TRAINING TIPS AND TACTICS

Electronically Controlled Suspension - ECS

VOLVO

Contents

ECS Generation 2

ECS Generation 3

Introduction

About this Pocket guide

This guide is intended as a memory jogger for the knowledge you have gained during your training course.

The guide includes a summary of the material covered in:

Electronically Controlled Suspension - ECS

Danger, Warning, Caution & Note

In this guide, risk of injury or damage is indicated by the following headings:

DANGER - indicates a risk of serious personal injury or death.

WARNING - indicates a risk of personal injury, or severe product damage.

CAUTION - indicates risk of product damage.

Note - draws attention to special methods or particular features.

Read and implement all **DANGER**, **WARNING** and CAUTION instructions.

Replacement parts

When replacement parts are required, it is essential that only Volvo genuine parts are fitted. If Volvo genuine parts are not used:

- safety features embodied in the vehicle or components may be impaired.

- performance and/or operation of the vehicle or components may be adversely affected.

- Volvo warranty terms may be invalidated.

Specification

Volvo are constantly seeking ways to improve their products, and alterations take place accordingly. Whilst every effort has been made to ensure the accuracy of this guide, it should not be regarded as an infallible guide to current specifications of any product.

Neither Volvo, nor the supplier of this guide shall, in any circumstances, be held liable for inaccuracy or the consequences thereof.

General information

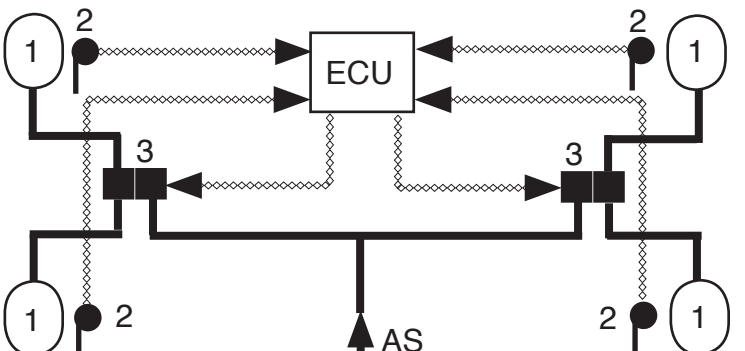
General information

The information in this section applies to all Generations of ECS.

Information specific to each Generation is found in the sections - Gen. 1, Gen. 2 or Gen. 3.

ECS - general description

The main advantage of a basic air suspension system is the ability to maintain a constant level ride height regardless of changing load.
This is possible by the use of height control valves which respond to any change of frame to ground clearance, and release or admit air to the air springs.



Air pipe
Electronic control signal

1. Air bellows
2. Height sensor
3. Solenoid valve

AS. Air supply
ECU. Electronic Control Unit

Electronic control

Introducing electronic control adds the following main benefits:

- faster height change response times.

- easy addition of other features.

With electronic control, the height control valves are replaced by electronic height sensors, and air admission and release is controlled by solenoid valves.
The sensors send a voltage signal to an Electronic Control Unit (ECU). The voltage varies according to ride height.
The ECU compares the height signals with pre-programmed parameters, and sends signals to the solenoid valves to admit or release air.
The concept is shown in the simplified diagram above.

Gen. 2 vs. Gen. 1

New versions of:

- ECU (2 connectors vs. 1 connector)
- Solenoid valves
- Bogie switch functions
- Overflow valves 52a and 52b
- Height sensor calibration

Additional:

- Pressure sensors
- ECS functions
- VCADS tests

Gen. 3 vs. Gen. 2

New versions of:

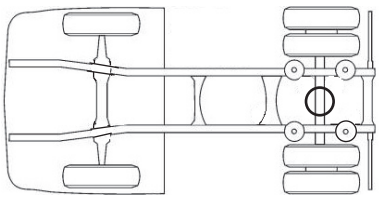
- ECU
- Solenoid valves
- Remote control

ECS evolution ECS has gradually evolved, and there are now three ‘Generations’.

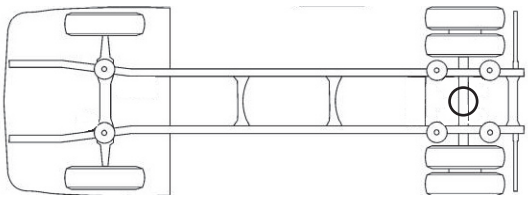
Gen. 1 Generation 1 was introduced on FM trucks in 1998.
All ‘Electronic ‘98’ trucks are fitted with ECS Gen. 1 .

Gen. 2 Generation 2 was introduced on ‘Version 2’ FM/FH trucks
All ‘Version 2’ trucks are fitted with ECS Gen. 2 .

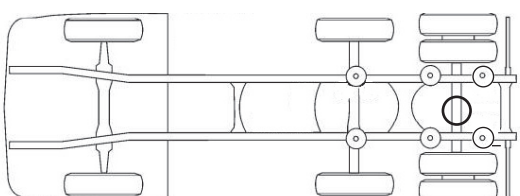
Gen. 3 Generation 3 was introduced on ‘Version 2’ trucks in week 51 2004.
All ‘Version 2’ trucks, built after this date, are fitted with ECS Gen. 3 .



RAD-A4, tractor - FSS-LEAF



RAD-A4 - FSS-AIR



RAPD-A6 - FSS-LEAF

Suspension configurations

Rear suspension		Front suspension		
Type	**Air springs**	**Type**	**Air springs**	**Chassis heights**
RAD-A4 Single drive axle	4	FSS-LEAF	-	CHH-STD CHH-810* CHH-850** CHH-900***
RAD-A4 Single drive axle	4	FSS-AIR	2	
RAPD-A6 Single drive axle pusher axle bogie	4 + 2	FSS-LEAF	-	CHH-STD CHH-900***

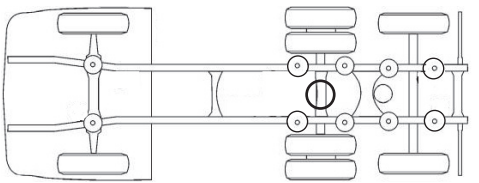
Chassis heights - later designations

* CHH-XLOW

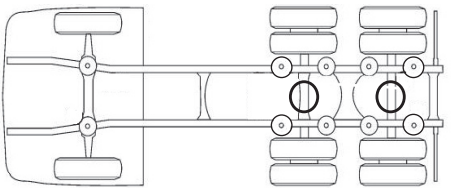
** CHH-LOW

*** CHH-MED

CHH-STD = 1025mm (min.)



RADT-A8 FSS-AIR



RADD-A8 FSS-AIR

Suspension configurations

Rear suspension		Front suspension		
Type	**Air springs**	**Type**	**Air springs**	**Chassis heights**
RADT-A8 Single drive axle, trailing axle bogie	4 + 4	FSS-AIR	2	CHH850**
RADD-A8 Double drive axle	4 + 4	FSS-AIR	2	CHHSTD

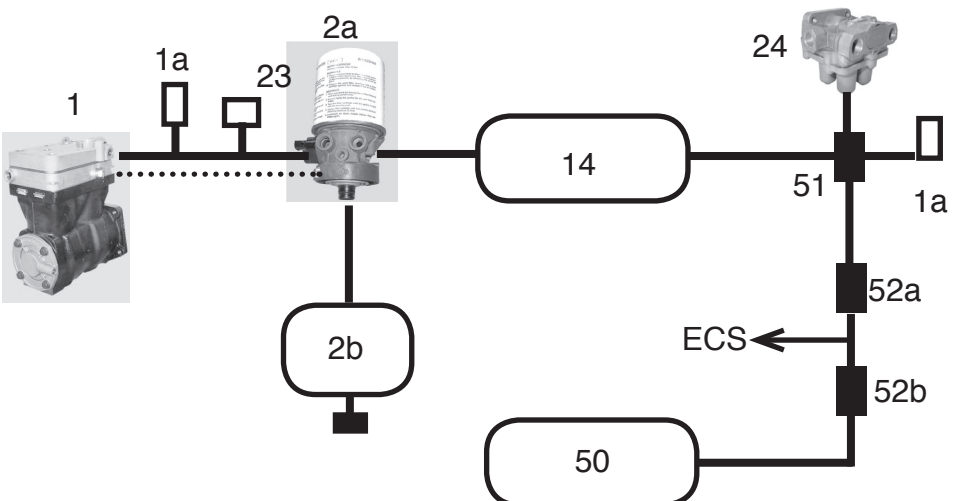
Chassis heights - later designations

* CHH-XLOW

** CHH-LOW

*** CHH-MED

CHH-STD = 1025mm (min.)

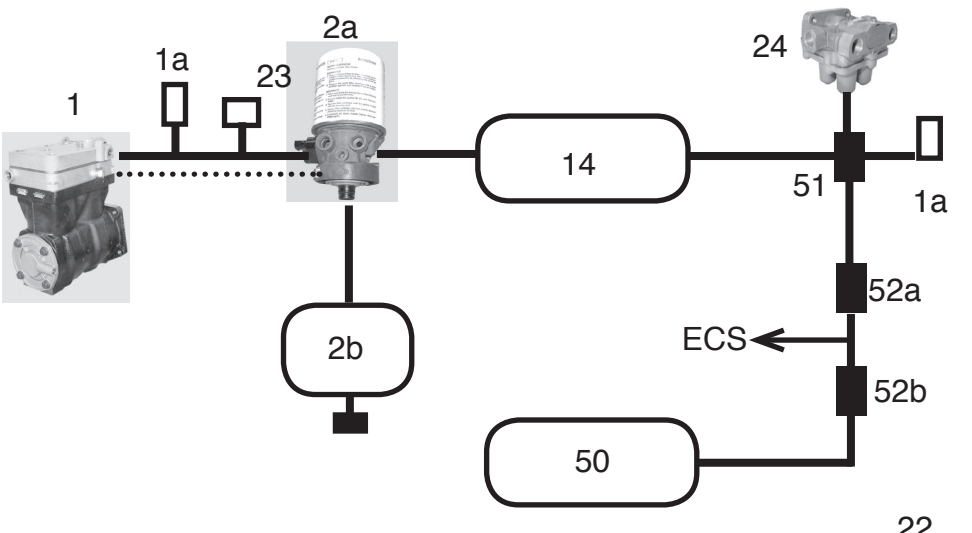

2a
1a
23
1
24
14
51
1a
52a
ECS
2b
52b
50
20

Air suspension air supply

The main components in this circuit are:

1 Compressor
1a Safety valve
2a Air dryer
2b Regeneration tank - not with AIRDRY-E, version 2 trucks
14 Wet tank
23 Test point
24 Multi-circuit protection valve (MCPV)
50 Air suspension air tank
51 Pressure limiting valve
52a Overflow valve - 6.7 - 7.0 bar
52b Overflow valve - 10.0 - 10.4 bar

ECS → To ECS solenoid valve blocks


2a
1a
23
1
24
14
51
1a
52a
ECS
2b
52b
50
22

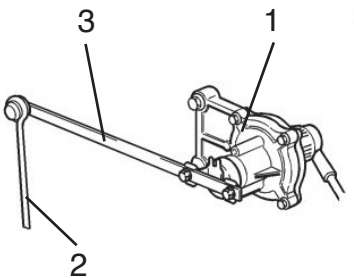
Air suspension air supply

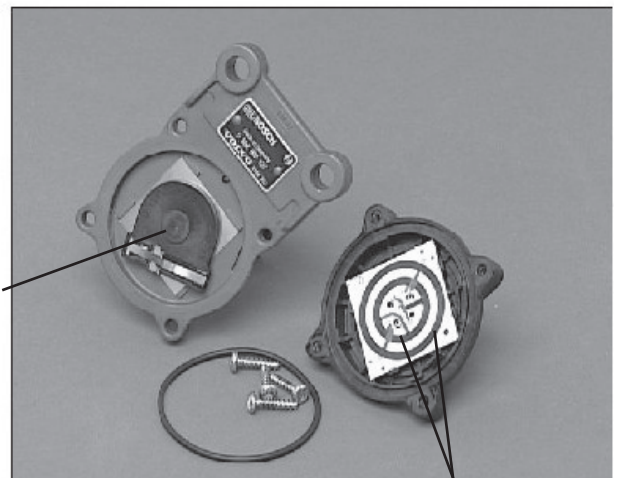
Overflow valves

Overflow valve 52a is fed from the wet tank. When air pressure opens the valve, air is supplied to the ECS solenoid valve blocks.

Overflow valve 52b is fitted only on trucks with ‘full’ air suspension - i.e. at front and rear, which have a separate air suspension tank (50).

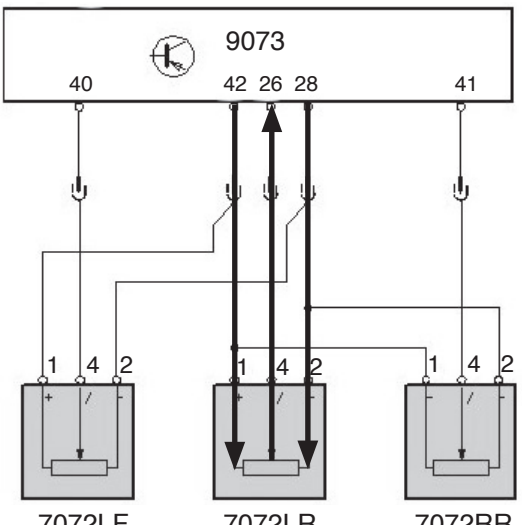
More information on overflow valves is included in sections - Gen. 1 and Gen. 2.

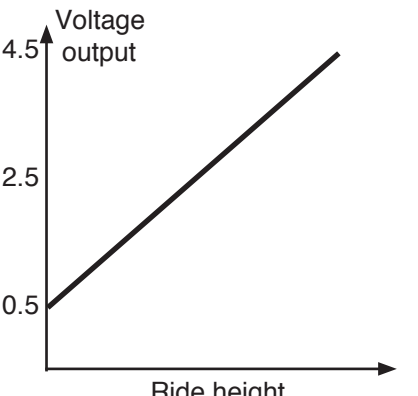

3
1
2


4
5

Height sensors

The height sensors are mechanically actuated potentiometers.
The sensors (1) are attached to the inside of the chassis frame. The bottom end of rod (2) is attached to a point on the axle, so any change of height between the frame and axle moves lever (3).
Movement of the lever rotates a sliding contact (4), which is in contact with two concentric semi-circlular fixed contacts (5).


9073
40
42
26
28
41
1
4
2
1
4
2
1
4
2
7072LF
7072LR
7072RR


Voltage output
4.5
2.5
0.5
Ride height

Height sensors

One end of each semicircular contact is fed with 5V from ECU pin 42, and the other end is fed with 0 V from ECU pin 28.
Depending on the angle of the lever and, therefore, on the position of the sliding contact, each semicircular contact can supply between 5V and 0V to the sliding contact.
This voltage, which varies in direct proportion to the ride height, is fed to ECU pin 26.
The ECU compares the sensor signal with pre-programmed desired height parameters, and sends signals to the air control solenoid valves.
The valves admit or release air from the air springs to maintain the programmed level chassis ride height.

Note: At normal ride height, the signal from the sensor is 2.3 to 2.8 V.

Sensor location	SID	Component No. (Version 2 truck)	Wiring diag. No. (Electronics '98 truck)
Front axle	17	B28	7072LF
Rear axle RH	18	B30	7072RR
Rear axle LH	19	B29	7072LR

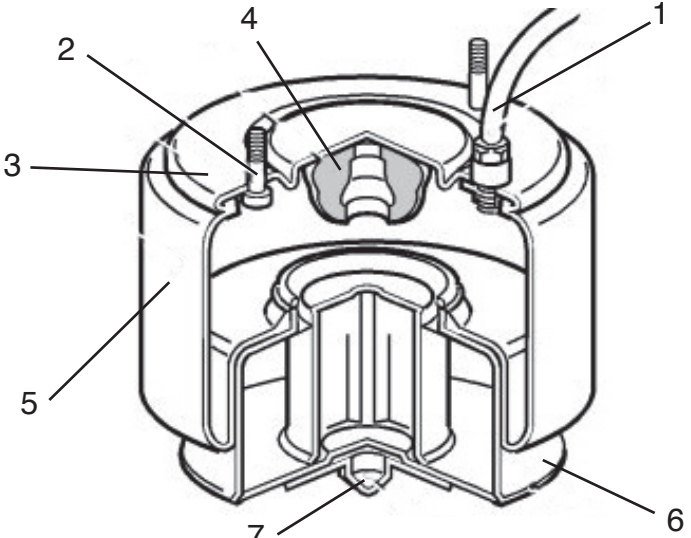
Height sensors - number

The number of sensors varies according to truck model and axle configuration.
All air suspended trucks have two rear sensors - except - 4x2 tractor with front leaf springs (RAD-A4), which has only one sensor at the O/S.
Note: The use of only one sensor is possible because a 4x2 tractor has a short wheelbase. This means that the chassis frame is rigid, with very little twist. Consequently, there is little side to side height deviation.
Trucks with front air suspension (FSS-AIR) have one front sensor.

The chart above shows the unique reference numbers for each sensor.

Calibration

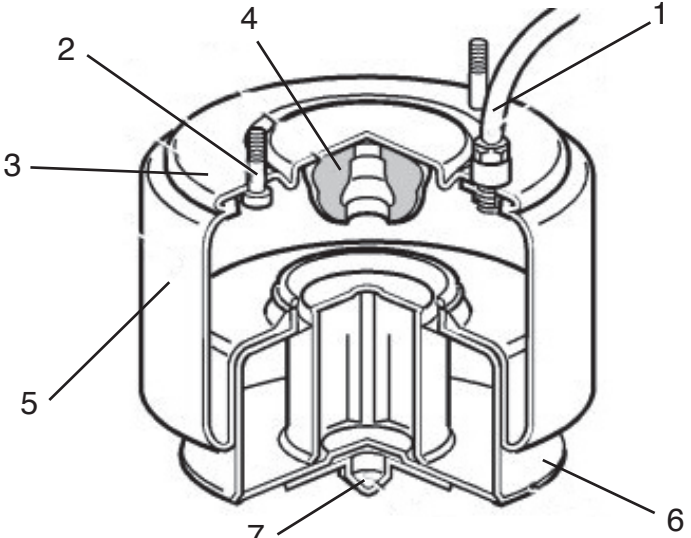
Note: If a sensor is removed and refitted, or renewed, it must be calibrated using VCADSPro.


1
2
3
4
5
6
7

Air bellows

1. Air supply from the solenoid valve block
2. Attachment screw
3. Bellows plate
4. Hollow rubber damper
5. Air bellows
6. Plunger
7. Guide pin

Bellows plate (3) is attached to the frame, and plunger (6) is attached to the axle.
During normal suspension movement, and during frame height change, rubber air bellows (5) rolls up and down plunger (6).
If the bellows is fully compressed - due to e.g. loss of air pressure, high speed cornering, very uneven surfaces - the load is carried on damper (4).


1
2
3
4
5
6
7

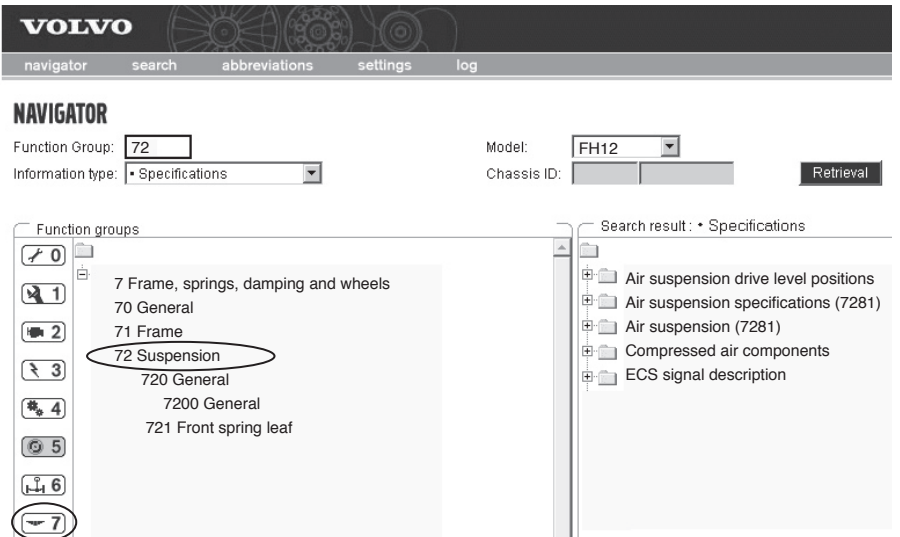
Air bellows

CAUTION
If the load is being carried on the damper, because of loss of air pressure, the vehicle may be driven at up to 10km/h.

