear propeller shaft (5) on transfer case output yoke (3) with two U-bolts (4), four lockwashers (2), and nuts (1). Tighten nuts (1) to 21 lb.-ft (28 N·m).
3. Apply parking brake [TM 9-2320-280-10] and remove wheel chocks.
FOLLOW-ON TASK: Lubricate propeller shaft (TM 9-2320-280-10)
6-5. REAR PROPELLER SHAFT MAINTENANCE (1330 SERIES)

This task covers:

a. Removal
b. Inspection
c. Installation

INITIAL SETUP:

Applicable Models
M1097, "A1" and "A2" series

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

a. Removal

2. Remove four capscrews (6), two straps (5), and disconnect propeller shaft (3) from differential pinion yoke (4).
3. Slide propeller shaft end yoke (1) out of transfer case extension (2) and remove propeller shaft (3).

b. Inspection

1. Inspect propeller shaft (3) for cracks and dents. Replace if cracked or dented.
2. Inspect grease fittings and universal joints for serviceability. Replace universal joints (para. 6-6) or grease fittings if unserviceable.
3. Inspect splined end of end yoke (1) for damage. Replace end yoke (1) if damaged (para. 6-6).

c. Installation

1. Slide propeller shaft end yoke (1) on transfer case extension (2) and install propeller shaft (3).
2. Connect propeller shaft (3) to differential pinion yoke (4) with two straps (5) and four capscrews (6). Tighten capscrews (6) to 13-18 lb-ft (18-24 N·m).
3. Apply parking brake (TM 9-2320-280-10) and remove wheel chocks.
FOLLOW-ON TASK: Lubricate propeller shaft (TM 2320-280-10)
6-6. REAR PROPELLER SHAFT REPAIR

This task covers:

a. Disassembly
b. Cleaning and Inspection
c. Assembly

INITIAL SETUP:

Tools
General mechanic's tool kit:
automotive (Appendix B, item 1)
Universal joint bearing kit
(Appendix B, Item 171)

Materials/Parts
Dust cap (Appendix G, Item 31)
Grease (Appendix C, Item 22)
Drycleaning solvent (Appendix C, Item 18)

Manual References
TM 9-2320-280-24P

Equipment Condition
Rear propeller shaft removed (para. 6-4 or 6-5).

General Safety Instructions
Cleaning will be done in well-ventilated area and a fire extinguisher will be kept nearby when solvent is used.

a. Disassembly

NOTE
Prior to disassembly, mark slip yoke and propeller shaft for assembly.

1. Pull slip yoke (3) from propeller shaft (1).
2. Place slip yoke (3) into vise.
3. Pry dust cap (2) off of slip yoke (3). Discard dust cap (2).

b. Cleaning and Inspection

WARNING
Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when solvent is used. Use only in well-ventilated area. Failure to do this may result in injury to personnel and/or damage to equipment.

CAUTION
Do not allow drycleaning solvent to come into contact with U-joint. Damage to equipment will result.

1. Use drycleaning solvent to clean all metallic parts.
2. Inspect propeller shaft (1) and slip yoke (3) for cracks and damage. Replace if cracked or damaged.
3. Inspect splined end of propeller shaft (1) and splined end of slip yoke (3) for damage. Replace either if damaged.

c. Assembly

1. Install dust cap (2) on propeller shaft (1).
2. Coat spline on propeller shaft (1) and slip yoke (3) with grease.
3. Insert propeller shaft (1) into slip yoke (3) and install dust cap (2).
FOLLOW-ON TASK: Install rear propeller shaft (para. 6-4).
6-7. UNIVERSAL JOINT REPAIR

This task covers:

a. Disassemble
b. Assembly

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: One mechanic One assistant</td>
<td></td>
</tr>
<tr>
<td>Automotive (Appendix B, Item 1)</td>
<td>Manual References</td>
</tr>
<tr>
<td>Universal joint bearing kit (Appendix B, Item 171)</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal and bearing kit (Appendix G, Item 56)</td>
<td>Propeller shaft removed (para. 6-2 or 6-4).</td>
</tr>
</tbody>
</table>

NOTE

All universal joint replacement procedures are basically the same. This procedure covers the rear universal joint.

a. Disassembly

CAUTION

Do not drop bearing cups. Needle bearings can be easily lost.

1. Remove grease fitting (6) from cross (4).
2. Remove two bearing cups (1) from cross (4).
3. Remove two snaprings (2) from yoke (5).
4. Position propeller shaft (3) in vise with 1-1/8 in. socket between vise jaw and bearing cup (1) being removed. Ensure open end of socket is facing bearing cup (1).
5. Place 11/16 in. socket between opposite bearing cup (1) and vise jaw. Ensure open end of socket is facing vise jaw.
6. Press bearing cup (1) out of yoke (5) and remove bearing cup (1) from cross (4).
7. Reverse position of sockets and press remaining bearing cup (1) out of yoke (5).
8. Remove cross (4) from yoke (5).

b. Assembly

CAUTION

Ensure grease fitting on cross faces yoke. Damage to equipment will result if improperly installed.

1. Install cross (4) into yoke (5).
2. Install bearing cup (1) into yoke (5).

CAUTION

Ensure bearing cup is aligned with yoke before pressing in with vise. Damage to cross and bearing cups will result if forced into yoke.

3. Place yoke (5) in vise with 11/16 in. socket between vise jaw and bearing cup (1).
4. Press bearing cup (1) into yoke (5) far enough to install snapring (2) and install snapring (2) into yoke (5).
5. Install bearing cup (1) into yoke (5).
6. Place yoke (5) in vise with 11/16 in. socket between bearing cup (1) and vise jaw.
7. Press bearing cup (1) into yoke (5) far enough to install snapring (2) and install snapring (2) into yoke (5).
8. Install two bearing cups (1) on cross (4).
9. Install grease fitting (6) into cross (4).
FOLLOW-ON TASK: Install propeller shaft (para. 6-2 or 6-4).
### Section II. FRONT AND REAR AXLES MAINTENANCE

#### 6-8. FRONT AND REAR AXLES MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-9</td>
<td>Halfshaft Maintenance</td>
<td>6-17</td>
</tr>
<tr>
<td>6-10</td>
<td>Geared Hub Side Cover Replacement</td>
<td>6-24</td>
</tr>
<tr>
<td>6-11</td>
<td>Geared Hub Replacement</td>
<td>6-26</td>
</tr>
<tr>
<td>6-12</td>
<td>Geared Hub Input Seal Replacement</td>
<td>6-32</td>
</tr>
<tr>
<td>6-13</td>
<td>Geared Hub Spindle Seal Replacement</td>
<td>6-34</td>
</tr>
<tr>
<td>6-14</td>
<td>Geared Hub Spindle Bearing Adjustment</td>
<td>6-38</td>
</tr>
<tr>
<td>6-15</td>
<td>Wheel Stud Replacement</td>
<td>6-40</td>
</tr>
<tr>
<td>6-16</td>
<td>Differential Vent Line Replacement</td>
<td>6-41</td>
</tr>
<tr>
<td>6-17</td>
<td>Rear Geared Hub Vent Line Replacement</td>
<td>6-42</td>
</tr>
<tr>
<td>6-18</td>
<td>Front Geared Hub Vent Line Replacement</td>
<td>6-44</td>
</tr>
<tr>
<td>6-19</td>
<td>Steering Stop Maintenance</td>
<td>6-48</td>
</tr>
<tr>
<td>6-20</td>
<td>Air Lifting Bracket Replacement</td>
<td>6-50</td>
</tr>
<tr>
<td>6-21</td>
<td>Differential Cover Maintenance</td>
<td>6-52</td>
</tr>
</tbody>
</table>
6-9. HALFSHAFT MAINTENANCE

This task covers:

a. Removal
d. Assembly
b. Disassembly
e. Installation
c. Cleaning and Inspection

INITIAL SETUP:

Tools
General mechanic’s tool kit:
- automotive (Appendix B, Item 1)

Materials/Parts
- Boot service kits (fixed) (Appendix G, Item 6)
- Boot service kits (plunged) (Appendix G, Item 6)
- Clip (Appendix G, Item 13)
- Cotter pin (Appendix G, Item 17)
- Seven lockwashers (Appendix G, Item 119)
- Drycleaning solvent (Appendix C, Item 18)
- Lithium grease (Appendix C, Item 25)
- Sealing compound (Appendix C, Item 41)

Manual References
- TM 9-2320-280-24P

Equipment Condition
- Wheel removed (para. 8-3)

General Safety Instructions
- Drycleaning solvent is flammable and will not be used near an open flame.

a. Removal

1. Remove access plug (8) and washer (7) from geared hub (4).
2. Remove halfshaft retaining capscrew (6) and lockwasher (5) from halfshaft (9) and geared hub (4).
   Discard lockwasher (5).
3. Remove six capscrews (3), lockwashers (2), and halfshaft (9) from rotor (1) and output flange (10).
   Discard lockwashers (2).

   NOTE
   Perform steps 4 and 5 for rear halfshafts only.
4. Remove cotter pin (15), washer (16), and clevis pin (18) from parking brake clevis (17) and lever (14).
   Discard cotter pin (15).
5. Remove clip (13) and disconnect cable (11) from caliper cable bracket (12). Discard clip (13).
6-9. HALFSHAFT MAINTENANCE (Cont’d)

b. Disassembly

1. Loosen two clamps (7) and (8) securing inner boot (6) to inner joint (1) and shaft (5).
2. Clamp shaft (5) in soft-jawed vise.
3. Remove inner boot (6) from inner joint (1) and slide up on shaft.
4. Remove retainer clip (2) from inner joint (1).
5. Remove inner joint (1), retainer clip (2), and six ball bearings (3) from bearing assembly (4).
6-9. HALFSHAFT MAINTENANCE (Cont'd)

NOTE

- Remove excess grease from bearing assembly and separate ball race from inner race.
- Perform steps 6 through 8 for all models except the M1097, “A1” and “A2” vehicles.
- Perform steps 9 and 10 for M1097, “A1” and “A2” series vehicles.

6. Pry spacer (3) from groove on shaft (5) and slide spacer (3) and inner race (2) up on shaft (5).
7. Remove retainer ring (1) from shaft (5). Discard retainer ring (1).
8. Remove inner race (2), spacer (3), and ball race (4) from shaft (5). Discard spacer (3).
9. Remove retainer ring (6) from shaft (5). Discard retainer ring (6).
10. Remove inner race (2) and ball race (4) from shaft (5).
6-9. HALFSHAFT MAINTENANCE (Cont’d)

11. Remove inner boot (1) and clamps (2) and (3) from shaft (7). Discard boot (1) and clamps (2) and (3).
12. Remove shaft (7) from soft-jawed vise.
13. Loosen two boot clamps (4) and (5) securing outer boot (6) to outer joint (8) and shaft (7).
14. Remove outer boot (6) and clamps (5) and (4) from shaft (7). Discard boot (6) and clamps (5) and (4).

NOTE

Perform steps 15 through 17 for all models except the M1097 and “A1” and “A2” series vehicles.

15. Remove slinger (11) from outer joint (8).
16. Remove outer joint (8) from shaft (7) using slide hammer.
17. Remove retainer ring (10) and spacer (9) from shaft (7). Discard retainer ring (10).

c. Cleaning and Inspection

WARNING

Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

1. Clean all metallic parts with drycleaning solvent.
2. Inspect shaft (7) for cracks and distortion. Replace shaft (7) if cracked or distorted.
3. Inspect splined end of shaft (7) for damage. Replace shaft (7) if damaged.
4. Inspect inner joint (12) for pitting or rough joint operation. Replace inner joint (12) if pitted or unserviceable.
d. Assembly

NOTE
Perform steps 1 through 3 for all models except the M1097 and "A1" and "A2" series vehicles.

1. Install spacer (9) and retainer ring (10) on shaft (7).
2. Align splines on shaft (7) to outer joint (8) and push outer joint (8) onto shaft (7) until it snaps in place.
3. Install slinger (11) on outer joint (8).
4. Pack outer joint (8) with lithium grease.
5. Install outer boot (6) on shaft (7). Ensure boot (6) seats in groove of shaft (7).
6. Secure outer boot (6) on shaft (7) with clamp (4).
7. Install outer boot (6) on joint (8). Ensure boot (6) seats in groove of joint (8).
8. Secure outer boot (6) on joint (8) with clamp (5).
9. Clamp shaft (7) in soft-jawed vise.
10. Position clamps (3) and (2) on shaft (7).
11. Install inner boot (1) on shaft (7). Push boot (1) past groove on shaft (7).
12. Position ball race (13) on shaft (7).
6-9. HALFSHAFT MAINTENANCE (Cont’d)

NOTE

- Perform steps 13 and 14 for all models except M1097 and “A1” and “A2” series vehicles.
- Perform steps 15 and 16 for M1097 and “A1” and “A2” series vehicles.

13. Install spacer (3) and retainer ring (2) on shaft (4).
14. Align splines of inner race (1) with open spline of shaft (4). Use press to install inner race (1) until it snaps in place.
15. Align splines of inner race (1) with open spline on shaft (4). Use press to install inner race (1) on shaft (4) until inner race (1) seats into place.
16. Install retainer ring (6) in upper groove of shaft (4) behind inner race (1).
17. Position ball race (5) and six ball bearings (9) on inner race (1) and retain with lithium grease.
18. Position retainer clip (8) and inner joint (7) over bearing assembly (13).

NOTE

Ensure ball bearings are retained in ball race.

20. Pack inner joint (7) with lithium grease.
21. Move inner boot (10) on shaft (4) until boot (10) seats in groove of shaft (4).
22. Secure inner boot (10) on shaft (4) with clamp (12).
23. Install inner boot (10) on inner joint (7). Ensure boot (10) seats in groove of joint (7).
24. Secure inner boot (10) on inner joint (7) with clamp (11).
6-9. HALFSHAFT MAINTENANCE (Cont’d)

e. Installation

1. Install halfshaft (9) into geared hub (4).
2. Apply sealing compound to halfshaft retaining capscrew (6) and install halfshaft (9) to geared hub (4) with lockwasher (5) and halfshaft retaining capscrew (6). Tighten halfshaft retaining capscrew (6) to 37 lb-ft (50 N·m).
3. Install washer (7) and access plug (8) into geared hub (4). Tighten access plug (8) to 8-13 lb-ft (11-18 N·m).

**NOTE**

Ensure all six capscrew holes in the rotor align with holes in output flange.

4. Apply sealing compound to six capscrews (3). Install halfshaft (9) to rotor (1) and output flange (10), with six lockwashers (2) and capscrews (3). Tighten capscrews (3) to 48 lb-ft (65 N·m).

**NOTE**

Perform steps 5 through 7 for rear halfshafts only.

5. Install parking brake cable (18) to caliper cable bracket (11) with clip (12).

**CAUTION**

- Ensure lever is in contact with caliper cable bracket stop. Damage to equipment and poor performance will result if not aligned properly.
- Ensure that the clevis and clevis pin are aligned in the lever. Do not move the lever to accommodate misadjusted clevis. Damage to equipment and poor performance may result.

6. Install parking brake clevis (16) to lever (13) with clevis pin (17), washer (15), and cotter pin (14). Check position of lever (13) and ensure it is in contact with caliper cable bracket stop (19).

7. If lever (13) is not in contact with caliper cable bracket stop (19), adjust rear dual service parking brake (para. 7-26).

FOLLOW-ON TASK: Install wheel (para. 8-3).
6-10. GEARED HUB SIDE COVER REPLACEMENT

This task covers:

a. Removal  
b. Cleaning and Inspection  
c. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Sealing compound (Appendix C, Item 46)
- Sealant (Appendix C, Item 38)
- Drycleaning solvent, (Appendix C, Item 18)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Wheel removed (para. 8-3).

**General Safety Instructions**
- Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places.

**NOTE**
- Have drainage container ready to catch oil.
- Geared hub side cover replacement procedures are basically the same for front and rear covers. This procedure deals with the front side cover.

**a. Removal**

1. Remove drainplug (5) from geared hub (1) and drain geared hub (1).
2. Install drainplug (5) in geared hub (1).
3. Remove eight capscrews (4), washers (3), and side cover (2) from geared hub (1).

**b. Cleaning and Inspection**

**WARNING**
- Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

1. Using drycleaning solvent, clean side cover (2).
2. Inspect side cover (2) for damage. If damaged replace.

**c. Installation**

1. Apply sealant (RTV) to side cover (2) and install side cover (2) on geared hub (1).
2. Apply sealing compound to capscrews (4) and install eight washers (3) and capscrews (4) on side cover (2). Tighten capscrews (4) to 15 lb-ft (20 N-m).
6-10. GEARED HUB SIDE COVER REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Fill geared hub to proper level (TM 9-2320-280-10).
- Install wheel (para. 8-3).
6-11. GEARED HUB REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10
- Puller kit (Appendix B, Item 167)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Wheel removed (para. 8-3)
- Steering stop removed (para. 6-19)
- Air lifting bracket removed, rear only (para. 6-20)

**Materials/Parts**
- Three cotter pins (Appendix G, Item 18)
- Lockwasher (Appendix G, Item 120)
- Eight locknuts (Appendix G, Item 65)
- Sealing compound (Appendix C, Item 45)
- Sealer (Appendix C, Item 39)

**General Safety Instructions**
- Geared hub must be supported during removal and installation.

**NOTE**
- Have drainage container ready to catch drained fluid.
- Removal and installation procedures are basically the same for front and rear geared hubs. This procedure covers the front geared hub.

**Personnel Required**
- One mechanic
- One assistant

**CAUTION**
- Use of a pickle fork in lieu of the puller kit may damage serviceable components (boots).

**WARNING**
- Geared hub must be supported during removal and installation.

**a. Removal**

1. Remove drainplug (29) from geared hub (9) and drain geared hub (9).
2. Install drainplug (29) in geared hub (9).
3. Remove capscrew (22), washer (23), vent line bracket and clamp (24) from geared hub (9).
4. Loosen clamp (10) and disconnect vent line (1) from geared hub fitting (11).
5. Remove cotter pin (25), slotted nut (26), and washer (27) from tie rod end (28) and geared hub (9).
   - Discard cotter pin (25).
6. Using puller, disconnect tie rod end (28) from geared hub (9).
7. Remove access plug (14), washer (15), axle halfshaft retaining capscrew (13), lockwasher (12) and disconnect halfshaft (20) from geared hub (9).
   - Discard lockwasher (12).
8. Remove four locknuts (21), washers (16), capscrews (17), and washers (16) from lower ball joint (18) and lower control arm (19).
9. Remove four locknuts (7), washers (3), capscrews (2), and washers (3) from boot retainer (8), ball joint retainer (5), upper ball joint (6) and upper control arm (4).

**WARNING**
- Failure to support geared hub may cause injury to personnel or damage to equipment.
6-11. GEARED HUB REPLACEMENT (Contd)

10. Lower support and remove geared hub (9).
6-11. GEARED HUB REPLACEMENT (Cont’d)

11. Place geared hub (3) in vise.
12. Remove cotter pin (8), slotted nut (9), and upper ball joint (10) from geared hub (3). Discard cotter pin (8).
13. Remove cotter pin (1), slotted nut (2), and lower ball joint (4) from geared hub (3). Discard cotter pin (1).

b. INSTALLATION

NOTE
Upper ball joint has grease fitting.

1. Install upper ball joint (10) to geared hub (3) with slotted nut (9), but do not tighten.
2. Install lower ball joint (4) to geared hub (3) with slotted nut (2), but do not tighten.

NOTE
• If geared hub received is P/N 5598766 and left front or right rear installation is required, replace steering arm cover P/N 5591279 with P/N 5591280.
• If geared hub received is P/N 5598767 and right front or left rear installation is required, replace steering arm cover P/N 5591280 with P/N 5591279.
• Use existing steering arm cover if serviceable.
• Perform steps 3 through 5 for replacement of steering arm cover. Proceed to step 6 for geared hub-installation.

3. Remove four capscrews (7), washers (6), and steering arm cover (5) from geared hub (3).

NOTE
Immediately install steering arm cover after application of sealant.

4. Clean sealing surfaces on geared hub (3) and steering arm cover (5). Apply anaerobic sealant to steering arm cover (5).
5. Apply sealing compound to threads on capscrews (7) and install steering arm cover (5) to geared hub (3) with four washers (6) and capscrews (7). Tighten capscrews (7) to 65 lb-ft (88 N·m).

WARNING
Geared hub must be supported during removal and installation. Failure to support geared hub may cause injury to personnel or damage to equipment.

6. Install geared hub (3) and upper ball joint (10) on upper control arm (13) ensuring upper ball joint (10) is placed above upper control arm (13), and boot (16) and ball joint retainer (14) are placed below upper control arm (13).
7. Install upper ball joint (10) and ball joint retainer (14) to upper control arm (13) with four washers (12), capscrews (11), washers (12), and locknuts (15). Tighten locknuts (15) to 252 lb-in. (28 N·m).

CAUTION
Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

8. Tighten slotted nut (9) on upper ball joint (10) to 65 lb-ft (88 N·m). Install cotter pin (8).
9. Apply sealing compound to halfshaft retaining capscrew (18) and install halfshaft (24) to geared hub (3) with lockwasher (17) and halfshaft retaining capscrew (18). Tighten halfshaft retaining capscrew (18) to 37 lb-ft (50 N·m).
6-11. GEARED HUB REPLACEMENT (Cont’d)

10. Install washer (20) and access plug (19) to geared hub (3). Tighten access plug (19) to 8-13 lb-ft (11-18 N·m).

11. Install lower ball joint (4) and geared hub (3) on lower control arm (23). Ensure lower ball joint (4) is below lower control arm (23).

12. Secure lower ball joint (4) to lower control arm (23) with four washers (21), capscrews (22), washers (21), and locknuts (25). Tighten locknuts (25) to 35 lb-ft (47 N·m).

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

13. Tighten slotted nut (2) on lower ball joint (4) to 73 lb-ft (99 N·m). Install cotter pin (1).
14. Install tie rod end (4) into geared hub (5) with washer (3) and slotted nut (2). Tighten slotted nut (2) to 70 lb-ft (95 N\textcdot m). Install cotter pin (1).

15. Connect vent line (6) to geared hub fitting (8) with clamp (7).

16. Install vent line (6) and clamp (9) to geared hub (5) with washer (10) and capscrew (11). Tighten capscrew (11) to 38 lb-ft (52 N\textcdot m).

17. Tighten drainplug (14) to 8-13 lb-ft (18-18 N\cdot m).

18. Remove fill plug (13) and washer (12) from geared hub (5).

19. Fill geared hub (5) to proper level [TM 9-2320-280-10].

20. Install washer (12) and fill plug (13) to geared hub (5). Tighten fill plug (13) to 8-13 lb-ft (11-18 N\cdot m).
FOLLOW-ON TASKS:

- Install steering stop (para. 6-19).
- Install wheel (para. 8-3).
- Install air lifting bracket, rear only (para. 6-20).
- Check alignment (paras. 8-10 and 8-11).
6-12. GEARED HUB INPUT SEAL REPLACEMENT

This task covers:

**a. Removal**

**b. Installation**

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)
  - Vise insert (Appendix B, Item 170)

**Special Tools**
- Installer (Appendix B, Item 126)
- Driver handle (Appendix B, Item 75)

**Materials/Parts**
- Input seal (Appendix G, Item 55)
- Lubricating oil (Appendix C, Item 26)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Halfshaft removed (para. 6-9).

---

**a. Removal**

Shim gaskets must be reused to maintain proper drive gear bearing adjustment.

1. Remove capscrew (1), washer (2), and vent line bracket (3) from drive gear retainer (4).
2. Remove three capscrews (1), washers (2), drive gear retainer (4), and shim gasket(s) (5) from geared hub (6).
3. Install drive gear retainer (4) in vise with inserts and remove input seal (7). Discard input seal (7).

**b. Installation**

1. Using driver handle and input seal installer, install input seal (7) in drive gear retainer (4). Ensure radius on outer diameter of input seal (7) faces toward inside of geared hub (6).
2. Install shim gasket(s) (5) and drive gear retainer (4) to geared hub (6) with three washers (2) and capscrews (1). Tighten capscrews (1) to 38 lb-ft (52 N.m).
3. Install vent line bracket (3) to drive gear retainer (4) with washer (2) and capscrew (1). Tighten capscrew (1) to 38 lb-ft (52 N.m).
4. Coat lip of input seal (7) with lubricating oil.

---
FOLLOW-ON TASK: Install halfshaft (para. 6-9).
This task covers:

- **a. Removal**
- **b. Installation**

### INITIAL SETUP

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Special Tools**
- Wrench (Appendix B, Item 127)
- Installer (Appendix B, Item 128)
- Driver handle (Appendix B, Item 75)

**Materials/Parts**
- Lockwasher (Appendix G, Item 121)
- Seal (Appendix G, Item 214)
- Grease (Appendix C, Item 22)
- Sealer (Appendix C, Item 39)
- Lubricating oil (Appendix C, Item 29)
- Sealing compound (Appendix C, Item 45)

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#### a. Removal

**NOTE**
- Have drainage container ready to catch oil.

1. **Remove drainplug (2) from geared hub (1) and drain geared hub (1). Install drainplug (2) in geared hub (1).** Tighten drainplug (2) to 8-13 lb-ft (11-18 N·m).

2. **Remove four capscrews (5), washers (4), and steering arm cover (3) from geared hub (1).**

**NOTE**
- For new configuration, two locktabs on lockwasher must be bent away from retaining nut for removal.

3. **Bend locktab on lockwasher (13) away from retaining nut (14).**

**NOTE**
- If four-slotted retaining nut TN-07 is present, it is recommended to replace it with eight-slotted retaining nut 12342680.

4. **Using retaining nut wrench, remove retaining nut (14), lockwasher (13), and keyed washer (12) from spindle (7). Discard lockwasher (13).**
6-13. GEARED HUB SPINDLE SEAL REPLACEMENT (Cont’d)

5. Remove spindle (7), spacer (6), bearing(11), and spacer (10) from geared hub (1).

6. Remove spindle seal (15) from geared hub (1). Discard spindle seal (15).

7. Inspect spindle (7) for rough or corroded sealing surface (8). Replace geared hub (1) [para. 6-11] if spindle (7) is damaged.

8. Inspect bearings (9) and (11) for damage. Replace geared hub (1) [para. 6-11] if bearing (9) or (11) is damaged.
b. Installation

1. Using driver handle and spindle seal installer, install spindle seal (1) in geared hub (2).
2. Coat spindle seal (1) with lubricating oil.
3. Install spacer (3) and spindle (4) in geared hub (2).
4. Apply grease to face of retaining nut (9).

**NOTE**
- If four-slotted retaining nut TN-07 is present, it is recommended to replace it with eight-slotted retaining nut 12342680.
- Ensure lip of spacer faces the bearing for a proper fit.

5. Install spacer (5), bearing (6), keyed washer (7), lockwasher (8), and retaining nut (9) on spindle (4).
6. Using retaining nut wrench, tighten retaining nut (9) to 35-45 lb-ft (47-61 \( \text{N}\cdot\text{m} \)).
7. Rotate spindle (4) five full rotations clockwise and five full rotations counterclockwise to properly seat bearings.
8. Loosen retaining nut (9) until it is finger tight, then retighten nut to 23-27 lb-ft (31-37 \( \text{N}\cdot\text{m} \)).

**WARNING**
Ensure locktab on lockwasher is bent completely into slot on retaining nut. Eight-slotted retaining nut provides additional security by enabling two locktabs on lockwasher to be bent into slots on retaining nut. Failure to do this may cause injury to personnel or damage to equipment.

**NOTE**
- For new configuration, two locktabs on lockwasher must be bent into slots on retaining nut.
- It may be necessary to slightly loosen or tighten retaining nut to gain proper alignment with locktabs.

9. Determine which locktab (10) on lockwasher (8) aligns with slot (11) in retaining nut (9). Bend locktab (10) into slot (11) on retaining nut (9).

**NOTE**
Immediately install steering arm cover after application of sealant.

10. Clean sealing surfaces on geared hub (2) and steering arm cover (14). Apply anaerobic sealant to steering arm cover (14) and install steering arm cover (14) on geared hub (2).
11. Apply sealing compound to threads of capscrews (12) and install steering arm cover (14) on geared hub (2) with four washers (13) and capscrews (12). Tighten capscrews (12) to 65 lb-ft (88 \( \text{N}\cdot\text{m} \)).
12. Remove fill plug (15) and washer (16) from geared hub (2).
13. Fill geared hub (2) to proper oil level (TM 9-2320-280-10).
14. Install washer (16) and fill plug (15) on geared hub (2). Tighten fill plug (15) to 8-13 lb-ft (11-18 \( \text{N}\cdot\text{m} \)).
6-13. GEARED HUB SPINDLE SEAL REPLACEMENT (Cont’d)

FOLLOW-ON TASK: Install wheel [para. 8-3].
6-14. GEARED HUB SPINDLE BEARING ADJUSTMENT

This task covers:

Adjustment

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)

**Special Tools**
- Wrench (Appendix B, Item 127)

**Materials/Parts**
- Lockwasher (Appendix G, Item 121)
- Sealer (Appendix C, Item 39)
- Sealing compound (Appendix C, Item 45)
- Grease (Appendix C, Item 22)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Wheel removed (para. 8-3).

**General Safety Instructions**
- Ensure locktab on lockwasher is bent completely into slot on retaining nut.

**Adjustment**

**NOTE**
- Have drainage container ready to catch oil.

1. Remove drainplug (4), and drain geared hub (1). Install drainplug (4) into geared hub (1). Tighten drainplug (4) to 8-13 lb-ft (11-18 N·m).

2. Remove four capscrews (7), washers (6), and steering arm cover (5) from geared hub (1).
   **NOTE**
   - For new configuration, two locktabs must be bent away from locknut for removal.

3. Bend locktab (12) on lockwasher (9) away from retaining nut (10).

4. Using retaining nut wrench, remove retaining nut (10) and lockwasher (9) from spindle (8). Discard lockwasher (9).
   **NOTE**
   - If four-slotted retaining nut TN-07 is present, it is recommended to replace it with eight-slotted retaining nut 12342680.

5. Apply grease to face of retaining nut (10) and install lockwasher (9) and retaining nut (10) on spindle (8).

6. Using retaining nut wrench, tighten retaining nut (10) to 35-45 lb-ft (47-61 N·m).

7. Rotate spindle (8) five full rotations clockwise and five full rotations counter clockwise to properly seat bearings.

8. Loosen retaining nut (10) until it is finger tight, then retighten nut to 23-27 lb-ft (31-37 N·m).

**WARNING**
- Ensure locktab on lockwasher is bent completely into slot on retaining nut. Eight-slotted retaining nut provides additional security by enabling two locktabs on lockwasher to be bent into slots on retaining nut. Failure to do this may cause injury to personnel or damage to equipment.

**NOTE**
- For new configuration, two locktabs must be bent into slots on retaining nut.
- It may be necessary to slightly loosen or tighten retaining nut to gain proper alignment with locktabs.

9. Determine which locktab (12) on lockwasher (9) aligns with slot (11) in retaining nut (10). Bend locktab (12) into slot (11) on retaining nut (10).
6-14. GEARED HUB SPINDLE BEARING ADJUSTMENT (Cont’d)

NOTE
Immediately install steering arm cover after application of sealant.

10. Clean sealing surfaces on geared hub (1) and steering arm cover (5). Apply anaerobic sealant to steering arm cover (5) and install steering arm cover (5) on geared hub (1).

11. Apply sealing compound to threads of capscrew (7) and install steering arm cover (5) on geared hub (1) with four washers (6) and capscrews (7). Tighten capscrews (7) to 65 lb-ft (88 N·m).

12. Remove fill plug (2) and washer (3) from geared hub (1).

13. Fill geared hub (1) to proper oil level [TM 9-2320-280-10].

14. Install washer (3) and fill plug (2) on geared hub (1). Tighten fill plug (2) to 8-13 lb-ft (11-18 N·m).

FOLLOW-ON TASK: Install wheel (para. 8-3.)
6-15. WHEEL STUD REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: Wheel removed (para. 8-3).
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Three washers (Appendix G, Item 34)
- Hex nut (Appendix G, Item 54)

**Manual References**
- TM 9-2320-280-24P

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**WARNING**
Always wear eye protection when replacing wheel studs. Severe eye injury may result if metal chips contact eyes.

**a. Removal**

1. Rotate spindle (3) to allow clearance for removal of stud (4) from spindle (3).
2. Drive stud (4) from spindle (3). Discard stud (4).

**b. Assembly**

1. Align splines on stud (4) with splines in spindle (3) and install stud (4) in spindle (3).
2. Install three flat washers (2) and hex nut (1) on stud (4).
3. Tighten hex nut (1) until head on stud (4) seats against spindle (3).
4. Remove and discard hex nut (1) and three flat washers (2).

---

FOLLOW-ON TASK: Install wheel (para. 8-3)
6-16. DIFFERENTIAL VENT LINE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**NOTE**
Differential vent line replacement procedures are basically the same. This procedure covers the rear differential vent line.

### a. Removal

1. Remove vent line (7) from differential fitting (6) and tee fitting (1).
2. Remove two line clips (2) from vent line (3) and brake line (5).
3. Remove vent line (3) from two tee fittings (1) and (4).

### b. Installation

1. Install vent line (3) on tee fittings (1) and (4).
2. Install two line clips (2) on vent line (3) and brake line (5).
3. Install vent line (7) on differential fitting (6) and tee fitting (1).
6-17. REAR GEARED HUB VENT LINE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>(Appendix B, Item 1)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE
Rear geared hub vent line replacement procedures are basically the same. This procedure covers the right rear geared hub vent line.

**a. Removal**

1. Disconnect vent line (4) from geared hub fitting (3).
2. Remove capscrew (7), clamp (6), and vent line (4) from bracket (5).
3. Remove capscrew (8), clamp (1), and vent line (4) from control arm (2).
4. Remove capscrew (10), clamp (9), and vent line (4) from bracket (11).
5. Remove capscrew (15), clamp (14), and vent line (4) from frame (13).
6. Remove vent line (4) from tee fitting (12).

**b. Installation**

1. Install vent line (4) to tee fitting (12) and geared hub fitting (3).
2. Install vent line (4) to frame (13) with clamp (14) and capscrew (15).
3. Install vent line (4) to bracket (11) with clamp (9) and capscrew (10).
4. Install vent line (4) to control arm (2) with clamp (1) and capscrew (8).

**NOTE**
Position clamp at a 45° angle toward the wheel before securing with capscrew.

5. Install vent line (4) to bracket (5) with clamp (6) and capscrew (7).
6-18. FRONT GEARED HUB VENT LINE REPLACEMENT

This task covers:

a. Right Side Removal
b. Right Side Installation
c. Left Side Removal
d. Left Side Installation

INITIAL SETUP:

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-24P

Equipment Condition
Wheel removed (para. 8-3).

a. Right Side Removal

NOTE
Mark clamp position before loosening to ensure clamps are properly positioned during installation.

1. Loosen four screws (7) and clamps (3) from front control arm (2) and geared hub (8).
2. Remove two hose clamps (6) and front vent line hose (4) from elbow (5) and tee fitting (1).

b. Right Side Installation

NOTE
Step 1 is necessary to prevent vent line damage. If new clamp has been previously installed, perform steps 3 through 5.

1. Locate, mark, and drill 0.266 in. (6.76 mm) diameter hole (9) in front control arm (2).
2. To fabricate front vent line hose (4), cut 33.63 in. (85.42 cm) piece of hose from bulk.

3. Route front vent line hose (4) through four existing clamps (3), and secure with two hose clamps (6) to tee fitting (1) and elbow (5).

4. Position 9.0 to 10.0 in. (22.9 to 25.4 cm) of hose (4) between two existing clamps (3). Secure existing clamps (3), as noted in removal, with screws (7).

5. Install new clamp (3) on front vent line (4), and control arm (2) at hole (9) with screw (10), washer (11), and nut (12).
6-18. FRONT GEARED HUB VENT LINE REPLACEMENT (Cont’d)

c. Left Side Removal

1. Loosen three screws (3) and clamps (2) from front control arm (8) and geared hub (7).
2. Remove two hose clamps (5) and vent line hose (1) from elbow (6) and union on tube (4).

d. Left Side Installation

NOTE
Step 1 is necessary to prevent vent line damage. If new clamp has been previously installed, perform steps 3 through 5.

1. Locate, mark, and drill 0.266 in. (6.75 mm) diameter hole (9) in left front control arm (8).
2. To fabricate front side vent line hose (1), cut a 28.2 in. (71.6 cm) piece from hose (1) removed in para. c, step 2. If hose (1) is unserviceable cut anew piece from bulk-
3. Route vent line hose (1), fabricated in step 2 through three existing clamps (2), and secure hose (1) with two hose clamps (5) to union on tube (4) and elbow (6) on geared hub (7).
6-18. FRONT GEARED HUB VENT LINE REPLACEMENT (Cont’d)

4. Position 11.5 to 12.5 inches (29.2 to 31.8 cm) of hose (1) between two existing outer clamps (2) and secure existing clamps (2) with screws (3). Ensure center clamp (2) is positioned as shown.

5. Bend 90° bracket (14) on geared hub (7) 30° outward as shown.

NOTE
Do not close loop on clamps installed on control arms. Hose lines should move freely through control arm clamp loops.

6. Install new clamp (13) on vent line hose (1), and control arm (8) with screw (10), washer (12), and nut (11).

FOLLOW-ON TASK: Install wheel (para. 8-3).
6-19. STEERING STOP MAINTENANCE

This task covers:

a. Removal
b. Installation
c. Adjustment

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
</tr>
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<tr>
<td>General mechanic's tool kit:</td>
<td>One mechanic</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>One assistant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sealing compound (Appendix C, Item 45)</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>Chalk (Appendix C, Item 15)</td>
<td></td>
</tr>
</tbody>
</table>

a. Removal

1. Loosen jamnut (2) and remove steering stop capscrew (3) and jamnut (2) from geared hub (1).
2. Remove jamnut (2) from capscrew (3).

b. Installation

1. Apply sealing compound to capscrew (3).
2. Install jamnut (2) on capscrew (3).
3. Install capscrew (3) and jamnut (2) on geared hub (1). Tighten capscrew (3) finger tight.

c. Adjustment

NOTE
Prior to adjustment ensure length of each tie rod is the same. If tie rod lengths are not the same ±1/8 in. (3 mm), check toe-in alignment (para. 8-10).

1. Draw a reference chalk line (6) 30 feet long. Mark this line “A”.
2. Position vehicle so that center of left rear and left front tires are positioned directly on reference line “A” (6).
3. Using a protractor, draw a second reference line “B” (5) at 34°. Mark this line “B”.
4. Again, using a protractor, draw a third reference line “C” (4) at 36°. Mark this line “C”.
5. Roll vehicle forward until center of left front tire is over intersection of lines “A”, “B”, and “C”.
6. Turn steering wheel full left.
7. If the centerline of front and rear of left front tire (7) is over area between lines “B” and “C”, no adjustment is necessary.
8. If centerline of front and rear of left front is not over area between lines “B” and “C”, loosen jamnut (2) and turn capscrew (3) all the way in.
9. Turn steering wheel until centerline of front and rear of tire (7) is over area between lines “B” and “C”.
10. Unscrew capscrew (3) until head makes contact with wheel stop (9) on lower control arm (8).
11. Secure capscrew (3) with jamnut (2).
12. Repeat adjustment procedure for opposite side.
6-20. AIR LIFTING BRACKET REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**  
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**  
TM 9-2320-280-24P

**Materials/Parts**  
Four lockwashers (Appendix G, Item 120)

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**a. Removal**

Remove four capscrews (4), lockwashers (3), and lifting bracket (2) from geared hub (1). Discard lockwashers (3).

**b. Installation**

Install lifting bracket (2) to geared hub (1) with four lockwashers (3) and capscrews (4). Tighten capscrews (4) to 43 lb-ft (58 N·m).
6-21. DIFFERENTIAL COVER MAINTENANCE

This task covers:

a. Removal
b. Cleaning and Inspection
c. Installation

INITIAL SETUP:

Tools
General mechanic’s tool kit: TM 9-2320-280-10
automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Materials/Parts
Sealant (Appendix C, Item 38)
Drycleaning solvent (Appendix C, Item 18)

General Safety Instructions
Drycleaning solvent is flammable and will not be used near an open flame.

NOTE
- The following procedure applies to vehicles with new brake adapters, P/N 10453002. These brakes are cut away, which allows access to left center capscrews.
- Have drainage container ready to catch fluid.

a. Removal

1. Remove drainplug (3) from differential assembly (4) and drain differential.
2. Remove twelve capscrews (2) and cover (1) from differential assembly (4).

b. Cleaning and Inspection

WARNING
Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

1. Use drycleaning solvent to clean differential cover (1), capscrews (2), and differential assembly (4).
2. Inspect differential cover (1) for cracks, wear, or breaks. Replace cover (1) if cracked, worn, or broken.

C. Installation

1. Apply RTV sealant to cover (1) sealing surface and install cover (1) on housing (4) with twelve capscrews (2). Tighten capscrews (2) to 16 lb-ft (22 N·m).
2. Install drain plug (3) into differential assembly (4) and tighten to 13-18 lb-ft (18-25 N·m).
FOLLOW-ON TASK: Fill differential to proper level [TM 9-2320-280-10]
# Section III. SUSPENSION MAINTENANCE

## 6-22. SUSPENSION MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-23</td>
<td>Stabilizer Bar Replacement</td>
<td>6-55</td>
</tr>
<tr>
<td>6-24</td>
<td>Stabilizer Bar Link Replacement</td>
<td>6-56</td>
</tr>
<tr>
<td>6-25</td>
<td>Radius Rod Replacement</td>
<td>6-57</td>
</tr>
<tr>
<td>6-26</td>
<td>Upper Ball Joint Replacement</td>
<td>6-58</td>
</tr>
<tr>
<td>6-27</td>
<td>Lower Ball Joint Replacement</td>
<td>6-60</td>
</tr>
<tr>
<td>6-28</td>
<td>Upper Control Arm Replacement</td>
<td>6-62</td>
</tr>
<tr>
<td>6-29</td>
<td>Lower Control Arm Replacement</td>
<td>6-64</td>
</tr>
<tr>
<td>6-30</td>
<td>Coil Spring Replacement</td>
<td>6-66</td>
</tr>
<tr>
<td>6-31</td>
<td>Shock Absorber Replacement</td>
<td>6-68</td>
</tr>
</tbody>
</table>
6-23. STABILIZER BAR REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**

General mechanic's tool kit: TM 9-2320-280-24P, automotive (Appendix B, Item 1)

**Manual References**

TM 9-2320-280-24P (Appendix B, Item 1)

**Materials/Parts**

Two locknuts (Appendix G, Item 66)

---

**a. Removal**

1. Remove two locknuts (10), nuts (7), and six washers (8) from bar links (11) and stabilizer bar (9).
   Discard locknuts (10). Remove bar links (11) and pins (1) from stabilizer bar (9).
2. Remove four nuts (5), washers (6), two clamps (4), and stabilizer bar (9) from frame brackets (2).
3. Remove stabilizer bar bushings (3) from stabilizer bar (9).

**b. Installation**

1. Install stabilizer bar bushings (3) on stabilizer bar (9).
2. Install stabilizer bar (9) on frame brackets (2) with two clamps (4), four washers (6), and nuts (5).
   Tighten nuts (5) to 60 lb-ft (81 N·m).
3. Install pins (1) in bar links (11).
4. Install bar links (11) to stabilizer bar (9) with six washers (8), two nuts (7), and locknuts (10).
   Tighten locknuts (10) to 75 lb-ft (102 N·m).
6-24. STABILIZER BAR LINK REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Tools
- General mechanic’s tool kit: TM 9-2320-280-24P
  - automotive (Appendix B, Item 1)

Manual References
- TM 9-2320-280-24P

Materials/Parts
- Locknut (Appendix G, Item 66)
- Sealing compound (Appendix C, Item 46)

a. Removal

1. Remove locknut (1) and two washers (2) from bar link (3) and stabilizer bar (4). Discard locknut (1).
2. Remove capscrew (5), two washers (6), and bar link (3) from lower control arm (7).

b. Installation

1. Apply sealing compound to threads of capscrew (5). Install bar link (3) to lower control arm (7) with
   two washers (6) and capscrew (5). Tighten capscrew (5) to 70 lb-ft (95 N·m).
2. Install bar link (3) to stabilizer bar (4) with two washers (2) and locknut (1). Tighten locknut (1) to
   75 lb-ft (102 N·m).
6-25. RADIUS ROD REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Cotter pin (Appendix G, Item 20)
- Wheel removed (para. 8-3).
- Locknut (Appendix G, Item 64)

**Equipment Condition**
- Wheel removed (para. 8-3).

---

**a. Removal**

1. Remove cotter pin (7), slotted nut (6), and washer (5) from radius rod (4) and geared hub (8). Discard cotter pin (7).
2. Remove locknut (9), washer (2), capscrew (1), washer (2), and radius rod (4) from bracket (3) and geared hub (8). Discard locknut (9).

**b. Installation**

1. Install radius rod (4) to bracket (3) with washer (2), capscrew (1), washer (2), and locknut (9).

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

2. Install radius rod (4) to geared hub (8) with washer (5) and slotted nut (6). Tighten slotted nut (6) to 70 lb-ft (95 N·m). Install cotter pin (7).
3. Tighten locknut (9) to 260 lb-ft (353 N·m).

---

**FOLLOW-ON TASKS:**
- Lubricate radius rod (TM 9-2320-280-10)
- Install wheel (para. 8-3).
- Adjust rear wheel toe-out alignment (para. 8-11).
6-26. UPPER BALL JOINT REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: One mechanic automotive (Appendix B, Item 1)
- Pickle Fork (Appendix B, Item 129)

**Special Tools**
- Socket adapter (Appendix B, Item 146)
- Crowfoot 15/16 in. (Appendix B, Item 151)

**Personnel Required**
- One mechanic
- One assistant

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Wheel removed (para. 8-3)

**Materials/Parts**
- Cotter pin (Appendix G, Item 16)
- Four locknuts (Appendix G, Item 66)

---

**a. Removal**

1. Raise and support lower control arm (1).
2. Remove cotter pin (8) and slotted nut (7) from lower ball joint (4) and geared hub (6). Discard cotter pin (8).
3. Remove four locknuts (3), washers (2), capscrews (9), washers (2), and lower ball joint (4) from boot retainer (5), ball joint retainer (10), and upper control arm (1). Discard locknuts (3).
4. Using puller, remove ball joint (4) from geared hub (6).

---

**b. Installation**

1. Install ball joint (4) to upper control arm (1), ensuring upper ball joint (4) is placed above upper control arm (1), and boot retainer (5) and ball joint retainer (10) are placed below upper control arm (1).
2. Secure upper ball joint (4) to upper control arm (1) with four washers (2), capscrews (9), washers (2), and locknuts (3). Tighten locknuts (3) to 252 lb-in (28 N·m).

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

3. Install ball joint (4) to geared hub (6) with slotted nut (7). Using crowfoot and adapter, tighten slotted nut (7) to 65 lb-ft (88 N·m), install cotter pin (8) in slotted nut (7).
FOLLOW-ON TASKS:

- Lubricate upper ball joint (TM 9-2320-280-10).
- Install wheel (para. 8-3).
6-27. LOWER BALL JOINT REPLACEMENT

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

INITIAL SETUP:

Tools
   General mechanic's tool kit:
      automotive (Appendix B, Item 1)
      Pickle fork (Appendix B, Item 129)

Materials/Parts
   Cotter pin (Appendix G, Item 18)
   Four locknuts (Appendix G, Item 65)

Personnel Required
   One mechanic
   One assistant

Manual References
   TM 9-2320-280-10
   TM 9-2320-280-24P

Equipment Condition
   Wheel removed (para. 8-3)

---

a. Inspection

1. Chock rear wheels.
2. Raise and support front wheels 2 in. (5.1 cm) off ground.
3. Mark a line across the top screw (11) of steering arm cover (10). Mark should be parallel with lower control arm (9).
4. Set a 6-in. (15.3 cm) ruler upright between lower control arm (9) and marked screw (11).
5. Install prybar between lower control arm (9) and geared hub (5). Push down on prybar and try to move geared hub (5).
6. Measure any movement in the geared hub (5). Replace lower ball joint (3) if any movement is more than 1/8 in. (3.2 mm).

b. Removal

1. Raise and support lower control arm (9).
2. Remove cotter pin (7) and slotted nut (6) from lower ball joint (3) and geared hub (5). Discard cotter pin (7).
3. Remove four locknuts (2), washers (1), capscrews (8), and washers (1) from lower ball joint (3) and lower control arm (9). Discard locknuts (2).
4. Using puller, remove ball joint (3) with boot retainer (4) from geared hub (5).

c. Installation

**NOTE**

Lower ball joint replacement procedures are the same for all models, except M996, M997, M1037, M1042, M1097, and "A1" and "A2" series vehicles. These have heavy duty rear lower ball joints and the locknuts securing ball joints to rear lower control arms on these vehicles must be tightened to 60 lb-ft (81 N·m).

