

**TRUCK, CARGO, LIGHT AND TRUCK, CARGO, LIGHT, WINCH,
MC2 - LAND ROVER 110 6X6**

LIGHT GRADE REPAIR

This instruction is authorised for use by command of the Chief of Army. It provides direction, mandatory controls and procedures for the operation, maintenance and support of equipment. Personnel are to carry out any action required by this instruction in accordance with EMEI General A 001.

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INTRODUCTION

1. This EMEI contains procedures for removing, dismantling, repairing, assembling and installing various components of the Truck, Cargo, Light, MC2, including winch models. Where applicable, instructions for the adjustment, lubrication and minor servicing of these items are included.



Do not use adhesive tapes to seal fuel or oil openings. The adhesive tape is soluble in fuel or oil and can cause contamination. Remove temporary covers before assembling.

2. Prevent dirt and foreign objects from entering any component by placing clean temporary coverings over all exposed openings, including hoses, tubes and lines.



Before removing any electrical system components, disconnect the battery leads. Failure to comply may result in damage to the vehicle electrical system.

3. When disconnecting electrical connectors, hoses and fittings, remove clamps, as required, to gain slack and avoid damage to connectors and fittings.

4. Discard all used gaskets, seals, cotter pins, tab washers, lock pins, key washers, locknuts and lock washers. Discard all contaminated fuel and lubricants drained from the truck.

5. Use only those fuels and lubricants specified in the Servicing Instruction, EMEI Vehicle G 209, the User Handbook and this EMEI when replenishing fuel or lubricants.

6. Any fastenings or fittings being tightened to prescribed torques are to have dry, clean threads unless otherwise specified. When specified, thread sealants are to be applied to dry, clean, oil free threads.

7. The engine cooling system contains Nalcool corrosion inhibitor in water at a ratio of 1:12.

Items Previously Known To Have Contained Asbestos



Asbestos is a hazardous material and a carcinogen. Airborne asbestos fibre poses a serious danger to personnel and can lead to acute health concerns and eventual death.

The Land Rover Family of Vehicles (FOV) was originally fitted with a number of gaskets, seals and washers known to have contained asbestos.

Since 2009, all genuine Land Rover Australia supplied repair parts including; gaskets, seals and washers are asbestos free. If it is unknown as to whether the material contains asbestos, such items are to be removed, handled and disposed of IAW Defence WHSManual.

NOTE

Prior to the disruption, removal or replacement of items contained within Table 1, the vehicle logbook (GM120) should be reviewed. If the item has been replaced since 2009 and noted in Part 4 of the GM120 the item can safely be handled as being asbestos free.

8. The following table provides a list of all known, in-situ, items including; parts, gaskets, seals and washers found in Land Rover 6X6 FOV which may contain asbestos. If an item in Table 1 is to be replaced, the GM120, Part 4 should be reviewed. If the item in question has been replaced after 2009 and noted in Part 4 of the GM120 the item can safely be handled as being asbestos free. If no evidence can be found in Part 4 the item is to be considered contaminated with asbestos. The item is to be replaced IAW Defence WHSManual Vol 2, Part 3A, Chap 5, Asbestos Management in Defence and recorded in the GM120 Part 4.

Table 1 Items Previously Known To Have Contained Asbestos

Serial	ACM NIIN	NON-ACM NIIN	Item name	Description	RPS: 02185 ISSUE 3 MAR 00	Entry into GM120 Part 4 YES/NO
1	991373054	661566324	Gasket, transmission magnetic plug	Fibre washer for the transmission magnetic plug	FBA 016	
2	991373055	661566325	Gasket, transmission oil strainer plug	Filler plug fibre washer	FBA 021 / FBB 006	
3	661284266	661285409	Gasket, exhaust manifold	Exhaust manifold gasket	ABA 020	
4	998221518	661566345	Gasket, cover plate transfer casing reverse idler access	Transmission side plate gasket	FBA 012	
5	998221724	661566352	Gasket, transfer casing lower cover plate	Transfer case bottom plate gasket	FBB 001	
6	998221850	661566360	Gasket, transmission pneumatic valve	PTO actuator fibre washer	FEA 024	
7	998240915	661566354	Gasket, transmission oil pump cover	Transmission oil pump cover gasket	FC 019	
8	998498732	661566323	Gasket, transmission oil pump cover	Filler plug gasket for transfer case, front axle housing, rear / intermediate axle housing.	FBA 014 / FBC 012 / JA 903 / KA 006	
9	997980214	994957906	Brake shoe set, transmission handbrake	Handbrake brake shoes	MFB 001	
10	998221517	661566341	Gasket, transmission top cover plate	Transmission top plate gasket	FBA 010	
11	996666734	661566343	Gasket Housing Dog Clutch	PTO Actuator housing gasket	FBC 026	
12	998238297	661568461	Ring oil pick up	Transmission front cover plate oil pickup ring	FC 010	
13	661284264	661586333	Gasket	Oil cooler housing gasket	BE 009	
14	997628209	661566325	Joint washer	Filler plug fibre washer transfer case	FBA 021 / FBB 006	
15	998221722	661566353	Gasket Speedometer case	Speedo drive housing gasket	FBC 015	
16	997920835	661566324	Gasket Magnetic Plug	Filler plug fibre washer transfer case	FBA 016	

Paint

WARNING

This vehicle is painted with polyurethane (PUP). Precautions should be taken prior to carrying out repairs which include painting, sanding, scraping or welding. Fine PUP particles from sanding, filing or welding are eye and lung irritants. Refer to EMEI Workshop D 701 – Repair Policy for Equipment Painted in Polyurethane Paint.

WARNING

The primer used on this vehicle contains chromates. Precautions should be taken prior to carrying out repairs which include painting, sanding, scraping or welding. Fine particles from sanding, filing or welding the primer will contain traces of chromate which are skin, eye and lung irritants. PPE is as for PUP.

WARNING

Do not use compressed air to remove dust from areas which vehicle paint has been sanded, filed or drilled. Fine particles of dust will contain chromates and polyurethane which are skin, eye and lung irritants.

9. This vehicle is painted with polyurethane paint. The primer may contain chromium or zinc chromates. Both PUP and primer are most carcinogenic when in a liquid state but are still harmful if exposed to dust or fumes during repairs which include sanding, filing, welding or drilling through or removing paint layers. Wet sanding methods and / or local extract ventilation will minimise and control exposure from dust or fumes generated.

10. **PPE Requirements.** During repairs that involve sanding, filing, welding or drilling of the paint the following PPE must be worn:

- a. safety glasses,
- b. rubber or PVC gloves,
- c. overalls or full length clothing,
- d. fully enclosed foot wear, and
- e. a Class P1 (Particulate) respirator.

General Safety Warnings

WARNING

All industrial safety, work practices and equipment operating and maintenance instructions pertaining to this EMEI are to be adhered to.

The handling, storage and use of chemical substances are to be in accordance with WHS Manual, ChemAlert and EMEI Workshop E series requirements.

Under no circumstances is compressed air to be used to remove dust from the clutch assembly and flywheel housing or the brake drums/discs and brake linings. Dust from the brake linings can be a health risk if inhaled.

Associated Publications

11. Reference may be necessary to the latest issue of the following documents:
- a. [Defence Work Health and Safety Manual](#) (WHSManual);
 - b. [Electronic Supply Chain Manual \(ESCM\)](#);
 - c. [ChemAlert](#);
 - d. [Technical Regulation of ADF Materiel Manual - Land version 5](#)(TRAMM-L);
 - e. [Defence Road Transport Manual](#) (DRTM);
 - f. Complete Equipment Schedules (CES):
 - (1) SCES 12044 Truck, Cargo, Light, MC2 – Land Rover 110 6X6;
 - (2) SCES 12040 Truck, Cargo, Light, Winch, MC2 – Land Rover 110 6X6;
 - (3) Equipment Kit SCES 12045 Land Rover 110;
 - g. Block Scale 2406/31 Special Tools for RAEME – B Vehicles – Truck, Utility and Trucks, Light, MC2 (Land Rover Model 110);
 - h. EMEI Vehicle A 019-1 – Replacement of Vehicle Speedometers/Hour Meters and Trailer Odometers;
 - i. EMEI Vehicle A 291-1 – Tyres and Tubes – Care and Maintenance Of B Vehicles;
 - j. EMEI Vehicle A 291-5 – General Service B Vehicles Tyre Guide – Operating Instructions;
 - k. EMEI Vehicle A 319-1 – Vehicle/Trailer Electrical Connectors – 12 Pin NATO – Wiring Diagrams;
 - l. EMEI Vehicle A 459-2 – Hydraulic Brake Fluid Deterioration, Miscellaneous Instruction;
 - m. EMEI Vehicle D 108 – Recovery Equipment – Inspection Of Recovery Equipment;
 - n. EMEI Vehicle G 008-1 – Truck, Lightweight, MC2, All Types – Inspection of Towing Pintle Assembly;
 - o. EMEI Vehicle G 188 – Truck, Lightweight and Truck, Light, – All Types – Land Rover 110 4X4 and 6X6 – Inspection Guidelines;
 - p. EMEI Vehicle G 188-1 – Truck, Lightweight and Truck, Light, – All Types – Land Rover 110 4X4 and 6X6 – Suspension and Steering Inspection Procedure;
 - q. EMEI Vehicle G 189-18 – Truck, Lightweight and Truck, Light, – All Types – Land Rover 110 4X4 and 6X6 – Wheel Balancing;
 - r. EMEI Vehicle G 189-19 – Truck, Lightweight and Truck, Light, – All Types – Land Rover 110 4X4 and 6X6 – Power Steering Box – Warranty and Repair Procedures;
 - s. EMEI Vehicle G 200 – Truck, Cargo, Light and Truck, Cargo, Light, Winch, MC2 – Land Rover 110 6X6 – Data Summary;
 - t. EMEI Vehicle G 202 – Truck, Cargo, Light and Truck, Cargo, Light, Winch, MC2 – Land Rover 110 6X6 – Technical Description;
 - u. EMEI Vehicle G 209 – Truck, Cargo, Light, MC2, Landrover 110 6X6 – All Types – Servicing Instruction;
 - v. EMEI Vehicle G 299-6 – Truck, Cargo, Light, MC2, Landrover 110 6X6 – All Types – Fitting of Windscreen Washer Nozzle Guard;
 - w. EMEI Workshop D 701 – Repair Policy for Equipment Painted in Polyurethane Paint;
 - x. RPS 02185; and
 - y. RPS 02186 (Winch).

12. A number of modifications and improvements have been made during the service life of the vehicle. Reference to the following publications may be required during repair activities:

NOTE

Any effect of these publications pertaining to the technical content of this document has been included in the text.

- a.** EMEI Vehicle G 187-1 – Truck, Utility, Lightweight, MC2, Land Rover 110 4X4 and Truck, Cargo, Light, MC2, Land Rover 110 6X6 – Fitting of Link Cable to the Headlamp Electrical Circuit;
- b.** EMEI Vehicle G 187-2 – Truck, Lightweight, MC2, Land Rover 110, All Types and Truck, Light, MC2, Land Rover 110, All Types – Fitting of Mudguard Reinforcement Plates;
- c.** EMEI Vehicle G 187-3 – Truck, Utility, Lightweight, MC2, Land Rover 110, All Types and Truck, Cargo, Light, MC2, Land Rover 110, All Types – Fitting of an Extra Earth Strap;
- d.** EMEI Vehicle G 187-4 – Truck, Utility, Lightweight, MC2, Land Rover 110, All Types and Truck, Cargo, Light, MC2, Land Rover 110, All Types – Fitting of Spot Mirrors;
- e.** EMEI Vehicle G 187-5 – Truck, Utility, Lightweight, MC2, Land Rover 110, All Types and Truck, Cargo, Light, MC2, Land Rover 110, All Types – Fitting of Instrument Blackout Cover;
- f.** EMEI Vehicle G 187-6 – Truck, Utility, Lightweight, MC2, All Types, Land Rover 4X4 and Truck, Cargo, Light, MC2, All Types, Land Rover 6X6 – Fitting of External Bonnet Release;
- g.** EMEI Vehicle G 187-7 – Truck, Utility, Lightweight, MC2, All Types, Land Rover 4X4 and Truck, Cargo, Light, MC2, All Types, Land Rover 6X6 – Air Cleaner Bracket Mounting;
- h.** EMEI Vehicle G 187-8 – Truck, Lightweight, MC2, Land Rover 110 4X4, All Types with Winch and Truck, Light, MC2, Land Rover 110 6X6, All Types with Winch – Rework of the Winch Drum Grooves and Replacement of the Winch Rope and Chain;
- i.** EMEI Vehicle G 187-9 – Truck, Lightweight, MC2, Land Rover 110 4X4, All Types not fitted with Snorkel and Truck, Light, MC2, Land Rover 110 6X6, All Types not fitted with Snorkel – Repositioning of the Air Inlet Hose and Rear Axle Breather;
- j.** EMEI Vehicle G 187-10 – Truck, Lightweight, MC2, All Types, Land Rover 4X4 and Truck, Light, MC2, All Types, Land Rover 6X6 – Fitting of Seat Belt Protector Sleeve;
- k.** EMEI Vehicle G 187-12 – Truck, Lightweight and Truck, Light, MC2, Land Rover 110 4X4 and 6X6, All Types – Strengthening of Bonnet Stay;
- l.** EMEI Vehicle G 187-13 – Truck, Lightweight and Truck, Light, All Types, Land Rover 110 4X4 and 6X6 – Fitting of Trailer Safety Chain Brackets;
- m.** EMEI Vehicle G 187-14 – Truck, Utility, Lightweight, FFR, MC2, Land Rover 110, All Types, Truck, Utility, Light, FFR, Land Rover Series 3, All Types and Truck, Cargo, Light, FFR, MC2, Land Rover 110, All Types – Rewiring of the 28V Voltmeter Circuit;
- n.** EMEI Vehicle G 187-15 – Truck, Lightweight and Truck, Light, All Types, Land Rover 110 4X4 and 6X6 – Replacement of 24V Power Distribution Box Cables Between Generator Input Plug and Battery Connections;
- o.** EMEI Vehicle G 187-16 – Truck, Lightweight, MC2, All Types, Land Rover 110 4X4 and Truck, Light, MC2, All Types, Land Rover 110 6X6 – Conversion From Oil Filled to Grease Filled Swivel Pin Housings;
- p.** EMEI Vehicle G 189-6 – Truck, Utility, Lightweight, MC2, All Variants, Land Rover 110 4X4 and Truck, Cargo, Light, MC2, All Variants, Land Rover 110 6X6 – Reclaiming Broken Indicator Switch;
- q.** EMEI Vehicle G 189-12 – Truck, Lightweight, MC2, All Types, Land Rover 110 4X4 and Truck, Light, MC2, All Types, Land Rover 110 6x6 – Fitting of Speedi Sleeves;
- r.** EMEI Vehicle G 189-15 – Truck, Lightweight and Truck, Light, All Types, Land Rover 110 4X4 and 6X6 – Chassis Repairs;

- s.** EMEI Vehicle G 207-1 – Truck, Cargo, Light and Truck, Cargo, Light, Winch, MC2 – Land Rover 110 6X6 – Fitting of Tailgate Upper Reinforcement and Steps, Tailgate Buffers, Seat Grab Handles and Lower Troop Footsteps;
- t.** EMEI Vehicle G 297-1 – Truck, Cargo, Light, MC2, Landrover (110) – All Types – Plate ‘U’ Bolt and fitting of modification record plate;
- u.** EMEI Vehicle G 297-2 – Truck, Light, MC2, Landrover (110) – All Types – Fitting of Transfer Case Caution Decal;
- v.** EMEI Vehicle G 297-3 – Truck, Cargo, Light, MC2, Landrover 110 – All Types – Fusing of Additional Circuits;
- w.** EMEI Vehicle G 297-4 – Truck, Cargo, Light, MC2, Landrover 110 – All Types – Replacement of the Securing Clip and securing of the Map light Wiring;
- x.** EMEI Vehicle G 297-5 – Truck, Cargo, Light, MC2, Landrover 110 – All Types – Fitting of the Steering Protection Plate and Improved Winch Fairlead Plate Mounting Bolts;
- y.** EMEI Vehicle G 297-6 – Truck, Cargo, Light, MC2, Landrover 110 – All Types – Fitting of Improved Steyr Weapon Mount;
- z.** EMEI Vehicle G 297-8 – Truck, Cargo, Light, MC2, Landrover 110 – All Types – Fitment of Centre Seat Back Rubber Block;
- aa.** EMEI Vehicle G 297-9 – Truck, Cargo, Light, MC2, Landrover 110, All Types W/Winch – Rework of the Winch Rear Driveshaft;
- bb.** EMEI Vehicle G 297-10 – Truck, Cargo, Light, MC2, Landrover 110 – All Types – Replacement of the Rear and Intermediate Axle Rebound Strap Retaining Clips and Rework of the Brake Pipe Protector Plate;
- cc.** EMEI Vehicle G 297-11 – Truck, Light, MC2, All Types – Landrover 110 6X6 – Fitment of a Securing Clip to the Turbocharger Oil Feed Pipe;
- dd.** EMEI Vehicle G 297-12 – Truck, Cargo, Light, MC2, Landrover 110 6X6 – All Types – Replacement of the Lower Throttle Linkage Lever;
- ee.** EMEI Vehicle G 297-13 – Truck, Light, MC2, Landrover 110 6X6 – All Types – Fitting of Rear Disc Brakes;
- ff.** EMEI Vehicle G 297-14 – Truck, Light, MC2, Landrover 110 6X6 – All Types – Fitting of Fuel Balance Pipe;
- gg.** EMEI Vehicle G 297-18 – Truck, Light, MC2, Landrover 110 6X6 – All Types – Upgrade of Rear Leaf Springs from seven to 11 Leaf;
- hh.** EMEI Vehicle G 297-19 – Truck, Light, MC2, Landrover 110 6X6 – All Types – Fitting of Front Coil Spring Retainers; and
- ii.** EMEI Vehicle G 297-20 – Truck, Light, MC2, Landrover 110 6X6 – All Types – Fuel Injector Unique Identifier.

Identification Numbers

13. The location of identification numbers on components of the vehicle is described in Table 2.

Table 2 Location of Identification Numbers

Serial	Identification Number	Location
1	Chassis number	Right-hand side of the chassis, forward of the spring mounting turret
2	Chassis nameplate	Left-hand seat box, in the cab
3	Engine number	Left-hand side of the engine block
4	Injection pump identification	Side of the pump
5	Transmission and transfer case	Rear of the transfer case
6	Axle	Near the breather
7	Power steering pump	Ref EMEI Vehicle G 189-19

LIGHT GRADE REPAIR

Special Tools and Gauges

14. Many of the procedures described in this EMEI require the use of special tools, jigs or fixtures. The special tools required are listed in Table 3 and illustrated in Figure 1.

Table 3 Special Tools

Serial	Part No.	NSN	Item Name
1	5-85317-001-0	5220-66-128-4311	Adapter
2	5-8840-2008-0	5220-66-128-4310	Compression Gauge
3	LRT-57-014	5120-99-724-4444	Puller, Steering Wheel
4	LRT-51-003	5120-66-128-4300	Wrench, Adjustable
5	LRT-54-004	5120-99-735-2537	Drift, Pinion Oil Seal Replacer
6	EYA3953	5120-66-158-0612	Hub Adjusting Spanner
7	18G1349	5130-99-767-3075	Hub Oil Seal Replacer
8	LRT-99-503	5220-66-128-4307	Bracket, Dial Gauge Indicator
9	LRT-37-004	5120-99-725-6474	Adapter for stub axle bush and oil feed ring removal
10	LRT-99-004	5120-99-806-9013	Impulse Extractor
11	LRT-99-003	5120-99-874-1715	Replacer, Bearing and Oil Seal
12	LRT-70-500	5120-99-820-6918	Disc Brake Piston Compressor
13	LRT-57-018	5120-66-128-4304	Separator, Ball Joint
14	LRT-51-005	5130-99-767-3078	Remover, Ball Joint
15	NATO 12 pin socket tester	NIC	Trailer wiring tester
16	LA 18GA084	5120-66-128-4332	Adaptor, Shackle Bush Remover
17	LA 18GA083	5120-66-128-4331	Adaptor, Rocker Beam Bush Remover

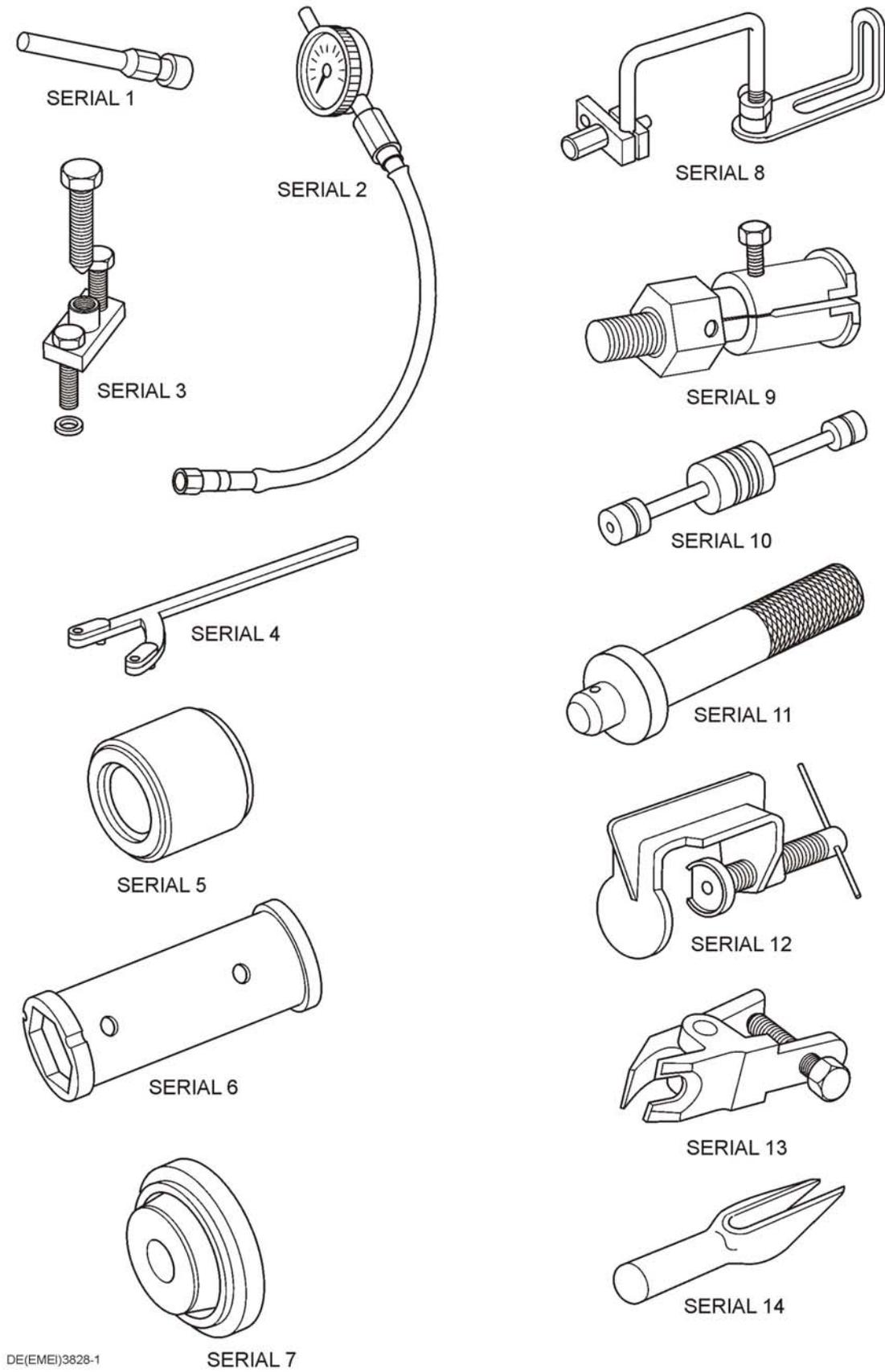


Figure 1 Special Tools

Lubricants

15. The lubricants used with the vehicle are identified in Table 4.

Table 4 List of Lubricants

Serial	Equipment	Lubricant	Capacity (Litres)
1	Engine (including filters)	SAE Grade 40 (OMD-115)	8.5
2	Transmission	SAE Grade 40 (OMD-115)	2.7
3	Transfer case (with PTO)	SAE Grade 40 (OMD-115)	5.8
4	Front axle	OEP-220	1.7
5	Intermediate axle	OEP-220	2.6
6	Rear axle	OEP-220	2.3
7	Swivel pin housings	Molytex Grease	EP00 Sachet
8	Brake master cylinder	OX-8	Fill to level
9	Clutch master cylinder	OX-8	Fill to level
10	Power steering system reservoir	OX-46	1.25
11	Fanbelt jockey pulley	XG-291	As required
12	Wheel bearings	XG-291	As required
13	Winch cable	Rocol wire rope lube NSN 9510-99-337-1498	As required
14	Radiator inhibitor	Nalcool	As required (1:12 ratio)
15	Clutch pedal trunion	XG-291	As required
16	Speedometer cable	XG-291	As required
17	Propeller shaft	XG-291	As required
18	Winch driveline	XG-291	As required
19	Parking brake adjuster	XG-291	As required
20	Windscreen wiper drive cable	XG-291	As required
21	Winch	OEP-220	2.1

ENGINE

Oil Filter

16. **Replacement.** Replace the oil filters as follows:
- Wash the area around the oil filters. Blow it dry with compressed air.
 - Position a suitable container under the filters to catch the oil spill.
 - Unscrew the oil filters, using a suitable oil filter removing tool if necessary.
 - Clean the filter housing surface.
 - Apply a film of clean engine oil on the rubber seals and install the new filters until the seal contacts the adapter face.
 - Tighten the filter a further half a turn by hand only.
 - Check that there is sufficient oil in the engine.
 - Start the engine and allow it to idle for several minutes, check for oil leaks and retighten the filter slightly.
 - Top up with clean engine oil to the full level shown on the dipstick.

Engine Rear Mounting

17. **Removal.** Remove the engine rear mounting as follows:
- Remove the nuts and washers securing both mountings to the transmission and chassis mountings (Figure 2).
 - Position a suitable jack beneath the transmission.
 - Raise the jack sufficiently to take the weight of the transmission.
 - Remove the three bolts and washers securing each mounting bracket to the chassis.
 - Remove the brackets.
 - Remove the mounting from the brackets.

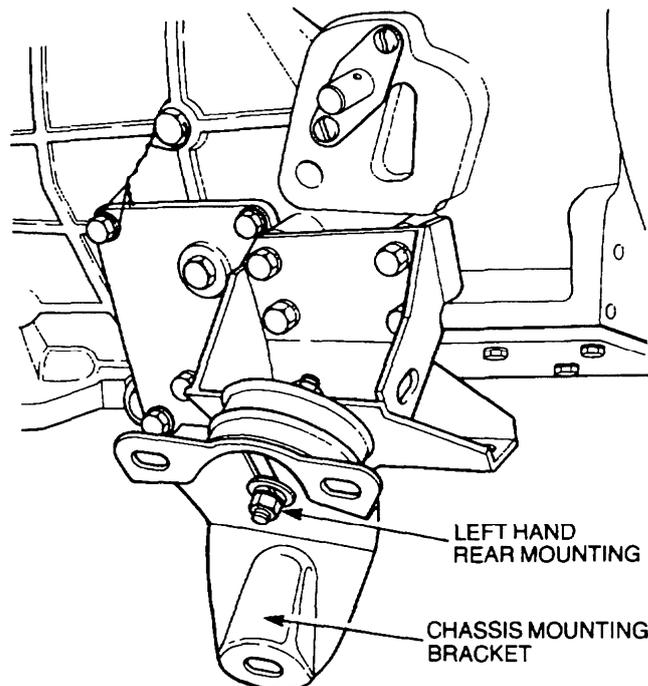


Figure 2 Engine Rear Mounting Removal

- 18. Installation.** Install the engine rear mounting as follows:
- a. Install the new mountings on the transmission mounting brackets and install the nuts together with new washers.
 - b. Position the chassis mounting brackets over the mountings and install the nuts together with new washers.
 - c. Align the mounting brackets with the bolt holes in the chassis.
 - d. Install and securely tighten the retaining bolts.
 - e. Carefully lower and remove the jack from under the vehicle.
 - f. Securely tighten the retaining nuts on both mountings.

Engine Front Mounting

- 19.** Remove the engine front mounting as follows (Figure 3):

NOTE

The following procedure is applicable to both left-hand and right-hand mountings.

- a. Place a suitable block of wood on a jack.
- b. Position the jack under the sump.
- c. Remove the bolts, nuts and washers securing the mounting and the earth strap (left-hand side only) to the mounting brackets. Discard the washers.



When raising the engine using the jack, extreme care must be taken to prevent damage to any pipes, hoses, wiring harnesses and the front exhaust pipe.

- d. Raise the engine enough to enable the mounting to be removed and remove the mounting.

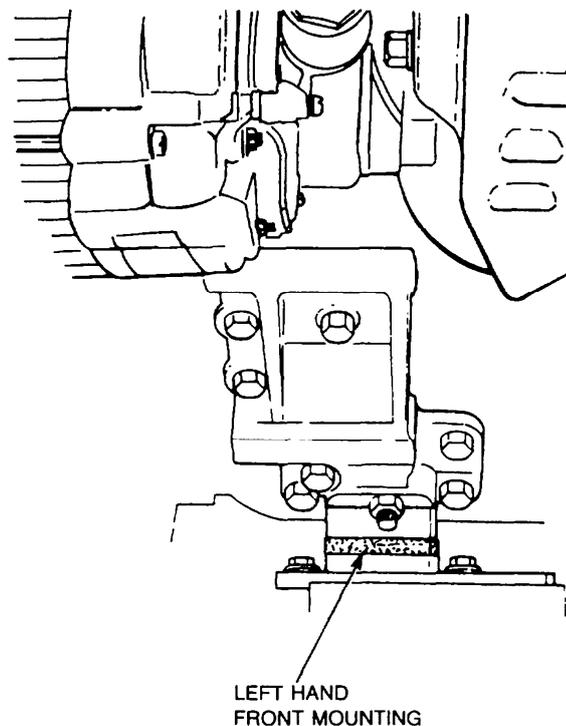


Figure 3 Engine Front Mounting (Left)

20. **Installation.** Install the engine front mounting as follows:

NOTE

The following procedure is applicable to both the left-hand and right-hand mountings.

- a. Position the new engine mounting between the two brackets.
- b. Install the bolts and the earth strap (left-hand side only) to the chassis bracket.
- c. Install the nuts and new washers to secure the mounting to the engine.
- d. Carefully lower the jack and remove it from under the vehicle.
- e. Securely tighten the mounting nuts and bolts.

Exhaust Manifold

21. **Removal.** Remove the exhaust manifold as follows:

WARNING

New gaskets provided by Land Rover do not contain asbestos. Older gaskets still fitted to vehicles may contain asbestos. During this task some parts may contain asbestos; refer and comply with procedures and warnings in the introduction section of this EMEI under paragraph heading: Items Previously Known To Have Contained Asbestos.

- a. Remove the turbocharger (Para 73).
- b. Remove the nuts and bolts securing the exhaust manifold to the cylinder head.
- c. Remove the exhaust manifold.

22. **Cleaning and Inspection.** Clean and inspect the exhaust manifold as follows:

WARNING

New gaskets provided by Land Rover do not contain asbestos. Older gaskets still fitted to vehicles may contain asbestos. During this task some parts may contain asbestos; refer and comply with procedures and warnings in the introduction section of this EMEI under paragraph heading: Items Previously Known To Have Contained Asbestos.

- a. Remove all trace of gasket material from the manifold and the cylinder head.
- b. Inspect the exhaust manifold for cracks and/or damage (replace as necessary).
- c. Ensure that the machined faces are flat and smooth with no burn tracks or warping of the manifold. Replace the manifold if necessary.
- d. Ensure that the cylinder head studs and manifold studs are not bent or damaged. Replace the studs as necessary (Figure 4).

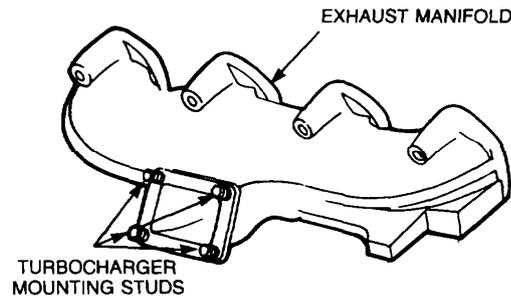


Figure 4 Exhaust Inspection

23. Installation. Install the exhaust manifold as follows:

- a. Position two new exhaust manifold gaskets on the cylinder head so that the word 'TOP' is toward the manifold (Figure 5).

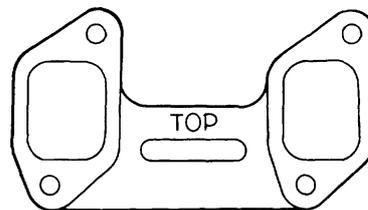


Figure 5 Exhaust Manifold Gasket Installation

- b. Place the exhaust manifold over the gaskets, aligning the studs with the corresponding holes in the manifold.
- c. Secure the manifold in position with the nuts, flat washers, new lock washers and bolts and tighten them finger-tight.
- d. Check that each gasket is correctly positioned and not distorted.
- e. Tighten the manifold retaining nuts and bolts to 16–25 N.m (12–19 lbf.ft) using the tightening sequence as shown in Figure 6.

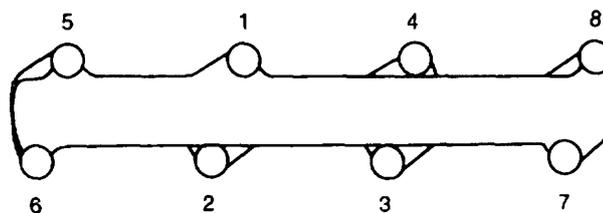


Figure 6 Exhaust Manifold Tightening Sequence

- f. Install the turbocharger and related parts (Para 75).

Air Inlet Manifold

24. Removal. Remove the air inlet manifold as follows:

- a. Clean the area around the inlet manifold using a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the high pressure fuel lines (Para 53).
- c. Disconnect and plug the fuel return line at the fuel filter.
- d. Remove the main fuel lines from the fuel filter to the injection and transfer pump (Figure 7).

NOTE

Plug all openings in the injection pump and filter adapter following the removal of the fuel lines to prevent the ingress of dirt.

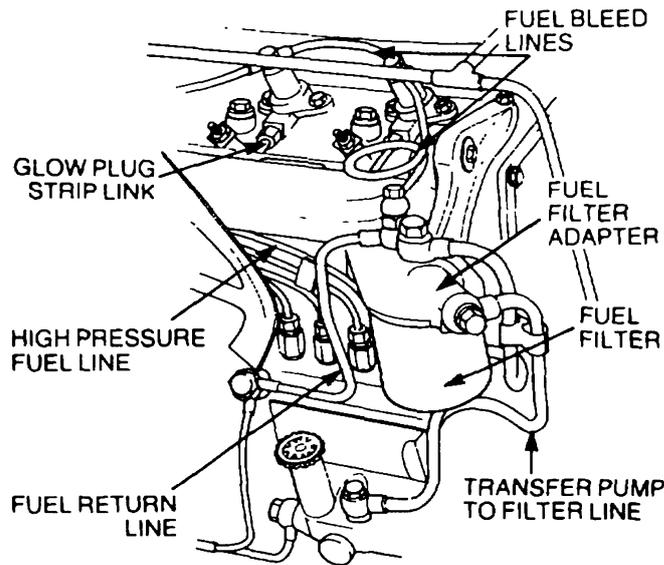


Figure 7 Air Inlet Manifold Removal

- e. Remove the stop cable mounting bracket from the inlet manifold.
 - f. Remove the two bolts securing the fuel filter assembly to the support bracket.
 - g. Remove the filter assembly from the vehicle.
 - h. Remove the two bolts securing the inlet pipe to the inlet pipe mounting bracket.
 - i. Remove the two bolts securing the air inlet pipe to the inlet manifold and cylinder head.
 - j. Loosen the two hose clamps securing the air inlet pipe to the turbocharger.
 - k. Remove the air inlet pipe. Plug the turbocharger.
 - l. Remove the nuts, washers and springs securing the inlet manifold to the engine and remove the manifold.
 - m. Remove and discard the gasket.
- 25. Cleaning and Inspection.** Clean and inspect the air inlet manifold as follows:
- a. Remove all trace of gasket material from the manifold and cylinder head. Inspect the manifold for cracks or damage. Replace the manifold if necessary.
 - b. Ensure that the machined face is flat and smooth with no warping or burn tracks. Replace the manifold if necessary.
- 26. Installation.** Install the air inlet manifold as follows:
- a. Position a new manifold gasket on the cylinder head with the projection uppermost and toward the rear of the engine (Figure 8).
 - b. Place the inlet manifold over the gasket.
 - c. Secure the manifold in position with the nuts, washers and spring. Tighten the nuts finger-tight.
 - d. Check that the gasket is correctly positioned and not distorted.
 - e. Tighten the nuts and bolts to 16–25 N.m (12–19 lbf.ft).
 - f. Install the air inlet tube and tighten the hose clamps.
 - g. Secure the tube to the inlet manifold and cylinder head with the two bolts.

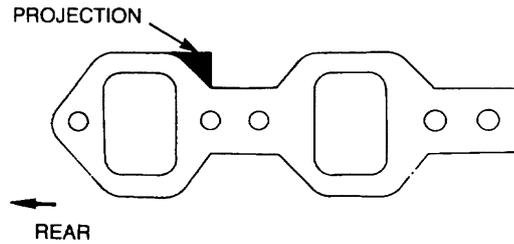


Figure 8 Air Inlet Manifold Gasket Installation

- h. Install the two bolts securing the inlet pipe to the inlet pipe mounting bracket.
- i. Tighten the bolts securely.
- j. Position the fuel filter assembly on the support bracket.
- k. Install the two retaining bolts and tighten them securely.
- l. Using new sealing washers, install the main fuel lines between the transfer pump, fuel filter and injection pump.
- m. Install the high pressure fuel lines (Para 54).
- n. Install the stop cable bracket on the inlet manifold and adjust the cable (Para 66).
- o. Using new sealing washers; connect the fuel return line to the fuel filter and tighten the banjo bolt securely.
- p. Bleed the fuel system (Para 76).

Valve Clearance

27. **Adjustment.** Adjust the valve clearance as follows:

WARNING

To avoid the possibility of the engine firing, ensure that the stop control is operated (ignition turned off).

- a. Wash the area around the valve cover using a recommended cleaning agent and blow it dry with compressed air.
- b. Remove the three nuts securing the valve cover to the cylinder head and remove the cover.
- c. Rotate the crankshaft by hand in the direction of rotation until the number four cylinder valves are on the rock.
- d. Align the timing mark on the crankshaft pulley with the calibration mark on the timing cover.
- e. Number one cylinder is now on top dead centre (TDC) compression stroke (Figure 9).

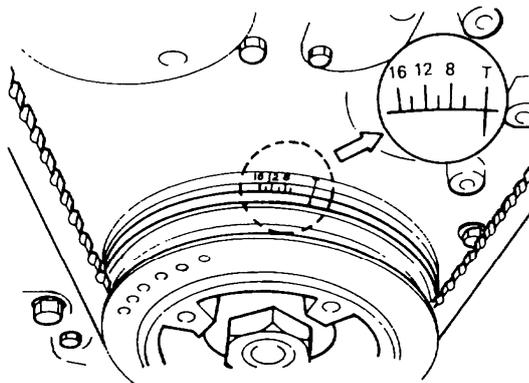


Figure 9 Timing Mark Alignment

- f. Check that the valve clearances for the valves are 0.4 mm (0.016 in) and adjust the clearances as necessary (Figure 10).

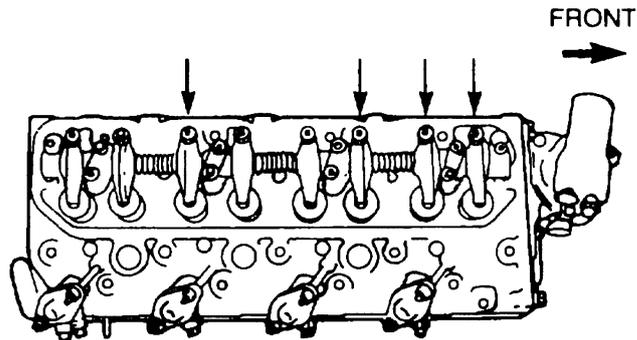


Figure 10 Valve Adjustment First Sequence

- g. To adjust the remaining valves, rotate the crankshaft by hand in the direction of rotation for one complete revolution until the timing mark is aligned (Figure 9).
- h. Check that the valve clearances for the valves are 0.4 mm (0.016 in) and adjust the clearances as necessary (Figure 11).

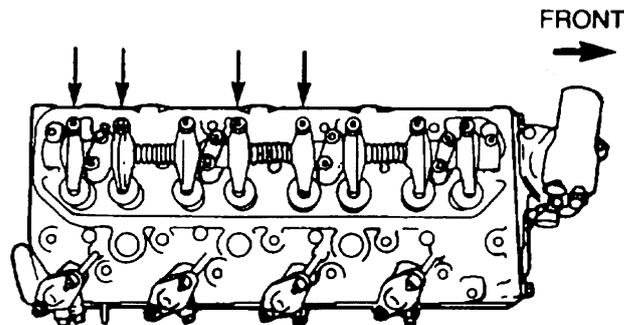


Figure 11 Valve Adjustment Second Sequence

- 28. **Reassembly.** Reassemble the valve cover as follows:
 - a. Using a new valve cover gasket and retaining nut seals, install the cover.
 - b. Tighten the three nuts to 19 N.m (14 lbf.ft).

Engine Sump

- 29. **Removal.** Remove the engine sump as follows:
 - a. Clean the area around the sump using a suitable cleaning agent and blow it dry with compressed air.
 - b. Remove the sump drain plug and drain the oil into a suitable container.
 - c. Install the drain plug with a new sealing washer and tighten it securely.
 - d. Remove the bolts and nuts securing the sump to the engine block.
 - e. Remove the sump and the supporting plates (Figure 12).
 - f. Remove all trace of gasket material from the engine block and the sump.
 - g. Clean the sump thoroughly.
- 30. **Installation.** Install the sump as follows:
 - a. Position a new gasket on the sump.
 - b. Position a new gasket and the supporting plates over the rim of the sump.
 - c. Position the sump complete with the gaskets and supporting plate on the engine block.
 - d. Install the retaining bolts and nuts and tighten them to 10–20 N.m (8–15 lbf.ft).

- e. Fill the engine with clean engine oil to the correct level.

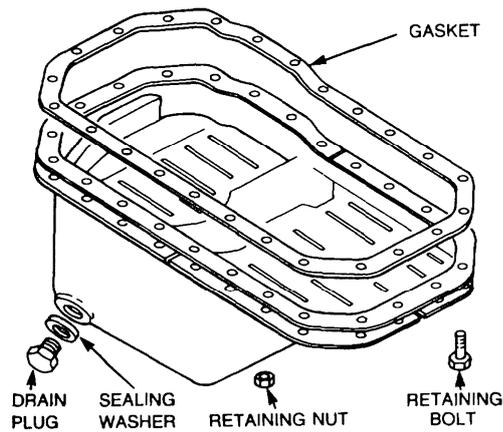


Figure 12 Engine Sump Removal

Engine Side Cover Plate Gaskets

- 31. **Rear Cover Plate Replacement.** Replace the rear cover plate as follows:

- a. Clean the area around the rear cover plate using a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the two bolts and packing washers securing the rear cover to the engine block and remove the rear cover (Figure 13). Discard the sealing washers.

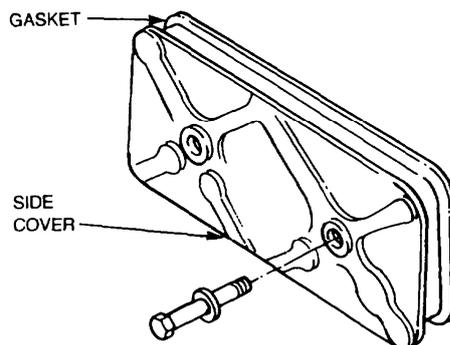


Figure 13 Rear Side Cover Plate Gasket Replacement

- c. Remove and discard the gasket.
 - d. Remove all trace of gasket material from the engine block and the rear cover.
 - e. Position a new gasket on the rear cover and new packing washers on the retaining bolts.
 - f. Install the rear cover and tighten the retaining bolts to 16–27 N.m (12–20 lbf.ft).
- 32. **Front Cover Plate Replacement.** Replace the front cover plate as follows:
 - a. Loosen the alternator mounting bolts and remove the adjusting bolt (Figure 14).
 - b. Remove the fanbelt from the alternator drive pulley.
 - c. Swing the alternator away from the engine.
 - d. Remove the two bolts securing the front cover to the engine block.
 - e. Remove the front cover.
 - f. Remove and discard the gasket.
 - g. Remove all trace of gasket material from the engine block and the front cover.

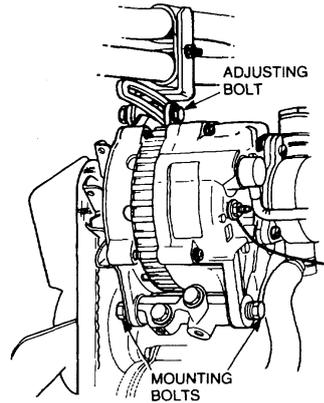


Figure 14 Alternator Adjusting Bolt

- h. Discard the packing washers fitted to the bolts.
- i. Position a new gasket on the front cover and new packing washers on the retaining bolts.
- j. Install the front cover and tighten the retaining bolts to 16–27 N.m (12–20 lbf.ft).
- k. Install the fanbelt on the alternator drive pulley and adjust it (Para 36).

Compression Test

33. Procedure. Carry out the compression test as follows:

- a. Apply the handbrake.
- b. Start the engine.
- c. Stop the engine when it reaches normal operating temperature.
- d. Remove the in-line fuse located in the stop motor wiring harness, adjacent to the brake master cylinder.

WARNING

Operate the ignition switch prior to continuing to ensure that the vehicle will not start.

- e. Disconnect the wiring harness connected to the glow plug link strip.
- f. Remove the nuts and washers securing the link strip to the glow plugs.
- g. Using a 12 mm deep socket, remove the glow plugs.
- h. Install the adapter (Table 3, Serial 1) into the first cylinder by using a 17 mm deep socket and fit the compression gauge (Table 3, Serial 1).
- i. Using the starter, crank the engine four to five revolutions and note the reading on the compression gauge.
- j. Note the reading and repeat the procedure for the remaining cylinders.
- k. The compression pressure for each cylinder must be between 22 kg/cm² (313 psi) and 30 kg/cm² (441 psi) with a maximum variation of 5 kg/cm² (71 psi) between cylinders.
- l. Remove the compression gauge and adapter from the cylinder head.
- m. Install the glow plugs and torque them to 22–27 N.m (16–20 lbf.ft).
- n. Position the electrical strip link on the glow plugs and tighten the retaining nuts securely.
- o. Connect the wiring harness to the glow-plug link strip.
- p. Install the in-line fuse adjacent to the brake master cylinder.
- q. Ensure the engine starts.

Engine System Specifications

34. The engine system specifications are listed in Table 5.

Table 5 Engine System Specifications

Serial	Specification	Measurement
1	Air inlet manifold to cylinder head tightening torque	16–25 N.m (12–19 lbf.ft)
2	Exhaust manifold to cylinder head tightening torque	16–25 N.m (12–19 lbf.ft)
3	Rocker shaft tightening torque	20–30 N.m (15–22 lbf.ft)
4	Valve clearance inlet and exhaust	0.4 mm (0.016 in.)
5	Valve cover tightening torque	19 N.m (14 lbf.ft)
6	Engine oil pan (sump) tightening torque	10–20 N.m (8–15 lbf.ft)
7	Engine side covers tightening torque	16–27 N.m (12–20 lbf.ft)
8	Fanbelt deflection	10–15 mm
9	Transfer pump fuel delivery pressure	176–245 kPa
10	Compression pressure	22–30 kg/cm ² (313–441 psi) [maximum variation 5 kg/cm ² (71 psi)]
11	Glow plug torque	22–27 N.m (16–20 lbf.ft)

Engine Fault Finding

35. The procedures for engine fault finding are detailed in Table 6.

Table 6 Engine Fault Finding

Serial	Symptom	Probable Cause	Action
1	Engine misfiring	Poor quality fuel, water or dirt in fuel	Drain sedimenter. Drain and flush the fuel tank. Install new filters and fill tank with clean diesel fuel
		Air in fuel system	Check the system for air leaks. Air will generally enter the fuel system on the suction side of the transfer pump
		Broken or leaking high pressure fuel lines	Check for fuel leaks and replace defective parts
		Restriction in fuel lines or return lines	Check for fuel flow. If no flow, replace lines
		Low fuel supply pressure	Check that there is fuel in the fuel tank. Look for leaks, sharp bends or kinks in the fuel line between fuel tank and transfer pump. Check for a clogged or perforated suction pipe in the tank or a blocked fuel suction hose. Look for air in the system. Check fuel pressure, if much less than the specified figure of approx 176–245 kPa change the filter and recheck. If still low, replace the transfer pump. Check that the overflow valve is operating
		Improper valve adjustment	Check valve clearance, adjust to specification
		Defective fuel injection nozzle or fuel injection pump	Run the engine at a speed that gives maximum misfiring or rough running. Loosen the high pressure fuel line nuts, one at a time, on the injection pump cutting the fuel flow to the cylinder. NOTE When fuel is cut from a given cylinder and running speed does not change, it is an indication that the cylinder is not firing. If however, no fuel is evident when the nut is Loosened off, it is an indication that the injection pump is defective
		Engine improperly timed	Check and adjust timing
		Cylinder head gasket leakage	Check for visible signs of leakage e.g. coolant in the engine oil or oil traces in the coolant
2	Engine stalls at low speeds	Idle speed too low	Check the idle setting (650 ±20 rpm) and make the necessary adjustments
		Fuel tank vent blocked or partially blocked	Check the vent and hose, if blocked, replace
		Low fuel supply	Check that there is fuel in the tank. Look for leaks, sharp bends or kinks in the fuel supply lines. Check for air in the fuel system. Drain the sedimenter. Check that fuel pressure is approx 176–245 kPa. If not, replace the fuel filter and recheck the pressure. If still low replace the transfer pump
		Injection pump overflow valve leaking, stuck open or closed	Repair or replace valve
3	Engine will not reach no-load governed speed	Air in fuel system	Check the fuel system for air leaks. Air will generally get into the fuel system on the suction side of the transfer pump
		Accelerator linkage loose or out of adjustment	Check all linkages and make the necessary repairs
		Restricted fuel lines or stuck overflow valve	Check flow in the fuel lines. Check the overflow valve for a defective spring, worn valve, and valve setting or sticking. Make all necessary repairs
		High idle speed incorrect	Replace injection pump
		Blocked in-line filter	Clean or replace filter

Table 6 Engine Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
4	Erratic engine speed	Air leaks in fuel suction line	Check for air leaks and correct as necessary
		Accelerator linkage loose or out of adjustment	Check all accelerator linkages and make the necessary adjustments
5	<p>Low power</p> <p>NOTE</p> <p>When diagnosing low power complaints, it is possible the trouble can be traced to chassis components, other than the engine. Make sure the vehicle rolls freely when the brakes are released</p>	Restrictions in the air intake system: clogged air filter	Check the air pressure in the air inlet manifold. Replace the air cleaner elements
		Damage or restrictions in the accelerator or stop cable linkage	Check the linkages, adjust to obtain sufficient travel
		Low fuel pressure.	Check the fuel supply lines for leaks, kinks or restrictions. Also check for air in system. Check fuel pressure, if low, replace the fuel filter and recheck the pressure. If still low replace the transfer pump. Also check for sticking, binding or defective fuel overflow valve. Repair or replace as necessary
		Excessive valve clearance	Adjust valve clearance to specification
		Blocked in-line filter	Clean or replace filter
6	Excessive engine vibration	Crankshaft pulley loose	Tighten pulley retaining bolt
		Fan blade not in balance	Loosen or remove fanbelt and operate the engine for a short time at the speed that the vibration was present. If the vibration disappears, replace the fan assembly
		Engine mountings are loose, worn or defective	Tighten all mounting bolts. Install new components as required
		Misfiring or running rough	Refer to Serial 1
7	Excessive black or grey smoke	Insufficient air for combustion	Replace air filter element
		High exhaust back pressure	Check for faulty exhaust piping or muffler obstruction. Repair or replace defective parts
		Faulty injection nozzle	Isolate faulty nozzle and report. Refer Serial 1
		Improper engine timing	Check the timing and make the necessary adjustments
8	Excessive blue or white smoke	Engine lubricating oil level too high	Remove excess lubricating oil. If oil is contaminated with either fuel or coolant, completely drain the system and replace the oil filter. Locate and rectify the source of the leak. Refill with clean engine oil (8.5 litres), then check level with dipstick after running the engine for several minutes. DO NOT overfill
		Engine misfiring or running rough	Refer to Serial 1
		Worn engine components	Report condition
9	Excessive fuel consumption	Restrictions in air induction system	Inspect system and remove restrictions
		External fuel system leakage	Check fuel system piping for signs of fuel leakage. Repair or replace as necessary
		Faulty injection nozzle	Isolate faulty nozzle and report. Refer Serial 1
10	Excessive oil consumption	External oil leaks	Check the engine for visible signs of oil leaks. Check the front and rear crankshaft oil seals, check gaskets and sump drain plug
		Clogged engine breather pipe	Clean the pipe to remove the obstruction
		Excessive exhaust back pressure	Check the exhaust pressure and make necessary corrections
		Worn engine components	Report condition

Table 6 Engine Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
11	Engine overheats	Coolant level low	Determine the cause. Replace leaking gaskets and hoses. Tighten connections and add coolant
		Loose or worn fanbelt	Adjust or replace
		Air flow through radiator restricted	Remove all obstructions from outer surface or radiator
		Radiator pressure cap defective	Check the pressure release of radiator cap 103 kPa (14 psi). Replace if necessary
		Defective thermostat or temperature gauge	Check the opening temperature and for correct installation of the thermostat. Replace as necessary. Check operation of the temperature gauge. Repair or replace as necessary
		Combustion gases in coolant	Report condition
		Blocked oil cooler	Report condition
		Defective water pump	Replace the pump
		Incorrect driving techniques	Advise driver
12	High exhaust temperature	Operating the vehicle in the wrong gear ratio for load, grade and altitude	Select the appropriate gear ratio
		Restriction in air induction system	Inspect the system and remove restrictions. Replace parts as necessary
		Air leaks in air induction system	Check pressure in the air intake manifold. Check for restrictions at the air cleaner. Make necessary corrections
		Fuel injection timing incorrect	Report condition
		Restriction in the exhaust system	Inspect the system. Repair or replace as necessary
		Incorrect valve clearance	Adjust valves to specified clearance
		Defective injection nozzle	Isolate the defective nozzle assembly and replace
13	Oil in cooling system	Defective oil cooler core	Report condition
		Failed head gasket	Report condition
14	Low lubricating oil pressure	Insufficient oil, oil leaks	Check the oil level: add oil as required. Check for oil leaks, repair or report
		Incorrect engine oil	Drain the lubricating oil. Change the filters and refill with clean engine oil. Check the level on the dipstick. DO NOT overfill
		Defective oil pump	Repair or replace as necessary
		Dirty oil filter	Check the operation of the by-pass valve for the filter. Install new filter element. Drain engine oil and refill with clean engine oil (8.5 litres)
15	Coolant in lubricating oil	Defective oil cooler core	Report condition
		Failed head gasket	Report condition
16	Low compression	Incorrect valve clearance	Adjust valves to specified clearance
		Failed head gasket	Report condition
		Broken or weak valve spring	Report condition
		Burned valves or seals	Report condition

COOLING SYSTEM

Fanbelt

36. **Replacement.** Replace the fanbelt as follows:
- Loosen the alternator mounting bolts and remove the adjusting bolt (Figure 15).
 - Detach the fanbelt from the alternator drive pulley.
 - Remove the fanbelt from the crankshaft and water pump drive pulleys.
 - Install a new fanbelt.

NOTE

Ensure that the fanbelt is located in all three drive pulleys.

- Swing the alternator away from the engine.

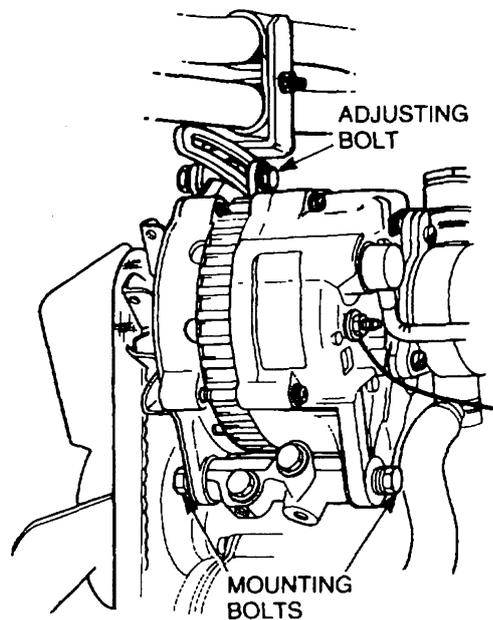


Figure 15 Fanbelt Replacement

- Check the tension of the belt by applying moderate thumb pressure to the longest span of the belt.
- When a belt deflection of 10–15 mm has been obtained, install and tighten the adjusting bolt and the mounting bolts.
- Start and run the engine for approximately 20 minutes.
- Stop the engine and recheck the belt deflection.
- Readjust as necessary.

Thermostat

37. **Removal.** Remove the thermostat as follows:
- Clean the area around the thermostat housing using a suitable cleaning agent and blow it dry with compressed air.
 - Loosen a clamp on the bottom radiator hose.
 - Disconnect the hose and drain approximately four litres of coolant into a suitable clean receptacle.

NOTE

It may be necessary to loosen the expansion tank pressure cap to increase the flow of coolant.

- d. Reconnect the hose and tighten the hose clamp.
- e. Loosen the hose clamp securing the top radiator hose to the thermostat housing.
- f. Remove the hose from the housing.
- g. Remove the three bolts securing the cover to the thermostat housing and remove the cover.
- h. Remove and discard the gasket.
- i. Lift out the thermostat.
- j. Remove all trace of gasket material from the thermostat housing and the cover.
- k. Inspect for corrosion, wear or damage. Repair or replace parts as necessary.

38. Installation. Install the thermostat as follows:

- a. Install a thermostat of the correct temperature range (82°C).
- b. Position a new gasket on the housing.
- c. Position the water outlet on the housing and install the three bolts.
- d. Tighten the bolts securely.
- e. Install the top hose onto the water outlet and tighten the top hose clamp securely.
- f. Refill the cooling system (Para 39).

Coolant

39. Refilling Procedure. Refill the coolant system as follows:

- a. Remove the brass filler plug from the thermostat housing (Figure 16).
- b. Remove the expansion tank pressure cap.
- c. Move the heater controls to the highest temperature position.

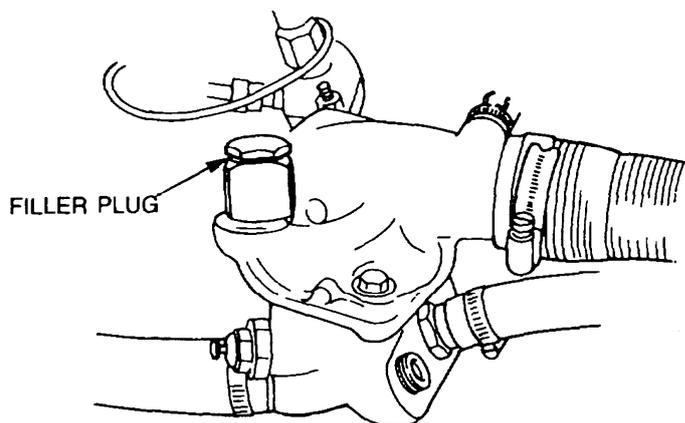


Figure 16 Thermostat Removal

- d. Using coolant with a mixture ratio of 1:12 of Nalcool to water, top up the system through the filler hole, then install the plug.
- e. With the pressure cap removed, run the engine for a minimum of two minutes.
- f. Stop the engine and remove the plug from the thermostat housing.
- g. Top up as required and replace the plug.
- h. Fill the expansion tank to the correct level and replace the cap.
- i. Run the engine and check for leaks.

Water Pump

40. **Removal.** Remove the water pump as follows:

- a. Clean the area around the water pump using a suitable cleaning agent and blow it dry with compressed air.
- b. Loosen the bottom radiator hose securing clamp and drain the coolant into a suitable clean receptacle.
- c. Install the hose and tighten the securing clamp.

NOTE

The water pump must be replaced if any bearing noise is present and there is excessive end float or radial movement.

- d. Loosen the alternator mounting bolts and remove the adjusting bolt (Figure 15).
- e. Detach the fanbelt from the alternator drive pulley.
- f. Remove the screws and washers securing the fan shroud and move the shroud.
- g. Remove the four bolts securing the water pump drive pulley to the water pump.
- h. Remove the fan, spacer and pulley (Figure 17).

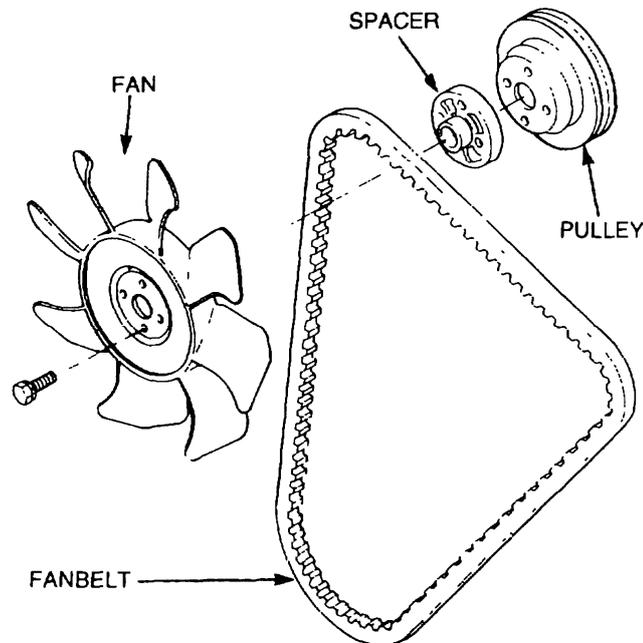


Figure 17 Fan, Spacer and Pulley

- i. Loosen the hose clamps securing the bypass and heater hoses to the water pump.
- j. Remove the hoses (Figure 18).

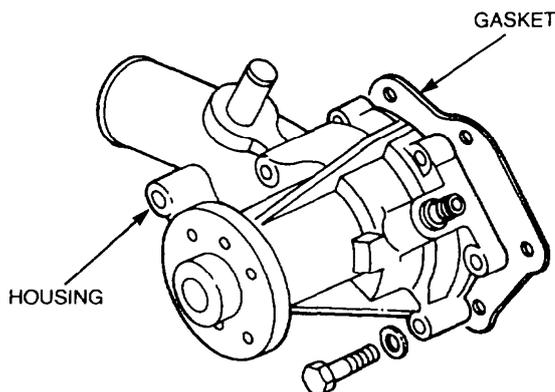


Figure 18 Water Pump Gasket Replacement

NOTE

As the water pump retaining bolts are different lengths, note their respective positions on removal.

- k. Remove the bolts securing the water pump.
 - l. Remove the water pump from the vehicle.
 - m. Remove the screws securing the rear cover to the water pump.
 - n. Remove and discard the gasket.
- 41. Cleaning and Inspection.** Clean and inspect the water pump as follows:
- a. Remove all trace of gasket material from the water pump and engine block surfaces.
 - b. Inspect the water pump cover and housing for cracks, nicks, burrs or damage.
 - c. Inspect the housing for warping and check that the bearings rotate smoothly.
 - d. Replace the water pump as necessary.
- 42. Installation.** Install the water pump as follows:
- a. Using a new gasket and a liquid sealer, secure the rear cover to the water pump.
 - b. Tighten the screws securely.
 - c. Install the water pump retaining bolts in the positions noted on removal.
 - d. Using a new gasket and a suitable sealer, install the water pump and tighten the bolts to 44 N.m (32 lbf.ft).
 - e. Install the drive pulley, spacer and fan, then tighten the four bolts securely.
 - f. Install the fan shroud and secure it with the screws and washers.
 - g. Connect the bypass and heater hoses and tighten the hose clamps securely.
 - h. Install the fan belt (Para 36).
 - i. Fill the cooling system (Para 39).

Radiator

43. **Removal.** Remove the radiator as follows:

- a. Loosen the bottom radiator hose securing clamp and drain the coolant into a suitable, clean receptacle.
- b. Remove the bottom hose from the radiator.
- c. Loosen the top radiator and overflow hose securing clamps and remove the hoses from the radiator.
- d. Remove the screws and washers securing the shroud to the radiator and move the shroud towards the engine (Figure 19).

