Instrument cluster (E46)

General

The instrument cluster features three bus interfaces which enable the information link (data link/serial) to the connected control units.

These busses are:

- K-bus (body bus)
- CAN-bus
- Diagnosis bus

Coded data which determine the scope of functions of the instrument cluster are stored in a non-volatile data memory (data are retained when supply voltage is disconnected).

Replacing Instrument Cluster

The four cases described in the following show the steps which must be taken under certain circumstances in order to ensure trouble-free replacement of the instrument cluster.

Case 1: The instrument cluster control unit is defective and the light switching center (LSZ) is OK.

Measures	Result	Remarks
Replace instrument cluster (new part)	The manipulation point is set with the ignition switched on.	The manipulation point is set since the vehicle identification number in the light switching center differs from the vehicle identification number in the instrument cluster.
Re-encode the instrument cluster		Encode the instrument cluster in accordance with the central encoding code
Encode vehicle identification number into instrument cluster		As long as the vehicle identification number is not coded in the instrument cluster, total odometer recording (only trip odometer recording) does not take place either in the instrument cluster or in the light switching center (LSZ).
Switch off ignition and switch on again	The manipulation point goes out, the instrument cluster adopts the total odometer reading from the LSZ as well as the SIA data.	The data exchange between the instrument cluster control unit and light switching center control unit for mutual data storage (SIA data, total odometer reading, vehicle identification number etc.) is now OK. again.

Case 2: The instrument cluster control unit is OK and the light switching center (LSZ) is defective.

Measures	Result	Remarks
Replace light switching center (new part)	The manipulation point is set with the ignition switched on.	The manipulation point is set since the vehicle identification number in the light switching center differs from the vehicle identification number in the instrument cluster.
Re-encode light switching center		Encode the light switching center in accordance with the central encoding code
Encode vehicle identification number in the light switching center		As long as the vehicle identification number is not coded in the light switching center, the total odometer reading will not be recorded in the light switching center.
Switch off ignition and switch on again	The manipulation point goes out, the light switching center adopts the total odometer reading from the instrument cluster as well as the SIA data.	The data exchange between the instrument cluster control unit and light switching center control unit for mutual data storage (SIA data, total odometer reading, vehicle identification number etc.) is now OK. again.

Case 3: The control unit for the instrument cluster and the control unit for the light switching center (LSZ) must be replaced.

Only replace both control units at the same time when this is unavoidable (stored total odometer reading is irretrievably lost).

Note

Disconnect battery !

Measures	Result	Remarks
Replace instrument cluster and light switching center with battery disconnected (new parts)	The manipulation point is set with the ignition switched on and the total odometer reading (mileage) is set to zero.	The previous total odometer reading (mileage) is irretrievably lost.
Encode instrument		

Measures	Result	Remarks
cluster and light switching center		Encode instrument cluster and light switching center in accordance with the central encoding code
Encode vehicle identification number in the instrument cluster and in the light switching center		As long as the vehicle identification number is not coded, the total odometer reading (mileage) is recorded in the instrument cluster and in the light switching center.
Switch off ignition and switch on again	The manipulation point goes out, the LM adopts the total odometer reading (mileage) from the instrument cluster as well as the SIA data.	The data exchange between the instrument cluster and light switching center for mutual data storage (SIA data, total odometer reading, vehicle identification number etc.) is now OK. again.

Case 4: As a check, replace the control unit for the instrument cluster or the light switching center control unit (LSZ).

Note

Although exchanging one of the two control units is possible in principle, it should, however, be avoided wherever possible.

Measures	Result	Remarks
As a check, an instrument cluster or light switching center control unit from another vehicle is installed	The manipulation point is set with the ignition switched on and the instrument cluster continues to record the total odometer reading.	For as long as the vehicle identification number differs, the total odometer reading is only recorded in the instrument cluster. There is no total odometer reading calibration with the light switching center.

Scope of function

Following functions are displayed or used for a function:

Display/function	Required signal
Speed display	Position signal tw from ASC/DSC control unit

Display/function	Required signal
Engine speed display	Engine speed information from engine control unit (CAN-bus)
Fuel consumption (economy) display	Injection information ti from engine control unit (CAN-bus)/ engine speed information from engine control (CAN-bus)/position signal tw from ASC/DSC control unit
Fuel gauge	Resistance value of both lever sensors (analog input)
Coolant temperature gauge	Coolant temperature information from engine control unit (CAN-bus)
Service interval display	Injection information ti from engine control unit (CAN-bus)
Reset service interval display	Line connection to diagnostic socket
Total odometer reading	Position signal tw from ASC/DSC control unit
Trip odometer reading	Position signal tw from ASC/DSC control unit
Outside temperature display with ice warning (+3 ° C)	Resistance value from outside temperature sensor/ position signal tw from ASC/DSC control unit
Text display	Simple text display for time, total distance recorder, trip recorder, remaining kilometers (miles) to service inspection, on basic BC outside temperature, fuel consumption, range and average speed operable via steering column switch.
Dimming instruments	Dimmer signal from light switching center (LSZ)/ internal signal from photo transistor
Gong activation	Gong tone 3 (T3) priority gong at 1 kHz
Speed-A signal/output	Speed signal
Brake pad wear indication	Resistance value of brake pad wear sensor and sensor lines arranged in a ring (analog positive output to analog ground input).
Transmission program display (automatic transmission)	Transmission program information from transmission control unit (CAN-bus)

