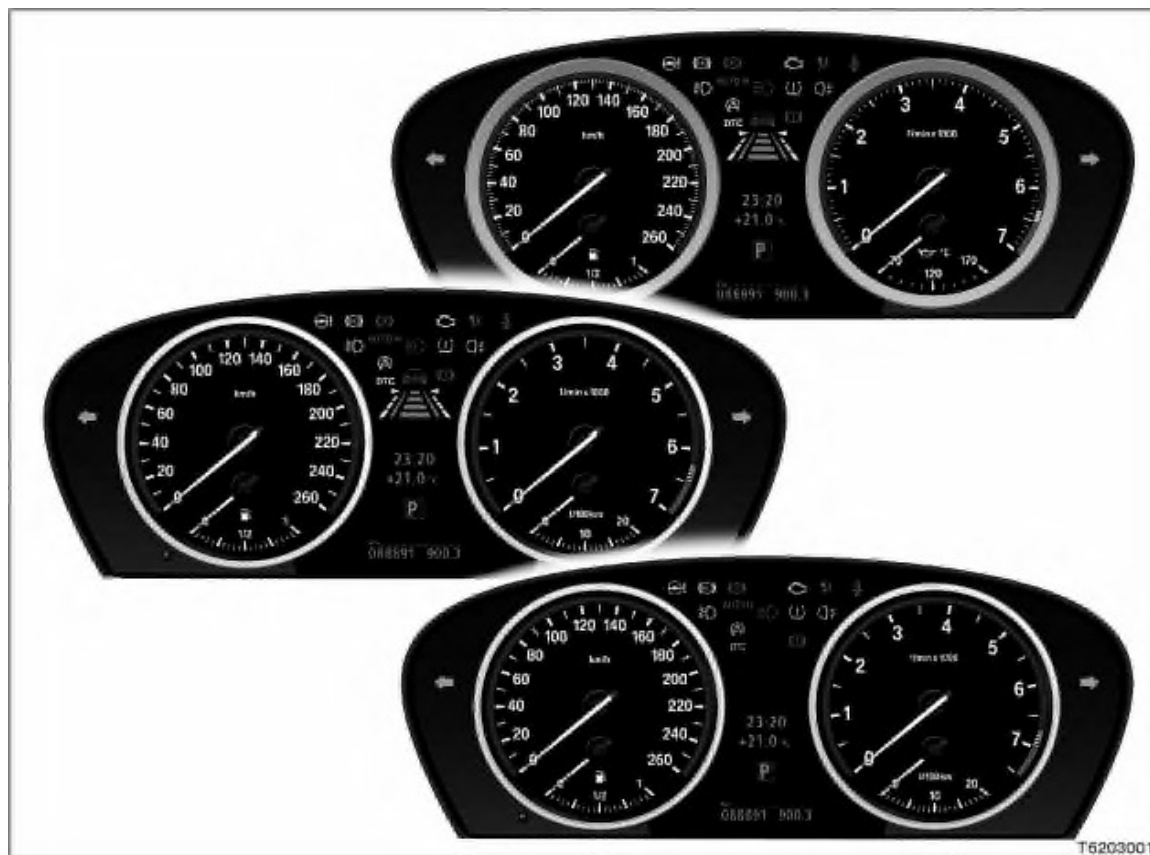


## Instrument cluster

E60, E61, E63, E64, E70



### Introduction

The instrument cluster has the typical BMW design.

2 large pointer instruments display speed and rpm. On the BMW 6-Series, the speedometer has a finer scale.

2 small pointer instruments (hanging needles) display the following:

- BMW 5-Series and X5: Fuel reserve and current fuel consumption
- BMW 6-Series: Fuel reserve and engine oil temperature

### New on the E70 and E6x from 03/2007:

Test functions can no longer be started with terminal 15. Test functions must be called up with terminal R, coming from terminal 30: Terminal 15 > Terminal R > Terminal 30 > Terminal R.

