TRAILER, MEDIUM PLANT TRANSPORTER, MC3 HAULMARK 4 AXLE DOG

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 all Light Grade Repair procedures for the Trailer, Medium Plant Transporter, MC3 Haulmark 4 Axle Dog.

Associated Publications

2. Reference may be necessary to the latest issue of the following documents:

a. Defence Road Transport Instructions (DRTI);

b. EMEI Vehicle A 291-1 - Tyres and Tubes – Care and Maintenance of B Vehicles;

c. EMEI Vehicle A 291-5 – Tyres and Tubes – General Service B Vehicles Tyre Guide;

d. EMEI Workshop D 701 – Painting of Army Equipment – Repair Policy for Equipment Painted in Polyurethane Paint – General Instruction;

e. EMEI Workshop E 410 − Occupational Health and Safety Instructions – Asbestos − General Instruction;

f. EMEI Workshop E 652 – Occupational Health and Safety Instructions – Application and Removal of Polyurethane Paints and Solvents – General Instruction;

g. EMEI Vehicle H 600 – Trailer, Medium Plant Transporter, MC3 Haulmark 4 Axle Dog – Data Summary;

h. EMEI Vehicle H 602 – Trailer, Medium Plant Transporter, MC3 Haulmark 4 Axle Dog – Technical Description;

i. EMEI Vehicle H 609 – Trailer, Medium Plant Transporter, MC3 Haulmark 4 Axle Dog – Servicing Instruction;

j. Repair Parts Scale – 02203;

k. User Handbook – Trailer, Medium Plant Transporter, MC3 Haulmark 4 Axle Dog – NSN – 7610-66-131-5119;

l. Defence Safety Manual (SAFETYMAN);

m. Material Safety Data Sheets (MSDS) – Product Information Sheets; and

n. Technical Regulation of Army Material Manual (TRAMM).

Authorised Personnel

3. Repairs are to be carried out by the following technical tradespersons:

a. Vehicle Mechanic ECN 229;

b. Technician Electrical ECN 418;

c. Fitter Armament ECN 146;

d. Metalsmith ECN 235-2; and

e. civilian equivalents qualified in accordance with the requirements of the TRAMM.

Safety Precautions

WARNING

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

Personnel working on this equipment are to adhere to all industrial safety standards, work practices and equipment operating and maintenance instructions relating to the equipment.

Some assemblies contain powerful springs and injury can result if they are not properly disassembled. Use only proper tools and observe all precautions relevant to the use of the tools.

General Instructions

4. 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.

5. Disconnect the trailer electrical connector from the towing vehicle before removing any electrical system components.

6. When disconnecting electrical connectors, hoses and fittings, remove sufficient clamps in order to gain the necessary slack to avoid damage to connectors and fittings. Re-install all clamps and supporting devices as installed by the manufacturer.

7. Use only authorised replacement parts and components.

8. Replacement hardware, tubing, hose fittings, etc. are to be of equivalent size, type, length and strength to the original equipment.

9. Use only those lubricants specified in the Servicing Instruction EMEI Vehicle H 609 and the User Handbook.

10. Any fastenings of fittings being tightened to prescribed torques are to have dry, clean threads unless otherwise specified. When specified, thread sealants are to be applied to dry, clean, oil free threads.

11. Replace all components with stripped threads or damaged parts.

Identification Numbers

12. The location of identification numbers on components of the vehicle are described in Table 1.

Table 1 Location of Identification Numbers

Serial		Location
1	Axle assemblies	Centre of axle beam, opposite brake chamber mountings
2	Ballrace	Outer circumference, to rear of trailer
3	Support legs	Gear case
4	Spare wheel winch	Front panel of winch assembly

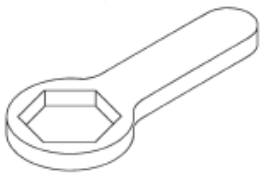
Special Tools and Gauges

13. The special tools, listed in Table 2 and illustrated in Figure 1, are required as indicated, to perform the tasks detailed.

Table 2 Special Tools

Serial	Part No	NSN	Name	Para No
1	550-5039	4910-99-930-6356	Hub seal installing tool	34
2	CS 39/2	5120-66-156-0824	Hub lock nut wrench	29, 36
3	CS 213	-	Hub nut tube wrench	29, 36
4	M9007003	-	Spring brake release tool	29, 69

Hub seal installing tool
Manuf. No. 550-5039



Hub lock nut wrench
Manuf. No. CS 39/2

Hub nut tube wrench
Manuf. No. CS 213

Spring brake release tool
Manuf. No. M9007003

Figure 1 Special Tools

Adjustment and Calibrations

14. Light Grade Repair includes the following procedures:

a. axle alignment, and

b. brake adjustment.

Functional Tests

15. Light Grade Repair includes the brake system operating and leak test.

Replacement/Repair

16. Light Grade Repair includes replacement and/or repair of the following components:

a. wheels, including:

(1) hubs,

(2) hub seals,

(3) hub bearing cups, and

(4) hubodometer.

b. brakes, including:

(1) brake relay valve;

(2) spring brake control valve – SR3 and ABV3082;

(3) yard release valve;

(4) brake power chamber;

(5) spring brake assembly; and

(6) wheel brake assembly – all versions.

c. suspension, including:

(1) springs,

(2) equaliser assembly,

(3) spring hangers, and

(4) radius rods.

d. electrics, and

e. frame, including:

(1) drawbar assembly;

(2) loading ramps – all versions;

(3) loading ramp pivot bushes;

(4) landing legs;

(5) spare wheel winch assembly; and

(6) towing lunette.

ADJUSTMENT PROCEDURES

Axle Alignment

17. When the trailer axles are correctly aligned, the centre lines of the axles are parallel to each other and at right angles to the centre line of the trailer frame (Figure 2). The allowable tolerance for each dimension is ± 1 mm.

18. Preliminary Checks. Prior to carrying out any axle alignment adjustment:

a. Ensure that all suspension components are in good condition.

b. Ensure that all tyre pressures are correct.

c. Ensure the trailer is on flat, level ground.

d. Ensure that the trailer has travelled in a straight line for a minimum of 20 metres before checking any adjustment (this removes any stresses from the suspension components).

e. Ensure that the trailer is unladen.

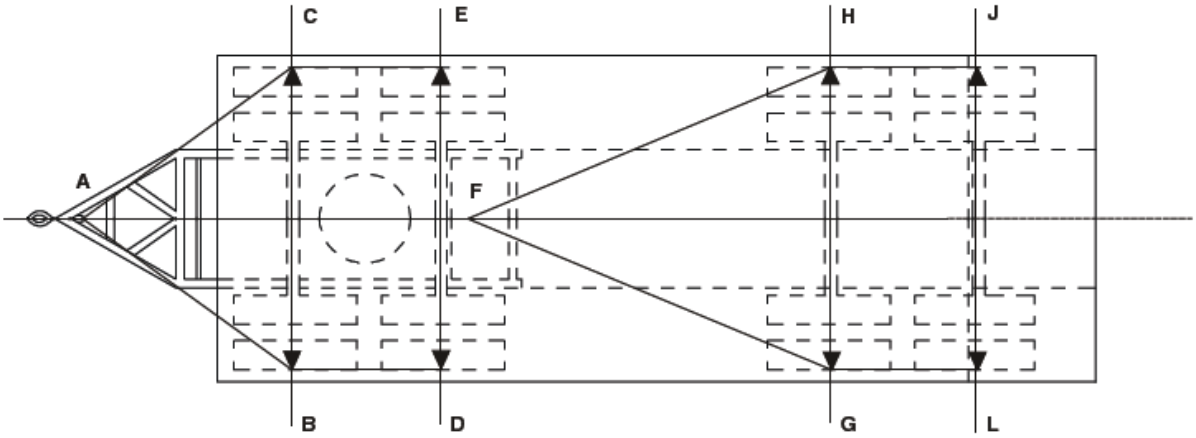


Figure 2 Axle Alignment Diagram

19. Dolly Converter. Align the front axle of the dolly converter so that the distances from the axle axis at each end of the axle, points B and C (Figure 2) to a fixed point at the towing eye, on the centre line of the dolly converter, point A, are equal. Align the rear axle with the front axle so that the centre lines of both axles are parallel.

20. Check the axle alignment as follows:

a. Clearly establish and mark a point on the centre line of the dolly converter drawbar at the towing eye (Figure 2, point A).

b. Measure the distance from point A to the centre line of the front axle on the left-hand end (point B).

c. Measure the distance from point A to the centre line of the front axle on the right-hand end (point C). This distance should be equal to the measurement obtained in Para 20.b.

d. Measure the distance between the centre lines of the front and rear axles (points B to D and C to E). These two measurements should be equal.

e. For adjustment details refer to Para 23.

21. Main Trailer. Align the front axle of the main trailer so that the distance from the axle axis at each end of the axle, (points G and H), to a fixed point on the centre line of the main frame, (point F), are equal. Establish Point F just rearward of the ballrace. Align the rear axle with the front axle, so that the centre lines of both axles are parallel.

22. Check the axle alignment as follows:

a. Clearly establish and mark a point on the centre line of the main frame (Figure 2, point F).

b. Measure the distance from point F to the centre line of the front axle on the left-hand end (point G).

c. Measure the distance from point F to the centre line of the front axle on the right-hand end (point H). This distance should be equal to the measurement obtained in Para 22.b.

d. Measure the distance between the centre lines of the front and rear axles (points G to L and H to J). These two measurements should be equal.

e. For adjustment details refer to Para 23.

23. To adjust the axle alignment:

a. Loosen the four clamp bolts on the adjustable (right-hand) radius rods.

b. Turn the centre section of the applicable radius rod to alter the axle alignment as required.

c. When the axle alignment is correct, torque the radius rod clamp bolts to 100 N.m.

d. Recheck the axle alignment after tightening the clamp bolts.

NOTE

Align the front axle of the applicable bogie group correctly before attempting to align the rear axle. Adjustment of the adjustable radius rod affects the measurement obtained at both ends of the axle assembly.

Brake Adjustment

24. With the brakes applied, the correct brake adjustment is obtained when the angle formed by the centreline of the slack adjuster and the brake chamber push rod is just over 90° (Figure 3).

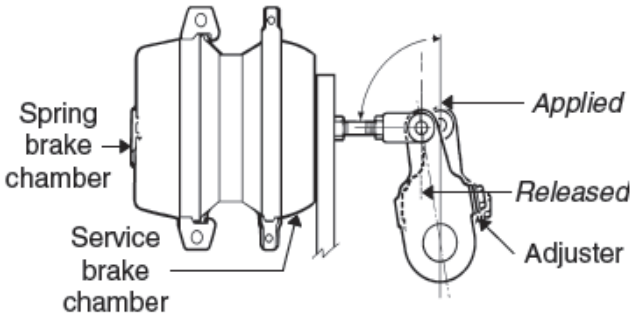


Figure 3 Slack Adjuster Alignment

25. To adjust the brakes, depress the locking ring around the adjusting screw and use a $^{9}/_{16}$ in AF wrench to turn the adjusting screw.

NOTE

Rotating the screw clockwise applies the brakes and anticlockwise releases the brakes.

FUNCTIONAL TESTS

BRAKE SYSTEM OPERATING AND LEAK TESTS

Spring Brake Control Valve

26. Test the spring brake control valve using the following procedure:

a. Check the towing vehicle dash gauge against a calibrated test gauge prior to performing these tests.

b. Chock all the wheels.

c. Connect the towing vehicle air lines to the trailer.

d. Allow the towing vehicle and trailer to attain full system pressure.

e. Place the trailer supply valve in the towing vehicle to the exhaust position (the spring brakes should apply). Disconnect the trailer supply line and apply a soap solution to the hose coupling to check for leaks.

NOTE

A 25 mm soap bubble in not less than five seconds is permissible.

f. Reconnect the supply hose coupling and push the trailer supply valve into the charge position. The spring brakes should release.

g. Shut off the engine, leaving the ignition on. Open the drain cock on the trailer service reservoir.

NOTE

The towing vehicle air system should bleed down to approximately 310 kPa with low pressure indication occurring at 413 kPa. The trailer spring brakes should remain released.

h. Apply a soap solution to the exhaust port of the spring brake control valve to check for leaks.

NOTE

A 25 mm soap bubble in not less than three seconds is permissible.

i. Leaving the towing vehicle air system pressure at approximately 310 kPa, place the trailer supply valve in the exhaust position.

j. Ensure the trailer spring brakes are applied and place the trailer supply valve in the charge position. The spring brakes should release.

NOTE

The trailer supply valve and possibly the parking control valve may have to be held in.

k. If the system functions as described, close the service reservoir drain cock as a final step in completing these tests.

l. Replace or overhaul the spring brake valve if it does not function as described above or if leaks are excessive.

Relay Valve

27. Test the relay valve as follows:

a. Fully charge the air brake system.

b. Adjust the brakes (ref Para 24).

c. Make several brake applications whilst checking for prompt application and release at all appropriate wheels.

d. With the brake valve in the released position, coat the exhaust port with soap solution and check for inlet valve and O ring leaks.

NOTE

A 25 mm soap bubble in not less than five seconds is permissible.

e. Make and hold a brake valve application.

f. Coat the exhaust port with soap solution and check for leaks.

NOTE

A 25 mm soap bubble in three seconds is permitted.

g. Make and hold a brake valve application.

h. Apply soap solution to the outside of the valve body in the area where the cover joins the body. Observe the area for leakage from the O ring.

NOTE

No leaks are permitted.

i. Replace or overhaul the relay valve if it does not function as described or if leaks are evident.

