



## AMI Software Utility User Guide

### AptioV AFU User Guide

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## Document Information

### Purpose

This document provides information to use the AptioV AFU to update the system BIOS.

### Audience

Generic BIOS Engineers, OEM Engineers, and Aptio Customers.

### Change History

Date	Revision	Description
2013-11-19	1.00	Initial document created and update content to latest released of Afu

## Introduction

### Overview

**A**FU (AMI Firmware Update) is a package of utilities used to update the system BIOS under various operating systems. AFU only works for APTIO with SMI FLASH support.

### AFUAPTIO Features

This list of features is supported from command line, command prompt, EFI Shell, or BSD/Linux shell.

- Read system ROM image
- Flash ROM image
- Command line operating

### Requirements

#### Supported Operating System

AFU is supported by the following operating systems:

- Microsoft® Windows® 2000
- Microsoft® Windows® XP
- Microsoft® Windows® 2003
- Microsoft® Windows® 2008
- Microsoft® Windows® Vista (32 bit)
- Microsoft® Windows® Vista (64 bit)
- Microsoft® Windows® 7 (32 bit)
- Microsoft® Windows® 7 (64 bit)
- Microsoft® Windows® 8 (32 bit)
- Microsoft® Windows® 8 (64 bit).
- Microsoft® Windows® 8.1 (32 bit).
- Microsoft® Windows® 8.1 (64 bit).
- Microsoft® Windows® PE (32 bit)
- Microsoft® Windows® PE (64 bit)
- EFI Shell
- DOS
- BSD

- Linux

## Firmware Requirements

- Compatible with Aptio V and later.
- Requires that the current installed firmware has SMI flashing support enabled.
- For supporting Secure Flash, the following eModules are required:
  - *SecureFlash/NIST SP800-147 (5.004\_SecureFlash\_06 or later)*
  - *AmiCryptoPkg (5\_004.CryptoPkg\_010 or later)*
  - *SMIFlash (5.001\_SmiFlash\_03 or later)*
  - *On Flash Block Description (APTIO) (5.001\_OFBD\_03 or later)*
  - *On Flash Block Description (APTIO) - Secure Flash (5.005\_OfbdSecureFlash\_000 or later)*



## Getting Started

### Installation

To run, extract all of the files from the folder with the name corresponding to the desired operating system.



