MODEL 212
as of model year 2014
with CODE 258 (Collision Prevention Assist)
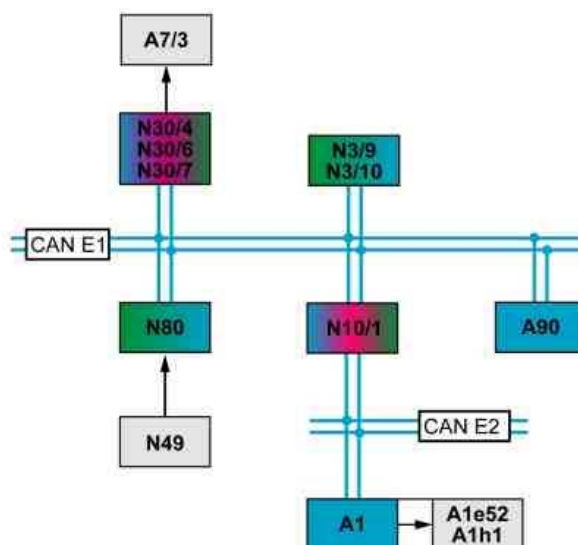
P30.30-2490-79

A1	Instrument cluster	N30/4	Electronic Stability Program control unit (except model 212.074/095/098/274/298, without code (233) DISTRONIC PLUS)
A1e52	COLLISION PREVENTION ASSIST warning lamp	N30/6	Regenerative braking system control unit (model 212.095/098/298)
A1h1	Warning buzzer	N30/7	Premium Electronic Stability Program control unit (except model 212.095/098/298, with code (233) DISTRONIC PLUS, model 212.074/274)
A7/3	Traction system hydraulic unit	N49	Steering angle sensor
A90	COLLISION PREVENTION ASSIST controller unit	N80	Steering column tube module control unit
N3/9	CDI control unit (with diesel engine)	CAN E1	Chassis CAN 1
N3/10	ME-SFI [ME] control unit (with gasoline engine)	CAN E2	Chassis CAN 2
N10/1	Front SAM control unit with fuse and relay module		

Function requirements, general

ℹ️ The units and values for the speed shown in the text should be assigned to the possible national versions. The details in "miles per hour (mph)" refer to vehicles with a miles indicator.

● COLLISION PREVENTION ASSIST coded in SAM control unit at the front
● No undervoltage or overvoltage
● COLLISION PREVENTION ASSIST activated in the "Assistance" menu of the instrument cluster
● Engine running or drivetrain operational
● Dirt and function test of the radar sensor in the COLLISION PREVENTION ASSIST controller unit completed successful
● Vehicle is not in backward movement

ℹ️ The CDI control unit or the ME-SFI [ME] control unit sends the signal "Engine running" or the "Drivetrain operational" signal via the chassis CAN 1 to the COLLISION PREVENTION ASSIST controller unit.

COLLISION PREVENTION ASSIST, general

The COLLISION PREVENTION ASSIST is a proximity warning system that warns the driver optically and acoustically about a possible collision (e.g. a rear-end collision) with an obstacle or with the vehicle driving immediately ahead. Output of these warnings takes place in a vehicle speed range of v = 7 km/h (v = 4 mph) up to the maximum speed of the vehicle. Control occurs by means of the COLLISION PREVENTION ASSIST controller unit.
The following components are integrated in the COLLISION PREVENTION ASSIST controller unit:

