

# OptiTire™

## TIRE PRESSURE MONITORING FOR COMMERCIAL VEHICLES

### SYSTEM DESCRIPTION



**WABCO**



**OptiTire™**

**TIRE PRESSURE MONITORING  
FOR COMMERCIAL VEHICLES  
SYSTEM DESCRIPTION**

**Edition 1**

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**WABCO**

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## 1 Abbreviations

ABBREVIATION	MEANING
<b>ADR</b>	(French: Accord européen relatif au transport international des marchandises Dangereuses par Route); European agreement concerning the international carriage of dangerous goods by road
<b>CAN</b>	Controller Area Network; asynchronous serial bus system for networking control units in vehicles
<b>ECAS</b>	Electronically Controlled Air Suspension
<b>ECU</b>	Electronic Control Unit
<b>GND</b>	Ground; earth
<b>TEBS</b>	Electronic Braking System for Trailers
<b>VCS</b>	Vario-Compact-System; compactly structured ABS for trailers
<b>WIS</b>	Wheel Internal Sensor; internal wheel sensor or module
<b>WM2</b>	Wheel Module 2; external wheel sensor or module

## 2 General Information

### Purpose of the document

This document describes the function and installation of the OptiTire™ tire pressure monitoring system.

### Copyright and trademark notice

The content, particularly technical information, descriptions and figures, corresponds to the state current at the time of printing and is subject to change without notice.

This document, including all its parts, in particular texts and figures, is protected by copyright. Use outside the statutory or contractual limits require authorisation by the copyright owner. All rights reserved.

Any brand names, even if not indicated as such, are subject to the rules of the trademark and labelling rights.

### Symbols used



#### WARNING

#### Specifies a potentially hazardous situation

Not observing the safety instruction can result in severe injuries or death.

- *Follow the instructions in this warning note to avoid injury or death.*

#### CAUTION

#### Specifies possible material damage

Not observing the safety instruction can lead to material damage.

- *Follow the instructions in this warning note to avoid any material damage.*

! Important instructions, information, or tips that you should always observe.



Reference to information on the Internet

- Action step
  - ⇒ Consequence of an action
- List

## Technical documents



- Open the WABCO INFORM online product catalogue:  
<http://inform.wabco-auto.com>
- Search for documents by entering the document number.

The WABCO online product catalogue INFORM provides you with convenient access to the complete technical documentation.

All documents are available in PDF format. Please contact your WABCO partner for printed versions.

Please note that the publications are not always available in all language versions.

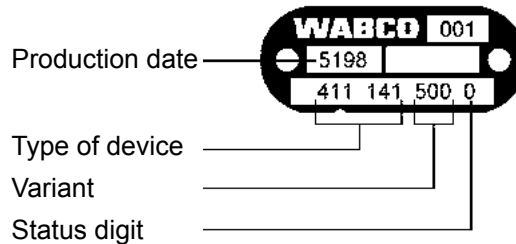
DOCUMENT TITLE	DOCUMENT NUMBER
OptiTire™ – System Description	815 XX0 229 3
OptiTire™ – Installation instructions	815 XX0 230 3
General Repair and Test Information	815 XX0 109 3
Diagnosis – Product Overview	815 XX0 037 3
SmartBoard – Operating Instructions	815 XX0 138 3
TEBS E system description	815 XX0 093 3
TEBS C/D system description	815 XX0 020 3
TX-TRAILERGUARD™	<a href="http://www.transics.com">www.transics.com</a>

\*Language code XX: 01 = English, 02 = German, 03 = French, 04 = Spanish, 05 = Italian, 06 = Dutch, 07 = Swedish, 08 = Russian, 09 = Polish, 10 = Croatian, 11 = Romanian, 12 = Hungarian, 13 = Portuguese (Portugal), 14 = Turkish, 15 = Czech, 16 = Chinese, 17 = Korean, 18 = Japanese, 19 = Hebrew, 20 = Greek, 21 = Arabic, 24 = Danish, 25 = Lithuanian, 26 = Norwegian, 27 = Slovenian, 28 = Finnish, 29 = Estonian, 30 = Latvian, 31 = Bulgarian, 32 = Slovakian, 34 = Portuguese (Brazil), 35 = Macedonian, 36 = Albanian, 97 = German/English 98 = = multilingual, 99 = non-verbal

# General Information

## Structure of the WABCO product number

WABCO product numbers consist of 10 digits.



- 0 = New device (complete device)
- 1 = New device (subassembly)
- 2 = Repair kit or subassembly
- 4 = Component part
- 7 = Replacement device

## Choose genuine WABCO parts

Genuine WABCO parts are made of high quality materials and are rigorously tested before they leave our factories. You also have the assurance that the quality of every WABCO product is supported by a powerful customer service network.

As a leading supplier to the industry, WABCO collaborates with the world's leading original equipment manufacturers, and disposes of the experience and capacitive capability required to also satisfy the most stringent production standards. The quality of every genuine WABCO part is supported by:

- Tooling made for serial production
- Regular sub-supplier audits
- Exhaustive end-of-line tests
- Quality standards < 50 PPM

**Installing replica parts can cost lives – genuine WABCO parts protect your business.**

## WABCO additional services

The package you will get with a genuine WABCO part:

- 24-month product warranty
- Overnight delivery
- Technical support from WABCO
- Professional training solutions from the WABCO University
- Access to diagnostics tools and support from the WABCO Service Partner network
- Straightforward claims handling
- Confidence that the vehicle manufacturer's rigorous quality standards are met.



## WABCO Service Partner



WABCO Service Partners – the network you can rely on. You can access 2000 high quality workshops with more than 6000 specialist mechanics, all trained to WABCO's exacting standards and equipped with our most up-to-the-minute systems diagnostic and support technology.

## Your direct contact to WABCO

In addition to our online services, trained members of staff are there to help you at our WABCO Service Partners to directly answer any technical or business-related questions you may have.

Contact us if you need assistance:

- Find the right product
- Diagnosis support
- Training
- System support
- Order management



You can find your WABCO partner here:  
<http://www.wabco-auto.com/en/how-to-find-us/contact/>

### 3 Safety information

#### Observe all required provisions and instructions:

- Read this publication carefully.  
Adhere to all instructions, information and safety information to prevent injury to persons and damage to property.  
WABCO will only guarantee the security, reliability and performance of their products and systems if all information in this publication is adhered to.
- Always follow the specifications and instructions of the vehicle manufacturer.
- Observe all accident regulations of the respective company as well as regional and national regulations.

#### Make provisions for a safe work environment:

- Only trained and qualified technicians may carry out work on the vehicle.
- Use personal protective equipment if required (protective goggles, respiratory protection, ear protectors, etc.).
- Ensure that the workplace is dry and provided with sufficient lighting.
- Pedal actuations can lead to severe injuries if persons are in the vicinity of the vehicle. Make sure that pedals cannot be actuated as follows:
  - Switch the transmission to "neutral" and actuate the park brake.
  - Secure the vehicle against rolling by using chocks.
  - Fasten a note clearly visible to the steering wheel indicating that work is being performed on the vehicle and that the pedals are not to be actuated.

## 4 Introduction

WABCO OptiTire™ is the next generation of tire pressure monitoring for commercial vehicles and replaces the predecessor system IVTM.

OptiTire™ was specially developed to reduce the running costs for fleets and increase safety.

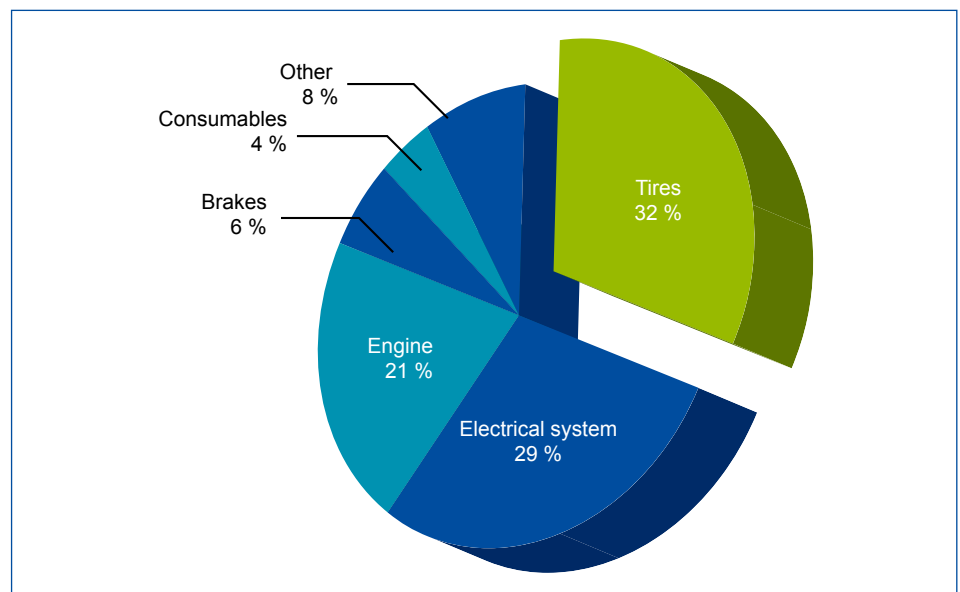
### Reduced downtimes, extended tire life

The need to maintain the correct tire pressure seems self-evident, but in reality the tire pressure is not checked frequently enough. Time pressure, inattention and complacency are some of the reasons for this. An official study has found that more than 30 % of all truck breakdowns are caused by tire issues. Further studies have shown that even 15 % over or underinflation can reduce the life of a tire by more than 10 %.

With underinflated tires there is an increased risk of sustained overheating. This can cause terminal damage to the carcass. WABCO OptiTire™ helps to maintain the correct tire pressure and to detect slow punctures early.

#### Downtimes

Tire damage is the most frequent reason for commercial vehicle vehicles to be out of service.



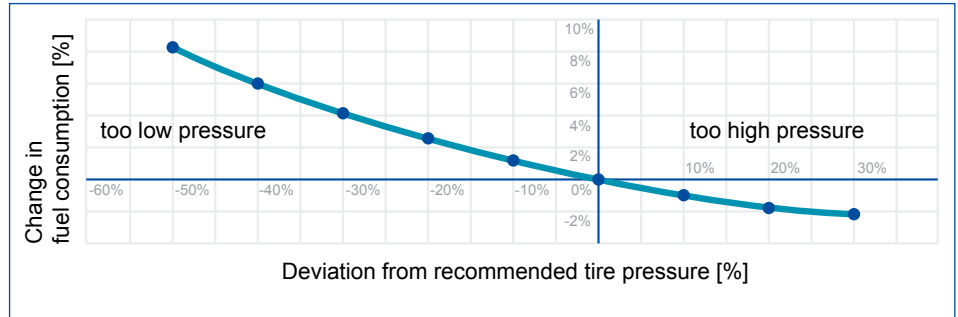
### Cut fuel costs, minimise CO<sub>2</sub> emissions

Fuel is the largest variable cost for fleet operators. With diesel prices more frequently going up than down, fuel economy is of paramount importance.

Studies by the tire industry have confirmed that the increased rolling resistance of underinflated tires has a negative impact on fuel consumption and increases CO<sub>2</sub> emissions. Tires that maintain the correct air pressure, on the other hand, can save up to 2 % fuel and reduce CO<sub>2</sub> emissions.

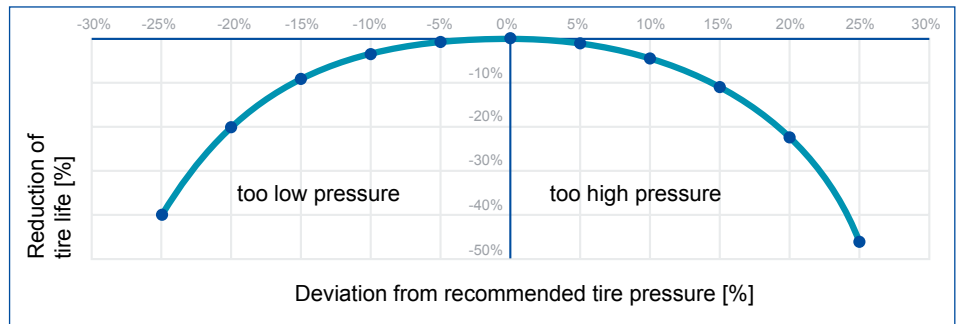
## Fuel efficiency

A constantly 17% underinflated tire leads up to 1,400 litres increase in fuel consumption (200,000 km annual mileage for long haul applications).



## Life of the tires

A deviation of 15 % from the recommended tire pressure reduces the life of a tire by more than 10 %.



## Reduce risk, improve safety

Incorrect tire pressure is dangerous and may present any of the following risks:

- a tire failure
- a deterioration in vehicle handling
- extended braking distances

WABCO's OptiTire helps maintain tire pressure at the recommended level, preventing tire damage and enhancing fleet safety.

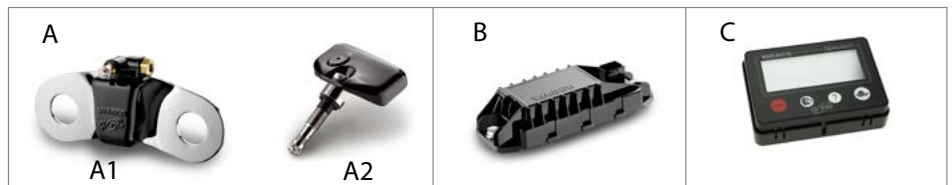
! OptiTire™ cannot announce sudden, extreme tire damage caused by external effects.

