

## Light check control module (LCM)

The light check control module combines the functions of the following control units previously installed individually in the E38:

- Light module
- Check-control module
- Manual beam throw control

As of production break 95, the light check control module replaces the light module and check control module control units in the E38 and will be installed in all E39 vehicles as of series launch.

### Functions, general

Diagnosis as well as communication with other control units takes place via the I-bus (E38/E39 high) or K-bus (E39 basic).

In the event of the control unit or one of its peripheral elements failing, an emergency operation facility maintains following functions.

- The outer rear lights (no licence plate light) low beam light, are switched on at "terminal 15 ON" irrespective of the position of the light switch.
- The left and right brake lights are switched on at "terminal 15 ON" and the brake light switch operated.

No communication via the I-bus/K-bus, i.e. also no diagnosis, is possible in emergency mode.

If a trailer coupling is installed in the vehicle, the lamp circuits of the pulling vehicle with a trailer module must be disconnected from those of the trailer. The LCM is connected to the trailer module via a data link.

A diagnosis program is provided for all 3 function spheres of the LCM.

### Light functions

The light check control module controls and monitors

- all external vehicle headlights and lamps both when switched on and switched off (cold and warm monitoring)
- all switches and buttons for light functions
- The functions of the dimmer for the instrument lights and locator lights

### Components

With the exception of the brake light switch, all switches scanned by the LCM are designed such that they switch to ground.

The following switches are scanned by the LCM:

- Combined switch for parking light/low beam
- Turn signal/dip switch
- Fog light switch
- Brake light switch
- Hazard warning push-button
- Dimmer potentiometer for instrument locator lights

The LCM receives further information via the I-bus/K-bus.

#### Light switch

When the light switch is in rest position, all contacts are closed ( $R < 1 \text{ Ohm}$ ) and the corresponding contact is opened ( $R > 1 \text{ MOhm}$ ) in the low beam or high beam position.

The lighting for the light switch is controlled separately by the LCM. It lights at full brightness when the light switch is in the OFF position. It is dimmed to the same extent as the instrument and locator lights when they are switched on.

#### Brake light switch

The brake light switch is permanently monitored by the LCM when terminal R is activated.

It is designed as a Hall sensor and features 3 lines (terminal R, terminal 31, signal line). The test switch is not necessary.

### **Hazard warning switch**

The indicator lamp for the hazard warning function is located in the hazard warning switch. It also serves as a locator light.

### **Dimmer potentiometer**

The dimmed instrument, locator and function lights (terminal 58g) is activated when the light switch is in the parking light or low beam light position.

The voltage generated at terminal 58g is dependent on the position of the dimmer potentiometer.

### **Activation of indicator lamps in the instrument cluster**

The indicator lamps for left turn signal indicator, right turn signal indicator, rear fog light, fog light and high beam located in the instrument cluster are activated via the I-Bus/K-bus.

## **Lights**

The lamps of the vehicle lighting system are monitored both when switched off and switched on (cold and warm monitoring).

The lamps are activated by means of transistors. Due to the fact that they are now short-circuit-protected, the standard lamp fuses are no longer necessary.

The lamps can also be activated via the diagnosis function.

The country-specific functions of the lamp circuits are coded.

## **Check control functions**

The task of the check control is to inform the driver. It provides him with information via the text display in the display unit of the IKE (E38/E39 high) or via the LC display field for check control messages in the instrument cluster (E39 basic) regarding failure of important functions as well as notes and warnings.

## **Common features of both wiring systems**

The check control function in the LCM monitors its own sensors and detects when a message is necessary for these sensors. Consequently it sends a data telegram to the IKE/instrument cluster with the request to display the message text in the text display or the message in the display field for check control messages.

The following sensors are monitored:

- Thermal oil level sensor
- Brake fluid level switch
- Coolant level switch
- Wash water level switch

The LCM is additionally connected via a line to the EML and DDE control units.

An ignition lock and belt buckle contact is included in the US version.

In addition, it also receives LCM-internal messages concerning defective lamps.

Added to this, it evaluates messages from other control units which it receives via the I-bus and sends the corresponding request to the IKE/instrument cluster.

