MODULAR ABS SERIES
MODULAR 1 UPGRADE
MODULAR 1 PLUS
MODULAR 2

INSTALLATION INSTRUCTIONS

Haldex
Brake Systems

000 700 062
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COMPANY
DELIVERY ADDRESS
POST CODE
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Preceding the Modular main index sheet, this manual should contain the document registration form and an amendment record sheet. Both of these documents are intended to assist your Company and Haldex Brake Products Ltd in maintaining this manual in an up to date condition.

Please follow the instructions included on each sheet to ensure that we are able to give both yourself and your company the best product information support whenever the need may arise.

For ease of reference each section of this manual deals with the individual systems of MODULAR trailer ABS.

This manual has been designed to assist personnel in satisfactorily installing MODULAR 1 UPGRADE, MODULAR 1 PLUS and MODULAR 2 ABS on semi-trailers. The intention has been to illustrate the various areas of installation. It is expected that this manual will be in possession of the appropriate person throughout their ‘training’ and ‘experience’ and that the manual will be used as:

a) A teaching aid following supervision of a HALDEX ENGINEER.

b) A reminder of the correct procedure of MODULAR ABS installation.

For any other deviation consult Haldex Brake Products Ltd. Technical Services.

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- Use only genuine Haldex parts in repairs.
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Fig 1

MODULAR 1 UPGRADE
ECU and Modulator assembly

MODULAR 1 PLUS
ECU and Modulator assembly

MODULAR 2
ECU and Modulator assembly

The Warning lamp and
The Driver's information plate

ISO 7638 Connector
assembly

The Sensor and Exciter

INFO CENTRE
### Semi-Trailer Configurations

<table>
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<th>Semi-Trailer</th>
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<tr>
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Details viewed from above.

- **N 1** = 2 Port Modulator valve assembly (preferred)
- **N 2** = 6 Port Modulator valve assembly
- **N 3** = 3 Port Modulator valve assembly
- **L** = Axle which may be a lift axle.
### CENTRE AXLE TRAILER CONFIGURATIONS

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**Fig 3**

Details viewed from above.

- **N 1** = 2 Port Modulator valve assembly (preferred)
- **N 2** = 6 Port Modulator valve assembly
- **N 3** = 3 Port Modulator valve assembly
- **L** = Axle which may be a lift axle.
### ACTUATION RECOMMENDATIONS

![Diagram showing actuation recommendations](image)

<table>
<thead>
<tr>
<th>Suspension Type</th>
<th>Number of Axles</th>
<th>Sensed Axle</th>
<th>Actuation Size</th>
<th>Lever Length Variation</th>
<th>Comments</th>
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<td>2 &amp; 1</td>
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<td>2 &amp; 1</td>
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<td>-A</td>
<td>4S/2M</td>
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<tr>
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<td>2</td>
<td>Equal</td>
<td>0</td>
<td>2S/1M+2S/2M Preferred</td>
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<tr>
<td>Air</td>
<td>2</td>
<td>2 &amp; 1</td>
<td>Equal</td>
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<tr>
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<td>2</td>
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<tr>
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<td>2S/1M+2S/2M Alternative</td>
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<td>2 &amp; 1</td>
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<td>Balance Beam</td>
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<td>+A</td>
<td>4S/2M</td>
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<td>Rubber</td>
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<tr>
<td>Balance Beam</td>
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<td>2 &amp; 1</td>
<td>Equal</td>
<td>+A</td>
<td>4S/2M</td>
</tr>
</tbody>
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Fig 4

The input torque to a brake can be varied by changing the brake chamber size or lever length. This chart shows examples where the brake chamber size remains constant and variations in lever length control the brake input torque.

A = Variation in lever length of 25 to 30mm
B = Variation in lever length of 12 to 15mm
ISO 7638 SOCKET ASSEMBLY - 24V

Fig 5
Pin detail and identification key location

Fig 6
Clearance dimensions

Fig 7
Socket mounting dimensions
**N1** This wire is to be connected to the unfused ignition switched battery positive supply.

**N2** This wire is to be connected to the fused ignition switched battery positive supply (same point as the direction indicators).

**N3** This wire is to be connected using separate ring tongue connectors to the main battery negative pick up point.

**N4** This wire is to be connected to an unfused battery positive supply which has a continuous current rating of at least 15A. The supply will be switched by a relay internal to the control.

---

**ISO 7638 Description Colour Cable size**

<table>
<thead>
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<th>Pin No.</th>
<th>Description</th>
<th>Colour</th>
<th>Cable size</th>
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<tr>
<td>1</td>
<td>25A Unfused BAT+</td>
<td>BK/BN</td>
<td>6.0mm²</td>
</tr>
<tr>
<td>2</td>
<td>3A Ignition switched B+</td>
<td>RD</td>
<td>1.5mm²</td>
</tr>
<tr>
<td>3</td>
<td>BAT -</td>
<td>YE</td>
<td>1.5mm²</td>
</tr>
<tr>
<td>4</td>
<td>BAT -</td>
<td>W</td>
<td>6.0mm²</td>
</tr>
<tr>
<td>5</td>
<td>Lamp (Direction indicators)</td>
<td>BK</td>
<td>1.5mm²</td>
</tr>
</tbody>
</table>

**Key**

- BK = Black
- BN = Brown
- RD = Red
- YE = Yellow
- W = White
N1 This wire is to be connected to the unfused ignition switched battery positive supply.

N2 This wire is to be connected to the fused ignition switched battery positive supply (same point as the direction indicators).

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**Fig 8**

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**Key**

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**GENERAL TRUCK WIRING DIAGRAM FOR ISO 7638 USING EXISTING VEHICLE TRAILER ABS WARNING LAMP**

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<td>1.5mm²</td>
</tr>
<tr>
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<td>YE</td>
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</tr>
<tr>
<td>4</td>
<td>BAT -</td>
<td>W</td>
<td>6.0mm²</td>
</tr>
<tr>
<td>5</td>
<td>Lamp (Direction indicators)</td>
<td>BK</td>
<td>1.5mm²</td>
</tr>
</tbody>
</table>
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**Key**

- BK = Black
- BN = Brown
- RD = Red
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**N1** This wire is to be connected to the unfused ignition switched battery positive supply.

**N2** This wire is to be connected using separate ring tongue connectors to the main battery negative pick up point.

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<tr>
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<td>BAT -</td>
<td>W</td>
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</tr>
<tr>
<td>5</td>
<td>Lamp (Direction indicators)</td>
<td>BK</td>
<td>1.5mm²</td>
</tr>
</tbody>
</table>

### Key

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**MODULAR**

**AXLE INSTALLATION**

**STRIPPING OF AXLE**
See individual axle manufacturers information. Remove hub and drum assembly. Refer to individual ABS axle layout for details of machine location area 'A' on hub 'B'.

**EXCITER (Solid type)**
Available in two sizes to suit differing diameters of wheel. Establish correct exciter teeth in relation to tyre size refer to GS0006.
- **100 Tooth Exciter** - Dynamic effective rolling radius (rdyn) = 442 to 645mm
- **80 Tooth Exciter** - Dynamic effective rolling radius (rdyn) = 357 to 522mm

Heat exciter uniformly to required temperature.

Fit to hub and ensure that it is fully seated on the location area machined on the hub 'B'. Dimension 'C' to be zero to equal gap 0 to 360 degrees.
**SENSOR**

Position sensor bracket as detailed on the ABS axle layout, reference dimension ‘D’.

Tack weld bracket first ‘E’. Recheck for position and squareness and complete weld ‘F’.

With grease provided liberally coat sensor ‘I’ steel casing and bore of bracket ‘G’. Push the retaining clip ‘H’ fully home into the sensor bracket housing and insert sensor through the retaining clip pushing it firmly into place until the sensor abuts against the back face of the bracket housing ‘J’.

With a grease based corrosion inhibitor, Recommended type - Molykote Cu 7439 Plus (Dow Corning) or from the 4g sachet, Haldex part number - 042 5857 09, liberally coat sensor ‘I’ steel casing, retaining clip ‘H’ and bore of bracket/housing ‘G’.

