BEFORE COMMENCING REPAIRS ENSURE THE HYDRAULIC SYSTEM IS SHUT DOWN AND THE SYSTEM IS DEPRESSURISED. REMOVAL OF HYDRAULIC CONNECTIONS UNDER PRESSURE WILL RESULT IN AN EXPLOSIVE RELEASE OF HYDRAULIC OIL AND COMPONENTS MAY BECOME PROJECTILES. DEATH OR SERIOUS INJURY COULD OCCUR IF A COMPONENT IS DISCONNECTED OR REMOVED WITHOUT FIRST RELIEVING THE HYDRAULIC PRESSURE. EXERCISE EXTREME CAUTION WHEN ‘CRACKING’ HYDRAULIC CONNECTIONS.

Crane

226. General

a. To depressurise the hydraulic system proceed as follows:
(1) Disengage the PTO (i.e. stop the hydraulic pump).
(2) Stop the engine.
(3) Remove the filler/breather cap located on top of the hydraulic reservoir to relieve the pressure in the reservoir.
(4) Replace the filler/breather cap and tighten securely.

NOTE
Before commencement of repairs, observe the data contained in EMEI Miscellaneous O-018 Cranes, Hoists and Winches - Inspection Data.

NOTE
To prevent dirt, dust and foreign matter from entering or adhering to any component maintain a high standard of cleanliness. Before disconnecting hydraulic lines, clean the connections thoroughly. Cap or plug all disconnected hoses and lines with plastic caps or plugs.

NOTE
Use a large drip tray to prevent oil spillage on the ground.

NOTE
Discard all used seals, O-rings, cotter pins, washers and lockpins. Discard any hydraulic oil drained from components.

Crane Assembly

227. Removal

a. Ensure the crane (including the stabilisers) is stowed.

b. Prepare a temporary storage area for the vehicle crane when removed from the vehicle.

c. Disengage the PTO and shut down the engine.

d. Ensure the crane hydraulic control levers are in a neutral position.

e. Depressurise the hydraulic system, see para 226.

f. Close the ball valve at the base of the hydraulic reservoir.

g. Remove the crane filter assembly (refer to EMEI Veh D 393 Group 16 - Crane).

h. Remove the top panels of the storage platform.

i. Clean around the oil supply and return hydraulic hose connections at the directional control valve bank.

j. Tag and disconnect the hydraulic hoses from the directional control valve bank. Catch any draining oil in a suitable container.
1. Crane lifting bracket
2. Crane controls
3. Main boom cylinder
4. Main boom
5. Outer boom cylinder
6. Outer boom pivot and link pivot
7. Stabiliser cylinder RH
8. Stabiliser foot RH
9. Extension boom cylinder
10. Hook assembly
11. Extension boom
12. Outer boom
13. Stabiliser leg locking bolt
14. Stabiliser foot LH
15. Stabiliser pin
16. Slewing cylinder LH and RH
17. Stabiliser leg LH
18. Directional control valve
19. Multiple grease point
20. Base assembly
21. Crane post
22. Crane stowage bracket

**Figure 378 - Crane Assembly**

**CAUTION**

**USE A CRANE AND LIFTING TACKLE WITH A SAFE WORKING LOAD GREATER THAN 1(ONE) TONNE TO LIFT THE CRANE.**

- k. Secure the lifting tackle to the lifting eye provided on the crane main boom.
- l. Take the weight of the vehicle crane with the lifting crane.
- m. Remove the lower protective caps from the three crane mounting bolts.
- n. Remove the two M 24 nuts and one M 30 nut and square washers (if not tack welded to the crane base) securing the crane base to the sub-frame (Fig 379).

**Figure 379 - Crane Mountings**

- o. Hoist the crane clear of the vehicle.
- p. Lower the crane to rest on its mounting frame at the prepared location.

- l. Mounting bolts
228. Installation

a. Ensure the stabilisers are in their stowed position.

b. Fit the lifting tackle to the lifting eye on the main boom.

c. Lift the vehicle crane into position on the sub-frame. Centralise the crane left to right and align the slots in the base with the mounting lugs on the recovery sub frame. Check the clearance to the left and right hand equipment cabinets.

d. Secure the crane base to the sub-frame with the three mounting bolts, square washers and nuts (Fig 379). Torque the three mounting bolts in three equal steps as follows:
   (1) M24 bolts to 600 Nm.
   (2) M30 bolt to 1200 Nm.

e. Install the protective caps on the mounting bolts.

f. Remove the lifting tackle.

g. Connect the supply and return hydraulic hoses to the directional control valve bank.

h. Install the crane filter assembly. Torque the M8 mounting bolts to 22 Nm.

i. Install the top panels of the storage platform. Torque the M8 mounting bolts to 22 Nm.

j. Open the ball valve at the base of the hydraulic reservoir.

k. Engage the crane hydraulics. Unstow the crane and cycle all booms through their full range of travel. Operate the stabilisers.

l. Inspect for oil leaks and check the performance of the crane.

m. Check the oil level in the hydraulic reservoir, top up if required.

Slewing Cylinders

229. Removal

a. Unstow the crane and position it so that the boom can be rotated 180° without fouling.

b. Depressurise the hydraulic system, see para 226.

c. Disengage the PTO and shut down the engine.

d. Close the ball valve at the base of the hydraulic reservoir.

e. Place a container underneath the oil pipe connections at the left hand and right hand slewing cylinders.

f. Disconnect the hydraulic oil pipes (Fig 380(6)) from the left hand slewing cylinder (Fig 380(11)) and the right hand slewing cylinder (Fig 380(5)).

NOTE
To reduce spillage, rotate the crane boom manually to expel oil from the slewing cylinders.

g. Unscrew the slewing cylinders using a strap spanner and remove the cylinders.

NOTE
The disassembly procedure for the left hand and right hand slewing cylinder pistons is identical.

h. Remove the piston bolt (Fig 380(12)) and spring washer from the piston (Fig 380(14)) and remove the piston and piston seal (Fig 380(13)).

i. Remove and discard the back-up ring (Fig 380(15)) and the O-ring (Fig 380(16)) from the slewing rack.

NOTE
Mark the position of the slewing rack in relation to the crane base, before removing the rack (to facilitate ease of installation).

NOTE
The rack can only be removed by feeding the end that has the teeth cut all the way to the piston through the pinion.

j. Manually slew the crane until the rack is in a position where it can be removed.

k. Remove the piston at the other end of the slewing rack, see sub-paras g. to h.

l. Disengage and withdraw the slewing rack (Fig 380(17)) from the crane base. Withdraw the slewing rack guide block (Fig 380(7)).
230. **Cleaning and Inspection**

**WARNING**

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

- a. Wash the parts in an appropriate cleaning agent and blow dry with compressed air.
- b. Inspect the slewing rack, the guide block, the pistons and cylinders. Replace damaged or suspect parts.
- c. Lightly coat all parts with hydraulic fluid (Shell Tellus 68).

231. **Installation**

- a. Insert the slewing rack (Fig 380(17)) through the pinion. Align the marks, made on disassembly, on the rack and the crane body.
- b. Install a new O-ring (Fig 380(16)) and the back-up ring (Fig 380(15)) on the slewing rack (Fig 380(17)).

**NOTE**

The assembly procedure for the left hand and right hand slewing cylinder pistons is identical.

**NOTE**

Ensure the rack is centralised before fitting the pistons.

- c. Install the piston seal (Fig 380(13)) and piston (Fig 380(14)) on the rack and secure with the piston bolt (Fig 380(12)) fitted with a spring washer.
- d. Insert the slewing guide block (Fig 380(7)) to interlock the slewing rack against the pinion wheel.
- e. Install the piston on the other end of the slewing rack, see sub-paras b. and c.
- f. Install the left hand slewing cylinder (Fig 380(11)) and the right hand slewing cylinder (Fig 380(5)). Tighten the cylinders using a strap spanner.
- g. Uncap and connect the hydraulic oil pipes (Fig 380(6)) to the left hand slewing cylinder (Fig 380(11)) and the right hand slewing cylinder (Fig 380(5)).
- h. Open the ball valve at the base of the hydraulic reservoir.
i. Operate the hydraulics and test the operation of the slewing cylinders. Cycle the cylinders through full travel at least twice.

j. Stow the crane in the travelling position and check the oil level in the hydraulic reservoir. Top up if necessary.

**Extension Boom and Extension Boom Cylinder**

232. **Removal**

a. Unstow the crane and centralise it on the passenger side of the vehicle.

b. Place a support under the outer boom.

c. Disengage the PTO and switch off the engine.

d. Depressurise the hydraulic system, see para 226.

e. Close the ball valve at the base of the hydraulic reservoir.

f. Place a container underneath the extension boom cylinder connections.

g. Remove the cargo hook and shackle (if fitted).

h. Knock out one of the roll pins (Fig 381(12)) and remove the retaining pin (Fig 381(11)) securing the rod of the extension boom cylinder (Fig 381(4)) to the extension boom (Fig 381(10)).

i. Remove the four M8 socket head screws (Fig 382(2)) securing the front upper guide blocks (Fig 382(1)) to the outer boom (Fig 382(9)). Slide out the guide blocks.

j. Slide the extension boom (Fig 381(10)) out of the outer boom.

k. Disconnect the two hydraulic oil pipes (Fig 381(9)) from the extension boom cylinder connections, cap all connections.

l. Remove the M8 nut (Fig 381(3)), socket head bolt (Fig 381(2)) and distance piece (Fig 381(1)) securing the front of the extension boom cylinder to the outer boom (Fig 382(9)).

m. Remove the two M8 nuts (Fig 381(7)) and socket head bolts (Fig 381(8)) securing the rear end of the extension boom cylinder to the outer boom and remove the extension cylinder.
n. Disconnect the two extension boom oil pipes from the connectors at the load holding valve block mounted on the outer boom, cap all connections.

o. Remove the socket head screws (Fig 381(5)) securing the three pipe clamps (Fig 381(6)) to the extension cylinder, then remove the pipes from the cylinder.

233. Cleaning and Inspection

**WARNING**

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

a. Wash the parts in an appropriate cleaning agent and blow dry with compressed air. Do not wipe with cloth or paper towel because lint or other matter could enter the hydraulic system and cause a malfunction.

b. Inspect all parts for wear or damage. Inspect the operating rod and the cylinder bore for scratches and scuffmarks, replace as required.

c. Lightly coat all chrome parts with hydraulic fluid (Shell Tellus 68).

234. Installation

a. Position the extension boom cylinder (Fig 381(4)) on the outer boom (Fig 382(9)) and secure the rear end of the extension cylinder to the boom with the two M8 socket head bolts and nuts (Fig 381(8) and (7)). Torque the bolts to 22 Nm.

b. Secure the front of the extension boom cylinder to the outer boom with the bolt (Fig 381(2)), distance piece (Fig 381(1)) and the nut (Fig 381(3)). Torque the bolt to 22 Nm.

c. Connect the two hydraulic oil pipes (Fig 381(9)) to the connectors on the extension boom cylinder. Secure the oil pipes to the cylinder with the three clamps (Fig 381(6)) and socket head screws (Fig 381(5)).

d. Connect the two hydraulic oil pipes (Fig 381(9)) to the load holding valve block on the outer boom.

e. Slide the extension boom (Fig 381(10)) into the outer boom (Fig 382(9)).

f. Fit the two upper guide blocks (Fig 382(1)) in the outer boom and secure with the four M8 socket head screws (Fig 382(2)).

g. Check that a clearance of 0.5 mm exists between the extension boom and the outer boom. Selectively fit guide blocks to obtain the clearance. Refer to the Note after para 236c.

h. Align the mounting holes of the front end of the extension boom cylinder rod and the front end of the extension boom and insert the retaining pin (Fig 381(11)). Secure the pin in position with a roll pin (Fig 381(12)).

i. Attach the cargo hook and D shackle (if required).

j. Open the ball valve at the base of the hydraulic reservoir.

k. Test the operation of the crane. Cycle the extension boom through full travel at least twice.

l. Stow the crane in the travelling position and check the oil level in the hydraulic tank. Top up if necessary.

Outer Boom and Cylinder

235. Removal

a. Unstow the crane and centralise it on the passenger side of the vehicle.

b. Disengage the PTO and switch off the engine.

c. Depressurise the hydraulic system, see para 226.

d. Close the ball valve at the base of the hydraulic reservoir.

e. Place a container underneath the extension boom cylinder connections.

f. Remove the extension boom, see para 232.

g. Place a container underneath the outer boom cylinder connections.

h. Disconnect the hose lines to the outer boom cylinder (Fig 383(5)).

i. Remove the bolt and top half of the hydraulic hose clamp and then remove the hoses from the outer boom.

j. Attach a suitable capacity sling around the outer boom (Fig 382(9)). Operate the crane and take the weight of the outer boom.

**NOTE**

Support the outer boom cylinder by lashing the outer boom cylinder (Fig 383(5)) to the main boom (Fig 383(2)).

k. Remove the locating bolt (Fig 382(21)) and washer (Fig 382(22)) of the lever pivot pin - upper (Fig 382(23)) securing the outer boom (Fig 382(9)) to the lever (Fig 382(19)).
1. Remove the lever pivot pin - upper (Fig 382(23)) using a hammer and a soft metal drift punch.

m. Remove the locking screw (Fig 382(13)) and washer (Fig 382(14)).

n. Remove the outer boom pivot pin (Fig 382(15)) using a hammer and a soft metal drift punch.

o. Remove the outer boom with the aid of a crane. Carefully slide the hydraulic hoses through the top aperture in the outer boom during the removal procedure.

p. Connect a lifting strap centrally around the outer boom cylinder and take the weight of the cylinder with a crane.

q. Remove the circlip (Fig 382(11)) and washer (Fig 382(12)) from the lever pivot pin - lower (Fig 382(17)).

r. Partially knock out (using a hammer and a soft metal drift) the lever pivot pin - lower (Fig 382(17)) to free the outer boom cylinder from the lever (Fig 382(19)).

**NOTE**

Support the main boom cylinder (lash the main boom cylinder (Fig 383(7)) to the main boom (Fig 383(2)).

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**Figure 382 - Outer Boom**

- 1. Front upper guide block
- 2. M8 socket head screw
- 3. Distance piece
- 4. Bolt
- 5. Nut
- 6. Washer
- 7. Mid-upper guide block
- 8. Screw
- 9. Outer boom
- 10. Rear guide block
- 11. Circlip
- 12. Washer
- 13. Screw
- 14. Washer
- 15. Outer boom pivot pin
- 16. Plate pivot pin
- 17. Lever pivot pin - lower
- 18. Plate
- 19. Lever
- 20. Plate
- 21. Locating bolt
- 22. Washer
- 23. Lever pivot pin - upper
- 24. Load holding valve
- 25. Front lower guide block
- 26. Nut
s. Remove the circlip and washer from the pivot pin (Fig 383(3)) and securing the outer boom cylinder and main boom cylinder to the main boom.

t. Partially knock out (using a hammer and a soft metal drift) the main boom cylinder and outer boom cylinder pivot pin (Fig 383(3)) to free the outer boom cylinder from the main boom cylinder operating rod boss.

u. Remove the outer boom cylinder with the aid of a crane.

236. Cleaning and Inspection

WARNING

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

a. Wash the parts in an appropriate cleaning agent and blow dry with compressed air.

b. Inspect all parts for wear or damage, paying particular attention to the operating rod and the cylinder bore for scratches and scuff marks, replace as required.

c. Lightly coat all unprotected parts with hydraulic fluid (Shell Tellus 68).

NOTE

The lower guide blocks (Fig 382(25)) fitted to the front end of the outer boom are available in 7mm, 8mm, 9mm, 10mm and 11mm thicknesses. The upper guide blocks (Fig 382(1)) fitted to the front end of the outer boom are available in 1mm, 6mm, 8mm and 10mm thicknesses.

NOTE

The mid-upper guide blocks (Fig 382(7)) fitted towards the front end of the outer boom are available in 7mm, 8mm, 9mm, 10mm and 11mm thicknesses. The lower guide blocks (Fig 382(10)) fitted to the rear end of the outer boom are available in 6mm, 8mm and 10mm thicknesses.

d. Inspect the guide blocks and pieces for wear, replace if required. When the extension boom is fitted in the outer boom a clearance of 0.5 mm should exist.

237. Installation

a. With the assistance of a crane align the outer boom cylinder (Fig 383(5)) with the operating rod boss in the main boom cylinder (Fig 383(7)) and the main boom (Fig 383(2)) and secure the two cylinders in position with the main boom cylinder and outer boom cylinder pivot pin (Fig 383(3)). Install the spacer washer and circlip on the pin.

b. With the assistance of a crane align the outer boom (Fig 382(9)) with the main boom (Fig 383(2)) and install the outer boom pivot pin (Fig 382(15)).

c. Lock the outer boom pivot pin (Fig 382(15)) in position with the washer (Fig 382(14)) and locking screw (Fig 382(13)). Tighten the locking bolt securely.

d. Align the mounting holes for the plates (Fig 382(18) and (20)), the operating rod for the outer boom cylinder (Fig 383(5)) and the lever (Fig 382(19)) and install the lever pivot pin - lower (Fig 382(17)) using a hammer and a soft metal drift.

e. Lock the lever pivot pin - lower (Fig 382(17)) in position using the washer (Fig 382(12)) and the circlip (Fig 382(11)).

f. Align the outer boom (Fig 382(9)) and the lever (Fig 382(19)) and install the pivot pin - upper (Fig 382(23)) using a hammer and a soft metal drift.

g. Lock the pivot pin - upper (Fig 382(23)) in position with the bolt (Fig 382(21)) and washer (Fig 382(22)). Tighten the locking bolt securely.

h. Remove the lifting sling from the outer boom.

i. Uncap and connect the hose lines to the outer boom cylinder.

j. Install the hydraulic hose clamps and bolts. Tighten the bolts securely.

k. Open the ball valve at the base of the hydraulic reservoir.

l. Operate the hydraulics and test the operation of the crane. Cycle the outer boom through full travel at least twice.

m. Stow the crane in the travelling position and check the oil level in the hydraulic reservoir. Top up if required.
1. Main boom pivot pin
2. Main boom
3. Main boom cylinder and Outer boom cylinder pivot pin
4. Outer boom pivot pin
5. Outer boom cylinder
6. Outer boom cylinder load holding valve
7. Main boom cylinder

Figure 383 - Main Boom and Outer Boom Cylinders

Main Boom and Cylinder

238. Removal

a. Unstow the crane.

b. Depressurise the hydraulic system, see para 226.

c. Remove the extension boom and cylinder, see para 232.

d. Remove the outer boom and cylinder, see para 235.

e. Disconnect the oil hoses from the main boom cylinder (Fig 383(7)).

f. Remove the circlip and the washer from the main boom cylinder pivot pin (Fig 383(12)).

g. Support the main boom cylinder (Fig 383(7)) and remove the main boom cylinder pivot pin (Fig 383(12)) with a hammer and a soft metal drift.

h. With the aid of a crane, remove the main boom cylinder.

