

68 - AIR SUSPENSION

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RANGE ROVER ELECTRONIC AIR SUSPENSION - (EAS)

Description

The electronic air suspension is a versatile microprocessor controlled system that exploits the advantages of air suspension. It provides a variable spring rate which achieves near constant ride frequency for all load conditions, giving:

- **Improved ride quality.**
- **Continuity of ride quality, laden or unladen.**
- **Constant ride height.**
- **Improved headlamp levelling.**

The function of the system is to provide five height modes, each of which is automatically maintained at the given height by the system logic with the minimum of driver involvement. Vehicle height is sensed by four rotary potentiometer type height sensors. Vehicle height information from each potentiometer signals the ECU to adjust each air spring by switching the solenoid valves to hold, add or release air. The system provides five height settings and automatic self levelling as follows:

Standard - standard ride height i.e. 790mm \pm 7mm, measured from centre of wheelarch eyebrow to floor.

Low profile: 20 mm below standard.

Access: 60 mm below standard.

High profile: 40 mm above standard.

Extended profile: 20 to 30 mm above high profile.

Self levelling

The system provides self levelling under varying vehicle loads. The vehicle will self level to the lowest corner height level for 20 seconds after switching off engine, exiting vehicle and closing doors.

Standard

Vehicle ride height is the same as with conventional suspension, but is maintained under all load conditions. This also provides improved headlamp levelling.

Low profile

This position gives improved handling and fuel consumption at high speed. When the vehicle speed exceeds 80 kph (50 mph) for more than 30 seconds, with INHIBIT switch off, the vehicle will enter the low profile position. The vehicle will return to standard height when vehicle speed drops below 56 kph (35 mph) for more than 30 seconds, unless vehicle stops, in which case it returns to standard when driven away. The LOWER lamp is illuminated in this condition.

Access

This position makes passenger boarding and luggage loading easier. With the vehicle stationary, park brake on (manual), P selected (automatic), footbrake off, doors closed and INHIBIT switch off, pressing the LOWER switch will select the ACCESS position. It is possible to select access for 15 seconds after switching engine off. The LOWER lamp flashes until access position is reached, when it remain constantly illuminated



NOTE: Opening a door will freeze vehicle position.

From access the vehicle will return to standard ride height if the RAISE switch is pressed, OR inhibit switched on OR park brake released, OR the vehicle driven off.

High profile

This position is used to improve approach and departure angles and when wading. Pressing the RAISE switch will select this position provided the road speed is below 56 kph (35 mph) with INHIBIT off. The vehicle will return to standard position when road speed exceeds 56 kph (35 mph) or LOWER switch is pressed. The RAISE lamp is illuminated in this condition.

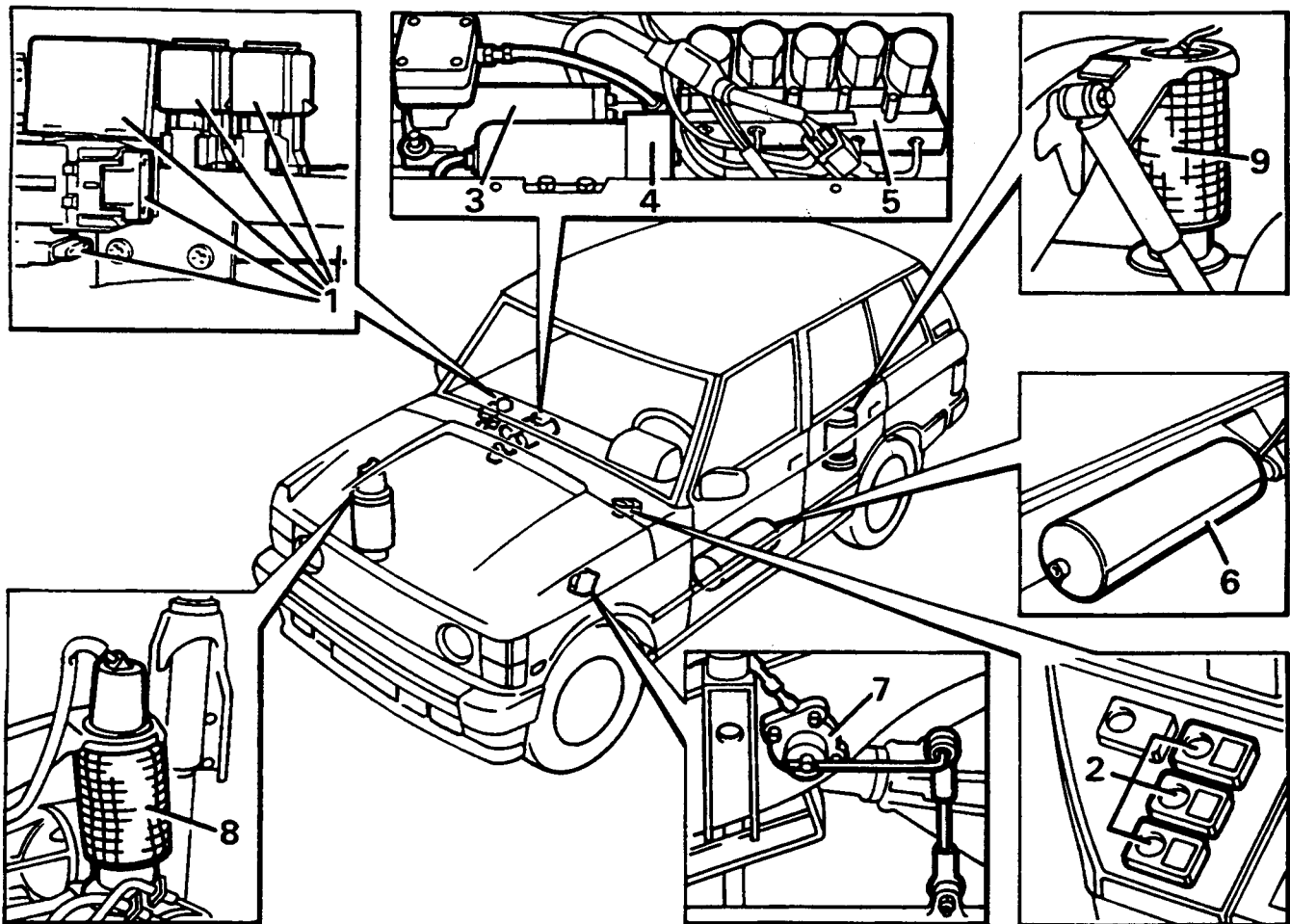


NOTE: When raising ride height, rear of vehicle will raise by 70% of movement first followed by 70% of front. Rear will raise remaining 30% before front. Lowering will be achieved by lowering front of vehicle first. This will ensure that, with headlamps illuminated, there is no inconvenience from headlamp dazzle to other road users. BUT, lowering to access position will be achieved by the fastest possible means, by opening all air valves at the same time.

Extended profile

This position is achieved when vehicle is off road in standard or high profile and the chassis is grounded leaving wheels unsupported. Initial ECU reaction is to deflate (lower) affected springs. After a timed period ECU detects no height change, therefore it reinflates springs in an attempt to regain traction. The RAISE lamp will flash in this mode. After ten minutes system will return to high profile, unless LOWER switch is pressed.

LOCATION OF COMPONENTS (RR3856M)



RR3856M

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Electronic control unit (ECU), relays, fuses and disable switch. 2. Control switches 3. Compressor 4. Air dryer 5. Valve block | <ol style="list-style-type: none"> 6. Reservoir 7. Height sensors (4) 8. Front air spring 9. Back air spring |
|---|--|



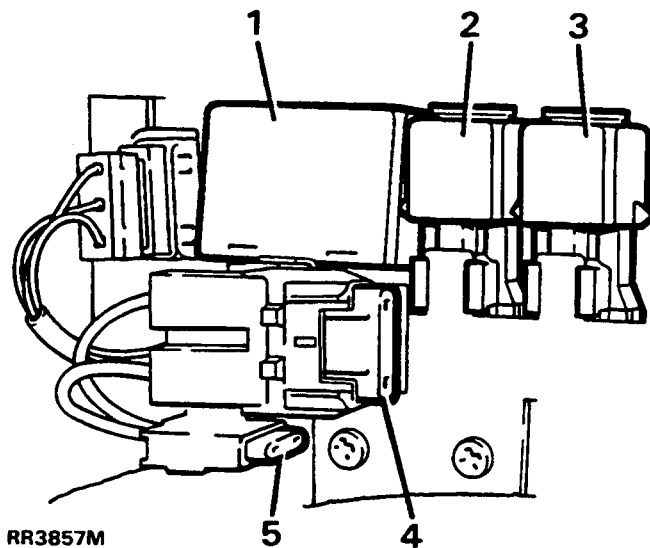
DESCRIPTION OF COMPONENTS

- see RR3868M

Electrical control unit - ECU

The ECU is located underneath the right hand front seat, on top of the fuel ECU. It maintains the requested vehicle ride height by adjusting the volume of air in each air spring. It is connected to the cable assembly by a 35 way connector. To ensure safe operation the ECU has extensive on board diagnostic and safety features. The ECU is non-serviceable, in case of failure it must be replaced.

