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EPROMs & EEPROMs

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EPROMs & EEPROMs

Model: E31/32/34/36/38/39

Production: All

OBJECTIVES

After completion of this module you will be able to:

- Identify Engine & Transmission Control Modules for which EPROMs can be replaced
- Understand why EPROM's do not always need to be replaced
- Explain what "Flash" programming means
- Determine what EPROM or replacement part number needs to be installed
- Understand the replacement procedure

Introduction

Early Engine and Transmission Control Modules used EPROMs (Electrically Programmable Read Only Memory device) to store operational programs and operating data specific for the application that they were used for. Since the operating program and associated data is installed at the factory during the vehicle assembly process updates could not be provided for vehicles once they were programmed and left the factory floor. In order to install a new or updated program (DME or TCM) the module needed to be replaced. Eventually it became possible to replace EPROMs and/or update them which dramatically reduced the cost of updating a module and a vehicle.

Engine Control Module EPROM Programming

With the introduction of M3.X & DME/ECM control modules it was no longer necessary to replace the entire control module in order to install updated engine operating programs and/or data.

	DME/ECM Version	Vehicle Application
M3.X	M3.1	E36 - 325i/is (up to 8/92)
		E34 - 525i (up to 8/92)
	M3.3	E31 - 840Ci (9/93 - 12/95)
		E32 - 740i/iL (9/92 - 8/94)
		E34 - 530i/it & 540i (3/93 - 12/95)
		E38 - 740i/iL (9/94 - 12/95)
	M3.3.1	E36 - 325i/is & M3 (as of 9/92)
		E34 - 525i/it (as of 9/92)

M3.x engine control modules allow EPROMs:

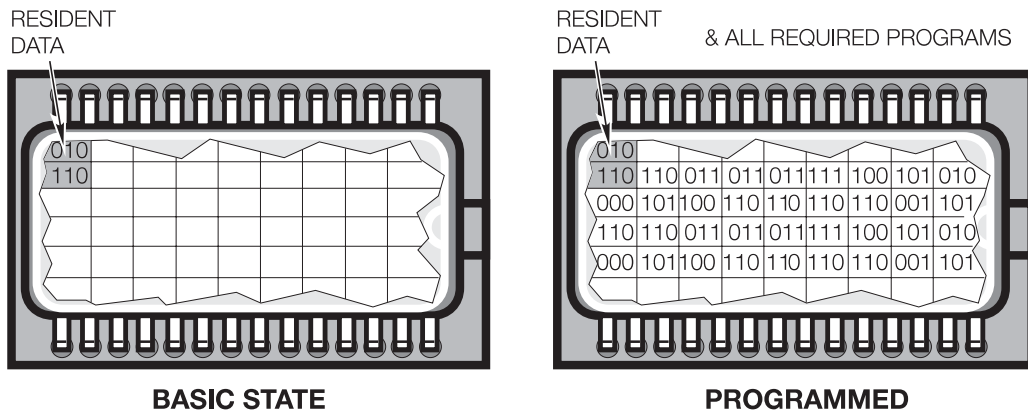
- To be removed & replaced
- Programmed or updated depending on control module version

M3.1 Engine Control Modules

Beginning with M3.1 DME/ECM control modules, BMW introduced the ability to program an EPROM using BMW diagnostic equipment. On the M3.1 control module the originally installed EPROM needs to be removed from the control module and a new partially blank EPROM installed in order to update the existing control module.

