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Introduction

The E39 M5 is the third generation of BMW's successful 5 Series "sport sedans". It follows the E28 and E34 - M5s to become the most powerful BMW in series production. Subtle changes to the body design allow the M5 to retain the characteristics of the 5 series sedan while setting it apart as its own distinctive vehicle.

The M5 was designed and developed by BMW "M" division in Garching. However, the M5 is built on the production line at BMW's plant in Dingolfing. In the same manner, the S62B50 engine was also developed by "M" and is produced at the special engine plant in Munich.

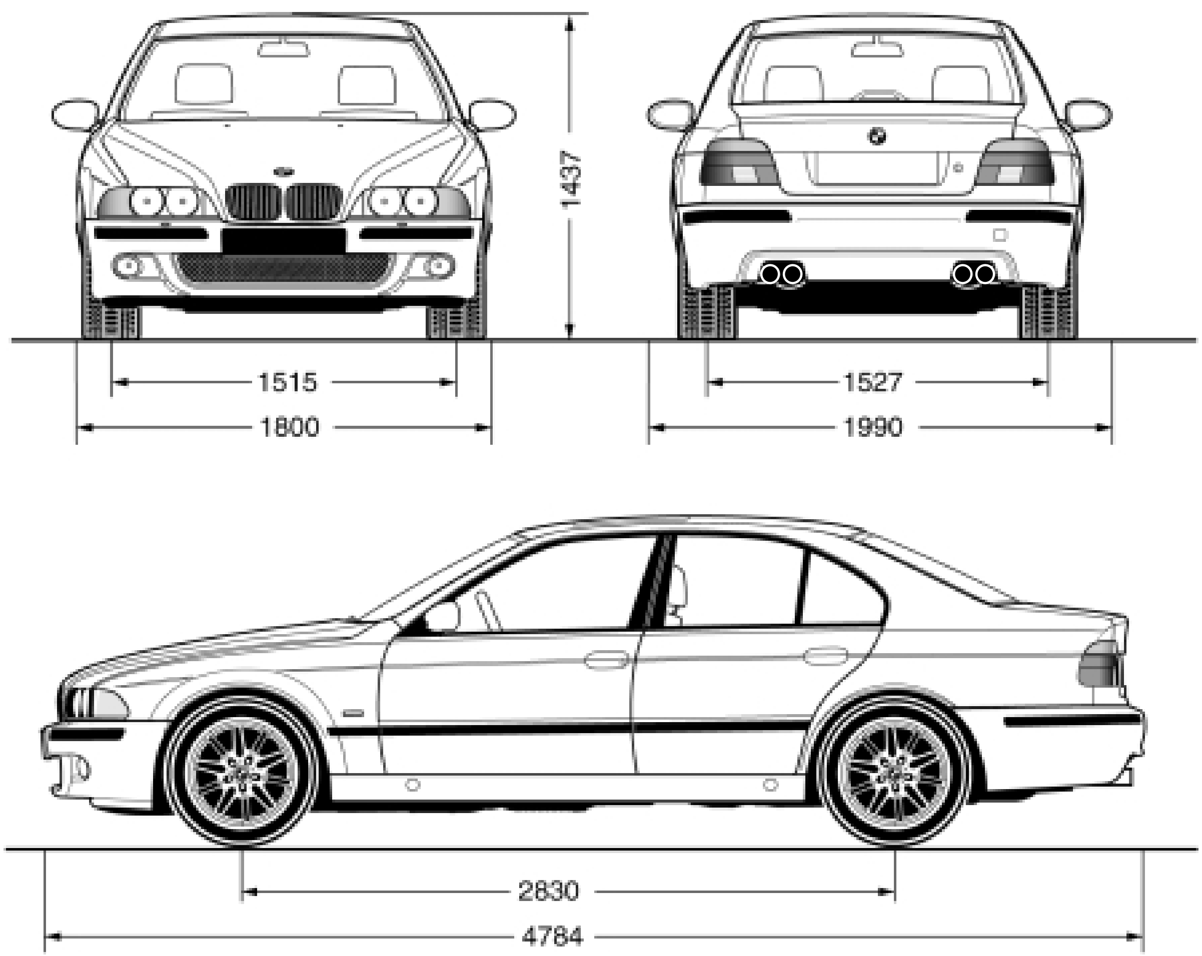
The M62B50 engine develops 400 horsepower at 6600 RPM and 500 Nm of torque at 3800 RPM. The transmission is the S6S420G - 6 speed that has been modified for use with the high performance engine. The rear axle has a 3.15 : 1 ratio with a 25% locking differential.

