

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

MEDIUM 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 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 and lock-washers. Discard all contaminated fuel and lubricants drained from the vehicle in accordance with current local instructions.

5. Use only those fuels and lubricants specified in the Servicing Instruction, EMEI Vehicle G 109, the User Handbook and this instruction 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 WHS Manual.

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 4X4 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 WHS Manual 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. Block Scale [2406/31](#) Issue 1 – Special Tools for RAEME – B Vehicles – Truck Utility and Truck Light MC2 (Land Rover Model 110);
 - b. Complete Equipment Schedules (CES):
 - (1) [SCES 12044](#), Truck, Cargo, Light, MC2;
 - (2) Equipment Kit [SCES 12045](#), Land Rover 110 6 x 6;
 - (3) [SCES 12046](#), Truck, Cargo, Light, Winch, MC2;
 - c. [AS/NZS 2717.1](#) ES6-GC/M-W503AH Welding – Electrodes – Gas Metal Arc – Ferritic Steel Electrodes;
 - d. [AS/NZS 4855](#):E4918 Welding Consumables – Covered Electrodes for Manual Metal Arc Welding of Non-alloy and Fine Grain Steels;
 - e. [EMEI Vehicle A 029](#) Servicing of B Vehicles, Trailers, Stationary Equipment, Auxiliary and Small Engines – Servicing of B Vehicles;
 - f. [EMEI Vehicle G 184-2](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Reworking of Propeller Shaft Flanges;
 - g. [EMEI Vehicle G 189-12](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Fitting of Speedi-sleeves;
 - h. [EMEI Vehicle G 200](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Data Summary;
 - i. [EMEI Vehicle G 202](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Technical Description;
 - j. [EMEI Vehicle G 203](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Light Grade Repair;
 - k. [EMEI Vehicle G 204-2](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Heavy Grade Repair;
 - l. [EMEI Vehicle G 209](#) Truck Cargo, Light MC2 - Land Rover 110 6 X 6 Truck, Cargo, Light, Winch MC2 - Land Rover 110 6 X 6 – Servicing Instruction;
 - m. [EMEI Workshop D 180](#) – Flaw Detection - Non Destructive;
 - n. [Defence Work Health and Safety Manual](#) (WHSSManual);
 - o. [Electronic Supply Chain Manual \(ESCM\)](#);
 - p. [ChemAlert](#);
 - q. [Technical Regulation of ADF Materiel Manual - Land version 5](#)(TRAMM-L);
 - r. [Repair Parts Scale 02185](#) (Truck, Cargo, Light); and
 - s. [Repair Parts Scale 02186](#) (Truck, Cargo, Light, 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.

Location of Identification Numbers

- 13.** The location of identification numbers on components of the vehicle are 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	Front axle number	Adjacent to the axle breather
7	Intermediate axle number	Adjacent to the axle breather
8	Rear axle number	Adjacent to the axle breather

MEDIUM 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.

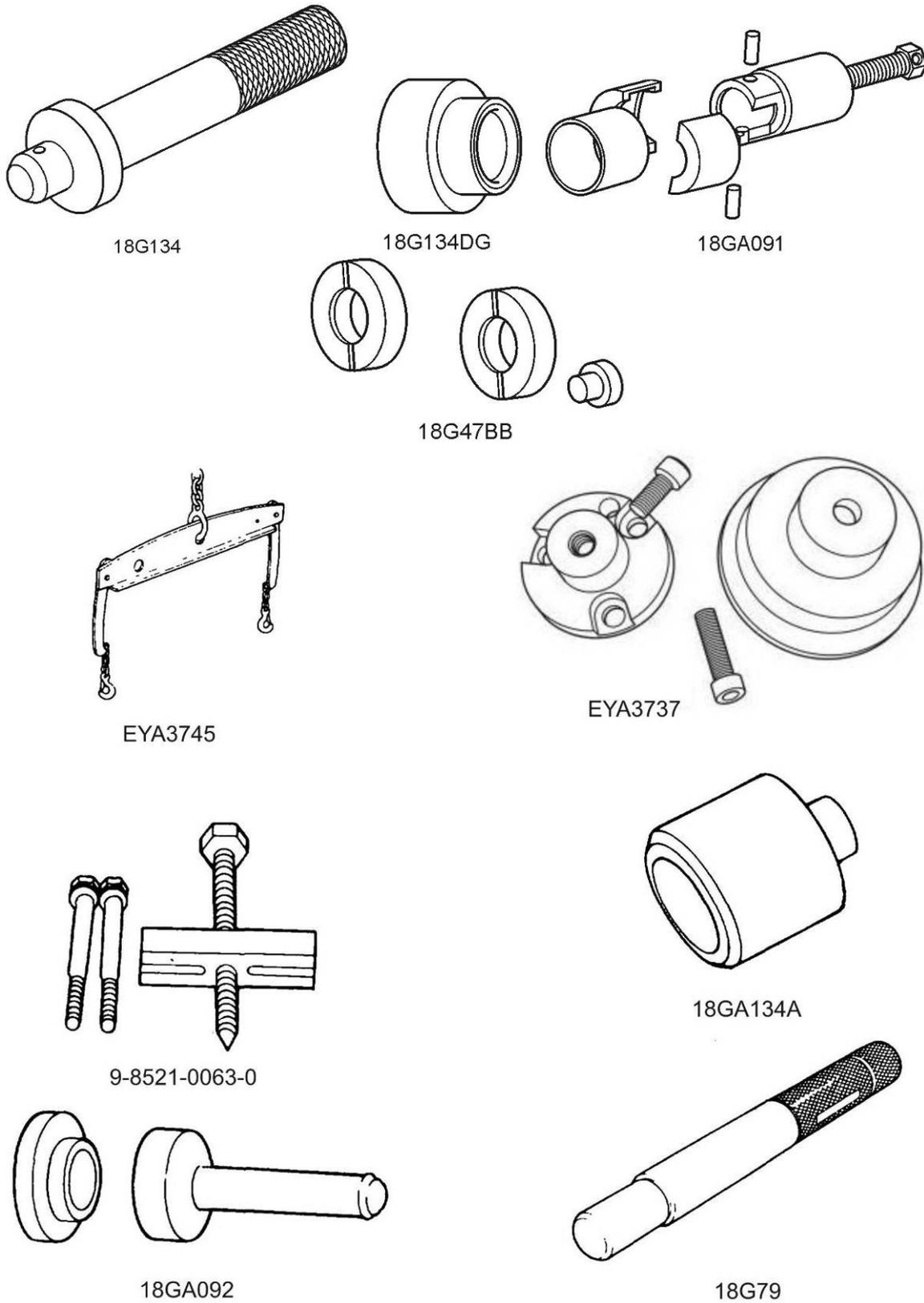
NOTE

Items in Table 3 without an NSN were issued to units authorised to conduct Medium Grade Repairs as part of the Introduction into Service process.

NSN and Manufacturer's part numbers and designations used in this EMEI were current at the date of issue. If twelve months or more have expired since issue, the NSN and Manufacturer's part number should be checked for supersession.

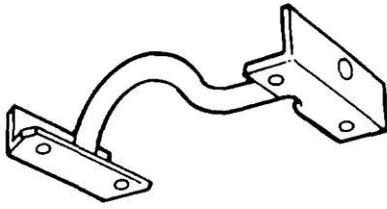
Table 3 Special Tools

Part No.	NSN	Item name	Intended use
EYA3745		Engine lifting sling	Engine lifting
9-8521-0063-0		Puller	Removing crankshaft pulley
18GA092	5120-66-128-4312	Insertor, Seal	Installing crankshaft front oil seal
EYA3737	2815-66-149-1913	Tool Kit, Seal Installation	Crankshaft rear oil seal installation
18GA134A	5120-66-128-4309	Adaptor	Installing spigot bush
18G79	5120-99-820-6912	Clutch Centraliser	Clutch plate installation
RO1001			Transmission removal
18G1205	4910-99-824-1266	Wrench, Propeller	Adjustable flange holding wrench
18G1063	5120-66-128-4304	Separator, Ball-joint	Ball-joint separator
18GA083	5120-66-128-4331	Insertor, bush	Centre rocker beam bush remover/replacer
18GA084	5120-66-128-4332	Remover, Bearing and Bushing	Rocker beam end and spring eye bush remover/replacer
18GA085			Steering wheel puller
18G47BB	5120-99-825-0838	Extractor, Differential Bearing	Bearing remover
18G134	5120-99-874-1715	Replacer, Bearing and Oil Seal	Handle
18G134DG	5120-99-825-0833	Replacement Adaptor Ring	Adaptor ring
18GA091	5120-66-128-4344	Remover, Mainshaft Output Gear and Sleeve	Remover



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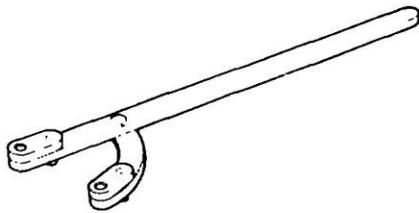
Figure 1 Special Tools (Sheet 1 of 2)



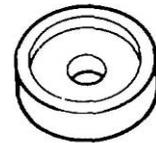
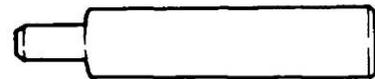
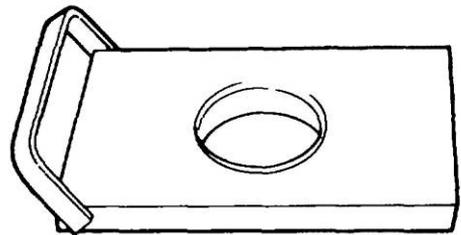
RO1001



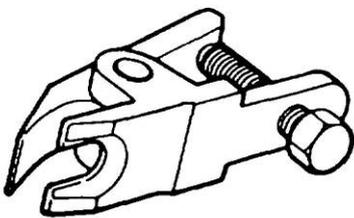
18GA085



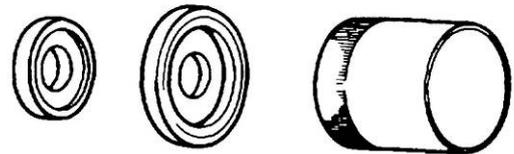
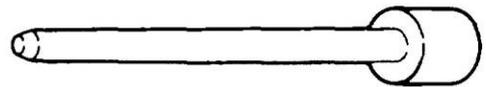
18G1205



18GA083



18G1063



18GA084

Figure 1 Special Tools (Sheet 2 of 2)

List of Lubricants

15. The list of lubricants is detailed in Table 4.

Table 4 List of Lubricants

Serial	Equipment	Lubricant	Capacity (litres)
1	Engine (including filter)	SAE Grade 40 (OMD-115)	8.5
2	Transmission	SAE Grade 40 (OMD-115)	2.7
3	Transfer case (without PTO)	SAE Grade 40 (OMD-115)	3.2
4	Transfer case (with PTO)	SAE Grade 40 (OMD-115)	5.8
5	Front differential	OEP-220	1.7
6	Intermediate differential	OEP-220	2.6
7	Rear differential	OEP-220	2.3
8	Swivel pin housings	Molytex grease	EP00 Sachet
9	Brake master cylinder	OX-8	Fill to level
10	Clutch master cylinder	OX-8	Fill to level
11	Steering box (including reservoir)	OX46	1.25
12	Transmission input shaft	XG-276	As required
13	Clutch pedal trunnion	XG-291	As required
14	Speedometer cable	XG-291	As required
15	Propeller shaft	XG-291	As required
16	Parking brake adjuster	XG-291	As required
17	Windscreen wiper drive cable	XG-291	As required
18	Wheel bearings	XG-291	As required
19	Winch drive line	XG-291	As required
20	Winch cable	Rocol wire rope lube	As required
21	Winch	OEP-220	2.1
22	Radiator inhibitor	Nalcool	1:12 Ratio (8% solution)

ENGINE

16. **Removal.** Remove the engine as follows:

- a. Clean the engine and engine bay with a recommended cleaning agent and blow them dry with compressed air.
- b. Disconnect the battery cables and the carrier retaining nuts and remove the battery from the engine compartment.
- c. Remove the bonnet (Body – Group 17).
- d. Remove the bumper brush guard in accordance with EMEI Vehicle G 203 – Group 16.
- e. Remove the grille in accordance with EMEI Vehicle G 203 – Group 17.
- f. Remove the horn.
- g. Remove the bolts and washers securing the top of the cross-braces to the grille top panel (Figure 2). Remove the bonnet lock and the bolts, washers and nuts securing the bottom of the cross-braces to the chassis and remove the cross-braces.

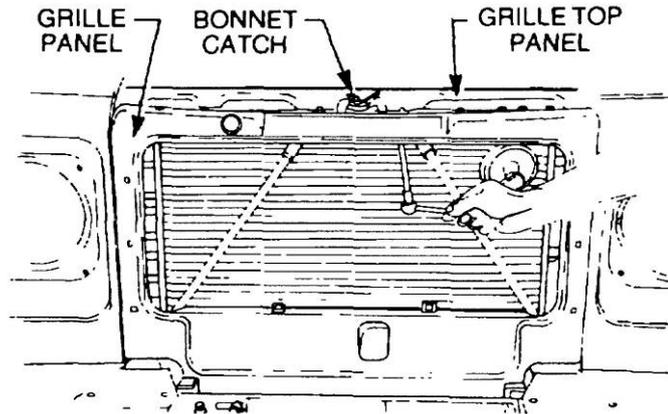


Figure 2 Removal of the Grille Panel

- h.** Remove the bolts and washers securing the grille panel to the mudguards and lift the grille panel and the grille top panel from the vehicle.
- i.** Remove the radiator in accordance with EMEI Vehicle G 203 – Group 2.
- j.** Disconnect the heater hoses at the thermostat and water pump housings (Figure 3) and plug them with suitable plastic plugs. Disconnect the differential lock vacuum line and the vacuum line to the brake servo.

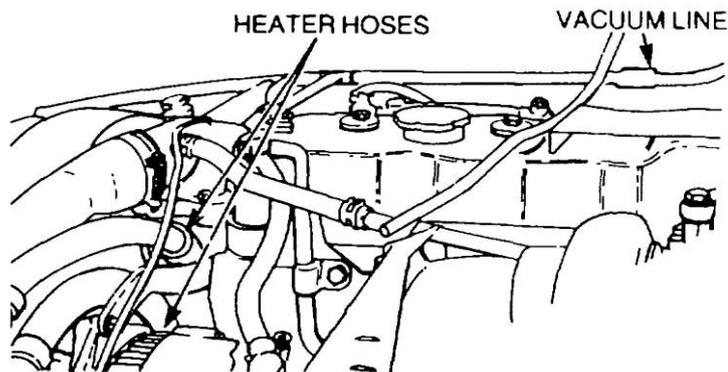


Figure 3 Removal of the Heater Hoses

- k.** Remove the hose clamps securing the air inlet and outlet hoses to the air cleaner housing and disconnect the hoses. Remove the two wing-nuts from the clamp bolts (Figure 4) and carefully lift the air cleaner out of the mounting brackets. Disconnect the engine air intake hose at the manifold and remove the air intake hose assembly.

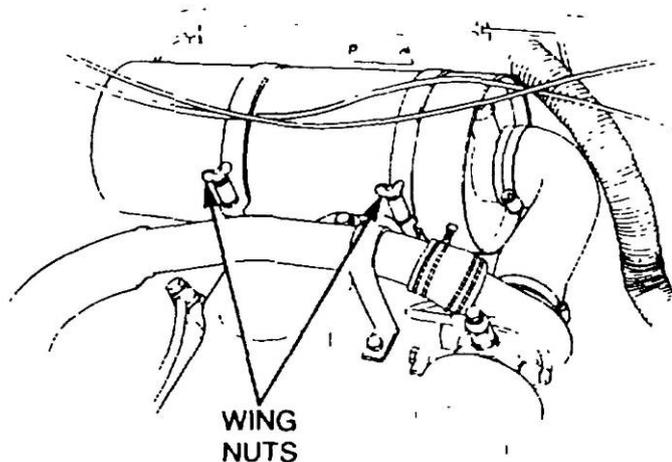


Figure 4 Removal of the Air Cleaner

- l. Disconnect the hoses from the adaptors on the power steering pump (Figure 5) and plug them with suitable plastic plugs to prevent fluid loss.

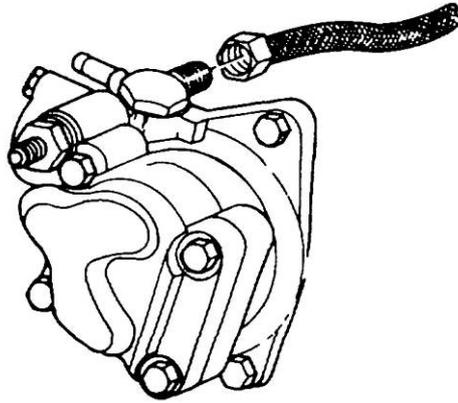


Figure 5 Removal of the Pump-to-power Steering Hoses

- m. Remove the nuts securing the front exhaust pipe to the turbocharger exhaust adaptor flange, (Figure 6) discard the sealing ring if it is damaged.

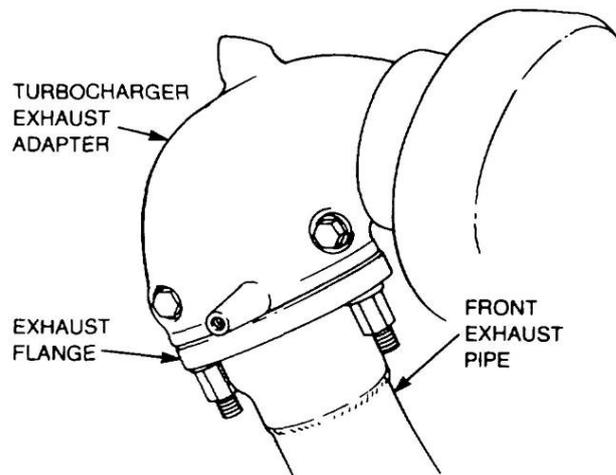


Figure 6 Removal of the Front Exhaust Pipe

- n. Remove the nuts, washers and bolts securing the front exhaust pipe to the muffler pipe and remove the front exhaust pipe.
- o. Disconnect the fuel supply and fuel return lines at the rubber hoses on the fuel injection pump (Figure 7). Plug all apertures with suitable plastic plugs.

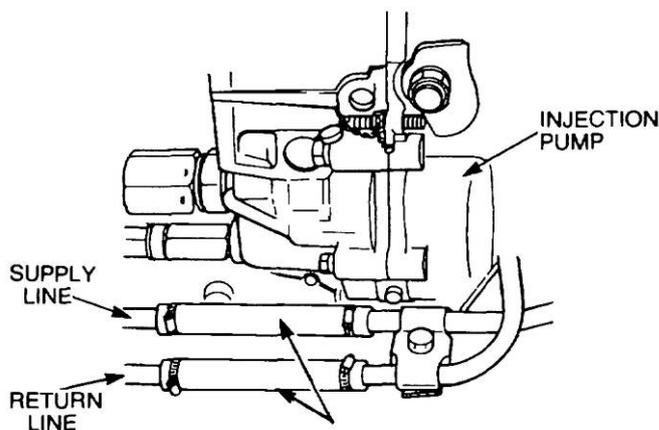


Figure 7 Removal of the Fuel Lines

- p. Disconnect the engine stop cable end from the injection pump stop lever (Figure 8).

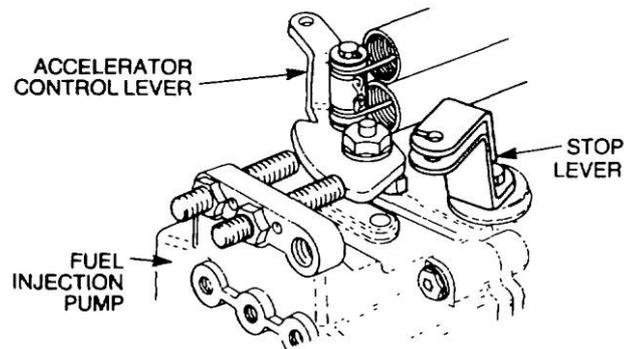


Figure 8 Removal of the Engine Stop Cable

- q. Disconnect the accelerator cable from the fuel injection pump control lever.
- r. Remove the field excitation plug from the alternator (Figure 9) and remove the nut securing the cable to the B-terminal of the alternator. Remove the wire from the terminal and then reinstall the nut.

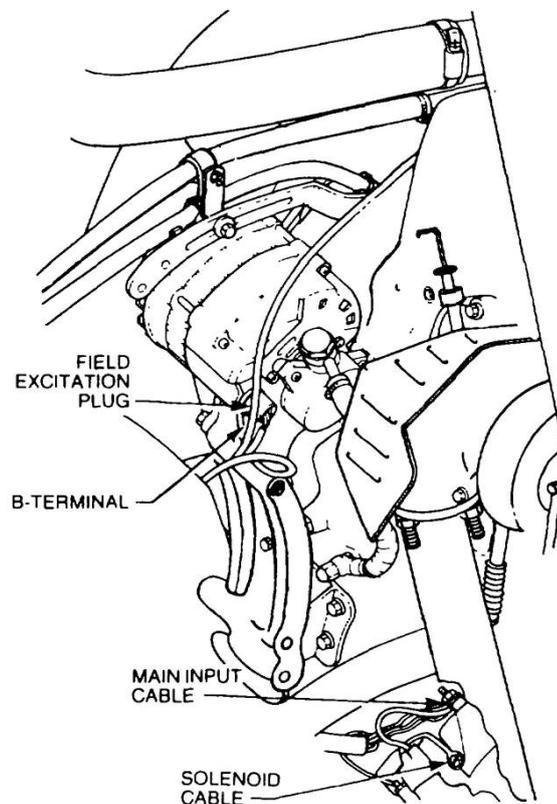


Figure 9 Removal of the Alternator and Starter Motor Cables

- s. Remove the nut securing the main input cable to the starter motor (Figure 9), remove the cable and reinstall the nut. Loosen the screw securing the cable to the starter motor solenoid and remove the cable.
- t. Remove the connector from the temperature sender on the thermostat housing.
- u. Remove the connector from the oil pressure sender.
- v. Remove the two connectors from the reverse light pressure switch located towards the rear of the engine block.
- w. Remove the nut securing the glow plug electrical connection at number four cylinder. Disconnect the wire and then reinstall the nut.

- x. Remove the bolts securing the clutch slave cylinder to the transmission bell housing and the nut and bolt securing the hydraulic pipe bracket to the firewall. Remove the slave cylinder complete with dust cover and backing plate (Figure 10).

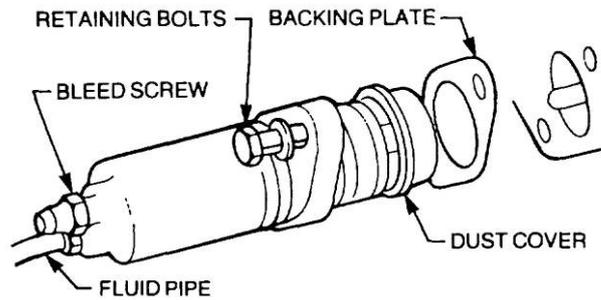


Figure 10 Removal of the Slave Cylinder

- y. Secure the central pivot-lifting bar with chains, (special tool EYA3745), to the overhead lifting equipment.
- z. Install the front engine lifting bracket and tighten the bolts securely.

WARNING

The overhead lifting equipment must have a minimum Safe Working Load (SWL) of 500 kg. Lifting equipment with a lower SWL may fail unexpectedly causing injury to personnel and damage to the equipment.

- aa. Position the overhead lifting equipment over the engine (Figure 11) and secure the chains to the engine lifting brackets.

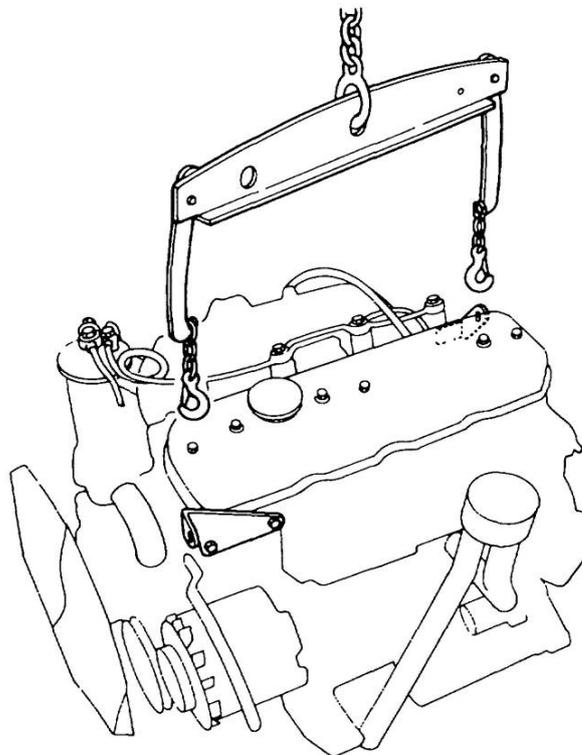


Figure 11 Removal of the Engine

- bb. Remove the bolts, nuts and washers securing the engine front mountings to the mounting brackets.

- cc.** Raise the engine approximately 75 mm. To support the transmission, insert a suitable piece of wood between the transmission and the removable cross-member.
- dd.** Remove the bolts securing the transmission to the flywheel housing.
- ee.** Carefully pull the engine forward until it is disconnected from the transmission and raise the engine, tilting slightly, to allow the transmission input-shaft to clear the clutch pressure-plate. When the oil pan is high enough to clear the front cross-member, withdraw the engine from the vehicle.

17. Installation. Install the engine as follows:

- a.** Secure the central pivot lifting bar with chains, (special tool EYA3745), to the overhead lifting equipment.

WARNING

The overhead lifting equipment must have a minimum Safe Working Load (SWL) of 500 kg. Lifting equipment with a lower SWL may fail unexpectedly causing injury to personnel and damage to the equipment.

- b.** Position the overhead lifting equipment over the engine and secure the chains to the engine lifting brackets and raise the engine.
- c.** Carefully position the engine in the engine bay, tilting slightly to allow the transmission input shaft to engage in the clutch pressure plate. Slight rotation of the crankshaft may be necessary to align the splines.

CAUTION

During installation of the engine or transmission, DO NOT use the bell housing bolts to pull the assemblies together if there is a gap evident as this will cause the input bearing retaining plates to bend and allow excess end float of the main shaft.

If the plates are bent, the transmission must be removed and returned for overhaul.

- d.** Align the transmission and flywheel housing bolt holes and secure the housings with the retaining bolts.
- e.** Raise the engine slightly and remove the piece of wood supporting the transmission.
- f.** Lower the engine onto the engine mountings.
- g.** Fit the bolts (and earth strap – left-hand mounting) to the chassis bracket and install the washers and nuts to secure the mountings to the engine.
- h.** Remove the overhead lifting equipment and lifting bar.
- i.** Apply a suitable sealer to both sides of the clutch slave cylinder backing plate and position the plate on the cylinder.
- j.** Smear the inside of the dust cover with clean hydraulic fluid and install the dust cover on the cylinder. Install the slave cylinder into the transmission bell housing ensuring that the push rod is inserted into the dust cover (Figure 12) and the bleed screw is uppermost.

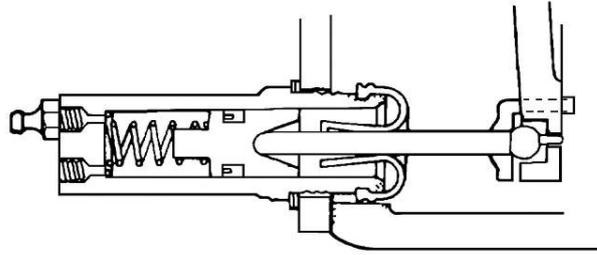


Figure 12 Installation of the Slave Cylinder

- k. Install the slave cylinder retaining bolts and washers and torque them to 27 N.m (20 lbf.ft). Install the nut and bolt securing the hydraulic pipe bracket to the firewall and tighten them securely.
- l. Remove the nut from the glow plug electrical terminal at number four cylinder, connect the electrical wire, and securely install the retaining nut.
- m. Connect the two electrical connectors to the reverse light pressure switch at the rear of the engine block.
- n. Connect the electrical terminal to the oil pressure sender.
- o. Connect the electrical terminal to the temperature sender.
- p. Connect the main input cable and the solenoid cable to the starter motor (Figure 13).

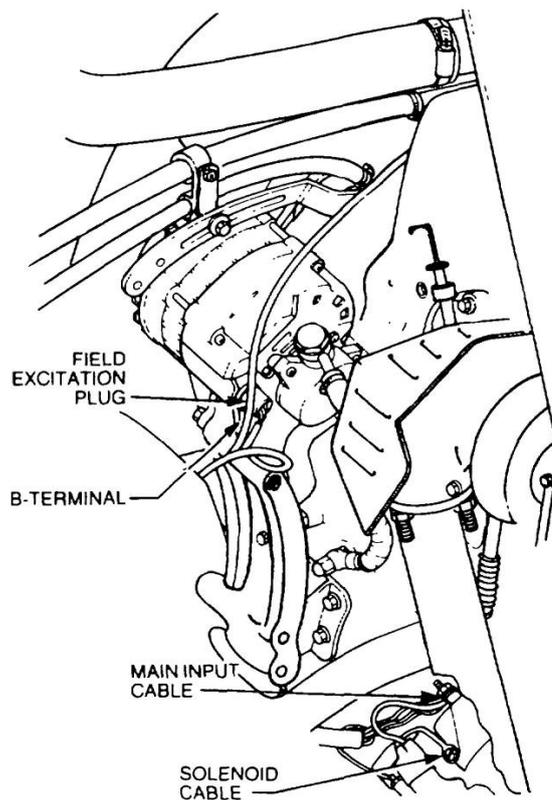


Figure 13 Installation of the Alternator and Starter Motor Cables

- q. Connect the cable to the B-terminal of the alternator (Figure 13) and connect the field excitation plug to the socket at the rear of the alternator.
- r. Connect the accelerator cable to the fuel injection pump control lever.
- s. Connect the engine stop cable to the fuel injection pump stop lever.
- t. Remove the plastic plugs and connect the fuel supply and fuel return lines at the rubber hoses on the fuel injection pump (Figure 14).

- u.** Install the sealing ring and secure the front exhaust pipe to the turbocharger exhaust adaptor ensuring that the sealing ring is correctly seated in the flange. Install, but do not tighten the three nuts and washers.
- v.** Align the front exhaust pipe with the muffler pipe and install the sealing ring, secure it with the three bolts, washers and nuts. Tighten the turbocharger adaptor exhaust flange nuts and the muffler flange bolts securely.
- w.** Connect the vacuum line to the brake servo and differential lock (Figure 15).

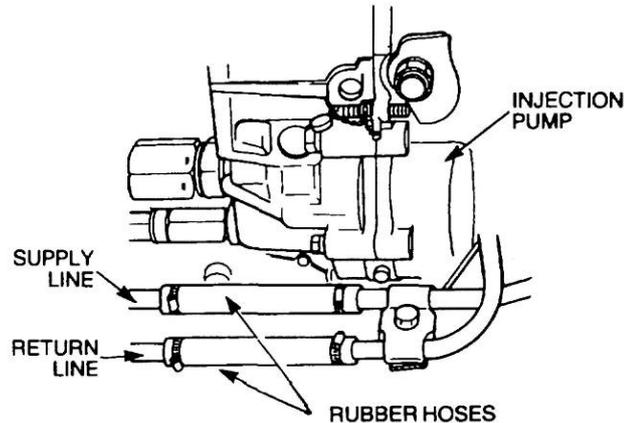


Figure 14 Installation of the Fuel Lines

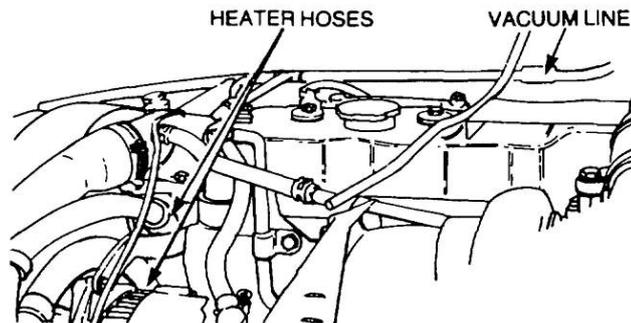


Figure 15 Vacuum Line and Heater Hose Connections

- x.** Remove the plastic plugs and connect the heater hoses (Figure 15).
- y.** Carefully position the air cleaner in the mounting bracket and tighten the two wing-nuts on the clamp bolts. Connect the air inlet and outlet hoses to the air cleaner and tighten the hose clamps. Connect the engine air intake hose at the manifold.
- z.** Install the radiator in accordance with EMEI Vehicle G 203 – Group 2.
- aa.** Position the grille panel and grille top panel between the mudguards and secure them with the six bolts and washers.
- bb.** Position the catch plate on the grille top panel (Figure 16), then position the bonnet lock and one cross-brace under the top panel and secure it with one retaining bolt and washers, but only finger tight. Install the second cross-brace and secure the cross-brace and bonnet lock with the retaining bolt and washers, finger tight. Position the bottom of each cross-brace in its respective bracket and secure them with the retaining bolt, washers and nut. Tighten the cross-brace retaining bolts and grille panel retaining bolts securely.
- cc.** Install the horn.
- dd.** Install the grille in accordance with EMEI Vehicle G 203 – Group 17.
- ee.** Install the bumper brush guard in accordance with EMEI Vehicle G 203 – Group 16.
- ff.** Install the bonnet (Body – Group 17).

- gg. Install the battery and connect the battery cables.
- hh. Start the engine and allow it to warm up to normal operating temperature. Check for leaks and rectify them as necessary. Ensure that the engine functions correctly and rectify any faults found.

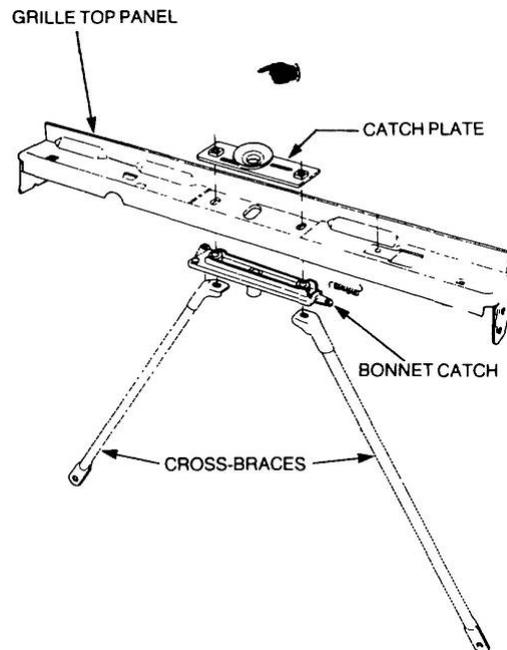


Figure 16 Installation of the Bonnet Catch

Cylinder Head

- 18. **Removal.** Remove the cylinder head 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 bonnet (Body – Group 17).
- b. Clean the engine with a recommended cleaning agent, paying particular attention to the area around the cylinder head and blow it dry with compressed air.
- c. Remove the three nuts securing the front exhaust pipe to the turbocharger exhaust adaptor flange. Discard the sealing ring.
- d. Ensure that the heater temperature control is set to maximum, loosen the bottom radiator hose clamp and drain the coolant into a suitable clean receptacle.
- e. Remove the top radiator hose, when all coolant has drained from the cooling system, fit the bottom radiator hose and secure it with the clamp.
- f. Remove the hose clamps securing the air inlet and outlet hoses to the air cleaner housing and disconnect the hoses. Remove the two wing-nuts from the clamp bolts (Figure 17) and carefully lift the air cleaner out of the mounting brackets.

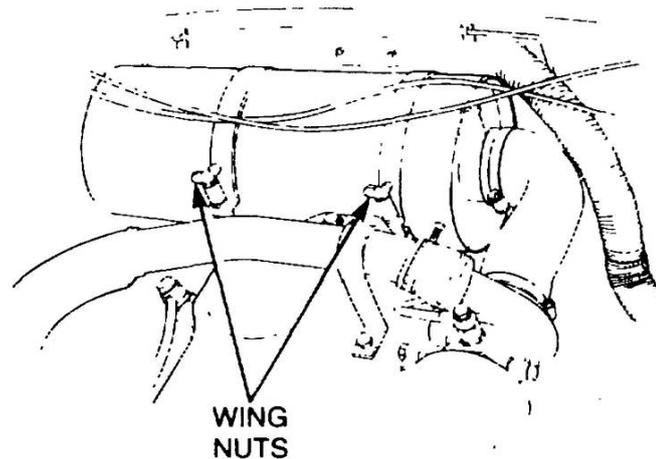


Figure 17 Removal of the Air Cleaner

- g.** Remove the two bolts securing the air cleaner bracket to the engine and remove the bracket.
- h.** Remove the turbocharger in accordance with EMEI Vehicle G 203 – Group 4.
- i.** Remove the heater hoses at the thermostat housing, water pump and at the heater inlet and outlet pipes (Figure 18). Plug the thermostat housing, water pump and inlet and outlet pipes with suitable plastic plugs.

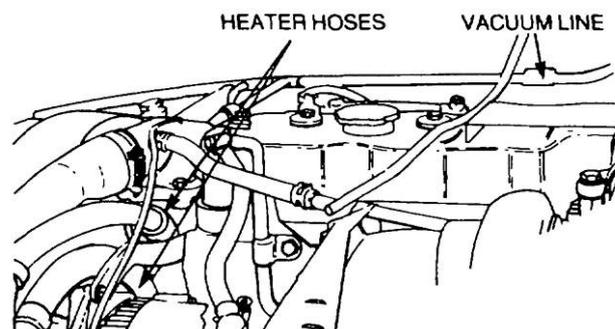


Figure 18 Removal of the Heater Hoses and Vacuum Line

- j.** Disconnect the turbocharger coolant hose from the thermostat housing and remove the bolt securing the coolant pipe bracket to the exhaust manifold. Remove the turbo-charger coolant pipe.
- k.** Loosen the alternator mounting bolts and the adjusting bolt and remove the bolt securing the alternator adjustment bracket to the thermostat housing.
- l.** Remove the bolt securing the dipstick top supporting bracket.
- m.** Disconnect the differential lock vacuum line from the alternator to brake servo vacuum line (Figure 18). Remove the vacuum line from the brake servo, the rear engine lifting bracket and the vacuum pump on the alternator. Plug the apertures with suitable plastic plugs.
- n.** Remove the two bolts securing the heater hose and vacuum line mounting brackets to the engine.
- o.** Remove the coolant by-pass hose between the thermostat housing and the water pump.
- p.** Remove the breather hose connecting the valve cover to the air inlet tube.
- q.** Remove the electrical connection from the temperature sensor.
- r.** Remove the electrical strip link from the top of the glow plugs (Figure 19) and remove the electrical feed wire from number four cylinder glow plug. Remove the glow plugs.

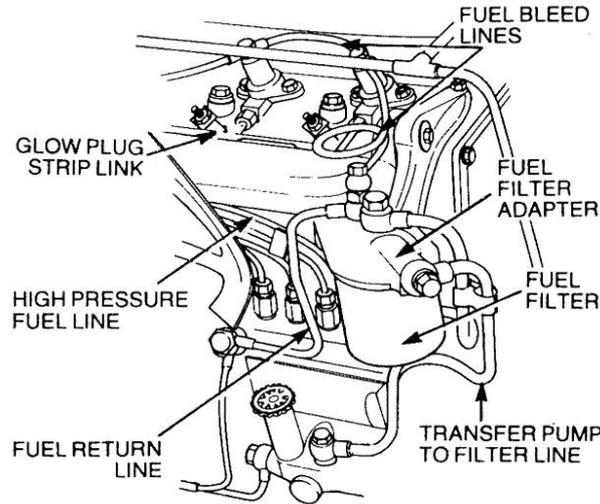


Figure 19 Removal of the Fuel Lines

- s. Place a suitable container beneath the engine to catch any fuel spillage and drain the fuel from the fuel filter into a suitable receptacle. Remove the fuel injector bleed lines (Figure 19) and plug all apertures with suitable plastic plugs.
- t. Disconnect and remove the remaining fuel lines from the fuel filter adaptor (Figure 19) and plug all apertures with suitable plastic plugs.
- u. Remove the two bolts securing the fuel filter adaptor to the bracket and remove the filter adaptor assembly.
- v. Crack loose the fuel line connections at the fuel injectors (Figure 19) and allow any residual fuel that may be under pressure to drain off. Disconnect the fuel lines and plug all apertures with suitable plastic plugs. Remove the clamps securing the fuel lines and remove the fuel lines at the injection pump. Plug all apertures with suitable plastic plugs.
- w. Remove the two nuts and spring washers securing each fuel injector to the cylinder head and carefully remove each injector. Remove and discard the injector sealing washers and nozzle gaskets.
- x. Remove the lock screw retaining the inner stop cable to the stop lever and remove the bolt securing the outer stop cable to the bracket.
- y. Remove the two bolts securing the air inlet pipe to the inlet manifold and discard the gasket.
- z. Remove the three nuts securing the valve cover and remove the valve cover assembly and gasket. Discard the gasket.
- aa. Slacken the rocker shaft retaining bolts in sequence (Figure 20) and remove the bolts and rocker shaft assembly.