Yard Release Valve

28. Test the yard release valve as follows:

a. Fully charge the air brake system.

b. Apply soap solution to the outside of the yard release valve body.

NOTE

A 25 mm soap bubble in not less than five seconds at the exhaust port is permissible.

There should be no leaks between upper and lower body.

c. Disconnect the trailer air lines from the truck. Push in the yard release valve to release the spring brakes. Ensure that all spring brakes are released. Failure to do so indicates a faulty yard release valve.

d. Apply soap solution to the outside of the yard release valve body.

NOTE

Leaks at the exhaust port and the plunger should not exceed a 25 mm bubble in three seconds.

e. Drain the air from the trailer air tank and note the spring brakes are applied before all air is exhausted from the air tank. Failure of all spring brake chambers to apply indicates a faulty spring brake control valve. Failure of individual brake chambers to apply indicates a faulty brake chamber or air line.

f. Replace or overhaul the yard release valve if it does not function as described or if leaks are evident.

REPLACEMENT PROCEDURES

AXLES

Wheel Hubs

29. Removal. Remove the wheel hubs as follows (Figure 4):

a. Chock the wheels.

b. Loosen the wheel nuts.

WARNING

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

c. Place a suitable jack beneath the applicable axle and raise the wheels clear of the ground.

d. Place a safety stand beneath the axle.

e. Lower the axle to the stand ensuring that the wheels remain clear of the ground.

f. Remove the wheel clamp nuts and the wheel clamps (8 and 7) securing the wheels to the wheel hub (5).

g. Remove the two wheels and spacer.

h. Remove the six hexagon headed screws securing the hub cap (15 or 18).

i. Remove the hub cap and wheel hub cap gasket (14) from the hub.

j. Mechanically release the spring brakes (ref Para 70. a. to d.).

k. Remove the wheel hub locknut (13) using the hub locknut wrench (Figure 1, Item 2).

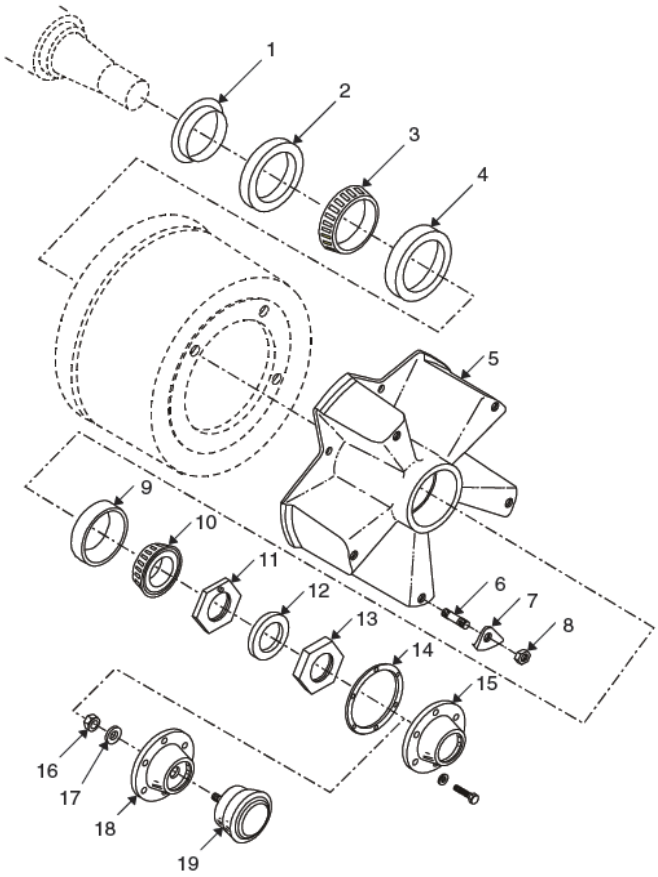
l. Remove the nut lock plate (12).

m. Remove the bearing adjusting nut (11) using the hub nut tube wrench (Figure 1, Item 3).

n. Support the wheel hub and brake drum assembly with a suitable jack.

o. Remove the outer bearing cone (10) from the hub and stub axle.

p. Slide the hub off the stub axle.



1 Hub seal sleeve	6 Wheel stud	11 Bearing adjusting nut	16 Hex nut
2 Inner hub seal	7 Wheel clamp	12 Lock washer	17 Flat washer
3 Inner bearing cone	8 Wheel clamp nut	13 Wheel hub locknut	18 Hub cap (hubodometer)
4 Bearing cup	9 Bearing cup	14 Wheel hub cap gasket	19 Hubodometer
5 Wheel hub	10 Outer bearing cone	15 Hub cap	

Figure 4 Wheel Hub Assembly – Exploded View

30. Hub Seal Removal. Remove the inner hub seal as follows (Figure 4):

a. Remove the wheel hub assembly (ref Para 29).

b. Position the hub and brake drum assembly on a solid surface with the wheel studs facing upwards.

c. Using a long steel drift, inserted through the centre of the hub and placed against the inner race of the inner wheel bearing, drive the inner hub seal (2) and bearing from the hub.

31. Bearing Cup Removal. Remove the bearing cups as follows:

a. Remove the hub and hub seals (ref Para 30).

CAUTION

Drifts used for removing bearing cups must be free of all burrs and jagged edges, to prevent steel chips being dislodged into the wheel hub and bearings.

b. Place a long steel drift, through the hub centre, against the inner face of the respective bearing cup.

CAUTION

Place the drift in alternate positions around the bearing cup, to ensure that it is driven evenly from the hub.

c. Drive out the bearing cups.

NOTE

If the bearing cups removed are to be refitted, ensure that they are matched, and remain with their respective bearing cones.

32. Bearing Cleaning and Inspection. Clean and inspect the bearings as follows:

CAUTION

Do not use a steel brush to clean the bearings.

Avoid spinning the cones when cleaning.

a. Wash the bearing cups and cones in a suitable clean solvent, using a stiff brush, but not steel. Avoid spinning the cones when cleaning.

b. Wipe the cleaned parts dry with clean, absorbent cloth or paper.

CAUTION

Lubricant will not adhere to a surface that is wet with solvent. Solvent will also dilute the lubricant.

c. Clean and dry hands and all tools used in the service operation.

d. Inspect the bearing cup for:

(1) discolouration, straw or blue colouring;

(2) chips or scoring on the bearing surface; and

(3) flaking of the case hardening.

e. Inspect the bearing cone for:

(1) discolouration of the tapered rollers;

(2) chipping or scoring of the case hardening;

(3) flaking of the case hardening;

(4) acceptable wear limits on the wear back surface (the large end of the tapered roller); and

(5) the condition of the tapered roller cage.

NOTE

Discard the bearing cup and cone if any defects are found. These must be replaced as a matched set.

33. Bearing Cup Installation. To install bearing cups proceed as follows:

a. Check that the wheel hub is free from any damage.

b. Pack the bearing cones with grease.

c. Place a faint smear of grease around the inner surface of the hub through which the cup is to pass.

CAUTION

Drifts used for fitting bearing cups must be free of all burrs and jagged edges, to prevent steel chips being dislodged into the wheel hub and bearings.

d. Place the bearing cup, smaller internal diameter innermost, in position on the hub.

CAUTION

Make sure that the drift is placed in alternate positions around the cup, to ensure that the cup is driven evenly into the hub.

e. Drive it into position using a suitable hammer and steel drift.

NOTE

The cup is fully in position when a solid metallic knock is heard in all positions around the cup.

f. Inspect the bearing cup for any steel chips. (Remove them if any are found).

34. Hub Seal Installation. Install the inner hub seal as follows:

a. Check that the stub axle land is clean and free from dirt and other foreign material.

b. Using the hub seal installing tool (Table 2, Item 1), drive the inner hub seal into position on the stub axle.

NOTE

The two parts of the hub seal are fitted to the stub axle during assembly. The hub seal is pushed into the wheel hub during installation of the wheel hub.

35. Hub Installation. Prior to installation of the hub and brake drum assembly, ensure that:

a. the brake drum mounting bolts are fit for use and correctly tensioned to 260 N.m in the sequence shown in Figure 5,

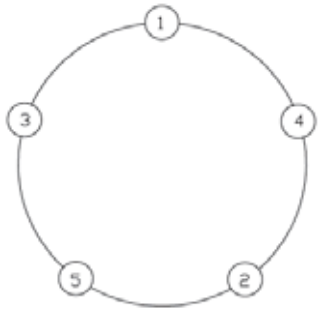


Figure 5 Brake Drum and Wheel Nuts – Tightening Sequence

b. the inner wheel bearing cone is properly lubricated and fitted,

c. the hub cavity is filled with grease,

d. the inner bearing cup is fit for use and correctly fitted, and

e. the hub seal is fit for use and correctly fitted to the stub axle.

36. Install the hub as follows (Figure 4):

a. Using a suitable trolley jack or similar device, slide the hub and brake drum assembly onto the stub axle, ensuring that it is pushed on as far as possible.

b. Fit the outer bearing cone (10), ensuring that it is correctly lubricated.

c. Fit the bearing adjusting nut (11) to the stub axle. Adjust the bearing preload by screwing the nut on until tight and backing off one-quarter of a turn using the hub nut tube wrench. Spin the hub while tightening the bearing adjusting nut.

d. Drain the air tank and check that the brakes are released, to prevent brake shoe drag during adjustment.

e. Fit the lock washer (12) to the stub axle and locate the bearing adjusting nut (11) lock pin into one of the holes around the lock washer. It may be necessary to turn the nut slightly to obtain proper alignment or to reverse the lock washer.

f. Fit and tighten the wheel hub locknut (13) onto the stub axle using the hub nut lock wrench. Use a 1.5 to 2 lb hammer to tighten the nut.

g. Fit the wheel hub cap gasket (14) to the wheel hub and install the hub cap (15 or 18), using the six hexagon headed screws and lock washers.

h. Remove the spring brake release tool, replace it in its stowage position and secure it.

i. Check for proper brake adjustment and adjust as necessary (ref Para 24.).

j. Fit the inner wheel and spacer, and then the outer wheel to the hub and secure it with the five wheel clamps and wheel clamp nuts (7 and 8). Tighten the wheel nuts evenly to 245 N.m in the sequence shown (Figure 5).

k. Jack the axle clear of the safety stand, remove the stand and lower the wheel to the ground.

CAUTION

Wheel nuts shall be checked and re-tensioned after travelling approximately 50 km, following the refitting of wheels.

Hubodometer

37. Removal. Remove the hubodometer as follows::

a. Remove the six hexagonal headed screws securing the hub cap to the right-hand rear wheel hub and remove the hub cap and hubodometer assembly.

b. Remove the hexagonal nut located inside the hub cap. Remove the internal star washer and withdraw the hubodometer from the hub cap.

38. Installation. Install the hubodometer as follows:

a. Fit the hubodometer to the hub cap and secure with the internal star washer and hexagonal nut. Tighten the nut to 15 N.m.

CAUTION

Ensure that the O ring is properly seated when fitting the hub cap to the wheel hub.

b. Refit the hub cap and hubodometer to the wheel hub using the six hexagonal headed screws and spring washers.

Radius Rods

39. Removal. Remove the radius rods as follows (Figure 6):

a. Support the weight of the trailer frame, leaving the axle assemblies resting on the ground or supported.

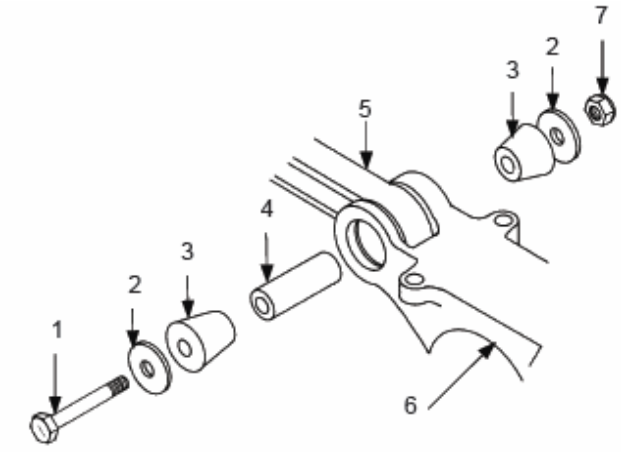
NOTE

All weight is to be off the suspension components.

b. Remove the two bolts (1) securing the radius rod (5) to the spring seat (6) and the respective spring hanger.

c. Remove the tapered bushes (3) and the steel sleeve (4) from the radius rod ends.

d. Remove the radius rod (5).



1	Bolt	5	Radius rod
2	Flat washer	6	Spring seat
3	Tapered bush	7	Nyloc nut
4	Steel sleeve		

Figure 6 Radius Rod Mounting Bushes and Pins

40. Installation. Install the radius rods as follows (Figure 6):

a. Refit the radius rods (5), tapered bushes (3), steel sleeves (4), washers, bolts and new Nyloc nuts.

b. Tighten the nut to 100 N.m.

c. Lower the trailer frame so that the suspension is taking the weight of the trailer.

d. Check and adjust the axle alignment (Para 18).

Springs

41. Removal. Remove the springs as follows (Figure 7):

WARNING

The removal of the springs requires two personnel and/or a suitable jack to support the weight of the spring.

a. Support the weight of the trailer frame.

NOTE

Leave the wheels resting on the ground with all the weight off the suspension components.

There should be approximately 25 mm clearance between the spring and the spring hanger seats.

b. Remove the hex nuts (1) and flat washers (2) from the U-bolts (5) retaining the spring to the axle.