● Radar sensor
● Control unit

The COLLISION PREVENTION ASSIST also includes an emergency braking function. This assists the driver by calculating the necessary brake pressure in the hydraulic brake system so that this pressure is immediately available in the event of emergency braking.
Furthermore, autonomous emergency braking (emergency braking function in the event of a risk of a collision) is initiated if there is no response from the driver to the warning messages. A potential collision can thus be avoided or at least the resulting consequences can be reduced.
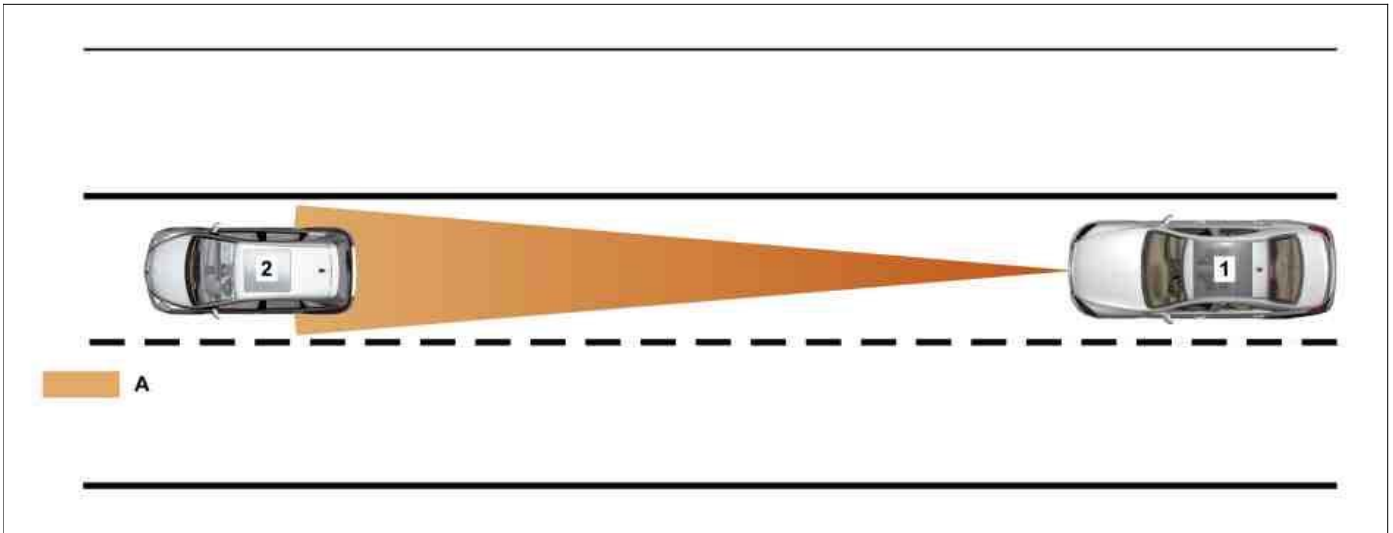
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Illustration of the principle of the detection area of the radar sensor system, shown on model 222

1   Vehicle, equipped with COLLISION PREVENTION ASSIST

2   The target vehicle (target object) moving directly ahead is detected by the radar sensor system

A   Detection area of the radar sensor system (up to s = 80 m, for a detection angle of about   (= 18° +/- 8°)

The COLLISION PREVENTION ASSIST comprises the following subfunctions:
● **Function sequence for collision warning**

COLLISION PREVENTION ASSIST function sequence
COLLISION PREVENTION ASSIST function is released manually over the operation level in the instrument cluster. The IC transmits the appropriate status via chassis CAN 2, the SAM control unit at the front and chassis CAN 1 to the COLLISION PREVENTION ASSIST controller unit. The COLLISION PREVENTION ASSIST controller unit performs a soiling and function test after every engine start.
The function test requires an object in the detection area of the radar sensor system which is used by the COLLISION PREVENTION ASSIST controller unit as a reference value. If malfunctions are established or if no function test is possible then the COLLISION PREVENTION ASSIST function cannot be activated.
Apart from data from the radar sensor, the COLLISION PREVENTION ASSIST controller unit also evaluates the following influencing factors:
● Direction of travel and vehicle speed
● Steering angle
Direction of travel and vehicle speed:
The direction of travel is determined over the wheel rotation direction of the wheels. The vehicle speed is calculated on the basis of the wheel speeds. The Electronic Stability Program control unit or the RBS control unit transmits this information via chassis CAN 1 to the COLLISION PREVENTION ASSIST controller unit.
Steering angle:
The steering angle sensor records the steering angle. The steering column tube module control unit directly reads in data from the steering angle sensor and transmits it to the COLLISION PREVENTION ASSIST controller unit via chassis CAN 1.

● **Function sequence for braking assistance**
● **Function sequence for autonomous emergency braking for collision avoidance**

