

# WABCO



## Operating Instructions

for the WABCO Diagnostic Controller  
with Program Card ECAS BUS - SAE  
446 300 633 0





# Operating Instructions

for the WABCO  
Diagnostic Controller  
446 300 320 0 with  
Program Card ECAS BUS-SAE  
446 300 633 0



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### Abbreviations used:

AA	drive axle
counts	unit of measurement for movement or pressure sensor values
ECAS	Electronically Controlled Air Suspension
ECU	Electronic Control Unit
HA	rear axle
k( $\Omega$ )	kilo(ohm)
KW	calendar week
LA	lift axle
SA	trailing axle
VA	front axle
V1	version 1
4x2	description code: 4 wheels, two of them driven
6x2	description code: 6 wheels, two of them driven

## 1. BRIEF DESCRIPTION OF THE “ECAS” SYSTEM

ECAS electronics 446 055 ... 0, combined with movement sensor 441 050 ... 0, solenoid valve 472 900 / 905 ... 0 and operating unit 446 056 ... 0, operates the automatic level regulation of commercial vehicles with air suspension. Distinctions are drawn between 4x2, 6x2 and bus systems with an appropriate range of equipment (eg., partial air, full air, trailing axle, lift axle).

The ECAS system regulates the specified level by continuous comparison between the actual heights measured (on an inductive basis) by the movement sensors, and the specified heights stored in the electronics. In the event of deviations between these values, solenoid valves are activated and the airbags pressurized or depressurized until the specified level is again achieved. The specified level can be the standard level (running level), but it can also be any other stored level.

All height adjustments take place within pre-selectable tolerance limits.

Adjustments to the level are introduced in a matter of seconds when the vehicle is at a standstill. In motion (recognized by a tachometer signal), they only take place after a delay of approximately 60 seconds.

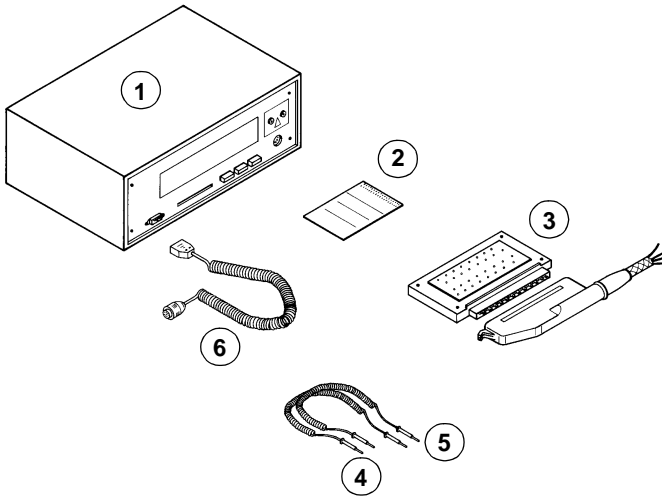
The level can be deliberately altered using the ECAS operating unit (truck) or the operating switch (bus). After the change has been completed, it is then stored as the new specified level. Re-adjustment takes place automatically if there is a change in load.

The ECAS can fulfil other functions:

- automatic upper and lower height limitation
- correction of transverse stability
- level and pressure checks
- fault recognition and display
- raise/lower lift-axle
- load/unload trailing axle
- start-up assistance
- zero-point adjustment with raised lift-axle
- LSV control
- maintenance of residual pressure to avoid crushing the airbags
- kneeling (for buses), lowering over one wheel, or the whole side, to assist boarding at bus stops
- start-up lock (for buses)
- door release (for buses)
- storage and retrieval of freely selectable levels by means of the operating unit

When faults are recognized, the indicator lamp lights up, and the faults are permanently stored for diagnostic purposes in the control electronics.