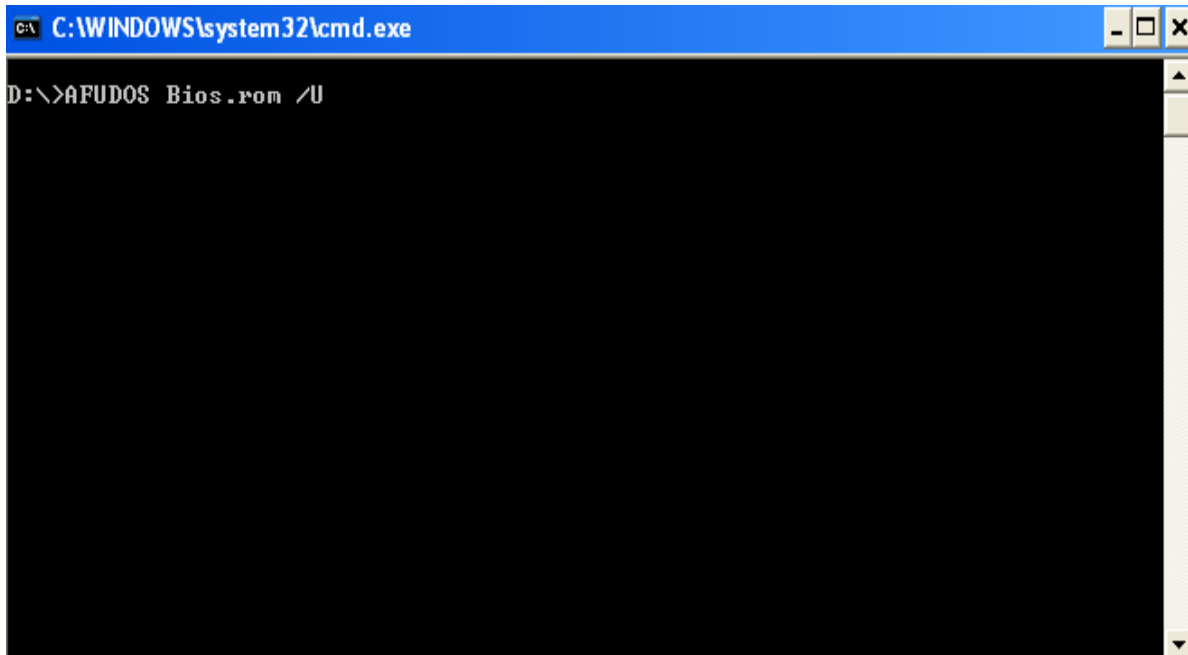
## AFUAPTIO Operation

### Overview

This mostly involves documenting all the SDL tokens and eLinks. This chapter explains the operation of AFUAPTIO.

The AFUAPTIO operation mode includes all of the AFUAPTIO features such as saving current ROM image to file, getting and displaying ROM ID from BIOS ROM file

An example of AFUDOS that Get and display ROM ID from BIOS ROM file command screen is shown below:



```
C:\WINDOWS\system32\cmd.exe
D:\>AFUDOS Bios.rom /U
```

## Commands and Options

The following list is to offer you an overview of the commands and options provided by AFUAPTIO. The content can also be found in AFUAPTIO's help information. A more detailed usage of the commands and options will be explained in the next chapter.

### Usage

*AFUDOS <BIOS ROM File Name> [Option 1] [Option 2] ...*

Or

*AFUDOS <Input or Output File Name > <Command>*

Or

*AFUDOS <Command>*

#### **BIOS ROM File Name**

The mandatory field is used to specify path/filename of the BIOS ROM file with extension.

### Commands

The mandatory field is used to select an operation mode.

- /O            Save current ROM image to file
- /U            Get and display ROM ID from BIOS ROM file
- /S            Refer to Option: /S
- /D            Verification test of given ROM File without flashing BIOS.
- /A            Refer to Option: /A
- /OAD          Refer to Option: /OAD
- /CLNEVNLOG Refer to Option: /CLNEVNLOG

## Options

The optional field used to supply more information for flashing BIOS ROM. Following lists the supported optional parameters and format:

- /Q                Silent execution
- /X                Do not check ROM ID
- /CAF             Compare ROM file's data with Systems is different or not, if not then cancel related update.
- /S                Display current system's ROMID
- /HOLEOUT:       Save specific ROM Hole according to given RomHole GUID.
- /SP               Preserve Setup setting.
- /R                Preserve all SMBIOS structures during programming.
- /Rn               Preserve SMBIOS type N during programming.(n=0-255)
- /B                Program Boot Block
- /P                Program main bios image
- /N                Program NVRAM
- /K                Program all non-critical blocks
- /Kn               Program n'th non-critical block (n=0-15)
- /HOLE:           Update sepcific ROM Hole according to RomHole GUID.
- /L                Program all ROM Holes
- /Ln               Program n'th ROM Hole only (n=0-15)
- /ECUF            Update EC BIOS when newer version is detected.
- /E                Program Embedded Controller block
- /ME               Program ME Entire Firmware Block.
- /MEUF            Program ME Ignition Firmware Block.
- /A                Oem Activation file.
- /OAD             Delete OEM Activation Key
- /CLNEVNLOG      Clear Event Log.
- /CAPSULE        Override Secure Flash policy by Capsule

- /RECOVERY      Override Secure Flash policy by Recovery
- /EC              Program Embedded Controller Block. (Flash Type)
- /REBOOT        Reboot after programming.
- /SHUTDOWN     Shutdown after programming.

## Rules

- Any parameter enclosed by < > is a mandatory field.
- Any parameter enclosed by [ ] is an optional field.
- <Commands> cannot co-exist with any [Options].
- Main BIOS image is default flashing area if no any option present.
- [/REBOOT], [/X], and [/S] will enable [/P] function automatically.
- If [/B] present alone, there is only the Boot Block area to be updated.
- If [/N] present alone, there is only the NVRAM area to be updated.
- If [/E] present alone, there is only the Embedded Controller block to be updated.

## Usage

### Overview

The AFUAPTIO offers the following basic command and option usages:

- AFUDOS <Input or Output File Name> [Option 1] [Option 2] ...
- AFUDOS <Input or Output File Name> <Command>
- AFUDOS <Command>

Other usages which are not mentioned in help are:

- AFUDOS <ROM Hole File Name> <ROM Hole Option>:<ROM Hole GUID>
- AFUDOS <BIOS ROM File Name> <Option><Number>
- AFUDOS <Option /A> <OEM Activation Key Bin File Name>

These usages are explained in more detail in this chapter.

