# Revision History

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| --- | --- | --- | --- |
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# Chapter 1 Introduction

## 1.1 Principle

Text



# Chapter 2 AAEON IPC EC Command Set

Host side OS utility/application can use IO port 0x584(DAT port) and 0x585(CMD port) to access/communicate with EC FW.

## 2.1 I/O Command Set

|  |  |  |
| --- | --- | --- |
| CMD | Function | Description/Usage |
| 0x85 | Get Panel brightness | Send Byte0:  (Panel Source)   |  |  | | --- | --- | | High nibble[7:4] - Type | Low nibble[3:0] - Number | | 1 - eDP | x - refer Note | | 2 - LVDS | x - refer Note | | 3 - HDMI | x - refer Note | | 4 - DP | x - refer Note | | 0xFF - Reserved for special case | | | Note:  Number follow motherboard printing number, or zero as default(if exist) | |   Received Byte0:  Brightness percentage level 0 to 100% |
| 0x86 | Set Panel brightness | Byte0:  Definition the same as [CMD 0x85 “Send Byte0”](#CMD_0x85_Get_Panel_Send_Byte0)  Byte1:  Definition the same as [CMD 0x85 “Received Byte0”](#CMD_0x85_Get_Panel_Brigtne_ReceivedByte0) |
| 0x8E | Read MISC function | Send Byte0:  Index number (refer to “[CMD 8Eh/9Eh Index Table](#CMD_8Eh_9Eh_Index_Table)”) |
| 0x8F | Read HW ID | Send Byte0:  0x00 - Board ID  0x01 - Panel ID  Received Byte0:  HW ID value  0xFF - Not Supported  0xFE - Invalid Parameter |
| 0x97 | Read FAN RPM | Send Byte0:  (FAN Source)   |  |  | | --- | --- | | High nibble[7:4] - Type | Low nibble[3:0] - Number | | 0 - CPU | x - refer Note | | 1 - System | x - refer Note | | 2 - Chassis | x - refer Note | | 3 - Power Supply | x - refer Note | | 4 - GPU | x - refer Note | | 0xFF - Reserved for special case | | | Note:  Number follow motherboard printing number, or zero as default(if exist) | |   Received  Byte0: High Byte  Byte1: Low Byte |
| 0x9E | Write MISC function | Byte0:  Index number (refer to “[CMD 8Eh/9Eh Index Table](#CMD_8Eh_9Eh_Index_Table)”)  Byte1:  Write Data |
| 0xAA | Read I2C/SMBus | Todo (ARStmp) |
| 0xAB | Write I2C/SMBus | Todo (ARStmp) |
| 0xBB | Read EC FW version | Received   |  |  | | --- | --- | | Case 1 - Standard Platform EC | Byte0: 0x09 (return total bytes, included Byte0)  Byte1: S - Standard platform EC  Byte2: I/A - Intel/AMD chipset  Byte3/4/5: Platform name  Byte6: F/H/T - EC kernel version type (Formal/Hot Fix/Test)  Byte7/8: version number  Example:  SICMLFxx = Standard Intel CometLake Formal EC kernel FW | | Case2 - for Project / Customize dedicated EC | Byte0: 0x13 (return total bytes, included Byte0)  (part1)  Byte1: P/C - Project/Customize dedicated EC  Byte2: I/A - Intel/AMD chipset  Byte3/4/5: Platform name  Byte6: F/H/T - EC kernel version type (Formal/Hot Fix/Test)  Byte7/8: version number  Byte9: ‘.’ - ASCII code 0x2E  (part2)  Byte 10 to 14: PROJECT\_TAG  Byte15: ‘.’ - ASCII code 0x2E  (part3)  Byte16: F/T - FW version type (Formal/Test)  Byte17/18: version number  Example:  PICMLT01.SMH41.T01 =  part1 - Project Intel CML Test EC kernel FW  part2 - for project SMS-H410  part3 - first Test version | |
