

VMS-BYT

Intel® Atom™ SoC Processor E3845
Fanless Vehicle Telematics System

Quick Reference Guide

3rd Ed –07 May 2021

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THIS DEVICE COMPLIES WITH PART 15 FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

- (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE.
- (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES.

THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS.

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1. Getting Started

1.1 Safety Precautions

Warning!



Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

Caution!



Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

1.2 Packing List

- 1 x VMS-BYT Intel® Atom™ SoC Processor E3845 Fanless Vehicle Telematics System
- Other major components include the followings:
 - 1 x Wall Mount Kit
 - 1 x Accessory kit (Dust Covers, Rubber foot and Screws)



If any of the above items is damaged or missing, contact your retailer.

1.3 System Specifications

| System | |
|---------------------|---|
| Board | <ul style="list-style-type: none"> EBM-BYTV |
| Processor | <ul style="list-style-type: none"> Intel® Atom™ E3845 4-Core 1.91GHz processo |
| System Memory | <ul style="list-style-type: none"> 1 x 204-Pin DDR3L 1333MHz SO-DIMM up to 8 GB |
| Watchdog Timer | <ul style="list-style-type: none"> H/W Reset, 1sec. ~ 65535sec. |
| H/W Status Monitor | <ul style="list-style-type: none"> Monitoring CPU & System Temperature and Voltage |
| Expansion & Storage | |
| Expansion | <ul style="list-style-type: none"> 1 x Avalue 80-Pin IET Interface 1 x Bluetooth Interface 1 x CAN module Interface 2 x Mini PCIe |
| Storage | <ul style="list-style-type: none"> 1 x CFast™ or mSATA 1 x 2.5" Drive Bay |
| I/O | |
| USB | <ul style="list-style-type: none"> 2 x USB 2.0 1 x USB 3.0 |
| COM Port | <ul style="list-style-type: none"> 2 x RS-232/422/485 (BIOS) |
| Other | <ul style="list-style-type: none"> 5 x Knockouts for Antenna Mounting 1 x DC-Out (12V/4A) |
| DIO | <ul style="list-style-type: none"> 1 x 8-Bit GPIO (Digital Input) Input Voltage (Internal Type): 5VDC TTL (default) Input Voltage (Source Type): 0~30 VDC (Digital Output) Digital Output (Sink Type): 5VDC TTL (default), max current: 20mA Digital Output (Source Type): 0~30VDC, max current: 250mA |
| Display | |
| Chipset | <ul style="list-style-type: none"> Intel® Valleyview SoC integrated Graphics Supports dual display |
| Resolution | <ul style="list-style-type: none"> VGA : 2560 x 1080 @ 60Hz LVDS : 1600 x 1200 @ 60Hz |
| Audio | |
| AC97 Codec | <ul style="list-style-type: none"> Realtek ALC888S HD codec |
| Audio Interface | <ul style="list-style-type: none"> 2 x Mic-In and 2 x Line-Out |
| Ethernet | |

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| | |
|---|---|
| LAN Chip | <ul style="list-style-type: none"> 2 x Intel® I211AT |
| Ethernet Interface | <ul style="list-style-type: none"> 10/100/1000 Base-Tx GbE compatible |
| LAN Port | <ul style="list-style-type: none"> 2 x RJ-45 |
| Power Requirement | |
| Power Connector | <ul style="list-style-type: none"> Phoenix Connector |
| Power Requirement | <ul style="list-style-type: none"> +9V ~ +36V |
| ACPI | <ul style="list-style-type: none"> Single Power ATX Support S0, S3, S4, S5 ACPI 5.0 Compliant |
| Power Mode | <ul style="list-style-type: none"> AT/ATX (PC Power Mode) |
| Mechanical & Environmental | |
| Construction | <ul style="list-style-type: none"> Aluminum + Metal |
| Mounting Kit | <ul style="list-style-type: none"> Wall Mount kit (Standard) |
| Dimension (W x D x H) | <ul style="list-style-type: none"> 9.45" x 7.3" x 2.36" (240mm x 186mm x 60mm) |
| Operating Temperature | <ul style="list-style-type: none"> (w/SSD, mSATA, CFast), ambient w/ air flow -40°C ~ 75°C (-40°F ~ 167°F) |
| Storage Temperature | <ul style="list-style-type: none"> -40°C ~ 85°C (-40°F ~ 185°F) |
| Relative Humidity | <ul style="list-style-type: none"> 0% ~ 90% Relative Humidity, Non-condensing |
| Vibration Test | <ul style="list-style-type: none"> Operating with SSD/CFast/mSATA : MIL-STD-810G, Method 514.6, Category 4, common carrier US highway truck vibration exposure Storage with SSD/CFast/mSATA : MIL-STD-810G, Method 514.6, Category 24, minimum integrity test |
| Shock Test | <ul style="list-style-type: none"> Operating with SSD/CFast/mSATA : MIL-STD-810G, Method 516.6, Procedure I, functional shock=20g Non-Operating with SSD/CFast/mSATA: MIL-STD- 810G, Method 516.6, Procedure V, crash hazard shock test=75g |
| Certification & Software Support | |
| Certification | <ul style="list-style-type: none"> CE, FCC Class A, e13 Mark |
| OS Information | <ul style="list-style-type: none"> Win 7, Win 8, Linux |
| Power management | |
| 1. Vehicle Power Mode: BIOS sets up as Vehicle PC ACC Function (JACC1) sets up as Enable AT/ATX Jumper (JAT1) sets up as AT 2. Industrial PC Power Mode: BIOS sets up as Industrial PC ACC Function (JACC1) sets up as Disable AT/ATX Jumper (JAT1) sets up as AT or ATX | |

3. ACC Function (JACC1)

It is Vehicle PC power mode (Power on/off controlled by Ignition or Power button) if ACC Function sets up as Enable.

It is Industrial PC power mode (Power on/off controlled by Power button) if ACC Function sets up as Disable.

4. AT/ATX Jumper (JAT1)

This function will be active if ACC Function (JACC1) sets up Disable (Industrial PC power mode).

5. Power Input Selection (SW2)

To set up the DC input voltage is +12Vdc, +24Vdc or wide range from +9~36Vdc.

6. Vin Work/Shutdown (BIOS)

To set up the startup/shutdown voltage in accordance with DC input voltage as +12Vdc, +24Vdc or wide range from +9~36Vdc.

| Mode | +12Vdc | | +24Vdc | |
|------|---------|----------|---------|----------|
| | Startup | Shutdown | Startup | Shutdown |
| 1 | 11.5V | 10.5V | 23V | 21V |
| 2 | 12.0V | 11.0V | 24V | 22V |
| 3 | 12.5V | 11.0V | 25V | 22V |
| 4 | 12.5V | 11.5V | 25V | 23V |

The following behaviors happen if ACC Function (JACC1) sets up as Enable:

VMS-BYT won't power on if the DC Input voltage is lower than the startup voltage.

VMS-BYT will automatically power on, if the DC input voltage reaches the startup voltage.

VMS-BYT will automatically power on, if the DC input voltage reaches the startup voltage and power on delay ends up (the power on delay is Enable in BIOS).

VMS-BYT will automatically power off, if the DC input voltage is lower than shutdown voltage, and the time exceeds 60sec. If it still doesn't power off and the time exceeds 6min, VMS-BYT will be forced power off immediately.

7. Power on delay time is selectable by BIOS in following hierarchies

10sec / 30sec / 1min / 5min / 10 min / 15min / 30min / 1hr.

The delay time starts to count if ignition turns on.

User can skip the delay time to turn on VMS-BYT if pressing power button.

VMS-BYT will automatically power on if the delay time ends up.

8. Power off delay time is selectable by BIOS in following hierarchies

20sec / 1min / 5min / 10min / 30min / 1hr / 6hr / 18hr.

The delay time starts to count if ignition turns off.

User can skip the delay time to turn off VMS-BYT if pressing power button.

VMS-BYT will automatically power off, if the delay time ends up. If it still doesn't power off and the time exceeds 60sec, VMS-BYT will be forced power off immediately.

9. S3, S4 suspend mode

In the vehicle power mode, the S3/S4 is only able to resume from power button.

VMS-BYT

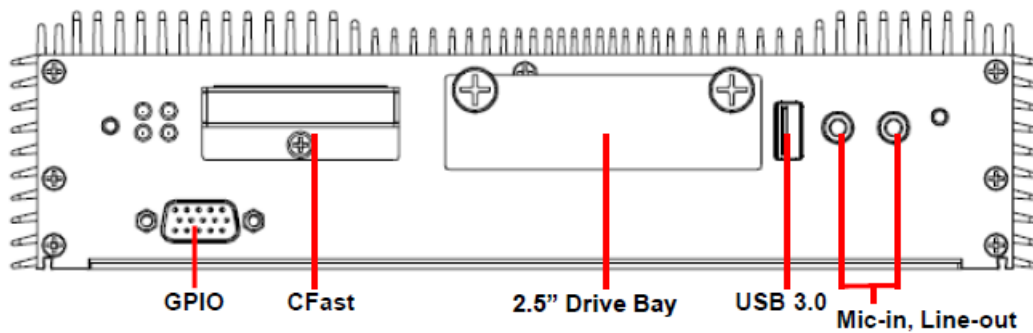
10. The status of Ignition On/Off is detectable by SW
11. The status of Low battery is detectable by SW
12. VMS will shut down automatically when internal temperature is reach the setting (it is selectable by BIOS).
13. VMS-BYT will cancel the delay function, and then continue to operate normally, if the ignition is turned on again and the power off delay is in process.
14. VMS-BYT will shut down completely, and then power on again automatically, if the ignition is turned on again and the power off delay ended.
15. VMS-BYT will cancel the delay and stayed in power off status, if the ignition is turned off again and power on delay is in process.
16. VMS-BYT is only 10mA if it is off.



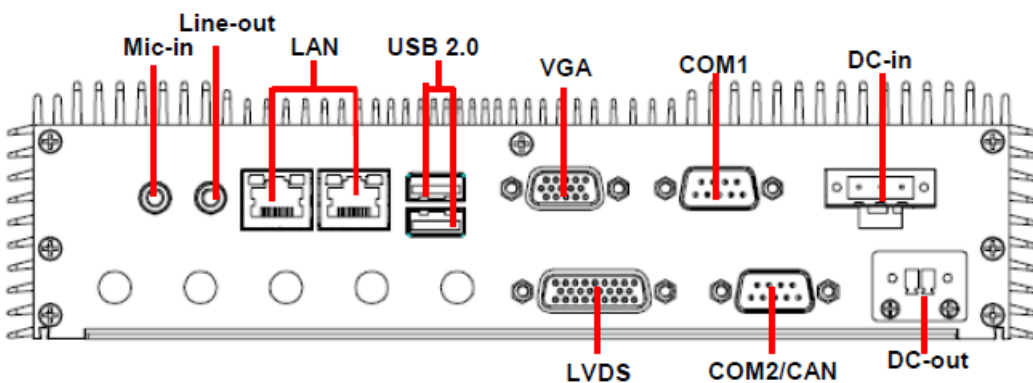
Note: Specifications are subject to change without notice.

1.4 System Overview

1.4.1 Front View



1.4.2 Rear View



Connectors

| Label | Function | Note |
|----------------|--|------|
| Line-out | Line-out jack | |
| Mic-in | Mic-in audio jack | |
| CFast | CF card socket | |
| GPIO | General purpose I/O connector | |
| 2.5" Drive Bay | 2.5" Driver Bay socket | |
| COM1 | Serial port 1 connector | |
| COM2/CAN | Serial port 2 connector CAN connector | |
| DC-in | DC power-in connector | |
| DC-out | DC power-out connector | |
| LAN | 2 x RJ-45 Ethernet connector | |
| LVDS | LVDS connector | |
| USB | 2 x USB 2.0 connector 1 x USB 3.0 connector | |
| VGA | VGA connector | |

2. Hardware Configuration

Jumper and Connector Setting, Driver and BIOS Installing

For advanced information, please refer to:

- 1- EBM-BYTV included in this manual.