### AFUDOS <Input or Output File Name> [Option 1] [Option 2] ...

User could put no option or combine multiple options in one command line. Commands cannot be combined in command line like options unless the command is categorized as both a command and an option, such as /S and /A.

For option combination case, AFUAPTIO will check its option priority list and execute the options according to the priority order. Three examples of this usage are provided below.

***AFUDOS < BIOS ROM File Name>***

Where BIOS ROM File Name, the mandatory field is used to specify path/filename of the BIOS ROM file with extension. This command line would trigger AFUAPTIO to run the default setting which flashes the system Main Block with the specified BIOS ROM File.

***AFUDOS <Output BIOS ROM File Name> /D /S***

Where Output BIOS ROM File Name, the mandatory field is used to specify path/filename of the BIOS ROM file with extension. /D is to verify the current BIOS and the BIOS ROM File, and /S, which is categorized as a command and also an option, gets and displays the current system's ROM ID.

***AFUDOS <Output BIOS ROM File Name> /P /B /N /REBOOT***

Where BIOS ROM File Name, the mandatory field is used to specify path/filename of the BIOS ROM file with extension. This command line is to flashing current BIOS by BIOS ROM file. /P /B /N is to specify that the flashing regions are Main Block, Boot Block and NVRAM. /REBOOT is to specify that reboot action will be performed in this execution. AFUAPTIO would execute the options in the order of /B, /P, /N and then reboot the system at the end. The order of execution is determined by AFUAPTIO design.

***AFUDOS <ME File Name> /ME***

Where ME File Name is used to specify path/filename of the ME file with extension. This command line programs entire ME block with the specified ME file.

## **AFUDOS <Input or Output File Name> <Command>**

AFUAPTIO can only execute one command at a time and it does not accept combinations of command and option in one command line except those can be both command and option. Three examples of this usage are provided below.

***AFUDOS <Output BIOS ROM File Name> /O***

Where BIOS ROM File Name, the mandatory field is used to specify path/filename of the BIOS ROM file with extension. This command line saves the current ROM image to a file.

***AFUDOS <Output BIOS ROM File Name> /U***

Where BIOS ROM File Name is used to specify path/filename of the BIOS ROM file with extension. This command line gets and displays the ROM ID from the specified BIOS ROM file.

## **AFUDOS <Command>**

This command usage is for some commands which do not require inputting any file to complete the execution. Usually this type of commands accesses the current BIOS only. An example of this usage is provided:

***AFUDOS /S***

This command line gets and displays the ROM ID of the current BIOS in system.

## **AFUDOS <ROM Hole File Name> <ROM Hole Option>:<ROM Hole GUID>**

This command usage is for outputting or flashing a certain ROM hole. For example, the command line for outputting a certain ROM hole whose GUID is 01234567- 89ab- cdef- 0123- 456789abcdef is as follows:

***AFUDOS <Output ROM Hole File Name> /HOLEOUT:0123456789abcdef0123456789abcdef***

Where Output ROM Hole File Name is used to specify path/filename of the output ROM hole file with extension. The GUID after the option should not contain dashes or spaces in between.

Another example of flashing a certain ROM Hole whose GUID is 01234567- 89ab- cdef- 0123- 456789abcdef is as follows:

***AFUDOS <ROM Hole File Name> /HOLE:0123456789abcdef0123456789abcdef***

Where ROM Hole File Name is used to specify path/filename of the ROM hole file with extension. Please discard dashes and spaces inside GUID line while typing.

## **AFUDOS <BIOS ROM File Name> <Option><Number>**

This command usage is for /Kn and /Ln commands where n is indicating the numeric order of a certain no-critical block or ROM hole. For example, to program the 4<sup>th</sup> ROM hole, the command line could be:

***AFUDOS <BIOS ROM File Name> /L4***



Where BIOS ROM File Name is used to specify path/filename of the BIOS ROM file with extension, and 4 is to specify that the 4<sup>th</sup> ROM hole is the one to perform /L operation.

The next chapter has more detail of the numbering rule of non-critical blocks and ROM holes.

