congatec Application Note

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Application Note #10

Revision 1.0

Application Note

Revision History

Revision	Date (dd.mm.yy)	Author	Changes
1.0	08.11.06	HCH	Initial release

Preface

This Application Note is intended to explain how the congatec Embedded BIOS Setup program can be customized and adapted to the requirements of a particular application. The customization of the BIOS Setup program can be done using the congatec System Utility tool (CGUTIL).

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Intended Audience

This Application Note is intended for technically qualified personnel. It is not intended for general audiences.

Symbols

The following symbols may be used in this Application Note:

Warning

Warnings indicate conditions that, if not observed, can cause personal injury.

Caution

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

Note

Notes call attention to important information that should be observed.

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Terminology

Some of the following terms may be used throughout this document.

Term	Description
BIOS	BIOS: Basic Input Output System. BIOS is actually firmware, the software that is programmed into a Flash Memory chip built onto the motherboard of a computer.
BIOS Setup	A program provided by the BIOS where user can change parameters that affect the BIOS & system configuration. Also known as CMOS Setup. The BIOS Setup program on congatec modules can be entered by pressing the delete key 'Del' during BIOS POST.
Setup Node	Menu item or option in the BIOS Setup.
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.

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1 Introduction

Allowing full access to the BIOS Setup could lead to the risk that the end user can change BIOS settings that may negatively affect the systems functionality and cause the system to no longer boot. One solution to avoid this is to secure the BIOS Setup with Supervisor and User passwords. With this solution the user access to the BIOS Setup can be completely blocked or they may be permitted read only access.

A more efficient solution is to customize the BIOS Setup program so that the user can only change settings that are not critical to the functionality of the complete system. That means that the end user will be allowed to have access to the BIOS Setup program but the settings that they are not allowed to change will be not visible to them. They will only see the settings that they can change that will not jeopardize the system's functionality. BIOS Setup program customization can be done using the congatec System Utility tool (CGUTIL). The following sections will describe how this can be done using the Windows GUI version of the CGUTIL tool. This function is not supported by the command line version of the CGUTIL tool (CGUTLCMD).

For detailed information about the congatec System Utility consult the CGUTIL User's Guide. This can be found on the congatec web page (www.congatec.com).

1.1 Requirements

The feature described in this Application Note is supported by the congatec System Utility tool starting from Revision 1.3.0.

The congatec System Utility requires a CGOS driver version that is equal or higher than 1.02.014.

The CGOS driver and CGUTIL tool can be downloaded from the congatec web page at www.congatec.com.
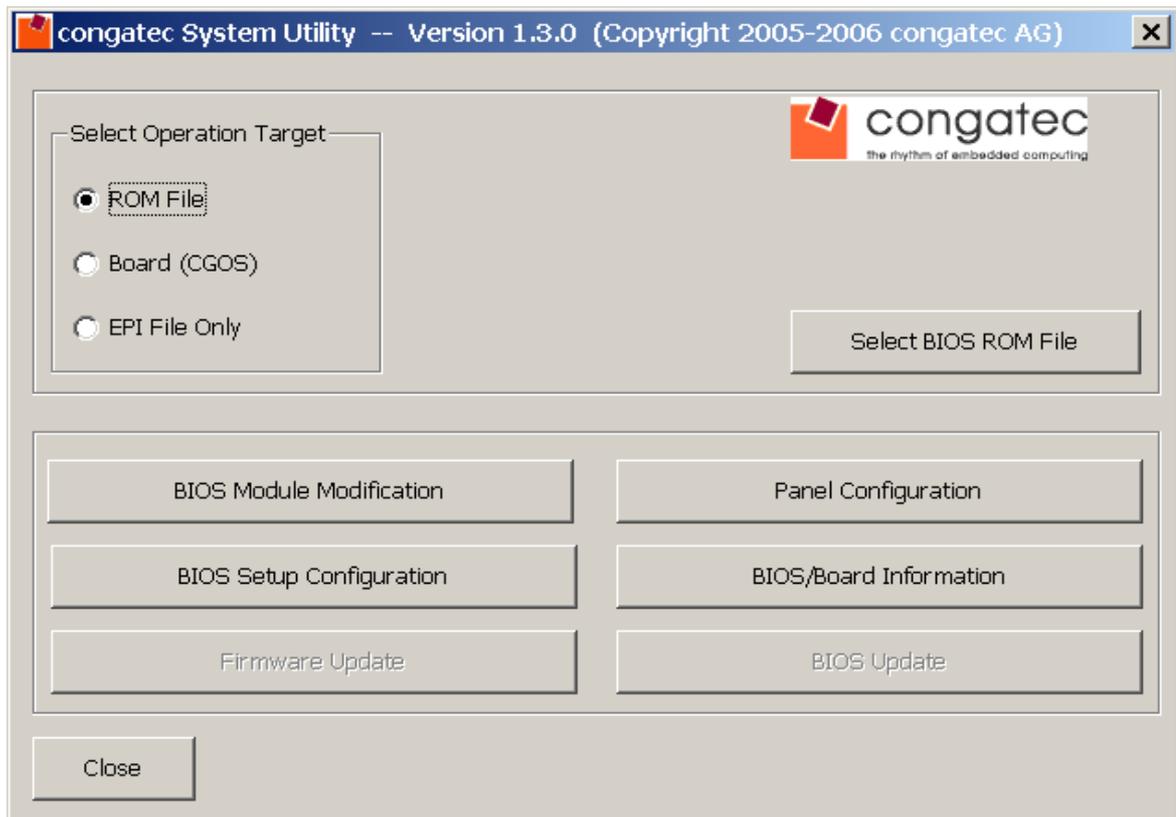
2 BIOS Setup Configuration