The suspension is taken from the E39 sedan with modifications and "M" sport tuning.

TECHNICAL DATA

The overall body dimensions of the M5 have changed compared to the E39 sedan as follows:

- The M5 is 10 mm longer than the E39 540i. This is due to the design of the license plate mounting brackets.
- The body height is increased by 2 mm over the E39 540i. This is due to the different wheels and tires used on the M5.
- The body width is the same as the E39 540i. However, the overall width is 9 mm wider due to the specific M sport mirror design.



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Technical Data		
	M5	**540i**
Length (mm)	4784	4775
Width Min/Max (mm)	1800/1990	1800/1981
Height (mm)	1437	1435
Cd	0.31	0.31
Turning Circle	11.6	11.1
Wheelbase (mm)	2830	
Track Width (mm) **Rear** **Front**	1517 1527	1512 1526
Unladen Weight (kg)	1790	1680
Gross Vehicle Weight (kg)	2290	2170
Trunk Capacity (l)	460	
Fuel Tank Capacity (l)	70 (18.5 US Gallons)	

Body

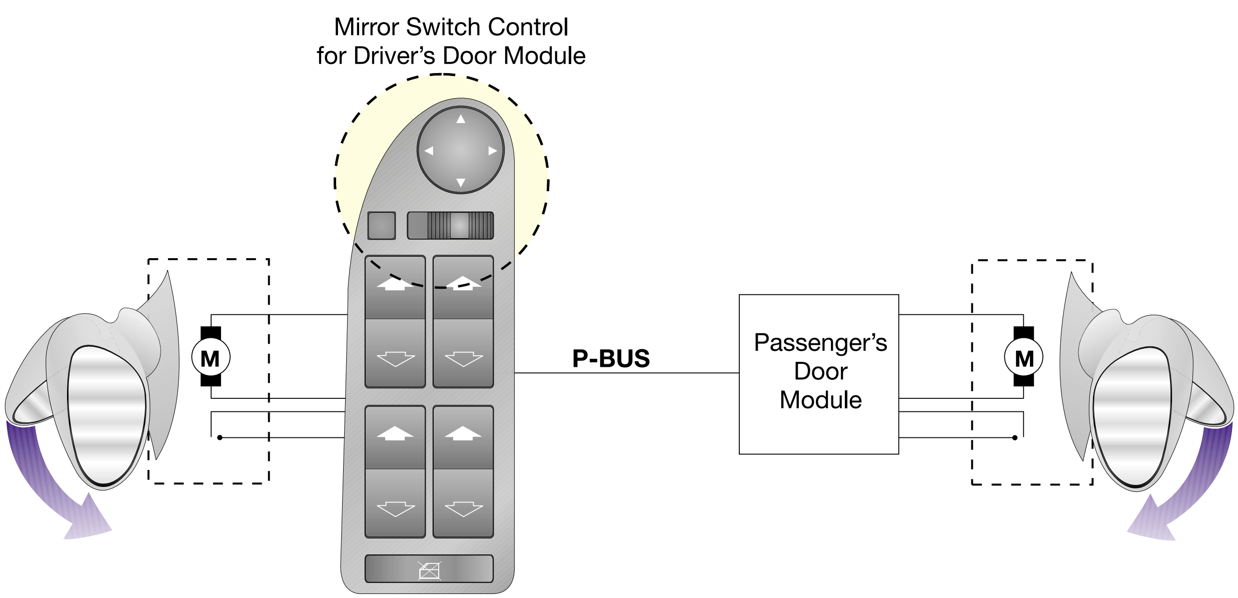
The basic E39 body shell was modified for the M5 with reinforcement plates and stronger support brackets for the engine, transmission and suspension components.

The major changes to the body of the M5 include the front and rear spoilers as well as the mirrors. The front spoiler incorporates the air intake for the engine which creates a venturi effect while driving. This serves to increase the down force on the front of the vehicle.

