



Vehicle & Operator Services Agency

Your Guide to ABS and EBS

updated September 2003



Produced by
VOSA Technical Services
Swansea
September 2003

Vehicle and Trailer ABS and EBS

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Section 1

Introduction to the Anti-Lock and Electronic Braking Guide

The aim of the document is to give enough information for all involved in inspecting vehicles and trailers to be able to understand and apply a uniform standard of approach.

It has been a difficult document to compile and we know that some will think it does not go far enough and some will think it is too technical. This is our second attempt based on comments which have been received from numerous sources. I would like to take this opportunity to thank all those who have contributed. We would welcome any feedback on this guide which will assist us in keeping it up to date.

This guide is not the end, as developments are ongoing we will endeavour to keep this supply of information as up to date as possible.

Could you send any comments to:

technical@vosa.gov.uk

or

Technical on the VOSA address book if using Lotus Notes.

Mark Pattison

Introduction to ABS

The abbreviation ABS stands for anti-lock braking system. The purpose of this system is to prevent the wheels from locking when the brakes are applied when the brake force generated exceeds that which can be transmitted to the road via the tyre.

A great benefit with the ABS system is that it provides a maximum exploitation of the available road surface friction when the brakes are applied. Consequently the braking distance is considerably shorter and the vehicle is much easier to control under emergency braking.

If the vehicle is pulling a trailer the most efficient conditions are when both the tractor and trailer are equipped with non-locking brakes.

The ABS system is governed by a control unit (micro-computer) which senses the wheel speeds with the aid of a sensor and a pole wheel or exciter ring fitted to the brake drum or disc. The signals from the sensor are processed by the control unit, which, via solenoid valves, governs the braking pressure of the individual wheel brake actuators. Where axles form a bogie, it may only have sensors fitted to one of the axles forming the bogie. The ABS system includes a number of control functions that test the individual electrical circuits to ensure that they are functioning correctly. Should a fault occur the driver is informed by a warning lamp on his instrument panel or, if a trailer is being drawn, via a lamp visible to the driver on the front of the trailer.

Categories of ABS

Towing Vehicles

Category 1

The ABS will operate on at least one front axle and on one rear axle and have the ability to utilise the higher adhesion when braking on a split friction surface. This will require one of the axles, usually the rear axle, to have independent control. A typical system would have four sensors and four modulators but could effectively have four sensors and 2 or 3 modulators. In the latter case the front axle could use one modulator with a "Select Low" control philosophy where modulation action is taken on the first wheel to lock. This system will protect the towing vehicle from brake induced jack-knifing and enable the driver to steer during braking by preventing the directly controlled wheels from locking.

Category 2

The ABS will operate on at least one front axle and on one rear axle. The system will have a minimum of four sensors and two modulators (one for each axle). The system will generally operate on a "select Low" control philosophy where modulation action will be taken on the first wheel to lock. This system will protect the towing vehicle from brake induced jack-knifing and enable the driver to steer during braking by preventing the directly controlled wheels from locking.

Category 3

The ABS operates only on the rear (drive) axle. The system will have two sensors and one modulator and generally a "select Low" control philosophy where modulation action will be taken on the first wheel to lock. This system will protect the towing vehicle from brake induced jack-knifing by preventing the directly controlled wheels from locking.

Section 2

Trailers

Category A

A trailer with a Category A ABS will meet the split friction deceleration requirements. Only trailers approved under the carriage of dangerous goods regulations (ADR) must have a Category A system. The minimum requirement for a Category A semi-trailer would be for two sensors and two modulators. Each modulator would control the wheels on one side of the trailer. The minimum requirement for a Category A full drawbar trailer (a turntable type) is four sensors and three modulators. In this case the rear axle would be independently controlled.

Category B

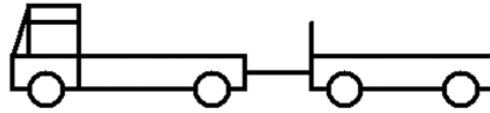
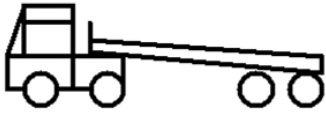
A trailer with a Category B ABS does not need to meet the split friction deceleration requirements. The minimum requirement for either a semi-trailer or a centre axle drawbar trailer is two sensors and one modulator. On a full drawbar (turntable type) the minimum requirement would be two sensors and two modulators, although four sensors and three modulators is the industry practice.

Mandatory ABS

Type of Vehicle	Dates	Category Required
Motor vehicles with design GVW greater than 16000kg and authorised to tow a semi-trailer, or a centre axle drawbar trailer, with total design axle weights greater than 10000kgs or a full drawbar trailer (turntable type) with a design GVW greater than 10000kgs (an O4 trailer). See examples below	First used from 1st April 1992 to 30 April 2002.	Category 1
Semi-trailers and centre axle drawbar trailers with a design total axle weight of more than 10000kg.	Manufactured after 1st October 1991.	Category A or B
Semi-trailers and centre axle drawbar trailers with a design total axle weight of more than 10000kg and do not have a load sensing valve.	Manufactured from 1st October 1982 to 30th September 1991.	No specific category
Semi-trailers and centre axle drawbar trailers with a design total axle weight of more than 3500kg.	Manufactured after 1st May 2002.	Category A or B
Full drawbar trailers (turntable type) with a design GVW of more than 10000kg.	Manufactured after 1st October 1991.	Category A or B
Full drawbar trailers (turntable type) with a design GVW of more than 10000kg and do not have a load sensing valve.	Manufactured from 1st October 1982 to 30th September 1991.	No specific category
Full drawbar trailers (turntable type) with a design GVW of more than 3500kg.	Manufactured after 1st May 2002.	Category A or B
All motor vehicles over 3500kg GVW. This includes Motor Homes based on an N1 chassis.	Manufactured from 1st November 2001 and first used from the 1st May 2002.	No specific category
Motor Homes over 3500kg based on an N1 chassis but are designed to meet M1 brake performance requirements.	Manufactured from 1st October 1991 and first used from 1st April 2002 and greater than 12000kg.	Category 1

Exempt vehicles

- Public works vehicles which have a maximum design GVW of 7500kg and which are specifically designed for and used solely for the purpose of street cleansing.



Example 1

Semi - Trailer

or

Rigid and Drawbar Trailer

Drawing vehicle GVW 18000kg

GTW greater than 28000kg (GTW - GVW > 10000kg)

Anti-lock brakes required

Example 2

Drawing vehicle GVW 18000kg

GTW equal to 28000kg or less (GTW - GVW < 10000kg)

Anti lock brakes may be required if:

1. The drawing hitch is rated at more than 10000kg, or;
2. the tractor is presented for test with a semi-trailer which has Total Axle Weight summation of greater than 10000kg, or;
3. the drawing vehicle is presented for test with a full drawbar trailer (turntable type) which has a GVW greater than 10000kg.

Note: the tow hitch should have a manufacturer's identification plate showing the hitch capacity.

Section 3

Introduction to EBS

The abbreviation EBS stands for Electronic Braking System. The purpose of this system is to improve vehicle control, reaction and stability during braking over and above that currently possible from a conventional pneumatic system. This is achieved by using electrical signals to operate pneumatic valves. A back up system is usually retained in case of an electrical failure.

A great benefit with EBS is that it can simultaneously fulfil the operation of an anti-lock system (ABS) and a load sensing system with a superior reaction time. If the vehicle is towing an EBS trailer the two systems can communicate via a data bus and offer the potential of improved tractor/ trailer compatibility. With motor vehicles it can also provide ASR (Anti-Slip Reduction).

Manufacturers claim:

- Reduced combination response times
- Improved stability under braking
- Improved compatibility between vehicle and trailer
- Reduced operating temperatures
- Reduction in components and pipework
- Reduced operating costs
- Improve even brake lining wear on motor vehicles
- Comprehensive self diagnostic tests

Motor Vehicle ECU (Electronic Control Unit)

This unit controls and monitors the operation of the EBS. It maybe linked to other electronic components through a CAN (Controlled Area Network) data line. In this way, whenever it receives a signal from the Brake Signal Transmitter, it takes instant and continuous readings from the wheel speed sensors on the vehicle. These figures can be used to calculate, in microseconds, the braking deceleration that is required.

The ECU measures pressure at the wheels on all the different axles, bogies, or multiples of axles and activates the modulator valves to maintain even and steady braking all round. When necessary the same sensors also prompt the ABS and ASR (if fitted) intervention.

Static Roller Brake Testing

EBS is a permanently powered system.

