

MODEL 164.1

as of Model Year 09 /Modification Year 08 model refinement package
with CODE (220) PARKTRONIC

MODEL 164.8, 251.0 /1

as of Model Year 09 /Modification Year 08
with CODE (220) PARKTRONIC

General function requirements

- Circuit 15 On

PARKTRONIC, general

The PARKTRONIC system is an ultrasonic measuring program with which the distance of the vehicle to an obstacle can be measured. It assists the driver when parking and in maneuvering situations at speeds of $v < 16$ km/h.

The distance between the vehicle and the obstacle is indicated to the driver visually and acoustically.

Additional function requirements for self-test

- Drive position engaged
- Parking brake not operated

i The engaged gear range is sent by the intelligent servo module for DIRECT SELECT (A80) to the central gateway control unit (N93) over the engine compartment CAN and then forwarded over the interior CAN to the PTS control unit (N62).

The parking brake inspection switch (S12) is read in by the front SAM control unit (N10) and forwarded over the interior CAN to the PTS control unit.

Self-test function sequence

The PTS control unit carries out a self-test after the ignition (circuit 15 ON).

The following components are checked for proper operation:

- PTS control unit
- PTS warning indicator, driver side dashboard (A44/1)
- Rear dome lamp PTS warning indicator (A44/3)
- Outer left front PTS ultrasonic sensor (B8/1)

In the event of a system malfunction or a system error the PARKTRONIC is deactivated and the LED in the PTS OFF switch (N72/1s8) (model 164 without code (430) Off-road package, model 251) goes on or a warning message is shown on the instrument cluster (A1) (model 164 with code (430) Off-road package).

The following states can be recorded:

System malfunction:

A system disturbance can be caused by a temporary external disturbance (e.g. a jackhammer on a construction site, a steam jet or by driving through a washing facility).

If a system disturbance occurs during operation, this is indicated by illumination of the red LED in each affected warning indicator.

Additional function requirements for activation and deactivation

- Self-test completed successfully
- Parking brake not operated

Activate and deactivate function sequence

PARKTRONIC is automatically activated when circuit 15 is switched on. The warning indicators are actuated to a certain degree of brightness depending on the ambient brightness. The intensity of the ambient brightness is sent by the rain/light sensor (B38/2) to the overhead control panel control unit (N70) and forwarded from there over the interior CAN to the PTS control unit. At "night" the warning indicators are actuated at 30 % brightness. During the "day" the warning indicators are actuated at 100 % brightness.

i The Parktronic system (PTS) is always reactivated even if it was manually deactivated during the last journey.

i Due to the principle on which it operates (transmission and reception of sound waves), PARKTRONIC cannot function properly in certain situations. So it can occur that incorrect values are displayed when an obstacle which absorbs a lot of sound is approached (e.g. a vehicle covered by snow).

PARKTRONIC comprises the following subfunctions:

- **Self-test function sequence**
- **Activate and deactivate function sequence**
- **Function sequence for reverse travel**
- **Function sequence for forward travel**
- **Rolling backwards on a slope function sequence**

- Center left front PTS ultrasonic sensor (B8/2)
- Inner left front PTS ultrasonic sensor (B8/3)
- Inner right front PTS ultrasonic sensor (B8/4)
- Center right front PTS ultrasonic sensor (B8/5)
- Outer right front PTS ultrasonic sensor (B8/6)
- Outer right rear PTS ultrasonic sensor (B8/7)
- Inner right rear PTS ultrasonic sensor (B8/8)
- Inner left rear PTS ultrasonic sensor (B8/9)
- Outer left rear PTS ultrasonic sensor (B8/10)
- All PARKTRONIC electrical lines

All the warning indicator light emitting diodes (LED) are fully actuated for $t = 1$ s following the self test. If there are no malfunctions or faults present, the two yellow horizontal standby LEDs of the two warning indicators illuminate at reduced brightness.

The PTS control unit performs further self-tests at regular intervals. The PTS control unit distinguishes between a system malfunction and a system fault.

If a system disturbance is present for an extended period of time, the cause of the system disturbance is identified during driving operation by means of a self-test. If the system disturbance is still present, this is interpreted as a system fault.

System fault(s)

A system fault can have the following causes:

- Defective component
- Fault in communication via interior CAN
- Overvoltage or undervoltage

If a system error is detected the red LED of the warning indicator in question is actuated. A warning tone is also emitted for $t = 2$ s. After a further $t = 20$ s the PARKTRONIC shuts down and a fault is written to the fault memory of the PTS control unit.