## 2. DIAGNOSTIC COMPONENTS



1.	Diagnostic controller	446 300 320 0
2.	Program card	446 300 633 0
3.	35-pin measuring adaptor	446 300 314 0
4.	Multimeter cable, black	894 604 354 2
5.	Multimeter cable, red	894 604 355 2
6.	Connecting cable (SAE, deutsch)	894 604 350 0
	Connecting cable (SAE, AMP)	894 604 351 0

The Diagnostic Controller Set	446 300 331 0
consists of Diagnostic Controller	446 300 320 0
and carrying case	446 300 022 2

### Accessories

Keyboard	446 300 328 0
----------	---------------

### 3 CONNECTION OF THE DIAGNOSTIC CONTROLLER

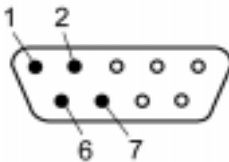
The allocation of PINs in the diagnostic socket must correspond to the SAE J 1587 standard as shown below. Connect Diagnostic Cable to diagnostic socket on vehicle.

Allocation of diagnostic socket:



- PIN A diagnostic line A
- PIN B diagnostic line B
- PIN C battery positive
- PIN E battery negative

Using the connecting adaptor, the pin allocation of the DB-9 “Diagnostic Input” plug on the front of the diagnostic controller is as follows:



- 1 Battery positive (terminal 30)
- 2 Battery negative (terminal 31)
- 6 Diagnostic cable (A)
- 7 Diagnostic cable (B)

Connect the 9-pin plug of the connecting cable or connecting adaptor to the diagnostic controller. This provides both the

diagnostic connection and the power supply. Black bars appear on the display screen.

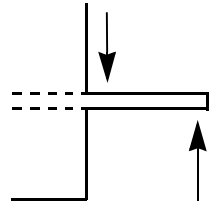
Push the program card into the special slot.

#### Plug in Card:

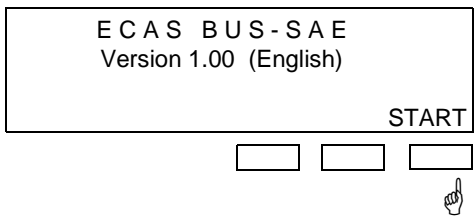
The contact side must face upwards

#### Removing Card:

Please do not pull hard. If a resistance is felt, push its end upwards lightly with your thumb whilst pressing downwards lightly with your index and middle fingers. This will make it very easy to remove.



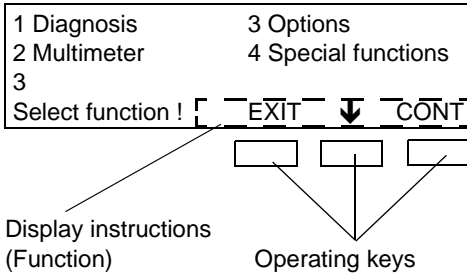
Depending on the program card used, the following (or similar) will appear in the display. If not, refer to Section 7, Malfunctions .



The first screen displays the System and version (1.00 in the example). Press the right-hand key.

## 4 OPERATING THE DIAGNOSTIC CONTROLLER

The diagnostic controller is operated by means of 3 operating keys on the front, or via the external keypad. The assignment of keys depends on the instructions which appear on the display directly above the keys.



Here are some examples for different key functions:

Key	Function
START	start the program.
EXIT	the display will return to the previous menu or programme item.
↓	selection of an item from the main menu. Every time the key is pressed, a new menu item will be suggested. The menu item selected will flash.




CONT	The menu item selected previously is activated or actuated.
ABORT	You have the option to abort the function in the event of an error
END	Ending the function you have been working on, i. e. setting parameters.
CHANGE	Changing the parameters appearing in the display.

## Operating the External Keyboard 446 300 328 0







The external keyboard permits you to enter numerical values. For the program card described in these operating instructions, an external keyboard is not required.


Functions are only assigned to the marked keys.