The best way to work is to start a congatec CPU module with the BIOS version that must be customized. Enter the BIOS Setup program by pressing the <Del> key during the BIOS POST (see picture 1). On a second computer (for example on a desktop) the CGUTIL tool should be installed and a copy of the BIOS ROM file that must be changed should be saved in a temporary folder. Refer to the congatec System Utility's User's Guide for instructions about how to install the Windows GUI version of the congatec System Utility tool.

Start the congatec System Utility in *'ROM File'* mode (see picture 2) on the second computer. This configuration of using a second computer to modify the BIOS ROM file provides the ability to make the changes step by step. You can view the BIOS Setup program on the CPU module and decide what changes need to be made and implement them immediately to the BIOS ROM file using the second computer. This modified BIOS ROM file can then be flashed on the congatec CPU module (see Application Note AN1_BIOS_Update.pdf).

The BIOS setup configuration function of the CGUTIL can of course also be used directly on the congatec CPU module when in *'Board mode'*. In this case the BIOS in the Flash Memory chip of the congatec CPU module will be modified directly.

```
 Main    Advanced    Boot    Security    Power    Exit
************************************************************************
* System Time                [22:18:30]         * Use [ENTER], [TAB]    *
* System Date                [Mon 09/25/2006]   * or [SHIFT-TAB] to     *
* **************************************************  * select a field.       *
* BIOS ID       : P915R115                       *                        *
* OEM Version   : Unknown                        * Use [+] or [-] to     *
*                                                * configure system Time. *
* Processor     : Intel(R) Pentium(R) M processor 1.4 *                  *
* CPU Frequency : 1400MHz                         *                       *
*                                                *                        *
* System Memory : 504MB                          *                        *
*                                                *                        *
* Board Information                              *                        *
* Product Revision : A.1                         * **     Select Screen  *
* Serial Number    : 50800                       * **     Select Item    *
* BC Firmware Rev. : 133                         * +-     Change Field   *
* MAC Address      : 00:13:95:00:03:04           * Tab    Select Field   *
* Boot Counter     : 1390                        * F1     General Help   *
* Running Time     : 162h                        * F10    Save and Exit  *
*                                                * ESC    Exit           *
*                                                *                        *
************************************************************************
        v02.58 (C)Copyright 1985-2004, American Megatrends, Inc.
```