When driving, the PARKTRONIC system switches into standby mode between $v = 40$ km/h and $v = 16$ km/h i.e. the PTS control unit, warning indicators and distance sensors are supplied with voltage but they are not yet actuated.

Model 164 without code (430) Off-road package, model 251:

The PARKTRONIC system can be manually deactivated or activated again using the PTS OFF switch. Actuation of the PTS OFF switch is transmitted by the upper control panel control unit (N72/1) to the PTS control unit via interior CAN.

Model 164 with code (430) Off-road package:

Because these vehicles are not equipped with a PTS OFF switch, deactivation or activation can only be performed via the "PARKTRONIC" menu in the instrument cluster. The instrument cluster forwards the PARKTRONIC status over the interior CAN to the PTS control unit.

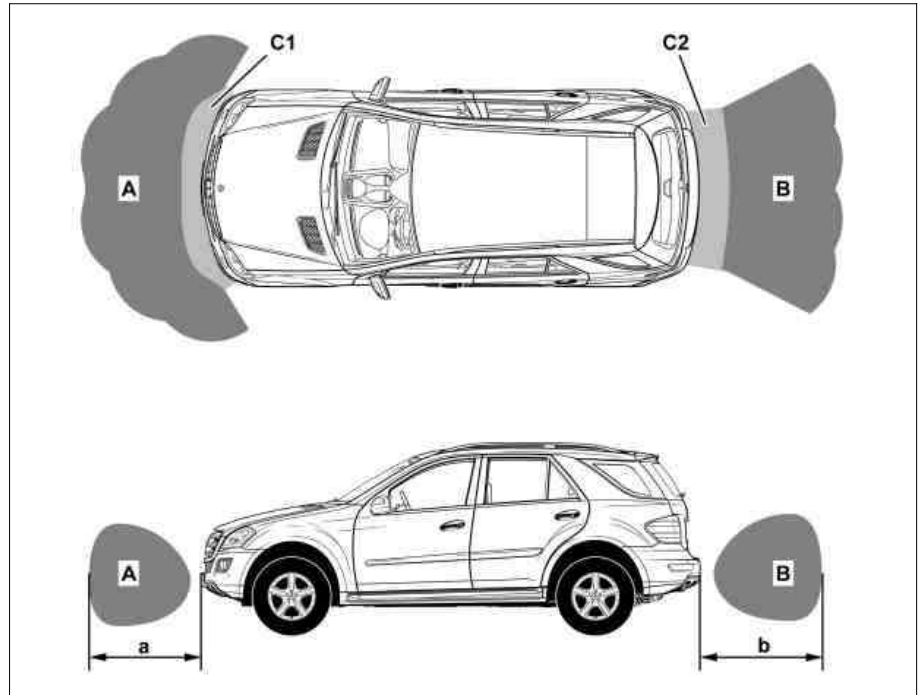
If the PARKTRONIC has been deactivated the LED in the PTS OFF switch goes on or a warning message is shown on the instrument cluster (model 164 with code (430) Off-road package).

Illustration of monitoring range on model 164.1

During reverse travel the areas (A and B) in front of and behind the vehicle are monitored. Area A in front of the vehicle is monitored when driving forward.

The range in front of the vehicle is maximum $s = 100$ cm (a), behind the vehicle maximum $s = 120$ cm (b).

If the distances are less than $s = 20$ cm (C1, C2), PARKTRONIC does not receive any more defined values due to technological limitations.



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i The outer left front ultrasonic sensor and outer right front ultrasonic sensor are used for protecting corners in the swivel range of the vehicle front. A minimum distance of $s = 15$ cm applies to the monitored range at these locations and it is implemented by means of software. Sensors are not installed for corner protection in the swivel range of the vehicle at the rear because these areas can be viewed using the outside mirrors.

i To facilitate differentiation of the acoustic warning signals issued by the two warning indicators, the driver-side instrument panel PTS warning indicator outputs a higher tone. The rear dome lamp PTS warning indicator outputs a lower tone.

Additional function requirements for reverse travel

- No trailer operation

Function sequence for reverse travel

When the reverse gear is engaged, the PARKTRONIC system switches to measuring mode. The area in front of and behind the vehicle is monitored.

The "reverse gear engaged" data is sent by the intelligent servo module for DIRECT SELECT over the engine compartment CAN to the central gateway control unit. This forwards information over the interior CAN to the PTS control unit.

If obstacles are detected in front of or behind the vehicle, the driver is first alerted visually by illumination of the corresponding display elements in the warning indicators. When the range drops below a distance $s < 30$ cm, the warning is emitted initially as an intermittent tone and then as a continuous signal (see table below).

i If a trailer (with code (550) Trailer hitch) is recognized by the rear SAM control unit (N10/8) the monitoring area at the rear is automatically deactivated during reverse travel.