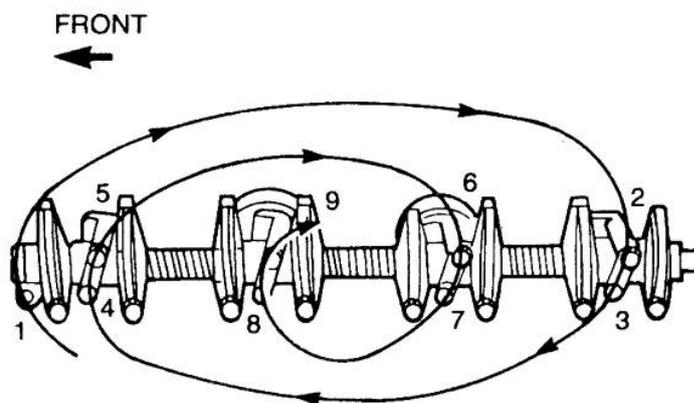


Figure 20 Removal of the Rocker Shaft

- bb. Remove the push rods and mark each rod to ensure correct location during installation.



The cylinder head is heavy, care must be taken on removal or personal injury may result.

- cc. Loosen the cylinder head bolts in sequence (Figure 21). Remove the bolts and remove the cylinder head complete with inlet manifold, exhaust manifold and thermostat housing.

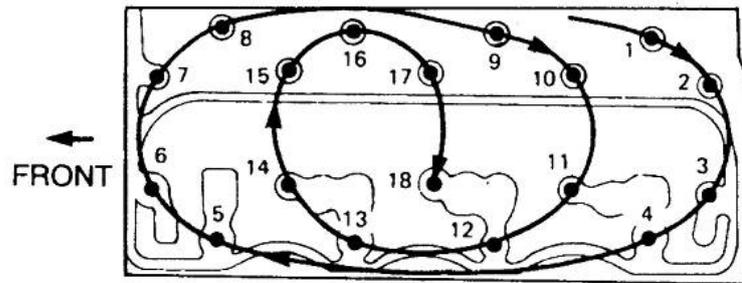


Figure 21 Removal of the Cylinder Head Bolts

- dd. Remove the nuts and washers securing the inlet manifold to the cylinder head taking care not to lose the springs. Remove and discard the gasket.
 - ee. Remove the bolts, nuts and washers securing the heat shield and exhaust manifold to the cylinder head. Remove and discard the two gaskets.
 - ff. Remove the bolts securing the thermostat housing to the cylinder head. Remove and discard the gasket.
19. **Cleaning and Inspection.** Clean and inspect the cylinder head as follows:



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 all trace of gasket material from the engine block, the cylinder head, the inlet and exhaust manifolds and the thermostat housing.
- b. Check the cylinder head for scratches, cracks, gouges and distortion. Using a straight edge and feeler gauge, check that the cylinder head distortion is less than 0.20 mm (0.008 in) in several directions (Figure 22). Replace the cylinder head as necessary.

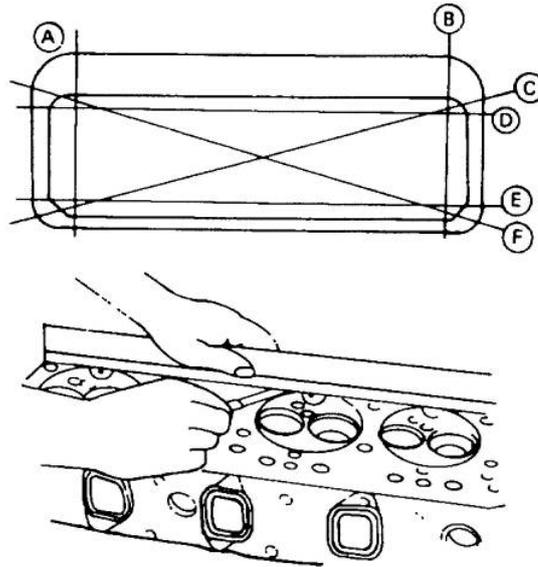


Figure 22 Checking for Cylinder Head Distortion

- c. Check the fuel injector cavities for carbon build-up. If a light build-up is noticed, clean it with a wire brush, however, if a heavy carbon build-up is evident, clean it with a suitable reamer.
 - d. Remove all trace of carbon build-up from the glow plug cavities and check all threads for cleanliness.
 - e. Using taps and dies, clean the threads in boltholes and on studs. Replace any damaged or bent studs.
 - f. Ensure that all oil and coolant galleries are free of restrictions.
 - g. Check that the push rods are not worn, damaged or bent. Replace them as necessary.
 - h. Check the rocker arms for contact surface wear and reface or replace as necessary. Check that all oil ports and passages are free of restrictions.
 - i. Check the condition of all expansion plugs (Para 32) and replace them as necessary.
20. **Installation.** Install the cylinder head as follows:
- a. Position the cylinder head so that the exhaust ports are uppermost.
 - b. Position two new exhaust manifold gaskets on the cylinder head so that the word TOP is toward the manifold (Figure 23).

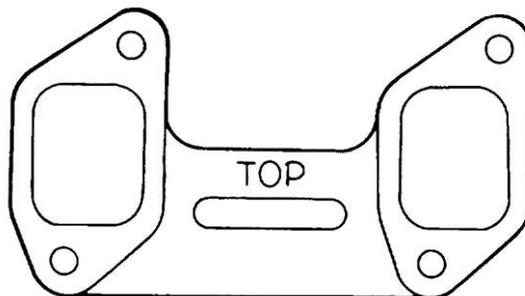


Figure 23 Installation of the Exhaust Manifold Gasket

- c. Place the exhaust manifold over the gaskets aligning the studs with the corresponding holes in the manifold. Secure the manifold in position with the four bolts and finger tighten the bolts. Check that each gasket is correctly positioned and not distorted and install the four nuts and washers. Torque the nuts and bolts to 16 to 25 N.m (12 to 19 lbf.ft) using the tightening sequence in Figure 24. Position the heat shield on the exhaust manifold and secure it with the retaining nuts and washers.

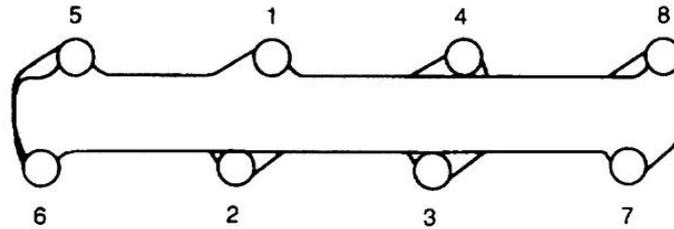


Figure 24 Exhaust Manifold - Tightening Sequence

- d. Position the cylinder head so that the inlet manifold ports are uppermost.
- e. Position a new inlet manifold gasket on the cylinder head with the gasket projection uppermost and toward the rear of the engine (Figure 25).

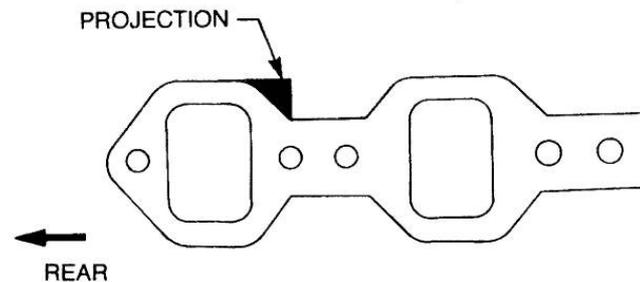


Figure 25 Installation of the Inlet Manifold Gasket

- f. Place the inlet manifold over the gasket aligning the studs with the corresponding holes in the manifold. Secure the manifold in position by installing the eight springs, flat washers and nuts on the studs and finger tighten. Check that the gasket is correctly positioned and not distorted and torque the nuts to 16 to 25 N.m (12 to 19 lbf.ft).
- g. Apply a suitable liquid sealant to both sides of a new thermostat housing gasket and position the gasket and housing on the cylinder head. Secure the housing in position with the four bolts and torque the bolts to 42 to 62 N.m (31 to 45 lbf.ft).
- h. Position a new cylinder head gasket on the engine block so that the TOP mark is uppermost and the FRONT mark is toward the front of the engine. Use two old cylinder head bolts, with the heads sawn off, to locate the gasket and facilitate cylinder head installation.

NOTE

A screwdriver slot in the head of the locating bolts will facilitate their removal once the cylinder head is in position.



The cylinder head is heavy, care must be taken on removal or personal injury may result.

- i. Carefully position the cylinder head and manifold assembly over the engine block locating the two bolts in the corresponding holes.
- j. Ensure that the cylinder head and gasket are correctly positioned, apply MOS2 grease to the bolt threads and install the cylinder head bolts. Remove the two locating bolts after several cylinder head bolts have been installed.
- k. Torque the cylinder head bolts in the sequence shown in Figure 26 in three steps:
 - (1) 68.7 N.m (51 lbf.ft);
 - (2) 88.3 N.m (65 lbf.ft); and
 - (3) torque the bolt through a further 30 degrees.

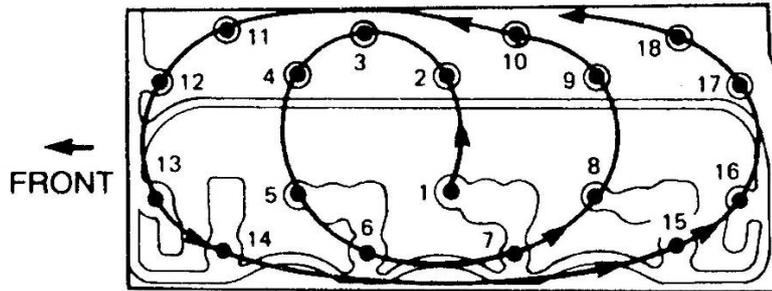


Figure 26 Cylinder Head Bolts - Tightening Sequence

- l. Lubricate the push rods with clean engine oil and install them in the cam followers as noted on removal.
- m. Position the rocker shaft assembly on the cylinder head and install the nuts, bolts and washers. Torque them to 20 to 30 N.m (15 to 22 lbf.ft) in the sequence shown (Figure 27).

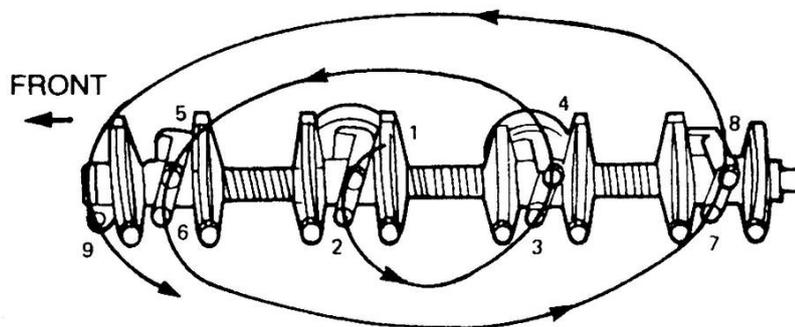


Figure 27 Rocker Shaft Assembly - Tightening Sequence

- n. Adjust the valve clearance in accordance with EMEI Vehicle G 203 – Group 1.
- o. Fit a new dust cap to each fuel injector and place a small amount of grease on each new nozzle gasket. Position a gasket over the nozzle on each injector.

NOTE

The grease will hold the nozzle gasket on the fuel injector during installation.

- p. Install each injector in the cylinder head and secure them with the retaining nuts. Torque the nuts to 20 to 30 N.m (15 to 22 lbf.ft).
- q. Install the glow plugs and torque them to 22 to 27 N.m (16 to 20 lbf.ft). Position the electrical strip link on the glow plugs and secure it with new nuts at cylinders 1, 2 and 3. Connect the electrical feed wire to cylinder number four glow plug and secure the feed wire and strip link to the glow plug with a new nut.
- r. Lightly lubricate the rocker arm assembly with clean engine oil.
- s. Fit a new gasket to the valve cover and position the valve cover on the engine. Secure the valve cover in position using a new washer and gasket on each retaining bolt. Torque the bolts to 16 to 26 N.m (12 to 19 lbf.ft).
- t. Install the fuel lines between the injector pump and the fuel injectors and torque the bolts to 28 to 31 N.m (21 to 23 lbf.ft). Install the fuel line clamp plates and tighten them securely (Figure 28).

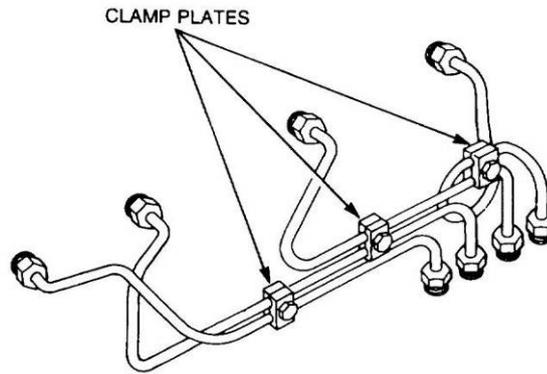


Figure 28 Clamp Plate Location

- u. Position the fuel filter adaptor on the air inlet manifold and secure it with the two bolts and new washers. Smear a new filter seal with clean fuel and install the new filter. Tighten the filter by hand until the seal contacts the adjuster and then tighten a further half a turn (Figure 29).

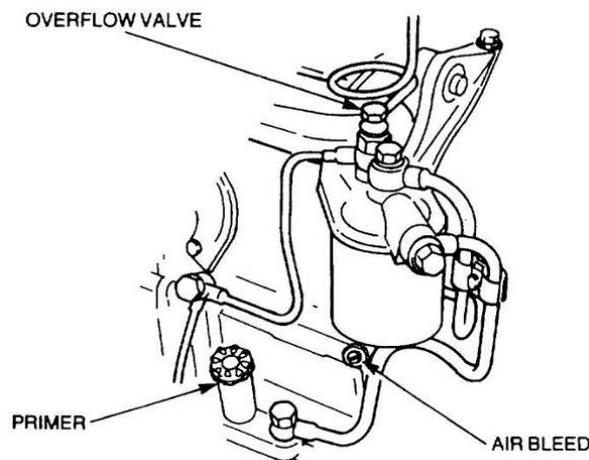


Figure 29 Installation of the Fuel Filter

- v. Connect the fuel bleed lines between each injector using new sealing washers and connect the fuel bleed line between number one cylinder injector and the fuel filter adaptor. Connect the remaining fuel lines to the filter adaptor (Figure 30) and tighten all the bolts securely.

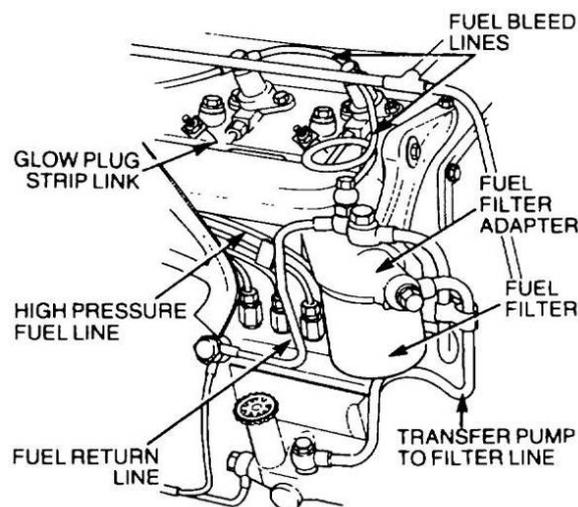


Figure 30 Installation of the Fuel Lines

- w. Using a new gasket, secure the air inlet pipe to the inlet manifold and tighten the two bolts securely.

- x. Position the engine stop inner cable to the stop lever and the outer cable to the bracket, tighten the locking screw and the retaining bolt securely.
- y. Connect the electrical connector to the temperature sensor.
- z. Install the coolant by-pass between the thermostat housing and the water pump.
- aa. Position the heater hose and vacuum line assembly on the engine. Insert the two retaining bolts through the mounting brackets and tighten the bolts securely. Connect the vacuum line to the brake servo and to the vacuum pump on the rear of the alternator and then install the rear engine lifting bracket. Tighten all bolts securely. Connect the heater hoses to the thermostat housing, the water pump and the heater inlet and outlet pipes (Figure 31) and tighten the hose clamps securely.

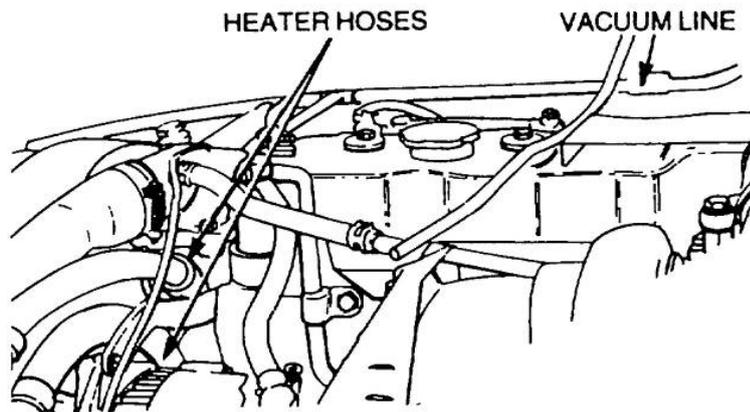


Figure 31 Installation of the Heater Hoses and Vacuum Line

- bb. Connect the turbocharger coolant hose to the thermostat housing and install the bolt securing the coolant pipe to the exhaust manifold. Tighten the clamp and the bolt securely.
- cc. Install the dipstick top-supporting bracket retaining bolt and tighten it securely.
- dd. Secure the alternator adjustment bracket to the water pump with the retaining bolt. Adjust the alternator to give a 10 to 15 mm deflection of the fanbelt and tighten the alternator mounting and adjusting bolts securely.
- ee. Position the air cleaner bracket at the rear of the engine and install the two retaining bolts, tighten the bolts securely.
- ff. Carefully position the air cleaner in the mounting bracket and tighten the two wing-nuts on the clamp bolts. Connect the air inlet and outlet hoses and tighten the hose clamps securely.
- gg. Connect the breather hose between the valve cover and the air inlet tube.
- hh. Install the turbocharger in accordance with EMEI Vehicle G 203 – Group 4.
- ii. Using a new sealing ring secure the front exhaust pipe to the turbocharger exhaust adaptor ensuring that the sealing ring is correctly seated in the flange. Tighten the exhaust flange nuts and the mounting clamp nuts securely.
- jj. Install the top radiator hose and tighten the clamps securely.
- kk. Fill the cooling system in accordance with EMEI Vehicle G 203 – Group 2.
- ll. Bleed the fuel system in accordance with EMEI Vehicle G 203 – Group 4.
- mm. Install the bonnet (Body – Group 17).
- nn. Start the engine and allow it to warm up to normal operating temperature. Check for oil, fuel or coolant leaks and rectify them as necessary. Ensure that the engine functions correctly and rectify any faults found.
- oo. Bleed the power steering system in accordance with EMEI Vehicle G 203 – Group 14.

Camshaft Followers

- 21. Removal.** Remove the camshaft followers as follows:
- a.** Clean the engine and engine bay with a recommended cleaning agent paying particular attention to the area around the valve cover, timing cover and side covers. Blow it dry with compressed air.
 - b.** Drain the engine oil into a suitable receptacle and reinstall the drain plug together with a new sealing ring and tighten it securely.
 - c.** Disconnect the battery.
 - d.** Remove the bonnet (Body – Group 17).
 - e.** Remove the bumper brush guard in accordance with EMEI Vehicle G 203 – Group 16.
 - f.** Remove the grille in accordance with EMEI Vehicle G 203 – Group 17.
 - g.** Remove the connector from the spade terminal on the horn.
 - h.** Remove the two bolts and washers securing the top of the cross-braces to the grille top panel. Remove the bolts, washers and nuts securing the bottom of the cross-braces to the chassis and remove the cross-braces.
 - i.** Remove the six bolts and washers securing the grille panel to the mudguards and lift the grille panel and the grille top panel from the vehicle.
 - j.** Remove the radiator in accordance with EMEI Vehicle G 203 – Group 2.
 - k.** Slacken the alternator mounting bolts (Figure 32), remove the adjusting bolt and remove the fanbelt.
 - l.** Remove the screws securing the fan shroud to gain access to the fan retaining bolts.
 - m.** Remove the bolts and washers retaining the cooling fan to the water pump drive flange and remove the fan, spacer and drive pulley.
 - n.** Disconnect the hoses from the power steering pump and plug the hoses and power steering pump adaptors.
 - o.** Remove the nut and washer securing the crankshaft pulley to the crankshaft, install special tool 8521-0063-0 and remove the pulley.
 - p.** Remove the bolts securing the timing cover to the timing case and remove the cover. Remove and discard the oil seal.
 - q.** Remove the three nuts securing the valve cover and remove the valve cover assembly and gasket. Discard the gasket.

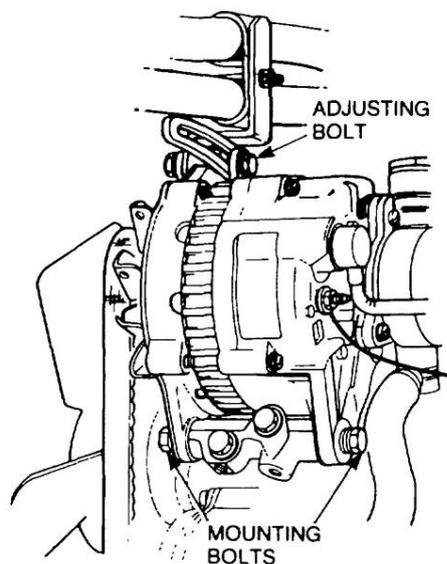


Figure 32 Alternator Adjusting Bolts

- r. Slacken the rocker shaft retaining bolts and nuts in sequence (Figure 33) and remove the bolts, nuts and rocker shaft assembly.

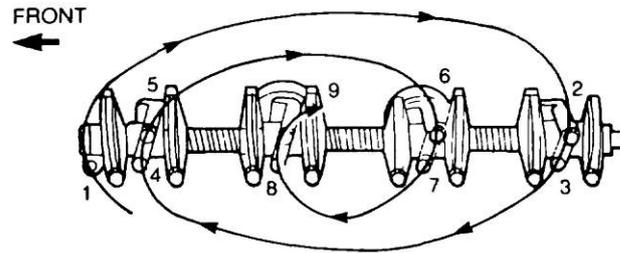


Figure 33 Removal of the Rocker Shaft

- s. Remove the push rods and mark each rod to ensure correct location during installation.
- t. Remove the nuts and bolts securing the oil pan to the engine block then remove the oil pan, the supporting plates and the gaskets. Discard the gaskets.
- u. Remove the oil pump cover from the left-hand side of the engine block and using an Allen key, remove the grub screw locating the oil pump drive pinion thrust bearing and remove the thrust bearing together with the drive pinion.
- v. Remove the bolts securing the side covers to the engine block and remove the side covers. Discard the gaskets and the bolt sealing washers.
- w. Lift the camshaft followers from the camshaft lobes and support the followers in the raised position with suitable clips or tape, ensuring that there is sufficient clearance to remove the camshaft.
- x. Rotate the camshaft drive gear to align the holes in the gear with the thrust plate retaining bolts. Remove the retaining bolts and carefully withdraw the camshaft from the engine block, ensuring that the camshaft lobes do not scratch or damage the camshaft bearings.
- y. Match mark or number the camshaft followers, (to ensure correct location at installation), then remove the device supporting the followers and remove the followers.

NOTE

The camshaft followers will drop from the engine when the support is removed.

22. Cleaning and Inspection. Clean and inspect the camshaft followers as follows:

- a. Clean the camshaft followers with a suitable cleaning agent using steel wool or a wire brush to remove any carbon build-up.
- b. Inspect the camshaft followers for cracks, pitting or irregular wear (Figure 34).

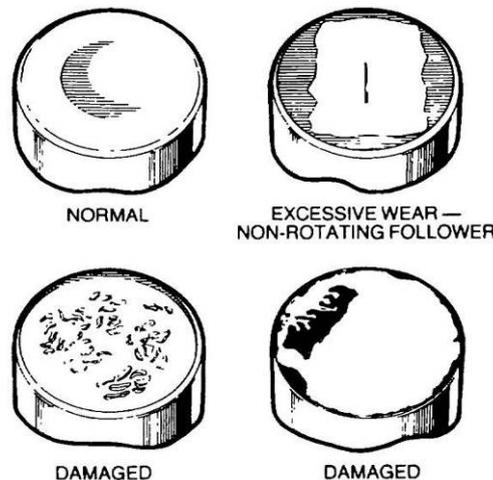


Figure 34 Camshaft Follower Wear Patterns

- c. Clean all trace of gasket material from the engine block and timing cover.

- d. Using a micrometer (Figure 35), check that the camshaft follower OD is 27.92 to 27.98 mm (1.100 to 1.102 in) and replace as necessary.

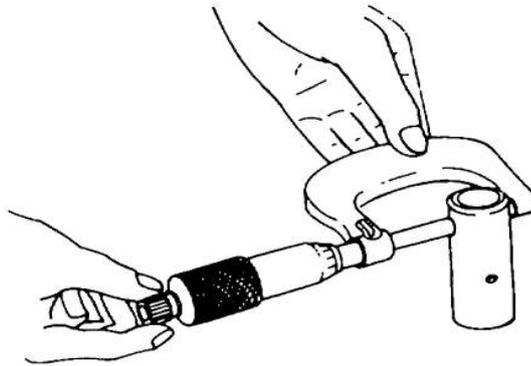


Figure 35 Camshaft Follower Outside Diameter Dimensions

- e. Using an internal micrometer, check that the camshaft follower bore is not worn beyond 0.100 mm (0.004 in) larger than the corresponding camshaft follower. If the bore is beyond the maximum limit the engine block is to be replaced.
- f. Check that the push rods are not worn, damaged or bent and replace them as necessary. Check the condition of the two side cover expansion plugs (Para 32) and replace them as necessary.

23. Installation. Install the camshaft followers as follows:

- a. Lubricate the camshaft followers and each of the bores with clean engine oil. Position the camshaft followers in their corresponding bores and ensure that each follower moves freely within the bore. Secure each of the followers in the fully raised position using a suitable clip or tape.
- b. Rotate the crankshaft to align the A mark on the crankshaft gear with the A mark on the idle gear and the C mark on the injection pump gear with the C mark on the idle gear. Carefully install the camshaft and align the B mark on the camshaft gear with the B mark on the idle gear (Figure 36). Rotate the camshaft to align the holes in the gear with the boltholes in the block and rotate the thrust plate to align with the boltholes. Install the retaining bolts and torque the bolts to 21 to 30 N.m (15 to 22 lbf.ft).

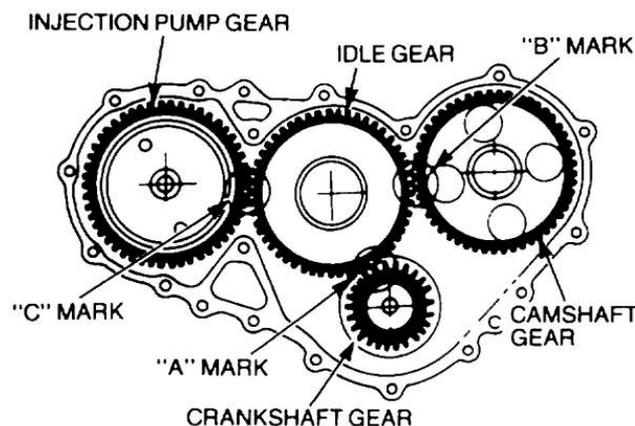


Figure 36 Aligning the Gear Timing Marks

- c. Position new gaskets on either side of the supporting plates and fit the oil pan to the engine block. Install the retaining bolts and nuts and torque them to 10 to 20 N.m (8 to 15 lbf.ft).
- d. Lubricate the push rods with clean engine oil and install them in the camshaft followers as noted on removal.
- e. Position a new gasket on the rear side cover and new sealing washers on the retaining bolts. Install the rear side cover and torque the retaining bolts to 16 to 27 N.m (12 to 20 lbf.ft). Repeat the procedure for the front side cover.

- f. Position the rocker shaft assembly on the cylinder head and install the retaining bolts, washers and nuts. Torque the bolts and nuts to 20 to 30 N.m (15 to 22 lbf.ft) in sequence (Figure 27).
- g. Adjust the valve clearance in accordance with EMEI Vehicle G 203 – Group 1.
- h. Fit a new gasket to the valve cover and position the valve cover on the engine. Secure the valve cover in position using a new washer and gasket on each retaining bolt. Torque the bolts to 16 to 26 N.m (12 to 19 lbf.ft).
- i. Connect the breather hose between the valve cover and the air inlet tube.
- j. Install a new seal into the timing cover ensuring that the open side of the seal is facing towards the rear of the cover. Smear the timing cover oil seal lip with rubber grease and position a new gasket on the timing cover using the timing cover retaining bolts to hold the gasket in place. Install the timing cover ensuring that the gasket is correctly aligned and the sealing lip on the seal is not distorted. Install the retaining bolts and torque them to 21 to 30 N.m (15 to 22 lbf.ft).
- k. Install the two Woodruff keys onto the crankshaft and the dust thrower onto the back of the crankshaft pulley. Smear the seal rubbing surface on the crankshaft pulley with rubber grease. Position the pulley over the end of the crankshaft, align the keyway with the keys and push the pulley onto the crankshaft. Install the retaining nut and washer and torque them to 382 to 480 N.m (282 to 354 lbf.ft).
- l. Connect the hoses to the power steering pump adaptors.
- m. Position the drive pulley, spacer and cooling fan on the water pump drive flange. Align the boltholes and install and securely tighten the four retaining bolts. Position the fanbelt over the pulleys and adjust the tension of the fan belt by moving the alternator outward. Check for a belt deflection of 10 to 15 mm between the water pump and alternator pulleys. When the correct tension is obtained, securely tighten the alternator adjusting bolt and the alternator mounting bolts.
- n. Install the radiator in accordance with EMEI Vehicle G 203 – Group 2.
- o. Install the grille and top panel and secure them to the mudguards using the six bolts and washers.
- p. Install the cross-braces and secure them to the chassis and grille top panel with the bolts, washers and nuts.
- q. Install the oil pump drive pinion and thrust bearings, insert and tighten the grub screw to locate the thrust bearing. Install the oil pump cover and a new gasket, tighten the bolts securely.
- r. Connect the wiring harness to the horn and install the front grille. Fit the eight screws and tighten them securely.
- s. Install the bumper brush guard in accordance with EMEI Vehicle G 203 – Group 16.
- t. Install the bonnet (Body – Group 17).
- u. Connect the battery.
- v. Replenish the engine with approximately 8.5 litres of new engine oil. Start the engine and allow it to warm up to normal operating temperature. Check for oil leaks and rectify them as necessary. Ensure that the engine functions correctly and rectify any faults found. Check the oil level and top up if required.

Oil Pump

24. Removal. Remove the oil pump as follows:

- a. Clean the oil pan and surrounding area with a recommended cleaning agent and blow them dry with compressed air.
- b. Position a suitable receptacle beneath the engine, remove the drain plug from the oil pan (sump) and drain the engine oil. Install the drain plug and tighten it securely.
- c. Remove the bolts and nuts securing the oil pan to the engine block and remove the oil pan.
- d. Wipe the oil pump with a clean dry cloth and remove the two bolts and washers securing the oil pipe to the engine block.
- e. Remove the two bolts securing the oil pump to the engine block and remove the oil pump and strainer assembly.

25. **Disassembly.** Disassemble the oil pump as follows:

- a. Remove the wire clip retaining the strainer gauze to the strainer body. Remove the four bolts securing the strainer body and the oil pump cover to the oil pump body (Figure 37).

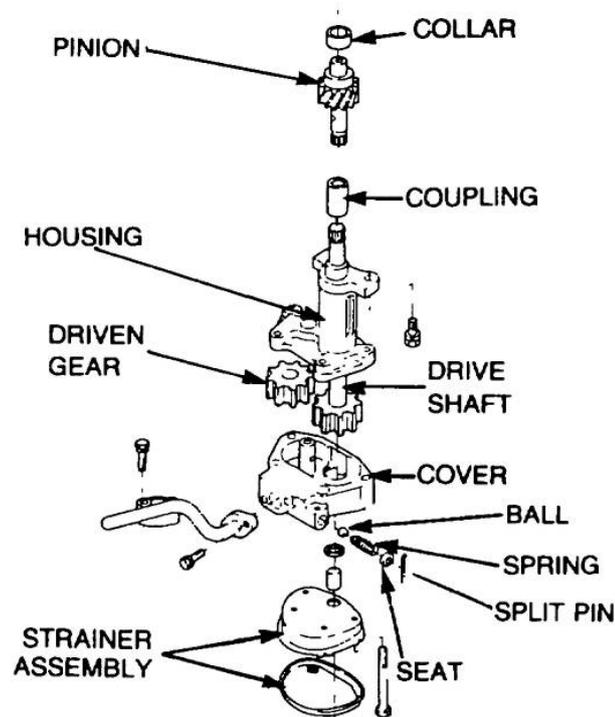


Figure 37 Oil Pump - Exploded View

- b. Remove the short oil pipe and spacer from the oil pump cover.
- c. Remove the collar and the drive gear from the drive coupling. Slide the coupling off the oil pump drive shaft (Figure 38).

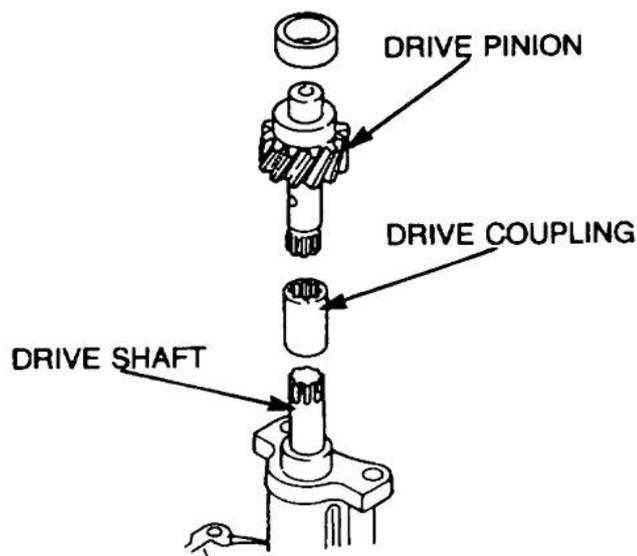


Figure 38 Removal of the Drive Pinion, Collar and Coupling

- d. Withdraw the drive shaft from the oil pump body and remove the driven gear from the locating pin in the cover.
- e. Remove the split pin, relief valve ball, seat and spring from the bore in the oil pump cover (Figure 39). Discard the split pin.

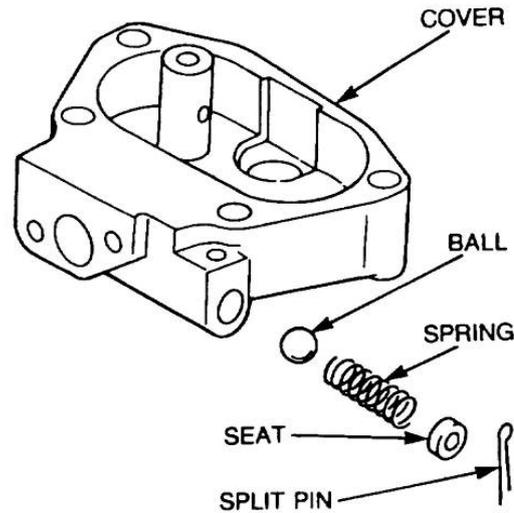


Figure 39 Removal of the Oil Relief Valve Ball

26. **Cleaning and Inspection.** Clean and inspect the oil pump as follows:
- Clean all parts with a recommended cleaning agent paying particular attention to the oil strainer assembly.
 - Clean all trace of gasket material from the oil pan, the engine block and the oil pipe.
 - Check the relief valve ball, spring and seat for damage or excessive wear and replace as necessary.
 - Check the body and the cover for scoring or damage and replace as necessary.
 - Check the drive and driven gears and the coupling for wear or damage.
 - Inspect the splines on the drive shaft for wear or damage and replace as necessary.

NOTE

The driven gear and the drive gear and shaft are a matched set and must be replaced together.

- Install the drive gear and shaft and the driven gear into the pump cover. Hold the assembly in a soft jawed vice, using a feeler gauge and straight edge (Figure 40), check the clearance between the gears and the body. The clearance should be 0.050 to 0.114 mm (0.002 to 0.0045 in), if it is outside this limit replace the gear set.

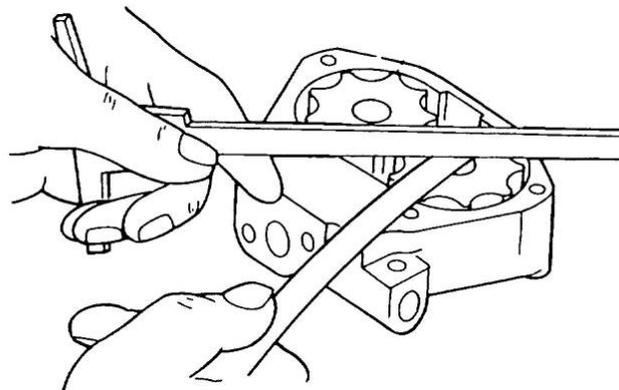


Figure 40 Checking the Gear to Body Clearance

- Using a feeler gauge check the clearance between the gears and the cover housing (Figure 41). The clearance should be 0.20 to 0.30 mm (0.008 to 0.012 in). If the clearance is outside this limit, replace the oil pump.

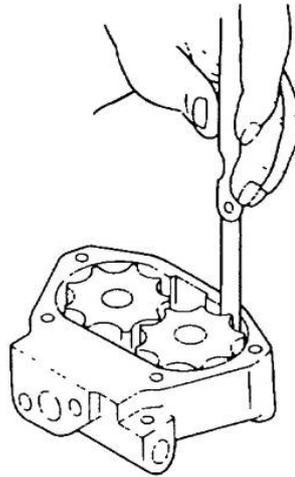


Figure 41 Checking the Gear to Cover Clearance

- i. Remove the drive and the driven gears from the housing cover.
- 27. Reassembly.** Reassemble the oil pump as follows:
- a. Lubricate the driven and drive gears, the drive shaft and the oil pump cover with clean engine oil.
 - b. Install the driven gear and the drive gear and shaft in the pump cover.
 - c. Locate the spacer and the short oil pipe in the pump cover and install the four bolts securing the strainer body and pump cover to the pump body.
 - d. Install the strainer gauze to the strainer body with the wire clip.
 - e. Lubricate the relief valve ball, spring and seat with clean engine oil and install them in the bore of the oil pump cover. Retain the items with a new split pin.
 - f. Slide the drive coupling over the drive shaft splines and install the drive pinion into the splines of the drive coupling. Position the collar on top of the drive gear.
 - g. Invert the oil pump and pour clean engine oil through the strainer, turn the drive shaft a few times to prime the oil pump.
- 28. Installation.** Install the oil pump as follows:
- a. Position the oil pump on the engine block engaging the drive shaft with the driven gear. When the oil pump is correctly positioned, install the two retaining bolts and finger tighten only.
 - b. Position a new gasket between the oil pipe and the engine block and secure the oil pipe with the two retaining bolts. Ensure that the gasket does not distort as the bolts are tightened.
 - c. Torque the oil pump to cylinder block retaining bolts to 42 to 60 N.m (31 to 45 lbf.ft).
 - d. Position a new gasket on the engine block and place the oil pan over the gasket. Place a new gasket and the supporting plates over the rim of the oil pan and install the retaining bolts and washers. Torque the retaining bolts to 10 to 20 N.m (8 to 15 lbf.ft).
 - e. Fill the engine with clean engine oil checking the oil level with the dipstick.
 - f. Start the engine and allow it to warm up to normal operating temperature. Check for oil leaks and rectify as necessary.

Oil Cooler

29. **Removal.** Remove the oil cooler 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 engine with a recommended cleaning agent paying particular attention to the area around the fuel injection pump and the oil cooler. Blow the area dry with compressed air.
- b. Place a suitable receptacle beneath the radiator, loosen the bottom radiator hose and drain the coolant into the receptacle. Reinstall the hose and tighten the clamp securely.
- c. Remove the oil filters using an oil filter removing tool.
- d. Remove the fuel injection pump and fuel filter in accordance with EMEI Vehicle G 203 – Group 4.
- e. Remove the bolts securing the oil pipe to the oil cooler and the oil filter adaptor. Discard the sealing rings.

NOTE

The oil cooler retaining bolts are different sizes. Accordingly, **note** the position of each bolt on removal to ensure correct positioning on installation.

- f. Remove the bolts securing the oil cooler to the engine block and remove the oil cooler. Discard the gasket.
- g. Remove the bolts securing the oil cooler element to the housing and remove the element from the housing. Discard the two gaskets.
- h. Remove the check valve retaining bolt, the spring and valve assembly. Discard the washer from the retaining bolt.