CAUTION

THE MAIN BOOM LIFTING POINT (FIG 378(1)) IS NOT AT THE POINT OF BALANCE WHEN LIFTING THE MAIN BOOM IN ISOLATION TO THE REST OF THE CRANE.

i. Attach a lifting sling to the main boom and take the weight of the boom with the crane.

j. Remove the nut and the washers securing the main boom pivot pin (Fig 383(1)).

k. Knock out the main boom pivot pin (Fig 383(1)) and remove the main boom from the crane post.
239. **Cleaning and Inspection**

**WARNING**

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

a. Wash the parts in an appropriate cleaning agent and blow dry with compressed air.
b. Inspect all parts for wear or damage, paying particular attention to the operating rod and the cylinder bore for scratches and scuff marks, replace as required.
c. Lightly coat all parts with hydraulic fluid (Shell Tellus 68).

240. **Installation**

a. With the aid of a crane, align the main boom (Fig 383(2)) to the crane post (Fig 383(9)).
b. Secure the main boom to the crane post with the main boom pivot pin (Fig 383(1)).
c. Lock the main boom pivot pin (Fig 383(1)) in the locating bracket and secure the pin with the washers and nut. Tighten the nut securely.

**NOTE**
The main boom cylinder operating rod is secured to the main boom during the installation of the outer boom cylinder, see para 237a.

d. Align the main boom cylinder (Fig 383(7)) to the crane post mounting holes and install the main boom cylinder pivot pin (Fig 383(12)).
e. Lock the main boom cylinder pivot pin (Fig 383(12)) in the locating bracket and secure with the washer and circlip.
f. Install the outer boom and cylinder, see para 237.
g. Install the extension boom and cylinder, see para 234.
h. Operate the hydraulics and test the operation of the crane. Cycle the inner boom through full travel at least twice.
i. Stow the crane in the travelling position and check the oil level in the hydraulic reservoir. Top up if required.

**Directional Control Valve**

241. **Removal**

a. Unstow the crane and centralise it on the passenger side of the vehicle.
b. Fully extend the extension boom and lower the main boom until the end of the crane rests on a firm prepared platform.
c. Place a container underneath the directional control valve connections.
d. Disengage the PTO and switch off the engine.
e. Depressurise the hydraulic system, see para 226.
f. Close the ball valve at the base of the hydraulic reservoir.

**NOTE**
Tag and cap all disconnected hoses and lines.

g. Disconnect the hydraulic hose to the overload valve (Fig 384(4)).
h. Disconnect the right hand stabiliser oil pipes (Fig 384(3)) from the directional control valve (Fig 384(2)).
i. Disconnect the slew cylinder oil pipe (Fig 384(1)) connections at the directional control valve.
j. Tag and disconnect the crane actuating cylinder hydraulic hoses at the directional control valve.
k. Disconnect the main supply and return hydraulic hoses from the supply connection (Fig 384(6) and the return connection (Fig 384(8)) at the directional control valve.
l. Disconnect the overload valve return oil pipe (Fig 384(9)) from the directional control valve.
m. Disconnect the left hand stabiliser oil pipes (Fig 384(10)) from the directional control valve.
n. Disconnect the oil pipe to the blocking valves manifold (Fig 384(7)).
o. Disconnect the oil pipe (Fig 384(5)) between the overload valve and the main boom hose connector at the directional control valve.
p. Remove the six circlips and pins connecting the vertical control rods (Fig 385(6)) to the directional control valve and release the control rods.
q. Support the directional control valve and remove the M8 socket head bolts with flat washers, securing the valve to the mounting bracket.
1. Slew cylinder oil pipes
2. Directional control valve assembly
3. Right hand stabiliser oil pipes
4. Overload valve
5. Overload valve to main boom hose oil pipe
6. Supply hydraulic hose connection
7. Blocking valves manifold
8. Return hydraulic hose connection
9. Overload valve return oil pipe connector
10. Left hand stabiliser oil pipes

**Figure 384 - Directional Control Valve Bank**

- Carefully lift the directional control valve with attached blocking cylinders from its mounted position.

### 242. Cleaning and Inspection

**WARNING**

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

- **a.** Wash the parts in an appropriate cleaning agent and blow dry with compressed air. Do not wipe with cloth or paper towel because lint or other matter could enter the hydraulic system and cause a malfunction.
- **b.** Inspect the directional control valve for wear or damage, replace as required. Replace any parts that have scratches or burrs that could cause leaks. Replace all sealing rings.

### 243. Installation

- **a.** Position the directional control valve (Fig 384(2)) with attached blocking cylinders in its mounted position and secure the control valve to the mounting bracket with the M8 socket head bolts fitted with flat washers. Torque the bolts to 22 Nm.
- **b.** Align the vertical control rods (Fig 385(6)) in the slots in their respective operating shafts on the directional control valve. Connect the rods to the shafts with the pins and lock the pins with the circlips.
- **c.** Connect the oil pipe (Fig 384(5)) between the overload valve and the main boom hose connector.
- **d.** Connect the oil pipe to the blocking valves manifold (Fig 384(7)).
- **e.** Connect the left hand stabiliser oil pipes (Fig 384(10)) to the directional control valve.
- **f.** Connect the overload valve return oil pipe (Fig 384(9)) to the directional control valve.
- **g.** Connect the main supply and return hydraulic hoses to the directional control valve oil supply and return connections (Fig 384(6) and (8)).
- **h.** Connect the crane actuating cylinder hydraulic hoses to the directional control valve.
- **i.** Connect the slew cylinder oil pipes (Fig 384(1)) to the directional control valve.
- **j.** Connect the right hand stabiliser oil pipes (Fig 384(3)) to the directional control valve.
- **k.** Connect the hydraulic hose to the overload valve (Fig 384(4)).
- **l.** Open the ball valve at the base of the hydraulic reservoir.
OPERATE EACH CRANE FUNCTION SLOWLY AS AIR IN THE SYSTEM MAY CAUSE ERRATIC MOVEMENT.

m. Operate the hydraulics and test the operation of all the crane functions (including the stabilisers). Cycle all functions through full travel at least twice.

n. Check for oil leaks, repair as required.

o. Stow the crane in the travelling position and check the oil level in the hydraulic reservoir. Top up if required.

Control Rod

244. Removal

a. Unstow the crane far enough to gain access to the control rod connections at the directional control valve bank. Lower the outer boom to the ground so weight is taken off the boom, or support the boom with blocks to prevent accidental movement.

b. Disengage the PTO and switch off the engine.

c. Remove the circlip (Fig 385(7)) from the clevis pin (Fig 385(8)) and remove the clevis pin.

d. Unscrew the control lever knob (Fig 385(1)) off the control lever (Fig 385(21)).

e. Remove the M5 socket head bolt (Fig 385(17)), washer (Fig 385(18)) and nut (Fig 385(20)) securing the control lever shaft split pin (Fig 385(19)) to the support post (Fig 385(15)).

f. Withdraw the control lever shaft (Fig 385(16)) far enough to disconnect the pivot bracket (Fig 385(22)) of the control lever.

g. Lower the control rod (Fig 385(6)) with control lever (Fig 385(21)) and remove from the crane support post (Fig 385(15)).

h. Record the position of the nut (Fig 385(4)) and lock nut (Fig 385(5)) on the M12 socket head screw (Fig 385(2)). Release the lock nut and nut and remove the M12 socket head screw from the control rod.

245. Installation

a. Install the M12 socket head screw (Fig 385(2)) in the pivot pin (Fig 385(3)) and screw the nut (Fig 385(4)) and lock nut (Fig 385(5)) on to the screw to the position recorded on removal. Do not tighten.

b. Fit the control rod (Fig 385(6)) and control lever (Fig 385(21)) in its installed position. Align the control lever pivot mounting hole with the control lever shaft (Fig 385(16)) and insert the shaft.

c. Align the lower mounting hole of the control rod with the mounting holes in the directional control valve bracket.

d. Check that a free pin fit exists for the clevis pin (Fig 385(8)) and that the control lever (Fig 385(21)) is in the neutral position. Adjust the M12 socket head screw (Fig 385(2)) length in the control rod as required.

e. Tighten the nut (Fig 385(4)) and the lock nut (Fig 385(5)).

f. Install the control lever knob (Fig 385(1)).

g. Install the circlip (Fig 385(7)) on the clevis pin (Fig 385(8)).

h. Install the split pin (Fig 385(19)) and secure with the M5 socket head screw (Fig 385(17)) fitted with the washer (Fig 385(18)) and nut (Fig 385(20)).

i. Test the operation of the crane function. Check the control lever travel for full and free movement, adjust if required.

j. Stow the crane in the travelling position.

Control Lever

246. Removal

a. Unstow the crane far enough to gain access to the control rod connections at the directional control valve bank. To prevent accidental movement lower the outer boom to the ground so weight is off the boom, or rest the boom on blocks.

b. Disengage the PTO and switch off the engine.

c. Remove the circlip (Fig 385(7)) from the clevis pin (Fig 385(8)) on the control rod connected to the lever and remove the clevis pin.

d. Remove the control lever knob (Fig 385(1)).

e. Remove the M5 socket head bolt (Fig 385(17)), washer (Fig 385(18)) and nut (Fig 385(20)) securing the control lever shaft split pin (Fig 385(19)) to the support bracket (Fig 385(15)).

f. Withdraw the control lever shaft (Fig 385(16)) far enough to disconnect the pivot of the control lever to be replaced.

g. Lower the control rod and lever and remove from the crane support bracket.
1. Control lever knob  
2. M12 socket head screw  
3. Pivot pin  
4. Nut  
5. Lock nut  
6. Control rod  
7. Circlip  
8. Clevis pin  
9. Directional control valve  
10. Bolt  
11. Washer  
12. Spacer  
13. M8 socket head screw  
14. Bolt  
15. Support post  
16. Control lever shaft  
17. M5 socket head bolt  
18. Washer  
19. Split pin  
20. M5 Nut  
21. Control lever  
22. Pivot bracket

**Figure 385 - Control Rod and Lever**

**Installation**

a. Insert the pivot pin (Fig 385(3)) in the control lever pivot bracket (Fig 385(22)).

b. Install the M12 socket head screw (Fig 385(2)) in the pivot pin (Fig 385(3)) and screw the nut (Fig 385(4)) and lock nut (Fig 385(5)) on to the screw to the position recorded on removal. Do not tighten the lock nut.

g. Record the position of the nut and lock nut (Fig 385(4) and (5)) on the M12 socket head screw (Fig 385(2)). Release the lock nut and nut and remove the M12 socket head screw from the control rod.

i. Remove the pivot pin (Fig 385(3)) from the control lever pivot bracket (Fig 385(22)).

j. Separate the control lever from the control rod.
c. Fit the control rod and lever in its installed position. Align the control lever pivot mounting hole with the control lever shaft (Fig 385(16)) and insert the shaft.

d. Align the mounting hole of the control rod with the mounting hole in the directional control valve bracket.

e. Check that a free pin fit exists for the clevis pin (Fig 385(8)) and that the control lever (Fig 385(1)) is in the neutral position. Adjust the M12 socket head screw (Fig 385(2)) length in the control rod as required.

f. Tighten the nut (Fig 385(4)) and the lock nut (Fig 385(5)).

g. Install the control lever knob.

h. Install the circlip (Fig 385(7)) on the clevis pin (Fig 385(8)).

i. Install the split pin (Fig 385(19)) and secure with the M5 socket head screw fitted with the washer (Fig 385(18)).

j. Test the operation of the crane function. Check the control lever travel for full and free movement, adjust if required.

k. Stow the crane in the travelling position.
GROUP 17 — CAB HEATING AND COOLING

**WARNING**

THE REFRIGERATION SYSTEM COMPONENTS AND COPPER PIPEWORK USED IN THE AIR CONDITIONING SYSTEM ARE UNDER HIGH PRESSURE AND CAN CAUSE SERIOUS INJURY IF THE AIR CONDITIONING SYSTEM IS OPENED.

**WARNING**

THE REFRIGERATION SYSTEM COMPONENTS AND COPPER PIPEWORK CONTAIN LIQUID-VAPOUR MIXTURES UNDER PRESSURE, WHICH ON CONTACT CAN FREEZE AND COLD-BURN HUMAN BODY TISSUE RESULTING IN PERMANENT DAMAGE. THIS DAMAGE CAN OCCUR WITHIN 1(ONE) SECOND. IF REFRIGERANT DOES ENTER THE EYE, FREEZING OF THE EYE CAN OCCUR AND BLINDNESS COULD RESULT.

**WARNING**

DO NOT ALLOW REFRIGERANT LUBRICATING OIL TO CONTACT EITHER BARE SKIN OR VEHICLE PAINT WORK. WASH OFF IMMEDIATELY IF CONTACT WITH OIL OCCURS. IF REFRIGERANT COMES INTO CONTACT WITH THE SKIN, THAW AFFECTED AREAS IMMEDIATELY WITH WARM WATER AND SEEK MEDICAL ADVICE. *DO NOT USE HOT WATER.*

**WARNING**

IF REFRIGERANT ENTERS THE EYES, KEEP CALM AND DO NOT RUB THE EYES. CARRY OUT THE FOLLOWING FIRST AID: SPLASH LARGE QUANTITIES OF COOL WATER INTO THE EYES TO INCREASE THE TEMPERATURE, TAPE A STERILE EYE PATCH IN PLACE TO PREVENT DIRT ENTERING AND SEEK IMMEDIATE MEDICAL TREATMENT FROM A DOCTOR. DO NOT ATTEMPT TO TREAT YOURSELF.

**WARNING**

AVOID INHALATION OF REFRIGERANT VAPOURS. ENSURE THAT THE WORKING AREA IS WELL VENTILATED.

**WARNING**

WHEN OPERATING, THE AIR CONDITIONING SYSTEM HAS SEVERAL HOT (> 60°C) AND COLD (>5°C) AREAS. WHEN WORKING ON THE VEHICLE BE WELL AWARE OF THESE AREAS TO AVOID INJURIES.

**WARNING**

WELDING TASKS ARE NOT TO BE PERFORMED ON THE REFRIGERANT CIRCUIT OR IN THE IMMEDIATE VICINITY. THE REFRIGERANT GAS IS NON-FLAMMABLE. HOWEVER, ENSURE THAT THERE ARE NO NAKED FLAMES WITHIN THE VICINITY AS TOXIC GAS IS PRODUCED WHEN THE REFRIGERANT GAS COMES IN CONTACT WITH FIRE.

**WARNING**

DO NOT CLEAN THE AIR CONDITIONING CONDENSER WITH STEAM CLEANING EQUIPMENT AS THE EXPANSION OF THE REFRIGERANT GAS WITHIN MAY CAUSE EXCESSIVELY HIGH PRESSURES IN THE AIR CONDITIONING SYSTEM THAT MAY RESULT IN AN EXPLOSION.

**CAUTION**

ALL MAINTENANCE AND REPAIR PROCEDURES TO THE REFRIGERATION COMPONENTS AND COPPER PIPEWORK USED IN THE AIR CONDITIONING SYSTEM MUST BE PERFORMED BY AN ACCREDITED REFRIGERATION TECHNICIAN WORKING TO THE CURRENT CODE OF ETHICS.
THE REFRIGERANT IS NOT TO BE RELEASED TO THE ATMOSPHERE BUT CAPTURED FOR RECYCLING. REFRIGERANT R134A IS NOT AN OZONE DEPLETING SUBSTANCE BUT ITS COST AND THE FACT THAT IT DOES CONTRIBUTE TO THE GREENHOUSE EFFECT MAKE IT ESSENTIAL THAT IT IS RECOVERED.

NOTE
Refrigerant R134a is transparent and colourless in both gaseous and liquid states. At normal temperatures and pressures the refrigerant will be a vapour. The vapour is heavier than air and is non-flammable, non-explosive, non-poisonous and non-corrosive (except when in contact with moisture or fire).

NOTE
The filter/receiver/drier must be replaced whenever the air conditioning system has been opened.

Air Conditioner Compressor

248. Removal
a. Operate the battery isolation switch so that the batteries are isolated from the vehicle.
b. Remove the grille and bonnet (refer to EMEI Veh D 393 Group 01 - Access For Repair).
c. Loosen the two hose clamps (Fig 386(1)) and remove the air intake hose between engine and air cleaner.
d. Recover the refrigerant from the air conditioning system, see para 272).
e. Tag the suction (port L) and discharge (port H) refrigerant hoses (Fig 387(4)). Crack open the hoses and then disconnect the hoses from the air conditioner compressor. Cap all hoses and ports immediately with airtight blanking plugs to prevent the absorption of moisture into the air conditioning system. Discard the O-rings.

f. Remove the air conditioner compressor drive belt (refer to EMEI Veh D 393 Group 1 - Engine).
g. Disconnect the electrical lead to the magnetic clutch at the connector on the air conditioner compressor.
h. Remove the mounting bolt, lock nut and flat washer securing the mounting bracket for the cold start reservoir (Fig 387(3)) to the air conditioner compressor and move the mounting bracket and reservoir (with air lines still connected) clear of the compressor.
i. Remove the air conditioner compressor drive belt adjusting bolt (Fig 388(1)) and nut and the compressor mounting bolts (Fig 388(2)), nuts and spring washers and then remove the air conditioner compressor from its cradle mounting on the engine.
1. Drive belt adjusting bolt
2. Compressor mounting bolt
3. Cradle mounting bolt

**Figure 388 - Air Conditioner Compressor Mountings**

j. Drain, measure and record the amount of refrigerant lubricating oil contained in the air conditioner compressor.

k. Check for oil leaks around the fittings and the shaft seal of the air conditioner compressor, repair/replace as required.

l. Inspect the air conditioner compressor clutch for serviceability. Check that the pulley rotation is true and there is no wear or noise (that indicates bearing failure).

m. Inspect the air conditioner compressor drive belt for wear, replace if required.