Renewing air bellows

DANGER
When renewing the air bellows, ensure that the following safety precautions are implemented at all times:

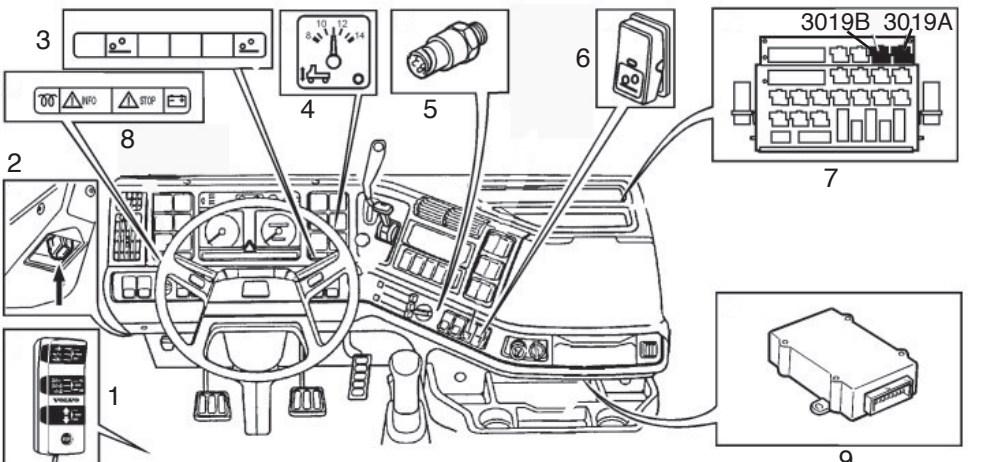
- Block up the truck frame.
- Empty all air tanks.
- Chock the truck wheels.


VOLVO
navigator
search
abbreviations
settings
log
NAVIGATOR
Function Group: 72
Information type: • Specifications
Model: FH12
Chassis ID:
Retrieval
Function groups
0
1
2
3
4
5
6
7
7 Frame, springs, damping and wheels
70 General
71 Frame
72 Suspension
720 General
7200 General
721 Front spring leaf
Search result : • Specifications
Air suspension drive level positions
Air suspension specifications (7281)
Air suspension (7281)
Compressed air components
ECS signal description

Use IMPACT To ensure that you are using the latest information - especially ‘Specifications’ - always get your information via IMPACT:

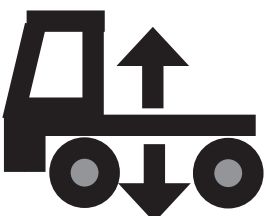
Suspension - group 72

ECS Generation 1


3
4
5
6
3019B
3019A
7
8
INFO
STOP
2
1
9

ECS Gen. 1 in-cab components

1. Remote control
   - full air suspension, 9009 - rear air suspension, 9010
2. Diagnostic socket
3. Indicator lamps
4. Pressure gauge
5. Pressure sensors
   - for wet tank, 754 connected directly to VECU
   - for rear axle load (6x2, 6x4, 8x2, 8x4), 7064 connected to ECS ECU
6. Bogie switch - 133
7. Relay panel
   - for solenoid valve 3019A,
   - for ECU power supply, 3019B
8. 'INFO' 'STOP' lamps / information display
9. ECS ECU (MID 150)



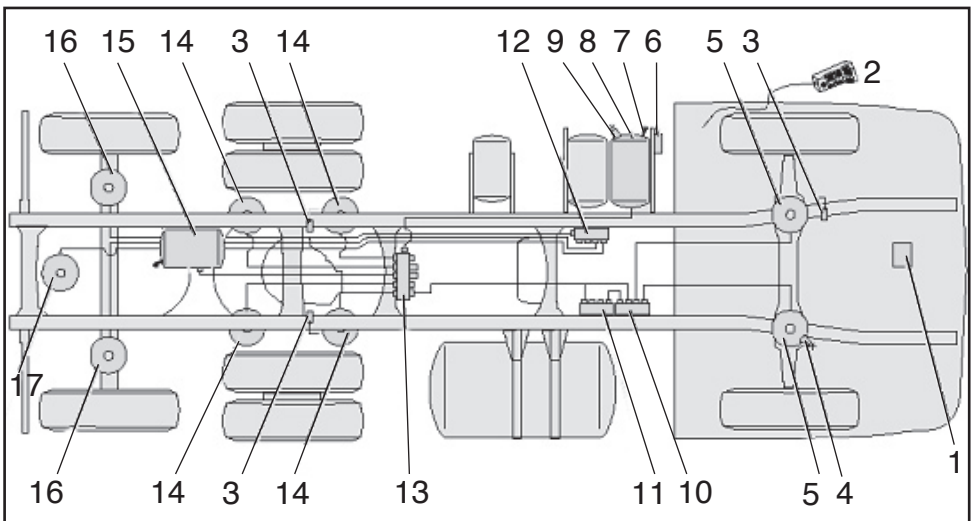
A

B

Suspension status display icons

Icon (A) is displayed when the switch on the remote control has been left in ‘manual’ position.
This icon is also displayed when suspension air pressure is too low.
If the truck is driven at above 10 km/h, the warning buzzer sounds

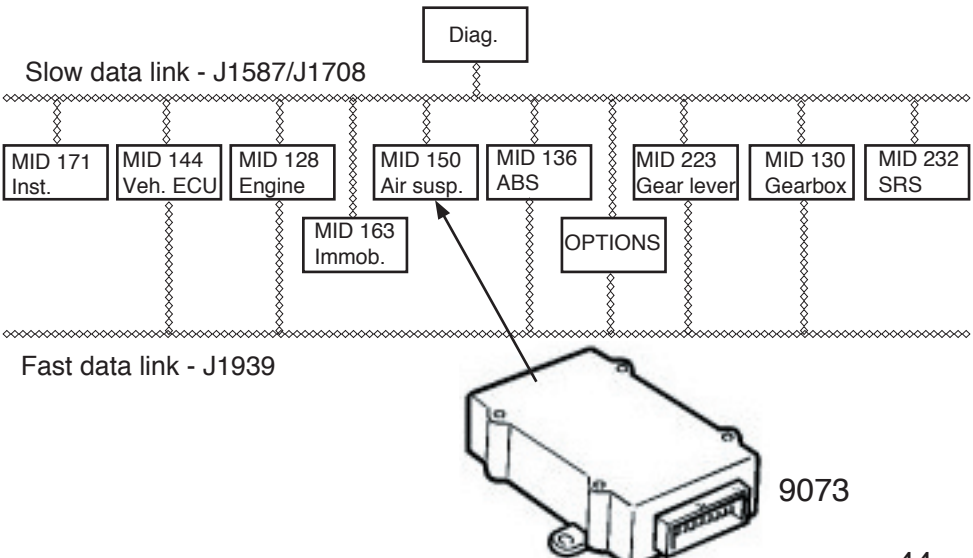
Icon (B) is displayed when the ‘vehicle is not in a drivable position’ - i.e. when the suspension system is still adjusting to the correct ride height.
When the correct height is reached, the icon is cancelled.


16
15
14
3
14
12
9
8
7
6
5
3
2
17
16
14
3
14
13
11
10
5
4
1

ECS Gen. 1 component locations

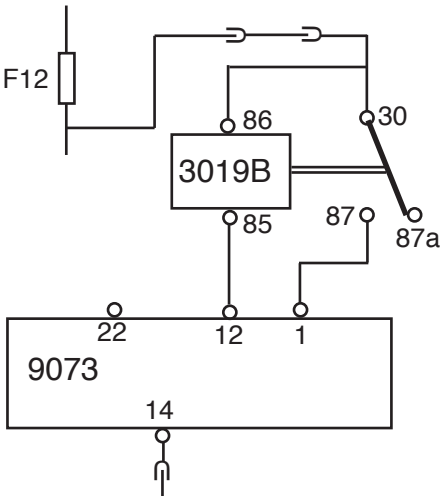
1. ECS ECU - 9073
2. Remote control - 9009, 9010
3. Height sensor - 7072
4. Test nipple
5. Air bellows - front axle
6. Distribution manifold - extra equipment (axle lift bellows)
7. Safety valve
8. Wet tank
9. Test nipple
10. Solenoid valve block - front axle - 6035LF
11. Solenoid valve block - drive axle - 6035C
12. Solenoid valve block - bogie - 6045
13. Overflow valve - 52a and 52b
14. Air bellows - drive axle
15. ECS air tank
16. Air bellows - trailing axle
17. Lift bellows - taring axle

ECS Gen. 1

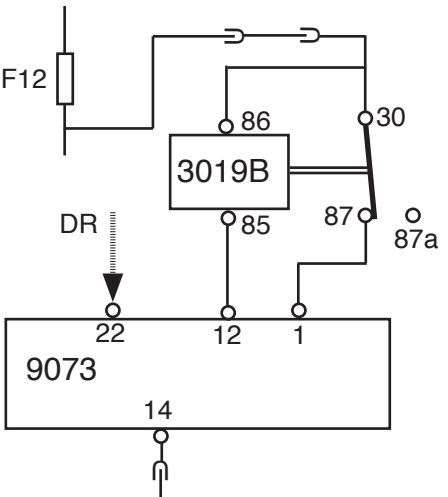

Diag.
Slow data link - J1587/J1708
MID 171
Inst.
MID 144
Veh. ECU
MID 128
Engine
MID 163
Immob.
MID 150
Air susp.
MID 136
ABS
OPTIONS
MID 223
Gear lever
MID 130
Gearbox
MID 232
SRS
Fast data link - J1939
9073

ECS Gen. 1 ECU - data link

The Gen. 1 ECU has only one connector, and is connected only to the slow data link.



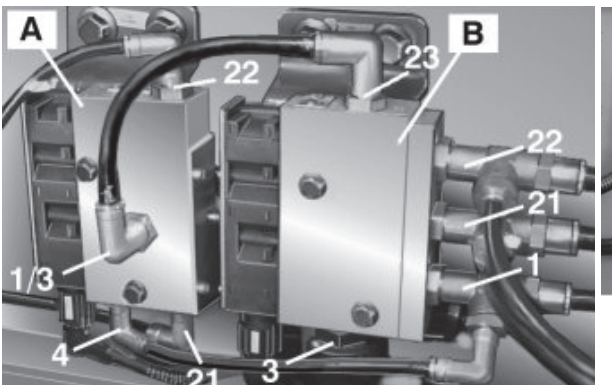
Ignition OFF

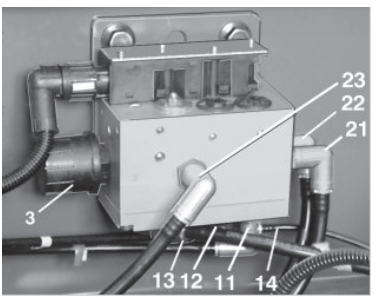


Ignition ON

ECU power supply relay - 3019B

When the ignition is switched on, a wake-up signal is sent to ECU pin (22).
The ECU switches a negative to relay pin (85) via ECU pin (12).
Because fuse F12 is supplying voltage to relay pin (30) and - by link - to pin (86), the relay is energised.
Pins (30) and (87) are now connected.
Voltage from fuse F12 can now pass through the relay to ECU pin (1).





C

ECS Gen. 1 solenoid valve blocks - design and function

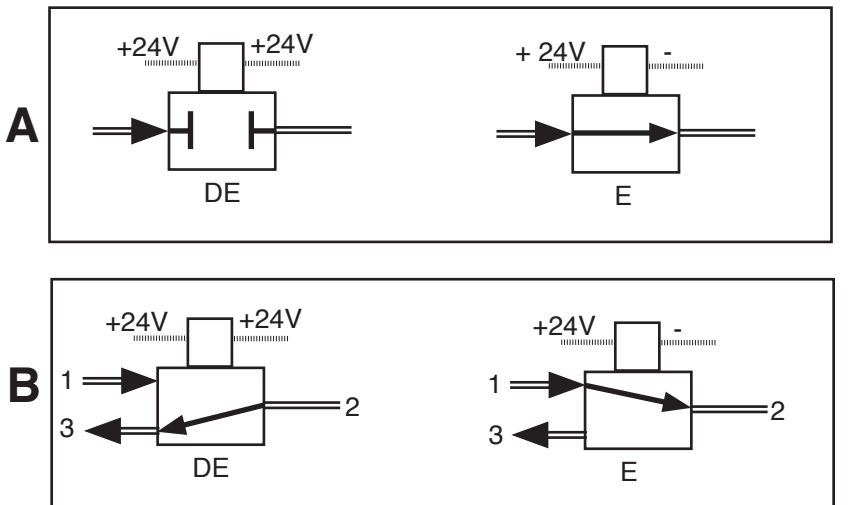
Three types of solenoid valve block are used in ECS Gen.1:

A. Front axle valve block
B. Drive axle valve block:
- variant 1 for 4x2 tractor
- variant 2 for other than 4x2 tractor

C. Bogie axle valve block:
- variant 1 for trailing axle
- variant 2 for pusher axle

All valve blocks contain solenoid operated air valves, which control air flow to and from the air bellows.

The solenoids are energised or de-energised by signals from the ECS ECU.


A
+24V
+24V
DE
+ 24V
-
E
B
+24V
+24V
1
2
3
DE
+24V
-
1
2
3
E

ECS Gen. 1 solenoid valve operation

A. Basic bellows air flow solenoid.
B. Control solenoid - found only in valve block for drive axles.

A - solenoid de-energised

DE. Solenoid ‘De-energised’. +24V supplied to **both** pins. No air can pass through the valve.

A - solenoid energised

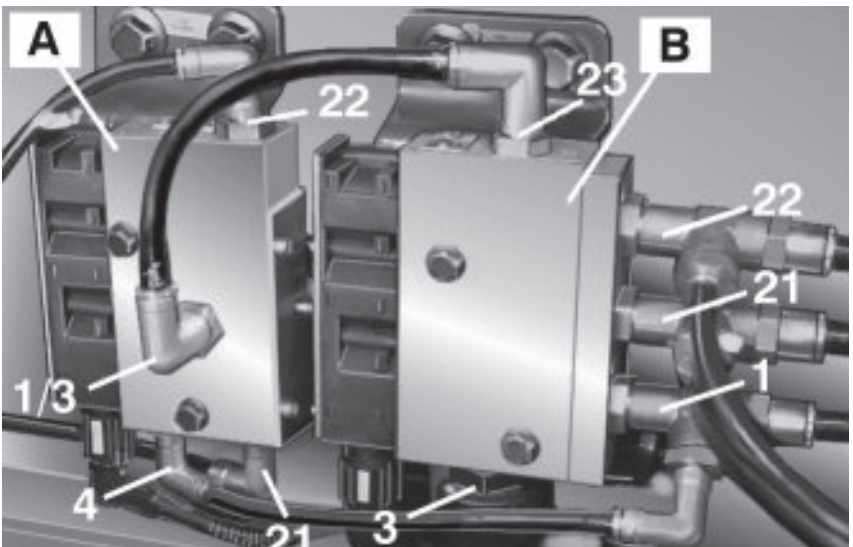
E. Solenoid ‘Energised’. +24V supplied to one pin, negative supplied to other pin. Air can pass through the valve.

B - control solenoid de-energised

DE. Control solenoid ‘De-energised’. +24V supplied to **both** pins.
Outlet (2) is connected to exhaust (3). No air can pass from inlet (1) to outlet (2).

B - control solenoid energised

E. control solenoid ‘Energised’. +24V supplied to one pin, negative supplied to other pin. Inlet (1) is connected to outlet (2). Air can pass through the valve.


A
B
22
23
22
21
1
1/3
4
21
3

ECS Gen. 1 solenoid valve blocks

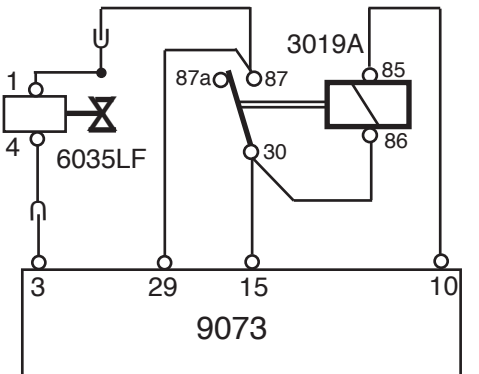
A. Solenoid valve - front axle, 6035LF (SID 2)

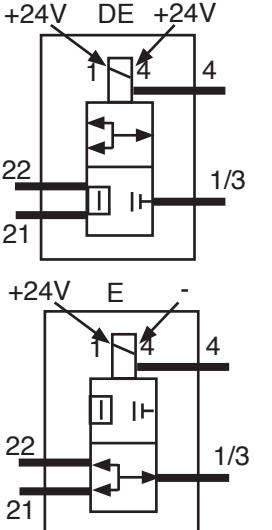
1/3. Supply air from - and drain to - drive axle valve, 6035C
4. Air supply from wet tank
21. Air to and from LH front air bellows
22. Air to and from RH front air bellows

B. Solenoid valve - drive axle, 6035C

1. Air supply from wet tank
3. Air drain via silencer
21. Air to and from LH drive axle air bellows, and trailing (or pusher) LH air bellows
22. Air to and from RH drive axle air bellows, and trailing (or pusher) LH air bellows
23. Air to and from front axle solenoid valve (plugged if rear air suspension only)


A
1/3
4
21


3019A
1
87a
87
85
4
6035LF
30
86
3
29
15
10
9073

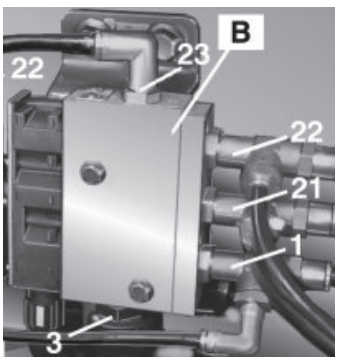

+24V
DE
+24V
1
4
4
22
1/3
21
+24V
E
-
1
4
4
22
1/3
21

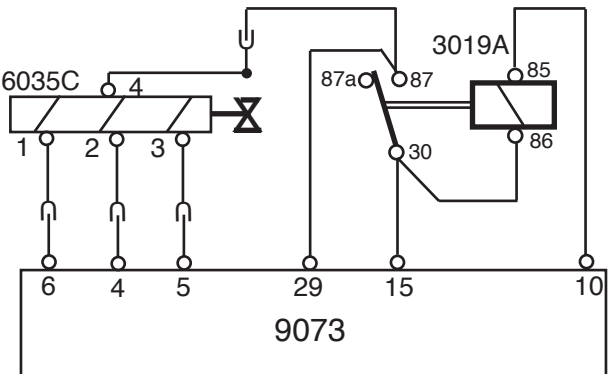
Solenoid valve block - front axle

A. Solenoid valve - front axle, 6035LF (SID 2)

1/3. Supply air from - and drain to - drive axle valve, 6035C
4. Air supply from wet tank
21. Air to and from LH front air bellows
22. Air to and from RH front air bellows

3019A. Power supply relay - ECU to solenoid valve
6035F. Solenoid valve - front axle
9073. ECS ECU


B
22
23
22
21
1
3


6035C
4
1
2
3
3019A
87a
87
85
30
86
6
4
5
29
15
10
9073

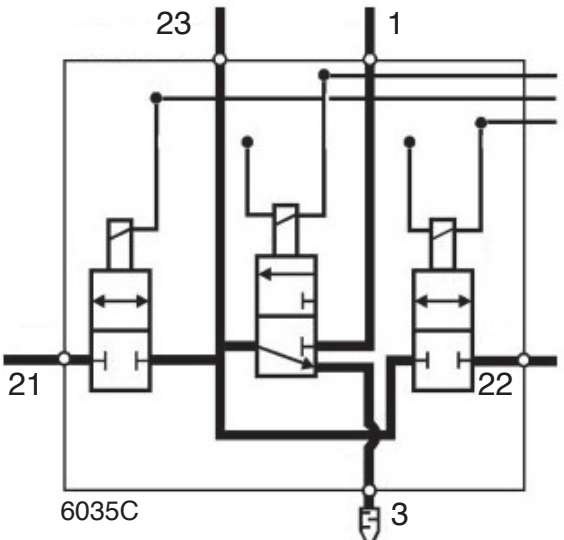
Solenoid valve block - drive axle

B. Solenoid valve - drive axle, 6035C

1. Air supply from wet tank
3. Air drain via silencer
21. Air to and from LH drive axle air bellows, and trailing (or pusher) LH air bellows
22. Air to and from RH drive axle air bellows, and trailing (or pusher) RH air bellows
23. Air to and from front axle solenoid valve (plugged if rear air suspension only)

3019A. Power supply relay - ECU to solenoid valve
6035C. Solenoid valve - drive axle
9073. ECS ECU

SID No's
SID 3 = RH
SID 4 = LH
SID 7 = central

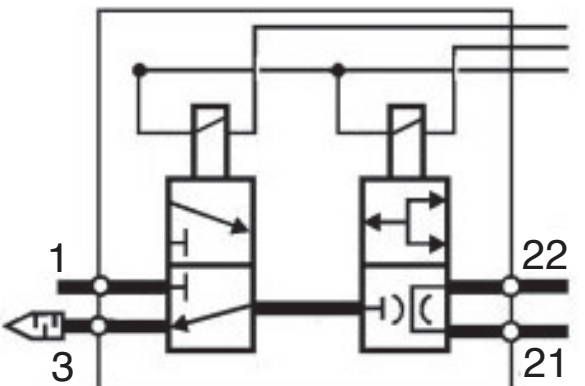

23
1
21
22
6035C
3

Solenoid valve block - drive axle (not 4x2 tractor)

1. Air supply from wet tank
3. Air drain via silencer
21. Air to and from LH drive axle air bellows, and trailing (or pusher) LH air bellows
21. Air to and from RH drive axle air bellows, and trailing (or pusher) LH air bellows
23. Air to and from front axle solenoid valve (plugged if rear air suspension only)

The solenoid block for all variants (except 4x2 tractor) contains 3 solenoid valves:

- **SID 3 the RH valve** - air to and from RH air bellows for drive axle and trailing or pusher axle.
- **SID 4 the LH valve** - air to and from LH air bellows for drive axle and trailing or pusher axle.
- **SID 7 the 'central' valve** - operating as a **control** valve.