The four tail pipe extensions (a “M” feature for all current and future ”M” vehicles) highlight the rear of the body along with the rear spoiler which also serves to limit the amount of lift.

Mirrors

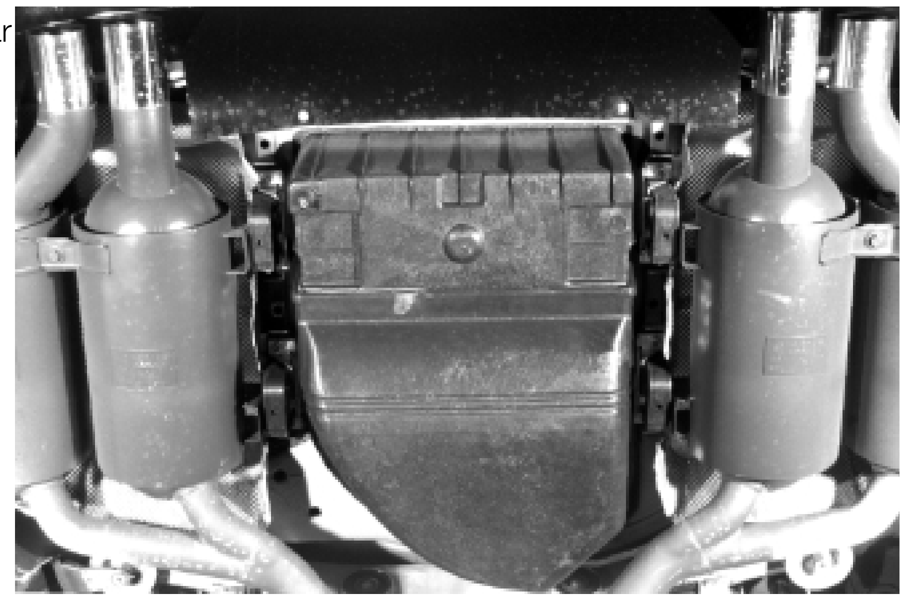
The aero style mirrors are specifically designed for use on the M5. A new feature being introduced for the US market is the ability to fold the mirrors up electrically. The motor drive for folding the mirrors is controlled through the door module. A push button switch is installed in the mirror adjusting switch, which when pressed will cause the mirrors to swing up vertically.



Trunk

The trunk of the M5 is redesigned due to the exhaust system of the vehicle. The rear mufflers prevent the inclusion of a a spare tire well so the M5 will be fitted with the “M” mobility system.

The center of the trunk floor is constructed from a plastic insert that houses the battery and the “M” mobility tank. The battery box incorporates a break - away housing that will cause the battery to move forward in the event of a rear end collision.



The battery is mounted, in the trunk, close to the rear bumper for weight distribution.

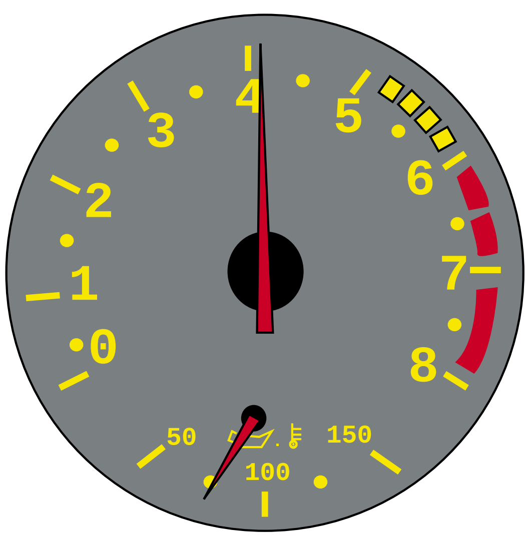
Battery Specs:
170Ahr
790 CCA
210A - RC

Interior

The electric power, sport seats are designed specifically for the M5. The seats include the memory function for the driver as well as the two stage lumbar support.

Tachometer

The tachometer incorporates a warm up RPM warning through the use of LEDs. Starting at 4000 RPM, orange LEDs are illuminated with a cold engine start up. The LEDs will go out, in 500 RPM increments, as the engine warms up. the last orange LED at 6500 RPM will remain illuminated. The MS S52 engine control system monitors the engine oil temperature and signals the instrument cluster over the CAN line for illumination of the LEDs.

