

Workshop Manual

Audi A4 2008 ➤

Audi A5 Cabriolet 2009 ➤

Audi A5 Coupé 2008 ➤

**System description - infotainment and navigation
system**

Edition 10.2011



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List of Workshop Manual Repair Groups

Repair Group

01 - Self-diagnosis, electrical checks

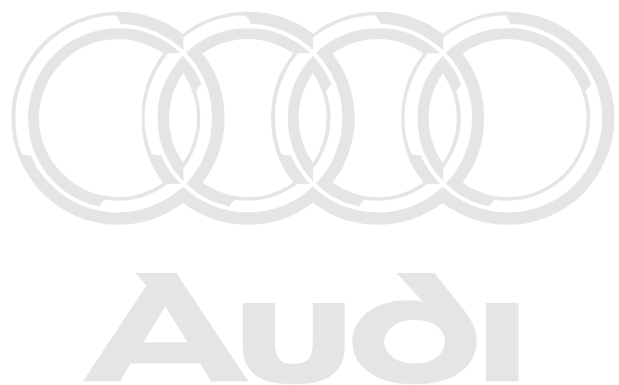


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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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01 – Self-diagnosis, electrical checks

1 General information on navigation system

Energy management

All of the infotainment control units, including the navigation control unit, are connected to the energy management system. This means that the MOST bus is shut down in the event of a poor energy balance in the vehicle. Depending on the condition of the battery, there are various shut-down levels affecting different control units. Navigation is no longer possible once the corresponding shut-down level has been activated.

Transport mode

The CD drive of the navigation control unit is disabled in transport mode. The drive can be enabled using a test program or via an adaption channel on the control unit.

Activating/deactivating eject button

In certain cases, e.g. on rental cars, it may be desirable to have the eject button deactivated by the navigation control unit. This can be achieved by changing the value in the appropriate adaption channel.

Requirements for operation

Type of navigation	Requirements
For all types of navigation	◆ All control units involved must be ready for operation. ◆ The power supply in the vehicle must be ok.
Satellite navigation	Only an operational MOST bus and satellite reception are required. (Please see note)
Dead reckoning navigation	An operational drive train CAN bus, an operational MOST bus, an operational gyro module (integrated in the navigation control unit) and a speed signal from the speed sensors are required. (Please see note)
Vehicle navigation	All of the requirements for satellite and dead reckoning navigation must be met.



Note

If there is no »ignition on« signal at terminal 15 and no buttons are pressed on the multimedia system operating unit -E380-, the MOST bus will operate for a limited period only. To continue navigation after this period, an »ignition on« signal must be activated at terminal 15 or the ON/OFF button on the multimedia system operating unit -E380- must be pressed (depending on the operating status of the MOST bus).



1.1 Definition of terms

Term	Definition						
Navigation control unit	◆ MMI (2nd generation). Equivalent to the control unit for front display and information control panel -J523- (for the basic version) or the navigation system with CD drive control unit -J401- (for the high version) ◆ MMI (3rd generation). Equivalent to control unit 1 for information electronics -J794-						
Gyro module	The turn angle sensor is integrated in the navigation control unit. It measures changes in direction of travel and detects rotational movements (gyroscopic compass).						
Bus versions	<table><tr><td>MOST bus</td><td> ◆ MOST stands for »Media-Oriented Systems Transport« ◆ Optical data transfer via fibre-optic cables ◆ High-speed data transfer </td></tr><tr><td>CAN bus</td><td> ◆ CAN stands for »Controller Area Network« ◆ Two-wire bus </td></tr><tr><td>LIN bus</td><td> ◆ LIN stands for »Local Interconnect« ◆ Single-wire bus ◆ Master/slave principle </td></tr></table>	MOST bus	◆ MOST stands for »Media-Oriented Systems Transport« ◆ Optical data transfer via fibre-optic cables ◆ High-speed data transfer	CAN bus	◆ CAN stands for »Controller Area Network« ◆ Two-wire bus	LIN bus	◆ LIN stands for »Local Interconnect« ◆ Single-wire bus ◆ Master/slave principle
MOST bus	◆ MOST stands for »Media-Oriented Systems Transport« ◆ Optical data transfer via fibre-optic cables ◆ High-speed data transfer						
CAN bus	◆ CAN stands for »Controller Area Network« ◆ Two-wire bus						
LIN bus	◆ LIN stands for »Local Interconnect« ◆ Single-wire bus ◆ Master/slave principle						
TMC	»Traffic Message Channel« is a digital radio data service which is used to transmit information about traffic disruptions to a suitable receiving device. TMC is broadcast in many (but not yet all) countries.						
GPS	Satellite-based global positioning system for determining location						
Map matching	Map matching is an algorithm used to determine the most probable position of an object on the map by matching the measured position to the topological information describing the location and geometry of objects on the map.						