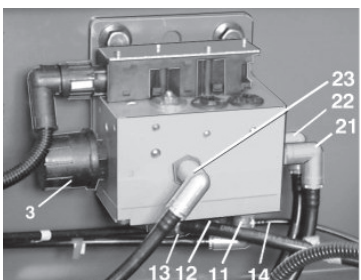
6035C (4x2)

Solenoid valve block - drive axle (4x2 tractor)

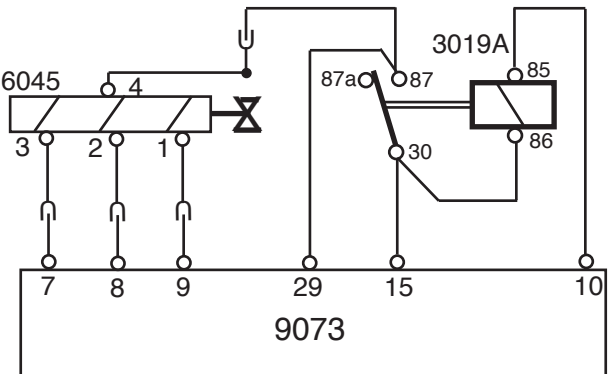
1/3. Supply air from - and drain to - drive axle valve, 6035C
4. Air supply from wet tank
21. Air to and from LH front air bellows
22. Air to and from RH front air bellows

The solenoid block for 4x2 tractors contains 2 solenoid valves:

- **SID 3 the RH valve** - air to and from RH and LH air bellows.
- **SID 7 the 'central' valve** - operating as a **control** valve.


23
22
21
3
13 12 11 14

6045


6045
4
3
2
1
3019A
87a
87
85
30
86
7
8
9
29
15
10
9073

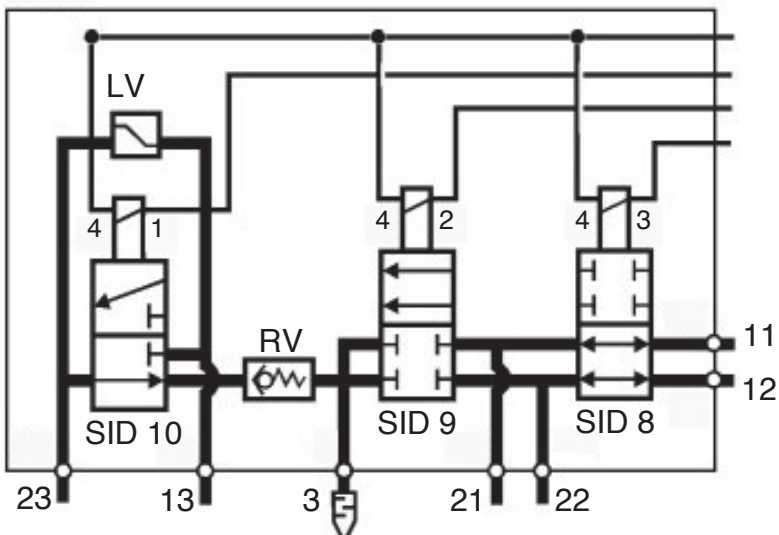
Solenoid valve block - bogie

B. Solenoid valve - bogie, 6045

3. Air drain via silencer
11. Air supply from drive axle valve block, port 21
12. Air supply from drive axle valve block, port 22
13. Air supply to bogie lift
14. Air supply to drive axle load sensor
21. Air to and from trailing (or pusher) LH air bellows
21. Air to and from trailing (or pusher) RH air bellows
23. Air to and from trailing (or pusher) lifting bellows

3019A. Power supply relay - ECU to solenoid valve
6045. Solenoid valve - bogie
9073. ECS ECU

6045



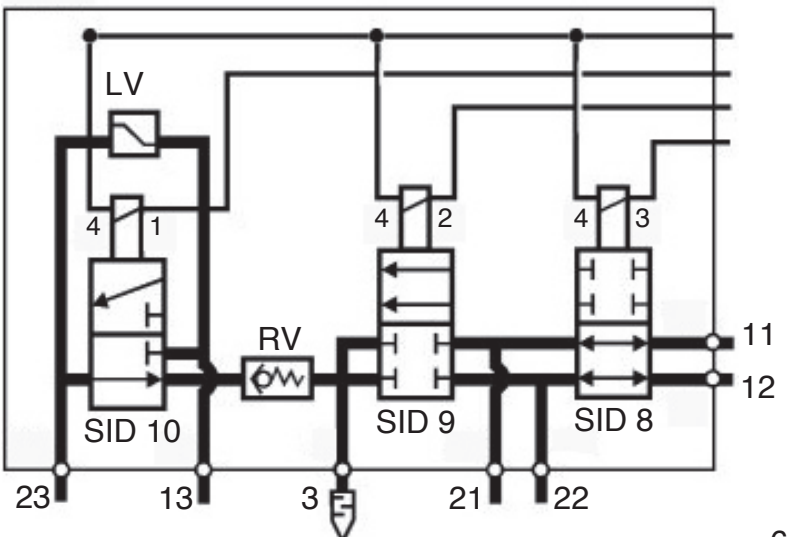
Solenoid valve block - bogie

3. Air drain via silencer
11. Air supply from drive axle valve block, port 21
12. Air supply from drive axle valve block, port 22
13. Air supply to bogie lift
14. Air supply to drive axle load sensor
21. Air to and from trailing (or pusher) LH air bellows
21. Air to and from trailing (or pusher) RH air bellows
23. Air to and from trailing (or pusher) lifting bellows

LV. Limiting valve
RV. Retention valve

SID 8. Blocking valve
SID 9. Draining valve
SID 10. Lifting valve

6045



Solenoid valve block - bogie

There are two variants of the bogie valve block:
- one for trucks with a non-drive axle behind the drive axle, 'trailing' (or 'Tag') axle bogie.
- one for trucks with a non-drive axle in front of the drive axle, 'pusher' axle bogie.

The difference is in the set pressures of the limiting valve (LV), and the retention valve (RV), which control the residual pressure in the lifting bellows.

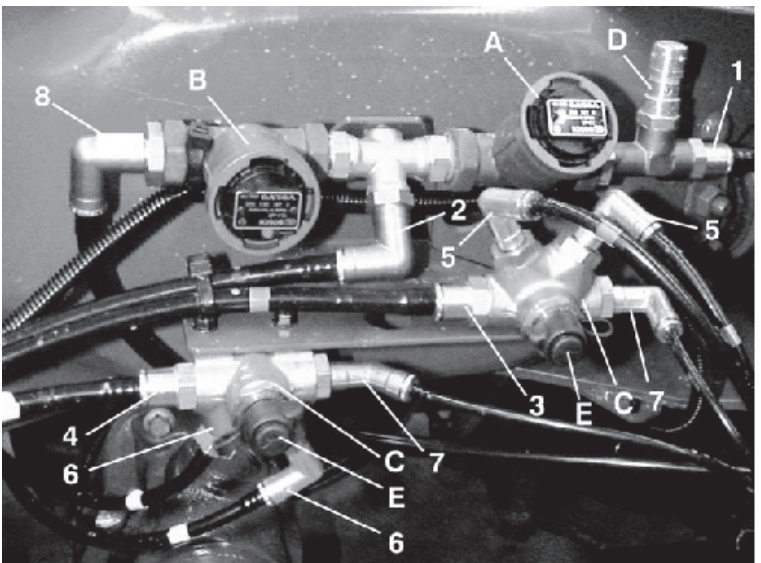
Trailing axle bogie

Residual pressure is set between 0.5 and 0.9 bar.

Pusher axle bogie

Residual pressure is set between 1.2 and 1.6 bar.

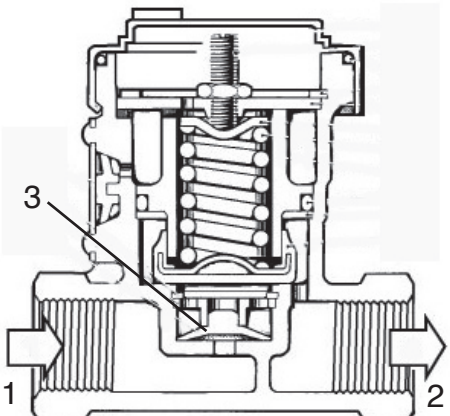
When residual pressure falls to the lower limit, the limiting valve cuts in and supplies air to the lifting bellows. When residual pressure reaches the higher limit, the retention valve opens, and air exhausts via port 3.


A
D
1
B
8
2
5
5
3
E
C
7
4
6
C
7
E
6

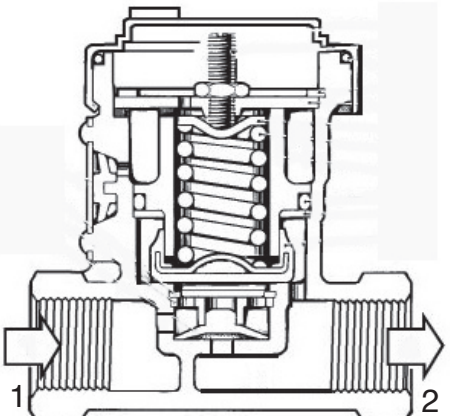
Overflow valves and distribution manifolds

A. Overflow valve without return flow - 52a
B. Overflow valve with return flow - 52b
C. Distributor manifold
D. Safety valve
E. Test nipple

1. From wet tank
2. To drive axle solenoid valve - 6035C, port 1
3. From drive axle solenoid valve - 6035C, port 21
4. From drive axle solenoid valve - 6035C, port 22
5. To drive axle LH air bellows
6. To drive axle RH air bellows
7. To load sensing valve - ports 41 and 42
8. To air suspension air tank



52a



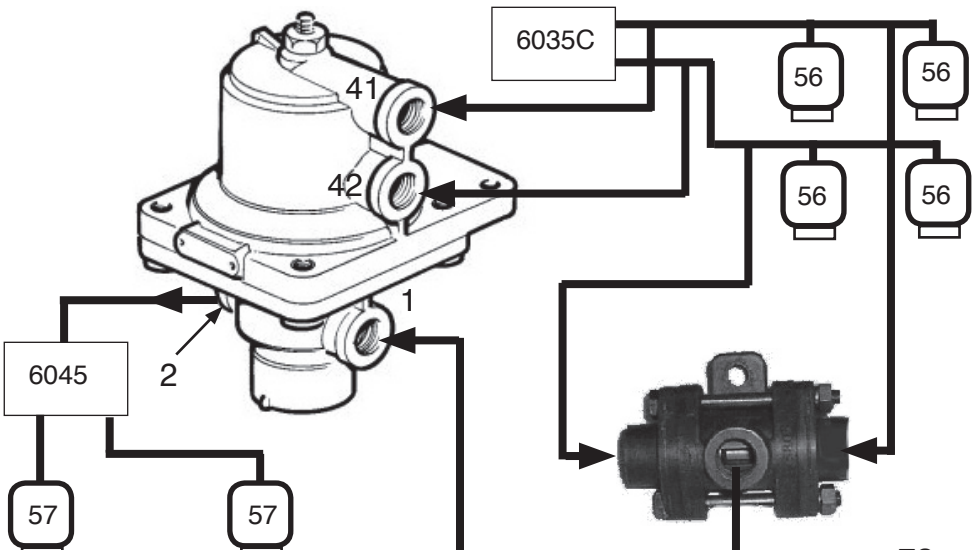
52b

Overflow valve 52a - no return flow

Valve 52a ensures that air is fed to the brake system before the air suspension system.
The valve opens at 6.7 to 7.0 bar, to allow air into the suspension system.

Overflow valve 52b - with return flow

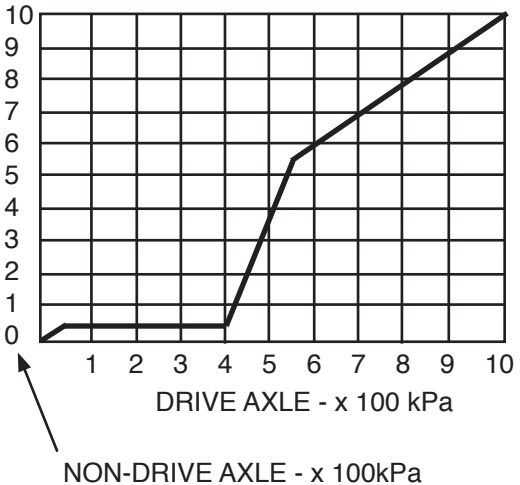
Valve 52b is fitted only on trucks with 'full' air suspension - i.e. at front and rear, which have a separate air suspension tank (50).
To ensure that the vehicle reaches correct ride height as soon as possible, valve 52b feeds air to fill the air bellows before allowing air to suspension air tank (50)
The valve opens at 10.0 to 10.4 bar, to allow air into the suspension air tank.
If the pressure is lower at inlet (1) than at outlet (2), the valve allows return flow from outlet (2) to inlet (1), via non-return valve (3).

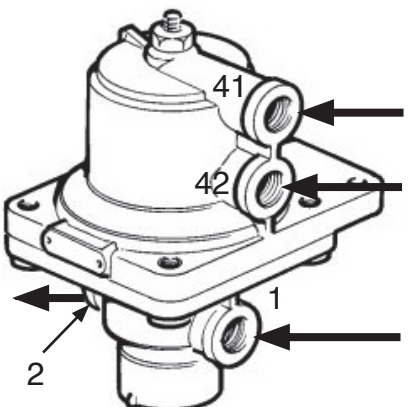

6035C
56
56
56
56
41
42
1
2
6045
57
57

Pressure control valve

1. Supply from 2-way valve
2. Supply to bogie valve block
41. Signal from drive axle air bellows RH
42. Signal from drive axle air bellows LH
56. Drive axle air bellows
57. Non-drive axle air bellows
6035C. Drive axle valve block
6045. Bogie valve block

A pressure control valve is fitted only to early trucks with a pusher axle bogie - up to and including ‘Electronics ‘98. The valve controls the pressure in the non-drive axle air bellows, in proportion to the pressure in the drive axle air bellows.
In this way, the weight distribution between the axles ensures optimum traction.


10
9
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10
DRIVE AXLE - x 100 kPa
NON-DRIVE AXLE - x 100kPa


41
42
1
2

Pressure control valve - testing

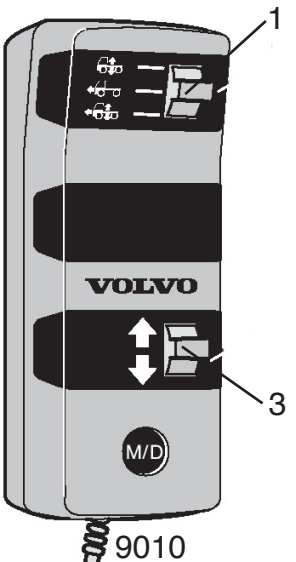
WARNING
Correct adjustment is important. The non-drive axle load sensing valves - which control brake pressure to the non-drive axle brakes - obtain the pressure signal from the non-drive axle air bellows.

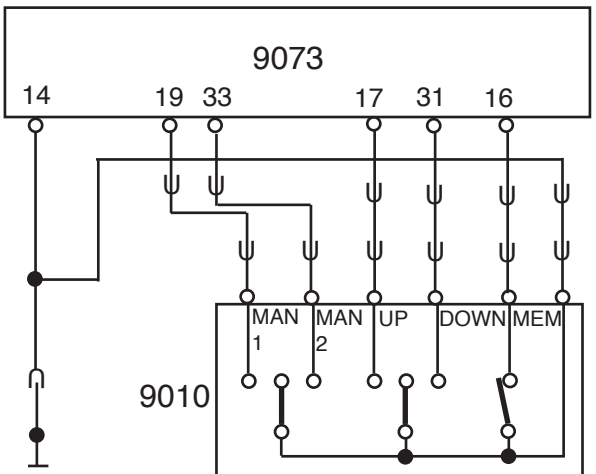
CAUTION
The valve adjuster screw is sealed.

Adjustment has legal implications re. axle loads

Connect an air supply - via an adjustable pressure regulator - to ports 1, 41, and 42.
Connect a pressure gauge to port 2.
Gradually increase the supply pressure, and note the valve output pressure on the gauge:

Supply pressure	Output pressure
1	0.5
2	0.5
3	0.5
4	0.5
5	4
6	6





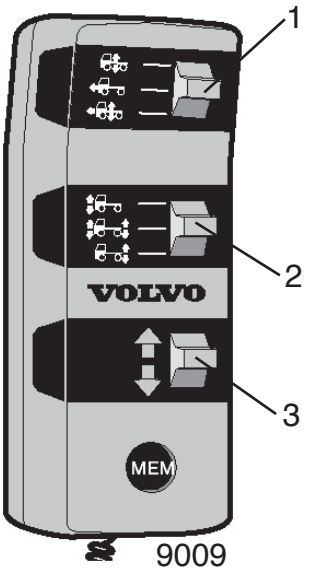
When closed, the internal switches connect the common earth to the appropriate pins

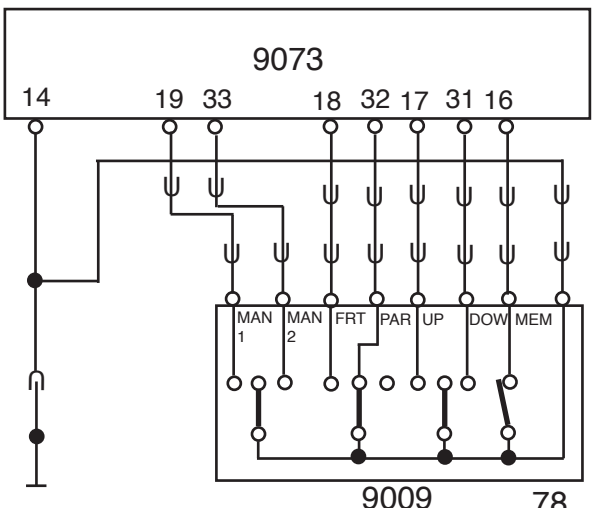
Remote control - 9010

Control 9010 is used for trucks with rear air suspension only.

Switch position	1. Control switch	3. Regulator switch
UP	 Manual control MAN1	Move up
CENTRE	 Drive position AUT	Stop
DOWN	 Control of drive pos'n MAN2	Move down

ECS Gen. 1


1
2
3
VOLVO
MEM
9009


9073
14
19
33
18
32
17
31
16
MAN 1
MAN 2
FRT
PAR
UP
DOW
MEM
9009
78

Remote control - 9009

Control 9009 is used for trucks with full air suspension.

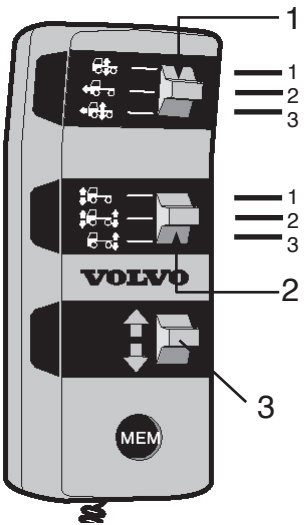
Switch position	1. Control switch	2. Axle switch	3. Regulator switch
UP	 Manual control MAN1	 Front axle mem. M1	Raise
CENTRE	 Drive position AUT	 Front & rear axle mem. (PARA) M2	Stop
DOWN	 Control of drive pos'n MAN2	 Rear axle mem. M3	Lower

Chassis height	Bogie arrangement	Maximum change of position - mm
CHH-STD RADT-A6 RADD-A8	RAD-A4, RAPD-A6	+/- 40 +/- 40 -0/+0
CHH-MED	RAD-A4, WB < 3.7 RAD-A4, WB > 3.7 RAPD-A6	-7/+0 -7/+0 -0/+0
CHH-LOW, CHH-XLOW	RAD-A4, RADT-A6 RADT-A8, RADT-A6S	-0/+0

Changing the drive height

CAUTION
To avoid possible vibration and excessive prop-shaft angles, which may cause instability or component damage, the drive height must not be changed by more than the values in the chart above.
The system will allow the drive height to be changed up to +/- 40 mm.
However, as shown in the chart, the maximum permissible height increase is +10 mm - and this is only with bogie arrangement RADT-A6, with chassis height CHH-STD.

