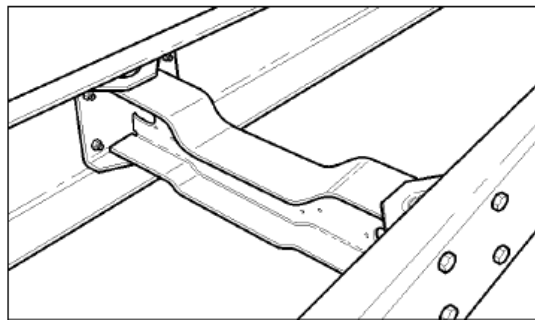


**TRUCK, HEAVY, MC3, MACK – ALL TYPES**  
**CHASSIS FIVE-PIECE CROSSMEMBER REPLACEMENT**  
**MISCELLANEOUS INSTRUCTION**

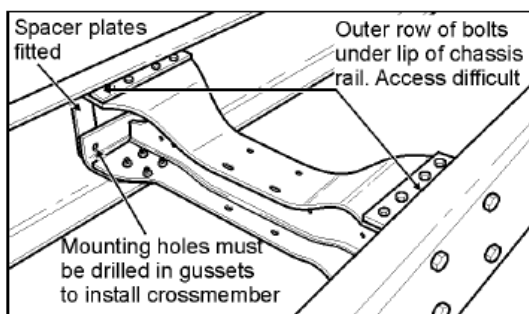
This instruction is authorised for use by command of the Chief of Army. It provides direction, mandatory controls and procedures for the operation, maintenance and support of equipment. Personnel are to carry out any action required by this instruction in accordance with EMEI General A 001.

**INTRODUCTION**

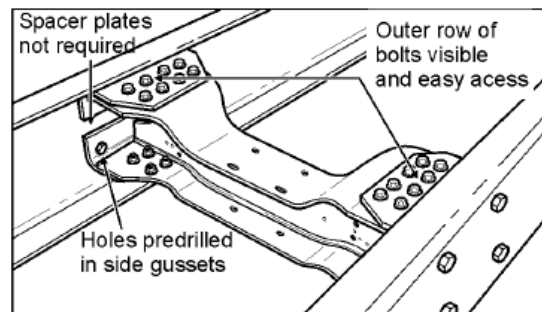
1. This instruction details the replacement of the front, inverted, one piece chassis crossmember on the Truck, Heavy, MC3, Mack, when the crossmember fails. The procedure is written specifically to assist workshops in fitting a new five-piece crossmember in the field. Although not specific to it, reference can be made to this instruction when replacing the early style five-piece crossmember (Figure 1). The new five-piece crossmember is of an improved construction, will reduce the probability of failure, and reduce repair time.



One Piece Construction



Five-piece Construction (Early Style)



Five-piece Construction (New Type)

**Figure 1 Crossmember Identification**

2. **Associated Publications.** Reference may be necessary to the latest issue of the following documents:
- [EMEI Vehicle G 799-16](#) – Chassis Welding;
  - [Material Safety Data Sheets \(MSDS\)](#);
  - EMEI Workshop E Series – Occupational Health and Safety;
  - [EMEI Vehicle G 703](#) – Truck, Cargo, Heavy, MC3 – Unit Repair;
  - [EMEI Vehicle G 733](#) – Truck, Dump, Heavy, MC3 – Unit Repair;
  - Technical Regulation of Army Materiel Manual (TRAMM);
  - [TRAMM, Volume 3, Section 2, Chapter 2](#), Fleet Engineering Change Management Process;
  - [Defence Supply Chain Manual \(DSCM\)](#); and
  - [Defence Safety Manual \(SAFETYMAN\)](#).

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**3. Application.** This repair is to be carried out to all Trucks, Heavy, MC3 – Mack when cracks in the front inverted crossmember exceed 50 mm in length.

**NOTE**

This repair is only to be carried out on those vehicles with cracks in the crossmember that exceed 50 mm in length, or if cracks have caused sections of the crossmember to separate. Cracks that are less than 50 mm in length are to be repaired in accordance with EMEI Vehicle G 799-16 Chassis Welding.



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

**4. Action Required.** Actions detailed in this instruction are to be performed by technical maintenance organisations authorised to carry out Medium or Heavy Grade Repairs. The repair is only to be performed by the following tradespersons:

- a. ECN 229 Vehicle Mechanic, or
- b. Civilian equivalent.

**5. Estimated Workhours.** For initial planning purposes only, it is estimated that this modification will take 12 workhours to perform.

**NOTE**

In Table 1, Item 2 of the Stores Required list must only to be requisitioned by technical maintenance organisations authorised to carry out up to Medium Grade Repair. of Table 1, Item 2 is not required at Heavy Grade Repair level.

**6. Stores Required.** The stores required are listed in Table 1. The stores will be supplied as a crossmember assembly (Table 1, Item 1), and for technical maintenance organisations authorised to carry out up to Medium Grade Repair, an accompanying installation kit (Table1, Item 2). All stores are to be demanded through normal supply channels.

**7. Crossmember Replacement.** Units are only to replace the crossmember with the new type crossmember (Figure 1). Re-build lines may use the early style crossmember (Figure 1).

