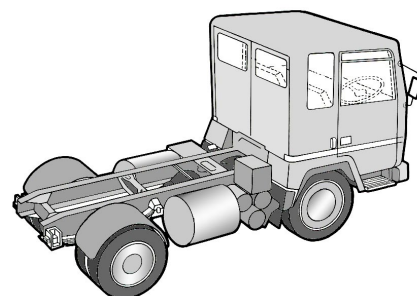


TK^x

INSTALLATION INSTRUCTIONS



000 700 285 / 11.04 / Redditch



This manual has been designed to assist personnel in satisfactorily installing Haldex **TK^x** on Trucks. 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 **HALDEXENGINEER**.
- b) A reminder of the correct procedure of Haldex **TK^x** installation.

For any other deviation consult
Haldex Brake Products Ltd.

Moons Moat Drive
Moons Moat North
Redditch
Worcestershire
B98 9HA
Tel: +44 1527 499 499
Fax: +44 1527 499 500

- Use appropriate spare-parts documentation when obtaining spare parts.
- Use only genuine Haldex parts in repairs.
- Due to continuous development the right is reserved to alter the specification without notice
- No legal rights can be derived from the contents of the manual.
- Duplication, translation and reprinting are prohibited without permission from Haldex Brake Products.

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ABS Warning Lamp:	This lamp serves two functions: it alerts drivers to an ABS fault and it is used during a diagnostic session to display the blink code identifier.
Blink Code:	A series of flashes, which describe a particular ABS system fault or condition.
Blink Code Cycle:	Two sets of flashes with each set separated by a 1.5-second pause. The interpretation of each code is given on Page 18 to 21.
Diagnostic Switch:	A momentary action switch that initiates a blink code diagnostic session.
Clear Faults:	The process of erasing faults from the ECU.
Diagnostics:	The process of determining ABS system faults by using blink codes.
Fault:	An ABS or Auxilliary components malfunction detected and stored by the ECU. There are two types of fault: Active or Stored .
Active Fault:	A condition that currently exists in the ABS system. An active fault must be repaired before it can be cleared from memory; and before additional blink code faults can be displayed.
Stored Fault:	There are two types of stored faults: <ol style="list-style-type: none"> 1. A repaired active fault, which has not been cleared from the ECU. 2. A fault that occurred but no longer exists. Because stored faults are not currently active they do not have to be repaired before they can be cleared from memory.
System Configuration Code:	A two-phase code displayed during the clear mode. The first phase indicates the ABS configuration. The second phase indicates any Auxiliary components fitted to the system. Configurations are shown on Page 16.
Diagnostic Mode:	To enter the diagnostic mode, press and hold the diagnostic switch for one second then release.
Clear Mode:	To erase faults from the ECU must be in Clear Mode. Pressing and holding the diagnostic switch for at least three seconds then releasing enters Clear Mode. If the system displays eight quick flashes followed by the System Configuration code, the clear operation was successful. The stored ABS faults have been cleared from memory. If eight flashes are not received there are still active faults that must be repaired before they can be cleared.

The **TK^x** ABS system has been designed and developed to meet the legislative requirements.

The system operates by analysing individual wheel speeds and takes anti lock action by removing the brake from a wheel or wheels when a predetermined level of wheel deceleration and slip have been achieved. When such a signal is seen by the controller and the respective solenoid in the control valve is energised the pressure in the brake chamber relative to that wheel is exhausted. When wheel acceleration occurs the control solenoid is de-energised and the brake reapplied.

The ABS valve was developed to ensure that air is able to pass rapidly both to and from the brake chambers.

While the valve is able to meet the air flow requirements of satisfactory anti lock operation the overall performance of a vehicle in terms of stability and driver comfort is dependant on the correct system air flow characteristics being achieved.

These criteria are not purely a function of the ABS valve but are directly related to the level of pipework, pipe fittings and port size en route from the ABS valve to brake chamber. Therefore, to ensure that the requisite parameters are achieved it is recommended that the guidelines of these instruction are adhered to at all times.

Failure to follow the instructions may result in reduced stability and driver comfort.

The **TK^x** system fitted has **4 Sensors** and **4 Modulators** (ABS valves), the configuration being 4S/4M. The Electronic control unit (ECU) is a sealed unit and is in-cab mounted. The ABS valves are SSILV with a two pin electrical connector and are chassis mounted. The ABS valves are not handed and can be fitted left or right, front and rear positions.

ABS Configuration:	4S/4M - 4S/3M Category 1 (ECE Regulation 13/09)
Operating Voltage:	24 Volts DC nominal (19 - 32 volt range)
Current Consumption:	5 Amps
ECU:	Flame retardant, fully encapsulated, plastic enclosure In-Cab mounting AMP C-175444 un-sealed connector, 34 way (12+22)
EMC / RFI Approval:	Directive 72/245/EEC as last amended by Directive 95/54/EEC
ABS Valves:	Haldex SSILV In-line, Chassis mount, un-handed, Inlet M16, Delivery M22
Operating Medium:	Air
Operating Pressure:	0 - 8.5b (9.5b, max)
Max Pressure:	16b
Residual Pressure:	0b
Brake chambers:	2 x T30 per valve, Max.
Exciter:	80-100T Options - refer to Haldex engineering
Diagnostics:	Blink Codes PC End-of-Line Test. via CAN interface
Retarder:	Automatic system configuration
Vehicle Configuration:	Tractor, Rigid, Bus 4x2, 6x2, 6x4
GVW:	8.0 to 44.0 Tonnes
Engine Location:	Front, Middle or Rear of Vehicle
Permissible Tyre Sizes:	Product standard, 311 rev/km +/- 17.5% i.e. 10:00 R 20 (Rolling circumference 3211mm)
Vehicle Brake System:	Full Air Air Over Hydraulic

