



congatec Application Note #8

Affected Products	All congatec x86 products with BIOS
Subject	Create and add an OEM CMOS Default Map Module
Confidential/Public	AN8_Create_OEM_Default_Map
Author	CJR

Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2006-07-31	OAL	Initial release
1.1	2006-08-30	RCH	Added guideline for the DOS version in section 3.
1.2	2006-11-09	OAL	Updated for congatec System Utility Tool version 13.0
1.3	2007-10-19	RCH	Updated DOS commands in section 3
1.4	2013-03-28	HOM	Added a Note for Section 2 and 3
1.5	2014-07-23	CJR	Major rework. Added chapter 4. Removed all references to saving a BIOS from flash to file and using this file to update other modules.
1.6	2017-03-21	CJR	Updated template and major rework.

Preface

This application note describes how to create an OEM CMOS Default Settings Map Module using the congatec System Utility based on examples.

The names “CMOS Default Map” and “CMOS Backup Map” refer to the old legacy BIOS. With the new UEFI firmware, these names are not used anymore because UEFI does not use the CMOS in the RTC to store the system configuration. Therefore, congatec System Utility revision 1.5.7 and later refer to “Current Settings Map” instead of “CMOS Backup Map” and “Default Settings Map” instead of “CMOS Default Map”.

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Symbols

The following are symbols used in this application note.



Notes call attention to important information that should be observed.



Cautions warn the user about how to prevent damage to hardware or loss of data.



Warnings indicate that personal injury can occur if the information is not observed.

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Terminology

Term	Description
BIOS	BIOS: Basic Input Output System. BIOS is actually firmware, the software that is programmed into a ROM (Read-Only Memory) chip built onto the motherboard of a computer
UEFI	Unified Extensible Firmware Interface is a specification that defines a software interface between an operating system and platform firmware. UEFI is meant as a replacement for the Basic Input/Output System (BIOS) firmware interface.
Flash	A special type of EEPROM (Electrically Erasable Read Only Memory) that can be erased and reprogrammed in blocks instead of one byte at a time. Many modern PCs have their BIOS stored on a flash memory chip so that it can easily be updated if necessary.
POST	Power-on Self Test - a diagnostic testing sequence run by a computer's BIOS as the computer's power is initially turned on. The POST will determine if the computer's RAM, disk drives, peripheral devices and other hardware components are properly working.
CGUTIL	congatec System Utility – universal tool for BIOS updates and BIOS modifications.
CGOS	congatec Operating System API – software driver for the congatec Embedded Features

1 Introduction

The following sections describe how to create an OEM CMOS Default Settings Map Module within the BIOS module using the congatec System Utility. It is compatible to all congatec x86 products and available as a Windows (CGUTIL GUI) application and command line (CGUTLCMD) application.

The second chapter is based on the Windows GUI version. The third chapter is based on the command line version. The target system consists of the conga-X915 COM and the BIOS ROM file "BHSLR014.BIN". The fourth chapter explains the most commonly used procedure to create a new OEM BIOS file. It also uses "BHSLR014.BIN" as an example BIOS.

The initial production BIOS is identified as BHSLR1xx:

- BHSL is the congatec internal project name.
- R is the identifier for a BIOS ROM file.
- 1 is the so called feature number.
- xx is the major and minor revision number.

The congatec Embedded BIOS employs a security feature preventing a password protected BIOS from overwrite (see note below).

To understand which settings are required in the congatec Embedded BIOS to enable the security feature and how the congatec System Utility (CGUTIL) can be used with a protected BIOS, see application note AN5_BIOS_Update_And_Write_Protection.pdf. It can be downloaded from the congatec website at www.congatec.com. For detailed information about the congatec System Utility, refer to the user's guide. It can be downloaded from the congatec website as well.



Note

The names "CMOS Default Map" and "CMOS Backup Map" refer to the old legacy BIOS. With the new UEFI firmware, these names are not used anymore because UEFI does not use the CMOS in the RTC to store the system configuration. Therefore, congatec System Utility revision 1.5.7 and later refer to "Current Settings Map" instead of "CMOS Backup Map" and "Default Settings Map" instead of "CMOS Default Map".

2 Creating and adding a OEM CMOS Default Map using CGUTIL GUI (Windows version)

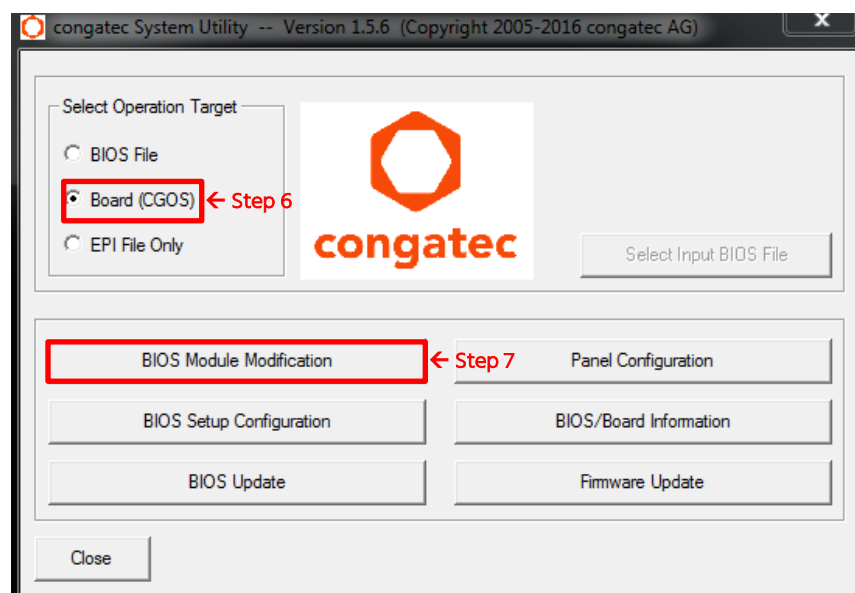
The method described below is useful for evaluating and testing the OEM customization feature offered by the congatec System Utility. If you work on the target system, you can immediately check changes of the BIOS. Another possibility is to work in BIOS File mode using a host PC described in chapter 4.