The keys    can be used instead of the three push-buttons on the diagnostic controller

**Exception:** if it is necessary to enter figures during the program, this function does not apply.

Using the ten-key block   to  it is possible either to enter numerical data (for example ISO addresses) or to select numbered items from the main menu.

Using the  key, the menu item indicated is executed. The key has the same function as the controller key CONTINUE.

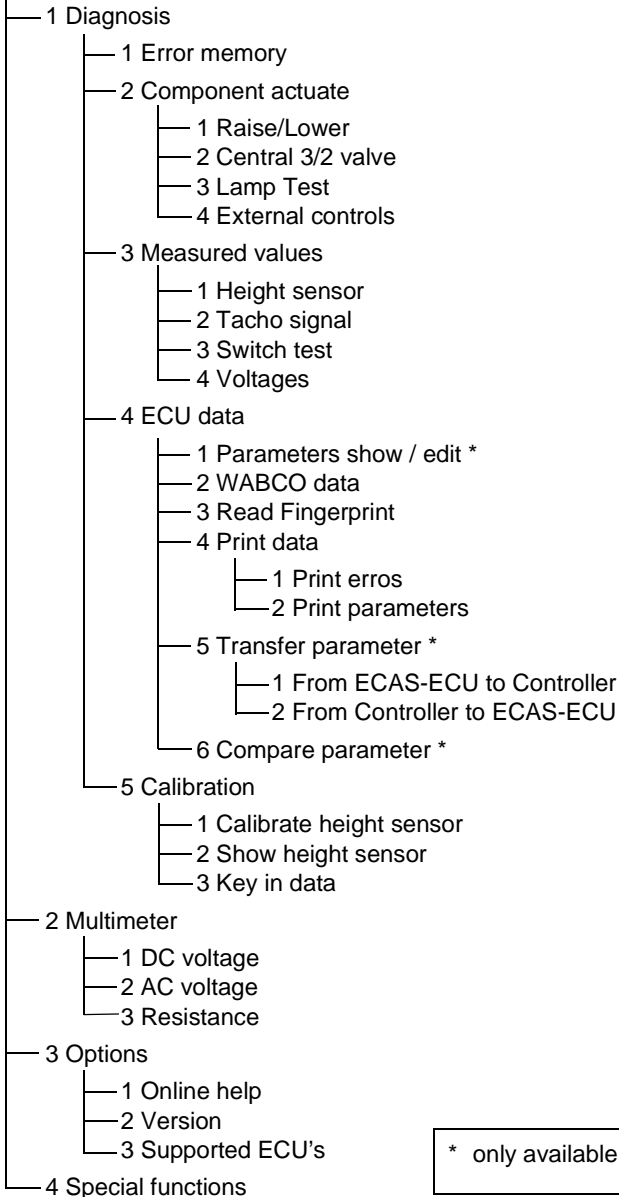
Using  you can revert to the previous main menu displayed.

Using , when there is a series of data displayed (eg., parameter, function test, calibration data), you can revert to the previous display.



## 5. PROGRAM STRUCTURE

### Menu Selection ECAS BUS - SAE 446 300 633 0




\* only available after entering the PIN

## 5.1 DIAGNOSIS


When the diagnostic function is called up from Menu Item 1, the connection is made to the ECAS control unit.

1 Diagnosis	4 Options
2 Multimeter	5 Special functions
Select function!	EXIT ↓ CONT
<input type="text"/>	<input type="text"/> <input type="text"/>



Let the cursor flash on "1", and press the "CONT" key.

ECU type	: ECAS BUS
Part No.	: 446 055 057 0
Prod. Date	: KW35,1996
Software-No.	: 7.3.0.1 /0
	CONT
<input type="text"/>	<input type="text"/> <input type="text"/>



When this has been achieved, the data of the ECAS-ECU are shown in the display.

1 Error memory	4 ECU data
2 Component actuate	5 Calibration
3 Measured values	
Select function!	EXIT ↓ CONT
<input type="text"/>	<input type="text"/> <input type="text"/>

The following functions can be selected in diagnostic mode, and the indicator lamp flashes or lights up, depending on the system.

