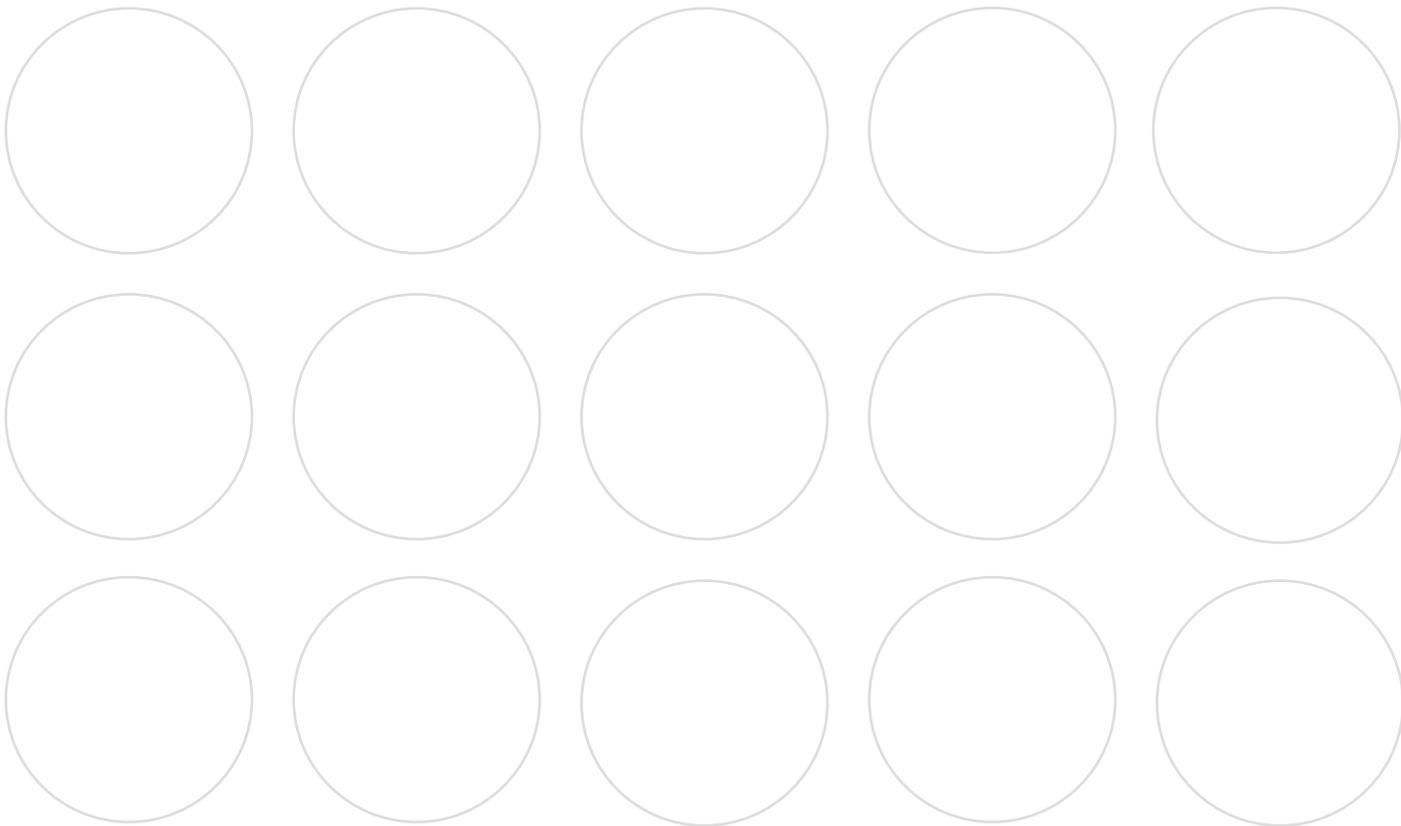


Maintenance manual no. MM-0556

# Trailer Air Suspension System

## CS Suspension Range

Issue: January 2006



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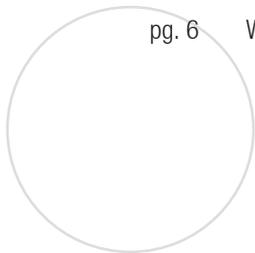
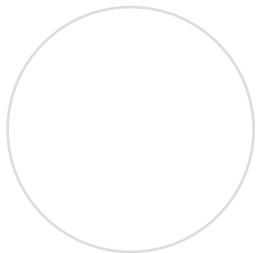
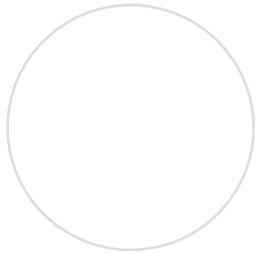
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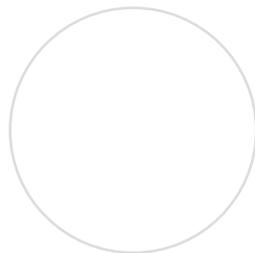
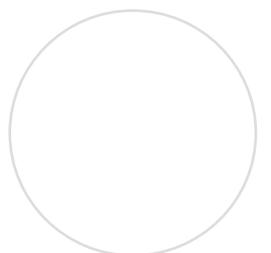
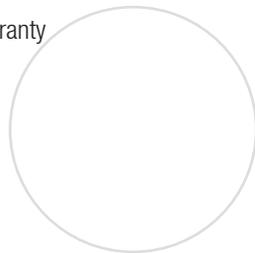
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# General Information

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pg. 6 Warranty



# 1 General Information

This manual describes the correct lubrication, service and installation procedures for ARVINMERITOR's CS trailer air suspension system. Information contained in this publication was in effect at the time the publication was approved for printing and is subject to change without notice or liability.

You must follow company procedures and understand all procedures and instructions before you begin to service or repair a unit. Some procedures require the use of special tools and lubricants for safe and correct service. Failure to use special tools when required can cause serious personal injury to service personnel, as well as damage to equipment and components.

ARVINMERITOR uses the following notations to warn the user of possible safety issues and to provide information that will prevent damage to equipment and components.



## **WARNING**

**A Warning indicates you must follow a procedure exactly. Otherwise serious Personal injury can occur.**

## **NOTE:**

**A NOTE indicates an operation, procedure or instruction that is important for correct service. A NOTE can also supply information that can help to make service quicker and easier.**



## **CAUTION**

**A caution indicates that you must follow a procedure exactly. Otherwise, damage to equipment or components can occur. Serious personal injury can also result, in addition to damaged or malfunctioning equipment or components.**



**This symbol indicates that you must tighten fasteners to a specific torque value.**

# 1 General Information

## ARVINMERITOR Suspension Warranty

CS SUSPENSION SYSTEMS 24 MONTHS PARTS AND LABOUR

For full warranty terms and conditions see 'ARVINMERITOR Warranty Terms and Conditions

Unless otherwise stated, Aftermarket components are warranted for 1 year, parts only, mechanical failure only.

### Warranty Procedure

Should any ARVINMERITOR equipment fitted to your trailer become unserviceable within the warranty period, contact the trailer manufacturer or ARVINMERITOR Service Department who will advise on the appropriate action.

A comprehensive network of original parts distributors and service stations operate throughout Europe; this is supported internationally with agents strategically placed around the world.

ARVINMERITOR H.V.S. reserves the right to make changes in specifications shown herein or add improvements at any time without notice or obligation.

### Patents and applications of MERITOR HEAVY VEHICLE SYSTEMS Ltd that is specifically relevant to air suspension systems:

**Compact Indair:** GB Patent no. 2194761.

**Vehicle Tracking Adjustment:** GB Patent no. 2257670.

**CS Cast Suspension:** GB Patent No, GB2396140B.

Patents applied for:

**EPO:** application no. EP 03780387.1

**USA:** application no. US 10/538,816

**CHINA:** application no. CN 200380106029.8

**Poland:** application no. P-376676

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# Introduction

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# 2 Introduction

## Description

The ARVINMERITOR CS International range of air suspension system is based on a semi-trailing arm suspension arrangement. The trailing arms are mounted onto the axle parallel to one another and perpendicular to the axle. The front of the trailing arm consists of a pivot bushing, hanger bracket and alignment bosses, while the rear of the trailing arm supports the air spring. (Figs 2.2 and 2.3)

The axle is attached to the trailing arms via a welding process that can only be performed by ARVINMERITOR. The trailing arms contain a multi-functional pivot bush at the eye ends, specially designed to accommodate vertical inputs, but remaining stiff for the fore and aft inputs. The trailing arms are mounted to hanger brackets, which are then welded to the chassis.

Ride height is a very important measurement for overall vehicle height. The ride height of the suspension unit is determined from the centerline of the axle to the under side of the vehicle chassis. (Fig 2.1).

**Note:** Ensure that ride height is set correctly. If ride height is incorrect this may result in damage to suspension components and affect the trailers performance. Refer to the Trailer Manufacturers recommendations for ride height setting on tractor fifth wheel.

## Features

Shock absorber with integral check strap

9 & 11 Tonne capacity designed for trailers and semi trailers.

Multi-functional bushing with interleaf shims for improved fore/aft stiffness.

Small diameter air spring for improved packaging.

Nominal ride height of 200 - 500mm with 200mm of total travel (100mm jounce and 100mm rebound nominal)

## Principle of Operation

During normal running in a straight line, striking bumps, potholes etc., superb ride characteristics are obtained due to the airsprings providing a very low vertical suspension stiffness at the wheel. This ensures very little shock is transmitted to the chassis/payload, thus minimising structural damage or problems with goods.

During cornering manoeuvres, the axle tube acts as an anti-roll bar and links each trailing arm. The majority of the compliance in roll comes from the multi-functional pivot bush.

Careful design of the damper characteristics and positioning ensures a high degree of damping required to gain the best possible performance from an air suspension.

Modern dynamic analysis methods and testing were used to determine such characteristics and positions.

## Product Compatibilities

### Range

CS9L

CS9T

CS11L

CS11T

### Brake Sizes

QMX, BMX, Elsa 195 & Elsa 2 ACMX TBA

QMX, BMX, ELSA 195 & ELSA 2 ACMX TBA

QMX, BMX, ELSA 195 & ELSA 2 ACMX TBA

QMX, BMX, ELSA 195 & ELSA 2 ACMX TBA

# 2 Introduction

## Ancillary Equipment

### 1. AXLE LIFT FACILITY

An axle lift facility will be available to fit the CS suspension models at a later date, and will be capable of being retrofitted.

### 2. AIRSPRING DUMP FACILITY

ARVINMERITOR recommends that all air suspended trailers without raise/lower valves are fitted with this facility and a kit is available from ARVINMERITOR.

When an air suspended trailer deflates, it can roll forward causing bending and possible collapse of the landing legs. This is caused by wheel rotation as the axle travels up. A good solution to this problem is to fit rocking type landing legs.

### 3. RAISE/LOWER FEATURE

With air suspensions it is possible to raise or lower the chassis to facilitate loading at different dock heights.

ARVINMERITOR offers the Levelride II system to facilitate this requirement.

This is an ARVINMERITOR patented system that is a raise/lower device but with an automatic reset facility triggered by application of the brakes. Upon the first brake application after using the raise/lower system, an electrical signal is sent to the Levelride unit that automatically resets the trailer to its normal ride height. This system eliminates unnecessary damage to the suspension that can occur if the trailer is driven in the raised or lowered position.

### 4. AUTO DROP

When a lift axle is fitted, it is possible to fit a ARVINMERITOR ELMS system or equivalent that enables the lift axle to automatically drop to its unlifted position when the axle load exceeds a predetermined level.