1. Enter the BIOS Setup Program of your congatec CPU board.
2. Select the settings required for your OEM specific Default Settings Map. A backup map will be automatically generated by saving the BIOS settings.

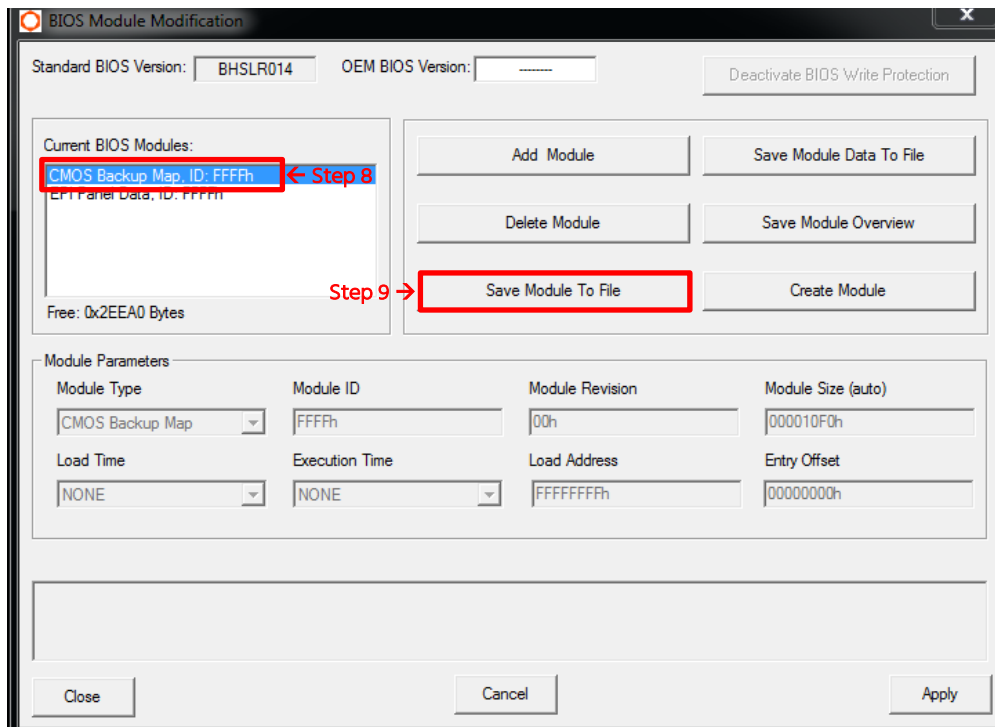
Note

The default maps are specific to BIOS revisions. A created default map can only be used on the BIOS revision it is derived from. It cannot be integrated into another BIOS revision.

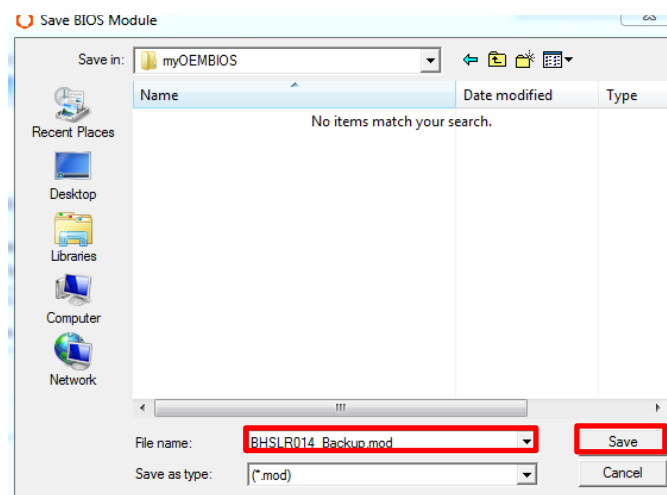
3. Boot Microsoft Windows.
4. To install the congatec System Utility, refer to the congatec System Utility user's guide.
5. Start the congatec System Utility.
6. Select "Board (CGOS)" to modify the onboard BIOS of your running system.
7. Click on "BIOS Module Modification".



