Operators Guide

TK+

www.haldex.com

Notes on the use of this manual

This manual has been designed to assist personnel in satisfactorily installing Haldex **TK**+ on Trucks and Buses.
The intention has been to illustrate the various areas of installation. It is expected that this manual will be in possession of the appropriate person throughout their 'training' and 'experience' and that the manual will be used as:

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

b) A reminder of the correct procedure of Haldex **TK**+ installation.

For any other deviation consult
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Moons Moat North
Redditch
Worcestershire
B98 9HA
Tel: +44 1527 499 499
Fax: +44 1527 499 500
E-Mail: ENG.BCBU@Haldex.com

- 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.
-

Table of Contents

Glossary of terms

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 29 to 31.

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 or PC.

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:

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 28**.**

Diagnostic Mode: To enter the diagnostic mode, press and hold the diagnostic switch for one second then release.

Clear Mode: To erase faults, 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 ten quick flashes followed by the System Configuration code, the clear operation was successful. The stored ABS faults have been cleared from memory.

If ten flashes are not received there are still active faults that must be repaired before they can be cleared.

Introduction

The Haldex **TK**+ has been developed to satisfy the legislative requirements of Regulation 13 / 10 and is an ABS/ ASR system offering many installation options. It can provide 4S/4M ABS or 4S/3M ABS using a single modulator on the steering or driven axle. ASR is also available on 4M and 3M systems with two rear modulators. The system has separate data communication interfaces according to SAE J1939 for control and diagnostics. Many functions can be provided using either hardware or the control data interface in accordance with SAE J1939.

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 this instruction are adhered to at all times. Failure to follow this instruction may result in reduced stability and driver comfort.

The **TK**+ system fitted has **4 S**ensors and **3** or **4 M**odulators (ABS valves), the configuration being 4S/3M, 4S/3MR or 4S/4M. The Electronic control unit (ECU) is not a sealed unit and must be mounted in cab. The ABS valves have a three pin electrical connector and are chassis mounted. The ABS valves are not handed and can be fitted at left or right, front or rear positions.

The **TK**+ system features as an optional fit an external brake apply valve. This will mitigate loss of torque to the driven wheels when traction is lost by selectively braking the slipping wheel.

The **TK**+ system is also available with a stand alone PC based diagnostic system. This is a custom application which provides a simple easy to use interface to the **TK**+ ABS unit for system configuration, diagnostics and fault monitoring.

TK+ ABS Specification

ABS Configuration:	4S/3M - 4S/3MR - 4S/4M Category 1 (ECE Regulation 13/10)
Operating Voltage:	24 Volts DC nominal (19 - 32 Volt range)
Current Consumption:	10 Amps Nominal
ECU:	Metal box enclosure with three fixing points for in-cab mounting, using a 33 way unsealed connector (compatible with a 15 way and an 18 way mating pieces).
EMC / RFI Approval:	ECE Regulation 10
ABS Valves:	Haldex In-Line In-line, Chassis mount, un-handed, Inlet M22 x 1.5, Delivery M22 x 1.5
Operating Medium:	Air
Operating Pressure:	1MPa max (10b)
Max Pressure:	1.6MPa (16b)
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 (SAE J1939)
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 R 20 (Rolling circumference 3211mm)
Vehicle Brake System:	Full Air Air Over Hydraulic
BAV:	Brake Apply Valve Chassis Mount, Inlet M12 x 1.5 internal thread, Delivery M12 x 1.5 internal thread

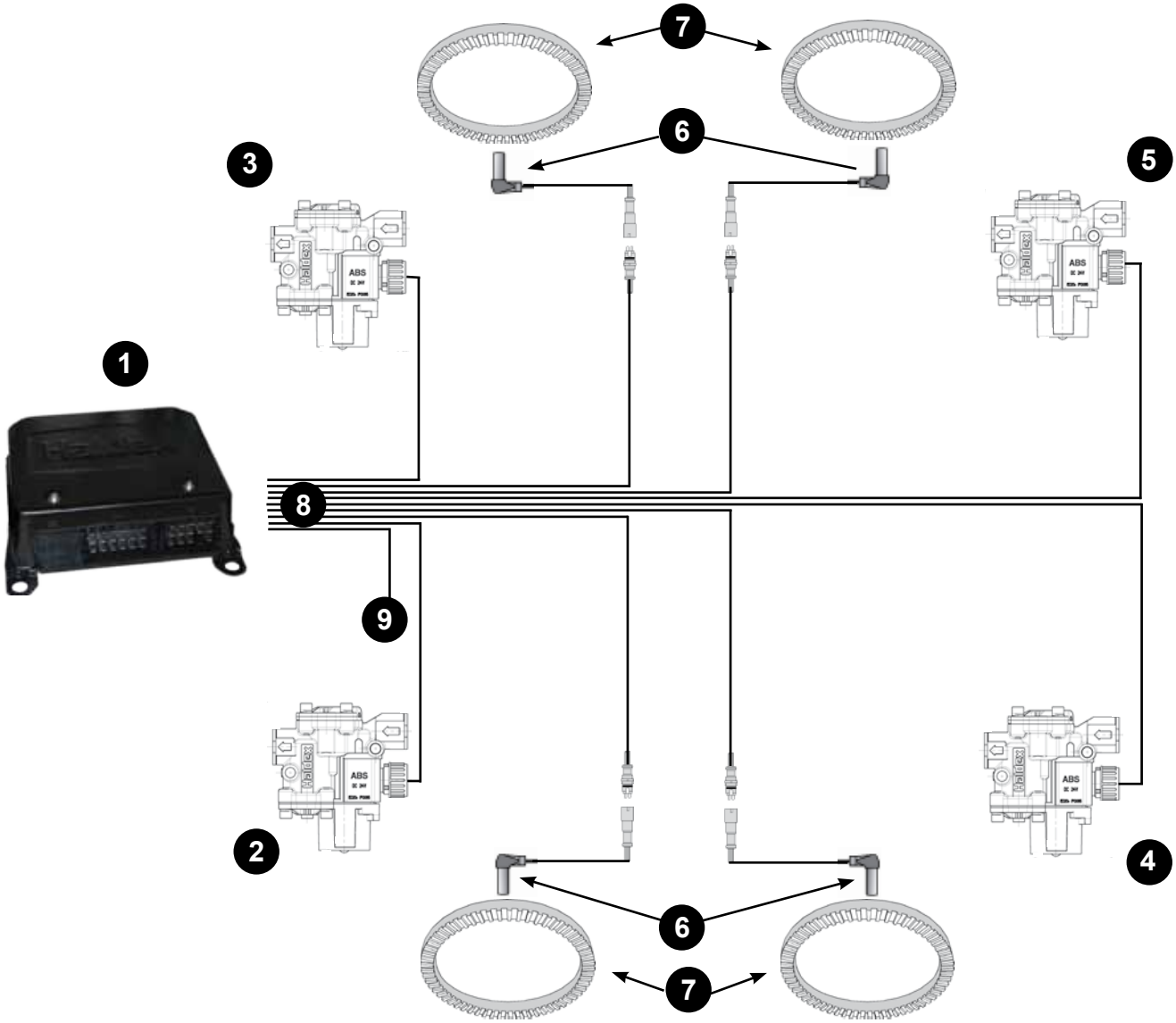
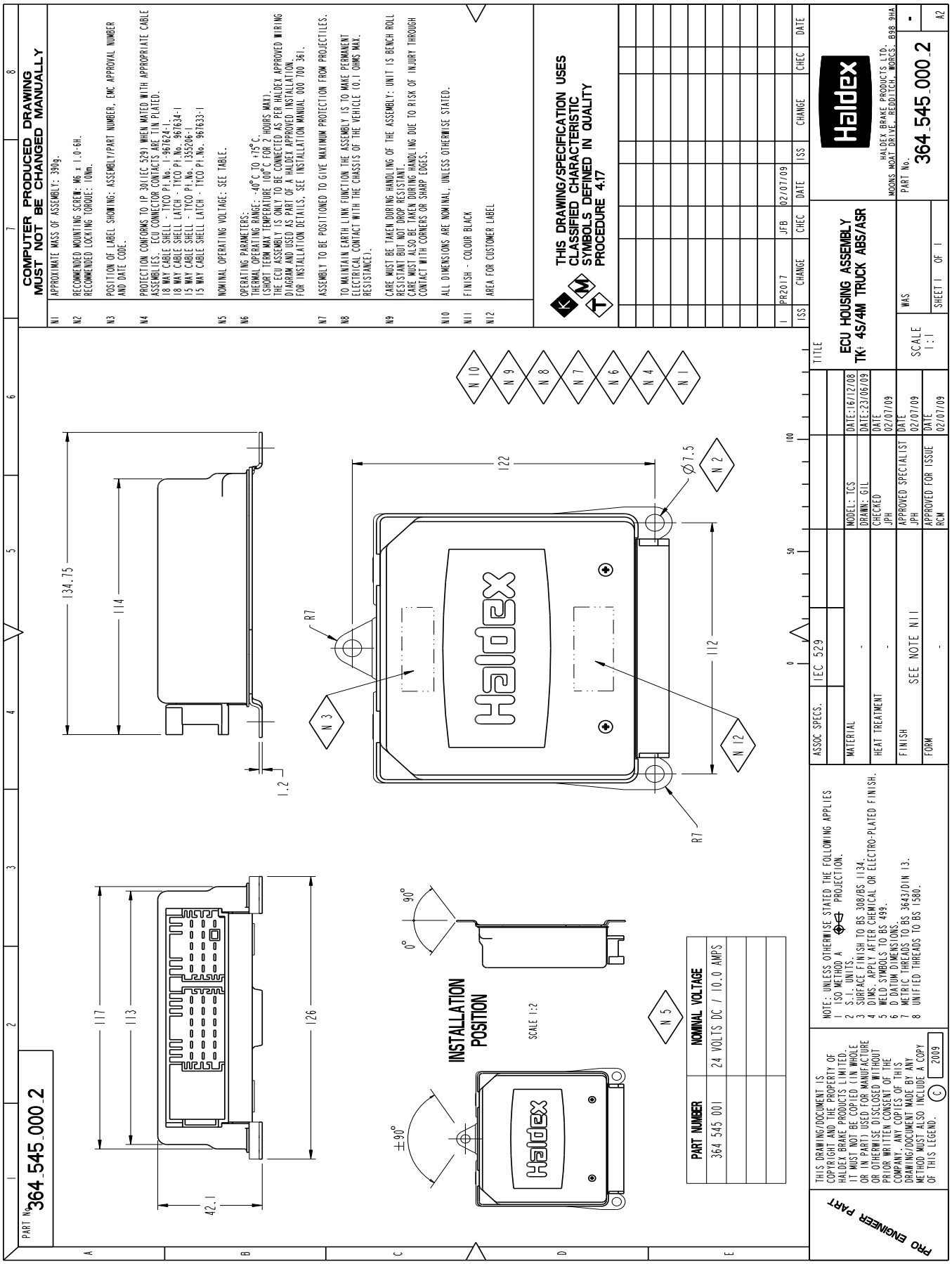


Fig 1

Item	Description
1	ECU
2	Front Left ABS valve
3	Front Right ABS valve
4	Rear Left ABS valve
5	Rear Right ABS valve
6	Sensor assembly
7	Exciter
8	Chassis cable assembly (Not Supplied)
9	Power/Diagnostic cable assembly (Not Supplied)


