

**TRUCK, FUEL TANKER, HEAVY, MC3 – MACK**

**REPAIRS TO THE FUEL TANK**

**LIGHT GRADE REPAIR**

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

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**GENERAL**

**Introduction**

1. This EMEI details the Light Grade Repair procedures for the fuel tank fitted to the Truck, Tank, Fuel, Heavy, MC3 – Mack. For further information on the cab/chassis or repair and servicing information of the cab/chassis, refer to EMEI Vehicle G 70 decade.

**Associated Publications**

1. Reference may be necessary to the latest issue of the following documents:
  - a. [Complete Equipment Schedule \(CES\) 11665](#) .....Truck, Fuel Tanker, Heavy, MC3 – Mack;
  - b. EMEI Vehicle G 70 Decade – Truck, Cargo, Heavy, MC3 – Mack;
  - c. [EMEI Vehicle G 740](#) – Truck, Fuel Tanker, Heavy, MC3 – Mack – Data Summary;
  - d. [EMEI Vehicle G 742](#) – Truck, Fuel Tanker, Heavy, MC3 – Mack – Technical Description;
  - e. [EMEI Vehicle G 744](#) – Truck, Fuel Tanker, Heavy, MC3 – Mack – Medium and Heavy Grade Repair;
  - f. [EMEI Vehicle G 747-2](#) – Additional Front Mudflaps;
  - g. [EMEI Vehicle G 747-3](#) – Passengers Grab Handle;
  - h. [EMEI Vehicle G 747-4](#) – Fitting of Class 3 Flammable Liquid Sign;
  - i. [EMEI Vehicle G 747-6](#) – Replacement Cabin Map Light;
  - j. [EMEI Vehicle G 747-7](#) – Hose Reel Isolation Valves;
  - k. [EMEI Vehicle G 747-8](#) – Stainless Steel Low-Point Drains;
  - l. [EMEI Vehicle G 747-9](#) – Non-Slip Ladder Rungs and Tread Plates;
  - m. [EMEI Vehicle G 747-14](#) – Installation and Removal of Self Protection System – Vehicle Interface Kit on Valir Hardened Cab Variant;
  - n. [EMEI Vehicle G 747-15](#) – Fitting of a Walkway Fall Restraint System;
  - o. [EMEI Vehicle G 747-17](#) – Installation and Removal of Force Protection Counter Measures System Vehicle Installation Kit Upgrade on Valir Hardened Cab Variant;
  - p. [EMEI Vehicle K 016-1](#) – Total Restraint Access Module (TRAM) Safety System Technical Manual.
  - q. [EMEI Workshop E 672](#) – Safety Precautions - Bulk Fuel Holding and Handling Equipment; and
  - r. [EMEI Workshop E 673](#) – Safety Procedures for the Repair and Maintenance of Road Tank Vehicles and Trailers for Bulk Fuel.

**Item Identification Locations**

2. The item identification locations are described in Table 1.

**Table 1 Item Identification Locations**

Serial	Item	Location
1	Chassis number	Right-hand rear frame, above intermediate axle
2	Chassis nameplate	Left-hand door inside cab
3	Engine number	Right-hand top of timing gear housing
4	Front axle number	Left rear of axle housing
5	Transmission number	Left-hand side
6	Transfer case	Right-hand rear
7	Intermediate axle number	Right-hand front of carrier housing
8	Rear axle number	Right-hand front of carrier housing

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**Table 1 Item Identification Locations (Continued)**

Serial	Item	Location
9	Injection pump identification	Side of the pump
10	Power take-off (PTO)	Right-hand side
11	Hydraulic pump	Lower side of the pump
12	Fuel tank	Left-hand forward area

**List of Lubricants**

3. The list of lubricants is detailed in Table 2.

**Table 2 List of Lubricants**

Serial	Equipment	Lubricant	Capacity (Litres)
1	Oil reservoir	OM-65	81

**DETAIL**

**WARNING**

Before working on the hydraulic system, check the temperature of the hydraulic fluid on the gauge fitted to the oil reservoir. Ensure that hydraulic fluid is sufficiently cool to avoid burns.

It is vitally important that dirt and other foreign matter are not allowed to enter the hydraulic system during repairs. Dirt or fluid other than clean hydraulic fluid in the system will cause almost immediate failure. Plug or protect openings to prevent dirt entering the system. Use plastic plugs or covers only for this purpose. Do not use cloth or paper as plugs or covers.

Always ensure that the fuel tanker is properly earthed, prior to carrying out repair procedures.

The TRAM safety system (if fitted) is to be used at all times when working at heights on the fuel tank body.

Eye protection must be worn when using compressed air.

**Hydraulic Oil Filter**

4. **Removal.** Remove the hydraulic oil filter as follows:

**WARNING**

Before removing the oil filter, ensure that the hydraulic fluid is sufficiently cool to avoid burns.

- a. Place a receptacle beneath the filter to catch any spillage during removal.
- b. Wash the area around the filter and blow it dry with compressed air.
- c. Remove the filter with the aid of a filter removing tool.

5. **Replacement.** Replace the hydraulic oil filter as follows:

- a. Clean the filter mounting surface on the adapter.
- b. Prime the new filter with clean hydraulic fluid (OM-65).

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- c. Apply a film of hydraulic fluid (OM-65) to the sealing gasket on the new filter.
- d. Carefully install the filter to avoid cross-threading and to ensure good gasket contact.
- e. Tighten the filter two-thirds of a turn by hand after the sealing gasket contacts the adapter.
- f. Check the level of fluid in the oil reservoir and if necessary, top up with OM-65.
- g. Remove the receptacle.

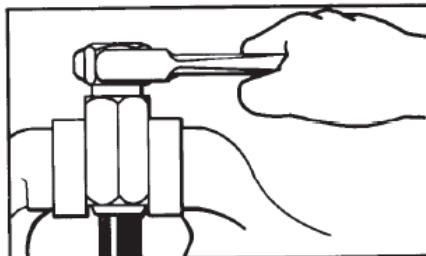
### Hydraulic Hoses

6. **Removal.** Remove the hydraulic hoses as follows:

**WARNING**

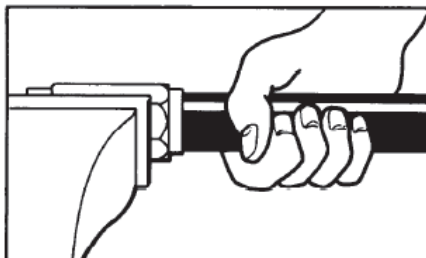
**Before removing any hydraulic hose, ensure that the hydraulic fluid is sufficiently cool to avoid burns.**

- a. Disengage the PTO and shut down the engine.
  - b. Place a suitable receptacle under the hose to be replaced to catch any spillage.
  - c. Crack loose the hose connections to allow any residual fluid (which may be under pressure) to drain off.
  - d. Disconnect the hose connections, remove any zip clamps or other clamping devices and remove the hose.
  - e. Plug the openings to prevent dirt or other foreign material from entering the hydraulic system.
7. **Replacement.** Replace the hydraulic hoses as follows:
- a. Clamp the ferrule in a vice and screw the insert from the hose in an anticlockwise direction (Figure 1).



**Figure 1 Removing Coupling Insert**

- b. With the ferrule clamped in the vice, remove the hose by turning it in a clockwise direction (Figure 2).



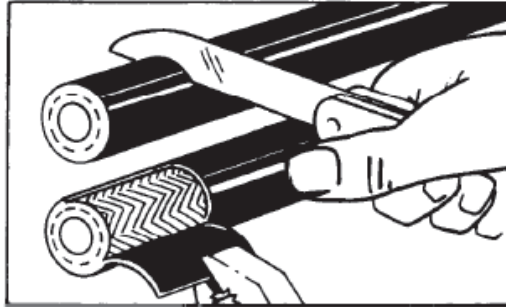
**Figure 2 Removing Ferrule**

- c. Repeat Para 7.a and 7.b for the other end of the hose.
- d. Measure the length of the hose for replacement purposes then discard it.
- e. Cut a new length of hose to the measurement determined at Para 7.d.

**NOTE**

A cutting disc will be required to obtain a clean cut through the hose without damaging the wire braid reinforcing.

- f. Make a knife cut around the circumference of the hose to the depth of the braid, at a distance from the end of the hose equal to the inside length of the ferrule (Figure 3).
- g. Make one lengthwise cut to the depth of the braid, from the circular cut to the end of the hose.



**Figure 3 Cutting Hose Outer Cover**

- h. Cleanly strip the cover down to the braid.
- i. Push the hose into the ferrule using semi-rotational movements in both clockwise and anticlockwise directions.
- j. The hose is fully home when the end of the hose is 0.8 to 1.2 mm (1/32 to 1/16 in.) from the inside shoulder.
- k. Liberally oil the insert and the inside of the hose with hydraulic fluid (OM-65).
- l. Screw the insert all the way into the ferrule.

**NOTE**

Do not allow the hose to turn during this operation.

- m. Repeat Para 7.g to 7.k for the other end of the hose.
- n. Remove the plugs and install the hose.

**NOTE**

Ensure that the hose is not twisted and any bends are smooth and gradual.

- o. Fit zip clamps or any other clamping device which may have been removed, then operate the hydraulics to ensure that the hose is correctly fitted and free of leaks.
- p. Rectify any leaks as necessary.
- q. Check the level of fluid in the oil reservoir and if necessary, top up with OM-65.

**Hydraulic Pump**

- 8. **Removal.** Remove the hydraulic pump as follows:

**WARNING**

**Before removing the hydraulic pump, ensure that the hydraulic fluid is sufficiently cool to avoid burns.**

- a. Clean the pump and the hose connections, then blow them dry with compressed air.
- b. Slacken the screw clamp on the supply hose.

- c. Remove and plug the supply hose and pump housing with suitable plastic plugs.
  - d. Remove the pressure hose and plug both the hose and the pump housing with suitable plastic plugs.
  - e. Remove the four nuts and washers from the pump adapter flange and remove the pump.
9. **Replacement.** Replace the hydraulic pump as follows:
- a. Clean the mounting faces on the pump and PTO.
  - b. Position a new gasket on the PTO and install the pump.
  - c. Install the retaining nuts and washers and torque the nuts to 34 to 38 N.m (25 to 28 lbf.ft).
  - d. Remove the plastic plugs and install the hoses.
  - e. Securely tighten the pressure hose connection and the supply hose screw clamp.
  - f. Start the truck engine, engage the PTO and ensure that the pump functions correctly.
  - g. Check the pump and hoses for leaks.
  - h. Disengage the PTO and shut down the engine and rectify any faults as necessary.
  - i. Check the level of the fluid in the oil reservoir and if necessary, top up with OM-65.