Push the retaining clip ‘H’ fully home into the sensor bracket housing and insert sensor through the retaining clip pushing it firmly into place until the sensor abuts the back face of the bracket/housing ‘J’.
Lay out the sensor cable route. Ensure sensor cable is not under tension and not fouling brake shoe. Avoid any sharp edges and moving parts. The cable exit from the brake torque plate or dirt shield should be via a grommet 'K'.

Reassemble hub assembly. Sensor must be central over the exciter teeth. The gap between exciter 'M' and sensor 'I' must not exceed N = 0.5mm. Maximum run out 0.2mm true indicator reading.

Before fitment of HUB CAP/ COVER check sensor output.
The preferred assembly orientation should be positioned so that the ECU faces towards the rear of the semi-trailer.

**Note:**
This is particularly important on 2M systems in order that the diagnostic codes for modulators and sensor are correct.

Mount Modulator Valve/s centrally to the brake chambers.
A. Tandem axle.
B. Tri-Axle.

Additional bracket design to be as firm as possible. The mounting fixing must provide an electrical connection between ECU/Modulator bracket and vehicle chassis.

**Check earth continuity** (resistance) between ECU/Modulator bracket and vehicle chassis.

Care should be taken to provide reasonable excess to the ECU for replacement of loom or ECU.

C = 200mm Minimum.
D = 1. Assembly to be above axle centre line.
   2. Adequate space should be provided for future fitment of a exhaust silencer.
Position assembly as high as possible in the chassis, to provide as much protection to the assembly from direct spray and other road debris. Also to achieve an acceptable hose routing.

**ELECTRIC WIRING**

*Remove* from ECU and modulator protective rubber covers. *Fit* appropriate connector to ECU and modulator.

**ECU Connector**

Identify shape of ECU plug and loom connector socket.

*Ensure* contact pins and seal are kept clean and free of any contamination prior to installation.

Mate together and click into position via two clips 'E'.

*Make sure* both clips 'E' are fully engaged.
For MODULAR 1 UPGRADE

Position bail latch 'D' over connector clips 'E'. Apply force at positions '1' in order to compress the bail latch. Whilst in a compressed state apply force at position '2' and hook over the eye of the bail latch onto the connector clip. Apply force at position '3' and repeat procedure.

Position cables from loom connector socket in support arm of mounting bracket. Secure with a cable tie.
For MODULAR 1 PLUS and MODULAR2
Open mounting bracket clip 'K' by using a tool 'L'.
Position loom socket in clip 'K'
Connect socket to ECU as in Fig 24 and Fig 25.

Position bail latch 'F' over connector lugs 'G'.

Close mounting bracket clip 'K' by applying force at '1'
to compress spring lever and while in this position
apply force at '2', clamping the socket 'M'.
Cables from the socket 'M' to be secured to an appropriate fixing at point 'N' and secured by a cable tie.
Cable from the socket 'M' should remain horizontal for 100mm before being directed towards a chassis securing point.

Check earth continuity between ECU/Modulator/Bracket and vehicle chassis.
**Modulator Connector**
Identify orientation of sockets in modulator connector and push fully connector onto modulator solenoid pins.

Tighten gland nut to torque 1.5Nm (1 lbft) maximum.

**For MODULAR 2**
Identify (blue marker-BU) and (yellow marker-YE) cables on loom assembly and connect to the appropriate Modulator.

Tighten gland nut to torque 1.5Nm (1 lbft) maximum.
**Power Cables Connector**

Remove coloured protective cover 'A' from end of cable to expose crimped pins 'B'.

Position gasket 'C' or O-ring onto backface of cable gland assembly 'D'. Ensure it is flat and undistorted.

Slide the 5 pins through the cable gland nut 'E' cable gland 'D' and backshell 'G' on cable.

On receptacle (9-way housing) 'J' with your thumb and index finger squeeze the red retainer plate flaps 'H' and pull outwards 'K': The plate is then in an unlocked position.
**ISO 7638 - Fused**

Fully insert the crimp pins into the appropriate receptacle cavities. Slightly rotate pins whilst pushing fully home.

Numbers relate to positions on the red retaining plate as viewed from inserting side. Numbers marked*, ARE NOT MARKED on red retainer plate.

**ISO 7638 - Un-Fused**

Fully insert the crimp pins into the appropriate receptacle cavities. Slightly rotate pins whilst pushing fully home.

Circled colours marked on the red retaining plate relate to wire inserting positions. Viewed from inserting side.

**Marking on plate**

- **BN** = Brown
- **YE** = Yellow
- **W** = White
- **BK** = Black
- **RD** = Red
ISO 1185 (24N)
Numbers relate to positions on the red retaining plate as viewed from inserting side.

ISO 3731 (24S)
Circled colours marked on the red retaining plate relate to wire inserting positions. Viewed from inserting side.
Marking on plate:
BN = Brown
YE = Yellow
W = White
BK = Black
RD = Red
Installation Instruction Ref. 000 700 180

DIAGNOSTIC
Numbers relate to positions on the red retaining plate as viewed from inserting side.
Ensure all wires are inserted fully as indicated by pin protrusion ‘L’ (approximately 2mm). This is critical to the locking of the red retaining plate.

Squeeze the retainer plate flaps ‘H’ and push inward ‘M’: the plate is then locked and retains the pins.

If plate fails to move, push each wire forward and repeat.

Ensure O-ring ‘O’ is correctly located in groove in receptacle housing.

Apply a pull test to the each wire ‘N’. Wires must not pull out.
Hold receptacle 'J' and screw in place backshell 'G' until it stops against receptacle shoulder.

Hold receptacle 'J' and screw in place cable gland 'D'. Ensure gasket 'C', if fitted, is evenly compressed and not distorted.
Hold receptacle 'J', backshell 'G' together, hand screw in place the gland nut 'E'.

For ISO7638 Fused and Un-Fused connector

To securely tighten, hold cable gland 'D', further screw in place the gland nut 'E'.

For ISO1185, ISO3731 and Diagnostic

To securely tighten, hold cable gland 'D', further screw in place the gland nut 'E'.

1.5 - 2 Nm
(1 - 1.5 lbft)

x 2 = 6.5 - 7.5 Nm
(4.5 - 6 lbft)

x 1 = 5 - 5.5 Nm
(3.5 - 4 lbft)
**ALL Power Cables Connector**

Identify orientation of keys on 9-way and 4-way socket and keyway on plug and connect together. Tighten gland nut on socket and ensure locking tab ‘O’ is located.

Secure connection by cable ties 'P' within 50mm of each end on an appropriate mounting feature in its area 'Q'. Example: nylon pipe.

Do NOT overtighten tie wraps.
Do NOT USE tie wraps within 80mm of connector gland nut.

All cables to run UP TO connection.
**Diagnostic Connector**

Clearance and mounting dimensions. Shaded area around hole to be flat and free from raised markings or surface imperfections which may prevent flush fitting of the connector.

Mount the diagnostic connector on the outside of the main chassis member 4m cable length from ECU.

The position **MUST** be in a accessible area, after the rear axle or alternatively before the front axle but **NOT** in the direct spray of the wheels.

The connector must be mounted horizontally.

Tighten nut 'R' to a torque of 3-4Nm (2-3 lbft).

Diagnostic identification label in to be mounted where it is visible and near the diagnostic connector.

Cable to run **UP TO** connector and secured to the chassis, or appropriate cable or pipe runs, with cable ties at 400mm intervals.

**Note:**

For Installation of INFO CENTRE refer to Instructions 000 700 067 Leaflet.

Ensure that the cover is fitted and correctly 'locked' in place.

If used permanently with an Info Centre the connection may be secured as Fig 53.
**Sensor Connection**
Sensor extension cable socket must be pushed fully into sensor cable plug till they clip into place to prevent falling out with axle vibration.

Where possible use a clip and bracket to secure sensor cable connection.

Alternatively: Sensor cable connection to be positioned on axle or between axle 'U' bolts and supported with cable ties within 50mm of each end.
Sensor cable route should follow the centre line or outer radius of pipe or hose. Tie wraps not to be overtightened because on brake application rubber hose expands, i.e. tie could damage the hose and sensor cable.

Do NOT run sensor leads in spiral wrapping on hoses.

Power leads should be secured down the chassis rail on piping and should be secured not less than 400mm intervals.

Note: All cables should run 'UP TO' loom connector and ECU.

**COLAS Connection**
Cable should be secured down the chassis rail on piping and should be secured not less than 400mm intervals.

