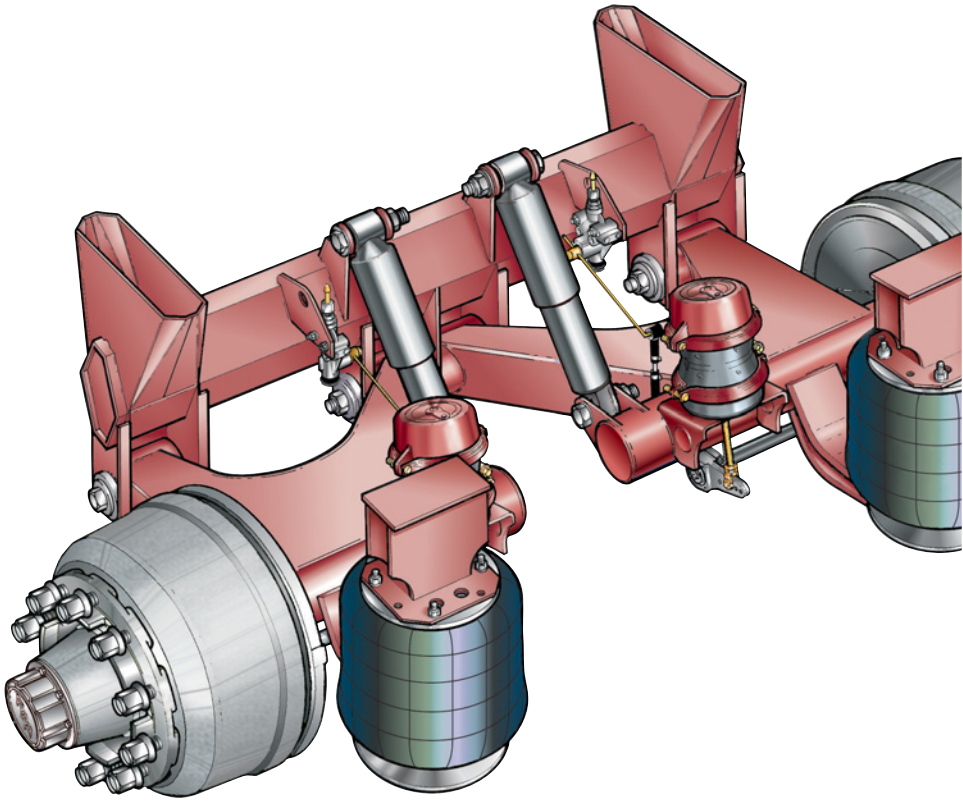
ROR Trailer Products

Indair Technical Manual



INDAIR
INDEPENDENT AIR SUSPENSION

ArvinMeritor™

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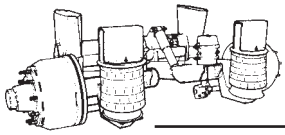


GENERAL INTRODUCTION TO THE SUSPENSION

Suspension main structure

The R.O.R. Indair suspension is a unique independent air suspension which has been constructed of a rigid truncated diamond shaped crossmember with two independent trailing arm and spindle assemblies as the main structure. These arm and spindle assemblies are fixed to the crossmember via large solid rubber bushes which provide vibration isolation from road inputs and act as hinges upon which the arms can move as required. Any lateral arm movement is constrained through the application of hardened thrust washers which are integral within the crossmember bushing brackets. The design eliminates all metal to metal contact and as such, has virtually no wearing components.

Control of axle movement and resultant ride and handling

Indair uses two airsprings and two shock absorbers per unit to control axle movement. As with all air suspensions, these produce a low sprung mass natural frequency with resultant control of oscillatory motion to achieve very high ride quality. Indair also employs two height control valves to assure that any unbalanced loads are always maintained at perfect level condition.

Suspension performance

Indair achieves unequalled ride performance and tyre life. There are a number of reasons for this:

a) The effective roll centre is at ground level instead of somewhere between the axle centreline and the ground.

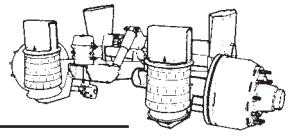
b) The Indair wheel stations NEVER bounce or leave the ground.

c) The roll stiffness is provided by the rigid link arms producing very wide effective spring centres rather than requiring U bolts to transmit torsion into a rigid axle tube.

d) There is no coupling effect between the axle stub ends due to the suspension being independent, thus input loads at the tyre are not fully transferred from one side to the other.

Effects of stiff crossmember on bogie

The crossmember on the suspension unit is designed to have inherent stiffness in all planes to such a degree that it can be used as part of the bogie design, enabling the existing crossmember in the bogie located above the desired suspension crossmember position to have a reduced section modulus.



Shock absorbers

Indair realises that a significant part of its unsurpassed ride quality is through the use of finely tuned heavy duty shock absorbers.

The design of the shock absorbers is such that they are capable of withstanding a tensile pull of over 9 tons and a pair of these on a suspension unit eliminates the need for check straps being fitted, even for ferry application.

Suspension attachment

The suspension attachment to the bogie chassis is provided by two frame brackets for the crossmember and individual brackets for the two air springs. Both types of bracket can be obtained in a range of heights (250-450mm in steps of 25mm) which are aimed at ensuring the airsprings work from their mid-position when the suspension is at normal ride height. This can be especially useful when considering the possible airspring mid-height variations in the front and rear units on a tri-axle system when fitted to a sloping bogie frame. It is also possible, by staggering the bracket heights, to optimise airspring operation for specified bogie slopes.

Fitting of the suspension is aimed at being simple, hence the units being complete assemblies and ready for attaching to the bogie frame, with no prior assembly work required.

A standard Indair unit works on the principle of having no built-in tracking facility because once the units are fitted and at this stage correctly tracked up, they should never require this operation again, since there is nothing to work loose that could upset the geometry setting. An option is available to permit tracking adjustment at the installation stage but this should really only be necessary on bogies utilising a subframe.

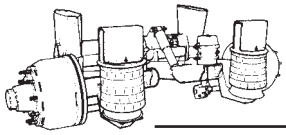
Camber angle is built into the suspension units at the production stage and differs for single and twin wheel versions. The specific angles have been selected to minimise tyre wear especially when the bogie is in its fully loaded condition within axle capacity.

Suspension piping system

The suspension pipe work is available as complete pre-assembled kits for quick and easy fitting. The kits come in different versions depending on the bogie set up i.e. tandem, tri-axle or single axle configurations. Each kit comes complete with all pre-assembled pipe runs, two levelling valves (one for each independent side of the suspension system), a combined filter and pressure protection valve assembly and all required nuts, bolts and sealing washers.

The unique Indair piping kit provides a uniform, simple and cost effective means of construction for the trailer builder. In most cases the total fitting time for the suspension piping is less than one hour per vehicle. It also contains the highest quality metric fittings, hose and valves selected to match Indair requirements.

Finally and most important, all piping and valves for Indair are retained by ROR stockists everywhere to make replacements easy to find.



The axle stubs

The axles used on the Indair suspension are standard ROR axles but split in two with the Indair associated brackets attached. This ensures standard ROR spares such as brake parts, bearings, seals etc. are easily available.

Indair unit weights

Compared with other suspension units on the market Indair is amongst the lightest depending on brake equipment. A complete Indair unit can weigh as little as 452 Kg.

Normal axle servicing

Indair was designed to reduce maintenance in every way. No metal to metal moving parts are used, arm rotation is achieved by allowing rubber to twist, thus no wear as with metal components takes place. The arm attachment and shock absorber bolts are secured by prevailing torque nuts to prevent loosening. Wear resistant washers are incorporated in the arm pivot housings to reduce wear when the trailer is undertaking side loading manoeuvrers. Indair uses Anchorlok spring brakes as standard features to further reduce required maintenance. Mechanical parking brake systems are not approved.

For these reasons the only recommended maintenance is visual inspection during normal code servicing.

INDAIR OPTIONS

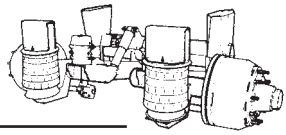
Axle Lift

An axle lift system is an available option which is fitted to the standard suspension units on request. It utilises the standard suspension airspring to power the lift operation applying the load through lever arms to each independent side of the unit it is fitted to. A useful feature of standardising the airspring is that in the unlikely event of a suspension unit airspring failing, the lift assembly airspring can be removed and fitted to the suspension in an emergency. With no lift airspring fitted, the unit with the lift assembly simply allows the axle to run in its normal dropped position.

A pre-assembled pipe kit is included with the lift system for use in conjunction with the available suspension pipe kits. This kit includes all valves, pipe runs, nuts, bolts and sealing washers. A useful inclusion in the kit is a cylinder that attaches to the suspension levelling valve arms which raises the suspension by approx 25mm when an axle is lifted, to allow extra ground clearance for the wheels on the lifted axle.

Bogie weighing equipment

Indair has a scale readout device available which provides the user with a precise total payload weight. The scale is contained in a side mounted watertight box and can also be used to additionally contain controls for a raise-lower system. The cost of this option is much less than one overload fine.



Raise-lower feature

Indair also has an optional feature which can lift or lower the entire trailer for loading/unloading requirements or for more solid ride when aboard ships. The trailer can be allowed to sit on the airspring bump stops. Controls can be fitted in the same box as used with the bogie weighing controls as stated.

Auto drop feature

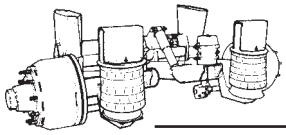
This system is used in combination with a lift axle to cause the lifted axle to automatically lower in the event of the operator accidentally overloading the remaining axle(s).

Suspension-parking brake interlock

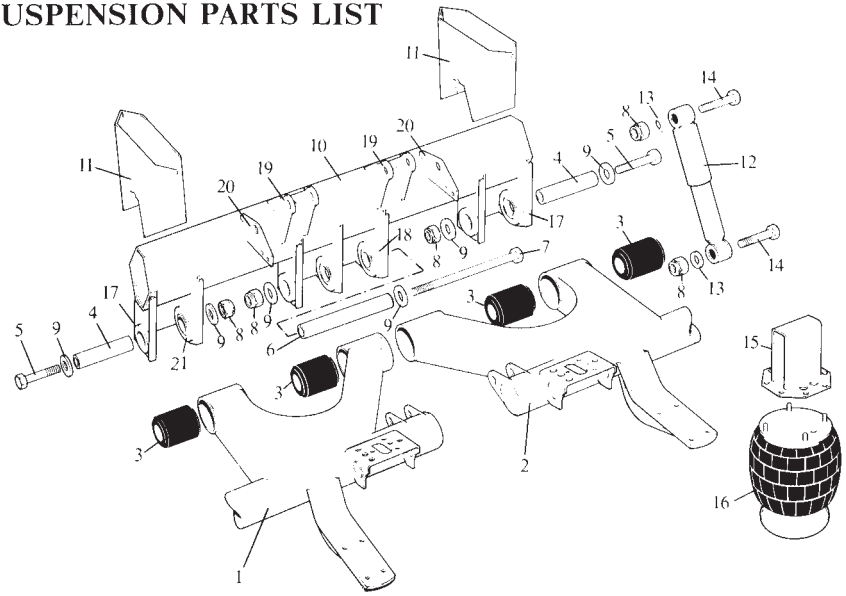
This system provides an interlock between the actuation of the spring parking brakes and the suspension to allow the airsprings to exhaust to bump stop position before the parking brakes come on. This system prevents damage to landing legs.

Tracking adjustment facility

An option is available to enable suspension units to be re-tracked to the kingpin before final welding to the trailer or after a subframe has been welded to a trailer and the suspension tracking has been found incorrect.

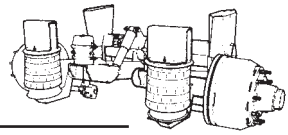


SUSPENSION PARTS LIST



Item No.	Description	Part No.
1	L.H. link arm and bush assembly	**
2	R.H. link arm and bush assembly	**
3	Rubber bush	21208093
4	Outer sleeve	21208783
5	Outer bolt	21208078
6	Centre sleeve	21208242
7	Centre bolt	21208079
8	Locknut	21206001
9	Washer	21208324
10	Crossmember assy. (less frame brackets)	**
11	Frame brackets	**
12	Shock absorber	21208363
13	Washer	21208376
14	Bolt	21208315
15	Airspring top bracket	**
16	Airspring (4 stud)	21208082
17	Outer bracket assembly	21208683
18	Inner bracket assembly	21208678
19	Top shock absorber bracket	21208626
20	Levelling valve bracket	21208693
21	Thrust washer	21208681

** Contact ROR for specific details.



HOW TO SPECIFY YOUR INDAIR

CONSIDER A TYPICAL PART No.

Suspension ride height: ℄ axle to U/S chassis

IND A TM/S 22510/P MX ~ 400 ~

- IND — Indair
- A — Insert 'A' if electronic antiskid is required
- TM/S — Axle type
- 22510/P — Brake Size
- MX — Wheel fixing
- ~ — Insert 'A' if aluminium wheels are to be used
- 400 — Suspension ride height: ℄ axle to U/S chassis
- ~ — Add 'L' if axle lift is required.

1. Single or twin wheel units

Single wheel:

The single wheel unit has a fixed track of 2045mm and can be supplied with the following brake sizes:

420 x 150mm "P" Brake

420 x 180mm "Q" Brake

420 x 220mm "Z" Brake

The frame bracket centres are standardised at 1200mm although centres down to 980mm may be possible depending on the design of the trailer. ROR should be contacted if special centres are required.

Twin wheel:

The twin wheel unit has two tracks depending on the brake sizes required:

1860 track for the following brake sizes:

420 x 150mm "P" Brake

420 x 180mm "Q" Brake

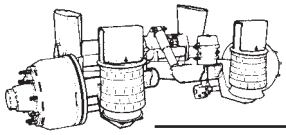
420 x 220mm "Z" Brake

1820 Track for low loader brake sizes:

310 x 190mm "AC" Brake

350 x 200mm "B" Brake

The frame centres are standardised at 1000mm although centres down to 780mm are possible depending on the design of the trailer. ROR should be contacted if special centres are required.



2. Wheel fixings

The wheel fixings can be specified as with standard ROR axles. The following are available on ROR hub ends:

$\frac{7}{8}$" BSF (B.S.) fixing for non-spigotted wheels.	"S" fixing
M22 x 1.5mm DIN standard for non-spigotted wheels.	"M" fixing
M22 x 1.5mm ISO 4107 fixing for spigotted wheels.	"MX" fixing

Number of bolts and pitch circle diameters.

a) 420mm diameter brakes.

10 bolt metric ISO standard (spigotted) on 335mm PCD.

10 bolt BSF (B.S. non-spigotted) on 335mm PCD.

10 bolt DIN standard (non-spigotted) on 335mm PCD.

b) 310/350mm diameter brakes.

10 bolt metric ISO standard (spigotted) on 225mm PCD.

10 bolt DIN standard (non-spigotted) on 225mm PCD.

8 bolt BSF (B.S. non-spigotted) on 275mm PCD.

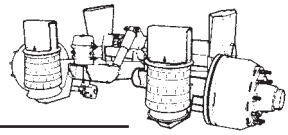
3. Tyres

Single wheel use:

420mm dia. brakes:	15R★22.5 (385/65 R 22.5) 16.5R★22.5 (425/65 R 22.5) 18R★22.5 (445/65 R 22.5)

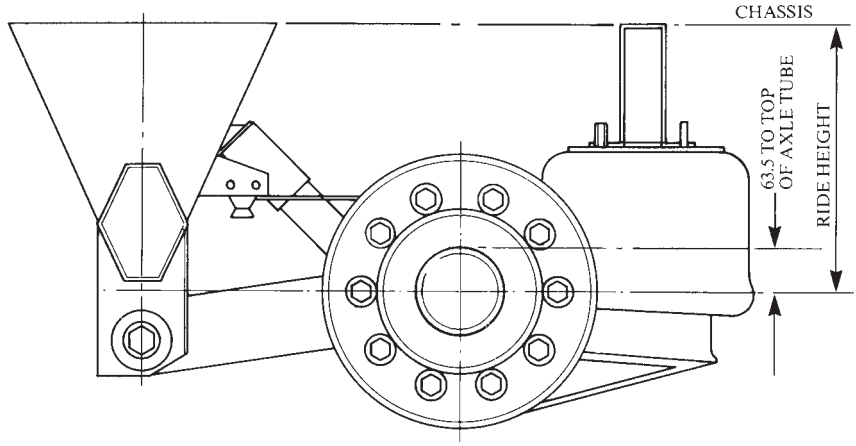
Twin wheel use:

420mm dia. brakes:	10.00R★20 11R★22.5 11/70R★22.5 (Low profile)
350mm dia. brake:	265/70R★19.5 (Low profile)
310mm dia. brake:	8.25R★15 10.00R★15 215/75R★17.5 (Low profile) 265/70R★19.5 (Low profile)



4. Ride height

This can be selected to accommodate trailer slope and obtain optimum stub axle travel in laden and unladen conditions.



