WABCO

Operating Manual

for WABCO Diagnostic Controller
with Program Card 446 300 651 0
Vario Compact ABS

ABS

Operating Manual

for the WABCO
Diagnostic Controller
446 300 320 0
with Program Card
VCS 446 300 651 0

Issue: November 1996

WABCO
Fahrzeugbremsen

A Division of
WABCO Standard GmbH

contents: page

Abbreviations:

VCS	Vario Compact ABS for trailer vehicles
ECU	Electronic Control Unit
V	Volt
k(Ω)	K Ohm

1. IMPORTANT NOTES

- **Diagnostics may only be carried out with the vehicle at a standstill.**

The VCS electronics automatically records all error messages in the error log during operation. It is **not necessary** to be driving to read this data.

Most faults can be detected with the vehicle at a standstill (e.g. cable breakage, short circuit). Some faults (e.g. excessive distance between pole wheel and sensor) can only be detected during travel.

- **The diagnostic controller may only be used by trained specialist personnel**.

- The supply voltage for the diagnostic controller is taken from the on-board vehicle voltage (12 - 24 V) DC.

- It is essential to ensure that **no strong electromagnetic fields** are present in the direct vicinity (e.g. electrical welding equipment) which could affect operation of the diagnostic controller.

- The operating temperature of the diagnostic controller is 0°C to +40°C. The storage temperature is 0°C to +60°C.

- **The unit must be handled with care to ensure correct operation**.

  Take great care if corrosive fluids such as brake fluid, thinners, acids etc. are used. Do not subject the unit to spray water.

- Use only **program cards and connection cables from WABCO**.

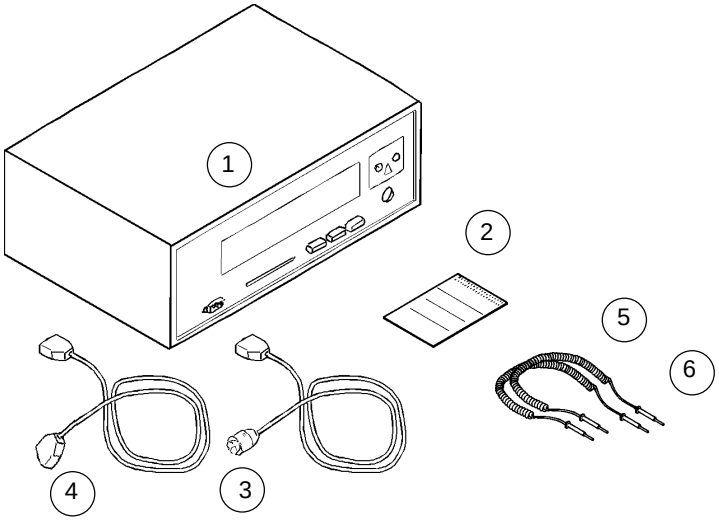
- If the VCS ECU is powered by a mixed supply (e.g. 24N, stop light supply, the VCS is supplied through the normal 24N plug for the lighting system) **the brake pedal must be operated for the power supply** or power must be provided from elsewhere.

- **Printing**
  The log can be printed out using the diagnostics menu, for example under section 2 “System check”. An additional commercially-available printer connection cable is required which is to be connected to the rear of the diagnostic controller (serial port) and a printer with an integral RS232 interface.

  If a printer with a parallel interface only is available, a serial/parallel converter is also required.

2. DIAGNOSTIC COMPONENTS

We recommend the following components for VCS diagnostics



1...	Diagnostic Controller	446 300 320 0
2...	Program Card VCS (English)	446 300 651 0
3...	Connection cable for vehicle **with** external diagnostics socket	446 300 329 2
4...	Connection cable for vehicle **with no** external diagnostics socket	446 300 401 0
5...	Multimeter cable, black	894 604 301 2
6...	Multimeter cable, red	894 604 302 2

The **Diagnostic Controller** Set	446 300 331 0
consists of the **Diagnostic Controller**	446 300 320 0
and the **Sholder Bag**	446 300 022 2

Printer cable (if required):

☞ See page 3 “Important Notes”

3. CONNECTING THE CONTROLLER

The VCS trailer to be tested and the controller are connected as follows:

- Vehicle with external trailer connection socket

If the trailer vehicle is equipped with an external round diagnostics socket you need only remove the screwed cover from the socket and insert the connection cable ③

When diagnostics are complete this cable must be removed again and the cover screwed back onto the diagnostics socket.