COMPUTER PRODUCED DRAWING
MUST NOT BE CHANGED MANUALLY
N1 APPROXIMATE MASS OF ASSEMBLY: 390g.
N2 RECOMMENDED MOUNTING SCREW: M6 x 1.0-6H.
RECOMMENDED LOCKING TORQUE: 10Nm.
N3 POSITION OF LABEL SHOWING: ASSEMBLY/PART NUMBER, EMC APPROVAL NUMBER AND DATE CODE.
N4 PROTECTION CONFORMS TO IP 30(IEC 529) WHEN MATED WITH APPROPRIATE CABLE ASSEMBLIES. ECU CONNECTOR CONTACTS ARE TIN PLATED.
18 WAY CABLE SHELL - TYCO PT.No. 1-967624-1.
18 WAY CABLE SHELL LATCH - TYCO PT.No. 967634-1
15 WAY CABLE SHELL - TYCO PT.No. 1-355206-1
15 WAY CABLE SHELL LATCH - TYCO PT.No. 967633-1
N5 NOMINAL OPERATING VOLTAGE: SEE TABLE.
N6 OPERATING PARAMETERS:
THERMAL OPERATING RANGE: -40°C TO +75°C.
(SHORT TERM MAX TEMPERATURE 100°C FOR 2 HOURS MAX).
THE ECU ASSEMBLY IS ONLY TO BE CONNECTED AS PER HALDEX APPROVED WIRING DIAGRAM AND USED AS PART OF A HALDEX APPROVED INSTALLATION.
FOR INSTALLATION DETAILS, SEE INSTALLATION MANUAL 000 700 361.
N7 ASSEMBLY TO BE POSITIONED TO GIVE MAXIMUM PROTECTION FROM PROJECTILES.
N8 TO MAINTAIN EARTH LINK FUNCTION THE ASSEMBLY IS TO MAKE PERMANENT ELECTRICAL CONTACT WITH THE CHASSIS OF THE VEHICLE (0.1 OHMS MAX. RESISTANCE).
N9 CARE MUST BE TAKEN DURING HANDLING OF THE ASSEMBLY: UNIT IS BENCH ROLL RESISTANT BUT NOT DROP RESISTANT.
CARE MUST ALSO BE TAKEN DURING HANDLING DUE TO RISK OF INJURY THROUGH CONTACT WITH CORNERS OR SHARP EDGES.
N10 ALL DIMENSIONS ARE NOMINAL, UNLESS OTHERWISE STATED.
N11 FINISH - COLOUR BLACK
N12 AREA FOR CUSTOMER LABEL
THIS DRAWING/SPECIFICATION USES CLASSIFIED CHARACTERISTIC SYMBOLS DEFINED IN QUALITY PROCEDURE 4.17
ISS CHANGE CHEC DATE ISS CHANGE CHEC DATE
1 PR2017 JFB 02/07/09
PART No. 364_545_000_2
134.75
114
1.2
122
Ø7.5
112
R7
117
113
126
42.1
90°
0°
±90°
INSTALLATION POSITION
SCALE 1:2
PART NUMBER
NOMINAL VOLTAGE
364 545 001
24 VOLTS DC / 10.0 AMPS
NOTE: UNLESS OTHERWISE STATED THE FOLLOWING APPLIES
1 ISO METHOD A PROJECTION.
2 S.I. UNITS.
3 SURFACE FINISH TO BS 308/BS 1134.
4 DIMS. APPLY AFTER CHEMICAL OR ELECTRO-PLATED FINISH.
5 WELD SYMBOLS TO BS 499.
6 D DATUM DIMENSIONS.
7 METRIC THREADS TO BS 3643/DIN 13.
8 UNIFIED THREADS TO BS 1580.
ASSOC SPECS. IEC 529
MATERIAL -
HEAT TREATMENT -
FINISH SEE NOTE N11
FORM -
MODEL: TCS DATE:16/12/08
DRAWN: GIL DATE:23/06/09
CHECKED JPH 02/07/09
APPROVED SPECIALIST JPH DATE 02/07/09
APPROVED FOR ISSUE RCM DATE 02/07/09
TITLE
ECU HOUSING ASSEMBLY
TK1 4S/4M TRUCK ABS/ASR
WAS
SCALE 1:1
SHEET 1 OF 1
PART No. 364_545_000_2
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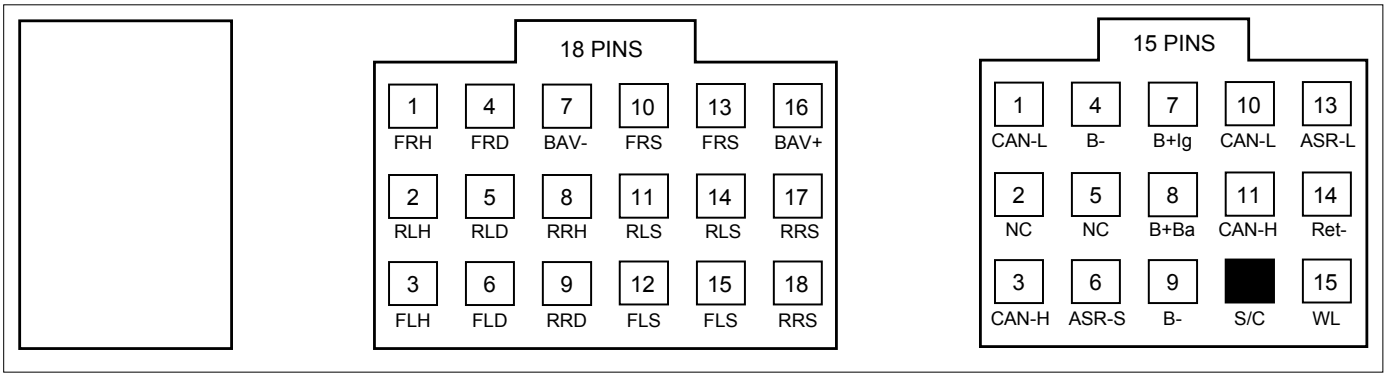
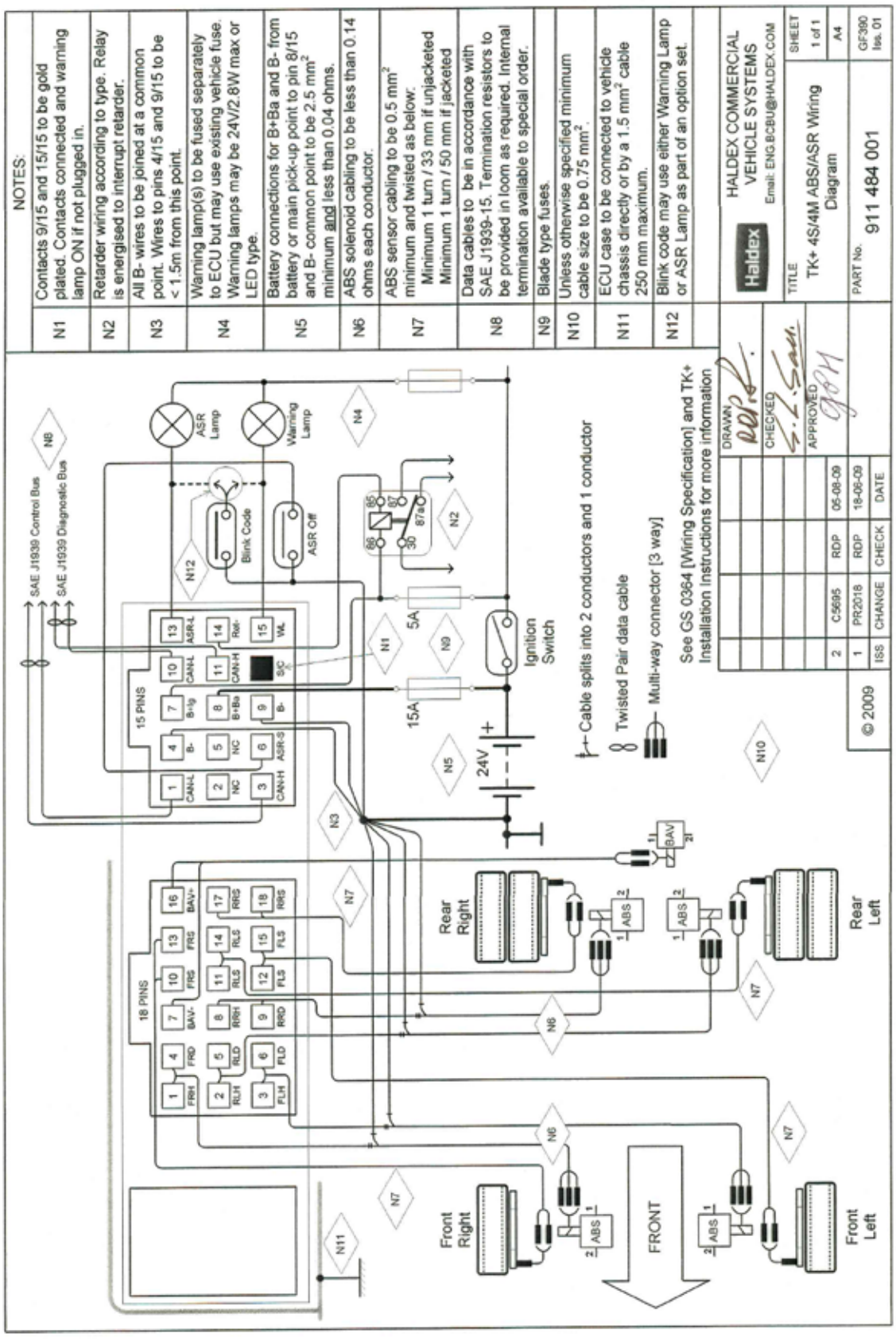
PRO ENGINEER PART

Pin-Out Assignment



NOTES:
1/15 refers to pin 1 of the 15 way connector, similarly 1/18 pin 1 of the 18 way.
* A Warning Lamp signal must always be provided but may use data-bus only.

Reference	Definition	Notes
1/15 CAN-L	Control CAN Low	Twisted-Pair
2/15 NC	No Connection	
3/15 CAN-H	Control CAN High	Twisted-Pair
4/15 B-	ECU B-	Used with 9/15
5/15 NC	No Connection	Reserved
6/15 ASR-S	ASR Off Switch	Optional
7/15 B+Ig	B+ Ignition Switched – Fused 5A	Terminal 15
8/15 B+Ba	B+ Battery – Fused 15A	Terminal 30
9/15 B-	ECU B-	Used with 4/15
10/15 CAN-L	Diagnostic CAN Low	Twisted-Pair
11/15 CAN-H	Diagnostic CAN High	Twisted-Pair
12/15 SC	Shorting Connector	
13/15 ASR-L	ASR Lamp	Optional
14/15 Ret-	Retarder Relay low side	Optional
15/15 WL	ABS Warning Lamp	Optional*
1/18 FRH	Front Right Hold Solenoid	
2/18 RLH	Rear Left Hold Solenoid	
3/18 FLH	Front Left Hold Solenoid	
4/18 FRD	Front Right Dump Solenoid	
5/18 RLD	Rear Left Dump Solenoid	
6/18 FLD	Front Left Dump Solenoid	
7/18 BAV-	Brake Apply Valve Solenoid	Lo-side return
8/18 RRH	Rear Right Hold Solenoid	
9/18 RRD	Rear Right Dump Solenoid	
10/18 FRS	Front Right Sensor	Twisted-Pair
11/18 RLS	Rear Left Sensor	Twisted-Pair
12/18 FLS	Front Left Sensor	Twisted-Pair
13/18 FRS	Front Right Sensor	Twisted-Pair
14/18 RLS	Rear Left Sensor	Twisted-Pair
15/18 FLS	Front Left Sensor	Twisted-Pair
16/18 BAV+	Brake Apply Valve Solenoid	Hi-side drive
17/18 RRS	Rear Right Sensor	Twisted-Pair
18/18 RRS	Rear Right Sensor	Twisted-Pair


NOTES:
N1 Contacts 9/15 and 15/15 to be gold plated. Contacts connected and warning lamp ON if not plugged in.
N2 Retarder wiring according to type. Relay is energised to interrupt retarder.
N3 All B- wires to be joined at a common point. Wires to pins 4/15 and 9/15 to be < 1.5m from this point.
N4 Warning lamp(s) to be fused separately to ECU but may use existing vehicle fuse. Warning lamps may be 24V/2.8W max or LED type.
N5 Battery connections for B+Ba and B- from battery or main pick-up point to pin 8/15 and B- common point to be 2.5 mm² minimum and less than 0.04 ohms.
N6 ABS solenoid cabling to be less than 0.14 ohms each conductor.
N7 ABS sensor cabling to be 0.5 mm² minimum and twisted as below:
Minimum 1 turn / 33 mm if unjacketed
Minimum 1 turn / 50 mm if jacketed
N8 Data cables to be in accordance with SAE J1939-15. Termination resistors to be provided in loom as required. Internal termination available to special order.
N9 Blade type fuses.
N10 Unless otherwise specified minimum cable size to be 0.75 mm².
N11 ECU case to be connected to vehicle chassis directly or by a 1.5 mm² cable 250 mm maximum.
N12 Blink code may use either Warning Lamp or ASR Lamp as part of an option set.
SAE J1939 Control Bus
SAE J1939 Diagnostic Bus
15 PINS
18 PINS
ASR Lamp
Warning Lamp
Blink Code
ASR Off
Ignition Switch
24V
15A
5A
Cable splits into 2 conductors and 1 conductor
Twisted Pair data cable
Multi-way connector [3 way]
See GS 0364 [Wiring Specification] and TK+ Installation Instructions for more information
Front Left
Front Right
Rear Left
Rear Right
FRONT
ABS
BAV
DRAWN
CHECKED
APPROVED
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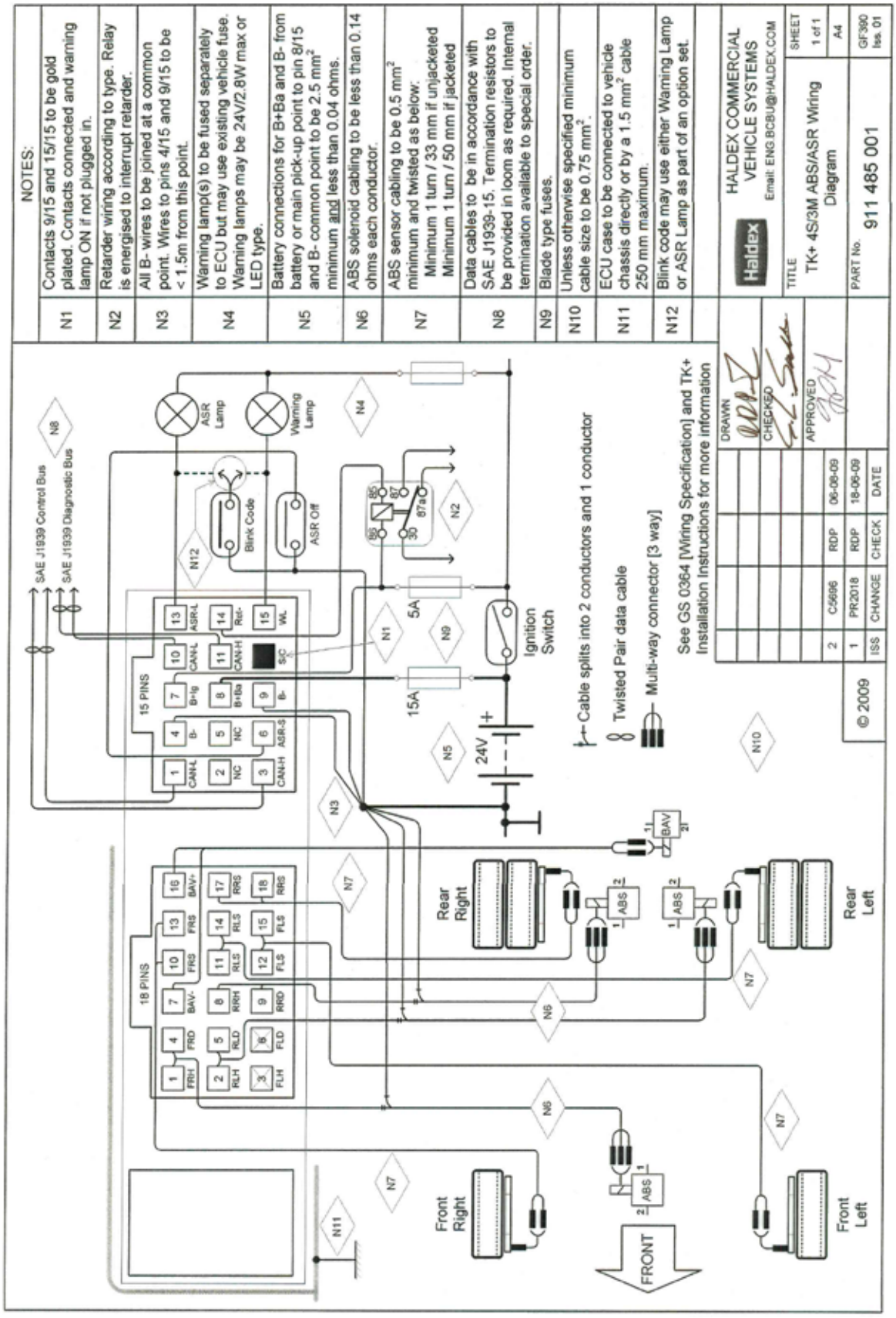
TITLE
TK+ 4S/4M ABS/ASR Wiring Diagram
SHEET 1 of 1
A4
PART No. 911 484 001
GF390 Iss. 01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TK+ 4S/3M ABS/ASR Wiring Diagram
SHEET 1 of 1
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PART No. 911 485 001
GF390 Iss. 01
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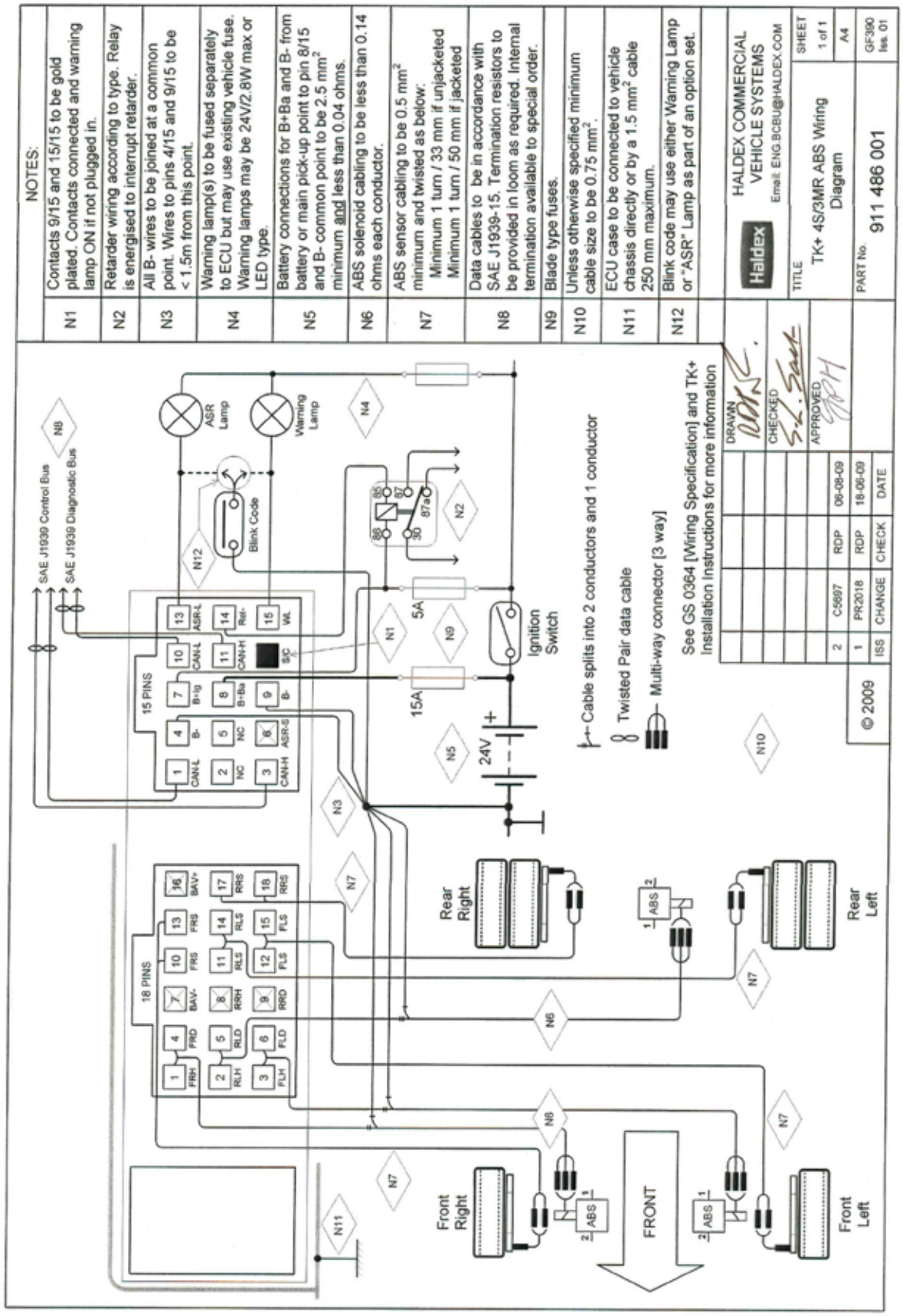
ISS CHANGE CHECK DATE
2 C5696 RDP 06-08-09
1 PR2018 RDP 18-08-09
© 2009
SAE J1939 Control Bus
SAE J1939 Diagnostic Bus
ASR Lamp
Warning Lamp
Blink Code
ASR Off
15 PINS
18 PINS
Ignition Switch
5A
15A
24V
Cable splits into 2 conductors and 1 conductor
Twisted Pair data cable
Multi-way connector [3 way]
See GS 0364 [Wiring Specification] and TK+ Installation Instructions for more information
Rear Right
Rear Left
Front Right
Front Left
FRONT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Warning Lamp
Blink Code
15 PINS
18 PINS
5A
15A
24V
Ignition Switch
Cable splits into 2 conductors and 1 conductor
Twisted Pair data cable
Multi-way connector [3 way]
See GS 0364 [Wiring Specification] and TK+ Installation Instructions for more information
Rear Right
Rear Left
Front Right
Front Left
FRONT
ABS
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ISS 1 PR2018 RDP 18-06-09
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Email: ENG.BCBU@HALDEX.COM
TITLE
TK+ 4S/3MR ABS Wiring Diagram
SHEET 1 of 1
A4
PART No. 911 486 001
GF390 Iss. 01