### 5.1.1 Error memory

If the ECAS control unit has detected an error in the system (indicator lamp lights up or flashes), this function will help to find the fault. Depending on the ECAS system in use, and the type of error, the following information will be displayed:

- Cause and location of fault displayed in clear, e.g. "Height sensor failure, rear right", "Broken cable or impedance too high".
- Indication of how frequently the fault has occurred.
- The display "The failure exists at present !" means that the fault was still present when the diagnostic mode was selected. There then arises a more detailed fault finding path with concrete instructions for fault correction. An example is given on page 14.

Upon instruction, the integrated multimeter, together with a measuring adapter, can be used to take electrical readings (e.g. resistance). Actual and preset values will both be displayed.

Once repair of the fault has been confirmed, it is deleted from the ECU. The fault tracing path can now be left once all faults have been repaired or the ignition switched off.

### 5.1.2 Component Actuate

1 Raise/Lower	3 Lamp Test
2 Central 3/2 valve	4 External controls
Select function!	EXIT ↓ CONT
<input type="text"/>	<input type="text"/> <input type="text"/>

"Component actuate" permits certain components of the ECAS system to be activated to check that they are working properly.

If a fault is detected when the valves are activated, an error message will be returned and the activation remains ineffective (e. g. front axle valve interrupt).

### Raising/Lowering

Depending on the type of system/parameters installed, this function can be used to activate the solenoid valves on the front and rear axles, or the individual bellows. The height sensor readings will appear on the display.

When pressing the "IN" key, the respective height sensor value will increase.

When pressing the "OUT" key, the respective height sensor value will decrease.

If no height sensor is connected, a value of "255" will appear instead. In the event of a short circuit, "---" will appear on the display.

The following maximum of combinations is possible (full configuration):

- front axle and driving axle right and left
- front axle only
- driving axle only
- driving axle left only
- driving axle right only

### Pressurizing Valve

The "pressurizing valve" (also called the central 3/2-way valve) is arranged in line with the 2/2-way valves and determines

whether "raising" or "lowering" is in operation. By pressing "ON" it is actuated independently from the 2/2-way valves. The height sensor readings must not change when that key is pushed; if they do this implies that a 2/2-way valve is leaking.

### Lamp Testing

Depending on the system/parameters in use, different lamps can be switched on at the push of a button:

- Signal Lamp
- Kneeling Lamp
- Low Ride Lamp
- High Ride Lamp

When exiting from the routine, all lamps are switched off.

### Actuate Exits

At the push of a key, different exits can be actuated. If any exits have not been connected due to the parameters set, the respective location will show "---" (actuation is then not possible).

- Exterior Sounder
- Dash Sounder
- Aux. Tank Control
- Wheel Chair Lift Inhibit

### 5.1.3 Testing and Measuring Values

1 Height sensor	3 Switch test
2 Tacho signal	5 Voltages
Select function!	EXIT ↓ CONT
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

## Height sensor Readings

The current readings of the height sensors will be displayed. If no height sensor has been connected, a value of "255" will be displayed, and if there is a short-circuit, "0" will appear in the display. If no height sensor has been fitted due to the parameters set, "---" will be displayed.

## Tacho signal

This function can be used to verify the connection to the signal output of the speedometer. For this purpose the vehicle must be brought to a speed supplying the speedometer with a signal (faster than 1 k.p.h.), e. g. on a roller dynamometer.

## Switch Positions

This function can be used to display the status of various switches. For this purpose, please actuate the respective switches on the vehicle.

- Park Brake Active
- Service Brake Active
- Input Door Position
- Shipping Level
- Transmission in Neutral
- Automatik Kneeling
- Manual Kneeling
- Recover to Normal
- High Ride
- Low Ride
- Stop

## Voltage

The current operating voltage and the valve relay voltages are displayed.