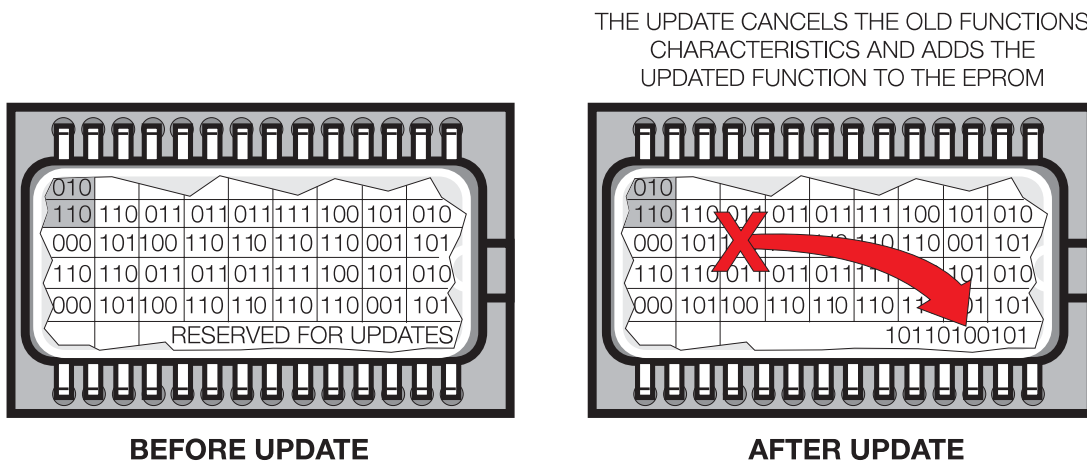
For the M3.1 systems the replacement EPROM that is installed does not contain all the data necessary for the engine to operate, it is a “basic” EPROM that only contains some basic data referred to as “resident data” which helps identify the module and allows the diagnostic equipment to determine what program and associated data needs to be installed/loaded.

For specific information refer to EPROM replacement **SIB 12 08 95(4274)**.



M3.3 & M3.3.1 Engine Control Modules

As later versions of engine control modules (M3.3 & M3.3.1) were introduced it was not always necessary to replace the EPROM in order to perform an update to the module. The EPROMs installed on the newer systems are larger and allow additional information to be loaded without having to install a new EPROM. In the event that the size of the update exceeds the space available on the installed EPROM or an update was previously performed, then the installed EPROM will need to be replaced. For specific information refer to EPROM replacement **SIB 12 08 95(4274)**



For the M3.3 & M3.3.1 systems the replacement EPROM that is installed does not contain all the data necessary for the engine to operate, it is a “basic” EPROM that only contains some basic data referred to as “resident data” which helps identify the module and allows the diagnostic equipment to determine what program and associated data needs to be installed/loaded.

Engine Control Modules Flash (EEPROM) Programming

At the end of 1995 new variations of DME/ECM control modules were introduced that no longer contained a removable EPROM but instead contained a soldered in EEPROM. An EEPROM is an Electrically Erasable Programmable Read Only Memory device, which means that programs & data stored on the chip can be electrically erased and replaced with new/revised programs or data. In order to erase the data on the chip a short duration low level voltage/charge is applied to a pin on the EEPROM and the stored data is erased, hence the name “Flash”. Once the data is erased new data is loaded.

By using a newer technology, these control modules have the ability to be updated a total of 13 times before they need to be replaced.

Theoretically an EEPROM can be erased and reprogrammed more than 13 times, BMW set the number to 13, since a point will be reached where the update being installed may no longer be compatible with the hardware of the installed module which could result in erroneous operation. If the program is not compatible with the hardware version of the module, the program used to determine the correct update for the module will indicate that the module will need to be replaced before the update can be performed.

The reference to Flash programming is a result of the technology used to erase the EEPROM prior to installing a new program and or data.

The control modules listed identify when EEPROMs were first introduced into the DME/ECM:

DME/ECM Version	ENGINE	Vehicle Application
M5.2	M44	E36 - 318i/iA (as of 12/95) E36 - Z3 (as of 1/96)
	M62	E39 - 540i/iA (as 3/96) E38 - 740iLA (as of 12/95) E31 - 840iCA (as of 1/96)
MS41.1	M52	E36 - 328i/iA (as of 10/95) E39 - 528i/iA (as of 2/96)
MS 41.2	S52	E36 - M3 (as of 1/96)

Refer to **SIB 12 05 96** for information pertaining to programming FLASH control modules.