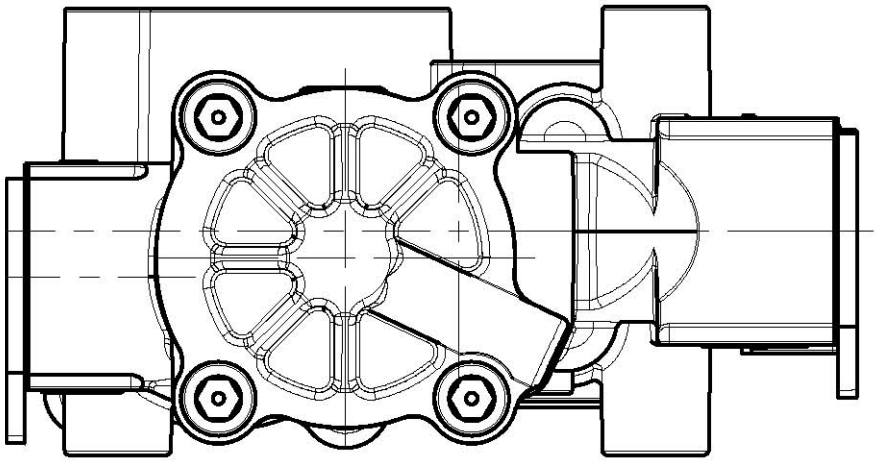


Fig. 7

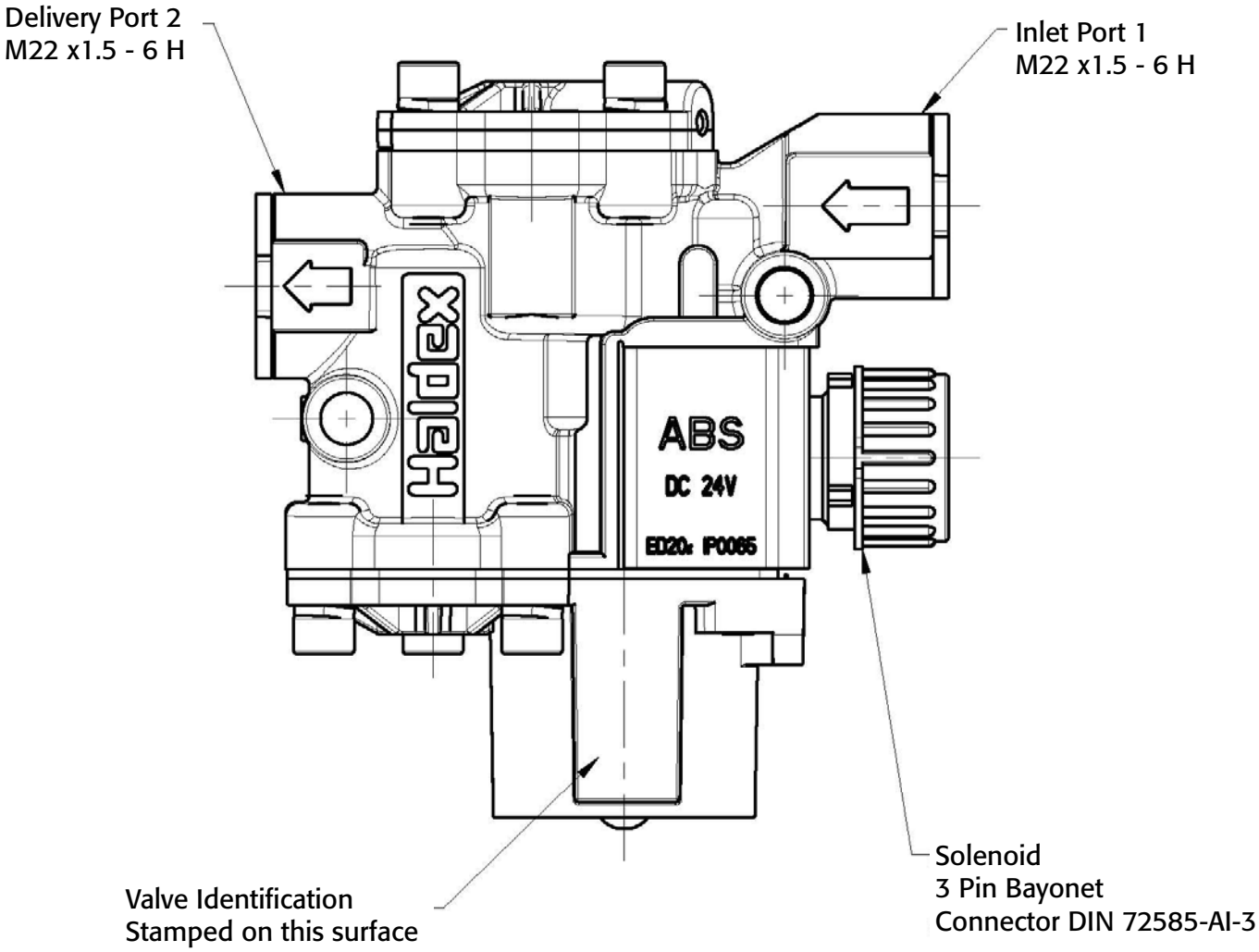
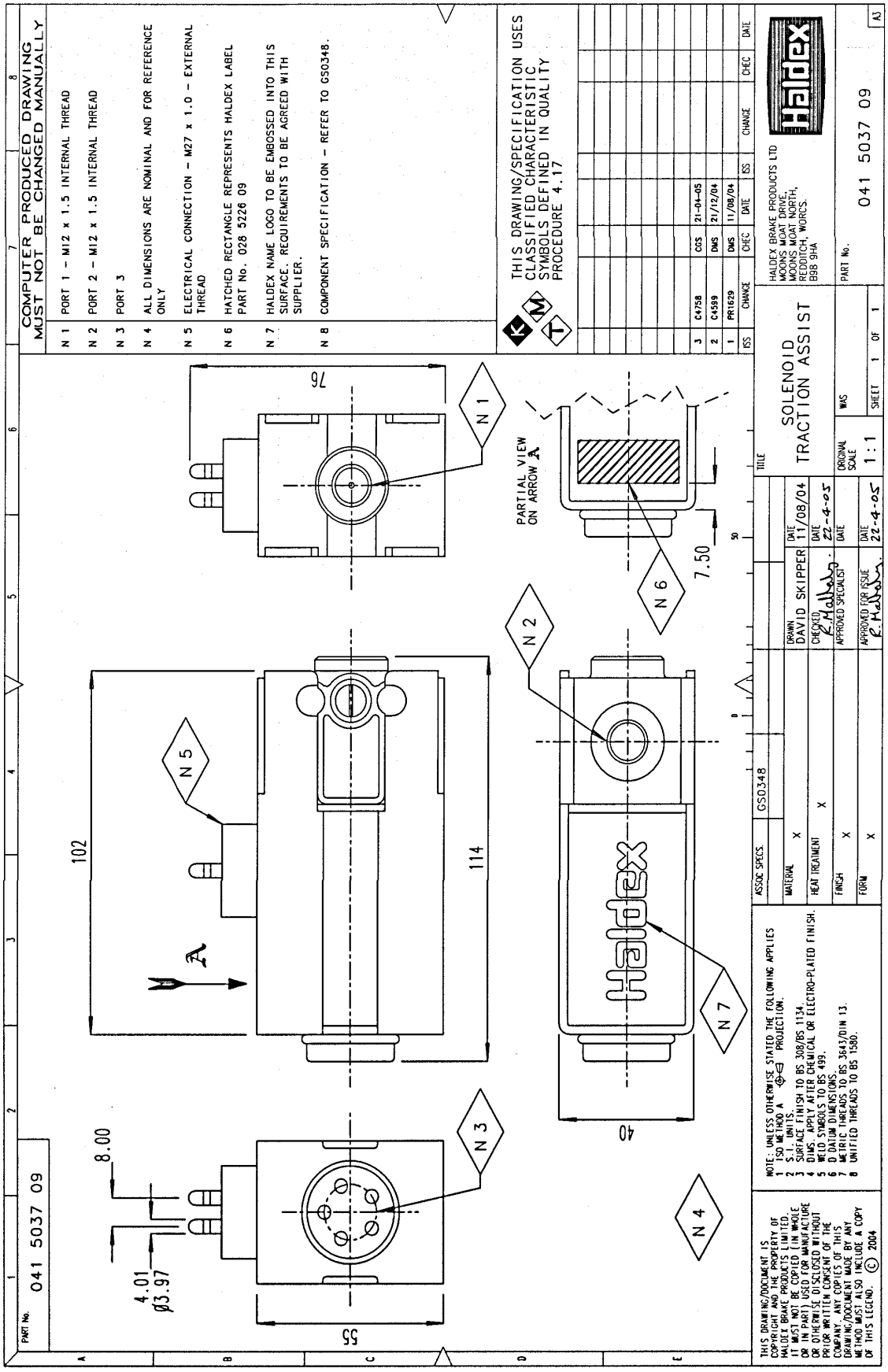

Delivery Port 2
M22 x1.5 - 6 H
Inlet Port 1
M22 x1.5 - 6 H
Haldex
ABS
DC 24V
Valve Identification
Stamped on this surface
Solenoid
3 Pin Bayonet
Connector DIN 72585-AI-3

Fig. 8



A DIN type connector is also available for the Brake Apply Valve. Please contact Haldex for further information.

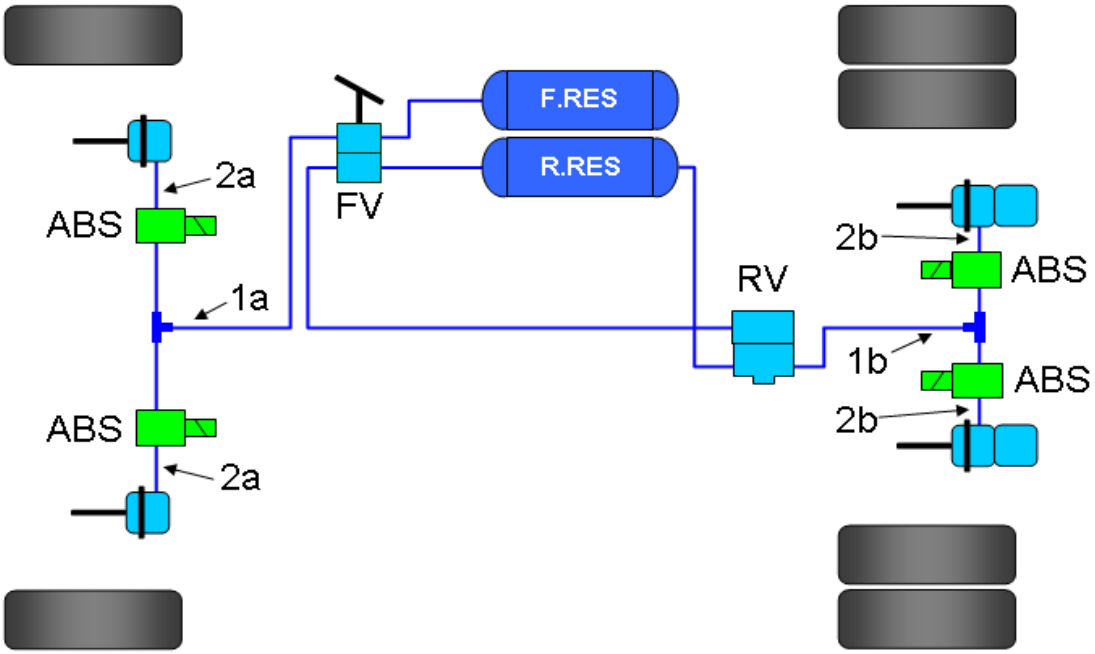
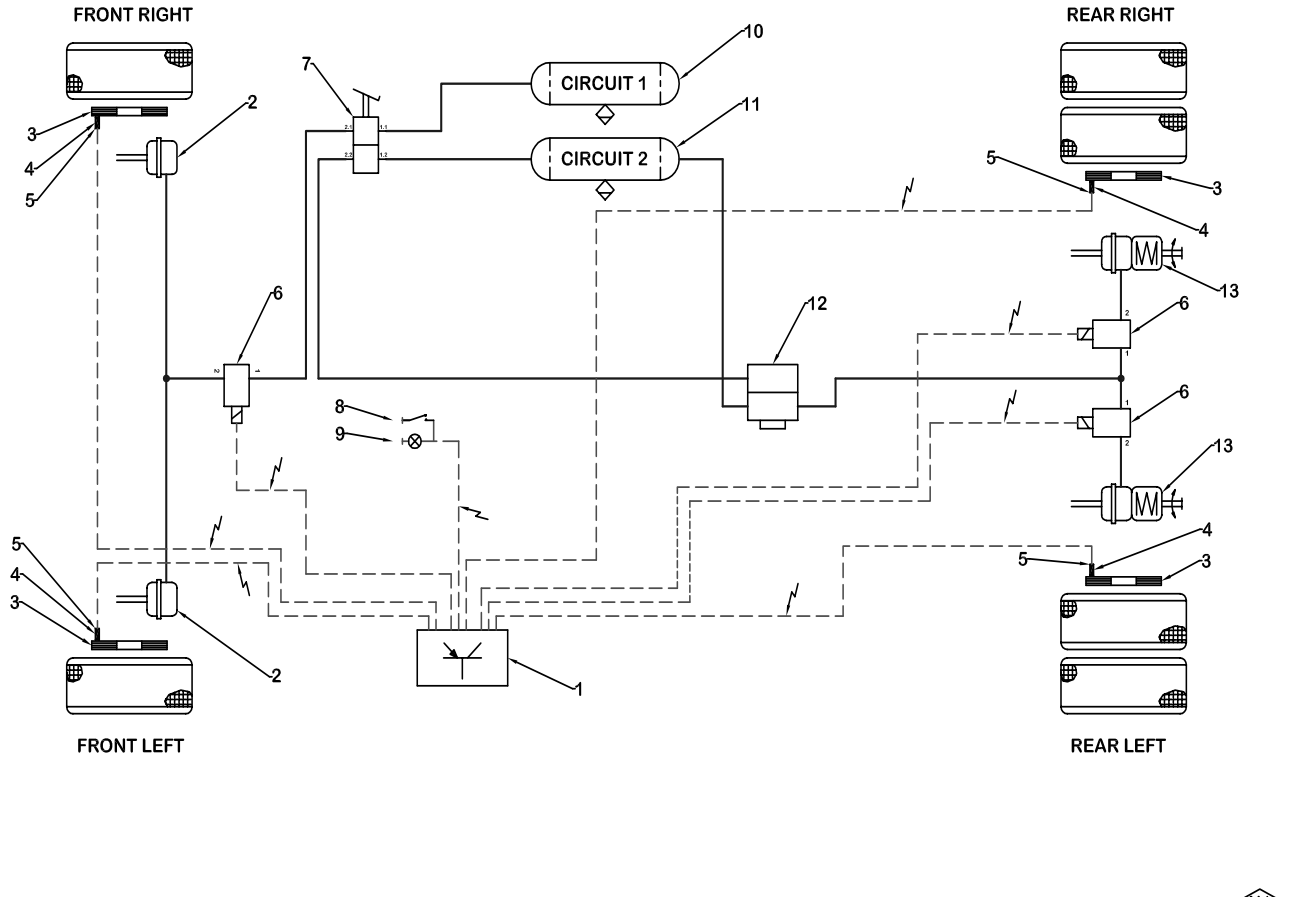


Fig.10

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. (Option 12mm I.D. Rubber Hose)

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



Notes.