Relays, fuses - RR3857M

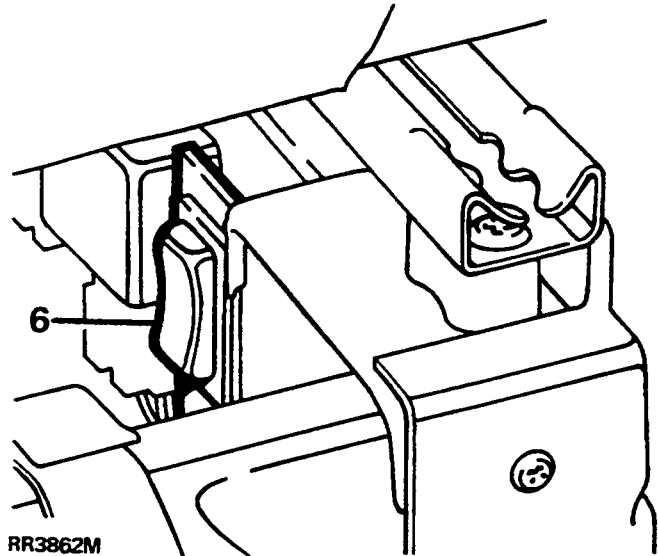


RR3857M

Power supply for the system consists of the following components:

1. Delayed power turn off relay. This remains powered up for 20 seconds after exiting vehicle to allow self levelling.
2. Compressor relay, 4 pin.
3. Warning light relay, 5 pin.
4. 30 amp 'maxifuse' for compressor power.
5. 15 amp fuse for ECU pin 1.

Disable switch - RR3862M



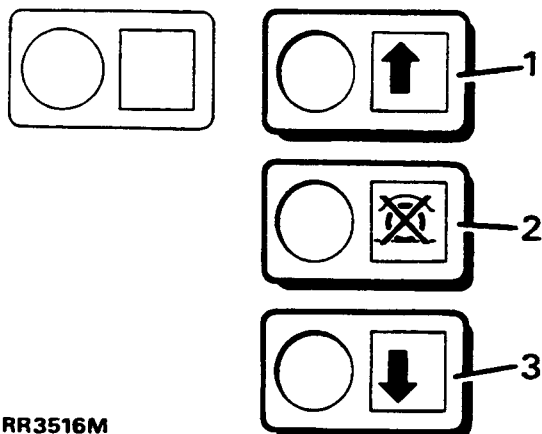
RR3862M

The disable switch 6. is mounted under the right hand front seat. The switch has no markings, in the DISABLE position the bottom of the switch is pushed in. It is used to disable system when vehicle is being delivered, or when working on the system after depressurising. The switch disables the system at speeds below 56 kph (35 mph).

Height sensors

Four potentiometer type height sensors signal vehicle height information to the ECU. The potentiometers are mounted on the chassis and activated by links to the front radius arms and rear trailing links. In case of height sensor failure the assembly must be replaced.

Control switches - see RR3516M



RR3516M

Mounted on the lower fascia, three control switches are arranged thus:

1 - **Raise** - momentary touch switch.

2 - **Inhibit** - self latching switch, when switched on the vehicle will remain at standard ride height. This position is used when the automatic height adjustment is not required i.e. when towing. Self levelling will continue to function.

3 - **Lower** - momentary touch switch.

The switches incorporate a warning lamp. When engine is started all three warning lamps will illuminate for three seconds as part of bulb check. The switches are illuminated when the vehicle lights are on, controlled by the dimmer switch.

The following components, AIR COMPRESSOR, AIR DRYER and VALVE BLOCK are contained in the AIR SUPPLY UNIT mounted on the right hand chassis side.

Air compressor

The air compressor provides system pressure. A thermal switch is incorporated which switches off the compressor relay earth at 130°C. The compressor has an air intake silencer mounted behind rear mud flap. The air intake filter is located adjacent to the fuel filler flap. The filter is renewed every 40,000 kms/24,000 miles/24 months. (30,000 miles USA).

Air dryer

The air dryer is connected into the air line between compressor and reservoir. It removes moisture from pressurised air entering the system. When air is exhausted from the system it passes through the dryer in the opposite direction. The air dryer is regenerative in that air absorbs moisture in the dryer and expels it to atmosphere.

The air dryer unit is non-serviceable, designed to last the life of the vehicle. However if water is found in the system when reservoir drain plug is removed, the air dryer must be changed.



CAUTION: If the air dryer is removed from the vehicle the ports must be plugged to prevent moisture ingress.

Valve block

The valve block controls the direction of air flow. Air flow to and from the air springs is controlled by six solenoid operated valves, one for each air spring, one inlet and one exhaust. A diaphragm valve operated by the solenoid outlet valve ensures that all exhausted air passes through the air dryer. In response to signals by the ECU, the valves allow high pressure air to flow in or out of the air springs according to the need to increase or decrease pressure. The valve block is non-serviceable, in case of failure it must be replaced.

Non-return valves

The valve block contains three non-return valves. NRV1 retains compressor air pressure by preventing flow back to the compressor. NRV2 prevents loss of pressure in the system if reservoir pressure drops. It also ensures correct flow through the inlet valve. NRV3 ensures correct flow through the exhaust valve.

Reservoir

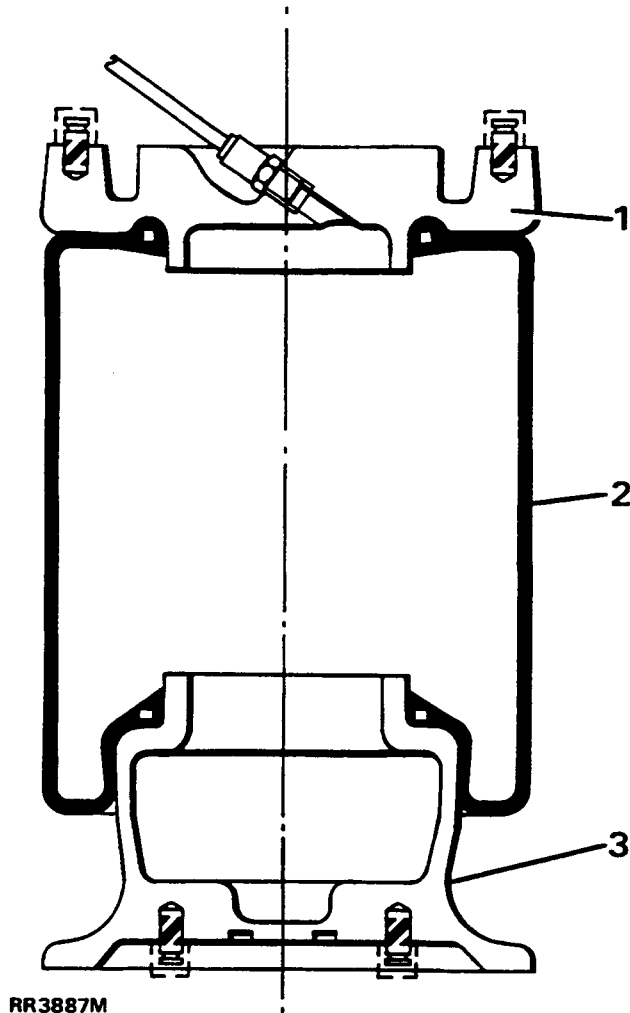
The 10 litre reservoir is mounted on the left hand side of the chassis. One connection acts as inlet and outlet to the rest of the system. It stores compressed air between set pressure levels. The reservoir drain plug requires removing every 40,000 kms/24,000 miles/24 months. (30,000 miles USA) to check for moisture in the system, **See Repair, Air reservoir - drain.**



Pressure switch

Mounted on the reservoir is a pressure switch which senses air pressure and signals the ECU to operate the compressor when required. The compressor will operate when pressure falls to between 7.2 and 8.0 bar. It will cut out at a rising pressure of between 9.5 and 10.5 bar.

Air springs - see RR3887M



RR3887M

Air springs components

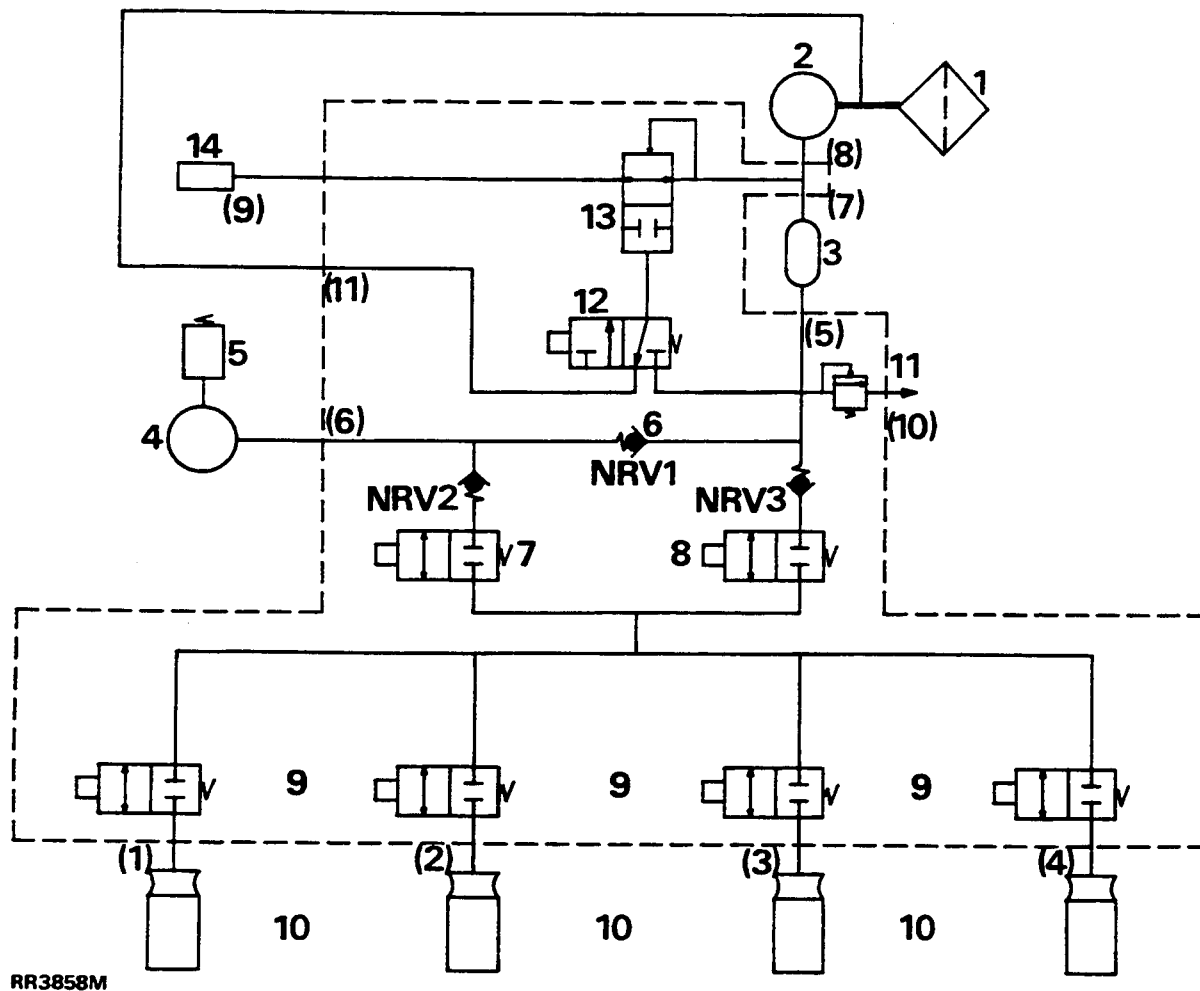
1. Top plate
2. Rolling rubber diaphragm
3. Piston