**PTO**

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

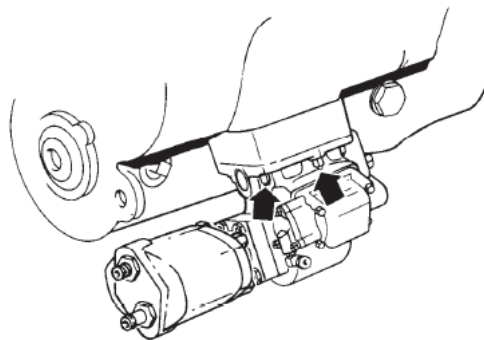
**WARNING**

**Before removing the PTO, ensure that the hydraulic fluid is sufficiently cool to avoid burns.**

**CAUTION**

**Both the PTO and adapter housings are quite brittle and easily damaged unless handled carefully.**

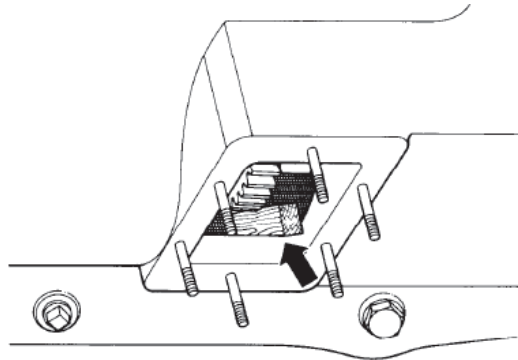
- a. Wash the area around the PTO and hydraulic pump and blow them dry with compressed air.
- b. Remove the hydraulic hoses.
- c. Seal the hoses and the ports in the hydraulic pump with plastic plugs.
- d. Remove the air line from the PTO selector housing.
- e. Remove the six retaining nuts and washers securing the PTO and adapter to the transmission (Figure 4).
- f. Remove the PTO and pump assembly and the adapter housing from the transmission.
- g. Remove all traces of gasket residue from the mounting surfaces.



**Figure 4 Location of Retaining Nuts**

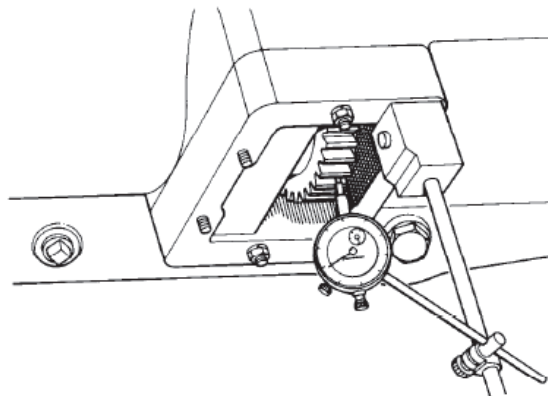
11. **Determining Backlash.** Determine the backlash in the PTO as follows:

- a. Insert a wooden wedge between the transmission PTO drive gear and the transmission housing (Figure 5).



**Figure 5 Wedge Location**

- b. Install the new gaskets and the adapter housing onto the transmission housing and secure it in place with the top and bottom nuts only.
- c. Install a dial indicator onto the adapter housing with the dial indicator plunger resting squarely on the adapter gear (Figure 6).

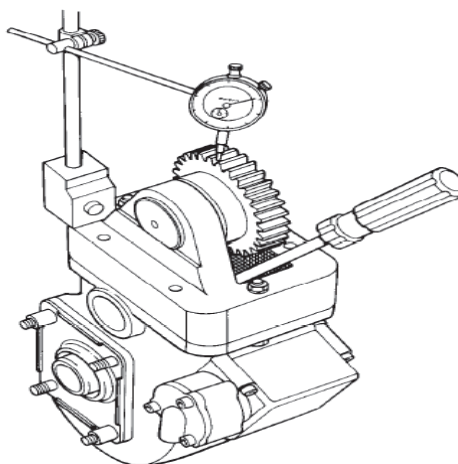


**Figure 6 Checking PTO Adapter-to-transmission Backlash**

- d. Rock the adapter gear back and forth by hand to check the backlash reading.
- e. Add or subtract gaskets between the adapter and transmission to obtain a backlash figure of 0.250 to 0.375 mm (0.010 to 0.015 in.).
- f. Remove the nuts from the adapter and remove the adapter from the transmission.
- g. Retain the gaskets.
- h. Remove the wooden wedge from the transmission.
- i. Position the new gaskets and the adapter on the PTO and secure the adapter to the PTO with two bolts and nuts.
- j. Install a dial indicator on the adapter housing with the dial indicator plunger resting squarely on the adapter gear (Figure 7).
- k. Slide the idler gear against the spring pressure to mesh the idler gear with the adapter gear.
- l. Hold the gear in this position and lock it to prevent it from turning, then rock the adapter gear back and forth by hand and check the backlash reading.

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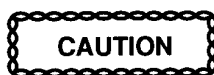




**Figure 7 Checking Adapter-to-PTO Backlash**

- m. Add or subtract gaskets between the adapter and PTO to obtain a backlash figure of 0.250 to 0.375 mm (0.010 to 0.015 in.).
- n. Remove the nuts and bolts and separate the adapter housing and PTO.
- o. Retain the gaskets.

**12. Installation.** Install the PTO as follows:



**Both the PTO and adapter housings are quite brittle and easily damaged unless handled carefully.**

- a. Position the gaskets (previously determined when setting the adapter-to-transmission backlash) and the adapter onto the transmission.
- b. Position the gaskets (previously determined when setting the adapter-to-PTO backlash) onto the adapter.
- c. Install the PTO.
- d. Apply Loctite 271 to the studs then install the spring washers and nuts.
- e. Torque the nuts to 34 to 38 N.m (25 to 28 lbf.ft).
- f. Fit the hydraulic pump and gasket to the PTO.
- g. Apply Loctite 271 to the studs then install the lock washers and nuts.
- h. Torque the nuts to 34 to 38 N.m (25 to 28 lbf.ft).
- i. Remove the plastic plugs from the pump and hoses, fit the hoses and tighten the screw clamp and the connector securely.
- j. Reconnect the air line to the selector housing and tighten it securely.
- k. Start the truck engine and engage the PTO.
- l. Check for leaks at the gaskets, the hydraulic hoses and the air hose and rectify if necessary.
- m. Check that the PTO is operating correctly and not making any whining or rattling noise.
- n. If the PTO whines or rattles, repeat the backlash adjustment (Para 11).
- o. Disengage the PTO and shut down the engine.
- p. Check the oil level in the transmission and if necessary, top up with OEP-220.
- q. Check the fluid level in the oil reservoir and if necessary, top up with OM-65.

### PTO Control Valve

13. **Removal.** Remove the PTO control valve as follows:
- Drain the air from the air brake reservoirs.
  - From under the centre console, disconnect the air lines from the control valve.
  - Remove the two retaining screws and the instruction plate from the fascia side of the console and remove the valve.
14. **Installation.** Install the PTO control valve as follows:
- Position the valve in the console then install the instruction plate and retaining screws and tighten the screws securely.
  - Reconnect the air lines and tighten the connections securely.
  - Start the engine and allow the air pressure in the brake system to build up then check for air leaks at the valve and rectify as necessary.
  - Shut down the engine.

### PTO Engagement Selector

15. **Removal.** Remove the PTO engagement selector as follows:
- Clean the selector housing and the area around the housing.
  - Disconnect the air line from the elbow on the selector housing.
  - Remove the four socket head bolts retaining the selector housing to the PTO and remove the selector housing and gasket from the PTO.
  - Clean any gasket residue from the mounting surfaces of the PTO and the selector housing.
16. **Installation.** Install the PTO engagement selector as follows:
- Position a new gasket and the selector housing on the PTO ensuring that the selector fork is aligned with the gear.
  - Install the retaining bolts and torque them to 34 to 38 N.m (25 to 28 lbf.ft).
  - Reconnect the air line and tighten the connection securely.
  - Start the engine and engage the PTO.
  - Check for air leaks at the air line connection and rectify it as necessary.
  - Disengage the PTO and shut down the engine.

### Fuel System

17. **Sampling Valve Tubes Removal.** Remove the sampling valve tubes as follows:

#### WARNING

Use nitrile rubber gloves and wear eye protection.

Have a spill control kit available in the event of a product spill.

- Ensure that the ball valve fitted to the tank compartment is closed.
- Place a receptacle under the sampling valve of the tube to be removed.
- Open the sampling valve and drain any fuel from the tube then close the sampling valve.
- Disconnect the stainless steel tube at the tank ball valve and the sample valve mounting plate (Figures 8, 9, 10 and 11) and remove the tube.

#### NOTE

If the vehicle is fitted with plastic sampling valve tubes, carry out a modification in accordance with EMEI Vehicle G 747-8.



Figure 8 Front Compartment Tank Sampling Valve Tubes



Figure 9 Centre Compartment Sampling Valve Tubes



Figure 10 Rear Compartment Tank Sampling Valve Tube



Figure 11 Mounting Plate and Ball Valves

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- 18. Sampling Valve Tubes Installation.** Install the sampling valve tubes as follows:
- a. Apply thread sealing tape to the threads on the ball valve connector and the sampling valve connector at the mounting bracket.

**NOTE**

Ensure that the thread tape does not obstruct the connector opening.

- b. Connect the tube to the ball valve and the sampling valve.
  - c. Open the ball valve, check for leaks and rectify as necessary.
- 19. Sampling Valves Removal.** Remove the sampling valves as follows:
- a. Place a receptacle under the sampling valve to be replaced.
  - b. Ensure that the ball valve at the appropriate tank compartment is closed, then open the sampling valve and drain any fuel from the tube.
  - c. Using a suitable spanner, remove the sampling valve from the mounting bracket.

**NOTE**

The sampling valves are non-repairable and are repaired by replacement.