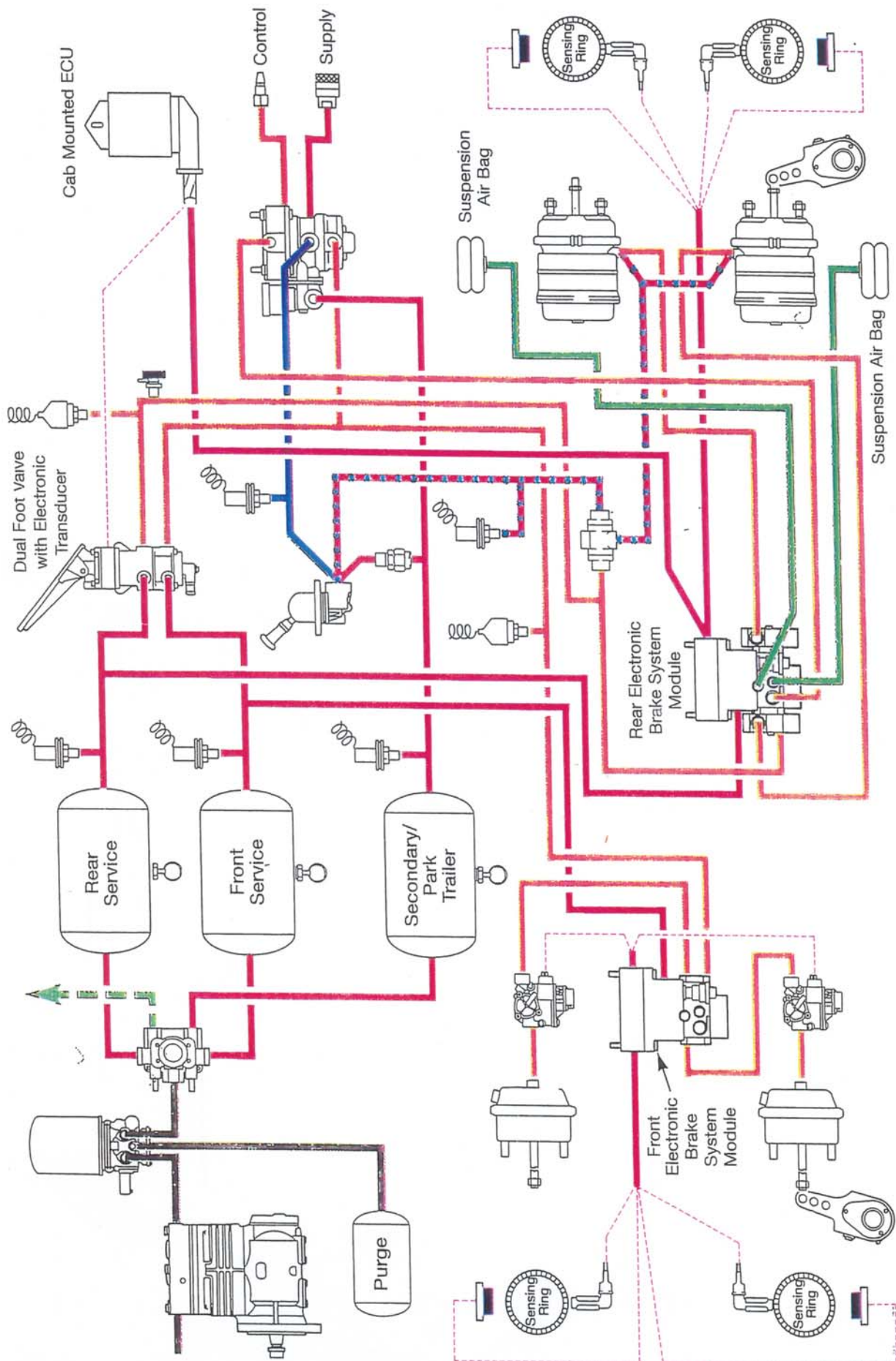
Motor Vehicles

With the advancement of electronic controls the modulation of braking on the axles is highly dependent on the imposed axle loads. During a roller brake test on a motor vehicle, which is not up to its design weight, it may give an impression of poor brake performance. If this is the case depending on the examining criteria i.e. for annual test purposes, it is possible the brake performance may not be sufficient to meet the Goods Vehicles (Plating and Testing) Regulations (these Regulations compare the braking effort produced to the design weights of the vehicle). For enforcement purposes the brake performance should be measured against the presented weight as required by the Road Vehicles (Construction and Use) Regulations.

For annual test purposes, in order to eliminate the modulating effect, it is acceptable (provided the vehicle is within 65% of its design weight) to build the air pressure to maximum, switch ignition off, release the parking brake and then conduct the brake test. The vehicle should be allowed to replenish its air reservoirs after each application of the footbrake.

Trailers

Please refer to section 9 of this guide for individual manufacturers guidance.



General Statement of Operation

Non Towing Vehicles

For non-towing vehicles, when the ignition is switched on, a single ABS warning lamp on the dashboard will go through one of the following sequences:

1. Lamp comes on and goes out within a few seconds.
2. Lamp comes on and will go out once driven over a nominal speed of between 7 and 15km/h.
3. Lamp comes on, goes out after a few seconds, after a few more seconds comes back on and will go out once driven over a nominal speed of between 7 and 15km/h.

Towing Vehicles

Note. Before checking any warning lamps ensure that all electrical connections between the vehicle and trailer are being used, i.e. power should be taken from the ISO 7638 connection but may take alternative feeds from the 24N and 24S. (Refer to section on electrical connections)

- ABS systems may take a power source from any of these connections with the 24N providing power from the stop lamp circuit.
- EBS can only source a permanent power feed from the 24S or the ISO7638.
- Manufacturers have the option to only install a dedicated power supply from the ISO7638 connection.
- Some systems are designed to have a back-up system powered by the brake light circuit depending on the manufacturer and or the age of the system.

For towing vehicles there are generally four arrangements of warning lamp:

1. One warning lamp on the vehicle dashboard, and one warning lamp on the trailer.
2. Two warning lamps on the vehicle dashboard, one for the vehicle and one for the trailer.
3. There are three warning lamps on the vehicle dashboard, one for the vehicle and one for the trailer and an information warning lamp that advises the driver he is towing a non ABS/EBS trailer.
4. Two yellow warning lamps on the dashboard, one for the vehicle, one for the trailer and one common red warning lamp.

As regards 2 & 3 above there may be, in addition, another warning lamp on the trailer headboard.

As motor vehicle technology progresses, you may come across more combinations of warning lamps and the greater use of LCD displays.

Vehicles fitted with the third information lamp (or LCD display) are used to inform the driver that the trailer being towed is either not fitted with ABS, or it can be activated when the trailer being used is fitted with a stop lamp powered ABS system. If the lamp illuminates and stays on, the dedicated trailer lamp will not come on. Some of these lamps are designed to go out after the first application of the footbrake and some can be manually switched off by the driver. If the trailer has a stop lamp powered ABS system, the driver should refer to the warning lamp on the trailer headboard. As this lamp is an advisory lamp, any defect would also have to be considered as advisory.

It must be stressed, this a general statement, if the vehicle/trailer combination does not follow the sequences as above refer to the quick reference sheet before taking any action.

Electrical Connections for ABS/EBS between Motor Vehicles and Trailers using 24N, 24S and ISO7638 Plugs and Sockets

You will come across four standard electrical connections:

- 24N (ISO 1185) is the **N**ormal lighting connector
- 24S (ISO 3731), is the **S**upplementary lighting connector
- ISO7638 is a 7 pin EEC standard connection for braking systems and running gears
- 15 pin continental lighting connector (ISO 12098).

The 24N consists of common return, side lights left, side lights right, indicator left, indicator right, stop lamp and provision for a warning device.

The 24S has optional connections, mainly: fog lamp, reversing lamp, permanent ABS/EBS power feed, ABS/EBS Cab warning lamp signal, interior lighting etc. (specific requirements are dependent on the age of the vehicle or trailer and are covered within the Lighting Regulations).

The ISO7638 is associated with braking systems only and provides connections for ABS/EBS, warning lamp, CAN (Controlled Area Network) data lines . This data line is used when both the vehicle and the trailer of a combination are fitted with EBS and it allows the two systems to communicate. This communication delivers improved response times (via the demand value signal regulated by the amount of braking required by the driver) and has the ability to indicate specified and non-specified faults. The data line can also be used for vehicles without EBS, for example, to indicate a warning for brake lining wear.

The continental lighting socket (ISO12098) is used when a continental spec trailer is being towed and this is the only connection provided on the trailer. A continental lighting connection replaces the 24N and 24S but does not include a power source for ABS or EBS.

If the vehicle and trailer are fitted with 24N, 24S and ISO7638 connections they should all be used. Below are examples showing the differences between the connectors:



The 24S is on the left. Note that the top pin by the locating lug is solid. The 24N on the right has a hollow top pin by the locating lug. We do not enforce a colour code requirement, generally the 24N is a dark colour and the 24S is a light colour.

Section 5



The top socket is the 24N with the solid top pin and the one below is the 24S with the hollow top pin.



Left hand side 15 pin continental lighting plug ISO 12098, on the right 7 pin ISO7638.

Following amendments to Regulation 15 of The Road Vehicles (Construction and Use) Regulations 1986 by Statutory Instrument 2001 No. 3208, a motor vehicle first used on or after 1 May 2002 or a trailer manufactured on or after 1 May 2002 shall comply with the construction, fitting and performance requirements of a number of EC Directives.

Regulation 18 was amended by the same Statutory Instrument above, to say that ISO7638 connections must be used if both the vehicle and trailer are fitted (this is irrespective of the age of vehicle or trailer). Retrofitting of vehicles and trailers is not required providing the vehicle and trailer are compatible. It is possible to find the ISO7638 connection fitted to motor vehicles and trailers manufactured in the 1980s. It is acceptable to retrofit older vehicles as a notifiable alteration if the owner requires this connection for operational reasons.

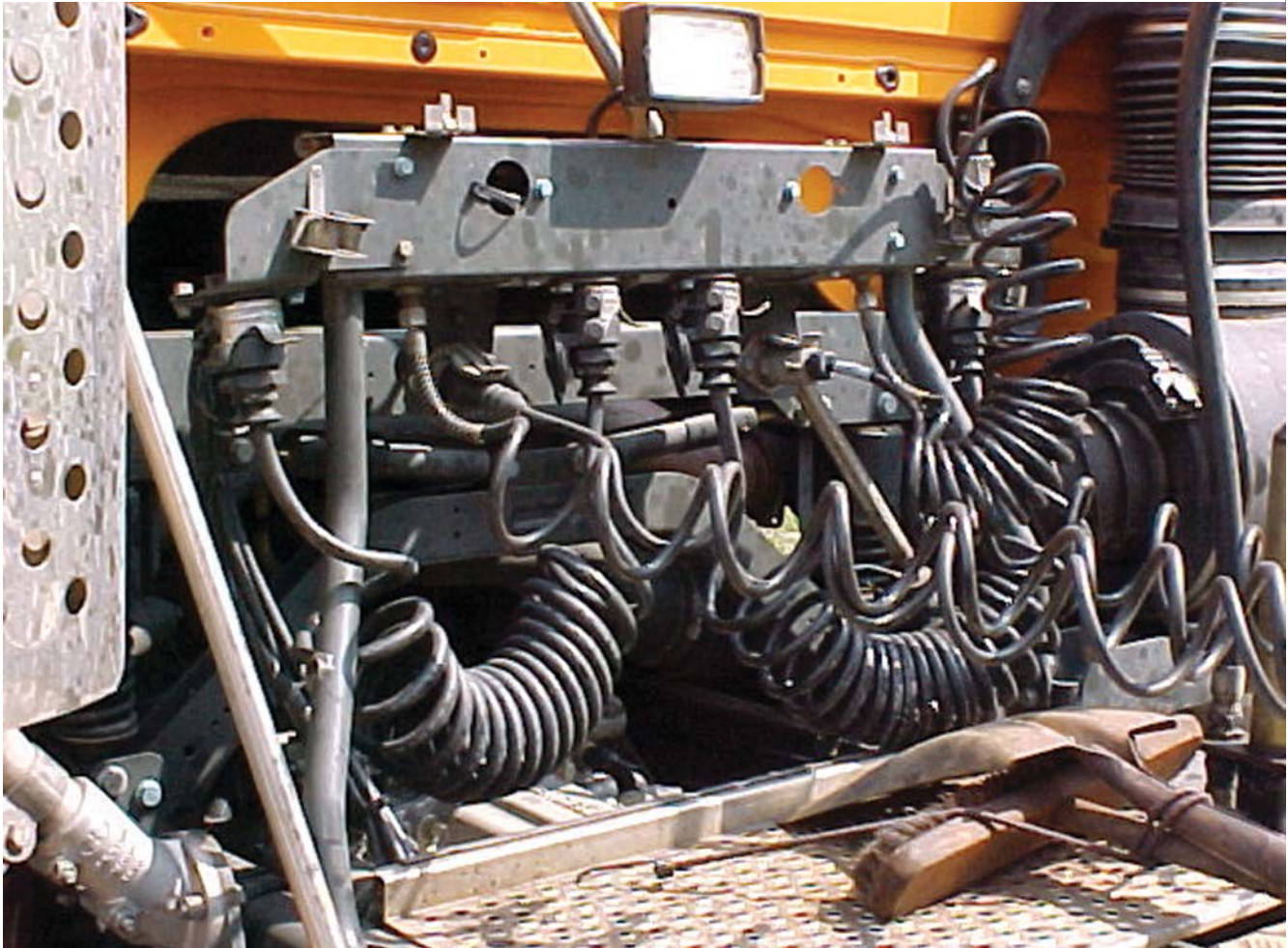


Above is an ISO7638 socket, these can be fitted to either the motor vehicle or trailer. They are connected by a cable with two male plugs. Alternatively the socket on an articulated motor vehicle can be removed and the cable permanently wired into the vehicle. In the case of a drawbar trailer, the legislation requires a socket to be fitted. As for the articulated motor vehicle the cable can be permanently wired into the trailer.

