Table of Contents

MS45 - E85 with M54 Engine

Subject   **Page**

Performance Controls


42-05-06

Dynamic Driving Control (if equipped)

The MS45 ECM contains two different throttle progression functions (Sport and Normal). The Dynamic Driving Control function is selected by pressing the "Sport" button located in the center console (1).

The switch provides a ground signal (input) to the ECM when pressed. The MS45 activates the sport characteristics for the Electronic throttle control (EDK). This provides an increase in throttle opening and response time over the non-sport position.

kt-10288

When this function is activated, the function indicator light in the Sport button is illuminated by the Electric Power Steering (EPS) Control Module. When the ignition is cycled, this function resets back to the non-sport function (it must be re-selected by the driver).
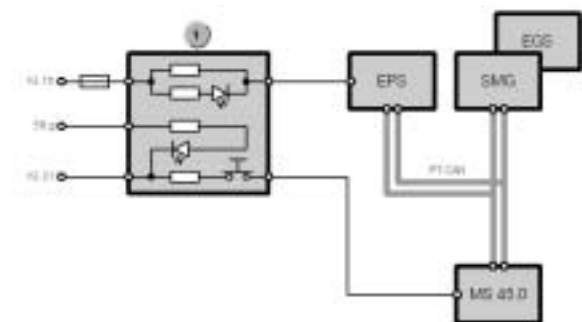
The ECM additionally provides the request for the Dynamic Driving Control function over the PT CAN bus to the following control modules:


kt-10057

	If equipped:
• Electronic Power Steering (EPS)	• Automatic transmission (EGS)
• Instrument cluster (Kombi)	• SMG 6-speed sequential manual gearbox

Note: Refer to the respective sections for the function influence on these systems.

Cruise Control

Cruise control functions are activated directly from the stalk (lever) to the ECM. The individual positions (requests) are digitally encoded and are input to the ECM over a serial data wire. The cruise control operational requirements are BMW "typical". *The E85 does not have a "system on" indicator light.*
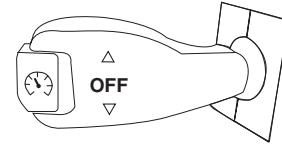
Cruise Control is integrated into the ECM because of the EDK operation.

45-02-06

- The ECM controls vehicle speed by activation of the Electronic Throttle Valve (EDK).
- The clutch switch disengages cruise control to prevent over-rev during gear changes.
- The brake light switch and the brake light test switch are input to the ECM to disengage cruise control as well as fault recognition during engine operation of the EDK.

Road speed is input to the ECM for cruise control as well as DSC regulation. The road speed signal for cruise control is supplied by the DSC Control module.

Electric Fan

The electric cooling fan is controlled by the ECM for engine cooling system and air conditioning system requirements. The ECM uses a remote power output final stage (mounted on the fan housing). The electric fan is controlled by a pulse width modulated signal from the ECM.

The fan (and speed) is activated by the ECM based on:

- Coolant outlet temperature
- Catalyst temperature (calculated by the ECM)
- Vehicle speed
- Battery voltage
- Air Conditioning refrigerant pressure (calculated by IHKA and sent via the PT CAN bus to the ECM)

16550025
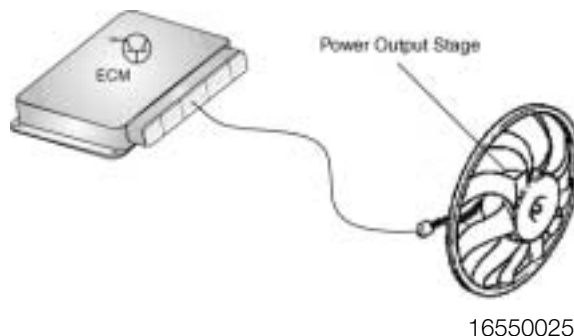
ECM Integrated Temperature Sensor

The E Box fan is controlled by the MS45 ECM. The control module contains an integral NTC temperature sensor for the purpose of monitoring the E box temperature and activating the fan.

When the internal temperature exceeds 65º C, the ECM provides a switched ground for the E Box fan to cool the E box control modules.