The following ride heights are available (in mm):

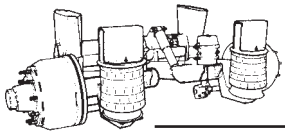
250	375
275	400
300	425
325	450
350	

5. Spindle end equipment

The available spindle end options available are as follows:

1. Standard ROR.
2. Rockwell TP (Same as Fruehauf. Less hub and drum).
3. Rockwell 'TKN' (Std. USA brg. journals. Less hub and drum).
4. ROR 18000 (Single wheel only).

Lubrication can be oil or grease on these options (with the exception of the 18000 series hub end which is oil lubricated only) and must be specified.



6. Brake actuation

The required brake actuation can be determined by the ROR brake engineering department on request. The following service/spring brake airchambers and automatic slack adjuster lever lengths are available.

Air chambers: 20/24, 24/24, 24/30.

Slack adjuster lever lengths (mm): 127, 140, 152.

7. Additional options

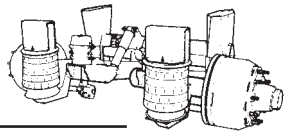
These options are discussed previously in this section of the manual and must be specified.

Axle lift (single or twin wheel version).
Raise/lower.
Automatic bogie weighing.
Axle auto-drop.
Tracking adjustment.
Automatic slack adjusters.
Piping kits (specify Number axles per trailer).
Suspension-parking brake interlock feature.

SUSPENSION WEIGHT CHART

Tyre Type	Axle Type	Brake Type	Weights in Kg for ride heights below (mm)								
			250	275	300	325	350	375	400	425	450
Sing	1800	420 x 150	494	496.5	499	501.5	504	506.5	509	511.5	514
Sing	22500	420 x 150	509	511.5	514	516.5	519	521.5	524	526.5	529
		420 x 180	520	522.5	525	527.5	530	532.5	535	537.5	540
		420 x 220	530	532.5	535	537.5	540	542.5	545	547.5	550
Twin	22500	420 x 150	501	503.5	506	508.5	511	513.5	516	518.5	521
		420 x 180	512	514.5	517	519.5	522	524.5	527	529.5	532
		420 x 220	522	524.5	527	529.5	532	534.5	537	539.5	542
		350 x 200	475	477.5	480	482.5	485	487.5	490	492.5	495
		310 x 190	452	454.5	457	459.5	462	464.5	467	469.5	472

Weights are for a complete assembly including all brackets, less air chambers and slack adjusters.



FITTING AND TRACKING OF UNITS

The standard version of Indair has no built-in tracking facility thus care must be taken to ensure it is installed correctly. The fitting and tracking procedures are different for single, tandem, triaxle, drawbar trailers and frameless trailers utilising some form of subframe. Indair is available in single and twin wheel versions. The procedures that follow for the fitting of the suspension units are applicable to both types. Each application will be considered below:

A. Single axle trailers

The chassis should be located upside down on the floor or on stands to allow the suspension unit to be fitted in its upside down position. Ideally the kingpin should be fitted to enable the tracking measurements to be carried out. If this is not possible the location point for the kingpin should be accurately marked and be accessible.

1. Mark off on the chassis the required axle centre position relative to the kingpin. Mark a line on each main chassis rail 537mm in front of the axle centre line mark (to position frame bracket centres) and a line 313mm behind the axle centre line mark (to position the centre of the top airspring bracket) as shown in fig. 1.

2. Lower the suspension unit onto the chassis and roughly line up with lines marked out. Support the airspring lower brackets with a 450mm block to ensure both axle stubs are level in relation to the chassis rails (see fig. 1) blocks are available through ROR part number 21208791 or the ROR drawing can be supplied on request.

3. Fit suspension centering tool to each brake drum on the unit being tracked ensuring the tool lies vertically as shown in fig. 1. Measure from the inside face of the tool to the outside face of the adjacent chassis rail on each side of the unit. These measurements each side correspond to LR and LL in fig. 2 and must be within ±2mm. This ensures the unit is central with the chassis and prevents building in error when tracking is carried out to the kingpin.

4. Fit clamps as shown in fig. 1 to ensure the frame brackets sit flat on the chassis. Measure from the flange of both hubs as shown in fig. 2 to the trailer kingpin. The measurement from each hub must be within ± 3mm.

It may be found necessary to move the unit to satisfy this requirement. This can be carried out by slackening the clamps and carefully tapping the frame brackets as close to their base as possible. It may be found helpful to lubricate the 450mm blocks to help them slide on the chassis. After each repositioning, step 3 above should be carried out again to ensure the unit is still central to the chassis.

5. When the unit is in position, ensure the clamps are tight and weld around the frame brackets as shown in fig. 3 using the weld procedure found in section 9.

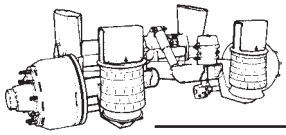
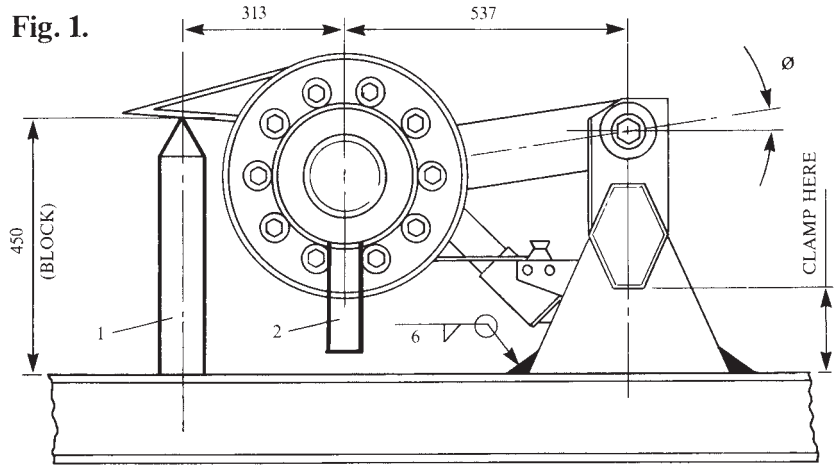


Fig. 1.

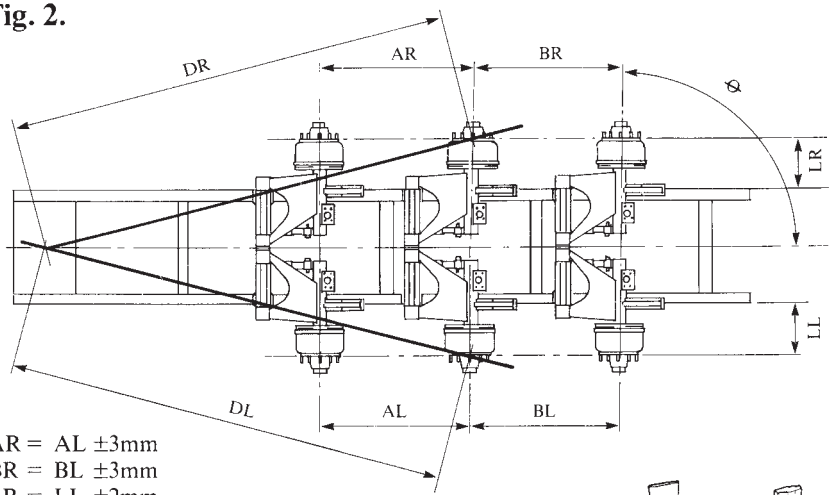


Item	Description
1	450mm High Block. See ROR Drawing No. 21208791
2	Suspension Centering Tool. See ROR Drawing No. 21208792

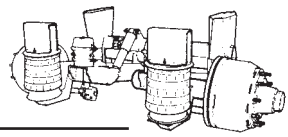
ø = 0° for 250mm ride height suspension with 450mm support block in position.
ø = 13.5° for 450 ride height with block in position.

It is recommended a 'sash' type clamp is used where clamping is advised.

Fig. 2.



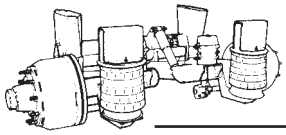
AR = AL ±3mm
BR = BL ±3mm
LR = LL ±2mm
DR = DL ±3mm
Θ = 90° ±10′



6. Remove the 450mm blocks from under the lower airspring brackets and let the shock absorbers support the link arms. Position the top airspring brackets on the chassis and centre the bracket with the lines marked in part 1. above (313mm behind the axle centre line) adjust the brackets to the correct lateral centres and weld in position as shown in fig. 7 using the weld procedure found in section 9.

7. Place the airspring in position on the lower airspring bracket and check that the top plate securing studs and air inlet align with the holes in the top bracket. If the holes are out of line remove the airspring and slacken the four M12 nuts inside the airspring piston. This will allow the piston to be rotated inside the bellows. Turn the piston to the required position and re-tighten the four nuts and torque to 7-8 Kg.m (50-60 ft. lbs.). (Note: Do not remove these nuts if possible).

8. Tighten the M12 screws supplied to secure the airspring piston to the lower support bracket to a torque of 6-7 Kg.m (45-50 ft. lbs.). Torque the nut(s) on the M12 stud(s) on top of the airspring to 7-8 Kg.m (50-60 ft. lbs.) and if the airspring is of two stud design tighten the nut on the air inlet nozzle to 6-7 Kg.m (45-50ft. lbs.).



Explanation of figures 3 to 7 referred to in Section 2 for the fitting of frame brackets and airspring top brackets to chassis frames.

Fig. 3.

Fig. 3 shows the welding sequence for the attachment of suspension frame brackets to the chassis or subframe.

Fig. 4-7

Figs. 4-7 show diagrams of recommended configurations of crossmember and support gusseting at the frame bracket locations on the chassis. The sections are as follows:

Fig. 4.

Crossmember attachment methods and positions when the crossmember rests on the flange of "I" beam or channel frame members or box section frame members are used.

Fig. 5.

Crossmember attachment methods and positions when the crossmember sits off the flange of "I" beam or channel frame members. In this case gusset plates are fitted as shown. The preferred method is the lipped design which reduces the possibility of tearing at the crossmember/plate weld.

Fig. 6.

Outer Chassis face support gussets at the frame bracket locations for "I" beam and channel chassis frames. The fitting of these supports is recommended on all units. The case shown for the channel shows the frame bracket offset from the chassis frame centre and requires a support that has a base with the same contour as the top of the frame bracket. This configuration also applies to the same situation using an "I" beam chassis member.

Fig. 7.

This shows recommended gusseting above the airsprings in conjunction with the standard Indair top airspring bracket and the flat plate used to support the top of the airspring when 250mm ride height has been specified. "I" beams, channel and box sectioned chassis frames have been considered.

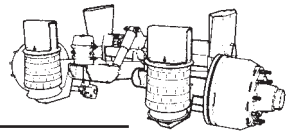


Fig. 3.

Weld run procedure.

Weld Stop/Start to occur at points 1-4. Recommended weld paths as follows — 1-2, 2-3, 3-4, 4-1.
All runs to have 6mm min. weld leg length.

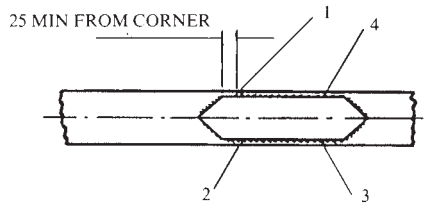
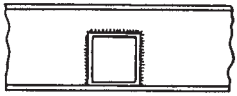


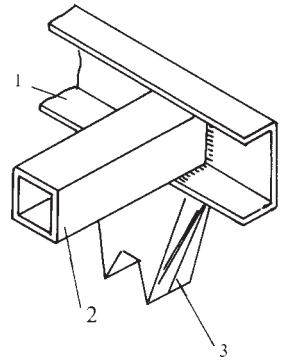
Fig. 4.

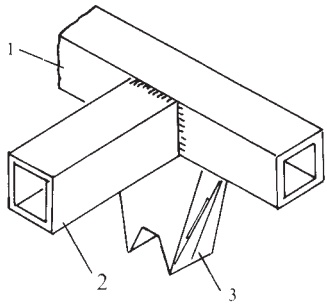
Crossmember configurations without gussets.

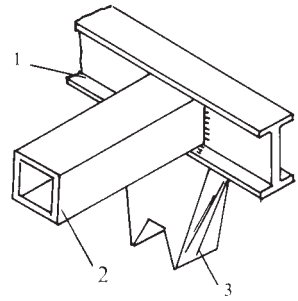


Item	Description
1	Chassis Frame Member
2	Crossmember (see note)
3	Frame Bracket

Note: The Crossmember should have a minimum elastic modulus of 80 cm^3 for single wheel versions and 120 cm^3 for twins.







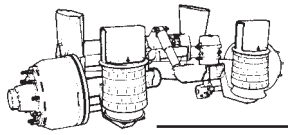
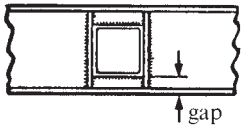


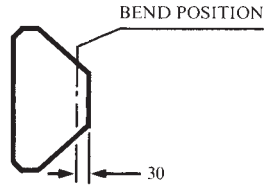
Fig. 5.

Crossmember and gusseting configurations

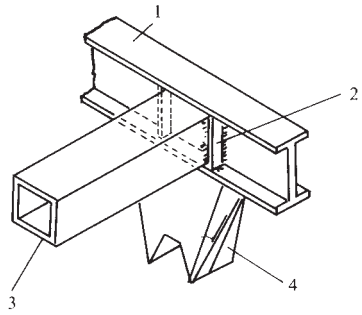


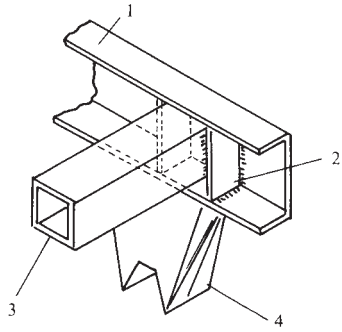
Item	Description
1	Chassis Frame Member
2	5mm Plate Support
3	Crossmember (see note)
4	Frame Bracket

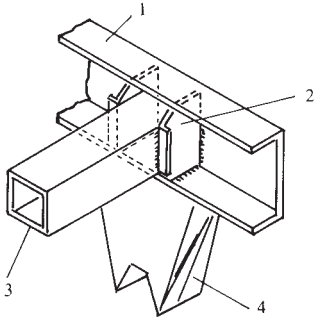
Note: The Crossmember should have a minimum elastic modulus of 80 cm^3 for single wheel versions and 120 cm^3 for twins.

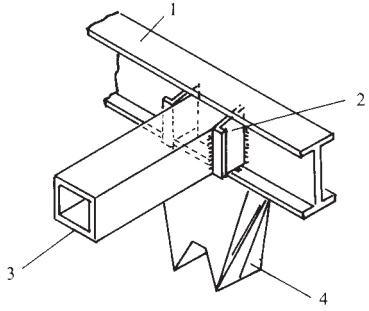


TYPICAL GUSSET PLATE WITH BENT LIP.