### 249. Installation

**NOTE**

If the oil in the air conditioner compressor was drained on removal but not measured, add a minimum of 155cc of new oil to the compressor before installation.

a. Fill the air conditioner compressor through the discharge port of the compressor with the same amount of new refrigerant lubricating oil that was drained on removal.

b. Position the air conditioner compressor in its mounting cradle and install the compressor mounting bolts (Fig 388(2)), nuts and spring washers. Torque the mounting bolts to 30 Nm.

c. Install the air conditioner compressor drive belt adjusting bolt (Fig 388(1)) and nut. Do not tighten at this stage.

d. Fit the air conditioner compressor drive belt and tension the belt (refer to EMEI Veh D 393 Group 1 - Engine).

e. Connect the electrical lead for the magnetic clutch to the connector on the air conditioner compressor.

f. Mount the cold start reservoir and mounting bracket on the air conditioner compressor and secure with the mounting bolt, flat washer and lock nut.

g. Remove the blanking plugs from all ports and hoses and connect the discharge and suction refrigerant hoses (Fig 387(4)) (previously tagged) to the air conditioner compressor. Lubricate the new O-rings and the threads and pipe flares with refrigerant lubricating oil (Emkarate RL375) prior to installation of the hoses.

h. Replace the filter/receiver/drier, see para 258.

i. Evacuate and charge the air conditioning system, see paras 273 and 274.

j. Connect the air intake hose between the engine and the air cleaner with the two hose clamps (Fig 386(1)).

k. Operate the battery isolation switch to connect the batteries to the vehicle electrical system.

l. Test the performance of the air conditioning system. Rectify as required, see para 275.

m. Install the grille and bonnet (refer to EMEI Veh D 393 Group 01 - Access For Repair).

**Air Conditioner Condenser and Fan Assemblies**

### 250. Removal

a. Operate the battery isolation switch to disconnect the batteries from the vehicle electrical system.

b. Recover the refrigerant from the air conditioning system, see para 272.

c. Remove four bolts, fitted with spring and flat washers, securing the condenser and fan assembly guard to the top of the right hand equipment lockers, then remove the guard.
d. Tag and disconnect the electrical lead (Fig 389(5)) to the condenser fan assembly and cut the cable ties securing the lead to the condenser and fan assembly.

e. Crack open the union nuts connecting the inlet hose (Fig 389(4)) and outlet pipe (Fig 389(2)) from the condenser and then fully unscrew the nuts and disconnect the hose and pipe. Cap all openings with airtight blanking plugs immediately and discard the O-rings.

f. Remove the filter/receiver/drier (Fig 389(3)), see para 258.

g. Remove the four bolts, flat washers and lock nuts securing the condenser and fan assembly to the top of the right hand equipment lockers and then remove the assembly.

h. Drain, measure and record the refrigerant lubricating oil contained in the condenser. Refit caps to all apertures and ensure the connections are watertight.

251. **Disassembly**

a. Remove the four bolts, spring and flat washers retaining the condenser to the condenser frame and fan assembly base.

b. Remove the condenser taking care not to damage the inlet and outlet fittings.

252. **Cleaning and Inspection**

**WARNING**

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

**CAUTION**

DO NOT USE EXCESSIVE PRESSURE (AIR OR WATER) THAT CAN DAMAGE CONDENSER COIL COOLING FINS OR OTHER COMPONENTS.

a. Clean any build up of debris from the condenser radiator cooling fins with an appropriate cleaning agent and water and blow dry with compressed air.

b. Inspect the condenser assembly for damage to the radiator or fins. Carefully straighten any bent fins.

c. Inspect the condenser assembly for leaks, cracks or holes, replace as required.

d. Inspect the condenser mounting brackets for cracks or damage, replace/repair if necessary.

e. Inspect the condition of the rubber grommets (that protect the inlet and outlet hoses) mounted in the access holes in the condenser frame. Replace as required.

253. **Reassembly**

a. Install the condenser in the condenser and fan assembly base and secure with the four mounting bolts, flat and spring washers. Ensure the rubber grommets are seated in position.

254. **Installation**

a. Position the condenser housing and fan assembly (Fig 389(1)) on the top of the right hand equipment locker and secure with the four mounting bolts, flat washers and lock nuts (from inside the equipment locker). Tighten the bolts securely.

b. Connect the electrical lead (Fig 389(5)) (previously tagged) to the condenser fan assembly.
c. Remove the sealing plugs from the pipes and apertures then connect the inlet hose (Fig 389(4)) and outlet pipe (Fig 389(2)) (previously tagged) to the condenser. Lubricate the new O-rings and the threads and pipe flares with refrigerant lubricating oil (Emkarate RL375) prior to installation of the hoses.

d. Install the new filter/receiver/drier (Fig 389(3)), see para 260.

e. Evacuate and charge the air conditioning system, see paras 273 and 274. Top up the air conditioner compressor refrigerant lubricating oil with an equal amount of new refrigerant lubricating oil to that that was drained and recorded on removal.

f. Position the condenser and fan assembly guard over the condenser and fan assembly and secure with the four mounting bolts fitted with flat and spring washers. Tighten the bolts securely.

g. Secure the refrigerant hoses and wiring loom to the condenser and fan assembly guard, in the area of the filter/receiver/drier, with cable ties.

h. Operate the battery isolation switch to connect the batteries to the vehicle electrical system.

i. Carry out a performance test on the air conditioning system, see para 275.

Air Conditioner Condenser Extractor Fan

NOTE

The removal/installation procedure is identical for the three extractor fans.

255. Removal

a. Operate the battery isolation switch to disconnect the batteries from the vehicle electrical system.

b. Remove four bolts, fitted with flat and spring washers, securing the condenser and fan assembly guard to the top of the right hand equipment lockers, then remove the guard.

c. Remove the four mounting screws (Fig 390(1)) on the extractor fan and remove the fan.

d. Disconnect the electrical lead (Fig 390(2)) from the fan to be removed.

256. Cleaning and Inspection

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

a. Clean any build-up of dirt from the extractor blades with an appropriate cleaning agent and water and blow dry with compressed air.

b. Inspect the motor drive shaft for wear and that it is running true.

c. Check all bolts/screws for tightness.

d. Test the operation of the fan using a 24 volt power source and check for smooth operation.

257. Installation

a. Connect the electrical lead (Fig 390(2)) to the fan motor.

b. Install the extractor fan on the condenser housing and secure with four mounting screws (Fig 390(1)).

c. Position the condenser and fan assembly mesh guard over condenser and fan assembly and secure with the four mounting bolts fitted with flat and spring washers. Tighten the bolts securely.

d. Operate the battery isolation switch to connect the batteries to the vehicle electrical system.

e. Test the operation of the extractor fan.
Filter/Receiver/Drier

NOTE

The filter/receiver/drier must be replaced whenever the air conditioning system has been opened.

258. Removal

a. Operate the battery isolation switch to disconnect the batteries from the vehicle electrical system.
b. Recover the refrigerant from the air conditioning system, see para 272.
c. Disconnect the electrical lead to the high pressure/low pressure (HP/LP) switch (Fig 391(4)).
d. Crack open the union nuts connecting the inlet pipe and outlet hose (Fig 391(2) and (5)) to the filter/receiver/drier, and then fully unscrew the nuts and disconnect the pipes. Cap all openings with airtight blanking plugs immediately. Discard the O-rings.
e. Loosen the two hose clamps (Fig 391(3)) securing the filter/receiver/drier clamp to the mounting bracket, then lift out the filter/receiver/drier.

f. Drain, measure and record the refrigerant lubricating oil contained in the filter/receiver/drier.

Figure 391 - Filter/Receiver/Drier - Removal

1. Electrical connector  4. HP/LP switch
2. Inlet pipe (to filter/receiver/drier)  5. Outlet hose (from filter/receiver/drier)
3. Hose clamp

259. Inspection

a. Inspect the supply and return fittings for damage.
b. Inspect the replacement filter/receiver/drier union fittings for damage.

260. Installation

NOTE

Ensure the fitting with the word IN is fitted to the inlet pipe of the filter/receiver/drier and faces to the left.

a. Slide the filter/receiver/drier into the hose clamps (Fig 391(3)).
b. Uncap the filter/receiver/drier hose and pipe fittings and the inlet pipe and outlet hose connections.
c. Align the inlet pipe and outlet hose (Fig 391(2) and (5)) with their respective fittings. Lubricate the new O-ring with a small amount of refrigerant lubricating oil (Emkarate RL375) prior to assembly.
d. Connect the filter/receiver/drier inlet pipe and filter/receiver/drier outlet hose to the filter/receiver/drier and tighten.
e. Secure the filter/receiver/drier with the two hose clamps.

NOTE

Ensure the HP/LP switch on top of the filter/receiver/drier faces towards the front of the vehicle.

f. Install the HP/LP switch with new O-ring to the front plug on top of the filter/receiver/drier. Lubricate the O-ring with refrigerant lubricating oil (Emkarate RL375) prior to installation.
g. Connect the electrical lead to the HP/LP switch (Fig 391(4)).
h. Remove the discharge refrigerant hose from the discharge port (marked H) at the air conditioner compressor; discard the O-ring.
i. Fill the air conditioner compressor through the discharge port (marked H) of the compressor with an equal amount of new refrigerant lubricating oil to that that was drained (and recorded) on removal of the filter/receiver/drier. Include the amount of oil that may have been drained (and recorded) from any other component that was removed during repair of the air conditioning system.
j. Connect the discharge refrigerant hose to the discharge port (marked H) of the air conditioner compressor. Lubricate the new O-ring and the threads and pipe flare with refrigerant lubricating oil (Emkarate RL375) prior to installation of the hose.

k. Evacuate and charge the air conditioning system, see paras 273 and 274.

l. Operate the battery isolation switch to connect the batteries to the vehicle electrical system.

m. Carry out a performance test on the air conditioning system, see para 275.

Evaporator Unit Assembly

NOTE

The filter/receiver/drier must be replaced whenever the air conditioning system has been opened.

261. Removal

a. Operate the battery isolation switch to disconnect the batteries from the vehicle electrical system.

b. Recover the refrigerant from the air conditioning system, see para 272.

c. Raise and secure the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair).

d. Tag and disconnect the liquid and suction refrigerant lines from the evaporator. Discard the O-rings and cap all openings with airtight plugs immediately.

e. Loosen the hose clamp (Fig 392(1)) securing the fresh air duct pipe to the evaporator, and disconnect the pipe.

f. Cut the cable tie (Fig 392(2)) securing the fresh air duct pipe to the aluminium heat shield just below the evaporator connection.

g. From the front of the cab, remove the two nuts (upper) and the two self tapping screws (lower) securing the aluminium heat shield and remove the shield from underneath the inlet air plenum.

h. From the rear of the cab remove the two condensate drain hoses and sealant surrounding the drain pipes at the rear of the evaporator.

i. Lower the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair). Do not secure.

j. Remove the eight M6 bolts, spring and flat washers securing the evaporator front cover, disconnect the electrical lead to the air conditioner controls and remove the cover.

k. Remove the four M6 bolts, spring and flat washers securing each of the evaporator side covers and remove the covers.

l. Remove the two M8 bolts (13 mm head size), spring and flat washers, above the evaporator core, securing the inlet air plenum to evaporator body.

m. At the front of the cab under the bonnet:

(1) Remove the centre M6 lock nut and flat washer securing the inlet air plenum to the firewall.
(2) Remove the M6 bolt, spring and flat washer securing the right hand side of the inlet air plenum to the firewall.

(3) Remove the M6 bolt, spacer, spring and flat washer securing the left hand side of the inlet air plenum to the mounting bracket for the fresh air duct.

(4) Cut the cable ties securing the wiring loom to the upper face of the inlet air plenum.

n. Remove the five Phillips head screws securing the glove box. Disconnect the map light electrical connector then remove the glove box.

o. Remove the trailer brake control from the steering column and swing the control away from the column. Do not disconnect the hose connections (refer to EMEI Veh D 393 Group 8 - Brake System).

p. Remove the retaining screw securing the protective cover to the steering column and remove the cover.

q. Remove the ten screws securing the steering column and transverse shaft protective cover to the lower part of the dash and remove the cover.

r. Disconnect the 6-pin connector joining the wiring loom to the evaporator.

s. From under the dash (on the passenger’s side), disconnect the 2-pin connector (purple leads) of the electrical loom connecting the evaporator to the circuit breaker loom.

t. Through the top of the dash (on the passenger’s side), remove the lock nut and spring washer securing the two evaporator earth wires (green) to the wiring loom grommet retaining bolt on the firewall.

u. Remove the two M6 bolts (Fig 393(1)), spring and flat washers securing the top of the evaporator to the firewall.

v. Remove the two lower M6 bolts, spring and flat washers (in the drain tray) securing the evaporator to the firewall.

w. Remove the evaporator unit from the cab.

Figure 393 - Evaporator Mounting Bolts - Removal

x. Drain, measure and record the refrigerant lubricating oil contained in the evaporator. Refit caps to all apertures and ensure the connections are air and watertight.

262. Cleaning and Inspection

**WARNING**

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

**CAUTION**

DO NOT USE EXCESSIVE PRESSURE (AIR OR WATER) THAT CAN DAMAGE EVAPORATOR COIL COOLING FINS OR OTHER COMPONENTS.

a. Clean any build-up of debris from the evaporator radiator cooling fins with an appropriate cleaning agent and water and blow dry with compressed air.

b. Inspect the evaporator assembly for damage to the radiator or fins. Carefully straighten any fins that are bent.
c. Inspect the evaporator assembly for leaks, cracks or holes, replace as required.

d. Inspect the evaporator and unit mountings for cracks, wear or damage, replace/repair if necessary.

e. Inspect the return air filter, clean or replace as required.

f. Check the adhesion of insulation and seals, repair/replace as necessary.

263. Installation

a. Remove the front and side covers off the evaporator before positioning a new evaporator unit in the cab.

b. Position the evaporator unit in the cab and secure to it the firewall with the two M6 bolts (Fig 393(1)) spring and flat washers at the top, and the two lower M6 bolts, spring and flat washers in the drain tray of the evaporator.

c. Install the two M8 bolts (13 mm head size), spring and flat washers securing the inlet air plenum to the evaporator body.

d. Through the top of the dash (on the passenger’s side) secure the two evaporator earth wires (green) to the wiring loom grommet retaining bolt on the firewall with the lock nut and spring washer.

e. Connect the wiring loom (6 pin connector) to the evaporator electrical lead.

f. Under the dash (on the passenger’s side), connect the two pin electrical lead connector (purple leads) connecting the evaporator to the circuit breaker loom.

g. Install the steering column and transverse shaft protective cover and secure the cover to the lower part of the dash with the ten screws.

h. Install the steering column protective cover and secure with the retaining screw.

i. Install the trailer brake hand control valve (refer to EMEI Veh D 393 Group 8 - Brake System).

j. Join the map light electrical lead connector, install the glove box and secure with the five Phillips head screws.

k. Install the left and right evaporator side covers and secure with M6 bolts, fitted with spring and flat washers (four bolts each side).

l. Connect the electrical lead to the air conditioner controls wiring loom and install the evaporator front cover. Secure the cover with eight M6 bolts fitted with spring and flat washers.

m. Raise and secure the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair).

n. From the front of the cab, position the aluminium heat shield underneath the inlet air plenum. Secure the heat shield with the two nuts (upper) and the two self tapping screws (lower).

o. Install the centre M6 lock nut and flat washer on the bolt securing the inlet air plenum centrally to the firewall.

p. Install the M6 bolt, spring and flat washer securing the inlet air plenum to the right hand side of the firewall.

q. Install the M6 bolt, spacer, spring and flat washer securing the left hand side of the inlet air plenum to the mounting bracket for the fresh air duct.

r. Secure the wiring loom to the upper face of the inlet air plenum with cable ties.

s. At the rear of the cab connect the fresh air duct to the evaporator and secure with the hose clamp (Fig 392(1)) and the cable tie (Fig 392(2)).

t. Install two new condensate drain hoses to the drain pipes on the rear of the evaporator and seal the hose outlets at the cab wall with a sealing compound (Silastic).

u. Remove the blanking plugs from all the hoses and fittings and connect the suction and liquid refrigerant lines (previously tagged) to the connectors on the evaporator unit. Lubricate all threads, pipe flares and new O-rings with refrigerant lubricating oil (Emkarate RL375) and tighten the hose connections securely.

v. Lower and secure the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair).

w. Install the new filter/receiver/drier (Fig 389(3)), see para 260.

x. Evacuate and charge the air conditioning system, see paras 273 and 274.

y. Operate the battery isolation switch to connect the batteries to the vehicle electrical system.

z. Carry out a performance check of the air conditioning system, see para 275. Rectify as necessary.
Suction and Discharge Refrigerant Hoses

264. **Removal/Installation**

**CAUTION**

ALL REFRIGERANT HOSES ARE TO BE OF BARRIER TYPE WITH A NYLON SHEATH BETWEEN THE INNER LINEN AND THE BRAID AND MUST BE APPROVED FOR USE WITH R134a REFRIGERANT.

**NOTE**

The suction and discharge refrigerant hoses are tailor made for individual vehicles during initial installation of the air conditioning system.

**NOTE**

Access to most refrigerant hoses will require the cab to be raised (refer to EMEI Veh D393 Group 01 - Access for Repair).

**NOTE**

If there is a significant amount of refrigerant lubricating oil lost due to a component failure (e.g. blown discharge refrigerant hose) the only way to ensure the correct oil level is maintained is to completely drain all the oil from all the components and recharge the system.

**NOTE**

The air conditioning system holds 1.5 kg of refrigerant with a total oil charge of 300cc of lubricating oil. On a new system the air conditioner compressor holds 160 cc of oil and 140 cc must be added.

**NOTE**

The filter/receiver/drier must be replaced whenever the air conditioning system has been opened.

- Operate the battery isolation switch so that the batteries are isolated from the vehicle.

**ELECTRICAL AND MECHANICAL ENGINEERING INSTRUCTIONS**

- Recover the refrigerant from the vehicle air conditioning system, see para 272.
- Crack the connectors on the refrigerant hose, then fully unscrew the connectors and disconnect the hose. Cap all openings with air tight plugs immediately. Discard all O-rings.

