

**SCANIA**

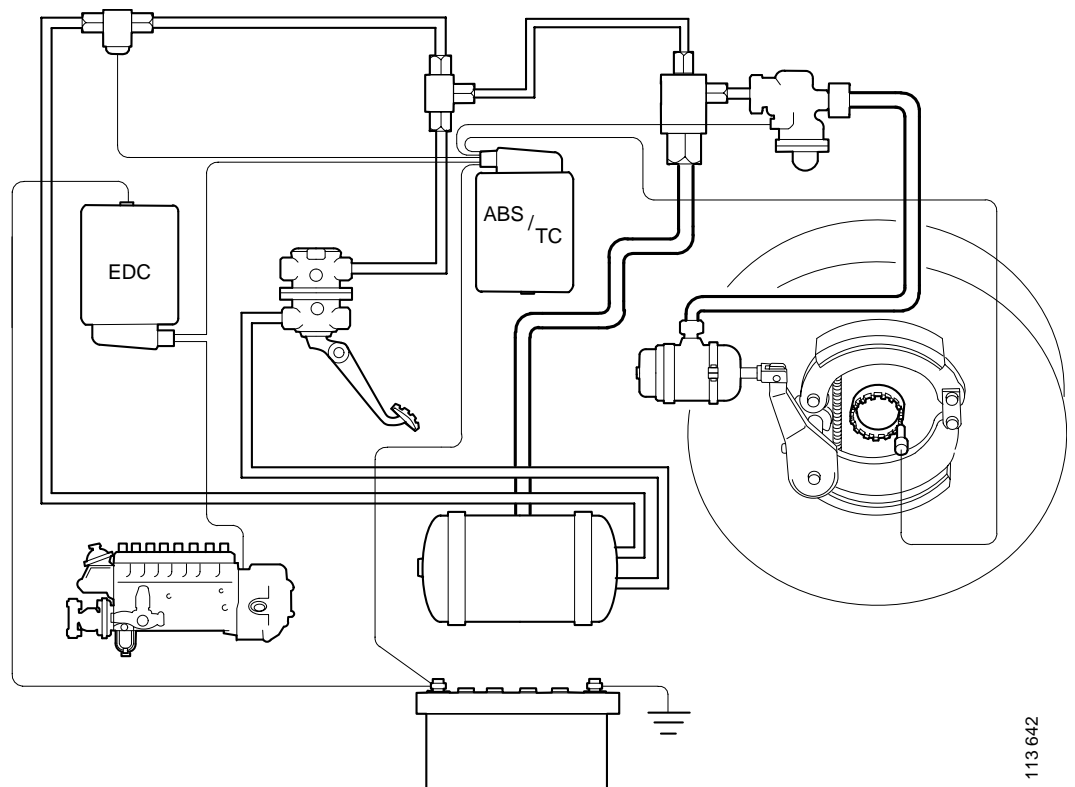
**10:04-03**

Issue 3 en

## Wabco ABS/TC "D"

### 4 and 6 channel system

#### Function and work description



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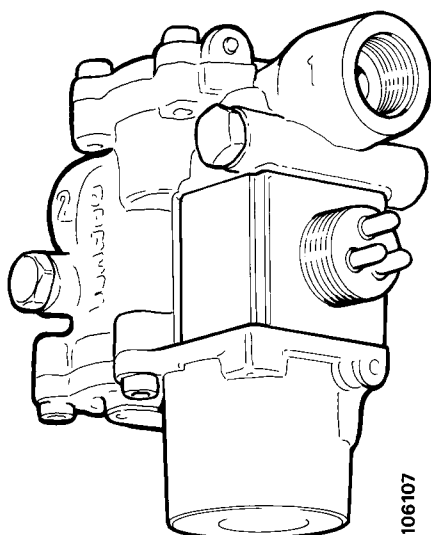
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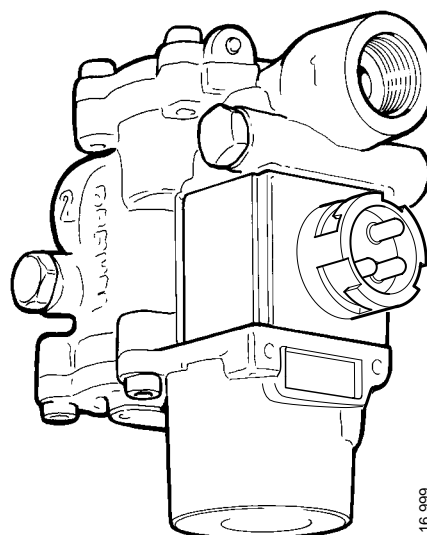
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## General

From chassis numbers SS 1250601, SA 9042879, SN 4413456 and onwards, a new control valve has been introduced in production. The appearance of the electrical connector on the control valve has been changed. The contact pins in the connector have been given different functions. New current path diagrams have been added to the booklet.



*Wabco control valve type 1.*



*Wabco control valve type 2. From chassis numbers SS 1250601, SA 9042879, SN 4413456 and onwards.*

# Control unit, ABS

## Function

### Functions, general

#### General

- This WABCO ABS/TC system has a new generation of control unit which is different from the previous one. The main difference is TC control with CAN communication to the EDC control unit. A vehicle without EDC has a proportional valve for this function instead.
- Exchange of information with the EDC control unit takes place via CAN communication. There is one control unit for 4x2, multi-axle vehicles with one driving axle and one control unit for multi-axle vehicles with two driving axles.

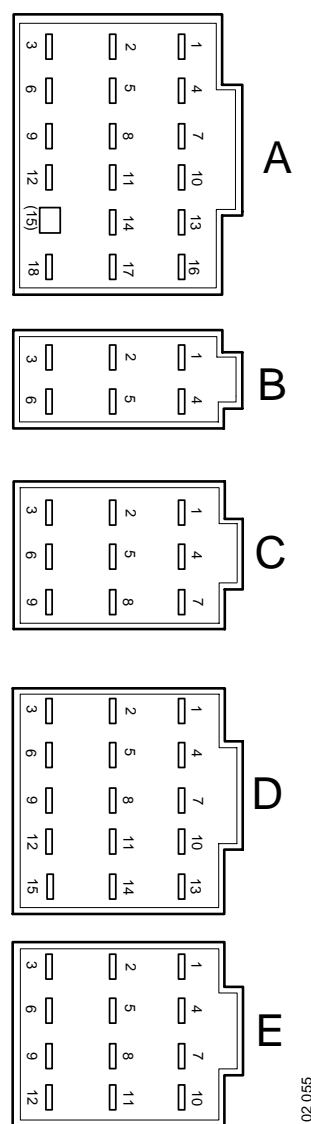


**The control units for multi-axle vehicles with one driving axle and multi-axle vehicles with two driving axles are not interchangeable. If the incorrect control unit is fitted to the vehicle, it may jeopardise road safety.**

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- After turning the starter lock to drive, the control unit conducts a test and activates the control valves (six clicking noises for the 4-channel system and eight clicking noises for the 6-channel system are heard).
- When the starter lock is turned to the drive position, the truck ABS warning lamp should go out after about 3 seconds, provided that there are no faults in the ABS.

- The ABS warning lamp shows whether there was a fault in the wheel sensors the last time the power was switched on. In order for the warning lamp to go out after the wheel sensors have been repaired, it is necessary to start driving the vehicle.
- The TC indicator lamp/diagnostics lamp goes out after about 1.5 seconds, if the control unit is not configured for TC. For other functions of the TC indicator lamp, see Function description for ABS/TC p.21
- If the system is not already configured for TC, the control unit is automatically configured for TC when the starter lock is turned to the drive position. This happens, provided that the control unit can establish contact with the EDC/proportional valve and the TC valve.
- Function-specific connectors. (Five for the 4-channel system and five for the 6-channel system. Connector E exists only for the 6-channel system). Connector A contains connections for voltage supply, diagnostics and features on the instrument panel. Other connectors are mainly designed for components located on the chassis frame and their cable harnesses.
- Information exchange with other control units in the vehicle takes place via CAN communication.
- Vehicles with speed limiter and no EDC use the proportional valve which limits acceleration.



#### *Control unit connector*

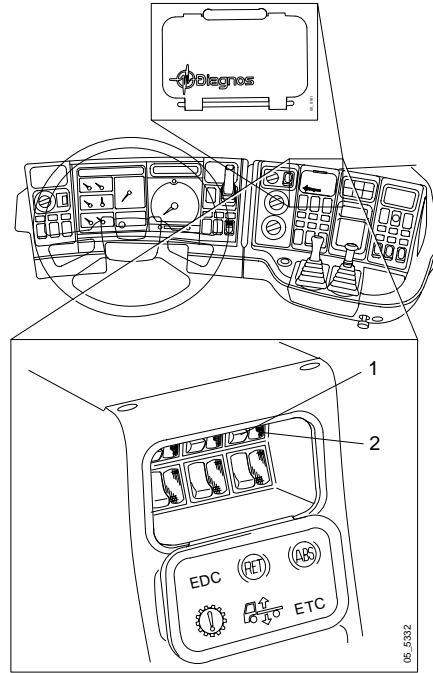
*Connector E exists only in the 6-channel ABS system*

# Scania Diagnos ABS/TC

## Reading fault codes

### Diagnostics panel

This version of WABCO ABS/TC has an integral troubleshooting/diagnostics system. The diagnostics panel is located on the instrument panel and consists of a switch for activating and erasing the diagnostics memory, as well as a diagnostics lamp for flashing codes. If a TC warning lamp is fitted it is connected in parallel with the diagnostics lamp.



- 1 1 Diagnostics switch ABS/TC  
2 2 Diagnostics lamp

### Diagnostics mode

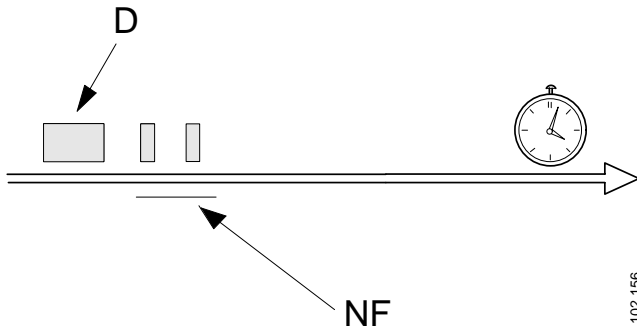
Two things can be shown in diagnostics mode:

- 1 Fault code for the particular fault, if the system has one (see "AF" in the "Displaying fault codes" section). In order for other faults to be displayed, the current fault must be repaired.
- 2 Fault codes for the faults which have been stored in the fault code memory (see "F1", "F2" and "F3" in the "Displaying fault codes" section). The latest four of these fault codes are flashed out in reverse order, i.e. the latest registered code is shown first. There can be a maximum of 16 stored fault codes.

## Displaying fault codes

In order for the control unit to display the current or stored fault codes, the diagnostics switch (D in the figures on the following pages) must be pressed 0.5-3.0 seconds (=diagnostics mode). Fault codes consist of two blocks.

No fault exists/no fault codes stored

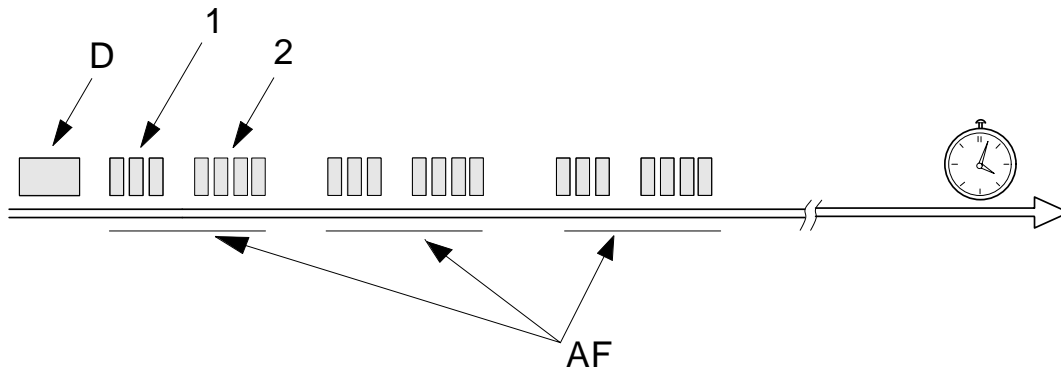


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*D = Diagnostics switch is pressed for 0.5-3.0 seconds*

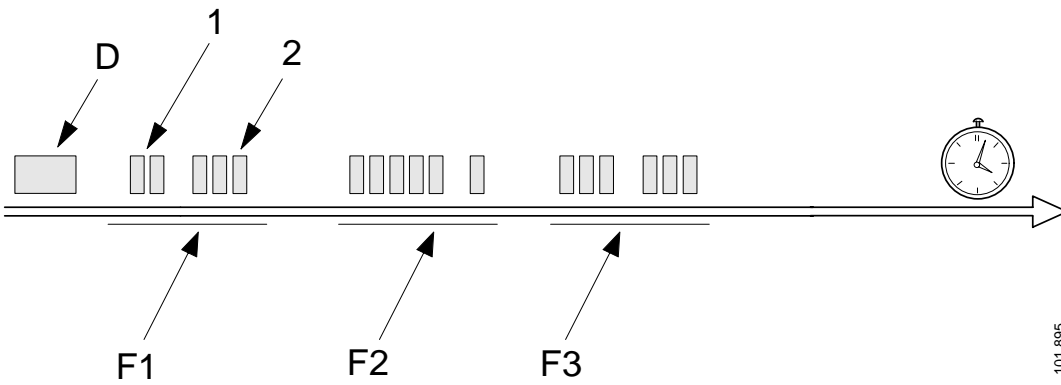
*NF = No fault exists/no fault codes stored. If there are no faults in the vehicle, this flashing code is displayed once.*

Current fault code



101 894

Stored fault codes (no current fault code exists)



101 895

*D = Diagnostics switch pressed for 0.5-3.0 seconds*

*1 = 1st block in fault code.*

*2 = 2nd block in fault code.*

*AF = The control unit senses that there is a fault present. Current fault code is displayed again. The vehicle can only display 1 current fault code.*

*F1 = 3rd stored fault code*

*F2 = 2nd stored fault code*

*F3 = 1st stored fault code*

*Comment regarding F1, F2 and F3: Stored fault codes are displayed once and there can be no more than 16 codes.*



## System mode

In order to set the control unit to system mode, the diagnostics switch must be pressed for 3-6 seconds.