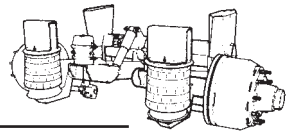
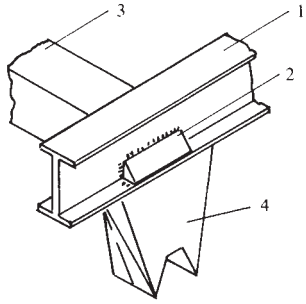


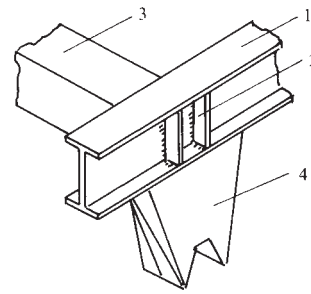
Fig. 6

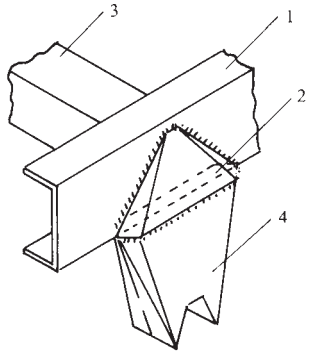
Support gussets to outside face of chassis members

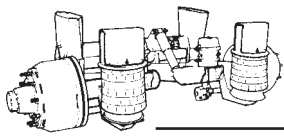
Item	Description
1	Chassis Frame Member
2	5mm Plate Support
3	Crossmember (see note)
4	Frame Bracket

Note: The Crossmember should have a minimum elastic modulus of 80 cm^3 for single wheel versions and 120 cm^3 for twins.









INDAIR INDEPENDENT AIR SUSPENSION

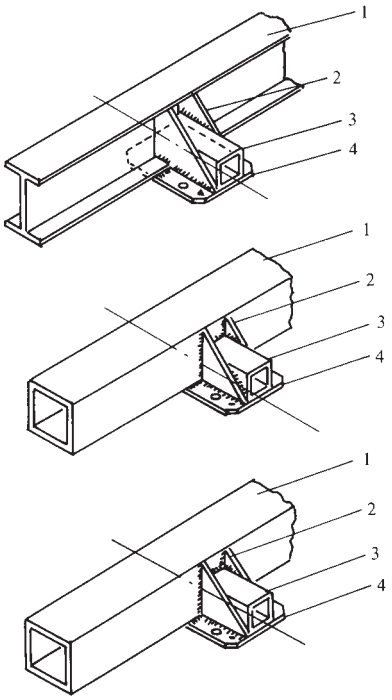
Fig. 7.

Crossmember, gusseting and top support of airsprings.

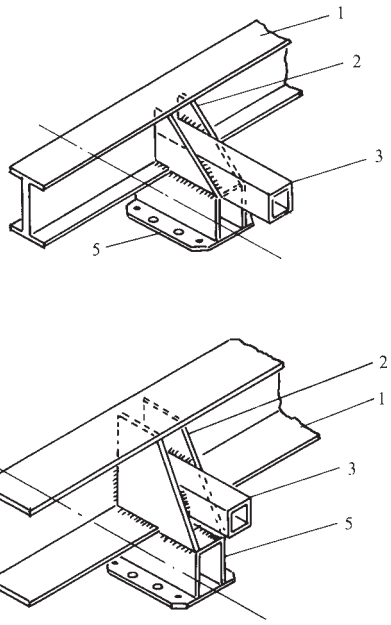
Item	Description
1	Chassis Frame Member
2	5 mm Plate Support
3	Crossmember (See Note)
4	Airspring Plate (250 only)
5	Airspring Pedestal

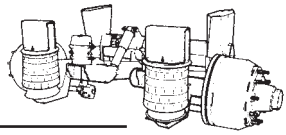
TYPICAL GUSSET PLATE FORM (ITEM 2)

Note: Crossmember (70 x 70 x 5 RHS) required only on rearmost axle of triaxles and both axles of tandems.



ITEM 4 ABOVE IS ONLY REQUIRED ON 250 RIDE HEIGHT UNITS.





B. Tandem axle trailers

On a tandem axle trailer, the front suspension unit should be fitted first. This is carried out exactly as in section A above for a single axle trailer. When the front axle is fitted proceed as follows:

1. Mark on the chassis the required centre line for the axle stub on the rear suspension unit. Mark on the chassis rails, the position for the chassis bracket centres (537mm in front of axle stub centre line) and the top airspring bracket position (313mm behind the axle stub centre line).

2. Lower the suspension unit onto the chassis and roughly line up with marked lines. Support the airspring lower brackets (hence link arms) with the 450mm blocks (see fig. 1).

3. Fit the suspension centering tool as shown in fig. 1. and centre the unit as described in sub-section A3. Fit clamps as shown in fig. 1. to ensure frame brackets lie flat on the chassis.

4. With the unit central to the chassis, measure between hub flanges on the front and rear units on the horizontal axis. This corresponds to dimensions AR and AL in fig. 2, ensuring they are within ±3mm. The unit should be moved if required by slackening the clamps off and carefully tapping the base of the frame brackets, lubricating the 450mm blocks if needed. After each repositioning the step in subsection A3 should be carried out.

5. When the unit is in position tighten up the clamps and weld the frame brackets to the chassis as shown in fig. 3. using the weld procedure found in section 9. Ensure no weld splatter falls on the airsprings fitted to the front unit during this operation.

6. Remove the 450mm blocks from under the airspring lower brackets and let the shock absorbers support the link arms. Position the airspring top brackets on the chassis centering them with the lines marked 313mm behind the axle stub centre line. Weld in position as shown in fig. 7. using the weld procedure found in section 9.

7. Fit the airsprings to the lower airspring bracket, aligning holes and securing as described in sub-section A7 and A8.

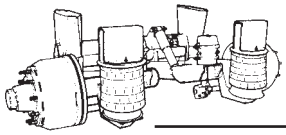
C. Triaxle trailers

On a triaxle trailer the centre suspension unit should be fitted first. This should be carried out using the procedure explained in section A. above for single axle trailers. When the centre unit is fitted proceed as follows:

1. Mark on the chassis the required axle stub centre line positions for the front and rear unit axle stubs. Mark on the chassis a line for the frame bracket centre positions for the front and rear units (537mm in front of the axle stub centre lines) and for the airspring top bracket centres (313mm behind the axle stub centre lines).

2. Lower the front suspension unit onto the chassis and roughly line up with the lines marked on the chassis. Support the airspring lower brackets (hence link arms) with the 450mm blocks (see fig. 1.).

3. Fit suspension centering tools as shown in fig. 1. and centre the unit with the chassis as described in section A3. Fit clamps as shown in fig. 1. to ensure the frame brackets lie flat on the chassis.



4. With the unit central to the chassis, measure the distance between the hub flanges on the centre and front unit axle stubs on the horizontal axis. This corresponds to dimensions AR and AL in fig. 2., ensuring they are within ±3mm. The unit should be moved if required by slackening the clamps off and carefully tapping the base of the frame brackets, lubricating the 450mm blocks if needed. After each repositioning the step in subsection A3 should be followed.

5. When the front unit is in position, tighten up the clamps and weld the frame brackets to the chassis as shown in fig. 3. using the weld procedure found in section 9. Ensure no weld splatter falls onto the airspring bellows during this operation.

6. Remove the 450mm blocks from under the airspring lower brackets and let the shock absorbers support the link arms. Position the airspring top brackets on the chassis aligning them with the lines marked (313mm behind the axle stub centre line). Weld in position as shown in fig. 7. using the weld procedure found in section 9.

7. Fit the airsprings to the lower airspring bracket, aligning holes and securing as described in sub-section A7 and A8.

8. Lower the rear suspension unit onto the chassis and roughly line up with the lines marked on the chassis. Support the airspring lower brackets (hence link arms) with the 450mm blocks (see fig. 1.).

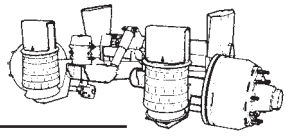
9. Fit the suspension centering tool as shown in fig. 1. and centre the unit as described in sub-section A3. Fit clamps as shown in fig. 1. to ensure frame brackets lie flat on the chassis.

10. With the unit central to the chassis, measure between hub flanges on the front and rear units on the horizontal axis. This corresponds to dimensions BR and BL in fig. 2, ensuring they are equal to within ±3mm. The unit should be moved if required by slackening the clamps off and carefully tapping the base of the frame brackets, lubricating the 450mm blocks if needed. After each repositioning the step in subsection A3 should be carried out.

11. When the unit is in position tighten up the clamps and weld the frame brackets to the chassis as shown in fig. 3. using the weld procedure found in section 9. Ensure no weld splatter falls on the airsprings fitted to the front unit during this operation.

12. Remove the 450mm blocks from under the airspring lower brackets and let the shock absorbers support the link arms. Position the airspring top brackets on the chassis aligning them with the lines marked (313mm behind the axle stub centre line). Weld in position as shown in fig. 7. using the weld procedure found in section 9.

13. Fit the airsprings to the lower airspring bracket, aligning holes and securing as described in sub-section A7 and A8.



D. Subframe trailers

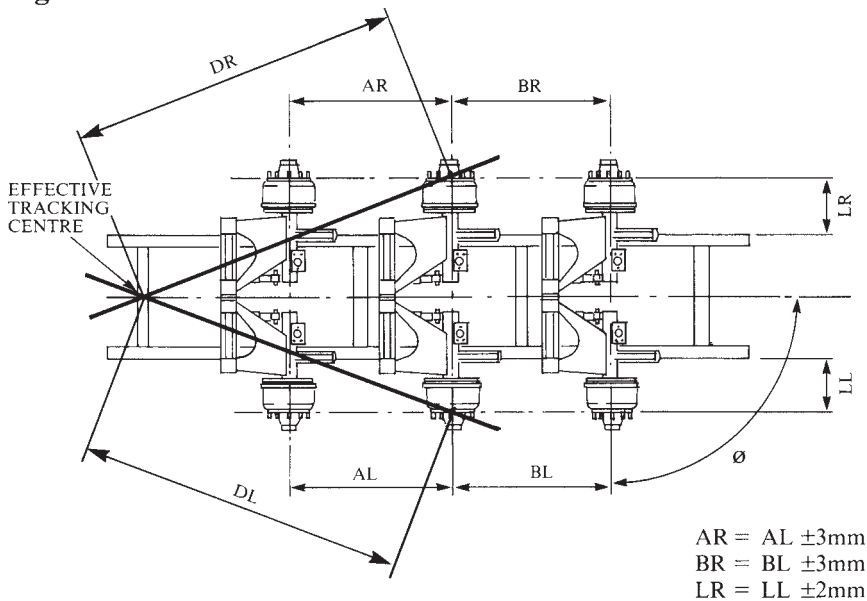
The fitting of the suspension units whether single, tandem or tri-axle to a subframe is carried out in the same manner as for a normal chassis configuration considered in sections A, B and C previous. The tracking operation in this case is carried out to a mark on the subframe typically shown in fig. 8. in place of the kingpin.

Care must be taken in the fitting of the subframe to the chassis or body of the trailer to ensure the suspension units and subframe are tracked to the actual kingpin. Errors can easily occur due to inaccuracies in locating the frame. There are two methods advised by ROR for overcoming problems of this nature:

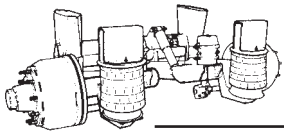
1. With the suspension units fitted to the subframe and the subframe in position on the chassis/body, re-track the subframe to the actual kingpin before final welding. This re-tracking operation must be carried out using the suspension unit used as the datum during initial tracking since the method used to track and locate the units relative to the subframe covered in sections A, B and C ensure that the remaining units will also be accurately tracked.

2. Use the alignment adjusting facility available as an option on the units (see fig. 9.). This enables the suspension to be tracked up after the subframe has been welded to the chassis/body. The facility consists of a two piece sliding assembly which is welded to front and rear of each frame bracket on the suspension unit during assembly at ROR. When the suspension is fitted to the subframe and aligned as accurately as possible as discussed, the base part of the adjusting assembly is welded to the subframe.

Fig. 8.



AR = AL ±3mm
BR = BL ±3mm
LR = LL ±2mm
DR = DL ±3mm
Ø = 90° ±10′



To adjust the suspension units, proceed as follows:

a) Slacken off the M16 screw on each assembly as shown in fig. 10.

b) Use the M12 bolts to move the frame brackets relative to the subframe and check all measurements as discussed in subsections A, B and C of this section. The slots in the assembly are designed to produce a true rotation of the axle stubs during adjustment.

c) When tracking is correct, tighten the M16 screws to a torque of 21-22 Kg.m (150-160 ft. lbs.) and tack the frame brackets in position ensuring tacks are placed only at points 1-4 in fig. 3. in section 2. In the tacked state, check that the frame brackets have not moved. If the alignment is still correct, fully weld up the brackets as shown in fig. 3., following the weld procedure found in section 9.

d) Remove the M16 screws and M12 adjusting bolts from each assembly.

Fig. 9.

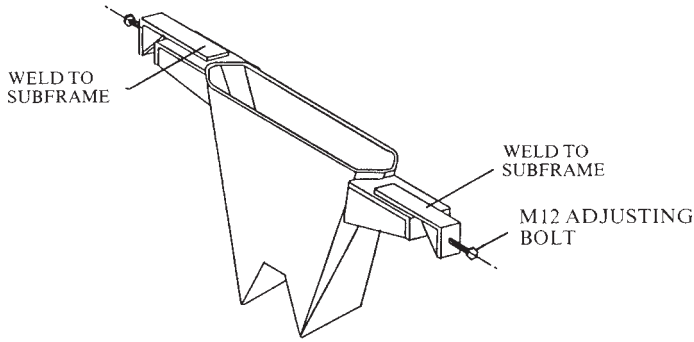
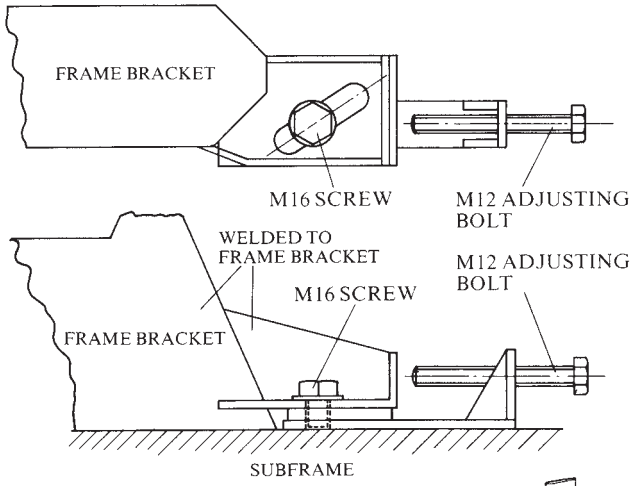
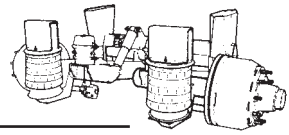


Fig. 10.





E. Drawbar trailers

These instructions apply to single and twin wheel versions of Indair and the varying configurations of axle layout used on drawbar trailers. The general principle for fitting will be to fit accurately the "A" frame brackets to the front end of the trailer chassis (see fig. 11.) then accurately track the front suspension unit to the towing eye of the "A" frame. The remaining suspension units to be fitted should then be located and aligned with the unit immediately in front of it in turn until all are fitted. The gap between the "A" frame/chassis joint and the front suspension frame brackets should then be supported using the gusset arrangement shown in fig. 13.

The fitting procedure is thus as follows:

1. With the chassis upside down on the floor or on stands, locate and attach the "A" frame to the chassis as shown in fig. 11/12., ensuring the towing eye is central to the chassis.

2. Mark on the chassis the axle stub centre lines for the required axle centre spacings.

3. Mark a line 537mm in front of each axle stub centre line and a mark 313mm behind the centre line for each axle station. These will be used to locate initially the frame bracket and airspring top bracket respectively for each suspension unit.

4. Position the front suspension unit on the chassis and track the unit following the procedure found in section 2. of this manual, paragraphs A2 to A8, except that instead of measuring dimensions DR and DL in fig. 2. to a kingpin, they will be measured to the "A" frame towing eye as shown in fig. 12.

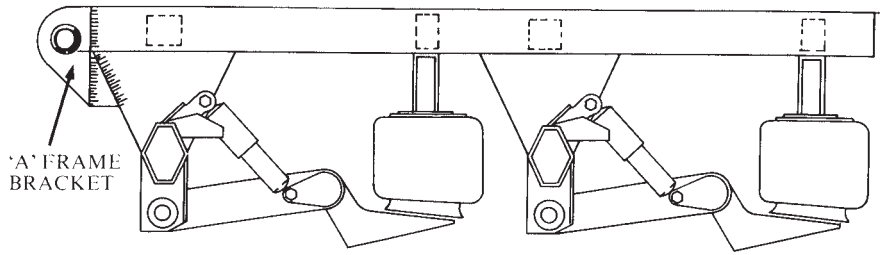
5. When the front unit is fitted, cut and fit gusset plates as shown in fig. 13. to suit and weld following the weld procedure in section 9. of this manual.

