1. Right hand fording manifold
2. Banjo bolt (PTO shift cylinder)
3. Cable tie
4. PTO shift cylinder pressure switch
5. Banjo bolt (main transmission housing breather)
6. Left hand supply air manifold

**Figure 181 - PTO Shift Cylinder**

(12) Disconnect the electrical lead to the PTO shift cylinder pressure switch (Fig 181(4)). Cut the cable ties securing the lead to the PTO shift cylinder air line.

**Figure 182 - Fording and Supply Air Manifolds**

p. Unclip the air lines of the planetary gear shift cylinder from their mounting brackets on the main transmission.

q. Tag and disconnect the vent line (Fig 183(1)) from the bottom of the right hand side fording manifold. Cut the cable ties securing the vent line to the air line for the planetary gear shift cylinder. Secure the vent line clear of the main transmission.

**Figure 183 - Fording Manifold Vent Line**

1. Vent line
r. Cut the cable ties securing the rear and intermediate axle brake actuator vent lines and the intermediate axle torque tube boot breather line with insulator, to the mounting bracket on the right hand rear of the main transmission.

s. Tag and disconnect the rear and intermediate axle brake actuator vent line quick disconnect connections (Fig 171(2)) at the right hand rear of the transmission as follows:

1. Gently prise the two locking lugs on the plastic dust cover outwards and slide the dust cover away from the quick disconnect fitting.

2. With a pointed tool depress the quick disconnect fitting and pull the vent line out of the fitting.

3. Remove and retain the dust covers from the vent line.

u. Cut the cable ties securing the main transmission breather line to the rear and intermediate axle brake actuator vent lines and the intermediate axle torque tube boot breather line. Swing the main transmission breather line to the right hand side of the chassis rail.

v. Cut the cable ties (Fig 181(3)) securing the intermediate axle torque tube boot breather line (running towards the rear of the transmission) to the right hand fording manifold air lines, the air lines to the quick disconnect fittings (Fig 171(2)), the left hand air supply manifold and air lines, the PTO air line and the PTO electrical lead. Swing the intermediate axle torque tube boot breather line above and clear of the main transmission.

w. Swing the right hand fording manifold and air lines, the PTO air line and electrical leads to the left side of the chassis and tie up clear of the main transmission.

x. Tag and disconnect the two flexible hoses (Fig 184(1)) of the main transmission oil cooler lines situated at the chassis cross member in front of the auxiliary transmission (working gear group). Plug all openings to stem leaking oil.

y. Remove the main transmission oil cooler pipes (Fig 185(1)) and mounting brackets from the transmission. Note the position of the mounting bracket on the auxiliary transmission (working gear group) mounting stud.

z. Remove the planetary gear shift cylinder, see para 91.

NOTE

Attach the shift linkage jig so that the planetary gear shift lever is engaged (i.e. high range, the shift lever is forward and the shift cylinder is extended).

aa. Attach the shift linkage holding jig (Table 2, Item 19) to the top of the transmission housing utilising the shift cylinder mounting bolt holes (Fig 186).
1. Holding jig

Figure 186 - Holding Jig - Installation

ab. Remove the auxiliary transmission (working gear group), see para 82.

ac. Remove the eleven auxiliary transmission (working gear group) mounting studs from the transmission housing.

ad. Disconnect the air compressor supply pipe connections as follows:

(1) Disconnect the air compressor supply line at the joiner at the rear of the splitter transmission. Discard the sealing ring and thrust washer.

(2) Remove the M6 bolts and lock nuts securing the air compressor supply pipe clamp to the two mounting brackets on the right hand chassis rail.

(3) Remove the two M6 bolts, lock nuts and four clamps securing the air compressor supply pipe to the air outlet pipes at the air dehumidifier.

(4) Disconnect the air compressor supply pipe from the air dehumidifier, and remove the pipe from the vehicle.

ae. Remove the wheel hub covers on the intermediate axle and disconnect the CTIS quick disconnects at the wheel hubs (Fig 187).

Figure 187 - CTIS Quick Disconnect Coupling - Removal

af. Manually release the intermediate axle park brake actuating cylinders (refer to EMEI Veh D 393 Group 8 - Brake System).

ag. Disconnect the two air lines to the front trailer brake supply line filter and check valve, situated on the right hand chassis rail adjacent to the transmission.

ah. Remove the bolt securing the front trailer brake supply line filter and check valve mounting bracket to the chassis rail and remove the filter and valve assembly.

ai. Disconnect the connections between the transmission and the intermediate axle and pull back the axle as follows:

(1) Remove the lower mounting bolts, self locking nuts and plates securing the left hand and right hand shock absorbers to the intermediate axle.

(2) Undo the self locking nut from the front right hand inner mounting bolt (Fig 188(2)) securing the right hand longitudinal link and slide the mounting bolt back so there is sufficient room to lower the intermediate axle panhard rod (Fig 188(1)).
1. Panhard rod
2. Inner mounting bolt

**Figure 188 - Panhard Rod Mount Connection**

(3) Disconnect the intermediate axle panhard rod from the right hand chassis rail and lower the rod out of the mounting bracket (refer to Group 19 Frame/Chassis Group, para 345).

(4) Cut the cable ties securing the hoses, air lines and leads to the intermediate axle torque tube. Note the position of the insulator pieces (Fig 189(2)).

1. M6 bolt
2. Insulator piece
3. Flexible brake hose

**Figure 189 - Intermediate Axle Torque Tube Connection**

(5) Remove the M6 bolt (Fig 189(1)) and self locking nut securing the CTIS hose with bracket and the park brake actuator cylinder air supply hose to the mounting bracket at the front of the intermediate axle torque tube.

(6) Cut the cable tie securing the intermediate axle torque tube boot breather line to the torque tube boot connector and remove the line from the boot.