## **AFUDOS <Option /A> <OEM Activation Key Bin File Name>**

This command usage is for /A command which insert a specific OEM activation key into the empty key inside current system BIOS. The command line is as follows:

***AFUDOS /A <OEM Activation Key Bin File Name>***

Where OEM Activation Key Bin File Name is used to specify path/filename of the OEM activation key file with extension. Please make sure that the OEM Activation Key region is empty before inserting the key, or please perform /OAD command before insertion.

## Overview

This chapter is to describe commands/options which require extra attention and to explain cases which may occur in certain unique scenarios.

## Preserving Setup Setting – /SP

/SP command is designed specifically for “OEM NVRAM/Setup Variable Preserve” module part of OFBD. If /SP is called, AFUAPTIO would send SMI 0x26 twice to save setup setting before starting updating NVRAM and to restore setup setting after finishing updating NVRAM. Customer can customize their OFBD module to preserve certain NVRAM data when AFUAPTIO flashes the NVRAM area. For example, there are two methods for preserving Setup Password:

### Method 1

Enable PRESERVE\_PASSWORDS token – The BIOS will preserve its Setup password when AFUAPTIO calls the SMIFlash module.

### Method 2

Control through /SP command – Customer can port PreserveSetupPassword in OFBDSETUPStoreHandle and RestoreSetupPassword in OFBDSETUPRestoreHandle, and use /SP command to keep or not to keep the Setup Password while updating the NVRAM:

AFUDOS xxx.ROM /N /SP - keep Setup password

AFUDOS xxx.ROM /N - don't keep Setup password.

This feature needs BIOS' cooperation. To learn more about preserving setup data, please consult with your BIOS provider.

## Preserving SMBIOS – /R and /Rn

If the SMBIOS data is stored in Main Block or Boot Block, AFUAPTIO /R and /Rn options would take the responsibility to preserve the SMBIOS data. If the SMBIOS data is stored in NVRAM and BIOS project's token SMBIOS\_PRESERVE\_NVRAM=0, the preservation process would take place at OFBD module. To know more about the detail of preserved data, please consult with your BIOS provider.

/R is used to preserve the whole SMBIOS data. To preserve a certain type of SMBIOS, please use /Rn. For example, to preserve SMBIOS Type 2 and Type 41 during BIOS flashing and the SMBIOS data is located in Boot Block, the command could be:

***AFUDOS <BIOS ROM File Name> /B /R2 /R41***

## Programming NVRAM Region – /N

Erasing NVRAM may cause important variables lose.

## Programming Specific NCB Block – /Kn

/Kn command is designed to program a specific non-critical block, or NCB block. AFUAPTIO would search ROM and identify the first NCB Block found as K0, and the second one as K1, etc. Therefore, command /K2 would program the third NCB Block found by AFU.

## Programming Specific ROM Hole – /Ln

/Ln command is designed to program a specific ROM Hole. Each ROM Hole is identified in the following way: AFUAPTIO would search for ROM Holes in the order of Boot Block area and Main Block area, and identify each ROM Hole in consecutive integers from 0 to 15. So, for example, /L1 is used to program the second ROM Hole found in ROM.

Scenarios:

- If a ROM contains two ROM Holes in Boot Block area and two in Main Block area, AFUAPTIO would identify L0 and L1 for the two in Boot Block area and L2 and L3 for the two in Main Block area.
  
- If a ROM contains 2 ROM Holes in Boot Block area and none in Main Block area, AFUAPTIO would only find 2 ROM Holes in total and identify them as L0 and L1.
  
- If a ROM contains no ROM Holes in Boot Block area and three in Main Block area, AFUAPTIO would find nothing in Boot Block area and identify L0, L1 and L2 for the three ROM Holes in Main Block area.

## Secured Flash Update – /CAPSULE and /RECOVERY

For Secured BIOS, the command rule for programming the current BIOS is different. There are two more modes, Capsule Mode and Recovery Mode, which are different from the regular Runtime Mode mentioned in the previous contents. Unlike Runtime Mode where all the commands/options are supported, Capsule Mode and Recovery Mode only support /P, /B, /N, and /E options, or depending on the BIOS design. The following description explains how to program BIOS under these two modes.

To override Secure Flash policy and program the BIOS image in Capsule Mode, please use the command:

***AFUDOS <BIOS ROM File Name> /CAPSULE /P /B /N /E***

And to override Secure Flash policy and program the BIOS image in Recovery Mode, please use this command:

***AFUDOS <BIOS ROM File Name> /RECOVERY /P /B /N /E***

Where BIOS ROM File Name is used to specify path/filename of the BIOS ROM file with extension.

