Reference Manual

RDC TOOL

Technical Training

Technical training.
Product information.

RDC Tool

Edited for the U.S. market by:
BMW Group University
Technical Training
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BMW Service

General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:

Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status: November 2018

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

The information contained in the training course materials is solely intended for participants in this training course conducted by BMW Group Technical Training Centers, or BMW Group Contract Training Facilities.

This training manual or any attached publication is not intended to be a complete and all inclusive source for repair and maintenance data. It is only part of a training information system designed to assure that uniform procedures and information are presented to all participants.

For changes/additions to the technical data, repair procedures, please refer to the current information issued by BMW of North America, LLC, Technical Service Department.

This information is available by accessing TIS at www.dealerspeed.net.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application
- Aftersales Information Research (AIR)

RDC Tool

Contents.

RDC Tool

1. Introduction

Real tire pressures have been monitored since the introduction of active tire pressure control systems. For this purpose, the tire pressures are determined by sensors (wheel electronics) and transmitted by means of a radio signal to a vehicle control unit. The various tire pressure control systems used by BMW may differ terms of their operating principle.

The following tire pressure control systems (RDC) have been used up to now by BMW:

- RDC 1st generation
- RDC 2nd generation
- RDC low 3rd generation
- RDCi 4th generation
- RDCi 5th generation

The RDC Tool assists BMW Group aftersales employees in performing a variety of servicing tasks on the tire pressure control system. The RDC Tool is used in the current 3rd/4th/5th generation RDC systems (RDC low and RDCi).

Functions:

- Diagnosis of wheel electronics
- Programming of tire data.

Depending on the RDC generation, only the diagnostic function is available. The wheel electronics can only be programmed for some RDCi systems starting from the BMW 3 Series with the development code G20. As a prerequisite for programming, Huf ®Generation 5 wheel electronics (sensors) must be installed.

The RDC Tool has been specially designed for the requirements of BMW Group vehicles.
The manufacturer of the device, Texa®, has worked in close cooperation with BMW Group designers. The RDC Tool can therefore be used for the following vehicles:

- Motorcycles
- Passenger cars

1.1. Diagnosis with the RDC Tool

The following table provides an overview of the possible uses of the RDC Tool with regard to the different RDC generations.

	RDC low (Gen 3)	RDCi (Gen 4)	RDCi (Gen 5)
Control unit	RDC[1]	DSC[2]	DSC[2]
Reception antenna	RDC[1]	FBD[3]	FBD[3]
Diagnosis with the RDC Tool	Yes	Yes	Yes

RDC Tool

1. Introduction

	RDC low (Gen 3)	RDCi (Gen 4)	RDCi (Gen 5)
Programmable wheel electronics	No	No	Yes
Electronic tire pressure specification	No	Yes	Yes
Input options for the tire data in the electronic tire pressure specification	None	Manual	QR code Manual

[1]RDC = Control unit, Tire Pressure Control

[2]DSC = Control unit, Dynamic Stability Control

[3]FBD = Remote control receiver

1.2. Hardware

RDC Tool case

RDC Tool

1. Introduction

1.2.1. Case

RDC Tool case contents

Index	Explanation
1	Storage case
2	RDC Tool
3	USB cable
4	Power pack
5	Power pack adapters for various national-market versions

RDC Tool

1. Introduction

1.2.2. Device

RDC Tool hardware overview

Index	Explanation
A	Back
B	Front
C	Top view
1	QR code scanner camera
2	LED (torch/flashlight)
3	Protective sleeve
4	Display
5	Input pad
6	ON button
7	USB port (2.0 type mini B)

RDC Tool

1. Introduction

1.2.3. Technical data

Hardware specifications	
Display	3.5" LCD with a resolution of 480 x 320 pixels
Transmission frequency	125 kHz
Received frequency	315 MHz – 433 MHz
Cable interface	USB
Battery	Li-ion 2500 mAh (3.7 V)
Charging time	approx. 5 h with device switched off
Operating temperature	-10 °C – +45 °C (14 °F – +113 °F)
Storage temperature	-20 °C – +60 °C (-4 °F – +140 °F)

RDC Tool
2. Systems and Functions

2.1. RDCi tire pressure control

2.1.1. Tire pressures

Optimum adjustment of tire pressure is necessary for the following reasons:

- Best possible driving dynamics
- Maximum utilization of tire service life
- Reduction of the fuel consumption
- Optimum operation of various suspension control systems.

For this, the physical principles should be observed in combination with pressure and temperature. The following rule of thumb applies in this case: A temperature change of +10 °C (+50 °F) produces an increase in tire pressure of roughly 0.1 bar.

The tire pressures specified by the manufacturer apply for summer and winter operation, irrespective of the temperature. However, it must be noted that due to the seasonal temperature differences, the tire pressures should be checked frequently.

Cold tire pressure

If the tire air temperature is the same as the current ambient temperature, this is referred to as cold tire pressure. The tire pressures should only be changed with a cold tire pressure on vehicles without the electronic tire pressures plate.

Warm tire pressure

During longer drives at higher driving speeds the tire warms up due to the friction with the road surface and tire creep. The temperature of the tire increases as a result and this is accompanied by an increase in tire pressure.

If there is a significant difference between ambient temperature and tire air temperature this is always referred to as warm tire pressure. Avoid changing the tire pressures when the tire is warm on vehicles without a nominal pressure display in the Central Information Display (electronic tire pressure specification).

2.1.2. Functional description

RDCi is a system which performs direct measurement and which determines the real tire pressures by means of wheel electronics in each wheel. Unlike with RDC low, a separate control unit is not required for RDCi. The functions of RDCi are integrated into the Dynamic Stability Control (DSC) control unit. The remote control receiver FBD acts as a receiver for the sent reports of all wheel electronics. It then forwards this information via bus to the DSC control unit. Different warning stages are activated if the discrepancy between the predefined and actual tire pressures is too great. The position of the corresponding wheel is also indicated to the driver in the Central Information Display (CID).