**NOTE**

Note the position of the refrigerant hoses and note the number and position of the cable ties and clamps that secure them, before disconnecting. As a rule of thumb cable ties must fasten the hoses at intervals of 500 mm but may be fitted at shorter intervals if required.

- Remove the cable ties and clamps securing the refrigerant hose to the vehicle.
- Using the old refrigerant hose as a template, cut the new hose to length and fit new connectors to the hose.
- Install the refrigerant hose on the vehicle and secure with clamps and cable ties. Lubricate all threads, pipe flares and new O-rings with refrigerant lubricating oil (Emkarate RL375). Tighten the connectors securely.
- Replace the filter/receiver/drier, see paras 258 to 260.
- Evacuate and recharge the air conditioning system, see paras 273 and 274.
- Carry out a performance test on the air conditioning system, see para 275.

Fan and Air Conditioner Control Switches

265. **Removal**

- Operate the battery isolation switch so that the batteries are isolated from the vehicle.
- With a suitable tool (small screwdriver) insert the blade under the flange provided at the end of housing of the control switch to be replaced (Fig 394(1) or (2)) and lever the switch away from the evaporator housing.
- Tag and disconnect the electrical leads from the control switch to be replaced and remove the switch.
1. Fan speed switch
2. Fan and air conditioner ON/OFF switch

**Figure 394 - Air Conditioner Controls**

266. **Installation**

a. Connect the electrical leads (previously tagged on removal) to the new control switch.

b. Install the new control switch (Fig 394(1) or (2)) in the evaporator housing and press firmly into position.

c. Operate the battery isolation switch so that the batteries are connected to the vehicle.

d. Test the operation of the control switch.

267. **Return Air Filter**

268. **Cleaning**

a. Carefully wash the filter medium in warm soapy water and blow dry with compressed air from front to back, and from back to front. Replace the filter medium if holed.

269. **Installation**

a. Install the filter medium and the filter screen (Fig 395(4)) on the evaporator housing (Fig 395(1)) and secure with the three upper bolts (Fig 395(2)) (fitted with spring washers) and the three lower bolts (Fig 395(3)) (fitted with spring and flat washers) and the three lower bolts (Fig 395(3)) (fitted with spring and flat washers).
Air Conditioning System

NEVER RUN THE AIR CONDITIONER COMPRESSOR WITHOUT REFRIGERANT IN THE SYSTEM AS COMPRESSOR LUBRICANT RELIES ON REFRIGERANT FLOW.

270. Evacuation and Charging Equipment

a. The following equipment is required for evacuating and charging the air conditioning system:

(1) Refrigerant calibration charging cylinder or weighing device (Fig 396(8) or (8A)).

(2) Manifold gauge set including pressure gauges (Fig 396(2)) and hoses.

(3) Vacuum pump (Fig 396(6)).

(4) Refrigerant recovery unit (including compressor, oil collector and cylinder) (Fig 396(1) and (9)).

(5) R134a supply cylinder (Fig 396(7)).

(6) Electronic leak detector.

NOTE

All hoses at the point of connection to the air conditioning system must have isolation valves fitted.

271. Commissioning

a. New Air Conditioning System. Evacuate the air conditioning system for a minimum period of four hours.

NOTE

The filter/receiver/drier must be replaced if the air conditioning system has been opened.

b. Existing Air Conditioning System. If the system has been opened to undergo repairs an evacuation period of one hour should be sufficient provided connections have been capped during the repair period.

---

**Figure 396 - Air Conditioning System - Evacuation and Charging Connections (Typical)**
NOTE

Refrigerant Recovery

THE REFRIGERANT IS NOT TO BE RELEASED TO THE ATMOSPHERE BUT CAPTURED FOR RECYCLING. REFRIGERANT R134A IS NOT AN OZONE DEPLETING SUBSTANCE BUT ITS COST AND THE FACT THAT IT DOES CONTRIBUTE TO THE GREENHOUSE EFFECT, MAKE IT ESSENTIAL THAT IT IS RECOVERED.

NOTE

Several types of refrigerant recovery unit systems are available. The system depicted in Figure 397 is representative only.

WARNING

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

a. Clean around the suction and discharge service valves on the air conditioner compressor with an appropriate cleaning agent, and then blow dry using compressed air.

b. Connect the refrigerant recovery unit outlet to an R134a recovery cylinder (Fig 397(6)) with a hose and open the valve on the cylinder.

c. Remove the caps from the air conditioning suction and discharge service valves on the air conditioner compressor.

d. Connect a manifold gauge set (Fig 397(2)) to the suction and discharge service valves and the centre manifold gauge line to the inlet on the refrigerant recovery unit.

e. Ensure that the high and low sides of the manifold hand valves on the manifold gauge set (Fig 397(2)) are closed.

f. Connect the refrigerant recovery unit to an electrical supply.

g. Open the gauge set to allow refrigerant to enter the refrigerant recovery unit via the centre hose and turn the refrigerant recovery unit on.

Figure 397 - Refrigerant Recovery - Connections (Typical)
h. The refrigerant recovery unit will operate until the vehicle air conditioning system has been emptied of refrigerant down to atmospheric pressure.

i. Close the tap on the recovery cylinder and the manifold gauge set.

j. Measure the amount of refrigerant lubricating oil removed from the air conditioning system. The oil is normally separated from the incoming refrigerant into the refrigerant recovery unit. The same amount of new clean oil must be added into the system before recharging with refrigerant.

k. On completion of reclaiming:

(1) Disconnect the manifold gauge from the air conditioner compressor, suction and discharge service valves and fit the dust caps to the valves; and

(2) Disconnect the centre manifold gauge line from the inlet on the refrigerant recovery unit.

l. Filling the Calibrated Charging Cylinder. If the capacity of the air conditioning system is known and a “dial-a-charge” charging cylinder is to be used prepare the cylinder as follows:

(1) Open valve on bottom of charging cylinder, allowing refrigerant to enter cylinder from storage cylinder.

(2) Bleed the cylinder via the valve on top (behind the pressure gauge) as required to allow refrigerant to enter. This valve should be connected via a hose to a refrigerant recovery unit and recovery cylinder. When refrigerant reaches the desired level, close the valve at the bottom of the cylinder and be certain that the bleed valve is securely closed.

273. Evacuation and Leak (Vacuum) Test

CAUTION

DO NOT START THE ENGINE. DAMAGE TO THE AIR CONDITIONER COMPRESSOR WILL OCCUR IF THE ENGINE IS RUN DURING THE EVACUATION AND LEAK TEST.

NOTE

Ensure that the system charge has been recovered.

WARNING

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

a. Clean around the suction and discharge refrigerant hoses and the service valves at the air conditioning compressor with an appropriate cleaning agent. Blow dry using compressed air.

b. Remove the caps from the air conditioning suction and discharge service valves and connect a suitable manifold gauge set to the suction and discharge service valves.

c. Connect the centre manifold gauge line to the vacuum pump inlet on the refrigerant recovery unit.

d. Check that both manifold hand valves on the gauge set are closed.

NOTE

Do not use spanners when connecting the hoses to the suction and discharge service valves.
e. Start the vacuum pump and slowly open the low side manifold hand valve. The low side gauge reading should decrease to 98-102 kPa vacuum and the high side gauge should read slightly below the zero index of gauge. If the high side gauge reading does not register, check the air conditioning system for a blockage.

f. When the high side gauge is slightly below the zero index of the gauge, open the high side manifold hand valve.

g. Evacuate the air conditioning system for 15 minutes, to a vacuum of –100 kPa. Close both the low and high side hand valves then stop the vacuum pump. The system must hold the vacuum of –100 kPa for a minimum of 15 minutes. If the reading holds and ambient temperatures are above 32°C, continue evacuation for 45 minutes. If the ambient temperature is below 32°C or high humidity conditions prevail, continue the evacuation for 2-4 hours.

h. If the vacuum is not held locate and repair the leak/s and repeat the test.

i. Connect the centre manifold gauge line to the charging cylinder and open the charging cylinder tap. Do not open the low or high side valves on the manifold gauge at this stage.

j. Partially charge the system with 200g of R134a by slowly opening the high side manifold hand valve. The low side gauge should register a pressure, if not, check for a blockage. Close the high side manifold hand valve as soon as 200g of R134a has entered the system.

k. Inspect for leaks by slowly moving the probe of the detector around all refrigerant hose connections and points of possible leakage. Refrigerant R134a is heavier than air and will be more apparent at the bottom of a fitting. If a leak is detected, recover the refrigerant, see para 272 and repair the faulty component or connection. Repeat steps b. to k. of this para after repair of the leak.

l. Replace the filter/receiver/drier, see paras 258 to 260.

m. Carry out a leak test, see para k.

274. Charging

**NOTE**

Charging the air conditioning system includes weighing the charging cylinder or filling the calibrated charging cylinder, performing an evacuation and leak test, reclaiming the refrigerant, charging the air conditioning system and carrying out a performance test.

a. Weigh the charging cylinder, or if the capacity of the air conditioning system is known and a “dial-a-charge” charging cylinder is to be used prepare the cylinder as follows:

(1) Open valve on bottom of charging cylinder, allowing refrigerant to enter cylinder from storage cylinder.

(2) Bleed the cylinder via the valve on top (behind the pressure gauge) as required to allow refrigerant to enter. This valve should be connected via a hose to a refrigerant recovery unit and recovery cylinder. When refrigerant reaches the desired level, close the valve at the bottom of the cylinder and be certain that the bleed valve is securely closed.

b. Recover the refrigerant, see para 272.

c. Perform an evacuation and leak test, see para 273.

**CAUTION**

**DO NOT OPEN THE LOW PRESSURE HAND VALVE WHILST OPERATING THE AIR CONDITIONER COMPRESSOR WHEN CHARGING THE AIR CONDITIONING SYSTEM AND THE HIGH PRESSURE VALVE IS OPEN. DAMAGE TO THE AIR CONDITIONER COMPRESSOR WILL OCCUR IF THE ENGINE IS RUN DURING THE CHARGING PROCEDURE.**

d. Open the HIGH SIDE manifold hand valve slowly. Fill the system with as much of the specified refrigerant vapour charge as possible, do not use liquid in the charging process, then close the high side manifold hand valve.
IRREVERSIBLE DAMAGE TO THE AIR CONDITIONER COMPRESSOR WILL OCCUR IF THE FOLLOWING PROCEDURE IS NOT STRICTLY ADHERED TO.

e. Rotate the air conditioner compressor by hand for 12 revolutions to ensure no liquid refrigerant is trapped in the suction side of the compressor.

f. Ensure that the evaporator coil de-ice thermostat is functioning.

g. Start the engine, depress the air conditioning switch to the ‘ON’ position and select ‘High’ fan speed at the evaporator control panel.

h. Open the centre vent of the heating/cooling/ventilation console and run engine up to approximately 2000 rpm.

i. If the system has been charged with the specified amount of R134a (1.5 kg), carry out a performance test of the air conditioning system, see para 275.

DO NOT ALLOW MORE THAN 275 KPA TO BE REGISTERED ON THE LOW PRESSURE GAUGE.

j. If the system has not been charged with the specified amount of R134a (1.5 kg), complete the charging of the system. Slowly open the LOW side manifold hand valve until the specified amount has been charged into the system.

NOTE

At higher or lower ambient temperatures, pressure gauge readings will vary accordingly. In winter conditions, position vehicle in the sun with maximum solar penetration of cab glass. Blank or partially blank fan intake of condenser using sheet metal or cardboard to raise discharge pressure to nominal 820 kPa.

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NOTE

Due to the refrigerant lubricating oil’s foaming properties, a milky appearance sight glass does not indicate system undercharge for an R134a system using polyolester oil.

NOTE

Pressure gauge readings together with face air outlet temperatures are the only method of checking and diagnosing the system cooling capacity (comparing results with the appropriate graph).

NOTE

If in doubt as to gas charge, e.g. suction pressure low, discharge pressure low or air outlet temperature (face) above the graph range, recover the refrigerant from the system using R134a specific equipment, evacuate the system and charge with 1.5 kg of R134a and carry out a performance test.

k. Note the air conditioner compressor discharge and suction pressures and check the feel of the compressor suction and discharge pipes. To provide adequate compressor cooling and maximum evaporator coil performance, the gas returning to the air conditioner compressor should be cold and the suction service valve cold and sweaty but NOT icing.

l. Referring to the charts (Figs 398 and 399), ensure discharge pressure and suction pressure is within the acceptable limits at its respective ambient condition when the cabin temperature is down to comfort conditions.
When the de-ice thermostat is set to the minimum setting, it is necessary to ensure the evaporator cannot ice up under low return air temperatures on high or low fans and the air conditioner compressor running at maximum speed.

m. If the system has been charged with the specified amount of R134a (1.5 kg), carry out a performance test of the air conditioning system, see para 275.

n. If the system has not been charged with the specified amount of R134a, complete the charging of the system, see para 274.

TAKE CARE WHEN DISCONNECTING THE DISCHARGE REFRIGERANT HOSE AS AN EXTREMELY HIGH PRESSURE COULD BE PRESENT.

o. Stop the engine, disconnect the gauges and replace the protective caps.

p. Carry out a performance test, see para 275.
275. **Performance Test**

**NOTE**

At higher or lower ambient temperatures, pressure gauge readings will vary accordingly.

a. Park the vehicle in the shade.

b. Connect the manifold and gauge set, charging hoses and adaptors to the air conditioning system as shown in Figure 396.

c. Open all doors and close the vehicle bonnet.

d. Ensure the heater is switched off.

e. Close all the vents on the heater (refer to the Operator Handbook).

f. Switch the air conditioner switch to ON and the fan switch to MEDIUM.

**NOTE**

The test duration should be 10 minutes minimum.

ga. Start the engine and run at 2000 RPM.

hb. Record the ambient temperature.

ic. Open all air conditioning face level outlet vents and position the vents in the straight ahead position.

jd. The high pressure gauge of the manifold gauge set should indicate a minimum pressure of 1040 - 1726 kPa at a temperature of 20°C (Fig 398).

ke. Insert the temperature probe into the centre dash vent to a depth not exceeding 50 mm.

lf. Record the temperature at the centre vent when at the lowest reading (not when the thermostatic switch is heard).

m. Compare the lowest readings with the manufacturers acceptable limits (Figs 398 and 399) and the Fault Finding charts at the rear of this Group, rectify as required.

**WARNING**

TAKE CARE WHEN DISCONNECTING THE DISCHARGE REFRIGERANT HOSE AS AN EXTREMELY HIGH PRESSURE COULD BE PRESENT.

n. Stop the engine, disconnect the gauges and replace the protective caps.

276. **Removal**

**NOTE**

The heater radiator is located in the heater housing situated behind the dashboard panel. The heater assembly must be removed to access the heater radiator.

a. Operate the battery isolation switch to disconnect the batteries from the vehicle electrical system.

**CAUTION**

ALWAYS IDENTIFY AND CLEARLY TAG THE SUPPLY AND RETURN COOLANT HOSES PRIOR TO REMOVAL. DO NOT REVERSE THE HOSES ON INSTALLATION. IF THE HOSES ARE REVERSED, HOT WATER WILL BE PRESENT AT THE HEATER CORE AT ALL TIMES AND THE HEATER WILL OPERATE CONTINUOUSLY.

b. Tilt the cab to gain access to the cab heater hoses (refer to EMEI Veh D 393 Group 01 - Access for Repair).

c. Loosen the hose clamp securing the fresh air duct pipe to the evaporator and disconnect the pipe.

d. Cut the cable tie securing the fresh air duct pipe to the aluminium heat shield just below the evaporator connection.

e. Loosen the hose clamps securing the supply and return coolant hoses to the heater pipes and disconnect the hoses.

f. Lower the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair). Do not secure.

g. Open the heater controls in the cabin and drain the engine coolant from the system (refer to EMEI Veh D 393 Group 2 - Cooling System). Retain the coolant for reuse.

h. Remove the circuit breaker panel cover (Fig 400(4)).

i. Remove the six screws securing the upper panel (Fig 400(6)) on the dashboard.

j. Loosen the two bolts securing the upper panel at the circuit breaker panel.
1. Glove box
2. Heater assembly
3. Circuit breaker panel
4. Circuit breaker panel cover
5. Headlight adjustment control knob
6. Upper panel
7. Instrument panel

**Figure 400 - Upper Panel - Removal**

k. Lift off the headlight adjustment control knob (Fig 400(5)).
l. Remove the securing nut, cover plate and spacer from the headlight adjustment control body.
m. Remove the two screws securing the black out flap mounting brackets to the dash and remove the upper panel.

n. Remove the two Phillips head screws and detach the instrument panel (Fig 400(7)) from the dashboard; tilt it towards the steering column.
o. Remove the five Phillips head screws securing the glove box (Fig 400(1)). Disconnect the map light electrical connector then remove the glove box.
p. Tag and disconnect the electrical connector to the heater pump microswitch.

q. Tag and disconnect the electrical connectors to the gear select indicator and the heater fan switch (not used).
r. Cut the cable ties securing the instrument panel wiring loom to the dashboard and the cable tie (if fitted) securing the wiring loom to the heater pipe.
s. Remove the left hand and right hand demister flexible hoses.

t. Remove the three screws (two front, one rear) securing the heater body to the dashboard.
u. Detach the heater pipe to the right hand side footwell.
v. Lift the instrument panel wiring loom out over the lip of the dashboard to provide manoeuvring room.
w. Lift the heater assembly out of the dash taking care not to foul the windscreen wiper linkage.

277. **Disassembly**

a. Tag and disconnect the four electrical leads (Fig 401(3)) to the heater resistor.
b. Lever off the retaining bracket (Fig 401(4)) securing the four electrical leads to the heater resistor.
c. Disconnect the Bowden cable (Fig 401(1)) from the right hand footwell vent flap operating linkages and from the spring clip (Fig 401(2)).
d. Remove the knobs from the controls on the heater control panel.

e. Remove the Bowden cable (Fig 402(3)) from the hot/cold tap and remove the cable from its spring clip (Fig 402(4)).
Figure 402 - Hot/Cold Tap Bowden Cable - Removal

f. Lever off the Bowden cable/loom retaining bracket (Fig 402(2)).
g. Remove the two screws securing the bottom of the control panel to the heater housing.
h. Lift the top of the control panel clear of the four lugs in the body and swing the panel clear of the heater.
i. Remove the five spring clips (2 x wide, 3 x narrow) securing the two halves of the heater housing.
j. Remove the foam rubber seal, two retaining clips and retaining plate from the supply and return pipe-mounting flange.
k. Separate the right hand side of the heater housing from the left hand side housing which holds the heater radiator.
l. Remove the two M5 x 20 bolts and nuts securing the heater tap and pipe assembly to the radiator and remove the heater tap and pipe.
m. Remove the O-ring fitted in the groove on the heater tap and pipe assembly and discard.
n. Remove the two M5 x 12 bolts securing the return pipe to the radiator and remove the pipe.
o. Remove the O-ring fitted in the groove on the heater radiator and discard.
p. Remove the heater radiator from the left hand heater housing, taking care not to damage the foam rubber sealing rings.