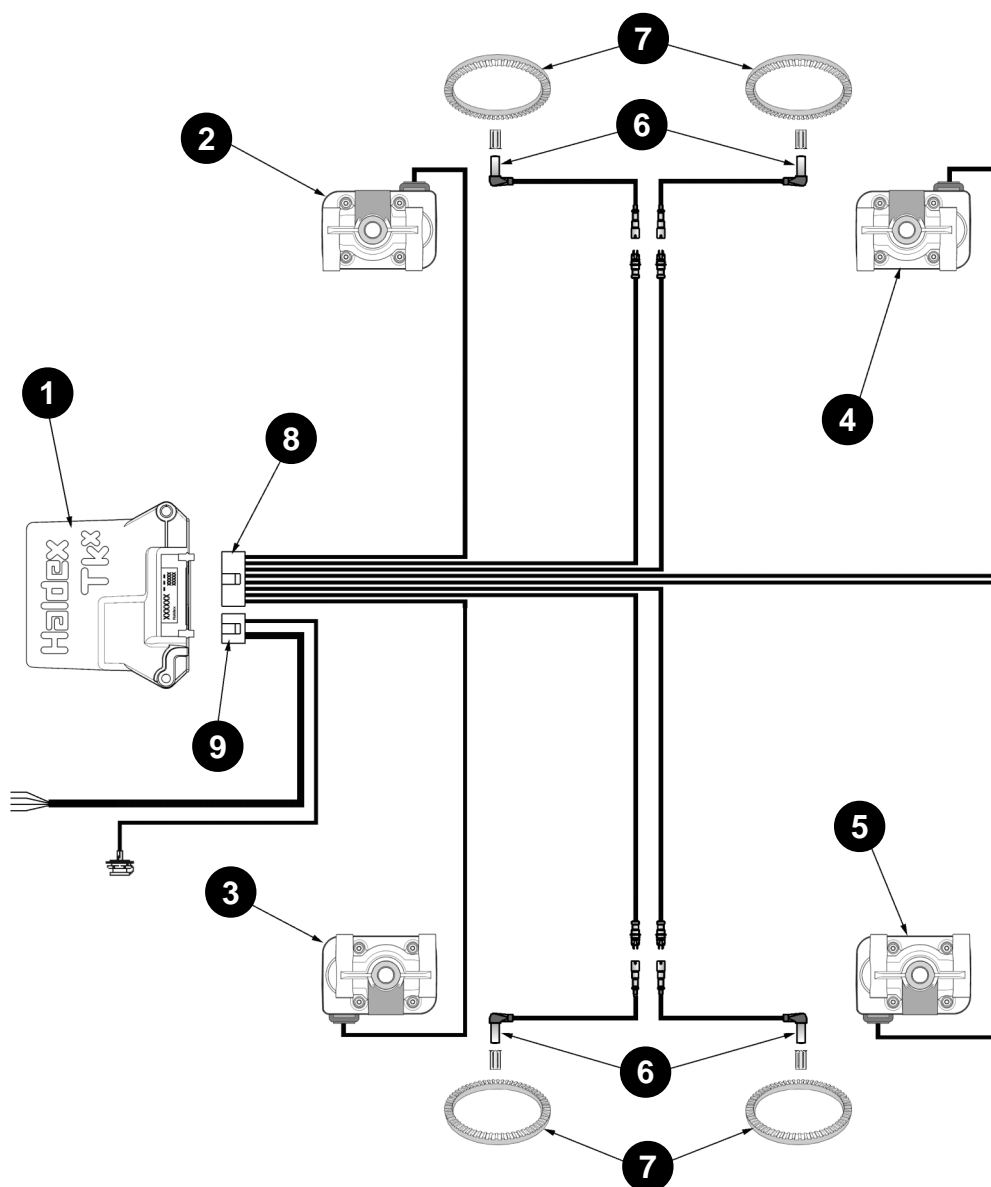


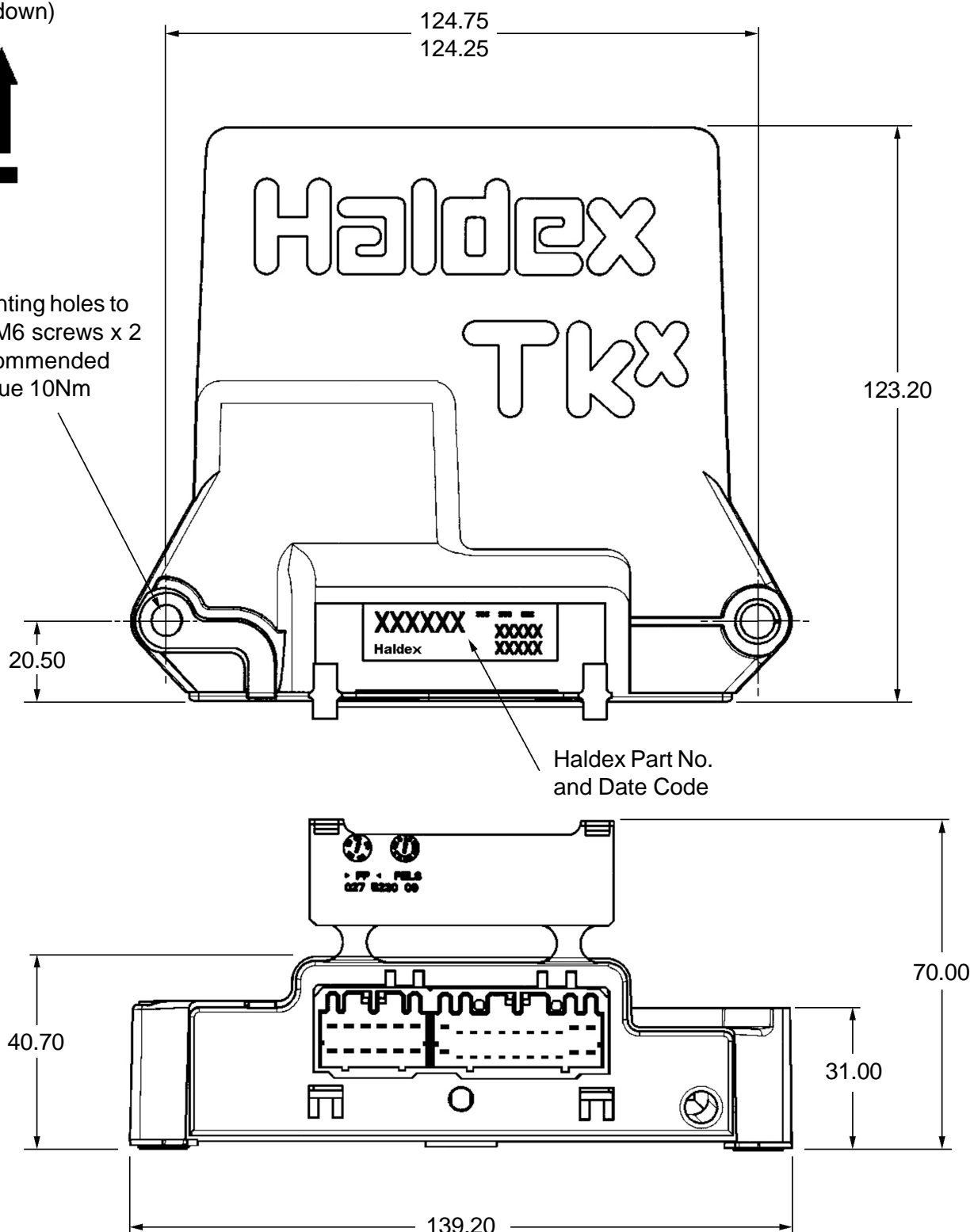
Fig 1

Item	Description
1	ECU
2	Front Right ABS valve
3	Front Left ABS valve
4	Rear Right ABS valve
5	Rear Left ABS valve
6	Sensor assembly
7	Exciter
8	Chassis cable assembly
9	Power/Diagnostic cable assembly

MOUNTING
POSITION
(Connector
facing down)

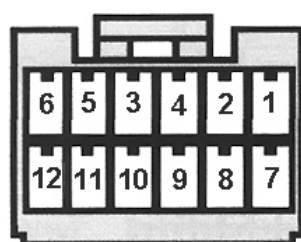


Mounting holes to
suit M6 screws x 2
Recommended
Torque 10Nm



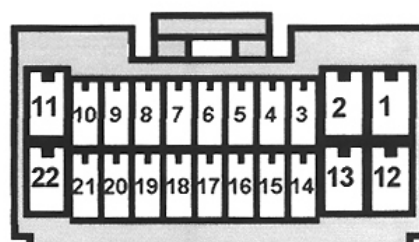
Mass of assembly = 320g

Fig 2



Cab Connector

(12 Way) Fig 3



Chassis Connector

(22 Way) Fig 4

ECU Pin No (Ref Only)	Pin Reference	Wiring Loom	Cable Colour (Reference Only)
Cab Connector			
1	CAN Lo	6	Yellow
2	B+ Ignition	5	White
3	ABS Lamp / Diag Switch	4	Yellow
4	CAN B+	3	Red
5	B+ Solenoid	2	Red
6	Retarder	1	Black
7	CAN Hi	12	Green
8	CAN B-	11	Blue
9		10	
10		9	
11	B- Common	8	Black
12	B- Common	7	Black
Chassis Connector			
13		11	
14	Solenoid RR	2	Brown
15	Solenoid RL	1	Brown
16	B- Common	22	
17	Solenoid FR	13	Brown
18	Solenoid FL	12	Brown
19	B- Common	10	
20	B- Common	9	
21	Sensor FR Hi	8	S1B Brown
22	Sensor RL Hi	7	S2A Black
23	Sensor FL Hi	6	S1A Black
24	Sensor RR Hi	5	S2B Brown
25		4	
26	80/100T Select	3	Brown
27	B- Common	21	
28	B- Common	20	
29	Sensor FR Lo	19	S1B Black
30	Sensor RL Lo	18	S2A Brown
31	Sensor FL Lo	17	S1A Brown
32	Sensor RR Lo	16	S2B Black
33		15	
34	80/100T Select	14	Brown