The utilization of EEPROMs within the Engine Management Systems continues to be used today, and has expanded into other control modules as well.

Transmission EPROMS

Beginning with vehicles produced in the early 1990's the Transmission EPROM can be replaced on some vehicles in order to address customer complaints that would normally be addressed by having to replace the Transmission Control Module (TCM). Service EPROMs are available for the following systems:

TCM Version	Engine	Application
EGS 1.27	M70B50	E31 - 850iA (1/90 - 9/91)
EGS 1.29	M70B50	E31 - 850iA (9/91 - 12/91)
EGS 4.16	M42B18	E36 - 318iA/isA/iCA/itA (12/92 - 12/95)
	M50B25	E36 - 325iA/iSA/iCA (10/91 - 9/95)
		E34 - 525iTA/iA (9/90 - 12/95)
EGS 7.30	M60B30	E34 - 530iA (3/93 - 8/93)
AGS 7.32	M60B30	E34 - 530iA (9/93 - 6/95)
EGS 9.20	M60B40	E34 - 540iA (3/93 - 8/93)
		E32 - 740iA/iLA (9/92 - 9/94)
		E31 - 840CiA (9/93 - 9/94)
AGS 9.22	M60B40	E34 - 540iA (9/93 - 5/96)
		E38 - 740iA/iLA (9/94 - 5/95)
		E38 - 750iLA (1/95 - 6/95)

Refer to **SI B24 04 96** for additional information pertaining to Transmission EPROM Application.

Refer to **SI B24 05 95** for information pertaining to Transmission Control Module EPROM Replacement.

Transmission Control Module Flash (EEPROM) Programming

The introduction of newer generation Transmission Control Modules introduced with the M44, M52 and M62 engines at the end of 1995, brought with it the ability to “flash” program this module as well. By being able to electrically erase and install a new program and or data stored on the EEPROM, it no longer becomes necessary to replace the chip to get an updated transmission program installed.

The technology used on the Transmission Control module is the same as explained in the section “Engine Control Module Flash (EEPROM) Programming”.

When is EPROM Replacement and/or Programming Necessary?

The program and or data of an engine or transmission control module only needs to be updated or replaced if:

- The control module is replaced with a non programmed/basic module.
- A Service Action, Recall or customer concerns have resulted in the release of a new/updated program or revised operational data.

The programming procedure of the diagnostic equipment will identify if:

- a DME EPROM needs to be replaced or can be updated
- a control module (DME or Transmission) can still be programmed or needs to be replaced if the reprogramming limit of 13 times has been reached

How is a Replacement EPROM or Control Module Determined?

DME/ECM EPROM

As mentioned previously on the M3.1 Engine Control Modules the EPROM needs to be replaced whenever an update is to be performed. On M3.3 and M3.3.1 Control Modules the EPROM's for these modules generally have enough additional space to add/load one update. However, if the update that needs to be installed is too large, then the installed EPROM needs to be removed and a Basic EPROM reinstalled. The diagnostic equipment (DISplus, GT1 or SSS) contains a program within CIP that will determine the part number of the replacement EPROM or control module that needs to be installed.

For some control module variations there is more than one replacement EPROM available.

Example: An M3.1 DME has three different hardware versions:

Bosch Hardware Number 0 261 200 402

Bosch Hardware Number 0 261 200 403

Bosch Hardware Number 0 261 200 405

This requires three different replacement EPROM's, however one EPROM is not necessarily specific to one hardware version.

TCM

Regarding the replacement EPROM for Transmission Control Modules there are specific Service Bulletins which identify various situations that can be addressed by replacing the EPROM in the control module. The replacement transmission EPROM does not require any type of programming after being installed, as it already contains all the program and operational data.

If an early version Transmission Control Module, for vehicles prior to 1996 model year, is replaced it generally also does not need to have the EPROM replaced as the required program is already installed.