1. Install ball joint (3) with boot retainer (4) to lower control arm (9), ensuring ball joint (3) is placed below lower control arm (9) with four washers (1), capscrews (8), washers (1), and locknuts (2). Tighten locknuts (2) to 35 lb-ft (47 N·m).
CAUTION

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

2. Install ball joint (3) to geared hub (5) with slotted nut (6). Tighten slotted nut (6) to 73 lb-ft (99 N·m). Install cotter pin (7) in slotted nut (6).

FOLLOW-ON TASKS:
- Lubricate lower ball joint (TM 9-2320-280-10)
- Install wheel (para. 8-3)
6-28. UPPER CONTROL ARM REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Six locknuts (Appendix G, Item 65)
- Cotter pin (Appendix G, Item 18)
- Lockwasher (Appendix G, Item 119) (front upper control arms only)
- Sealing compound (Appendix C, Item 40)

**Equipment Condition**
- Wheel removed (para. 8-3)
- Hood raised and secured (TM 9-2320-280-10) (front upper control arms only)

**NOTE**
The procedures for removing and installing the front and rear upper control arms are basically the same. This procedure covers the left front upper control arm.

### a. Removal
1. Remove capscrew (1), washer (2), and vent line bracket (3) from geared hub (4).
2. Loosen clamp (6) and disconnect vent line (5) from fitting (7).
3. Remove capscrew (23), clamp (21), and vent line (5) from upper control arm (16).
4. Remove capscrew (24), washer (25), nut (27), clamp (26), and vent line (5) from upper control arm (16).
5. Remove cotter pin (31), slotted nut (32), washer (30), and disconnect tie rod end (29) from geared hub (4). Discard cotter pin (31).
6. Remove access plug (8), washer (33), halfshaft retaining capscrew (9), and lockwasher (10) from halfshaft (28) and geared hub (4). Discard lockwasher (10).
7. Remove four locknuts (15), washers (14), capscrews (11), and washers (14) from upper ball joint (13), boot retainer (12), ball joint retainer (22), and upper control arm (16). Discard locknuts (15).
8. Remove two locknuts (17), washers (18), capscrews (20), washers (18), and upper control arm (16) from brackets (19). Discard locknuts (17).

### b. Installation

**NOTE**
On front control arms, capscrew head is toward rear of vehicle. On rear control arms, capscrew head is toward front of vehicle.

1. Install upper control arm (16) to brackets (19) with two washers (18), capscrews (20), washers (18), and locknuts (17).
2. Install upper ball joint (13) to upper control arm (16) ensuring upper ball joint (13) is placed above upper control arm (16), and boot retainer (12) and ball joint retainer (22) are placed below upper control arm (16). Secure with four washers (14), capscrews (11), washers (14), and locknuts (15). Tighten locknuts (15) to 21 lb-ft (28 N·m).
3. Tighten locknuts (17) to 260 lb-ft (353 N·m).
4. Apply sealing compound to halfshaft retaining capscrew (9) and install halfshaft (28) to geared hub (4) with lockwasher (10) and halfshaft retaining capscrew (9). Tighten capscrew (9) to 37 lb-ft (50 N·m).
6-28. UPPER CONTROL ARM REPLACEMENT (Cont’d)

5. Install washer (33) and access plug (8) to geared hub (4). Tighten access plug (8) to 8-13 lb-ft (11-18 N·m).

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

6. Install tie rod end (29) into geared hub (4) with washer (30) and slotted nut (32). Tighten slotted nut (32) to 70 lb-ft (95 N·m). Install cotter pin (31).

7. Connect vent line (5) to fitting (7) with clamp (6).

**NOTE**

If installing new vent line bracket on left front geared hub, bend bracket 30° (from standard 90° angle to 120°) before installation.

8. Install vent line bracket (3) to geared hub (4) with washer (2) and capscrew (1). Tighten capscrew (1) to 38 lb-ft (52 N·m).

9. Install clamp (21) and vent line (5) to control arm (16) with capscrew (23).

10. Install clamp (26) and vent line (5) to upper control arm (16) with screw (24), washer (25), and nut (27).

**FOLLOW-ON TASKS:**

- Install wheel [(para. 8-3)]
- Lower and secure hood [(TM 9-2320-280-10)] (front upper control arm only)
6-29. LOWER CONTROL ARM REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)

**Materials/Parts**
- Six locknuts (Appendix G, Item 106)
- Sealing compound (Appendix C, Item 40)

**Personnel Required**
- One mechanic
- One assistant

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Wheel removed (para. 6-3).
- Shock absorber removed (para. 6-31).

**General Safety Instructions**
- Lower control arm must be supported during removal and installation.

**NOTE**
The procedures for removing and installing the front and rear lower control arms are basically the same. This procedure covers the left front lower control arm.

### a. Removal

**WARNING**
Lower control arm must be supported during removal and installation. Failure to support lower control arm may cause injury to personnel or damage to equipment.

1. Remove four locknuts (5), washers (7), capscrews (8), and washers (7) from lower ball joint (6), geared hub (4) and lower control arm (9). Discard locknuts (5).
2. Remove capscrew (14), two washers (12), and bar link (13) from lower control arm (9).
3. Raise and support lower control arm (9) and pull geared hub (4) away.
4. Lower the lower control arm (9) and remove coil spring (10).
5. Remove two locknuts (3), washers (2), capscrews (1), washers (2), and lower control arm (9) from brackets (11). Discard locknuts (3).

### b. Installation

**NOTE**
On lower control arms, capscrew heads are toward front of vehicle.

1. Install lower control arm (9) on brackets (11) with two washers (2), capscrews (l), washers (2), and locknuts (3).
2. Install coil spring (10) on lower control arm (9) ensuring end of coil spring (10) fits in spring pocket of lower control arm (9).

**WARNING**
Lower control arm must be supported during removal and installation. Failure to support lower control arm may cause injury to personnel or damage to equipment.

3. Raise lower control arm (9) to align with geared hub (4) and ball joint (6) ensuring lower ball joint (6) is placed below lower control arm (9).
4. Install geared hub (4) and ball joint (6) on lower control arm (9) with four washers (7), capscrews (8), washers (7), and locknuts (5). Tighten locknuts (5) to 35 lb-ft (47 N·m).

5. Tighten locknuts (3) to 260 lb-ft (352 N·m).

6. Install wheel [para. 8-3].

7. Apply sealing compound to threads of capscrew (14). Install bar link (13) to lower control arm (9), with two washers (12) and capscrew (14). Tighten capscrew (14) to 70 lb-ft (95 N·m).

FOLLOW-ON TASK: Install shock absorber [para. 6-31].
6-30. COIL SPRING REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>Hood raised and secured (TM 9-2320-280-20-10) (front springs only). M1037 and M1042 only:</td>
</tr>
<tr>
<td>Materials/Parts</td>
<td>Shelter removed (para. 11-120) (rear shock absorbers only).</td>
</tr>
<tr>
<td>Five locknuts (Appendix G, Item 106)</td>
<td>Lower control arm supported (para. 6-29), (rear shock absorbers only).</td>
</tr>
<tr>
<td>Sealing compound (Appendix C, Item 40)</td>
<td></td>
</tr>
</tbody>
</table>

Manual References

TM 9-2320-280-10
TM 9-2320-280-24P

NOTE

The procedure for removing and installing all four coil springs are basically the same. This procedure covers the left front coil spring.

a. Removal

NOTE

For rear coil spring replacement on M1037 and M1042 models, it may be necessary to spread frame from body by positioning prybar between hinge mount bracket and rear bumper to gain access to shock absorber retaining pin nut.

1. Remove capscrew (13), two washers (14), and stabilizer bar link (15) from lower control arm (12).
2. Remove wheel (para. 8-3).
3. Remove four locknuts (10), washers (8), capscrews (9), and washers (8) from lower ball joint (7), geared hub (6) and lower control arm (12). Discard locknuts (10).
4. Place jack under lower control arm (12) and raise lower control arm (12) slightly to relieve tension on shock pin (2).
5. Remove locknut (5), pin (2), washer (3), and shock absorber (11) from spring seat (4) and collapse shock absorber (11). Discard locknut (5).

NOTE

It maybe necessary to loosen lower control arm capscrews to allow lower control arm to be lowered.

6. Pull geared hub (6) and ball joint (7) away from control arm (12), lower control arm (12), and remove coil spring (1) from lower control arm (12) and shock absorber (11).

b. Installation

1. Install coil spring (1) over shock absorber (11) and onto lower control arm (12) ensuring end of coil spring (1) fits in spring pocket of lower control arm (12).
2. Ensure coil spring (1) is aligned with spring seat (4) flange, and raise lower control arm (12).
3. Extend shock absorber (11) into spring seat (4) and install washer (3), pin (2), and locknut (5). Tighten locknut (5) to 300 lb-ft (407 N·m).
4. Install lower ball joint (7) and geared hub (6) to lower control arm (12) ensuring lower ball joint (7) is placed below lower control arm (12). Secure with four washers (8), capscrews (9), washers (8), and locknuts (10). Tighten locknuts (10) to 35 lb-ft (47 N·m).
5. Install wheel (para. 8-3).
6. Apply sealing compound to threads of capscrew (13). Install stabilizer bar link (15) to lower control arm (12) with two washers (14) and capscrew (13). Tighten capscrew (13) to 70 lb-ft (95 N·m).
FOLLOW-ON TASKS: 
• Lower and secure hood (TM 9-2320-280-10).
• M1037 and M1042 only: 
  • Install shelter (if removed) (para. 11-120).
  • Remove lower control arm supports (para. 6-29).
6-31. SHOCK ABSORBER REPLACEMENT

This task covers:

a. Removal  

b. Installation

INITIAL SETUP:

**Tools**

General mechanic’s tool kit:
- Automotive (Appendix B, Item 1)
- Drive socket (Appendix B, Item 168)

**Materials/Parts**

- Ten locknuts (Appendix G, Item 67)
- Two lockwashers (Appendix G, Item 117)

**Personnel Required**

- One mechanic
- One assistant

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**

- Hood raised and secured (TM 9-2320-280-10) (front shock absorbers only).
- M1037 and M1042 only:
  - Shelter removed (para. 11-120) (rear shock absorbers only).
  - Lower control arm supported (para. 6-29) (rear shock absorbers only).

**NOTE**

The procedures for removing and installing all shock absorbers are the same except rear lower shock pins must be installed with head of pin facing rearward. This procedure covers the left front shock absorber.

a. Removal

**NOTE**

For rear shock absorber replacement on M1037 and M1042 models, it may be necessary to spread frame from body by positioning prybar between hinge mount bracket and rear bumper to gain access to shock absorber retaining pin nut. Perform steps 1 through 3 only if required.

1. Remove four locknuts (6), washers (5), capscrews (4), and washers (5) from bumper bracket (3), plate (2), and frame (1). Discard locknuts (6).
2. Remove two locknuts (12), washers (10), capscrews (9), washers (10), and tiedown bracket (8) from body mount bracket (11) and rear bumper (7). Discard locknuts (12).
3. Remove two locknuts (12), washers (10), capscrews (9), and washers (10) from body mount bracket (11) and rear bumper (7). Discard locknuts (12).
6-31. SHOCK ABSORBER REPLACEMENT (Cont'd)

4. Remove two capscrews (10), lockwashers (9), and washers (8) from bracket (11) and lower control arm (6). Discard lockwashers (9).

5. Remove locknut (5), pin (2), and washer (3) from shock absorber (1) and spring seat (4). Note position of pin (2) for installation. Discard locknut (5).

6. Compress shock absorber (1) and remove shock absorber (1) and bracket (11).

   NOTE
   Note alignment of shock absorber and bracket for installation reference.

7. Position shock absorber (1) in vice, and remove locknut (7), pin (13), washer (12), and bracket (11) from shock absorber (1). Discard locknut (7).

b. Installation

   NOTE
   • It may be necessary to spread spring seat to allow installation of shock absorber.
   • Shock absorbers are marked “FRONT” or “REAR” to aid identification.

1. Position shock absorber (1) in vice, and install bracket (11) to shock absorber (1), with washer (12), pin (13), and locknut (7). Tighten locknut (7) to 300 lb-ft (407 N·m).

   CAUTION
   Do not pry or use sharp tools on shock absorber position rod. A damaged rod will cause shock failure.

2. Install shock absorber (1) and bracket (11) through lower control arm (6).

3. Extend shock absorber (1) and install piston rod end of shock absorber (1) on spring seat (4) with washer (3), pin (2), and locknut (5). Tighten locknut (5) to 300 lb-ft (407 N·m).

4. Install bracket (11) to lower control arm (6) with two washers (8), lockwashers (9), and capscrews (10). Tighten capscrews (10) to 178 lb-ft (241 N·m).
NOTE
Perform steps 5 through 8 if necessary to reassemble body mount bracket to frame and rear bumper.

5. Install tiedown bracket (3) and body mount bracket (6) on rear bumper (2) with two washers (5), capscrews (4), washers (5), and locknuts (7).
6. Secure body mount bracket (6) to rear bumper (2) with two washers (5), capscrews (4), washers (5), and locknuts (7).
7. Secure bumper bracket (9) and plate (8) to frame (1) with four washers (11), capscrews (10), washers (11), and locknuts (12).
8. Tighten capscrews (10) and locknuts (7) to 90 lb-ft (122 N·m).

FOLLOW-ON TASKS:
- Lower and secure hood (TM 9-2320-280-10) (front shock absorbers only)
- M1037 and M1042 only:
  - Install shelter (para. 11-120), (rear shock absorbers only).
  - Remove support from lower control arm (para. 6-29).
  - Install rear wheel (para. 8-3), (rear shock absorbers only).
## 7-1. PARKING BRAKE SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-2</td>
<td>Parking Brake Adjustment</td>
<td>7-2</td>
</tr>
<tr>
<td>7-3</td>
<td>Parking Brake Caliper and Rotor Maintenance</td>
<td>7-4</td>
</tr>
<tr>
<td>7-4</td>
<td>Parking Brake Lever Replacement</td>
<td>7-10</td>
</tr>
<tr>
<td>7-5</td>
<td>Parking Brake Cable Replacement</td>
<td>7-12</td>
</tr>
<tr>
<td>7-6</td>
<td>Parking Brake Rod Replacement</td>
<td>7-14</td>
</tr>
<tr>
<td>7-7</td>
<td>Parking Brake Heat Shield Replacement</td>
<td>7-16</td>
</tr>
<tr>
<td>7-8</td>
<td>Parking Brake Heat Shield and Heat Shield Extension Replacement</td>
<td>7-17</td>
</tr>
</tbody>
</table>
7-2. PARKING BRAKE ADJUSTMENT

This task covers:

Brake Adjustment

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit:</td>
<td>TM 9-2320-280-10</td>
<td>Wheels chocked and parking brake released</td>
</tr>
<tr>
<td>Materials/Parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two cotter pins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Appendix G, Item 17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel Required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One mechanic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One assistant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
The following procedure applies to vehicles with serial numbers USBL Eff. 1 through 44824.

Brake Adjustment

1. Remove clip (5) and open boot (6) to allow access to clevis pin (7). Remove cotter pin (4), washer (9), and clevis pin (7) securing clevis (8) to bellcrank (1). Discard cotter pin (4).
2. Remove cotter pin (13) from slotted nut (14). Discard cotter pin (13).
   **NOTE**
   Total gauge thickness should not exceed 0.020 in. (0.508 mm).
3. Place 0.020 in. (0.508 mm) thickness gauge between rotor (12) and brake pad (11).
4. Adjust slotted nut (14) until thickness gauge is snug, and cam (10) is at 11 o’clock Position. Install cotter pin (13) in slotted nut (14).
5. Repeatedly apply and adjust parking brake lever until bellcrank (1) linear travel is 0.75 in. (19 mm).
   **NOTE**
   Ensure slack is removed from parking brake linkage.
6. Release parking brake lever and adjust clevis (8) so clevis pin (7) slides easily into bellcrank (1) and secure with washer (9) and cotter pin (4). If alignment cannot be made at clevis (8), adjust rod (3) in or out of rear clevis (2) to obtain proper alignment.
7. Remove thickness gauge.
8. Close boot (6) and secure with clip (5).

**CAUTION**
Apply parking brake lever gradually, while burnishing brakes, to bring vehicle to a gradual stop. Sudden or quick application of brake lever can damage parking brake rotor.

**NOTE**
Perform steps 9-11 only if parking brake pads were replaced.
9. Burnish parking brake pads (11) by operating vehicle at 10 mph (16 kph) and, using the parking brake, slow down and bring the vehicle to a gradual stop. Allow parking brake rotor (12) to cool by operating vehicle 2.5 miles (4 km) at 20 mph (32 kph). Repeat this step ten times.
10. Remove parking brake rotor (12) (para. 7-3) and inspect brake pads (11) for a large contact pattern across the surface of the brake pads (11). If contact pattern is not a minimum of 90%, install parking brake rotor (12) (para. 7-3c) and repeat step 9. If contact pattern is satisfactory, install parking brake rotor (para. 7-3c) and go to step 11.
11. Readjust, following steps 1 through 8.
7-2. PARKING BRAKE ADJUSTMENT (Cont'd)

FOLLOW-ON TASK: Check parking brake for proper operation (TM 9-2320-280-10)
7-3. PARKING BRAKE CALIPER AND ROTOR MAINTENANCE

This task covers:

a. Removal
b. Inspection
c. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>One mechanic</td>
<td>TM-9-2320-280-10</td>
<td>Wheels chocked and parking brake released</td>
</tr>
<tr>
<td>Two lockwashers (Appendix G, Item 127)</td>
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<td></td>
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<tr>
<td>Two cotter pins (Appendix G, Item 17)</td>
<td></td>
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<tr>
<td>Four lip seals (Appendix G, Item 215)</td>
<td></td>
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<tr>
<td>Two locknuts (Appendix G, Item 58)</td>
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<tr>
<td>Sealing compound (Appendix C, Item 45)</td>
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<tr>
<td>Grease (Appendix C, Item 22)</td>
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</tr>
</tbody>
</table>

NOTE
The following procedure applies to vehicles with serial numbers USBL Eff. 1 through 44824.

a. Removal

1. Remove four capscrews (15) and lockwashers (14) from rear propeller shaft (16) and parking brake rotor (13). Disconnect rear propeller shaft (16) and remove rotor (13). Discard lockwashers (14).
2. Remove cotter pin (17) from slotted nut (19), and loosen slotted nut (19). Discard cotter pin (17).
3. Remove cotter pin (24), washer (23), spring (21), clevis pin (3), and clevis (22) from cam (20). Remove spring (21) from pin post (18). Discard cotter pin (24).
4. Remove two locknuts (11), washers (6), capscrews (5), washers (6), and clamp (4) from parking brake cable (7) and plate and guide pin assembly (8). Discard locknuts (11).
5. Remove two capscrews (1) and lockwashers (2) from plate and guide pin assembly (8) and caliper mounting bracket (9). Discard lockwashers (2).
6. Slide plate and guide pin assembly (8) towards front of vehicle until pins (10) come out of bracket (9).
7. Remove plate and guide pin assembly (8) and caliper assembly (12).
7-3. PARKING BRAKE CALIPER AND ROTOR MAINTENANCE (Cont’d)
7-3. PARKING BRAKE CALIPER AND ROTOR MAINTENANCE (Cont'd)

8. Remove slotted nut (1), washer (2), and cam (3) from caliper (50).
9. Remove plate and guide pin assembly (4) from caliper (5).
10. Remove two push pins (12) and two lip seals (6) from caliper (5). Discard lip seals (6).
11. Remove spring (7) and rear brake pad (8) from caliper half (14).
12. Remove two springs (10), front brake pad (9), and two lip seals (11) from caliper half (13). Discard lip seals (11).
13. If caliper (5) requires disassembly, remove two long capscrews (17), washers (18), short capscrew (16), and washer (15). Separate caliper halves (13) and (14).

b. Inspection

1. Inspect caliper halves (13) and (14) for cracks, wear, elongated holes, and bends. Replace as necessary.
2. Inspect rotor (19) for cracks, wear, elongated holes, and warping. Replace if defective, or rotor thickness is less than 5/32 in. (4 mm).
3. Inspect brake pads (9) and (8) for wear. If brake pad thickness is less than 1/8 in. (3.2 mm), replace both pads (9) and (8). Replace both pads (9) and (8) if rotor (19) was replaced.

c. Installation

1. If caliper halves (13) and (14) require assembly, apply sealing compound to threads of capscrews (17) and (16). Install caliper halves (13) and (14) with washer (15), short capscrew (16), two washers (18), and two long capscrews (17). Tighten capscrews (17) and (16) in sequence shown, to 30-35 lb-ft (41-47 N·m).
2. Install two lip seals (11) and front brake pad (9) on caliper (5) with two springs (10).
3. Install long spring (7) on rear brake pad (8).
4. Install rear brake pad (8) on caliper (5) with spring (7).
5. Clean and lubricate push pins (12), cam-to-push pin contact area, and push pin openings in caliper (5) with grease.
6. Install two lip seals (6) and push pins (12) in caliper (5) with rounded ends of push pins (12) facing outward.
7. Install plate and guide pin assembly (4) on caliper (5).
8. Install cam (3) on caliper (5) with washer (2) and slotted nut (1). Do not tighten slotted nut (1).
7-3. PARKING BRAKE CALIPER AND ROTOR MAINTENANCE (Cont’d)

NOTE
Avoid placing parking brake cable behind mounting bracket when performing step 9.

9. Install caliper (11) and plate and guide-pin assembly (8) on caliper mounting bracket (9).

10. Apply sealing compound to threads of capscrews (2). Install plate and guide pin assembly (8) to caliper mounting bracket (9) with two lockwashers (3) and capscrews (2). Tighten capscrews (2) to 90 lb-ft (122 N•m).

11. Install parking brake cable (7) on plate and guide pin assembly (8) with clamp (4), two washers (5), capscrews (6), washers (5), and locknuts (10). Tighten locknuts (10) to 5 lb-ft (7 N•m).

12. Position rotor (12) to caliper (11).

13. Install clevis (19) to cam (17) with clevis pin (20), long end of spring (18), washer (21), and cotter pin (l).

14. Install short end of spring (18) on pin post (16) and crimp short end of spring (18) with pliers.

15. Install rear propeller shaft (15) to rotor (12) with four lockwashers (13) and capscrews (14). Tighten capscrews (14) to 60 lb-ft (81 N•m).
FOLLOW-ON TASK: Adjust parking brake (para. 7-2).
7-4. PARKING BRAKE LEVER REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Two nut and lockwasher assemblies (Appendix G, Item 144)
- Five locknuts (Appendix G, Item 58)
- Cotter pin (Appendix G, Item 17)

**Manual References**
- TM-9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Wheels chocked and parking brake released (TM 9-2320-280-10)
- Parking brake switch removed (para. 4-19)

**Personnel Required**
- One mechanic
- One assistant

### a. Removal

1. Remove clip (1) and open boot (2) to allow access to clevis pin (4).
2. Remove cotter pin (7), washer (6), and clevis pin (4) from clevis (5) and bellcrank (3). Discard cotter pin (7).
3. Remove nut and lockwasher assembly (9), wiring harness clamp (10), nut and lockwasher assembly (9). Discard nut and lockwasher assembly (9).
4. Remove three locknuts (11), washers (12), and capscrews (17) from parking brake lever (8) and body (20). Discard locknuts (11).
5. Remove two locknuts (16), washers (15), capscrews (13), washers (14), and parking brake lever (8) from body (20). Discard locknuts (16).
6. Remove upper boot (18) from parking brake lever (8).
7. Remove lower boot (2) from body (20).

### b. Installation

1. Install lower boot (2) on body (20).
2. Install upper boot (18) on parking brake lever (8).
3. Install parking brake lever (8) on body (20) with two washers (14), capscrews (13), washers (15), and locknuts (16).
4. Secure parking brake lever (8) on body (20) with capscrew (19), nut and lockwasher assembly (9), wiring harness clamp (10), and nut and lockwasher assembly (9).
5. Secure parking brake lever (8) on body (20) with three capscrews (17), washers (12), and locknuts (11).
6. Install clevis (5) on bellcrank (3) with clevis pin (4), washer (6), and cotter pin (7).
7. Apply parking brake lever (8) and tighten capscrews (13), (17), and (19) to 8 lb-ft (11 N·m).
7-4. PARKING BRAKE LEVER REPLACEMENT (Cont'd)

FOLLOW-ON TASKS:
- Install parking brake switch [para. 4-19].
- Adjust parking brake [para. 7-2].
# 7-5. PARKING BRAKE CABLE REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

**INITIAL SETUP:**

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td>Two cotter pins (Appendix G, Item 17)</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>Two locknuts (Appendix G, Item 58)</td>
<td></td>
</tr>
<tr>
<td>Four lockwashers (Appendix G, Item 118)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two cotter pins (Appendix G, Item 17)</td>
<td>- Wheels chocked and parking brake released (TM 9-2320-280-10)</td>
</tr>
<tr>
<td>Two locknuts (Appendix G, Item 58)</td>
<td></td>
</tr>
<tr>
<td>Four lockwashers (Appendix G, Item 118)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

The following procedure applies to vehicles with serial numbers USBL Eff. 1 through 44824.

### a. Removal

1. Remove four capscrews (10) and lockwashers (9) and disconnect rear propeller shaft (11) from parking brake rotor (8). Discard lockwashers (9).
2. Remove cotter pin (12) and loosen slotted nut (14). Discard cotter pin (12).
3. Remove cotter pin (17), washer (16), spring (15), clevis pin (20), and clevis (18) from cam (19). Remove spring (15) from pin post (13). Discard cotter pin (17).
4. Remove two locknuts (7), washers (6), capscrews (23), washers (6), and clamp (22) from brake cable (5) and plate and guide pin assembly (21). Discard locknuts (7).
5. Remove cotter pin (3), washer (4), and clevis pin (1) from brake cable (5) and brake rod clevis (2). Discard cotter pin (3).
6. Remove clip (24) and brake cable (5) from bracket (25).

### b. Installation

1. Install brake cable (5) in bracket (25) with clip (24).
2. Install brake rod clevis (2) on brake cable (5) with clevis pin (1) washer (4), and cotter pin (3).
3. Install brake cable (5) on plate and guide pin assembly (21) with clamp (22), two washers (6), capscrews (23), washers (6), and locknuts (7). Tighten locknuts (7) to 5 lb-ft (7 N-m).
4. Install short end of spring (15) onto pin post (13) and crimp short end of spring (15).
5. Install cable clevis (18) to cam (19) with clevis pin (20), long end of spring (15), washer (16), and cotter pin (17).
6. Connect rear propeller shaft (11) to rotor (8) with four lockwashers (9) and capscrews (10). Tighten capscrews (10) to 60 lb-ft (81 N-m).
7-5. PARKING BRAKE CABLE REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:  
- Install muffler and insulator [para. 3-48].
- Adjust parking brake [para. 7-2].
7-6. PARKING BRAKE ROD REPLACEMENT

This task covers:

a. Removal  

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)

**Equipment Condition**
- Wheels chocked and parking brake released (TM 9-2320-280-10)
- Muffler and insulator removed (para. 3-48)

**Materials/Parts**
- Cotter pin (Appendix G, Item 17)
- Locknut (Appendix G, Item 58)

**Manuals/References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

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**NOTE**

The following procedure applies to vehicles with serial numbers USBL Eff. 1 through 44824.

**a. Removal**

1. Remove clip (1) and open boot (2) to allow access to clevis pin (4).
2. Remove cotter pin (9), washer (8), and clevis pin (4) from brake rod (6) and bellcrank (3). Discard cotter pin (9).
3. Disconnect spring (7) from brake rod (6).
4. Remove cotter pin (17), washer (16), clevis pin (15), and brake rod (6) from brake cable (18). Discard cotter pin (17).
5. Remove clevis (5) and clevis (19) from brake rod (6).

**NOTE**

Perform steps 6 and 7 if replacing spring. If not replacing spring, go to b., installation.

6. Remove locknut (10), washer (11), capscrew (13), washer (11), spring (7), and spacer (12) from body (14). Discard locknut (10).
7. Install spacer (12) and spring (7) to body (14) with washer (11), capscrew (13), washer (11), and locknut (10).

**b. Installation**

1. Install clevis (5) and clevis (19) on brake rod (6).
2. Install brake rod (6) to brake cable (18) with clevis pin (15), washer (16), and cotter pin (17).
3. Connect spring (7) to brake rod (6).
FOLLOW-ON TASKS:  
- Install muffler and insulator [para. 3-48].
- Adjust parking brake [para. 7-2].
7-7. PARKING BRAKE HEAT SHIELD REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Two lockwashers (Appendix G, Item 110)

**Manual References**
- TM 9-2320-280-24P

**NOTE**

The following procedure applies to vehicles with serial numbers USBL Eff. 1 through 44824.

**a. Removal**

Remove two capscrews (1), lockwashers (2), and heat shield (3) from parking brake bracket (4). Discard lockwashers (2).

**b. Installation**

Install heat shield (3) to parking brake bracket (4) with two lockwashers (2) and capscrews (1). Tighten capscrews (1) to 6 lb-ft (8 N•m).
7-8. PARKING BRAKE HEAT SHIELD AND HEAT SHIELD EXTENSION REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-24P
- Automotive (Appendix B, Item 1)

**Materials/Parts**
- Four lockwashers (Appendix G, Item 113)
- Felt sheet (Appendix D, Fig. 84)
- Heat Shield Extension (Appendix D, Fig. 85)

**NOTE**
- The heat shield extension is used for extra protection of the parking brake. The replacement of it can be left up to the discretion of the commander.
- The following procedure applies to vehicles with serial numbers USBL Eff. 1 through 44824.

**a. Removal**

1. Remove two capscrews (8) and lockwashers (7) from heat shield extension (1), heat shield (2) and parking brake bracket (3). Discard lockwashers (7).
2. Remove capscrew (4), heat shield extension (1), and felt sheet (5) from crossmember (6). Discard felt sheet (5).
3. Remove two nuts (12), lockwashers (11), heat shield (2), capscrews (9), and washers (10) from heat shield extension (1). Discard lockwashers (11).
b. Installation

1. Install heat shield (2) to heat shield extension (1) with two washers (10), capscrews (9), lockwashers (11), and nuts (12).
2. Install felt sheet (5) and heat shield extension (1) to crossmember (6) with capscrew (4).
3. Install heat shield extension (1) and heat shield (2) on parking brake bracket (3) with two lockwashers (7) and capscrews (8).
Section II. SERVICE BRAKE SYSTEM MAINTENANCE

7-9. SERVICE BRAKE SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td>Service Brake System Bleeding Instructions</td>
<td>7-19</td>
</tr>
<tr>
<td>7-11</td>
<td>Service Brake Pad Maintenance</td>
<td>7-24</td>
</tr>
<tr>
<td>7-12</td>
<td>Service Brake Caliper Maintenance</td>
<td>7-26</td>
</tr>
<tr>
<td>7-13</td>
<td>Master Cylinder Maintenance</td>
<td>7-28</td>
</tr>
<tr>
<td>7-14</td>
<td>Hydro-Boost Replacement</td>
<td>7-30</td>
</tr>
<tr>
<td>7-15</td>
<td>Brake Lines Replacement</td>
<td>7-32</td>
</tr>
<tr>
<td>7-16</td>
<td>Service Brake Pedal (12338394) Replacement</td>
<td>7-40</td>
</tr>
<tr>
<td>7-17</td>
<td>Service Brake Pedal (EX 5935037) Replacement</td>
<td>7-42</td>
</tr>
<tr>
<td>7-18</td>
<td>Proportioning Valve Replacement</td>
<td>7-44</td>
</tr>
<tr>
<td>7-19</td>
<td>Service Brake Rotor Replacement</td>
<td>7-46</td>
</tr>
</tbody>
</table>

7-10. SERVICE BRAKE SYSTEM BLEEDING INSTRUCTIONS

This task covers:

a. Pressure Bleeding
b. Manual Bleeding

c. Master Cylinder Bleeding

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10
  - automotive (Appendix B, Item 1)

**Materials/Parts**
- Brake fluid (Appendix C, Item 14)

**Personnel Required**
- One mechanic
- One assistant (task b. only)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)
- Master cylinder filled to proper level (para. 2-11, pg 2-12, Item 11).

**General Safety Instructions**
- Always wear eye protection when bleeding brakes.

**WARNING**

Always wear eye protection when bleeding brakes. Failure to do this may cause injury if brake fluid comes in contact with eyes.

**NOTE**

- If only the front or rear half of the system has been serviced, it is usually necessary to bleed only that half of the system. However, if a firm brake pedal cannot be obtained after bleeding, it will be necessary to bleed the entire system. The brake hydraulic system can be bled manually or by using a pressure tank and adapters. Each method is outlined in the following procedures.
- Bleed brakes in the following order: right rear, left rear, right front, left front.
7-10. SERVICE BRAKE SYSTEM BLEEDING INSTRUCTIONS (Cont’d)

a. Pressure Bleeding

**CAUTION**

- When using a pressure bleeding tank, follow the manufacturer’s instructions for its use. Do not exceed the recommended working pressure when pressurizing the tank. A tank pressure of 15–20 psi (103, 138 kPa) is sufficient to bleed the brake hydraulic system. Release all air pressure from the tank after using it.
- After refilling pressure bleeding tank with silicone brake fluid, let tank sit undisturbed for 30 minutes minimum to ensure all visible as well as minute air bubbles are gone.

**NOTE**

This procedure covers bleeding at one wheel. Repeat bleeding task for remaining wheels.

1. Remove cover from master cylinder (1).
2. Install pressure tank bleeder adapter (2) to master cylinder (1).
3. Connect line (3) from pressure tank to adapter (2).
4. Remove protective cap (5) from bleeder screw (6) on caliper assembly (7).
5. Connect short piece of hose (8) to bleeder screw (6), and place other end of hose (8) in container 3/4 full of brake fluid.
6. Open valve (4) on line from pressure tank to master cylinder (1), allowing pressurized brake fluid to enter system.
7. Open bleeder screw (6) 3/4 turn and observe brake fluid in container. Close bleeder screw (6) when brake fluid flows free of air bubbles.
8. Disconnect hose (8) from bleeder screw (6) and install protective cap (5) on bleeder screw (6).
9. Close valve (4) on line (3) from pressure tank to master cylinder (1).
10. Disconnect line (3) from adapter (2).
11. Remove adapter (2) from master cylinder (1) and install master cylinder cover.

b. Manual Bleeding

**NOTE**

- This procedure covers bleeding at one wheel. Repeat bleeding task for remaining wheels.
- Assistant is required to depress the brake pedal when manually bleeding brakes while mechanic opens and closes bleeder screw.

1. Remove protective cap (5) from bleeder screw (6) on caliper assembly (7).
2. Connect short piece of hose (8) to bleeder screw (6), and place other end of hose (8) in container 3/4 full brake fluid.

**CAUTION**

- Check the master cylinder fluid level frequently during the bleeding operation and refill the reservoirs as necessary. Do not allow the master cylinder to run out of fluid at any time, or additional air will be drawn into the system.
- After adding silicone brake fluid to master cylinder, let cylinder sit undisturbed for 30 minutes minimum to ensure all visible as well as minute air bubbles are gone.
3. Have assistant pump brake pedal toward floor and hold it there. Open bleeder screw (6) 3/4 turn.
4. When pedal reaches floor, tighten bleeder screw (6) and have assistant slowly release brake pedal.
5. Repeat steps 3 and 4 until fluid flows clear and free of air bubbles.
6. Disconnect hose (8) from bleeder screw (6) and install protective cap (5) on bleeder screw (6).
7-10. SERVICE BRAKE SYSTEM BLEEDING INSTRUCTIONS (Cont’d)

c. Master Cylinder Bleeding

NOTE
Perform this procedure prior to installing master cylinder on vehicle.

1. Secure master cylinder flange (5) in vise.
2. Remove cover (1) and fill reservoirs (2) with silicone brake fluid.
3. Screw threaded end of bleeder hose (3) into brake line port on master cylinder (6) and insert opposite end into reservoir (2). Repeat step for other bleeder hose (3).
4. Slowly push piston (4) into master cylinder (6). Do not release piston (4). While holding piston (4), pinch bleeder hoses (3) off and release piston (4). Piston (4) will return automatically.

CAUTION
Whenever the master cylinder is filled with silicone brake fluid, let cylinder sit undisturbed for 30 minutes minimum to ensure that all visible as well as minute air bubbles are gone.

5. Refill reservoirs (2) with silicone brake fluid and repeat step 4 until no air bubbles remain in brake fluid.
6. Remove two bleeder hoses (3) from brake line ports on master cylinder (6).
7. Install cover (1) on master cylinder (6) and remove from vise.
8. Install master cylinder (para. 7-13).
FOLLOW-ON TASKS:  • Lower and secure hood (TM 9-2320-280-10)
  • Operate vehicle (TM 9-2320-280-10) and check for proper operation.
7-11. SERVICE BRAKE PAD MAINTENANCE

This task covers:

a. Removal
b. Cleaning and Inspection
c. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)
  - “C” clamp (Appendix B, Item 164)

**Materials/Parts**
- Grease (Appendix C, Item 22)
- Sealing compound (Appendix C, Item 45)

**Special Tools**
- Crow-foot, 14 mm (Appendix B, Item 152)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**General Safety Instructions**
- Make sure brake pads are installed with linings facing rotor.

**NOTE**
- The following procedure applies to the front brake system on all vehicles and to the rear brake system on vehicles with serial numbers USBL Eff. 1 through 44824.
- For replacement of rear dual service/parking brake pad on vehicles with serial numbers USBL Eff. 44825 and above, refer to para. 7-21.
- If removing left front brake pads, halfshaft must be removed (para. 6-9).

### a. Removal

**CAUTION**
Caliper must be supported during removal to prevent damage to brake line.

1. Using crowfoot, remove two capscrews (7), washers (6), caliper (4), and yoke (5) from adapter (3).
   
   **NOTE**
   Note positioning of brake pad surfaces for installation.

2. Remove two brake pads (1) from adapter (3).

### b. Cleaning and Inspection

1. Clean mating surfaces of caliper (4) and adapter (3) and lubricate with grease.
2. Inspect caliper (4) and caliper piston (8) for cracks, pitting, or damage. Replace caliper (4) if cracked, pitted, or damaged (para. 7-12).
3. Inspect dust boot (9) for tears or deterioration. Replace caliper (4) if dust hot (9) is torn or deteriorated (para. 7-12).
4. Inspect rotor (2) for heat cracks, discoloration, pitting, or scoring. Replace rotor (2) if cracked, pitted, or scored (para. 7-19).

   **NOTE**
   - To ensure proper brake function, replace brake pads in pairs on both sides of axle.
   - Replace brake pads if thickness is less than 3/16 in. (4.8 mm) and operation in wet and muddy conditions is expected.

5. Inspect brake pads (1) for glazing, oil saturation, or wear. If glazed, oil saturated, or if brake pad thickness is less than 1/8 in. (3.2 mm), replace both pads (1) and pads from opposite caliper.
7-11. SERVICE BRAKE PAD MAINTENANCE (Cont’d)

c. Installation

**WARNING**
Ensure brake pads are installed with linings facing rotor. Failure to do this may cause injury to personnel or damage to equipment.

1. Position brake pads (1) to adapter (3).

**NOTE**
When installing yoke and caliper, use a “C” clamp and a block of wood to bottom out position in caliper if needed.

2. Apply sealing compound to threads of capscrews (7). Using crowfoot, install yoke (5) and caliper (4) to adapter (3) with two washers (6) and capscrews (7). Tighten two capscrews (7) to 30-40 lb-ft (41-54 N-m).
7-12. SERVICE BRAKE CALIPER MAINTENANCE

This task covers:

a. Removal
b. Cleaning and Inspection
c. Installation

INITIAL SETUP:

Tools
- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)
  - “C” clamp (Appendix B, Item 164)

Special Tools
- Hex-head driver, 7 mm
  (Appendix B, Item 162)
- Crowfoot, 14 mm (Appendix B, Item 152)

Materials/Parts
- Copper washer (Appendix G, Item 15)
- Grease (Appendix C, Item 22)
- Sealing compound (Appendix C, Item 45)

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

General Safety Instructions
- Make sure brake pads are installed with linings facing rotor.

NOTE
- The following procedure applies to the front brake system on all vehicles and to the rear brake system on vehicles with serial numbers USBL Eff. 1 through 44824.
- For replacement of rear dual service/parking brake caliper on vehicles with serial numbers USBL Eff. 44825 and above, refer to para. 7-22.
- If removing left front caliper, halfshaft must be removed (para. 6-9).

a. Removal

CAUTION
Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

1. Disconnect brake line (1) from coupling (10).
2. Remove coupling (10) and washer (11) from caliper (9).
3. Using crowfoot, remove two capscrews (7), washers (6), yoke (5), and caliper (9) from adapter (4).

NOTE
- Note positioning of brake pad surfaces for installation.

4. Remove two brake pads (2) from adapter (4).
5. Slide yoke (5) and locating pins (8) out from caliper (9).

b. Cleaning and Inspection

1. Clean mating surfaces of caliper (9) and adapter (4) and lubricate with grease.
2. Clean cooling fins of rotor (3).
3. Inspect caliper (9) and caliper piston (12) for cracks, pitting, or damage. Replace caliper (9) if cracked, pitted, or damaged.
4. Inspect locating pin bearings and bushings (14) for tears or deterioration. Replace bearings and bushings (14) if torn or deteriorated.
5. Inspect dust boot (13) for tears or deterioration. Replace caliper (9) if dust boot (13) is torn or deteriorated.
7-12. SERVICE BRAKE CALIPER MAINTENANCE (Cont’d)

6. Inspect yoke locating pins (8) for cracks or corrosion. Perform step 7 if cracked or corroded. If not, perform step 7.

7. Using 7 mm hex-head driver, remove locating pins (8) from yoke (5). Discard locating pins (8).

8. Inspect rotor (3) for heat cracks, discoloration, pitting, or scoring. Replace rotor (3) if cracked, pitted, or scored [para. 7-19].

NOTE
- Replace brake pads in sets only.
- Replace brake pads if thickness is less than 3/16 in. (4.8 mm) and operation in wet and muddy conditions is expected.

9. Inspect brake pads (2) for glazing, oil saturation, or wear. If glazed, oil saturated, or if brake pad thickness is less than 1/8 in. (3.2 mm), replace both pads (2) and pads from opposite caliper [para. 7-11].

1. Install brake pads (2) on adapter (4).

NOTE
Perform step 2 only if yoke locating pins were replaced.

2. Apply sealing compound to threads of locating pins (8) and install locating pins (8) in yoke (5). Tighten locating pins (8) to 25-35 lb-ft (34-47 N·m).

3. Install caliper (9) on yoke (5).

NOTE
When installing caliper, use a “C” clamp and a block of wood to bottom out piston in caliper if needed.

4. Apply sealing compound to tapped holes of adapter (4). Using crowfoot, install yoke (5) and caliper (9) to adapter (4) with two washers (6) and capscrews (7). Tighten two capscrews (7) to 30-40 lb-ft (41-54 N·m).

5. Install copper washer (11) and coupling (10) on caliper (9).

6. Connect brake line (91) to coupling (10).

FOLLOW-ON TASK: Bleed brake system [para. 7-10].
7-13. MASTER CYLINDER MAINTENANCE

This task covers:

a. Removal  
b. Installation  
c. Bleeding

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials Parts**
- Five locknuts (Appendix G, Item 106)

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)

**Personnel Required**
- One mechanic
- One assistant

---

**a. Removal**

**CAUTION**
Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
Have drainage container ready to catch brake fluid.

1. Disconnect brake lines (5) and (6) from master cylinder (2).
2. Remove locknut (3), washer (4), and proportioning valve bracket (8) from right master cylinder mounting stud (10). Discard locknut (3).
3. Remove locknut (14), washer (11), capscrew (12), and washer (11) from bracket (17) and splash shield (13).
4. Remove locknut (15), washer (16), and bracket (17) from hydro-boost (1). Discard locknut (15).

**CAUTION**
Do not lean on master cylinder.

5. Remove two locknuts (9) and master cylinder (2) from hydro-boost (1). Discard locknuts (9).

---

**b. Installation**

**CAUTION**
Ensure O-ring is properly seated on master cylinder prior to installation. Damage to master cylinder may result if O-ring is not properly seated.

1. Install master cylinder (2) on hydro-boost (1) with two locknuts (9). Tighten locknuts (9) to 22 lb-ft (30 N·m).
2. Install bracket (17) on hydro-boost (1) with washer (16) and locknut (15). Tighten locknut (15) to 22 lb-ft (30 N·m).
3. Install bracket (17) on splash shield (13) with washer (11), capscrew (12), washer (11), and locknut (14). Tighten locknut (14) to 26 lb-ft (35 N·m).
4. Install proportion in valve bracket (8) on stud (10) with washer (4) and locknut (3). Tighten locknut (3) to 22 lb-ft (30 N·m).
5. Connect brake lines (5) and (6) to master cylinder (2).
c. Bleeding

**NOTE**

Master cylinder must be filled (para. 2-11, pg 2-12, Item 11) and kept at least half full during bleeding operation.

1. Depress brake pedal slowly and hold. Loosen brake line (5) to purge air from the front reservoir.
2. Tighten brake line (5) and release brake pedal.
3. Repeat steps 1 and 2 until front reservoir is purged of air.
4. Repeat steps 1 through 3 for rear reservoir with brake line (6)

FOLLOW-ON TASK: Bleed brake system (para. 7-10).
7-14. HYDRO-BOOST REPLACEMENT

This task covers:

a. Removal                        b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>One mechanic</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>One assistant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotter pin (Appendix G, Item 20)</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>Spring washer (Appendix G, Item 236)</td>
<td></td>
</tr>
<tr>
<td>Four lockwashers (Appendix G, Item 120)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master cylinder removed (para. 7-13).</td>
</tr>
</tbody>
</table>

a. Removal

CAUTION
Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

NOTE
Have drainage container ready to catch brake fluid.

1. Mark and disconnect two high pressure lines (4) and one return line (5) from hydro-boost (6).
2. Remove cotter pin (3), washer (2), and disconnect pushrod (7) from brake pedal bellcrank (13). Remove spring washer (1) from brake pedal bellcrank (13) and discard cotter pin (3) and spring washer (1).
3. Remove four nuts (12), lockwashers (11), washers (10), hydro-boost (6), and gasket (8) from cowl (9). Discard lockwashers (11).

b. Installation

1. Install gasket (8) and hydro-boost (6) on cowl (9) with four washers (10), lockwashers (11), and nuts (12).
2. Install spring washer (1) on brake pedal bellcrank (13). Connect hydro-boost pushrod (7) to brake pedal bellcrank (13). Install washer (2) and cotter pin (3).
3. Tighten nuts (12) to 21 lb-ft (28 N·m).
4. Connect two high pressure lines (4) and one return line (5) to hydro-boost (6).
7-14. HYDRO-BOOST REPLACEMENT (Cont'd)

FOLLOW-ON TASKS:

- Install master cylinder (para. 7-13).
- Bleed power steering system (para. 8-29).
7-15. BRAKE LINES REPLACEMENT

This task covers:

a. Caliper to Tee Brake Line Removal
b. Caliper to Tee Brake Line Installation
c. Rear Brake Line Removal
d. Rear Brake Line Installation
e. Intermediate Brake Line Removal
f. Intermediate Brake Line Installation
g. Proportioning Valve to Union Brake Line Removal
h. Proportioning Valve to Union Brake Line Installation
i. Proportioning Valve to Front Tee Brake Line Removal
j. Proportioning Valve to Front Tee Brake Line Installation

INITIAL SETUP:

Tools
General mechanic's tool kit: Hood raised and secured (TM 9-2320-280-10).

Equipment Condition
Hood raised and secured (TM 9-2320-280-10)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

CAUTION
Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

NOTE
- Have drainage container ready to catch brake fluid.
- Brake line replacement procedures for the service brake system and the rear dual service/parking brake system are basically the same. (Service brake system shown).

a. Caliper to Tee Brake Line Removal

NOTE
- Removal and installation procedures are basically the same for all caliper to tee brake lines except "A2" vehicles. Steps 1 through 3 covers the right rear caliper to tee line.
- Perform steps 4 through 6 for "A2" vehicles only. These steps cover the right front caliper to tee line.