- Vehicles with no external trailer diagnostics socket

If the trailer vehicle does not have the above diagnostics socket the diagnostics cable ④ must be connected directly to the electronics at the DIAGN. slot. First remove the protective cover.

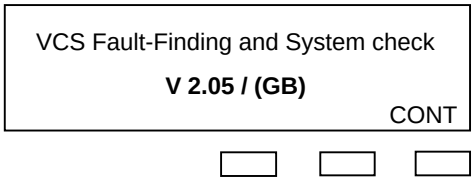
When diagnostics are complete this cable is to be removed and the electronics connection cover refitted.

Start

Now connect the 9-pin plug on the connection cable to the front of the diagnostic controller. This provides both the diagnostics link and the power supply. Black bars will appear on the display.

Then slide the program card into the slot provided. Ensure that the side of the card with the **contacts** is at the **top**.

The display shown below will appear. If this is not the case, check in section 10 “Trouble-shooting” on page 13.

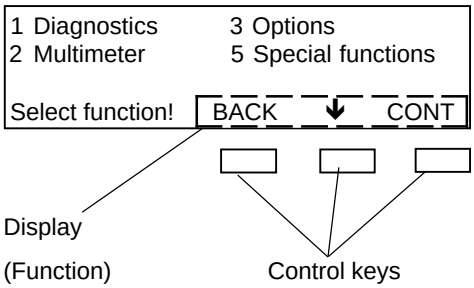


The first display shows the system (VCS), the version (for example 2.05) and the language (GB = English).

Press the right key to “CONTINUE”.

4. OPERATING THE DIAGNOSTIC CONTROLLER

The diagnostic controller is operated using the three keys on the front panel or an external keypad. The function of the keys depends on the relevant instructions on the display.



Key	Function
BACK	The display returns to the previous menu or programming point
🡻	Select an option on the main menu. Pressing the key repeatedly moves from one menu option to another. The option selected flashes.
CONT	The program is continued or the menu option previously selected is activated or executed.
EXIT	This cancels the relevant function.

5. MENU TREE

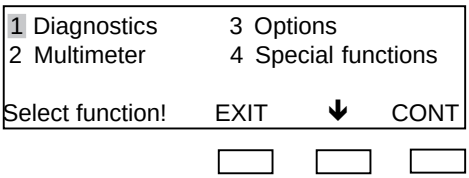
Menu selection
VCS Fault-Finding and Commissioning

Start

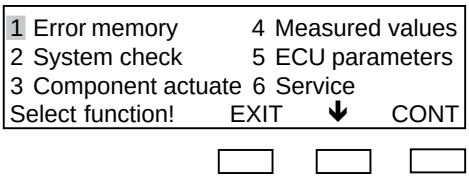
- 1 Diagnostics
  - 1 Faultfinding
  - 2 System check
  - 3 Control
    - 1 ABS Lamp
    - 2 Third brake
    - 3 Modulators
      - 1 Modulator-A (L)
      - 2 Modulator-B (H1)
      - 3 Modulator-C (H2)
    - 4 C3-Output
    - 5 Test the supply
    - 6 ISS
  - 4 Test and measurement values
    - 1 Operating voltages
    - 2 Wheel speeds
  - 5 ECU data
    - 1 Parameters
    - 2 WABCO data
    - 3 Calibrate KM counter
    - 4 ABS lamp function
    - 5 Tyre parameters
    - 6 ISS switching threshold
  - 6 Service
    - 1 Kilometre counter
    - 2 Service interval
- 2 Multimeter
  - 1 DC voltage
  - 2 AC voltage
  - 3 Resistance
- 3 Options
  - 1 ISO address
  - 2 Help text
  - 4 ABS Lamp function
  - 4 Component requirements
  - 5 Printing the log
- 4 Special functions

6. DIAGNOSTICS

When menu option 1 “Diagnostics” is selected, leave the cursor flashing on “1” and press the “CONT” key.



The diagram below shows the main diagnostics menu. Compare this display with the summary on page 6.



6.1 Fault finding

If the VCS control unit detects a fault in the system the red warning lamp in the driver’s cabin lights up continuously with the **ISO 7638 power supply** (separate ABS supply cable between motor vehicle and trailer). In addition the LED indicator on the VCS control unit flashes.