In system mode:

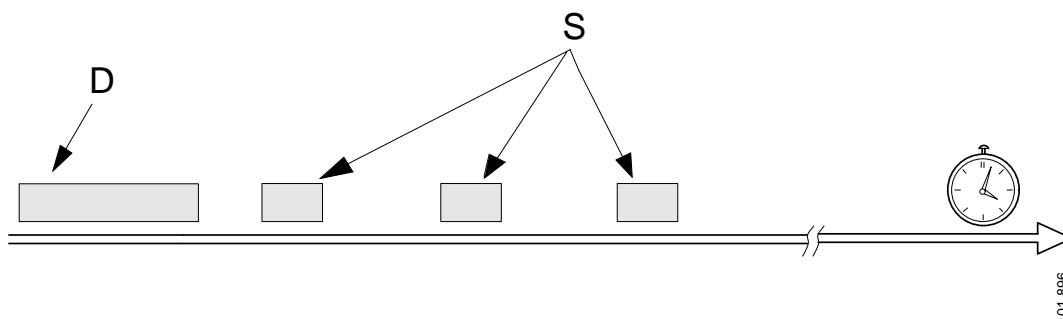
- 1 Stored fault codes are erased. The erasure of stored fault codes is confirmed by the diagnostics lamp with eight quick flashes (see "C" in the "Displaying the system mode" section). If there is a current fault code, this cannot be erased without the fault first being rectified.
- 2 The type of the ABS/TC system control unit is displayed. The control unit type is flashed out in the system block which is repeated. One flash = multi-axle vehicles with one driving axle; two flashes = 4x2 vehicle; five flashes = multi-axle vehicles with two driving axles. See "S" in the "Displaying the system mode" section.
- 3 Engine control/speed limiter can be checked. If the diagnostics switch is pressed twice (the switch must be pressed for at least 0.5 seconds each time, but the interval in-between must not exceed 3.0 seconds), the engine speed is reduced to idling for 10 seconds (the engine must be running at a speed of about 1000 rpm). Always wait until after the first system block before activating the diagnostics switch to reduce the engine speed. See "DM" in the "Activating control unit functions in system mode" section.

- 4 The TC/Retarder can be reconfigured. The control unit senses whether there is a TC valve, EDC/Proportional valve or DBR relay connected. The control unit is configured by pressing the diagnostics switch three times (the switch must be pressed for at least 0.5 seconds each time, but the interval in-between must not exceed 3.0 seconds). The new configuration of the control unit is confirmed by the diagnostics lamp with four quick flashes. Always wait until after the first system block before activating the diagnostics switch to configure the control unit. See "DR" and "CR" in the "Activating control unit functions in system mode" section.
- If the control unit is configured for TC and there are no faults in the TC system the TC indicator lamp/diagnostics lamp comes on for 3 seconds when the starter lock is turned to drive. If the control unit is not configured for TC, the TC indicator lamp/diagnostics lamp comes on for about 1.5 seconds. However, if there is a fault in the TC system it remains on continuously.
  - If the system is not already configured for TC, the control unit is automatically configured when the starter lock is turned to the drive position, provided that the control unit can establish contact with the EDC/Proportional valve and the TC valve.
  - If the control unit is configured for ABS/TC, and it should be configured for ABS only, it must be configured manually as described in the "Activating control unit functions in system mode" section (see "DR" and "CR").

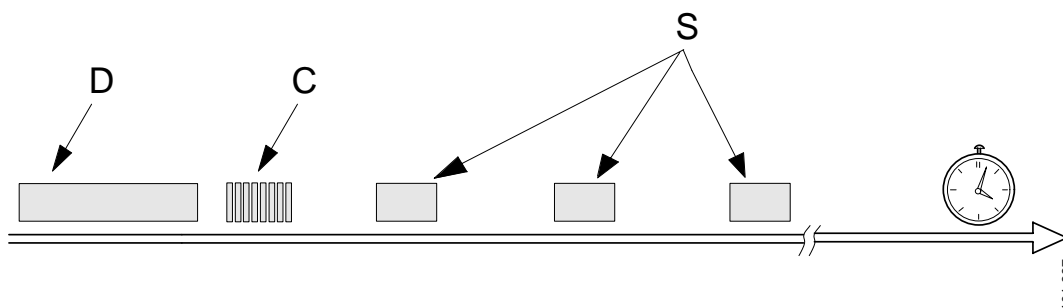
## Displaying the system mode

In order to set the control unit to system mode, the diagnostics switch must be pressed for 3-6 seconds. The following is displayed/happens:

If there is a current fault code



If no current fault code exists = erasure of stored fault codes



*D = Diagnostics switch pressed for 3-6 seconds*

*S = The system block is flashed out as long as the control unit is in system mode:*

*-One flash = Multi-axle vehicles with one driving axle*

*-Two flashes = 4x2 vehicles*

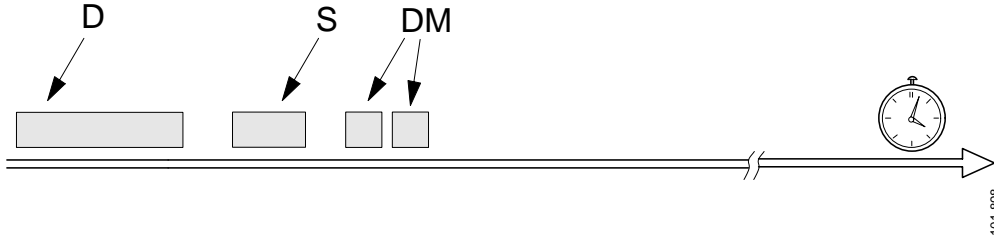
*-Five flashes = multi-axle vehicles with two driving axles*

*C = Eight rapid flashes, a confirmation that stored fault codes have been erased*

## Activating control unit functions in system mode

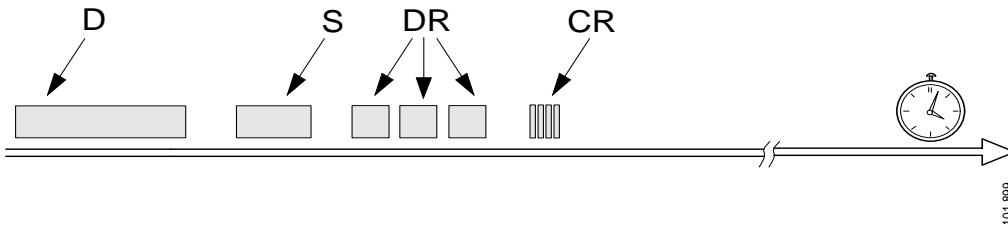
By pressing the diagnostics switch two more times after the first system block, you can check that the engine control/speed limiter are working.

Checking engine control/speed limiter



TC/Retarder is reconfigured by pressing the diagnostics switch three times after the first system block.

Configuring TC/Retarder



*D = Diagnostics switch pressed for 3-6 seconds.*

*S = System block:*

*-One flash = 6x2 vehicles*

*-Two flashes = 4x2 vehicles*

*-Five flashes = 6x4 vehicles*

*DM = Diagnostics switch is pressed twice after the first system block. The switch must be pressed for more than 0.5 seconds each time, but the interval in-between must not exceed 3.0 seconds. If the control unit has accepted your activation, the engine speed is reduced to idling for 10 seconds (the engine must be running at about 1000 rpm).*

*DR = Diagnostics switch pressed three times after the first system block. The switch must be pressed for more than 0.5 seconds each time, but the intervals in-between must not exceed 3.0 seconds.*

*CR = Four quick flashes, a confirmation that the control unit has been configured.*

# Troubleshooting

## Testing using a multimeter

There is no Scania test instrument suitable for the five control unit connectors.

**IMPORTANT!** Do not take readings at the pins in the control unit connectors, but take readings at the rear of the connector instead. Otherwise, the pins in the connectors might become damaged.

## How to conduct troubleshooting

- 1 Press the ABS/TC diagnostics switch for 0.5-3.0 seconds and read the flashing code, see "Diagnostics mode" in the "Scania Diagnos ABS/TC" section. The current fault code or stored fault codes are then displayed. If there is a current fault code, this fault must be rectified before any stored fault codes are displayed.
- 2 Check that there are no faults as described in the fault code table in the "Fault codes" section.
- 3 If there is a fault, read the fault code text and identify the current path in the wiring diagrams. If you are unsure about the significance of the component designation, check this in the "Wiring diagrams manual".
- 4 Choose a suitable connector to take readings at, and locate the connector using the component location figure. Do not take readings at the pins in the control unit connectors, but take readings at the rear of the connector instead.
- 5 Take readings using a multimeter and check the values as described in "Electronic control system" in the Function description of "Electrical System".

**Fault codes**

<b>1st digit</b>	<b>Description</b>	<b>2nd digit</b>	<b>Description</b>	<b>Current path</b>
1	No fault	1	No fault	
2	ABS control valve, open/short circuit	1	Front right	54
		2	Front left	29
		3	Right axle 2	37
		4	Left axle 2	62
		5	Right axle 3	46
		6	Left axle 3	71
3	Sensor, air gap too great	1	Front right	15
4	Sensor, open/short circuit	2	Front left	3
5	Sensor, incorrect tyre/cross-connection/frequency too high	3	Right axle 2	7
6	Faulty pulse wheel, dirty/damaged	4	Left axle 2	19
		5	Right axle 3	10
		6	Left axle 3	22

1st digit	Description	2nd digit	Description	Current path
7	System function	1	Open circuit, short circuit or faulty CAN message/tachograph signal	180/215
		2	Open or short circuit, TC solenoid valve	207
		3	Open/short circuit, DBR signal	186
		4	ABS warning lamp faulty. Check operation when power is switched on	142
		5	Open circuit in lead to proportional valve or disengaged TC feature due to a fault in TC solenoid valve/CAN communication	221/207/ 180
		6	Open circuit or short circuit, proportional valve	221
8	Control unit	1	Voltage supply to diagonals too low, less than 18 volts	163
		2	Voltage supply to diagonals too high, greater than 30 volts	163
		3	Faulty supply relay/internal fault	-
		4	Faulty internal configuration	-
		5	Open circuit or short circuit in earth lead for one of the diagonals	191

# Diagonal wheel connections

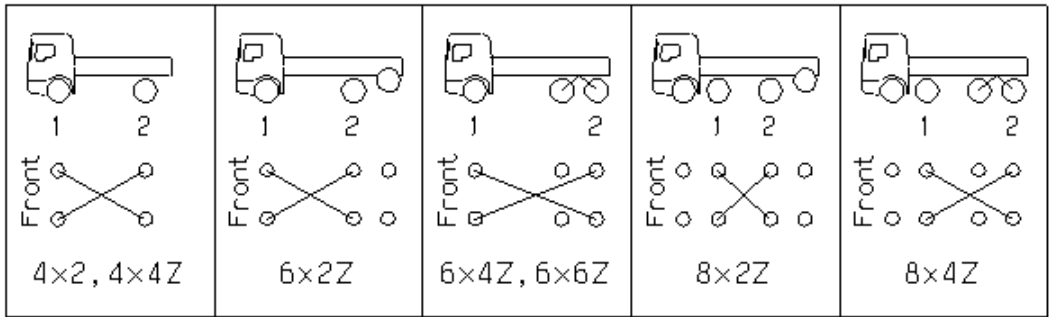
The drawings below show the numerical order of the axles on the various types of vehicles. It also shows the wheel diagonals, i.e. the wheels on the front and rear axles which are electrically connected, diagonally to each other and to the ABS/TC control unit.

Diagonal 1 = Front right/Left axle 2/Left axle 3

Diagonal 2 = Front left / Right axle 2/Right axle 3

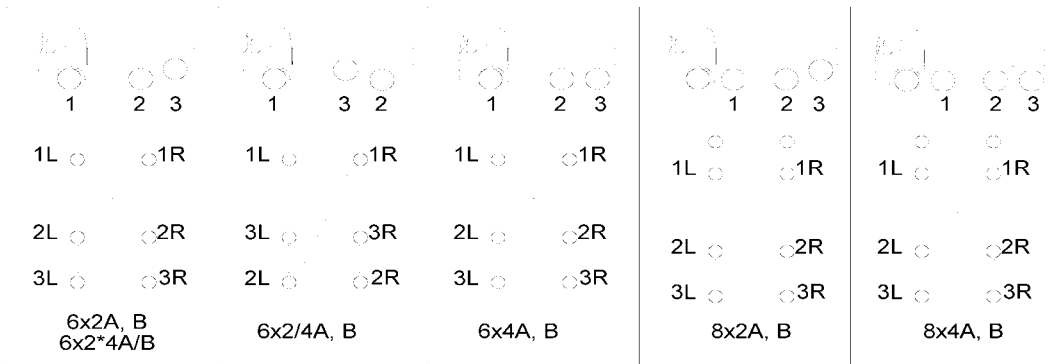
For certain electrical faults in the ABS/TC system, only the faulty diagonal becomes disconnected.