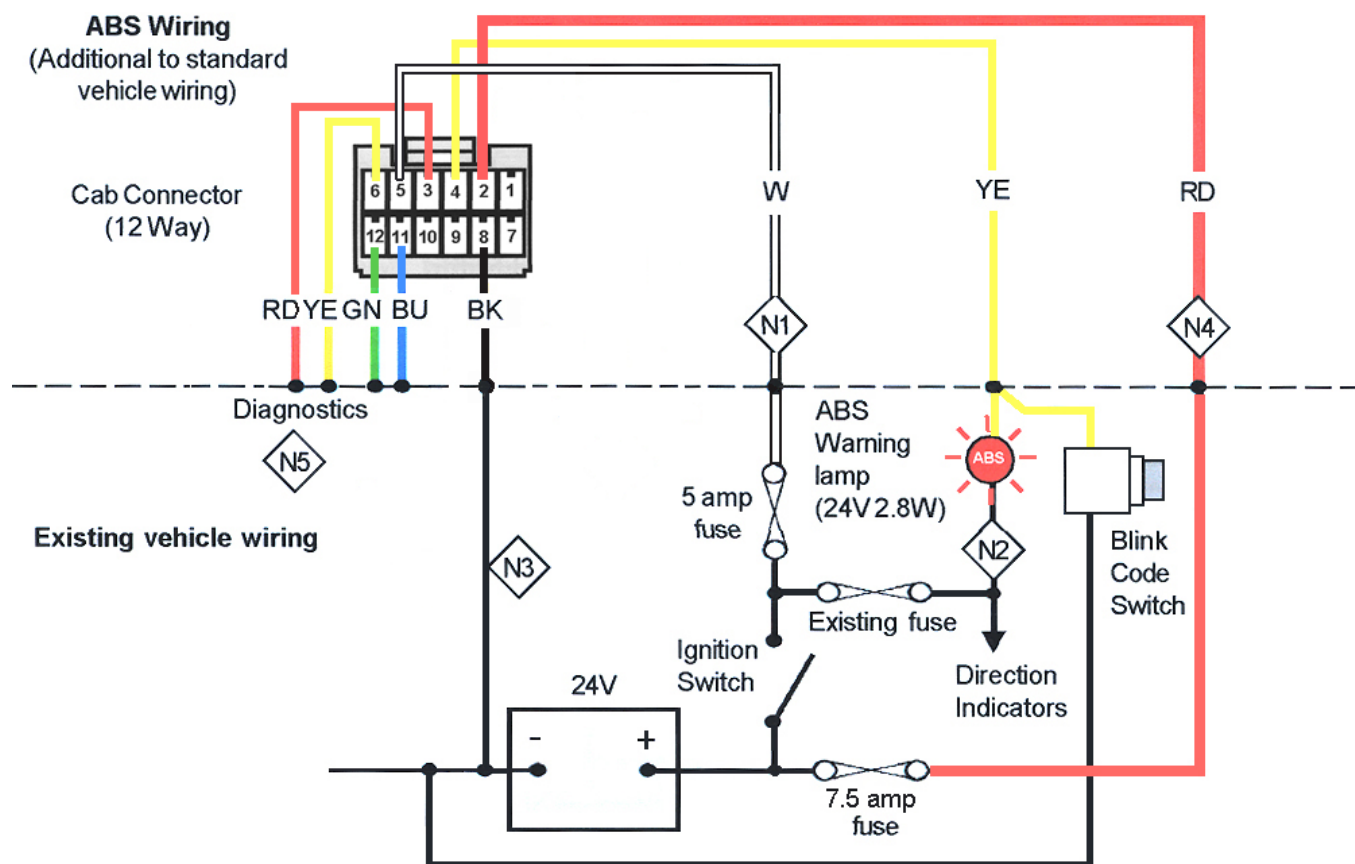


Fig 5

- N1 This wire is to be connected to the fused 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 connector to the main battery negative pick up point.
- N4 This wire is to be connected to an fused battery positive supply which has a continuous current rating of at least 7.5A.
- N5 The CAN wires are not connected.

Cab Connector Pin No.	Description	Colour (Reference Only)	Cable size
2	Fused BAT+	RD	1.0mm ²
5	Fused Ignition switched B+	W	0.75mm ²
4	Blink code switch	YE	0.75mm ²
8	BAT -	BK	0.75mm ²
4	Lamp	YE	0.75mm ²
3	CAN B+	RD	0.75mm ²
6	CAN Lo	YE	0.75mm ²
11	CAN B-	BU	0.75mm ²
12	CAN Hi	GN	0.75mm ²