30. **Cleaning and Inspection.** Clean and inspect the oil cooler 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 all components with a recommended cleaning agent and blow them dry with compressed air.
- b. Remove all trace of gasket material from the oil cooler housing and the engine block.
- c. Inspect the check valve spring for wear, damage or loss of tension and replace as necessary.
- d. Remove any scale build-up with a wire brush. If scale cannot be removed soak the affected components in a recommended solvent and carefully blow them dry with compressed air. If scale cannot be removed with a wire brush after soaking, replace parts as necessary.
- e. Check the housing and element for cracks or pitting and replace as necessary.

31. **Installation.** Install the oil cooler as follows:

- a. Position two new gaskets on the element studs and install the element in the oil cooler housing. Torque the retaining nuts to 20 to 30 N.m (15 to 22 lbf.ft).
- b. Invert the oil cooler and insert the check valve and spring. Position a new washer on the retaining bolt and tighten it securely.

- c. Install a new gasket on the oil cooler housing and hold the gasket in position with retaining bolts at each end. Position the oil cooler on the engine block and secure it with the retaining bolts in the positions noted on removal. Torque the bolts to 20 to 30 N.m (15 to 22 lbf.ft) in sequence (Figure 42).

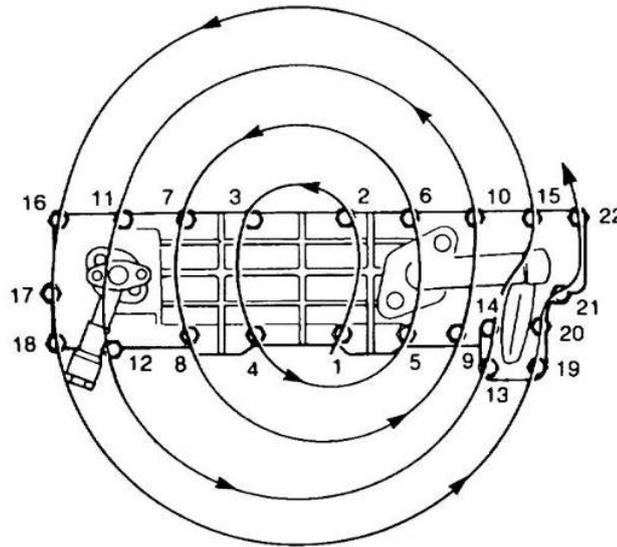


Figure 42 Oil Cooler - Tightening Sequence

- d. Fit new sealing rings and install the oil pipe between the oil cooler and the oil filter adaptor. Tighten the retaining bolts securely.
- e. Install the fuel injector pump and fuel filter in accordance with EMEI Vehicle G 203 – Group 4.
- f. Apply a film of clean engine oil to the oil filter seal and carefully install the oil filter avoiding cross-threading. Tighten the filter a further half a turn after the seal contacts the adaptor.
- g. Fill the engine with approximately 8.5 litres of new engine oil. Check the level on the dipstick and top up as necessary.
- h. Fill the cooling system in accordance with EMEI Vehicle G 203 – Group 2.

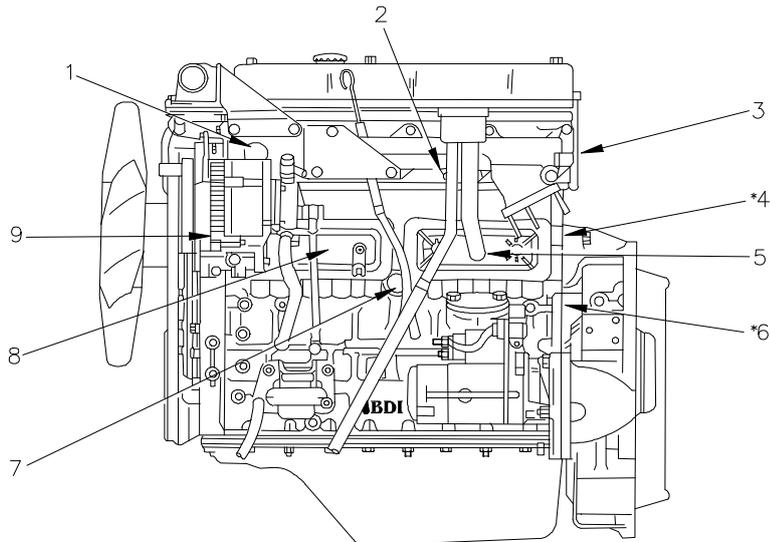
Expansion Plugs

- 32. **Removal.** Remove the expansion plugs as follows:

NOTE

Figures 43 and 44 illustrate the location of expansion plugs on the engine assembly. Removal of some engine components will facilitate access to the expansion plug to be removed. Refer to the relevant Group in EMEI Vehicle G 203 or this EMEI for the appropriate component removal and installation procedures.

- a. Drain the engine oil or cooling system as necessary.

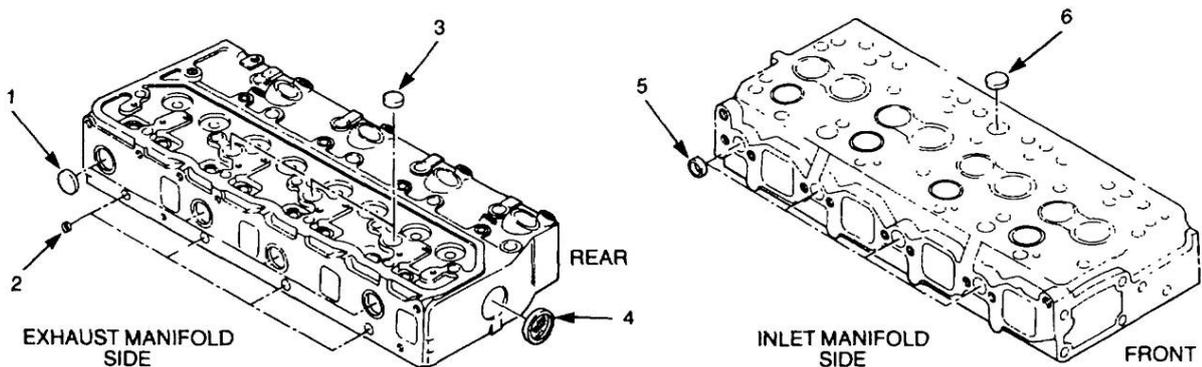


* HEAVY GRADE REPAIR ONLY. DO NOT REMOVE DURING MEDIUM GRADE REPAIR.

- | | |
|------------------------------------|------------------------------------|
| 1. FOUR OFF | 6. ONE OFF, BACK OF ENGINE BLOCK |
| 2. FOUR OFF | 7. ONE OFF. |
| 3. ONE OFF, BACK OF CYLINDER HEAD | 8. ONE OFF, BEHIND FRONT SIDECOVER |
| 4. ONE OFF, BACK OF ENGINE BLOCK | 9. ONE OFF, BEHIND WATER PUMP |
| 5. ONE OFF, BEHIND REAR SIDE COVER | |

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Figure 43 Engine Expansion Plug Location



- | | |
|--------------|-------------|
| 1. Four off | 4. One off |
| 2. Four off | 5. Four off |
| 3. Three off | 6. One off |

Figure 44 Cylinder Head Expansion Plug Location

- b. Using a sharp instrument pierce a hole in the expansion plug and prise the plug out. Discard the plug.

NOTE

The small expansion plugs may be difficult to remove. If necessary, use a drill but do not exceed the outer diameter of the expansion plug.

33. Installation. Install the expansion plugs as follows:

- Ensure that the plug cavity is clean and apply a suitable sealant to the expansion plug.
- Place the plug in the cavity and tap it into position ensuring that the plug is even and flush with the surround.
- Install any engine components previously removed and replenish the engine oil and/or cooling system as necessary.

Flywheel and Ring-gear

- 34. Removal.** Remove the flywheel and ring-gear as follows:
- a. Remove the transmission (Transmission – Group 6).
 - b. Remove the clutch assembly (Clutch – Group 5).
 - c. Lock the flywheel to prevent it from rotating and suitably support the flywheel. Remove the six retaining bolts and remove the flywheel.
 - d. Partially cut through the ring-gear with a hacksaw and knock the ring-gear from the flywheel using a hammer and cold chisel.
- 35. Installation.** Install the flywheel and ring-gear as follows:
- a. Fit a new ring-gear by heating it uniformly and positioning the ring-gear on the flywheel. Ensure that the ring-gear is positioned evenly against the shoulder on the flywheel and allow it to cool.
 - b. Lubricate the retaining bolts with clean engine oil.
 - c. Install the flywheel and secure it in position with the six retaining bolts. Torque the retaining bolts to 142 to 170 N.m (105-125 lbf.ft) in sequence (Figure 45).
 - d. Install the clutch assembly (Clutch – Group 5).
 - e. Install the transmission (Transmission – Group 5).

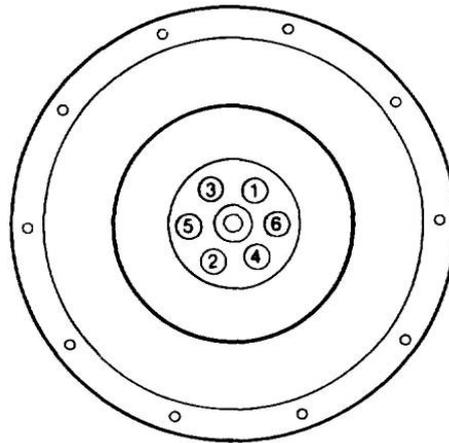


Figure 45 Flywheel - Tightening Sequence

Crankshaft Front Oil Seal

- 36. Removal.** Remove the crankshaft front oil seal as follows:
- a. Remove the radiator in accordance with EMEI Vehicle G 203 – Group 2.
 - b. Clean the crankshaft pulley and surrounding area with a recommended cleaning agent and blow it dry with compressed air.
 - c. Loosen the alternator adjusting bolt and mounting bolts and move the alternator toward the engine. Remove the fanbelt.
 - d. Ensure that the parking brake is applied, low gear is selected and all wheels are chocked. Remove the crankshaft front nut and washer (Figure 46) and remove the pulley.

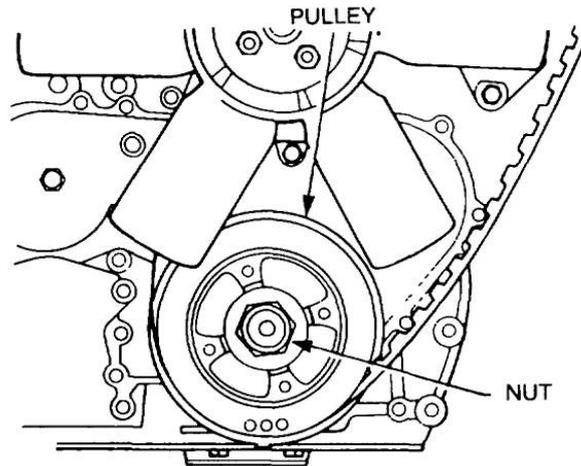


Figure 46 Removal of the Crankshaft Pulley

- e. Remove the oil seal using a lever or seal puller as required.

37. Installation. Install the crankshaft front oil seal as follows:

- a. Lubricate the outer surface of a new seal with clean engine oil and position the seal on the timing case cover. Install the seal using special tool 18GA092 (Figure 47).

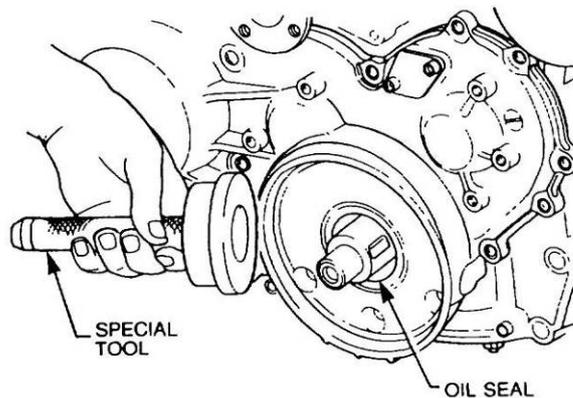


Figure 47 Installation of the Crankshaft Front Oil Seal

- b. Ensure that the seal rubbing surface on the pulley is not grooved or worn and install the pulley, washer and nut. Torque the nut to 382 to 480 N.m (282 to 354 lbf.ft).
- c. Install the fanbelt and adjust the alternator for a 10 to 15 mm deflection on the longest span of the fanbelt when depressed with the thumb.
- d. Install the radiator in accordance with EMEI Vehicle G 203 – Group 2.

Crankshaft Rear Oil Seal

38. Removal. Remove the crankshaft rear oil seal as follows:

- a. Remove the flywheel (Para 41).
- b. Pry off or pull out the oil seal from the flywheel housing and discard it.

39. Cleaning and Inspection. Clean and inspect the crankshaft rear oil seal as follows:

- a. Remove all trace of gasket material from the engine block and the flywheel housing.
- b. Clean the flywheel housing with a recommended cleaning agent and blow it dry with compressed air.
- c. Clean and inspect the crankshaft oil seal journal for any abrasion or scoring which may have been caused by previous oil seals.

CAUTION

Emery dust or metal filings must not be allowed to enter the engine and must be completely removed before continuing.

- d. Carefully remove any burrs or rough areas with emery paper or a fine file. Thoroughly clean away any resulting filings or emery paper dust. If wear is greater than 0.1 mm deep or wide, fill the damaged area with Loctite 3805 to prevent oil seeping under the seal.
- e. Inspect the seal installation, crank plate and push cone and carefully remove any burrs or sharp edges, particularly those on the outer diameter of the crank plate.

CAUTION

Handle the crank plate and push cone carefully during use to avoid causing burrs or sharp edges that may damage the seal during installation and cause early failure.

40. Installation. Install the crankshaft rear oil seal as follows:

- a. Fit the crank plate to the crankshaft with one hole positioned at the dowel pin and the other three holes aligned with the flywheel bolt holes (Figure 48). Secure the crank plate with the short screws, ensuring the screws are evenly tightened.



Figure 48 Crank Plate (Secured to Crankshaft)

NOTE

Before installation, apply only clean engine oil to the outside surface of the new type of seal. Do not apply any type of sealant in an attempt to improve the sealing between the housing and the outer surface of the new seal.

- b. Lubricate the outside surface of the new seal with clean engine oil. Position the seal over the crank guide so that the part number stamped on the flange of the green inner sleeve is visible. Push the seal, by hand, along the crank guide until it contacts the crankshaft (Figure 49).

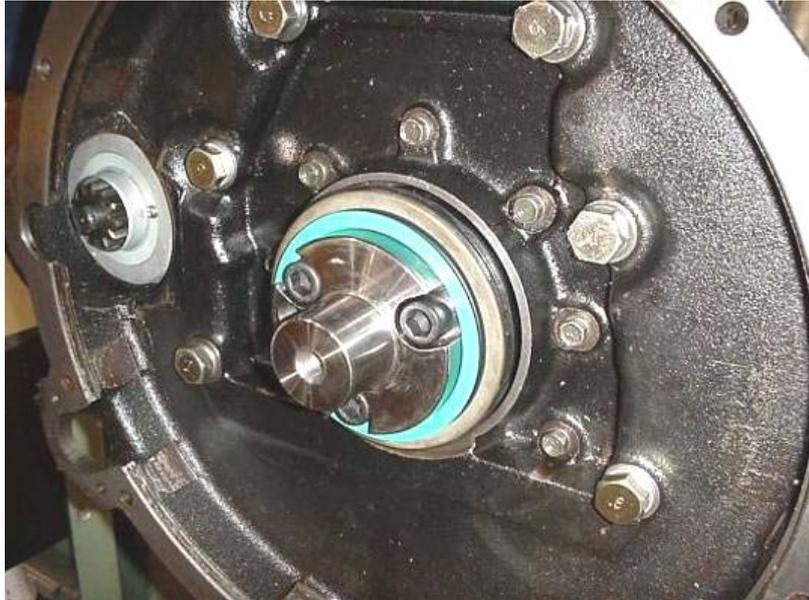


Figure 49 New Type of Seal (Placed on Crank Plate Ready for Installation)

- c. Position the push cone over the crank guide, locate it onto the seal and then engage the long screw into the crank guide (Figure 50).

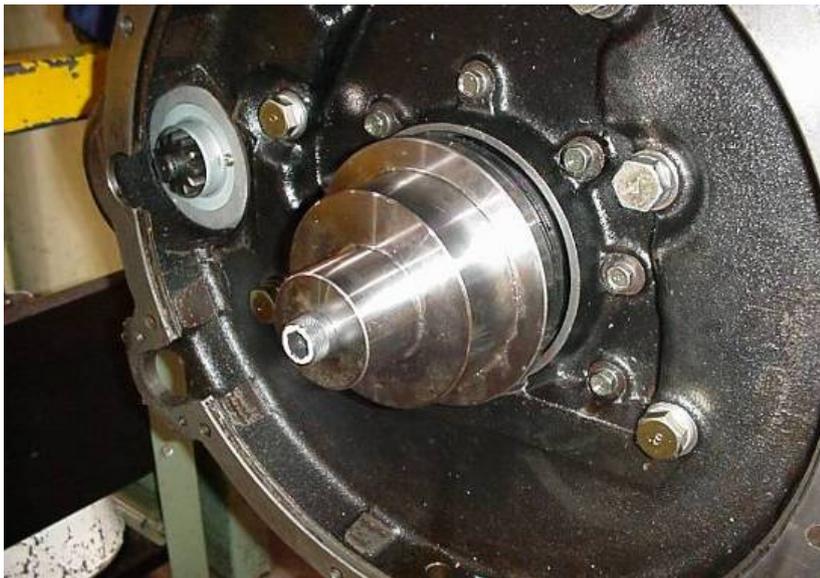


Figure 50 Push Cone (Located on Crank Plate and Against Seal)

CAUTION

To minimise creep back of the seal rubber and to ensure the seal remains in the correct position during service, the push cone must be left tight against the seal for at least two minutes.

- d. Rotate the screw to push the seal into its housing until hard resistance is felt. Leave the push cone in place for at least two minutes before loosening the screw.

NOTE

The presence of green bore sealant after the seal has been installed does not indicate there is a fault with the newly installed seal. However, if it does appear, it should be cleaned away using workshop wiping cloths.

- e. Remove the push cone and crank guide and clean away any green bore sealant that may have been forced from inside the seal.
- f. Clean away any excess engine oil from the general area.
- g. Install the flywheel (Para 41).

NOTE

Prior to installing the clutch assembly, check for wear or damage on the clutch plate and pressure plate, and check the release bearing for smoothness of operation.

- h. Install the clutch assembly (Clutch – Group 5).
- i. Install the transmission (Transmission – Group 6).

Special Tools for Crankshaft Rear Oil Seal

The special tools required for the installation of the crankshaft rear oil seal are listed in Table 5

Table 5 Special Tools Required For Crankshaft Rear Oil Seal Installation

Item	NSN	Mfr Part No	Designation or Description	Unit of Issue	Qty
1	2815-66-149-1913	EYA3737	Tool kit, seal installation (includes items 2 to 6)	ea	NA
2	NA	EYA3738	Crank plate, seal install tool	ea	1
3	NA	EYA3739	Push cone, seal install tool	ea	1
4	NA	NA	Screw, socket head cap, 14 x 1.5, 35 mm long	ea	3
5	NA	NA	Screw, socket head cap, 14 x 2, 50 mm long	ea	1
6	NA	EYA3740	Case, carry	ea	1

Engine Specifications

41. The engine specifications are detailed in Table 6.

Table 6 Engine Specifications

Serial	Item	Specification
1	Clutch slave cylinder tightening torque	27 N.m (20 lbf.ft)
2	Tightening torque (pipe bracket)	40 N.m (30 lbf.ft)
3	Cylinder head distortion	Less than 0.20 mm (0,008 in)
4	Cylinder head tightening torque - first step	68.7 N.m (51 lbf.ft)
5	Second step	88.3 N.m (65 lbf.ft)
6	Final step	+ 30 degrees
7	Exhaust manifold tightening torque	16 to 5 N.m (12 to 19 lbf.ft)
8	Air inlet manifold tightening torque	16 to 25 N.m (12 to 19 lbf.ft)
9	Thermostat housing tightening torque	42 to 62 N.m (31 to 45 lbf.ft)
10	Rocker shaft tightening torque	20 to 30 N.m (15 to 22 lbf.ft)
11	Fuel injectors tightening torque	20 to 30 N.m (15 to 22 lbf.ft)
12	Glow plugs tightening torque	22 to 27 N.m (16 to 20 lbf.ft)
13	Valve cover tightening torque	16 to 26 N.m (12 to 19 lbf.ft)
14	Fuel lines – high pressure tightening torque	28 to 31 N.m (21 to 23 lbf.ft)
15	Turbocharger to exhaust manifold tightening torque	30 to 34 N.m (22 to 25 lbf.ft)
16	Fanbelt deflection	10 to 15 mm
17	Cam followers - nominal O D	27.92 to 27.98 mm (1.100 to 1.102 in)
18	Cam follower-to-bore clearance - maximum	0.100 mm (0.004 in)
19	Engine side covers tightening torque	16 to 27 N.m (12 to 20 lbf.ft)
20	Engine breather tightening torque	16 to 25 N.m (12 to 19 lbf.ft)
21	Oil pump - gear to body clearance	0.050 to 0.114 mm (0.002 to 0.0045 in)
22	Gear to cover clearance	0.20 to 0.30 mm (0.008 to 0.012 in)
23	Drive shaft to pump housing clearance	0.032 to 0.070 mm (0.0013 to 0.0028 in)
24	Oil pump tightening torque	42 to 60 N.m (31 to 45 lbf.ft)
25	Engine oil pan (sump) tightening torque	10 to 20 N.m (8 to 15 lbf.ft)
26	Oil cooler tightening torque (element to cooler)	20 to 30 N.m (15 to 22 lbf.ft)
27	Oil cooler tightening torque	20 to 30 N.m (15 to 22 lbf.ft)
28	Flywheel tightening torque	142 to 170 N.m (105 to 125 lbf.ft)
29	Crankshaft front nut tightening torque	382 to 480 N.m (282 to 354 lbf.ft)
30	Crankshaft rear oil seal retainer tightening torque	20 to 30 N.m (15 to 22 lbf.ft)

Engine Fault Finding

42. The engine fault finding is detailed in Table 7.

Table 7 Engine Fault Finding

Serial	Symptom	Probable Cause	Action
1	Engine misfiring	Defective fuel injectors	Replace defective injectors
		Incorrectly adjusted valves	Adjust the valves to the correct clearances
		Worn or broken piston rings	Replace the engine
2	Engine stalls at low speed	Air leaks in the fuel supply	Trace the leak then rectify
		Internal or external fuel leaks	Rectify
		Incorrectly adjusted throttle linkage	Adjust the linkages to the correct specifications
		Governor weights incorrectly adjusted	Replace fuel injection pump
		Water in fuel	Drain sedimenters Drain and flush the fuel tanks Replace the fuel filter then fill the fuel tanks with clean fuel
		Incorrect fuel pump calibration	Replace pump
		Cylinder head gasket blow-by or leakage	Replace cylinder head gasket
		Blocked in-line filter	Clean or replace filter
3	Erratic engine speed	Governor weights assembled incorrectly	Replace fuel injection pump
		Incorrectly calibrated fuel injection pump	Replace fuel injection pump
4	Low power	Incorrectly calibrated fuel injection pump	Replace fuel injection pump
		Defective fuel injector(s)	Replace defective injectors
5	Engine will not reach no-load governed speed	Water in the fuel	Drain sedimenters. Drain and flush the fuel tanks. Replace the fuel filter then fill the tank with clean fuel
		Incorrectly calibrated fuel injection pump	Replace fuel injection pump
		Defective fuel injector(s)	Replace defective injectors
		Blocked in-line filter	Clean or replace filter
6	Excessive fuel consumption	Defective fuel injector(s)	Replace defective injectors
		Incorrect fuel pump calibration	Replace fuel injection pump
		Clogged air cleaner elements	Replace air cleaner elements
		Oil level too high resulting in viscous drag on crankshaft	Adjust oil level
		Overloaded engine	Ensure correct driving techniques
7	Engine overheats	Blocked coolant passages	Flush system
		Incorrectly calibrated fuel injection	Replace fuel injection pump
		Exterior of the engine caked with dirt	Clean engine and grime
		Blocked radiator	Clean
		Broken or loose fanbelt	Replace or adjust
		Low coolant level	Fill
		Faulty thermostat	Replace thermostat
		Faulty expansion tank cap	Replace expansion tank cap

CLUTCH

43. **Removal.** Remove the clutch assembly as follows:

WARNING

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

- a. Remove the engine (Engine – Group 1).
- b. Lock the flywheel to prevent it from turning and match mark the clutch pressure plate to the flywheel (Figure 51). Remove the bolts securing the pressure plate to the flywheel by alternately slackening each of the twelve bolts to prevent distortion of the pressure plate housing. Discard the lock-washers.

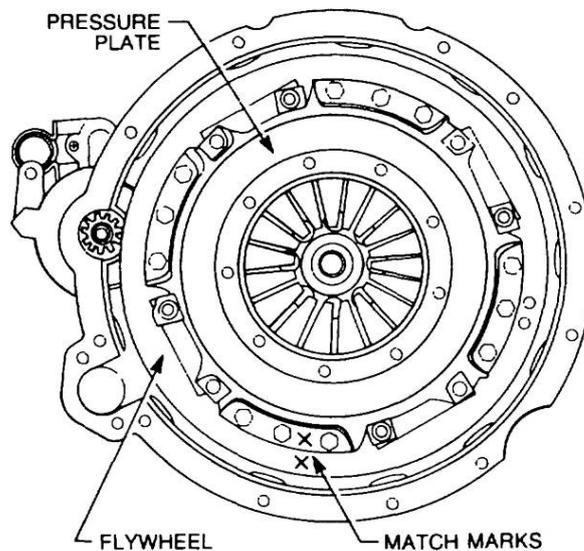


Figure 51 Removal of the Pressure Plate

- c. Withdraw the pressure plate and clutch plate.
 - d. Using a slide hammer or similar, remove the spigot bush from the crankshaft extension piece. Discard the spigot bush.
44. **Cleaning and Inspection.** Clean and inspect the clutch as follows:

WARNING

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

- a. Dust-off the pressure plate and check it for heat-cracks and wear. Check the diaphragm spring for wear or damage. Replace the pressure plate as necessary.
- b. Dust-off the clutch and check the lining material and the hub spline for excessive wear. Also check for damaged or broken springs. Replace the clutch plate as necessary.
- c. Inspect the clutch release bearing and replace the bearing if it is worn or damaged.

45. Installation. Install the clutch as follows:

- a. Using special tool 18GA134A, install a new spigot bush in the crankshaft extension piece. Apply a small amount of molybdenum disulphide base grease to the bush.



The clamping pressure of the Land Rover 4X4 pressure plate exceeds 540 kg, while the clamping pressure for the Land Rover 6X6 exceeds 800 kg. If a Land Rover 4X4 pressure plate is fitted to a Land Rover 6X6, failure will occur.

- b. Install the clutch plate using special tool 18G79 to centralise the clutch plate against the flywheel.
- c. Position the pressure plate on the flywheel engaging the dowels in the locating holes and ensuring that the match marks align. Install the retaining bolts and new lock-washers. Alternately tighten the retaining bolts to prevent distortion of the pressure plate and torque the bolts to 16 N.m (12 lbf.ft). Remove the clutch plate aligning tool and the flywheel locking device.
- d. Smear a thin film of molybdenum disulphide base grease on the transmission front cover extension sleeve and input shaft splines.
- e. Install the engine (Engine – Group 1).

46. Clutch Throw-out Lever Repair. Repair a loose clutch throw-out lever (or to prevent dislodgement of the clutch throw-out lever from the bell housing) as follows:

- a. Remove the engine (Engine - Group 1).
- b. Remove the throw-out lever pivot and retaining cap from the bell housing.
- c. Clean the lever pivot and housing hole with a Loctite cleaning solvent and allow it to dry.
- d. Apply Loctite 601 to the pivot and refit it and the retaining cap into the bell housing. Allow the Loctite to cure for at least one hour.

NOTE

Due to limited access, a right angle drill is required to drill the hole through the bell housing.

- e. Drill a hole through the bell housing and throw-out pivot lever, suitable to fit a 3 mm diameter x 25 mm long roll pin (Figure52).



ROLL PIN HOLE

Figure 52 Location Of Roll Pin Hole

- f. Fit the roll pin to prevent dislodgement of the pivot.
- g. Install the engine (Engine - Group 1).

Clutch Specifications

47. The clutch specification is detailed in Table 8.

Table 8 Clutch Specification

Serial	Item	Specification
1	Clutch pressure plate tightening torque	16 N.m (12 lbf.ft)

TRANSMISSION

48. **Removal.** Remove the transmission as follows:
- a. Clean the transmission and surrounding under-body area with a recommended cleaning agent and blow it dry with compressed air.
 - b. Disconnect the battery negative cable.
 - c. Remove the three floor mats and floor panels.
 - d. Remove the bonnet and left-hand door (Body – Group 17).

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

- e. Raise the vehicle and support it on suitable chassis stands.
- f. Remove the fuse-box cover and the two screws securing the fuse-box to the firewall (Figure 53). Secure the fuse-box out of the way.

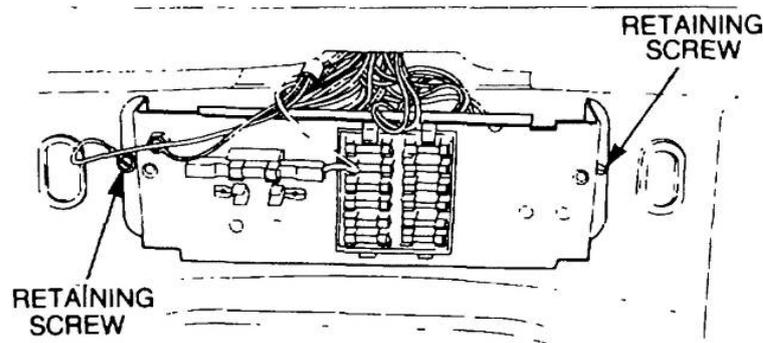


Figure 53 Removal of the Fuse Box

- g. Remove the following in accordance with EMEI Vehicle G 203 – Group 6:
 - (1) the gearlever;
 - (2) the top cover; and
 - (3) the transfer-case selector lever.
- h. Remove the two push-on connectors from the reverse light switch located on the top of the transmission (Figure 54).

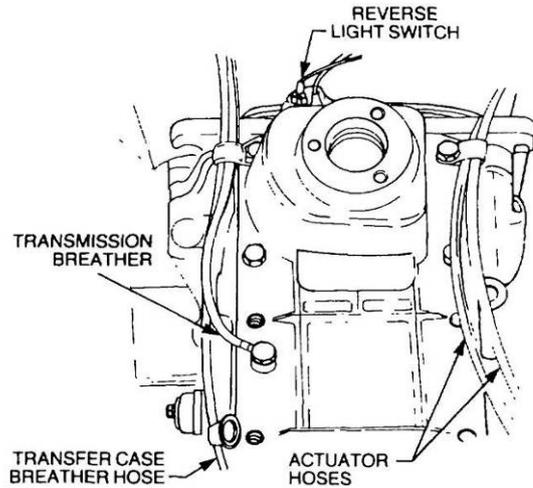


Figure 54 Removal of the Hose Clamps

- i. Remove the clamps securing the breather and actuator hoses to the transmission (Figure 54). Remove the transmission breather hoses from the top of the transmission and the breather on the bell housing.
- j. Secure the special lifting bracket RO1001 to the transmission with the bolts from the transfer case selector lever (Figure 55).

NOTE

The lifting bracket position is determined by the cut out for the transmission breather.

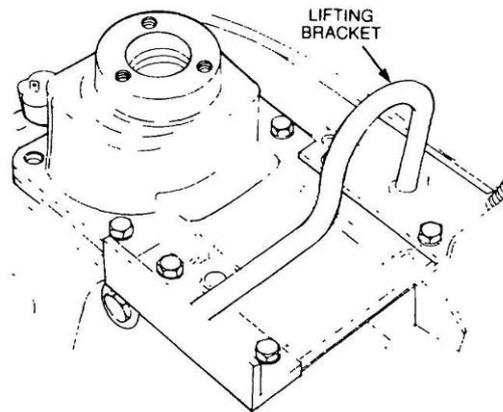


Figure 55 Transmission Lifting Bracket

- k. Remove the hose clamps securing the air inlet and outlet hoses to the air cleaner housing and disconnect the hoses. Remove the two wing-nuts from the clamp bolts (Figure 56) and carefully lift the air cleaner out of the mounting brackets.

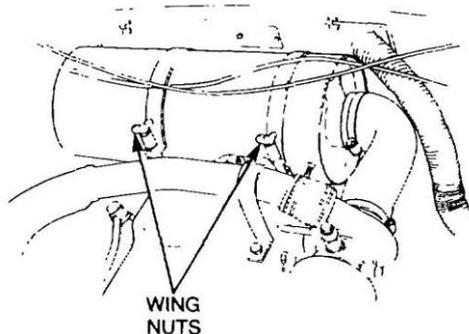


Figure 56 Removal of the Air Cleaner

- l.** Remove the three nuts securing the front exhaust pipe to the turbocharger exhaust adaptor flange. Discard the sealing ring (Figure 57).

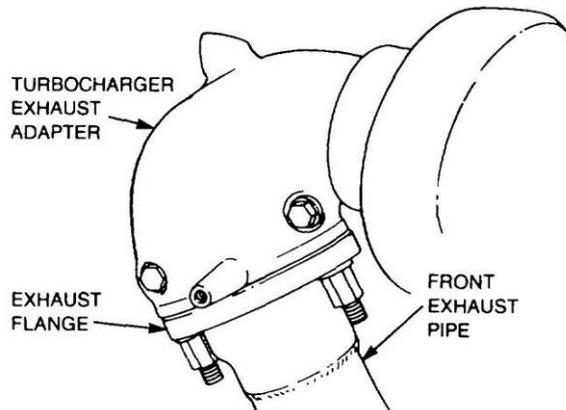


Figure 57 Removal of the Front Exhaust Pipe

- m.** Remove the three nuts, washers and bolts securing the front exhaust pipe to the muffler pipe and remove the front exhaust pipe.
- n.** Disconnect the bullet electrical connector from the differential lock warning light switch (Figure 58). Tag and disconnect the vacuum hoses from the differential lock vacuum chamber.

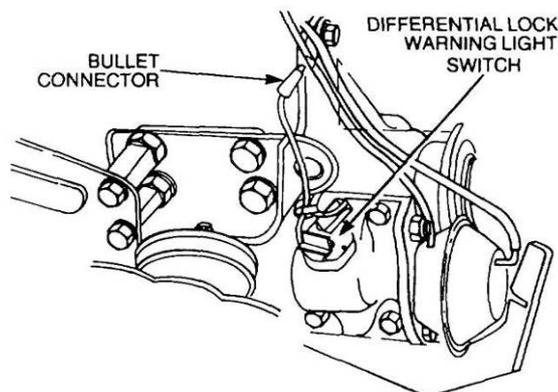


Figure 58 Disconnection of the Differential Lock

- o.** Remove the split pin and clevis pin securing the parking brake cable to the pivot at the transmission end of the cable (Figure 59). Loosen the locknuts and remove the end-nut from the cable. Withdraw the cable from the bracket.

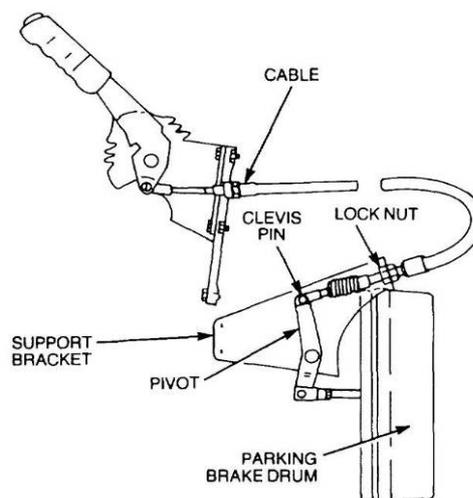


Figure 59 Removal of the Parking Brake Cable

- p. Remove the locknut and retaining clip securing the speedometer cable to the transmission (Figure 60) and remove the cable from the transmission.

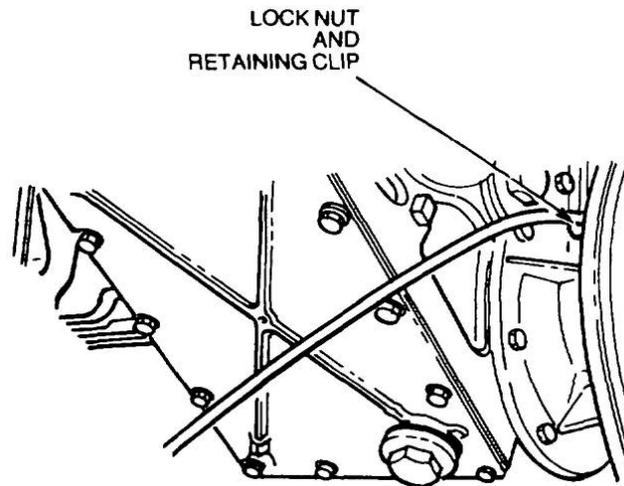
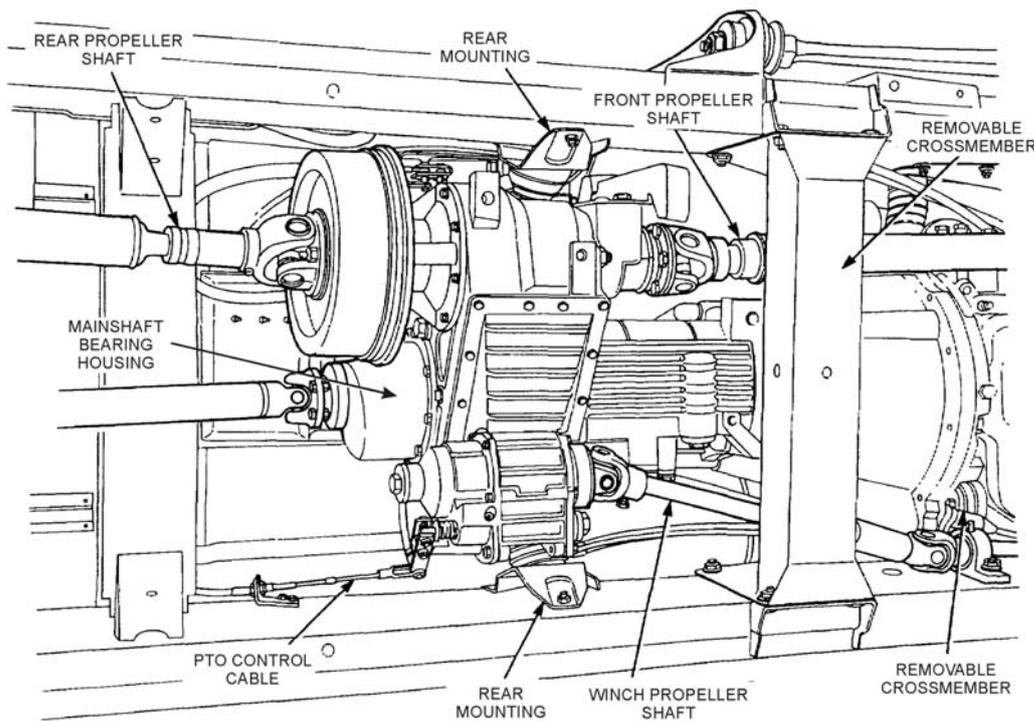


Figure 60 Removal of the Speedometer Cable

- q. Remove and discard the eight locknuts securing the rear propeller shaft flanges to the centre bearing flange and the transmission rear output flange (Figure 61). Remove the propeller shaft.



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Figure 61 Removal of the Transmission

- r. Remove and discard the eight locknuts securing the intermediate propeller shaft flanges to the intermediate differential and the transmission intermediate output shaft flange. Remove the propeller shaft.
- s. Remove and discard the four locknuts from the front propeller shaft flange at the transmission (Figure 61). Lower the propeller shaft.

NOTE

Ensure that the winch and PTO are disengaged.

- t.** Remove the four bolts and lock washers securing the winch propeller shaft flange to the PTO (Figure 61). Lower the propeller shaft.
- u.** Remove the split pin and clevis pin securing the PTO control cable to the PTO (Figure 61). Discard the split pin.
- v.** Remove the two bolts securing the clutch slave cylinder to the transmission bell housing and remove the nut and bolt securing the hydraulic pipe bracket to the firewall. Remove the slave cylinder complete with dust cover and backing plate.
- w.** Connect suitable overhead lifting equipment to the engine rear lifting bracket.
- x.** Position suitable lifting equipment, with a minimum safe working load of 350 kg in through the cabin door. Attach a suitable length of chain, with a D-shackle to the lifting equipment and the transmission lifting bracket.

NOTE

A suitable length of chain with a D-shackle should be used between the transmission lifting bracket and the lifting equipment.