## 5 System description

This chapter describes how the OptiTire™ system operates. Furthermore, you will also obtain information concerning technical reports for installing and retrofitting.

### 5.1 Basic OptiTire function

#### Solobus



LEGEND	
<b>A</b>	Sensors: external sensor WM2 ( <b>A1</b> ) or internal sensor WIS ( <b>A2</b> )
<b>B</b>	Electronic Control Unit (ECU)
<b>C</b>	Display

#### Measurement

The tire pressure is measured by sensors. The measured values are repeatedly transmitted to the electronic control unit by radio signal.

The actual tire pressure of each wheel is transmitted to a central ECU. The signals of all wheels are evaluated there and the information is conveyed to a display in the driver's cab.

#### Evaluating

In the ECU, the measured values are compared to one another and to standard values stored as a parameter set in the ECU.

A single OptiTire™ ECU can monitor up to 20 wheels + 2 spare wheels. Dual tires are sensed separately.

A warning is signalled in the event of a critical deviation.

Normal pressure fluctuations due to driving mode, ambient temperature changes or load are filtered.

The OptiTire™ system tolerates these typical pressure fluctuations even on poor road sections or with uneven load.

## Display

WABCO offers a driver's display for the dashboard for indicating warning messages and requesting tire pressure information.

Alternatively the data can also be transmitted to an integrated display, SmartBoard or TX-TRAILERGUARD™ (telematics). Detailed description of the display function ▶ see chapter 10 "Operation", page 53.

## 5.2 Configuration for bus and towing vehicle

Selection of OptiTire™ components depends on vehicle type, type and number of wheels and type of systems connected to OptiTire™ but not on the vehicle system voltage.

### ECU

Trucks, buses or articulated buses are equipped with the ECU (WABCO part number: 446 220 100 0).

### Display

In the case of original equipment, the tire pressures are retrieved by a central on-board computer via CAN and displayed on an integrated display in the dashboard.

If retrofitted, the WABCO display (WABCO part number: 446 221 000 0) is used for retrieving the tire pressures.

### Sensors

Select sensors and counterweights according to their axle configuration.

The table contains components for three vehicle type as examples. Further information in the chapter "Components",

▶ see chapter 6 "Components", page 22.



#### WABCO Bridge configurator

WABCO offers an online configurator "WABCO Bridge" for the configuration of OptiTire™ for different vehicles (towing vehicle, bus, semitrailer).

– Open the myWABCO website:

<http://am.wabco-auto.com/welcome/>

Help on logging in can be obtained by pressing the *Step-by-step instructions* button.

After the successful registration you can use the online configurator WABCO Bridge via myWABCO to carry out your own configuration of the OptiTire™ system.

Please contact your WABCO partner if you have any questions.

# System description

## Example: Parts list for bus / towing vehicle (with external sensors WM2)

WABCO PART NUMBER	COMPONENT	COMMENT	4X2	6X2	ARTICULATED BUS 6X2
446 220 100 0	ECU	Communication with trailer ECU / warning lamps	1	1	1
446 220 000 4	Support	Support for mounting the ECU	1	1	1
446 221 000 0	Display	Display of warning messages and retrieving tire pressures	1	1	1
894 607 390 0 + adapter 894 600 001 2	Wiring harness	Cable set 7-pin optional 894 607 295 0 (5-pin, no trailer operation)	1	1	1
960 731 051 0	External sensor, L-Shape	for the front axle, rim 22.5", 10 holes	2	4	2
960 731 031 0	External sensor	for rear axle, rim 22.5", 10 holes	4	4	8
960 905 822 4	Weight plate	Counterweights for front axle sensor	2	4	2
960 731 802 0	PA tube	for front axle sensor, L-shape	2	4	2
960 731 822 2	PA tube	for rear axle sensor, outside	2	2	4
960 731 804 0	PA tube	for rear axle sensor, inside	2	2	4
960 731 801 0	PA tube	Super Single	2	2	4

## Example: Parts list for bus / towing vehicle (with internal sensor WIS)

WABCO PART NUMBER	COMPONENT	COMMENT	4X2	6X2	ARTICULATED BUS 6X2
446 220 100 0	ECU	Communication with trailer ECU / warning lamps	1	1	1
446 220 000 4	Support	Support for mounting the ECU	1	1	1
446 221 000 0	Display	Display of warning messages and retrieving tire pressures	1	1	1
894 607 390 0 + adapter 894 600 001 2	Wiring harness	Cable set 7-pin optional 894 607 295 0 (5-pin, no trailer operation)	1	1	1
960 732 000 0	Internal sensor	Internal sensor to be attached to a special valve set	6	8	10
960 732 100 0	Valve set	Exact design of the valve depends on the rim	6	8	10



### Circuit diagrams

- Open the WABCO INFORM online product catalogue:  
<http://inform.wabco-auto.com>
- Search the desired circuit diagram by entering the 10 digit number:
  - 841 801 970 0 (solobus)
  - 841 801 971 0 (articulated bus)
  - 841 801 972 0 (tractor/truck)

## 5.3 Configuration for trailers

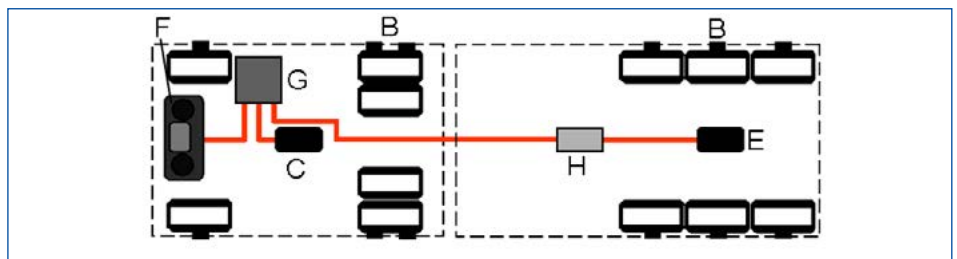
### Transmission types

To display the OptiTire™ data of the trailer in the driver's cabin, both trailer and towing vehicle must be equipped with OptiTire™ in combination with the external sensor WM2 if communication is implemented via radio link.

Alternatively, the trailer data can be displayed in the towing vehicle if it is equipped with an integrated display. When the trailer is also equipped with WABCO Trailer EBS, the data can be transferred to the towing vehicle's central computer via CAN.

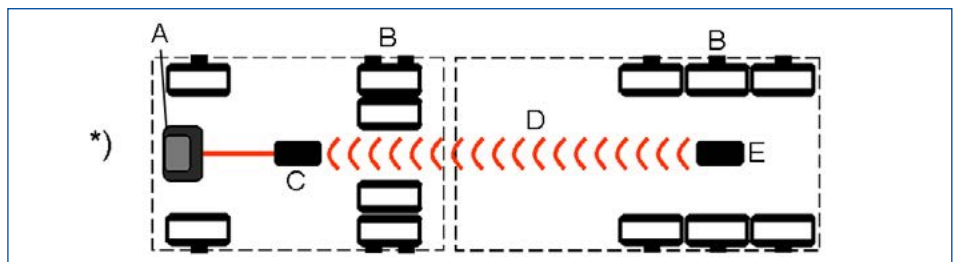
The following illustrations compare both transmission types, wireless connection and CAN bus, with each other.

#### Data transmission via a CAN bus



#### Data transmission via radio link

! The data can only be transmitted via a radio link if both the towing vehicle and the trailer are equipped with external sensors.



#### LEGEND

<b>A</b>	Display
<b>B</b>	Sensors
<b>C</b>	ECU
<b>D</b>	Wireless connection
<b>E</b>	Trailer ECU
<b>F</b>	Integrated display
<b>G</b>	Central computer
<b>H</b>	TEBS modulator
<b>*)</b>	In combination with external sensor in towing vehicle and trailer



## Stand-alone trailer towing operation

If the trailer should be independently equipped with OptiTire™, the pressure release can be carried out via telemetry or the vehicles own display. When using the OptiTire™ display, it requires a special box for splash protection or another protected installation position. The WABCO SmartBoard can be installed as an alternative.

The driver cannot receive fault messages without OptiTire™ support while the towing vehicle is in motion.

You will find further information in the TEBS E system description ▶ see section "Technical documents" on page 7.

## OptiTire™ with several trailers

Equipment of tractor/trailer combinations with more than one trailer is possible. Tractor/trailer combinations with two trailers can still be made with wireless connections; road trains need CAN bus connection with special ECUs.

Please contact your WABCO partner for more information.

## OptiTire™ with TEBS D or TEBS E

The installation in a vehicle with TEBS D or TEBS E is simple because in this case only pre-assembled cables need to be plugged in. Other systems would require open wiring that needs to be enclosed by protective housing.

You will find further information in the TEBS E or TEBS C/D system description ▶ see section "Technical documents" on page 7.

# System description

## Wiring diagrams for trailers



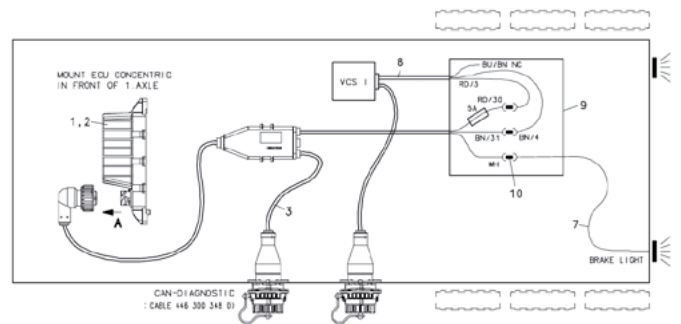
### Circuit diagrams

- Open the WABCO INFORM online product catalogue: <http://inform.wabco-auto.com>
- Search the desired circuit diagram by entering the 10 digit number.

#### Circuit diagram 841 801 943 0 "Trailer ABS VCS"

Cable position 8 (WABCO part number: 449 314 XXX 0) is opened and connected to cable position 3 (WABCO part number: 449 674 273 0) and a line to the stop light.

**Note:** If the OptiTire™ is installed instead of the IVTM system, additionally use the adapter cable with the WABCO part number: 894 600 001 2.

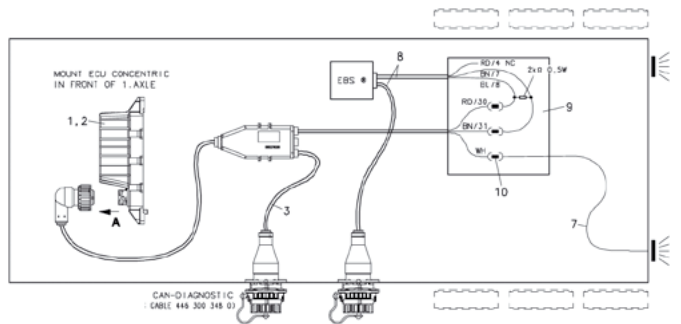


#### Circuit diagram 841 801 941 0 "Trailer EBS without CAN connection"

Cable position 8 (WABCO part number: 449 614 XXX 0) is opened and connected to cable position 3 (WABCO part number: 449 674 273 0) and a line to the stop light.

The ISS output must not be used and needs to be set to 0 km/h.

**Note:** If the OptiTire™ is installed instead of the IVTM system, additionally use the adapter cable with the WABCO part number: 894 600 001 2.

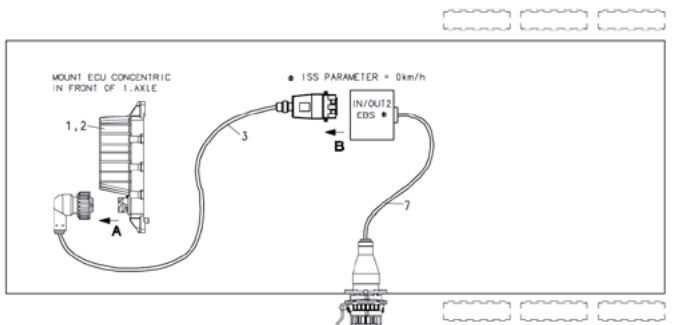


#### Circuit diagram 841 801 945 0 "Trailer EBS D with CAN"

Connection is implemented using cable position 3 (WABCO part number: 449 377 XXX 0 / 449 378 XXX 0). The ISS output must not be used and needs to be set to 0 km/h.

The OptiTire™ diagnosis is carried out using diagnostic cable 446 300 329 2 via the Trailer EBS diagnostic port.

**Note:** If the OptiTire™ is installed instead of the IVTM system, additionally use the adapter cable with the WABCO part number: 894 600 001 2.



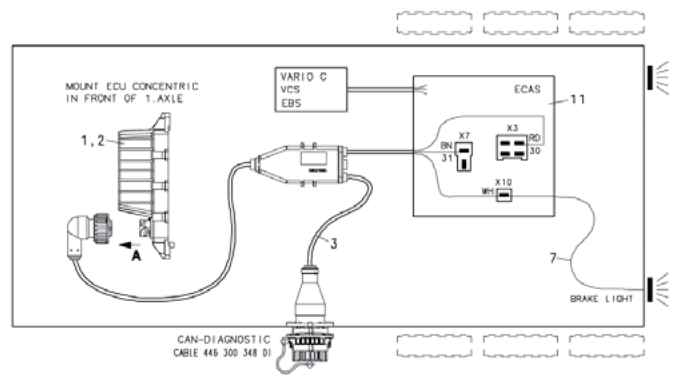
#### Circuit diagram 841 801 940 0 "Trailer ECAS"

The cable position 3 (WABCO part number: 449 674 273 0) is fed into bottom box of the ECAS-ECU and connected there.

One cable to stop light (position 7) is installed additionally.