- d. Place the sampling valve in a vice and remove the elbow, cam-lock adapter and dust cap.
  - e. If necessary, the cam-lock adapter may be removed from the elbow (Figure 11).
- 20. Sampling Valves Installation.** Install the sampling valves as follows:
- a. If the cam-lock adapter was removed from the elbow, apply thread sealing tape to the adapter thread ensuring that the tape does not protrude into the adapter.
  - b. Fit the cam-lock adapter to the elbow.
  - c. Apply thread sealing tape to the thread of the elbow ensuring that the thread tape does not obstruct the connector opening.
  - d. Fit the elbow to the sampling valve, ensuring that the final orientation of the elbow-to-sampling valve is as shown in Figure 11.
  - e. Apply thread sealing tape to the thread of the connector on the sampling valve mounting bracket ensuring that the thread tape does not obstruct the connector opening.
  - f. Fit the sampling valve assembly to the connector on the mounting bracket.
  - g. Open the ball valve and sampling valve, check for leaks and rectify as necessary.
- 21. Ball Valves Removal.** Remove the ball valves as follows:

**NOTE**

Ensure that the appropriate tank compartment is empty.

- a. Disconnect the stainless steel tube from the sampling valve at the ball valve elbow then remove the ball valve assembly from the tank.

**NOTE**

The ball valves are non-repairable and are repaired by replacement.

- b. Place the ball valve in a vice and remove the connector and elbow (Figure 8).
- 22. Ball Valves Installation.** Install the ball valves as follows:
- a. Apply thread sealing tape to the thread at both ends of the connector ensuring that the thread tape does not obstruct the connector openings.
  - b. Fit the connector into the ball valve.

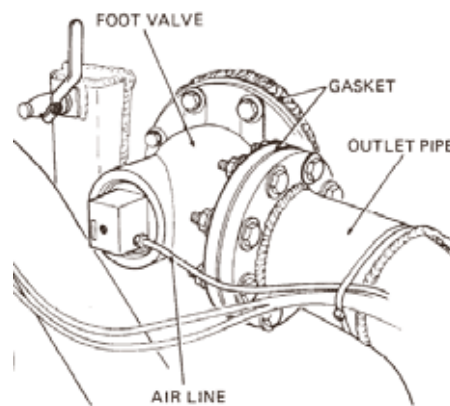
- c. Apply thread sealing tape to the thread of the elbow ensuring that the thread tape does not obstruct the elbow openings.
- d. Fit the elbow to the ball valve.
- e. Install the ball valve assembly into the base of the tank compartment and tighten it securely.
- f. Connect the hose from the sampling valve to the ball valve elbow and tighten them securely.
- g. Partially fill the tank compartment and open the ball valve, check for leaks and rectify as necessary.

**23. Tank Foot Valve Removal.** Remove the tank foot valve as follows:

**NOTE**

If the repairs on the foot valve have been initiated for air failure reasons, before work on the equipment commences, ensure that the valve has been returned to the closed position using the manual override system.

- a. Ensure that the fuel tanker has been drained of fuel.
- b. Remove the air line from the appropriate foot valve assembly (Figure 12), by pressing the brass collar into the connector and removing the air line.
- c. Remove the bolts, nuts and washers from the flange joint, connecting the outlet pipe to the foot valve.
- d. Support the valve assembly, then remove the bolts and washers securing the valve assembly to the tank and remove the valve.



**Figure 12 Foot Valve Assembly**

**24. Tank Foot Valve Installation.** Install the tank foot valve as follows:

- a. Position a new gasket on the top flange of the valve assembly then position the valve assembly in the outlet flange of the tank.
- b. Install the bolts and washers and torque them to 38 to 42 N.m (28 to 31 lbf.ft).
- c. Position a new gasket between the foot valve and the outlet pipe.
- d. Reconnect the pipe with the bolts, nuts and washers and torque them to 38 to 42 N.m (28 to 31 lbf.ft).
- e. Reconnect the air line to the foot valve by pushing the air line into the brass collar of the connector.
- f. Check the operation of the foot valve by filling or partially filling the fuel tank compartment.
- g. Check for leaks then drain the compartment to ensure that the foot valve operates correctly in both load and discharge functions.
- h. Rectify any leaks after the tank has been drained.

**25. Tank Outlet Valve (API Valve) Removal.** Remove the API valve as follows:

- a. Clean the outlet valve to be removed and surrounding area with a cleaning agent then blow them dry with compressed air.

- b. Ensure that the line from the tank foot valve to the API valve to be removed is completely drained of fuel.
- c. Note the position of the handle on the tank outlet valve to be removed. Handles of the tank outlet valves for compartments one and two are mounted in a vertical position. The handle of the tank outlet valve for compartment three is angled outwards to clear the mudguard.
- d. Note the position of the outlet gate mounting brackets if removing the tank outlet valves for compartments one or two.
- e. Remove the nuts, bolts and washers securing the outlet valve to the stub pipe.
- f. Remove the tank outlet valve.

**26. Tank Outlet Valve (API Valve) Installation.** Install the API valve as follows:

- a. Using a cleaning agent, clean the stub pipe mating surface of gasket residue and blow them clean with compressed air.
- b. Position a new gasket between the tank outlet valve and the tank stub pipe, and position the tank outlet valve as noted prior to removal.
- c. Install the two top mounting nuts, bolts and washers but do not tighten them.
- d. Position the mounting brackets for the outlet gate (if necessary) as noted prior to removal.
- e. Install the remaining nuts, bolts and washers (the longer bolts are to mount the outlet gate (if applicable)) and torque them to 33 to 37 N.m (25 to 28 lbf.ft).
- f. Operate the control buttons to open the foot valves allowing fuel to flow to the tank outlet valves.
- g. Check for leaks and rectify as necessary.

**27. Fuel Pump Inlet and Outlet Valves Removal.** Remove the fuel pump inlet and outlet valves as follows:

- a. Clean the inlet/outlet valve and the surrounding area with a cleaning agent then blow them dry with compressed air.
- b. Ensure that the manifold outlet valve is closed.
- c. Place a receptacle beneath the valve.
- d. Remove the flexible hose (inlet valve) or the dust cap (outlet valve).
- e. Open the valve to drain off any fuel which may be behind the valve.
- f. Support the valve and cam-lock fitting then remove the bolts, nuts and washers securing the cam-lock fitting and the valve to the pipe flange.
- g. Remove and discard the two O rings from the valve body.

**28. Fuel Pump Inlet and Outlet Valves Installation.** Install the fuel pump inlet and outlet valves as follows:

- a. Insert new flange sealing O rings into the grooves in the valve body.

**NOTE**

Avoid stretching the O rings by first pressing them into place at four points, then pressing them into place alternately at points between the original four until the O rings are smooth and evenly secured.

- b. Position the inlet/outlet valve and cam-lock fitting on the pipe flange and secure them with the retaining bolts, nuts and washers.
- c. Torque the retaining bolts to 33 to 37 N.m (25 to 28 lbf.ft).
- d. Reconnect the flexible hose (inlet valve) or the dust cap (outlet valve) as necessary.
- e. Check the valve for leaks and rectify as necessary.

- 29. Dual Pressure Relief Valve Removal.** Remove the dual pressure relief valve as follows:
- Clean the relief valve and the area around the top of the fuel pump with a cleaning agent then blow them dry with compressed air.
  - Ensure that the fuel tank outlet valves are in the closed position then remove the nuts and washers securing the relief valve to the fuel pump.
  - Remove all gasket residue from the base of the relief valve and from the adapter on the fuel pump. Ensure that no gasket residue enters the fuel pump.
- 30. Installation.** Install the dual pressure relief valve as follows:
- Place a new gasket on the fuel pump-to-relief valve adapter.
  - Position the relief valve on the adapter.
  - Install the nuts and washers and torque them to 19 to 21 N.m (14 to 15.5 lbf.ft).

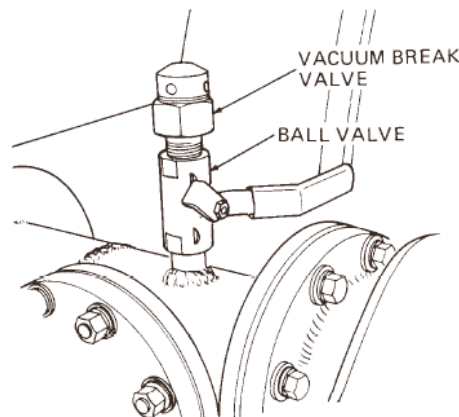
### Vacuum Break Valve and Ball Valve

- 31. Removal.** Remove the vacuum break valve and ball valve as follows:

#### NOTE

Both the vacuum break valve and the ball valve are non-repairable and are repaired by replacement.

- Remove the vacuum break valve and ball valve from the fuel pump outlet pipe (Figure 13).



**Figure 13 Vacuum Break Valve and Ball Valve**

- 32. Installation.** Install the vacuum break valve and ball valve as follows:
- Apply thread sealing tape to the thread of the vacuum break valve, ensuring that the tape does not protrude into the valve.
  - Fit the vacuum break valve to the ball valve and tighten it securely.
  - Apply thread sealing tape to the pipe thread, ensuring that the tape does not protrude into the pipe.
  - Fit the vacuum break valve and ball valve to the fuel pump outlet pipe and tighten them securely.

### Non-return Valve

- 33. Removal.** Remove the non-return valve as follows:
- Slacken the outlet pipe flange nuts at the fuel pump, then position a receptacle under the non-return valve.
  - Remove the bolts, nuts and washers retaining the valve between the outlet pipe and the hose reel supply pipe.
  - Move the outlet pipe to enable the valve to be withdrawn from between the pipe flanges.

- 34. Installation.** Install the non-return valve as follows:
- a. Position the valve between the outlet pipe and the hose reel supply pipe flanges.

**NOTE**

Ensure that the valve is positioned so that the valve plates open towards the hose reel supply pipe.

- b. Centralize the valve between the flanges, then install the bolts, nuts and washers and torque them to 51 to 56 N.m (38 to 42 lbf.ft).
- c. Torque the pump outlet flange bolts to 20 to 23 N.m (15 to 17 lbf.ft).
- d. Start the truck engine, engage the PTO, open the tank outlet valves and operate the pump.
- e. Check that the fuel is supplied to the four dispensing hoses under a constant, steady pressure by operating the nozzle on each hose in turn.
- f. Stow the hoses, shut down the pump, disengage the PTO and shut down the engine.
- g. Check for fuel leaks at the non-return valve and rectify as necessary.