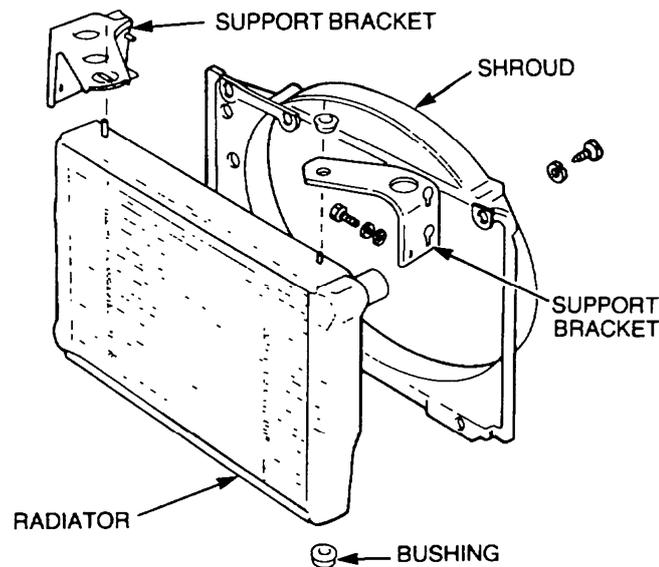


Figure 19 Radiator Assembly Exploded View

- e. Remove the screws securing the two top support brackets and lift the radiator up and out of the vehicle.

44. **Cleaning and Inspection.** Inspect the radiator for damaged seams, choked or damaged fins, corrosion and restrictions in the core. Replace the radiator as necessary.

45. **Installation.** Install the radiator as follows:

- a. Using new rubber bushes, install the radiator onto the lower mountings.
- b. Using new rubber bushes; install the two top support brackets and six screws and tighten them securely.
- c. Install the shroud and secure it with the screws and washers.
- d. Install the top radiator hose and the overflow hose then tighten the clamps.
- e. Install the bottom radiator hose and tighten the clamp.
- f. Fill the cooling system (Para 39).

Cooling System Specifications

46. The cooling system specifications are detailed in Table 7.

Table 7 Cooling System Specifications

Serial	Specification	Measurement
1	Fanbelt deflection	10–15 mm
2	Thermostat opening temperature	82°C
3	Water pump impeller to body clearance	0.3–0.8 mm
4	Water pump tightening torque	44 N.m (32 lbf.ft)
5	Pressure cap opening pressure	103 kPa (14 psi)
6	Expansion tank coolant level	Half-full (Cold)
7	Capacity	12.8 Lt (Cold)

EXHAUST SYSTEM

Exhaust System

47. **Removal.** Remove the exhaust system as follows:
- Remove the three nuts and washers securing the front exhaust pipe to the exhaust manifold (Figure 20).
 - Remove and discard the sealing ring.
 - Remove the bolts securing the muffler to the front exhaust pipe and remove the pipe.
 - Remove the bolts securing the muffler to the rear exhaust pipe.
 - Remove the two clamps securing the muffler to the chassis flexible mounting.
 - Remove the muffler and sealing rings. Discard the sealing rings.
 - Remove the clamp securing the rear exhaust pipe to the chassis flexible mounting.
 - Remove the pipe from over the rear axle.

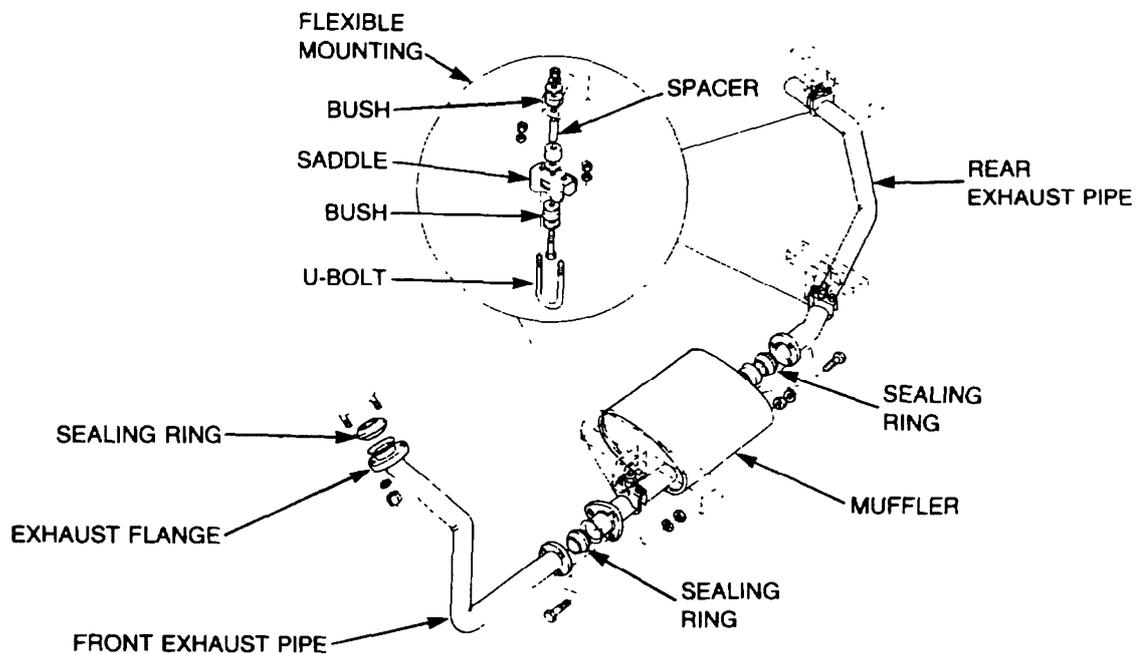


Figure 20 Exhaust System Exploded View

48. **Installation.** Install the exhaust system as follows:
- Install the rear exhaust pipe over the rear axle and install the clamp in approximately the correct location.

NOTE

Do not tighten any clamp or flange bolts until the complete exhaust system is in position on the vehicle.

- Secure the muffler to the flexible coupling with the clamp (Figure 20).
- Using a new sealing ring, position the rear pipe on the muffler flange and install the three bolts.
- Using a new sealing ring, secure the front exhaust pipe to the engine exhaust manifold with the three nuts and new washers.
- Using a new sealing ring, position the front exhaust pipe on the muffler flange and install the three bolts.

- f.** Tighten the three nuts securing the front exhaust pipe to the exhaust manifold, ensuring that the sealing ring is seated evenly in the flange.
- g.** Tighten the mounting bracket clamp.
- h.** Tighten the clamp and front flange bolts, ensuring that the muffler does not foul the chassis in any way.
- i.** Ensure the rear exhaust pipe does not foul the chassis or rear axle moving parts and tighten the rear clamp and muffler flange bolts.
- j.** Start the engine, check for exhaust gas leaks and rectify as necessary.

FUEL SYSTEM

Fuel Tank

NOTE

The removal and installation procedures apply to both the left and right-hand side fuel tanks.

When fuel lines/pipes are disconnected they must be plugged to prevent the ingress of dirt.

- 49. Removal.** Remove the fuel tank as follows:
- a.** Clean the areas around the fuel pipes using a suitable cleaning agent and blow them dry with compressed air.
 - b.** Remove the hexagonal head drain plug from the fuel tank (Figure 21).
 - c.** Drain the fuel into a suitable container.
 - d.** Remove the rubber mat and floor panel from the driver's and passenger's side.
 - e.** Place a suitable support under the fuel tank.
 - f.** Remove the tank front mounting bracket secured to the chassis.
 - g.** Loosen the hose clamp around the filler pipe hose and remove the hose from the fuel tank.
 - h.** Loosen the hose clamp securing the breather pipe to the tank and remove the hose from the fuel tank.
 - i.** Tag and remove the supply and return hoses from the tank sender unit and pick-up pipe.
 - j.** Disconnect the wiring harness from the tank sender unit.
 - k.** Remove the two bolts, nuts and lock washers securing the tank to the rear chassis bracket. Discard the lock washers.
 - l.** Lower the tank from under the vehicle.
- 50. Installation.** Install the fuel tank as follows:
- a.** Raise the fuel tank into position and install the tank front-mounting bracket.
 - b.** Install the two mounting bolts, nuts and new lock washers and tighten them securely.
 - c.** Install the supply and return fuel hoses on to the tank sender unit and pick-up pipe and tighten the connectors securely.
 - d.** Install the filler pipe and breather pipe hoses and tighten the hose clamps securely.
 - e.** Reconnect the wiring harness to the tank sender unit.
 - f.** Install the rubber mat and floor panel on the driver's and passenger's side.
 - g.** Ensure that the drain plug is tight.
 - h.** Refill the fuel tank with clean fuel.
 - i.** Bleed the fuel system (Para 76).

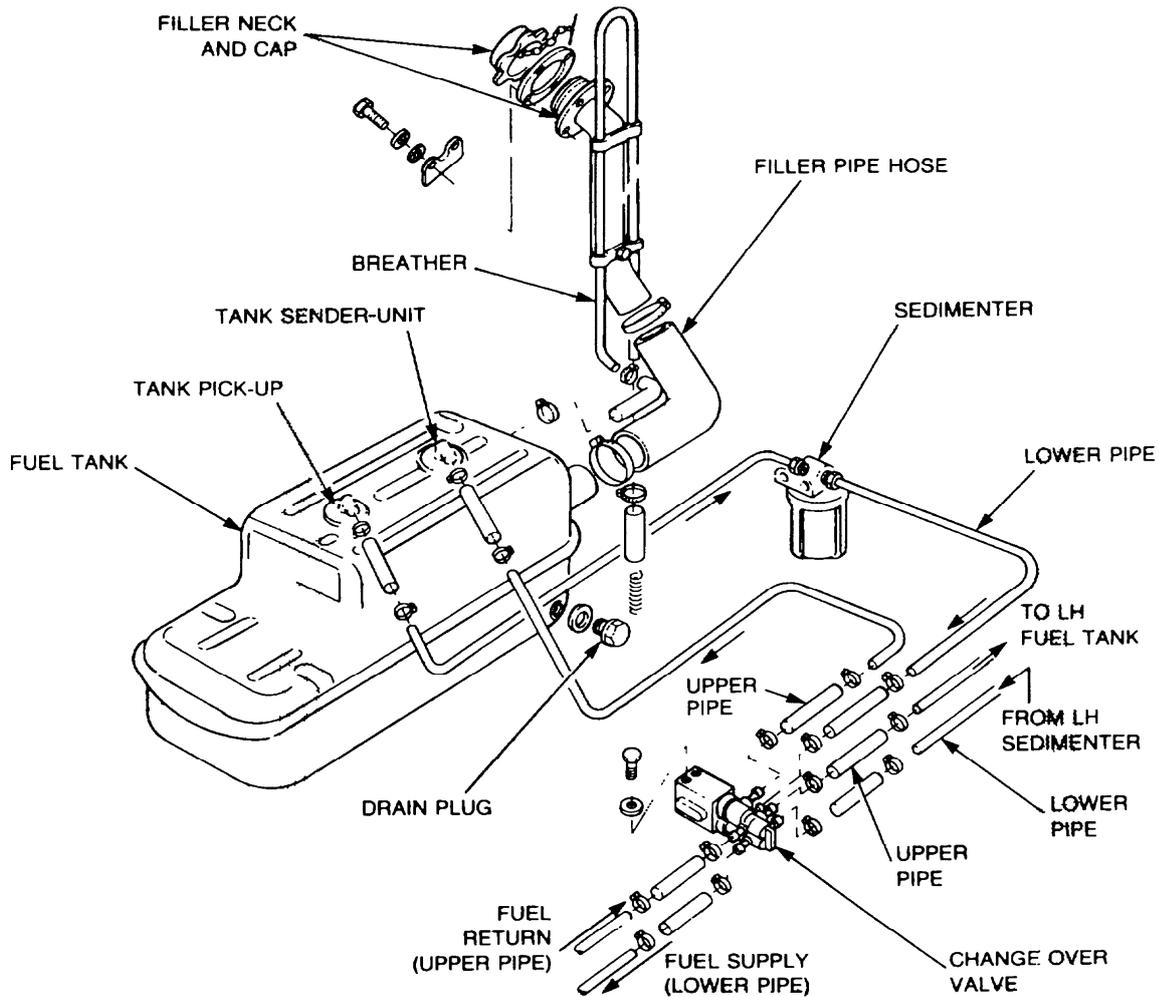


Figure 21 Fuel Tank (Right Side) Exploded View

Fuel Lines – Low Pressure

NOTE

The removal and installation procedures apply to both the left and right-hand side low pressure fuel lines.

51. **Removal.** Remove the fuel lines as follows:
- Clean the area around the fuel lines using a suitable cleaning agent and blow it dry with compressed air.
 - Tag and remove the supply and return lines from the fuel tank sender unit and the pick-up pipe (Figure 22).
 - Drain the fuel from the lines into a suitable receptacle.

NOTE

The fuel tank change over valve is shown in two parts to clarify the pipe layout, but read in conjunction with Figure 21.

- Remove the connectors securing the two lines to the sedimenter.

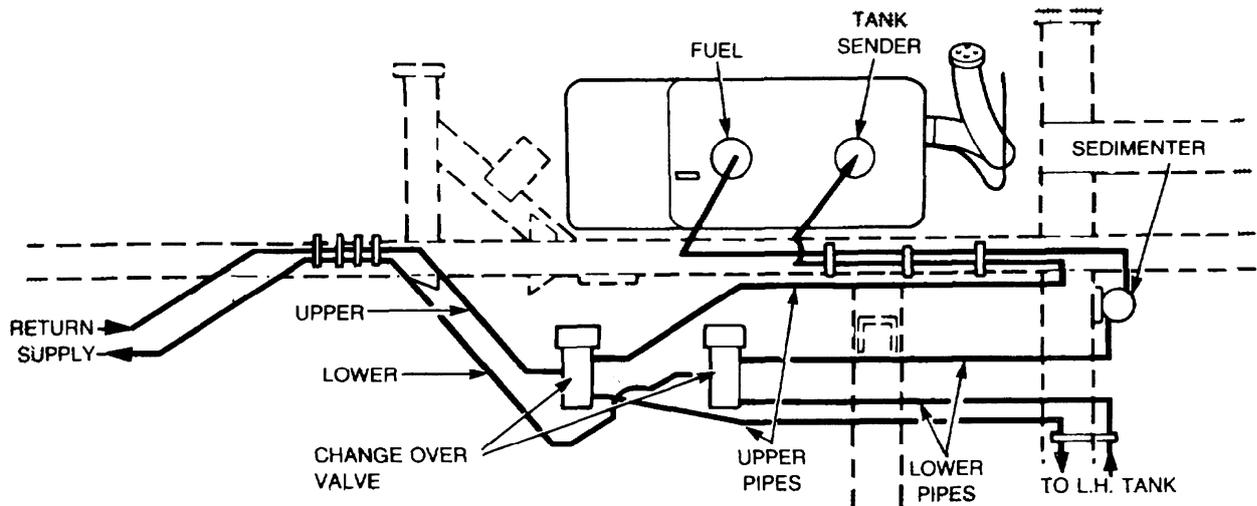


Figure 22 Fuel Lines (Right Side) Removal

- e. Loosen the hose clamps securing the return and supply lines to the engine (Figure 23).

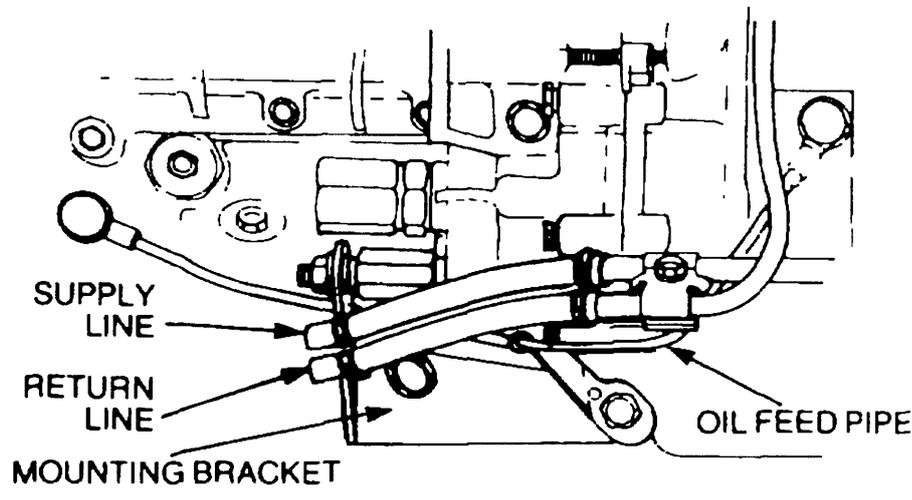


Figure 23 Engine Fuel Lines Disconnection

- f. Remove the fuel lines complete with the steel tubing from the chassis plastic clips.
- g. Remove the lines from the vehicle.
- 52. Installation.** Install the fuel lines as follows:
- a. Position the return fuel line along the chassis rail, then connect the line to the sedimenter housing and to the fuel return pipe on the engine (Figure 21).
 - b. Insert the return line into the plastic clips.
 - c. Position the supply fuel line along the chassis rail, and then connect the line to the tank sender unit and the fuel transfer pump (Figure 21).
 - d. Insert the supply line into the plastic clips.
 - e. Tighten the hose clamps that secure the supply and return lines to the engine (Figure 23).
 - f. Bleed the fuel system (Para 76).
 - g. Start the engine.
 - h. Check for leaks (rectify any leaks as necessary).

Fuel Lines – High Pressure

53. **Removal.** Remove the fuel lines as follows:

- a. Clean the area around the high pressure fuel line that is to be removed and blow it dry with compressed air.
- b. Crack open the nut securing the line to the injector to relieve residual pressure and then loosen the nut completely (Figure 24).

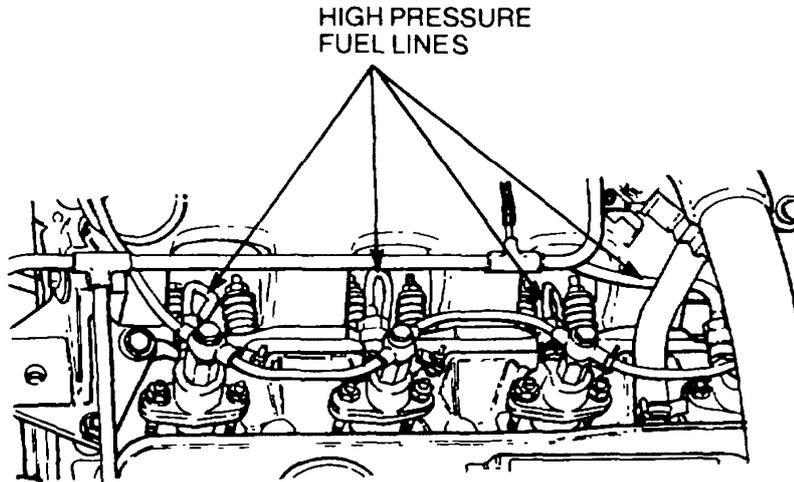


Figure 24 High Pressure Fuel Lines Removal

- c. Loosen the nut securing the fuel line to the injector pump.
- d. Remove the clamp plates retaining the fuel line (Figure 25).
- e. Remove the high pressure fuel line through the inlet manifold.
- f. Install suitable plugs into the injector pump and injectors.

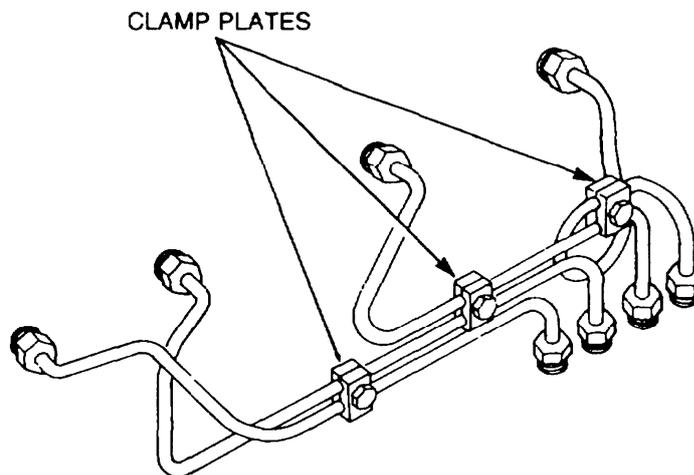


Figure 25 Clamp Plate Location

54. **Installation.** Install the fuel lines as follows:

- a. Install the high pressure fuel line, ensuring the line ends are seated correctly in the injector and the injector pump connectors.
- b. Tighten the fuel line connecting nuts to 28–31 N.m (21–23 lbf.ft).
- c. Install and tighten the clamp plates securely.
- d. Bleed the fuel system (Para 76).

Fuel Filter

55. **Replacement.** Replace the fuel filter as follows:

- a. Clean the area around the fuel filter using a suitable cleaning agent and blow it dry with compressed air.
- b. Place a suitable container below the filter body; then loosen the overflow valve (Figure 26).

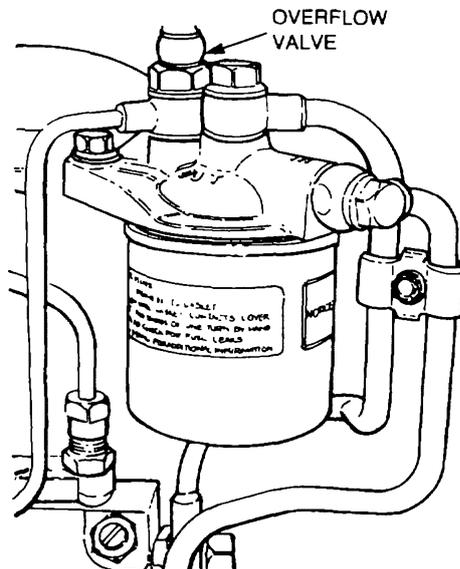


Figure 26 Fuel Filter Draining

- c. Using a suitable filter removing tool, remove the fuel filter (Figure 27).

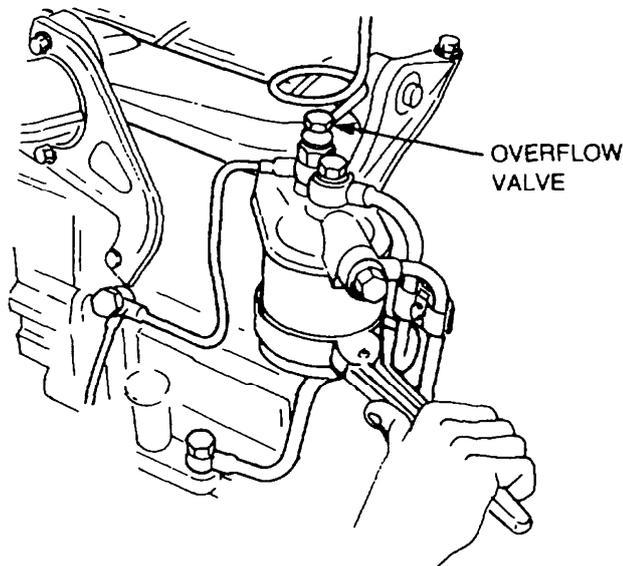


Figure 27 Fuel Filter Removal

- d. Inspect the filter housing surface to ensure that the rubber seal has not become detached from the filter.
- e. Check the cover for signs of cracks or distortion and replace as necessary.
- f. Check the threaded insert fitted to the cover and ensure that it is secure.
- g. Smear clean fuel on the filter body rubber seal and install the filter on the cover.
- h. Tighten the filter by hand until the rubber seal touches the cover face and tighten it one-half turn further.

- i. Bleed the fuel system (Para 76).

Fuel Sedimenter

NOTE

The removal and installation procedures apply to both the left and right-hand side fuel sedimenters.

56. Removal. Remove the fuel sedimenter as follows:

- a. Clean the area around the sedimenter using a suitable cleaning agent and blow it dry with compressed air.
- b. Remove and plug the fuel lines from the sedimenter.
- c. Remove the drain plug and drain the contents into a suitable container (Figure 28).

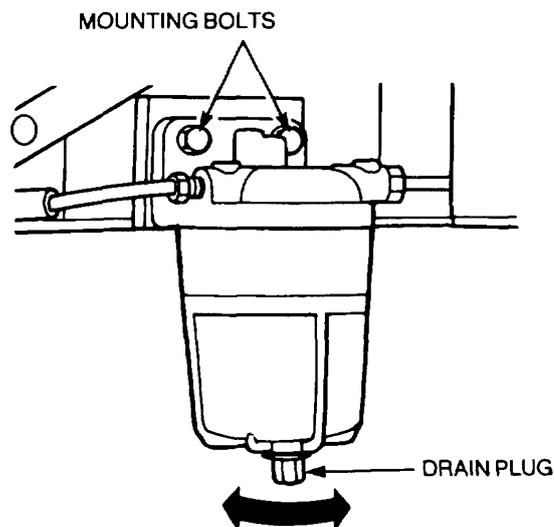


Figure 28 Fuel Sedimenter Removal

- d. Remove the two bolts securing the sedimenter to the chassis bracket.
 - e. Remove the sedimenter.
- 57. Installation.** Install the fuel sedimenter as follows:
- a. Position the sedimenter on the chassis bracket and secure it with the two bolts.
 - b. Remove the plugs and install the supply and return lines and tighten them securely.
 - c. Tighten the drain plug.
 - d. Bleed the fuel system (Para 76).

Fuel Transfer Pump

58. Test Procedure. Test the fuel transfer pump as follows:

- a. Prior to disconnecting any fuel pipes, clean the area around the transfer pump using a suitable cleaning agent and blow it dry with compressed air.
- b. Disconnect the fuel outlet pipe from the fuel transfer pump.
- c. Connect a T-connector between the transfer pump and the fuel outlet pipe.
- d. Connect the pressure gauge.
- e. Bleed the air from the fuel system (Para 76).
- f. Start the engine and check that the fuel pressure indicated is 175–245 kPa (25–35 psi).
- g. Stop the engine.

- h. If the pressure is less than specified, remove the in-line fuse located in the stop motor wiring harness adjacent to the brake master cylinder.

WARNING

Removal of the in-line fuse may not prevent the engine from starting. Ensure an operator has full control of the vehicle before proceeding to the next step to prevent injury to personnel and damage to the vehicle and / or the facility.

- i. Using the ignition switch, crank the engine to check that it does not start.
- j. Remove the T-connector and connect the pressure gauge directly to the transfer pump outlet.
- k. Crank the engine for four to five turns and check the pressure on the gauge.
- l. If the pressure shown is 333–412 kPa (48–60 psi), the pump is functioning correctly, indicating that the overflow valve is the cause of the initial low pressure and requires replacement.
- m. Crack loose the gauge connection at the transfer pump to allow the fuel (under pressure) to bleed off.
- n. Remove the gauge and using new sealing washers, install the pipe on the transfer pump outlet.
- o. Tighten the banjo bolt securely.
- p. Bleed the fuel system (Para 76).
- q. Connect the in-line fuse to the stop motor.

59. Removal Remove the fuel transfer pump as follows:

- a. Loosen the fuel line from the filter cover to the pump at the filter.
- b. Loosen the clamp securing the two lines (Figure 29).

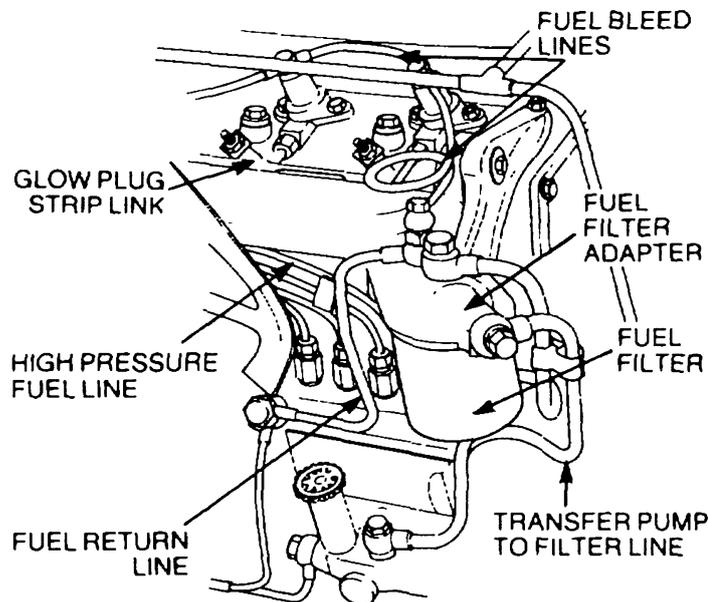


Figure 29 Fuel Transfer Pump Removal

- c. Remove the two fuel lines from the pump and plug them with suitable plugs. Discard the sealing washers.
- d. Remove the three nuts and spring washers securing the transfer pump to the injection pump. Discard the spring washers.
- e. Remove the pump.
- f. Remove and discard the O ring.

- 60. Installation.** Install the fuel transfer pump as follows:
- Using a new O ring, install the transfer pump on the injection pump.
 - Secure the transfer pump with the three nuts and new spring washers. Tighten the nuts evenly.

NOTE

An in-line filter is fitted to the inlet line banjo bolt on the transfer pump. The bolt head is marked with an arrow. Ensure the filter is clean and the arrow aligns with the fuel line on installation.

- Remove the plugs from the fuel lines.
- Using new sealing washers, install the two banjo bolts and tighten them securely.
- Tighten the banjo bolt securing the fuel line to the filter adapter and tighten the pipe clamp.
- Bleed the fuel system (Para 76).

Fuel Injection Pump

- 61. Removal.** Remove the fuel injection pump as follows:
- Disconnect the battery.
 - Wash the area around the injection pump using a suitable cleaning agent and blow dry with compressed air.
 - Disconnect the crankcase breather pipe connected to the air inlet tube.
 - Remove the inlet manifold (Para 24).
 - Disconnect the accelerator cable from the pump control lever.
 - Remove the four nuts and eight washers securing the oil filter housing and remove the oil filter housing complete with the filters. Discard the spring washers.
 - Disconnect and plug the fuel supply and return lines.
 - Remove and plug the oil feed pipe from the injection pump.
 - Remove the injection pump rear mounting bracket.
 - Rotate the crankshaft by hand in a clockwise direction, to align the crankshaft pulley and the TDC mark on the timing cover (Figure 30) with the number one cylinder at TDC.

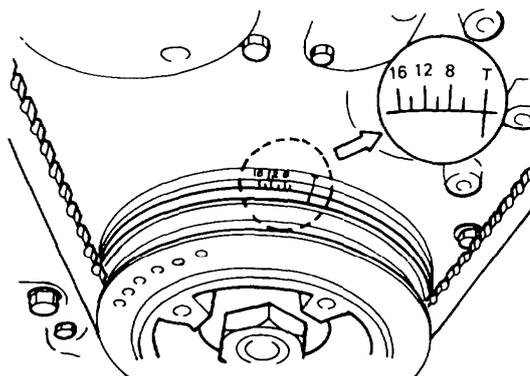


Figure 30 Timing Mark Alignment

- With the TDC mark aligned, remove the inspection plate on the timing cover and ensure that the notched line is aligned with the arrow mark (Figure 31).

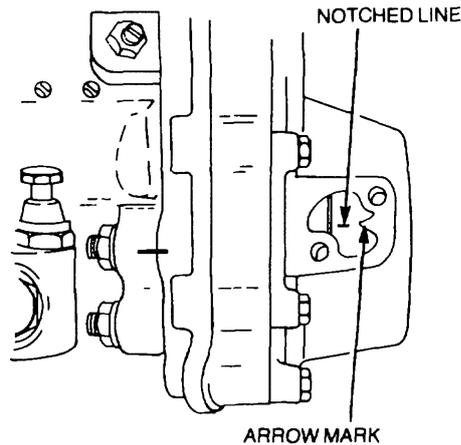


Figure 31 Injection Pump Timing Mark

- l. If the arrow mark does not align with the notched line, rotate the crankshaft a further 360 degrees.

NOTE

Do not rotate the engine once the timing mark is aligned.

- m. Remove the timing cover plug.
- n. Remove the seven injection pump mounting bolts (Figure 32).
- o. Withdraw the injection pump.

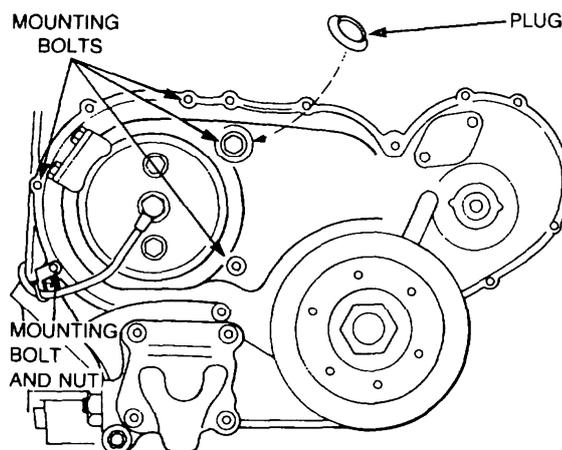


Figure 32 Injection Pump Removal

62. Installation. Install the fuel injection pump as follows:

- a. Remove the valve cover.
- b. Rotate the crankshaft by hand in the direction of rotation, until the number one cylinder is approaching TDC on the compression stroke and the number four cylinder valves are on the rock.
- c. Continue to turn the crankshaft until the notched line on the crankshaft pulley is aligned with the 12 degree mark on the timing case.

NOTE

This is only a reference setting as the timing is set at TDC.

- d. Align the pump advance notched line towards the mounting flange notched line; then rotate the pump clockwise until spring tension is felt.
- e. Install a new flange gasket and the pump; then check that the advance line is approximately 5 mm below the pointer on the timing case aperture (Figure 33).

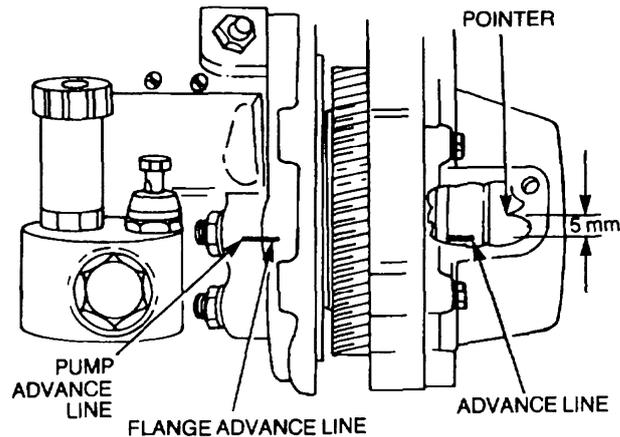


Figure 33 Injection Pump Installation

- f. Align the notched line on the pump with the notched line on the mounting flange.
- g. Secure the pump with one bolt to prevent radial movement.
- h. Rotate the crankshaft by hand in the direction of rotation, until the TDC mark on the crankshaft pulley aligns with the timing mark on the timing case. The advance line should now be in line with the pointer (Figure 30).
- i. Install the remaining bolts and tighten them securely.
- j. Install the valve cover and tighten the retaining bolts securely.
- k. Install the plug and inspection cover onto the timing case.
- l. Using new sealing washers, install the oil feed pipe onto the injection pump and tighten the banjo bolt securely.
- m. Connect the fuel supply and return lines (Para 52).
- n. Install the oil filter housing complete with the filters and secure it with the four nuts, flat washers and new spring washers.
- o. Connect the accelerator cable from the pump control lever.
- p. Install the inlet manifold (Para 26).
- q. Connect the crankcase breather pipe to the air inlet tube.
- r. Connect the accelerator cable and adjust it (Para 70).
- s. Bleed the fuel system (Para 76).
- t. Reconnect the battery.

Fuel Injectors

63. Removal. Remove the fuel injectors as follows:

- a. Wash the cylinder head area around the injectors and all the pipe connections with a suitable cleaning agent and blow them dry with compressed air.
- b. Remove the fuel return line from the injectors. Remove and discard the sealing washers.
- c. Remove the high pressure fuel lines from the injectors. Plug the fuel lines with suitable plugs.
- d. Remove the injector retaining nuts and spring washers. Discard the spring washers.

CAUTION

Do not strike the injector tip on the cylinder head or on the rack as this can damage the spray holes.

- e. Carefully remove the injectors from the cylinder head and place them in a suitable rack in numerical order, so that the injectors can be installed in the cylinders from which they were removed.

NOTE

To remove a stuck injector, apply penetrating oil around the injector body and gradually extract the injector by inserting a suitable lever between the cylinder head and injector body.

- f. Remove and discard the dust cap and nozzle gasket.
- g. After removing the injectors from the cylinder head, plug the injector cavities with a suitable plug to prevent contaminants from falling into the cylinder.

64. Installation. Install the fuel injectors as follows:

- a. Using a new dust cap and nozzle gasket, install the injectors in the cylinder head.
- b. Install the nuts and new spring washers. Tighten the nuts to 20–30 N.m (15–22 lbf.ft).
- c. Install the fuel return line and new sealing washers. Tighten the five banjo bolts securely.
- d. Connect the high pressure fuel lines to the injectors.
- e. Tighten the retaining nuts and clamps securely.
- f. Bleed the fuel system (Para 76).

Engine Stop Motor

65. Removal. Remove the engine stop motor as follows:

- a. Disconnect the battery.
- b. Disconnect the stop cable end from the injection pump stop lever (Figure 34).
- c. Disconnect the in-line fuse installed in the blue cable.
- d. Disconnect the white multi pin connector from the stop motor.

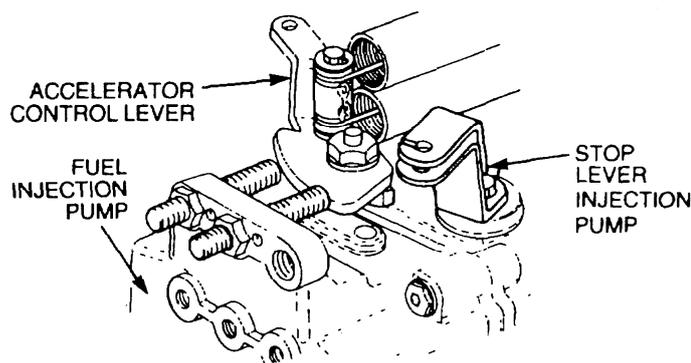


Figure 34 Engine Stop Cable Removal

- e. Remove the cable bracket from the inlet manifold (Figure 35).

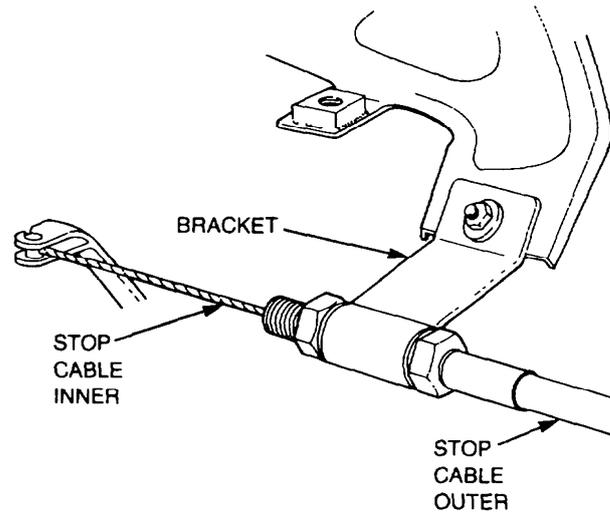


Figure 35 Stop Cable Mounting

- f. Remove the locknuts securing the stop motor to the firewall (Figure 36).

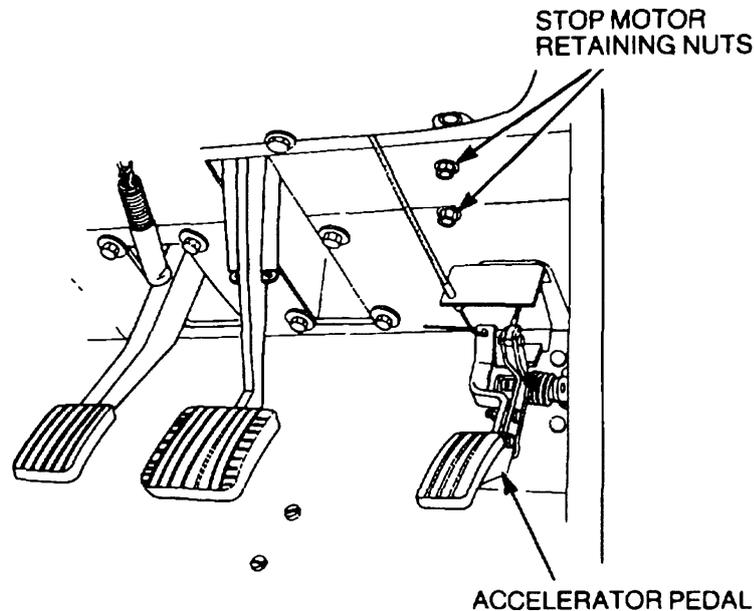


Figure 36 Stop Motor Removal

- g. Remove the stop motor complete with the stop cable from the vehicle.
- 66. Installation.** Install the engine stop motor as follows:
- a. Position the stop motor and cable assembly on the firewall and secure it with the two retaining nuts.
 - b. Install the cable bracket on the inlet manifold (Figure 35) and tighten the two bolts securely.
 - c. Connect the wiring harness to the motor.
 - d. Connect the battery.
 - e. Turn the ignition switch 'ON' to obtain the maximum length on the engine stop cable.
 - f. Connect the cable end to the stop lever.
 - g. Ensuring the stop lever is in the 'ON' position; adjust the stop cable to give approximately 1 mm free play.
 - h. Turn the ignition 'OFF'.

Hand Throttle Cable

67. **Removal.** Remove the hand throttle cable as follows:

- a. Disconnect the battery.
- b. Remove the screw securing the steering wheel cover and remove the cover.
- c. With the front wheels in the straight ahead position, remove the steering wheel retaining nut and shake proof washer. Using the steering wheel puller (Table 3, Serial 4), remove the steering wheel from the column.
- d. Remove the seven screws securing the shroud and remove the shroud with the hand throttle attached (Figure 37).

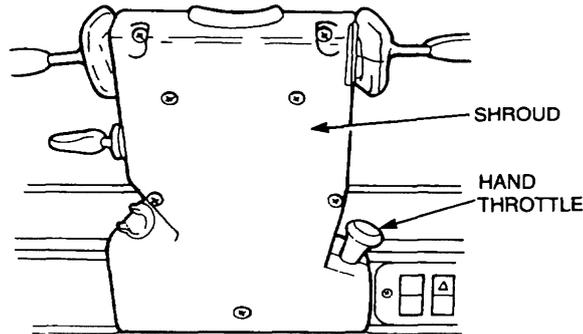


Figure 37 Steering Column Shroud Removal

e. Loosen the nut securing the cable outer to the shroud bracket (Figure 38).

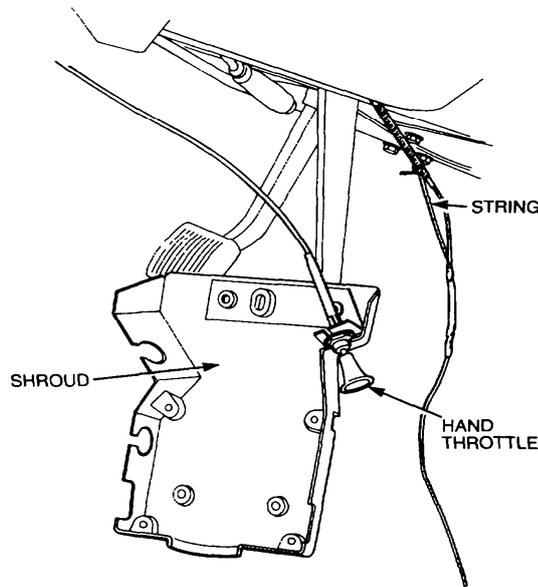


Figure 38 Hand Throttle Cable Removal

- f. Disconnect the cable from the accelerator pedal by loosening the clamp screw.
 - g. Secure a piece of string to the end of the cable and carefully remove the cable from the fascia.
 - h. Remove the string from the cable.
68. **Installation.** Install the hand throttle cable as follows:
- a. Ensuring the string is located behind the fascia, tie the end to the new cable.
 - b. Pull the string gently back through behind the fascia.
 - c. Fit the cable to the shroud bracket and install the shroud on the steering column.

- d. Fit the seven screws and tighten them securely.

NOTE

When installing the steering wheel, ensure the two prongs on the steering wheel hub engage the cut outs in the upper steering column bush. If necessary, rotate the bush to align with the two prongs, ensuring the arrow on the bush faces the indicator switch.

- e. Install the steering wheel, new shake proof washer and nut. Tighten the nut to 38 N.m (28 lbf.ft).
- f. Fit the steering wheel cover and secure it with the screw.
- g. Remove the string and insert the inner cable through the bracket.
- h. Connect the cable onto the accelerator pedal.
- i. Check the operation of the hand throttle and ensure the accelerator pedal returns without restriction.

Accelerator Cable

69. Removal. Remove the accelerator cable as follows:

- a. Disconnect the cable from the pedal by removing the split pin and clevis pin (Figure 39). Discard the split pin.

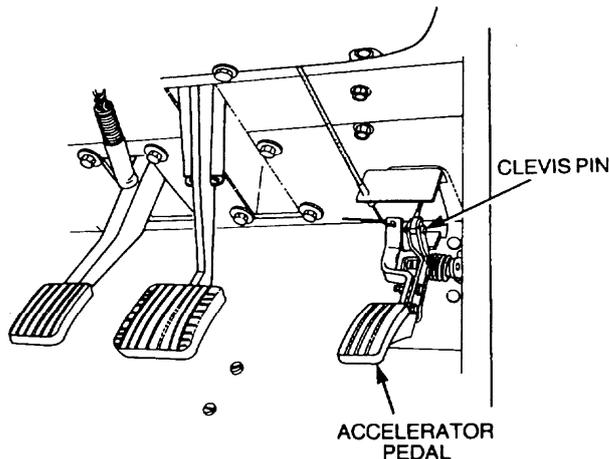


Figure 39 Accelerator Cable Removal

- b. Remove the nut and washers securing the cable to the firewall.
- c. Disconnect the cable from the fuel injection pump control lever. Discard the split pin.
- d. Remove the clamp securing the cable to the engine.
- e. Remove the cable from the vehicle.

70. Installation. Install the accelerator cable as follows:

- a. Insert the cable through the firewall from the engine side.
- b. Install the nut and washer and tighten them securely.
- c. Connect the clevis to the accelerator pedal.
- d. Insert the clevis pin and secure it with a new split pin.
- e. Connect the clevis to the fuel injection pump control lever.
- f. Insert the clevis pin, but do not secure it with the split pin at this stage.
- g. Secure the cable to the engine clamp and tighten it securely.
- h. Apply a sealant on to the outer cable and firewall.
- i. Adjust the cable (Para 71).

Idle Speed and Accelerator Cable Adjustment

71. Adjust the idle speed and accelerator cable as follows:
- Start the engine and warm up to normal operating temperature.
 - Ensure the control lever is in contact with the idle set bolt when the accelerator pedal is in the 'OFF' position (Figure 40).

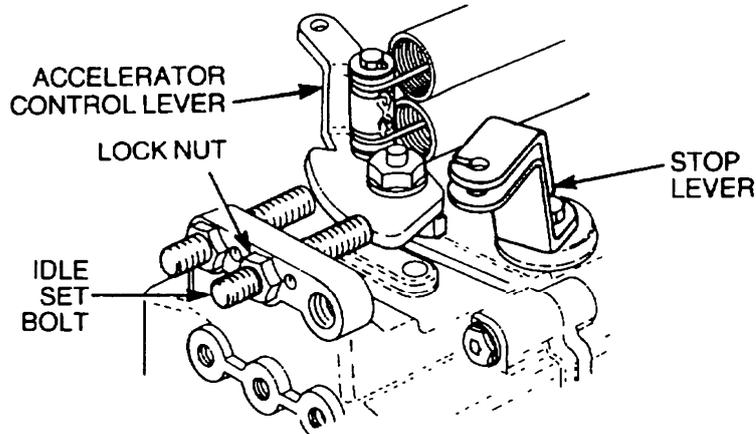


Figure 40 Accelerator Cable and Idle Speed Adjustment

- Using a tachometer, check that the idle speed is 650 ± 20 rpm.
- Adjust as necessary by turning the stop bolt clockwise to increase engine idle speed and anticlockwise to decrease engine idle speed.
- Secure the locknut following the adjustment.
- With the accelerator pedal still in the 'OFF' position, adjust the cable length as required to ensure the stop lever is in contact with the stop bolt.
- Increase the engine speed by operating the accelerator pedal and return it to the 'OFF' position.
- Check that the pedal returns correctly and the engine idle speed remains at 650 ± 20 rpm.
- Fit a new split pin to the control lever clevis.

Air Cleaner Elements

72. **Replacement.** Replace the air cleaner as follows:
- Loosen the hose clamps securing the air inlet and outlet hoses to the air cleaner housing.
 - Disconnect the hoses.
 - Remove the two wing nuts from the clamp bolts (Figure 41).

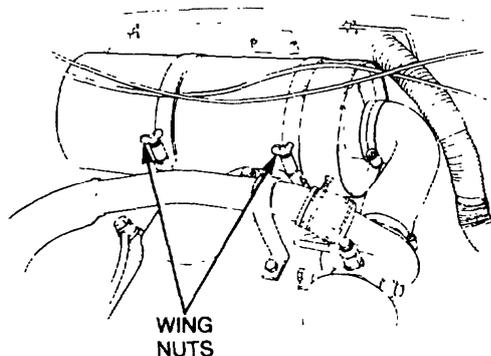


Figure 41 Air Cleaner Assembly Removal

- d. Carefully lift the air cleaner out of the mounting brackets.
- e. Remove the wing nuts securing the end cover (Figure 42) and remove the end cover.

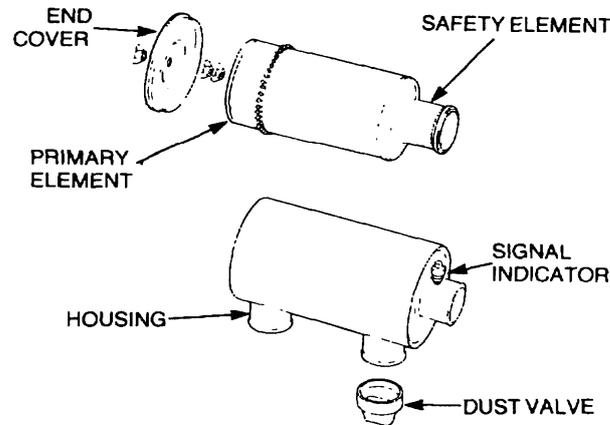


Figure 42 Air Cleaner Elements Replacement

- f. Remove the wing nuts securing the elements and remove the elements.
- g. Wipe out the air cleaner housing with a clean damp cloth.
- h. Inspect for signs of cracks and flaking paint.
- i. Install a new safety element and a primary element.
- j. Secure them in position with their respective wing nuts.
- k. Ensure the end cover gasket is serviceable.
- l. Install the cover on the housing and tighten the wing nut.
- m. Inspect the dust valve for cracks and replace if necessary.
- n. Position the air cleaner assembly in the mounting brackets and connect the inlet and outlet hoses.
- o. Tighten the hose clamps and the two clamp-bolt wing nuts securely.
- p. Depress the reset button on the signal indicator to enable the red signal to be released.

Turbocharger

73. **Removal.** Remove the turbocharger as follows:

- a. Wash the area around the turbocharger and blow it dry with compressed air.
- b. Remove the bolts securing the heat shield to the turbocharger and remove the heat shield (Figure 43).

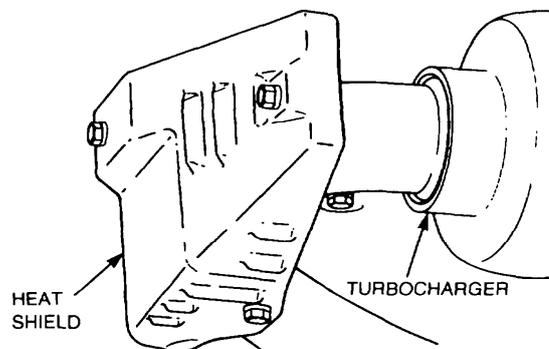


Figure 43 Turbocharger Heat Shield Removal

- c. Disconnect the oil supply line and the oil return line from the turbocharger (Figure 44).

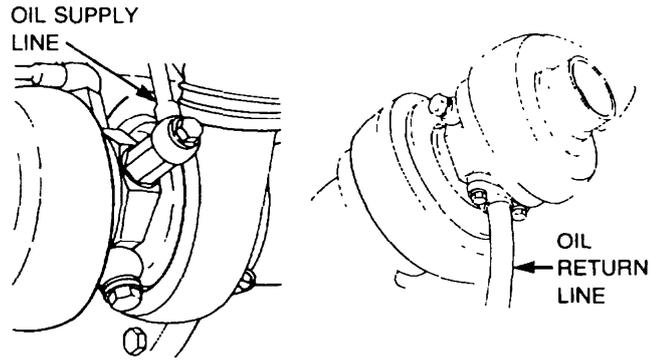


Figure 44 Oil Supply Line and Return Line Removal

- d. Loosen the air intake hose clamp and slide the hose from the turbocharger (Figure 45).

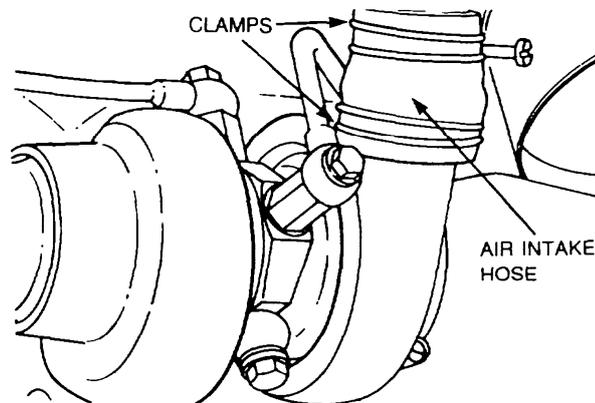


Figure 45 Air Intake Hose Removal

- e. Disconnect the coolant supply line and the coolant return line from the turbocharger (Figure 46).

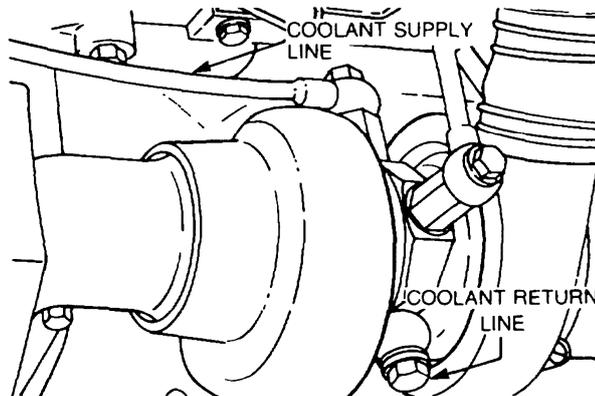


Figure 46 Coolant Supply and Return Lines Removal

- f. Remove the nuts securing the exhaust pipe to the turbocharger exhaust adaptor and remove the exhaust pipe (Figure 47).

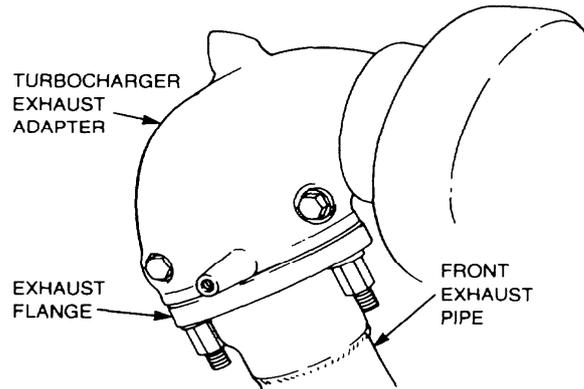


Figure 47 Exhaust Pipe to Turbocharger Removal

- g.** Remove the nuts securing the turbocharger to the exhaust manifold and the two bolts securing the exhaust adapter to the manifold. Carefully remove the turbocharger (Figure 48).

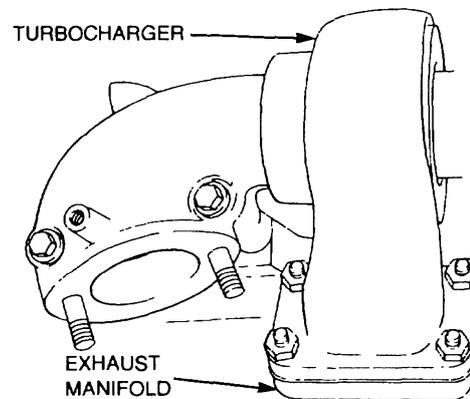


Figure 48 Turbocharger to Manifold Removal

- 74. Cleaning and Inspection.** Clean and inspect the turbocharger as follows:
- Remove all trace of gasket material from the turbocharger and exhaust manifold mating surfaces.
 - Inspect the turbocharger housing for cracks, burrs or warping and that the bearings rotate smoothly.
 - Replace the turbocharger if necessary.
- 75. Installation.** Install the turbocharger as follows:
- Position the new gasket and turbocharger on the exhaust manifold and loosely install the retaining nuts.
 - Loosely install the two bolts securing the turbocharger exhaust adapter to the manifold but do not tighten them at this stage.
 - Install the exhaust pipe to turbocharger nuts but do not tighten them at this stage.
 - Connect the oil supply line and tighten it to 12–16 N.m (8.8–11.6 lbf.ft).
 - Connect the oil return line and tighten it to 6–10 N.m (4.4–7 lbf.ft).
 - Connect the coolant supply line and the coolant return line and tighten the connections securely.
 - Tighten the turbocharger to exhaust manifold attaching nuts and the bolts securing the exhaust adapter to 30–34 N.m (22–25 lbf.ft).
 - Install the air intake hose and air cleaner tube. Tighten the clamps securely.
 - Tighten the exhaust pipe to turbocharger nuts securely.
 - Start the engine and check for air and exhaust leaks and rectify as necessary.
 - Install the heat shield on the turbocharger and secure it with the three bolts.

Bleeding the Fuel System

76. Procedure. Bleed the fuel system as follows:

- a. Loosen the screw cap on the transfer pump and operate the primer.
- b. Loosen the overflow valve on the fuel filter adaptor and continue operating the primer until a solid stream of fuel flows from the valve (Figure 49)

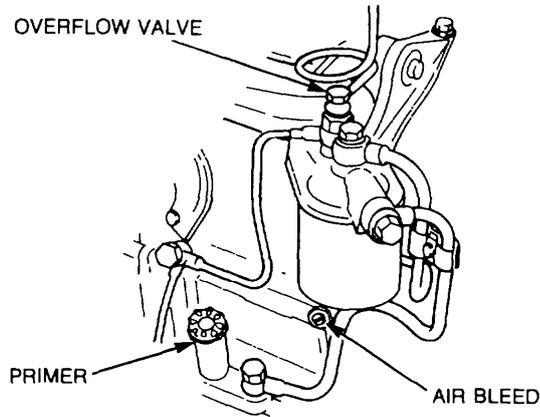


Figure 49 Bleeding the Fuel System

- c. Tighten the overflow valve while operating the primer.
- d. Loosen the air bleed screw and continue operating the primer until a solid stream of fuel flows from the air bleed screw.
- e. Tighten the air bleed screw.
- f. Secure the primer screw cap.
- g. Start the engine.
- h. Ensure that the engine runs smoothly.

Fuel System Specifications

77. The fuel system specifications are detailed in Table 8.

Table 8 Fuel System Specifications

Serial	Specification	Measurement
1	High pressure fuel line nuts tightening torque	28–31 N.m (21–23 lbf.ft)
2	Fuel transfer pump plug tightening torque	78–88 N.m (57–64 lbf.ft)
3	Fuel transfer pump primer tightening torque	40 N.m (28 lbf.ft)
4	Fuel transfer pump adapter tightening torque	12 N.m (10 lbf.ft)
5	Fuel injection pump timing	TDC
6	Fuel injector starting pressure	18 134 kPa (2 630 psi)
7	Fuel injector cap nut tightening torque	58–78 N.m (43–58 lbf.ft)
8	Fuel injector retaining nuts tightening torque	20–30 N.m (15–22 lbf.ft)
9	Engine idle speed	650 ±20 rpm
10	Air inlet manifold to cylinder head tightening torque	16–25 N.m (12–19 lbf.ft)
11	Turbocharger oil supply line tightening torque	12–16 N.m (8.8–11.6 lbf.ft)
12	Turbocharger oil drain pipe tightening torque	6–10 N.m (4.4–7.0 lbf.ft)
13	Turbocharger to exhaust manifold tightening torque	30–34 N.m (22–25 lbf.ft)

Fuel System Fault Finding

78. The procedures for fuel system fault finding are detailed in Table 9.

Table 9 Fuel System Fault Finding

Serial	Symptom	Probable Cause	Action
1	Difficult starting	Lack of fuel	Check tank contents
		Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel
		Stop motor faulty	Check motor and cable adjustment
		Incorrect starting procedure	Check heater plugs, accelerator and stop cable operations
		Air in fuel system	Check all unions, lines and hoses. Bleed system
		Fuel restriction	Check filters and supply lines
		Low cranking speed	Check battery, starter, cables and engine oil type
		Incorrect timing	Check timing
		Fuel return restricted	Check fuel return lines
		Fuel flow incorrect	Check fuel lines not crossed
		Engine condition	Check cylinder compressions, valve timing and clearances and air cleaner condition
		Faulty injectors	Check injectors for correct type, starting pressures and spray patterns
		Fuel tank breather blocked	Check tank breather
		High pressure fuel lines leaking	Check and tighten lines
		Injection pump faulty	Replace injection pump
Fuel transfer pump faulty	Replace transfer pump		
2	Irregular idle	Air in fuel system	Check all unions, lines and hoses. Bleed system
		Fuel restriction	Check filters and supply lines
		Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel
		Incorrect timing	Check timing
		Fuel return restricted	Check fuel return lines
		Fuel flow incorrect	Check fuel lines not crossed
		Engine condition	Check cylinder compressions, valve timing and clearances and air cleaner conditions
		Faulty injectors	Check injectors for correct type, starting pressures and spray patterns
		High pressure fuel lines leaking	Check and tighten lines
		Injection pump faulty	Replace injection pump
		High pressure fuel line restriction	Check for kinks, bore reduction
		Idle speed incorrect	Adjust idle speed
		Incorrect accelerator cable adjustment	Adjust cable
		Engine vibration	Check engine mountings
Injection pump loose	Check and tighten mounting bolts		
3	Insufficient maximum speed	Air in fuel system	Check all unions, lines and hoses. Bleed system
		Fuel restriction	Check filters and supply lines
		Injection pump faulty	Replace injection pump
		Incorrect accelerator cable adjustment	Adjust cable

Table 9 Fuel System Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
		Fuel transfer pump faulty	Replace transfer pump
		Incorrect timing	Check timing
		Faulty injectors	Check injectors for correct type, starting pressure and spray patterns
4	Irregular engine output	Fuel restriction	Check filters and supply lines
		Fuel transfer pump faulty	Replace transfer pump
		Air in fuel system	Check all unions, lines and hoses. Bleed the system
		Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel
		Injection pump faulty	Replace injection pump
		Faulty injector	Check injector for correct type, starting pressure and spray pattern
		Incorrect timing	Check timing
		Faulty advance mechanism	Report
		Incorrect stop and accelerator cable adjustment	Check and adjust
5	Excessive smoke	Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel.
		Incorrect timing	Check timing
		Engine condition	Check cylinder compressions, valve timing and clearances and air cleaner condition
		Injection pump fault	Replace injector pump
		Faulty injector	Replace injector
		Turbocharger wheel rubbing	Replace turbocharger
		Air leak between turbocharger and cylinder head	Check for air leaks and rectify
		Turbocharger turbine seal leaking	Replace turbocharger
6	Excessive knocking (Detonation)	Incorrect starting procedure	Check heater plugs
		Faulty injector	Replace injector
		Lack of coolant in radiator	Check level
		Lack of oil in engine	Check level and top up as necessary
		Incorrect timing	Check timing
		Faulty advance mechanism	Report
7	Maximum speed excessive	Injection pump faulty	Replace injection pump
8	Engine will not shut down	Stop motor or cable faulty	Check motor and cable adjustment
		Injection pump fault	Replace injection pump
9	Low power	Fuel rate low, fuel pressure correct and turbocharger pressure high. Air temperature between 10°C and 38°C	Replace turbocharger
10	Excessive crankcase gases (blow by)	Turbocharger seals leaking	Replace turbocharger

CLUTCH

Clutch Pedal

79. **Removal.** Remove the clutch pedal as follows:

- a. Clean the area around the clutch master cylinder using a suitable cleaning agent and blow it dry with compressed air.
- b. Disconnect and plug the fluid pipe from the master cylinder. Plug the master cylinder.
- c. Disconnect the clutch pedal return spring (Figure 50).

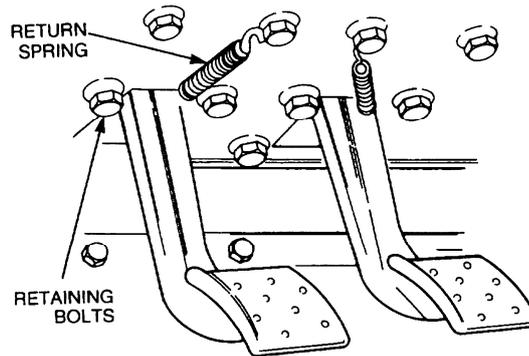


Figure 50 Pedal Bracket and Return Spring Removal

- d. Remove the six bolts securing the pedal bracket to the firewall (Figure 50).
- e. Remove the pedal and bracket assembly from the vehicle.
- f. Remove the six screws securing the top cover and gasket to the pedal bracket (Figure 51).