DANGER: Do not leave the control switch in the “MAN 1” position when working on the truck, with the ignition off. Because the system is in stand-by mode, automatic height adjustment may still occur.
This may cause a dangerous situation if chassis height suddenly and unexpectedly changes.



Location to be raised or lowered	1. Control switch position	2. Axle switch position
Front	2	1
Rear	2	3
Front & rear	2	2
Front LH	3	1
Front RH	1	1
Rear LH	3	3
Rear RH	1	3

Interlock mode

If an ECS fault occurs, the ECU will put the system into 'interlock' or 'blocked' mode. In this mode, the voltage supplies to the solenoid valve blocks are removed, so automatic height adjustment does not work.

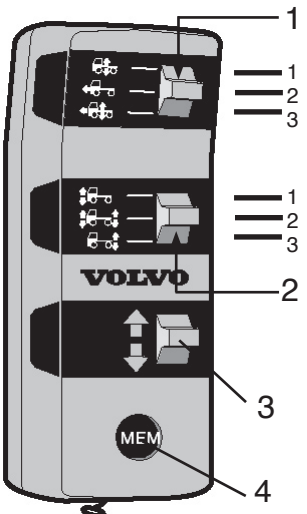
Is the system in interlock mode ?

A quick method to find out if the system is in interlock mode (on trucks with a lifting rear axle):

- put the control switch (1) in normal driving position - AUT

- move the regulator switch (3) to raise or lower position

- if the axle is raised or lowered, the system is in interlock mode



Location to be raised or lowered	1. Control switch position	2. Axle switch position
Front	2	1
Rear	2	3
Front & rear	2	2
Front LH	3	1
Front RH	1	1
Rear LH	3	3
Rear RH	1	3

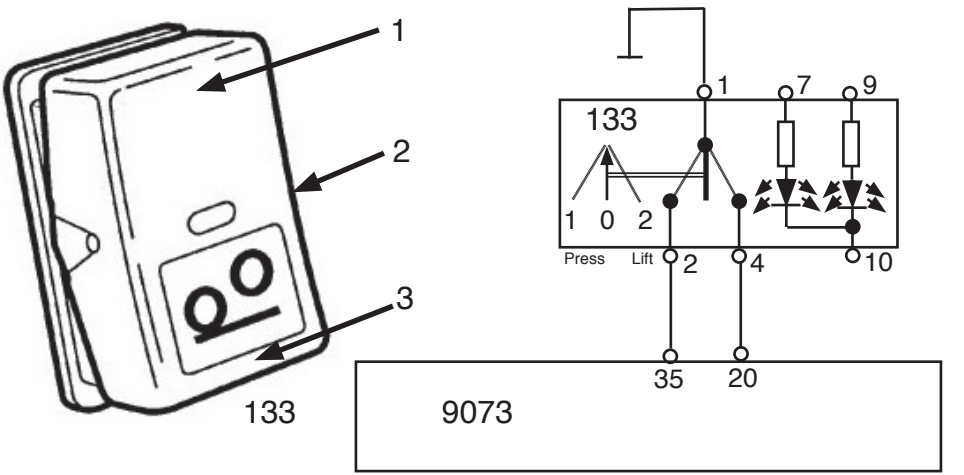
Changing chassis height in interlock mode

If it is necessary to change the chassis height before the fault is corrected, select the location to be changed, and set the control and axle switches as shown in the chart above.

Note: Because of the design of the solenoid block used on 4x2 tractors (i.e. ports 21 and 22 are controlled by a common solenoid valve) individual control of LH and RH is not possible.

Memory - store and recall

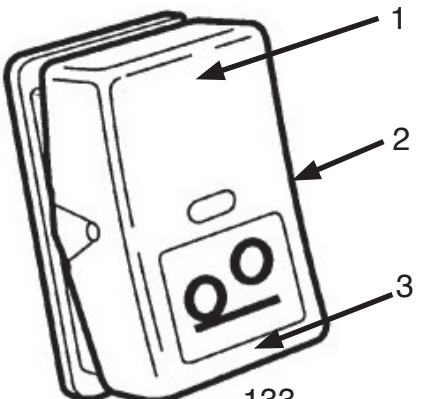
The settings arrived at using switch (2) in M1 or M2 position, can be stored in memory, and recalled, using button (4).
To store a setting, press the button for more than 5 sec.
To recall a setting, press the button for less than 2 sec.


1
2
3
133
133
1
7
9
1 0 2
Press
Lift
2
4
10
35
20
9073

Bogie switch

The bogie switch is used to fully raise/lower the lifting axle of a 2 axle bogie, or to alter the weight distribution between the two axles.
The switch used with ECS Gen. 1 has 3 fixed positions:

Switch position	Result
1 - upper section pressed	Axle lift or axle press, with offset raising Max. axle load - 11.5, 13.0 or 15.0 tonne - depending on variant
2 - centre position	Normal drive position - axle lowered
3 - lower section pressed	Axle press without offset raising



133

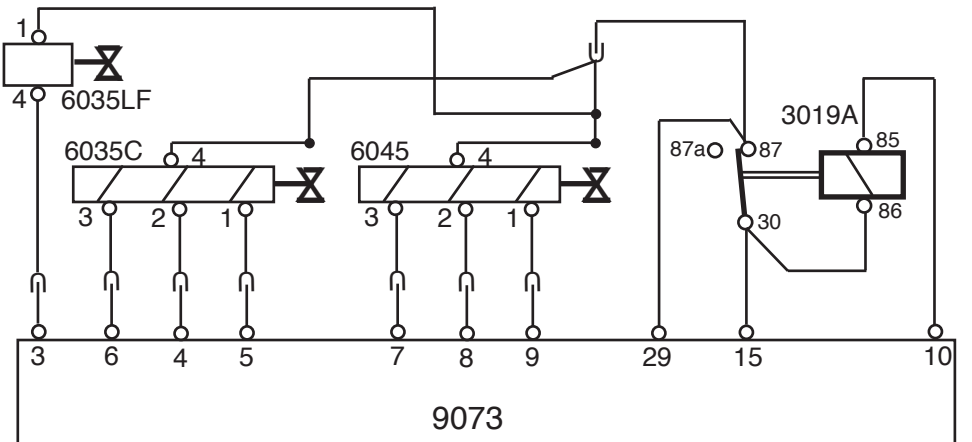
Bogie switch

Axle press (extra traction)

Axle press allows the drive axle to exert more pressure on the road surface. It is achieved by exhausting all the air from the non-drive axle air bellows.
This can give extra traction, and can be useful on certain poor road surfaces - e.g. slippery, rutted quarry roads etc.

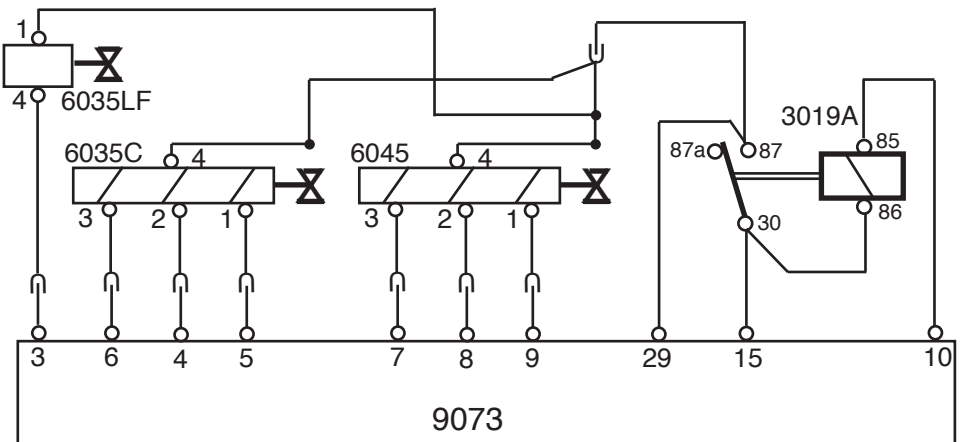
Offset raising

Offset raising raises the chassis height slightly to maintain ground clearance of raised axle tyres. It is achieved by supplying more air to the drive axle air bellows when the non-drive axle is raised.


1
4
6035LF
6035C
4
3
2
1
6045
4
3
2
1
3019A
87a
87
85
86
30
3
6
4
5
7
8
9
29
15
10
9073

Solenoid valve relay 3019A

When the ignition is switched on, a 'sensing' signal of 2 milli-volts is sent from ECU pin (29) through each individual solenoid and back to the ECU.
This signal checks to ensure that the solenoid circuits are OK.
If the return signal to pins 3, 4, 5, 6, 7, 8 and 9 is not correct, relay 3019A will not be energised.
If the return signal is correct, ECU pin 10 will supply a negative to relay pin (85).
Because ECU pin (15) supplies battery voltage to relay pin (30) and - by link - to pin (86), the relay is now energised and supplies battery voltage to the solenoids via pin (87).
ECU pins 3, 4, 5, 6, 7, 8 and 9 also supply battery voltage to the solenoids so, the solenoids are not energised.
To energise a solenoid, the ECU changes the supply from the relevant pins from battery voltage to negative.


1
4
6035LF
6035C
4
3
2
1
6045
4
3
2
1
3019A
87a
87
85
86
30
3
6
4
5
7
8
9
29
15
10
9073

Solenoid valve relay 3019A

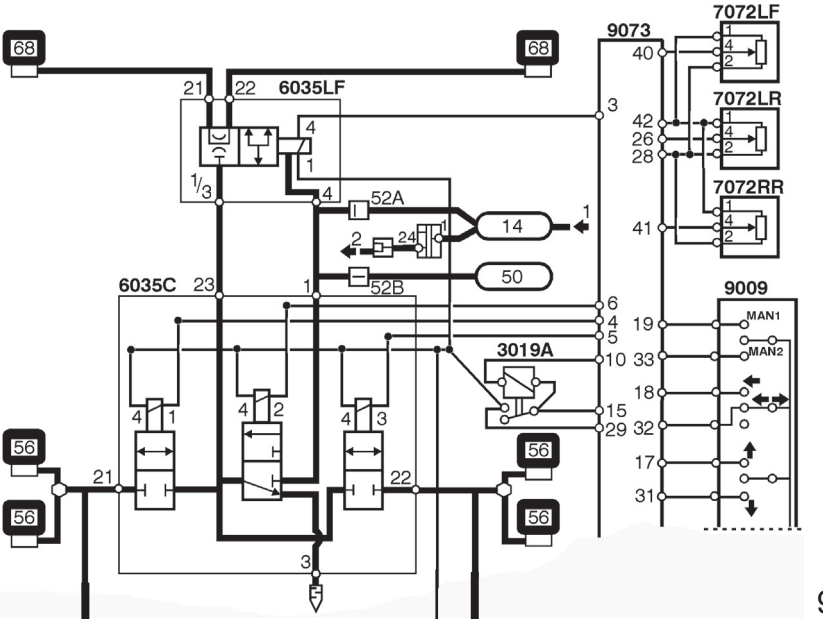
If a fault occurs in a solenoid or sensor, the ECU automatically puts the system into 'blocked' mode. This means that the normal automatic levelling function no longer works.

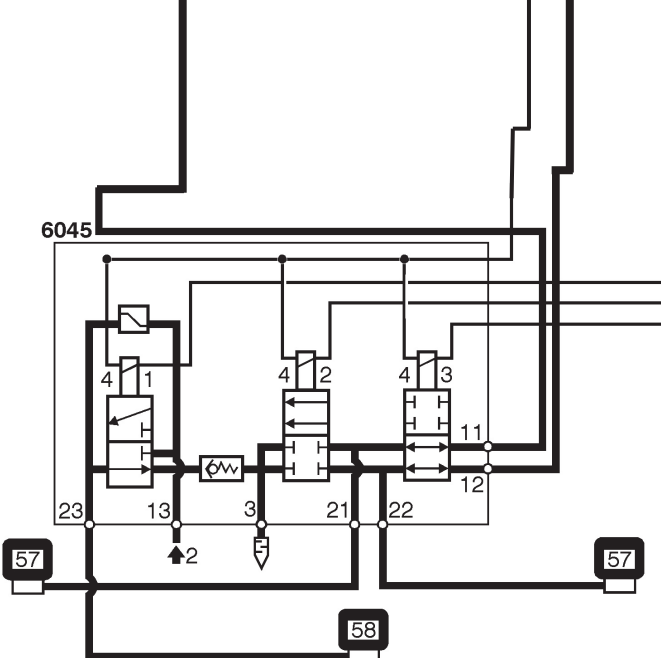
Blocked mode is activated by removing battery voltage from the solenoids.

This is done by the ECU changing the supply from pin (10) from negative to positive. Relay (3019A) is no longer energised, so battery voltage from ECU pin (15) can not pass through the relay to the solenoids.

At the same time, ECU pins 3, 4, 5, 6, 7, 8 and 9 become negative, and ECU pin 29 is positive.

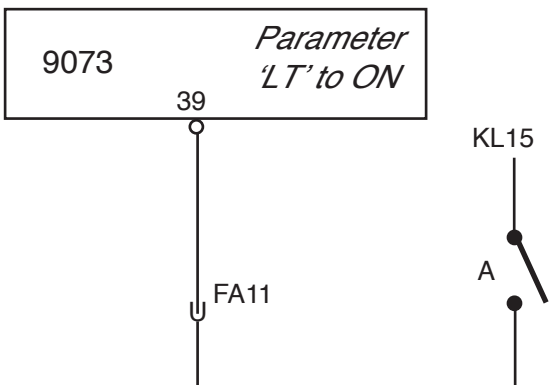
All solenoids are now energised, and the chassis is raised. In this condition the only way to alter the ride height is to use the remote control. The ECU will then supply positive to the solenoids which are not to be energised, and negative to the solenoids which are to be energised.


68
68
21
22
6035LF
4
1
1/3
4
52A
14
1
2
24
1
50
52B
6035C
23
1
3
9073
40
3
42
26
28
41
7072LF
7072LR
7072RR
1
4
2
6
4
5
3019A
10
15
29
9009
19
33
18
32
17
31
MAN1
MAN2
4
1
4
2
4
3
56
56
56
56
21
22
3



56. Air bellows - drive axle
57. Air bellows - bogie
58. air bellows - axle lift
68. Air bellows - front axle
3019A. Relay - solenoid valves
3019B. Relay - ECU power supply
6035C. Sol. valve - drive axle
6035LF. Sol. valve front axle
6045. Sol. valve - bogie
7072LF/LR/RR Height sensors
7064 - Pressure sensor
9073. ECS ECU
9009. Remote control

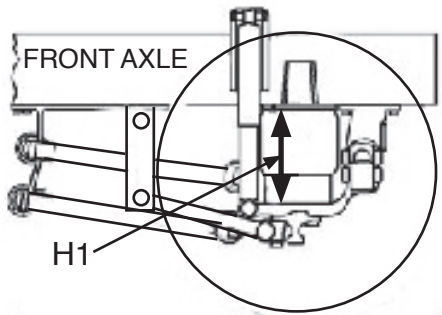
Air and electrical circuits - full air suspension

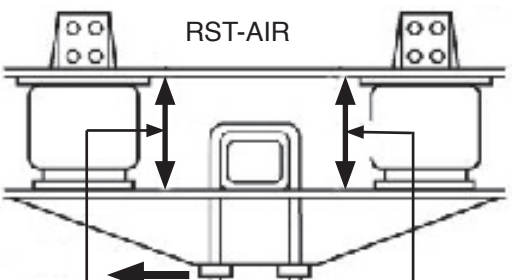

9073
Parameter
'L T' to ON
39
KL15
A
FA11

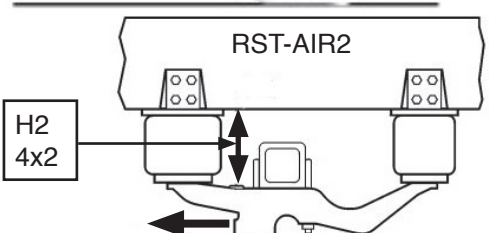
Level control - switch off

In certain cases it may be necessary to switch off the automatic height/levelling function - e.g. when using outrigger stabiliser legs, or a snowplough.
Switch off is activated by applying a positive signal to ECU pin (39)
The signal can be from a switch (A), or from a relay - either of which is fitted by the body-builder. The body-builder also fits some type of signal to indicate when level control is switched off.
The switch connection to the ECS ECU is as shown in the above diagram.
When switch (A) is closed:
- if the parking brake is applied, level control is switched off on both front and rear axles.
- if the parking brake is released, level control is switched off on the front axle only.

Note: For level control switch off to operate, parameter 'LT' in the ECS ECU must be activated using VCADSPro.





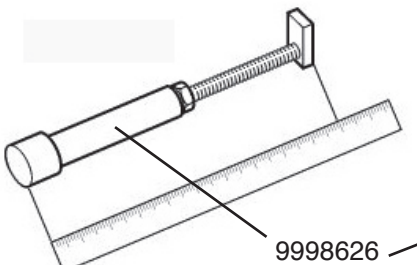


H2
6X2 RADT-A6
6X4
8X2
8X4

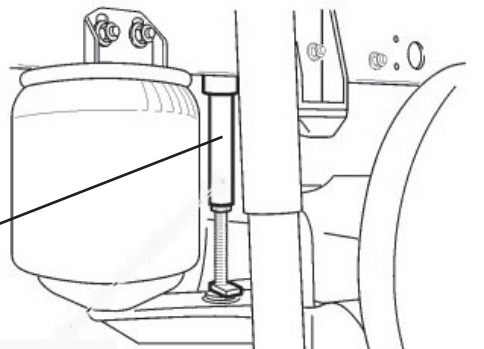
H2
6x2 RADT - A6S
RAPD -A6
4X2

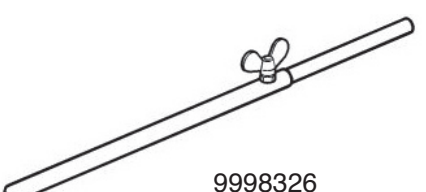
Height sensor calibration - measuring positions

The diagrams above show the position of the measuring tools for various bogie configurations.



9998626





9998326

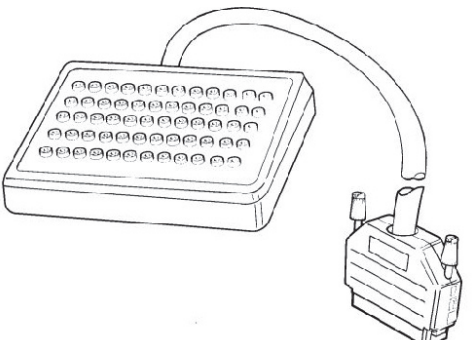
Height sensor calibration

Height sensors must be calibrated when:

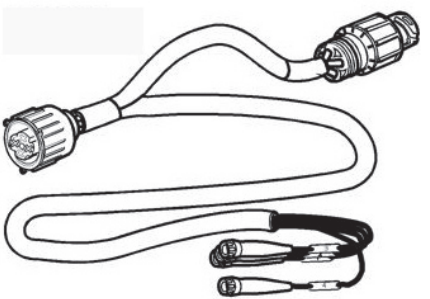
- a sensor has been removed and refitted
- a new sensor is fitted
- a new ECS ECU is fitted

Refer to IMPACT for correct ride height specifications. Follow the calibration instructions in IMPACT, and VCADSPro User Manual.

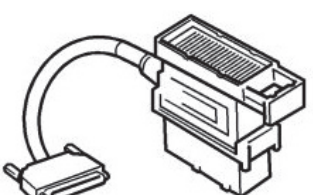
Note:
- During calibration, there must be no load on the truck.
- On trucks with a lifting axle, the axle must be down.