RDC Tool

2. Systems and Functions

2.1.3. System overview

System overview of RDCi in the G11/G12

Index	Explanation
1	Wheel electronics, front right
2	Central Information Display (CID) (Display of tire pressures possible)
3	Wheel electronics, rear right
4	Remote control receiver (FBD)
5	Wheel electronics, rear left
6	Instrument cluster (KOMBI)
7	Dynamic Stability Control (DSC)
8	Wheel electronics, front left

RDC Tool

2. Systems and Functions

2.1.4. Customer benefit

The system monitors the current tire pressures while driving and warns the driver in the event of a sudden loss of pressure and too great a discrepancy from the predefined tire pressures. This eliminates dangerous driving situations and unnecessarily high fuel consumption. The position of the relevant wheel is indicated to the driver in the Central Information Display (CID).

2.2. Electronic tire pressure specification

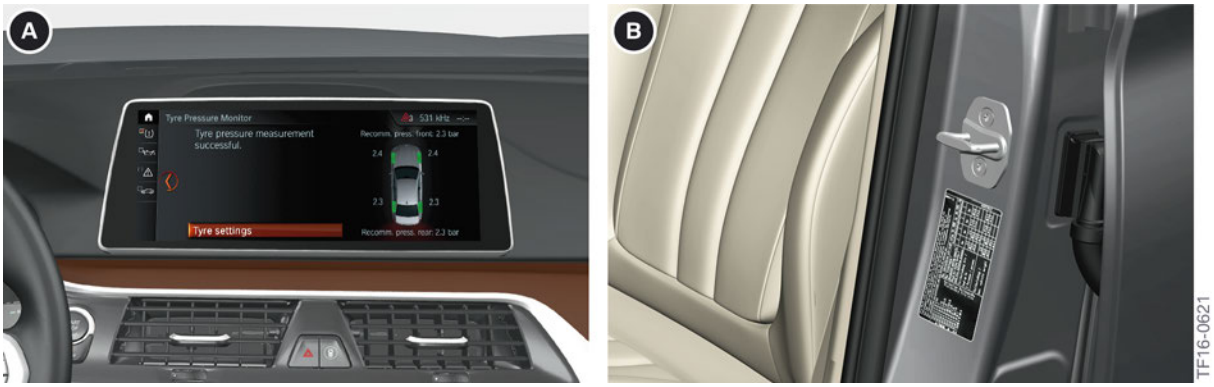
A detailed system description of the electronic tire pressure specification is provided in the "ST1604 G30 Chassis and Suspension" production information.

2.2.1. Functional description

The tire pressure specification sticker is supplemented in vehicles with electronic tire pressure specification by an additional user menu in the Central Information Display (CID).

Tire pressures are changing constantly depending on tire air temperature. For this reason, you may see a warning message of insufficient tire pressure if your tires have cooled significantly. In many of these cases, however, there is not technical fault, but insufficient checking of the tire pressures which should be checked at regular intervals.

Unlike the tire pressure specification sticker, the electronic tire pressure specification permanently monitors the nominal pressures taking into consideration the current temperatures. This means that it determines and displays the optimum tire pressure at any temperature.



Electronic tire pressure specification in the CID of a G30 and tire pressure specification sticker on the B-pillar

Index	Explanation
A	Electronic tire pressure specification
B	Tire pressure specification sticker

RDC Tool

2. Systems and Functions

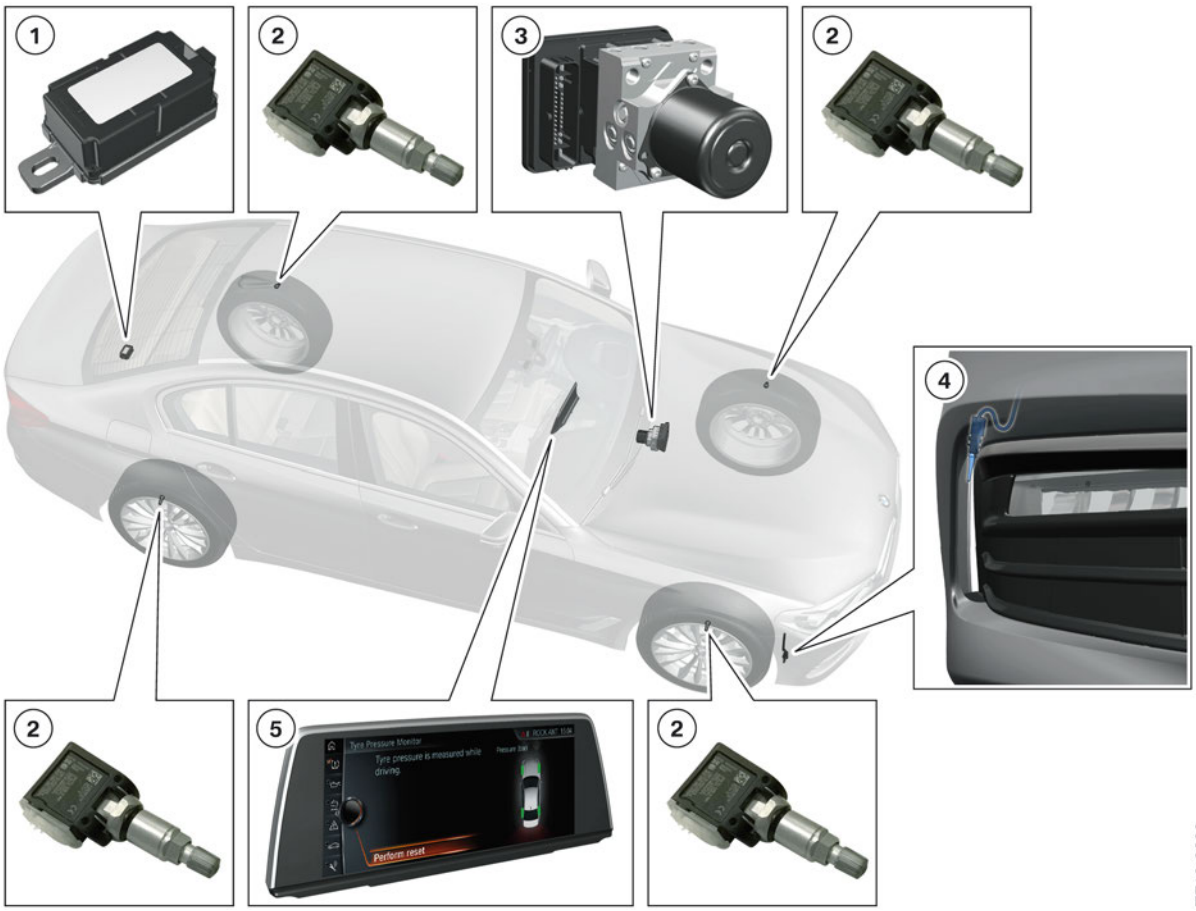
Once you have selected the relevant tire type (summer/winter), the tire size on the rear axle and the load status, the appropriate tire pressures are output to the CID (nominal pressure). Following the input and before the teach-in drive, these correspond to the tire pressures on the tire pressure specification sticker.