Note. There are two standards of ISO7638 which are ISO7638-1 and ISO7638-2. The difference being 1 are for 24 volt applications and 2 are for 12 volt applications. The 12 volt version can not be used for a 24 volt system. On the front of a trailer there may be three connections. VOSA would advise that the best practice would be that they are all independently wired back to the ABS/EBS operating unit. Wiring circuitry inside the operating unit is capable of prioritising the sources i.e. ISO7638, 24S and finally Stop Lamp. Some manufacturers can utilise a junction box to achieve this.

Section 5

Note. When an EBS vehicle is towing an EBS trailer you should ensure that a 7 core cable is being used. If a 5 core cable is being used the vehicle and trailer will operate as independent units. The combination will not be dangerous to drive unless a driver relies on the enhanced braking characteristics of an EBS plus EBS combination. If a 5 core cable is being used there may be a contravention of Regulation 18 of The Road Vehicles (Construction and Use) Regulations 1986 as amended. It is the prerogative of a court to make this decision.



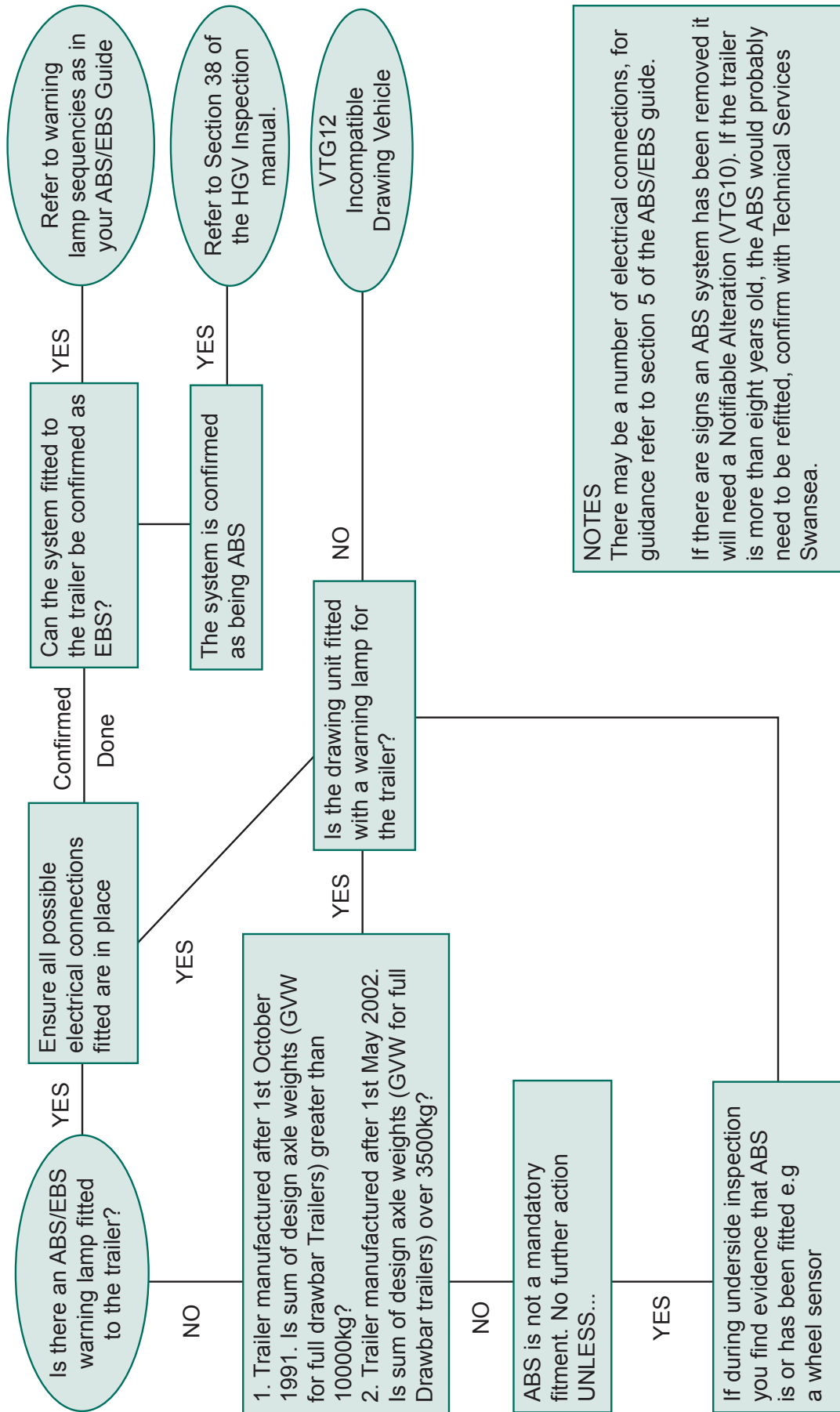
The rear of a tractor unit can be a very confusing place as in the example above. All the leads are black so recognition of the pin configuration is essential.

From left to right,

- Parking port for continental lighting plug.
- 'Yellow' Service line for trailer brakes. (In use)
- Output for 24N standard lighting socket. (In use)
- Output for continental lighting socket.
- Output for ISO7638 connections.
- Output for 24S supplementary connections.
- 'Red' emergency air line for brakes. (In use)
- Parking port for ISO7638 connection.
- On the top right hand side the 24S connection is stowed.

Note. The parking sockets look similar but with no wiring.

Annual Test Quick Reference Guide for Trailers



Antilock systems - Details of check if no manufacturer's instruction plate is fitted

Make	Model	Power Supply	Light Sequence	Indication of system fault
Bosch	Gamma System Motor Vehicle & Trailer	Permanent power via either 24S and or ISO7638, if fitted	Switch on ignition, warning lamp will illuminate and will remain on until speed exceeds 6km/h.	Lamp does not illuminate. Illuminates and remains on when speed exceeds 6km/h.
Knorr-Bremse	KB3-TA Trailer	Permanently Powered	Switch on ignition. Warning lamp will illuminate for 2 seconds and will go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Knorr-Bremse	KB3-TA Trailer	Stop Lamp Powered	Switch on ignition and apply the footbrake. Trailer mounted warning lamp will illuminate for 2 seconds and then go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Knorr-Bremse	A18 Trailer	Permanently Powered	Switch on ignition. Warning lamp will illuminate for 2 seconds and will go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Knorr-Bremse	A18 Trailer	Stop Lamp Powered	Switch on ignition and apply the footbrake. Trailer mounted warning lamp will illuminate for 2 seconds and then go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Knorr-Bremse	TEBS4 Trailer	Permanently Powered	Standard Mode of Operation. Switch on ignition, warning lamp will illuminate and go off after 2 seconds.	Lamp does not illuminate. Illuminates and stays on.
Knorr-Bremse	TEBS4 Trailer	Permanently Powered	Alternative Mode of Operation. Switch on ignition. Warning lamp will illuminate for 2 seconds, momentarily go off and come back on, then go off once speed exceeds 15 km/h.	Lamp does not illuminate. Illuminates and stays on. Does not go off when speed exceeds 15km/h.
Lucas Girling Grau (Haldex)	GX Motor Vehicle	Via Ignition	Switch on ignition. Warning lamp will illuminate and go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Lucas Girling Grau (Haldex)	MGX Trailers Blue Moulded Casing	Stop Lamp Powered	With ignition on apply footbrake. Warning lamp on trailer headboard will illuminate and go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Lucas Girling Grau (Haldex)	MGX Trailers Blue Moulded Casing	Permanently Powered	a) Switch on ignition, trailer warning lamp on tractor unit dashboard will illuminate and go off. b) Apply footbrake, switch ignition on, warning lamp on trailer headboard will illuminate and go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.

Antilock systems - Details of check if no manufacturer's instruction plate is fitted

Make	Model	Power Supply	Light Sequence	Indication of system fault
Lucas Girling Grau (Haldex)	MGX2 Trailers Black Moulded Casing	Stop Lamp Powered	With ignition on apply footbrake. Warning lamp on trailer headboard will illuminate and go off.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Lucas Girling Grau (Haldex)	MGX2 Trailers Black Moulded Casing	Permanently Powered	Switch on ignition, warning lamp on trailer will illuminate and go off. Note: on some installations there may be no warning lamp on the trailer. There must be a trailer warning lamp in the tractor unit.	Lamp does not illuminate. Illuminates and stays on. Illuminates goes off and comes back on.
Lucas Girling Grau (Haldex)	MGX2E Trailers Grey Moulded Case	Stop Lamp Powered	With ignition on, apply footbrake. Warning lamp on trailer headboard will illuminate and remain on until speed exceeds 10 km/h. Note: when the footbrake is released the lamp will go off.	Lamp does not illuminate. Illuminates and goes off with vehicle stationary. Illuminates and remains on when speed exceeds 10km/h with the footbrake applied.
Lucas Girling Grau (Haldex)	MGX2E Trailers Grey Moulded Case	Permanently Powered	Switch on ignition, warning lamp on trailer illuminates and remains on until speed exceeds 10km/h. Note: on some installations there may be no warning lamp on the trailer. There must be a trailer warning lamp in the tractor unit.	Lamp does not illuminate. Illuminates and goes off while vehicle stationary. Illuminates and remains on when speed exceeds 10km/h.
Lucas Girling Grau (Haldex)	DGX /DGXI Motor Vehicles and Trailers	Permanently Powered	Switch on ignition, warning lamp will illuminate for approximately 3 seconds, go off for one second, come back on and remain on until speed has exceeds 10km/h.	Lamp does not illuminate. Illuminates and remains on. After sequence does not come back on. Remains on at a road speed over 10km/h.
Lucas Girling Grau (Haldex)	Modal/Modular Trailer System	Stop Lamp Powered	Static Test. Normal Operation: switch on ignition, apply footbrake, warning lamp on trailer will illuminate for 2.5 seconds, go off for one second and come back on and remain on as long as the footbrake is depressed. Optional Operation: switch on ignition, apply footbrake, warning lamp on trailer will illuminate for 2.5 seconds go off and remain off. Dynamic test. Apply footbrake whilst speed exceeds 10km/h. Warning lamp will momentarily illuminate and go off.	Lamp does not illuminate. Illuminates and remains on. Does not come back on after 1 second pause. (Note: Optional light sequence). Lamp does not illuminate. Illuminates and remains on during application.