| 0xBC | Board Capabilities | |  |  | | --- | --- | | Type | Value | | Get FAN Sources | Send Byte0:  0x10  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0) | | Get Temperature Sources | Send Byte0:  0x12  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1) of CMD 0xCCh/CDh Index Table | | Get Voltage Sources | Send Byte0:  0x14  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [CMD 0xD4 “Send Byte0”](#CMD_0xD4_Get_Voltage_Send_Byte0) | | Get LED Sources | Send Byte0:  0x16  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [CMD 0xD2 “Send Byte0”](#CMD_0xD2_Get_LED_Status_Send_Byte0) | | Get DIO Sources | Send Byte0:  0x18  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [CMD 0xD0 “Send Byte0”](#CMD_0xD0_Get_DIO_pin_Send_Byte0) | | Get Panel Sources | Send Byte0:  0x1A  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [CMD 0x85 “Send Byte0”](#CMD_0x85_Get_Panel_Send_Byte0) | | Get Power Mode | Send Byte0:  0x20  Received Byte0:  0x00 - ATX mode  0x01 - AT mode  0xFE - Reserved  0xFF - Not Supported | |
| 0xC6 | Get Watchdog status | |  |  | | --- | --- | | Type | Value | | WDT status | Send Byte0:  0x00  Received Byte0:  0 - Inactive/Stop  1 - Activating | | Second/Minute mode | Send Byte0:  0x01  Received Byte0:  0 - Second (default)  1 - Minute | | Countdown value or Current Remaining value | Send  Byte0: 0x02  Byte1:  0 - [Countdown value](#CMD_0xC7_Set_Watchdog_0x02_Countdown_val)  1 - Current Remaining Value  Received  Byte0: second  Byte1: minute (only [Minute mode](#CMD_0xC6_Get_Watchdog_0x01_SecMin_Mode) report the byte) | | WDT Expired | Send Byte0:  0x03  Received Byte0:  0 - not Expired  1 - Expired  Note: EC also set “[WDT set(expired) LED](#CMD_0xD2_Get_LED_Send_Byte0_Watchdog_LED)” if the project supported the feature) | |
| 0xC7 | Set Watchdog | |  |  | | --- | --- | | Type | Value | | WDT Stop/Resume | Byte0:  0x00  Byte1:  0 - Stop WDT (EC will stop WDT counter and record currently timer [Remaining Countdown value](#CMD_0xC6_Get_Watchdog_0x02_1_ReaminValue). Turn off “[WDT active LED](#CMD_0xD2_Get_LED_Send_Byte0_Watchdog_LED)”, if the project supported WDT LED feature)  1 - Resume WDT (EC will restore previous [Remaining Countdown value](#CMD_0xC6_Get_Watchdog_0x02_1_ReaminValue). Turn on “[WDT active LED](#CMD_0xD2_Get_LED_Send_Byte0_Watchdog_LED)”, if the project supported WDT LED feature) | | Second/Minute mode | Byte0:  0x01  Byte1:  Definition the same as [CMD 0xC6 Second/Minute mode “Received Byte0”](#CMD_0xC6_Get_Watchdog_0x01_ReceivedByte0)  Note:   1. If WDT timer is activating, must Inactive/Stop WDT first through clear “[Countdown value](#CMD_0xC7_Set_Watchdog_0x02_Countdown_val)” or set “[WDT Stop/Resume](#CMD_0xC7_Set_Watchdog_0x00_WDT_Stop_Resu)” value to 0 2. Check status by “[WDT status](#CMD_0xC6_Get_Watchdog_0x00_WDT_status)” field | | Countdown value | Byte0:  0x02  Byte1:  Value (0~255 [second or minute](#CMD_0xC6_Get_Watchdog_0x01_SecMin_Mode))  Note:   1. Set value as 0 - clear countdown value and inactive WDT function 2. Set valid value - active WDT function and start countdown 3. Follow “[WDT Stop/Resume](#CMD_0xC7_Set_Watchdog_0x00_WDT_Stop_Resu)” LED behavior | | Clear WDT Expired | Byte0:  0x03  Note: EC also clear “[WDT set(expired) LED](#CMD_0xD2_Get_LED_Send_Byte0_Watchdog_LED)” if the project supported the feature) | | Reload/Retrigger WDT countdown value | Byte0:  0x04  Note:   1. EC according [Second/Minute mode](#CMD_0xC6_Get_Watchdog_0x01_SecMin_Mode) to Reload previous [Countdown value](#CMD_0xC7_Set_Watchdog_0x02_Countdown_val) 2. Start WDT function | |
| 0xCC | Read thermal related | Send Byte0:  Index number (refer to “[CMD CCh/CDh Index Table](#CMD_CCh_CDh_Index_Table)”) |