6. When the gusseting is complete, re-check the "A" frame positioning to the chassis and adjust at the bushes if required.

7. Lower the second suspension unit onto the chassis and roughly position using the markings (NOTE: The suspension units must be fitted in order from front to rear of chassis). Align the unit to the front suspension following the procedure in section 2, paragraphs B1 to B7 of this section.

8. Each consecutive suspension unit should then be fitted and aligned to the unit immediately in front of it in turn, following the same procedure as in 7 above.

Fig. 11.



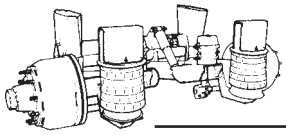


Fig. 12.

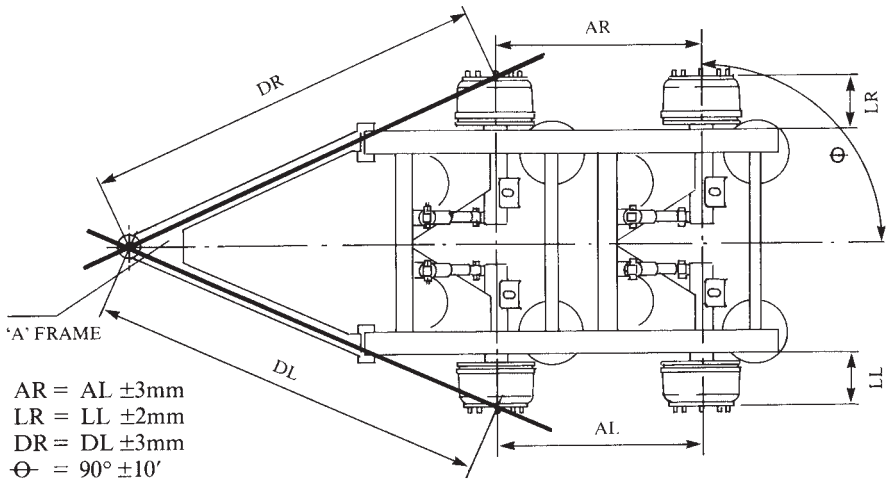
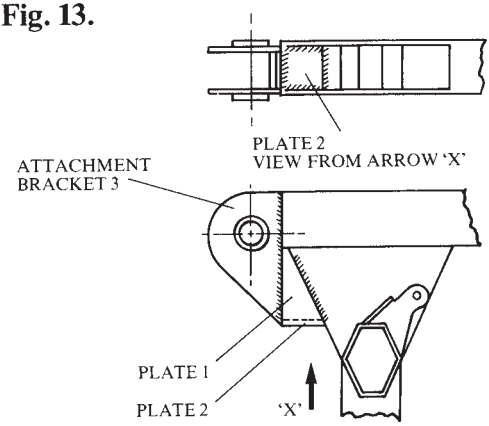
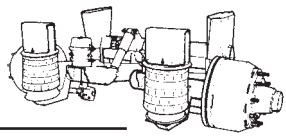


Fig. 13.

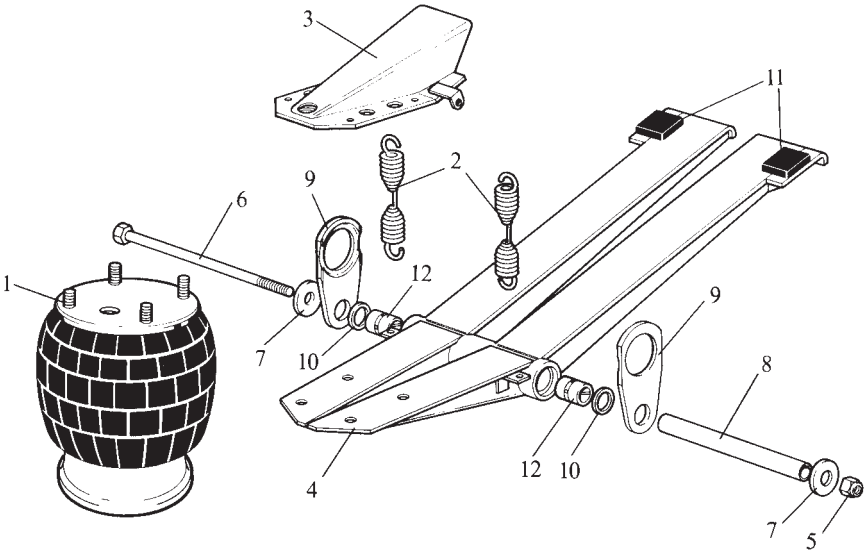


Description	Material	Qty/Size
Plate 1	BS4360 43A 6mm THK	2
Plate 2	BS4360 43A 6mm THK	1
Atch. Brkt. 3	BS4360 43A 6mm THK	

Plates should be cut and shaped to suit joint as required.



F. Lift kit fitting instructions

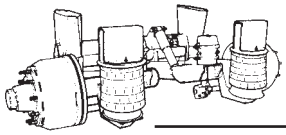


Item No.	Description	Part No.
1.	Airspring	21208082
2.	Return spring (4 stud)	21203389
3.	Upper mounting bracket	21208461
4.	Pivot arm	**
5.	Locknut	21206001
6.	Bolt	21208079
7.	Special washer	21208324
8.	Pivot shaft	21208466
9.	Pivot arm connecting links	21208467
10.	Felt seal	21208468
11.	Nylon pad	21208469
12.	Pivot arm bush	21209990
13.	Grease nipple	99040013

** Pivot arm No. 21213974 Single wheel.
21213958 Twin wheel.

NOTE: All lift kits ordered as original equipment will be fitted at the factory. The following fitting instructions only apply to retrofit lift kits.

1. Fit pivot arm connecting links (item 9) over the bosses welded to the centre pivot bracket of the suspension unit. Ensure that they lie flat against the bracket face.



2. Set the correct gap between the links by fitting the pivot shaft (item 1) and spacer tube (see fig. 14.) between the two links, and tighten up using the nut, bolt and washers provided to fit the assembly. Ensure that the links are square to the pivot boss centre line and the holes are correctly aligned and weld as shown in fig. 15.
(Note Ref. fig. 14, the spacer tube lengths can be found on ROR drawings No. 65208799 single wheel version and No. 65208800 twin wheel version).

3. Remove the axle pivot bolt, shaft and spacer tube.

4. Lightly grease the felt sealing rings (item 10.) and insert into the pivot arm assembly (note bushes item 12. and nipples item 13. will be ready fitted to the arm). Locate the pivot arm between the connecting links, lightly grease the pivot shaft and fit. Clamp assembly up with the nut, bolt and washers supplied. Torque assembly to 60-65 kg.m (430-470 ft. lbs.).

5. Mark the centre of the crossmember on the top face to enable centering of the airspring top mounting bracket (item 3.). Mark a centre line on the top of the mounting bracket. Locate the top bracket flush against the crossmember (this will automatically set the approx 2 deg. angle shown in fig. 16.) and centralise using the centre line marks. Set top bracket height as shown in fig. 16 and tack in position. Place the airspring on the base plinth on the arm to check top/bottom plinths align with the airspring. If they align, remove the airspring and fully weld the top bracket in place, following the weld procedure found in section 9.

6. Ensure all welds are clean and paint the assembly as required.

7. Locate, fit and secure the airspring using the fasteners provided.

8. Fit the return springs as shown in fig. 16.

Fig. 14.

SPACER TUBE

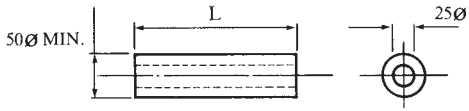


Fig. 15.

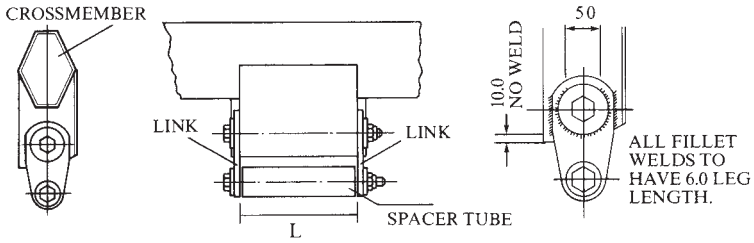
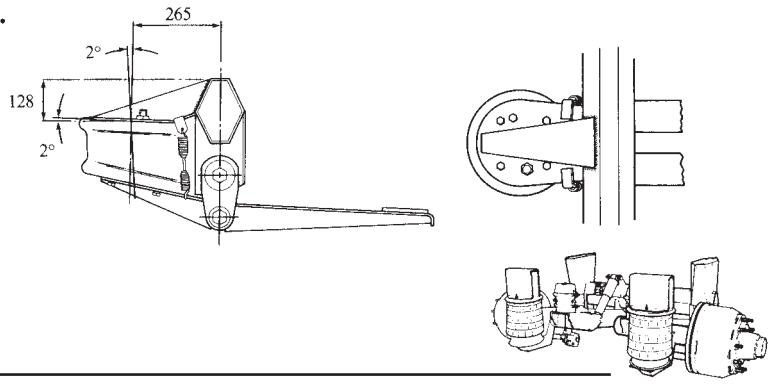


Fig. 16.



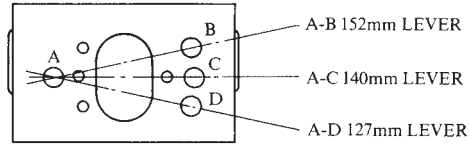
G. Fitting of automatic slack adjusters

1. Measuring from the face of the air chamber, cut the air chamber pushrod to the lengths specified in the following table:-

SLACK ADJUSTER LEVER LENGTH	PUSHROD LENGTH
127mm (5″)	157mm
140mm (5.5″)	155mm
152mm (6″)	152mm

These measurements should provide you with the correct length for installation, but you should always check for correct alignment by adhering to the following procedure.

Fig. 17.



AIRCHAMBER FITTING HOLES IN BRACKET

2. Position the air chamber in place on the air chamber bracket, ensuring the correct hole pairing on the bracket is used corresponding to automatic slack adjuster lever length being fitted (see fig. 17.). Secure the air chamber to the air chamber bracket using the locknuts provided to ensure the chamber does not move during the setting up procedure and tighten to a torque of 12-13 kg.m. (85-95 ft.lbs.) fig. 17.

3. Ensuring the spring brake air chamber is in the off position, fit the clevis to the pushrod end and screw it on until the end of the pushrod is flush with the back of the clevis thread.

4. Using an autoslack template marked for trailer use (available from ROR), position it on the end of the brake camshaft as shown in fig. 18 using a pencil point to locate through the relevant hole and into the hole in the end of the camshaft.

5. Fit the large clevis pin through the template and clevis and check if the small clevis pin-hole is aligned with the smaller template hole. If not, move the clevis up or down the pushrod and re-check with the template until both large and small clevis pins fit into their respective holes together (see fig. 18).

Fig. 18.

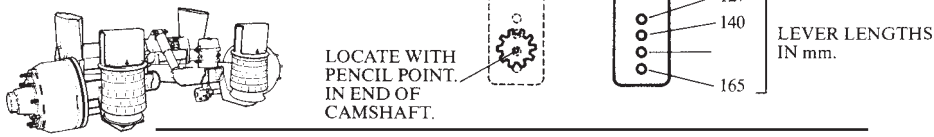
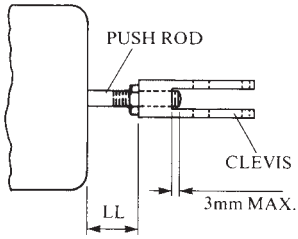


Fig. 19.



6. Check that at least 12mm of pushrod thread is in the clevis and no more than 3mm of rod protruding through the clevis (see fig. 19). Cut the rod to suit and lock the clevis using the lock nut onto the rod. If there are more chambers of the same type being fitted to the trailer using the same automatic slack adjuster lever length, these can be cut at the same time to the same length.

7. Coat the brake camshaft spline with anti-seize compound and fit the automatic slack adjuster, using spacer washers, before fitting the end circlip to produce a gap between the slack adjuster body and circlip of 1.5mm (see fig. 20).

8. Remove the pawl in the side of the adjuster (see fig. 21). Turn the manual adjusting nut until the hole for the large clevis pin and the small hole for the small pin on the adjusting rod align with the corresponding holes in the clevis. When in line, re-check by fitting the clevis pins into the slack adjuster with the templates also in place. If they still align, remove the template and fit the pins. If not aligned again adjust the clevis to suit.

NOTE: DO NOT ATTEMPT TO TURN THE MANUAL ADJUSTING NUT WITH THE PAWL IN POSITION OTHERWISE THE AUTOMATIC ADJUSTING MECHANISM WILL BE DAMAGED.

Fig. 20.

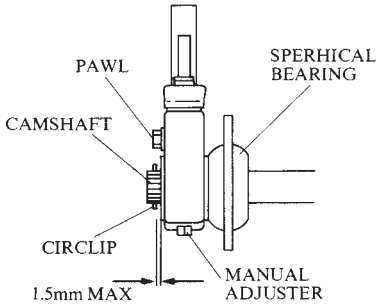
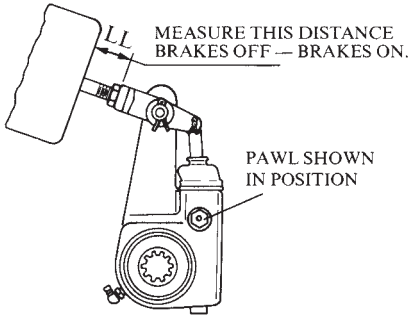
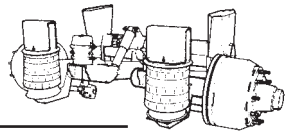


Fig. 21.



NOTE: THE MANUAL ADJUSTING NUT AT THE BASE OF THE SLACK ADJUSTER CAN ONLY BE TURNED CLOCKWISE IF THE PAWL IS REMOVED.

TURNING THE ADJUSTER CLOCKWISE CAUSES THE SLACK ADJUSTER TO MOVE AWAY FROM THE AIRCHAMBER (IN BRAKES ON DIRECTION).



9. Next, initial adjustment of the brakes must be carried out. With the pawl removed turn the manual adjuster counter clockwise until the brakes apply then turn the adjuster clockwise about half a turn to back the brakes off. Re-fit the pawl and torque to 2-3 kg.m. (15-20 ft.lbs.).

10. When the trailer is completed and an air supply available, the air chamber stroke can be checked. With the brakes off, measure between the collar and the air chamber face this being dimension LL as shown in fig. 21 (if a snap type clevis is fitted, measure from the chamber face to the snap nut). With 6.5 bar pressure applied to the system, apply the brakes and re-measure the distance as explained. To conform to the requirements of the trailer MOT test, the difference in measurement (i.e. the chamber working stroke) should not be greater than 47mm for service chambers up to type 24 and no greater than 57mm for service chambers larger than type 24.

Further information requirements regarding the brake system on Indair unit can be obtained from the ROR brake engineering department.

H. Pre-road-test requirements

The following procedure is intended only as a guide for the trailer builder and applies primarily to the suspension components. It is not intended as a rigid qualifying test procedure for trailer roadworthiness. IF THE OPERATOR IS IN ANY DOUBT ABOUT THE SAFETY OF THE VEHICLE, HE SHOULD NOT OPERATE IT AND SHOULD SEEK QUALIFIED ADVICE.

1. Check the suspension and brake air systems are piped up correctly.

2. Check the suspension for leaks by fully charging the system and leaving for 24 hours. If the suspension has deflated, refer to the flow chart in section 6.

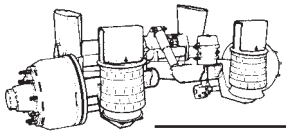
3. Ensure the suspension ride height is correctly set by referring to section 5 of this manual.

4. If an axle lift assembly is fitted operate the lift system to check it operates and observe the extra lift cylinders attached to the levelling valve arms to ensure they function. Refer to section 4.