The air springs are mounted in the same position as conventional coil springs.

Front and back air springs are of similar construction, but are not interchangeable.

The diaphragm is NOT repairable, if failure occurs the complete unit must be replaced.

PNEUMATIC SYSTEM DIAGRAM



RR3858M

Key to RR3858M

1. Inlet filter
2. Compressor
3. Air dryer
4. Reservoir
5. Pressure switch

Valve block comprises items 6. to 12.

1. One way valves NRV1, 2 and 3.
2. Inlet solenoid valve
3. Exhaust solenoid valve
4. Air spring solenoid valves
5. Air springs
6. Pressure relief valve
7. Solenoid diaphragm valve
8. System air operated diaphragm valve
9. Silencer

Valve block port numbers (1) TO (11)

- (1) Air spring - back left
- (2) Air spring - back right
- (3) Air spring - front left
- (4) Air spring - front right
- (5) Dryer outlet
- (6) Reservoir in/out
- (7) Dryer inlet
- (8) Compressor inlet
- (9) Outlet
- (10) Pressure relief valve vent
- (11) Diaphragm outlet (to compressor inlet)

----- denotes valve block



AIR PIPE COLOUR CODES

The following pipes have a coloured band to aid assembly:

Component	Colour
Back left spring	Red
Back right spring	Blue
Front left spring	Yellow
Front right spring	Green
Reservoir	Brown
Exhaust	Violet

SYSTEM OPERATION - see RR3858M

Air is drawn through the inlet filter 1. to the compressor 2., where it is compressed to 10.0 ± 0.5 bar.

Compressor operation activates the diaphragm solenoid valve 12. to prevent air going straight to atmosphere.

Compressed air passes to the air dryer 3. Moisture is removed as air flows through the dryer dessicant. The dessicant in the dryer becomes wet.

Dried air passes to the valve block, through NRV1 to the reservoir 4.

The three non-return valves 6. ensure correct air flow. They also prevent loss of spring pressure if total loss of reservoir pressure occurs.

A pressure switch 5. maintains system pressure between set limits by switching the compressor on and off via an ECU controlled relay.

For air to be admitted to any spring or springs, inlet valve 7. and the relevant air spring solenoid valve or valves 9. must be energised.

For air to be exhausted from any spring, the exhaust valve 8. and the relevant air spring solenoid valve or valves must be energised.

The diaphragm solenoid valve ensures that air exhausted to atmosphere passes through the dryer. This action purges moisture from the dessicant and regenerates the air dryer.

Air is finally exhausted through the system air operated diaphragm valve 13. and to atmosphere through a silencer 14. at the chassis rear crossmember.

ECU INPUTS

The air suspension system is controlled by the ECU, which operates dependant on driver selected inputs plus those listed below. In each mode the ECU maintains the requested ride height by adjusting the volume of air in one or more of the air springs.

Battery - 12 volt supply from ignition load relay.

Engine - from alternator phase tap, signals engine speed to ECU. Note that engine must be running for all height changes, except access and self-levelling when parked. The compressor will be disabled if engine speed falls below 500 rev/min. This is to prevent the compressor drawing current from the battery when the alternator is not charging.

Height sensors - four potentiometer height sensors provide suspension height signals to the ECU.

Road speed - the road speed transducer provides information enabling height changes to occur at correct road speed. Input speed signal to ECU is from a buffer unit located in the driver's side footwell.

Interior light delay unit - signals ECU if any door, not tailgate, is opened, which immediately suspends all height changes.

Parkbrake switch, manual vehicles - the parkbrake must be ON to enter ACCESS.

Gearbox inhibit switch, automatic vehicles - the transmission must be in park to enter ACCESS, parkbrake on or off.

Footbrake switch (brake light) - when footbrake is applied, and for one second after release, all height levelling is suspended below 1.6 kph (1 mph) and above 8 kph (5 mph). The purpose of this is to prevent the system reacting to suspension movement caused by weight transfer during braking and to prevent suspension wind up during height change. Note that this inhibit function is removed after sixty seconds e.g. if footbrake is held on for this time.

Delayed turn off relay - remains energised after switching engine off and exiting vehicle, enables self levelling to occur for 20 secs. If vehicle is stationary, the ECU will energise the relay every six hours to allow self levelling to occur if necessary.

Reservoir pressure switch - when the ECU detects an output from the pressure switch indicating low pressure, the ECU will operate the compressor relay until the pressure switch indicates normal pressure.

Diagnostic plug ground - note that the two halves of the diagnostic plug are normally connected. When disconnected the system will not operate. It will remain frozen at its current height until reconnected.

Disable switch - In the disable position the switch sends a door open signal to the ECU. This freezes the system in position at speeds below 56 kph (35 mph).



SYSTEM FUNCTION

The following table indicates conditions required for various air suspension modes.



NOTE: That the engine must be running unless indicated, and that ACCESS may be selected for 15 seconds after switching engine off.

Function	Condition	Warning lamp on
1. Automatic functions - Inhibit switch OFF.		
High profile to standard	Over 56kph (35mph)	No
Standard to low profile	Over 80kph (50 mph) for 30 secs	Lower
Low profile to standard	Below 56kph (35 mph) for 30 secs (but above 1.6 kph (1 mph))	No
Access to standard	Park brake off or drive away	No
2. Driver select functions - Inhibit switch OFF.		
Standard to high profile	Raise switch below 56kph (35 mph)	Raise
High profile to standard	Lower switch below 56kph (35 mph)	No
Standard to access	Lower switch)Stationary/)park brake on	Lower
Low profile to access (where vehicle has not returned to standard)	Lower switch)- manual/)transmission P)- automatic/)doors shut	Lower
High to Access	Press lower switch twice	No
Access to standard	Raise switch	Lower
Access to high	Press raise switch twice	Raise
3. Inhibit switch ON		
High profile to standard	Below 56kph (35 mph)	Inhibit
Low profile to standard		Inhibit
Access to standard	Stationary/park brake on	Inhibit
4. Self levelling		
Vehicle levelling for 20 secs, and every 6 hrs	Stationary/engine off/ exit vehicle	No

DIAGNOSTICS AND FAULT RECOVERY

The ECU incorporates Fault Recovery Strategies to minimise the effect of a system failure. A serial data link is provided to allow diagnostic information to be retrieved using the Lucas hand held tester. This is also used to set height sensor datum when required. Note that the serial link connector is coloured black for identification purposes. Any faults stored in the ECU memory, from the previous or current running period will cause the ECU to flash the RAISE and LOWER lamps for 30 secs. followed by continuous illumination. If the ECU registers a system fault, it will store the fault in the memory. The fault recovery programme will operate the system depending on the nature of the fault as follows:

Speed sensor fault - the ECU will place the system in standard height and activate inhibit.

Height sensor fault - the ECU will place the system in standard height and activate inhibit. Note that if more than one height sensor fails, the ECU will deflate the air springs to the bump stops.



WARNING: If any two failures occur the system deflates and lowers vehicle to its bump stops, it is possible to drive the vehicle provided that great caution is exercised. The vehicle ride will be extremely uncomfortable and only low speeds will be possible. It is essential that the vehicle fault is rectified as soon as possible.

Pressure switch fault - the ECU will register pressure switch failure if it detects that the compressor has worked for a programmed time with normal air spring operation possible. The ECU will periodically operate the compressor as air is required. The vehicle will be inhibited to standard.

Compressor fault - the ECU will register compressor failure if it detects that the compressor has worked for a programmed time with normal air spring operation not possible. The ECU will attempt to place the system in standard ride height, or a safe lowered position (which could be system deflated). The system will be inhibited from further ride height changes.