1. Disconnect brake line (1) from caliper (7).
2. Disconnect brake line (1) from rear tee (5) at forward rear crossmember (4).
3. Remove capscrew (6) and clamp (2) securing brake line (1) and vent be (3) to forward rear crossmember (4) and remove brake line (1) from clamp (2).
4. Disconnect right brake line hose (12) from caliper (16).
5. Remove nut (17), capscrew (9), washer (10), and clamp (11) from bracket (8).
6. Remove dip (15) and right brake line hose (12) from bracket (13) and intermediate brake line (14).
7-15. BRAKE LINES REPLACEMENT (Cont'd)

"A2" series vehicles
b. Caliper to Tee Brake Line Installation

NOTE

- Installation procedures are basically the same for all caliper to tee brake lines except "A2" vehicles. Steps 1 through 4 covers the right rear caliper to tee line.
- Perform steps 5 through 7 for "A2" vehicles only. These steps cover the right front caliper to tee line.

1. Connect brake line (1) to rear tee (5) at forward rear crossmember (4).
2. Connect brake line (1) to caliper (7).
3. Install brake line (1) and vent line (3) in clamp (2).
4. Install brake line (1), vent line (3) and clamp (2) to forward rear crossmember (4) with capscrew (6).
5. Install right brake line hose (12) on bracket (13) with clip (15) and connect to intermediate brake line (14).
6. Install clamp (11) and right brake line hose (12) on bracket (8) with washer (10) capscrew (9), and nut (17).
7. Connect right brake line hose (12) to caliper (16).
"A2" series vehicles
7-15. BRAKE LINES REPLACEMENT (Cont'd)

c. Rear Brake Line Removal

1. Disconnect rear brake line (2) from rear tee (1).
2. Remove capscrew (5) and clamp (4) from rear brake line (2) and forward rear crossmember (3).
3. Remove rear brake line (2) from intermediate brake line (6).

d. Rear Brake Line Installation

1. Install rear brake line (2) to intermediate brake line (6).
2. Install rear brake line (2) and clamp (4) to forward rear crossmember (3) with capscrew (5).
3. Connect rear brake line (2) to rear tee (1).

e. Intermediate Brake Line Removal

1. Disconnect intermediate brake line (6) from rear brake line (2).
2. Remove five capscrews (8) and clamps (7) securing intermediate brake line (6) to frame (9).
3. Remove intermediate brake line (6) from proportioning valve to union brake line (10).
7-15. BRAKE LINES REPLACEMENT (Cont’d)

f. Intermediate Brake Line Installation

1. Install intermediate brake line (6) to proportioning valve to union brake line (10).
2. Connect intermediate brake line (6) to rear brake line (2).
3. Install intermediate brake line (6) and five clamps (7) to frame (9) with five capscrews (8).
7-15. BRAKE LINES REPLACEMENT (Cont’d)

**g. Proportioning Valve to Union Brake Line Removal**

1. Disconnect brake line (1) from proportioning valve (5).
2. Remove nut (8), washer (7), capscrew (3), and clamp (2) from brake line (1) and bracket (9).
3. Remove brake line (1) from union (10).

**h. Proportioning Valve to Union Brake Line Installation**

1. Connect brake line (1) to union (10).
2. Install brake line (1) and clamp (2) to bracket (9) with capscrew (3), washer (7), and nut (8).
3. Connect brake line (1) to proportioning valve (5).

**i. Proportioning Valve to Front Tee Brake Line Removal**

1. Disconnect brake line (4) from proportioning valve (5).
2. Remove brake line (4) from front tee (6).

**j. Proportioning Valve to Front Tee Brake Line Installation**

1. Connect brake line (4) to front tee (6).
2. Connect brake line (4) to proportioning valve (5).
FOLLOW-ON TASK: Bleed brake system (para. 7-10).
7.16. SERVICE BRAKE PEDAL (12338394) REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Applicable Models**
- All vehicles except: M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Special Tools**
- Crowfoot, 7/8 in. (Appendix B, Item 153)
- Socket adapter (Appendix B, Item 146)

**Materials/Parts**
- Cotter pin (Appendix G, Item 20)
- Spring washer (Appendix G, Item 236)
- Pushnut (Appendix G, Item 170)
- Two bushings (Appendix G, Item 7)
- Grease (Appendix C, Item 22)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Protective control box removed (para. 4-5).

---

**a. Removal**

1. Remove pushnut (9) and disconnect stoplight switch rod (1) from brake pedal assembly (8). Discard pushnut (9).
2. Disconnect return spring (2) from brake pedal assembly (8).
3. Remove cotter pin (12), washer (11), and hydro-boost pushrod (5) from brake pedal bellcrank (6). Remove spring washer (7). Discard cotter pin (12) and spring washer (7).
4. Remove nut (4), two washers (3), pivot pin (14), and brake pedal assembly (8) from bracket (13).
5. Remove two bushings (10) from brake pedal assembly (8). Discard two bushings (10).

**b. Installation**

1. Apply grease to inside of two bushings (10). Install two bushings (10) in brake pedal assembly (8).
2. Install brake pedal assembly (8) to bracket (13) with pivot pin (14), two washers (3), and nut (4). Using adapter and crowfoot, tighten nut (4) to 60 lb-ft (81 N·m).
3. Installs ring washer (7) to brake pedal bellcrank (6). Connect hydro-boost pushrod (5) to brake pedal bellcrank (6) with washer (11), and cotter pin (12).
4. Connect return spring (2) to brake pedal assembly (8).
5. Connect stoplight switch rod (1) to brake pedal assembly (8) with pushnut (9).
FOLLOW-ON TASKS:
- Install protective control box (para. 4-5).
- Operate vehicle (TM 9-2320-280-10) and check brakes for proper operation.
7-17. SERVICE BRAKE PEDAL (EX 5935037) REPLACEMENT

This task covers:

a. Removal                        b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Special Tools
Crowfoot, 7/8 in. (Appendix B, Item 153)
Socket adapter (Appendix B, Item 146)

Materials/Parts
Cotter pin (Appendix G, Item 19)
Spring washer (Appendix G, Item 236)
Two bushings (Appendix G, Item 7)
Grease (Appendix C, Item 22)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition
- Protective control box removed (para. 4-5).
- Stoplight switch removed (para. 4-61)

a. Removal

1. Disconnect return spring (4) from brake pedal bracket (12).
2. Remove cotter pin (8) and washer (7) securing hydro-boost pushrod (6) to brake pedal bellcrank (10), and disconnect hydro-boost pushrod (6) from brake pedal bellcrank (10). Remove spring washer (9) from bellcrank (10). Discard cotter pin (8) and spring washer (9).
3. Remove nut (5), washer (2), pivot pin (1), and washer (2) securing brake pedal assembly (11) to bracket (3) and remove brake pedal assembly (11).
4. Remove two bushings (13) from brake pedal assembly (11). Discard two bushings (13).

b. Installation

1. Apply grease to inside of two bushings (13). Install two bushings (13) in brake pedal assembly (11).
2. Install brake pedal assembly (11) on bracket (3) with washer (2), pivot pin (1), washer (2), and nut (5). Using adapter and crowfoot, tighten nut (5) to 60 lb-ft (81 N·m).
3. Install ring washer (9) on brake pedal bellcrank (10). Connect hydro-boost pushrod (6) to brake pedal bellcrank (10) with washer (7) and cotter pin (8).
4. Connect return spring (4) to brake pedal bracket (12).
FOLLOW-ON TASKS: • Install stoplight switch [para. 4-6].
  • Install protective control box [para. 4-5].
  • Operate vehicle (TM 9-2320-280-10) and check brakes for proper operation.
7-18. PROPORTIONING VALVE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit:
- automotive (Appendix B, Item 1)

Materials/Parts
- Cotter pin (Appendix G, Item 20)
- Spring washer (Appendix G, Item 236)
- Pushnut (Appendix G, Item 170)
- Two bushings (Appendix G, Item 7)
- Lubricating oil (Appendix C, Item 33)

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

Equipment Condition
- Battery ground cable disconnected [para. 4-73].
- Hood raised and secured [TM 9-2320-280-10].

CAUTION
Prior to removal, tag brake lines for installation.
Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.
Do not attempt to disassemble proportioning valve. Damage to equipment will result.

NOTE
Have drainage container ready to catch brake fluid.

1. Disconnect electrical connector (1) from proportioning valve (6).
2. Disconnect two brake lines (5) from proportioning valve (6).
3. Disconnect two brake lines (4) from proportioning valve (6).
4. Remove locknut (2), washer (3), and proportioning valve (6) from hydro-boost (8) and proportioning valve bracket (7). Discard locknut (2).

b. Installation

1. Install proportioning valve (6) to proportioning valve bracket (7) and hydro-boost (8) with washer (3) and locknut (2). Tighten locknut (2) to 22 lb-ft (30 N·m).
2. Connect two brake lines (5) to proportioning valve (6).
3. Connect two brake lines (4) to proportioning valve (6).
4. Apply lubricating oil to pins (9) of proportioning valve (6).
5. Connect electrical connector (1) to proportioning valve (6).
FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
  • Bleed brake system (para. 7-10).
7-19. SERVICE BRAKE ROTOR REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-24P
  - automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Service brake pad removed (para. 7-11)

**Materials/Parts**
- Six lockwashers (Appendix G, Item 119)
- Sealing compound (Appendix C, Item 43)

### a. Removal

1. Remove six capscrews (1) and lockwashers (2) from halfshaft (3), rotor (4), and output flange (5).
   - Discard lockwashers (2).
2. Disconnect halfshaft (3) and remove rotor (4) from output flange (5).

### b. Installation

1. Apply sealing compound to threads of capscrews (1).
2. Install rotor (4) on output flange (5).
3. Connect halfshaft (3) to rotor (4) and install six lockwashers (2) and capscrews (1). Tighten capscrews (1) to 48 lb-ft (65 N·m).

FOLLOW-ON TASK: Install service brake pad (para. 7-11).
## Section III. REAR DUAL SERVICE/PARKING BRAKE SYSTEM MAINTENANCE

### 7-20. REAR DUAL SERVICE/PARKING BRAKE SYSTEM MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-21</td>
<td>Rear Dual Service/Parking Brake Pad Maintenance</td>
<td>7-48</td>
</tr>
<tr>
<td>7-22</td>
<td>Rear Dual Service/Parking Brake Caliper Maintenance</td>
<td>7-52</td>
</tr>
<tr>
<td>7-23</td>
<td>Right Parking Brake Cable Replacement</td>
<td>7-56</td>
</tr>
<tr>
<td>7-24</td>
<td>Left Parking Brake Cable/Mounting Bracket Replacement</td>
<td>7-58</td>
</tr>
<tr>
<td>7-25</td>
<td>Rear Dual Service/Parking Brake Rod Replacement</td>
<td>7-62</td>
</tr>
<tr>
<td>7-26</td>
<td>Rear Dual Service/Parking Brake Adjustment</td>
<td>7-64</td>
</tr>
</tbody>
</table>
7-21. REAR DUAL SERVICE/PARKING BRAKE PAD MAINTENANCE

This task covers:

- a. Removal
- b. Cleaning and Inspection
- c. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
<th>Equipment Condition</th>
<th>General Safety Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td></td>
<td>Wheels chocked and parking brake released</td>
<td>Make sure brake pads are installed with linings facing rotor.</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td></td>
<td>Pioneer tool stowage rack removed</td>
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<tr>
<td>[Crowfoot, 14 mm (Appendix B, Item 152)]</td>
<td>[TM 9-2320-280-10]</td>
<td>[TM 9-2320-280-24P]</td>
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<tr>
<td>Clip (Appendix G, Item 13)</td>
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<tr>
<td>Cotter pin (Appendix G, Item 17)</td>
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<tr>
<td>Sealing compound (Appendix C, Item 45)</td>
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</tr>
<tr>
<td>Grease (Appendix C, Item 22)</td>
<td></td>
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</tbody>
</table>

NOTE
The following procedure applies to vehicles with serial numbers USBL, Eff, 44825 and above.

a. Removal

1. Remove cotter pin (4), washer (5), and clevis pin (7) from parking brake clevis (6) and lever (3). Discard cotter pin (4).
2. Remove clip (2) and disconnect parking brake cable (8) from caliper cable bracket (1). Discard clips (2)
   CAUTION
   Caliper must be supported during removal to prevent damage to brake line.
3. Remove two capscrews (12), washers (13), and pull yoke (14) and caliper (15) away from rotor (10).
   NOTE
   Note positioning of brake pad surfaces for installation.
4. Remove two brake pads (9) from adapter (11) and rotor (10).
7-21. REAR DUAL SERVICE/PARKING BRAKE PAD MAINTENANCE (Cont’d)

b. Cleaning and Inspection

NOTE
Apply a light coat of grease on adapter slides.

1. Clean mating surfaces of caliper (1) and adapter (7) and lubricate adapter slides with grease.
2. Inspect caliper (1) and caliper piston face (3) for cracks, pitting, or damage. Replace caliper assembly if cracked, pitted, or damaged (para. 7-22).
3. Inspect dust boot (2) for tears or deterioration. Replace caliper assembly (1) if dust boot (2) is torn or deteriorated (para. 7-22).
4. Inspect caliper cable bracket (4) for looseness, damage, and rotation. If loose, damaged, or repositioned, replace caliper assembly (1).
5. Thoroughly clean and inspect rotor (6) for heat cracks, discoloration, pitting, or scoring. Replace rotor (6) if cracked, pitted, or scored (para. 7-19).

CAUTION
Ensure that grease and oil are not in contact with rotor and/or shoe and lining friction surface. Failure to do so will result in damage to equipment and poor performance.

NOTE
• Replace brake pads in axle sets only.
• Replace brake pads if thickness is less than 3/16 in. (4.8 mm) and operation in wet and muddy conditions is expected.

6. Inspect brake pads (5) for glazing, oil saturation, or wear. If glazed, oil saturated, or if brake pad thickness is less than 1/8 in. (3.2 mm), replace both pads (5) and pads on opposite caliper.

c. Installation

WARNING
Ensure brake pads are installed with linings facing rotor. Failure to do this may cause injury to personnel or damage to equipment and poor performance.

1. Position brake pads (5) facing rotor (6) in adapter (7).
2. Apply sealing compound to tapped holes of adapter (7).

CAUTION
Applying force to piston cap will result in piston cap damage.

3. Rotate caliper piston (3) in a clockwise direction and at the same time apply force on outer piston hex until caliper piston (3) is seated in piston bore.
4. Install caliper (1) and yoke (10) on adapter (7) and rotor (6) with two washers (9) and cap screws (8). Using crowfoot, tighten cap screws (8) to 30-40 lb-ft (41-54 N·m).
5. Install parking brake cable (19) on caliper cable bracket (13) with clip (14).

CAUTION
• Ensure lever is in contact with caliper cable bracket stop. Damage to equipment and poor performance will result if not aligned properly.
• Ensure that the clevis and clevis pin are aligned to the lever. Do not move the lever to accommodate a misadjusted clevis. Damage to equipment and poor performance will result.

6. Install parking brake clevis (17) on lever (12) with clevis pin (18), washer (16), and cotter pin (15). Check position of lever (12) and make sure it is in contact with caliper cable bracket stop (11).
7-21. REAR DUAL SERVICE/PARKING BRAKE PAD MAINTENANCE (Cont’d)

FOLLOW-ON TASKS: • Adjust rear dual service/parking brake (para. 7-26).
• Install pioneer tool stowage rack (TM 9-2320-280-10).
7-22. REAR DUAL SERVICE/PARKING BRAKE CALIPER MAINTENANCE

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

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Special Tools**
- Crowfoot, 14 mm (Appendix B, Item 152)
- Hex head driver, 7 mm (Appendix B, Item 162)

**Materials/Parts**
- Cotter pin (Appendix G, Item 17)
- Copper washer (Appendix G, Item 15)
- Clip (Appendix G, Item 13)
- Sealing compound (Appendix C, Item 45)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Wheels chocked and parking brake released (TM 9-2320-280-10)
- Pioneer tool stowage rack removed (TM 9-2320-280-10)
- Service brake rotor removed (para. 7-19)

**General Safety Instructions**
- Make sure brake pads are installed with linings facing rotor.

---

**a. Removal**

**CAUTION**

Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

The following procedure applies to vehicles with serial numbers USBL, Eff, 44825 and above.

1. Remove cotter pin (4), washer (5), and clevis pin (7) from parking brake clevis (6) and lever (3).
   Discard cotter pin (4).
2. Remove dip (2) and disconnect parking brake cable (8) from caliper cable bracket (1). Discard dip (2).

**NOTE**

Have drainage container ready to catch brake fluid.

3. Disconnect brake line (17) from coupling (16).
4. Remove coupling (16) and copper washer (15) from caliper (14). Discard copper washer (15).

**CAUTION**

Caliper must be supported during removal to prevent damage to brake line.

5. Remove two capscrews (10), washers (11), yoke (12), and caliper (14) from adapter (9).
6. Slide yoke (12) and location pins (13) out from caliper (14).
b. Cleaning and Inspection

NOTE
Apply a light coat of grease on adapter slides.

1. Clean mating surfaces of caliper (1) and adapter (7) and lubricate adapter slides with grease.
2. Clean cooling fins of rotor (6).
3. Inspect caliper (1) and caliper piston face (4) for cracks, pitting, or damage. Replace caliper assembly if cracked, pitted, or damaged.
4. Inspect caliper cable bracket (5) for looseness, damage, and rotation. If loose, damaged, or repositioned, replace caliper assembly (1).
5. Inspect dust boot (3) for tears or deterioration. Replace caliper assembly if dust boot (3) is torn or deteriorated.
6. Inspect rotor (6) for heat cracks, discoloration, pitting, or damage. Replace rotor (6) if cracked, pitted, or scored (para. 7-19).
7. Inspect yoke locating pins (12) for cracks or corrosion. Perform step 8 if cracked or corroded. If not, perform step 9.
8. Using 7 mm hex driver, remove locating pins (12) from yoke (11). Discard locating pins (12).
9. Inspect brake pads (8) for glazing, oil saturation, or wear. If glazed, oil saturated, or if brake pad thickness is less than 1/8 in. (3.2 mm), replace both pads (8) and pads on opposite caliper (para. 7-21).

CAUTION
Ensure that grease and oil are not in contact with rotor and/or brake shoe friction surfaces. Failure to do so will result in damage to equipment and poor performance.

c. Installation

1. Open bleeder valve (2) and depress piston (4) into caliper (1) while rotating piston (4) in a clockwise direction, and at the same time apply pressure until piston (4) is seated in piston bore.

NOTE
Perform step 2 only if yoke locating pins were removed.

2. Apply sealing compound to threads of locating pins (12) and install locating pins (12) in yoke (11) using 7 mm hex head driver. Tighten locating pins (12) to 25-35 lb-ft (34-47 N·m).
3. Slide yoke (11) and locating pins (12) into caliper (1).
4. Apply sealing compound to tapped holes of adapter (7).
5. Install caliper (1) and yoke (11) on adapter (7) with two washers (10) and capscrews (9). Using crowfoot, tighten capscrews (9) to 30-40 lb-ft (41-54 N·m).
6. Install copper washer (15) and coupling (14) on caliper (1) and connect brake line (13) to coupling (14).
7. Install parking brake cable (24) on caliper cable bracket (18) with clip (19).

CAUTION
- Ensure lever is in contact with caliper cable bracket stop. Damage to equipment and poor performance will result if not aligned properly.
- Ensure that the clevis and clevis pin are aligned to lever. Do not move the lever to accommodate a misadjusted clevis, or damage to equipment and poor performance will result.

8. Check position of lever (17) and ensure it is in contact with caliper cable bracket stop (16).
9. Install parking brake clevis (22) to lever (17) with clevis pin (23), washer (21), and cotter pin (20).
7-22. REAR DUAL SERVICE/PARKING BRAKE CALIPER MAINTENANCE (Cont’d)

FOLLOW-ON TASKS:
- Install service brake rotor [para. 7-19].
- Bleed brake system [para. 7-10].
- Adjust rear dual service/parking brake [para. 7-26].
- Install pioneer tool stowage rack [TM 9-2320-280-10].
7-23. RIGHT PARKING BRAKE CABLE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Materials/Parts</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit: automotive (Appendix B, Item 1)</td>
<td>Cotter pin (Appendix G, Item 18)</td>
<td>TM 9-2320-280-10</td>
<td>• Muffler and insulator removed (all models except “A2” vehicles) [para. 3-48].</td>
</tr>
<tr>
<td></td>
<td>Four lockwasher (Appendix G, Item 87)</td>
<td>TM 9-2320-280-24P</td>
<td>• Muffler and catalytic converter removed (“A2” vehicles only) [para. 3-49].</td>
</tr>
<tr>
<td></td>
<td>Two clips (Appendix G, Item 13)</td>
<td></td>
<td>• Wheels chocked and parking brake released (TM 9-2320-280-10).</td>
</tr>
</tbody>
</table>

Note
- The following procedure applies to vehicles with serial numbers USBL Eff. 44825 and above.
- If cables are chafing or crushed, use new cable clamp bracket.

a. Removal

1. Remove cotter pin (21), washer (20), clevis pin (18), and brake clevis (19) from rear caliper lever (22). Discard cotter pin (21).
2. Remove brake cable clip (1) and parking brake cable sleeve (17) from rear caliper cable bracket (2) and remove cable assembly (4) from caliper cable bracket (2). Discard cable clip (1).
3. Slide parking brake cable (11) through parking brake cable assembly (4). Remove parking brake cable clip (8) from parking brake cable sleeve (7) and “C” beam (10). Disconnect parking brake cable (4) from parking brake equalizer bar (9). Discard cable clip (8).
4. Remove two capscrews (5), parking brake cable clamps (6), and parking brake cable assembly (4) from body (12).

Note
- Perform steps 5 and 6 for vehicles with old parking brake cable bracket.
- Perform steps 7 through 9 for vehicles with new parking brake cable bracket configuration.
5. Remove capscrew (15), lockwasher (16), and parking brake cable clamp (14) from bracket (23). Discard lockwasher (16).
6. Remove two capscrews (13) and clamp bracket (23) from support bracket (3). Discard clamp bracket (23).
7. Remove nut (30), lockwasher (29), capscrew (27), washer (28), and parking brake cable clamp (31) from clamp bracket (35). Discard lockwasher (29).
8. Remove capscrew (32), lockwasher (33), and parking brake cable clamp (34) from bracket (35). Discard lockwasher (33).

Note
- Perform step 9 if clamp bracket is damaged. If not replacing bracket proceed to b., installation.
9. Remove nut (24), lockwasher (36), capscrew (26), washer (25), and clamp bracket (35) from support bracket (3). Discard lockwasher (36).

b. Installation

Note
- Ensure clamp bracket (P/N 12342965) is installed on vehicle.
1. Install clamp bracket (35) on support bracket (3) with washer (25), capscrew (26), lockwasher (36), and nut (24).
7-23. RIGHT PARKING BRAKE CABLE REPLACEMENT (Cont’d)

2. Slide parking brake cable clamp (34) onto parking brake cable assembly (4) and clamp bracket (35) with lockwasher (33) and capscrew (32).

3. Slide parking brake cable clamp (31) on parking brake cable assembly (4) and install on clamp bracket (35) with washer (28), capscrew (27), lockwasher (29), and nut (30).

4. Install two parking brake cable clamps (6) on parking brake cable assembly (4) and install parking brake cable clamps (6) on underbody (12) with two capscrews (5).

5. Install parking brake cable sleeve (7) to “C” beam (10) and parking brake cable (11) to equalizer bar (9) with clip (8).

**CAUTION**

Ensure that the caliper cable bracket is secure with no signs of looseness and the lever is in contact with the caliper cable bracket stop. Damage to equipment and poor performance will result if not align properly.

6. Install parking brake cable sleeve (17) to caliper cable bracket (2) with cable clip (1).

7. Install bracket clevis (19) on rear caliper lever (22) with clevis pin (18), washer (20), and cotter pin (21).

FOLLOW-ON TASKS:  
- Adjust parking brake lever (TM 9-2320-280-10)  
- Install muffler and catalytic converter (“A2” vehicles only) (para. 3-49).  
- Install muffler and insulator (all models except “A2” vehicles) (para. 3-48).
7-24. LEFT PARKING BRAKE CABLE/MOUNTING BRACKET REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Nut and lockwasher assembly (Appendix G, Item 148)
- Six lockwashers (Appendix G, Item 110)
- Cotter pin (Appendix G, Item 18)
- Two clips (Appendix G, Item 13)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Muffler and insulator removed (all models except "A2" vehicles (para. 3-48).
- Muffler and catalytic converter removed ("A2" vehicles only) (para. 3-49).
- Wheels chocked and parking brake released (TM 9-2320-280-10).

**NOTE**
- The following procedure applies to vehicles with serial numbers USBL Eff. 44825 and above.
- If cables are chafing or crushed, use new cable clamp bracket.

### a. Removal

1. Remove cotter pin (11), washer (12), clevis pin (14), and brake clevis (13) from rear caliper lever (10). Discard cotter pin (11).
2. Remove brake cable clip (9) and parking brake cable sleeve (2) from rear caliper cable bracket (8). Discard cable clip (9).
3. Slide parking brake cable (1) through parking brake cable assembly (15). Remove parking brake cable clip (24) and parking brake cable sleeve (2) from "C" beam (22). Disconnect parking brake cable (1) from parking brake equalizer bar (23). Discard cable clip (24).
4. Remove two capscrews (6), washers (4), and nut and lockwasher assembly (3) from brake cable clamp (5), mounting bracket (21) and parking brake cable assembly (15). Discard nut and lockwasher assembly (3).

**NOTE**
- Perform steps 5 and 6 for vehicles with old parking brake cable bracket. Perform steps 7 through 9 for vehicles with new parking brake cable bracket configuration.

5. Remove capscrew (17), lockwasher (16), parking brake cable clamp (18), and parking brake cable assembly (15) from bracket (19). Discard lockwasher (16).
6. Remove two capscrews (20) and bracket (19) from support bracket (7). Discard bracket (19).
7. Remove nut (34), lockwasher (33), capscrew (37), washer (35), and parking brake cable clamp (32) from bracket (28). Discard lockwasher (33).
8. Remove capscrew (31), lockwasher (30), and parking brake cable clamp (29) from bracket (28). Discard lockwasher (30).

**NOTE**
- Perform step 9 if clamp bracket is damaged. If not replacing bracket, proceed to b., installation.

9. Remove nut (26), lockwasher (27), capscrew (36), washer (25), and clamp bracket (28) from support bracket (7). Discard lockwasher (27).

**NOTE**
- Perform step 10 if replacing parking cable mounting bracket. If not replacing bracket, proceed to b., installation.

10. Remove two nuts (38), lockwashers (39), washers (40), capscrews (41), washers (40), mounting bracket (21), and tailpipe hanger (42) from rear body mount (43). Discard lockwashers (39).
b. Installation

Perform step 1 if replacing parking brake cable mounting bracket. If not, proceed to step 2.

1. Install parking brake cable mounting bracket (4) and tailpipe hanger (6) on rear body mount (7) with two capscrews (5), four washers (3), two lockwashers (2), and nuts (1).

   NOTE
   Ensure clamp bracket (P/N 12342966) is installed on vehicle.

2. Install clamp bracket (34) on support bracket (14) with washer (31), capscrew (42), lockwasher (33), and nut (32).
3. Slide parking brake cable clamp (35) onto parking brake cable assembly (22) and install cable clamp (35) on clamp bracket (34) with lockwasher (36) and capscrew (37).
4. Slide parking brake cable clamp (38) onto parking brake cable assembly (22) and install cable clamp (38) on clamp bracket (34) with washer (41), capscrew (43), lockwasher (39), and nut (40).
5. Install parking brake cable clamp (12) on parking brake cable assembly (22) and install cable clamp (12) on parking brake cable mounting bracket (4) with washer (11), capscrew (13), washer (11), and nut and lockwasher assembly (10).
6. Install parking brake cable sleeve (9) on "C" beam (28) and parking brake cable (8) on equalizer bar (29) with clip (30).

   CAUTION
   Ensure that the caliper cable bracket is secure with no signs of looseness and the lever is in contact with the caliper cable bracket stop. Damage to equipment and poor performance will result if not aligned properly.

7. Install parking brake cable sleeve (9) on rear caliper cable bracket (15) with cable clip (16).
8. Install brake clevis (20) on rear caliper lever (17) with clevis pin (21), washer (19), and cotter Pin (18).
9. Install parking brake cable assembly (22) on bracket (26) with clamp (23), capscrew (25), and lockwasher (24).
10. Install bracket (26) on bracket (14) with two capscrews (27).
7-24. LEFT PARKING BRAKE CABLE/MOUNTING BRACKET REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:

- Adjust parking brake lever (TM 9-2320-280-10).
- Install muffler and catalytic converter ("A2" vehicles only) (para. 3-49).
- Install muffler and insulator (all models except "A2" vehicles) (para. 3-48).
7-25. REAR DUAL SERVICE/PARKING BRAKE ROD REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Three cotter pins (Appendix G, Item 19)
- Two locknuts (Appendix G, Item 58)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**NOTE**
The following procedure applies to vehicles with serial numbers USBL Eff. 44825 and above.

### a. Removal

1. Remove two cotter pins (left and right) (23), washers (22), clevis pins (20), and brake clevis (21) from caliper levers (24). Discard cotter pins (23).
2. Remove clip (5) and spread boot (6) to allow access to cotter Pin (12).
3. Remove cotter pin (12), washer (11), clevis pin (8), and clevis (9) from brake rod (14) and bellcrank (7). Discard cotter pin (12).
4. Remove locknut (17), washer (16), spacer (15), washer (3), capscrew (4), and spring (2) from body (13). Discard locknut (17).
5. Remove locknut (19) and conical washer (18) from brake rod (14) and brake cable equalizer bar (1). Discard locknut (19).
6. Remove brake rod (14) by sliding brake rod (14) forward.
7. Remove clevis (9) and nut (10) from brake rod (14).

### b. Installation

1. Install spring (2) and spacer (15) on body (13) with washer (3), capscrew (4), washer (16), and locknut (17).
2. Install nut (10) and clevis (9) on brake rod (14).
3. Slide brake rod (14) rearward through spring (2).
4. Install brake rod (14) on brake cable equalizer bar (1) with conical washer (18) and locknut (19). Tighten locknut (19) far enough to expose 3-5 threads on the end of brake rod (14).
5. Spread boot (6) and install clevis (9) on bellcrank (7) with clevis pin (8), washer (11), and cotter pin (12).
6. Install clip (5) on boot (6).

**CAUTION**
Ensure that the caliper cable bracket is secure with no signs of looseness and the lever is in contact with the caliper cable bracket stop. Damage to equipment and poor performance will result if not aligned properly.

7. Install brake clevis (21) on rear caliper levers (24) with clevis pins (20), washers (22), and cotter pin (23).
7-25. REAR DUAL SERVICE/PARKING BRAKE ROD REPLACEMENT (Cont’d)

FOLLOW-ON TASKS:
- Adjust rear dual service/parking brake (para. 7-26).
- Install muffler and catalytic converter (“A2” vehicles only) (para. 3-49).
- Install muffler and insulator (all models except “A2” vehicles) (para. 3-48).
7-26. REAR DUAL SERVICE/PARKING BRAKE ADJUSTMENT

This task covers:
Adjustment

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>TM 9-2320-280-10</td>
<td>Wheels chocked and parking brake released</td>
</tr>
<tr>
<td>Materials/Parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotter pin (Appendix G, Item 19)</td>
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<td></td>
</tr>
<tr>
<td>Personnel Required</td>
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</tr>
<tr>
<td>One mechanic</td>
<td></td>
<td></td>
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<tr>
<td>One assistant</td>
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</tbody>
</table>

NOTE

- The Kelsey-Hayes parking brake mechanism has an automatic adjusting feature and does not require periodic manual adjustment. When parking brake components or rear brake pads are replaced, the parking brake linkage must be initially positioned to ensure proper parking brake system operation. The only additional adjustment necessary is accomplished with the parking brake hand lever. Refer to TM 9-2320-280-10.
- The following procedure applies to vehicles with serial numbers USBL Eff. 44825 and above.

Adjustment

1. Remove clip (1) and spread boot (2) to allow access to cotter pin (9).
2. Remove cotter pin (9), washer (8) and clevis pin (4) from clevis (5) and bellcrank (3). Discard cotter pin (9).
3. Repeatedly apply and adjust parking brake hand lever until bellcrank (3) linear travel is 0.75 in. (19 mm).

CAUTION

Holes in parking brake clevis must align to the holes in the adjusting bellcrank without force for proper parking brake adjustment. Failure to do this may result in damage to equipment and poor performance.

4. Release parking brake. Loosen nut (6) and adjust clevis (5) so holes in clevis (5) align to holes in bellcrank (3). Install clevis (5) on bellcrank (3) with clevis pin (4), washer (8), and cotter pin (9).

CAUTION

Do not overtighten brake rod. Overtightening brake rod may result in dragging brakes.

5. If necessary, remove excess slack in parking brake cables by turning the parking brake rod (7) clockwise or counterclockwise into the clevis (5).
7-26. REAR DUAL SERVICE/PARKING BRAKE ADJUSTMENT (Cont'd)

**CAUTION**

Ensure that the caliper cable bracket is secure with no signs of looseness and the lever is in contact with the caliper cable bracket stop. Damage to equipment and poor performance will result if not aligned properly.

**NOTE**

Perform step 6 on both sides.

6. Parking brake rod (7) is properly adjusted if lever (11) is in contact with caliper cable bracket stop (10).

7. Tighten nut (6) against clevis (5).

8. Install clip (1) in boot (2).

FOLLOW-ON TASK: Adjust parking brake lever ([TM 9-2320-280-10]).
# Chapter 8
## Wheels and Steering Maintenance
### Section I. Wheel and Runflat System Maintenance

#### 8-1. Wheel and Runflat System Maintenance Task Summary

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-2</td>
<td>Jacking Instructions</td>
<td>8-2</td>
</tr>
<tr>
<td>8-3</td>
<td>Wheel Replacement</td>
<td>8-6</td>
</tr>
<tr>
<td>8-4</td>
<td>Tire, Wheel, and Runflat Maintenance</td>
<td>8-8</td>
</tr>
<tr>
<td>8-5</td>
<td>Radial Tire, Wheel, and Rubber Runflat Maintenance</td>
<td>8-16</td>
</tr>
<tr>
<td>8-5.1</td>
<td>Radial Tire, Wheel, and Rubber Runflat Maintenance</td>
<td>8-24.2</td>
</tr>
<tr>
<td>8-6</td>
<td>Runflat Compressor (P/N J39250) Belt Replacement</td>
<td>8-25</td>
</tr>
<tr>
<td>8-7</td>
<td>Runflat Compressor (P/N 528236) Belt Replacement</td>
<td>8-26</td>
</tr>
<tr>
<td>8-8</td>
<td>Inner Rim Stud Maintenance</td>
<td>8-27</td>
</tr>
<tr>
<td>8-9</td>
<td>Tire Balancing</td>
<td>8-30</td>
</tr>
<tr>
<td>8-10</td>
<td>Front Wheel Toe-in Alignment</td>
<td>8-32</td>
</tr>
<tr>
<td>8-11</td>
<td>Rear Wheel Toe-out Alignment</td>
<td>8-38</td>
</tr>
</tbody>
</table>
8-2. JACKING INSTRUCTIONS

This task covers:

- a. Raising Corner of Vehicle
- b. Lowering Corner of Vehicle
- c. Raising Front of Vehicle
- d. Lowering Front of Vehicle
- e. Raising Rear of Vehicle
- f. Lowering Rear of Vehicle
- g. Raising Entire Vehicle
- h. Lowering Entire Vehicle

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>General Safety Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>Never work under vehicle unless wheels are</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>blocked and it is properly supported.</td>
</tr>
</tbody>
</table>

**WARNING**

Hydraulic jacks are used for raising and lowering, and are not used to support vehicle. Never work under vehicle unless wheels are blocked and it is properly supported. Injury or damage to equipment may result if vehicle suddenly shifts or moves.

**a. Raising Corner of Vehicle**

1. Block wheels (2) or (4).
2. Place jack under lower control arm (5) on corner to be raised.
3. Raise vehicle (1) high enough to place trestle (3).
4. Place trestle (3) under flat portion of frame rail (7) and lower jack until weight is supported by trestle (3).

**b. Lowering Corner of Vehicle**

1. Raise vehicle (1) and remove trestle (3).
2. Lower vehicle (1).
3. Remove blocks from wheels (2) or (4).

**c. Raising Front of Vehicle**

1. Block rear wheels (2).
2. Center jack under front suspension front crossmember (6). Use a wood block between jack and crossmember (6).
3. Raise vehicle (1) high enough to place trestles (3).
4. Place trestles (3) under flat portion of frame rails (7) and lower jack until weight is supported by trestles (3).

**d. Lowering Front of Vehicle**

1. Raise vehicle (1) and remove trestles (3).
2. Lower vehicle (1).
3. Remove blocks from rear wheels (2).
8-2. JACKING INSTRUCTIONS (Cont’d)

e. Raising Rear of Vehicle

1. Block front wheels (4).
2. Center jack under rear suspension rear crossmember (6). Use a wood block between jack and crossmember (6).
3. Raise vehicle (1) high enough to place trestles (3).
4. Place trestles (3) under flat portion of frame rails (5) and lower jack until weight is supported by trestles (3).

f. Lowering Rear of Vehicle

1. Raise vehicle (1) and remove trestles (3).
2. Lower vehicle (1).
3. Remove blocks from front wheels (4).

g. Raising Entire Vehicle

1. Raise front of vehicle (task c).
2. Center jack under rear suspension rear crossmember (6). Use a wood block between jack and crossmember (6).
3. Raise vehicle (1) high enough to place trestles (3).
4. Place trestles (3) under flat portion of frame rails (5) and lower jack until weight is supported by trestles (3).
5. Move blocks aside.

h. Lowering Entire Vehicle

1. Raise rear of vehicle (1) and remove trestles (3).
2. Lower rear of vehicle (1) and block rear wheels (2).
3. Lower front of vehicle (task d).
8-3. WHEEL REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, item 1)

**Manual References**
- TM 9-2320-280-24P

**General Safety Instructions**
- Always apply parking brake and chock opposite wheel before removing wheel.
- Remove only the inner group of nuts when removing a wheel from the vehicle.
- Never mix radial tires and bias ply tires.

**WARNING**

- Always apply parking brake and chock opposite wheel before removing wheel. Avoid removing wheel when vehicle is on sloping terrain. Injury to personnel or damage to equipment may result.
- Remove only the inner group of nuts when removing a wheel from the vehicle. Removing the outer nuts which hold the rim together while the assembly is inflated could result in serious injury or death.
- Radial and Bias ply tires should not be mixed on the same vehicle. Injury to personnel or damage to equipment may result.

**NOTE**

Check tire size designator on sidewall for tire construction identification:
- 36 X 12.50-16.5 LT-Bias ply
- 37 X 12.50R16.5LT-Radial

---

**a. Removal**

1. Lumen eight lug nuts (2), but do not remove.
2. Raise and support corner of vehicle (para. 8-2).
3. Remove eight lug nuts (2) securing wheel (1) to geared hub (3) and remove wheel (1).

---

**b. Installation**

**NOTE**

- Install lug nuts with fingers to full engagement. If nuts resist finger tightening, discard nuts. Examine studs for damage and replace if damaged (para. 6-14).
- The radial tire is nondirectional and can be used in either position.

1. Install wheel (1) on geared hub (3) with eight lug nuts (2).
2. Remove support and lower corner of vehicle (para. 8-2).
3. Tighten eight lug nuts (2) to 90-110 lb-ft. (122-149 N•m) in tightening sequence shown.
This task covers:

a. Disassembly  
b. Inspection and Cleaning  
c. Repair  
d. Assembly

INITIAL SETUP:

**Tools**
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Special Tools**
Torque adapter, 9/16 in. (Appendix B, Item 144)
Socket adapter (Appendix B, Item 146)

**Materials/Parts**
Eight locknuts (Appendix G, Item 92)
Four locknuts (Appendix G, Item 93)
Two lubricant packets (Appendix G, Item 141)
O-ring seal (Appendix G, Item 160)
Balance weights (Appendix G, Item 3)
Detergent (Appendix C, Item 17)
Adhesive tape (Appendix D, Figure D-32)
Filament tape (Appendix D, Figure D-33)

**Manual References**
TM 9-2320-280-10
TM 9-2320-280-24P
TM 9-2610-200-14

**Equipment Condition**
Wheel removed (para. 8-3).

**General Safety Instructions**
- Do not use tire machine.
- Ensure tire is totally deflated before removing wheel locknuts.
- Never use tubes in wheel assemblies.
- Rim surfaces must be kept clean and free of rust and dirt.
- Never use wheel assemblies with damaged studs.
- Never inflate a wheel assembly without first checking wheel locknut torques.
- Use only replacement parts specified in TM 9-2320-280-24P.
- Do not exceed recommended tire inflation pressure.
- Always use a tire inflation cage and a clip-on air chuck for tire inflation.

**WARNING**

Do not use tire machine. Injury to personnel or damage to equipment may result.

**NOTE**

The following maintenance procedure applies to vehicles using bias ply tires and two-piece magnesium runflats. Refer to para. 8-5 for maintenance instructions on radial tires and rubber runflats.

**a. Disassembly**

1. Place wheel assembly in a tire inflation cage.

   **WARNING**

   In all disassembly operations, ensure the tire is totally deflated before removing wheel locknuts. Failure to follow proper safety precautions could cause serious injury or death.

2. Remove valve core (4) from valve stem (3) and deflate tire (6). Run a piece of wire through valve stem (3) to make sure it is not plugged.
3. When tire (6) is fully deflated, remove wheel assembly from tire inflation cage and place flat on floor with valve stem (3) facing up.
4. Using a circular pattern, loosen eight wheel locknuts (1) securing rim halves (2) and (8) together. If you hear escaping air, do not proceed. Wait until the sound stops and recheck valve stem (3). When you are certain the tire (6) is fully deflated, proceed to remove wheel locknuts (1). Discard locknuts (1).
8-4. TIRE, WHEEL, AND RUNFLAT MAINTENANCE (Cont’d)

**WARNING**

Never inflate a wheel assembly with the wheel locknuts removed in an attempt to separate inner and outer rim halves. The assembly will separate under pressure, resulting in serious injury or death.

5. Remove rim half (2) from tire (6).
6. Remove tire (6) from rim half (8).
7. Remove O-ring seal (7) from rim half (8). Cut O-ring seal (7) in two, to make sure that it cannot be reused. Discard O-ring seal (7).
8. Remove four locknuts (11), flange bolts (9), and runflat halves (10) from tire (6). Discard locknuts (11).
9. Remove balance weights (5) from rim halves (2) and (8) (if present). Discard balance weights (5).
8-4. TIRE, WHEEL, AND RUNFLAT MAINTENANCE (Cont’d)

b. Inspection and Cleaning

**CAUTION**

Do not reuse a tire which has been run flat without thoroughly inspecting for damage. Failure to follow these instructions may result in damage to equipment.

1. Inspect inside of tire (1) for cord or belt separation, and inner liner damage. Replace tire (1) if damaged.
2. Inspect tire bead (2) for abrasions caused from runflat halves (3). Replace tire (1) if damaged.
3. Check for protruding objects inside tire (1) which may not be visible from outside. Repair tire (1) if damaged.
4. Check tread depth on tire (1). Tread should not be worn below level of wear bars (4). Replace tire (1) if tread is worn below wear bars (4).
5. Remove filament tape (7), lubricant packet (6), and adhesive tape (5) from runflat halves (3). Discard lubricant packet (6), filament tape (7), and adhesive tape (5).
6. Clean lubricant from tire (1) and runflat halves (3) with soap and water and allow to air dry.
8-4. TIRE, WHEEL, AND RUNFLAT MAINTENANCE (Cont’d)

7. Inspect inside diameter fins (9) and center section fins (10) of runflat halves (8) for cracks or broken sections. Replace runflat halves (8) if cracked or broken.

8. Inspect outside diameter (11) of runflat halves (8) for total penetration cracks. Replace runflat halves (8) if cracked.

**WARNING**

O-ring sealing surfaces and pressure relief grooves must be kept clean and free of rust and dirt. Failure to do so could cause the wheel assembly to separate under pressure if improperly disassembled, causing serious injury or death.

9. Using wire brush, clean studs (16). Clean all dirt and foreign material from rim halves (12) and (14) with soap and water and allow to air dry. Ensure O-ring sealing surfaces (17) and pressure relief grooves (15) on rim halves (12) and (14) if cracked, bent, or if mounting holes are oversized.

10. Inspect rim halves (12) and (14) for cracks, bent sealing surfaces, or oversized mounting holes. Replace rim halves (12) or (14) if cracked, bent, or if mounting holes are oversized.

**WARNING**

Never use wheel assemblies with studs which are damaged, loose, or have damaged threads. Damaged studs can cause improper assembly, which could cause individual fasteners to fail. Any of these situations could cause serious injury or death.

11. Inspect rim half (14) for cracked, broken rusted, pitted, bent, or loose studs (16), and inspect studs (16) for damaged or deformed threads. Replace studs (16) (para. 8-8) if damaged, loose, or threads are damaged.

12. Inspect valve stem (13) for cracks or deterioration. Replace valve stem (13) if cracked or deteriorated.
8-4. TIRE, WHEEL, AND RUNFLAT MAINTENANCE (Cont’d)

c. Repair

Refer to TM 9-2610-200-14 for maintenance and repair of tires.

d. Assembly

**WARNING**

- Never use tubes in wheel assemblies. Use of a tube defeats built-in safety features, and could allow the wheel to come apart under pressure, resulting in serious injury or death.
- Use only replacement parts specified in TM 9-2320-280-24P for bias tires. Eight bolt rims were designed for use with bias tire components only. Wheels assembled with components not specified for bias tires could cause the assembly to separate under pressure, resulting in serious injury or death.

**NOTE**

Magnesium runflats are going to be phased out of the military supply system. They will be replaced by a rubber runflat kit. If rubber runflat kit is received for use with bias tires, follow assembly instructions in para. 8-5.

1. Position strip of double-sided adhesive tape (13) on center of outer surface of each runflat half (1).
2. Position packets of lubricant (12) on adhesive tape (13) and runflat halves (1). Apply four strips of filament tape (11) around each packet of lubricant (12) to ensure bonding to runflat halves (1).
3. Install two runflat halves (1) inside tire (14) with four flange bolts (16) and locknuts (17). Using torque adapter, tighten locknuts (17) to 18-22 lb-ft (24-30 N·m).
8-4. TIRE, WHEEL, AND RUNFLAT MAINTENANCE (Cont’d)
4. Lubricate O-ring seal (8) with tire soap and install O-ring seal (8) on first ledge of rim half (9). Make sure Wing seal (8) is not twisted and is uniformly positioned 1 in. (25.4 mm) below studs (10). Do not overstretch O-ring seal (8).

5. Position inner rim half (9) on a raised stand (or another inner rim half) to ensure tire (6) sidewall will not contact floor when installed.

6. Lubricate tire bead (7) and rim bead seat areas with tire soap.

**NOTE**
Before installing tire on inner rim half, inspect tire sidewalls for a “paint dot”. Paint dots are often painted on tires to indicate the tire’s light spot, for balancing purposes. If paint dot is present, position tire on rim halves so that paint dot is 180° from valve stem on outer rim half.

7. Center runflat (5) in tire (6). Carefully lower tire (6) over rim half (9). Check to ensure O-ring seal (8) has not been disturbed.

8. Ensure runflat (5) is not binding flat portion of rim half (9). Runflat (5) should clear inner rim half (9).

9. Install rim half (2) in tire (6).

**CAUTION**
Tighten locknuts gradually to avoid bent and broken studs, or damage to wheel components.

10. Install rim half (2) to rim half (9) with eight locknuts (1). Tighten locknuts (1) in sequence shown until rim half (2) is nearly touching rim half (9).

11. Tighten locknuts (1) to 55 lb-ft (75 N·m) in sequence shown.

12. Tighten locknuts (1) to 65 lb-ft (88 N·m) in sequence shown.

13. Check wheel assembly for gaps at each stud (10) between rim half (2) and rim half (9). Use a 0.0015 in. (0.038 mm) thickness gauge to detect gaps. If gaps are detected, disassemble and reassemble wheel assembly and recheck for gaps. If gaps are still detected, replace rim half (2).

14. Install valve core (4) in valve stem (3).

**WARNING**
- Never inflate a wheel assembly without having checked wheel locknut torques to ensure the wheel locknuts are tightened to specifications. An assembly with improperly tightened locknuts could separate under pressure resulting in serious injury or death.
- Always use a tire inflation cage for inflation purposes. Stand on one side of cage, during inflation, never directly in front. Keep hands out of the cage during inflation. Inflate assembly to recommended pressure, using a clip-on air chuck. Do not exceed 30 psi (207 kPa) cold inflation pressure. Failure to follow these instructions may result in serious injury or death.