## 4 - channel ABS/TC



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## 6 - channel ABS/TC



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## Generation of fault codes

A Fault code for short circuit/open circuit can be generated after the power has been switched on but without the vehicle being driven. Other fault codes are generated based on a frequency change from the wheel sensors and the vehicle must therefore be driven.

When there is a short circuit to earth or to +24 volts, the diagonal in which the fault occurred is disconnected. If there is an internal fault in the control unit, the system is entirely or partially disconnected.

The most common causes of generated fault codes for the wheel sensors are an excessively large air gap between the sensor and the pulse wheel or a broken/dirty pulse wheel.

## Speed limiter

If the top speed is set to 160 km/h, the speed limiter feature is disengaged. For vehicles with EDC, speed limitation takes place via the EDC system.

A faulty speed signal from the tachograph is shown by the warning lamp and the TC lamp when speed is greater than 3 km/h. This fault is not revealed by the warning lamp if the vehicle is stationary. If a flashing code has been generated for the tachograph speed signal, the signal from the wheel sensors is used for speed limitation.

## CAN communication

CAN: Stands for Controller Area Network. CAN communication is used to reduce the number of cables in the vehicle. This is intended to increase reliability.

CAN communication is a serial type of communication. Vehicles with ABS/TC have a communication circuit which communicates with other control units via two cables, called CAN high (pin A-3) and CAN low (pin A-1).

In simple terms, CAN communication is similar to radio technology. The data signals which pass through a CAN lead can be compared to radio waves in the air.

When listening to the radio, the receiver is set so that one radio station is heard at a time. This is the only station that can be heard, despite the fact that there are many radio stations broadcasting at the same time.

A control unit does more or less the same thing with the data which comes through a CAN lead. For example, it listens for information from the EDC about engine torque, receives this value and uses it in calculations.

The control unit receives several CAN messages which are sent through the communication circuit in a special memory. This memory can be compared to several radio receivers which are switched on, but which are all set to different radio stations in order to listen to several particular radio programmes at the same time. In this way, the control unit continuously senses what is happening.

This is nothing that the mechanic needs to worry about. The only thing to remember is that it is not possible to check individual CAN messages using a multimeter.

## Limit values for front and rear wheels rolling circumference

In vehicles with ABS/TC an excessive difference between the rolling circumference of the front and rear wheels may give incorrect signals to the control unit resulting in longer braking distances. Use the values of tyre rolling circumference given by the manufacturer and choose tyres so that the difference is no greater than

+ 14.0% if the front wheels are larger than the rear wheels

-14.0% if the front wheels are smaller than the rear wheels

$$\text{Difference (\%)} = \frac{\text{Front rolling circumference} - \text{Rear rolling circumference}}{\text{Front rolling circumference}} \times 100$$

Example:

Tyre, front axle: 315/80R 22.5

Rolling circumference: 3329 mm

Tyre, rear axle: 12R 22.5

Rolling circumference: 3360 mm

$$\text{Difference (\%)} = \frac{3329 - 3360}{3329} \times 100 = -0.9\%$$

This difference is permitted as it may be up to -14.0%.

# Electrical System

## Specifications

### Components

Component	Designation	Resistance, Ohm
T11/T12	Wheel sensor, front	1100-1900
T13/T14	Wheel sensor, axle 2	1100-1900
T28/T30	Wheel sensor, axle 3	1100-1900
V3/V4/V5/V6/ V46/V47	Control valve/in	14-21
V3/V4/V5/V6/V46/V47	Control valve/out	14-21
V81	TC solenoid valve	54-63
V88	Proportional valve	18-30

Part No., control unit	Manufacturer's No.
4x2: 489 814	446 004 406 0 from April 1999
Multi-axle vehicles with one driving rear axle: 1 412 038	446 003 403 0
Multi-axle vehicles with two driving rear axles: 1 412 040	446 003 404 0

## Wiring diagrams

The flashing codes table in the "Troubleshooting" section refers to current paths.

The component location figure is followed by the wiring diagrams. These have running current path numbers. Use the references to the current paths from the table for flashing codes in order to find the correct diagram and the components in question.

The diagrams use the component names, e.g. E37. The full names of the components are given in the "Wiring diagrams handbook", group 16 of the Workshop Manual.

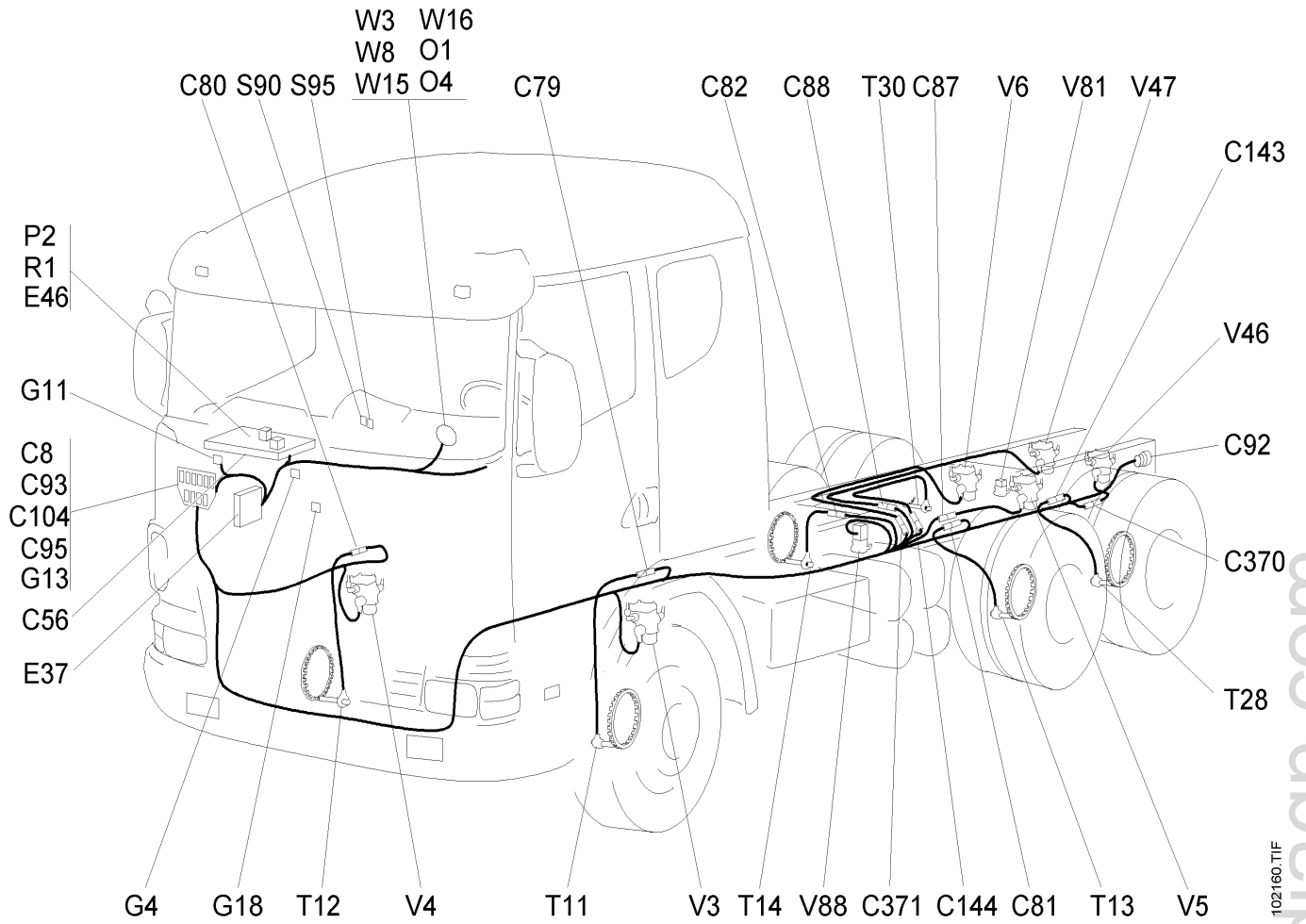
### Associated diagram in group 16

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#### Colour codes for electrical wiring

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink

### Component location



*This position drawing applies to 4 and 6 channel ABS*

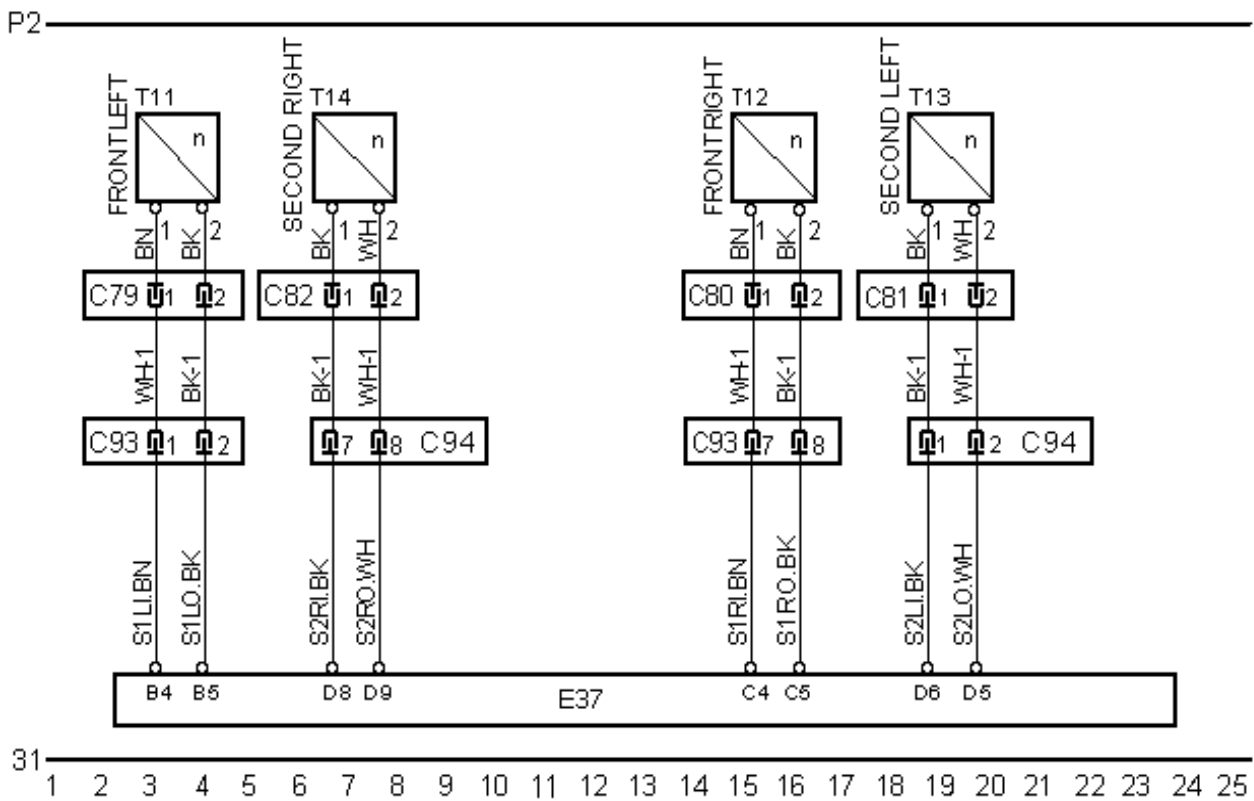
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# Electrical System