NOTE

The gear selector indicator light loom does not fit under the retaining bracket.

j. Position the Bowden cable (Fig 402(3)) for the hot/cold tap and the heater fan switch (not used) wiring loom under the Bowden cable/loom retaining bracket (Fig 402(2)) and press the bracket firmly onto its mountings.
k. Install the Bowden cable on the hot/cold tap and secure with the spring clip (Fig 402(4)).

l. Connect the Bowden cable (Fig 401(1)) to the right hand footwell vent flap operating linkage and secure with the spring clip (Fig 401(2)).

m. Connect the four electrical leads (Fig 401(3)) (previously tagged) to the heater resistor.

n. Position the four electrical leads under the retaining bracket (Fig 401(4)) and press the bracket firmly onto its mountings.

o. Install the knobs on the controls on the heater control panel.

p. Operate the sliding controls and test all the flaps on the heater for freedom of movement, rectify as required.

q. Check the operation of the heater pump microswitch with a multimeter (refer to EMEI Veh D 393 Group 10 - Electrical). Ensure the micro switch operates before the hot/cold slide reaches its stop (i.e. the auxiliary coolant pump is switched off).

280. Installation

a. In the cab, lift the instrument panel wiring loom out over the lip of the dashboard to provide manoeuvring room whilst installing the heater assembly.

b. Lift the heater assembly into the cavity in the dash taking care not to foul the windscreen wiper linkage.

c. Attach the heater pipe to the right hand side footwell.

d. Install the left hand and right hand flexible hoses to the demister piping.

e. Secure the heater body to the dashboard with the three screws (two front, one rear).

f. Tilt the cab to gain access to the cab heater supply and return hose connections (refer to EMEI Veh D 393 Group 01 - Access for Repair).

g. Connect the heater supply and return coolant hoses to the heater pipes and secure with the hose clamps.

h. Connect the fresh air duct pipe to the evaporator and secure with the hose clamp.

i. Cable tie the fresh air duct pipe to the aluminium heat shield.

j. Lower and secure the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair).

k. Connect the wiring loom (previously tagged) to the heater pump microswitch.

l. Connect the wiring loom (previously tagged) to the gear selector indicator and the heater fan switch (not used).

m. Fill the cooling system (refer to EMEI Veh D 393 Group 02 - Cooling System). Do not run the engine at this stage.

n. Pressure test the cooling system (refer to EMEI Veh D 393 Group 2 - Cooling System).

o. Secure the instrument panel wiring loom to the dashboard with cable ties.

p. Install the instrument panel (Fig 400(7)) on the dashboard and secure with the two lower retaining screws.

q. Position the upper panel (Fig 400(6)) with blackout flap in its mounted position on the dashboard and secure with the six screws.

r. Secure the blackout flap mounting bracket to the dash with the two screws.

s. Tighten the two bolts securing the upper panel at the circuit breaker panel.

t. Install the circuit breaker panel cover (Fig 400(4)).

u. Operate the battery isolation switch so that the batteries are connected to the vehicle.

v. Run the engine and visually inspect the cooling system for leaks, repair where necessary. Top up the cooling system as required (refer to the Operator Handbook).

w. Test the heater operation in all modes, repair/replace as required.

x. Install the spacer cover plate and securing nut on the headlight adjustment control body and tighten the nut.

y. Press on the headlight adjustment control knob (Fig 400(5)).

z. Position the glove box to enable the connection of the map light electrical wiring loom, then mount the glove box on the dashboard and secure with the five Phillips head screws.
## Table 14 - Fault Finding - Air Conditioning

### CHART 1 - SYSTEM PRODUCES NO COOLING

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Indications</th>
<th>Cause</th>
<th>Action/Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX valve sweating or frosty.</td>
<td>TX valve jammed shut.</td>
<td></td>
<td>Replace TX valve.</td>
</tr>
<tr>
<td>Compressor operative. Suction gauge high, discharge gauge high.</td>
<td>Evaporator sweating or frosty.</td>
<td>Blocked condenser.</td>
<td>Check and clean.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TX valve jammed open.</td>
<td>Remove and clean or replace TX valve.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>System overcharged.</td>
<td>Correct refrigerant charge.</td>
</tr>
<tr>
<td>Compressor operative. Only slight pressure variations at change in compressor speed.</td>
<td>Compressor reed valves inoperative.</td>
<td></td>
<td>Replace compressor reed valves.</td>
</tr>
<tr>
<td>Compressor operative. Discharge gauge low, suction gauge low.</td>
<td>Frosting at point of line blockage.</td>
<td>Blocked receiver drier.</td>
<td>Replace receiver drier.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blocked TX valve filter screen.</td>
<td>Remove and clean or replace TX valve filter screen.</td>
</tr>
<tr>
<td>Compressor inoperative. Suction gauge low or zero. Discharge gauge low or zero.</td>
<td>No bubbles in sight glass.</td>
<td>Electrical fault.</td>
<td>Check wiring, fuses or circuit breaker.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complete loss of charge. LP switch tripped.</td>
<td>Insert small amount of charge to verify leak. Evacuate and charge system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compressor clutch coil burnt out.</td>
<td>Replace clutch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermostat inactive due to tripped circuit breaker.</td>
<td>Check wiring and reset circuit breaker.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loosen or broken drive belt.</td>
<td>Adjust or replace drive belt.</td>
</tr>
</tbody>
</table>
### Table 14 - Fault Finding - Air Conditioning (Continued)

#### CHART 2 - SYSTEM ONLY PARTIALLY COOLS

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Indications</th>
<th>Cause</th>
<th>Action/Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>System only partially cools.</td>
<td>Faulty condenser fan.</td>
<td>Clean and rectify cause.</td>
<td></td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Blocked condenser coil.</td>
<td>Clean as necessary.</td>
<td></td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Reduced air flow at vents.</td>
<td>Sluggish or faulty evaporator fan motor.</td>
<td>Remove blower for service or replacement.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Blocked evaporator coil.</td>
<td>Clean as necessary.</td>
<td></td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Blocked return air filter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Sight glass shows occasional bubbles.</td>
<td>Air or moisture in system.</td>
<td>Leak test. Evacuate and charge system.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td></td>
<td>Heating system not correctly shut off.</td>
<td>Check and rectify.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Front of clutch and compressor oily.</td>
<td>Compressor shaft leak.</td>
<td>Replace shaft seal.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>TX valve sweating or frosty.</td>
<td>Blocked TX valve.</td>
<td>Clean or replace TX valve.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Receiver drier sweating or frosty.</td>
<td>Blocked receiver drier.</td>
<td>Replace receiver drier.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Discharge hose sweating or frosty.</td>
<td>Restriction in discharge hose.</td>
<td>Locate and rectify.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td></td>
<td>Faulty TX valve sensor.</td>
<td>Check valve operation. Replace if necessary.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Noisy compressor.</td>
<td>Faulty compressor.</td>
<td>Replace compressor.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td></td>
<td>Defective or improper installation of thermostat.</td>
<td>Diagnosis of electronic thermostat required.</td>
</tr>
<tr>
<td>System only partially cools.</td>
<td>Compressor cycles too frequently.</td>
<td>Defective or improperly adjusted thermostat.</td>
<td>Adjust or replace thermostat.</td>
</tr>
</tbody>
</table>
### Table 14 - Fault Finding - Air Conditioning (Continued)

#### CHART 3 - SYSTEM COOLS INTERMITTENTLY

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Indications</th>
<th>Cause</th>
<th>Action/Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>System cools intermittently. Electrical components operate intermittently.</td>
<td></td>
<td>Defective circuit breaker, fan switch or motor.</td>
<td>Replace defective part for service or replacement.</td>
</tr>
<tr>
<td>System cools intermittently. Clutch disengages prematurely during operation.</td>
<td></td>
<td>Improper ground, loose connection in clutch coil.</td>
<td>Check connections or replace clutch coil.</td>
</tr>
<tr>
<td>System cools intermittently. Compressor operates until discharge pressure builds up, then clutch starts to slip. Clutch may or may not be noisy.</td>
<td></td>
<td>Compressor clutch slipping.</td>
<td>Adjust air gap. Replace clutch if necessary.</td>
</tr>
<tr>
<td>System cools intermittently. Suction gauge may be excessively low or high.</td>
<td></td>
<td>Defective thermostat.</td>
<td>Replace thermostat.</td>
</tr>
<tr>
<td>System cools intermittently. Evaporator ices up intermittently. Supply air restricted.</td>
<td></td>
<td>Faulty TX valve sensing bulb.</td>
<td>Replace if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incorrect TX valve superheat adjustment.</td>
<td>Adjust or replace valve.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thermostat adjusted too low.</td>
<td>Replace thermostat.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>De-ice probe incorrectly placed or malfunctioning.</td>
<td>Diagnosis of electronic thermostat required.</td>
</tr>
<tr>
<td>System cools intermittently. System cools well in early morning or late evening. Will not cool during hot day.</td>
<td>Suction gauge and discharge normal.</td>
<td>Excessive moisture in system.</td>
<td>Replace receiver drier.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Evacuate and charge system.</td>
</tr>
</tbody>
</table>
### Table 14 - Fault Finding - Air Conditioning (Continued)

#### CHART 4 - SYSTEM EXCESSIVELY NOISY

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Indications</th>
<th>Cause</th>
<th>Action/Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>System excessively noisy. Idler pulley whines or growls. Has rough spots when rotated by hand.</td>
<td>Worn bearings.</td>
<td>Replace pulley bearing.</td>
<td></td>
</tr>
<tr>
<td>System excessively noisy. Clutch vibrates - may slip.</td>
<td>Defective coil winding. Improper coil connection.</td>
<td>Repair or replace as necessary.</td>
<td></td>
</tr>
<tr>
<td>System excessively noisy. Belts slip and are noisy.</td>
<td>Loose or worn drive belts.</td>
<td>Adjust or replace as required.</td>
<td></td>
</tr>
<tr>
<td>System excessively noisy. Compressor vibrates.</td>
<td>Loose or worn compressor.</td>
<td>Check mountings. Remove compressor for service or replacement.</td>
<td></td>
</tr>
<tr>
<td>Discharge gauge reading high.</td>
<td>HP service valve closed.</td>
<td>Open valve immediately.</td>
<td></td>
</tr>
<tr>
<td>System excessively noisy. Noisy condenser fan.</td>
<td>Worn motor bearings or brushes. Damaged or loose fan blades or fan cowling.</td>
<td></td>
<td>Remove motor/fan and repair or replace.</td>
</tr>
<tr>
<td>Noisy compressor.</td>
<td>Low compressor oil.</td>
<td>Check system for leaks. Correct oil level.</td>
<td></td>
</tr>
</tbody>
</table>

a. Operate the battery isolation switch to disconnect the batteries from the vehicle electrical system.

b. Open the heater controls in the cab and drain the engine coolant from the system (refer to EMEI Veh D 393 Group 2 - Cooling System). Retain the coolant for re-use.

c. Remove the floor mats from the cab.

d. Remove the five Phillips head screws and the nut securing the left hand footwell panel and ease out the panel to gain access to the hour meter leads.

e. Tag and disconnect the two electrical leads to the rear of the hour meter.

f. Remove the two Phillips head screws and washers securing the right hand footwell cover and remove the cover.

g. Remove the five Phillips head screws securing the glove box. Disconnect the map light electrical connector then remove the glove box.

h. Remove the circuit breaker panel cover (Fig 403(4)).

i. Taking care not to damage the fluid lines, disconnect the headlight adjustment control and cover plate from the upper panel on the dash.

j. Lift off the knob (Fig 403(5)) of the headlight adjustment control.

k. Remove the securing nut, cover plate and spacer from the headlight adjustment control body.

l. Remove the rubber grommet on the firewall and feed the headlight adjustment control through the hole in the firewall. Cut cable ties as required to free the fluid lines from the cab.

m. Remove the two screws securing the black out flap mounting brackets to the instrument panel (Fig 403(6)) and remove the upper panel.

n. Remove the two Phillips head screws and detach the instrument panel (Fig 403(6)) from the dashboard; tilt it towards the steering column.

NOTE

Before disconnecting the electrical wiring, consult the vehicle wiring diagrams in EMEI Veh D 393, Group 10 - Electrical, for wiring identification codes.
Tag, cut cable ties and disconnect the electrical connectors of the three looms that enter the cab through the left hand footwell including:

(1) The power loom to the positive busbar (Fig 404(2)) in the left hand footwell;

1. Air conditioner earth lead connection
2. Positive busbar
3. Loom protective boot

Figure 404 - Positive Busbar - Left Hand Footwell

(2) The air conditioner loom at the connector (Fig 405(2));

1. Rotating beacon and body lighting loom
2. Air conditioner loom connector
3. Steering linkage

Figure 405 - Air Conditioner Loom - Left Hand Footwell

(3) The loom at the speed limiter control module (Fig 406(1));

(4) The rotating beacon and body lighting loom (Fig 406(1)) that runs across to the right hand side of the dash and is protected with convoluted plastic, and;

(5) The individual leads to the instrument panel including the speedometer signal lead.

Remove the self locking nut securing the air conditioner earth lead connection (Fig 404(1)) to the upper mounting bolt for the loom protective boot (Fig 404(3)).

Remove the four bolts and nuts securing the loom protective boot (Fig 404(3)) to the firewall in the left hand footwell.

Free the loom protective boot from the firewall and pull the combined looms through the firewall into the engine compartment.

Free the rubber grommet from the firewall and pull the air conditioning loom (Fig 405(2)) and the rotating beacon and body lighting loom (Fig 405(1)) through the firewall into the engine compartment.

Raise and secure the cab (refer to EMEI Veh G 393, Group 01 - Access for Repair).

Remove the air cleaner assembly (refer to EMEI Veh D 393 Group 1 - Engine).
ALWAYS IDENTIFY AND CLEARLY TAG THE SUPPLY AND RETURN COOLANT HOSES TO THE CAB PRIOR TO REMOVAL. DO NOT REVERSE THE HOSES ON INSTALLATION. IF THE HOSES ARE REVERSED HOT WATER WILL BE PRESENT AT THE HEATER CORE AT ALL TIMES AND THE HEATER WILL OPERATE CONTINUOUSLY.

v. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

w. Remove the M6 bolt securing the retaining bracket (Fig 408(3)) for the looms, air lines, hoses and the six-wheel work brake pressure limiting valve to the left hand inner wall of the engine compartment.

x. Tag, cut cable ties (Fig 409(2) and (4)) and disconnect all electrical cables, hydraulic hoses and pneumatic lines from fittings on the left hand side of the firewall including the fresh air blower electrical connector (Fig 409(1)) and the electrical lead for the auxiliary coolant pump (Fig 409(3)). Seal the clutch hydraulic line connections and cut cable ties as required to free the looms.

y. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

v. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

w. Remove the M6 bolt securing the retaining bracket (Fig 408(3)) for the looms, air lines, hoses and the six-wheel work brake pressure limiting valve to the left hand inner wall of the engine compartment.

x. Tag, cut cable ties (Fig 409(2) and (4)) and disconnect all electrical cables, hydraulic hoses and pneumatic lines from fittings on the left hand side of the firewall including the fresh air blower electrical connector (Fig 409(1)) and the electrical lead for the auxiliary coolant pump (Fig 409(3)). Seal the clutch hydraulic line connections and cut cable ties as required to free the looms.

y. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

v. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

w. Remove the M6 bolt securing the retaining bracket (Fig 408(3)) for the looms, air lines, hoses and the six-wheel work brake pressure limiting valve to the left hand inner wall of the engine compartment.

x. Tag, cut cable ties (Fig 409(2) and (4)) and disconnect all electrical cables, hydraulic hoses and pneumatic lines from fittings on the left hand side of the firewall including the fresh air blower electrical connector (Fig 409(1)) and the electrical lead for the auxiliary coolant pump (Fig 409(3)). Seal the clutch hydraulic line connections and cut cable ties as required to free the looms.

y. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

v. Tag and disconnect the heater hoses (Fig 407(2)) between the cab and the auxiliary coolant pump (Fig 407(4)) and the cylinder head connection (Fig 407(1)).

w. Remove the M6 bolt securing the retaining bracket (Fig 408(3)) for the looms, air lines, hoses and the six-wheel work brake pressure limiting valve to the left hand inner wall of the engine compartment.

x. Tag, cut cable ties (Fig 409(2) and (4)) and disconnect all electrical cables, hydraulic hoses and pneumatic lines from fittings on the left hand side of the firewall including the fresh air blower electrical connector (Fig 409(1)) and the electrical lead for the auxiliary coolant pump (Fig 409(3)). Seal the clutch hydraulic line connections and cut cable ties as required to free the looms.
Tag and disconnect the two left hand indicator light wiring loom connectors (Fig 408(2)) and the two right hand indicator light wiring loom connectors on the inner walls of the engine compartment. Cut cable ties as necessary to free the looms.

Tag and disconnect the left hand earth straps (Fig 408(4)) and the right hand earth straps from the inner walls of the engine compartment.

Recover the refrigerant from the air conditioning system (refer to Group 17 - Cab Heating and Cooling, para 272).

Tag and disconnect the liquid and suction refrigerant hoses from the air conditioner evaporator and disconnect the hoses from the firewall. Discard the O-rings and cap all openings with airtight plugs immediately.

Disconnect all clamps and cable ties securing the liquid and suction hoses from the evaporator, the firewall and the right hand inner wall of the engine compartment.

Tag and disconnect the windscreen washer reservoir supply hose and the windscreen washer pump electrical connector from the reservoir.

Tag and disconnect the air supply line to the engine throttle up cylinder.

Tag and disconnect the air supply line (Fig 410(1)) to the base of the engine exhaust brake actuator (front air line only). Cut the cable ties securing the air supply line to the other air lines on the cab base as required.
ah. Cut all cable ties, undo clips and reposition the wiring looms from the right hand inner guard, the front of the cab at the base of the windscreen and the loom from behind the fresh air blower, across to the left hand side of the vehicle. Ensure the looms are free of the cab.