When a **VCS mixed supply ECU** (24N) is used the green warning lamp on the side of the trailer and the LED indicator on the VCS control units **only light during braking**.

The **menu option “Error memory”** now helps to localise the faults. Connection to the VCS control unit is made by pressing the **“CONT”** key.

The following notes are shown on the display depending on the VCS configuration and the type of fault involved:

- The cause and location of the fault is displayed in plain text, for example “Sensor error on wheel D (H1)”.

- If the display shows **“Currently present: Yes”** this means that the fault was still present when the diagnostics facility was selected. Pressing the **“Repair”** key then gives a detailed search path for the fault with specific instructions on fault correction.

  If the display shows **“Currently present: No”** the fault was not present when the diagnostics facility was called, i.e. the fault may not be detected during fault-finding (electrical measurements). One example of this would be an intermittent contact.

- Indication of how often the fault occurred.

Electrical measurements (e.g. resistance measurements) can be carried out on the wiring using the **multimeter** according to the instructions. To do this you must return to the basic menu “2. Multimeter”.

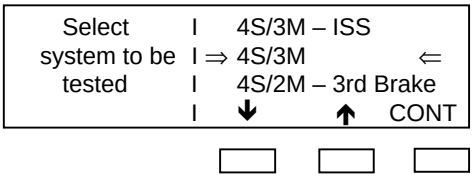
At the end of fault-finding you are asked whether the fault is to be erased. If you select “Yes” the fault is automatically erased in the VCS ECU. However, this is **only** possible if the **fault is no longer present**.

6.2 System check

A complete VCS function test including the printing of a test log can be executed using the “System check” option. This is of benefit for example after first installation or extensive repairs.

When the menu option “2. System check” is selected, leave the cursor flashing on “2” and press the “CONT” key.

With the additional information then presented you can decide on “Cancell” or “System check” using the “CONT” key. If you press “CONT” the following display appears:



You must now use the arrows to select the system as otherwise the diagnostic controller will subsequently detect a configuration error. Then press the “CONT” key to make the connection to the control unit in order to carry out the function and component tests.

You can then decide whether you want to print or save the log. Return to the menu by pressing “CONT”.

Important notes:

If 'system check' has been started, it must be executed step by step. It is not possible to step backwards or to skip individual stages in the test.

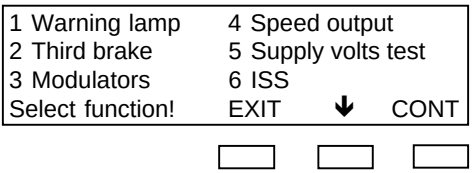
If the supply voltage to the diagnostic controller is interrupted, all data previously checked and saved for the print log is erased. For this reason the diagnostics connection must never be interrupted if you want to print the log.

The data for the printed log is saved when the operator confirms a measurement or check by pressing the appropriate key.

6.3 Component actuate

The components in the VCS system can be controlled with this option in order to check their operation.

If you select “3. Component actuate” on the diagnostics menu using the arrow key you can then switch with the “CONT” key to the following menu for further information:



You can call up and test the relevant components (if fitted) using the arrow key.

6.4 Measured values

The operating voltages and wheel speeds can be displayed under section 4 of the diagnostics menu.

Operating voltages

The actual ECU supply voltage (ISO + 24N) and the actual valve relay voltage are measured and displayed on the control unit.

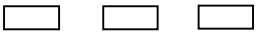
Wheel speeds

The actual wheel speeds measured by the ABS sensors are displayed.

6.5 ECU data

If you select "5. **ECU data**" on the diagnostics menu the following display appears:

1 Parameter set	4 ABS lamp sequence
2 Wabco Data	5 Tyre parameters
3 KM-recorder calib.	6 ISS threshold
Select function!	EXIT ↓ CONT



1 Parameter set

By pressing the "CONT" key you can check the setting of the ECU under "Parameter". **Example**:

System expected	:	4S/3M
Rated voltage	:	24 V
ISO address	:	10

2 WABCO Data

If you select the option "2. WABCO data" with the arrow key, the following display will appear, **for example**:

ECU type	: VCS
ECU part no.	: 446 108 030 0
Serial no./param set	: 3090000303 / 001
Prod. date	: 13/1995

3 KM recorder calibration

With the option "3. KM recorder calibration" you can adjust the kilometre recorder specifically for the vehicle used and therefore increase its accuracy. Various different numbers of teeth and the circumference lengths of tyres are available for selection. You are then prompted as to whether you wish to save the adjusted parameter in the control unit. A menu with presets for the most often used pole wheels is provided. Under the option "Others" it is possible to calibrate special pole wheels which are not already listed. The exact procedure is explained in the VCS system description.