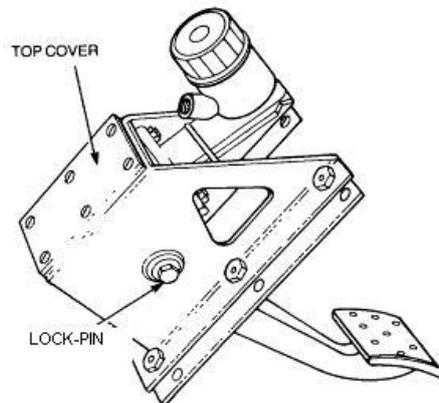


Figure 51 Top Cover Removal

- g. Remove the top cover and gasket and discard the gasket.
- h. Clean the top cover and pedal bracket.
- i. Remove the nut and washer from the end of the master cylinder push rod.
- j. Push the rod in and detach the pedal trunnion.
- k. Remove the lock-pin from the pedal pivot (Figure 51).
- l. Remove the pedal pivot.
- m. Remove the pedal from the pedal bracket.
- n. Remove the trunnion, distance piece and bushes from the pedal (Figure 52). Discard the bushes.

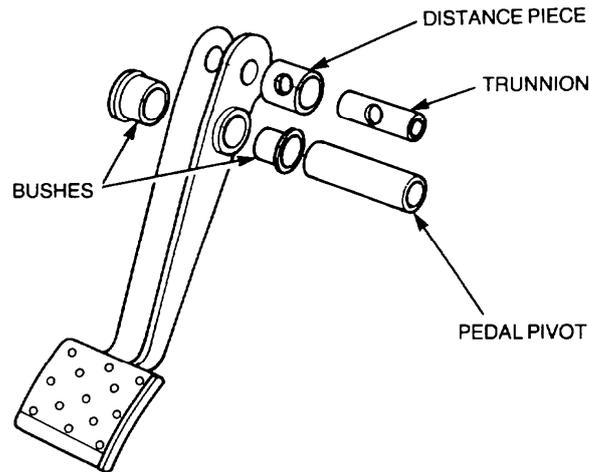


Figure 52 Clutch Pedal Exploded View

- 80. Installation.** Install the clutch pedal as follows:
- Using a suitable press, install two new bushes in the pedal.
 - Install the pedal pivot (check that the pedal pivot moves freely).
 - Lubricate the trunnion and distance piece with grease and fit them to the pedal.
 - Install the pedal in the pedal bracket ensuring that the clutch master cylinder push rod is inserted into the trunnion.
 - Install the lock-pin on the pedal pivot (Figure 51).
 - Install the nut and washer on the master cylinder push rod, but do not tighten it at this stage.
 - Position the pedal and bracket in the vehicle and secure it with the six retaining bolts (Figure 50).
 - Reconnect the fluid pipe to the master cylinder and tighten it securely.
 - Connect the pedal return spring.
 - Bleed the hydraulic system (Para 86).
 - Adjust the clutch pedal (Para 81).
- 81. Adjustment.** Adjust the clutch pedal as follows:
- Remove the top cover and gasket (if not already removed). Discard the gasket.
 - Check the distance from the lower edge of the clutch pedal to the floor (Figure 53).
 - Loosen the locknuts on the push rod and adjust the pedal stop as required.
 - Adjust the push rod until there is approximately 1.5 mm (0.062 in) free play between the push rod and the master cylinder piston and tighten the locknuts.
 - Check the clutch pedal and ensure that there is a minimum of 6 mm (0.250 in) free movement of the pedal before pressure is felt.
 - If necessary, readjust the push rod.
 - Install the top cover and a new gasket and tighten the six screws securely.

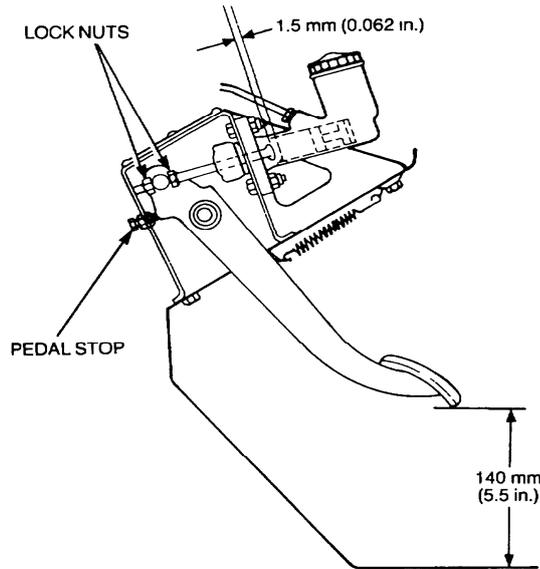


Figure 53 Clutch Pedal Adjustment

Clutch Master Cylinder

82. **Removal.** Remove the clutch master cylinder as follows:

- a. Using a suitable cleaning agent, clean the area around the master cylinder and blow it dry with compressed air.
- b. Remove the six screws securing the top cover and gasket to the pedal bracket.
- c. Remove the top cover and gasket and clean the gasket area.
- d. Disconnect and plug the fluid pipe from the master cylinder.
- e. Remove the nut and washer from the push rod (Figure 54).
- f. Remove the two retaining bolts securing the master cylinder to the pedal bracket.
- g. Remove the master cylinder from the pedal bracket.

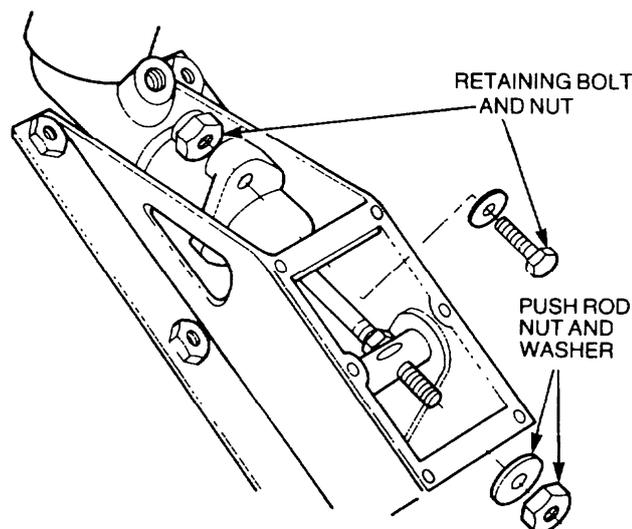


Figure 54 Clutch Master Cylinder Removal

83. **Installation.** Install the clutch master cylinder as follows:

- a. Install the master cylinder onto the pedal bracket and tighten the two retaining bolts securely.
- b. Reconnect the fluid pipe to the outlet pipe and tighten it securely.

- c. Install the nut and washer on the push rod.
- d. Bleed the clutch (Para 86).
- e. Adjust the clutch (Para 81).
- f. Refit the top cover and new gasket.

Clutch Slave Cylinder

84. **Removal.** Remove the clutch slave cylinder as follows:

- a. Clean the area around the slave cylinder with a suitable cleaning agent and blow it dry with compressed air.
- b. Loosen the bleed screw and drain the hydraulic fluid into a suitable receptacle.
- c. Disconnect and plug the fluid pipe from the slave cylinder. Plug the slave cylinder.
- d. Remove the two bolts securing the cylinder to the transmission bell housing.
- e. Remove the hydraulic pipe bracket from the starter motor stud.
- f. Remove the backing plate.
- g. Remove the dustcover (Figure 55).
- h. Remove the slave cylinder.

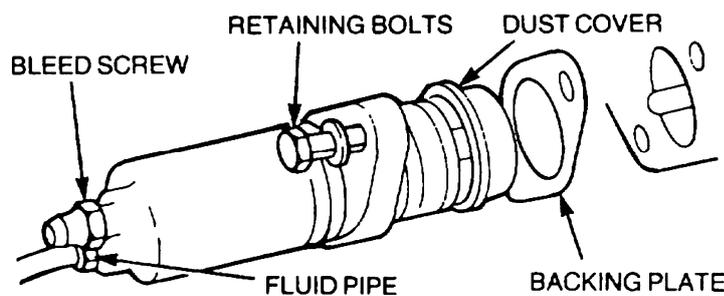


Figure 55 Clutch Slave Cylinder Removal

85. **Installation.** Install the clutch slave cylinder as follows:

- a. Apply a suitable sealer to both sides of the backing plate and install the plate onto the cylinder.
- b. Smear the inside of the dust cover with clean hydraulic fluid and install it onto the cylinder.
- c. Install the cylinder into the bell housing ensuring the push rod is inserted into the dust cover and the bleed screw is uppermost (Figure 56).

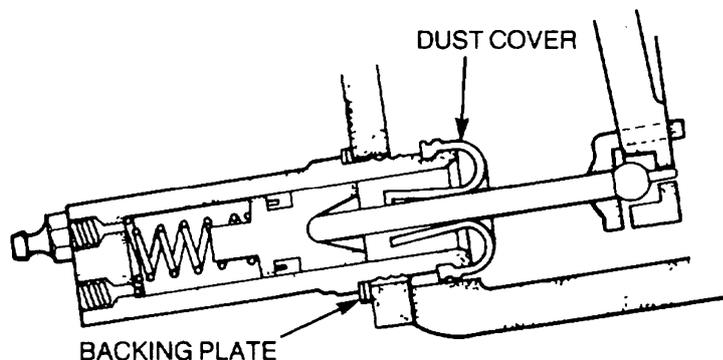


Figure 56 Clutch Slave Cylinder Installation

- d. Install the two retaining bolts and washers and tighten them to 27 N.m (20 lbf.ft).
- e. Fit the hydraulic pipe bracket to the starter motor stud and tighten the nut to 40 N.m (30 lbf.ft).
- f. Reconnect the fluid pipe and replenish the hydraulic fluid.
- g. Carry out the bleeding procedure (Para 86).

- h.** Check the clutch adjustment. If necessary, adjust the clutch (Para 81).

Bleeding the Clutch System

- 86. Procedure.** Bleed the clutch system as follows:

NOTE

When bleeding the hydraulic system, keep the fluid reservoir topped up to avoid the introduction of air into the system.

- a.** Attach a length of suitable tubing to the slave cylinder bleed screw (Figure 57) and place the free end of the tube in a container.

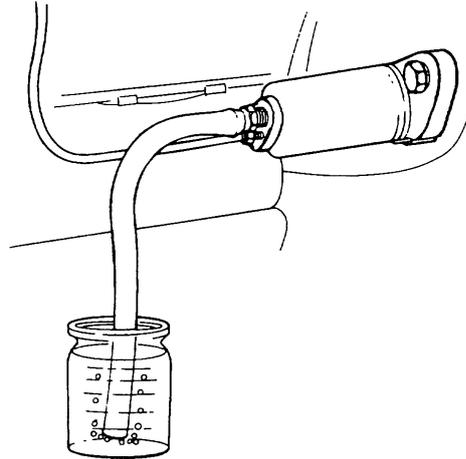


Figure 57 Clutch System Bleeding Procedure

- b.** Pump the clutch pedal and loosen the bleed screw. Pause at the end of each stroke and tighten the bleed screw.
- c.** Repeat the process until the fluid issuing from the tube is free of air.
- d.** Tighten the bleed screw when the pedal has completed a downward stroke.
- e.** Remove the tube and jar.

Clutch System Specifications

87. The clutch system specifications are detailed in Table 10.

Table 10 Clutch System Specifications

Serial	Specification	Measurement
1	Clutch pedal trunnion bushes internal dimension	19.05 mm + 0.02 mm (0.750 in. ±0.002 in)
2	Clutch master cylinder push rod free play	1.5 mm (0.062 in)
3	Clutch pedal free play	6 mm (0.250 in)
4	Clutch pedal height	140 mm (5.5 in)
5	Clutch slave cylinder tightening torque	27 N.m (20 lbf.ft)

Clutch System Fault Finding

88. The procedures for clutch system fault finding are detailed in Table 11.

Table 11 Clutch System Fault Finding

Serial	Symptom	Probable Cause	Action
1	Clutch grabbing	Clutch pedal sticking	Repair or replace
		Oil on friction plate	Report
		Defective friction plate	Report
2	Clutch slipping	Incorrect clutch adjustment	Carry out adjustment procedure
		Oil on friction plate	Report
		Defective friction plate	Report
3	Dragging or spinning clutch	Incorrect clutch adjustment	Carry out adjustment procedure
		Low fluid level	Top up as necessary
		Air in the hydraulic system	Check for leaks and bleed the system
4	Rattling clutch	Broken pedal return spring	Replace
		Defective friction plate	Report
5	Squeaking clutch	Crankshaft spigot bearing fault	Report
6	Clutch judder	Defective friction plate	Report
		Flywheel loose	Report
		Loose engine mountings	Tighten or replace
		Primary shaft bent	Report
		Worn propeller shaft universal joints	Replace
7	Stiff operation	Pedal faulty	Repair or replace

TRANSMISSION

Gear Lever

89. **Removal.** Remove the gear lever as follows:

- a. Remove the zip-clamp securing the rubber boot to the transmission tunnel cover (Figure 58).

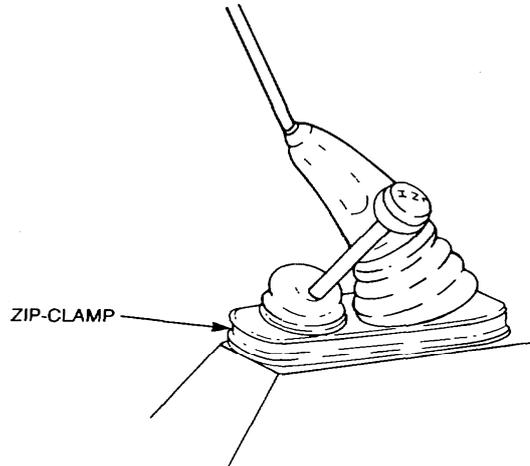


Figure 58 Gear Lever Rubber Boot Removal

- b. Remove the knobs from the gear lever and transfer selector lever.
- c. Remove the rubber boot and insulating pad from the vehicle.
- d. Remove the small rubber boot covering the retaining plate.
- e. Remove the three bolts securing the retaining plate to the top cover (Figure 59).
- f. Lift the lever out of the top cover.

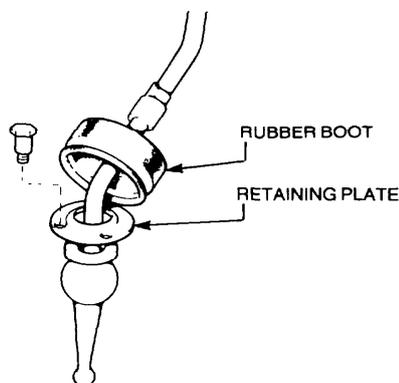


Figure 59 Gear Lever Removal

90. **Installation.** Install the gear lever as follows:

- a. Smear the ball of the gear lever with suitable graphite grease.
- b. Insert the lever into the top cover and selectors ensuring the locating pin is correctly engaged in the slot on the ball.
- c. Tighten the three retaining bolts securely.
- d. Check the selection of all gears.
- e. Stretch the small rubber boot over the top cover.
- f. Install the insulating pad in the tunnel cover.
- g. Install the rubber boot onto the tunnel cover and secure it with the zip-clamp (Figure 58).
- h. Install both the gear lever knob and transfer lever knob.

Transfer Case Selector Lever

91. **Removal.** Remove the transfer case selector lever as follows:
- Remove the zip-clamp securing the rubber boot to the transmission tunnel cover (Figure 58).
 - Remove the knobs from the gear lever and transfer selector lever.
 - Remove the rubber boot and insulating pad from the vehicle.
 - Tap out the roll pin securing the transfer case selector lever to the cross shaft (Figure 60).

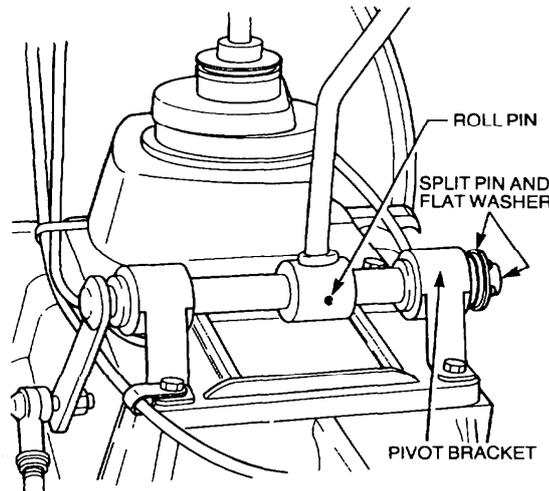


Figure 60 Transfer Case Selector Lever Removal

- Remove the split pin and flat washer from the end of the cross shaft. Discard the split pin.
 - Remove the two bolts securing the pivot bracket to the top cover and remove the bracket.
 - Slide the lever off the cross shaft.
92. **Installation.** Install the gear lever as follows:
- Install the lever on the cross shaft, ensuring that the lever is angled towards the rear of the vehicle.
 - Smear the inside of the pivot bracket bush with grease and install the bracket on the cross shaft.
 - Install the flat washer and secure in position with a new split pin.
 - Install the two pivot bracket bolts and tighten them securely.
 - Install the roll pin to secure the lever to the cross shaft (Figure 60).
 - Install the insulating pad into the tunnel cover.
 - Install the rubber boot onto the tunnel cover and secure it with the zip-clamp (Figure 58).
 - Install both the gear lever knob and transfer lever knob.
93. **Lever Fouling Rectification.** To ensure that the transfer case lever is not fouling on the bodywork carry out repairs as follows:
- Remove the zip clamp, securing the gear lever rubber boot and ease the boot upwards so the transfer case lever movement can be viewed.
 - Select 'High Range' and then select 'Low Range' to ensure that there is no fouling between the transfer case lever and the foam sound deadening material.
 - If fouling does occur in either position, remove the foam deadening material by cutting and recheck high/low range selection.
 - Resecure the gear lever rubber boot with a zip clamp.

Transfer Case Selector Fork

94. **Adjustment.** The selector fork adjustment is to be carried out as follows:

WARNING

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- a. Chock the vehicle wheels.
- b. Remove the centre plastic access tray/rifle butt box.
- c. Remove the transfer case top cover plate.

NOTE

Some difficulty may be experienced removing the transfer case top cover plate due to the baffle fitted to the plate.

- d. Select neutral on the transfer lever and check that the input gear on the intermediate gear assembly is in the neutral position and the front fork is in contact with the input gear inner member.
- e. Adjust the rear fork position on the selector shaft. to allow a clearance of 0.12–0.25 mm (005–010 in), between the front face of the rear fork and the rear face of the input gear inner member.
- f. Tighten the pinch bolt securely.
- g. Fit a new gasket.
- h. Refit the transfer case top cover plate and tighten it securely.
- i. Refit the centre plastic access tray/rifle butt box.

PTO Control Cable

95. **Removal.** Remove the PTO control cable as follows:

- a. Remove the split pin from the PTO lever clevis (Figure 61). Discard the split pin.

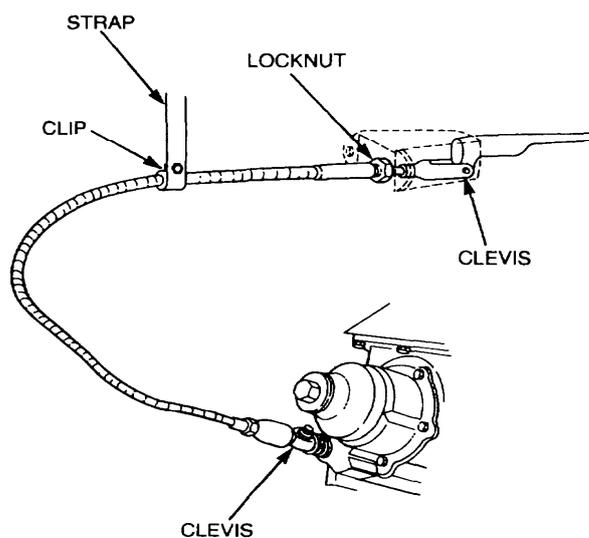


Figure 61 PTO Control Cable Removal

- b. Loosen the clevis locknut. Remove the clevis and the locknut from the inner cable.
- c. Remove the nut securing the outer cable to the seat base.

- d. Remove the cable from the seat base.
- e. Remove the clip securing the cable to the strap.
- f. Disconnect the control cable from the selector shaft.
- g. Remove the cable.

96. Installation. Install the PTO control cable as follows:

- a. Insert the cable through the seat base.
- b. Install the locknut on the cable and secure the cable to the seat base (Figure 61).
- c. Install the clip and secure the cable to the strap with the nut and bolt.
- d. Connect the control cable on the selector shaft.
- e. Install the clevis and locknut on the inner cable.

NOTE

Do not tighten until the adjustment has been carried out.

97. Adjustment. Adjust the PTO control cable as follows:

- a. Push the PTO lever down towards the floor.
- b. Push the selector shaft to the disengaged position (to the front of the vehicle).
- c. Adjust the clevis and nut along the inner cable to the end of the threaded portion, until the hole in the clevis aligns with the hole in the PTO lever.
- d. Insert the pin and secure it with a new split pin.
- e. Tighten the clevis locknut.
- f. Check the operation of the PTO and readjust as necessary.

Transmission Filter and Magnetic Plug

98. Removal. Remove the transmission filter and magnetic plug as follows:

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- a. Remove the filler/level plug from the left-hand side of the transmission (Figure 62).
- b. Remove the drain plug and drain the oil into a suitable receptacle.
- c. Remove the filter located behind the drain plug.
- d. Remove the magnetic plug.

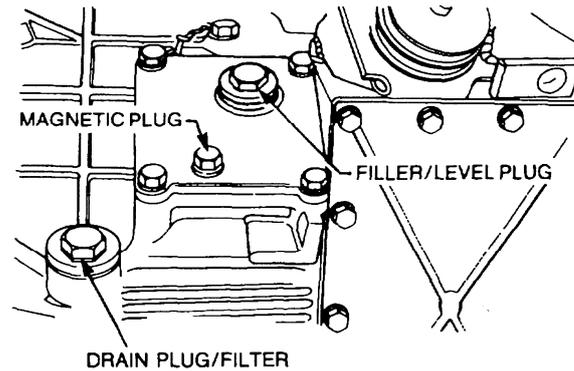


Figure 62 Transmission Filter Removal

- 99. Cleaning and Inspection.** Clean and inspect the transmission filter and magnetic plug as follows:
- a. Inspect the transmission filter for damage and any large metal particles that may be present. Wash the filter in a suitable solvent.
 - b. Inspect the magnetic plug for any large metal particles that may be present. Wash the magnetic plug in a suitable solvent.
- 100. Installation.** Install the transmission filter and magnetic plug as follows:
- a. Insert the filter into the transmission and using a new sealing washer, install the drain plug and tighten it securely.
 - b. Using a new sealing washer, install the magnetic plug and tighten it securely.
 - c. Fill the transmission with approximately 2.7 litres of oil until oil begins to flow from the filler/level hole.
 - d. Install the filler/level plug and a new sealing washer and then tighten it securely.

Output Shaft Cover Oil Seal – Front

- 101. Removal.** Remove the output shaft cover oil seal (front) as follows:
- a. Clean the area around the front output shaft with a suitable cleaning agent and blow it dry with compressed air.
 - b. Remove the four nuts securing the front propeller shaft to the front output shaft coupling flange. Discard the nuts.
 - c. Remove the locknut and flat washer (Figure 63). Discard the locknut.
 - d. Remove the flange.
 - e. Remove the mud shield.
 - f. Remove the oil seal using a suitable lever and discard the seal.

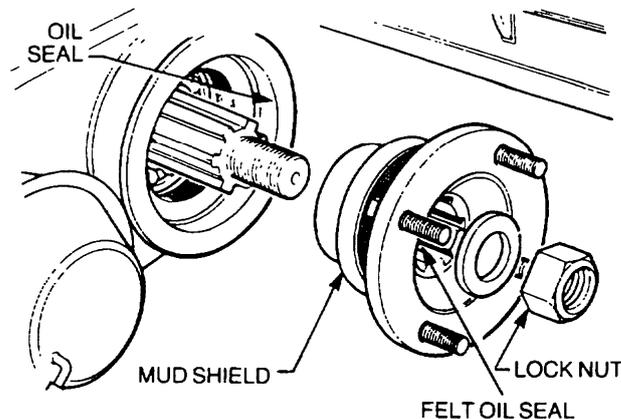


Figure 63 Output Shaft Cover Oil Seal Removal (Front)

- 102. Installation.** Install the output shaft cover oil seal (front) as follows:
- a. Press in the new oil seal with the sealing lip towards the bearing.
 - b. Apply a smear of clean SAE Grade 40 (OMD-115) around the lip of the seal.
 - c. Install the mud shield.
 - d. Install the flange.
 - e. Apply Loctite 242 to the output shaft threads and install the new locknut
 - f. Using the adjustable wrench (Table 3, Serial 4) to prevent the flange rotating, tighten the locknut to 146–180 N.m (108–132 lbf.ft).
 - g. Position the front propeller shaft on the coupling flange.
 - h. Install the four new nuts and tighten them securely.
 - i. Check the oil level and top it up if necessary.

Output Shaft Cover Oil Seal – Intermediate Axle

- 103. Removal.** Remove the output shaft cover oil seal (intermediate axle) as follows:
- a. Clean the area around the rear output shaft with a suitable cleaning agent and blow it dry with compressed air.
 - b. Remove the locknuts and bolts securing the propeller shaft to the intermediate axle. Discard the locknuts.
 - c. Remove the propeller shaft.
 - d. Remove the locknut, flat washer and felt seal (Figure 64). Discard the locknut and felt seal.

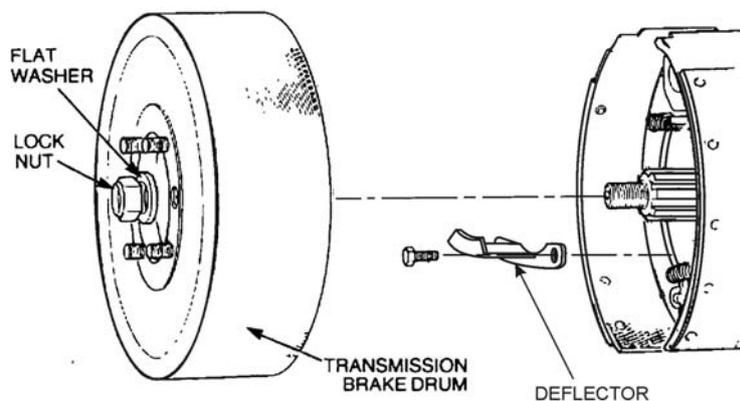


Figure 64 Output Shaft Cover Oil Seal Removal (Intermediate Axle)

WARNING

Under no circumstances is compressed air to be used to remove dust from the hand brake drum or brake linings. Dust from the brake linings can be a health risk if inhaled.

- e. Remove the brake drum, complete with the rear coupling flange.
- f. Remove the two bolts securing the deflector.
- g. Remove the deflector.
- h. Remove the retainer packing.
- i. Remove the oil seal using a suitable lever.

- 104. Installation.** Install the output shaft cover oil seal (intermediate axle) as follows:
- Squarely locate the lip of the new oil seal into the housing and press it in, until the seal plain face just clears the chamfer on the seal housing bore.
 - Install the retainer packing.
 - Apply a smear of Bostik Compound 772 (or equivalent) to seal the deflector against the brake back-plate.
 - Install the two bolts and tighten the bolts securely.
 - Apply a smear of clean SAE Grade 40 (OMD-115) around the lip of the seal.
 - Install the transmission brake drum and rear coupling flange.
 - Insert a new felt oil seal into the coupling flange.
 - Install the flat washer and new locknut. Tighten the locknut to 146–180 N.m (108–132 lbf.ft).
 - Install the propeller shaft.
 - Secure the propeller shaft with new locknuts and bolts.
 - Check the oil level and top it up if necessary.

Output Shaft Cover Oil Seal – Rear Axle

- 105. Removal.** Remove the output shaft cover oil seal (rear axle) as follows:
- Clean the area around the rear axle output shaft with a suitable cleaning agent and blow it dry with compressed air.
 - Remove the four locknuts securing the rear axle propeller shaft to the rear axle output shaft coupling flange. Discard the locknuts.
 - Using adjustable wrench (Table 3, Serial 4) to prevent the coupling flange rotating remove the locknut, flat washer and felt oil seal (Figure 65). Discard the locknut and felt oil seal.
 - Remove the coupling flange.
 - Remove the mud shield.
 - Remove the oil seal using a suitable lever.

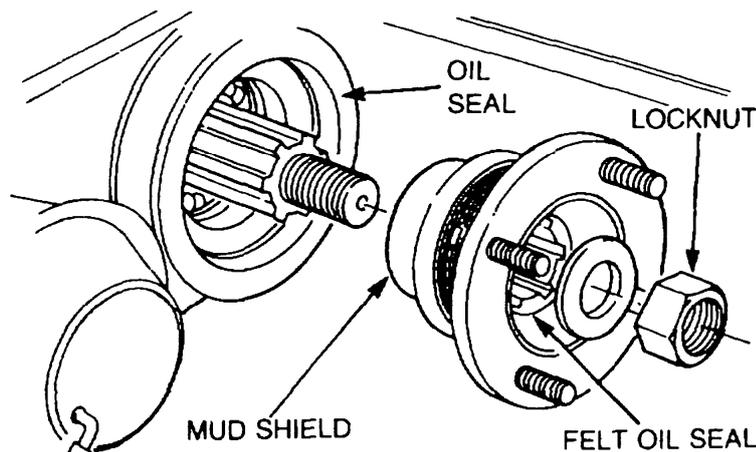


Figure 65 Output Shaft Cover Oil Seal Removal (Rear Axle)

- 106. Installation.** Install the output shaft cover oil seal (rear axle) as follows:
- Press in the new oil seal with the sealing lip towards the bearing.
 - Apply a smear of clean SAE Grade 40 (OMD-115) oil around the lip of the seal.
 - Install the mud shield.
 - Install the coupling flange.

- e. Insert a new felt oil seal into the coupling flange.
- f. Apply Loctite 242 to the shaft thread and install the flat washer and new locknut (Figure 65).
- g. Using adjustable wrench (Table 3, Serial 4) to prevent the flange rotating, tighten the locknut to 146–180 N.m (108–132 lbf.ft).
- h. Position the rear axle propeller shaft on the coupling flange.
- i. Install the four new locknuts and tighten them to 41–52 N.m (30–38 lbf.ft)
- j. Check the oil level and top up if necessary.

Bottom Cover

107. Removal. Remove the bottom cover as follows:

WARNING

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- a. Clean the area around the bottom cover with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the fill plug.
- c. Remove the drain plug and drain the oil from the transfer case into a suitable receptacle.
- d. Replace the drain plug.
- e. Remove the fourteen bolts and lock washers securing the bottom cover to the transfer case. Discard the lock washers.
- f. Remove the cover and gasket. Discard the gasket.
- g. Remove all trace of gasket material from the transfer case and cover.

108. Installation. Install the bottom cover as follows:

- a. Using a new gasket, install the bottom cover and secure it with the fourteen bolts and new lock washers.
- b. Evenly tighten the bolts to 30 N.m (22 lbf.ft).
- c. Fill the transfer case with oil and refit the fill plug.

Top Cover

109. Removal. Remove the top cover as follows:

WARNING

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- a. Clean the area around the top cover with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the zip-clamp securing the rubber boot to the transmission tunnel cover (Figure 66).
- c. Remove the knobs from the gear lever and transfer selector lever.

- d. Remove the two knurled nuts and the fuse cover.
- e. Remove the rubber boot and insulating pad from the vehicle.
- f. Carefully remove the rubber transmission cover and both floor mats.

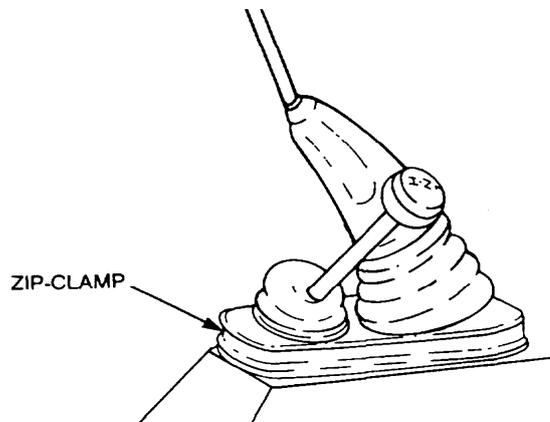


Figure 66 Gear Lever Rubber Boot Removal

- g. Remove the sixteen screws securing the tunnel cover to the floor plates and seat base.
- h. Remove the cover from the vehicle.
- i. Clean the area around the top cover with a suitable cleaning agent and blow it dry with compressed air.
- j. Disconnect the two wires from the reverse switch.
- k. Remove and plug the breather tube installed on the selector cover (Figure 67).
- l. Disconnect the upper ball joint installed on the transfer lever cross-shaft.

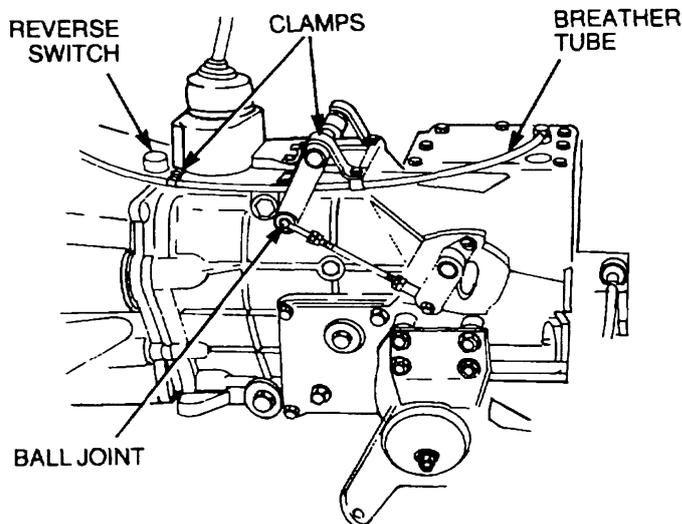


Figure 67 Top Cover Removal

- m. Select 'NEUTRAL'. Remove the eight bolts securing the top cover and transfer lever cross-shaft brackets.
- n. Lift off the cross-shaft and top cover assembly, taking care not to lose the detent springs.

NOTE

The reverse gear detent spring (yellow) is not interchangeable with other detent springs.

- o. Remove and discard the gasket.
- p. Remove all trace of gasket material from the top cover and main casing.

- 110. Installation.** Install the top cover as follows:
- a. Position a new gasket on the main casing.
 - b. Install the top cover assembly ensuring that the gear lever is located in the selectors.
 - c. Install the transfer selector lever cross-shaft to the top cover and install the eight bolts.
 - d. Tighten the bolts securely.
 - e. Install the reverse switch (Para 111).
 - f. Fit the upper ball joint to the cross-shaft.
 - g. Connect the breather tube to the top cover and tighten the banjo bolt securely.
 - h. Install the tunnel cover and sixteen screws and tighten them securely.
 - i. Install the rubber transmission cover and floor mats.
 - j. Install the fuse cover and secure it with the two knurled nuts.
 - k. Install the rubber boot and secure it with a new zip-clamp.
 - l. Install both the gear lever knob and transfer selector lever knob.

Reverse Switch

- 111. Replacement.** Replace the reverse switch as follows:
- a. Remove the rubber boot (Para 89).
 - b. Clean the area around the reverse switch with a suitable cleaning agent and blow it dry with compressed air.
 - c. Disconnect the two electrical wires from the reverse switch.
 - d. Remove the reverse stop screw.
 - e. Unscrew the reverse light switch (Figure 68).

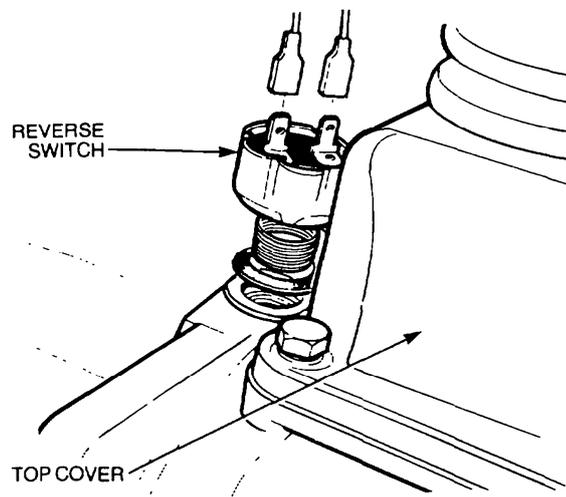


Figure 68 Reverse Switch Removal

- f. Screw in the new switch a few turns.
- g. Engage reverse gear.
- h. Connect the two electrical wires to the reverse switch.
- i. Adjust the reverse stop screw to lightly contact the selector (Figure 69).

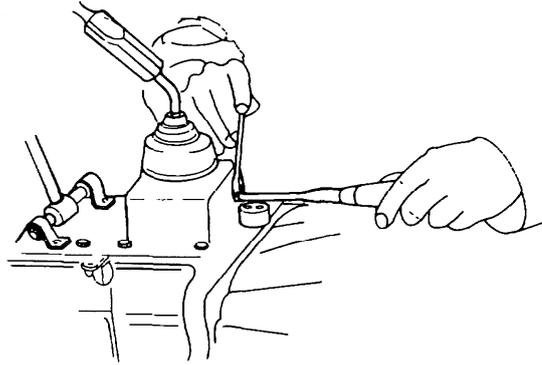


Figure 69 Reverse Stop Screw Adjustment

- j. Unscrew the reverse stop screw half a turn, apply Loctite 242 or similar and tighten the locknut.
- k. With an assistant sitting in the driver's seat, engage the clutch and start the engine.
- l. With reverse gear selected, screw in the switch until the reverse light is illuminated.
- m. Screw the switch in a further half a turn and tighten it to 20–24 N.m (15–17 lbf.ft).
- n. Switch off the engine.
- o. Install the rubber boot (Para 90).

Breather Hoses and Differential Lock Actuating Lines

112. Replacement. Replace the breather hoses and differential lock actuating lines as follows:

- a. Remove the rubber boot and tunnel cover (Para 89).
- b. Remove the centre seat.
- c. Remove the six screws and washers securing the cover plate and remove the plate.
- d. Loosen the four bolts securing the transfer lever cross-shaft pivot brackets to the top cover.
- e. Remove the two banjo bolts and sealing washers securing the breather hoses to the top cover and transfer case cover (Figure 70).

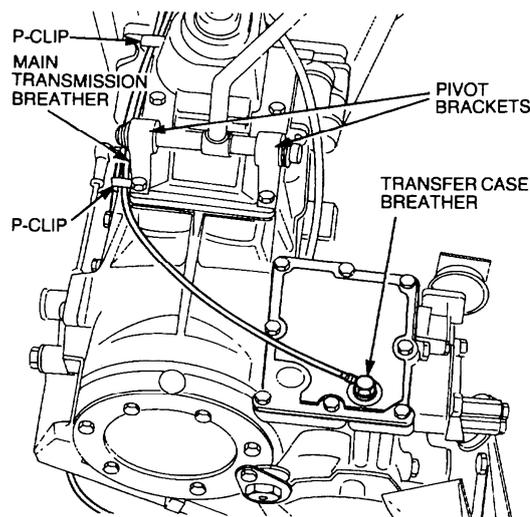


Figure 70 Breather Hose Removal from Transmission

- f. Remove the bolts securing the two P-clips to the top cover.
- g. Remove the clamp securing the two hoses to the firewall (Figure 71).
- h. Remove the hoses from the vehicle.

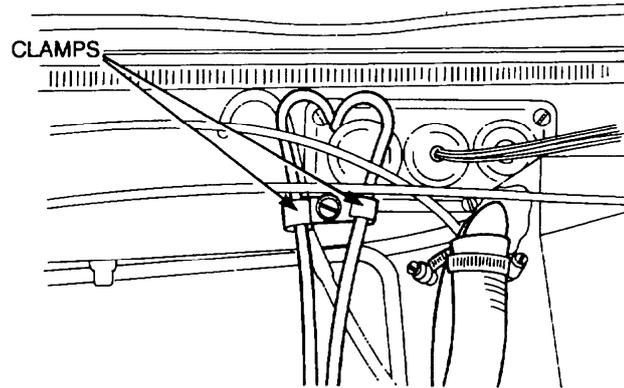


Figure 71 Breather Hose Removal from Firewall

- i. Connect the new breather hoses to the transmission.
- j. Using new sealing washers on the banjo bolts, tighten the bolts securely.
- k. Install the two P-clips on the top cover and tighten the two bolts securely.
- l. Install the transfer lever cross-shaft pivot brackets on the top cover and tighten the four bolts securely.
- m. Position the breather hoses on the firewall, install the clamp and tighten the screw securely.
- n. Install the rubber boot and tunnel cover (Para 90).
- o. Install the cover plate and secure it with the six screws and washers.
- p. Install the centre seat.

NOTE

The differential control actuating lines are an interference fit on the vacuum chamber and a compression type fitting on the control switch (Para 302).

Rear Axle and Differential Lock Engagement Switch

NOTE

The same replacement procedure applies to both switches.

113. Replacement. Replace the differential lock engagement switch as follows:

- a. Clean the area around the switch with a suitable cleaning agent, and blow it dry with compressed air.
- b. Disconnect the two electrical wires, unscrew the switch and remove the shims (Figure 72).

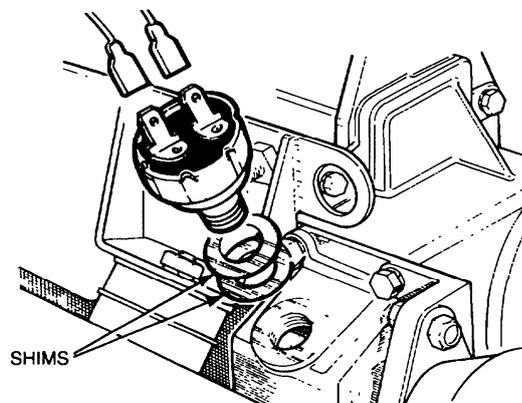


Figure 72 Differential Lock Engagement Switch Removal

- c. Screw in the new switch a few turns without the shims.

- d. Start the engine and move the differential lock vacuum control valve to the 'OUT' position.
- e. Connect the two electrical wires to the switch.
- f. Screw in the switch until the differential lock warning light is illuminated and then screw it in a further one-half a turn.
- g. Using feeler gauges, measure the clearance between the switch lower face and the transmission (Figure 73).

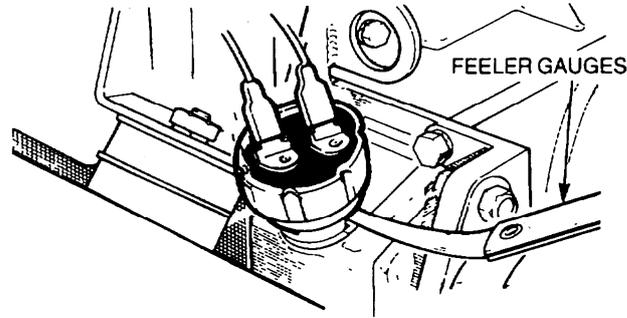


Figure 73 Differential Lock Engagement Switch Adjustment

NOTE

Available shim thicknesses are 0.5 mm (0.020 in) and 0.127 mm (0.005 in).

- h. Switch the engine off, disconnect the two electrical wires and remove the switch.
- i. Move the differential lock vacuum control valve to the 'IN' position.
- j. Install the selected shims (to the measurement determined in sub-paragraph g) and switch to the transmission and tighten the switch to 20–24 N.m (15–17 lbf.ft).
- k. Reconnect the two electrical wires to the switch.

Rear Axle and Differential Lock Vacuum Chamber

114. Removal. Remove the differential lock vacuum chamber as follows:

WARNING

New gaskets provided by Land Rover do not contain asbestos. Older gaskets still fitted to vehicles may contain asbestos. During this task some parts may contain asbestos; refer and comply with procedures and warnings in the introduction section of this EMEI under paragraph heading: Items Previously Known To Have Contained Asbestos.

- a. Clean the area around the selector housing with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the drain plug and drain the oil from the transfer case into a suitable receptacle.
- c. Refit the drain plug.
- d. Disconnect the two electrical wires from the differential lock engagement switch.
- e. Disconnect and tag the two vacuum hoses from the chamber.
- f. Remove the four bolts securing the vacuum chamber selector housing to the transmission (Figure 74).
- g. Remove the housing from the transmission. Remove and discard the gasket.
- h. Remove the detent spring and ball from the housing.

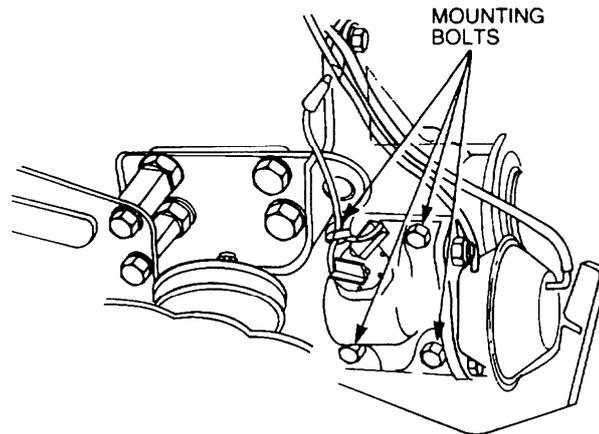


Figure 74 Vacuum Chamber Selector Housing Removal

- i. Remove the differential lock engagement switch and shims from the housing.
- j. Using a suitable pin punch, tap out the roll pin securing the selector fork to the vacuum chamber shaft (Figure 75).

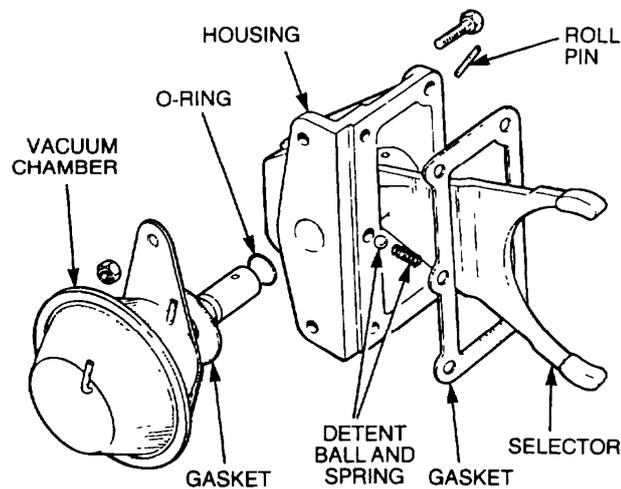


Figure 75 Vacuum Chamber Selector Disassembly

- k. Remove the two bolts and nuts securing the vacuum chamber to the housing.
 - l. Remove the vacuum chamber, O ring and gasket from the housing. Discard the O ring and gasket.
 - m. Taking care not to score or damage any surface; clean all gasket residue from the surfaces.
- 115. Installation.** Install the differential lock vacuum chamber as follows:
- a. Install a new O ring to the vacuum chamber shaft.
 - b. Lightly smear a suitable sealant on both sides of the new gasket.
 - c. Position the gasket on the vacuum chamber.
 - d. Position the chamber on the housing.
 - e. Install the two bolts and nuts. Tighten them securely, ensuring that the shaft locates into the selector.
 - f. Insert a new roll pin to secure the selector to the shaft.
 - g. Lightly smear a suitable sealant on both sides of the housing to transmission gasket.
 - h. Install the vacuum chamber housing complete with gasket on the transmission, ensuring the selector fork engages with the dog clutch.
 - i. Install the four bolts and new lock-washers and tighten them to 30 N.m (22 lbf.ft).

- j. Fill the transfer case to the correct level with clean oil.
- k. Connect the two vacuum pipes on the vacuum chamber.
- l. Adjust the engagement switch (Para 113).

Speedometer Cable and Drive

116. **Removal.** Remove the speedometer cable and spindle as follows (Figure 76 and 77):



There are different coloured spindles used on different Land Rover models. The spindles are not interchangeable due to differing gearing ratios. Ensure that the new spindle is the same colour as the one removed.

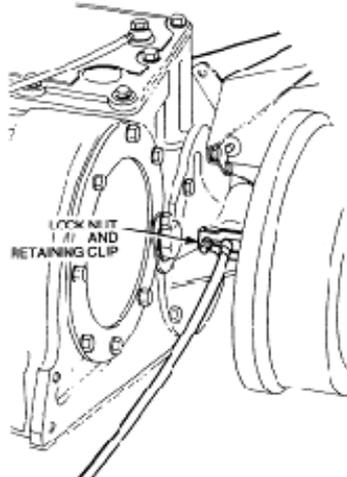


Figure 76 Speedometer Cable Locknut and Retaining Clip

- a. Disconnect the battery.
- b. Remove the locknut, washer and retaining clip securing the cable and spindle housing. Discard the locknut.

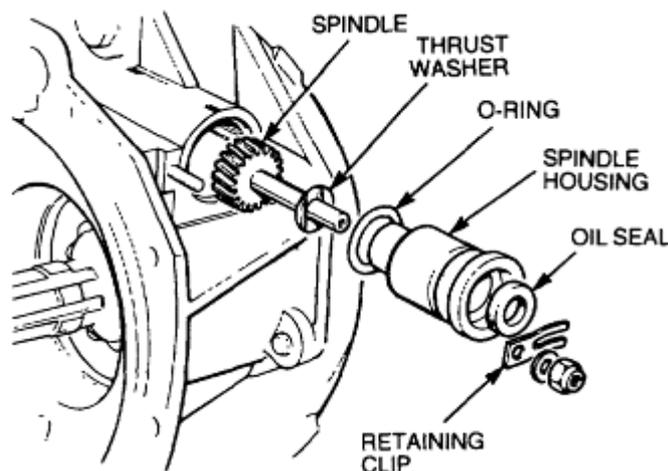


Figure 77 Speedometer Spindle Housing Exploded View

- c. Remove the speedometer cable from the spindle housing.
- d. Using a suitable screwdriver, carefully remove the spindle housing.
- e. Remove and discard the O ring and inner oil seal.
- f. Lift out the spindle and thrust washer.

- g.** Remove the four screws securing the instrument panel to the fascia.
- h.** Carefully lift the panel off and move it to one side.
- i.** Depress the clip retaining the speedometer cable to the speedometer and withdraw the cable (Figure 78).
- j.** Withdraw the cable through the firewall into the engine compartment.
- k.** Remove the inner cable from the outer cable.
- l.** Detach the outer cable and grommets from the retaining clips at the engine flywheel housing, chassis side-member and transfer case.

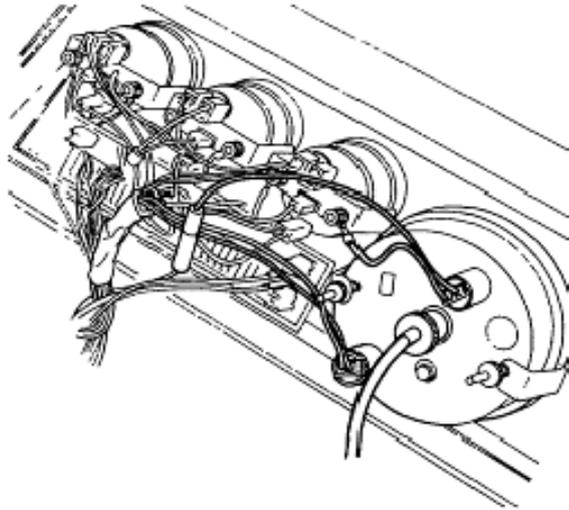


Figure 78 Speedometer Cable Removal

- 117. Installation.** Install the speedometer cable and drive as follows :
- a.** Insert the outer cable through the firewall.
 - b.** Smear the inner cable with grease and insert it into the outer cable.
 - c.** Fit the cable on the speedometer ensuring the drive end is engaged and the retaining clip is secure (Figure 78).
 - d.** Check that all electrical connections are secure.
 - e.** Position the instrument panel on the fascia ensuring that the wiring harness is free from restrictions.
 - f.** Install the retaining screws and tighten them securely.
 - g.** Fit a new O ring to the spindle housing and insert a new inner oil seal (Figure 76 and 77).
 - h.** Smear the spindle with clean oil.
 - i.** Install the thrust washer on the spindle and insert the spindle into the spindle housing.
 - j.** Lightly smear clean oil around the O ring.
 - k.** Insert the spindle housing into the rear output shaft cover ensuring that the spindle engages with the spindle drive gear.
 - l.** Fit the speedometer cable to the spindle housing ensuring the inner cable engages with the spindle.
 - m.** Install the retaining clip, washer and new locknut and tighten the nut to 16 N.m (12 lbf.ft).
 - n.** Secure the speedometer cable and grommets to the clips on the flywheel housing and chassis side-member.
 - o.** Connect the battery.

Transmission System Specifications

118. The transmission system specifications are detailed in Table 12.

Table 12 Transmission System Specifications

Serial	Specification	Measurement
1	Front and rear output coupling flange nuts tightening torque	146–180 N.m (108–132 lbf.ft)
2	Transmission bottom cover bolts tightening torque	16 N.m (12 lbf.ft)
3	Switch and differential lock engagement switch tightening torque	20–24 N.m (15–17 lbf.ft)
4	Differential lock vacuum chamber tightening torque	30 N.m (22 lbf.ft)

Transmission Fault Finding

119. The procedures for transmission fault finding are detailed in Table 13.

Table 13 Transmission Fault Finding

Serial	Symptom	Probable Cause	Action
1	Transmission noisy in neutral	Insufficient oil in transmission	Top up as necessary
		Incorrect oil grade	Drain and refill
		Primary pinion bearing worn	Report
		Constant mesh gears worn	Report
		Countershaft bearings worn	Report
2	Transmission noisy in all gears except top	Countershaft, mainshaft or primary pinion bearings worn	Report
		Constant mesh gears worn	Report
		Transmission oil pump and/or relief valve faulty	Report
3	Transmission noisy in one gear only	Worn or damaged gears or bearings	Report
4	Transmission noisy in all gears	Worn bearings on primary pinion, mainshaft or countershaft	Report
		Transmission oil pump and/or relief valve faulty.	Report
5	Oil leaks from transmission	Transmission over filled	Rectify oil level with vehicle on level floor
		Loose or damaged drain or level plugs	Tighten plugs. If damaged, fit new plugs and joint washer as required
		Blocked breathers	Clean pipes and fitting
		Gaskets damaged, incorrectly fitted or missing	Report
		Oil seals damaged or incorrectly fitted	Replace
		Cracked or broken gearbox casings	Report
6	Difficulty in engaging forward gears	Weak springs or worn parts in synchro units	Report
		Worn selector forks and/or interlock pins	Report
		Faulty clutch operation or clutch fluid leaks	Check clutch master and slave cylinders. Report / Replace as necessary
7	Difficulty in engaging reverse gear	Reverse detent spring installed in forward positions.	Report.
		Reverse gear bearings worn or damaged	Report
		Faulty clutch operation or clutch fluid leaks	Check clutch master and slave cylinders. Report / Replace as necessary
8	Difficulty in disengaging forward gears	Damaged gears or worn synchro cones	Report
		Distorted or damaged splines	Report
		Reverse detent spring installed in forward position	Report
9	Difficulty in disengaging reverse gear	Reverse gear seized on shaft	Report
10	Gear lever going into reverse too easily and not into top	Weak or broken reverse stop plate tension spring	Report

Table 13 Transmission Fault-Finding (Continued)

Serial	Symptom	Probable Cause	Action
11	Transfer of oil between transmission and transfer case	Faulty O ring on reverse idler shaft	Report
		Faulty mainshaft oil seal	Report
		Blocked transmission breather	Clean breather
12	Oil leakage to bell housing	Crankshaft rear seal leaking	Report
		Primary shaft oil seal faulty	Report
13	Transfer case noisy	Insufficient oil in transfer case	Top up as necessary.
		Incorrect oil grade	Drain and refill.
		Excessive end-float on intermediate gears	Report
		Worn transmission differential	Report
		Worn intermediate gearshaft bearing	Report
14	Differential lock warning light not working	Faulty globe	Replace
		Faulty switch or wiring	Check and replace as necessary
		Switch adjustment incorrect	Carry out adjustment procedure
		Faulty vacuum hoses	Check for leaks, replace as necessary
		Faulty vacuum chamber	Replace
15	Reverse Lights not working	Faulty globes	Replace globes
		Faulty switch or wiring	Check and replace as necessary

PROPELLER SHAFTS

Front Propeller Shaft

120. Removal. Remove the front propeller shaft as follows:

- a. Remove and discard the eight locknuts securing the propeller shaft flanges to the front differential and the transmission front output flange.
- b. Remove the propeller shaft.

121. Universal Joint Phasing. The front propeller shaft is assembled with the universal joints phased out of alignment by 39.2° to 43.2° refer to Figure 79. This is explained as when the propeller shaft is rotated in a clockwise direction from the short (transmission or front) end to the long (axle or rear) end the universal joint of the long end is ahead of the universal joint at the short end.

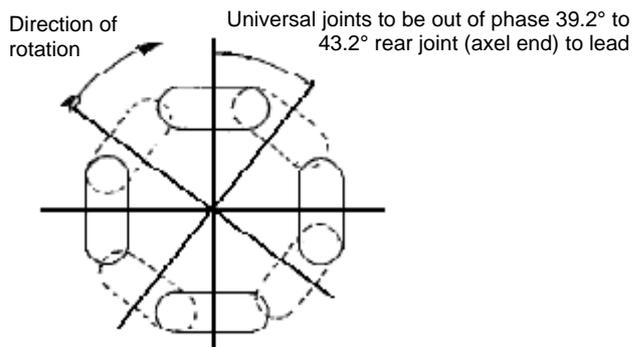


Figure 79 Diagrammatic View Of Universal Joints

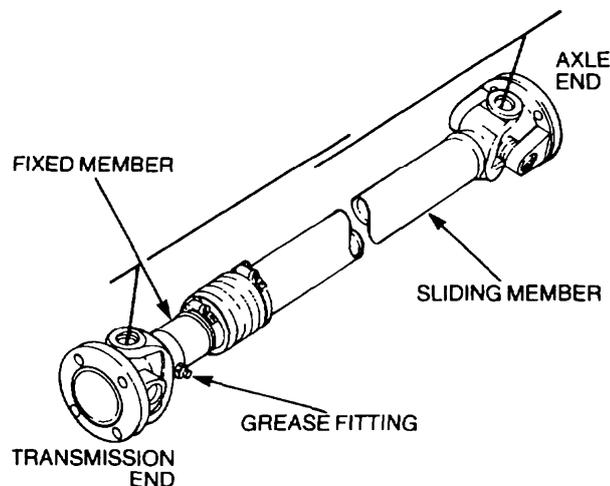
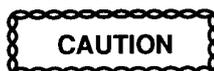


Figure 80 Front Propeller Shaft Alignment

122. Installation. Install the front propeller shaft as follows:

- a. Ensuring the propeller shaft is correctly aligned (Figure 80), install the shaft on the front differential with the sliding member to the front of the vehicle and onto the transmission front output flange.



Ensure propeller shaft flange retaining bolt length is 1-1/8" (approximately 29 mm) in length. If bolt length is shorter there will be insufficient thread for the Nyloc to grip on. No less than two bolt threads must protrude from the Nyloc.

- b. Fit eight new locknuts and tighten them to 41–52 N.m (30–38 lbf.ft).
- c. Lubricate the propeller shaft with grease.

Propeller Shaft Dust Boot

123. **Replacement.** Replace the propeller shaft dust boot as follows:

- a. Remove the front propeller shaft flanges (Para120).
- b. Loosen the two hose clamps securing the rubber boot and slide the boot and clamps away from the splines.
- c. Unscrew the dust cap and remove the sliding member.
- d. Remove the dust boot.

NOTE

The repair of propeller shafts for worn splines is not authorised.

- e. Clean and inspect the splines for wear. Replace the propeller shaft if wear is excessive.
- f. Slide on the new propeller shaft dust boot and smear the splines with grease.

NOTE

The front propeller shaft is assembled with the yokes phased out of alignment. Ensure that the alignment marks on both halves of the shaft are correctly aligned.

The rear propeller shafts are assembled with the yokes in phase. Ensure the yokes are correctly aligned.

- g. Insert the sliding member splines into the fixed member ensuring the match marks are aligned (Figure 96).

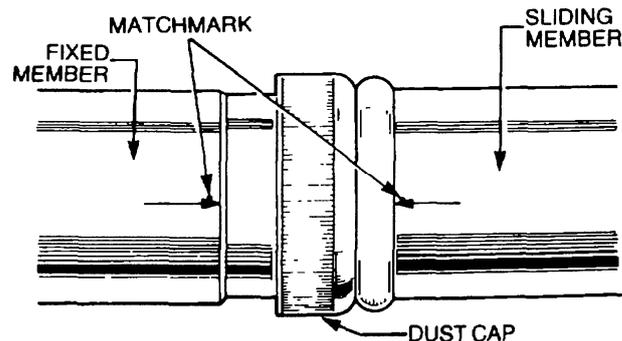


Figure 81 Front Propeller Shaft Matchmark

- h. Tighten the dust cap.
- i. Slide the propeller shaft dust boot along over the splines.
- j. Move the sliding member to the centre of travel and tighten both hose clamps ensuring they are positioned at 180 degrees to each other (Figure 82).

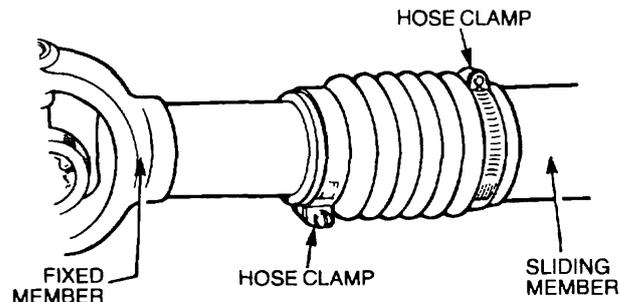


Figure 82 Hose Clamp Positions

- k. Install the propeller shaft (Para 122).

Rear Axle Propeller Shaft

124. **Removal.** Remove the rear axle propeller shaft as follows:

- a. Remove and discard the four locknuts securing the propeller shaft to the transmission output flange (Figure 83).

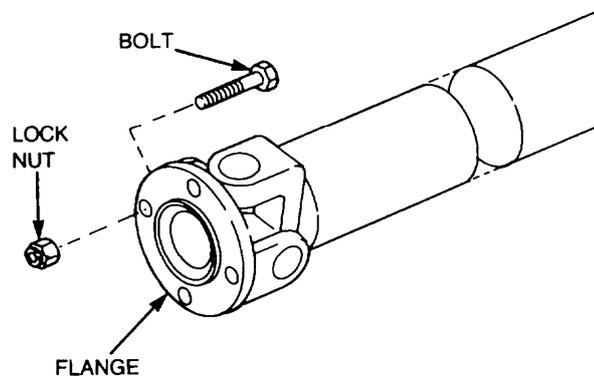


Figure 83 Rear Axle Propeller Shaft Removal

- b. Remove the bolts, locknuts and washers securing the propeller shaft centre bearing to the chassis cross-member. Discard the locknuts.
- c. Remove and discard the four locknuts securing the propeller shaft to the rear differential flange.
- d. Remove the shaft including the centre bearing as a complete assembly.

125. **Inspection of the Rear Propeller Shaft Front Securing Bolts.** Inspect the rear propeller shaft front securing bolts for wear, damaged threads and security (replace as necessary) (Para 126).

126. **Replacement of the Rear Propeller Shaft Front Securing Bolts.** Replace the rear propeller shaft front securing bolts as follows:

WARNING

Under no circumstances is compressed air to be used to remove dust from the hand brake drum or brake linings. Dust from the brake linings can be a health risk if inhaled.

- a. Remove the transfer case rear output flange securing nut (handbrake drum flange).
- b. Remove the rear output flange and separate the handbrake drum from the flange.
- c. Remove the faulty bolts and tack weld the heads of the replacement bolts using an electronic welder (Figure 84).
- d. Remove the rear output shaft oil seal (Para 105sub-paras f to i).
- e. Install the rear output shaft oil seal (Para 106sub-paras a to d).

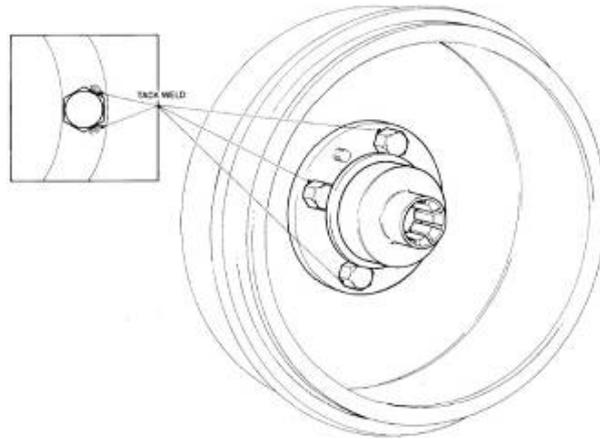


Figure 84 Welding Points For Propeller Shaft Bolts

- f. Refit the handbrake drum to the transfer case flange (apply Loctite 242 or similar to the screws).
- g. Apply a smear of clean SAE Grade 40 (OMD-115) oil around the lip of the seal and install the flange and handbrake assembly to the transfer case output shaft (apply Loctite 242 or similar to the output shaft threads).
- h. Fit a new felt seal and locknut and tighten the nut to 146–180 N.m (108–132 lbf.ft).

127. Installation. Install the rear axle propeller shaft as follows:

- a. Ensuring the propeller shaft is correctly aligned; secure the centre bearing to the chassis cross-member with the bolts, washers and new locknuts.