ARVINMERITOR recommends the fitment of this system to remove potential damage to the tyres and running gear, from drivers not resetting the manual system before moving.

### 5. ANTI-VACUUM SYSTEM

Ferry companies require that air suspended trailers are fully exhausted before trailers are loaded aboard ship.

Consequently there is risk that during loading, the rubber side walls of the airspring can become trapped between the internal rubber bump stop and piston and become damaged. Applications that involve a rapid removal of the load (e.g. HucklePak), could also cause the airspring sidewalls to become contracted and result in damage.

These instances can be avoided by using an anti-vacuum system available from ARVINMERITOR. A special quick release valve is fitted to each side of the suspension, which allows air into the system from atmosphere when the airspring pressure falls below atmospheric pressure, thus preventing the sidewalls from collapsing.

## 2 Introduction

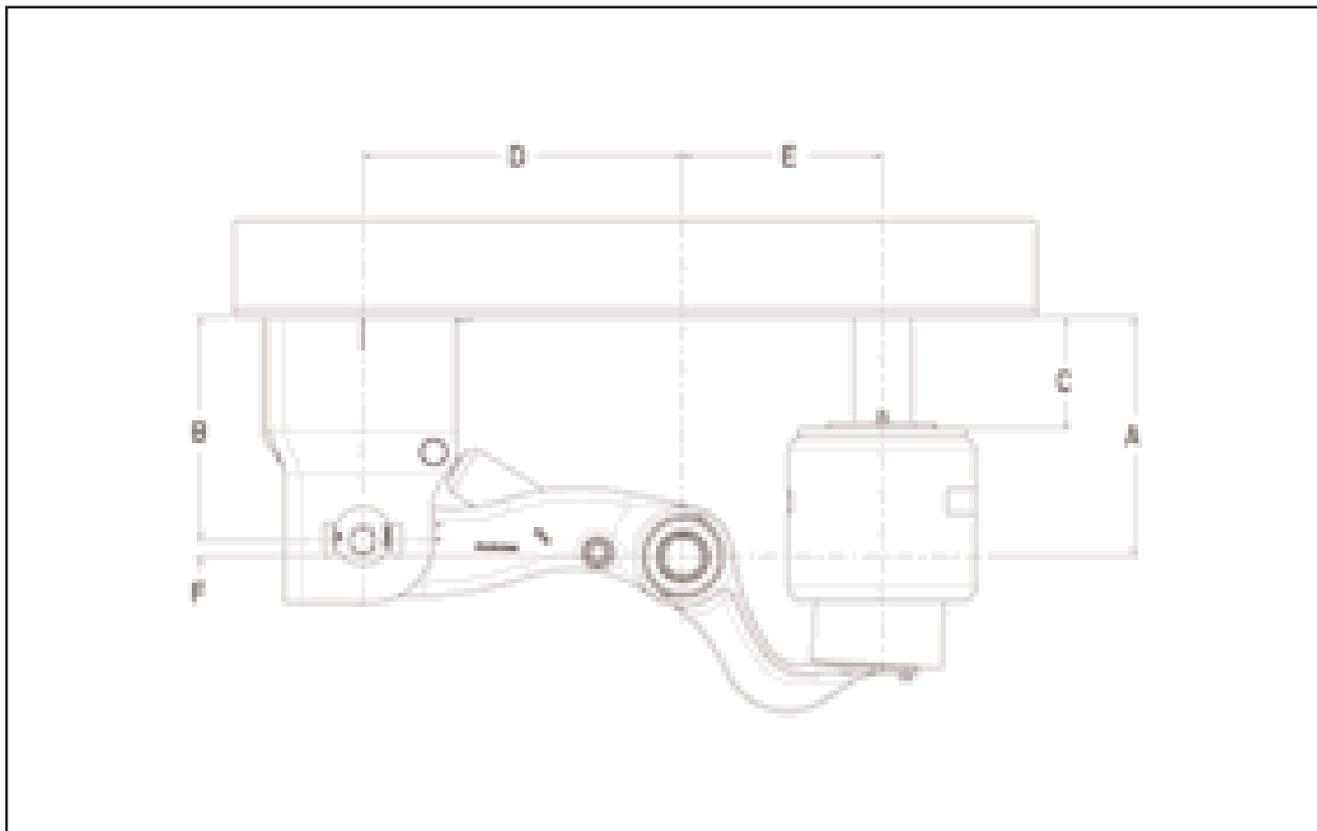


Fig 2.1

### Important Suspension Parameters

#### A. RIDE HEIGHT

This is the distance from the centre of the axle to the underside of the chassis.

#### B. FRAME BRACKET HEIGHT

#### C. AIRSPRING PEDESTAL HEIGHT

#### D. PIVOT TO AXLE CENTRE LINE

This is the distance from the pivot centre in the frame bracket to the centre of the axle tube.\*

#### E. AXLE CENTRE TO AIRSPRING CENTRE LINE

This is the distance from the axle tube centre to the centre of the airspring pedestal.\*

#### F. AXLE TO CENTRE LINE TO PIVOT BUSH CENTRE.

**NOTE:** Refer to ARVINMERITOR installation drawings CD or contact ARVINMERITOR Technical Sales Department for allowable options and recommendations.

\* Both dimension 'D' and 'E' must be measured when the axle is in the ride height position and dimension 'A' is set.

## 2 Introduction

### Identifying the Suspension Type

#### Low Mount Range Exploded View

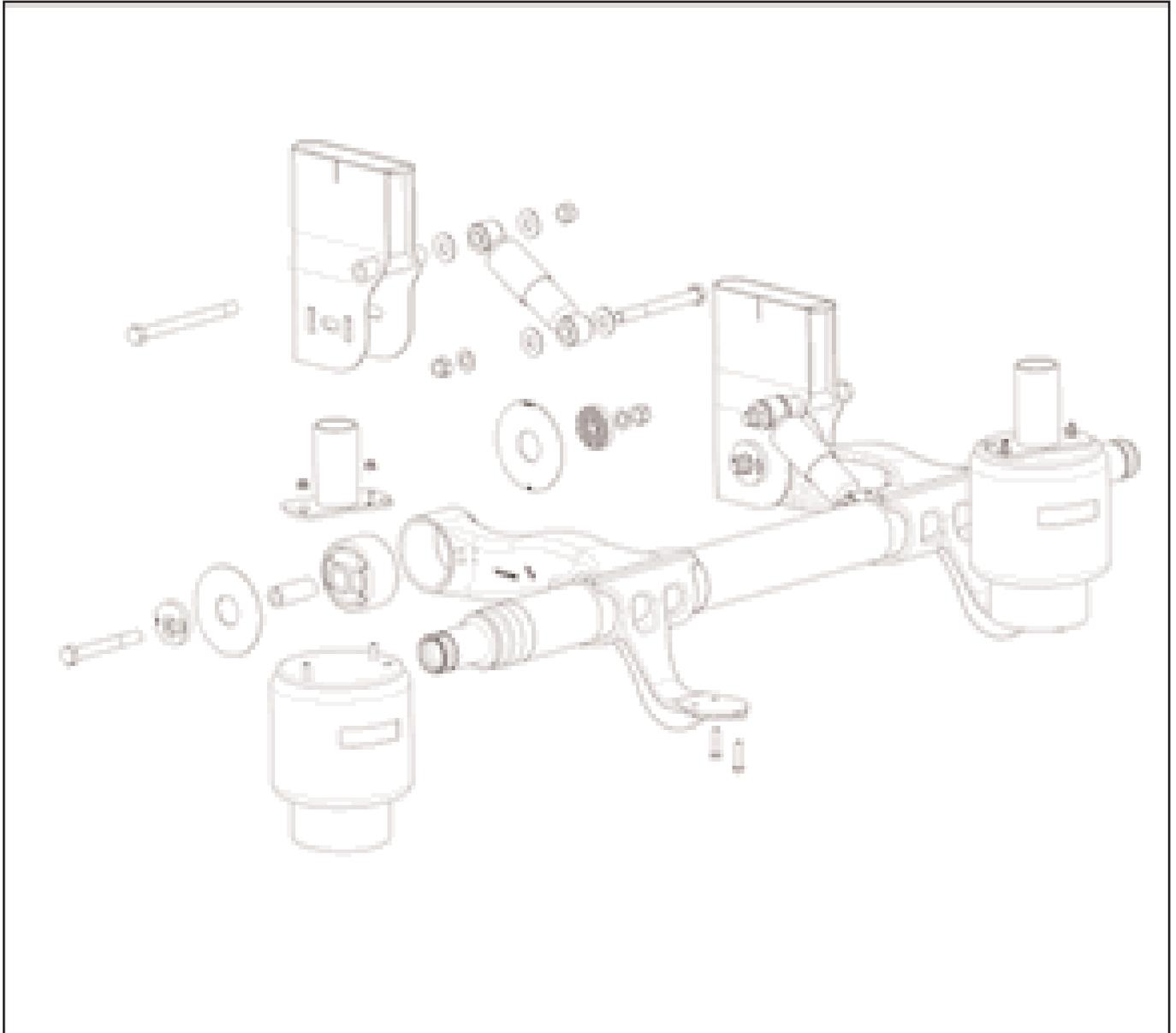


Fig 2.2

- |   |                           |    |                          |
|---|---------------------------|----|--------------------------|
| 1 | AXLE ASSEMBLY             | 8  | ECCENTRIC ALIGNMENT BOSS |
| 2 | TRAILING ARM SUSPENSION   | 9  | SHOCK ABSORBER BOLT      |
| 3 | PIVOT BUSHING             | 10 | HANGER BRACKET           |
| 4 | PIVOT BUSH SLEEVE         | 11 | SHOCK ABSORBER           |
| 5 | WEAR WASHER               | 12 | AIR SPRING PEDESTAL      |
| 6 | CONCENTRIC ALIGNMENT BOSS | 13 | AIR SPRING               |
| 7 | PIVOT BOLT                |    |                          |