1.2 Technical data

Control unit versions	EU, USA, Japan, China	
Receivable satellites	12 - 20 (theoretical maximum); 4 satellites are required in order to determine the position. Audi navigation systems currently evaluate information from 12 satellites.	
Media used	MMI (2nd generation)	MMI (3rd generation)
	◆ MMI high: DVDs ◆ MMI basic: CDs Several different CDs/DVDs, containing information about different countries, are available for both versions.	◆ MMI high - hard disk ◆ MMI basic - DVD
Evaluation of TMC information	Within the navigation route corridor plus a 200 km radius around the current position	

1.3 Components used in MMI high (2nd generation)

As the individual vehicle systems are networked, the navigation system uses a large number of different control units.

These control units communicate with each other across different types of bus. The data bus diagnostic interface -J533-, which is connected to all the different bus versions, prepares and transmits the data to the corresponding control unit.

- Control unit in dash panel insert -J285-

- ABS control unit -J104-

- Front left speed sensor -G47-

- Front right speed sensor -G45-

- Data bus diagnostic interface -J533-

- GPS aerial -R50-

- Navigation system with CD drive control unit -J401-

- Control unit for front display and information control panel -J523-

- Display unit for front information display and operating unit control unit -J685-

- Multimedia system operating unit -E380-

- Radio -R-

- Speech input control unit -J507- (fitted in radio -R-)