Display/function	Required signal
K-bus (body bus)	Information link (data link/serial) to connected control units
Diagnosis bus	Information links (data link/serial) to BMW service tester systems

Test functions

System test (Test No. 2): This system test facilitates simple visual assessment of the instrument cluster (pointer instruments, displays, lighting, warning lamps and indicator lamps).

Selecting system test function

The system test is started by pressing the left-hand button in the instrument cluster (trip recorder reset button. The button must be pressed and held with the ignition lock in "0" position, now turn the ignition lock to position "1" (terminal R radio setting) and release the button. When "tESt 1." appears in the display press the button once again, "tESt 2." now appears. After a short period of time, the display changes to "tESt 2.0". The system test can now be started by pressing the button once again.

By switching the terminals, ignition lock from position "1" (terminal R radio setting) to position "2", the two-colored indicator lamps are activated yellow and red. On completion of the system test, it can be repeated by pressing the button once more.

These elements are:

- All pointer instruments (pointers are moved once over their indication range)
- All LC displays with a segment test and their background lighting

Indicator and warning lamps for:

- High beam
- Oil pressure (red) (ignition lock in position 2/terminal 15) **or**
- Oil level (yellow (ignition lock in position 1/terminal R)
- ASC
- Front/rear fog lights
- Windshield washer fluid level
- "CHECK ENGINE"
- EML (EPC) / MDK
- Coolant level
- Brake pad wear
- Tire pressure control
- Cruise control
- Belt warning
- Fuel reserve
- Coolant high temperature
- Left/right direction indicators
- Windshield washer fluid level
- Shift indicator (if automatic transmission is coded)
- Cruise control (Tempomat) cut-in
- Battery charge indicator lamp
- General brake warning lamp (at terminal 15)

All test functions, apart from test numbers one and two, are interlocked and must be released by means of test function number nineteen.

Selecting test functions

The test functions are started by pressing the left-hand button in the instrument cluster (trip recorder reset button. The button must be pressed and held with the ignition lock in "0" position, now turn the ignition lock to position "1" (terminal R radio setting) and release the button. Once " tESt 1. " appears in the display the required test can be selected by pressing the button. " tESt 2. " " tESt 3. " " tESt 4. " etc. now appear in the display. After a short time, the display changes to " tESt x.0 " (x stands for selected test group), by pressing the

button once again, it is possible to switch to another test in the test group or, as in the system test, start the respective test.

If the test is a locked test (test 3 to 21) the lock is released with test 19 by pressing the trip recorder button when "_L_oFF" appears in the display. The display then jumps to test 0 so that the corresponding test group can be selected by briefly pressing the button.

Test No.	Function
1	Instrument cluster identification
	1.0 Vehicle identification number without ASCII characters
	1.1 Constant for road speed calculation (K-number)
	1.2 BMW part number
	1.3 Coding index, diagnosis index and bus index
	1.4 Date of manufacture of instrument cluster (week/year)
	1.5 Hardware number, software number
	1.6 Not used
	1.7 CAN-bus index, revision index
2	System test
3	Service interval indicator - data (SIA-data)
	3.0 SIA-data, liters since last reset
	3.1 SIA-data, time inspection, time counter since last reset
4	4.0 Momentary consumption values in l/100 km
	4.1 Momentary consumption values in l/h
5	5.0 Range-consumption (calculation value for range)
	5.1 Momentary range
6	6.0 Fuel tank values of left/right lever-type sensors (display LLLRRR corresponds to LL,L and RR,R in liters. L corresponds to liter value left, R corresponds to liter value right)
	6.1 Fuel tank values of both lever-type sensors averaged (display __SSSS corresponds to SSS,S sum of both sensor values in liters)

Test No.	Function
	6.2 Internal fuel tank calculation values
7	7.0 Coolant temperature in degrees Celsius (as from ignition lock position 2, terminal 15 "ON")
	7.1 Outside temperature in degrees Celsius with 0.5 degrees resolution
	7.2 Momentary engine speed in revolutions per minute
	7.3 Momentary road speed in kilometers per hour
8	Values from analog/digital converter (ADC, internal calculation values)
9	System voltage terminal 30 in Volt
10	not used
11	not used
12	not used
13	Triggering of acoustic signals (gong T3)
14	not used
15	not used
16	not used
17	not used
18	not used
19	Locking and Unlocking Test Functions
20	not used
21	Reset instrument cluster (software reset)
0	End of test, the test mode can be exited with this function.