1. ALB linkage

**Figure 190 - ALB Linkage - Disconnecting**

(10) Remove the spring clamp Fig 191(1)) securing the rubber boot around the intermediate axle torque ball housing and slide back the boot.

1. Spring clamp
2. M10 bolt

**Figure 191 - Intermediate Axle Torque Ball Housing**

(7) Undo the union connecting the flexible brake hose (Fig 189(3)) to the steel brake pipe on top of the intermediate axle torque tube. Blank-off all openings.

(8) Remove the locking clip securing the flexible hose to the torque tube and tie up the hose.

(9) Remove the locking clip from the ball joint connecting the ALB linkage (Fig 190(1)) to the socket on the mounting bracket on the intermediate axle housing and disconnect the ball joint from the socket.
ELECTRICAL AND MECHANICAL
ENGINEERING INSTRUCTIONS

VEHICLE D 394
Issue 1, Jun 04

TO PREVENT DAMAGE TO THE INTERMEDIATE AXLE TORQUE BALL HOUSING SUPPORT THE TORQUE TUBE WITH A TROLLEY JACK AND A SUITABLE EXTENSION PIECE BEFORE UNBOLTING THE TORQUE BALL HOUSING BOLTS.

(11) Support the intermediate axle torque tube with a trolley jack and a suitable extension piece (Fig 192).

![Figure 192 - Intermediate Axle Torque Tube - Supporting](image)

(12) Remove the M10 bolts (Fig 191(2)) securing the intermediate axle torque ball housing to the transfer case intermediate axle output housing.

![Figure 193 - Intermediate Axle Torque Tube - Separating](image)

AVOID DAMAGE TO SURROUNDING COMPONENTS AND ATTACHED FITTINGS WHEN PULLING BACK THE INTERMEDIATE AXLE TORQUE TUBE. CHECK THAT THE AXLE IS NOT FOULING AS IT IS MOVED REARWARD.

(14) Pull back the torque tube with the block and tackle until there is sufficient space to lower the transmission.

(15) Remove the front torque ball shell halves (Fig 194(5)).

![Figure 194 - Torque Ball Assembly - Intermediate Axle](image)

**WARNING**

THE INTERMEDIATE AXLE TORQUE TUBE WILL ACT LIKE A GUILLOTINE IF IT INADVERTANTLY SLIDES TOWARDS THE TRANSFER CASE WHILST THE TRANSMISSION IS BEING REMOVED OR REPLACED AND LOSS OF FINGERS CAN OCCUR. ENSURE THE INTERMEDIATE AXLE TORQUE TUBE IS SECURED AT ALL TIMES DURING THE REMOVAL/INSTALLATION PROCEDURE OF THE TRANSMISSION AND BEFORE ATTEMPTING THE REMOVAL AND INSTALLATION OF THE INTERMEDIATE AXLE TORQUE TUBE.

(13) Attach a block and tackle between the intermediate axle torque tube strut brackets and a suitable anchor point on the rear of the vehicle (Fig 193).
THE TRANSFER CASE IS HELD IN POSITION ON THE RIGHT HAND SIDE BY THE TRANSMISSION. ENSURE THE TRANSFER CASE IS SUPPORTED SO IT DOES NOT MOVE WHEN THE TRUNNION MOUNTING BOLTS SUPPORTING THE TRANSMISSION ARE REMOVED. IF THE TRANSFER CASE IS NOT ADEQUATELY SUPPORTED IT WILL FALL, CAUSING INJURY TO PERSONEL AND DAMAGE TO COMPONENTS.

NOTE

Check for lines and attachments that may impede the removal of the transmission. Remove or reposition as required.

aj. Place a support under the transfer case and remove the four M12 (Grade 12.9), right hand trunnion mounting bolts (Fig 156(11)) and shims (Fig 156(10)) securing the transmission housing to the mounting on the right hand side of the chassis (Fig 195). Discard the trunnion mounting bolts.

Figure 195 - Right Hand Transmission Mount

ak. Fit the transmission holding jig (Table 2, Item 20) and support the transmission from underneath.

al. Remove the three remaining mounting bolts securing the transmission to the transfer case. Two of the mounting bolts are located adjacent to the pulse generator (speedometer) mounting on the rear face of the transfer case. The remaining mounting bolt is located at the bottom right hand corner of the transmission.

Figure 196 - Transmission - Removal

NOTE

If the transmission is being exchanged, change over all associated mounting brackets and fittings not supplied.

80. 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 PERSONEL.

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. Remove the transmission housing gasket or sealant and clean the mating surfaces of all gasket or sealant residue. Note the type of sealing medium between the transmission housing and the transfer case housing (gasket or sealant).

c. Remove the right hand transmission mounting bracket (Fig 156(3)) from the chassis and inspect the rubber bushes, replace as required.

d. Install the right hand transmission mounting bracket. Torque the M36 bracket mounting bolt securing the transmission mounting bracket to the right hand chassis rail to 180 Nm (Fig 197).
81. **Installation**

THE TRANSMISSION HOUSING TO TRANSFER CASE HOUSING CLEARANCE IS CRITICAL WHEN THE TRANSFER CASE DRIVE GEAR PRELOAD IS DETERMINED. SUBSTITUTING THE TRANSMISSION HOUSING TO TRANSFER CASE HOUSING GASKET WITH SEALANT, OR SEALANT WITH A GASKET WILL ALTER PREDETERMINED BEARING PRELOAD IN THE TRANSFER CASE CAUSING FAILURE OF THE TRANSMISSION ASSEMBLY. WHEN REPLACING THE TRANSMISSION, IF A GASKET WAS PREVIOUSLY FITTED BETWEEN THE TRANSMISSION HOUSING AND THE TRANSFER CASE HOUSING, A NEW GASKET MUST BE FITTED. CONVERSELY, IF SEALANT WAS PREVIOUSLY USED THEN SEALANT MUST BE USED, AND A GASKET CANNOT BE FITTED. IF EITHER SEALING MEDIUM IS CHANGED THEN THE TRANSFER CASE DRIVE GEAR BEARING PRELOAD MUST BE RESET.