The vehicle must then be driven so it can learn the new wheels. Once the teach-in drive has been successfully completed, the current optimum tire pressure taking into consideration the tire air temperatures is always displayed. This can differ from the information on the tire pressure specification sticker because it has taken the tire air temperatures into consideration.

The tire air temperatures are measured by the four wheel electronics units in the various wheels. Since the wheel electronics units do not begin transmitting until driving speed has reached 20 km/h (12 mph), it is not possible to determine this while the vehicle is parked. A substitute value can be produced using the outside temperature sensor when the vehicle is stationary for wheels that have already been taught-in.

2.2.2. System overview

The electronic tire pressures plate is an extension to the vehicle software. No additional components are required for the integration of this new function. All the information is supplied by sensors that are already built into the vehicle.



System overview of the electronic tire pressures plate in the G30

Index	Explanation
1	Remote control receiver (FBD)
2	Wheel electronics
3	Dynamic Stability Control (DSC)
4	Outside temperature sensor
5	Central Information Display (CID)

2.2.3. Operation

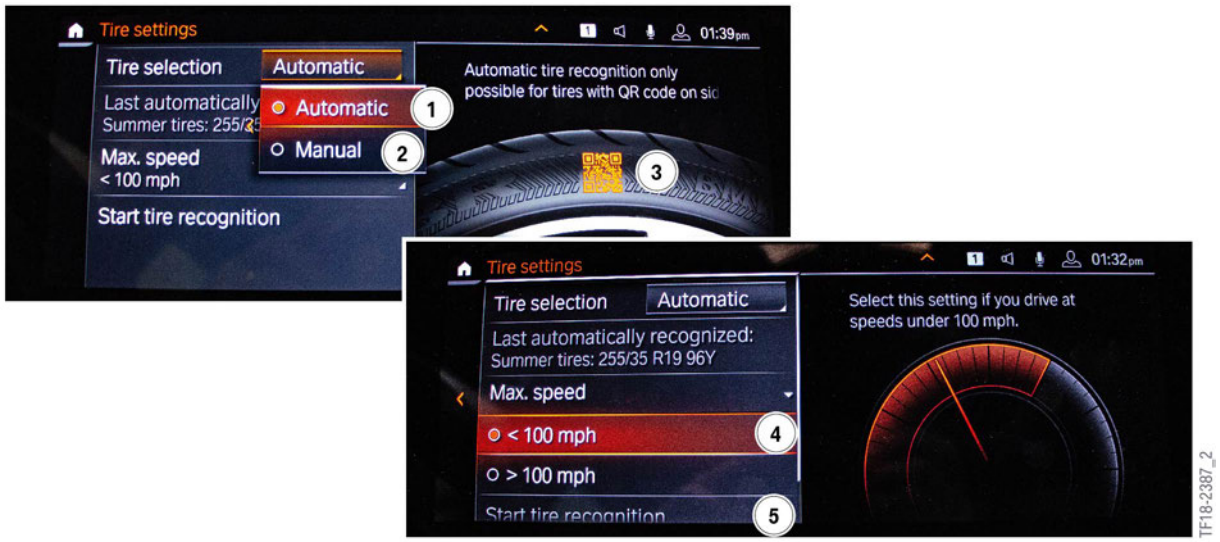
Menu guidance for electronic tire pressure specification in the G30

Index	Explanation
A	My Vehicle
B	Vehicle status
C	Tire settings
D	Tire type (summer/winter)

A distinction must be made when using the electronic tire pressures specification in the following three situations:

- Checking the tire pressures
- Checking the tire pressures after a wheel change
- Checking the tire pressures of wheel and tire combinations that have not been saved (special sizes).