15. Place assembly in safety cage and inflate tire (6) to 30 psi (207 kPa) to seat tire bead.

16. Deflate tire (6) to recommended tire pressure ([TM 9-2320-280-10]).

17. Check for leaks around rim edges (11) and valve stem (4) with soapy solution.
8-4. TIRE, WHEEL, AND RUNFLAT MAINTENANCE (Cont’d)

FOLLOW-ON TASK: Balance tire (para. 8-9).
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE (ALL EXCEPT “A2” VEHICLES)

This task covers:

a. Disassembly
b. Inspection and Cleaning
c. Repair
d. Assembly

INITIAL SETUP:

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

Special Tools
Runflat compressor (Appendix B, Item 131)
Torque adapter, 9/16 in. (Appendix B, Item 144)
Socket adapter (Appendix B, Item 146)

Materials/Parts
Two lubricant packets (Appendix G, Item 141)
 Twelve locknuts (Appendix G, Item 68)
 Locknut (Appendix G, Item 71)
 O-ring seal (Appendix G, Item 163)
 Insert O-Ring (Appendix G, Item 165.1)
 Detergent (Appendix C, Item 17)
 Sealing compound, if required (Appendix C, Item 44)
 Adhesive tape (Appendix D, Figure D-32)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P
TM 9-2610-200-14

Equipment Condition
Wheel removed (para. 8-3).

General Safety Instructions
- Do not use tire machine.
- Ensure tire is totally deflated before removing wheel locknuts.
- Never use tubes in wheel assemblies.
- Rim surfaces must be kept clean and free of rust and dirt.
- Never use wheel assemblies with damaged studs.
- Never inflate a wheel assembly with the wheel locknuts removed.
- Never inflate a wheel assembly without first checking wheel locknut torques.
- Do not exceed recommended tire inflation pressure.
- Always use a tire inflation cage and a clip-on air chuck for tire inflation.
- Ensure runflat compressor strap is centered around runflat.
- Never install radial tire on eight bolt wheel.
- Do not mix radial and bias tires.

WARNING
Do not use tire machine. Injury to personnel or damage to equipment may result.

NOTE
The following maintenance procedure applies to vehicles using load range “D” tires and one-piece rubber runflats. Refer to para. 8-4 for maintenance instructions on bias tires and magnesium runflats.

**a. Disassembly**

1. Place wheel assembly in a tire inflation cage.

**WARNING**
In all disassembly operations, ensure the tire is totally deflated before removing wheel locknuts. Failure to follow proper safety precautions could cause serious injury or death.

2. Remove valve core (8) from valve bore (9) and deflate tire (6). Run a piece of wire through valve bore (9) to make sure it is not plugged.

3. When tire (6) is fully deflated, use a circular pattern and loosen twelve wheel locknuts (2) securing rim halves (1) and (4) together. If you hear escaping air, do not proceed. Wait until the sound stops and recheck valve bore (9). When you are certain the tire (6) is fully deflated, proceed to remove wheel locknuts (2). Discard locknuts (2).
Never inflate a wheel assembly with the wheel locknuts removed in an attempt to separate inner and outer rim halves. The assembly will separate under pressure resulting in serious injury or death.

4. Remove outer rim half (1) from tire (6).

NOTE
Perform steps 5 and 6 only if damage to valve bore, insert, or O-ring is evident.

5. Remove valve bore (9) from insert (10). Remove insert (10) and locknut (12) from outer rim (1). Discard locknut (12).
8. Remove tire (6) from inner rim half (4).
9. Remove balance weights (3) from rim halves (1) and (4), if present. Discard balance weights (3).
10. Remove runflat spacer (7) from tire (6).
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE (ALL EXCEPT “A2” VEHICLES) (Cont’d)

11. Lay tire (1) flat.

**WARNING**

Do not use runflat compressor if compressor strap is frayed or damaged. Ensure runflat is free of grease and runflat compressor strap is centered around runflat. Failure to do so could cause injury to personnel.

**NOTE**

Perform steps 12 and 13 when using runflat compressor P/N J 39250.
Perform steps 14 and 15 when using runflat compressor P/N 528236.

12. Position runflat compressor (3) on runflat (2) so that runflat compressor hex drive (4) is facing up and strap (5) is centered around runflat (2).

**NOTE**

Compress runflat by rotating hex drive in either direction. Rotate hex drive opposite to loosen.


14. Position runflat compressor (6) on an outer edge of runflat (2) with handle assembly (7) facing up and strap (8) centered around runflat (2).

**NOTE**

Compress runflat by rotating the handle assembly in a clockwise direction. Rotate handle assembly counterclockwise to loosen.

15. Using runflat compressor (6), compress runflat (2).

**NOTE**

- It may be necessary to use a tire spoon and tire soap to remove runflat from tire.
- When using runflat compressor P/N 528236, handle may need to be removed before removing runflat.

16. Remove runflat (2) from tire (1) and remove runflat compressor (3) or (6) from runflat (2).

17. Remove two lubricant packets (9) and adhesive tape (10) from runflat (2).
b. Inspection and Cleaning

**CAUTION**

Do not reuse a tire which has been run flat without thoroughly inspecting for damage. Failure to follow these instructions may result in damage to equipment.

1. Inspect inside of tire (1) for cord or belt separation, and inner liner damage. Replace tire (1) if damaged.
2. Inspect tire bead (12) for abrasions caused from runflat (2). Replace tire (1) if damaged.
3. Check for protruding objects inside tire (1) which may not be visible from outside. Repair tire (1) if damaged.
4. Check tread depth on tire (1). Tread should not be worn below level of wear bars (13). Replace tire (1) if tread is worn below wear bars (13) or 3/32 in. (2.38 mm).
5. Inspect runflat spacer (11) for splitting, wear, or excessive chafing. Replace runflat spacer (11) if damaged.
6. Clean all grease, dirt, and foreign material from the runflat (2) with soap and water and allow to air dry. Inspect runflat (2) for splitting, wear, or excessive chafing. Replace runflat (2) if damaged.
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE (ALL EXCEPT "A2" VEHICLES) (Cont’d)

WARNING

O-ring sealing surfaces and pressure relief grooves must be kept clean and free of rust and dirt. Failure to do so could cause the wheel assembly to separate under pressure, causing serious injury or death.

7. Using wire brush, clean studs (4). Clean all dirt and foreign material from rim halves (1) and (2) with soap and water and allow to air dry. Ensure O-ring sealing surfaces (5) and pressure relief grooves (3) on rim halves (1) and (2) are smooth and clean.

8. Inspect rim halves (1) and (2) for cracks, bent sealing surfaces (5), or oversized mounting holes. Replace rim halves (1) or (2) if cracked, bent, or if mounting holes are oversized.

WARNING

Never use wheel assemblies with studs which are damaged, loose, or have damaged threads. Damaged studs can cause improper assembly, which could cause individual fasteners to fail. Any of these situations could cause serious injury or death.

9. Inspect inner rim half (2) for cracked, broken, rusted, pitted, bent, or loose studs (4) and studs (4) with damaged, mutilated, or deformed threads. Replace studs (4) (para. 8-8) if damaged, loose, or threads are damaged.

10. Inspect valve core (6) for cracks or deterioration. Replace valve core (6) if cracked or deteriorated.

NOTE

Perform steps 11 and 12 only if valve bore and insert were removed.

11. Inspect valve bore (7) for cracks or deterioration. Replace valve bore (7) if cracked or deteriorated.

12. Inspect insert (8) for damage. Replace insert (8) if damaged.

c. Repair

Refer to TM 9-2610-200-14 for maintenance and repair of tires.
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
(ALL EXCEPT “A2” VEHICLES) (Cont’d)

d. Assembly

WARNING

- Never use tubes in wheel assemblies. Use of a tube defeats built-in safety features, and could allow the wheel to come apart under pressure, resulting in serious injury or death.
- Use only replacement parts specified in TM 9-2320-280-24P for radial tires. Never install radial tire components on eight bolt rims. Wheels assembled with components not specified for radial tires could cause the assembly to separate under pressure, resulting in serious injury or death.
- Radial and bias tires should not be mixed on the same vehicle. Injury to personnel or damage to equipment may result.
- Do not use if compressor strap is frayed or damaged. Ensure runflat is free of grease and runflat compressor strap is centered on runflat. Failure to do so could cause injury to personnel.

NOTE

Perform steps 1 and 2 when using runflat compressor P/N J39250.
Perform steps 3 and 4 when using runflat compressor P/N 528236.

1. Position runflat compressor (10) on runflat (9) so that runflat compressor hex drive (11) is facing up and strap (12) is centered around runflat (9).

   NOTE
   Compress runflat by rotating hex drive in either direction. Rotate hex drive opposite to loosen.

2. Using runflat compressor (10), compress runflat (9).

3. Position runflat compressor (13) on an outer edge of runflat (9) with handle assembly (14) facing up and strap (15) centered around runflat (9).

   NOTE
   Compress runflat by rotating the handle assembly in a clockwise direction. Rotate handle assembly counterclockwise to loosen.

4. Using runflat compressor (13), compress runflat (9).
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
(ALL EXCEPT “A2” VEHICLES) (Cont’d)

NOTE
The radial tire is a bidirectional tire and the tread maybe
positioned in either direction.

5. Stand tire (1) up and lubricate tire bead (3) with tire soap.

NOTE
It maybe necessary to remove the handle assembly on runflat
compressor (P/N 528236) before inserting runflat into tire.

6. Insert runflat (2), compressor side first, as far as possible into tire (1).

7. Lay tire (1) flat on protruding runflat side. Loosen compressor (4). Runflat (2) should insert itself
inside tire (1). If not, repeat steps 5 through 7 and/or use a tire spoon to assist in installation.

NOTE
If required, clean and lubricate bearing assembly on runflat
compressor P/N 528236 after removal.

8. Loosen runflat compressor (4) and remove from tire (1).

9. Position strip of double-sided adhesive tape (7) on each side of runflat (2).

10. Position two packets of lubricant (6) on adhesive tape (7) and runflat (2).

NOTE
- Ensure longer lip of runflat faces inner rim of tire.
- Ensure square cut edge of runflat spacer butts up against flat
  side of runflat.

11. Install runflat spacer (5) inside tire (1) and position on valve side of tire (1).

12. Lubricate O-ring seal (10) with tire soap. Install O-ring (10) in groove (11.1) on top of inner rim (11),
around studs (12). Ensure O-ring is not twisted and that it is uniformly positioned in groove (11.1).
Do not overstretch O-ring (10).

13. Lubricate tire bead (3) and rim bead seat areas with tire soap.
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE (ALL EXCEPT "A2" VEHICLES) (Cont’d)

**WARNING**

Never install radial tire on eight bolt wheel. Damage to equipment may result causing injury to personnel.

**NOTE**

Before installing tire on inner rim half, inspect tire sidewalls for a "paint dot". Paint dots are often painted on tires to indicate the tire's light spot, for balancing purposes. If paint dot is present, position tire on rim halves so that paint dot is aligned with insert hole on outer rim half.

14. Center runflat (2) and runflat spacer (5) in tire (1). Carefully lower tire (1) over inner rim half (11). Check to ensure O-ring seal (10) has not been disturbed.

15. Ensure runflat (2) and runflat spacer (5) are not binding on flat portion of inner rim half (11). Runflat (2) and runflat spacer (5) should clear inner rim half (11).

16. Install valve core (13) in valve bore (14).

**NOTE**

Perform step 17 only if valve bore and insert were removed.

17. Install insert (15), O-ring (16), and locknut (17) on outer rim (9). Apply sealing compound to valve bore (14) and install valve bore (14) on insert (15). Tighten locknut (17) to 40-60 lb-in. (5-7 N·m). Tighten valve bore (14) to 25-30 lb-ft (34-41 N·m).

18. Install outer rim half (9) on inner rim half (11).

**CAUTION**

Tighten locknuts gradually to avoid bent and broken studs, or damage to wheel components.

19. Install outer rim half (9) to inner rim half (11) with twelve locknuts (8).
8-5. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE (ALL EXCEPT "A2" VEHICLES) (Cont’d)

20. Tighten locknuts (1) to 85 lb-ft (115 N\(\cdot\)m) in tightening sequence shown.
21. Tighten locknuts (1) to 125 lb-ft (170 N\(\cdot\)m) in sequence shown.
22. Check wheel assembly for gaps at each stud (2). Use a 0.0015 in. (0.038 mm) thickness gauge to detect gaps. If gaps are detected, disassemble and reassemble wheel assembly and recheck for gaps. If gaps are still detected, replace outer rim half (3).

**WARNING**

- Never inflate a wheel assembly without having checked wheel locknut torques to ensure the wheel locknuts are tightened to specifications. An assembly with improperly tightened locknuts could separate under pressure, resulting in serious injury or death.
- Always use a tire inflation cage for inflation purposes. Stand on one side of the cage, during inflation, never directly in front. Keep hands out of the cage during inflation. Inflate assembly to recommended pressure, using a clip-on air chuck. Do not exceed 50 psi (345 kPa) cold inflation pressure. Failure to follow these instructions may result in serious injury or death.

23. Place assembly in safety cage and inflate front and rear tires to recommended tire pressure [TM 9-2320-280-10].
24. Check for leaks around rim edges (4), insert (6), and valve bore (5) with soapy solution.

TIGHTENING SEQUENCE
FOLLOW-ON TASK: Balance tire (para. 8-9).
8-5.1. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
(“A2” VEHICLES)

This task covers:

a. Disassembly
b. Inspection and Cleaning
c. Repair
d. Assembly

INITIAL SETUP:

Tools
General mechanic’s tool kit: Wheel removed (para. 8-3).
automotive (Appendix B, Item 1)

Special Tools
Runflat compressor (Appendix B, Item 131)
Torque adapter, 9/16 in. (Appendix B, Item 144)
Socket adapter (Appendix B, Item 146)

Materials/Parts
Lubricant (Appendix G, Item 141.1)
Twelve locknuts (Appendix G, Item 68)
Locknut (Appendix G, Item 71)
O-ring seal (Appendix G, Item 163.1)
Insert O-Ring (Appendix G, Item 165.1)
Detergent (Appendix C, Item 17)
Sealing compound, if required
(Appendix C, Item 44)

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P
TM 9-2610-200-14

Equipment Condition
Wheel removed (para. 8-3).

General Safety Instructions
- Do not use tire machine.
- Ensure tire is totally deflated before removing wheel locknuts.
- Never use tubes in wheel assemblies.
- Rim surfaces must be kept clean and free of rust and dirt.
- Never use wheel assemblies with damaged studs.
- Never inflate a wheel assembly with the wheel locknuts removed.
- Never inflate a wheel assembly without first checking wheel locknut torques.
- Do not exceed recommended tire inflation pressure.
- Always use a tire inflation cage and a clip-on air chuck for tire inflation.
- Ensure runflat compressor strap is centered around runflat.
- Never install radial tire on eight bolt wheel.
- Do not mix radial and bias tires.

WARNING
Do not use tire machine. Injury to personnel or damage to equipment may result.

NOTE
The following maintenance procedure applies to vehicles using load range “D” tires and one-piece rubber runflats. Refer to para. 8-4 for maintenance instructions on bias tires and magnesium runflats.

a. Disassembly

1. Place wheel assembly in a tire inflation cage.

WARNING
In all disassembly operations, ensure the tire is totally deflated before removing wheel locknuts. Failure to follow proper safety precautions could cause serious injury or death.

2. Remove valve core (8) from valve bore (7) and deflate tire (6). Run a piece of wire through valve bore (7) to make sure it is not plugged.

3. When tire (6) is fully deflated, use a circular pattern and loosen twelve wheel locknuts (2) securing rim halves (1) and (4) together. If you hear escaping air, do not proceed. Wait until the sound stops and recheck valve bore (7). When you are certain the tire (6) is fully deflated, proceed to remove wheel locknuts (2). Discard locknuts (2).
WARNING

Never inflate a wheel assembly with the wheel locknuts removed in an attempt to separate inner and outer rim halves. The assembly will separate under pressure resulting in serious injury or death.

4. Remove outer rim half (1) from tire (6).

NOTE

Perform steps 5 and 6 only if damage to valve bore, insert, or O-ring is evident.

5. Remove valve bore (7) from insert (10). Remove insert (10) and locknut (11) from outer rim (1). Discard locknut (11).

6. Remove O-ring (9) from insert (10). Discard O-ring (9).


8. Remove tire (6) from inner rim half (4).

9. Remove balance weights (3) from rim halves (1) and (4), if present. Discard balance weights (3).
10. Lay tire (1) flat.

**WARNING**
Do not use runflat compressor if compressor strap is frayed or damaged. Ensure runflat is free of grease and runflat compressor strap is centered around runflat. Failure to do so could cause injury to personnel.

**NOTE**
Perform steps 11 and 12 when using runflat compressor P/N J39250. Perform steps 13 and 14 when using runflat compressor P/N 528236.

11. Position runflat compressor (3) on runflat (2) so that runflat compressor hex drive (4) is facing up and strap (5) is centered around runflat (2).

**NOTE**
Compress runflat by rotating hex drive in either direction. Rotate hex drive opposite to loosen.


13. Position runflat compressor (6) on an outer edge of runflat (2) with handle assembly (7) facing up and strap (8) centered around runflat (2).

**NOTE**
Compress runflat by rotating the handle assembly in a clockwise direction. Rotate handle assembly counterclockwise to loosen.

14. Using runflat compressor (6), compress runflat (2).

**NOTE**
- It may be necessary to use a tire spoon and tire soap to remove runflat from tire.
- When using runflat compressor P/N 528236, handle may need to be removed before removing runflat.

15. Remove runflat (2) from tire (1) and remove runflat compressor (3) or (6) from runflat (2).
8-5.1. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
(“A2” VEHICLES) (Cont’d)

b. Inspection and Cleaning

CAUTION

Do not reuse a tire which has been run flat without thoroughly inspecting for damage. Failure to follow these instructions may result in damage to equipment.

1. Inspect inside of tire (1) for cord or belt separation, and inner liner damage. Replace tire (1) if damaged.
2. Inspect tire bead (9) for abrasions caused from runflat (2). Replace tire (1) if damaged.
3. Check for protruding objects inside tire (1) which may not be visible from outside. Repair tire (1) if damaged.
4. Check tread depth on tire (1). Tread should not be worn below level of wear bars (10). Replace tire (1) if tread is worn below wear bars (10) or 3/32 in. (2.38 mm).
5. Clean all grease, dirt, and foreign material from the runflat (2) with soap and water and allow to air dry. Inspect runflat (2) for splitting, wear, or excessive chafing. Replace runflat (2) if damaged.
8-5.1. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
(“A2” VEHICLES) (Cont’d)

**WARNING**

O-ring sealing surfaces and pressure relief grooves must be kept clean and free of rust and dirt. Failure to do so could cause the wheel assembly to separate under pressure, causing serious injury or death.

6. Using wire brush, clean studs (4). Clean all dirt and foreign material from rim halves (1) and (2) with soap and water and allow to air dry. Ensure O-ring sealing surfaces (5) and pressure relief grooves (3) on rim halves (1) and (2) are smooth and clean.

7. Inspect rim halves (1) and (2) for cracks, bent sealing surfaces (5), or oversized mounting holes. Replace rim halves (1) or (2) if cracked, bent, or if mounting holes are oversized.

**WARNING**

Never use wheel assemblies with studs which are damaged, loose, or have damaged threads. Damaged studs can cause improper assembly, which could cause individual fasteners to fail. Any of these situations could cause serious injury or death.

8. Inspect inner rim half (2) for cracked, broken, rusted, pitted, bent, or loose studs (4) and studs (4) with damaged, mutilated, or deformed threads. Replace studs (4) [para. 8-8] if damaged, loose, or threads are damaged.

9. Inspect valve core (6) for cracks or deterioration. Replace valve core (6) if cracked or deteriorated.

**NOTE**

Perform steps 10 and 11 only if valve bore and insert were removed.

10. Inspect valve bore (7) for cracks or deterioration. Replace valve bore (7) if cracked or deteriorated.

11. Inspect insert (8) for damage. Replace insert (8) if damaged.

**c. Repair**

Refer to TM 9-2610-200-14 for maintenance and repair of tires.
8-5.1. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
(“A2” VEHICLES) (Cont’d)

d. Assembly

**WARNING**

- Never use tubes in wheel assemblies. Use of a tube defeats built-in safety features, and could allow the wheel to come apart under pressure, resulting in serious injury or death.
- Use only replacement parts specified in TM 9-2320-280-24P for radial tires. Never install radial tire components on eight bolt rims. Wheels assembled with components not specified for radial tires could cause the assembly to separate under pressure, resulting in serious injury or death.
- Radial and bias tires should not be mixed on the same vehicle. Injury to personnel or damage to equipment may result.
- Do not use if compressor strap is frayed or damaged. Ensure runflat is free of grease and runflat compressor strap is centered on runflat. Failure to do so could cause injury to personnel.

**NOTE**

Perform steps 1 and 2 when using runflat compressor P/N J 39250.
Perform steps 3 and 4 when using runflat compressor P/N 528236.

1. Position runflat compressor (10) on runflat (9) so that runflat compressor hex drive (11) is facing up and strap (12) is centered around runflat (9).

   **NOTE**
   Compress runflat by rotating hex drive in either direction. Rotate hex drive opposite to loosen.

2. Using runflat compressor (10), compress runflat (9).

3. Position runflat compressor (13) on an outer edge of runflat (9) with handle assembly (14) facing up and strap (15) centered around runflat (9).

   **NOTE**
   Compress runflat by rotating the handle assembly in a clockwise direction. Rotate handle assembly counterclockwise to loosen.

4. Using runflat compressor (13), compress runflat (9).
8-5.1. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE
("A2" VEHICLES) (Cont'd)

NOTE
The radial tire is a bidirectional tire and the tread maybe
positioned in either direction.

5. Apply even coat of lubricant on outer edge (2) of runflat (3).

NOTE
It maybe necessary to remove the handle assembly on runflat
compressor (P/N 528236) before inserting runflat into tire.

6. Insert runflat (3), compressor side first, as far as possible into tire (1).

7. Lay tire (1) flat on protruding runflat side. Loosen compressor (5). Runflat (3) should insert itself
inside tire (1). If not, repeat steps 5 through 7 and/or use a tire spoon to assist in installation.

NOTE
If required, clean and lubricate bearing assembly on runflat
compressor P/N 528236 after removal.

8. Loosen runflat compressor (5) and remove from tire (1).

WARNING
Never install radial tire on eight bolt wheel. Damage to equipment
may result causing injury to personnel.

NOTE
Before installing tire on inner rim half, inspect tire sidewalls for a
“paint dot”. Paint dots are often painted on tires to indicate the tire’s
light spot, for balancing purposes. If paint dot is present, position tire on
rim halves so that paint dot is aligned with insert hole on outer rim half

9. Lubricate tire bead (4) and rim bead seat areas with tire soap.

10. Center runflat (3) in tire (1). Carefully lower tire (1) over inner rim half (9).

11. Ensure runflat (3) is not binding on flat portion of inner rim half (9). Runflat (3) should clear inner
rim half (9).
8-5.1. RADIAL TIRE, WHEEL, AND RUBBER RUNFLAT MAINTENANCE ("A2" VEHICLES) (Cont'd)

NOTE
Ensure longer lip of runflat faces outer rim half.

12. Lubricate O-ring seal (8) with tire soap. Install O-ring (8) in groove (10) on top of inner rim (9), around studs (11). Ensure O-ring is not twisted and that it is uniformly positioned in groove (10). Do not overstretch O-ring (8).

13. Install valve core (12) in valve bore (13).

NOTE
Perform step 14 only if valve bore and insert were removed.

14. Install insert (14), O-ring (15), and locknut (16) on outer rim (7). Apply sealing compound to valve bore (13) and install valve bore (13) on insert (14). Tighten locknut (16) to 40-60 lb-in. (5-7 N·m). Tighten valve bore (13) to 25-30 lb-ft (34-41 N·m).

15. Install outer rim half (7) on inner rim half (9).

CAUTION
Tighten locknuts gradually to avoid bent and broken studs, or damage to wheel components.

16. Install outer rim half (7) on inner rim half (9) with twelve locknuts (6).
17. Tighten locknuts (1) to 85 lb-ft (115 N·m) in tightening sequence shown.
18. Tighten locknuts (1) to 125 lb-ft (170 N·m) in sequence shown.
19. Check wheel assembly for gaps at each stud (2). Use a 0.0015 in. (0.038 mm) thickness gauge to detect gaps. If gaps are detected, disassemble and reassemble wheel assembly and recheck for gaps. If gaps are still detected, replace outer rim half (3).

**WARNING**

- Never inflate a wheel assembly without having checked wheel locknut torques to ensure the wheel locknuts are tightened to specifications. An assembly with improperly tightened locknuts could separate under pressure, resulting in serious injury or death.
- Always use a tire inflation cage for inflation purposes. Stand on one side of the cage, during inflation, never directly in front. Keep hands out of the cage during inflation. Inflate assembly to recommended pressure, using a clip-on air chuck. Do not exceed 50 psi (345 kPa) cold inflation pressure. Failure to follow these instructions may result in serious injury or death.

20. Place assembly in safety cage and inflate front and rear tires to recommended tire pressure.

21. Check for leaks around rim edges (4), insert (6), and valve bore (5) with soapy solution.

**TIGHTENING SEQUENCE**

**FOLLOW-ON TASK:** Balance tire (para. 8-9).
8-6. RUNFLAT COMPRESSOR (P/N J39250) BELT REPLACEMENT

This task covers:
   a. Removal
   b. Installation

INITIAL SETUP:

**Tools**
General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-24P

**Materials/Parts**
Runflat belt repair kit
(Appendix G, Item 205)

---

**a. Removal**

**NOTE**
Note position of belt for installation.

1. Remove small pin (8) from belt (4) and worm gear shaft assembly (1). Discard small pin (8).
2. Remove shaft pin (7) and worm gear shaft assembly (1) from compressor assembly (6). Discard shaft pin (7).
3. Remove two locknuts (5), sockethead screws (2), spacers (3), and belt (4) from compressor assembly (6). Discard locknuts (5).

---

**b. Installation**

**NOTE**
Belt overlap is to be positioned so that you have equal amount of belt on each side of worm gear shaft assembly.

1. Install belt (4) on compressor assembly (6) with two spacers (3), sockethead screws (2), and locknuts (5).
2. Install worm gear shaft assembly (1) on compressor assembly (6) with shaft pin (7).
3. Install belt (4) to worm gear shaft assembly (1) with small pin (8).
8-7. RUNFLAT COMPRESSOR (P/N 528236) BELT REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Tools**

General mechanic’s tool kit:
- automotive (Appendix B, Item 1)

**Materials/Parts**

Runflat belt repair kit
- (Appendix G, Item 206)

**Manual References**

TM 9-2320-280-24P

---

**a. Removal**

NOTE

Note position of belt for installation.

Remove locknut (1), capscrew (2) and belt (3) from compressor (4). Discard locknut (1).

---

**b. Installation**

1. Install belt (3) on compressor (4) with capscrew (2) and locknut (1).
2. Loop free end of belt (3) around retaining bracket (5) as shown.
8-8. INNER RIM STUD MAINTENANCE

This task covers:

a. Removal
b. Cleaning and Inspection
c. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280-24P

**Equipment Condition**
Wheel removed (para. 8-3).

**General Safety Instructions**
- Always wear eye protection when replacing wheel studs.
- Ensure tire is totally deflated before removing wheel locknuts.
- Never use wheel assemblies with damaged studs.
- Never inflate a wheel assembly without first checking wheel locknut torques.
- Always use a tire inflation cage and a clip-on air chuck for tire inflation.

**WARNING**
Always wear eye protection when replacing wheel studs. Severe eye injury may result if metal chips contact eyes.

**a. Removal**

**NOTE**
Perform steps 1 through 4 for stud removal without disassembly of wheel. Perform steps 5 and 6 for stud removal with disassembled wheel.

1. Place wheel assembly in tire inflation cage.

**WARNING**
In all assembly operations, ensure the tire is totally deflated before removing wheel locknuts. Failure to follow proper safety precautions may result in serious injury or death.

2. Remove valve core (3) from valve bore (4) and deflate tire (1). Run a wire through valve bore (4) to ensure it is not plugged.

3. When tire (1) is fully deflated, loosen wheel locknut (2) from each side of the broken stud(s) (5). If you hear escaping air, do not proceed. Wait until the sound stops and recheck valve bore (4). When you are certain tire is fully deflated, proceed to remove wheel locknut (2). Discard locknut (2).
8-8. INNER RIM STUD MAINTENANCE (Cont’d)

NOTE
When replacing broken rim stud(s), replace studs on both sides of the broken stud(s).

4. Drive studs (1) out of inner rim (2). Discard studs (1).
5. Disassemble wheel and runflat (para. 8-4 or 8-5.)
6. Drive stud (3) out of inner rim half (4). Discard stud (3).

b. Cleaning and Inspection

1. Using wire brush, clean studs. Clean all dirt and foreign material from rim with soap and water and allow to air dry.

WARNING
Never use wheel assemblies with studs which are damaged, loose, or have damaged threads. Damaged studs can cause improper assembly, which could cause individual fasteners to fail. Any of these situations may result in serious injury or death.

2. Inspect inner rim (4) for cracked, broken, rusted, pitted, bent, or loose studs (3), and studs (3) with damaged, mutilated, or deformed threads.

c. Installation

NOTE
Perform steps 1 and 2 for stud installation with disassembled wheel. Perform steps 3 through 11 for stud installation without disassembly of wheel.

1. Align splines on stud (3) with splines in inner rim (4) and drive stud (3) into inner rim (4) until stud shoulder seats against inner rim (4).
2. Assemble wheel and runflat (para. 8-4 or 8-5.).
3. Align splines on stud (1) with splines in inner rim (2) and drive stud (1) into rim (2) until shoulder of stud (1) seats against inner rim (2).
4. Repeat step 3 for all studs (1) being replaced.

CAUTION
Tighten locknuts gradually to avoid bent and broken studs, or damage to wheel components will result.

5. Install locknuts (6) on studs (1).

NOTE
After replacing broken stud(s), all rim nuts must be retorqued.

6. Tighten locknuts (6) to 85 lb-ft (115 N·m) in sequence shown.
7. Tighten locknuts (6) to 125 lb-ft (170 N·m) in sequence shown.
8. Check wheel assembly for gaps at each stud. Use a 0.0015 in. (0.038 mm) thickness gauge to detect gaps. If gaps are detected, disassemble and reassemble wheel assembly and recheck for gaps. If gaps are still detected, replace outer rim half (para. 8-4 or 8-5).
9. Install valve core (7) in valve bore (8).
8-8. INNER RIM STUD MAINTENANCE (Cont’d)

**WARNING**

- Never inflate a wheel assembly before checking wheel locknut torques to ensure the wheel locknuts are tightened to specifications. An assembly with improperly tightened locknuts could separate under pressure, resulting in serious injury or death.
- Always use a tire inflation cage for inflation purposes. Stand on one side of the cage during inflation, never directly in front. Keep hands out of cage during inflation. Inflate assembly to recommended pressure, using a clip-on air chuck. Do not exceed 50 psi (345 kPa) cold inflation pressure. Failure to follow these instructions may result in serious injury or death.

10. Place tire assembly (5) in safety cage and inflate front and rear tires to recommended tire pressure (TM 9-2320-280-10).

11. Check for leaks around rim edges, insert, and valve bore (8) with soapy solution.

**FOLLOW-ON TASK:** Install wheel (para. 8-3).
8-9. TIRE BALANCING

This task covers:

Balancing

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
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<tbody>
<tr>
<td>General mechanic's tool kit: One mechanic</td>
<td>One assistant</td>
</tr>
<tr>
<td>automotive (Appendix B, item 1)</td>
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</table>

<table>
<thead>
<tr>
<th>Test Equipment</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bubble balancer (Appendix B, Item 130)</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Equipment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel balance weights (as required) (Appendix G, Item 3)</td>
<td>Wheel removed (para. 8-3).</td>
</tr>
<tr>
<td>Chalk (Appendix C, Item 15)</td>
<td></td>
</tr>
</tbody>
</table>

NOTE

- Wheel and tire must be clean and free of foreign material.
- Wheel must be centered on balancer utilizing lug nut mounting holes.

1. Mount tire (1) and wheel (2) on balancer, curb side up.
2. Locate and mark light spot (5) on tire (1).

NOTE

- If more than 29 oz. of weight is required to balance tire, wheel and runflat must be disassembled and tire rotated 180° on wheel.
- Tires can be balanced using either adhesive backed or clip on type weights. Follow steps 3 through 10 if using adhesive backed weights, or steps 11 through 15 for clip on type weights.

3. Add 6 oz. of weight (4) to center of light spot (5) between wheel (2) and clamp ring (3) until weight required to balance tire (1) is met or exceeded. Do not permanently attach weights (4) at this time.
4. If weight requirement is exceeded, evenly remove weights (4) in 1/2 oz. increments from each side of light spot (5) until tire (1) and wheel (2) are properly balanced.
5. Record amount of weights (4) used, and remove tire (1) and wheel (2) from balancer.
6. Working from light spot (5) on front side of tire (1), mark rear side of tire (1) and inside of wheel (2) for light spot (5) identification.
7. Temporarily attach weights (4) with tape to inside of wheel (2), in a radial direction, following weight placement diagram.
8. Repeat step 1 and add or subtract weights (4) until tire (1) is properly balanced.

NOTE

Wheel must be smooth and clean before attaching wheel weights.

9. Remove adhesive backing from weights (4) and attach to inside of wheel (2) following weight placement diagram.
10. Repeat step 1 to ensure tire (1) is properly balanced.
11. Place a 6 oz. weight (6) on edge of wheel (2) with clip (7) centered on light spot (5). Do not permanently attach weight (6) at this time.
12. Check wheel (2) and tire (1) for proper balance. If necessary, add weights (6), or replace 6 oz. weight (6) with a lighter weight (6), making sure weight clips (7) are centered on light spot (5) and weight (6) are not permanently attached.
8-9. TIRE BALANCING (Cont’d)

13. Repeat step 12 until wheel (2) and tire (1) are properly balanced.
14. Record total amount of weight (6) on wheel (2), and remove weights(s) from wheel (2) and wheel (2) from balancer.

**NOTE**

Total amount of weight must be split “50/50” between inner and outer edges of wheel rim. For example, if 6 oz. of total weight was required to balance wheel, attach 3 oz. to outer edge of rim and 3 oz. to inner edge of rim.

15. Attach weights (6) to inner and outer edges of wheel (2), ensuring weight clips (7) are centered on light spot (5), or weights (6) are placed evenly to sides of light spot (5) if more than one weight (6) is used. Using small hammer or clip claw-hammer tool, tap weights to conform to wheel (2) edge contour.

FOLLOW-ON TASK: Install wheel (para. 8-3).
8-10. FRONT WHEEL TOE-IN ALIGNMENT

This task covers:

a. Preliminary Inspection
b. Toe-in Check
c. Toe-in Adjustment

INITIAL SETUP:

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Materials/Parts
Chalk (Appendix C, Item 15)

Personnel Required
One mechanic
One assistant

Initial Setup:

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

Materials/Parts
Chalk (Appendix C, Item 15)

Personnel Required
One mechanic
One assistant

Manual References
TM 9-2320-280-10
TM 9-2320-280-24P

Equipment Condition

- Tires inflated to proper pressure (TM 9-2320-280-10)
- Vehicle on level ground.

NOTE

- It is not necessary to perform front wheel toe-in alignment prior to the scheduled semiannual or 3,000 mile (4,827 km) maintenance interval unless abnormal vehicle handling or control is reported, or it is directed by another maintenance task.
- Front wheel alignment adjustments other than toe-in are performed by DS maintenance.
- Make sure models M1037 and M1042 have S250 shelter installed before performing front wheel toe-in alignment.

a. Preliminary Inspection

1. Check all tires (6) for uniform tread wear.
2. Raise vehicle and place support under lower control arms (9).
3. Check geared hubs (4) for output spindle end play by grasping edges of tires (6) and attempting to move tires (6) up and down. Adjust spindle bearings (para. 6-14) if any spindle movement is apparent.
4. Check for looseness of upper ball joints (3) by grasping top of tires (6), and attempting to move tires (6) in and out. Replace upper ball joints (3) (para. 6-26) if tire (6) movement at top outer edge of tires (6) is 3/8 in. (9 mm) or more.
5. Check for looseness of lower ball joints (7) by grasping bottom of tires (6), and attempting to move tires (6) in and out. Replace lower ball joints (7) (para. 6-27) if tire (6) movement at bottom outer edge of tires (6) is 1/2 in. (13 mm) or more.
7. Check for looseness of tie rod ends (5) by attempting to move tie rods (8) vertically and horizontally. Replace tie rod end(s) (5) (para. 8-16) if any movement is apparent.
8. Check for damaged control arm bushings (1). Replace upper control arms (2) (para. 6-28) or lower control arms (9) (para. 6-29) if bushings (1) are damaged.
b. Toe-in Check

**NOTE**

- Vehicle must be on level ground with wheels set straight ahead.
- Steps 1 through 3 will determine centerline of tire.
- "Point of Measurement" for checking toe-in will be where lines marked in steps 1 and 3 intersect.

1. Mark line (4) on center tread (1) of tire (2) 16-1/2 in. (42 cm) from ground.
2. Measure total width of tire tread (3) and record.
3. Mark line (5) on center tread (1) at one-half total tread width (3).
4. Repeat steps 1 through 3 for opposite tire.
5. Measure distance between "Points of Measurement" on front side of tires (2) and record.
6. Rotate tires (2) by moving vehicle forward until “Points of Measurement” are 16-1/2 in. (42 cm) above the ground at rear side of tires (2).
7. Measure distance between “Points of Measurement” on rear side of tires (2) and record.

**NOTE**

- If measurement is larger on front side of tires than measurement on rear side of tires, tires have toe-out.
- If toe-in alignment does not meet specifications, repeat checking procedures to eliminate any possible reading errors.

8. Subtract measurement from front side of tires (2), obtained in step 5, from measurement from rear side of tires (2), obtained in step 7. The result of this subtraction represents inches of toe-in. Refer to table 8-1 for toe-in specifications. If toe-in does not meet specifications, adjust toe-in (task c). Refer to table 8-1 for toe-in adjustment specifications.

9. If toe-in is within specifications, refer to task c and perform step 5.

**NOTE**

- Vehicles should be at curb weight to ensure proper alignment. Refer to table 8-1(a.) for adjustment specifications.
- Table 8-1(b.) is optional and can be used when the vehicle’s average operation is at less than gross vehicle weight. Vehicle is to be loaded to its average operating weight when using this table.

### Table 8-1. Toe-In Alignment Adjustment Specifications.

<table>
<thead>
<tr>
<th>TOE-IN (FRONT) ADJUSTMENT SPECIFICATIONS</th>
<th>BIAS TIRE</th>
<th>RADIAL TIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Vehicle @ curb weight</td>
<td>7/16 ± 1/8 in. (11 mm ± 3 mm)</td>
<td>5/16 ± 1/8 in. (8 mm ± 3 mm)</td>
</tr>
<tr>
<td>b. Vehicle @ normal operating weight (optional)</td>
<td>1/4 ± 1/8 in. (6 mm ± 3 mm)</td>
<td>1/4 ± 1/8 in. (6 mm ± 3 mm)</td>
</tr>
</tbody>
</table>
8-10. FRONT WHEEL TOE-IN ALIGNMENT (Cont'd)
8-10. FRONT WHEEL TOE-IN ALIGNMENT (Cont’d)

c. Toe-in Adjustment

1. Loosen two locknuts (3) from clamps (1) on each adjusting sleeve (2).

   **NOTE**

   Toe-in can be increased or decreased by changing length of tie rods. A threaded sleeve is provided for this purpose. Both tie rods must be the same length ± 1/8 inch (3 mm) after adjustment.

2. Turn each adjusting sleeve (2) equally but in opposite directions.

3. Roll vehicle rearward then forward to original position.

4. Repeat toe-in check and adjustment procedures until correct adjustment is indicated.

   **CAUTION**

   Ensure bolt and nut on adjusting sleeve clamp nearest to geared hub is facing halfshaft. Bolt and nut on adjusting sleeve clamp nearest to frame must be facing away (180°) from stabilizer bar, to prevent damage to equipment.

5. Secure two clamps (1) on each adjusting sleeve (2) with two locknuts (3). Tighten locknuts (3) to 30 lb·f·t (40 N·m).
FOLLOW-ON TASK: Operate vehicle (TM 9-2320-280-10) and check for pull or wander.
8-11. REAR WHEEL TOE-OUT ALIGNMENT

This task covers:

a. Preliminary Inspection  
b. Toe-in Check  
c. Toe-out Adjustment

INITIAL SETUP:

Tools

- General mechanic's tool kit: TM 9-2320-280-10
- Automotive (Appendix B, Item 1)

Manual References

- TM 9-2320-280-10
- TM 9-2320-280-24P

Materials/Parts

- Chalk (Appendix C, Item 15)
- Tape (Appendix C, Item 50)
- Twine (Appendix C, Item 53)

Personnel Required

- One mechanic
- One assistant

NOTE

- It is not necessary to perform rear wheel toe-out alignment prior to the scheduled semiannual or 3,000 mile (4,827 km) maintenance interval unless abnormal vehicle handling or control is reported, or it is directed by another maintenance task.
- Rear wheel alignment adjustments other than toe-out are performed by DS maintenance.
- Make sure models M1037 and M1042 have S250 shelter installed before performing rear wheel toe-out alignment.

a. Preliminary Inspection

1. Check all tires (7) for uniform tread wear.
2. Raise vehicle and place support under lower control arms (11).
3. Check geared hubs (5) for output spindle end play by grasping edges of tires (7) and attempting to move tires (7) up and down. Adjust spindle bearings (para. 6-14) if any spindle movement is apparent.
4. Check for looseness of upper ball joints (4) by grasping top of tires (7), and attempting to move tires (7) in and out. Replace upper ball joints (4) (para. 6-26) if tire (7) movement at top outer edge of tires (7) is 3/8 in. (9 mm) or more.
5. Check for looseness of lower ball joints (8) by grasping bottom of tires (7), and attempting to move tires (7) in and out. Replace lower ball joints (8) (para. 6-27) if tire (7) movement at bottom outer edge of tires (7) is 1/2 in. (13 mm) or more.
7. Check for looseness of radius rod ends (6) by attempting to move adjusting sleeves (10) vertically and horizontally. Replace radius rod end(s) (6) (para. 6-25) if any movement is apparent.
8. Check for damaged control arm bushings (1). Replace upper control arms (3) (para. 6-28) or lower control arms (11) (para. 6-29) if bushings (1) are damaged.
9. Set front wheels in straight ahead position. This can be checked by driving vehicle a short distance on a flat surface to determine steering wheel position at which vehicle follows a straight path.
10. Tape one end of a piece of string (12) to inner wall of front tire (7).
11. Ensure front tire (7) is straight. Pull string (12) to rear tire (7) until string (12) touches front of rear tire (7). Measure distance between string (12) and rear side wall of rear tire (7).
8-11. REAR WHEEL TOE-OUT ALIGNMENT (Cont'd)

12. Measurement must be 0-118 in. (0-3 mm). If measurement is not within specifications, perform step 13. If measurement is within specifications, proceed to step 14.

13. Loosen two locknuts (2) securing clamps (9). Turn adjusting sleeve (10) until measurement is within specifications. Roll vehicle forward then rearward and repeat steps 10 through 12 to ensure correct adjustment.

14. Repeat steps 10 through 12 for opposite side.

15. Proceed to task b.
8-11. REAR WHEEL TOE-OUT ALIGNMENT (Cont’d)

b. Toe-out Check

NOTE
- Vehicle must be on level ground with wheels set straight ahead.
- Steps 1 through 3 will determine centerline of tire.
- “Point of Measurement” for checking toe-out will be where lines marked in steps 1 and 3 intersect.

1. Mark line (4) on center tread (1) of tire (2) 16-3/2 in. (42 cm) from ground.
2. Measure total width of tire tread (3) and record.
3. Mark line (5) on center tread (1) at one-half total tread width (3).
4. Repeat steps 1 through 3 for opposite tire.
5. Measure distance between “Points of Measurement” on front side of tires (2) and record.
6. Rotate tires (2) by moving vehicle forward until “Points of Measurement” are 16-1/2 in. (42 cm) above the ground at rear side of tires (2).
7. Measure distance between “Points of Measurement” on rear side of tires (2) and record.

NOTE
- If measurement is larger on rear side of tires than measurement on front side of tires, tires have toe-in.
- If toe-out alignment does not meet specifications, repeat checking procedures to eliminate any possible reading errors.

8. Subtract measurement from rear side of tires (2) step 7, from measurement from front side of tires (2) step 5. The result of this subtraction represents inches of toe-out. Refer to table 8-2 for toe-out specifications. If toe-out does not meet specifications, adjust toe-out (task c). Refer to table 8-2 for toe-out adjustment specifications.

9. If toe-out is within specifications, refer to (task c), and perform step 5.

NOTE
- Vehicles should be at curb weight to ensure proper alignment. Refer to table 8-2(a.) for adjustment specifications.
- Table 8-2(b.) is optional and can be used when the vehicle’s average operation is at less than gross vehicle weight. Vehicle is to be loaded to its average operating weight when using this table.

Table 8-2. Toe-Out Alignment Adjustment Specifications.
8-11. REAR WHEEL TOE-OUT ALIGNMENT (Cont'd)

POINT OF MEASUREMENT

TOE-OUT MEASUREMENT
8-11. REAR WHEEL TOE-OUT ALIGNMENT (Cont’d)

c. Toe-out Adjustment

1. Loosen two locknuts (1) securing two clamps (3) on each adjusting sleeve (2).

   **NOTE**
   
   Toe-out can be increased or decreased by changing length of radius rods. A threaded sleeve is provided for this purpose.

2. Turn each adjusting sleeve (2) equally but in opposite directions.
3. Roll vehicle rearward then forward to original position.
4. Repeat toe-out check and adjustment procedures until correct adjustment is indicated.
5. Secure two clamps (3) on each adjusting sleeve (2) with two locknuts (1). Tighten locknuts (1) to 30 lb-ft (40 N·m).

FOLLOW-ON TASK: Operate vehicle (TM 9-2320-280-10) and check for pull or wander.
## 8-12. STEERING COMPONENTS MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-13</td>
<td>Steering Wheel Replacement</td>
<td>8-44</td>
</tr>
<tr>
<td>8-14</td>
<td>Pitman Arm Replacement</td>
<td>8-46</td>
</tr>
<tr>
<td>8-15</td>
<td>Center Link Replacement</td>
<td>8-48</td>
</tr>
<tr>
<td>8-16</td>
<td>Tie Rod Maintenance</td>
<td>8-50</td>
</tr>
<tr>
<td>8-17</td>
<td>Tie Rod End Replacement</td>
<td>8-52</td>
</tr>
<tr>
<td>8-18</td>
<td>Idler Arm Maintenance</td>
<td>8-54</td>
</tr>
<tr>
<td>8-19</td>
<td>Steering Column Replacement</td>
<td>8-58</td>
</tr>
<tr>
<td>8-20</td>
<td>Intermediate Steering Shaft Replacement</td>
<td>8-62</td>
</tr>
<tr>
<td>8-21</td>
<td>Steering Gear Replacement</td>
<td>8-64</td>
</tr>
<tr>
<td>8-22</td>
<td>Steering Shaft U-Joint Replacement</td>
<td>8-68</td>
</tr>
<tr>
<td>8-23</td>
<td>Intermediate Steering Shaft Close-off and Retainer Replacement</td>
<td>8-70</td>
</tr>
<tr>
<td>8-24</td>
<td>Power Steering Pump, Pulley, and Bracket Maintenance</td>
<td>8-72</td>
</tr>
<tr>
<td>8-25</td>
<td>Power Steering Hydraulic System Pressure and Return Hose Replacement</td>
<td>8-76</td>
</tr>
<tr>
<td>8-26</td>
<td>Power Steering System Hydraulic Control Valve Maintenance</td>
<td>8-78</td>
</tr>
<tr>
<td>8-27</td>
<td>Power Steering Cooler Hose Replacement</td>
<td>8-82</td>
</tr>
<tr>
<td>8-28</td>
<td>Power Steering Cooler Replacement</td>
<td>8-84</td>
</tr>
<tr>
<td>8-29</td>
<td>Power Steering System Bleeding</td>
<td>8-86</td>
</tr>
</tbody>
</table>
8-13. STEERING WHEEL REPLACEMENT

This task covers:

| a. Removal | b. Installation |

INITIAL SETUP:

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)
  - Steering wheel puller (Appendix B, Item 169)

**Materials/Parts**
- Nut (Appendix G, Item 143)

**Equipment Condition**
- Horn switch removed (para. 4-20).

**Manual References**
- TM 9-2320-280-24P

---

**a. Removal**

1. Remove nut (2) from steering wheel (1) and shaft (3). Discard nut (2).
2. Using puller, remove steering wheel (1).

**b. Installation**

1. Align splines on steering wheel (1) with splines on shaft (3).
2. Install steering wheel (1) on shaft (3) with nut (2). Tighten nut (2) to 35 lb-ft (47 N·m).
3. Peen nut (2).
FOLLOW-ON TASK: Install horn switch (para. 4-20).
8-14. PITMAN ARM REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit:
   automotive (Appendix B, Item 1)
   Puller kit (Appendix B, Item 167)

Materials/Parts
   Cotter pin (Appendix G, Item 22)
   Lockwasher (Appendix G, Item 114)

NOTE
Ensure front wheels are in straight ahead position while pitman arm is removed and installed.

a. Removal

1. Remove nut (1), lockwasher (2), and pitman arm (3) from steering gear shaft (4). Discard lockwasher (2).
2. Remove cotter pin (6) and slotted nut (7) from pitman arm (3) and center link (5). Discard cotter pin (6).
3. Using puller, remove pitman arm (3) from center link (5).

b. Installation

1. Install pitman arm (3) on steering gear shaft (4) with lockwasher (2) and nut (1).
2. Install pitman arm (3) on center link (5) with slotted nut (7). Tighten slotted nut (7) to 80 lb-ft (108 Nm).
3. Tighten nut (1) to 185 lb-ft (251 N·m).