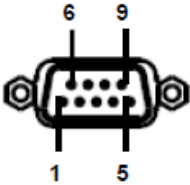
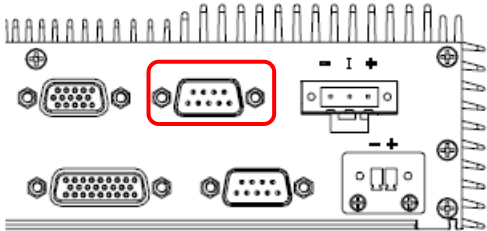


Note: If you need more information, please visit our website:

<http://www.avalue.com.tw>

2.1 VMS-BYT connector mapping

2.1.1 Serial Port 1 connector (COM1)



In RS-232 Mode

| Signal | PIN | PIN | Signal |
|--------|-----|-----|--------|
| NDCD# | 1 | 6 | NDSR# |
| NRXD | 2 | 7 | NRTS# |
| NTXD | 3 | 8 | NCTS# |
| NDTR# | 4 | 9 | NRI# |
| GND | 5 | | |

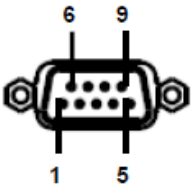
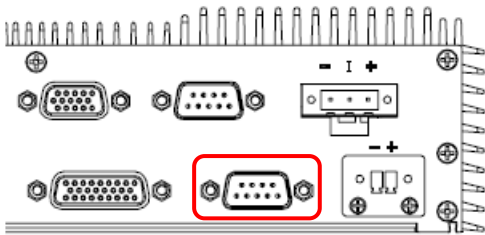
In RS-422 Mode

| Signal | PIN | PIN | Signal |
|--------|-----|-----|--------|
| TxD1- | 1 | 6 | NC |
| TxD1+ | 2 | 7 | NC |
| RxD1+ | 3 | 8 | NC |
| RxD1- | 4 | 9 | NC |
| GND | 5 | | |

In RS-485 Mode

| Signal | PIN | PIN | Signal |
|--------|-----|-----|--------|
| DATA1- | 1 | 6 | NC |
| DATA1+ | 2 | 7 | NC |
| NC | 3 | 8 | NC |
| NC | 4 | 9 | NC |
| GND | 5 | | |

2.1.2 Serial Port 2 connector/ CAN connector (COM2/CAN)



In RS-232 Mode

Note:

The CAN Bus is factory option which will replace the location of COM2.

CAN BUS

| | DB9/M |
|-------|-------|
| 1708- | 1 |
| 1708+ | 8 |
| 1939- | 5 |
| 1939+ | 3 |
| GND | 2 |

| Signal | PIN | PIN | Signal |
|--------|-----|-----|--------|
| NDCD# | 1 | 6 | NDSR# |
| NRXD | 2 | 7 | NRTS# |
| NTXD | 3 | 8 | NCTS# |
| NDTR# | 4 | 9 | NRI# |
| GND | 5 | | |

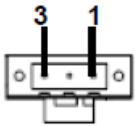
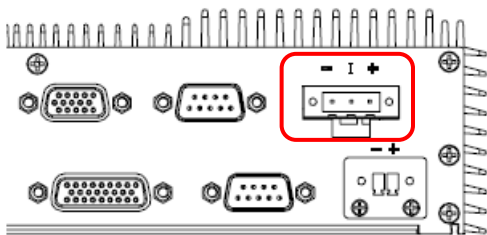
In RS-422 Mode

| Signal | PIN | PIN | Signal |
|--------|-----|-----|--------|
| TxD1- | 1 | 6 | NC |
| TxD1+ | 2 | 7 | NC |
| RxD1+ | 3 | 8 | NC |
| RxD1- | 4 | 9 | NC |
| GND | 5 | | |

In RS-485 Mode

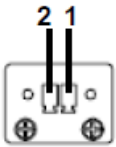
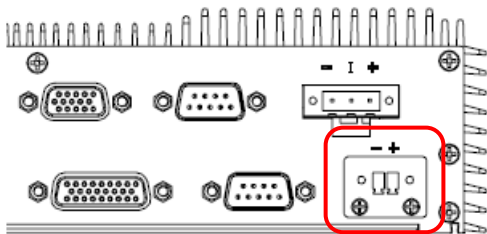
| Signal | PIN | PIN | Signal |
|--------|-----|-----|--------|
| DATA1- | 1 | 6 | NC |
| DATA1+ | 2 | 7 | NC |
| NC | 3 | 8 | NC |
| NC | 4 | 9 | NC |
| GND | 5 | | |

2.1.3 DC power-in connector (DC-in)



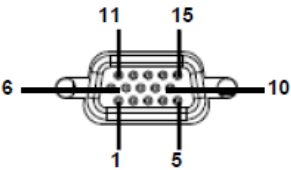
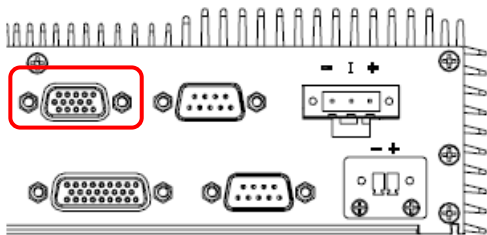
| Signal | PIN |
|--------------|-----|
| VIN + (BAT+) | 1 |
| ACC (IGN) | 2 |
| VIN- (BAT-) | 3 |

2.1.4 DC power-out connector (DC-out)



| Signal | PIN |
|--------|-----|
| +12V | 1 |
| GND | 2 |

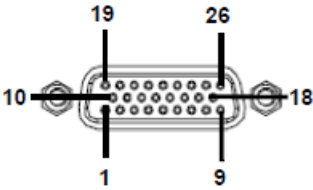
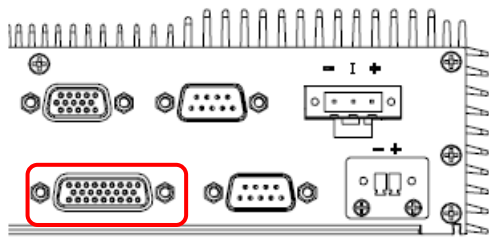
2.1.5 VGA connector (VGA)



| PIN | Signal | PIN | Signal | PIN | Signal |
|-----|--------|-----|--------|-----|--------|
| 1 | RED | 6 | GND | 11 | NC |
| 2 | GREEN | 7 | GND | 12 | DDCDAT |
| 3 | BLUE | 8 | GND | 13 | HSYNC |
| 4 | NC | 9 | +5V | 14 | VSYNS |
| 5 | GND | 10 | GND | 15 | DDCCLK |

VMS-BYT

2.1.6 LVDS connector (LVDS)

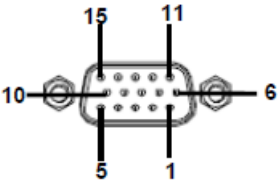
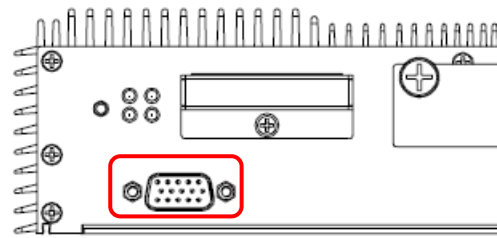


Note:

This connector included LVDS, USB, 12V and 5V interfaces.

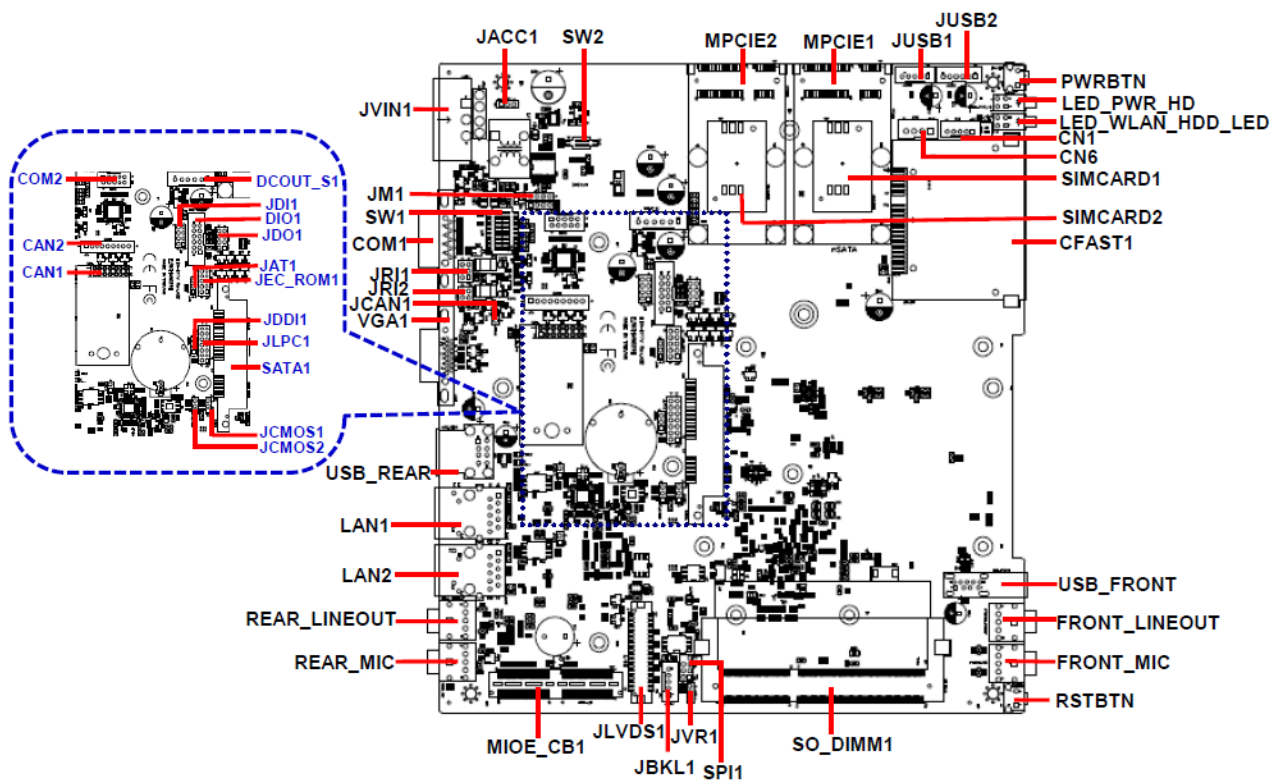
| PIN | Signal | PIN | Signal | PIN | Signal |
|-----|--------|-----|--------|-----|--------------|
| 1 | PS_ON | 10 | 1+ | 19 | 12V |
| 2 | GND | 11 | 1- | 20 | GND |
| 3 | 3.3V | 12 | GND | 21 | Backlight_EN |
| 4 | 5V | 13 | 2+ | 22 | VBRIGHT |
| 5 | GND | 14 | 2- | 23 | USB_VCC |
| 6 | GND | 15 | 3+ | 24 | D- |
| 7 | 0+ | 16 | 3- | 25 | D+ |
| 8 | 0- | 17 | CLK+ | 26 | USB_GND |
| 9 | GND | 18 | CLK- | | |

2.1.7 General purpose I/O connector (GPIO)



| PIN | Signal | PIN | Signal | PIN | Signal |
|-----|----------|-----|----------|-----|--------|
| 1 | DIO_GPO0 | 6 | DIO_GPI2 | 11 | GND |
| 2 | DIO_GPI0 | 7 | DIO_GPO3 | 12 | +3.3V |
| 3 | DIO_GPO1 | 8 | DIO_GPI3 | 13 | NC |
| 4 | DIO_GPI1 | 9 | MBCLK | 14 | NC |
| 5 | DIO_GPO2 | 10 | SMB_DATA | 15 | NC |