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

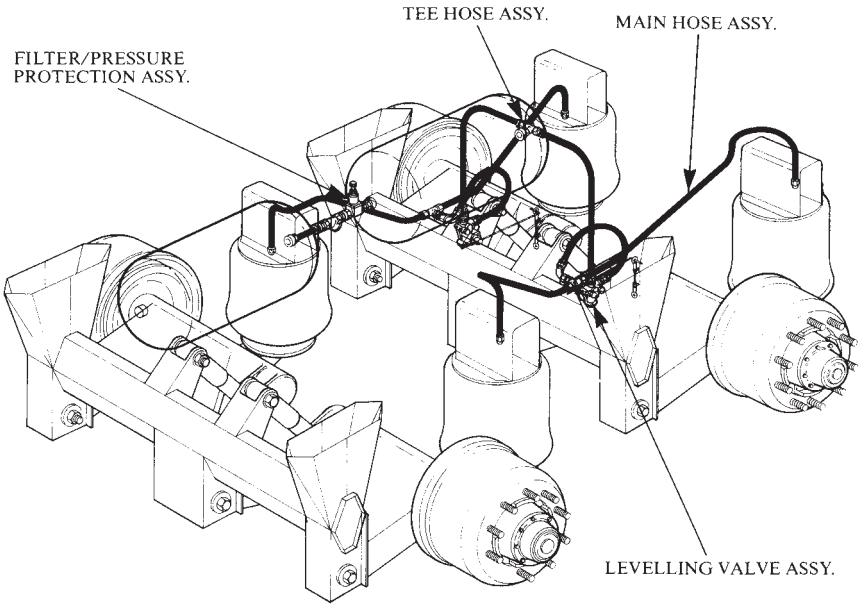
6. Check the brake system operates correctly.

7. Check the operation of all optional equipment fitted to the trailer and seek qualified advice if unsure.



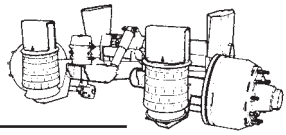
3. THE SUSPENSION PIPING KITS

The Suspension Piping Kit



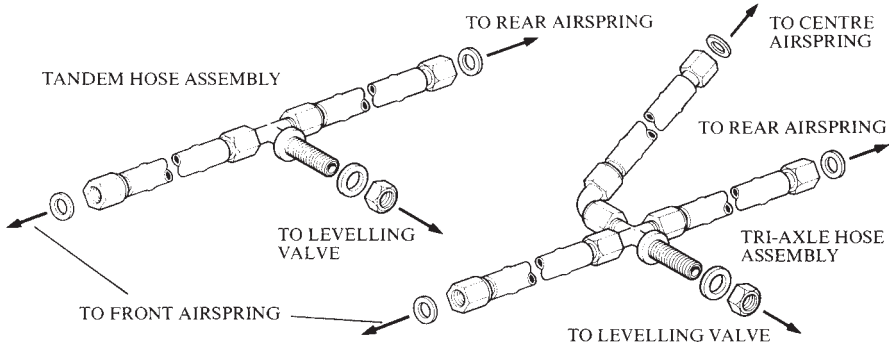
This is available in three forms, namely tri-axle, tandem or single axle versions, which are suitable for twin or single wheel applications. The only differences between these three kits are in the main hose assemblies; the fitting procedure and installation remain the same so that the following information can readily be applied to each kit.

The kit is pre-assembled and employs high quality metric fittings and rubber brake line quality high pressure hose capable of 400 p.s.i. operating and 1600 p.s.i. minimum burst pressure. Rubber brake hose is utilised because it won't chafe or permanently kink even when making sharp bends. It is suitable for temperatures in the range of minus 40 degrees Centigrade to plus 93 degrees Centigrade.

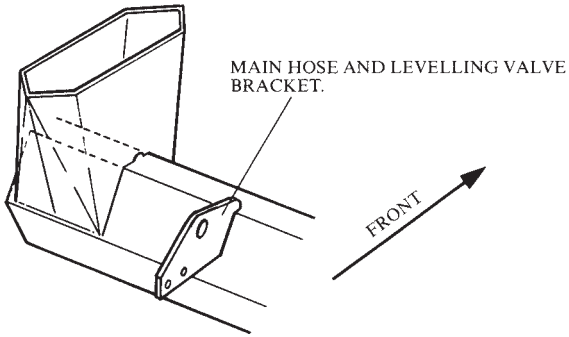


1. The main hose assembly.

This is supplied complete and ready for installation. The hose is rubber brake hose specification and has running nut type fittings either end for ease of assembly. The fittings are simply inserted into the hose and do not require any clipping

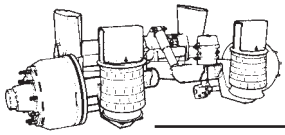


If hoses require shortening the air bag end connection should be removed by splitting the hose, the hose shortened to the correct length and the fitting re-inserted into the hose using a silicon lubricant type spray.

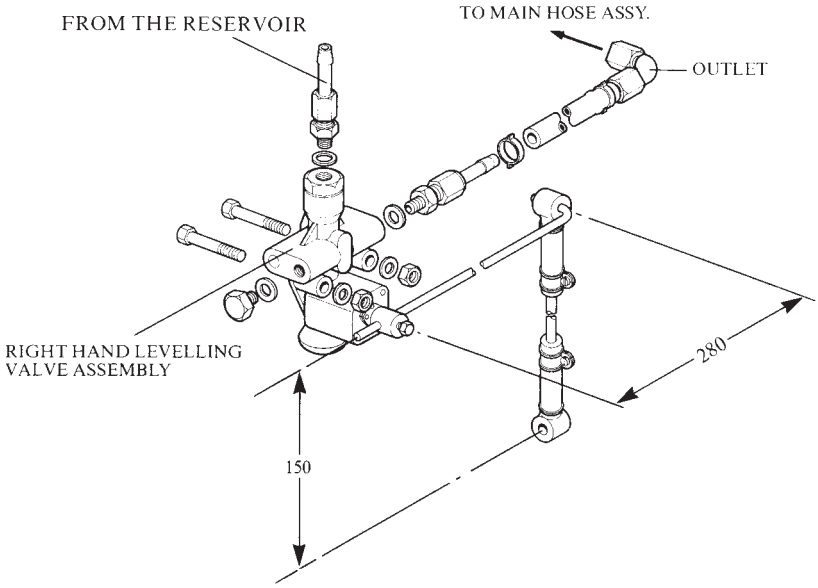


A pair of brackets is attached to each Indair crossmember, which are used for mounting the main hose assemblies and levelling valves. The main hose assembly should be mounted onto the centre crossmember for tri-axles and the rear for tandems. It is mounted via the uppermost hole in the bracket using the washer and M16 x 1.5 locknut provided in the bag of fittings (tighten to 36 kg. m. (20 ft. lbs.). On tri-axles the twin hoses should be run to the rear and the short hose to the front on tandems.

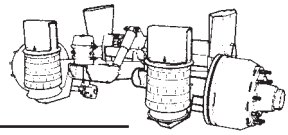
To connect the fitting to the airspring a fibre washer should be placed onto the airspring stud prior to screwing on the running nut assembly. As there is no movement of this hose required it should be rigidly fixed to the chassis by means of clips to prevent chafing.



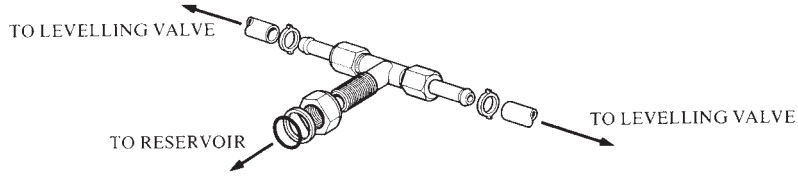
2. The levelling valve assemblies.



These are supplied as a complete assembly consisting of levelling valve, operating arm to locate on axle and rubber hose to connect to main hose assemblies. The levelling valve assembly should be mounted to the inner face of the brackets which are provided on the crossmember (centre crossmember on tri-axle and rear axle on tandems) using the bolts, nuts and washers provided in the bag of fittings. The control arm is preset in the levelling valve at a distance of 280mm from centre of valve to centre of rubber eye end. The connecting arm is roughly set at a distance of 150mm from eye end to eye end; this should be properly adjusted once air has been applied to the system (see setting suspension height in section 5).
The hose which is attached to the levelling valve is the outlet and should be run in a loop (see drawing Nos. 65208366 & 7) to the main hose assembly. This is a compression type fitting and needs no seal or jointing compound. The other port on the front of the valve is an M12 x 1.75 and is plugged. This is a second outlet and if an air load sensing valve is fitted to the system (rather than anti-skid) a pipe should be run from here to the pilot port on the load sensing valve. If a double pilot port load sensing valve is fitted a pipe is run from each valve to each port. If a single pilot port valve is fitted a double check valve of low hysteresis and suitable type (e.g. ROR part number 41204263 or Wabco part number 434 208 000 0) must be fitted to the port and the pipes run from the levelling valve to each side of the double check valve. This will keep the two sides of the system separate. e.g. If both pipes were run into a teepiece this would have the effect of connecting the two sides of the suspension together and cause roll problems.



3. The Tee/hose assembly



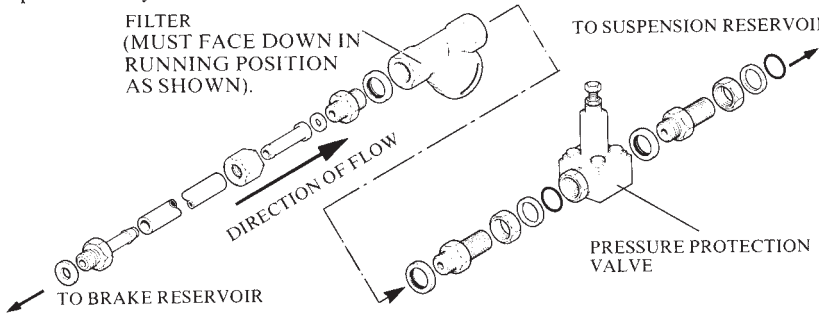
This assembly is an M22 x 1.5 stud teepiece with two lengths of hose attached which are the levelling valve supplies. The stud tee should be mounted into a reservoir port in the suspension reservoir and the nut and seal assembly screwed up against the reservoir port face. The reservoir should be mounted in such a position that the hoses reach the hose tail pieces which are screwed into the top of the levelling valves. The hoses should be run to the levelling valves and cut off to length. Put an "O" clip onto the pipe from the bag of fittings and push the pipe onto the fitting. Position the "O" clip and pinch up with a pair of "Knipex" pincers or similar.

4. The filter/pressure protection valve assembly

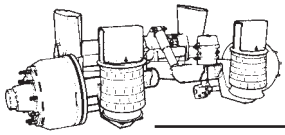
This is supplied for connection between two tanks. It has two roles:

1. To ensure a clean air supply to the valve gear on the suspension.

2. To protect the brake system from loss of air pressure in the event of a failure of the suspension air system.

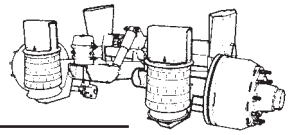


The filter is installed such that if it should become blocked, air will still pass through it. It has a removable element which should be positioned at the bottom and should be cleaned when the brake system is periodically inspected. The pressure protection valve is fitted after the filter and will protect the brake system to a pressure of 5.5 Bar. It comes preset but can be adjusted during service by means of the screw on top of the valve if required. It is a full back flow type valve so that in the event of the brake system pressure dropping during heavy braking applications it will allow the air suspension reservoir to back up the brake reservoir by passing air through a built in non-return valve. The valve should be positioned with the adjusting screw uppermost. The valve assembly should be screwed into the reservoir and the nut assembly screwed up against the reservoir port face. Screw the fixed hose tail piece with a rubber/steel sealing washer into the other tank and run the hose from the valve assembly to it. Cut the hose off to length and push onto the hose tail piece. No clip is needed.



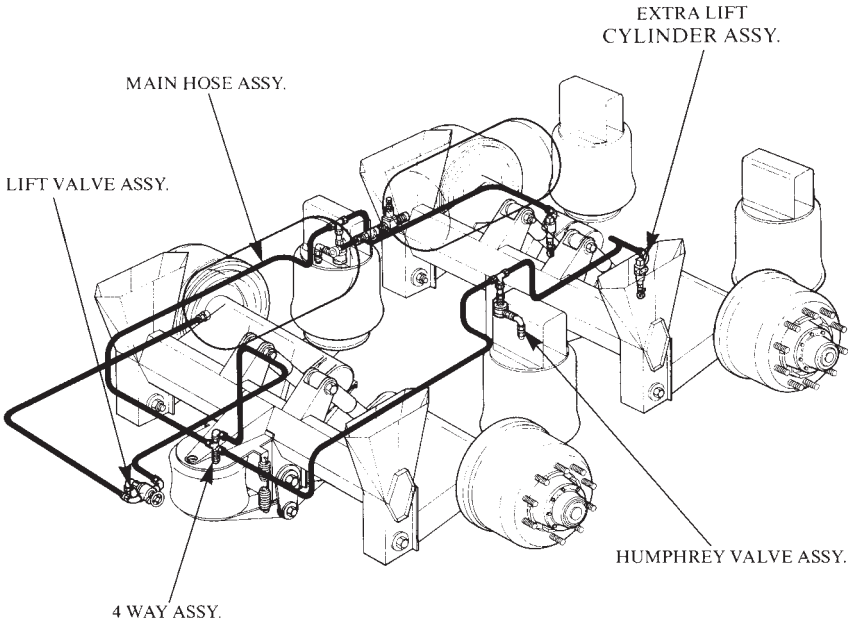
5. Air reservoirs

No air reservoirs are supplied. It is recommended that two 60 litre tanks are used for tri-axle (2 line and 3/2 line with Anchorloks) and two 50 litres for tandems. Single axles should have two 30 litre reservoirs fitted. Extra capacity is not required for lift axles due to the infrequency of operation. The air reservoirs should have M22 x 1.5 ports.



LIFT PIPING KIT

The Lift Piping Kit

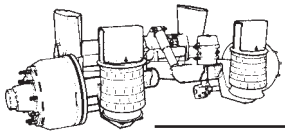


This kit is designed to integrate with the suspension piping kits with a minimum of modification.

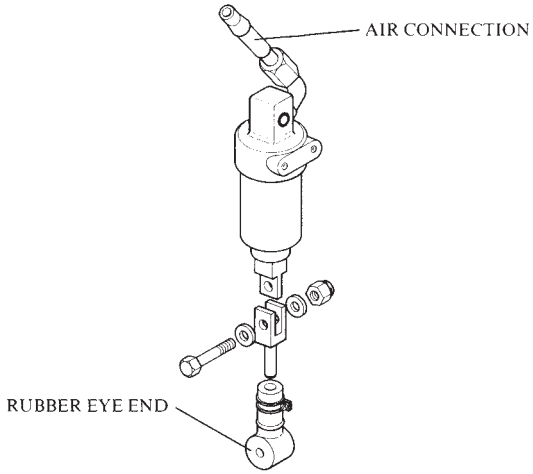
It incorporates:

1. Two cylinder assemblies (which are attached to the levelling valve drop arms and give an extra lift to the unraised suspension units).
2. Two Humphrey valve assemblies.
3. One four-way connector/two main hose assemblies.
4. One hand control (lift) valve and hose assembly.
5. Necessary fittings.

All pipework is rubber brake hose specification. The lift axle is manually operated by means of a hand control valve which should preferably be mounted next to the axle to be lifted so that the operator can observe that there is no obstruction whilst the axle is being raised or lowered. If in doubt request ROR drawing No. 65208601.