Note: All cables should run 'UP TO' connector.
ANTI-VIBRATION SUPPORT
Excess cable must not be allowed to hang free, but must be attached to the chassis to prevent damage due to vibration and abrasion.

EXCESS CABLE
Cable lengths LESS than 1m to be coiled intro loops of 100mm minimum and 150mm maximum diameter.

Excess length which will not form a complete loop may be left to hang in partial loops having a cable bend radius of 50mm minimum.

Cable lengths GREATER than 1m to be coiled and then flattened in the centre 'B' to produce a 'dog bone' shape.

The resulting loops at the end must have a minimum bend radius of 50mm. Cable ties are to be used to fix the cable in the flattened loop shape.

Excess coiled up cable of sensor to be separated from modulator solenoid cabela.
**TERMINATION OF CABLES**

Un-used or excess cable can be shortened in length but must be terminated in the form of a sealed joint.

Permissable cables to modify are:

1. COLAS (Reset to ride) cable
2. ISO1185 (24N) Power cable

**Cable preparation:**

1. COLAS - 2 core cable. Cut one wire 15mm difference to the other wire. This will prevent a short circuit occurring.

2. ISO1185 (24N) - 3 core cable. Gain access to the cable by dismateling the 4-way connector. Cut back the individual wires in a staggered manner.

**DO NOT** cut wires the same length or cut flush with the outer insulation, so that it is possible for the individual wires to join and cause a short circuit fault.
Cut heat shrink sleeve (Haldex 75610245) to a minimum length of 75mm.

Insert heat shrink sleeve onto cable so that the total length of the heat shrink covers half the length of the cable.

Apply heat with a suitable hot air gun, such as Hellerman No. GHL 1550.

Make sure the heat shrink sleeve sealant melts and is visible on the cable. A watertight joint is formed when the sealant solidifies on cooling.
While shrink sleeve is still warm, gently squeeze the end of the sleeve.

Make sure a amount of sealant is visible from the end of the sleeve. A watertight joint is formed when the sealant solidifies on cooling.

DO NOT over squeeze and create air gaps.

Before fully cooled, fold back sleeve on itself and secure with a cable tie.
GENERAL CHASSIS COMPONENTS

ISO 7638 Connector
Should be positioned / grouped with other electrical connections.

When installing ISO 7638 it is important that sufficient extra length of cable is allowed to expose the socket assembly for replacement in service.

It will be necessary to pull the ISO 7638 socket clear or the trailer headboard to undo the gland nut.

Warning Lamp
When wiring of warning lamp the cable outer insulation must enter the rubber boot of the lamp.

Junction Box
Should be mounted on a flat surface.
Mounting holes to be drilled 6.25mm diameter to avoid stress at the box from in correct location.
Ensure cable runs "UP" to the junction box.

Ensure outer insulation of the cable enters inside junction box.
This must be positioned where it can be seen from the driver's rear view mirror.

The warning lamp and wiring should be mounted above the fifth wheel plate.

It must not protrude beyond the vehicle width.

**Instruction Label**
Should be mounted adjacent to the green warning lamp.

**POSITION OF ADDITIONAL VALVES**
Ideal position of RELAY EMERGENCY VALVE

**PIPING**
Avoid elbows as much as possible.
If essential, use swept type elbow.

Inside diameter of fitting should be or the same as the pipe diameter it is serving.

On metric (parallel thread) pipe fitting a backing washer and 'O' ring should be used. The use of tape and/or sealing liquid is not necessary.
FINAL PRODUCTION TEST PROCEDURE FOR 24V TRAILER INSTALLATIONS

Reference: GS 0105 (Issue 5) - Section 2

Scope

These tests verify that the wiring to the ABS electronic control unit (ECU) and piping to the ABS modulator has been satisfactory completed.

Equipment Required

(Item 4 below is only required if the installation to be tested is not fitted with an Info Centre)

1. A supply switch box with a 24 volt supply (see Figure 84). A smooth d.c. supply must be used. An a.c. supply will damage the ECU while a d.c. supply whose voltage varies by more than 4 volts, from the nominal 24V, will degrade system performance.
2. A trolley jack and wheel chocks.
3. Workshop compressed air supply (regulated to a maximum of 8 bar, minimum of 6 bar).
4. A Diagnostic Display Unit (DDU) (Haldex part No. 905 027 001) and an ECU to DDU 2 metre cable assembly (Haldex part No. 003 8467 09).

Main Procedure

1. Lower any raised lift axles.
2. Connect and switch on the workshop compressed air supply to the trailer red and yellow lines.
3. Record the information requested below concerning the installation to be tested. This information may be obtained either from the installation drawing or by direct inspection of the trailer (preferred method).
   - **For all Modular installations.** The location of each of the wheels to which a sensor is fitted.
   - **For Modular 1 Plus and Modular 2 installations only.** Whether the installation includes suspension control.
   - **For Modular 2 installations only.** The physical position and connection to the brake chambers of each of the ABS modulators (BLUE and YELLOW) on the trailer, so that in later testing the order in which they exhaust air can be identified.
4. Set all of the switches on the supply switch box to OFF and check that the ammeter link has been fitted.
5. If necessary locate the DDU output socket on the trailer and connect this socket to the DDU using the 2m cable assembly.
6. If the trailer is not fitted with or the ECU is not powered by an ISO1185 (24N) connector go to item 9.
ISO1185 (24N) connector test

a) Plug the ISO1185 (24N) connector into the trailer.

b) Set the ISO1185 (24N) switch on the supply switch box to ON.

c) Carry out the Modular Configuration test described at the end of this procedure.

d) Set the supply switch box circuit breaker switch to ON. The following will occur sequentially,

i) The trailer mounted warning lamp will illuminate.

ii) On Modular 2 installations, a single short burst of air will be exhausted from each of the ABS modulators in the sequence BLUE, YELLOW.

or

On Modular 1 Upgrade or Plus installations, a single short burst of air will be exhausted from the ABS modulator.

iii) The trailer mounted warning light will switch off for between 0.5 and 1 second and then come on again permanently.

e) If necessary set the circuit breaker switch to OFF and repeat d) above to confirm valve, lamp and DDU sequences.

ISO3731 (24S) connector test

a) Set the circuit breaker switch and all other switches on the switch box to OFF and unplug the ISO1185 (24N) connector. Plug in the ISO3731 (24S) connector.

b) Set the warning light switch on the supply switch box to ON. Set the circuit breaker switch on the supply switch box to ON. The lamp on the switch box will come on permanently (wait for at least 2 seconds to check that lamp does not flash). Set the circuit breaker switch on the supply switch box to OFF. Note that the trailer mounted warning lamp will remain off throughout this ISO3731 test.

c) Set the ISO3731 B+P switch on the supply switch box to ON. If the ISO1185 (24N) connector test (point 7) was not required, carry out the Modular Configuration test as described at the end of this procedure.

d) Set the supply switch box circuit breaker switch to ON. The following will occur sequentially,

NOTE: If the trailers wired for 3 power option as drawing 911 304 001 the trailer warning light will also come on during this test.

i) The supply switch box warning light will illuminate.
ii) On Modular 2 installations, a single short burst of air will be exhausted from each of the ABS modulators in the sequence BLUE, YELLOW.

or On Modular 1 Upgrade or Plus installations, a single short burst of air will be exhausted from the ABS modulator.

iii) The supply switch box warning light will switch off for between 0.5 and 1 second and then come on again permanently.

10 If the trailer is not fitted with an ISO 7638 connector go to item 12.

11 ISO7638 connector test

a) Set the circuit breaker switch and all other switches on the supply switch box to OFF and unplug the ISO3731 (24S) and/or the ISO1185 (24N) connector. Plug in the ISO7638 connector. Note that the trailer mounted warning lamp will remain off throughout this ISO7638 test.

b) Set the warning light switch on the supply switch box to ON. Set the circuit breaker switch on the supply switch box to ON. The lamp on the switch box will come on permanently (wait for at least 2 seconds to check lamp does not flash). Set the circuit breaker switch on the supply box to OFF.

c) Set the ISO7638 B+P switch on the supply switch box to ON. If the ISO1185 (24N) and the ISO3731 (24S) connector tests (point 7 and 9) were not required, carry out the Modular Configuration test as described at the end of this procedure.

d) Set the supply switch box circuit breaker switch to ON. The following will occur sequentially,

i) The supply switch box warning light will illuminate.

ii) On Modular 2 installations, a single short burst of air will be exhausted from each of the ABS modulators in the sequence BLUE, YELLOW.

or Modular 1 Upgrade or Plus installations, a single short burst air will be exhausted from the ABS modulator.

iii) The supply switch box warning light will switch off for between 0.5 and 1 second and then come on again permanently.

e) If necessary set the circuit breaker switch to OFF and repeat d) above to confirm valve, lamp and DDU sequences.
12 Reconnect the ISO1185 B+I/ISO3731 B+P/ISO7638 B+P plugs to the trailer. (if fitted).