You need screwed cable glands (PG 11: 894 130 312 2) for two cables.

**Note:** If the OptiTire™ is installed instead of the IVTM system, additionally use the adapter cable with the WABCO part number: 894 600 001 2.



# System description

## Circuit diagram 841 801 913 0 "Trailer EBS D with CAN and SmartBoard"

(from year of manufacture 2004)

The SmartBoard and OptiTire™ are connected to the Trailer EBS D modulator on port IN/OUT2.

CAN2 must be activated via the Diagnostic Software.

1 Trailer EBS D modulator (WABCO part number: 480 102 014 0)

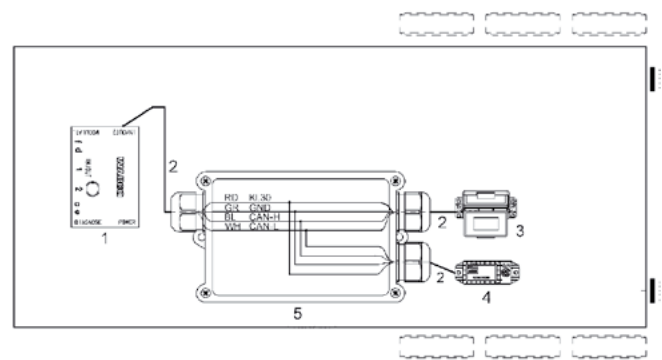
2 Cable family (WABCO part number: 449 377 XXX 0)

3 SmartBoard (WABCO part number: 446 192 110 0)

4 OptiTire™-ECU

5 Distributor housing

**Note:** If the OptiTire™ is installed instead of the IVTM system, additionally use the adapter cable with the WABCO part number: 894 600 001 2.



## Circuit diagram 841 802 066 0 "Trailer EBS E"

The circuit diagram shows different connection options with Trailer EBS E.

1 Standard TEBS E (WABCO part number: 480 102 03X 0)

2 Premium TEBS E (WABCO part number: 480 102 06X 0)

3 Multi-Voltage TEBS E (WABCO part number: 480 102 08X 0)

4 OptiTire™-ECU (WABCO part number: 446 220 110 0)

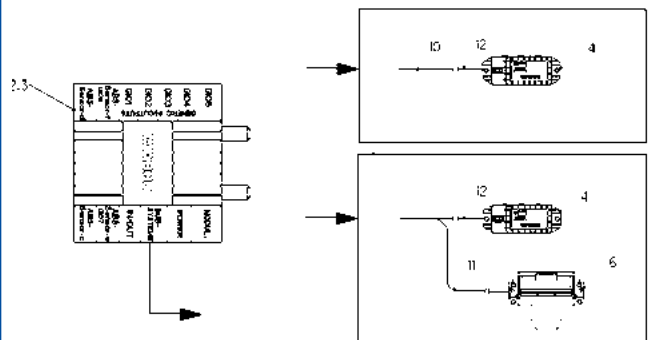
6 SmartBoard (WABCO part number: 446 192 11X 0)

10 Cables (WABCO part number: 449 913 XXX 0)

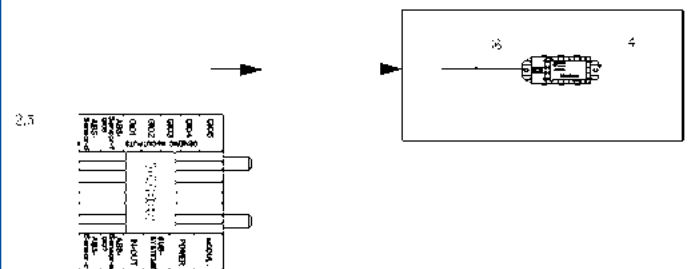
11 Cables (WABCO part number: 449 916 XXX 0)

12 Adapter cables (WABCO part number: 894 600 001 2)

16 Cables (WABCO part number: 449 627 XXX 0)



Additional GIO5 options



## 5.3.1 OptiTire™ in trailer operation

### Operating mode

The OptiTire™ system in the trailer operates self-sufficiently if supplied with power.

Tire pressures can be displayed with the SmartBoard. In addition, the tire pressure information is transmitted to the towing vehicle via the ISO 7638 CAN connection.

---

**!** Not all towing vehicles display the tire pressures transmitted via CAN in the dashboard. Please contact the manufacturer of the towing vehicle if you have any questions on this subject.

---

Alternatively the trailer's tire pressures can be transmitted to the OptiTire™ in the towing vehicle by means of a radio signal.

This wireless transmission can only occur if the external sensors are configured on both vehicles.

Apart from the display of trailer tire data in the towing vehicle, this data can also be transmitted directly to the haulage company by means of telematics. The combination of OptiTire™ with TX-TRAILERGUARD™ is of particular interest if the trailer is transported by subcontractors or rented to third parties.

### Automatic trailer recognition

The towing vehicle ECU automatically detects the combination with a trailer ECU: The stop light is enabled on towing vehicle and trailer when hitting the brake. The trailer ECU radiates a signal with this voltage pulse that is expected by the towing vehicle's ECU that instant. The towing vehicle thus clearly detects that the trailer belongs to the tractor/trailer combination and subsequently transmits trailer ECU messages to the display.

As trailers are usually not permanently powered, it is possible that due to the frequency of sensor transmission the tire pressure data for all the wheels of the trailer is not available in the display for up to 21 minutes after starting the drive – depending on the sensor used.

### 5.4 Expert's report / certificates

Expert's reports / Certificates for mounting and additional mounting of OptiTire™ are available, which significantly facilitate approval of vehicle registration papers.



#### Expert's report / certificate

- Type approval 94/9/EG CE 0123, ATEX Q 402
- Area of application ADR: ex II 2G EEx ib IIC T4
- Open the WABCO INFORM online product catalogue:  
<http://inform.wabco-auto.com>
- Search for the desired expert's report / certificate by entering the index word "OptiTire".

### 5.5 OptiTire RF declaration of conformity

#### OptiTire FCC Declaration for FCC ID: SA4-OPTITIRE and SA4-WM731:

"This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation"

#### OptiTire IC Declaration for model: IC: 6970A-OPTITIRE and 6970A-WM731

"This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device."

"Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- 1) l'appareil ne doit pas produire de brouillage;
- 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

---

**!** CAUTION TO USERS: "Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."

---

## 6 Components

This component description details the properties of basic components.



### Outline drawings

- Open the WABCO INFORM online product catalogue:  
<http://inform.wabco-auto.com>
- Search for the desired outline drawing by entering the product number of the component.

**!** OptiTire™ can be interrupted in its function if other devices or systems in the vicinity are also transmitting in the area of 433 MHz. These can be radio sets, radio remote controls (e.g. for door actuation, cranes, forklift), insufficiently shielded electrical drives with high power or other radio transmitters. When the OptiTire™ system is removed from the area of interference, the function is guaranteed again.

### 6.1 Sensors

#### General information and technical data

SENSORS (APPLIES TO INTERNAL AND EXTERNAL SENSOR)	
<b>Material</b>	Plastic (moulded and self-contained)
<b>Integrated components</b>	<ul style="list-style-type: none"> <li>■ Pressure sensor</li> <li>■ Circuit for evaluation</li> <li>■ Radio transmitter and battery</li> </ul>
<b>Radio transmission</b>	433 MHz signal
<b>Transmission intervals</b>	<ul style="list-style-type: none"> <li>■ depends on the sensor type</li> <li>■ the transmission frequency is increased when there are pressure changes.</li> </ul>
<b>Repairs</b>	not possible
<b>Warning messages</b>	with position on the vehicle
<b>Battery</b>	<ul style="list-style-type: none"> <li>■ Lithium</li> <li>■ Service life: up to 9 years</li> <li>■ around 6 months before the end of its service life the sensor transmits a warning signal that the battery is exhausted</li> </ul>

#### Sensor ID

An ID makes each sensor unique and ensures that the sensors are clearly assigned to particular wheels. The sensor will "report" to ECU using this code. This will exclude pressure signals from other vehicles to be assigned to own system. The ID is defined when the sensor is manufactured and cannot be changed.


This ID is imprinted on the sensor for start-up.

Only in the case of internal sensors can the ID also be read out wirelessly by means of the WABCO OptiTire™ Handheld Tool (WABCO part number 300 200 001 0).


! Assignment between wheel and sensor must be absolutely maintained during tire change procedure. If wheels and sensors were not properly assigned, Optitire™ could not set off the required alarm when a wheel with low pressure was incorrectly assigned to an axle.

The assignment of an ID to a wheel is determined during initial start-up of the diagnostic software on commissioning, ▶ see chapter "9 Start-up" on page 49.

## 6.1.1 The external sensor (WM2)

 <b>CAUTION</b>	<p><b>Risk due to incorrect handling</b></p> <p>Any changes of manipulation to the sensor of any type, especially attempts made to change the battery will destroy the device and may lead to injuries.</p> <p>– Do not unscrew or remove the sensor from the bracket.</p>
--------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

### Information and technical data

THE EXTERNAL SENSOR (WM2)	
	
<b>WABCO part numbers</b>	Variants of "External sensors" ▶ see page 24. Depending on rim crank, use of the normal external sensor or the so-called L-shape or T-shape version is recommended.
<b>Pressure range</b>	2 to 14 bar correspond to the nominal values of pressures from 3 to 10.5 bar
<b>Transmission interval</b>	<ul style="list-style-type: none"> <li>■ depends on the part number and availability of an acceleration sensor</li> <li>■ with constant pressure: 9 minutes (without acceleration sensor) or 18 minutes (with acceleration sensor)</li> </ul>
<b>Counter weight</b>	<ul style="list-style-type: none"> <li>■ required ▶ see page 26.</li> <li>■ with twin tires: two external sensors and no counter weight</li> </ul>
<b>Installation</b>	<ul style="list-style-type: none"> <li>■ fastening by means of standard wheel nuts on the outside of the rim</li> <li>■ connected via a PA tube to the valve.</li> </ul>
<b>Start-up</b>	with magnet ▶ see chapter "9 Start-up" on page 49
<b>Retrofit</b>	Tires do not need to be removed from the rim.


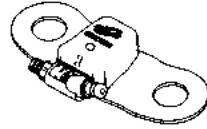
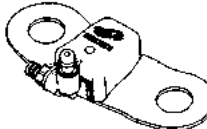


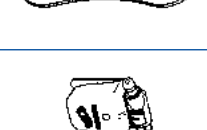
### Function

The external sensor, which is fastened to the existing wheel bolts, enables a wheel change without the need to reconfigure the system. The external sensor is also predestined for retrofitting due to the way it is installed. Please note that special external sensor and PA tube variants must be used for different rims and installation locations.

! With twin wheels and Super Single rims, problems may occur with the radio transmission due to the immersion depth. To ensure a good quality of reception, T-shaped external sensors should be used (WABCO part numbers: 960 731 031 0 or 960 731 041 0).

## "External sensors WM2" variants

The various types of external sensors are illustrated in the table:

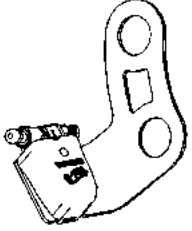

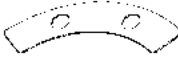

APPLICATION	WABCO PART NUMBER	HOLE, WHEEL BOLT	BOLT HOLE Ø	ANGLE	FIGURE
Trailer: Independent wheel (no Super-Single)	960 731 011 0	26 mm	335 mm	0°	
Trailer: Independent wheel (no Super-Single), 20° for special purposes (e.g. Iveco)	960 731 013 0	23 mm	335 mm	0°	
Trailer: Independent wheel (no Super-Single), 23 mm pitch circle diameter	960 731 017 0	23 mm	335 mm	0°	
Trailer: Independent wheel (no Super-Single)	960 731 021 0	32 mm	335 mm	0°	
Twin tires, Super-Single	960 731 031 0	26 mm	335 mm	70°	
Twin tires, Super-Single	960 731 041 0	32 mm	335 mm	70°	



# Components

APPLICATION	WABCO PART NUMBER	HOLE, WHEEL BOLT	BOLT HOLE Ø	ANGLE	FIGURE
Towing vehicle: Front axle, load axle	960 731 051 0	26 mm	335 mm	60°	
Towing vehicle: Front axle, load axle	960 731 053 0	32 mm	335 mm	0°	
Towing vehicle: Front axle, load axle	960 731 055 0	26 mm	335 mm	60°	
Towing vehicle: Front axle, load axle	960 731 061 0	32 mm	335 mm	33°	
Twin tires, Super-Single	960 731 073 0	26 mm	285.75 mm	70°	
Towing vehicle: Front axle, load axle	960 731 075 0	26 mm	285.75 mm	33°	




# Components

APPLICATION	WABCO PART NUMBER	HOLE, WHEEL BOLT	BOLT HOLE Ø	ANGLE	FIGURE
Twin tires, Super-Single	960 731 081 0	26 mm	225 mm	70°	
Counterweight for L-shape sensor	960 905 822 4 960 905 823 4	26 mm 32 mm	335 mm	0°	
Counterweight independent wheels	960 905 820 4 960 905 821 4	26 mm 32 mm	335 mm	0°	
Counterweight independent wheels (North America)	960 905 824 4	26 mm	285.75 mm	0°	

## Counterweight

To prevent the external sensor causing an imbalance on the wheel, a counterweight is mounted on the opposite side.

Axles with twin tires do not need a counterweight. In this case, the external sensor of one wheel serves as counterweight for the external sensor of the other wheel. The external sensors are opposite each other.