a. Fit a new gasket or sealant (as noted on removal) to the transmission housing. Hold the gasket in position with grease if required.

b. Seat the transmission on the holding jig (Table 2, Item 20) and install from underneath the vehicle. Raise and align the transmission mounting holes with the mounting holes in the transfer case and push the transmission fully home against the transfer case.

c. Attach the transmission to the transfer case with the two mounting bolts located adjacent to the pulse generator (speedometer) mounting on the rear face of the transfer case and the mounting bolt located at the bottom right hand corner of the transmission. Coat the threads of the bolts with a thread sealant (Loctite 515) prior to assembly but do not tighten the bolts at this stage.

d. Install the eleven mounting studs in the transmission housing and torque the studs to 20 Nm. Coat the threads of the studs with a thread locking agent (Loctite 241) prior to assembly.

e. Torque the two mounting bolts located adjacent to the pulse generator (speedometer) mounting on the rear face of the transfer case and the mounting bolt located at the bottom right hand corner of the transmission to 75 Nm.

f. Align the holes of the transmission housing with the mating holes in the transmission mounting brackets.

**NOTE**

Use new M12 X 112 (Grade 12.9) trunnion mounting bolts (Fig 156(11)) to fasten the transmission housing to the transmission mounting brackets.

g. Insert the right hand intermediate pieces and the four right hand M12 X 112 (Grade 12.9) trunnion mounting bolts (Fig 198). Coat the threads of the bolts with a thread locking agent (Loctite 243) prior to assembly and torque the bolts to 150 Nm.

h. Install the auxiliary transmission (working gear group), see para 84.

i. Remove the shift linkage jig (Table 2, Item 19) from the top of the transmission housing and the support from underneath the transfer case.
j. Connect the intermediate axle and connections to the transmission as follows:

**CAUTION**

**TO PREVENT DAMAGE TO THE INTERMEDIATE AXLE TORQUE BALL HOUSING, SUPPORT THE TORQUE TUBE WITH A TROLLEY JACK AND A SUITABLE EXTENSION PIECE WHILE INSTALLING THE TORQUE BALL HOUSING BOLTS.**

1. Install the front torque ball halves in the intermediate axle torque ball housing. Lubricate the torque ball halves with a molybdenum disulphide based grease (XG-276).

**THE INTERMEDIATE AXLE TORQUE TUBE WILL ACT LIKE A GUILLOTINE IF IT INADVERTANTLY SLIDES TOWARD THE TRANSFER CASE WHILST THE TORQUE BALL HALVES ARE BEING INSTALLED AND LOSS OF FINGERS CAN OCCUR. CHAIN BACK THE TORQUE BALL HOUSING SO THAT IT WILL NOT MOVE BEFORE ATTEMPTING TO INSTALL THE TORQUE BALL HALVES.**

2. Slowly release the intermediate axle ensuring the intermediate axle torque ball housing mounting flange is aligned with the transfer case intermediate axle output housing mounting flange.

3. Coat the mating surface of the intermediate axle torque ball housing with a sealant (Omnifit FD 10, Part No. 002 989 00 20 10, or equivalent) and connect the torque ball housing to the transfer case housing with the M10 x 150 (Grade 12.9) bolts (Fig 199). Torque the bolts to 65 Nm.

**WARNING**

4. Remove the block and tackle from the intermediate axle and the jack and extension piece supporting the intermediate axle torque tube.

5. Slide the rubber boot over the intermediate axle torque ball housing and secure with the spring clamp Fig 200(1)).

6. Connect the intermediate axle torque tube boot breather line to the torque tube boot connector and secure with a cable tie.

**Figure 199 - Intermediate Axle Drive Torque Ball Housing - Installation**

**Figure 200 - Intermediate Axle Torque Ball Housing Rubber Boot**

k. Connect the ALB linkage (Fig 201(1)) ball joint to the socket on the mounting bracket on the intermediate axle housing and secure with the locking clip. Lubricate the inside of the socket with grease prior to connection.
1. ALB linkage

**Figure 201 - ALB Linkage - Connecting**

- Connect the intermediate axle panhard rod (Fig 202(1)) to the right hand chassis rail mounting bracket. Torque the mounting bolt to 315 Nm.

- Slide the right hand inner mounting bolt (Fig 202(2)) securing the right hand longitudinal link into position and fit the self locking nut. Torque the bolt to 150 Nm.

2. Panhard rod

3. Inner mounting bolt

**Figure 202 - Panhard Rod Mount Connection**

- Install the lower mounting bolts, self locking nuts and plates securing the left hand and right hand shock absorbers to the intermediate axle. Torque the mounting bolts to 250 Nm.

- Secure the front trailer brake supply line filter and check valve and mounting bracket to the chassis rail with the mounting bolt.

- Connect the two air lines to the front trailer brake supply line filter and check valve.

- Connect the air compressor supply pipe and fittings as follows:
  1. Connect the air compressor supply pipe to the connector on the air dehumidifier. Do not tighten the union nut at this stage.
  2. Connect the air compressor supply pipe, new sealing ring and thrust washer to the joiner at the rear of the splitter transmission. Do not tighten the connection at this stage.
  3. Secure the air compressor supply pipe to the air outlet pipes at the air dehumidifier with the four clamps, two M6 bolts and lock nuts.
  4. Connect the air compressor supply pipe clamp to the two mounting brackets on the right hand chassis rail and secure with the M6 bolts and lock nuts.
  5. Tighten the air compressor supply pipe connections at the connector on the air dehumidifier and at the joiner at the rear of the splitter transmission.

- Connect the main transmission oil cooler pipes to the main transmission and the mounting bracket to the stud on the auxiliary transmission (working gear group). Torque the stud lock nut to 75 Nm.