- y.** Support both the engine and the transmission with the lifting equipment and remove the bolts securing the transmission to the flywheel housing.
- z.** Remove the eight bolts securing the removable cross-member to the chassis rails (Figure 61) and remove the cross-member by forcing it downward.
- aa.** Remove the three bolts and washers securing each rear mounting bracket to the chassis rails (Figure 61).
- bb.** Lower the transmission and the rear of the engine simultaneously until the transmission lifting bracket clears the seat support. Remove the transfer case breather from the top of the transfer case and slide the transmission rearward until the transmission input shaft clears the clutch pressure plate. When the transmission is clear of the clutch, lower the transmission.

49. Installation. Install the transmission as follows:

- a.** Secure the special lifting bracket RO1001 to the transmission with the bolts that normally secure the transfer case selector lever (Figure 62).

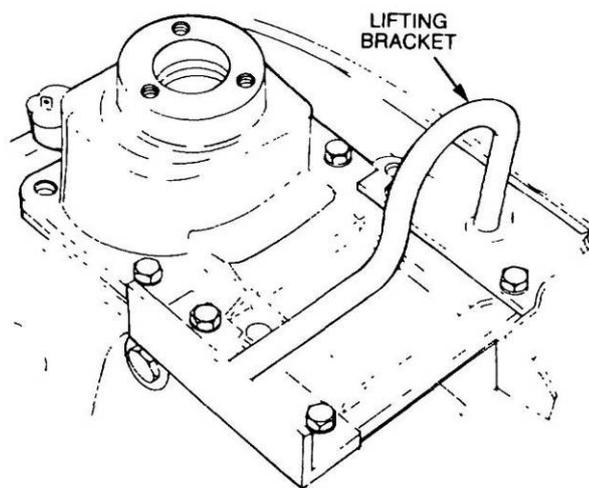


Figure 62 Transmission Lifting Bracket

NOTE

The lifting bracket position is determined by the cut out for the transmission breather.

- b. Smear a thin film of molybdenum disulphide grease on the transmission front cover extension sleeve and on the input shaft, including the splines, then position the transmission beneath the vehicle.
- c. Position suitable lifting equipment, with a minimum safe working load of 350 kg in through the cabin door. Attach a suitable length of chain, with a D-shackle, to the lifting equipment and the transmission lifting bracket.
- d. Connect suitable overhead lifting equipment to the engine rear lifting bracket.
- e. Slowly raise the transmission to allow the transmission input shaft to engage in the clutch pressure plate. Slight rotation of the crankshaft may be necessary to align the splines.
- f. Connect the transfer case breather to the top of the transfer case before raising the transmission fully.
- g. Carefully raise the transmission and the rear of the engine until the transmission is in place. Position the rear mounting brackets on the chassis rails, align the boltholes, install the retaining bolts and tighten them securely.
- h. Install the bolts securing the transmission to the flywheel housing and tighten the bolts securely.
- i. Support the front propeller shaft and the winch propeller shaft, install the removable cross-member and tighten the retaining bolts securely.
- j. Remove the lifting equipment and the transmission lifting bracket.
- k. Apply a suitable sealer to both sides of the clutch slave cylinder backing plate and position the plate on the cylinder.
- l. Smear the inside of the dust cover with clean hydraulic fluid and install the dust cover on the cylinder. Install the slave cylinder into the transmission bell housing, ensuring that the push rod is inserted into the dust cover (Figure 63), and the bleed screw is uppermost.

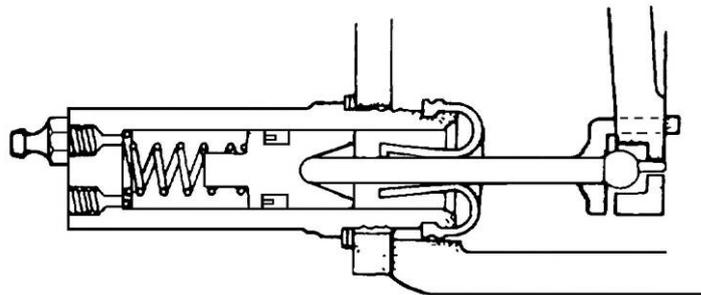


Figure 63 Installation of the Slave Cylinder

- m. Install the slave cylinder retaining bolts and washers and torque them to 27 N.m (20 lbf.ft). Install the nut and bolt securing the hydraulic pipe bracket to the firewall.
- n. Secure the PTO control cable to the PTO with the clevis pin and a new split pin.
- o. Align the winch propeller shaft flange with the PTO output shaft and, using new lock-washers, install the four retaining bolts and torque them to 61 N.m (45 lbf.ft).
- p. Align the front propeller shaft flange with the transmission output flange and secure it with four new locknuts. Torque the locknuts to 41 to 52 N.m (30 to 38 lbf.ft).
- q. Position the intermediate propeller shaft between the intermediate differential and the transmission intermediate output shaft flange. Using new locknuts, install the eight bolts and torque them to 41 to 52 N.m (30 to 38 lbf.ft).
- r. Position the rear propeller shaft between the centre bearing flange and the transmission rear output flange, with the propeller shaft sliding member toward the rear of the vehicle. Fit eight new locknuts and torque them to 41 to 52 N.m (30 to 38 lbf.ft).
- s. Secure the speedometer cable to the transmission with the retaining clip and a new locknut.
- t. Fit the parking brake cable on the support bracket and adjust the locknuts on the cable until the clevis fork aligns with the pivot. Install the clevis pin and secure it with a new split pin.

- u.** Install the bullet electrical connector on the differential lock warning light switch (Figure 64) and connect the vacuum hoses to the differential lock vacuum chamber, ensuring that the red hose is connected to the front fitting.

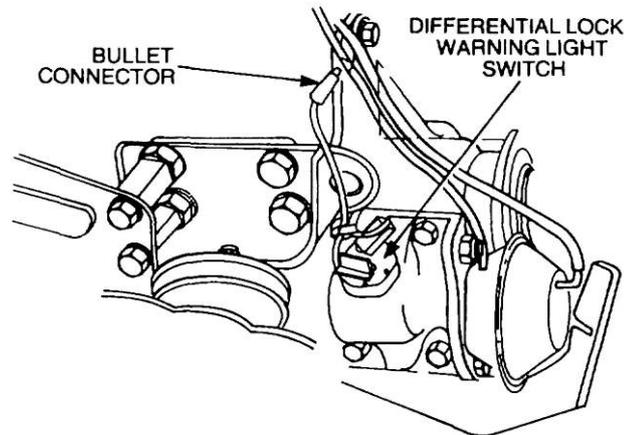


Figure 64 Connection of the Differential Lock

- v.** Position the front exhaust pipe on the vehicle. Install a new sealing ring and secure the front exhaust pipe to the turbocharger exhaust adaptor flange, ensuring that the sealing ring is correctly seated in the flange. Tighten the exhaust flange nuts securely.
- w.** Align the front exhaust pipe with the muffler pipe and secure it with the three bolts, washers and nuts. Tighten the retaining bolts securely.
- x.** Carefully position the air cleaner in the mounting bracket and tighten the two wing-nuts on the clamp bolts. Connect the air inlet and outlet hoses to the air cleaner and tighten the hose clamps.
- y.** Connect the breather hoses to the top of the transmission and to the bell housing. Secure the breather hose and the actuator hoses in position with the respective clamps (Figure 65).

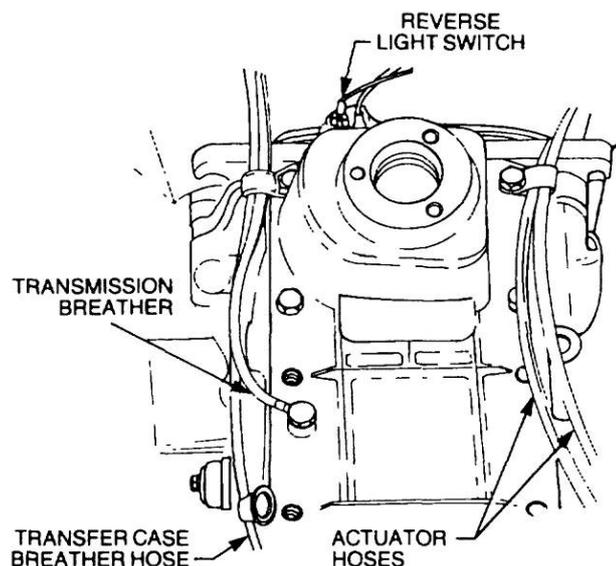


Figure 65 Installation of the Hose Clamps

- z.** Install the two push-on electrical connectors on the reverse light switch located on top of the transmission (Figure 65).
- aa.** Install the following in accordance with EMEI Vehicle G 203 – Group 6:
 - (1)** the transfer-case selector lever;
 - (2)** the top cover; and
 - (3)** the gearlever.

- bb. Position the fuse box against the firewall and secure it with the two screws. Install the fuse box cover.
- cc. Install the three floor mats and panels.
- dd. Check the oil level in both the transmission and the transfer case and top-up if necessary. Raise the vehicle and remove the chassis stands. Lower the vehicle and chock the wheels.
- ee. Install the bonnet and left-hand door in accordance with Body – Group 17.
- ff. Check the application of the parking brake and adjust it if necessary in accordance with EMEI Vehicle G 203 – Group 12.
- gg. Connect the battery negative cable, start the engine and allow it to warm up to normal operating temperature. Check that the transmission functions correctly and rectify any faults found.
- hh. Remove the chocks from the wheels.

Power Take-off (PTO)

50. **Removal.** Remove the PTO as follows:

- a. Clean the transfer case and PTO housing thoroughly with a recommended cleaning agent and blow the area dry with compressed air.
- b. Place a suitable receptacle beneath the transfer case, remove the transfer case drain plug and drain the contents into the receptacle. Reinstall the drain plug.
- c. Ensure that the winch and PTO are disengaged and remove the split pin and clevis pin securing the PTO control cable to the PTO (Figure 66). Discard the split pin.

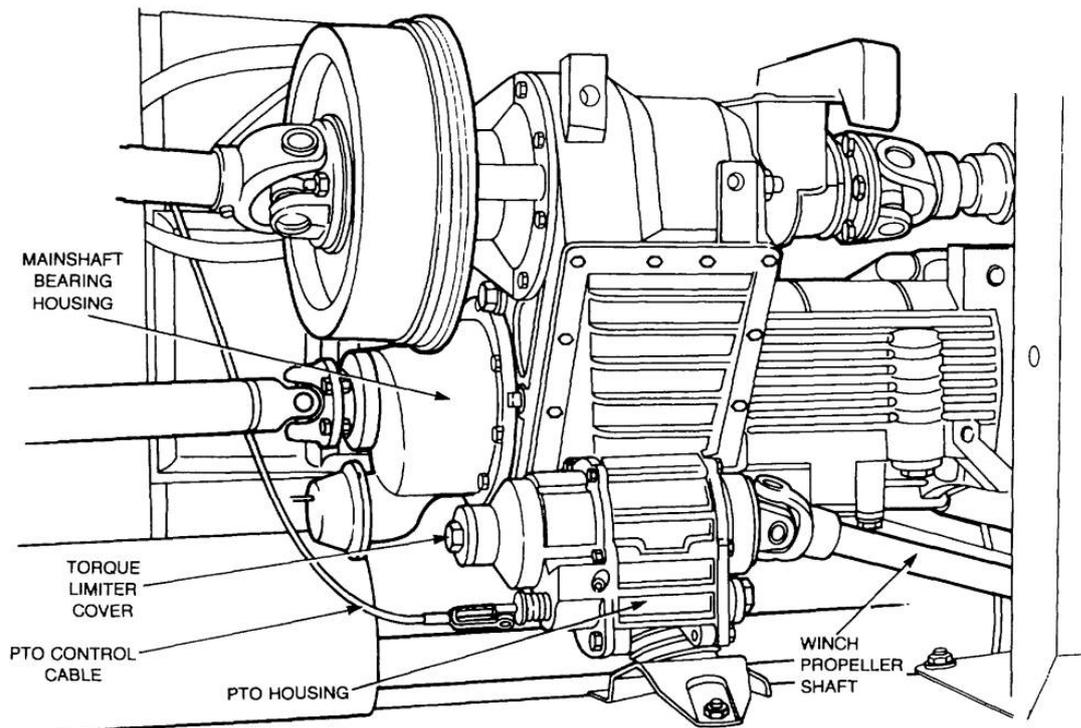


Figure 66 Removal of the Power Take-Off

- d. Remove the four bolts and lock-washers securing the winch propeller shaft flange to the PTO and lower the propeller shaft.
- e. Using special flange holding wrench 18G1205, remove the output shaft flange retaining nut and the bolts securing the output shaft end cover to the PTO housing. Remove the end cover and discard the gasket.
- f. Remove the propeller shaft and the main shaft bearing housing from the transfer case (Figure 66). Remove the housing and discard the gasket.

- g.** Remove the bolts securing the torque limiter cover to the PTO housing and remove the cover and shaft assembly. Discard the gasket.
- h.** Lift the lower sprocket up and remove the chain from the sprocket (Figure 67). Remove the chain from the upper sprocket and withdraw the chain through the opening in the transfer case. Remove the lower sprocket from the PTO housing.

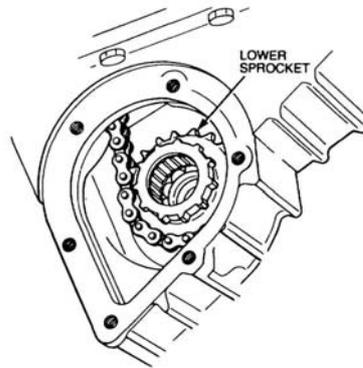


Figure 67 Removal of the PTO Chain

- i.** Remove the bolts securing the PTO housing to the transfer case and remove the housing. Discard the gasket.
- j.** Remove all trace of gasket material from the PTO housing and the transfer case.

51. Installation. Install the PTO as follows:

- a.** Position a new gasket on the PTO housing and hold the gasket in place with two retaining bolts. Position the PTO housing on the transfer case and finger tighten the retaining bolts. Install the remaining bolts and torque them to 30 N.m (22 lbf.ft).
- b.** Insert the sprocket in the PTO housing ensuring that the sprocket is correctly positioned. Lightly lubricate the chain with engine oil and insert the chain in through the opening in the transfer case. Fit the chain over the lower sprocket, raise the lower sprocket and install the chain on the upper sprocket.
- c.** Position a new gasket on the torque limiter cover and hold the gasket in place with two retaining bolts. Install the torque limiter cover and shaft assembly ensuring that the lower sprocket is correctly located on the shaft. Secure them with the retaining bolts. Install the remaining bolts and tighten all bolts securely.
- d.** Position a new gasket on the output shaft and cover, holding the gasket in place with two retaining bolts. Install the end cover on the PTO housing and finger tighten the bolts. Install the remaining bolts and tighten all bolts securely.
- e.** Using special flange holding wrench 18G1205, install the output shaft flange retaining nut and torque it to 61 N.m (45 lbf.ft).
- f.** Position a new gasket on the main shaft bearing housing and hold the gasket in place with two retaining bolts. Install the bearing housing ensuring that the mainshaft is correctly located in the bearing and finger tighten the bolts. Install the remaining bolts and torque all bolts to 24 to 30 N.m (18 to 22 lbf.ft)
- g.** Align the winch propeller shaft flange with the PTO output shaft. Using new lock-washers, install the bolts and torque them to 61 N.m (45 lbf.ft).
- h.** Secure the PTO control cable to the PTO with the clevis pin and a new split pin.
- i.** Fill the transfer case with approximately 5.8 litres of new oil.
- j.** Start the engine and check the PTO and winch for correct operation. Rectify any faults found.

Transfer Case

52. **Disassembly.** Disassemble the transfer case as follows:

WARNING

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- a. Remove the PTO (if fitted) and the transmission assembly (Para 50).
- b. Remove the transfer case drain plug and drain the oil into a suitable receptacle.
- c. Remove the transmission brake drum retaining screws and remove the brake drum.
- d. Using special tool 18G1205, secure the rear output flange and remove the locknut. Remove the flange, washer and felt seal.
- e. Disconnect the park brake draw link clevis and remove the four bolts securing the back plate to the speedometer housing. Remove the back plate.
- f. Remove the locknut retaining the speedometer spindle housing and remove the housing and the spindle from the transmission.
- g. Remove the bolts and washers retaining the bottom cover (if fitted) and remove the cover.
- h. Remove the lock-tab securing the intermediate gear-retaining shaft and while supporting the intermediate gear assembly, unscrew the shaft. The intermediate gear assembly can now be removed from the transmission as one unit.
- i. Remove the shim installed on the end of the hollow sleeve and remove each gear complete with the bearing cups and cones. Using a suitable press, replace the bearings if required (Figure 68).

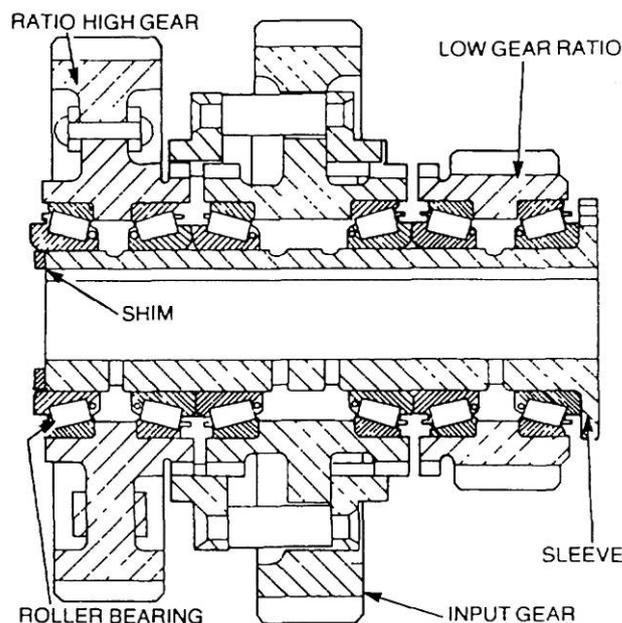


Figure 68 Intermediate Gears - Sectional View

- j. Remove the intermediate gear shaft spacer from the rear of the transmission case and discard the two O rings.
- k. Remove the pegged end-cap from inside the transmission case and check the security of the pegs. Replace the cap if necessary.

- l.** Using special tool 18G1205 to prevent the front output flange from rotating, remove the locknut retaining the flange to the output shaft. Remove the flange.
- m.** Remove the four bolts and lock-washers retaining the differential lock vacuum chamber assembly (Figure 69). Remove the differential lock vacuum chamber assembly and discard the gasket and lock-washers. Take care not to lose the detent ball and spring during removal.

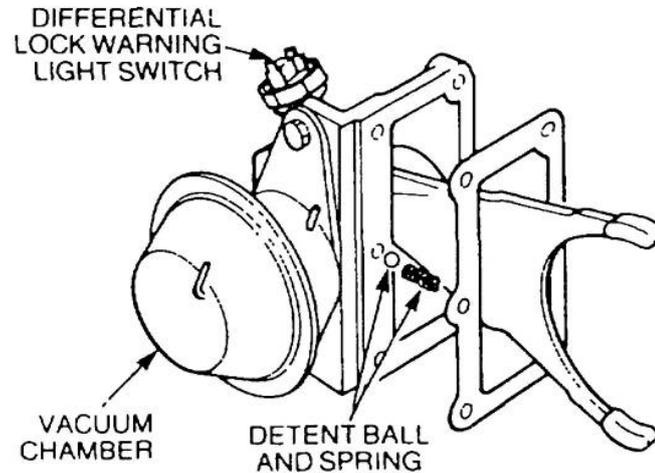


Figure 69 Removal of the Differential Lock Vacuum Chamber Assembly

- n.** Remove the six bolts and lock-washers securing the front output shaft housing to the transfer casing (Figure 70). Withdraw the housing and output shaft. Remove the lock-up dog clutch, the output shaft and the oil seal. Remove the circlip, and using a suitable press, remove the bearing.

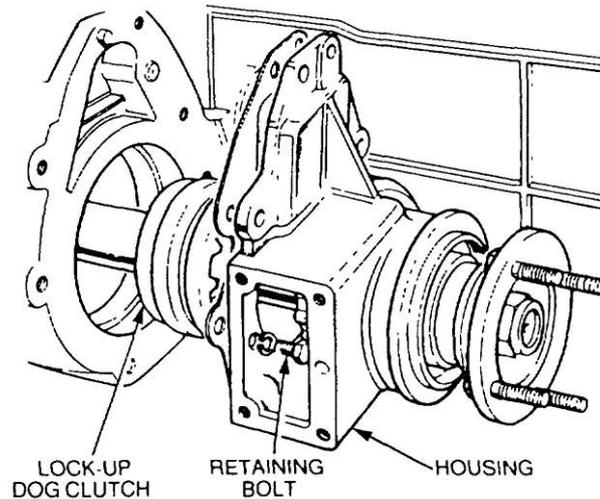


Figure 70 Removal of the Front Output Shaft and Housing

- o.** Remove the eight bolts and lock-washers retaining the speedometer drive housing to the transfer case and remove the housing complete with the output shaft. Remove the oil shield, oil seal and circlip (Figure 71). Using a suitable press, remove the output shaft and bearing.

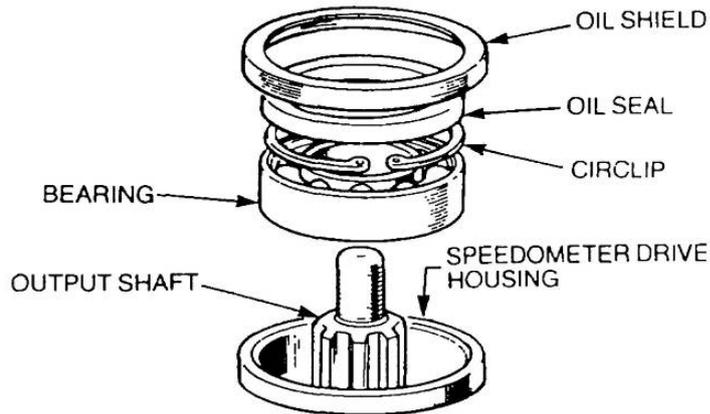


Figure 71 Removal of the Output Shaft

- p. Remove the differential assembly complete with the output (high) gear (Figure 72).

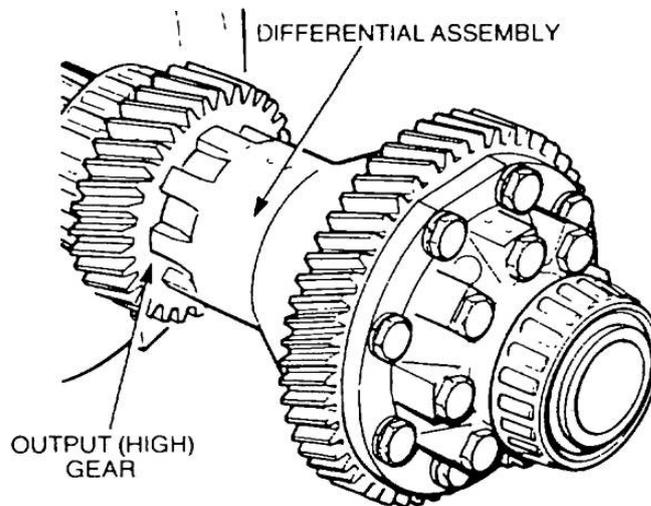


Figure 72 Removal of the Differential Assembly

- q. Using special tool 18G47BB and a suitable press, remove the taper roller bearings. Remove the cups from the transfer casing and the speedometer drive housing.

NOTE

All differential components must be match marked prior to removal to maintain their correct settings.

The output (high) gear is secured to the differential assembly with Loctite 648.

- r. Remove the eight bolts and lock-washers retaining the output (low) gear to the differential (Figure 73) and remove the gear. Discard the lock-washers.

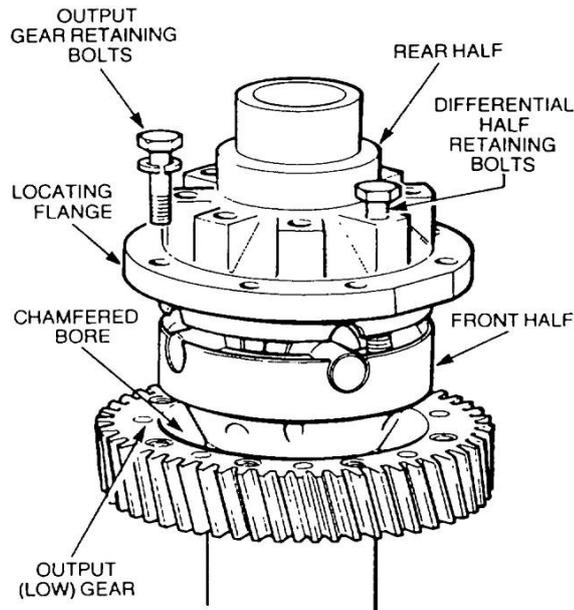


Figure 73 Removal of the Output (Low) Gear

- s. Support the differential assembly in the vertical position with the rear half uppermost (Figure 73) and remove the eight bolts and lock-washers retaining the two differential halves together. Discard the lock-washers and lift off the rear half.
- t. Lift off the upper side gear (Figure 74), slide out the pinion shafts and remove the bevel pinions and thrust washers. Remove the lower side gear.

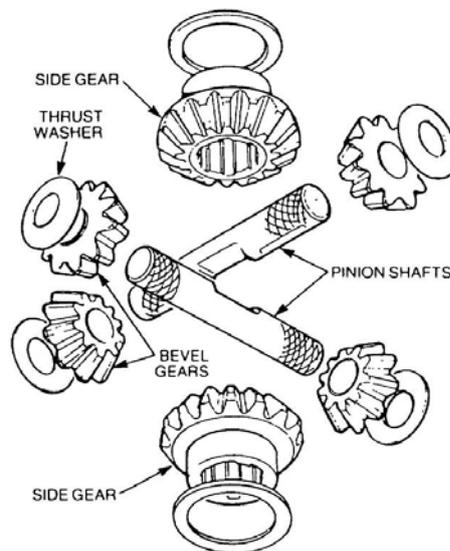


Figure 74 Removal of the Differential Gears

- u. Remove the eight bolts and lock-washers retaining the transfer selector cover to the transfer casing and remove the cover.
- v. Remove the roll-pin securing the selector fork to the shaft (Figure 75) and move the selector to the front of the casing.

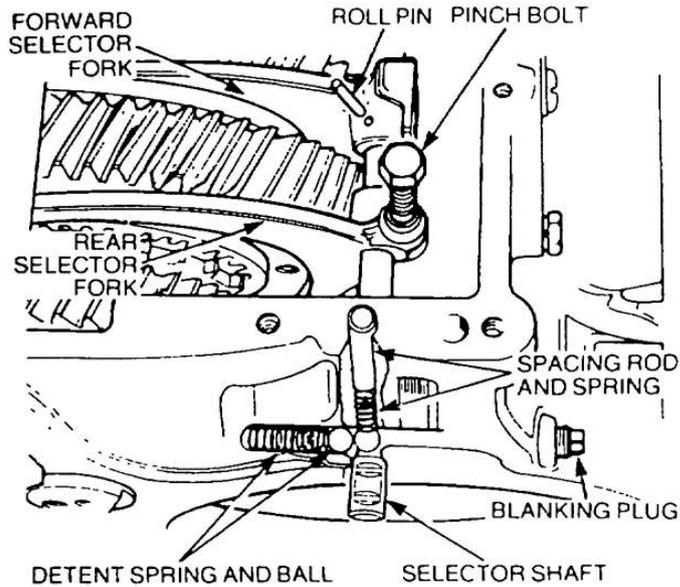


Figure 75 Removal of the Transfer Selectors

- w. Pull the selector shaft to the rear to disengage the detent balls and remove the pinch bolt on the rear selector fork. Partially withdraw the selector shaft to enable the selector forks to be removed.
- x. Carefully remove the selector shaft to allow the detent balls to be removed.
- y. Lift out the spacing rod and spring and remove the blanking plug. Using a piece of hooked wire, remove the detent spring from the drilling.
- z. Remove the roll-pin securing the transfer selector lever to the internal cross-shaft and remove the lever.
- aa. Slacken the pinch bolt securing the selector to the cross-shaft (Figure 76) and remove the two screws securing the retaining plates fitted to both ends of the cross-shaft. Remove the two plates and withdraw the shaft selector and spacer. Discard the two seals.

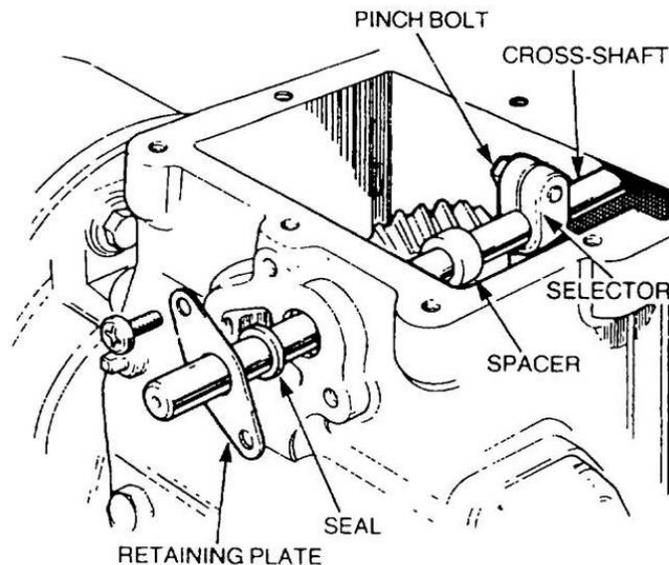


Figure 76 Removal of the Transfer Selector Cross-shaft

53. **Cleaning and Inspection.** Clean and inspect the transfer case as follows:

WARNING

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- a. Clean the case, covers and all other parts of the transmission thoroughly with a suitable cleaning agent and blow them dry with compressed air. Remove all trace of gasket material and sealer.
- b. Clean the bearings in a suitable cleaning agent and blow them dry with compressed air.

CAUTION

Do not spin the bearings with compressed air as damage to the bearings may result.

- c. Check the bearings for damage or wear and replace as necessary.
- d. Inspect the gear teeth for wear, damage, scoring, surface fatigue, ridging or cracking. The gears may also be checked by Colour Contrast Dye Penetrant Inspection in accordance with EMEI Workshop D 180 for cracks that would not otherwise be visible.
- e. Replace the selector forks and/or sliding clutches if the side clearance in the groove is excessive.
- f. Replace the selector shaft if it is cracked in either the detent or locating roll-pin holes.
- g. Check the transmission case for cracks and replace if necessary.
- h. Inspect the detent springs for damage or loss of tension and replace as necessary.
- i. Check all other parts for wear or damage and replace all parts as required.
- j. Clean up any damaged threads.
- k. Inspect the bevel pinions and side gears for wear, damage, scoring, surface fatigue, ridging or cracking. Replace all parts as required.

NOTE

The bevel pinions and side gears are supplied as a matched set of six and should not be interchanged. Replace as a set only.

- l. Inspect the differential case halves and pinion shafts for wear, damage scoring, surface fatigue, ridging or cracking. Replace all parts as required.

NOTE

The differential case halves and the pinion shafts are supplied as matched pairs only.

54. **Reassembly.** Reassemble the transfer case as follows:

NOTE

It is important that the differential components are lubricated with clean oil during assembly.

The bevel pinions and side gears are supplied as a matched set of six and should not be interchanged. Replace as a set only.

Both the differential case halves and the pinion shafts are supplied as matched pairs only.

The side gears must be adjusted to allow an end float of 0.025 mm (0.635 in.) and a pre-load of 0.025 mm (0.635 in). The range of shims available is from 1.05-1.45 mm (0.041-0.057 in) in 0.10 mm (0.003 in) increments.

- a. Support the differential front half in the vertical position (Figure 77). Install a side gear and thrust washer into the front half of the differential, fit the bevel pinions, thrust washers and pinion shafts onto the front half and side gear. Insert the remaining side gear and thrust washer into the rear half and fit the two halves together.

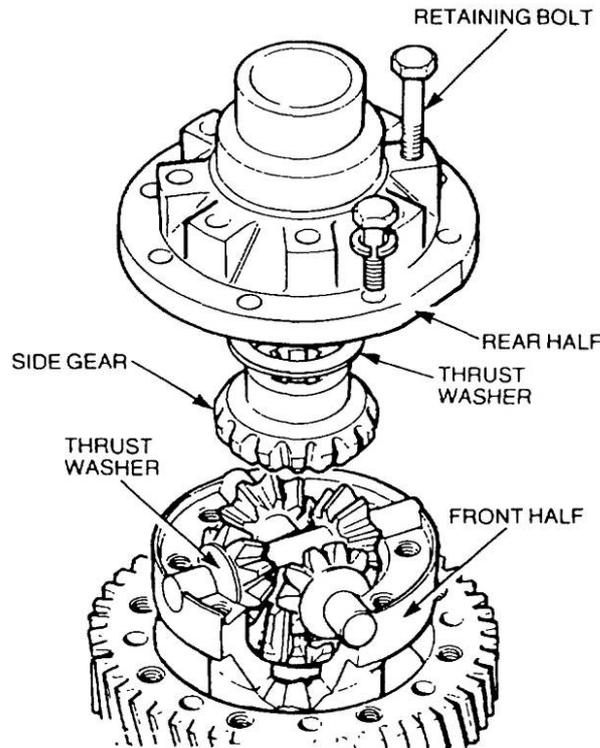


Figure 77 Reassembly of the Differential

- b. Align the bolt holes and apply Loctite 241 to the threads of the bolts. Install and tighten the bolts in sequence and torque them to 54 to 68 N.m (40 to 50 lbf.ft).

NOTE

The boltholes in the output (low) gear are not equally spaced to ensure the relationship between the differential and gear is maintained.

- c. Install the output (low) gear over the front half of the differential ensuring that the chamfered bore and countersunk ends of the tapped hole are towards the locating flange (Figure 73). Align the boltholes and apply Loctite 241 to the threads of the bolts. Install the bolts and lock-washers and tighten in sequence to a torque of 60 to 64 N.m (44 to 47 lbf.ft).

NOTE

If the differential assembly or bearings have been replaced, the differential bearing pre-load must be checked as described in Para's 51. q. to t.

- d. Using a suitable press, install the new taper roller bearings on the differential front and rear halves.
- e. Using a suitable press, install the bearing cup into the front of the transfer case.
- f. Apply Loctite 648 to the splines of the output (high) gear. Using a suitable press, install the gear on the differential front half and insert the differential assembly in the transfer case.
- g. Using a suitable press, install the bearing cups in the intermediate gears. Thoroughly lubricate the gears and taper roller bearings with clean oil and install the gears and bearings on the sleeve. Do not fit

the shim washer at this stage. Using an 18 mm bolt and large flat washers (Figure 78), gradually tighten the nut to 130 N.m (96 lbf.ft), while rotating and tapping the gears.

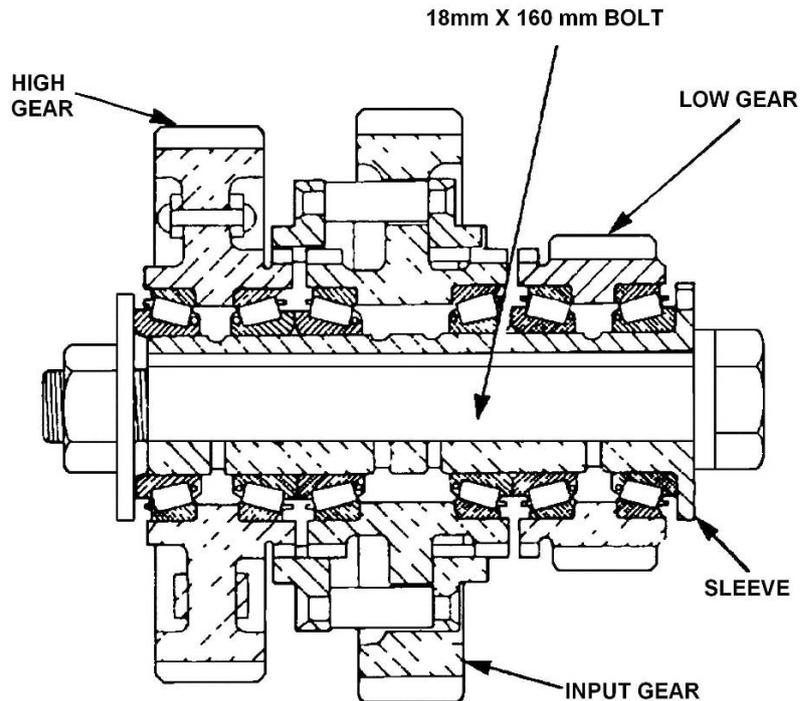


Figure 78 Intermediate Gear Assembly Pre-load Adjustment – Sectional View

NOTE

The bearings must be fully seated prior to torquing the nut.

- h.** Position the assembly vertically with the nut uppermost. Remove the bolt, flat washers and nut, taking care not to disturb the gears and bearings.
- i.** Using a dial indicator, measure the gap between the shoulder of the sleeve and the face of the bearings (Figure 79). Select a shim washer to obtain a pre-load of 0.10 to 0.20 mm (0.004 to 0.008 in).

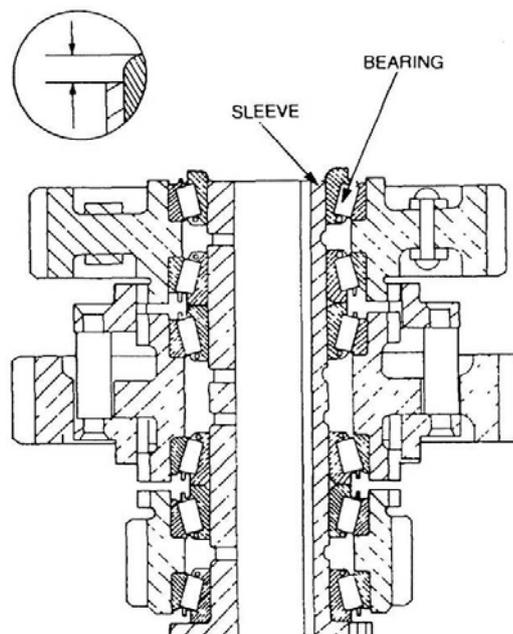


Figure 79 Intermediate Gear Assembly Pre-Load Setting - Sectional View

NOTE

During the installation of the intermediate gear assembly, pour clean oil into both cast oil feed holes in the transfer case to ensure the shaft and bearings are adequately lubricated.

- j.** Fit the pegged end-cap to the inside of the casing and carefully position the intermediate gear assembly and the selected shim washer into the casing. Ensure that the groove in the sleeve is towards the top of the transmission and aligns with the oil hole. Fit the new O rings to the end spacer and install the end spacer in the transmission case. Insert the intermediate gear shaft and new lock-tab. Torque the shaft to 170 to 190 N.m (125 to 140 lbf.ft) and check the gears rotate freely. The maximum resistance should be 0.5 N.m (0.36 lbf.ft). If the resistance is greater than specified the pre-load will require resetting. Bend the lock-tab to secure the shaft.
- k.** Position the cross-shaft selector in the transfer case and insert the cross-shaft and spacer, engaging the selector (Figure 76). Fit a new seal on both ends of the shaft and secure them with the retaining plates. Tighten the retaining screws securely.
- l.** Align the hole in the transfer selector linkage lever with the hole in the cross-shaft and install a new roll-pin.
- m.** Insert the detent spring in the transfer case drilling and install the detent ball (Figure 75). Push the ball against the spring and insert the selector shaft. Position the rear selector, with the plain face to the rear, on the shaft ensuring that the fork engages the rear side of the input gear. Push the shaft further and position the front selector on the cross-shaft selector with the extended boss to the rear and forks engaging the front side of the input gear. Insert the shaft fully to allow the roll-pin hole in the front selector to align with the hole in the shaft and secure it with a new roll-pin.
- n.** Install the detent ball, spring and spacing-rod into the vertical drilling. Smear a suitable sealing compound on the blanking plug threads and fit the plug in the casing (Figure 75).
- o.** 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. Adjust the rear fork position on the selector shaft to allow a clearance of 0.12 to 0.25 mm (0.005 to 0.010 in) between the front face of the rear fork and the rear face of the input gear inner member (Figure 80). Tighten the pinch-bolt securely.

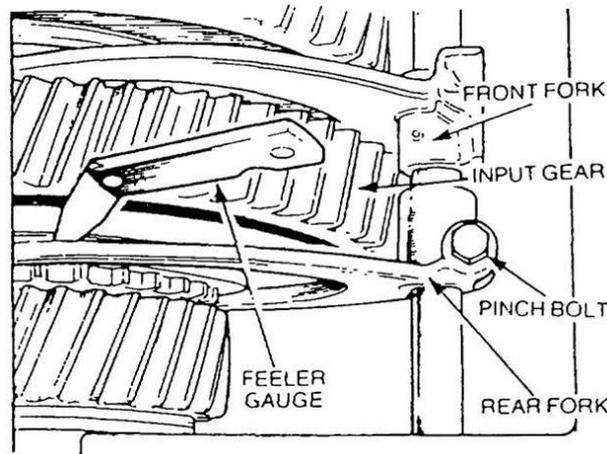


Figure 80 Adjustment of the Transfer Selectors

- p.** Position a new gasket on the selector housing and install the cover. Fit the eight bolts and new lock-washers and tighten them securely.
- q.** Using a micrometer, measure the thickness of the new gasket to be installed between the speedometer drive housing and the transfer case, and record the measurement.
- r.** Install the shim that was previously fitted in the speedometer drive-housing. Using a suitable press fit the bearing cup.