External sensor with counterweight	External sensor for twin wheels	External sensor 960 731 051 0 with counterweight 960 905 822 4
		
	(Top view onto the outer twin)	

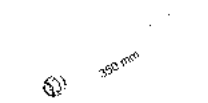

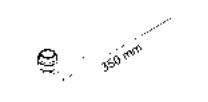

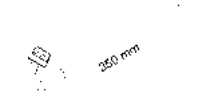
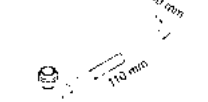


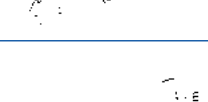

## Connecting tube

The external sensors must be permanently connected to the tires for sensing tire pressures. Use WABCO pre-assembled PA tubes for this purpose. The connection does not have to be disconnected for inflating the tires as valves for inflating the tire are located on the external sensors.

Depending on wear situation, a replacement of the PA tube is recommended after 1,000,000 km.

Various types of PA tubes are illustrated in the chart:


### "PA tube" variants

WABCO PART NUMBER	FIGURE	ORDER NUMBER	FIGURE
960 731 800 0		960 731 808 0	
960 731 801 0		960 731 810 0	
960 731 802 0		960 731 816 0	
960 731 803 0		960 731 822 0	
960 731 804 0		960 731 827 0	


- Check PA tubes frequently for damages and replace them if necessary.
- Replace defective hose connections with PA tubes. Fit a new external sensor at the same time ▶ see chapter "11.2.2 Replacing 1st generation external sensor with 2nd generation" on page 61.

Rubber hoses can be fitted in vehicles installed with OE equipment. Before replacing the hoses, observe the approvals of the manufacturer.

## 6.1.2 The internal sensor (WIS)

 <b>CAUTION</b>	<p><b>Risk due to incorrect handling</b> Any changes or manipulation to the sensor of any type, especially attempts made to change the battery will destroy the device and may damage the tire.</p> <p>– Adhere to the maximum torques and use screws with locking paint.</p>
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### Information and technical data

THE INTERNAL SENSOR (WIS)	
	
<b>WABCO part numbers</b>	960 732 000 0
<b>Pressure range</b>	0 to 13 bar correspond to the nominal values of pressures from 3 to 10.5 bar
<b>Transmission intervals</b>	every minute
<b>Counter weight</b>	Not required
<b>Installation</b>	<ul style="list-style-type: none"> <li>■ Installation on the rim by means of valve neck</li> <li>■ Fastened to a special tire inflation valve with a 6 mm hollow screw coated with locking varnish</li> <li>■ The tire valve must match the installation conditions of the original valve.</li> <li>■ In the interior the mounting surface for the valve must be aligned so that the internal sensor rests flat and level on mounting surface. This prevents large forces acting on the internal sensor and tearing it off during tire assembly/disassembly.</li> </ul>
<b>Start-up</b>	using WABCO OptiTire™ Handheld Tool (WABCO part number 300 200 001 0)

### Purpose and function

In addition to monitoring the tire pressure, the internal sensor also enables an indication of the tire temperature.

---

**!** Make sure you use suitable tire inflation valves during installation.

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# Components

## Valve sets

The following valve sets (consisting of valve, nut and locking screw) are available.

APPLICATION	WABCO PART NUMBER	SURFACE	OUTER CONTOUR
Standard steel rims 17 to 22.5"	960 732 100 0	Brass	ETRTO V0.07.3
Standard steel rims 17...22.5", tighter rim crank	960 732 101 0	Nickel	ETRTO V3.22.1
Standard steel rims 17 to 22.5", additional 5° inclined section	960 732 102 0	Nickel	ETRTO V3.22.1

## "Rim" overview

Valve sets are available for the following rims. This overview is for example only.

RIM SIZE	MATERIAL	SUPPLIER	RIM NO.	VALVE SET
22.50 x 09.00	Steel	Gianetti	15941	960 732 100 0
22.50 x 09.00	Steel	Gianetti	16088	960 732 100 0
22.50 x 08.25	Steel	Gianetti	16094	960 732 100 0
22.50 x 07.50	Steel	Hayes Lemmerz	2920499	960 732 100 0
22.50 x 07.50	Steel	Hayes Lemmerz	2920699	960 732 100 0
22.50 x 08.25	Steel	Kronprinz	15098	960 732 100 0
22.50 x 08.25	Steel	Mefro	15098	960 732 100 0
17.50 x 06.00	Steel	Kronprinz	35038	960 732 101 0
17.50 x 06.00	Steel	Mefro	35038	960 732 101 0
17.50 x 06.00	Steel	Kronprinz	803 WA	960 732 101 0
17.50 x 06.00	Steel	Südrad	803 WA	960 732 101 0
22.50 x 08.25	Steel	Kronprinz	850 RA	960 732 100 0
22.50 x 08.25	Steel	Südrad	850 RA	960 732 100 0
22.50 x 09.00	Steel	Mefro	15099	960 732 100 0
22.50 x 11.75	Steel	Mefro	15084	960 732 100 0
22.50 x 11.75	Steel	Südrad	15084	960 732 100 0
22.50 x 11.75	Steel	Kronprinz	15084	960 732 100 0
22.50 x 11.75	Steel	Mefro	15083	960 732 100 0
22.50 x 11.75	Steel	Kronprinz	15083	960 732 100 0
22.50 x 11.75	Steel	Mefro	15095	960 732 100 0
22.50 x 11.75	Steel	Südrad	15095	960 732 100 0
17.50 x 06.75	Steel	Südrad	805 YA	960 732 101 0
17.50 x 06.75	Steel	Kronprinz	805 YA	960 732 101 0
22.50 x 11.75	Steel	Südrad	857 BB	960 732 100 0
22.50 x 11.75	Steel	Kronprinz	857 BB	960 732 100 0
22.50 x 11.75	Steel	Gianetti	16103	960 732 102 0
22.50 x 11.75	Steel	Gianetti	15815	960 732 102 0
22.50 x 11.75	Steel	Gianetti	15645	960 732 102 0
22.50 x 11.75	Steel	Hayes Lemmerz	2920751 073 85	960 732 102 0
22.50 x 09.00	Steel	Kronprinz	852 XA	960 732 102 0

## 6.2 ECU – The electronic control unit

### Purpose and function

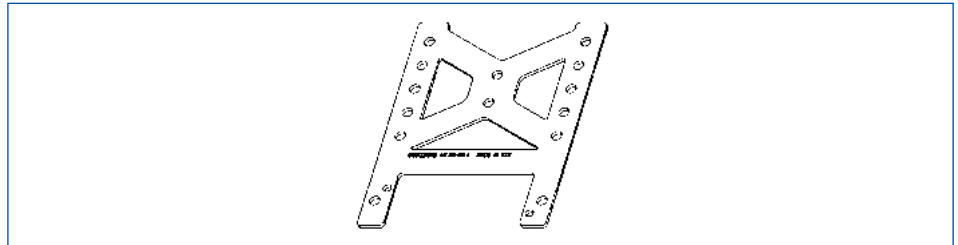
The ECU receives the sensor signals and immediately recognises all changes from programmed nominal tire pressure values by combined comparison with threshold pressure values and pressure changes.

Incorrect values of tire pressures are already displayed before departure (if ECU is permanently powered).

Faults occurring during operation are stored in the electronic unit for diagnostic purposes.

The ECU is mounted to chassis in central part of vehicle, so that perfect radio contact with all sensors and between trailer ECU and towing vehicle ECU is ensured. You should use special brackets for good radio contact.

#### Fixing bracket (WABCO part number: 446 220 000 4)



Radio contact is provided by antenna integrated in the control unit housing that guarantees interference-free pressure signal reception from all sensors.

### Information and technical data

ECU – THE ELECTRONIC CONTROL UNIT	
<b>WABCO part numbers</b>	<ul style="list-style-type: none"> <li>■ 446 220 100 0: Towing vehicle and bus</li> <li>■ 446 220 110 0: Trailer and trailer train (can be cascaded up to 5 times with 22 sensors respectively, must be parameterised by diagnosis)</li> </ul> <p>ECUs essentially differ by radio communication signal structure and CAN bus (ID) connection. External distinguishing mark by type label only.</p> <p>Further ECU types are tailored to specific customer requests and have other pin assignments.</p>
<b>Supply voltage</b>	12 or 24 volts
<b>Assembly</b>	central position on the vehicle chassis

## 6.3 WABCO Display

### Purpose and function

The display is used for indication and retrieval of all pressure and leakage information and for checking all necessary information on the OptiTire™ system. It operates in combination with the OptiTire™ ECU (WABCO part number: 446 220 100 0).

It is connected to ECU via CAN bus.

All tire pressures can be queried by pressing a button ▶ see chapter "10.3 Retrieving pressure values" on page 55. Manual checks of the tire pressure are superfluous. Faulty tire pressures should be corrected directly via tire inflation valve.

Since warnings are also signalled acoustically, the display does not need to be installed within driver's direct field of vision. Optical warnings are indicated by integrated lights:

- red (stop immediately)
- yellow (drive slowly)

### Information and technical data

WABCO DISPLAY	
	
<b>WABCO part numbers</b>	446 221 000 0 (standard version) 446 221 100 0 (special variant for straddle carrier)
<b>Supply voltage</b>	12 or 24 volts
<b>Display</b>	up to 16 tires
<b>Operation</b>	▶ see chapter "10 Operation" on page 53

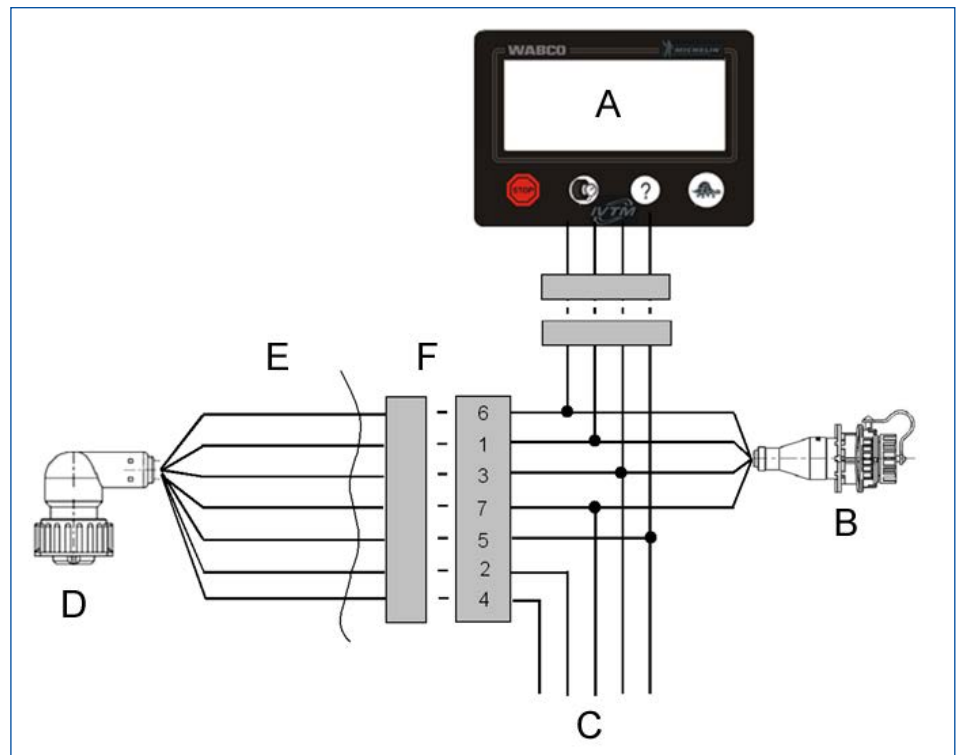
## 6.4 Connecting cables

For towing vehicle / bus OptiTire™ is connected to the vehicle wiring in two sections:

- The first section comprises the connection of the ECU to the distribution element in the vicinity of the driver's workplace. This section is splash-proof allowing external installation on vehicle. The OptiTire™ cables are connected via the adapter cable (WABCO part number: 894 600 001 2).
- The second section is a cable set designed exclusively for the interior. Here there is a split connection from the coupling of the first cable to the WABCO display, to the diagnostic port and a connection to the vehicle wiring terminals using free cable ends.

Basic wiring principle for towing vehicle / bus is displayed in the following illustration:

### Wiring of towing vehicle



#### LEGEND

<b>A</b>	Display
<b>B</b>	Diagnosis
<b>C</b>	Vehicle electrical system
<b>D</b>	ECU (via adapter cable with WABCO part number: 894 600 001 2)
<b>E</b>	external
<b>F</b>	internal



## Cable set assignment

PIN NO.	CONNECTOR PIN ASSIGNMENT	CABLE COLOUR 5-PIN	CABLE COLOUR 7-PIN
2	CAN High		
1	CAN Low		
8	GND	blue	blue
7	+24 V or 12 V	red	red
6	Ignition	yellow & grey	grey
4	Stop light / warning lamp 2		yellow
3	Warning lamp 1		green

! Connection to +12 V/24 V and ignition must be fused with 5 ampere fuses. Since OptiTire™ has a low current consumption an existing fused circuit can normally be integrated as well.

### Cable set "Towing vehicle 7-pin" 894 607 390 0

The 7-pin wiring is provided in accordance with the cable set (WABCO part number: 894 607 390 0) ▶ see figure "Towing vehicle wiring".

Pin assignment on the connecting plugs corresponds to the 5-pin variant.

In addition, either a connection to the stop light (for synchronising with the trailer ECU) or connection of one or two warning lamps is possible.

### Cable set "Towing vehicle 5-pin" 894 607 295 0

A simpler wiring (WABCO part number: 894 607 295 0) is provided as a 5-pin variant for retrofitting in buses.