## Current paths

### 4 - channel system

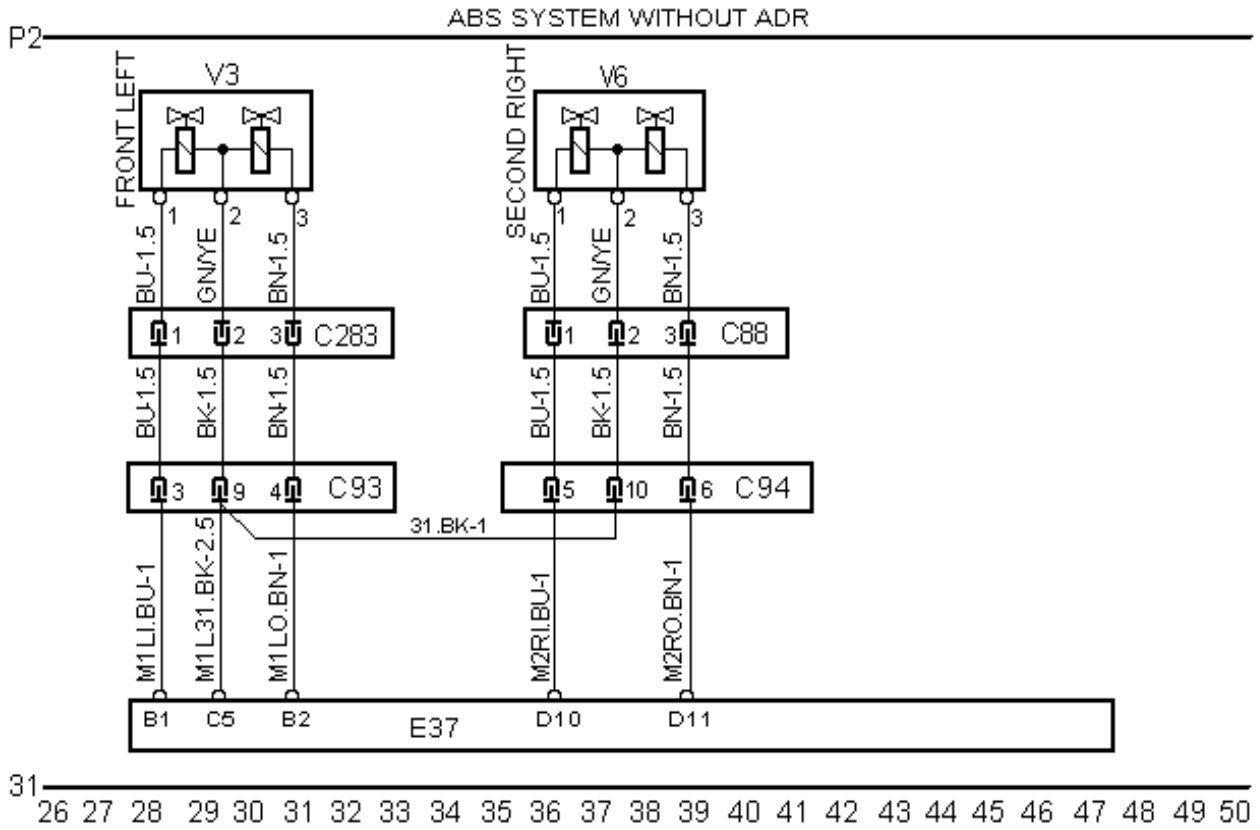
#### 4 - channel current path 1 - 25



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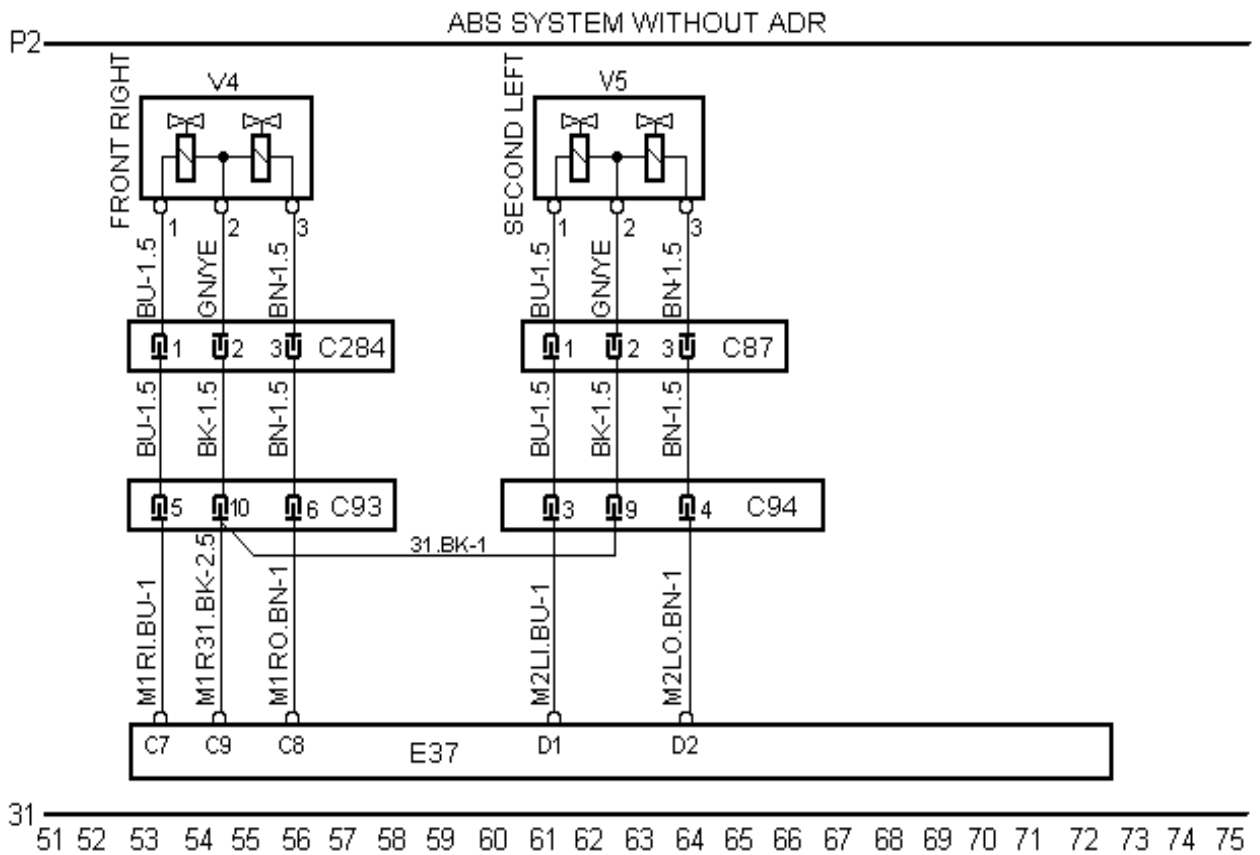
4 - channel current path 26 - 50



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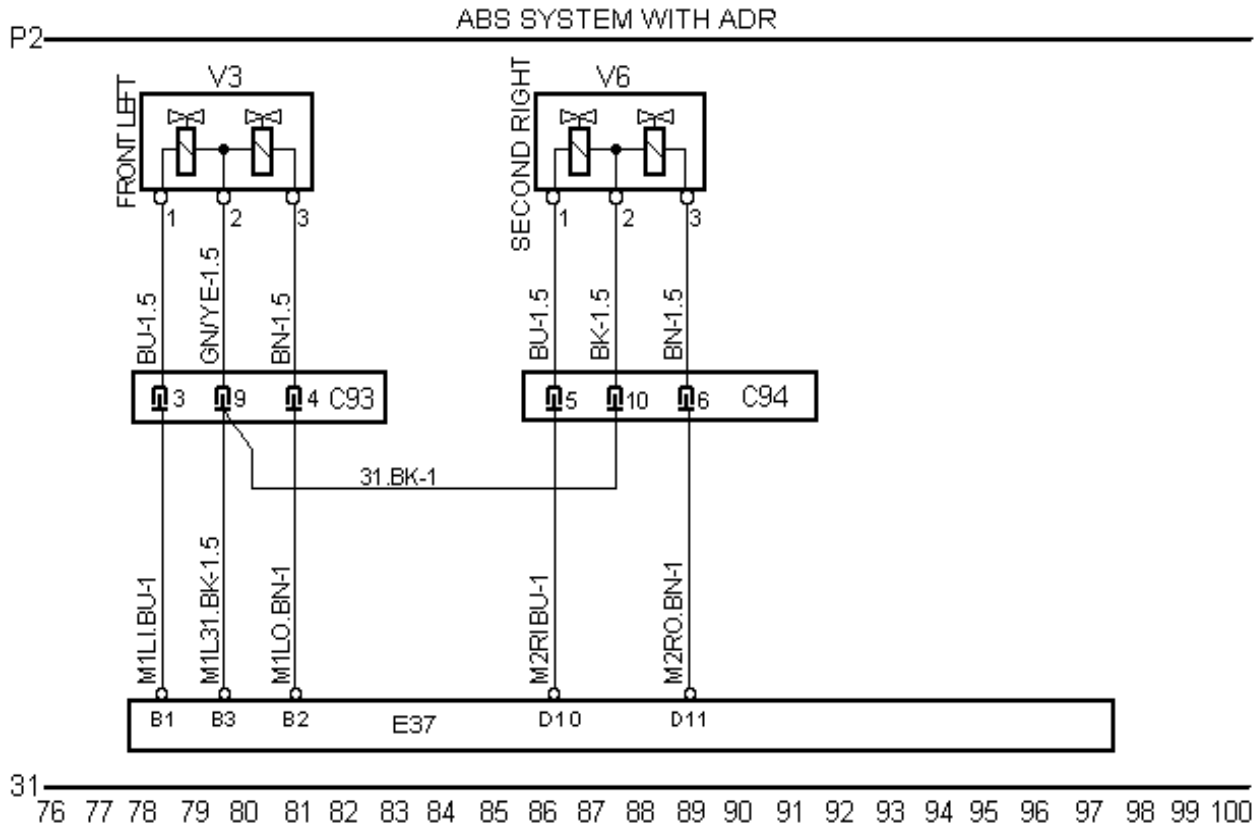
4 - channel current path 51 - 75



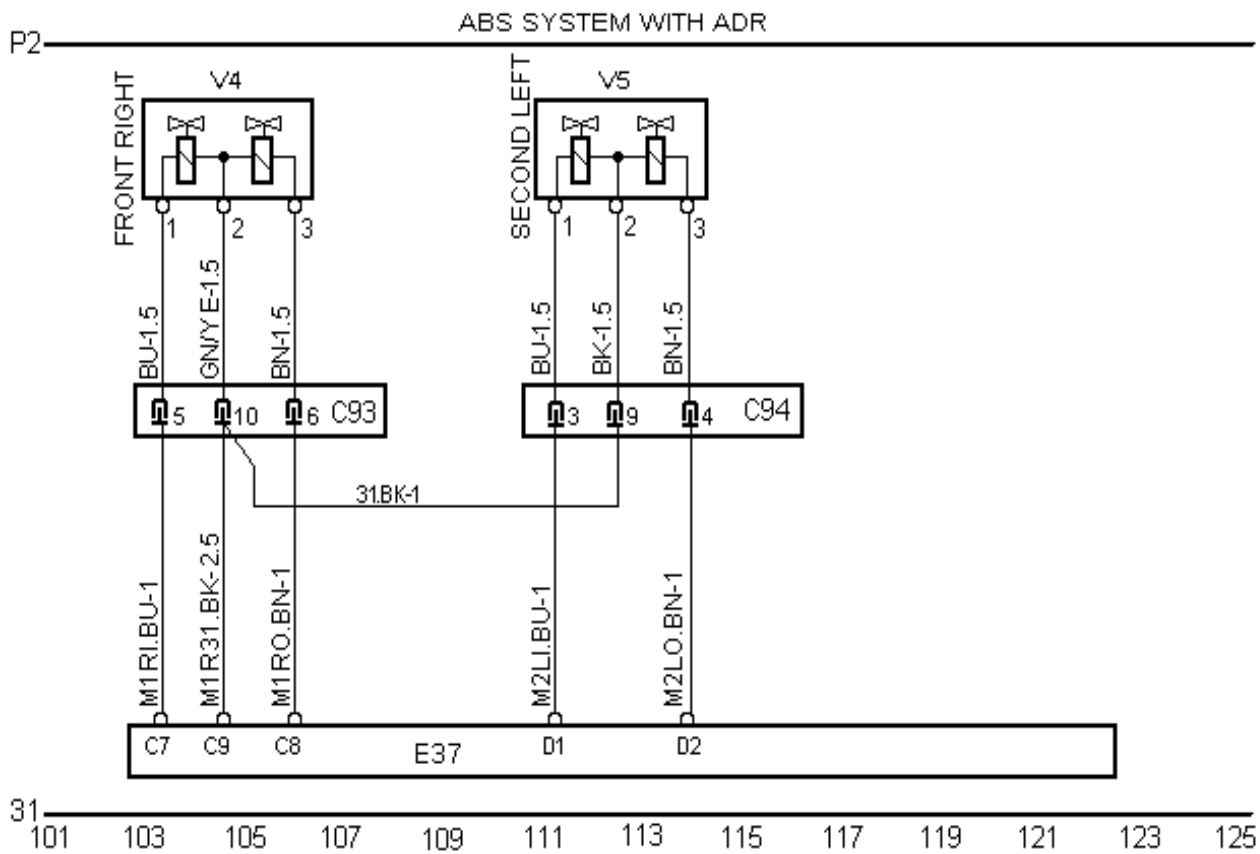
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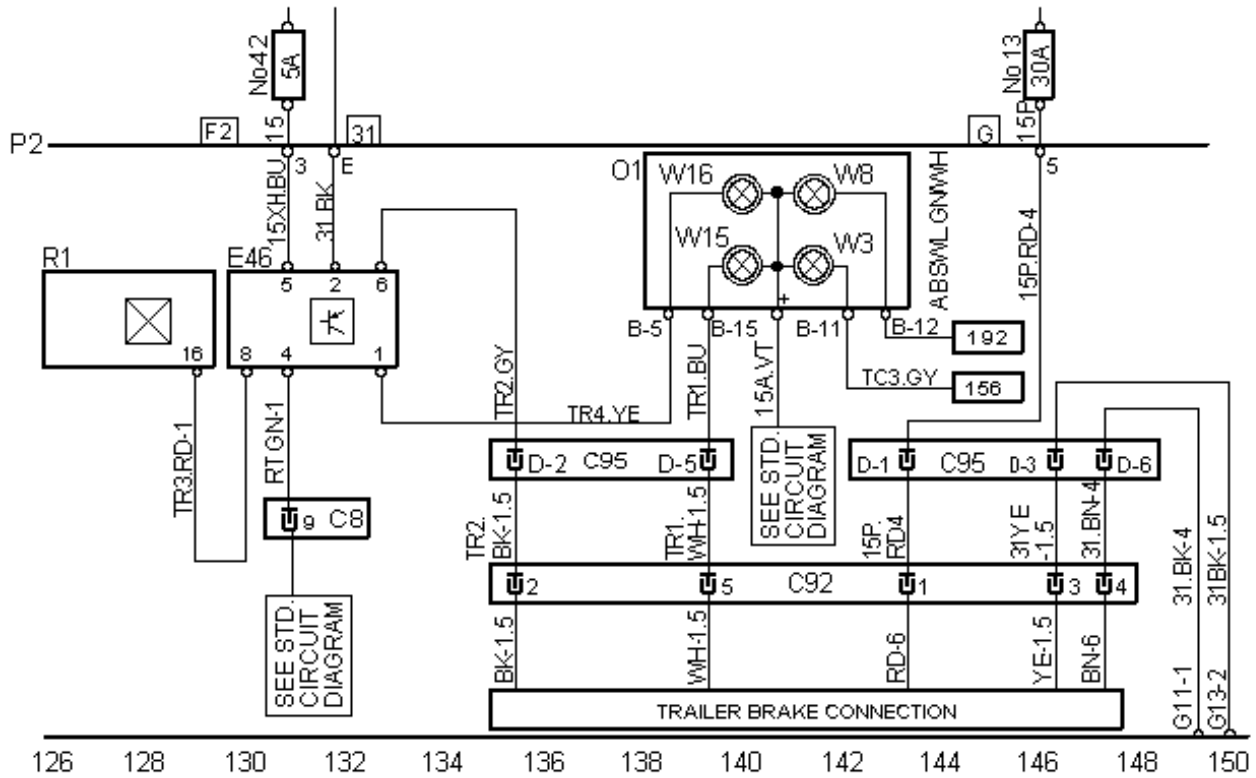
4 - channel current path 76 - 100