N1	SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.

I.D.	Qty	Description	Part Number
13	2	BRAKE CHAMBER (WITH SPRING)	
12	1	RELAY VALVE	
11	1	RESERVOIR CHAMBER 2	
10	1	RESERVOIR CHAMBER 1	
9	1	ABS WARNING LAMP	
8	1	BLINK CODE SWITCH	
7	1	FOOT BRAKE PEDAL	
6	3	ABS SOLENOID VALVE	364 546 001
5	4	SENSOR SLEEVE	059 5253 09
4	4	WHEEL SPEED SENSOR	364 528 ---
			364 094 ---
3	4	TOOTHED WHEEL	
2	2	BRAKE CHAMBER (WITHOUT SPRING)	
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001

ISS.	CHANGE	CHECK	DATE
1	PR2017	JFB	02/07/09

DRAWN JFB

CHECKED R D Prescott

APPROVED J P Hicks

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TITLE

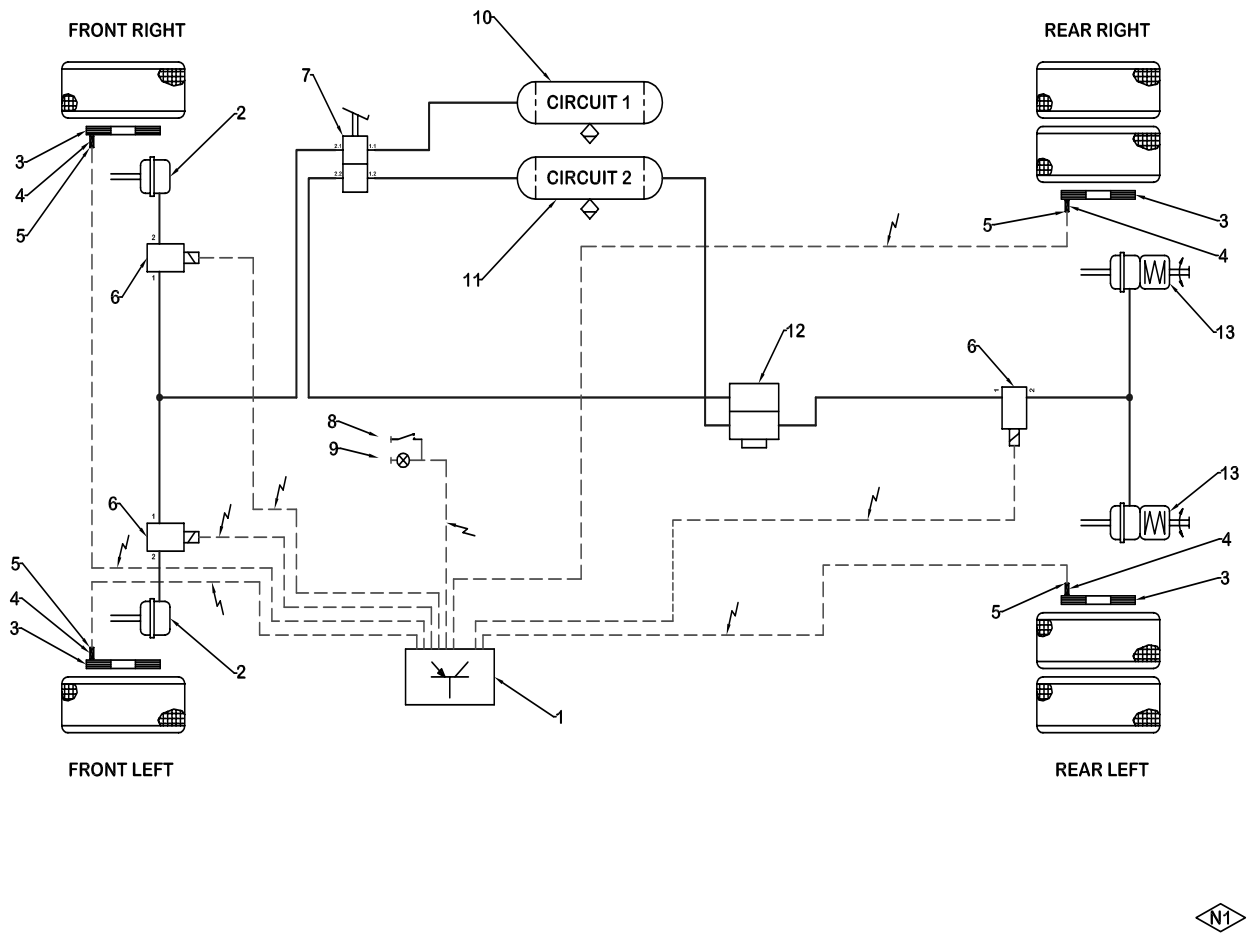
ABS 4S/3M Schematic

Sheet 1 of 1

A4

PART No. 911_487_001

Form. GF 390 Iss. 01



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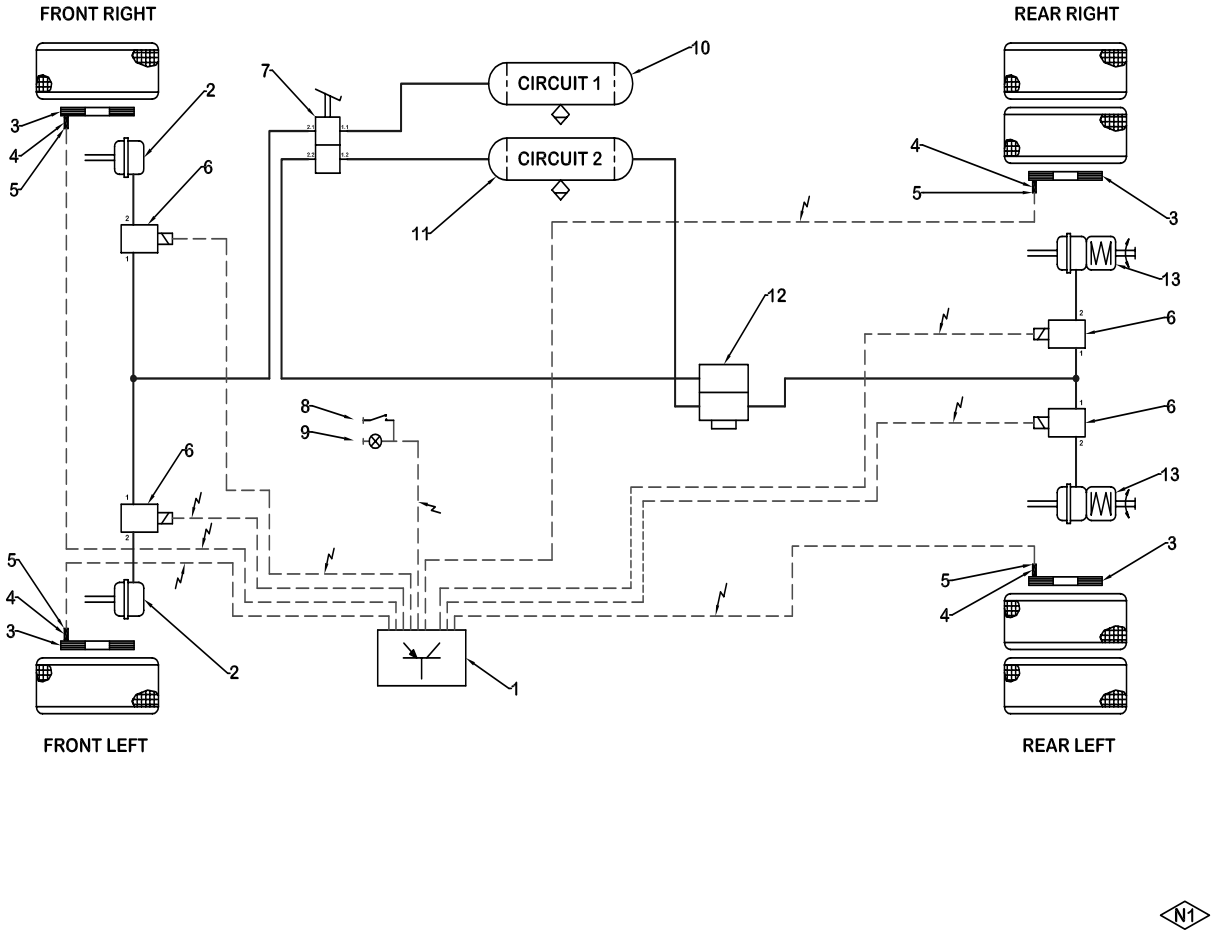
ABS 4S/3MR Schematic

Sheet 1 of 1

A4

Form. GF 390 Iss. 01

PART No. 911_488_001



Notes.

N1	SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.

I.D.	Qty	Description	Part Number
14			
13	2	BRAKE CHAMBER (WITH SPRING)	
12	1	RELAY VALVE	
11	1	RESERVOIR CHAMBER 2	
10	1	RESERVOIR CHAMBER 1	
9	1	ABS WARNING LAMP	
8	1	BLINK CODE SWITCH	
7	1	FOOT BRAKE PEDAL	
6	4	ABS SOLENOID VALVE	364 546 001
5	4	SENSOR SLEEVE	059 5253 09
4	4	WHEEL SPEED SENSOR	364 528 ---
			364 094 ---
3	4	TOOTHED WHEEL	
2	2	BRAKE CHAMBER (WITHOUT SPRING)	
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001

I.D.	Qty	Description	Part Number

ISS.	CHANGE	CHECK	DATE
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TITLE ABS 4S/4M Schematic

Sheet 1 of 1

A4

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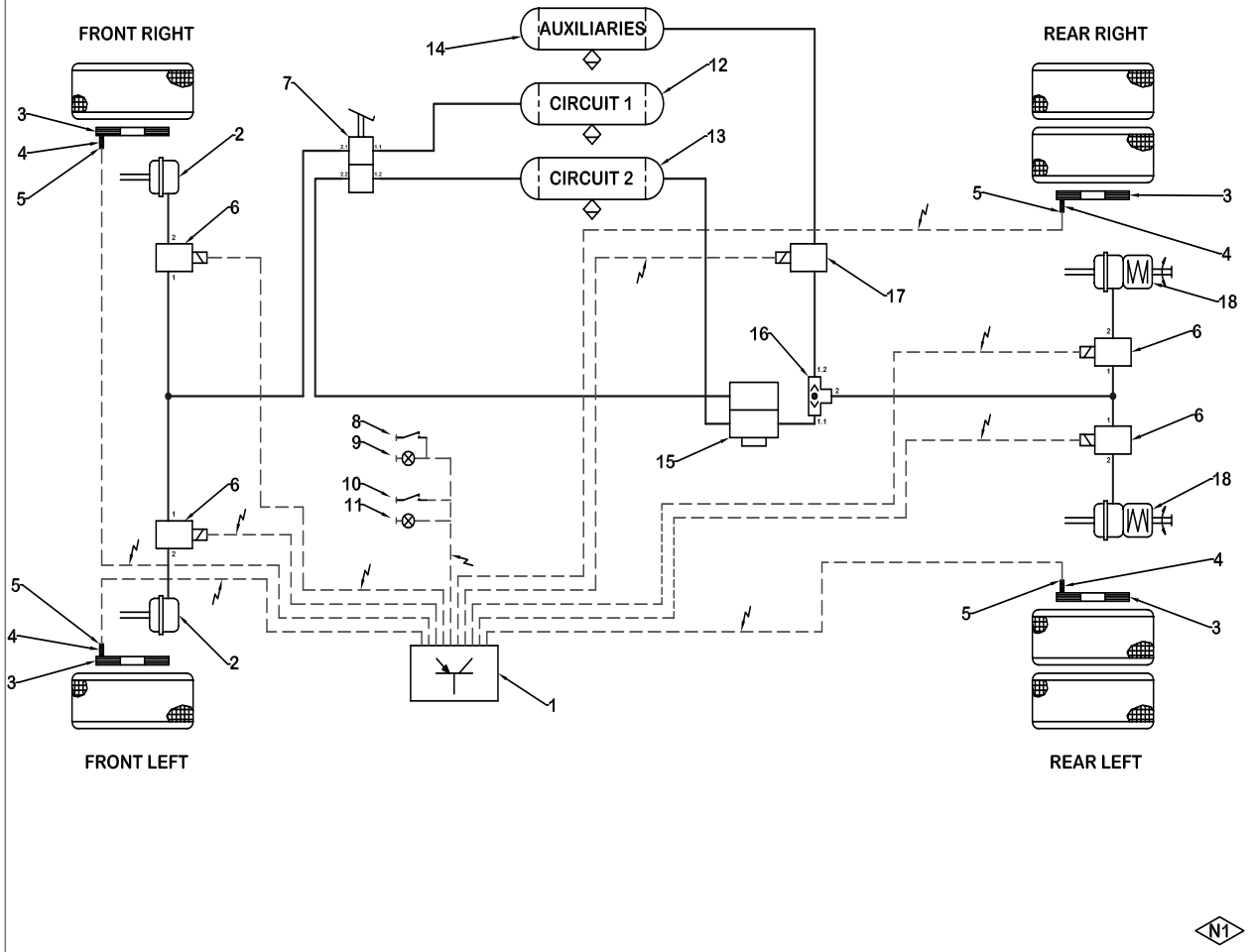
PART No. 911_489_001



Notes.

N1 SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.