Important:

An adjustment under "KM recorder calib." does **not** affect the tyre parameters input under section 5 and only determines the accuracy of the km counter.

4 ABS lamp sequence

You can use this to affect the response of the ABS lamp when the ignition is switched on.

5 Tyre parameters

Vehicles which have **different tyres on different axles** can be adjusted with these parameters. The exact procedure is explained in the **VCS system description**. This may only be carried out by trained specialist personnel. For this reason you must first enter a confidential number on the main menu under section 4 "Special functions". When the tyre parameters have been adjusted the km counter is calibrated automatically.

Important :

The confidential number (PIN) is issued by WABCO, Department SI, telephone no. (0049) 01802- 23 23 20.

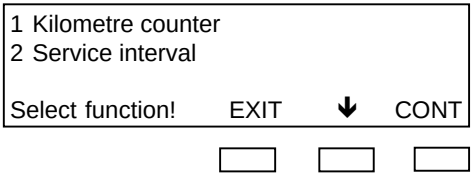
6 ISS threshold

Most of the VCS electronics are supplied with an integral speed-dependent switch (ISS). In this way it is possible, for example, to disable self steering axles.

When using an ECU with ISS you can adjust the speed threshold parameter (between 4 and 120 kph) at which switching is to take place. The default value is 0 kph.

6.6. Service

The following display appears if you select menu option “6. Service”:



1 Kilometer counter

You can check the total number of kilometres and the daily kilometres under the menu option “Kilometre counter”. You can also reset the daily kilometre counter (the Trip counter).

On the service menu, select option “1. Kilometre counter”. Then press “CONT” to see additional information and the kilometre display.

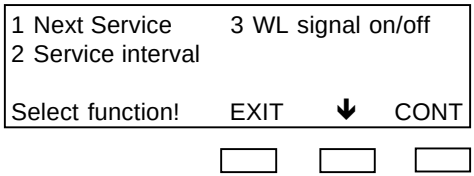
You can reset the trip meter to 0 kilometres using “TRIP reset”.

If calibration is not correct, the values for section 6.5 “ECU data” can be adjusted using the option “3. Calibrate km counter”.

The **VCS system description** includes information about the accuracy of the kilometre counter.

2 Service interval

VCS electronics are equipped with an electronic notepad. A service signal can be set with the controller. When the signal is set, a warning lamp in the driver’s cabin lights up after a specified number of kilometres (set ex. works to 30,000 km). (The WL flashes 8 times quickly when the ignition is turned on). If you use the arrow key on the service menu to select the option “2. Service interval”, you can switch with the “CONT” key through additional information and to the following menu:



1 Next Service

This display shows the actual total kilometre reading as well as the reading at which the WL will generate a warning signal in the driver’s cab when the ignition is switched on. If the service has been completed and this menu option is called after the WL has been flashing, the kilometre reading is automatically updated for the next service. The warning lamp then does not flash when the ignition is next switched on.

2 Service interval

You can check the service interval under option “2. Service interval” and adjust it in steps of 5,000 km with the arrow keys. This also adjusts the value for the “Next service” under section 1.

3 WL signal on/off

With this option on the menu you can enable or disable the flashing warning lamp as a service signal. If it is set to “OFF” the driver is no longer given a warning signal about service being required.

7. MULTIMETER

Application:

DC voltages: On-board supply
AC voltages: Sensor supply
Resistances: Valve, relays, sensors, cable continuity.
Nominal values: See section 8 "**Component values**".

1 DC voltages	3 Resistance		
2 AC voltages			
Select function!	EXIT	🡻	CONT

Electrical measurements within the range applicable to the vehicle (low voltages) can be made using the integral multimeter facility. You only need to select the measurement facility required (a DC voltage, an AC voltage or the resistance). The measurement range is set automatically by the unit.