9998551

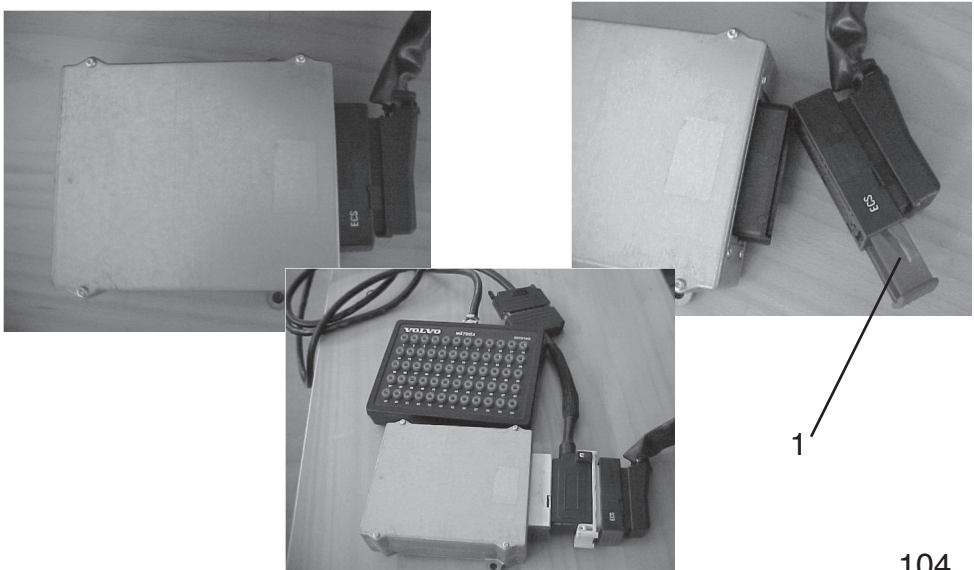


9998534



Test equipment 9511355 - is used to connect to the ECS ECU.

9998534 - is used to check height sensors and solenoid valves.

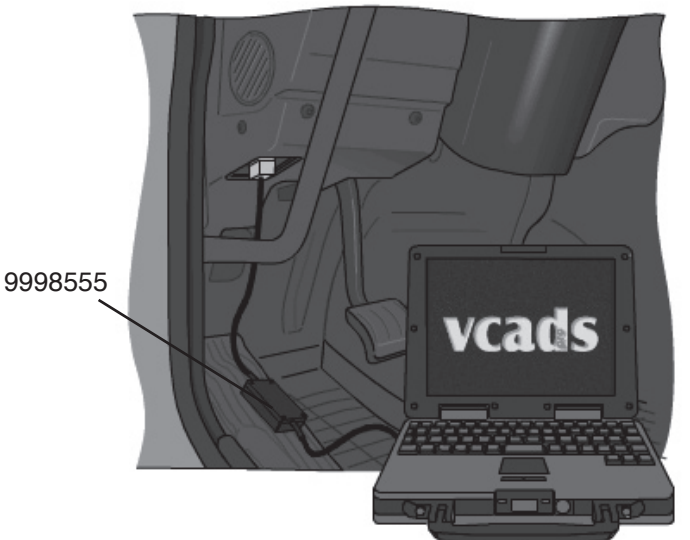

ECS
VOLVO
1

Test equipment - Connecting to the ECU

System check using break-out box and test harness.

Pull out purple locking slide (1) to remove the multi-way plug.

Connect cables as shown above.


9998555
vcads

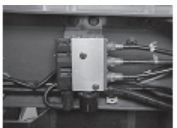
VCADSPro After connecting the VCADSPro PC to the diagnostic socket, using communications unit 9998555, several tests and settings can be carried out.

The checks and settings are listed on a testing/calibration menu.
Instructions on how to reach and use the menu are contained within the VCADSPro programme, and in Group 0 of the VCADSPro User Manual

ECS Generation 2

ECS Gen. 2

1



2

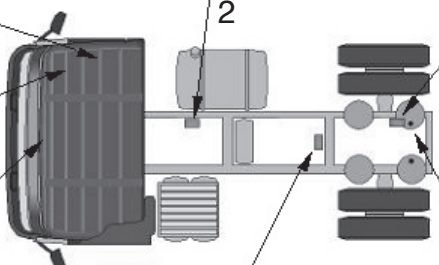
3

7

6

5

4



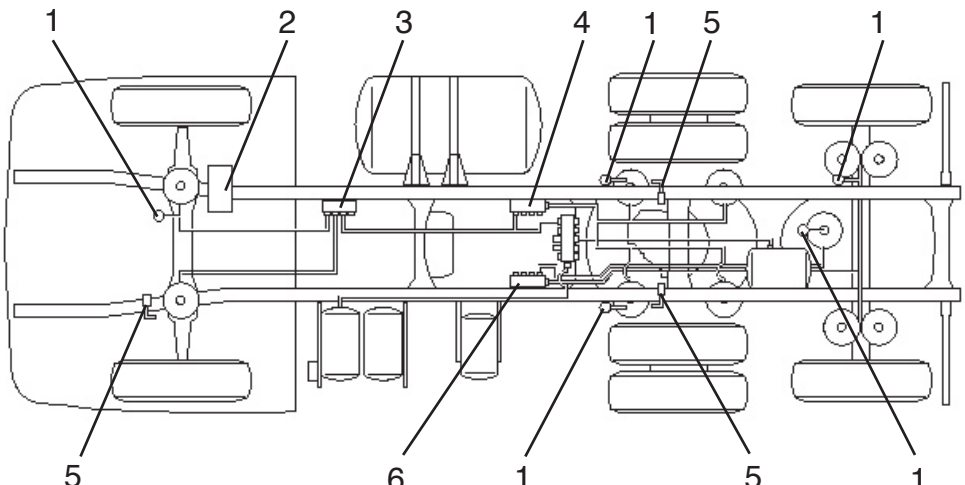
ECS Gen. 2 main components

1. ECU
2. Solenoid valve
3. Height sensor
4. Pressure sensor
5. Overflow valve
6. Relay panel
7. Remote control

Gen. 1/Gen.2 - main differences

The main differences between Gen. 1 and Gen. 2 systems are:

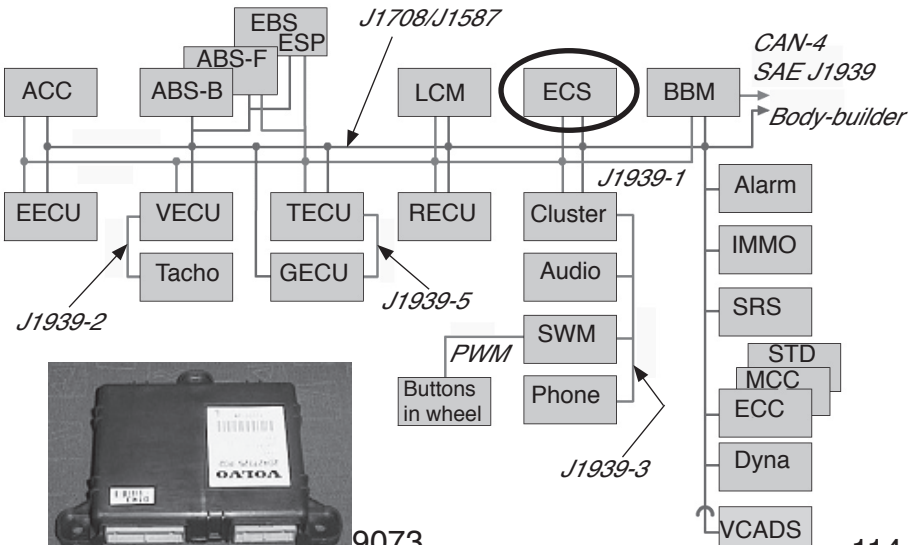
- ECU - now has 2 connectors
- Solenoid valves
- Additional pressure sensors
- Bogie switch operation
- Overflow valves
- Height sensor calibration
- Additional functions
- Additional VCADSPro tests
- Only one relay



6x2 - full air suspension - trailing axle bogie

ECS Gen. 2 main components

1. Pressure sensor
2. ECS ECU
3. Solenoid valve - front axle
4. Solenoid valve - drive axle
5. Height sensor
6. Solenoid valve - trailing axle

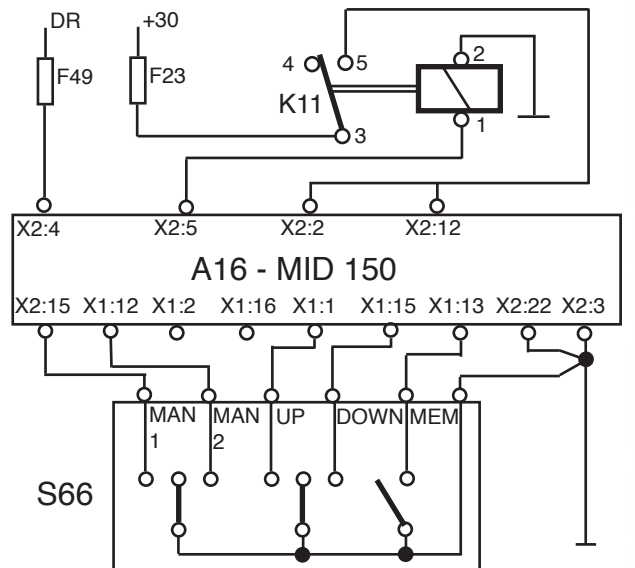

EBS
ESP
ABS-F
J1708/J1587
CAN-4
SAE J1939
ACC
ABS-B
LCM
ECS
BBM
Body-builder
J1939-1
EECU
VECU
TECU
RECU
Cluster
Alarm
IMMO
Tacho
GECU
Audio
SRS
J1939-2
J1939-5
PWM
SWM
STD
MCC
Buttons
in wheel
Phone
ECC
J1939-3
Dyna
VCADS

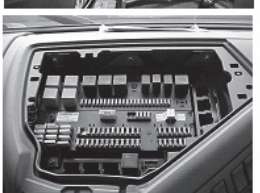
VOLVO

9073

ECS Gen. 2 ECU - data link

The Gen. 2 ECU has two connectors - X1 (30 pins) and X2 (22 pins), and is connected to both the slow data link and the fast data link.

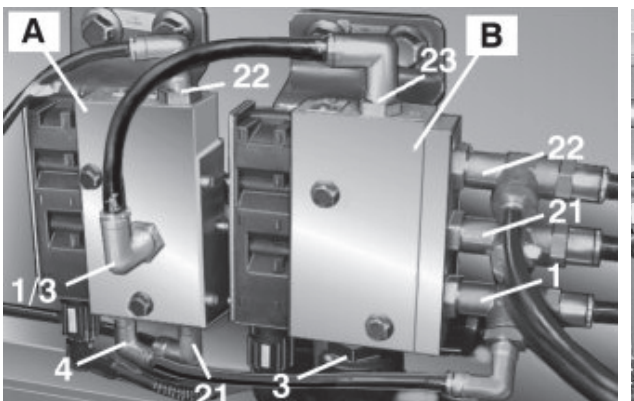

DR
+30
F49
F23
4
5
2
K11
3
1
X2:4
X2:5
X2:2
X2:12
A16 - MID 150
X2:15 X1:12 X1:2 X1:16 X1:1 X1:15 X1:13 X2:22 X2:3
MAN 1
MAN 2
UP
DOWN
MEM
S66

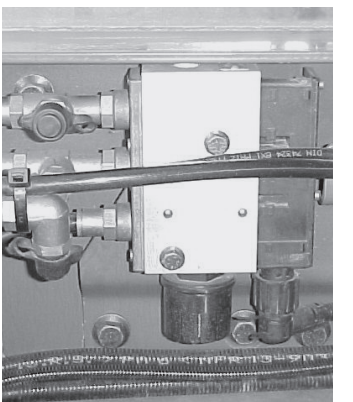


ECS Gen. 2 ECU - power supply

The ECU is located in a compartment within the offside storage locker, behind the drivers seat.

When the ignition key is turned on, a voltage is fed from the DR line to the ECU via fuse F49. The ECU now energises relay K11 via pin X2:5.
Via fuse F23, K11 now supplies a voltage from the +30 line to ECU pin X2:2 and pin 2:12.





C

ECS Gen. 2 solenoid valve blocks - design and function

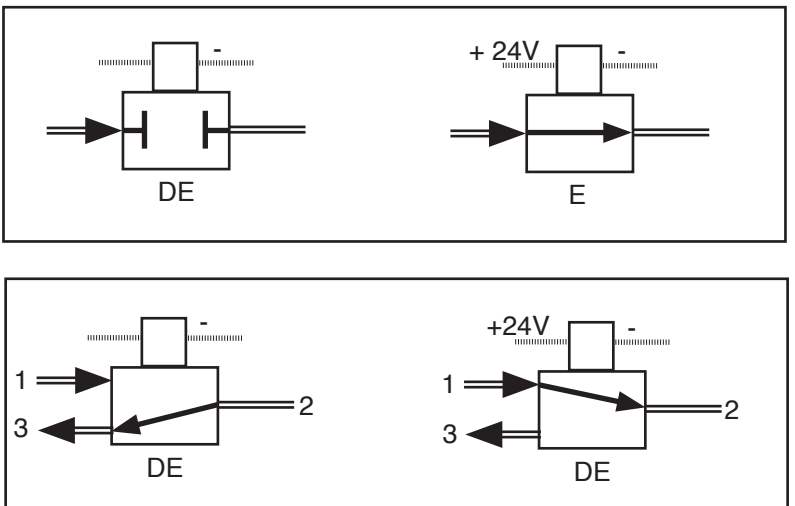
Three types of solenoid valve block are used in ECS Gen.2:

A. Front axle valve block
B. Drive axle valve block:
- variant 1 for 4x2 tractor
- variant 2 for other than 4x2 tractor

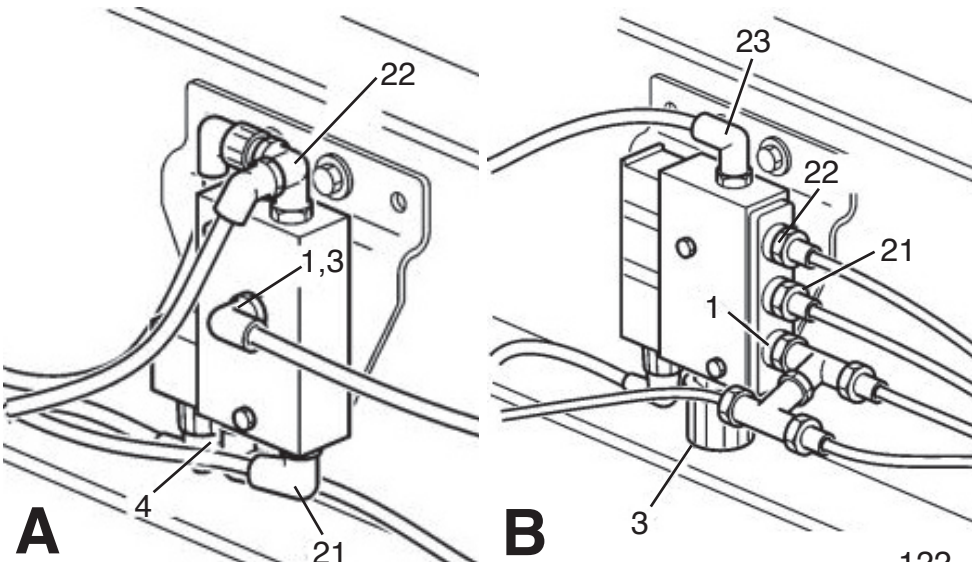
C. Bogie axle valve block:

All valve blocks contain solenoid operated air valves, which control air flow to and from the air bellows.

The solenoids are energised or de-energised by signals from the ECS ECU.


A
-
DE
+ 24V
-
E
B
-
1
2
3
DE
+24V
-
1
2
3
DE

ECS Gen. 1 solenoid valve operation	A. Basic bellows air flow solenoid. B. Control solenoid - found only in valve block for drive axles.
A - solenoid de-energised	DE. Solenoid ‘De-energised’. Negative to one pin. No air can pass through the valve.
A - solenoid energised	E. Solenoid ‘Energised’. +24V supplied to one pin, negative supplied to other pin. Air can pass through the valve.
B - solenoid de-energised	DE. Solenoid ‘De-energised’. Negative to one pin. Outlet (2) is connected to exhaust (3). No air can pass from inlet (1) to outlet (2).
B - solenoid energised	E. Solenoid ‘Energised’. +24V supplied to one pin, negative supplied to other pin. Inlet (1) is connected to outlet (2). Air can pass through the valve.


22
1,3
4
21
A
23
22
21
1
3
B
122

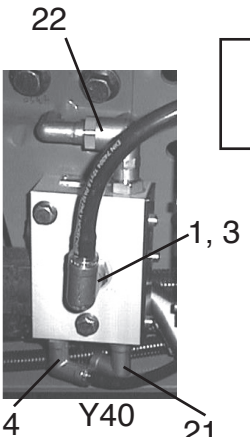
ECS Gen. 2 solenoid valve blocks

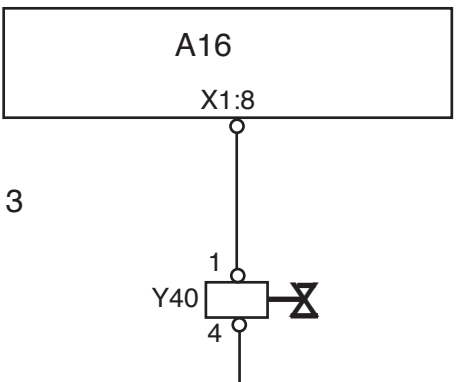
A. Solenoid valve - front axle, Y40

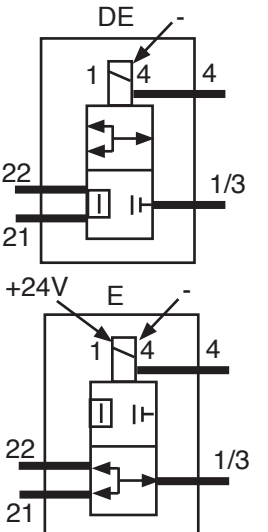
1/3. Supply air from - and drain to - drive axle valve, Y25
4. Air supply from wet tank
21. Air to and from LH front air bellows
22. Air to and from RH front air bellows

B. Solenoid valve - drive axle, Y25

1. Air supply from wet tank
3. Air drain via silencer
21. Air to and from LH drive axle air bellows
22. Air to and from RH drive axle air bellows
23. Air to and from front axle solenoid valve (plugged if rear air suspension only)


22
1, 3
4
Y40
21

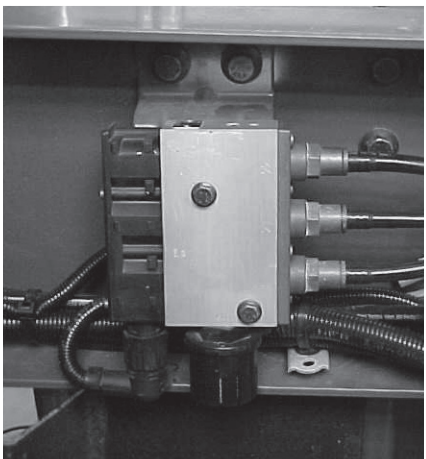

A16
X1:8
1
Y40
4


DE
-
1
4
4
22
1/3
21
+24V
E
-
1
4
4
22
1/3
21

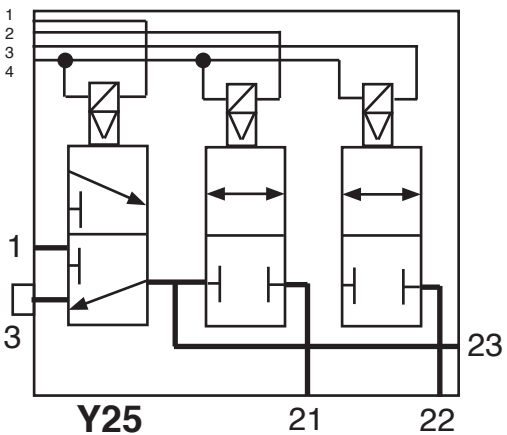
Solenoid valve block - front axle

A16. ECS ECU
Y40. Solenoid valve - front axle

1/3. Supply air from - and drain to - drive axle valve, 6035C
4. Air supply from wet tank
21. Air to and from LH front air bellows
22. Air to and from RH front air bellows



Y25

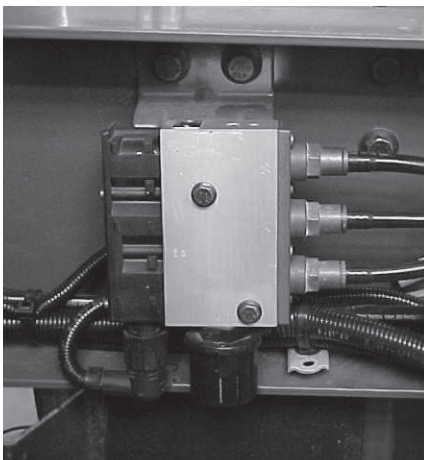


Solenoid valve block - drive axle - not 4x2

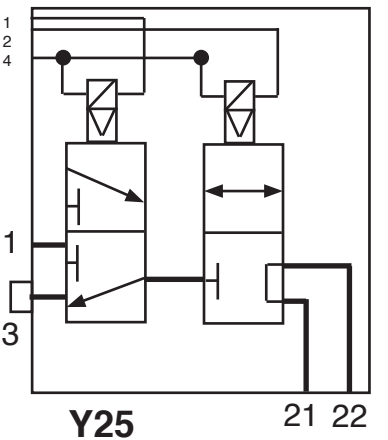
Y25. Solenoid valve - drive axle

1. Air supply from wet tank
3. Exhaust via silencer
21. Air to and from LH drive axle air bellows
22. Air to and from RH drive axle air bellows

The solenoid valve block for other than 4x2 trucks contains 3 solenoid valves.