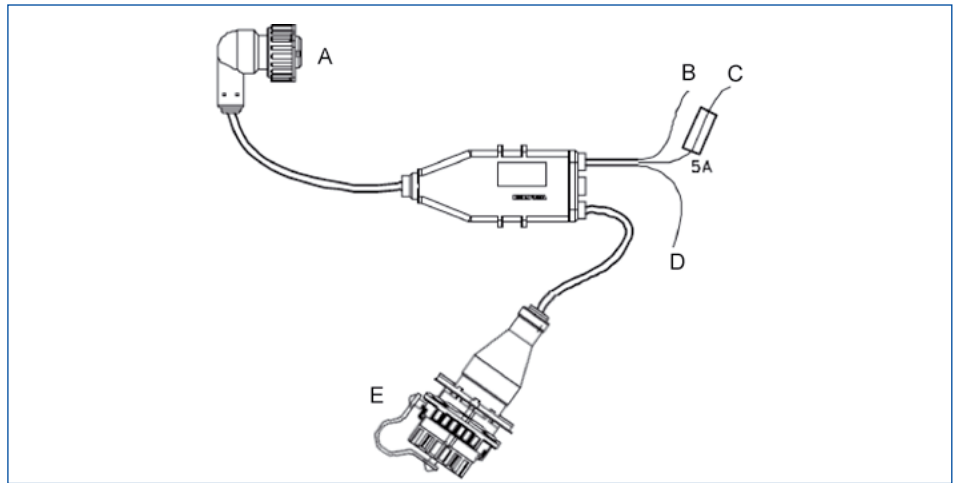
Employment of this wiring allows driving of warning lights inside display or via CAN respectively but not separate warning lights on dashboard.

### Cable set "Trailer"

Information about the different interconnections with CAN-enabled systems (with Trailer EBS) ▶ see chapter 5.2 "Configuration for bus and towing vehicle", page 14 and ▶ see chapter 5.3 "Configuration for trailers", page 16.

If only the radio link is to transmit data to the towing vehicle, the cable (WABCO part number: 449 674 XXX 0) is used ▶ see figure "Trailer wiring".

## Trailer wiring



### LEGEND

<b>A</b>	ECU (via adapter cable with WABCO part number: 894 600 001 2)
<b>B</b>	Brown: Ground
<b>C</b>	Red: +12 V/24 V
<b>D</b>	White: Stop light
<b>E</b>	Diagnosis

## 7 Installation

In this chapter you will learn how the OptiTire™ is installed in your vehicle. Observe all safety instructions when carrying out assembly work on the vehicle.



### WABCO Bridge configurator

- Open the myWABCO website:  
<http://am.wabco-auto.com/welcome/>

Help on logging in can be obtained by pressing the *Step-by-step instructions* button.

After the successful registration you can use the online configurator WABCO Bridge via myWABCO to carry out your own configuration of the OptiTire™ system.

Please contact your WABCO partner if you have any questions.

### 7.1 Safety information

- Observe the occupational health and safety regulations of the respective country, the workshop as well as the vehicle manufacturer's instructions.

#### Risk of accident due to loose wheel nuts

Loose wheel nuts may lead to accidents when driving on roads.

- Wheel nuts must be tightened with torque specified by vehicle manufacturer.
- Check the tightness of the wheel nuts after 500 km.

#### Risk of accident due to unsecured vehicle

Vehicles not secured may roll away during the assembly. This might lead to severe injuries or even death.

- Secure the vehicle against rolling away before carrying out work on the vehicle.

#### Danger to health due to dust

Dusts that are dangerous to health are generated when the rim is cleaned using compressed air.

- Do not clean the rims using compressed air.

## 7.2 Assembly of the external sensors WM2

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**!** The vehicle does not need to be jacked up when only four wheel nuts are removed.

---

### Preparing assembly

- Please read the chapters ▶ see chapter "6.1.1 The external sensor (WM2)" on page 23 and ▶ see chapter 4.5 "Connecting tubes", page 24.
- If necessary, also remove the rim protecting ring.



### Assembly of the external sensor

- Loosen and remove two wheel nuts positioned next to each other near the valve.
- Check if the position of the external sensor is suitable for connecting to the PA tube and the valve.

The PA tube should be guided to the tire valve without stretching, deformation or twisting.

- Position the external sensor on the wheel bolts.
- Screw the wheel nuts back on.
- Remove the white protective cap from the pressure connection.

### Assembly of the counterweight

- Loosen the wheel nuts that are exactly opposite of the external sensor (trailer). If the counterweight has 3 holes, loosen another nut clockwise to the left (front axle, load axle ▶ see section "Counterweight" on page 26).
- Position the counterweight on the wheel bolts.
- Screw the wheel nuts back on.

## Assembly of the PA tube

### CAUTION

#### Increased wear due to incorrect installation

With tubes that rest on the edge of enclosures, there is an increased wear due to vibrations. This might lead to leakages.

- *PA tubes need to be installed such that they neither exercise tensile or compressive stress on connections nor rest on the rim.*
- *Avoid excess lengths to prevent undesired vibrations.*
- *Avoid moisture in the PA tube or at the pressure port of the external sensor.*

- Hold the PA tube with the connection to the tire valve.
- Hold the other end of the PA tube to the external sensor.
- Mark the position on the tube where the PA tube sits flush with the edge of the external sensor (e.g. using adhesive tape).
- Cut the PA tube (WABCO part number: 960 731 800 0 bis 960 731 802 0) to the required length if necessary.  
Also consider that the PA tube disappears to 20 mm in the connection. For this purpose, the PA tube should be cut 20 mm behind the marking.  
Use a suitable right-angled cutting tool, such as those that are also used for shortening plastic brake lines.

**Tube cutting tool for  
ø 4 to ø 12**



**Tube cutting tool for  
ø 4 to ø 22**



- Mount the connecting tube to external sensor by inserting the end of the PA tube into the external sensor opening.
  - ⇒ After pressing with force, the PA tube is locked in position and can then only be removed again after unscrewing the brass screw connection (WABCO part number: 893 770 005 2).
- Using the marking, check if the PA tube has been pushed in up to the stop.
- Pull on the PA tube to check if the PA tube has been inserted with a tight connection (approx. 20 N).
- Connect the PA tube to the tire valve.
- Tighten union nuts on the tire valve hand tight.

- Check that the connection is tight using a leakage indicating spray.



## Getting external sensor ready for operation

- Tighten the wheel nuts crosswise again according to the vehicle manufacturer's specifications.
- Re-tighten the rim protective ring if necessary.

! Correct assignment of external sensor ID vs. connected wheel is essential for subsequent start-up.

- Note position of installed external sensors on a sheet of paper.
- Affix stickers with external sensor ID next to the respective wheel module.
- Adjust tires to correct operating pressure according to the vehicle manufacturer's instructions.
- Note pertinent nominal pressure values per axle for later nominal pressure parameterisation through diagnosis.

! Avoid standing water in the filling tool when filling.

- Check wheel nuts for tightness after 500 km.

### **WARNING**

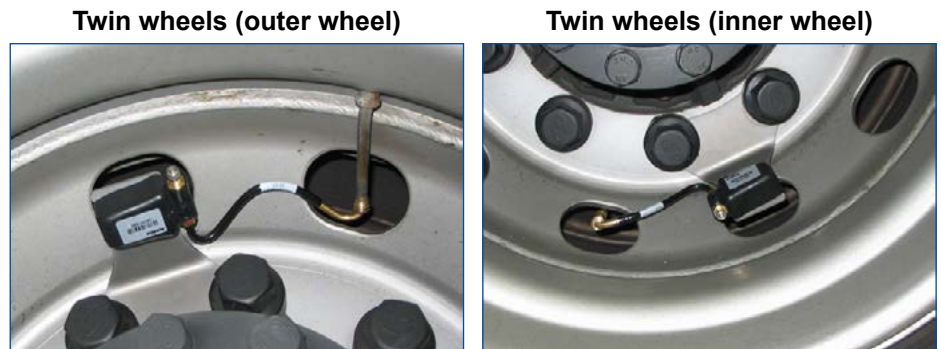
#### **Risk of accidents due to loosening the fastening screws of the external sensor**

The safe fixing of the wheel module is only possible when the external sensor housing has a tight fit to the bracket.

- *Never loosen the fastening screws fixing the sensor housing on the bracket.*

## Valve extension

! Do not use plastic valve extensions. These will not remain tight under permanently existing pressure.



## 7.3 Assembly of the internal sensor

### Safety information

- Always observe the applicable hazard warnings and correct procedures on the assembly machine. This information has priority over these instructions.
- Replace the internal sensor if the pressure opening is blocked with foreign bodies.
- Make sure that the screw can retain the internal sensor permanently with 4 Nm.
- In the case of screws with locking varnish, always use new screws with every assembly.
- Never re-tighten self-locking screws and union nuts.
- Use self-locking fastening screws only once.
- Use the valve that matches the rim. Select the correct valve using an assignment table
  - ▶ see chapter "6.1.2 The internal sensor (WIS)" on page 28.
- Do not apply compressed air, assembly paste, detergents or other cleaners to the internal sensor.
- Never clean the rim with high pressure when the tires are removed and the internal sensor still installed.
- Remove contaminations only with a clean, lint-free cloth.
- Renew the internal sensor if you have identified the following:
  - The housing is visibly damaged.
  - Foreign bodies can be seen in the pressure opening.
  - The battery of the internal sensor has reached the end of its life.

### Preparing assembly

- Read the following chapter ▶ see chapter "6.1.2 The internal sensor (WIS)" on page 28.

- Jack up the vehicle at the corresponding wheel positions.
- Remove the wheel.
- Use a suitable assembly device to remove the tire.  
It is sufficient to pull the tire over the rim on one side; free access to the drop-centre and valve is all that is required.
- Remove the original tire inflation valve.

## Assembly of the internal sensor

- Fit the suitable tire inflation valve (figure 1).  
Observe the tightening torque specified for the rim and correct alignment of the valve.

**Figure 1**



- After the valve is fitted, the internal sensor is placed on the valve head on the rim's inside (figure 2) and fastened with the screw (figure 3). The following must be observed during this procedure:
  - The internal sensor must be aligned parallel to the rim (figures 4 & 5).
  - The sensor must make contact over the entire contact area of the valve; in addition it must be supported at two other points on the rim (3-point assembly) (figures 6 & 7).
  - The tightening torque is  $4 \pm 0.5$  Nm (figures 8 & 9). Always use a torque wrench for the exact torque!

**Figure 2**



**Figure 3**





**Figure 4**

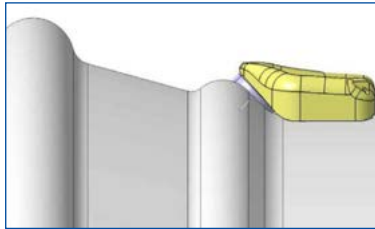


**Figure 5**



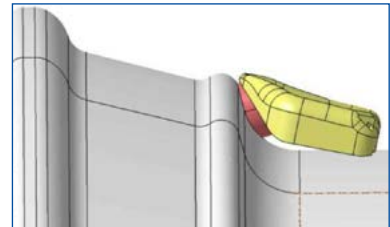
**Figure 6**

In the case of steel rims the internal sensor sits flat on the rim.



**Figure 7**

In the case of aluminium rims only the rear section of the wheel electronics sits on the rim.



**Figure 8**



**Figure 9**



## Assembly of the tire

- Fit the wheel onto the assembly machine that the assembly head is on the opposite side of the valve, i.e. offset by 180° (figure 10).

**Figure 10**



## CAUTION

### Damage to the internal sensor

The internal sensor can be damaged by the penetration of fluids.

- *Make sure that the internal sensor does not come into contact with fluids (e.g. assembly fluid).*

- Apply assembly fluid to the tire bead and rim flange.
- Now push the bead to be fitted onto the rim over the rim flange.

! During assembly the tire bead must not be pressed against the wheel electronics. Otherwise there is a risk of the internal sensor coming off at the fastening point.

- Then pull the second tire bead onto the rim.

! During this procedure the bead must never be pressed onto the internal sensor or pulled over it.

During assembly the assembly head must have a minimum distance of 20 cm to the internal sensor (figure 11). The remaining part of the bead can be pressed over the rim flange in the normal way (figure 12).

Figure 11

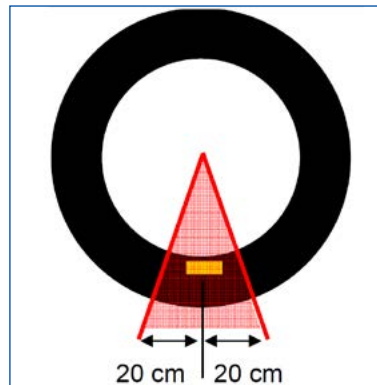


Figure 12



- Then remove the complete wheel from the assembly machine and inflate it as usual.  
If a filling bell is used, the tire must not exert any pressure on the internal sensor housing or get stuck on the housing.

## Assembly of the wheel

- Fit the complete wheel to the vehicle. When doing this, apply the tightening torques specified by the vehicle manufacturer.