**8. Items to be Removed.** The items to be removed are listed in Table 2. All stores removed are to be processed in accordance with the Defence Supply Chain Manual (DSCM).

**DETAIL**

**9. Preparation of the Vehicle.** Prepare the vehicle as follows:

A rectangular warning box with a thick black border and the word "WARNING" in bold, uppercase letters.

**Prior to commencing work on the vehicle ensure that the batteries are disconnected and the air system is drained. Safety glasses are to be worn when working under the vehicle.**

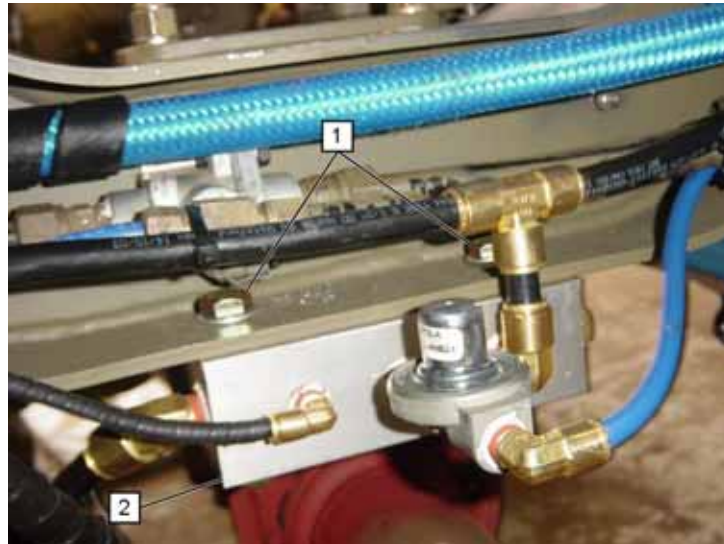
A rectangular warning box with a thick black border and the word "WARNING" in bold, uppercase letters.

**To remove the risk of explosion, TTF variants are to be degassed prior to entering the workshop.**

- a. Steam clean the area around the front inverted crossmember to remove all traces of oil, grease and combustible deposits.

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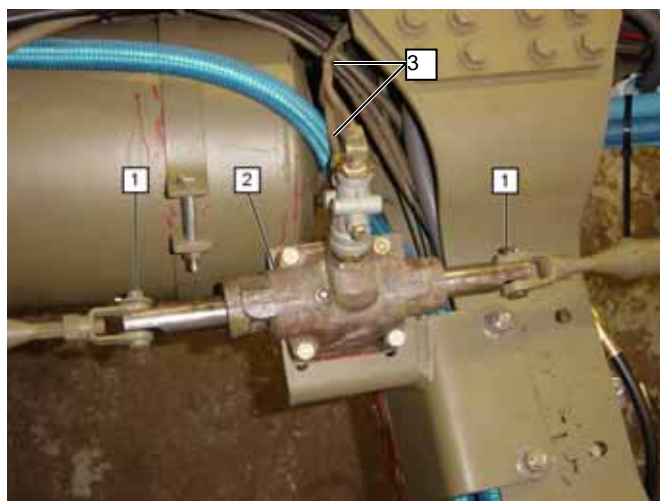
- b.** Locate the vehicle in a suitable area of the workshop over a servicing pit or on a hoist.
- c.** Disconnect the vehicle batteries.
- d.** Remove the fuel tank (LRV variant only) in accordance with EMEI Vehicle G 703.
- e.** Drain all the air reservoirs.
- f.** Tag and disconnect all the air line push-on fittings at the air filter manifold (if fitted) (Figure 2, Item 2).



- 1. Air filter manifold mounting bolts
- 2. Air filter manifold

**Figure 2 Air Filter Manifold Connections**

- g.** Remove the two lock-nuts, washers and bolts (Figure 2, Item 1) securing the air filter manifold (if fitted) to the crossmember.
- h.** Remove the air filter manifold.
- i.** Remove the power take-off (PTO) shaft (if fitted) in accordance with EMEI Vehicle G 703.
- j.** Remove the transfer case selector linkage (Figure 3, Item 1) from the transfer remote selector and tie it up.



- 1. Cotter pin
- 2. Transfer case remote selector housing
- 3. Air lines

**Figure 3 Transfer Case Selector Linkage Connections**

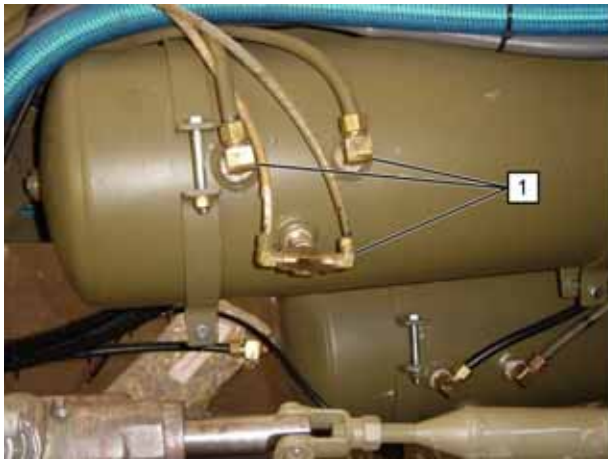
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- k. Tag and disconnect the two air lines (Figure 3, Item 3) from the transfer case remote selector shift valve.
- l. Remove the transfer case remote selector housing (Figure 3, Item 2) from the centre bearing support bracket.
- m. Remove the front axle propeller shaft in accordance with EMEI Vehicle G 703.
- n. Remove the centre bearing support bracket.