4 - channel current path 101 - 125

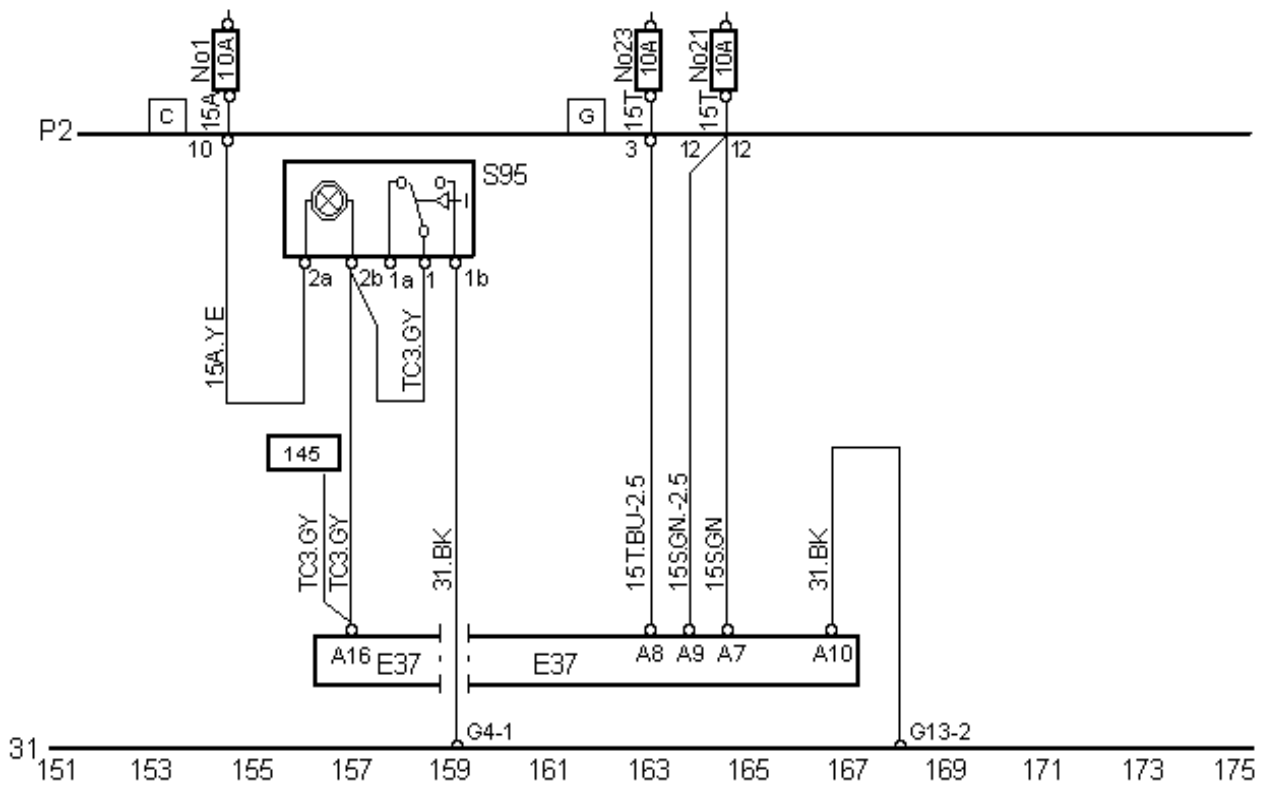


4 - channel current path 126 - 150



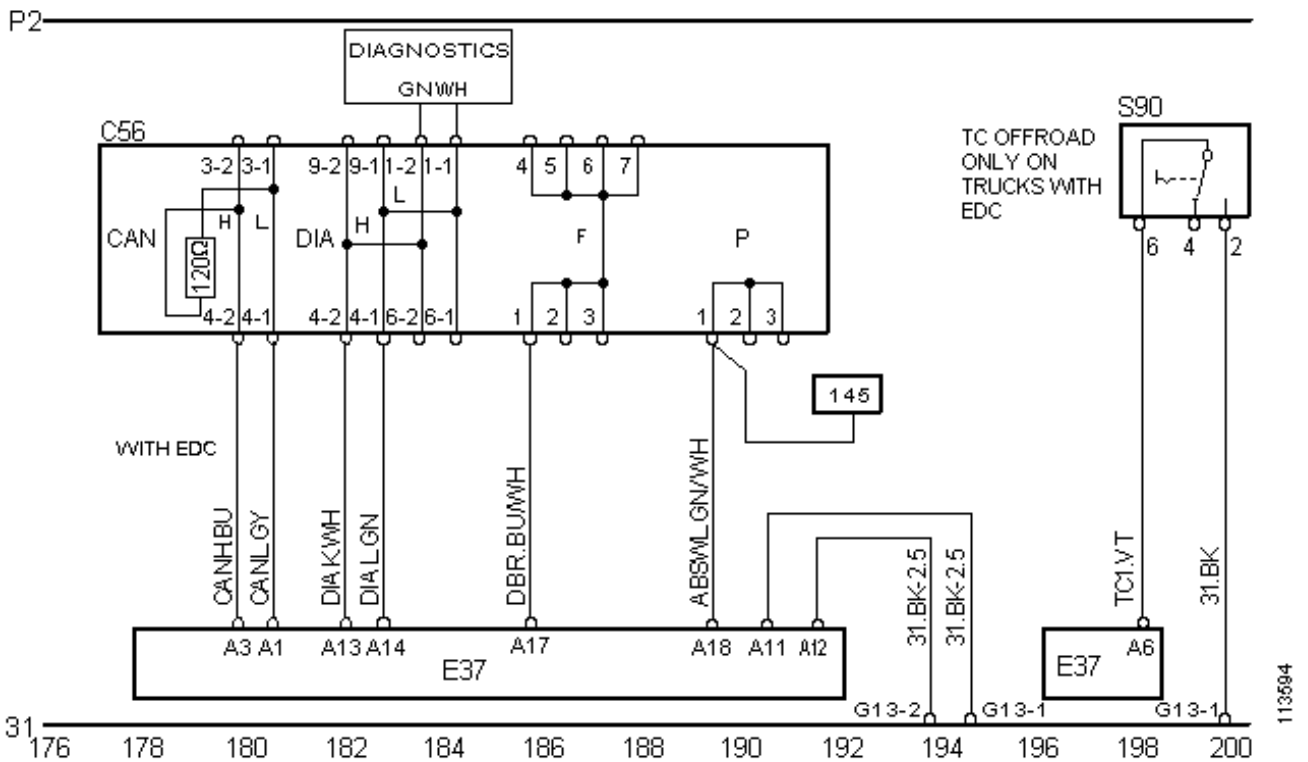
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4 - channel current path 151 - 175

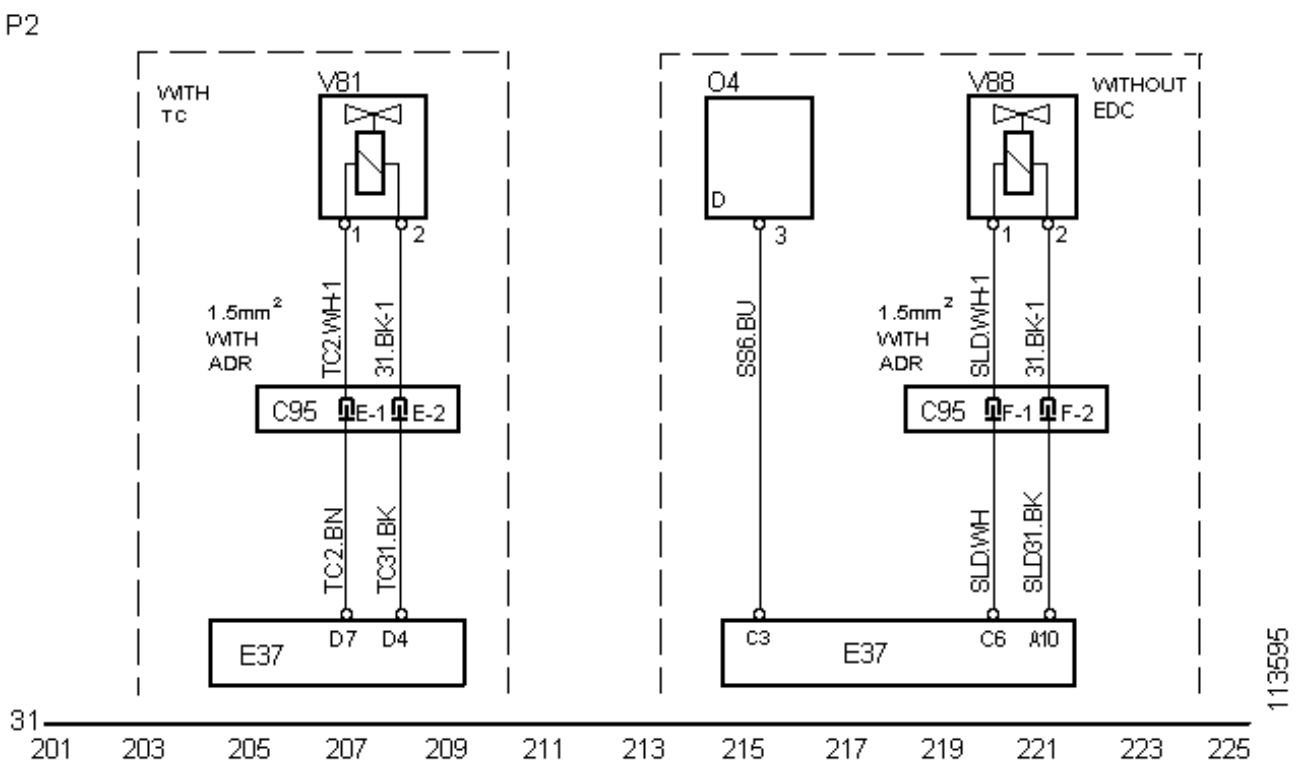


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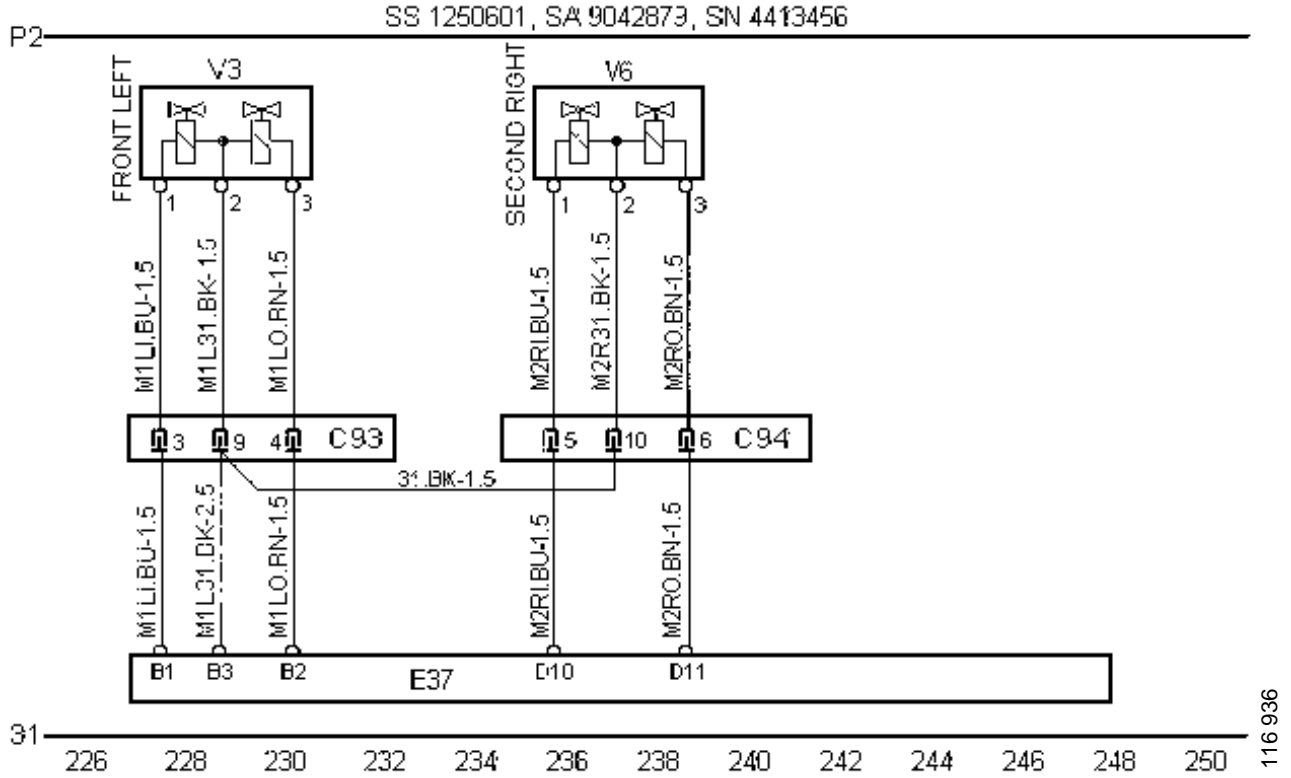
4 - channel current path 176 - 200