2.2.4. Tire identification



Automatic tire recognition of the electronic tire pressure specification in the CID

Index	Explanation
1	Automatic tire recognition
2	Manual input of tire data
3	QR code tires
4	Speed rating
5	Start tire recognition

RDC Tool

2. Systems and Functions

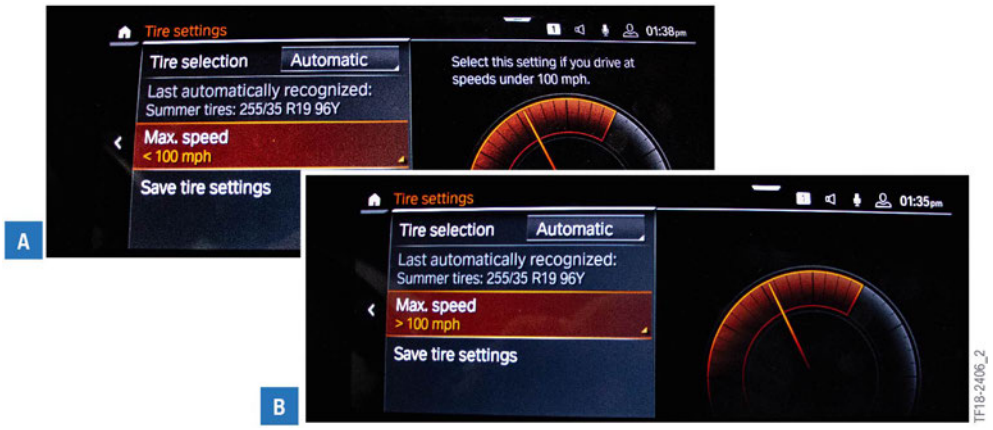
In the Central Information Display (CID) the menu of the electronic tire pressure specification has been adapted and extended to include automatic tire recognition. Vehicles with programmable wheel electronics no longer feature manual input of tire data in the CID. Vehicles without programmable wheel electronics continue to feature the option of manual input.

For automatic tire recognition the following prerequisites must be fulfilled to calculate and display the tire pressures:

- Programmed wheel electronics mounted on the vehicle
- Teach procedure successfully completed.

For a new wheel set it is indeed possible to enter the tire data by means of manual input in the electronic tire pressure specification, but these are always overwritten during the first teach-in drive by the transmitted tire data from the programmed wheel electronics. This is not the case if the wheel set is already taught-in and therefore known. The tire data of such a wheel set can be set by means of manual input as often as one likes.

Another innovation is the choice of 2 different speed ratings.



Menu for setting the load status in the CID of the G20

Index	Explanation
A	< 100 miles per hour (Speeds under 100 mph)
B	>100 miles per hour (Speeds above 100 mph)

Since the system is based on the functions of RDCi tire pressure control, automatic tire recognition takes place solely while the vehicle is driving. For this reason, no tire pressures can be output while the vehicle is stationary when the system is newly installed. The corresponding cold inflation pressures can be read off from the tire pressure specification sticker.

RDC Tool

2. Systems and Functions

Tire pressure specification sticker in the G20

Index	Explanation
1	Tire front/rear
2	Tire size dimensions
3	Cold tire pressures

The cold inflation pressures of the tire pressure specification sticker correspond to the cold inflation pressures in the electronic tire pressure specification. To prevent the incorrect inflation of already taught-in wheels, the tire pressures should after a successful teach-in time always be taken from the electronic tire pressure specification.

2.2.5. Customer benefit

Since the tire air temperatures are included, the customer always receives a display of the currently applicable tire pressure when compared with the tire pressure specification sticker. The customer can therefore correct the tire pressure at any time, regardless of whether the pressure is cold or warm. Since the details of the tire pressures given on the tire pressure specification sticker always refer to the cold inflation pressure, it was only permitted to correct the tire pressures in previous RDC systems while the tires were cold (cold inflation pressure).

Incorrect inputs can be avoided by the expansion of automatic tire recognition. On the basis of detailed stored tire data the driver receives situation-dependent warning messages displayed in the CID, e.g. "Puncture detected, continued driving at reduced speed possible" (with run-flat tires) or "Puncture detected, please stop" (with non-run-flat tires).

Correct tire pressures reduce fuel consumption and ensure greater driving safety.

RDC Tool

2. Systems and Functions

2.3. QR code tires

With the launch of the BMW 3 Series with the development code G20 various tires of different models can be provided with a QR code.

QR code tires

2.3.1. Information in the QR code

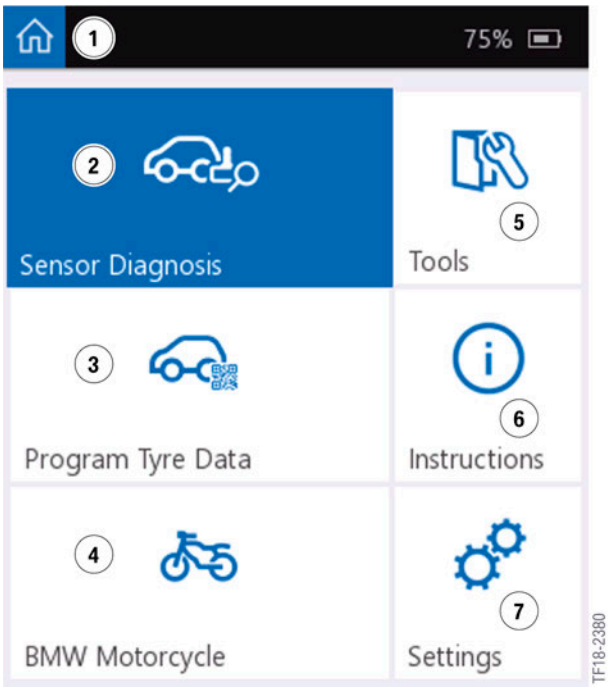
This QR code contains the following information about the tire:

- Summer or winter tire
- Tire size
- Run-flat or standard tire
- Production date
- Inside or outside
- Load index
- Speed index

RDC Tool

3. Operation

3.1. User interface



RDC Tool user interface

Index	Explanation
1	Main menu (start screen)
2	Reading-out of wheel electronics
3	Programming of wheel electronics
4	BMW Motorcycle
5	Tools
6	Instructions
7	Settings

3.1.1. Menus

Reading-out of wheel electronics

Allows the data of the wheel electronics variants used by BMW to be read out.