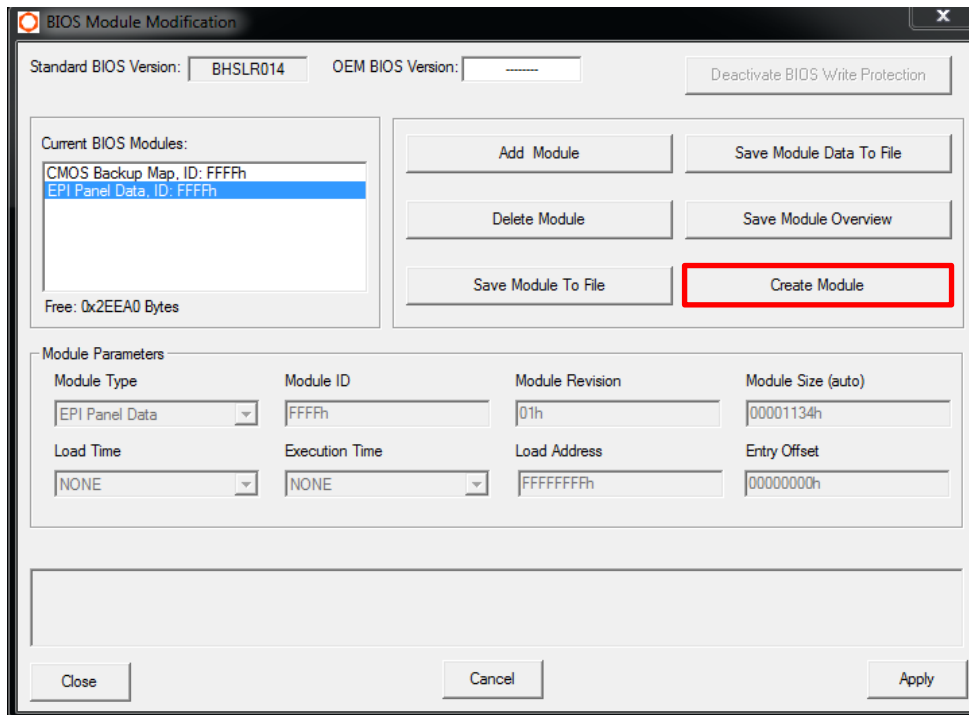
8. Click on "CMOS Backup Map" in the "Current BIOS Modules" section.
9. Click on "Save Module To File" button.



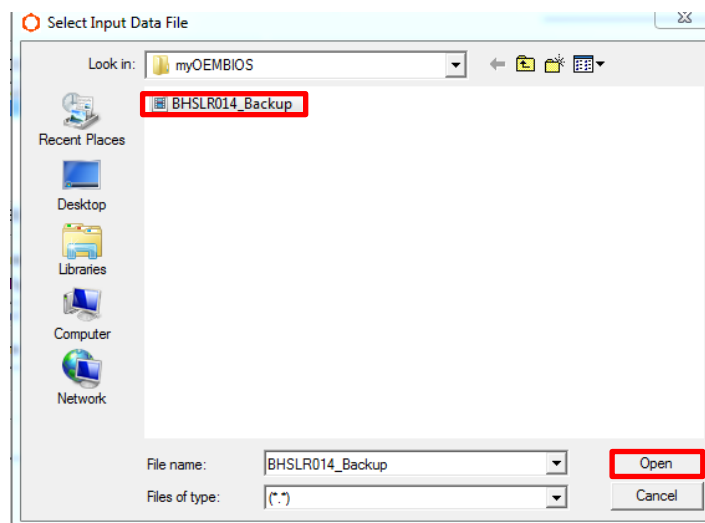
10. Enter a name for the CMOS Backup Map (in this example "BHSLR014_BACKUP.mod") and click on "Save". Later on, this file will be implemented in to your original BIOS binary file.



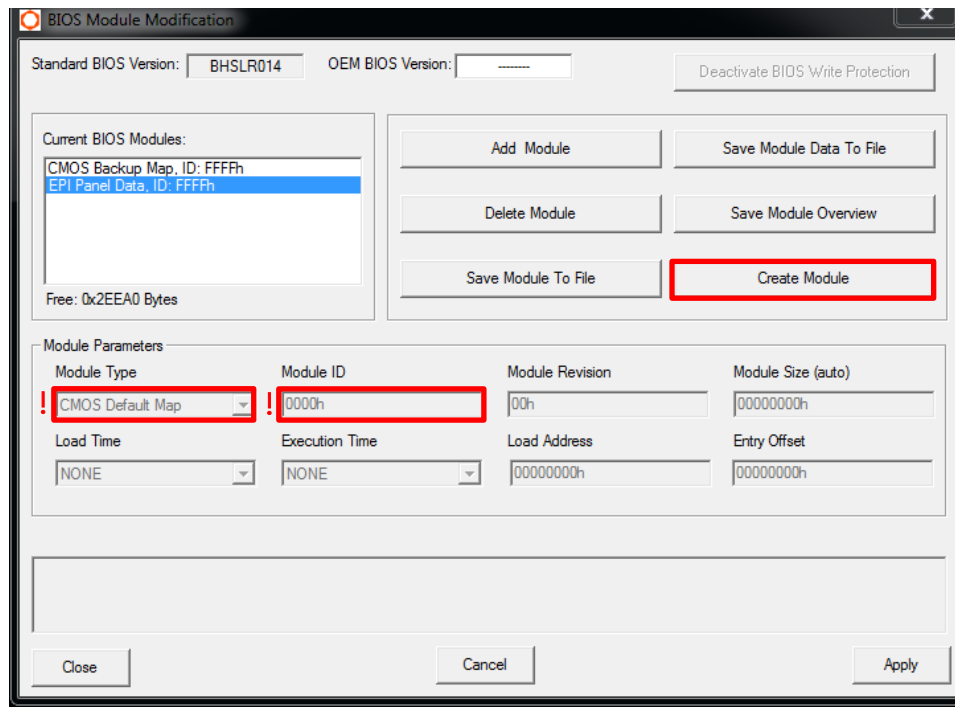
11. Click on the “Create Module” button to create an OEM CMOS Default Map from your CMOS Backup Map.