September 2003. If in any doubt contact Technical Services, Welcombe House Swansea: 0870 60 60 440

Antilock systems - Details of check if no manufacturer's instruction plate is fitted

Make	Model	Power Supply	Light Sequence	Indication of system fault
Lucas Girling Grau (Haldex)	Modal/Modular Trailer System	Permanently Powered	Switch on ignition. Warning lamp will illuminate for 2.5 seconds, momentarily go off, come back on and will go off speed exceeds 10km/h.	Lamp does not illuminate. Illuminates and remains on. Illuminates goes off but does not come back on. Remains when speed exceeds 10km/h.
Lucas Girling Grau (Haldex)	MGX 100 Trailers, Green Moulded Casing	Stop Lamp Powered	Static Test. Switch on ignition, apply footbrake, warning light will illuminate for three seconds, momentarily go off and come back on. Dynamic Test. Apply footbrake whilst speed exceeds 10km/h. Lamp will momentarily illuminate and go off.	Lamp does not illuminate. Illuminates and remains on. Illuminates for 3 seconds goes off and does not come back on. Lamp does not illuminate. Illuminates and remains on during brake application.
Lucas Girling Grau (Haldex)	MGX 100 Trailers, Green Moulded Casing	Permanently Powered	Switch ignition on, warning lamp will illuminate for three seconds, momentarily go off, come back on and remain on until speed exceeds 10km/h.	Lamp does not illuminate. Illuminates and remains on. Illuminates for 3 seconds, goes off but does not come back on. Remains when speed exceeds 10km/h.
Maxaret	CR system for Motor Vehicles	Permanently powered	Fully charge air system, apply footbrake and switch on ignition. A short exhaust of air will be heard and the warning lamp will illuminate and stay on.	Lamp does not illuminate. Illuminates and goes off. No exhaust of air is heard.
Maxaret	MK III System for Motor Vehicles	Permanently Powered	Fully charge air system. Stop engine, fully charge air system. Stop engine, apply footbrake and start engine. Warning lamp will illuminate and go off, a short exhaust of air will be heard.	Lamp does not illuminate. Illuminates and goes off. No exhaust of air is heard.

Antilock systems - Details of check if no manufacturer's instruction plate is fitted

Make	Model	Power Supply	Light Sequence	Indication of system fault
Maxaret	MK IV System for Motor Vehicles	Permanently Powered	Fully charge air system. Warning lamp will illuminate and stay on.	Lamp does not illuminate. Illuminates and goes off.
Maxaret	Trailer System	Permanently Powered	Check that warning lamp is off at trailer test point, press button switch warning lamp will illuminate, release button and warning lamp goes off.	Does not illuminate when button pressed. Stays on when button released.
Maxaret	Trailer System	Stop Lamp Powered	Apply footbrake, switch on ignition, warning lamp will illuminate and go off.	Lamp does not illuminate. Illuminates and stays on.
WABCO	B & C Series for Motor Vehicles and Trailers	Stop Lamp Powered	Static Test. Apply footbrake, warning light remains on with brake application. Dynamic Test. Apply footbrake whilst speed exceeds 7km/h. Warning lamp will momentarily illuminate and go off.	Lamp does not illuminate. Lamp does not illuminate. Illuminates and remains on during brake application.
WABCO	B & C Series for Motor Vehicles and Trailers	Permanently Powered	Switch on ignition. Warning lamp will illuminate and remain on until speed exceeds 7km/h.	Lamp does not illuminate. Illuminates and remains when speed exceeds 7km/h.
WABCO	Motor Vehicle C Series	Permanently Powered	Switch on Ignition. Warning lamp will illuminate and remain on until speed exceeds 7km/h. (on Iveco lamp will go off after two seconds).	Lamp does not illuminate. Illuminates and remains on when speed exceeds 7km/h.
WABCO	Motor Vehicle D Series	Permanently Powered	Switch on Ignition. Warning lamp illuminates for two seconds and goes off.	Lamp does not illuminate. Illuminates and remains on.
WABCO	Trailer Vario C	Permanently Powered via 24S and or ISO7638 if fitted.	Switch on ignition. Warning lamp will illuminate and remain on until speed exceeds 7km/h.	Lamp does not illuminate. Illuminates and remains on when speed exceeds 7km/h.

Antilock systems - Details of check if no manufacturer's instruction plate is fitted

Make	Model	Power Supply	Light Sequence	Indication of system fault
WABCO	Trailer Vario C	Stop Lamp Powered	Switch on ignition. Footbrake on. Warning lamp will illuminate and stay on until speed exceeds 7km/h. Note. Footbrake off, lamp off.	Lamp does not illuminate. Stays on when speed exceeds 7km/h with footbrake applied.
WABCO	Trailer VCS Up to September 1999	Permanently Powered via 24S and or ISO7638 if fitted.	Switch on ignition. Warning lamp will illuminate and remain on until speed exceeds 7km/h.	Lamp does not illuminate. Stays on when speed exceeds 7km/h.
WABCO	Trailer VCS Up to September 1999	Stop lamp powered	Switch on ignition. Footbrake on. Warning lamp will stay on until speed exceeds 7km/h. Note. Footbrake off, lamp off.	Lamp does not illuminate. Stays on when speed exceeds 7km/h with footbrake applied.
WABCO	VARIO C and VCS produced after October 1999 Trailer	Permanently Powered via 24S and or ISO7638 if fitted	Switch on Ignition. Warning lamp will illuminate for two seconds and go off.	Lamp does not illuminate. Illuminates and remains on.
WABCO	VARIO C and VCS produced after October 1999 Trailer	Stop lamp powered	Switch on Ignition. Footbrake on. Warning lamp will illuminate for two seconds and go off.	Lamp does not illuminate. Illuminates and remains on.

Information on KNORR BREMSE, Haldex and WABCO EBS, refer to section 9 front sheet.

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer; numbers, colours and operating sequences	Special notes
Dennis Eagle	Elite	RED. The letters ABS inside a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 3 seconds.		
ERF	ABS for ECX series	YELLOW. Shows the letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds.	YELLOW. Shows the letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds if the trailer is connected via 24S or ISO 7638.	Left lamp vehicle Right lamp trailer
ERF	ABS for ES and ECS series	RED. Shows the letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 3 to 4 seconds	RED. Shows the letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 3 to 4 seconds if the trailer is connected via 24S or ISO7638.	Left lamp vehicle Right lamp trailer
Isuzu	NPR 70 6.2 tonne NQR 70 7.5 tonne	AMBER. Lamp with the letters ABS. Lamp illuminates with ignition and goes off after approx. 3 seconds.	N/A	

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer; numbers, colours and operating sequences	Special notes
IVECO Ford	ABS for: Cargo/Tector Super Cargo Eurotech Eurostar Euro Trakker	RED. Shows the letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds.	1. RED. Shows the letters ABS inside a circle with what looks like brake shoes either side above a pictogram of a trailer. Lamp illuminates with ignition and remains on. The lamp will go off once vehicle speed exceeds 5-10 km/h. 2. YELLOW. Optional information lamp. Shows the letters ABS in a circle with what looks like brake shoes either side above a pictogram of a trailer with a cross through the warning lamp. When illuminated it informs the driver that the trailer has no ABS or the trailer has a stop lamp powered system with it's own warning lamp on the headboard.	The optional YELLOW information lamp is no longer used. If it is fitted and is not working this is not a reason to fail or prohibit the vehicle. It is only an advisory defect.
Iveco Ford	EBS for Eurotech Eurostar with Cursor 10	EBS Lamp. RED. Shows the letters EBS inside a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds. ABS Lamp. Shows the letters ABS and EBS in the form of a cross inside a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds.	YELLOW. Shows the letters ABS inside a circle with what looks like brake shoes either side above a pictogram of a trailer. Lamp illuminates with ignition and remains on. The lamp will go off once vehicle speed exceeds 5-10 km/h. If the lamp does not illuminate, the trailer is not fitted with ABS or the trailer has a stop lamp powered ABS system, refer to the warning lamp on the trailer head board.	
Leyland DAF	LF, CF,	YELLOW. The letters ABS above a pictogram of tractor unit in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and will go off after 2 to 3 seconds.	YELLOW. The letters ABS above a pictogram of a trailer in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and will go off after 2 to 3 seconds.	CF with EBS will show these letters. Lamp will be RED. Some vehicles have been configured for lamp to remain on until 5-10km/h is achieved.

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer, numbers, colours and operating sequences	Special notes
Leyland DAF	XF	ORANGE. The letters ABS with an "I" below in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after 2 to 3 seconds.	ORANGE. The letters ABS with "II" below in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after 2 to 3 seconds.	
MAN	All Models (except TG-A)	RED (left). The letters "ABS" are written in a circle with what looks like brake shoes either side. The lamp illuminates with the ignition and can go off after 3 secs, or remain on until the vehicle has been driven above 6km/h.	<p>1. RED (right). The letters "ABS" are written in a circle with what looks like brake shoes either side. The lamp illuminates with the ignition and can go off after 3 secs. or remain on until the vehicle has been driven above 5-7km/h (controlled directly by ABS system on trailer via ISO 7638 dedicated socket).</p> <p>2. ORANGE. The letters "ABS" are written in a circle with what looks like brake shoes either side. The lamp can remain on provided the trailer is not fitted with ABS or the trailer has a stop lamp powered ABS system or is wired through 24S socket. If the trailer is equipped with ABS and coupled via ISO 7638 socket this lamp will be disabled.</p>	

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer; numbers, colours and operating sequences	Special notes
MAN	TG-A (with LCD Panel)	1. RED/YELLOW. The letters "ABS" are written in a circle with what looks like brake shoes either side. When the ignition is turned on the lamp shows RED for 2 secs, then changes to YELLOW for 2 secs, then goes off (further lamp functions will be accompanied by a text message to identify "Tractor ABS warning").	1. RED/YELLOW. Same lamp as tractor. When the ignition is turned on the lamp shows RED for 2 secs, then changes to YELLOW for 2 secs. Then goes off OR lamp remains yellow until the vehicle has been driven over 10km/h. (Further lamp functions will be accompanied by a text message to identify "Trailer ABS warning") 2. YELLOW. The letters "ABS" are written in a circle with what looks like brake shoes either side, a diagonal line through and number 1 to the right side. The lamp can remain on provided the trailer is not equipped with ABS or the trailer has a stop lamp powered ABS system or is wired through the 24S socket. If the trailer is equipped with ABS and coupled via an ISO 7638 socket lamp "2" will be disabled.	If the vehicle LCD displays a fault but the warning lamp is YELLOW, the vehicle is safe to proceed. This is an information device.
Mercedes	Atego 7.5 to 15 tonnes PRE 2000 Dashboard	Red Warning lamp with letters ABS at top of dashboard. Illuminates with ignition on and goes off after 3 seconds.		Lamp is advisory. If lamp remains on, the vehicle may be driven but workshop examination and rectification should be sought at earliest opportunity.
Mercedes	Atego 7.5 to 15 tonnes, year 2000 dashboard with information display panel	ABS warning lamp (white/grey, letters ABS with (O) symbol) to left of driver display illuminates with ignition on and goes off when engine is started. If fault detected, warning lamp illuminates in conjunction with red or yellow section of status bar.		Yellow status bar is advisory - vehicle may be driven. If red status bar illuminated the vehicle requires immediate attention and should not be driven.