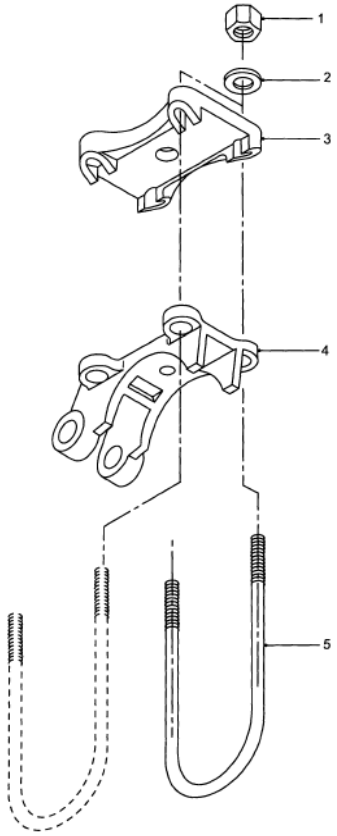
c. Remove the U-bolts and the spring cap (3).

d. Remove the hex nuts (Figure 8, Item 4) and hex bolts (Figure 8, Item 3) from the equaliser (Figure 8, Item 10).

NOTE

The removal of the hex bolt and hex nut from the rear spring hanger may assist in the removal of the rear spring.

e. Slide the spring clear of the axle and frame.



1 Hex nut
2 Flat washer
3 Spring cap
4 Spring seat
5 U-bolt

Figure 7 Spring Seats and U-bolts

42. Installation. Install the springs as follows (Figure 7):

WARNING

The installation of the springs requires two personnel and/or a suitable jack to support the weight of the spring.

a. Lift the spring up to the axle spring seat.

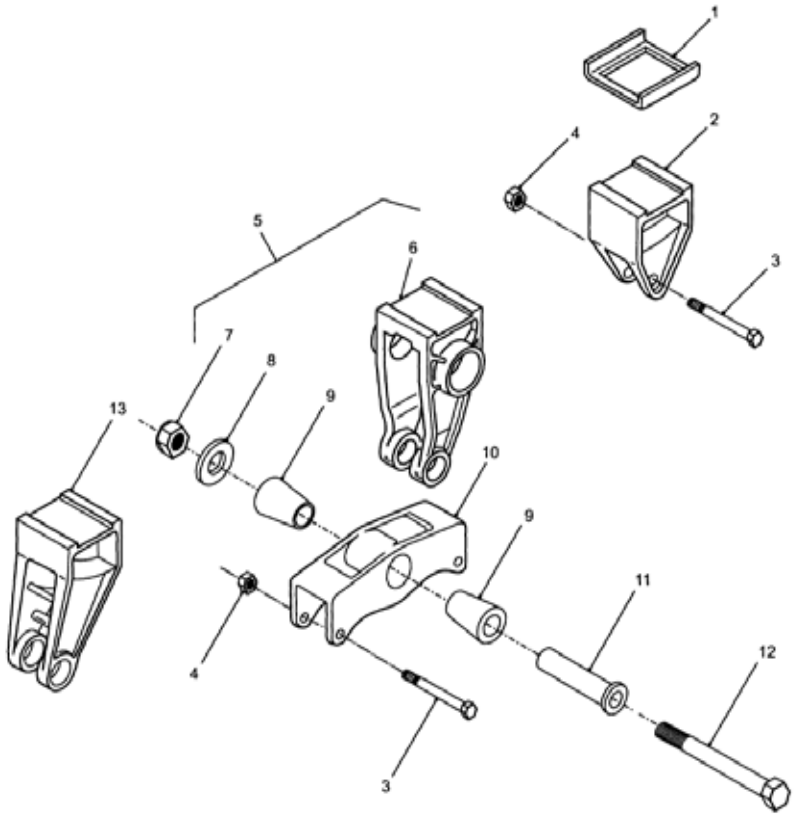
NOTE

Ensure that the spring ends are correctly located and that the folded leaf end is in the equaliser assembly.

b. Fit the hex bolts (Figure 8, Item 3) and hex nuts (Figure 8, Item 4) to the equaliser (Figure 8, Item 10) and rear spring hanger if removed.

c. Fit the spring U-bolts (5), the spring cap (3), flat washers (2) and hex nuts (1).

d. Tighten the nuts evenly to 415 N.m.



1	Straddle mount	5	Equaliser assembly	8	Flat washer	11	Equaliser shaft
2	Spring hanger, rear	6	Spring equaliser hanger	9	Tapered Rubber Bush	12	Centre bolt
3	Hex bolt	7	Nyloc nut	10	Equaliser	13	Spring hanger, front
4	Hex nut						

Figure 8 Spring Hanger – Exploded View

Equaliser Assembly

43. Bush replacement. Replace the equaliser bushes as follows (Figure 8):

a. Support the weight of the trailer frame, leaving the axle assemblies resting on the ground or supported. All weight is to be off the suspension components.

b. Remove the Nyloc nut (7), centre bolt (12), flat washer (8) and equaliser shaft (11) from the equaliser (10).

c. Whilst supporting the equaliser, remove the two tapered rubber bushes (9) from the equaliser hanger and beam.

d. Fit replacement bushes to the hanger and equaliser beam.

e. Fit the equaliser shaft(11), flat washer(8), centre bolt(12) and a new Nyloc nut(7). Tighten the nut to 200 N.m.

NOTE

Fit the bolts from inside the trailer frame.

BRAKE SYSTEM

Brake System Maintenance

44. Precautions

WARNING

If there is any doubt that asbestos free brake shoes are fitted, all handling and repairs are to be in accordance with EMEI Workshop E 410.

All genuine replacement brake shoes are to be asbestos free.

Some assemblies contain powerful springs and injury can result if they are not properly disassembled. Use only proper tools and observe all precautions relevant to the use of the tools.

45. When working on or around air brake systems and components, observe the following precautions:

a. Always chock the wheels. Stop the engine when working under a vehicle liable to roll. Keep hands away from chamber push rods and slack adjusters; they may apply as system pressure drops.

b. Never connect or disconnect a hose or line containing air pressure. It may whip as air escapes. Never remove a component or pipe plug unless you are certain all system pressure has been depleted.

c. Never exceed the recommended air pressure.

d. Always wear safety glasses when working with air pressure. Never look into air jets or direct them at anyone.

e. Never attempt to disassemble an assembly until you have read and understand the recommended procedures.

Brake Relay Valve

46. Removal. Remove the brake relay valve as follows (Figure 9):

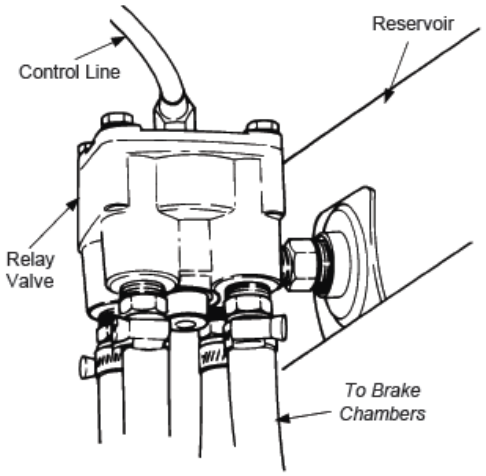


Figure 9 Brake Relay Valve Mounting

a. Chock the wheels.

b. Drain the brake system reservoir.

c. Tag all air lines connected to the valve to facilitate installation.

d. Disconnect the air lines from the valve.

e. Remove the valve from the reservoir.

47. Installation. Install the brake relay valve as follows (Figure 9):

a. Clean all the connectors on the air lines to be connected to the valve.

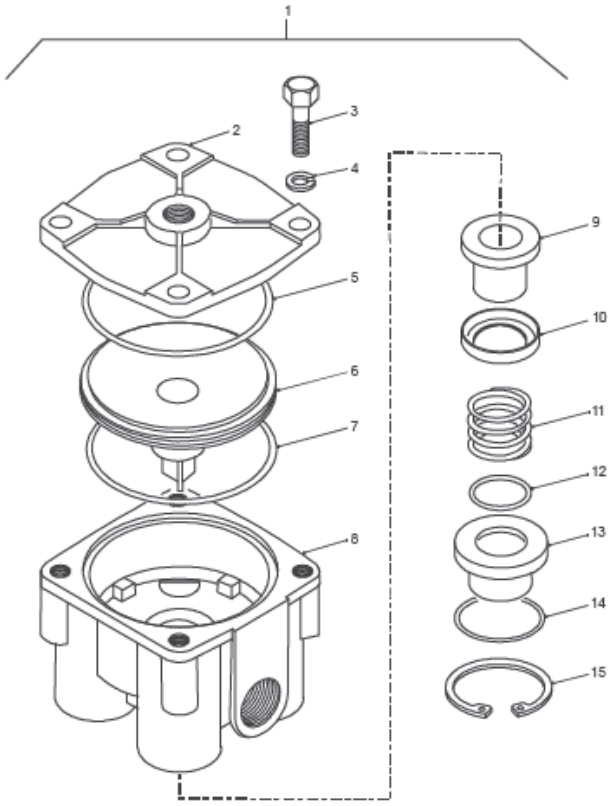
b. Inspect all lines and/or hoses for damage and replace as necessary.

c. Install the valve to the air reservoir.

d. Connect the air lines to the valve according to the labelling attached during removal.

e. Test the valve (ref Para 27.).

48. Disassembly. Disassemble the brake relay valve as follows (Figure 10):



1	Brake relay valve	5	O ring	9	Inlet and exhaust valve poppet	13	Valve poppet guide
2	Top cover	6	Valve piston	10	Valve retainer	14	O ring
3	Cover bolt	7	O ring	11	Compression spring	15	Circlip
4	Spring washer	8	Valve body	12	O ring		

Figure 10 Brake Relay Valve – Exploded View

a. Match mark the location of the top cover in relation to the valve body.

b. Remove the four cover bolts (3) and spring washers (4) securing the top cover (2) to the valve body (8).

c. Remove the top cover (2) and O ring (5) from the valve body (8).

d. Remove the valve piston (6) and O ring (7) from the valve body (8).

e. Turn the valve body upside down and depress the valve poppet guide (13), remove the circlip (15) and slowly relax the compression spring (11) beneath the valve poppet guide.

f. Remove the O ring (14) and the valve poppet guide (13).

g. Remove the O ring (12) and compression spring (11) from the valve body(8).

h. Remove the valve retainer (10) from the inlet/exhaust valve poppet (9).

i. Remove the inlet/exhaust valve poppet (9) from the valve body (8).

49. Cleaning and Inspection. Clean and inspect the parts as follows:

a. Replace all rubber parts, and any other parts showing any signs of wear or deterioration.

b. Wash all metal parts in a suitable solvent.

c. Wipe all the metal parts dry.

d. Inspect springs for cracks, distortion or corrosion and replace any defective parts.

e. Inspect the inlet and exhaust seats for nicks and burrs (replace them as necessary).

50. Reassembly. Reassemble the valve as follows (Figure 10):

a. Lightly coat all the components with grease XG–315.

b. Install the valve retainer (10) on the inlet and exhaust valve poppet (9) and install the inlet and exhaust valve poppet in the valve body (8).

c. Install the compression spring (11) in the valve body(8).

d. Install the inner and outer O rings (12 and 14) in the valve poppet guide (13).

e. Install the valve poppet guide (13) in the valve body (8); taking care not to damage the O ring (14).

f. Depress the valve poppet guide (13) and install the circlip (15).

NOTE

Make certain the circlip is completely seated in its groove in the body before releasing the pressure on the spring.

g. Fit the large piston O ring (7) onto the valve piston (6).

h. Install the valve piston (6) in the valve body (8), taking care not to damage the piston O ring.

i. Install the O ring (5) on the top cover (2).

j. Noting the match marks made during disassembly (Para 48.) install the top cover (2) on the valve body (8).

k. Secure the top cover to the valve body using the four cover bolts (3) and spring washers (4).

l. Tighten the screws to 9 to 14 N.m.

Spring Brake Control Valve – SR3 and ABV3802

51. Removal

a. Chock the trailer and completely drain the air system reservoir.

b. Tag and then disconnect all supply, delivery and exhaust lines at the spring brake valve (Figure 11).

CAUTION

Only remove the spring brake valve by applying a spanner to the hexagon area of the reservoir mounting nipple - DO NOT apply force to the valve body.

c. Remove the spring brake valve from the brake reservoir.

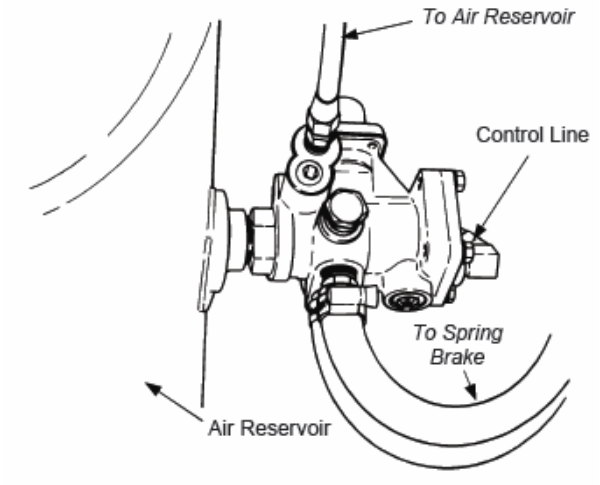


Figure 11 Spring Brake Control Valve Mounting

52. Installation – SR3 – Versions 1, 2 & 3.

a. Clean the connectors of the air lines to be connected to the valve.

b. Inspect all lines and/or hoses for damage (replace as necessary).

c. Fit the valve to the air reservoir.

d. Connect the air lines to the valve.

e. Test the valve (ref Para 26.).