CAUTION
Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

4. Install cotter pin (6) in slotted nut (7).
FOLLOW-ON TASKS:

- Lubricate pitman arm (TM 9-2320-280-10)
- Remove supports and lower front of vehicle (para. 8-2)
8-15. CENTER LINK REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**

- General mechanic's tool kit: TM 9-2320-280-24P automotive (Appendix B, Item 1)
- Puller kit (Appendix B, Item 167)

**Manual References**

- TM 9-2320-280-24P

**Equipment Condition**

Front of vehicle raised and supported (para. 8-2).

**Materials/Parts**

- Four cotter pins (Appendix G, Item 22)

---

**CAUTION**

Use of a pickle fork in lieu of puller kit may damage serviceable components (boots).

### a. Removal

1. Remove cotter pin (5) and slotted nut (4) from idler arm (8) and center link (3). Discard cotter pin (5).
2. Remove cotter pin (9) and slotted nut (10) from pitman arm (2) and center link (3). Discard cotter pin (9).
3. Remove two cotter pins (1) and slotted nuts (6) from two tie rods (7) and center link (3). Discard cotter pins (1).
4. Using puller, remove center link (3) from two tie rods (7), idler arm (8), and pitman arm (2).

### b. Installation

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

1. Install center link (3) on pitman arm (2) and idler arm (8) with slotted nuts (4) and (10). Tighten slotted nuts (4) and (10) to 80 lb-ft (108 N·m).
2. Install cotter pins (5) and (9) in slotted nuts (4) and (10).
3. Install two tie rods (7) to center link (3) with two slotted nuts (6). Tighten slotted nuts (6) to 70 lb-ft (95 N·m).
4. Install two cotter pins (1) in slotted nuts (6).
8-15. CENTER LINK REPLACEMENT (Cont’d)

FOLLOW-ON TASK: Remove supports and lower front of vehicle (para. 8-2).
8-16. TIE ROD MAINTENANCE

This task covers:

a. Removal  
b. Disassembly  
c. Assembly  
d. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- Puller kit (Appendix B, Item 167)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Two cotter pins (Appendix G, Item 22)

**Equipment Condition**
- Front of vehicle raised and supported (para. 8-2).

---

**CAUTION**

Use of a pickle fork in lieu of puller kit may damage serviceable components (boots).

---

**a. Removal**

1. Remove cotter pin (8), and slotted nut (7) from tie rod (2) and center link (1). Discard cotter pin (8).
2. Remove cotter pin (6), slotted nut (5), washer (4), and tie rod (2) from geared hub (3). Discard cotter pin (6).

---

**b. Disassembly**

1. Loosen two capscrews (10), nuts (13), and clamps (11) securing tie rod ends (9) to adjusting sleeve (12).
   
   **NOTE**
   
   Note number of threads exposed on each tie rod end for installation. Approximately the same number of threads should be exposed on each tie rod end.

2. Remove two tie rod ends (9) from adjusting sleeve (12).
3. Remove two nuts (13), capscrews (10), and clamps (11) from adjusting sleeve (12).

---

**c. Assembly**

1. Install two clamps (11), capscrews (10), and nuts (13) on adjusting sleeve (12).
2. Install two tie rod ends (9) into adjusting sleeve (12), turning tie rod ends (9) equally but in opposite directions.

---

**d. Installation**

1. Install tie rod (2) to center link (1) with slotted nut (7). Tighten slotted nut (7) to 70 lb-ft (95 N·m).
   
   **CAUTION**
   
   Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

2. Install tie rod (2) to geared hub (3) with washer (4) and slotted nut (5). Tighten slotted nut (5) to 70 lb-ft (95 N·m).
3. Install cotter pin (8) in slotted nut (7).
4. Install cotter pin (6) in slotted nut (5).
8-16. TIE ROD MAINTENANCE (Cont’d)

CAUTION

Ensure the outboard clamp faces the halfshaft and the inboard clamp faces away from the stabilizer bar (front only) or damage to equipment may result.

5. Tighten two locknuts (13).

FOLLOW-ON TASKS:
- Lubricate tie rod end (TM 9-2320-280-10)
- Remove supports and lower front of vehicle (para. 8-2)
- Align toe-in (para. 8-10)
8-17. TIE ROD END REPLACEMENT

This task covers:
   a. Removal
   b. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)
  - Pickle fork (Appendix B, Item 129)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Front of vehicle raised and supported (para. 8-2).

**Materials/Parts**
- Cotter pin (Appendix G, Item 22)

---

**a. Removal**

1. Remove cotter pin (8), slotted nut (7), and washer (6) from tie rod end (4) and geared hub (5).
   - Discard cotter pin (8).
2. Using puller, remove tie rod end (4) from geared hub (5).

**NOTE**

Note number of threads exposed on each tie rod end for installation. Approximately the same number of threads should be exposed on each tie rod end.

3. Loosen nut (9), capscrew (3), clamp (2), and tie rod end (4) from adjusting sleeve (1).

---

**b. Installation**

**CAUTION**

Ensure clamp faces halfshaft or damage to equipment may result.

1. Install tie rod end (4) into sleeve (1) with clamp (2), capscrew (3), and nut (9).

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

2. Install tie rod end (4) to geared hub (5) with washer (6) and slotted nut (7). Tighten slotted nut (7) to 70 lb-ft (95 N•m).
3. Install cotter pin (8) in slotted nut (7).
FOLLOW-ON TASKS:

- Lubricate tie rod end (TM 9-2320-280-10).
- Remove supports and lower front of vehicle (para. 8-2).
- Align toe-in (para. 8-10).
8-18. IDLER ARM MAINTENANCE

This task covers:

a. Removal
b. Installation
c. Inspection

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10 (automotive)
- Pickle fork (Appendix B, Item 129)
- Spring scale, dial indicating (Appendix B, Item 2)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Front of vehicle raised and supported (para. 8-2).

**Materials/Parts**
- Cotter pin (Appendix G, Item 19)

---

**a. Removal**

1. Remove cotter pin (1) and slotted nut (8) from idler arm (7) and center link (2). Discard cotter pin (1).
2. Using puller, disconnect center link (2) from idler arm (7).
3. Remove two nuts (6), washers (4), capscrews (3), washers (4), and idler arm (7) from frame (5).

**b. Installation**

1. Install idler arm (7) to frame (5) with two washers (4), capscrews (3), washers (4), and nuts (6). Tighten nuts (6) to 60 lb-ft (81 N·m).
2. Install idler arm (7) to center link (2) with slotted nut (8). Tighten slotted nut (8) to 80 lb-ft (108 N·m).

**CAUTION**

Do not loosen slotted nut to install cotter pin. Doing this may result in damage to equipment.

3. Install cotter pin (1) in slotted nut (8).
8-18. IDLER ARM MAINTENANCE (Cont’d)
c. Inspection

NOTE
Set front wheels in a straight ahead position.

1. Check idler arm (5) for visible damage, such as breaks and cracks. If damaged, replace idler arm (5).
2. Check capscrews (4) for looseness of idler arm bracket (3) on frame (6). Tighten capscrews (4) if loose.

NOTE
A flat steelplate or piece of scrap metal is required for step 3.

3. Secure a flat steelplate or piece of scrap metal to front crossmember (2).
4. Pull center link (1) downward to seat ball and socket of idler arm (5).
5. Using flat surface on center link (1) as a guide, mark first reference line on steelplate or scrap metal, as shown in figure A.
6. Position spring scale (7) on center link (1) and pull in an upward direction to obtain a 25 lb (11Kg) reading on spring scale (7).

NOTE
Maintain 25 lb (11 Kg) reading on spring scale (7) to perform step 7.

7. Using flat surface on center link (1) as a guide, mark second reference line on steel plate or scrap metal, as shown in figure B.
8. Remove spring scale (7) from center link (1).
9. Remove clamp and steelplate or scrap metal from front crossmember (2).
10. Measure distance between first and second reference line on steel plate or scrap metal. If measurement exceeds 0.25 inch (6mm), replace idler arm (5).
8-18. IDLER ARM MAINTENANCE (Cont’d)

**FOLLOW-ON TASKS:**
- Lubricate idler arm [TM 9-2320-280-10].
- Remove supports and lower front of vehicle (para. 8-2).
### 8-19. STEERING COLUMN REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### INITIAL SETUP:

**Tools**

- General mechanic’s tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**

- Four locknuts (Appendix G, Item 106)
- Lockwasher (Appendix G, Item 108)
- Locknut (Appendix G, Item 91)
- Nut and lockwasher assembly (Appendix G, Item 151)

**Manual References**

- TM 9-2320-280-24P

**Equipment Condition**

- Steering wheel removed (para. 8-13).
- Directional signal control removed (para. 4-64 or 4-65).

#### a. Removal

1. Remove locknut (1), lockwasher (2), washer (3), pin (6), and two spacers (5) from steering column (7 and mounting bracket (4). Discard lockwasher (2) and locknut (1).
2. Remove nut and lockwasher assembly (18), screw (9), and ground 57C (15) from steering column (7). Discard nut and lockwasher assembly (18).

**NOTE**

- Only vehicles with serial number 99,999 and below, using steering column part number 1419, are equipped with spacers as indicated in step 1.
- Steering column part number 1419 is no longer available and is being replaced with part number 1493.

3. Remove locknut (10), washer (11), capscrew (12), washer (11), and two brackets (8) from steering column (7). Discard locknut (10).
4. Disconnect lead 25A (21) from steering column (7).

**NOTE**

Perform step 3 for vehicles with serial numbers 100,000 and above only.

5. Remove locknut (14), washer (13), capscrew (16), and washer (13) and disconnect intermediate shaft (17) from steering column (7). Discard locknut (14).

**NOTE**

When performing step 5, temporarily install steering wheel and turn steering column to gain access to steering column intermediate shaft mounting hardware.

6. Remove two locknuts (22), washers (23), screws (24), washers (23), and steering column (7) from mounting bracket (4). Discard locknuts (22).
7. Remove two locknuts (19), washers (20), shoulder bolts (9), and steering column (7) from mounting bracket (4). Discard locknuts (19).

**NOTE**

Perform step 6 for “A2” series vehicles only.
8-19. STEERING COLUMN REPLACEMENT (Cont'd)
8-19. STEERING COLUMN REPLACEMENT (Cont'd)

b. Installation

NOTE
Perform step 1 for “A2” series vehicles only.

1. Install steering column (7) on mounting bracket (4) with two washers (23), screws (24), washers (23) and locknuts (22). Tighten locknuts (22) finger tight.

2. Install steering column (7) on mounting bracket (4) with two shoulder bolts (9), washera (20), and locknuts (19). Tighten locknuts (19) finger tight.

3. Install intermediate shaft (17) on steering column (7) with washer (13), capscrew (16), washer (13), and locknut (14). Tighten locknut (14) to 40-50 lb-ft (54-68 N·m).

4. Connect lead 25A (21) to steering column (7).

5. Install two brackets (8) on steering column (7) with washer (11), capscrew (12), washer (11), and locknut (10).

6. Install ground 57C (15) on steering column (7) with screw (9) and nut and lockwasher assembly (18).

NOTE
- Only vehicles with serial number 99,999 and below using steering column part number 1419, are equipped with spacers as indicated in step 7.
- Insert washer and pin with locking tabs in the “up” position.

7. Secure steering column (7) to mounting bracket (4) with two spacers (5), pin (6), washer (3), lockwasher (2), and locknut (1). Tighten locknut (1) finger tight.

8. Position steering column (7) in upright position and tighten locknut (1) to 12-15 lb-ft (16-20 N·m).

9. Tighten locknuts (22) and (19) to 9-11 lb-ft (12-15 N·m).
FOLLOW-ON TASKS: • Install directional signal control (para. 4-64 or 4-65).
  • Install steering wheel (para. 8-13).
8-20. INTERMEDIATE STEERING SHAFT REPLACEMENT

This task covers:

| a. Removal | b. Installation |

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit:
  - automotive (Appendix B, Item 1)
  - TM 9-2320-280-10

**Manual References**
- TM 9-2320-280-24P

**Materials/Parts**
- Two locknuts (Appendix G, Item 58)

**NOTE**
Ensure front wheels are in straight-ahead position while removing and installing intermediate steering shaft.

### a. Removal

1. Remove locknut (6), washer (5), capscrew (8), and washer (5) from intermediate steering shaft (4) and steering gear (7). Discard locknut (6).
2. Remove locknut (2), washer (3), capscrew (9), washer (3), and steering shaft (4) from steering column (1). Discard locknut (2).

### b. Installation

1. Install intermediate steering shaft (4) on steering gear (7) with washer (5), capscrew (8), washer (5), and locknut (6). Tighten locknut (6) to 40-50 lb-ft (5468 N·m).
2. Install steering shaft (4) on steering column (1) with washer (3), capscrew (9), washer (3), and locknut (2). Tighten locknut (2) to 40-50 lb-ft (54-68 N·m).
FOLLOW-ON TASK: Lubricate steering shaft (TM 9-2320-280-10)
# 8-21. STEERING GEAR REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
</table>

## INITIAL SETUP:

### Tools
- General mechanic's tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)
- TM 9-2320-280-24P

### Materials/Parts
- Locknut (Appendix G, Item 58)
- Lockwasher (Appendix G, Item 110)
- Three lockwashers (Appendix G, Item 118)

### Equipment Condition
- Hood raised and secured (TM 9-2320-280-10)
- Battery ground cable disconnected (para. 4-73)

## a. Removal

**CAUTION**

Cover or plug all open lines and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**
- Make sure front wheels are in the straight ahead position.
- Have drainage container ready to catch fluid.

1. Disconnect two power steering lines (4) from steering gear (10).
2. Turn steering wheel left and right several times to bleed off power steering fluid.
3. Remove intermediate shaft locknut (l), washer (2), capscrew (5), and washer (2) and disconnect intermediate shaft (3) from steering gear (10). Discard locknut (1).
4. Remove nut (14) and lockwasher (13) from pitman arm (12). Discard lockwasher (13).
5. Remove pitman arm (12) from shaft (11).
6. Remove three capscrews (8), lockwashers (7), washers (6), and steering gear (10) from frame (9). Discard lockwashers (7).
8-21. STEERING GEAR REPLACEMENT (Cont'd)
8-21. STEERING GEAR REPLACEMENT (Cont’d)

b. Installation

1. Install steering gear (12) on frame (11) with three washers (8), lockwashers (9), and capscrews (10). Tighten capscrews (1) to 54-66 lb-ft (73-89 N·m).

2. Align hole in yoke (3) with notch on steering gear splines (7) and slide intermediate shaft (4) on steering gear splines (7).

3. Install intermediate shaft (4) to steering gear splines (7) with washer (2), capscrew (6), washer (2), and locknut (1). Tighten locknut (1) to 40-50 lb-ft (54-68 N·m).

4. Connect two power steering lines (5) to steering gear (12).

**NOTE**
Make sure front wheels are in the straight-ahead position.

5. Install pitman arm (14) on shaft (13) with lockwasher (15) and nut (16). Tighten nut (16) to 167-203 lb-ft (227-275 N·m).
8-21. STEERING GEAR REPLACEMENT (Cont'd)

FOLLOW-ON TASKS:
- Fill power steering reservoir (TM 9-2320-280-10).
- Connect battery ground cable (para. 4-73).
- Bleed power steering system (para. 8-29).
8-22. STEERING SHAFT U-JOINT REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools

- General mechanic’s tool kit: TM 9-2320-280-24P
- Universal joint bearing kit (Appendix B, Item 171)

Manual References

- TM 9-2320-280-24P
- Equipment Condition

- Intermediate steering shaft removed (para. 8-20).

Materials/Parts

- Center parts kit (Appendix G, Item 12)

---

a. Removal

**CAUTION**

Do not drop bearing cups. Needle bearing can be easily lost.

1. Remove grease fitting (6) from cross (4).
2. Remove four bearing cups (1) from cross (4).
3. Remove four snaprings (2) from yoke (5).
4. Position intermediate steering shaft (3) in vise with 1-1/8 in. socket between vise jaw and bearing cup (1) being removed. Ensure open end of socket is facing bearing cup (1).
5. Place 11/16 in. socket between opposite bearing cup (1) and vise jaw. Ensure open end of socket is facing vise jaw.
6. Press bearing cup (1) out of yoke (5) and remove bearing cup (1) from cross (4).
7. Reverse position of sockets and press remaining bearing cup (1) out of yoke (5).
8. Remove cross (4) from yoke (5).
b. Installation

CAUTION

Ensure grease fitting on cross faces yoke. Damage to equipment will result if improperly installed.

1. Install cross (4) into yoke (5).
2. Install bearing cup (1) into yoke (5).

CAUTION

Ensure bearing cup is aligned with yoke before pressing in with vise. Damage to cross and bearing cups will result if forced into yoke.

3. Place yoke (5) in vise with 11/16 in. socket between vise jaw and bearing cup (1).
4. Press bearing cup (1) into yoke (5) far enough to install snapring (2) and install snapring (2) into yoke (5).
5. Install bearing cup (1) into yoke (5).
6. Place yoke (5) in vise with 11/16 in. socket between bearing cup (1) and vise jaw.
7. Press bearing cup (1) into yoke (5) far enough to install snapring (2) and install snapring (2) into yoke (5).
8. Install four bearing cups (1) on cross (4).
9. Install grease fitting (6) into cross (4).

FOLLOW-ON TASK: Install intermediate steering shaft [para. 8-20].
This task covers:

a. Removal
b. Installation

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Personnel Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic's tool kit:</td>
<td>One mechanic</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>One assistant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials/Parts</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five locknuts (Appendix G, Item 58)</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

**NOTE**
Perform steps a. 1 and b.2 only when replacing close-off retainer. Close-off may be replaced without disconnecting intermediate steering shaft.

### a. Removal

1. Remove locknut (8), washer (9), capscrew (11), and washer (9) and disconnect intermediate steering shaft (10) from steering column (2). Discard locknut (8).
2. Remove four locknuts (12), washers (6), capscrews (5), and washers (6) from hand throttle bracket (7), close-off retainer (4), close-off (3), and cowl panel (1). Remove close-off retainer (4) and close-off (3) from steering shaft (10). Discard locknuts (12).

### b. Installation

1. Install close-off (3), close-off retainer (4) on cowl panel (1) and hand throttle bracket (7) with four washers (6), capscrews (5), washers (6), and locknuts (12). Tighten locknuts (12) to 8 lb-ft (11 N·m).
2. Install intermediate steering shaft (10) through close-off (3) on steering column (2) with washer (9), capscrew (11), washer (9), and locknut (8). Tighten locknut (8) to 40-50 lb-ft (54-68 N·m).
8-24. POWER STEERING PUMP, PULLEY, AND BRACKET MAINTENANCE

This task covers:

a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: TM 9-2320-280-10P (Appendix B, Item 1)
- Automotive (TM 9-2320-280-24P)

**Special Tools**
- Pulley installer (Appendix B, Item 137)

**Materials/Parts**
- Three lockwashers (Appendix G, Item 108)
- O-ring seal (Appendix G, Item 161)
- Sealing compound (Appendix C, Item 45)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Equipment Condition**
- Hood raised and secured (TM 9-2320-280-10)
- Serpentine drivebelt removed ('A2' vehicles only) (para. 3-83)

---

**CAUTION**

Cover or plug all hoses and connections immediately after disconnecting to prevent contamination. Remove all plugs prior to connection.

---

**a. Removal**

Have drainage container ready to catch fluid.

1. Loosen two clamps (2) and disconnect two return lines (1) and high pressure line (5) from power steering pump (3). Remove O-ring seal (4) from high pressure line (5). Discard O-ring seal (4).

   **NOTE**

   Perform steps 2 through 4 for all vehicles except “A2” series vehicles.

2. Loosen alternator adjusting capscrew (6), two alternator mounting capscrews (16), and push alternator (7) toward engine. Remove two drivebelts (22) from power steering pump pulley (10).

3. Loosen adjusting capscrews (29) and (17) from front of power steering bracket (14).

4. Loosen engine mounting capscrew (11) and push power steering bracket (14) toward engine. Remove two drivebelts (21) from power steering pump pulley (10).

   **NOTE**

   Perform step 5 for “A2” series vehicles only.

5. Remove screw (30), lockwasher (31), and idler bracket (32) from support bracket (14) and alternator mounting bracket (15). Discard lockwasher (31).

6. Remove capscrew (11) and lockwasher (12) from power steering bracket (14) and alternator bracket (15). Discard lockwasher (12).

7. Remove adjusting capscrew (17), lockwasher (18), and washer (19) from power steering bracket (14) and alternator bracket (15). Discard lockwasher (18).

8. Remove adjusting capscrew (29), lockwasher (28), and washer (27) from power steering bracket (14) and power steering front support bracket (23). Discard lockwasher (28).

9. Remove power steering pump (3), pulley (10), and power steering bracket (14).

10. Inspect support bracket (23) for breaks or cracks. Perform step 11 if support bracket (23) is defective.

11. Remove two nuts (24) securing support bracket (23) to studs (20) and remove support bracket (23).

---

**b. Disassembly**

1. Remove screw (8), washer (9), and pulley (10) from power steering pump (3).

2. Remove capscrew (25), capscrew (13), two capscrews (26), and power steering pump (3) from power steering bracket (14).
8-24. POWER STEERING PUMP, PULLEY, AND BRACKET MAINTENANCE (Cont’d)

c. Assembly

1. Apply sealing compound adhesive to threads of capscrews (6), (20), (21), and (1).
2. Install power steering pump (8) on power steering bracket (7) with capscrew (6), short capscrew (20), and two long capscrews (21). Tighten capscrews (6), (20), and (21) to 40 lb-ft (54 N·m).
3. Using pulley installer, install pulley (3) on power steering pump (8) with washer (2) and capscrew (1). Tighten capscrew (1) to 37 lb-ft (50 N·m).

d. Installation

NOTE
Perform step 1 if support bracket was removed.

1. Apply sealing compound to studs (15) and install support bracket (18) to studs (15) with two nuts (19). Tighten nuts (19) to 45 lb-ft (61 N·m).
2. Install power steering pump (8), pulley (3), and power steering bracket (7) on alternator bracket (9) with washer (14), lockwasher (13), and capscrew (12).
3. Install power steering bracket (7) to support bracket (18) with washer (22), lockwasher (23), and capscrew (24).

NOTE
Perform steps 4 through 6 for all vehicles except “A2” series vehicles.

4. Install four drivebelts (16) and (17) onto pulley (3).
5. Install power steering bracket (7) to alternator bracket (9) with lockwasher (5) and capscrew (4).
6. Pull alternator (10) away from engine. Tighten alternator adjusting capscrew (32) and two alternator mounting capscrews (11) finger tight.

NOTE
Perform step 7 for “A2” series vehicles only.

7. Install idle bracket (27) on support bracket (7) and alternator mounting bracket (9) with lockwasher (26) and screw (25).
8. Connect two return lines (28) to power steering pump (8) and secure with two clamps (29).
9. Install O-ring seal (30) on high pressure line (31) and connect high pressure line (31) to power steering pump (8).
FOLLOW-ON TASKS:  
- Install serpentine drivebelt ("A2" vehicles only) (para. 3-83).  
- Adjust drivebelts (para. 3-82).  
- Bleed power steering system (para. 8-29).
This task covers:

- **a. Removal**
- **c. Inspection**

**INITIAL SETUP:**

**Tools**
- General mechanic's tool kit:
  - automotive (Appendix B, Item 1)

**Materials/Parts**
- Three locknuts (Appendix G, Item 58)
- Two O-ring seals (Appendix G, Item 161)

**Manual References**
- [TM 9-2320-280-10](#)
- [TM 9-2320-280-24P](#)

**NOTE**

Removal and installation procedures are basically the same for all hydraulic system pressure and return hoses. This procedure covers the power steering pump to hydro-boost return hose and the steering gear to hydro-boost pressure hose.

**WARNING**

Do not drain fluid when engine is hot. Severe injury to personnel will result.

**CAUTION**

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

Have drainage container ready to catch fluid.

1. Loosen two clamps (3) and disconnect return hose (8) from power steering pump (9) and hydro-boost (19).
2. Remove two locknuts (12), washers (13), and cap screws (14) from clamps (15) and control valve hose (16). Remove two clamps (15) from return hose (8). Discard locknuts (12).

**NOTE**

Perform step 4 for vehicles with new alternator support bracket configuration.

3. Remove locknut (6), washer (7), cap screw (2), spacer (4), two clamps (5), clamp (10), and return hose (8) from alternator bracket (1). Remove clamp (5) from return hose (8). Discard locknut (6).
4. Remove locknut (6), two washers (7), cap screw (2), two clamps (5), harness clamp (10), and return hose (8) from power steering lines bracket (11). Remove clamp (5) from return hose (8). Discard locknut (6).
5. Remove pressure hose (17) from hydro-boost (19) and steering gear (20). Remove two O-ring seals (18) from pressure hose (17). Discard O-ring seals (18).

**b. Installation**

1. Install two O-ring seals (18) on pressure hose (17) and connect pressure hose (17) to steering gear (20) and hydro boost (19).
2. Connect return hose (8) to power steering pump (9) and hydro-boost (19) with two clamps (3).
8-25. POWER STEERING HYDRAULIC SYSTEM PRESSURE AND RETURN HOSE REPLACEMENT (Cont’d)

3. Position two clamps (15) and clamp (5) on return hose (8) and install control valve hose (16) and two clamps (15) with two capscrews (14), washers (13), and locknuts (12).

**NOTE**
Perform step 5 for vehicles with new alternator support bracket configuration.

4. Install clamp (10), spacer (4), and two clamps (5) to alternator bracket (1) with capscrew (2), washer (7), and locknut (6).

5. Install harness clamp (10) and two clamps (5) to power steering lines bracket (11) with capscrew (2), two washers (7), and locknut (6).

**NEW CONFIGURATION**

FOLLOW-ON TASKS: • Connect battery ground cable (para. 4-73).
• Bleed power steering system (para. 8-29).
8-26. POWER STEERING SYSTEM HYDRAULIC CONTROL VALVE MAINTENANCE

This task covers:

a. Removal
b. Back Flush Procedure
c. Inspection
d. Installation

INITIAL SETUP:

Tools
General mechanic's tool kit:
- Battery ground cable disconnected (para. 4-73).
- Automotive (Appendix B, Item 1)

Equipment Condition
- Battery ground cable disconnected (para. 4-73).
- Hood raised and secured (TM 9-2320-280-10).

Manual References
- TM 9-2320-280-10
- TM 9-2320-280-24P

General Safety Instructions
- Do not drain fluid when engine is hot.

NOTE

If referred here from TM 9-2320-280-20-1 troubleshooting instructions to perform back flush procedure, follow steps 1 through 4 and then proceed to b.

a. Removal

WARNING

Do not drain fluid when engine is hot. Severe injury to personnel will result.

CAUTION

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

NOTE

- Note location of hoses for installation.
- Have drainage container ready to catch fluid.

1. Loosen clamp (2) and disconnect power steering return line hose (1) from control valve elbow (4).
2. Loosen clamp (11) and disconnect fan clutch hose (12) from control valve fitting (10).
3. Loosen clamp (14) and disconnect steering gear hose (13) from control valve elbow (3).
4. Disconnect time delay module connector (6) from control valve connector (7).
5. Loosen clamp (5) and remove control valve (8) from bracket (9).

b. Back Flush Procedure

1. Connect battery ground cable (para. 4-73).
2. Install steering gear hose (13) on control valve fitting (10).
3. Remove control valve elbow (4) from control valve (8) and install pipe plug (15) (NSN 4730-00-011-2578) on control valve (8).
4. Install drain hose (16) (make from NSN 4720-01-186-2358, 36 in. (91.4 cm) long) on control valve elbow (3).
5. Place drainage container underneath drain hose (16) to catch fluid.
CAUTION

- To ensure there is no load on the steering gear, position front wheels straight ahead before starting engine. Failure to do this may cause damage to the control valve.
- Maintain power steering fluid level at all times while performing back flush procedure to prevent air from entering power steering system. Failure to do this may result in damage to equipment.

6. Start engine and allow to run for about two or three seconds and stop, check, and fill power steering reservoir. Repeat the process once.
7. Remove pipe plug (2) from control valve (7).
8. Install control valve elbow (1) on control valve (7).
9. Remove steering gear hose (4) from control valve fitting (3) and install on control valve elbow (1).
10. Remove control valve fitting (3) from control valve (7) and install pipe plug (2) on control valve (7).

CAUTION

- To ensure there is no load on the steering gear, position front wheels straight ahead before starting engine. Failure to do this may cause damage to the control valve.
- Maintain power steering fluid level at all times while performing back flush procedure to prevent air from entering power steering system. Failure to do this may result in damage to equipment.

11. Start engine and allow to run for about two to three seconds and stop, check, and fill power steering reservoir. Repeat the process once.
12. Remove drain hose (5) from control valve elbow (6).
13. Remove steering gear hose (4) from control valve elbow (1).
14. Remove pipe plug (2) from control valve (7).
15. Install control valve fitting (3) on control valve (7).
16. Disconnect battery ground cable.(para. 4-73)

**c. Inspection**

1. Inspect elbows (6) and (1) for damage. Replace elbows (6) or (1) if damaged.
2. Inspect valve fitting (3) for damage. Replace valve fitting (3) if damaged.

**d. Installation**

**NOTE**

Perform step 1 only if control valve was removed.

1. Install control valve (7) on bracket (13) with clamp (10).
2. Connect steering gear hose (4) to control valve elbow (6) and tighten clamp (16) to 10-20 lb-in. (1-2 N•m).
3. Connect fan clutch hose (15) to control valve fitting (3) and tighten clamp (14) to 10-20 lb-in. (1-2 N•m).
4. Connect power steering return line hose (8) to control valve elbow (1) and tighten clamp (9) to 10-20 lb-in. (1-2 N•m).
5. Connect time delay module connector (11) to control valve connector (12).
FOLLOW-ON TASK:  
- Connect battery ground cable (para. 4-73).
- Bleed power steering system (para. 8-29).
8-27. POWER STEERING COOLER HOSE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Two locknuts (Appendix G, Item 58)
- Tiedown strap (Appendix G, Item 241)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

---

**a. Removal**

**WARNING**

Do not drain fluid when engine is hot. Severe injury to personnel will result.

**CAUTION**

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

Have drainage container ready to catch fluid.

1. Loosen two clamps (14) and disconnect hoses (7) and (10) from cooler (13).
2. Remove tiedown strap (11) from oil cooler lines (12) and hoses (7) and (10). Discard tiedown strap (11).
3. Loosen clamp (9) and remove hose (10) from steering gear (8).
4. Remove two locknuts (6), washers (5), and capscrews (1) from four clamps on hoses (7) and (15). Discard locknuts (6).
5. Loosen clamp (2) and remove hose (7) from control valve elbow (3) and remove hose (7).
8-27. POWER STEERING COOLER HOSE REPLACEMENT (Cont'd)

b. Installation

1. Connect hose (7) to control elbow (3) and secure with clamp (2).
2. Position hoses (7) and (15) with four clamps (4) and install two capscrews (1), washers (5), and locknuts (6).
3. Connect hose (10) to steering gear (8) with clamp (9).
4. Connect hoses (7) and (10) to cooler (13) with two clamps (14).
5. Install tiedown strap (11) to oil cooler lines (12) and hoses (7) and (10).

FOLLOW-ON TASK: Bleed power steering system (para. 8-29).
This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
- General mechanic's tool kit: Hood raised and secured (TM 9-2320-280-10).
  - automotive (Appendix B, Item 1)

**Materials/Parts**
- Two lockwashers (Appendix G, Item 109)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**CAUTION**

Do not bend power steering oil cooler fins. Damaged fins reduce cooling efficiency, which may damage power steering pump and/or gear.

**a. Removal**

**WARNING**

Do not drain fluid when engine is hot. Severe injury to personnel will result.

**CAUTION**

Cover or plug all hoses and connections immediately after disconnection to prevent contamination. Remove all plugs prior to connection.

**NOTE**

Have drainage container ready to catch fluid.

1. Loosen two clamps (4) and disconnect hoses (2) and (3) from cooler (8).
2. Remove two screws (5), lockwashers (6), washers (7), and cooler (8) from oil cooler (1). Discard lockwashers (6).
8-28. POWER STEERING COOLER REPLACEMENT (Cont’d)

b. Installation

1. Install cooler (8) to oil cooler (1) with two washers (7), lockwashers (6) and screws (5). Tighten screws (5) to 125-155 lb-in. (14-18 N·m).
2. Connect two hoses (2) and (3) to cooler (8) with two clamps (4). Tighten clamps (4) 35-45 lb-in. (4-5 N·m).

FOLLOW-ON TASK: Bleed power steering system [(para. 8-29)].
8-29. POWER STEERING SYSTEM BLEEDING

This task covers:
- Bleeding

INITIAL SETUP:

<table>
<thead>
<tr>
<th>Tools</th>
<th>Manual References</th>
</tr>
</thead>
<tbody>
<tr>
<td>General mechanic’s tool kit:</td>
<td>TM 9-2320-280-10</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td>TM 9-2320-280-24P</td>
</tr>
</tbody>
</table>

Personnel Required
- One mechanic
- One assistant

Equipment Condition
- Hood raised and secured (TM 9-2320-280-10)

Bleeding

1. Start engine (TM 9-2320-280-10) and turn wheels all the way to the left and right holding wheels at steering stops for five seconds.
2. Return wheels to center position and shut engine off (TM 9-2320-280-10).
3. Check and add power steering fluid (TM 9-2320-280-10) if necessary.

NOTE
Fluid with air in it will have a milky appearance. Air must be eliminated from system before normal steering action can be obtained.

4. Start engine (TM 9-2320-280-10) and run engine for two or three minutes or until milky appearance is gone, then shut engine off (TM 9-2320-280-10).

FOLLOW-ON TASKS:
- Check power steering fluid level (TM 9-2320-280-10)
- Lower and secure hood (TM 9-2320-280-10)
- Operate vehicle and check for proper steering operation (TM 9-2320-280-10)
# CHAPTER 9
## FRAME MAINTENANCE

### 9-1. FRAME MAINTENANCE TASK SUMMARY

<table>
<thead>
<tr>
<th>TASK PARA.</th>
<th>PROCEDURES</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-3</td>
<td>Front Bumper and Towing Brackets Replacement (M1026, M1026A1, M1036, M1038, M1038A1, M1042, M1044, M1044A1, M1046, M1046A1)</td>
<td>9-3</td>
</tr>
<tr>
<td>9-4</td>
<td>Front Bumper and Towing Brackets Replacement (M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2)</td>
<td>9-4</td>
</tr>
<tr>
<td>9-5</td>
<td>Frame Extension Replacement</td>
<td>9-6</td>
</tr>
<tr>
<td>9-6</td>
<td>Tiedown Ring Replacement</td>
<td>9-8</td>
</tr>
<tr>
<td>9-7</td>
<td>Radiator Front Mount Bracket Replacement</td>
<td>9-9</td>
</tr>
<tr>
<td>9-8</td>
<td>Rear Bumper Brace Replacement</td>
<td>9-10</td>
</tr>
<tr>
<td>9-9</td>
<td>Rear Crossmember Brace Replacement</td>
<td>9-11</td>
</tr>
<tr>
<td>9-10</td>
<td>Rear Bumper Replacement</td>
<td>9-12</td>
</tr>
<tr>
<td>9-11</td>
<td>Rear Bumper Inner Mounting Bracket Replacement</td>
<td>9-14</td>
</tr>
<tr>
<td>9-12</td>
<td>Towing Pintle Maintenance</td>
<td>9-15</td>
</tr>
<tr>
<td>9-13</td>
<td>Lifting Shackle Replacement</td>
<td>9-20</td>
</tr>
<tr>
<td>9-14</td>
<td>Receptacle Mounting Bracket Replacement</td>
<td>9-21</td>
</tr>
<tr>
<td>9-15</td>
<td>Transmission Mount Crossmember Replacement</td>
<td>9-22</td>
</tr>
</tbody>
</table>
9-2. FRONT BUMPER AND TOWING BRACKETS REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Applicable Models
M 966, M 966A1, M 996, M 996A1, M 997, M 997A1, M 998, M 998A1, M 1025, M 1025A1, M 1035, M 1035A1, M 1037, M 1043, M 1043A1, M 1045, M 1045A1

Materials/Parts
Four locknuts (Appendix G, Item 66)

Manual References
TM 9-2320-280-24P

Tools
General mechanic's tool kit:
automotive (Appendix B, Item 1)

a. Removal

Remove four locknuts (3), washers (4), capscrews (6), washers (4), bumper (1), and two towing brackets (5) from mounting brackets (2). Discard locknuts (3).

b. Installation

Install bumper (1) and two towing brackets (5) on mounting brackets (2) with four washers (4), capscrews (6), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).
9-3. FRONT BUMPER AND TOWING BRACKETS REPLACEMENT

This task covers:

a. Removal  

INITIAL SETUP:

Applicable Models
M1026, M1026A1, M1036, M1038, M1038A1, M1042, M1044, M1044A1, M1046, M1046A1

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

b. Installation

Materials/Parts
Six locknuts (Appendix G, Item 66)

Manual References
TM 9-2320-280-24P

Equipment Condition
Winch removed (para. 10-107).

a. Removal

1. Remove four locknuts (3), washers (4), capscrews (5), washers (4), and two towing brackets (6) from front bumper (1) and two frame extensions (2). Discard locknuts (3).

2. Remove two locknuts (3), washers (4), capscrews (5), and washers (4) from front bumper (1) and frame extensions (2). Discard locknuts (3).

3. Remove two capscrews (7), washers (8), and front bumper (1) from frame extensions (2).

b. Installation

1. Install front bumper (1) on two frame extensions (2) with two washers (8) and capscrews (7). Tighten capscrews (7) to 90 lb-ft (122 N·m).

2. Install front bumper (1) on two frame extensions (2) with two washers (4), capscrews (5), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).

3. Install two towing brackets (6) on front bumper (1) with four washers (4), capscrews (5), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).

FOLLOW-ON TASK: Install winch (para. 10-107).
9-4. FRONT BUMPER AND TOWING BRACKETS REPLACEMENT

This task covers:

<table>
<thead>
<tr>
<th>a. Removal</th>
<th>b. Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIAL SETUP:</strong></td>
<td><strong>Materials/Parts</strong></td>
</tr>
<tr>
<td><strong>Applicable Models</strong></td>
<td>Ten locknuts (Appendix G, Item 66)</td>
</tr>
<tr>
<td>M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2</td>
<td></td>
</tr>
<tr>
<td><strong>Tools</strong></td>
<td><strong>Manual References</strong></td>
</tr>
<tr>
<td>General mechanic's tool kit:</td>
<td>TM 9-2320-280-24P</td>
</tr>
<tr>
<td>automotive (Appendix B, Item 1)</td>
<td><strong>Equipment Condition</strong></td>
</tr>
<tr>
<td></td>
<td>Winch removed, if installed (para. 10-108).</td>
</tr>
</tbody>
</table>

**NOTE**

Perform steps 1 and 2 for bumpers with winch. Proceed to step 3 for bumpers without winch.

**a. Removal**

1. Remove four locknuts (5), washers (6), capscrews (8), washers (6), and two towing brackets (7) from bumper (1). Discard locknuts (5).
2. Remove six locknuts (3), washers (4), capscrews (9), washers (4), and front bumper (1) from two mounting brackets (2). Discard locknuts (3).
3. Remove four locknuts (5), washers (6), capscrews (8), washers (6), bumper (1), and two towing brackets (7) from mounting brackets (2). Discard locknuts (5).

**b. Installation**

**NOTE**

Perform step 1 for bumpers without winch. Proceed to step 2 for bumpers with winch.

1. Install bumper (1) and two towing brackets (7) on two mounting brackets (2) with four washers (6), capscrews (8), washers (6), and locknuts (5). Tighten locknuts (5) to 90 lb-ft (122 N·m).
2. Install front bumper (1) on two mounting brackets (2) with six washers (4), capscrews (9), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).
3. Install two towing brackets (7) on bumper (1) with four washers (6), capscrews (8), washers (6) and locknuts (5). Tighten locknuts (5) to 90 lb-ft (122 N·m).
FOLLOW-ON TASK: Install winch if removed (para. 10-108).
9-5. FRAME EXTENSION REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

Applicable Models
M997A2, M1025A2, M1026, M1026A1, M1035A1, M1035A2, M1036, M1038, M1038A1, M1042, M1043A2, M1044, M1044A1, M1045A2, M1046, M1046A1, M1097A2

Materials/Parts
Three locknuts (Appendix G, Item 66)

Manual References
TM 9-2320-280-24P

Equipment Condition
- Front bumper removed (para. 9-2, 9-3, or 9-4).
- Hood and hinge removed (para. 10-5).

Tools
- General mechanic's tool kit: automotive (Appendix B, Item 1)

a. Removal

NOTE
- Note position of winch cable bracket for installation.
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles are not equipped with a winch cable bracket as indicated in step 1.

1. Remove two locknuts (2), washers (3), capscrews (5), washers (3), and winch cable bracket (6) from frame extension (8). Discard locknuts (2).
2. Remove locknut (2), washer (3), capscrew (7), washer (3), frame extension (8), and bumper mounting bracket (1) from frame (4). Discard locknut (2).

b. Installation

NOTE
- M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2, vehicles are not equipped with a winch cable bracket as indicated in step 1.

1. Install bumper mounting bracket (1), frame extension (8), and winch cable bracket (6) on frame (4) with two washers (3), capscrews (5), washers (3), and locknuts (2).
2. Install mounting bracket (1) and frame extension (8) on frame (4) with washer (3), capscrew (7), washer (3), and locknut (2). Tighten locknuts (2) to 90 lb-ft (122 N·m).
FOLLOW-ON TASKS: • Install hood and hinge (para. 10-5).
• Install front bumper (para. 9-3 or 9-4).
9-6. TIEDOWN RING REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Applicable Models**
- M997A, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2

**Materials/Parts**
- Cotter pin (Appendix G, Item 21)

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-24P

---

**a. Removal**

Remove cotter pin (2), nut (3), and tiedown ring (1) from mounting bracket (4). Discard cotter pin (2).

**b. Installation**

Install tiedown ring (1) on mounting bracket (4) with nut (3). Tighten nut (3) to 16 lb-ft (22 N·m). Back off to the nearest cotter pin slot, and install cotter pin (2).
9-7. RADIATOR FRONT MOUNT BRACKET REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**

General mechanic's tool kit:
- automotive (Appendix B, Item 1)

**Manual References**

- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**

- Three locknuts (Appendix G, Item 70)

**Equipment Condition**

- Hood raised and secured (TM 9-2320-280-10)

---

**a. Removal**

1. Remove locknut (3), washer (2), capscrew (10), washer (2), and spacer (9) from radiator (4) and front mount bracket (11). Discard locknut (3).

2. Remove two locknuts (7), washers (8), capscrews (1), washers (8), bracket (11), and mount (6) from front suspension crossmember (5). Discard locknuts (7).

**b. Installation**

1. Install mount (6) and bracket (11) on front suspension crossmember (5) with two washers (8), capscrews (1), washers (8), and locknuts (7). Tighten locknuts (7) to 90 lb-ft (122 N·m).

2. Install radiator (4) on bracket (11) with spacer (9), washer (2), capscrew (10), washer (2), and locknut (3). Tighten locknut (3) to 30 lb-ft (41 N·m).

---

FOLLOW-ON TASK: Lower and secure hood (TM 9-2320-280-10)
9-8. REAR BUMPER BRACE REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2, M1037, M1042, M1097, M1097A1, M1097A2

Materials/Parts
Three locknuts (Appendix G, Item 70)

Tools
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

Manual References
TM 9-2320-280-24P

a. Removal

1. Remove locknut (5), washer (2), capscrew (1), and washer (2), from rear bumper brace (3) and frame rail (4). Discard locknut (5).

2. Remove two locknuts (9), washers (7), capscrews (6), washers (7), and rear bumper brace (3) from rear bumper (8). Discard locknuts (9).

b. Installation

1. Install rear bumper brace (3) on rear bumper (8) with two washers (7), capscrews (6), washers (7), and locknuts (9).

2. Install rear bumper brace (3) on frame rail (4) with washer (2), capscrew (1), washer (2), and locknut (5). Tighten locknuts (5) and (9) to 90 lb-ft (122 N•m).
9-9. REAR CROSSMEMBER BRACE REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Tools
General mechanic’s tool kit: automotive (Appendix B, Item 1)

Materials/Parts
Locknut (Appendix G, Item 70)

Manual References
TM 9-2320-280-24P

Equipment Condition
Towing pintle removed (para. 9-12).

a. Removal

Remove locknut (5), washer (2), capscrew (3), washer (2), and rear crossmember brace (4) from frame rail (1). Discard locknut (5).

b. Installation

Install rear crossmember brace (4) on frame rail (1) with washer (2), capscrew (3), washer (2), and locknut (5). Tighten locknut (5) to 90 lb-ft (122 N·m).

FOLLOW-ON TASK: Install towing pintle (para. 9-12).
9-10. REAR BUMPER REPLACEMENT

This task covers:

a. Removal
b. Installation

INITIAL SETUP:

**Applicable Models**
- M996, M996A1, M997, M997A1, M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1037, M1042, M1097, M1097A1, M1097A2

**Personnel Required**
- One mechanic
- One assistant

**Manual References**
- TM 9-2320-280-24P

**Equipment Condition**
- Towing pintle removed (para. 9-12)

**Tools**
- General mechanic's tool kit: automotive (Appendix B, Item 1)

**Materials/Parts**
- Sixteen locknuts (Appendix G, Item 66)
- Six nut and lockwasher assemblies (Appendix G, Item 146)

---

### a. Removal

1. Remove four nut and lockwasher assemblies (9), capscrew (15), and trailer receptacle cover (16) from trailer receptacle (10). Discard nut and lockwasher assemblies (9).
2. Remove two nut and lockwasher assemblies (11) capscrews (14), plate (13), and trailer receptacle (10) from rear bumper (12) and remove plate (13) from rear bumper (12). Discard nut and lockwasher assemblies (11).
3. Remove four locknuts (1), washers (2), capscrews (20), and washers (2) from rear bumper (12) and two braces (21). Discard locknuts (1).

**NOTE**
Perform steps 4 and 5 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

4. Remove two cotter pins (22), nuts (23), and two tiedown rings (24) from rear bumper (12) and two mounting brackets (5). Discard cotter pins (22).
5. Remove eight locknuts (27), washers (26), capscrews (25), and washers (26) from rear bumper (12) and two mounting brackets (5). Discard locknuts (27).
6. Remove four locknuts (3), washers (4), capscrews (18), washers (4), and two tiedown brackets (19) from rear bumper (12) and two mounting brackets (5). Discard locknuts (3).
7. Remove four locknuts (3), washers (4), capscrews (18), and washers (4) from rear bumper (12) and mounting brackets (5). Discard locknuts (3).
8. Remove four locknuts (6), washers (7), capscrews (17), washers (7), and rear bumper (12) from two inner mounting brackets (8). Discard locknuts (6).

**NOTE**
Perform step 9 only if bumper is being replaced.

### b. Installation

**NOTE**
Perform step 1 only if bumper was replaced.

1. Install lifting shackles (para. 9-13).
9-10. REAR BUMPER REPLACEMENT (Cont’d)

2. Install rear bumper (12) on inner mounting brackets (8) with four washers (7), capscrews (17), washers (7), and locknuts (6). Tighten locknuts (6) to 90 lb-ft (122 N·m).