## 5.1.4 Control Equipment Data

1 Parameters	4 Print data
2 WABCO data	5 Transfer parameter
3 Read Fingerprint	6 Compare parameter
Select function!	EXIT    ↓    CONT



### Parameter

Parameters are values set on the ECU for a specific system and can be displayed using the Diagnostic Controller. After entering the PIN under menu item "special functions", the parameters can be changed and stored in the control unit.

### WABCO Data

Display of the data stored in the ECAS control unit: Type of ECU, type of equipment, part number, manufacturing date and ECU software number.

### Read Fingerprint

Here you can see who last entered or changed the parameters. Information is provided on:

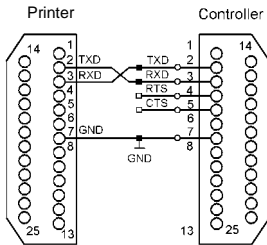
- ID-Code
- Company code
- Serial number of the program card

### Print Data

This is where the contents of the error memory and/or the parameters can be printed in a table.

Connection with the printer is established via the 25-pin socket on the rear and a serial printer cable. The cable must have a DB 25-

plug (not socket !) **at both ends.**



The program works with EPSON FX-compatible printers with a serial interface (RS 232). The transmission parameters of the printer must be set to the configuration shown below:

Speed: 1200 Baud  
 Data bits: 8  
 Stop bit: 1  
 Parity bit: X ON / X OFF

### Transfer Parameters

Parameters can be transferred from the ECU and the Diagnostic Controller, and vice-versa. Thus it is possible to copy the parameters from one ECU into another. This function requires entry of the PIN under the menu item "special functions".

### Compare Parameters

This allows the parameters stored in the Diagnostic Controller to be compared with those in the ECU.

### 5.1.5 Calibration

1 Cal. height sen.	3 Key in data
2 Show height sen.	
Select function!	EXIT ↓ CONT

<input type="text"/>	<input type="text"/>	<input type="text"/>
----------------------	----------------------	----------------------

The purpose of system calibration is to eliminate to the largest possible extent any installation and equipment tolerances resulting from ECAS installation. Calibration also has to be repeated when sensors or ECU have been replaced.

### How is the calibration made?

Using the "ACTUATE" key, the vehicle is brought to the desired normal level (running level). By operating the keys, the actual level is stored as the normal level. Depending on the system, further levels (upper and lower level) are calibrated in the same way.

**Note:** at least the normal level must be known, for instance as a distance between the frame and the axle, in accordance with the vehicle manufacturer's data. It should also be known whether the upper and lower level are the buffer stops, for instance, or whether other levels must be calibrated.

### Error Recognition During System Calibration

If faulty calibration is suspected, the calibration data can be read via menu item "Show height sensor". The calibration levels must show a clear allocation.

Calibration must meet the following requirements:

1. The height sensor values must be > 4 counts, and
2. < 255 counts.
3. The upper stop level must be larger than the normal level (in counts) plus triple tolerance of the index level plus 3 counts.

4. The lower stop level must be smaller than the normal level minus double tolerance of the index level.

**Please note:**

The index level tolerances front/rear are determined by Parameters 8/9.

**Display Calibration Values**

The calibration data stored in the ECAS control unit for all three levels are displayed.

**Enter Calibration Values**

After entering the PIN under "special functions", it is possible to manually enter the calibration data for all three levels.

The integrated multimeter function permits electric measurements on the vehicle. Only the desired measuring function (direct voltage, alternating voltage or resistance) needs to be selected. The measuring range is automatically set by the unit.

**Application:**

Direct voltage: supply voltage on vehicle  
 Alternating voltage: sensor voltage  
 Resistance: valves, relays, sensors, wiring

**NOTE:**

The measuring instrument is designed only for measurings within the vehicle-specific-range (low voltage). It must not be used beyond the above-mentioned measuring range.