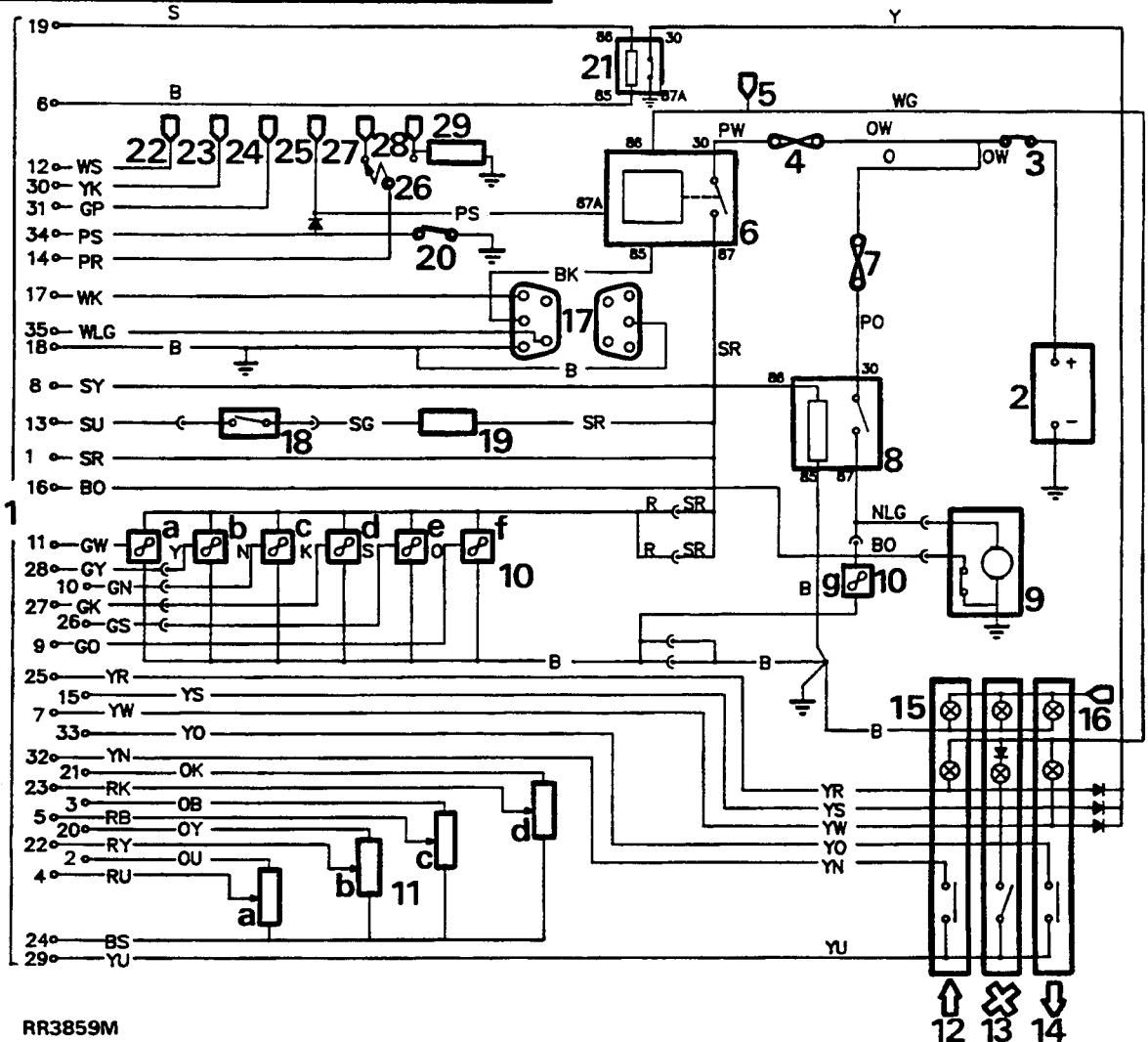
Air leaks - during normal operation the ECU correlates the operating time of the compressor with air usage. If compressor use is greater than programmed, the ECU will register an air leak and attempt to place the system in standard ride height, or a safe lowered position (which could be system deflated). The system will be inhibited from further ride height changes.

Valve block fault - the control of each air spring is monitored to determine that every valve is working correctly.

1. If the ECU detects an air valve stuck open it will attempt to adjust the vehicle to standard height or a safe lowered position (which could be system deflated). The system will be inhibited from further ride height changes.
2. If an air valve is stuck closed above standard height the ECU will deflate the other three air springs.
3. If an air valve is stuck closed, at or below standard height, the ECU will attempt to adjust the other springs to the same height and activate inhibit



AIR SUSPENSION CIRCUIT DIAGRAM
- RR3859M



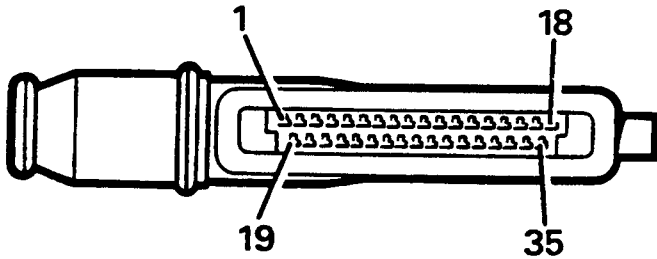
RR3859M

Key to RR3859M

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. ECU 2. Battery 3. Fusible link 4. 15 amp fuse 5. Ignition feed 6. Delayed turn off relay 7. 30 amp maxi fuse 8. Compressor relay 9. Compressor and thermal switch 10. Solenoid valves <ul style="list-style-type: none"> a. back left b. back right c. front left d. front right e. inlet f. exhaust g. outlet 11. Height sensors <ul style="list-style-type: none"> a. back left b. back right | <ul style="list-style-type: none"> c. front left d. front right 12. RAISE switch 13. INHIBIT switch 14. LOWER switch 15. Warning lamps 16. Switch illumination from panel lamps 17. Diagnostic plug 18. Pressure switch 19. 1 Kohm resistor (in harness) 20. Disable switch 21. Warning light relay 22. Engine speed input from alternator 23. Road speed input from speed buffer 24. Brake switch input 25. Door open input 26. Manual/auto select link 27. Park brake input 28. Park switch (microswitch in shifter) 29. 1 Kohm resistor (in harness) |
|---|---|

ECU HARNESS PLUG WIRING DETAILS

- see RR3692M



RR3692M

- | | |
|------------------|-----------------------|
| 1. Slate/red | 19. Slate/red |
| 2. Orange/slate | 20. Orange/red |
| 3. Orange/blue | 21. Orange/purple |
| 4. Orange/pink | 22. Orange/brown |
| 5. Orange/green | 23. Orange/Yellow |
| 6. Black/slate | 24. Black/pink |
| 7. Yellow/white | 25. Yellow/pink |
| 8. Slate/yellow | 26. Green/orange |
| 9. Green/slate | 27. Green/pink |
| 10. Green/black | 28. Green/yellow |
| 11. Green/white | 29. Yellow/blue |
| 12. White/slate | 30. Yellow/pink |
| 13. Slate/blue | 31. Green/pink |
| 14. Black/blue | 32. Yellow/brown |
| 15. Yellow/slate | 33. Yellow/orange |
| 16. Not used | 34. Purple/slate |
| 17. White/pink | 35. White/light green |

SYSTEM CALIBRATION - HEIGHT SENSOR DATUM

Equipment required:

Lucas hand held test unit and air suspension memory card



NOTE: This procedure must be carried out when a new ECU or height sensor has been fitted.

Calibration will also be required if any part affecting damper relationship to body is changed i.e. damper mounts, axles, chassis unit and body panels. The vehicle can be calibrated laden or unladen, but Gross Vehicle Weight must not be exceeded. Tyres must all be the same size and at correct pressures.

IMPORTANT: The floor used for calibration must be level and smooth in all directions to enable procedure to be carried out successfully.



SUSPENSION COMPONENTS

This section gives repair procedures for air suspension components. It is essential to note that repairs to other suspension and transmission components are affected by air suspension.

To remove the following components
DEPRESSURISE the system: front axle, panhard rod, radius arms, rear top and bottom links and rear axle.



WARNING: The air spring must be restricted by suspension loading, with dampers fitted before inflation.

Unrestricted movement of a pressurised air spring will result in failure of the assembly, causing component and possible personal injury.

DEPRESSURISE SYSTEM

Service repair no - 60.50.38

Service tool:

RTC 6834 - Lucas hand held tester



WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Depressurising system will lower body on to bump stops.
2. Connect hand held tester and follow manufacturer's instructions to depressurise complete system.
3. Ensure system is completely depressurised. Check that all air springs are deflated, and vehicle has dropped evenly to the bump stops. If a spring, or springs, remains inflated possibly due to a stuck solenoid valve, it will be necessary to disconnect the pressurised pipe at air spring.



WARNING: Wear hand, ear and eye safety standard protection. For extra protection wrap a clean cloth around pipe to be disconnected. Note that vehicle will lower to bump stops when pipe is disconnected.

4. Disconnect air pipe *See Disconnect/connect air pipe*
5. Disable system using switch under right hand front seat.

Repressurise

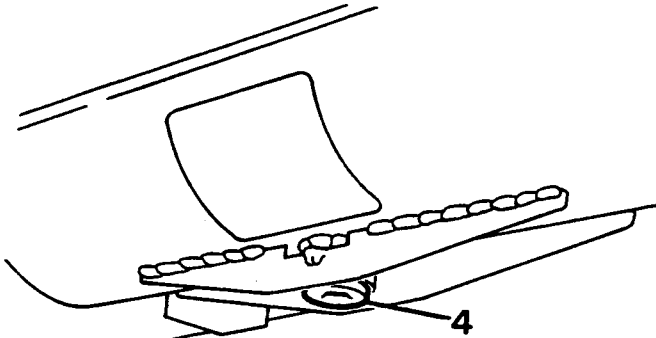
6. Switch disable switch OFF.
7. Run engine to repressurise system.

AIR RESERVOIR - DRAIN

Service repair no - 50.50.24

The reservoir is drained every 40,000 Kms (24,000 miles) - USA 30,000 miles.

1. Depressurise system, *See Depressurise system*
2. Clean area around reservoir drain plug.
3. Partially open drain plug, allow residual air to escape.