**NOTE**

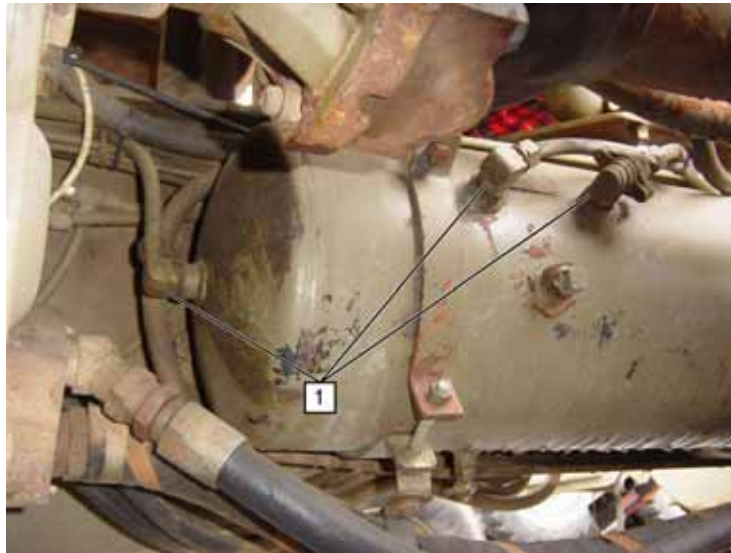
To assist in the identification of pneumatic components refer to EMEI Vehicle G 703.

- o. Tag and disconnect the primary upper reservoir air line connections (Figure 4, Item 1) and the secondary reservoir air line connections (Figure 5, Item 1) at the respective reservoirs.



1.Primary upper reservoir – air line connections

**Figure 4 Air Line Connections - Primary Upper Reservoir (Air Filter Fitted)**

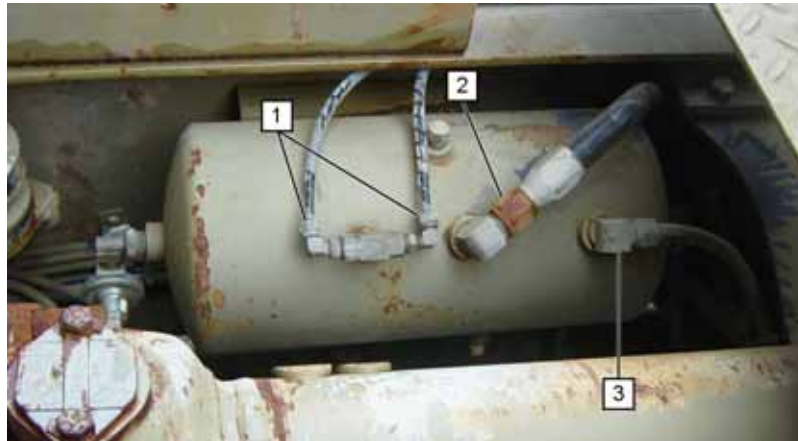


1. Secondary reservoir air line connections

**Figure 5 Air Line Connections - Secondary Reservoir (Air Filter Not Fitted)**

- p. Tag and disconnect the compressor supply air line (Figure 6, Item 2), the secondary reservoir supply air line (Figure 6, Item 3), the governor air lines (Figure 6, Item 1), and the air filter air line (if fitted) from the wet tank.

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1. Governor air lines
2. Compressor supply air line
3. Secondary reservoir supply air line

**Figure 6 Wet Tank Air Line Connections (Air Filter Not Fitted)**

- q. Carefully, pull the compressor charge air line, the secondary feed air line, and the governor feed air line through the crossmember and secure them clear of the crossmember.
- r. Remove the primary and secondary reservoirs.
- s. Tag and disconnect the connections at the double check valve (Figure 7, Item 1) centrally mounted on the front of the crossmember.