The permanent indicator and warning lights are centrally located between the two pointer instruments.

There is no indicator lamp for spare fuel. Then the fuel reserve level has been reached, a Check-Control message will be displayed.

Between the two pointer instruments there is an LCD display.

2 moving-disc instruments are used in the instrument cluster. The moving-disc instruments show the speed setting for the cruise control system and the variable engine speed warning zone (currently only with M-Technology).

[system overview ...]

The scales of the instrument cluster are country-specific, vehicle-specific and engine-specific. Navigation-system messages are not shown in the instrument cluster.

### Brief description of components

The instrument cluster receives input signals from the following components:

- **Outside temperature sensor**

The outside temperature sensor supplies the value for the temperature outside the car to the instrument cluster. The outside temperature is shown on the liquid-crystal display. Instrument resolution is 0.5 °C (1 °F). The value for outside temperature is also made available to other control units via the K-CAN.

- **Fuel-level sensors, left and right**

The fuel tank contains two fuel-level sensors. Each fuel-level sensor sends a signal indicating the amount of fuel in the tank. A value is obtained by adding the two signals.

> E70

The fuel level sensor is connected to the junction box electronics (JBE). The signal is transmitted to the instrument cluster on the K-CAN.

- **Coolant-level switch**

The coolant-level switch sends a signal if the coolant level is too low (Reed contact). The information is output on the liquid-crystal display in the form of a Check-Control message.

> E70

The coolant level sensor is connected to the junction box electronics (JBE). The signal is transmitted to the instrument cluster on the K-CAN.

- **Windscreen washer fluid level switch**

The washer fluid level switch sends a signal when the washer fluid level is too low. The information is output on the liquid-crystal display in the form of a Check-Control message.

> E70

The washer fluid level switch is connected to the junction box electronics (JBE). The signal is transmitted to the instrument cluster on the K-CAN.

- **Parking brake warning switch**

The parking brake warning switch indicates that the handbrake is applied. When the parking brake is applied, the brake system warning lamp lights up red as a permanent indicator lamp.

> E70

The X5 does not have a parking brake (electromechanical parking brake = EMF). The parking brake button is connected to the Dynamic Stability Control (DSC). The DSC transmits the signals on the PT-CAN to the junction box electronics (JBE). The JBE transmits the signals on the K-CAN to the instrument cluster.

- **Axial buttons direction of travel full-beam headlight switch**

> E6x

The axial buttons (check-control button at top, on-board computer button at bottom) are for the following functions:

- Menu of the Check-Control system in the liquid-crystal display and clock/date toggle
- Menu of the on-board computer in the liquid-crystal display

The signal generated when one of the axial buttons is pressed is transmitted through the bus system.

> E70

The E70 has an on-board computer button and a rocker switch on the turn-signal/main-beam switch. The signals from these two switches are transmitted by a direct wire to the instrument cluster.

- **Reset button in the instrument cluster**

The reset button is used for the following functions:

- Reset trip meter
- Call up Condition Based Service (CBS)
- Call up Test functions (only for service staff)

Below, the responsible control units are listed which have a permanent indicator lamp. These control units communicate with the instrument cluster control unit via the PT-CAN and K-CAN.

- **DSC: Dynamic Stability Control**

An active regulation sequence or a fault in the DSC will be indicated by the corresponding indicator and warning light (ABS, DSC or DTC).

The brake pad wear sensors are also connected to the DSC control unit. The general brake warning light is actuated if the brake pads wear to the permissible limit. Front and rear brake pad wear is a CBS maintenance operation (sensor-based).

Similarly, the Run Flat Indicator is integrated in the DSC. The RPA records the wheel speeds using the wheel-speed sensors. The RPA compares the speeds of the individual wheels and computes an average speed. In this way the RPA is able to detect a loss of tyre pressure. The RPA fault status is displayed by the RPA indicator and warning light.

- **ACC: Active Cruise Control - E6x only**

There are an indicator and warning lights in the instrument cluster for Active Cruise Control (ACC). They indicate: Object detected or driver override, distance levels 1 to 4.