E-BOX FAN CONTROL
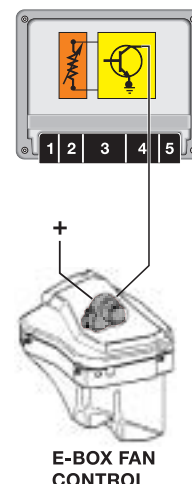
Alternator Interface

The alternator communicates data with the ECM via the BSD line (bit-serial data interface - single wire). This is necessary to allow the ECM to adapt its calculations and specific control data to the alternator output. In addition, the ECM controls the following functions:

- Activation/deactivation of the alternator.
- Informimg the voltage regulator of the nominal voltage value to be set.
- Controlling the alternator's load response.
- Diagnosing the BSD line.
- Storing alternator fault codes.
- Activating the charging indicator light in the instrument cluster.

The charging indicator light operation has not changed from present vehicles.

EWS III (3.3)

The electronic driveaway protection system (EWS III) remains unchanged from the current E46 BMW models.

PT CAN Bus Communication

The ECM provides signals to other "driveline" related modules for torque control, shift quality, diagnosis, safety enhancements, etc. This is covered in the appropriate sections.

45-02-05
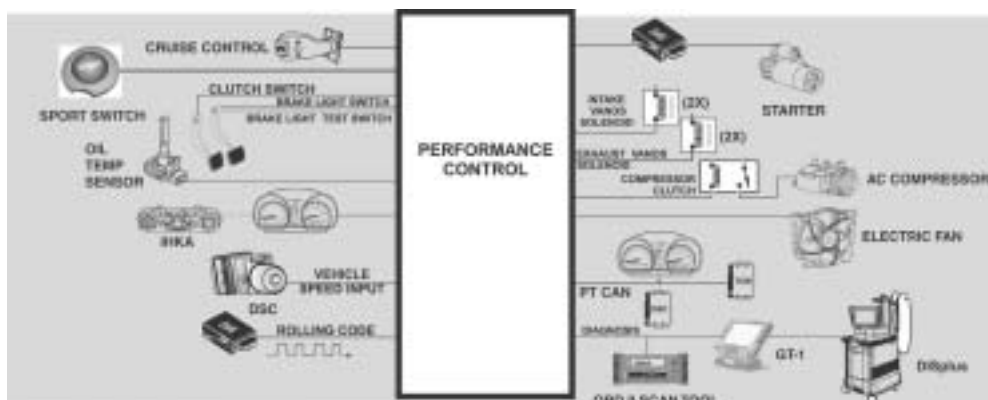
Dual VANOS Control

Performance, torque, idle characteristics and exhaust emissions reduction are improved by Variable Camshaft Timing (VANOS). The VANOS unit is mounted directly on the front of the cylinder head and adjusts the *Intake and Exhaust* camshaft timing from retarded to advanced. The ECM controls the operation of the VANOS solenoid which regulates the oil pressure required to move the control piston. Engine RPM, load and temperature are used to determine VANOS activation.

