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E65 SERVICE

Model: E65 - 745i / E66 - 745Li

Production Date: 11/2001 - E65, 01/2002 - E66

Objectives of The Module

After Completing this module, you will be able to:

- Describe the sensor based service items.
- List the internally calculated service items.
- Identify the service indicators.
- Demonstrate how to extract Condition Based Service information from the Control Display.
- List the E65 key information read by the Key Reader.

E65 SERVICE

Introduction



42-15-01

Connected Service

The term "Connected Service" refers to "Networked service." Modern vehicles are already heavily networked internally by the single bus systems. Communication of vehicle occupants with the vehicle occurs via several control and display systems like the instrument cluster, on-board monitor with navigation system and on the E65 with the central Control Display.

This networking in constant progress is also revolutionizing the service process. It is called "Connected Service" and allows increasing communication and networking between the vehicle and the Retail Service Departments.

Customers can expect the following from the BMW Service in the future:

- Exactly planned appointments, no loss of information, early problem detection and flexible service.
- Fast handling of the service process without long waiting times for the service advisor, spare parts or vehicle.
- Departure from fixed items of inspection/repair, same high service quality, personal and individual advice.

Connected Service offers new possibilities. Vehicle specific service requirements are automatically assessed. Fixed inspection/maintenance schedules will be replaced by more flexible maintenance services.

The existing process will be further optimized, the appointment process will be faster and more effective and service advisors will have more time for individual consultation.

Overview of Technical Aspects

Connected Service is made up of several modules some of which are already available or are introduced starting with the E65.

The modules are:

Condition Based Service (CBS)

CBS defines vehicle specific maintenance requirements by sensor based monitoring of engine oil, air conditioning micro-filters and the front and rear brake linings. In addition, time dependent monitoring of the engine oil, brake fluid and coolant.

CBS also provides distance dependent monitoring of spark plugs as well as visual and functional checks. The service need display (SBA) is located in the instrument cluster and the details are displayed in the Control Display.

Coded Keys

The BMW keys have already been storing information for approximately 3 years. Since 1998 the chassis number and since 1999 the chassis number, mileage and status of the Service Interval Display (SIA) is stored.



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The E65 keys (FBD keys or remote control service keys) store more information, such as check control messages and all CBS relevant data like: mileage, oil condition, brake pad wear and microfilter condition. The key is the “business card” of the vehicle.



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Key Reader

The Key Reader allows readout of the data stored in the key when the vehicle is checked in for service. The required basic data of the vehicle and the data concerning all service requirements are automatically available.

Service Acceptance Module Software (SAM)

SAM is the software running at the service advisor work place. The software interprets and displays (processes) the data stored in the key.

SAM includes two future extension levels:

SAM 2 (Extension of SAM 1 - Future)

Associated with TeleService 1, it allows the remote transmission of vehicle data stored in the keys and access to the central service databases (central repair history).

SAM 3 (Extension of SAM 2 - Future)

Associated with TeleService 2, it allows the dealer to communicate with the vehicle for troubleshooting complex electronic problems.

TeleService (Future)

TeleService will be offered at two levels:

TeleService 1 will allow automatic or manual data transfer by cellular phone from the vehicle to a TeleService center. The Service Call transmits wear and fault information. Emergency service calls may be placed to an assistance service center. The transmission of information via SMS (Short Message Service) will allow collection of data from customers.

TeleService 2, will allow remote diagnosis of the vehicle electronics. Finally, Tele-Programming will allow the removal of faults, encoding and flash programming via the telephone interface.

Transfer and Analysis of Vehicle Operation and Service Data (FASTA)

FASTA increases product quality, gives input to Research and Development and is the basis for developing more accurate diagnostic tools and optimizing processes aimed at solving problems. In the workshop, the vehicle data is read with DISplus and transferred via network to the central FASTA vehicle related database at BMW.

Starting with the E46, FASTA was implemented for the first time for a select number of dealers in Europe and in the USA. This pilot phase now is over and FASTA is now being used for the launch of all new models and as an integral part of quality control.

Please refer to SIB # 07 08 01 & # 07 07 01 for further details.

Condition Based Service (CBS)

Purpose of the System

The current Service Interval Indicator systems (SIA3 and SIA4) determine maintenance intervals based on fuel consumption, which is done to assess the need to change the engine oil. The main determining factor for the maintenance interval currently is the condition of the engine oil. Other maintenance needs, including the replacement of wear and tear items, are arranged to coincide with due engine oil changes.

On the E65, BMW is measuring the need for maintenance of several critical components besides the engine oil, and independently of the engine oil. This would theoretically afford us the ability to bring a vehicle in for service whenever one of the measured components requires maintenance or replacement. However, customers would be inconvenienced because the maintenance intervals would be dramatically reduced.