## 7.4 Mounting the ECU in bus / towing vehicle

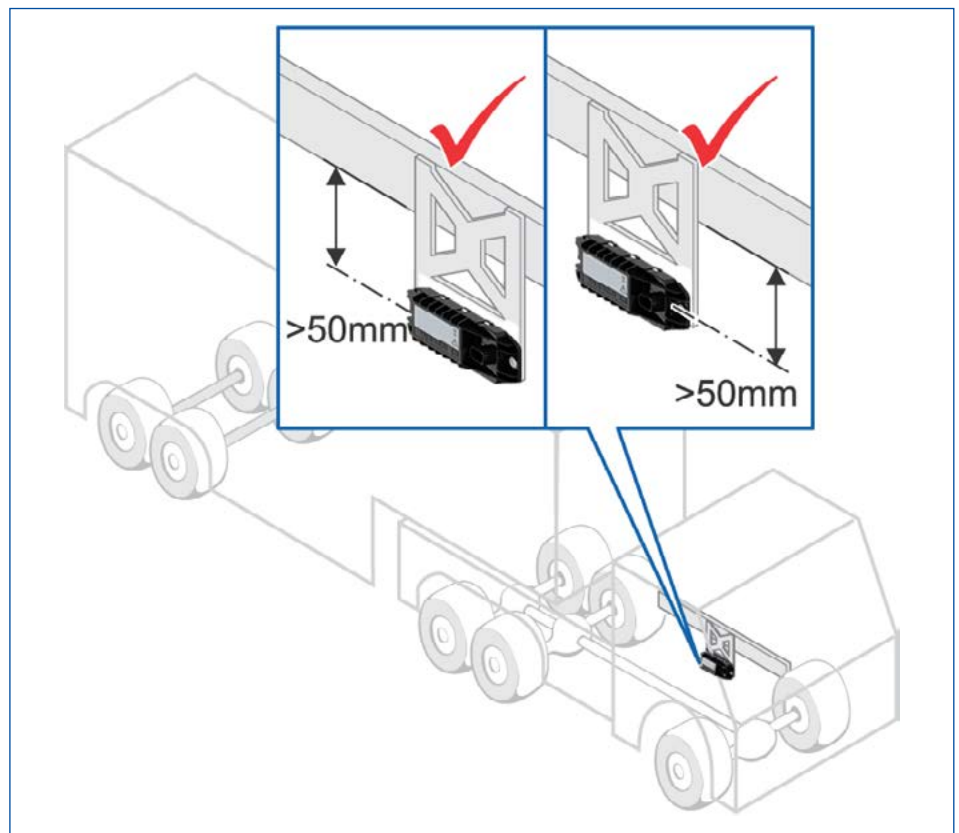
### ECU position on vehicle

#### Towing vehicle

The ECU plug must point to side (to the right or left) but not up or down.

- Choose the fitting position in accordance with the figure "Assembly on the longitudinal beam".
- If the vehicle is equipped with a low lying coupling for central axle trailer, install the ECU on the right side of the vehicle so that the wireless connection to the trailer is not shielded off by the coupling.

#### Assembly on the longitudinal beam



#### Bus

The ECU plug must point upwards.

- Use threaded rods for hanging assembly at the roof frame in the cabin.
- For solobus: Position the ECU at the centre of the vehicle.
- For articulated bus: Position the ECU in front of the articulation in driving direction.

Further possible installation positions are:

- in the roof cove opposite the entrances (if the cover is made of plastic)
- in the roof lining
- with articulated buses, in the rear area of the front section (at the geometric centre of all axles)
- with coaches, also to the luggage compartment ceiling (if the luggage compartment components are at least in part of wood or plastic)

## Mounting the ECU

- Read the chapter
  - ▶ see chapter 6.2 "ECU – The electronic control unit", page 30.
- Mount ECU so that the distance to the sensors is as equal as can be. Select distance to truck driver's cab such that length of ECU cable (8 m) is sufficient to reach driver's cab.  
In the towing vehicle there is an ideal installation position between the front and rear axles underneath the frame.  
For good radio contact, the ECU should not be shielded off by metal walls in its direct vicinity, e.g. by a U-section.
- For the towing vehicle use the bracket (WABCO part number 446 220 000 4). Screw the bracket to the vehicle.  
Welding could impair the stability of the frame.
- Tighten ECU to bracket using torque of  $15 \pm 1.5$  Nm.

## 7.5 Wiring in towing vehicle/bus

Proceed as follows to install the wires of the OptiTire™ system into the bus or the towing vehicle:

- Read the following chapter
  - ▶ see chapter 6.4 "Connecting cables", page 32.
- Select the suitable circuit diagram ▶ see chapter 5.2 "Configuration for bus and towing vehicle", page 14.
- Attach display to the included support at a suitable attachment location. The display must not necessarily be located inside driver's direct field of vision.
- Fit the diagnostic socket to a suitable attachment location and label it with "Diagnostic OptiTire™".  
Locations where diagnostic ports are already located would be specially suitable as the attachment location.
- Install cables according to the wiring diagram using cable ties in parallel with already existing wiring harnesses.
- Form large loops from ample lengths.
- Turn off the ignition.
- In the fuse box, search for appropriate fused circuits or connect 5 A "flying" fuses to terminal 15 (ignition) and 30 (U Batt).
- Designate the flying fuses with "OptiTire™".
- Connect the cable set with the fuses.
- Connect the ground line to the ground contact.
- Connect display and ECU.

## 7.6 Mounting the ECU in the trailer

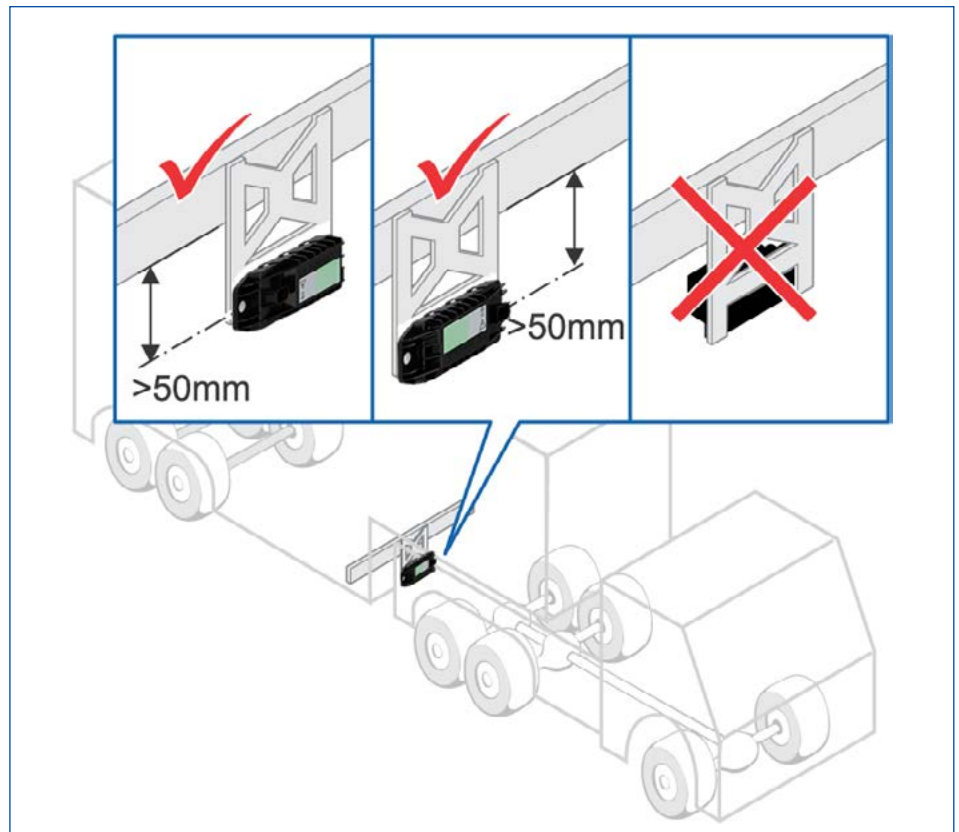
- Read the following chapter ▶ see chapter 6.2 "ECU – The electronic control unit", page 30.
- Determine the best possible installation position, depending on the trailer type:
  - Drawbar trailer:  
Install the ECU between the first axle and the middle of the trailer.
  - Semitrailer:  
Mount the ECU at the cross member in the front area so that it points towards the towing vehicle.
  - Central axle trailer:  
Install the ECU in front of the first axle on the right-hand side of the vehicle.

! For the towing vehicle use the bracket (WABCO part number: 446 220 000 4).

■ Screw on bracket to vehicle. Welding could impair frame stability.

- Attach the ECU at the bottom of the frame.  
ECU longitudinal axis must be in parallel with the vehicle axis.  
For good radio contact, the ECU must not be shielded off by metal walls in its direct vicinity.

### Semitrailer: Assembly at cross member



- Tighten ECU to bracket using torque of  $15 \pm 1.5$  Nm.

## 7.7 Wiring in trailer

Proceed as follows to install the wires of the OptiTire™ in the trailer:

- Read the following chapter
  - ▶ see chapter 6.4 "Connecting cables", page 32.
- Select the suitable circuit diagram ▶ see chapter 5.3 "Configuration for trailers", page 16.
- Fit the diagnostic socket to a suitable attachment location and label it with "Diagnostic OptiTire™".  
Locations where diagnostic ports are already located would be specially suitable as the attachment location.
- Make the trailer currentless.

---

**!** Consider any risks of short circuits through batteries inside the vehicle.

---

- Install cables according to the wiring diagram using cable ties in parallel with already existing wiring harnesses.  
Form large loops from ample lengths.
- Connect OptiTire™ wiring to existing wiring.
- Connect the ECU.

# 8 Requirements for start-up

## 8.1 Training

Entering a PIN is required for setting the parameters.

Having participated in a course of E-Learning, you can request a PIN for the Diagnostic Software from us. You can then use this personal identification number to enable further functions in the software that allow you to modify the settings in electronic control units.



### WABCO University – Registration for a training course / eLearning

- Open the myWABCO website:  
<http://am.wabco-auto.com/welcome/>

Help on logging in can be obtained by pressing the *Step-by-step instructions* button.

Once you have successfully registered and logged in you can book training courses and work through E-Learnings via myWABCO.

Please contact your WABCO partner if you have any questions.

## 8.2 Diagnostic Software

With the Diagnostic Software you have the following options:

- Retrieving the diagnostic memory data
- Retrieving current measured values
- Parameter setting
- Display of measures to remedy faults (if faults are indicated).

! The ECU settings can only be changed by trained workshop staff in the protected program area.



### Downloading the Diagnostic Software

- Open the myWABCO website:  
<http://am.wabco-auto.com/welcome/>

Help on logging in can be obtained by pressing the *Step-by-step instructions* button.

After successfully logging in you can download the desired Diagnostic Software (available in various languages).

Please contact your WABCO partner if you have any questions.

# Requirements for start-up

## 8.3 Diagnosis hardware

### Diagnostic components for towing vehicle

The OptiTire™ diagnostic cable (WABCO part number 446 300 348 0) is used for diagnosis on towing vehicles.

### Diagnostic components for trailer vehicles

When carrying out diagnosis on trailers, please extract the WABCO part number of the required diagnostic components from the chart:

SYSTEM IN TRAILER VEHICLES	PREREQUISITES	DIAGNOSIS HARDWARE	
VCS ECAS TEBS before 2004	depends on system	Diagnostic cable 446 300 329 2 	
TEBS since 2004 VCS II	ISO 7638 breakout box with CAN socket 446 300 360 0 	Diagnostic Interface (DI-2) with USB port (for connection to a PC) 446 301 030 0 	CAN diagnostic cable 446 300 361 0 (5 m) 
TEBS E Premium	External diagnostic socket with yellow cap 449 611 XXX 0 	Diagnostic Interface (DI-2) with USB port (for connection to a PC) 446 301 030 0 	CAN diagnostic cable 446 300 348 0 

## 8.4 Installing the Diagnostic Software

Proceed as follows to put the diagnostic software of the OptiTire™ into operation:

- Make sure that the OptiTire™ system is installed in accordance with the instructions ▶ see chapter 7 "Installation", page 35.
- Connect the computer to the vehicle using the diagnostic cable and Diagnostic Interface.



## 9 Start-up

### 9.1 Starting the Diagnostic Software

- Start the Diagnostic Software.
- Switch on ignition. Ensure power supply of trailer if necessary.
- Chose whether a guided selection should take place or the Diagnostic Software should automatically search for connected ECUs.

### 9.2 Parameter setting

#### 9.2.1 Reading in a parameter set



- This button can be used to read in a parameter set directly.

#### 9.2.2 Selection/entry of parameter data



- Click the accompanying button if you wish to enter the parameters yourself.

⇒ The *Parameters* window is opened.

- Select whether the *Module reception* should be displayed or an *Assignment test* should be carried out.

##### "Vehicle configuration" tab

- Enter the respective vehicle type and vehicle data.
- Select the vehicle configuration to use under *System configuration*. If the vehicle is not included under the standard system configurations, a spare tire is used with the internal sensor, select the free *System configuration*.
- Define the type and position of the axles for this free configuration.
- Select the *Sensor type: Internal sensor (WIS)* or *External sensor (WM2)*.

##### "Module configuration" tab

- Enter IDs of the sensors and tire pressure values (according to vehicle manufacturer) in list of axes and wheels.