VANOS mechanical operation is dependent on engine oil pressure applied to position the control pistons. When oil pressure is applied to the control pistons (regulated by the solenoids), the pistons move causing the splined adjustment shafts to move. The straight splines slide within the camshaft sleeves. The helical splines rotate the camshaft drive sprockets changing the position in relation to the camshaft position which advances/retards the intake/exhaust camshaft timing.
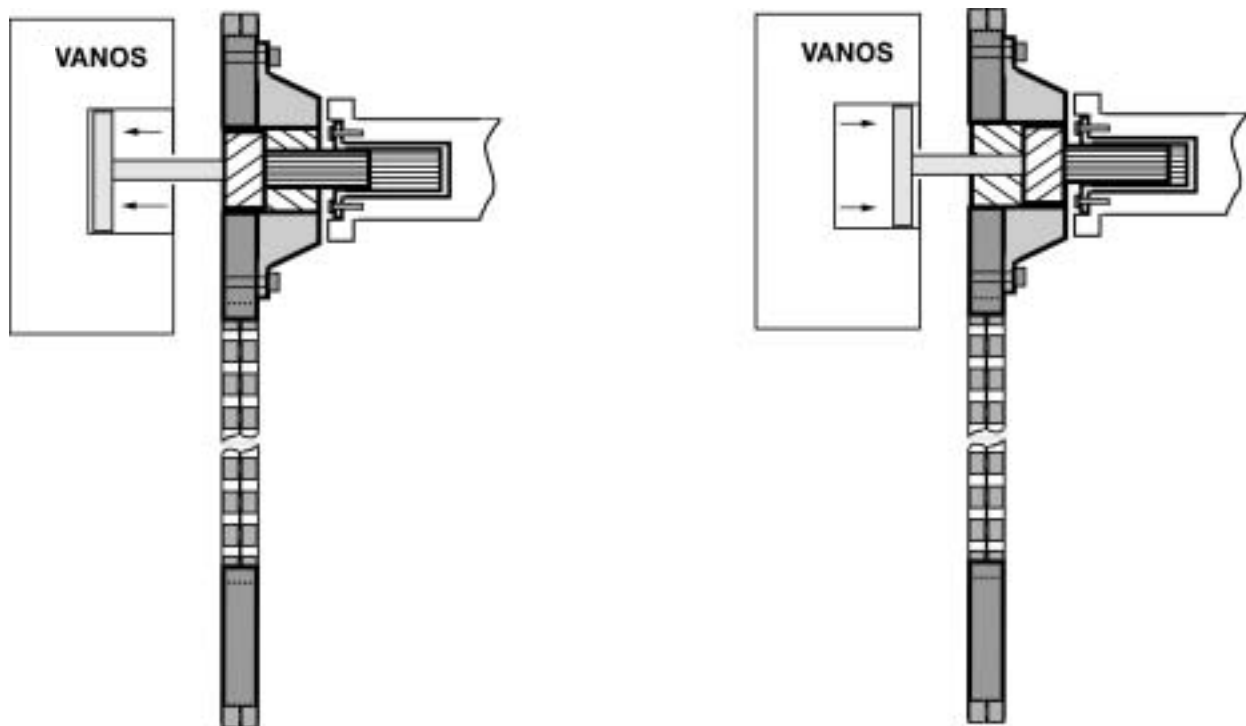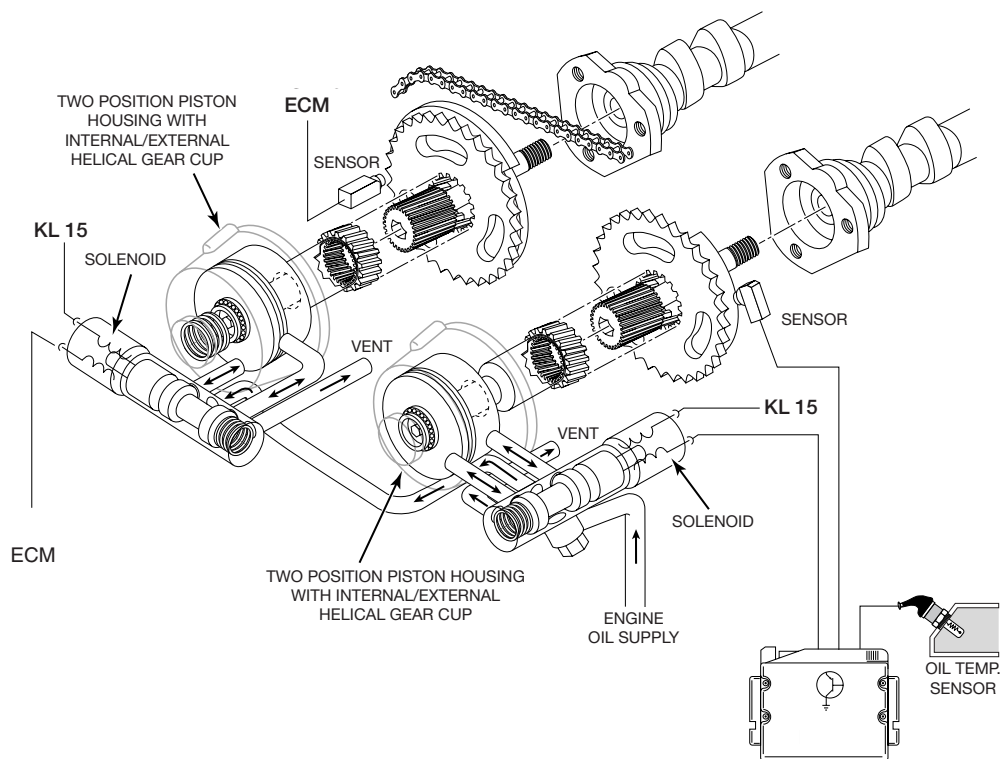

135500066

The operation of the VANOS solenoid is monitored in accordance with the OBD II requirements for emission control. The ECM monitors the final stage output control and the signal from the Camshaft Position Sensors for VANOS operation.