**5.2 MULTIMETER**

1 DC voltage	3 Resistance
2 AC voltage	
Select function!	EXIT ↓ CONT
<input type="text"/>	<input type="text"/> <input type="text"/>

Range	Display resolution	Accuracy of measuring range. Final value at 20°C	
DC-voltage			
2.0 volt	0.1 volt	± 0.2 %	± 0.0 volt
20.0 volt	0.1 volt	± 0.2 %	± 0.1 volt
50.0 volt	0.1volt	± 0.2 %	± 0.1 volt
AV-Voltage			
2.0 volt	0.01 volt	± 0.6 %	± 0.02 volt
35.0 volt	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
2.0 kΩ	1.0 Ω	± 0.2 %	± 1.0 Ω
20.0 kΩ	10.0 Ω	± 0.1 %	± 10.0 Ω
95.0 kΩ	100.0 Ω	± 0.2 %	± 100.0 Ω

### 5.3 OPTIONS

1 Online help	3 Support ECU's
2 Version	
Select function!	EXIT ↓ CONT
<input type="text"/>	<input type="text"/> <input type="text"/>

#### Help Texts

This function permits the operator to obtain additional operating information. If this function has been activated, more detailed information on the programme will appear at suitable times between the programme's steps.

#### Versions

Thus function shows the data on the Controller and the Programme Card supplied: e. g.:

Hardware	: V1	Multimeter:	V1
Operating system:	V3.1	(07.03.1991)	
Program	: V1.00	(09.09.1997)	
Serial number	: 22435	CONT	
<input type="text"/>	<input type="text"/>	<input type="text"/>	

#### ECUs for Testing

Indicates the WABCO numbers of the control units supported by the program.

### 5.4 SPECIAL FUNCTIONS

When a code (PIN) is entered in this menu, the ECU's specific parameters applying to that vehicle which normally cannot be altered may be adjusted and transmitted from one control unit to another.

Authorization to modify these parameters requires attending a WABCO training course.

### 6 EXAMPLE OF FAULT FINDING "MOVEMENT SENSOR CABLE BREAK"

The fault finding is explained in this section, using an example.

The ECAS-ECU has stored 3 error(s) in the error memory
CONT
<input type="text"/> <input type="text"/> <input type="text"/>

This display only appears if more than one fault has been stored.

2/2 valve rear axle left (Broken wire or impedance too high) The failure exist at present ! ( 1 x recorded)	CONT	REPAIR
<input type="text"/>	<input type="text"/>	<input type="text"/>

Fault location (2/2 valve rear axle left) and type (Broken wire or impedance too high) are displayed. In addition, there is an indication of whether the fault was actually present when the diagnosis started. If the fault occurs several times (eg., an intermittent contact) the frequency is indicated

The fault search is started with the "REPAIR" key.

Any further faults present are then revealed by using "CONT" key.

**Please note:**



When using the separate keyboard 446 300 328 0, this key can be used to return to the previous error display.

Press "REPAIR" to initiate the fault finding path.

Check height sensor, connecting cable and connector for damage.		
Fault found?	NO	YES
	<input type="checkbox"/>	<input type="checkbox"/>

Check components visually for damage. If fault has been found, confirm with "YES". If not, answer "NO" to go on to the next step.

Check resistance: PIN 25 / 27		
Should be: 100 - 140 Ω	ACTUAL:	> 1 kΩ
Check actual value		
	LOW	OK
	<input type="checkbox"/>	<input type="checkbox"/>

Connect multimeter cables (red and black) to the multimeter sockets on the Diagnostic Controller. In this example, the test probes must be plugged into sockets 25 and 27 of the measuring adaptor.

Compare the actual value (the measured value) with the specified value. Using the appropriate key, enter whether the actual value is lower, within the tolerance range OK or greater than the specified value (on the display illustrated, the actual value is greater than the specified value).