Key

BK = Black
 BN = Brown
 RD = Red
 YE = Yellow
 W = White
 GN = Green
 BU = Blue

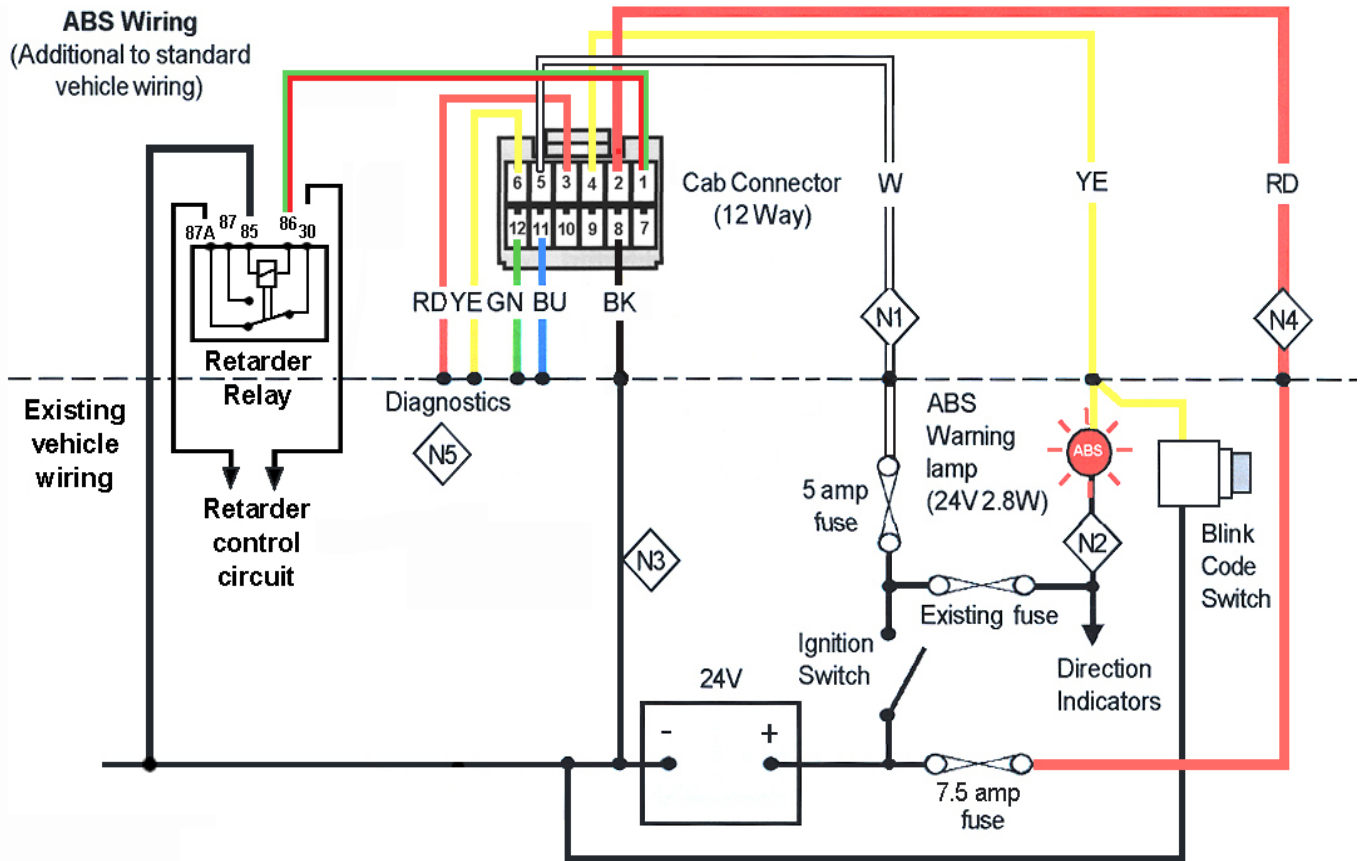
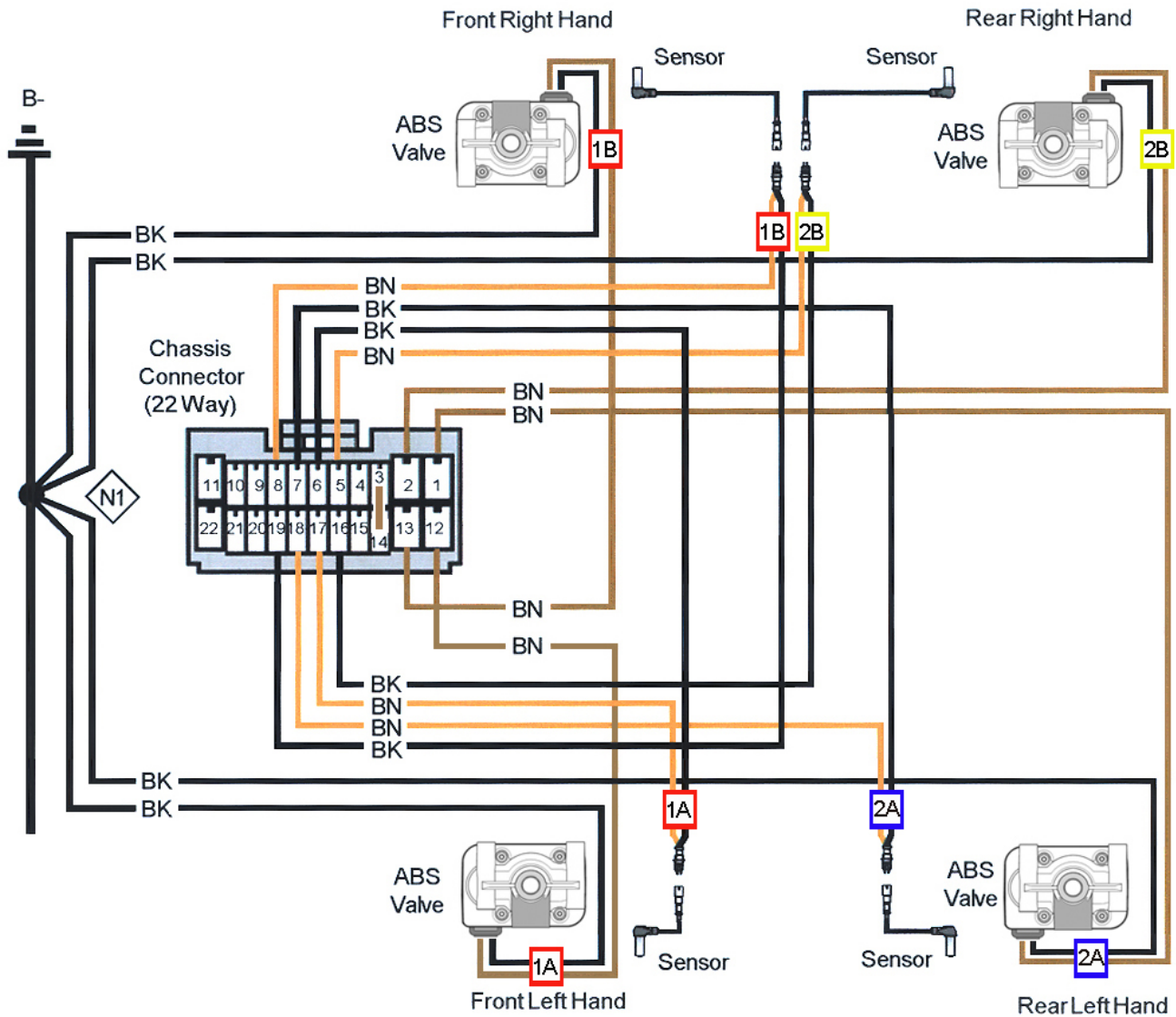


Fig 6

- N1 This wire is to be connected to the fused 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 connector to the main battery negative pick up point.
- N4 This wire is to be connected to an fused battery positive supply which has a continuous current rating of at least 7.5A.
- N5 The CAN wires are not connected.

Cab Connector Pin No.	Description	Colour (Reference Only)	Cable size
2	Fused BAT+	RD	1.0mm ²
5	Fused Ignition switched B+	W	0.75mm ²
4	Blink code switch	YE	0.75mm ²
8	BAT -	BK	0.75mm ²
4	Lamp	YE	0.75mm ²
3	CAN B+	RD	0.75mm ²
6	CAN Lo	YE	0.75mm ²
11	CAN B-	BU	0.75mm ²
12	CAN Hi	GN	0.75mm ²

Key
BK = Black
BN = Brown
RD = Red
YE = Yellow
W = White
GN = Green
BU = Blue



N1 These wires is to be connected to the main battery negative pick up point.