RR3865M

4. Remove drain plug, NO water should be present. If water is present, air dryer unit must be changed *See Air dryer*
5. Fit drain plug, checking sealing washer. Tighten to **70 Nm**.
6. Repressurise system.

AIR SPRINGS/HEIGHT SENSORS - INSPECT

Visually check air springs for cuts, abrasions and stone damage to alloy end plates. Check security of retention clips. Check height sensors for damage to housing, operating links and cable assembly.

AIR HARNESS INSPECT

Check air harness (pipes) for damage and security over its full length around vehicle.

LEAK TEST PROCEDURE

Service repair no - 60.50.35

If an air leak is suspected the use of a proprietary leak detection spray is recommended. This procedure should also be used where pneumatic components have been disturbed.

The spray used must have a corrosion inhibitor, and must not cause damage to paintwork, plastics, metals and plastic pipes.

Recommended leak detection spray is GOTEK LDS. This is available under part number STC1090.

1. Ensure system is fully pressurised.
2. Clean around area of suspected leak.
3. Using manufacturer's instructions, spray around all component joints and air springs, working systematically until source of leak is found.
4. If a component eg: air spring, air dryer is leaking, rectify by fitting a new component.
5. If an air pipe connection is leaking cut 5 mm off end of pipe. Fit new collet, *See Air pipe connection collet and 'O' rings*
6. Reinflate system, carry out leak test.



OPERATING SWITCH WARNING LIGHT AND ILLUMINATION

Service repair no - 60.50.17

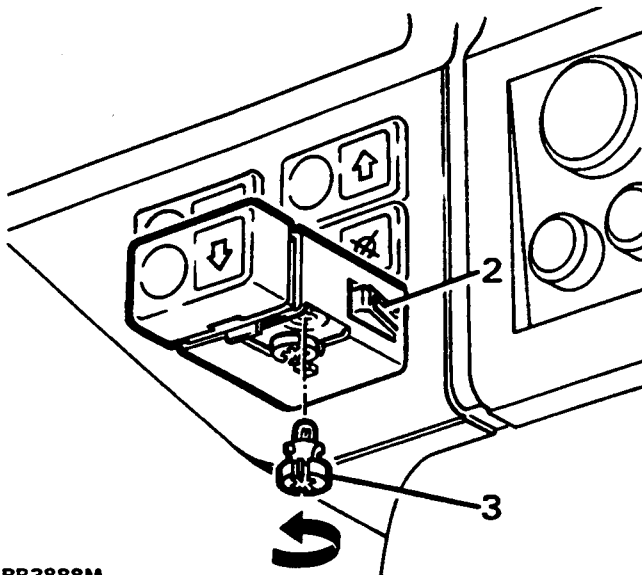
Remove and refit



NOTE: Each switch contains a warning light bulb, and an illumination bulb.

Remove

1. Remove centre dash panel, *See CHASSIS AND BODY, Repair, centre dash panel*
2. Depress locating tags of switch to remove switch.



RR3888M

3. Remove bulb by turning anti-clockwise and releasing from switch.

Refit

4. Fit new bulb and turn anti-clockwise until fully located.
5. Reverse removal procedure.

DISCONNECT/CONNECT AIR PIPE

Remove and refit

Remove



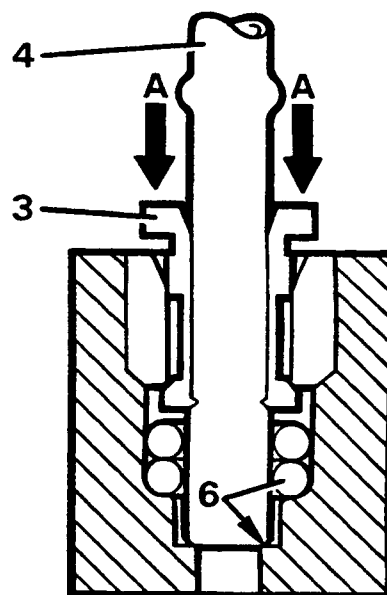
WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Depressurise complete system, *See Depressurise system*



CAUTION: Air pipes may be damaged if not disconnected correctly, resulting in possible leaks.

2. Clean air pipe connection with stiff brush and soapy water. Peel back rubber boot.
3. To disconnect air pipes apply equal downward pressure on collet at 'A' as shown.



RR3592M

4. Pull air pipe firmly out through centre of collet.
5. Inspect disconnected end of air pipe for damage and scores. Rectify as necessary.



NOTE: Air pipe may be trimmed if sufficient straight pipe remains. Ensure pipe end is cut square, without distortion or frays to obtain air tight seal. Use service tool LRT 60 - 002. Lightly chamfer pipe using a pencil sharpener after cutting. **DO NOT CUT PIPES MORE THAN TWICE.**

Refit

6. Push pipe firmly through two 'O' rings until it contacts base of housing as shown. Gently pull pipe to ensure connection. The collet will retain some movement while depressurised. Refit rubber boot.
7. Pressurise system, *See Depressurise system*
8. Leak test connection, *See Leak test procedure*

AIR PIPE CONNECTION COLLET AND 'O' RINGS

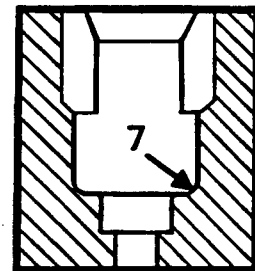
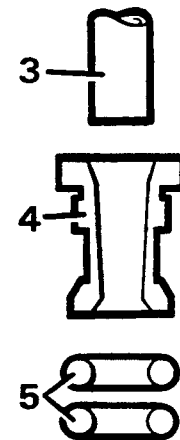
Remove and refit

Remove



WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Clean area with stiff brush and soapy water.
2. Depressurise system, *See Depressurise system*
3. Disconnect air pipe, *See Disconnect/Connect air pipe*



RR3593M

4. Remove collet.
5. Carefully pry out two 'O' rings, using a smooth plastic hook, eg: a crochet hook.



CAUTION: Avoid scratching inside wall of housing, creating possible leak path.

Refit

6. Lightly grease new 'O' rings.
7. Fit 'O' rings into recess. Use a crochet hook to avoid damage to 'O' rings and housing.
8. Locate collet legs into housing, push fully home.
9. Inspect end of air pipe for damage and scores rectify by trimming.



NOTE: Air pipe may be trimmed if sufficient straight pipe remains. Ensure pipe end is cut square, without distortion or frays to obtain air tight seal. Use service tool LRT-60 - 002. Lightly chamfer pipe using a pencil sharpener after cutting. **DO NOT CUT PIPES MORE THAN TWICE.**

10. Connect air pipe, *See Disconnect/connect air pipe*
11. Pressurise system, *See Depressurise system*
12. Leak test connection, *See Leak test procedure*



FRONT SHOCK ABSORBER

Service repair no - 60.30.02

Remove and refit

Remove

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

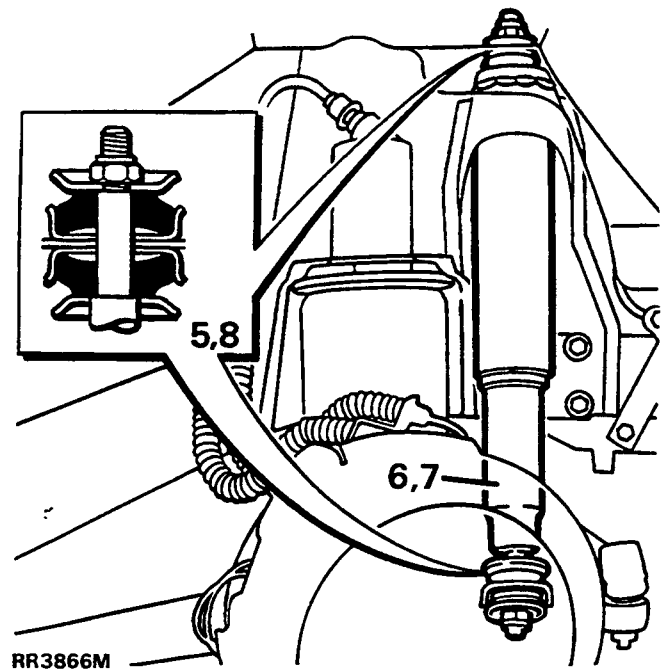
WARNING: Unrestricted movement of a pressurised air spring will result in failure of assembly, causing component damage and possible personal injury. It is possible to remove shock absorber assembly without depressurising air springs, providing distance between axle and chassis is held as if shock absorber assembly were still fitted. This is achieved by supporting vehicle on stands with a jack under the axle.

1. Disconnect the battery negative lead.
2. Remove wheel, *See WHEELS AND TYRES, Repair, Wheels*
3. Support chassis on axle stands.
4. Support front axle with jack.



CAUTION: Do not lower axle when shock absorber is removed, this may result in damage to air springs.

5. Remove top and bottom shock absorber fixings.



6. Remove shock absorber.

Refit

7. Fit shock absorber.
8. Fit top and bottom fixings, ensuring mounting rubbers are fitted as shown.
9. Tighten fixings to **38 Nm**.
10. Reverse removal procedure. 1 to 4.

REAR SHOCK ABSORBER

Service repair no - 64.31.02

Remove and refit

Remove



WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.