1. Double check valve

**Figure 7 Double Check Valve Connections**

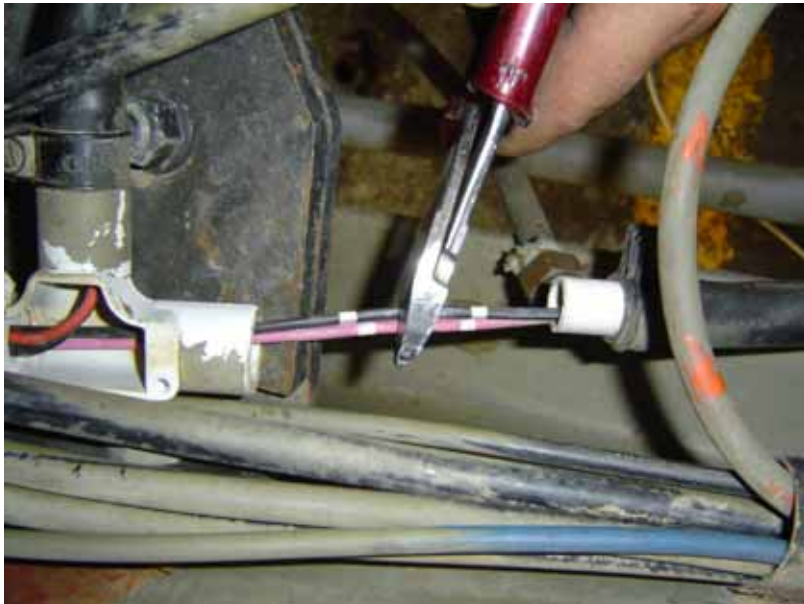
- t. Remove the locknut, flat washer and bolt securing the double check valve from the crossmember.
- u. Remove the double check valve.
- v. Tag and disconnect the air starter line at the air start reservoir.
- w. Note the position of, and remove all cable ties and clamps securing air lines to the front of the crossmember.
- x. Tie back all the air lines from the front of the crossmember.
- y. Note the position of, and remove all the clamps, cable ties and protective sleeves securing the air lines and the electrical lead to the rear of the chassis crossmember.
- z. Tag and cut the two leads of the transfer case HI-LO air switch solenoid (Fig 8, Item 1) approximately 150 mm from where the leads protrude out of the junction box on the left-hand side of the chassis (Figure 9);





1. Transfer case Hi-Lo air switch

**Figure 8 Transfer Case Hi-Lo Air Switch Connections**



**Figure 9 Electrical Leads - Cutting**

**CAUTION**

When tying back the air lines maintain a radius that does not put stress on the lines. Over bending of the lines will cause kinking which will necessitate replacement of the line.

- aa. Pull all the disconnected air lines and the electrical leads with protective conduit through the crossmember cutouts and tie back free of the crossmember.

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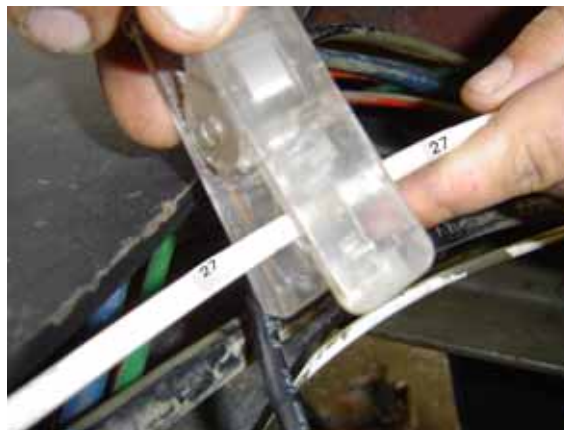
**CAUTION**

For best results and to prevent air leaks the air lines must be scrupulously clean and free of dirt, grease and paint prior to fitting the push-on connectors on reassembly. Do not use mechanical means to remove paint etc. as this will compromise the sealing at the connector. Use an approved paint remover to clean the air lines where the joins are to be made.

**CAUTION**

Use the tube cutter (Table 1, Item 2.4) provided in the crossmember replacement kit. Do not use sidecutters or bladed knives. Make a clean cut squarely at 90 degrees (tolerance  $\pm 7$  degrees) to the air line. Use of an incorrect tool will result in the failure of the air line at the push-on connector on reassembly, with resultant loss of air pressure.

- bb. Clean, tag and cut (Figure 10) all the remaining air lines that cannot be pulled through the crossmember cutouts with the tube cutter (Table 1, Item 2.4). Cut the air lines in staggered positions (Figure 11).



**Figure 10 Cutting Air Line - Special Tool**



- 1. Air lines cut in staggered positions

**Figure 11 Cutting Air Lines**



When tying back the air lines, maintain a radius that does not put stress on the lines. Over bending of the lines will cause kinking which will necessitate replacement of the line.

- cc. Carefully pull all the air lines through the crossmember cutouts and tie them back clear of the crossmember (Figure 12).



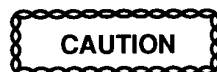
Figure 12 Tying Back Air Lines

- dd. Inspect the area around the crossmember to ensure all leads and hoses have been removed and/or tied back and all components are suitably protected with heat insulation blankets. Some variants fitted with hydraulic systems (e.g. dump truck) will require air lines to the reserve reservoir and the hoist control valve to be tagged and disconnected, and extra protection provided for hydraulic hoses to the hydraulic tank and the hoist control valve.

- 10. **Removal of Crossmember.** Remove the crossmember as follows:



Ensure relevant safety precautions are adhered to. Suitable heat insulation blankets must be provided, and protective clothing must be worn to prevent injury to personnel as a result of fire or explosion. Ensure all procedures are in accordance with SAFETYMAN, and EMEI Workshop E Series. Ensure sufficient fire extinguishers of a suitable capacity are accessible.