Dual VANOS consists of the following parts:

- Intake and exhaust camshafts with helical gear insert

- Sprockets with adjustable gears

- VANOS actuators for each camshaft

- 2 three-way solenoid switching valves

- 2 impulse wheels for detecting camshaft position

- 2 camshaft position sensors (Hall effect)

13550006

When the engine is started, the camshafts are in the "failsafe" position (deactivated). The intake camshaft is in the RETARDED position - held by oil pressure from the sprung open solenoid. The exhaust camshaft is in the ADVANCED position - held by a preload spring in the actuator and oil pressure from the sprung open solenoid.

After 50 RPM (2-5 seconds) from engine start, the ECM is monitoring the exact camshaft position. The ECM positions the camshafts based on engine RPM and the throttle position signal. From that point the camshaft timing will be varied based on intake air and coolant temperatures.

The dual VANOS system is "fully variable". When the ECM detects the camshafts are in the optimum positions, the solenoids are modulated (approximately 100-220 Hz) maintaining oil pressure on both sides of the actuators to hold the camshaft timing.
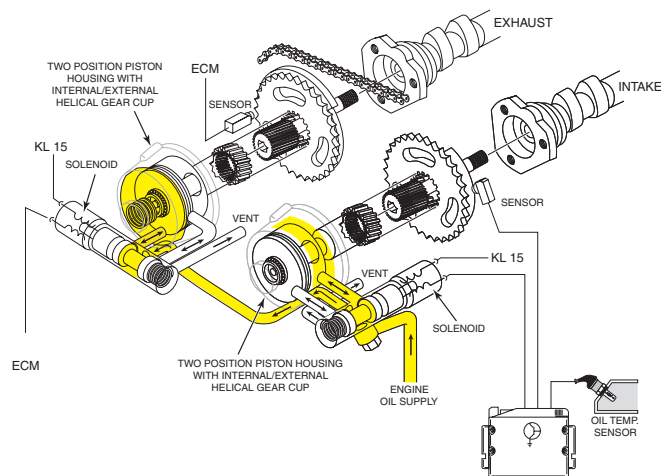
CAUTION: The VANOS __MUST__ be removed and installed exactly as described in the Repair Instructions!

NOTE: If the VANOS camshaft system goes to the failsafe mode (deactivated) there will be a noticeable loss of power.

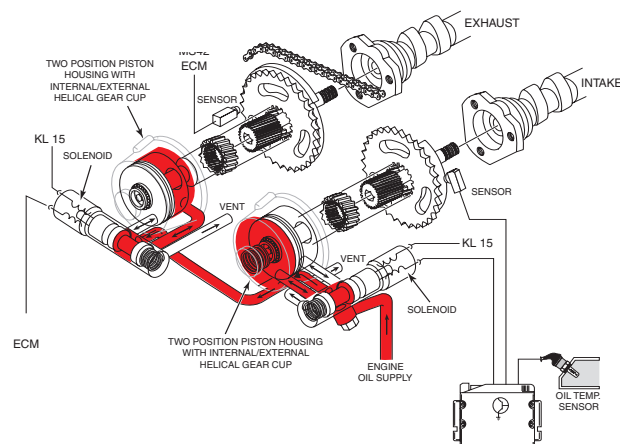## DEACTIVATED

EXHAUST: Advanced -piston moved in

INTAKE: Retard - piston moved out

ACTIVATED

EXHAUST: Advanced - piston moved out

INTAKE: Retard - piston moved in

ECM Programming - FLASH Control Modules

The MS45 ECM is a programmable "FLASH" Control Module. The ECM contains a soldered in *FLASH EPROM* which can be programmed/updated up to 13 times. The EPROM has basic information always present in it referred to as "resident data". This resident data gives the EPROM its identification and contains instructions for the programming of the operational maps. When you program, you are inputting operational maps to the ECM such as injection timing and ignition timing, etc.

Always refer to the latest programming IDC Bulletin for a complete list of FLASH programmable control modules and the latest program highlights. *An unprogrammed control module will not allow the engine to start.* DME (ECM) FLASH programming is performed with the DISplus/GT1 using the latest software.

Using the "automatic" determination process (preferred method), the GT1 compares the part numbers stored in the FLASH EPROM of the currently installed ECM with a list of possible replacement part numbers stored in the DISPlus or GT1 memory. The comparison is done to:

• Display the part number for the replacement programmable control module for that vehicle.

• Determine if the GT1 can " recommend" a replacement part number(s) from the list of part numbers stored in memory.