- Connect the planetary gear shift cylinder to the transmission, see para 93. Do not adjust at this stage.

- Remove the plugs and connect the two main transmission oil cooler flexible hoses (previously tagged on removal) to the oil lines located at the chassis cross member in front of the auxiliary transmission (working gear group).

- Connect the hydraulic triple pump to the PTO (refer to Group 11 - Hydraulic System, para 167).
NOTE

Ensure that all cable ties (noted on removal) are replaced. As a rule of thumb cable ties must fasten wiring looms and air lines at intervals of 500 mm but may be fitted at shorter intervals if required.

v. Connect the left hand air supply manifold, air lines and associated leads, the right hand fording manifold air lines and associated leads and transmission component air lines and electrical leads as follows:

(1) Untie the left hand air supply manifold, lines and associated leads from their temporary position on the left hand side of the vehicle and position them in their mounted positions on the main transmission.

(2) Untie the right hand fording manifold and lines from their temporary position on the left hand side of the vehicle and position the manifold and lines in their normal mounted position on the main transmission.

(3) Secure the left hand supply air manifold (Fig 203(3)) and the right hand fording manifold (Fig 203(1)) to the bracket on top of the main transmission with the two M6 mounting bolts (Fig 203(2)), washers and nuts.

(4) Connect the flexible brake hose (Fig 204(3)) to the steel brake pipe on the top of the intermediate axle torque tube. Secure the hose to the mounting bracket on the torque tube with the locking clip.

1. M6 bolt
2. Insulator piece
3. Flexible brake hose

Figure 204 - Intermediate Axle Torque Tube Connections

(5) Connect the torque tube boot breather line to the torque tube boot connector on the intermediate axle and secure with the cable tie.

(6) Secure the CTIS hose with bracket and the park brake actuator cylinder air supply line to the mounting bracket at the front of the intermediate axle torque tube with the M6 bolt (Fig 204(1)) and self locking nut.

(7) Secure the hoses, air lines and leads to the intermediate axle torque tube with cable ties. Ensure the insulator pieces (Fig 204(2)) are fitted in the positions noted on removal.

(8) Secure the breather line to the top of the main transmission with the banjo bolt (Fig 205(1)). Renew the sealing washers on the banjo bolt prior to installation.

Figure 203 - Left Hand Supply Air Manifold and Right Hand Fording Manifold - Installation
1. Banjo bolt
2. Mounting bracket

Figure 205 - Main Transmission Breather Line and Right Hand Fording Manifold Loom - Connections

1. Mounting bracket
2. Quick disconnect fitting

Figure 206 - Rear and Intermediate Axle Brake Actuator Connections

12. Secure the intermediate axle torque tube boot vent lines with insulator to the mounting bracket (Fig 206(1)) on the right hand rear of the main transmission with cable ties.

13. Connect the air line (Fig 207(4)) to the PTO shift cylinder with the banjo bolt. Renew the sealing washers on the banjo bolt prior to installation.

14. Connect the electrical lead to the PTO shift cylinder pressure switch (Fig 207(3)).

15. Connect the vent line, tagged on removal, to the bottom of the right hand side fording manifold and secure the vent line to the planetary gear shift cylinder air line at the rear of the main transmission gear shift mechanism with cable ties.

16. Secure the right hand fording manifold air lines, the rear and intermediate axle torque tube boot vent lines, the intermediate axle torque tube boot breather line and the PTO air line to the mounting brackets (Fig 207(5)) on the left hand rear of the main transmission with cable ties.

17. Secure the PTO electrical lead to the mounting brackets (Fig 207(5)) on the left hand rear of the main transmission with cable ties.

18. Install the pulse generator (speedometer) (Fig 207(10)) and lock wire and seal in position.

19. Connect the electrical lead to the pulse generator (speedometer) and seal the connector with lock wire.

20. Connect the air vent hose (Fig 207(7)) at the base of the planetary gear shift cylinder control valve and secure with the locking clip.

21. Connect the electrical lead to the gear shift gate indicator switch (Fig 207(6)).

22. Connect the electrical lead to the reverse light pressure switch (Fig 207(2)).

23. Connect the air supply line (tagged on removal) for the planetary gear shift cylinder control valve to the connector immediately below the left hand supply air manifold.
1. Left hand supply air manifold
2. Reverse light switch
3. PTO shift cylinder pressure switch
4. PTO air line
5. Mounting bracket

6. Gear shift gate indicator switch
7. Air vent hose
8. Park brake warning light switch
9. Mounting bracket
10. Pulse generator (speedometer)

**Figure 207 - Transmission Switches and Looms - Connections**

(24) Cable tie the air supply line for the planetary gear shift cylinder control valve, in two places, to the supply air manifold (left hand loom).

(25) Cable tie the gear shift gate indicator switch and the reverse light switch electrical leads to the air lines and to the left hand loom for the supply air manifold.

w. Clip the air lines of the planetary gear shift cylinder into the mounting brackets on the main transmission. Inspect the electrical leads and air lines to the transmission, the left hand and right hand chassis rail looms, and associated components to ensure the cable ties cut during the removal have been replaced. Rectify as required.

x. Connect the main transmission gear shift shaft and the forward/reverse shift rod as follows:

(1) Connect the forward/reverse shift rod to the forward/reverse lever, at the control panel, with the serrated washer and nut.

(2) Connect the forward/reverse shift rod to the main transmission forward/reverse selector lever with the serrated washer and the nut.

(3) Secure the dampener to the forward/reverse shift rod at the main transmission end with the self locking nut (Fig 208(1)).

**NOTE**

Fit the wave washer to the outside of the left hand O-ring prior to connecting the main transmission gear shift shaft to the main transmission gear shift lever.

(4) Connect the main transmission gear shift shaft to the main transmission gear shift lever with the spacer tube, new O-rings and wave washer (as noted on removal). Secure with the M10 x 70 bolt and lock nut.