## 2 Introduction

### Top Mount Range Exploded View

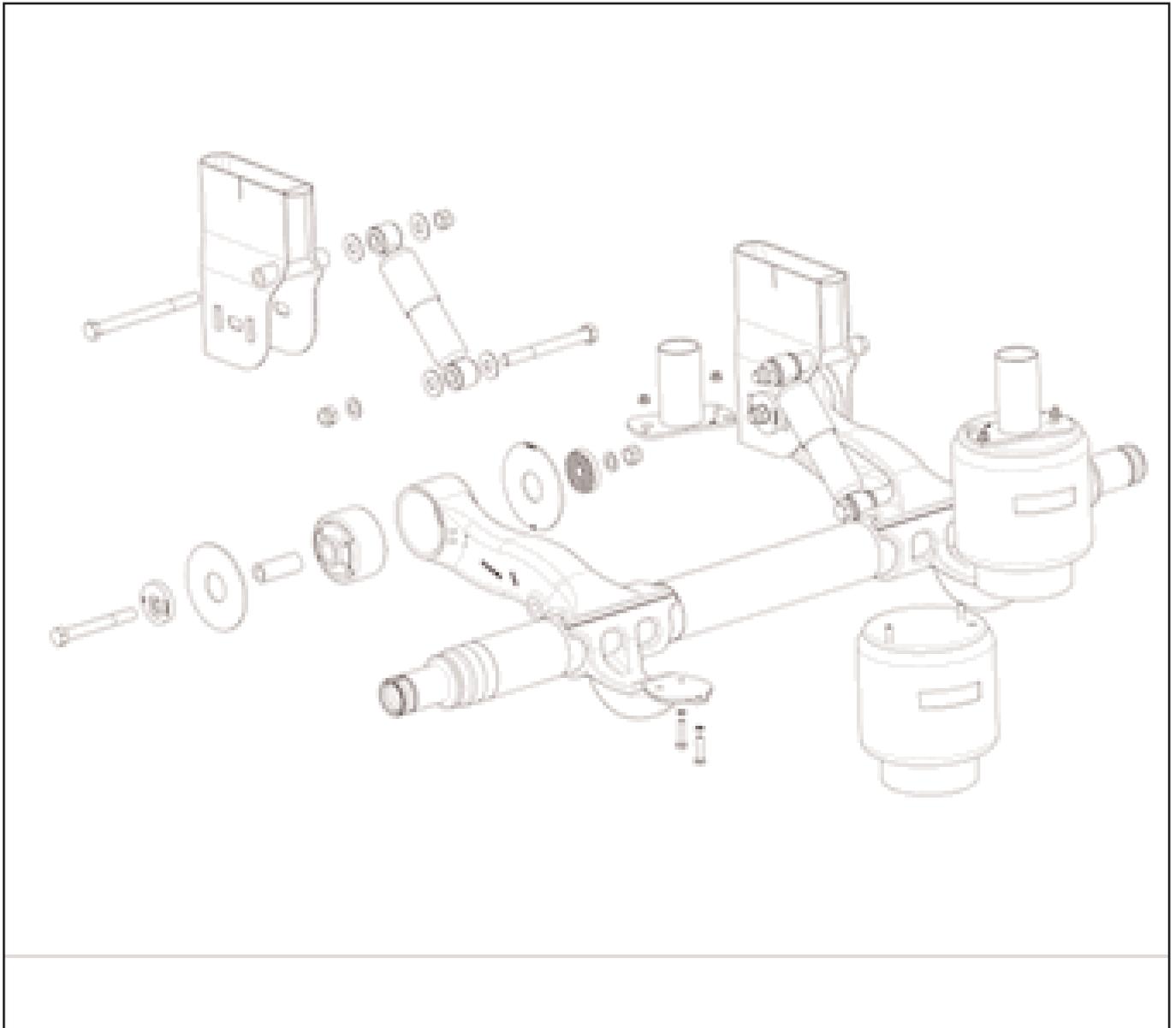


Fig 2.3

1	AXLE ASSEMBLY	8	ECCENTRIC ALIGNMENT BOSS
2	TRAILING ARM SUSPENSION	9	SHOCK ABSORBER BOLT
3	PIVOT BUSHING	10	HANGER BRACKET
4	PIVOT BUSH SLEEVE	11	SHOCK ABSORBER
5	WEAR WASHER	12	AIR SPRING PEDESTAL
6	CONCENTRIC ALIGNMENT BOSS	13	AIR SPRING
7	PIVOT BOLT		

## 2 Introduction

### Identification Plate Details

The suspension type can be determined by viewing the details in the type box "A" as shown (Fig 2.4)



Fig 2.4



## Inspection & Maintenance

3

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# 3 Inspection & Maintenance



## CAUTION

If any welding is done around the suspension and axle running gear, then suitable precautions should be made to protect the running gear from weld spatter. Failure to do so may result in premature failure of running gear components.

Ensure that welding earth clamps or connectors are not connected to any part of the suspension and axle running gear.



## WARNING

**To prevent serious eye injury, always wear safe Eye protection when you perform vehicle maintenance or service.**

### Before Entering Service

**IF THE OPERATOR IS IN ANY DOUBT ABOUT THE SAFETY OF THE VEHICLE, THEN IT SHOULD NOT BE OPERATED AND QUALIFIED ADVICE SHOULD BE SOUGHT.**

Check the suspension and brake systems operate correctly.

Check the suspension air system for leaks by charging the system with air and testing all joints and fittings using soapy water.

Ensure the suspension ride height is correctly set, by referring to the **Ride Height Adjustment details in Section 2.**

If an axle lift system is fitted, operate the lift system to check it operates correctly and observe the extra lift cylinders attached to the levelling valve arms to ensure they function.

Carry out a visual inspection of all suspension and brake system pipe work to ensure no possibility of fouling or rubbing against each other or other components.

Check the brake system operates correctly.

Check the operation of all optional equipment fitted. If any doubt or problems arise refer to the appropriate service manual or seek qualified advice.

### Inspection



## WARNING

**Check fastener torque values, tighten loose fasteners and replace damaged or missing fasteners. Loose, damaged or missing fasteners can cause loss of vehicle control, death, serious personal injury and damage to components.**

Inspect air suspension components, height control valve and axle at regular intervals during normal operation and each time the trailer is serviced.

Before each trip: Visually inspect the suspension system and listen for any leaks.

**Perform the following inspections after the first 1600 km (1000 miles) of operation and at normal service intervals or annually thereafter as a minimum.**

1. Check fastener torque values, tighten loose fasteners and replace damaged or missing fasteners.
2. Inspect all upper and lower air spring and damper nuts and bolts for looseness and movement. Tighten any loose nuts and bolts to the correct torque value as specified in **Section 8.** Thereafter, inspect the suspension components each time the trailer is serviced or as specified above.
3. Inspect all height control valve nuts, bolts and linkage for looseness and movement. Tighten any loose nuts and bolts to the correct torque value as specified in **Section 8.** Thereafter, inspect the suspension components each time the trailer is serviced or as specified above.
4. Inspect Pivot bolts for looseness and movement. Align/Track the axle before tightening any loose nuts and bolts to the correct torque value as specified in **Section 8.** Thereafter, inspect the suspension components each time the trailer is serviced or as specified above.

# 3 Inspection & Maintenance

## Maintenance



### WARNING

**Check fastener torque values, tighten loose fasteners and replace damaged fasteners. Loose, damaged or missing fasteners can cause loss of Vehicle control, serious personal injury and Damage to components.**

1. Inspect for, broken or missing fasteners. Repair or replace as needed. Refer to **Section 8** for correct Torque specifications.
2. Inspect welds for cracks at the axle, hanger bracket and suspension trailing arm.
3. Inspect bushings for free play, use a crow bar to check for looseness or free play. Replace bushings if there are any signs of excessive vertical movement.
4. Inspect the rubber bellows of the air spring for any cuts or abrasions. Replace the air spring immediately if it is cut or damaged in anyway.



### CAUTION

**The Air Spring surface must be free of interference or obstructions by items such as tyres, loose steel and brake chambers etc... Damage to components can result from abrasion.**

5. Check for obstructions or interference to the air spring surface that can lead to damage to the air spring. Relocate and secure items, such as air hoses, that can contact the air spring.
6. Check for leaks in the air lines, at the air spring bead plate, piston and mounting studs. Replace air lines, fittings or air springs that leak. **Refer to Section 4** for replacement details.

7. Inspect shock absorbers for worn bushings, oil leaks and dents. Check that the mounting holes have not become enlarged.
8. Inspect the structure of the suspension including:
  - Hanger Brackets
  - Trailing arm suspension
  - Shock absorber mountings
  - Axle welds
  - Brake interference (cam or chamber)
  - Hanger bracket bracing (where fitted)
  - Alignment Bosses



### WARNING

**Verify that people are clear of the trailer before you inflate or deflate the air springs. The air suspension has various pinch points that can cause serious personal injury.**



### CAUTION

**Do not add lubrication or cleaning solvents to the air system. These additives can contaminate the air system and damage fittings. Damage to components will result.**

9. Inspect the height control valve for air leaks and cracked lever arm housing. If air leaks or cracks are detected, replace the height control valve.

## Lubrication

The 'CS' range of suspensions does not require lubrication, only lubrication is required when installing replacement pivot bushes.

**NOTE:** Only use lubricant supplied in the service kit when fitting new pivot bushes.

# 3 Inspection & Maintenance

## Ride Height Adjustment



### WARNING

**Overall trailer height must not exceed recommended limits for territories of application for the vehicle to clear bridge underpasses during operation. Serious personal injury and damage to components will result.**

This is an area that is probably most unfamiliar to the trailer operator and the one that will cause most problems if the following parameters are not adhered to.

Too high a ride height can cause more roll motion too low means that there will be loss of axle travel (contacting bump stop) during arduous use.

### Parameters for setting ride height:

1. The trailer should be on level ground.
2. It should preferably be connected to the tractor unit to be used and in a straight line with the unit, or set at the correct kingpin height. Refer to chassis identification plate or contact manufacturer.
3. All the trailer brakes should be off.
4. There should be an air supply of at least 6.5 bar.
5. The trailer should be unladen .
6. If the trailer has been running it should be given at least 10 minutes to "settle down".
7. The valve should be set on increasing height as there is a "dead band" in the actuating stroke of the valve.

8. The ride height must be set on the axle that has the levelling valve.
9. If the trailer is fitted with a lift axle this should be in the down position.

Once an initial setting of the ride height has been made it should be checked by measuring from the top of the axle tube to the underside of the trailer frame, and comparing with the nominal ride height less 63.5mm (tube radius) (Figs 3.1 & 3.2).

The nominal ride height is specified by the trailer builder and is shown on the axle or chassis identification plates.

If the ride height is found to require resetting the following procedure should be used :-

Lengthen or shorten the linkage rods which connect the levelling valve arm to the axle (giving a proportional increase or decrease in the ride height) by slackening the two screws that pinch the rubber eye ends onto the drop bar and pulling the bar in or out of the rubber. If there is insufficient adjustment i.e. the bar is in danger of coming out of the rubber, then further adjustment can be gained by slackening the bolts holding the levelling valve to the bracket and repositioning the valve within the holes. Bending of the levelling valve actuating arm is not recommended.

If the ride height is found to be above the recommended setting, the height should first be dropped below the required setting and then increased back to the nominal ride height, thus avoiding the "dead band" in the actuating stroke of the valve. This can be done by shortening the linkage rod and bleeding air from the suspension by slackening the air pressure connection on top of the airsprings. This method also applies to situations where the ride has accidentally been taken above the recommended setting.

**NOTE:** Some care is needed when checking the ride height as a false reading may be obtained after tipping a load etc. The levelling valve emits and exhausts air very slowly, so time should be allowed for it to react once adjusted.

# 3 Inspection & Maintenance

The valve emits air slightly faster than it exhausts. This is so that large volumes of air are not constantly bled off during normal suspension travel but still allowing a relatively quick reaction to an increase in load or when the trailer is being brought up to operating height from flat.

## Determining the correct ride height

Measure ride height from the top of the axle to the bottom of the chassis rail. See diagram (Fig 3.1) and chart (Fig 3.2) for setting dimensions. This can be found on the axle I.D. plate or contact ARVINMERITORs Technical Sales Department.