Programming of wheel electronics

Allows the Huf® Generation 5 variant wheel electronics to be programmed with the tire data. Programming can be performed by manually inputting the tire data or automatically by scanning the QR code on the tire.

RDC Tool
3. Operation

Manual input of the tire data is only permitted if a QR code tire was not fitted or the QR code on the outside and inside of the tire is no longer readable. To be able to offer the driver the best possible form of the RDC system, it is necessary to transmit the tire data by scanning the QR code to the wheel electronics.

Tools

The following device functions can be used under "Tools":

- Scan tire data
  - To read out the tire information from the QR code
- Read tire data
  - To read out the programmed tire data from the wheel electronics
- USB
  - Interface for data transfer
- Data matrix code reader
  - To read out data matrix codes
- Light
  - To illuminate areas that are difficult to read

Instructions

General descriptions on the following topics:

- Device functions
- Installation of wheel electronics

Settings

Various country-specific settings, such as e.g. language, pressure and temperature, can be made in this menu. Furthermore, the current software version can be read out under the Information menu item.

RDC Tool

3. Operation

3.2. Reading-out of wheel electronics

Reading out the wheel electronics with the RDC Tool

The RDC Tool enables service employees to access the wheel electronics data quickly and easily. To wake up and activate the wheel electronics to send messages, the RDC Tool must transmit a trigger signal on the frequency of the wheel electronics. It must therefore be held close to the wheel electronics. At this point the operational wheel electronics unit sends a message containing various information back to the RDC Tool.

RDC Tool

3. Operation

Reading out the wheel electronics via the RDC Tool

Index	Explanation
1	Wheel
2	Trigger signal
3	RDC Tool
4	Wheel electronics
5	Message with information

3.2.1. Error

The following faults may be in evidence if no messages can be received:

- Too great a distance between the RDC Tool and the wheel electronics
- Incorrect setting on the RDC Tool (wrong menu)
- Wheel electronics battery status too low
- Faulty wheel electronics.

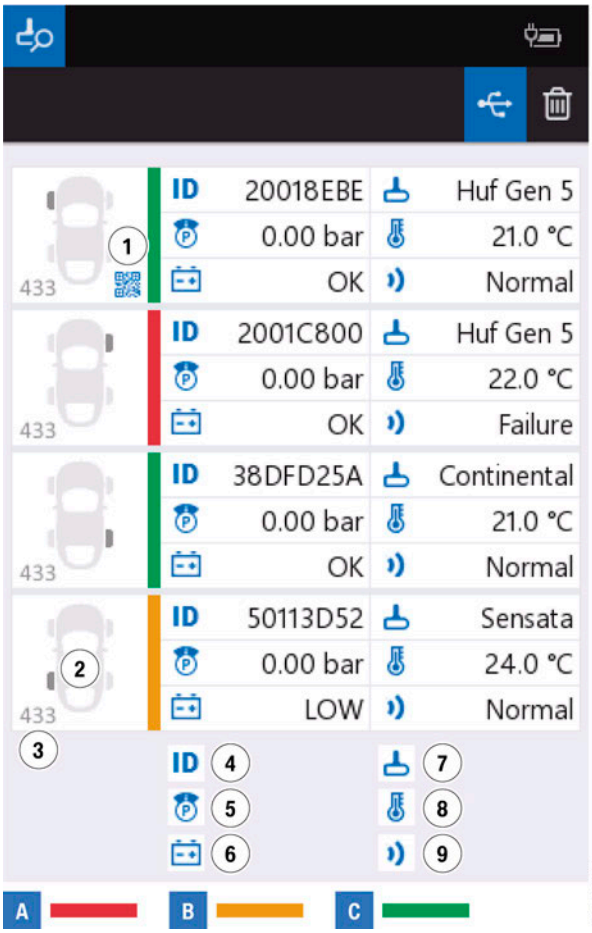
3.2.2. Information

The following information on the wheel electronics can be retrieved:

- Manufacturer
- Identification number
- Tire pressure
- Temperature
- Battery status
- Transmission mode
- Wheel electronics programmed (Yes/No)
- Frequency range in MHz

RDC Tool

3. Operation

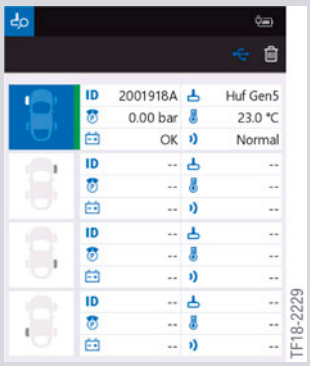
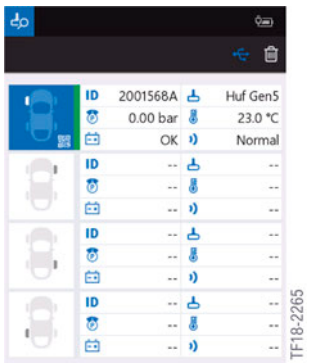
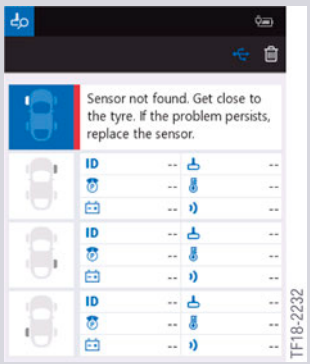
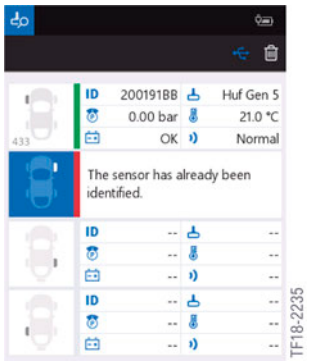