(5) Secure the main transmission gear shift shaft (Fig 208(6)) to the ball joints for the vertical shift rod (Fig 208(4)) and the cross shaft flange with the shift shackle (Fig 208(5)), flat washer and nuts. Do not torque the ball joint nuts at this stage.
1. Self locking nut
2. Forward/reverse shift rod
3. Forward/reverse selector lever
4. Vertical shift rod
5. Shift shackle
6. Main transmission gear shift shaft
7. Self locking nut

Figure 208 - Main Transmission Shift Levers - Connections

(6) Connect the dampener to the main transmission gear shift shaft at the main transmission end with the self locking nut (Fig 208(7)).

y. Connect the propeller shaft - rear section and guard to the main transmission (refer to EMEI Veh D 393 Group 6 - Main Transmission).

z. Mount the front winching guide tube in position. Secure the front winching guide tube front mounting bracket to the chassis cross member with the two M6 Phillips head screws and spring washers.

aa. Secure the front winching guide tube rear mounting bracket to the mounting bracket on the transfer case intermediate axle output housing with the two M6 Phillips head screws, spring washers and lock nuts.

ab. Install the fire extinguisher upper and lower mounting brackets to the right hand equipment bin and secure with the eight M8 bolts, flat washers and nuts.

ac. Install the fire extinguisher on the right hand equipment bin.

ad. Fit and tighten the drain plugs in the main transmission housing, transfer case and auxiliary transmission (working gear group) and replenish the oil (Castrol Syntrans 75W/85). Refer to the Operator Handbook.

ae. Connect the CTIS quick disconnects at the intermediate axle wheel hubs (Fig 209).

af. Remove the vehicle from the chassis stands.

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

**CAUTION**

WHEN THE ENGINE IS TO BE RUN WITH THE CABIN RAISED, ENSURE THAT THE ENGINE AIR INTAKE HOSE AND THE AIR COMPRESSOR INTAKE HOSE IS CONNECTED TO THE AIR CLEANER TO PREVENT THE INGRESS OF CONTAMINANTS.

**CAUTION**

WHEN THE ENGINE IS TO BE RUN WITH THE CABIN RAISED ENSURE THE HEATER HOSES AND UPPER STEERING SHAFT ARE CLEAR OF MOVING PARTS TO PREVENT DAMAGE TO COMPONENTS.
ah. Run the engine, crack the banjo bolt (Fig 210(1)) at the oil feed line connection on the front of the auxiliary transmission (working gear group) and check the oil flow at the connection. Oil must discharge from the connection when the engine is running. Tighten the banjo bolt securely after the check.

Figure 210 - Oil Feed line Connection

ai. Check the transmission, hydraulic triple pump and connections for oil leaks, rectify as required.
aj. Check the tyre inflation hoses for air leaks, rectify as required.
ak. Check the auxiliary transmission (working gear group) linkage adjustment, see para 87.
al. Adjust the planetary gear shift cylinder (refer to EMEI Veh D 393 Group 6 - Main Transmission).
am. Bleed the brakes (refer to EMEI Veh D 393 Group 8 - Brake System).
an. Lower and secure the cab (refer to EMEI Veh D 393 Group 01 - Access for Repair).
ao. Adjust the main transmission gear shift shaft and main transmission gear shift lever (refer to EMEI Veh D 393 Group 6 - Main Transmission).
ap. Adjust the forward/reverse shift linkage (refer to EMEI Veh D 393 Group 6 - Main Transmission).
aq. Stow the crane.
ar. Install the wheel hub covers on the intermediate axles.

as. Inspect the ALB control linkage for damage; adjust if necessary (Refer to Group 8 - Brake System, para 140).
at. Road test the vehicle, inspect for leaks and check the performance of the transmission and service brakes.
au. Check the transmission oil level after the road test, top up if required.

Auxiliary Transmission (Working Gear Group)

82. Removal

a. Remove the drain plugs from the main transmission housing, transfer case and auxiliary transmission (working gear group) and drain the oil into a suitable receptacle. Refer to the Operator Handbook.
b. Remove the shift cylinder from the auxiliary transmission (working gear group), see para 85.
c. Remove the mounting bolts and nuts (Fig 211(2)) securing the auxiliary transmission (working gear group) to the transfer case housing.

d. Move the main transmission oil cooler pipes and mounting bracket clear of the auxiliary transmission (working gear group).
83. **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 approved cleaning agent and blow dry with compressed air. Clean the transfer case mating surface of all gasket or sealant residue. Note the type of sealing medium (gasket or sealant) that was used between the auxiliary transmission (working gear group) housing and the transfer case housing.

b. Inspect all parts for wear or damage, replace as required.

e. Move the auxiliary transmission (working gear group) forward away from the transfer case by about 25mm.

f. To facilitate separation of the auxiliary transmission (working gear group) from the transfer case have a second person rotate the auxiliary transmission (working gear group) main shaft (with a suitable length screwdriver) to align the splines of the auxiliary transmission (working gear group) shaft drive gear with the splines of the transfer case drive gear.

g. Slide the auxiliary transmission (working gear group) forward and remove it from the vehicle.

h. Remove the auxiliary transmission (working gear group) housing gasket or sealant.

84. **Installation**

**WARNING**

THE AUXILIARY TRANSMISSION (WORKING GEAR GROUP) WEIGHS ABOUT 25 KG. USE A JACK TO INSTALL THE AUXILIARY TRANSMISSION.