I.D.	Qty	Description	Part Number	I.D.	Qty	Description	Part Number
14	1	AUXILIARY RESERVOIR CHAMBER					
13	1	RESERVOIR CHAMBER 2					
12	1	RESERVOIR CHAMBER 1					
11	1	ASR WARNING LAMP					
10	1	ASR OFF SWITCH					
9	1	ABS WARNING LAMP					
8	1	BLINK CODE SWITCH					
7	1	FOOT BRAKE PEDAL					
6	1	ABS SOLENOID VALVE	364 546 001				
5	4	SENSOR SLEEVE	059 5253 09				
4	4	WHEEL SPEED SENSOR	364 528 ---	18	2	BRAKE CHAMBER (WITH SPRING)	
			364 094 ---	17	1	BRAKE APPLY SOLENOID VALVE	041 5037 09
3	4	TOOTHED WHEEL					041 5062 09
2	2	BRAKE CHAMBER (WITHOUT SPRING)		16	1	DOUBLE CHECK VALVE	333 001 101
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001	15	1	RELAY VALVE	

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1	PR2017	JFB	02/07/09

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TITLE
4S/4M
ABS / ASR Schematic

Sheet 1 of 1

A4

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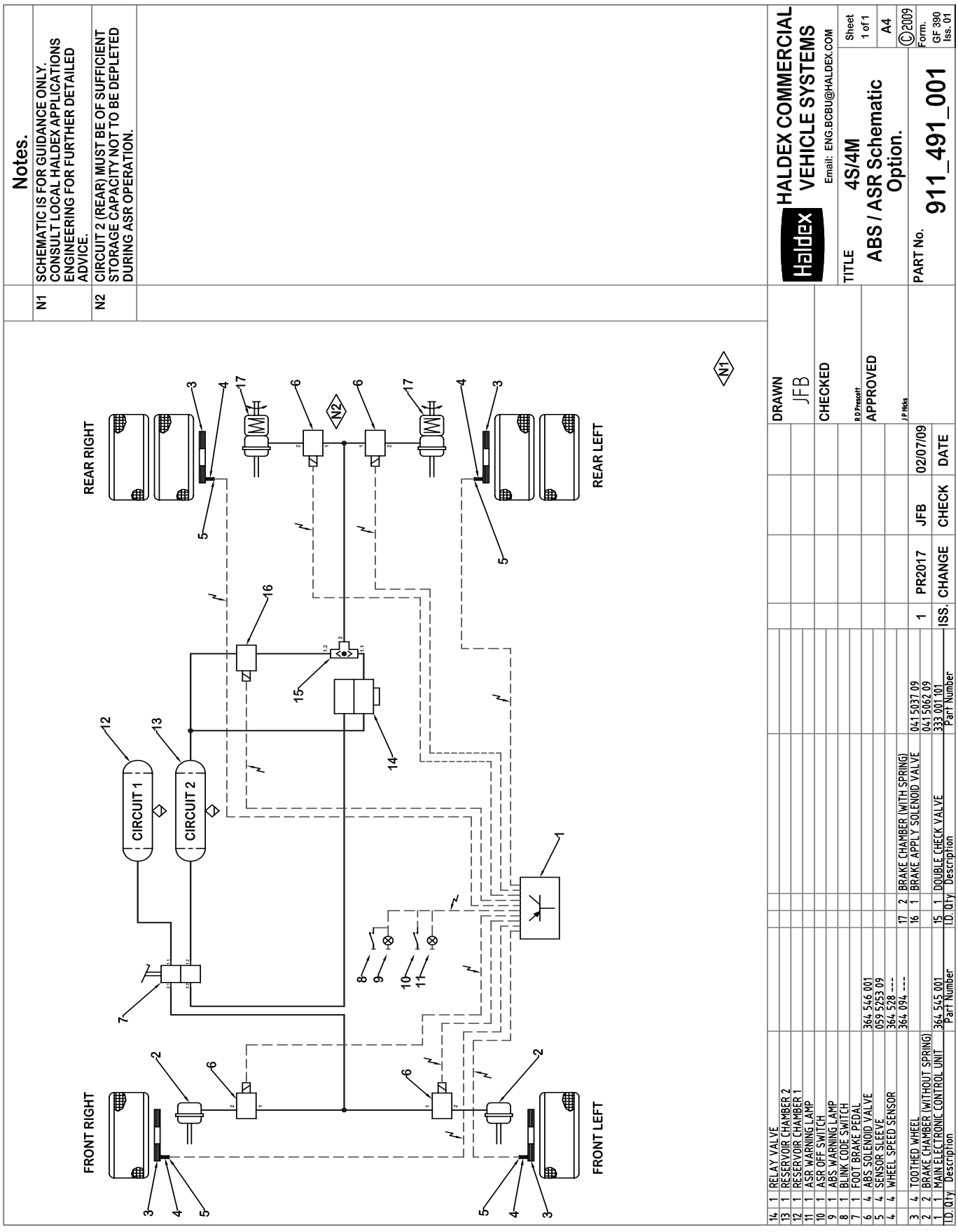
PART No. 911_490_001


Notes.
N1 SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.
N2 CIRCUIT 2 (REAR) MUST BE OF SUFFICIENT STORAGE CAPACITY NOT TO BE DEPLETED DURING ASR OPERATION.
FRONT RIGHT
FRONT LEFT
REAR RIGHT
REAR LEFT
CIRCUIT 1
CIRCUIT 2
N1
N2
14 1 RELAY VALVE
13 1 RESERVOIR CHAMBER 2
12 1 RESERVOIR CHAMBER 1
11 1 ASR WARNING LAMP
10 1 ASR OFF SWITCH
9 1 ABS WARNING LAMP
8 1 BLINK CODE SWITCH
7 1 FOOT BRAKE PEDAL
6 4 ABS SOLENOID VALVE 364 546 001
5 4 SENSOR SLEEVE 059 5253 09
4 4 WHEEL SPEED SENSOR 364 528 ---
364 094 ---
3 4 TOOTHED WHEEL 17 2 BRAKE CHAMBER (WITH SPRING) 041 5037 09
2 2 BRAKE CHAMBER (WITHOUT SPRING) 16 1 BRAKE APPLY SOLENOID VALVE 041 5062 09
1 1 MAIN ELECTRONIC CONTROL UNIT 364 545 001 15 1 DOUBLE CHECK VALVE 333 001 101
ID. Qty Description Part Number ID. Qty Description Part Number
ISS. CHANGE CHECK DATE
1 PR2017 JFB 02/07/09
DRAWN JFB
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PART No. 911_491_001
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A4
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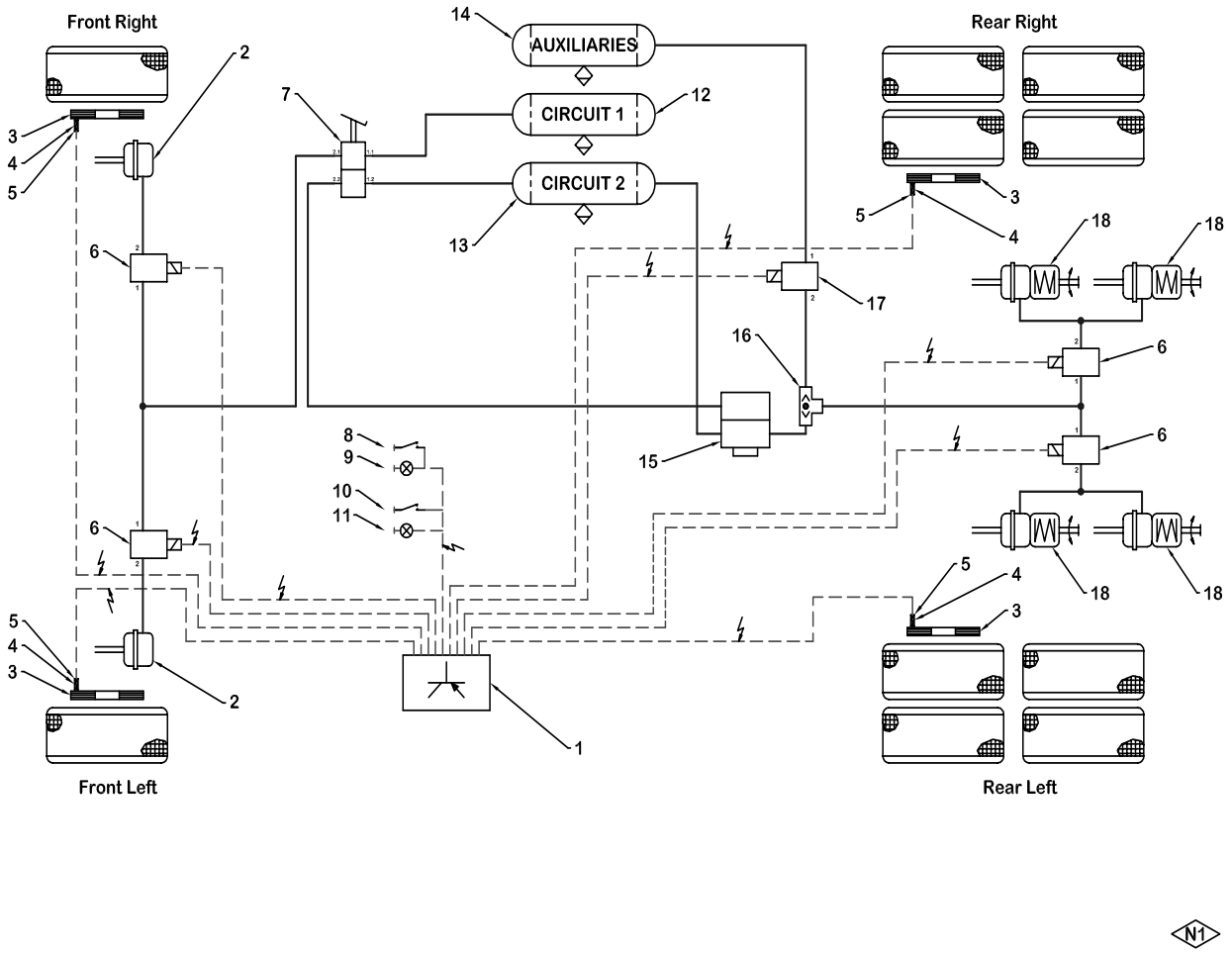

Notes.

N1	SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.

I.D.	Qty	Description	Part Number	I.D.	Qty	Description	Part Number
14	1	AUXILIARY RESERVOIR CHAMBER					
13	1	RESERVOIR CHAMBER 2					
12	1	RESERVOIR CHAMBER 1					
11	1	ASR WARNING LAMP					
10	1	ASR OFF SWITCH					
9	1	ABS WARNING LAMP					
8	1	BLINK CODE SWITCH					
7	1	FOOT BRAKE PEDAL					
6	4	ABS SOLENOID VALVE	364 546 001				
5	4	SENSOR SLEEVE	059 5253 09				
4	4	WHEEL SPEED SENSOR	364 528 ---	18	4	BRAKE CHAMBER (WITH SPRING)	
			364 094 ---	17	1	BRAKE APPLY SOLENOID VALVE	041 5037 09
3	4	TOOTHED WHEEL					041 5062 09
2	2	BRAKE CHAMBER (WITHOUT SPRING)		16	1	DOUBLE CHECK VALVE	333 001 101
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001	15	1	RELAY VALVE	

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1	PR2017	JFB	02/07/09

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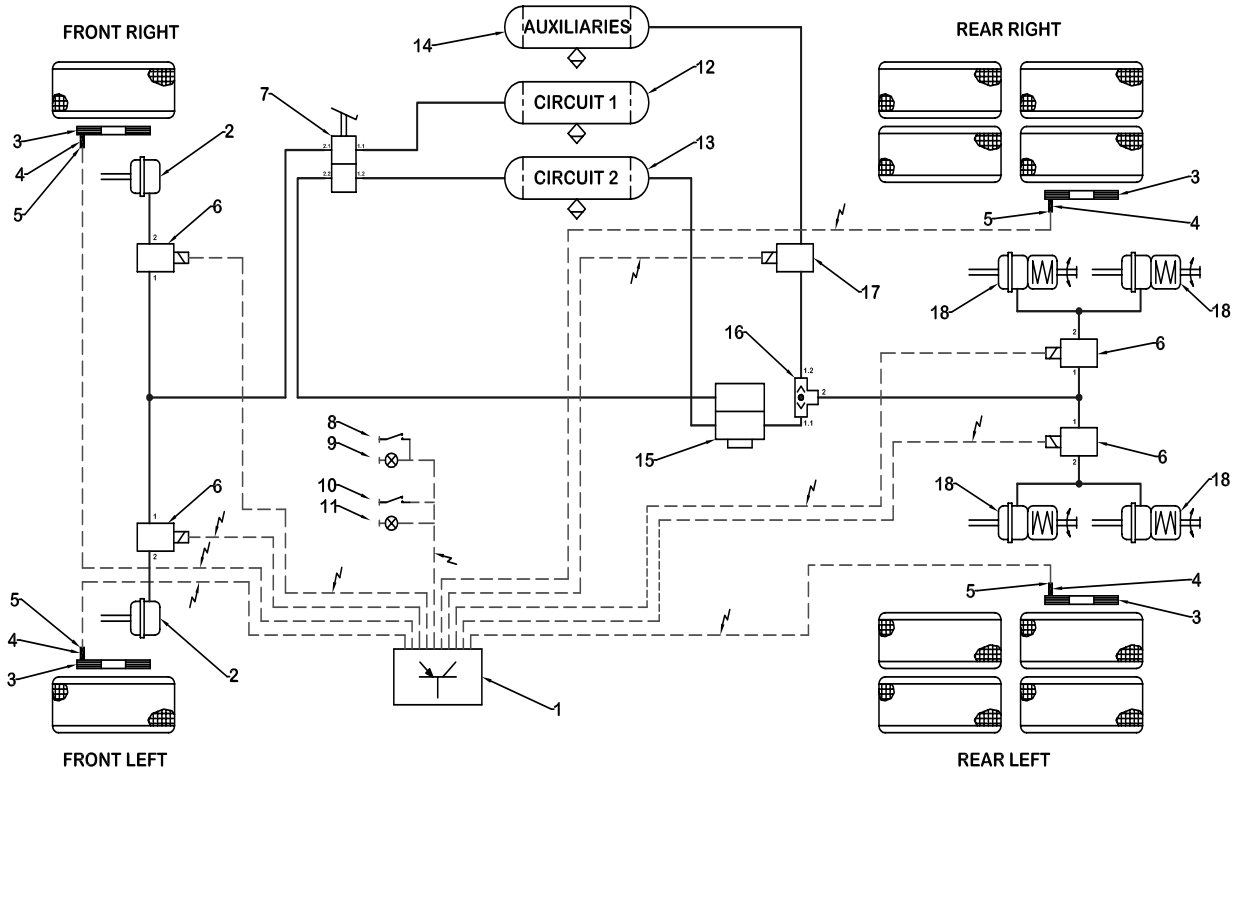
TITLE 4S/4M ABS / ASR Schematic 6 x 4

Sheet 1 of 1

A4

Form. GF 390 Iss. 01

PART No. 911_492_001



Notes.

N1	SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.