The COLLISION PREVENTION ASSIST controller unit calculates the distance from the obstacle and the time up to a possible collision. The proximity warning system differentiates here between a static (without code (494) USA version) and a collision-critical distance warning.
Static distance warning (without code (494) USA version):
Output of the static distance warning takes place purely optically.
If the distance from the vehicle directly ahead goes below t = 0.8 s in flowing traffic and this critical distance is maintained for t > 3 s (e.g. at a speed of v = 100 km/h, distance about s = 22.2 m), the COLLISION PREVENTION ASSIST controller unit sends the request to output the warning via chassis CAN 1, the front SAM control unit and chassis CAN 2 to the instrument cluster. The instrument cluster reacts by actuating the COLLISION PREVENTION ASSIST warning indicator.
Collision critical distance warning:
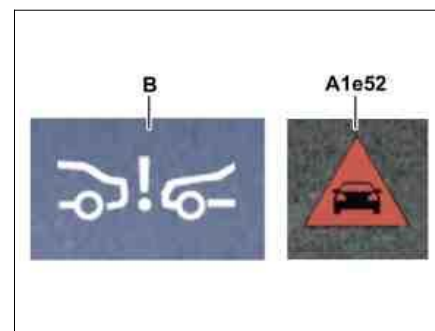Output of the collision-critical distance warning takes place optically and acoustically.
If an obstacle within the detection range of the radar sensor system is classified as accident-critical for a vehicle speed v > 7 km/h (v > 4 mph), the COLLISION PREVENTION ASSIST controller unit sends the request to output the warning via chassis CAN 1, the front SAM control unit and chassis CAN 2 to the instrument cluster, which reacts by activating the COLLISION PREVENTION ASSIST warning indicator. Furthermore the IC actuates the external warning buzzer (intermittent tone) directly.
The warning output cannot be acknowledged. Take-back of the warning only occurs if the situation has been defused.
Due warning of stationary obstacles is only given in a vehicle speed range v ≥ 7 to 72 (v ≥ 4 to 45 mph) .

Indication in the IC for an active AWS and currently present warning

A1e52   *COLLISION PREVENTION ASSIST warning lamp*
B   *Distance warning readiness indicator*

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Function sequence for braking assistance
If the driver then reacts to the collision-critical distance warning with an emergency braking maneuver, the Brake Assist System provides support for the best possible utilization of the braking distance to the obstacle.

Function requirements for autonomous emergency braking for collision avoidance

- Vehicle speed: v ≤ 30 km/h (v ≤ 19 mph) (for stationary obstacles) or v ≤ 72 km/h (v ≤ 45 mph) (for vehicles driving ahead)

[i] The system limits "Autonomous emergency braking for collision avoidance" are currently in consultation with the respective development area.

Function sequence for autonomous emergency braking for collision avoidance

To avoid a rear-end collision in the lower vehicle speed range (urban traffic, traffic jam), autonomous emergency braking is initiated in collision-critical situations (collision-critical distance warning active). To this end, the COLLISION PREVENTION ASSIST controller unit assesses the traffic events ahead of the vehicle and in the process permanently determines the risk potential for a rear-end collision. The first response to the distance warning is partial braking and, where required, emergency braking.

If the driver fails to react to the collision-critical distance warning, autonomous partial braking occurs. For this, the COLLISION PREVENTION ASSIST controller unit calculates the necessary braking torque, taking into account the following information:

[i] The hazard braking is defined over the actuation speed and the actuation strength with which the brake pedal is actuated.
The COLLISION PREVENTION ASSIST controller unit also uses data from the radar sensor and calculates the necessary brake servo assistance while taking account of the distance and the closing speed to the obstacle. The COLLISION PREVENTION ASSIST controller unit transmits the appropriate requests to the Electronic Stability Program control unit or the RBS control unit via chassis CAN 1, which actuates the hydraulic brake pressure over the traction system hydraulic unit. The PRE-SAFE function implemented in the Electronic Stability Program control unit or the RBS control unit evaluates the currently requested braking torque in parallel and implements appropriate measures if necessary. If there is no actuation or the intensity of actuation of the brake pedal by the driver reduces, the brake servo assistance on the driver braking is reduced and the Brake Assist System is deactivated. The Brake Assist System will also be deactivated if the driver presses the accelerator pedal.

- Relative speed to vehicle or obstacle
- Distance from vehicle or obstacle

The Electronic Stability Program controller unit transmits an appropriate brake request via chassis CAN 1 to the Electronic Stability Program control unit or the RBS control unit. The Electronic Stability Program control unit or regenerative braking system control unit reacts by actuating the traction system hydraulic unit directly.

If the driver then reacts to the autonomous partial breaking with emergency braking, the Brake Assist System provides support for the best possible utilization of the braking distance to the obstacle.

If the driver fails to react to the autonomous partial braking, the COLLISION PREVENTION ASSIST controller unit initiates autonomous emergency braking.

[i] If a collision is unavoidable, occupant protection measures are taken in addition to intervention by the brake system. More detailed information on the topic of occupant protection is available in the function PRE-SAFE.

	Electrical function schematic for COLLISION PREVENTION ASSIST		PE30.30-P-2058-97DAA
	Overview of system components for driver assistance systems		GF54.00-P-9998FLM