2.2 EBM-BYTV Overviews



2.3 EBM-BYTV Jumper & Connector list

Jumpers

| Label | Function | Note |
|--------|--|-----------------------------|
| JCMOS1 | Clear CMOS | 3 x 1 header, pitch 2.00mm |
| JRI1/2 | COM 1/2 pin 9 signal selector | 3 x 2 header, pitch 2.00 mm |
| JAT1 | AT/ATX Jumper | 3 x 1 header, pitch 2.00 mm |
| SW1 | Serial port 1/ 2 – RS485 mode selector | DIP switch 10pin |
| SW2 | Power Input selector | DIP switch 4pin |
| JVR1 | LCD backlight brightness adjustment | 3 x 1 header, pitch 2.00 mm |
| JDDI1 | IET interface DP mode selector | 3 x 1 header, pitch 2.00 mm |
| JDI1 | Digital Input selector | 4 x 2 header, pitch 2.00 mm |
| JDO1 | Digital Output selector | 4 x 2 header, pitch 2.00 mm |
| JACC1 | ACC Function | 3 x 1 header, pitch 2.00 mm |
| JCAN1 | CAN/COM selector | 2 x 1 header, pitch 2.00 mm |

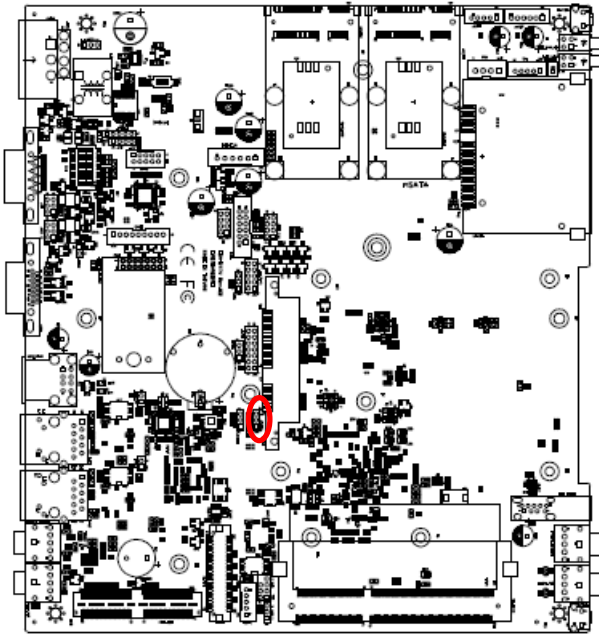
Connectors

| Label | Function | Note |
|-----------|--------------------------------|-----------------------------|
| USB_REAR | USB 2.0 connector | |
| USB_FRONT | USB 3.0 connector | |
| JCMOS2 | Clear CMOS (Reserved) | 3 x 1 header, pitch 2.00 mm |
| JM1 | MCU download connector | 5 x 1 header, pitch 2.00 mm |
| JUSB1 | On-board header for USB2.0 | 5 x 1 wafer, pitch 2.00 mm |
| JUSB2 | On-board header for USB2.0 | 6 x 1 wafer, pitch 2.00 mm |
| LAN1/2 | LAN connector 1/2 | |
| VGA1 | VGA connector | |
| DIO1 | General purpose I/O connector | 6 x 2 wafer, pitch 2.00 mm |
| COM1 | Serial port connector 1 | |
| COM2 | Serial port connector 2 | 5 x 2 wafer, pitch 2.00 mm |
| CAN1 | CAN Module slot | 7 x 2 header, pitch 2.00 mm |
| CAN2 | CAN box connector | 9 x 1 wafer, pitch 2.00 mm |
| MPCIE1/2 | Mini PCI Express connector 1/2 | 52 pin |
| PWRBTN | Power button | |
| RSTBTN | Reset button | |

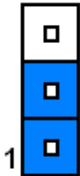
| | | |
|-------------------------|--------------------------|-----------------------------|
| LED_PWR_HD | LED Power HDD | |
| LED_WLAN_HDD_LED | LED LAN | |
| CFAST1 | CF card socket | |
| FRONT_LINEOUT | Audio line-out connector | |
| REAR_LINEOUT | Audio line-out connector | |
| FRONT_MIC | Audio mic-in connector | |
| REAR_MIC | Audio mic-in connector | |
| SIMCARD1/2 | SIM card slot 1/2 | |
| JLVDS1 | LVDS connector | 20 x 2 wafer, pitch 1.25 mm |
| SO_DIMM1 | DDR3 SODIMM connector | |
| MIOE_CB1 | IET Expansion slot | |
| JLPC1 | LPC port connector | 7 x 2 header, pitch 2.00 mm |
| SPI1 | SPI connector | 4 x 2 header, pitch 2.00 mm |
| JBKL1 | LCD inverter connector | 5 x 1 wafer, pitch 2.00 mm |
| SATA1 | Serial ATA connector 1 | |
| CN1 | Front Panel connector 1 | 5 x 1 wafer, pitch 2.00 mm |
| CN6 | Front Panel connector 2 | 4 x 1 wafer, pitch 2.50 mm |
| DCOUT_S1 | DC Output connector | 6 x 1 wafer, pitch 2.50 mm |
| JEC_ROM1 | EC Debug connector | 5 x 2 header, pitch 2.00 mm |

2.4 EBM-BYTV Jumpers & Connectors settings

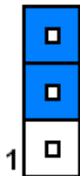
2.4.1 Clear CMOS (JCMOS1)



Protect*

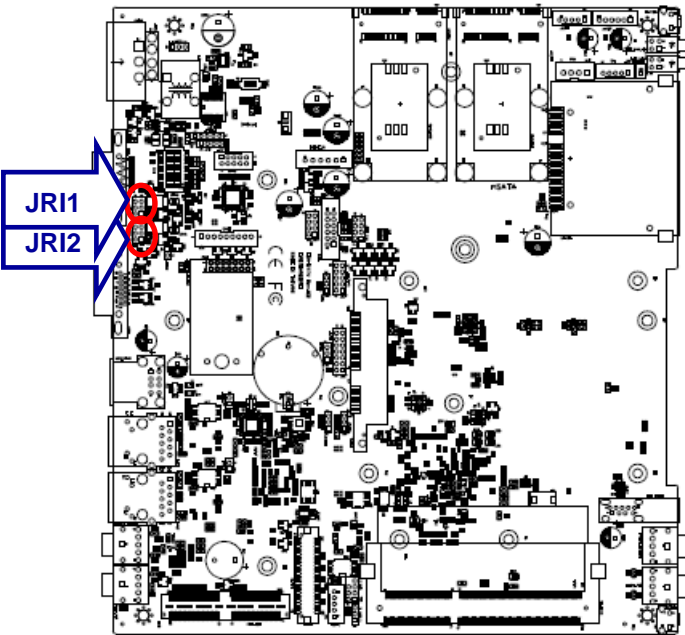


Clear CMOS

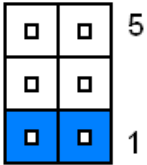


*Default

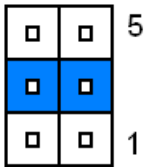
2.4.2 COM 1/2 pin 9 signal selector (JRI1/2)



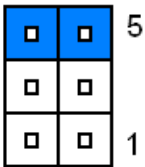
Ring*



+5V

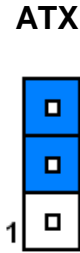
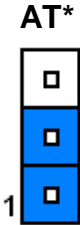
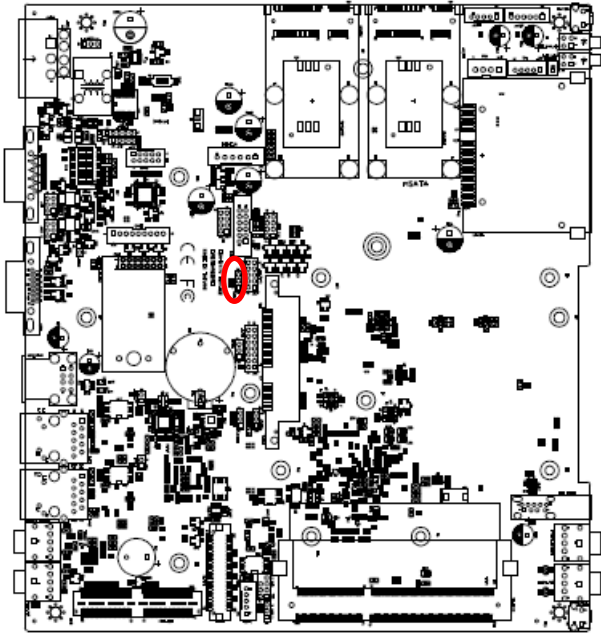


+12V



* Default

2.4.3 AT/ATX Jumper (JAT1)

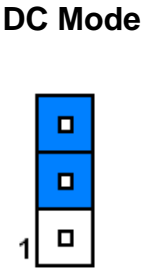
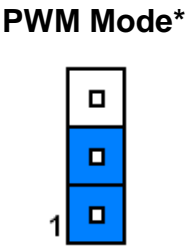
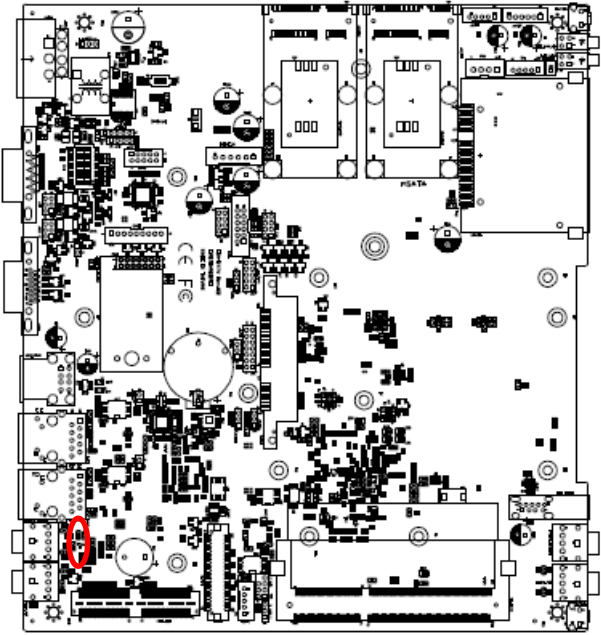


*Default

Note:

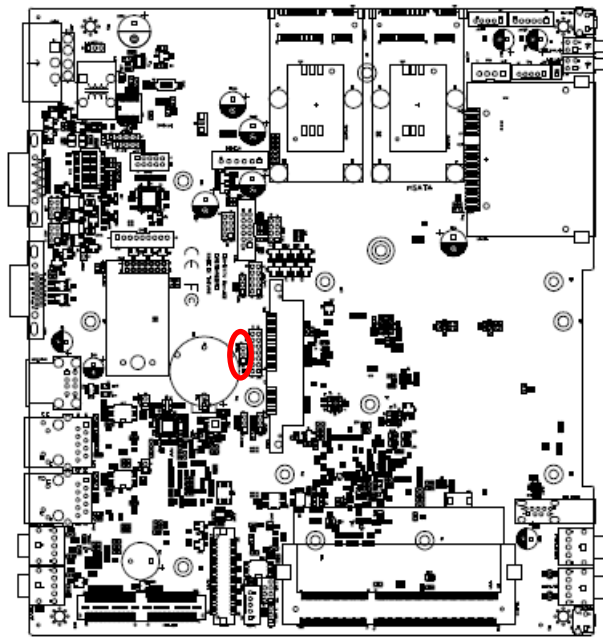
This function will be active if ACC Function (JACC1) sets up Disable (Industrial PC power mode).