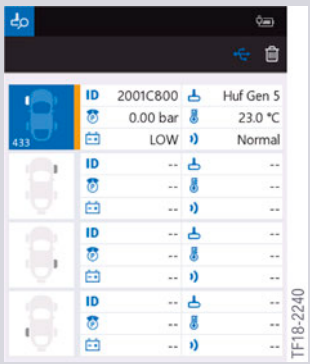
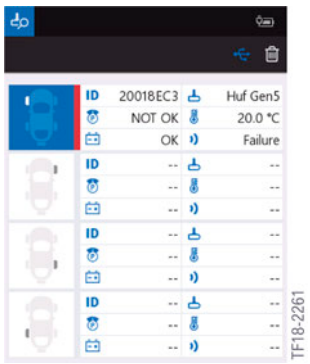
Menu in the RDC Tool for reading out the wheel electronics

Index	Explanation
A	Wheel electronics with fault
B	Wheel electronics battery status too low
C	Wheel electronics faultless
1	Wheel electronics programmed via QR code
2	Installation location
3	Frequency
4	Identification number
5	Tire pressure
6	Battery status
7	Manufacturer and generation of wheel electronics
8	Tire inflation temperature
9	Transmission mode

RDC Tool

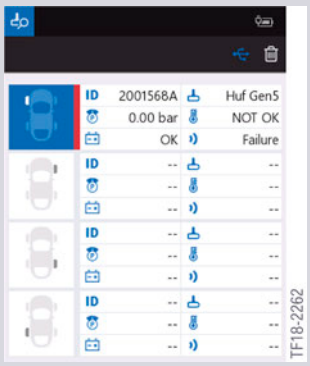
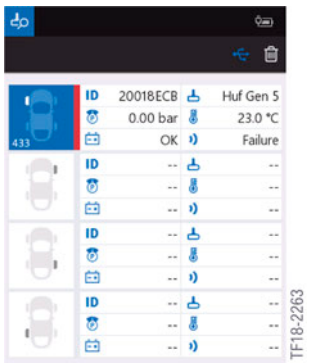
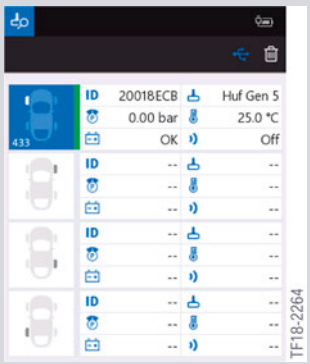
3. Operation

RDC Tool display	Description
	Wheel electronics read out fault free.
	Wheel electronics programmed via QR code and read out fault free.
	Wheel electronics not found. Hold the device closer to the tire and try again. Replace the wheel electronics if the fault persists.
	Wheel electronics unit has already been read out on a different wheel. Each wheel electronics unit has its own identification number. This cannot be positioned simultaneously at 2 different wheels.

RDC Tool display	Description
	Wheel electronics with excessively low battery status.
	Fault message due to a faulty wheel electronics pressure sensor.

RDC Tool

3. Operation

RDC Tool display	Description
	Fault message due to a faulty wheel electronics temperature sensor.
	Wheel electronics with fault.
	Wheel electronics unit is in the delivery status. This status prevails when the wheel electronics unit is new and has not yet been pressurized. The wheel electronics unit barely consumes any power in this status. The status is automatically quit when the unit is pressurized for the first time.

3.3. Programming the wheel electronics

Programmable wheel electronics (Huf® Gen. 5)

As soon as the programmable wheel electronics units are depressurized for more than 2 minutes, the tire data record written on them is deleted. In this way, they can be written with the tire data or a new wheel set. A wheel electronics unit that has already been written cannot be programmed again. To do this, a 2-minute depressurized state must, as described above, be established.

Information from the wheel electronics	
1. Tire sizes	Tire width, aspect ratio, rim diameter
2. Enhanced tire information	Load capacity, speed index
3. Application range	Summer, winter, all-season tire
4. Tire type	Run-flat or conventional
5. Production date	DOT number
6. Direction of travel	Yes/No

3.3.1. Programming via QR code

Automatic programming of the wheel electronics is provided for when QR code tires are used.
The tire data are read off from the QR code via the device's optical system and transmitted to the corresponding wheel electronics. To prevent incorrect programming due to tire data records being mixed up, the user has a limited time window of 7 seconds to transmit the information. If the wheel electronics unit could not be taught within this period of time, the programming must be repeated by pressing the OK button. The QR code does not need to be read off again.

RDC Tool

3. Operation

Programming the wheel electronics via the QR code

Index	Explanation
A	FlexRay
B	Body CAN (K-CAN)
C	Automotive Pixel Link (APIX)
1	QR code
2	Read-out optical system
3	RDC Tool
4	Trigger signal for data transfer
5	Wheel electronics (Huf® Generation 5)
6	Radio signal 433 MHz
7	Remote control service (FBD)
8	Body Domain Controller (BDC)
9	Dynamic Stability Control (DSC)
10	Head unit
11	Central Information Display (CID)

To transmit the stored tire data from the wheel electronics to the vehicle, the vehicle must be driven at a speed above 20 km/h (12 mph) for a maximum of 10 minutes. The teach procedure starts automatically as soon as the vehicle moves above this driving speed. The teach procedure does not necessarily have to be concluded in one driving cycle, but can be interrupted as often as one likes.

RDC Tool

3. Operation

The tire data are transmitted by the wheel electronics by radio signal to the remote control receiver and from there directed via bus to the DSC control unit. The various information is processed in the DSC control unit and output in the Central Information Display for the driver.