For more detail on Secure Flash, please consult with your BIOS provider.

## Support Table

### Command/Option Support in Each Mode

Command	Runtime Mode	Capsule Mode	Recovery Mode
/O	Supported	Not Supported	Not Supported
/U	Supported	Not Supported	Not Supported
/S	Supported	Not Supported	Not Supported
/D	Supported	Not Supported	Not Supported
/A	Supported	Not Supported	Not Supported
/OAD	Supported	Not Supported	Not Supported
/CLNEVNLOG	Supported	Not Supported	Not Supported

Option	Runtime Mode	Capsule Mode	Recovery Mode
/Q	Supported	Not Supported	Not Supported
/X	Supported	Not Supported	Not Supported
/CAF	Supported	Not Supported	Not Supported
/S	Supported	Not Supported	Not Supported
/SP	Supported	Not Supported	Not Supported
/R	Supported	Supported ( *1 )	Not Supported
/Rn	Supported	Supported ( *1 )	Not Supported
/B	Supported	Supported	Supported
/P	Supported	Supported	Supported
/N	Supported	Supported	Supported
/K	Supported	Not Supported	Not Supported
/Kn	Supported	Not Supported	Not Supported
/HOLE:	Supported	Not Supported	Not Supported
/HOLEOUT:	Supported	Not Supported	Not Supported
/L	Supported	Not Supported	Not Supported
/Ln	Supported	Not Supported	Not Supported
/ECUF	Supported	Not Supported	Not Supported
/E	Supported	Supported	Supported
/ME	Supported	Not Supported	Not Supported
/MEUF	Supported	Not Supported	Not Supported
/A	Supported	Not Supported	Not Supported
/OAD	Supported	Not Supported	Not Supported

Option	Runtime Mode	Capsule Mode	Recovery Mode
/CLNEVNLOG	Supported	Not Supported	Not Supported
/EC	Supported	Not Supported	Not Supported
/REBOOT	Supported	Not Supported	Not Supported
/SHUTDOWN	Supported	Not Supported	Not Supported

**Note:**

**\* 1: This option must use with either /P or /B in order to be supported under Capsule Mode.**

## Error Codes

### Error Code Definition

CODE	Definition
0x01	Error: Unknown command.
0x02	Error: BIOS has no flash information available.
0x03	Error: ROM file size does not match existing BIOS size.
0x04	Error: ROM file ROMID is not compatible with existing BIOS ROMID.
0x05	Error: Bootblock error.
0x06	Error: This BIOS version has more Non-Critical blocks than supported.
0x07	Error: BIOS checksum error.
0x08	Error: Invalid option
0x09	Error: Size of ROM file does not match the size of system ROM
0x0A	Error: Unable to update ROM hole
0x0B	Error: ROMHOLE not exist
0x0C	Error: BIOS update cancelled by user.
0x0D	Error: BIOS Report Error.
0x0E	Error: Kernel source files cannot be found.
0x10	Error: Unable to load driver.
0x11	Error: Unable to unload driver.
0x12	Error: No non-critical blocks found in ROM file.
0x13	Error: Requested non-critical block not available in ROM file.
0x14	Error: Non-critical blocks in ROM image file do not match those in the system.
0x15	Error: Secure Flash function is not supported on this platform.
0x16	Error: Unable to get Secure Flash policy from BIOS.
0x17	Error: Unsupported Secure Flash policy.
0x18	Error: Unable to start a Secure Flash session.
0x19	Error: Failed to erase flash chip (at Runtime Secure Flash).
0x1A	Error: Failed to update flash chip (at Runtime Secure Flash).
0x1B	Error: Failed to read flash chip (at Runtime Secure Flash).
0x1C	Error: Failed to verify flash chip (at Runtime Secure Flash).
0x1D	Error: Failed to load image into memory.
0x1E	Error: Secure Flash function is not supported on this file.
0x1F	Error: Reserved for Secure Flash.
0x20	Error: Unable to initialize memory manager.
0x21	Error: Unable to close memory manager.
0x22	Error: Problem allocating memory.