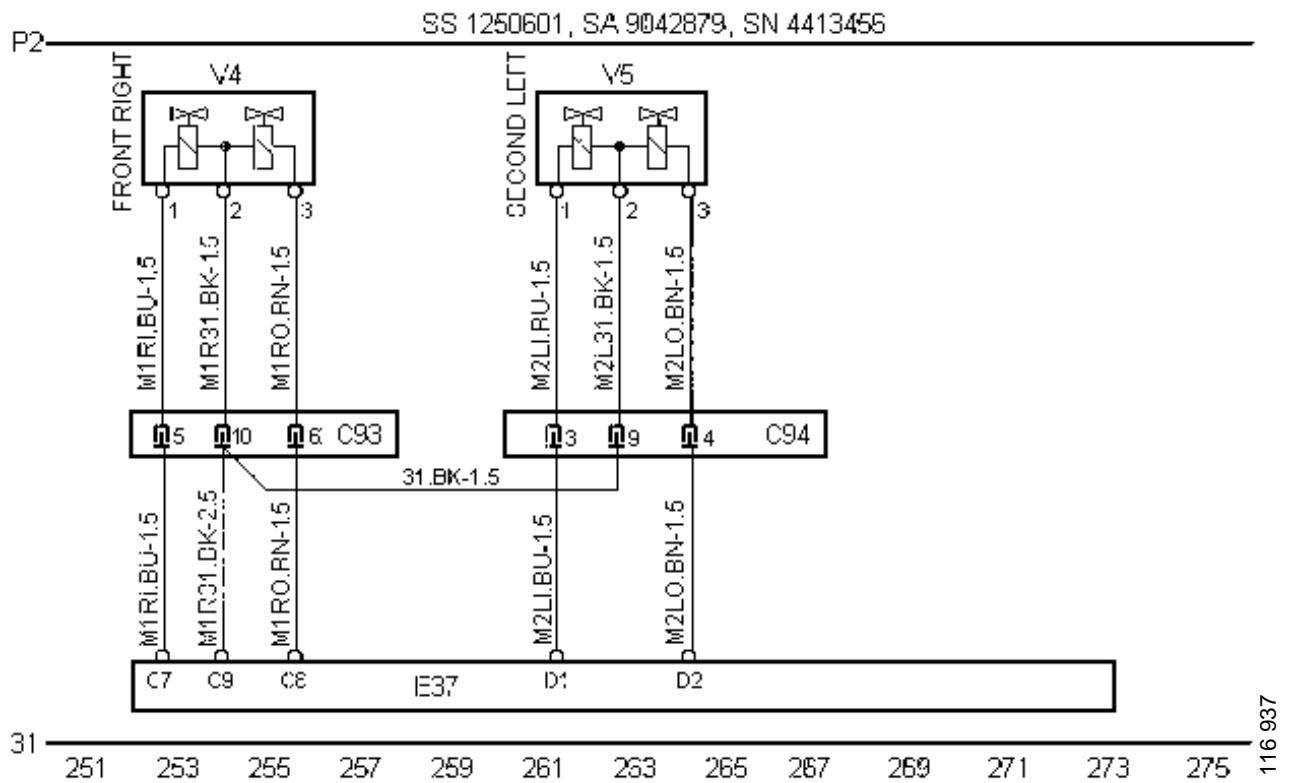
4 - channel current path 201 - 225



4 - channel current path 226 - 250



4 - channel current path 251 - 275

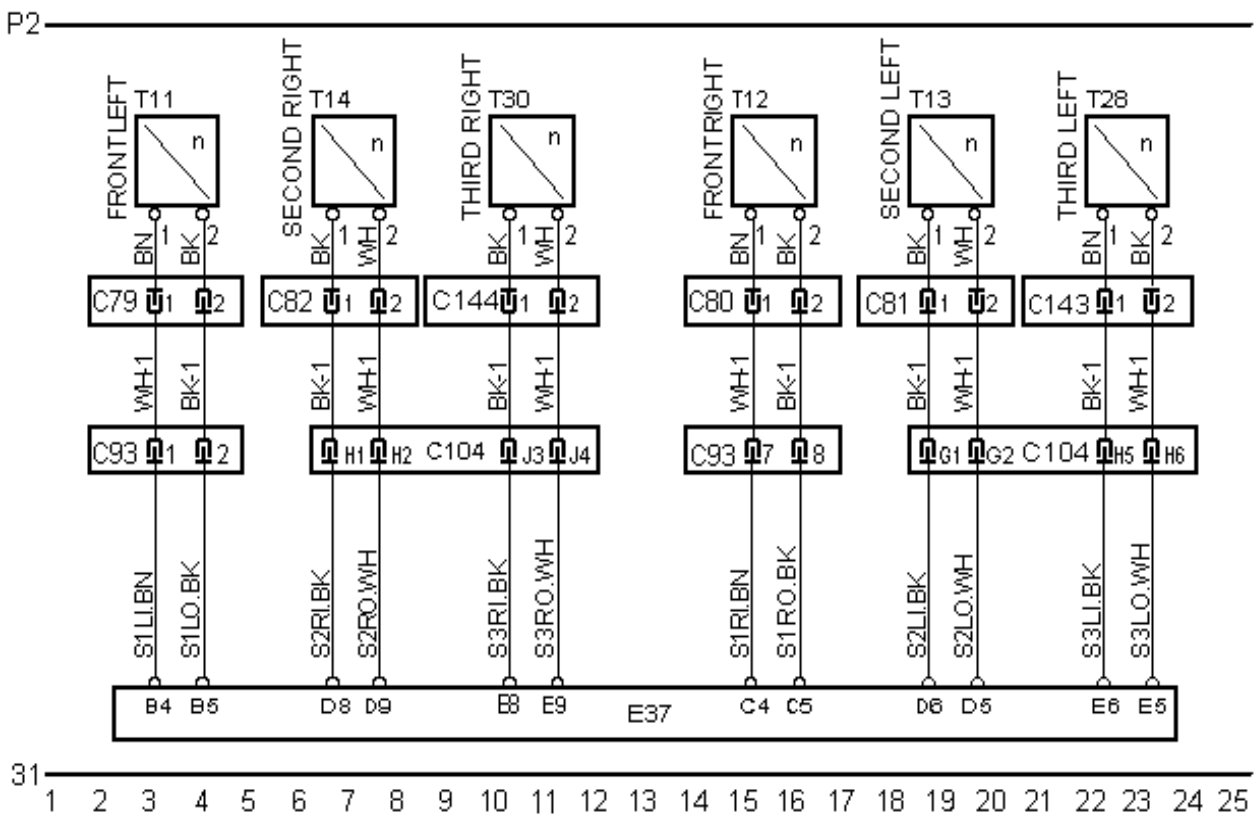


# Electrical System

## Current paths

### 6 - channel system

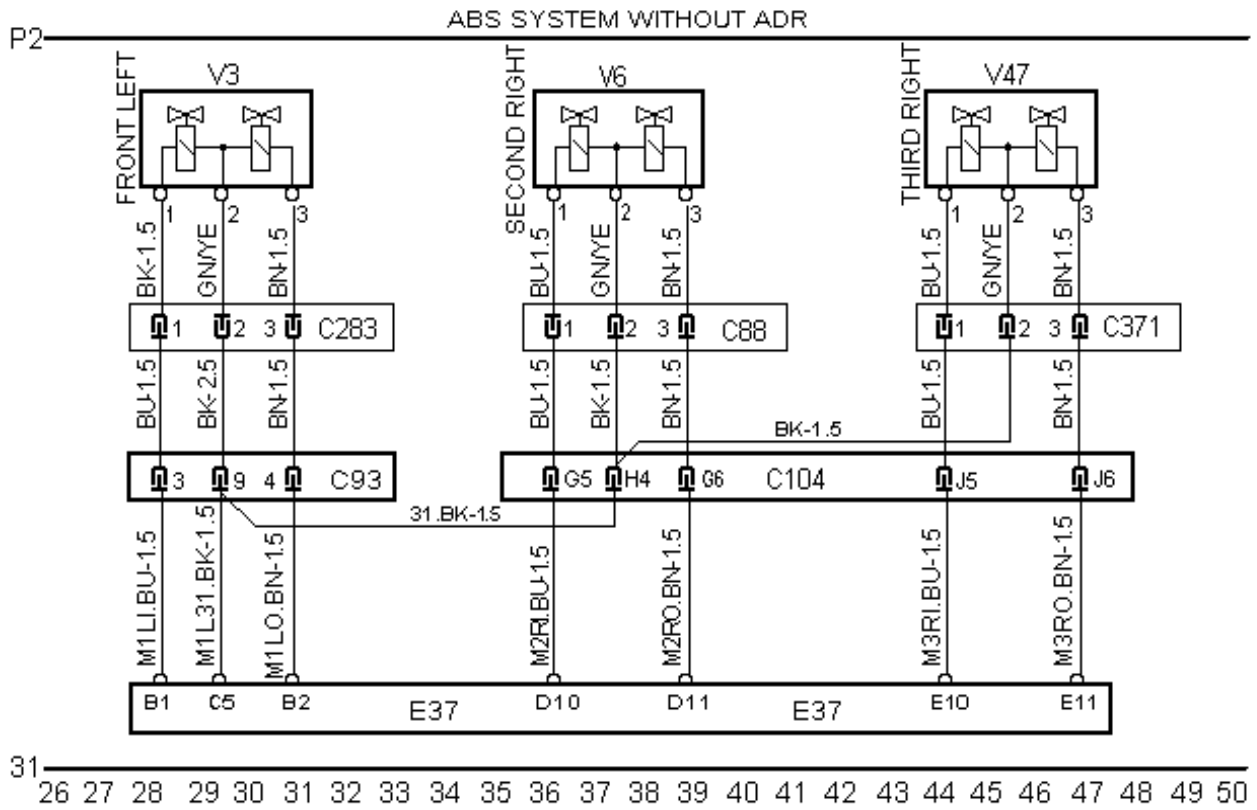
#### 6 - channel current path 1 - 25



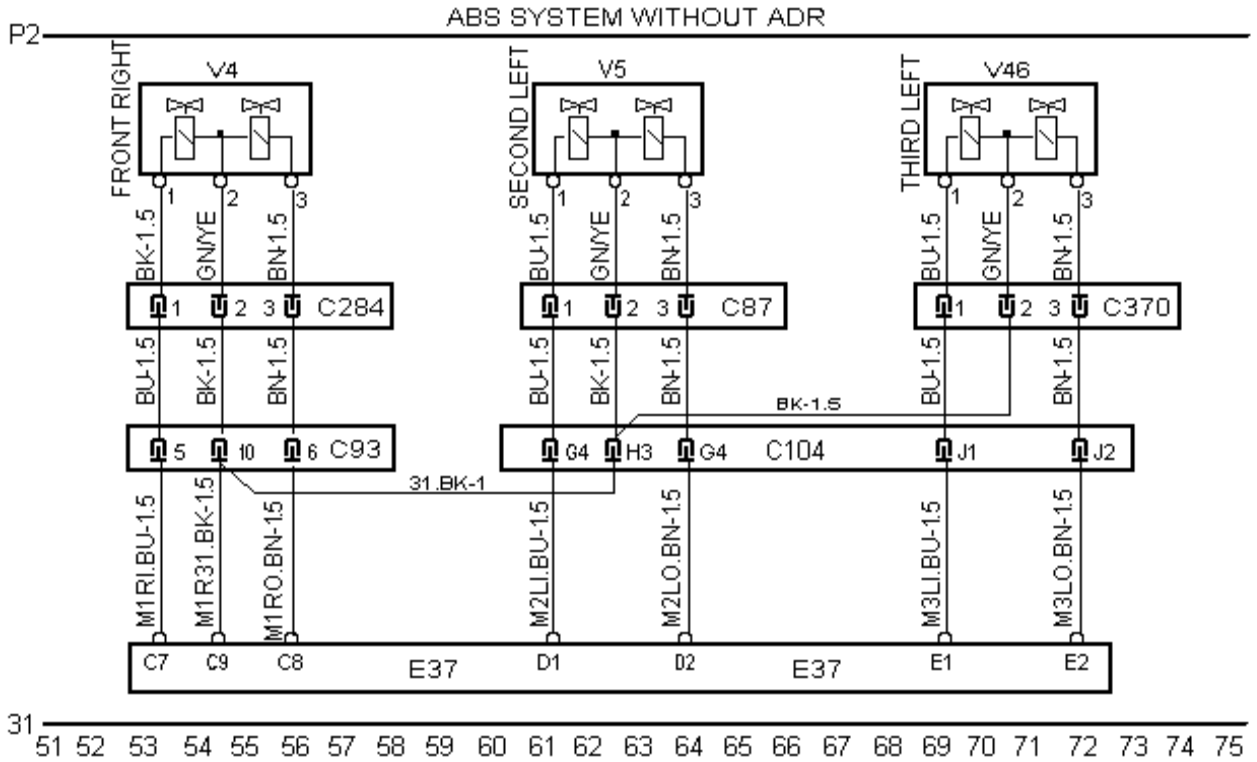
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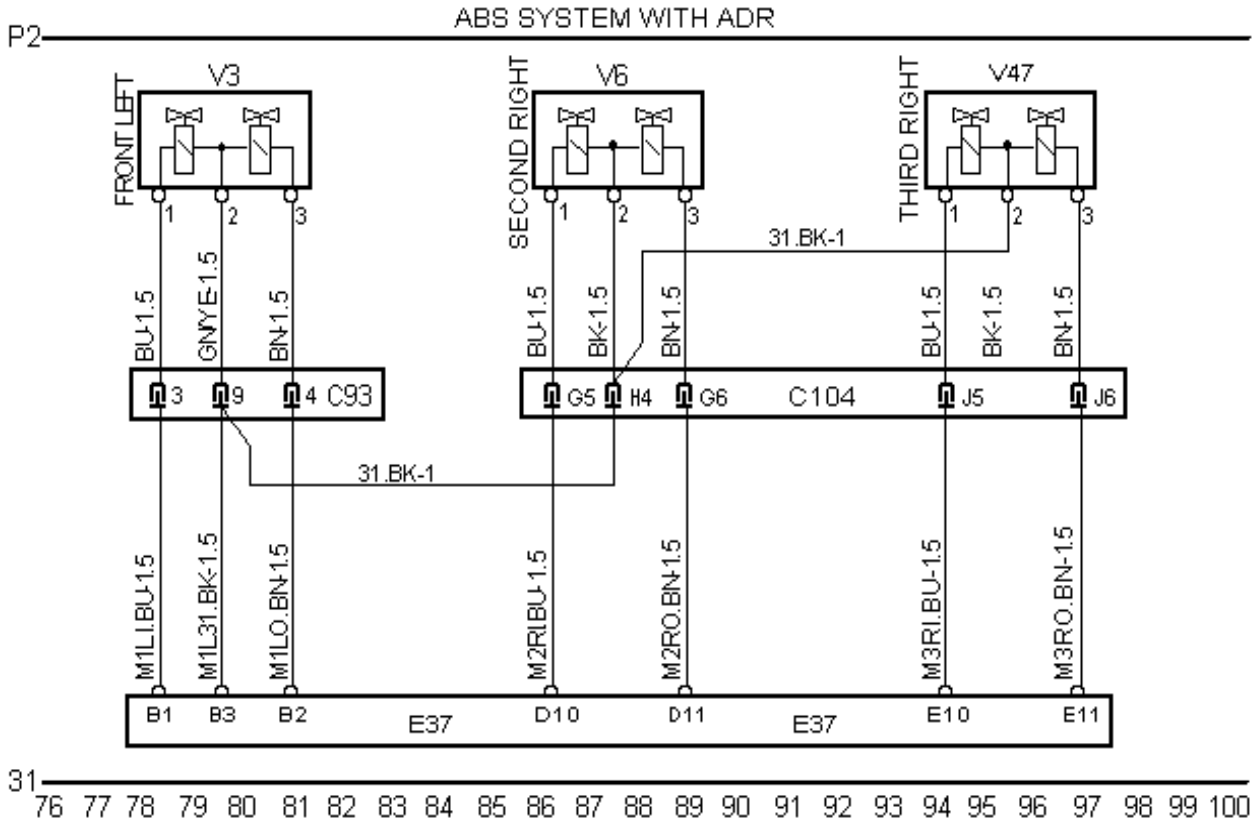
6 - channel current path 26 - 50