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer, numbers, colours and operating sequences	Special notes
Mercedes	SK/MK tractors to 1997	RED. Warning lamp with letters ABS above tachograph. Left hand part for tractor, right hand part for trailer. Lamp illuminates with ignition and stays on until vehicle moves.	RED. Warning lamp with letters ABS above tachograph. Lamp illuminates with ignition and stays on until vehicle moves.	Lamp is advisory. Vehicle may be driven unless RED 'STOP' lamp is illuminated, if it is, workshop examination and rectification must be sought at earliest opportunity.
Mercedes	Atego, Actros, Econic pre 2000 dashboard	ABS warning lamp RED with letters ABS with (O) symbol in display zone. Left hand symbol for vehicle and right hand symbol for trailer. Lamp illuminates with ignition on and either goes off after 3 seconds or when the vehicle is driven.	RED letters with ABS with (O) symbol in display zone. Lamp illuminates with ignition on and either goes off after 3 seconds or when the vehicle is driven.	If a fault is detected the symbol is displayed with a fault code. The vehicle may be driven with a fault code displayed but not if the 'STOP' lamp is illuminated. If 'STOP' is illuminated immediate attention is required.
	Atego, Actros from 18 tonnes. Axor, Econic 2000 on dashboard with information display panel.	YELLOW. With the letters ABS and the (O) symbol in top right hand corner of display panel. Left hand symbol for vehicle, right hand for trailer. Illuminates with ignition and goes off after approx. 3 seconds. If a fault is detected, warning lamp illuminates in conjunction with red or yellow section of status bar. Warning text may also be displayed.	YELLOW. Letters ABS with (O) symbol. Illuminates with ignition and either goes off after approx. 3 seconds or when the vehicle is driven away. If fault detected, warning lamp illuminates in conjunction with red or yellow section of status bar. Warning text may also be displayed.	The yellow status bar is advisory so the vehicle may be driven. The warning may be temporarily canceled using the display reset button. If the red status bar cannot be cancelled, immediate attention is required.

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer; numbers, colours and operating sequences	Special notes
Renault	All models 7.5 tonne GVW and above	ORANGE. Has an icon that looks either like a circle with two arrows pointing out and with what looks like brake shoes either side or an icon of a vehicle skidding in a circle with again what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 seconds.	ORANGE. Has an icon that looks like a circle with two arrows pointing out with an 'R' in the middle and what looks like brake shoes on either side. Lamp illuminates with ignition and goes off after approx. 2 seconds.	If lamp remains on ensure that the front drive axle or inter axle dog clutches are not engaged. Disengagement may put the lamp out.
Renault	All models less than 7.5 tonne GVW.	ORANGE. Warning lamp T11. Lamp illuminates with ignition and goes off after approx. 2 seconds.	N/A	
Scania	92, 93, 112, 113, 142 & 143	RED. Shows the letters ABS with a pictogram of a truck. Lamp illuminates with ignition, stays on, goes off when driven over 5-7km/h.	1. RED. Shows the letters ABS with a pictogram of a trailer. The lamp illuminates with ignition, stays on and goes off when driven over 5-7km/h. ORANGE. As above but with a cross through the letters ABS. This lamp can remain on provided the trailer is NOT fitted with ABS or the trailer has a stop lamp powered ABS system.	

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer; numbers, colours and operating sequences	Special notes
Scania	94, 114, 124, 144, 164	ORANGE. Shows the letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 3 seconds.	1. ORANGE. The letters ABS in a circle with what looks like brake shoes either side with the figure '1' to the right hand side. This lamp can either illuminate with ignition and go off after 3 seconds or illuminate, remain on and will go off once moved above 5-7km/h. 2. ORANGE. As 1 above but with a cross through the letters ABS. This lamp can remain on provided the trailer is NOT fitted with ABS or the trailer has a stop lamp powered ABS system.	On some vehicles there may be fitted an additional ISO7638 male plug. This plug is normally stowed in a parking port. When towing a non ABS trailer or a Stop Lamp powered ABS trailer the Number 2 trailer warning lamp remains on. This plug can be inserted into the ISO7638 output socket which will disable this lamp.
Seddon Atkinson	M5 6x2 Rear Steer, Euromover 4x2 and 6x2 Municipals	RED. The letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds.	NA	
Seddon Atkinson	T6 Range of 4x2, 6x2 and 6x4 Artics	RED. The letters ABS in a circle with what looks like brake shoes either side. Lamp illuminates with ignition and goes off after approx. 2 to 3 seconds.	1. RED. The letters ABS in a circle with what looks like brake shoes either side above a pictogram of a two axled trailer. Lamp illuminates with ignition and will go off when moved over 7 km/h. 2. YELLOW. It has the same symbol as 1 but with a cross through it. When on, this informs the driver that the trailer is not fitted with ABS or the trailer has a stop lamp powered ABS system.	

Motor Vehicle ABS and EBS Warning Lamps Descriptions and Operating Sequences

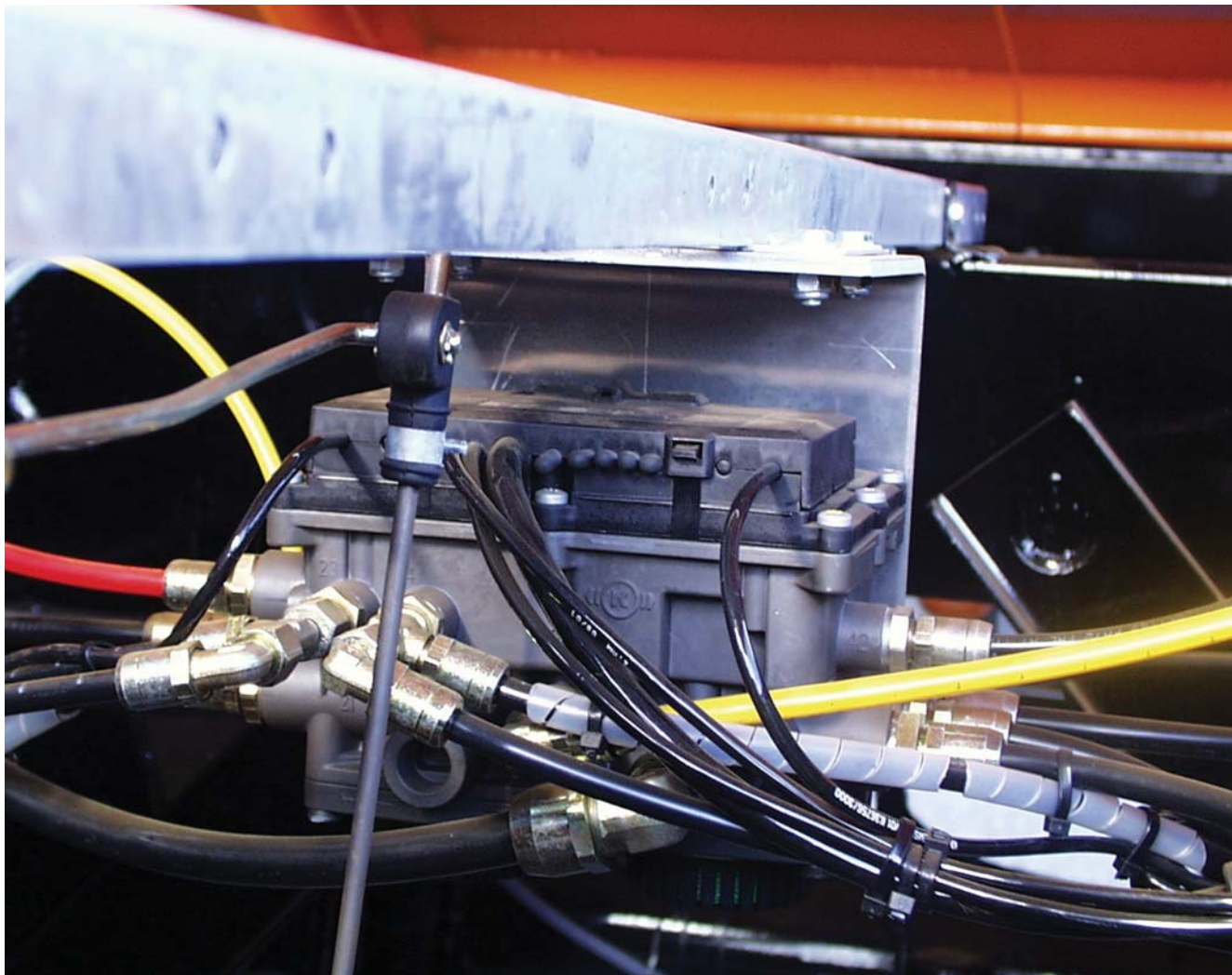
Make of vehicle	Models covered	Description of vehicle warning lamp, colours and operating sequence	Description of any warning lamps for a trailer; numbers, colours and operating sequences	Special notes
Volvo	1993 to 1998	ORANGE. Shows the letters ABS with a pictogram of a truck. Lamp illuminates with ignition, stays on, goes off when driven at over 5-7km/h.	1. ORANGE. Shows the letters ABS with a pictogram of a trailer. Lamp illuminates with ignition, stays on, goes off when driven at over 5-7km/h. 2. ORANGE. As above but a cross through the letters ABS. This lamp will illuminate and remain on when towing a non ABS trailer or when towing a trailer that has a stop lamp powered ABS system.	On some early models Volvo supplied relays which only operated No. 2 warning lamp once on the first brake application.
Volvo	1998 onwards	ORANGE. Shows the letters ABS with a pictogram of a truck. Lamp illuminates with ignition and off after approx. 3 seconds.	1. ORANGE. Icon of a trailer with the letters ABS in a circle with what looks like brake shoes either side. It will not illuminate if ABS is not fitted to the trailer or if the trailer ABS is stop lamp powered. When using the 24S and or ISO7638 the lamp follows the sequence designated by the trailer ABS system fitted. 2. ORANGE. As above but a cross through the letters ABS. This lamp will illuminate and remain on when towing a non ABS trailer or when towing a trailer that has a stop lamp powered ABS system.	
Volvo	FH & FM range 1998 onwards with LCD panel	ORANGE. Shows the letters ABS with a pictogram of a truck. Lamp illuminates with ignition and off after approx. 3 seconds.	1. ORANGE. Icon of a trailer with the letters ABS in a circle with what looks like brake shoes either side. It will not illuminate if ABS is not fitted to the trailer or if the trailer ABS is Stop Lamp Powered. When using the 24S and or ISO7638 the lamp follows the sequence designated by the trailer ABS system fitted. 2. To the left of the speedometer there is an LCD display. The driver will be advised if the trailer is not fitted with ABS or the trailer has a Stop Lamp Powered ABS system. It will also indicate other faults and will also advise if the driver is to stop or report the fault at the end of the journey.	