Ensure that the ISO1185 B+I/ISO3731 B+P/ISO7638 B+P and warning light switches are ON.

Set the supply switch box circuit breaker switch to ON.

The following will occur sequentially,

i) The switch box and trailer mounted warning lamp will illuminate.

ii) On Modular 2 installations, a **single** short burst of air will be exhausted from each of the ABS modulators in the sequence BLUE, YELLOW.

or On Modular 1 Upgrade or Plus installations, a **single** short burst of air will be exhausted from the ABS modulator.

iii) The switch box and trailer mounted warning light will switch off for between 0.5 and 1 second and then come on again permanently.

13 **Sensor Test**

The following is carried out with the ECU powered up.

For each of the two wheels to which a wheel speed sensor is fitted

a) Jack up the wheel and chock remaining wheels.

b) Disconnect the workshop compressed air supply to the trailer yellow line.

c) Spin the wheel at approximately one revolution every two seconds.

d) The bar on the DDU corresponding to the wheel being spun will be displayed (see Figure 83).

e) Reconnect the workshop compressed air supply to the trailer yellow line.

f) Lower jacked up wheel.

14 **No stored diagnostic codes check**

a) Press (and keep depressed) button on the top face of the DDU.

b) The DDU will display two horizontal lines for several seconds and then if no diagnostic codes are stored 00. Release switch. If any code other than 00 was displayed carry out the procedure for clearing diagnostic fault codes described after the Configuration test.

15 Switch off all of the supply switch box switches and then disconnect the switch box from the trailer.

16 Disconnect the workshop compressed air supply from the trailer.

Disconnect the DDU cable from the trailer mounted connector and ensure that the dust cover for the connector is refitted.

**END OF TEST PROCEDURE**
CONFIGURATION TEST

1. Set the operating switch to ON and observe the DDU. The DDU will display 88 then a code in the range C0 - C2 for approximately 2 seconds followed by 07. If the installation includes optional retarder and/or suspension control an additional A code or codes will appear between the C code and 07.

   The group C code displayed is dependent on the number of modulators and sensors fitted to the trailer (see main procedure item 3 - page 34).
   - C0 Modular 1 Upgrade and Modular 1 Plus
   - C1 Modular 2 fitted with two wheel speed sensors
   - C2 Modular 2 fitted with four wheel speed sensors

   The A codes for the optional additional control features are given below.
   - A1 Manual raise/lower suspension control valve
   - A2 Retarder control

2. Set the circuit breaker switch to OFF.

3. Connect the workshop compressed air supply to both the Red and Yellow lines. If there is any audible loss from the system repair the fault before continuing.

RETURN TO MAIN PROCEDURE AT ITEM 7d), 9d) OR 11d) - page 35 and 36.
MODULAR

MODULAR PRODUCT FAMILIES DIAGNOSTIC CODE CLEARANCE PROCEDURE

1. Press (and keep depressed) the button on the top face of the DDU.
2. The DDU will display two horizontal bars for several seconds and then a diagnostic code. Release switch.
3. Repeat items 1 and 2 until the code displayed is CA. Press the button again while DDU is still displaying CA (if it has already reverted to another code start procedure again).
4. The DDU will rapidly scan through its complete numeric range and then display 00. Release switch.
5. Press (and keep depressed) the button switch on the top face of the DDU.
6. The DDU will display two horizontal bars for several seconds and then 00. Release switch. If any other code is displayed repeat this whole procedure.

RETURN TO ITEM 13 OF THE MODULAR TEST PROCEDURE

Note: This procedures will not clear a 1 or 2 series diagnostic code (11, 14, 22, 26 etc.) until the trailer has been towed (or some other method used to rotate all sensed wheels simultaneously) at a speed sufficient to cause the warning lamp to switch off.

Figure 83 - Sensor location chart (Alternatively Refer to Page 3 and 4)
**Figure 84 - Circuit diagram of supply switch test box**

CIRCUIT BREAKER
KLOCKNER MOELLER FAZL6-1
or R.S. 335-924

WARNING LAMP SWITCH
WARNING LAMP 24V 2.8W

PIN 2
PIN 6
PIN 1
PIN 5
PIN 1
PIN 2
PIN 3
PIN 4
PIN 4
PIN 1
ISO 3731 (24S) CONNECTOR
ISO 7638 (24N) CONNECTOR
ISO 7638 ABS CONNECTOR

NOTE: AMMETER OR LINK MUST BE CONNECTED AT ALL TIMES

ISO 7638 SWITCH (B+P)
ISO 1185 SWITCH (B+I)

AMMETER
LINK

ISO 3731 SWITCH (B+P)
ISO 1185 (24N) CONNECTOR

B+
+ 20-32 VOLTS
B-
-

**Figure 85 - Mains power supply circuit**

3A FUSE

110V or 240V

200VA 20V Sec

25A BRIDGE RECTIFIER

Connect A to C and B to D for 110V operation.
Connect B to C 240V operation.
**ABS TEST PROCEDURE - SUMMARY**

Apply foot brake and Switch on ignition:

**STEP 1**
Watch RED and GREEN WARNING LAMP.

**STEP 2**
Listen for order of BLOW DOWN.

**STEP 3**
Refer to DIAGNOSTIC DISPLAY UNIT or INFO Centre CODE,
Release foot brake SPIN EACH SENSED WHEEL IN TURN and refer to:

- DIAGNOSTIC DISPLAY UNIT INDICATION
- INFO Centre INDICATION.

CHECK MEMORY CODES OF THE ECU ARE CLEAR. Refer to SERVICE MANUAL.

Drawing references:

- Semi Trailer MODULAR 1 UPGRADE - 2S/1M System (Fig. 86)
- Semi Trailer MODULAR 1 PLUS - 2S/1M System (Fig. 86)
- Semi Trailer MODULAR 2 - 2S/2M System (Fig. 87)
- Semi Trailer MODULAR 2 - 4S/2M System (Fig. 88)
Fig 86

2.5 SEC
1 SEC

1A M 1B

STEP 1

DDU Code

0.7

STEP 3

Key

Modulator
Blowdown

O.K.

NOT O.K.

Diagnostic Display Unit

M

STEP 2

1x

2x

0x

MODULAR

MODULAR 1 Upgrade and MODULAR 1 PLUS - 2S/1M
**Fig 87**

**STEP 1**

- 2.5 SEC
- 1 SEC
- 
- 
- 
- 
- 

**STEP 2**

- M → M
- 
- 
- 
- 
- 

**STEP 3**

- DDU Code: 0.7
- 
- 
- 
- 
- 

**Key**

- Modulator
- Blowdown
- Blue Modulator
- Yellow Modulator
- O.K.
- NOT O.K.
MODULAR

MODULAR 2 - 4S/2M

STEP 1

2.5 SEC

1 SEC

STEP 2

M

M

STEP 3

DDU Code

0.7

Key

- Modulator Blowdown
- Blue Modulator
- Yellow Modulator

O.K.

NOT O.K.

Fig 88
MODULAR

DIAGNOSTIC CODES - DDU

If a diagnostic code not listed below is displayed check for intermittent sensor and wiring faults. Refer to Service Manual for detailed diagnostic testing procedures.

BLANK DISPLAY
No supply on ignition switched line.