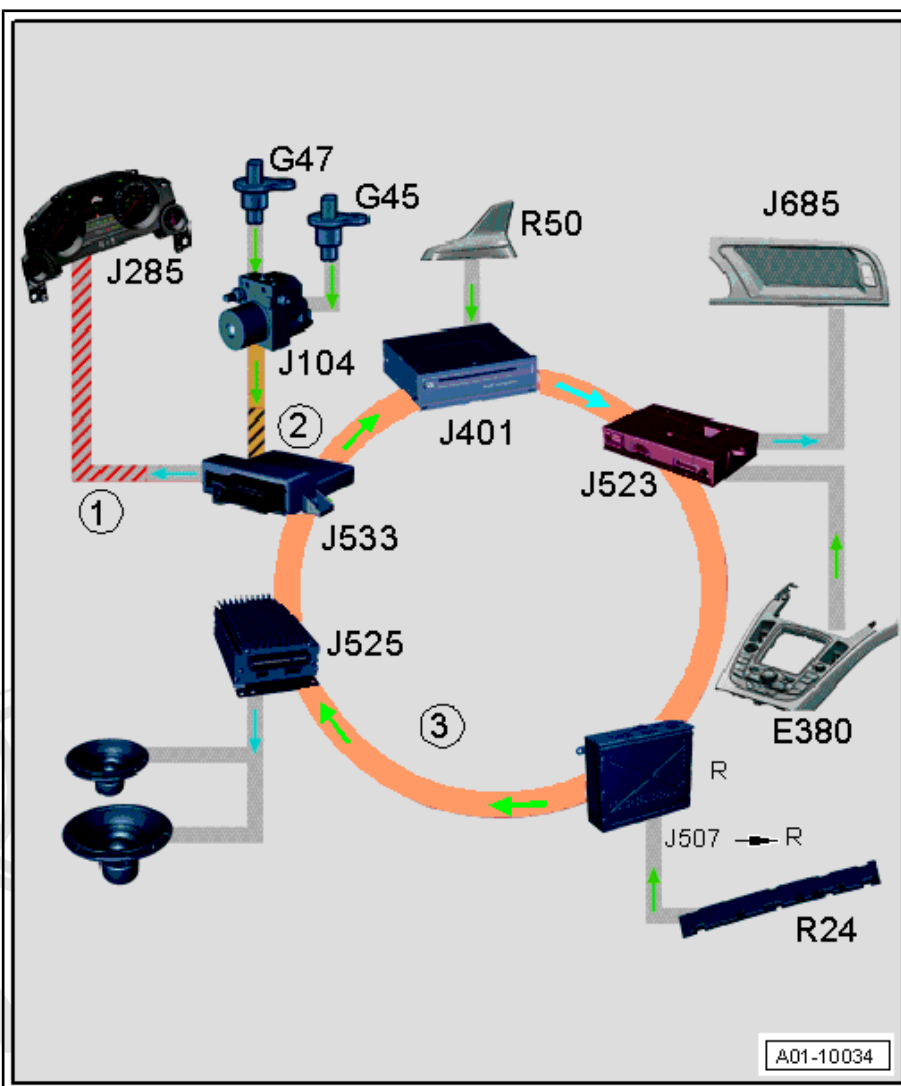
- Aerial amplifier -R24-

- Digital sound package control unit -J525-

1 - Instrument cluster CAN

2 - Drive train CAN

3 - MOST bus



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Note

The onboard supply control unit -J519- and gear detector switch -F208- are required in addition for vehicles with a manual gearbox in order to detect the direction of travel. The multifunction switch -F125- and automatic gearbox control unit -J217- are required in order to detect the direction of travel on vehicles with an automatic gearbox.



Note

The rear right speed sensor -G44- and rear left speed sensor -G46- are required in addition on vehicles with four-wheel drive.

1.4 Components used in MMI basic (2nd generation)

As the individual vehicle systems are networked, the navigation system uses a large number of different control units.

These control units communicate with each other across different types of bus. The data bus diagnostic interface -J533-, which is connected to all the different bus versions, prepares and transmits the data to the corresponding control unit.

- Control unit in dash panel insert -J285-

- ABS control unit -J104-

- Front left speed sensor -G47-

- Front right speed sensor -G45-

- Data bus diagnostic interface -J533-

- Aerial amplifier -R24-

- GPS aerial -R50-

- Control unit for front display and information control panel -J523-

- Display unit for front information display and operating unit control unit -J685-

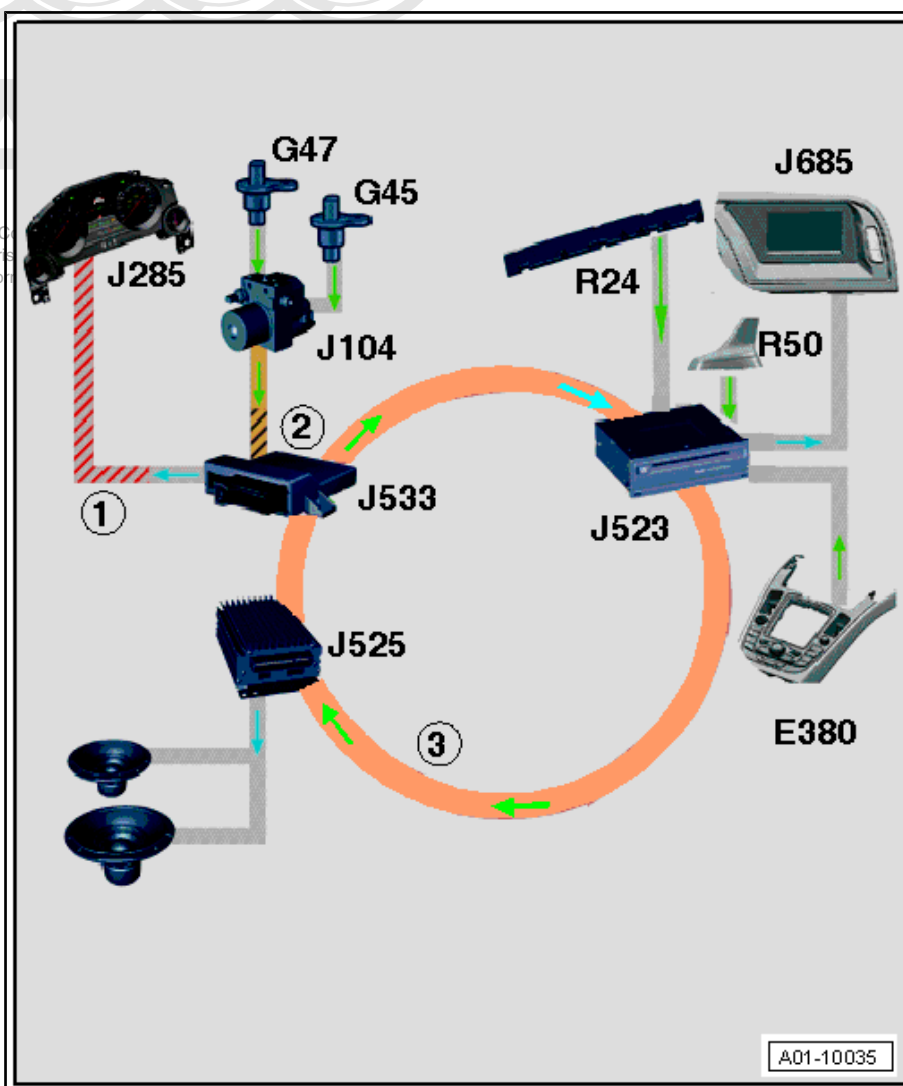
- Multimedia system operating unit -E380-