3. Install rear bumper (12) on mounting brackets (5) with four washers (4), capscrews (18), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).

NOTE
Perform steps 4 and 5 for M997A2, M1025A2, M1035A2, M1043A2, M1045A2, and M1097A2 vehicles only.

4. Secure rear bumper (12) to two mounting brackets (5) with eight washers (26), capscrews (25), washers (26), and locknuts (27). Tighten locknuts (27) to 90 lb-ft (122 N·m).

5. Install two tiedown rings (24) on rear bumper (12) and two brackets (5) with two nuts (23). Tighten nuts (23) to 16 lb-ft (22 N·m), back off to the nearest cotter pin slot, and install two cotter pins (22).

6. Install two tiedown brackets (19) on rear bumper (12) with four washers (4), capscrews (18), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).

7. Install rear bumper (12) on braces (21) with four washers (2), capscrews (20), washers (2), and locknuts (1). Tighten locknuts (1) to 90 lb-ft (122 N·m).

8. Position trailer receptacle (10) through rear bumper (12) and install plate (13) and trailer receptacle (10) on rear bumper (12) with two capscrews (14) and nut and lockwasher assemblies (11). Tighten nut and lockwasher assemblies (11) to 8 lb-ft (11 N·m).

9. Install trailer receptacle cover (16) on plate (13) and rear bumper (12) with four capscrews (15) and nut and lockwasher assemblies (9). Tighten nut and lockwasher assemblies (9) to 8 lb-ft (11 N·m).

FOLLOW-ON TASK Install towing pintle para. 9-12.
This task covers:

a. Removal
b. Installation

INITIAL SETUP:

Applicable Models
M996, M996A1, M997, M997A1, M997A2, M1037, M1042, M1097, M1097A1, M1097A2

Materials/Parts
Six locknuts (Appendix G, Item 70)

Manual References
TM 9-2320-280-24P

Tools
General mechanic's tool kit: automotive (Appendix B, Item 1)

a. Removal

1. Remove two locknuts (3), washers (4), capscrews (9), and washers (4) from bracket (7) and rear bumper (1). Discard locknuts (3).
2. Remove four locknuts (10), washers (6), capscrews (5), washers (6), spacer (8), and bracket (7) from frame rail (2). Discard locknuts (10).

b. Installation

NOTE

Ensure spacer on outer side of frame rail is in position before installing spacer and bracket.

1. Install spacer (8) and bracket (7) on frame rail (2) with four washers (6), capscrews (5), washers (6), and locknuts (10). Tighten capscrews (5) to 90 lb-ft (122 N·m).
2. Install bracket (7) on rear bumper (1) with two washers (4), capscrews (9), washers (4), and locknuts (3). Tighten locknuts (3) to 90 lb-ft (122 N·m).
9-12. TOWING PINTLE MAINTENANCE

This task covers:

a. Removal  
b. Disassembly  
c. Cleaning  
d. Assembly  
e. Installation

INITIAL SETUP:

**Tools**
- General mechanic’s tool kit: TM 9-2320-280-10 automotive (Appendix B, Item 1)

**Manual References**
- TM 9-2320-280-10
- TM 9-2320-280-24P

**Materials/Parts**
- Two cotter pins (Appendix G, Item 22)
- Drive screw (Appendix G, Item 30)
- Two locknuts (Appendix G, Item 71)
- Four locknuts (Appendix G, Item 93)
- Drycleaning solvent (Appendix C, Item 18)

**General Safety Instructions**
- Cleaning will be done in a well-ventilated area and a fire extinguisher will be kept nearby when drycleaning solvent is used.

**NOTE**
- Contact DS maintenance for fabrication instructions of optional towing pintle.

**a. Removal**

Perform steps 1 and 2 for rear-mounted towing pintle. Perform steps 3 and 4 for optional towing pintle mounted to the front bumper.

1. Remove cotter pin (3), slotted nut (2), washer (4), and towing pintle (9) from rear crossmember (7). Discard cotter pin (3).
2. Remove four nuts (1), washers (11), capscrews (10), washer (11), two support plates (6), backing plate (5), and safety chain plate (8) from rear crossmember (7).
9-12. TOWING PINTLE MAINTENANCE

3. Remove cotter pin (4), slotted nut (6), washer (5), and towing pintle (3) from front bumper (1). Discard cotter pin (4).

4. Remove four locknuts (9), washers (8), capscrews (10), washers (8), front plate (2), and back plate (7) from front bumper (1). Discard locknuts (9).
9-12. TOWING PINTLE MAINTENANCE (Cont'd)

b. Disassembly

NOTE
Perform step 1 for rear-mounted towing pintle only.

1. Remove grease fitting (12) from backing plate (11).
2. Remove cotter pin (15) from towing pintle latch (20).
3. Remove locknut (21), capscrew (19), pintle latch lock (17), and spring (16) from towing pintle latch (20). Discard locknut (21).
4. Remove locknut (24), capscrew (18), and towing pintle latch (20) from towing pintle hook (22). Discard locknut (24).
5. Remove cotter pin (15) from pintle lock chain hook (14). Discard cotter pin (15).
6. Remove drivescrew (23) and pintle lock chain (13) from towing pintle hook (22). Discard drivescrew (23).

c. Cleaning

WARNING
Drycleaning solvent is flammable and will not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated places. Failure to do this may result in injury to personnel and/or damage to equipment.

Clean all metallic parts with drycleaning solvent.
9-12. TOWING PINTLE MAINTENANCE (Cont'd)

d. Assembly

1. Install pintle lock chain (1) on towing pintle hook (10) with drivescrew (11).
2. Install cotter pin (3) on pintle lock chain (1) with pintle lock chain hook (2).
3. Install towing pintle latch (8) on towing pintle hook (10) with capscrew (6) and locknut (12). Tighten locknut (12) to 15 lb-ft (20 N·m).
4. Install spring (4) and pintle latch lock (5) on towing pintle latch (8) with capscrew (7) and locknut (9). Tighten locknut (9) to 15 lb-ft (20 N·m).
5. Install cotter pin (3) in pintle latch (8).

NOTE
Perform step 6 for rear-mounted towing pintle only.

6. Install grease fitting (14) in backing plate (13).

e. Installation

NOTE
- Perform steps 1 through 3 for rear-mounted towing pintle.
- Perform steps 4 through 6 for optional towing pintle mounted to the front bumper.
- Grease fitting on backing plate must face downward.

1. Install safety chain plate (22), support plates (20), and backing plate (13) on rear crossmember (21) with four washers (16), capscrews (24), washers (16), and nuts (15).
2. Install towing pintle (23) and tighten nuts (15) to 90 lb-ft (122 N·m).
3. Install towing pintle (23) with washer (19) and slotted nut (17). Loosen slotted nut (17) slightly if towing pintle (23) will not rotate easily. Install cotter pin (18) in slotted nut (17).
9-12. TOWING PINTLE MAINTENANCE (Cont’d)

4. Install front plate (26) and back plate (31) on front bumper (25) with four washers (32), capscrews (34), washers (32), and locknuts (33). Tighten locknuts (33) to 90 lb-ft (122 N·m).

5. Install towing pintle (27) with washer (29) and slotted nut (30).

6. Tighten slotted nut (30) until towing pintle (27) is tight. Back off nut (30) until towing pintle (27) rotates freely and hole in towing pintle (27) shaft aligns with slot in nut (30). Install cotter pin (28).

OPTIONAL

FOLLOW-ON TASKS: Lubricate rear-mounted towing pintle (TM 9-2320-280-10).
9-13. LIFTING SHACKLE REPLACEMENT

This task covers:

a. Removal  
b. Installation

INITIAL SETUP:

**Tools**
General mechanic's tool kit:
  automotive (Appendix B, Item 1)

**Materials/Parts**
Cotter pin (Appendix G, Item 18)

**Manual References**
TM 9-2320-280-24P

**NOTE**
- All lifting shackles are replaced basically the same. This procedure covers the rear lifting shackle on all vehicles except M996, M996A1, M997, M997A1, M997A2, M1037, and M1042.
- Vehicles with serial numbers 100,000 and above have new, reinforced lifting shackles. Previous models lifting shackles will be used on vehicles with serial numbers 99,999 and below only. Refer to vehicle serial number before ordering replacement parts.

**a. Removal**
Remove cotter pin (1), slotted nut (2), cap screw (5), spring washer (4), and shackle (6) from frame (3). Discard cotter pin (1).

**b. Installation**

1. Install shackle (6) on frame (3) with spring washer (4), cap screw (5), and slotted nut (2). Tighten slotted nut (2) enough to allow movement of shackle (6). Torque slotted nut (2) to 15-20 lb-ft (20-27 N\(\cdot\)m).

2. Back off slotted nut (2) to align with hole in cap screw (5) and install cotter pin (1) in slotted nut (2).
9-14. RECEPTACLE MOUNTING BRACKET REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

Applicable Models

| All vehicles except M996, M996A1, M997, M997A1, M997A2, M1037, M1042 |

Materials/Parts

| Two locknuts (Appendix G, Item 65) |
| Four nut and lockwasher assemblies (Appendix G, Item 146) |

Tools

General mechanic's tool kit: automotive (Appendix B, Item 1)

Manual References

| TM 9-2320-280-24P |

a. Removal

1. Remove four nut and lockwasher assemblies (9), capscrews (6), cover (5), and receptacle (1) from bracket (4). Discard nut and lockwasher assemblies (9).

   NOTE
   
   • If bracket is held on to “D” beam with rivets, proceed to step 2.
   If not, proceed to step 3.
   • For instructions on removal of rivets, refer to para. 10-66.

2. Remove two rivets and bracket (4) from “D” beam (3).
3. Remove two locknuts (2) capscrews (8), washers (7), and bracket (4) from “D” beam (3). Discard locknuts (2).

b. Installation

   NOTE
   
   If bracket was held on to “D” beam with rivets, do step 1. If not, do step 2.

1. With a 0.3125-in. drill bit, enlarge existing rivet holes on bracket (4) and “D” beam (3).
2. Install bracket (4) on “D” beam (3) with two washers (7), capscrews (8), and locknuts (2).
3. Install receptacle (1) and cover (5) on bracket (4) with four capscrews (6) and nut and lockwasher assemblies (9).
9-15. TRANSMISSION MOUNT CROSSMEMBER REPLACEMENT

This task covers:

a. Removal

b. Installation

INITIAL SETUP:

**Tools**
General mechanic’s tool kit:
automotive (Appendix B, Item 1)

**Manual References**
TM 9-2320-280--24P

**Materials/Parts**
Four locknuts (Appendix G, Item 107)

**CAUTION**
Transmission must be supported during removal and installation of transmission mount crossmember to prevent damage to equipment.

---

**a. Removal**

**NOTE**
Perform step 1 and 2 for all vehicles except “A2” series. Perform steps 3 and 4 for "A2" series only.

1. Place support under transmission and remove two locknuts (8), washers (2), capscrews (3) and washers (2) from transmission mount crossmember (5) and two transmission support brackets (1). Discard locknuts (8).

2. Remove two locknuts (7), washers (6), and crossmember (5) from transmission mount (4). Discard locknuts (7).

3. Place support under transmission and remove two locknuts (12), washers (11), capscrew (10) and washer (11) from crossmember (13) and two support brackets (1).

4. Remove two locknuts (15), washers (14), and crossmember (13) from transmission mount (9).

---

**b. Installation**

**NOTE**
Perform step 1 and 2 for all vehicles except “A2” series. Perform steps 3 and 4 for “A2” series only.

1. Install crossmember (5) on two support brackets (1) with washers (2), capscrews (3), washers (2), and locknuts (8). Tighten locknuts (8) to 90 lb-ft (122 N·m).

2. Install crossmember (5) on transmission mount (4) with two washers (6) and locknuts (7). Tighten locknuts (7) to 29 lb-ft (38 N·m).

3. Install crossmember (13) on two support brackets (1) with washer (11), capscrew (10), two washers (11), and locknuts (12). Tighten locknuts (12) to 90 lb-ft (122 N·m).

4. Install crossmember (13) on transmission mount (9) with two washers (14) and locknuts (15). Tighten locknuts (15) to 28 lb-ft (38 N·m).

5. Remove support.
9-15. TRANSMISSION MOUNT CROSSMEMBER REPLACEMENT (Cont'd)

“A2” Series

9-23/(9-24 blank)
<table>
<thead>
<tr>
<th>A</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerator linkage:</td>
<td>Adjust</td>
<td>3-42d 3-80</td>
</tr>
<tr>
<td></td>
<td>Inspection</td>
<td>3-42b 3-79</td>
</tr>
<tr>
<td></td>
<td>Installation</td>
<td>3-42c 3-80</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-42a 3-78</td>
</tr>
<tr>
<td>Accelerator pedal:</td>
<td>Installation</td>
<td>3-43b 3-82</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-43a 3-82</td>
</tr>
<tr>
<td>Accelerator system:</td>
<td>Maintenance task summary</td>
<td>3-41 3-77</td>
</tr>
<tr>
<td>Air cleaner assembly and dust unloader:</td>
<td>Inspection</td>
<td>3-12b 3-20</td>
</tr>
<tr>
<td></td>
<td>Installation</td>
<td>3-12c 3-20</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-12a 3-20</td>
</tr>
<tr>
<td>Air cleaner filter element:</td>
<td>Cleaning</td>
<td>3-13e 3-24</td>
</tr>
<tr>
<td></td>
<td>Emergency cleaning</td>
<td>3-13d 3-22</td>
</tr>
<tr>
<td></td>
<td>Inspection</td>
<td>3-13b 3-22</td>
</tr>
<tr>
<td></td>
<td>Installation</td>
<td>3-13c 3-24</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-13f 3-22</td>
</tr>
<tr>
<td>Air cleaner to air horn elbow:</td>
<td>Installation</td>
<td>3-15b 3-28</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-15a 3-28</td>
</tr>
<tr>
<td>Air horn:</td>
<td>Installation</td>
<td>3-14b 3-26</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-14a 3-26</td>
</tr>
<tr>
<td>Air horn to air cleaner elbow:</td>
<td>Installation</td>
<td>3-15b 3-28</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-15a 3-28</td>
</tr>
<tr>
<td>Air horn support bracket:</td>
<td>Installation</td>
<td>3-16b 3-29</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-16a 3-29</td>
</tr>
<tr>
<td>Air take and fuel pump vent:</td>
<td>Installation</td>
<td>3-20d 3-33</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-20a 3-33</td>
</tr>
<tr>
<td>Air lifting bracket:</td>
<td>Installation</td>
<td>6-20b 6-50</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>6-20a 6-50</td>
</tr>
<tr>
<td>Airlift to shroud shield assembly:</td>
<td>Installation</td>
<td>3-62b 3-116</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-62a 3-116</td>
</tr>
<tr>
<td>Air restriction gauge:</td>
<td>Installation</td>
<td>3-17b 3-30</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-17a 3-30</td>
</tr>
<tr>
<td>Air restriction gauge hose:</td>
<td>Installation</td>
<td>3-19d 3-32</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-19c 3-32</td>
</tr>
<tr>
<td>Alternator, 12 volt cable:</td>
<td>Installation</td>
<td>4-75b 4-126</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-75a 4-124</td>
</tr>
<tr>
<td>Alternator, 60 ampere:</td>
<td>Adjust</td>
<td>4-2c 4-6</td>
</tr>
<tr>
<td></td>
<td>Installation</td>
<td>4-2b 4-4</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-2a 4-2</td>
</tr>
<tr>
<td>Alternator (A0013036AA), 200 ampere:</td>
<td>Installation</td>
<td>4-109b 4-256</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-109a 4-254</td>
</tr>
<tr>
<td>(6.2L) Alternator (12338796-1), 200 ampere:</td>
<td>Installation</td>
<td>4-110b 4-260</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-110a 4-258</td>
</tr>
<tr>
<td>(6.5L) Alternator (12338796-1), 200 ampere:</td>
<td>Installation</td>
<td>4-110.1b 4-260.4</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-110.1a 4-260.2</td>
</tr>
<tr>
<td>Alternator cable (12339317), 200 ampere:</td>
<td>Installation</td>
<td>4-112b 4-264</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-112a 4-264</td>
</tr>
<tr>
<td>Alternator cable (12448621-2), 200 ampere:</td>
<td>Installation</td>
<td>4-111b 4-262</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-111a 4-262</td>
</tr>
<tr>
<td>Alternator drivebelt set:</td>
<td>Installation</td>
<td>3-81b 3-138</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-81a 3-138</td>
</tr>
<tr>
<td>Alternator mounting brackets:</td>
<td>Installation</td>
<td>4-4b 4-10</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-4a 4-10</td>
</tr>
<tr>
<td>Alternator pulley:</td>
<td>Installation</td>
<td>4-3b 4-8</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-3a 4-8</td>
</tr>
<tr>
<td>Ambulance electrical system:</td>
<td>Maintenance task summary</td>
<td>4-86 4-157</td>
</tr>
<tr>
<td>Antenna cables (M996, M996A1):</td>
<td>Installation</td>
<td>4-105b 4-236</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-105a 4-236</td>
</tr>
<tr>
<td>Antenna cables (M997, M997A1, M997A2):</td>
<td>Installation</td>
<td>4-106b 4-240</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-106a 4-238</td>
</tr>
<tr>
<td>Auxiliary fuel pickup and return:</td>
<td>Installation</td>
<td>3-26b 3-50</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>3-26a 3-50</td>
</tr>
<tr>
<td>Axles, front and rear:</td>
<td>Maintenance task summary</td>
<td>6-8 6-16</td>
</tr>
<tr>
<td>Backup light assembly (M996, M996A1, M997, M997A1, M997A2):</td>
<td>Installation</td>
<td>4-95b 4-174</td>
</tr>
<tr>
<td></td>
<td>Removal</td>
<td>4-95a 4-174</td>
</tr>
</tbody>
</table>
### INDEX (Cont'd)

<table>
<thead>
<tr>
<th>B (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup light lamp:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-69b</td>
<td>4-110</td>
</tr>
<tr>
<td>Removal</td>
<td>4-69a</td>
<td>4-110</td>
</tr>
<tr>
<td>Backup light bracket:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-70b</td>
<td>4-112</td>
</tr>
<tr>
<td>Removal</td>
<td>4-70a</td>
<td>4-112</td>
</tr>
<tr>
<td>Backup light assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-68b</td>
<td>4-109</td>
</tr>
<tr>
<td>Removal</td>
<td>4-68a</td>
<td>4-109</td>
</tr>
<tr>
<td>Ball joint, lower:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>6-27a</td>
<td>6-60</td>
</tr>
<tr>
<td>Installation</td>
<td>6-27d</td>
<td>6-60</td>
</tr>
<tr>
<td>Removal</td>
<td>6-27b</td>
<td>6-60</td>
</tr>
<tr>
<td>Ball joint, upper:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-26b</td>
<td>6-58</td>
</tr>
<tr>
<td>Removal</td>
<td>6-26a</td>
<td>6-58</td>
</tr>
<tr>
<td>Battery cable:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>4-73a</td>
<td>4-116</td>
</tr>
<tr>
<td>Ground cables disconnection</td>
<td>4-73b</td>
<td>4-117</td>
</tr>
<tr>
<td>Ground cable installation</td>
<td>4-73e</td>
<td>4-118</td>
</tr>
<tr>
<td>Ground cables reconnection</td>
<td>4-73c</td>
<td>4-117</td>
</tr>
<tr>
<td>Ground cable removal</td>
<td>4-73d</td>
<td>4-118</td>
</tr>
<tr>
<td>Interconnecting cable installation</td>
<td>4-73g</td>
<td>4-119</td>
</tr>
<tr>
<td>Interconnecting cable removal</td>
<td>4-73f</td>
<td>4-118</td>
</tr>
<tr>
<td>Positive cable installation</td>
<td>4-73l</td>
<td>4-120</td>
</tr>
<tr>
<td>Positive cable removal</td>
<td>4-73h</td>
<td>4-120</td>
</tr>
<tr>
<td>Battery cable terminal clamp:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-72b</td>
<td>4-114</td>
</tr>
<tr>
<td>Removal</td>
<td>4-72a</td>
<td>4-114</td>
</tr>
<tr>
<td>Battery holdown:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-78b</td>
<td>4-132</td>
</tr>
<tr>
<td>Removal</td>
<td>4-78a</td>
<td>4-132</td>
</tr>
<tr>
<td>Battery replacement and servicing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-79c</td>
<td>4-134</td>
</tr>
<tr>
<td>Removal</td>
<td>4-79a</td>
<td>4-134</td>
</tr>
<tr>
<td>Servicing</td>
<td>4-79b</td>
<td>4-134</td>
</tr>
<tr>
<td>Battery system:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>4-71</td>
<td>4-113</td>
</tr>
<tr>
<td>Battery tray:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>4-80b</td>
<td>4-136</td>
</tr>
<tr>
<td>Installation</td>
<td>4-80d</td>
<td>4-136</td>
</tr>
<tr>
<td>Preventive modification</td>
<td>4-80q</td>
<td>4-136</td>
</tr>
<tr>
<td>Removal</td>
<td>4-80a</td>
<td>4-136</td>
</tr>
<tr>
<td>Bearing adjustment, geared hub:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spindle.</td>
<td>6-14</td>
<td>6-38</td>
</tr>
<tr>
<td>Blackout drive light assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-50b</td>
<td>4-82</td>
</tr>
<tr>
<td>Removal</td>
<td>4-50a</td>
<td>4-82</td>
</tr>
<tr>
<td>Blackout drive light lamp:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-51b</td>
<td>4-84</td>
</tr>
<tr>
<td>Removal</td>
<td>4-51a</td>
<td>4-84</td>
</tr>
</tbody>
</table>

| Blackout switch and bracket: | | |
| Bulkhead head door: | | |
| Installation | 4-94b | 4-172 |
| Removal | 4-94a | 4-172 |
| Blackout switch/bracket, rear door: | | |
| Installation | 4-93b | 4-170 |
| Removal | 4-93a | 4-170 |
| Blackout switch, rear steps: | | |
| Installation | 4-91b | 4-166 |
| Removal | 4-91a | 4-166 |
| Boot, fuel injection pump: | | |
| Installation | 3-22d | 3-35 |
| Removal | 3-22a | 3-35 |
| Brace, rear bumper: | | |
| Installation | 9-8b | 9-10 |
| Removal | 9-8a | 9-10 |
| Brace, rear crossmember: | | |
| Installation | 9-9b | 9-11 |
| Removal | 9-9a | 9-11 |
| Bracket, air lifting: | | |
| Installation | 6-20b | 6-50 |
| Removal | 6-20a | 6-50 |
| Bracket, alternator mounting: | | |
| Installation | 4-4b | 4-10 |
| Removal | 4-4a | 4-10 |
| Bracket, backup light: | | |
| Installation | 4-70b | 4-112 |
| Removal | 4-70a | 4-112 |
| Bracket, fuel injection lines, left: | | |
| Installation | 3-40b | 3-76 |
| Removal | 3-40a | 3-76 |
| Bracket, fuel injection lines, right: | | |
| Installation | 3-39b | 3-75 |
| Removal | 3-39a | 3-75 |
| Bracket, horn mounting: | | |
| Installation | 4-23b | 4-43 |
| Removal | 4-23a | 4-43 |
| Bracket, muffler support: | | |
| Assembly | 3-53a | 3-96 |
| Disassembly | 3-53b | 3-96 |
| Installation | 3-53d | 3-96 |
| Removal | 3-53a | 3-96 |
| Bracket, radiator front mount: | | |
| Installation | 9-7b | 9-9 |
| Removal | 9-7a | 9-9 |
| Bracket, rear bumper inner mounting: | | |
| Installation | 9-11b | 9-14 |
| Removal | 9-11a | 9-14 |
INDEX (Cont'd)

B (Cont'd)  Para  Page  Para  Page

Bracket, rear steps blackout switch
Installation .................................. 4-91b  4-166
Removal ..................................... 4-91a  4-166

Brake adjustment, parking... 7-2  7-2
Brake adjustment, rear dual service/parking:
  Adjustment ................................ 7-26  7-64
Bracket, receptacle mounting:
  Installation ................................ 9-14b  9-21
  Removal .................................. 9-14a  9-21

Brake cable/mounting bracket, parking, left:
  Installation ................................ 7-24b  7-60
  Removal .................................. 7-24a  7-58

Brake cable, parking, right:
  Installation ................................ 7-23b  7-56
  Removal .................................. 7-23a  7-56

Brake cable, parking:
  Installation ................................ 7-56  7-12
  Removal .................................. 7-5a  7-12

Brake caliper and rotor, parking:
  Inspection .................................. 7-3b  7-6
  Installation ................................ 7-3c  7-6
  Removal .................................. 7-3a  7-4

Brake caliper, rear dual service/parking:
  Cleaning and Inspection ..................... 7-22b  7-54
  Installation ................................ 7-22c  7-54
  Removal .................................. 7-22a  7-52

Brake heat shield, parking:
  Installation ................................ 7-1b  7-16
  Removal .................................. 7-1a  7-16

Brake lever, parking:
  Installation ................................ 7-4b  7-10
  Removal .................................. 7-4a  7-10

Brake lines:
  Caliper to tee brake line installation ...... 7-15b  7-34
  Caliper to tee brake line removal .......... 7-15a  7-32
  Intermediate brake line installation ...... 7-15f  7-37
  Intermediate brake line removal .......... 7-15e  7-36
  Proportioning valve to front tee brake line installation ..... 7-15i  7-38
  Proportioning valve to front tee brake line removal ...... 7-15i  7-38
  Proportioning valve to union brake line installation .... 7-15h  7-38

Proportioning valve to union brake line removal ........ 7-15g  7-38
Rear brake line installation ............... 7-15d  7-36
Rear brake line removal ..................... 7-15c  7-36

Brake pad, rear dual service/parking:
  Cleaning and Inspection ..................... 7-21b  7-50
  Installation ................................ 7-21c  7-50
  Removal .................................. 7-21a  7-48

Brake pad, service:
  Cleaning and Inspection ..................... 7-11b  7-24
  Installation ................................ 7-11c  7-25
  Removal .................................. 7-11a  7-24

Brake pedal (12338394), service:
  Installation ................................ 7-16b  7-40
  Removal .................................. 7-16a  7-40

Brake pedal (EX5935037) service:
  Installation ................................ 7-17b  7-42
  Removal .................................. 7-17a  7-42

Brake rod, parking:
  Installation ................................ 7-6b  7-14
  Removal .................................. 7-6a  7-14

Brake rod, rear dual service/parking:
  Installation ................................ 7-25b  7-62
  Removal .................................. 7-25a  7-62

Brake rotor, service:
  Installation ................................ 7-19b  7-46
  Removal .................................. 7-19a  7-46

Brake system bleeding, service:
  Manual bleeding .............................. 7-10b  7-20
  Master cylinder bleeding .................... 7-10c  7-22
  Pressure bleeding ........................... 7-10a  7-20

Brake system, parking:
  Maintenance task summary ................... 7-1  7-1

Brake system, service:
  Maintenance task summary ................... 7-9  7-19

Brake system, rear dual service/parking:
  Maintenance task summary ................... 7-20  7-47

Brush, horn control:
  Installation ................................ 4-21b  4-41
  Removal .................................. 4-21a  4-41

Bulkhead door blackout switch and bracket:
  Installation ................................ 4-94b  4-172
  Removal .................................. 4-94a  4-172

Bumper inner mounting bracket, rear:
  Installation ................................ 9-11b  9-14
  Removal .................................. 9-11a  9-14
<table>
<thead>
<tr>
<th>B (Cont’d)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bumper and towing brackets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>9-2a</td>
<td>9-2</td>
</tr>
<tr>
<td>2. Removal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bumper and towing brackets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(M1026, M1026A1, M1036, M1038, M1038A1, M1042, M1044, M1044A1, M1046, M1046A1), front:</td>
<td>9-3b</td>
<td>9-3</td>
</tr>
<tr>
<td>1. Installation</td>
<td>9-3a</td>
<td>9-3</td>
</tr>
<tr>
<td>2. Removal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bumper and Towing Brackets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(M997A2, M1025A2, M1035A2, M1043A2, M1045A2, M1097A2), front:</td>
<td>9-4b</td>
<td>9-4</td>
</tr>
<tr>
<td>1. Installation</td>
<td>9-4a</td>
<td>9-4</td>
</tr>
<tr>
<td>2. Removal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bumper, rear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>9-10b</td>
<td>9-12</td>
</tr>
<tr>
<td>2. Removal</td>
<td>9-10a</td>
<td>9-12</td>
</tr>
<tr>
<td>Bumper brace, rear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>9-8b</td>
<td>9-10</td>
</tr>
<tr>
<td>2. Removal</td>
<td>9-8a</td>
<td>9-10</td>
</tr>
<tr>
<td>Buss bar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-76b</td>
<td>4-127</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-76a</td>
<td>4-127</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable, alternator, 200 ampere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-112b</td>
<td>4-264</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-112a</td>
<td>4-264</td>
</tr>
<tr>
<td>Cable, 200 ampere umbilical power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-113b</td>
<td>4-268</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-113a</td>
<td>4-266</td>
</tr>
<tr>
<td>Cable and core, (12338428-2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>speedometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-151b</td>
<td>4-32.4</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-151a</td>
<td>4-32.2</td>
</tr>
<tr>
<td>Cable and slave receptacle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-81b</td>
<td>4-140</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-81a</td>
<td>4-138</td>
</tr>
<tr>
<td>Cables, antenna (M996, M996A1):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-105b</td>
<td>4-236</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-105a</td>
<td>4-236</td>
</tr>
<tr>
<td>Cables, antenna (M997, M997A1, M997A2):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-106b</td>
<td>4-240</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-106a</td>
<td>4-238</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable, battery:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cleaning and Inspection.</td>
<td>4-73a</td>
<td>4-116</td>
</tr>
<tr>
<td>2. Ground cables disconnection.</td>
<td>4-73b</td>
<td>4-117</td>
</tr>
<tr>
<td>3. Ground cables installation.</td>
<td>4-73c</td>
<td>4-118</td>
</tr>
<tr>
<td>4. Ground cables reconnection.</td>
<td>4-73d</td>
<td>4-118</td>
</tr>
<tr>
<td>5. Ground cable removal.</td>
<td>4-73e</td>
<td>4-118</td>
</tr>
<tr>
<td>6. Interconnecting cable installation.</td>
<td>4-73f</td>
<td>4-119</td>
</tr>
<tr>
<td>7. Interconnecting cable removal.</td>
<td>4-73g</td>
<td>4-118</td>
</tr>
<tr>
<td>8. Positive cable installation.</td>
<td>4-73h</td>
<td>4-120</td>
</tr>
<tr>
<td>9. Positive cable removal.</td>
<td>4-73i</td>
<td>4-120</td>
</tr>
<tr>
<td>Cable, hand throttle control, and bracket:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>3-45b</td>
<td>3-85</td>
</tr>
<tr>
<td>2. Removal</td>
<td>3-45a</td>
<td>3-84</td>
</tr>
<tr>
<td>Cable, intercom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(M996, M996A1):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-107b</td>
<td>4-244</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-107a</td>
<td>4-242</td>
</tr>
<tr>
<td>Cable, intercom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(M997, M997A1, M997A2):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-108b</td>
<td>4-259</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-108a</td>
<td>4-248</td>
</tr>
<tr>
<td>Cable, parking brake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>7-5b</td>
<td>7-12</td>
</tr>
<tr>
<td>2. Removal</td>
<td>7-5a</td>
<td>7-12</td>
</tr>
<tr>
<td>Cable, parking brake, right:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>7-23b</td>
<td>7-56</td>
</tr>
<tr>
<td>2. Removal</td>
<td>7-23a</td>
<td>7-56</td>
</tr>
<tr>
<td>Cable resuscitator/aspirator:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-104b</td>
<td>4-234</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-104a</td>
<td>4-234</td>
</tr>
<tr>
<td>Cables, starter power:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>4-77b</td>
<td>4-130</td>
</tr>
<tr>
<td>2. Removal</td>
<td>4-77a</td>
<td>4-128</td>
</tr>
<tr>
<td>Caliper and rotor, parking brake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Inspection</td>
<td>7-3b</td>
<td>7-6</td>
</tr>
<tr>
<td>2. Removal</td>
<td>7-3a</td>
<td>7-4</td>
</tr>
<tr>
<td>Caliper, rear dual service/parking brake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cleaning and Inspection.</td>
<td>7-22b</td>
<td>7-54</td>
</tr>
<tr>
<td>2. Installation</td>
<td>7-22c</td>
<td>7-54</td>
</tr>
<tr>
<td>3. Removal</td>
<td>7-22a</td>
<td>7-52</td>
</tr>
<tr>
<td>Caliper, service brake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cleaning and Inspection.</td>
<td>7-12b</td>
<td>7-26</td>
</tr>
<tr>
<td>2. Installation</td>
<td>7-12c</td>
<td>7-27</td>
</tr>
<tr>
<td>3. Removal</td>
<td>7-12a</td>
<td>7-26</td>
</tr>
<tr>
<td>CDR valve and bracket:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Cleaning and inspection.</td>
<td>3-9c</td>
<td>3-16</td>
</tr>
<tr>
<td>2. Installation</td>
<td>3-9d</td>
<td>3-16</td>
</tr>
<tr>
<td>3. Removal</td>
<td>3-9e</td>
<td>3-14</td>
</tr>
<tr>
<td>4. Testing</td>
<td>3-9f</td>
<td>3-14</td>
</tr>
<tr>
<td>CDR valve hoses:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Installation</td>
<td>3-10b</td>
<td>3-18</td>
</tr>
<tr>
<td>2. Removal</td>
<td>3-10a</td>
<td>3-18</td>
</tr>
<tr>
<td>C (Cont'd)</td>
<td>Para</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>Ceiling light assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-87b</td>
<td>4-159</td>
</tr>
<tr>
<td>Removal</td>
<td>4-87a</td>
<td>4-159</td>
</tr>
<tr>
<td>Center link</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-15b</td>
<td>8-48</td>
</tr>
<tr>
<td>Removal</td>
<td>8-15a</td>
<td>8-48</td>
</tr>
<tr>
<td>Circuit breaker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-9b</td>
<td>4-20</td>
</tr>
<tr>
<td>Removal</td>
<td>4-9a</td>
<td>4-20</td>
</tr>
<tr>
<td>Clamp, battery cable terminal:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-72b</td>
<td>4-114</td>
</tr>
<tr>
<td>Removal</td>
<td>4-72a</td>
<td>4-114</td>
</tr>
<tr>
<td>Close-off and retainer, steering shaft:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-23b</td>
<td>8-70</td>
</tr>
<tr>
<td>Removal</td>
<td>8-23a</td>
<td>8-70</td>
</tr>
<tr>
<td>Coil spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-30b</td>
<td>6-66</td>
</tr>
<tr>
<td>Removal</td>
<td>6-30a</td>
<td>6-66</td>
</tr>
<tr>
<td>Cold advance switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-27b</td>
<td>4-47</td>
</tr>
<tr>
<td>Removal</td>
<td>4-27a</td>
<td>4-47</td>
</tr>
<tr>
<td>Column, steering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-19b</td>
<td>8-60</td>
</tr>
<tr>
<td>Removal</td>
<td>8-19a</td>
<td>8-60</td>
</tr>
<tr>
<td>Composite light assembly, front:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-52b</td>
<td>4-86</td>
</tr>
<tr>
<td>Removal</td>
<td>4-52a</td>
<td>4-86</td>
</tr>
<tr>
<td>Composite light assembly, rear:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-56b</td>
<td>4-92</td>
</tr>
<tr>
<td>Removal</td>
<td>4-56a</td>
<td>4-92</td>
</tr>
<tr>
<td>Composite light lamp, front:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-53b</td>
<td>4-88</td>
</tr>
<tr>
<td>Removal</td>
<td>4-53a</td>
<td>4-88</td>
</tr>
<tr>
<td>Composite light lamp, rear:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-57b</td>
<td>4-94</td>
</tr>
<tr>
<td>Removal</td>
<td>4-57a</td>
<td>4-94</td>
</tr>
<tr>
<td>Compressor/heater fuel pump wiring harness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(M997, M997A1, M997A2):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-122b</td>
<td>4-288</td>
</tr>
<tr>
<td>Removal</td>
<td>4-122a</td>
<td>4-286</td>
</tr>
<tr>
<td>Condenser fan/pressure switch wiring harness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-121b</td>
<td>4-284</td>
</tr>
<tr>
<td>Removal</td>
<td>4-121a</td>
<td>4-284</td>
</tr>
<tr>
<td>Connector, wiring harness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connector assembly repair</td>
<td>4-85d</td>
<td>4-155</td>
</tr>
<tr>
<td>Female cable connector repair</td>
<td>4-85c</td>
<td>4-155</td>
</tr>
<tr>
<td>Male cable connector repair</td>
<td>4-85b</td>
<td>4-155</td>
</tr>
<tr>
<td>Protective control box lower cannon plug assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-85f</td>
<td>4-156</td>
</tr>
<tr>
<td>Receptacle assembly repair</td>
<td>4-85e</td>
<td>4-156</td>
</tr>
<tr>
<td>Terminal-type cable connector repair</td>
<td>4-85a</td>
<td>4-154</td>
</tr>
</tbody>
</table>

Connector and grommet, service headlight and blackout drive light:
- Installation: 4-67b, 4-108
- Removal: 4-67a, 4-108

Control arm, lower:
- Installation: 6-29b, 6-64
- Removal: 6-29a, 6-64

Control arm, upper:
- Installation: 6-28b, 6-62
- Removal: 6-28a, 6-62

Control box and wiring harness, NBC (M996, M996A1):
- Installation: 4-99b, 4-198
- Removal: 4-99a, 4-194

Control box and wiring harness, NBC (M997, M997A1, M997A2):
- Installation: 4-100b, 4-206
- Removal: 4-100a, 4-202

Control box and wiring harness, heater/vent system:
- Installation: 4-123b, 4-294
- Removal: 4-123a, 4-292

Control box assembly (M996, M996A1):
- Installation: 4-97b, 4-184
- Removal: 4-97a, 4-182

Control box assembly (M997, M997A1, M997A2):
- Installation: 4-96b, 4-179
- Removal: 4-96a, 4-176

Control box electrical plug receptacle:
- Installation: 4-119d, 4-280
- Plug installation: 4-119e, 4-280
- Plug removal: 4-119a, 4-280
- Removal: 4-119c, 4-280

Control box fuse block and relay socket:
- Installation: 4-117b, 4-276
- Removal: 4-117a, 4-276

Control box light switch:
- Installation: 4-118b, 4-278
- Removal: 4-118a, 4-276

Control box power cables:
- Installation: 4-98b, 4-190
- Removal: 4-98a, 4-188

Control box, protective:
- Installation: 4-5b, 4-12
- Removal: 4-5a, 4-12

Control box relay:
- Installation: 4-120b, 4-282
- Removal: 4-120a, 4-282
## INDEX (Cont'd)

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control box terminal block</strong> and mounting buss:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-116b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-116a</td>
</tr>
<tr>
<td><strong>Control panel, NBC:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-124b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-124a</td>
</tr>
<tr>
<td><strong>Control panel, (M996, M996A1), heat/vent:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-125b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-125a</td>
</tr>
<tr>
<td><strong>Control valve, power steering system hydraulic:</strong></td>
<td></td>
</tr>
<tr>
<td>Back flush procedure</td>
<td>8-26a</td>
</tr>
<tr>
<td>Inspection</td>
<td>8-26c</td>
</tr>
<tr>
<td>Installation</td>
<td>8-26a</td>
</tr>
<tr>
<td>Removal</td>
<td>8-26a</td>
</tr>
<tr>
<td><strong>Controller, glow plug:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-29a</td>
</tr>
<tr>
<td>Removal</td>
<td>4-29a</td>
</tr>
<tr>
<td><strong>Converter housing cover (1 piece):</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-19b</td>
</tr>
<tr>
<td>Removal</td>
<td>5-19a</td>
</tr>
<tr>
<td><strong>Converter housing cover, sealed lower:</strong></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>5-17b</td>
</tr>
<tr>
<td>Installation</td>
<td>5-17c</td>
</tr>
<tr>
<td>Removal</td>
<td>5-17a</td>
</tr>
<tr>
<td><strong>Converter housing cover, sealed upper:</strong></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>5-18b</td>
</tr>
<tr>
<td>Installation</td>
<td>5-18c</td>
</tr>
<tr>
<td>Removal</td>
<td>5-18a</td>
</tr>
<tr>
<td><strong>Cooling system:</strong></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>3-59</td>
</tr>
<tr>
<td><strong>Cooling system servicing:</strong></td>
<td></td>
</tr>
<tr>
<td>Repressurizing</td>
<td>3-60a</td>
</tr>
<tr>
<td>Draining system</td>
<td>3-60b</td>
</tr>
<tr>
<td>Filling system</td>
<td>3-60d</td>
</tr>
<tr>
<td>Preventive cleaning</td>
<td>3-60c</td>
</tr>
<tr>
<td><strong>Cover, converter housing: (1 piece)</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-19b</td>
</tr>
<tr>
<td>Removal</td>
<td>5-19a</td>
</tr>
<tr>
<td><strong>Cover, geared hub side:</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>6-10b</td>
</tr>
<tr>
<td>Installation</td>
<td>6-10c</td>
</tr>
<tr>
<td>Removal</td>
<td>6-10a</td>
</tr>
<tr>
<td><strong>Crankcase depression regulator (CDR) valve and bracket:</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>3-9a</td>
</tr>
<tr>
<td>Installation</td>
<td>3-9d</td>
</tr>
<tr>
<td>Removal</td>
<td>3-9b</td>
</tr>
<tr>
<td>Testing</td>
<td>3-9a</td>
</tr>
<tr>
<td><strong>Crossmember, transmission mount:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>9-15b</td>
</tr>
<tr>
<td>Removal</td>
<td>9-15a</td>
</tr>
<tr>
<td><strong>Crossover pipe:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-50b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-50a</td>
</tr>
<tr>
<td><strong>Crossover, water:</strong></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>3-77b</td>
</tr>
<tr>
<td>Installation</td>
<td>3-77e</td>
</tr>
<tr>
<td>Removal</td>
<td>3-77a</td>
</tr>
</tbody>
</table>

**D**

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Differential cover:</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>6-21b</td>
</tr>
<tr>
<td>Installation</td>
<td>6-21c</td>
</tr>
<tr>
<td>Removal</td>
<td>6-21a</td>
</tr>
<tr>
<td><strong>Differential vent line:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-16b</td>
</tr>
<tr>
<td>Removal</td>
<td>6-16a</td>
</tr>
<tr>
<td><strong>Dipstick tube, engine oil:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-2a</td>
</tr>
<tr>
<td>Removal</td>
<td>3-2b</td>
</tr>
<tr>
<td><strong>Dipstick tube, transmission oil:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-5b</td>
</tr>
<tr>
<td>Removal</td>
<td>5-5a</td>
</tr>
<tr>
<td><strong>Directional signal control:</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning</td>
<td>4-64b</td>
</tr>
<tr>
<td>Installation</td>
<td>4-64a</td>
</tr>
<tr>
<td>Removal</td>
<td>4-64a</td>
</tr>
<tr>
<td><strong>Directional signal control (&quot;A2&quot; vehicles):</strong></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>4-65b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-65a</td>
</tr>
<tr>
<td><strong>Directional signal control canceling ring:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-66b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-66a</td>
</tr>
<tr>
<td><strong>Directional signal control indicator lamp:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-63b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-63a</td>
</tr>
<tr>
<td><strong>Directional signal flasher:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-62a</td>
</tr>
<tr>
<td>Removal</td>
<td>4-62b</td>
</tr>
<tr>
<td><strong>Drainage bracket:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-21b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-21a</td>
</tr>
<tr>
<td><strong>Drivebelts adjustment:</strong></td>
<td></td>
</tr>
<tr>
<td>Alternator belt adjustment</td>
<td>3-82b</td>
</tr>
<tr>
<td>Power steering belt adjustment</td>
<td>3-82a</td>
</tr>
<tr>
<td><strong>Drivebelt, serpentine:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-83b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-83a</td>
</tr>
<tr>
<td><strong>Drivebelt set, alternator:</strong></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-81b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-81a</td>
</tr>
</tbody>
</table>
### INDEX (Cont'd)

<table>
<thead>
<tr>
<th>D (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivebelt set, power steering:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-80b</td>
<td>3-137</td>
</tr>
<tr>
<td>Removal</td>
<td>3-80a</td>
<td>3-137</td>
</tr>
<tr>
<td>Driveshaft and core (12338428), speedometer flexible:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-15b</td>
<td>4-32</td>
</tr>
<tr>
<td>Removal</td>
<td>4-15a</td>
<td>4-32</td>
</tr>
<tr>
<td>Driven gear, speedometer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-24b</td>
<td>5-50</td>
</tr>
<tr>
<td>Removal</td>
<td>5-24a</td>
<td>5-50</td>
</tr>
<tr>
<td>Duct assembly, wiring harness:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main duct installation</td>
<td>4-103c</td>
<td>4-232</td>
</tr>
<tr>
<td>Main duct removal</td>
<td>4-103b</td>
<td>4-232</td>
</tr>
<tr>
<td>Spotlight branch duct installation.</td>
<td>4-103d</td>
<td>4-232</td>
</tr>
<tr>
<td>Spotlight branch duct removal</td>
<td>4-103a</td>
<td>4-232</td>
</tr>
<tr>
<td>Dust unloader and air cleaner assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>3-12b</td>
<td>3-20</td>
</tr>
<tr>
<td>Installation</td>
<td>3-12c</td>
<td>3-20</td>
</tr>
<tr>
<td>Removal</td>
<td>3-12a</td>
<td>3-20</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-13b</td>
<td>4-28</td>
</tr>
<tr>
<td>Removal</td>
<td>4-13a</td>
<td>4-28</td>
</tr>
<tr>
<td>Electrical outlet/bracket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-90b</td>
<td>4-164</td>
</tr>
<tr>
<td>Removal</td>
<td>4-90a</td>
<td>4-164</td>
</tr>
<tr>
<td>Electrical receptacle, control box:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-119c</td>
<td>4-280</td>
</tr>
<tr>
<td>Plug installation</td>
<td>4-119b</td>
<td>4-280</td>
</tr>
<tr>
<td>Plug removal</td>
<td>4-119a</td>
<td>4-280</td>
</tr>
<tr>
<td>Removal</td>
<td>4-119c</td>
<td>4-280</td>
</tr>
<tr>
<td>Electrical system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>4-86</td>
<td>4-157</td>
</tr>
<tr>
<td>Element, air cleaner filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning</td>
<td>3-13d</td>
<td>3-24</td>
</tr>
<tr>
<td>Emergency cleaning</td>
<td>3-13e</td>
<td>3-22</td>
</tr>
<tr>
<td>Inspection</td>
<td>3-13c</td>
<td>3-24</td>
</tr>
<tr>
<td>Installation</td>
<td>3-13b</td>
<td>3-22</td>
</tr>
<tr>
<td>Element, fuel filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>3-33b</td>
<td>3-62</td>
</tr>
<tr>
<td>Element installation</td>
<td>3-33c</td>
<td>3-63</td>
</tr>
<tr>
<td>Element removal</td>
<td>3-33a</td>
<td>3-62</td>
</tr>
<tr>
<td>Engine and transmission oil cooler assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>3-8d</td>
<td>3-12</td>
</tr>
<tr>
<td>Installation</td>
<td>3-8b</td>
<td>3-12</td>
</tr>
<tr>
<td>Removal</td>
<td>3-8a</td>
<td>3-12</td>
</tr>
<tr>
<td>Engine idle speed adjustment</td>
<td>3-44</td>
<td>3-83</td>
</tr>
<tr>
<td>Engine oil cooler adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine oil cooler adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine idle speed adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>3-7b</td>
<td>3-10</td>
</tr>
<tr>
<td>Installation</td>
<td>3-7c</td>
<td>3-10</td>
</tr>
<tr>
<td>Removal</td>
<td>3-7a</td>
<td>3-10</td>
</tr>
<tr>
<td>Engine oil dipstick tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-2b</td>
<td>3-2</td>
</tr>
<tr>
<td>Removal</td>
<td>3-2a</td>
<td>3-2</td>
</tr>
<tr>
<td>Engine oil filler tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-3b</td>
<td>3-4</td>
</tr>
<tr>
<td>Removal</td>
<td>3-3a</td>
<td>3-4</td>
</tr>
<tr>
<td>Engine oil filter adapter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-4b</td>
<td>3-5</td>
</tr>
<tr>
<td>Removal</td>
<td>3-4a</td>
<td>3-5</td>
</tr>
<tr>
<td>Engine oil service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draining oil</td>
<td>3-5a</td>
<td>3-6</td>
</tr>
<tr>
<td>Installing filter</td>
<td>3-5c</td>
<td>3-6</td>
</tr>
<tr>
<td>Removing filter</td>
<td>3-5b</td>
<td>3-6</td>
</tr>
<tr>
<td>Replenishing oil</td>
<td>3-5d</td>
<td>3-6</td>
</tr>
<tr>
<td>Engine RPM sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-33b</td>
<td>4-55</td>
</tr>
<tr>
<td>Removal</td>
<td>4-33a</td>
<td>4-55</td>
</tr>
<tr>
<td>Engine temperature sending unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-24b</td>
<td>4-44</td>
</tr>
<tr>
<td>Removal</td>
<td>4-24a</td>
<td>4-44</td>
</tr>
<tr>
<td>Exhaust manifold, left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-56b</td>
<td>3-103</td>
</tr>
<tr>
<td>Removal</td>
<td>3-56a</td>
<td>3-102</td>
</tr>
<tr>
<td>Exhaust manifold, right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-57b</td>
<td>3-104</td>
</tr>
<tr>
<td>Removal</td>
<td>3-57a</td>
<td>3-104</td>
</tr>
<tr>
<td>Exhaust manifold heat shield, right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-55b</td>
<td>3-100</td>
</tr>
<tr>
<td>Removal</td>
<td>3-55a</td>
<td>3-100</td>
</tr>
<tr>
<td>Exhaust manifold rear heat shield, right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-54b</td>
<td>3-98</td>
</tr>
<tr>
<td>Removal</td>
<td>3-54a</td>
<td>3-98</td>
</tr>
<tr>
<td>Exhaust system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>3-46</td>
<td>3-86</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan cut-off switch (4L80-E)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-44b</td>
<td>4-70</td>
</tr>
<tr>
<td>Removal</td>
<td>4-44a</td>
<td>4-70</td>
</tr>
<tr>
<td>Fan drive and fan blade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>3-78b</td>
<td>3-134</td>
</tr>
<tr>
<td>Installation</td>
<td>3-78c</td>
<td>3-134</td>
</tr>
<tr>
<td>Removal</td>
<td>3-78a</td>
<td>3-134</td>
</tr>
<tr>
<td>Fan drive fiction lining replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-79b</td>
<td>3-136</td>
</tr>
<tr>
<td>Removal</td>
<td>3-79a</td>
<td>3-136</td>
</tr>
<tr>
<td>Fan drive hose and quick-disconnect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-68b</td>
<td>3-122</td>
</tr>
<tr>
<td>Removal</td>
<td>3-68a</td>
<td>3-122</td>
</tr>
<tr>
<td>Fan shroud and radiator assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>3-61b</td>
<td>3-112</td>
</tr>
<tr>
<td>Installation</td>
<td>3-61c</td>
<td>3-112</td>
</tr>
<tr>
<td>Removal</td>
<td>3-61a</td>
<td>3-110</td>
</tr>
</tbody>
</table>