NOTE

The rear propeller shaft is assembled with the yokes in phase. Ensure the yokes are correctly aligned.



Ensure propeller shaft flange retaining bolt length is 1-1/8" (approximately 29 mm) in length. If bolt length is shorter there will be insufficient thread for the Nyloc to grip on. No less than two bolt threads must protrude from the Nyloc.

- b. Using new locknuts; secure the propeller shaft to the transmission output shaft flange and tighten the nuts to 41–52 N.m (30–38 lbf.ft).
- c. Using new locknuts, secure the propeller shaft to the rear differential flange and tighten the nuts to 41–52 N.m (30–38 lbf.ft).

Intermediate Propeller Shaft

128. Removal. Remove the intermediate propeller shaft as follows:

- a. Remove and discard the eight locknuts securing the propeller shaft flanges to the intermediate axle and the transmission rear output flange.
- b. Remove the propeller shaft.

129. Installation. Install the intermediate propeller shaft as follows:

- a. Ensure the propeller shaft is correctly aligned.
- b. Install the shaft on the intermediate axle with the sliding member to the rear of the vehicle and the end onto transmission rear output flange.

NOTE

Should the propeller shaft require dismantling, ensure the matchmarks are aligned on assembly.

The rear propeller shaft is assembled with the yokes in phase. Ensure the alignment marks are correctly aligned.



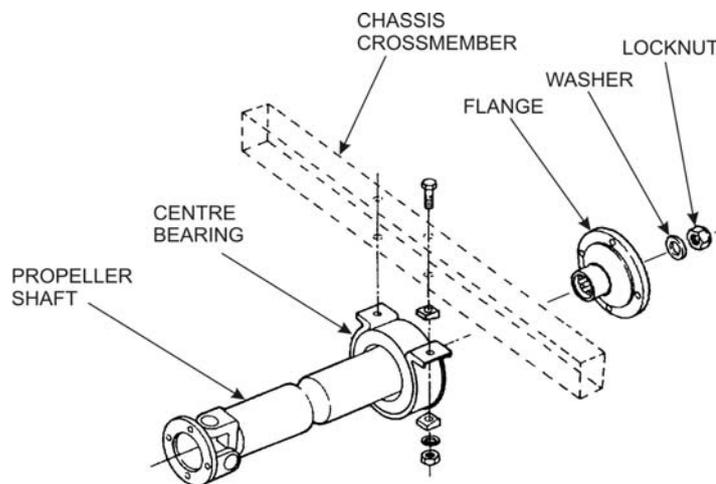
Ensure propeller shaft flange retaining bolt length is 1-1/8" (approximately 29 mm) in length. If bolt length is shorter there will be insufficient thread for the Nyloc to grip on. No less than two bolt threads must protrude from the Nyloc.

- c. Fit eight new locknuts and tighten them to 41–52 N.m (30–38 lbf.ft).
- d. Lubricate the propeller shaft with grease.

Centre Bearing

130. **Removal.** Remove the centre bearing as follows:

- a. Remove the four bolts and locknuts securing the front section of the rear axle propeller shaft to the transmission (Figure 83). Discard the locknuts.
- b. Remove the four bolts and locknuts securing the front section of the rear axle propeller shaft to the centre bearing flange. Discard the locknuts.
- c. Remove the bolts, locknuts and the washers securing the centre bearing to the chassis cross-member (Figure 85). Discard the locknuts.
- d. Remove the front section of the rear axle propeller shaft.
- e. Secure the flange in a vice and remove the locknut and washer securing the flange and centre bearing. Discard the locknut.
- f. Slide the flange and centre bearing from the propeller shaft.



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Figure 85 Propeller Shaft Centre Bearing Removal

131. **Tapered Washers.** Tapered washers were introduced at ARN 50648 and further modified after ARN 51875 (Para 132). There are two variations of the centre bearing installation depending whether the chassis is imperial tube section (Figure 86) or metric tube section (Figure 87).

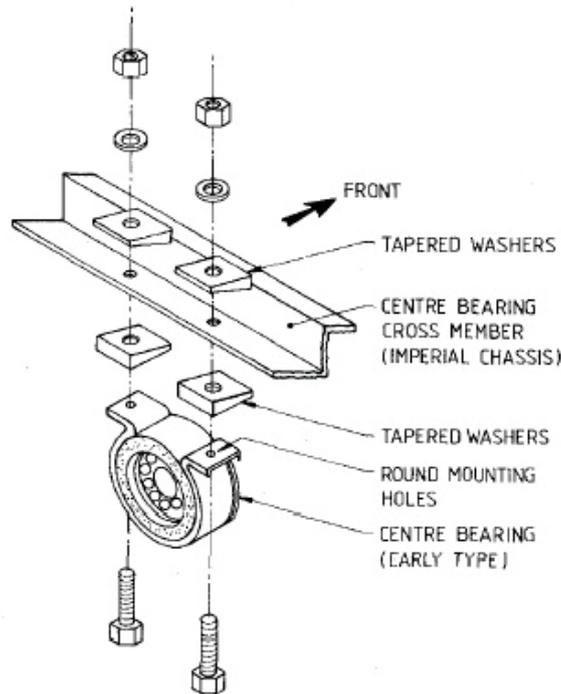


Figure 86 Imperial Tube Chassis Centre Bearing Assembly and Tapered Washers

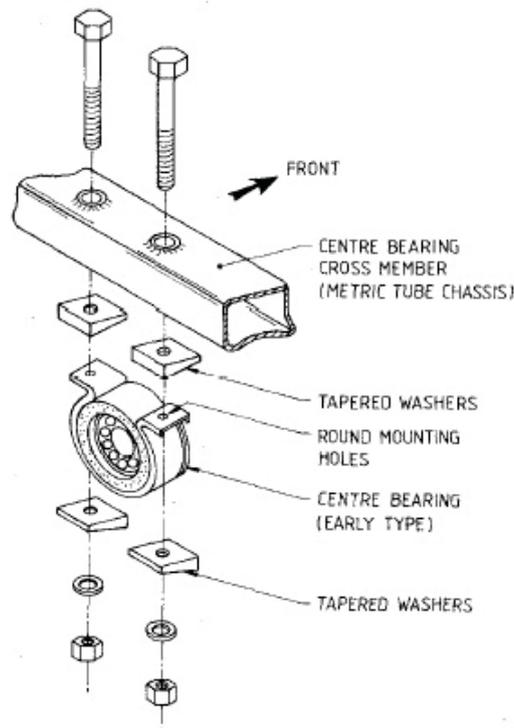


Figure 87 Metric Tube Chassis Centre Bearing Assembly and Tapered Washers

132. Centre Bearing with Longitudinal Slots. Vehicles built after ARN 51875 are fitted with a bearing housing which features longitudinal mounting bolts and the tapered washers are not required (Figure 88). The longitudinal slots allow the housing to be moved to allow correct alignment and prevent scraping.

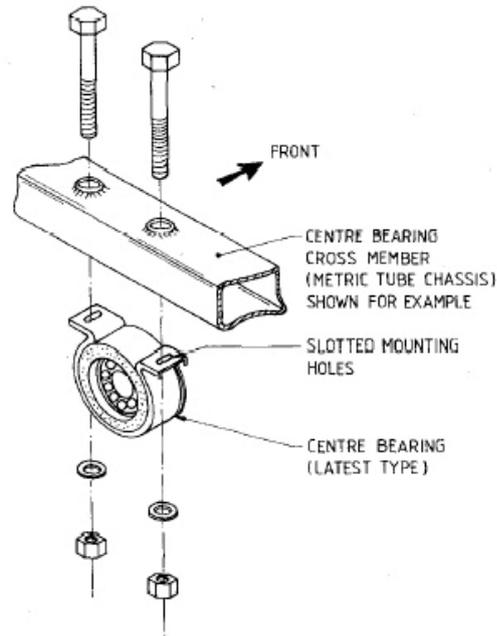


Figure 88 Centre Bearing Housing Longitudinal Mounting Slots

- 133. Inspection.** Inspect the centre bearing as follows:
- Inspect for excessive movement between the bearing and the rubber encasement.
 - Check the bearing for damage to the bearing cage and excessive roughness in bearing operation.
 - Replace the bearing assembly as necessary.
- 134. Installation.** Install the centre bearing as follows:
- Coat the splines on the propeller shaft with a liberal coating of grease.
 - Slide the centre bearing and the flange onto the propeller shaft.

NOTE

The latest centre bearing does not require tapered washers (Para's 131 and 132).

- Install the new locknut and washer securing the flange and the centre bearing to the propeller shaft. Tighten the nut to 115 N.m (85 lbf.ft).
- Ensure the propeller shaft is correctly aligned and the tapered washers are in position.
- Secure the centre bearing to the chassis crossmember with the bolts, washers and new locknuts. Tighten the locknuts to 41–52 N.m (30–38 lbf.ft).
- Using new locknuts, secure the propeller shaft to the transmission shaft flange. Tighten the locknuts to 41–52 N.m (30–38 lbf.ft).
- Using new locknuts, secure the propeller shaft to the rear differential flange. Tighten the locknuts to 41–52 N.m (30–38 lbf.ft).

Universal Joints

- 135. Removal.** Remove the universal joints as follows:
- Clean the area around the universal joint.
 - Remove the circlips (Figure 89).

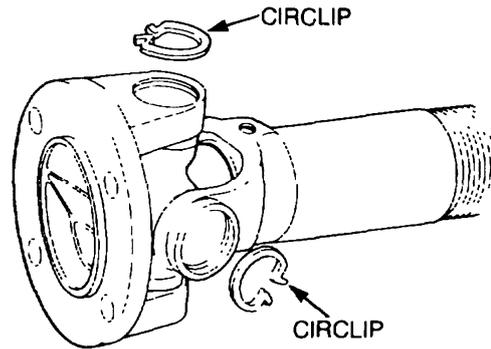


Figure 89 Circlip Removal

- c. Remove and discard the bearing cups and spider (Figure 90).

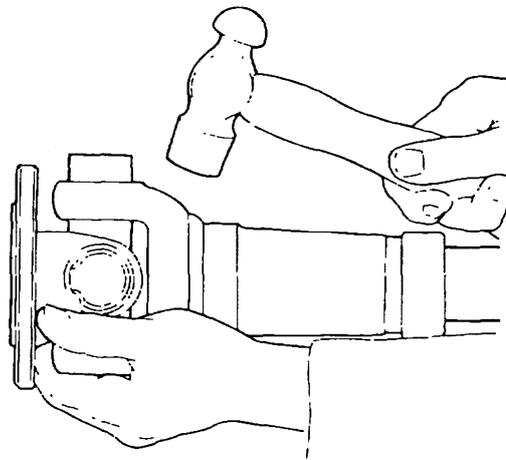


Figure 90 Bearing Cup Removal

- d. Thoroughly clean the yokes and bearing cup seats.

136. **Installation.** Install the universal joints as follows:



Do not press the cups further than the circlip groove or damage to the cups and seals will result.

NOTE

A small amount of material may need to be removed from one side of the yoke assembly to allow for fitting of the spider.

Install the spider with the hole for the grease nipple facing away from the flange.

Grease the universal joint prior to fitting to the vehicle.

- a. Remove the bearing cups from the new spider and check that all the needle rollers are correctly positioned in the cup.
- b. Ensure the bearing cups are one-third full of clean grease.
- c. Install the spider complete with the seals into the yokes.
- d. Partially insert one bearing cup into one yoke and insert the spider into the cup taking care not to dislodge the needle rollers.
- e. Insert the opposite bearing cup into the opposite yoke.

- f. Using a vice, carefully press both cups into place, taking care not to dislodge the needle rollers as the spider engages the cup (Figure 91).

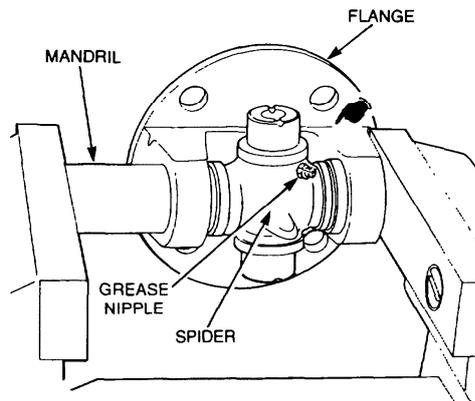


Figure 91 Bearing Cup Installation

- g. Remove the flange and spider from the vice.
- h. Using a suitable mandrel of slightly smaller diameter than the bearing cup position the yoke in a vice.
- i. Carefully press each cup until they reach the lower edge of the circlip groove.
- j. Remove the flange from the vice and fit the circlips.
- k. Check that the flange moves smoothly in all directions.

Hooke’s Cardan Universal Joint

137. Disassembly. Disassemble the Hooke’s Cardan universal joint as follows:

NOTE

The moulded plastic rings retaining the yoke bearing cups will be destroyed on removal. The replacement bearings cups are provided with grooves to allow circlips to be used for retention.

- a. Clean the area around the universal joint.
- b. Match mark the propeller shaft yoke, the coupling yoke and flange yoke to maintain the balanced position.
- c. Position a suitable size tube or socket over the flange bearing cup (Figure 92).
- d. Position a mandrel on the opposing cup (Figure 92) and press the lower cup from the flange.

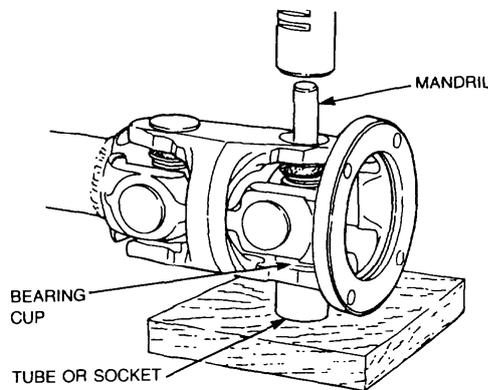
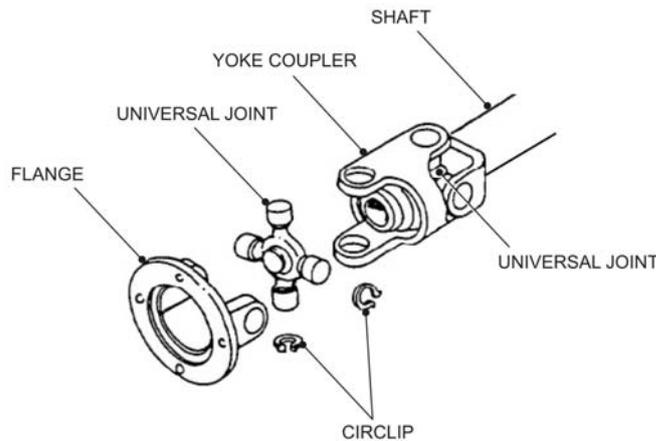


Figure 92 Bearing Cup Removal

- e. Rotate the propeller shaft 180 degrees and remove the opposite cup.
- f. Repeat the procedure for the remaining cups.

- g.** Remove the bearing cups from the coupling yoke (Para 135) (Figure 93).



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Figure 93 Hooke's Cardan Universal Joint Assembly

- 138. Cleaning and Inspection.** Clean and inspect the Hooke's Cardan universal joint as follows:
 - a.** Using a suitable cleaning agent clean the flanges, coupler, shaft and adjacent areas.
 - b.** Check for signs of excessive wear or broken parts (replace as necessary).
- 139. Reassembly.** Reassemble the Hooke's Cardan universal joint as follows:
 - a.** Install the shaft yoke (Para 136).

NOTE

Due to the difference in yoke design it is only necessary to press each bearing cup into the yoke until the circlip groove is completely exposed on the inside of the yoke.

- b.** Install the circlips into the bearing cup grooves (Figure 94).

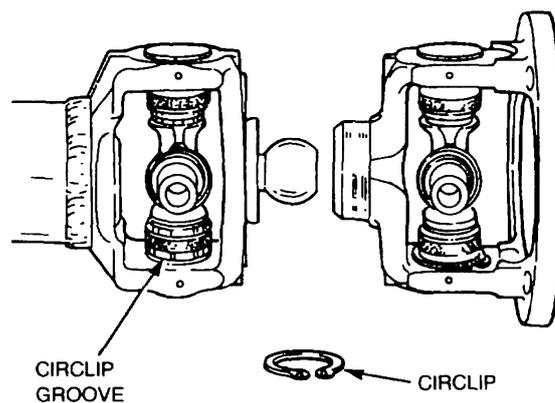


Figure 94 Circlip Installation

NOTE

Ensure that the alignment match marks on the flange and shaft yokes are correctly positioned.

- c.** Install the coupling yoke over the shaft yoke spider.
- d.** Install the bearing cups (Para 136).

- e. Engage the flange yoke spider in the coupling yokes (Figure 95).

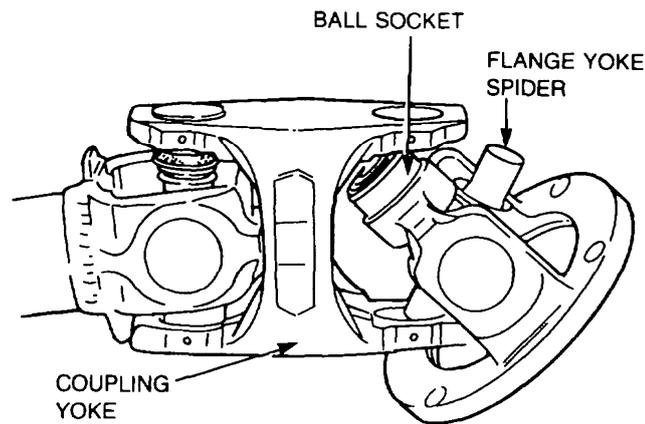


Figure 95 Flange Yoke Spider Installation

- f. Engage the centring ball into the socket.
- g. When the ball is fully engaged in the socket, locate the flange yoke spider into the coupling yoke.
- h. Install the bearings (Para 136).
- i. Check that the universal joint is free to move in all directions (if the joint is slightly stiff, tap around the yoke to loosen the bearing).

Rubber Boot

140. Replacement. Replace the rubber boot as follows:

- a. Remove and discard the eight locknuts securing the front propeller shaft flanges.
- b. Remove the propeller shaft.
- c. Loosen the two hose clamps securing the rubber boot and slide the boot and clamps away from the splines.
- d. Matchmark the propeller shaft (Figure 96).

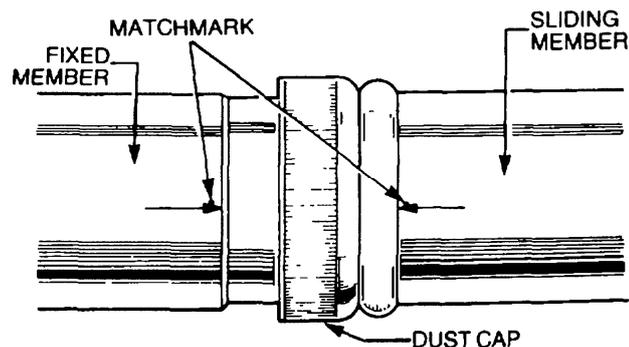


Figure 96 Propeller Shaft Matchmark

- e. Unscrew the dust cap and remove the sliding member.
- f. Remove the boot.
- g. Clean and inspect the splines for wear (replace the propeller shaft if wear is excessive).
- h. Slide on the new rubber boot and smear the splines with grease.
- i. Insert the sliding member splines into the fixed member ensuring the match marks are aligned.
- j. Tighten the dust cap.
- k. Slide the rubber boot along over the splines.

- l.** Move the sliding member to the centre of travel and tighten both hose clamps, ensuring they are positioned at 180 degrees to each other (Figure 97).

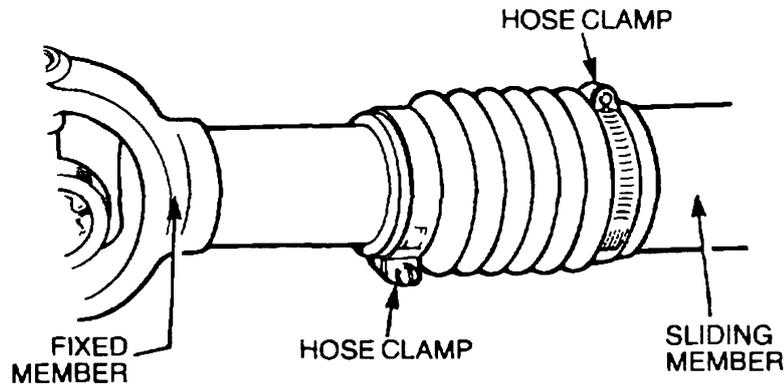


Figure 97 Hose Clamp Positions

- m.** Install the propeller shaft on the vehicle ensuring that the sliding member is fitted to the front of the vehicle.
- n.** Install new locknuts and tighten them to 41–52 N.m (30–38 lbf.ft).
- o.** Lubricate the shaft.

Propeller Shaft Inspection

141. Inspect the propeller shaft as follows:

- a.** Check that the balance weights are secure. If the weights are loose, replace the propeller shaft.
- b.** Check that all universal joint circlips are correctly installed.
- c.** Check that the rubber boot hose clamps (front propeller shaft only) are installed at 180 degrees to each other and are of the same type.
- d.** With the parking brake applied, grip the propeller shaft and check the lateral and radial movement in the splines. (Replace the propeller shaft assembly if movement is excessive).
- e.** Check that the grease nipple functions correctly (replace as necessary).
- f.** Check that the universal joint grease seals are not damaged (replace as necessary).
- g.** Check that the propeller shaft is aligned correctly (Figure 80).
- h.** Using a dial test indicator, check that the radial movement between the sliding shaft and the fixed shaft does not exceed 0.1 mm (0.004 in) at the slip-joint splines (replace the propeller shaft assembly if measurement exceeds specifications).

Propeller Shaft System Specifications

142. The propeller shaft system specifications are detailed in Table 14.

Table 14 Propeller Shaft System Specifications

Serial	Specification	Measurement
1	Front, intermediate and rear propeller shaft flange locknuts tightening torque	41–52 N.m (30–38 lbf.ft)
2	Maximum radial movement at slip-joint	0.1 mm (0.004 in)
3	Centre bearing and flange to propeller shaft tightening torque	115 N.m (85 lbf.ft)
4	Centre bearing assembly to frame cross member tightening torque	41–52 N.m (30–38 lbf.ft)

REAR AXLES

Differential Cover Gasket

143. **Removal.** Remove the differential cover gasket as follows:

WARNING

New gaskets provided by Land Rover do not contain asbestos. Older gaskets still fitted to vehicles may contain asbestos. During this task some parts may contain asbestos; refer and comply with procedures and warnings in the introduction section of this EMEI under paragraph heading: Items Previously Known To Have Contained Asbestos.

- a. Clean the area around the differential cover with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the fill plug from the differential.
- c. Remove the drain plug and drain the oil into a suitable receptacle.
- d. Refit the drain plug.
- e. Note the position of the support strip.
- f. Remove the bolts and lock washers securing the cover and brake pipe bracket to the axle casing. Discard the lock washers.
- g. Remove the cover. Remove and discard the gasket.
- h. Remove all trace of gasket material from the cover and the axle casing.
- i. Wash the cover in a suitable cleaning agent.

144. **Installation.** Install the differential cover gasket as follows:

- a. Smear a suitable sealant on both sides of the new gasket and fit the cover and the gasket to the axle casing.
- b. Install the bolts and new lock washers ensuring that the securing strip is fitted to the lower bolts.
- c. Tighten the bolts to 27–34 N.m (20–25 lbf.ft).
- d. Fill the axle casing with clean gear oil, until oil flows from the lower edge of the fill plug hole.
- e. Refit the fill plug.

Differential Pinion Oil Seal

145. **Removal.** Remove the differential pinion oil seal as follows:

- a. Clean the area around the differential pinion with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove and discard the four locknuts securing the rear propeller shaft to the rear differential flange.

CAUTION

To maintain the loading of the collapsible spacer, the pinion shaft, flange and nut must be matchmarked prior to removal.

- c. Remove the propeller shaft.
- d. Matchmark the pinion shaft and the flange.
- e. Using the adjustable wrench (Table 3, Serial 4) to prevent the coupling flange rotating, remove the pinion locknut and washer (Figure 98). Discard the locknut.
- f. Remove the coupling flange and the oil seal. Discard the oil seal.

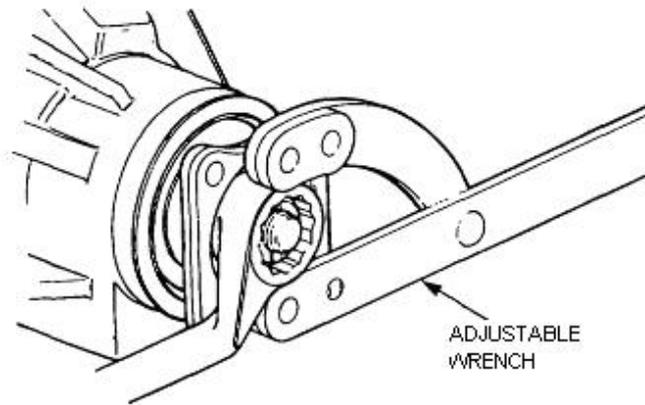


Figure 98 Differential Pinion Coupling Flange Removal

146. Installation. Install the differential pinion oil seal as follows:

- a. Using the pinion oil seal replacer drift (Table 3, Serial 5) insert the new oil seal with the seal lips towards the pinion (Figure 99).

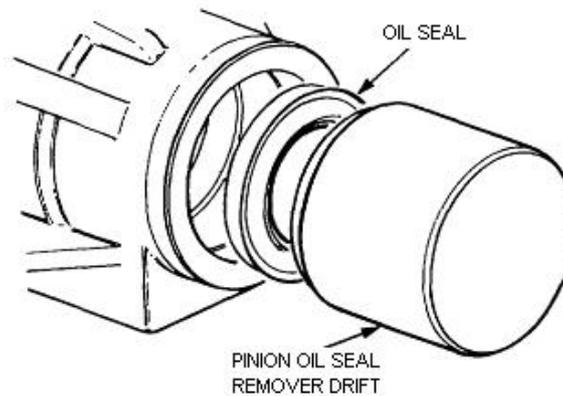
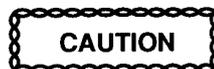


Figure 99 Pinion Oil Seal Installation

NOTE

Prior to installing the coupling flange, inspect the outer surface for roughness or damage, which may cause premature failure of the oil seal.

- b. Lubricate the seal lips with clean gear oil.



Ensure that the coupling flange is installed with the matchmarks aligned and that the locknut is not tightened beyond the marked position.

- c. Install the coupling flange, washer and a new locknut.
- d. Using the adjustable wrench (Table 3, Serial 4), to prevent the flange rotating, tighten the locknut to 95–163 N.m (70–120 lbf.ft).
- e. Install the rear propeller shaft on the coupling flange.
- f. Fit four new locknuts and tighten them to 41–52 N.m (30–38 lbf.ft).
- g. Drain the rear axle oil and refill.

Rear Differential Level Plug

147. **Installation.** Install the rear differential level plug as follows:

- a. Ensure that the thread on the plug and in the differential cover plate is clean and free from damage.
- b. Fit the level plug and screw it in until it is finger tight.
- c. Using a socket bar or differential plug spanner, tighten the level plug a further one-half to three-quarters of a turn.

NOTE

If the level plug cannot be tightened or protrudes too far into the differential cover plate, the original plug is to be discarded and replaced by a flange type plug and gasket.

Axle Shafts

148. **Removal.** Remove the axle shafts as follows:

- a. Clean the area around the hub assembly with a suitable cleaning agent and blow it dry with compressed air.

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- b. Chock the front wheels and engage the transmission differential lock.
- c. Using a suitable hydraulic jack, raise the rear of the vehicle and support it on stands positioned beneath the rear axle.
- d. Remove the hub cap from the driving hub.
- e. Remove the five bolts and spring washers securing the driving hub to the hub. Discard the spring washers (Figure 100).

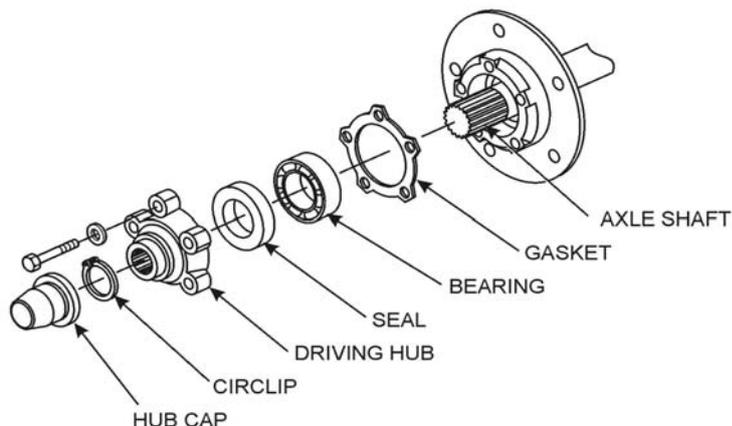


Figure 100 Axle Shaft and Flange Exploded View

- f. Remove the driving hub complete with the axle shaft.
- g. Remove and discard the gasket.
- h. Remove all trace of gasket material from the driving hub and the hub.

- 149. Installation.** Install the axle shafts as follows:
- a. Install a new gasket over the axle shaft and insert the driving hub with the axle shaft in the axle case.
 - b. Turn the driving hub until the shaft engages into the differential and fits flush against the hub.
 - c. Ensure the driving hub, gasket and hub bolt holes align.
 - d. Apply Loctite 271, or equivalent, to the bolt threads.
 - e. Install the bolts and new spring washers and tighten them to 60–70 N.m (44–52 lbf.ft).
 - f. Fit the hub cap onto the driving hub ensuring that a tight fit is obtained.
 - g. Raise the vehicle off the axle stands, remove the stands and lower the vehicle to the ground.
 - h. Remove the wheel chocks.
 - i. Disengage the transmission differential lock.

Hub Oil Seal

- 150. Removal.** Remove the hub oil seal as follows:
- a. Clean the area around the hub assembly with a suitable cleaning agent and blow it dry with compressed air.

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- b. Loosen the wheel nuts.
- c. Chock the front wheels and engage the transmission differential lock.
- d. Using a suitable hydraulic jack, raise the rear of the vehicle and support it on stands positioned beneath the rear axle.
- e. Remove the wheel nuts and wheel.
- f. Disconnect and plug the brake pipe from the caliper.
- g. Remove the two bolts securing the brake caliper to the axle housing and remove the caliper from the disc.
- h. Remove the hub cap from the driving flange.
- i. Remove the circlip retaining the axle shaft.
- j. Remove the five bolts and spring washers securing the driving flange. Remove the flange and the gasket. Discard the spring washers and the gasket.
- k. Using the hub adjusting spanner (Table 3, Serial 6) remove the locknut.
- l. Remove the lock washer, adjusting nut and seal track (Figure 101). Discard the lock washer.
- m. Remove the hub assembly.
- n. Pry out and discard the oil seals, using a suitable lever.

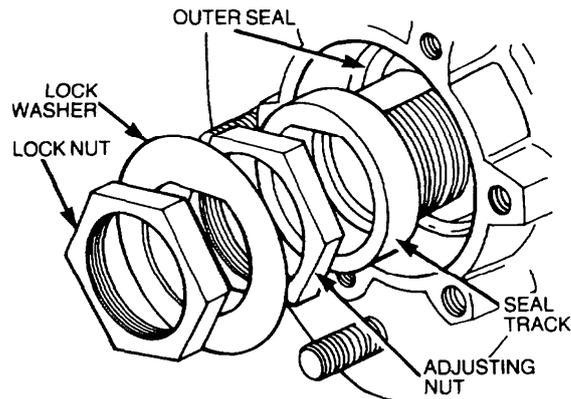


Figure 101 Hub Retaining Nuts

151. Installation. Install the hub oil seal as follows:

- a. Smear grease around the seal lips.
- b. Using the hub oil seal replacer (Table 3, Serial 7) and the bearing and oil seal replacer (Table 3, Serial 11), press the new oil seals into the hub with the seal lip towards the hub bearing (Figure 102).

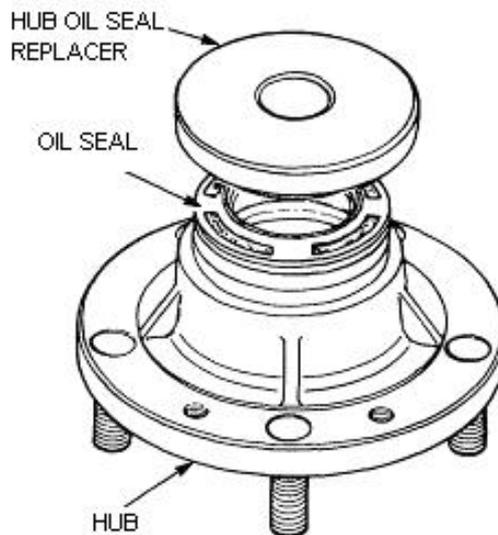


Figure 102 Hub Oil Seal Installation

- c. Ensure the hub is half full of grease.
- d. Install the hub.
- e. Insert the seal track and adjusting nut.
- f. Spin the hub to settle the bearings.
- g. Tighten the nut by hand until there is no end float.
- h. Back off the hub nut 90 degrees then tighten it to 10 N.m (7 lbf.ft).
- i. Fit a new lock washer and the locknut. Tighten the locknut to 50 N.m (37 lbf.ft).
- j. Tab over the lock washer.
- k. Install the driving flange and a new gasket, ensuring the splines are aligned with those on the drive shaft.
- l. Fit each bolt with a new spring washer; then apply Loctite 271, or equivalent, to the bolt threads.
- m. Install the bolts and tighten them to 60–70 N.m (44–52 lbf.ft).
- n. Install the drive shaft shim and secure it with the circlip.

- o.** Install the hub cap securely.
- p.** Ensure that the brake disc is free from oil and grease.
- q.** Install the caliper.
- r.** Apply Loctite 242 or equivalent to the retaining bolts.
- s.** Install and tighten the bolts to 120–150 N.m (89–110 lbf.ft).
- t.** Reconnect the brake hose to the caliper.
- u.** Bleed the brake system Para 209.
- v.** Install the wheel and wheel nuts. Tighten the nuts.
- w.** Raise the vehicle off the axle stands, remove the stands and lower the vehicle to the ground.
- x.** Tighten the wheel nuts.
- y.** Remove the wheel chocks.
- z.** Check the axle oil level through the differential fill plug and top up if necessary.
- aa.** Disengage the differential lock.

Wheel Bearings

152. Removal. Remove the wheel bearings as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a.** Remove the hub oil seals (Para 150).
- b.** Remove the bearing cups, using a suitable drift or press.
- c.** Using a suitable cleaning agent, wash all trace of grease from the hub.
- d.** Inspect the hub for cracks and damaged wheel studs (replace if necessary).
- e.** Inspect the seal track around the outer running surface for wear (replace it if it is worn).

153. Installation. Install the wheel bearings as follows:

- a.** Using a suitable drift or press, install the bearing cups, ensuring that the wide sides are towards each other (Figure 103).

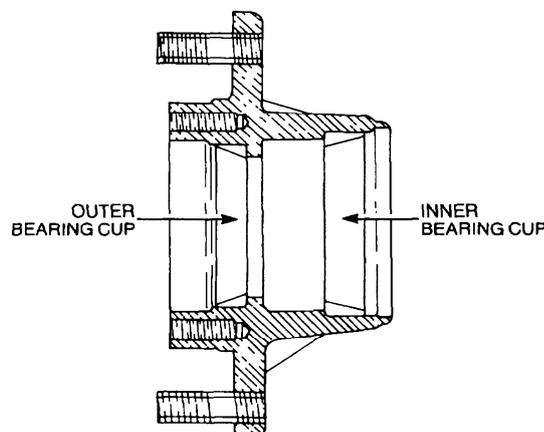


Figure 103 Bearing Cup Installation

- b. Pack the inner and outer bearing cones with grease.
- c. Insert the cones into the hub; then half fill the hub with grease.
- d. Install the hub oil seal (Para 151).

Breather Hose

154. **Replacement.** Replace the breather hose as follows:

- a. Clean the area around the banjo bolt with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the banjo bolt securing the breather hose to the axle casing (Figure 104). Discard the sealing washers.

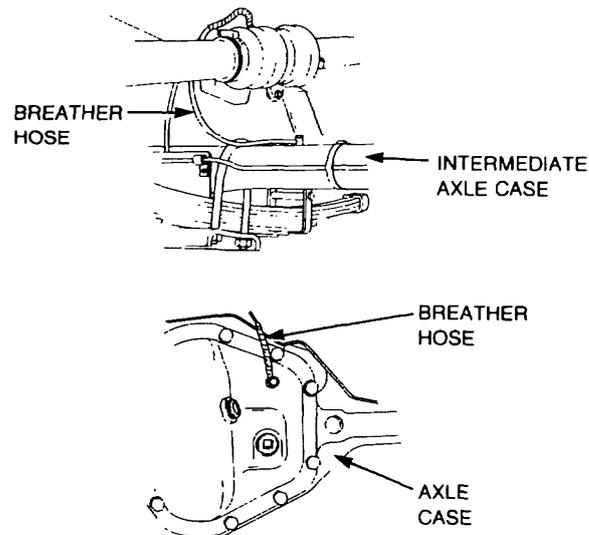


Figure 104 Rear and Intermediate Axle Breather Hose Location

- c. Remove the clips securing the hose to the intermediate axle case.
- d. Remove the hose from the chassis plastic clip.
- e. Position the new hose along the axle and up onto the chassis.
- f. Using new sealing washers; fit the hose to the axle case and tighten the banjo bolt securely.
- g. Install the clips to secure the hose to the axle case.
- h. Secure the hose to the chassis with the chassis plastic clip.

Rear Axles Specifications

155. Specifications for the rear axles are detailed in Table 15.

Table 15 Rear Axles Specifications

Serial	Specification	Measurement
1	Differential cover retaining bolts tightening torque	27–34 N.m (20–25 lbf.ft)
2	Differential pinion flange tightening torque	95–163 N.m (70–120 lbf.ft)
3	Propeller shaft retaining nuts tightening torque	41–52 N.m (30–38 lbf.ft)
4	Hub driving flange retaining bolts tightening torque	60–70 N.m (44–52 lbf.ft)
5	Hub bearing adjustment hub nut torque	10 N.m (7 lbf.ft)
6	Hub locknut torque	50 N.m (37 lbf.ft)

FRONT AXLE

Differential Pinion Oil Seal

156. Removal. Remove the differential pinion oil seal as follows:

- a. Clean the area around the pinion with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove and discard the four locknuts securing the front propeller shaft to the front differential flange.
- c. Remove and discard the flange nut split pin.
- d. Using the adjustable wrench (Table 3, Series 5) to prevent the coupling flange rotating, remove the flange slotted nut (Figure 105).

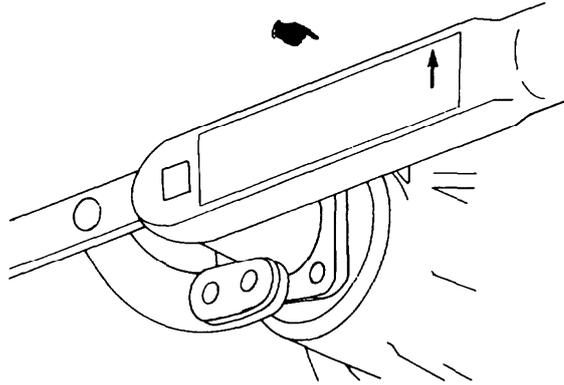


Figure 105 Front Differential Pinion Flange Nut Removal

- e. Remove the coupling flange and the deflector.
- f. Remove and discard the oil seal.

157. Installation. Install the differential cover gasket as follows:

WARNING

New gaskets provided by Land Rover do not contain asbestos. Older gaskets still fitted to vehicles may contain asbestos. During this task some parts may contain asbestos; refer and comply with procedures and warnings in the introduction section of this EMEI under paragraph heading: **Items Previously Known To Have Contained Asbestos.**

- a. Smear the outside edge of the oil seal with a suitable sealant.
- b. Using pinion oil seal replacer drift (Table 3, Serial 5) (Figure 106), insert the seal with the seal lip towards the pinion.

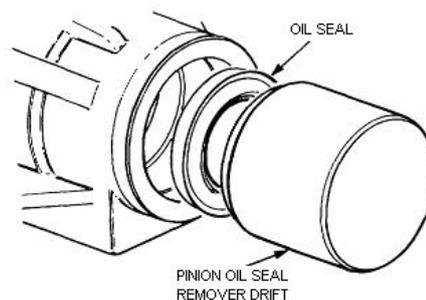


Figure 106 Pinion Oil Seal Installation

NOTE

Prior to installing the coupling flange, inspect the outer surface for roughness or damage which may cause premature failure of the oil seal.

- c.** Lubricate the seal lip with clean gear oil.
- d.** Install the deflector.
- e.** Install the coupling flange, washer and flange nut.
- f.** Tighten the flange nut to 94–163 N.m (70–120 lbf.ft) and ensure the slots align with the split pin hole.
- g.** Install the split pin.
- h.** Install the front propeller shaft on the coupling flange.
- i.** Fit four new locknuts and tighten them to 41–52 N.m (30–38 lbf.ft).
- j.** Drain the front axle oil and refill.

Hub Oil Seal

158. Removal. Remove the hub oil seal as follows:

- a.** Clean the area around the hub assembly with a suitable cleaning agent and blow it dry with compressed air.

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- b.** Loosen the wheel nuts.
- c.** Chock the rear wheels.
- d.** Using a suitable hydraulic jack, raise the front of the vehicle and support it on stands positioned beneath the front axle.
- e.** Remove the wheel nuts and wheel.
- f.** Loosen the nut securing the brake hose to the retaining bracket (Figure 107).
- g.** Disconnect the wear indicator cable at the caliper (left-hand side only).
- h.** Remove the two bolts securing the caliper to the swivel housing.
- i.** Move the caliper away from the disc.
- j.** Ensuring that the brake pipes are not bent, secure the caliper to the road spring with wire or string.
- k.** Using a suitable lever, pry off the hub cap.

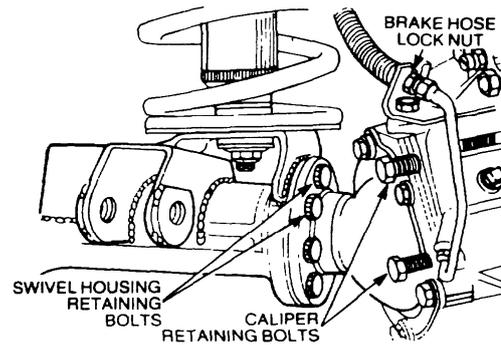


Figure 107 Brake Caliper Removal

- i. Remove the circlip from the drive shaft and remove the shim (Figure 108).

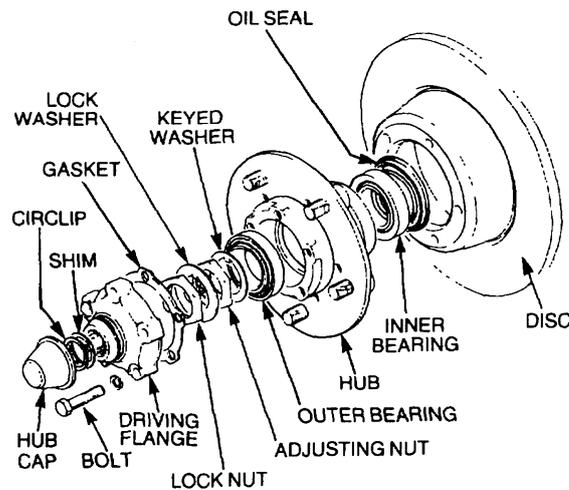


Figure 108 Front Hub and Disc Exploded View

- m. Remove the five bolts securing the driving flange to the hub and remove the driving flange.
 - n. Discard the gasket and spring washers.
 - o. Clean away all trace of gasket material.
 - p. Using the hub adjusting spanner (Table 3, Serial 6), remove the locknut then the lock washer, adjusting nut and the keyed washer.
 - q. Remove the hub assembly.
 - r. Using a suitable lever, pry out the oil seal.
 - s. Discard the oil seal.
 - t. Clean off any oil spillage.
 - u. Ensure the brake disc is clean and free from cracks.
- 159. Installation.** Install the hub oil seal as follows:
- a. Using the hub oil seal replacer (Table 3, Serial 7) and the bearing and oil seal replacer (Table 3, Serial 11), press the new oil seal into the hub with the seal lip towards the hub bearings.
 - b. Smear grease around the seal lip.
 - c. Ensure that the hub is half-full of grease.
 - d. Install the hub complete with bearings.
 - e. Install the keyed washer and adjusting nut.
 - f. Spin the hub to settle the bearings and tighten the nut by hand until there is no end float.

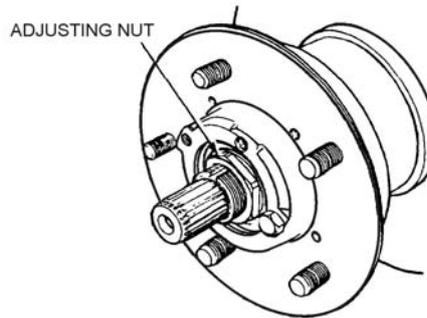


Figure 109 Hub Bearing Adjustment

- g.** Back off the hub nut 90 degrees then tighten it to 10 N.m (7 lbf.ft).
- h.** Fit a new lock washer.
- i.** Install the locknut. Tighten it to 50 N.m (37 lbf.ft) and tab over the lock washer.
- j.** Install the driving flange and a new gasket ensuring the splines are aligned with those on the drive shaft.
- k.** Fit each bolt with a new spring washer and apply Loctite 271 or equivalent to the bolt threads.
- l.** Install the bolts and tighten them to 60–70 N.m (44–52 lbf.ft).
- m.** Install the drive shaft shim and secure it with the circlip.
- n.** Install the hub cap securely.
- o.** Ensure that the brake disc is free from oil and grease.
- p.** Install the caliper.
- q.** Apply Loctite 271 or equivalent to the retaining bolts.
- r.** Install and tighten the bolts to 82 N.m (60 lbf.ft).
- s.** Fit the brake hose on the retaining bracket and tighten the locknut.
- t.** Connect the wear indicator cable (left-hand side only).
- u.** Install the road wheel and tighten the wheel nuts.
- v.** Raise the vehicle off the axle stands, remove the stands and lower the vehicle to the ground.
- w.** Recheck the wheel nuts.
- x.** Remove the wheel chocks.
- y.** Operate the brake pedal several times to centralise the brake pads.

Wheel Bearings

160. Removal. Remove the wheel bearings as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a.** Remove the hub oil seal (Para 158).
- b.** Remove the bearings and using a suitable drift remove the bearing cones (Figure 110).

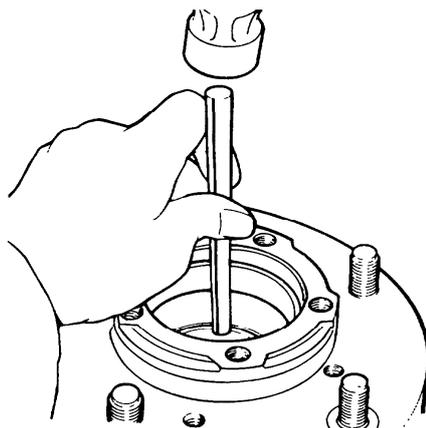


Figure 110 Bearing Cup Removal

- c. Clean and degrease the hub with a suitable cleaning agent.
- 161. Installation.** Install the wheel bearings as follows:
- a. Using a suitable drift, install the bearing cones (Figure 111).
 - b. Pack the inner and outer bearings with grease and insert them into the hub.
 - c. Half fill the hub with grease.

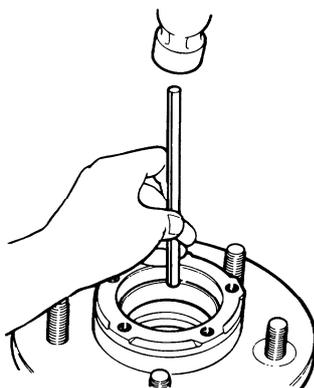


Figure 111 Bearing Cup Installation

- d. Install the new hub oil seal (Para 159).

Swivel Pin Housing

- 162. Removal.** Remove the swivel pin housing as follows:
- a. Drain the oil from the axle case into a suitable receptacle.
 - b. Remove the front hub assembly (Para 158).
 - c. Using the ball joint separator (Table 3, Serial 13), disconnect the left-hand side tie rod and drag link ball joints from the swivel housing steering arms.
 - d. Remove the six bolts and locking plate retaining the hub stub axle to the swivel housing (Figure 112).

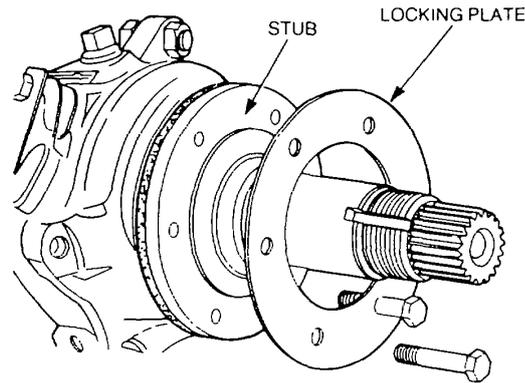


Figure 112 Stub Axle Removal

- e. Remove the stub axle and gasket from the swivel housing. Discard the gasket.
- f. Withdraw the drive shaft assembly from the axle.
- g. Remove the two bolts and washers retaining the upper swivel pin, the hose retaining bracket and the shims (Figure 113).

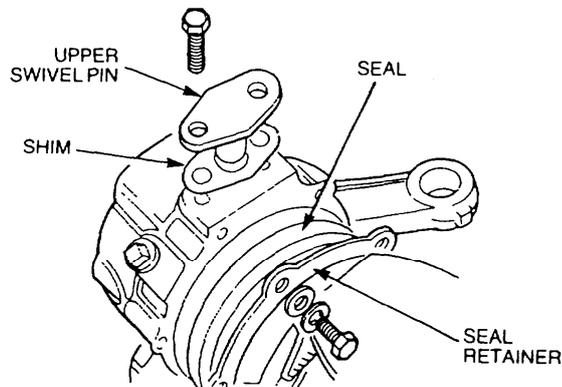


Figure 113 Swivel Housing Oil Seal Removal

- h. Remove the bolt securing the backing plate to the lower retaining bracket.
- i. Remove the two bolts and washers retaining the lower swivel pin and shims.
- j. Remove the swivel pin housing.
- k. Remove the six bolts retaining the bearing housing to the axle case (Figure 114) and remove the bearing housing.

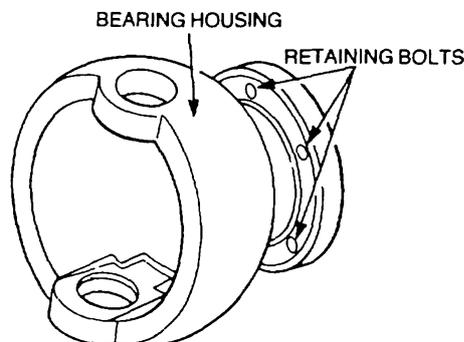


Figure 114 Bearing Housing Removal

- 163. Disassembly.** Disassemble the bearing housing as follows:
- a. Remove the oil seal from the bearing housing (Figure 115).
 - b. Using a suitable press, remove the lower bearing cup and upper bush housing.

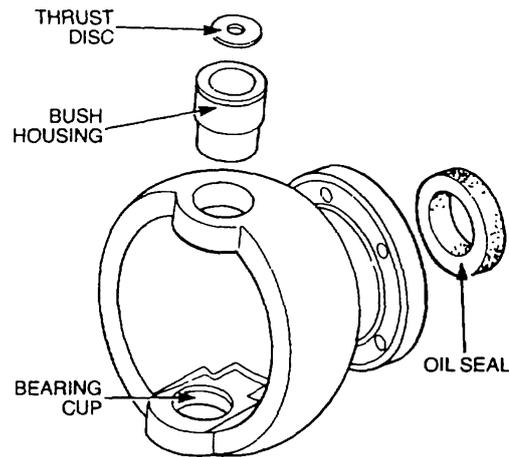


Figure 115 Bearing Housing Disassembly

- c. Using the adaptor (Table 3, Serial 9) and the impulse extractor (Table 3, Serial 10), remove the oil seal and bronze bush from the stub axle (Figure 116).

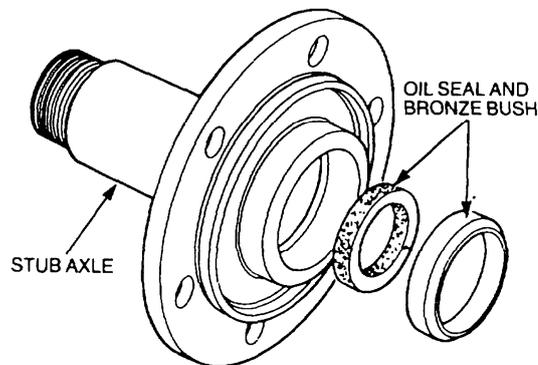


Figure 116 Stub Axle Oil Seal Removal

- 164. Cleaning and Inspection.** Clean and inspect the bearing housing as follows:

NOTE

Do not clean the upper swivel bush if it is to be used again. This will damage the characteristics of the bush and render it unusable.

- a. Clean all the components with the exception of the upper swivel bush with a suitable cleaning agent and blow them dry with compressed air.
 - b. Inspect the upper bush and housing (replace if necessary).
 - c. Ensure that the lower bearing is a push fit on the lower swivel pin.
 - d. Inspect the bearing for pitting, corrosion or excessive wear (replace if necessary).
 - e. Clean all trace of gasket material from the stub axle and bearing housing mating flanges.
- 165. Reassembly.** Reassemble the bearing housing as follows:
- a. Using a suitable press, install the oil seal and bronze bush in the stub axle. Ensure that the open face of the seal is toward the swivel housing.
 - b. Press the lower bearing cup, wide face first, into the bearing housing.
 - c. Press in the upper swivel bush with the machined flat towards the mounting flange.
 - d. Thoroughly lubricate the bush with clean oil.
 - e. Press the oil seal into the bearing housing, plain side first (Figure 115).
 - f. Smear grease around the seal lip.

166. Installation. Install the swivel pin housing as follows:

- a. Fit the swivel housing oil seal and seal retainer over the bearing housing flange. Ensure that the open face of the seal is toward the spherical face of the housing.
- b. Install the bearing housing and a new gasket onto the axle casing.
- c. Smear Loctite 275 on the threads of the bolts.
- d. Insert and tighten the bolts to 65–80 N.m (48–59 lbf.ft).
- e. Lubricate the lower roller bearing and thrust disc with oil.
- f. Install the bearing into the bearing housing cup and the thrust disc into the upper bush.
- g. Install the swivel pin housing onto the bearing housing.
- h. Insert the upper swivel pin and a new gasket.
- i. Secure the swivel pin and the backing plate bracket with the two bolts and new lock washers.
- j. Insert the upper swivel pin and original shims.
- k. Secure the pin and brake hose bracket with the two bolts and new lock washers.
- l. Tighten the upper pin bolts to 60–70 N.m (44–52 lbf.ft) and the lower pin bolts to 22–28 N.m (16–20 lbf.ft).
- m. Connect a spring balance to the steering arm ball-joint eye.
- n. Measure the resistance to rotation after the initial movement (Figure 117).
- o. Resistance must be 4.5–9 kg (10–20 lb).
- p. Adjustment can be achieved by adding or subtracting shims installed under the upper swivel pin.

NOTE

The shims range from 0.076, 0.127, 0.254, 0.762 mm (0.003, 0.005, 0.010, 0.030 in).

- q. When the resistance is within specification, remove the upper and lower pin retaining bolts.
- r. Apply Loctite 275 to the threads and install the bolts.

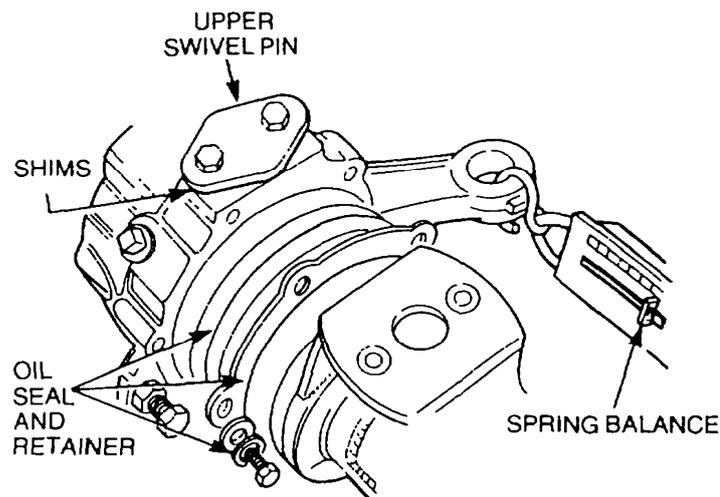


Figure 117 Measuring the Rotating Resistance

- s. Tighten the upper pin bolts to 60–70 N.m (44–52 lbf.ft) and the lower pin bolts to 22–28 N.m (16–21 lbf.ft).
- t. Repeat the rolling resistance check.
- u. Smear the swivel housing oil seal with grease, then install the seal and seal retaining plate.

- v. Install the six bolts and new lock washers (Figure 117).
- w. Tighten the bolts to 7–10 N.m (5–7 lbf.ft).
- x. Check that the seal wipes the spherical surface of the bearing housing.
- y. Install a new gasket and the stub axle onto the swivel pin housing.
- z. Apply Loctite 275 to the threads of the bolts.
- aa. Install the bolts and locking plate and tighten the bolts to 60–70 N.m (44–52 lbf.ft).
- bb. Connect the tie rod to the steering arm.
- cc. While applying pressure on the ball joint, tighten the nut securely and lock the nut in position with a new split pin.
- dd. Install the hub assembly (Para 157).
- ee. Fill the axle with oil to the correct level and grease the swivel pin housings with NSN 9150–99–911–1798, Grease, Automotive, 7XD, One Shot Cartridge.
- ff. Carry out the front wheel alignment (Para 257)

Drive Shaft

167. Removal. Remove the drive shaft as follows:

- a. Drain the oil from the axle case into a suitable receptacle.
- b. Remove the front hub assembly (Para 158).
- c. Remove the six bolts and locking plate retaining the hub stub axle to the swivel housing (Figure 118).
- d. Withdraw the drive shaft from the axle case.

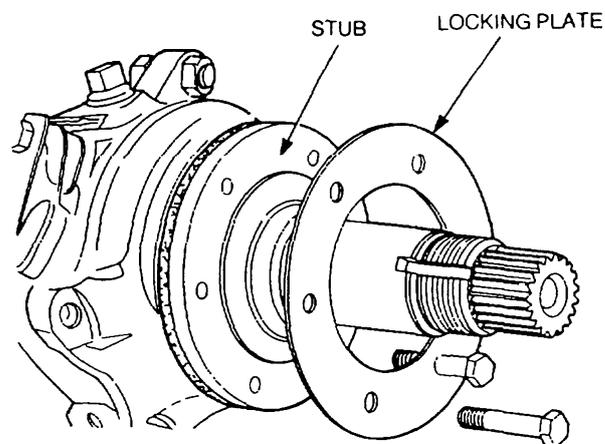


Figure 118 Stub Axle Removal

168. Disassembly. Disassemble the drive shaft as follows:

- a. Clamp the axle end of the shaft firmly in a vice fitted with soft-jawed protectors.
- b. Using a soft-faced hammer, remove the constant velocity joint from the shaft.
- c. Remove the circlip and collar from the shaft.
- d. Match mark the constant velocity joint inner and outer race to the cage.
- e. To remove the steel balls, tilt and swivel the cage then the inner race (Figure 119).

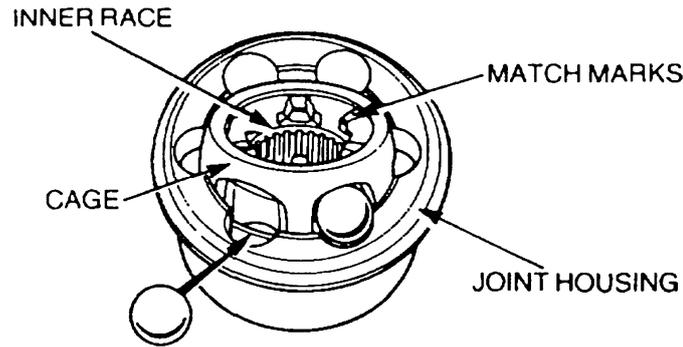


Figure 119 Constant Velocity Joint Steel Ball Removal

- f. Swivel the cage to line up with the axis of the constant velocity joint (Figure 120).
- g. Turn the cage until two opposite windows line up with two lands of the joint housing.
- h. Remove the cage.

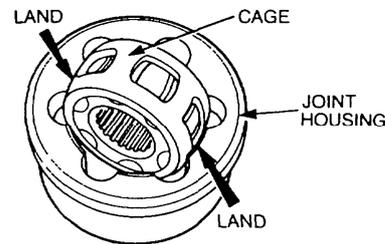


Figure 120 Constant Velocity Joint Cage Removal

- i. Turn the inner race at right angles to the cage with two of the lands opposite the cage windows.
- j. Remove the race (Figure 121).



Figure 121 Inner Race Removal

- 169. **Cleaning and Inspection.** Clean and inspect the drive shaft as follows:
 - a. Clean all the components with a suitable cleaning agent and blow them dry with compressed air.
 - b. Inspect all components for wear. Replace the complete assembly if any part is excessively worn.
- 170. **Reassembly.** Reassemble the drive shaft as follows:
 - a. Turn the inner race at right angles to the cage with two of the lands opposite the cage windows.
 - b. Insert the race (Figure 121).
 - c. Position the cage on the constant velocity joint (Figure 120).
 - d. Line up the two opposite windows with the two opposite lands then fit the cage.
 - e. Align the match marks made on the joint inner and outer race and the cage.
 - f. Tilt and swivel the cage to allow the steel balls to be inserted (Figure 119).
 - g. Fit the collar and circlip on the shaft.
 - h. Using a soft-faced hammer, install the constant velocity joint onto the shaft.
 - i. Check the drive shaft end float (The maximum permissible end float on the assembled constant velocity joint is 0.64 mm (0.025 in).

171. Installation. Install the drive shaft as follows:

- a. Using a new gasket, install the stub axle and locking plate.
- b. Apply Loctite 275 to the bolt threads.
- c. Install the bolts and tighten them to 60–70 N.m (44–52 lbf.ft).
- d. Install the hub assembly (Para 159).
- e. Fill the axle with oil to the correct level and grease the swivel pin housings with NSN 9150–99–911–1798, Grease Automotive, 7XD, One Shot Cartridge.

Swivel Pin to Bush Clearance

172. Inspection and Adjustment. Inspect and adjust the swivel pin to bush clearance in accordance with EMEI Vehicle G 188-1.

Breather Hose

173. Replacement. Replace the breather hose as follows:

- a. Clean the area around the breather with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the banjo bolt securing the breather hose to the front axle casing (Figure 122). Discard the sealing washers.

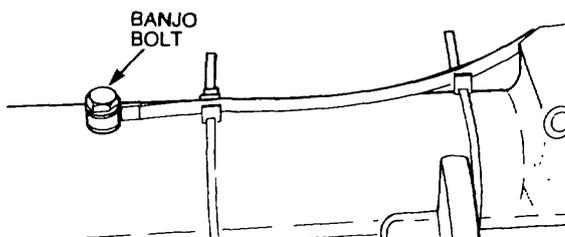


Figure 122 Front Axle Breather Hose Location

- c. Disconnect the hose from the securing clips on the left-hand radius arm.
- d. Remove the P-clip securing the hose to the chassis.
- e. Remove the P-clip securing the hose to the firewall.
- f. Remove the hose from the vehicle.
- g. Position the new hose along the chassis and up into the firewall.
- h. Using new sealing washers; fit the hose to the axle case and tighten the banjo bolt securely.
- i. Using the securing clips, secure the hose to the left-hand radius arm.
- j. Secure the hose to the chassis and firewall with the P-clips.

Front Axle System Specifications

174. The front axle system specifications are detailed in Table 16.

Table 16 Front Axle System Specifications

Serial	Specification	Measurement
1	Pinion flange nut tightening torque	94–163 N.m (70–120 lbf.ft)
2	Propeller shaft retaining nuts tightening torque	41–52 N.m (30–38 lbf.ft)
3	Hub bearing adjustment hub nut torque	10 N.m (7 lbf.ft)
4	Hub locknut torque	50 N.m (37 lbf.ft)
5	Hub driving flange retaining bolts tightening torque	60–70 N.m (44–52 lbf.ft)
6	Rotation resistance	4.5–9 kg (10–20 lb.)
7	Drive shaft end float	0.127–0.254 mm (0.005–0.010 in)
8	Front brake caliper retaining bolts tightening torque	82 N.m (60 lbf.ft)
9	Brake disc wear limit	13 mm (0.51 in)
10	Brake disc thickness(new)	13.97–14.22 mm (0.55–0.56 in)
11	Brake disc run-out	0.15 mm (0.005 in)
12	Swivel bearing housing tightening torque	65–80 N.m (48–59 lbf.ft)
13	Swivel pin (upper) tightening torque	60–70 N.m (44–52 lbf.ft)
14	Swivel pin (lower) tightening torque	22–28 N.m (16–21 lbf.ft)
15	Swivel pin housing rotation resistance	4.5–9 kg (10–20 lb)
16	Swivel pin housing seal retainer tightening torque	7–10 N.m (5–7 lbf.ft)
17	Constant velocity joint maximum end play	0.64 mm (0.025 in)

WHEELS

175. Wheel Balancing. Balance the wheels in accordance with EMEI Vehicle G 189-18

BRAKE SYSTEM

Master Cylinder

176. Removal. Remove the master cylinder as follows:

- a. Clean the area around the master cylinder with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the clamp securing the expansion tank (Figure 123) to the mounting bracket and place the tank on the right-hand mudguard.