- Digital sound package control unit -J525-

1 - Instrument cluster CAN

2 - Drive train CAN

3 - MOST bus





Note

The onboard supply control unit -J519- and gear detector switch -F208- are required in addition for vehicles with a manual gearbox in order to detect the direction of travel. The multifunction switch -F125- and automatic gearbox control unit -J217- are required in order to detect the direction of travel on vehicles with an automatic gearbox.



Note

The rear right speed sensor -G44- and rear left speed sensor -G46- are required in addition on vehicles with four-wheel drive.

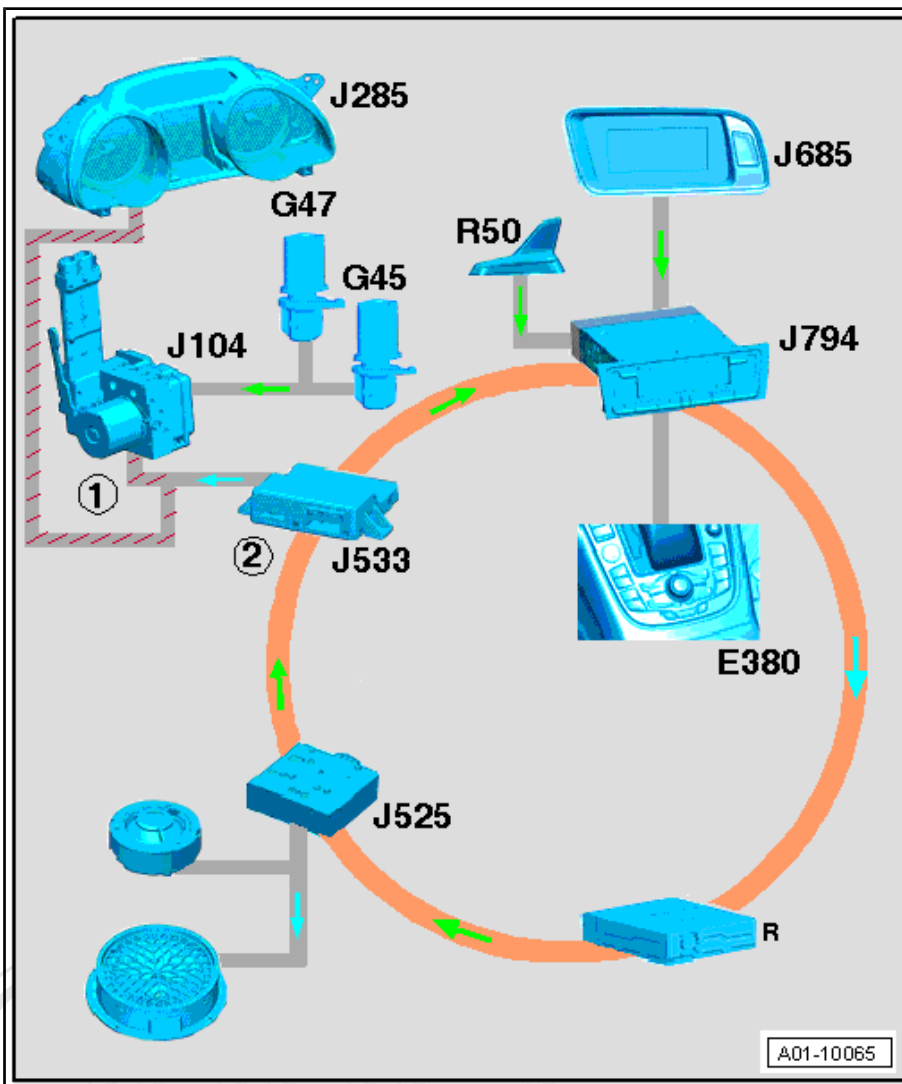
1.5 Components used in MMI (3rd generation)

As the individual vehicle systems are networked, the navigation system uses a large number of different control units.