Picture 1: BIOS Setup of a congatec CPU module
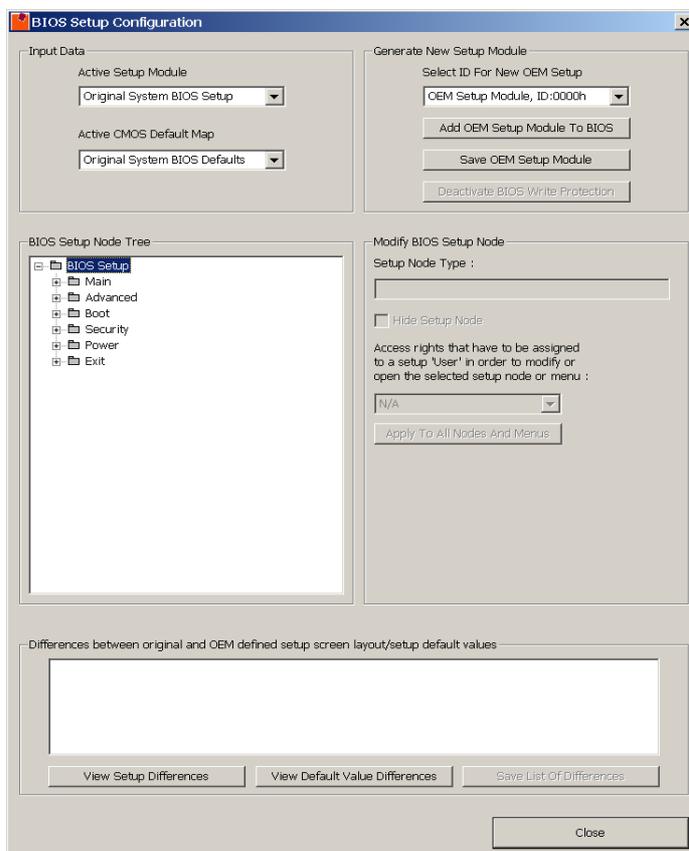
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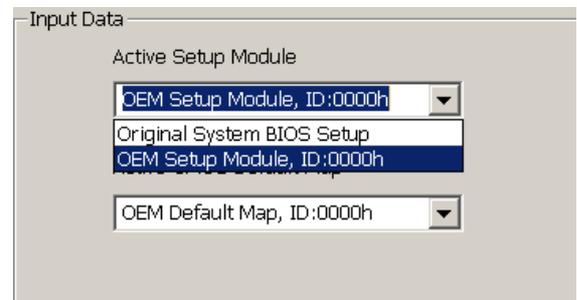**Picture 2:** CGUTIL Main window

To enter the configuration module for BIOS Setup (see picture 3) press the button *'BIOS Setup Configuration'* in the main window of the CGUTIL tool.
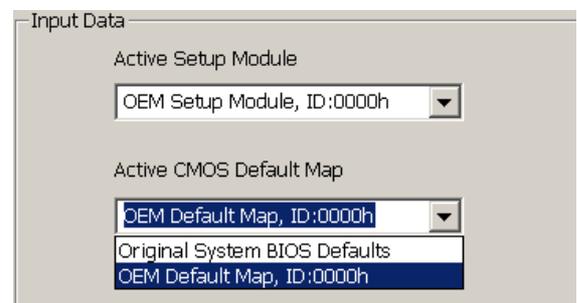
2.1   Selecting BIOS Setup

In the upper left hand corner (*'Input Data'*) the BIOS Setup can be selected to which the customization will be done. On a congatec standard BIOS the only choices available are *'Original System BIOS Setup'* and *'Original System BIOS Defaults'*. When modifying a BIOS where a customized BIOS Setup (*'OEM Setup Module'*) has been added, this setup mode will also be visible and can be selected for additional modifications (see picture 4). The *'OEM Setup Module'* is always the one with the highest priority. If the BIOS contains a *'OEM Default Map'* (see application note AN8_Create_OEM_ Default_Map) this default map has a higher priority than the *'OEM System BIOS defaults'*. The setup customization should be done on this *'OEM Default Map'* (see picture 5).