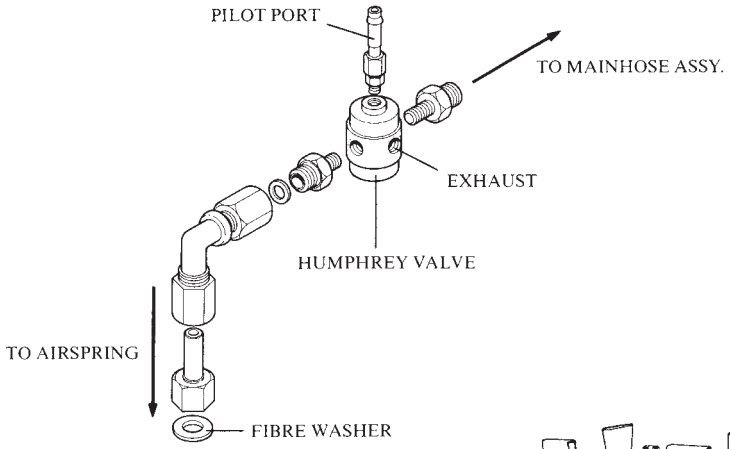


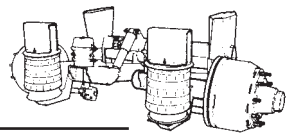
1. The cylinder assemblies



The cylinder assemblies need to be fitted to the levelling valve actuating arms by removing and discarding the drop arms supplied with the suspension piping kit. This is performed by removing the split pin and pulling off the rubber eye end and substituting the cylinder. It will be noticed that the lower end of the cylinder has a rubber eye end similar to the drop arm for ease of fitting to the axle (simply push over pin on axle). The distance from eye end to cylinder eye end is roughly set at 150mm; this should be properly adjusted once air has been applied to the system (see setting suspension height in section 5).

2. The Humphrey Valve Assemblies





These consist of a 3/2 way valve with fittings for attachment to the airspring connection. The Humphrey valve has 4 ports, 3 of which are marked as follows:

IN N.O. . . . . Which represents "IN NORMALLY OPEN."

IN N.C. . . . . Which represents "IN NORMALLY CLOSED."

CYL. . . . . Which represents "CYLINDER."

The other port which is not marked (and is smaller) is the pilot port.

The "IN N.O." port is the supply port (this is connected to the main hose assembly of the suspension piping kit).

The "IN N.C." port is the exhaust port (nothing should be connected to this port).

The "CYL." port is the outlet port (this should be connected to the airspring pressure connection by means of the running nut assembly).

To install the Humphrey valve assemblies a fibre washer should be placed onto the air pressure connection of each lift axle main air springs and the running nut assembly screwed down onto it.

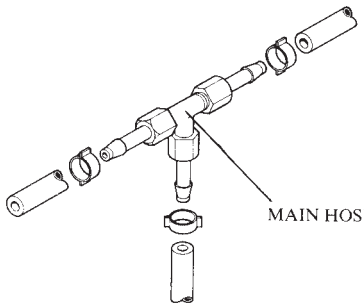
3. The 4 Way Connector/Main Hose Assembly

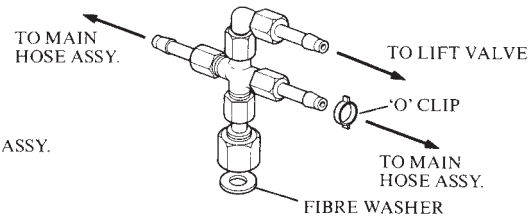
The 4 Way connector should be fitted to the lift airspring air pressure connection by placing a fibre washer onto the pressure connection and tightening the running nut assembly down onto it.

The main hose assemblies are suitable for front or rear axle lift and need to be placed the correct way around as follows:

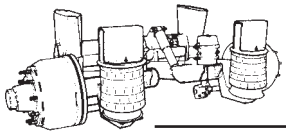
Front axle lift: lay the main hose assembly down the chassis with the small teed off hose approximately above the Humphrey valve, run the hose pointing forward to the four way connector and the hose pointing rearward to the cylinder assembly on the levelling valve. Repeat for the other side.

Rear axle lift: lay the main hose assembly down the chassis with the small teed off hose approximately above the 4 way connector, run the hose pointing forward to the cylinder assembly on the levelling valve and the hose pointing rearward to the Humphrey valve pilot port. Repeat for the other side.





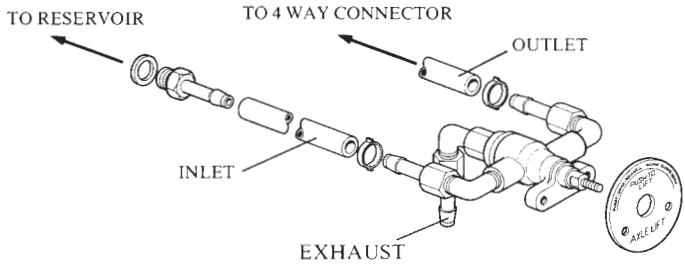
4 WAY CONNECTOR



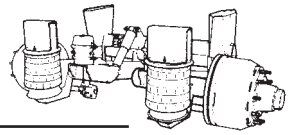
The hoses should be clipped to the chassis and run to their appropriate connections and cut off to length ensuring that sufficient is left on the connections to the cylinders to allow the suspension to move up and down 110mm from normal ride height position. Place an "O" clip onto the end of each hose and push it onto its relative hosetail fitting using a silicone spray type lubricant if required. Position the "O" clip over the hosetail and pinch up with a pair of "Knipex" pincers or similar.

4. The Lift Valve/Hose Assembly

The lift valve assembly consists of a 3/2 way hand operated valve complete with fittings and hose for connection to reservoir and 4 way connector. The lift valve should be mounted in a convenient place adjacent to the lift axle using the screws and label provided in the bag of fittings. The fixed hosetail supplied in the bag of fittings should be screwed into a spare port in the suspension air tank utilising a rubber/steel sealing washer also supplied. It will be noticed that there are three ports in the hand control valve, two of which are marked "IN" and "OUT" and have hoses attached. The third is the exhaust port and has no hose but has a fitting to keep the dirt out of the valve.



Run the hose from the port marked "IN" to the fixed hosetail that is mounted in the tank and cut off to length. Put an "O" clip onto the hose from the bag of fittings and push the hose onto the fitting using a silicone lubricant type spray if required. Position the "O" clip over the hosetail and pinch up with a pair of "Knipex" pliers or similar. Run the other hose from the port marked "OUT" to the top hosetail of the 4 way connector and cut off to length and secure as previous.



SETTING SUSPENSION HEIGHT CONTROL VALVES

This is the area which is probably most unfamiliar to the trailer operator and the one which is most easily done incorrectly if the following parameters are not adhered to. Too high a ride height means that the trailer will roll excessively and too low means that there will be loss of axle travel (contacting bump stop) during arduous use.

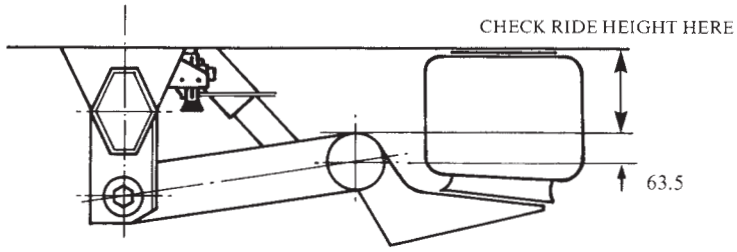
Parameters for setting ride height:

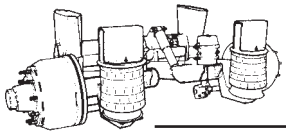
1. The trailer should be on level ground.
2. It should preferably be connected to the tractor unit to be used and in a straight line with the unit, or set at the correct kingpin height.
3. All the trailer brakes should be off.
4. There should be an air supply of at least 6.5 Bar.
5. The trailer should preferably be unladen or the load evenly distributed laterally across the trailer.
6. If the trailer has been running it should be given at least 10 minutes to "settle down."
7. Both valves 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 which has the levelling valves.
9. If the trailer is fitted with a lift axle this should be in the down position.

The ride height is the distance between centre line of axle and underside of frame. By deducting 63.5mm which is half the axle tube diameter from the ride height we get an easily checkable dimension from the underside of the frame to the top of the axle tube.

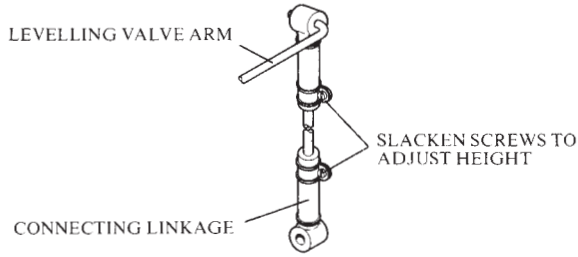
To check the ride height measure from the top of the axle tube to the underside of the trailer frame and compare with the nominal ride height less 63.5mm. (Nominal ride height is specified by the trailer builder and is shown on the axle I/D Tag — last three digits, top line).

The permissible tolerance away from the ride height figure is plus 0mm and minus 25mm provided that both sides are the same within 3mm.





If the ride height is found to be outside these tolerances then the valves will require adjustment. This is performed by lengthening or shortening the linkage rods which connect the levelling valve arm to the axle (giving a proportional increase or decrease in the ride height) and is easily carried out by slackening the two cheesehead screws which 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.

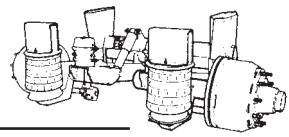


If the ride height is found to be above the recommended setting, it is preferable to drop the setting first and then come back up on the required figure, this can be done by shortening both bars and bleeding air off from both sides of the suspension by slackening the air pressure connection on top of the airsprings. This method also applies to situations where the ride has accidentally been taken above the recommended setting.

Once an adjustment has been made on one side the height should then be checked on the other side as it may have altered.

If the ride height of a particular unit is unknown it can be found on the identity plate attached to the front of the crossmember. The ride height is the last three numeric characters of the axle type number.

Note: some care is needed when checking ride heights as a false reading may be obtained after tipping a load etc. The levelling valve admits and exhausts air very slowly so time should be allowed for the levelling valves to react once adjusted. The valves admit air slightly faster than they exhaust, this is normal so that large volumes of air are not being constantly bled off during normal suspension travel whilst still being able to react relatively quickly to an increase in load or being brought up to operating height from flat.



INDAIR FAULT FINDING CHART

This section is intended to give a guide to the trailer operator to enable him to assess problems.

Those listed are by no means all the causes or cures but are intended to give assistance and to help alleviate some of the problems.

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

The flowchart has three types of box with instructions inside, they are:

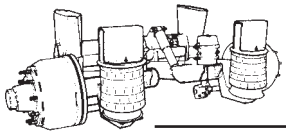
1. Oval for start and stop.
2. Diamond for decisions.
3. Oblong for checking or correcting.

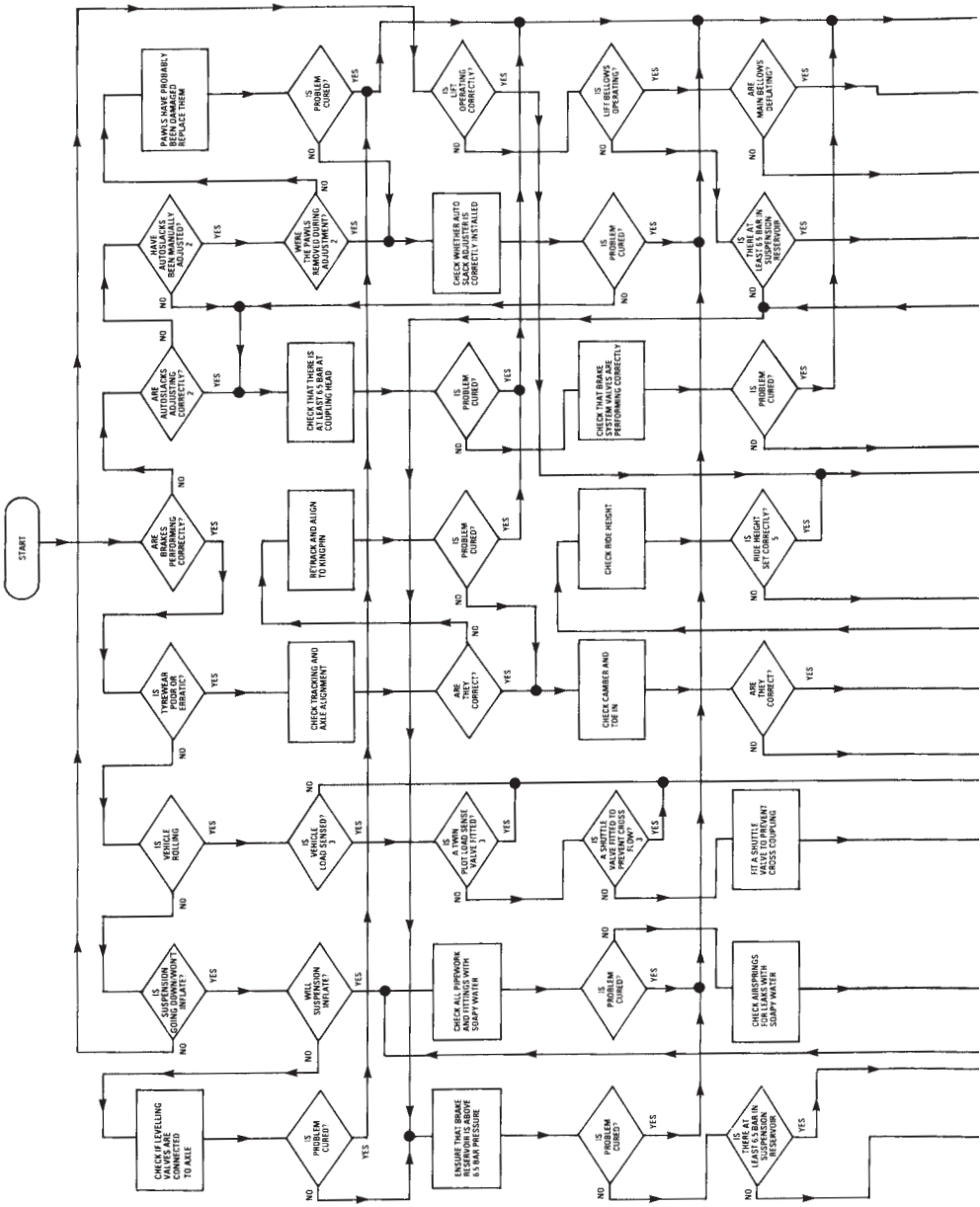
The chart should be followed through in the direction of the arrows and the checks and instructions performed as requested.

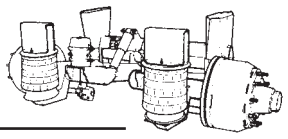
The flowchart covers five basic problems which are namely:

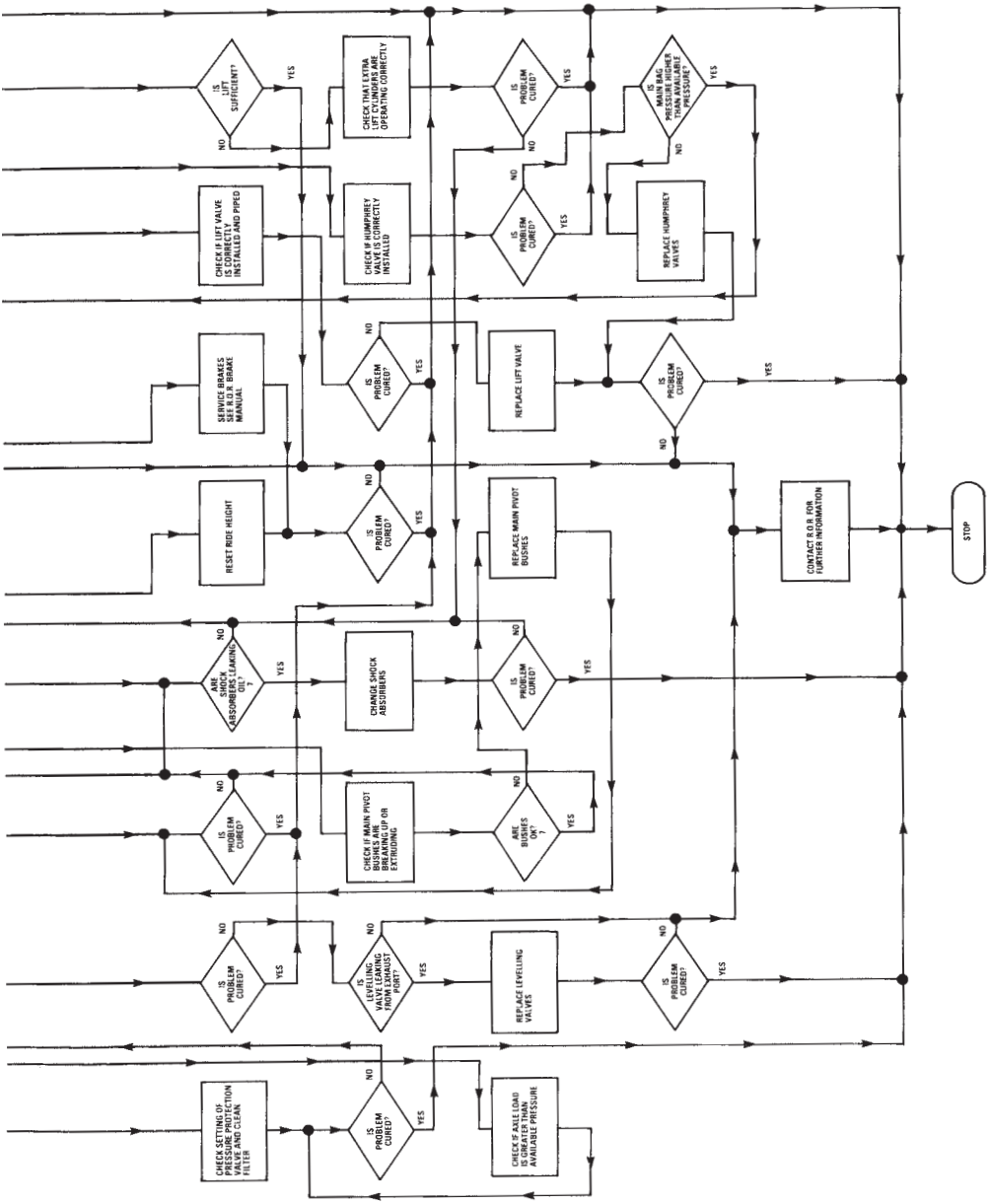
1. Braking problems. (Covers problems arising from auto slack adjusters, brake system valves etc.).
2. Tyre wear. (Covers causes due to suspension misalignment, incorrect ride height adjustment etc.).
3. Roll. (Covers problems arising from lack of shuttle valve, worn shock absorbers etc.).
4. Suspension air related problems. (Suspension won't inflate, leaks etc.).
5. Lift problems. (Covers problems due to incorrect piping, faulty valves etc.).