**WARNING**

**THE STEERING SHAFT ALIGNMENT**
**PROCEDURE MUST BE CARRIED OUT BY A SECOND PERSON FROM THE LEFT HAND SIDE OF THE VEHICLE.**

**NOTE**

The sliding joint on the steering shaft has a master spline, which must be aligned with the missing tooth on the plastic gear splined section of the shaft.

ai. Lower the cab ensuring there is no interference from, or damage to the disconnected components. Ensure the steering shaft sliding joint and the steering shaft splines are aligned as the cab is lowered.

aj. Remove the bolt and self locking nut securing the left hand and right hand front cab shock absorbers to the cab.

ak. Remove the locking pins and lynch pins from the two front cab tilting hinges (Fig 411(1)). Rotate the hinges downwards and off the pivot bars and insert the locking pins and lynch pins to secure the hinges in place.

alam. Remove the cab tilt cylinder (refer to EMEI Veh D 393 Group 01 - Access for Repair).

**WARNING**

WHEN REMOVING THE CAB ENSURE NO PERSONS ARE UNDER THE CAB.

**CAUTION**

USE AN OVERHEAD LIFTING DEVICE AND SLING WITH A CAPACITY GREATER THAN 1000 KG.

TO AVOID DAMAGING THE CAB USE PURPOSE MADE LIFTING JIG, SLING AND STANDS.

am. Attach the lifting jig to the cab with the lifting strap and attach steady ropes to the front and rear to balance the cab (Fig 412).

![Figure 412 - Cab - Removal](image)

**NOTE**

Check for lines and attachments that may impede the removal of the cab and exercise care when disconnecting the steering shaft.
an. Lift the cab from the vehicle and place on purpose made stands.

**282. Installation**

**WARNING**

USE AN OVERHEAD LIFTING DEVICE AND SLING WITH A CAPACITY GREATER THAN 1000 KG.

**WARNING**

WHEN INSTALLING THE CAB ENSURE NO PERSONS ARE UNDER THE CAB.

**CAUTION**

TO AVOID DAMAGING THE CAB USE A PURPOSE MADE LIFTING JIG AND SLING.

a. Attach the lifting jig to the cab with the lifting strap and attach steady ropes to the front and rear to balance the cab.

b. Lift the cab into position above the chassis ensuring there is no interference from, or damage to the disconnected components.

**WARNING**

THE STEERING SHAFT ALIGNMENT PROCEDURE MUST BE CARRIED OUT BY A SECOND PERSON FROM THE LEFT HAND SIDE OF THE VEHICLE.

**NOTE**

The sliding joint on the steering shaft has a master spline, which must be aligned with the missing tooth on the plastic gear splined section of the shaft.

c. Lower the cab sufficiently to enable the steering shaft to engage into the sliding joint. Ensure wiring looms and air lines are kept clear and forward of the cab.

d. Fit the splined portion of the steering shaft into the sliding joint.

e. Lower the cab onto the chassis mountings.

f. Secure left hand and right hand front cab shock absorbers to the cab with the bolts and self locking nuts.

g. Remove the locking pins (Fig 411(3)) from the two front cab tilting hinges (Fig 411(1)) and rotate the hinges upwards and over the two pivot bars (Fig 411(2)) on the cab. Insert the two locking pins to secure the hinges in place. Secure the locking pins with the lynch pins.

h. Install the cab tilt cylinder (refer to EMEI Veh D 393 Group 01 - Access for Repair).

**CAUTION**

DO NOT CABLE TIE THE ELECTRICAL CABLES, HYDRAULIC HOSES AND PNEUMATIC LINES AT THIS STAGE AS THEY MAY COME UNDER STRESS WHEN THE CAB IS RAISED.

i. Temporarily position the electrical cables, hydraulic hoses and pneumatic lines in their mounted positions in the engine compartment, do not secure at this stage.

j. Feed the looms (with rubber grommet and protective boot attached) through the hole in the firewall in the left hand footwell and position the looms in the cab. Do not cable tie the looms at this stage.

k. Feed the air conditioning, rotating beacon and body lighting looms (with rubber grommet) through the hole in the firewall in the left hand footwell and position the looms in the cab. Do not cable tie the looms at this stage.

l. Connect the electrical connectors (tagged on removal) for the combined looms that enter the cab including:

(1) The power loom to the cab positive bus bar (Fig 413(2)) in the left hand footwell;
1. Air conditioner earth lead
2. Positive busbar
3. Loom protective boot

Figure 413 - Positive Busbar - Left Hand Footwell
(2) The loom to the speed limiter control module (Fig 414(1));

1. Speed limiter control module
2. Loom connector

Figure 414 - Wiring Looms - Left Hand Footwell
(3) The individual leads to the instrument panel including the speedometer signal lead.
(4) The air conditioner loom at the connector (Fig 415(2)); and
(5) The rotating beacon and body lighting loom (Fig 415(1)) that runs across to the right hand side of the dash (and is protected by convoluted plastic).

m. Secure the loom protective boot (Fig 413(3)) to the firewall with the four bolts and nuts.

n. Attach the air conditioner earth lead (Fig 413(1)) to the left hand upper mounting bolt for the loom protective boot (Fig 413(3)) and secure with the self locking nut.

o. Taking care not to damage the fluid lines, feed the headlight adjustment control body through the hole in the firewall and install the rubber grommet in the firewall.

p. Secure the headlight adjustment control body to the cover plate with the spacer and nut. Do not cable tie the fluid lines at this stage.

q. Fit the headlight adjustment control knob (Fig 416(5)) to the headlight adjustment control body and fit the assembly to the dash.

1. Glove box
2. Heater assembly
3. Circuit breaker panel
4. Circuit breaker panel cover
5. Headlight adjustment control knob
6. Instrument panel

Figure 416 - Dash Panel Components - Installation
r. Raise and secure the cab (refer to EMEI Veh G 393 Group 01 - Access for Repair).

ALWAYS IDENTIFY THE SUPPLY AND RETURN COOLANT HOSES TO THE CAB PRIOR TO INSTALLATION. DO NOT REVERSE THE HOSES. IF THE HOSES ARE REVERSED HOT WATER WILL BE PRESENT AT THE HEATER CORE AT ALL TIMES AND THE HEATER WILL OPERATE CONTINUOUSLY.

s. Connect the heater hoses (Fig 417(2)) between the cab and the auxiliary coolant pump (Fig 417(4)), to the cylinder head connection (Fig 417(1)).

1. Cylinder head connection 3. Retaining bracket
2. Cab heater hoses 4. Auxiliary coolant pump

Figure 417 - Cab Heater Hoses

t. Remove the sealing plugs from the refrigerant hoses and apertures then connect the liquid and suction hoses (previously tagged) to the evaporator. Lubricate the new O-rings and the threads and pipe flares with refrigerant lubricating oil (Emkarate RL375) prior to installation of the hoses.

u. Secure the air conditioner evaporator liquid and suction hoses to the firewall and right hand inner guards with clamps and cable ties.

v. Connect the left hand earth straps (Fig 418(4)) and the right hand earth straps (previously tagged) to the inner walls of the engine compartment.

w. Connect the windscreen washer reservoir supply hose and the windscreen washer pump electrical connector (previously tagged) to the reservoir.

x. Connect the two left hand and the two right hand indicator light wiring loom connectors (previously tagged) on the inner walls of the engine compartment.

y. Temporarily position the electrical looms in the clips on the firewall across the base of the windscreen towards the left side of the vehicle.

z. Connect the air supply line (previously tagged) to the engine throttle up cylinder.

aa. Connect the air supply line (Fig 410(1)) to the base of the cab engine exhaust brake actuator (front line only). Cable tie the supply line to air lines on the cab base as noted on removal.

ab. Connect all electrical cables, hydraulic hoses and pneumatic lines (previously tagged) to the fittings on the left hand side of the firewall including the auxiliary coolant pump and the fresh air blower electrical leads. Remove the sealing plugs from the clutch hydraulic lines before connecting the hydraulic line.
ac. Secure the retaining bracket (Fig 418(3)) for the looms, air lines, hoses and the six-wheel work brake pressure limiting valve to the left hand inner wall of the engine compartment with the M6 bolt. Position the loom behind the bracket prior to securing the bracket.

ad. Connect the six wheel work brake pressure limiting valve upper mounting bracket to the upper fresh air blower mount and secure with the Phillips head screw (Fig 418(1)) to the left hand inner wall of the engine compartment.

ae. Cable tie all electrical looms, cables, hydraulic hoses and pneumatic lines in position on the firewall, inner engine compartment wall and across the cab below the windscreen (as noted on removal). Ensure that all leads, looms and lines are positioned so that they will not be under strain with the cab lowered or raised, or subject to chafing wear during vehicle operation.

af. Lower and secure the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair). Do not fit the grille, brushguard or bonnet at this stage.

ag. Replace all cable ties inside the cab that were cut during the removal of the cab.

DO NOT OPERATE THE BATTERY ISOLATION SWITCH SO THAT THE BATTERIES ARE CONNECTED TO THE VEHICLE UNTIL EACH CIRCUIT IN THE CAB HAS BEEN TESTED FOR A SHORT CIRCUIT.

ah. Connect the two electrical connectors (previously tagged) to the rear of the hour meter and temporarily support the footwell panel so the electrical leads are not under strain.

ai. Trip all the circuit breakers on the two main circuit breaker panels (A Bank and B Bank) at the top of the dashboard immediately behind the steering wheel.

aj. Operate the battery isolation switch so that the batteries are connected to the vehicle.

ak. Engage each circuit breaker individually. If the circuit breaker trips rectify as required.

al. Test the operation of the lights, switches, gauges, warning lights and hour meter. Rectify as required.

am. Bleed the clutch (refer to EMEI Veh D 393 Group 5 - Clutch System).

an. Fill the cooling system (refer to EMEI Veh D 393 Group 2 - Cooling System).

ao. Run the engine and check the operation of lights, switches, gauges and warning lights, rectify as required.

ap. Install the instrument panel (Fig 416(6)) on the dashboard and secure with the lower retaining screws.

aq. Position the blackout flap in its mounted position on the dashboard and secure with the six screws.

ar. Secure the blackout flap to the instrument panel (Fig 416(6)) with the two screws.
as. Install the circuit breaker panel cover (Fig 416(4)).
at. Secure the left hand footwell panel (Fig 419(2)) with the nut and the five Phillips head screws.

aw. Install and secure the right hand footwell cover with the two Phillips head screws fitted with washers and then install the floor mats.

ax. Road test the vehicle and check the function of all cab controls, including the speed limiter, during vehicle operation.
ay. Connect a trailer to the recovery vehicle. Road test the vehicle and test the operation of the trailer brake hand control valve and the trailer brakes.

az. Test the function of cab doors, door windows and the cupola, re-swing/adjust as required.

Front Cab Mount

283. Removal

a. Raise and secure the cab (refer to EMEI Veh G 393 Group 01 - Access For Repair).

b. Remove the four M10 bolts (Fig 420(13)) securing the front mount (Fig 420(14)) and the housing (Fig 420(15)) to the base of the cab and remove the mount and housing.

c. Separate the bush (Fig 420(16)) from the mounting.

284. Installation

a. Install the bush (Fig 420(16)) and mount (Fig 420(14)) into the housing (Fig 420(15)).

b. Secure the mount to the base of the cab with the four bolts (Fig 420(13)). Tighten the bolts securely.

c. Lower and secure the cab (refer to EMEI Veh D 393 Group 01 - Access For Repair).

Rear Cab Mount

285. Removal

a. Raise and secure the cab (refer to EMEI Veh G 393 Group 01 - Access For Repair).

b. Remove the four M10 bolts (Fig 420(5)) and self locking nuts securing the rear mount (Fig 420(6)) to the housing on the chassis and then remove the mount.

c. Remove the bolt (Fig 420(9)) with washer (Fig 420(8)) securing the spacer washer (Fig 420(7)) to the mount.

286. Installation

a. Install the spacer washer (Fig 420(7)) on the rear mount (Fig 420(6)) and secure with the bolt (Fig 420(9)) fitted with a washer (Fig 420(8)).

b. Install the mount into the housing on the chassis and secure with the four M10 bolts (Fig 420(5)) and self locking nuts.

c. Lower and secure the cab (refer to EMEI Veh D 393 Group 01 - Access For Repair).
Cab Door
287. Removal
   a. Open the cab door.
   b. Remove the snap ring from the retaining pin in the door check-arm and remove the retaining pin from the check-arm and swing the arm clear of the pillar.
   c. With the assistance of another person, lift the door off the hinges.

288. Cleaning and Inspection

   [WARNING]

ENSURE THE SAFETY REQUIREMENTS FOR USE OF COMPRESSED AIR ARE STRICTLY ADHERED TO. INADVERTANT USE OF COMPRESSED AIR EQUIPMENT MAY RESULT IN INJURY TO PERSONNEL.

   a. Wash the parts in an appropriate cleaning agent and blow dry with compressed air. Inspect all parts for wear or damage, replace as required.
   b. Clean the hinge brackets on the door pillars, the door rubbers and the door frame.
   c. Lubricate the hinges with penetrating oil and apply talcum powder to the door seals.

289. Installation

   a. With the assistance of another person position the door so that the door hinge brackets are aligned with the brackets on the door pillar and lower the door onto the brackets.
   b. Install the retaining pin in the door check-arm and pillar bracket then fit the snap-ring to the retaining pin.
   c. Check the alignment of the door in the doorframe and adjust if necessary.
   d. Check the action of the door catch against the striker plate and adjust the position of the striker plate in relation to the door catch if required.

Window Winder Handle
290. Removal

   a. Remove the centre screw securing the window winder handle and spacer to the winder shaft.

   [CAUTION]

TO PREVENT DAMAGE TO THE PUSH-CLIPS SECURING THE DOOR PANEL USE THE SPECIAL PULLER (TABLE 2, ITEM 45) TO REMOVE THE CLIPS.

   c. Lever the push-clips, which hold the door panel in place, out of the door using the puller (Table 2, Item 45) and remove the panel from the door.
   d. Clean that portion of the door from which the door panel was removed.

293. Installation

   a. Position the panel against the door so that the clip holes are aligned, insert the push-clips and push them fully home.
   b. Slide the window winder handle spacer onto the window winder handle shaft and align the spacer locating lug with the slot in the trim panel.
   c. Install the window winder handle, see para 289.
Door Lock

NOTE

Each cab door is fitted with an interior door lock that consists of a piece of pre-formed plastic.

294. Removal

a. Remove the door panel, see para 292.
b. Remove the screw securing the interior door lock to the door lock mechanism and remove the interior door lock.
c. Remove the plastic cover to reveal the door lock.
d. Remove the two M6 nuts securing the door handle with tumbler lock from the door.
e. Carefully manoeuvre the door handle with exterior door lock and the rubber seals from the door.
f. Remove the locking ring securing the tumbler lock to the door handle, and then remove the tumbler lock with operating arm, retaining ring and return springs.
g. Remove the operating arm securing screw and separate the arm, retaining ring and return springs from the tumbler lock.

295. Installation

a. Install the return springs, retaining ring and locking ring on the tumbler lock.

NOTE

The round headed Phillips head screw faces the outside of the handle when installed.

b. Secure the operating arm to the tumbler shaft with the securing screw. Coat the threads of the screw with a thread locking agent (Loctite 241) prior to assembly.
c. Align the lugs on the tumbler lock with the slots in the door handle and insert the lock fully into the door handle.
d. Secure the tumbler lock assembly in the handle with the locking ring.
e. Carefully manoeuvre the door handle with lock and the rubber seals into the door and secure with the two M6 nuts. Secure the outer nut first.
f. Check that about 2mm free play exists between the tumbler striker screw and the striker plate, adjust as required.
g. Attach the inner plastic cover to the door lock using an adhesive compound (Silastic).
h. Install the door panel, see para 293.
i. Secure the interior door lock to the door lock mechanism with the screw.
j. Test the operation of the door locks, rectify as required.

Roof Panel

296. Removal

a. Operate the battery isolation switch to isolate the batteries from the vehicle.
b. Remove the interior light (refer to EMEI Veh D 393 Group 10 - Electrical).
c. Remove the inner grab handle adjacent to the cupola, see para 306.
d. Remove the two Phillips head screws at the front of the CTIS panel and lower the panel.
e. Remove the four Phillips head screws securing the radio/cassette player to the cab roof and lower the unit to expose the connections at the back.
f. Remove the right hand CTIS control panel bracket mounting screw.
g. Remove the two Phillips head screws securing the left hand radio/cassette player mounting bracket to the roof.
h. Disconnect the power, earth, speaker and aerial leads and remove the radio/cassette player.
i. Remove the eleven two-part push-clips securing the roof panel to the cab roof by levering the inner clips first and then the outer clips downwards using the special puller (Table 2, item 45) to remove the clips.

CAUTION

TO PREVENT DAMAGE TO THE TWO-PART PUSH-CLIPS ENSURE THE EXTERNAL CLIP IS REMOVED BEFORE ATTEMPTING TO REMOVE THE INNER CLIP AND USE THE SPECIAL PULLER (TABLE 2, ITEM 45) TO REMOVE THE CLIPS.
j. Insert a screwdriver beside each fixed locking clip at the edge of the roof panel, compress the clip and lever the panel away from and over the clip.
k. Repeat the above procedure on the four sides of the roof panel until it is free of the fixed clips then remove the roof panel from the cab.
l. Clean that portion of the roof from which the roof panel was removed.

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297. **Installation**
   
   a. Position the roof panel so that the clip holes are aligned. Insert the eleven inner push-clips and lock the push-clips in position with the eleven outer push-clips.
   
   b. Compress each fixed locking clip at the edge of the roof panel and lock the edges of the roof panel to the roof.
   
   c. Insert a screwdriver along the side of the panel where it locates into the recess. When fitting the panel front edge under the CTIS mounting bracket, loosen the panel mounting screws if required.
   
   d. Repeat this procedure on the four sides of the panel until it is seated and in position in the roof.
   
   e. Install the right hand CTIS control panel bracket mounting screw and tighten.
   
   f. Install the inner grab handle adjacent to the cupola, see para 307.
   
   g. Secure the left hand radio/cassette player mounting bracket to the roof with the two Phillips head screws.
   
   h. Install the interior light (refer to EMEI Veh D 393 Group 10 - Electrical).
   
   i. Connect the power, earth, speaker and aerial leads (previously tagged) to the radio/cassette player and secure the unit to the cab roof with four Phillips head screws.
   
   j. Secure the CTIS panel with the two Phillips head screws.
   
   k. Operate the battery isolation switch to isolate the batteries from the vehicle.
   
   l. Test the operation of the radio/cassette player and the dome light, rectify as required.