0x23	Error: Problem freeing memory.
0x24	Error: Problem allocating BIOS buffer.
<b>CODE</b>	<b>Definition</b>
0x25	Error: Problem freeing BIOS buffer.
0x26	Error: Problem freeing mapping BIOS.
0x27	Error: Problem freeing unmapping BIOS.
0x28	Error: Problem mapping BIOS data.
0x29	Error: Problem unmapping BIOS data.
0x30	Error: Problem opening file for reading.
0x31	Error: Problem reading file.
0x32	Error: Problem opening file to write.
0x33	Error: Problem writing file.
0x40	Error: BIOS is write-protected.
0x41	Error: Can not close flash interface.
0x42	Error: Problem reading flash.
0x43	Error: Problem erasing flash.
0x44	Error: Problem writing flash.
0x45	Error: Problem verifying flash.
0x46	Error: Problem getting flash information.
0x47	Error: No firmware id.
0x48	Error: Power cord not connected. Plug in power cord to flash.
0x49	Error: A platform condition has prevented flashing.
0x50	Error: This program must be run in MS-DOS mode.
0x60	Error: Accessing registry.
0x61	Error: Program already running.
0x70	Error: BSD access IO.
0x80	Error: Size of system ROM mismatches size of ROM file
0x81	Error: ROM ID mismatch
0x82	Error: Bootblock checksum error
0x90	Error: Error to shutdown
0x91	Error: Error to restart...
0x92	Error: Can't open ROM ID file
0x93	Error: ROM ID file is not a ROM file.
0x94	Error: Invalid MAC address
0x95	Error: Invalid load current CMOS option
0x96	Error: Invalid retry count
0x97	Error: Invalid defined ROM ID length
0x98	Error: Invalid SMI
0x99	Error: ROM File ID don't exist
0x9A	Error: System ROM ID don't exist
0x9B	Error: Password Retry count exceeded.
0x9C	Error: BIOS don't support NVRAM/SETUP preserve function
0x9D	Error: Store SETUP setting error
0x9E	Error: Restore SETUP setting error
0x9F	Error: Cannot analyze ROM file. ROM file may be corrupted
0xA0	Error: Cannot analyze the ME Data. ROM file may be corrupted



0xA1	Error: BIOS does not support ME Entire Firmware update
0xA2	Error: BIOS does not support ME Ignition Firmware update
0xA3	Error: Invalid EC ROM file
0xA4	Error: EC ROM file checksum error
<b>CODE</b>	<b>Definition</b>
0xA5	Error: Can't enter EC flash mode
0xA6	Error: Erasing EC flash memory fail
0xA7	Error: Initial EC programming fail
0xA8	Error: EC flash data transmit error
0xA9	Error: Writing EC flash memory fail
0xAA	Error: Exit EC programming mode fail
0xAB	Error: ROM Chip ID mismatch
0xAC	Error: Invalid EC Header Table
0xAD	Error: EC does not permit BIOS update
0xAE	Error: BIOS doesn't support OEMCMD function
0xAF	Error: Store DMI Data error
0xB0	Error: Restore DMI Data error
0xB1	Error: Invalid Activation Key file.
0xB2	Error: File Size is greater than image activation key length.
0xB3	Error: Image activation key larger than BIOS activation key.
0xB4	Error: Activation Key checksum error.
0xB5	Error: No Support Activation Key error.
0xB6	Error: OA Key is not NULL at all.
0xB7	Error: OA Key is NULL at all already.
0xB8	Error: OA key region incorrect.
0xB9	Error: BIOS doesn't support Clear event log function.
0xBA	Error: Clear event log error.
0xBB	Error: Rom image layout detected RomHole is redesigned.
0xBC	Error: BIOS have more than one RomHole's GUID is the same.
0xBD	Error: Requested Rom Hole not available in ROM file.
0xBE	Error: Romholes in ROM image file do not match those in the system.
0xBF	Error: OA key is not NULL at all. And OA Key is the same as Bin File in system.
0xC0	Error: BIOS doesn't support process ME information
0xC1	Error: BIOS return error, when trying to re-flash ME Firmware data.
0xC2	Error: Region is write-protected
0xC6	Error: No EC blocks found in system ROM.
0xC7	Error: BIOS doesn't support all ROM flashing function.
0xD0	Error: OA Data invalid.
0xD1	Error: BIOS has already updated OA.
0xD2	Error: BIOS does not allow updating OA.
0xD3	Error: BIOS doesn't support updating OA.
0xD4	Error: The DMI data size of system is greater than File's DMI data length.
0xD5	Error: BIOS doesn't support EC Battery Check function.