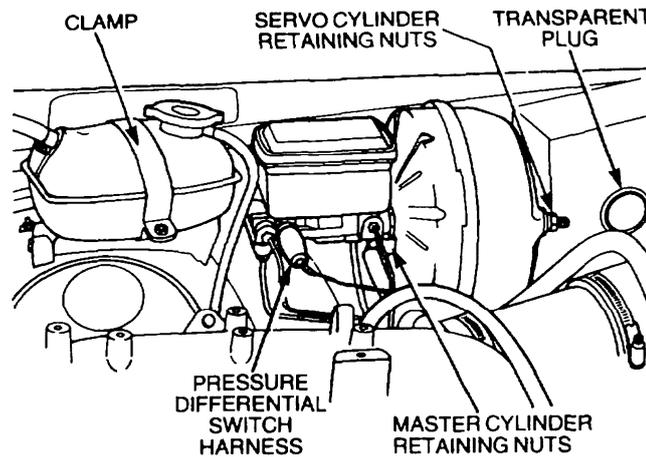


Figure 123 Servo Cylinder Removal

- c. Disconnect the wiring harness from the pressure differential switch.
 - d. Remove and plug the brake pipes from the master cylinder.
 - e. Remove the two nuts and spring washers securing the master cylinder to the brake servo cylinder. Discard the spring washers.
 - f. Remove the master cylinder and drain the brake fluid from it.
- 177. Installation.** Install the master cylinder as follows:
- a. Fit the master cylinder on the servo cylinder and install new spring washers.
 - b. Install the nuts but do not tighten them at this stage.
 - c. Remove the plugs and install the brake pipes on the master cylinder. (If necessary, move the master cylinder slightly to enable the connectors to be correctly fitted).
 - d. Tighten the master cylinder retaining nuts securely.
 - e. Connect the wiring harness to the pressure differential switch.
 - f. Install the expansion tank and secure the clamp.
 - g. Fill the master cylinder with clean hydraulic fluid.
 - h. Bleed the brake system (Para 209).

Servo Cylinder

178. Removal. Remove the servo cylinder as follows:

- a. Clean the area around the master cylinder with a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the master cylinder (Para 176).
- c. Remove and plug the vacuum hose from the servo cylinder.
- d. Remove the transparent plastic plugs from the pedal bracket.

- e. From inside the vehicle, remove the split pin securing the clevis to the pedal and discard the split pin.
- f. Withdraw the clevis pin through the pedal bracket.
- g. Remove the three nuts and washers securing the servo cylinder to the pedal bracket.
- h. Remove the servo assembly.

179. Installation. Install the servo cylinder as follows:

- a. Ensure that the distance from the centre of the clevis fork to the servo cylinder face is 110 mm for the early pedal box and 120 mm for the late pedal box (Figure 124).

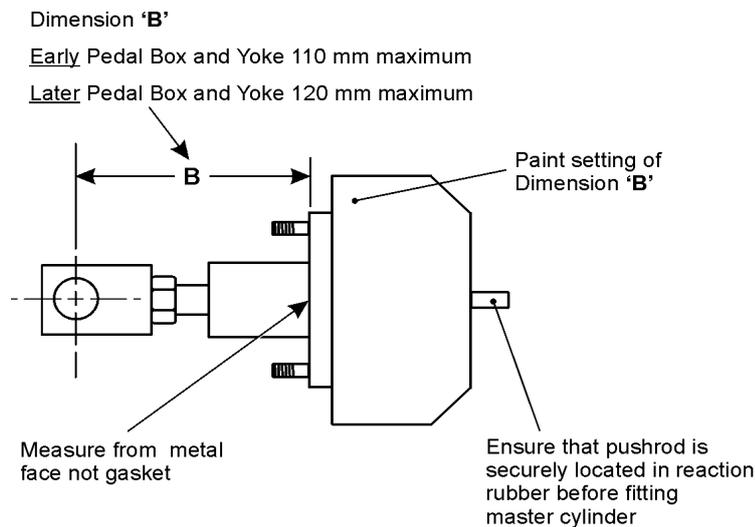


Figure 124 Servo Cylinder Input Rod Length

- b. Position the servo cylinder in the pedal bracket and install the three nuts and washers.
- c. Tighten the nuts securely.
- d. Ensuring that the push rod clevis fork is engaged with the brake pedal, insert the clevis pin through the pedal bracket opening.
- e. Secure it with a new split pin.
- f. Apply a smear of grease on the fork and clevis pin.
- g. Fit the transparent plastic covers.
- h. Connect the vacuum hose to the non-return valve.
- i. Secure it with the hose clamp.
- j. Install the master cylinder (Para 177).

Vacuum Tank

180. Removal. Remove the vacuum tank as follows:

- a. Remove the battery and battery cables (Para 268).
- b. Remove and plug the inlet hose and the overflow hose from the expansion tank.
- c. Remove the nut and bolt securing the clamp to the expansion tank and remove the expansion tank.
- d. Remove the power steering fluid reservoir (Para 259).
- e. Remove and plug the vacuum hose from the vacuum tank.
- f. Remove the four screws securing the vacuum tank to the right-hand inner wheel arch (Figure 125).
- g. Remove the vacuum tank from the engine compartment.

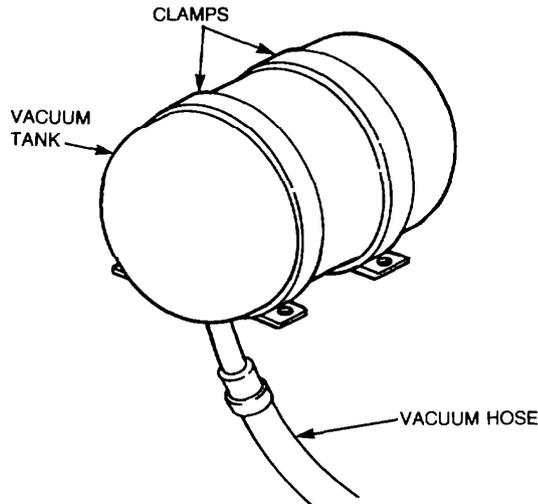


Figure 125 Vacuum Tank Removal

181. **Inspection.** Inspect the vacuum tank as follows:

- a. Check the outside of the vacuum tank for cracks or seam separation.
- b. Check that the clearance between the flexible brake vacuum hose and the front inboard corner of the battery carrier exceeds 15 mm (Figure 126). If the clearance is less than 15 mm carefully bend the steel vacuum pipe to lead the flexible hose towards the front of the vehicle.

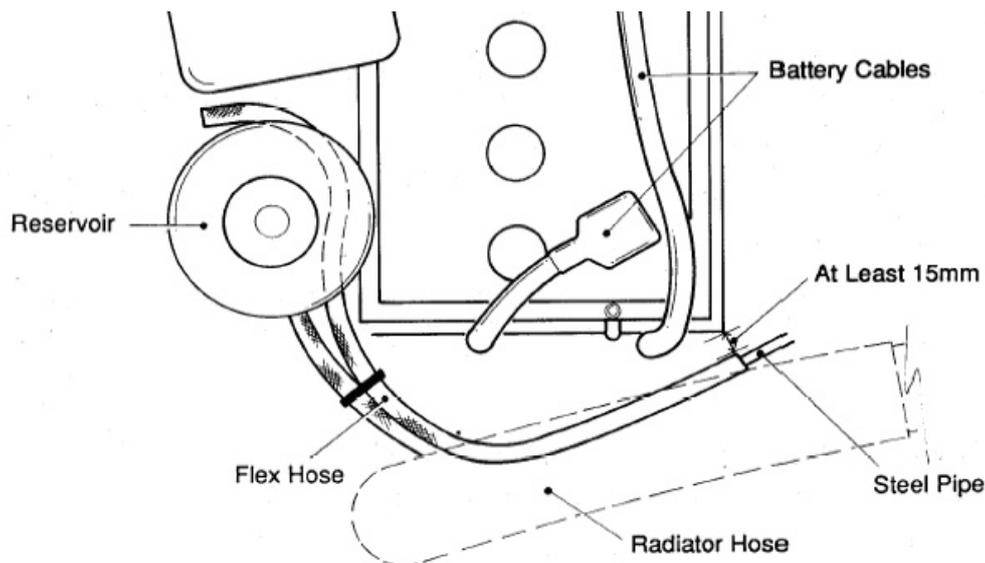


Figure 126 Rework of the Brake Vacuum Hose

182. **Installation.** Install the vacuum tank as follows:

- a. Connect the vacuum hose to the outlet on the vacuum tank and tighten the clamp securely.
- b. Position the clamps for the vacuum tank and secure them to the right-hand inner wheel arch with the four screws.
- c. Position the clamp around the expansion tank and secure it with the nut and bolt.
- d. Connect the inlet and overflow hoses to the expansion tank and tighten the clamps securely.
- e. Fill the expansion tank to the correct level and install the cap.
- f. Install the power steering fluid reservoir (Para 260).
- g. Start the engine and check for air leaks (rectify if necessary).

Front Brake Caliper and Pads

NOTE

Brake disc pads must only be replaced as an axle set not as one side only.

183. Removal. Remove the front brake caliper and pads as follows:

WARNING

Do not use an air line to remove dust from the brake assembly. Dust from the brake linings can be a health risk if inhaled.

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

NOTE

Brake disc pads must only be replaced as an axle set not as one side only.

- a. Loosen the front wheel nuts.
- b. Chock the rear wheels.
- c. Using a suitable hydraulic jack, raise the front of the vehicle and place axle stands beneath the front axle.
- d. Lower the vehicle on to the stands.
- e. Remove the front wheels.
- f. Loosen the flexible hose locknut and remove the pipe from the slotted retaining bracket.
- g. Remove the disc pad retaining pins and remove the retaining springs and pads (Figure 127).
- h. Remove the two bolts securing the brake caliper to the swivel housing.
- i. Remove the caliper from the disc.

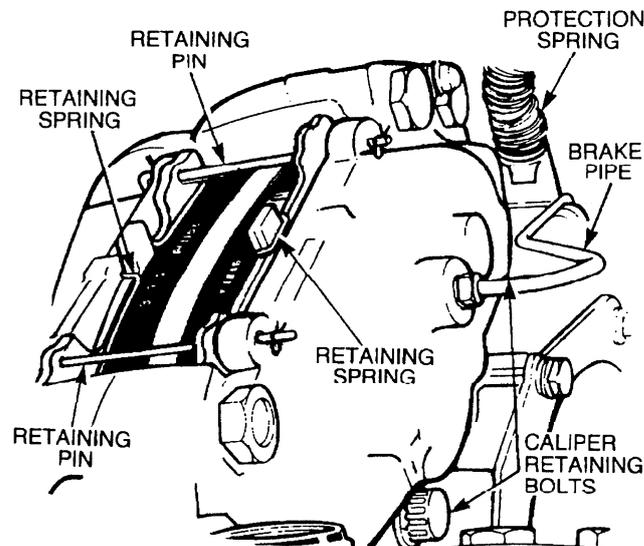


Figure 127 Brake Caliper Removal

184. **Disassembly.** Disassemble the front brake callipers as follows:



Do not separate the two halves of the caliper. The piston seals can be replaced without splitting the caliper.

- a. Thoroughly clean the caliper with a suitable cleaning agent and allow it to dry.
- b. Install the disc brake piston compressor (Table 3, Serial 12) to retain both the pistons in the mounting flange half of the caliper (Figure 128).

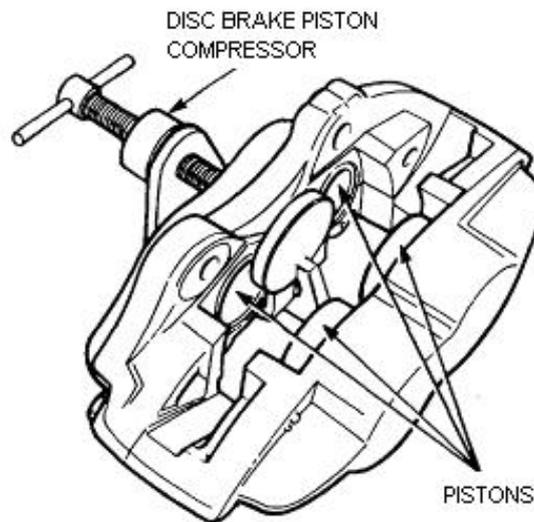


Figure 128 Securing the Pistons

WARNING

Keep fingers clear when expelling the pistons from the caliper. Pistons are expelled at high speed and will cause injuries to personnel.

- c. Apply air pressure to the fluid inlet port to expel the rim half pistons.
 - d. Mark the pistons internally to identify them with their respective bores.
 - e. Remove the wiper seal retainer by inserting a blunt screwdriver between the retainer and the seal.
 - f. Prise the retainer carefully from the mouth of the bore.
 - g. Taking care not to damage the seal grooves, remove the wiper seal and fluid seal.
 - h. Repeat the actions as detailed in sub-paragraphs c to e to remove the pistons from the mounting half of the caliper.
185. **Cleaning and Inspection.** Clean and inspect the front brake callipers (Figure 129)
- a. Using a suitable cleaning agent, thoroughly clean the bores, pistons and particularly the seal grooves and allow them to dry.
 - b. Check the pistons and caliper bores for corrosion and scoring (replace parts as necessary).

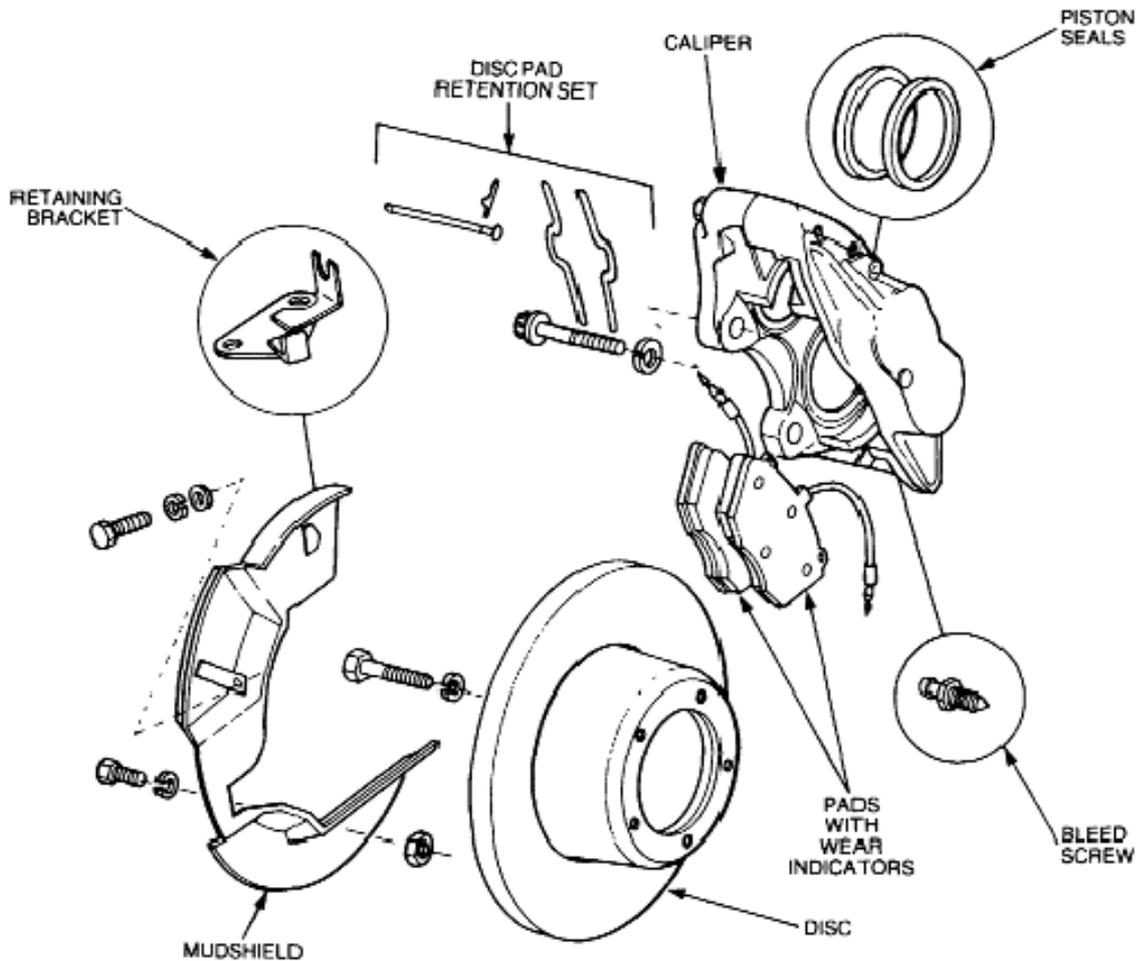


Figure 129 Brake Caliper Exploded View

186. Reassembly. Reassemble the front brake calipers as follows:

NOTE

The fluid seal and groove are not the same in section. This is so the seal feels proud to the touch when it is seated at the edge furthest away from the mouth of the bore.

- a. Smear the new fluid seal with Dow Corning 44 Silicone grease, or equivalent.

NOTE

Do not lift the piston during installation. Leave approximately 8 mm (5/16 in) projecting from the bore.

- b. Insert the seal into the groove, using fingers only and ensure that the seal is properly seated.
- c. Loosen the bleed screw one complete turn.
- d. Smear the appropriate piston with Dow Corning 44 Silicone grease, or equivalent.
- e. Insert it squarely into the bore by hand only.
- f. Smear the new wiper seal with the Dow Corning 44 Silicone grease or equivalent and fit it into a new seal retainer.
- g. Slide the assembly, seal-side first, over the protruding piston and into the bore recess.
- h. Remove the disc brake piston compressor (Table 3, Serial 12) from the mounting half of the caliper.
- i. Use the compressor to press home the seal retainer and piston.
- j. To install the rest of the pistons repeat the procedure.

- k. Tighten the bleed screw.
- l. Install the disc pads into the caliper.
- m. Fit the two retaining springs and pins.

187. Installation. Install the front brake caliper as follows:

- a. Fit the caliper to the swivel housing.
- b. Smear Loctite 271 or equivalent on the bolt threads.
- c. Install the bolts and new spring washers and tighten them to 82 N.m (60 lbf.ft).
- d. Install the brake pipe to the slotted retaining bracket and tighten the locknut.
- e. Bleed the brake system (Para 209).
- f. Install the wheels and wheel nuts.
- g. Raise the vehicle off the stands. Remove the stands and lower the vehicle to the ground.
- h. Tighten the wheel nuts and remove the wheel chocks.

Front Brake Disc

188. Removal. Remove the front brake disc as follows:

WARNING

Do not use an air line to remove dust from the brake assembly. Dust from the brake linings can be a health risk if inhaled.

- a. Remove the caliper (Para 183).
- b. Remove the hub assembly (Para 158).
- c. Matchmark the hub to the disc.
- d. Remove the five bolts and spring washers. Discard the spring washers.
- e. Separate the hub from the disc.

189. Cleaning and Inspection. Clean and inspect the front brake disc as follows::

- a. Clean the disc with a suitable cleaning agent and allow it to dry.
- b. Check the disc for corrosion, scoring and cracks (replace as necessary).
- c. Measure the thickness of the disc. If it is less than 13 mm (0.51 in), replace the disc.

190. Installation. Install the brake disc as follows:

- a. Fit the disc on the hub (align the matchmarks if re-using the original disc).
- b. Smear Loctite 271 or equivalent on the bolt threads.
- c. Install the bolts with new spring washers.
- d. Tighten the bolts to 50 N.m (38 lbf.ft).
- e. Install the hub assembly (Para 159).
- f. Install the caliper (Para 187).

Parking Brake

191. **Removal.** Remove the park brake as follows:

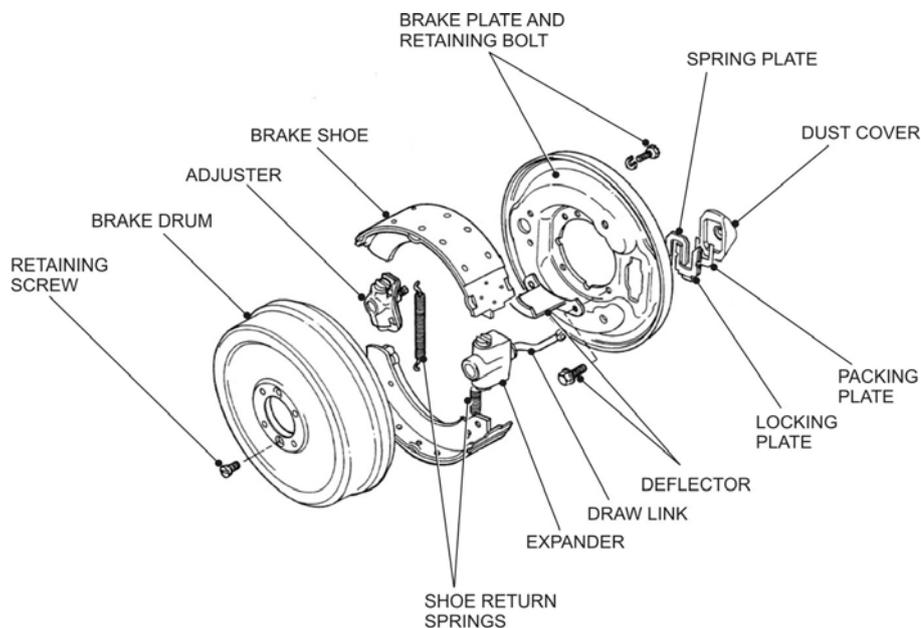
WARNING

Under no circumstances is compressed air to be used to remove dust from the hand brake drum or brake linings. Dust from the brake linings can be a health risk if inhaled.

WARNING

New gaskets provided by Land Rover do not contain asbestos. Older gaskets still fitted to vehicles may contain asbestos. During this task some parts may contain asbestos; refer and comply with procedures and warnings in the introduction section of this EMEI under paragraph heading: Items Previously Known To Have Contained Asbestos.

- a. Chock the wheels and disconnect the battery.
- b. Remove the bolts and locknuts securing the propeller shaft. Discard the locknuts.
- c. Remove the propeller shaft.
- d. Remove the two screws retaining the transmission brake drum and remove the drum (Figure 130).
- e. Remove the brake shoes, noting the position of the shoe return springs.



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Figure 130 Parking Brake Exploded View

192. **Disassembly.** Disassemble the park brake as follows:

- a. Remove the split pin and clevis pin from the draw link and discard the split pin.
- b. Remove the expander unit dust cover and fixing plates.
- c. Remove the expander.
- d. Remove the spring clip from the expander and remove the pistons and rollers.

- e. Remove the draw link from the expander.
- f. Remove the two bolts and spring washers securing the adjuster to the back plate. Discard the spring washers.
- g. Remove the adjuster.
- h. Remove the plungers and screw the adjuster cone inwards.
- i. Remove the cone from the housing (Figure 131).

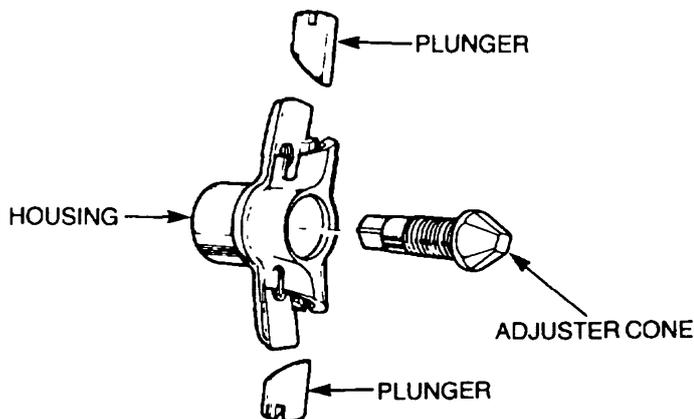


Figure 131 Adjuster Exploded View

- 193. Cleaning and Inspection.** Clean and inspect the park brake as follows:
- a. Clean all components with a suitable cleaning agent and allow to them dry.
 - b. Inspect all parts for wear and replace if necessary.
 - c. Check the drum for cracks or scoring and replace if necessary.
 - d. Inspect the brake shoes for loose, cracked or excessively worn linings and replace if necessary.
- 194. Reassembly.** Reassemble the park brake as follows:
- a. Smear the adjuster cone with grease and screw the adjuster cone fully into the housing.
 - b. Smear the plungers with grease and insert them into the adjuster ensuring that the chamfered ends align with the adjuster cone. Use an elastic band to prevent the plungers falling out.
 - c. Smear the expander with grease and insert the draw link in the expander.
 - d. Smear the plungers and rollers with grease and insert them into the expander ensuring the highest end of the ramp on the plunger is fitted toward the draw link.
 - e. Install the spring clip.
- 195. Installation.** Install the park brake as follows:
- a. Fit the adjuster to the back plate.
 - b. Install the two bolts and new spring washers.
 - c. Install the expander to the back plate and fit the spring, packing and locking plates.
 - d. Install the dust cover.
 - e. Connect the draw link clevis and secure it with a new split pin.

NOTE

The fully lined end of the lower shoe must be toward the expander housing. The fully lined end of the upper shoe must be toward the adjuster housing.

- f. Fit the shoe return springs on the brake shoes.
- g. Install the shoes onto the back plate.

- h. Install the brake drum and secure it with the two screws.
- i. Turn the adjuster in until the shoes are tight against the brake drum.
- j. Tighten the adjuster mounting bolts securely.
- k. Loosen off the adjuster half a turn and give the parking brake a firm application to centralise the shoes.
- l. Release the brake and ensure the drum is free to rotate.
- m. Fit the rear propeller shaft flange to the rear output shaft flange, using new locknuts. Tighten them to 43–51 N.m (32–38 lbf.ft).
- n. Apply the parking brake, connect the battery and remove the wheel chocks.

196. Adjustment. Adjust the park brake as follows:

- a. Chock the vehicle wheels.
- b. Release the parking brake lever.
- c. Screw in the adjuster (Figure 132), until the brake shoe is tight up against the brake drum.
- d. Loosen off the adjuster half a turn and ensure the drum is free to rotate.
- e. If not, apply the parking brake a few times to centralise the brake shoes and then repeat the procedure.
- f. Apply the parking brake.
- g. Remove the wheel chocks.

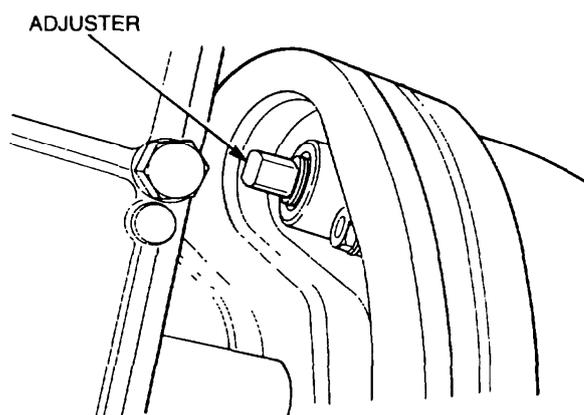


Figure 132 Parking Brake Adjustment

Parking Brake Cable

197. Replacement. Replace the park brake cable as follows:

- a. Chock the wheels.
- b. Remove the split pin and clevis pin securing the cable to the pivot under the vehicle (Figure 133). Discard the split pin.

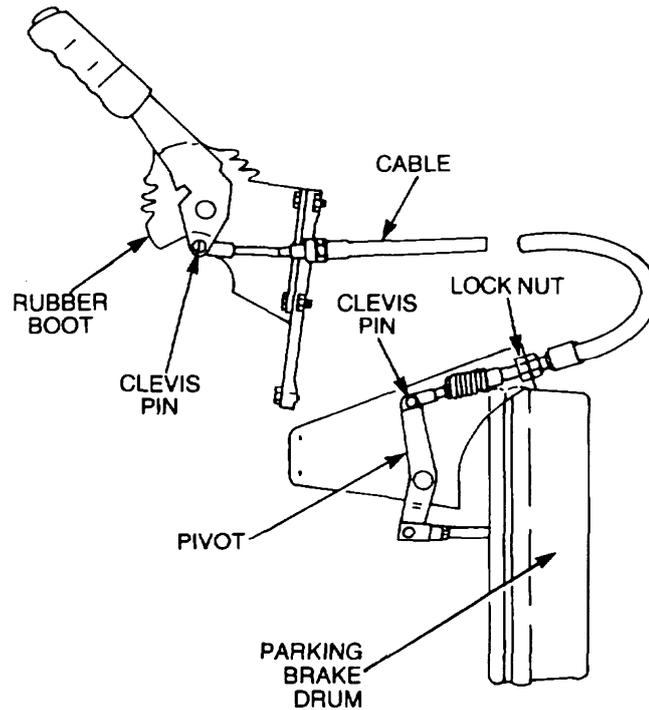


Figure 133 Parking Brake Cable Replacement

- c. Loosen the locknuts securing the brake cable to the transmission bracket.
- d. Remove the cable from the transmission bracket.
- e. Remove the end nut from the cable and withdraw the cable from the bracket.
- f. Remove the screws securing the rubber boot to the seat base.
- g. Remove the split pin and clevis pin from the hand brake lever. Discard the split pin.
- h. From under the vehicle, unscrew the cable from the seat base.
- i. Remove the cable from the vehicle.
- j. Screw in the new cable and tighten it securely.
- k. Connect the clevis fork on the parking brake lever and secure it with a new split pin.



Ensure that the parking brake cable does not loop right from the handbrake lever heelboard, subsequently curling over the right hand fuel tank and down to the transmission bracket. It will rub on fuel lines and may cause a fire.

- l. Fit the cable so that it loops left from the handbrake lever heelboard curling right to the transmission bracket as depicted in Figure 134.

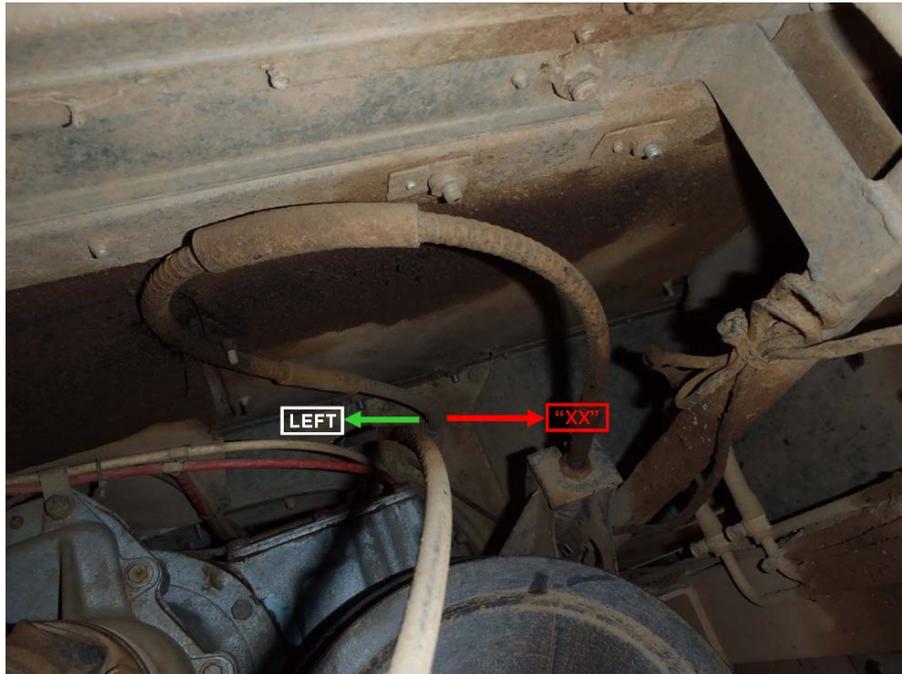


Figure 134 Parking Brake Cable Route

- m. Fit the cable on the transmission bracket.
- n. Using the two nuts on the cable, adjust the cable until the clevis fork is aligned with the pivot and the clevis pin can be installed.
- o. Secure the clevis fork to the pivot with the clevis and a new split pin.
- p. Apply the parking brake and remove the wheel chocks.
- q. Install the rubber boot and secure it to the seat base.
- r. Adjust the parking brake (Para 196).

Rear and Intermediate Pads and Calipers

198. Removal. Remove the rear and intermediate pads and calipers as follows:

WARNING

Do not use an air line to remove dust from the brake assembly. Dust from the brake linings can be a health risk if inhaled.

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a. Clean the area around the axle hubs and calipers using a suitable cleaning agent and allow them to dry.
- b. Chock the front wheels.
- c. Loosen the wheel nuts on the rear and intermediate wheels.
- d. Using a suitable hydraulic jack, raise the rear of the vehicle and position axle stands beneath the rear and intermediate axles lower the vehicle onto the stands.
- e. Remove the wheel nuts and the wheels.

- f. Disconnect and plug the brake pipe from the caliper.
- g. Remove the disc pad retaining pins from the caliper (Figure 135).

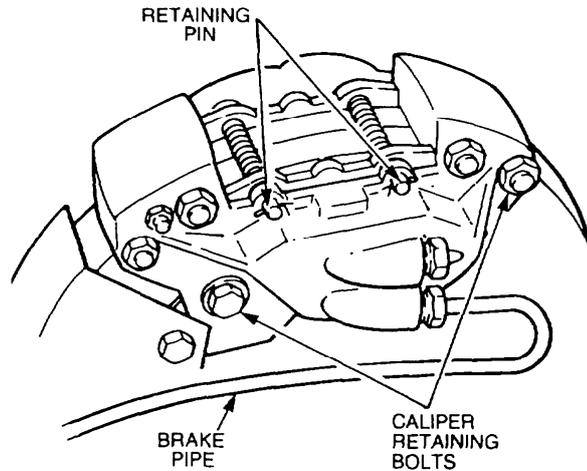


Figure 135 Brake Caliper Removal

- h. Remove the anti-rattle spring and the pads.
 - i. Remove the two bolts and lock washers securing the brake caliper to the axle housing. Discard the lock washers.
 - j. Remove the caliper from the disc.
199. **Disassembly.** Disassemble the rear and intermediate brake calipers as follows:



Do not separate the two halves of the caliper. The piston seals can be replaced without splitting the caliper.

- a. Clean the caliper using a suitable cleaning agent and allow it to dry.
- b. Install the disc brake piston compressor (Table 3, Serial 12) to retain both the pistons in the mounting flange half of the caliper (Figure 136).

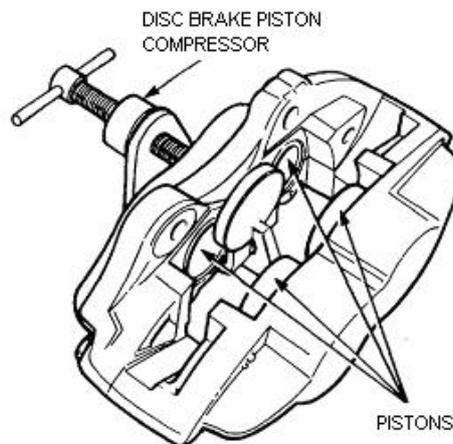


Figure 136 Securing the Pistons

WARNING

Keep fingers clear when expelling the pistons from the caliper. Pistons are expelled at high speed and will cause injuries to personnel.

- c. Apply air pressure to the fluid inlet port to expel the rim half pistons.
- d. Mark the pistons internally to identify them with their respective bores.
- e. Remove the wiper seal retainer by inserting a blunt screwdriver between the retainer and the seal.
- f. Prise the retainer carefully from the mouth of the bore.
- g. Taking care not to damage the seal grooves, remove the wiper seal and fluid seal.
- h. Repeat the process to remove the remaining pistons from the mounting half of the caliper.

200. Cleaning and Inspection. Clean and inspect the brake calipers (Figure 137) as follows:

- a. Clean the bores, pistons and particularly the seal grooves with a suitable cleaning agent and allow them to dry.
- b. Check the pistons and caliper bores for corrosion and scoring (replace parts as necessary).

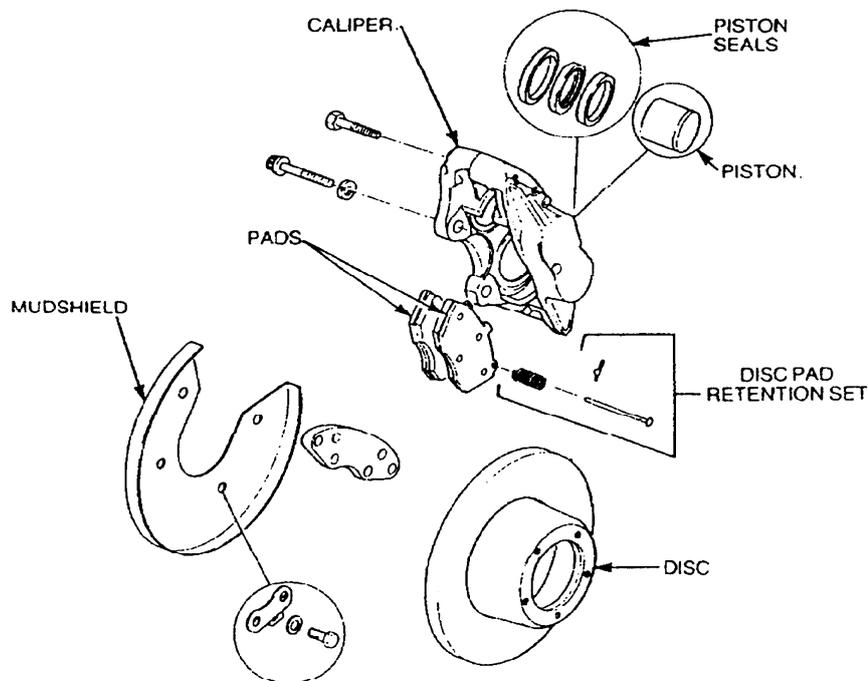


Figure 137 Brake Caliper Exploded View

201. Reassembly. Reassemble the rear and intermediate brake calipers as follows:

NOTE

The fluid seal and groove are not the same in section. This is so the seal feels proud to the touch when it is seated at the edge furthest away from the mouth of the bore.

- a. Smear the new fluid seal with Dow Corning 44 Silicone grease or equivalent.
- b. Insert the seal into the groove (Figure 138) using the fingers only and ensure that the seal is properly seated.

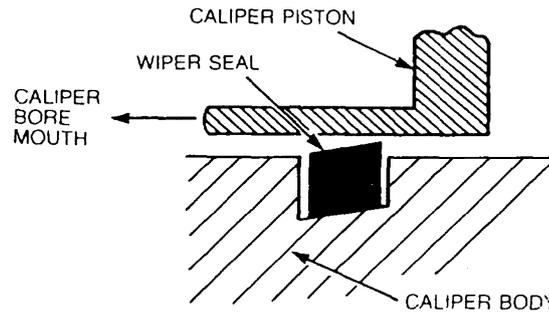


Figure 138 Fluid Seal Installation

NOTE

Do not tilt the piston during installation. Leave approximately 8 mm projecting from the bore to facilitate replacement of the wiper seal.

- c. Loosen the bleed screw one complete turn.
 - d. Smear the appropriate piston with Dow Corning 44 Silicone grease, or equivalent, and insert it squarely into the bore by hand.
 - e. Smear the new wiper seal with the Dow Corning 44 Silicone grease, or equivalent, and fit it into a new seal retainer.
 - f. Slide the assembly, seal side first, over the protruding piston and into the bore recess.
 - g. Remove the disc brake piston compressor (Table 3, Serial 12) from the mounting half of the caliper and use the clamp to press home the seal retainer and piston.
 - h. Repeat the process to install the remaining pistons in the mounting half of the caliper.
 - i. Tighten the bleed screw.
 - j. Install the disc pads into the caliper.
 - k. Fit the two retaining springs and pins.
- 202. Installation.** Install the rear and intermediate brake pads and calipers as follows:
- a. Ensure that the brake disc is free from oil and grease.
 - b. Apply loctite 242 or equivalent to the caliper retaining bolts and install them.
 - c. Tighten the bolts to 120–150 N.m (89–110 lbf.ft).
 - d. Fit the brake hose to the caliper.
 - e. Bleed the brake system (Para 209).

Rear and Intermediate Brake Disc

- 203. Removal.** Remove the rear and/or intermediate brake disc as follows:

WARNING

Do not use an air line to remove dust from the brake assembly. Dust from the brake linings can be a health risk if inhaled.

- a. Remove the brake caliper and pads (Para 198).
- b. Remove the hub cap from the hub and the circlip from the drive shaft.
- c. Remove the five bolts and spring washers securing the driving flange to the hub. Discard the spring washers.
- d. Remove the driving flange and the gasket. Discard the gasket.

- e. Remove all trace of gasket material.
- f. Remove the hub locknut using the hub adjusting spanner (Table 3, Serial 6).
- g. Remove the lock washer, the adjusting nut and the keyed washer.
- h. Remove the hub and disc assembly.
- i. Matchmark the disc to the hub.
- j. Remove the five bolts and remove the disc from the hub.

204. Cleaning and Inspection. Clean and inspect the brake disc as follows::

- a. Clean the disc with a suitable cleaning agent and allow it to dry.
- b. Check the disc for corrosion, scoring and cracks (replace as necessary).
- c. Measure the thickness of the disc. If it is less than 13 mm (0.51 in), replace the disc.

205. Installation. Install the rear and/or intermediate brake disc as follows:

- a. Fit the disc on the hub (align the matchmarks if using the original disc).
- b. Apply Loctite 275, or equivalent, to the bolts and install them with new spring washers.
- c. Tighten the bolts to 65–80 N.m (48–59 lbf.ft).
- d. Fit the hub on the stub axle.
- e. Install the keyed washer and the adjusting nut (Figure 139).
- f. Spin the hub to settle the bearings and tighten the adjusting nut by hand until there is no end float.
- g. Back off the hub nut 90 degrees, then tighten it to 10 N.m (7 lbf.ft.).
- h. Fit a new lock washer.
- i. Install the locknut and tighten it to 50 N.m (37 lbf.ft). Tab over the lock washer.
- j. Install the driving flange with a new gasket ensuring the splines are aligned with those on the drive shaft.

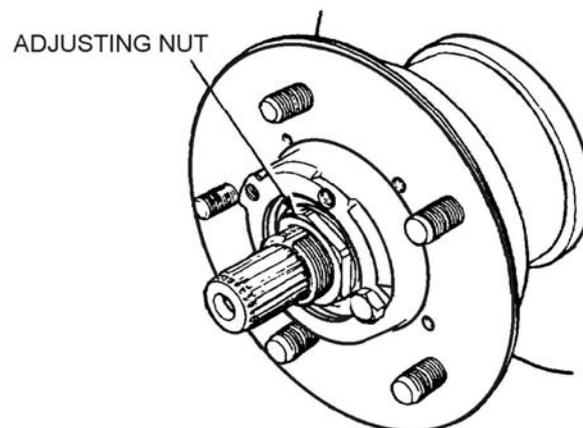


Figure 139 Hub Bearing Adjusting Nut

- k. Fit each bolt with a new spring washer; then apply Loctite 271, or equivalent, to the bolts.
- l. Install the bolts and tighten them to 60–70 N.m (44–52 lbf.ft).
- m. Install the drive shaft shim and secure it with the circlip.
- n. Install the hub cap securely.
- o. Install the calipers (Para 202).

Pedal Free Travel

206. Inspection. Inspect the pedal free travel as follows:

- a. Open the bonnet.
- b. Tag and remove the wires from the stop light switch located at the rear of the scuttle.
- c. Remove the switch.
- d. Manufacture a shim as detailed in Figure 140.
- e. Depress the brake pedal slightly and position the shim between the brake pedal and the brake light switch box (Figure 140).

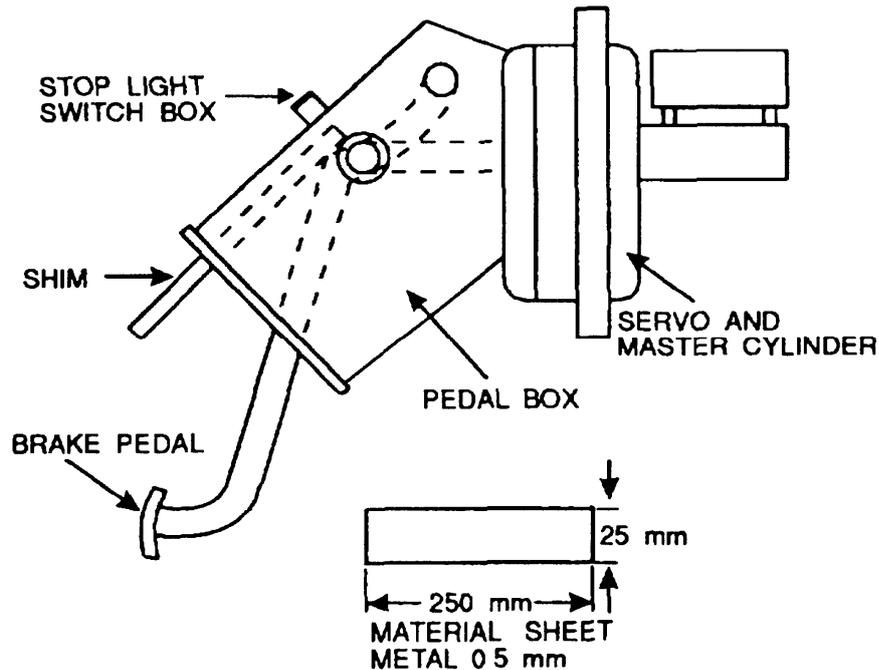


Figure 140 Pedal Free Travel Inspection

- f. Holding the shim in position, release the brake pedal and allow it to come to rest against the stop (the stop is inside the servo and cannot be adjusted).
 - g. Release the shim.
 - h. If the shim falls out, the brake system is set correctly.
 - i. If the shim is trapped and has to be pulled out, adjust the brake pedal free travel (Para 207).
 - j. If the system is correctly set, refit the stop light switch and tighten the locknut.
 - k. Reconnect the wires, ensuring that the green and green/purple wires only, are connected to the switch.
 - l. Check the brake light operation (rectify as necessary).
 - m. Close the bonnet.
- 207. Adjustment.** Adjust pedal free travel as follows:
- a. Open the bonnet and remove the two plastic plugs on the sides of the pedal box.
 - b. Remove the split pin from the clevis pin.
 - c. Remove the clevis pin from the yoke.
 - d. Remove the clamp securing the radiator expansion tank to the mounting bracket.
 - e. Place the tank on the right-hand mudguard.

NOTE

It is not necessary to remove any brake pipes from the master cylinder.

- f. Remove the two nuts and washers securing the master cylinder to the servo.
- g. Remove the brake pipes from the plastic clip on the scuttle.
- h. Withdraw the master cylinder until it clears the servo cylinder.
- i. Remove the three nuts and washers securing the servo cylinder to the pedal box.
- j. Remove the servo cylinder.
- k. Loosen the yoke locknut.

NOTE

This dimension is measured from the servo mounting face and not the recess at the base of the push rod guide.

- l. Measure and set the input rod length to the required dimensions (Figure 141). Tighten the yoke locknut.

Dimension 'B'

Early Pedal Box and Yoke 110 mm maximum

Later Pedal Box and Yoke 120 mm maximum

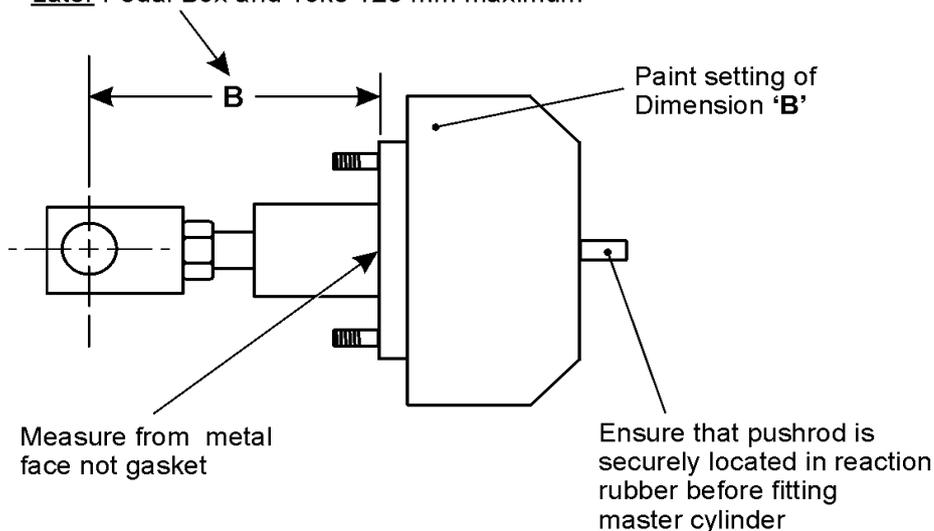


Figure 141 Servo Cylinder Input Rod Length

- m. Position the servo cylinder at the pedal box and secure it with the three nuts and washers.
- n. Position the master cylinder at the servo cylinder and secure it with the two washers and nuts.
- o. Secure the brake pipes in the plastic clip at the scuttle.
- p. Install the clevis pin and secure it with a new split pin.
- q. Install the two plastic plugs to the side of the pedal box.
- r. Install the expansion tank and secure it with the clamp.

NOTE

After resetting the input push rod there will be some spring pre-load between the master cylinder and the servo cylinder. No attempt should be made to place shims between the master cylinder and the servo cylinder.

- s. Check the brake pedal free travel (Para 206).
- t. Check the brake operation and the operation of the stop lights.

Hydraulic Hoses and Pipes

208. Replacement. Replace the hoses and pipes as follows:

- a.** Clean the area around the brake pipe with a suitable cleaning agent,.
- b.** Disconnect and plug the hose or pipe at both connections.
- c.** Remove the clips securing the rear brake pipe to the axle.
- d.** Release the hose or pipe from the chassis plastic clips and remove the pipe from the vehicle.
- e.** Position the new hose or pipe onto the vehicle and secure it with the chassis plastic clips or band clamps.
- f.** Remove the plugs, then connect and tighten both connections securely.
- g.** Bleed the brake system (Para 209).

Bleeding the Brake System

209. Bleeding. Bleed the brake system in accordance with EMEI Vehicle A 459-2.

Brake System Specifications

210. The brake system specifications are detailed in Table 17.

Table 17 Brake System Specifications

Serial	Specification	Measurement
1	Servo cylinder push rod length	110 mm (early pedal box)
		120 mm (late pedal box)
2	Servo cylinder push rod length	106–108 mm (4.1–4.2 in)
3	Disc to hub retaining bolts tightening torque	50 N.m (38 lbf.ft)
4	Rear wheel cylinder bleed screw tightening torque	5–8 N.m (4–6 lbf.ft)
5	Rear propeller shaft flange nuts tightening torque	43–51 N.m (32–38 lbf.ft)
6	Front brake caliper retaining bolts tightening torque	82 N.m (60 lbf.ft)
7	Disc pad minimum thickness	3.0 mm (0.125 in)
8	Brake disc wear limit	13 mm (0.51 in)
9	Brake disc thickness (new)	13.97–14.22 mm (0.55–0.56 in)
10	Brake disc run-out	0.15mm (0.005 in)
11	Rear and intermediate retaining bolts tightening torque	65–80 N.m (48–59 lbf.ft)
12	Rear and intermediate hub driving flange retaining bolts tightening torque	60–70 N.m (44–52 lbf.ft)
13	Rear and intermediate brake caliper retaining bolts tightening torque	120–150 N.m (89–110 lbf.ft)

Brake System Fault Finding

211. The brake system fault finding is detailed in Table 18.

Table 18 Brake System Fault Finding

Serial	Symptom	Probable Cause	Action
1	Brake Fade	Incorrect linings	Replace shoes
		Badly lined shoes	Replace shoes
		Distorted shoes	Replace shoes
		Overloaded vehicle	Check vehicle weight
		Old hydraulic fluid	Replace hydraulic fluid
		Excessive braking	Avoid excessive braking
2	Spongy pedal	Air in system	Bleed hydraulic system
		Badly lined shoes	Replace shoes
		Distorted shoes	Replace shoes
		Faulty drums	Replace drums
		Faulty master cylinder mounting	Check master cylinder mounting
3	Long pedal travel	Faulty calipers	Replace calipers
		Brakes require adjustment	Adjust brakes
		Hydraulic fluid leak	Tighten all connections
		Fluid contamination	Replace hydraulic fluid
		Faulty master cylinder	Replace master cylinder
4	Brakes binding	Incorrect adjustment	Adjust brakes
		Incorrect pedal free play	Adjust push rod clevis
		Faulty calipers	Replace calipers
		Faulty servo cylinder	Replace servo
		Faulty master cylinder	Replace master cylinder
		Rear shoe pull-off springs faulty	Replace springs
5	Hard pedal, poor braking	Linings faulty	Replace shoes
		Faulty servo cylinder	Replace servo
		Faulty calipers	Replace calipers
		Faulty shock absorbers	Replace shock absorbers
		Contaminated brake linings	Rectify fault
8	Disc brakes squeal	Worn retaining pins	Replace pins
		Worn discs	Replace discs
9	Uneven or excessive pad wear	Faulty disc	Replace disc
		Faulty pads	Replace pads
		Incorrect hub end-float	Rectify

Table 18 Brake System Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
6	Brakes pulling	Faulty calipers	Replace calipers
		Faulty wheel cylinders	Replace wheel cylinders
		Faulty linings	Replace shoes
		Faulty drums	Replace drums
		Loose calipers	Tighten calipers
		Tyres faulty	Replace tyres
		Faulty steering linkage	Rectify fault
7	Low fluid level	Worn disc pads	Replace pads
		Fluid leak	Rectify leak
		Faulty servo	Replace servo

SUSPENSION

Front Shock Absorbers

NOTE

Shock absorbers are to be replaced as an axle set.

212. Removal. Remove the front shock absorbers as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a. Loosen the front wheel nuts.
- b. Chock the rear wheels and engage the transmission differential lock.
- c. Using a suitable hydraulic jack, raise the front of the vehicle and support it on axle stands, positioned beneath the front axle.
- d. Remove the wheel nuts and wheels.
- e. Remove the nut securing the shock absorber to the axle casing (Figure 142).
- f. Remove the lower cup washer, rubber bush and seating washer.

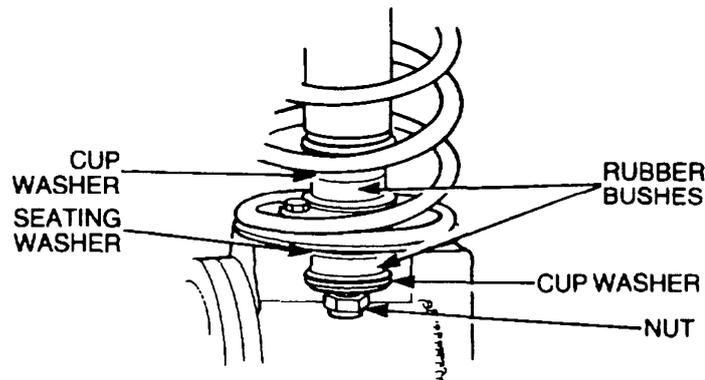


Figure 142 Front Shock Absorber Removal

- g. Remove the nuts and lock washers securing the shock absorber bracket to the chassis rail bracket (Figure 143).
- h. Withdraw the bracket and the shock absorber.

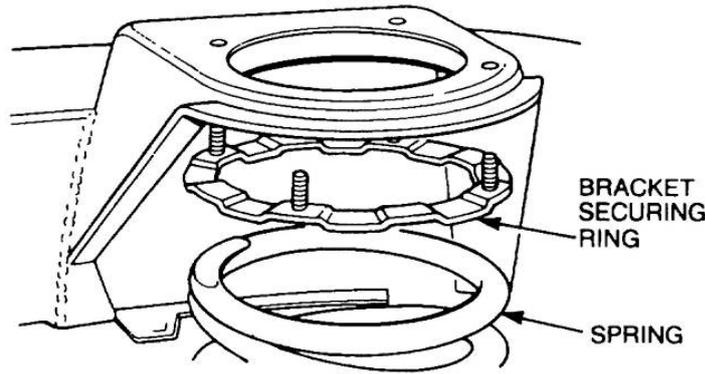


Figure 143 Front Shock Absorber Bracket Removal

- i. Remove the nuts securing the shock absorber to the bracket.
- j. Remove the cup washer, rubber bush and seating washer.
- k. Remove the bracket from the shock absorber and remove the remaining rubber bush and washers.
- l. Discard all rubber bushes.

213. Installation. Install the front shock absorbers as follows:

- a. Fit the new shock absorber into the shock absorber bracket, with the widest part uppermost.
- b. Install the bushes and washers (Figure 144).

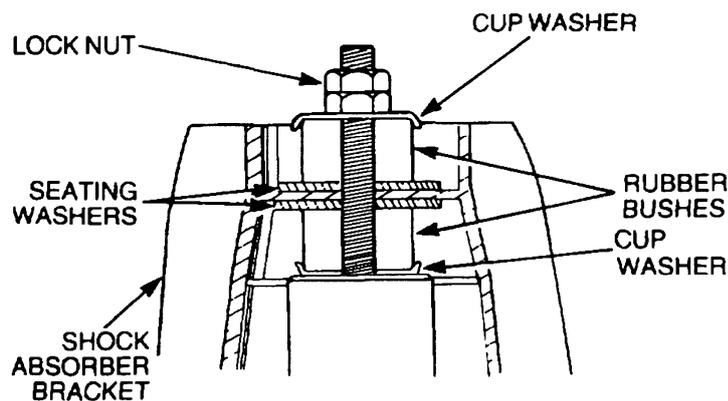


Figure 144 Front Shock Absorber Installation

- c. Insert the shock absorber through the front spring and through a cup washer, rubber bush and seating washer.
- d. Insert the threaded rod through the axle casing bracket.
- e. Fit a seating washer, rubber bush and cup washer and secure them with the nut (Figure 142). Tighten the lower nut securely.
- f. Install the nuts and new lock washers that secure the shock absorber bracket to the chassis rail bracket (Figure 143) and tighten them securely.
- g. Tighten the upper nut securely. Install and tighten the locknut.
- h. Repeat the procedure for the opposite side.
- i. Install the front wheels and wheel nuts.
- j. Raise the vehicle off the axle stands.
- k. Remove the stands and lower the vehicle to the ground.
- l. Remove the wheel chocks and disengage the transmission differential lock.
- m. Tighten the front wheel nuts securely.

Bump Stop (All Axles)

214. **Removal.** Remove the bump stop as follows:

- a. Remove the two bolts, nuts and lock washers, securing the bump stop and carrier to the chassis rail (Figure 145). Discard the lock washers.
- b. Remove the bump stop.

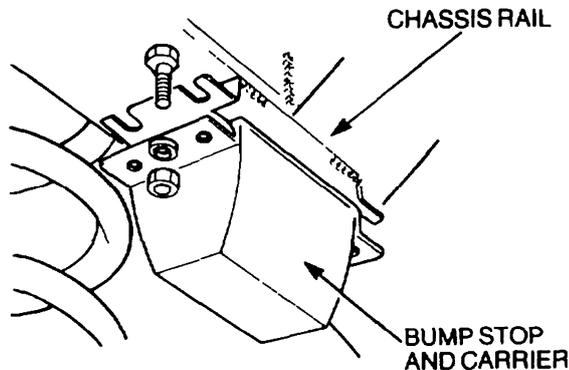


Figure 145 Bump Stop Removal

215. **Installation.** Install the bump stop as follows:

- a. Fit the bump stop and carrier to the chassis rail.
- b. Install the two bolts, new lock washers and nuts.
- c. Tighten the nuts securely.

Front Panhard Rod

216. **Removal.** Remove the front panhard rod as follows:

- a. Remove the locknut and bolt securing the rod to the chassis mounting arm (Figure 146).
- b. Remove the locknut and bolt securing the rod to the axle casing and remove the rod from the vehicle.
- c. Discard the locknuts.

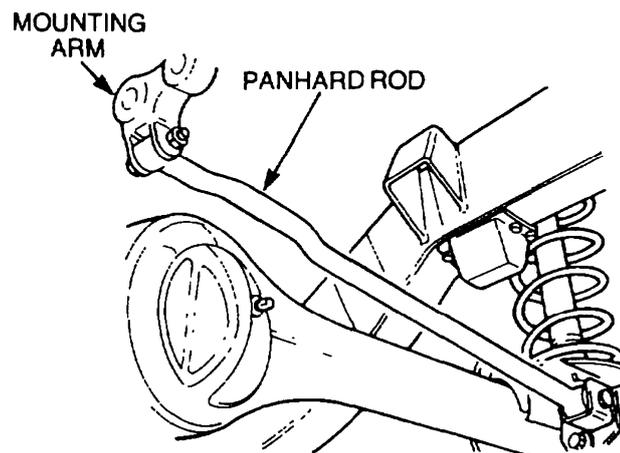


Figure 146 Panhard Rod Removal

217. **Installation.** Install the front panhard rod as follows:

- a. Install the rod on the mounting arm and fit the two bolts and new locknuts.
- b. Tighten the locknut and bolt securing the panhard rod to the chassis bracket to 176 N.m (130 lbf.ft).
- c. Tighten the locknut and bolt securing the rod to the axle case to 176 N.m (130 lbf.ft).

Front Radius Arm

218. **Removal.** Remove the front radius arm as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a. Loosen the front wheel nuts.
- b. Chock the rear wheels and engage the transmission differential lock.
- c. Using a suitable hydraulic jack, raise the front of the vehicle and support it on axle stands positioned beneath the chassis rails.
- d. Remove the front wheel nuts and wheels.
- e. Use the jack to support the axle.
- f. Remove the locknut, washers and rubber bushes from the chassis end of the arm (Figure 147). Discard the locknut.

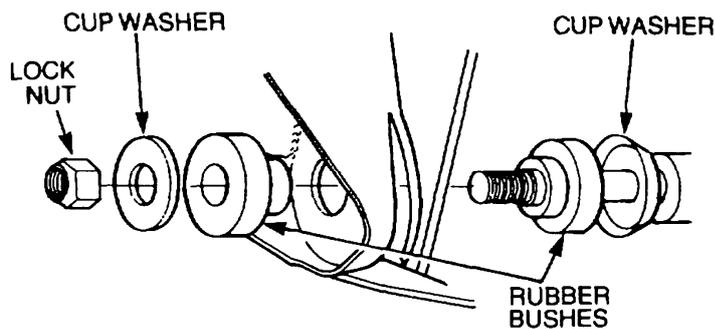


Figure 147 Radius Arm Bush Removal

- g. Using the ball joint separator (Table 3, Serial 13), disconnect the tie rod ball joints at the steering arms (Figure 148).

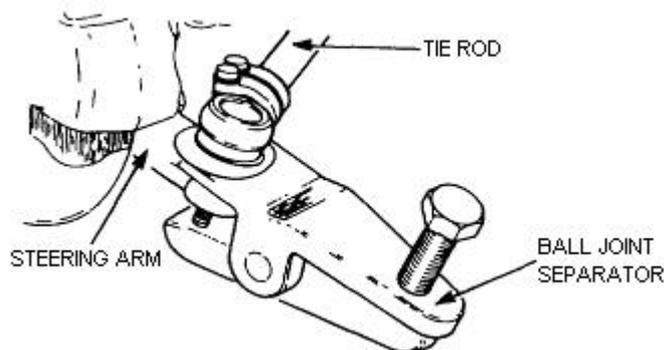


Figure 148 Tie Rod Removal

- h. Remove the locknuts and bolts, securing the radius arms to the axle case (Figure 149). Discard the locknuts.
- i. Lower the front end of the radius arms to clear the axle.
- j. Withdraw the arms from the chassis brackets.

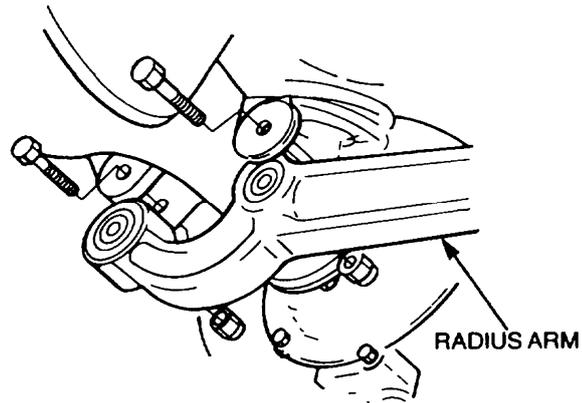


Figure 149 Radius Arm Removal

- 219. Installation.** Install the front radius arm as follows:
- a. Install a cup washer and rubber bush on the radius arm and insert it into the chassis bracket.
 - b. Install the remaining rubber bush and cup washer.
 - c. Fit a new locknut, but do not tighten it at this stage.
 - d. Raise the front end of the radius arm and locate the bushes in the axle casing.
 - e. Install the two bolts and new locknuts.
 - f. Install the front wheels and wheel nuts.
 - g. Raise the vehicle off the axle stands.
 - h. Remove the stands and lower the vehicle to the ground.
 - i. Remove the wheel chocks and disengage the transmission differential lock.
 - j. Tighten the front wheel nuts securely.
 - k. Tighten the nuts and bolts securing the arm to the axle case and chassis bracket to 176 N.m (130 lbf.ft).
 - l. Install the tie rod and tighten the ball joint nuts to 40 N.m (30 lbf.ft).