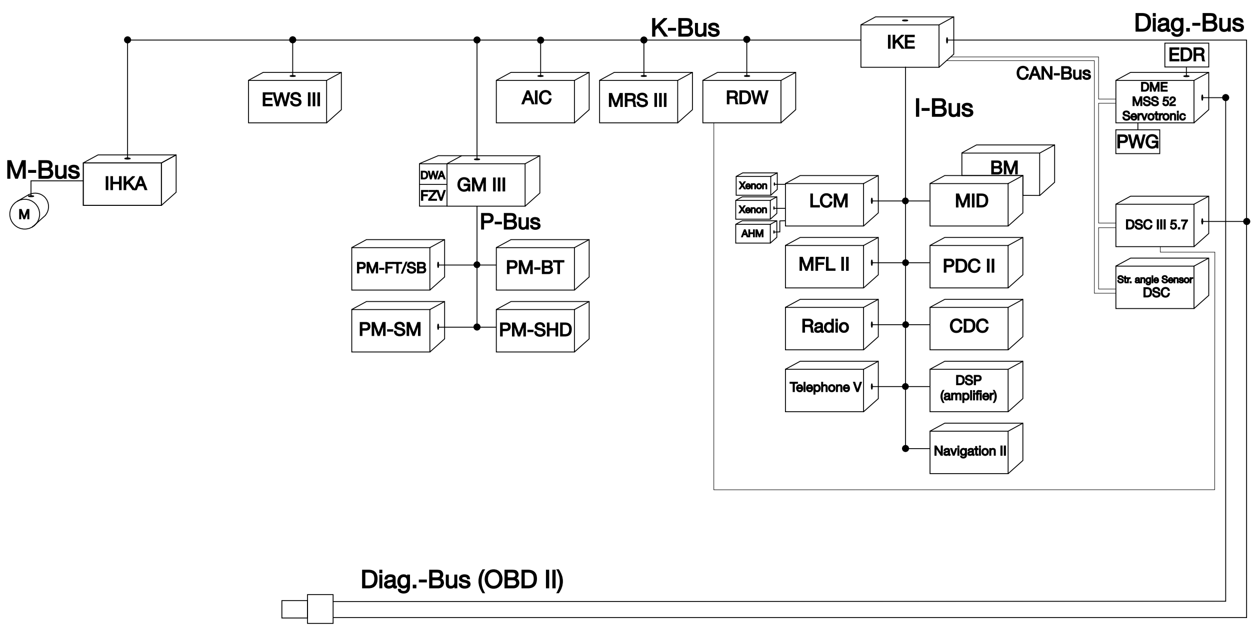


Vehicle Electronic Systems

The electrical system of the M5 is similar to the E39 high version. It includes the following systems:

- Central Body Electronics (ZKE III)
- IHKA
- MRS III
- Rain Sensor System (AIC)
- Driver Information systems - IKE - LCM - MFL II - MID/NAV - PDC II - DSP
- DSC III
- EWS III

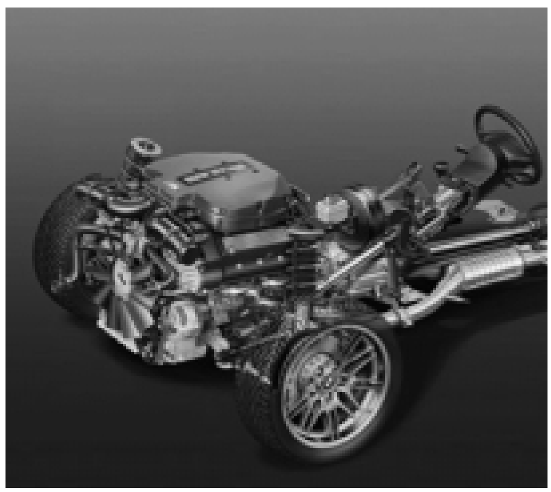
A new tire pressure warning system (RDW) is being introduced with the M5. Operation of this system is covered later on in this hand out.



Front Suspension

The front suspension is the double pivot design carried over from the 540i with the following modifications:

- The carrier is reinforced in the area of the steering gear and body mounts.
- The thrust bushings are reinforced compared to the 540i.
- The stabilizer bar is larger in diameter (27 mm).
- The front wheel bearings have been specifically designed for the M5.
- Springs and shocks are specifically tuned for the M5 driving dynamics.
- The servotronic steering incorporates two different control programs to match the two different driving programs of the MS S52 control system.