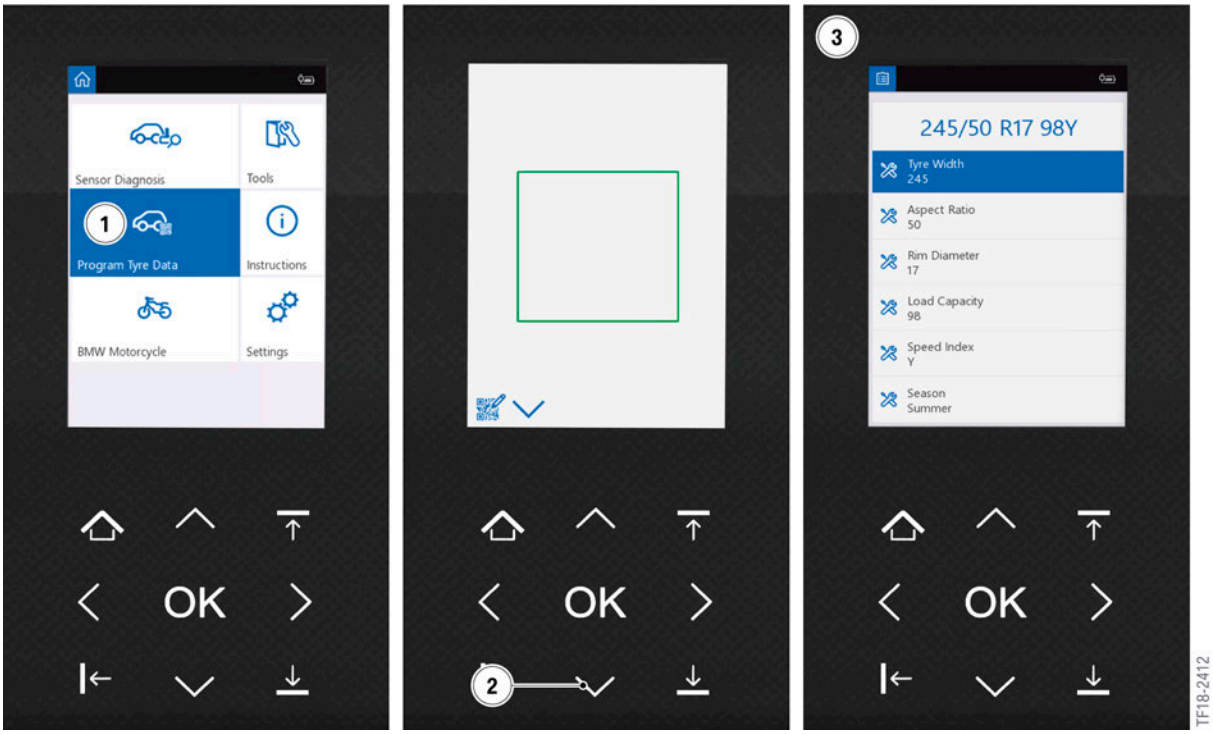
If the RDC Tool for reading in the tire data is not correctly aligned to the QR code, the read-out procedure will be aborted. The QR code can be read off from all perspectives.

All QR code tires have a QR code both on the outside and on the inside of the tire. If the QR code is hard to make out on the outside due to curb damage, the tire data can also be read off via the QR code on the inside of the tire.

3.3.2. Programming by manual input

Manual input of the tire data is only permitted if a QR code tire was not fitted or the QR code on the outside and inside of the tire is no longer readable. To be able to offer the driver the best possible form of the RDC system, it is necessary to transmit the tire data by scanning the QR code to the wheel electronics.

Menu for manual input



Select manual programming of wheel electronics with the RDC Tool

RDC Tool
3. Operation

Index	Explanation
1	Press “Program Tire Data”
2	Press arrow down button
3	Menu view for manual programming

The menu for manual programming of the wheel electronics can be called up as follows:

1 Select “Program Tire Data”

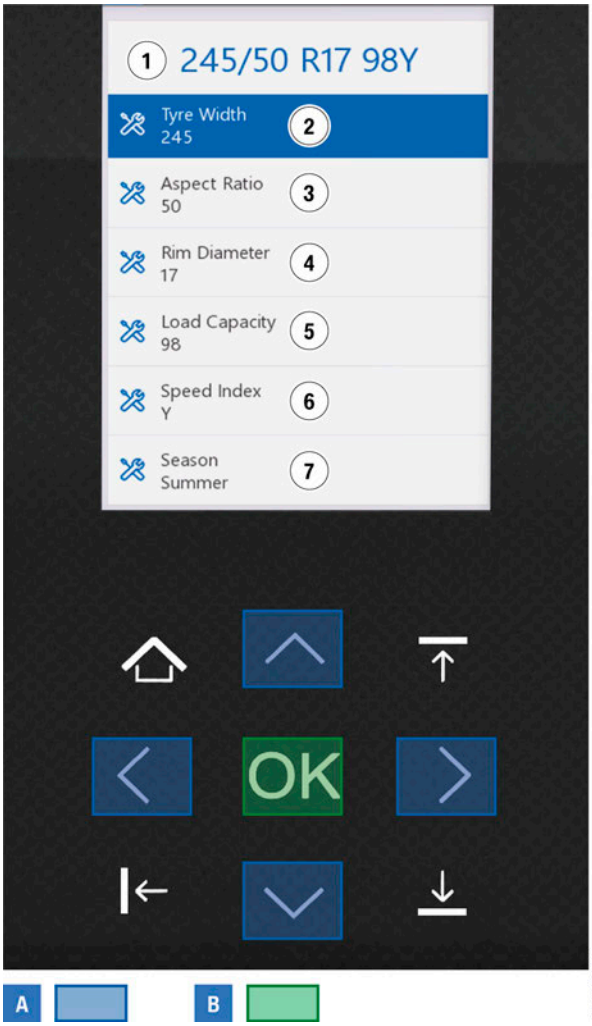
2 With the camera view activated, press arrow down button

3 The input box for manual tire input appears.

Tire data can now be input manually in the corresponding boxes. The information can be entered in the different menu boxes using the arrow buttons for this purpose. Only when all the input boxes are completed can the programming procedure be started by pressing the Confirm button (OK). Here too the corresponding wheel electronics unit must be programmed within 7 seconds. It the wheel electronics unit could not be programmed within the predefined time, the procedure must be repeated. The tire data input last are however retained and do not have to be input again.