Important:

The meter may only be used for the measurement ranges stated.

8. OPTIONS

This includes the following sub-menus:

1 ISO Address	4 Component values		
2 Help text	5 Print log		
3 Version			
Select function!	EXIT	🡻	CONT

ISO Address

The diagnostic controller makes contact with the required vehicle electronics by means of the ISO address when diagnostics is started. With the ISO address the ECU recognises that it is to communicate with the controller. Each type of electronics therefore has its own adjustable address (VCS = 10).

The ISO address should only be adjusted under special circumstances.

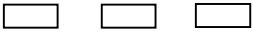
Range	Display resolution	Accuracy of measuring range. Final Value at 20°C	
DC-voltage			
2.0 volts	0.1 volt	± 0.2 %	± 0.0 volt
20.0 volts	0.1 volt	± 0.2 %	± 0.1 volt
50.0 volts	0.1 volt	± 0.2 %	± 0.1 volt
AC-voltage			
2.0 volts	0.01 volt	± 0.6 %	± 0.02 volt
35.0 volts	0.1 volt	± 0.6 %	± 0.4 volt
Resistance			
20.0 Ω	0.1 Ω	± 0.3 %	± 0.1 Ω
200.0 Ω	0.1 Ω	± 0.2 %	± 0.1 Ω
2.0K Ω	1.0 Ω	± 0.2 %	± 1.0 Ω
20.0K Ω	10.0 Ω	± 0.1 %	± 10.0 Ω
95.0K Ω	100.0 Ω	± 0.2 %	± 100.0 Ω

Help text

The help text facility enables the operator to obtain additional explanations concerning operation. If the help text facility is enabled, further explanations for the program will appear at suitable points during the procedures involved.

Version

Hardware	: V1	Multimeter: V1
Op. system	: V2.0	(03.07.1990)
Program	: V1.00	(9.6.1995)
Serial number	: 64241	CONT



This facility shows the status of the controller and the program card as supplied:

– Controller Hardware

– This facility shows the status of the controller and the program card as supplied:

– Multimeter version

– Program card with version, production date and serial number.

Component values

If the values of components were measured using the multimeter facility you can check the **reference value** here. The following information is provided, for example:

Sensor resistance	: 0,70 - 3,00	kOhm
Sensor fault resistance	: > 45	kOhm
Sensor voltage	: > 0,10	V
24V-Modulator resistance	: 10,7 - 25,0	Ohm
24V-Relay for 3rd Brake	: 190 - 650	Ohm
24V-Operating voltage	: 21,6 - 32,0	V
12V-Modulator resistance	: 4,0 - 9,2	Ohm
12V-Relay for 3rd Brake	: 25 - 160	Ohm
12V-Operating voltage	: 10,8 - 16,0	V

Protocol print-out

You can print the values measured using the print protocol facility.

9. SPECIAL FUNCTIONS

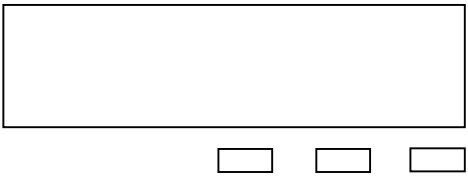
With a code which is to be entered on this menu it is possible to use the facilities which are not otherwise accessible (e.g. tyre parameters, see also section 6.6).

Training by WABCO and a subsequent PIN number are required as authority to adjust the tyre parameters.

Important :

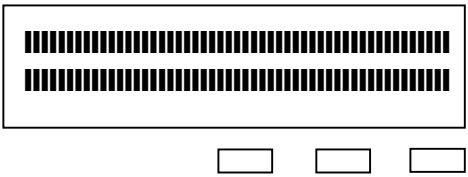
The confidential PIN number is issued by WABCO, Department SI, telephone no. (0049) 01802- 23 23 20.