Rear Suspension

The rear suspension is the integral - link design carried over from the E39 540i with the following modifications:

- The lower control arm is taken from the E39 sport wagon.
- The integral link is taken from the E38 - 750iL axle in order to absorb the higher braking forces.
- The springs and shocks are specifically tuned for the driving dynamics of the M5.
- The suspension mounting bushings are reinforced to improve wheel control.
- A 25% locking differential is used with a final drive ratio of 3.15 : 1.
- The final drive cover incorporates the differential breather and cooling fins.

Alignment points on the rear suspension are the same as the E39 sedan with camber adjustments on the upper link and toe-in adjustments on the lower control arm eccentric.

Brakes

The brake system on the M5 was designed specifically to meet the stopping requirements of the S62B50 engine. The vacuum booster is carried over from the E39 540i. Single piston calipers are used on both the front and rear. Vented brake rotors are used on both the front and rear axles.

Front Rotors:
- 345 mm diameter
- 32 mm thickness

Rear Rotors:
- 328 mm diameter
- 20 mm thickness

Wheels/Tires

New design 18” alloy wheels are installed on the M5. Eight inch wheels are installed on the front while nine and one-half inch wheels are on the rear. The rims feature an asymmetrical double hump that prevents the tire from slipping off the bead in the event of a loss of tire pressure.

Front Tires:

- 8J x18 AH2 IS20/245/40 ZR 18

Rear Tires:

- 9.5J x 18AH2 IS22/275/35 ZR 18

TIRE PRESSURE WARNING SYSTEM (RDW)

The Tire Pressure Warning System (RDW) is being introduced for the US market on the new E39 M5. RDW is the German acronym for “*Reifen Druck Warnen”* and it follows the tire pressure control system (RDC) that has been in use in other markets for several years. The RDW and RDC systems will eventually be linked to the run flat tires as a means of warning the driver of pressure losses in the tires.

Experience has shown that the majority of owners are unaware that the owner’s manual recommends that the inflation pressure be checked at 14 day intervals. The RDW system will aid in this by warning the driver of pressure losses in one or more of the tires.

Consequences of incorrect inflation pressures result in:

- Increased tire wear
- Reduced service life of the tires
- Impaired vehicle handling
- Increased risk of punctures due to worn tread

Overview

The RDW is a simple system that will warn the driver of pressure losses in one or more of the tires through the “Check Control” display.

The system measures the wheel speeds of all four tires and compares the speed of the diagonal wheels for the average speed. A rolling circumference value is calculated from the wheel speeds and this value is stored in the control module.

In the event of pressure loss, the rolling circumference of the affected tire is reduced . With this, the wheel speed of the tire increases and the control module will detect the change and post the warning in the Check Control matrix display.

An additional acoustical warning is sounded if the pressure loss is greater than 40%.

The tire pressure warning system is switched “ON” every time the ignition is switched “ON” and it can be switched OFF with the button on the lower dash to the right of the steering column.

NOTE: The system can only react to the pressures in the tires when the system is initialized, it cannot check for the correct inflation pressure.

System Components

The tire pressure warning system consists of the following components:

DSC III Control Module / Wheel Speed Sensor

The four wheel speed sensor inputs are processed by the DSC control module and four dedicated square wave output signals are provided to the RDW control module for its processing functions.