**Steyr Butt Rest**

**NOTE**

Steyr butt rests are located on the cab floor and barrel clips on the cab inner rear wall adjacent to the RH side of the drivers seat and the LH side of the passenger seat.

298. **Removal**

   a. Unscrew the two Phillips head screws securing the butt rest to the support bracket on the cab floor then remove the butt rest from the cab.
   
   b. Clean and inspect the support bracket.

299. **Installation**

   a. Position the new butt rest against the support bracket so that the screw holes are aligned.
   
   b. Install the two Phillips head screws holding the butt rest to the support bracket and tighten securely.

**Steyr Barrel Clip**

300. **Removal**

   a. Unscrew the two Phillips head screws securing the barrel clip to the support bracket on the cab rear wall then remove the clip.
   
   b. Clean and inspect the support bracket.

301. **Installation**

   a. Position the new barrel clip against the support bracket so that the screw holes are aligned.
   
   b. Install and tighten the two Phillips head screws securing the barrel clip to the support bracket.

**Minimi Butt Rest**

302. **Removal**

   a. Remove the two Phillips head screws and lock nuts securing the butt rest to the support bracket on the cab wall in between the drivers and passenger seat then remove the butt rest from the cab.
   
   b. Clean and inspect the support bracket.

303. **Installation**

   a. Position the new butt rest against the support bracket so that the screw holes are aligned.
   
   b. Insert and tighten the two Phillips head screws and lock nuts holding the butt rest to the support bracket.

**Minimi Barrel Clip**

304. **Removal**

   a. Remove the Phillips head screw and the lock nut securing the barrel retaining latch and washer to the clip on the support bracket on the cab rear wall.
   
   b. Clean and inspect the support bracket, barrel retaining latch and barrel clip.

305. **Installation**

   a. Position the new barrel clip against the support bracket so that the mounting holes are aligned and install the Phillips head screw and the nut securing the barrel retaining latch and washer to the barrel clip.
   
   b. Tighten the lock nut on the barrel retaining latch so the force required to rotate the latch is firm.
Grab Handles-Cupola

THE END COVERS OF THE GRAB HANDLE COVER ARE CAPTIVATED AND THE OTHER END IS HINGED. USE OF EXCESSIVE FORCE (ESPECIALLY SIDEWAYS) WHEN REMOVING THE COVER WILL RENDER IT UNSERVICEABLE.

306. Removal
   a. Lever the end cover down on the inner end (nearest the handle) using a flat bladed screwdriver to expose the mounting screws. Repeat the process on the opposite side of the handle.
   b. Remove the four Phillips head retaining screws securing the grab handle and remove the grab handle and two spacers from the cab roof.
   c. Clean that portion of the cab roof from which the grab handle was removed.

307. Installation
   a. Position the grab handle and the two spacers against the roof so that the screw holes are aligned; insert and tighten the four Phillips head retaining screws.
   b. Position the cover over the end of the grab handle and push it upwards to lock it in place.
   c. Repeat the procedure on the opposite side of the handle.

Sun Visor

308. Removal
   a. Remove the three Phillips head screws holding the sun visor bracket to the cab roof and remove the visor.

309. Installation
   a. Position the sun visor and bracket against the cab roof so that the screw holes are aligned.
   b. Insert and tighten the three Phillips head retaining screws.

Equipment Hook

310. Removal
   a. Remove the two Phillips head screws securing the equipment hook to the door pillar and remove the hook from the cab.
   b. Clean that portion of the pillar from which the equipment hook was removed.

311. Installation
   a. Position the equipment hook against the door pillar so that the screw holes are aligned.
   b. Insert and tighten the two Phillips head screws.

Drivers Seat Assembly

   NOTE

The four bolts that secure the drivers seat assembly to the cab floor are located inside the base frame beneath the seat. The bolts are accessible through a cut-out in the base frame.

312. Removal
   a. Remove the fire extinguisher situated beside the drivers seat from its bracket.
   b. Remove two M6 bolts and self locking nuts securing the fire extinguisher mounting bracket to the cab floor and remove the bracket.
   c. Remove the bolt, spacer and washers securing the lap/sash seat belt to the right hand rear drivers seat assembly.
   d. Remove the lynch pin, lock pin (Fig 421(2)) and restraining strap (Fig 421(1)) securing the rear of the seat frame to the cab.

Figure 421 - Restraining Strap Mounts

1. Restraining strap
2. Lock pin

   e. Remove the four bolts securing the drivers seat assembly to the cab floor.
   f. With the assistance of a second person lift and remove the seat assembly from the cab.
   g. Clean and inspect the drivers seat assembly mount on the cab floor. Check the mounting bolt hole threads for serviceability; repair/replace as required.
313. Disassembly

a. Note the position of the mounting bolts and the sliding rails, and move the driver’s seat and the sliding rails into a position where the seat to seat base bolts are accessible.

b. Remove the four M8 bolts that hold the seat and the sliding rails on the seat base frame and remove the base frame from the sliding rails.

c. Clean and inspect the base frame, drivers seat squab, backrest, seat belt stalk and the sliding rails. Inspect the seat height and vertical adjustment cams and springs for wear, repair/replace as required.

d. Lubricate the sliding rails and cams with petroleum jelly prior to reassembly.

314. Reassembly

a. Move the sliding rails on the drivers seat squab so that the securing bolt holes are accessible, as noted on removal.

b. Position the drivers seat squab on the base frame so that the bolt holes in the sliding rails and the bolt holes in the base frame are aligned. Insert and tighten the four M8 retaining bolts.

c. Secure the drivers seat base frame against movement. Lift the release handle on the seat and move the seat forwards and backwards on the sliding rails. Rotate the vertical travel adjustment knobs and check for a full range of movement. Check for ease of movement; lubricate and adjust if necessary.

315. Installation

a. With the assistance of a second person, position the drivers seat assembly on the cab floor so that the bolt holes are aligned. Install the four retaining bolts and tighten securely.

b. Install the washers, spacer, and bolt securing the lap/sash seat belt to the drivers seat assembly. Torque the bolt to 40 Nm.

c. Secure the rear of the seat frame to the cab with the restraining strap (Fig 421(1)) and lock pin (Fig 421(2)). Lock the pin with the lynch pin.

d. Install the fire extinguisher mounting bracket and secure with the two M6 bolts and self-locking nuts.

e. Install the fire extinguisher.

Passenger Seat Assembly

316. Removal

a. Remove the bolt, spacer and washers securing the lap/sash seat belt to the left hand rear of the passenger seat assembly.

b. Remove the four bolts securing the passenger seat base frame to the cab floor and with the assistance of a second person remove the passenger seat assembly from the cab.

317. Disassembly

a. Remove the spring clips, pins and four spacers that secure the passenger seat squab to the base frame and detach the seat squab from the base frame. Discard the spring clips.

b. Remove the two screws that secure the backrest to the base frame and detach the backrest from the base frame.

c. Clean the base frame, passenger seat squab and the backrest. Inspect the backrest, seat squab, retaining lock and springs, retaining clips and seat belt stalk for serviceability. Repair/replace as required. Lubricate the retaining lock and the backrest hinges with Vaseline.

318. Reassembly

a. Position the passenger seat backrest on the base frame so that the mounting holes are aligned. Secure the backrest to the base frame with the two screws. Coat the threads of the screws with a thread locking agent (Loctite 243) prior to assembly.

b. Position the passenger seat squab on the base frame so that the two pin mounting holes are aligned. Insert the pins and four spacers and secure with new spring clips.

319. Installation

a. With the assistance of a second person, position the passenger seat assembly in the cab so that the mounting bolt holes are aligned. Install and hand tighten the base frame to the cab floor.

b. Tighten the mounting bolts that secure the base frame to the cab floor evenly.
Cupola

320. Removal
   a. Open the cupola.
   b. Remove the four shouldered screws (Fig 422(1)) securing the plastic dust cover to the cupola post arm and remove the cover.

c. Remove the five mounting bolts (Fig 422(2)) and flat washers securing the cupola post mounting flange to the cab roof.

d. Remove the cupola and post assembly and the cupola mounting flange gasket.

321. Disassembly
   a. Remove and discard the spring clip (Fig 423(1)) from the swivel pin securing the cupola post arm to the cupola post hinge.

   b. Knock out the swivel pin.
   c. Remove and discard the spring clip from the pin (Fig 424(2)) securing the cupola lid to the cupola arm and knock out the pin.

   d. Remove the screw, wave washer and spacer washer securing the cupola lid support link to the cupola post.

   e. Clean the cupola lid and mount. Inspect the cupola lid for damage and the cupola arm (Fig 424(1)) for straightness, repair as required.

   f. Inspect the cupola seal for wear or damage, repair as required.

322. Reassembly
   a. Align the cupola lid and the cupola arm mounting holes and fit the pin at the centre of the cupola. Secure the pin (Fig 424(2)) in position with a new spring clip.

   b. Align the cupola arm and the cupola post mounting holes and fit the pin. Secure the pin in position with a new spring clip (Fig 423(1)).

   c. Align the cupola lid support link on the cupola post and secure with the screw, wave washer and spacer washer. Coat the threads of the screw with a thread locking agent (Loctite 243) prior to assembly. Check the support link for freedom of movement in the ramp, lubricate if required.

323. Installation
   a. Fit a new cupola post mounting flange gasket to the cab roof. Mount the cupola assembly on the cab roof and fit the five mounting bolts (Fig 422(2)) and flat washers. Coat the threads of the bolts with a thread locking agent (Loctite 243) prior to assembly. Tighten the bolts securely.

   b. Check the operation of the cupola in the closed and open position. Adjust if required, see para 325.
c. Install the plastic dust cover on the cupola post arm and secure with the four shouldered screws (Fig 422(1)). Coat the threads of the screws with a thread locking agent (Loctite 243) prior to assembly.

d. Lubricate the cupola seal with talc, close the cupola and lock down with the two locking handles.

Cupola Buffers

324. Removal

NOTE

Note the position of the different length buffers.

a. Remove the mounting screw securing the 40 mm buffer (Fig 425(1)), the mounting screw securing the 31 mm buffer (Fig 425(3)) and the mounting screw securing the 23 mm buffer (Fig 425(4)), then remove the buffers.

NOTE

The nut for the screw securing the 27 mm buffer (Fig 417(2)) is not captive.

b. Partially remove the roof panel (see para 296) on the right hand side of the cab, hold the nut for the 27 mm buffer (Fig 425(2)) mounting screw with a spanner and remove the securing screw and buffer.

![Figure 425 - Cupola Buffers](image)

<table>
<thead>
<tr>
<th>1. 40 mm buffer</th>
<th>2. 27 mm buffer</th>
<th>3. 31 mm buffer</th>
<th>4. 23 mm buffer</th>
</tr>
</thead>
</table>

325. Installation

a. Install the 40 mm buffer (Fig 425(1)), the 31 mm buffer (Fig 425(3)) and the 23 mm buffer (Fig 425(4)) and secure with the mounting screw.

b. Mount the 27 mm buffer (Fig 425(2)) and securing screw in position on the cab roof. Hold the nut with a spanner and tighten the mounting screw. Refit the partially removed roof panel (see para 297) to the right hand side of the cab.

c. Open the cupola and lock in the open position. Check that each buffer is compressed slightly when the cupola is locked in the open position. To adjust proceed as follows:

(1) Remove the four shouldered screws (Fig 422(1)) securing the plastic dust cover to the cupola post arm and remove the cover.

(2) Release the cupola lid from the locked down open position.

(3) Undo the lock nut (Fig 426(2)) and turn the adjusting screw (Fig 426(1)) to raise or lower the lid as required. Tighten the lock nut and recheck the adjustment with the cupola lid locked down in the open position, rectify as required.

(4) Install the plastic dust cover on the cupola post arm and secure with the four shouldered screws (Fig 422(1)). Coat the threads of the screws with a thread locking agent (Loctite 243) prior to assembly.

![Figure 426 - Cupola Arm - Installation](image)

| 1. Adjusting screw | 2. Lock nut | 3. Spring clip |

Figure 426 - Cupola Arm - Installation

d. Close the cupola and lock down with the two locking handles.
Rear Vision Mirror (Drivers Side)

326. **Removal**

a. With the aid of a flat tipped screwdriver, gently lever the back cover off the large rear vision mirror.

b. Mark the position of the two large mirror mounting plates on the mirror arm and then remove the four screws securing the two plates and the rear vision mirror to the mirror arm.

c. Remove the rear vision mirror from the mirror arm.

d. Mark the position of the small convex rear vision mirror and then remove the two screws and mounting plate securing the mirror to the mirror arm.

327. **Installation**

**NOTE**

Check the alignment of the mirrors from the drivers seat before tightening the securing screws.

a. Install the small convex rear vision mirror on the mirror arm in the position marked on removal and secure with the two screws and mounting plate.

b. Position the large rear vision mirror on the mirror arm in the position marked on removal, and secure with the four screws and two mounting plates.

c. Position the plastic cover on the rear of the large rear vision mirror and press it into position.

Rear Vision Mirror (Passenger Side)

328. **Removal**

a. Mark the position of the large rear vision mirror mounting bracket on the mirror arm.

b. Remove the dust cap and the M8 bolt and flat washer securing the mounting bracket and large rear vision mirror to the mirror arm.

c. Remove the large rear vision mirror, mounting bracket and plastic sleeve from the mirror arm.

d. Mark the position of the small convex rear vision mirror and then remove the two clamping screws and mounting plate securing the mirror to the mirror arm.

329. **Installation**

**NOTE**

Check the alignment of the mirrors from the drivers seat before tightening the securing screws.

a. Install the small convex rear vision mirror on the mirror arm, in the position marked on removal and secure with the two clamping screws and the mounting plate.

b. Position the plastic sleeve and the large rear vision mirror mounting bracket on the mirror arm in the position marked on removal.

c. Attach the large rear vision mirror to the mounting bracket with the M8 bolt and flat washer and tighten the bolt.

d. Install the dust cap on the M8 bolt head.
GROUP 19 — FRAME/CHASSIS GROUP

Front Lifting/Tiedown/Towing Bracket

330. **Removal**

a. Remove the towing A-Frame (if fitted) and brushguard (refer to EMEI Veh D 393 Group 01 - Access for Repair).

b. Remove the four bolts (and shims if fitted) securing the centre bumper bar and tow pin and remove the centre bumper bar.

c. Remove the brushguard mounting bracket on the side on which the lifting/tiedown/towing bracket is to be replaced, see para 332.

d. Remove the M6 bolt, spring washer and nut securing the LED blackout marker lamp and bracket to the outer bumper bar and swing the lamp and electrical lead clear.

e. Cut the cable ties to free up the wiring loom to the outer indicator light.

f. Remove the air lines to the front trailer coupling.

g. Cut the cable tie securing the headlight adjustment fluid line to the outer bumper bar.

h. Remove the four bolts securing the outer bumper bar brace section to the chassis rail.

---

1. Bumper bar bolt
2. M10 nut
3. M16 nut
4. Vertical bolt
5. A-Frame mounting bracket
6. Brushguard mounting bolt
7. Bracket shim
8. Spacer
9. M10 washer
10. M10 nut
11. M16 nut
12. Lifting/tiedown/towing bracket
13. Upper and lower M12 mounting bolt
14. Centre outer bolt
15. Clamping sleeves
16. M10 washer
17. M10 bolt

*Figure 427 - Front Lifting/Tiedown/Towing Bracket*
NOTE

Support the bumper bar section so as not to put a strain on electrical connections.

i. Remove the two M10 nuts (Fig 427(2)) and bolts (Fig 427(1)) securing the bumper bar outer section to the lifting/tiedown/towing bracket. Slide the bumper bar clear of the lifting/tiedown/towing bracket.

j. From underneath the vehicle remove the lower vertical bolt (Fig 427(4)) securing the lifting/tiedown/towing bracket to the chassis rail.

k. Remove the two forward, upper and lower M12 mounting bolts (Fig 427(13)) securing the lifting/tiedown/towing bracket to the chassis rail.

l. Remove the M16 centre bolt (Fig 427(14)) and nut (Fig 427(11)) securing the lifting/tiedown/towing bracket to the chassis rail.

m. Remove the two middle M10 bolts (Fig 427(17)), nuts (Fig 427(10)) and washers (Fig 427(9) and (16)) securing the lifting/tiedown/towing bracket to the chassis rail.

n. With a suitable punch, drive the clamping sleeves (Fig 427(15)) (for the M10 bolts (Fig 427(17)) into the chassis and clear of the lifting/tiedown/towing bracket.

o. Remove the lifting/tiedown/towing bracket from the chassis rail.

331. Installation

a. Position the lifting/tiedown/towing bracket on the chassis rail with the mounting bolt holes aligned.

b. Install the M16 centre bolt (Fig 427(14)) and nut (Fig 427(11)) securing the lifting/tiedown/towing bracket to the chassis rail, and hand tighten.

c. Knock the clamping sleeves (Fig 427(15)) into the lifting/tiedown/towing bracket until each sleeve is aligned flush with the chassis rail.

d. Install the two middle M10 bolts (Fig 427(17)), washers (Fig 427(9) and (16)) and nuts (Fig 427(10)) securing the lifting/tiedown/towing bracket to the chassis rail and hand tighten.

e. Install the two forward, upper and lower M12 mounting bolts (Fig 427(13)) securing the lifting/tiedown/towing bracket to the chassis rail.

f. Install the centre bumper bar and the lower vertical mounting bolts. Torque the bolts to 240 Nm.

g. Install the brushguard mounting bolts, see para 333.

h. Torque all M10 bolts to 60 Nm, all M12 bolts to 120 Nm and the M16 bolts to 240 Nm.

i. Slide the outer bumper bar section into its mounted position, install the four bolts securing the outer bumper bar brace section to the chassis rail and hand tighten.

j. Install the two bolts (Fig 427(1)) and nuts (Fig 427(2)), securing the bumper bar section to the lifting/tiedown/towing bracket and hand tighten.

k. Torque the two bolts (Fig 427(1)) to 60 Nm and tighten the four M8 bolts securing the outer bumper bar brace section to the chassis rail securely.

l. Connect the LED blackout marker lamp and bracket to the bumper bar and secure with the M6 bolt, spring washer and nut.

m. Cable tie the headlight adjustment fluid hose and the outer indicator light wiring loom to the outer bumper bar.

n. Connect the air lines to the front trailer brake coupling.

o. Install the brushguard and the towing A-frame (if fitted), see para 333.