Y25



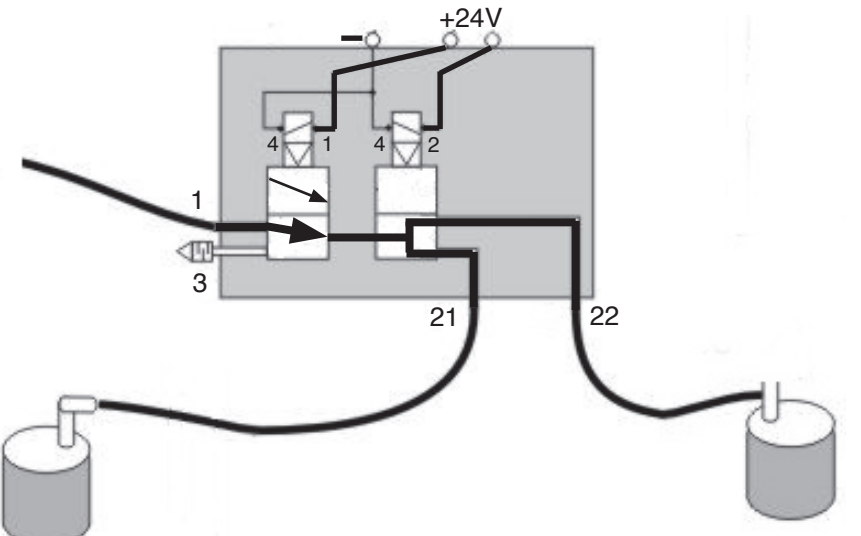
Y25

Solenoid valve block - drive axle - 4x2

Y25. Solenoid valve - drive axle

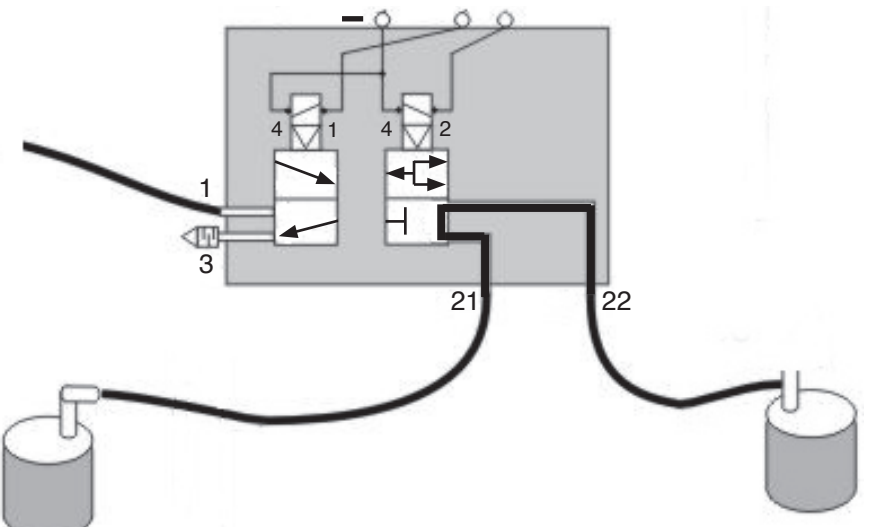
1. Air supply from wet tank
3. Exhaust via silencer
21. Air to and from LH drive axle air bellows
22. Air to and from RH drive axle air bellows

The solenoid valve block for 4x2 trucks contains 2 solenoid valves.
Because both LH and RH air bellows are fed from a common solenoid valve, the bellows cannot be inflated or deflated independently.


+24V
4
1
4
2
1
3
21
22

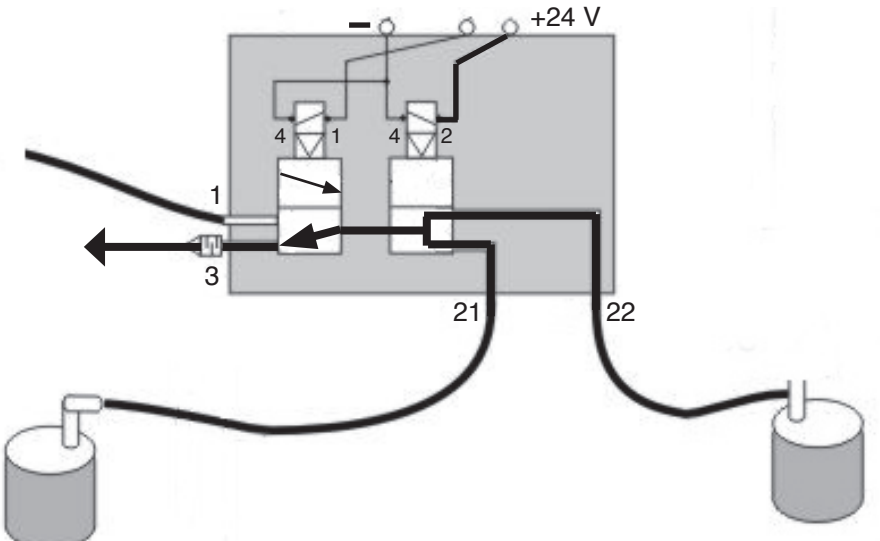
Solenoid valve block - drive axle - 4x2 - suspension raise

If the driver switches the bogie switch to ‘raise’ position, and/or the ECU receives a ‘raise’ signal from a height sensor, the ECU sends +24 V to energise the control solenoid and drive axle solenoid.
Air can now pass from valve block inlet (1) - supply from wet tank - to outlets (21) and (22) to the LH and RH air bellows.
The chassis is raised to the required height.


4
1
4
2
1
3
21
22

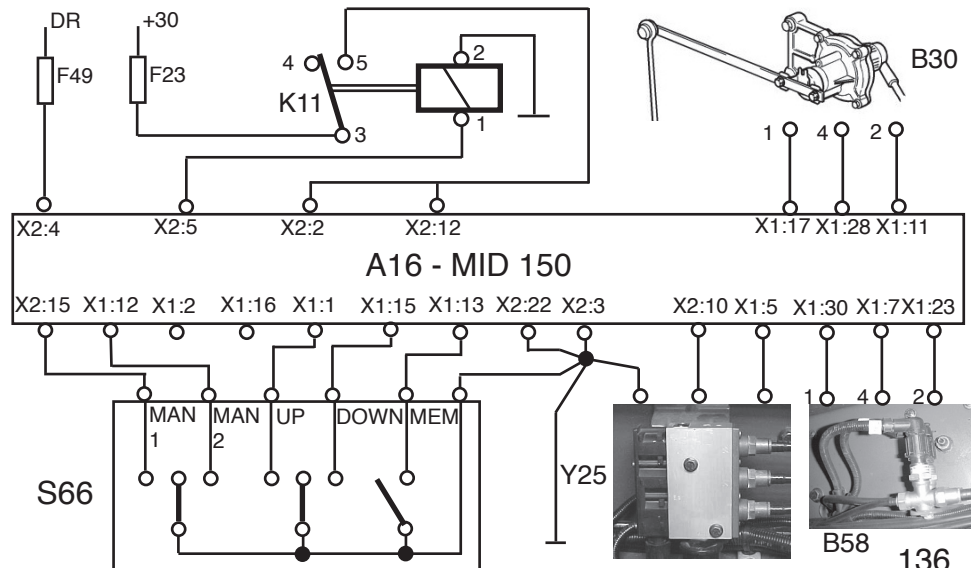
Solenoid valve block - drive axle - 4x2 - suspension hold

When the bogie switch is moved to off position, and/or the ECU receives a signal from a height sensor confirming that the correct ride height has been reached, the ECU removes +24 V from the control solenoid and drive axle solenoid.
The solenoid valves close, so no air can escape from the air bellows.
The chassis is stays at the required height.


–
+24 V
4
1
4
2
1
3
21
22

Solenoid valve block - drive axle - 4x2 - suspension lower

If the driver presses the bogie switch to ‘lower’ position, and/or the ECU receives a ‘lower’ signal from a height sensor, the ECU sends +24 V to energise the drive axle solenoid.
The control solenoid is not energised, so a path from the drive axle solenoid valve to exhaust, via the control valve, is created.
The chassis is lowered to the required height.

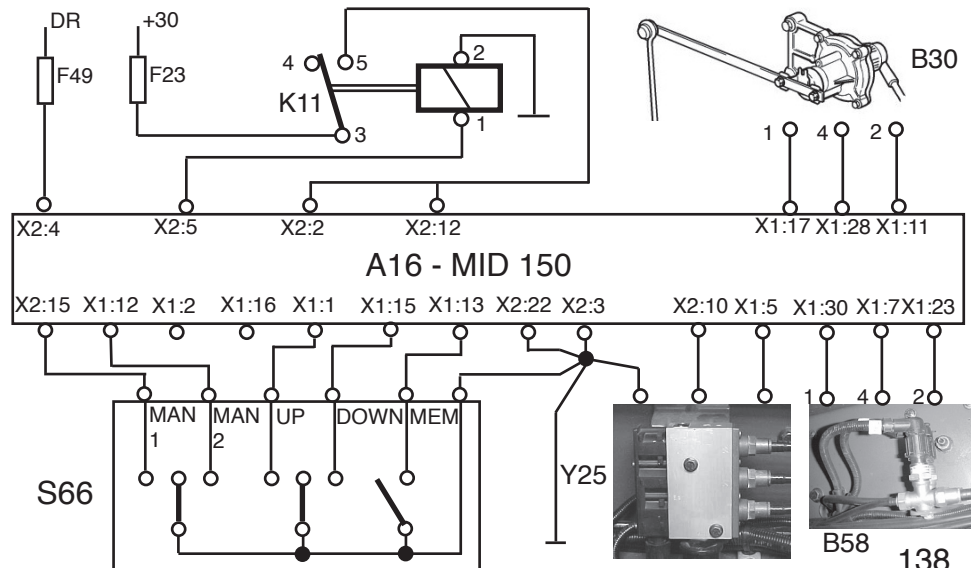

DR
+30
F49
F23
4
5
2
K11
3
1
B30
1
4
2
X2:4
X2:5
X2:2
X2:12
X1:17
X1:28
X1:11
A16 - MID 150
X2:15
X1:12
X1:2
X1:16
X1:1
X1:15
X1:13
X2:22
X2:3
X2:10
X1:5
X1:30
X1:7
X1:23
MAN 1
MAN 2
UP
DOWN
MEM
S66
Y25
1
4
2
B58

Electrical connections - 4x2

A16. ECS ECU
B30. Height sensor
B58. Pressure sensor
F49. Fuse - ignition supply
K11. Relay - battery supply to ECU
S66. Remote control
Y25. Solenoid valve - drive axle

ECU (A16) sends a low (earth) signal to:
- height sensor (B30) from pin (X1:11)
- pressure sensor (B58) from pin (X1:7)

ECU (A16) sends a reference voltage to:
- height sensor (B30) from pin (X1:17) - 0.5V to 4.5V
- pressure sensor (B58) from pin (X1:30) - 0.2V to 4.8V


DR
+30
F49
F23
4
5
2
K11
3
1
B30
1
4
2
X2:4
X2:5
X2:2
X2:12
X1:17
X1:28
X1:11
A16 - MID 150
X2:15
X1:12
X1:2
X1:16
X1:1
X1:15
X1:13
X2:22
X2:3
X2:10
X1:5
X1:30
X1:7
X1:23
MAN 1
MAN 2
UP
DOWN
MEM
S66
Y25
1
4
2
B58

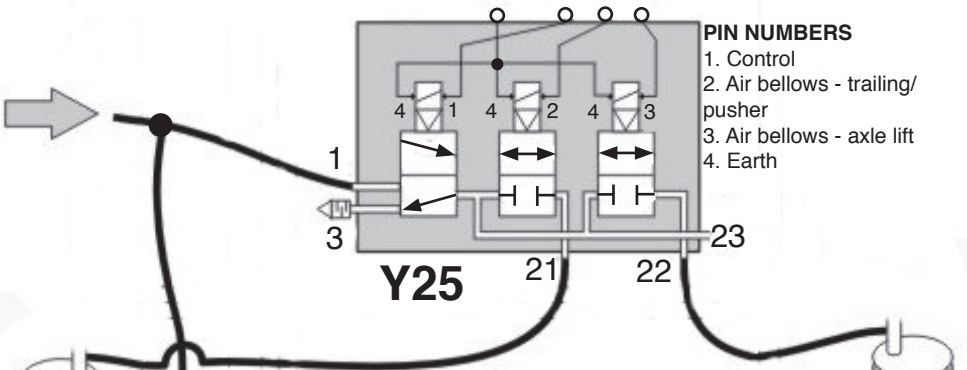
Electrical connections - 4x2

A16. ECS ECU
B30. Height sensor
B58. Pressure sensor
F49. Fuse - ignition supply
K11. Relay - battery supply to ECU
S66. Remote control
Y25. Solenoid valve - drive axle

ECU (A16) receives a varying voltage signal from height sensor (B30) at pin (X1:28), representing chassis height.

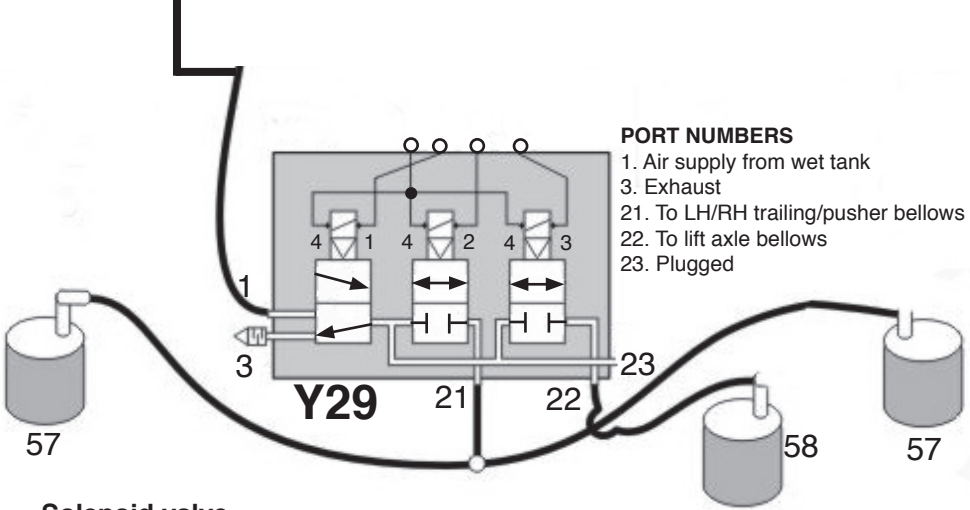
ECU (A16) receives a varying voltage signal from pressure sensor (B58) at pin (X1:23), representing chassis weight.

Pin (X2:22) provides the main earth connection for ECU (A16). The common earth point also provides an earth path for height sensor (B30).



PORT NUMBERS
1. Air supply from wet tank
3. Exhaust
21. To LH drive axle bellows
22. To RH drive axle bellows
23. To front axle

Y25. solenoid valve - drive axle
Y29. Solenoid valve - trailing/pusher axle/axle lift
56. Air bellows - drive axle
57. Air bellows - trailing/pusher axle
58. Air bellows - axle lift

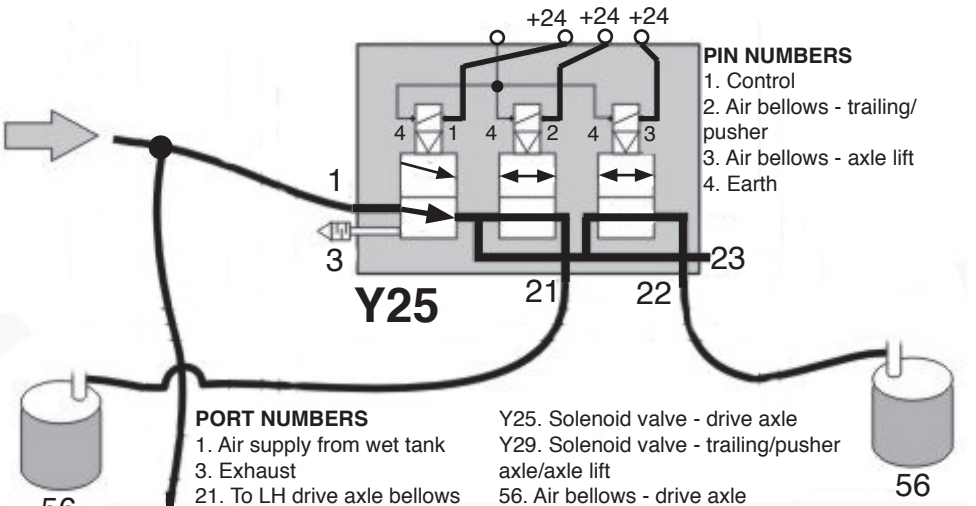


Solenoid valve blocks - 6x2 or 8x2 - ignition off

Note: Illustration spread across 2 pages

Note that, with ignition off, air cannot pass through any valve.

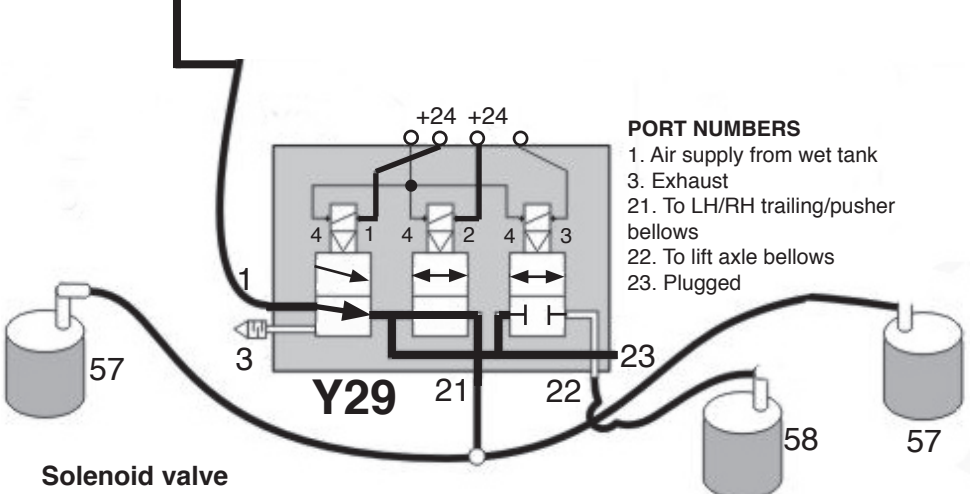
So, on Gen. 2 system, when the ignition is switched off, the lifting axle does not drop down.



PIN NUMBERS
1. Control
2. Air bellows - trailing/ pusher
3. Air bellows - axle lift
4. Earth

PORT NUMBERS
1. Air supply from wet tank
3. Exhaust
21. To LH drive axle bellows
22. To RH drive axle bellows
23.