- s.** Position the speedometer drive housing, less the gasket, on the transfer case and measure the gap in at least four locations between the housing and transfer case joint faces. The measurement must be 0.1 mm (0.004 in.) more than the thickness of the gasket measured in Para 51. q. The gap can be adjusted by replacing the shim installed behind the bearing (Figure 81).

NOTE

The range of shims available is from 1.65 to 2.80 mm (0.065 to 0.110 in) in 0.5 mm (0.020 in) increments.

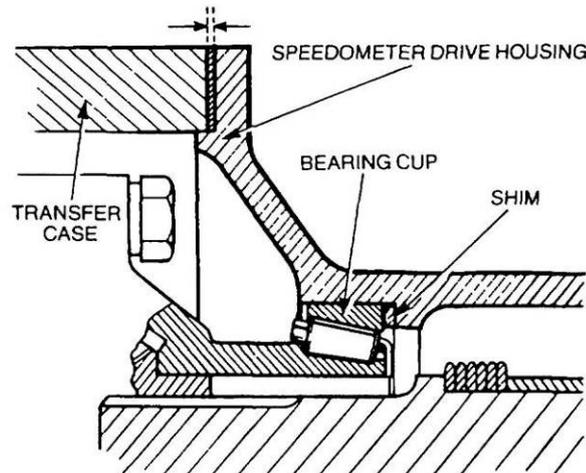


Figure 81 Differential Assembly - Pre-Load Adjustment - Sectional View

- t.** Remove the housing and install the selected gasket. Fit the eight bolts and new lock-washers and torque the bolts to 30 N.m (22 lbf.ft). With the differential lock disengaged and no oil seal fitted, the rolling resistance should be 6 to 7 kg (14 to 16 lbs). To obtain the rolling resistance, replace the shim with one of the correct thickness (Figure 81).
- u.** Insert the rear output shaft, speedometer drive worm and spacer. Using a suitable press, install the output shaft bearing and secure it with the circlip. Press in the rear oil seal, open face first, until the seal plain face just clears the chamfer on the seal housing.
- v.** Install the parking brake backing plate and secure it with the four bolts and lock-washers. Using a suitable sealant, install and seal the oil catcher against the backing plate. Fit the coupling flange felt seal, plain washer and new locknut. Torque the locknut to 146 to 180 N.m (108 to 132 lbf.ft). Connect the park brake draw link and secure it with a new split pin. Install the brake drum and secure it with the two screws. Insert the speedometer drive spindle, new O ring and housing into the speedometer drive housing.
- w.** Using a suitable press, install the bearing into the front output shaft housing and secure it with the circlip. Press in the front oil seal, open face first, until the seal plain face just clears the chamfer on the seal housing bore.
- x.** Fit the lock-up dog clutch on the differential front half and insert the front output shaft. Locate a new gasket on the transfer case dowel and install the front output shaft housing (Figure 82). Secure the housing with the six bolts and new lock-washers. Torque the bolts to 30 N.m (22 lbf.ft).

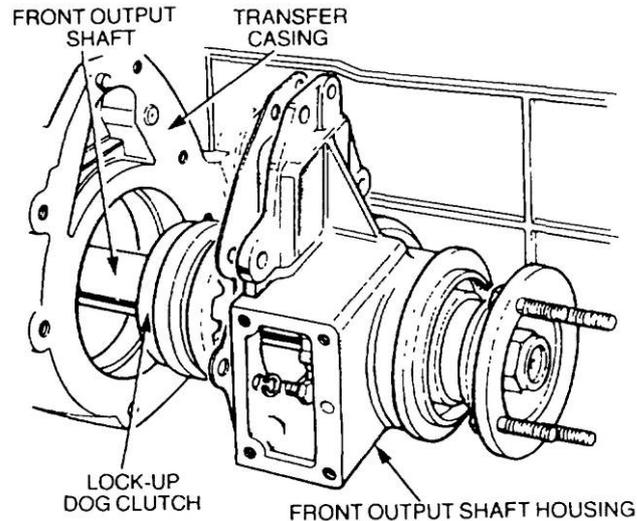


Figure 82 Installation of the Front Output Shaft Housing

- y. Fit the mud shield on the front output shaft flange and install the flange, plain washer and new locknut. Using special tool 18G1205, torque the locknut to 146 to 180 N.m (108 to 132 lbf.ft).
- z. Apply a suitable sealing compound to the differential lock vacuum chamber housing gasket and engage the selector fork in the lock-up dog clutch groove. Insert the four retaining bolts and new lock-washers. Torque the bolts to 30 N.m (22 lbf.ft).
- aa. Install the PTO (if fitted) and transmission assembly (Para 49).
- bb. Fill the transfer case to the correct level with clean oil.

CAUTION

After installation, run the engine for ten minutes with the transmission in fourth gear and the transfer selector in neutral. This procedure will flush out any petroleum jelly used during reassembly and will ensure oil circulation to all bearings.

Oil Pump Front Cover and Transmission Input Seal

55. **Repair.** Repair the front oil pump cover and transmission input seal as follows:

WARNING

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NOTE

If oil tracking is evident between the oil pump cover plate and the transmission housing, the following procedure is an in service repair.

- a. Remove the transmission assembly (Para 48).
- b. Drain the transmission oil into a suitable container and clean the area around the oil pump cover with a suitable cleaning agent.

- c. Remove the screws and washers securing the front cover and the oil pump to the transmission assembly. Remove the oil pump cover and the front input seal and gasket.
- d. Using kerosene and fine emery paper, hand lap the cover on a suitable flat surface to a flatness of 0.05 mm (0.002 in).
- e. Thoroughly clean the mating surfaces of the cover and the transmission with a suitable cleaning agent.
- f. Apply Permatex sealer to both faces of the gasket and place the gasket on the cover.
- g. Using special tools 18G134 and 18G134DG, press in the oil seal, plain face first (Figure 83), into the front cover.

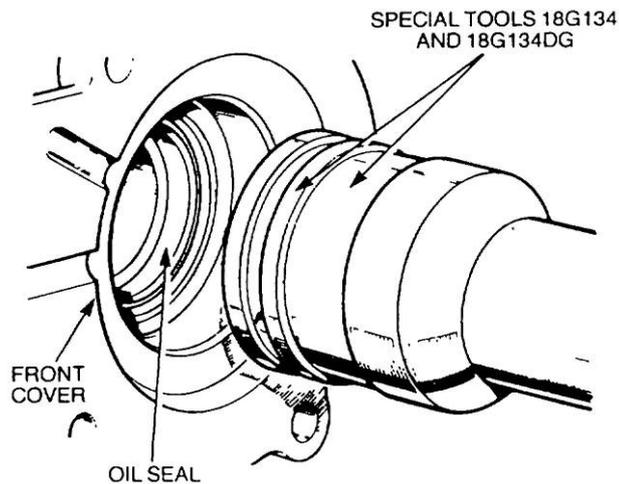


Figure 83 Installation of the Front Cover Oil Seal



The alignment of the oil feed ring and the oil delivery hole is most important. A restricted oil supply to the mainshaft will result if the holes are not aligned.

- h. Ensure the centre oil hole on the oil feed ring aligns with the oil delivery hole in the front cover. Using special tools 18G134 and 18G134DG, press in the oil feed ring (Figure 84). Ensure that the relief valve ball and spring are serviceable and check that the retaining plug is approximately one thread or 0.25 mm (0.010 in) below the front cover rear face.

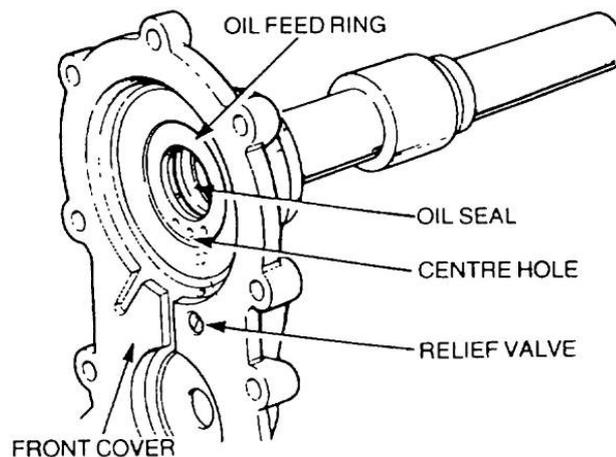


Figure 84 Installation of the Oil Feed Ring and Relief Valve

- i. Ensure the shim is installed on the counter-shaft front bearing; fit the oil pump front cover and a new gasket (Figure 85). Install the oil pump front cover retaining lock-washers, nuts and bolts, but do not tighten at this stage.

- j. Smear the oil pump drive gear with clean engine oil and carefully insert the drive gear into the oil pump and countershaft drive square.
- k. Fit the oil pump cover and a new gasket and secure them with the lock-washers and bolts. Torque the bolts to 10 N.m (8 lbf.ft).
- l. Ensure that the oil pump front cover is evenly fitted around the input shaft and torque the bolts and nuts to 30 N.m (22 lbf.ft).
- m. Install the transmission (Para 49.) and fill it with clean oil.

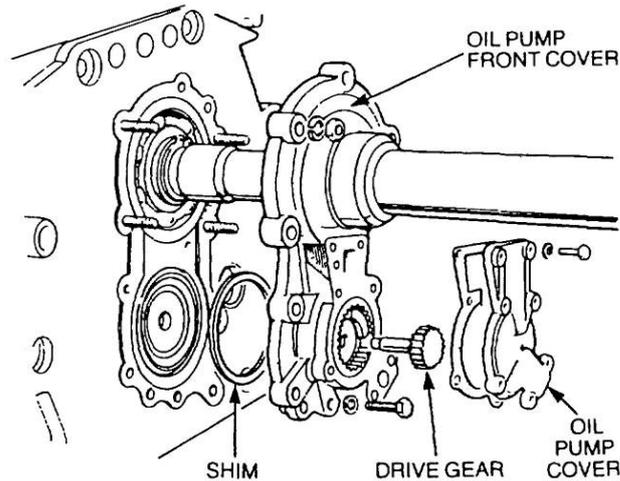


Figure 85 Installation of the Oil Pump Front Cover

Rectification of Oil Transfer Between the Transfer Case and the Transmission

56. The rectification procedure is to be conducted in three stages as follows:
- a. an oil level check,
 - b. a monitoring period, and
 - c. a repair procedure.
57. **Oil Level Check.** The following procedure is to be carried out when checking or filling the transfer case and transmission to stabilise oil levels prior to monitoring:
- a. Park the vehicle on a flat level surface overnight or for a period of no less than six hours.

NOTE

Checking of oil levels when the transmission assembly is warm or at operating temperature will cause incorrect readings, with excess oil readings of up to 250 millilitres possible.

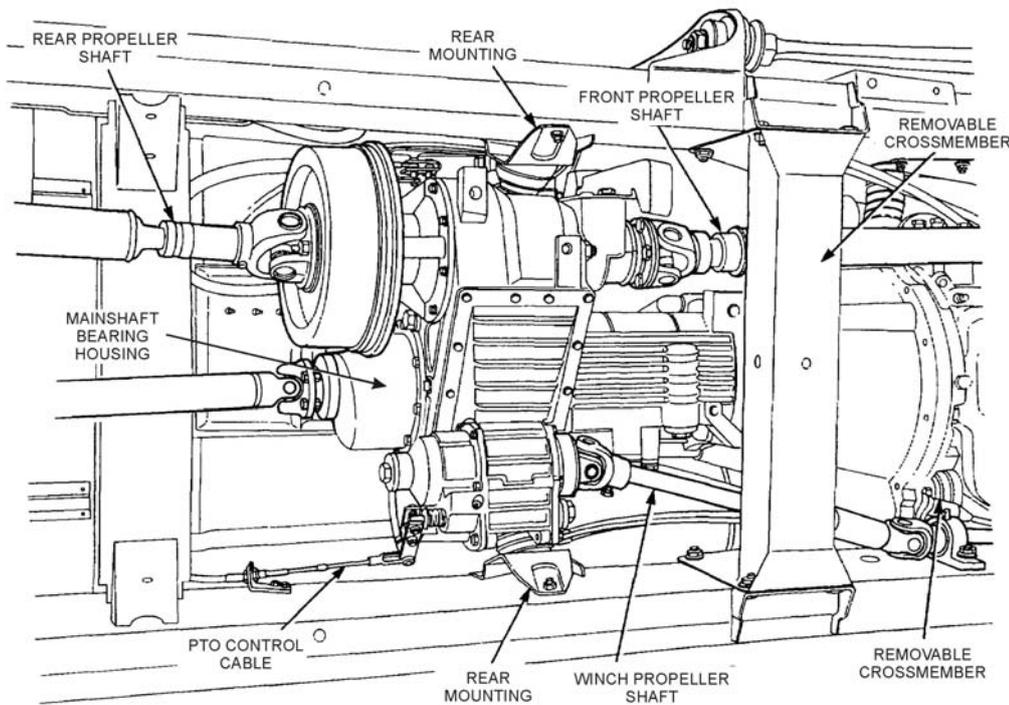
- b. Using a suitable container, remove the filler plugs and allow sufficient time for any excess oil to drain off completely.
 - c. Check both the transfer case and transmission breathers to ensure that they are fully functional.
 - d. Fill the transfer case/transmission as required with SAE Grade 40 (OMD-115) oil to the bottom of the filler plug hole and allow sufficient time for excess oil to drain off completely.
 - e. Refit the filler plugs.
 - f. Place a suitable warning decal on the vehicle dashboard and the ST2 (G2) cover, to notify any drivers that the transmission oil levels are being monitored and that all checks, where possible, be conducted by workshop personnel.
58. **Monitoring Period.** The monitoring period is to be for a minimum of 1000 kilometers with checks conducted monthly. Monitoring should not exceed 3000 kilometers as the occurrence of oil transfer should have been confirmed during monthly checks.

- 59. Should oil transfer not be evident during the monitoring period the warning decals are to be removed from the vehicle and the ST2 cover with the results of findings entered in the GM 120.
- 60. If oil transfer is evident during the monitoring period the following repair procedure is to be undertaken.
- 61. **Repair Procedure.** The following repair procedure can be carried out with the transmission in the chassis:

NOTE

Certain sequences in the following procedure only apply to the winch variant.

- a. Ensure the vehicle handbrake is applied and the wheels are chocked.
- b. Drain the oil from the transfer case.
- c. Ensure that the winch cable and PTO are disengaged and disconnect the PTO control cable at the PTO.
- d. Remove the bolts securing the winch propeller shaft to the PTO and lower the propeller shaft.
- e. Using flange holding wrench 18G1205, remove the output shaft flange retaining nut. Remove the bolts securing the output shaft end cover to the PTO housing and remove the cover. Discard the gasket.
- f. Remove the mainshaft bearing housing from the transfer case (Figure 86) taking care not to dislodge the mainshaft end support bearing. Discard the gasket.



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Figure 86 Mainshaft Bearing Housing Removal

- g. Disconnect the rear axle propeller shaft at the transfer case.
- h. Remove the rear axle actuator vacuum lines and the sender switch wire
- i. Remove the bolts securing the rear actuator assembly to the transfer case and remove the rear axle actuator assembly (Figure 87) taking care not to dislodge the mainshaft end support bearing.
- j. Remove the bolts securing the torque limiter cover to the PTO housing and remove the cover and shaft assembly. Discard the gasket.
- k. Lift the lower sprocket up and remove the chain from the sprocket (Figure 88) Remove the chain from the upper sprocket and withdraw the chain through the opening in the transfer case. Remove the lower sprocket from the PTO housing.

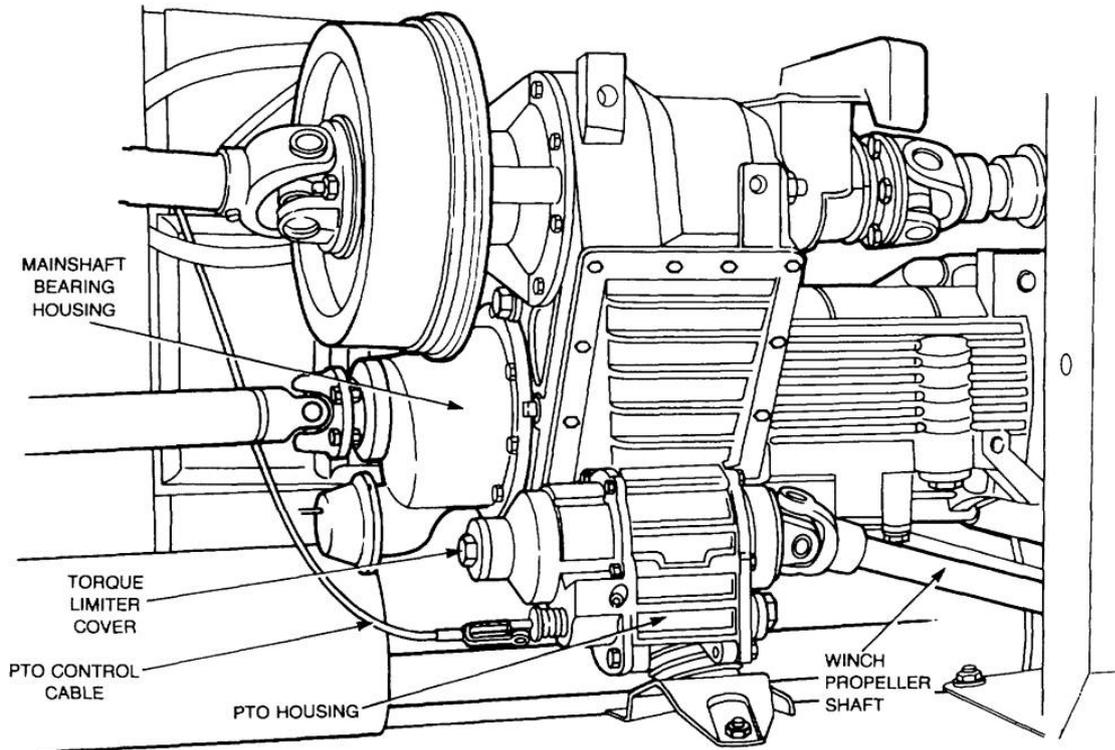


Figure 87 Power Take-off Removal

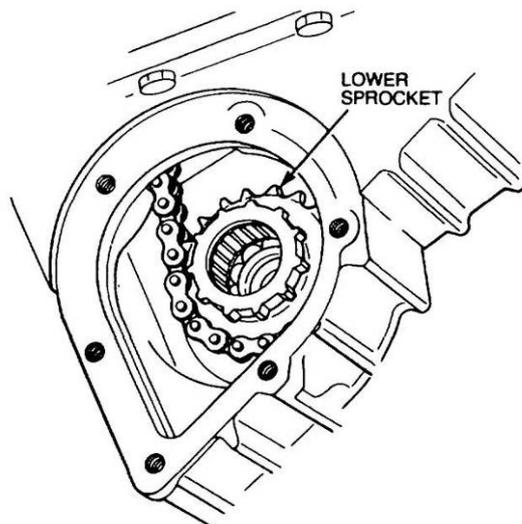


Figure 88 Removal of the PTO Chain

CAUTION

Failure to select third gear in the transmission can result in the dislodgement of a thrust bearing on the mainshaft which would necessitate the removal and overhaul of the transmission assembly for rectification.

- l. Select third gear in the transmission.
- m. Remove the circlip and shim retaining the transfer gear to the mainshaft.
- n. Remove the transfer gear and spacer. If required use special tool 18GA091 (Figure 89).

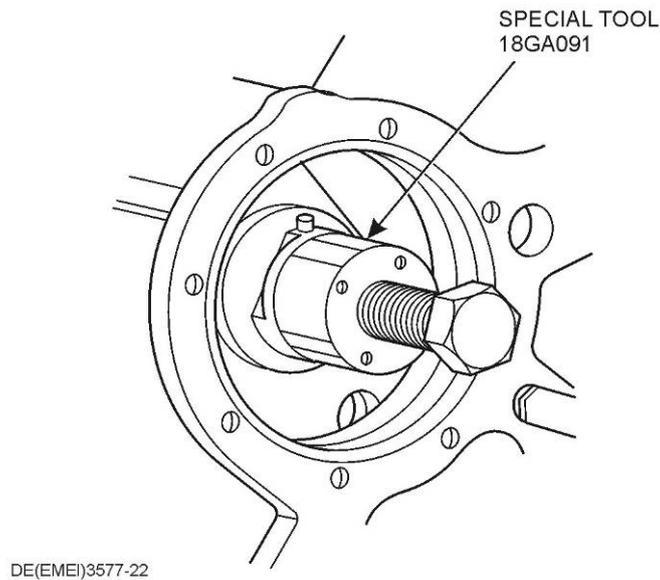


Figure 89 Removal of the Transfer Gear and Spacer

- o.** Replace the oil seal and inspect the spacer sealing surface, replace the spacer where necessary.
- p.** Install the mainshaft rear spacer on the shaft and position it in the seal (Figure 90).

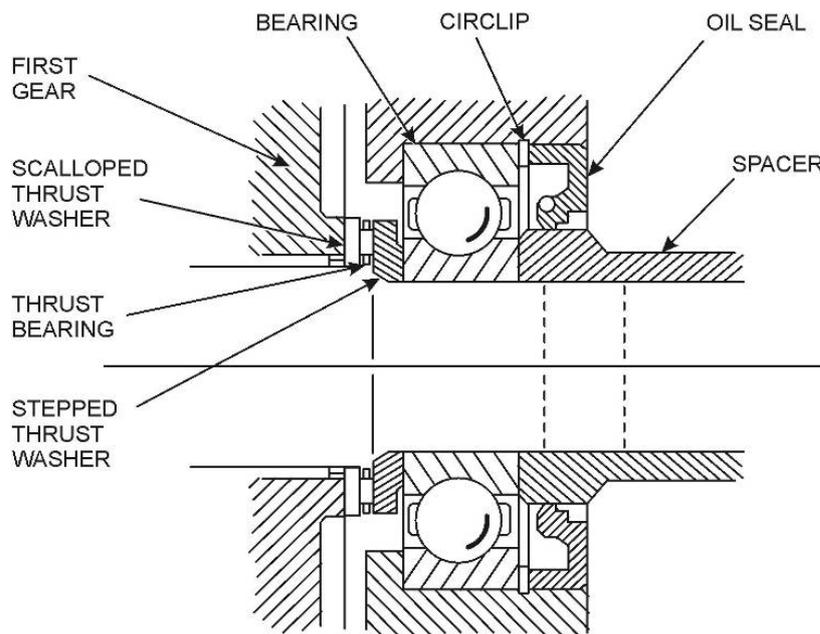


Figure 90 Installation of the Seal and Rear Spacer

- q.** Fit the transfer gear.
- r.** Secure the transfer gear to the mainshaft with a new circlip (Figure 91) and measure the clearance between the circlip and the transfer gear. The maximum clearance between the circlip and the transfer gear is 0.050 mm (0.002 in). To obtain the correct pre-load on the mainshaft, insert a shim of the correct thickness.

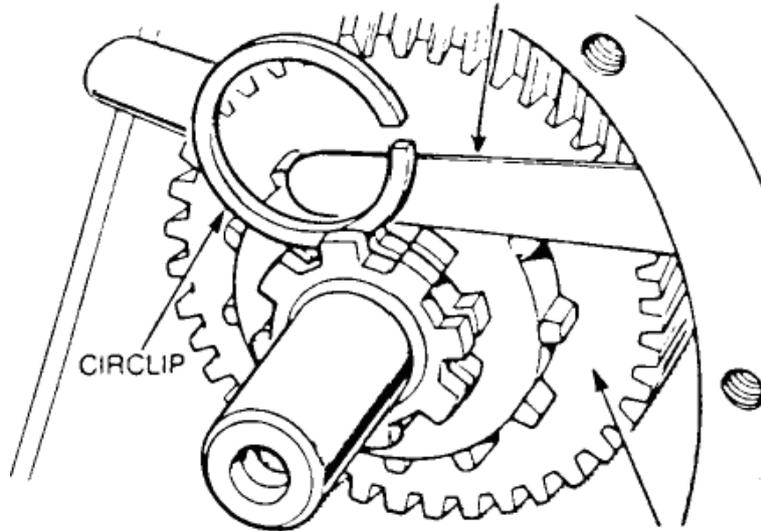


Figure 91 Adjustment of the Mainshaft Pre-load

- s. Remove the circlip, transfer gear and spacer.
- t. Clean all components and the exposed mainshaft. Apply Loctite Primer 271 to the mainshaft and internal diameter of the spacer.
- u. Apply a thin coating of Loctite 271 to the exposed area of the mainshaft and push the spacer forward to contact the rear bearing.
- v. Apply Loctite 271 to the mainshaft rear splines. Install the transfer gear and selected shim and secure them with the circlip.
- w. Install the PTO if applicable (Para 51).
- x. If a PTO is not fitted, using a new gasket install the mainshaft bearing housing and torque the bolts to 24 to 30 N.m (18 to 22 lbf.ft).
- y. Using a new gasket, install the rear axle actuator assembly ensuring the mainshaft end support bearing is correctly fitted.
- z. Refit both PTO and rear propeller shafts and ensure all bolts are tightened securely.
- aa. Refit the rear axle actuator vacuum lines and the sender switch wire.
- bb. Fill the transfer case with approximately 3.2 litres of SAE GRADE 40 (OMD-115).
- cc. Ensure the transmission is in neutral, start the engine and check the PTO and winch for correct operation (if fitted).

Selector Fork Setting

- 62. Adjustment.** Adjust the selector fork setting as follows:
- a. Remove the gearbox access plate and clean the area around the high range cover-plate. Remove the cover-plate.
 - b. Ensure that the detent ball/spring locates in the selector shaft with neutral on the transfer lever selected.
 - c. 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 member. Adjust the rear fork position on the selector shaft to allow a clearance of 0.12 to 0.25 mm (0.005 to 0.010 in) between the front face of the rear fork and the rear face of the input gear member (Figure 92), tighten the pinch bolt securely.

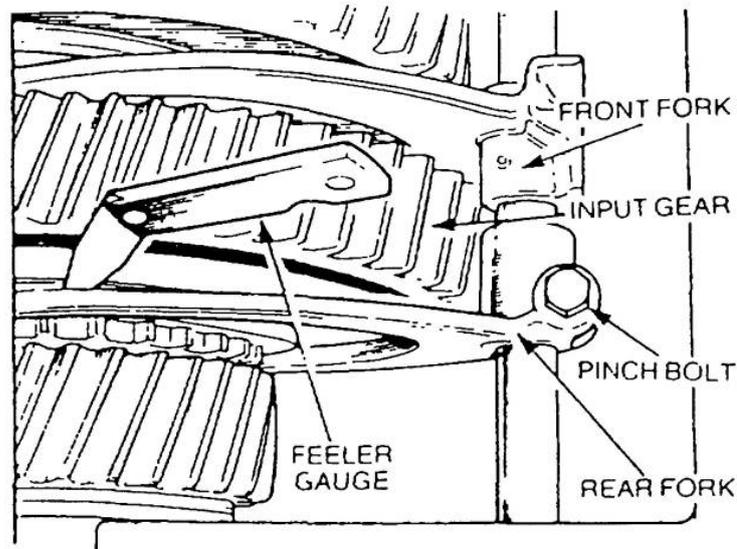


Figure 92 Selector Fork Adjustment

Selector Fork Adjustment High/Low Range Selector Lever Fouling

63. **Rectification.** Rectify lever fouling as follows:

- a. Remove the floor mats, fuse box cover, rubber moulding around the fuse box and the rubber around the transmission tunnel. Remove the cable ties and lift off the gear lever boot.
- b. Remove the screws from the gearbox tunnel cover and remove the sound deadening foam from the top of the gearbox.
- c. Remove the four bolts securing the pivot assemblies to the gearbox (Figure 93).

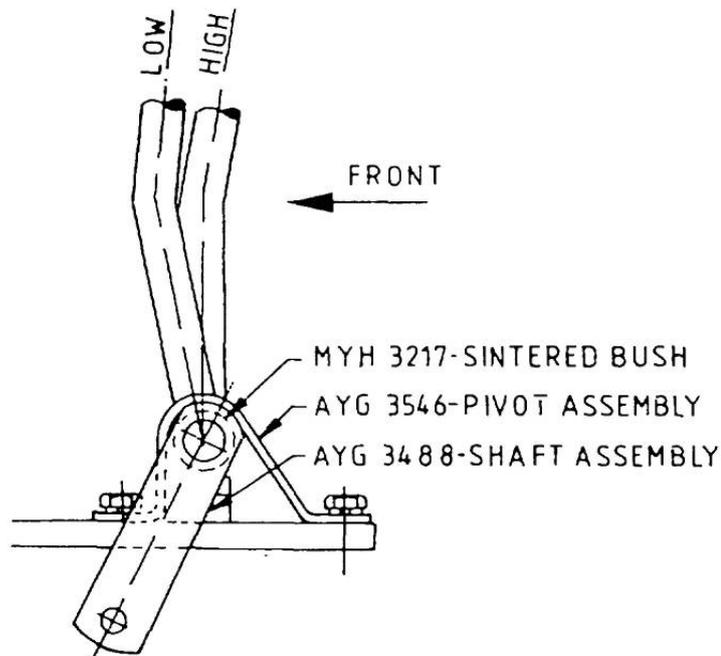


Figure 93 High/Low Range Selector Lever

- d. Lift, but do not fully remove the transmission tunnel cover and remove the adjustable selector rod from the shaft assembly. Adjust the rod to approx. 160 mm (Figure 94).

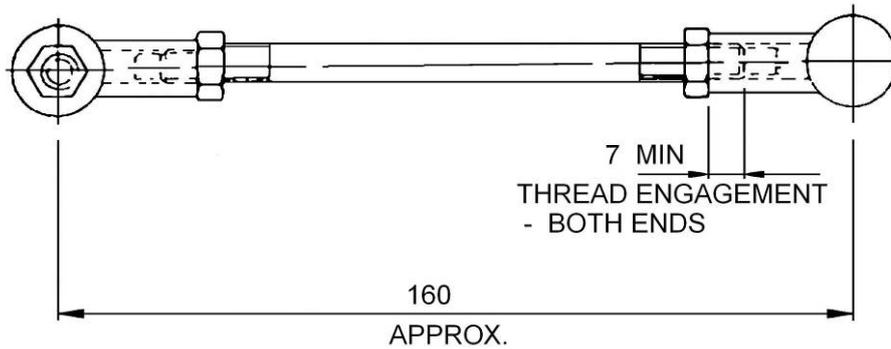


Figure 94 Rod Adjustment

- e. Remove the range selector assembly from the vehicle.
- f. Remove the split pin, washer and pivot assembly from the shaft.
- g. Using a pin punch, remove the roll-pin and remove the High/Low range lever. Remove the remaining pivot assembly from the shaft. Discard the pivot assemblies.

NOTE

The position of the sintered bush flange is towards the outer ends of the shaft and the orientation of the pivot assembly has the offset towards the front of the vehicle.

- h. Install a new pivot assembly on the shaft, position the High/Low selector lever on the shaft and secure it with a new roll-pin.
- i. Install the remaining pivot assembly and secure it with the washer and split pin.
- j. Position the range selector assembly at the transmission and install the selector rod.
- k. Secure the range selector assembly to the gearbox with the four bolts and tighten them securely.
- l. Cut the foam sound deadener (Figure 95) and position it on top of the gearbox.

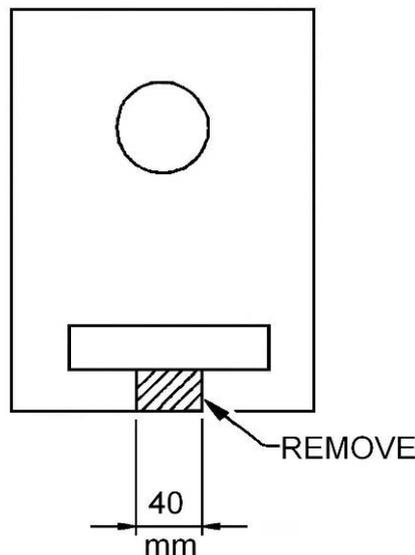


Figure 95 Foam Sound Deadener

- m. Install the screws and secure the gearbox tunnel.
- n. Install the gearlever boot and secure it with cable ties. Install the rubber around the gearbox tunnel.
- o. Install the fuse box rubber moulding, the fuse box cover and the floor mats.
- p. Check the operation of the shift mechanism to ensure no fouling exists.

Transmission Specifications

64. The transmission specifications are detailed in Table 9.

Table 9 Transmission Specifications

Serial	Item	Specification
1	Clutch slave cylinder tightening torque	27 N.m (20 lbf.ft)
2	Hydraulic pipe bracket tightening torque	40 N.m (30 lbf.ft)
3	Winch propeller shaft flange tightening torque	61 N.m (45 lbf.ft)
4	Front propeller shaft flange tightening torque	41 to 52 N.m (30 to 38 lbf.ft)
5	Intermediate propeller shaft flange tightening torque	41 to 52 N.m (30 to 38 lbf.ft)
6	Rear propeller shaft flange tightening torque	41 to 52 N.m (30 to 38 lbf.ft)
7	PTO housing tightening torque	30 N.m (22 lbf.ft)
8	PTO output shaft flange nut tightening torque	61 N.m (45 lbf.ft)
9	Mainshaft bearing housing tightening torque	24 to 30 N.m (18 to 22 lbf.ft)
10	Transfer case capacity	3.2 litres
11	Transfer case (with PTO) - capacity	5.8 litres
12	Differential casing bolts tightening torque	54 to 68 N.m (40 to 50 lbf.ft)
13	Differential output (low) gear tightening torque	60 to 64 N.m (44 to 47 lbf.ft)
14	Intermediate gears shaft tightening torque	170 to 190 N.m (125 to 140 lbf.ft)
15	Intermediate gears rolling resistance	0.5 N.m (0.36 lbf.ft)
16	Transfer selector fork clearance	0.12 to 0.25 mm (0.005 to 0.010 in)
17	Speedometer drive housing tightening torque	30 N.m (22 lbf.ft)
18	Differential assembly rolling resistance	6 to 7 kg (14 to 16 lb.)
19	Propeller coupling flange (front and rear) tightening torque	146 to 180 N.m (108 to 132 lbf.ft)
20	Front output shaft housing tightening torque	30 N.m (22 lbf.ft)
21	Differential lock vacuum chamber housing tightening torque	30 N.m (22 lbf.ft)

Transmission Fault Finding

65. The transmission fault finding is detailed in Table 10.

Table 10 Transmission Fault Finding

Serial	Symptom	Probable Cause	Action
1	Noisy transmission	Chipped or damaged gears	Replace the transmission
		Excessive mainshaft gear endplay	Replace the transmission
		Bearing failure	Replace the transmission
2	Difficult gear selection	Selector shaft detent balls binding selection	Clean holes and the balls in their holes
		Loose roll-pins in the selectors or selector forks	Replace roll-pins or replace the transmission
		Worn selector shaft bores	Replace the transmission
		Worn spigot bush	Replace the bush
		Clutch disc worn into the input shaft	Replace the clutch and the transmission
		Worn synchronesh assembly	Replace the transmission
3	Gear disengagement	Weak or broken selector shaft detent ball springs	Replace the springs
		Bent or worn selector forks	Replace the transmission
		Bent selector shaft or worn detents	Replace the transmission
		Excessive mainshaft gear endplay	Replace the transmission
		Worn taper or chipped teeth on the sliding clutch	Replace the transmission
		Worn spigot bush	Replace the bush
		Worn synchronesh assembly	Replace the transmission
4	Oil leaks	Gaskets broken, shifted or squeezed out of position	Replace the gaskets
		Oil seal failure	Replace the oil seal
5	Transmission differential lock inoperative	Differential vacuum switch inoperative	Replace or repair switch
		Vacuum lines from the differential switch to the diaphragm on the transmission fractured	Check lines and replace as necessary
		Vacuum diaphragm on transmission defective	Repair or replace vacuum diaphragm

REAR AXLES

Intermediate Axle Assembly

66. **Removal.** Remove the intermediate axle assembly as follows:

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Chock the front wheels. Loosen the wheel nuts on the wheels at the intermediate axle in accordance with EMEI Vehicle G 203 – Group 11. Raise the rear of the vehicle and support the vehicle on chassis stands.
- b. Remove the wheels from the intermediate axle in accordance with EMEI Vehicle G 203 – Group 11.
- c. Remove and discard the four bolts and locknuts securing the intermediate propeller shaft flange to the intermediate axle (Figure 96) and lower the propeller shaft.

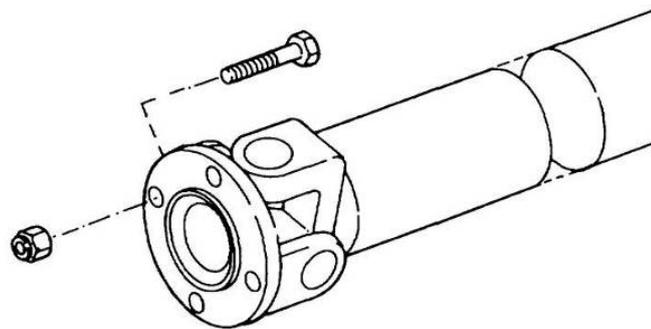


Figure 96 Removal of the Intermediate Axle Flange to Propeller Shaft

- d. Remove the banjo bolt securing the breather hose to the intermediate axle housing (Figure 97) and discard the sealing washers. Remove the zip-clamps that secure the breather hose to the axle case.

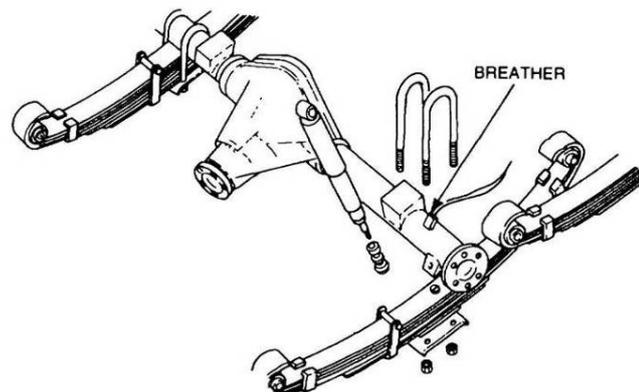


Figure 97 Removal of the Intermediate Axle Breather

- e. Remove the nut, cup washer and rubber bush securing each shock absorber to the axle housing (Figure 98).

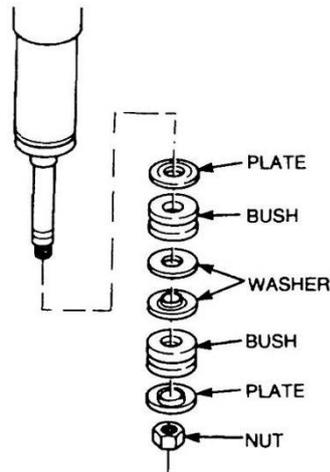


Figure 98 Removal of the Shock Absorber

- f. Disconnect the brake hose to the intermediate axle at the chassis bracket. Plug the hose and the pipe with suitable plastic plugs.
- g. Remove the locknuts from the U-bolts securing each spring retaining plate to the axle (Figure 99). Remove the U-bolts and retaining plates.

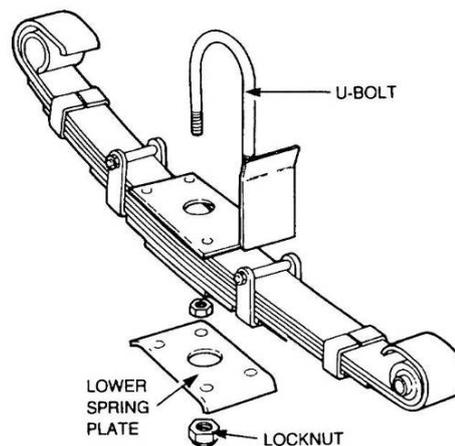
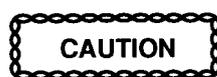


Figure 99 Removal of the U-Bolt

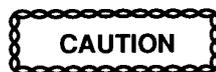
- h. Remove the bolts and nuts securing the rebound cables to the chassis brackets.
 - i. Position a suitable trolley jack under the axle and raise the axle off the spring centre bolt location. Manipulate the axle from beneath the vehicle.
- 67. Installation.** Install the intermediate axle assembly as follows:
- a. Place the axle on a suitable trolley jack and position the axle assembly on the springs ensuring that the locating holes in the axle are positioned over the spring centre bolts.
 - b. Install the U-bolts over the axle and position the spring retaining plate on the U-bolts. Ensure that the locating holes in the retaining plates align with the spring centre bolt nuts.
 - c. Install the new U-bolt locknuts and torque them to 128 to 142 N.m (95 to 105 lbf.ft).



When installing the rebound cable, ensure that the cable is routed between the axle housing and the brake line, to avoid damage to the brake line.

- d. Route the axle rebound cable under the axle and install the bolt and nut securing the cable to the frame bracket. Tighten the nut and bolt securely.