**Suction Strainer**

- 35. Removal.** Remove the suction strainer as follows:

- a. Clean the suction strainer housing with a cleaning agent then blow it dry with compressed air.
- b. Close the fuel pump inlet valve and place a receptacle beneath the suction strainer housing.
- c. Turn the two securing rings 90°, then lift the cover and rings from the housing and remove the element.
- d. Discard the cover gasket.

- 36. Cleaning and Inspection.** Clean and inspect the suction strainer as follows:

- a. Clean the strainer and housing with a cleaning agent then blow them dry with compressed air.
- b. Check the condition of the strainer and replace it if it is damaged.

- 37. Installation.** Install the suction strainer as follows:

- a. Install the strainer element into the housing.
- b. Insert a new gasket into the housing cover, then position the cover on the housing and turn the two securing rings 90° to secure the cover.
- c. Open the fuel pump inlet valve and check the strainer housing for leaks and rectify as necessary.
- d. Remove the receptacle from beneath the strainer housing and dispose of the contents in accordance with local waste disposal instructions.

**Hose Reel Isolation Valves**

- 38. Removal.** Remove the hose reel isolation valves as follows:

- a. Remove the bolts, nuts and washers from the flange joining the hose reel supply pipe to the header pipe and cover the header pipe opening with a blanking plate.
- b. Remove the bolts, nuts and washers securing the hose reel supply pipe to the end-cap and bearing housing.
- c. Remove the supply pipe and discard the gaskets.
- d. Remove the bolts, nuts and washers connecting the isolation valve to the supply pipe.
- e. Remove the isolation valve and discard the gaskets.

- 39. Cleaning and Inspection.** Clean and inspect the hose reel isolation valves as follows:

- a. Clean the isolation valve with a cleaning agent then blow it dry with compressed air.
- b. Check the condition of the isolation valve and replace it if it is damaged.



- 40. Installation.** Install the hose reel isolation valves as follows:
- a. Using new gaskets, orientate the isolation valve correctly on the supply pipe and install the bolts, nuts and washers, but do not tighten them.
  - b. Position the supply pipe, together with a new gasket, on the hose reel end-cap.
  - c. Align the bolt holes, then install the bolts and washers, but do not tighten them.
  - d. Remove the header pipe blanking plate, then position a new gasket between the header pipe and the hose reel supply pipe flanges.
  - e. Install the bolts, nuts and washers and tighten them securely.
  - f. Tighten the bolts at the hose reel end-cap.
  - g. Apply Loctite 243 to the male threads of the bolts connecting the isolation valve to the supply pipe and tighten them.
  - h. Partially fill the tank (enough to flood the header pipe manifold).
  - i. Pressurize the fuel system and open the hose reel isolation valve.
  - j. Check for leaks and rectify as necessary.

#### Hose Reel

- 41. Removal.** Remove the hose reel as follows:
- a. Slacken the hose reel lock, remove the nozzle from its retainer (Figure 14) and unroll the hose from the reel.
  - b. Place the nozzle in a receptacle and drain the fuel from the hose, then cut the metal band clamp securing the hose to the gooseneck and remove the hose.
  - c. Plug the end of the hose with a plastic plug to prevent the ingress of dust or dirt.
  - d. Remove the two bolts, nuts and washers securing the reel lock to the mounting bracket and remove the lock assembly.
  - e. Remove the bolts, nuts and washers from the flange joining the hose reel supply pipe to the header pipe and cover the header pipe opening with a blanking plate.
  - f. Remove the bolts, nuts and washers securing the hose reel supply pipe to the end-cap and bearing housing, then remove the supply pipe and discard the gaskets.
  - g. Remove the bolts and washers securing the bearing housing (at the crown wheel end of the hose reel) to the mounting bracket.
  - h. Remove the bolts, nuts and washers securing the bearing housing (at the opposite end of the hose reel) to the mounting bracket.
  - i. Lift the hose reel from the mounting bracket.
- 42. Disassembly.** Disassemble the hose reel as follows:
- a. Remove the end-cap, circlip and bearing housing from the gooseneck, then slacken the grub screw in the bearing on the other end of the shaft and remove the bearing.
  - b. Remove the bolts, nuts and washers securing the flange and shaft assembly to the reel, and then remove the flange and shaft assembly from the reel.
  - c. Remove the bolts, nuts and washers securing the crown wheel and the gooseneck to the reel, then remove the crown wheel and withdraw the gooseneck from the reel.
  - d. Remove the oil seal from the end-cap and discard the oil seal, then press the bearing from the bearing housing.

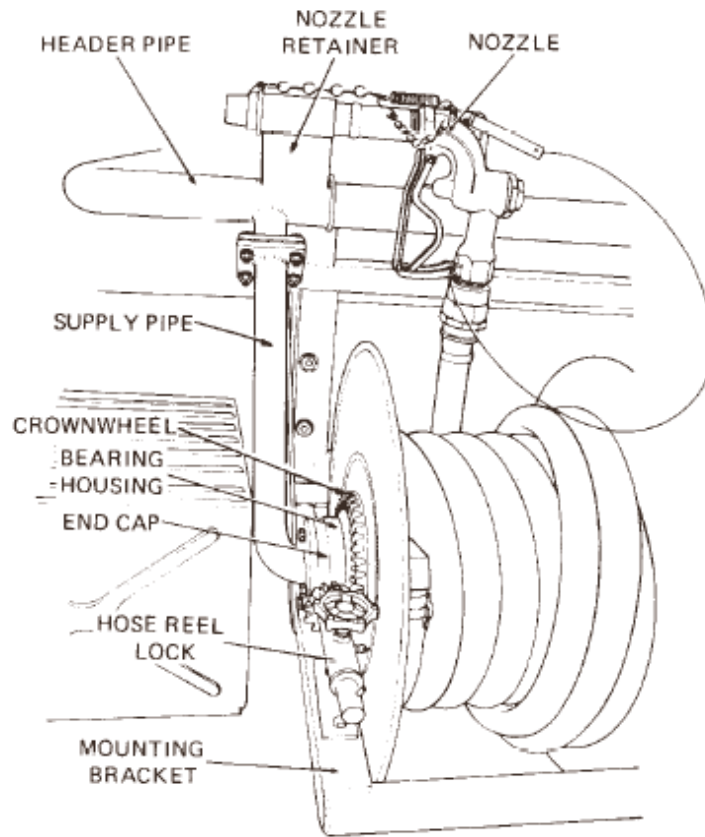


Figure 14 Hose Reel

43. **Cleaning and Inspection.** Clean and inspect the hose reel as follows:
- Clean all the components with a cleaning agent then blow them dry with compressed air.
  - Check the reel for damage (e.g. broken welds, distorted drum or sides) and repair or replace it as necessary.
  - Check the flange and shaft and the gooseneck for wear or damage and replace parts as necessary.
  - Check the condition of the bearings and replace as necessary.
  - Check the end-cap and the bearing housing for wear or damage and replace as necessary.
44. **Assembly.** Assemble the hose reel as follows:
- Position the gooseneck in the reel then install the flange and shaft.
  - Ensure that the shaft enters the spigot in the gooseneck, then install the bolts, nuts and washers and tighten them securely.
  - Position the crown wheel on the reel, align the bolt holes in the crown wheel with those in the reel and the gooseneck, then install the bolts, nuts and washers and tighten them securely.
  - Pack the open ball bearing with XG-291 grease then press the bearing into the bearing housing until it butts firmly against the flange in the housing.
  - Install the bearing housing (with the bearing facing outward) onto the bearing surface of the gooseneck, then install the circlip to retain the bearing.
  - Install a new oil seal into the end-cap, smear the sealing lip with XG-291 grease then position the end-cap (with the seal facing out) onto the bearing surface of the gooseneck.
  - Position the bearing onto the shaft at the end opposite the crown wheel and tighten the grub screw securely.

45. **Installation.** Install the hose reel as follows:
- a. Position the hose reel on the mounting bracket, position the bearing housing over the bolt holes, then install the bolts and washers and tighten them securely.
  - b. Install the cradle and housing above and below the bearing at the end opposite the crown wheel.
  - c. Install the bolts, nuts and washers and tighten them securely.
  - d. Position the supply pipe, together with a new gasket, on the end-cap.
  - e. Align the bolt holes, then install the bolts and washers, but do not tighten them.
  - f. Remove the header pipe blanking plate, then position a new gasket between the header pipe and the hose reel supply pipe flanges.
  - g. Install the bolts, nuts and washers and tighten them securely.
  - h. Tighten the bolts at the hose reel end-cap.
  - i. Position the hose reel lock on the mounting bracket, then install the bolts, nuts and washers and tighten them securely.
  - j. Remove the plastic plug from the hose, then reconnect the hose to the gooseneck and install a metal clamp.
  - k. Open the inlet/outlet valve on the manifold, then start the truck engine, engage the PTO and operate the fuel pump.
  - l. Check that the fuel can be dispensed through the nozzle and check for fuel leaks.
  - m. Shut down the pump, disengage the PTO and shut down the engine.
  - n. Rectify any fuel leaks, then wind the hose onto the reel and stow the nozzle.
  - o. Lock the hose reel to prevent the hose unwinding when not in use.

#### Hose Nozzle

46. **Removal.** Remove the hose nozzle as follows:
- a. Remove the dispensing hose nozzle from the nozzle retainer on the header pipe (Figure 14).
  - b. Slacken or remove the clamp securing the hose to the nozzle swivel and remove the hose. If necessary, plug the hose with a plastic plug.
47. **Installation.** Install the hose nozzle as follows:
- a. Fit the hose to the nozzle swivel and secure it with a metal clamp.
  - b. Operate the fuel pump and check the nozzle for leaks and rectify them as necessary.

#### Pressure and Vacuum Vent

**WARNING**

**The TRAM safety system (if fitted) is to be used at all times when working on top of the fuel tank body.**

48. **Removal.** Remove the pressure and vacuum vent as follows:
- a. Remove the nuts and washers securing the pressure and vacuum vent and remove the vent.
  - b. Remove all gasket residue from the vent mounting surface, ensuring that no residue falls into the tank.
  - c. Place a protective cover over the opening to prevent the ingress of dust or dirt.
49. **Installation.** Install the pressure and vacuum vent as follows:
- a. Remove the protective cover from the opening, then position a new gasket over the pressure and vacuum vent mounting bolts.
  - b. Position the pressure and vacuum vent on the mounting bolts then install the retaining nuts and washers and torque them to 20 to 23 N.m (15 to 17 lbf.ft).