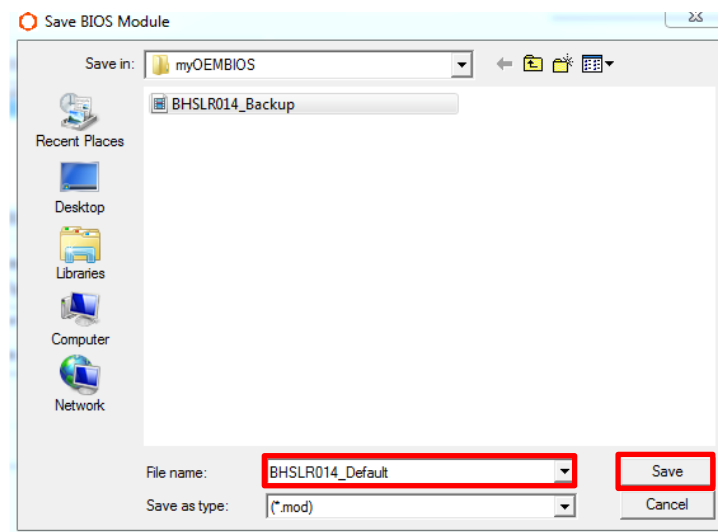
12. The “Select Input Data File” window pops up. Click on the previously saved backup file (in this example “BHSLR014_BACKUP.mod”) and then click on “Open”.



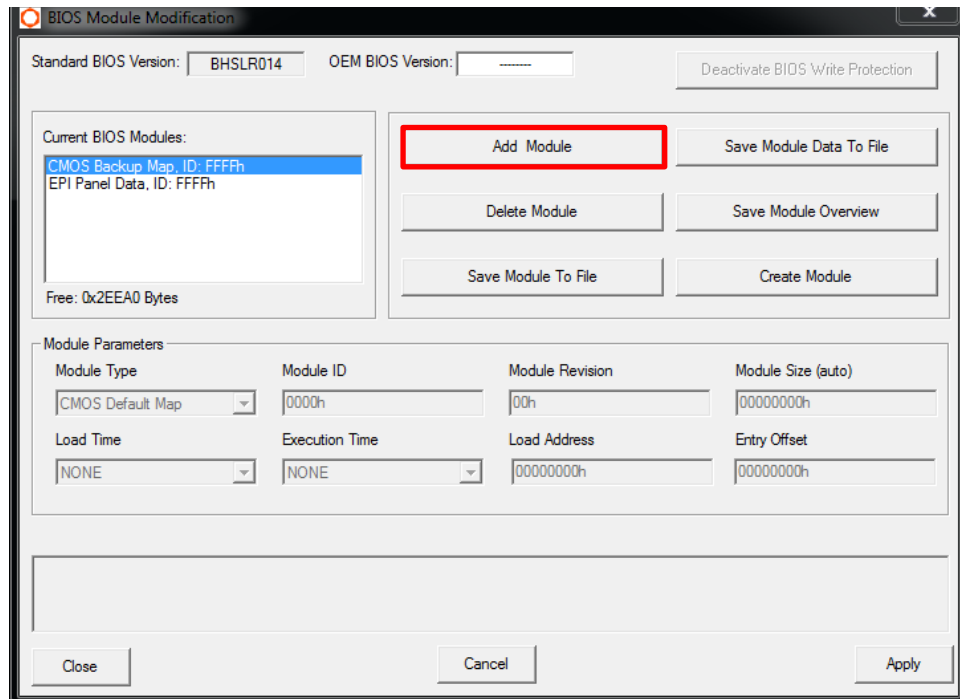
13. Make sure to change the "Module Type" to "CMOS Default Map" and keep the "Module ID" set at 0000h (default) before clicking on the "Create Module" button again to generate the new module.



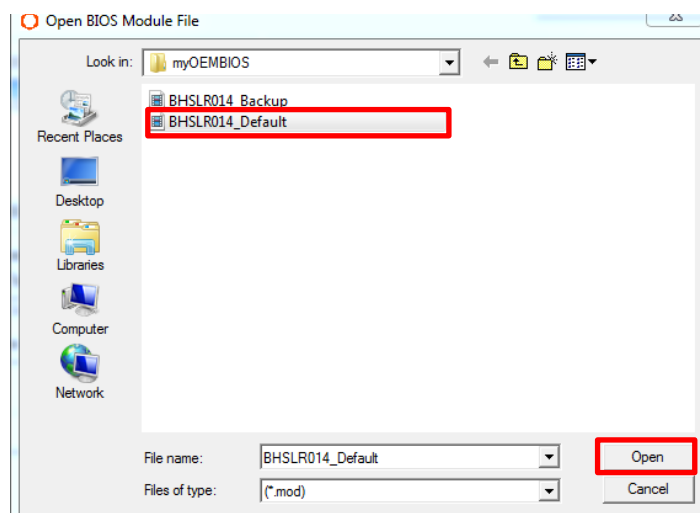
14. Save the created CMOS Default Map (in this example "BHSLR014_DEFAULT.mod"). Later on, this file will be implemented in to the original BIOS binary file.