- e. Remove the plugs from the brake hose and pipe and reconnect them at the chassis bracket. Tighten the connections securely.
- f. Insert the end of each shock absorber and the rubber bush through the axle housing and fit the cup washers and nuts. Tighten the nuts securely.
- g. Align the intermediate propeller shaft flange with the intermediate differential flange and secure it with four new bolts and locknuts. Torque the nuts to 41 to 52 N.m (30 to 38 lbf.ft).
- h. Using new sealing washers fit the axle breather hose to the axle case and tighten the banjo bolt securely. Install new zip-clamps to secure the breather hose to the axle case. Ensure that the hose is still secure in the chassis clips.
- i. Bleed the brake system in accordance with EMEI Vehicle G 203 – Group 12.
- j. Fit the road wheels and secure them with the wheel nuts. Raise the vehicle, remove the chassis stands and lower the vehicle to the ground. Remove the jack and tighten the wheel nuts in the correct sequence.



Ensure that the differential oil level plug threads are not stretched. Damaged threads may allow the oil level plug to contact the differential carrier causing severe damage. Rectify stretched threads in accordance with EMEI Vehicle G 203 – Group 9.

- k. Remove the fill plug from the differential rear cover and check the oil level. Top up if necessary with new oil, install the fill plug and tighten it securely.
- l. Remove the chocks from the front wheels and disengage the differential lock.

Rear Axle Assembly

- 68. Removal.** Remove the rear axle assembly as follows:



Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Chock the front wheels. Loosen the wheel nuts on the wheels at the rear axle in accordance with EMEI Vehicle G 203 – Group 11. Raise the rear of the vehicle and support the vehicle on chassis stands.
- b. Remove the wheels from the rear axle in accordance with EMEI Vehicle G203 – Group 11.
- c. Remove and discard the four bolts and locknuts securing the rear propeller shaft flange to the rear differential (Figure 100) and lower the propeller shaft.

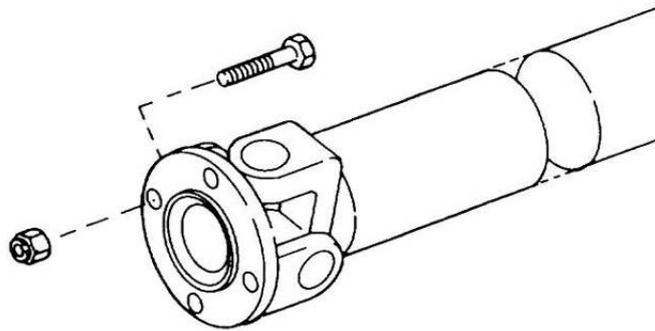


Figure 100 Removal of the Propeller Shaft to Rear Axle Flange

- d. Remove the banjo bolt securing the breather hose to the rear axle (Figure 101) and discard the sealing washers. Remove the zip-clamps that secure the breather hose to the axle case.

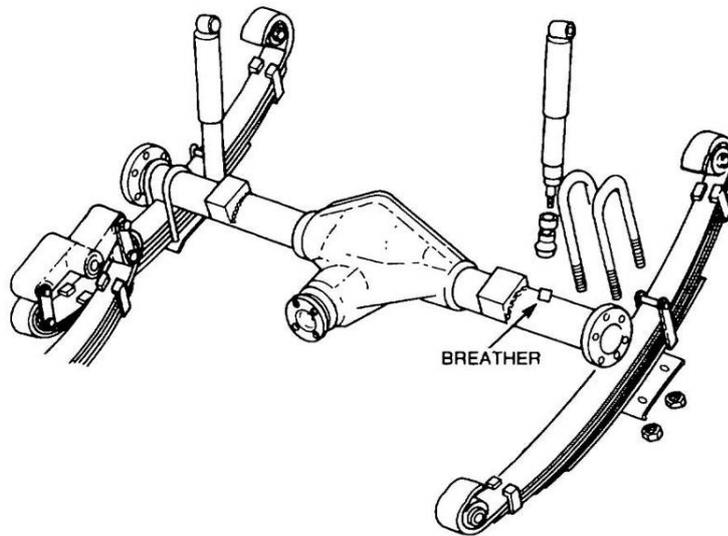


Figure 101 Removal of the Rear Axle Breather

- e. Remove the nut, cup washer and rubber bush securing each shock absorber to the axle housing (Figure 102).

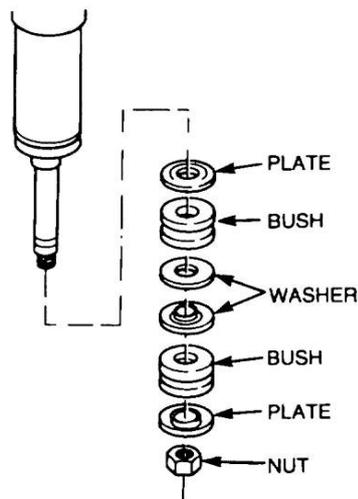


Figure 102 Removal of the Shock Absorber

- f. Disconnect the brake hose to the rear axle at the chassis bracket and plug the hose and the pipe with suitable plastic plugs.

- g. Remove the locknuts from the U-bolts securing each spring retaining plate to the axle (Figure 103). Remove the U-bolts and retaining plates.

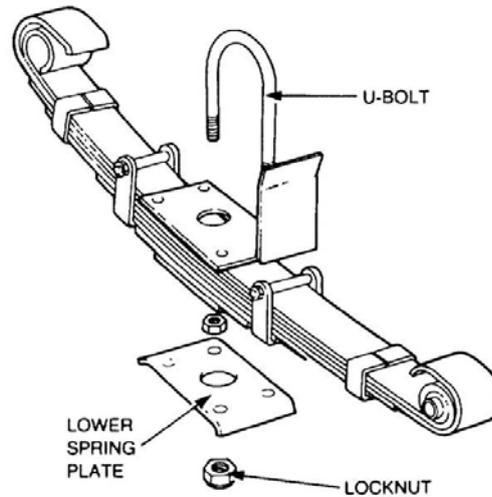
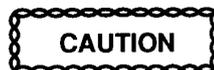


Figure 103 Removal of the U-Bolt

- h. Remove the bolts and nuts securing the rebound cables to the chassis brackets.
- i. Position a suitable trolley jack under the axle and raise the axle off the spring centre bolt location. Manipulate the axle from beneath the vehicle.
69. **Installation.** Install the rear axle assembly as follows:
- a. Place the axle on a suitable trolley jack and position the axle assembly on the springs ensuring that the locating holes in the axle are positioned over the spring centre bolts.
- b. Install the U-bolts over the axle and position the spring retaining plate on the U-bolts, ensure that the locating holes in the retaining plates align with the spring centre bolt nuts.
- c. Install the new U-bolt locking nuts and torque them to 128 to 142 N.m (95 to 105 lbf.ft).



When installing the rebound cable, ensure that the cable is routed between the axle housing and the brake line, to avoid damage to the brake line.

- d. Route the axle-rebound cable under the axle and install the bolt and the nut securing the cable to the frame bracket. Tighten the nut and bolt securely.
- e. Remove the plugs from the brake hose and pipe and reconnect them at the chassis bracket. Tighten the connections securely.
- f. Insert the end of each shock absorber and the rubber bush through the axle housing and fit the cup washer and nut. Tighten the nuts securely.
- g. Align the rear propeller shaft flange with the rear axle differential flange and secure it with the four new bolts and locknuts. Torque the locknuts to 41 to 52 N.m (30 to 38 lbf.ft).
- h. Using new sealing washers, fit the axle breather hose to the axle case and tighten the banjo bolt securely. Install the zip-clamps to secure the breather hose to the axle case. Ensure that the hose is still secure in the chassis clips.
- i. Bleed the brake system in accordance with EMEI Vehicle G 203 – Group 12.
- j. Fit the road wheels and secure them with the wheel nuts. Raise the vehicle, then remove the chassis stands and lower the vehicle to the ground. Remove the jack and tighten the wheel nuts in the correct sequence.
- k. Remove the upper fill plug from the differential rear cover and check the oil level. If necessary top-up with clean oil, install the fill plug and tighten it securely.

- l. Remove the chocks from the front wheels and disengage the differential lock.

Reclamation of Rear Axle Lower Link Mounts

70. The rear axle lower link mount reclamation procedures described are to be applied to axle assemblies whenever the holes in the rear axle lower link mounting plates have worn more than 1.5 mm.

71. The rear axle lower link casing mount reclamation is carried out as follows:

- a. Disconnect the vehicle battery.

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

- b. Using a suitable hydraulic jack, raise the rear of the vehicle and support it on stands positioned beneath the chassis rails.
- c. Support the axle weight with the jack.
- d. Remove the locknut and bolt securing the rear lower link to the axle bracket.
- e. Remove the locknut and flat washer securing the rear lower link to the chassis bracket and withdraw the link from the bush.
- f. Using a grinder or file, clean the outside surfaces of both the lower link mounts on the axle casing.
- g. Fit items 2, 3 and 4 from Table 11 to the axle case mounts, (Figure 104), ensuring that the bolt is fitted from inside to out and is parallel to the axle casing centre line Tighten the bolts firmly.

NOTE

Ensure the mounting bolt is fitted from inside to outside and is parallel to the axle casing centre line before welding the spacer and nut into place.

- h. Weld the inside spacer and the outside nut to the axle casing mount, (Figure 104), with a 3 mm continuous fillet weld, using either:
 - (1) Manual Metal Arc Welding (MMAW) process using electrodes conforming to AS/NZS 4855: E4918 Welding Consumables – Covered Electrodes for Manual Metal Arc Welding of Non-alloy and Fine Grain Steels; or
 - (2) Gas Metal Arc Welding (GMAW) process using consumables conforming to AS/NZS 2717.1: ES6-GC/M-W503AH and shielding gas Argoshield Standard.
- i. Remove the bolts and paint all bare metal surfaces.
- j. Ensure the lower link bushes are fully functional. Replace them if required.
- k. Insert the lower link in the chassis bracket bush and install the flat washer and a new locknut, but do not tighten it.
- l. Position the lower link into the axle casing mount and install the bolt (Table 11, Item 4) and locknut (Table 11, Item 5), but do not tighten it.
- m. Lower the vehicle to the ground and allow the suspension to settle.
- n. Torque the retaining bolt at the axle end of the link to 168 to 186 N.m (124 to 137 lbf.ft)
- o. Torque the locknut securing the link to the chassis bracket bush to 176 N.m (130 lbf.ft).
- p. Connect the vehicle battery.

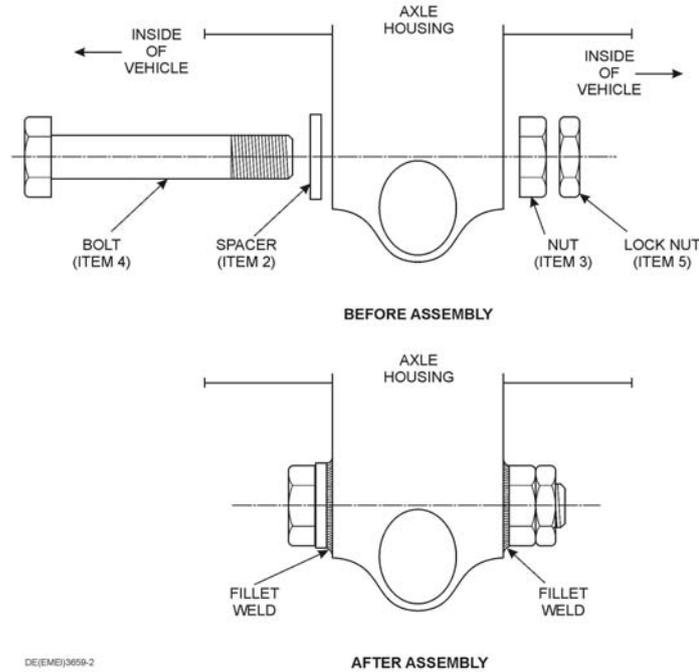


Figure 104 Rear Lower Link

72. The stores required for the reclamation of the rear lower link mounts are listed in Table 11.

Table 11 Stores Required for the Rear Lower Link Mounts Reclamation

Item	NSN	Mfr Part No	Description	Qty Per Kit	Qty Per Equip
1	2590-66-128-8451	AYG 7456	Modification Kit, Vehicular Equipment Components Radius Arm, EMEI Veh G 189-11 (comprising items 2 to 5)		1
2		AYG 7446	Spacer to suit 5/8 inch bolt, 27 mm OD, 6 mm thick	4	
3		NH 610041	Nut, 5/8 inch UNF	4	
4		NH 610321	Bolt, 5/8 inch, 18 TPI, UNF, 4 inch long	4	
5		NT 610041	Locknut, 5/8 inch UNF	4	

Rear Axle Specifications

73. The rear axle specifications are detailed in Table 12.

Table 12 Rear Axle Specifications

Serial	Item	Specification
1	Spring U-bolt to intermediate axle tightening torque	128 to 142 N.m (95 to 105 lbf.ft)
2	Intermediate and propeller shaft flange tightening torque	41 to 52 N.m (30 to 38 lbf.ft)
3	Spring U-bolt to rear axle	128 to 142 N.m (95 to 105 lbf.ft)
4	Rear propeller shaft flange	41 to 52 N.m (30 to 38 lbf.ft)

Rear Axle Fault Finding

74. The rear axle fault finding is detailed in Table 13.

Table 13 Rear Axle Fault Finding

Serial	Symptom	Probable Cause	Action
1	Noisy operation	Improper lubrication	Replace the axle
		Incorrect bearing pre-load	Replace the axle
		Misaligned gears	Replace the axle
		Worn or failed bearings	Replace the axle
		Incorrect tooth contact	Replace the axle
2	Vibration	Driveline phasing incorrect	Correct the phasing
		Driveline angle incorrect	Correct driveline angle
		Worn, damaged or failed flange	Replace the flange
		Failed universal joint	Replace the universal joint
		Worn or failed bearings	Replace the axle

FRONT AXLE

75. **Removal.** Remove the front axle assembly as follows:

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Chock the rear wheels and loosen the wheel nuts on the front wheels. Raise the front of the vehicle and support the vehicle on chassis stands.
- b. Remove the front wheels.
- c. Remove and discard the four locknuts securing the front propeller shaft flange to the front differential. Lower the propeller shaft.
- d. Remove the banjo bolt securing the breather hose to the front axle casing (Figure 105) and discard the sealing washers. Remove the zip-clamps securing the breather hose to the axle case and tie the breather hose out of the way.

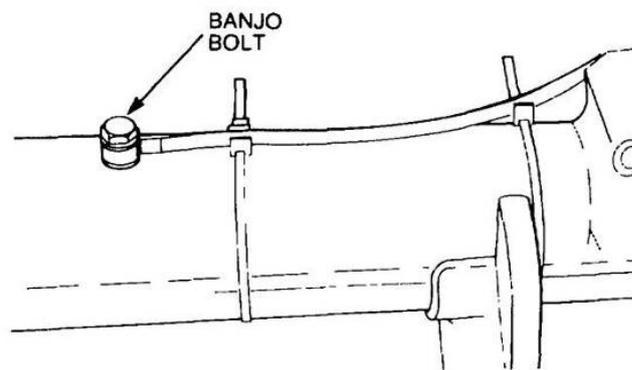


Figure 105 Removal of the Front Axle Breather Hose

- e. Position a suitable trolley jack beneath the front differential and support the weight of the front axle assembly.
- f. Remove the locknut, washers and rubber bushes from the chassis end of each radius arm (Figure 106) and discard the locknuts.

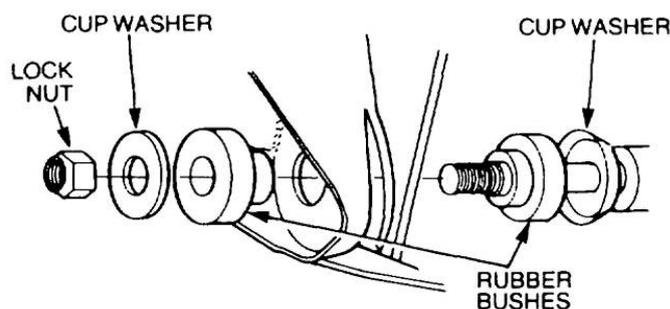


Figure 106 Removal of the Radius Arm Bush

- g. Using special tool 18G1063, disconnect the tie rod ball-joints at the steering arms (Figure 107).

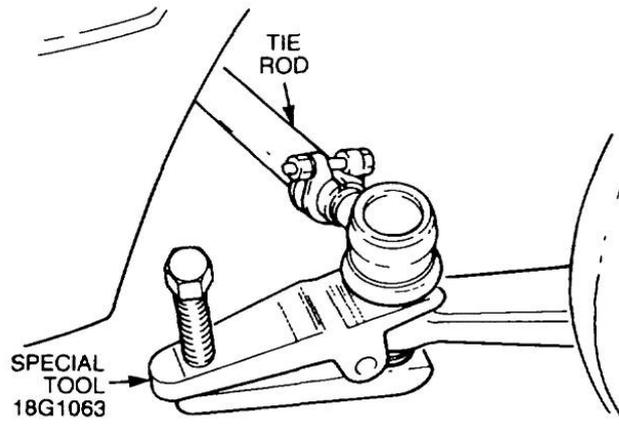


Figure 107 Removal of the Tie Rod

- h.** Remove the locknuts and bolts securing the radius arms to the axle case (Figure 108) and discard the locknuts. Lower the front end of the radius arms to clear the axle and withdraw each arm from the chassis brackets.

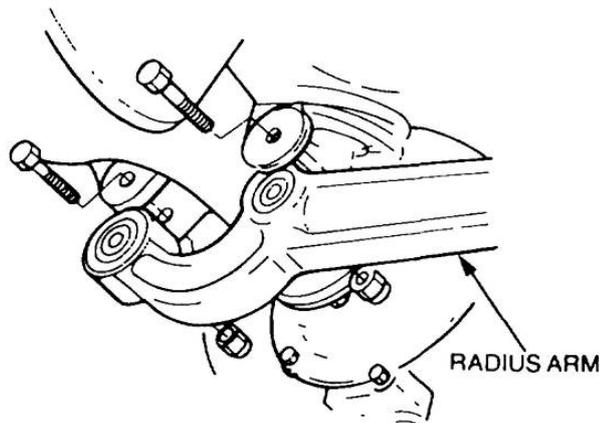


Figure 108 Removal of the Radius Arm

- i.** Remove the nut securing each front shock absorber to the axle casing (Figure 109), then remove the lower cup washer, rubber bush and seating washer from the shock absorbers.

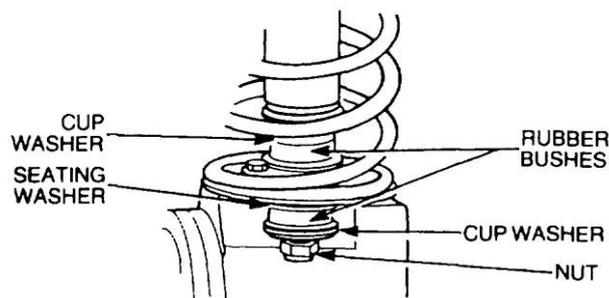


Figure 109 Removal of the Front Shock Absorber

- j.** Slacken the nut securing the brake hose to the retaining bracket (Figure 110).

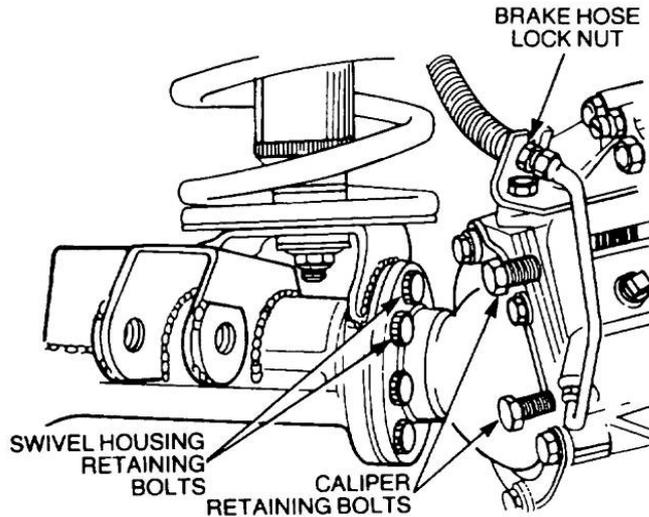


Figure 110 Removal of the Brake Calliper

- k. Disconnect the brake pad wear indicator cable at the front left-hand brake calliper and tie the cable out of the way.
- l. Remove the two bolts securing the calliper to the swivel housing. Move the calliper away from the disc and, ensuring that the brake pipes are not bent, secure the calliper to the chassis rail with wire or string.
- m. Remove the split pin, castellated nut and washer securing the drag link to the steering arm. Using special tool 18G1063, disconnect the drag link (Figure 111) and discard the split pin.

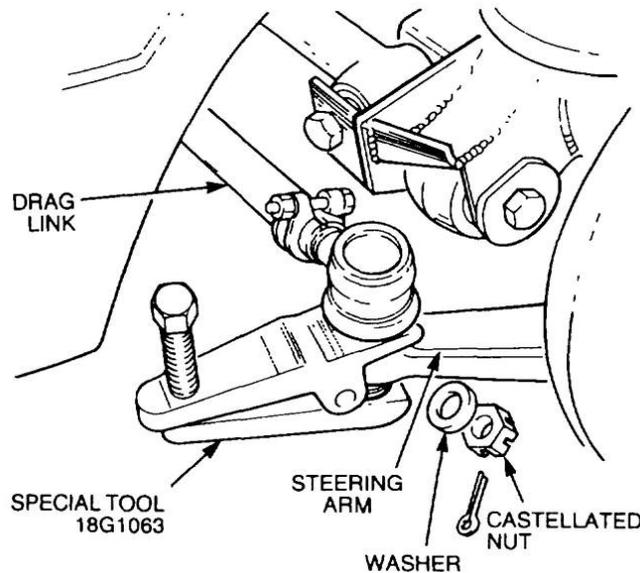


Figure 111 Removal of the Drag Link

- n. Remove the locknut and bolt securing the Panhard rod to the axle casing and remove the rod from the bracket. Discard the locknut.
- o. Lower the front axle assembly and withdraw the front springs. Remove the axle assembly from beneath the vehicle.

76. Installation. Install the front axle assembly as follows:

- a. Place the front axle on a suitable trolley jack and position the axle assembly beneath the vehicle.
- b. Position the Panhard rod in the bracket on the axle casing and secure it with the retaining bolt and a new locknut. Torque the locknut to 176 N.m (130 lbf.ft).
- c. Extend the shock absorbers, position the springs over the shock absorbers and onto the spring seat.

- d. Raise the front axle while guiding the shock absorbers into the lower mounting brackets.
- e. Install a cup washer and rubber bush on each radius arm and insert each arm into the corresponding chassis bracket. Install the remaining rubber bush, cup washer and new locknut (Figure 112) but do not tighten.

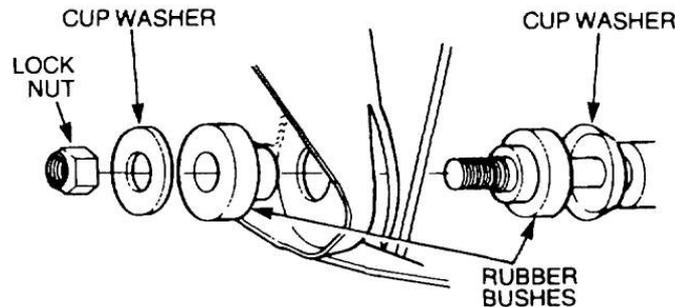


Figure 112 Installation of the Radius Arm Bush

- f. Raise the front of each radius arm, locate the bushes in the axle casing and install the retaining bolts and new locknuts. Torque all radius arm retaining bolts to 176 N.m (130 lbf.ft).
- g. Align the front propeller shaft flange with the front differential flange and secure it with four new locknuts. Torque the locknuts to 41 to 52 N.m (30 to 38 lbf.ft).
- h. Fit the drag link ball-joint on the steering arm and install the washer and castellated nut. While applying hand pressure to the ball-joint, torque the nut to 40 N.m (30 lbf.ft) and install a new split pin.
- i. Install the brake calliper. Smear the two bolts with a thin film of Loctite 271 and install the bolts and new lock-washers. Torque the bolts to 82 N.m (60 lbf.ft). Tighten the locknut securing the brake hose to the swivel housing bracket.
- j. Connect the brake pad wear indicator cable at the front left-hand brake calliper.
- k. Ensure that the upper cup washer, rubber bush and seating washers are fitted to the shock absorber threaded rods (Figure 113). Position the threaded rods in the axle casing bracket and fit the lower seating washer, rubber bush, cup washer and nut to each shock absorber. Tighten the nuts securely.

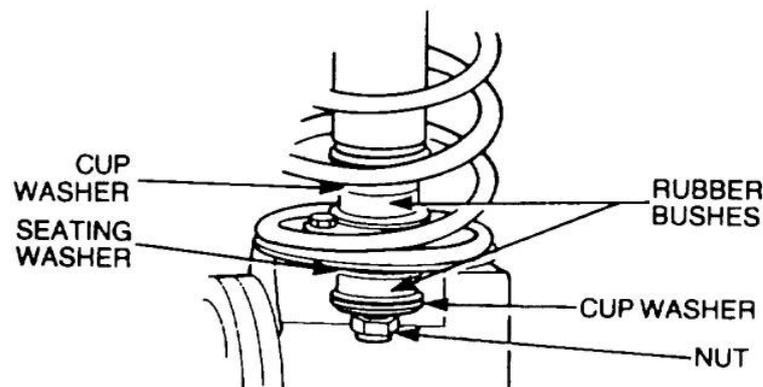


Figure 113 Installation of the Front Shock Absorber

- l. Using new sealing washers, fit the axle breather hose to the axle case and tighten the banjo bolt securely. Install new zip-clamps to secure the breather hose to the axle case. Ensure that the hose is still secure in the chassis clips.
- m. Install the tie-rod and torque the ball-joint nuts to 40 N.m (30 lbf.ft).
- n. Operate the foot brake several times to centralise the front brake pads.
- o. Fit the front wheels and secure them with the wheel nuts. Raise the vehicle, remove the chassis stands and lower the vehicle to the ground. Remove the jack and tighten the wheel nuts in the correct sequence.

- p. Remove the fill plug from the axle case and check the oil level. If necessary, top-up with new oil then install the fill plug and tighten it securely.
- q. Remove the chocks from the rear wheels and disengage the differential lock.
- r. Carry out the wheel alignment procedure in accordance with EMEI Vehicle G 203 – Group 14.

Differential Carrier

77. **Removal.** Remove the differential carrier as follows:

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Chock the rear wheels and loosen the wheel nuts on the front wheels. Raise the front of the vehicle and support the vehicle on axle stands.
- b. Remove the front wheels.
- c. Remove and discard the four locknuts securing the front propeller shaft flange to the front differential. Lower the propeller shaft.
- d. Remove the differential drain plug and drain the oil into a suitable receptacle.
- e. Slacken the nut securing the brake hose to the retaining bracket (Figure 114).

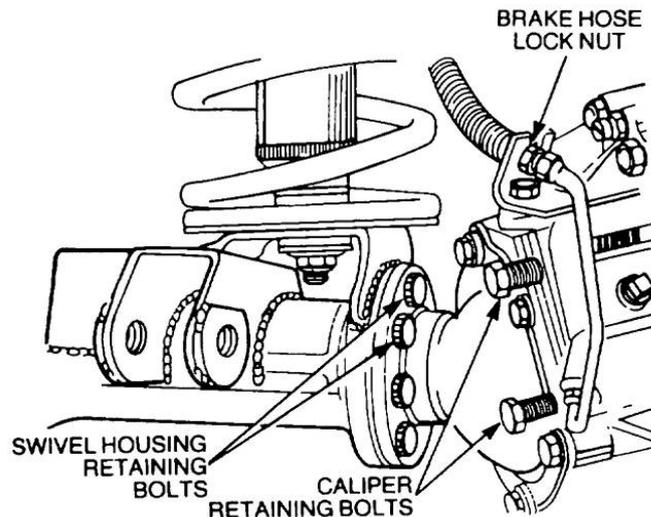


Figure 114 Removal of the Brake Calliper

- f. Disconnect the wear indicator cable at the left-hand calliper and secure it out of the way.
- g. Remove the two bolts securing the calliper to the swivel housing. Move the calliper away from the disc and, ensuring that the brake pipes are not bent, secure the calliper to the spring with wire or string.
- h. Remove the split pin, castellated nut and washer securing the tie rod ball-joints. Using special tool 18G1063, disconnect the ball-joints from the steering arms. Discard the split pin (Figure 115).

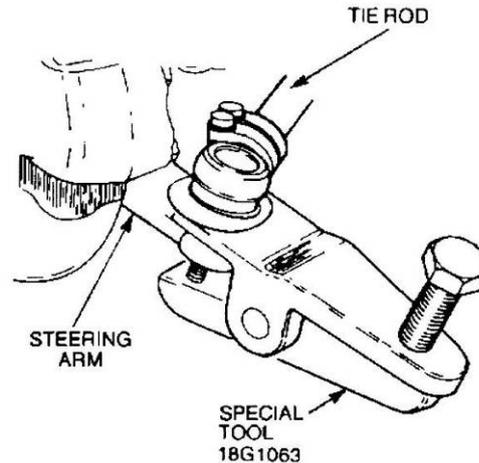


Figure 115 Removal of the Steering Linkage

- i. Remove the locknut and washer securing the drag link ball-joint to the swivel housing arm. Using special tool 18G1063, disconnect the ball-joint.
 - j. Remove the six bolts securing the swivel housing to the axle casing and remove the hub assembly.
 - k. Repeat Paras 74. e. to g, and j. for the opposite side of the axle.
 - l. Remove the ten locknuts securing the differential carrier to the axle case and remove the differential carrier and the gasket.
 - m. Remove all trace of gasket material from the axle case and differential carrier.
- 78. Installation.** Install the differential carrier as follows:
- a. Position a new gasket on the differential carrier and install the differential carrier on the axle case. Secure the carrier to the axle case with ten new locknuts. Torque the nuts to 36 to 46 N.m (26 to 34 lbf.ft).
 - b. Ensure that the gasket fitted between the swivel housing and axle case is useable, position the axle shaft in the axle casing and push the shaft in until the swivel housing flange is hard against the case flange. Using a thin film of Loctite 275, install the six bolts and torque them to 65 to 80 N.m (48 to 59 lbf.ft).
 - c. Position the front propeller shaft flange onto the differential pinion flange, install four new locknuts and torque the nuts to 41 to 52 N.m (30 to 38 lbf.ft).
 - d. Fit the drag-link ball-joint to the swivel housing arm, install a flat washer and new locknut and torque the nut to 40 N.m (30 lbf.ft).
 - e. Position the tie-rod ball-joint on the steering arm, install the flat washer and castellated nut and torque the nut to 40 N.m (30 lbf.ft). Install a new split-pin.
 - f. Install the brake calliper. Smear the two bolts with a thin film of Loctite 271 and install the bolts and new lock-washers. Torque 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.
 - g. Repeat Paras 75. b. and f. for the opposite side of the axle.
 - h. Remove the axle fill plug, ensuring that the drain plug is secure, fill the axle with approximately 1.7 litres of new oil and install the fill plug.
 - i. Operate the foot brake several times to centralise the front brake pads.
 - j. Install the front wheels and tighten the wheel nuts.
 - k. Raise the front of the vehicle and remove the axle stands. Lower the vehicle and remove the jack. Tighten the wheel nuts in sequence, remove the wheel chocks and disengage the differential lock.
 - l. Carry out the wheel alignment procedure in accordance with EMEI Vehicle G 203 – Group 14.

Front Axle Specifications

79. The front axle specifications are detailed in Table 14.

Table 14 Front Axle Specifications

Serial	Item	Specification
1	Panhard rod to axle casing tightening torque	176 N.m (130 lbf.ft)
2	Radius arm tightening torque	176 N.m (130 lbf.ft)
3	Front propeller shaft flange tightening torque	41 to 52 N.m (30 to 38 lbf.ft)
4	Drag link to steering arm ball-joint tightening torque	40 N.m (30 lbf.ft)
5	Front differential to axle case tightening torque	36 to 46 N.m (26 to 34 lbf.ft)
6	Swivel housing to axle case tightening torque	65 to 80 N.m (48 to 59 lbf.ft)
7	Tie rod to steering arm tightening torque	40 N.m (30 lbf.ft)
8	Front brake calliper retaining bolts tightening torque	82 N.m (60 lbf.ft)

Reclamation of Worn Panhard Rod Mounts

80. The Panhard rod reclamation procedures described are to be applied to axle assemblies whenever the holes in the Panhard rod mounting plates have worn more than 1.5 mm.

81. Stores Required. The stores required are shown in Table 15 and should be ordered on an ‘as required’ basis.

Table 15 Stores Required for Panhard Rod Mount Reclamation

Item	NSN	Mfr Part No	Description	Qty Per Kit	Qty Per Equip
1	2590-66-128-8450	AYG 7455	Modification Kit, Vehicular Equipment Components Radius Arm, EMEI Veh G 189-11 (comprising items 2 to 5)		1
2		AYG 7488	Spacer, 27 mm OD, 14 mm ID, 6 mm thick	1	
3		NH 114041	Nut, Metric, 14 mm	1	
4		NT 114041	Locknut, Metric, 14 mm	1	
5		AYG 6093	Bolt, M14 mm, Class 8.8, 83 mm long	1	

82. Reclamation. The Panhard rod axle mount reclamation is carried out as follows:

- a. Disconnect the battery.
- b. Remove the locknut and bolt securing the panhard rod to the chassis mounting arm.
- c. Remove the locknut and bolt securing the panhard rod to the axle casing and remove the panhard rod from the vehicle.
- d. Using a grinder or file, clean the outside surfaces of the panhard rod mount.
- e. Fit Items 2, 3 and 5 from Table 15 into the axle case mounts as shown in Figure 116.

NOTE

Ensure the mounting bolt is fitted from front to rear and is parallel to the axle casing centre line before welding the spacer and nut into place.

- f. Weld the front spacer and the rear nut to the front axle casing mount, as shown in Figure 116 with a 3 mm continuous fillet weld, using either:
 - (1) Manual Metal Arc Welding (MMAW) process using electrodes conforming to AS/NZS 4855: E4918 Welding Consumables – Covered Electrodes for Manual Metal Arc Welding of Non-alloy and Fine Grain Steels.
 - (2) Gas Metal Arc Welding (GMAW) process using consumables conforming to AS/NZS 2717.1: ES6-GC/M-W503AH and shielding gas Argoshield Standard.

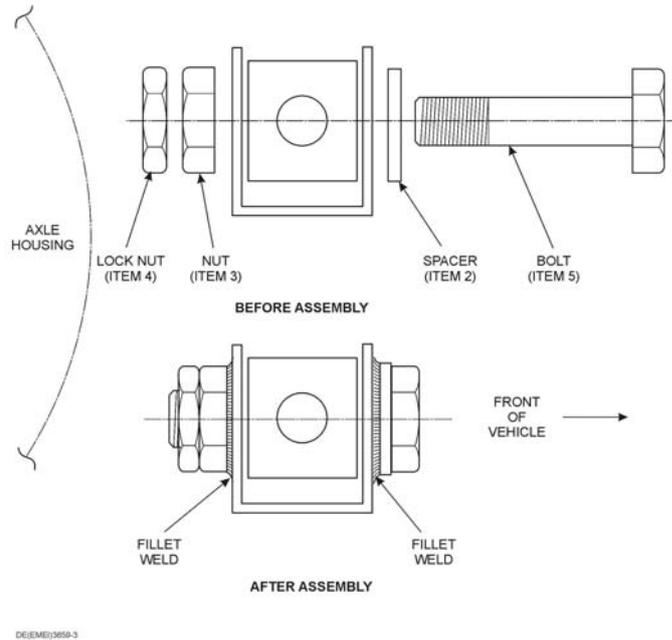


Figure 116 Panhard Rod Mount

- g. Remove the bolt and paint all bare metal surfaces.
- h. Inspect the panhard rod bushes for useability and replace if required.
- i. Install the panhard rod to the chassis mounting arm and refit the bolt and locknut but do not tighten it.
- j. Install the panhard rod to the front axle case mount and install the bolt (Table 15, Item 5) and locknut (Table 15, Item 4) but do not tighten it.
- k. Torque the bolt securing the Panhard rod to the chassis mounting arm to 196 N.m (145 lbf.ft).
- l. Torque the bolt securing the Panhard rod to the axle casing to 176 N.m (130 lbf.ft) and secure the locknut.
- m. Connect the battery.

Reclamation of Worn Radius Arm Mounts

83. The radius arm reclamation procedures described are to be applied to axle assemblies whenever the holes in the radius arm mounting plates on axle housings with the narrow type mounts (i.e. 49 mm between the locating plates) have worn more than 1.5 mm.

84. **Stores Required.** The stores required are shown in Table 16 and should be ordered on an 'as required' basis.

Table 16 Stores Required for Radius Arm Reclamation

Item	NSN	Mfr Part No	Description	Qty Per Kit	Qty Per Equip
1	2590-66-128-8451	AYG 7456	Modification Kit, Vehicular Equipment Components Radius Arm, EMEI Veh G 189-11 (comprising items 2 to 5)		1
2		AYG 7446	Spacer to suit 5/8 inch bolt, 27 mm OD, 6 mm thick	4	
3		NH 610041	Nut, 5/8 inch UNF	4	
4		NH 610321	Bolt, 5/8 inch, 18 TPI, UNF, 4 inch long	4	
5		NT 610041	Locknut, 5/8 inch UNF	4	

85. Radius Arm Mount Reclamation Procedure. The radius arm axle assembly mount reclamation is carried out as follows:

- a. Disconnect the battery.

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- b. Chock the rear wheels and loosen the wheel nuts on the front wheels. Using a suitable hydraulic jack, raise the front of the vehicle and support it on stands positioned beneath the chassis rails.
- c. Remove the front wheel nuts and wheels and use the jack to support the axle weight.
- d. Remove the locknuts, washers and rubber bushes from the chassis end of the radius arm.
- e. Using special tool 18G1063, disconnect the tie rod ball-joints at the steering arms.
- f. Remove the locknuts and bolts securing the radius arms to the axle case.
- g. Lower the front end of the radius arms to clear the axle and withdraw the arms from the chassis brackets.
- h. Using a grinder or file, clean the outside surfaces of the axle assembly mounts for the radius arms.
- i. Fit Items 2, 3 and 4 from Table 16 to the axle case mounts, ensuring the bolts are fitted from the inside facing out and are parallel to the axle casing, (Figure 117), and tighten them firmly.

NOTE

Ensure the bolts are fitted from inside to outside and are parallel to the axle casing centre line before welding the spacer and nut into place.

- j. Weld the inside spacers and outside nuts to the axle casing mounts (Figure 117), with a 3 mm continuous fillet weld using either:
 - (1) Manual Metal Arc Welding (MMAW) process using electrodes conforming to AS/NZS 4855: E4918 Welding Consumables – Covered Electrodes for Manual Metal Arc Welding of Non-alloy and Fine Grain Steels; or
 - (2) Gas Metal Arc Welding (GMAW) process using consumables conforming to AS/NZS 2717.1: ES6-GC/M-W503AH and shielding gas Argoshield Standard.
- k. Remove the bolts and paint all bare metal surfaces.
- l. Inspect the radius arm bushes for useability and replace as sets, if required.
- m. Install a cup washer and rubber bush on the radius arm and insert the radius arm into the chassis bracket. Install the remaining rubber bush and cup washer. Fit the nut but do not tighten it.
- n. Raise the front end of the radius arm and locate the bushes in the axle casing. Install the bolts and nuts (Table 16, Items 3, 4 and 5) but do not tighten it.
- o. Install the front wheels and wheel nuts. Lower the vehicle to the ground and allow the suspension to settle.
- p. Tighten the wheel nuts.
- q. Torque the nuts and bolts securing the radius arms to the axle case and chassis bracket to 176 N.m (130 lbf.ft).
- r. Install the tie rods and torque the ball-joint nuts to 41 N.m (30 lbf.ft).

- s. Remove the chocks from the rear wheels and disengage the differential lock.