## Air System

50. The pneumatic circuit for the tanker section of the truck is shown in Figure 19. For information on the truck, engine and chassis pneumatic circuits refer to EMEI Vehicle G 70 decade.

51. **Hold Back Valve Removal.** Remove the hold back valve as follows:

- a. Drain the air from the brake system secondary air reservoir.
- b. Disconnect the air line from the hold back valve then unscrew the valve assembly from the connector on the secondary air reservoir (Figure 15).

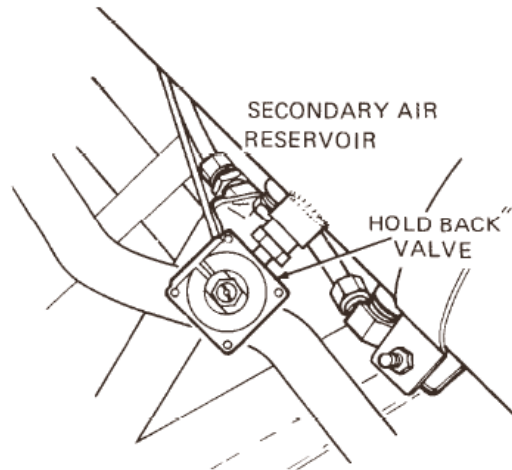


Figure 15 Hold Back Valve

52. **Hold Back Valve Installation.** Install the hold back valve as follows:

- a. Screw the valve assembly onto the connector on the secondary air reservoir and tighten it securely.

### NOTE

Do not reconnect the air line at this stage.

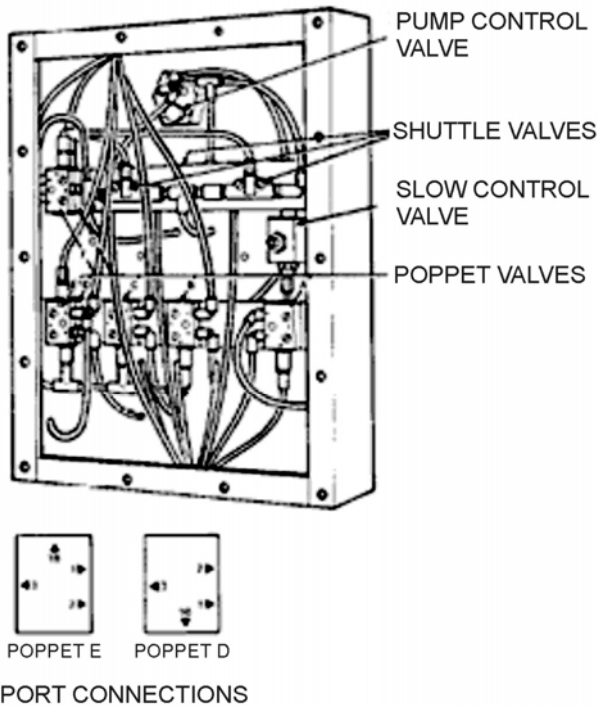
- b. Start the truck engine and allow the air pressure in the secondary air reservoir to build up.
- c. When air starts to flow through the hold back valve, check the secondary brake system pressure indicated by the dual pressure gauge on the instrument panel in the cab.
- d. The pressure indicated should be 550 kPa (80 psi), if not, slacken the lock nut on the hold back valve and screw the adjusting screw clockwise (to raise the opening pressure) or anticlockwise (to lower the opening pressure).
- e. Once the correct setting has been obtained, hold the adjusting screw in position and tighten the locknut.
- f. Shut down the engine and connect the air line to the hold back valve and tighten the connection securely.

53. **Poppet Valves Removal.** Remove the poppet valves as follows:

- a. Remove the screws securing the rear cover to the control box and remove the rear cover.
- b. Tag and remove the airlines from the defective poppet valve (Table 3 and Figure 16) then remove the screws and nuts securing the poppet valve to the mounting bracket and remove the poppet valve.
- c. Note the port numbers (1, 2, 3 or 10) of the connectors vent and blanking plug then remove these from the poppet valve.

### NOTE

Do not remove the plug from the bottom of the valve as this holds the internal components in place.



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**Figure 16 Control Box Air Valves**

54. **Poppet Valves Installation.** Install the poppet valves as follows:
- a. Install the connectors, vent and blanking plug into the ports noted (Para 53.c).
  - b. Correctly position the poppet valve in the control box, then install and tighten the retaining screws and nuts.
  - c. Install the air lines into the connectors as tagged.
  - d. Position the rear cover on the control box, then install and tighten the retaining screws.

**Table 3 Poppet Valve Identification**

Serial	Identification Letter	Poppet Valve Use
1	A	Connects air input from the hold back valve to the control buttons.
2	B	Tank compartment No. 1 level sensor.
3	C	Tank compartment No. 2 level sensor.
4	D	Tank compartment No. 3 level sensor.
5	E	Provides initial exhaust for control buttons E, 1, 2 and 3 when L or U buttons are shut off.
6	F	Provides rapid exhaust for the vapour transfer vents.
7	G	Inhibits level sensor poppet valves B, C and D during fuel discharge.
8	H	Ensures valve E closes when L or U buttons are shut off.

55. **Flow Control Valve Removal.** Remove the flow control valve as follows:
- a. Remove the screws securing the rear cover to the control box and remove the rear cover.
  - b. Tag and remove the air lines from the flow control valve (Figure 16) by pushing the collar of the connector in, while pulling the air line out.
  - c. Remove the two screws securing the flow control valve to the control box then remove the valve.

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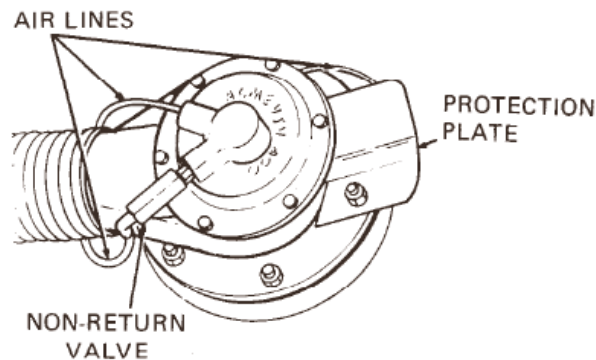
56. **Flow Control Valve Installation.** Install the flow control valve as follows:
- Position the flow control valve in the control box, then install and tighten the retaining screws.
  - Install the air lines into the connectors as tagged.
  - Using a screwdriver, screw the adjusting spindle in (clockwise) until it bottoms, then back it out one complete turn.
  - Position the rear cover on the control box, then install and tighten the retaining screws.
57. **Pump Control Valve Removal.** Remove the pump control valve as follows:
- Remove the screws securing the rear cover to the control box and remove the rear cover.
  - Tag and then remove the air lines from the pump control valve (Figure 16) by pushing the collar of the connector in, while pulling the air line out.
  - From the front of the control box, slacken the grub screw securing the lever to the control valve and remove the lever.
  - Remove the four screws securing the valve assembly to the control box and withdraw the valve assembly from the back of the control box.
58. **Pump Control Valve Installation.** Install the pump control valve as follows:
- Position the pump control valve in the control box, then install the four retaining screws and tighten them securely.
  - Install the air lines into the appropriate connectors as tagged.
  - Position the rear cover on the control box, then install and tighten the retaining screws.
  - Position the lever on the spindle and tighten the grub screw.
  - Start the truck engine, engage the PTO and operate the fuel pump to ensure that the pump operates in conjunction with the pump control valve.
  - Set the pump control lever to NEUTRAL, disengage the PTO and shut down the engine.
59. **Shuttle Valve Removal.** Remove the shuttle valve as follows:
- Remove the screws securing the rear cover to the control box and remove the rear cover.
  - Tag and remove the air lines and connectors from the shuttle valve (Figure 16).
  - Remove the retaining screws, washers and nuts and remove the shuttle valve.
60. **Shuttle Valve Installation.** Install the shuttle valve as follows:
- Position the shuttle valve on the mounting bracket and secure with the retaining screws, washers and nuts.
  - Install the air lines and connectors as tagged.
  - Position the rear cover on the control box, then install and tighten the retaining screws.
61. **Vapour Transfer Vent Removal.** Remove the vapour transfer vent as follows:

**WARNING**

**The TRAM safety system (if fitted) is to be used at all times when working on top of the fuel tank body.**

- Slacken the screw clamp securing the convoluted hose to the vapour transfer vent and remove the hose from the vent.
- Remove the nut and washer securing the air line protection plate to the vent and remove the protection plate (Figure 17).
- Tag and remove the air lines, then remove the non-return valve from the vent.

- d. Remove the nuts and washers securing the vent to the tank and remove the vent.
- e. Remove all gasket residues from the vent mounting surface, ensuring that no residue falls into the tank.
- f. Place a protective cover over the opening to prevent the ingress of dust or dirt.



**Figure 17 Vapour Transfer Vent**

- 62. Vapour Transfer Vent Installation.** Install the vapour transfer vent as follows:
- a. Remove the protective cover from the opening and position a new gasket over the vapour transfer vent mounting bolts.
  - b. Position the vapour transfer vent on the mounting bolts, aligning the outlet with the convoluted hose.
  - c. Install the non-return valve to the correct port (Figure 17) then connect the air lines as tagged.
  - d. Tighten the air lines securely.
  - e. Position the air line protection plate, then install the vent retaining nuts and washers and torque them to 71 to 80 N.m (53 to 60 lbf.ft).
  - f. Operate the control buttons (E and L) and check that the vent functions correctly.

**NOTE**

This can be verified by looking in through the vent outlet.