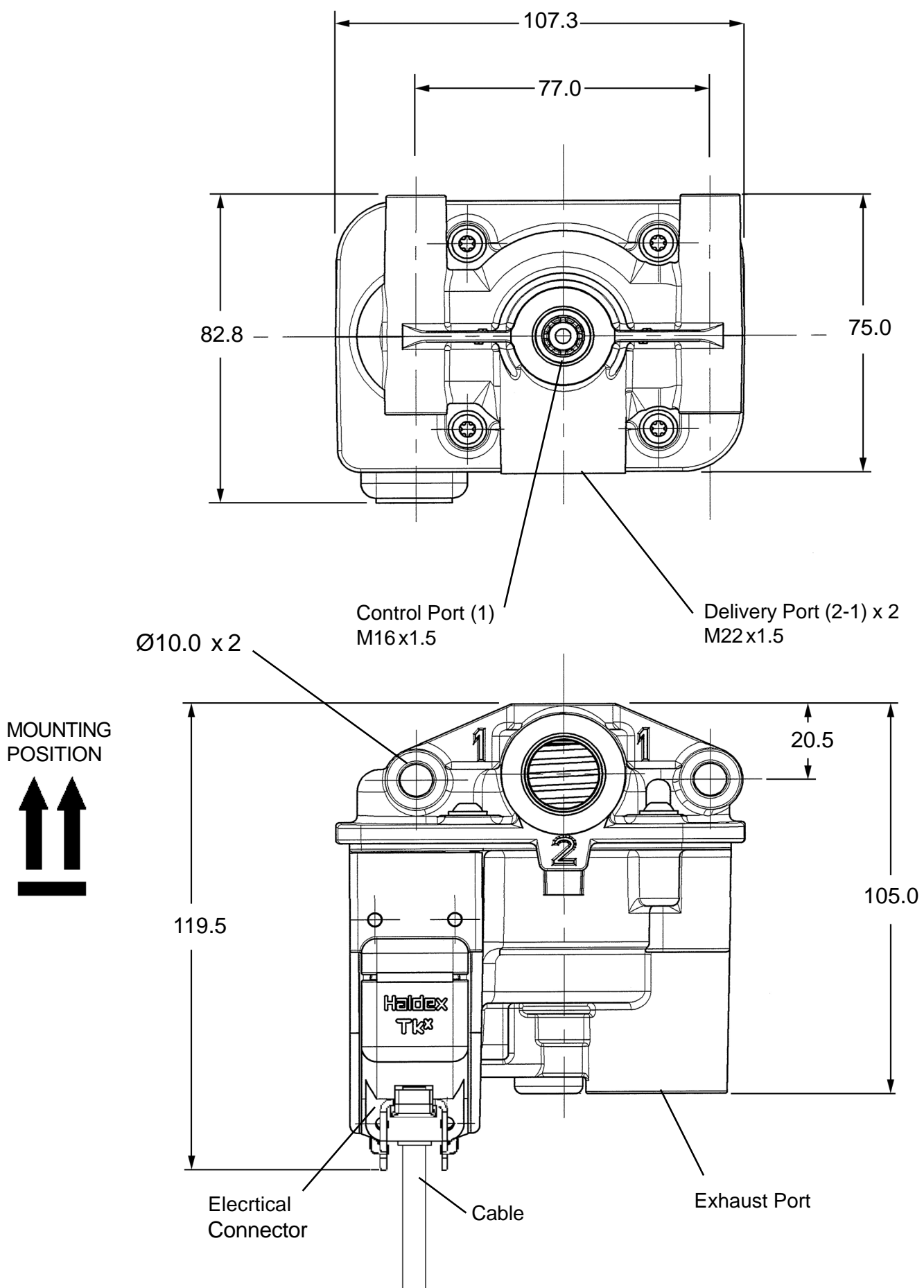
N2 With Link 80 tooth selected, Without Link 100 tooth selected

Chassis Connector Pin No.	Description	Colour (Reference Only)	Cable size
1	Solenoid RL	BN	0.75mm ²
2	Solenoid RR	BN	0.75mm ²
3 and 14	80 or 100 T Link	BN	0.75mm ²
5	Sensor RR Hi	BN	0.75mm ²
6	Sensor FL Hi	BK	0.75mm ²
7	Sensor RL Hi	BK	0.75mm ²
8	Sensor FR Hi	BN	0.75mm ²
12	Solenoid FL	BN	0.75mm ²
13	Solenoid FR	BN	0.75mm ²
16	Sensor RR Lo	BK	0.75mm ²
17	Sensor FL Lo	BN	0.75mm ²
18	Sensor RL Lo	BN	0.75mm ²
19	Sensor FR Lo	BK	0.75mm ²

Key

BK = Black
BN = Brown

Fig 7



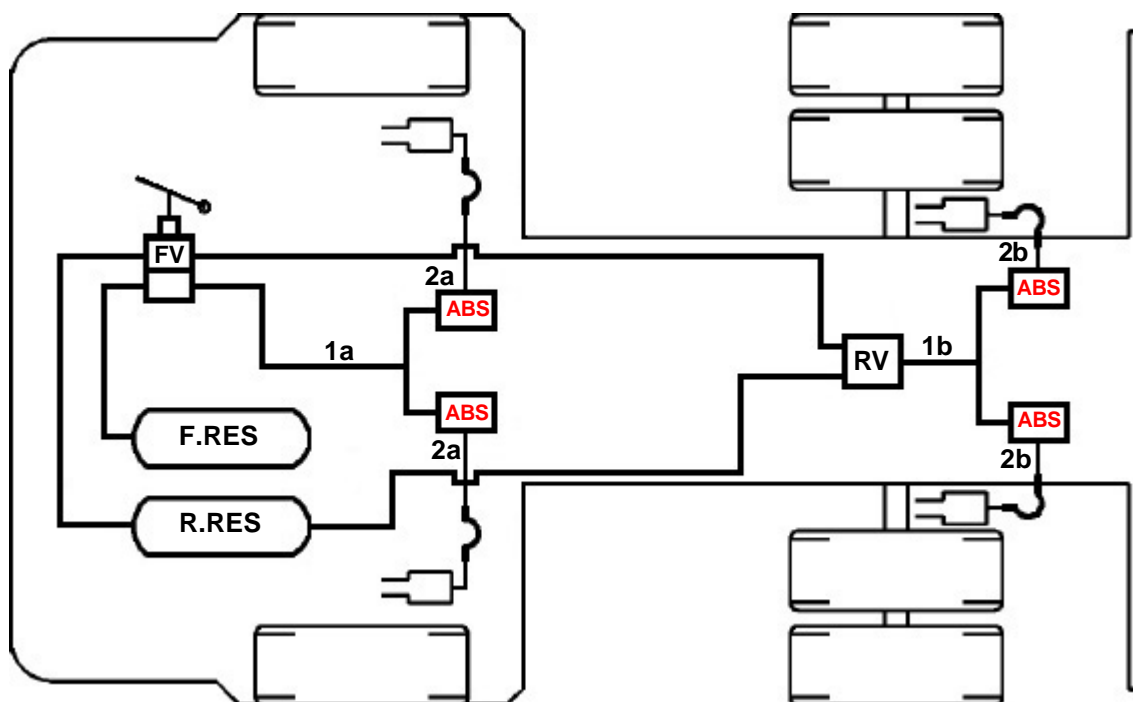


Fig 9

FV= Foot Valve
RV= Relay Valve
F.RES= Front Reservoir
R.RES= Rear Reservoir
ABS= ABS Valve

Nylon Pipe
1a,1b= 12x1.5
2a,2b= 12x1.5 Min. (Alt. 12mm I.D. Rubber Hose)

Nylon pipe to specification:
 DIN 73378 / DIN 74324 - Metric pipe

The **TK^x** system is provided with a warning lamp which is fitted in the cab dashboard to indicate the ABS status. The warning lamp is operated when the **TK^x** system is powered by the ignition switch.

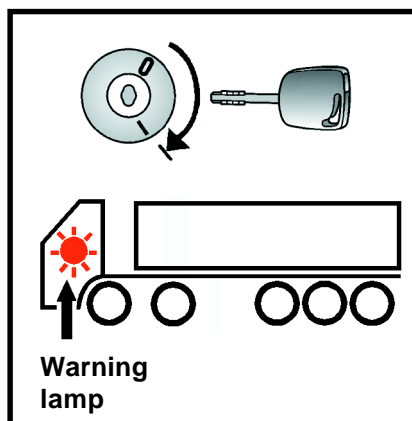


Fig 10

1. On power up of the system, the ABS warning lamp must indicate in the following sequence in order to show a fault-free system:

Normal Operation

ON for 1 seconds = Warning device OK and system self-checking.

OFF = System self-checked (not sensors)

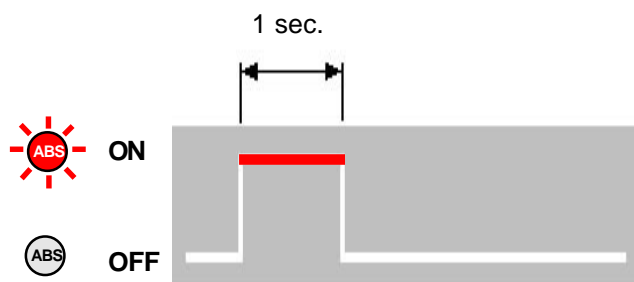


Fig 11

2. During the self-check procedure, the system cycles the ABS Valves. With foot brake applied one exhaust of air from each ABS Valve in order of Front Left, Front Right, Rear Left and Rear right will be audible. Once these two checks are made with correct results, no further static checks are required.