Ensure that air lines, fuel lines, hydraulic lines, and electrical wiring are protected from hot metal.

- a. Using the bracket mounting holes (Figure 13, Item 1) as a guide, cut a section out of the centre of the old crossmember.

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1. Bracket mounting holes

**Figure 13 Crossmember Section - Removed**

- b. Remove and discard the four nuts, washers, and bolts securing the left-hand section of the crossmember to the chassis rail.
- c. Remove and discard the crossmember section and spacers (if fitted).
- d. Support the right-hand crossmember section (on a stand if necessary), taking care not to put undue strain on the fuel lines running through the section. If necessary, remove clamps and/or cable ties securing the fuel lines to the chassis to prevent strain on the lines.
- e. Remove and discard the four nuts, washers, and bolts securing the right-hand section of the crossmember to the chassis rail.
- f. Carefully lower and position the right-hand crossmember section in an upright position on the floor/stand beside the chassis rail in preparation for removing a section of the end of the crossmember to allow the fuel lines to be removed from the crossmember.
- g. Secure the heat shield (Table 1 Item 2.5) with cable ties (Table 1 Item 2.6.2) over the fuel hoses (Figure 14, Item 4), and position a heat insulation blanket to protect the hoses from damage.



- 1. Aluminium heat shield
- 2. Cable tie
- 3. Right-hand crossmember section
- 4. Fuel lines

**Figure 14 Protecting the Fuel Lines**

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Ensure relevant safety precautions are adhered to and that air lines, fuel lines and electrical wiring are protected from heat and molten metal. Ensure all procedures are in accordance with the SAFETYMAN and EMEI Workshop E Series. Ensure suitable fire extinguishers are accessible.

- h. Cut a 30 mm wide piece out of the end of the crossmember section (Figure 14, Item 3).
- i. When the crossmember has cooled sufficiently remove the heat shield and insulation blanket and separate the two fuel lines from the crossmember section (Figure 15).



**Figure 15 Removing the Fuel Lines.**

- j. Remove and discard the right-hand crossmember section spacers (if fitted).
- k. Clean the crossmember mounting surfaces on the chassis rails.

**11. Installation of Crossmember.** Proceed as follows:

**NOTE**

Due to space constraints and differing clearances between chassis rails, the upper and lower gussets must be removed from the new crossmember and fitted to the chassis rails prior to fitting the centre section of the crossmember. The crossmember centre section and the upper and lower gussets are to be reconnected on the chassis and aligned to the position of the original crossmember.

- a. Remove the thirty two nuts, washers, and bolts securing the upper and lower gussets to the centre section of the new crossmember.

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**CAUTION**

Take care when selecting the length of the side chassis bolts. The old bolts removed may not be an indication of the correct length due to differences in chassis rail configuration and new fasteners. Failure to fit the correct bolts could cause loss of rigidity of the chassis and subsequent damage to components.

**NOTE**

Chassis side bolts are supplied in 2.5 in (Table 1, Item 1.5), 2.75 in (Table 1, Item 1.6) and 3.0 in (Table 1 Item 1.7) lengths. Variants are fitted with various brackets that mount on the side chassis bolts and the length of bolt differs in some instances. Determine the most suitable length of side chassis bolt to the suit the configuration of the vehicle. The bolt shanks must not protrude past the outside of the chassis rail or mounting bracket, and the head of the threaded section of the bolt must protrude through the nut when tightened.

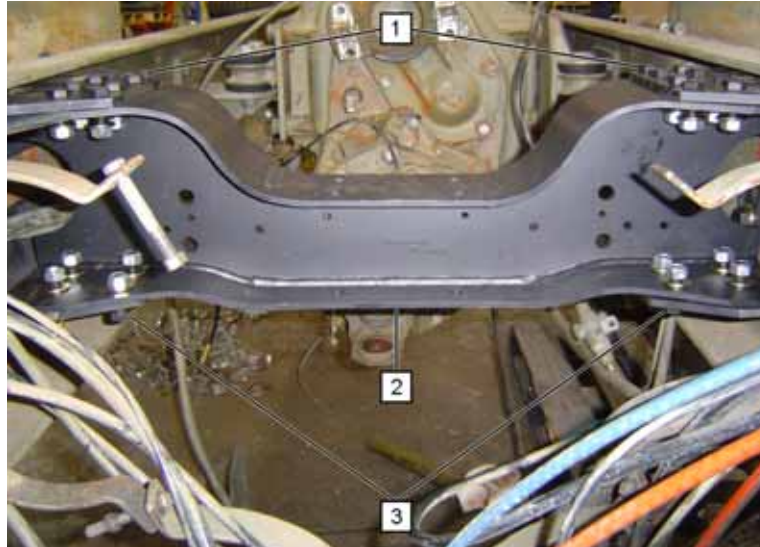
Position the left and right-hand lower gussets (Figure 16, Item 2) on the chassis rails.