Condition Based Service (CBS - further development of SIA) will strike a compromise between too frequent maintenance and too rigid intervals which call for the replacement of maintenance items that may still have substantial useful life left. ***The objective is to furnish economical maintenance by providing the ideal service for individual vehicles.***

Principle of Operation

Sensor Based (CBS) Schedules

The trend in the vehicle service business is to lengthen service intervals and reduce replacement of maintenance items. Additional measures have been taken to keep the vehicles in a roadworthy and comfortable condition.

Usage dependent maintenance of select wear and tear items is detected by physical and virtual sensors. This means that, in cases where the wear is not measured directly, the service due date will be determined by using auxiliary variables such as mileage, vehicle performance, temperature, etc.

Sensors built into certain components and control module algorithms take even more detailed account of the various conditions of vehicle use. The remaining times for selected maintenance tasks as well as any dates for State and/or Emissions Inspections (determined by the state in which the vehicle is registered) are individually displayed.

CBS thus determines the current and future maintenance requirements. The current status of Service items determined by CBS are shown in the Control Display. This data can also be read from the vehicle key by using the Key Reader, as the vehicle's current service status is automatically saved in the ignition key every time the key is used to operate the vehicle.

3 sensors detect the following wear conditions:

- Engine oil (sensor)
- Microfilter (virtual sensor)
- Front and rear brake linings (sensor as reference point)

The instrument cluster collects the values from the wear detection control modules and manages the internally defined service repair schedule. Data exchange is carried out on the bus systems.

Engine Oil Condition

The condition of the engine oil is detected by the oil condition sensor. Simultaneously, it also detects the engine oil level and the oil temperature.

The engine oil condition sensor is monitored by the ECM and is mounted in the lower oil sump.

The ECM contains an algorithm for evaluating the service due date. The following parameters are considered in the calculation:

- The correct oil grade is installed
- Oil level
- Oil temperature
- Engine load
- Fuel consumption (ti signal)
- Mileage
- Date (time elapsed since the last oil change)

The remaining life to the next service is forwarded from the ECM to the instrument cluster by a bus message when the ignition is switched "ON." When the "engine oil" service is due, it is shown in the instrument cluster or the Control Display.

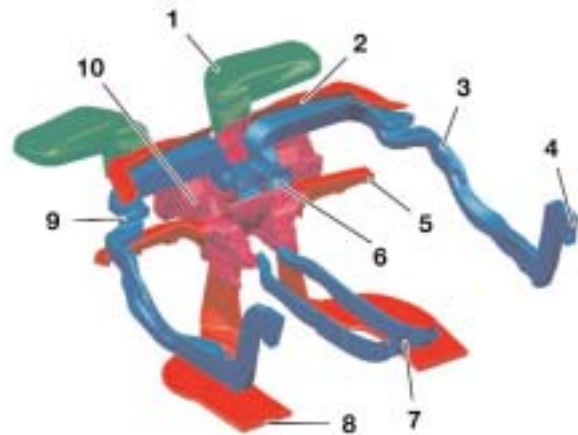
Note: The instrument cluster and the ECM must not be replaced simultaneously, otherwise all current oil maintenance schedule data will be lost.



Microfilters State of Wear

The air intake section of the air conditioning system includes a microfilter on the right and on the left. The microfilters (1) include an additional active carbon filter.

The condition of the microfilter is detected by the IHKA control module. It does not include a physical sensor to measure the level of contamination in the microfilter.



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The IHKA uses an algorithm to calculate this from the following parameters:

- Ambient air temperature
- Heating use
- Driving speed
- Mileage
- Rain sensor signal
- Air recirculation settings
- Fan speed
- Date (time elapsed since the last oil change)

The remaining life to the next service is forwarded by the IHKA control module to the instrument cluster by a bus message when the ignition is switched "ON." When the "microfilter" service due date occurs, it is shown in the instrument cluster or the Control Display.

Note: The instrument cluster and the IHKA control module must not be replaced simultaneously, otherwise all current oil maintenance schedule data will be lost.

Front and Rear Brake Linings State of Wear

The brake lining state of wear on the front and rear axle is detected by 2-stage brake lining wear sensors. These are located on the left front and right rear brake pads.

The first stage (reference point for the calculation) of the wear indicator is activated when the thickness of the lining is 6 mm, and the second when it is down to 4 mm.

The brake lining wear sensors voltage signals are monitored by the DSC control module. The brake lining wear sensor operates in the first stage as on current models and a resistor was added for the second stage.