2.4.4 LCD backlight brightness adjustment (JVR1)

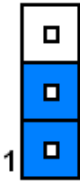


* Default

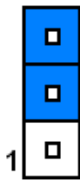
2.4.5 IET interface DP mode selector (JDDI1)



HDMI/DVI

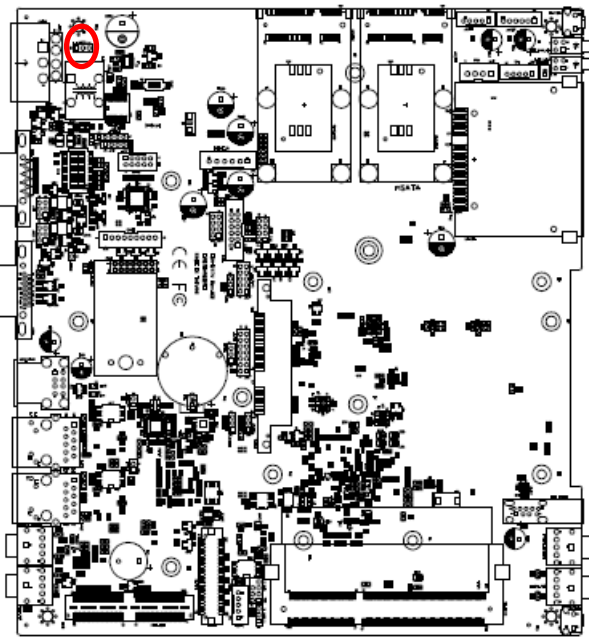


Display Port*



*Default

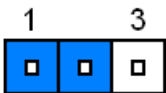
2.4.6 ACC Function (JACC1)



Enable*



Disable



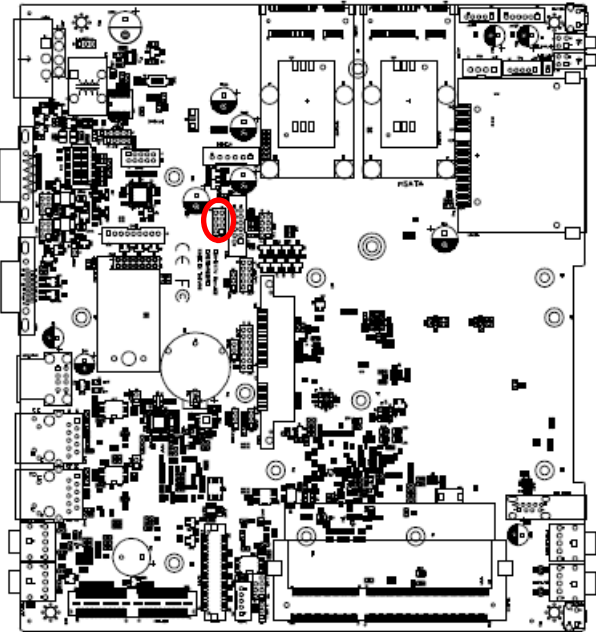
* Default

Note:

It is Vehicle PC power mode (Power on/off controlled by Ignition or Power button) if ACC Function sets up as Enable.

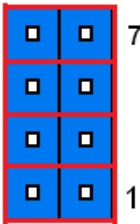
It is Industrial PC power mode (Power on/off controlled by Power button) if ACC Function sets up as Disable.

2.4.7 Digital Input selector (JDI1)

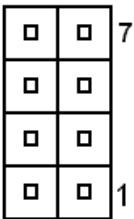


* Default

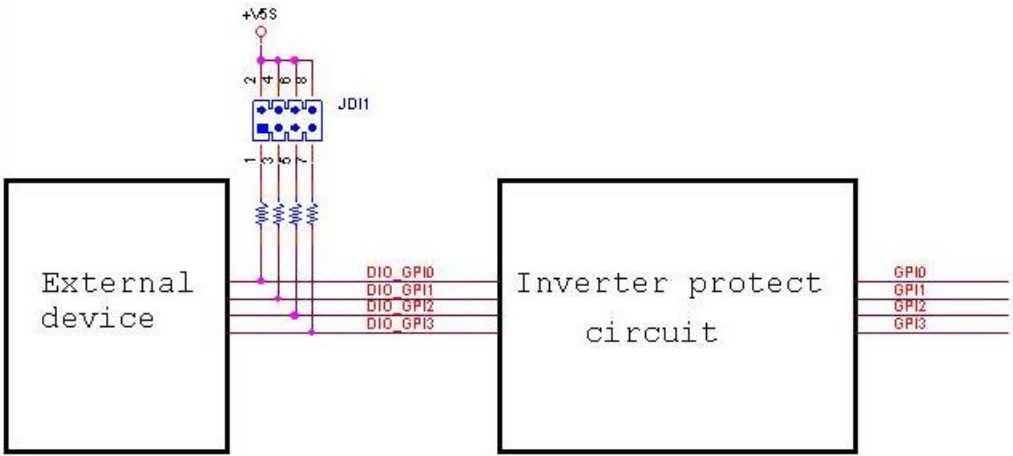
Dry*



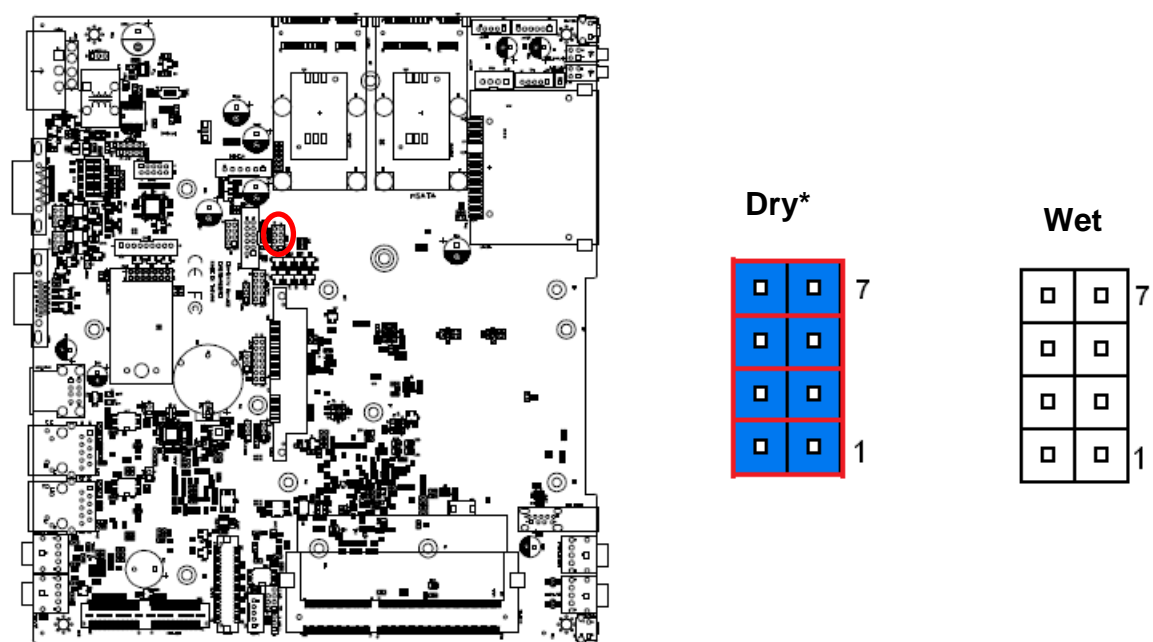
Wet



| Mode | Digital Input |
|------|--|
| Dry | Logic level 1: Close to GND Logic level 0: Open |
| Wet | Logic level 1: < 3V Logic level 0: 5V ~ 30V |



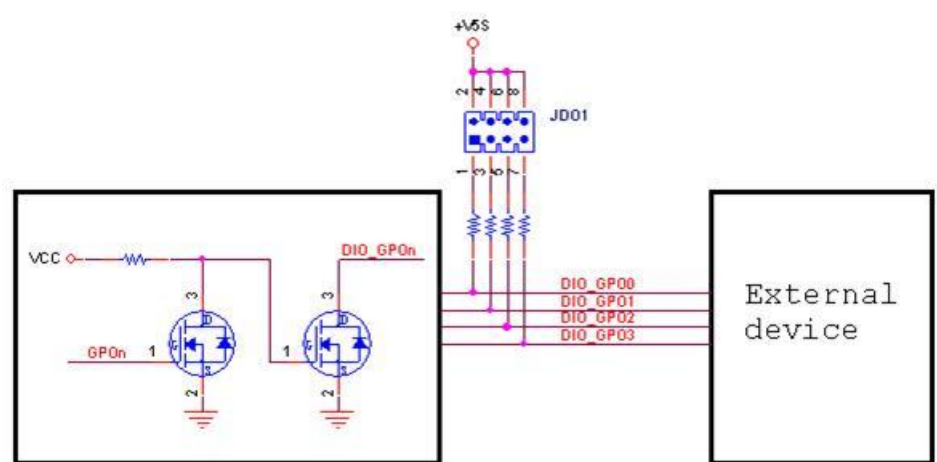
2.4.8 Digital Output selector (JD01)



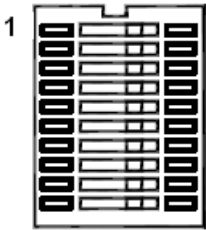
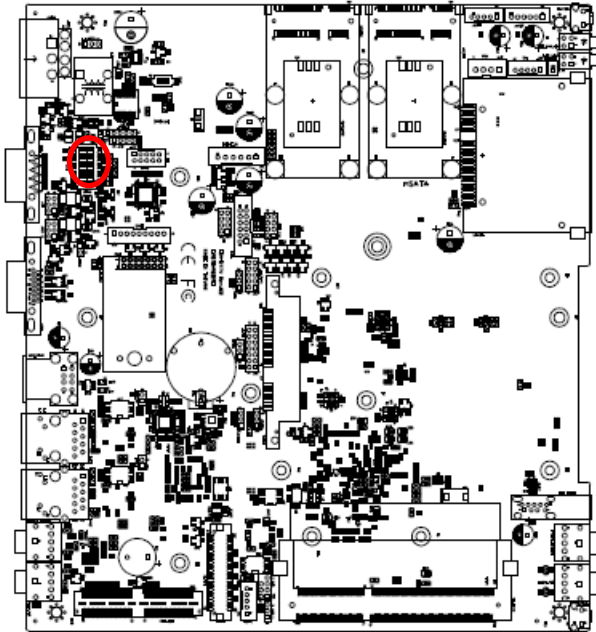
* Default

Note:

Output Voltage: Max 250 mA per channel, current sink type.



2.4.9 Serial port 1/ 2 – RS485 mode selector (SW1)



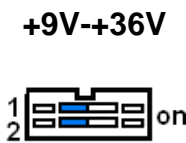
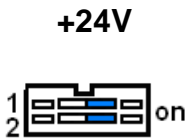
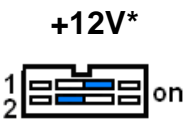
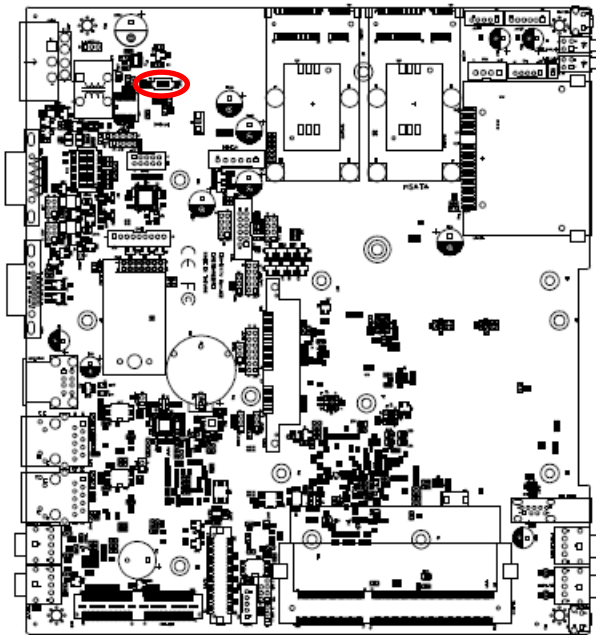
In Serial Port 1 mode

| | ON | OFF |
|---|-------------------------------------|---------------|
| 1 | Auto Direction | RTS# Control* |
| 2 | 485TXP external biasing resistor | OPEN* |
| 3 | 485TXN external biasing resistor | OPEN* |
| 4 | 485RXP external biasing resistor | OPEN* |
| 5 | 485RXN external biasing resistor | OPEN* |