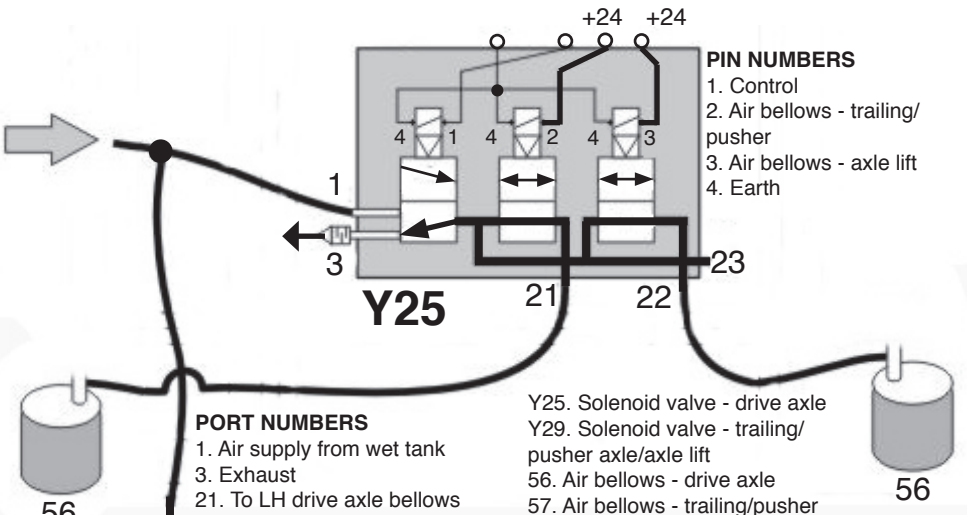
Y25. Solenoid valve - drive axle
Y29. Solenoid valve - trailing/pusher axle/axle lift
56. Air bellows - drive axle
57. Air bellows - trailing/pusher axle
58. Air bellows - axle lift



Solenoid valve blocks - 6x2 or 8x2 - suspension raise

Note: Illustration spread across 2 pages

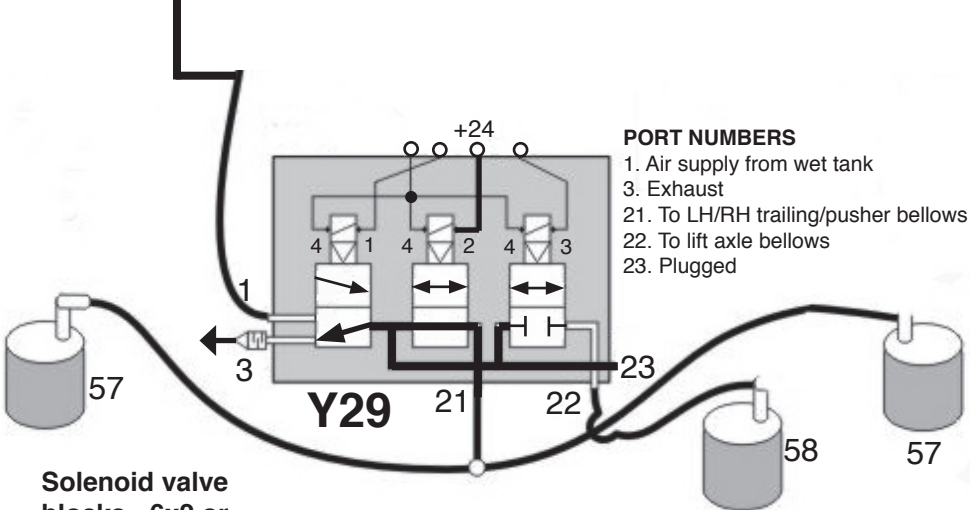
If the driver presses the bogie switch to 'raise' position, and/or the ECU receives a 'raise' signal from a height sensor, the ECU sends +24 V to energise the control solenoid and drive axle solenoids in Y25.
The control solenoid and drive axle solenoid in Y29 are also energised. Air is supplied to both the drive axle and trailing/pusher axle air bellows.



PIN NUMBERS
1. Control
2. Air bellows - trailing/ pusher
3. Air bellows - axle lift
4. Earth

PORT NUMBERS
1. Air supply from wet tank
3. Exhaust
21. To LH drive axle bellows
22. To RH drive axle bellows
23. To front axle

Y25. Solenoid valve - drive axle
Y29. Solenoid valve - trailing/ pusher axle/axle lift
56. Air bellows - drive axle
57. Air bellows - trailing/pusher axle
58. Air bellows - axle lift

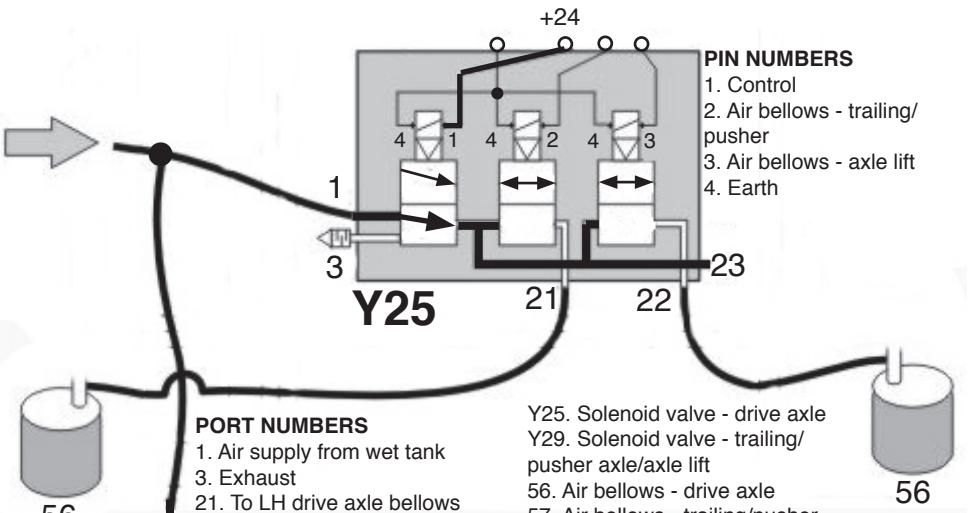


Solenoid valve blocks - 6x2 or 8x2 - suspension lower

Note: Illustration spread across 2 pages

If the driver presses the bogie switch to 'lower' position, and/or the ECU receives a 'lower' signal from a height sensor, the ECU removes +24V from the control solenoids in Y25 and Y29 - the air bellows solenoids remain energised.

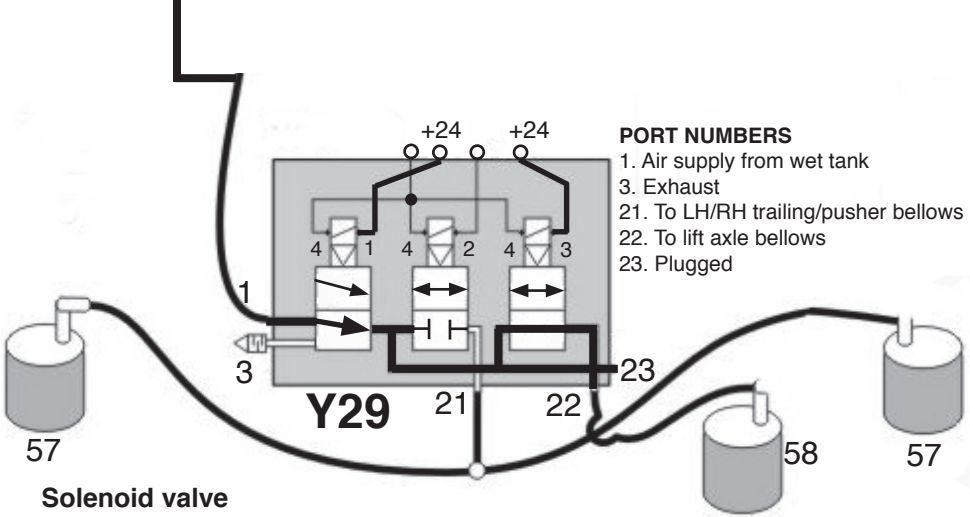
Air escapes to atmosphere via ports (3).



PIN NUMBERS
1. Control
2. Air bellows - trailing/ pusher
3. Air bellows - axle lift
4. Earth

PORT NUMBERS
1. Air supply from wet tank
3. Exhaust
21. To LH drive axle bellows
22. To RH drive axle bellows
23. To front axle

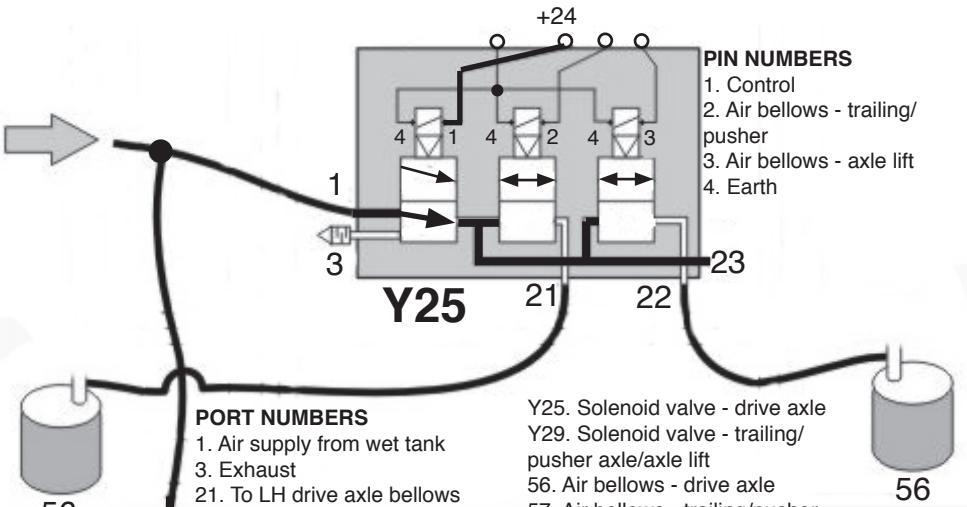
Y25. Solenoid valve - drive axle
Y29. Solenoid valve - trailing/ pusher axle/axle lift
56. Air bellows - drive axle
57. Air bellows - trailing/pusher axle
58. Air bellows - axle lift



Solenoid valve blocks - 6x2 or 8x2 - axle lift

Note: Illustration spread across 2 pages

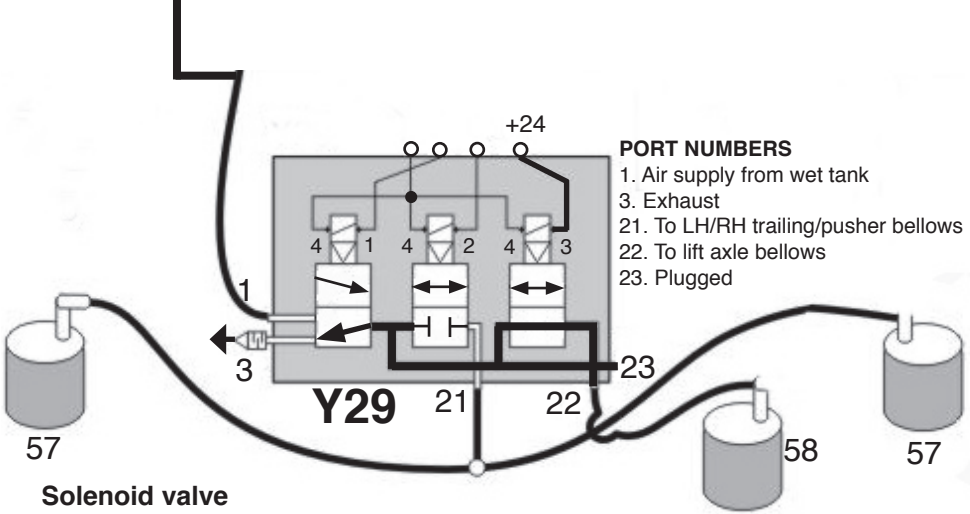
If the driver presses the bogie switch to 'lift axle' position, the ECU energises the control solenoid in (Y25), and control and lift axle solenoids in (Y29). Air is fed to the lift axle air bellows (58).
Max. air pressure in the lift axle air bellows is 12 bar for a pusher axle, and 8 bar for a trailing axle.
The ride height is raised by 5 to 8mm.



PIN NUMBERS
1. Control
2. Air bellows - trailing/ pusher
3. Air bellows - axle lift
4. Earth

PORT NUMBERS
1. Air supply from wet tank
3. Exhaust
21. To LH drive axle bellows
22. To RH drive axle bellows
23. To front axle

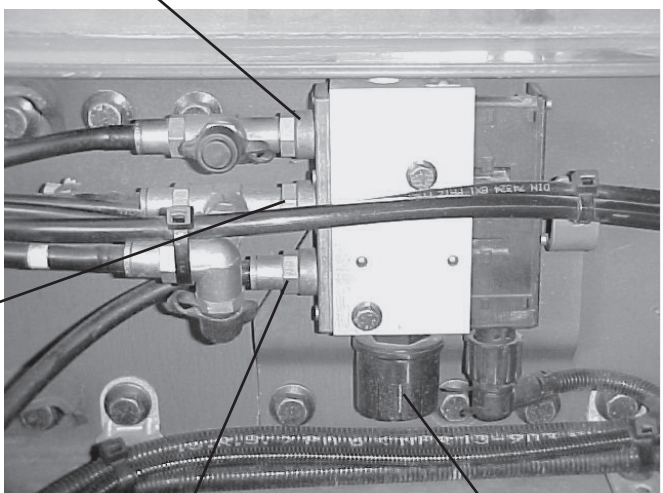
Y25. Solenoid valve - drive axle
Y29. Solenoid valve - trailing/ pusher axle/axle lift
56. Air bellows - drive axle
57. Air bellows - trailing/pusher axle
58. Air bellows - axle lift



Solenoid valve blocks - 6x2 or 8x2 - axle lower

Note: Illustration spread across 2 pages

If the driver presses the bogie switch to 'lower axle' position, the ECU removes the voltage from the control solenoid in (Y29). Air escapes to atmosphere via port (3) of (Y29). Note that the 'lift axle' solenoid in (Y29) remains energised.

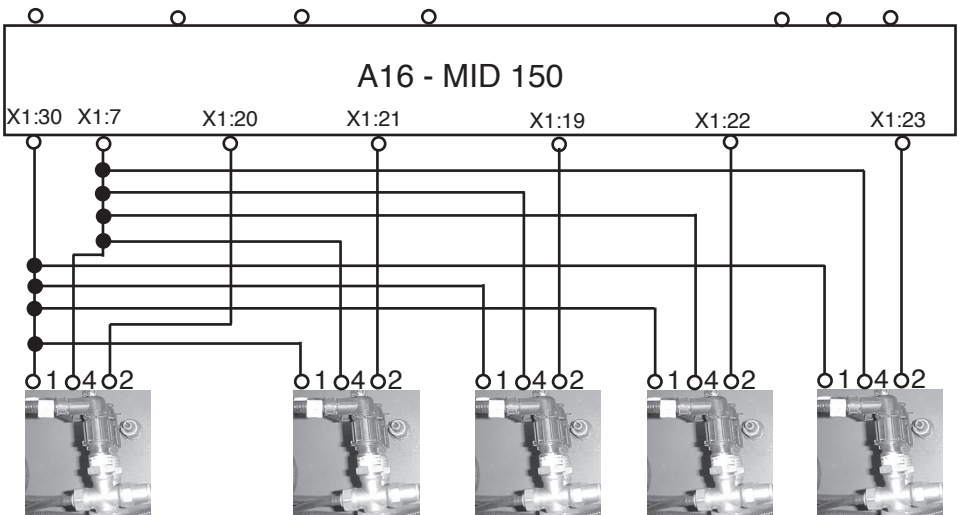

22
21
1
3

Solenoid valve block - pusher axle

Y29. Solenoid valve - pusher axle

1. Air supply from drive axle solenoid valve block
3. Exhaust via silencer
21. Air to and from LH and RH bogie axle air bellows
22. Air to and from lifting axle air bellows

The solenoid valve block for 4x2 trucks contains 2 solenoid valves.
The valves control the pusher axle suspension air bellows, and the lifting axle air bellows.


A16 - MID 150
X1:30
X1:7
X1:20
X1:21
X1:19
X1:22
X1:23
1 4 2
1 4 2
1 4 2
1 4 2
1 4 2
B24
B55
B56
B57
B58

Pressure sensors

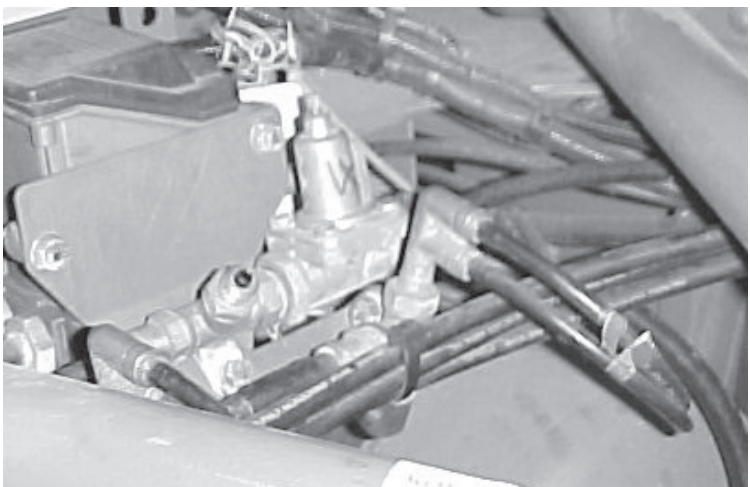
ECS Gen. 2 systems have four pressure sensors (five if front air suspension is fitted):

B24 - lift axle lifting bellows
B55 - lift axle suspension bellows
B56 - front axle bellows
B57 - drive axle bellows RH
B58 - drive axle bellows LH

This allows the pressure in each individual circuit to be separately monitored.
This means that the pressure control valve is not needed,

Pressure vs. voltage

Sensed pressure - bar	Voltage to ECU
1	0.8
3	1.5
5	2.2
7	2.8
9	3.5
11	4.2



Overflow valves

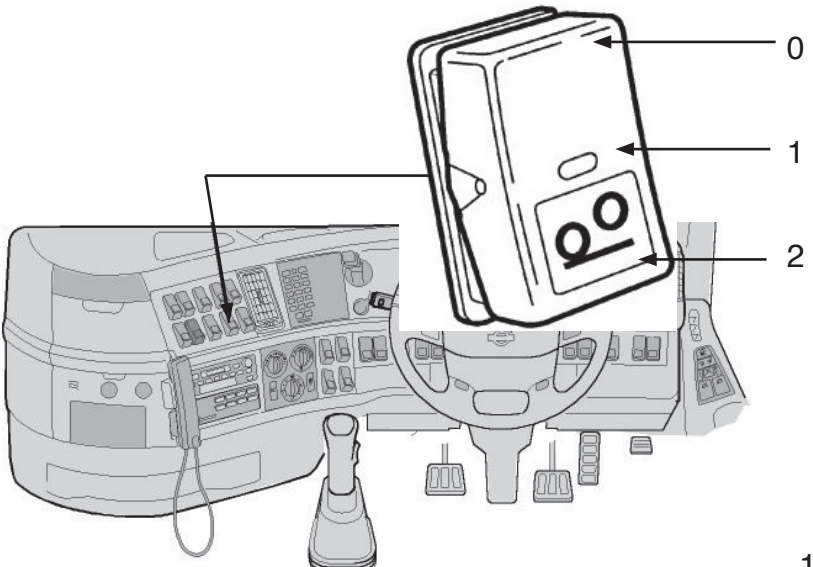
Gen. 2 overflow valves are still referred to as 52a and 52b.

As for the Gen.1 design, the two valves are identical externally, but different internally.

Opening pressure

52a - 6.7 - 7.0 bar

52b - 10.0 - 10.3 bar

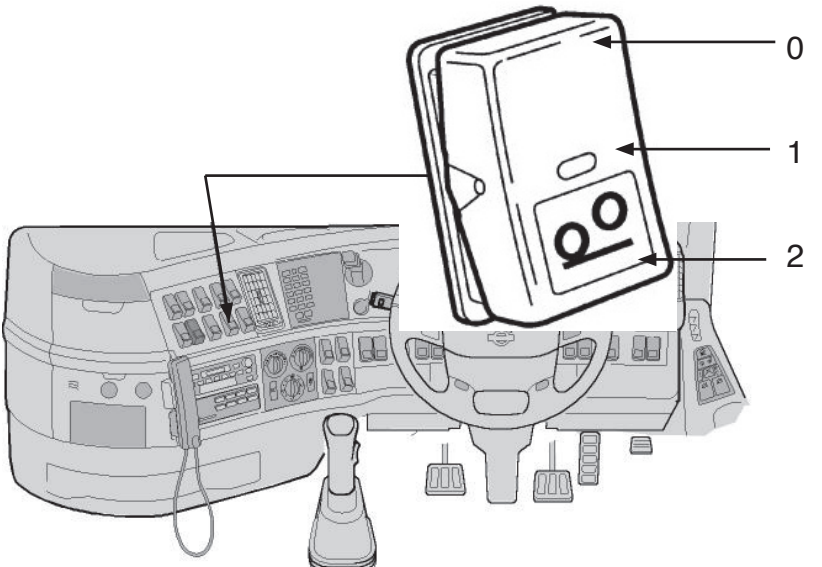

0
1
2

Bogie switch - early type

The bogie switch is used to fully raise/lower the lifting axle of a 2 axle bogie, or to alter the weight distribution between the two axles.
The switch may have 2 or 3 positions according to the suspension variant. Position 3 is normally spring return.

Switch position	Result	Light
0 - upper section pressed	Axle lifted - unladen condition only	ON
1 - centre position	Normal drive position - axle lowered - 60% load on drive axle 40% load on pusher/trailing axle	OFF
2 - lower section pressed	1st. press - optimised traction* 2nd. press - extra traction** 3rd. press - back to 60/40 split	ON FLASH OFF

*/** See following pages


0
1
2

Bogie switch - later type

The bogie switch is used to fully raise/lower the lifting axle of a 2 axle bogie, or to alter the weight distribution between the two axles.
The switch may have 2 or 3 positions according to the suspension variant. Position 3 is normally spring return.