1. Fuel lines
2. Crossmember right-hand lower gusset

**Figure 16 Lower Gusset and Repositioning Fuel Lines**

- b.** Secure the gussets with the two side chassis bolts (fitted with washers) from the inside, and loosely (minimum 2 mm slack) fit the washers and nuts.
- c.** Position the fuel lines (Figure 16, Item 1) on the crossmember right-hand lower gusset.
- d.** Slide the centre section of the crossmember into position and align the mounting holes.
- e.** Fit, from below, the 16 lower mounting bolts, fitted with washers, that secure the centre section (Figure 17, Item 2) to the lower gussets (Figure 17, Item 3), and loosely (min 2 mm slack) fit the washers and nuts.
- f.** Fit the left-hand and right-hand upper gussets (Figure 17, Item 1) on the chassis rails.
- g.** Secure the gussets with the four side chassis bolts (fitted with washers) from the inside and loosely (min 2 mm slack) fit the washers and nuts.
- h.** Fit the 16 upper gusset bolts (fitted with washers) from above, and loosely (min 2 mm slack) fit the washers and nuts.



1. Upper gusset
2. Centre section
3. Lower gusset

**Figure 17 New Crossmember - Mounting Bolts Loosely Fitted**

**NOTE**

All mounting bolts on the replacement crossmember are to be retensioned after 5000 km.

- i. Tighten the centre section mounting bolts (working from the centre to the outside) and the chassis side mounting bolts in two stages, initially to 100 N.m and finally, 218 to 231 N.m.

**12. Preparation of Vehicle.** Proceed as follows:



**When feeding the air lines through the cut-outs do not stress the air lines. Over bending of the lines will cause kinking which will necessitate replacement of the line.**

- a. Feed the air lines, including the compressor charge air line, the secondary feed air line, the governor feed air line and the transfer case HI-LO air switch electrical leads with protective conduit between the right-hand gussets, through the crossmember cutouts, and across the crossmember (Figure 18).



**Figure 18 Positioning the Air Lines**



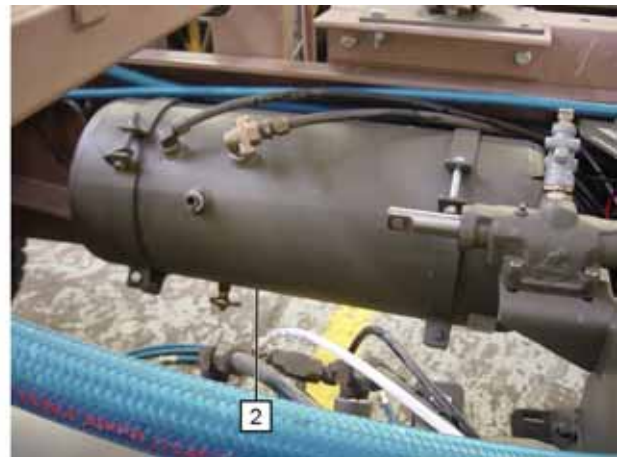
- (1) Using the ¼ in connector (Table 1, Item 2.3), the 3/8 in connector (Table 1, Item 2.2) or the ½ in connector (Table 1, Item 2.1) as applicable, install the connectors (Figure 19, Item 1) and reconnect the air lines.



1. Air line connectors

**Figure 19 Air Lines Connectors - Fitted**

- b. Connect the two electrical leads, cut at para 9.z, of the HI-LO air switch solenoid at the left-hand side of the chassis using the crimp connectors (Table 1, Item 2.6.1).
- c. Install the primary upper and secondary reservoirs and secure with the clamps (Figure 20).



1. Primary Upper Reservoir  
2. Secondary Reservoir

**Figure 20 Primary Upper and Secondary Reservoirs (Air Filter Fitted) - Installed**

- d. Connect the air lines to their respective connectors on the primary upper and secondary reservoirs.
- e. Install the double check valve (Figure 21, Item 1) centrally mounted on the front of the crossmember and secure with the 5/16 in UNF bolt, washer, and locknut.
- f. Tighten the bolt to 22 N.m.

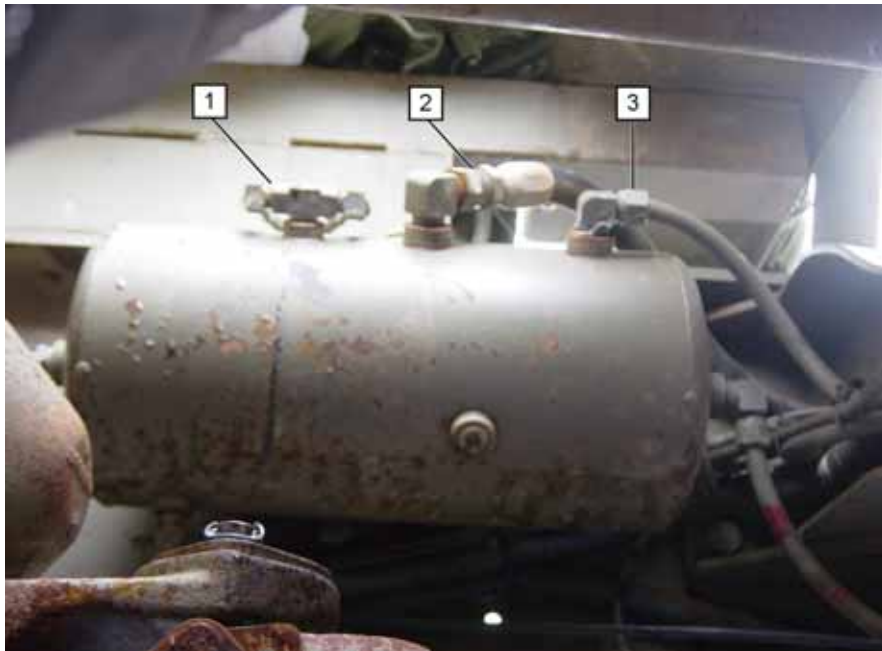
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1. Double check valve