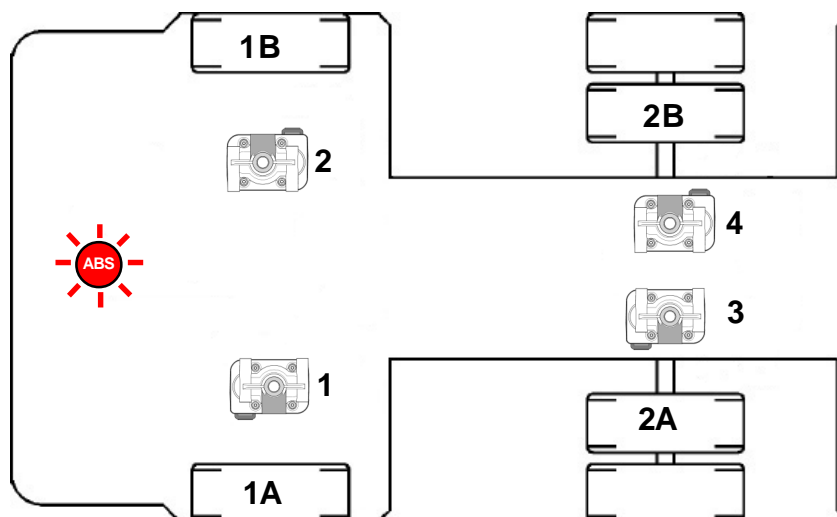
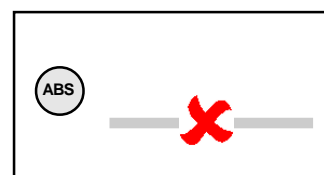
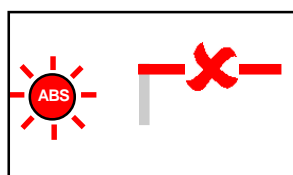
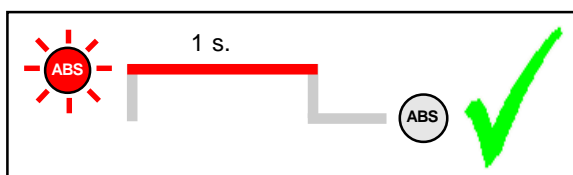


Fig 12

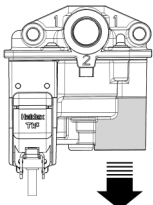
Key	
	ABS valve Cycle
	O.K.
	NOT O.K.

1 Power ON, Watch ABS lamp.

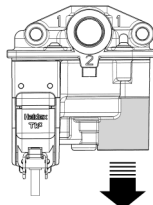


2 Depress foot brake, Power ON, Listen for order of blow down.

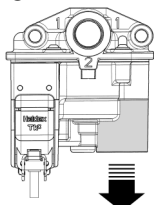
1 - FLH



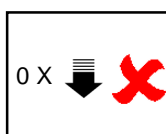
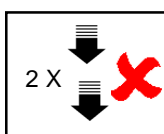
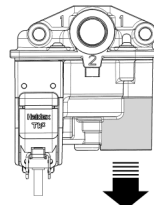
2 - FRH



3 - RLH



4 - RRH



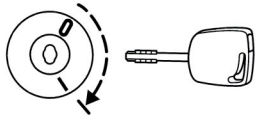
A blink code switch is provided to indicate the **TK^x** System and Auxiliary configuration. A two-digit code is displayed in the form of a blink code cycle.

4S/4M ABS Configuration = 5 Lamp flashes (1st Digit)

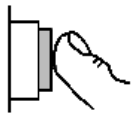
No Auxiliary Configuration = 1 Lamp flash (2nd Digit)

The procedure and configuration blink code are illustrated as follows:

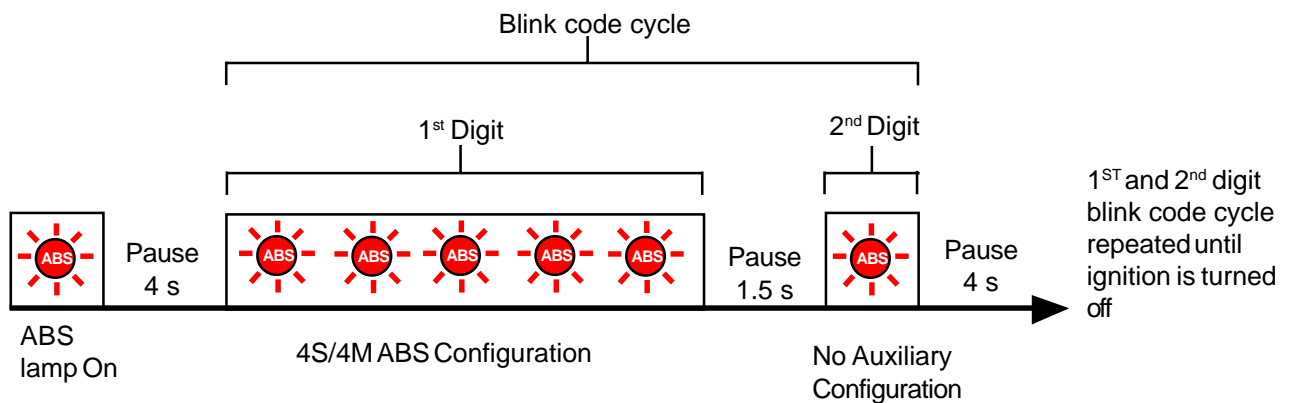
1. Switch ignition ON



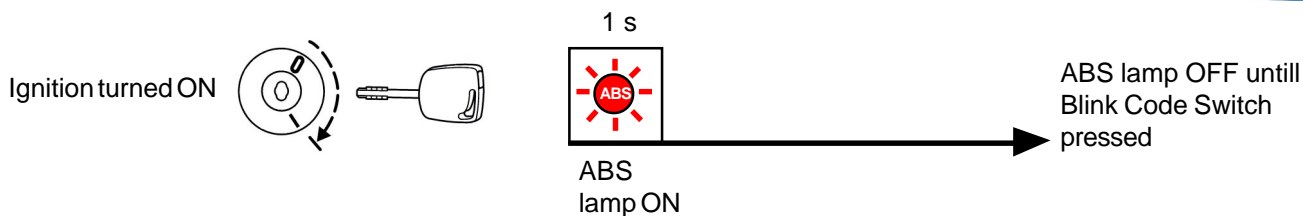
2. Press, hold for 3 secs then release blink code switch