## **Vehicle system E38/E39 high**

The messages are, in part, accompanied by an acoustic annunciator.

The gong in conjunction with check control messages is activated via the I-bus (no direct line link between the LCM and gong). It should be noted that depending on the importance and number of messages previously occurred an acoustic signal does not sound every time and also not for the same message.

The following check control text messages are possible in the E38/E39 high system:

### **Check engine oil level**

The level is determined by a thermal oil level sensor.

It supplies a square-wave signal and receives voltage as of terminal 15.

**Check brake fluid****Top up wash water****Check coolant level****Engine emergency program**

If problems are detected at the throttle or at the pedal sensor, the EML assumes emergency mode, accompanied by a distinct reduction in engine performance. In this case, the check control receives a signal via a line, with which the LCM is connected directly to the EML, and outputs this message.

**Preheating/injection systemg**

The LCM is connected via a line to the DDE control unit, from which it receives a signal for the messages preheating and injection system.

**EEPROM LCM**

appears when the LCM is not coded.

**Ignition key in lock (US only)**

A switch connected to ground is located in the ignition lock. The display is shown when the driver's door is open until the ignition key is removed, however, only at "ignition OFF".

**Buckle belt (US, Gulf States only)**

The message appears when the seat belt has not been buckled (closed). The belt contact switch which switches to ground is connected directly to the LCM.

**Information which the check control receives from the IKE/instrument cluster:**

The check control receives information from the IKE for the following messages. Troubleshooting should be continued in the IKE if incorrect messages are received.

**Transmission emergency program**

If there is a defect in a transmission control unit to the IKE, the LCM is informed via the I-bus.

**Release parking brake**

This message appears on exceeding a speed of 5 km/h with the parking brake applied.

**Check brake pad****Coolant temperature****Stop! Engine oil pressure****Information which the check control receives from the ZKE:**

The check control receives information from the ZKE and processes it for the following messages. Troubleshooting should be continued in the ZKE if incorrect messages are received.

**Door open**

This message is output as of a speed of 5 km/h if the driver's, passenger's or rear door is open.

**Luggage compartment (boot/trunk) open**

This message appears on exceeding a speed of 5 km/h with the boot/trunk lid open.

**Light on?**

This indication appears in ignition lock position "0" when the driver's door is opened with the parking light switched on.

**The LCM evaluates all light messages internally.**

**E39 basic system**

On vehicles with the basic system, information is indicated not in the form of text messages but rather by warning lamps and symbols in the LC display field for check control messages in the instrument cluster.

The check control also requests indication for following lamps:

**General brake warning lamp**

This switch is activated by the LCM when its brake fluid level switch informs it that the brake fluid level is too low.

**Wash water**

This lamp lights when the switch connected to the LCM signals that the wash water level is too low.

**Oil level indicator lamp**

The oil level is determined by a thermal oil level sensor. It is connected directly to the LCM and supplies a square-wave signal with a frequency serving as a measure for the level. It receives its power supply as of terminal 15.

**Preheating**

The LCM is connected via a line link to the DDE control unit, from which it receives the signal to activate this lamp.

**Seat belt indicator lamp**

On US and Gulf State vehicles, this lamp lights as of "ignition ON" when the seat belt has not been buckled (closed). The belt contact switch which switches to ground is connected directly to the LCM.

**Defective lamps (in the LC display for check control messages)****Door messages (in the LC display for check control messages)****Catalytic converter overheating (Japan version only)****Additionally: Gong with ignition key in lock (US version only)****Manual headlight beam throw control**

If a manual headlight beam throw control facility is installed in the vehicle (identification feature): Knurled wheel for manual headlight beam throw control (on instrument panel) then this function is included in the LCM.

The LCM receives a voltage signal from the knurled wheel for manual headlight beam throw control and activates the motors in the headlights accordingly.

These motors are designed as stepper motors. They are connected in parallel. For this reason, although the electronic control can detect a short-circuit, it cannot detect a break in one of the two motors.

Adjustment via the knurled wheel is no longer possible in the case of fault.

The electronic control conducts a referencing run when the parking lights are switched on or when terminal 61 ("engine running") is activated.