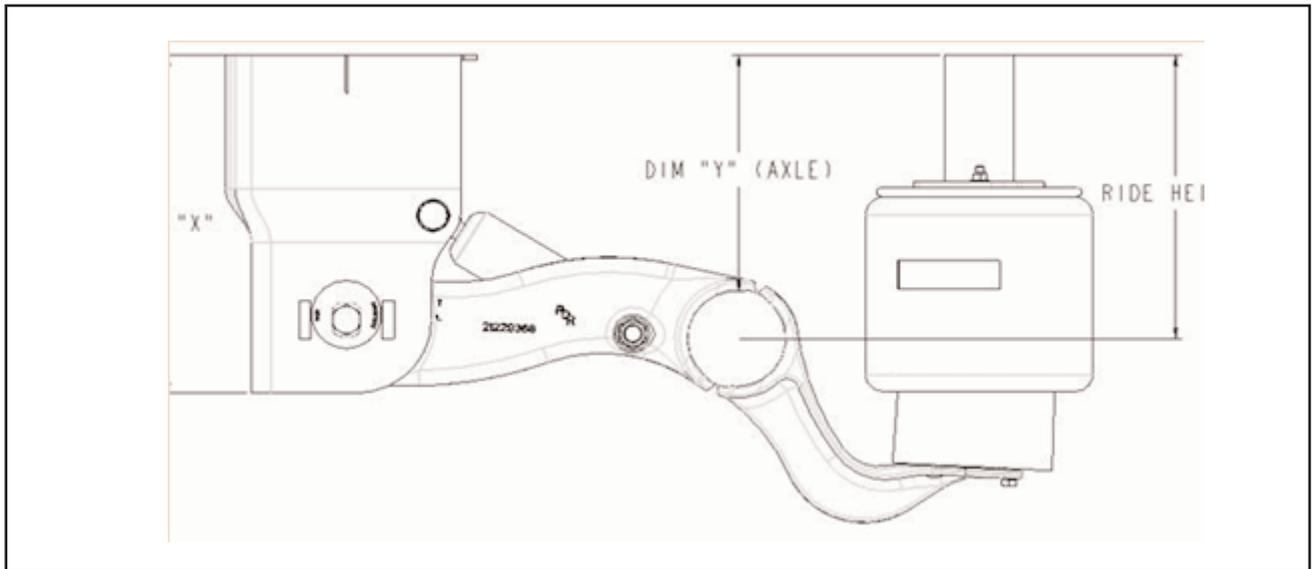


Fig 3.1

No	DIM "X"	DIM "Y"	Ride Height	Model	Bush Alignment	Damper P/No.
1	272	136.5	200	Lowmount	L	21228392
2	297	161.5	225	Lowmount	L	21228392
3	322	186.5	250	Lowmount	L	21228392
4	347	211.5	275	Lowmount	L	21228392
5	372	236.5	300	Lowmount	L	21228392
6	397	261.5	325	Lowmount	L	21228392
7	422	286.5	350	Lowmount	L	21228392
8	447	311.5	375	Lowmount	L	21228392
9	272	261.5	325	Topmount	T	21228930
10	297	286.5	350	Topmount	T	21228930
11	322	311.5	375	Topmount	T	21228930
12	347	336.5	400	Topmount	T	21228930
13	372	361.5	425	Topmount	T	21228930
14	397	386.5	450	Topmount	T	21228930
15	422	411.5	475	Topmount	T	21228930
16	447	436.5	500	Topmount	T	21228930

Fig 3.2



# Replacement & Adjustment

# 4

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pg. 24	Fitting New Air Spring
pg. 26	Shock Absorber Replacement
pg. 29	Pivot Bush Removal
pg. 33	Pivot Bush Replacement

# 4 Replacement & Adjustment

## CS International Air Spring Range

### WARNING

Park the un-laden vehicle on a flat surface and block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip or fall over. Serious personal injury can result.

### Air Spring Replacement

#### Removal

- 1 Expel all air from the system (Fig 4.1).



Fig 4.1

2. Remove the air inlet pipe from the push to connect fitting (Fig 4.2).



Fig 4.2

3. Using a 19mm spanner remove the M12 nuts from the top of the air spring (Figure 4.3) and the two M12 bolts and washers securing the airspring piston to the trailing arm (Fig 4.4).

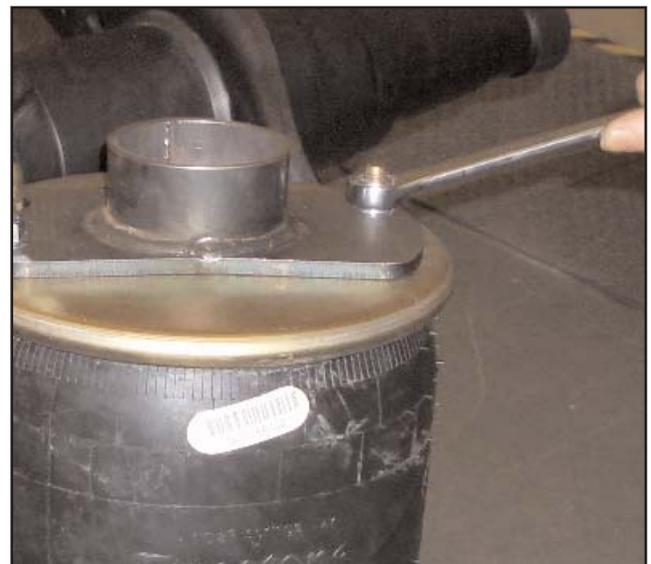


Fig 4.3

4. Remove the complete airspring by compressing it slightly if required.



Fig 4.4

# 4 Replacement & Adjustment

5. Remove the air fitting (Fig 4.5).



Fig 4.5

3. Align and locate the air inlet and mounting stud respectively in the slot and hole on the pedestal (Fig 4.7).



Fig 4.7

## Fitting a New Air Spring

1. Fit the air fitting (Fig 4.6).



Fig 4.6

2. Compress the new air spring and slide into position between the trailing arm platform and the air spring pedestal.

**T** 4. Align and locate the lower mounting bolt holes with the relevant holes in the trailing arm platform (Fig 4.8). Fit new retaining bolts and washer and tighten to a torque of 70Nm.



Fig 4.8

## 4 Replacement & Adjustment

5. Fit new nuts to the upper mounting studs and tighten to a torque of 41Nm (Fig 4.9)



Fig 4.9

6. Connect the airline (Fig 4.10).



Fig 4.10

7. Pressurise the air system (Fig 4.11).



Fig 4.11



### CAUTION

The air spring and connecting pipes must be free from interference or obstruction by tyres, metal components etc. Damage to components through abrasion will result in premature failure.

8. Check that tyres, metal components etc. do not interfere with the air spring, particularly the rubber components.

9. Check all disturbed connections for air leaks.

10. Raise the trailer and remove the safety stands.

11. Verify that the ride height of the trailer is correct. Refer to the trailer OEM's specification for the correct ride height. Adjust accordingly following the procedure detailed in the **Section 3 Ride Height Adjustment**.

# 4 Replacement & Adjustment



## WARNING

Verify that people are clear of the trailer before you inflate or deflate the air springs. The air suspension has various pinch points that can cause serious personal injury.

Park the un-laden vehicle on a flat surface and block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip or fall over. Serious personal injury can result.

Check Shock bushings for looseness and wear. Replace worn or damaged bushes or shock absorbers. Worn or damaged shock absorbers can lead to reduced ride and handling performance of the trailer.

## Shock Absorber Replacement

### CS International Shock Absorber

**NOTE:** Ensure that fitment of replacement Shock absorber is with the correct size Shock absorber, i.e. L or T type Shock absorber (Figure 4.12).

Model	Bush Alignment	Damper P/No.
Lowmount	L	21228392
Topmount	T	21228930

Fig 4.12

# 4 Replacement & Adjustment

## Removal

Identify the specific shock absorber that is damaged or leaking.

1. With the trailer in its normal ride height (un-laden) using a 36 mm socket and ring spanner, remove the nuts and washers from the top and bottom damper bolts (Fig 4.13).



Fig 4.13

2. Withdraw both the upper and lower mounting bolts (Fig 4.14 and 4.15) and remove the damper.



Fig 4.14



Fig 4.15

# 4 Replacement & Adjustment

## Replacement

1. Locate the top eye of the damper and fit the mounting bolt with a flat washer behind the nut. Ensure the bolt head is outboard (Fig 4.16). Fit a new nut and washer.



Fig 4.16

2. Rotate the damper and slowly pull it to extend its length until the lower eye aligns with the mounting hole in the trailing arm. Fit the lower mounting bolt, flat washers and new nut. Ensure the bolt head is inboard.



3. Using a 36mm socket and ring spanner torque the two nuts to 500 Nm (Fig 4.17).

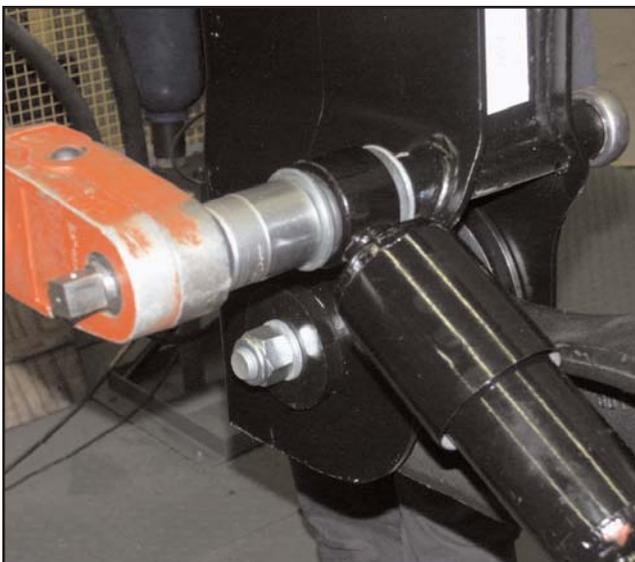


Fig 4.17

**NOTE:** Ensure suspension is at the ride height setting before fully tightening to torque.

## CS International Pivot Bush Range

**NOTE:** Ensure replacement Pivot Bush is in line with the correct alignment pip, either T (TOP mount) or L (LOW mount) Fig 4.18.

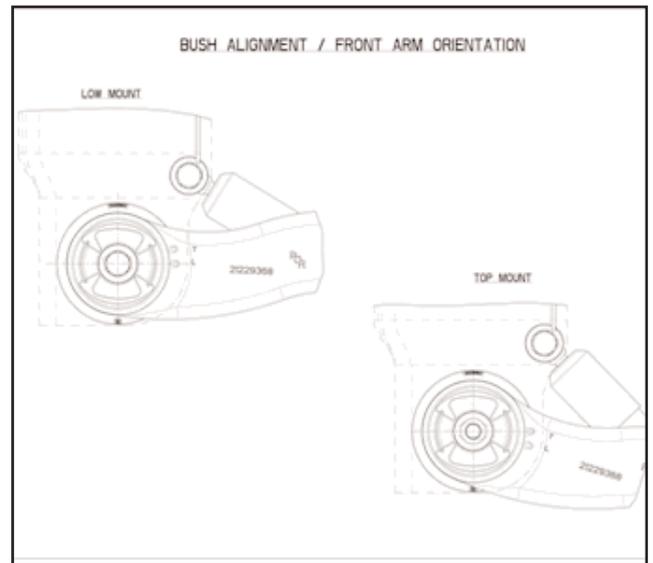


Fig 4.18



## WARNING

**Check pivot bushings for looseness and wear. Replace worn or damaged pivot bushings. Worn bushings can loosen and cause the trailer to wander during operation. Serious injury and damage to components can result.**

Verify that people are clear of the trailer before you inflate or deflate the air springs. The air suspension has various pinch points that can cause serious personal injury.

Park the un-laden vehicle on a flat surface and block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip or fall over. Serious personal injury can result.