*Possible causes:*
- Fuse blown.
- DDU or cable fault.
- Open circuit B -

SENSOR BAR
Bar displayed = Sensor output O.K.
Bar not displayed = Sensor output too low

00
System is O.K. vehicle is moving
01
1A Sensor/wiring open or short circuit
02
1B Sensor/wiring open or short circuit
03
2A Sensor/wiring open or short circuit
04
2B Sensor/wiring open or short circuit
05
3A Sensor/wiring open or short circuit
06
3B Sensor/wiring open or short circuit
07
System is O.K. vehicle is stationary
08
Retarder / Wiring open circuit
09
Retarder / Wiring short circuit
OC
Reset to ride / Wiring open circuit
OA
Reset to ride / Wiring short circuit
OE
Warning lamp circuit fault

LOW SENSOR OUTPUT GROUP

11
1A Sensor system fault
12
1B Sensor system fault
13
2A Sensor system fault
14
2B Sensor system fault
15
3A Sensor system fault
16
3B Sensor system fault

*Possible causes:*
- Sensor worn, maladjusted sensor, wiring open or short circuit.
- Incorrect exciter type.

20

*Possible causes:*
- Exciter tooth count different each side of axle.

INTERMITTENT LOW SENSOR OUTPUT GROUP

21
1A Sensor system fault
22
1B Sensor system fault
23
2A Sensor system fault
24
2B Sensor system fault
25
3A Sensor system fault
26
3B Sensor system fault

*Possible causes:*
- Loose sensor, connection, bracket or exciter. Damaged exciter.
- Maladjusted sensor or worn sensor cable insulation.
Lamp signalled by external device

**ONE WHEEL WITH SLOW RECOVERY GROUP**

Sensor wiring crossed across an axle
Slow recovery of one wheel of red channel
Slow recovery of one wheel of blue channel
Slow recovery of one wheel of yellow channel

*Possible causes:*
- Slow brake release, foundation brake mechanical faults, dry bearings, broken spring, restricted piping
- Check for kinks and blockages etc.
- Incorrect piping, Wiring
- Modulator fault

**OPEN CIRCUIT MODULATOR SOLENOID OR SOLENOID WIRING GROUP**

Hold solenoid circuit fault, red channel
Hold solenoid circuit fault, blue channel
Hold solenoid circuit fault, yellow channel
Dump solenoid circuit fault, red channel
Dump solenoid circuit fault, blue channel
Dump solenoid circuit fault, yellow channel

**SHORT CIRCUIT ACROSS MODULATOR SOLENOID OR SOLENOID WIRING GROUP**

Hold solenoid circuit fault, red channel
Hold solenoid circuit fault, blue channel
Hold solenoid circuit fault, yellow channel
Dump solenoid circuit fault, red channel
Dump solenoid circuit fault, blue channel
Dump solenoid circuit fault, yellow channel

**MODULATOR SOLENOID WIRING OR SOLENOID SHORT TO B+ GROUP**

Poor insulation in the modulator solenoid or wiring fault
Hold solenoid circuit fault, red channel
Hold solenoid circuit fault, blue channel
Hold solenoid circuit fault, yellow channel
Dump solenoid circuit fault, red channel
Dump solenoid circuit fault, blue channel
Dump solenoid circuit fault, yellow channel

**SUPPLY VOLTAGE GROUP**

Supply voltage at ECU less than 18v when a solenoid is energised
Faulty supply from ISO 7638 Pin 1 or fuse blown
Supply voltage at the ECU greater than 32v
Internal ECU fault
CODE DISPLAYED

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>Internal ECU fault</td>
</tr>
</tbody>
</table>

SYSTEM FUNCTION GROUP

- A1: Reset to ride height (COLAS)
- A2: Retarder

CONFIGURATION CODES

Figures in brackets indicate sensing is disabled when the axle is lifted.

<table>
<thead>
<tr>
<th>Function</th>
<th>Axle Lifted</th>
<th>Sensors Used</th>
<th>Modulators Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>C0</td>
<td>2S/1M</td>
<td>1A, 1B</td>
<td>Red</td>
</tr>
<tr>
<td>C1</td>
<td>2S/2M</td>
<td>2A, 2B</td>
<td>Blue, Yellow</td>
</tr>
<tr>
<td>C2</td>
<td>4S/2M</td>
<td>2A, 2B, 3A, 3B</td>
<td>Blue, Yellow</td>
</tr>
<tr>
<td>C3</td>
<td>4S/2M</td>
<td>2A, 2B, (3A), (3B)</td>
<td>Blue, Yellow</td>
</tr>
</tbody>
</table>

SUNDARY ADDITIONAL CODES

- CA: Erase stored fault
- CC: Clear Configuration
- CF: Sensors and Solenoid not connected
- LO: Open circuit wiring to the DDU connector either between ECU and connector or in the DDU fly lead.

Note: If a code is displayed and after following recommended procedure, as detailed in the Service Manual, no fault is found, the ABS ECU should be replaced.
## MULTIMETER READINGS

<table>
<thead>
<tr>
<th>CHECKING POSITION</th>
<th>MEASURE BETWEEN</th>
<th>CORRECT VALUE</th>
<th>REMARKS</th>
<th>Fig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor output</td>
<td>A B</td>
<td>0.2V AC Min.</td>
<td>Sensor 1A, 1B, 2A, 2B or 3A,3B Sensor disconnected from ECU. Wheel rotated at 1 rev/2 sec.</td>
<td>89</td>
</tr>
<tr>
<td>Sensor resistance</td>
<td>A B</td>
<td>&gt;1.0 &lt;2.4 kohm</td>
<td>Sensor 1A, 1B, 2A, 2B or 3A,3B Sensor disconnected from ECU.</td>
<td>89</td>
</tr>
<tr>
<td>Modulator Solenoid resistance</td>
<td>B - DS</td>
<td>&gt;12 &lt;20 ohm</td>
<td>Modulator cable disconnected from solenoid.</td>
<td>90</td>
</tr>
<tr>
<td>Modulator Solenoid resistance</td>
<td>B - HS</td>
<td>&gt;12 &lt;20 ohm</td>
<td>Modulator cable disconnected from solenoid.</td>
<td>90</td>
</tr>
<tr>
<td>Supply from ISO 7638</td>
<td>1 4</td>
<td>&gt;18 &lt;32V</td>
<td>Ignition on. Approx battery voltage</td>
<td>91</td>
</tr>
<tr>
<td>Supply from ISO 1185 (24N)</td>
<td>1 4</td>
<td>&gt;18 &lt;32V</td>
<td>Brake applied, Ignition on Approx battery voltage</td>
<td>91</td>
</tr>
<tr>
<td>Earth continuity</td>
<td>ECU/Modulator Bracket and Vehicle chassis</td>
<td>&lt;5 ohms</td>
<td></td>
<td>92_1</td>
</tr>
<tr>
<td>COLAS Solenoid resistance</td>
<td>+ -</td>
<td>&gt;79 &lt;96 ohms</td>
<td>Cable disconnected</td>
<td>92</td>
</tr>
</tbody>
</table>

---

### Diagrams

- **Sensor Connector** - Fig 89
- **Solenoid Connector** - Fig 90
- **Diagnostic Connector** - Fig 91
- **COLAS Connector** - Fig 92
- **COLAS Connector** - Fig 92_1
SECTION 2

MODULAR 1 UPGRADE
2S/1M ABS
Item | Description
--- | ---
1 |ABS Label
2 |Green Warning lamp
   Bulb (24v-5w Double pole)
3 |2 core cable
4 |Junction box
5 |ISO 7638 Socket assembly - PVC
5 |Alternative ISO 3731 (24S) Cable assembly - PVC
6 |ISO 1185 (24N) Cable assembly - PVC
7 |Sensor assembly
8 |ECU and Modulators assembly
9 |Loom assembly
10 |Diagnostic Connector
11 |Diagnostic Label
12 |Diagnostic Display Unit
13 |INFO CENTRE
14 |PC Interface (End of line Test)
MODULAR 1 UPGRADE INTEGRATED ASSEMBLY