INDEX 7
### INDEX (Cont'd)

<table>
<thead>
<tr>
<th>Description</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan temperature switch:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>4-30b</td>
<td>4-52</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>4-30a</td>
<td>4-52</td>
</tr>
<tr>
<td>Filler cap and spout, fuel tank:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inspection</strong></td>
<td>3-28b</td>
<td>3-54</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-28c</td>
<td>3-54</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-28a</td>
<td>3-54</td>
</tr>
<tr>
<td>Filler tube, engine oil:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-3b</td>
<td>3-4</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-3a</td>
<td>3-4</td>
</tr>
<tr>
<td>Filler spout hose:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-30a</td>
<td>3-68</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-30a</td>
<td>3-68</td>
</tr>
<tr>
<td>Filter adapter, engine oil:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-4b</td>
<td>3-5</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-4a</td>
<td>3-5</td>
</tr>
<tr>
<td>Filter, fuel:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bleeding</strong></td>
<td>3-32c</td>
<td>3-61</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-32b</td>
<td>3-60</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-32a</td>
<td>3-60</td>
</tr>
<tr>
<td>Flasher, directional signal:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>4-62b</td>
<td>4-102</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>4-62a</td>
<td>4-102</td>
</tr>
<tr>
<td>Frame:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance task summary</strong></td>
<td>9-1</td>
<td>9-1</td>
</tr>
<tr>
<td>Frame extension:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>9-5a</td>
<td>9-6</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>9-5a</td>
<td>9-6</td>
</tr>
<tr>
<td>Front and rear axles:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance task summary</strong></td>
<td>6-8</td>
<td>6-10</td>
</tr>
<tr>
<td>Front geared hub vent line:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong>, left side</td>
<td>6-18a</td>
<td>6-46</td>
</tr>
<tr>
<td><strong>Installation</strong>, right side</td>
<td>6-18b</td>
<td>6-44</td>
</tr>
<tr>
<td><strong>Removal</strong>, left side</td>
<td>6-18c</td>
<td>6-46</td>
</tr>
<tr>
<td><strong>Removal</strong>, right side</td>
<td>6-18a</td>
<td>6-44</td>
</tr>
<tr>
<td>Fuel drain back tube:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-37b</td>
<td>3-72</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-37a</td>
<td>3-72</td>
</tr>
<tr>
<td>Fuel filter:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bleeding</strong></td>
<td>3-32c</td>
<td>3-61</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-32b</td>
<td>3-60</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-32a</td>
<td>3-60</td>
</tr>
<tr>
<td>Fuel filter drain hose and valve:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-34b</td>
<td>3-64</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-34a</td>
<td>3-64</td>
</tr>
<tr>
<td>Fuel filter element:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cleaning and Inspection</strong></td>
<td>3-33b</td>
<td>3-62</td>
</tr>
<tr>
<td><strong>Element installation</strong></td>
<td>3-33c</td>
<td>3-63</td>
</tr>
<tr>
<td><strong>Element removal</strong></td>
<td>3-33a</td>
<td>3-62</td>
</tr>
<tr>
<td>Fuel injection lines bracket, left:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-40b</td>
<td>3-76</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-40a</td>
<td>3-76</td>
</tr>
<tr>
<td>Fuel injection lines bracket, right:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-39b</td>
<td>3-75</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-39a</td>
<td>3-75</td>
</tr>
<tr>
<td>Fuel injection pump boot:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-22b</td>
<td>3-35</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-22a</td>
<td>3-35</td>
</tr>
<tr>
<td>Fuel injection return hoses:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel drain back hose installation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-36b</td>
<td>3-68</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-36a</td>
<td>3-68</td>
</tr>
<tr>
<td>Nozzle cap installation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-36e</td>
<td>3-70</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-36d</td>
<td>3-70</td>
</tr>
<tr>
<td>Nozzle to nozzle hose installation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-36f</td>
<td>3-70</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-36e</td>
<td>3-70</td>
</tr>
<tr>
<td>Tube to nozzle hose installation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-36d</td>
<td>3-68</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-36c</td>
<td>3-68</td>
</tr>
<tr>
<td>Fuel injection pump return hose check valve replacement:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning &amp; Inspection:</td>
<td>3-35b</td>
<td>3-66</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-35c</td>
<td>3-66</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-35a</td>
<td>3-66</td>
</tr>
<tr>
<td>Fuel level sending unit:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>4-28b</td>
<td>4-48</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>4-28a</td>
<td>4-48</td>
</tr>
<tr>
<td>Fuel pickup and return lines, auxiliary</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-26b</td>
<td>3-50</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-26a</td>
<td>3-50</td>
</tr>
<tr>
<td>Fuel pressure transducer:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>4-26b</td>
<td>4-46</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>4-26a</td>
<td>4-46</td>
</tr>
<tr>
<td>Fuel pump:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-23b</td>
<td>3-36</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-23a</td>
<td>3-36</td>
</tr>
<tr>
<td>Fuel system:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance task summary</strong></td>
<td>3-31</td>
<td>3-19</td>
</tr>
<tr>
<td>Fuel tank:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>3-24e</td>
<td>3-44</td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>3-24d</td>
<td>3-42</td>
</tr>
<tr>
<td>Disassembly</td>
<td>3-24c</td>
<td>3-42</td>
</tr>
<tr>
<td>Draining</td>
<td>3-24a</td>
<td>3-38</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-24f</td>
<td>3-46</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-24d</td>
<td>3-38</td>
</tr>
<tr>
<td>Fuel tank filler cap and spout:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inspection</strong></td>
<td>3-28b</td>
<td>3-54</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-28c</td>
<td>3-54</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-28a</td>
<td>3-54</td>
</tr>
<tr>
<td>Fuel tank filler spout vent line:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-29b</td>
<td>3-56</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-29a</td>
<td>3-56</td>
</tr>
<tr>
<td>Fuel tank hangers:</td>
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</tr>
<tr>
<td><strong>Installation</strong></td>
<td>3-31b</td>
<td>3-59</td>
</tr>
<tr>
<td><strong>Removal</strong></td>
<td>3-31a</td>
<td>3-59</td>
</tr>
<tr>
<td>Para</td>
<td>Page</td>
<td></td>
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<tr>
<td>------</td>
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<tr>
<td>Fuel tank supply and return lines:</td>
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<td>Installation</td>
<td>3-25b 3-48</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>3-25a 3-48</td>
<td></td>
</tr>
<tr>
<td>Fuel tank vent line and filter:</td>
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<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-27b 3-52</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>3-27a 3-52</td>
<td></td>
</tr>
<tr>
<td>Fuse block and relay socket, control box:</td>
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<td></td>
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<tr>
<td>Installation</td>
<td>4-117b 4-276</td>
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<td>Removal</td>
<td>4-117a 4-276</td>
<td></td>
</tr>
<tr>
<td>Gauge, air restriction:</td>
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<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-17b 3-30</td>
<td></td>
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<tr>
<td>Removal</td>
<td>3-17a 3-30</td>
<td></td>
</tr>
<tr>
<td>Gauge, electrical:</td>
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<tr>
<td>Installation</td>
<td>4-13b 4-28</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>4-13a 4-28</td>
<td></td>
</tr>
<tr>
<td>Geared hub:</td>
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<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-11b 6-28</td>
<td></td>
</tr>
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<td>Removal</td>
<td>6-11a 6-26</td>
<td></td>
</tr>
<tr>
<td>Geared hub input seal:</td>
<td></td>
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</tr>
<tr>
<td>Installation</td>
<td>6-12b 6-32</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>6-12a 6-32</td>
<td></td>
</tr>
<tr>
<td>Geared hub side cover:</td>
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<td></td>
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<tr>
<td>Cleaning and Inspection</td>
<td>6-10b 6-24</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-10c 6-24</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>6-10a 6-24</td>
<td></td>
</tr>
<tr>
<td>Geared hub spindle bearing adjustment:</td>
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<td>Adjustment</td>
<td>6-14 6-38</td>
<td></td>
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<tr>
<td>Geared hub spindle seal:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-13b 6-36</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>6-13a 6-34</td>
<td></td>
</tr>
<tr>
<td>Geared hub vent line, rear:</td>
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<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-17b 6-42</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>6-17a 6-42</td>
<td></td>
</tr>
<tr>
<td>Geared hub vent line, front:</td>
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<tr>
<td>Installation, right side</td>
<td>6-18b 6-44</td>
<td></td>
</tr>
<tr>
<td>Removal, right side</td>
<td>6-18a 6-44</td>
<td></td>
</tr>
<tr>
<td>Installation, left side</td>
<td>6-18c 6-46</td>
<td></td>
</tr>
<tr>
<td>Removal, left side</td>
<td>6-18d 6-46</td>
<td></td>
</tr>
<tr>
<td>Generating and protective control box system:</td>
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<tr>
<td>Maintenance task summary</td>
<td>4-1 4-1</td>
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</tr>
<tr>
<td>Glow plug:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-38b 3-74</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>3-38a 3-74</td>
<td></td>
</tr>
<tr>
<td>Glow plug controller:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-29b 4-50</td>
<td></td>
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<td>Removal</td>
<td>4-29a 4-50</td>
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<tr>
<td>Grommet and connector, service headlight and blackout drive light:</td>
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<td>Installation</td>
<td>4-67b 4-108</td>
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<td>4-67a 4-108</td>
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**H**

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Halfshaft:</td>
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<tr>
<td>Assembly</td>
<td>6-9d 6-21</td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>6-9c 6-20</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6-9b 6-18</td>
</tr>
<tr>
<td>Installation</td>
<td>6-9e 6-23</td>
</tr>
<tr>
<td>Removal</td>
<td>6-9a 6-17</td>
</tr>
<tr>
<td>Hangers, fuel tank:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-31b 3-59</td>
</tr>
<tr>
<td>Removal</td>
<td>3-31a 3-59</td>
</tr>
<tr>
<td>Hanger, muffler:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-58b 3-106</td>
</tr>
<tr>
<td>Removal</td>
<td>3-58a 3-106</td>
</tr>
<tr>
<td>Hanger, tailpipe:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-51b 3-94</td>
</tr>
<tr>
<td>Removal</td>
<td>3-51a 3-94</td>
</tr>
<tr>
<td>Harness assembly (M997, M997A1, M997A2), interior lighting:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-101b 4-216</td>
</tr>
<tr>
<td>Removal</td>
<td>4-101a 4-212</td>
</tr>
<tr>
<td>Harness assembly (M996, M996A1), interior lighting:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-102b 4-226</td>
</tr>
<tr>
<td>Removal</td>
<td>4-102a 4-222</td>
</tr>
<tr>
<td>Headlight assembly, service:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-40b 4-80</td>
</tr>
<tr>
<td>Removal</td>
<td>4-40a 4-80</td>
</tr>
<tr>
<td>Headlight beam selector switch:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-58b 4-95</td>
</tr>
<tr>
<td>Removal</td>
<td>4-58a 4-95</td>
</tr>
<tr>
<td>Headlight lamp, service:</td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>4-48c 4-79</td>
</tr>
<tr>
<td>Installation</td>
<td>4-48d 4-78</td>
</tr>
<tr>
<td>Removal</td>
<td>4-48a 4-78</td>
</tr>
<tr>
<td>Heat/air-conditioning control panel relay and switch (M997, M997A1, M997A2):</td>
<td></td>
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<tr>
<td>A/C on-off switch installation</td>
<td>4-127l 4-324</td>
</tr>
<tr>
<td>A/C on-off switch removal</td>
<td>4-127k 4-324</td>
</tr>
<tr>
<td>Fan hi-low switch installation</td>
<td>4-127j 4-323</td>
</tr>
<tr>
<td>Fan hi-low switch removal</td>
<td>4-127i 4-323</td>
</tr>
<tr>
<td>Fuel hi-low switch installation</td>
<td>4-127g 4-322</td>
</tr>
<tr>
<td>Fuel hi-low switch removal</td>
<td>4-127h 4-322</td>
</tr>
<tr>
<td>Heat A/C panel installation</td>
<td>4-127b 4-319</td>
</tr>
<tr>
<td>Heat A/C panel removal</td>
<td>4-127a 4-319</td>
</tr>
<tr>
<td>Heat on light installation</td>
<td>4-127j 4-321</td>
</tr>
<tr>
<td>Heat on light removal</td>
<td>4-127e 4-321</td>
</tr>
<tr>
<td>Heater run-start switch installation</td>
<td>4-127d 4-320</td>
</tr>
<tr>
<td>Heater run-start switch removal</td>
<td>4-127c 4-320</td>
</tr>
<tr>
<td>Rollover switch removal</td>
<td>4-127n 4-325</td>
</tr>
<tr>
<td>Rollover switch installation</td>
<td>4-127r 4-325</td>
</tr>
<tr>
<td>Heat shield, parking brake:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-7b 7-16</td>
</tr>
<tr>
<td>Removal</td>
<td>7-7a 7-16</td>
</tr>
<tr>
<td>Parameter</td>
<td>Para</td>
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<tr>
<td>--------------------------------------------------------------------------</td>
<td>------</td>
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<td>Heat shield and heat shield extension, parking brake:</td>
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<tr>
<td>Installation</td>
<td>7-8b</td>
</tr>
<tr>
<td>Removal</td>
<td>7-8a</td>
</tr>
<tr>
<td>Heat shield, right exhaust manifold:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-55b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-55a</td>
</tr>
<tr>
<td>Heat shield, right exhaust manifold rear:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-54b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-54a</td>
</tr>
<tr>
<td>Heat/vent control panel (M996, M996A1):</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-125b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-125a</td>
</tr>
<tr>
<td>Heat/vent control panel relay and switch (M996, M996A1):</td>
<td></td>
</tr>
<tr>
<td>Fan hi-low switch installation</td>
<td>4-126n</td>
</tr>
<tr>
<td>Fan hi-low switch removal</td>
<td>4-126m</td>
</tr>
<tr>
<td>Fuel hi-low switch installation</td>
<td>4-126l</td>
</tr>
<tr>
<td>Fuel hi-low switch removal</td>
<td>4-126k</td>
</tr>
<tr>
<td>Heat on light installation</td>
<td>4-126h</td>
</tr>
<tr>
<td>Heat on light removal</td>
<td>4-126g</td>
</tr>
<tr>
<td>Heater run-start switch</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-126b</td>
</tr>
<tr>
<td>Heater run-start switch removal</td>
<td>4-126a</td>
</tr>
<tr>
<td>Relay socket installation</td>
<td>4-126f</td>
</tr>
<tr>
<td>Relay socket removal</td>
<td>4-126e</td>
</tr>
<tr>
<td>Rollover switch installation</td>
<td>4-126p</td>
</tr>
<tr>
<td>Rollover switch removal</td>
<td>4-126o</td>
</tr>
<tr>
<td>Spot vent switch installation</td>
<td>4-126i</td>
</tr>
<tr>
<td>Spot vent switch removal</td>
<td>4-126j</td>
</tr>
<tr>
<td>24-volt relay installation</td>
<td>4-126d</td>
</tr>
<tr>
<td>24-volt relay removal</td>
<td>4-126c</td>
</tr>
<tr>
<td>Heater/vent system control box and wiring harness:</td>
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<tr>
<td>Installation</td>
<td>4-123b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-123a</td>
</tr>
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<td>High beam lamp</td>
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<tr>
<td>Installation</td>
<td>4-18b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-18a</td>
</tr>
<tr>
<td>Holddown, battery</td>
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<td>Installation</td>
<td>4-78b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-78a</td>
</tr>
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<td>Hood wiring harness</td>
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<tr>
<td>Installation</td>
<td>4-84b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-84a</td>
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<td>Horn</td>
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<tr>
<td>Installation</td>
<td>4-22b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-22a</td>
</tr>
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<td>Horn control brush</td>
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<td>Installation</td>
<td>4-21b</td>
</tr>
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<td>Removal</td>
<td>4-21a</td>
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<td>Installation</td>
<td>4-23b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-23a</td>
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<td>Horn switch</td>
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<td>4-20b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-20a</td>
</tr>
<tr>
<td>Hose, air restriction gage</td>
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</tr>
<tr>
<td>Installation</td>
<td>3-19b</td>
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<td>3-19a</td>
</tr>
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<td>Hose, fuel filter drain, and valve</td>
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</tr>
<tr>
<td>Installation</td>
<td>3-34b</td>
</tr>
<tr>
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<td>3-34a</td>
</tr>
<tr>
<td>Hose, overflow, surge tank</td>
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<td>Installation</td>
<td>3-74b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-74a</td>
</tr>
<tr>
<td>Hose, power steering hydraulic system pressure and return</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-25b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-25a</td>
</tr>
<tr>
<td>Hose, radiator inlet</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-69b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-69a</td>
</tr>
<tr>
<td>Hose, radiator, lower</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-71b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-71a</td>
</tr>
<tr>
<td>Hoses, return, fuel injection</td>
<td></td>
</tr>
<tr>
<td>Fuel drain back hose installation</td>
<td>3-39b</td>
</tr>
<tr>
<td>Fuel drain back hose removal</td>
<td>3-39a</td>
</tr>
<tr>
<td>Nozzle cap installation</td>
<td>3-39b</td>
</tr>
<tr>
<td>Nozzle cap removal</td>
<td>3-39a</td>
</tr>
<tr>
<td>Nozzle to nozzle hose installation</td>
<td>3-39f</td>
</tr>
<tr>
<td>Nozzle to nozzle hose removal</td>
<td>3-39e</td>
</tr>
<tr>
<td>Tube to nozzle hose installation</td>
<td>3-36o</td>
</tr>
<tr>
<td>Tube to nozzle hose removal</td>
<td>3-36c</td>
</tr>
<tr>
<td>Hose, surge tank to lower radiator tube</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-73b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-73a</td>
</tr>
<tr>
<td>Hose, thermostat bypass</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-67b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-67a</td>
</tr>
<tr>
<td>Hose, vent, radiator to surge tank</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-65b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-65a</td>
</tr>
<tr>
<td>Hose, vent, surge tank to water crossover</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-66b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-66a</td>
</tr>
<tr>
<td>H (Cont'd)</td>
<td>Para</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Hose, water pump inlet:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-72b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-72a</td>
</tr>
<tr>
<td>Housing assembly, shift controls,</td>
<td></td>
</tr>
<tr>
<td>replacement</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-7b</td>
</tr>
<tr>
<td>Removal</td>
<td>5-7a</td>
</tr>
<tr>
<td>Housing assembly, shift controls,</td>
<td></td>
</tr>
<tr>
<td>maintenance</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>5-8b</td>
</tr>
<tr>
<td>Disassembly</td>
<td>5-8a</td>
</tr>
<tr>
<td>Hydraulic system pressure and</td>
<td></td>
</tr>
<tr>
<td>return hose, power steering:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-25b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-25a</td>
</tr>
<tr>
<td>Hydro-boost</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-14b</td>
</tr>
<tr>
<td>Removal</td>
<td>7-14a</td>
</tr>
<tr>
<td>Idler arm</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>8-18c</td>
</tr>
<tr>
<td>Installation</td>
<td>8-18b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-18a</td>
</tr>
<tr>
<td>Idle speed adjustment, engine</td>
<td>3-44</td>
</tr>
<tr>
<td>Idler pulleys, and mounting</td>
<td></td>
</tr>
<tr>
<td>hardware, tensioner:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-84b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-84a</td>
</tr>
<tr>
<td>Inner rim stud:</td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>8-8b</td>
</tr>
<tr>
<td>Installation</td>
<td>8-8c</td>
</tr>
<tr>
<td>Removal</td>
<td>8-8a</td>
</tr>
<tr>
<td>Instrument cluster:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-11b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-11a</td>
</tr>
<tr>
<td>Instrument cluster light:</td>
<td></td>
</tr>
<tr>
<td>Lamp installation</td>
<td>4-16b</td>
</tr>
<tr>
<td>Lamp removal</td>
<td>4-16a</td>
</tr>
<tr>
<td>Light assembly installation</td>
<td>4-16c</td>
</tr>
<tr>
<td>Light assembly removal</td>
<td>4-16d</td>
</tr>
<tr>
<td>Instrument panel:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-12b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-12a</td>
</tr>
<tr>
<td>Instruments, sending units,</td>
<td></td>
</tr>
<tr>
<td>switches, and horn:</td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>4-10</td>
</tr>
<tr>
<td>Insulator and muffer:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-48b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-48a</td>
</tr>
<tr>
<td>Insulator, tailpipe:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-52b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-52a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercom cable (M996, M996A1):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-107b</td>
<td>4-244</td>
</tr>
<tr>
<td>Removal</td>
<td>4-107a</td>
<td>4-242</td>
</tr>
<tr>
<td>Intercom cable (M997, M997A1, M997A2):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-108b</td>
<td>4-250</td>
</tr>
<tr>
<td>Removal</td>
<td>4-108a</td>
<td>4-248</td>
</tr>
<tr>
<td>Interior lighting harness (M997, M997A1, M997A2):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-101b</td>
<td>4-216</td>
</tr>
<tr>
<td>Removal</td>
<td>4-101a</td>
<td>4-212</td>
</tr>
<tr>
<td>Intermediate steering shaft:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-20b</td>
<td>8-62</td>
</tr>
<tr>
<td>Removal</td>
<td>8-20a</td>
<td>8-62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>J (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacking instructions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowering corner of vehicle</td>
<td>8-2b</td>
<td>8-2</td>
</tr>
<tr>
<td>Lowering entire vehicle</td>
<td>8-2h</td>
<td>8-4</td>
</tr>
<tr>
<td>Lowering front of vehicle</td>
<td>8-2d</td>
<td>8-2</td>
</tr>
<tr>
<td>Lowering rear of vehicle</td>
<td>8-2f</td>
<td>8-4</td>
</tr>
<tr>
<td>Raising corner of vehicle</td>
<td>8-2a</td>
<td>8-2</td>
</tr>
<tr>
<td>Raising entire vehicle</td>
<td>8-2g</td>
<td>8-4</td>
</tr>
<tr>
<td>Raising front of vehicle</td>
<td>8-2c</td>
<td>8-2</td>
</tr>
<tr>
<td>Raising rear of vehicle</td>
<td>8-2e</td>
<td>8-4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>K (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick-down switch (3L80):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>4-43c</td>
<td>4-68</td>
</tr>
<tr>
<td>Installation</td>
<td>4-43b</td>
<td>4-68</td>
</tr>
<tr>
<td>Removal</td>
<td>4-43a</td>
<td>4-68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp, backup light:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-68b</td>
<td>4-109</td>
</tr>
<tr>
<td>Removal</td>
<td>4-68a</td>
<td>4-109</td>
</tr>
<tr>
<td>Lamp and lens, side marker:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-54b</td>
<td>4-89</td>
</tr>
<tr>
<td>Removal</td>
<td>4-54a</td>
<td>4-89</td>
</tr>
<tr>
<td>Lamp, blackout drive light:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-51b</td>
<td>4-84</td>
</tr>
<tr>
<td>Removal</td>
<td>4-51a</td>
<td>4-84</td>
</tr>
<tr>
<td>Lamp, directional signal control indicator:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning</td>
<td>4-64b</td>
<td>4-104</td>
</tr>
<tr>
<td>Installation</td>
<td>4-64c</td>
<td>4-104</td>
</tr>
<tr>
<td>Removal</td>
<td>4-64a</td>
<td>4-104</td>
</tr>
<tr>
<td>Lamp, front composite light:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-53b</td>
<td>4-88</td>
</tr>
<tr>
<td>Removal</td>
<td>4-53a</td>
<td>4-88</td>
</tr>
<tr>
<td>Light assembly, backup:</td>
<td>4-95a 4-174</td>
<td>4-110a 4-110b</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Lamp, service headlight:</td>
<td>Adjust</td>
<td>4-48a 4-79</td>
</tr>
<tr>
<td>Light assembly, backup</td>
<td>Installation</td>
<td>4-48b 4-78</td>
</tr>
<tr>
<td>Light assembly, blackout drive:</td>
<td>Installation</td>
<td>4-48a 4-78</td>
</tr>
<tr>
<td>Lamp, rear composite light:</td>
<td>Installation</td>
<td>4-57a 4-94</td>
</tr>
<tr>
<td>Light assembly, backup</td>
<td>Removal</td>
<td>4-57a 4-94</td>
</tr>
<tr>
<td>Lamp, wait-to-start:</td>
<td>Installation</td>
<td>4-17a 4-36</td>
</tr>
<tr>
<td>Light assembly, backup</td>
<td>Removal</td>
<td>4-17a 4-36</td>
</tr>
<tr>
<td>Lever, parking brake:</td>
<td>Installation</td>
<td>7-48 7-10</td>
</tr>
<tr>
<td>Light assembly, interior</td>
<td>Removal</td>
<td>7-4a 7-10</td>
</tr>
<tr>
<td>Lifting shackle:</td>
<td>Installation</td>
<td>9-13a 9-20</td>
</tr>
<tr>
<td>Light assembly, ceiling:</td>
<td>Installation</td>
<td>4-87a 4-159</td>
</tr>
<tr>
<td>Light assembly, front composite:</td>
<td>Installation</td>
<td>4-52a 4-86</td>
</tr>
<tr>
<td>Light assembly, rear composite:</td>
<td>Installation</td>
<td>4-56a 4-92</td>
</tr>
<tr>
<td>Light assembly, side marker:</td>
<td>Installation</td>
<td>4-55a 4-90</td>
</tr>
<tr>
<td>Light bracket, backup:</td>
<td>Installation</td>
<td>4-70a 4-112</td>
</tr>
<tr>
<td>Light, instrument cluster:</td>
<td>Lamp installation</td>
<td>4-16a 4-34</td>
</tr>
<tr>
<td>Light, instrument cluster:</td>
<td>Lamp removal</td>
<td>4-16a 4-34</td>
</tr>
<tr>
<td>Light assembly installation:</td>
<td>Installation</td>
<td>4-16b 4-34</td>
</tr>
<tr>
<td>Light assembly installation:</td>
<td>Removal</td>
<td>4-16c 4-35</td>
</tr>
<tr>
<td>Light lamp, backup:</td>
<td>Installation</td>
<td>4-68a 4-103</td>
</tr>
<tr>
<td>Light switch, backup:</td>
<td>Installation</td>
<td>4-34a 4-56</td>
</tr>
<tr>
<td>Lighting harness assembly (M997, M997A1, M997A2), interior:</td>
<td>Installation</td>
<td>4-101a 4-212</td>
</tr>
<tr>
<td>Linkage, accelerator:</td>
<td>Adjustment</td>
<td>3-42a 3-80</td>
</tr>
<tr>
<td>Lighting system:</td>
<td>Maintenance task summary</td>
<td>4-47 4-77</td>
</tr>
<tr>
<td>Link, center:</td>
<td>Installation</td>
<td>8-15b 8-48</td>
</tr>
<tr>
<td>Lighting harness assembly (M996, M996A1), interior:</td>
<td>Installation</td>
<td>4-102a 4-222</td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>3-1 3-1</td>
<td></td>
</tr>
<tr>
<td>Main light switch:</td>
<td>Installation</td>
<td>4-59a 4-96</td>
</tr>
<tr>
<td>Master cylinder:</td>
<td>Bleeding</td>
<td>7-13c 7-29</td>
</tr>
<tr>
<td>Modulator assembly (3L80):</td>
<td>Installation</td>
<td>5-14b 5-34</td>
</tr>
<tr>
<td>Modulator link (3L80):</td>
<td>Installation</td>
<td>5-15a 5-34</td>
</tr>
<tr>
<td>Module, time delay:</td>
<td>Installation</td>
<td>4-31a 4-53</td>
</tr>
<tr>
<td>Muffler and catalytic converter (“A2” vehicles):</td>
<td>Installation</td>
<td>3-49a 3-90</td>
</tr>
<tr>
<td>Muffler and insulator (all except “A2”):</td>
<td>Installation</td>
<td>3-48a 3-88</td>
</tr>
<tr>
<td>Muffler and insulator (all except “A2”):</td>
<td>Removal</td>
<td>3-48a 3-88</td>
</tr>
</tbody>
</table>
## INDEX (Cont’d)

### M (Cont’d)

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muffler hanger:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-58b 3-106</td>
</tr>
<tr>
<td>Removal</td>
<td>3-58a 3-106</td>
</tr>
<tr>
<td>Muffler support bracket:</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>3-53c 3-96</td>
</tr>
<tr>
<td>Disassembly</td>
<td>3-53b 3-96</td>
</tr>
<tr>
<td>Installation</td>
<td>3-53c 3-96</td>
</tr>
<tr>
<td>Removal</td>
<td>3-53a 3-96</td>
</tr>
</tbody>
</table>

### N

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBC control box and wiring harness (M996, M996A1):</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-99b 4-198</td>
</tr>
<tr>
<td>Removal</td>
<td>4-99a 4-194</td>
</tr>
<tr>
<td>NBC control box and wiring harness (M997, M997A1, M997A2):</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-100b 4-206</td>
</tr>
<tr>
<td>Removal</td>
<td>4-100a 4-202</td>
</tr>
<tr>
<td>NBC control panel:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-124b 4-304</td>
</tr>
<tr>
<td>Removal</td>
<td>4-124a 4-298</td>
</tr>
<tr>
<td>Neutral start switch:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-6b 5-16</td>
</tr>
<tr>
<td>Removal</td>
<td>5-6a 5-16</td>
</tr>
</tbody>
</table>

### O

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odometer/speedometer:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-14b 4-30</td>
</tr>
<tr>
<td>Removal</td>
<td>4-14a 4-30</td>
</tr>
<tr>
<td>Oil cooler, engine and transmission:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-8b 3-12</td>
</tr>
<tr>
<td>Removal</td>
<td>3-8a 3-12</td>
</tr>
<tr>
<td>Oil cooler lines, transmission:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-3b 5-10</td>
</tr>
<tr>
<td>Removal</td>
<td>5-3a 5-8</td>
</tr>
<tr>
<td>Oil cooler supply and return lines, engine:</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>3-7b 3-10</td>
</tr>
<tr>
<td>Installation</td>
<td>3-7c 3-10</td>
</tr>
<tr>
<td>Removal</td>
<td>3-7a 3-10</td>
</tr>
<tr>
<td>Oil pan:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-6b 3-8</td>
</tr>
<tr>
<td>Removal</td>
<td>3-6a 3-8</td>
</tr>
<tr>
<td>Oil pressure sending unit:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-25b 4-45</td>
</tr>
<tr>
<td>Removal</td>
<td>4-25a 4-45</td>
</tr>
<tr>
<td>Oil service, engine:</td>
<td></td>
</tr>
<tr>
<td>Draining oil</td>
<td>3-5a 3-6</td>
</tr>
<tr>
<td>Installing filter</td>
<td>3-5c 3-6</td>
</tr>
<tr>
<td>Removing filter</td>
<td>3-5b 3-6</td>
</tr>
<tr>
<td>Replenishing oil</td>
<td>3-5c 3-6</td>
</tr>
</tbody>
</table>

### O (Cont’d)

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outlet/bracket, electrical:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-90b 4-164</td>
</tr>
<tr>
<td>Removal</td>
<td>4-90a 4-164</td>
</tr>
<tr>
<td>Overflow (surge) tank:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-64b 3-118</td>
</tr>
<tr>
<td>Removal</td>
<td>3-64a 3-118</td>
</tr>
<tr>
<td>Panel, instrument:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-12b 4-26</td>
</tr>
<tr>
<td>Removal</td>
<td>4-12a 4-26</td>
</tr>
<tr>
<td>Parking brake adjustment:</td>
<td></td>
</tr>
<tr>
<td>Parking brake adjustment, rear dual service:</td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>7-26 7-64</td>
</tr>
<tr>
<td>Parking brake cable:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-5b 7-12</td>
</tr>
<tr>
<td>Removal</td>
<td>7-5a 7-12</td>
</tr>
<tr>
<td>Parking brake cable/mounting bracket, left:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-24b 7-60</td>
</tr>
<tr>
<td>Removal</td>
<td>7-24a 7-58</td>
</tr>
<tr>
<td>Parking brake cable, right:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-23b 7-56</td>
</tr>
<tr>
<td>Removal</td>
<td>7-23a 7-56</td>
</tr>
<tr>
<td>Parking brake caliper and rotor:</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>7-3b 7-6</td>
</tr>
<tr>
<td>Installation</td>
<td>7-3c 7-6</td>
</tr>
<tr>
<td>Removal</td>
<td>7-3a 7-4</td>
</tr>
<tr>
<td>Parking brake caliper, rear dual service:</td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-22b 7-54</td>
</tr>
<tr>
<td>Removal</td>
<td>7-22a 7-52</td>
</tr>
<tr>
<td>Parking brake heat shield:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-7b 7-16</td>
</tr>
<tr>
<td>Removal</td>
<td>7-7a 7-16</td>
</tr>
<tr>
<td>Parking brake heat shield and heat shield extension:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-8b 7-18</td>
</tr>
<tr>
<td>Removal</td>
<td>7-8a 7-17</td>
</tr>
<tr>
<td>Parking brake lever:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-4b 7-10</td>
</tr>
<tr>
<td>Removal</td>
<td>7-4a 7-10</td>
</tr>
<tr>
<td>Parking brake pad, rear dual service:</td>
<td></td>
</tr>
<tr>
<td>Cleaning and Inspection:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-21b 7-50</td>
</tr>
<tr>
<td>Removal</td>
<td>7-21a 7-48</td>
</tr>
<tr>
<td>Parking brake rod:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-6b 7-14</td>
</tr>
<tr>
<td>Removal</td>
<td>7-6a 7-14</td>
</tr>
<tr>
<td>Parking brake rod, rear dual service:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-25b 7-62</td>
</tr>
<tr>
<td>Removal</td>
<td>7-25a 7-62</td>
</tr>
<tr>
<td>Para</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Parking brake switch:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-19b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-19a</td>
</tr>
<tr>
<td>Parking brake system:</td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>7-1</td>
</tr>
<tr>
<td>Parking brake system, rear dual service:</td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>7-20</td>
</tr>
<tr>
<td>Pedal, accelerator:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-43b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-43a</td>
</tr>
<tr>
<td>Pedal, service brake (12338394):</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-16b</td>
</tr>
<tr>
<td>Removal</td>
<td>7-16a</td>
</tr>
<tr>
<td>Pedal, service brake (EX5935037):</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-17b</td>
</tr>
<tr>
<td>Removal</td>
<td>7-17a</td>
</tr>
<tr>
<td>Pintle, towing:</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>9-12a</td>
</tr>
<tr>
<td>Cleaning</td>
<td>9-12b</td>
</tr>
<tr>
<td>Disassembly</td>
<td>9-12c</td>
</tr>
<tr>
<td>Installation</td>
<td>9-12d</td>
</tr>
<tr>
<td>Removal</td>
<td>9-12e</td>
</tr>
<tr>
<td>Pipe, crossover:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-50b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-50a</td>
</tr>
<tr>
<td>Pitman arm:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-14b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-14a</td>
</tr>
<tr>
<td>Power cables, control box:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-98b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-98a</td>
</tr>
<tr>
<td>Power cable, 200 ampere umbilical:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-113b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-113a</td>
</tr>
<tr>
<td>Power feed through stud:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-74b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-74a</td>
</tr>
<tr>
<td>Power steering cooler hose:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-27b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-27a</td>
</tr>
<tr>
<td>Power steering cooler:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-28b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-28a</td>
</tr>
<tr>
<td>Power steering drivebelt set:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-80b</td>
</tr>
<tr>
<td>Removal</td>
<td>3-80a</td>
</tr>
<tr>
<td>Power steering hydraulic system pressure and return hose:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-25b</td>
</tr>
<tr>
<td>Removal</td>
<td>8-25a</td>
</tr>
<tr>
<td>Power steering pump, pulley, and bracket:</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>8-24d</td>
</tr>
<tr>
<td>Disassembly</td>
<td>8-24b</td>
</tr>
<tr>
<td>Installation</td>
<td>8-24d</td>
</tr>
<tr>
<td>Removal</td>
<td>8-24a</td>
</tr>
<tr>
<td>Power steering system bleeding:</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>8-26b</td>
</tr>
<tr>
<td>Installation</td>
<td>8-26d</td>
</tr>
<tr>
<td>Removal</td>
<td>8-26a</td>
</tr>
<tr>
<td>Propeller shaft assembly maintenance, front:</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>6-2b</td>
</tr>
<tr>
<td>Installation</td>
<td>6-2c</td>
</tr>
<tr>
<td>Removal</td>
<td>6-2a</td>
</tr>
<tr>
<td>Propeller shaft assembly repair, front:</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>6-3c</td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>6-3b</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6-3a</td>
</tr>
<tr>
<td>Propeller shaft maintenance, rear:</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>6-4b</td>
</tr>
<tr>
<td>Installation</td>
<td>6-4c</td>
</tr>
<tr>
<td>Removal</td>
<td>6-4a</td>
</tr>
<tr>
<td>Propeller shaft maintenance (1330 series), rear</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>6-5b</td>
</tr>
<tr>
<td>Installation</td>
<td>6-5c</td>
</tr>
<tr>
<td>Removal</td>
<td>6-5a</td>
</tr>
<tr>
<td>Propeller shaft repair, rear:</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>6-6c</td>
</tr>
<tr>
<td>Cleaning and Inspection</td>
<td>6-6b</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6-6a</td>
</tr>
<tr>
<td>Propeller shafts:</td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>6-1</td>
</tr>
<tr>
<td>Proportioning valve:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-18b</td>
</tr>
<tr>
<td>Removal</td>
<td>7-18a</td>
</tr>
<tr>
<td>Protective control box:</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-5b</td>
</tr>
<tr>
<td>Removal</td>
<td>4-5a</td>
</tr>
<tr>
<td>Pulley and bracket, power steering pump:</td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>8-24d</td>
</tr>
<tr>
<td>Disassembly</td>
<td>8-24b</td>
</tr>
<tr>
<td>Installation</td>
<td>8-24d</td>
</tr>
<tr>
<td>Removal</td>
<td>8-24a</td>
</tr>
<tr>
<td>Para</td>
<td>Page</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Pulley, alternator: Installation</td>
<td>4-3b 4-8</td>
</tr>
<tr>
<td>Pulley, alternator: Removal</td>
<td>4-3a 4-8</td>
</tr>
<tr>
<td>Pulley, water pump: Installation</td>
<td>3-76b 3-131</td>
</tr>
<tr>
<td>Pulley, water pump: Removal</td>
<td>3-76a 3-131</td>
</tr>
<tr>
<td>Pump, pulley and bracket, power steering: Assembly</td>
<td>8-24c 8-74</td>
</tr>
<tr>
<td>Pump, pulley and bracket, power steering: Disassembly</td>
<td>8-24b 8-72</td>
</tr>
<tr>
<td>Pump, pulley and bracket, power steering: Installation</td>
<td>8-24d 8-74</td>
</tr>
<tr>
<td>Pump, pulley and bracket, power steering: Removal</td>
<td>8-24e 8-72</td>
</tr>
<tr>
<td>Radiator and fan shroud assembly: Cleaning and inspection</td>
<td>3-61b 3-112</td>
</tr>
<tr>
<td>Radiator and fan shroud assembly: Installation</td>
<td>3-61c 3-112</td>
</tr>
<tr>
<td>Radiator and fan shroud assembly: Removal</td>
<td>3-61a 3-110</td>
</tr>
<tr>
<td>Radiator front mount bracket: Installation</td>
<td>9-76 9-9</td>
</tr>
<tr>
<td>Radiator front mount bracket: Removal</td>
<td>9-7a 9-9</td>
</tr>
<tr>
<td>Radiator hose, lower: Installation</td>
<td>3-71b 3-126</td>
</tr>
<tr>
<td>Radiator hose, lower: Removal</td>
<td>3-71a 3-126</td>
</tr>
<tr>
<td>Radiator inlet hose: Installation</td>
<td>3-69b 3-124</td>
</tr>
<tr>
<td>Radiator inlet hose: Removal</td>
<td>3-69a 3-124</td>
</tr>
<tr>
<td>Radiator lower hose to surge tank hose: Installation</td>
<td>3-73b 3-128</td>
</tr>
<tr>
<td>Radiator lower hose to surge tank hose: Removal</td>
<td>3-73a 3-128</td>
</tr>
<tr>
<td>Radiator lower tube assembly: Installation</td>
<td>3-70b 3-125</td>
</tr>
<tr>
<td>Radiator lower tube assembly: Removal</td>
<td>3-70a 3-125</td>
</tr>
<tr>
<td>Radiator support: Installation</td>
<td>3-63b 3-117</td>
</tr>
<tr>
<td>Radiator support: Removal</td>
<td>3-63a 3-117</td>
</tr>
<tr>
<td>Radius rod: Installation</td>
<td>6-25b 6-57</td>
</tr>
<tr>
<td>Radius rod: Removal</td>
<td>6-25a 6-57</td>
</tr>
<tr>
<td>Rear geared hub vent line: Installation</td>
<td>6-17b 6-42</td>
</tr>
<tr>
<td>Rear geared hub vent line: Removal</td>
<td>6-17a 6-42</td>
</tr>
<tr>
<td>Rear door blackout switch/bracket: Installation</td>
<td>4-93b 4-170</td>
</tr>
<tr>
<td>Rear door blackout switch/bracket: Removal</td>
<td>4-93a 4-170</td>
</tr>
<tr>
<td>Rear steps blackout switch: Installation</td>
<td>4-92b 4-168</td>
</tr>
<tr>
<td>Rear steps blackout switch: Removal</td>
<td>4-92a 4-168</td>
</tr>
<tr>
<td>Receptacle mounting bracket: Installation</td>
<td>9-14b 9-21</td>
</tr>
<tr>
<td>Receptacle mounting bracket: Removal</td>
<td>9-14a 9-21</td>
</tr>
<tr>
<td>Regulator (A0013036AA), 200 ampere: Installation</td>
<td>4-114b 4-270</td>
</tr>
<tr>
<td>Regulator (A0013036AA), 200 ampere: Removal</td>
<td>4-114a 4-270</td>
</tr>
<tr>
<td>Regulator (12338796-1, S-311), 200 ampere: Installation</td>
<td>4-115b 4-272</td>
</tr>
<tr>
<td>Regulator (12338796-1, S-311), 200 ampere: Removal</td>
<td>4-115a 4-272</td>
</tr>
<tr>
<td>Relay, control box: Installation</td>
<td>4-120b 4-282</td>
</tr>
<tr>
<td>Relay, control box: Removal</td>
<td>4-120a 4-282</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Fan hi-low switch installation</td>
<td>4-126n 4-317</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Fan hi-low switch removal</td>
<td>4-126m 4-316</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Fuel hi-low switch installation</td>
<td>4-126l 4-316</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Fuel hi-low switch removal</td>
<td>4-126k 4-316</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Heat on light installation</td>
<td>4-126h 4-314</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Heat on light removal</td>
<td>4-126g 4-314</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Heat run-start switch installation</td>
<td>4-126f 4-310</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Heat run-start switch removal</td>
<td>4-126e 4-310</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Relay socket installation</td>
<td>4-126d 4-310</td>
</tr>
<tr>
<td>Relay and switch (M996, M996A1), heat/vent control panel: Relay socket removal</td>
<td>4-126c 4-310</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: A/C on-off switch installation</td>
<td>4-127i 4-324</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: A/C on-off switch removal</td>
<td>4-127j 4-324</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Fan hi-low switch installation</td>
<td>4-127k 4-323</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Fan hi-low switch removal</td>
<td>4-127l 4-323</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Fuel hi-low switch installation</td>
<td>4-127h 4-322</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Fuel hi-low switch removal</td>
<td>4-127g 4-322</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Heat A/C panel installation</td>
<td>4-127f 4-319</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Heat A/C panel removal</td>
<td>4-127e 4-319</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Heat on light installation</td>
<td>4-127d 4-321</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Heat on light removal</td>
<td>4-127c 4-321</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Heater run-start switch installation</td>
<td>4-127b 4-320</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Heater run-start switch removal</td>
<td>4-127a 4-320</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Rollover switch installation</td>
<td>4-127m 4-325</td>
</tr>
<tr>
<td>Relay and switch (M997, M997A1, M997A2), heat air-conditioning control panel: Rollover switch removal</td>
<td>4-127l 4-325</td>
</tr>
</tbody>
</table>
### INDEX (Cont'd)