Quick Reference Table for Trailer EBS Information

EBS Manufacturer	Methods of Recognition	Warning Lamp Fitment & Sequences	Notes for Roller Brake Testing	System Anomalies
WABCO	Pictogram on Headboard, or Department reference number shows last digit as 8 or W	Standard specification is not to fit a lamp to the trailer. Early equipment, Turn ignition on, trailer lamp in cab illuminates and will stay on until moved over 10km/h. Later equipment, turn ignition on, trailer lamp in cab illuminates, goes off and illuminates again. It will go off once driven over 10km/h.	If the measured axle weight is less than 65% of the axle design weight. Condition for brake test by switching off engine, ensure no brake is applied, start engine, load sensing valve will be activated. This must be done for each axle being tested. Brake reading must be taken within 5 seconds before standstill function cuts in. Ensure a steady application of the brake. The system has a panic function which will override the load sensing valve. Acceptable to brake test with warning lamp illuminated.	If there is an ISO 7638 power failure to the system, the ABS and Load Sensing will not function. Units manufactured after 1st Feb 2003 will incorporate stop lamp back up ABS and LSV will be active.
Haldex	Pictogram on Headboard, or Department reference number shows last digit as H	Standard specification is not to fit a lamp to the trailer. Turn ignition on, trailer lamp in cab illuminates, goes off and illuminates again. It will go off once driven over 7km/h.	All functions active from ignition on. It is acceptable to brake test with the cab warning lamp illuminated. Ensure a steady application of the brake. This system has a panic function which will override the load sensing valve.	If there is an ISO 7638 power failure this system has a brake light back up, but it will only activate the ABS.
Knorr Bremse	Pictogram on Headboard, or Department reference number shows last digit as K	Standard specification is not to fit a lamp to the trailer. Turn ignition on the cab warning lamp will illuminate and go off.	If the tri-axle trailer trial brake test is still current, we must accept these trailers are tested unladen with the LSV on 1:1. Later units are fitted with a 5 to 15 minute delay from power up, where the brake lamp circuit will activate load sensing. If the warning lamp in the cab flashes it is indicating an unspecified fault, it is acceptable to continue with brake test. Ensure a steady application of the brake. The system has a panic function which will override the load sensing valve.	There is no Emergency Relay valve fitted. When the Red Emergency line is disconnected the spring parking brakes will come on. If there is an ISO 7638 power failure there is back up system via the brake lights which will work the ABS only.

September 2003. If in any doubt contact Technical Services, Welcombe House Swansea: 0870 60 60 440

KNORR BREMSE EBS



This manufacturer has the option of not fitting a Relay Emergency valve.

If not fitted the first thing you will notice about this system is when you disconnect the Red emergency line to conduct the shunt test, the parking spring brakes are applied and not the service brake. This is acceptable.

Light sequence

The trailers will not be fitted with a warning lamp unless the customer purchasing the trailer specifically requests one fitted. The light sequence will be ignition on, the dedicated trailer lamp will come on and go out and remain out. If the lamp starts to flash, it is indicating an unspecified fault. All the systems will function so it will be acceptable to continue with the trailer annual test.

When conducting the air depletion test the warning lamp sequence can be different when starting the engine to build the air up. If the air pressure in the trailer falls below 4.5 bar the lamp will indicate a fault until this pressure is achieved in the trailer reservoir. Over this pressure the lamps will sequence as normal.

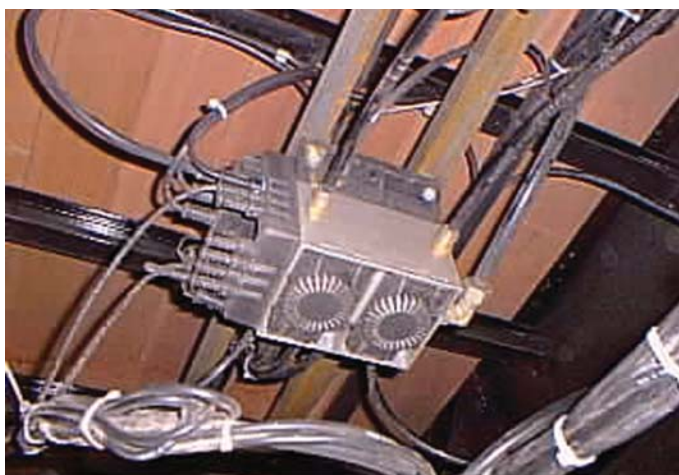
Conditioning for brake test

Providing the tri-axle unladen brake test method is still appropriate, trailers fitted with this system must still be accepted. For any reason other than a *statutory annual test*, the following information is relevant.

For early specifications, with our current test methods we have no way of bypassing the stationary non function of the load sensing valve. Later specification units are designed with a time delay system. From power up the brake light circuit will activate the load sensing side of the EBS unit for between 5 to 15 minutes before setting the standstill function back to a 1:1 application. We will try and identify these trailers by allocating a 'K' (see note below) as the sixth digit of the DTp reference number.

For information, this system is fitted with a back up system if there is a main power feed failure. The system will draw a small amount of current from the brake light circuit. This current is only enough to operate the ABS side of the system, i.e. no load sensing.

Trailers Fitted with HALDEX EB+/EBS



Roller Brake Testing

This system is fitted with a standstill function. If air is being fed by operating the footbrake pedal via the service line to the trailer during initial power up the standstill function is activated. This sets the load sensing to 1:1 for whatever state of load. The correct load sensing only becomes active when moved at over 15km/h. To condition the system for a brake test, ensure during power up, no air is being fed via the service line to the trailer, the load sensing valve is active for a maximum brake application of two minutes, if the brake is applied any longer the system reverts to a 1:1 application. Two minutes should be ample time to conduct a roller brake test. Provided that no application has lasted longer than two minutes, all axles can be checked without having to re-set the system. To ensure the load sensing valve is active, it is recommended that the first axle of the trailer be placed in the brake roller, switch off ignition, ensure no brake is applied, start engine and complete the roller brake test. The system must be powered up via the ISO7638 connection. (see below)

Electrical Systems

The standard cabling method for this system is a dedicated supply via an ISO7638 connection and a back up system via the 24N brake light circuit. The brake light back up system will only power the ABS, not the load sensing. If the ISO7638 is not connected and only the 24N is connected the driver will receive indication via the ABS/EBS warning lamp for the trailer. To confirm that only the ABS back up system is working it will be indicated by, turning the ignition on, the warning will come on after a wait of approx. 10 seconds, come on for two seconds and go off.

Section 9

Warning lights are generally not fitted to the trailers (you may come across an odd one; this will be fitted at a customer's specific request). The normal cab or trailer light sequence is; turn ignition on, the light will illuminate, go out, come back on again and remain on. The light will only go out when the trailer has exceeded 15km/h. There is the possibility that you may come across an acceptable alternative system where the warning light will illuminate for two seconds, go out and stay out. There are no clues to indicate which lamp sequence is being used, the only sure indication that everything is working is that no lamp is illuminated when being moved at over 15km/h.

If the first mentioned lamp sequence is being used, the roller brake tester will not rotate fast enough to put the warning lamp out. As long as the system has been conditioned to conduct a brake test, the load sensing valve will be operating even with the light on, therefore it is acceptable to brake test with the warning lamp on.

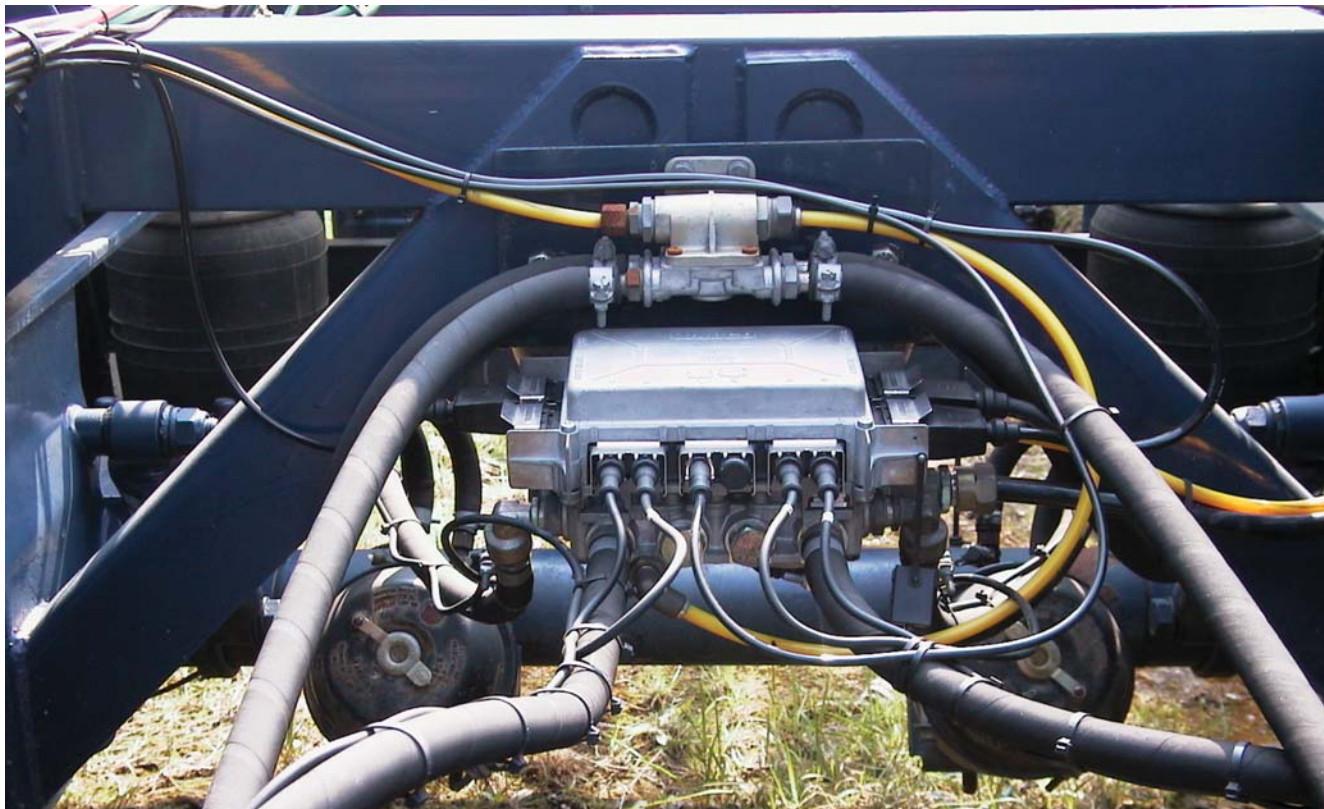
When conducting the air depletion test the warning lamp sequence can be different when starting the engine to build the air up. If the air pressure in the trailer falls below 4.5 bar the lamp will indicate a fault until this pressure is achieved in the trailer reservoir. Over this pressure the lamps will sequence as normal.