The algorithm is controlled by these two different voltages in the control module and determines the residual thickness of the brake lining. The residual wear of the brake lining is calculated from the following input parameters:

- Wheel speed
- Brake disc temperature
- Braking frequency
- Brake pressure
- Braking time
- Mileage (travel distance)

The residual wear of the brake lining on the front and rear axles is stored in the DSC control module when the ignition is switched "OFF" and is used as the starting value the next time the vehicle is started.

The residual distance to the next service is forwarded by the DSC control module to the instrument cluster by a bus message when the ignition is switched "ON." The "Front or Rear brake linings" service due date is displayed in the instrument cluster or the Control Display.

Note: The instrument cluster and the DSC control module must not be replaced simultaneously, otherwise all current oil maintenance schedule data will be lost.

Internal Calculation of CBS Service Volumes

For certain wear and tear items, sensors are not needed by the Condition Based Service. The wear items that are calculated and managed internally by the instrument cluster are:

- Brake fluid
- Coolant
- Spark plugs
- Visual and functional checks (vehicle check)
- Official State safety and/or emissions inspections

The maintenance of these items is performed at fixed intervals. The residual wear or the remaining time to next service is calculated by the instrument cluster using the travel/time parameters of: mileage, current date and internal distance counter. When a service item is due, it is shown in the instrument cluster or the Control Display.

Note: The internal distance counter plays a particular role. Unlike the Time/Date, this counter cannot be set by the driver.

However, battery down times (battery cut off by the distribution switch) also stop the trip distance counter which leads to longer time based service intervals. This will disrupt the CBS volumes for engine oil, microfilter, brake fluid and coolant.

To correct this, the internal counter status must be reset by the DISplus. The wear dependent items internally calculated by the instrument cluster are stored in the instrument cluster and in the CAS control module (redundancy).

Note: The instrument cluster and the CAS must not be replaced simultaneously, otherwise all current oil maintenance schedule data will be lost .

Service Indicators

Regarding CBS, there are three different service indicators:

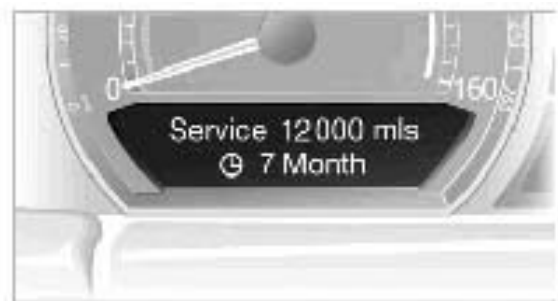
- Service need display (SBA) in the instrument cluster (base of speedometer)
- Check Control display in the instrument cluster (base of tachometer)
- CBS indicator in the Control Display

Service Need Display (SBA)

The Service Need Display is the evolution of the SIA4 Service Interval display. When KL15 is "ON," the Service Need Display appears under the speedometer in the instrument cluster for 10 seconds in the place where the fuel tank level is normally displayed.

The first line corresponds to the mileage dependent service items. It specifies the mileage when the next service is due. If the mileage is exceeded (service overdue), it appears with a minus sign.

The second line corresponds to the time dependent service items and is displayed by a clock symbol. It specifies the weeks/months/years when the next service is due. If the service is overdue, it appears with a minus sign.



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The actual service item (with additional information) can be viewed in the Control Display.

Check Control Message

The CBS produces a Check Control message that indicates the brake lining wear at the front or rear axle. When the brake linings are worn, this is shown as follows:

- The general brake warning lamp and the variable control lamp come on in the instrument cluster.
- The variable control lamp shows the symbol of a car on a lifting platform.



In the base of the tachometer is a Check Control message that appears in short form: "Service, see Vehicle menu." For more detailed information, the user can access the Control Display.

CBS Indicator in the Control Display

The Control Display provides additional information on service and maintenance procedures by selecting the "OB data" menu.



After releasing the Controller or returning to the central position, the "On-board data" menu appears.

Turn the Controller to the left until the bottom left button is highlighted (vehicle symbol).

Confirm your selection by pressing the Controller.



The CBS menu appears with the service items.

The Control Display shows a list of selected service and maintenance procedures, as well as legally-mandated official inspections.



42-15-03

Now you will see a service road in the Control Display. The service and maintenance procedures are displayed in different colors:

- Green: No service is currently required
- Yellow: Service deadline is approaching
- Red: Service deadline has already passed



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The service items highlighted in red with the highest priority appear in the bottom part of the display.

You can scroll through the list of service and maintenance procedures from top to bottom by turning the Controller from right to left. You can leave the list of service items by pressing the button with the Up arrow symbol.