Disconnect sensor from connecting cable.		
Check resistance: PIN 25 / 27		
SHOULD BE > 45 kΩ		
ACTUAL: >100 kΩ		
Actual value OK ?	NO	YES
	<input type="checkbox"/>	<input type="checkbox"/>

Disconnect the sensor from the cable and measure again. After once again comparing the specified value with the actual value, use the respective button to indicate whether the specified value has been achieved (YES) or not (NO). In this example it has been achieved.

Sensor faulty!		
Exchange Sensor.		
		CONT
	<input type="checkbox"/>	<input type="checkbox"/>

Check the parts indicated (the sensor in this case) and replace them as required. If there is more than one fault or error, the display would now show the next fault. If all errors are displayed according to identical or similar repair instructions, the following will appear on the display:

No FURTHER errors stored in the ECAS-ECU		
		CONT
	<input type="checkbox"/>	<input type="checkbox"/>

No further errors are stored.

The error memory in the ECAS-ECU has now been cleared !		
		CONT
	<input type="checkbox"/>	<input type="checkbox"/>

The fault memory is read again for checking purposes. The display indicates that no fault is stored in the ECU. Otherwise the fault search would recommence.

To quit the fault search path press "CONT".



## 7. MALFUNCTIONS



no display

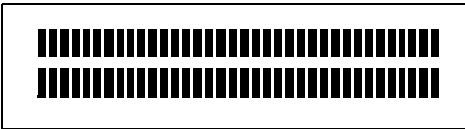


Cause

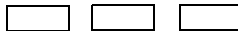
- no voltage supply
- undervoltage (less than about 7 volts)

Remedy

- check all plugged connections
- check supply voltage



black "bars"

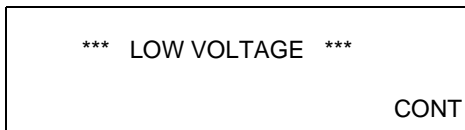


Cause

- program card not inserted

Remedy

- push program card in as far as the stop (Contacts overhead).



Cause

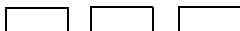
- Supply voltage too low (only during diagnostic operation)

Remedy

- check battery load capacity, and ensure adequate supply.

\*\*\* Initialization error \*\*\*  
 Switch ignition on!  
 Check diagnostic connection!

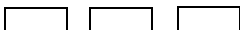
CONT



Cause	Remedy
<ul style="list-style-type: none"> <li>Insufficient supply voltage (&lt; 18 volts)</li> <li>No supply voltage (ignition off)</li> <li>Diagnostic lines switched or disconnected</li> </ul>	<ul style="list-style-type: none"> <li>Ensure supply</li> <li>Switch on ignition</li> <li>Check lines and connections for function and proper allocation</li> </ul>

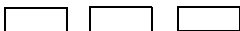
\*\*\* Unknown control unit \*\*\*  
 Diagnosis not possible  
 with this program card!

CONT



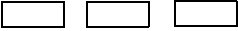
Cause	Remedy
<ul style="list-style-type: none"> <li>Wrong ECU connected</li> <li>Wrong "WABCO Data" in ECU or defective ECU</li> </ul>	<ul style="list-style-type: none"> <li>Check ECU part number</li> <li>If right ECU has been, fitted, replace</li> </ul>

\*\*\* Communication Breakdown \*\*\*  
 Check diagnostic connection  
 and diagnostic lines.  
 Restart diagnostic procedure. CONT