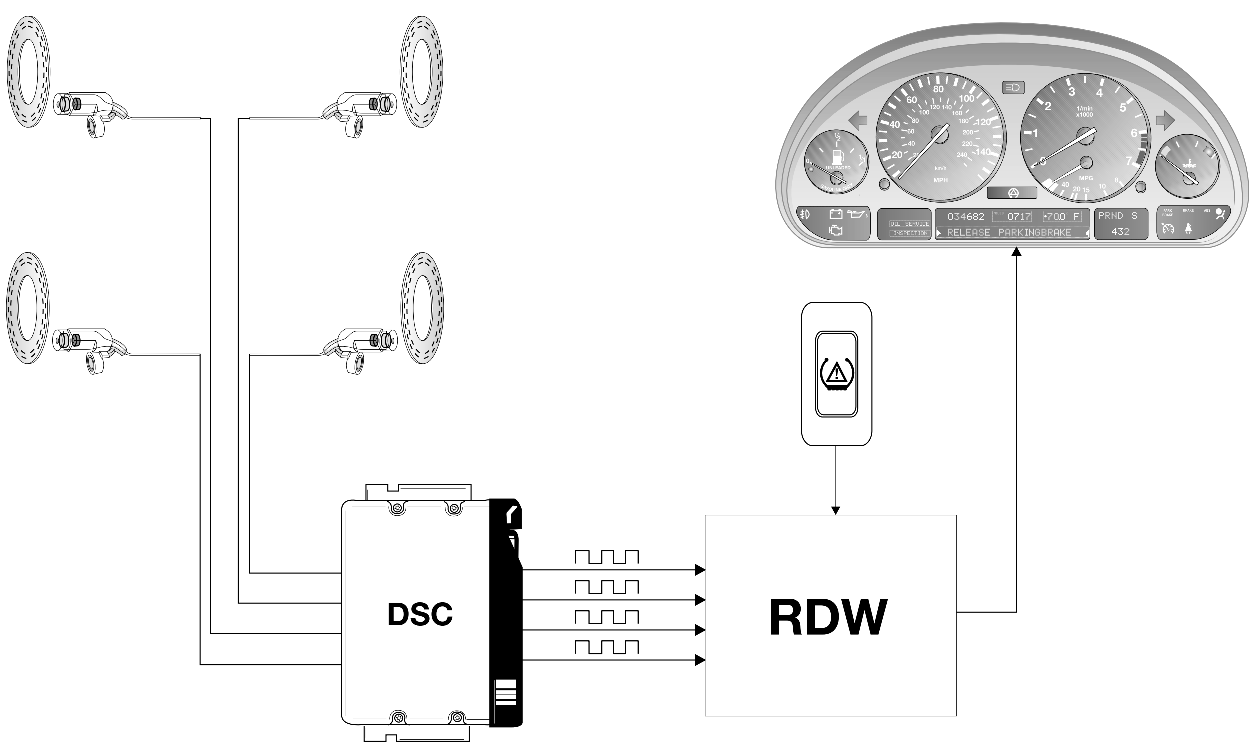
RDW Control Module

The RDW control module is located behind the glove box in the control module carrier. in addition to the four wheel speed signals, the module receives power (KL 15), ground (KL 31) and a ground signal input from the set/push button switch in the console.

The control module is connected to the K-Bus for:

- Output display in the check control matrix
- Diagnostic communication through the instrument cluster with the DISplus tester or MoDiC