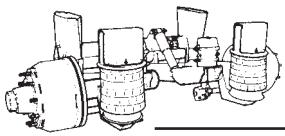
The flowchart should be followed through from start to finish by following the direction of the arrows from each block. As a general rule the input for each block is from the top with the "yes" answer coming out from the bottom, arrows coming out from the side are "no" answers. Where lines cross and there is no large dot there is no connection and progress should be continued along the line.




START
ARE BRAKES PERFORMING CORRECTLY?
IS TYREWEAR PATTERN ERRATIC?
IS VEHICLE ROLLING
IS SUSPENSION GOING DOWN BUT WON'T INFLATE?
WILL SUSPENSION INFLATE?
IS PROBLEM CURED?
CHECK IF LEVELLING VALVES ARE CONNECTED TO AXLE
CHECK TOEING AND AXLE ALIGNMENT
IS VEHICLE LOAD SENSED?
CHECK ALL PIPEWORK AND FITTINGS WITH SOAPY WATER
ENSURE THAT BRAKE RESERVOIR IS ABOVE 6.5 BAR PRESSURE
IS PROBLEM CURED?
RETRACK AND ALIGN TO KINGPIN
ARE AUTOLEACHES ADJUSTING CORRECTLY? 2
HAVE AUTOLEACHES BEEN MANUALLY ADJUSTED? 2
WERE THE PAWLS REMOVED DURING ADJUSTMENT?
PAWLS HAVE PROBABLY BECOME WORN REPLACE THEM
IS PROBLEM CURED?
CHECK THAT THERE IS AT LEAST 6.5 BAR AT COUPLING HEAD
ARE SUSPENSION HEIGHTS CORRECT?
IS A TWIN PILOT CHECK VALVE FITTED? 3
IS PROBLEM CURED?
CHECK WHETHER AUTO LEACH VALVE IS CORRECTLY INSTALLED
IS PROBLEM CURED?
IS OPERATING CORRECTLY?
IS PROBLEM CURED?
CHECK THAT BRAKE SYSTEM VALVES ARE PERFORMING CORRECTLY
IS PROBLEM CURED?
CHECK RIDE HEIGHT
IS RIDE HEIGHT SET CORRECTLY? 5
IS A SHUTTLE VALVE FITTED TO PREVENT CROSS FLOW?
IS PROBLEM CURED?
CHECK CAMBER AND TOE IN
ARE THEY CORRECT?
IS LIFT BELLOWS OPERATING
ARE MAIN BELLOWS DEFLATING?
IS THERE AT LEAST 6.5 BAR IN SUSPENSION RESERVOIR
FIT A SHUTTLE VALVE TO PREVENT CROSS COUPLING
CHECK AIRSPRINGS FOR LEAKS WITH SOAPY WATER
IS THERE AT LEAST 6.5 BAR IN SUSPENSION RESERVOIR
YES
NO




CHECK SETTING OF PRESSURE PROTECTION VALVE AND CLEAN FILTER
IS PROBLEM CURED?
CHECK IF AXLE LOAD EXCEEDS TOTAL AVAILABLE PRESSURE
IS LEVELLING VALVE LEAKING FROM EXHAUST PORT?
REPLACE LEVELLING VALVES
IS PROBLEM CURED?
IS PROBLEM CURED?
CHECK IF MAIN PIVOT BUSHES ARE BREAKING UP OR EXTRUDING
ARE BUSHES OK?
REPLACE MAIN PIVOT BUSHES
IS PROBLEM CURED?
ARE SHOCK ABSORBERS LEAKING OIL?
CHANGE SHOCK ABSORBERS
IS PROBLEM CURED?
RESET RIDE HEIGHT
IS PROBLEM CURED?
SERVICE BRAKES SEE R.O.R BRAKE MANUAL
IS PROBLEM CURED?
REPLACE LIFT VALVE
IS PROBLEM CURED?
CHECK IF LIFT VALVE IS CORRECTLY INSTALLED AND PIPED
CHECK IF HUMPHREY VALVE IS CORRECTLY INSTALLED
IS PROBLEM CURED?
REPLACE HUMPHREY VALVES
IS PROBLEM CURED?
IS LIFT SUFFICIENT?
CHECK THAT EXTRA LIFT CYLINDERS ARE OPERATING CORRECTLY
IS PROBLEM CURED?
IS MAIN BAG PRESSURE HIGHER THAN VALVES PRESSURE?
CONTACT R.O.R FOR FURTHER INFORMATION
STOP
YES
NO



GENERAL MAINTENANCE SECTION

The Indair suspension was designed to require minimum general maintenance. Most of the requirements considered below are precautionary, and are aimed at avoiding future problems.

By far the largest maintenance requirement on the suspension will be the work demanded by the axle stub (i.e. brakes, bearings, etc.). These items are covered in detail in the standard ROR axle service manual, along with service intervals. If the trailer is off the road for any reason, it is always worthwhile to have a quick inspection of the suspension itself as a matter of form. This inspection should be along the lines covered in the 10000 km check considered below.

Periodic checks:

1. After first 1600 km/1000 miles

After the suspension has been "run in" the following checks are advised to be carried out:

A. Check all fastener torques according to the table in section 9 in this manual.

B. Examine all valves and air hose joints for leaks and signs of pipework rubbing the chassis or components.

C. Check the suspension ride height as explained in section 5 of this manual and re-set as required.

D. If a lift kit is fitted, check its operation and that the extra lift cylinders on the levelling valve links are operating.

E. Inspect the shock absorbers for signs of oil leaks.

2. After first 10000 km/6200 miles and subsequent 10000 km intervals.

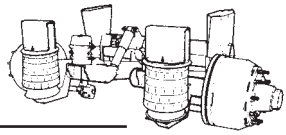
This service should occur with an axle service. Thus, whilst checking the axle components, the following visual inspection of the suspension should be carried out:

A. Shock absorbers: look for any signs of oil leaks along the shock absorber body.

B. Airsprings: check for any signs of air leaks, and examine the rubber bellows for any signs of damage from road debris.

C. Valves: observe that they are not fouled up with road dirt to such a degree that their operation may be impaired (especially the levelling valves). This is particularly necessary if the trailer has been operating in a harsh environment, e.g. coal dust, quarries etc.

D. Axle lift (if fitted): check the lift is operating correctly and that the extra lift cylinders on the levelling valves are functioning.



3. Every 100,000 km/62000 miles

A. Shock absorbers: Check for oil leaks along the body. Lever between the eye ends of the shock absorbers (top and bottom joints) and the brackets, to ensure no lateral movement is evident. If any movement is found, check the torque on the bolts which should be 48-55 kg.m (350-400 ft.lbs.). If after checking the torques they are correct, or after re-tightening there is still movement, new bushes may be required or at worst a new shock absorber. Details of how to remove the shock absorbers can be found in section 8 in this manual.

B. Airsprings: Check for signs of air leaks (i.e. the suspension going flat overnight on one or both sides), and for signs of damage to the rubber bellows. Details on the removal and replacement of airsprings can be found in section 8 of this manual.

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

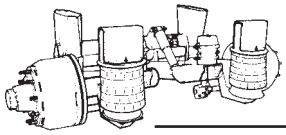
D. Pressure protection valve: Drain the brake and suspension air tanks and couple up an air pressure gauge to each tank. With an air supply of 6.5 bar, recharge the tanks. The brake tank pressure should reach 5 bar minimum before the suspension tank begins to charge.

E. Main pivot bushes: Park the trailer (laden) on even ground, using a calibrated spirit level, measure the camber angle of each link arm by placing the level on top of the axle tube where it is attached to the link arm body (the axle tube should be brushed down and cleaned before measuring to prevent a false reading). If the camber angle is greater than 1.0 deg. outwards at the base of the tyre for a single or twin wheel unit an inspection of the pivot bushes is required.

The first check on the bushes should be a visual one. Clean under the suspension around the inner and outer pivot brackets and check between the thrust washer (tacked to the inner faces of the brackets) and link arm boss for signs of rubber extruding and wear on the thrust washers. If extrusion is evident then removal of the link arm and replacement of the bushes is advised, otherwise increased tyre wear may result. This operation is detailed in section 8 of this manual.

F. Fastener torques: Check all fastener torques and tighten where required according to the table in section 9 of this manual.

G. Axle lift kit (if fitted): Ensure that the lift mechanism is operating. Check that the extra lift cylinders are operating as the axle is being raised. Examine the lift arm for excessive lateral movement by pulling backwards and forwards at the stub axle lifting end of the arm. If excessive play is found the bushes in the arm may need replacing. Details of this operation can be found in section 8 of this manual.



PROCEDURES TO REMOVE AND REPLACE INDAIR COMPONENTS

Tool requirement list

This is a guide to the tools ROR service engineers use, to carry out the work covered in this section.

Open end spanners: 19mm, 27mm, 32mm, 36mm.

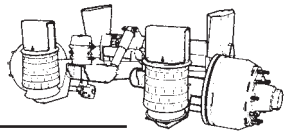
Ring spanners: 19mm, 36mm, $^{15}/_{16}$" AF.

Metric sockets: 13mm, 19mm, 36mm.

ROR service tools:

21011428	Axle end nut assembly sockets.
21200141	Hub puller.
21213212	End nut socket.
21208622	Pivot bush removal tool.

General:
Large copper/hide hammer.
$^1/_2$" and $^3/_4$" drive ratchets.
Wheel trolley. (Wheel dolly).
Pump trolley. (Collis Truck).
3 bottle jacks (5-10 tonne).
Various wooden blocks.
20mm bar 1 metre long.
45mm bar 1 metre long.
Various levers.
Torque wrench (up to 100 kg.m.).
Torque wrench (up to 20 kg.m.).



A. Removal and replacement of link arm bushes

This procedure is aimed at providing a guide to removing link arms and main pivot bushes from the single and twin wheel versions of the Indair suspension.

Removal

1. Ensure no air is in the suspension system and the spring brakes are released using caging tool.

2. Remove the clevis pins from the automatic slack adjuster lever. Using a 15/16" A/F ring spanner, remove the two nuts holding the Anchorlock chamber to the air chamber bracket and lift the chamber from its location. Place in a safe position on the trailer chassis ensuring it is not allowed to hang from its air lines.

3. Place a jack under the "V" part of the lower airspring bracket of the arm to be removed and lift the side of the trailer until the tyre on the link arm is clear of the ground and support the chassis at this height, leaving the jack in place under the arm. Again care should be taken in the positioning of the chassis supports to ensure clear access to the suspension units especially if more than one link arm on the particular side of the trailer is to be removed. (NOTE: This operation ensures there is upward travel of the link arms on the side of the trailer considered since the link arms will drop clear of the airspring bump stops when the chassis supports are in place and jacks are removed).

4. Using a 13mm socket, remove the hub cap and joint. Clean off any excess grease or oil from the axle end nut assembly.

5. Using ROR service tool part No. 21011428, remove the axle end nut assembly, taking care the wheel/hub/drum assembly or outer bearing cone does not fall off.

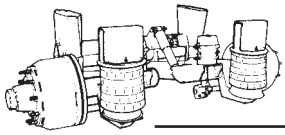
If the suspension is fitted with TL/S 18010/PMX axles, the wheel and brake drum (being outboard) can be removed independently of the hub assembly. With the drum removed, the hub/bearing assembly can be removed by unscrewing the prevailing torque nut using ROR service tool No. 21213212. These nuts are torqued to 650 ft. lbs. so a high back off torque can be expected. A note should be made of the bearing cone pairings on these axles to ensure they are matched up with the same hub if used again.

6. Place a wheel dolly or other suitable device under the wheel and slide the assembly (hub, drum and tyre for standard axles) off the end of the axle stub. Ensure the bearing cones and oil seal do not get damaged or fall.

If difficulty is encountered in pulling the assembly off, use ROR service tool part No. 21200141.

7. With the chassis fully supported and a jack still in position under the bottom airspring bracket of the arm to be removed, position an axle stand under the inner bearing journal of the exposed axle stub end, and lower the link arm down onto the stand. Keep the jack in position for later.

8. Using an M36 socket and ring spanner, remove the bottom shock absorber bolt and loosen the top one. Pivot the shock absorber about the remaining top bolt and position it so it rests on the suspension crossmember out of the way.



9. If it is intended to remove the airspring proceed as follows, otherwise continue from 10 below.
Using an M27 O/E spanner disconnect the air line to the top of the airspring. If the airspring is of four stud design top plate, using an M19 O/E spanner, remove the four M12 nuts off the studs.

If the airspring is of two stud top plate design, using an M32 ring spanner, remove the M22 locknut and spring washer off the air inlet stud using an M19 O/E spanner remove the M12 nut of the single stud.

Using an M19 socket, remove the four M12 screws securing the airspring to the lower bracket and remove the airspring.

10. Using an M36 socket and ring spanner, remove the two nuts securing the inner and outer pivot bush assemblies.

11. Place a jack under each boss within which the rubber pivot bush is located and just support the weight.

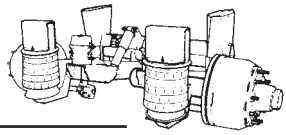
12. Remove the outer pivot bolt and using a 40-45mm diameter punch, tap the centre shaft through from the outside end. The height of the support jack under the outer boss may need adjusting to ensure the shaft moves freely and fully takes the arm weight on that side when the shaft is removed.

13. Depending on the link arm being removed, if the centre pivot bolt enters the centre shaft from the same side as the link arm you are removing, pull the bolt out through the outer pivot shaft hole from which the outer shaft has already been removed. If the bolt enters from the other side of the centre bracket, you can only push it half way through so that it clears the boss and bush you are removing. If the suspension is of the twin wheel type it will be found that the centre pivot bolt should be left in place in the centre shaft at all times. If it is required to remove the bolt this can be carried out when the link arm on the same side as the bolt head, has been removed. The bolt can then be passed through the outer pivot bracket holes on that side.

14. If an axle lift kit is fitted, slacken off the main pivot bolt on the lift arm using an M36 socket and ring spanner. This ensures that the bolt on the lift arm does not prevent the sides of the centre bracket from moving out slightly which helps when removing the link arm.