Brushguard Mounting Bracket

332. Removal

a. Remove the towing A-Frame from the brushguard (if fitted).

b. Remove the brushguard (refer to EMEI Veh D 393 Group 01 - Access for Repair).

c. Remove the two upper vertical mounting bolts (Fig 427(4)) and flat washers (if fitted).

d. Remove the bracket shims (Fig 427(7)) and spacer block (Fig 427(8)).

e. Clean and inspect the brushguard mounting bracket, spacer block, bracket shims and bolts. Replace as required.

333. Installation

a. Refit the spacer block (Fig 427(8)).

b. Fit the mounting bracket and mounting bolts, and hand tighten the mounting bolts. Nip the mounting bolts up firmly so the mounting bracket is seated squarely.
Measure and fit the shims (Fig 427(7)) to the front mounting bolt or the rear mounting bolt, whichever is appropriate.

c. Measure the gap between the spacer block and the mounting bracket and fit shims (Fig 427(7)) to suit.
d. Torque the mounting bolts to 240 Nm.
e. Install the brushguard (refer to EMEI Veh D 393 Group 01 - Access for Repair).
f. Install the towing A-Frame on the brushguard (if fitted).

**A-Frame Mounting Bracket**

**NOTE**
The MRV is fitted for, but does not normally carry an A-Frame.

**NOTE**
The removal/installation procedure for the left and right hand A-Frame mounting bracket is identical.

### 334. Removal

a. Remove the A-Frame bracket locking lever lynch pin (Fig 428(4)).
b. Release the locking lever (Fig 428(6)) and swivel the top half of the bracket clear of the brushguard.
c. Remove the A-Frame (if fitted).
d. Press out the pivot pin (Fig 428(7)) securing the upper clamp (Fig 428(8)) to the lower mount.

e. Inspect the linkages, pivot pin, locking mechanism and anti-vibration (insulator) strips (Fig 428(1)), replace as required. To replace the anti-vibration (insulator) strips remove the countersunk screws (Fig 428(3)) and spacer blocks (Fig 428(2)).
f. Lubricate the threads of the clamp adjusting bolt (Fig 428(10)) and the pivot pins with engine oil and free up the adjusting bolt.
g. Inspect the lynch pin and lanyard, replace if necessary.

### 335. Installation

a. Position the upper clamp (Fig 428(8)) on the A-Frame bracket and secure the upper clamp to the lower mount with the pivot pin (Fig 428(7)).
b. Check the adjustment of the upper clamp as follows:
   1. Lift the A-Frame into position in the mounting brackets, swivel the upper clamp over the A-Frame with the locking lever (Fig 428(6)) and check that the clamp adjusting bolt (Fig 428(10)) engages in the slot provided in the brushguard.
   2. Adjust the clamp adjusting bolt as required and tighten the lock nut (Fig 428(9)) on completion of the adjustment.
c. Engage the locking lever and lock the lever with the lynch pin (Fig 428(4)).

---

**Figure 428 - A-Frame Mounting Bracket**

1. Anti-vibration (insulator) strip  4. Lynch pin  7. Pivot pin
2. Spacer block  5. Screw  8. Upper clamp
10. Clamp adjusting bolt
Grab Handles-Rising

336. **Removal**
   a. Remove the two Phillips head screws and lock washers securing the grab handle to the door pillar and remove the grab handle.
   b. Clean the portion of the door pillar from which the grab handle was removed.

337. **Installation**
   a. Position the grab handle against the door pillar.
   b. Insert and tighten the two Phillips head screws fitted with lock washers.

Side Step

338. **Removal**

   SUPPORT THE INNER SIDE STEP WITH SAFETY STANDS PRIOR TO REMOVING IT FROM THE VEHICLE.
   a. Unlock and unfold the side step. Place safety stands underneath either end of the inner step.
   b. Remove and discard the split pins securing the side step clevis pins (Fig 429(1)), and remove the clevis pins securing the side step to the fuel tank mounting bracket.
   c. With the assistance of another person, remove the step.

339. **Installation**
   a. With the assistance of two persons, lift the side step into position on the fuel tank support brackets and align the mounting holes.
   b. Install the two clevis pins (Fig 429(1)) and secure the clevis pins with split pins.

   **CAUTION**
   INCORRECT ADJUSTMENT OF THE LEVEL ADJUSTING BOLTS WILL PLACE UNDUE STRAIN ON THE SIDE STEP HINGES AND ULTIMATE FAILURE OF HINGES. ENSURE THAT ALL LEVEL ADJUSTING SCREWS ARE CONTACTING THE STEP ON COMPLETION OF THE ADJUSTMENT/CHECK.
   c. Lower the inner step and check that it is level. Adjust as required with the two level adjusting screws. Lower the outer step and check that the outer step is level. Adjust as required with the three level adjusting screws. Ensure that all level adjusting screws are contacting the step on completion of the adjustment/check and all the lock nuts are tightened.
   d. Raise and secure the side step with the lynch pin and lock the pin.

Left Hand Front CES Bin

340. **Removal**
   a. Remove all CES and contents from the left hand front CES bin.
   b. Remove the two M8 bolts (Fig 430(1)), nuts and flat washers securing the side clearance light to the outer lower corner of the left hand front CES bin.

   **Figure 429 - Side Step - Removal**

1. Clevis pin

   **Figure 430 - Side Clearance Light Mounts**

1. M8 bolt
2. Side clearance light
c. Remove the M6 bolt, nut, flat washer and clamp securing the clearance light wiring loom to the underside of the left hand front CES bin.

d. Remove the M6 bolt and flat washer securing the earth strap (Fig 431(1)) to the front inner face of the left hand front CES bin.

e. Remove the four M8 bolts (Fig 432(1)), nuts and flat washers securing the crane filter mounting bracket to the front face of the left hand front CES bin.

f. Loosen the left hand rotating beacon securing wing nut (Fig 434(1)) and remove the left hand rotating beacon.

g. Loosen the right hand rotating beacon securing wing nut and remove the right hand rotating beacon.

h. Remove the eight M8 bolts, spring washers and flat washers securing the two sections of the camouflage net stowage platform to the mounting cross bars and remove the two platform sections (Fig 433).

i. Cut the two cable ties (Fig 434(2)) securing the flood light wiring loom to the rear upright of the left hand front CES bin.

j. Disconnect the floodlight wiring loom cable at the connector (Fig 434(3)) on the left hand rear upright.

Figure 431 - Front Earth Strap

Figure 432 - Crane Filter Mountings

Figure 433 - Camouflage Net Stowage Platform

Figure 434 - Flood Light Wiring Loom
k. Disconnect the left hand rotating beacon wiring loom cable connector (Fig 435(2)).

Figure 435 - Rotating Beacon Wiring Loom and CES Bin Earth Strap

l. Remove the four M16 bolts (Fig 436), nuts and flat washers securing the camouflage net stowage platform front cross bar and remove the cross bar.

Figure 436 - Front Cross Bar Mounting Bolts

m. Remove the four M16 bolts (Fig 437), nuts and flat washers securing the camouflage net stowage platform rear cross bar and remove the cross bar complete with flood lights.

n. Remove the M6 bolt and flat washer securing the earth strap (Fig 435(1)) to the left hand rear inner face of the left hand front CES bin.

Figure 437 - Rear Cross Bar Mountings Bolts

o. Position two webbing lifting straps at either end of the left hand front CES bin and support the bin using a crane.

p. Remove the four M16 lower CES bin mounting bolts, nuts and flat washers (Fig 438).

Figure 438 - Left Hand Front CES Bin Mounting Bolts

q. Remove the left hand front CES bin and place on stands.

341. Cleaning and Inspection

a. Clean and inspect the CES bin earth straps and the earth strap mounting points on the CES bin and the sub-frame.

342. Installation

a. Sling the left hand front CES bin with two webbing straps and lift the CES bin into position using a crane. Locate the CES bin in position using the four lower M16 mounting bolts (Fig 438).

b. Fit nuts and flat washers to the four lower M16 CES bin mounting bolts. Do not tighten the bolts at this stage.
c. Secure the earth strap (Fig 435(1)) to the left hand rear inner face of the left hand front CES bin with the M6 bolt, fitted with a flat washer, and torque the bolt to 9 Nm.

d. Install the camouflage net stowage platform rear cross bar complete with floodlights and secure with the four M16 bolts (Fig 437), nuts and flat washers. Torque the bolts to 190 Nm.

e. Position the camouflage net stowage platform front cross bar and secure using the four M16 bolts (Fig 436), nuts and flat washers. Torque the bolts to 190 Nm.

f. Torque the four lower M16 CES bin mounting bolts (Fig 438) to 190 Nm.

g. Connect the left hand rotating beacon wiring loom cable electrical connector (Fig 435(2)) to the rotating beacon connector.

h. Connect the floodlight wiring loom cable electrical connector to the flood light connector (Fig 434(3)).

i. Secure the floodlight wiring loom to the rear upright of the left hand front CES bin with two cable ties (Fig 434(2)).

j. Position the two camouflage net stowage platform sections on the mounting cross bars and secure with the eight M8 bolts, spring and flat washers (Fig 433). Torque the bolts to 22 Nm.

k. Install the left hand rotating beacon and secure with the wing nut (Fig 434(1)).

l. Install the right hand rotating beacon and secure with the wing nut.

m. Install the crane filter mounting bracket on the front face of the left hand front CES bin and secure with the four M8 bolts (Fig 432(1)), nuts and flat washers. Torque the bolts to 22 Nm.

n. Connect the earth strap (Fig 431(1)) to the front inner face of the left hand front CES bin with the M6 bolt and flat washer. Torque the bolt to 9 Nm.

o. Install the side clearance light on the outer lower corner of the left hand front CES bin and secure with two M8 bolts (Fig 430(1)), nuts and flat washers. Torque the bolts to 22 Nm.

p. Secure the clearance light wiring loom to the underside of the left hand front CES bin with the M6 bolt, clamp, flat washer and nut.

q. Check the operation of the side clearance lights, flood lights and the rotating beacon.

r. Stow all CES and contents into the left hand front CES bin (refer to the Operator Handbook).
Rear Sway Bar

343. **Removal**

a. Chock the front wheels front and rear.

b. Remove the four self locking nuts (Fig 439(2)) from the U-bolts (Fig 439(1)) securing the sway bar mounting brackets (Fig 439(6)) to the intermediate axle housing.

c. Remove the U-bolts securing the sway bar to the intermediate differential housing.

d. Remove the two M16 bolts (Fig 439(3)) and self locking nuts (Fig 439(5)), securing the sway bar to the left and right brackets (Fig 439(4)).

e. Remove the sway bar from the vehicle.

344. **Installation**

a. Chock the front wheels front and rear.

b. Position the U-bolts (Fig 439(1)) on the axle housing and fit the sway bar mounting brackets (Fig 439(6)) to the U-bolts. Attach the self locking nuts (Fig 439(2)); however do not tighten at this stage.

c. Position the ends of the sway bar so the mounting holes are aligned with the left and the right hand side bracket (Fig 439(4)) and insert the M16 bolts (Fig 439(3)). Attach the self locking nuts (Fig 439(5)) and torque the bolts to 125 Nm.

d. Torque the U-bolt securing nuts (Fig 439(2)) to 90 Nm.

e. Remove the chocks from the front wheel.

f. Road test the vehicle and check the operation of the sway bar.

---

**Figure 439 - Rear Sway Bar Connections**

1. U-bolt 5. Nut
3. M16 bolt 7. Sway bar
4. Bracket
Panhard Rod

NOTE

The removal/replacement procedure for the front (Fig 441) and rear (Fig 440) panhard rods is identical. Only the removal/replacement procedure for the front is described.

1. Rear panhard rod

Figure 440 - Rear Panhard Rod

345. Removal

a. Chock the rear wheels.

b. Remove the self locking nut (Fig 441(2)) and M14 bolt (Fig 441(4)) and conical spring washer (Fig 441(3)) securing the panhard rod (Fig 441(5)) to the chassis bracket. Remove the panhard rod from the vehicle.

c. Remove the M16 bolt (Fig 441(7)) with conical spring washer (Fig 441(6)) securing the panhard rod (Fig 441(5)) to the differential housing bracket. Remove the panhard rod from the vehicle.

346. Installation

a. Position the panhard rod on its mounting brackets on the vehicle.

b. Install the M16 bolt (Fig 441(7)) with a new conical spring washer (Fig 441(6)) securing the panhard rod (Fig 441(5)) to the differential housing bracket. Torque the bolt to 315 Nm.

c. Install the M16 bolt (Fig 441(4)), conical spring washer (Fig 441(3)) and nut (Fig 441(2)) securing the panhard rod (Fig 441(5)) to the chassis bracket. Torque the bolt to 315 Nm.

d. Remove the chocks from the rear wheels.

e. Road test the vehicle and check the operation of the panhard rod.

Dampers/Floor Ply Panels

347. Replacement

a. To replace the dampers/floor ply panels cut out the new panels, from 5 ply 13 mm thick marine ply material, using the old panels as templates. Glue and screw the panels using a two-pack wood glue.
Welding Repair

348. Cab/Chassis

**CAUTION**

IN ORDER TO PROTECT ELECTRONIC CONTROL UNITS AGAINST OVER-VOLTAGE DURING ELECTRICAL WELDING TASKS THE FOLLOWING PROCEDURES MUST BE.observed.

DISCONNECT THE VEHICLE BATTERIES VIA THE BATTERY ISOLATION SWITCH OR DISCONNECT THE NEGATIVE LEAD TO THE BATTERIES. CONNECT THE EARTH CONNECTION OF THE ELECTRIC WELDING DEVICE DIRECTLY TO THE PART TO BE WELDED, AT THE SAME TIME ENSURE THERE IS NO ELECTRICALLY INSULATED PART SITUATED BETWEEN THE EARTH CONNECTION AND THE PART TO BE WELDED. DO NOT TOUCH ELECTRONIC CONTROL UNITS OR ELECTRICAL CABLES WITH THE EARTH CONNECTION OR THE WELDING ELECTRODE. COVER AIR LINES AND WIRING LOOMS TO PROTECT THEM FROM MOLTEN METAL.

**NOTE**

Depending on the location of the welding task on the chassis, welding procedures may require specific pre-heat, post-heat and inter-pass temperature procedures. All welding repairs on structural components are to be referred to the Defence Material Organisation (DMO) (via RODUM) for specific repair procedures.

**a.** Repairs to the chassis are to be carried out using standard workshop practices. In the event of chassis damage always inspect all seams and parts of the chassis for cracks. Repairs on the chassis are only to be carried out to a limited extent and in accordance with the manufacturer’s specifications.

**b.** During repair the following must be observed:

1. The chassis or side member must be aligned in a cold condition.
2. Welding is not permitted on the lower and upper flange of the chassis.
3. To repair hairline cracks, the crack must be ground out uniformly at both sides of the gap to a width of approx. 8 mm. The chassis should be ground several millimetres beyond either end of the fracture.

349. Repair Tools

**a.** In addition to the usual workshop equipment, an electric welding device, dc welding device or arc welding device is required.

350. Repair Materials

**a.** Welding Electrodes

1. Electrode diameter - 3.25 mm, 4.00 mm or 5.0 mm.
2. Electrode standard DIN 1913 E 5155 B 10 ISO 2560 E 55.5 B 12026.
3. Manufacturer (optional) CASTCRAFT 55.

**b.** Welding Wire (MIG)

1. Wire standard SG 3 DIN 8559.
2. Manufacturer (optional) CIGWELD NICORE 55.

351. Recovery Platform

**a.** The recovery equipment is manufactured from several grades of steel and aluminium. Reference to the manufacturer’s drawings is required prior to performing any repairs to equipment to ensure that the current component build standards are maintained. All welding repairs on structural components are to be referred to DMO (via RODUM) for specific repair procedures.
Vehicle Painting

352. General

THE PAINT SYSTEM APPLIED TO THE MRV RECOVERY SYSTEM IS A POLYURETHANE (TWO PACK) SYSTEM. INGESTION OF THIS PRODUCT DURING REPAIRS, OR DURING APPLICATION MAY LEAD TO RESPIRATORY FAILURE OR DEATH. WORKPLACE HEALTH AND SAFETY REGULATIONS APPLY WHERE REPAIRS SUCH AS GRINDING, WELDING, PANEL BEATING AND PAINTING OF COMPONENTS IS REQUIRED. REFER TO CURRENT DEFENCE INSTRUCTIONS, REGULATIONS, EMEI E SERIES AND CONSULT WITH THE APPROPRIATE AUTHORITIES OR SAFETY PERSONNEL BEFORE COMMENCING REPAIRS OR PAINTING.

a. The vehicle is painted in a disruptive pattern to the specification Army (AUST) 6461 Paint System (CARC-DPP) for Defence Equipment. All surface preparation, touch up, patch coating or repaint is to be carried out in accordance with EDE Technical Specification A4.2888-050-004 and current instructions.

353. Materials

a. The following types of materials are used in the preparation and painting of the vehicle;

(1) Degreaser - a phosphate type metal pre-treatment (e.g. Henkel Paint Grip 253) (for non-structural and thin section steel components).

(2) Deoxidising agent - a slow deoxidising agent (e.g. diluted Henkel Deoxidine 624) (for aluminium alloy components).

(3) Conversion coating - a low concentrate MIL-C-5541 conversion coating (e.g. Henkel Aloxidine 600) (for aluminium alloy components).

(4) Primer - MIL-P-53022 chromate free epoxy primer (e.g. Valspar 691-6003/676-9001).

(5) Topcoat Olive Drab - Army (Aust) 6461 polyurethane topcoat (e.g. Valspar 450-2022 Olive Drab).

(6) Topcoat Black - Army (Aust) 6461 polyurethane topcoat (e.g. Valspar 450-0009 Black).

(7) Topcoat Tan - Army (Aust) 6461 polyurethane topcoat (e.g. Valspar 450-4058 Tan).