53. Installation – ABV3802.

a. Clean the connectors of the air lines to be connected to the valve.

b. Inspect all lines and/or hoses for damage (replace as necessary).

c. Fit the valve to the air reservoir; ensuring that the valve is vertical.

CAUTION

Only tighten by applying a spanner to the hexagon area of the reservoir mounting nipple - DO NOT tighten via the valve body.

If thread sealant is used on the adapter, take particular care to ensure that the material does not enter the valve. Do not use tape. Apply Teflon paste to the male threads, beginning with the second thread from the end.

d. Connect the air lines to the valve.

e. Test the valve (ref Para 26.).

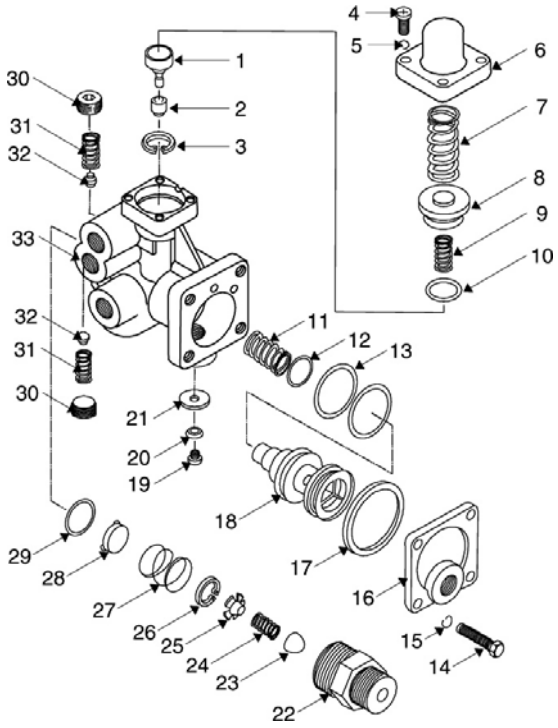
Spring Brake Control Valve (SR3)

54. Disassembly. Disassemble the spring brake control valve as follows (Figure 12):

WARNING

Take care when removing the cover as it is spring loaded.

a. Remove the four cover screws (4), spring washers (5) and then the cover (6).



1	Valve stem	10	O ring	19	Screw	28	Valve disc
2	Inlet/exhaust valve	11	Spring	20	Washer	29	O ring
3	Circlip	12	O ring	21	Exhaust diaphragm	30	Plug
4	Cover screw	13	O ring	22	Adapter body	31	Spring
5	Spring washer	14	Cover screw	23	Check valve	32	Check valve
6	Cover	15	Spring washer	24	Spring	33	Valve body
7	Spring	16	Control piston cover	25	Retainer		
8	Pressure protection valve piston	17	Gasket	26	Circlip		
9	Spring	18	Control piston	27	Spring		

Figure 12 Spring Brake Control Valve (SR3) – Exploded View

CAUTION

Do not attempt to remove the circlip (3), the valve stem (1), and the spring (9) from the pressure protection valve piston (8).

b. Remove the spring (7) and the pressure protection valve piston (8).

c. Remove the inlet/exhaust valve (2).

d. Remove the O ring (10) from the pressure protection valve piston (8).

e. Match mark the control piston cover (16) and the valve body (33).

f. Remove the four cover screws (14) and spring washers (15).

g. Remove the control piston cover (8), gasket (17), control piston (18) and spring (11) from the valve body (33).

h. Remove the three O rings (12 and 13) from the control piston (18).

i. Remove the adapter body (22) from the valve body (33).

j. Remove the O ring (29) from the adapter body (22).

k. Remove the valve disc (28) and the spring (27).

l. Depress the retainer (25) and remove the circlip (26).

m. Slowly relax the pressure on the retainer (25) and remove the retainer, spring (24), and the check valve (23).

n. Remove the screw (19), washer (20), and exhaust diaphragm (21) from the valve body (33).

o. Remove the two plugs (30) from the valve body (33).

p. Remove the two springs (31) and check valves (32) from the valve body (33).

55. Cleaning and inspection. Clean and inspect the valve as follows:

a. Wash all metal parts in a suitable solvent and then dry them.

b. Replace all the rubber parts.

c. Inspect all the parts for excessive wear or deterioration (replace them as necessary).

d. Inspect the valve seats for nicks or burrs (replace them as necessary).

56. Reassembly. Reassemble the valve as follows (Figure 12):

a. Lubricate all the O rings, O ring grooves, piston bores and metal-to-metal moving surfaces with grease XG-315.

b. Assemble a spring (31) to each of the check valves (32) with a twisting motion.

c. Fit the spring (31) complete with the check valve (32) into their respective bores in the valve body (33) and install plugs (30).

d. Fit the check valve (23) and spring (24) into the adapter body (22).

e. Fit the retainer (25) into the adaptor body (22)

f. Depress the retainer (25), fit the circlip (26) and release the retainer.

g. Insert the valve disc (28) into the valve body (33).

NOTE

The flat side of the valve, with the four 'ears' protruding, rests against the inlet and exhaust valve seat.

h. Install the spring (27). Ensure that the spring is aligned and rests evenly on the four 'ears' of the valve disc.

i. Install the O ring (29) in its proper groove on the adapter body (22).

j. Correctly align the spring (27) in the recess at the end of the adapter body (22).

k. Install the adapter body (22) into the valve body (33) and tighten it to 15 to 19 N.m.

l. Install the three O rings (12 and 13) in their respective grooves on the control piston (18).

m. Position the spring (11) and the control piston (18) into the valve body (33).

n. Fit the control piston cover (16), complete with new gasket (17), in the orientation marked during disassembly.

o. Install the spring washers (15) and screws (14) and tighten the screws to 5 to 7 N.m.

p. Install the exhaust diaphragm (21), washer (20), and screw (19) in the control piston exhaust port and tighten the screw to 2 N.m.

q. Install the inlet/exhaust valve (2) into the valve body (33).

r. Install the O ring (10) in the respective groove of the pressure protection valve piston (8).

s. Install the pressure protection valve piston (8) complete with the valve stem (1) circlip (3) and O ring (10) into the valve body (33).

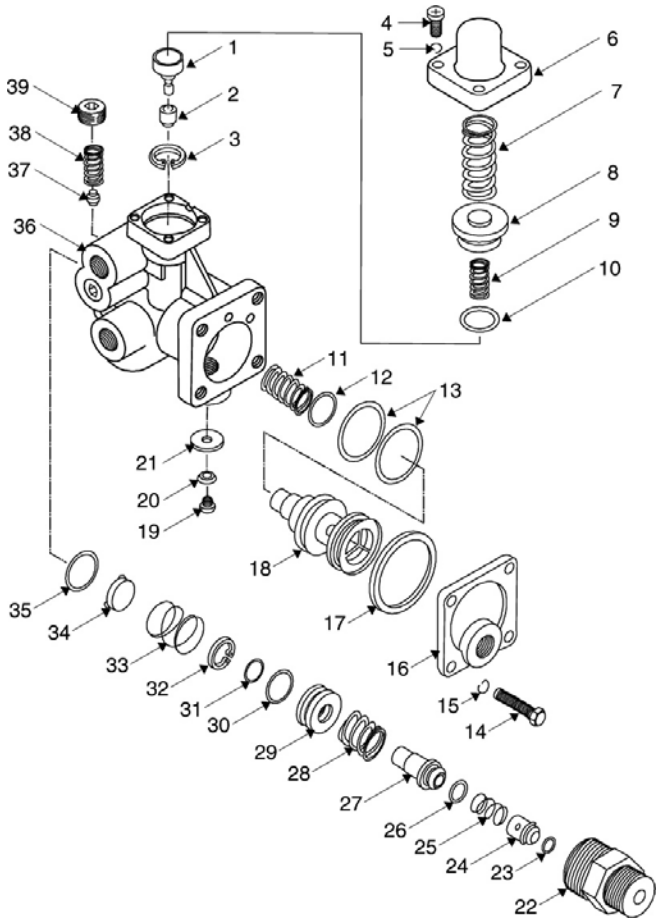
t. Position the spring (7) and cover (6) on top of the pressure protection valve piston (8).

u. Secure the cover (6) with the spring washers (5) and cover screws (4).

v. Tighten the screws to 2 to 3 N.m.

Spring Brake Control Valve (ABV3082)

57. Disassembly. Disassemble the spring brake control valve as follows (Figure 13):



1	Valve stem	11	Spring	21	Exhaust diaphragm	31	O ring inner
2	Inlet/exhaust valve	12	O ring	22	Adapter body check valve	32	Circlip
3	Circlip	13	O ring	23	O ring	33	Spring
4	Cover screw	14	Cover screw	24	Check valve	34	Valve disc
5	Spring washer	15	Spring washer	25	Spring	35	O ring
6	Cover	16	Control piston cover	26	O ring	36	Valve body
7	Spring	17	Gasket	27	Pressure protection piston 'B'	37	Check valve
8	Pressure protection piston 'A'	18	Control piston	28	Spring	38	Spring
9	Spring	19	Screw	29	O ring retainer	39	Plug
10	O ring	20	Washer	30	O ring outer		

Figure 13 Spring Brake Control Valve (ABV3082) – Exploded View

CAUTION

Take care when removing the cover as it is spring loaded.

a. Remove the four cover screws (4), spring washers (5) from the cover (6) and remove the cover (6) from the valve body (36).

CAUTION

Do not attempt to remove the circlip (3), spring (9) and valve stem (1) from the pressure protection piston 'A' (8).

b. Remove the spring (7) and the pressure protection piston 'A' (8) complete with the valve stem (1), the circlip (3) and the O ring (10) from the valve body (36).

c. Remove the inlet/exhaust valve (2) from the valve body (36)

d. Remove the O ring (10) from the from the pressure protection piston 'A' (8).

e. Match mark the control piston cover (16) and the valve body (36).

f. Remove the four cover screws (14) and spring washers (15).

g. Remove the control piston cover (16), gasket (17), control piston (18), and spring (11) from the valve body (36).

h. Remove the three O rings (12 and 13) from the control piston (18).

CAUTION

This plug is located at the rear of the valve, immediately above the mounting nipple. Do not interfere with the socket-head plug in the side of the body.

i. Remove the plug (39) from the valve body (36).

j. Remove the spring (38) and the check valve (37) from the valve body (36).

k. Remove the screw (19), washer (20) and exhaust diaphragm (21) from the valve body (36).

l. Remove the adapter body check valve (22) from the valve body (36).

m. Extract the valve disc (34) and spring (33) from the valve body (36).

n. Remove the O ring (35) from the adapter body check valve (22).

o. Place the adapter body check valve (22) in a vice (gripped by the hexagon area only).

WARNING

Take care when dismantling the adapter, as the components are spring loaded.

p. Depress the O ring retainer (29) and remove the circlip (32).

q. Slowly release the pressure on the O ring retainer (29) and remove the O ring retainer, spring (28), pressure protection piston 'B' (27), spring (25), and check valve (24) from the adapter body check valve (22).

r. Remove the O ring outer (30) and O ring inner (31) from the O ring retainer (29).

s. Remove the O ring (26) from the pressure protection piston 'B' (27).

t. Remove the O ring (23) from the check valve (24).

58. Cleaning and inspection. Clean and inspect the valve as follows:

a. Wash all the metal parts in a suitable solvent and dry them.

b. Replace all the rubber parts.

c. Inspect all the parts for excessive wear or deterioration (replace them as necessary).

d. Inspect the valve seats for nicks or burrs (replace them as necessary).

59. Reassembly. Reassemble the spring brake valve as follows (Figure 13):

CAUTION

Do not lubricate the O ring (23) on the check valve (24).

a. Lubricate all the O rings (except Item 23), O ring grooves, piston bores and metal-to-metal moving surfaces with grease XG-315.

b. Assemble the spring (38) to the check valve (37) with a twisting motion.

c. Fit the check valve(37) and spring (38) into its bore in the valve body (36) and install the plug (39).

d. Position the valve disc (34) into the valve body (36).

NOTE

The flat side of the valve disc, with the four 'ears' protruding, rests against the inlet and exhaust valve seat.

e. Install the spring (33) ensuring that the spring is aligned and rests evenly on the four 'ears' of the valve disc (34).

f. Place the adapter body check valve (22) in a vice (gripped by the hexagon area) with the largest threaded connection facing upwards.

g. Place a new non-lubricated O ring (23) in the groove in the seating area of the check valve (24).

h. Slide the spring (25) over the check valve (24).

i. Place a new lubricated O ring (26) in the groove in the pressure protection piston 'B' (27) and place the assembled check valve onto the piston.

j. Insert the assembled pressure protection piston 'B' (23, 24, 25, 26, and 27) into the adapter body check valve (22).

k. Insert the spring (28) into the adapter body check valve (22), ensuring that it seats correctly on the pressure protection piston 'B' (27).

l. Place the O ring inner (31) and O ring outer (30) onto the O ring retainer (29), and slide the retainer into the adapter body check valve (22).

m. Depress the O ring retainer (29) and fit the circlip (32).

n. Install the O ring (35) in its proper groove in the adapter body check valve (22).

o. Correctly align the spring (35) into the recess of the adapter body check valve (22).

p. Install the adapter body check valve (22) and tighten it to 23 to 34 N.m.

q. Install the three O rings (12 and 13) in their respective grooves on the control piston (18).

r. Position the spring (11) and the control piston (18) in the valve body (36).

s. Fit the control piston cover (16), complete with a new gasket (17), in the orientation marked during disassembly.

t. Fit the spring washers (15) onto the screws (14) and secure the control piston cover (16) to the valve body (36). Tighten the screws to 5 to 7 N.m.

u. Install the exhaust diaphragm (21), washer (20) and screw (19) in the control piston exhaust port. Tighten the screw to 2 N.m.

v. Install the O ring (10) in the respective groove of the pressure protection piston 'A' (8).

w. Install the inlet/exhaust valve (2) onto the pressure protection piston 'A' (8).

x. Install the assembled pressure protection piston 'A' (2 and 8) in the valve body (36).

y. Position the spring (7) and cover (6) on top of the pressure protection piston 'A' (8) and secure the cover with the four round-headed cover screws (4) and spring washers (5). Tighten the screws to 2 to 3 N.m.