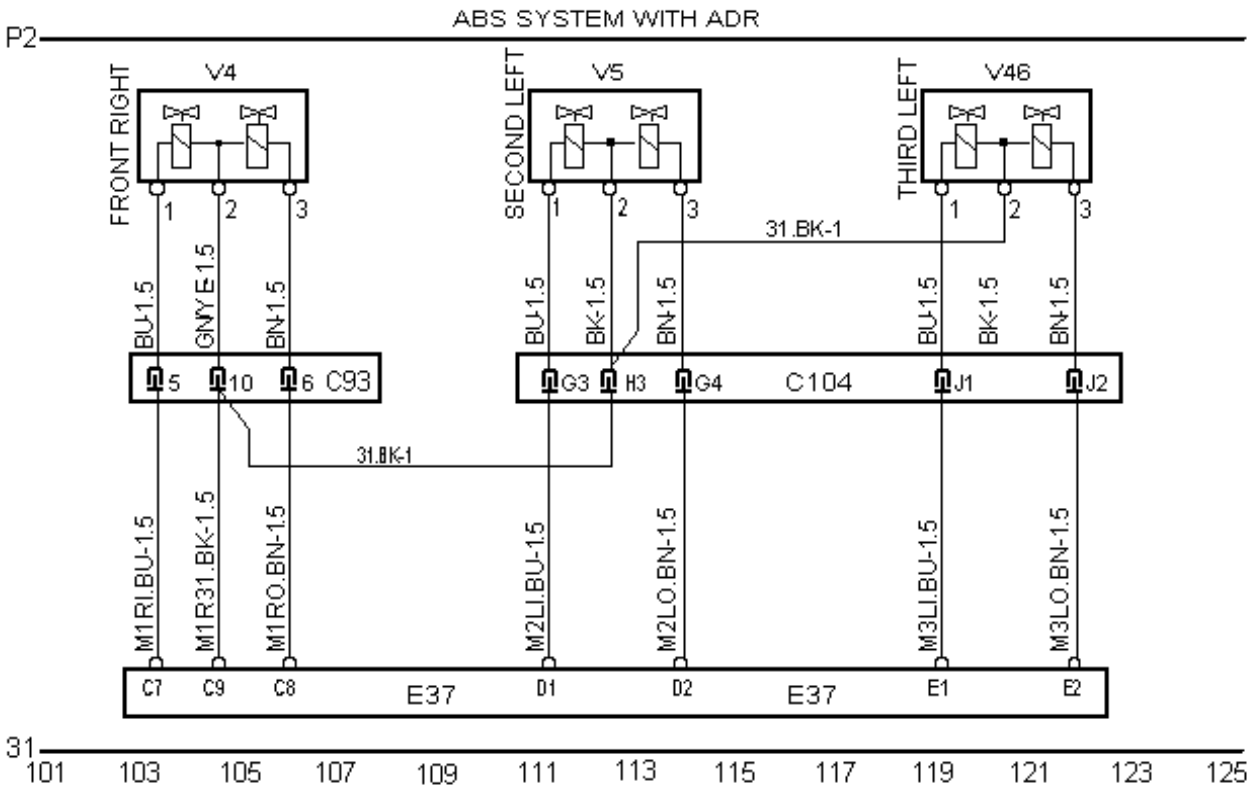
6 - channel current path 51 - 75



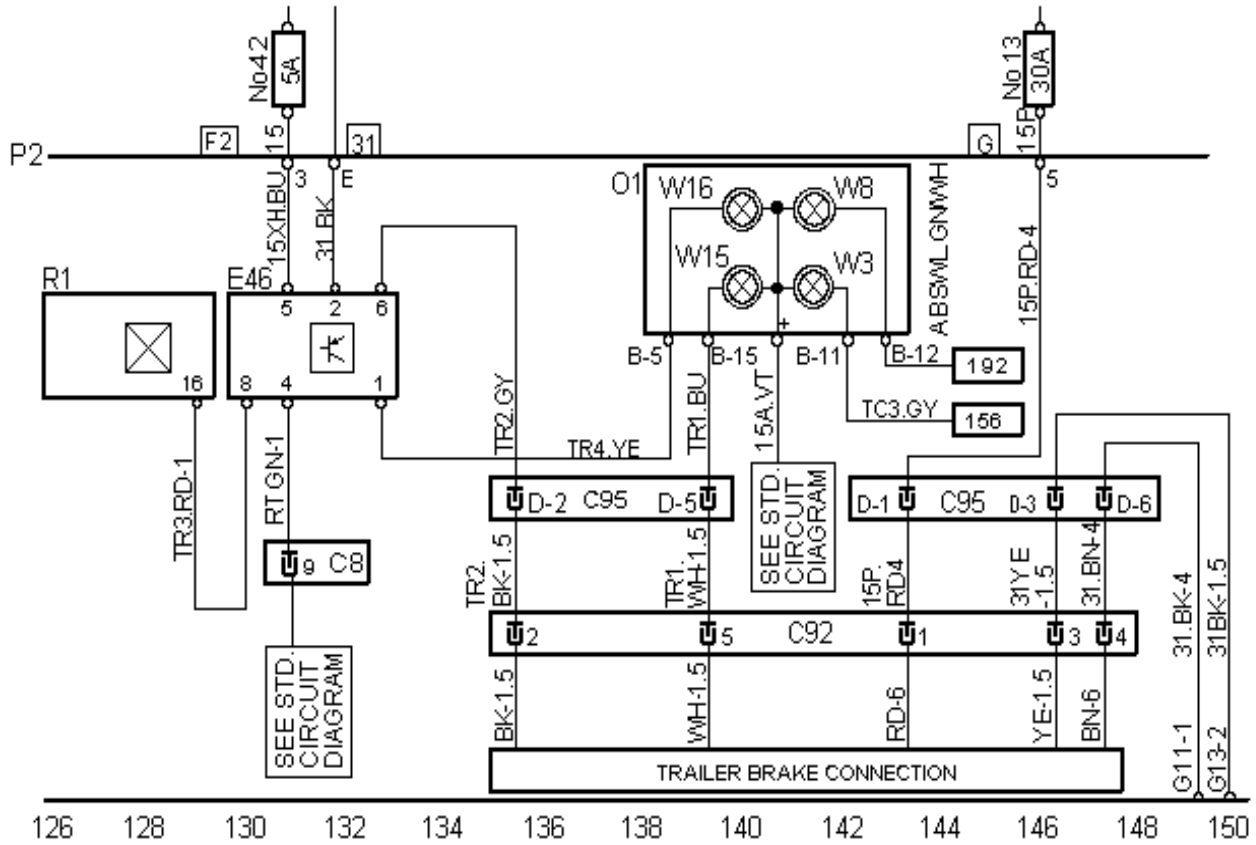
6 - channel current path 76 - 100



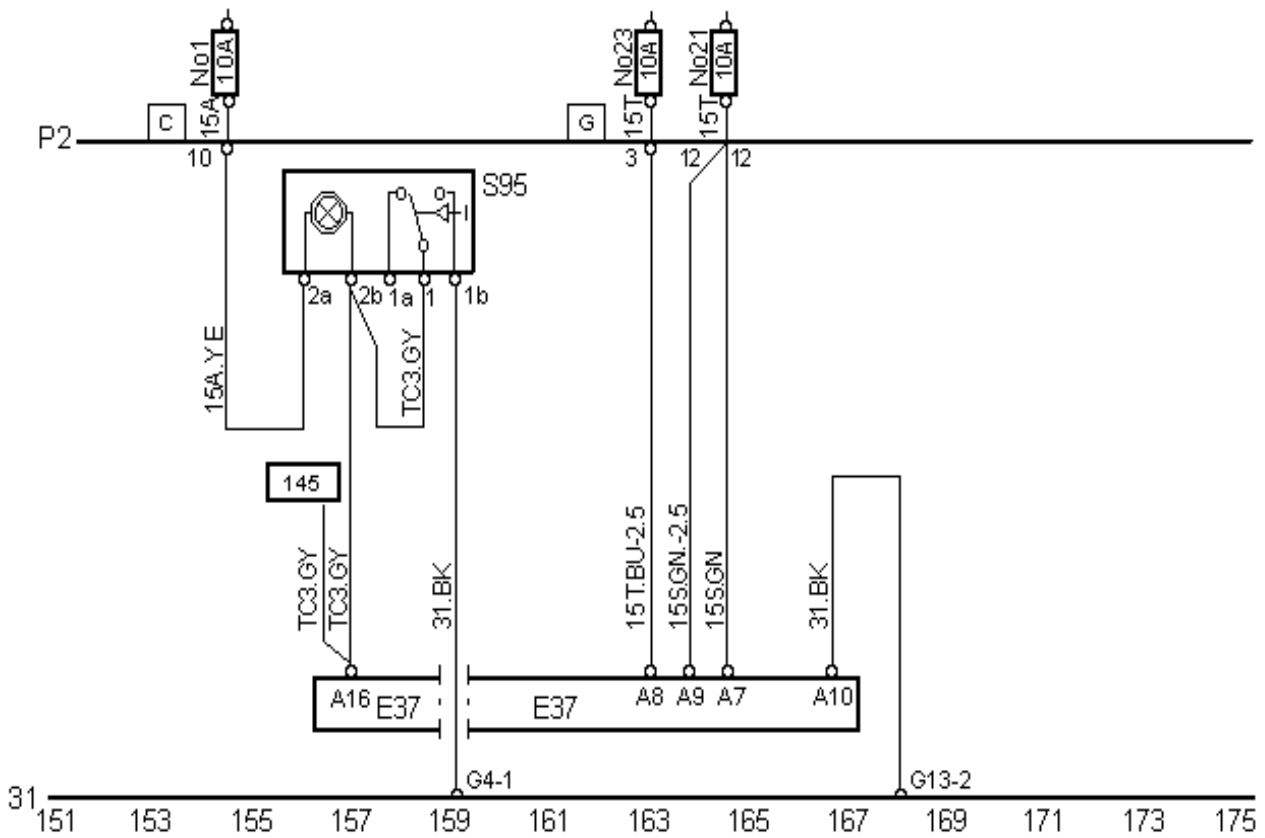
6 - channel current path 101 - 125



6 - channel current path 126 - 150

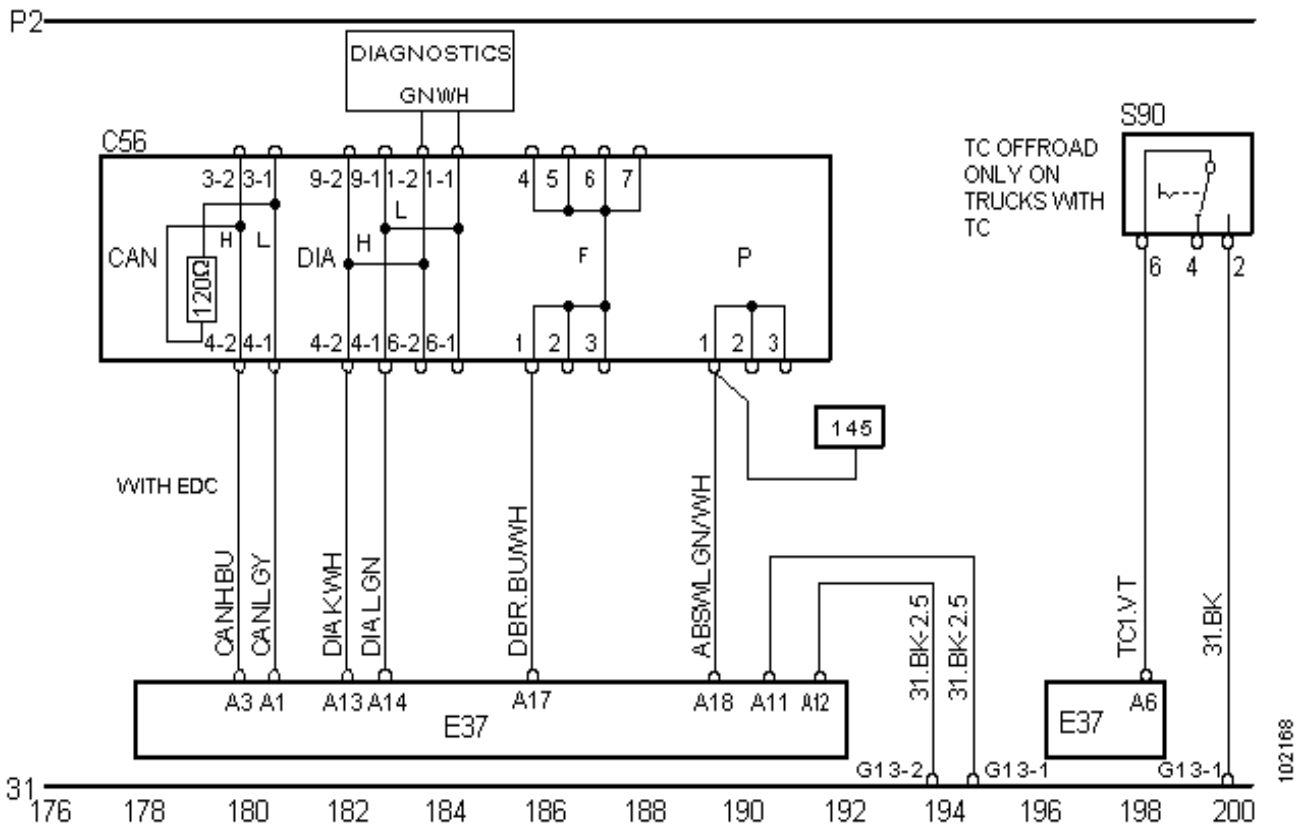