- g. Connect the convoluted hose to the vent and tighten the screw clamps securely.
  - h. Shut down the control buttons.
- 63. Level Sensor Removal.** Remove the level sensor as follows:

**WARNING**

**The TRAM safety system (if fitted) is to be used at all times when working on top of the fuel tank body.**

- a. Remove the air line protection plate then disconnect the air line.
  - b. Remove the bolts securing the level sensor to the tank then remove the level sensor.
  - c. Remove all gasket residue from the sensor mounting surface, ensuring that no residue falls into the tank.
  - d. Place a protective cover over the opening to prevent the ingress of dust or dirt.
- 64. Level Sensor Installation.** Install the level sensor as follows:
- a. Remove the protective cover from the opening, then position a new gasket on the mounting surface.
  - b. Insert the level sensor tube into the opening, then install the sensor retaining bolts, except the bolt used for securing the air line protection plate

- c. Connect the air line to the sensor and tighten the connection securely.
- d. Position the air line protection plate and install the retaining bolt.
- e. Torque the bolts securing the level sensor to the tank to 61 to 68 N.m (45 to 50 lbf.ft).

**65. Level Sensor Calibration.** Calibrate the level sensor as follows:

**NOTE**

To calibrate the level sensor, fill the tank compartment to 20 mm above the safe fill limit.

- a. Remove the bolts from the adjusting cap.
- b. While maintaining finger pressure on the centre of the cap, rotate the cap clockwise until it reaches the stop.
- c. Open the relevant tank compartment control button valve to supply air to the level sensor.
- d. While retaining finger pressure on the adjusting cap, rotate the cap anticlockwise until the sensor air is discharged.
- e. Rotate the cap to align it with the nearest bolt holes, then install and tighten the retaining bolts.
- f. Reset the emergency control button in the control box and close the relevant valve at the manifold.
- g. Disconnect and stow the hoses and install the cap on the inlet pipe.

**66. Clippard Valve Removal.** Remove the Clippard valve as follows:

- a. Remove the Scully overfill detection socket cap.
- b. Remove the screws retaining the socket plate of the Scully overfill detection socket and the nut holding the Clippard valve to the socket plate.
- c. Remove the cap, the socket plate and the gasket.
- d. From the side entry points feed through enough of the two air lines to allow the Clippard valve to be removed from the body of the Scully overfill detection socket.
- e. Tag and disconnect the air lines.

**NOTE**

The Clippard valve is non-repairable and is repaired by replacement.

**67. Clippard Valve Installation.** Install the Clippard valve as follows:

- a. Install the air lines as tagged and feed the two air lines back through the Scully overfill detection socket until the Clippard valve is positioned within the body of the Scully overfill detection socket.
- b. Position the gasket and the socket plate on the base ensuring that the Clippard valve mounting union protrudes through the socket plate.
- c. Install the two mounting bolts, but do not tighten them, ensuring the cap's security strap is mounted under the left-hand bolt.
- d. Install and tighten the nut securing the Clippard valve to the socket plate and tighten both mounting bolts.

**68. Inversion Valve Removal.** Remove the inversion valve as follows:

- a. Tag and disconnect the air lines.
- b. Remove the inversion valve from the spring brake relay valve.

**69. Inversion Valve Installation.** Install the inversion valve as follows:

- a. Fit the inversion valve to the spring brake relay valve.
- b. Install the air lines as tagged.



Tank

**WARNING**

**The TRAM safety system (if fitted) is to be used at all times when working on top of the fuel tank body.**

- 70. Ladder Removal.** Remove the ladder as follows:
- Release the two latches securing the drop ladder to the ladder and lower the drop ladder.
  - Slacken the clamps securing the drain hoses to the walkway drain outlets and disconnect the hoses from the outlets.
  - Remove the bolts, nuts and washers securing the ladder to the tank and remove the ladder.
  - Slacken the clamps securing the drain hoses and extension hoses to the ladder and remove the hoses.
  - If necessary, remove the two latches from the ladder.
  - Remove the bolts, nuts and washers securing the drop ladder to the mounting brackets and remove the drop ladder.
- 71. Ladder Installation.** Install the ladder as follows:
- Position the drop ladder on the mounting brackets and install the retaining bolts, nuts and washers.
  - Torque the bolts to 51 to 56 N.m (38 to 42 lbf.ft).
  - Position the ladder on the tank then install the retaining bolts, nuts and washers in the top mounting holes.
  - Install the retaining bolts, nuts and washers in the lower mounting holes and torque them to 38 to 42 N.m (28 to 31 lbf.ft).
  - Connect the drain hoses between the ladder and the walkway drain outlets and secure them in position with metal clamps.
  - Position the extension hoses on the bottom of the ladder rails and secure them with metal clamps.
  - If the drop ladder securing latches were previously removed, install the latches on the ladder half way between the first and second rungs.
- 72. Access Cover Removal.** Remove the access cover as follows:
- Unlock the cam-locks and lift the hatches from the dipstick and fill tubes in the access cover.
  - Remove the dipstick and place it to one side, then remove the nuts and washers securing the dipstick and fill tubes to the access cover.
  - Lift the tubes up and out of the access cover, place them to one side and discard the gaskets.
  - Remove the bolt and nut from the clamp securing the access cover to the combing around the access hole.
  - Remove the clamp then lift the access cover off the access hole and discard the combing seal.
  - Place a protective cover over the access hole to prevent the ingress of dust or dirt.
- 73. Access Cover Installation.** Install the access cover as follows:
- Install a new combing seal around the outer flange of the access cover.
  - Remove the protective cover from the access hole, then position the access cover over the access hole.
  - Install the clamp over the combing and the access cover then insert the bolt and nut into the clamp and tighten it securely.
  - Position new gaskets on the fill and dipstick tube mounting flanges, then install the fill and dipstick tubes, ensuring that they are correctly mated to the bracket inside the base of the tank.
  - Install the nuts and washers securing the tubes to the access cover.
  - Insert the dipstick into the dipstick tube, then install and secure the hatches.

## Electrical System

- 74. Battery Isolation Switch Removal.** Remove the battery isolation switch as follows:
- Remove the battery cover then disconnect both the earth and the positive leads, respectively, from the batteries.
  - Lift the rubber protection boots from the terminals on the isolation switch and tag the wires.
  - Remove the nuts, washers and wires from the terminals.
  - Support the isolation switch then remove the bolts, nuts and washers securing the switch to the mounting bracket.

### NOTE

The battery isolation switch is non-repairable and is repaired by replacement.

- 75. Battery Isolation Switch Installation.** Install the battery isolation switch as follows:
- Position the new switch on the mounting bracket, then install and tighten the retaining bolts, nuts and washers.
  - Connect the wires to the terminals as tagged, then install and tighten the retaining nuts and washers.
  - Fit the rubber protection boots over the terminals.
  - Connect the positive and earth leads, respectively, to the battery terminals and install the battery cover.
  - With the battery isolation switch in the OFF position, check that the work lamps operate correctly, but all other electrical circuits are inoperative.
  - Set the battery isolation switch to the ON position and check all electrical circuits operate correctly.
- 76. Emergency Shutdown Switch Removal.** Remove the emergency shutdown switch as follows:
- Remove the battery cover then disconnect both the earth and positive leads, respectively, from the batteries.
  - Remove the screws securing the top half of the shutdown switch enclosure.
  - Lift the top half of the shutdown switch enclosure from the bottom half, tag and disconnect the wires and remove the shutdown switch assembly from the top half of the enclosure.

### NOTE

The emergency shutdown switch is non-repairable and is repaired by replacement.

- 77. Emergency Shutdown Switch Installation.** Install the emergency shutdown switch as follows:
- Fit the shutdown switch to the top half of the enclosure.
  - Position the top half of the enclosure complete with the shutdown switch above the lower half of the enclosure and connect the wires as noted in Para 76.c.
  - Fit the top half of the shutdown switch enclosure onto the lower half of the enclosure.
  - Install and tighten the retaining screws.
  - Connect the positive and earth leads, respectively, to the battery terminals and install the battery cover.

### NOTE

Operation of the emergency shutdown switch may cause the engine to completely stall. This is acceptable.

- With the battery isolation switch ON, start the truck engine and set the hand throttle to 1 100 rpm.
- Operate the emergency shutdown switch and check that the engine speed is reduced to approximately 550 rpm (or less).
- Shutoff the engine and reset the emergency shutdown switch.

**78. Mechanical Engine Strangler (MES) Removal.** Remove the MES as follows:

- a. Tag and disconnect the air line from the air solenoid on the MES.

**NOTE**

Depending upon the location of the MES along the intake hose between the turbo charger and the intercooler, it may be necessary to remove all or part of the intake hose in order to remove the MES.

- b. Loosen and remove the hose clamps.

**NOTE**

Tag or match mark the arrangement of the hoses, adaptors and orientation of the strangler to aid in reassembly.

- c. Remove the MES from the intake hose.

**79. MES Inspection and Repair.** Inspect and repair the MES as follows:

- a. Remove the two screws connecting the actuating mechanism to the body of the strangler.
- b. Pull out the actuating mechanism together with the operating shaft.
- c. Push out the butterfly plate and inspect the O ring and replace it if necessary.
- d. Lubricate the O ring with rubber grease.
- e. Insert the butterfly plate.
- f. Insert and secure the actuating mechanism to the body of the strangler with the two screws.

**80. MES Installation.** Install the MES as follows:

- a. Reassemble the strangler to the intake hose in the reverse order to that stated in paragraph 78.
- b. Reconnect the air line and tighten all the hose clamps securely.
- c. Test according to paragraphs 82.e to 82.i.

**81. Engine Strangler Emergency Shutdown Switch Removal (For Original Build Vehicles).**

- a. Drain the air from the air reservoir that feeds the emergency shutdown switch.
- b. Remove the screws securing the front cover of the shutdown switch enclosure.
- c. From the entry points feed through enough of the two air lines to allow the front cover and switch to be removed from the enclosure.
- d. Tag and disconnect the air lines then remove the shutdown switch assembly from the enclosure cover plate.

**NOTE**

The emergency shutdown switch is non-repairable and is repaired by replacement.

**82. Engine Strangler Emergency Shutdown Switch Installation (For Original Build Vehicles).**

Install the emergency shutdown switch as follows:

- a. Fit the shutdown switch to the front cover of the enclosure.
- b. Position the front cover of the enclosure complete with the shutdown switch adjacent to the enclosure and connect the air lines as noted in Para 81.d.
- c. Fit the cover of the shutdown switch enclosure onto the enclosure.
- d. Install and tighten the retaining screws.
- e. Start the truck engine and set the hand throttle to 1 100 rpm then wait till all air reservoirs have been recharged.

**NOTE**

Operation of the Emergency shutdown switch must cause the engine to completely stop.