10. TROUBLE-SHOOTING "DIAGNOSTICS"



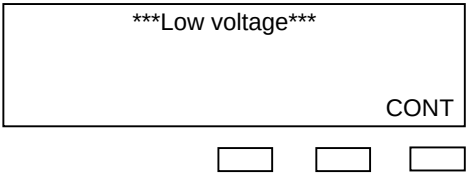
No display

Cause	Remedy
- No voltage - Low voltage (below approx. 7 V)	- Check all plug connections - Check supply voltage



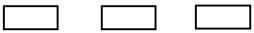
Black "bars"

Cause	Remedy
- Program card not inserted	- Insert program card to 'stop'



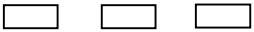
Cause	Remedy
- Supply voltage too low (only during diagnostics)	- Check battery and ensure adequate supply

*** Initialisation failure ***
Switch on ignition!
Check diagnostic conn. and ISO address!
CONT



Cause	Remedy
- Supply voltage too low (less than 18 V)	- Check the supply
- No supply voltage (Ignition off)	- Switch ignition on
- Incorrect ISO address	- Reset ISO address. VCS preset: Address 10 See section 5.3 "ISO Address“
- ECU not connected or incorrect	- Check ECU and connections
- Diagnostic lead interrupted or reversed	- Check leads and connections for correct function

*** Incorrect code words ***
no diagnostics possible!



Cause	Remedy
- Incorrect ECU connected	- Check ECU part no. and card
- Incorrect "WABCO-Data“ in the ECU or ECU dective	- If ECU fitted is correct, replace it.

Program card defective !

Cause	Remedy
- Program card defective - Program card incorrect - Program card not fully inserted	- Replace program card - Use correct program card - Insert program card to 'stop'

*** Communication terminated ***
Restart diagnostics!

CONT

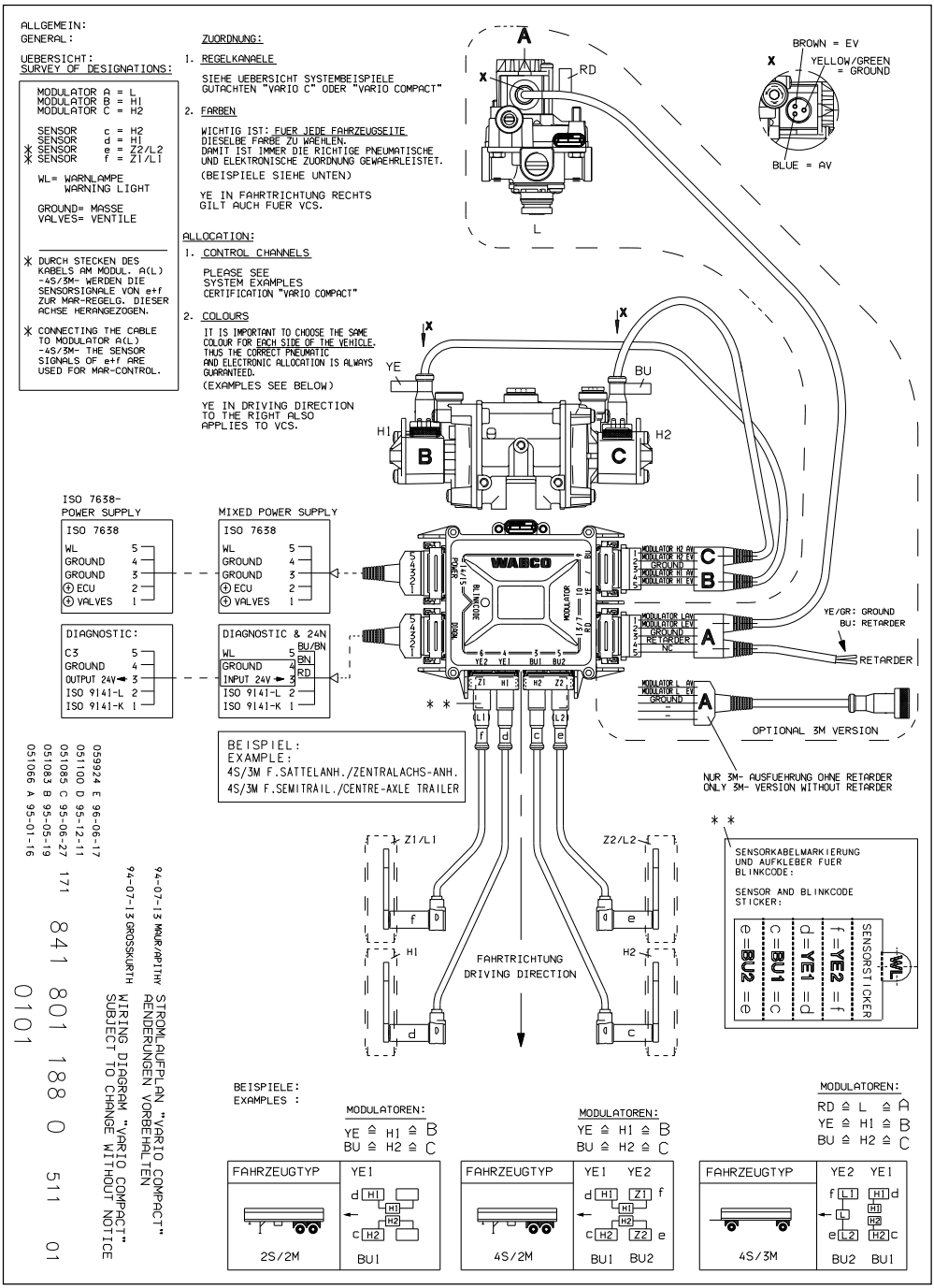
Cause	Remedy
- Data transfer interrupted during diagnostics - Cable interrupted or voltage interrupted during diagnostics	- Check all connections - Check voltage supply