## 4 Replacement & Adjustment

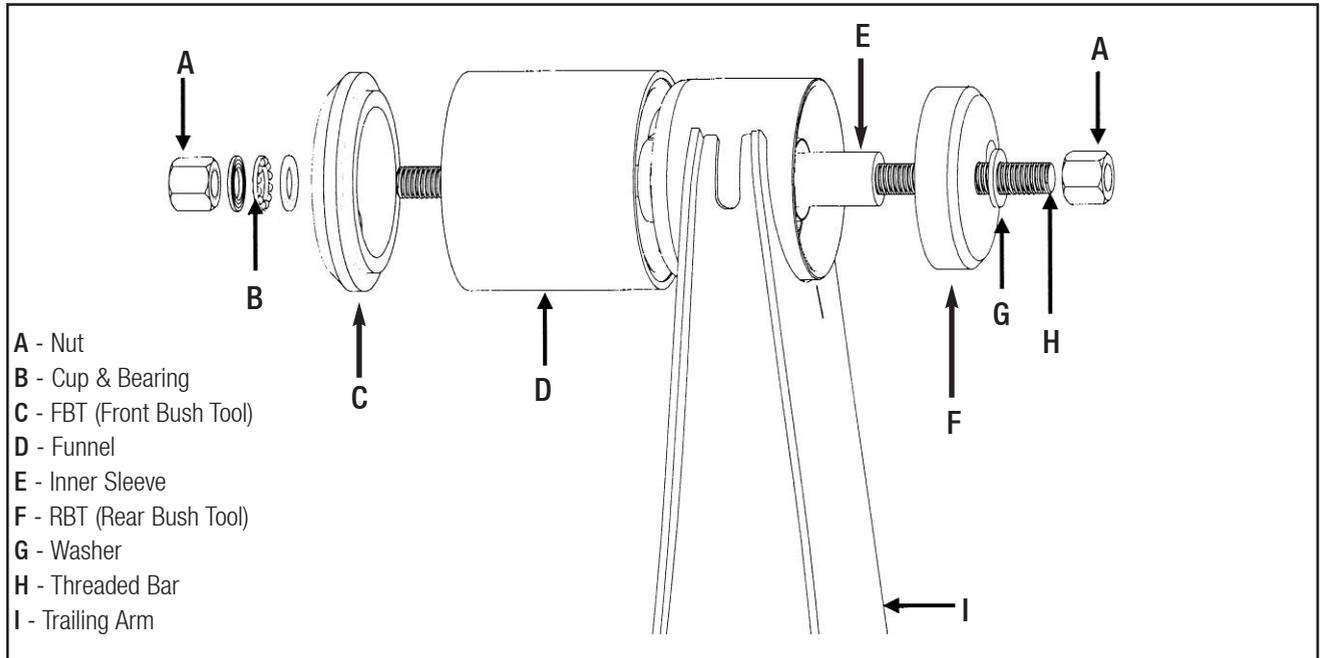


Fig 4.19

**NOTE:** This following procedure requires the assistance of another person.

Before removal and fitment of pivot bushes

A genuine ARVINMERITOR pivot bush replacement kit is required.

A pivot bush removal and insertion tool (Part No. ?????) will be required (Fig 4.19).

**NOTE:** Check the position and orientation of the original bush before removing. This will provide a guideline when fitting a new bush

### Pivot Bush Removal

1. Lower the landing gear.
2. Support the REAR of the trailer frame.
3. Set the parking brake.
4. Exhaust air pressure from the suspension air springs.
5. Support the axle and remove the wheel/(s) to access the pivot bolts.
6. Remove the top mounting shock absorber bolt from both hanger brackets and withdraw the bolt back into the hanger bracket. This will allow the trailing arm to articulate down when the pivot bolts are removed.

## 4 Replacement & Adjustment

7. Remove the pivot bolts and alignment bosses from the hanger bracket (Figs 4.20 & 4.21).



Fig 4.20



Fig 4.21



### WARNING

Ensure that the axle support is secure during this operation as the arcuate motion may cause the axle to move backwards (Fig 4.22).

8. Carefully remove the trailing arm from the hanger bracket (Fig 4.23) and pull down when clear (Fig 4.24). **DO NOT** lever off the brake chamber as shown (Fig 4.25).



Fig 4.22



Fig 4.23

## 4 Replacement & Adjustment



Fig 4.24

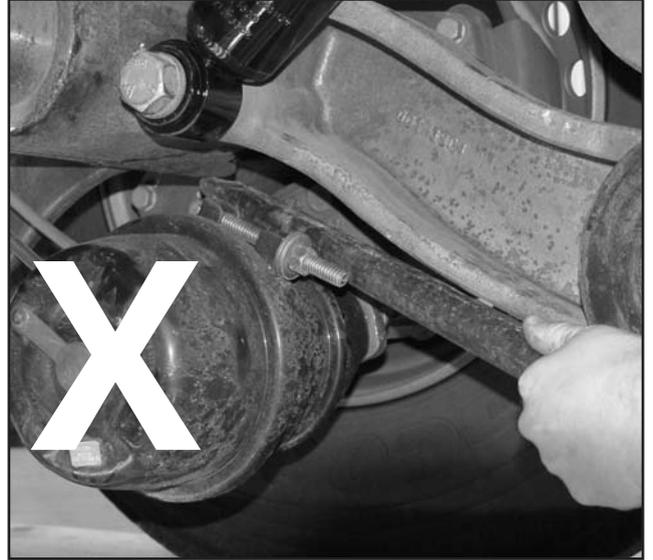


Fig 4.25

9. Remove the wear washers and the steel inner sleeves from the pivot bushes (Figs 4.26 & 4.27).



Fig 4.26



Fig 4.27

10. Fit the bush replacement service tool to trailing arm. When using the service tool ensure the tool components are assembled as shown in (Fig 4.19).

11. Insert 'inner sleeve' into the pivot bush central tube.

## 4 Replacement & Adjustment

12. Press the Front Bush Tool (FBT) "C" against the pivot bush and insert the threaded bar "H". Fit washer "G" and nut "A" to draw bar and secure to FBT "C" (Fig 4.28).



Fig 4.28

13. Push funnel "D" onto the trailing arm outer tube opposite the FBT "C" (Recess facing towards pivot bush) (Fig 4.29).

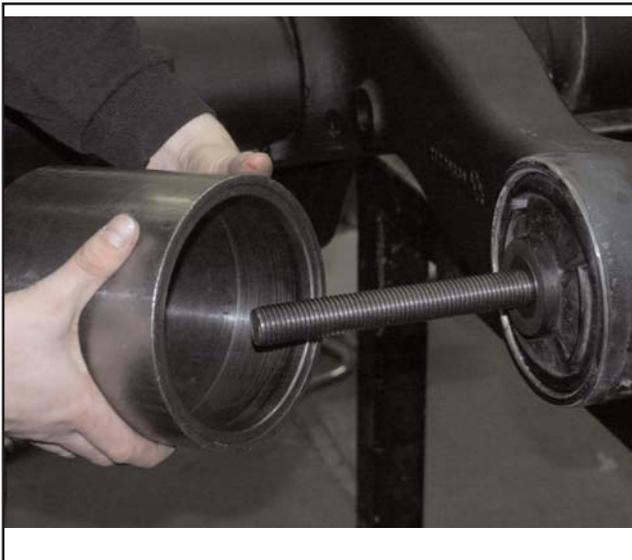


Fig 4.29

14. Attach the Rear Bush Tool (RBT) "F" to the funnel "D" and secure in place with the bearing cups, bearing race "B" and nut "A" (Fig 4.30)

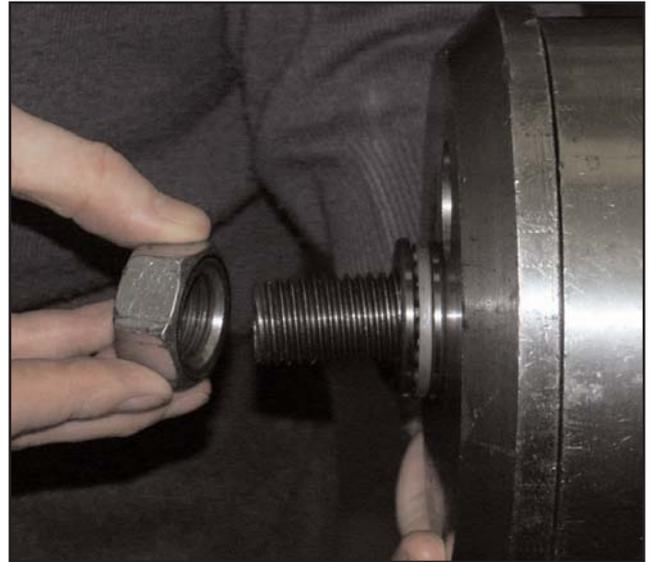


Fig 4.30

15. Apply turning moment to the nut "A" at the bearing end, continue turning the nut until the pivot bush is drawn completely into the funnel "D" (Fig 4.31).



Fig 4.31

## 4 Replacement & Adjustment

16. Dismantle the tooling and remove the pivot bush from the funnel "D" (Fig 4.32).



Fig 4.32

17. Remove any debris that may be left from the trailing arm outer tube.

### Pivot Bush Replacement

1. Apply P-80 gel solution around the pivot bush (Fig 4.33), funnel "D" (Fig 4.34) and trailing arm outer tube (Fig 4.35).

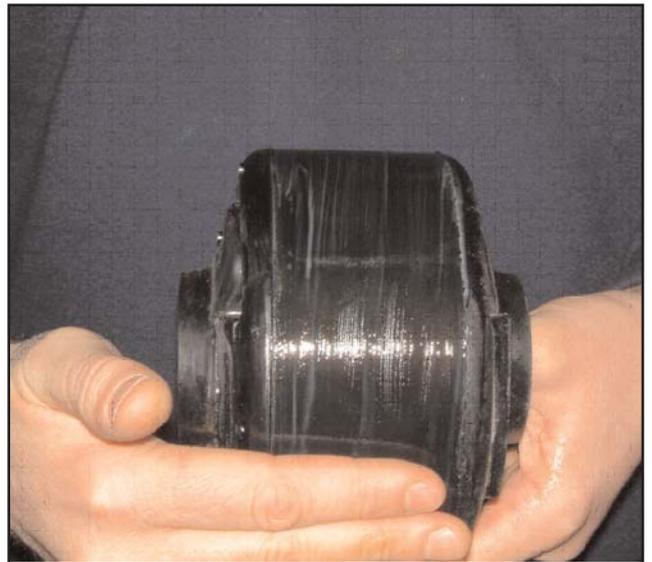


Fig 4.33



Fig 4.34

## 4 Replacement & Adjustment



Fig 4.35

2. Insert the replacement pivot bush into the funnel "D" and align the dots on the pivot bush with the marked line on the funnel (Fig 4.36)



Fig 4.36

3. Fit bush tool to trailing arm as shown (Fig 4.37).

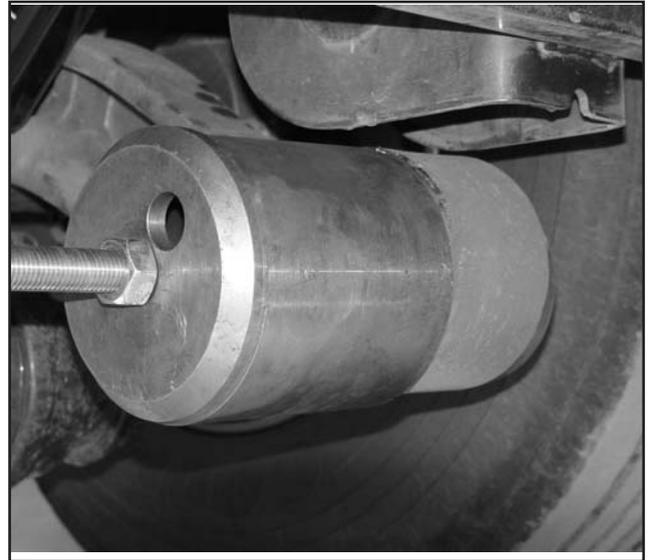


Fig 4.37

4. Insert inner sleeve "E" into the pivot bush central tube.

5. Press the Rear Bush Tool (RBT) "F" against the trailing arm outer tube and insert the threaded bar "H". Fit washer "G" and nut "A" to draw bar and secure to RBT "F".