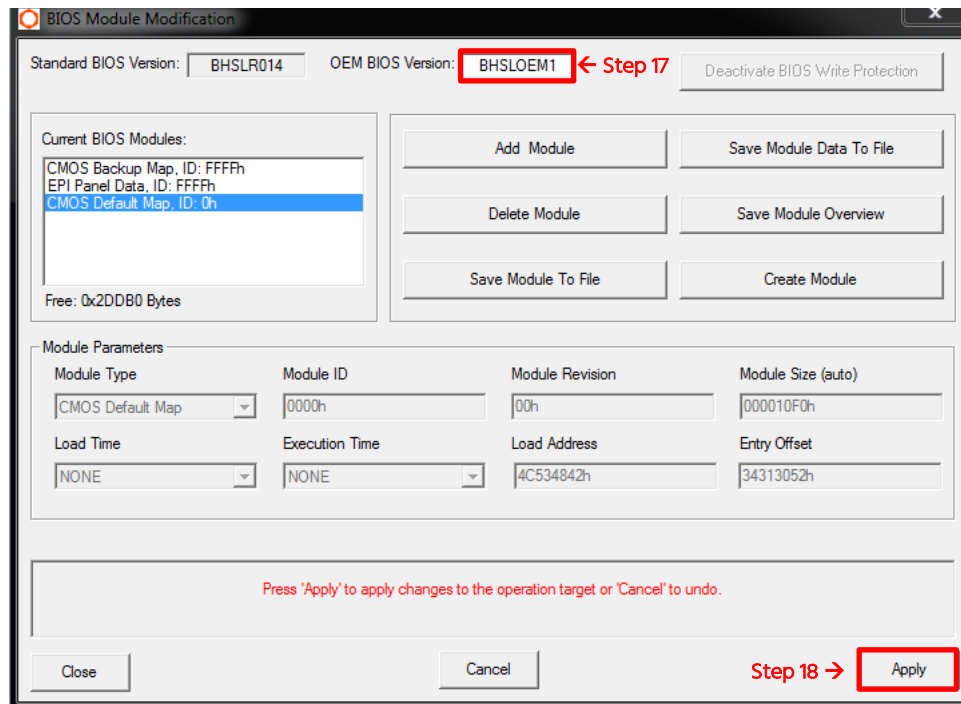
15. Click on “Add Module” in the “BIOS Module Modification” window to add the CMOS Default Map Module (in this example “BHSLR014_DEFAULT.mod”).



16. Click on the previously saved CMOS Default Map (in this example “BHSLR014_DEFAULT.mod”) from step 14 and then click on “Open”.



17. The CMOS Default Map appears in the “Current BIOS Modules” module window. Name your OEM BIOS Version (in this example “BHSLOEM1”). This name is shown in the BIOS Setup Program below the congatec BIOS version as well as during POST.
18. Click on “Apply” to confirm your changes.



Caution

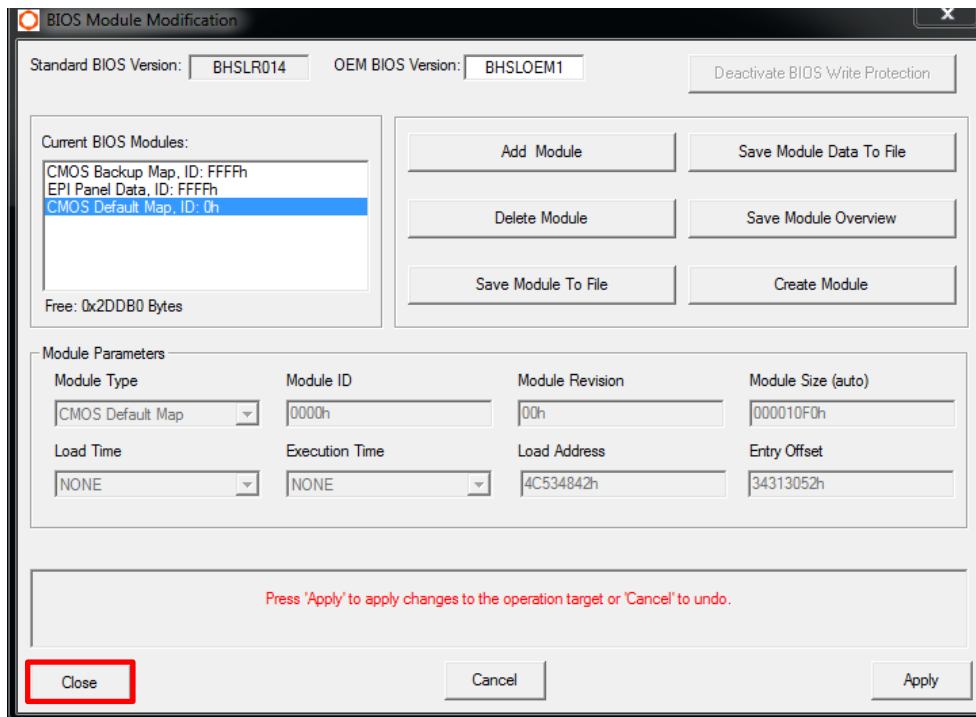
An incorrect setting may damage your onboard BIOS file which could lead to a problem. In the worst case, the board may no longer be bootable. A safe alternative way would be to switch to a host PC system and do the necessary changes on a BIOS binary file separately.