Switch position	Result	Light
0 - upper section pressed	Axle lifted - laden max. 14950kg Drive axle load increased by 30%	< 30 kph - FLASH > 30 kph - ON
1 - centre position	Axle lowered - optimised traction*	OFF
2 - lower section pressed	1st. press - extra traction** < 30 kph	< 30 kph - FLASH > 30 kph - ON
	2nd. press - back to optimised traction	OFF

*/** See following pages

Bogie switch

***Optimised traction**

When the bogie switch is pressed to lower the lifting axle - or to select 'optimised traction' , the air pressure, in the drive axle and lift axle air bellows, is adjusted to give the best weight distribution and traction for the prevailing conditions.
The pressure is controlled by the ECU in response to air pressure signals from the air bellows pressure sensors.

****Extra traction**

When driving in certain conditions of poor road surface/ composition - e.g. slippery/rutted quarry roads etc. - it may be possible to increase traction if more weight is carried by the drive axle.
This is done by releasing more air from the lift axle air


3
1
2
STOP
CHECK
Gauges
1/7
15°C
98°C
11:45
AM
CC
4234mi
7.8mi
4
5
5

Main instrument panel

The main instrument panel has three main warning lamps designed to get the attention of the driver;

1. STOP

2. CHECK

3. Information

The information display panel (4) can be used to access a variety of additional information, including diagnostic information - e.g. fault codes.
If the truck has a lifting axle, indicator lamps (5) show the status of the axle.

	Function	1	2	3	4	5	6	7	8
1	Inhibit ride height	1x2P	2x2P	2x2P	2x2P	2x2P	2x2P	2x2P	2x2P
2	Kneeling Park brake applied		1x2P	1x3P	2x2P	1x3P	-	1x3P	2x2P
3	Kneeling One axle			1x2p	2x2P	-	-	-	2x2P
4	Alternative drive height				1x2P	2x2P	2x2P	2x2P	2x2P
5	Load height M1					1x2P	1x3P	1x3P	2x2P
6	Load height M2						1x2P	-	2x2P
7	Ferry mode							1x2P	1x3P
8	Alternative axle load distribution								1x2P
11	Bogie lift 30%	Can be selected regardless of which other functions are selected Separate 1x3 position switch.							

Additional functions

Nine additional functions can be programmed into the ECS ECU using VCADSPro.
Of the nine functions, the customer can choose one or two of functions 1 - 8 + function 11.

The table above shows permitted combinations and the required switches:

1x2P = One x 2 position switch
2x2P = Two x 2 position switch
1x3P = One by 3 position switch
- = Combination not permitted
= Function not requested if other function is requested or active

	Function	1	2	3	4	5	6	7	8
1	Inhibit ride height	1x2P	2x2P	2x2P	2x2P	2x2P	2x2P	2x2P	2x2P
2	Kneeling Park brake applied		1x2P	1x3P	2x2P	1x3P	-	1x3P	2x2P
3	Kneeling One axle			1x2P	2x2P	-	-	-	2x2P
4	Alternative drive height				1x2P	2x2P	2x2P	2x2P	2x2P
5	Load height M1					1x2P	1x3P	1x3P	2x2P
6	Load height M2						1x2P	-	2x2P
7	Ferry mode							1x2P	1x3P
8	Alternative axle load distribution								1x2P
11	Bogie lift 30%	Can be selected regardless of which other functions are selected Separate 1x3 position switch.							

Example Function 1 on its own would need One x 2 position switch.

Function 1 with function 2 would need Two x 2 position switches - etc.

Note:
- Only one of functions 2, 3, 5 and 6 can be activated at the same time.

- Functions 3 and 5, 6, 7 are not available together.

Function 1

Inhibit ride height adjustment
ECS is active, but automatic ride height adjustment is prevented. Used when automatic adjustment is not wanted - e.g. using a snow plough.

Programming

DIH* on pin X2-06 (BHA**-1) to inhibit ride height adjustment.

One x 2 position switch - (BHC**)

* DIH = Digital High Input (In simple terms - a ‘positive’).

** Parameters in the ECU which are switched on.
The ECU will then accept DIH input as a programming request.

Function 2 **Kneeling axle - park brake applied**.
When the park brake is applied the chassis is lowered, at the front and/or rear, by the amount programmed.
Can be applied when the road speed is < 30 km/h, and functions 1, 3, 5, or 6 are not active or requested.

Programming DIH on pin X2-06 (BHA-2) to kneel when park brake applied.

One x 2 position switch - (BHC)

Function 3

Kneeling one axle.
When the function switch is pressed, the chassis is lowered, at front or rear, by the amount programmed.

Can be applied when the road speed is < 30 kmh, and functions 1, 2, 5, or 6 are not active or requested.

Programming

DIH on pin X2-06 (BHA-3) to kneel at front or rear

One x 2 position switch - (BHC)

Function 4 **Alternative ride height**

An alternative ride height is programmed, and activated using the function switch irrespective of road speed. When not activated, the height reverts to the normal setting.

Note: The alternative height must be within the permitted range for the particular truck/suspension variant.
If the function switch is not pressed, the ride height will be either the normal ride height, or the height last set using the remote control.

Programming

DIH on pin X2-06 (BHA-4) to activated alternative ride height.

One x 2 position switch - (BHC)

Function 5 **Load height - M1**

Pressing the function switch changes the chassis height to that stored as M1.
Can be applied when the road speed is < 30 kmh, and functions 1, 2, 3, or 6 are not active or requested.
Note: The truck must have a remote control which allows load height M1 to be set for a full air suspension system.

Programming

Function 5 on its own - DIH on pin X2-06 (BHA-5)
Function 5 + another function - DIH on pin X2-66 (BHB)

One x 2 position switch - (BHB)
Two x 2 position switch - (BHA-5)

Function 6

Load height - M2
Pressing the function switch changes the chassis height to that stored as M2.
Can be applied when the road speed is < 30 kmh, and functions 1, 2, 3, or 6 are not active or requested.
Note: The truck must have a remote control which allows load height M2 to be set for a full air suspension system.

Programming

DIH on pin X2-06 (BHA-6) to set load height at M2.

One x 2 position switch - (BHC)

Function 7 **Ferry mode**

This is a ‘short-cut’ for ferry mode on the remote control. All air is released from all air bellows, allowing the vehicle to be chained to the ferry deck

Can be applied when the road speed is < 30 km/h.

Programming DIH on pin X2-06 (BHA-7) to lower chassis fully.

One x 2 position switch - (BHC)

Function 8 **Alternative axle load distribution**

CAUTION

The alternative load distribution must be within the permitted range for the particular truck/suspension/tyre variant.

An alternative axle load distribution figure is programmed, and activated by pressing the function switch.

The function is de-activated at road speeds > 30 km/h, and must be re-activated by pressing the function switch, or by switching the ignition off and on.

This function is not available when function 1 is active or requested.

DIH on pin X2-06 (BHA-8) to activate alternative axle load distribution.

One x 2 position switch - (BHC)

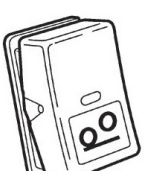
Function 11 **Bogie lift + 30%**

CAUTION

Ensure that this function is permissible for the particular truck/suspension/tyre variant.

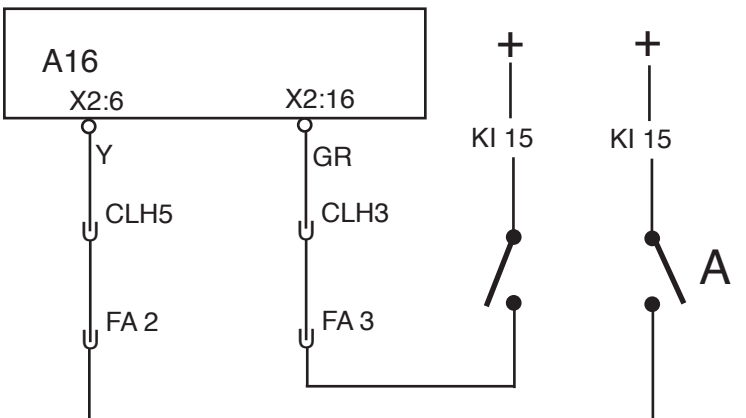
When the bogie switch is set to position 1 - trailing axle lifted - and road speed < 30 km/h, the drive axle load may increase by up to 30%.

Note: This applies only to suspension variants RALIM 115, 105 and 95.



DIH on pin X2-06 (CMR) to 'YES" to activate bogie lift + 30%.

Fit Bogie Lift switch - One x 3 position switch.


A16
X2:6
X2:16
Y
GR
CLH5
CLH3
FA 2
FA 3
+
KI 15
+
KI 15
A

Additional functions - wiring connection

The additional functions are hard wired into connector (FA), pins (2) and (3), and can be activated by either:

- a DIH signal to pin (06) plug (X2) from an additional switch.
- a DIH signal to pin (16) plug (X2) from an additional switch.

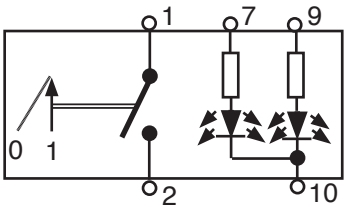
Switch permutations

Depending upon the requirements of the customer, activation be arranged as follows:

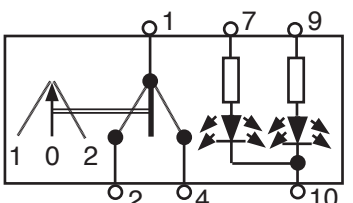
1 or 2 functions activated by one x 2 position switch, or one x 3 position switch.

2 functions activated by two x 2 position switches.

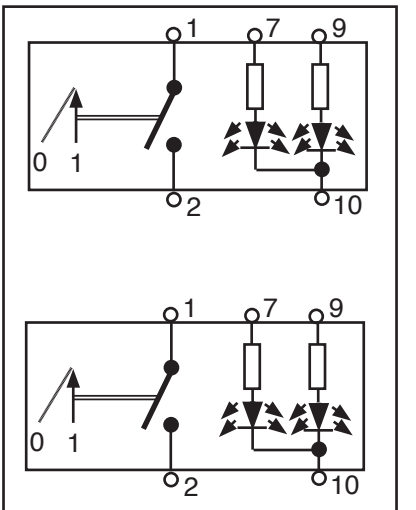
For more information, refer to IMPACT section (72).



One x 2 position



One x 3 position



Two x 2 position

Additional functions - switches, BHC

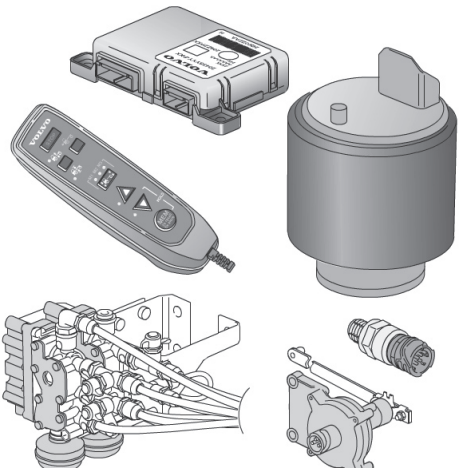
1. One x 2 position switch on X216 - active high.
2. One x 2 position switch on X206 - active high.
3. One x 3 position switch on X206 and X216 - active high.
4. Two x 2 position switch on X206 and X216 - active high.
5. No added function switch

Height sensor calibration

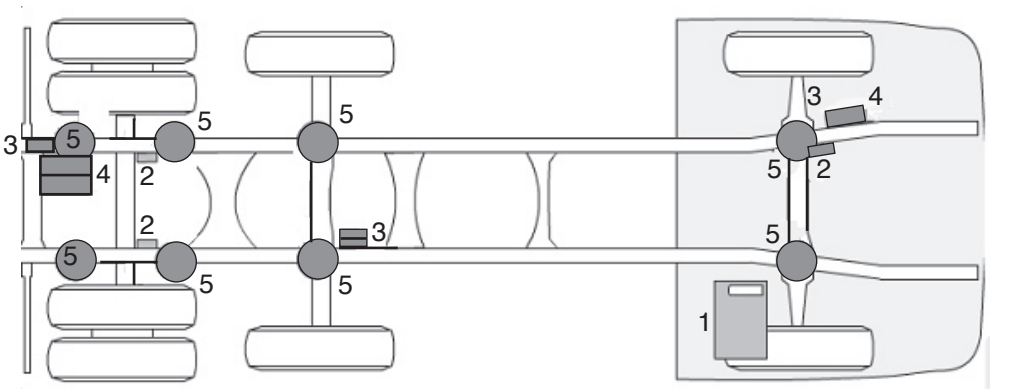
Note: Compared to Gen. 1, there is an important difference to remember when calibrating Gen. 2 height sensors:

- irrespective of ride height, a fixed calibration height of 307 mm is always used.

For more information, refer to IMPACT - Diagnostics - 722881-8, step 5.



ECS Generation 3


3
5
4
2
5
5
2
5
5
3
5
5
3
4
5
2
5
1

ECS Gen. 3 introduction

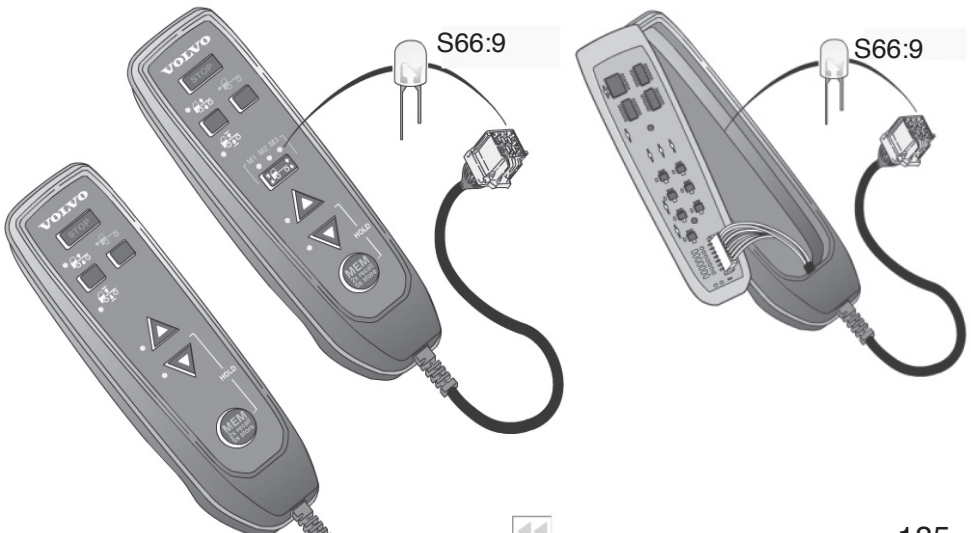
ECS generation 3 was introduced week 51 2004.
The principle of operation is the same as previous generations, but new components are used:

- ECS ECU
- height sensors
- pressure sensors
- solenoid valves

New Service Information is included in IMPACT Group 72.

ECS Gen. 3 component locations

1. ECS ECU
2. Height sensor
3. Pressure sensor
4. Solenoid valve
5. Air bellows


S66:9
S66:9
VOLVO
VOLVO
HOLD
MEM

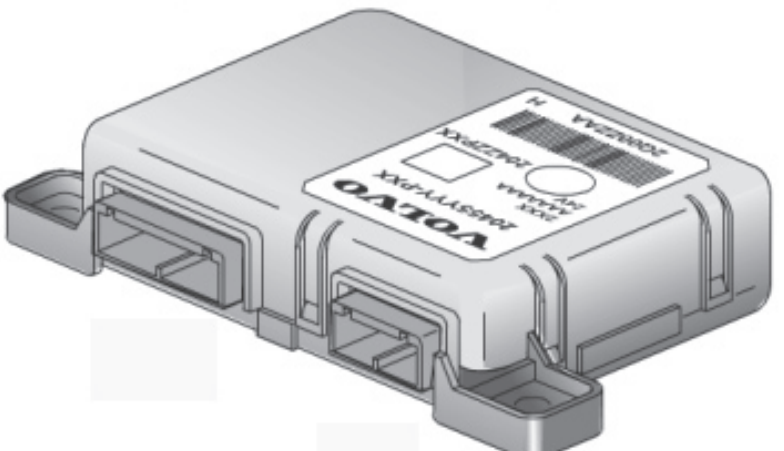
Remote control

Gen. 3 remote control contains a micro processor, and has 9 terminals.

Operation of this control is similar to that for previous controls, but the selector button ‘toggles’ through the functions, and the LED indicates which function has been selected.

A new feature is the ‘STOP’ button.
If a function is started, and then a dangerous situation develops, pressing the ‘STOP’ button immediately cancels the selected function.

The Gen. 3 control can be used with Gen.1 and Gen. 2, but needs connection of an additional wire to power the LED’s via the 5V supply to the sensors.

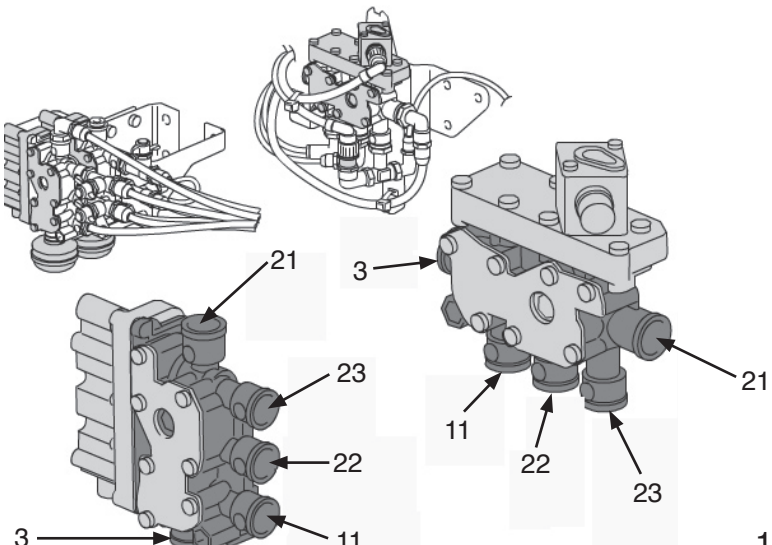

VOLVO

ECS ECU

The external appearance of Gen. 3 ECS ECU is identical to that used with Gen. 2.
Internally there is new hardware and software.

Provided that the correct adapted software and data sets are loaded, the Gen. 3 unit will work with Gen. 1 and Gen. 2 systems.
So, using the correct software and data sets, a Gen. 3 ECU can be used to replace a faulty Gen.1 or Gen. 2 ECU.

Note: The new software does not work with earlier ECU's.


21
23
22
3
11
3
21
11
22
23

Solenoid valve blocks

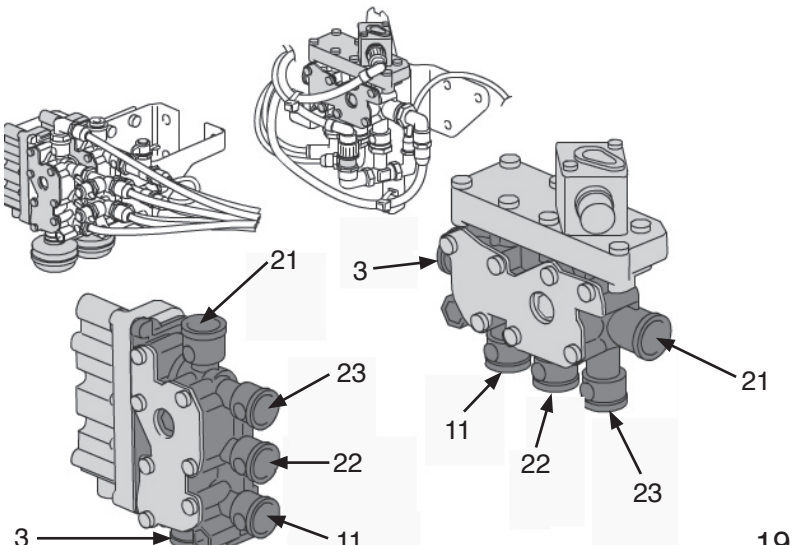
Compared to earlier valves, Gen. 3 solenoid valve blocks have different characteristics/features:

- a slightly higher air flow rate, and a slightly slower response time.

- port numbering

- electrical pin configuration on single channel valves for drive axles is different on Volvo valves and Renault valves
Note: Volvo valves can be identified by the fact that they are painted.

- valve location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3
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Valve block installation

CAUTION
The valve blocks must be installed on separate brackets. To prevent excessive heat build-up, they must not be stacked on top of each other.

Some materials in the valve blocks can soften at high temperatures. This can lead to vibration causing the valve blocks to come loose on the brackets.

VOLVO