3. Observe blink code cycle.

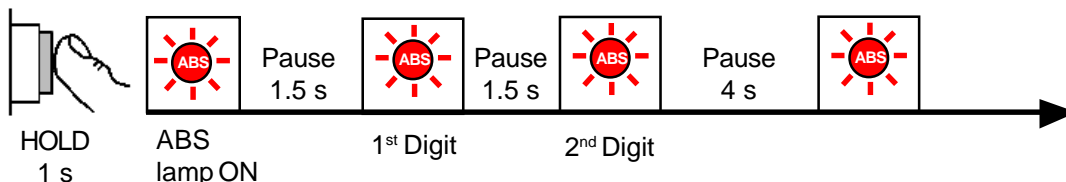


DIAGNOSTICS	STEP 1 Turn Ignition On	A. ABS warning lamp comes ON momentarily then OFF B. ABS warning lamp is OFF (does not illuminate) C. ABS warning lamp comes ON and stays ON	System OK Wiring fault Blown Bulb Fault or Faults in the system. Sensor fault during last operation. Faults cleared from ECU but vehicle not moved. ECU disconnected.	No recognisable active faults in the ABS. No action required. Inspect wiring. Check/replace bulb Continue with blink code diagnostics (Go to step 2) Continue with blink code diagnostics (Go to step 2) Drive vehicle - lamp OFF at speed 6Km/h (4 mph). Connect ECU
	STEP 2 Press and Hold Blink code switch for one second, then release.	ABS warning lamp begins flashing two-digit blink code(s)	Fault	Determine if fault is active or stored: Active Fault: Lamp repeatedly displays one code. Stored Fault: Lamp will display code for each stored fault then stop blinking. Faults will only be displayed one time only .
	STEP 3 Count the flashes to determine the blink code.	1st Digit: 1 to 8 flashes, Pause (1.5s) 2nd Digit: 1 to 6 flashes, Pause (4s)	Fault(s)	Find definition for blink code on diagnostic chart.
	STEP 4 Turn Ignition OFF Repair Faults	Active faults Stored faults	Fault Fault(s)	Check, repair or replace as necessary. (Go to step 5)
	STEP 5 Turn Ignition ON Clear faults from memory: Press and Hold Blink code switch for at least three seconds then release.	ABS Warning lamp flashes ten times. After s. the ABS configuration will be displayed and continue to be displayed until ignition is re-cycled. Ten flashes not displayed	System OK Fault(s)	All stored faults successfully cleared. Turn Ignition OFF. Active faults still exist, repeat steps 1-4.
	STEP 6			Repeat steps 1 to 3 until system is OK (code 1-1 displayed).



System O.K.

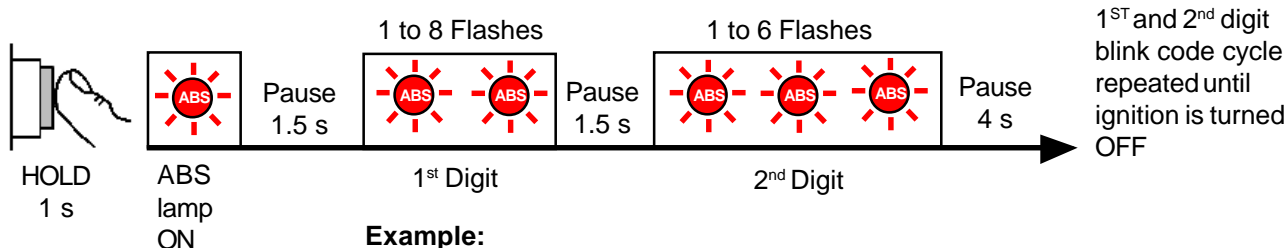
Blink
Code
Switch



Example:

1 Flash (1st Digit) = No Fault
1 Flash (2nd Digit) = No Fault

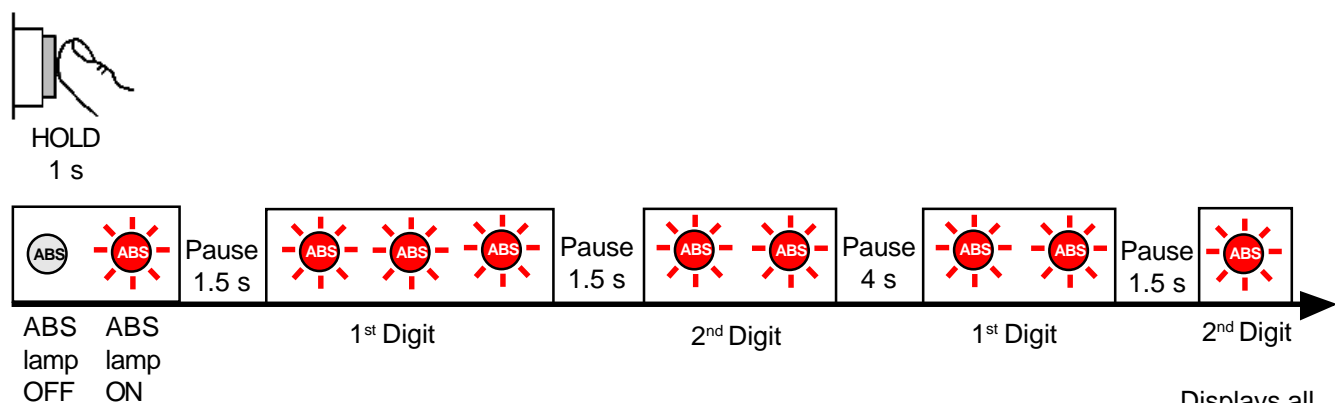
Display Active faults



Example:

2 Flashes (1st Digit) = ABS Valve
3 Flashes (2nd Digit) = Right Rear

Display Stored faults



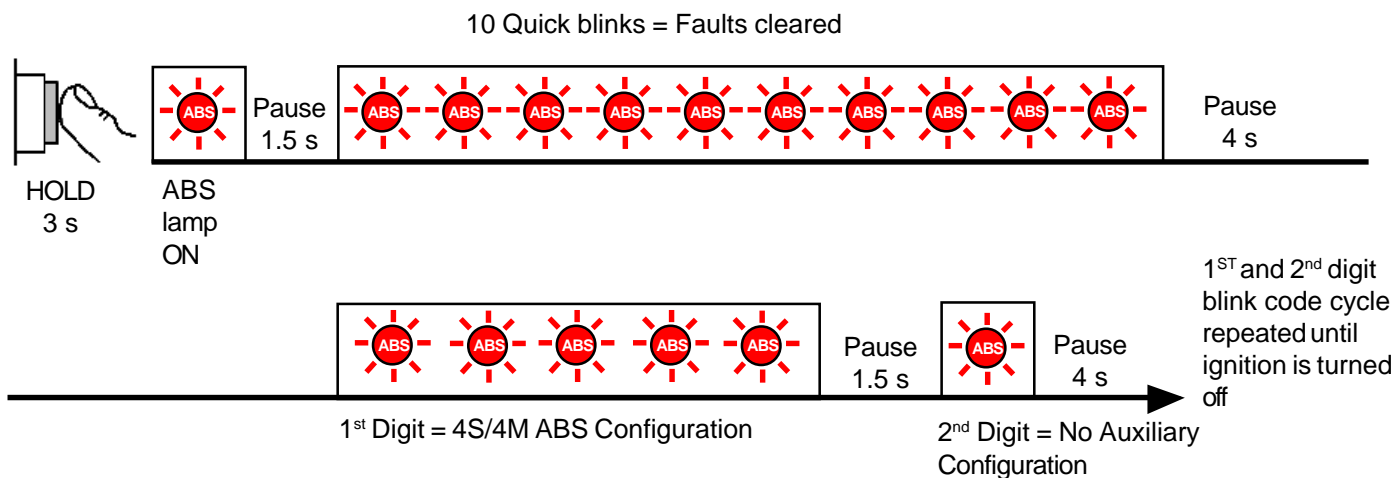
Example:

3 Flashes (1st Digit) = Wheel Sensor - Tooth Wheel gap
2 Flashes (2nd Digit) = Right Front

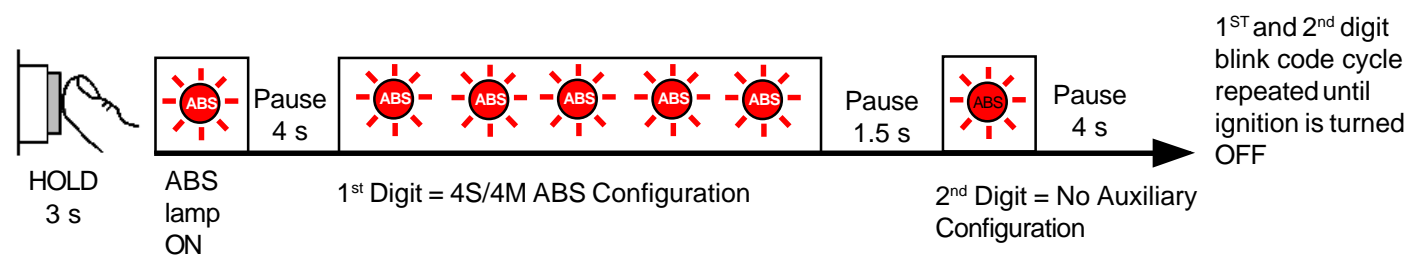
2 Flashes (1st Digit) = ABS Valve
1 Flashes (2nd Digit) = Left Front