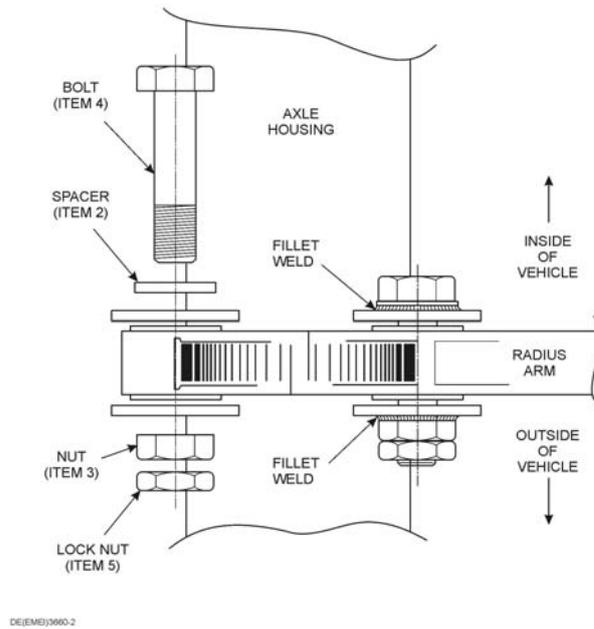


Figure 117 Radius Arm Mounts

SUSPENSION

Front Springs

86. **Removal.** Remove the front springs as follows:

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Raise the front of the vehicle and support it on chassis stands. Leave the axle supported on the jack and chock the rear wheels. Engage the transmission differential lock.
- b. Slacken the nut securing the brake hose to the retaining bracket (Figure 114).
- c. Disconnect the wear indicator cable at the left-hand calliper and secure it out of the way.
- d. Remove the two bolts securing the calliper to the swivel housing. Move the calliper away from the disc and, ensuring that the brake pipes are not bent, secure the calliper to the chassis rail with wire or string.
- e. Remove the nut, cup-washer, rubber bush and seating washer securing the shock absorber to the axle case.
- f. 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.
- g. Lower the axle on the side the spring is to be removed. Remove the spring and bracket securing ring (Figure 118).

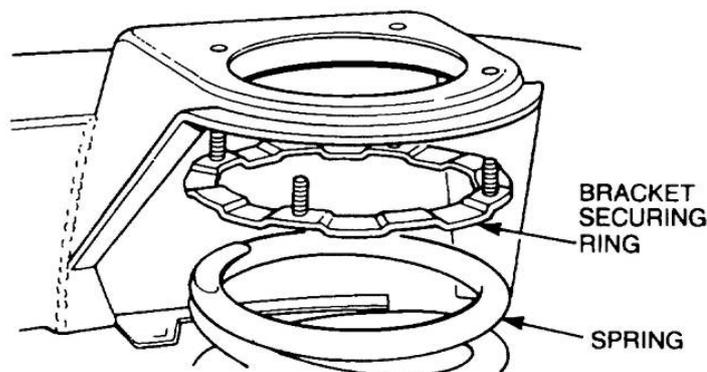


Figure 118 Removal of the Front Spring

- h. Repeat the procedure for the opposite spring if necessary.
87. **Installation.** Install the front springs as follows:
- a. Position the bracket-securing ring and retain it in position with 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 calliper. Smear the two bolts with a thin film of Loctite 271 and install the bolts and new lock-washers. Torque 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, raise the vehicle and remove the chassis stands. Lower the vehicle and remove the jack and wheel chocks.
- g. Disengage the differential lock.

Intermediate Axle Spring

88. **Removal.** Remove the intermediate axle spring as follows:

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Chock the front wheels, raise the rear of the vehicle and support it on chassis stands. Leave the axle supported on the jack. Engage the transmission differential lock.

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 is necessary to position and operate a trolley jack under the opposite (intermediate) axle. This will relieve the load on the shackle bolt and make removal or installation of the bolt easier.

- b. Remove the locknuts securing the shackle bolt to the rocker beam and the spring eye. Discard the locknuts.
- c. Remove the outer shackle plate and the two flat washers. 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 119).

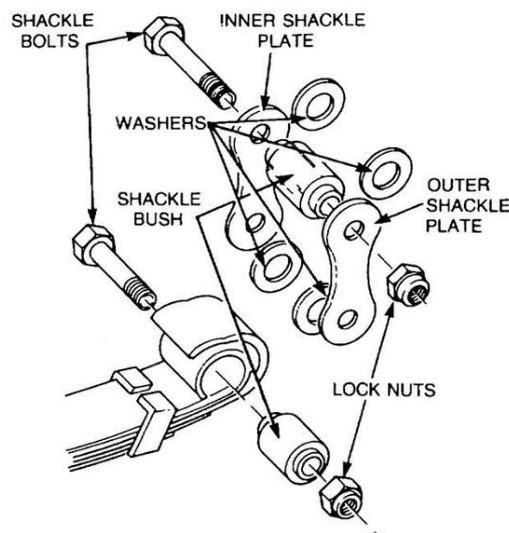


Figure 119 Removal of the Shackle Bolts (Rocker Beam End)

- d. To assist with removal of the spring, support the spring with a suitable trolley-jack. Remove the four locknuts from the U-bolts (Figure 120) and discard the locknuts.

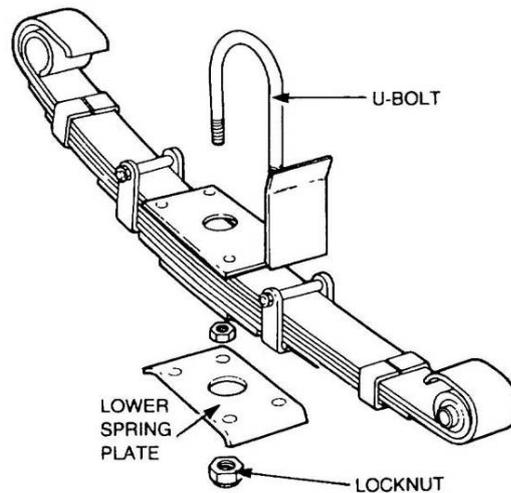


Figure 120 Removal of the U-Bolt and Retaining Plate

- e. 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 121).

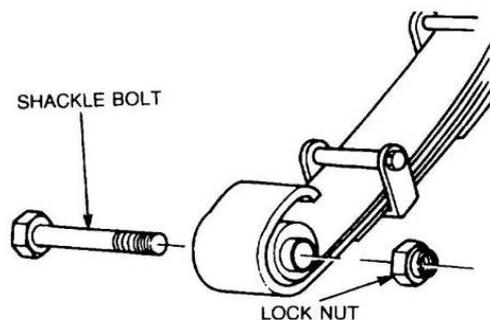


Figure 121 Removal of the Shackle Bolt (Fixed End)

- f. Lower the trolley jack supporting the spring allowing the spring to clear the mounting points and remove the spring from beneath the vehicle.

89. 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 outside of the shackle bolt. Insert the bolt and install the new locknut. Torque 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 threaded end of 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 torque 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 is necessary to position and operate a trolley jack under the opposite (rear) axle. This will relieve the load on the shackle bolt and make removal or installation of the bolt easier.

- 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. Remove the support trolley jacks.
- j. Raise the vehicle, remove the chassis stands and lower the vehicle. Torque the rocker beam shackle bolt nuts to 81 to 95 N.m (60 to 70 lbf.ft).
- k. Disengage the differential lock and remove the wheel chocks.

Rear Axle Spring

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

A rectangular warning box with a thick black border. The word "WARNING" is written in bold, uppercase letters in the center.

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- a. Chock the front wheels, raise the rear of the vehicle and support it on chassis stands. Leave the axle supported on the jack. Engage the transmission differential lock

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 is necessary to position and operate a trolley jack under the opposite (rear) axle. This will relieve the load on the shackle bolt and make removal or installation of the bolt easier.

- b. Remove the locknuts securing the shackle bolts to the rocker beam and the spring eye. Discard the locknuts.
- c. Remove the outer shackle plate and the two flat washers. 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 122).
- d. To assist with removal of the spring, support the spring with a suitable trolley-jack. Remove the four locknuts from the U-bolts (Figure 123) and discard the locknuts.

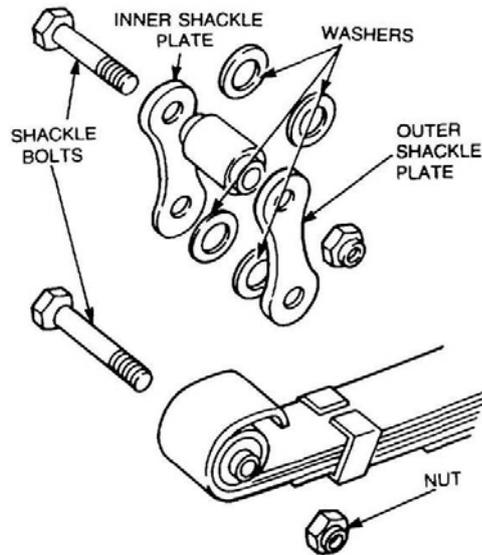


Figure 122 Removal of the Shackle Bolts (Rocker Beam End)

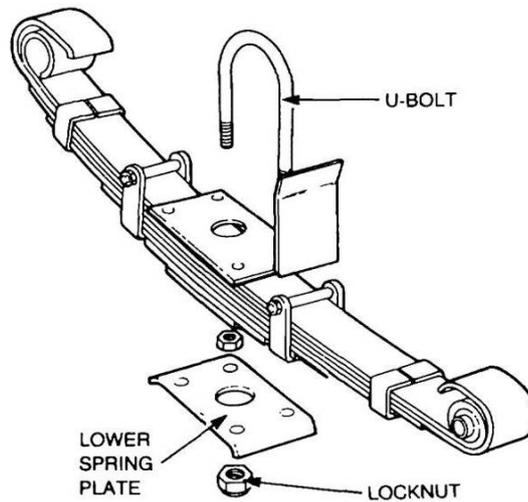


Figure 123 Removal of the U-Bolt And Retaining Plate

- e. Remove the locknut and spacer from the fixed shackle bolt. Using a suitable drift, drive the shackle bolt through the shackle bush and the fixed shackle mounting (Figure 124). Discard the locknut.

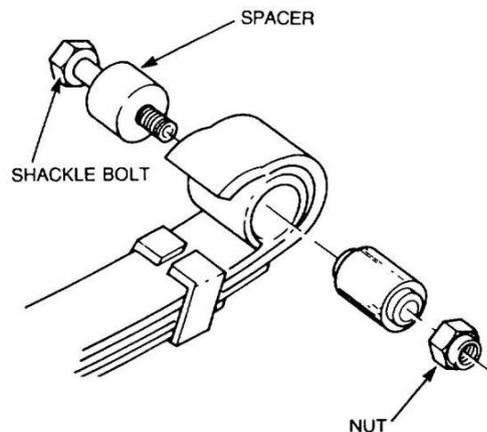


Figure 124 Removal of the Shackle Bolt (Fixed End)

- f. Lower the trolley jack supporting the spring, allowing the spring to clear the mounting points and remove the spring from beneath the vehicle.

91. 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 outside of the shackle bolt. Insert the bolt and spacer and install the new locknut. Torque 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 threaded end of 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 torque 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 is necessary to position and operate a trolley jack under the opposite (rear) axle. This will relieve the load on the shackle bolt and make removal or installation of the bolt easier.

- 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 at this stage. Remove the support trolley jacks.
- j. Raise the vehicle, remove the stands and lower the vehicle. Torque the rocker beam shackle bolt nuts to 81 to 95 N.m (60 to 70 lbf.ft).
- k. Disengage the differential lock and remove the wheel chocks.

Shackle Bushes (Intermediate and Rear Axle Springs)

92. Replacement. Replace the shackle bushes as follows:

- a. Remove the intermediate/rear spring (Paras 88. and 90.).
- b. Support the spring in a hydraulic press or similar device.
- c. Position special tool 18GA084 on the shackle bush (Figure 125). Ensure that the tool is correctly aligned and press the shackle bush from the spring eye.
- d. Inspect the bush and the spring eye for damage and 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 special tool 18GA084, press the shackle bush into the spring eye.

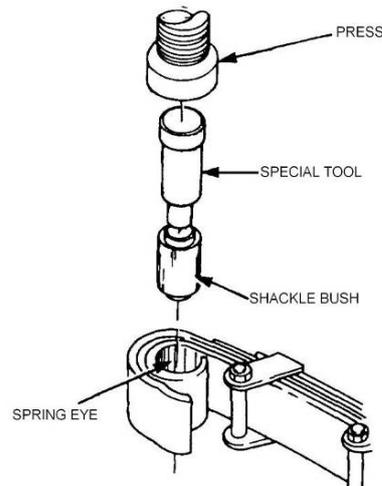


Figure 125 Replacement of the Shackle Bush

Rocker Beam Spring Bush

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

- a. Remove the rocker beam in accordance with EMEI Vehicle G 203 – Group 13.
- b. Support the rocker beam in a hydraulic press or similar device.
- c. Position special tool 18GA084 on the rocker beam spring bush (Figure 126). Ensure that the tool is correctly aligned and press the spring bush from the rocker beam.

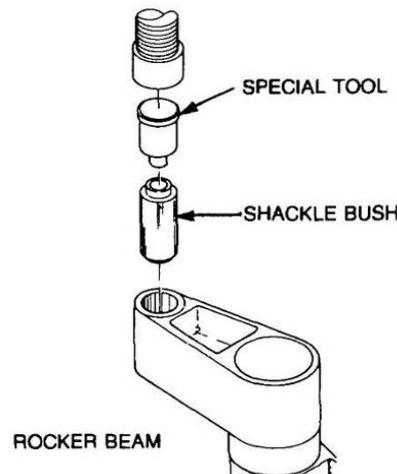


Figure 126 Replacement of the Rocker Beam Spring Bush

- d. Inspect the bush and the spring eye for damage and 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 special tool 18GA084 press the shackle bush into the rocker beam eye.

Rocker Beam Centre Bush

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

- a. Remove the rocker beam in accordance with EMEI Vehicle G 203 – Group 13.
- b. Support the rocker beam in a hydraulic press or similar device.
- c. Position special tool 18GA083 on the centre bush, ensure that the tool is correctly aligned and press the centre bush from the rocker bore (Figure 127).

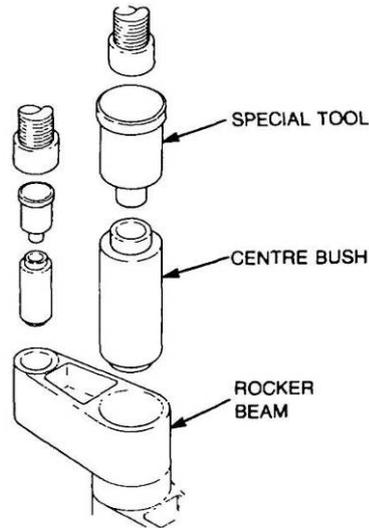


Figure 127 Replacement of the Rocker Beam Centre Bush

- d. Inspect the bush and the rocker beam centre bore for damage and replace the rocker beam if 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 special tool 18GA083, press the bush into the rocker beam.

Spring Centre Bolt

95. Replacement. Replace the spring centre bolt as follows:

- a. Remove the intermediate or rear spring (Paras 88. and 90.).
- b. Using a vice or similar device, clamp the spring leaves so movement of the spring leaves will not be evident when the centre bolt is removed.
- c. Remove the centre bolt nut (Figure 128).

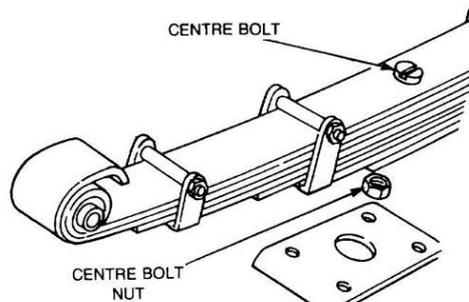


Figure 128 Replacement of the Centre Bolt

- d. Using a suitable drift, tap the centre bolt through and out of the spring leaf pack.
- e. Apply a liberal amount of grease to the new centre bolt, tap the centre bolt in place with the threaded end toward the underside of the spring leaf pack.
- f. Install the centre bolt nut, tighten it securely and peen the thread of the centre bolt. Remove the spring from the vice.
- g. Install the spring in the vehicle (Para 89. or 91.).

Spring Leaf

96. Replacement. Replace the spring leaf as follows:

- a. Remove the rear or intermediate spring (Paras 88. and 90.).

- b.** Remove the centre bolt (Para 95.).

NOTE

The spring leaf clamps are secured to both ends of Number 3 and 6 spring leaves by rivets. Should replacement of either of these spring leaves be necessary, it will be as a spring leaf and clamp assembly.

- c.** Remove the two bolts, nuts and spacers from the spring retaining clamps located towards the centre of the spring.
- d.** Bend the two clamps, located towards the end of the spring, away sufficiently to allow for removal of the defective spring leaf (Figure 129).

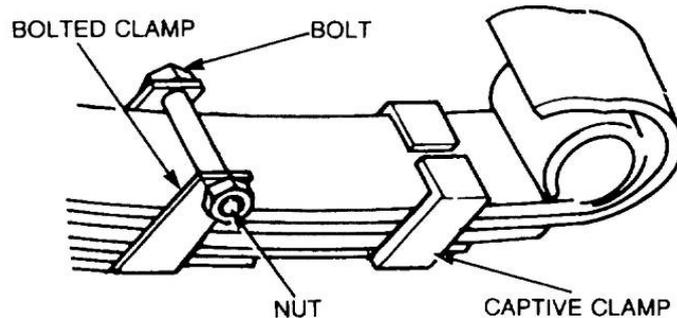


Figure 129 Removal of the Spring Clamps

- e.** Remove the spring from the vice or the press and lift off the defective spring leaf from the spring assembly.
- f.** Coat the new spring leaf with a liberal amount of grease and locate the spring leaf in the correct position.
- g.** Align the centre bolt holes in each spring leaf and insert the centre bolt. Install the centre bolt nut but do not tighten.
- h.** Install the two bolts, spacer and nuts securing the clamp to the spring, but do not tighten it.
- i.** Using a vice or press, clamp the spring leaves together, then tighten the centre bolt nut securely. Peen the thread of the centre bolt.
- j.** Tighten the spring clamp nuts and bend the two captive clamps into position around the spring leaves.
- k.** Remove the spring from the vice and install it in the vehicle (Para 89. or 91.).

Suspension System Specifications

97. The suspension system specifications are detailed in Table 17.

Table 17 Suspension Specifications

Serial	Item	Specification
1	Spring shackle bolt tightening torque	81 to 95 N.m (60 to 70 lbf.ft)
2	Spring U-bolt tightening torque	128 to 142 N.m (95 to 105 lbf.ft)

Suspension System Fault Finding

98. The suspension system fault finding is detailed in Table 18.

Table 18 Suspension System Fault Finding (Springs - Intermediate and Rear)

Serial	Symptom	Probable Cause	Action
1	Uneven or harsh ride	Spring centre bolt broken or sheared	Replace
		Rebound clips missing or broken	Replace
		Loose U-bolts	Tighten, replace if thread is damaged
		Damaged or worn shackle bolts	Replace
		Damaged or worn rocker beam	Replace
2	Erratic steering	Spring centre bolt broken or sheared	Replace
		Loose U-bolts	Tighten, replace if thread is damaged
		Worn rocker beam centre bush	Replace

STEERING

Steering Box

99. **Removal.** Remove the steering box as follows:
- Remove the filler cap from the steering fluid reservoir.
 - Disconnect and remove the battery. Remove the three bolts securing the battery tray and remove the tray.
 - Disconnect the high-pressure hose from the connector on the power steering pump and drain the fluid from the system into a suitable container. Reinstall the filler cap and connect the high-pressure hose to the steering pump.



The fluid drained from the system shall not be reused.

- Remove the two bolts securing the steering shaft cover to the inner guard and remove the cover.
- Remove the steering protection plate in accordance with EMEI Vehicle G 203 – Group 14. Using special tool 18G1063 disconnect the drop arm ball-joint.
- Disconnect the flexible hoses from the steering box housing (Figure 130). Plug the disconnected hoses and connections to prevent ingress of foreign matter.

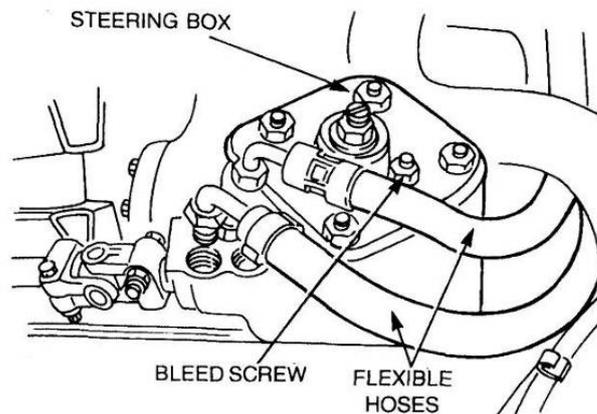


Figure 130 Removal of the Flexible Hoses to the Steering Box

WARNING

Do not work on the vehicle without the use of an axle stand beneath the axle. Place the axle stand as close to the raised wheel as possible. This procedure is required for all repairs and maintenance activities involving positioning of body parts in potential crush zones of the vehicle. Failure to comply may result in serious injury or death.

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

- Chock the rear wheels; using a suitable hydraulic jack, raise the front of the vehicle and support it on axle stands. Engage the transmission differential lock.
- Ensure the front wheels and the steering wheel are in the straight ahead position. Match mark the relationship of the steering column inner shaft to the top universal joint (Figure 131).

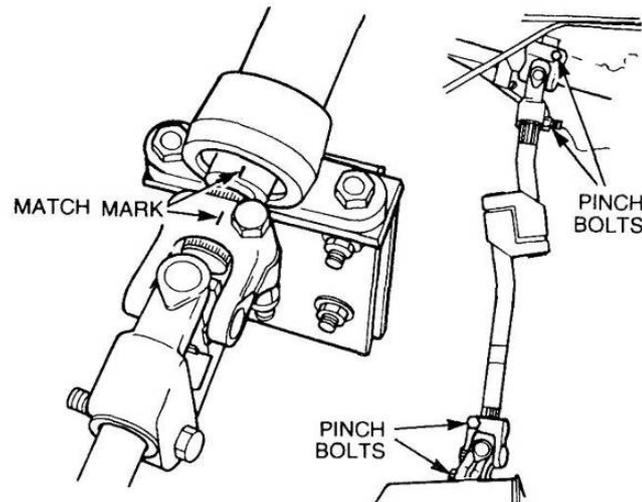


Figure 131 Alignment of the Steering Column

- i. Remove the pinch bolt and locknut securing the universal joint to the steering box worm shaft. Slacken the two pinch bolts securing the upper universal joint and slide the collapsible shaft and lower universal joint off the steering box worm shaft. Discard the locknuts.
- j. Slacken the locknut securing the tiebar to the Panhard rod mounting-arm. Remove the two locknuts, washers and bolts securing the tie bar to the steering box (Figure 132) and swing the tiebar clear of the steering box. Discard the locknuts.

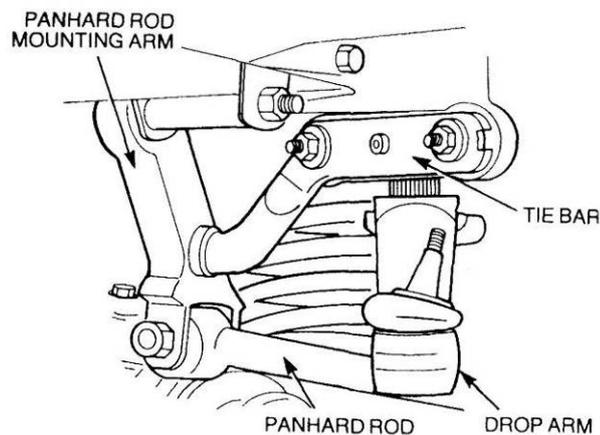


Figure 132 Removal of the Tie Bar

- k. Bend back the tabs on the locking plates and remove the bolts securing the steering box to the chassis frame. Remove the steering box and discard the locking plates (Figure 133).

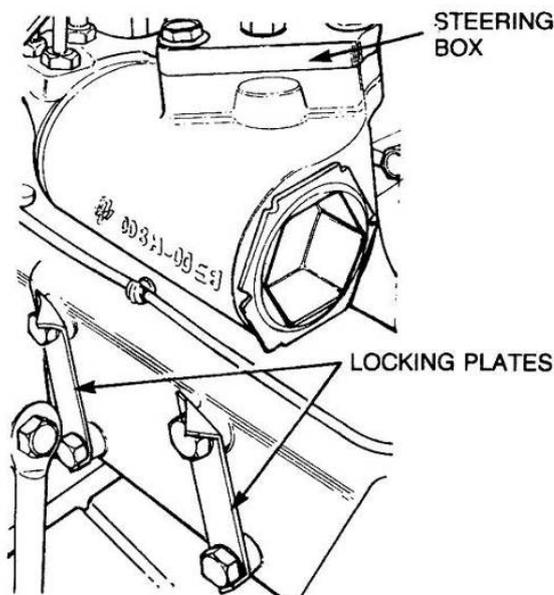


Figure 133 Removal of the Steering Box

100. Installation. Install the steering box as follows:

- a. Ensure the four mounting bolts and the locking plates are positioned through the chassis and install the steering box on the bolts. Fit the four flat washers and new locking plates and torque the nuts to 80 N.m (60 lbf.ft). Bend the locking plate tabs over the heads of the four bolts.
- b. Check that the steering wheel is in the straight ahead position and set the steering to the mid-way lock-to-lock position.
- c. Taking care not to turn the steering wheel, align the match mark and install the top universal joint to the steering column inner shaft. Connect the lower universal joint on the steering box worm shaft and install the pinch bolts. Fit new locknuts to all the pinch bolts and torque them to 20 to 25 N.m (15 to 19 lbf.ft).
- d. Fit the steering shaft cover on the inner guard and secure it with the two bolts and washers.
- e. Install the tie bar on the steering box, but do not tighten the two nuts and bolts.
- f. Install the battery tray and secure it with the three bolts.
- g. Using a new locknut secure the tie bar to the Panhard rod mounting arm. Slacken the two tie bar retaining bolts and then tighten them securely. Torque the locknut securing the tie bar to the Panhard rod mounting arm to 80 N.m (60 lbf.ft).
- h. Connect the drag link to the drop arm and torque the nut to 40 N.m (30 lbf.ft). Insert the new split pin and install the steering protection plate in accordance with EMEI Vehicle G 203 – Group 14.
- i. Remove the plugs from the steering box hoses and connections and connect them to the steering box. Tighten the connections securely.
- j. Remove the filler cap and fill the reservoir with a recommended fluid to the full level marked on the dipstick. Install the filler cap.
- k. Install and connect the battery.
- l. Lower the vehicle and remove the axle stands and chocks. Disengage the transmission differential lock
- m. Bleed the power steering system in accordance with EMEI Vehicle G 203 – Group 14.

Steering Column

101. Removal. Remove the steering column as follows:

- a. Disconnect the battery.
- b. Ensure the front wheels and steering wheel are in the straight ahead position and match mark the relationship of the steering column inner shaft to the top universal joint (Figure 134).

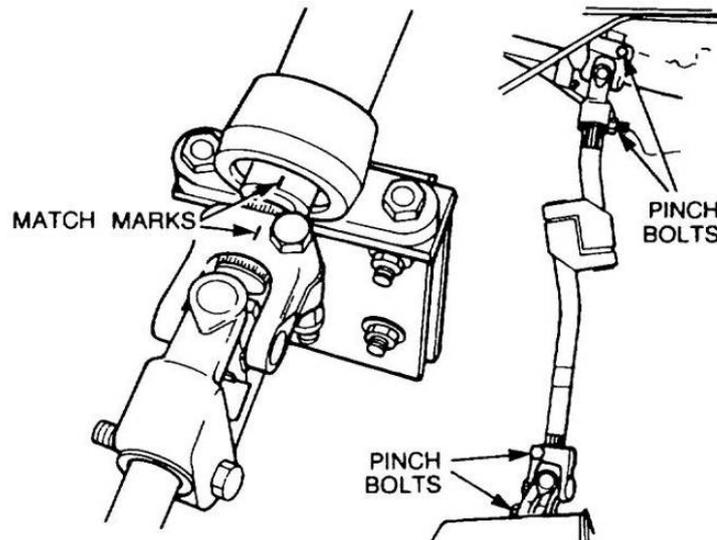


Figure 134 Alignment of the Steering Column

- c. Remove the two pinch bolts from the top universal joint and remove the lower bolt from the bottom universal joint. Slacken the top bolt of the lower universal joint and withdraw the shaft.
- d. Remove the screw securing the steering wheel cover and remove the cover.
- e. Remove the steering wheel retaining nut and using special tool 18GA085, remove the steering wheel from the steering column.
- f. Remove the five screws securing the instrument panel to the fascia and move the panel away slightly. Remove the bolt securing the steering column tie bar (Figure 135).

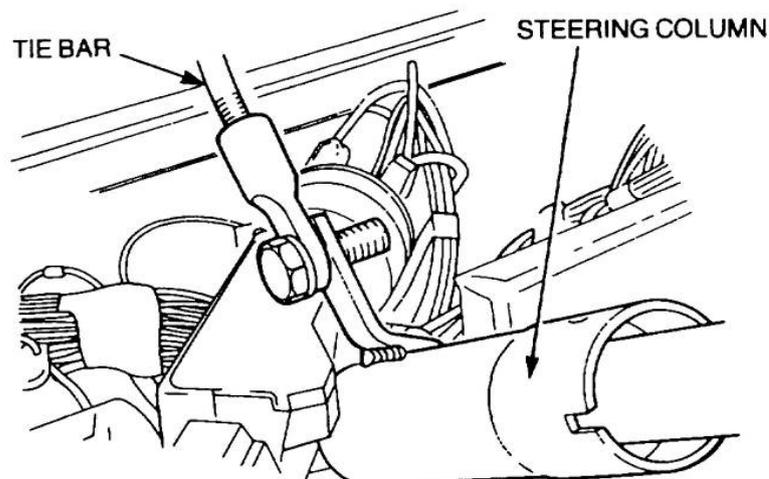


Figure 135 Disconnection of the Steering Column Tie Bar

- g. Remove the seven screws securing the shroud (Figure 136) and remove the shroud with the hand throttle attached.

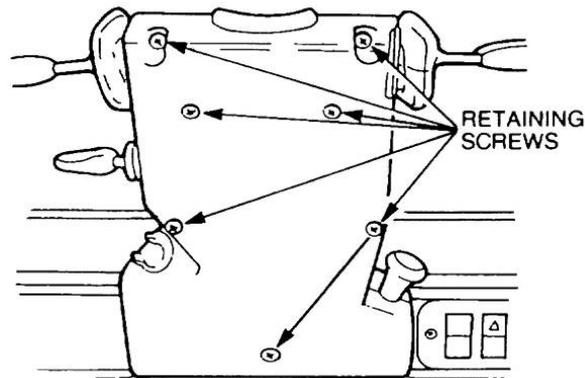


Figure 136 Removal of the Steering Column Shroud

- h. Disconnect the multi-plug connectors from the switches and remove the clamp screw securing the switch cluster to the steering column (Figure 137). Remove the cluster.

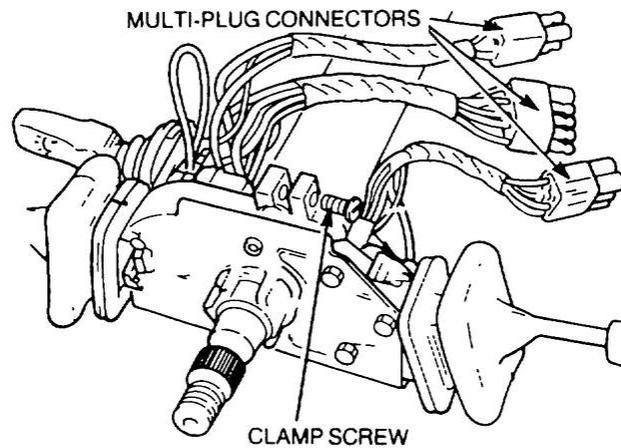


Figure 137 Removal of the Switch Cluster

- i. Remove the two nuts and bolts securing the ignition switch mounting bracket to the column and move the switch and bracket away from the column.
- j. Remove the brake master cylinder and servo cylinder in accordance with EMEI Vehicle G 203 – Group 12.
- k. Remove the six bolts securing the brake pedal bracket to the firewall and carefully remove the bracket. Remove the two bolts securing the lower end of the column to the firewall (Figure 138).

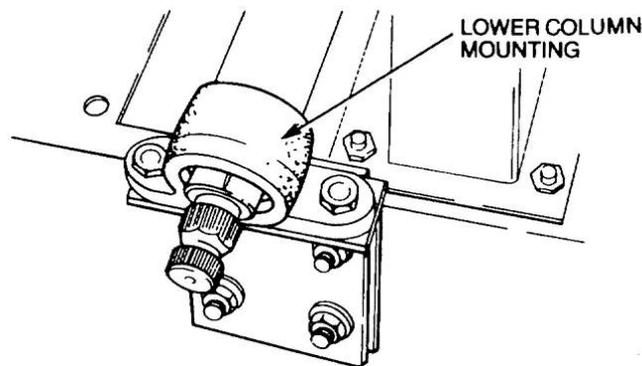


Figure 138 Removal of the Steering Column Lower Mounting

- l. Remove the two bolts securing the two halves of the top clamp and the two bolts that secure the top half of the clamp to the firewall. Remove the clamp and rubber packing (Figure 139).

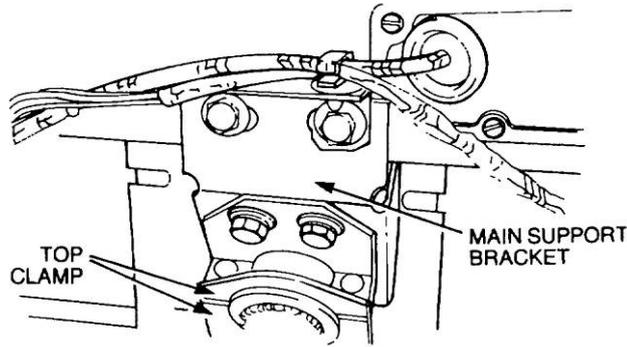


Figure 139 Removal of the Steering Column Upper Mounting

- m. Remove the two bolts securing the steering column main support bracket to the firewall and remove the column complete with the support bracket.

102. Disassembly. Disassemble the steering column as follows:

- a. Remove the circlip from the lower end of the steering column and remove the inner shaft complete with the bearing from the upper end of the column (Figure 140).

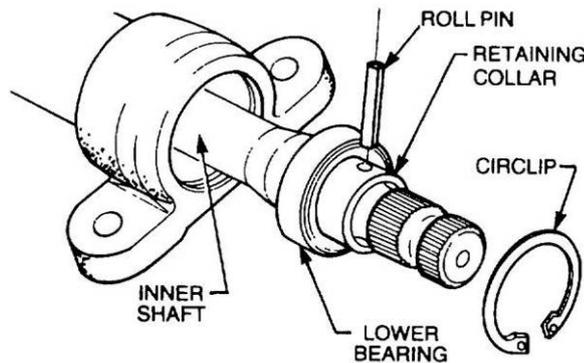


Figure 140 Removal of the Inner Shaft and Bearing

- b. Using a suitable drift, remove the roll-pin from the lower bearing retaining collar and press the collar and bearing from the inner shaft.
- c. Using a suitable drift, drive the needle roller bearing from the outer column (Figure 141).

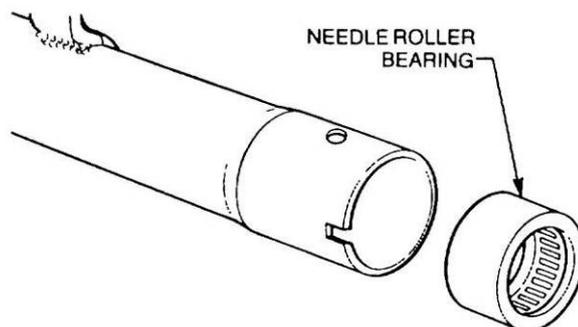


Figure 141 Removal of the Upper Column Bearing

103. Cleaning and Inspection. Clean and inspect the steering column as follows:

- a. Clean all components of the steering column using a recommended cleaning agent and blow them dry with compressed air.
- b. Inspect all parts for cracks or excessive wear and replace parts as necessary.

104. Reassembly. Reassemble the steering column as follows:

- a. Press a new lower bearing on the inner shaft and fit the retaining collar. Ensure the collar fits against the bearing and the roll-pinholes are aligned. Install a new roll-pin.
- b. Press in a new needle roller bearing to the top of the steering column, ensuring that a gap of 10 mm (0.39 in) is obtained from the bearing to the end of the column (Figure 142).

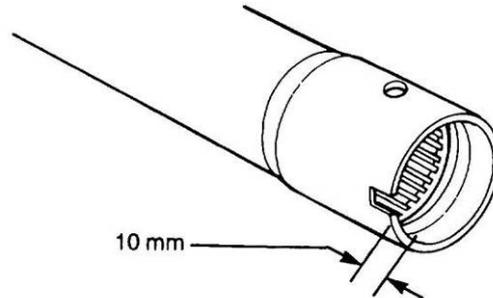


Figure 142 Installation of the Upper Column Bearing

- c. Ensure that both bearings are adequately lubricated with grease and insert the inner shaft and lower bearing into the outer column and secure it with the circlip.

105. Installation. Install the steering column as follows:

- a. Install the main support bracket and rubber packing on the steering column and manoeuvre the column into position in the vehicle.
- b. Loosely secure the main support bracket to the firewall with the two bolts (Figure 139).
- c. Fit the clamp and rubber packing strip to the column and loosely secure them with the two bolts.
- d. Loosely secure the lower end of the column to the lower support bracket with the two nuts and bolts (Figure 138).
- e. Loosely secure the clamp bracket to the main support bracket with the two bolts.
- f. From inside the vehicle, carefully move the instrument panel to one side and secure the tie bar to the column with the bolt. Tighten the bolt securely. Check that all electrical connections are secure, install the instrument panel and secure it with the five screws.
- g. Tighten the main support bracket bolts, clamp bracket bolts, upper clamp bolts and the lower support bracket nuts and bolts.
- h. Install the brake pedal bracket and tighten the six bolts securely.
- i. Install the brake servo and master cylinders and bleed the brake system in accordance with EMEI Vehicle G 203 – Group 12.
- j. Install the ignition switch mounting-bracket on the column and tighten the nuts and bolts securely.
- k. Install the switch cluster and secure it with the clamp screw. Reconnect the multi-pin connectors.
- l. Install the steering column shroud and secure it with the seven screws (Figure 136).

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.

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

NOTE

The collapsible shaft has the long joint fitted to the short length of the shaft and the short joint fitted to the long length. The joints can only be fitted to the shaft one way.

- o.** Ensure that the steering wheel and the front wheels are in the straight ahead position and that the match marks on the top universal joint and the steering column align. Install the collapsible shaft with the long length towards the steering box, fit the pinch bolts with new locknuts and torque them to 20 to 25 N.m (15 to 19 lbf.ft).
- p.** Connect the battery.

Power Steering Pump

106. Disassembly. Disassemble the power steering pump as follows:

- a.** Remove the power steering pump from the engine in accordance with EMEI Vehicle G 203 – Group 14. Discard all O rings during the disassembly procedure.

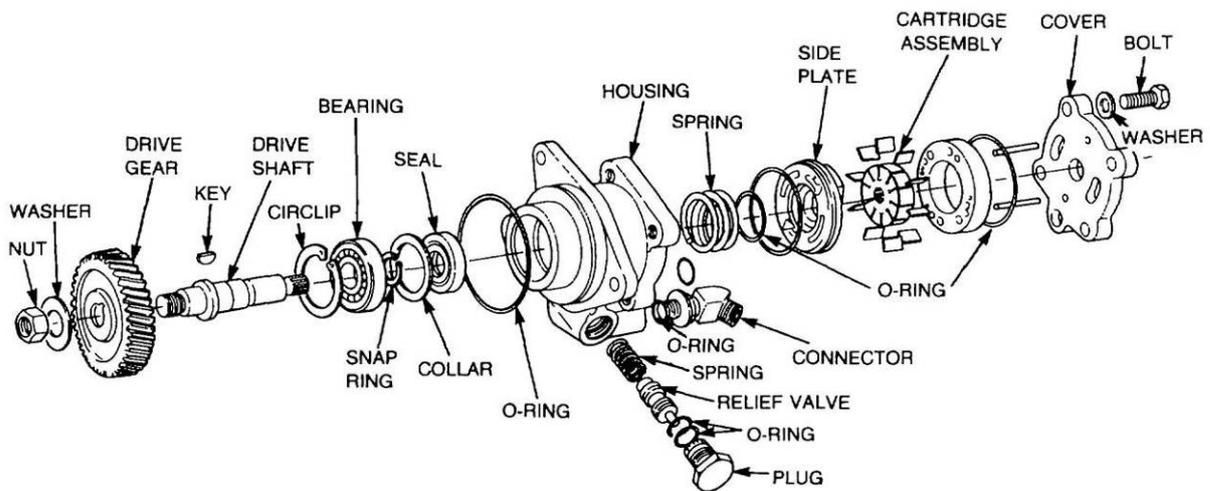


Figure 143 Disassembly of the Power Steering Pump

- b.** Secure the pump in a vice with the cover facing up.
- c.** Remove the plug from the pump body and withdraw the flow control assembly (Figure 144).