6. Push funnel "D" onto the trailing arm outer tube opposite the RBT "F" (Recess facing towards outer tube). Attach the FBT "C" to the funnel "D" and secure in place with the bearing cups, bearing race "B" and nut "A".

7. Rotate the funnel "D" so that the mark is aligned to the mark on the trailing arm (Fig 4.38)

8. Apply turning moment to the nut "A" at the bearing "B" end, continue turning the nut until the pivot bush is drawn completely into the trailing arm outer tube. The turning action will lock out when the pivot bush mates up with the RBT "F".

9. Back off the nut and dismantle the pivot bush tooling. Check for any damage to the membrane of the pivot bush.

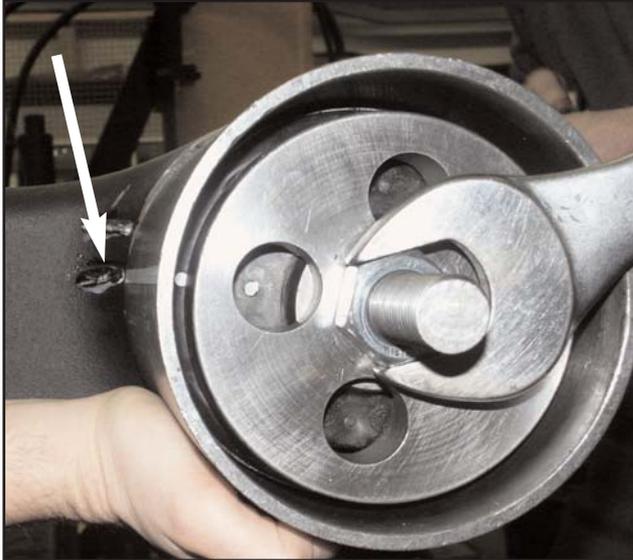


Fig 4.38

10. Insert steel inner sleeve "X" into the pivot bush central tube. Fit the replacement wear washers "Y" to either side of the pivot bush (Fig 4.39).

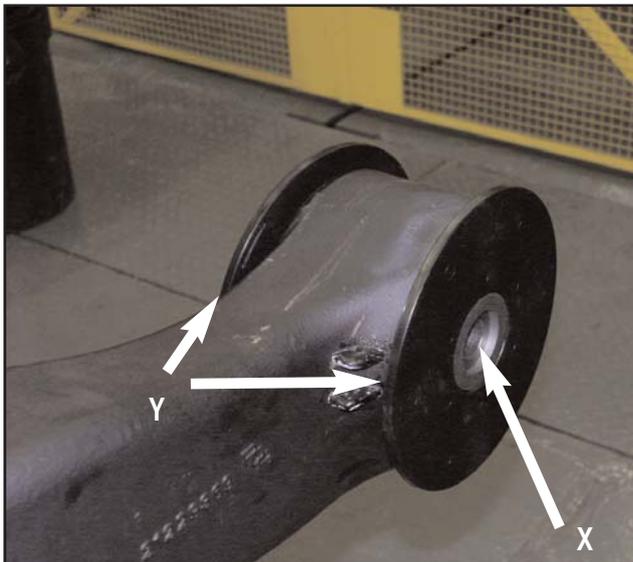


Fig 4.39

11. Refit the trailing arm to the hanger bracket (Fig 4.40) and insert new pivot bolts.



Fig 4.40

Do not torque the pivot nuts to final torque until the axle is aligned and the trailer is at the ride height with the wheels on. See **CS Axle Alignment - Section 6** and refer to the **Ride Height Adjustment details - Section 3**.

12. Refit the shock absorber top mount. Do not torque the Shock absorber nuts to final torque until the axle is aligned and the trailer is at the ride height with the wheels on. See **CS Axle Alignment Section 6** and refer to the **Ride Height Adjustment details - Section 3**.

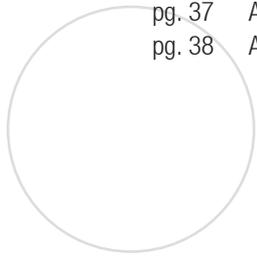
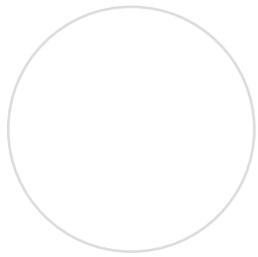
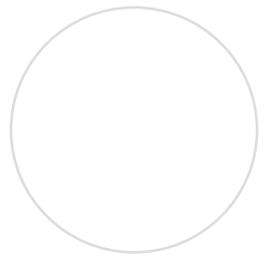
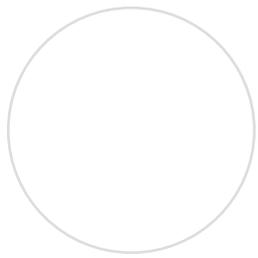
13. Refit the wheel (s) pressurise the air springs and set ride height.



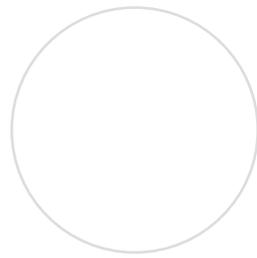
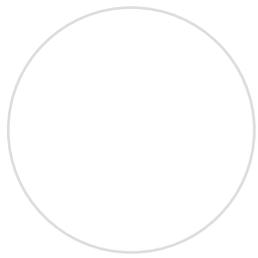
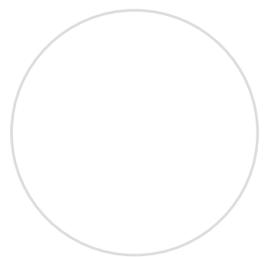
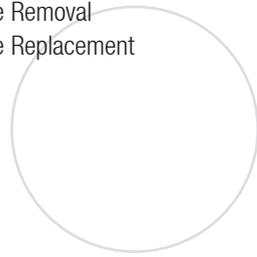
14 Torque all nuts and bolts to final tightening torque. Refer to **Section 8** for torque specification table

# Axle Removal & Replacement

5



pg. 37 Axle Removal  
pg. 38 Axle Replacement



# 5 Axle Removal & Replacement

There are a number of ways of removing the axle depending on how much of the suspension is to be dismantled. The following procedure however, is recommended assuming the suspension is to be left in place.

## Removal

1. Ensure no air is left in the system.

2. If spring brakes are fitted they should be released and constrained using a caging tool.

3a. **Drum Brake Trailers** - Remove the split pins and clevis pins securing the brake chambers to the slack adjuster levers.

3b. **Disc Brake Trailers** - Remove the brake pipes, leaving the chamber attached to the calliper.

4. If the axle is used to locate the bottom arm, with the suspension height control valve, remove the eye coupling on the levelling valve arm from the pin on the axle (Figure 5.1).



Fig 5.1

5. Jack up the trailer and support it under the chassis to take the weight of the axle to be removed.

6. Support the axle to be removed on stands such that a pump trolley or similar device can be slid between them lower the axle once it is unbolted from the suspension.

7. Remove the wheels from the axle.

8. Using a 36 mm spanner and socket, remove the nut and washer from the lower damper bolt and withdraw the bolt. Slacken the top damper bolt nut and pivot the damper upwards to clear the axle and secure it to the chassis.

9. Remove the airspring as detailed in **Section 3**.

For single axle trailers and rear axles of tandems and tri-axles proceed as follows;

10. Using a 36 mm spanner and socket, slacken the two main pivot bolt nuts just enough to allow the arms to easily pivot.

11. Slide trolley jacks as required under the axle, jack them up to take the weight of the stands. Remove the stand and lower the jacks. Pull the axle clear backwards and clear of the trailer.

For the front axle of a tandem and the centre or the front axle on a triaxles trailer proceed as follows;

12. Using a 36 mm spanner and socket, remove the two main pivot nuts and washers and remove the bolts ensure the arms are supported to prevent them dropping.

13. Slide trolley jacks as required under the axle and take the axle weight. Remove the axle stands and slide the axle out sideways.

# 5 Axle Removal & Replacement

## Replacement

If the original axle and suspension unit is not refitted, the replacement must be supplied and approved by ARVINMERITOR.

If in doubt contact the ARVINMERITOR Technical Sales Department for detailed recommendations.

1. Lift axle onto trolley jacks and rotate to ensure it's correctly oriented.
2. For single axle trailers and rear axles of tandems and triaxles slide the axle and suspension unit sideways into position, and place the arms eye ends in the position in the frame brackets.
3. Align the holes in the arm bushes - **ENSURE NO GREASE IS ON THE THREADS.** Fit the bolts and new washers and nuts and tighten such that the arms can pivot easily.

Continue for all models as follows:

4. Lower/raise the axle and trailing arm until the hole in the lower damper bush is aligned with the location hole in the arm, if the old bolts are being re-used, ensure they are clean (especially the threads) and undamaged - **ENSURE NO GREASE IS ON THREADS.**

Re-fit the bolts.

5. Fit new nuts and washers and nip up.

6. Lower/raise the axle and arms until the axle is in the ride height position (see section 1). **IT IS VERY IMPORTANT THAT THE DAMPER AND PIVOT BOLTS ARE FULLY TIGHTEND WHEN AXLE IS IN THE RIDE HIEGHT POSITION.** Torque up the top and bottom damper bolts using a 36mm spanner and socket and the pivot bolts. **Refer to torque tables - Section 8.**

7. Drum Brake Trailers-refit the brake chambers on the air chamber brackets and secure using the original nuts if undamaged, ideally new nuts and washers should be used, ensure nuts and washers are clean.

8. Disc Brake Trailers-reconnect the brake pipes.

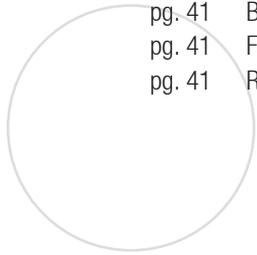
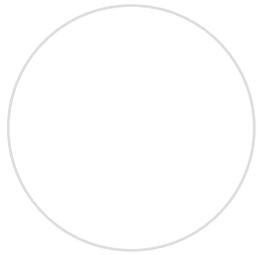
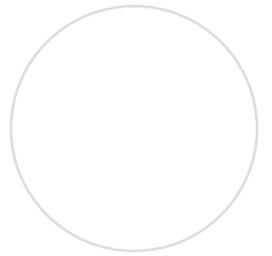
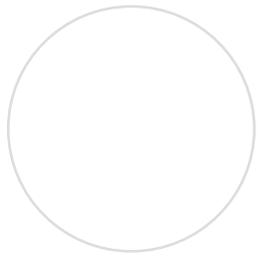
9. Refit the clevis and split pins in the slack adjuster levers and remove the spring cages if spring brakes are fitted. Check the brake adjustment as detailed in the ARVINMERITOR axle service manual.