Mass of Assembly = 2Kgs
### PIPE RECOMMENDATIONS

Applicable to MODULAR 1 UPGRADE

**Fig 95**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material</th>
<th>Size</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency pipe</td>
<td>Nylon</td>
<td>8 X 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 X 1 / 1.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 X 1.5</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>8 X 1 Pref</td>
<td>2a To be 1/3 of total trailer length</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>12 x 1.5 Pref</td>
<td>2b to be one size greater than 2a and 2c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>2c</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>8 x 1 Pref</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>Reservoir pipe</td>
<td>Nylon</td>
<td>12 x 1.5 Pref</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 x 1.5 Alt</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>Reservoir pipe</td>
<td>Nylon</td>
<td>15 x 1.5</td>
<td>Short as possible 1.0m Max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18 x 2</td>
<td>Short as possible 4.0m Max.</td>
</tr>
<tr>
<td>4a</td>
<td>Brake delivery</td>
<td>Nylon</td>
<td>12 x 1.5</td>
<td>4a and 4c to be similar in length,</td>
</tr>
<tr>
<td>4b</td>
<td>or</td>
<td>or</td>
<td></td>
<td>4b to be as short as possible.</td>
</tr>
<tr>
<td>4c</td>
<td>pipe</td>
<td>Rubber</td>
<td>11.0 I.D.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>hose I.D.</td>
<td>13.0</td>
<td></td>
</tr>
</tbody>
</table>

Pref = Preferred  
Alt = Alternative  
All pipe and rubber hose to comply to recognised international standards. 
Nylon pipe to DIN 73378, Rubber hose to SAE 1402. The above pipe sizes are defined as guide lines only. 
Actual sizes need to be optimised for a given trailer to meet system response time requirements.
PIPE LAYOUT

MODULAR UPGRADE
3 axle Semi-Trailer - 2 line air brake system - S/D Brake Chambers

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Coupling</td>
</tr>
<tr>
<td>2</td>
<td>Service Coupling</td>
</tr>
<tr>
<td>3</td>
<td>Pipe Filter</td>
</tr>
<tr>
<td>4</td>
<td>Relay Emergency Valve</td>
</tr>
<tr>
<td>5</td>
<td>Air Reservoir (30L/Axle - Single Diaphragm B.C.)</td>
</tr>
<tr>
<td>6</td>
<td>Drain valve</td>
</tr>
<tr>
<td>7</td>
<td>Load Sensing valve - mechanical</td>
</tr>
<tr>
<td>8</td>
<td>Test point</td>
</tr>
<tr>
<td>9</td>
<td>ABS Modulator</td>
</tr>
<tr>
<td>10</td>
<td>Brake Chamber</td>
</tr>
</tbody>
</table>
MODULAR UPGRADE

3 axle Semi-Trailer - 2 line air brake system - Spring Brake Chambers - (Air Suspension)

**Item** | **Description**
---|---
1 | Emergency Coupling
2 | Service Coupling
3 | Pipe Filter
4 | Shunt valve
5 | Relay Emergency Valve
6 | Air Reservoir (40L/Axle - Spring Brake Chamber)
7 | Drain valve
8 | Load Sensing valve - pneumatic
9 | Test point
10 | ABS Modulator
11 | Spring Brake Chamber
12 | Park Valve
13 | Double Check Valve
14 | Quick Release Valve
**MODULAR**

**PIPING LAYOUT**

MODULAR 1 UPGRADE

3 axle Semi-Trailer - 2 line air brake system - Spring Brake Chambers - (Air Suspension)

---

**Item** | **Description**
---|---
1 | Emergency Coupling
2 | Service Coupling
3 | Pipe Filter
4 | Combined Park and Shunt valve
5 | Relay Emergency Valve
6 | Air Reservoir (40L/Axle - Spring Brake Chamber)
7 | Drain valve
8 | Load Sensing valve - pneumatic
9 | Test point
10 | ABS Modulator
11 | Spring Brake Chamber
12 | Double Check Valve
13 | Quick Release Valve

---

Fig 98

---

70006253_3 Page 55
Maximum length of cable between ISO 1185 (24N) connector (or alternative wiring for ISO 3731 (24S)) and front junction box to be 1m.
MODULAR INSTALLATION INSTRUCTIONS

WIRING DIAGRAM - MODULAR 1 UPGRADE 2S/1M with ISO 7638 (Fused) and ISO 1185 (24N) Power Supply

Key

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>PU</td>
<td>Purple</td>
</tr>
<tr>
<td>RD</td>
<td>Red</td>
</tr>
<tr>
<td>YE</td>
<td>Yellow</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>X</td>
<td>Fuse position (Pin 1 Assy.)</td>
</tr>
<tr>
<td>Y</td>
<td>1m MAX.</td>
</tr>
</tbody>
</table>

Fig 100
MODULAR INSTALLATION INSTRUCTIONS

WIRING DIAGRAM - MODULAR 1 UPGRADE 2S/1M with ISO 7638 (UnFused) and ISO 1185 (24N) Power Supply

**Key**

<table>
<thead>
<tr>
<th>Letter</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>White</td>
</tr>
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<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>PU</td>
<td>Purple</td>
</tr>
<tr>
<td>RD</td>
<td>Red</td>
</tr>
<tr>
<td>YE</td>
<td>Yellow</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>Y</td>
<td>1m MAX.</td>
</tr>
</tbody>
</table>

**Wiring Diagram**

- ISO 7638 ABS
- ISO 1185 (24N)

**Fig 101**
**MODULAR**

**WIRING DIAGRAM**
**MODULAR 1 UPGRADE 2S/1M**
ISO3731 (24S) and ISO 1185 (24N)

**Key**
- W - White
- BK - Black
- BN - Brown
- RD - Red
- YE - Yellow
- PU - Purple
- BU - Blue
- Y - 1m MAX.

**ISO 3731 (24S)**
- W/BK
- BN/BK
- Y/E
- W
- RD

**ISO 1185 (24N)**
- W
- RD
- BK
- YE
- BK
- Y

**Diagram Details**
- **ECU**
- **Front Junction Box**
- **INFO CENTRE**
- **D.D.U.**
- **PC. INTERFACE**
- **ABS Modulator Wiring side View**
- **Right Sensor**
- **Left Sensor**
- **HOLD**
- **DUMP**
- **COMMON**
- **B+ IGN**
- **B+P**
- **B- CAB LAMP**
- **B- TRAILER LAMP**
- **B+P**
- **B- IGN**
- **B+P**
- **B- IGN**
- **B+P**

**Fig 102**
SECTION 3

MODULAR 1 PLUS
2S/1M  ABS
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABS Label</td>
</tr>
<tr>
<td>2</td>
<td>Green Warning lamp Bulb (24v-5w Double pole)</td>
</tr>
<tr>
<td>3</td>
<td>2 core cable</td>
</tr>
<tr>
<td>4</td>
<td>Junction box</td>
</tr>
<tr>
<td>5</td>
<td>ISO 7638 Socket assembly - PVC</td>
</tr>
<tr>
<td>5</td>
<td>Alternative ISO 3731 (24S) Cable assembly - PVC</td>
</tr>
<tr>
<td>6</td>
<td>ISO 1185 (24N) Cable assembly - PVC</td>
</tr>
<tr>
<td>7</td>
<td>Sensor assembly</td>
</tr>
<tr>
<td>8</td>
<td>ECU and Modulators assembly</td>
</tr>
<tr>
<td>9</td>
<td>Loom assembly</td>
</tr>
<tr>
<td>10</td>
<td>Diagnostic Connector</td>
</tr>
<tr>
<td>11</td>
<td>Diagnostic Label</td>
</tr>
<tr>
<td>12</td>
<td>Suspension Controller</td>
</tr>
<tr>
<td>13</td>
<td>Diagnostic Display Unit</td>
</tr>
<tr>
<td>14</td>
<td>INFO Centre</td>
</tr>
<tr>
<td>15</td>
<td>PC Interface (Vehicle data system and End of Line Test)</td>
</tr>
</tbody>
</table>

Fig 103
Fig 104

Mass of Assembly = 2.5Kgs

Control port (4)
M16 x 1.5

Reservoir port (1)
M22 x 1.5

Delivery port (2)
M16 x 1.5 x 6

193.55 MAX
224.70 MAX
216.00 MAX
154.75 154.25
Ø 9.00
8.50 x 2
186.50 MAX
28.50 27.75
PIPE RECOMMENDATIONS  Applicable to MODULAR 1 PLUS