| 0xCD | Write thermal related | Byte0:  Index number (refer to “[CMD CCh/CDh Index Table](#CMD_CCh_CDh_Index_Table)”)  Byte1:  Write Data |
| 0xD0 | Get DIO pin status | Send Byte0:  (Digital I/O Source)   |  |  | | --- | --- | | Bit[5:4] - Header Number | Bit[3:0] - Pin Number | | x - refer Note 1 | x - refer Note 2 | | 0xFF - Reserved for special case | | | Note:  1. Number follow motherboard printing number, or zero as default(if exist)  2. Number follow motherboard printing number, or one as default(if exist) | |   Received Byte0:   |  |  | | --- | --- | | Bit[3:2] - Mode | Bit[1:0] - Value | | 0 - Output | 0 - Low  1 - High | | 1 - Input | 0 - Low  1 - High (for Read) | |
| 0xD1 | Set DIO pin | Byte0:  Definition the same as [CMD 0xD0 “Send Byte0”](#CMD_0xD0_Get_DIO_pin_Send_Byte0)  Byte1:  Definition the same as [CMD 0xD0 “Received Byte0”](#CMD_0xD0_Get_DIO_pin_Received_Byte0) |
| 0xD2 | Get LED status | Send Byte0:   |  |  | | --- | --- | | High nibble[7:4] - Type | Low nibble[3:0] - Number | | 0 - Power LED | 0 - Power on LED (S0)  1 - AC IN LED  2 - Reserved  3 - Sleep LED (S3)  4 - Hibernate LED (S4)  5 - Soft off LED (S5) | | 1 - Battery LED | x - refer Note | | 2 - Watchdog LED | 0 - WDT active LED  1 - WDT set(expired) LED | | 3 - Cap Lock LED | 0 | | 4 - Wireless LED | 0 | | 5 - Temperature Alert LED | x - refer Note | | 6 - FAN Alert LED | x - refer Note | | 7 - HDD Alarm LED (Note: On/Off controlled by SW) | x - refer Note | | 8 - Debug LED | 0 | | 0xFF - Reserved for special case | | | Note:  Number follow motherboard printing number, or zero as default(if exist) | |   Received Byte0:   |  |  | | --- | --- | | LED type | Value | | General purpose LED | 0 - LED not active  1 - LED active | | Debug LED status | HW Error:  0x11 - Power failure  0x12 - System unable to power on  0x13 - Processor not installed  0x14 - New Processor  0x15 - Memory not installed  0x16 - Memory error  0x17 - CPU temperature abnormal  0x18 - FAN speed fault  0x19 - Case open  0x1A - Storage not found  SW Error:  0x40 - POST fail  0x41 - Pre-video memory error  0x42 - Pre-video graphics error  0x43 - Bootable volume not found  0x44 - ROM checksum not valid | |
| 0xD3 | Set LED | Byte0:  Definition the same as [CMD 0xD2 “Send Byte0”](#CMD_0xD2_Get_LED_Status_Send_Byte0)  Byte1:  Definition the same as [CMD 0xD2 “Received Byte0”](#CMD_0xD2_Get_LED_Status_Received_Byte0)  Note:   1. Set value “0 - LED not active” also Clear the LED’s related Alert status. 2. Set value “1 - LED active” is for testing only which not really control the LED’s behavior (ex. Alert status). 3. Set value “2 - Toggle LED On/Off status” which is 1-times toggled only. (if LED is in Blink mode that the LED still be turn On or Off at specific time by EC)   Note: Through [Index 0xD0 “Get LED Blink mode”](#CMD_8Eh_9Eh_Index_0xD0_Get_LED_BLINK_mod) and [Index 0xD1 “Set LED Blink mode”](#CMD_8Eh_9Eh_Index_0xD1_Set_LED_BLINK_mod) of the 8Eh/9Eh index table to operate LED Blink mode. |
| 0xD4 | Get Voltage | Send Byte0:  (Voltage Source)  0x00 - VCORE  0x01 - VCOREREFIN  0x02 - +12V  0x03 - +5V  0x04 - 5VSB  0x05 - 5VDUAL  0x06 - +3.3V  0x07 - 3VSB  0x08 - +1.8V  0x09 - VMEM  0x0A - RTC  0x0B - VBAT  0x12 - 12VSUS  0xFF - Reserved for special case  Received  (Note: Get Voltage may spend 30ms at most)  Byte0: Integer part of Voltage value  Byte1: High byte of decimal point  Byte2: Low byte of decimal point |