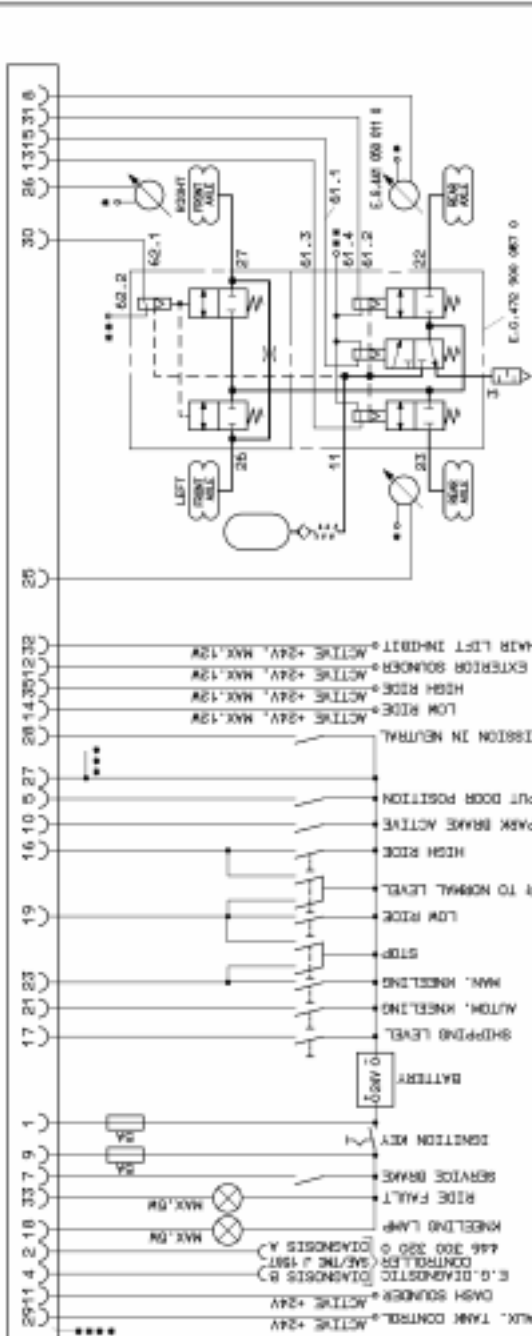
Cause	Remedy
<ul style="list-style-type: none"> <li>Data transmission discontinued during</li> <li>Diagnostic Line or voltage disconnection during diagnosis</li> <li>critical error in diagnostic operation</li> </ul>	<ul style="list-style-type: none"> <li>Check all connections</li> <li>switch on ignition</li> </ul>

\*\*\* Error during self-test \*\*\*  
EEPROM of Diagnostic Controller  
faulty  
CONT



Cause	Remedy
<ul style="list-style-type: none"><li>EEPROM (Diagnostic Controller's) non-volatile memory of DC defective</li></ul>	<ul style="list-style-type: none"><li>Repair Diagnostic Controller</li></ul>

ELECTRONIC CONTROL UNIT 446 055 057 0



SENSOR WIRES HAVE TO BE LED IN PARALLEL TO THE CENTRAL COLLECTING POINT \*\*\*

DATE		DRAWN		CHECKED		BY		TITLE	
19-10-08	SP/TRY	19-10-08	SP/TRY	ECAS BUS		KNEELING AT FRONT AXLE		-HCL-	
DATE FOR DOCUMENT SHEET		DATE FOR DOCUMENT SHEET		DATE FOR DOCUMENT SHEET		DATE FOR DOCUMENT SHEET		DATE FOR DOCUMENT SHEET	
17/	841 801 559 0	402	01	PART NO. / REV. DATE		PART NO. / REV. DATE		PART NO. / REV. DATE	
A 3	0407	0407	0407	DATE FOR DOCUMENT SHEET		DATE FOR DOCUMENT SHEET		DATE FOR DOCUMENT SHEET	

- \* CONNECTED WITH CENTRAL COLLECTING POINT\*\*\*
- \*\* CONNECTED WITH ECU PIN 27
- \*\*\* CENTRAL COLLECTING POINT-DISTANCE 3m FROM ECU
- \*\*\*\* SPRING CONTACT PLUG BVA 510 764 2 (35 POLES)

**WABCO**

**WABCO**  
**Fahrzeugbremsen**

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