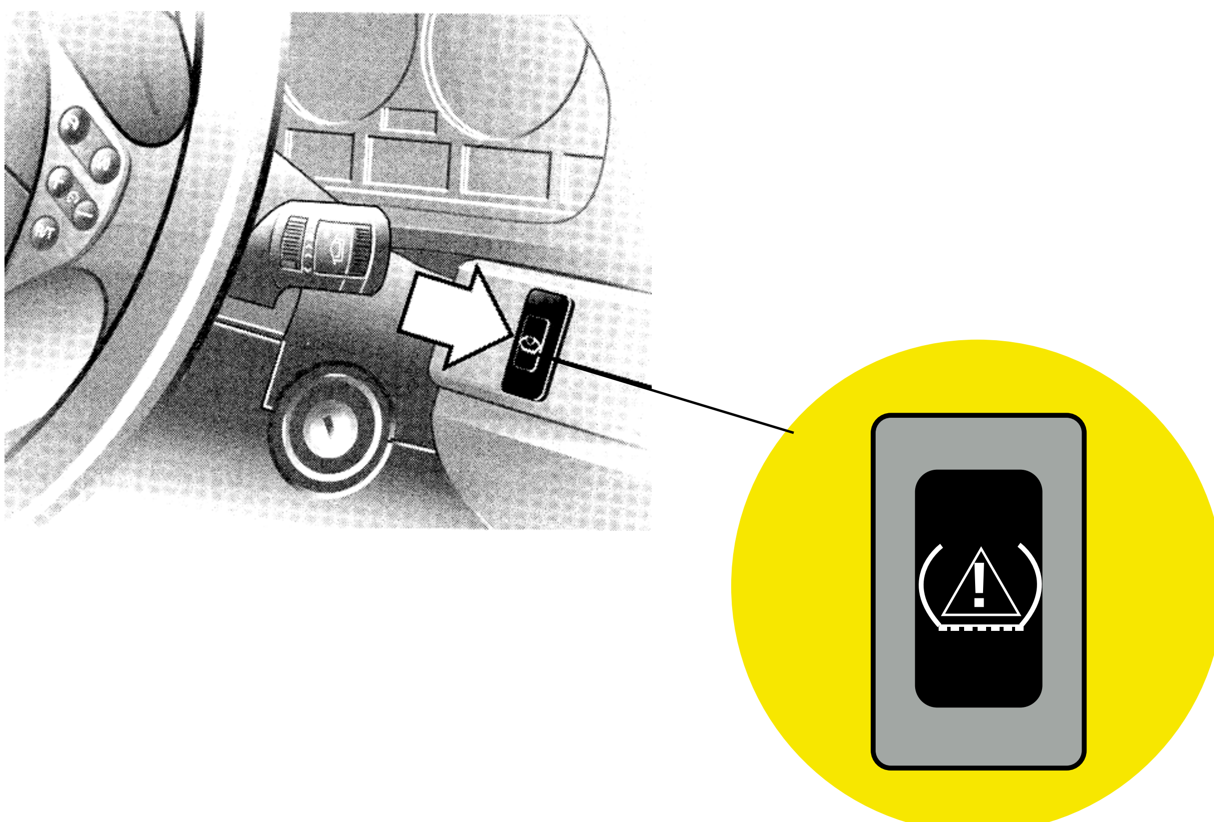
The control module processes the wheel speed signals and stores rolling circumference values for determining pressure losses in one or more tires.



Set/Push Button Switch

The push button (with tire failure symbol) is mounted below the instrument cluster to the right of the steering wheel. The push button is used to carry out the following functions:

- Initialization of the system - after changing inflation pressures or tires.
- Switching the RDW system OFF - After switching the ignition switch ON, briefly press the button “TIRE MONITORING INACTIVE” will be displayed in the matrix.
- Self diagnosis of the control module (only for manufacturing purposes) - however if the push button is pressed and held while switching the ignition ON, “TIRE PRESSURE INACTIVE” will be displayed in the matrix.



Check Control Display

The check control display is used to show the operating status of the RDW system. The displays are as follows:

- "TIRE PRESSURE FAILURE" - (with an acoustic warning) this display will remain active until the ignition is switched OFF.
- "TIRE PRESSURE SET" - Will be displayed when the system is put into the initialization mode.
- "TIRE MONITORING INACTIVE" - Will be displayed when the system is manually switched OFF or there is a system fault.

Initialization

The RDW system must be initialized to allow the control module to adopt the wheel speed signals and set the rolling circumferences in its memory. Initialization must be carried out when:

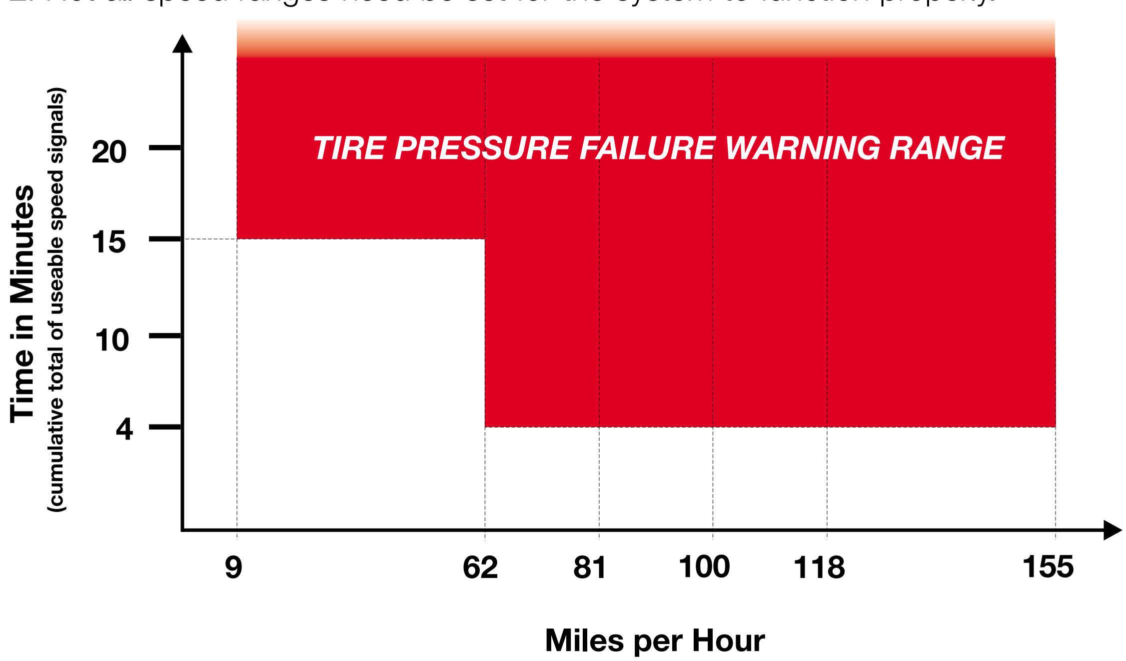
- Tire inflation pressures are changed.
- New tires are installed.
- The control module or wheel speed sensors are changed.