I.D.	Qty	Description	Part Number	I.D.	Qty	Description	Part Number
14	1	AUXILIARY RESERVOIR CHAMBER					
13	1	RESERVOIR CHAMBER 2					
12	1	RESERVOIR CHAMBER 1					
11	1	ASR WARNING LAMP					
10	1	ASR OFF SWITCH					
9	1	ABS WARNING LAMP					
8	1	BLINK CODE SWITCH					
7	1	FOOT BRAKE PEDAL					
6	4	ABS SOLENOID VALVE	364 546 001				
5	4	SENSOR SLEEVE	059 5253 09				
4	4	WHEEL SPEED SENSOR	364 528 ---	18	4	BRAKE CHAMBER (WITH SPRING)	
			364 094 ---	17	1	BRAKE APPLY SOLENOID VALVE	041 5037 09
3	4	TOOTHED WHEEL					041 5062 09
2	2	BRAKE CHAMBER (WITHOUT SPRING)		16	1	DOUBLE CHECK VALVE	333 001 101
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001	15	1	RELAY VALVE	

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1	PR2017	JFB	02/07/09

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TITLE 4S/4M ABS / ASR Schematic 6 x 4 - Option

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A4

PART No. 911_493_001

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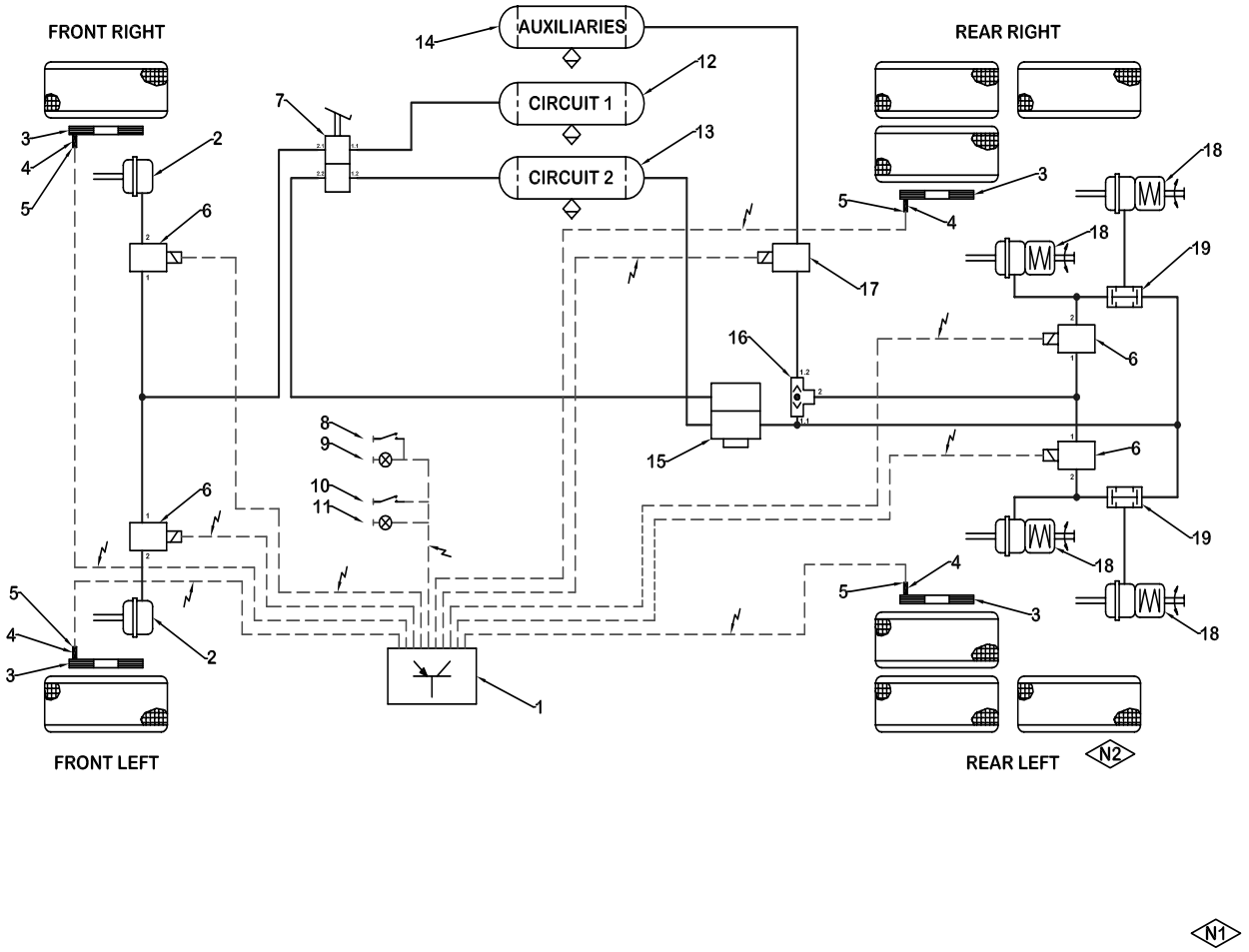

	Notes.
N1	SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.
N2	TAG AXLE MAY BE LIFT AXLE.

I.D.	Qty	Description	Part Number
14	1	AUXILIARY RESERVOIR CHAMBER	
13	1	RESERVOIR CHAMBER 2	
12	1	RESERVOIR CHAMBER 1	
11	1	ASR WARNING LAMP	
10	1	ASR OFF SWITCH	
9	1	ABS WARNING LAMP	
8	1	BLINK CODE SWITCH	
7	1	FOOT BRAKE PEDAL	
6	4	ABS SOLENOID VALVE	364 546 001
5	4	SENSOR SLEEVE	059 5253 09
4	4	WHEEL SPEED SENSOR	364 528 ---
			364 094 ---
3	4	TOOTHED WHEEL	
2	2	BRAKE CHAMBER (WITHOUT SPRING)	
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001

I.D.	Qty	Description	Part Number
19	2	TWO PRESSURE VALVE	G833 999 999
18	4	BRAKE CHAMBER (WITH SPRING)	
17	1	BRAKE APPLY SOLENOID VALVE	041 5037 09
			041 5062 09
16	1	DOUBLE CHECK VALVE	333 001 101
15	1	RELAY VALVE	

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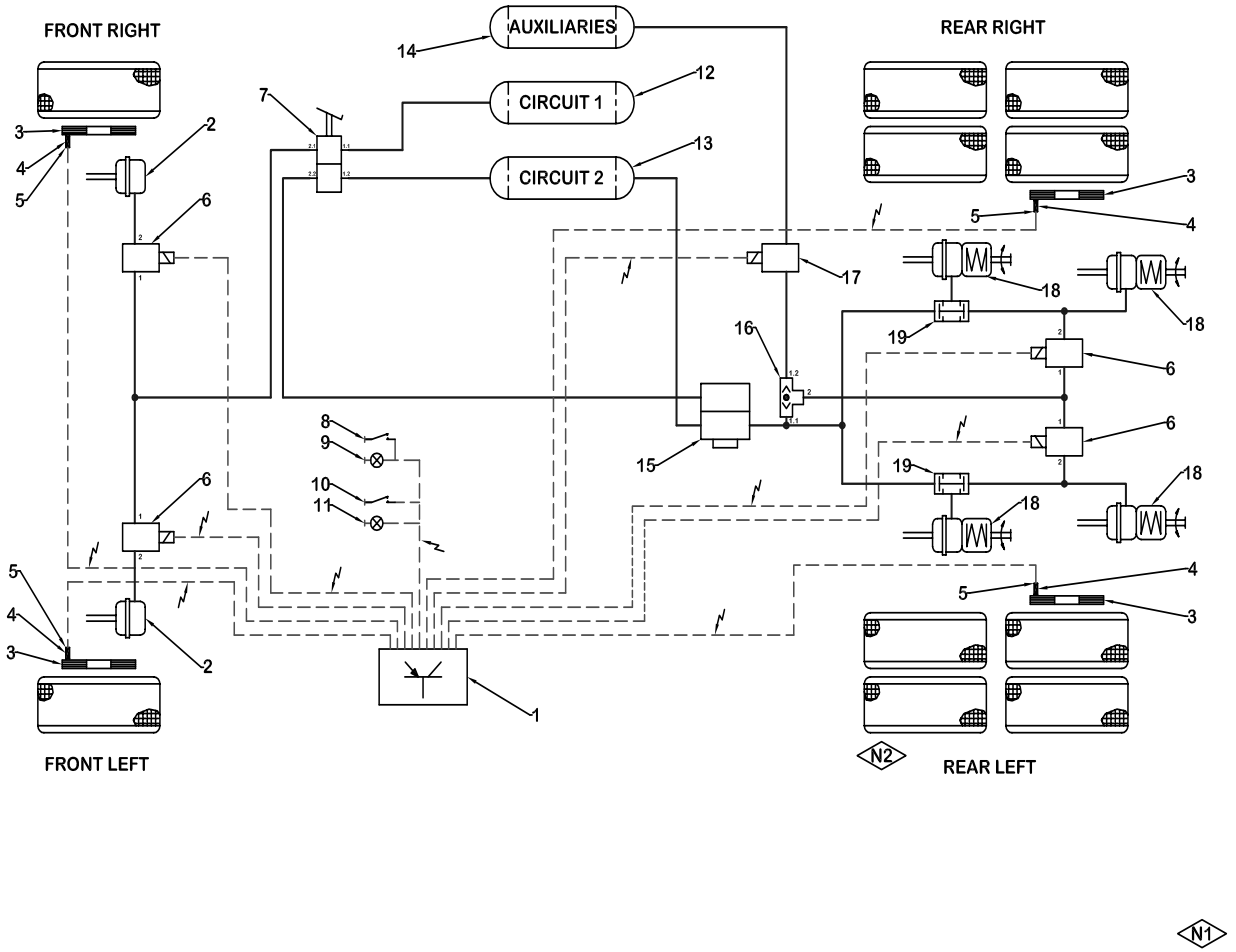
TITLE 4S/4M ABS / ASR Schematic 6 x 2 - Tag

Sheet 1 of 1

A4

Form. GF 390 Iss. 01

PART No. 911_494_001



	Notes.
N1	SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.
N2	PUSHER AXLE MAY BE LIFT AXLE.

I.D.	Qty	Description	Part Number	I.D.	Qty	Description	Part Number
14	1	AUXILIARY RESERVOIR CHAMBER					
13	1	RESERVOIR CHAMBER 2					
12	1	RESERVOIR CHAMBER 1					
11	1	ASR WARNING LAMP					
10	1	ASR OFF SWITCH					
9	1	ABS WARNING LAMP					
8	1	BLINK CODE SWITCH					
7	1	FOOT BRAKE PEDAL					
6	4	ABS SOLENOID VALVE	364 546 001				
5	4	SENSOR SLEEVE	059 5253 09	19	2	2 PRESSURE DOUBLE CHECK VALVE	G833 999 999
4	4	WHEEL SPEED SENSOR	364 528 ---	18	4	BRAKE CHAMBER (WITH SPRING)	
			364 094 ---	17	1	BRAKE APPLY SOLENOID VALVE	041 5037 09
3	4	TOOTHED WHEEL					041 5062 09
2	1	BRAKE CHAMBER (WITHOUT SPRING)		16	1	DOUBLE CHECK VALVE	333 001 101
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001	15	1	RELAY VALVE	

ISS.	CHANGE	CHECK	DATE
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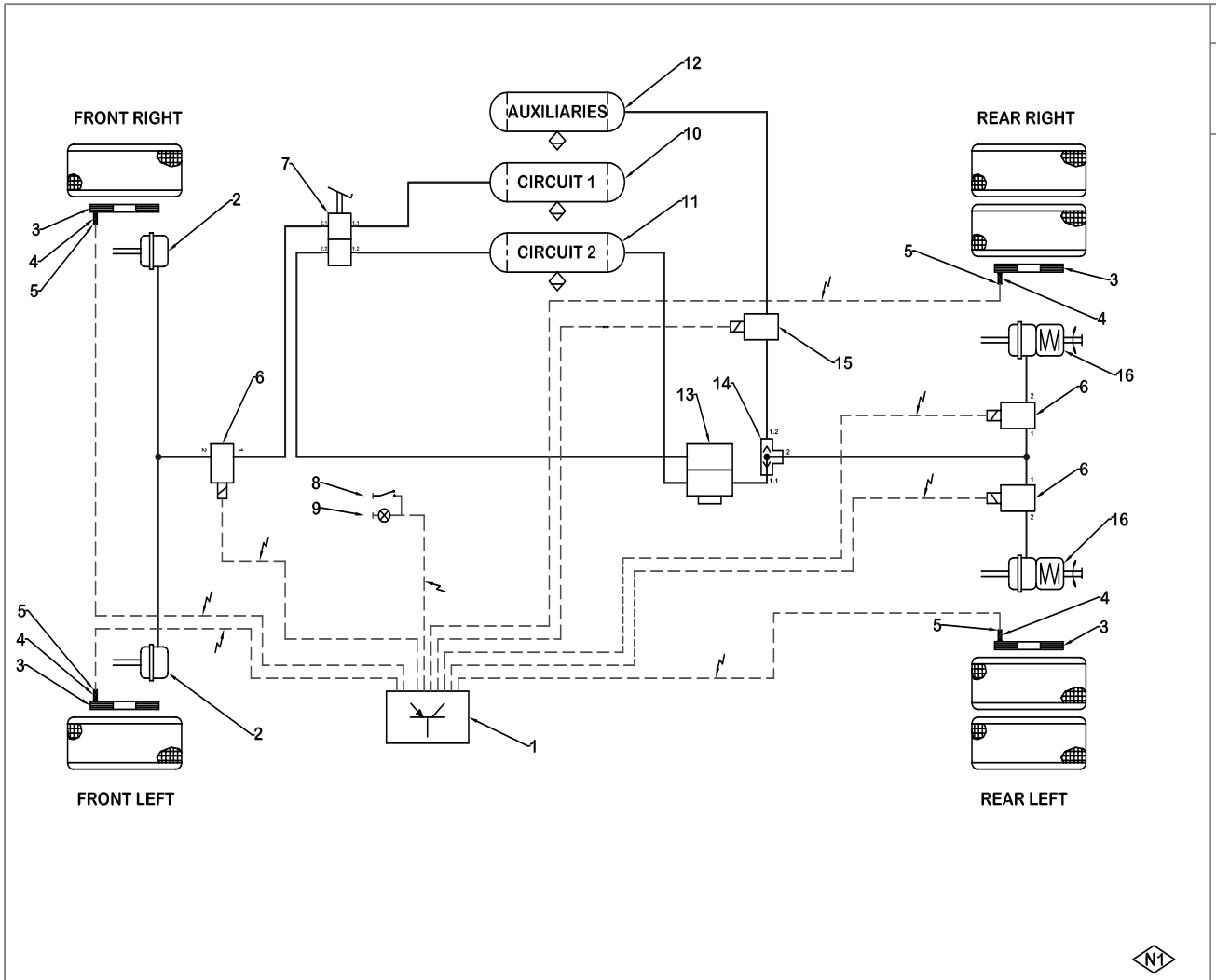
TITLE 4S/4M ABS / ASR Schematic 6 x 2 - Pusher

PART No. 911_495_001

Sheet 1 of 1

A4

Form. GF 390 Iss. 01



Notes.

N1 SCHEMATIC IS FOR GUIDANCE ONLY. CONSULT LOCAL HALDEX APPLICATIONS ENGINEERING FOR FURTHER DETAILED ADVICE.

I.D.	Qty	Description	Part Number	I.D.	Qty	Description	Part Number
14	1	DOUBLE CHECK VALVE					
13	1	RELAY VALVE					
12	1	AUXILIARY RESERVOIR CHAMBER					
11	1	RESERVOIR CHAMBER 2					
10	1	RESERVOIR CHAMBER 1					
9	1	ABS WARNING LAMP					
8	1	BLINK CODE SWITCH					
7	1	FOOT BRAKE PEDAL					
6	3	ABS SOLENOID VALVE	364 546 001				
5	4	SENSOR SLEEVE	059 5253 09				
4	4	WHEEL SPEED SENSOR	364 528 ---				
			364 094 ---				
3	4	TOOTHED WHEEL		16	2	BRAKE CHAMBER (WITH SPRING)	
2	2	BRAKE CHAMBER (WITHOUT SPRING)		15	1	BRAKE APPLY SOLENOID VALVE	041 5037 09
1	1	MAIN ELECTRONIC CONTROL UNIT	364 545 001				041 5062 09

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TITLE: ABS/ASR 4S/3M Schematic

Sheet 1 of 1

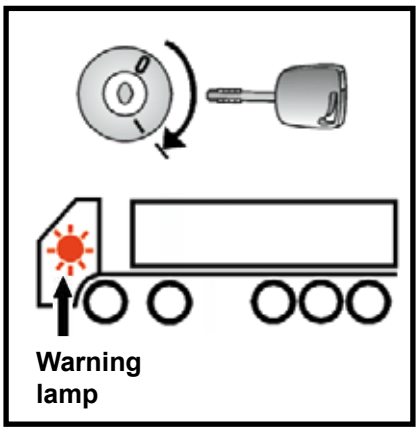
A4

Form. GF 390 Iss. 01

PART No. 911_496_001

System Check Procedure

The **TK**+ 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**+ system is powered by the ignition switch.

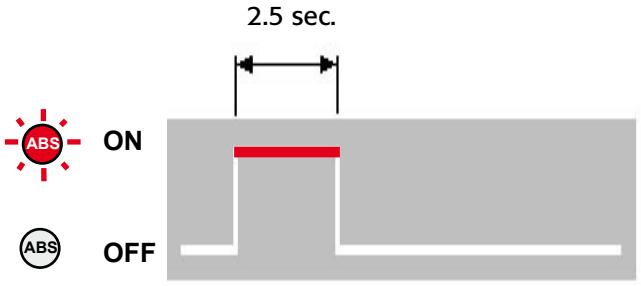


1. On power up of the system, the ABS warning lamp must indicate in the following sequence in order to show a fault-free system:

Normal Operation

ON for 2 seconds = Warning device OK and system self-checking.