**Figure 21 Double Check Valve - Installed**

- g.** Connect the air lines to the double check valve (Figure 21) centrally mounted on the front of the crossmember.
- h.** Secure the air lines and leads running along the front of the chassis crossmember with the clamps and cable ties removed during the crossmember removal.
- i.** Connect the compressor supply air line (Figure 22, Item 2), the secondary reservoir supply air line (Figure 22, Item 3), and the governor air lines (Figure 22, Item 1), and the air filter air line (if fitted) at the wet tank.



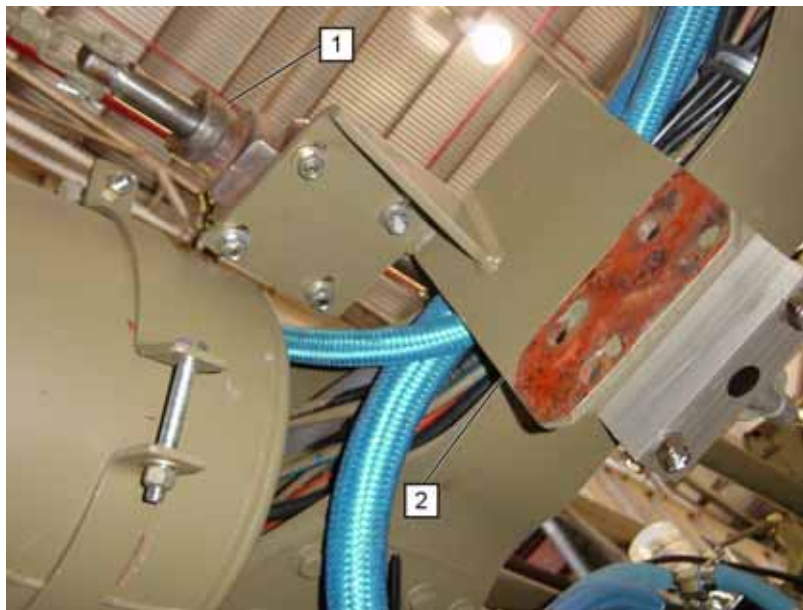
1. Governor air lines
2. Compressor supply air line
3. Secondary reservoir supply air line

**Figure 22 Wet Tank Connections (Air Filter Not Fitted)**

- j.** Connect all the air lines, including the air starter supply line that runs along the front of the crossmember, to their respective connectors.

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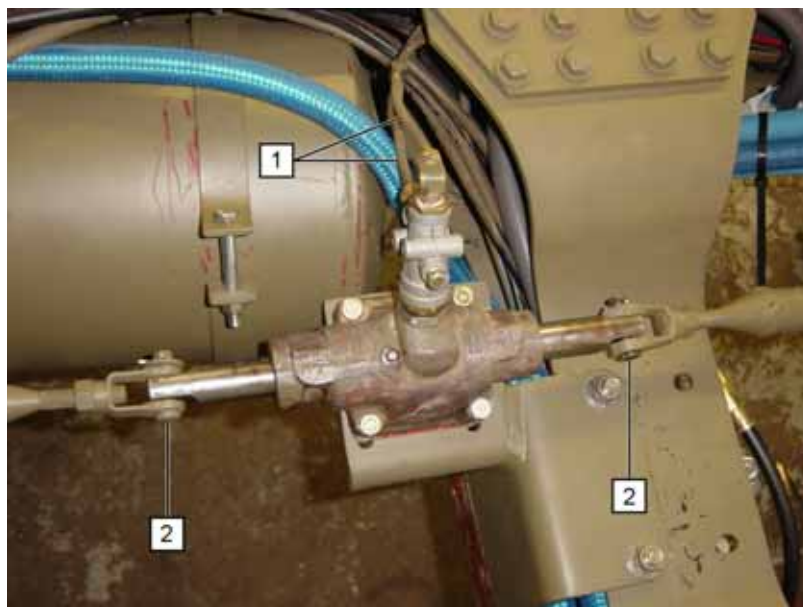
- k. Secure the air lines that run across the front of the crossmember with the clamps and cable ties.
- l. Install the centre bearing support bracket (Figure 23, Item 2) and secure it with the two 1/2 in UNF mounting bolts, nuts and washers.