Yard Release Valve

60. Removal. Remove the yard release valve as follows (Figures 14 and 15):

a. Chock and/or hold the trailer by a means other than the air brakes and drain all reservoirs.

b. Drive the button roll pin out with a punch and remove the button.

c. Disconnect the air lines, remove the panel mounting nut and remove the valve.

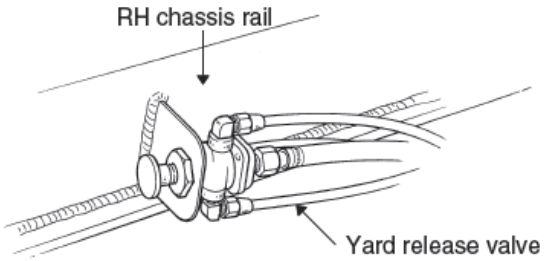
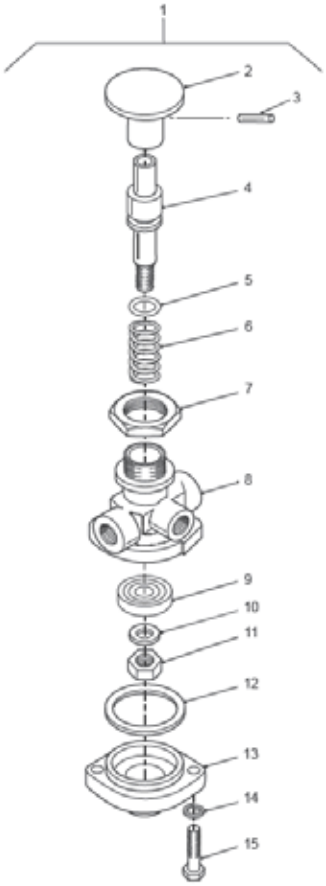


Figure 14 Yard Release Valve Mounting



1	Yard release valve	5	O ring	9	Inlet/Exhaust valve	13	Lower cover
2	Button	6	Spring	10	Washer	14	Spring washer
3	Roll Pin	7	Panel mounting nut	11	Locknut	15	Cap-screw
4	Plunger	8	Body	12	Sealing ring		

Figure 15 Yard Release Valve – Exploded View

61. Installation. Install the yard release valve as follows (Figures 14 and 15):

a. Install the valve in the mounting bracket, securing it with the panel mounting nut.

b. Re-connect the air lines.

c. Install the button. Secure the button to the plunger by installing the roll pin.

62. Disassembly. Disassemble the yard release valve as follows (Figure 15):

a. Remove the two cap-screws (15), spring washers (14), and remove the lower cover (13).

b. Remove the sealing ring (12).

c. Holding the plunger (4) with a small punch through the roll pin hole, remove the locknut (11) and washer (10).

d. Remove the inlet/exhaust valve (9), plunger (4), and spring (6).

e. Remove the O ring (5) from the plunger.

63. Reassembly. Reassemble the yard release valve as follows (Figure 15):

a. Lubricate all the O rings, O ring grooves and metal-to-metal moving surfaces with grease XG–315.

b. Fit the O ring (5) and spring (6) to the plunger (4).

c. Fit the plunger (4) into the body (8) and fit the inlet/exhaust valve (9).

d. Holding the plunger (4) with a small punch through the roll pin hole, fit the washer (10) and the locknut (11).

e. Fit the sealing ring (12) and the lower cover (13).

f. Secure the cover with the two cap-screws (15) and the spring washers (14).

Brake Power Chamber

64. Removal. Remove the brake power chamber as follows:

a. Disconnect the air line at the brake power chamber.

b. Remove the clevis pin from the clevis assembly.

c. Remove the two hexagon nuts and washers securing the brake power chamber.

d. Remove the brake power chamber from the mounting bracket.

65. Installation. Install the brake power chamber as follows:

a. Fit the power chamber to the mounting bracket and secure it with the two lock washers and hexagon nuts.

b. Connect the power chamber to the slack adjuster.

c. Connect the air line to the power chamber.

66. Disassembly. Disassemble the brake power chamber as follows (Figure 16):

a. Remove the clevis (9) and locknut (8).

b. Secure the power chamber in a suitable press with the pushrod (3) facing downwards.

WARNING

Take care when removing the cover as it is spring loaded.

CAUTION

Do not apply excessive pressure to the cover.

c. Apply light pressure to the end cover (1) with the press and remove the screws (6) and then the clamp (7).

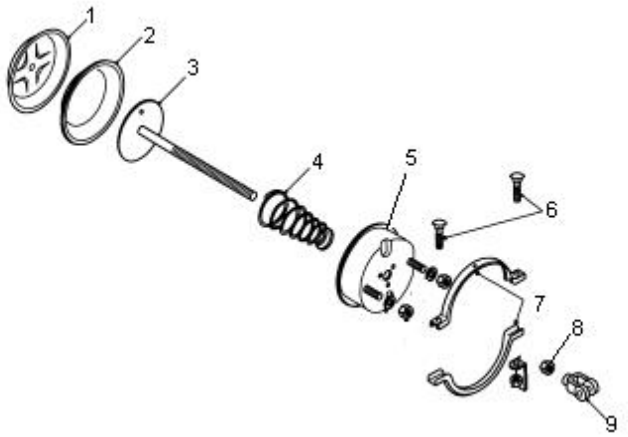


Figure 16 Brake Power Chamber – Exploded View

d. Slowly release the press until the spring (4) is fully extended.

e. Remove the cover (1), diaphragm (2), pushrod (3) and spring (4) from the chamber (5).

67. Cleaning and Inspection. Clean and inspect the brake power chamber as follows:

a. Clean all metal components in a suitable solvent, ensuring all rust and scale is removed from the diaphragm sealing surfaces. Blow them dry.

b. Inspect the diaphragm for perishing or damage to the sealing edge (replace if necessary).

c. Inspect the rear cover including the threaded boss for damage (replace if necessary).

d. Inspect the chamber for cracks or damage (replace as necessary).

68. Reassembly. Reassemble the brake power chamber as follows (Figure 16):

a. Apply a light film of grease XG–315 to the pushrod (3) and the edge of the diaphragm (2).

b. Assemble the spring (4), pushrod (3), diaphragm (2), and cover (1) into the chamber (5) and insert them into a suitable press.

c. Compress the components until the cover (1) and chamber (5) come into contact.

NOTE

Ensure the diaphragm is correctly sealed between the cover and the chamber.

d. Fit the clamp (7) and secure it with the two screws (6).

e. Remove the press.

f. Fit the clevis.

Spring Brake Chamber

69. Removal. Remove the spring brake chamber as follows:

WARNING

Never attempt to 'cage' any spring brake which shows signs of structural damage or significant corrosion. Handle damaged spring brakes with extreme caution.

a. Remove the plastic plug from the spring brake chamber housing.

b. Remove the release tool from the chamber body and insert it into the spring brake chamber, passing it through to the centre of the spring brake pressure plate.

NOTE

Prior to inserting the release tool into the chamber, fit the flat washer and nut to the end of the tool.

c. Rotate the release tool 90° either way to engage the lugs into the pressure plate. Pull the tool to ensure that the lugs are properly engaged in the pressure plate.

d. Tighten the nut onto the release tool and continue turning, withdrawing the release tool from the housing. This compresses the spring brake compression spring and releases the brake.

e. Tag and remove the two air hoses from the brake chamber.

f. Remove the cotter pin connecting the clevis assembly to the slack adjuster.

g. Remove the two nuts and bolts from the mounting bracket and remove the spring brake chamber.

70. Installation. Install the spring brake chamber as follows:

a. Ensure that the spring brake compression spring is fully caged by the release tool.

b. Attach the two hose stems to the chamber adapter housing.

c. Fit the brake chamber to the axle mounting bracket and secure it with the respective hexagon nuts and washers.

d. Connect the clevis to the slack adjuster.

e. Connect the two air hoses, ensuring that they are connected to the correct ports.

f. Remove the release tool from the spring brake chamber housing and return it to its stowage boss.

g. Fit the plastic plug into the spring brake housing.

h. Check the brake adjustment and adjust as required (Para 24.).

71. Service Brake Disassembly. Disassemble the service brake chamber as follows (Figure 17):

WARNING

Before repairs are carried out to the brake chambers, ensure that the spring brake compression spring is fully caged.

Extremely high spring pressures exist within the spring brake chamber.

The spring brake chamber shall not be disassembled.

a. Match mark the spring brake chamber (1), the service brake housing (10) and the clamp (6) to facilitate the correct alignment on reassembly.

b. Remove the clevis (12) and the hexagon nut (11) from the pushrod (8).

c. Remove the vent tube (3) and the two vent tube elbows (2).

d. Remove the clamp screws (5), clamp screw nuts (4), and clamps (6).

e. Remove the service brake housing (10), service brake return spring (9), pushrod (8) and the service brake diaphragm (7).

72. Cleaning and inspection. Clean and inspect the chamber as follows:

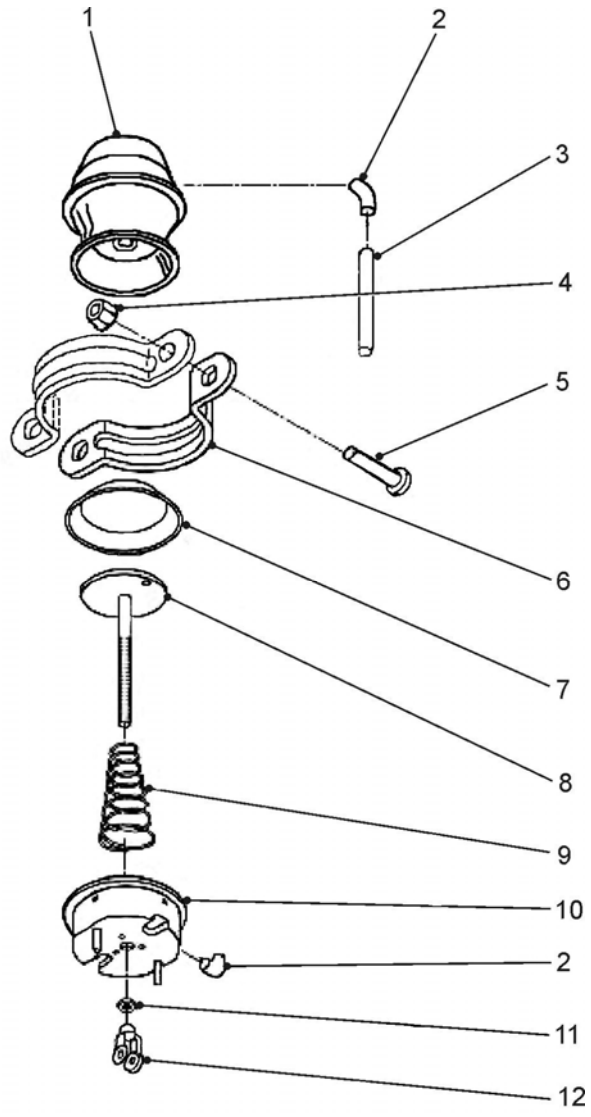
a. Thoroughly wash all the metal components in a suitable solvent and blow them dry with compressed air.

b. Inspect the clevis for any wear or damage and replace it if necessary.

c. Inspect the pushrod for bends or excessive wear and replace it as necessary.

d. Inspect the pressed metal housings for evidence of cracks or metal fatigue around the mounting studs and the clamping flange and replace it if any cracks or metal fatigue are found.

e. Inspect the spring brake housing for wear or cracks, particularly around the clamping flange and the rear face and replace it if any wear, cracking or other damage is evident.



DE(EMEI)3662-2

1	Spring brake chamber	7	Service brake diaphragm
2	Vent tube elbow	8	Pushrod
3	Vent tube	9	Service brake return spring
4	Clamp screw nuts	10	Service brake housing
5	Clamp screws	11	Hexagon nut
6	Clamp	12	Clevis

Figure 17 Brake Chamber – Exploded View

f. Inspect the spring for functionality and replace it if necessary.

g. Inspect the clamps, screws and nuts for wear or damage and replace them if any damage exists.

NOTE

It is good practice to replace the diaphragm during overhaul if possible. Do not refit an old diaphragm if it is not fit for purpose.

h. Inspect the diaphragm for any signs of perishing or other damage. Inspect the outer edge for build up of rust and scale, remove the rust and scale if the diaphragm is otherwise usable. Replace the diaphragm if any flaws are found.

73. Reassembly. Reassemble the service brake chamber as follows (Figure 17):

a. Apply a light film of grease XG–315 to the adapter pushrod and the edge of the diaphragm.

b. Fit the service brake diaphragm (7) into the spring brake chamber (1).