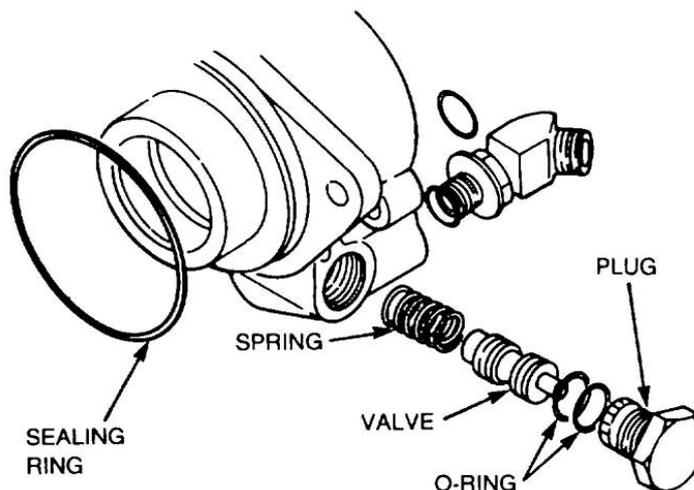


Figure 144 Removal of the Flow Control Assembly

- d.** Remove the four bolts and washers securing the cover to the power steering pump (Figure 145) and remove the cover.

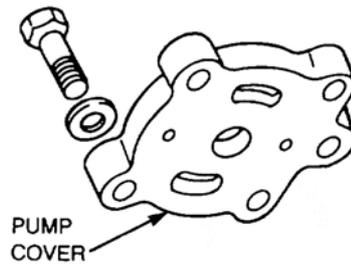


Figure 145 Removal of the Steering Pump Cover

- e. Remove the power steering pump from the vice and by gently shaking the pump, remove the cartridge and spring (Figure 146).

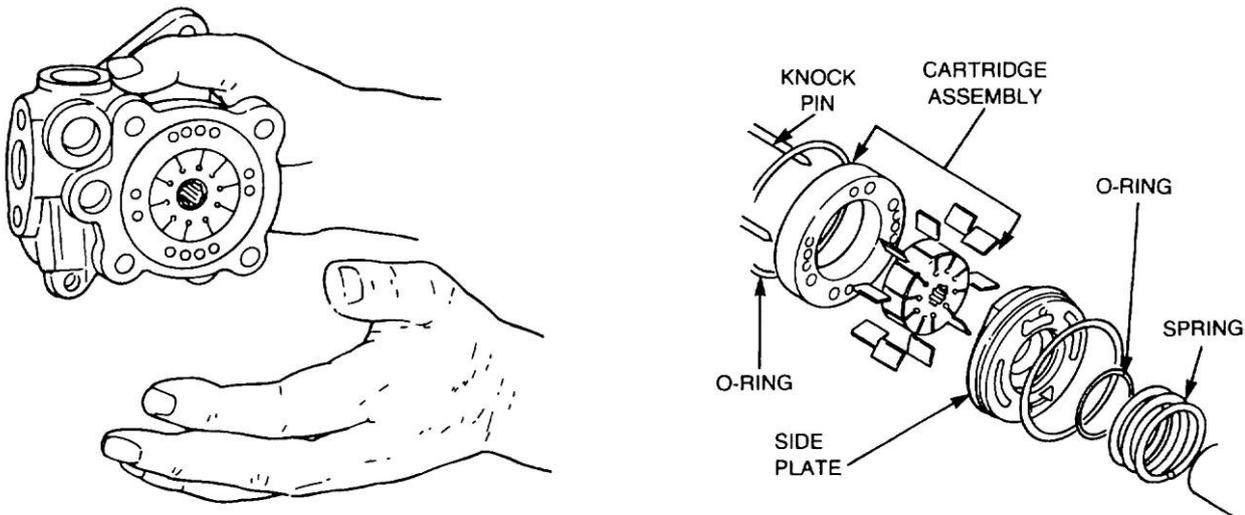


Figure 146 Removal of the Cartridge and Coil Spring

- f. Resecure the pump in the vice.
- g. Remove the nut and washer securing the oil pump drive gear to the shaft. Remove the drive gear from the shaft (Figure 147).

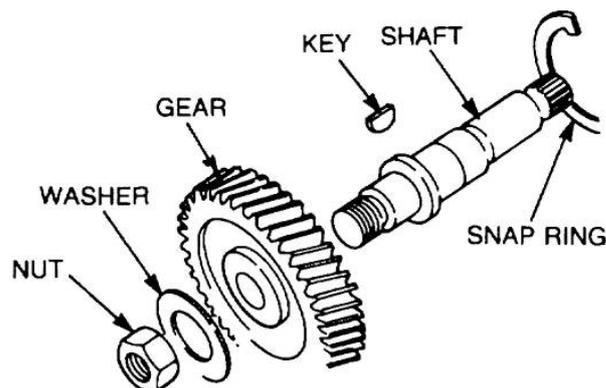


Figure 147 Removal of the Drive Gear

- h. Using pointed nose pliers, remove the snap-ring. Remove the pump shaft from the housing by lightly tapping the shaft with a soft hammer (Figure 148).

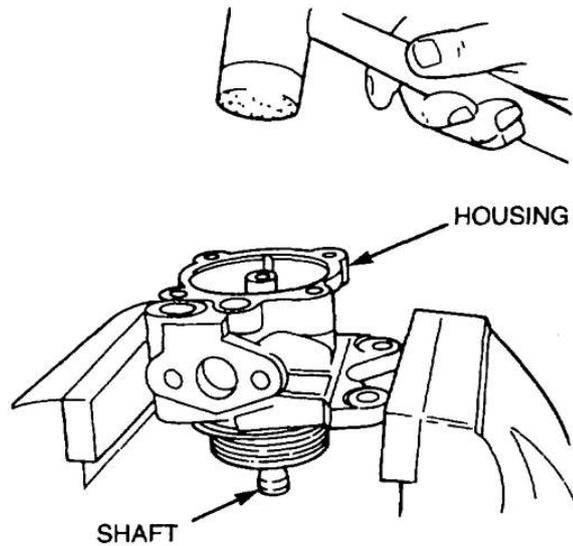


Figure 148 Removal of the Pump Shaft from the Housing

- i. Using a suitable lever pry the oil seal from the pump housing. Remove the snap-ring retaining the bearing (Figure 149) and remove the bearing from the housing.

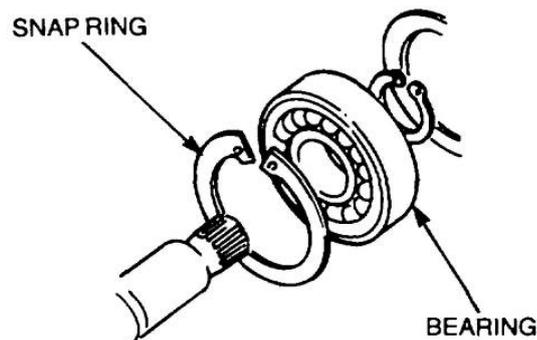
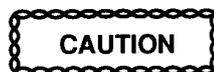


Figure 149 Removal of the Snap Ring and Bearing

107. Cleaning and Inspection. Clean and inspect the power steering pump as follows:

- a. Thoroughly clean all the parts with a solvent which is compatible with the system fluid. Dry all the parts with filtered, dry compressed air.



Keep all the parts clean during inspection and reassembly otherwise damage of close tolerance parts will result.

- b. **Cartridge Assembly.** Inspect the wearing surfaces of the body, cam-ring and rotor for scoring or excessive wear. Remove light score marks by lapping and replace heavily scored or badly worn parts. Inspect the vanes for burrs, wear or excessive play in the rotor slots. Replace badly worn or scored parts (Figure 150).

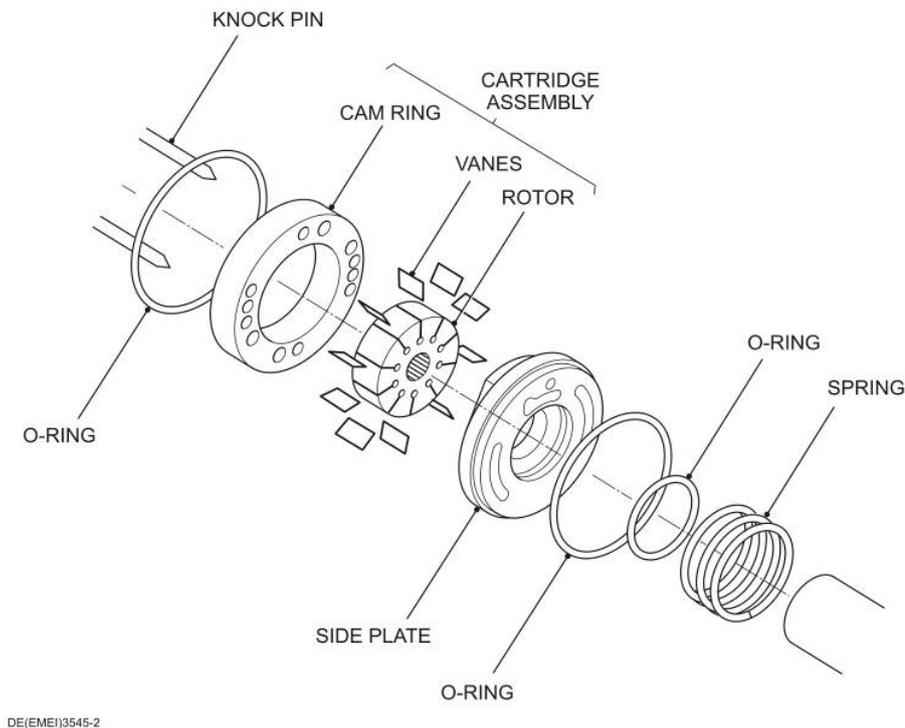


Figure 150 Power Steering Pump - Exploded View

- c. Inspect the oil seal wearing surface on the shaft for scoring or wear. If marks are present and cannot be removed by lightly polishing, replace the shaft.
- d. **Flow Control Valve Assembly.** Check for free movement of the relief valve in the housing bore. Manually operate the spool control valve in its housing and check that it does not stick. Remove any burrs with light polishing but take care not to round off the sharp edges of the lands. Do not attempt to rework the housing bore. Replace the housing if the bore is damaged. Measure the outside diameter of the flow control valve spool and the inside diameter of the housing bore, if the difference between the two measurements exceeds 0.030 mm (0.0012 in), replace the control valve spool.

108. Reassembly. Reassemble the power steering pump as follows:

- a. Apply a suitable lubricant to all parts prior to reassembly. A small amount of petroleum jelly can be used to hold the O rings in position during reassembly.



Due to the possibility of damage to the machined cartridge parts during handling and shipping, all sharp edges should be oil-stoned prior to reassembly.

- b. Secure the pump body in a vice and using a suitable mandrel, tap the oil seal into position in the pump body. Lubricate the seal lip with petroleum jelly.
- c. Position the Woodruff key in the key-way on the drive-shaft. Install the drive gear on the drive shaft and secure it with the washer and nut. Torque the nut to 73 to 84 N.m (54 to 62 lbf.ft).
- d. Support the bearing, press the shaft into the bearing and install the bearing retainer snap-ring.
- e. Install the snap-ring in the groove on the bearing and slide the shaft and collar into the body until the bearing is correctly seated. A light tap with a soft hammer may be necessary to correctly seat the bearing.
- f. Install the inner and outer O rings to the side plate and install the spring and the side plate into the pump body.

- g.** Assemble the cartridge assembly, ensuring that the R-shaped area of the vanes touch the surface of the cam ring profile.
- h.** Install the cartridge into the pump body, ensuring that the reference holes in the side plate and cam ring are aligned.
- i.** Fit the O ring into the pump body, install the locating pins in the side cover and position the cover on the pump. Install the bolts and torque them to 30 to 40 N.m (22 to 30 lbf.ft).
- j.** Insert the flow control spring, valve and O rings into the bore in the body and install the O ring on the plug. Install the plug and torque it to 73 to 84 N.m (54 to 62 lbf.ft).
- k.** Carefully fit the discharge connector and torque it to 68 to 78 N.m (50 to 58 lbf.ft).

Steering System Specifications

109. The steering system specifications are detailed in Table 19.

Table 19 Steering Specifications

Serial	Item	Specification
1	Steering box to chassis tightening torque	80 N.m (60 lbf.ft)
2	Collapsible shaft universal joint tightening torque	20 to 25 N.m (15 to 19 lbf.ft)
3	Steering wheel tightening torque	38 N.m (28 lbf.ft)
4	Tie bar to Panhard rod mounting arm tightening torque	80 N.m (60 lbf.ft)
5	Drag-link to drop-arm tightening torque	40 N.m (30 lbf.ft)
6	Upper steering column bearing to column installation distance	10 mm (0.39 in.)
7	Power steering pump flow control valve spool to spool hole clearance	0.030 mm (0.0012 in.)
8	Power steering pump gear to drive shaft tightening torque	73 to 84 N.m (54 to 62 lbf.ft)
9	Power steering pump side cover to pump body tightening torque	30 to 40 N.m (22 to 30 lbf.ft)
10	Power steering pump control valve plug tightening torque	73 to 84 N.m (54 to 62 lbf.ft)
11	Power steering pump discharge connector tightening torque	68 to 78 N.m (50 to 58 lbf.ft)

Steering System Fault Finding

110. The steering system fault finding is detailed in Table 20.

Table 20 Steering Fault Finding

Serial	Symptom	Probable Cause	Action
1	Oil leaking at output shaft of steering box	Clogged oil filter in reservoir (high back pressure)	Replace the reservoir
		Restricted oil return line	Check and rectify as necessary
2	Oil leaking between reservoir and pump	Loose at connections or adaptor	Check and rectify as necessary
		Damaged pressure or return lines	Replace as necessary
3	Oil forced from the oil reservoir	Clogged oil filter in reservoir	Replace the reservoir
		Air in system	Bleed the system and check for air leaks
4	Engine oil in the power steering reservoir	Faulty oil pump shaft seal	Repair the power steering pump
5	No power steering on cold start	Vanes in power steering pump not extending	Increase engine speed to extend vanes and start pump action. Usually a temporary or infrequent occurrence, pump repair or replacement not required
6	Hard steering	Faulty power steering pump	Repair or replace the pump

BODY

Bonnet

111. **Removal.** Remove the bonnet as follows:

- a. Remove the de-ditching tools from the bonnet.
- b. Open the bonnet and remove the split pin securing the clevis pin in the bonnet stay (Figure 151). Remove the clevis pin to allow the stay to be detached.

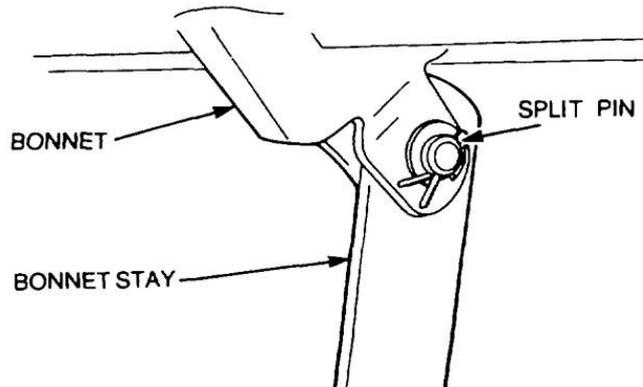


Figure 151 Removal of the Bonnet

- c. Raise the bonnet to the vertical position and lift it clear of the hinges.

112. **Installation.** Install the bonnet as follows:

- a. Ensuring the two rubber sleeves are positioned with the slots uppermost in the hinges, lower the bonnet vertically to allow the bonnet hinge brackets to engage in the slots.
- b. Position the stay in the bracket (Figure 151) and install the clevis pin and split pin.
- c. Adjust the bonnet in accordance with EMEI Vehicle G 203 – Group 17.
- d. Close the bonnet and fit the de-ditching tools.

Mudguard — Front Left

113. **Removal.** Remove the mudguard as follows:

- a. Disconnect the battery.
- b. Remove the bonnet (Para 111.).
- c. Remove the three screws and washers securing the windscreen washer container to the inner guard. Disconnect the hoses from the washer pump and remove the container.
- d. Remove the six screws securing the shock absorber turret cap to the inner guard. Remove the cap.
- e. Remove the eight screws securing the front grille and remove the grille.
- f. Remove the connector from the spade terminal on the horn.
- g. Remove the two bolts and washers securing the grille panel to the mudguard.
- h. Remove the nut, washers and bolt securing the mudguard to the chassis bracket and remove the packing plates if fitted (Figure 152).

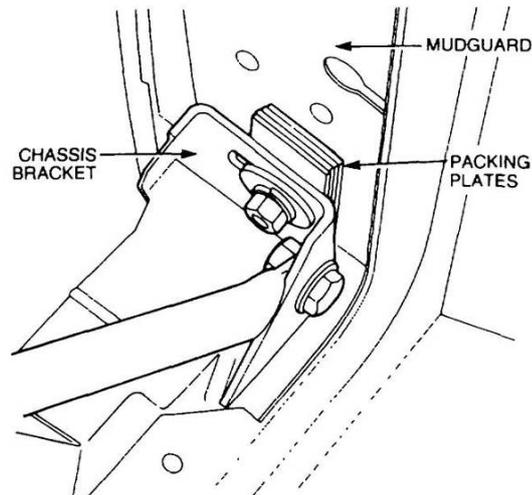


Figure 152 Removal of the Left Mudguard

- i. Remove the three bolts and washers securing the top left radiator support bracket to the mudguard.
- j. Using a suitable pin punch remove the sixteen pins from the wheel arch trim plastic retaining clips and remove the trim from the mudguard. Retain the pins.
- k. Tag and disconnect the wiring harnesses from the front lighting. Remove the bolt, washer and nut securing the earth leads to the inner guard. Remove the harnesses from the securing clips.
- l. Remove the bolt and flat washer securing the top of the mudguard to the firewall bracket (Figure 153).

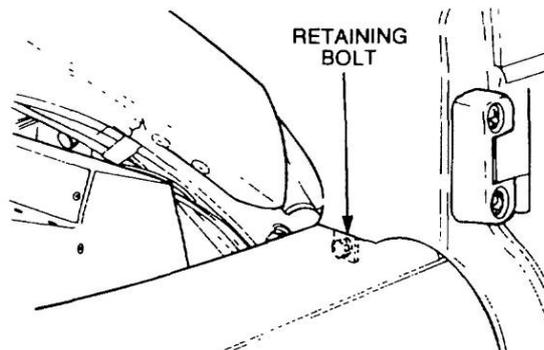


Figure 153 Removal of the Mudguard-to-firewall Bracket

- m. Remove the two bolts and washers securing the mudguard to the sill panel.
- n. Remove the two screws and washers securing the inner guard to the toe board bracket (Figure 154).

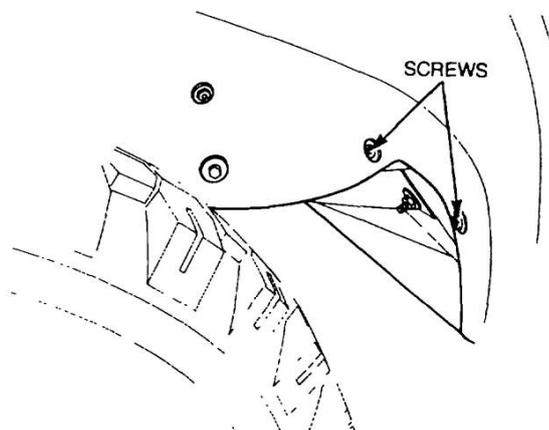


Figure 154 Removal of the Mudguard-to-toe Board Bracket

- o. Remove the four bolts and washers securing the mudguard to the A-post.
- p. Remove the two bolts and washers securing the inner guard to the chassis mounting.
- q. Carefully remove the mudguard complete with the inner guard by tilting the rear end upwards and tilting the mudguard outwards to clear the shock absorber turret.

114. Installation. Install the mudguard as follows:

- a. Position the mudguard complete with the inner guard on the vehicle and secure the inner guard to the chassis mounting with the two bolts and washers. Do not tighten them at this stage.
- b. Secure the mudguard to the A-post with the four bolts and washers, but do not tighten them.
- c. Secure the inner guard to the toe-board bracket with the two screws and washers, but do not tighten them.
- d. Install the two bolts and washers that secure the mudguard to the sill panel, but do not tighten them.
- e. Secure the top rear of the mudguard to the firewall bracket with the bolt and washer.
- f. Position the mudguard on the grille panel and install the two bolts and washers.
- g. Install the packing plates (if required) between the mudguard and chassis bracket (Figure 152) and fit the bolt, washers and nut.
- h. Install the three bolts and washers that secure the left-side top radiator support bracket to the mudguard and tighten the bolts securely.
- i. Tighten all bolts and screws securing the mudguard and inner guard to the vehicle. Connect the wiring harnesses to the front lights and horn and secure them to the inner guard with the clips. Secure the earth leads to the inner guard with the bolt, washer and nut and tighten it securely.
- j. Position the wheel arch trim on the mudguard and secure it with the plastic clips and pins.
- k. Install the windscreen washer container on the inner guard and secure it with the three screws and washers. Connect the two hoses to the washer pump.
- l. Install the bonnet (Para 112).
- m. Connect the battery.

Mudguard – Front Right

115. Removal. Remove the mudguard as follows:

- a. Disconnect the battery cables and remove the battery and carrier.
- b. Remove the bonnet (Para 111.).
- c. Remove the screw securing the expansion tank strap. Remove the tank from the bracket and secure it away from the mudguard.
- d. Remove the power steering fluid reservoir in accordance with EMEI Vehicle G 203 – Group 14.
- e. Remove the six screws securing the shock absorber turret cap to the inner guard and remove the cap.
- f. Remove the eight screws securing the front grille and remove the grille.
- g. Remove the bolt, washer and nut securing the air-intake clamp to the inner-guard. Remove the two bolts and washers securing the steering shaft cover to the inner guard and remove the cover.
- h. Remove the two bolts and washers securing the grille panel to the mudguard.
- i. Remove the nut, washers and bolt securing the mudguard to the chassis bracket and remove the packing plates if fitted (Figure 155).

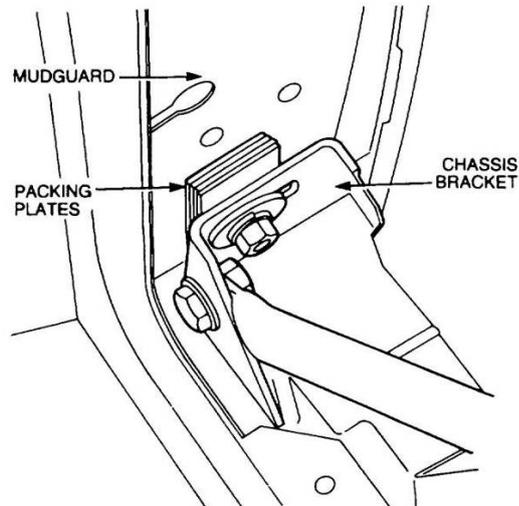


Figure 155 Removal of the Right Mudguard

- j.** Remove the three bolts and washers securing the top right radiator support bracket to the mudguard.
- k.** Using a suitable pin punch remove the sixteen pins from the wheel arch trim plastic retaining clips and remove the trim from the mudguard. Retain the pins.
- l.** Tag and disconnect the wiring harnesses from the front lighting. Remove the bolt, washer and nut securing the earth leads to the inner guard. Remove the harnesses and bonnet release cable from the securing clips.
- m.** Remove the bolt and flat washer securing the top of the mudguard to the firewall bracket (Figure 156).

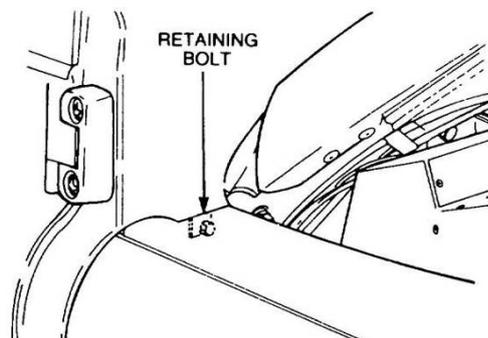


Figure 156 Removal of the Mudguard-to-firewall Bracket

- n.** Remove the two bolts and washers securing the mudguard to the sill panel.
- o.** Remove the two screws and washers securing the inner guard to the toe board bracket (Figure 157).

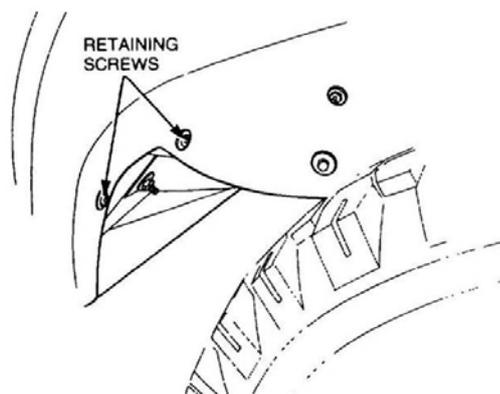


Figure 157 Removal of the Mudguard-to-toe Board Bracket

- p. Remove the four bolts and washers securing the mudguard to the A-post.
- q. Remove the two bolts and washers securing the inner guard to the chassis mounting.
- r. Carefully remove the mudguard complete with the inner guard by tilting the rear end upwards and tilting the mudguard outwards to clear the shock absorber turret.

116. Installation. Install the mudguard as follows:

- a. Position the mudguard complete with the inner guard on the vehicle and secure the inner guard to the chassis mounting with the two bolts and washers. Do not tighten them at this stage.
- b. Secure the mudguard to the A-post with the four bolts and washers, but do not tighten them.
- c. Secure the inner guard to the toe-board bracket with the two screws and washers, but do not tighten them.
- d. Install the two bolts and washers that secure the mudguard to the sill panel, but do not tighten them.
- e. Secure the top rear of the mudguard to the firewall bracket with the bolt and washer.
- f. Position the mudguard on the grille panel and install the two bolts and washers.
- g. Install the packing plates (if required) between the mudguard and chassis bracket (Figure 155), and fit the bolt, washer and nut.
- h. Install the three bolts and washers that secure the right-side top radiator support bracket to the mudguard and tighten the bolts securely.
- i. Tighten all bolts and screws securing the mudguard and inner guard to the vehicle.
- j. Connect the wiring harnesses to the front lights and secure them to the inner guard with the clips. Secure the earth leads to the inner guard with the bolt, washer and nut and tighten them securely. Secure the bonnet release cable to the inner guard with the clips.
- k. Position the wheel arch trim on the mudguard and secure it with the plastic clips and pins.
- l. Secure the air-intake clamp to the inner guard with the bolt, washer and nut and tighten them securely. Install the steering shaft cover to the inner guard and tighten the two bolts securely.
- m. Install the expansion tank and the retaining strap and secure it with the screw.
- n. Install the shock absorber turret cap and secure it with the six screws.
- o. Install the power steering fluid reservoir in accordance with EMEI Vehicle G 203 – Group 14.
- p. Install the bonnet (Para 112.).
- q. Connect the battery.

Doors

117. Removal. Remove the doors as follows:

- a. Remove and discard the split pin securing the door check strap clevis pin. Remove the clevis pin and flat washer (Figure 158).
- b. Support the door and remove the four locknuts, special plastic washers and bolts that secure the hinges to the door. Remove the door.

118. Installation. Install the doors as follows:

NOTE

The special plastic washers must be fitted with the taper towards the door.

- a. Support the door, position the hinges and install the four bolts. Fit the special plastic washers with the taper towards the door frame and install the locknuts. Tighten the four locknuts securely.
- b. Ensure the door lock aligns with the striker plate and if necessary reposition as required.
- c. Install the check strap into the firewall bracket and insert the clevis pin and flat washer. Secure the clevis pin with a new split pin.

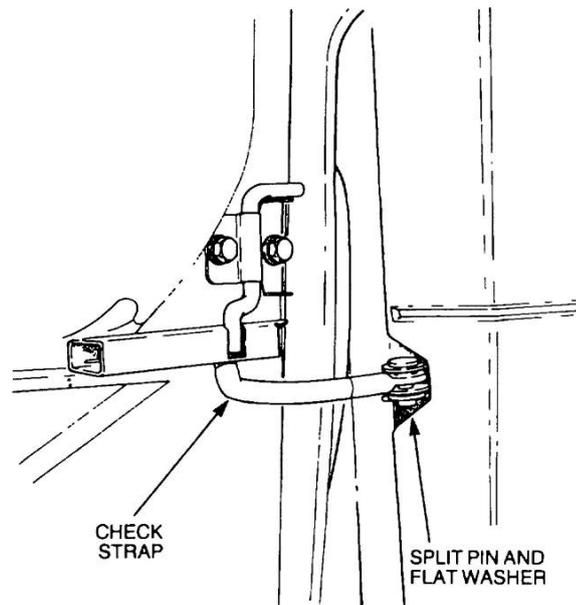


Figure 158 Removal of the Door

Windscreen Glass

119. **Replacement.** Replace the windscreen glass as follows:

NOTE

It will be necessary to utilise a second person to assist in the replacement of the windscreen glass.

- a. Apply even pressure to the inside face of the glass and push the glass and rubber surround out of the frame.
- b. Remove all trace of hardened sealer from the frame.
- c. Install the windscreen rubber on the glass.
- d. Using approximately four metres of rope with a diameter of 7 mm, insert the rope into the groove of the rubber (Figure 159), starting at the bottom centre of the glass and leaving enough rope at the start to enable it to be pulled on installation.

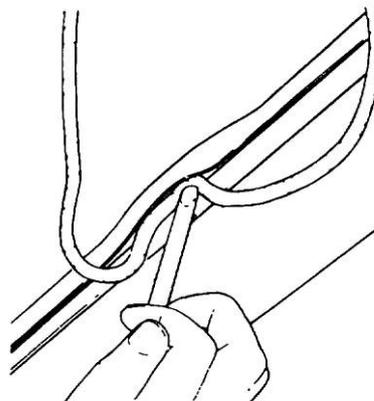


Figure 159 Installing Rope into the Rubber Seal

- e. Using a solution of soap and water, lubricate the rope and rubber thoroughly (Figure 160).

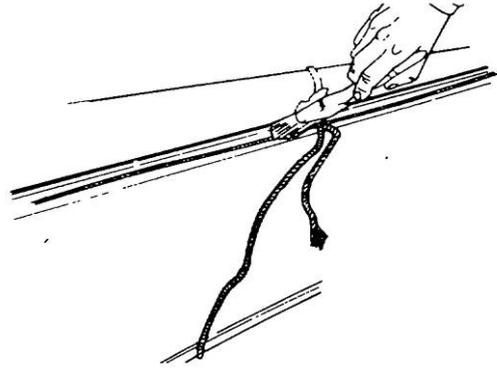


Figure 160 Applying Soap Solution to the Rubber Seal

- f. Apply a thin bead of suitable sealant to the front face of the windscreen frame flange (Figure 161).

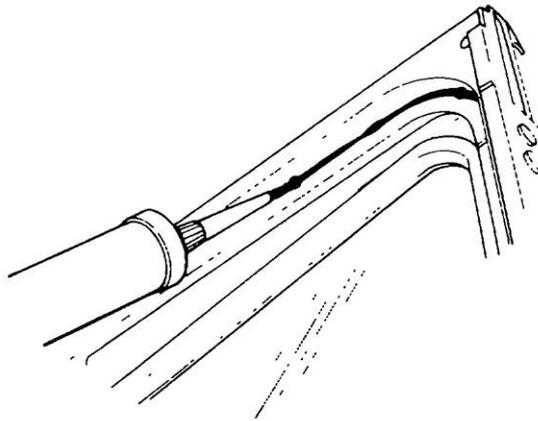


Figure 161 Applying Sealant to the Windscreen Frame

- g. Position the windscreen glass and rubber in the frame (Figure 162) ensuring that the etched motif on the glass is toward the bottom of the frame.

NOTE

The inside of the face of the glass can be determined by the etched motif.

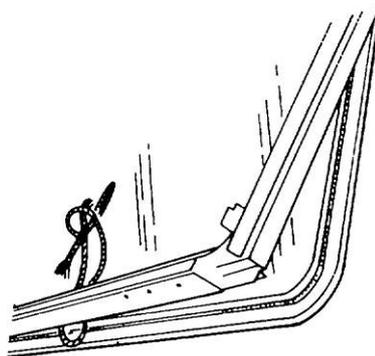


Figure 162 Installation of the Windscreen Glass

- h. Push on the glass continuously and pull one end of the rope around the rubber until the frame flange is correctly located. If the corners are not fitting correctly, remove the glass, install the rope and repeat Paras 116. g. and h. until it is installed.
- i. Press the inside face of the rubber seal to ensure that the glass is seating correctly.

CAB HEATING/COOLING

Heater Assembly

120. Removal. Remove the heater assembly as follows:

- a. Using a suitable container drain the engine cooling system, if necessary open the heater controls to allow the heater to be completely drained.
- b. Remove the seven screws securing the ducting and grille to the left-side front mudguard and remove the ducting.
- c. Disconnect the securing clip and cable from the air directional control lever (Figure 163).

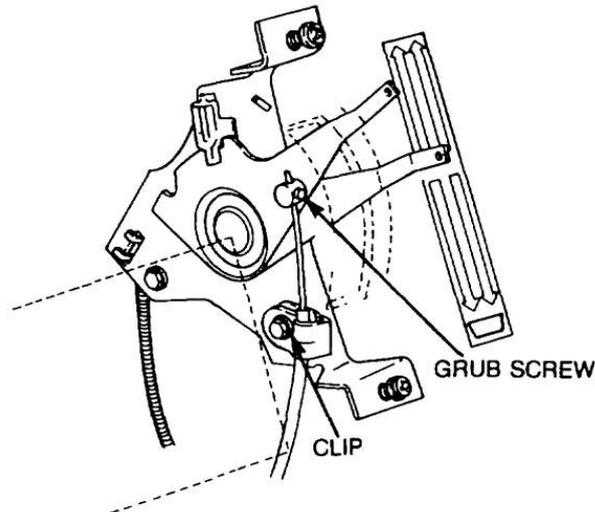


Figure 163 Removal of the Heater Assembly

- d. Slacken the hose clamps securing the inlet and outlet hoses to the pipes and disconnect the hoses.
 - e. Disconnect the securing clip and cable from the temperature control lever.
 - f. Remove the two bolts that secure the top of the heater assembly to the firewall.
 - g. Disconnect the wiring harness at the three-pin connector.
 - h. Remove the two bolts that secure the lower mounting bracket to the firewall and remove the heater assembly.
- 121. Disassembly.** Disassemble the heater assembly as follows:

- a. Using a suitable drill remove the four rivets securing the resistor plate to the case (Figure 164), withdraw the resistor and plate assembly.

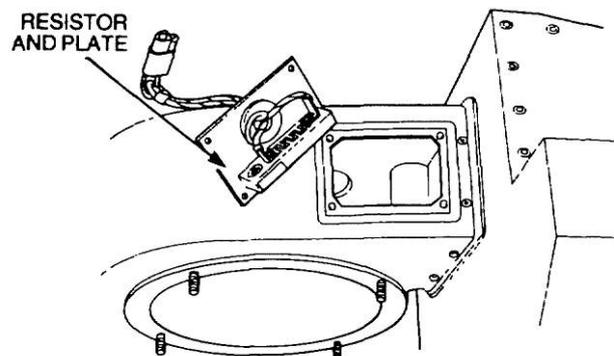


Figure 164 Removal of the Resistor and Plate

- b. Using a suitable drill, remove the twenty four rivets securing the panel to the heater case, noting that three of the rivets are located beneath the foam seal. Remove the panel and heater radiator (Figure 165).

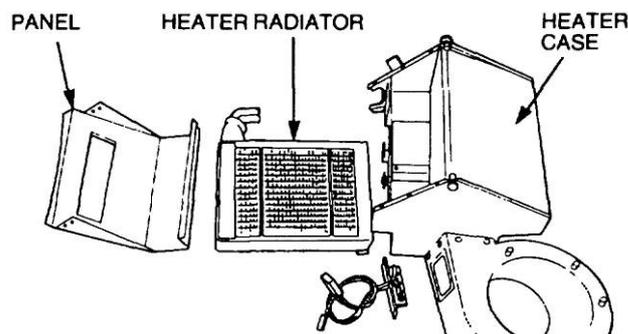


Figure 165 Heater Assembly - Exploded View

122. **Cleaning and Inspection.** Clean and inspect the heater assembly as follows:
- Inspect the radiator for damaged seams, choked or damaged fins, corrosion and restrictions in the core. Replace the radiator as necessary.
 - Remove all traces of sealing compound from the case and panel.
123. **Reassembly.** Reassemble the heater assembly as follows:
- Install the heater radiator in the case. Apply a suitable sealing compound around the rivet faces and install the panel. Secure the cover with pop rivets.
 - Apply a suitable sealing compound to the resistor plate and install the plate on the case. Secure the plate with pop rivets.
124. **Installation.** Install the heater assembly as follows:
- Position the heater assembly on the firewall then install the four mounting bolts and tighten them securely.
 - Install both the temperature and air directional cables and secure them with the clip and grub screw. Ensure that when the dash-mounted levers are operated, full travel is obtained at the heater assembly.
 - Install the inlet and outlet heater hoses and secure them with the hose clamps.
 - Refill the cooling system in accordance with EMEI Vehicle G 203 – Group 2.
 - Install the ducting and mudguard grille and secure them with the seven screws.

WINCH

125. **Removal.** Remove the winch as follows:

- a. Remove the 3/8 in UNC Allen screw securing the winch driveline universal joint to the winch input shaft (Figure 166).

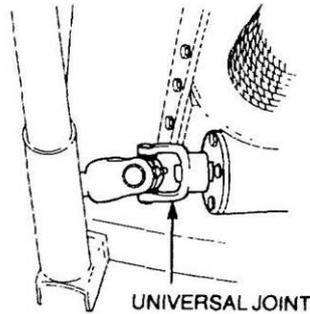


Figure 166 Disconnection of the Winch Input Shaft Universal Joint

NOTE

The universal joint may need to be prised off the shaft. Take care not to lose the key fitted to the shaft.

- b. Remove the chain from the towing eyes.
- c. Remove the two bolts securing the winch rear support bracket to the lugs attached to the chassis rails.
- d. Using a suitable jack, support the weight of the winch and remove the four bolts securing the fairlead frame to the chassis (Figure 167). Carefully pull the winch and fairlead frame forward to allow the universal joint to slide off the input shaft and to clear the chassis ends.

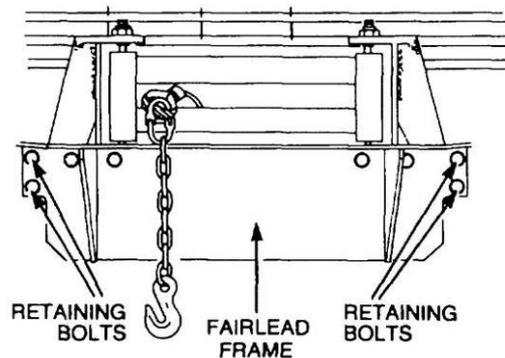


Figure 167 Removal of the Fairlead Frame to the Chassis

- e. Remove the four bolts securing the fairlead frame to the winch housing and remove the frame (Figure 168). Feed the winch rope and chain through the fairlead rollers.

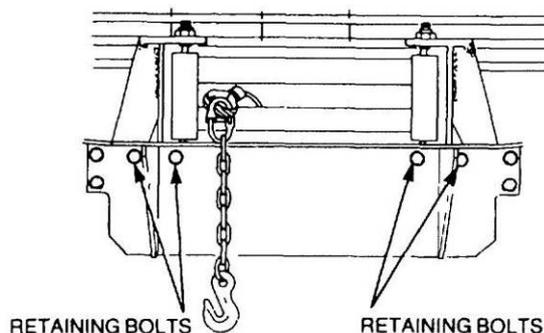


Figure 168 Removal of the Fairlead Frame to Winch Housing

- f.** Remove the four bolts securing the winch rear support bracket to the housing. Remove the bracket and discard the washers.
- g.** Remove the winch assembly from the supporting jack.

126. Installation. Install the winch as follows:

NOTE

Use a suitable sealing compound on all bolts installed into the winch gear housing to prevent oil leakage.

- a.** Position the winch rear support bracket on the winch housing, install the four bolts and washers and torque them to 77 N.m (57 lbf.ft).
- b.** Position the fairlead frame on the winch housing and install the four bolts and washers. Do not tighten them fully.
- c.** Support the weight of the winch assembly on the jack. Position the winch in between the chassis rails and fit the universal joint onto the input shaft ensuring the key is correctly located.
- d.** Secure the rear support bracket to the chassis rail lugs and tighten the two bolts securely.
- e.** Install the four bolts (Figure 167) and torque them to 77 N.m (57 lbf.ft). Torque the four bolts securing the fair-lead frame to the winch housing to 77 N.m (57 lbf.ft).
- f.** Ensure that the drive line universal joint is fully installed on the input shaft and tighten the Allen screw.
- g.** Secure the chain to the front towing eyes and remove the jack.
- h.** Functionally test the winch operation.

Winch System Specifications

127. The winch system specifications are detailed in Table 21.

Table 21 Winch Specifications

Serial	Item	Specification
1	Winch to rear support bracket tightening torque	77 N.m (57 lbf.ft)
2	Winch frame to chassis tightening torque	77 N.m (57 lbf.ft)
3	Fairlead frame to winch tightening torque	77 N.m (57 lbf.ft)

END

Distribution List: **VEH G 20.0 – Code 2** (Maint Level)
(Sponsor: CGSVSPO, Light B Vehicles)
(Authority: EC-006638)