<table>
<thead>
<tr>
<th>R (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resuscitator/aspirator cable:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-104b</td>
<td>4-234</td>
</tr>
<tr>
<td>Removal</td>
<td>4-104a</td>
<td>4-234</td>
</tr>
<tr>
<td>Retainer, steering shaft close-off:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-23b</td>
<td>8-70</td>
</tr>
<tr>
<td>Removal</td>
<td>8-23a</td>
<td>8-70</td>
</tr>
<tr>
<td>Rim stud, inner:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>8-8b</td>
<td>8-28</td>
</tr>
<tr>
<td>Installation</td>
<td>8-8c</td>
<td>8-28</td>
</tr>
<tr>
<td>Removal</td>
<td>8-8a</td>
<td>8-27</td>
</tr>
<tr>
<td>Ring, tiedown:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>9-6b</td>
<td>9-8</td>
</tr>
<tr>
<td>Removal</td>
<td>9-6a</td>
<td>9-8</td>
</tr>
<tr>
<td>Road test, transmission:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road test (3L80)</td>
<td>5-21a</td>
<td>5-46</td>
</tr>
<tr>
<td>Road test (4L80E)</td>
<td>5-21b</td>
<td>5-46</td>
</tr>
<tr>
<td>Rod, radius:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-25b</td>
<td>6-57</td>
</tr>
<tr>
<td>Removal</td>
<td>6-25a</td>
<td>6-57</td>
</tr>
<tr>
<td>Rotary switch:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-7b</td>
<td>4-14</td>
</tr>
<tr>
<td>Removal</td>
<td>4-7a</td>
<td>4-14</td>
</tr>
<tr>
<td>Rotor and caliper, parking brake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>7-3b</td>
<td>7-4</td>
</tr>
<tr>
<td>Installation</td>
<td>7-3a</td>
<td>7-4</td>
</tr>
<tr>
<td>Removal</td>
<td>7-3a</td>
<td>7-4</td>
</tr>
<tr>
<td>Rotor, service brake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-19b</td>
<td>7-46</td>
</tr>
<tr>
<td>Removal</td>
<td>7-19a</td>
<td>7-46</td>
</tr>
<tr>
<td>RPM, engine sensor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-33b</td>
<td>4-55</td>
</tr>
<tr>
<td>Removal</td>
<td>4-33a</td>
<td>4-55</td>
</tr>
<tr>
<td>RPM sensor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-32b</td>
<td>4-54</td>
</tr>
<tr>
<td>Removal</td>
<td>4-32a</td>
<td>4-54</td>
</tr>
<tr>
<td>Rubber runflat (all except &quot;A2&quot; vehicles) maintenance radial tire, wheel and:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>8-5d</td>
<td>8-21</td>
</tr>
<tr>
<td>Disassembly</td>
<td>8-5a</td>
<td>8-16</td>
</tr>
<tr>
<td>Inspection and cleaning</td>
<td>8-5b</td>
<td>8-19</td>
</tr>
<tr>
<td>Repair</td>
<td>8-5c</td>
<td>8-20</td>
</tr>
<tr>
<td>Rubber runflat (&quot;A2&quot; vehicles) maintenance, radial tire, wheel and:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>8-51d</td>
<td>8-24.7</td>
</tr>
<tr>
<td>Disassembly</td>
<td>8-51a</td>
<td>8-24.2</td>
</tr>
<tr>
<td>Inspection and cleaning</td>
<td>8-51b</td>
<td>8-24.5</td>
</tr>
<tr>
<td>Repair</td>
<td>8-51c</td>
<td>8-24.6</td>
</tr>
<tr>
<td>Runflat compressor (P/N 39250) belt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-6b</td>
<td>8-25</td>
</tr>
<tr>
<td>Removal</td>
<td>8-6a</td>
<td>8-25</td>
</tr>
<tr>
<td>Runflat compressor (P/N 528236) belt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-7b</td>
<td>8-26</td>
</tr>
<tr>
<td>Removal</td>
<td>8-7a</td>
<td>8-26</td>
</tr>
</tbody>
</table>

### INDEX (Cont'd)

<table>
<thead>
<tr>
<th>R (Cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runflat maintenance, tire, wheel and:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>8-4d</td>
<td>8-12</td>
</tr>
<tr>
<td>Disassembly</td>
<td>8-4a</td>
<td>8-8</td>
</tr>
<tr>
<td>Inspection and cleaning</td>
<td>8-4b</td>
<td>8-10</td>
</tr>
<tr>
<td>Repair</td>
<td>8-4c</td>
<td>8-12</td>
</tr>
<tr>
<td>Seal, geared hub input:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-12b</td>
<td>6-32</td>
</tr>
<tr>
<td>Removal</td>
<td>6-12a</td>
<td>6-32</td>
</tr>
<tr>
<td>Sealed lower converter housing cover:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>5-17b</td>
<td>5-40</td>
</tr>
<tr>
<td>Installation</td>
<td>5-17a</td>
<td>5-40</td>
</tr>
<tr>
<td>Removal</td>
<td>5-17a</td>
<td>5-40</td>
</tr>
<tr>
<td>Sealed upper converter housing cover:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>5-18b</td>
<td>5-42</td>
</tr>
<tr>
<td>Installation</td>
<td>5-18a</td>
<td>5-42</td>
</tr>
<tr>
<td>Removal</td>
<td>5-18a</td>
<td>5-42</td>
</tr>
<tr>
<td>Sending unit, engine temperature:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-24b</td>
<td>4-44</td>
</tr>
<tr>
<td>Removal</td>
<td>4-24a</td>
<td>4-44</td>
</tr>
<tr>
<td>Sending unit, fuel level:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-28b</td>
<td>4-48</td>
</tr>
<tr>
<td>Removal</td>
<td>4-28a</td>
<td>4-48</td>
</tr>
<tr>
<td>Sending unit, oil pressure:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-25b</td>
<td>4-45</td>
</tr>
<tr>
<td>Removal</td>
<td>4-25a</td>
<td>4-45</td>
</tr>
<tr>
<td>Sensor, engine RPM:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-33b</td>
<td>4-55</td>
</tr>
<tr>
<td>Removal</td>
<td>4-33a</td>
<td>4-55</td>
</tr>
<tr>
<td>Sensor, RPM:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-32b</td>
<td>4-54</td>
</tr>
<tr>
<td>Removal</td>
<td>4-32a</td>
<td>4-54</td>
</tr>
<tr>
<td>Serpentine drivebelt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-83b</td>
<td>3-142</td>
</tr>
<tr>
<td>Removal</td>
<td>3-83a</td>
<td>3-142</td>
</tr>
<tr>
<td>Service brake caliper:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>7-12a</td>
<td>7-26</td>
</tr>
<tr>
<td>Installation</td>
<td>7-12c</td>
<td>7-27</td>
</tr>
<tr>
<td>Removal</td>
<td>7-12a</td>
<td>7-26</td>
</tr>
<tr>
<td>Service brake pad:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>7-11b</td>
<td>7-24</td>
</tr>
<tr>
<td>Installation</td>
<td>7-11c</td>
<td>7-25</td>
</tr>
<tr>
<td>Removal</td>
<td>7-11a</td>
<td>7-24</td>
</tr>
<tr>
<td>Service brake pedal (12238394):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-16a</td>
<td>7-40</td>
</tr>
<tr>
<td>Removal</td>
<td>7-16b</td>
<td>7-40</td>
</tr>
<tr>
<td>Service brake pedal (EX5935037):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-17a</td>
<td>7-42</td>
</tr>
<tr>
<td>Removal</td>
<td>7-17a</td>
<td>7-42</td>
</tr>
</tbody>
</table>

INDEX 16
### INDEX (Cont’d)

<table>
<thead>
<tr>
<th>S (Cont’d)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service brake rotor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-19b</td>
<td>7-46</td>
</tr>
<tr>
<td>Removal</td>
<td>7-19a</td>
<td>7-46</td>
</tr>
<tr>
<td>Service brake system:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>7-9</td>
<td>7-19</td>
</tr>
<tr>
<td>Service brake system bleeding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual bleeding</td>
<td>7-10b</td>
<td>7-20</td>
</tr>
<tr>
<td>Master cylinder bleeding</td>
<td>7-10c</td>
<td>7-22</td>
</tr>
<tr>
<td>Pressure bleeding</td>
<td>7-10a</td>
<td>7-20</td>
</tr>
<tr>
<td>Service headlight and blackout drive light electrical connector and grommet:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-67b</td>
<td>4-108</td>
</tr>
<tr>
<td>Removal</td>
<td>4-67a</td>
<td>4-108</td>
</tr>
<tr>
<td>Service headlight assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-49b</td>
<td>4-80</td>
</tr>
<tr>
<td>Removal</td>
<td>4-49a</td>
<td>4-80</td>
</tr>
<tr>
<td>Service headlight lamp:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>4-48c</td>
<td>4-79</td>
</tr>
<tr>
<td>Installation</td>
<td>4-48b</td>
<td>4-78</td>
</tr>
<tr>
<td>Removal</td>
<td>4-48a</td>
<td>4-78</td>
</tr>
<tr>
<td>Service/parking brake adjustment, rear dual:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>7-26</td>
<td>7-64</td>
</tr>
<tr>
<td>Service/parking brake caliper, rear dual:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>7-22b</td>
<td>7-54</td>
</tr>
<tr>
<td>Installation</td>
<td>7-22c</td>
<td>7-54</td>
</tr>
<tr>
<td>Removal</td>
<td>7-22a</td>
<td>7-52</td>
</tr>
<tr>
<td>Service/parking brake pad, rear dual:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>7-21b</td>
<td>7-50</td>
</tr>
<tr>
<td>Installation</td>
<td>7-21c</td>
<td>7-50</td>
</tr>
<tr>
<td>Removal</td>
<td>7-21a</td>
<td>7-48</td>
</tr>
<tr>
<td>Service/parking brake rod, rear dual:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>7-25b</td>
<td>7-62</td>
</tr>
<tr>
<td>Removal</td>
<td>7-25a</td>
<td>7-62</td>
</tr>
<tr>
<td>Shaft assembly, front propeller, maintenance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>6-2b</td>
<td>6-2</td>
</tr>
<tr>
<td>Installation</td>
<td>6-2c</td>
<td>6-2</td>
</tr>
<tr>
<td>Removal</td>
<td>6-2a</td>
<td>6-2</td>
</tr>
<tr>
<td>Shaft assembly front propeller, repair:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>6-3c</td>
<td>6-5</td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>6-3b</td>
<td>6-4</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6-3a</td>
<td>6-4</td>
</tr>
<tr>
<td>Shaft, intermediate steering:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-20b</td>
<td>8-62</td>
</tr>
<tr>
<td>Removal</td>
<td>8-20a</td>
<td>8-62</td>
</tr>
<tr>
<td>Shaft, rear propeller:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td>6-4b</td>
<td>6-6</td>
</tr>
<tr>
<td>Installation</td>
<td>6-4c</td>
<td>6-6</td>
</tr>
<tr>
<td>Removal</td>
<td>6-4a</td>
<td>6-6</td>
</tr>
<tr>
<td>Shaft, rear propeller (1330 series):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-5b</td>
<td>6-8</td>
</tr>
<tr>
<td>Removal</td>
<td>6-5a</td>
<td>6-8</td>
</tr>
<tr>
<td>Shaft, rear propeller, repair:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>6-6c</td>
<td>6-10</td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>6-6b</td>
<td>6-10</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6-6a</td>
<td>6-10</td>
</tr>
<tr>
<td>Shackle, lifting:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>9-13b</td>
<td>9-20</td>
</tr>
<tr>
<td>Removal</td>
<td>9-13a</td>
<td>9-20</td>
</tr>
<tr>
<td>Shift controls housing assembly (SF-5583581):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>5-8b</td>
<td>5-20</td>
</tr>
<tr>
<td>Disassembly</td>
<td>5-8a</td>
<td>5-20</td>
</tr>
<tr>
<td>Shift controls housing assembly (SF-5583581) repair:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>5-9d</td>
<td>5-24</td>
</tr>
<tr>
<td>Cleaning</td>
<td>5-9c</td>
<td>5-24</td>
</tr>
<tr>
<td>Disassembly</td>
<td>5-9a</td>
<td>5-22</td>
</tr>
<tr>
<td>Inspection</td>
<td>5-9c</td>
<td>5-24</td>
</tr>
<tr>
<td>Shift controls housing assembly (SF-5583581) replacement:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-7b</td>
<td>5-18</td>
</tr>
<tr>
<td>Removal</td>
<td>5-7a</td>
<td>5-18</td>
</tr>
<tr>
<td>Shift control housing assembly (EX3725) replacement (4L80-E):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-10b</td>
<td>5-26</td>
</tr>
<tr>
<td>Removal</td>
<td>5-10a</td>
<td>5-26</td>
</tr>
<tr>
<td>Shift control housing assembly (EX3725) maintenance (4L80-E):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>5-11a</td>
<td>5-28</td>
</tr>
<tr>
<td>Disassembly</td>
<td>5-11b</td>
<td>5-28</td>
</tr>
<tr>
<td>Shift rod, transfer case:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>5-23c</td>
<td>5-48</td>
</tr>
<tr>
<td>Installation</td>
<td>5-23b</td>
<td>5-48</td>
</tr>
<tr>
<td>Removal</td>
<td>5-23a</td>
<td>5-48</td>
</tr>
<tr>
<td>Shift rod, transmission (3L80):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>5-12c</td>
<td>5-30</td>
</tr>
<tr>
<td>Installation</td>
<td>5-12b</td>
<td>5-30</td>
</tr>
<tr>
<td>Removal</td>
<td>5-12a</td>
<td>5-30</td>
</tr>
<tr>
<td>Shift rod, transmission (4L80-E):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>5-13c</td>
<td>5-32</td>
</tr>
<tr>
<td>Installation</td>
<td>5-13b</td>
<td>5-32</td>
</tr>
<tr>
<td>Removal</td>
<td>5-13a</td>
<td>5-32</td>
</tr>
<tr>
<td>Shock absorber:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-31b</td>
<td>6-70</td>
</tr>
<tr>
<td>Removal</td>
<td>6-31a</td>
<td>6-68</td>
</tr>
<tr>
<td>Shroud shield to airlift assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-62c</td>
<td>3-116</td>
</tr>
<tr>
<td>Removal</td>
<td>3-62a</td>
<td>3-116</td>
</tr>
<tr>
<td>Shunt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-83b</td>
<td>4-144</td>
</tr>
<tr>
<td>Removal</td>
<td>4-83a</td>
<td>4-144</td>
</tr>
<tr>
<td>Component</td>
<td>Para</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>Side marker light assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-55b</td>
<td>4-90</td>
</tr>
<tr>
<td>Removal</td>
<td>4-55a</td>
<td>4-90</td>
</tr>
<tr>
<td>Side marker light lens and lamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lens and lamp installation</td>
<td>4-54b</td>
<td>4-89</td>
</tr>
<tr>
<td>Lens and lamp removal</td>
<td>4-54a</td>
<td>4-89</td>
</tr>
<tr>
<td>Signal control canceling ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-66b</td>
<td>4-107</td>
</tr>
<tr>
<td>Removal</td>
<td>4-66a</td>
<td>4-107</td>
</tr>
<tr>
<td>Signal control, directional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-64b</td>
<td>4-104</td>
</tr>
<tr>
<td>Removal</td>
<td>4-64a</td>
<td>4-104</td>
</tr>
<tr>
<td>Signal control, directional (A2 series vehicle)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-65b</td>
<td>4-106</td>
</tr>
<tr>
<td>Removal</td>
<td>4-65a</td>
<td>4-106</td>
</tr>
<tr>
<td>Signal control indicator lamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-63b</td>
<td>4-103</td>
</tr>
<tr>
<td>Removal</td>
<td>4-63a</td>
<td>4-103</td>
</tr>
<tr>
<td>Signal flasher, directional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-62b</td>
<td>4-102</td>
</tr>
<tr>
<td>Removal</td>
<td>4-62a</td>
<td>4-102</td>
</tr>
<tr>
<td>Slave receptacle and cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-81b</td>
<td>4-140</td>
</tr>
<tr>
<td>Removal</td>
<td>4-81a</td>
<td>4-138</td>
</tr>
<tr>
<td>Socket, spotlight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>4-89c</td>
<td>4-162</td>
</tr>
<tr>
<td>Installation</td>
<td>4-89b</td>
<td>4-162</td>
</tr>
<tr>
<td>Removal</td>
<td>4-89a</td>
<td>4-162</td>
</tr>
<tr>
<td>Speedometer cable and core</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(12338428-2)</td>
<td>4-15b</td>
<td>4-32</td>
</tr>
<tr>
<td>Installation</td>
<td>4-15a</td>
<td>4-32</td>
</tr>
<tr>
<td>Removal</td>
<td>4-15a</td>
<td>4-32</td>
</tr>
<tr>
<td>Speedometer driven gear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-24b</td>
<td>5-50</td>
</tr>
<tr>
<td>Removal</td>
<td>5-24a</td>
<td>5-50</td>
</tr>
<tr>
<td>Speedometer flexible driveshaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and core (12338428)</td>
<td>4-15b</td>
<td>4-32</td>
</tr>
<tr>
<td>Installation</td>
<td>4-15a</td>
<td>4-32</td>
</tr>
<tr>
<td>Removal</td>
<td>4-15a</td>
<td>4-32</td>
</tr>
<tr>
<td>Speedometer/odometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-14b</td>
<td>4-30</td>
</tr>
<tr>
<td>Removal</td>
<td>4-14a</td>
<td>4-30</td>
</tr>
<tr>
<td>Spotlight assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-88b</td>
<td>4-160</td>
</tr>
<tr>
<td>Removal</td>
<td>4-88a</td>
<td>4-160</td>
</tr>
<tr>
<td>Spotlight socket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>4-89c</td>
<td>4-162</td>
</tr>
<tr>
<td>Installation</td>
<td>4-89b</td>
<td>4-162</td>
</tr>
<tr>
<td>Removal</td>
<td>4-89a</td>
<td>4-162</td>
</tr>
<tr>
<td>Spring coil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-30b</td>
<td>6-66</td>
</tr>
<tr>
<td>Removal</td>
<td>6-30a</td>
<td>6-66</td>
</tr>
<tr>
<td>Stabilizer bar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-23b</td>
<td>6-55</td>
</tr>
<tr>
<td>Removal</td>
<td>6-23a</td>
<td>6-55</td>
</tr>
<tr>
<td>Stabilizer bar link</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-24b</td>
<td>6-56</td>
</tr>
<tr>
<td>Removal</td>
<td>6-24a</td>
<td>6-56</td>
</tr>
<tr>
<td>Starter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-8b</td>
<td>4-18</td>
</tr>
<tr>
<td>Removal</td>
<td>4-8a</td>
<td>4-16</td>
</tr>
<tr>
<td>Starter and starting control system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>4-6</td>
<td>4-14</td>
</tr>
<tr>
<td>Starter power cables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-77b</td>
<td>4-130</td>
</tr>
<tr>
<td>Removal</td>
<td>4-77a</td>
<td>4-128</td>
</tr>
<tr>
<td>Start switch, neutral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-6d</td>
<td>5-16</td>
</tr>
<tr>
<td>Removal</td>
<td>5-6a</td>
<td>5-16</td>
</tr>
<tr>
<td>Steering column</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-19b</td>
<td>8-60</td>
</tr>
<tr>
<td>Removal</td>
<td>8-19a</td>
<td>8-58</td>
</tr>
<tr>
<td>Steering components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary</td>
<td>8-12</td>
<td>8-43</td>
</tr>
<tr>
<td>Steering gear replacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-21b</td>
<td>8-66</td>
</tr>
<tr>
<td>Removal</td>
<td>8-21a</td>
<td>8-64</td>
</tr>
<tr>
<td>Steering shaft close-off and retainer intermediate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-23b</td>
<td>8-70</td>
</tr>
<tr>
<td>Removal</td>
<td>8-23a</td>
<td>8-70</td>
</tr>
<tr>
<td>Steering shaft, intermediate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-20b</td>
<td>8-62</td>
</tr>
<tr>
<td>Removal</td>
<td>8-20a</td>
<td>8-62</td>
</tr>
<tr>
<td>Steering shaft U-joint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-22b</td>
<td>8-69</td>
</tr>
<tr>
<td>Removal</td>
<td>8-22a</td>
<td>8-68</td>
</tr>
<tr>
<td>Steering stop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>6-19c</td>
<td>6-48</td>
</tr>
<tr>
<td>Installation</td>
<td>6-19b</td>
<td>6-48</td>
</tr>
<tr>
<td>Removal</td>
<td>6-19a</td>
<td>6-48</td>
</tr>
<tr>
<td>Steering wheel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>8-13b</td>
<td>8-44</td>
</tr>
<tr>
<td>Removal</td>
<td>8-13a</td>
<td>8-44</td>
</tr>
<tr>
<td>Stop, steering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>6-19c</td>
<td>6-48</td>
</tr>
<tr>
<td>Installation</td>
<td>6-19b</td>
<td>6-48</td>
</tr>
<tr>
<td>Removal</td>
<td>6-19a</td>
<td>6-48</td>
</tr>
</tbody>
</table>
INDEX (Cont'd)

<table>
<thead>
<tr>
<th>S (cont'd)</th>
<th>Para</th>
<th>Page</th>
<th>S (cont'd)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stoplight switch (RCSK17810):</td>
<td></td>
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<td>Stoplight switch (11663279):</td>
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<tr>
<td>Adjustment</td>
<td>4-61a</td>
<td>4-100</td>
<td>Adjustment</td>
<td>4-61b</td>
<td>4-100</td>
</tr>
<tr>
<td>Installation</td>
<td>4-61a</td>
<td>4-100</td>
<td>Installation</td>
<td>4-61b</td>
<td>4-100</td>
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<td>Removal</td>
<td>4-61a</td>
<td>4-100</td>
<td>Removal</td>
<td>4-61b</td>
<td>4-100</td>
</tr>
<tr>
<td>Stud, power feed through:</td>
<td></td>
<td></td>
<td>Support, radiator:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-25a</td>
<td>3-48</td>
<td>Installation</td>
<td>3-25a</td>
<td>3-48</td>
</tr>
<tr>
<td>Removal</td>
<td>3-25b</td>
<td>3-48</td>
<td>Removal</td>
<td>3-25b</td>
<td>3-48</td>
</tr>
<tr>
<td>Surge tank</td>
<td></td>
<td></td>
<td>Surge tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-63a</td>
<td>3-117</td>
<td>Installation</td>
<td>3-63a</td>
<td>3-117</td>
</tr>
<tr>
<td>Removal</td>
<td>3-63b</td>
<td>3-117</td>
<td>Removal</td>
<td>3-63b</td>
<td>3-117</td>
</tr>
<tr>
<td>Surge tank overflow hose:</td>
<td></td>
<td></td>
<td>Surge tank to-radiator vent hose:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-64a</td>
<td>3-118</td>
<td>Installation</td>
<td>3-64a</td>
<td>3-118</td>
</tr>
<tr>
<td>Removal</td>
<td>3-64b</td>
<td>3-118</td>
<td>Removal</td>
<td>3-64b</td>
<td>3-118</td>
</tr>
<tr>
<td>Surge tank to-radiator vent hose:</td>
<td></td>
<td></td>
<td>Surge tank to-radiator vent hose:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-65a</td>
<td>3-119</td>
<td>Installation</td>
<td>3-65a</td>
<td>3-119</td>
</tr>
<tr>
<td>Removal</td>
<td>3-65b</td>
<td>3-119</td>
<td>Removal</td>
<td>3-65b</td>
<td>3-119</td>
</tr>
<tr>
<td>Heat on light removal.</td>
<td>3-66b</td>
<td>3-120</td>
<td>Heat on light installation.</td>
<td>3-66a</td>
<td>3-120</td>
</tr>
<tr>
<td>Heat on light installation.</td>
<td>3-66b</td>
<td>3-120</td>
<td>Heat on light installation.</td>
<td>3-66a</td>
<td>3-120</td>
</tr>
<tr>
<td>Heat A/C panel removal.</td>
<td>3-66a</td>
<td>3-120</td>
<td>Heat A/C panel removal.</td>
<td>3-66b</td>
<td>3-132</td>
</tr>
<tr>
<td>Heat on light installation.</td>
<td>3-66a</td>
<td>3-120</td>
<td>Heat on light installation.</td>
<td>3-66b</td>
<td>3-132</td>
</tr>
<tr>
<td>Switch, backup light:</td>
<td>4-34a</td>
<td>4-56</td>
<td>Switch, backup light:</td>
<td>4-34a</td>
<td>4-56</td>
</tr>
<tr>
<td>Installation</td>
<td>4-34b</td>
<td>4-56</td>
<td>Installation</td>
<td>4-34b</td>
<td>4-56</td>
</tr>
<tr>
<td>Removal</td>
<td>4-34a</td>
<td>4-56</td>
<td>Removal</td>
<td>4-34a</td>
<td>4-56</td>
</tr>
<tr>
<td>Switch/bracket, bulkhead door blackout:</td>
<td></td>
<td></td>
<td>Switch/bracket, bulkhead door blackout:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-94a</td>
<td>4-172</td>
<td>Installation</td>
<td>4-94b</td>
<td>4-172</td>
</tr>
<tr>
<td>Removal</td>
<td>4-94b</td>
<td>4-172</td>
<td>Removal</td>
<td>4-94a</td>
<td>4-172</td>
</tr>
<tr>
<td>Switch/bracket, rear door blackout:</td>
<td></td>
<td></td>
<td>Switch/bracket, rear door blackout:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-93a</td>
<td>4-170</td>
<td>Installation</td>
<td>4-93b</td>
<td>4-170</td>
</tr>
<tr>
<td>Removal</td>
<td>4-93b</td>
<td>4-170</td>
<td>Removal</td>
<td>4-93a</td>
<td>4-170</td>
</tr>
<tr>
<td>Switch, control box light:</td>
<td>4-118a</td>
<td>4-278</td>
<td>Switch, control box light:</td>
<td>4-118b</td>
<td>4-278</td>
</tr>
<tr>
<td>Installation</td>
<td>4-118a</td>
<td>4-278</td>
<td>Installation</td>
<td>4-118b</td>
<td>4-278</td>
</tr>
<tr>
<td>Removal</td>
<td>4-118b</td>
<td>4-278</td>
<td>Removal</td>
<td>4-118a</td>
<td>4-278</td>
</tr>
<tr>
<td>Switch, cold advance:</td>
<td></td>
<td></td>
<td>Switch, cold advance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-27a</td>
<td>4-47</td>
<td>Installation</td>
<td>4-27b</td>
<td>4-47</td>
</tr>
<tr>
<td>Removal</td>
<td>4-27b</td>
<td>4-47</td>
<td>Removal</td>
<td>4-27a</td>
<td>4-47</td>
</tr>
</tbody>
</table>

Switch, fan cut-off (4L80-E):                                               | 4-44b| 4-70 |
| Installation                                                              | 4-44a| 4-70 |
| Removal                                                                   | 4-44a| 4-70 |

Switch, fan temperature:                                                  | 4-30a| 4-52 |
| Installation                                                              | 4-30b| 4-52 |
| Removal                                                                   | 4-30b| 4-52 |

Switch, headlight beam selector:                                           | 4-58a| 4-95 |
| Installation                                                              | 4-58b| 4-95 |
| Removal                                                                   | 4-58a| 4-95 |

Switch, horn:                                                              | 4-20a| 4-40 |
| Installation                                                              | 4-20b| 4-40 |
| Removal                                                                   | 4-20b| 4-40 |

Switch, kick-down (3L80):                                                 | 4-43a| 4-68 |
| Adjustment                                                                | 4-43b| 4-68 |
| Installation                                                              | 4-43c| 4-68 |
| Removal                                                                   | 4-43c| 4-68 |

Switch, main light:                                                       | 4-59a| 4-96 |
| Installation                                                              | 4-59b| 4-96 |
| Removal                                                                   | 4-59a| 4-96 |

Switch, neutral start:                                                    | 5-6a | 5-16 |
| Installation                                                              | 5-6b | 5-16 |
| Removal                                                                   | 5-6b | 5-16 |

Switch, parking brake:                                                    | 4-19a| 4-39 |
| Installation                                                              | 4-19b| 4-39 |
| Removal                                                                   | 4-19a| 4-39 |

Switch, rear steps blackout:                                              | 4-92b| 4-168|
| Installation                                                              | 4-92a| 4-168|
| Removal                                                                   | 4-92a| 4-168|

Switch and relay (M997, M997A1, M997A2), heat air-conditioning control panel: | 4-127a| 4-335|
| A/C on-off switch installation.                                          | 4-127| 4-335|
| A/C on-off switch removal.                                               | 4-127| 4-335|
| Fan hi-low switch installation.                                          | 4-127| 4-335|
| Fan hi-low switch removal.                                               | 4-127b| 4-335|
| Fuel hi-low switch installation.                                         | 4-127c| 4-335|
| Fuel hi-low switch removal.                                              | 4-127d| 4-335|
| Heat A/C panel installation.                                            | 4-127e| 4-335|
| Heat A/C panel removal.                                                 | 4-127f| 4-335|
| Heat on light installation.                                             | 4-127g| 4-335|
| Heat on light installation.                                             | 4-127h| 4-335|
| Heater run-start switch installation.                                    | 4-127i| 4-335|
| Heater run-start switch removal.                                        | 4-127j| 4-335|
| Rollover switch installation.                                           | 4-127k| 4-335|
| Rollover switch removal.                                                | 4-127l| 4-335|
| Switch and relay (M996, M996A1), heat/vent control panel:               | 4-126a| 4-317|
| Fan hi-low switch installation.                                          | 4-126b| 4-317|
| Fan hi-low switch removal.                                              | 4-126c| 4-317|
| Fuel hi-low switch installation.                                        | 4-126d| 4-317|
| Fuel hi-low switch removal.                                             | 4-126e| 4-317|
| Heat on light installation.                                             | 4-126f| 4-317|
| Heat on light installation.                                             | 4-126g| 4-317|

INDEX 19
### INDEX (Cont’d)

#### S (Cont’d)

<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat on light removal</td>
<td>4-126c</td>
<td>4-314</td>
<td></td>
</tr>
<tr>
<td>Heater run-start switch installation</td>
<td>4-126b</td>
<td>4-310</td>
<td></td>
</tr>
<tr>
<td>Heater run-start switch removal</td>
<td>4-126a</td>
<td>4-310</td>
<td></td>
</tr>
<tr>
<td>Relay socket installation</td>
<td>4-126f</td>
<td>4-313</td>
<td></td>
</tr>
<tr>
<td>Relay socket removal</td>
<td>4-126e</td>
<td>4-313</td>
<td></td>
</tr>
<tr>
<td>Rollover switch installation</td>
<td>4-126g</td>
<td>4-318</td>
<td></td>
</tr>
<tr>
<td>Rollover switch removal</td>
<td>4-126d</td>
<td>4-318</td>
<td></td>
</tr>
<tr>
<td>Spot vent switch installation</td>
<td>4-126c</td>
<td>4-315</td>
<td></td>
</tr>
<tr>
<td>Spot vent switch removal</td>
<td>4-126b</td>
<td>4-315</td>
<td></td>
</tr>
<tr>
<td>24-volt relay installation</td>
<td>4-126c</td>
<td>4-312</td>
<td></td>
</tr>
<tr>
<td>24-volt relay removal</td>
<td>4-126b</td>
<td>4-312</td>
<td></td>
</tr>
<tr>
<td>Switch, rotary: Installation</td>
<td>4-7b</td>
<td>4-14</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>4-7a</td>
<td>4-14</td>
<td></td>
</tr>
<tr>
<td>Switch, stoplight (11663279): Adjustment</td>
<td>4-60c</td>
<td>4-98</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-60b</td>
<td>4-98</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>4-60a</td>
<td>4-98</td>
<td></td>
</tr>
<tr>
<td>Switch, stoplight (RCSK17810): Adjustment</td>
<td>4-61c</td>
<td>4-100</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-61b</td>
<td>4-100</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td>4-61a</td>
<td>4-100</td>
<td></td>
</tr>
</tbody>
</table>

#### T

<table>
<thead>
<tr>
<th>Tables:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Belt tension requirements</td>
<td>(table 3-2)</td>
<td>3-82 3-141</td>
</tr>
<tr>
<td>Guide for preparation of antifreeze solutions</td>
<td>(table 3-1)</td>
<td>3-60 3-109</td>
</tr>
<tr>
<td>Toe-in alinement specifications</td>
<td>(table 8-1)</td>
<td>8-10 8-34</td>
</tr>
<tr>
<td>Toe-out alinement specifications</td>
<td>(table 8-2)</td>
<td>8-11 8-40</td>
</tr>
<tr>
<td>Tailpipe: Installation</td>
<td>3-47b</td>
<td>3-87</td>
</tr>
<tr>
<td>Removal</td>
<td>3-47a</td>
<td>3-86</td>
</tr>
<tr>
<td>Tailpipe hanger: Installation</td>
<td>3-51b</td>
<td>3-94</td>
</tr>
<tr>
<td>Removal</td>
<td>3-51a</td>
<td>3-94</td>
</tr>
<tr>
<td>Tailpipe insulator: Installation</td>
<td>3-52b</td>
<td>3-95</td>
</tr>
<tr>
<td>Removal</td>
<td>3-52a</td>
<td>3-95</td>
</tr>
<tr>
<td>Temperature sending unit, engine: Installation</td>
<td>4-24b</td>
<td>4-44</td>
</tr>
<tr>
<td>Removal</td>
<td>4-24a</td>
<td>4-44</td>
</tr>
<tr>
<td>Tensioner, idler pulleys, and mounting hardware: Installation</td>
<td>3-84b</td>
<td>3-144</td>
</tr>
<tr>
<td>Removal</td>
<td>3-84a</td>
<td>3-144</td>
</tr>
</tbody>
</table>

<p>| Terminal block and mounting buss, control box Installation | 4-116b | 4-274   |
| Removal | 4-116a | 4-274   |
| Thermostat: Installation | 3-75b | 3-130   |
| Removal | 3-75a | 3-130   |
| Thermostat bypass hose: Installation | 3-67b | 3-121   |
| Removal | 3-67a | 3-121   |
| Throttle control cable and bracket, hand: Installation | 3-45b | 3-85    |
| Removal | 3-45a | 3-84    |
| Throttle position (TP) sensor (4L80-E): Adjustment | 4-45c | 4-72    |
| Installation | 4-45b | 4-72    |
| Removal | 4-45a | 4-72    |
| Tie rod: Assembly | 8-16c | 8-50    |
| Disassembly | 8-16b | 8-50    |
| Installation | 8-16d | 8-50    |
| Removal | 8-16a | 8-50    |
| Tie rod end: Installation | 8-17b | 8-52    |
| Removal | 8-17a | 8-52    |
| Tiedown ring: Installation | 9-6b | 9-8     |
| Removal | 9-6a | 9-8     |
| Time delay module: Installation | 4-31b | 4-53    |
| Removal | 4-31a | 4-53    |
| Tire balancing | 8-9 | 8-30    |
| Tire, wheel, and runflat: Assembly | 8-4d | 8-12    |
| Disassembly | 8-4a | 8-8     |
| Inspection and cleaning | 8-4b | 8-10    |
| Repair | 8-4c | 8-12    |
| Tire, radial, wheel, and rubber runflat (all except “A2” vehicles): Assembly | 8-5d | 8-21    |
| Disassembly | 8-5a | 8-16    |
| Inspection and cleaning | 8-5b | 8-19    |
| Repair | 8-5c | 8-20    |
| Tire, radial, wheel, and rubber runflat (“A2” vehicles): Assembly | 8-5.1d | 8-24.7 |
| Disassembly | 8-5.1a | 8-24.2 |
| Inspection and cleaning | 8-5.1b | 8-24.5 |
| Repair | 8-5.1c | 8-24.6 |</p>
<table>
<thead>
<tr>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (Cont'd)</td>
<td></td>
</tr>
<tr>
<td>Toe-in alinement, front wheel:</td>
<td></td>
</tr>
<tr>
<td>Preliminary inspection........</td>
<td>8-10a</td>
</tr>
<tr>
<td>Toe-in adjustment..............</td>
<td>8-10b</td>
</tr>
<tr>
<td>Toe-in check...................</td>
<td>8-10c</td>
</tr>
<tr>
<td>Toe-out alinement, rear wheel:</td>
<td></td>
</tr>
<tr>
<td>Preliminary inspection........</td>
<td>8-11a</td>
</tr>
<tr>
<td>Toe-out adjustment.............</td>
<td>8-11b</td>
</tr>
<tr>
<td>Toe-out check..................</td>
<td>8-11c</td>
</tr>
<tr>
<td>Towing brackets and bumper (M1026, M1026A1, M1036, M1038, M1038A1, M1042, M1044, M1044A1, M1046, M1046A1) front:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>9-3a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>9-3b</td>
</tr>
<tr>
<td>Towing brackets and bumper (M966, M966A1, M996, M996A1, M997, M997A1, M998, M999A1, M1025, M1025A1, M1035, M1035A1, M1037, M1043, M1043A1, M1045M1, M1045A1) front:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>9-2b</td>
</tr>
<tr>
<td>Removal........................</td>
<td>9-2a</td>
</tr>
<tr>
<td>Towing brackets and bumper (M997A2, M1025A2, M1035A2, M1043A2, M1045M2, M1097A2), front:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>9-4</td>
</tr>
<tr>
<td>Removal........................</td>
<td>9-4a</td>
</tr>
<tr>
<td>Towing pintle:</td>
<td></td>
</tr>
<tr>
<td>Assembly.......................</td>
<td>9-12d</td>
</tr>
<tr>
<td>Cleaning.......................</td>
<td>9-12c</td>
</tr>
<tr>
<td>Disassembly....................</td>
<td>9-12b</td>
</tr>
<tr>
<td>Installation..................</td>
<td>9-12e</td>
</tr>
<tr>
<td>Removal.......................</td>
<td>9-12a</td>
</tr>
<tr>
<td>Transducer, fuel pressure:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-26a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-26b</td>
</tr>
<tr>
<td>Transfer case:</td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary......</td>
<td>5-22</td>
</tr>
<tr>
<td>Transfer case and transmission:</td>
<td></td>
</tr>
<tr>
<td>Electrical maintenance task summary</td>
<td>4-35</td>
</tr>
<tr>
<td>Transfer case indicator lamp cable assembly:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-37a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-37b</td>
</tr>
<tr>
<td>Transfer case indicator switch:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-36a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-36b</td>
</tr>
<tr>
<td>Transfer case indicator lamp assembly:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-38a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-38b</td>
</tr>
<tr>
<td>Transfer case oil seal:</td>
<td></td>
</tr>
<tr>
<td>Front oil seal installation...</td>
<td>5-26a</td>
</tr>
<tr>
<td>Front oil seal removal.........</td>
<td>5-26a</td>
</tr>
<tr>
<td>Rear oil seal installation....</td>
<td>5-26c</td>
</tr>
<tr>
<td>Rear oil seal removal..........</td>
<td>5-26c</td>
</tr>
<tr>
<td>Transfer case shift rod:</td>
<td></td>
</tr>
<tr>
<td>Adjustment.....................</td>
<td>5-23c</td>
</tr>
<tr>
<td>Installation..................</td>
<td>5-23a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>5-23a</td>
</tr>
<tr>
<td>Transfer case vent line:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>5-25b</td>
</tr>
<tr>
<td>Removal........................</td>
<td>5-25a</td>
</tr>
<tr>
<td>Transmission:</td>
<td></td>
</tr>
<tr>
<td>Maintenance task summary.....</td>
<td>5-1</td>
</tr>
<tr>
<td>Transmission by-pass valve:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>5-4b</td>
</tr>
<tr>
<td>Removal........................</td>
<td>5-4a</td>
</tr>
<tr>
<td>Transmission circuit breakers and jumper leads (4L80-E):</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-40a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-40a</td>
</tr>
<tr>
<td>Transmission control module (TCM)(4L80-E):</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-42b</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-42a</td>
</tr>
<tr>
<td>Transmission indicator lamp assembly (4L80-E):</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-39a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-39a</td>
</tr>
<tr>
<td>Transmission input speed sensor (TISS) and output speeds (TOSS) (4L80-E):</td>
<td></td>
</tr>
<tr>
<td>Inspection....................</td>
<td>4-46b</td>
</tr>
<tr>
<td>Installation..................</td>
<td>4-46c</td>
</tr>
<tr>
<td>Removal........................</td>
<td>4-46a</td>
</tr>
<tr>
<td>Transmission mount:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>5-20a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>5-20a</td>
</tr>
<tr>
<td>Transmission mount crossmember:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>9-15a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>9-15a</td>
</tr>
<tr>
<td>Transmission oil cooler, engine and:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>3-8a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>3-8a</td>
</tr>
<tr>
<td>Transmission oil cooler lines:</td>
<td></td>
</tr>
<tr>
<td>Installation..................</td>
<td>5-3a</td>
</tr>
<tr>
<td>Removal........................</td>
<td>5-3a</td>
</tr>
</tbody>
</table>
### INDEX (Cont’d)

<table>
<thead>
<tr>
<th>T (Cont’d)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission oil dipstick tube:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-5b</td>
<td>5-14</td>
</tr>
<tr>
<td>Removal</td>
<td>5-5a</td>
<td>5-14</td>
</tr>
<tr>
<td>Transmission relay (4L80-E):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-41b</td>
<td>4-66</td>
</tr>
<tr>
<td>Removal</td>
<td>4-41a</td>
<td>4-66</td>
</tr>
<tr>
<td>Transmission road test:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road test (3L80)</td>
<td>5-21a</td>
<td>5-46</td>
</tr>
<tr>
<td>Road test (4L80-E)</td>
<td>5-21b</td>
<td>5-46</td>
</tr>
<tr>
<td>Transmission service:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draining fluid</td>
<td>5-2a</td>
<td>5-38</td>
</tr>
<tr>
<td>Replenishing fluid</td>
<td>5-2d</td>
<td>5-38</td>
</tr>
<tr>
<td>Transmission filter installation</td>
<td>5-2c</td>
<td>5-38</td>
</tr>
<tr>
<td>Transmission filter removal</td>
<td>5-2b</td>
<td>5-38</td>
</tr>
<tr>
<td>Transmission shift rod (3L80):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>5-12c</td>
<td>5-30</td>
</tr>
<tr>
<td>Installation</td>
<td>5-12b</td>
<td>5-30</td>
</tr>
<tr>
<td>Removal</td>
<td>5-12a</td>
<td>5-30</td>
</tr>
<tr>
<td>Transmission shift rod maintenance (4L80-E):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment</td>
<td>5-13c</td>
<td>5-32</td>
</tr>
<tr>
<td>Installation</td>
<td>5-13b</td>
<td>5-32</td>
</tr>
<tr>
<td>Removal</td>
<td>5-13a</td>
<td>5-32</td>
</tr>
<tr>
<td>Transmission vent line:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>5-16b</td>
<td>5-38</td>
</tr>
<tr>
<td>Removal</td>
<td>5-16a</td>
<td>5-38</td>
</tr>
<tr>
<td>Tray, battery:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning and inspection</td>
<td>4-80b</td>
<td>4-136</td>
</tr>
<tr>
<td>Installation</td>
<td>4-80c</td>
<td>4-136</td>
</tr>
<tr>
<td>Removal</td>
<td>4-80a</td>
<td>4-136</td>
</tr>
<tr>
<td>Throttle position (TP) sensor (4L80):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-45b</td>
<td>4-72</td>
</tr>
<tr>
<td>Adjustment</td>
<td>4-45c</td>
<td>4-72</td>
</tr>
<tr>
<td>Removal</td>
<td>4-45a</td>
<td>4-72</td>
</tr>
<tr>
<td>Tube, fuel drain back:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-37b</td>
<td>3-72</td>
</tr>
<tr>
<td>Removal</td>
<td>3-37a</td>
<td>3-72</td>
</tr>
<tr>
<td>Tube, radiator, lower assembly:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-70b</td>
<td>3-125</td>
</tr>
<tr>
<td>Removal</td>
<td>3-70a</td>
<td>3-125</td>
</tr>
<tr>
<td>Umbilical power cable, 200 ampere:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>4-113b</td>
<td>4-268</td>
</tr>
<tr>
<td>Removal</td>
<td>4-113a</td>
<td>4-268</td>
</tr>
<tr>
<td>Universal joint:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly</td>
<td>6-7b</td>
<td>6-14</td>
</tr>
<tr>
<td>Disassembly</td>
<td>6-7a</td>
<td>6-14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U (Cont’d)</th>
<th>Para</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper ball joint:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-26b</td>
<td>6-58</td>
</tr>
<tr>
<td>Removal</td>
<td>6-26a</td>
<td>6-58</td>
</tr>
<tr>
<td>Upper control arm:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-28b</td>
<td>6-62</td>
</tr>
<tr>
<td>Removal</td>
<td>6-28a</td>
<td>6-62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent line, air intake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-20b</td>
<td>3-33</td>
</tr>
<tr>
<td>Removal</td>
<td>3-20a</td>
<td>3-33</td>
</tr>
<tr>
<td>Vent line, differential:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-16b</td>
<td>6-41</td>
</tr>
<tr>
<td>Removal</td>
<td>6-16a</td>
<td>6-41</td>
</tr>
<tr>
<td>Vent line and filter, fuel tank:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-27b</td>
<td>3-52</td>
</tr>
<tr>
<td>Removal</td>
<td>3-27a</td>
<td>3-52</td>
</tr>
<tr>
<td>Vent line, fuel tank filler spout:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>3-29b</td>
<td>3-56</td>
</tr>
<tr>
<td>Removal</td>
<td>3-29a</td>
<td>3-56</td>
</tr>
<tr>
<td>Vent line, geared hub:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>6-17b</td>
<td>6-42</td>
</tr>
<tr>
<td>Removal</td>
<td>6-17a</td>
<td>6-42</td>
</tr>
<tr>
<td>Vent line, transfer case:</td>
<td></td>
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<td>5-16b</td>
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<td>4-17b</td>
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<td>Water crossover:</td>
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<td>Inspection</td>
<td>3-77b</td>
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<td>Water pump inlet hose:</td>
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<td>Water pump pulley:</td>
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<td>Weathercap:</td>
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<tr>
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<td>8-3b</td>
<td>8-6</td>
</tr>
<tr>
<td>Removal</td>
<td>8-3a</td>
<td>8-6</td>
</tr>
</tbody>
</table>
INDEX (Cont'd)

Para Page

W (Cont'd)

Wheel and rubber runflat (all except "A2" vehicles) maintenance, radial tire:
- Assembly ........................................ 8-5d 8-21
- Disassembly .................................. 8-5a 8-16
- Inspection and cleaning ................ 8-5b 8-19
- Repair ........................................ 8-5c 8-20

Wheel and rubber runflat ("A2" vehicles) maintenance, radial tire:
- Assembly ........................................ 8-5.1d 8-24.7
- Disassembly .................................. 8-5.1a 8-24.2
- Inspection and cleaning ................ 8-5.1b 8-24.5
- Repair ........................................ 8-5.1c 8-24.6

Wheel and runflat maintenance, tire:
- Assembly ........................................ 8-4d 8-12
- Disassembly .................................. 8-4a 8-8
- Inspection and cleaning ................ 8-4b 8-10
- Repair ........................................ 8-4c 8-12

Wheel and runflat system:
- Maintenance task summary .......... 8-1 8-1

Wheel, steering:
- Installation ................................. 8-13b 8-44
- Removal .................................... 8-13a 8-44

Wheel stud:
- Installation .................................. 6-15b 6-40
- Removal .................................... 6-15a 6-40

Wheel toe-in alignment, front:
- Preliminary inspection ................. 8-10a 8-32
- Toe-in adjustment .................... 8-10c 8-36
- Toe-in check ................................ 8-10b 8-34

Wheel toe-out alignment, rear:
- Preliminary inspection ................. 8-11a 8-38
- Toe-out adjustment .................... 8-11c 8-42
- Toe-out check ................................ 8-11b 8-40

Winch power cable:
- Installation .................................. 4-82b 4-142
- Removal .................................... 4-82a 4-142

Wiring harness, condenser fan/pressure switch:
- Installation ................................. 4-121b 4-284
- Removal .................................... 4-121a 4-284

Wiring harness connector:
- Cannon plug assembly repair ........ 4-85f 4-156
- Connector assembly repair ........... 4-85d 4-155
- Female cable connector repair ...... 4-85c 4-155
- Male cable connector repair ......... 4-85b 4-154
- Protective control box lower ........ 4-85e 4-154
- Receptacle assembly repair .......... 4-85e 4-154
- Terminal-type cable connector repair ........................................... 4-85a 4-154

Wiring harness duct:
- Main duct installation ................. 4-103c 4-232
- Main duct removal ....................... 4-103b 4-232
- Spotlight branch duct installation ................. 4-103d 4-232
- Spotlight branch duct removal ...... 4-103a 4-232

Wiring harness, hood:
- Installation .................................. 4-84b 4-149
- Removal .................................... 4-84a 4-146

Wiring harness, condenser heater fuel pump:
- Installation .................................. 4-122b 4-288
- Removal .................................... 4-122a 4-288

INDEX 23 (INDEX 24 Blank)
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<td>Step 4 states: &quot;secure lead 7(3) and lead 6(5) to airlift bracket (16) with two screws (14) and clamps (15).&quot; The screws needed are actually cap screws. Step 4 should be changed to read: &quot;Secure lead 7(3) and lead 6(5) to airlift bracket (16) with two cap screws (14) and clamps (15).&quot;</td>
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**SAMPLE**
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U.S. ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND
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WARREN, MI 48397-5000
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<th>PARAGRAPH</th>
<th>FIGURE NO.</th>
<th>TABLE NO.</th>
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BE EXACT . . . PIN-POINT WHERE IT IS IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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<th>PAGE NO.</th>
<th>PARAGRAPH NO.</th>
<th>FIGURE NO.</th>
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#### LINEAR MEASURE
1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches
1 Kilometer = 1,000 Meters = 0.621 Miles

#### WEIGHTS
1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces
1 Kilogram = 1,000 Grams = 2.2 Lb
1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

#### LIQUID MEASURE
1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1,000 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 = 3.86 Sq Miles

#### CUBIC MEASURE
1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

#### TEMPERATURE
5 °F (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius

### APPROXIMATE CONVERSION FACTORS

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