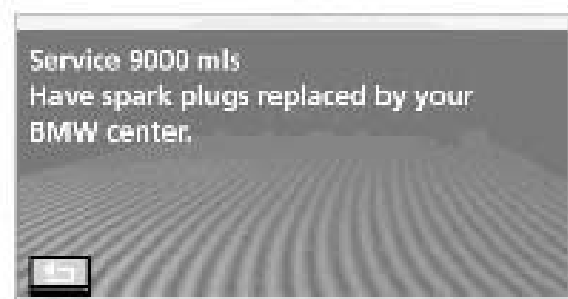
The service and maintenance items are:

- | | | |
|-----------------------------------|------------------|--------------------------|
| 1. Engine oil | 5. Brake fluid | 9. State Inspection |
| 2. Front brake pads | 6. Coolant | 10. Emissions Inspection |
| 3. Rear brake pads | 7. Spark plugs | |
| 4. Ventilation system microfilter | 8. Vehicle check | |

To display the service and maintenance item information in the Control Display, turn the Controller to select the item and confirm your selection by pressing the Controller.

For the "Spark plugs" service and maintenance item, for example, the following information appears:

1. Service due 9000 mls, Have your BMW Center replace the spark plugs.
2. Button with arrow symbol



42-15-05

You can exit this menu by pressing the button with the arrow symbol at the bottom left. The lowest menu automatically closes after a short time (timeout) if you do not touch the controller. In the same way, you can access the full text for each service item.

To Enter and View Official Emissions and Vehicle Inspections Deadlines

Select “Emissions inspection” or “State inspection” and confirm your selection.

Turn the Controller to select an inspection date for entry.

Confirm the inspection date. The first part of the date entry is activated - here month.

Turn the Controller to reset. Press the Controller to store and move to the next entry - here year.

The system adopts the date when you store your entry. Press the Controller to select “CONFIRM”.



42-15-06



42-15-07

Note: This function is only available if the time in the Control Display has been correctly set.

When the deadline for the next emissions or state vehicle inspection is approaching, the remaining distance and time will appear briefly in the base of the speedometer when the ignition is switched on “KL15” (as shown on the right).



42-15-08

Resetting Service Items

When one or more service and maintenance items has been performed, these items must be reset (to the full service interval). This is achieved via the instrument cluster or DISplus.

To reset a service item, press the reset button (1) on the top left side of the instrument cluster for > 10 seconds.

This brings you directly to Reset mode.



KT-9270

A 4-line menu appears in the speedometer. At the top is the Back function, then the first three service and maintenance items sorted by priority. In addition, the residual wear or the remaining time are specified (possibly with a minus sign).

The "!" symbol means that you can reset this service and maintenance item, while a "0" indicates it is not able to be reset (the first 20% of the service interval is protected against premature/accidental reset).

1. Service items (in the speedometer)
2. Resettable service item (in the tachometer)
 - a. Back
 - b. Vehicle Check
 - c. Microfilters
 - d. Brake fluid
 - e. Back
 - f. RESET Vehicle Check



KT-8988

You can scroll through the service and maintenance items by pressing the reset button or the lower axial (FAS) button on the turn signal/high beam switch. When you have selected a service item, press the reset button for a few seconds to display a 2-line menu in the tachometer.

The Back function is at the top and the resettable service and maintenance item is below it. Now select the service and maintenance item with the reset button (or the axial button) and press the reset button again for a few seconds.

In a third menu line, the system confirms that the reset was successful. The whole interval for the service operation is highlighted in the Service Need Display.

Using the DISplus, the CBS resetting procedure is found under: **Service Functions - Maintenance - CBS Reset**. Two selections are possible:

CBS Reset Selection 1

Reset engine oil
Reset microfilter
Reset front brakes
Reset rear brakes
Reset vehicle check

CBS Reset Selection 2

Reset spark plugs
Reset brake fluid
Reset coolant
Correction motor vehicle inspection
Correction emissions inspection

Key Reader

The Key to a New Dimension

Starting with the E65, BMW opens a new dimension in customer service. Using the Key Reader, Service Reception uses the data stored in the vehicle key to provide the following benefits:

- Accelerate and facilitate service consultation.
- Routine tasks, such as collecting vehicle data, will be minimized.
- After accessing the data stored in the vehicle's key, service and maintenance requirements are determined for the individual vehicle (CBS).
- A customized service maintenance list will be printed out for specific operations (E65 no longer utilizes a conventional Service Maintenance Checklist).