Displays all stored faults once.
Last fault stored is displayed first

Faults Cleared

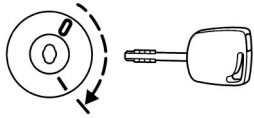


Faults Not Cleared (Active Faults Still Exist)



1 st Digit	Type of Fault	2 nd Digit	Location of Fault
1	No Fault	1	No Fault
2	ABS Valve	1	Left Front Wheel
3	Wheel Sensor - Tooth Wheel Gap	2	Right Front Wheel
4	Wheel Sensor Continuity	3	Left Rear Wheel
5	Wheel Sensor Signal Credibility	4	Right Rear Wheel
6	Exciter wheel	5	Additional Left Rear Wheel
		6	Additional Right Rear Wheel
7	System Function	1	J1939 Datalink
		2	Brake Apply Valve
		3	Retarder Relay
		4	Warning Lamp
		5	ASR Configuration
		6	ASR Diff Lock
		7	Lining Wear Sensor
8	ECU	1	Low Supply Voltage
		2	High Supply Voltage
		3	Internal Fault
		4	System Configuration Error

Ignition turned ON

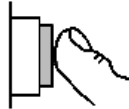


Indication 1



ABS lamp comes ON and stays ON

Press and hold 1s
Blink Code Switch



ABS remains ON

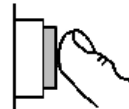
**Fault - B+ Non ignition
switch fuse blown**

Indication 2



ABS lamp comes ON Dim

Press and hold 1s
Blink Code Switch



ABS lamp becomes Bright

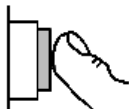
**Fault - B+ Ignition
switch fuse blown**

Indication 3



ABS lamp OFF

Press and hold 1s
Blink Code Switch



ABS lamp stays OFF

Fault -

1. Blown bulb
(Check/replace bulb)

2. ABS lamp supply fuse
blown
(Check/replace fuse)

3. No B- to ECU
(Check B- wires for open
circuit)

CHECKING POSITION	MEASURE BETWEEN	CORRECT VALUE	REMARKS	Fig
Sensor output	A B	0.2V AC Min.	Sensor 1A, 1B or 2A, 2B Sensor disconnected from ECU. Wheel rotated at 1 rev/2 sec.	13
Sensor resistance	A B	>1.0 <2.4 kohm	Sensor 1A, 1B or 2A, 2B Sensor disconnected from ECU.	13
ABS Valve Solenoid resistance	+ -	>30 <55 ohms	Cable disconnected	14
Earth Continuity	ECU and Vehicle Chassis	0 ohms <0.1 ohms		15

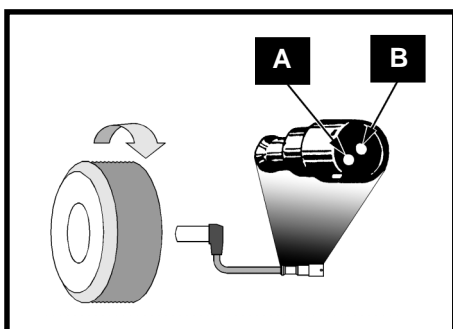


Fig 13 - Sensor Connector

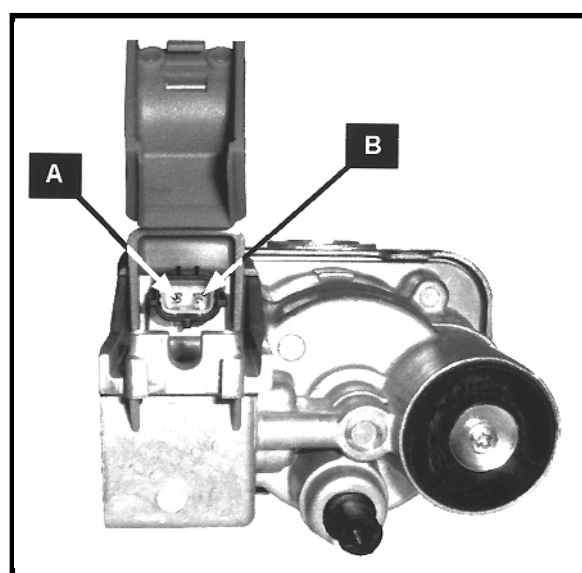


Fig 14 - ABS Valve Connector

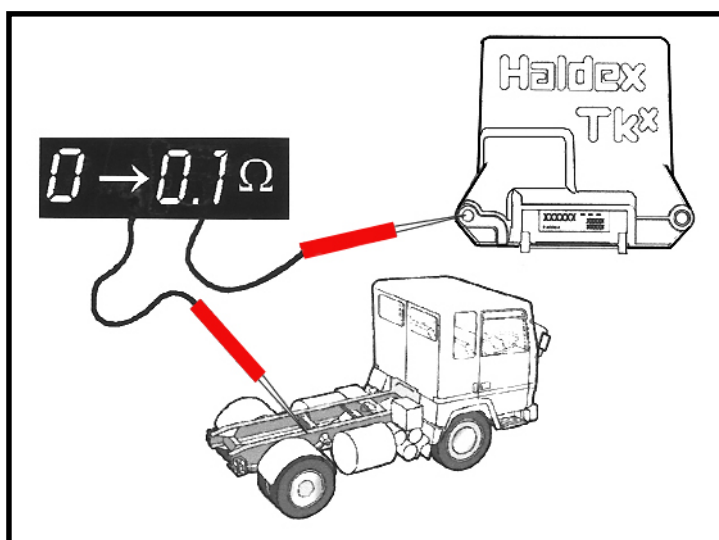


Fig 15 - ECU Earth Continuity

For further information:

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The Haldex Group is a global supplier of proprietary products for trucks, cars and industrial vehicles, with special emphasis on performance and safety. The Group is organized in Divisions which focus on their respective product niche:

Haldex Brake Systems supplies ABS and brake components for heavy vehicle air brakes.

Haldex Barnes Hydraulics supplies gear pumps and hydraulic systems for power steering and lifting functions on industrial vehicles and trucks.

Haldex Garphyttan Wire supplies specially steel-alloyed wire products mainly for applications in combustion engines.

Haldex Traction Systems supplies 4WD systems for cars and trucks.

Sales companies are established in Europe, North and South America and Asia. Production takes place in 9 factories in USA, 9 factories in Europe and 1 joint venture in India.

The Haldex Group is listed on the Stockholm Stock Exchange.

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Company Vision

We use our demonstrated competence to provide innovative components, systems and service for trucks, trailers and buses, that lower life cycle costs and improve vehicle safety. Haldex wants to become the first choice business partner of commercial vehicle manufacturers world wide in the areas of braking and suspension control systems with special emphasis on heavy commercial vehicles.

Total Support

A uniquely wide range of services is available from Haldex. These include expert consultancy for braking and suspension development, brake calculations, type approvals and application engineering. The aim is accurate specification for manufacturers and low cost of ownership for the operator. Full aftermarket support includes a Worldwide parts distribution and service network, on-line technical advice, field visits and installation/maintenance training held on-site or at Haldex facilities.

Research and Development

Continual, heavy investment in Research and Development is carried out in response to ever increasing commercial, legislative, environmental, performance and technological demands.

Quality and Production Standards

The very latest production technology ensures the very highest quality standards. All production sites are ISO 9001 approved.



www.brake-eu.haldex.com