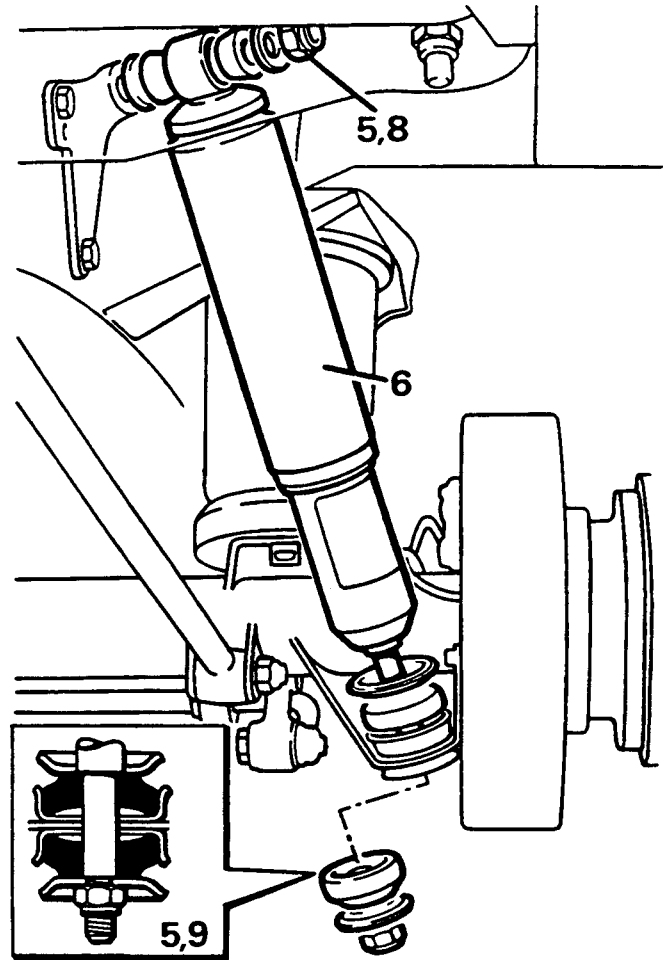
WARNING: Unrestricted movement of pressurised air spring will result in failure of assembly, causing component damage and possible personal injury. It is possible to remove shock absorber assembly without depressurising air springs, providing distance between axle and chassis is held as if shock absorber assembly were still fitted. This is achieved by supporting vehicle on stands with a jack under the axle.

1. Disconnect the battery negative lead.
2. Remove wheel, See *WHEELS AND TYRES, Repair, Wheels*
3. Support chassis on stands.
4. Support axle with jack.



CAUTION: Do not lower axle when shock absorber is removed, this may result in damage to air springs.

5. Remove shock absorber top and bottom fixings.



RR3867M

6. Remove shock absorber.

Refit

7. Fit shock absorber.
8. Fit top fixings. Tighten to **82 Nm**
9. Fit bottom fixings, ensure mounting rubbers are fitted as shown. Tighten to **38 Nm**
10. Reverse removal procedure. 1 to 4.



FRONT AIR SPRING

Service repair no - 60.21.01

Remove and refit

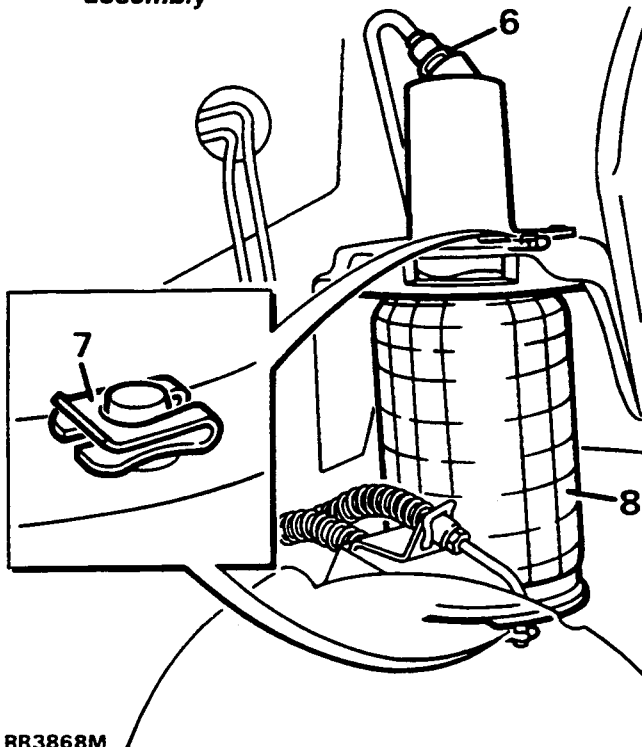
Remove

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

WARNING: The air spring must be restricted by suspension loading, with shock absorbers fitted before inflation.

Failure to observe this warning could cause air spring failure, resulting in component damage or personal injury. **DO NOT ATTEMPT TO DISMANTLE AIR SPRING**

1. Depressurise system, *See Depressurise system*
2. Disconnect the battery negative lead.
3. Remove wheel, *See WHEELS AND TYRES, Repair, Wheels*
4. Support chassis on axle stands.
5. Support front axle with jack.
6. Peel back rubber boot. Disconnect air pipe from air spring, *See Disconnect/Connect air pipe assembly*



RR3868M

7. Remove four retaining clips from upper and lower fixing.
8. Remove air spring assembly.

Refit

9. Locate air spring assembly onto lower fixing, ensure air pipe connection points rearwards.
10. Connect air pipe to air spring assembly, *See Disconnect/Connect air pipe assembly*.
11. Raise axle to locate air spring assembly into upper fixing, if required.
12. Fit new retaining clips to fixing points.
13. Reverse removal instructions 1 to 6.
14. Leak test air spring and around connections, *See Leak test procedure*

REAR AIR SPRING ASSEMBLY

Service repair no - 64.21.01

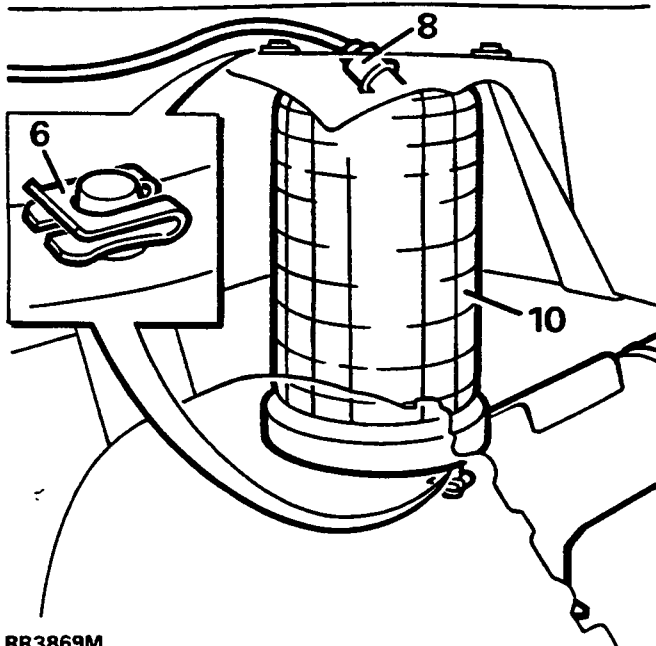
Remove and refit**Remove**

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.



WARNING: The air spring must be restricted by suspension loading, with shock absorbers fitted before inflation. Failure to observe this warning could cause air spring failure, resulting in component damage or personal injury. **DO NOT ATTEMPT TO DISMANTLE AIR SPRING**

1. Depressurise system, *See Depressurise system*
2. Disconnect the battery negative lead.
3. Remove wheel *See WHEELS AND TYRES, Repair, Wheels*
4. Support chassis on axle stands.
5. Support axle with jack.
6. Remove four retaining clips from upper and lower fixing.



RR3869M

7. Lower axle for access to air pipe connection at top of air spring.
8. Clean connection with a stiff brush and soapy water. Peel back rubber boot.
9. Disconnect air pipe, *See Disconnect/Connect air pipe*
10. Remove air spring assembly.

Refit

11. Locate air spring assembly onto lower fixing. Ensure air pipe connection points towards rear.
12. Connect air pipe to air spring assembly, fitting rubber boot, *See Disconnect/Connect air pipe*
13. Raise axle to locate air spring assembly into upper fixing, if required.
14. Fit four new retaining clips to fixing points.
15. Reverse removal procedure. 1 to 5.
16. Leak test air spring and connector, *See Leak test procedure*



BUMP STOP

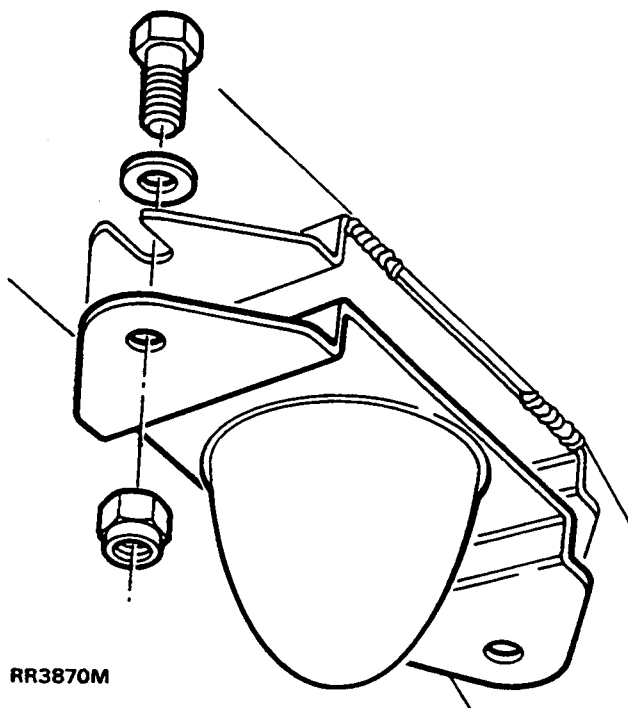
Service repair no - 60.30.10

Remove and refit

CAUTION: Air suspension system uses 'progressive' bump stops, which must not be interchanged with those used on coil spring suspension.