Options

There is an option with this system where the disconnection of the red emergency line can apply the spring parking brakes. The normal system will apply the service brakes. If either system operates when the red line is released the emergency function is operating correctly.

The system has a memory and can store information, which may be useful for accident investigations; Haldex can offer technical advice on 01527499499.

Trailers Fitted with WABCO EBS



A Pictogram is also fitted to the headboard to indicate that EBS is fitted.

If there is no power feed to this system the ABS and Load Sensing will not function (see Technical Notes).

Disconnection of the Red emergency will apply the brakes via the RE4 valve (see Technical Notes overleaf)

These trailers are generally not fitted with a warning lamp. There may be one fitted if a customer has specifically requested one. Refer to the dedicated trailer ABS warning lamp on vehicle dashboard.

There are two warning lamp sequences. It is intended that the first one will become the standard sequence, the second sequence is fitted to some early installations.

A.

- When vehicle stationary.
- Warning light comes on when ignition is switched on.
- Warning light goes off after approx. 2 seconds, if no defect is present.
- If a fault has been detected e.g. a sensor fault, the warning light will stay on.

B.

- When vehicle stationary.
- Warning light comes on when ignition is switched on.
- If no current fault detected, warning light goes off after approx. 2 seconds, comes back on and after approx. another 2 secs the lamp will remain on until moved at over 7km/h.

Section 9

For case B only it will be acceptable with the WABCO system to conduct a roller brake test with a warning lamp illuminated.

Note. In both cases warning light will come on at speeds above 7 km/h if a fault is detected (as with ABS today).

When conducting the air depletion test the warning lamp sequence can be different when starting the engine to build the air up. If the air pressure in the trailer falls below 4.5 bar the lamp will indicate a fault until this pressure is achieved in the trailer reservoir. Over this pressure the lamps will sequence as normal.

This unit needs to be conditioned before commencing a roller brake test. Place the first axle of the trailer in the roller brake tester, the vehicle ignition is switched off, ensure no brakes are applied, start engine. The load sensing valve will be active. This must be repeated for each axle in turn.

In a future update of the VOSA brake program we have requested a prompt from the roller brake tester to ensure this procedure is completed. Failure to do this, the brake test will be meaningless as a full pressure application will be made. If you start the engine with any air being fed down the trailer service line, load sensing will not become active until the sensed wheel speed has exceeded 7km/h.

When conducting the brake test a gradual application of the footbrake is essential. The system has a panic function where a sudden application of the footbrake is made, it will over ride the load sensing function but will still have an active ABS.

Technical Notes

If this system is towed by an EBS drawing unit, there is an additional data line between the two systems (CAN data) only with this combination and at **over 7km/h** will the disconnection of the emergency line not apply the brakes. Below 7km/h, the system will function as normal. If the combination separates above 7km/h the failure of the ISO 7638 connection will cause the brakes to be applied. This function is only integrated in modulators until October 2003. From this date the emergency brake will be applied independently from the CAN-data communication.

Stand Still Function

With the parking brake of the vehicle applied and air fed down the service line when the ignition is switched on, the system will give a 1:1 brake output i.e. no load sensing (this is a standstill function). In the normal running condition this unit has a slightly different standstill function. This alternative standstill function is activated after the vehicle combination has been driven over 7km/h. When the combination comes to rest and the vehicle footbrake or handbrake (which feeds air down the service line) is fully applied, the control unit will supply a load sensed pressure to the foundation brakes. If the brake application remains applied for longer than 5 seconds the control unit will supply a full service brake supply, bypassing the load sensing function. (i.e. the load sensing valve will go onto a 1:1 air pressure). During the annual test full pressure check, you must wait 5 seconds before carrying out the examination.

WABCO have advised that EBS units manufactured after 1February 2003 will be installed with a stop lamp back up system. The back up will operate both the load sensing and anti-lock systems.

ABS/EBS Information for Buses

The purpose of this section is to advise inspection staff of the current and future ABS requirements for buses and to address some general operational issues.

Application

Category 1 ABS is mandatory on the following passenger vehicles (the ABS will operate on at least one front axle and on one rear axle).

- Coaches, capable of more than 60mph, with a design Gross Vehicle Weight greater than 12000kg, with more than 16 passenger seats, first used on or after 1st April 1992, and manufactured on or after 1st October 1991.
- For all passenger carrying vehicles with more than eight passenger seats in addition to the drivers, first used on or after 1st May 2002, and manufactured on or after 1st November 2001.

Operation

Some ABS/EBS warning lamps or digital displays are capable of advising the driver that there is a minor fault with the system, i.e. the vehicle is safe to drive but will need some service attention as soon as practicably possible. As we come across these systems we will attempt to compile data of what information is given to the driver and publish it.

Later legislation requires the colours of the display to be red for a warning or stop and amber for information. There was no requirement for colour coding within the original C&U (Construction and Use Regulations) so, for some earlier installations these requirements may have not been complied with. These will continue to be acceptable. There are three common warning lamp sequences:

- a) Turn ignition on, lamp illuminates for approx. 2 seconds and goes out.
- b) Turn ignition on, lamp illuminates and stays on, it will then go out when driven over a preset speed, normally between 7 and 15km/h.
- c) Turn ignition on, lamp illuminates for approx. 2 seconds, momentarily goes out and comes back on, it will then go out when driven over a preset speed normally, between 7 and 15km/h.

During the annual test two possible actions may be noted, when the air depletion test is completed the lamp may stay on until a satisfactory air reservoir pressure has been achieved. During the roller brake test the lamp may come on as it may be sensitive enough to sense one wheel is rotating while the other is stationary.

Common Questions and Answers

In order not to delay the publication of this document we have tried to offer sensible guidance and good practice. Changes to the Annual Test procedures and standards and the Categorisation of Defects are made only following full consultation with interested parties, including associations representing commercial vehicle operators.

The following statements are to be regarded as provisional until this process has been completed. The following answers are included to provide an indication of how VOSA is likely to be dealing with these specific faults when encountered by examiners. Changes may be made when views expressed during the consultation process have been taken into account.

Annual Test

Question: What if there is no EBS pictogram fitted on a trailer headboard?

Answer: No action will be taken by testing staff. Pictograms are industry standard practice but there is currently no requirement to fit them.

Question: What would happen if there are no ABS/EBS warning lamps on the trailer or the vehicle and the trailer is found to be fitted with ABS/EBS?

Answer: The testing station will issue a form VTG12 "Notification of Failure to comply with Conditions of Accepting a Goods Vehicle for Examination" for the trailer because it is not accompanied by a suitable motor vehicle. The trailer test fee will be forfeited.

Question: If the trailer is presented for test and is fitted with an EBS system is it acceptable if the trailer warning lamp in the vehicle is marked ABS?

Answer: Yes.

Question: From what dates are ISO 7638 connections a mandatory fitment to vehicles and trailers?

Answer: Towing Vehicles first used on or after 1st May 2002 and Trailers over 3500kg manufactured on or after 1st May 2002 must be fitted with ISO 7638 connections. Earlier vehicles may optionally be fitted.

Question: From what dates must the ISO 7638 connections be used if they are both fitted to the vehicle and trailer?

Answer: If both tractor and trailer are fitted with connections they must be used regardless of date.

Question: What if the trailer presented for annual test is fitted with an ISO 7638 socket but the vehicle is not. Is it necessary for the vehicle to be fitted so the trailer socket can be tested on the trailer?

Answer: Changes to the annual test requirement are being considered. It is VOSA's intention to introduce an extra check for trailers fitted with an ISO7638 socket (irrespective of their age), to ensure that the drawing vehicle can power up the trailer systems using this connection rather than relying on other wiring such as brake light circuits. After the test is amended if the drawing vehicle towing this type of trailer has no ISO 7638 socket we will issue a VTG12 "Notification to Refusal to Test" and the trailer test fee will be forfeited. Check with your local testing station to see if this amendment has been implemented.

In the meantime as far as the test is concerned trailer ABS systems can be powered by the other electrical connections. However you should be aware that trailer EBS controls load sensing as well, and for this to work a permanent (not brake light powered) electrical supply is required to allow us to test these trailers. Accordingly you must present all EBS trailers drawn by ISO 7638-equipped tractors in any case. If you do not, your trailer will not be tested and you will be asked to represent it with a suitably equipped tractor unit.

Question: What happens at annual test if the ISO 7638 connector is fitted but the warning lamp in the vehicle does not operate or follow the correct sequence?

Answer: VOSA staff will carry out the annual test, but the trailer will fail under test item 38 Reason for Rejection No. 5 “Anti-lock warning lamp does not follow its correct sequence.”

Question: What if the ISO 7638 connector is fitted to both vehicle and trailer and during the annual test the dedicated trailer warning lamp in the vehicle indicates a fault?

Answer: Again VOSA staff will carry out the annual test, but the trailer will fail under test item 38 Reason for Rejection No. 5 “Anti-lock warning lamp does not follow its correct sequence.”

Question: What happens if the ISO 7638 connector is fitted between vehicle and trailer, and the vehicle is fitted with a third warning light that indicates the trailer is not fitted with ABS/EBS?

Answer: If the trailer has an independent warning device which follows the correct sequence, the trailer will be considered to have met the test requirements. The presenter will be advised that there may be a fault on the drawing vehicle.

Question: The ISO7638 connector is fitted between the vehicle and trailer. The trailer warning lamp in the vehicle functions correctly, however the trailer is fitted with a warning lamp that is not working. What action will be taken?

Answer: Some systems can deactivate a trailer headboard-warning lamp. The tester will confirm that the dashboard-warning lamp is working correctly and pass accordingly. To confirm the operation of the trailer headboard warning lamp disconnect the ISO7638 connection leaving the 24N and 24S and check for operation.