Programming Procedure

Within CIP is a procedure that requires the selection of the model/series whenever a/an:

- EPROM needs to be updated/replaced
- EEPROM needs to be updated
- Control module needs to be replaced

Then select “Programming” - “DME Programming” or “EGS Programming” and follow the steps given in the respective SIB.



Workshop Exercise - SIB Look-up

Detailed information pertaining to updates and replacements is provided in:

SI B12 08 95(4274) - DME EPROM replacement

SI B12 08 94(4117) - M50 DME EPROM Update

SI B12 07 94(4116) - M50 DME Programming Update,

SI B12 09 94(4132) - M60 DME EPROM Update

SI B 12 07 95(4273) - M60 DME EPROM Needs Replacement

SI B12 05 96 - Programming Flash Control Modules (DME)

SI B2404 96 - EPROM Replacement Application Chart

SI B24 05 95 - EGS/AGS EPROM Replacement

Plus additional situation/complaint specific Service Bulletins available on the TIS website.

Determination Process for DME EPROM

In the event a DME EPROM, a control module or the program of a control module needs to be updated or replaced the program contained within CIP will provide the information necessary to perform the specific task. A program within CIP is used to determine the correct replacement part numbers (EPROM, Control Module or software update) to be installed.

For earlier production vehicles there are two ways to perform this process:

- “automatic” determination
- or
- “manual” determination.

The automatic determination is the preferred method as it is faster and mistakes made during data entry into the tester are avoided. For newer production vehicles that utilize EEPROMs/Flash programming the determination process is done automatically as part of determining a measures plan (refer to CIP section or more information).

Automatic Determination

In order to determine which EPROM needs to be installed there is a special procedure that is executed as part of the “Exchange EPROM” process. The procedure will “automatically” determine the correct replacement EPROM or control module part number, based on the “Basic part number” and “Programmed part number” stored on the installed EPROM, if the EPROM is not damaged.

The procedure is run automatically if “YES” is selected for the answer to the question “Is old EPROM still installed.”

During the automatic determination process the tester compares the part numbers stored in the EPROM of the currently installed DME control module with a list of possible replacement part numbers contained in the program of the tester.

The comparison is done to determine if the tester can "recommend" a replacement EPROM or control module part number.

Manual Determination

If the EPROM is damaged then the “Basic part number” and “Programmed part number” indicated on the label of the control module that is located on the cover of the module must be entered “manually” via the touch screen on the tester so that the replacement part numbers can be determined.

This procedure is followed if “NO” is selected for the answer to the question “Is old EPROM still installed?”

During a manual determination you will need to:

- Enter the part number for a basic (programmable) control module.
- Enter the VIN number of the vehicle.
- Enter the part number of a programmed control module

Once the correct numbers are entered, the tester searches a “master list” for the proper replacement part number and will display either that part number or the message "no substitute found."

Regardless of which process is used if the replacement part does not match the part number displayed and "expected" by the program on the tester, programming will not occur. You need to obtain the proper replacement part.

At no time during the determination or programming process should you turn off the ignition, disconnect the control module or tester/interface.

Once the EPROM is programmed by way of the “Automatic” or “Manual” determination process it contains the operating program for the engine and the associated operational data or characteristic maps. In the event a basic replacement control module is installed, the EPROM installed in the control module will be programmed in the same manner.

Note: The EPROM in a basic replacement module does not need to be replaced since it only contains the “resident data” and nothing else.

Review Questions

1. Do EPROMs always need to be replaced in an Engine Control Module?

2. What does “Flash” programming mean?

3. Why does BMW limit the number of times a control module containing/using a EEPROM can be reprogrammed? What is the BMW limit?

Review Questions

1. *What is the purpose of a ZCS code in a vehicle?*

2. *Where is the ZCS code stored in a vehicle?*

3. *How can you determine what modules in the vehicle are codeable via the ZCS code?*

4. *What is the purpose of a Vehicle Order what information does it contain?*

5. *When was the VO structure introduced?*

6. *Which models utilize a VO structure?*

7. *How can the VO information of a vehicle be accessed?*