These control units communicate with each other across different types of bus. The data bus diagnostic interface -J533-, which is connected to all the different bus versions, prepares and transmits the data to the corresponding control unit.

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- Control unit in dash panel insert -J285-
 - ABS control unit -J104-
 - Front left speed sensor -G47-
 - Front right speed sensor -G45-
 - Data bus diagnostic interface -J533-
 - GPS aerial -R50-
 - Control unit 1 for information electronics -J794-
 - Display unit for front information display and operating unit control unit -J685-
 - Multimedia system operating unit -E380-
 - Radio -R-
 - Digital sound package control unit -J525-
- 1 - Running gear/instrument cluster CAN
2 - MOST bus



Note

The onboard supply control unit -J519- and gear detector switch -F208- are required in addition for vehicles with a manual gearbox in order to detect the direction of travel. The multifunction switch -F125- and automatic gearbox control unit -J217- are required in order to detect the direction of travel on vehicles with an automatic gearbox.

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Note

The rear right speed sensor -G44- and rear left speed sensor -G46- are required in addition on vehicles with four-wheel drive.

2 Function - Satellite navigation

2.1 General notes, components used

The navigation control unit and GPS aerial -R50- are required for pure "satellite navigation". Vehicle-specific data are not required or evaluated.

2.2 Description

Each time the navigation control unit is switched on, it attempts to receive satellite signals over the GPS aerial -R50- .

The system must be receiving 4 satellites in order to determine the exact position. Only then can the receiver's position be calculated everywhere on the earth's surface.

The satellites transmit an identification code, their position and an ultra-accurate time signal towards the earth at intervals of one millisecond. The GPS receiver in the navigation control unit receives the satellite data over the GPS aerial -R50- . The navigation control unit calculates the length of time taken to transfer the data by comparing the time signal with the signal from its own ultra-accurate clock.

Once the navigation computer has received data from at least 4 satellites, it can calculate the position of the vehicle.

2.3 Notes for service

Pure satellite navigation is not possible whenever there is no satellite reception, for example if the GPS aerial -R50- is defective or the vehicle is driving through a tunnel.

On 2nd generation MMI systems, information about the satellites being received and the status of the GPS aerial -R50- can be read out on the navigation control unit via measured value block 5.



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The number of satellites received can also be displayed on the MMI. To do this, press the NAV-Info button while the navigation function is active. The number of satellites currently being received will appear at the top or bottom of the screen (depending on which generation of MMI is installed).

After a cold start, it can take up to 10 minutes to receive valid GPS data, depending on the current location.

The navigation systems fitted in Audi vehicles use the "vehicle navigation" function whenever possible.

3 Function - Dead reckoning navigation

3.1 General notes, components used

For navigation according to the dead reckoning principle, the navigation control unit with gyro module, GPS aerial -R50- , ABS control unit -J104- and its connected front right speed sensor -G45- and front left speed sensor -G47- are required.

Using the dead reckoning principle, it is possible to continue navigating temporarily even if no GPS signals are received.



Note

The rear right speed sensor -G44- and rear left speed sensor -G46- are required in addition on vehicles with four-wheel drive, because the speed signal is taken from all driven wheels.

3.2 Description

Audi navigation systems use the distance pulse count from the speed sensors to navigate according to the dead reckoning principle.

The ABS control unit -J104- calculates the pulse count from the front axle, based on the signals from the front right speed sensor -G45- and front left speed sensor -G47- and transmits the result across the instrument cluster/running gear CAN bus.

The signals from the rear right speed sensor -G44- and rear left speed sensor -G46- are evaluated in addition on vehicles with four-wheel drive.

The data bus diagnostic interface -J533- reads the information from the instrument cluster/running gear CAN bus and transmits it across the MOST bus to the navigation control unit.

A gyro module, which detects rotational movements, is integrated in the navigation control unit and used to determine the direction of travel. The dead reckoning function calculates the position as a function of the interaction between the »speed« and »rotational movement«.

3.3 Notes for service

When the navigation function is started, a GPS signal must be available in order to determine the current position of the vehicle.