**CAUTION**

THE AUXILIARY TRANSMISSION (WORKING GEAR GROUP) TO TRANSFER CASE HOUSING CLEARANCE IS CRITICAL WHEN THE TRANSFER CASE DRIVE GEAR PRELOAD IS DETERMINED. SUBSTITUTING THE AUXILIARY TRANSMISSION (WORKING GEAR GROUP) TO TRANSFER CASE HOUSING GASKET WITH SEALANT, OR SEALANT WITH A GASKET WILL ALTER PREDETERMINED BEARING PRELOAD IN THE TRANSFER CASE, CAUSING FAILURE OF THE TRANSMISSION ASSEMBLY. WHEN REPLACING THE AUXILIARY TRANSMISSION (WORKING GEAR GROUP), A NEW GASKET MUST BE FITTED IF A GASKET WAS PREVIOUSLY FITTED. CONVERSELY, IF SEALANT WAS PREVIOUSLY USED SEALANT MUST AGAIN BE USED AND A GASKET CANNOT BE FITTED. IF EITHER SEALING MEDIUM IS CHANGED THEN THE TRANSFER CASE DRIVE GEAR BEARING PRELOAD MUST BE RESET.

a. Install the auxiliary transmission (working gear group) gasket, or sealant as previously fitted.

b. Position the auxiliary transmission (working gear group) on the transfer case housing. Leave a gap between the auxiliary transmission and the transfer case.

c. To facilitate installation of the auxiliary transmission (working gear group) on the transfer case have a second person rotate the auxiliary transmission (working gear group) main shaft (with a suitable length screwdriver) to align the splines of the auxiliary transmission (working gear group) shaft drive gear with the splines of the transfer case drive gear.
d. Slide the auxiliary transmission (working gear group) home on the transfer case housing. Ensure the main transmission oil cooler pipes mounting bracket does not foul the auxiliary transmission.

e. Fit the main transmission oil cooler pipes mounting bracket onto the auxiliary transmission (working gear group) mounting studs and secure the auxiliary transmission with the nuts and bolts (Fig 211(2)). Torque the nuts and bolts to 75 Nm.

f. Connect the auxiliary transmission shift cylinder to the auxiliary transmission (working gear group), see para 86.

g. Check the operation of the auxiliary transmission (working gear group), adjust if required, see para 87.

h. Fit and tighten the drain plugs in the main transmission housing, transfer case and auxiliary transmission (working gear group) and replenish the oil (Castrol Syntrans 75W/85). Refer to the Operator Handbook.

i. Test drive the vehicle and check the operation of the auxiliary transmission (working gear group).

**Auxiliary Transmission (Working Gear Group)**

**Shift Cylinder**

**85. Removal**

a. Drain the air from the compressed air accumulator circuit 1 (bottom tank), compressed air accumulator circuit 2 (top tank) and the compressed air accumulator trailer brake circuit.

b. Tag and disconnect the air lines (Fig 212(2)) from the auxiliary transmission (working gear group) shift cylinder.

c. Remove the split pin and washer securing the auxiliary transmission (working gear group) shift cylinder to the mounting stud (Fig 212(1)), then slide the cylinder (with rubber bush) off the stud. Inspect the rubber bush for wear, replace if required.

d. Remove the spring clip securing the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint off the auxiliary transmission (working gear group) shift lever (Fig 212(4)) and remove the cylinder. Inspect the ball joint for wear, replace if required.

**86. Installation**

a. Slide the rubber bushed end of the auxiliary transmission (working gear group) shift cylinder onto the mounting stud (Fig 212(1)) and secure with the washer and a new split pin. Bend over the split pin legs.

b. Check the adjustment of the auxiliary transmission (working gear group) shift cylinder, see para 87.

c. Connect the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint to the auxiliary transmission (working gear group) shift lever (Fig 212(4)) and secure with the spring clip. Lubricate the inside of the ball joint socket with grease prior to connection.

d. Connect the previously tagged air lines (Fig 212(2)) from the auxiliary transmission (working gear group) shift cylinder.

e. Run the engine and test the operation of the auxiliary transmission (working gear group) shift cylinder.

**87. Adjustment**

a. Remove the spring clip securing the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint off the auxiliary transmission (working gear group) shift lever (Fig 212(4)).
DO NOT FORCE THE AUXILIARY TRANSMISSION (WORKING GEAR GROUP) SHIFT LEVER WHEN MANUALLY CHANGING FROM HIGH TO LOW RANGE.

b. Position the forward/reverse lever and the main transmission gear shift lever in gear.

c. Have a second person depress the clutch and rotate the rear propeller shaft by hand at the same time applying forward pressure on the auxiliary transmission (working gear group) shift lever to select the high range position.

d. Turn the auxiliary transmission (working gear group) switch to the high range (hare) position.

e. Adjust the operating rod (Fig 212(3)) so that the centre of the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint is approx. 4 mm past the centre of the auxiliary transmission (working gear group) shift lever ball.

f. Ensure the forward/reverse lever and the main transmission gear shift lever is in gear.

g. Have a second person depress the clutch and rotate the rear propeller shaft by hand whilst applying rearward pressure on the auxiliary transmission (working gear group) shift lever to select the low range position.

h. Turn the auxiliary transmission (working gear group) switch to the low range (donkey) position.

i. Check that the centre of the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint is approx. 4 mm past the centre of the auxiliary transmission shift lever ball.

j. Loosen the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint lock nut and adjust the operating rod (Fig 212(3)) as required.

k. Recheck the adjustment (sub-paras c to i), rectify as required.

l. Tighten the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint lock nut.

m. Connect the auxiliary transmission (working gear group) shift cylinder operating shaft ball joint to the auxiliary transmission (working gear group) shift lever (Fig 212(4)) and secure with the spring clip. Lubricate the inside of the ball joint socket with grease prior to connection.

n. Road test the vehicle and check the operation of the auxiliary transmission (working gear group) shift mechanism and linkage.