Note

If the “CMOS Backup Map” module is not visible in the “Current BIOS Modules” window (as in the picture above), add the module created in step 10 with your desired default settings. If a “CMOS Backup Map” module is displayed with the wrong default settings, overwrite it with the correct module.

19. Click on the “Close” button to close the “BIOS Module Modification” window.



Caution

Do not save the BIOS of the target module to a file to use for mass production of additional modules. For the purpose of generating a mass production BIOS, you should always work in file mode. UEFI based BIOS binaries might not work correctly following this procedure. Always work on a BIOS binary file as explained in chapter 4 when a new BIOS file must be created.



Note

For more information about how to update the BIOS file, see application note AN1_BIOS_Update.pdf. This application note can be downloaded from the congatec homepage.

3 Creating and adding an OEM Default Map using CGUTIL command line version

The method described here is helpful for updating the congatec BIOS on the production line using the command lines from step 6 and 7 in a simple batch script. This example explains the procedure in DOS. The command line version of CGUTIL works the same way in Linux and the UEFI shell. All example names used in the steps below may be changed. Only the DOS naming convention of an 8 character name and 3 character extension, separated by a dot, must be adhered to.

1. Enter the BIOS Setup of your congatec CPU board and select the settings required for your OEM specific CMOS Default Map.
2. Press the <F10> key or "Save and Exit" to save the BIOS settings. A CMOS Backup Map will be automatically generated.
3. Reset your computer and start DOS.
4. Switch to the "congatec System Utility" folder.

Enter the command below to save the CMOS Backup Map created in step 2. You may change the name "BHSLCBM.mod".

```
cgutlcmd module /ot:board /save /of:BHSLCBM.mod /t:1
```

5. Enter the command below to create an OEM CMOS Default Map. You may change the parameter "/of:" (in this example "BHSLCBM") with its default extension ".mod". Use the selected Backup Map name from the previous step (in this example "BHSLCBM.mod") after parameter '/if:'.

```
cgutlcmd module /ot:board /create /if:BHSLCBM.mod /of:BHSL0EM.mod /t:2
```

6. Enter the command below to add the newly created OEM CMOS Default Map to your system BIOS. Use the name of the parameter '/if:' from the previous step (in this example "BHSL0EM.mod").

```
cgutlcmd module /ot:board /add /if:BHSL0EM.mod
```



Note

The default maps are specific to BIOS revisions. A created default map can only be used on the BIOS revision it is derived from. It can not be used to flash another BIOS revision. For further information about your system BIOS, please refer to the appropriate user's guide, which can be found on the congatec website.

7. Use the command below to assign a customized OEM BIOS name to the modified BIOS. This OEM name will be shown in the main page of the BIOS below the initial production BIOS name when entering the system BIOS Setup Program. You may change the name "BHSL0EM1".

```
cgutlcmd module /ot:board /OEM:BHSL0EM1
```

The screenshot below shows how the commands above are executed in the UEFI shell:

```
fs0:\> cgutlcmd module /ot:board /save /of:BHSLCBM.mod /t:1

congatec System Configuration Utility --- Version 1.5.6
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BIOS Module Modification Module
Saving module...DONE

fs0:\> cgutlcmd module /ot:board /create /if:BHSLCBM.mod /of:BHSL OEM.mod /t:2

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BIOS Module Modification Module
Creating module CMOS Default Map...DONE

fs0:\> cgutlcmd module /ot:board /add /if:BHSL OEM.mod

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BIOS Module Modification Module
Adding module...DONE
Applying changes to operation target...DONE!

fs0:\> cgutlcmd module /ot:board /DEM:BHSL OEM1

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BIOS Module Modification Module
Assigning OEM version...DONE
Applying changes to operation target...DONE!

fs0:\> _
```

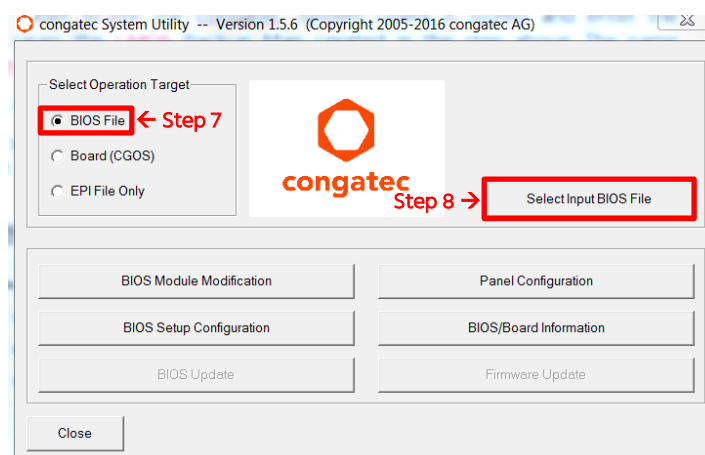
4 Creating and adding a OEM Default Map using CGUTIL CMD and GUI

The easiest way to create a customized BIOS with an OEM CMOS Default Map is to use the command line version CGUTLCMD on the target system first and then switch to a development PC running the Windows GUI version of CGUTIL in 'File Mode'.