Remove

1. Remove fixings.
2. Remove bump stop assembly.



Refit

3. Position fixing bolts in chassis bracket.
4. Fit bump stop.
5. Tighten fixings.

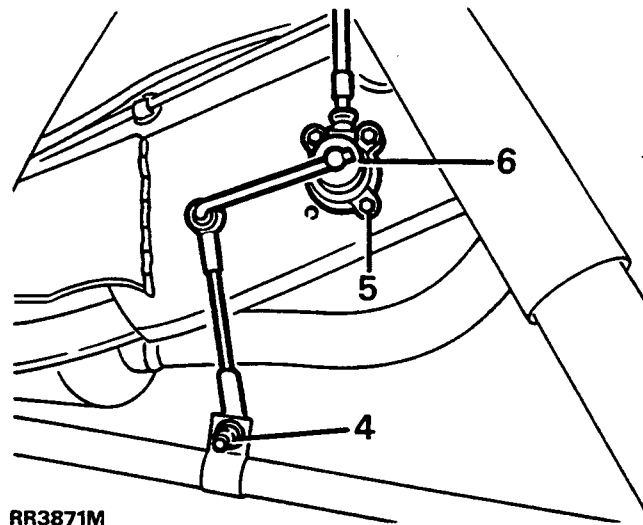
HEIGHT SENSOR

Service repair no - 60.36.01 - Front
Service repair no - 64.36.01 - Back

Remove and refit

Remove

1. Disconnect the battery negative lead.
2. Remove wheel *See WHEELS AND TYRES, Repair, Wheels*
3. Disconnect height sensor multiplug.
4. Remove height sensor lower link fixing.



CAUTION: Back height sensors have longer lower link than the front sensors.

5. Remove height sensor fixings.
6. Remove height sensor.

Refit

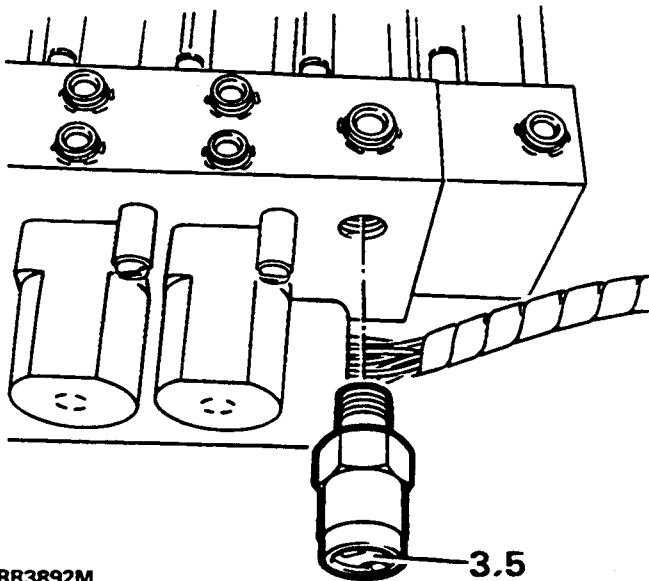
7. Reverse removal instructions.
8. Recalibrate system *See Description and operation, System calibration - height sensor datum*
9. Attain standard ride height.

PRESSURE RELIEF VALVE**Remove and refit**

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

Remove

1. Remove valve block *See Valve block*
2. Clean around pressure relief valve with a stiff brush and soapy water.
3. Remove pressure relief valve.



RR3892M

Refit

4. Coat threads of pressure relief valve with Loctite 572.
5. Fit valve. Tighten to **12 Nm**.
6. Reverse removal procedure.

COMPRESSOR INLET FILTER**Service repair no - 60.50.12****Remove and refit**

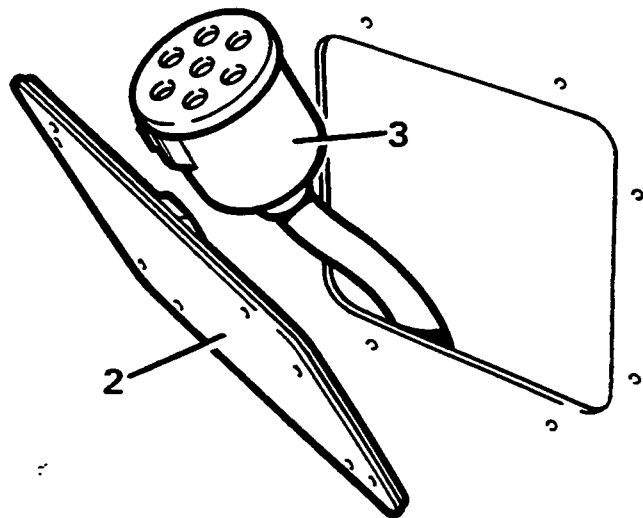
The inlet filter is changed every 40,000 Kms (24,000 miles) - USA 30,000 miles.



NOTE: Compressor inlet filter is situated adjacent to the fuel filler flap. Access is gained by removing the closure plate situated in the right hand side of load space.

Remove

1. Remove sub woofer, (if fitted) *See ELECTRICAL, Repair, Subwoofer box*
2. Remove eight screws. Remove closure panel.



RR3891M

3. Remove inlet filter from mounting bracket.
4. Remove filter from pipe.

Refit

5. Fit new filter.
6. Reverse removal procedure.



AIR SUPPLY UNIT

Service repair no - 60.50.23

Remove and refit

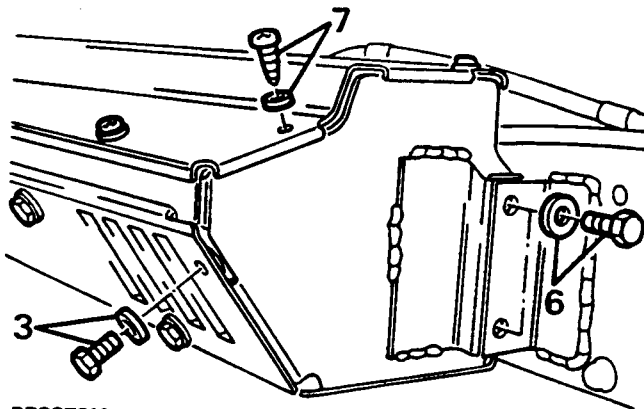
Mounted on the chassis this unit contains compressor, air dryer and valve block. The unit must be removed before removing these components.



WARNING: System is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

Remove

1. Depressurise system *See Depressurise system*
2. Disconnect the battery negative lead.
3. Remove air supply unit side cover plate.



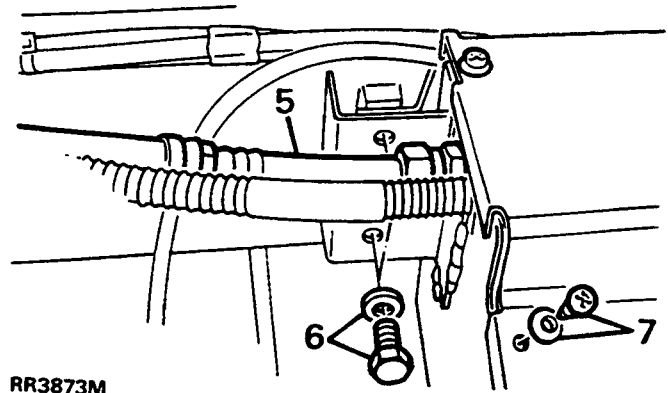
RR3872M

4. Disconnect multiplug.
5. Disconnect compressor inlet pipe, seal all exposed ends.
6. Support air supply unit. Remove four mounting bolts.



CAUTION: DO NOT allow unit to hang on pipes or electrical leads.

7. Remove air supply assembly top cover plate.



RR3873M

8. Clean all components. Identify air pipe connections.
9. Disconnect air pipe connections, *See Disconnect/Connect air pipe* Seal all exposed ends. Disconnect remaining multiplug.
10. Remove air pipes and wiring harness from assembly.
11. Remove air supply unit from vehicle.

Refit

12. Reverse removal procedure. Tighten mounting bolts to **24 Nm**.
13. Leak test all disturbed connections *See Leak test procedure*

AIR DRYER

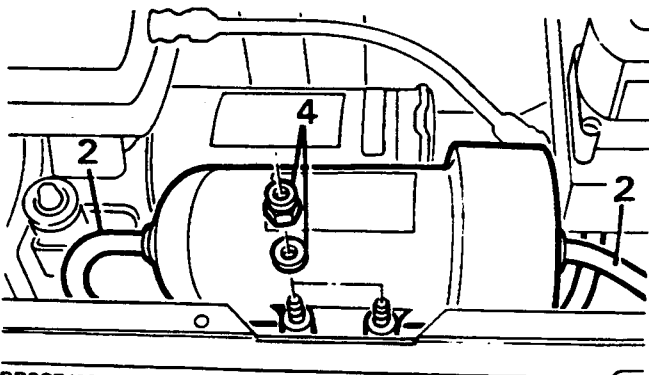
Service repair no - 60.50.09

Remove and refit

Remove

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Remove air supply unit *See Air supply unit*
2. Disconnect two air pipes from air dryer, *See Disconnect/Connect air pipe*



RR3874M

3. Seal dryer connections to prevent moisture intake.
4. Remove fixings.
5. Remove dryer.

Refit

6. Inspect air pipes. If damaged fit new pipes. **DO NOT ATTEMPT TO TRIM DRYER PIPES.**
7. Reverse removal procedure. Tighten nuts to **12 Nm**
8. Leak test connections, *See Leak test procedure*

AIR COMPRESSOR

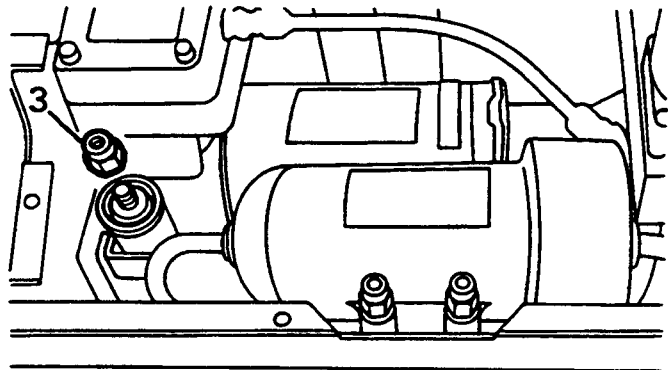
Service repair no - 60.50.10

Remove and refit

Remove

WARNING: The air compressor assembly becomes hot when running. Avoid personal contact or allow to cool.