Question: When a warning lamp sequence requires the combination to be moved in excess of 7kph to complete the flash cycle, does this have to be checked?

Answer: Currently this is not an annual test requirement.

Question: If during the speed limiter test by speed simulation as part of the Annual Test, the ABS/EBS warning lamp illuminates, what should be done?

Answer: Continue with the speed limiter test. The warning lamp may simply have been illuminated because the management ECU has detected that the tachograph indicates 80+ km/h whilst the wheels are stationary. Frequently this has no effect on the correct operation of the speed limiter and the warning lamp resets once wheel and propshaft speed are re-synchronised. Attempt to complete the simulated speed test, and pass or fail according to what speed the response occurs at.

If the EBS/ABS lamp illuminates and the speed limiter does not appear to respond at all this may be because the signal for the limiter is coming from the wheel speed sensors for the EBS/ABS and not the tachograph. In this case revert to tachograph chart evidence or in the absence of these inform VOSA Enforcement that no speed limiter check could be carried out. Again the warning lamp should reset when the equipment is removed and the vehicle driven for a short distance.

Categorisation of Defects for in-service inspections

Question: If the vehicle needs to be moved to check a warning lamp goes out, when can this be done?

Answer: Only when and where the examiner considers it safe to do so.

Question: What if a vehicle and trailer are being used with only the 24N and 24S connections used?

Answer: All EBS trailers must have an ISO 7638 connection from the towing vehicle. For ABS trailers, if either the vehicle or trailer are not fitted with an ISO7638 socket, provided the driver has a functioning ABS warning device for the trailer this is acceptable. If the vehicle and trailer are both fitted with ISO 7638 connections they must be connected and the operating lamps checked again. If the ISO 7638 cable is not being used but the ABS system on the trailer is confirmed to be working, a delayed prohibition will be issued. If the ABS system can not be confirmed to be working or if an EBS trailer

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used with a non-ISO 7638 equipped towing vehicle, an immediate prohibition will be issued to the trailer.

Question: The ISO 7638 connection is fitted between vehicle and trailer. What if the dedicated trailer warning lamp fitted to the drawing vehicle is inoperative but there is a warning lamp on the trailer that functions correctly?

Answer: A delayed prohibition will be issued to the drawing vehicle.

Question: What if the vehicle dashboard trailer warning lamp functions correctly but there is a warning lamp fitted to the trailer that is inoperative?

Answer: If an ISO7638 cable is in use, some systems can disable a headboard trailer warning lamp and this is acceptable. To confirm the trailer headboard warning lamp operates, disconnect the ISO7638 cable leaving the 24N and 24S connected; the headboard lamp should then work as normal.

Question: If a vehicle is indicating an ABS fault when inspected and it is also fitted with an ABS reset button, can the driver operate this button? If the pressing of the button clears the fault what action will be taken?

Answer: A delayed prohibition will be issued. The fault may re-occur once the vehicle is driven i.e. it could be indication of a wheel sensor defect.

Question: The vehicle has the two trailer warning lamps i.e. one main trailer warning lamp and an advisory lamp to inform the driver that he is towing a trailer without ABS. What happens if the advisory trailer lamp is illuminated, yet the trailer is found to be fitted with ABS but the trailer is not fitted with a correctly functioning warning lamp on the trailer headboard?

Answer: A delayed prohibition will be issued to the vehicle as it indicates a brake system wiring fault.

Question: As above the vehicle has the two trailer warning lamps i.e. one main trailer warning lamp and an advisory lamp to inform the driver that the trailer being towed is not equipped with ABS. What if the advisory trailer lamp is illuminated but the trailer has a correctly functioning ABS warning lamp on the trailer headboard?

Answer: The trailer is probably fitted with a stop lamp powered system. The examiner will disconnect all cables except the 24N, and if the warning lamp on the trailer still operates it is OK to proceed. It is important that after this test the other cables are reconnected!

Question: What if the system in the vehicle is indicating an advisory defect where it is informing the driver to have the system looked at as soon as possible?

Answer: Because it is not indicating a failure fault in the system the vehicle should be allowed to proceed. A Defect Notice will be issued.

Question: Is it acceptable for off-road vehicles to be fitted with an isolator switch, which temporarily disconnects the ABS function?

Answer: Yes, but only on goods motor vehicles over 3500kg, which are off-road vehicles. There are more conditions which can be found in EEC Directive 98/12 or UNECE Regulation 13. The driver must reset the ABS when the vehicle rejoins the public highway. The motor vehicle must automatically reset the ABS to standard operation when the ignition switch is activated. Vehicles used by a Police Authority which have been authorised by the Chief Constable to perform accident re-construction duties are also permitted to use isolator switches. A separate device to isolate the ABS for the trailer is not permitted.

Question: Are there any other examples of vehicles that are exempt from ABS?

Answer: Purpose built vehicles with a maximum design weight of 7500kg, designed and used for street cleaning are exempt.

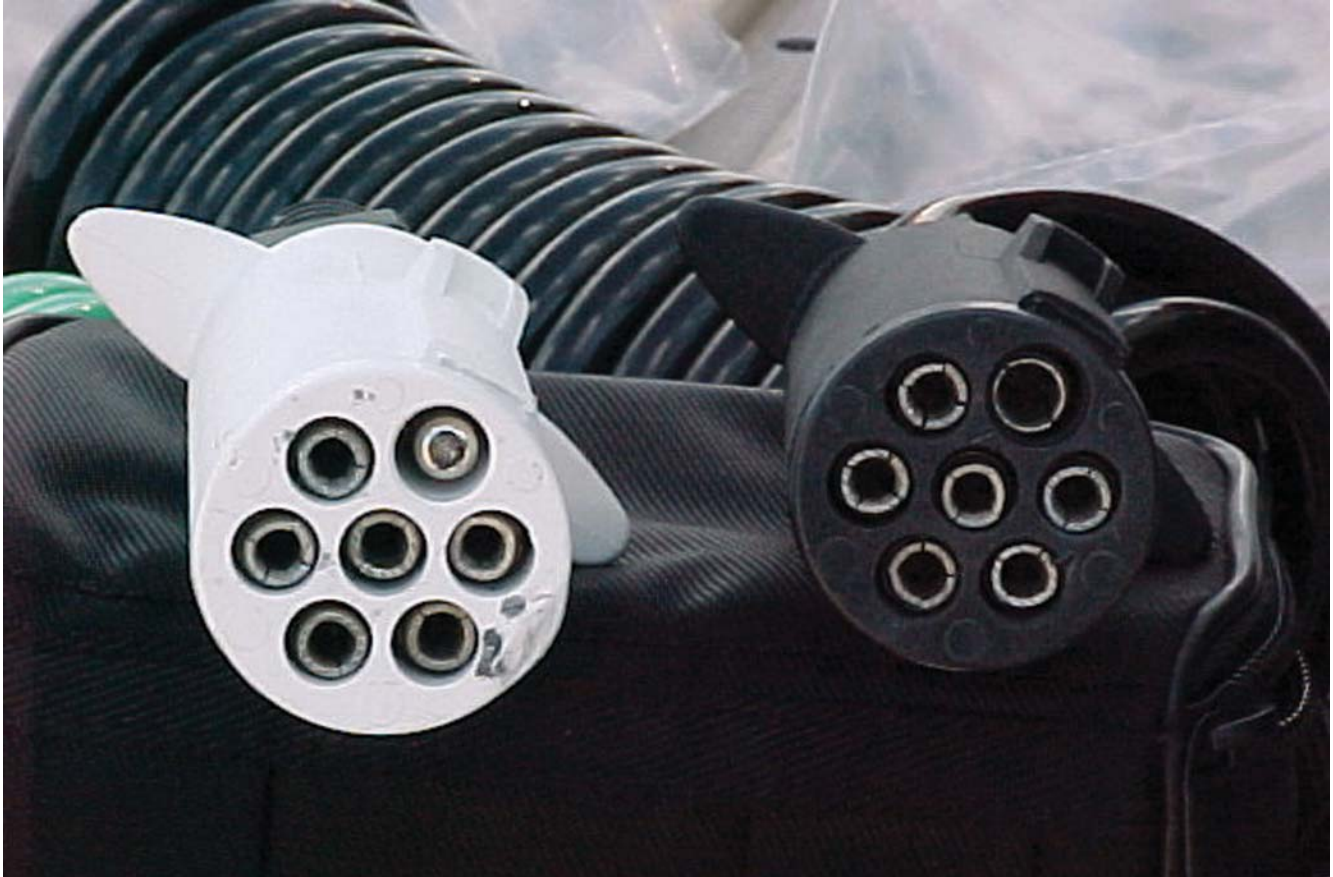
Question: If during a static test the drawing vehicle indicates an ABS trailer fault what action should be taken.

Answer: The answer to this is not straightforward. It is normal for some later model vehicles to indicate a trailer fault when the ignition has been switched on. What is happening is that the vehicle on board diagnostics attempts to do a static test of the trailer ABS. There are a number of trailer ABS systems that will not carry out this test and consequently the drawing vehicle will indicate a trailer fault. When the drawing vehicle begins to move and gets over the system threshold speed (around 15km/h) the drawing vehicle will then conduct a dynamic diagnostic test, if this is successful the warning lamp will go out. Before issuing any prohibitions you must ensure beyond doubt the trailer ABS is faulty.

Version June 2003

IMPORTANT INFORMATION FOR DRIVERS ABOUT ABS

If your vehicle is of an age where it is only fitted with a 24N (Lighting ISO1185) and 24S (Supplementary ISO3731) electrical connections, as below, you must be fully aware of the following notes.



If the trailer you are about to couple is fitted with ABS, it is your responsibility to ensure that the system is working before commencing a journey. There is a Vehicle and Operator Services Agency publication (Your Guide to ABS and EBS) which will give you details of which trailers must be fitted with ABS. Other trailers may also be fitted with ABS.

Helpful clues are; is the trailer fitted with an ABS warning lamp? Is the trailer fitted with a black socket which you use the metal positive locking clip? If yes, it means the trailer is fitted with ABS. Look on the Ministry Plate, does the DTp Ref. Number have a last digit of 2, 3, 6, 7, 8, W, K, or H? If yes the trailer is fitted with ABS.

If there is no warning lamp fitted on the trailer it may still be fitted with ABS. It is not essential for a trailer manufacturer to fit a warning lamp to the trailer as the warning light may be in the drawing vehicle cab.

If the trailer has ABS you must not drive this combination if you have not got a warning lamp informing you that the system on the trailer is functioning. If you rely on a dashboard warning lamp, it must be the one which is dedicated for the trailer. If both vehicle and trailer are fitted with the new type ISO7638 connections they must be used at all times.

If you are not sure seek advice!