10. Refit the road wheels and lower trailer chassis and axle off their support stands.

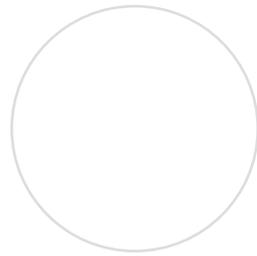
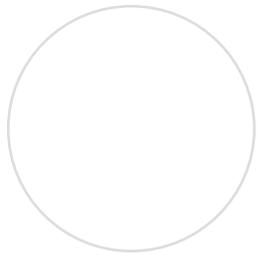
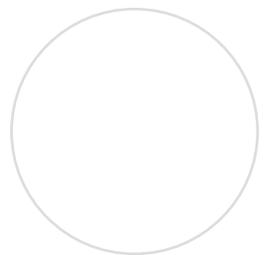
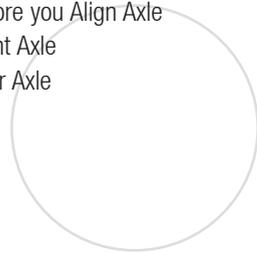


# Axle Alignment (Tracking)

6



pg. 41 Before you Align Axle  
pg. 41 Front Axle  
pg. 41 Rear Axle



# 6 Axle Alignment

This section provides details of how to re-align suspensions if their settings are changed due to other work.

All CS models are available with the patented pivot eye tracking facility. This is re-usable and does not require welding, and offers +/- 7 mm of fore and aft movement.

It is recommended that tracking is performed before painting, and that no debris is left in the clamped faces of the joint.

## Before you align the Axle

1. The trailer must be on a level surface and un-laden.
2. Adjust the trailer landing gear: The height of the king pin should be the same as when the trailer is connected.
3. Support the chassis on suitable axle stands
4. Expel all air from the system.
5. Remove the road wheels.

## Front Axle

1. Verify that the suspension is at the correct ride height. **Refer to Ride Height Adjustment - Section 3**
2. Measure from the king pin to each end of the first axle (measurement **DR** and **DL**. To obtain correct alignment, settings (Figs 6.2 & 6.3).

**NOTE:** Rotate the hub backwards and forwards to ensure that the measurement is the maximum possible.

If Adjustment is required: Proceed to step 3 below. If Adjustment is not required: Proceed to 'Rear Axle' in this section.

**NOTE:** Before you align an axle, ensure the pivot bolt is free to move in the adjustment slot.

3. Using a 36 mm spanner and suitable wrench, loosen the pivot bolts on both sides. Place 36 mm spanner on an outboard boss (eccentric boss) (Fig 6.1), and rotate in desired direction to give an equal measurement on either of the axle to the kingpin.



Fig 6.1

**NOTE:** To obtain correct alignment, the dimensions **DR** and **DL** must be within +/- 3mm at both ends of the axle (Figs 6.2 & 6.3)



Repeat the procedure on the other pivot bolt if required. When the desired measurements have been achieved, tighten pivot bolts to 800 Nm.

## Rear Axle

1. Check the dimension from the centerline of the front axle to the centerline of the rear axle (measurements **AR** and **AL**).
2. To obtain correct alignment, the dimensions must be within +/- 3mm at both ends of the axle. (Figs 6.2 and 6.3). If Adjustment is required: Proceed to step 3 below. If Adjustment is not required: Proceed to step 4.

**NOTE:** Before you align an axle, ensure the pivot bolt is free to move in the adjustment slot.

# 6 Axle Alignment

3. Using a 36 mm spanner and suitable wrench, loosen the pivot bolts on both sides. Place 36 mm spanner on an outboard boss (eccentric boss) (Fig 6.1), and rotate in desired direction to give an equal measurement on either of the axle to the kingpin.

**NOTE:** Align the axle so that measurement **AR** equals measurement **AL** within +/- 3 mm. (Figs 6.2 and 6.3)

Repeat the procedure on the other pivot bolt if required.

**T** 4. When the axle is aligned correctly, tighten the pivot bolts to 800 Nm.

5. Refit the road wheels.

6. Charge the system with air.

7. Apply the parking brake.

8. Remove the chassis stands

9. Reinflate the suspension

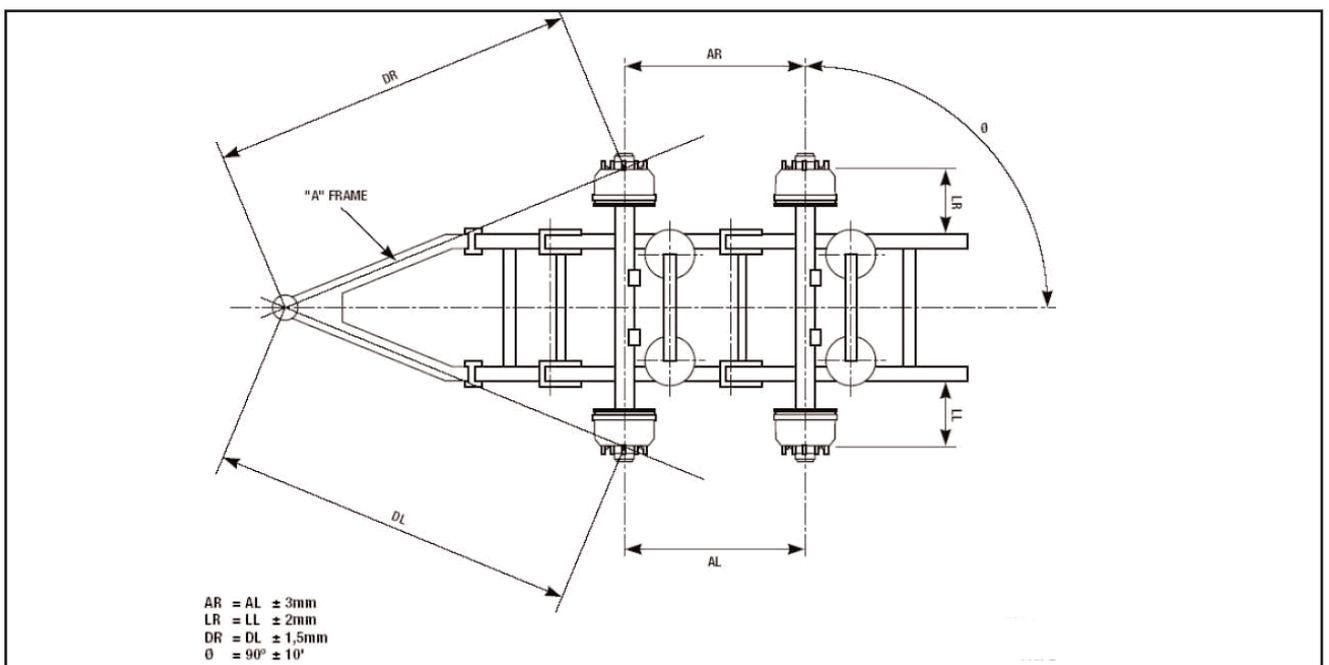


Fig 6.2

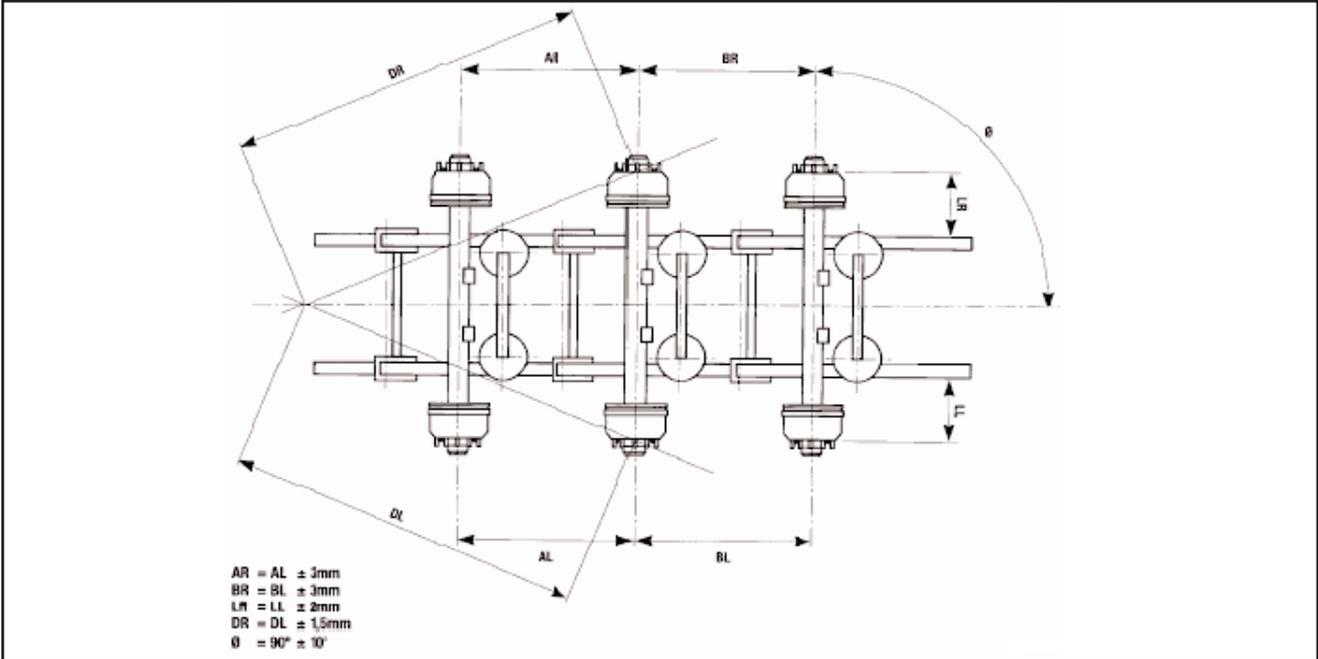


Fig 6.3

# Axle & Suspension Welding Recommendations

**7**

pg. 45 Axle & Suspension Welding Recommendations

## 7 Axle & Suspension Welding Recommendations



### **WARNING**

**To prevent serious eye injury, always wear always wear safe eye protection when you perform vehicle maintenance or service.**

Incorrect weld placement will void ARVINMERITOR's warranty and can reduce the fatigue life of the trailer axle beam and suspension components. Serious personal injury can result.



### **WARNING**

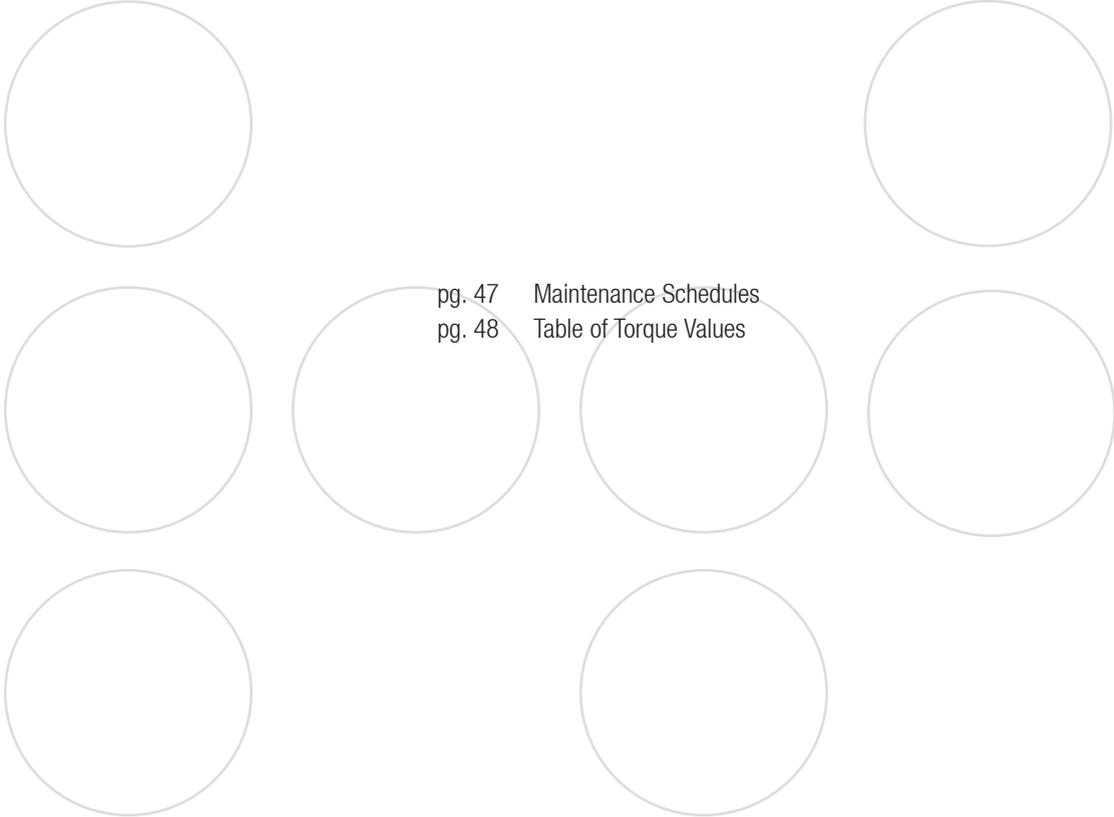
**Incorrect weld placement, or weld spatter, can result in reduced fatigue life of the suspension system, serious personal injury and damage to components.**

For further information refer to the ROR Care website at **[WWW.RORCARE.COM](http://WWW.RORCARE.COM)**

Refer to ARVINMERITOR CS Suspension General Assembly Drawings for further details.