1. Remove air supply unit, *See Air supply unit*
2. Remove compressor outlet pipe, seal all exposed ends.



RR3875M

3. Remove four fixing nuts.
4. Remove compressor assembly.

Refit

5. Inspect compressor mountings, replace if necessary.
6. Reverse removal procedure. Tighten nuts to **7Nm**
7. Check operation of compressor.
8. Leak test connections, *See Leak test procedure*



VALVE BLOCK

Service repair no - 60.50.11

Remove and refit

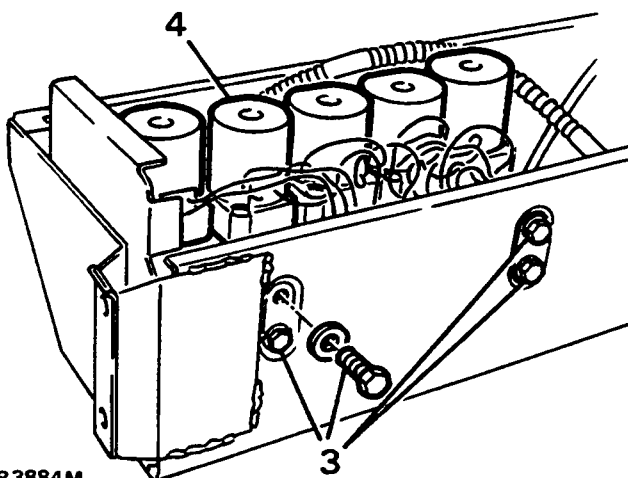
Remove

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Remove air supply assembly *See Air supply unit*
2. Disconnect air pipes from valve block, *See Disconnect/Connect air pipe*

CAUTION: Air pipes must be refitted correctly to avoid component damage.

3. Remove four fixing bolts.



RR3884M

4. Remove valve block assembly.

Refit

5. Reverse removal procedure.
6. Leak test connections, *See Leak test procedure*

RESERVOIR PRESSURE SWITCH

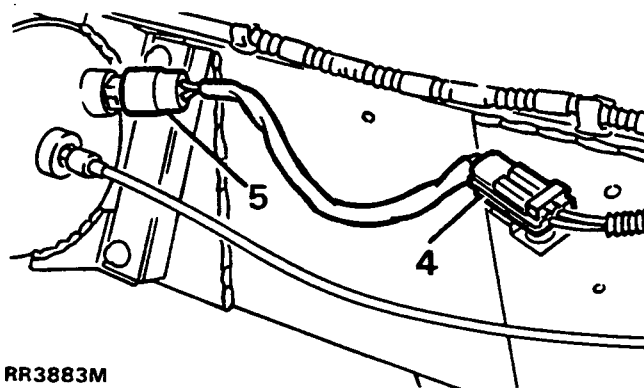
Service repair no - 60.50.07

Remove and refit

Remove

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Depressurise system, *See Depressurise system*
2. Disconnect the battery negative lead.
3. Clean around pressure switch with stiff brush and soapy water.
4. Disconnect pressure switch multiplug.



RR3883M

5. Unscrew and remove pressure switch.

CAUTION: Protect opening from ingress of dirt.

Refit

6. Apply Loctite 572 to thread of pressure switch.
7. Fit pressure switch. Tighten to 23 Nm.
8. Connect multiplug and battery.
9. Start engine to re-pressurise system.
10. Attain standard ride height.
11. Leak test pressure switch, *See Leak test procedure*

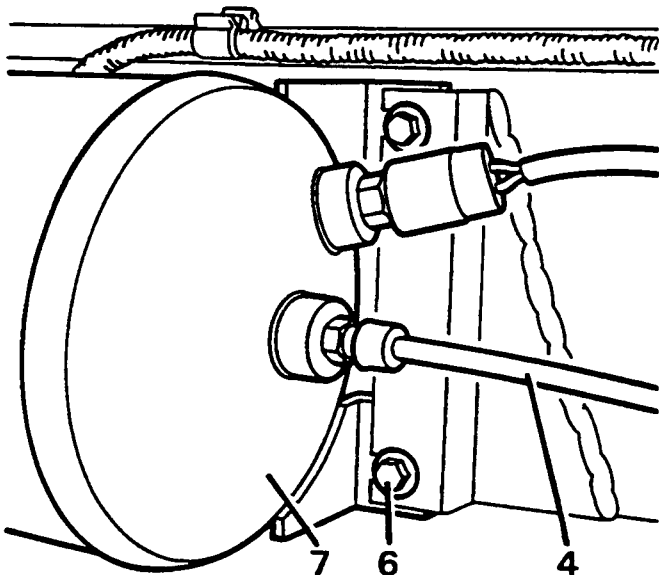
AIR RESERVOIR

Service repair no - 60.50.03

Remove and refit**Remove**

WARNING: Air suspension is pressurised up to 10 bar. Dirt or grease must not enter the system. Wear hand, ear and eye safety standard protection when servicing system.

1. Depressurise reservoir, *See Depressurise system*
2. Clean around air pipe connection and drain plug with stiff brush and soapy water.
3. Open drain plug to release any residual pressure.
4. Disconnect air pipe, *See Disconnect/Connect air pipe*



RR3885M

5. Disconnect pressure switch multi-plug.
6. Release four fixing bolts.
7. Remove reservoir.

Refit

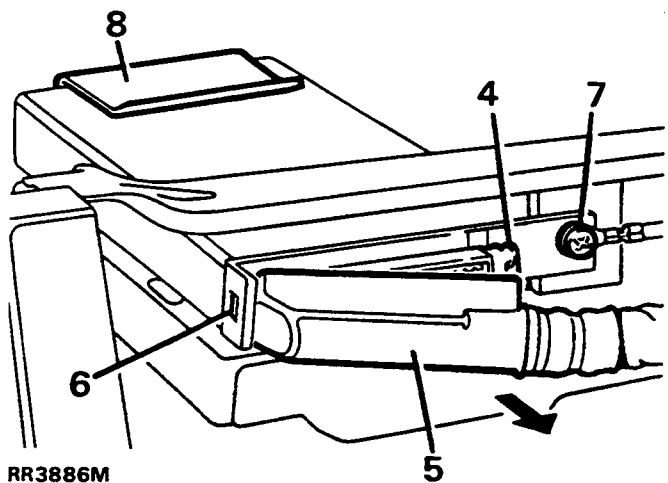
8. Fit reservoir. Tighten to 24 Nm.
9. Connect air pipe, fitting rubber boot, *See Disconnect/Connect air pipe*
10. Connect pressure switch multi-plug.
11. Tighten drain plug to 70 Nm.
12. Start engine to repressurise system.
13. Leak test reservoir, *See Leak test procedure*

ELECTRONIC CONTROL UNIT

Service repair no - 60.50.04

Remove and refit**Remove**

1. Remove front trim from right hand front seat base.
2. Adjust seat rearward and upward.
3. Disconnect the battery negative lead.
4. Release retaining clip from upper ECU plug.



RR3886M

5. Move plug in direction of arrow.
6. Detach hooked end of plug from retaining post.
7. Remove retaining screw.
8. Remove ECU from retaining clip.

Refit

9. Fit ECU into retaining clip.
10. Fit retaining screw.
11. Connect ECU harness plug. Ensure plug retaining clip engages.
12. Reverse removal procedure.
13. If fitting a new ECU, recalibrate height settings, *See Description and operation, System Calibration - height sensor datum*



AIR HARNESS

Service repair no - 60.50.21

Remove and refit

Remove



CAUTION: Thoroughly clean around all connections before disconnecting air pipes. Seal all exposed components against ingress of dirt and moisture.

1. Place vehicle on a wheel free ramp.
2. Remove wheels, **See WHEELS AND TYRES, Repair, Wheels**
3. Remove air supply unit, **See Air supply unit**
4. Disconnect air pipe from front left air spring.
5. Release front left chassis cable ties and clips.
6. Disconnect air pipe from reservoir.
7. Release back left chassis cable ties and clips, leave clips in chassis.
8. Disconnect air pipe from back left air spring.
9. Release three rear chassis cable ties.
10. Disconnect air pipe from back right air spring.
11. Release back right chassis cable ties and clips.
12. Disconnect air pipe from front right air spring.
13. Release front right chassis cable ties and clips.
14. Remove air harness from vehicle.

Refit

15. Layout air harness, identifying routing and connections.
16. Route air harness around chassis.
17. Remove sealing plugs, reconnect left front air spring.
18. Secure left front chassis ties and clips.
19. Working around chassis. Reverse removal procedure.

**RECOMMENDED EQUIPMENT**

Lucas hand held tester RTC 6834
Adaptor lead, air suspension STC 1089

Memory card, air suspension

English STC 590
French STC 591
German STC 592
Italian STC 593
Spanish STC 594
Dutch STC 595
Japanese STC 598

Pressure test equipment LRT 60.001
Pipe cutter LRT 60.002
Leak detection spray STC 1090
35 way 'pin out' box STC 644