Additional function requirements for forward travel

- $v < 16$ km/h
- Gear range "D" engaged

Additional function requirements for rolling backwards on a slope

- Reverse gear not engaged

Function sequence for forward travel

When the vehicle drops below the lower limit speed of $v < 16$ km/h, the PARKTRONIC changes to measurement mode. The area in front of the vehicle is monitored.

The gear range data is sent by the intelligent servo module for DIRECT SELECT over the engine compartment CAN to the central gateway control unit. This forwards information over the interior CAN to the PTS control unit.

If obstacles are detected in front of the vehicle, the driver is first alerted visually by illumination of the corresponding display elements in the warning indicator. When the range drops below a distance $s < 30$ cm, the warning is emitted initially as an intermittent tone and then as a continuous signal (see table above).

If a vehicle speed of $v = 18$ km/h is exceeded, PARKTRONIC returns to standby mode.

Rolling backwards on a slope function sequence

When the reverse gear is not engaged, the rear area of the vehicle is not monitored. If the vehicle rolls backwards, there is a risk that the vehicle might hit an obstacle without previous warning. To prevent this, the rear monitoring range is automatically activated over a distance of $s = 15$ cm if the vehicle rolls backwards. If the vehicle approaches an obstacle, an appropriate warning message is output (see following tables).

The ESP control unit (N47-5) records the speeds and the direction of rotation for the individual wheels over the following sensors:

- Left front rpm sensor (L6/1)
- Right front rpm sensor (L6/2)
- Left rear rpm sensor (L6/3)
- Right rear rpm sensor (L6/4)

The information is forwarded over the engine compartment CAN to the central gateway control unit, which then sends it over the interior CAN to the PTS control unit.

Warning messages in the front monitoring range on the driver-side instrument panel PTS warning indicator


Warning messages in front monitoring range

PTS warning indicator, driver side instrument panel

Warning message	Display element	Warning chime	Distance (cm)	
			Ultrasonic sensors (outer front)	Ultrasonic sensors (center front/inside)
Visual	1 (yellow)	-	-	< 100
	2 (yellow)	-	-	< 80
	3 (yellow)	-	< 60	< 65
	4 (yellow)	-	< 50	< 50
	5 (yellow)	-	< 40	< 40
optical and acoustical	6 (red)	Intermittent tone with f = 6 Hz	< 30	< 30
	7 (red)	Continuous signal	< 15	< 20

Warning messages in the rear monitoring range on the rear dome lamp PTS warning indicator

Warning message	Display element	Warning chime	Distance (cm)	
			Ultrasonic sensors (outer rear)	Ultrasonic sensors (center rear/inside)
Visual	1 (yellow)	-	-	< 120
	2 (yellow)	-	-	< 95
	3 (yellow)	-	< 80	< 75
	4 (yellow)	-	< 55	< 55
	5 (yellow)	-	< 40	< 40
optical and acoustical	6 (red)	Intermittent tone with f = 6 Hz	< 30	< 30
	7 (red)	Continuous signal	< 20 (without code (849) Spare tire holder/ spare tire and without code (550) Trailer hitch)	< 20 (without code (849) Spare tire holder/ spare tire and without code (550) Trailer hitch)
			< approx. 28 (with code (849) Spare tire holder/ spare tire or with code (550) Trailer hitch)	< approx. 28 (with code (849) Spare tire holder/ spare tire or with code (550) Trailer hitch)

	PARKTRONIC location of components	Model 164 Model 251	GF54.65-P-0003-01GM GF54.65-P-0003-01GV
	Electrical function schematic for PARKTRONIC	Model 164 Model 251	PE54.65-P-2053-97MAA PE54.65-P-2053-97RAA
	PARKTRONIC block diagram		GF54.65-P-0003-02GM
	Instrument cluster, component description	A1	GF54.30-P-6000GM
	Intelligent servo module for DIRECT SELECT, component description	A80	GF27.19-P-4020AHZ
	Front SAM control unit, component description	N10	GF54.21-P-7010GM
	ESP control unit, component description	N47-5	GF42.45-P-5118GM
	PARKTRONIC control unit component description	N62 Model 164.1 Model 164.8, 251	GF54.65-P-5001GMA GF54.65-P-5001GM
	Overhead control panel control unit, component description	N70	GF82.20-P-5216GM
	Upper control panel control unit, component description	N72/1	GF54.21-P-6040GM
	Component description for the EZS control unit	N73	GF80.57-P-6003GM
	Central gateway control unit, component description	N93	GF54.21-P-4170GM