NOTE

Ensure that a light film of lubricant has been applied to the outer edge of the diaphragm.

c. Place the pushrod (8) in position on the service brake diaphragm (7) and slide the service brake return spring (9) in position on the pushrod.

d. Slide the service brake housing (10) over the pushrod (8) and align it with the spring brake chamber (1).

e. Fit the clamp (6) in position ensuring that it is correctly aligned and secure using the clamp screws (5) and clamp screw nuts (4). Tighten the clamp screw nuts to 35 N.m.

f. Fit the hexagon nut (11) and the clevis (12) to the pushrod.

g. Fit the vent tube elbows (2) and the vent tube (3).

Brake Shoes – Version 1, 2 and 3

74. Removal. Remove the brake shoes as follows (Figure 18):

a. Remove the spring brake chamber (ref Para 69.).

b. Remove the wheel hub and brake drum assembly (ref Para 29.).

c. Move the slack adjuster and camshaft into the fully released position.

d. Remove the two circlips (3) securing the brake shoe anchor pins (11).

e. Slide the two anchor pins from the brake shoe mountings. Remove the brake shoes (6) and separate them from the return spring (7).

75. Installation. Install the brake shoes as follows (Figure 18)

a. Fit the return spring (7) to the two brake shoes (6) and slide the brake onto the mounting plates.

b. Fit the brake shoe anchor pins (11) and circlips (3).

c. Fit the brake drum and hub assembly (ref Para 35.).

d. Fit the spring brake chamber (ref Para 70.).

Brake Camshaft and Mountings – Version 1, 2 and 3

76. Removal. Remove the brake camshaft and mountings as follows (Figure 19):

a. Remove the brake shoes (Ref Para 74).

b. Remove the retaining clips (Figure 18, Item 8) and camshaft rollers (Figure 18, Item 9) from the brake shoes.

c. Remove the slack adjuster retaining circlip (1) and the flat washer (2) from the inner end of the camshaft (17).

d. Slide the slack adjuster (3) from the camshaft splines.

e. Remove the circlip (1 near 13) and washer (2) from the camshaft (17).

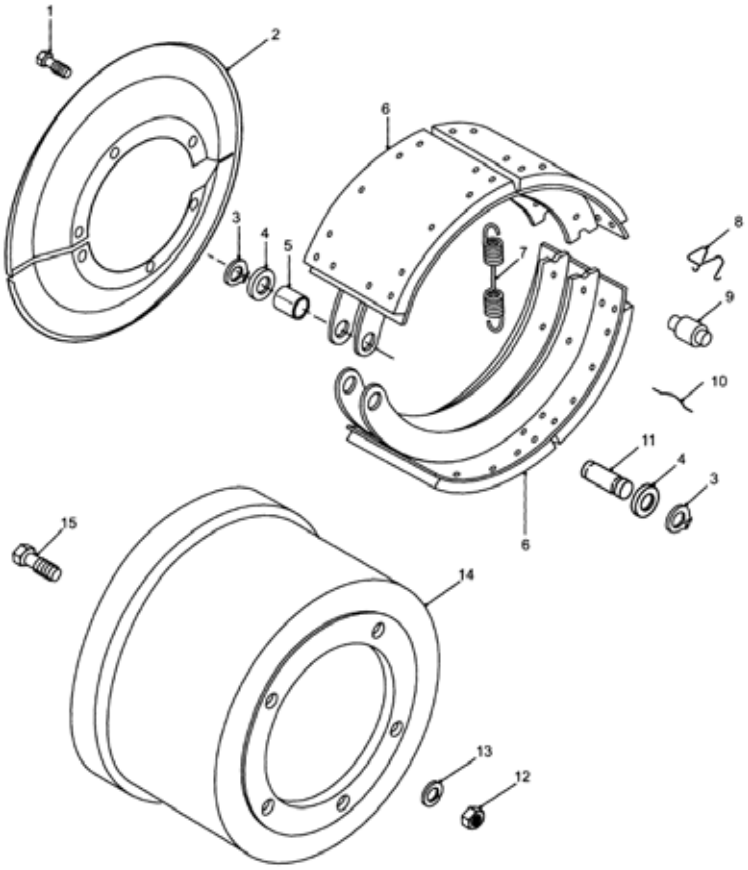
f. Slide the camshaft (17) from its mountings.

g. Remove the four hex bolts (5), hex nuts (11) and lock washers (10) securing the two housing (6) to the camshaft bracket (12).

h. Remove the housing (6), nylon bushing (8) and the two O rings (7).

i. Remove the two seals (13) from the brake mounting plate.

j. If worn, remove and discard the bronze bushing (14).



1. Screw	5. Anchor bushing	9. Camshaft roller	13. Lock washer
2. Backing plate	6. Brake shoe	10. Retaining pin	14. Brake drum
3. Circlip	7. Return spring	11. Anchor pin	15. Hex bolt
4. Flat washer	8. Retaining clip	12. Hex nut	

Figure 18 Wheel Brake Assembly – Version 1, 2 & 3

77. Cleaning and inspection. Clean and inspect the brake assembly as follows:

a. Remove all grease nipples, noting their location. Refit them after cleaning.

b. Thoroughly wash all the metal components in a suitable solvent and blow them dry with compressed air.

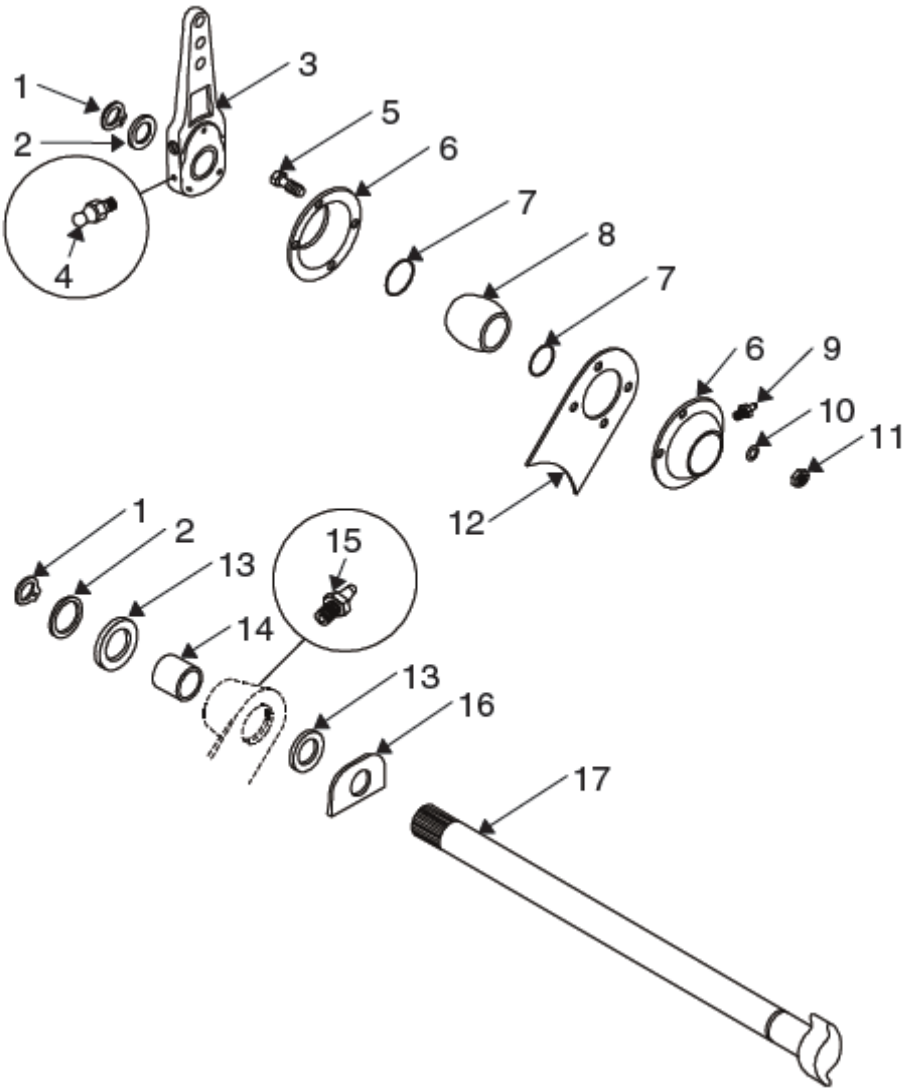
c. Inspect all parts for wear or damage and replace where necessary.

78. Reassembly. Reassemble the wheel brake assembly as follows (Figure 19):

a. Fit the new bronze bushing (14) to the brake mounting plate.

NOTE

Ensure that the seals are correctly fitted and facing in the correct direction. The lip of the outer seal faces into the brake mounting plate to prevent grease entering the brake assembly. The lip of the inner seal faces towards the centre line of the trailer. This allows excess grease to escape thus preventing dirt and moisture ingress.



1	Circlip	6	Housing	11	Hex nut	16	Camshaft Plate
2	Flat washer	7	O rings	12	Camshaft bracket	17	Camshaft
3	Slack adjuster	8	Nylon bush	13	Seal		
4	Grease nipple	9	Grease nipple	14	Bronze bushing		
5	Hex bolt	10	Lock washer	15	Grease nipple		

Figure 19 Brake Camshaft and Mountings – Version 1,2 and 3

b. Fit the two seals (13) to the brake mounting plate.

NOTE

Do not tighten the nylon bush mounting nuts until instructed.

c. Install the nylon bush (8), the two O rings (7) and the two housing (6) to the camshaft bracket and hold them in place with the hex bolts (5), lock washers (10) and hex nuts (11).

d. Fit the camshaft (17) through the bronze bushing (14) in the brake mounting plate.

e. Slide the flat washer (2) and circlip (1) onto the camshaft (17) as it passes through the bronze bushing.

f. Fit the camshaft (17) through the nylon bushing (8).

g. Ensure the circlip (1) is seated correctly in the groove in the camshaft.

h. Tighten the four hex nuts (11) and check for free rotation of the camshaft.

i. Fit the slack adjuster (3) on to the camshaft, ensuring that the adjusting screw is facing away from the spring brake mounting plate.

j. Fit the flat washer (2) and the circlip (1) to the inner end of the camshaft.

k. Lubricate all grease nipples and ensure that the camshaft operates freely.

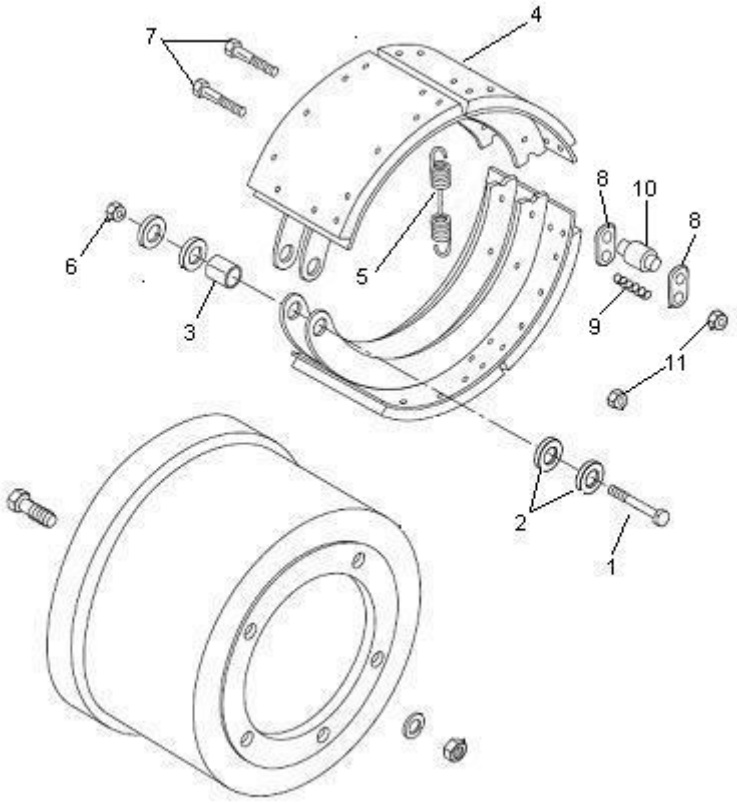
l. Rotate the camshaft to the fully released position.

m. Fit the camshaft rollers (Figure 18, Item 9) and the retaining clips (Figure 18, Item 8) to the brake shoes Figure 18, Item 6).

n. Install the brake shoes, wheel hub, brake drum assembly, spring brake chamber and test and adjust the brake system (ref Para 24) .

Brake Shoes – Version 4

79. Removal. Remove the brake shoes as follows (Figure 20):



1. Hex bolt 2. Flat washer 3. Anchor pin
4. Brake shoe 5. Spring 6. Nut

Figure 20 Wheel Brake Assembly – Version 4

a. Remove the spring brake chamber (ref Para 69.).

b. Remove the wheel hub and brake drum assembly (ref Para 29.).

c. Move the slack adjuster and camshaft into the fully released position.

d. Remove the hex bolts (1), flat washers (2) and nuts (6) securing the anchor pins (3).

e. Slide the two anchor pins from the brake shoe mountings; remove the brake shoes (4) and separate them from the return spring (5).

80. Installation. Install the brake shoes as follows (Figure 20)

a. Fit the return spring (5) to the brake shoes (4) and slide the replacement brake shoes onto the mounting plates.

b. Fit the brake shoe anchor pins (3) and fit the bolts (2), flat washers (1) and nuts (6).

c. Fit the brake drum and hub assembly (ref Para 35.).

d. Fit the spring brake chamber (ref Para 70.).

Brake Camshaft and Mountings – Version 4

81. Disassembly. Disassemble the brake camshaft and mountings as follows:

a. Remove the wheel brake shoes (ref Para 79).

b. Disassemble the cam roller mechanisms as follows (Figure 20):

(1) Remove the two bolts (1) and nuts (11.