KT-9275

The customer expects not only innovative products, but also a perfect mobility service. The Key Reader facilitates and accelerates service reception. As soon as the key is inserted, the reader accesses the stored vehicle data and the information is displayed on screen depending on the vehicle and model. **Refer to SI # 04 04 02 for additional information.**

Key - Vehicle Data Holder and Business Card

The Key Reader automatically collects service relevant data from the vehicle key. The data is transmitted from the CAS module to the key.

The CAS is located in the instrument panel behind the key insertion unit (next to the start/stop button).

The CAS requests data from the instrument cluster over the K-CAN Bus and stores the time when the data was last written to the key.



KT-7836

1. Start/stop button
2. Key insertion unit

Under the following conditions, the data is re-transmitted to the key and stored there:

- Vehicle at standstill (no speed signal)
- Distance of at least 6 miles driven since last data storage
- Driving speed since last data storage exceeds 6 mph at least once

Note: There are circumstances under which the current vehicle data is not stored in the key, for example: the customer has provided the spare key, which has not been used recently.

For this reason, a service function is provided to store data in the key:

- ***Keep centerlock toggle switch in the unlock position and use the start/stop button to switch the vehicle on or off = Vehicle data is will be stored on the spare key.***

The following information is stored on the vehicle key:

<u>Model Range</u>	<u>Model Year</u>	<u>Information on the Vehicle Key</u>
E46, E38, E39 E52, E53	2000	General vehicle data: - Vehicle Identification Number - Current mileage - Build code
From E65	From series launch	General vehicle data: - Vehicle Identification Number - Current mileage - Vehicle type Other vehicle data: - Check Control message - Condition Based Service Data

Notes: _____

E65 Service Maintenance Checklist

As previously explained, *Condition Based Service will determine which of the possible maintenance services listed below are required* for a particular service visit. Please refer to *SI # 00 05 01* that outlines the proper service procedures.

Standard Operations

- o brief diagnostic test
- o verify Check Control messages
- o check indicator and warning lights
- o reset CBS display

Engine Oil

- o Change engine oil and oil filter. We recommend BMW High Performance 5W-30 Synthetic Oil, available under part number 07 51 0 017 866
- o after every 4th engine oil change: replace air cleaner filter element

Microfilter

- o replace

Front Brakes

- o Brake pads: replace; clean brake pad contact points in calipers
- o Brake discs: check surface and thickness

Rear Brakes

- o Brake pads: replace; clean brake pad contact points in calipers
- o Brake discs: check surface and thickness
- o Parking Brake: check condition, brake lining thickness and function

Vehicle Check

- o check operation of horn, headlight flasher and hazard warning lights
- o check instrument and control lighting, and heater/AC blower
- o check lighting system: turn signals, back-up, license plate, interior (incl. map reading lights), glovebox, flashlight, luggage area lights
- o safety belts: check condition and function

-
- o check windshield wiper and jet positions
 - o body: check for corrosion
 - o tires: check tread depth, wear pattern, outer condition, inflation pressure (incl. spare)
 - o battery: check state of charge ("magic eye") and recharge if required
 - o power steering reservoir: check fluid level
 - o visually inspect all SRS airbag units for torn covers, obvious damage or attachment of stickers
 - o function of rear-view mirrors
 - o coolant: check fluid level and concentration
 - o windshield washer system: check fluid level and protection level
 - o brake system connections and lines: check for leaks, damage and correct positioning
 - o underbody: all visible parts incl. transmission, rear axle, fuel tank, exhaust system: check for damage, leaks, corrosion
 - o steering components: check for clearance, leaks, damage and wear
 - o parking brake: check function
 - o Final Inspection: road test with check of
 - brakes
 - steering
 - shock absorbers (external)
 - transmission

Brake Fluid: replace every 2 years

Coolant: replace every 4 years

Spark Plugs: replace every 100,000 miles

Automatic Transmission: replace ATF every 100,000 miles

Service Booklet

The Service booklet provides evidence of maintenance work. The innovation introduces a new appearance in the service and maintenance items. As in the past, it will show which service item and the mileage when the service is performed. The Retail Center appears with date, stamp and signature. This documentation must be checked in the "yes" or "no" to record and verify the indications in the Control Display (CBS).

yes	no	yes	no	
☐	☐	☐	☐	
☐	☐	☐	☐	
☐	☐	☐	☐	
☐	☐	☐	☐	
☐	☐	☐	☐	

Distance reading

Date, stamp and signature

KT-9282

Review Questions

1. Describe the sensor based service and maintenance items. _____

2. List the internally calculated service and maintenance items: _____

3. What are the service indicators? _____

4. How is the Condition Based Service information extracted from the Control Display?

5. List the E65 key information read by the Key Reader: _____