15. Ensuring the support jack is under the inner boss (see 11 above), using a 40-45mm punch (or steel bar), pass it through the outer pivot shaft hole (shaft removed) through to the inner pivot shaft (still in place) and tap the shaft until it is halfway through the centre bracket so it allows the inner boss and bush to clear it, but still retains the inner boss and bush of the other link arm. If the suspension is of the twin wheel type the centre pivot bolt will still be in the centre shaft, thus on one of the arms on a unit it will be necessary to tap the centre shaft by striking against the head of the bolt. The support jack may need adjusting to ensure the shaft moves freely and fully takes the link arm weight on the inner side when the shaft is clear of the inner boss and bush.

16. If the link arm is to be fully removed proceed from 18 below. To leave the link arm in place under the trailer and simply remove the pivot bushes (and thrust washers if required), proceed as follows: lower the two support jacks under the link arm bosses until the full boss diameters are clear of their respective brackets. It may be found necessary to lower the jack under the lower airspring bracket and lower the axle stand under the axle stub to obtain sufficient down movement of the arm. It should be noted that the airspring can be left fully attached to the link arm and chassis if it is not intended to remove the link arm from under the trailer.



17. To remove the pivot bushes, use ROR service tool part number 21208622. The thrust washers tacked to the inner faces of the pivot brackets can be replaced by the tack welds, cleaning the bracket faces up and tacking on new washers. This should only be necessary if grooves are worn in any part of the washer which are deeper than 25% of the total washer thickness.

18. To remove the link arm completely, ensure the three support jacks positioned under the two bosses and lower airspring bracket are fully supporting the weight of the arm and remove the axle stand. Slide a pump trolley or similar device under the link arm, between the jacks and offset it towards the front of the arm to allow good balance. Trial and error may be needed here to obtain the balanced state and it may be found necessary to block between the arm and the trolley to ensure the arm sits horizontally on the trolley.

19. Take the weight of the link arm on the trolley and remove the support jacks. Slide the arm from under the trailer.

If the trailer is of single axle configuration, place a jack under the lower air spring bracket, locating under the "V" point. Jack the side of the trailer up until the tyre has lifted clear of the ground. Support the chassis at this height but keep the jack in position in order to lower the link arm later. The positioning of the chassis support should be such that clear access to the front and rear of the suspension unit is available.

Refitting

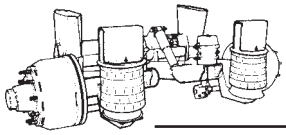
1. Ensure that the inner faces of the thrust washers tacked to the pivot brackets are clean, free from burrs and damage from use or removal. Apply a coating of grease to all faces and bores.

2. If the link arm has not been removed from under the trailer proceed as in 5 below. If the arm has been removed proceed as follows: place the link arm in its correct attitude for fitting on a pump trolley or similar device and use wooden blocks to shim the arm until it is horizontal to the trolley and in a balanced state.

3. Slide the link arm under the trailer and align the bosses with the pivot brackets on the crossmember. Ensure the link arm is pushed forward relative to the brackets so that if the bush and bracket holes do not align when the arm is raised up, the arm must be pushed backwards not forwards to obtain lateral alignment. The reason for this is that it is easy to lever the arm backwards between the boss and bracket, but much more difficult to move the arm forward; this can only be achieved by tapping the arm forward with a large hide hammer.

4. Place support jacks under the two bosses and lower airspring bracket on the link arm and take the weight of the arm. Remove the trolley from underneath to allow room to work. Position an axle stand under the exposed axle stub end in case a jack slips.

5. The link arm should now be supported on three jacks ready for lifting and manipulating into position whether the link arm was completely removed or kept in position to remove the bushes/washers. If the arm was removed the airspring will not be in position, but this will not affect the procedure.



6. Jack the link arm up until the inner bush is aligned with the hole in the centre bracket. The arm may need to be levered or tapped into alignment position as discussed in 3 above. If the arm must be tapped forward into position, use a hide hammer and strike the rear face of the axle tube, being careful to avoid surface damage on the tube. When the holes are in line on this inner pivot, tap the centre pivot shaft through from the other side of the pivot bracket (i.e. the shaft protrudes halfway out on the side of the other link arm). If there is insufficient room to tap the end of the shaft with a hide hammer, you may need to remove the outer pivot bolt on the other link arm and pass a 20mm steel bar through the bolt hole to strike the end of the shaft. As soon as there is room to tap the shaft directly with the hide hammer, do so and tap the shaft fully into position in the centre pivot bracket.

If the suspension unit is a twin wheel configuration the centre pivot bolt will always be left in the centre shaft and the centre shaft will in some cases be tapped into position by striking against the head of the bolt.

The support jacks under the two bosses may need manipulating to allow the shaft to move freely.

7. If the centre pivot bolt could be removed during the arm removal procedure it must now be replaced by passing it through the outer pivot bush whilst the outer pivot shaft has not yet been fitted. If the bolt was not removed, simply push through the centre shaft and fit the washer and M24 nut ready for tightening later.

8. Align the outer bush hole with the outer bracket by manipulating the jack under the outer boss and levering/tapping the link arm to obtain lateral alignment as discussed in 6 above. When aligned, tap the outer pivot shaft into position using a 40-45mm punch (or bar). Refit the outer pivot bolt, washers and M24 nut and hand tighten.

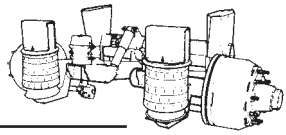
9. If the airspring was not removed proceed as in 10 below. If the airspring was removed proceed as follows: position the airspring on the lower bracket, ensuring the studs and air inlet on the top of the airspring align with the holes in the top bracket welded to the chassis. Secure the spring using M12 screws and spring washers originally fitted and torque them up to 6-7 kg.m (45-50 ft. lbs.).

Raise the rear of the link arm using the jack under the lower airspring bracket until the studs on top of the spring locate in their respective holes. If a two stud airspring is being fitted fit the M22 locknut and spring washer on the air inlet nozzle and torque to 6-7 kg.m (45-50 ft.lbs.) using an M32 socket/spanner. Fit the M12 nut(s) and washer(s) and torque to 7-8 kg.m (50-60 ft. lbs.) using an M19 socket. Re-connect the air hose to the top of the airspring top nozzle and tighten up using an M27 O/E spanner. Ensure a new fibre washer is used in the joint.

10. Pivot the shock absorber back over and align the bottom eye hole with the lower bracket. Refit the M24 bolt, washer and nut and tighten both top and bottom bolts to a torque of 48-55 kg.m (350-400 ft. lbs.) using an M36 socket and ring spanner.

11. Remove the two support jacks under the bosses and the axle stand, but leave the jack in position under the lower airspring bracket. Using an M36 socket and ring spanner, torque the main pivot bolts to 70-76 kg.m (500-550 ft. lbs.).

12. Ensure that the bearing journals and threads on the axle stub are clean. Grease the bearing journals and lower the link arm to a height roughly near the height to fit the wheel/hub/drum, using the jack under the airspring bracket.



13. Ensuring the inner and outer bearing cones are greased and hub cavity has the required grease packing (see ROR axle manual) if this is the required lubrication. Slide the wheel/hub/drum assembly onto the axle stub using a wheel dolly or similar device.

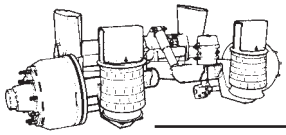
14. Refit the outer bearing cone and end nut assembly and tighten using ROR service tool part No. 21011428. Adhere to ROR service bulletin No. 21 to set the bearing adjustment. If the suspension is fitted with TL/S 18010/PMX axles, refit the prevailing torque nut after ensuring the bearing cones are correctly matched in the hub and torque up to 85-90 kg.m using ROR service tool No. 21213212.

15. Remove the wheel dolley and raise the jack under the lower airspring bracket until the side of the trailer is high enough to enable the chassis supports to be removed. Lower the trailer wheels onto the ground and remove the jack.

16. If the axle bearings are grease lubricated repack the hub cap with grease (see axle manual) and refit the cap using a new joint if necessary and the original screws and washers. If the bearings are oil lubricated, fit the hub cap and fill with oil as recommended in the axle service manual. Tighten the hub cap screws to the required torque according to the appropriate service instructions for the type of axle.

17. Reposition the Anchorlok chamber on the airchamber bracket and secure using the original $\frac{5}{8}$" UNC nuts and washers. Tighten up using a $\frac{15}{16}$" AF O/E spanner.

18. Refit the clevis pins and split pins in the autoslack/slack adjuster lever, and remove securing stud to release spring. It is worthwhile to check the brake adjustment at this stage, thus refer to ROR axle/brake manuals or section 2/6 of this manual.



B. Removal and replacement of airsprings

Removal

1. Drain the suspension air tank and slacken air spring pressure connection to deflate all airsprings, the suspension will drop onto the rubber bump stops inside the airsprings.

2. If the trailer has a single axle, place a bottle jack under the "V" section of the lower airspring mounting bracket and raise the side of the suspension the airspring is to be removed from. Place a chassis support of some form under the chassis and remove the jack to allow the axle stub to drop.

If the trailer has more than one axle, place a bottle jack under the "V" section of one of the axle stubs that is not to have the airspring removed, on the side of the trailer being worked on. This will allow the stub being worked on to drop (Note: The arm can be in a position such that the wheel tyre is clear of the floor. In this case the shock absorber will simply support the stub).

3. Using an M27 O/E spanner, remove the M22 air inlet pipe from the top of the airspring.

4. If the airspring is of two stud design, remove the M22 locknut from the air inlet nozzle on top of the airspring using an M32 O/E spanner.

If the airspring is of four stud design, either remove the straight connector or elbow that will be fitted or leave in position.

5. Using an M19 O/E spanner, remove the M12 nut(s) from the stud(s) on top of the airspring.

6. Using an M19 ring spanner, remove the two or four M12 screws (depending on the lower airspring mounting bracket design) securing the airspring to the lower bracket and remove the airspring.

Replacement

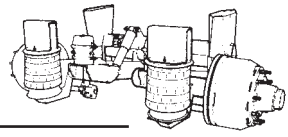
1. With the trailer still raised on one side (see removal section), place the airspring in position on the lower mounting bracket and check the alignment of the air inlet and M12 studs with the top bracket by fitting loosely the base securing screws. If the holes are not aligned, remove the airspring and slacken the four M12 nuts inside the piston base using an M19 socket. (NOTE: Do not remove these nuts otherwise the sealing plate inside the rubber case will become detached and may be difficult to refit).

2. Rotate the piston inside the rubber case until the holes align as required. Tighten the four M12 nuts to 7-8 kg.m (58-60 ft. lbs.) using and M19 socket.

3. Fit the airspring in position and secure the piston onto the lower bracket using the M12 screws. Tighten the screws up to 6-7 kg.m (45-50 ft. lbs.) torque using an M19 socket.

4. Place a bottle jack under the "V" section of the axle stub and raise it until the top of the airspring is in position in the top bracket. Fit the M12 nut(s) to the stud(s) and tighten to 7-8 kg.m (50-60 ft. lbs.) torque.

5. If a two stud airspring is being fitted, fit the flat washer and M22 locknut to the air inlet nozzle and tighten to 6-7 kg.m (45-50 ft.lbs.) torque using an M32 spanner.



If a four stud airspring is being fitted, an elbow or straight connector should be fitted to the airspring when supplied. If such a connector is not fitted, do so at this stage ensuring the correct sealing washers are fitted.

6. Fit the air inlet pipe, ensuring a new fibre washer is used and tighten using an M27 O/E spanner.

7. Lower the side of the trailer and remove the bottle jacks. Recharge the suspension air tank. Using soapy water, check around the air inlet connection for leaks.

C. Removal and replacement of shock absorbers

Removal

1. With the trailer in normal position (laden or unladen), remove the M24 prevailing torque nuts from the top and bottom joint of the shock absorber using an M36 socket and O/E spanner.

2. Tap the lower bolt out through the bracket then the top one and remove the unit.

Replacement

1. Locate the top joint of the shock absorber and fit the M24 bolt ensuring the bolt head is inboard. Fit the prevailing torque nut and flat washer.

2. Rotate the shock absorber and very slowly pull it to extend its length until the lower joint holes align. It is better to extend too far than not enough because you can then tap the unit on the lower "eye" end until the holes align. Fit the M24 prevailing torque nut and flat washer.

3. Tighten the nuts up to 48-55 kg.m (350-400 ft. lbs.) torque using an M36 socket and O/E spanner.

D. Removal and replacement of axle lift pivot arm

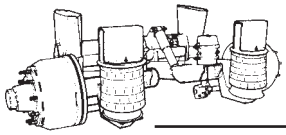
Removal

1. Ensure the lift airspring is not pressurised.

2. Using an M19 spanner, remove the four M12 screws securing the airspring piston to the pivot arm.

3. Using an M36 socket and ring spanner, unfasten and remove the M24 bolt passing through the pivot pin.

4. Using a 40-45mm diameter drift, tap the pivot shaft through the pivot arm body until the arm drops out.

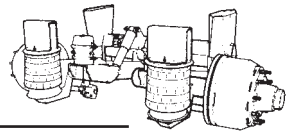


Replacement

1. Clean the phosphor bronze bushes in each end of the pivot arm and liberally grease with TOTAL EXTEMP along with the pivot shaft.

2. Lift the pivot arm into position and align the body with the holes in the arm connecting links. Tap the pivot shaft through and into position.

3. Fit the M24 bolt through the pivot shaft and secure, using the washer and locknut provided. Tighten the nut to a torque of 60-65 kg.m (435-470 ft. lbs.).



DATA, TABLES AND CHARTS

A. Table of torques on Indair fasteners

Fastener Description	Torque	
	Kg.m.	ft. lbs.
Main pivot bolts.	70-76	500-550
Shock absorber bolts.	48-55	350-400
Airspring base plate.	7-8	50-60
Airspring bottom bracket.	6-7	45-50
Airspring top bracket (M12 studs).	7-8	50-60
Airspring top bracket (M22 nozzle).	6-7	45-50
Levelling valve bracket.	2-3	15-20
Lift arm pivot bolt.	60-65	435-470
Anchorlok mounting studs.	12-13	85-95

B. Lubrication

Main pivot shafts (applied during fitting): TOTAL EXTEMP.

Brake components: SHELL DARINA.

Fitting of rubber bushes in link arms: Delco Double Crown
seed oil and potash soft soap.
(W. H. Delf Ltd., Delco Works,
Liverpool 9).

or
Dow Corning 55M Silicon Based
Grease

C. Weld procedures

This procedure is intended as a guide to the welding of Indair attachment brackets to a trailer chassis made from B.S. 4360 or equivalent steels.

1. MIG welding with bare wire

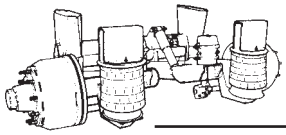
Weld position: Flat.

Consumables: 1.2mm dia. wire to B.S.2901 part 1 1983 A18
A.W.S. A5 18-79 ER 70s-6
D.I.N. 8559 SG 2.

DC Current: 240-300 Amps.

Gas: Argon/5% CO_2. Argon/20% CO_2.

Gas flow rate: 10-20 litres/min.



2. MIG with cored wire

Weld position:	Flat.
Consumables:	A.W.S. 5-20-69 E70 Tl.
DC current:	2.0mm dia. 200-450 Amps. 2.4mm dia. 250-500 Amps.
Gas:	CO_2.
Gas flow rate:	14-21 litres/min.

3. Manual electrode

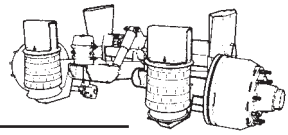
Weld position:	Flat.
Consumables:	4mm dia. electrode to B.S.639 1976 E5154 B11024 H A.W.S. A5-1-69 E7018
DC Current:	110-180 Amps

Electrodes to be stored at 20 deg. F above ambient air temperature.

10.55

RELEVANT DRAWINGS

Single wheel 420mm dia. brake G.A.	65208332
Twin wheel 420mm dia. brake G.A.:	65208793
Twin wheel 350mm dia. brake G.A.:	65208849
Twin wheel 310mm dia. brake G.A.:	65208843
Triaxle piping kit fitting:	65208366
Tandem axle piping kit fitting:	65208367
Single axle piping kit fitting:	65208848
Single wheel axle lift assembly:	65208799
Twin wheel axle lift assembly:	65208800
450mm support block:	21208791
Suspension centering device:	21208792
Lift piping kit fitting:	65208601
Tag axle valve kit:	65208676



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