*** Unknown ECU ***
Diagnostics with this program card
is not possible!

CONT

Cause	Remedy
- ECU cannot be tested with this program card - EEPROM defective (non-volatile memory in diagnostic controller)	- Use correct program card - Arrange repair of diagnostic controller

11. SYSTEM DIAGRAM 841 801 188 0



059924 E 96-06-17
051100 D 95-12-11
051085 C 95-06-27
051083 B 95-05-19
051066 A 95-01-16

171

841 801 188 0

511

01

0101

94-07-13 MAUK/APITHY STROMLAUFPLAN "VARIO COMPACT" AENDERUNGEN VORBEHALTEN

94-07-13 GROSSKURTH WIRING DIAGRAM "VARIO COMPACT" SUBJECT TO CHANGE WITHOUT NOTICE

*** SYSTEM SIGN-OFF * * *

Trailer Vario Compact ABS (VCS)

..... Vehicle type S/ M 446

..... Chassis Number ..... ABS-System ..... ECU part number

Component test

Component		nominal		actual	
Valve relay voltage		21,6 - 32,0	Volt	_____	Volt
Electronics voltage		21,6 - 32,0	Volt	_____	Volt
Coil resistance	Sensor C	0,9 - 2,00	kOhm	_____	kOhm
Resistance of sensor C to ground		> 45	kOhm	_____	kOhm
Sensor voltage	Sensor C	> 0,10	Volt	_____	Volt
Coil resistance	Sensor D	0,9 - 2,00	kOhm	_____	kOhm
Resistance of Sensor D to ground		> 45	kOhm	_____	kOhm
Sensor voltage	Sensor D	> 0,10	Volt	_____	Volt
Coil resistance	Sensor E	0,9 - 2,00	kOhm	_____	kOhm
Reistance of Sensor E to ground		> 45	kOhm	_____	kOhm
Sensor voltage	Sensor E	> 0,10	Volt	_____	Volt
Coil resistance	Sensor F	0,9 - 2,00	kOhm	_____	kOhm
Resistance of Sensor F to ground		> 45	kOhm	_____	kOhm
Sensor voltage	Sensor F	> 0,10	Volt	_____	Volt
Coil resistance	IV-Modulator A	11,7 - 16,5	Ohm	_____	Ohm
Coil resistance	OV-Modulator A	11,7 - 16,5	Ohm	_____	Ohm
Coil resistance	IV-Modulator B	11,7 - 16,5	Ohm	_____	Ohm
Coil resistance	OV-Modulator B	11,7 - 16,5	Ohm	_____	Ohm
Coil resistance	IV-Modulator C	11,7 - 16,5	Ohm	_____	Ohm
Coil resistance	OV-Modulator C	11,7 - 16,5	Ohm	_____	Ohm

Function test

Sensor	Allocation	Function
Sensor C		
Sensor D		
Sensor E		
Sensor F		

Modulator	Allocation	Function
Mod. A		
Mod. B		
Mod. C		

The test was carried out with:

❑ Blinkcode plug ❑ Compact Tester

❑ Diagnostic Controller ❑ PC

..... Location ..... Date ..... Signed

WABCO

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