The following options are available for entering the IDs:

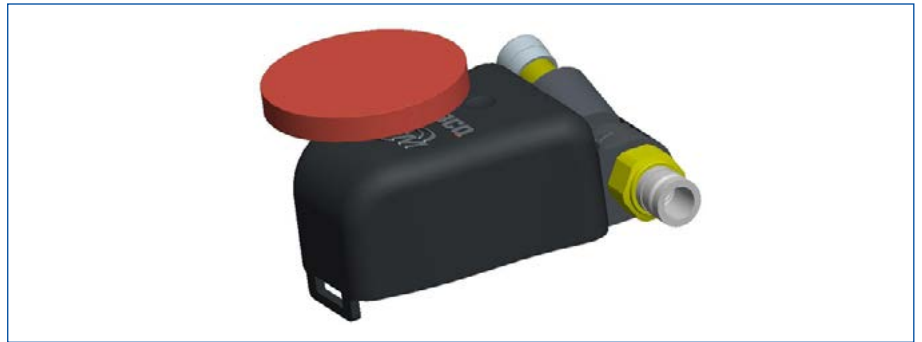
- First option: Manual entry of the IDs
  - Enter the number code on the barcode directly at the corresponding wheel position.
- Second option: Barcode scanner
  - If you have stuck the barcode label onto a sheet of paper in accordance with the vehicle configuration, you can scan in the values directly using a barcode scanner.

## ■ Third option: Sensor assignment and stimulation

The modules can be assigned by means of a free or sequential assignment. For this purpose a diagnostic message is stimulated for the selected sensors and the corresponding ID is inserted automatically at the selected position:

- Under *Module assignment*, click the *Execute* button.
- Select *Sequential* (complete installation of a vehicle) or *Free module selection* (replacement of a wheel or sensor).
- Stimulating the external sensors:  
For this purpose, touch the housing of each wheel module below the sticker "OptiTire™" for 5 seconds using a magnet (2 kg retention force) or using a bar magnet parallel to the OptiTire™ logo.

### External sensor with magnet for stimulating the external sensors



- Stimulating the internal sensors:  
Hold the WABCO OptiTire™ Handheld Tool (WABCO part number: 300 200 001 0) near the internal sensor, either from the tire flank side or from the tread.  
The adjacent wheel may interfere with the radio signal, in which case the respective wheel must be turned.

### WABCO OptiTire™ Handheld Tool for stimulating the internal sensors



### "Warning lamp configuration" tab

- Configure any warning lamps.  
For a towing vehicle ECU, only one external warning lamp can be configured.  
For a trailer ECU, two external warning lamps can currently be configured.

## 9.2.3 Country-specific adjustments

- Carry out country-specific adjustments, e.g. indication of bar or PSI, use of USA radio protocol (FCC), resolution of the tire message.

## 9.2.4 Expert parameters

---

! As the last parameter setting define the parameters in the *Expert parameters* window.

---

Expert parameters are available for special applications:

- In the *Parameter* under the module configuration tab activate the *Display expert parameters* function for this purpose.
  - ⇒ The *Expert parameters* window appears.

You have the following options:

- **Temperature warning:**  
If internal sensors are used, a warning message can be given out when the defined temperature value is exceeded. 100 °C is defined as default here (maximum value: 120 °C).
- **Tire status messages:**  
Here the transmission of trailer data in the towing vehicle and the transmission of the vehicle configuration can be deactivated. The latter can be useful for telemetry configurations.  
With external sensors, the temperature transmission can be deactivated.
- **Tire pressure limit values:**  
Here the nominal pressure values that can be defined in the module configuration can be restricted.
- **Lifting axle positions:**  
To prevent the monitoring of non-moving wheels (which, in the worst case, can result in a sensor not being received) with lifting axles, the corresponding axles can be selected here.
- **CAN configuration:**  
Here the CAN bus baud rate can be adjusted.

---

! After the data is written to the ECU, diagnosis needs to be re-established.

---

- **CAN termination:**  
For an integration in an existing CAN bus or a trailer train configuration it may be necessary to deactivate the CAN termination, which is activated by default.  
In addition, you can define whether the CAN termination should remain activated in sleep and listen mode.

---

! Increased power consumption with ignition off if the CAN termination is activated with sleep and listen mode.

---

- **Reset and leakage parameter:**  
If activated, another page displays the parameters for resetting the leakage algorithm are displayed.
- **DM1 message:**  
These parameters define the conditions for sending DM1 messages and whether they should be empty or filled in fault-free state.

## 9.3 Finalising start-up

- Delete content of diagnostic memory (start window: *Messages => Diagnostic memory*).
- Check if data has been received from all sensors (start window: *Measured values => Module reception*).



- Print out the start-up protocol by clicking the accompanying button (*Start-up window*).



- Print the vehicle label onto self-adhesive aluminium foil (WABCO part number: 899 200 922 4) (*Start-up window*).
- Attach the vehicle label to the vehicle where it is protected and legible.
- Exit the start-up procedure in the diagnostic software.
- Check operation on display and data exchange with towing vehicle respectively.

## 10 Operation

In this chapter, the handling of the OptiTire™ system is described by means of the WABCO display.

Additionally installed warning lamps indicate the same warning as the display if parameterised accordingly.

! Please refer to manufacturer's operating instructions when operating by means of an integrated display.

### 10.1 Warning signals

The colour of the signal lamp and the type of audio signal indicate the severity of the fault:

- Red warning lamp / STOP symbol on the WABCO Display and acoustic warnings at one minute intervals:  
Critical fault The vehicle must be stopped immediately (potential risk to persons and vehicle).
- Yellow warning lamp / turtle symbol on the WABCO Display and acoustic warnings at ten minute intervals:  
Minor fault: The vehicle speed should be reduced and the tire pressure corrected at the next opportunity.

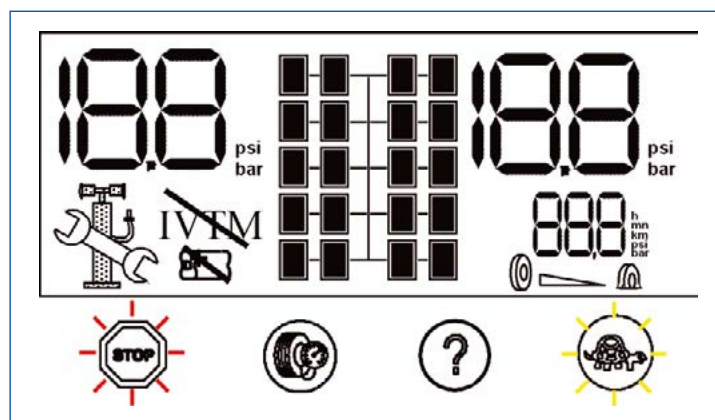
The faults identified by OptiTire™ are stored in the ECU for diagnostic purposes.

### 10.2 Switching on the ignition

After ignition is switched on, the OptiTire™ system performs an internal check procedure where all internal functions are tested for correct function.

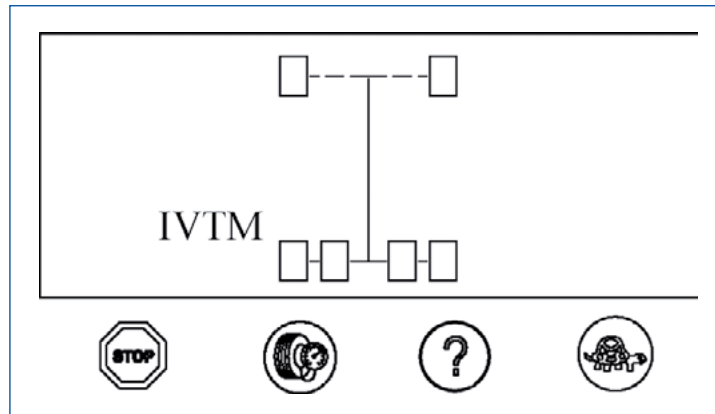
All symbols are displayed for one second, all pilot lights and audio signals are enabled. This procedure is repeated twice.

#### Initialisation



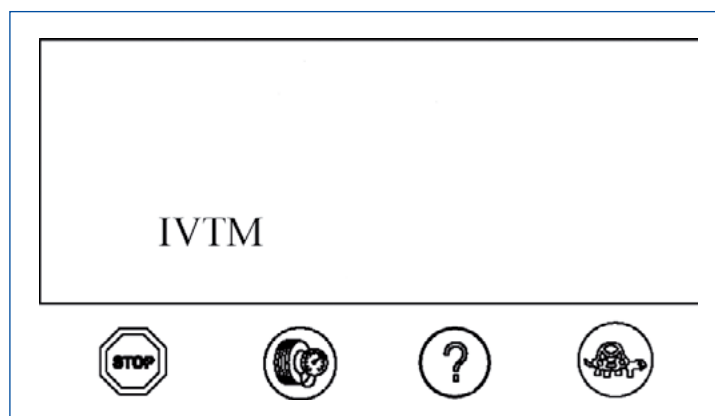
After initialisation, if tire pressures are within specified values, the following picture will show for a few seconds:

## System check



The display will change to normal mode if all pressures are correct.

## Normal mode



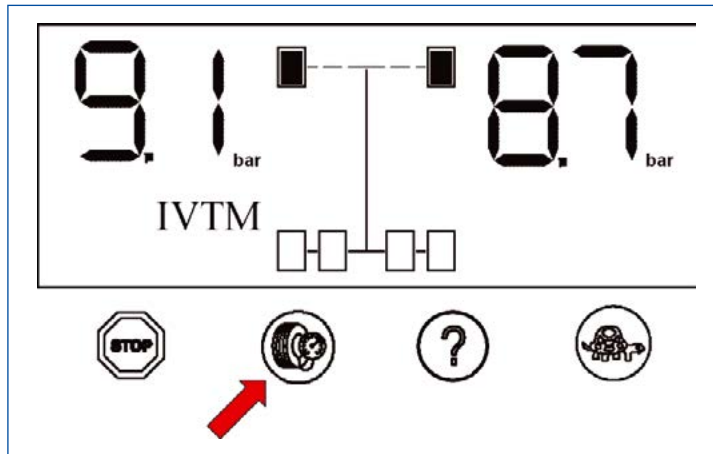
## 10.3 Retrieving pressure values

Proceed as follows to display the pressure values of the individual tires:

- Press the button with the tire symbol.

The axle for which the pressures are displayed is marked on the display. Left pressure value on the display corresponds to left tire in driving direction. Right pressure value on the display corresponds to right tire in driving direction.

### Checking pressure values



- Repeatedly touch button with the tire symbol to display pressure values of further axles.

Axles with twin tires have their wheels represented outside and inside one after the other.

- Repeatedly touch button with the tire symbol to display the axles of the towing vehicle as well as the axles of the trailer.

---

**!** The display will switch back to normal mode if no button has been touched for a period of 20 seconds.

---

## 10.4 Display of faults

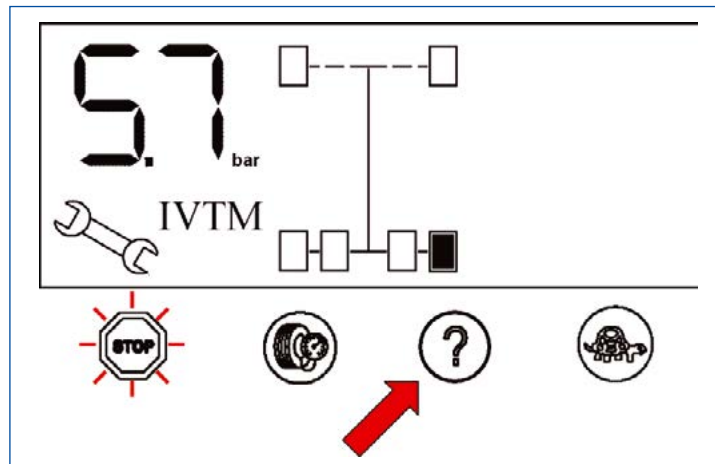
When OptiTire™ detects a fault, an amber or red warning lamp illuminates. Proceed as follows to display the type of fault on the vehicle:

- Touch button with the question mark after the yellow or red warning lamp lights up.

The pressure value of the affected wheel will be indicated and the position on the vehicle is indicated by a flashing wheel icon.

If no current fault is found, the system does not react to pressing the button with the question mark.

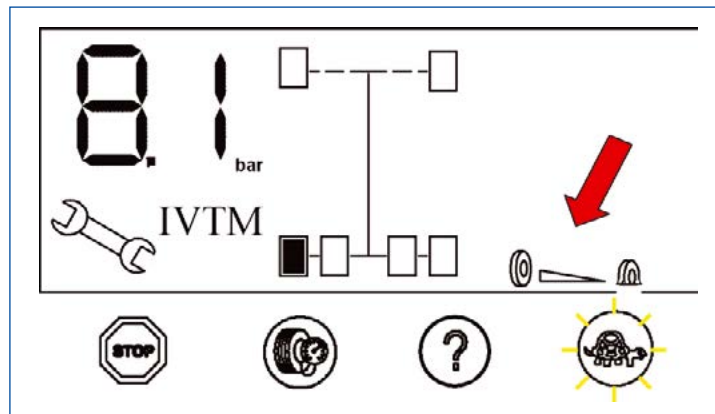
### Display of faults



! If the system warns about several tires the tire with the most serious fault is indicated first.










Repeated pressing of the button with the question mark displays further faults.

### Creeping pressure loss





## Overview of fault types

FAULT	DISPLAY			ACTION
Extremely low pressure				<ul style="list-style-type: none"> <li>– Stop the vehicle immediately.</li> <li>– Look for the cause of the reduced pressure.</li> <li>– If necessary, also change the tire.</li> </ul>
Low pressure				<ul style="list-style-type: none"> <li>– Reduce your driving speed.</li> <li>– Adjust tire pressure at the next opportunity.</li> </ul>
Creeping pressure loss				<ul style="list-style-type: none"> <li>– Reduce your driving speed.</li> <li>– Stop the vehicle at the next opportunity.</li> <li>– Look for the cause of the pressure loss.</li> <li>– If necessary, also change the tire.</li> </ul>
High pressure				<ul style="list-style-type: none"> <li>– Reduce your speed for preventing the tire from bursting.</li> <li>– Stop the vehicle at the next opportunity.</li> <li>– Search for the cause of excess pressure (e.g. defective, overheated brake).</li> <li>– Correct the tire pressure in the event of overpressure when the tire is cold.</li> </ul>

## 10.5 Adjusting tire pressures

Proceed as follows to adjust the tire pressures on the vehicle:

**!** Do not adjust tire pressure with the ignition on - this may cause faulty warning messages on display.

- Turn off the ignition.
- Adjust air pressure.
- Switch on ignition again.