- **AL: active front steering**

A fault in the active front steering system is indicated by the corresponding indicator and warning light being actuated.

- **DME or DDE: digital engine electronics or digital diesel electronics**

The appropriate indicator and warning light is activated to indicate a fault in the DME or DDE.

Engine oil is a CBS maintenance operation.

- **ACSM: Crash safety module**

The appropriate indicator and warning light is activated to indicate a fault in the passive safety system (airbag).

The ACSM (= Advanced Crash Safety Module) is connected to the K-CAN.

> E6x before 09/2005

These vehicles have a safety and gateway module (SGM) that is connected to the **byteflight**.

- **LM: light module - E6x only**

When the vehicle lighting (e.g. turn signals, main-beam headlights) is actuated, the light module (LM) sends the information to the instrument cluster and the corresponding indicator and warning lights are actuated.

- **FRM: footwell module - E70 only**

When the vehicle lighting (e.g. turn signals, main-beam headlights) is actuated, the footwell module (FRM) sends the information to the instrument cluster and the corresponding indicator and warning lights are actuated.

- **EMF: electromechanical parking brake - E70 only**

The electromechanical parking brake is a parking brake.

In the event of a failure or malfunction in the EMF, the warning and indicator lamp for the EMF will light up.

When the Automatic Hold button is pressed, "AUTO H" appears under the parking brake indicator lamp.

- **TLC: track lane control - only E6x from 03/2007**

TLC (also Time to Line Crossing) warns the driver before he leaves his lane. The display that track lane control is switched on or off appears on the instrument cluster and optionally on the head-up display.

Other control units communicate via the bus to send messages (check-control messages) to the instrument cluster. The instrument cluster emits these Check-Control messages via symbols in the LCD display.

*Note: Document of available Check-Control messages in BMW diagnosis system.*

The service functions include a tabular list of Check-Control messages listed by their identification numbers.

Path: Service functions > Vehicle information > Check-Control messages.

The following control units remain important for the function of the instrument cluster:

- **Headset and Central Information Display**

For the instrument cluster, the headset (M-ASK, CHAMP, CCC) serves as the interface to the Central Information Display (CID). The CID displays detailed texts concerning Check-Control messages and information about CBS and other on-board computer functions. The CID also enables the driver to change the units of measurement (e.g. Celsius to Fahrenheit, and vice versa) for the instrument cluster.

Moreover, the headset establishes a telephone connection when a CBS maintenance operation is due (= TeleService). This is achieved by sending a message to the telephone control unit via the MOST.

- **EGS: Electronic transmission control**

The EGS control unit supplies the signal for the gear engaged to the instrument cluster. The selected gear is shown in the selector-lever and shift indicator in the LCD display.

> E6x from 03/2007 and E70

The gear is selected with the gear selector switch (GWS). The GWS is a control unit in its own right on the PT-CAN.

- **Car access system**

The CAS control unit serves for redundant data storage. The following are stored in the CAS control unit (redundantly to the instrument cluster):

- Vehicle identification number
- Odometer status
- CBS data

- **Integrated automatic heating/air-conditioning system - only E6x up to 03/2007**

The IHKA calculates the condition of the microfilter. The condition of the microfilter is CBS maintenance operation.

The instrument cluster internally controls the following instruments and indicators:

- **Analogue instruments and moving-disc indicators**

The instrument cluster incorporates a number of instruments that operate with step motors, namely:

- Speedometer
- Revolution counter
- Fuel gauge
- Fuel consumption indicator (E60, E61, E70)
- Engine oil temperature (E63/E64)
- Moving-disc instrument for the speed setting of the cruise control system
- Moving-disc instrument for variable engine speed warning zone (currently only M-Technology)

[more ...]

- **Indicator and warning lights:**

The single-colour indicator and warning lights that are required by law at the top, centred between the two large analogue instruments (exception: turn signal indicator lights at sides).