Dead reckoning navigation is not possible unless the position has been determined beforehand by means of »satellite navigation«.

Information on the required components can be read out on the navigation control unit via the following measured value blocks:

MMI (2nd generation)	MMI (3rd generation)
◆ Measured value block 19 Travel pulses ◆ Measured value block 4 Speed ◆ Measured value block 9 Gyro module	◆ Measured value block 96 - Speed ◆ Measured value block 101 - Gyro module

The navigation systems fitted in Audi vehicles use the »vehicle navigation« function whenever possible.

4 Function - Vehicle navigation

4.1 General notes, components used

All components of the »satellite navigation« and »dead reckoning navigation« functions are required for vehicle navigation.

The radio -R- is required in addition for dynamic navigation. All the data from the components of the »satellite navigation« and »dead reckoning navigation« functions are used on the navigation control unit in order to determine the current position.

To increase the accuracy, the calculated route profile is compared several times per second with the road maps stored on the CD, DVD or hard disk (map matching).

4.2 Description

The desired route is entered using the optional speech control system or the control buttons of the multimedia system operating unit -E380- , which is connected to the navigation control unit via a serial interface.

The road map stored on CD, DVD or hard disk is used to determine the position of the travel destination.

The navigation control unit calculates the current position from the satellite data received over the GPS aerial -R50- . A coaxial cable is routed from the GPS aerial to the rear panel of the navigation control unit.

The position of the vehicle is determined accurate to +/- 5 m based on dead reckoning navigation and map matching (comparison with the digital map data).

The radio -R- receives the TMC signal via the RDS channel on the FM waveband. The radio -R- transmits this information across the MOST bus to the navigation control unit.

The navigation control unit evaluates the TMC information and calculates the route, direction of travel, changes in direction, etc.

These digital route recommendations are prepared by the navigation control unit for visualisation, and are then output on the display unit for front information display and operating unit control unit -J685- , which is connected directly.

The route recommendations can also be displayed via the control unit in dash panel insert -J285- . The navigation control unit makes the route recommendations available on the MOST bus for this purpose. The data bus diagnostic interface -J533- transmits the route recommendations to the control unit in dash panel insert -J285- across the instrument cluster/running gear CAN bus.

The digital sound package control unit -J525- outputs the spoken navigation directions on the connected speakers. The navigation control unit then transmits the information for audio output across the MOST bus to the digital sound package control unit -J525- .

The values for »distance pulse count« and »change of direction« received from the dead reckoning function are used to calculate the distance travelled.

Different procedures are used to detect reverse gear on manual and automatic vehicles.

Reverse gear detection on vehicles with manual gearbox:

The gear detector switch -F208- is actuated when reverse gear is engaged. The onboard supply control unit -J519- detects that reverse gear has been engaged based on the resistance coding

of the switch and places the »reverse gear« information on the data bus.

Reverse gear detection on vehicles with automatic gearbox:

When the selector lever is operated, the multifunction switch - F125- requests the gearbox to engage reverse gear. When reverse gear has been engaged, a feedback message is transmitted to the automatic gearbox control unit -J217- . The control unit transmits the »reverse gear« message across the data bus.

This message is forwarded across the MOST bus by the data bus diagnostic interface -J533- and is subsequently evaluated by the navigation control unit. The navigation control unit can thus detect whether the vehicle is moving forwards or backwards.

The system checks continuously whether the route recommendations have been followed. The driver is notified if the recommended route has not been followed. The route to the destination is recalculated if the driver stays on the alternative route.

If the navigation control unit receives TMC information related to the route during navigation, the route is recalculated based on the traffic information. Traffic jams or roadworks on the route are shown as symbols on the display unit for front information display and operating unit control unit -J685- . Traffic jams, roadworks, etc. which are not directly on the route are displayed as grey symbols.

The system outputs the cue "You have reached your destination" when the vehicle arrives at the route destination.

4.3 Notes for service

This note applies to 2nd generation MMI systems only if a navigation system with CD drive control unit -J401- is installed.

When a navigation DVD is inserted, the system always checks whether the software on the DVD matches the software on the control unit.

If the software is not identical, the software is flashed from the DVD onto the navigation control unit, regardless of whether the software on the DVD is older or newer.

This procedure is necessary in order to prevent errors from occurring during navigation because of the close connection between the software on the DVD and the navigation database.

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