Shock Absorbers (Rear and Intermediate Axle)

NOTE

Shock absorbers are to be replaced as an axle set.

- 220. Removal.** Remove the shock absorbers as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a. Loosen the rear wheel nuts.
- b. Chock the front wheels and engage the transmission differential lock.
- c. Using a suitable hydraulic jack, raise the rear of the vehicle and support it on stands positioned beneath the rear axle.
- d. Remove the rear wheel nuts and wheels.

- e. Remove the nut, cup washer and rubber bush that secures the shock absorber to the axle casing.
- f. Remove the nut, cup washer and rubber bush that secures the shock absorber to the chassis bracket.
- g. Remove the shock absorber.

221. Installation. Install the shock absorbers as follows:

- a. Ensuring the rubber bushes are secure in the eye of the shock absorber, install the shock absorber on the chassis bracket.
- b. Install the nut that secures the shock absorber to the chassis bracket. Do not tighten the nut at this stage.
- c. Insert the lower end of the shock absorber and rubber bushes through the axle casing.
- d. Fit the cup washer and nut and tighten them securely.
- e. Tighten the upper mounting nut securing the shock absorber to the chassis bracket.
- f. Repeat the procedure for the opposite side.
- g. Install the rear wheels and wheel nuts.
- h. Raise the vehicle off the axle stands.
- i. Remove the stands and lower the vehicle to the ground.
- j. Remove the wheel chocks and disengage the transmission differential lock.
- k. Tighten the front wheel nuts securely.

Front Springs

222. Removal. Remove the front springs as follows:

WARNING

To prevent the vehicle from rolling, chock the rear wheels and engage the transmission differential lock prior to raising the vehicle.

Never work under a raised vehicle unless it is supported by chassis stands. Place the stands as close as possible to the raised wheel.

- a. Chock the rear wheels. Engage the transmission differential lock.
- b. Loosen the front wheel nuts.
- c. Raise the front of the vehicle and support the chassis on chassis stands leaving the axle supported by the jack.
- d. Remove the wheel nuts and the wheel.
- e. Loosen the nut securing the brake hose to the retaining bracket.
- f. Disconnect the wear indicator cable at the left-hand caliper and secure it out of the way.
- g. Remove the two bolts securing the caliper to the swivel housing. Move the caliper away from the disc and, ensuring that the brake pipes are not bent, secure the caliper to the chassis rail with wire or string.
- h. Remove the locknut, cup-washer, rubber bush and seating washer securing the shock absorber to the axle case. Discard the locknut.
- i. Remove the four nuts and lock-washers securing the shock absorber turret to the chassis. Remove the shock absorber complete with the turret. Discard the lock-washers.
- j. Lower the axle on the side the spring is to be removed. Remove the spring and bracket securing ring (Figure 150).

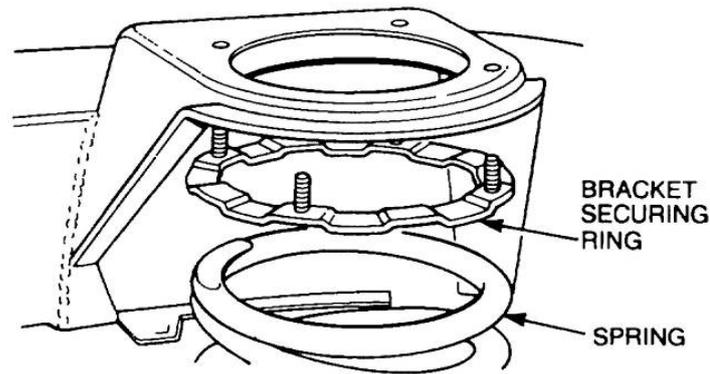


Figure 150 Removal of the Front Spring

223. Installation. Install the front springs as follows:

- a. Position the bracket-securing ring and secure it in position with the two nuts.
- b. Install the spring and raise the axle to engage the spring in the upper seat.
- c. Remove the two nuts retaining the bracket securing ring and install the shock absorber and turret. Install the four nuts and new lock-washers and tighten them securely.
- d. Install the rubber bush, cup-washer and seating washer on the shock absorber and secure it to the axle case with a new locknut.
- e. Install the brake caliper. Smear the two bolts with a thin film of Loctite 271 and install the bolts and new lock-washers. Tighten the bolts to 82 N.m (60 lbf.ft). Tighten the locknut securing the brake hose to the swivel housing bracket and reconnect the wear indicator cable
- f. Ensure that the axle breather hose is secure.
- g. Install the wheel and secure it with the wheel nuts.
- h. Raise the vehicle and remove the chassis stands.
- i. Lower the vehicle and tighten the wheel nuts.
- j. Remove wheel chocks and disengage the differential lock.

Intermediate Axle Spring

224. Removal. Remove the intermediate axle spring as follows:

WARNING

To prevent the vehicle from rolling, chock the front wheels and engage the transmission differential lock prior to raising the vehicle.

Never work under a raised vehicle unless it is supported by chassis stands. Place the chassis stands as close as possible to the raised wheel.

- a. Chock the front wheels and engage the transmission differential lock.
- b. Loosen the wheel nuts.
- c. Raise the rear of the vehicle and support it on chassis stands. Leave the axle supported on the jack.
- d. Remove the wheel.

NOTE

To ensure that the rocker beam is horizontally positioned during removal or installation of the shackle bolt at the rocker end of the spring, it may be necessary to position and operate a trolley jack under the axle to relieve the load on the shackle bolt.

- e. Remove the locknuts securing the shackle bolt to the rocker beam and the spring eye. Discard the locknuts.
- f. Remove the outer shackle plate and the two flat washers.
- g. Using a suitable drift, drive the shackle bolts from the spring eye and the rocker beam. Remove the shackle bolts, the two flat washers and the inner shackle plate (Figure 151).

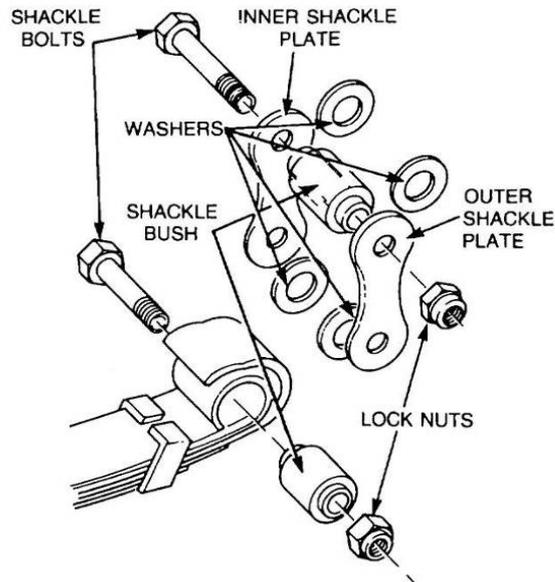


Figure 151 Removal of the Shackle Bolts (Rocker Beam End)

- h. To assist with removal of the spring, support the spring with a suitable trolley-jack. Remove the four locknuts from the U-bolts (Figure 152). Discard the locknuts.

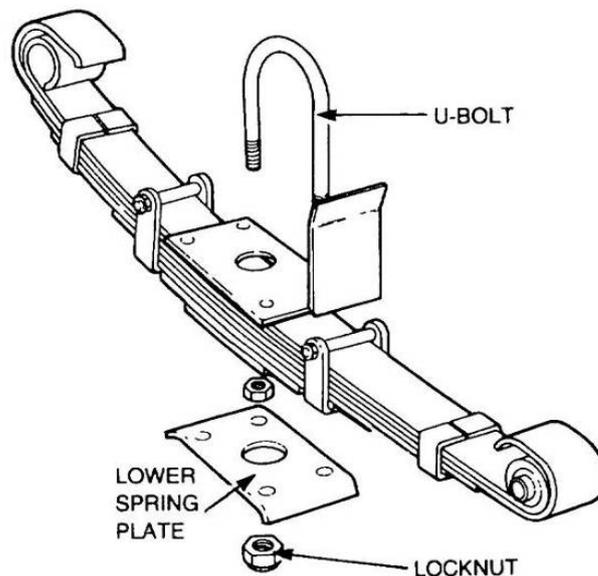


Figure 152 Removal of the U-Bolt and Retaining Plate

- i. Remove the locknut from the fixed shackle bolt. Using a suitable drift, drive the shackle bolt through the shackle bush and from the fixed shackle mounting. Discard the locknut (Figure 153).
- j. Lower the trolley jack supporting the spring allowing the spring to clear the mounting points and remove the spring from beneath the vehicle.

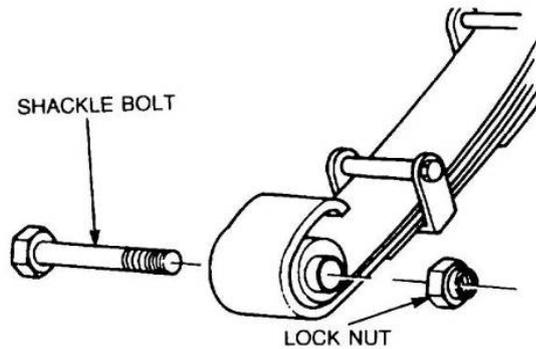


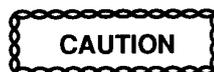
Figure 153 Removal of the Shackle Bolt (Fixed End)

- 225. Installation.** Install the intermediate axle spring as follows:
- a. Using a suitable trolley jack, position the fixed shackle end of the spring at the mounting point. Align the hole in the shackle bush with the mounting hole in the frame.
 - b. Apply a liberal coating of grease to the shackle bolt. Insert the bolt and install the new locknut. Tighten the locknut to 81 to 95 N.m (60 to 70 lbf.ft).
 - c. Using the trolley jack, lift the spring until the spring centre bolt is located in the axle housing recess.
 - d. Install the U-bolts over the axle and install the spring plate over the U-bolts. Ensure the centre hole in the plate aligns with the spring centre bolt.
 - e. Install the four new locknuts on the U-bolts and tighten them to 128 to 142 N.m (95 to 105 lbf.ft).
 - f. Reposition the trolley jack near the spring eye at the rocker beam end.

NOTE

To ensure that the rocker beam is horizontally positioned during removal or installation of the shackle bolt at the rocker end of the spring, it may be necessary to position and operate a trolley jack under the axle to relieve the load on the shackle bolt.

- g. Operate the jack supporting the spring as necessary to aid in the alignment of the holes in the spring eye, the rocker beam and the shackle plates.
- h. Apply a liberal coating of grease to the shackle bolts. Position the flat washers and the inner shackle plate and insert the shackle bolts through the spring eye and the rocker beam.



The shackle bolts and nuts at the rocker beam end must not be tightened until the spring is positioned in the mid-point of its deflection range. This can be achieved by lowering the vehicle onto its wheels and loading the vehicle to approximately two tonne. Failure to follow this procedure will result in premature damage to the shackle bushes.

- i. Position the flat washers and the outer shackle plate over the shackle bolts and install the new locknuts. Do not tighten them at this stage.
- j. Install the wheel. Install and tighten the wheel nuts.
- k. Remove the support trolley jacks.
- l. Raise the vehicle, remove the chassis stands and lower the vehicle.
- m. Tighten the rocker beam shackle bolt nuts to 81 to 95 N.m (60 to 70 lbf.ft).
- n. Tighten the wheel nuts.
- o. Disengage the differential lock and remove the wheel chocks.

Rear Axle Spring

226. **Removal.** Remove the rear axle spring as follows:

WARNING

To prevent the vehicle from rolling, chock the front wheels and engage the transmission differential lock prior to raising the vehicle.

Never work under a raised vehicle unless it is supported by chassis stands. Place the chassis stands as close as possible to the raised wheel.

- a. Chock the front wheels and engage the transmission differential lock.
- b. Loosen the wheel nuts.
- c. Raise the rear of the vehicle and support it on chassis stands. Leave the axle supported on the jack.
- d. Remove the wheel.

NOTE

To ensure that the rocker beam is horizontally positioned during removal or installation of the shackle bolt at the rocker end of the spring, it may be necessary to position and operate a trolley jack under the axle to relieve the load on the shackle bolt.

- e. Remove the locknuts securing the shackle bolts to the rocker beam and the spring eye. Discard the locknuts.
- f. Remove the outer shackle plate and the two flat washers.
- g. Using a suitable drift, drive the shackle bolts from the spring eye and the rocker beam. Remove the shackle bolts, the two flat washers and the inner shackle plate (Figure 154).

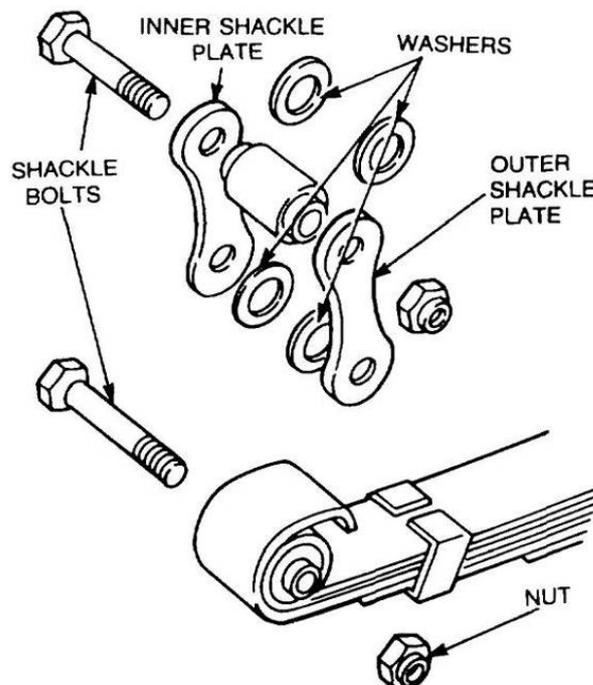


Figure 154 Removal of the Shackle Bolts (Rocker Beam End)

- h. Remove the four locknuts from the U-bolts (Figure 155). Discard the locknuts.

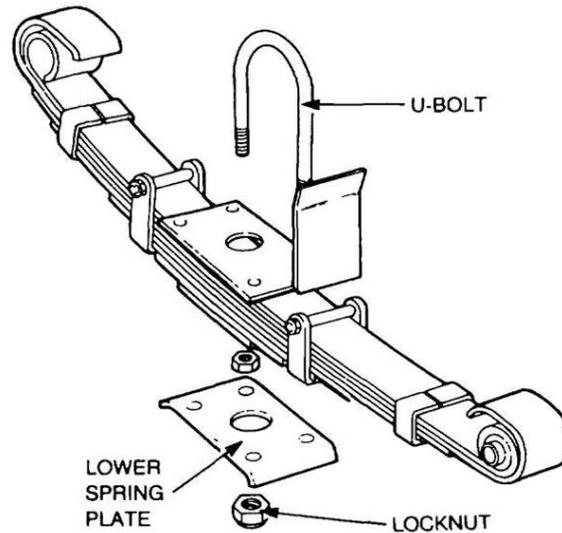


Figure 155 Removal of the U-Bolt and Retaining Plate

- i. Remove the locknut from the fixed shackle bolt. Discard the locknut.
- j. Using a suitable drift, drive the shackle bolt through the shackle bush and the fixed shackle mounting (Figure 156). Remove the spacer.

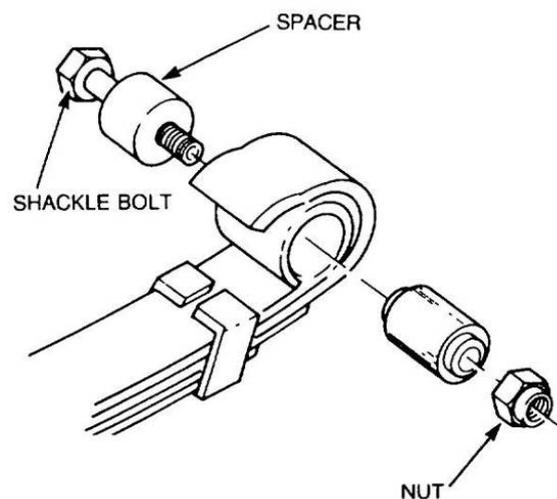


Figure 156 Removal of the Shackle Bolt (Fixed End)

- k. Lower the trolley jack supporting the spring, allowing the spring to clear the mounting points and remove the spring from beneath the vehicle.
- 227. Installation.** Install the rear axle springs as follows:
- a. Using a trolley jack, position the fixed shackle end of the spring at the mounting point and align the hole in the shackle bush with the mounting hole in the frame.
 - b. Apply a liberal coating of grease to the shackle bolt. Insert the bolt and spacer and install the new locknut. Tighten the locknut to 81 to 95 N.m (60 to 70 lbf.ft).
 - c. Using the trolley jack, lift the spring until the spring centre bolt is located in the axle housing recess.
 - d. Install the U-bolts over the axle and install the spring plate over the U-bolts. Ensure the centre hole in the plate aligns with the spring centre bolt.
 - e. Install four new locknuts on the U-bolts and tighten them to 128 to 142 N.m (95 to 105 lbf.ft).
 - f. Reposition the trolley jack near the spring eye at the rocker beam end.

NOTE

To ensure that the rocker beam is horizontally positioned during removal or installation of the shackle bolt at the rocker end of the spring, it may be necessary to position and operate a trolley jack under the axle to relieve the load on the shackle bolt.

- g. Operate the jack supporting the spring as necessary to align the holes in the spring eye, the rocker beam and the shackle plates.
- h. Apply a liberal coating of grease to the shackle bolts. Position the flat washers and the inner shackle plate and insert the shackle bolts through the spring eye and the rocker beam.



The shackle bolts and nuts at the rocker beam end must not be tightened until the spring is positioned in the mid-point of its deflection range. This can be achieved by lowering the vehicle onto its wheels and loading the vehicle to approximately two tonne. Failure to follow this procedure will result in premature damage to the shackle bushes.

- i. Position the flat washers and the outer shackle plate over the shackle bolts and install the new locknuts. Do not tighten them at this stage. Remove the support trolley jacks.
- j. Install the wheel and wheel nuts. Tighten the wheel nuts.
- k. Raise the vehicle, remove the stands and lower the vehicle. Tighten the rocker beam shackle bolt nuts to 81 to 95 N.m (60 to 70 lbf.ft).
- l. Tighten the wheel nuts.
- m. Disengage the differential lock and remove the wheel chocks.

Shackle Bushes (Intermediate and Rear Axle Springs)

228. Replacement. Replace the shackle bushes as follows:

- a. Remove the intermediate/rear spring (Para's 224 and 226).
- b. Support the spring in a hydraulic press or a similar device.
- c. Position the shackle bush remover adaptor (Table 3, Serial 16) on the shackle bush (Figure 157). Ensure that the tool is correctly aligned and press the shackle bush from the spring eye.

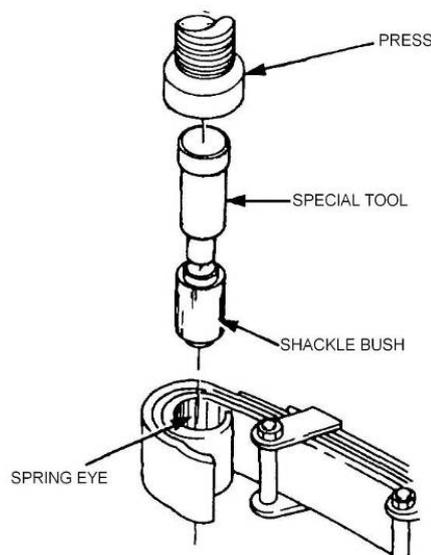


Figure 157 Replacement of the Shackle Bush

- d. Inspect the bush and the spring eye for damage (replace as necessary).

- e. Apply a liberal coating of grease to the outer surface of the shackle bush.
- f. Ensure that the bush is correctly aligned to the spring eye, then using the shackle bush remover adaptor (Table 3, Serial 16), press the shackle bush into the spring eye.

Rocker Beam (Spring Equaliser)

229. Removal. Remove the rocker beam as follows:

- a. Remove the end of the springs connected to the rocker beam (Para's 224 and 226)
- b. Remove the locknut from the pivot bolt (Figure 158).
- c. Using a suitable drift, drive the pivot bolt through the rocker beam bush.
- d. Remove the rocker beam.

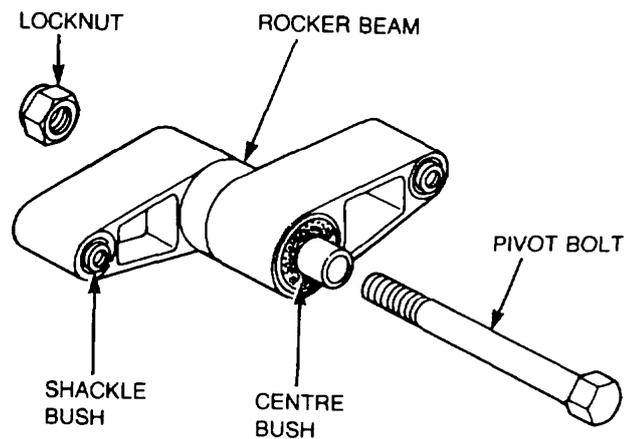


Figure 158 Rocker Beam Removal

230. Inspection. Inspect the rocker beam as follows:

- a. Inspect the rocker beam centre bush, the shackle bushes and the area around the spring eye (replace as necessary).

231. Installation. Install the rocker beam as follows:

- a. Apply a liberal coating of grease to the new pivot bolt; then gently tap the bolt through the frame and the rocker beam bush.
- b. Install the new locknut on the bolt and tighten it to 366 N.m (270 lbf.ft).
- c. Install the springs (Para's 225 and 227).

Rocker Beam Spring Bush

232. Replacement. Replace the rocker beam spring bush as follows:

- a. Remove the rocker beam (Para 229).
- b. Support the rocker beam in a hydraulic press or similar device.
- c. Position the rocker beam bush remover adaptor (Table 3, Serial 17) on the rocker beam spring bush (Figure 159). Ensure that the tool is correctly aligned and press the spring bush from the rocker beam.

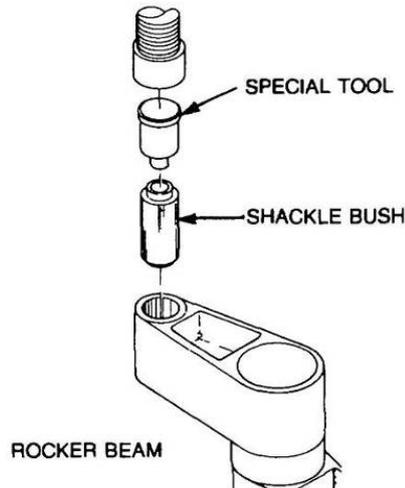


Figure 159 Replacement of the Rocker Beam Spring Bush

- d. Inspect the bush and the spring eye for damage (replace as necessary).
- e. Apply a liberal coating of grease to the outer surface of the shackle bush.
- f. Ensure that the bush is correctly aligned to the rocker beam eye. Using the rocker beam bush remover adaptor (Table 3, Serial 17) press the shackle bush into the rocker beam eye.
- g. Install the rocker beam (Para 231).

Rocker Beam Centre Bush

233. Replacement. Replace the rocker beam centre bush as follows:

- a. Remove the rocker beam (Para 229).
- b. Support the rocker beam in a hydraulic press or similar device.
- c. Position the rocker beam bush remover adaptor (Table 3, Serial 17) on the centre bush, ensure that the tool is correctly aligned and press the centre bush from the rocker bore (Figure 160).

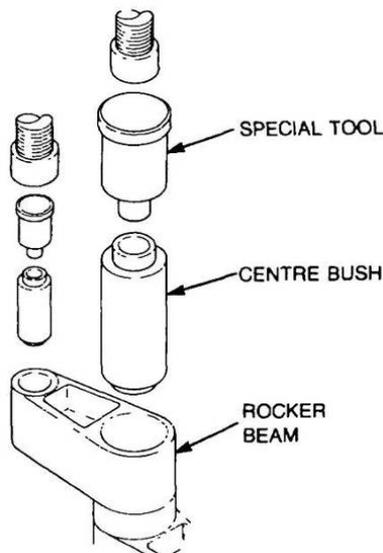


Figure 160 Replacement of the Rocker Beam Centre Bush

- d. Inspect the bush and the rocker beam centre bore for damage (replace as necessary).
- e. Apply a liberal coating of grease to the outside surface of the bush.
- f. Ensure that the bush is correctly aligned in the centre beam bore. Using the rocker beam bush remover adaptor (Table 3, Serial 17), press the bush into the rocker beam.

Axle Rebound Check Cable

234. **Removal.** Remove the axle rebound check cable as follows:

- a. Remove the nuts and washers supporting the rebound cable to the support bracket (Figure 161).
- b. Lightly tap the bolt through the frame bracket.
- c. Remove the rebound cable down and around the axle housing.
- d. Check the rebound cable for cracks, fractures or distortion and replace it if necessary.

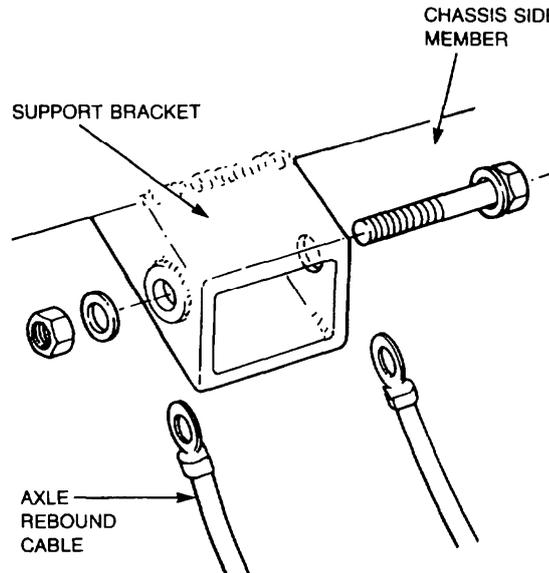


Figure 161 Axle Rebound Check Cable Removal

235. **Installation.** Install the axle rebound check cable as follows:

- a. Ensure that the rebound cable is correctly routed between the axle housing and the brake lines.
- b. Secure the rebound cable to the frame bracket.
- c. Install the bolt and new spring washer. Secure them with the nut. Tighten the nut and bolt securely.

U-bolts

236. **Removal.** Remove the U-bolts as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by chassis stands. Place the chassis stands as close as possible to the raised wheel.

- a. Chock the wheels and engage the transmission differential lock.
- b. Loosen the wheel nuts.
- c. Raise the rear of the vehicle chassis sufficiently to take the weight off the spring.
- d. Place the axle stands directly beneath the chassis and lower the vehicle onto the stands.
- e. Remove the wheel nuts and the wheel.
- f. Remove the locknuts from the U-bolts securing the spring to the axle and then remove the lower spring plate (Figure 162). Discard the locknuts.
- g. Remove the U-bolts from the axle.

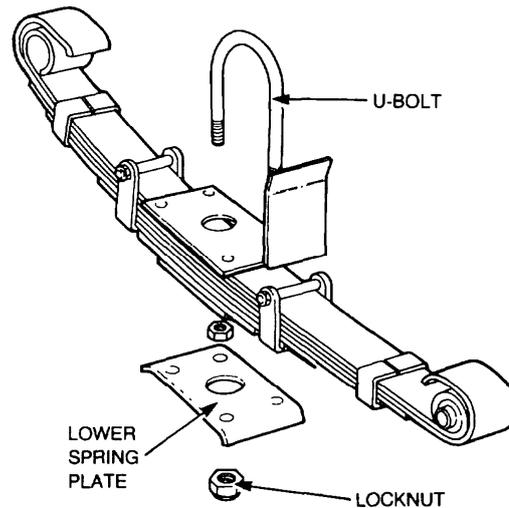


Figure 162 U-bolts and Spring Plate Removal

- 237. Inspection.** Inspect the U-bolts for distortion or thread damage, replace as necessary.
- 238. Installation.** Install the U-bolts as follows:
- Position the U-bolts over the axle.
 - Install the spring plate over the threaded end of the U-bolts, ensuring that the centre hole in the plate aligns with the spring centre bolt.
 - Install the four new locknuts and tighten them to 120–142 N.m (95–105 lbf.ft).
 - Install the wheel. Install and tighten the wheel nuts.
 - Raise the vehicle, then remove the stands and lower the vehicle.
 - Tighten the wheel nuts.

Inspection Procedures



Bushes, mounting bolts and nuts are to be replaced as sets.

- 239. Panhard Rod Assembly.** Inspect the panhard rod assembly in accordance with EMEI Vehicle G 188-1
- 240. Radius Arm Assembly.** Inspect the radius arm assembly in accordance with EMEI Vehicle G 188-1
- 241. Swivel Pin Housing Bushes and Bearings.** Inspect the swivel pin housing bushes and bearings in accordance with EMEI Vehicle G 188-1.
- 242. Rear Lower Link, Front Flexible Mount and Rear Mounting Bush.** Inspect the rear lower link, the front flexible mount and the rear mounting bush in accordance with EMEI Vehicle G 188-1.
- 243. Rear Top Link and Top Link Ball Joint.** Inspect the rear top link and top link ball joint in accordance with EMEI Vehicle G 188-1.
- 244. Front and Rear Shock Absorbers.** Inspect front and rear shock absorbers in accordance with EMEI Vehicle G 188-1.
- 245. Front and Rear Bump Stops.** Inspect the front and rear bump stops in accordance with EMEI Vehicle G 188-1.
- 246. Rear Springs and Limit Straps.** Inspect the rear springs and limit straps in accordance with EMEI Vehicle G 188-1.
- 247. Rocker Beam.** Inspect the rocker beam in accordance with EMEI Vehicle G 188-1.

Suspension System Specifications

248. The suspension system specifications are detailed in Table 19.

Table 19 Suspension System Specifications

Serial	Specification	Measurement
1	Front panhard rod to chassis bracket tightening torque	176 N.m (130 lbf.ft)
2	Front panhard rod to axle case tightening torque	176 N.m (130 lbf.ft)
3	Front radius arm to chassis bracket tightening torque	176 N.m (130 lbf.ft)
4	Steering tie rod ball joint to steering arm tightening torque	40 N.m (30 lbf.ft)
5	Rear spring shackle pins tightening torque	89–95 N.m (60–70 lbf.ft)
6	Spring equaliser rocker to frame tightening torque	366 N.m (270 lbf.ft)
7	U-bolt to intermediate, rear axle tightening torque	128–142 N.m (95–105 lbf.ft)

STEERING

Steering Wheel

- 249. Removal.** Remove the steering wheel as follows:
- Disconnect the battery.
 - Remove the screw securing the steering wheel cover.
 - Remove the cover.
 - With the front wheels in the straight ahead position, remove the steering wheel retaining nut.
 - Using the steering wheel puller (Table 3, Serial 3), remove the steering wheel from the column.
- 250. Installation.** Install the steering wheel as follows:

NOTE

When installing the steering wheel, ensure that the two prongs on the steering wheel hub engage the cut outs in the upper steering column bush. If necessary, rotate the bush to align with the two prongs, ensuring that the arrow on the bush faces the indicator switch.

- Install the steering wheel, shake proof washer and nut. Tighten the nut to 38 N.m (28 lbf.ft).
- Fit the steering wheel cover and secure it with the screw.

Steering Linkages and Tie Rod Ends

- 251. Removal.** Remove steering linkages and tie rod ends as follows:



A tie rod that is damaged or bent must be replaced. No attempt should be made to repair or straighten it.

- Remove the split pin, castellated nut and washer securing the tie rod ends to the steering arms. Discard the split pin.
- Using the ball joint separator (Table 3, Serial 13), disconnect the tie rod ends from the steering arms (Figure 163) and remove the tie rod from the vehicle.

NOTE

The tie rod ends are manufactured with either left-hand or right-hand thread for adjustment purposes.

- Apply a spot of paint on the threads adjacent to the tie rod shoulder to maintain the approximate position of the tie rod end on the tie rod during reassembly.
- Loosen the clamp bolts securing the tie rod ends to the tie rod.
- Unscrew the ends from the rod.

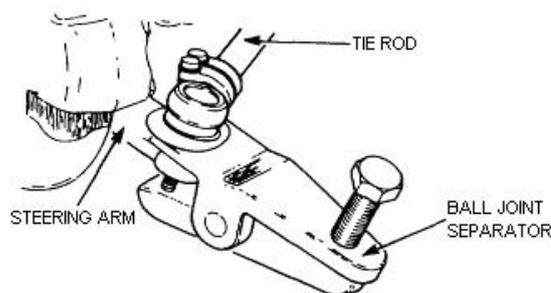


Figure 163 Steering Linkage Removal

252. **Installation.** Install steering linkages and tie rod ends as follows:

NOTE

When adjusting or renewing a tie rod it is important that the ball joints are assembled in the same angular plane and that the ball joint pins are central in their respective housings (A). Premature wear could result if the pins are inclined to one side (B) (Figure 164).

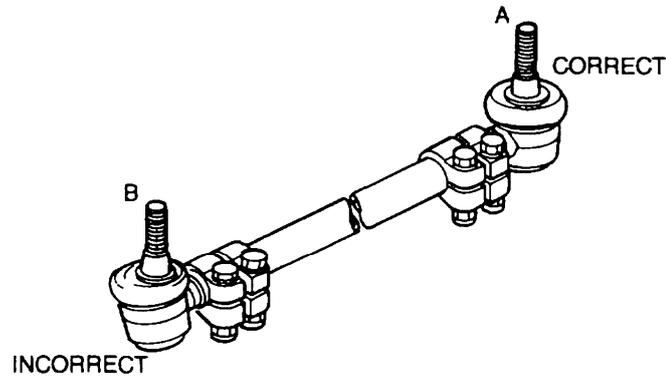


Figure 164 Tie Rod End Installation

- a. Screw the tie rod ends on the tie rod until the shoulders align with the spots of paint on the threads.
- b. Do not tighten the clamp bolts at this stage.
- c. Install the tie rod assembly on the vehicle. Fit the washer and castellated nut on both tie rod ends.
- d. While applying hand pressure to the ball end of the ball joints, tighten the nuts to 40 N.m (30 lbf.ft).
- e. Install new split pins.
- f. Carry out the wheel alignment procedure (Para 257).
- g. Tighten the bolts to 14 N.m (10 lbf.ft) ensuring that the clamps are in the same plane and that the bolts are on the split side of the rod.

Steering Damper

253. **Removal.** Remove the steering damper as follows:

- a. Remove the two nuts securing the steering damper to the chassis bracket and remove the rubber bushes and cup washers (Figure 165).

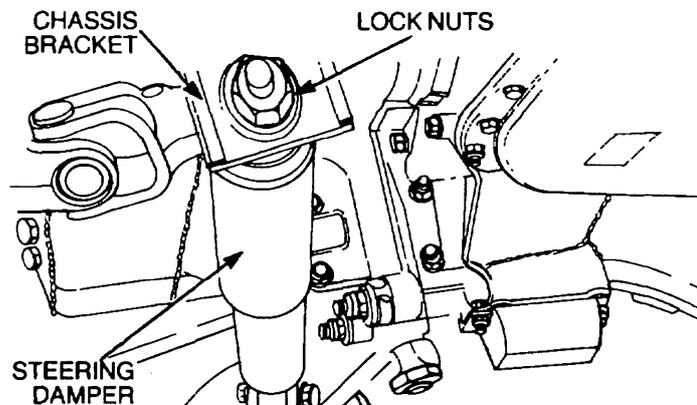


Figure 165 Steering Damper to Chassis Bracket Removal

- b. Remove the locknut and bolt securing the steering damper to the drag link (Figure 166). Discard the locknut.
- c. Remove the steering damper.

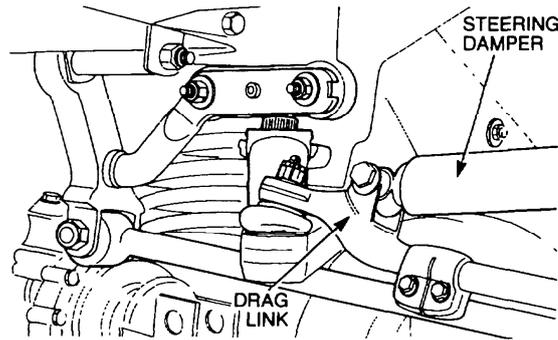


Figure 166 Steering Damper to Drag Link Removal

254. Installation. Install the steering damper as follows:

- a. Fit the steering damper to the drag link and install the bolt and a new locknut.
- b. Do not tighten the locknut at this stage.
- c. Install a cup washer and rubber bush on the steering damper (sleeved end) and insert the threaded rod through the chassis bracket.
- d. Fit the remaining rubber bush and cup washer and secure them with the nuts.
- e. Tighten the steering damper to the drag link retaining bolt securely.

Steering Drag Link and Drag Link Ends

255. Removal. Remove the steering drag link and drag link ends as follows:

WARNING

Prior to raising the vehicle, chock the wheels and engage the transmission differential lock to prevent the vehicle from rolling.

Never work under a raised vehicle unless it is supported by axle stands. Place the axle stands as close as possible to the raised wheel.

- a. Loosen the left-hand front wheel nuts.
- b. Chock the rear wheels and engage the transmission differential lock.
- c. Using a suitable hydraulic jack, raise the front of the vehicle and support it on axle stands positioned beneath the front axle.
- d. Remove the left-hand front wheel.
- e. Remove the locknut and bolt securing the steering damper to the drag link (Figure 166). Discard the locknut.
- f. Remove the split pin, castellated nut and washer securing the drag link to the drop arm ball joint. Discard the split pin.
- g. Using ball joint separator (Table 3, Serial 13), disconnect the drag link (Figure 167).

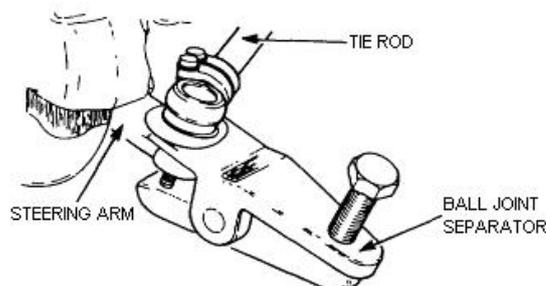


Figure 167 Drop Arm Ball Joint Disconnection

- h.** Remove the split pin, castellated nut and washer securing the drag link to the steering arm. Discard the split pin.
- i.** Using ball joint separator (Table 3, Serial 13), disconnect the drag link.

NOTE

The drag link ends are manufactured with either left-hand or right-hand threads for adjustment purposes.

- j.** Apply a spot of paint on the threads adjacent to the tie rod shoulder to maintain the approximate position of the tie rod end on the tie rod during reassembly.
- k.** Loosen the clamp bolts securing the drag link ends to the drag link and unscrew the ends from the rod.

256. Installation. Install the steering drag link and drag link ends as follows:

NOTE

When adjusting or renewing a drag link, it is important that the ball joint end and cranked end are assembled in the same angular plane. The ball joint pin and cranked end hole must also be aligned. Premature wear could result if they are inclined to one side.

- a.** Screw the ball joint and cranked end on the drag link until the shoulders align with the spots of paint on the threads.
- b.** Do not tighten the clamp bolts at this stage.
- c.** Fit the ball joint on the steering arm and install the washer and castellated nut.
- d.** While applying hand pressure to the ball joint, tighten the nut to 40 N.m (30 lbf.ft) and install a new split pin.
- e.** Install the left-hand front wheel and wheel nuts.
- f.** Raise the vehicle off the axle stands, remove the stands and lower the vehicle to the ground.
- g.** Remove the wheel chocks.
- h.** Tighten the front wheel nuts securely.
- i.** Ensuring that the wheels are on a flat surface and in the straight ahead position, check that the toe-out dimension is 1.2–2.4 mm (0.045–0.09 in.).
- j.** Adjust the track rod, if necessary, to obtain the required dimension.
- k.** Centralise the steering box, ensuring that the steering wheel is correctly aligned.
- l.** Adjust the drag link length to enable the cranked end hole to align with the drop arm ball joint pin.
- m.** Install the washer and castellated nut on the cranked end.
- n.** While applying hand pressure to the drag link, tighten the castellated nut to 40 N.m (30 lbf.ft) and install a new split pin.
- o.** Position the clamps in the same plane, ensuring that the bolts are on the split side of the rod.
- p.** Tighten the bolts to 14 N.m (10 lbf.ft).

Front Wheel Alignment

257. Alignment. Align the front wheels as follows:

NOTE

No adjustment is provided for caster, camber or swivel pin inclination.

- a.** With the vehicle on level ground and the front wheels in the straight ahead position, push the vehicle backwards, then forwards, for a short distance, to settle the linkage.

- b. Measure the toe-out at the horizontal centre line of the wheels and ensure that a toe-out of 1.2–2.4 mm (0.045–0.09 in) is obtained.
- c. Adjust if necessary, by loosening the tie rod clamp bolts and turning the tie rod anticlockwise to increase the toe-out and clockwise to decrease the toe-out.
- d. When the toe-out is within specification, lightly tap the tie rod ends towards the rear of the vehicle, to ensure that full unrestricted working travel is obtained.
- e. Position the clamps in the same plane, ensuring that the bolts are on the split side of the rod.
- f. Tighten the bolts to 14 N.m (10 lbf.ft).

Steering Lock Stops

258. **Adjustment.** Adjust the steering lock stops as follows:

NOTE

The steering lock stop must be adjusted to provide a minimum clearance of 20 mm (0.78 in) between the tyre wall and the radius arm.

- a. Loosen the stop bolts locknuts.
- b. Turn the bolt clockwise or anticlockwise to obtain the correct clearance (Figure 168).

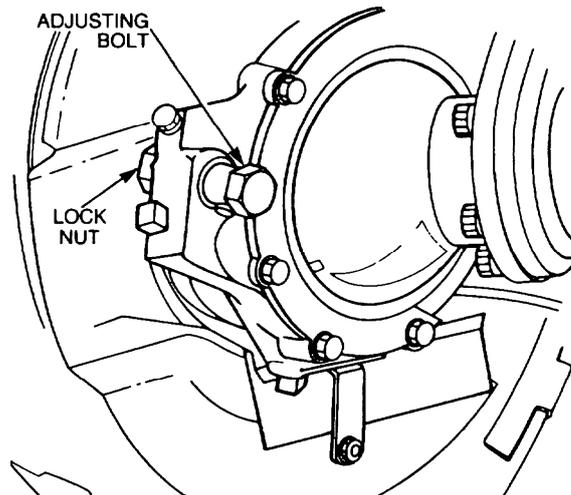


Figure 168 Steering Lock Stop Adjustment

- c. Tighten the locknuts and check the wheel positions on full lock.
- d. Ensure that the minimum clearance of 20 mm (0.78 in) is obtained.

Power Steering Fluid Reservoir

NOTE

The reservoir filter is designed to function effectively for the life of the vehicle therefore replacement of the filter is not necessary.

259. Removal. Remove the power steering fluid reservoir as follows:

- a. Remove the fluid reservoir filler cap.
- b. Disconnect the return hose from the steering box and drain the fluid from the reservoir into a container.
- c. Reconnect the power steering return hose to the steering box.
- d. Loosen the clamps securing the supply and return hoses to the fluid reservoir. Disconnect and plug the hoses (Figure 169).
- e. Loosen the nut and bolt on the reservoir clamp sufficiently to allow the reservoir to be lifted up and out of the clamp.

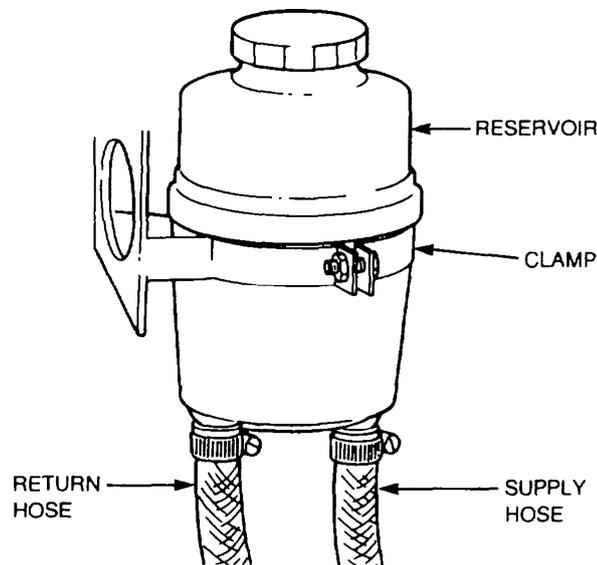
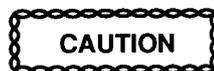


Figure 169 Return and Supply Hoses to Reservoir Removal

260. Installation. Install the power steering fluid reservoir as follows:

- a. Install the reservoir in the clamp and tighten the clamp.
- b. Connect the supply and return hoses to the fluid reservoir and tighten the clamps.



Do not reuse the fluid drained from the reservoir.

- c. Fill the reservoir with recommended fluid to the correct level and bleed the power steering system (Para 261).
- d. Install the reservoir filler cap.

Bleeding the Power Steering System

261. Bleed the power steering system as follows:



During the bleeding procedure ensure that the reservoir is always full, that the engine speed is not increased and the steering wheel is not moved.

- a. Fill the steering fluid reservoir to the correct level.
- b. Start and run the engine until the operating temperature is reached.
- c. Loosen the bleed screw in the steering box (Figure 170) until fluid is observed at the bleed screw.

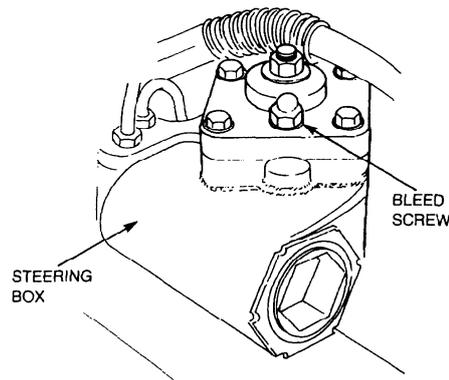


Figure 170 Power Steering Bleed Screw Location

- d. Tighten the bleed screw and check the reservoir for the correct fluid level (top up if necessary).
- e. Clean away the fluid released during bleeding.



To avoid causing the oil to overheat and possible damage to the oil seals, do not maintain full lock for longer than thirty seconds in any one minute.

NOTE

The steering operation should be smooth lock-to-lock, any heavy or light spots when changing direction in a stationary vehicle are unacceptable.

- f. Check all hose connections, the steering pump and the steering box for fluid leaks by holding the steering hard on full lock in both directions.

Power Steering Pump

262. **Removal.** Remove the power steering pump as follows:

- a. Place a suitable container under the power steering pump.
- b. Remove the power steering pump reservoir cap.
- c. Disconnect the low pressure hose from the power steering pump and drain the fluid into the container.
- d. Disconnect the high pressure hose from the power steering pump.
- e. Plug the high and low pressure hoses.
- f. Remove the bolts securing the power steering pump to the timing gear and remove the pump (Figure 171).

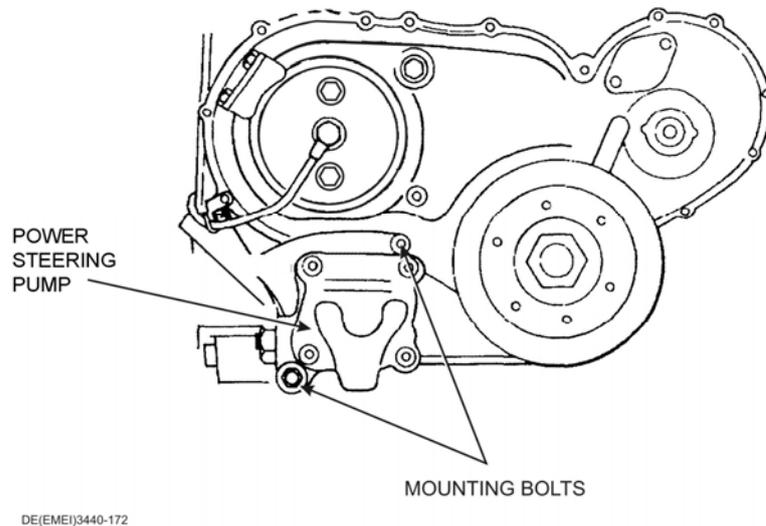


Figure 171 Power Steering Pump Removal

- g.** Remove and discard the O ring and gasket. Plug all apertures on the power steering pump.
- 263. Installation.** Install the power steering pump as follows:
- a.** Remove all trace of gasket from the pump and mating surfaces.
 - b.** Using a new O ring and gasket, install the power steering pump-to-timing gear housing. Tighten the bolts to 64 N.m (48 lbf.ft).
 - c.** Connect the high and low pressure hoses to the power steering pump and tighten them securely.



Do not reuse the fluid drained from the reservoir.

- d.** Fill the power steering fluid reservoir and install the reservoir filler cap.
- e.** Bleed the power steering system (Para 261).

Steering Protection Plate

- 264. Removal.** Remove the steering protection plate as follows:

NOTE

Check the security of the rear winch mounting prior to removing the fairlead plate.

- a.** Remove the centre bumper (cargo variants) or the winch fairlead plate (winch variants).
- b.** Support the protection plate and remove the lower panhard rod mounting arm-to-chassis mounting bolt, washers and nut (Figure 172).

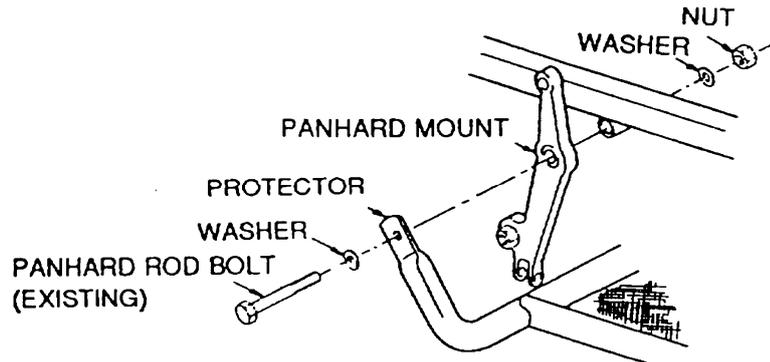


Figure 172 Protection Plate Removal

- c. Remove the left-hand rear protector-to-chassis mounting bolt, washers, nut and spacer (Figure 173).

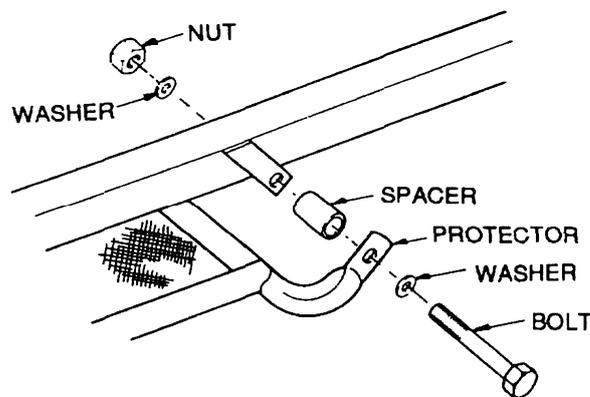


Figure 173 Left-hand Rear Protection Plate Mounting

- d. Remove the steering protection plate.

265. Inspection. Inspect the four winch housing mounting bolt holes (for the winch fairlead plate). If the threads are damaged, repair using NSN: 5180-66-131-6876 – Tool Kit, Screw Thread, Insert, Metric, 4 mm to 12 mm, Oversize.

266. Installation. Install the steering protection plate as follows:

- a. Position the protection plate at the chassis and install the lower panhard rod mounting arm-to-chassis mounting bolt, washers and nut.
- b. Install the left-hand rear protection plate-to-chassis mounting bolt, washers and nut.
- c. Tighten both the rear mounting bolts firmly, allowing the front of the protection plate to be raised to contact the front of the chassis.

NOTE

On variants fitted with winch, install the spacer between the winch fairlead plate and the winch (Figure 174).

Use Loctite 271 on the winch fairlead mounting bolts.

- d. On winch variants, install the winch fairlead plate to the winch housing, using new mounting bolts.
- e. On cargo variants, secure the centre bumper to the chassis mount, using new mounting bolts.
- f. Tighten all mounting bolts securely.

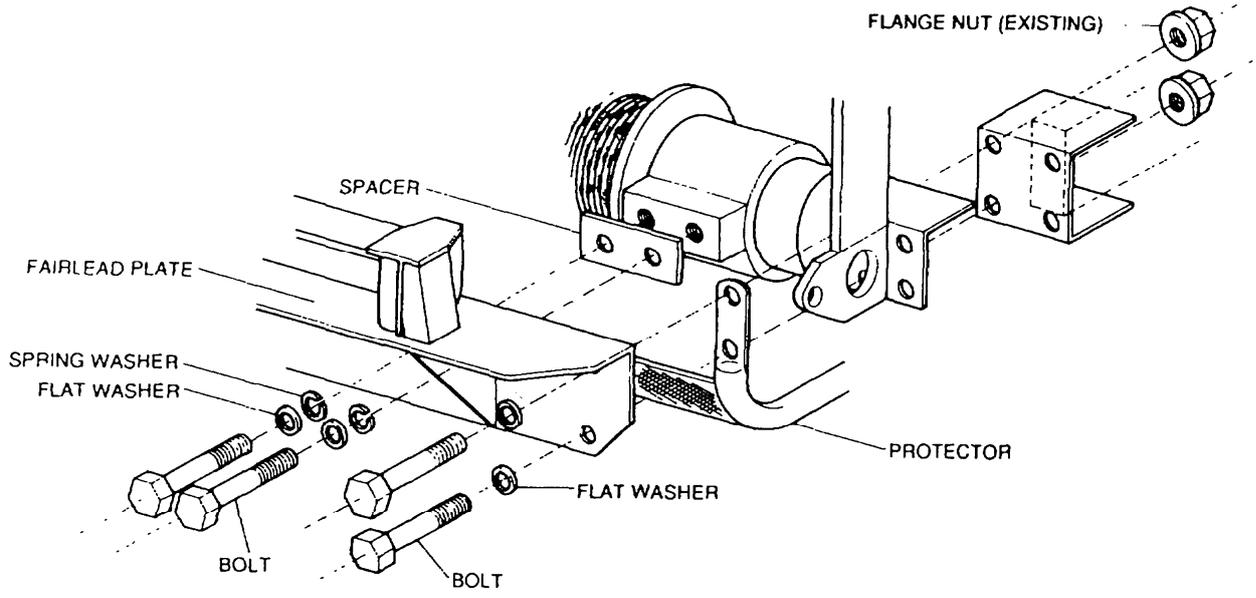


Figure 174 Winch Fairlead Plate Mounting

Steering System Specifications

267. The steering system specifications are detailed in Table 20.

Table 20 Steering System Specifications

Serial	Specification	Measurement
1	Steering linkage, tie rod and drag link ball joint nuts tightening torque	40 N.m (30 lbf.ft)
2	Steering linkage and drag link clamp bolts tightening torque	14 N.m (10 lbf.ft)
3	Toe-out setting	1.2–2.4 mm (0.045–0.09 in)
4	Tyre wall to radius arm (steering lock stop – adjustment) minimum clearance	20 mm (0.78 in)
5	Steering wheel retaining nut tightening torque	38 N.m (28 lbf.ft)
6	Power steering pump mounting bolts tightening torque	64 N.m (48 lbf.ft)

ELECTRICAL

Battery and Cables

268. Removal. Remove the battery and cables as follows:

- a. Raise the bonnet.
- b. Loosen the negative cable clamp and remove the clamp from the battery post.
- c. Loosen the positive cable clamp and remove the clamp from the battery post.
- d. Remove the nuts and washers securing the battery retaining bracket and remove the bracket (Figure 175).
- e. Lift the battery from the battery tray.
- f. Remove the nut, washers and bolt securing the negative (earth) cable to the chassis and remove the cable.
- g. Remove the nut and washer securing the positive cable to the starter solenoid and remove the cable.

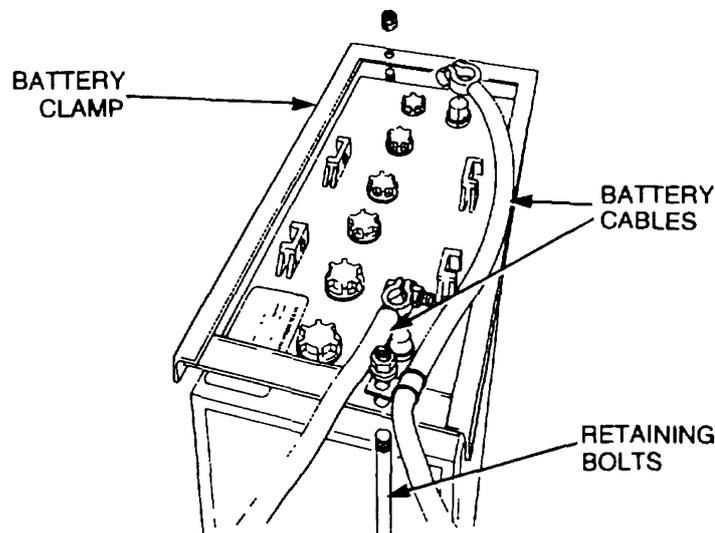


Figure 175 Battery Removal

269. Installation. Install the battery and cables as follows:

- a. Install the positive cable on the starter solenoid and secure it with the washer and nut.
- b. Fit the negative (earth) cable to the chassis ensuring that the earthing point is clean and free from corrosion.
- c. Install the bolt, washers and nut and tighten the nut securely.
- d. Position the battery into the battery tray ensuring that the negative (earth) post is towards the negative cable and secure the retaining bracket with the nuts and washers.
- e. Fit the positive cable clamp on the battery post and secure it with the nut and bolt.
- f. Ensure that all electrical switches are in the 'OFF' position.
- g. Fit the negative cable clamp on the battery post and secure it with the nut and bolt.
- h. Close the bonnet.

Glow Plugs

270. Removal. Remove the glow plugs as follows:

- a. Disconnect the battery.
- b. Loosen the nuts securing the electrical strip link to the glow plugs and slide the link away (Figure 176).
- c. Remove the nut from No. 4 cylinder plug and remove the feed wire.
- d. Using a 12 mm deep socket remove the glow plugs from the cylinder head.

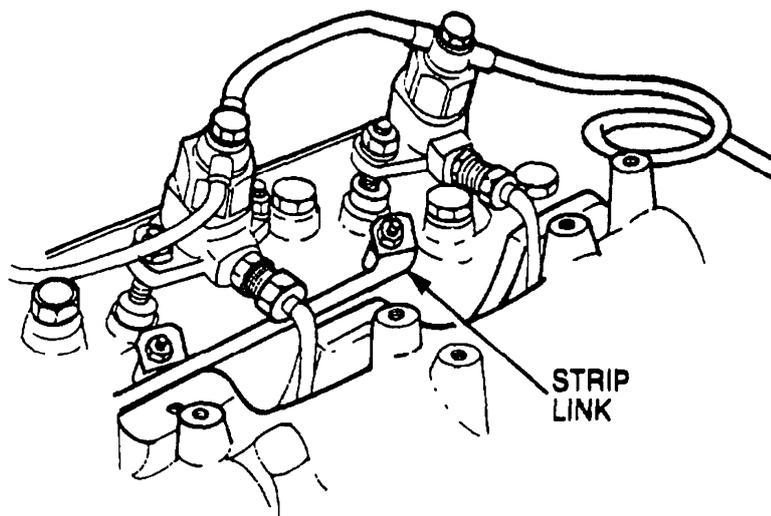


Figure 176 Glow Plug Removal

271. Installation. Install the glow plugs as follows:

- a. Install the glow plugs and torque them to 22–27 N.m (16–20 lbf.ft).
- b. Position the electrical strip link on the glow plugs and secure it with new nuts at cylinders 1, 2 and 3.
- c. Connect the electrical feed wire to cylinder No. 4 glow plug.
- d. Secure the feed wire and strip link to the glow plug with a new nut.
- e. Connect the battery.

Starter Motor

272. Removal. Remove the starter motor as follows:

- a. Disconnect the battery.
- b. Remove the nuts and washers securing the cables to the starter motor and solenoid.
- c. Tag and remove the cables.
- d. Remove the bolt, two nuts and lock washers securing the starter motor to the flywheel housing. Discard the lock washers.
- e. Remove the starter motor.

273. Installation. Install the starter motor as follows:

- a. Install the starter motor and secure it in position with the bolt, two nuts and new lock washers.
- b. Tighten the bolt and two nuts to 40 N.m (30 lbf.ft).
- c. Install the cables and washers and tighten the nuts securely.
- d. Connect the battery.

Alternator and Vacuum Pump

274. Removal. Remove the alternator and vacuum pump as follows:

- a. Disconnect the battery.
- b. Loosen the hose clamp securing the hose to the vacuum pump (Figure 177) and plug the hose with a suitable plug.

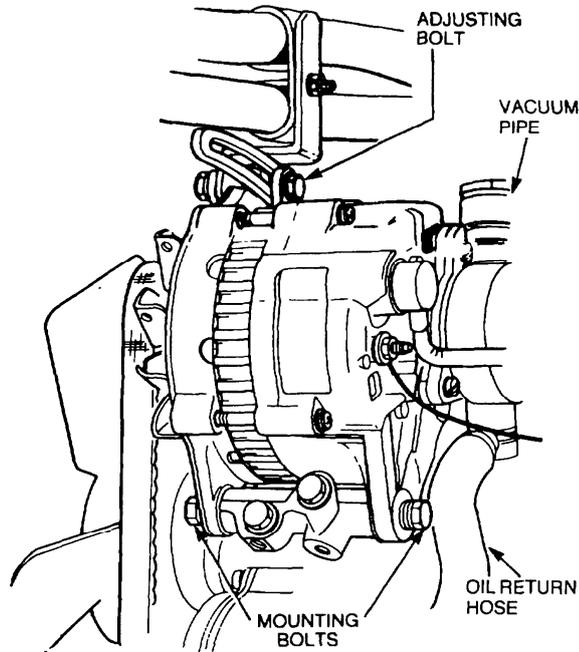


Figure 177 Alternator Removal

- c. Remove the banjo bolt and sealing washers securing the oil feed pipe to the vacuum pump. Discard the sealing washers.
- d. Remove and plug the pipe.
- e. Loosen the hose clamp securing the oil return hose to the vacuum pump.
- f. Remove and plug the hose.
- g. Remove the nut and washer securing the cable to the B-terminal of the alternator.
- h. Remove the field excitation plug from the alternator.
- i. Loosen the alternator mounting bolts and remove the adjusting bolt.
- j. Remove the fanbelt from the alternator drive pulley and swing the alternator away from the engine.
- k. Remove the mounting bolts and remove the alternator.

275. Installation. Install the alternator and vacuum pump as follows:

NOTE

Prior to installation, apply a few drops of engine oil into the oil feed opening. Rotate the alternator pulley to prevent oil starvation on initial starting.

- a. Position the alternator on the mounting bracket and install the two mounting bolts. Do not tighten them at this stage.
- b. Move the alternator towards the engine and install the fanbelt.
- c. Fit the adjusting bolt and move the alternator away from the engine until a belt deflection of 10–15 mm is obtained.
- d. Tighten the adjusting and mounting bolts securely.

- e. Fit the field excitation plug to the alternator socket and the single cable to the alternator B-terminal.
- f. Install the oil return hose to the vacuum pump and secure it with the hose clamp.
- g. Install the pipe, new sealing washers and banjo bolt. Tighten the bolt securely.
- h. Install the vacuum hose to the alternator and secure it with the hose clamp.
- i. Connect the battery.

Headlight

276. Bulb Replacement. Replace the headlight bulb as follows:

- a. Remove the four screws securing the headlight bezel and remove the bezel.
- b. Remove the three screws securing the headlight rim and remove the rim.
- c. Disconnect the plug connector from the light unit and remove the light unit.
- d. Remove the rubber seal and release the spring clip securing the bulb to the light unit. Remove the bulb.
- e. Fit the new bulb in the light unit ensuring that the bulb is seated correctly and install the rubber seal.
- f. Connect the plug connector to the light unit and install the light unit to the light unit shell.
- g. Fit the headlight rim and secure it with the three screws.
- h. Fit the headlight bezel and secure it with four screws.
- i. Adjust the headlights (Para 278).

277. Light Unit Replacement. Replace the light unit as follows:

- a. Remove the four screws securing the headlight bezel and remove the bezel.
- b. Remove the three screws securing the headlight rim and remove the rim (Figure 178).

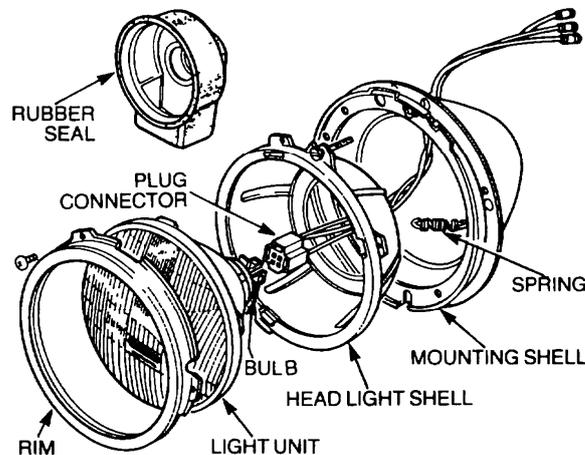


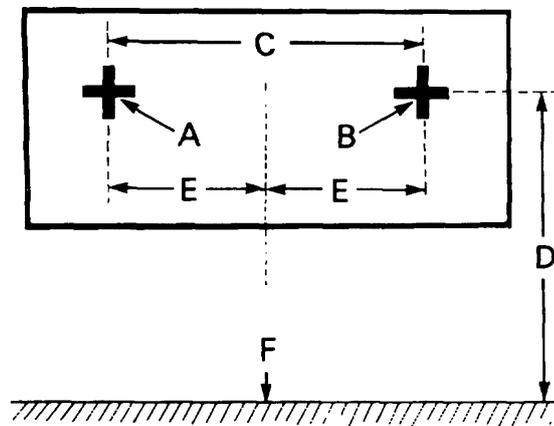
Figure 178 Headlight Unit Exploded View

- c. Disconnect the plug from the light unit and remove the light unit.
- d. Disconnect the spring from the headlight shell and remove it by rotating it clear of the slotted location.
- e. Tag and disconnect the main wiring harness from the headlight harness.
- f. Disconnect zip-clamps as necessary.
- g. Remove the screws securing the mounting shell to the mudguard front panel, then remove the shell and the gasket and discard the gasket.
- h. Fit the gasket on the mounting shell and fit the shell on the mudguard.
- i. Secure the shell with the screws.
- j. Ensure that the wiring harness and grommet are located in the mounting shell.