RDC Tool

3. Operation



Manual programming of the wheel electronics with the RDC Tool

Index	Explanation
A	Arrow buttons
B	Confirm button
1	Display with selected tire data
2	Tire width
3	Aspect ratio
4	Rim diameter
5	Load capacity
6	Speed index
7	Season (summer, winter, all-season tire)

3.3.3. Notes for Service

The following table sets out different situations and their effects on the electronic tire pressure specification.

Situation	Impact and effects
New wheel set with programmed wheel electronics units installed.	Correct functionality: Message with corresponding tire indication that new tires have been detected.
Wheel electronics units without data record installed.	Fault message: Automatic tire recognition not possible (only with activated automatic tire recognition).
Wheel electronics units with different tire data installed on the rear axle.	Fault message: Automatic tire recognition not possible.
Wheel electronics unit with tire data which are not stored in the vehicle (special sizes).	Fault message: Automatic tire recognition not possible.
New wheel set with programmed wheel electronics units installed and manual input of the tire data performed in the CID.	There is always changeover to automatic tire recognition when the system is taught for the first time. Consequently the transmitted tire data of the wheel electronics units are adopted.
Already taught wheel set changed over by manual input of the tire data in the CID.	Tire data of already taught wheel set can be changed as often as one likes by changeover to manual input. For offroad driving with particularly low tire pressure, the driver has the opportunity to define his/her own tire pressures in the RDC system. This is done by selecting the tire special sizes. Then the desired tire pressure must be set and an RDC reset carried out.

RDC Tool

3. Operation

3.4. Troubleshooting with the RDC Tool

3.4.1. Connecting to ISTA

The RDC Tool can be connected to the ISTA workshop information system for warranty-compliant diagnosis. The service employee can select a diagnosis via the RDC Tool in the corresponding sequence. After the diagnosis the ascertained data are transmitted by USB cable to the ISID.

Data exchange between the RDC Tool and ISTA

Index	Explanation
1	ISTA user interface (Integrated Service Technical Application)
2	RDC Tool
3	ISID (Integrated Service Information Display)
4	USB cable

Options for reading out the wheel electronics battery status:

- Determine via RDC Tool
  - The data are read out with the RDC Tool directly at the wheel electronics and following instructions transmitted directly to the ISTA workshop information system.
- Determine via pressure encoding
  - Here the wheel electronics units are prompted by means of a pressure change in the tire to transmit the data. These data are then displayed and evaluated in the ISTA workshop information system.

3.4.2. Customer benefit

Direct reading-out of the wheel electronics units reduces the time spent on troubleshooting and consequently the costs for the customer.

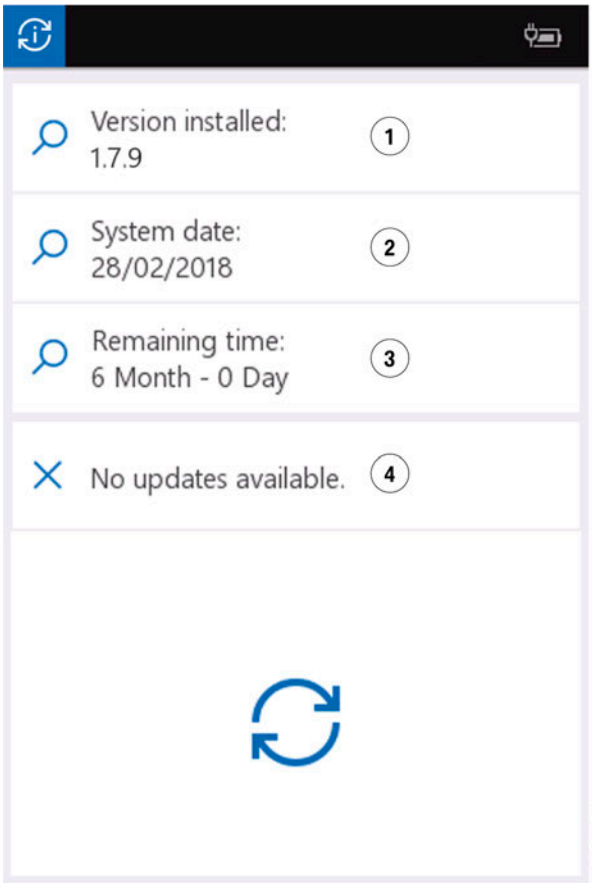
3.5. Software update

The RDC Tool is always supplied disabled on delivery. This ensures that the device is always loaded with the current device software before it is used for the first time. The RDC Tool must be connected to the ISTA workshop information system via USB cable for this purpose. If the corresponding RDC Tool device file has been enabled by the responsible administrator via the ISPI Admin Client, the device searches for a software update as soon as it is connected to the ISTA workshop information system.

ISTA cannot unblock the RDC Tool; only the RDC Tool software can do this. The RDC Tool software is an independent software package which should be installed on each computer on which ISTA is also installed.

Following a successful software update the RDC Tool is unblocked for 6 months. If within this period of 6 months the device is not connected to the ISTA workshop information system, the device disable engages again.

RDC Tool
3. Operation



RDC Tool user interface device software

Index	Explanation
1	Installed version
2	Current date
3	Time remaining until the next device update (after which the device is disabled)
4	Information about available updates

Independent operators can perform a device update via the Aftersales Online System (AOS portal).

3.5.1. Customer benefit

The update requirement ensures that the devices on the market always have the current software version.