Picture 4: *'Active Setup Module'*

Picture 5: *'Active CMOS Default Map'*

Picture 3: '*BIOS Setup Configuration'* window

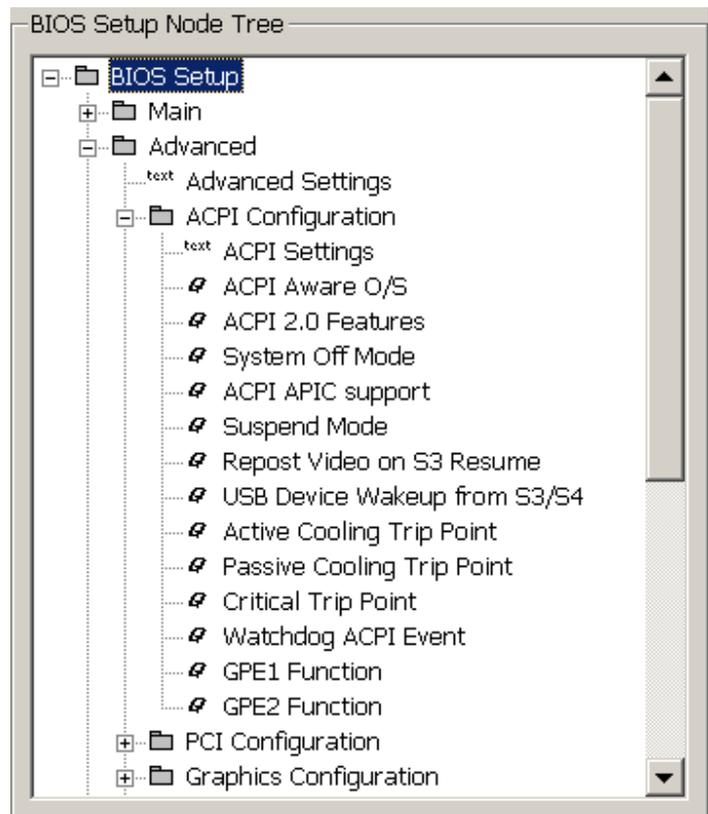# Application Note

2.2 BIOS Setup Nodes

After the BIOS Setup and BIOS Default Map have been selected, the tree displaying all setup nodes will be shown (see picture 6). If the setup tree displayed by the CGUTIL tool is compared with the BIOS Setup nodes on the congatec module (see picture 1) it's possible that some of the setup nodes are not visible. These BIOS Setup Nodes were hidden by the congatec BIOS department because they have no major influence on the functionality of the CPU module and don't need to be changed. These setup nodes can not be changed to *'Visible'* with the CGUTIL tool.

Four types of Setup Nodes can be found:

- Menu Items
- Info Text   text
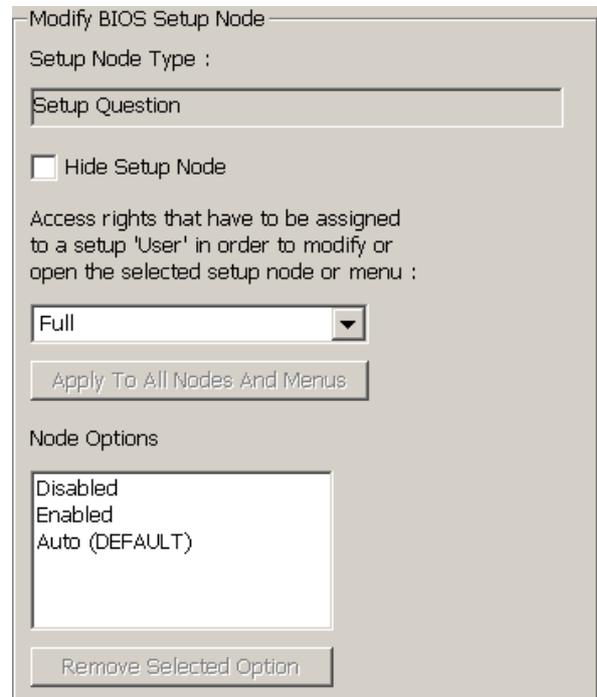- Setup Questions   Q
- Execution Items   exec

Picture 6: *'BIOS Setup Node Tree'*

These nodes may have different subtypes (see picture 7: *'Setup Node Type:'*). The subtype information has no importance for the CGUTIL user and is intended for internal congatec use.

2.3 Modifying Setup Nodes

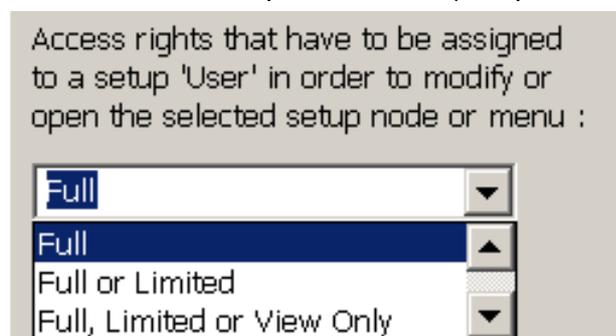A Setup Node can be modified in three different ways (see picture 7):

- • a. The Setup Node can be hidden
  'Hide Setup Node'

- • b. The user access level for the setup node can be modified
  'Access rights that have ...'