- 1. Transfer case remote selector shift valve
- 2. Centre bearing support bracket

**Figure 23 Centre Bearing Support Bracket**

- m. Tighten the bolts to 88 N.m.
- n. Secure the transfer case remote selector shift valve (Figure 24, Item 1) to the centre bearing support bracket (Figure 24, Item 2) with the four 3/8 in UNF bolts, flat and spring washers, and nuts.



- 1. Air line connections
- 2. Cotter pins

**Figure 24 Transfer Case Selector Linkage - Connected**

- o. Tighten the bolts to 40 N.m.
- p. Connect the transfer case selector linkage to the transfer remote selector with the cotter pins (Figure 24, Item 2) and secure them with the split pins.

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- q. Connect the two air lines (Figure 24, Item 1) to the transfer case remote selector shift valve.
- r. Secure the air filter manifold (if fitted) (Figure 25, Item 1) to the crossmember with the two 1/2 in UNF bolts (Figure 25, Item 2), washers and locknuts.



- 1. Air filter manifold
- 2. Air filter manifold mounting bolts

**Figure 25 Air Filter Manifold Connections**

- s. Tighten the bolts to 88 N.m.
- t. Connect all the air line push-on fittings at the air filter manifold (if fitted).
- u. Install the front axle propeller shaft in accordance with EMEI Vehicle G 703.
- v. Install the PTO shaft (if fitted) in accordance with EMEI Vehicle G 703.
- w. Install the fuel tank (LRV variant only) in accordance with EMEI Vehicle G 703.
- x. Connect the batteries.
- y. Run the engine until the pressure in the compressed air reservoirs is at operating pressure and check for leaks. Rectify as required.
- z. Check the operation of the transfer case shift mechanism and the PTO (if fitted).



**Table 1 Stores Required**

Item	NSN	Mfr Part No	Description	Unit Of Issue	Qty Per Kit	Qty Per Equip
1	2510-66-143-5911	9QLA4632RPM	Crossmember Assembly: consisting of the following;			1
1.1	NIC	9QL4631	Flange and web (centre section)	Each		1
1.2	NIC	7RU3514	Gusset, crossmember, upper	Each		2
1.3	NIC	7RU3513	Gusset, crossmember, lower	Each		2
1.4	NIC	2AM15	Bolt, hex hd, 5/8 in, UNF, 2A, Grade 8, zinc plated (crossmember flange and web to gussets)	Each		32
1.5	NIC		Bolt, hex hd, 5/8 in, UNF, T8 X 2.5 in lg, grade 8, zinc plated (mounting bolt, gusset to frame)	Each		6
1.6	NIC		Bolt, hex hd, 5/8 in, UNF, T8 X 2.75 in lg, grade 8, zinc plated (mounting bolt, gusset to frame)	Each		6
1.7	NIC		Bolt, hex hd, 5/8 in, UNF, T8 X 3.0 in lg, grade 8, zinc plated (mounting bolt, gusset to frame)	Each		6
1.8	NIC		Nut, self-locking, hexagon, 5/8 in UNF (crossmember flange and web to gussets mounting bolt, and gussets to frame mounting bolt)	Each		38
1.9	NIC		Washer, flat, 5/8 in ID, hardened steel (crossmember flange and web to gussets mounting bolt, and gussets to frame mounting bolt)	Each		76
2.0	2510-66-151-7902	FA97026P150339	Kit, crossmember replacement, consisting of the following items	Each	NA	1
2.1	NIC	DQ62DOT08	Connector, push-on, air line ½ in OD	Each	3	3
2.2	NIC	DQ62DOT06	Connector, push-on, air line 3/8 in OD	Each	7	7
2.3	NIC	DQ62DOT04	Connector, push-on, air line 1/4 in OD	Each	8	8
2.4	NIC	307FP	Cutter, tube	Each	1	NA
2.5	NIC	GP-151139	Shield, fuel line, 465 mm lg, aluminium	Each	1	
2.6	NIC	GP-CHASSIS KIT	Repair kit, consisting of the following;	Each		1
2.6.1	NIC		Connector, 2.5 to 3 mm cable, double crimp type		2	
2.6.2	NIC		Tie, cable, 365 mm lg	Each	30	
2.6.3	NIC		Tag, self adhesive, dual number, line indicator	Each	30	

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**Table 2 Items to be Removed**

Item	NSN	Mfr Part No	Description	Qty Per Equip	RPS 02160 Location
1	NIC	X50QL562A	Crossmember Front (Inverted)	1	RA Serial No 022024
2	NIC	3AX1645	Bolt (Capscrew) Special Bodyfit, 5/8-18 UNF, 2A	2	RA Serial No 022025
3	NIC	3AX1646	Bolt (Capscrew) Special Bodyfit, 5/8-18 UNF, 2A	6	RA Serial No 022026
4	NIC	21AX785	Nut, Lock, 5/8-18 UNF, 2B		RA Serial No 022027
5	NIC	35AX1367	Washer, Flat, Hardened, 0.68 in ID X 1.25 OD X 0.18 in thk	16	RA Serial No 022028

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**END**

Distribution List: **VEH G 50.0 – Code 3** (Maint Level)  
(Sponsor: LV SPO, Mdm/Hvy B Vehicle Section)  
(Authority: ECO LVSP0038/08)