- k. Connect the headlight harness to the main wiring harness and secure them with zip-clamps if necessary.
- l. Install the headlight shell into the mounting shell and connect the spring.
- m. Ensure that the bulb is correctly installed in the light unit; then connect the plug.
- n. Fit the light unit to the headlight shell and secure it with the headlight rim.
- o. Install the three screws and tighten them securely.
- p. Install the headlight bezel and secure it with the four screws.
- q. Carry out the headlight adjustment procedure (Para 278).

278. Adjustment. Adjust the light unit as follows:

- a. Mark the headlight pattern (Figure 179) on a board or wall.
- b. Position the vehicle headlights 9.7 metres (32 feet) from the pattern.
- c. Ensure that the vehicle centre line is at right angles to the pattern and that the centre line of the pattern is in the same plane as the vehicle centre line.



- A — Concentrated area of light — Left hand head light
- B — Concentrated area of light — Right hand head light
- C — 1275 mm (50 in.)
- D — 880 mm (35 in.)
- E — 637 mm (25 in.)
- F — Ground level

Figure 179 Headlight Unit Adjustment

- d. Adjust the lateral and vertical screws (Figure 180), until the area of concentrated light corresponds with the pattern on the board i.e. approximately 76 mm (3 in) below the centre line of the corresponding headlight.

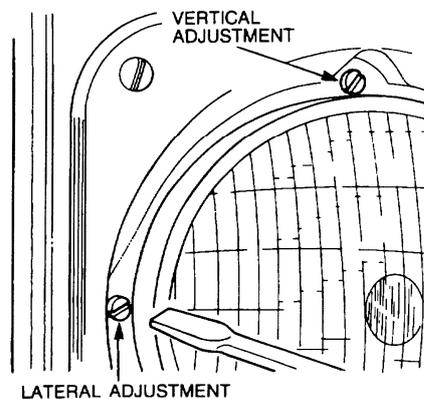


Figure 180 Headlight Beam Adjustment

Park Light

279. **Bulb Replacement.** Replace the park light bulb as follows:

- a. Remove the two screws securing the lens (Figure 181).
- b. Remove the lens then remove the bulb.
- c. Install the bulb and the lens. Install and tighten the two screws securely.

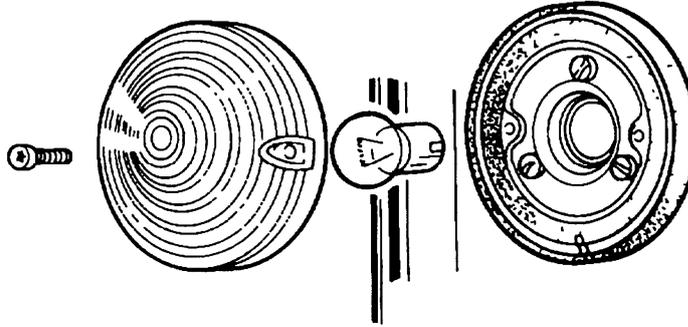


Figure 181 Park Light Exploded View

280. **Light Unit Replacement.** Replace the light unit as follows:

- a. Remove the two screws securing the lens then remove the lens.
- b. Tag and disconnect the light harness from the main wiring harness.
- c. Disconnect any zip-clamps if necessary.
- d. Remove the screws securing the light unit to the mudguard front panel.
- e. Remove and discard the light unit.
- f. Connect the light harness to the wiring harness.
- g. Position the new light unit on the mudguard front panel and secure it with the screws.
- h. Insert the bulb, then install the lens and secure it with the two screws.

Turn Indicator Light

281. **Bulb Replacement.** Replace the turn indicator light bulb as follows:

- a. Remove the two screws securing the lens (Figure 182).
- b. Remove the lens then remove the bulb.
- c. Install the bulb and the lens and tighten the two screws securely.

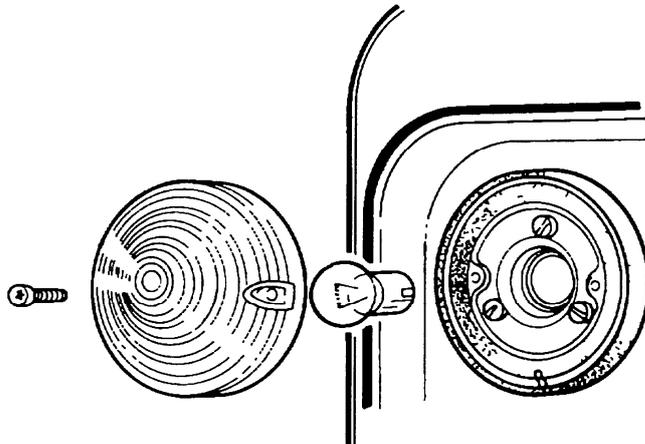
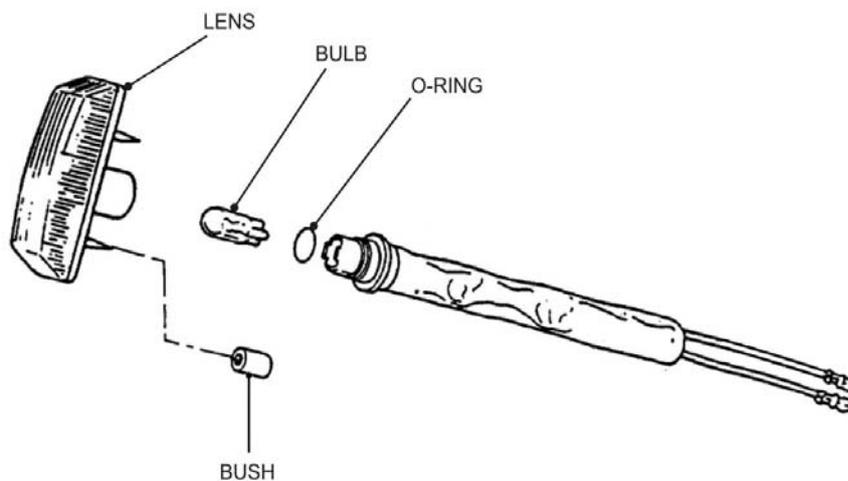


Figure 182 Turn Indicator Light Exploded View

- 282. Light Unit Replacement.** Replace the light unit as follows:
- Remove the two screws securing the lens and remove the lens.
 - Tag and disconnect the light harness from the main wiring harness.
 - Remove the screws securing the light unit to the mudguard front panel.
 - Remove and discard the light unit.
 - Position the new light unit on the mudguard front panel and secure it with the screws.
 - Insert the bulb, then install the lens and secure it with the two screws.
 - Connect the light harness to the wiring harness.

Side Indicator Light

- 283. Light Unit Replacement.** Replace the light unit as follows
- Prise the lens from the guard.
 - Withdraw the lens complete with light harness from the vehicle.
 - Tag and disconnect the light harness from the wiring harness.
 - Remove the light unit complete (Figure 183).
 - Insert the light unit through the mudguard and connect the wiring harness.
 - Push the lens unit with light harness into the vehicle and relocate the studs in the friction bushes.



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Figure 183 Side Indicator Light Exploded View

Stop/Tail, Reversing, Number Plate and Indicator Lights

- 284. Bulb Replacement.** Replace the stop/tail, reversing, number plate and indicator light bulb as follows:
- Remove the two screws securing the lens to the light unit.
 - Replace the bulb as required (Figure 184).
 - Install the lens ensuring the rubber seal is fitted correctly and secure it with the two screws.

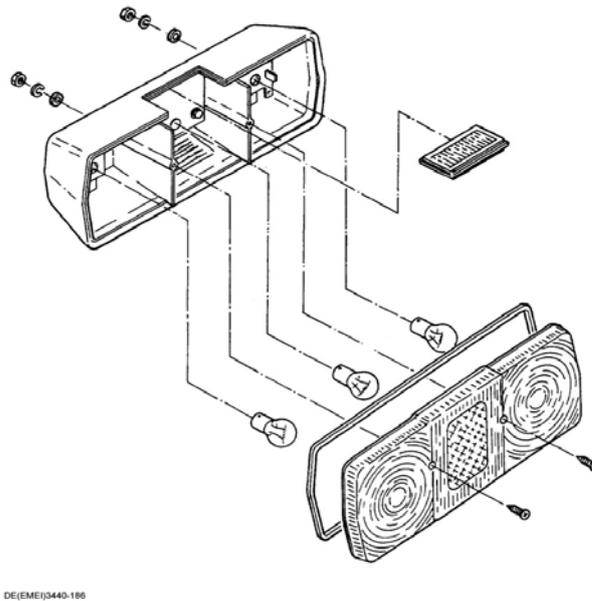


Figure 184 Stop/Tail, Reversing and Indicator Light Exploded View

285. Light Unit Replacement. Replace the light unit as follows:

- a. Tag and disconnect the light unit wiring harness from the main wiring harness.
- b. Disconnect any zip-clamps if necessary.
- c. Remove the two nuts and washers securing the light unit to the rear crossmember and remove the light.
- d. Install the light unit and secure with the two lock washers and nuts.
- e. Connect the light unit wiring harness to the main wiring harness and secure with zip-clamps if necessary.

Reduced Headlight

286. Bulb Replacement. Replace the reduced headlight bulb as follows:

- a. Remove the two screws securing the light rim, lens and gasket (Figure 185).

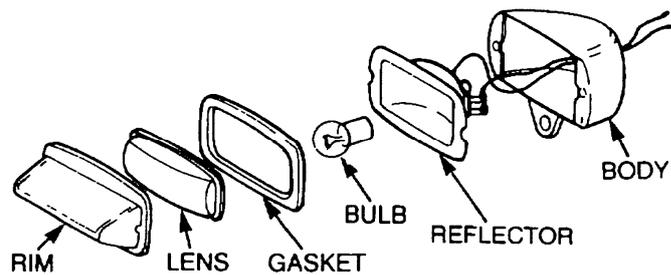


Figure 185 Reduced Headlight Exploded View

- b. Replace the bulb.
- c. Install the gasket, lens and light rim and secure them with the two screws.

287. Light Unit Replacement. Replace the light unit as follows:

- a. Tag and disconnect the light unit wiring harness from the main wiring harness.
- b. Disconnect any zip-clamps if necessary.
- c. Remove the bolt securing the light unit to the mounting bracket.
- d. Withdraw the light unit harness through the grommet in the front panel and remove the light.

- e. Fit the light unit wiring harness through the front panel grommet.
- f. Install the light unit on the mounting bracket and secure it with the bolt.
- g. Connect the light unit wiring harness to the main wiring harness and secure it with zip-clamps if necessary.

Blackout Light (Front)

- 288. Light Unit Replacement.** Replace the front blackout light unit as follows:
- a. Tag and disconnect the light unit wiring harness from the main wiring harness.
 - b. Disconnect any zip-clamps if necessary.
 - c. Remove the two nuts and washers securing the light unit to the front panel (Figure 186).
 - d. Remove the light.

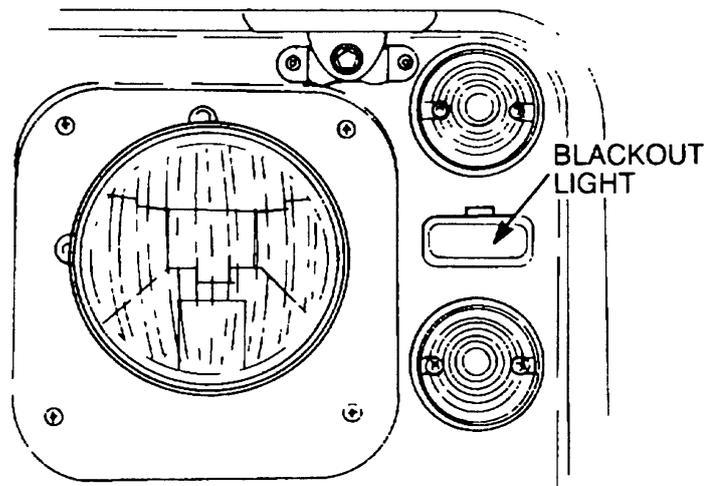


Figure 186 Blackout Light (Front) Removal

- e. Insert the light unit wiring harness through the front panel and fit the light unit.
- f. Secure the light unit with the two nuts and washers.
- g. Connect the wiring harness and secure it with zip-clamps if necessary.

Blackout Stop/Tail Lights

- 289. Light Unit Replacement.** Replace the blackout stop/tail light unit as follows:
- a. Tag and disconnect the light unit wiring harness from the main wiring harness.
 - b. Disconnect any zip-clamps if necessary.
 - c. Remove the two nuts and washers securing the light unit to the rear cross-member (Figure 187).
 - d. Remove the light unit.
 - e. Insert the light unit wiring harness through the rear cross-member.
 - f. Fit the light unit and secure it with the two nuts and washers.
 - g. Connect the wiring harnesses and secure it with zip-clamps if necessary.

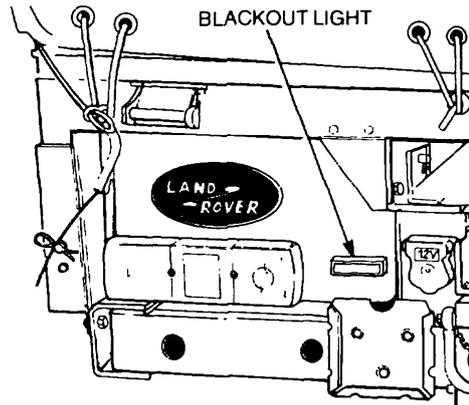


Figure 187 Blackout Stop/Tail Light Removal

Convoy Light

290. **Bulb Replacement.** Replace the convoy light bulb as follows:

- a. Loosen the two screws securing the lens.
- b. Remove the lens and the sealing-washers (Figure 188).
- c. Replace the bulb.

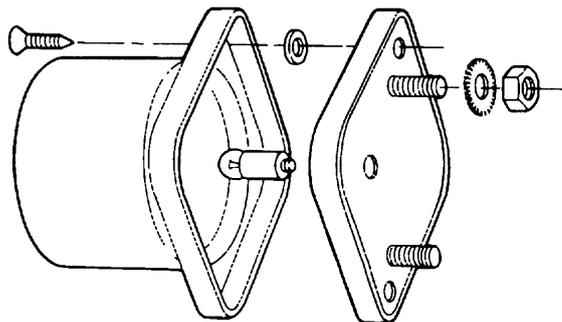


Figure 188 Convoy Light Exploded View

- d. Install the two sealing-washers onto the screws.
- e. Install the lens and tighten the screws.

291. **Light Unit Replacement.** Replace the light unit as follows:

- a. Tag and disconnect the light unit harness at the right-hand rear lamp.
- b. Disconnect any zip-clamps if necessary.
- c. Remove the two nuts, washers and bolts securing the light unit to the chassis bracket.
- d. Remove the light.
- e. Insert the light unit harness through the chassis bracket and fit the light unit.
- f. Secure it with the two nuts, washers and bolts.
- g. Connect the wiring harness and secure with zip-clamps, if necessary.

Cab Dome Light

292. **Bulb Replacement.** Replace the cab dome light bulb as follows:

- a. Remove the screw retaining the lens and rim to the light unit (Figure 189).
- b. Replace the bulb and fit the lens and secure it with the screw.

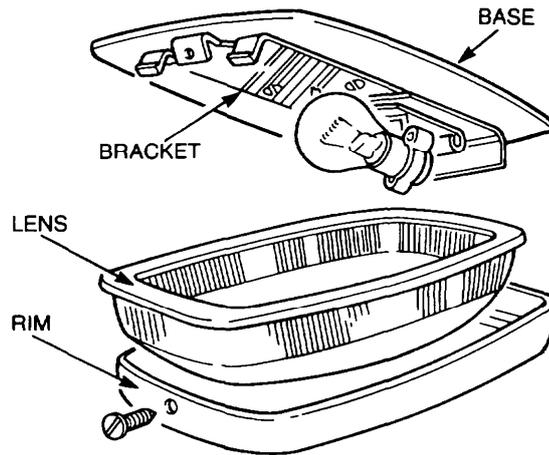


Figure 189 Cab Dome Light Exploded View

- 293. Light Unit Replacement.** Replace the light unit as follows:
- Remove the screw retaining the lens and rim to the light unit and remove the bulb.
 - Disconnect the wiring harness at the light.
 - Remove the two screws securing the light unit to the windscreen bracket and remove the light unit.
 - Insert the wire through the appropriate hole in the base.
 - Connect the wire to the light unit bracket with the retaining screw.
 - Secure the light unit bracket and base to the windscreen bracket with the two screws.
 - Insert the bulb. Secure the lens and rim with the retaining screw.

Map Reading Light

- 294. Bulb Replacement.** Replace the map reading light bulb as follows:
- Using a small screwdriver, insert the blade into the slot at the side of the lens.
 - Carefully pry the lens away from the body (Figure 190).

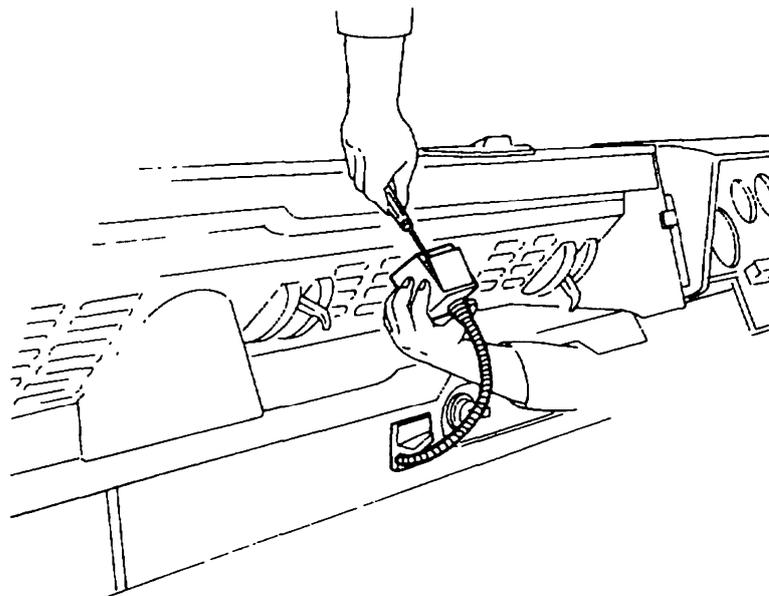


Figure 190 Map Reading Light Lens Removal

- Replace the bulb and install the lens.

295. **Light Unit Replacement.** Replace the light unit as follows:

- a. Remove the four screws securing the cover to the dash panel (Figure 191).
- b. Carefully remove the cover enough to enable the light unit wiring harness to be disconnected from the quick release terminals.

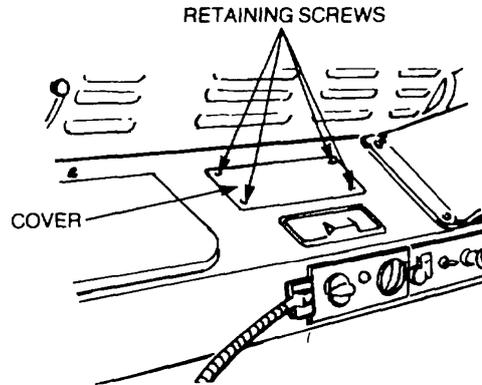


Figure 191 Map Reading Light Removal

- c. Remove the two nuts and washers securing the light unit to the dash panel and remove the light unit.
- d. Insert the wiring harness through the dash panel then fit the new light unit.
- e. Secure the light unit with the nuts and washers.
- f. Connect the wiring harness to the quick release terminals.
- g. Install the cover and secure it with the four screws.

Instrument Panel Lighting

296. **Bulb Replacement.** Replace the instrument panel light bulb as follows:

- a. Disconnect the battery.
- b. Remove the four screws retaining the instrument panel (Figure 192).

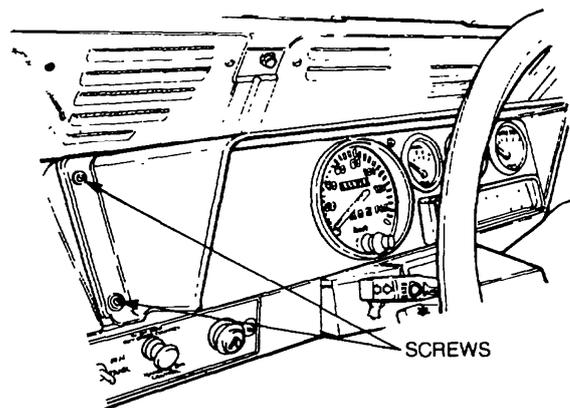


Figure 192 Instrument Panel Light Bulb Replacement

- c. Carefully ease the panel away from the surround.

NOTE

If necessary disconnect the speedometer cable to allow easier access.

- d. Remove the bulb holder from the socket with a pull/twist action.
- e. Replace the bulb.
- f. Insert the bulb holder with a push/twist action.

- g.** Check that the speedometer cable is connected. Install the instrument panel and secure it with the four screws.
- h.** Connect the battery.

Warning Lights

297. Replace the warning light bulb as follows:

- a.** Disconnect the battery.
- b.** Remove the two screws retaining the warning light module to the instrument panel (Figure 193).
- c.** Withdraw the module and the blackout cover. Disconnect the plug.
- d.** Remove the bulb holder from the socket with a pull/twist action then replace the bulb.
- e.** Insert the bulb holder with a push/twist action.
- f.** Connect the plug and install the module and the blackout cover on the instrument panel and secure it with the two screws.
- g.** Connect the battery.

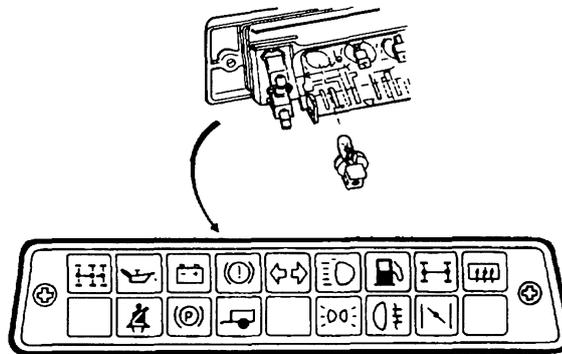


Figure 193 Warning Light Module Removal

Ignition Switch

298. Replacement. Replace the ignition switch as follows:

- a.** Disconnect the battery.
- b.** Remove the screw securing the steering wheel cover and remove the cover.
- c.** With the front wheels in the straight-ahead position remove the steering wheel retaining nut and shake proof washer. Discard the washer.
- d.** Using the steering wheel puller (Table 3, Serial 3), remove the steering wheel from the column.
- e.** Remove the seven screws securing the steering column shroud (Figure 194).

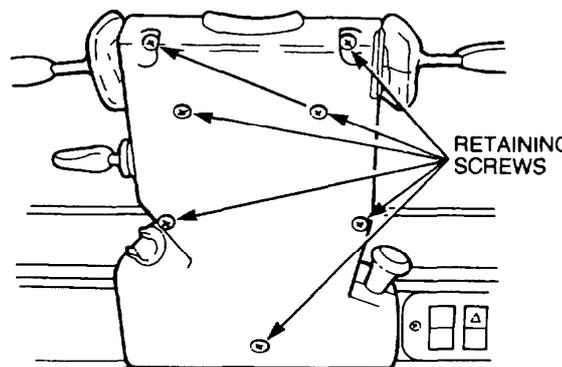


Figure 194 Steering Column Shroud Removal

- f. Using a length of 2 mm thick wire, insert the wire in the hole located in the lower part of the switch (Figure 195), depress the lock barrel plunger and withdraw the lock barrel.

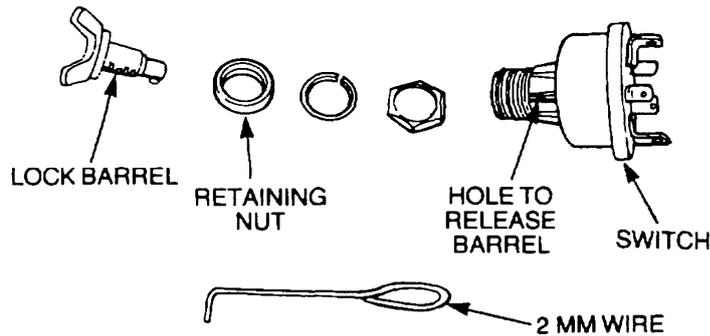


Figure 195 Ignition Switch Exploded View

- g. Remove the retaining nut and remove the switch from the mounting bracket.
h. Tag and disconnect the wires from the switch.
i. Connect the wires to the correct terminals and install the switch to the mounting bracket.
j. Secure the switch to the bracket with the retaining nut.
k. Insert the lock barrel.
l. Install the steering column shroud and secure it with the seven screws.

NOTE

When installing the steering wheel, ensure that the two prongs on the steering wheel hub engage the cut outs in the upper steering column bush. If necessary, rotate the bush to align with the two prongs, ensuring that the arrow on the bush faces the indicator switch.

- m. Install the steering wheel, new shake proof washer and nut. Tighten the nut to 38 N.m (28 lbf.ft).
n. Fit the steering wheel cover and secure it with the screw.
o. Connect the battery.

Combination Switch

299. Replacement. Replace the combination switch as follows:

- a. Disconnect the battery.
b. Remove the screw securing the steering wheel cover and remove the cover.
c. With the front wheels in the straight ahead position, remove the steering wheel retaining nut and the shake proof washer. Discard the washer.
d. Using the steering wheel puller (Table 3, Serial 3), remove the steering wheel from the column.
e. Remove the seven screws securing the steering column shroud (Figure 194). Remove the shroud.
f. Tag and disconnect the light switch harness plug.
g. Loosen the nut securing the switch to the bracket and remove the switch.
h. Tag and disconnect the wiper switch harness plug.
i. Remove the three screws securing the switch to the combination switch bracket (Figure 196).
j. Carefully remove the wiper switch to prevent loss of internal components.
k. Loosen the clamp screw securing the combination switch to the upper steering column.
l. Slide the assembly off the column.

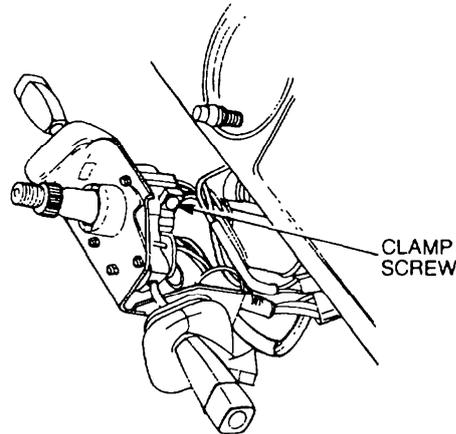


Figure 196 Combination Switch Removal

- m. Fit the switch assembly on the column and tighten the clamp screw.
- n. Connect the wiring harness.
- o. Install the wiper switch to the bracket and secure it with the three screws.
- p. Connect the wiring harness.
- q. Fit the light switch to the bracket and tighten the retaining nut.
- r. Connect the wiring harness.
- s. Install the steering column shroud and secure it with the seven screws.

NOTE

When installing the steering wheel, ensure that the two prongs on the steering wheel hub engage the cut outs in the upper steering column bush. If necessary, rotate the bush to align with the two prongs, ensuring that the arrow on the bush faces the indicator switch.

- t. Install the steering wheel shake proof washer and nut, then torque it to 38 N.m (28 lbf.ft).
- u. Fit the steering wheel cover and secure it with the screw.
- v. Connect the battery.

Headlight and Park Light Switch

300. Replacement. Replace the headlight and park light switch as follows:

- a. Disconnect the battery.
- b. Remove the screws securing the steering wheel cover and remove the cover.
- c. With the front wheels in the straight ahead position, remove the steering wheel retaining nut and the shake proof washer. Discard the washer.
- d. Using the steering wheel puller (Table 3, Serial 3), remove the steering wheel from the column.
- e. Remove the seven screws securing the steering column shroud (Figure 194).
- f. Tag and disconnect the light switch harness plug.
- g. Loosen the locknut securing the switch to the bracket and remove the switch
- h. Fit the new light switch to the bracket and tighten the locknut.
- i. Connect the wiring harness.
- j. Install the steering column shroud and secure it with the seven screws.

NOTE

When installing the steering wheel, ensure that the two prongs on the steering wheel hub engage the cut outs in the upper steering column bush. If necessary, rotate the bush to align with the two prongs, ensuring that the arrow on the bush faces the indicator switch.

- k. Install the steering wheel and secure it with a new shake proof washer and the nut. Tighten the nut to 38 N.m (28 lbf.ft).
- l. Fit the steering wheel cover and secure it with the screw.
- m. Connect the battery.

Panel Light Dimmer Switch

301. Replacement. Replace the panel light dimmer switch as follows:

- a. Disconnect the battery.
- b. Remove the four screws securing the top cover to the dash panel (Figure 197).

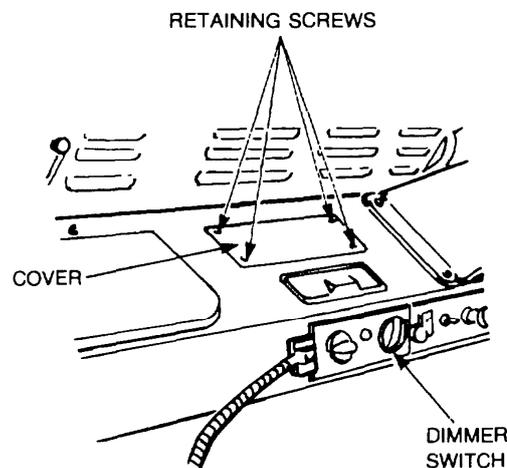


Figure 197 Switch Top Cover Removal

- c. Using a small screwdriver, push in the spring-loaded pin and remove the knob from the switch.
- d. Remove the nut retaining the switch to the mounting bracket.
- e. Tag and disconnect the two wires connected to the switch and remove the switch.
- f. Insert the switch through the mounting bracket and secure it with the nut.
- g. Fit the knob on the switch ensuring the spring-loaded pin engages.
- h. Connect the two wires and install the top cover and secure the cover with the four screws.
- i. Connect the battery.

Differential Lock Control Switch

302. Replacement. Replace the differential lock control switch as follows:

- a. Disconnect the battery.
- b. Remove the four screws securing the top cover to the dash panel (Figure 197).
- c. Using a small screwdriver, loosen the screw securing the knob to the blackout switch. Remove the knob.
- d. Push in the spring-loaded pin and remove the knob from the dimmer switch.
- e. Using an open-ended spanner, secure the shaft on the differential lock control switch and unscrew the knob.
- f. Remove the two screws securing the fascia plate and mounting bracket to the dash panel.

- g.** Tag and disconnect the three vacuum pipes connected to the differential lock control switch (Figure 198).

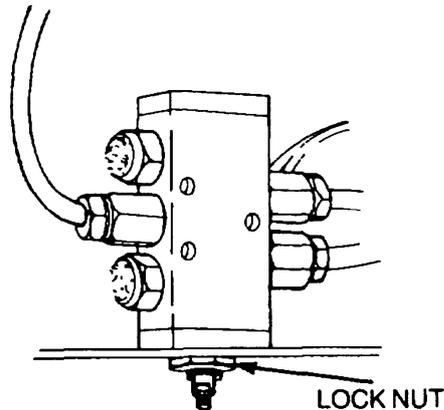


Figure 198 Differential Lock Control Switch Removal

- h.** Remove the locknut securing the switch to the mounting bracket.
- i.** Position the control switch in the mounting bracket and secure it with the locknut.
- j.** Insert the three vacuum pipes and tighten the connectors securely.
- k.** Position the mounting bracket and fascia plate on the dash panel and secure them with the two screws.
- l.** Using an open-ended spanner, secure the control switch shaft and screw the knob back on.
- m.** Push the knob onto the dimmer switch, ensuring the spring-loaded pin engages.
- n.** Install the blackout switch knob and tighten the retaining screw.
- o.** Install the top cover and secure it with the four screws.
- p.** Connect the battery.

Blackout Light Switch

303. Replacement. Replace the blackout light switch as follows:

- a.** Disconnect the battery.
- b.** Remove the four screws securing the top cover to the dash panel (Figure 197).
- c.** Using a small screwdriver, loosen the screw securing the knob to the blackout switch.
- d.** Using a small screwdriver, push in the spring-loaded pin to release the knob from the dimmer switch.
- e.** Using an open-ended spanner, secure the shaft on the differential lock control switch and unscrew the knob.
- f.** Remove the two screws securing the fascia plate and mounting bracket to the dash panel.
- g.** Remove the two round-head screws securing the switch to the bracket and remove the switch (Figure 199).
- h.** Tag and disconnect all the wires from the terminals.
- i.** Remove the two countersunk screws securing the plate to the switch.
- j.** Remove the two long nuts and replace the switch.
- k.** Install the two long nuts, then fit the plate and secure it with the two countersunk screws.
- l.** Connect the wires on the correct terminals as tagged.
- m.** Fit the switch to the mounting bracket with terminal three uppermost and secure it with the two round-head screws.

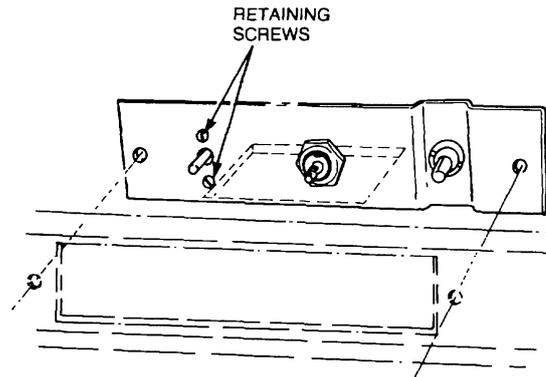


Figure 199 Blackout Lighting Switch Removal

- n. Fit the mounting bracket and fascia plate to the dash panel and secure them with the two screws.
- o. Install the blackout switch knob and tighten the retaining screw.
- p. Push on the dimmer light switch knob, ensuring the spring-loaded pin engages.
- q. Using an open-ended spanner, secure the shaft on the differential lock control switch and screw the knob back on.
- r. Install the top cover and secure it with the four screws.
- s. Connect the battery.

Hazard Warning Switch

304. Replacement. Replace the hazard warning switch as follows:

- a. Remove the two screws securing the switch panel and remove the panel.
- b. Disconnect the plug from the switch.
- c. Press the securing clips on the back of the switch and draw the switch out of the panel.
- d. Insert the new switch into the switch panel ensuring the securing clips click into place.
- e. Connect the plug to the new switch.
- f. Install the switch panel and secure it with the two screws.

Dash Instruments

305. Speedometer Replacement. Replace the speedometer as follows:

- a. Disconnect the battery.
- b. Remove the four screws retaining the instrument panel (Figure 192) and carefully ease the panel away from the surround.
- c. Depress the clip securing the speedometer cable to the speedometer and withdraw the cable.
- d. Tag and remove the bulb holders from the speedometer sockets.
- e. Remove the two knurled nuts securing the speedometer to the instrument panel and remove the speedometer.
- f. Insert the new speedometer into the instrument panel and secure it with the two knurled nuts.
- g. Install the bulb holders on the speedometer.
- h. Fit the speedometer cable on the speedometer, ensuring that the clip locks into position.
- i. Install the instrument panel and secure it with the four screws.
- j. Connect the battery.
- k. Record the speedometer replacement in the GM-120 – Record Book for Service Equipment and SDSS in accordance with EMEI Vehicle A 019-1.

306. Fuel Gauge Replacement. Replace the fuel gauge as follows:

- a. Disconnect the battery.
- b. Remove the four screws retaining the instrument panel (Figure 192) and carefully ease the panel away from the surround.

NOTE

If necessary, disconnect the speedometer cable to allow easier access.

- c. Remove the bulb holder from the fuel gauge.
- d. Tag and disconnect the electrical connections.
- e. Remove the nut securing the gauge to the instrument panel and remove the gauge.
- f. Insert the new gauge into the panel and secure it with the nut.
- g. Connect the electrical connections as tagged.
- h. Install the bulb holder on the fuel gauge.
- i. Ensure that the speedometer cable is connected.
- j. Install the instrument panel and secure it with the four screws.
- k. Connect the battery.

307. Temperature Gauge Replacement. Replace the temperature gauge as follows:

- a. Disconnect the battery.
- b. Remove the four screws retaining the instrument panel (Figure 192) and carefully ease the panel away from the surround.

NOTE

If necessary, disconnect the speedometer cable to allow easier access.

- c. Remove the bulb holder from the temperature gauge.
- d. Tag and disconnect the electrical connections.
- e. Remove the nut securing the gauge to the instrument panel and remove the gauge.
- f. Insert the new gauge into the panel and secure it with the nut.
- g. Connect the electrical connections as tagged.
- h. Install the bulb holder on the temperature gauge.
- i. Ensure that the speedometer cable is connected.
- j. Install the instrument panel and secure it with the four screws.
- k. Connect the battery.

308. Volt Meter Replacement. Replace the volt meter as follows:

- a. Disconnect the battery.
- b. Remove the four screws retaining the instrument panel (Figure 192) and carefully ease the panel away from the surround.

NOTE

If necessary, disconnect the speedometer cable to allow easier access.

- c. Remove the bulb holder from the volt meter gauge.
- d. Tag and disconnect the electrical connections.
- e. Remove the nut securing the gauge to the instrument panel and remove the gauge.

- f. Insert the new gauge into the panel and secure it with the nut.
- g. Connect the electrical connections as tagged.
- h. Install the bulb holder on the volt meter gauge.
- i. Ensure that the speedometer cable is connected.
- j. Install the instrument panel and secure it with the four screws.
- k. Connect the battery.

Windscreen Wiper Motor

309. Removal. Remove the windscreen wiper motor as follows:

- a. Disconnect the battery.
- b. Remove the wiper blades and arms.
- c. Slide the rubber boot up the drive cable tubing and loosen the nut securing the tubing to the wiper motor.
- d. Disconnect the wiring harness plug from the wiper motor (Figure 200).

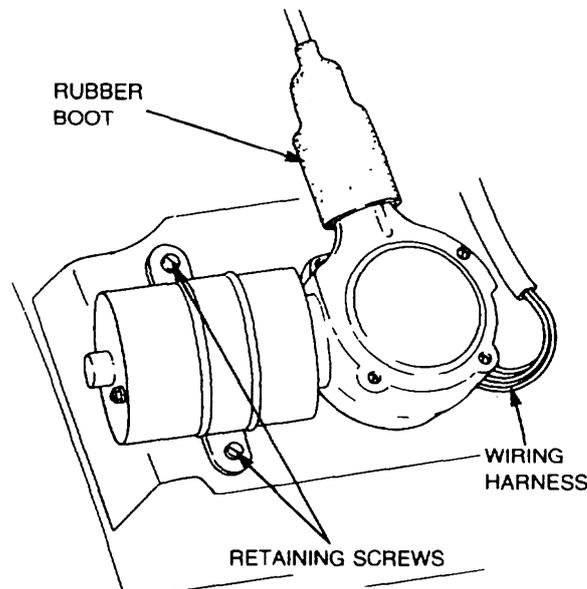
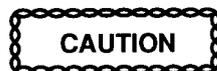


Figure 200 Wiper Motor Removal



The two screws, retaining the wiper motor, also retain a tapped plate on the engine side of the firewall. Do not fully remove the wiper motor retaining screws. If the plate falls away from the mounting position they are difficult to reposition correctly.

- e. Loosen the two wiper motor retaining screws and slide the motor, rubber pad and drive cable out of the clamp.

310. Installation. Install the windscreen wiper motor as follows:

- a. Insert the drive cable in the drive cable tubing and rotate the wheel box spindles to engage the drive between the cable and gears.
- b. Slide the wiper motor into the retaining clamp.
- c. Position the rubber pad between the wiper motor and the firewall and tighten the retaining screws securely.

- d. Tighten the drive cable tubing nut securely and cover it with the rubber boot.
- e. Connect the wiring harness plug.
- f. Install the wiper blades and arms.
- g. Connect the battery.

Windscreen Wiper Cable

311. Removal. Remove the windscreen wiper cable as follows:

- a. Disconnect the battery.
- b. Remove the wiper blades and arms.
- c. Slide the rubber boot up the drive cable tubing and loosen the nut securing the tubing to the wiper motor.
- d. Disconnect the wiring harness plug from the wiper motor (Figure 200).
- e. Loosen the two wiper motor retaining screws and slide the motor, rubber pad and drive cable out of the clamp.
- f. Remove the four screws securing the motor gearbox cover plate and remove the plate.
- g. Remove the circlip and washer securing the connecting rod.
- h. Disconnect the drive cable from the rod.

312. Installation. Install the windscreen wiper cable as follows:

- a. Connect the drive cable to the connecting rod.
- b. Smear grease on the connecting rod and cable end.
- c. Fit the cover plate to the gearbox and secure it with the four screws.
- d. Smear the drive cable with grease and insert the cable in the drive cable tubing. Rotate the wheel box spindles to engage the drive between the cable and gears.
- e. Slide the wiper motor into the retaining clamp and tighten the retaining screws securely.
- f. Tighten the drive cable tubing nut securely and cover it with the rubber boot.
- g. Connect the wiring harness plug.
- h. Install the wiper blades and arms.
- i. Connect the battery.

Windscreen Washer Motor

313. Removal. Remove the windscreen washer motor as follows:

- a. Remove the delivery pipe from the washer motor (Figure 201) and remove the motor from the reservoir.
- b. Plug the supply port with a suitable plug.

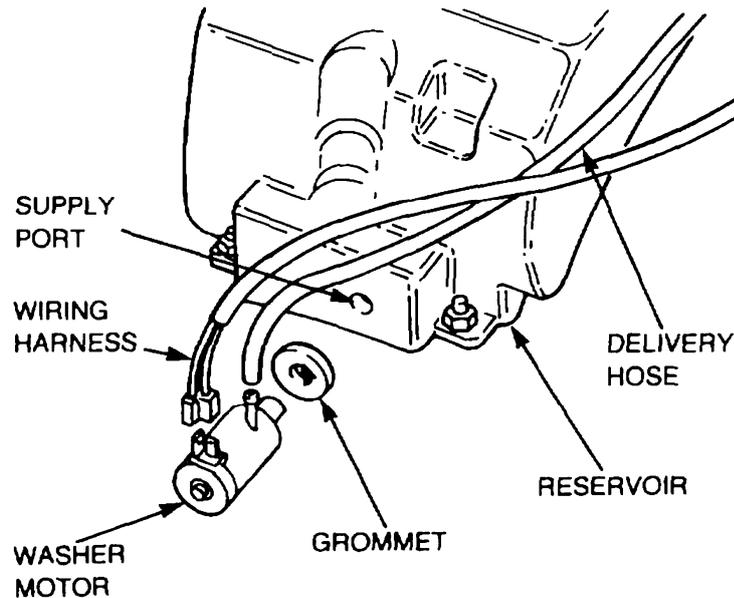


Figure 201 Windscreen Washer Motor Removal

- c. Remove the wiring harness plug from the motor.
- d. Remove and discard the grommet.

314. Installation. Install the windscreen washer motor as follows:

- a. Install a new grommet on the motor, remove the plug from the port then push in the motor.
- b. Push on the wiring harness connector.
- c. Connect the delivery pipe on the washer motor.
- d. Check the reservoir for leaks.

Horn

315. Removal. Remove the horn as follows:

- a. Remove the eight screws securing the front grille and remove the grille.
- b. Disconnect the wiring harness plug from the horn.
- c. Remove the two bolts securing the horn to the front panel and remove the horn.

316. Installation. Install the horn as follows:

- a. Position the horn on the front panel and secure it with the two bolts.
- b. Connect the wiring harness plug to the horn.
- c. Position the front grille on the vehicle and secure it with the eight screws.

Turn Indicator Flasher Unit

317. Removal. Remove the turn indicator flasher unit as follows:

- a. Disconnect the battery.
- b. Remove the fuse panel cover.
- c. Remove the two screws securing the fuse panel to the firewall (Figure 202) and move the panel away.

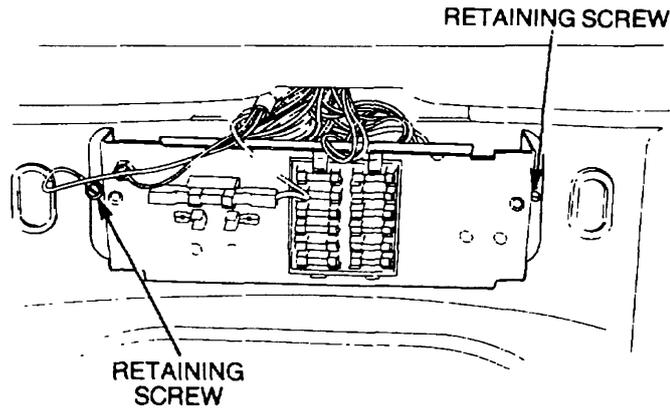


Figure 202 Fuse Panel Removal

- d. Remove the flasher unit from the socket (Figure 203).

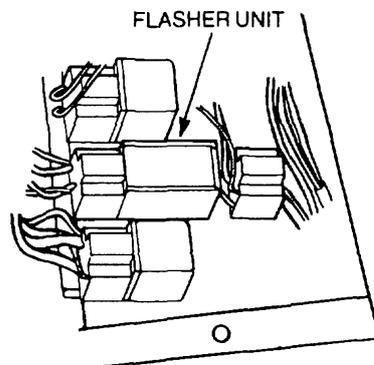


Figure 203 Flasher Unit Removal

- 318. **Installation.** Install the turn indicator flasher unit as follows:
 - a. Align the flasher unit pins with the socket and push it in.
 - b. Position the fuse panel on the firewall and secure it with the two screws.
 - c. Install the fuse panel cover and secure it with the two knurled knobs.
 - d. Connect the battery.

NATO Socket

- 319. **Removal.** Remove the NATO socket as follows:
 - a. Disconnect the battery.
 - b. Tag and disconnect the wiring harness connectors located behind the right rear tail lamp.
 - c. Remove the four nuts, washers and bolts securing the socket to the rear cross-member.
 - d. Remove the three clamps securing the socket wiring harness to the rear cross-member.
 - e. Remove the socket and harness from the vehicle.
- 320. **Installation.** Install the NATO socket as follows:
 - a. Insert the wiring harness through the rear cross-member and position the socket with the hinge uppermost.
 - b. Install the four bolts, washers and nuts and tighten them securely.
 - c. Connect the wiring harness connectors to the main harness (if necessary secure it with zip-clamps).
 - d. Secure the harness to the rear cross-member with the clamps.
 - e. Connect the battery.

321. Test Procedure. Test the NATO socket for correct operation as follows:



If bulb replacement is required, all bulbs are accessible from the front panel of the tester. Do not remove the bottom cover.

NOTE

In order to check both earth terminals, all lights except the tail light are earthed through terminal L. The tail light is earthed through terminal D.

- a. Plug the NATO tester into the NATO socket.
- b. With the vehicle ignition and light switches 'OFF', all lights on the tester should be extinguished with the exception of the auxiliary power.
- c. Switch on the left side indicator and check that the left side indicators flash.
- d. Switch on the right side indicator and check that the right side indicators flash.
- e. Apply the foot brake and check that both stop lights illuminate.
- f. Switch on the park lights and check that the tail lights illuminate.
- g. Switch to the blackout mode.
- h. Check that all green blackout and convoy lights illuminate.
- i. Apply the foot brake and check that the red blackout stop light illuminates.
- j. Check that the auxiliary power light is extinguished in the blackout mode.

Tester Pin Connections

322. A list of terminals to light connections is shown in Table 21.

Table 21 Tester Pin Connections

Serial	Pin	Colour and Function
1	A	Green, blackout and convoy light
2	C	Green, blackout and convoy light
3	H	Green, blackout and convoy light
4	M	Red, left side indicator
5	N	Red, right side indicator
6	B	Red, stop, left side
7	J	Red, stop, right side
8	E	Amber, tail lamp
9	F	Red blackout stop light
10	K	Blue auxiliary power lamp

Fuse Boxes

323. The main change to the fuse box assembly has been the change from barrel to blade fuses, with minor changes to the blade fuse loom components. Details of blade fuses and associated relays are contained in the relevant variant RPS in Group QMA.

324. ARN change points and main loom types are shown in Table 22. The looms can be broken down into four basic types as follows:

- a. Group1 – Barrel fuses;
- b. Group 2 – Blade fuses (no wiper delay);

- c. Group 3 – Blade fuses (headlight override relay removed and link cable fitted in accordance with EMEI Vehicle G 187-1); and
- d. Group 4 – Blade fuses (wiper delay relay fitted).

Table 22 ARN Change Points Barrel/Blade Fuses

	Group 1 Barrel Fuses	Group 2 Blade Fuses	Group 3 Blade Fuses and Headlight Link Cable	Group 4 Blade Fuses with Wiper Delay Relay
Cargo	50504	-	50793	51802
Cargo with winch	50572	-	-	-
Air Defence – RBS 70	50664	-	-	-
Ambulance	50515	-	-	-
GMV	50665	-	50764	50820
ERV	50666	50842	51973	50851 & 50852 51984 ON
Parakeet (crew cab)	-	-	-	All
LRPV	-	-	-	All (BYG9059) Rework of (PRC8384)

325. The breakdown of individual components within each type of is shown in Table 23 and is provided to assist parts identification.

Table 23 Loom Component Identification

Description	Group 1 Barrel Fuses	Group 2 Blade Fuses	Group 3 Blade Fuses and Headlight Link Cable	Group 4 Blade Fuses with Wiper Delay Relay
Main harness	6150-66-139-0078	PRC7850	2590-66-128-8456	2590-66-128-8456
Control unit – variable delay	-	-	-	2540-99-709-0106
Label fuse identification	9905-66-128-4966	9905-66-128-5961	9905-66-128-5961	9905-66-128-5961
Fuse relay mounting panel	AYG9996	2590-99-795-1082	2590-99-795-1082	2590-99-795-1082
Cable assembly – engine	6150-66-128-4900	6150-66-128-4900	6150-66-128-4900	6150-66-128-4900
Harness – front marker lamp	BYG9066	BYG9066	BYG9066	BYG9066
Label – blackout light fuses	9905-66-128-4968	-	-	-
Fuse box – blackout fuses	PRC3737	-	-	-
Chassis harness	AYG9971	BYG9065	BYG9065	BYG9065
Twin fuel tank harness (6x6 and RFSV)	CYG9041	6150-66-139-0038	6150-66-139-0038	6150-66-139-0038
Label – inline fuses	9905-66-128-5844	BYG9074	BYG9074	BYG9074
Harness – cigar lighter	AYG9899	BYG9064	BYG9064	BYG9064
Cable assembly – Santon switch	BYG9357	6150-66-139-0052	6150-66-139-0052	6150-66-139-0052
Harness header panel (6x6 Ambulance)	BYG9022	BYG9068	BYG9068	BYG9068

326. Protection of Wiring Looms. The wiring loom length and routing may vary from vehicle to vehicle, from changes during production or as a result of subsequent repairs. Spiral wrap plastic tubing (Table 24) may be used to enclose the loom to prevent chafing, especially where disassembly and rerouting of the loom is impracticable.

Table 24 Spiral Wrap Details

Serial	NSN	Designation
1	9330-66-057-8399	Tubing, plastic, spiral wrap, nylon, 12 mm
2	9330-00-733-7799	Tubing, plastic, spiral wrap, 3 mm
3	9330-66-057-8392	Tubing, plastic, spiral wrap, 4 mm
4	9330-66-057-8396	Tubing, plastic, spiral wrap, 6 mm

Wiring Diagram and Loom Replacement

327. A vehicle wiring diagram is shown in Figure 243. In the event that the main loom requires replacement, all looms will continue to be serviced as spare parts by Rover Australia. Early main looms (Para324) can be upgraded from barrel fuses to blade fuses by fitting the latest loom, NSN 2590-66-128-8456, however the following tasks must also be carried out:

- a. Fuse panel – replace it with a new panel, NSN 2590-99-152-4191.
- b. Wiper switch and relay – replace them with an intermittent wiper switch, NSN 2590-99-127-4385.
- c. Fuse box label – replace it with a new label, NSN 9905-66-128-5961.
- d. Headlight override relay – install then jumper cable, NSN 6150-66-128-5993 as detailed in EMEI Vehicle G 187-1.

FRAME

Bumper Brushguard

328. Removal. Remove the bumper brushguard as follows:

- a. Loosen the twelve nuts, washers and bolts securing the bumper to the chassis frame (Figure 204).

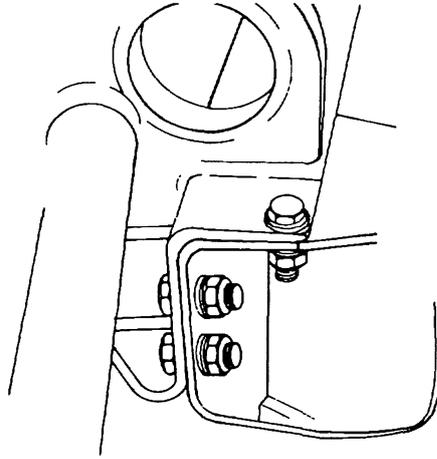


Figure 204 Bumper Brushguard Removal

- b. Support the bumper and remove the nuts, lock washers and bolts. Discard the lock washers.
- c. Remove the bumper from the chassis frame.

329. Installation. Install the bumper brushguard as follows:

- a. Support the bumper on the chassis frame.
- b. Install the twelve bolts, new lock washers and nuts and tighten them securely.

Towing Pintle

330. Replacement. Replace the towing pintle as follows:

- a. Support the weight of the towing pintle and remove the four nuts, washers and bolts securing the towing pintle to the rear cross-member.

NOTE

For inspection and repair of the towing pintle refer to EMEI Vehicle G 008-1.

- b. Position the new towing pintle on the rear cross-member.
- c. Install the four bolts, washers and nuts. Tighten the nuts to 61 N.m (44 lbf.ft).

Spare Wheel Carrier

331. Replacement. Replace the spare wheel carrier as follows:

- a. Remove the spare wheel from the carrier.
- b. Using a suitable pin punch, remove the roll pin securing the shaft to the carrier mechanism.
- c. Withdraw the shaft from the coupling (Figure 205).

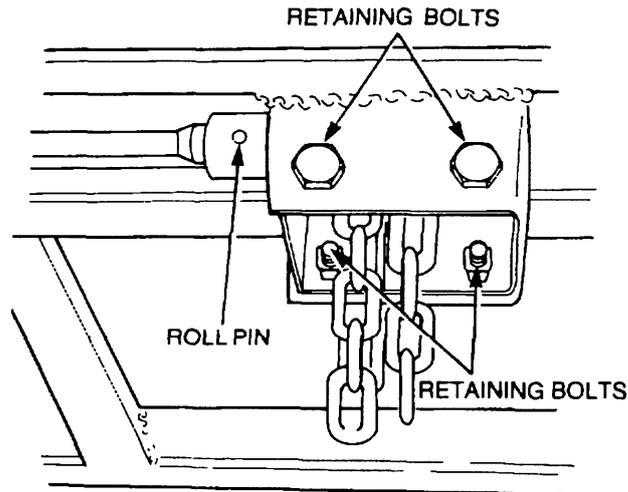


Figure 205 Spare Wheel Carrier Removal

- d.** Remove the four bolts securing the carrier to the rear subframe.
- e.** Position the new carrier in the rear subframe. Install the four bolts and tighten them securely.
- f.** Insert the shaft in the coupling, ensuring that the pin holes align. Install a new roll pin.

Frame System Specifications

332. The frame system specifications are detailed in Table 25.

Table 25 Frame System Specifications

Serial	Specification	Measurement
1	Towing pintle retaining bolts tightening torque	61 N.m (44 lbf.ft)

BODY

Cabin Seats

333. Removal. Remove the cabin seats as follows:

- a. Remove the seat cushion and slide the seat frame rearwards.
- b. Remove the two countersunk screws at the front of the frame (Figure 206).

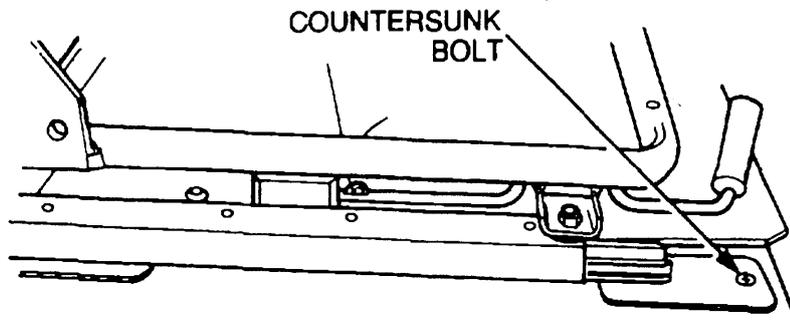


Figure 206 Cabin Seat Removal

- c. Slide the seat frame forwards and remove the two countersunk screws at the rear of the frame.
- d. Lift the seat assembly out of the vehicle.

334. Installation. Install the cabin seats as follows:

- a. Position the seat frame on the seat base and install the four countersunk screws.
- b. Tighten the screws securely.
- c. Install the seat cushion.

Grille

335. Replacement. Replace the grille as follows:

- a. Remove the eight screws securing the grille to the front panel.
- b. Remove the grille.
- c. Position the new grille on the front panel and secure it with the eight screws.

Roof Hatch

336. Replacement. Replace the roof hatch as follows:

- a. Remove the four nuts and washers securing the hinges to the roof hatch.
- b. Remove the two screws securing the lock mechanism to the hatch.
- c. Lift the hatch from the cab roof.
- d. Position the new roof hatch on the cab roof and align the hinge bolts and the lock mechanism.
- e. Install the four nuts and washers and the two screws.
- f. Tighten the nuts and screws securely and check the operation of the hatch.

Bonnet Release Catch

337. Removal. Remove the bonnet release catch as follows:

- a. Raise the bonnet.
- b. Remove the insect screen from the long range patrol vehicle (LRPV).
- c. Remove the plastic grille.

- d. Remove the split pin from the clevis pin at the bonnet catch and remove the clevis pin. Discard the split pin.
- e. Remove the bolts, nuts and washers securing the pivot plate to the grille panel (Figure 207).

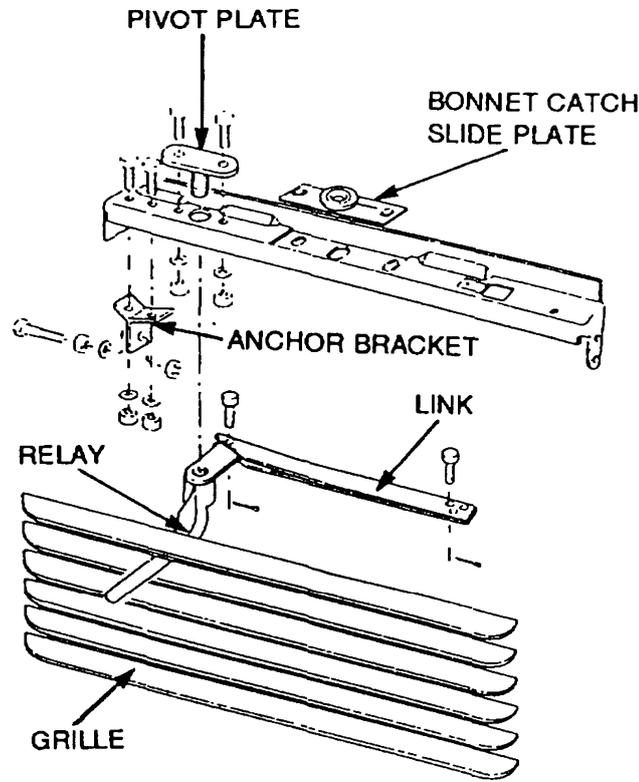


Figure 207 Bonnet Mechanism

- f. Hold the relay and unscrew the pivot plate.
 - g. Remove the split pin and the clevis pin securing the link to the relay. Discard the split pin.
- 338. Installation.** Install the bonnet release catch as follows:
- a. Install the link to the relay with a clevis and a new split pin (Figure 207).

NOTE

Lubricate the pivot plate thread with graphite powder or grease XG-291. A gap of approximately 15 mm is required between the top of the pivot plate and the relay.

- b. Position the relay below the top grille panel.
- c. Screw the pivot plate downwards into the relay through the 16 mm hole.
- d. Secure the pivot plate to the grille panel with the bolts, washers and nuts.

NOTE

When the bonnet catch slide plate is fully open, the relay should be at an angle of approximately 85 degrees to the vehicle centreline.

- e. Position the grille at its mounting position. Check that when the relay is in the open position it does not foul the vertical web. If fouling occurs, select an alternative hole.
- f. Connect the link to the bonnet catch with a clevis pin through one of the three holes in the link and secure it with a split pin.
- g. Adjust the anchor stop screw in the closed position so the bonnet lock slide plate travels 5 mm (Figure 208).

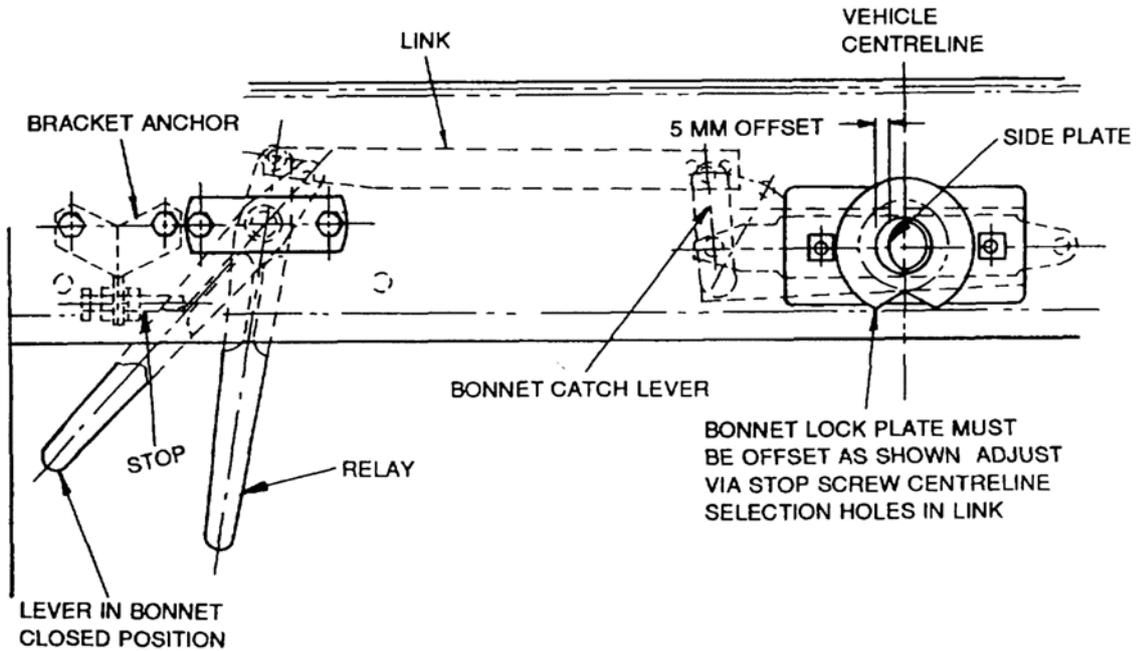


Figure 208 Bonnet Lock Slide Plate

- h. Open and close the bonnet a number of times to ensure correct operation.
- i. Install the grille and install the insect screen on the LRPV.

Bonnet

339. Bonnet Adjustment. Adjust the bonnet as follows:

- a. Open the bonnet.
- b. Visually inspect the bonnet hinges and ensure that the open-ended slot of the bush is facing towards the front of the vehicle.
- c. Check that the bushes pivot in the hinge when the bonnet is raised and lowered.

NOTE

All bushes fitted or operating incorrectly are to be removed and inspected. Replace bushes if worn and lubricate on refitting.

- d. Remove the bonnet buffer rubbers from the adjusting screw heads.
- e. Adjust the bonnet striker pin to the correct dimensions (Figure 209).

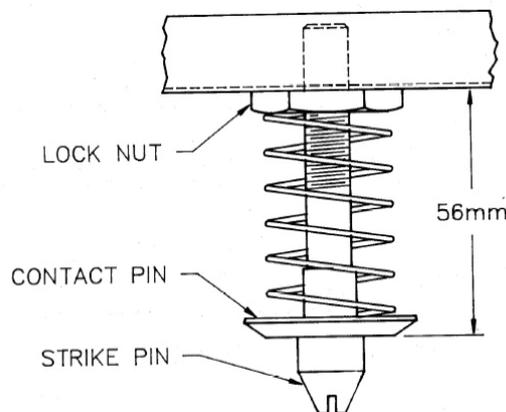


Figure 209 Bonnet Striker Pin

- f. Inspect the bonnet safety catch lever to ensure it is aligned and repair or replace as necessary.