(2) Remove the retaining plates (8), compression spring (9), and camshaft roller (10).

c. Disassemble the camshaft as follows (Figure 21):

(1) Remove the circlip (1) and the washer (2) from the inner end of the camshaft (15).

(2) Slide the slack adjuster (4) from the camshaft splines.

(3) Remove the circlip (22) securing the camshaft to the camshaft pivot in the brake anchor plate from its groove.

(4) Slide the camshaft from its mountings whilst sliding the circlip and washers (16 and 21) from the camshaft.

(5) Remove the four bolts (6) securing the plates (7 and 13) to the mounting bracket (14).

(6) Remove the plates (7 and 13), bush (10), seals (8 and 12), and the O rings (9 and 11).

(7) Remove the two camshaft seals (17 and 20) from the brake mounting plate.

(8) If it is worn, press the bush (19) from the brake mounting plate and discard it.

82. Cleaning and inspection. Clean and inspect the brake assembly as follows:

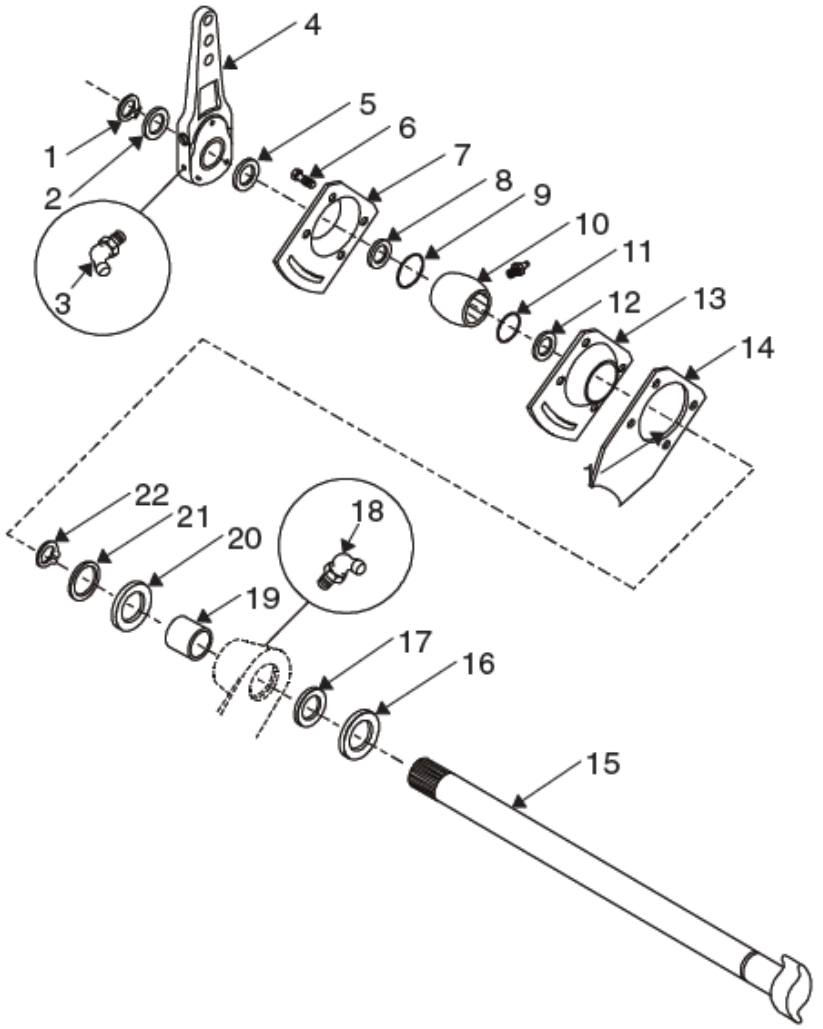
a. Remove all grease nipples, noting their location, and install them after cleaning.

b. Thoroughly wash all the metal components in a suitable solvent and blow them dry with compressed air.

c. Inspect all parts for wear or damage and replace where necessary.

83. Reassembly. Reassemble the brake camshaft and mountings as follows (Figure 21):

a. If removed, press the new bush (19) into the brake mounting plate.



1	Circlip	7	Plate	13	Plate	19	Bush
2	Washer	8	Seal	14	Mounting bracket	20	Seal
3	Grease nipple	9	O ring	15	Camshaft	21	Washer
4	Slack adjuster	10	Bush	16	Washer	22	Circlip
5	Washer	11	O ring	17	Seal		
6	Bolt	12	Seal	18	Grease nipple		

Figure 21 Brake Camshaft and Mountings

NOTE

The lip of the outer seal faces into the brake mounting plate to prevent grease entering the brake assembly. The lip of the inner seal faces towards the centre line of the trailer. This allows excess grease to escape preventing dirt and moisture ingress.

b. Fit new camshaft seals (17 and 20) to the camshaft pivot in the brake mounting plate.

c. Install the bush (10), seals (8 and 12) and O rings (9 and 11) into the housing plates (7 and 13).

NOTE

Do not tighten the bolts until instructed.

d. Fit the housing plates to the mounting bracket (14) and loosely fit the four bolts (6).

e. Fit the washer (16) to the camshaft (15).

f. Fit the camshaft (15) through the bushing (19) in the brake mounting plate.

g. Fit the flat washer (21) and the circlip (22) to secure the camshaft (15) to the brake mounting plate.

h. Fit the camshaft through the bush (10).

i. Ensure the circlip (22) is seated correctly in the groove in the camshaft.

j. Tighten the four bolts and check for free rotation of the camshaft.

NOTE

Ensure that the adjusting screw is facing away from the spring brake mounting plate.

k. Fit the washer (5) and the slack adjuster (4) to the camshaft.

NOTE

l. Ensure that the circlip locates correctly in its groove in the camshaft.

m. Fit the washer (2) and the circlip (1) on the camshaft.

n. Lubricate all grease nipples and ensure that the camshaft operates freely.

o. Rotate the camshaft to the fully released position.

p. Reassemble the cam roller mechanisms to the brake shoes by installing the rollers, retaining plates, springs, nuts and bolts (Figure 20).

q. Install the brake shoes, the wheel hub, brake drum assembly, the spring brake chamber, and adjust and test the brakes (ref Para 24).

Brake System Fault Finding

Table 3 Brake System Fault Finding

Serial	Symptom	Probable Cause	Action
1	Insufficient braking	a. Mechanical components damaged	a. Check for damaged parts, replace as required
		b. Worn brake linings	b. Replace the brake linings
		c. Low pressure in the brake system	c. Check the supply pressure from the towing vehicle
		d. Reservoir drain cock open	d. Close the drain cock
		e. Brakes require adjusting	e. Adjust the brakes
2	Brakes apply too slowly	a. Brakes require adjusting or lubrication	a. Adjust the brakes; lubricate brake components
		b. Relay valve faulty	b. Replace the valve
		c. Blocked or restricted air lines/hoses	c. Clear the blockage. Replace air line or hose
		d. Leaking brake chamber diaphragm	d. Replace the brake chamber
3	Brakes release too slowly	a. Brakes require adjusting or lubrication	a. Adjust the brakes; lubricate brake components
		b. Relay valve faulty	b. Replace the valve
		c. Blocked or restricted air lines/hoses	c. Clear the blockage. Replace air line or hose
4	Brakes do not release	a. Brake shoe return spring weak or broken.	a. Replace the spring
		b. Spring brake chamber diaphragm faulty	b. Replace the brake chamber
		c. Faulty spring brake control valve or relay valve	c. Replace the faulty valve
5	Brakes grab or are erratic	a. Grease on brake linings	a. Replace the brake shoes and hub seal
		b. Faulty brake chambers	b. Replace the faulty brake chambers
		c. Eccentric brake drum(s)	c. Replace the brake drum(s)
		d. Loose brake lining	d. Replace the brake shoes
		e. Brake shoe return spring broken or weak	e. Replace the spring
6	Uneven braking	a. Grease on brake linings	a. Replace the brake shoes and hub seal
		b. Eccentric brake drum(s)	b. Replace the brake drum(s)
		c. Brake chamber diaphragm leaking	c. Replace the brake chamber.
7	Spring brake does not hold	a. Power spring broken	a. Replace the brake chamber
		b. Brakes require adjusting	b. Adjust the brakes
		c. Faulty SR-3 or ABV3802 valve	c. Replace the valve
8	Brakes drag after spring brakes have been used	a. Low spring brake hold-off air pressure	a. Check the air pressure in the system
		b. Leaking air lines	b. Repair leaks
9	Spring brakes will not release	a. Insufficient air pressure	a. Check the air pressure in the system
		b. Faulty SR-3 or ABV3802 valve	b. Replace the valve
		c. Spring brake chamber diaphragm faulty	c. Replace the brake chamber

ELECTRICAL

Repairs

84. Carry out repairs to, and replacement of, electrical components using standard workshop techniques.

85. When carrying out repairs to the electrical system ensure that the following points are observed:

a. A 6 mm white loop wire is to be fitted to plug pins ‘D' & ‘L'.

b. A 4 mm blue loop wire is to be fitted to plug pins ‘C' & ‘H'.

c. All wiring is to be installed in soft conduit.