- • c. Node options of the Setup Node can be removed
  'Remove Selected Option'

Picture 7: *'Modify BIOS Setup Node'*

a. To hide a Setup Node means that the respective node will disappear from the BIOS Setup and therefore the end user cannot change the setting of this node. The setup node will be hidden when the check box *'Hide Setup Node'* is checked. The symbol of the Setup Node will now be marked with a red square that shows that this node has been modified.

b. The congatec BIOS offers four levels of user access (BIOS Setup: *Security Menu*): *No Access, View Only, Limited* and *Full Access*. With the CGUTIL tool the access levels for the Setup Nodes can be set to a requested value (see picture 8).

Picture 8: Access rights for Setup Nodes

Depending on the user access level set in the BIOS Setup, the following restrictions apply:

- **No access:** Only the system Supervisor has access to the BIOS Setup. The user can not enter the BIOS Setup.

With all other access levels the user can enter the BIOS Setup (with the correct password or by using the <ENTER> key if no user password has been installed in the BIOS Setup).

- **View Only:** The user can only change the values of the Setup Nodes where the access level was set to *'View Only'*. The user has only read access to the Setup Nodes with higher access level requirements (*'Limited'* and *'Full Access'*).

- **Limited:** The user can change the values of the Setup Nodes where the access level was set to *'View Only'* and *'Limited'*. The user has only read access to the setup nodes with a higher access level requirement (*'Full Access'*).

- **Full Access:** The system user can change settings of all nodes (except some settings from the BIOS Setup Security Menu where only the system Supervisor has unlimited access. For example they cannot change the Supervisor password).

c. 'Node Options', settings that are offered as optional values for the respective Setup Nodes, can be removed so that the user cannot select these options anymore. The default node option cannot be removed.
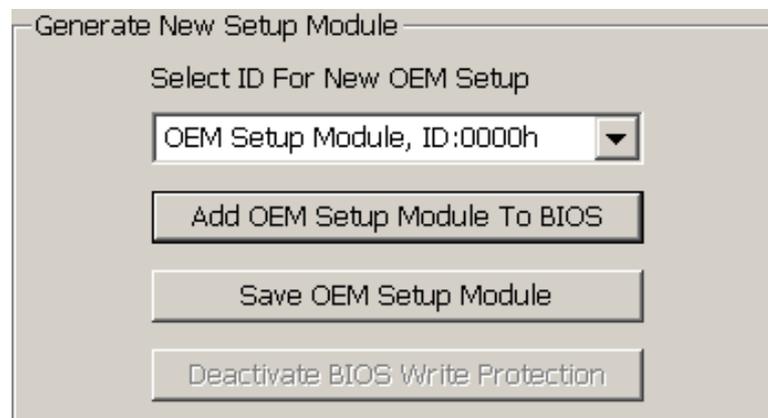
Depending on the Setup Node type, not all modification options are possible. The modifications that can be done on the respective node will be displayed in the *'Modify Setup Node'* window (see picture 7). The modifications that are not possible on this Setup Node will not be accessible (grayed out) or not visible.
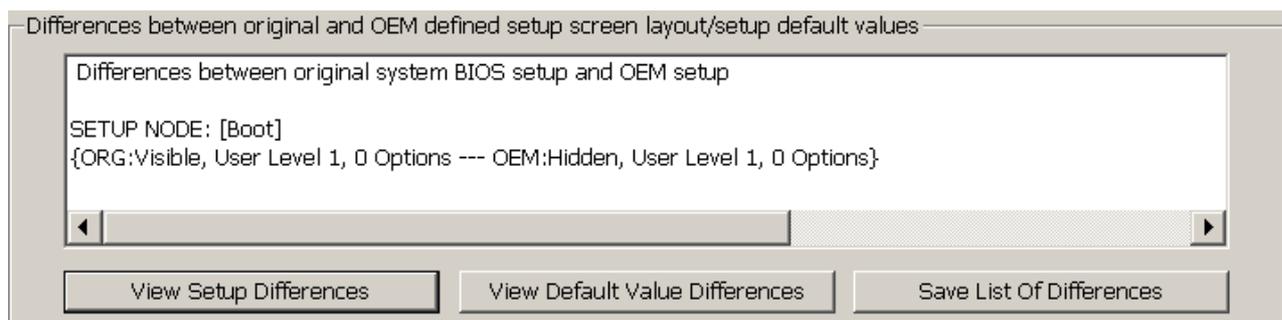
2.4 Writing OEM Setup to BIOS

After the required modifications of the BIOS Setup program are finished, the new BIOS Setup program can be saved in a *.mod* file (see picture 9: *'Save OEM Setup Module'*) or this OEM BIOS Setup program can be added directly into the BIOS ROM file (see picture 9: *'Add OEM Setup Module to BIOS'*).