In Serial Port 2 mode

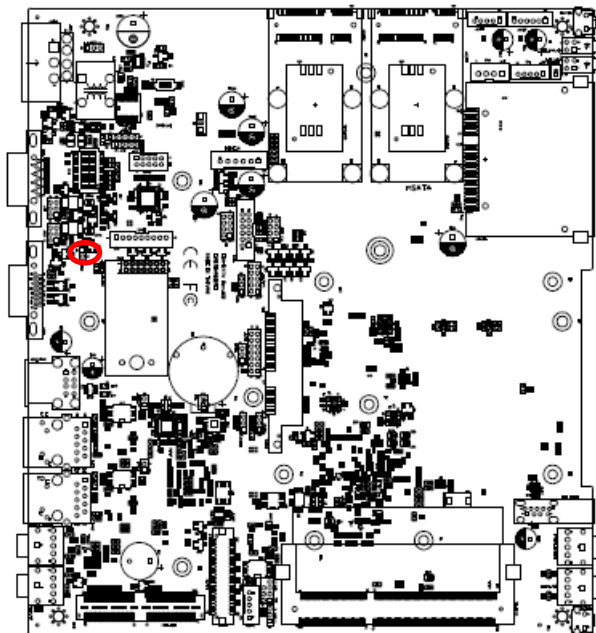
| | ON | OFF |
|----|-------------------------------------|---------------|
| 6 | Auto Direction | RTS# Control* |
| 7 | 485TXP external biasing resistor | OPEN* |
| 8 | 485TXN external biasing resistor | OPEN* |
| 9 | 485RXP external biasing resistor | OPEN* |
| 10 | 485RXN external biasing resistor | OPEN* |

2.4.10 Power Input selector (SW2)



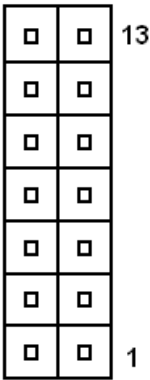
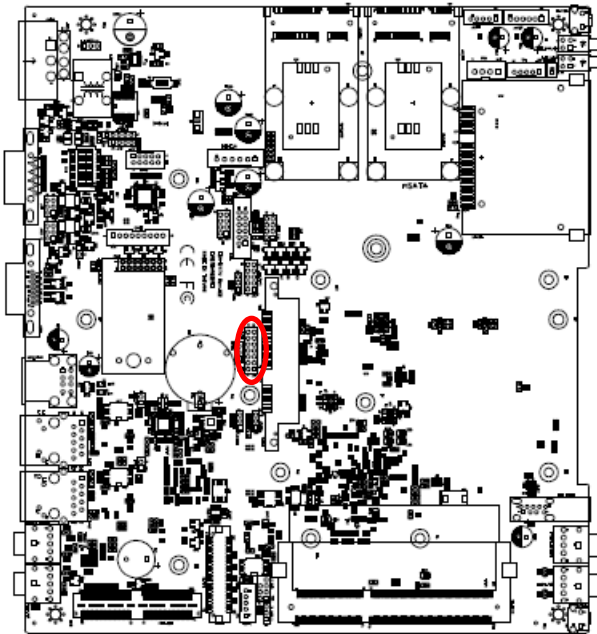
* Default

2.4.11 CAN/COM selector (JCAN1)



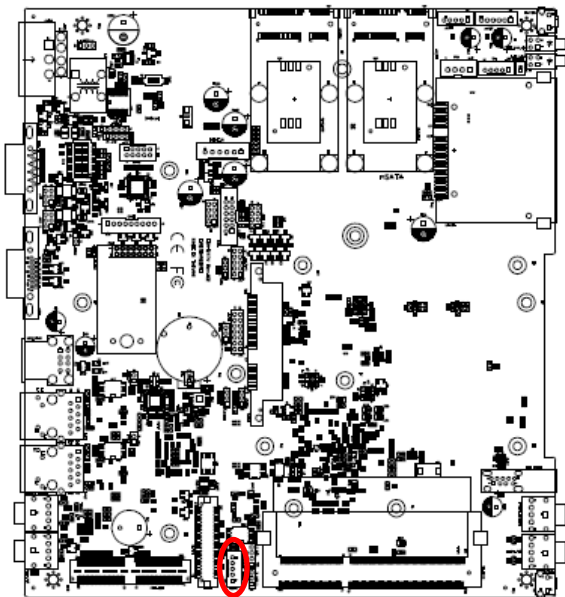
* Default

2.4.12 LPC port connector (JLPC1)



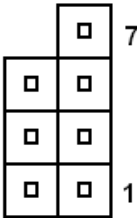
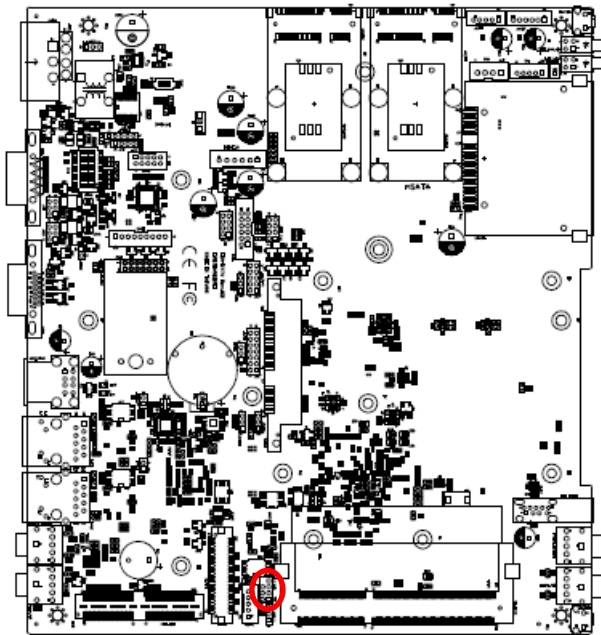
| Signal | PIN | PIN | Signal |
|---------|-----|-----|-----------------|
| LPC_AD0 | 1 | 2 | +3.3V |
| LPC_AD1 | 3 | 4 | LPC_PORT80_RST# |
| LPC_AD2 | 5 | 6 | LPC_FRAME# |
| LPC_AD3 | 7 | 8 | LPC1_PORT80_CLK |
| SERIRQ | 9 | 10 | GND |
| +5V | 11 | 12 | GND |
| +5VSB | 13 | 14 | NC |

2.4.13 LCD inverter connector (JBKL1)



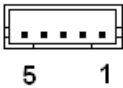
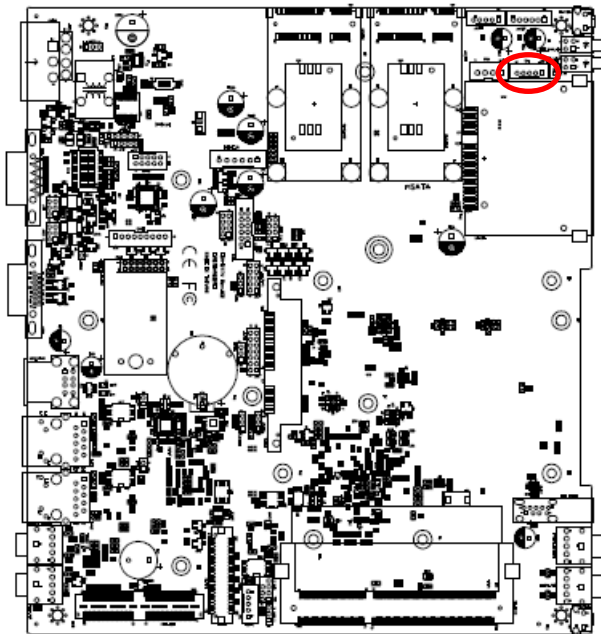
| Signal | PIN |
|---------|-----|
| +5V | 5 |
| VBRIGHT | 4 |
| BKLEN | 3 |
| GND | 2 |
| +12V | 1 |

2.4.14 SPI connector (SPI1)



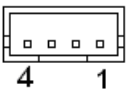
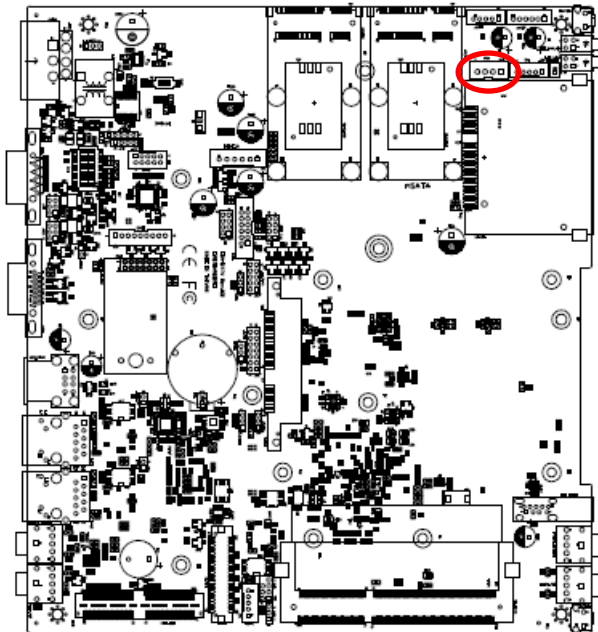
| Signal | PIN | PIN | Signal |
|--------------|-----|-----|----------------|
| | | 7 | SPI_HOLD# |
| SPI_ROM_MOSI | 6 | 5 | SPI_ROM_MISO_R |
| SPI_ROM_CLK | 4 | 3 | SPI_ROM_CS# |
| GND | 2 | 1 | +VSPI_BIOS |

2.4.15 Front Panel Connector 1 (CN1)



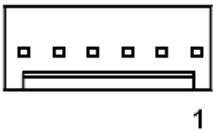
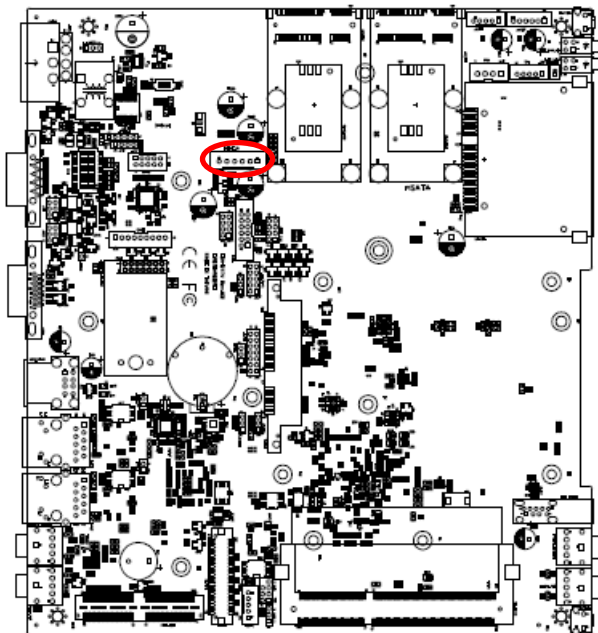
| Signal | PIN |
|-------------|-----|
| PWR_BTN_IN# | 1 |
| SYSRST# | 2 |
| GND | 3 |
| +5VSB | 4 |
| PWR_LED- | 5 |

2.4.16 Front Panel Connector 2 (CN6)



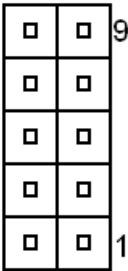
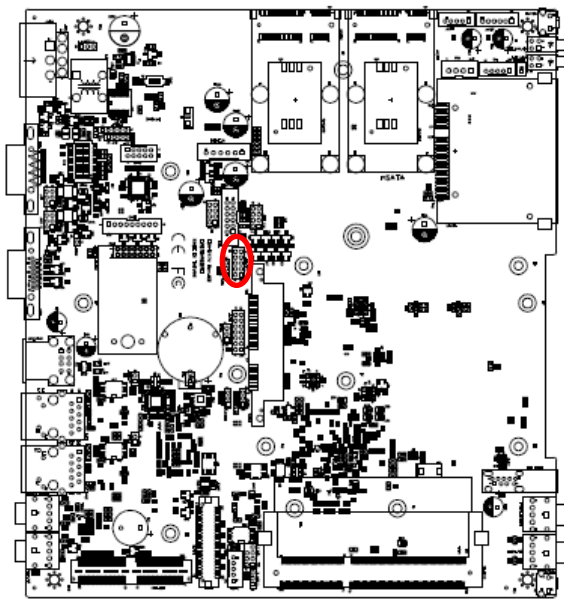
| Signal | PIN |
|--------|-----|
| +5V | 1 |
| GND | 2 |
| GND | 3 |
| +12V | 4 |