# Maintenance Schedules

8



pg. 47 Maintenance Schedules  
pg. 48 Table of Torque Values

# 8 Maintenance Schedules

## After First 1000 KM

Check all fastener torques and tighten where required according to the values in the table in this section.

Examine all valves and air hose joints for leaks or signs of pipe work rubbing against the chassis or suspension components.

Check the suspension ride height as explained in **Section 3**.

Inspect the dampers for evidence of oil leaks.

If an axle lift is fitted, check that it is functioning correctly.

Check the operation of all optional equipment and test for air leaks on air system equipment. Individual service manuals should be referred to if required.

Check arms and welds for cracks in all inspection intervals stated.

## After First 10000 KM & Subsequent 10,000 KM Intervals

Inspect the dampers for evidence of oil leaks and inspect the damper bushes for signs of rubber extrusion or damage.

Check the airsprings for signs of leakage and examine the rubber bellows for signs of damage from road debris or internal bump stop failure.

Check all pipe joints for signs of leakage and ensure that no valves are fouled with road dirt such that their operation may be impaired. This is especially relevant to the levelling valve. This is particularly important if the trailer has been operated in a harsh environment e.g. coal, dust, quarries etc.

If an axle lift is fitted, check it is operating correctly.

Check the operation of all optional equipment and test for air leaks on air system equipment. Individual service manuals should be referred to if required.

Examine tyres for uneven wear. If there is any present check the pivot bushes for damage and re-check the axle alignment as detailed in **Section 6**.

If damage is found then the trailing arms should be removed as detailed in **Section 4** and replacement of the bush and possibly the wear plates is advised. Failure to do so may result in tyre wear or structural damage.

Check all fastener torques and tighten where required according to the values in the table in this section.

If an axle lift assembly is fitted ensure it is operating correctly. Check the extra lift cylinders (if fitted) are operating as the axle is being raised.

Check arms and welds for cracks in all inspection intervals stated.

## Every 100,000 KM

Check the dampers for oil leaks along their body. Lever between the damper eye ends (top and bottom) and close bracketry to ensure no excessive lateral movement exists indicating bush failure or loose bolts.

Check the airsprings for air leaks and signs of damage especially to the rubber bellows. Details of replacing them can be found in **Section 4**.

Uncouple the levelling valve arm/axle rubber joint and raise and lower the arm to check that the valve is passing air in and out of the suspension system.

# 8 Maintenance Schedules

Check the pressure protection valve by draining the brake and suspension air tanks and couple up an air pressure gauge to each tank. With an air supply of 6.5 bar, recharge the tanks. The brake tank pressure should reach 5.5 bar minimum before the suspension tank begins to charge.

Clean under the suspension inside the hanger brackets and around the trailing arm pivots. Check between the wear plates on the inside faces of the hanger brackets and the trailing arms for signs of excessive wear or damage to the rubber pivot bushes.

All torques must be within  $\pm 5\%$  of stated values.

Check arms and welds for cracks in all inspection intervals stated.



## WARNING

**Check fastener torque values, tighten loose fasteners and replace damaged fasteners. Loose, damaged or missing fasteners can cause loss of vehicle control, death, serious personal injury and damage to components.**



## Table of Torques on CS Fasteners

Fastener Description	Torque (Nm) +/- 5%
Pivot Nut	800 *
Shock Absorber Nut (Top & Bottom)	500 *
Upper Air spring nut (M12)	41
Lower Air spring Screw (M12)	70

**NOTE:** \* Do not torque the Pivot Nut or Shock Absorber nuts to final torque until the axle is aligned and the trailer is at the ride height with the wheels on. Refer to **CS Axle Alignment - Section 6 (Figs 6.2 & 6.3)** and **Ride Height Adjustment - Section 3**



## Fault Finding & Diagnostics

# 9

pg. 51 Braking Problems  
pg. 51 Tyre Wear  
pg. 51 Excessive Roll  
pg. 51 Suspension Related Problems  
pg. 52 Axle Lift Problems

# 9 Fault Finding & Diagnostics

This section is intended to give a guide to the trailer operator to enable him to assess problems. The range of problems and suggested causes and cures are by no means complete but are intended to provide a solution to the most commonly encountered difficulties.

**NOTE:** IF THE OPERATOR IS IN DOUBT ABOUT THE SAFETY OF THE VEHICLE HE SHOULD NOT OPERATE IT, AND SHOULD IMMEDIATELY SEEK QUALIFIED ADVICE FROM ARVINMERITOR.

## How to use this section.

The faults are listed under five main headings, namely

### 1. BRAKING PROBLEMS

### 2. TYRE WEAR

### 3. EXCESSIVE ROLL

### 4. SUSPENSION AIR RELATED PROBLEMS

### 5. AXLE LIFT RELATED PROBLEMS

Listed under each of these headings are the likely specific problems, each followed by a check procedure which should highlight the cause of the problem. If the problem cannot be solved after working through the relevant check list, then further information should be obtained from ARVINMERITOR.

## Braking Problems

### If brakes are not functioning correctly:

- Check that there is at least 6.5 bar at coupling head, and the correct ratio of air is delivered to the brake chamber.
- Check slack adjusters are correctly adjusted
- Ensure all brake system valves are functioning correctly

**IF PROBLEM PERSISTS SEE ARVINMERITOR AXLE AND BRAKE SERVICE MANUALS FOR FULL BRAKE SERVICE PROCEDURE. OR SEE [WWW.RORCARE.COM](http://WWW.RORCARE.COM)**

## Tyre Wear

### If tyre wear is excessive:

- Check axle alignment is correct
- Check wheels are parallel (i.e. zero camber and toe in/out)
- Inspect parabolic trailing arm pivot bushes for damage, and replace if necessary
- Check shock absorber for oil leaks
- Inspect shock absorber bushes for damage
- Ensure ride height is set correctly
- Check application, operation and route.
- Ensure no axle is lifted when trailer is fully loaded.

## Excessive Roll

### If trailer is rolling excessively:

- Check pivot bolt torque is correct
- Check pivot bush condition.
- Check axle and suspension trailing arms for cracks.

### Is centre of gravity excessive ?

- Ensure ride height is set correctly
- If vehicle is load sensed, check that a shuttle valve is fitted to prevent cross coupling. Fit if necessary

## Suspension Air Related Problems

### If suspension will not inflate:

- Check that the levelling valve is connected to the axle
- Ensure the brake air reservoir pressure is more than 6.5 bar
- Ensure the suspension air reservoir pressure is at least 6.5 bar
- Check the setting of the pressure protection valve and clean the air filter
- Check the axle load is not greater than the available pressure
- Check all pipework and fittings for leaks using soapy water
- Check the airsprings for leaks using soapy water

## 9 Fault Finding & Diagnostics

- Check levelling valve for leakage at the exhaust port, and if necessary replace valve if suspension is deflating:
- Check all pipework and fittings for leaks using soapy water
- Check the airsprings for leaks using soapy water
- Check levelling valve for leakage at the exhaust port, and if necessary replace the valve

### Axle Lift Related Problems

#### If lift will not operate:

- Work through check procedure for main suspension airsprings not inflating
- Check that the lift valve is correctly installed and piped. Replace valve if faulty

Condition	Possible Cause		Recommended Action
All air springs flat	1	Insufficient air pressure to suspension air springs.	Build air pressure to 6.5 Bar, or more. Check compressor for correct function. Check all air lines and fittings for leaks.
	2	Defective pressure protection valve.	Check and replace valve if necessary.
	3	Height control valve supply or delivery fitting clogged.	Inspect height control valve supply & delivery fittings for restrictions .
	4	Air leak in system	Inspect entire system for leaks. Repair or replace as necessary.
	5	Suspension overloaded.	Review load to suspension rated capacity
Air springs fully raised but do not exhaust	1	Height control valve delivery port or exhaust port plugged.	Inspect port for restrictions. Repair or replace as necessary.
	2	Height control linkage broken	Replace linkage.
Vehicle body incorrect ride height during operation	1	Height control valve not adjusted properly	Inspect and adjust as necessary.
	2	Height control lever bent or broken	Straighten or replace lever.

## 9 Fault Finding & Diagnostics

Condition	Possible Cause		Recommended Action
Vehicle body incorrect ride height during operation	3	Insufficient air pressure to the suspension system.	Check air compressor and pressure protection valve for proper operation. Inspect system for leaks. Repair and replace as necessary.
Main air pressure drops to 6.5 Bar	1	Ruptured air spring	Inspect air springs and replace as necessary.
	2	Leaking air lines	Inspect air lines and repair or replace as necessary.
Hard Ride	1	Improper ride height or air springs flat	Check and adjust ride height. See first condition
Suspension ride height not maintained during operation	1	Clogged air filters	Inspect and clean or replace as necessary.
	2	Moisture in air tank	Drain air tank and evacuate air system of moisture.
		Clogged filter screens in height control valve	Inspect and clean or replace as necessary.
	4	Damaged linkage or incorrect valve mounting	Replace, repair or adjust as necessary.
Incorrect tyre clearance in full bounce	1	Incorrect tyre size	Replace tires with the recommended tyre size.
Trailer not pulling straight (dog-walk)	1	Trailer axles out of alignment	Realign axles
	2	Loose alignment bosses or pivot bolt	Align axles and tighten pivot bolts to the correct torque.
Trailer wandering or unusual rattling	1	Worn bushings	Inspect bushings and replace as needed
Broken Shock Absorbers	1	Trailer fitted with manual raise/lower valve. Driver forgets to set to ride height	Fit auto raise/lower device. Driver education.
	2	Auto reset fitted, check function of Colas/EBS tractor is compatible	Check operation
	3	Is trailer towed on sit with Dock spotter etc.	Check operation
	4	Incorrect King pin height	Set Kingpin height to recommended values from trailer plate details or contact manufacturer
Air spring bump stop broken	1	Trailer driven with no air in the suspension	Driver education
Damage to lifter in red emergency coupling at headboard of trailer	1	Dirt in air system.	Check operation. Replace worn lifter in coupling
	2	General wear and tear	

**For further information contact**

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