- f. Operate the Emergency shutdown switch and check that the engine stops.
- g. Turn off the ignition switch.
- h. Reset the Mechanical Engine Strangler by rotating the valve handle clockwise until it latches behind the trigger pin.
- i. Reset the Emergency stop switch.

**83. Engine Strangler Emergency Shutdown Switch Removal (For Rebuilt Vehicles with Rollover Sensor).** The fitting of the rollover sensor when the vehicle was rebuilt added a check valve, two tee fittings and a solenoid to the engine strangler shutdown switch pneumatic circuit. These extra components necessitate a larger control box (Figure 18 and Table 4). In addition, the emergency shutdown switch is removed because it was a backup to the original fire extinguisher shutdown system and is now redundant. Remove the emergency shutdown switch as follows:

- a. Drain the air from the air reservoir that feeds the emergency shutdown switch.
- b. Remove the battery cover then disconnect both the earth and positive leads, respectively, from the batteries.
- c. Remove the screws securing the front cover of the shutdown switch enclosure.
- d. From the entry point, feed through enough of the air lines to allow the front cover and switch to be removed from the enclosure.
- e. Tag and disconnect the air lines and the electrical cables then remove the shutdown switch cover assembly from the enclosure.
- f. Remove the retaining clamps and cable ties, disconnect the air lines and remove the components.

**NOTE**

The valves and fittings used in the emergency shutdown switch are non-repairable and are repaired by replacement.

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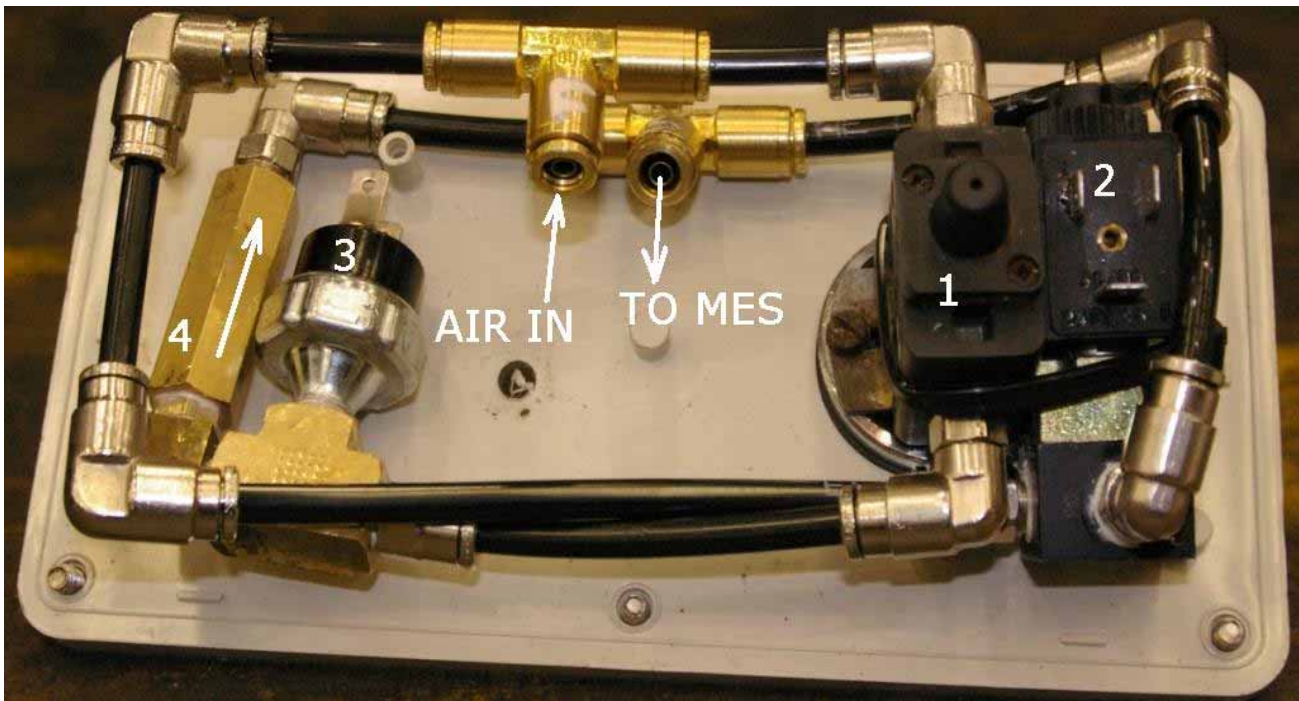


Figure 18 Emergency Stop Enclosure Pneumatic Circuit

**Table 4 Emergency Stop Pneumatic Circuit Components**

Item	Description	Function	Quantity
1	Emergency stop, push button, N/C, 2/2 valve	Manual emergency engine stop	1
2	Solenoid valve N/C 2/2	Rollover engine stop	1
3	Brake switch	Release battery isolation switch on manual stop	1
4	Check valve (note flow direction)	Isolate manual and rollover functions	1
5	Air hose and fittings	–	As Required

- 84. Rollover Sensor Removal (For Rebuilt Vehicles).** Remove the rollover sensor as follows:
- a. Remove the battery cover then disconnect both the earth and positive leads, respectively, from the batteries.
  - b. Tag and disconnect the Rollover sensor cables at the junction box.
  - c. Remove the four bolts securing the rollover sensor.

**NOTE**

The rollover sensor is non-repairable and is repaired by replacement.

- 85. Rollover Sensor Installation (For Rebuilt Vehicles).** Install the rollover sensor as follows:

**NOTE**

The rollover sensor must be mounted in a horizontal position with the writing on the lid facing up. The arrow must be pointing across the vehicle chassis (from side to side)

- a. Mount the rollover sensor to the bracket with four bolts and tighten it securely.
- b. Reconnect the cables.
- c. Connect the positive and earth leads, respectively, to the battery terminals and install the battery cover.
- d. With the battery isolation switch ON, start the truck engine and set the hand throttle to 1 100 rpm.

**NOTE**

Operation of the rollover sensor must cause the engine to completely stop.

- e. Remove one of the humpback pins and using the other pin as a pivot, rotate the sensor past 60° from the horizontal.
- f. Check that the engine stops and the battery isolator switch opens.
- g. Reset the mechanical engine strangler by rotating the valve handle clockwise until it latches behind the trigger pin.
- h. Reset the battery isolation switch.
- i. Restart the engine.
- j. Replace the first humpback pin and remove the other humpback pin.
- k. Rotate the sensor in the opposite direction past 60° from the horizontal.
- l. Check that the engine stops and the battery isolator switch opens.
- m. Turn off the ignition switch.
- n. Reset the mechanical engine strangler by rotating the valve handle clockwise until it latches behind the trigger pin.
- o. Reset the battery isolation switch.
- p. Replace the humpback pin.

**86. Engine Strangler Emergency Shutdown Switch Installation (For Rebuilt Vehicles with Rollover Sensor).** Install the emergency shutdown switch as follows:

- a. Reassemble components in reverse order to that stated in paragraph 83.
- b. Position the front cover of the enclosure complete with the pneumatic circuit and shutdown switch adjacent to the enclosure and connect the air lines as noted in Para 83.e.
- c. Fit the cover of the shutdown switch enclosure onto the enclosure.
- d. Install and tighten the retaining screws.
- e. Test according to paragraphs 82.e to 82.i.

**87. Scully Overfill Detection Socket Removal.** Remove the Scully overfill detection socket as follows:

- a. Remove the cap from the Scully overfill detection socket.
- b. Remove the nut holding the Clippard valve to the socket plate and the two screws retaining the socket plate to the base.
- c. Remove the cap, the socket plate and the gasket.
- d. From the side entry points feed through enough of the two air lines to allow the Clippard valve to be removed from the body of the Scully overfill detection socket.
- e. Tag and disconnect the air lines.
- f. Tag and disconnect the wiring of the electrical dummy socket.
- g. Remove the nut, bolt and washer securing dummy socket to the base and remove the dummy socket.
- h. Remove the bolts and washers from the rear of the base and remove the base from the mounting bracket.

**88. Scully Overfill Detection Socket Installation.** Install the Scully overfill detection socket as follows:

- a. Install the base of Scully overfill detection socket onto the mounting bracket and secure it with the bolts and washers.
- b. Connect the wiring as tagged to the electrical dummy socket and mount it to the base with the nut, bolt and washer.
- c. Install the air lines as tagged and feed them back through the Scully overfill detection socket until the Clippard valve is positioned within the body of the Scully overfill detection socket.
- d. Position the gasket and the socket plate, ensuring that the Clippard valve mounting union protrudes through the socket plate.
- e. Install the mounting bolts, but do not tighten them, ensuring the cap's security strap is mounted under the left hand bolt.
- f. Install and tighten the nut securing the Clippard valve to the socket plate and tighten both the mounting bolts.

**89. Scully Optical Probe Removal.** Remove the Scully optical probe as follows:

**WARNING**

**The TRAM safety system (if fitted) is to be used at all times when working on top of the fuel tank body.**

- a. Remove the screws and washers that secure the cap to the probe base and remove the cap complete with O ring.
- b. Tag and disconnect the wiring of the probe.
- c. Loosen the level adjusting screw and remove the optic probe.
- d. Unscrew the base from the top of the compartment.
- e. Remove the O ring and gasket.

- 90. Scully Optical Probe Installation.** Install the Scully optical probe as follows:
- a. Fit the O ring and the gasket to the base and install the base into the top of the compartment.
  - b. Install the optic probe into the probe base and set the safe fill level by aligning the top of the light prism on the optical probe to 10 mm above the safe fill level marked on the dipstick.
  - c. Tighten the level adjusting screw.
  - d. Connect the wiring as tagged.
  - e. Refit the cover and O ring and secure it with the screws and washers.

**FAULT FINDING**

- 91.** Fault finding procedures are contained in Table 5.