2.4.17 DC Output connector (DCOUT_S1)



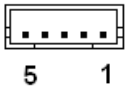
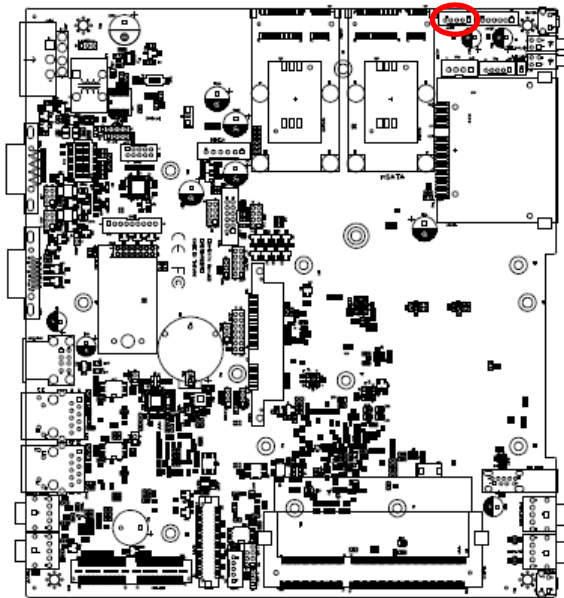
| Signal | PIN |
|-----------|-----|
| +VOUT_12V | 1 |
| +VOUT_12V | 2 |
| +VOUT_12V | 3 |
| GND | 4 |
| GND | 5 |
| GND | 6 |

2.4.18 EC Debug connector (JEC_ROM1)



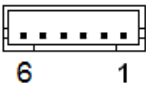
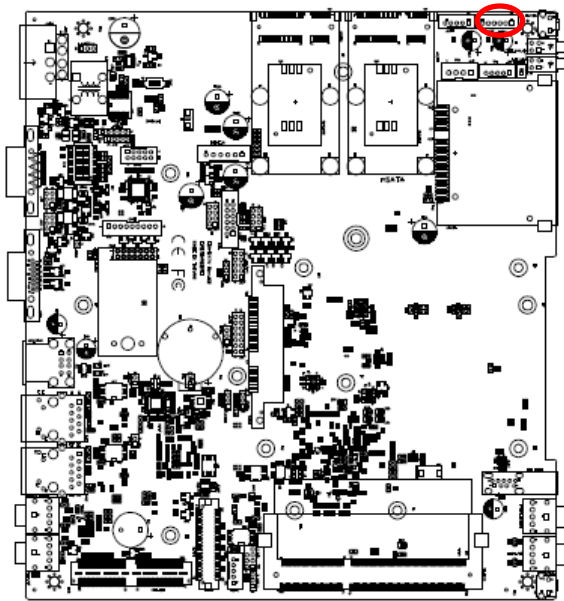
| Signal | PIN | PIN | Signal |
|--------------------|-----|-----|--------------------|
| EC_SMDAT_DE BUG | 10 | 9 | EC_SMCLK_D EBUG |
| NC | 8 | 7 | EC_HOLD# |
| EC_FMOSI | 6 | 5 | EC_FMISO |
| EC_FSCK | 4 | 3 | EC_FSCE# |
| GND | 2 | 1 | +VSPI_EC |

2.4.19 On-board header for USB2.0 (JUSB1)



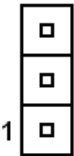
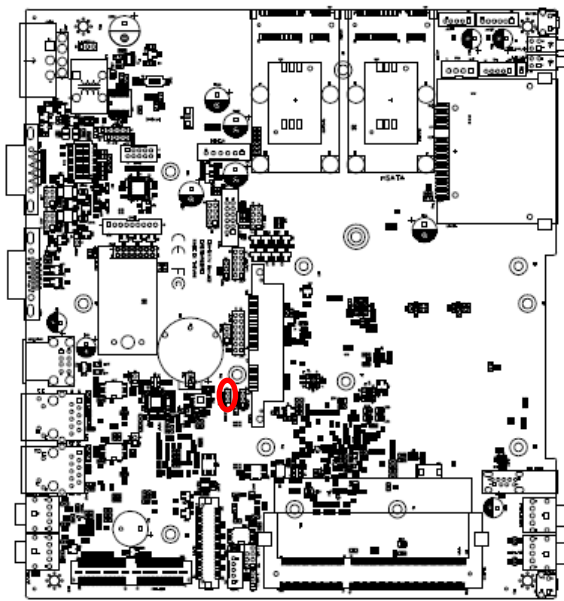
| Signal | PIN |
|---------------|-----|
| USBVCC_HEADER | 1 |
| USB_HUB2_DN_1 | 2 |
| USB_HUB2_DP_1 | 3 |
| GND | 4 |
| GND | 5 |

2.4.20 On-board header for USB2.0 (JUSB2)



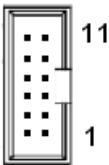
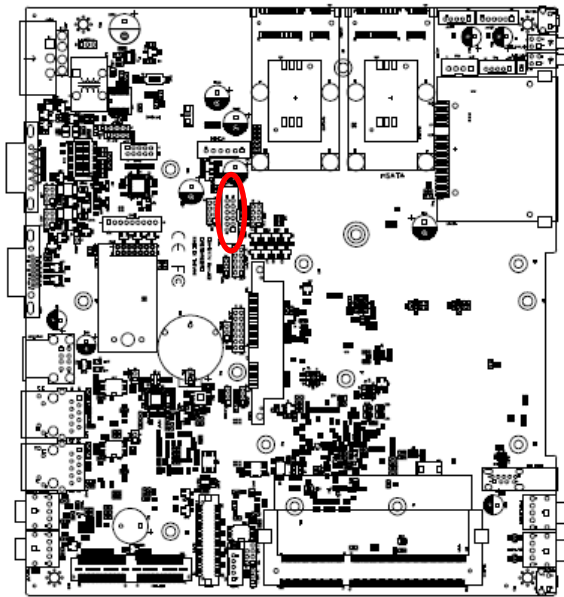
| Signal | PIN |
|---------------|-----|
| USBVCC_BT | 1 |
| USB_HUB2_DN_4 | 2 |
| USB_HUB2_DP_4 | 3 |
| GND | 4 |
| GND | 5 |
| BT_EN | 6 |

2.4.21 Clear CMOS (Reserved) (JCMOS2)



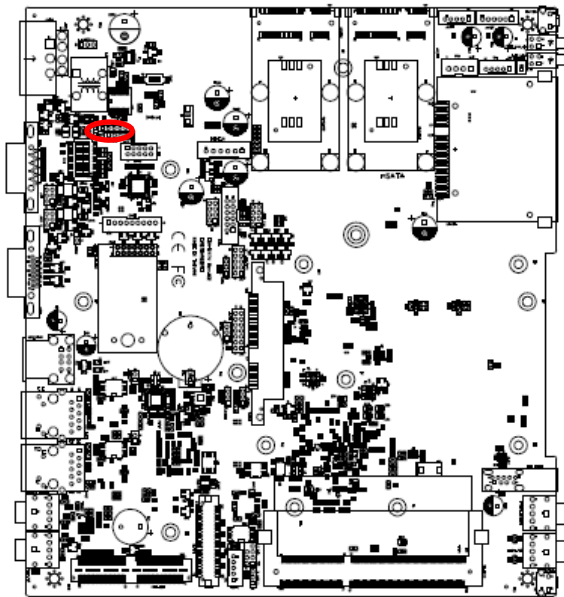
| Signal | PIN |
|-----------------|-----|
| GND | 3 |
| ILB_RTC_RST# | 2 |
| ILB_RTC_R_TEST# | 1 |

2.4.22 General purpose I/O connector (DIO1)



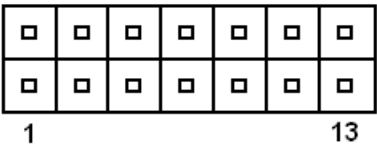
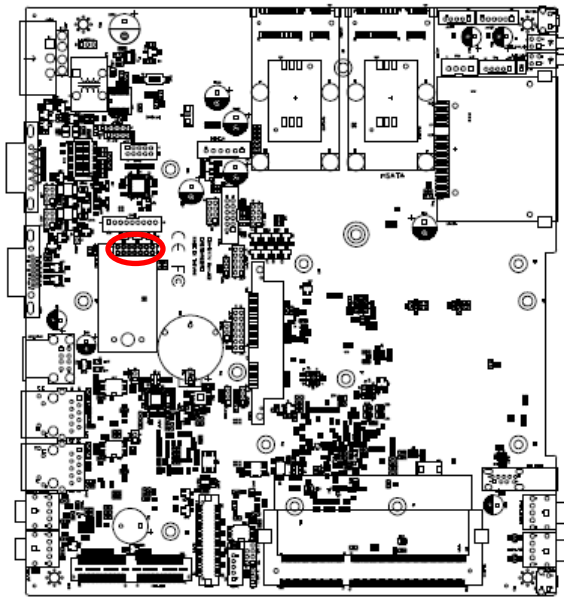
| Signal | PIN | PIN | Signal |
|----------|-----|-----|----------|
| +3.3V | 12 | 11 | GND |
| SMB_DATA | 10 | 9 | SMB_CLK |
| DIO_GPI3 | 8 | 7 | DIO_GPO3 |
| DIO_GPI2 | 6 | 5 | DIO_GPO2 |
| DIO_GPI1 | 4 | 3 | DIO_GPO1 |
| DIO_GPI0 | 2 | 1 | DIO_GPO0 |

2.4.23 MCU download connector (JM1)



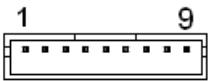
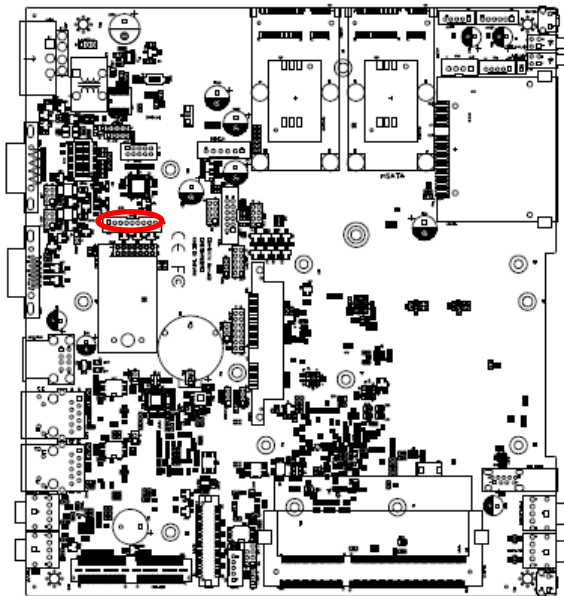
| Signal | PIN |
|---------------|-----|
| +MCU | 1 |
| MCU_VPP_MCLR# | 2 |
| ICSP-CLK | 3 |
| ICSP-DAT | 4 |
| GND | 5 |