## 2.2 CMD 8Eh/9Eh Index Table

The index table intend for miscellaneous functions which access by CMD [0x8E](#CMD_0x8E), [0x9E](#CMD_0x9E).

|  |  |  |
| --- | --- | --- |
| Index | Function | Description/Usage |
| 0x40 | Get FAN mode | Send Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Received Byte0:  0x00 - Auto (default)  0x01 - Silent  0x02 - Performance  0x03 - Full speed  0x10 - Manual (Get only. Through [Index 0x43 “Set FAN duty”](#CMD_8Eh_9Eh_Index_0x43_Set_FAN_duty) of the 8Eh/9Eh index table to set value that EC will automatically change FAN mode to Manual mode)  0xFF - Disable |
| 0x41 | Set FAN mode | Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Byte2:  Definition the same as [Index 0x40 - Get FAN mode “Received Byte0”](#CMD_8Eh_9Eh_Index_0x40_Get_FAN_mode_Rec0) |
| 0x42 | Get FAN duty | Send Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Received Byte0:  Duty cycle value 0 to 255 |
| 0x43 | Set FAN duty | Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Byte2:  Duty cycle value 0 to 255 |
| 0x44 | Get FAN Alert RPM | Send Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Received  Byte0: High Byte  Byte1: Low Byte |
| 0x45 | Set FAN Alert RPM | Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Byte2:  High Byte  Byte3:  Low Byte  Note:   1. Once EC detected FAN RPM lower or equal than the settings value, EC will turn on [FAN Alert LED](#CMD_0xD2_Get_LED_Send_Byte0_FanAlert_LED) (if the project supported the LED). 2. Default FAN Alert RPM was 0. |
| 0x46 | Get FAN Alert Status | Send Byte1:   1. Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0) 2. 0xFF - 1-step to Get have any one has Alerted   Received Byte0:  0 - Not Alerted  1 - Alerted |
| 0x47 | Clear FAN Alert | Byte1:   1. Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0) 2. 0xFF - 1-step to Clear all of Alerted status |
| 0x48 | Get FAN Referenced Temperature Sources | Send Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Received  Byte0: Count (return total bytes, included Byte0)  ByteX: Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1) of CMD 0xCCh/CDh Index Table |
| 0x49 | Set FAN Reference Temperature Source | Byte1:  Definition the same as [CMD 0x97 “Send Byte0”](#CMD_0x97_Read_FAN_RPM_Send_Byte0)  Byte2:  Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1) of CMD 0xCCh/CDh Index Table  Byte3:  Operate, 0-Remove/1-Add |
| 0xD0 | Get LED Blink mode | Byte1:  Definition the same as [CMD 0xD2 “Send Byte0”](#CMD_0xD2_Get_LED_Status_Send_Byte0) (only for general purpose LED, exclude Debug LED)  Received Byte0:   |  |  | | --- | --- | | Type | Value | | Reserved | 0x00 | | Always On | 0x01 | | LED On/Off per 0.5s | 0x03 | | LED On/Off per 1s | 0x04 | |
| 0xD1 | Set LED Blink mode | Byte1:  Definition the same as [CMD 0xD2 “Send Byte0”](#CMD_0xD2_Get_LED_Status_Send_Byte0) (only for general purpose LED, exclude Debug LED)  Byte2:  Definition the same as [Index 0xD0 - Get LED Blink mode “Received Byte0”](#CMD_8Eh_9Eh_Index_0xD0_GetLedBlink_Rec0) |