• Identify a proper replacement program or control module

Tools and Equipment

The DISplus/Gt1 as well as a reputable hand held multimeter can be used when testing inputs/components.

It is best to make the checks at the ECM connection, this method includes testing the wiring harness.

The correct Universal Adapter for the MS45 application should be used (#90 88 6 121 300). This will ensure the pin connectors and the harness will not be damaged.

When installing the Universal Adapter to the ECM (located below the windshield on the passenger side of the engine compartment), make sure the ignition is switched off.
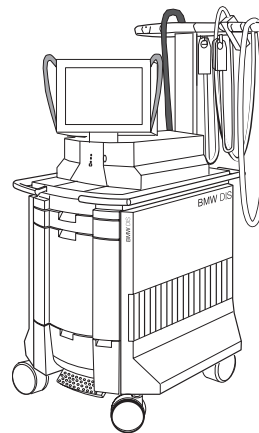
NOTE for MS45: Allow at least 3 minutes to elapse after the key was set to the "OFF" position before disconnecting the ECM/ TCM.

This will allow sufficient time to complete the DM TL test. Voltage may be present (up to 3 minutes) causing damage to the ECM/TCM if they are disconnected during this time period (arcing).

DISplus   GT-1

16550019

SKE BREAKOUT BOX SET
P/N 90 88 6 121 300

ENGINE CONTROL MODULE HARNESS

26 PIN BOX
88 88 6 611 459

134 PIN SKE

26 PIN BOX
88 88 6 611 459

16550020

VANOS

The electrical/hydraulic function can be checked "statically" by using the adapter tools and shop supplied **regulated** compressed air.

Special Tool # 90 88 6 113 450 adapts regulated compressed air to substitute for engine oil pressure required to move the VANOS piston. Special Tool # 90 88 6 126 410 allows battery voltage and ground to activate the solenoid.
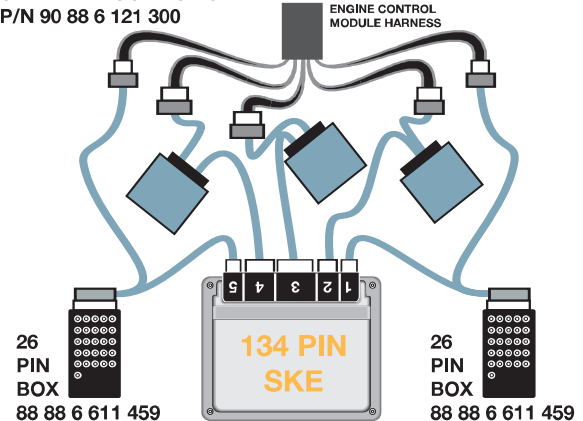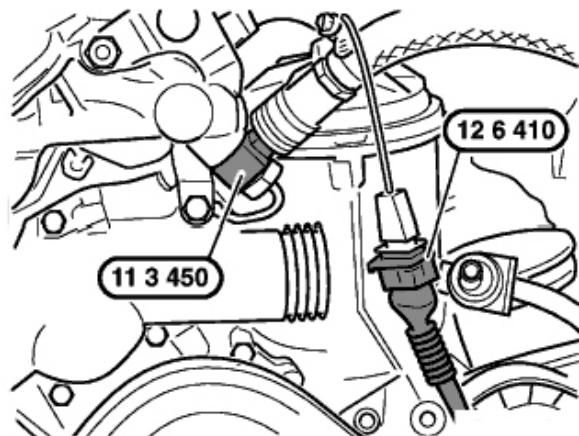

12 6 410

11 3 450

135500076

Review Questions

1. Describe the Power Supply for the MS45 Fuel Injectors and Ignition Coils:

_____
_____
_____
_____

2. Name the Components of the MS45 Fuel Supply System that are "integral" in the fuel tank:

_____   _____   _____

_____   _____   _____

3. List the inputs required for Fuel Injector operation:

_____   _____   _____

_____   _____   _____

4. Describe the Emission Optimized Function:_____

_____
_____
_____

5. Name two types of Emissions the ECM controls:_____   _____

6. What two sensors are used to monitor MS45 accelerator movement?

_____   _____

7. Why are there two inputs from the Accelerator Module?_____

_____
_____

8. Where is the DM TL located on an E85?_____

9. Why does the MS45 have multiple ignition pulses? _____

_____

10. How is the ignition system monitored? _____

_____
_____
_____
_____