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material</th>
<th>Size</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency pipe</td>
<td>Nylon</td>
<td>8 X 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 X 1 / 1.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 X 1.5</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>8 X 1 Pref</td>
<td>2a To be 1/3 of total trailer length</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>12 x 1.5 Pref</td>
<td>2b to be one size greater than 2a and 2c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>2c</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>8 x 1 Pref</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>Reservoir pipe</td>
<td>Nylon</td>
<td>12 x 1.5 Pref</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 x 1.5 Alt</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td></td>
<td>Nylon</td>
<td>15 x 1.5</td>
<td>Short as possible 1.0m Max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18 x 2</td>
<td>Short as possible 4.0m Max.</td>
</tr>
<tr>
<td>4a</td>
<td>Brake delivery</td>
<td>Nylon</td>
<td>12 x 1.5</td>
<td>4a and 4c to be similar in length,</td>
</tr>
<tr>
<td>4b</td>
<td>or pipe</td>
<td>Rubber</td>
<td>11.0</td>
<td>4b to be as short as possible.</td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td>hose I.D.</td>
<td>I.D. 13.0</td>
<td></td>
</tr>
</tbody>
</table>

Pref = Preferred  Alt = Alternative  All pipe and rubber hose to comply to recognised international standards. Nylon pipe to DIN 73378, Rubber hose to SAE 1402. The above pipe sizes are defined as guide lines only. Actual sizes need to be optimised for a given trailer to meet system response time requirements.
**MODULAR**

**PIPING LAYOUT**

**MODULAR 1 PLUS**  
3 axle Semi-Trailer - 2 line air brake system - S/D Brake Chambers

![Diagram of piping layout]

**Fig 106**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Coupling</td>
</tr>
<tr>
<td>2</td>
<td>Service Coupling</td>
</tr>
<tr>
<td>3</td>
<td>Pipe Filter</td>
</tr>
<tr>
<td>4</td>
<td>Relay Emergency Valve</td>
</tr>
<tr>
<td>5</td>
<td>Air Reservoir (30L/Axle - Single Diaphragm B.C.)</td>
</tr>
<tr>
<td>6</td>
<td>Drain valve</td>
</tr>
<tr>
<td>7</td>
<td>Load Sensing valve - mechanical</td>
</tr>
<tr>
<td>8</td>
<td>Test point</td>
</tr>
<tr>
<td>9</td>
<td>ABS Modulator</td>
</tr>
<tr>
<td>10</td>
<td>Brake Chamber</td>
</tr>
</tbody>
</table>
MODULAR

PIPING LAYOUT MODULAR 1 PLUS
3 axle Semi-Trailer - 2 line air brake system - Spring Brake Chambers - (Air Suspension )

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Coupling</td>
</tr>
<tr>
<td>2</td>
<td>Service Coupling</td>
</tr>
<tr>
<td>3</td>
<td>Pipe Filter</td>
</tr>
<tr>
<td>4</td>
<td>Shunt valve</td>
</tr>
<tr>
<td>5</td>
<td>Relay Emergency Valve</td>
</tr>
<tr>
<td>6</td>
<td>Air Reservoir (40L/Axle - Spring Brake Chamber)</td>
</tr>
<tr>
<td>7</td>
<td>Drain valve</td>
</tr>
<tr>
<td>8</td>
<td>Load Sensing valve - pneumatic</td>
</tr>
<tr>
<td>9</td>
<td>Test point</td>
</tr>
<tr>
<td>10</td>
<td>ABS Modulator</td>
</tr>
<tr>
<td>11</td>
<td>Spring Brake Chamber</td>
</tr>
<tr>
<td>12</td>
<td>Park Valve</td>
</tr>
<tr>
<td>13</td>
<td>Double Check Valve</td>
</tr>
<tr>
<td>14</td>
<td>Quick Release Valve</td>
</tr>
</tbody>
</table>
MODULAR

PIPING LAYOUT MODULAR 1 PLUS
3 axle Semi-Trailer - 2 line air brake system - Spring Brake Chambers - (Air Suspension)

Fig 108

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Coupling</td>
</tr>
<tr>
<td>2</td>
<td>Service Coupling</td>
</tr>
<tr>
<td>3</td>
<td>Pipe Filter</td>
</tr>
<tr>
<td>4</td>
<td>Combined Park and Shunt valve</td>
</tr>
<tr>
<td>5</td>
<td>Relay Emergency Valve</td>
</tr>
<tr>
<td>6</td>
<td>Air Reservoir (40L/Axle - Spring Brake Chamber)</td>
</tr>
<tr>
<td>7</td>
<td>Drain valve</td>
</tr>
<tr>
<td>8</td>
<td>Load Sensing valve - pneumatic</td>
</tr>
<tr>
<td>9</td>
<td>Test point</td>
</tr>
<tr>
<td>10</td>
<td>ABS Modulator</td>
</tr>
<tr>
<td>11</td>
<td>Spring Brake Chamber</td>
</tr>
<tr>
<td>12</td>
<td>Double Check Valve</td>
</tr>
<tr>
<td>13</td>
<td>Quick Release Valve</td>
</tr>
</tbody>
</table>
Maximum length of cable between ISO 1185 (24N) connector (or alternative wiring for ISO 3731 (24S)) and front junction box to be 1m.
Key

- W - White
- BK - Black
- PU - Purple
- RD - Red
- YE - Yellow
- BU - Blue
- BN - Brown
- X - Fuse position (Pin 1 Assy.)
- Y - 1m MAX.

ABS Modulator Wiring side View

SUSPENSION CONTROLLER (COLAS)

Right Sensor

ECU Loom Connector

Left Sensor

INFO CENTRE

PC. INTERFACE

D.D.U.
WIRING DIAGRAM - MODULAR 1 PLUS 2S/1M with ISO 7638 (UnFused) and ISO 1185 (24N) Power Supply

**Key**
- W - White
- BK - Black
- BN - Purple
- RD - Red
- YE - Yellow
- BU - Blue
- Y - 1m MAX.

**ISO 7638 ABS**

**ISO 1185 (24N)**

**Suspension Controller (COLAS)**

**Right Sensor**

**ECU Loom Connector**

**Info Centre**

**PC. Interface**

**D.D.U.**

**Fig 111**
WIRING DIAGRAM - MODULAR 1 PLUS 2S/1M with ISO 3731 (24S) and ISO 1185 (24N) Power Supply

Key

<table>
<thead>
<tr>
<th>W</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>PU</td>
<td>Purple</td>
</tr>
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<td>Red</td>
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<td>YE</td>
<td>Yellow</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>Y</td>
<td>1m MAX.</td>
</tr>
</tbody>
</table>

ISO 3731 (24S)

ISO 1185 (24N)

Front Junction Box

INFO CENTRE

PC. INTERFACE

ABS Modulator Wiring side View

HOLD

DUMP

SUSPENSION CONTROLLER (COLAS)

ECU Loom Connector

ECU

D.D.U.

Right Sensor

Left Sensor

Front Junction Box

Fig 112
SECTION 4

MODULAR 2
2S/2M - 4S/2M ABS
MODULAR 2 - ABS CHASSIS COMPONENTS

**Item** | **Description**
--- | ---
1 | ABS Label
2 | Green Warning lamp
   Bulb (24v-5w Double pole)
3 | 2 core cable
4 | Junction box
5 | ISO 7638 Socket assembly - PUR
5 Alternative | ISO 3731 (24S) Cable assembly - PUR
6 | ISO 1185 (24N) Cable assembly - PUR
7 | Sensor assembly
8 | ECU and Modulators assembly
9 | Loom assembly
10 | Diagnostic Connector
11 | Diagnostic Label
12 | Suspension Controller
13 | Diagnostic Display Unit
14 | INFO CENTRE
15 | PC Interface (Vehicle Data System and End of Line Test)

Fig 112
MODULAR 2 INTEGRATED ASSEMBLY 2S-4S/2M Without Manifold

Mass of Assembly = 4.5Kgs

Control port (4)  
M16 x 1.5

Reservoir port (1)  
M22 x 1.5

Delivery port (2)  
M16 x 1.5 x 6

Fig 114
MODULAR 2 INTEGRATED ASSEMBLY 2S-4S/2M With Manifold

Mass of Assembly = 5Kgs

Control port (4)
M16 x 1.5

Reservoir port (1)
M22 x 1.5

Delivery port (2)
M16 x 1.5 x 6

Fig 115
**PIPE RECOMMENDATIONS**  
Applicable to MODULAR 2 without manifold.