2.4.24 CAN Module slot (CAN1)



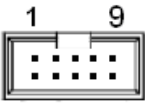
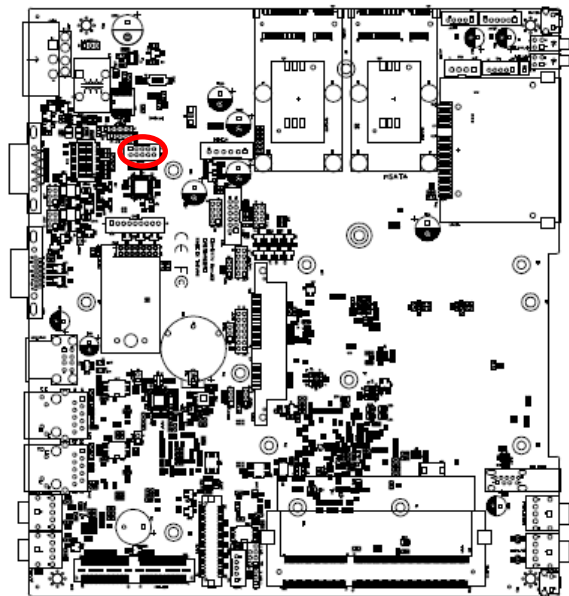
| Signal | PIN | PIN | Signal |
|-----------|-----|-----|---------|
| CAN_PWR | 1 | 2 | CAN_8 |
| CAN_IND | 3 | 4 | CAN_9 |
| GND | 5 | 6 | BAT_GND |
| CAN_WAKE | 7 | 8 | CAN_11 |
| SINB_CAN | 9 | 10 | CAN_12 |
| SOUTB_CAN | 11 | 12 | CAN_13 |
| +5V | 13 | 14 | CAN_14 |

2.4.25 CAN box connector (CAN2)



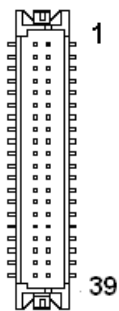
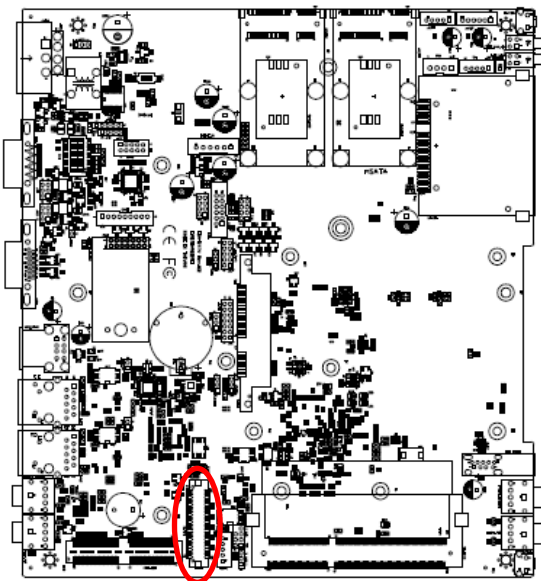
| Signal | PIN |
|---------|-----|
| BAT_PWR | 1 |
| CAN_8 | 2 |
| CAN_9 | 3 |
| BAT_GND | 4 |
| CAN_11 | 5 |
| CAN_12 | 6 |
| CAN_13 | 7 |
| CAN_14 | 8 |
| NC | 9 |

2.4.26 Serial port connector 2 (COM2)



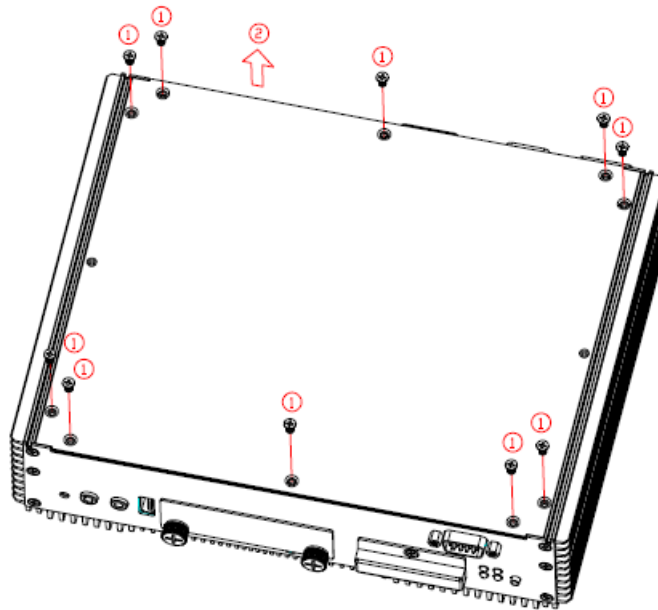
| Signal | PIN | PIN | Signal |
|---------------|-----|-----|---------------|
| NDCDB#_485TXN | 1 | 2 | NRXDB_485TXP |
| NTXDB_485RXP | 3 | 4 | NDTRB#_485RXN |
| GND | 5 | 6 | NDSRB# |
| NRTSB# | 7 | 8 | NCTSB# |
| NRIB# | 9 | 10 | NC |

2.4.27 LVDS connector (JLVDS1)



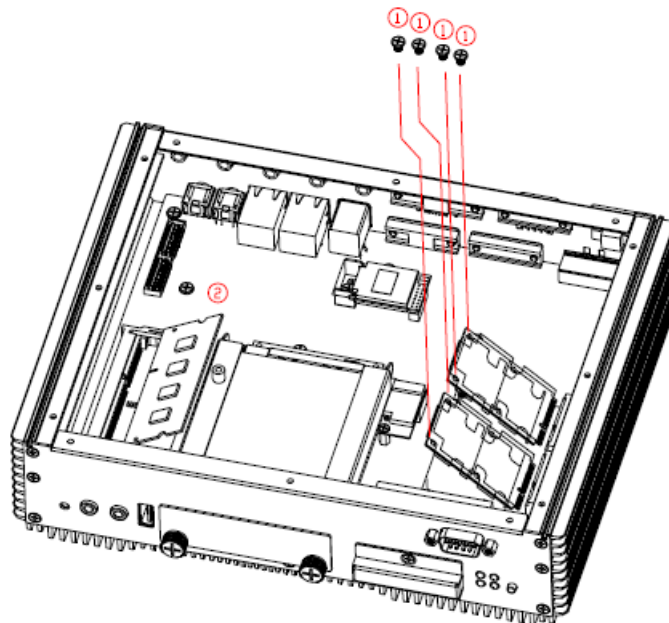
| Signal | PIN | PIN | Signal |
|--------------|-----|-----|--------------|
| +5V | 2 | 1 | +3.3V |
| +5V | 4 | 3 | +3.3V |
| NC | 6 | 5 | NC |
| GND | 8 | 7 | GND |
| LVDS_DATA0_P | 10 | 9 | LVDS_DATA1_P |
| LVDS_DATA0_N | 12 | 11 | LVDS_DATA1_N |
| GND | 14 | 13 | GND |
| LVDS_DATA2_P | 16 | 15 | LVDS_DATA3_P |
| LVDS_DATA2_N | 18 | 17 | LVDS_DATA3_N |
| GND | 20 | 19 | GND |
| LVDS_DATA4_P | 22 | 21 | LVDS_DATA5_P |
| LVDS_DATA4_N | 24 | 23 | LVDS_DATA5_N |
| GND | 26 | 25 | GND |
| LVDS_DATA6_P | 28 | 27 | LVDS_DATA7_P |
| LVDS_DATA6_N | 30 | 29 | LVDS_DATA7_N |
| GND | 32 | 31 | GND |
| LVDS_CLK1_P | 34 | 33 | LVDS_CLK2_P |
| LVDS_CLK1_N | 36 | 35 | LVDS_CLK2_N |
| GND | 38 | 37 | GND |
| +12V | 40 | 39 | +12V |

2.5 Installing PCI-e devices, Memory, Hard Disk & CF card



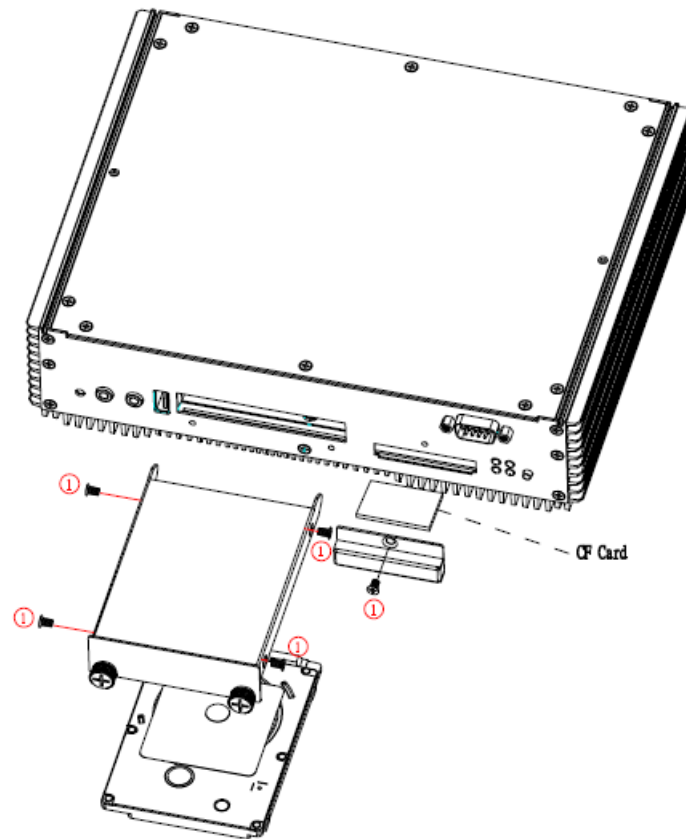
Step 1. Remove 10 screws from the bottom of your system.

Step 2. Remove the chassis cover.



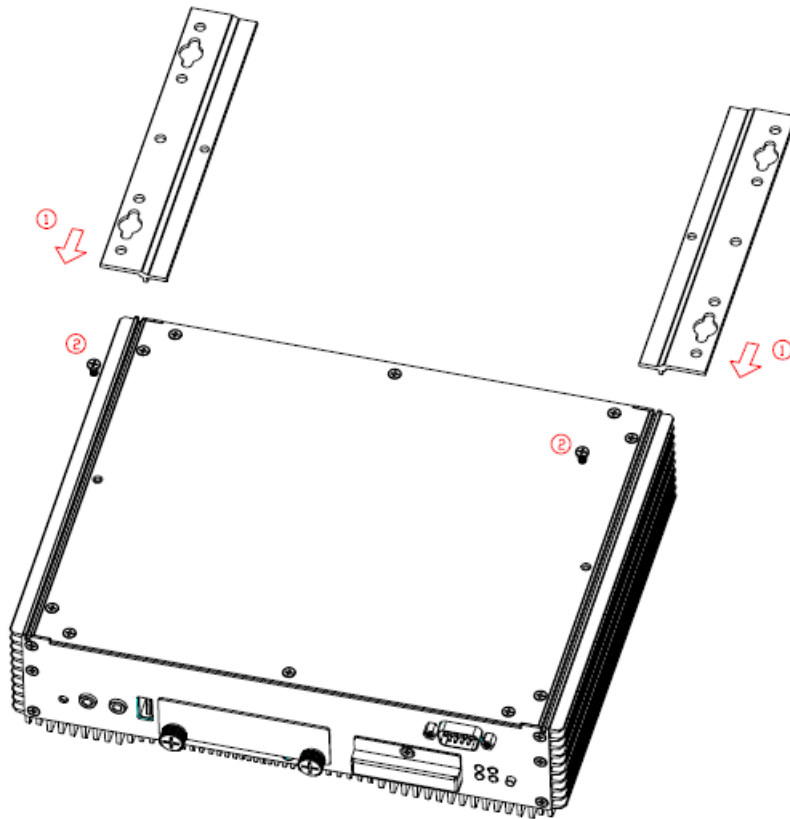
Step 1. PCI-e device Installation: Insert MPCIE cards into designated locations and fasten with 4 screws to complete MPCIE installation.

Step 2. Memory Installation: Slide the DDR3 SODIMM into the memory socket and press it down until properly seated.



- Step 1. HDD Installation:** Remove 4 screws to release the HDD bracket.
- Step 2.** Slide HDD into its bracket until properly seated.
- Step 3.** Secure HDD by means of 4 screws.
- Step 4. CF card Installation:** Unlock the screw from the rear side of the System.
- Step 5.** Put the CF card into the socket and fasten the screw back.

2.6 Installing Mounting Brackets



Step 1. Position brackets on both sides, matching the holes on the system.

Step 2. Insert and fasten screw on each side of the system to secure Mounting brackets.