**Table 5 Fault Finding**

Symptom	Probable Cause	Action
<b>Hydraulic System</b>		
No fluid flow No pressure	Fluid level in the reservoir too low.	Top up with OM-65.
	Pump not receiving fluid.	Check the oil reservoir gate valve is open. Replace the filter. Check for a blocked pump supply hose, clean or replace as necessary. Clean the reservoir breather vent then check the fluid level in the reservoir. Top up if necessary with OM-65.
	PTO not engaging.	Check the PTO operation and replace parts as necessary.
	PTO to pump splined connection is damaged.	If the pump only is damaged, replace. If the PTO is damaged raise a work order or EMEFIX as required.
	Air leaks in the pump supply line.	Check the hose connections and tighten them as necessary. Replace the hose if damaged.
	Cavitation or aeration in the pump.	Check for air leaks in the pump supply line and rectify as necessary. Clean or replace the blocked pump supply line. Clean the reservoir breather vent and if necessary change the system fluid and filter.
Low fluid flow rate	Fluid level in the reservoir is incorrect.	Top up with OM-65.
	Leaking hose connections.	Tighten the connections.
	Damaged or leaking hose(s).	Replace it.
	Fluid viscosity is too high.	Warm the fluid up to operating temperature. If the viscosity is still too high, change the filter and fluid. Use only OM-65.
	Pump not operating at optimum capacity.	Replace the pump.
	Air leaks in the pump supply line.	Check the hose connections and tighten them as necessary. Replace the hose if necessary.
	Cavitation or aeration in the pump.	Check for air leaks in the pump supply line and rectify as necessary. If the supply line is blocked, clean or replace it as necessary. Ensure that the reservoir breather vent is clear and if necessary change the system fluid and filter.
	Filter is restricted.	Replace it.
Low fluid pressure	Inadequate flow rate.	Refer to "No fluid flow-No pressure", or "Low fluid flow".
	Excessive external leakage.	Rectify the leaks and fill the reservoir to correct level with OM-65.

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Table 5 Fault Finding (Continued)

Symptom	Probable Cause	Action
<b>Hydraulic System (Continued)</b>		
Erratic fluid pressure	Air in the fluid.	Repair or replace the damaged hoses. Tighten the leaking connections then fill the reservoir to correct level with OM-65.
	Hydraulic fluid is contaminated.	Check for a blocked pump supply hose, clean or replace as necessary. Ensure that the breather vent is clear and if necessary change the filter and system fluid. Use only OM-65.
Excessive fluid pressure	Incorrect oil viscosity.	Change the filter and fluid. Use only OM-65.
	Interface or relief valve is damaged or operating incorrectly.	Raise a work order or EMEFIX as required.
Noisy pump	Cavitation in the pump.	Check the oil reservoir gate valve is open. Replace the filter. Check for a blocked pump supply hose, clean or replace it as necessary. Ensure that the breather vent is clear and if necessary change the system fluid. Use only OM-65.
	Air in the fluid.	Replace the damaged hoses or tighten the leaking connections. Fill the reservoir to the correct level with OM-65.
	Fluid viscosity is too high.	Warm the fluid up to operating temperature. If the viscosity is still too high, change the filter and fluid. Use only OM-65.
	Pump is operating too fast.	Set the truck engine to the correct speed.
	Worn or damaged pump.	Replace the pump.
Fluid overheated	Fluid is dirty or the reservoir level is low or the incorrect fluid viscosity.	Replace the fluid filter, if necessary change the system fluid. Ensure the reservoir is filled to the correct level with OM-65.
	System pressure is too high.	Raise a work order or EMEFIX as required.
Pump overheated	Fluid is dirty or the reservoir level is low or the incorrect fluid viscosity.	Replace the fluid filter, if necessary change the system fluid. Ensure the reservoir is filled to the correct level with OM-65.
	Air in the fluid.	Replace the damaged hoses or tighten the leaking connections. Fill the reservoir to the correct level with OM-65.
	Cavitation in the pump.	Check the oil reservoir gate valve is open. Replace the filter. Check for a blocked pump supply hose, clean or replace it as necessary. Ensure that the breather vent is clear and if necessary change the system fluid. Use only OM-65.
	Worn or damaged pump.	Replace the pump.
	Defective fuel pump.	Raise a work order or EMEFIX as required.
	Defective hydraulic system.	Raise a work order or EMEFIX as required.
	Defective air system.	Replace the defective valve or air line.
	Defective hose or nozzle.	Repair or replace it.

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**Table 5 Fault Finding (Continued)**

Symptom	Probable Cause	Action
<b>Fuel System</b>		
No fuel output	Empty tank compartment.	Refill it.
	Inlet/outlet valve(s) incorrectly selected.	Open the appropriate valves.
	Pump control lever is incorrectly selected.	Select the 'DISCHARGE' position.
	Foot valve(s) shut.	Check the parking brakes are applied, air in the secondary reservoir exceeds 550 kPa (80 psi) and the air circuit operates correctly. If necessary, manually open the foot valve(s), discharge fuel then replace the foot valve(s).
Tank will not load (bottom fill with pump)	Inlet/outlet valve(s) shut.	Open the appropriate valve(s).
	Pump control lever is incorrectly selected.	Select the 'LOAD' position
	Foot valve(s) shut.	Check the parking brakes are applied, air in the secondary reservoir exceeds 550 kPa (80 psi) and the air circuit operates correctly. If necessary, replace the foot valve(s).
	Faulty level sensor.	Replace it.
	Defective fuel pump.	Raise a work order or EMEFIX as required.
	Defective hydraulic system.	Raise a work order or EMEFIX as required.
	Defective air system.	Replace the defective valve or air line.
<b>Air System</b>		
Control button(s) will not stay on	No air supply.	Build the air in the secondary reservoir to exceed 550 kPa (80 psi)
	Parking brake not applied.	Apply the parking brake.
	Defective hold back valve.	Replace it.
	Defective poppet valve 'A'.	Replace it.
	Defective poppet valve 'E'.	Replace it.
	Defective control button valve.	Raise a work order or EMEFIX as required.
	Defective vapour transfer vent.	Replace it.
	Defective level sensor.	Replace it.
	Defective air line.	Replace it.
	Loose air connection.	Tighten it.
Level sensor fails to shut off loading operating	Defective level sensor.	Replace it.
	Defective poppet valve 'B', 'C' or 'D', depending on the tank compartment.	Replace it.
	Defective control button valve.	Raise a work order or EMEFIX as required.
	Defective poppet valve 'G'.	Replace it.
	Defective air line.	Replace it.
	Loose air connection.	Tighten it.
	Defective foot valve.	Drain fuel from tank and replace foot valve
No fuel pump directional control	Defective air operated directional control valve.	Raise a work order or EMEFIX as required.
	Defective pump control valve.	Replace it.
	Defective flow control valve.	Replace it.

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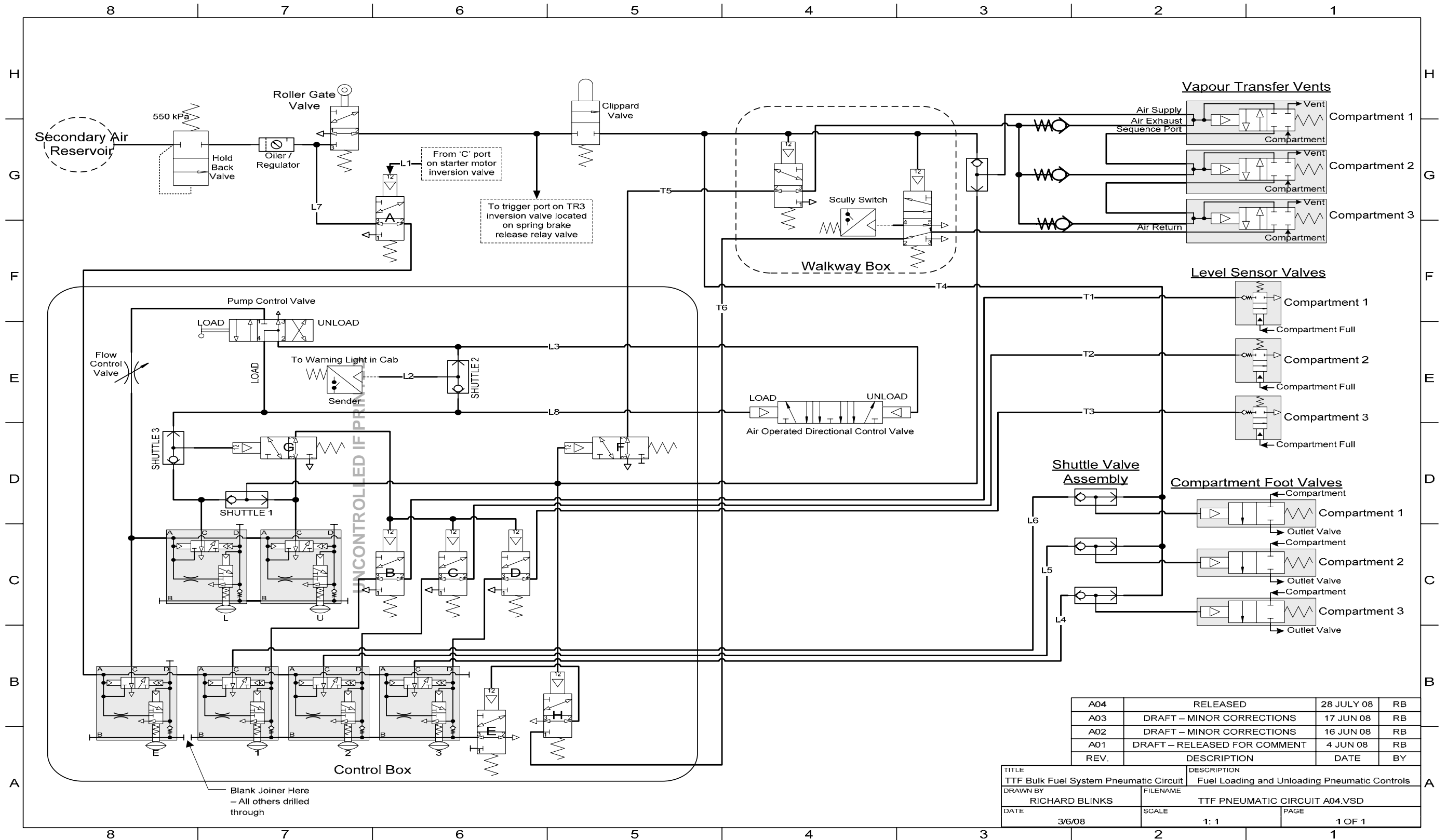


Figure 19 Tanker Pneumatic Circuit

**END**  
Distribution List: **VEH G 54.0 - Code 3** (Maint Level)  
(Sponsor: LV SPO, Mdm/Hvy B Vehicles)  
(Authority: TRAMM)