The most important indicator and warning lights briefly light up during the pre-drive-check when terminal 15 is switched ON. The indicator warning lights and symbols are illuminated by LEDs which are soldered into place.

- **Liquid-crystal display**

The liquid-crystal display is centred at the bottom between the two large analogue instruments. The liquid-crystal display is divided into two zones. The top zone shows information such as the time and date and the outside temperature. In addition, Check-Control messages appear by means of a symbol in the top area. The bottom zone displays information concerning the on-board computer functions, for example, and the drive range currently selected for the automatic transmission. The shift point indicator (E60, E61) is also in the lower area.

The LCD display is activated when terminal R is switched ON.

[more ...]

- **Acoustic generator**

Acoustic warnings are issued in support of the check-control messages. The instrument cluster controls these warnings by means of the K-CAN. The headset (M-ASK, CHAMP, CCC) outputs acoustic warnings via the loudspeakers.

An additional loudspeaker in the instrument cluster issues the following acoustic warnings:

- Flash
- Warning flash

## System functions

The control unit of the instrument cluster incorporates certain functions over and above the display and indication functions, namely:

- Lighting of the instrument cluster
- Dimming of the instrument cluster
- Undervoltage detection and overvoltage detection for the instrument cluster
- Heating and contrast for the liquid-crystal display
- On-board computer functions
- Check-Control messages
- Pre-drive check
- Outside temperature compensation
- Condition Based Service (CBS)
- Vehicle identification check

### Lighting of the instrument cluster

The instrument cluster has an integral power supply unit. The power supply is connected to terminal 30. The power supply provides the supply voltage for the instrument cluster.

This arrangement means that the lighting of the instrument cluster is independent of the onboard power supply. If the onboard power supply is disrupted (voltage dips), the brightness cannot fluctuate.

LEDs in BMW orange provide backlighting for the liquid-crystal display, the pointers of the analogue instruments and the scale rings.

The pointers and the scale rings are illuminated when the lights are switched ON (= function display).

The display itself is not backlit unless it contains a reading.

### Dimming of the instrument cluster

The brightness of the liquid-crystal display and all indicator and warning lights is adapted to suit ambient lighting conditions. This function is implemented by a phototransistor in the instrument cluster.

The brightness signal is calculated in the instrument cluster on the basis of the following values:

- Signal from the phototransistor (ambient luminosity)
- Dimmer signal (on the control panel for the lights)

The brightness signal calculated in this way is made available to the other control units via the K-CAN.

### Undervoltage detection and overvoltage detection for the instrument cluster

If the on-board voltage drops below approximately 7.5 volts, no further read or write accesses to the data memory are permitted. The instrument cluster initiates data backup in advance of a pending reset triggered by undervoltage. Overvoltage in the onboard power supply is also detected.

If the on-board voltage is greater than 16 volts:

- Certain inputs and outputs are disabled in order to protect the hardware.
- Indicator and warning lights are dimmed for the duration of the overvoltage or are deactivated in order to prevent overload.

### Heating and contrast for the liquid-crystal display

A heater built into the display ensures good legibility even at low ambient temperatures. The heater is switched on if the temperature of the liquid-crystal display is below 10 °Celsius. The switch-on signal is transmitted (by the CAS control unit to the instrument cluster via the K-CAN) when the driver's door is opened.

The contrast of the liquid-crystal display is automatically set as a function of the temperature of the liquid-crystal display and the operating time. A counter registers the standby times and operating times logged by the instrument cluster, so that due allowance can be made for ageing. Contrast voltage is automatically adjusted depending on increasing time in operation (ageing).