OFF = System self-checked (not sensors)



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.

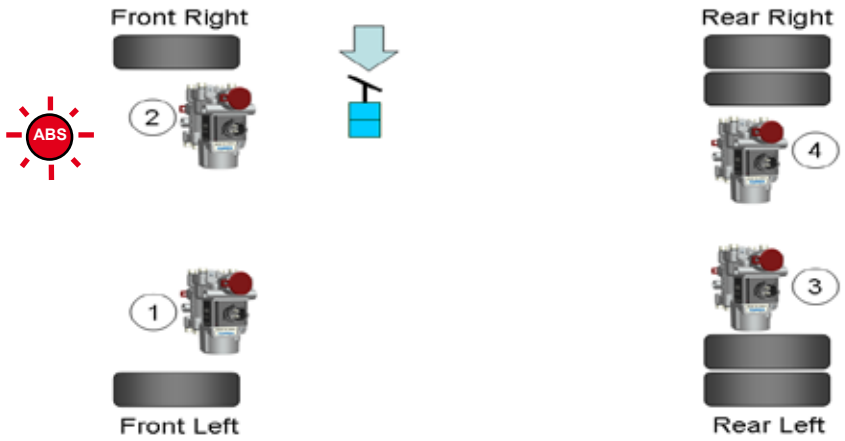
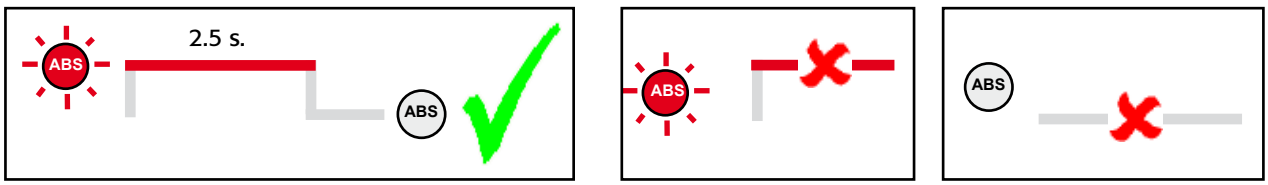


Fig 21

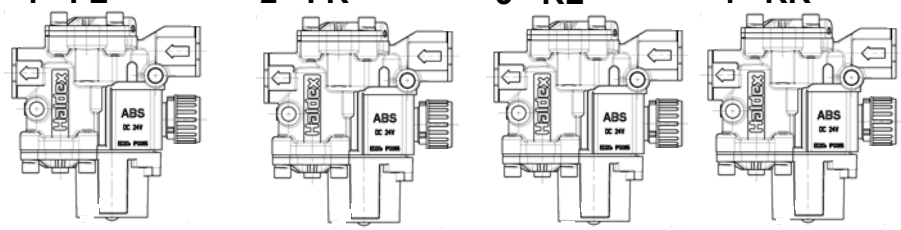
Key	
	ABS valve Cycle
	O.K.
	NOT O.K.

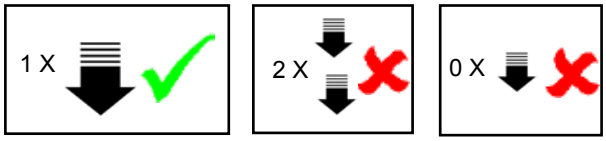
1 Power ON, Watch ABS lamp.



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

1 - FL **2 - FR** **3 - RL** **4 - RR**





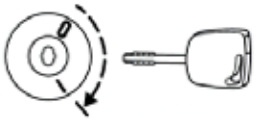
ABS and Auxiliary Configuration

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

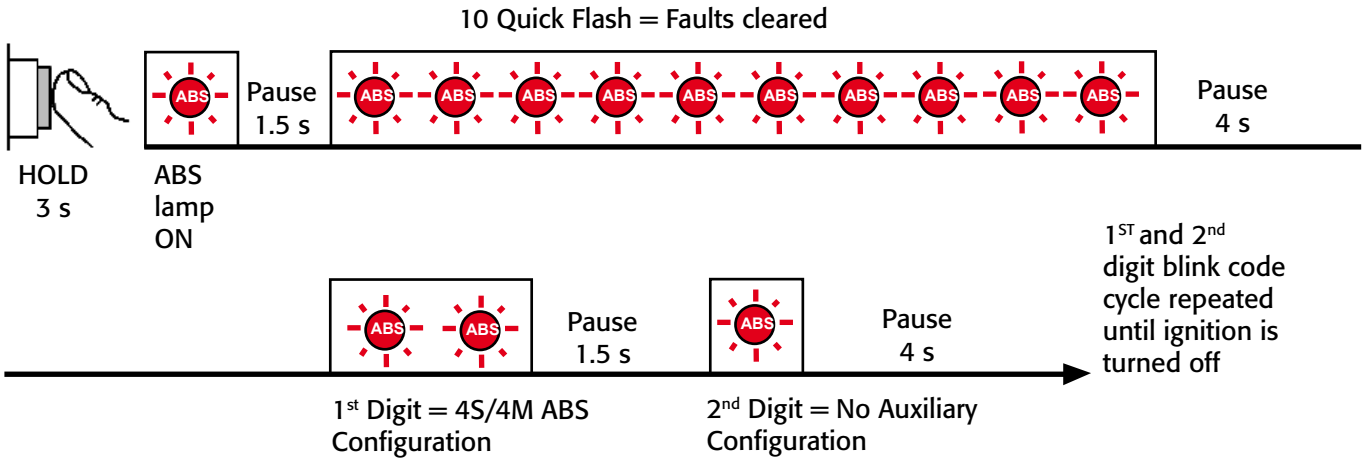
4S/4M ABS Configuration = 2 Lamp flashes (1st Digit)
No Auxiliary Configuration = 1 Lamp flash (2nd Digit)

The procedure and configuration blink code are illustrated as follows:

1. Switch ignition ON



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



Note: This is only displayed with option set 2 (see page 32)

ABS System Configurations

Flashes	ABS System Configuration
2	4S/4M
3	4S/3M
6	4S/3MR

Aux Configurations - Only common configurations are defined

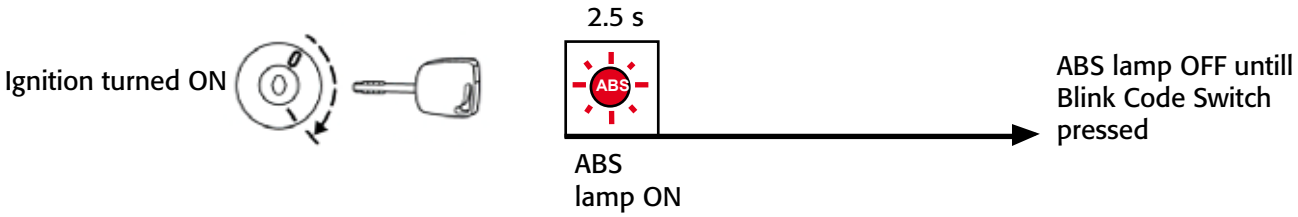
Flashes	Relay Controlled Retarder	CAN Controlled Retarder (1	CAN Controlled Engine Torque	Brake Apply Valve	Description
1					ABS Only
2	Y				ABS + Retarder Relay
3				Y	ABS + Brake only ASR
4	Y			Y	ABS + Brake only ASR + Retarder relay
5			Y	Y	ABS + Full ASR
6	Y		Y	Y	ABS + Full ASR + Retarder relay
7		Y	Y	Y	ABS + Full ASR + CAN Retarder
10	OTHER COMBINATIONS				Any other combination not defined above

(1 - Retarder may be engine or driveline or both

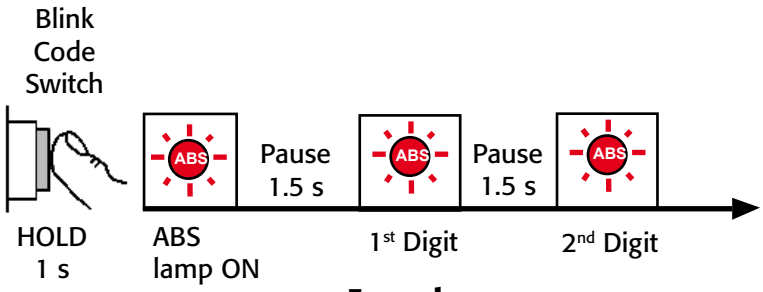
Blink Code Diagnostics

Mode	Procedure	System Response	Action
Diagnostic	Step 1 Turn Ignition ON.	Possible Responses A. ABS Warning lamp comes on momentarily then goes out indicating that the system is OK. B. ABS Warning lamp does not light, indicating possible wiring fault or burned out bulb. C. ABS Warning lamp stays on, indicating: • 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. Inspect bulb. Make necessary repairs. Continue with blink code diagnostics (Go to step 2) Continue with blink code diagnostics (Go to step 2) Drive vehicle – lamp will go out when the vehicle reaches 6Km/h (4 mph). Connect ECU
	Step 2 Press and hold Diagnostic Switch for one second, then release.	ABS Warning Lamp begins flashing up to seven digit blink code(s)	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.	First Digit: 1-8 flashes, Pause (1.5s) Subsequent Digits: 1-6 flashes, Pause (4s)	Find definition for blink code on diagnostic chart.
	Step 4 Turn Ignition OFF. Repair Faults	Active Fault Stored Faults:	Make the necessary repairs. Repeat steps 1 to 3 until system is OK(code 1-1 displayed). Note: Most recent fault stored is the first to be displayed.
Clear	Step 1 Turn Ignition ON Clear Faults from Memory: Press and hold Diagnostic switch for at least three seconds then release.	ABS Warning lamp flashes ten times Ten flashes not displayed	All stored faults successfully cleared. Turn ignition OFF. Active faults still exist, repeat Steps 1- 4.
Reset Configuration	Step 1 Turn Ignition ON Reset Configuration in Internal Memory: Press and hold Diagnostic switch for at least 6 seconds then release.	Blink Code Lamp flashes continuously	Configuration reset successfully. Turn ignition OFF.
Change Option Set	Step 1 Turn Ignition ON Change Option Set: Press and release Diagnostic switch 3 times in the first 5 seconds	Long flashes followed by very short flashes to indicate in Option set mode	If 1 long flash then Option Set 1 is current setting, if 2 long flashes then Option Set 2 is current setting
	Step 2 Press and hold Diagnostic switch for at least 2 seconds	Long flashes followed by very short flashes to indicate in Option set mode	Option Set will change from 1 to 2, or from 2 to one and then display current setting. If 1 long flash then Option Set 1 is current setting, if 2 long flashes then Option Set 2 is current setting
	Step 3 Switch off ignition		Current Option set is stored

Blink Code Illustrated

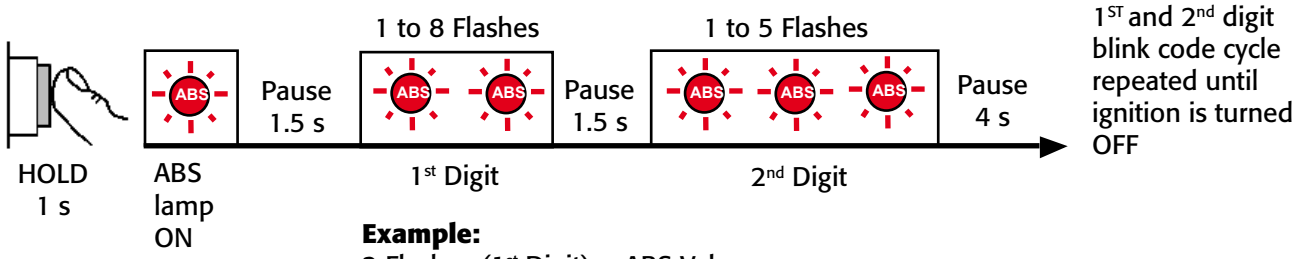


System O.K.



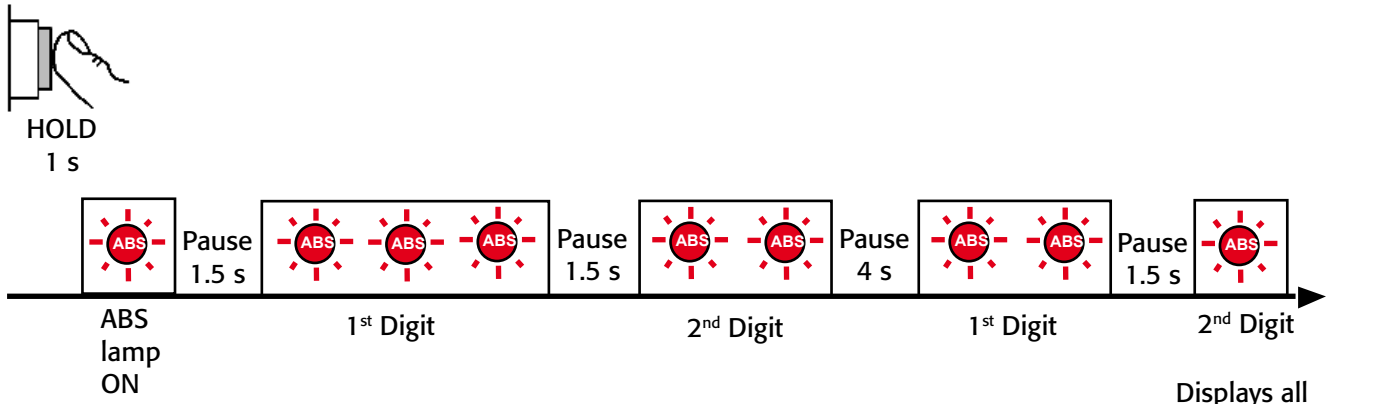
Example:
1 Flash (1st Digit) = No Fault
1 Flash (2nd Digit) = No Fault

Display Active faults



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

Display Stored faults

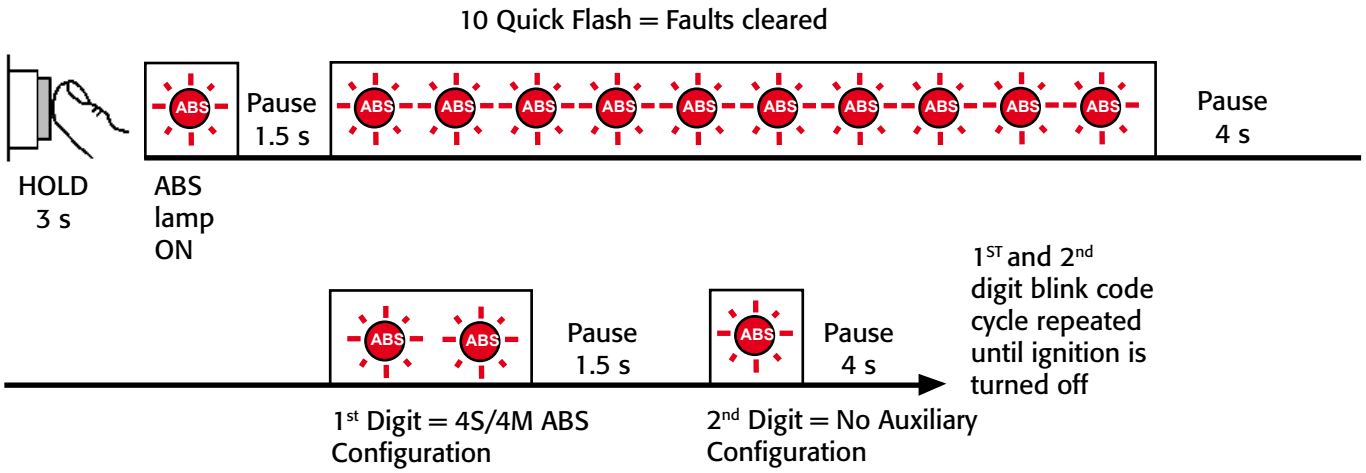


Displays all stored faults once. Last fault stored is displayed first

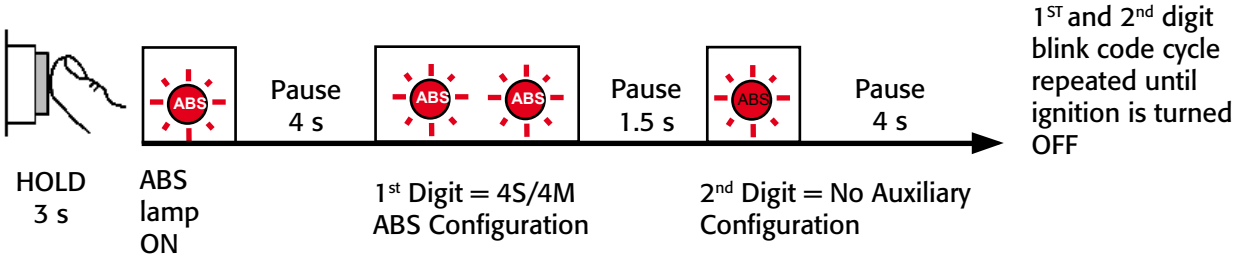
Example:
3 Flashes (1st Digit) = Wheel Sensor - Tooth Wheel gap
2 Flashes (2nd Digit) = Right Front