- g. Adjust the bonnet buffer screws to the correct dimensions (Figure 210) and refit the buffer rubbers.
- h. Lubricate the striker mechanism.

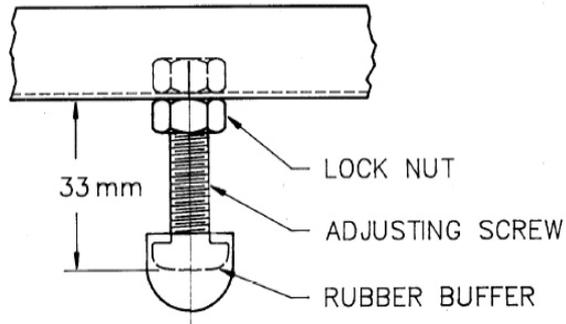


Figure 210 Bonnet Buffer Screw

Front Door

340. Removal. Remove the front door as follows:

- a. Remove the split pin and clevis pin securing the door check link.
- b. Support the door and remove the locknuts, special plastic washers and bolts that secure the door to the 'A' post.
- c. Remove the door.
- d. Place the door on a clean workbench with a soft protective covering to prevent damage to the door surface.

341. Disassembly. Disassemble the front door as follows:

- a. Prise the plastic cover from the window winder handle (Figure 211).
- b. Remove the securing screw.
- c. Remove the handle.
- d. Using a small screwdriver, prise the end covers from the interior handle (Figure 211).
- e. Remove the screws.
- f. Remove the handle from the door.

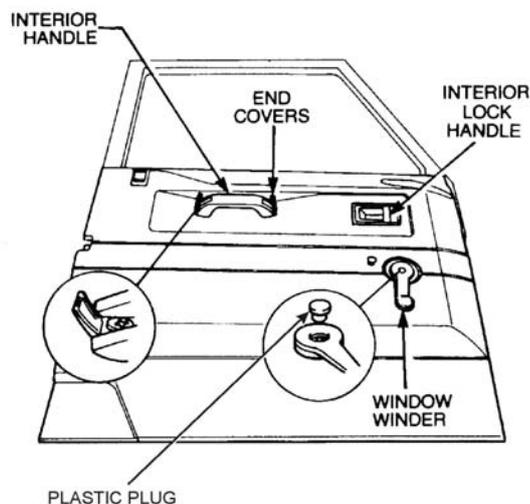


Figure 211 Window Winder Handle Removal

- g. Remove the plastic escutcheon from the lock button by depressing the locking tab with a small screwdriver (Figure 212).

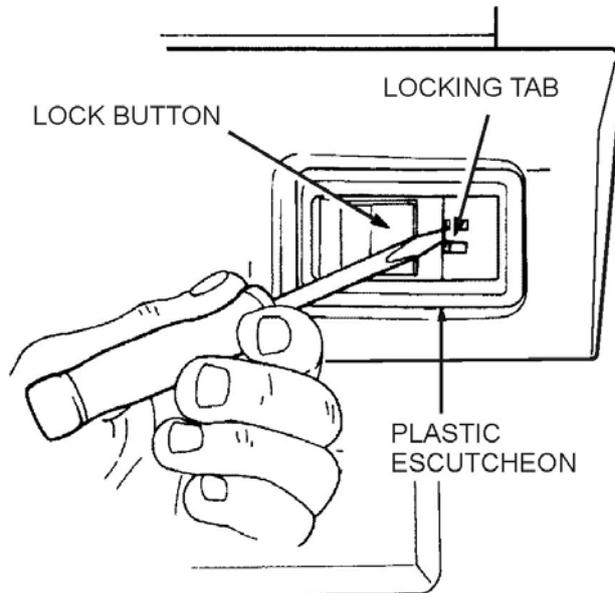


Figure 212 Door Lock Button Escutcheon Removal

- h. Remove the screws securing the interior lock handle bezel (Figure 212).
- i. Remove the bezel.
- j. Carefully prise the plastic trim fasteners from around the edge of the door trim, removing the corner fasteners first.
- k. Remove the trim (Figure 213).
- l. Remove the adhesive tape and plastic sheet from the door.
- m. Temporarily fit the window winder handle and lower the window approximately half way.

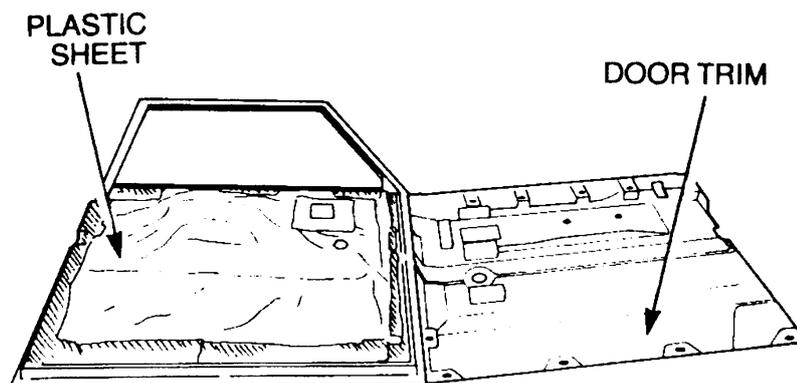


Figure 213 Door Trim Removal

- n. Disconnect the clip securing the lock handle rod to the door lock (Figure 214).
- o. Remove the screws securing the door lock to the door frame.

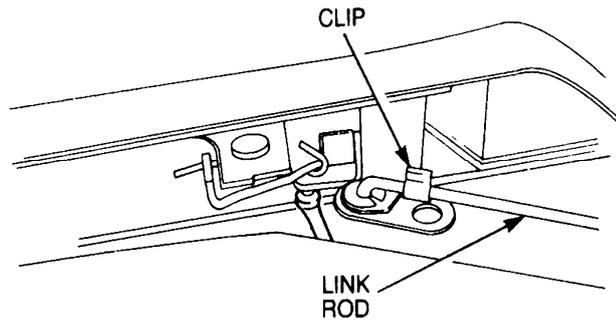


Figure 214 Door Lock Handle Link Rod Removal

- p. Raise the lock sufficiently to allow the link rod to be disconnected from the lock and remove the door lock.
- q. Remove the screws securing the inner panel (Figure 215).

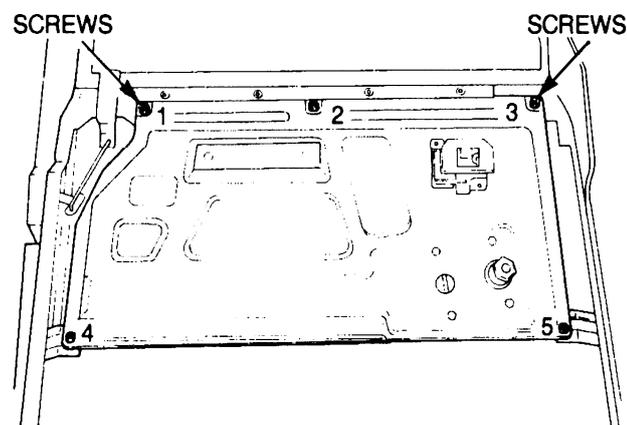


Figure 215 Door Inner Panel Removal

NOTE

It may be necessary to remove the screws and washers securing the interior lock handle and window regulator prior to removal of the inner panel.

- r. Slide the inner panel down to disengage it from the door frame.
- s. Slide the panel towards the front edge of the door to disengage the regulator rollers from the window lift channel.
- t. Remove the inner panel from the door (Figure 216).

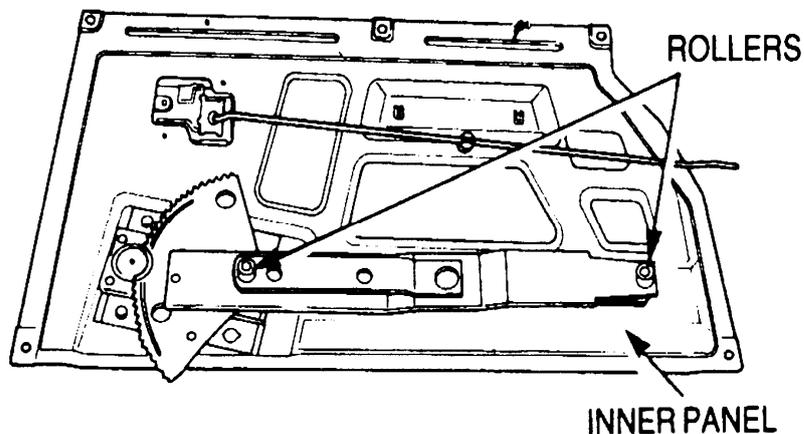


Figure 216 Window Regulator Roller Location

- u. Remove the recessed screws securing the lower end of the rear window channel (Figure 217).

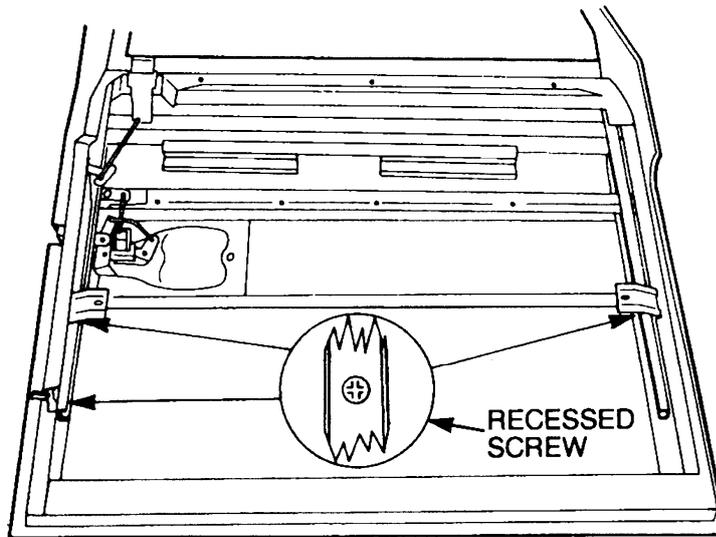


Figure 217 Window Channel Lower End Detachment

- v. Remove the screw securing the front channel.
- w. Remove the inner and outer waist seals (Figure 218).

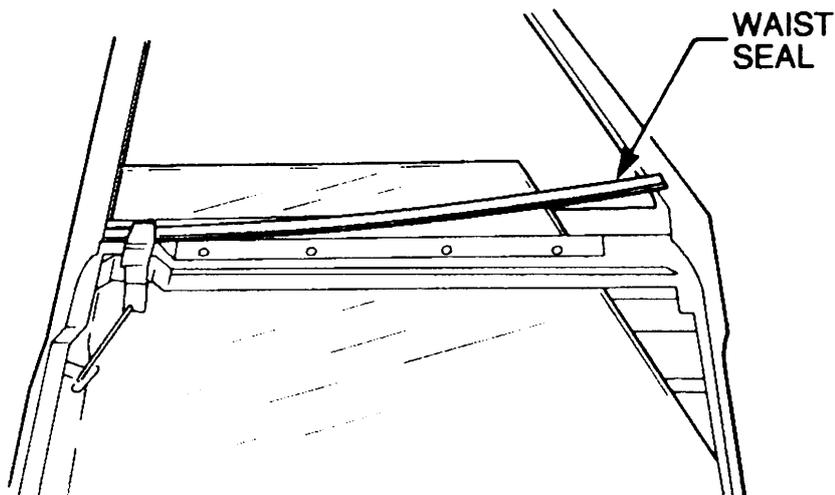


Figure 218 Window Glass Removal

- x. Slide the window down to the bottom of the door.
- y. Lift the lower edge of the window to clear the door frame and slide the window from the channels.

NOTE

It may be necessary to bend back the two lower inner panel mounting brackets to allow the window to clear the door frame.

- z. Remove the recessed screws securing the window channels (Figure 219).
- aa. Remove the channels, spacers and plastic fill channels.

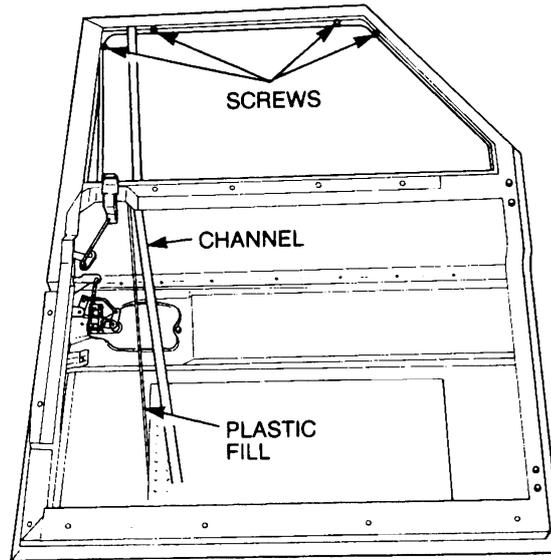


Figure 219 Window Channel Removal

- bb. Disconnect the outer handle link rod from the lock assembly (Figure 220).

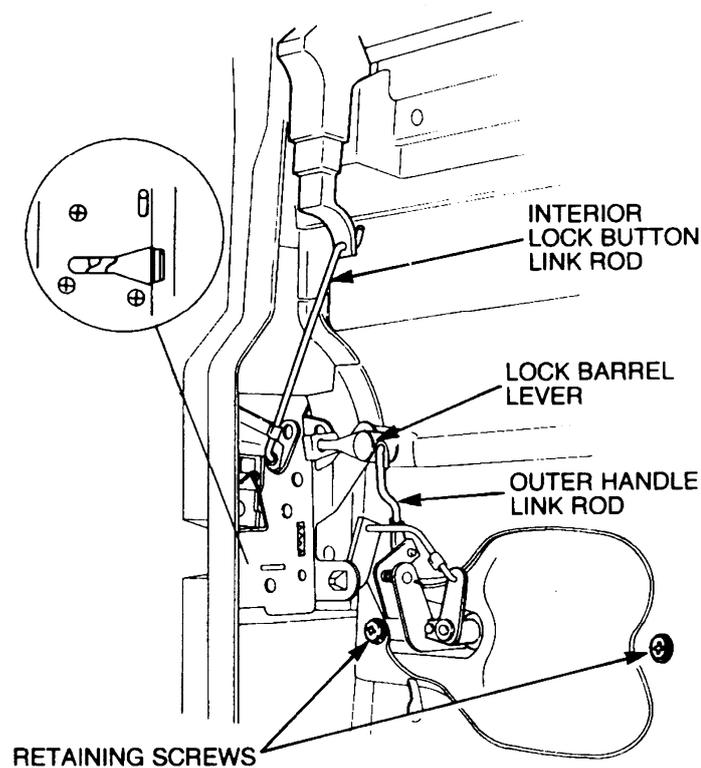


Figure 220 Door Lock Removal

- cc. Disconnect the interior lock button link rod from the lock assembly.
- dd. Remove the countersunk screws securing the door lock to the door.
- ee. Remove the lock.
- ff. Remove the recessed screws securing the outer door handle to the door (Figure 220).
- gg. Remove the handle and plastic seals.
- hh. Remove the nuts, screws and nylon washers securing the door hinges to the door frame.
- ii. Remove the hinges.

342. **Reassembly.** Reassemble the front door as follows:

- a. Position the hinges on the door frame and install the bolts.
- b. Fit the special plastic washers with the taper towards the door frame and install the locknuts.
- c. Tighten the locknuts securely.
- d. Position the new plastic gaskets (Figure 221) on the door handle.

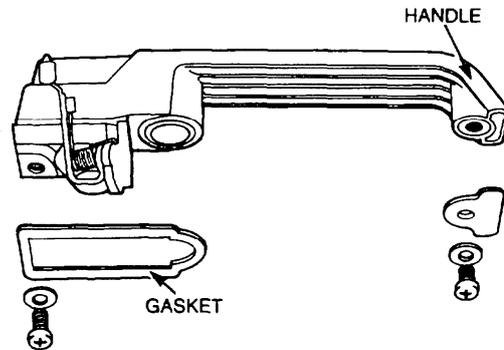


Figure 221 Door Handle Gaskets Installation

- e. Fit the handle to the door.
- f. Secure the handle with the screws and washers.
- g. Install the door lock assembly into the door frame and loosely fit the screws.
- h. Connect the link rods (Figure 220).
- i. Install the plastic fill channels and corner pieces on the door frame.
- j. Fit the window channels and spacers.
- k. Secure the channels with the recessed screws, except the two screws fitted to the bottom of the rear vertical channel (Figure 217).
- l. Insert the window glass into the channels and carefully slide the glass to the top of the door.

NOTE

Ensure that the glass slides freely.

- m. Secure the bottom of the vertical channels.
- n. Install the window regulator and interior lock handle on the inner panel and secure them with the screws.
- o. Press the link rod into the plastic support clip (Figure 222).

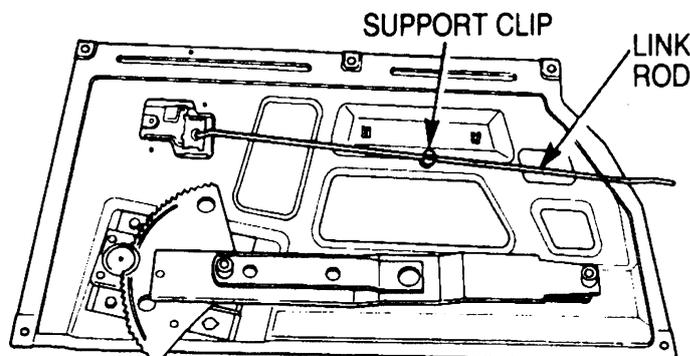


Figure 222 Window Regulator Installation

- p. Fit the inner panel into the door frame.

NOTE

Ensure the regulator rollers engage in the window lift channel.

- q.** Connect the interior lock link rod to the lock assembly (Figure 223).
- r.** Secure the inner panel to the door with the screws and tighten the screws retaining the door lock assembly.

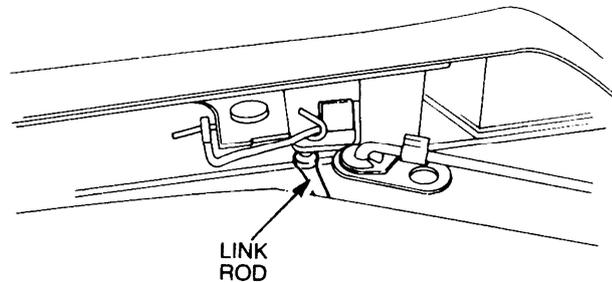


Figure 223 Door Lock Handle Link Rod Connection

- s.** Lightly smear suitable grease into the window lift channel.
- t.** Install the plastic sheet onto the door, using new adhesive tape as required.
- u.** Position the door trim on the door.
- v.** Secure it with the plastic trim fasteners.



Do not over tighten the screw. Fine threads strip easily.

- w.** Install the interior lock handle trim and secure the screw.
- x.** Fit the lock button plastic escutcheon (Figure 212).
- y.** Install the window winder and escutcheon and secure them with the screw.
- z.** Press in the plastic cover.
- aa.** Fit the grab handle and secure it with the screws.
- bb.** Clip the end covers into place.

343. Installation. Install the front door as follows:

- a.** Support the door and position the hinges.
- b.** Install the bolts.
- c.** Fit the special plastic washers towards the door frame and install the locknuts.
- d.** Tighten the locknuts securely.
- e.** Ensure that the door lock aligns with the striker plate and, if necessary, loosen the bolts that secure the hinges to the 'A' post, adjust the door alignment and retighten the bolts.
- f.** Install the check link into the firewall bracket.
- g.** Insert the clevis pin and flat washer. Secure the clevis pin with a new split pin.

Rear Window

344. Replacement. Replace the rear window as follows:

- a.** Remove the rubber filler strip from the groove in the glazing rubber (Figure 224) to expose the rivets.
- b.** Using a suitable drill, remove the rivets securing the window to the cab panel.
- c.** Remove the window assembly.

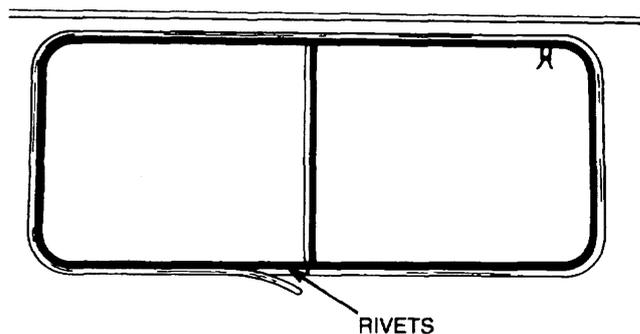


Figure 224 Filler Strip Removal

- d. Remove the rubber filler strip from the inside groove at the front of the window frame (Figure 225).

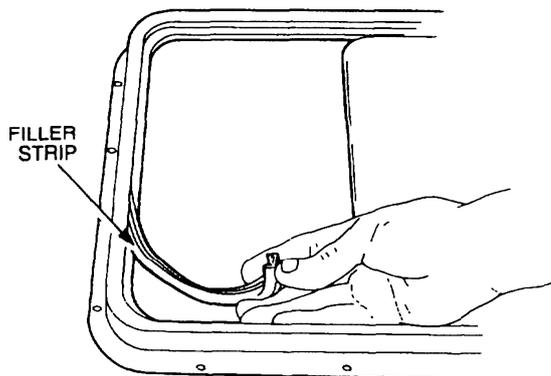


Figure 225 Forward Filler Strip Removal

- e. Remove the six recessed screws securing the upper and lower halves of the window frame together (Figure 226).

NOTE

Two of the recessed screws retain the draught rail to the window frame.

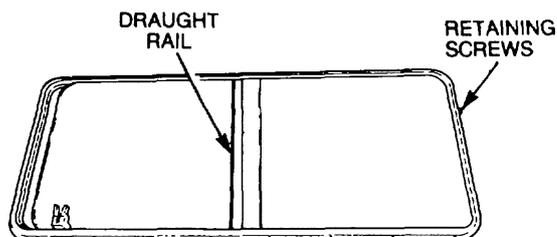


Figure 226 Window Frame Halves Removal

NOTE

Do not pull the frame completely apart at this stage as damage to the felt channel could result.

- f. Carefully pull the frame halves apart sufficiently to allow the glass to be removed (Figure 227).
- g. Remove the sliding glass.

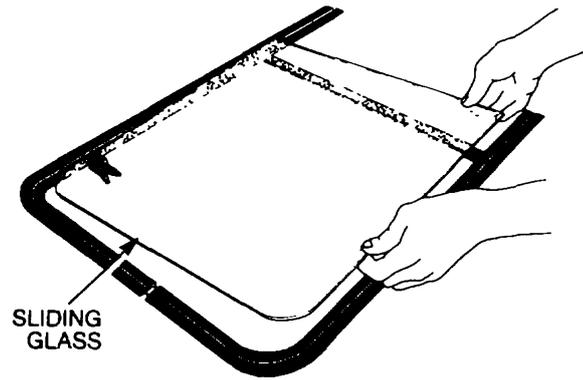


Figure 227 Sliding Glass Removal

- h. Carefully remove the fixed glass and draught rail from the glazing rubber (Figure 228).

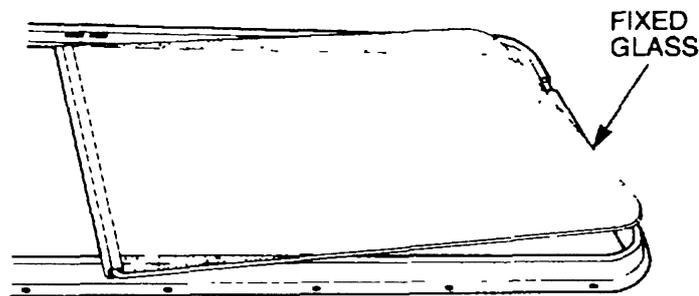


Figure 228 Fixed Glass Removal

NOTE

Do not remove the felt channel unless it is to be replaced as damage to the seal could result.

- i. Remove the glazing rubber from the frame and, if necessary, remove the felt seals (Figure 229).

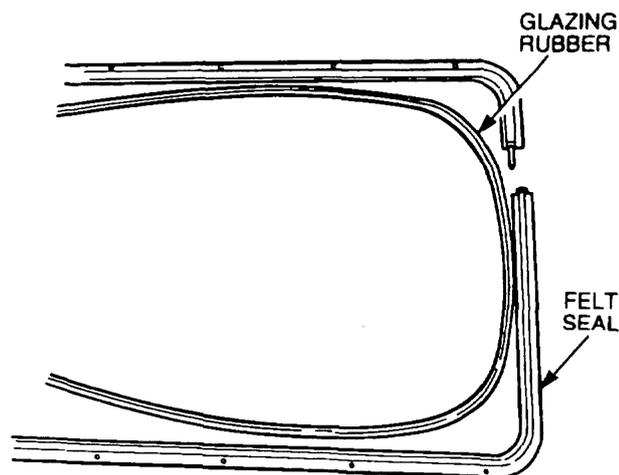


Figure 229 Glazing Rubber Removal

- j. Remove the draught rail seal by pulling it out of the groove (Figure 230).
- k. Carefully tap the draught rail off the glass and discard the glazing strip.

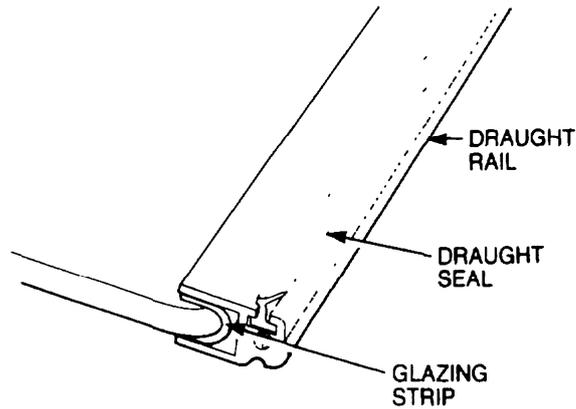


Figure 230 Draught Rail Removal

- l.** Remove the screw securing the window catch to the sliding window (Figure 231) then remove the catch.

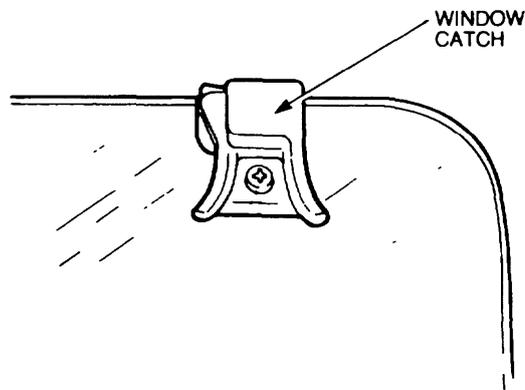


Figure 231 Window Catch Removal

- m.** Apply a small amount of sealant around the catch mounting hole in the sliding window.
- n.** Fit the catch and secure it with the screw.
- o.** Fit a new glazing strip on the sliding window then apply a soapy solution to the glass.
- p.** Using a soft-faced hammer first tap the rail fully onto the strip and glass then trim off any excess strip.
- q.** Lubricate the draught rail seal with the soapy solution and fit the draught seal.
- r.** Apply a soapy solution to the outside edge of the fixed window glass and position the glazing rubber around the glass.
- s.** Locate the rubber around the glass ensuring that the glass is located in the groove (Figure 232).

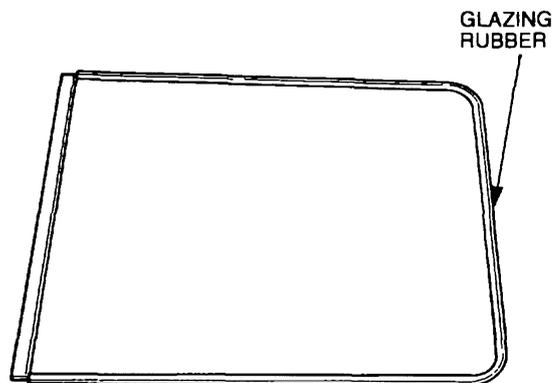


Figure 232 Fixed Window Rubber Installation

- t. Fit the sliding and fixed window glass into the frame, ensuring that the windows are in their respective channels and the fixed glass has the draught rail seal facing the sliding glass.
- u. Push the fixed window and seal into the channel as far as possible.
- v. Install the six screws to secure the two halves of the window frame together.
- w. Apply pressure on the fixed glass and carefully ease the seal into the channel.
- x. Using a small screwdriver, ensure that the seal is correctly located.
- y. Check that the sliding glass moves freely and seats correctly in the felt channel when fully cleared.
- z. Tighten the six screws securely (Figure 226).
- aa. Fit the filler strip to the outer channel at the sliding glass end of the frame (Figure 225).
- bb. Remove all traces of sealant from the window frame aperture on the cab and install the new frame seal on the outside of the rear panel.
- cc. Position the window frame in the cab aperture and secure it with rivets (Figure 224).
- dd. Install the frame filler strip.

Wheel Arch Trim

345. Replacement. Replace the wheel arch trim as follows:

- a. Using a suitable pin punch, remove the central plastic pin from each plastic rivet securing the trim to the wheel arch.
- b. Pry the rivets from the holes and remove the trim from the wheel arch.

NOTE

The wheel arch trims are moulded with attaching holes around the mounting edge. These holes align with predrilled holes in the wheel arch.

- c. Align the new trim attaching holes with the wheel arch holes and insert the plastic rivets.
- d. Press in the central plastic pins to expand the rivets.

Floor Panels

346. Removal. Remove the floor panels as follows:

- a. Remove the right and left side floor mats.
- b. Loosen the two knurled knobs securing the fuse cover and remove the cover.
- c. Carefully remove the rubberised transmission tunnel cover.
- d. Unscrew both the gear lever and transfer lever knobs.
- e. Release the plastic zip-clamp from around the gear lever rubber boot.
- f. Slide the rubber boot off the gear levers.
- g. Remove all expanded screws securing the floor panels and tunnel cover.
- h. Remove the tunnel cover and the floor panels.

347. Installation. Install the floor panels as follows:

- a. Install the floor panels and the tunnel cover. Secure them with the screws.
- b. Fit the rubber boot over the gear levers and secure it to the tunnel cover with the plastic zip-clamp.
- c. Install the gear knobs.
- d. Carefully install the rubberised transmission tunnel cover.
- e. Install the fuse cover and secure it with the knurled knobs.
- f. Install the floor mats.

Cupola

348. Leak Sealing. Leak seal the cupola as follows:

- a. Remove the rubber cover strip from the lower frame of the roof hatch.
- b. Remove the screws securing the lower frame to the upper frame.
- c. Push the roof hatch upwards and remove it from the cabin roof.
- d. Inspect all the sealing surfaces thoroughly and apply Bostick 2638 (Figure 233).

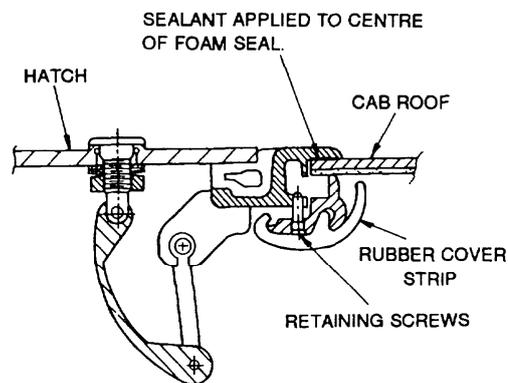


Figure 233 Roof Hatch Applying Sealant

NOTE

Ensure the four long screws are fitted to the corners of the frame.

- e. Position the roof hatch in the vehicle.
- f. Position the lower frame and secure it to the upper frame with the screws.
- g. Remove any surplus sealant.
- h. Allow 12 hours for curing and test for leaks.
- i. Install the rubber cover strip to the lower frame.

Roof Panel

349. Sealing. Seal the roof panel seal as follows:

- a. Using a suitable tool remove the sealant from the exposed area of the joint between the cab frame and the roof panel (Figure 234, Inset A).
- b. Using Bostick 2638 fill the joint between the cab frame and the roof panel (Figure 234, Inset B).
- c. Allow the sealant to cure for 12 hours and touch up the paint work.

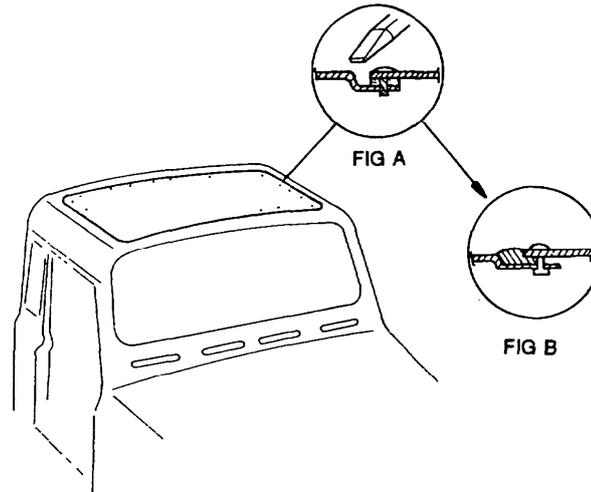


Figure 234 Roof Panel – Applying Sealant

Glove Box Lid Rivnuts

350. Replacement. Replace the rivnuts as follows:

- a. Remove the screws securing the glove box hinge mounting bracket to the dash.
- b. Remove the glove box lid, hinge and mounting bracket from the vehicle.
- c. Remove the screws securing the hinges to the lid and mounting bracket.

NOTE

Trace around the rivnut heads with a scribe to mark the rivnut position. This is only necessary on holes that have been slotted.

- d. Remove the aluminium rivnuts from the glove box lid by using a 6.2 mm drill (if the rivnuts are secure) or by using side cutters to cut off the rivnut head.
- e. Using a rivnut tool, insert rivnuts in all holes that are required to mount the hinges.

NOTE

If required, a suitable rivnut tool may be requested through normal supply channels using NSN 5340-66-155-3717.

- f. Ensure the rivnuts line up with the previously marked position of the aluminium rivnuts.
- g. Install the hinges on the glove box lid and hinge mounting bracket.

NOTE

In the event that some of the holes do not line up ensure that a minimum of two screws are used on each side of the hinge.

- h. Install the glove box lid on the dash.

Windscreen Washer Nozzle Guard

351. Replacement. Replace the windscreen nozzle guard in accordance with EMEI Vehicle G 299-6.

CAB HEATING/COOLING

Heater Assembly

352. Removal. Remove the heater assembly as follows:

- a. Using a suitable container, drain the engine cooling system.
- b. Open the heater controls to allow the heater to be completely drained.
- c. Remove the seven screws securing the ducting and grille to the left front mudguard and remove the ducting.
- d. Disconnect the securing clip and cable from the air directional control lever (Figure 235).

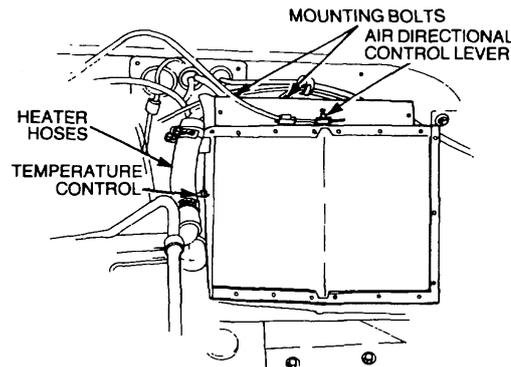


Figure 235 Heater Assembly Removal

- e. Loosen the hose clamps securing the inlet and outlet hoses to the pipes and disconnect the hoses.
- f. Disconnect the securing clip and cable from the temperature control lever.
- g. Remove the two bolts that secure the top of the heater assembly to the firewall.
- h. Disconnect the wiring harness at the three-pin connector.
- i. Remove the two bolts that secure the lower mounting bracket to the firewall.
- j. Remove the heater assembly.

353. Installation. Install the heater assembly as follows:

- a. Position the heater assembly on the firewall.
- b. Install the four mounting bolts and tighten them securely.
- c. Install both the temperature and air directional cables and secure them with the clip and grub screw.
- d. Ensure that when the dash mounted levers are operated, full travel is obtained at the heater assembly.

NOTE

Install Flexiform grommet material into the heater box around the heater pipes.
Secure the material in place with Silastic.

- e. Install the inlet and outlet heater hoses and secure them with the hose clamps.
- f. Refill the cooling system (Para 39).
- g. Install the ducting and mudguard grille and secure it with the seven screws.

Heater Motor and Fan Assembly

354. Replacement. Replace the heater motor and fan assembly as follows:

- a. Remove the heater assembly (Para 352).
- b. Remove the three nuts securing the fan housing to the heater box bracket.
- c. Remove the four remaining nuts securing the fan assembly to the housing.

- d. Remove the motor and fan assembly.
- e. Remove the E-clip securing the fan to the motor shaft (Figure 236).
- f. Withdraw the fan from the motor.

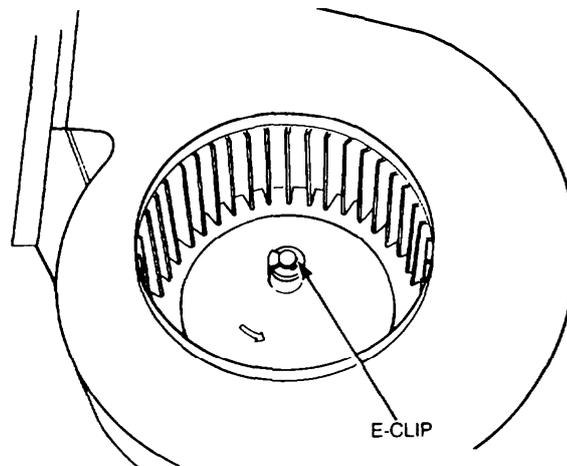


Figure 236 Heater Motor and Fan Removal

- g. Install the new heater motor on the fan housing and install the fan.
- h. Secure the fan to the shaft with the E-clip.
- i. Install the motor and fan assembly on the housing and secure it with the four nuts.
- j. Fit the fan housing to the heater box bracket and secure it with the three nuts.
- k. Install the heater assembly (Para 353).

Heater Hoses

355. Replacement. Replace the heater hoses as follows:

- a. Using a suitable container, drain the engine cooling system.
- b. Open the heater controls to allow the heater to be completely drained.
- c. Loosen the hose clamps and remove the hoses.
- d. Install the new hoses and clamps, ensuring that there are no twists or kinks in the hoses.
- e. Tighten the clamps.
- f. Refill the cooling system (Para 39).

Heater Controls

356. Removal. Remove the heater controls as follows:

- a. Disconnect the battery.
- b. Remove the screws securing the heater control knobs and withdraw the knobs.
- c. Remove the four screws securing the instrument panel to the dash panel.
- d. Ease the panel towards the steering wheel slightly.
- e. Remove the two screws securing the end panel to the fascia.
- f. Ease the end panel complete with the control levers away from the fascia.
- g. Remove the two screws securing the heater control assembly to the end cover (Figure 237).

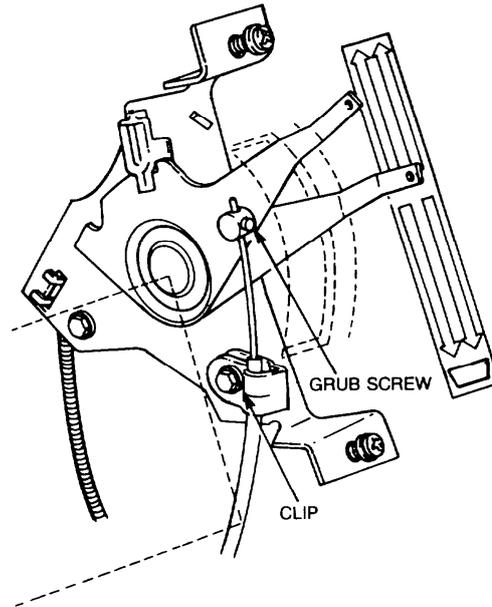


Figure 237 Heater Control Removal

NOTE

There are two spacers installed between the control lever assembly and the end panel.

- h.** Tag and remove the cables from the levers.
- i.** Remove the spring clip retaining the outer cables to the control and remove the control.

357. Installation. Install the heater controls as follows:

- a.** Position the cables on the control, ensuring that the temperature control cable is connected to the lever nearest the instruments.
- b.** Install the spring clips.
- c.** Insert the inner cables through their respective levers and tighten the grub screws.
- d.** Operate the levers and check that the levers on the heater assembly operate accordingly.
- e.** Ensure that the two spacers are fitted and secure the panel to the control with the two screws.
- f.** Install the end panel to the fascia and secure it with the two screws.
- g.** Fit the instrument panel and secure it with the four screws.
- h.** Install the heater control knobs and secure them with the two screws.

WINCH

Winch Rope

358. **Removal.** Remove the winch rope as follows:



WARNING

Always wear industrial gloves when handling steel wire rope. When winching, do not use the hands to guide the rope on or off the drum. Steel wire protrudes from the wire rope and will cause injury to exposed hands.

- a. Place the winch dog clutch handle in the disengaged (vertical) position.
 - b. Release the winch rope from the travelling position.
 - c. Free spool the rope from the winch.
 - d. Using an Allen key, remove the grub screw securing the end of the rope to the drum.
 - e. Withdraw the rope from the vehicle.
359. **Cleaning and Inspection.** Clean and inspect the winch rope as follows:
- a. Check the rope for kinks, heavy rust, fraying or excessive wear.
 - b. Replace the rope if any of these conditions are found.
 - c. Brush the rope to remove dirt and light rust.
 - d. Clean the rope thoroughly in accordance with EMEI Vehicle G 209).
360. **Installation.** Install the winch rope as follows:
- a. Feed the end of the rope through the rollers and sheaves and reconnect it to the drum.



CAUTION

Ensure that the rope is securely locked to the drum.

- b. Install and tighten the grub screw.
- c. Ensure that the rope is securely locked to the drum.
- d. Lay the rope out in front of the vehicle.
- e. Connect the end to a suitably weighted object which will keep tension on the rope as it is winched in.
- f. Start the engine and select neutral on the transfer case lever.
- g. Place the winch dog clutch handle in the engaged position.
- h. Rotate the drum by hand until the dog clutch engages.
- i. Depress the vehicle clutch.
- j. Engage low gear on the main gear lever and pull out the PTO handle.
- k. Slowly release the vehicle clutch to take up the slack in the rope.
- l. Apply Rocol wire rope lubricant to the rope as it is winched in.
- m. Wipe any excess grease from the rollers and sheaves.
- n. Ensure that the rope lays on the drum evenly and avoid sharp crossovers.
- o. When the rope end nears the rollers, depress the clutch and return the main gear lever to neutral.
- p. Push in the PTO handle and select high on the transfer case lever.
- q. Switch off the engine and disengage the PTO handle.

- r. Secure the rope to the towing eyes with the chain.

Front Fairlead Roller Assembly

361. **Removal.** Remove the roller assembly as follows:

NOTE

Feed the chain and rope back through the rollers and secure out of the way. This allows easy access and prevents the rope fouling the fairlead frame while it is being removed.

- a. Remove the nuts and washers from the mounting bolts (Figure 238).
- b. Remove the bolts that screw into the winch housing.
- c. Support the winch by using a suitable axle stand.

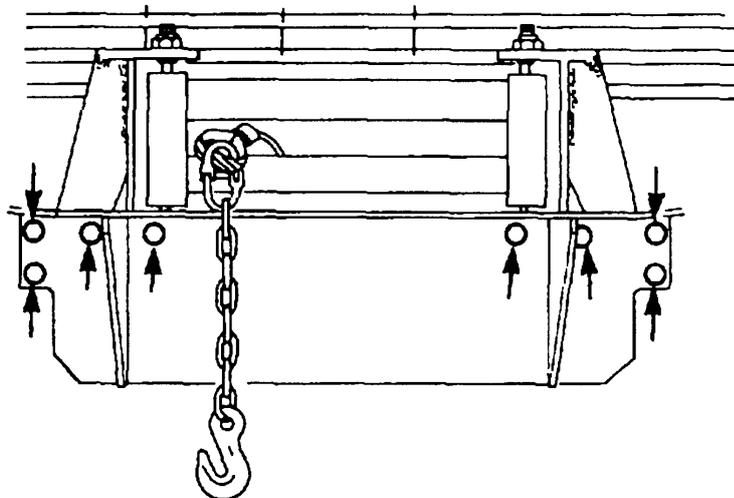


Figure 238 Front Fairlead Removal

- d. With the weight of the winch supported on the remaining bolts and axle stand, remove the fairlead frame from the vehicle.

362. **Disassembly.** Disassemble the roller assembly as follows:

- a. Using an open-ended spanner, secure the square-headed end of the roller shaft.
- b. Remove the nut and flat washer from the opposite end.
- c. Withdraw the roller shaft and remove the roller from the frame.
- d. Repeat the procedure for the remaining three rollers.

363. **Cleaning and Inspection.** Clean and inspect the roller assembly as follows:

- a. Thoroughly clean the rollers and roller shaft in a suitable cleaning agent to remove all trace of grease and dirt.
- b. Inspect the rollers for cracks and signs of binding on the shafts (replace if necessary).

364. **Reassembly.** Reassemble the roller assembly as follows:

- a. Position the rollers in the frame and insert the roller shafts.
- b. Install the flat washers and new locknuts and tighten them to 190 N.m (140 lbf. ft).
- c. Ensure that the rollers revolve freely and without drag.

365. **Installation.** Install the roller assembly as follows:

- a. Position the fairlead frame on the chassis frame.
- b. Install the mounting bolts and nuts and torque to 77 N.m (57 lbf. ft).

- c. Feed the chain and rope back through the rollers and secure the chain.

Winch Driveline

- 366. Removal.** Remove the winch driveline as follows:

NOTE

Ensure that the winch and the PTO are disengaged.

- a. Remove the four bolts and lock washers securing the shaft flange to the PTO and discard the lock washers.

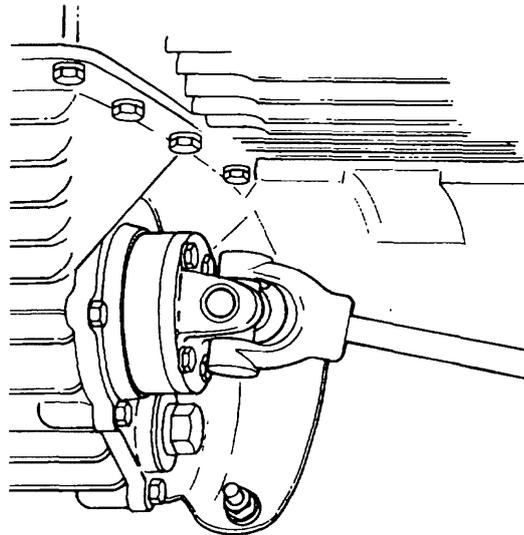


Figure 239 Winch PTO

- b. Remove the two nuts and lock washers securing the pillow block to the chassis bracket. Discard the lock washers.
- c. Loosen the Allen screw securing the universal joint to the winch.



Take care not to lose the lock key fitted to the winch input shaft.

NOTE

A soft-faced hammer may be required to tap the universal joint away from the winch input shaft.

- d. Remove the winch driveline from the vehicle (Figures 240 and 241).

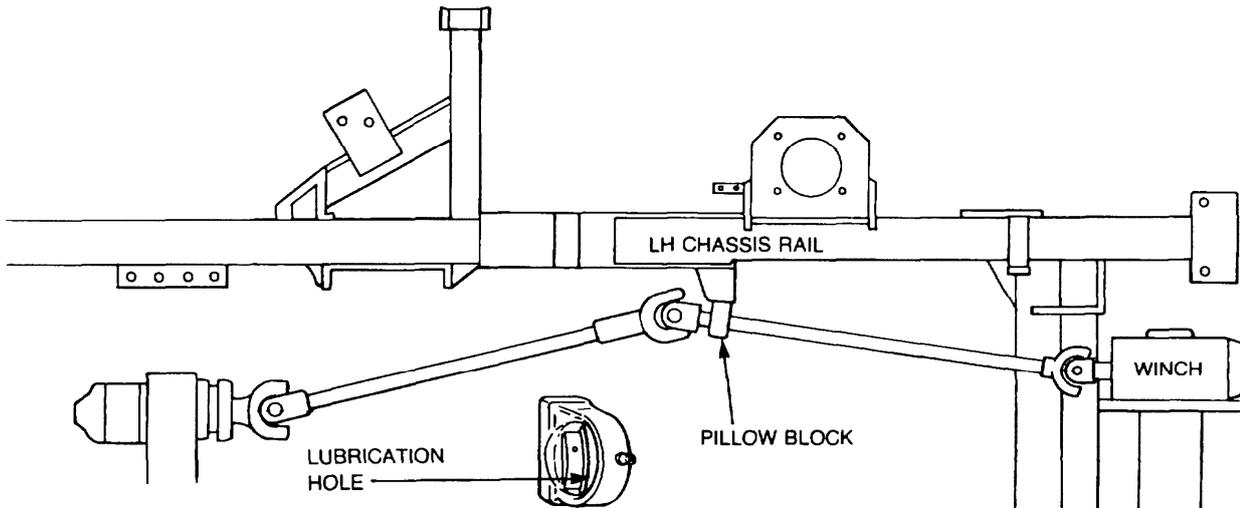


Figure 240 Winch Driveline

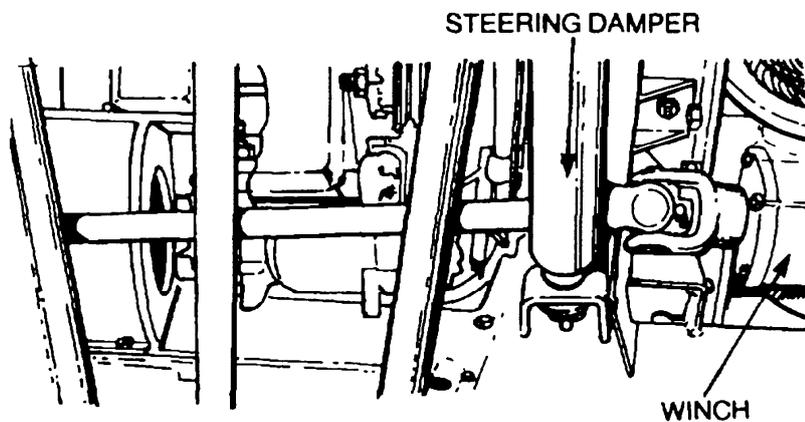


Figure 241 Winch Driveline Installed

367. **Installation.** Install the winch driveline as follows:

- a. Position the winch driveline over the cross-member and steering damper (Figures 240 and 241).

NOTE

Ensure that the flanged universal joint is towards the PTO.

- b. Fit the flange onto the PTO shaft (Figure 239).
- c. Using new lock washers, install the bolts and tighten them to 61 N.m (45 lbf.ft).
- d. Fit the key to the winch input shaft.
- e. Align the universal joint yoke with the key and push the yoke onto the shaft.

NOTE

The pillow bearing block position may be altered as necessary by loosening the Allen screw, or universal joint.

- f. Position the pillow block on the mounting bracket bolts (Figure 242).

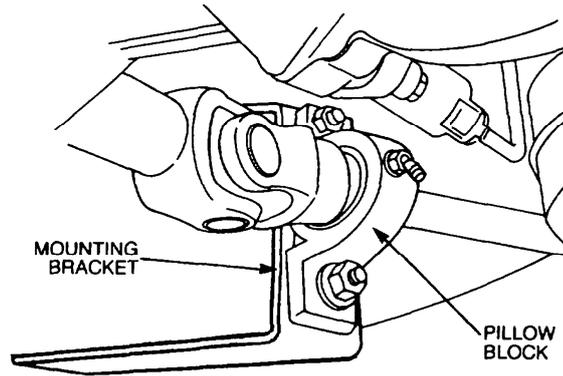


Figure 242 Pillow Block Installation

- g. Install the flat washers, new lock washers and the two nuts. Tighten them securely.
- h. Tighten the grub screws securely.
- i. Lubricate the winch driveline with grease.
- j. Start the engine, engage the PTO and check that the shafts turn smoothly without vibration.

Pillow Block Bearing

368. Removal. Remove the pillow block bearing as follows:

- a. Remove the winch driveline (Para 366).

NOTE

A soft faced hammer may be required to tap the universal joint away from the centre shaft.

- b. Loosen the Allen screws securing the universal joints yokes to the centre shaft.
- c. Remove the yokes from the shafts, taking care not to lose the keys.
- d. Loosen the Allen screws securing the pillow block to the shaft and withdraw the pillow block.
- e. Secure the pillow block in a vice.
- f. Using a suitable screwdriver inserted through the centre of the bearing, turn the bearing through 90 degrees to the pillow block and remove it from the pillow block.

369. Installation. Install the pillow block as follows:

- a. Secure the pillow block in a vice and insert the new bearing into the pillow block, ensuring that the lubrication hole in the bearing outer aligns with the lubrication groove in the pillow block (Figure 240).

NOTE

The lubrication hole and the groove are offset from the centre of the pillow block. The hole in the bearing must also be positioned equally, either side of one of the two grooves in the pillow block.

- b. With the bearing correctly positioned in the pillow block, rotate the bearing through 90 degrees and ensure the bearing is fully installed in the pillow block.
- c. Fit the pillow block on the shaft but do not tighten the Allen screw until the driveline is in position on the vehicle.
- d. Install the key.
- e. Install the universal joint yokes on the centre shaft and tighten the Allen screws.
- f. Install the winch driveline (Para 367).

Winch System Specifications

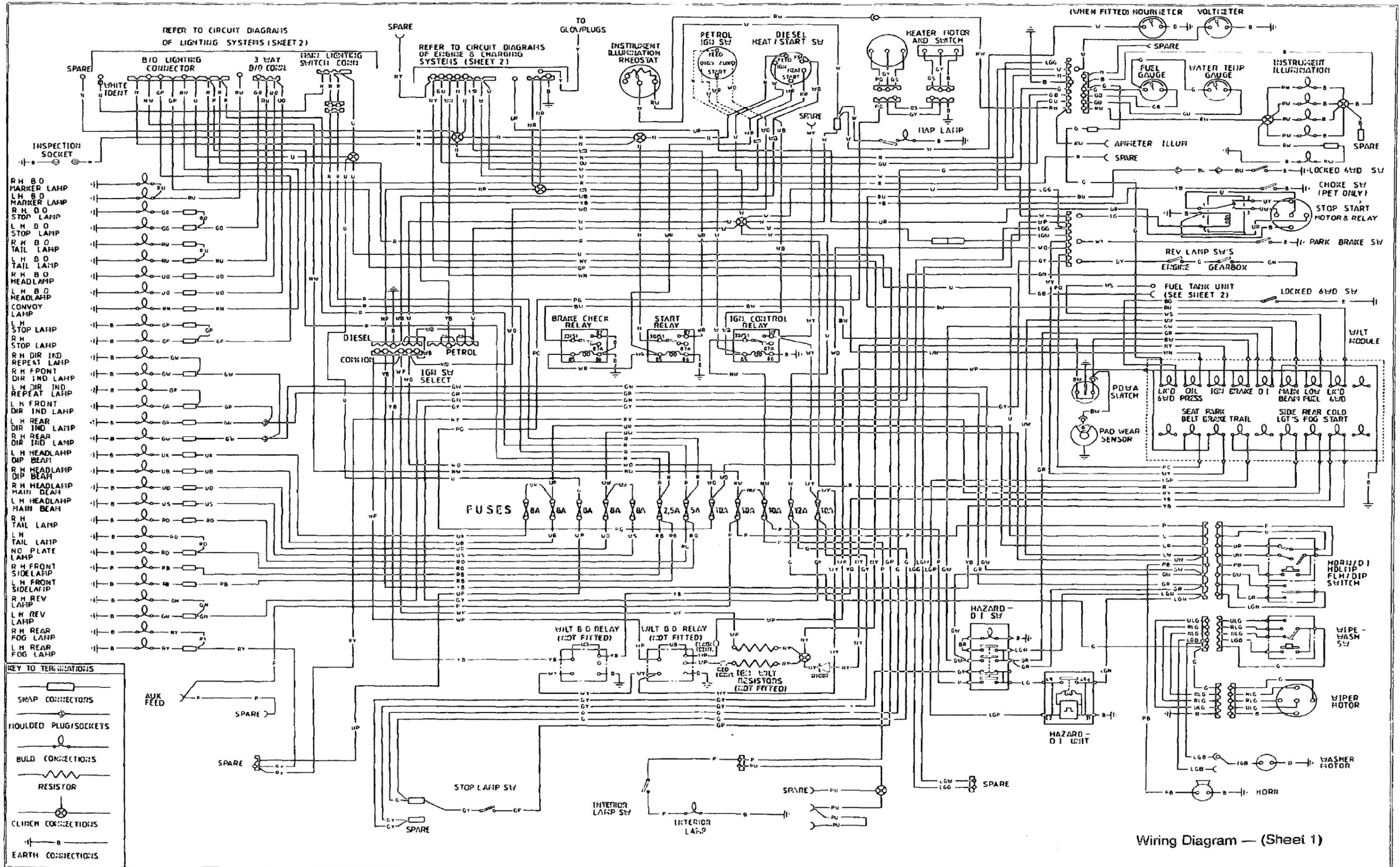
370. The winch system specifications are detailed in Table 26.

Table 26 Winch System Specifications

Serial	Specification	Measurement
1	Fairlead roller shaft locknuts tightening torque	190 N.m (140 lbf.ft)
2	Fairlead frame mounting bolts and nuts tightening torque	77 N.m (57 lbf.ft)
3	Winch driveline flange to PTO tightening torque	61 N.m (45 lbf.ft)

ROAD TEST CHECKS

- 371.** Complete a road test in accordance with EMEI Vehicle G 188.



Wiring Diagram - (Sheet 1)

Figure 243 Wiring Diagram (Sheet 1 of 3)

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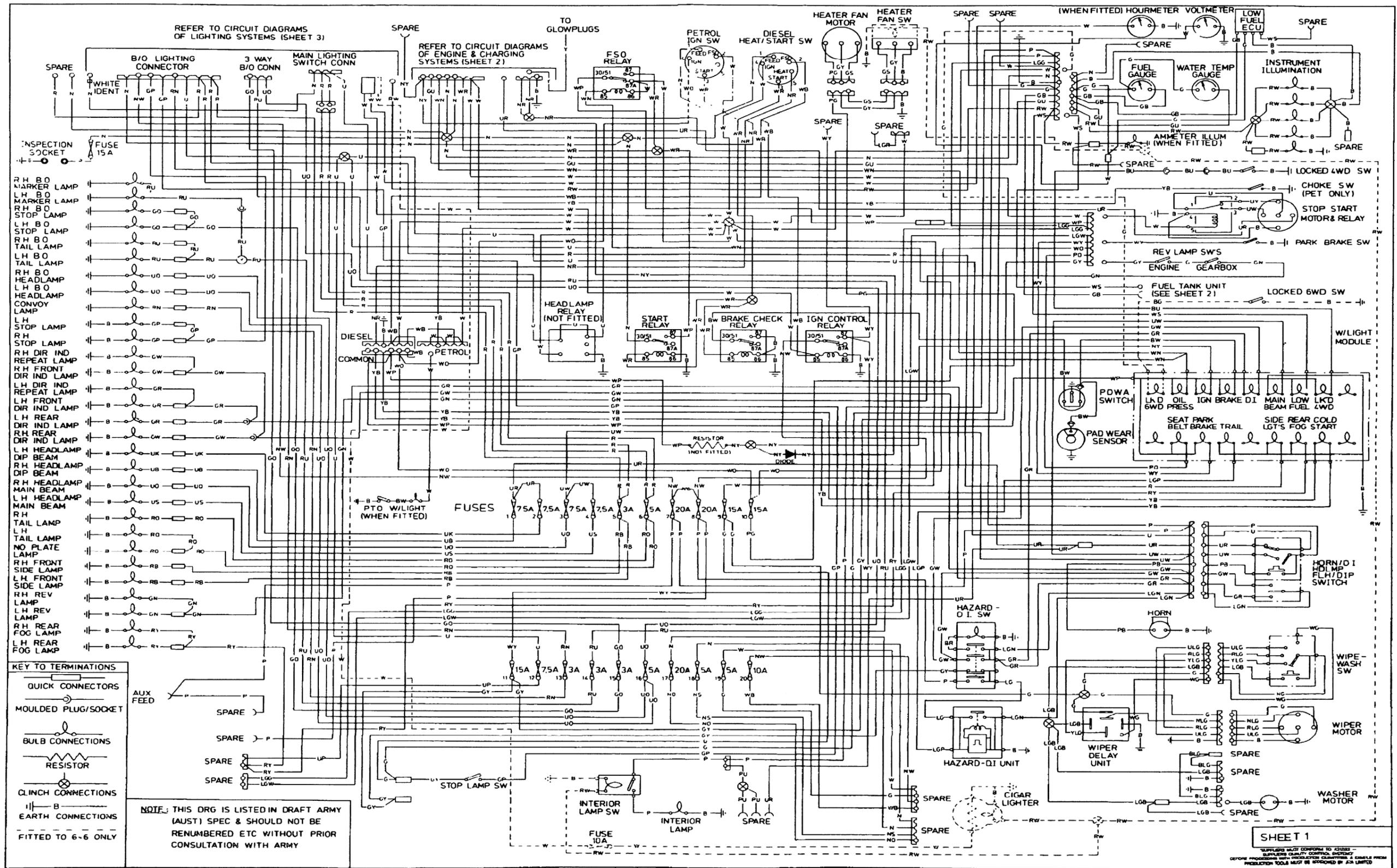


Figure 238 Wiring Diagram (Sheet 2 of 3)

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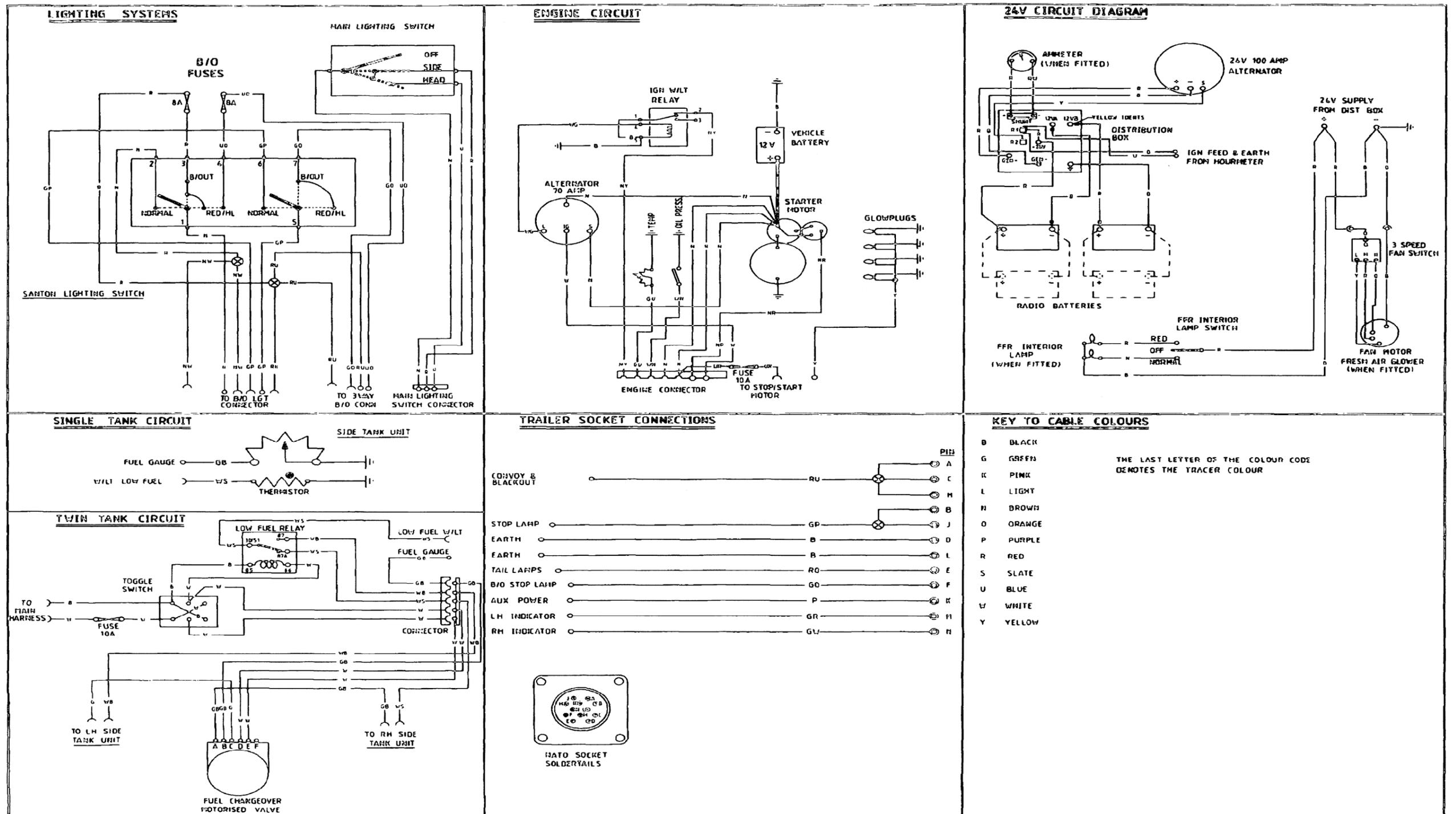


Figure 238 Wiring Diagram (Sheet 3 of 3)

END

Distribution List: VEH G 20.0 – Code 2 (Maint Level)
(Sponsor: CGSVSPO, Light B Vehicles)
(Authority: EC-006637)