### **On-board computer functions**

There are two ways in which on-board computer functions can be displayed:

- in the instrument cluster
- in the Central Information Display (extended on-board computer functions)

The on-board computer functions for the instrument cluster are as follows:

- Outside temperature
- Time
- Date
- Average consumption (resettable)
- Range
- Average speed (resettable)

The on-board computer function required can be displayed: When terminal R is ON by pressing the on-board computer button on the turn-signal/main-beam switch in a specific sequence. The last line is followed by an empty line, before the first line reappears on the screen (rolling list). When terminal R switches ON, the on-board computer function most recently selected by means of the on-board computer button reappears. If the on-board computer button is pressed and held down for longer than 2 seconds, the values of the resettable on-board computer functions are recalculated.

### **Check-control messages**

The Check-Control system informs the driver if important functions, information or warnings are no longer available. Check-Control messages are displayed in the form of a symbol on the LCD display (red, yellow, orange).

The instrument cluster discharges the functions of priority control for the check-control messages. The readings for time and date and outside temperature are overwritten.

If a Check-Control message is present but not displayed, this will be indicated by warning triangle in the LCD display.

Supplementary notes and instructions are available for most Check-Control messages and are displayed in the Central Information Display (CID) (short form can be found in the status bar).

In addition to the visual display, the Check Control also alerts the driver with acoustic signals. Depending on the importance of the associated message, a single or double gong with varying volume and tone will sound.

Current Check-Control messages can be called up with the Check-Control button (press and hold for longer than 2 seconds) on the turn-signal/main-beam switch. The check-control messages can then be viewed in sequence (press for less than 2 seconds). When the Check-Control button is pressed, this is registered via the K-CAN.

If 8 seconds pass without a button being pressed, either the time and ambient temperature or a current Check-Control message with priority 1 will appear.

### **Pre-drive check**

The pre-drive check serves as:

- A check of internal functions in the instrument cluster
- Monitoring of the live signals from all control units that may emit Check-Control messages

During the pre-drive check, the most important indicator and warning lights are activated for 4 seconds when terminal 15 is switched ON. Exception: Indicator and warning lights for airbags actuated when terminal R is

switched ON.

Once a pre-drive check completes successfully, all indicator and warning lights are switched off. If faults occur during the pre-drive check, the test of the systems concerned is interrupted. The indicator and warning lights for this system remain on. The check-control system issues the appropriate message.

### **Outside temperature compensation**

The computation model in the instrument cluster compensates for effect that the residual heat from the engine compartment has on the outside temperature signal. An increase in temperature is then only displayed with a time lag.

[more ...]

### **Condition Based Service**

Condition Based Service (CBS), as the name suggests, is a means of ensuring that the car is serviced as and when necessary. CBS has been in use in the field of service since the launch of the E65. CBS is a landmark in the increasingly close communication and networking between vehicles and Service.

The vehicle-specific scope of service required is registered automatically. In conjunction with TeleService, an automatic Service call can be placed, notifying the home dealership that Service is due.

The instrument cluster calculates when a service interval is due. When terminal 15 is switched ON, the "Next Service" indicator appears in the LCD display (remaining visible for 6 seconds). The countdown distance or the countdown time is also shown.

More information on CBS can be called up at the same time on the central information display (CID).

The service interval can be reset by means of the reset button in the instrument cluster (press and hold down for longer than 5 seconds). The target date for the vehicle inspection and emissions test can only be entered in the CID via the controller.

### **Vehicle identification check**

The information stored redundantly in the instrument cluster and the CAS control unit (Car Access System) is:

- Vehicle identification number
- Odometer status
- CBS data

The vehicle identification number and odometer are used to prevent manipulation. Information about manipulation is given by a warning light.

CBS data are important in service (KeyReader and service reception module (SAM)). These data must not be lost.

[more ...]

### **Notes for service staff**

Service staff should note the following points:

- General notes: [more ...]
- Diagnosis: [more ...]
- Encoding/programming: ---

### **National versions**

#### **US national version**

The speed scale is shown in both mph (miles per hour) and in km/h (kilometres per hour). Fuel consumption is displayed in mpg (miles per gallon).

[more ...]

#### **Japanese national version**

Fuel consumption is shown in km/l (kilometres per litre).

Subject to change.