![Diagram](Image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material</th>
<th>Size</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency pipe</td>
<td>Nylon</td>
<td>8 X 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 X 1 / 1.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 X 1.5</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>8 X 1 Pref</td>
<td>2a To be 1/3 of total trailer length</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>12 x 1.5 Pref</td>
<td>2b to be one size greater than 2a and 2c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>2c</td>
<td>Service pipe</td>
<td>Nylon</td>
<td>8 x 1 Pref</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1 Alt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 1.25 Alt</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>Reservoir pipe</td>
<td>Nylon</td>
<td>12 x 1.5 Pref</td>
<td>Short as possible 1.0m Max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 x 1.5 Alt</td>
<td></td>
</tr>
<tr>
<td>3b and 3c</td>
<td>Nylon</td>
<td>15 x 1.5</td>
<td>Short as possible 4.0m Max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 x 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Brake delivery</td>
<td>Nylon</td>
<td>12 x 1.5</td>
<td>4a and 4c to be similar in length,</td>
</tr>
<tr>
<td>4b</td>
<td>or delivery pipe</td>
<td>or</td>
<td>or</td>
<td>4b to be as short as possible.</td>
</tr>
<tr>
<td>4c</td>
<td>pipe</td>
<td>Rubber hose I.D.</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I.D.</td>
<td>13.0</td>
<td></td>
</tr>
</tbody>
</table>

Pref = Preferred  
Alt = Alternative  
All pipe and rubber hose to comply to recognised international standards.  
Nylon pipe to DIN 73378, Rubber hose to SAE 1402. The above sizes are defined as guide lines only.  
Actual sizes need to be optimised for a given trailer to meet response time requirements.

---

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Page 75
MODULAR

PIPING LAYOUT MODULAR 2 without Manifold
3 axle Semi-Trailer - 2 line air brake system - Spring Brake Chambers - (Air Suspension)

Fig 117

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Coupling</td>
</tr>
<tr>
<td>2</td>
<td>Service Coupling</td>
</tr>
<tr>
<td>3</td>
<td>Pipe Filter</td>
</tr>
<tr>
<td>4</td>
<td>Shunt valve</td>
</tr>
<tr>
<td>5</td>
<td>Relay Emergency Valve</td>
</tr>
<tr>
<td>6</td>
<td>Air Reservoir (40L/Axle - Spring Brake Chamber)</td>
</tr>
<tr>
<td>7</td>
<td>Drain valve</td>
</tr>
<tr>
<td>8</td>
<td>Load Sensing valve - pneumatic</td>
</tr>
<tr>
<td>9</td>
<td>Test point</td>
</tr>
<tr>
<td>10</td>
<td>ABS Modulator (w/o Manifold)</td>
</tr>
<tr>
<td>11</td>
<td>Spring Brake Chamber</td>
</tr>
<tr>
<td>12</td>
<td>Park Valve</td>
</tr>
<tr>
<td>13</td>
<td>Double Check Valve</td>
</tr>
<tr>
<td>14</td>
<td>Quick Release Valve</td>
</tr>
</tbody>
</table>
### Item Description

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergency Coupling</td>
</tr>
<tr>
<td>2</td>
<td>Service Coupling</td>
</tr>
<tr>
<td>3</td>
<td>Pipe Filter</td>
</tr>
<tr>
<td>4</td>
<td>Combined Park and Shunt valve</td>
</tr>
<tr>
<td>5</td>
<td>Relay Emergency Valve</td>
</tr>
<tr>
<td>6</td>
<td>Air Reservoir (40L/Axle - Spring Brake Chamber)</td>
</tr>
<tr>
<td>7</td>
<td>Drain valve</td>
</tr>
<tr>
<td>8</td>
<td>Load Sensing valve - pneumatic</td>
</tr>
<tr>
<td>9</td>
<td>Test point</td>
</tr>
<tr>
<td>10</td>
<td>ABS Modulator (w/o Manifold)</td>
</tr>
<tr>
<td>11</td>
<td>Spring Brake Chamber</td>
</tr>
<tr>
<td>12</td>
<td>Double Check Valve</td>
</tr>
<tr>
<td>13</td>
<td>Quick Release Valve</td>
</tr>
</tbody>
</table>
Maximum length of cable between ISO 1185 (24N) connector (or alternative wiring for ISO 3731 (24S)) and front junction box to be 1m.
MODULAR

WIRING DIAGRAM - MODULAR 2 2S/2M with ISO 7638 (Fused) and ISO 1185 (24N) Power Supply

Key

| W  | White          |
| BK | Black          |
| PU | Purple         |
| RD | Red            |
| YE | Yellow         |
| BU | Blue           |
| X  | Fuse position  |
|    | (Pin 1 Assy.)  |
| Y  | - 1m MAX.      |

ABS Modulator Wiring side View

SUSPENSION CONTROLLER (COLAS)

Right Sensor

ISO 7638 ABS

ISO 1185 (24N)

INFO CENTRE

D.D.U.

PC. INTERFACE

Fig 120

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WIRING DIAGRAM - MODULAR 2 2S/2M with ISO 7638 (UnFused) and ISO 1185 (24N) Power Supply

Key
- W - White
- BK - Black
- PU - Purple
- RD - Red
- YE - Yellow
- BU - Blue
- BN - Brown
- Y - 1m MAX.

Fig 121
MODULAR

WIRING DIAGRAM - MODULAR 2 2S/2M with ISO 3731 (24S) and ISO 1185 (24N) Power Supply

Key

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
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<tbody>
<tr>
<td>W</td>
<td>W</td>
</tr>
<tr>
<td>BK</td>
<td>BK</td>
</tr>
<tr>
<td>PU</td>
<td>PU</td>
</tr>
<tr>
<td>RD</td>
<td>RD</td>
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<tr>
<td>YE</td>
<td>YE</td>
</tr>
<tr>
<td>BU</td>
<td>BU</td>
</tr>
<tr>
<td>BN</td>
<td>BN</td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Key:
- White (W)
- Black (BK)
- Purple (PU)
- Red (RD)
- Yellow (YE)
- Blue (BU)
- Brown (BN)
- Y - 1m MAX.

Fig 122

ISO 3731 (24S)

- W/BK
- BK
- BN/BK
- YE
- W
- RD
- YE/BK

ISO 1185 (24N)

- W
- RD
- BK
- YE
- BK
- YE

Front Junction Box

INFO CENTRE

PC. INTERFACE

SUSPENSION CONTROLLER (COLAS)

ABS Modulator

Wiring side View

ECU Loom Connector

Right Sensor

ABS Modulator

Wiring side View

D.D.U.

Left Sensor
WIRING DIAGRAM - MODULAR 2 4S/2M with ISO 7638 (Fused) and ISO 1185 (24N) Power Supply

Key

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>PU</td>
<td>Purple</td>
</tr>
<tr>
<td>RD</td>
<td>Red</td>
</tr>
<tr>
<td>YE</td>
<td>Yellow</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>X</td>
<td>Fuse position (Pin 1 Assy.)</td>
</tr>
<tr>
<td>Y</td>
<td>1m MAX.</td>
</tr>
</tbody>
</table>

Fig 123
MODULAR

WIRING DIAGRAM - MODULAR 2 4S/2M with ISO 7638 (UnFused) and ISO 1185 (24N) Power Supply

Key

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>PU</td>
<td>Purple</td>
</tr>
<tr>
<td>RD</td>
<td>Red</td>
</tr>
<tr>
<td>YE</td>
<td>Yellow</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>Y</td>
<td>1m MAX.</td>
</tr>
</tbody>
</table>

ABS Modulator Wiring side View

SUSPENSION CONTROLLER (COLAS)

Right Sensors

ISO 7638 ABS

ISO 1185 (24N)

ECU Loom Connector

Fig 124

Page 83
WIRING DIAGRAM - MODULAR 2 4S/2M with ISO 3731 (24S) and ISO 1185 (24N) Power Supply

Key

- W - White
- BK - Black
- PU - Purple
- RD - Red
- YE - Yellow
- BU - Blue
- BN - Brown
- Y - 1m MAX. 24N and 24S

Fig 125
MODULAR 1M and 2M Systems
ISO 3731 (24S), ISO 1185 (24N), and ISO 7638 Power supply

**Key**
- BK = Black
- BN = Brown
- RD = Red
- YE = Yellow
- W = White

CIRCUIT DIAGRAM FOR REFERENCE ONLY

Fig 126