The active *'OEM Setup Module'* must always have the ID:0000h. It is possible to add more than one *'OEM Setup Module'* into the BIOS ROM file. If this is required contact congatec technical support for assistance.

In a situation where the *'BIOS Write Protection'* is active, it must be deactivated before the new *'Setup Module'* can be added to the BIOS (see application note AN5_BIOS_Update_and_Write_Protection).

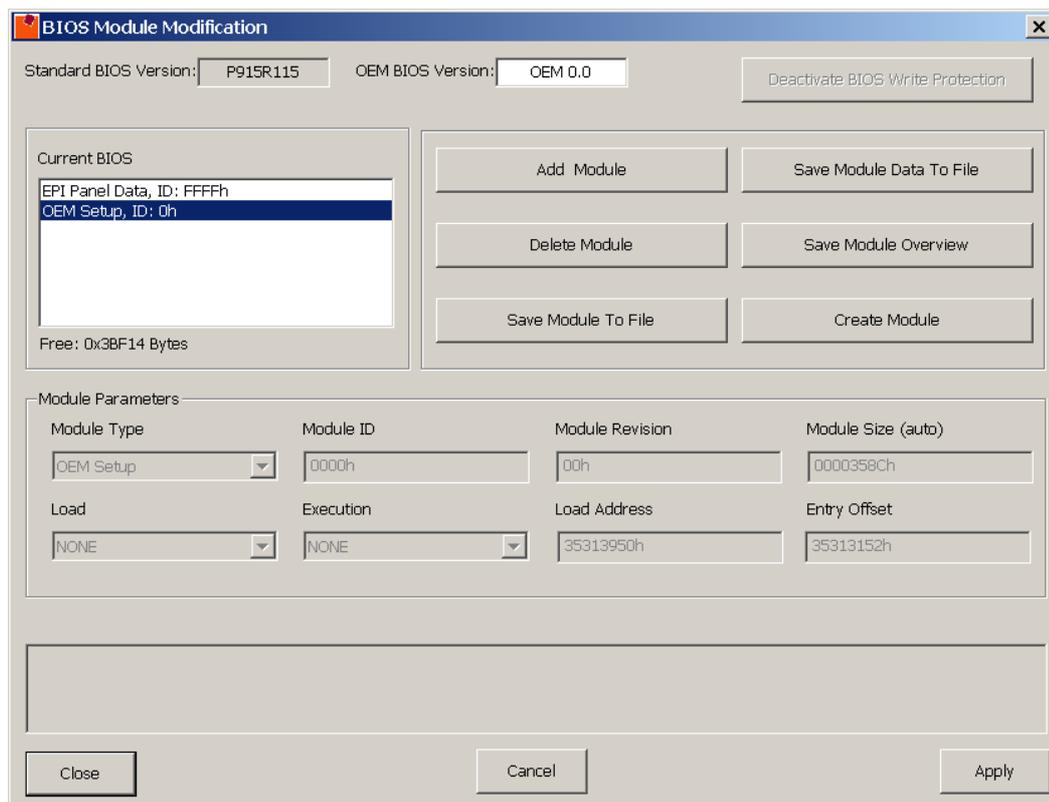**Picture 9:** *'Generate New Setup Module'*

Picture 10: Comparison between original BIOS Setup and OEM Setup

The differences between the *'Original System BIOS Setup'* and corresponding *'Original BIOS System Defaults'* and the newly created *'OEM Setup Module'* and corresponding *'OEM Default Map'* can be easily compared and saved afterwards (see picture 10).

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2.5 Deleting OEM Setup from BIOS

It's possible to delete the *'OEM Setup Module'* from the BIOS. This can be done using the module modification window of the CGUTIL tool (see picture 11). To gain access to this window press the *'BIOS Module Modification'* button on the main window of the CGUTIL tool (see picture 2).

Picture 11: *'BIOS Module Modification'*

Select the OEM Setup module that must be deleted and press the *'Delete Module'* button. After the *'Apply'* button is pressed, the OEM Setup module will be deleted from the BIOS ROM file.

In the same *'BIOS Modification Module'* window, a saved *'OEM Setup Module'* (*.mod*) can be added to the BIOS ROM file. Press the *'Add Module'* button and select the respective *.mod* file. After the *'Apply'* button is pressed the module will be written into the BIOS ROM file.