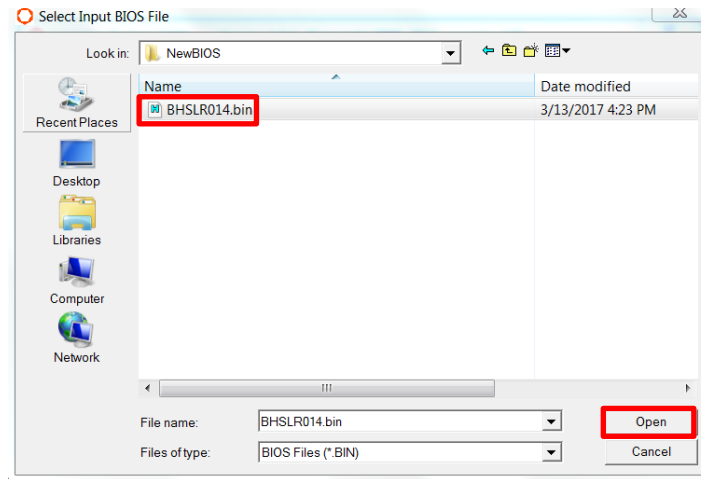
The method described here is typically used to build a customized OEM BIOS binary file that can then be flashed on additional congatec CPU boards.

The first five steps are almost identical to the method described in chapter 3.

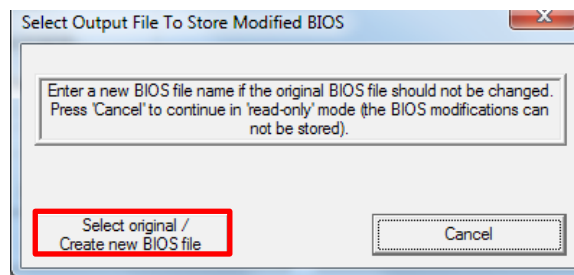
1. Enter the BIOS Setup of your congatec CPU board and select the settings required for your OEM specific CMOS Default Map. For further information about your system BIOS, please refer to the appropriate user's guide, which can be found on the congatec website.
2. Press the <F10> key or "Save and Exit" to save the BIOS settings. A CMOS Backup Map will be automatically generated.
3. Reset your computer and start DOS or the UEFI shell (typically from a USB stick).
4. Switch to the "congatec System Utility" folder.
5. Enter the command below to save the CMOS Backup Map created in step 2. You may change the name "BHSLCBM.mod".
`cgutlcmd module /ot:board /save /of:BHSLCBM.mod /t:1`
6. Switch to your Windows based development PC and start the congatec System Utility "CGUTIL.exe".
7. Select "BIOS File" to modify the original congatec BIOS binary file.
8. Click on "Select Input BIOS ROM File".



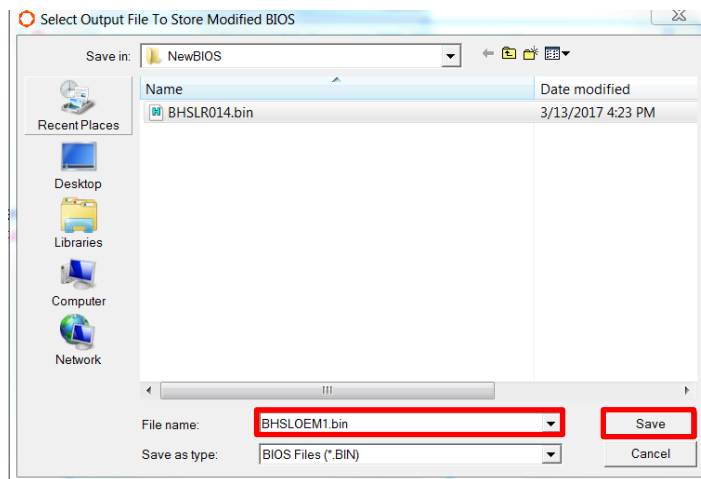
9. Load the BIOS binary you want to modify (in this example “BHSLR014.bin”).



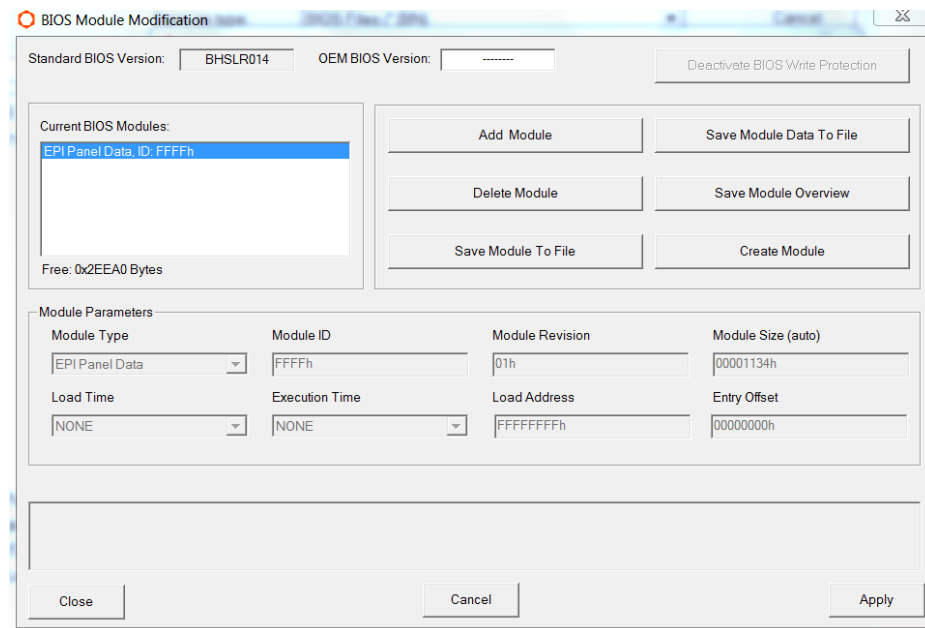
10. Click on “Select original / Create new BIOS file” in order to create your new OEM BIOS binary file CGUTIL as shown in the pop-up menu below.