6 - channel current path 151 - 175

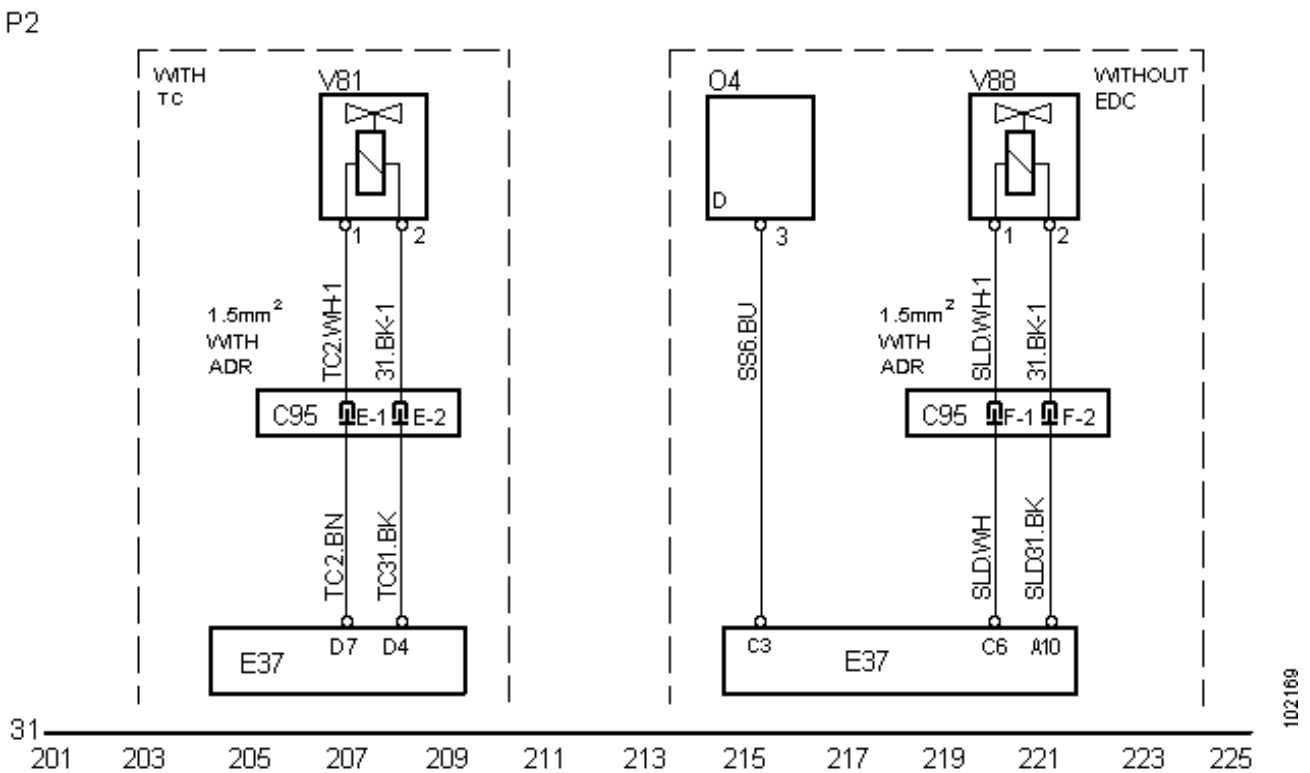




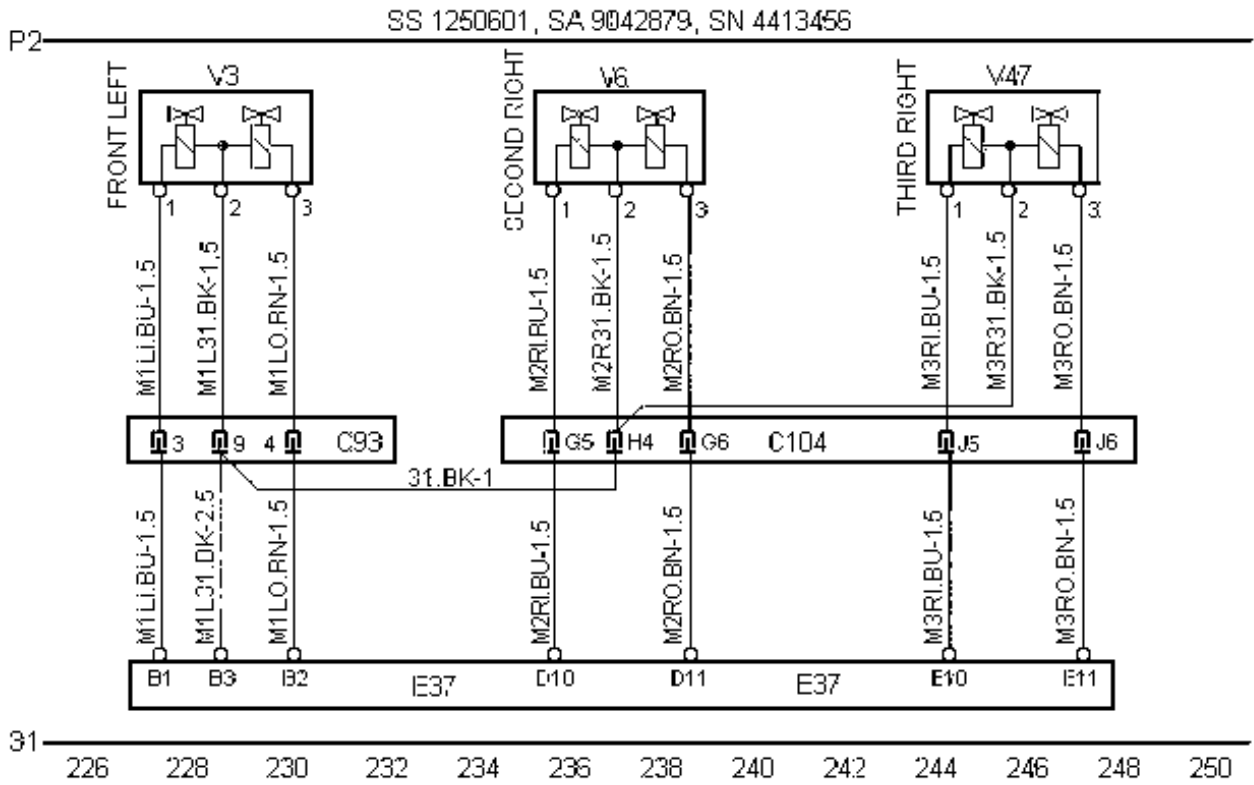
6 - channel current path 176 - 200



6 - channel current path 201 - 225

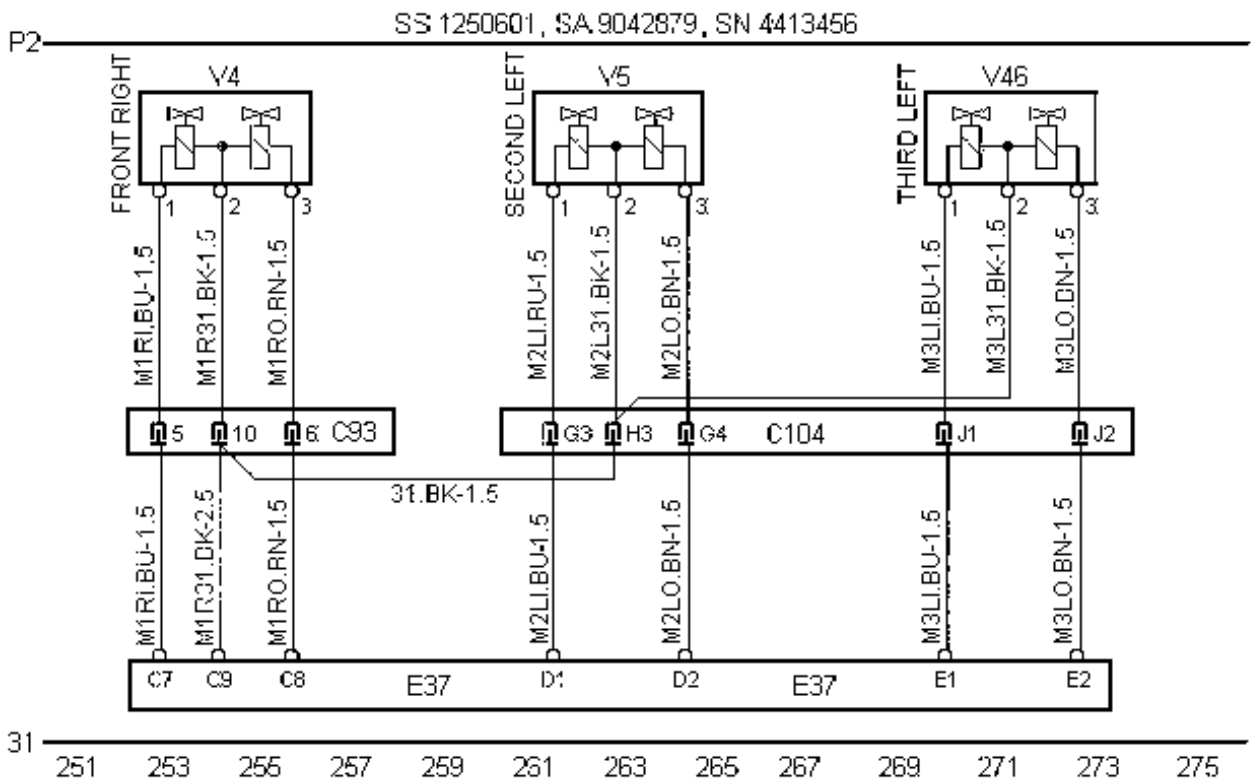


6 - channel current path 226 - 250



116 934

6 - channel current path 251 - 275



116 935