## 2.3 CMD CCh/CDh Index Table

The index table functions intend for thermal related which access by CMD [0xCC](#CMD_0xCC), [0xCD](#CMD_0xCD).

|  |  |  |
| --- | --- | --- |
| Index | Function | Description/Usage |
| 0x00 | Read Temperature | Send Byte1:  (Temperature Source)  0x00 - PECI  0x10 - Thermal Sensor: CPU  0x11 - Thermal Sensor: VCORE  0x12 - Thermal Sensor: Memory  0x13 - Thermal Sensor: PCIe Graphic  0x14 - Thermal Sensor: PCH  0x15 - Thermal Sensor: Ambient  0x16 - Thermal Sensor: GPU  0x20 - Thermal Sensor: System  0xFF - Reserved for special case  Received Byte0:  Temperature value (degree C) |
| 0x02 | Get Sensor Alert Temperature | Send  Byte1: Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1)  Byte2: Auto/Silent/Performance/Full speed. Definition the same as [Index 0x40 - Get FAN mode “Received Byte0”](#CMD_8Eh_9Eh_Index_0x40_Get_FAN_mode_Rec0)  Received Byte0:  Temperature value (degree C) |
| 0x03 | Set Sensor Alert Temperature | Byte1:  Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1)  Byte2:  Auto/Silent/Performance/Full speed. Definition the same as [Index 0x40 - Get FAN mode “Received Byte0”](#CMD_8Eh_9Eh_Index_0x40_Get_FAN_mode_Rec0)  Byte3:  Temperature value (degree C)  Note:  Once EC detected Sensor temperature higher than the settings value, EC will turn on [Temperature Alert LED](#CMD_0xD2_Get_LED_Send_Byte0_TemAlert_LED) (if the project supported the LED). |
| 0x04 | Get Sensor Alert Status | Send Byte1:   1. Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1) 2. 0xFF - 1-step to Get have any one has Alerted   Received Byte0:  0 - Not Alerted  1 - Alerted |
| 0x05 | Clear Sensor Alert | Byte1:   1. Definition the same as [Index 0x00 “Send Byte1”](#CMD_CCh_CDh_Index_0x00_Read_Temp_SendBy1) 2. 0xFF - 1-step to Clear all of Alerted status |

# Chapter 3 AAEON IPC EC Command Set (Extended)

The chapter commands is extended from previous chapter common part, main concept is used by BIOS team since these Command Set was more bottom layer operation.

## 3.1 I/O Command Set

|  |  |  |
| --- | --- | --- |
| CMD | Function | Description/Usage |
| 0x0E | “EC Command Set” Extra Settings | |  |  | | --- | --- | | Type | Value | | Get Panel Invert type | Byte0:  0x10  Byte1:  Definition the same as [CMD 0x85 “Send Byte0”](#CMD_0x85_Get_Panel_Send_Byte0)  Received Byte0:  0 - Normal (default)  1 - Invert | | Set Panel Invert type | Byte0:  0x11  Byte1:  Definition the same as [CMD 0x85 “Send Byte0”](#CMD_0x85_Get_Panel_Send_Byte0)  Byte2:  Definition the same as [CMD 0x0E Get Panel Invert type “Received Byte0”](#CMD_0x0E_0x00_Panel_Invert_ReceivedByte0) | |
| 0x87 | Get/Set GPIO pin | Send  Byte0: Operation Type  Byte1: GPIO Port & Pin  Received Byte0:  (for Read) pin status, 1-High/0-Low |
| 0x8B | Set System State | 0x03 - notified EC to enter into S3  0x04 - notified EC to enter into S4  0x05 - notified EC to enter into S5  0xF0 - EC redetect FAN present status  others - Reserved |
| 0xB3 | Miscellaneous function for BIOS using | |  |  | | --- | --- | | Type | Value | | Disable USB Power in S4/S5 | Byte0:  0x10  Byte1:  0 - Default (keep power)  1 - Disable Power | | UART Mode Settings | Byte0:  0x11  Byte1:  1 - COM1  2 - COM2  3 - COM3  4 - COM4  5 - COM5  6 - COM6  Byte2:  Flags refer to mapping table “\_COM\_CONTROL\_Flag\_BitMap” in BIOS/EC definition file(.h) | |