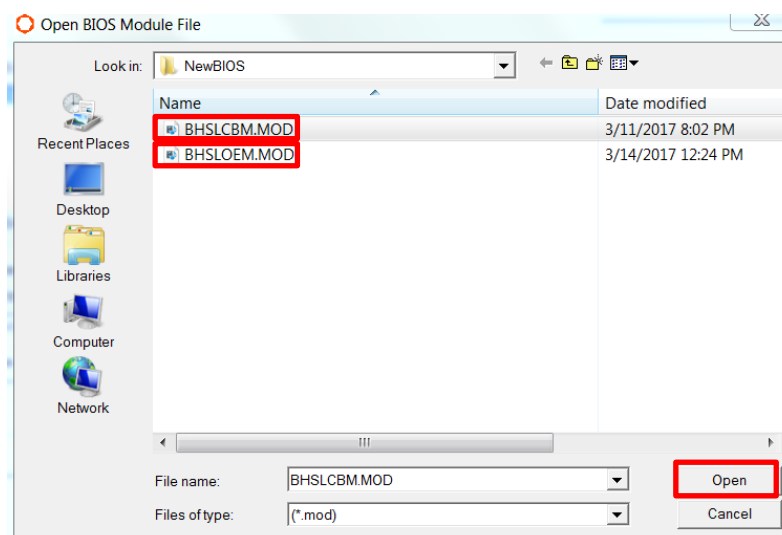
11. Name your OEM BIOS file (in this example “BHSLOEM1.BIN”) and click “Save”.



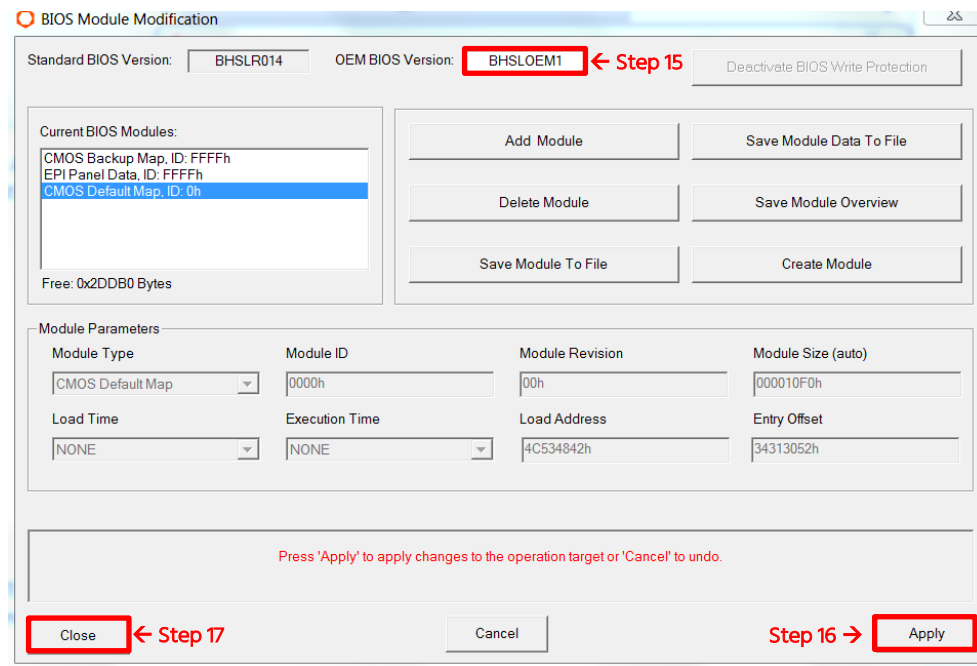
- Click the “BIOS Module Modification” button to open the window pictured below. You will see that neither a CMOS backup map nor a CMOS default map is present in the congatec standard BIOS binary.



- Create the OEM Default Map as described in steps 11 to 14 in chapter 2. In this example, the file name of the Backup Map is “BHSLCBM.mod” and for the Default Map “BHSLOEM.mod”. You must copy the Backup Map file from your USB stick beforehand.
- Click the “Add Module” button in the “BIOS Module Modification” window to add the CMOS Default Map Module (in this example “BHSLOEM.mod”). Then, also add the Backup Map Module (in this example “BHSLCBM.mod”) created earlier in DOS or the UEFI shell to the new BIOS.



15. Assign your OEM name to the BIOS.
16. Save the new BIOS file by clicking the “Apply” button.
17. Click “Close” to close CGUTIL.



18. The new “BHSLOEM1.BIN” BIOS binary file can now be flashed on additional congatec products.

Note

It is assumed that a new OEM BIOS should not only load the OEM defaults when the Load Default command is executed in BIOS Setup (F9), it should also start with these settings on the first boot after the OEM BIOS has been updated. That's why the same settings are also added as Backup Map.