The initialization process is started by pressing the push button >4 seconds (Tire Pressure Set will be displayed in the matrix). The system is now in the learn mode and after driving off, the control module will start to store the values for the rolling circumferences of the tires based on the road speed.

For leakage detection, three different speed ranges are taken into account and must be recognized by the control module to complete a full initialization process. The control module must receive useable speed signals for a cumulative total of 4 to 15 minutes depending on the speed range.

Once a speed range is set, the control module will then monitor that speed range for and pressure losses. The system can only display a pressure loss warning, it can not display the exact tire with the pressure loss. All tires need to be checked when the warning is displayed in the matrix.

NOTE: Not all speed ranges need be set for the system to function properly.



Initialization

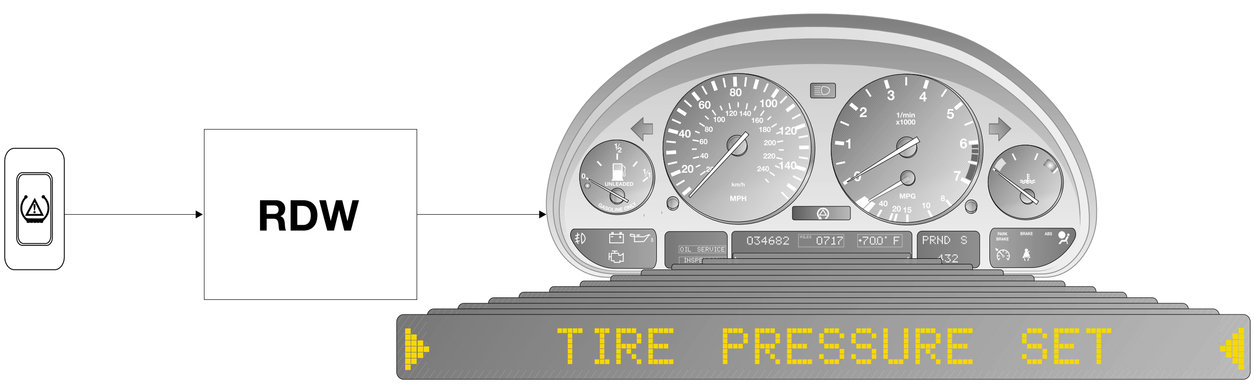
Under certain driving conditions the control module will not evaluate the wheel speed sensors as false warnings could be triggered. These conditions include:

- Initialization in a speed range that has not been complete
- During rapid acceleration
- Severe (heavy) braking
- High speed cornering
- Road speeds < 7MPH
- High slip differentials between individual wheels

No Warning Conditions

The system can only detect pressure differences between tires, it can not measure absolute pressure. The system can not detect the following:

- Natural diffusion that occurs on all tires equally
- A tire blow out
- Pressure loss at the rear axle at speeds > 90 MPH



Diagnosis

The RDW is fully diagnosable via the K-bus interface using the DISplus tester or MoDiC.

Information included in the diagnosis includes:

- How often and at what speed the fault occurred
- If the initialization has been carried out for all speed ranges