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

Faults Cleared

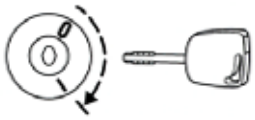


Faults Not Cleared (Active Faults Still Exist)

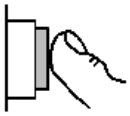


Operational Sequence to change from Option Set 1 to Option Set 2

Ignition turned ON

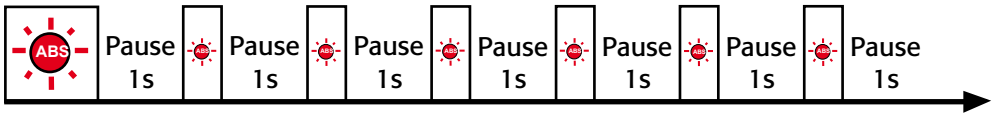


Blink Code Switch



Press 3 times within the 1st 5 seconds after power up

1s

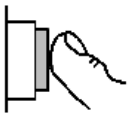


ABS lamp ON

Lamp flash sequence if Option Set 1 is active

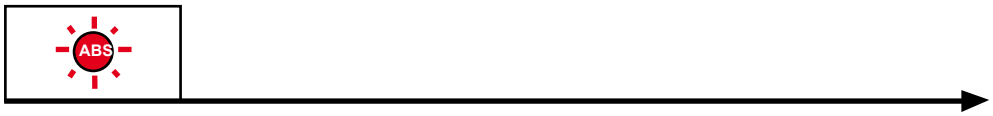
Change to Option Set 2

DIAG Switch



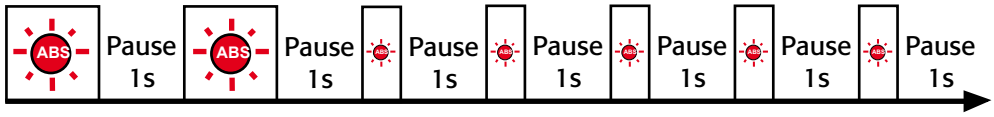
HOLD 2 s

2s



ABS lamp ON

1s



ABS lamp ON

Lamp flash sequence if Option Set 2 is active

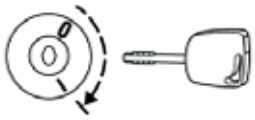
Ignition turned OFF

The current active option setting is retained when the ignition is turned OFF

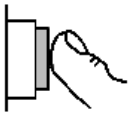
Option Set 1	Option Set 2
Use ASR Lamp for blink Codes	Use ABS Lamp for Blink Codes
Do no show Auxillaries in Blink Configuration Code	Show Auxillaries in Blink Configuration Code
Wheel/Valve Blink Code Labels: Front Right = 1	Wheel/Valve Blink Code Labels: Front Left = 1
Front Left = 2	Front Right = 2
Rear Right = 3	Rear Left = 3
Rear Left = 4	Rear Right = 4

Operational Sequence to change from Option Set 2 to Option Set 1

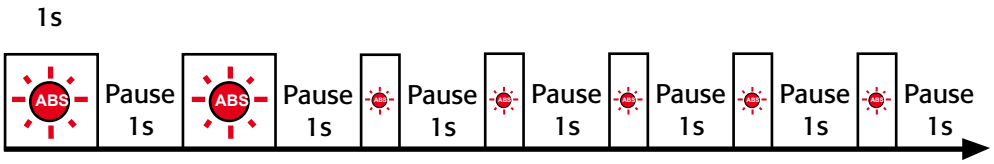
Ignition turned ON



Blink Code Switch



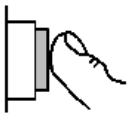
Press 3 times within the 1st 5 seconds after power up



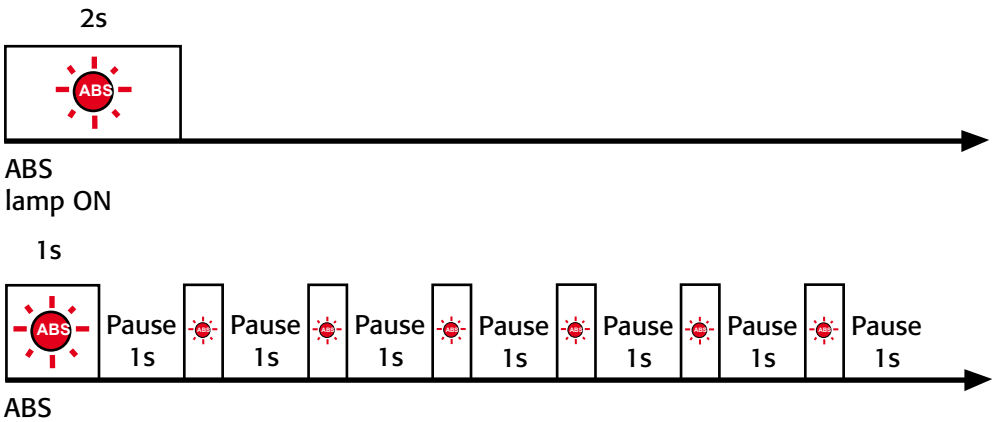
Lamp flash sequence if Option Set 2 is active

Change to Option Set 1

DIAG Switch



HOLD 2 s



Lamp flash sequence if Option Set 1 is active

Ignition turned OFF

The current active option setting is retained when the ignition is turned OFF

Option Set 1	Option Set 2
Use ASR Lamp for blink Codes	Use ABS Lamp for Blink Codes
Do no show Auxillaries in Blink Configuration Code	Show Auxillaries in Blink Configuration Code
Wheel/Valve Blink Code Labels: Front Right = 1	Wheel/Valve Blink Code Labels: Front Left = 1
Front Left = 2	Front Right = 2
Rear Right = 3	Rear Left = 3
Rear Left = 4	Rear Right = 4

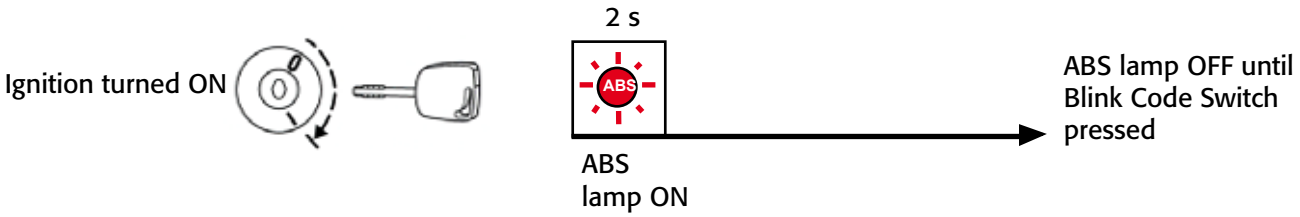
Auxiliary Configuration Reset

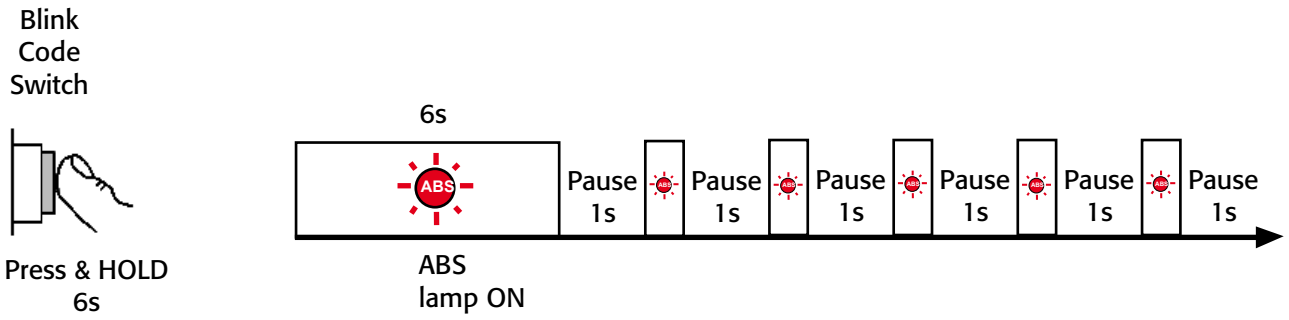
The TK+ ABS ECU will auto detect the following auxiliaries:

- Retarder Relay
- ASR Valve
- J1939 Engine Control
- J1939 Retarder Control

Once the auxiliary has been auto detected, the ECU "expects" the auxiliary to be present, and if it is not present, a fault will be reported. If an auxiliary is removed, the auxiliary configuration in the ECU should be reset to avoid the generation of faults. Once the power is re-applied after the reset procedure (detailed below), the ECU will auto detect the remaining auxiliaries and update the ECU auxiliary configuration.

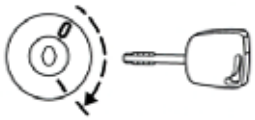
Reset Procedure



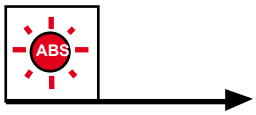


1st Digit	Type of Fault	2nd Digit	Location of Fault	
1	No Fault	1	No Fault	
			Option Set 1	Option Set 2
2	ABS Valve	1	Front Right Wheel	Front Left Wheel
3	Wheel Sensor - Tooth Wheel Gap	2	Front Left Wheel	Front Right Wheel
4	Wheel Sensor Continuity	3	Rear Right Wheel	Rear Left Wheel
5	Wheel Sensor Signal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

Alternative ABS Lamp Sequence Identification

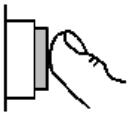
Ignition turned ON 

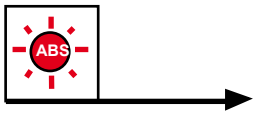
Indication 1



ABS lamp comes ON and stays ON

Press and hold 1s
Blink Code Switch

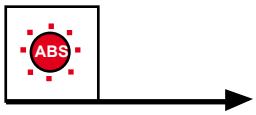




ABS remains ON

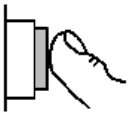
Fault - B+ Non ignition switch fuse blown

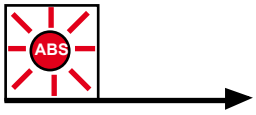
Indication 2



ABS lamp comes ON slightly dimmer

Press and hold 1s
Blink Code Switch

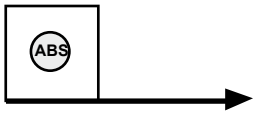




ABS lamp becomes slightly brighter

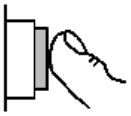
Fault - B+ Ignition switch fuse blown

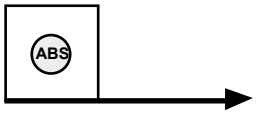
Indication 3



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 Minimum	Sensor disconnected from ECU. Wheel rotated at 1 rev/2 sec.	22
Sensor resistance	A B	>1.0 < 2.4 kohms	Sensor disconnected from ECU.	22
ABS Valve Solenoid resistance	Dump - Common Hold - Common	>10 < 20 ohms	Cable disconnected	23
Chassis Continuity	ECU and Vehicle Chassis	⩽0.1 ohms		24

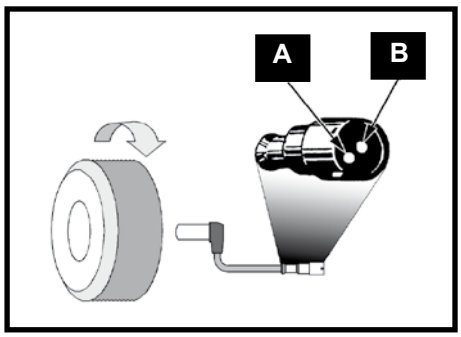


Fig 22 - Sensor Connector

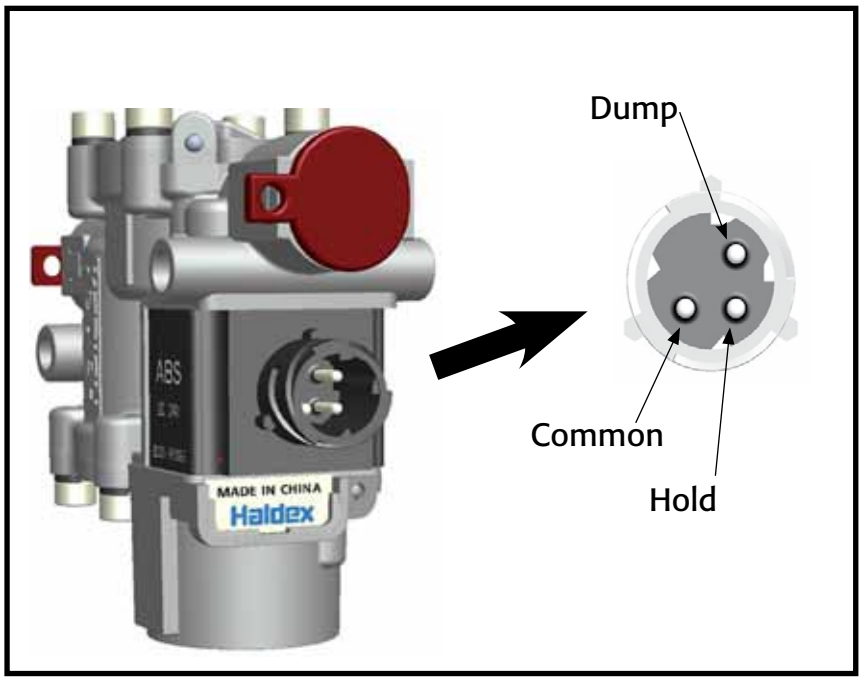


Fig 23 - ABS Solenoid Connector

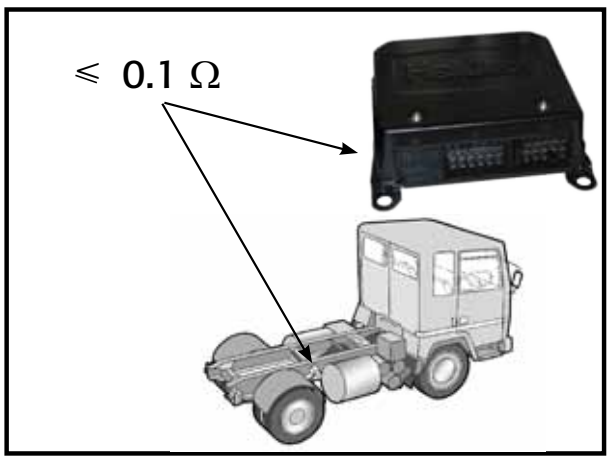


Fig 24 - ECU Chassis Continuity

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Haldex is listed on the Stockholm Stock Exchange. Haldex has a yearly turnover of close to 5.6 billion SEK and employs 4,300 people.

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