86. Electrical wiring diagrams are shown in Figures 22, 23 and 24.

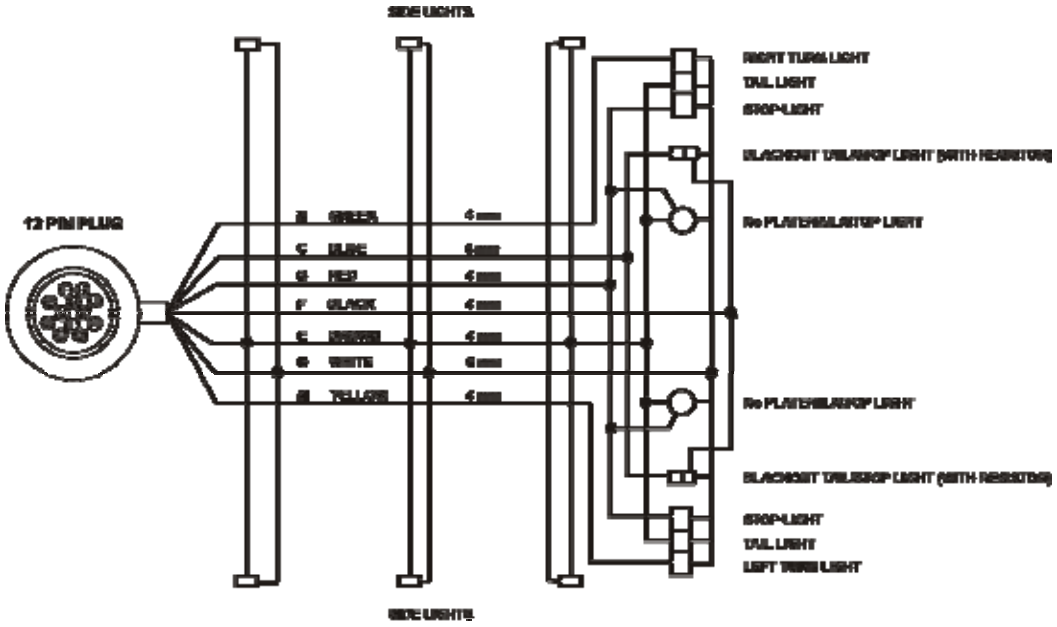


Figure 22 Electrical Circuit Diagram – Version 1

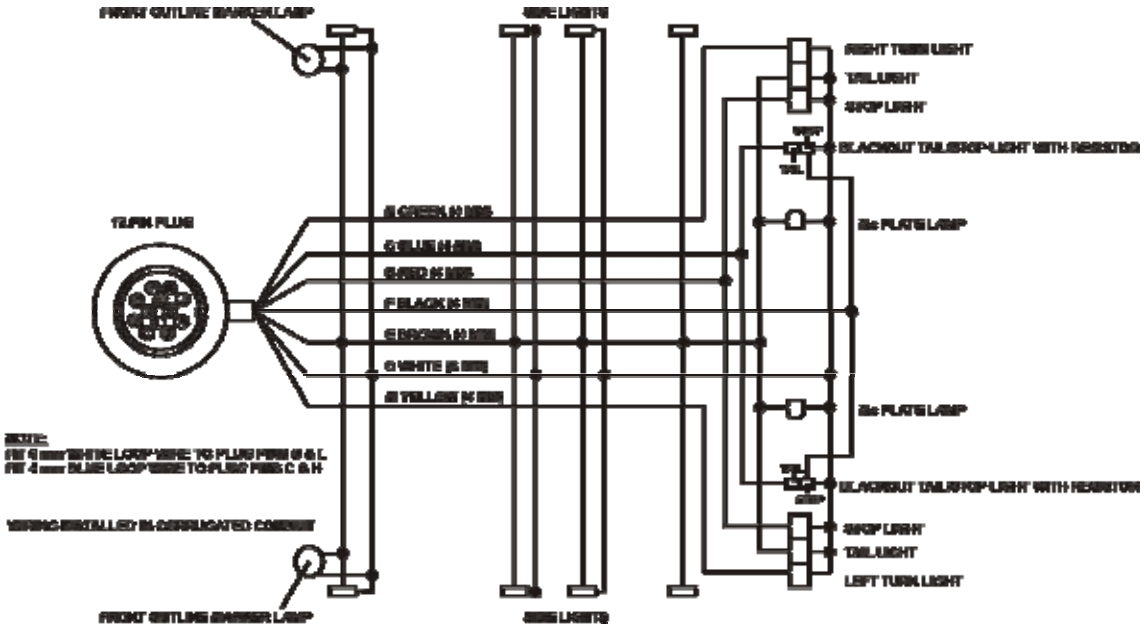


Figure 23 Electrical Circuit Diagram – Version 2 & 3

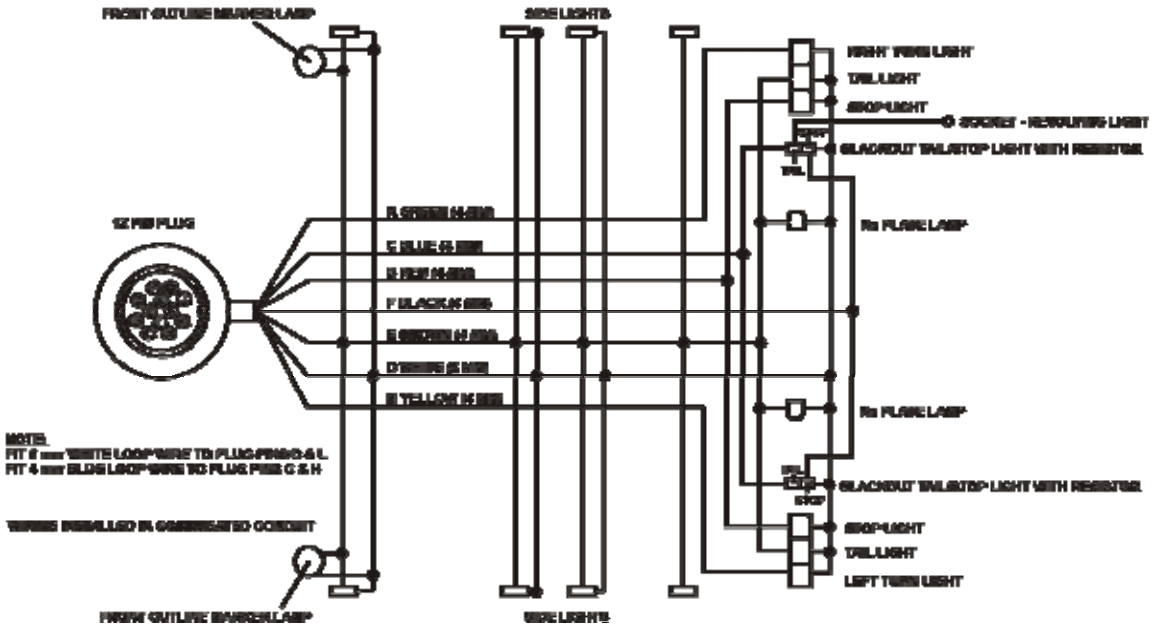


Figure 24 Electrical Circuit Diagram – Version 4

Electrical System Specifications

87. The electrical system specifications are detailed in Table 4.

Table 4 Electrical System Specifications

Serial	Description	Specification
1	System voltage	24 V dc
2	Blackout module voltage	12 V dc
3	Blackout stop lamp resistor	3 300 Ohm ¼ Watt
4	Blackout marker lamp resistor	680 Ohm ¼ Watt
5	Connector plug	12-pin NATO

FRAME ASSEMBLY

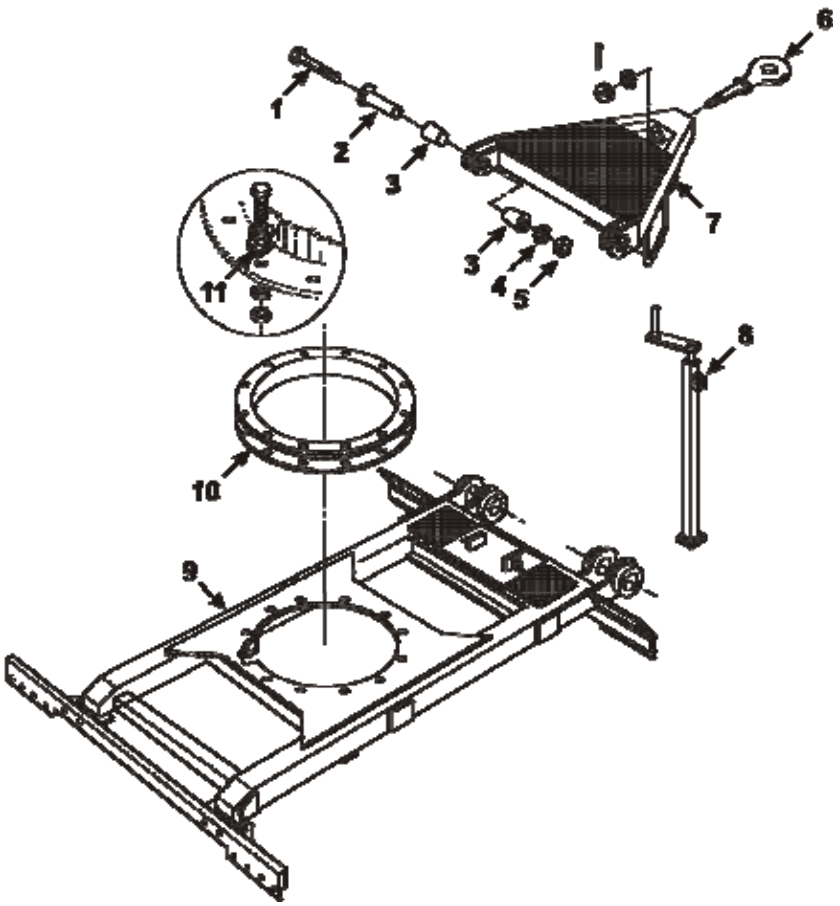
Drawbar Assembly

88. Removal. Remove the drawbar assembly as follows (Figure 25):

- **a.** Disconnect the brake air lines and electrical harness from the drawbar assembly.
- **b.** Remove the drawbar leg (8) or fold it into the raised position.
- **c.** Remove the Nyloc nuts (5) from the two pivot bolts (1). Remove the two bolts and pivot shafts (2).
- **d.** Remove the four tapered rubber bushes (3) and lift the drawbar clear of the dolly.

89. Installation. Install the drawbar assembly as follows (Figure 25):

- **a.** Position the drawbar pivots into the dolly frame and support it in this position.
- **b.** Fit the four tapered bushes (3).
- **c.** Fit the pivot shaft (2) and the pivot bolt (1) from the outer side of each pivot. Fit the large flat washer (4) with a new Nyloc nut (5) and tighten the nut to 500 N.m.



1. Pivot bolt
2. Pivot shaft
3. Tapered bush
4. Flat washer
5. Nyloc nut
6. Towing eye
7. Drawbar
8. Drawbar leg
9. Frame
10. Ballrace
11. Tapered washer (Ver 1, 2 & 3 only)

Figure 25 Dolly Converter Frame

Landing Legs

90. Removal. Remove the landing legs as follows:

a. Remove the safety chains from the lower legs and lower the legs.

b. Remove the bolts connecting the interconnecting drive shaft between the two support legs and remove the shaft.

c. Remove the bolts from the stabiliser bracket and junction box mounting plates.

d. Disconnect the leg support strut.

CAUTION

Ensure that the leg is correctly supported.

e. Support the main frame and remove the ten hexagon-headed bolts securing the leg to the main frame.

f. Lift the leg clear of the trailer frame.

91. Installation. Install the landing legs as follows:

a. Fit the landing leg to the mounting bracket and secure it with the ten hexagon-headed bolts.

NOTE

Ensure that the drive shaft is engaged with the interconnecting shaft.

b. Fit the leg support strut.

c. Fit the interconnecting drive shaft inside the beaver tail and secure it with the bolts.

d. Ensure that the legs are raised to the fully raised position and fit the safety chains to the lower legs.

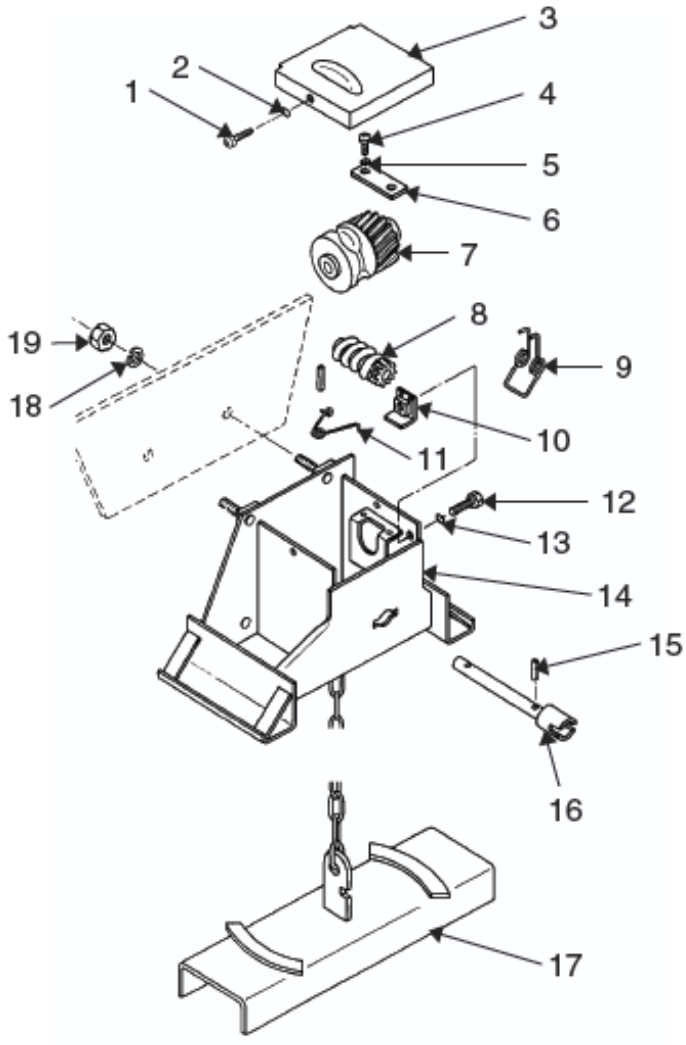
Spare Wheel Winch Assembly

92. Removal. Remove the spare wheel assembly as follows:

a. Remove the spare wheel from the winch assembly.

b. Remove the four hexagon nuts, securing the mounting bracket to the trailer frame. Lift the winch assembly clear of the bracket.

93. Disassembly. Disassemble the spare wheel winch assembly as follows (Figure 26):



1. Screw	6. Retaining plate	11. Locking spring	16. Shaft
2. Washer	7. Wheel gear	12. Screw	17. Bracket
3. Top cover	8. Worm gear	13. Washer	18. Washer
4. Screw	9. Ratchet spring	14. Casing	19. Nut
5. Washer	10. Ratchet pawl	15. Roll pin	

Figure 26 Spare Wheel Winch – Exploded View

a. Remove the two screws (1) securing the top cover (3) and remove the top cover.

b. Disconnect the lift chain from the casing by spreading the split link.

c. Remove the two screws (4) securing the retaining plate (6) to the casing (14) and remove the retaining plate.

d. Lift the wheel gear (7) from the casing (14) and disengage the lift chain.

e. Remove the screw (12) securing the ratchet pawl (10) to the casing (14) and remove the ratchet pawl and the ratchet spring (10).

f. Using a suitable parallel punch and hammer, drive the two roll pins (15) from the shaft (16). Remove the shaft from the assembly.

g. Remove the worm gear (8) from the casing (14).

h. Remove the locking spring (11) from the locking pawl.

NOTE

The locking pawl is welded to the casing and should only be removed if absolutely necessary.

94. Cleaning and Inspection.

a. Clean all components in a suitable solvent and dry them.

b. Inspect the worm and wheel gear for damage or wear to the gear teeth.

c. Inspect the worm gear for damage or wear to the ratchet teeth.

d. Inspect the two springs for evidence of wear or cracking.

e. Replace components as required.

95. Reassembly. Reassemble the spare wheel winch assembly as follows (Figure 26):

a. If they are not already in place, fit the locking pawls and weld the pivot to the casing.

b. Fit the locking spring (11).

c. Place the worm gear (8) in position in the casing (14). Fit the shaft (16) and the two roll pins (15).

d. Fit the ratchet pawl (10) and secure it with the screw (12).

e. Fit the lift chain through the assembly leaving a loop large enough to fit the wheel gear (7).

f. Position the wheel gear (7) through the chain loop and fit it into the casing (14). Fit the retaining plate (6) and secure with the two screws (4) and washers (5).

g. Place sufficient grease XG-291 into the casing and around the gears to ensure proper lubrication.

h. Fit the lift chain into the winch assembly and secure it to the casing with the split link.

i. Fit the top cover (3) and secure it with the two screws (1) and washers (2).

96. Installation

a. Fit the winch and mounting bracket assembly in position on the trailer frame and secure it in place.

b. Fit the four spring washers and hexagonal nuts and tighten the nuts.

c. Fit the spare wheel to the lifting frame. Wind the spare wheel up and secure it in position.

Towing Lunette

97. Inspection Standard. The towing lunette is manufactured to strict specifications with maximum allowable wear limits (Table 5). Towing eyes which are worn beyond the wear limits are to be removed and discarded, they are not to be recovered by welding.

Table 5 Towing Lunette Specifications

Serial	Description	Specification
1	Maximum allowable end float	Nil
2	Maximum allowable side movement	Nil
3	Maximum allowable wear to the eye	6 mm

98. When replacing lunettes the retaining nut is to be tightened to 500 N.m. To align the cotter pin hole, the nut is to be tightened further. **DO NOT** loosen the retaining nut to align the cotter pin hole when installing the towing lunette.

END

Distribution List: **VEH H 05.0 – Code 2** (Maint Level)
(Sponsor: LV SPO, Mdm/Hvy B Vehicles)