Gear Shift Mechanism

88. Removal

a. Remove the two M6 Phillips head screws, spring washers and lock nuts securing the front winching guide tube rear mounting bracket (Fig 213(1)) to the bracket on the transfer case intermediate axle output housing.

b. Remove the two M6 Phillips head screws and spring washers securing the front winching guide tube front mounting bracket to the chassis cross member and remove the guide tube (Fig 213(2)).

c. Remove the two nuts and washers, and the shift shackle securing the main transmission gear shift shaft ball joints (Fig 214(1)) to the vertical shift rod and the cross shaft flange. Ease the shift shackle and the shift shaft away from the gear shift mechanism cross shaft flange.

d. Tag and disconnect the two output lines (Fig 214(7)) from the planetary gear shift cylinder control valve (Fig 214(5)).

e. Disconnect the air input line (Fig 214(6)) from the planetary gear shift cylinder control valve.
f. Remove the locking clip and disconnect the air vent line (Fig 214(8)) from the base of the planetary gear shift cylinder control valve.

g. Disconnect the electrical cable from the gear shift gate indicator switch (Fig 214(9)).

h. Remove the two bolts securing the gear shift linkage dampener bracket (Fig 214(3)) to the housing of the gear shift mechanism (Fig 214(4)) and shift the bracket to one side.

i. Remove the remaining six bolts securing the gear shift mechanism (Fig 214(4)) to the main transmission housing then remove the gear shift mechanism.

j. Remove and discard the gear shift mechanism gasket.

89. 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 approved cleaning agent and blow dry with compressed air. Clean all gasket residue from the gear shift mechanism housing and the main transmission sealing surfaces.

b. Inspect the shift shackle, shift shaft, shaft bearings and gear shift mechanism for wear. Replace worn components.

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2. Dust boot 5. Planetary gear shift cylinder control valve 8. Vent line

**Figure 214 - Gear Shift Mechanism and Connections**
c. Inspect the cross flange shaft dust boot for wear or damage, replace as required.

NOTE

If replacing the gear shift gate indicator switch (Fig 214(9)), coat the switch threads with a thread locking agent (Loctite 243) prior to screwing it into the gear shift mechanism housing.

NOTE

If replacing the planetary gear shift cylinder control valve (Fig 214(5)), install a new O-ring. Lubricate the O-ring with petroleum jelly and coat the threads of the mounting bolts with a thread locking agent (Loctite 243) prior to installation.

d. Inspect all other parts for wear or damage, replace as required.

90. Installation

a. Set the shift mechanism to the neutral position.

b. Install a new gasket and secure the gear shift mechanism onto the main transmission housing with the six mounting bolts. Torque the bolts to 25 Nm.

c. Position the gear shift linkage dampener bracket (Fig 214(3)) on the gear shift mechanism housing and secure with the two bolts. Torque the bolts to 25 Nm.

d. Connect the two output lines (Fig 214(7)) (tagged during removal) to the planetary gear shift cylinder control valve (Fig 214(5)).

e. Connect the air vent line (Fig 214(8)) to the base of the planetary gear shift cylinder control valve and secure with the locking clip.

f. Connect the air input line (Fig 214(6)) to the planetary gear shift cylinder control valve.

g. Connect the electrical lead to the gear shift gate indicator switch (Fig 214(9)).

h. Coat the threads of the two shift shaft ball joints (Fig 214(1)) with a thread locking agent (Loctite 241). Attach the shift shaft and shift shackle to the vertical shift rod and the gear change mechanism cross shaft flange with the two nuts. Ensure the washer is fitted under the nut securing the shift shaft and shift shackle to the gear change mechanism cross shaft flange. Do not torque the nuts at this stage.

i. Adjust the gear shift mechanism (refer to EMEI Veh D 393 Group 6 - Main Transmission). Torque the ball joint nuts securing the shift shaft to the shift mechanism to 35 Nm on completion of the adjustment.

j. Mount the front winching guide tube (Fig 213(2)) in position and secure the front winching guide tube front mounting bracket to the chassis cross member with the two M6 Phillips head screws and spring washers.

k. Position the front winching guide tube rear mounting bracket (Fig 213(1)) on the bracket on the transfer case intermediate axle output housing and secure with the two M6 Phillips head screws, spring washers and lock nuts.

l. Road test the vehicle and check the operation of the gear change linkage.

Planetary Gear Shift Cylinder

91. Removal

a. Drain the air from the compressed air accumulator circuit 1 (bottom tank), compressed air accumulator circuit 2 (top tank) and the compressed air accumulator trailer brake circuit.

b. Remove the fire extinguisher on the right hand equipment bin.

c. Remove the eight M8 bolts, flat washers and nuts securing the upper and lower fire extinguisher mounting brackets to the right hand equipment bin.

d. Tag and disconnect the two air lines at the planetary gear shift cylinder and move the lines to one side.

e. Remove the split pin from the pivot pin securing the selector lever to the planetary gear shift cylinder shaft clevis (Fig 215(15)) and then remove the pivot pin and flat washer.
f. Remove the circlip (Fig 215(1)) and washer (Fig 215(2)) securing the planetary gear shift cylinder to the planetary gear shift cylinder mounting bracket.

g. Remove the planetary gear shift cylinder from the planetary gear shift cylinder mounting bracket.

**92. Cleaning and Inspection**

**WARNING**

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

a. Clean the planetary gear shift cylinder in an appropriate cleaning agent and blow dry with compressed air.

b. Inspect the clevis (Fig 215(15)), pivot pin, bush (Fig 215(3)) and planetary gear shift cylinder mounting bracket for wear, replace as required.

93. **Installation/Adjustment**

a. Mount the planetary gear shift cylinder on the planetary gear shift cylinder mounting bracket and secure with the washer (Fig 215(2)) and the circlip (Fig 215(1)).

b. Identify the two air lines, previously tagged during removal and connect them to the planetary gear shift cylinder.

c. Temporarily connect the planetary gear shift cylinder clevis (Fig 215(15)) to the selector lever with the pivot pin.

d. Run the engine and check the planetary gear shift cylinder and connections for air leaks.

e. Adjust the planetary gear shift cylinder (refer to EMEI Veh D 393 Group 6 - Main Transmission).

f. Install the upper and lower fire extinguisher mounting brackets to the right hand equipment bin and secure with the eight M8 bolts, spring washers and nuts.