If leakage warning has been active, reset on display and stored on diagnostic memory of the ECU.

## 10.6 Display of System Faults

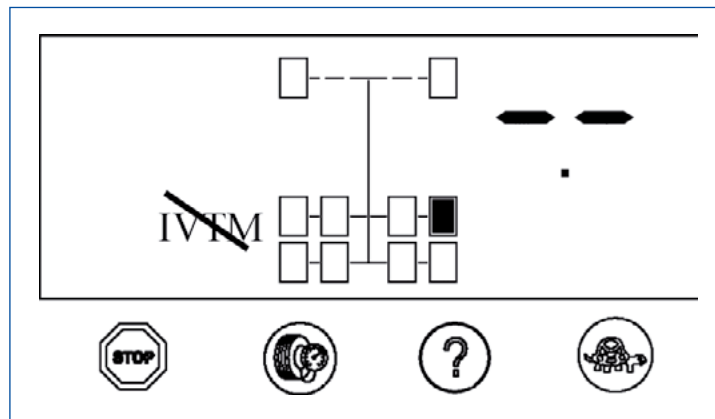
If "IVTM" is represented crossed out then there are one or more system faults.

! System should be checked in the workshop.

### No reception

Marked wheel has not transmitted pressure value for over one hour. OptiTire™ has stopped sending warning messages for this wheel, driver needs to check tire pressures on the wheel manually.

### No reception



### Repair note

With an older system, the sensor battery may be exhausted:

- Renew the sensor.
- Start operating the new sensor using diagnostic software by setting a new ID in the parameters.

If it is a newer system, the radio connection between the sensor and the ECU may be disturbed:

- Remove any possible dirt.
- Define the installation position of the ECU via diagnosis (position of best reception from all sensors).

## System failure

A system failure has occurred if display shows crossed-out "IVTM". OptiTire™ does not signal warning messages for any wheel. The driver must check the tire pressures manually on the wheel.

### System error

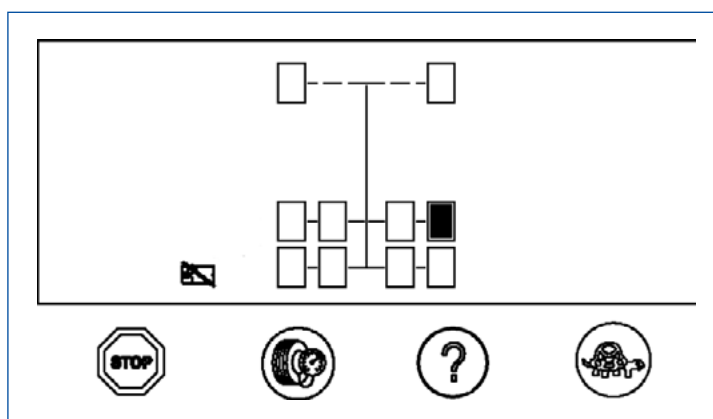


### Repair note

- Check the supply voltage of the ground line.
- Check the cable connections.
- Carry out a system diagnosis.

## Battery warning

If the wheel sensor battery's end of life has been reached after around 9 years, a battery warning is set around half a year beforehand. This is indicated in the display by a flashing sensor and a corresponding battery symbol. No warning lamp is indicated.



## 10.7 Display via SmartBoard


WABCO SmartBoard	
	
<b>WABCO part numbers</b>	446 192 110 0 (with integrated battery) 446 192 111 0 (for hazardous goods vehicles)

The SmartBoard is a display and operating console that can be used to display the following information relating to the OptiTire™ system:

- System configuration, such as part number, software version, serial number, production date and vehicle identification number (VIN)
- Nominal values and actual value pressures
- Tire status (OK / not OK)
- ID of a sensor (if the sensor is activated with a magnet)
- ECU data


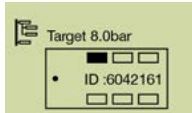


### "Tire pressure" menu

FUNCTION	DISPLAY	DESCRIPTION	OPTIONS
Display of tire pressure information		Displays the actual and nominal pressure value of the tire from the OptiTire™ system	⏪ Continue to the next tire pressure



### "Tools" menu

FUNCTION	DISPLAY	DESCRIPTION	OPTIONS
System Info		Displays the system information of the sensor and the OptiTire™ system	⏪ Continue to the next item
		Displays the ID of an OptiTire™ sensor	⏪ Continue with the next sensor

# 11 Workshop notes

## 11.1 Maintenance

OptiTire™ is maintenance-free.

Only when the display indicates a malfunction, fault finding must be performed with diagnosis.

## 11.2 Replacement and repair

### 11.2.1 Replacing an IVTM ECU with an OptiTire™ ECU

In principle, the OptiTire™ is backwards compatible with the IVTM ECU, but the following differences need to be noted:

- Assembly: If the original IVTM retaining plate and associated 8 mm screws are used, either cap nuts or suitable washers must be used in addition to compensate the 11 mm holes in the OptiTire™ housing.
- The adapter connector (WABCO part number 894 600 001 2) should be used to connect the original IVTM cable.
- A new Diagnostic Software is required because OptiTire™ is addressed by means of a UDS diagnostic protocol (IVTM: KWP2000).

### 11.2.2 Replacing 1st generation external sensor with 2nd generation

To choose the right 2nd generation external sensor, not only the 1st generation sensor to be replaced is important as well as the rim shape (ET, size). On this basis the matching external 2nd generation sensor and associated PA hose can be selected.

### 11.2.3 Wheel change

#### Wheel with external sensor

Due to the external fixation of the sensor on the wheel bolts after wheel change a new sensor is not needed. It is only to be ensured, that after wheel exchange the sensor is fitted exactly to the same position as before.

As long as the external itself is not exchanged, there is no need for new settings of system parameters.

---

! The external sensors are not allowed to be swapped with each other.

- Make sure that the external sensor are respectively located in the original position on the vehicle after the wheel change.

Especially with dual tires, the accurate relationship to the inner or outer wheel must be observed.

---

Please perform wheel changes as follows:

- Remove any dirt from the external sensor and PA tube.

- Note ID of external sensor (engraved on top of the housing) and its position on the vehicle, e.g. rear axle left, outside.  
Alternative: Fix a plate with the description of the location to each external sensor.
- Loosen the union nut of the PA tube on the tire valve.
- Pull the PA tube from the valve.
- First unscrew only those wheel nuts that fasten the external sensor.
- Remove external sensor completely, together with the PA tube.  
Do not turn the PA tube at the external sensor and do not remove the PA tube from external sensor unnecessarily.  
Prevent dirt from entering into the PA tube.
- Check the PA tube for any damage.
- Replace the PA tube if ageing ruptures or rubbing wear is visible ▶ see chapter 11.2.4 "Replacement of PA tubes (external sensor)", page 63.
- Remove the remaining wheel nuts.
- Change the wheel or tire.
- Fit the wheel or wheels again.
- Fix the wheel or wheels with a few wheel nuts to the wheel bolt to which neither the external sensor nor the weight plate will be mounted.  
While assembling the wheel make sure that the tire valve gets its original position.  
With twin tires, the tire valves should be placed in opposite position.
- Place the respective external sensor to its original position and fix it with wheel nuts.  
With individual wheels, assemble the counterweight in the opposite of the external sensor.
- Screw the union nut of the hose back on to the tire valve.
- Tighten union nuts manually only.
- Check that the connection is tight using a leakage indicating spray.
- Tighten the wheel nuts crosswise according to the vehicle manufacturer's specifications.

### Wheel with internal sensor

When changing a wheel with the internal sensor it must be ensured that the new wheel is also equipped with such an internal sensor. If this is not the case, the internal sensor must be installed in the new wheel ▶ see chapter "7.3 Assembly of the internal sensor" on page 39.

For start-up, the new ID of this internal sensor must be learned. For this purpose that Diagnostic Software must be opened.

#### **"Module configuration" parameter setting**

- Enter the new ID of the respective wheel position directly or carry out a free assignment under *Module assignment* ▶ see chapter "7.3 Assembly of the internal sensor" on page 39.

## 11.2.4 Replacement of PA tubes (external sensor)

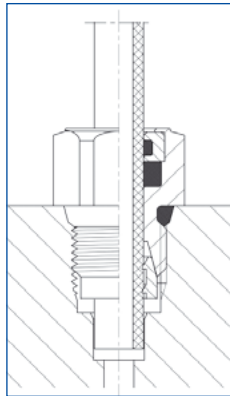
To replace a defective PA tube, proceed as follows:

- Loosen the PA tube from the valve.
- Unscrew the V203 connection together with the PA tube from the external sensor.

! When removing the PA tube from the external sensor, take care that the thread on the external sensor is kept clean.

- Check the thread on the external sensor for damage.
- With damaged thread, replace the complete external sensor.
- Screw the new V203 connection into the thread of the external sensor.  
A new V203 connection can be obtained using the WABCO part number 893 770 005 2.

### VOSS SV 203 connection



- Tighten the V203 connection with a tightening torque of 3 Nm (hand tight).
- Remove the protective cap of the V203 connection.
- Insert the new, cut to length PA tube into the V203 connection.
- Check if the PA tube has been pushed in until the stop into the V203 connection.
- Check if the PA tube has a tight connection (approx. 20 N).
- Connect the PA tube to the valve.
- Tighten union nuts on the valve hand tight.
- Check that the connection is tight using a leakage indicating spray.

## 11.2.5 Creeping pressure loss

If the WABCO Display indicates a creeping pressure loss:

- First use leak detection spray to check the connection of the indicated wheel between valve and sensor.
- If these connections are tight, check bearing surface and edges.  
So-called indicators at the tire edges indicate damage on the carcass, which usually causes creeping pressure loss of the wheel.
- If the carcass is damaged, replace the tire.

## 11.2.6 No signal received from the sensor

### Battery life

An internal lithium battery supplies the sensor with power.

For reasons relating to mechanical stress and tightness, the battery is coated within the sensor and cannot be exchanged.

The battery life-time depends on certain factors. Under normal operating conditions the life of the battery will be up to 9 years.

Since significant pressure deviation increases transmission frequency for short-term warning, frequent pressure changes cause a shorter lifetime.

! The replacement required due to a weak battery will be indicated around half a year before the end of its life. A corresponding entry in the diagnostic memory will be seen.

### Checklist for sensor

- If the warning "no reception wheel module" is repeated often in the WABCO Display ▶ see page 58, you can use the checklist to determine if the sensor should be replaced.
- Enter the default value in the "Result" column each time a test is applicable.
- Total the standard values in the "Result" column.  
You will find more information on your items in the section "Test result" ▶ see page 65.

! Ensure while troubleshooting that the vehicle is not in vicinity of high-frequency radiation ▶ see chapter "6.1.1 The external sensor (WM2)" on page 23.

#### Checklist

NO.	DESIGNATION	DEFAULT	RESULT
1a	Warning "No reception" is not active but stored in diagnostic memory (fault shown blue in diagnosis).	0	
1b	Warning "No reception" is active (fault shown in red in diagnosis).	2	
2a	Warning "no reception" appears for one sensor.	0	
2b	Warning "no reception" appears for several sensors.	3	
3a	The age of the sensor (according to the engraved production date in format WW/YY) is less than 5 years.	0	
3b	The age of the sensor lies between 5 and 7 years.	4	
3c	The age of the sensor is more than 7 years.	8	
4a	The average outside temperature was around -20 °C during occurrence of the failure	0	
4b	The average outside temperature was around 0 °C during occurrence of the fault	3	
4c	The average outside temperature was around +20 °C during occurrence of the fault	5	



NO.	DESIGNATION	DEFAULT	RESULT
5a	Activation of the external sensor WM2 with bar magnet or the internal sensor WIS with WABCO OptiTire™ Handheld Tool (WIS) is successful.	0	
5b	Activation of the external sensor WM2 with bar magnet or the internal sensor WIS with WABCO OptiTire™ Handheld Tool (WIS) is not successful.	4	
6	In the display the sensor is indicated with a crossed-out battery symbol.	4	
7a	During diagnosis only one bar is indicated in the module reception test.	10	
7b	During diagnosis no bar is indicated in the module reception test.	12	
		Total	

### Test result

*Total between 0 and 11 points*

The battery of the sensor is in order. The loss of the sensor from time to time might be caused by very low temperatures, contamination of sensor / ECU or an unfavourable installation position of the ECU.

*Total between 12 and 15 points*

Monitor the correct reception of the sensor and replace as required.

*Total between 16 and 22 points*

Battery of sensor exhausted.

- Replace the sensor with a new one.
- Parameterise ID of the sensor to the ECU via diagnosis.

### 11.3 Disposal / Recycling



- The system components are electronic scrap and must not be disposed of together with domestic waste. When disposing components, observe all the laws and regulations applicable in your country.
- This applies in particular to sensors that contain lithium batteries. These are solidly potted inside the housing and can not be replaced. Once they have reached the end of their life, dispose of the sensors while observing all the laws and regulations that apply in your country.
- WABCO strives to protect the environment. As with other old devices, all components can be returned to WABCO. Speak to your WABCO sales partner about this.





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