**g.** Install the fire extinguisher on the right hand equipment bin.

**h.** Road test the vehicle and check the operation of the planetary gear shift cylinder.

94. **Transmission Oil Pump**

94. **Removal**

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

b. Remove the fire extinguisher on the right hand equipment bin.

c. Remove the eight M8 bolts, flat washers and nuts securing the upper and lower fire extinguisher mounting brackets to the right hand equipment bin.

**d.** Remove the propeller shaft - rear section (refer to EMEI Veh D 393 Group 6 - Main Transmission).

e. Remove the main transmission input flange securing bolt (Fig 216(2)), washer and O-ring. Discard the O-ring.
1. Input shaft flange
2. Input flange securing bolt

Figure 216 - Input Flange - Removal

f. Remove the main transmission input flange with two levers.

g. Remove the transmission oil pump locating screw (Fig 217(1)).

h. Remove the transmission oil pump with the puller (Table 2, Item 4). Discard the O-ring.

i. Remove the locating key. Inspect the locating key and shaft for wear, replace as required.

Installation

a. Install the locating key in the slot provided on the transmission oil pump.

b. Fit a new sealing O-ring to the transmission oil pump body and lubricate the O-ring with petroleum jelly.

c. Install the pump in the main transmission and secure the pump with the locating screw (Fig 217(1)). Torque the screw to 23 Nm.

d. Install the main transmission input flange (Fig 216(1)), new O-ring, washer and securing bolt (Fig 216(2)). Lubricate the input flange seals and O-ring with petroleum jelly and coat the threads of the securing bolt with a thread locking agent (Loctite 262) prior to assembly.

e. Torque the main transmission input shaft flange retaining bolt to 70 Nm.

f. Install the propeller shaft - rear section (refer to EMEI Veh D 393 Group 6 - Main Transmission).

g. Install the upper and lower fire extinguisher mounting brackets to the right hand equipment bin and secure with the eight M8 bolts, spring washers and nuts.

h. Install the fire extinguisher on the right hand equipment bin.

i. Check the oil level in the transmission and top up with oil (Castrol Syntrans 75W/85) if required. Refer to the Operator Handbook.

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

k. Run the engine and check the oil flow at the auxiliary transmission (working gear group) oil feed line banjo bolt (Fig 210(1)). Oil must discharge from the bore when the banjo bolt is “cracked” with the engine running. Tighten the banjo bolt securely after the check.

l. Check the transmission oil level and top up if required.

Power Take-Off Transmission (PTO)

96. Removal

a. Drain the transmission oil. Refer to the Operator Handbook.

b. Remove the hydraulic triple pump (refer to Group 11 - Hydraulic System, para 165).

c. Disconnect the air supply line at the PTO shift cylinder. Discard the banjo bolt sealing washers.

d. Remove the electrical lead from the PTO shift cylinder pressure switch (Fig 218(1)).

e. Remove the four Allen head bolts securing the hydraulic triple pump adapter plate to the PTO and remove the plate.
1. PTO shift cylinder pressure switch
2. Mounting bolt

**Figure 218 - PTO - Removal**

**f.** Remove the mounting bolts (Fig 218(2)) securing the PTO to the transmission housing and remove the PTO, the gasket (if fitted) and the main transmission drive shaft and lay shaft bearing pre-load shims. Note the sealing medium (gasket or sealant) that is used between the PTO and the main transmission. Retain the old PTO to compare with the new PTO when determining the thickness of the main transmission drive shaft bearing pre-load shim stack.

**g.** Remove the O-ring between the main transmission input shaft output housing and the PTO and discard it.

97. **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.** When fitting a new PTO to the transmission compare the depth of the transmission drive shaft and lay shaft bearing housings in the new PTO and the old PTO. Add or remove shims, if required, to ensure that:

1. The depth of the transmission drive shaft bearing housing in the new PTO is identical to the depth of the transmission drive shaft bearing housing in the old PTO when the shims are fitted; and

2. The depth of the transmission lay shaft bearing housing in the new PTO is identical to the depth of the transmission lay shaft bearing housing in the old PTO when the shims are fitted.

**c.** When refitting the old PTO to the transmission ensure that the identical shim stacks (noted on removal) are fitted back into the transmission drive shaft and lay shaft bearing housings.
98. **Installation**

   a. Fit a new O-ring between the transmission input shaft output housing and the PTO. Lubricate the O-ring with petroleum jelly prior to assembly.

   **NOTE**

When refitting the old PTO to the transmission ensure that the identical shim stacks (noted on removal) are fitted back into the transmission drive shaft and lay shaft bearing housings.

   b. Install the predetermined shims for the transmission drive shaft and lay shaft bearing pre-load on the transmission. Hold them in position with a light smear of petroleum jelly.

   c. Install the PTO gasket on the transmission housing. If sealant was previously used, do not use a gasket and coat the mating surface of the PTO with a sealing compound (Omnifit FD 10, Part No. 002 989 00 20 10 or equivalent).

   d. Install the PTO and secure with the mounting bolts (Fig 218(2)). Torque the bolts to 33 Nm.

   e. Connect the air supply line to the PTO shift cylinder. Renew the sealing washers on the banjo bolt.

   f. Connect the electrical lead to the PTO shift cylinder pressure switch (Fig 218(1)).

   g. Install the hydraulic triple pump adapter plate on the PTO and secure with the four Allen head bolts.

   h. Install the hydraulic triple pump (refer to Group 11 - Hydraulic System, para 167).

   i. Fill the transmission with oil (Castrol Syntrans 75W/85). Refer to the Operator Handbook.

   j. Start the engine and check the operation of the PTO. Top up the oil level in the transmission as required.