3.BIOS Setup

3.1 Introduction

The BIOS setup program allows users to modify the basic system configuration. In this following chapter will describe how to access the BIOS setup program and the configuration options that may be changed.

3.2 Starting Setup

The AMI BIOS™ is immediately activated when you first power on the computer. The BIOS reads the system information contained in the NVRAM and begins the process of checking out the system and configuring it. When it finishes, the BIOS will seek an operating system on one of the disks and then launch and turn control over to the operating system.

While the BIOS is in control, the Setup program can be activated in one of two ways:

By pressing or <F2> immediately after switching the system on, or

By pressing the or <F2> key when the following message appears briefly at the left-top of the screen during the POST (Power On Self Test).

Press or <F2> to enter SETUP

If the message disappears before you respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON or pressing the "RESET" button on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys. If you do not press the keys at the correct time and the system does not boot, an error message will be displayed and you will again be asked to.

Press F1 to Continue, DEL to enter SETUP

3.3 Using Setup

In general, you use the arrow keys to highlight items, press <Enter> to select, use the PageUp and PageDown keys to change entries, press <F1> for help and press <Esc> to quit. The following table provides more detail about how to navigate in the Setup program using the keyboard.

| Button | Description |
|---------|---|
| ↑ | Move to previous item |
| ↓ | Move to next item |
| ← | Move to the item in the left hand |
| → | Move to the item in the right hand |
| Esc key | Main Menu -- Quit and not save changes into NVRAM Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu |
| + key | Increase the numeric value or make changes |
| - key | Decrease the numeric value or make changes |
| F1 key | General help, only for Status Page Setup Menu and Option Page Setup Menu |
| F2 key | Previous Values. |
| F3 key | Optimized defaults |
| F4 key | Save & Exit Setup |

- **Navigating Through The Menu Bar**

Use the left and right arrow keys to choose the menu you want to be in.



Note: Some of the navigation keys differ from one screen to another.

- **To Display a Sub Menu**

Use the arrow keys to move the cursor to the sub menu you want. Then press <Enter>. A “➤” pointer marks all sub menus.

3.4 Getting Help

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press <Esc> or the F1 key again.

3.5 In Case of Problems

If, after making and saving system changes with Setup, you discover that your computer no longer is able to boot, the AMI BIOS supports an override to the NVRAM settings which resets your system to its defaults.

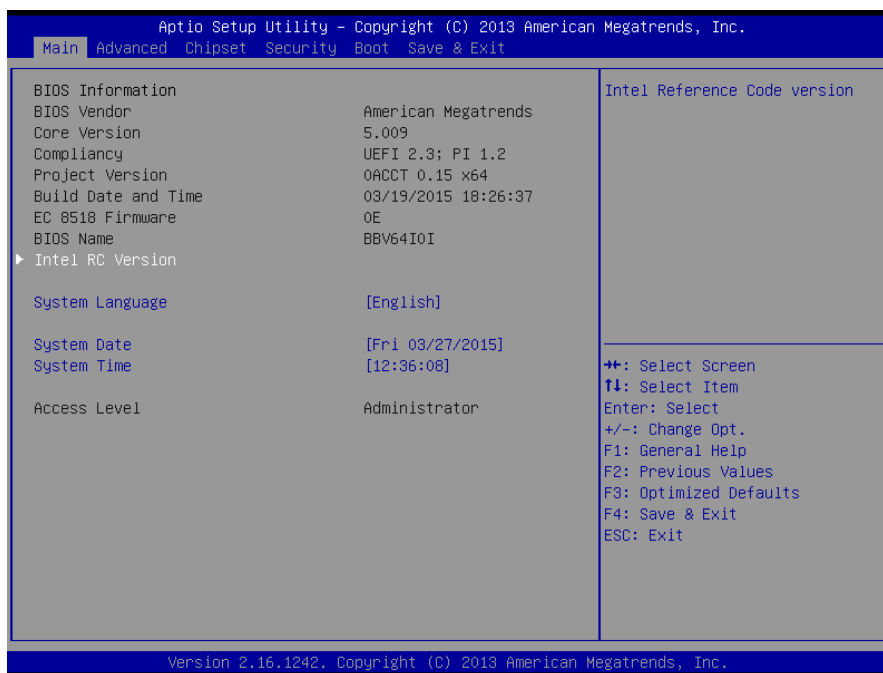
The best advice is to only alter settings which you thoroughly understand. To this end, we strongly recommend that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both BIOS Vendor and your systems manufacturer to provide the absolute maximum performance and reliability. Even a seemingly small change to the chipset setup has the potential for causing you to use the override.

3.6 BIOS setup

Once you enter the Aptio Setup Utility, the Main Menu will appear on the screen. The Main Menu allows you to select from several setup functions and exit choices. Use the arrow keys to select among the items and press <Enter> to accept and enter the sub-menu.

3.6.1 Main Menu

This section allows you to record some basic hardware configurations in your computer and set the system clock.



3.6.1.1 System Language

This option allows choosing the system default language.

3.6.1.2 System Date

Use the system date option to set the system date. Manually enter the day, month and year.

3.6.1.3 System Time

Use the system time option to set the system time. Manually enter the hours, minutes and seconds.

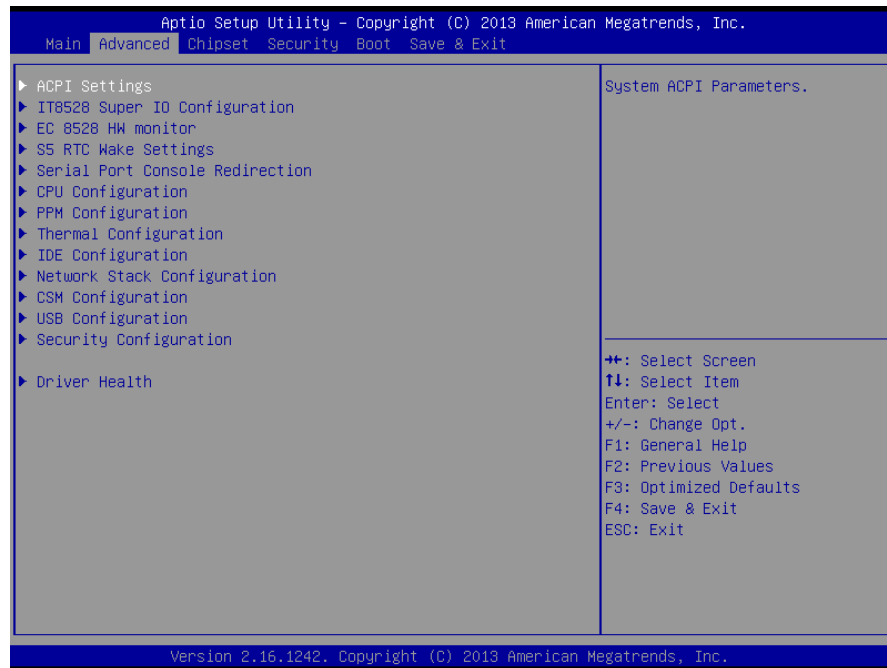


Note: The BIOS setup screens shown in this chapter are for reference purposes only, and may not exactly match what you see on your screen.

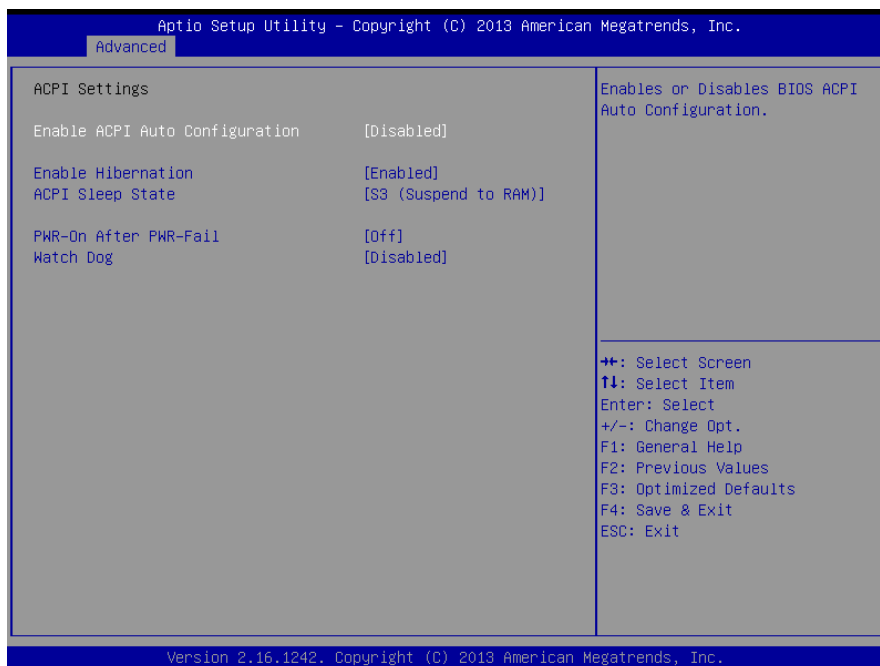
Visit the Avalue website (www.avalue.com.tw) to download the latest product and BIOS information.

3.6.2 Advanced Menu

This section allows you to configure your CPU and other system devices for basic operation through the following sub-menus.



3.6.2.1 ACPI Settings



| Item | Options | Description |
|---------------------------------------|-------------------------------|---|
| Enable ACPI Auto Configuration | Disabled[Default], Enabled | Enables or Disables BIOS ACPI Auto Configuration. |
| Enable Hibernation | Disabled Enabled[Default], | Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some |

| | | |
|------------------------------|---|---|
| | | OS. |
| ACPI Sleep State | Suspend Disabled, S3 (Suspend to RAM) [Default] | Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed. |
| PWR-On After PWR-Fail | Off [Default] On Last state | AC loss resume. |
| Watch Dog | Disabled [Default] , 30 sec 40 sec 50 sec 1 min 2 min 10 min 30 min | Select WatchDog. |

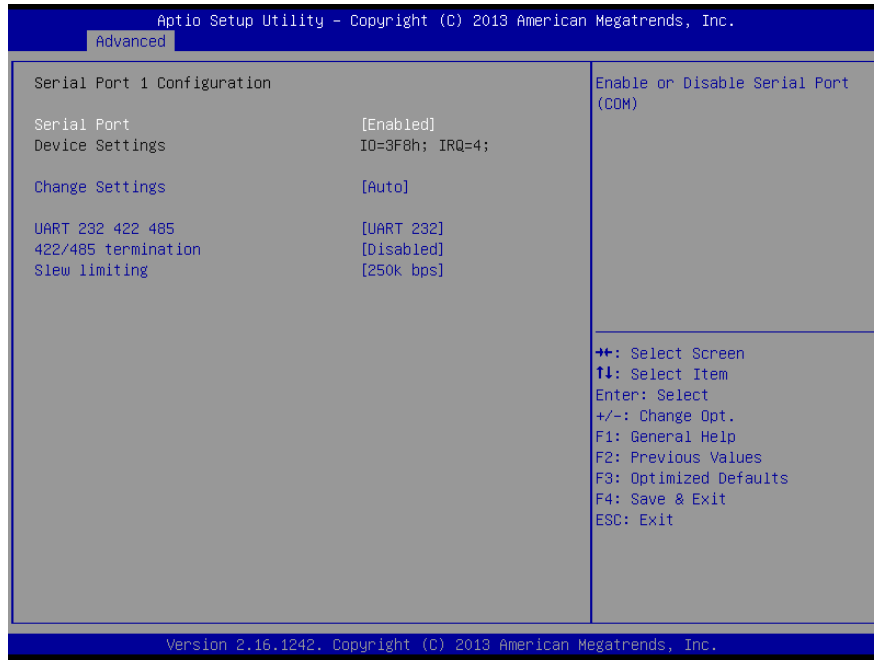
3.6.2.2 IT8528 Super IO Configuration

You can use this item to set up or change the IT8528 Super IO configuration for serial ports. Please refer to 3.6.2.2.1~ 3.6.2.2.2 for more information.



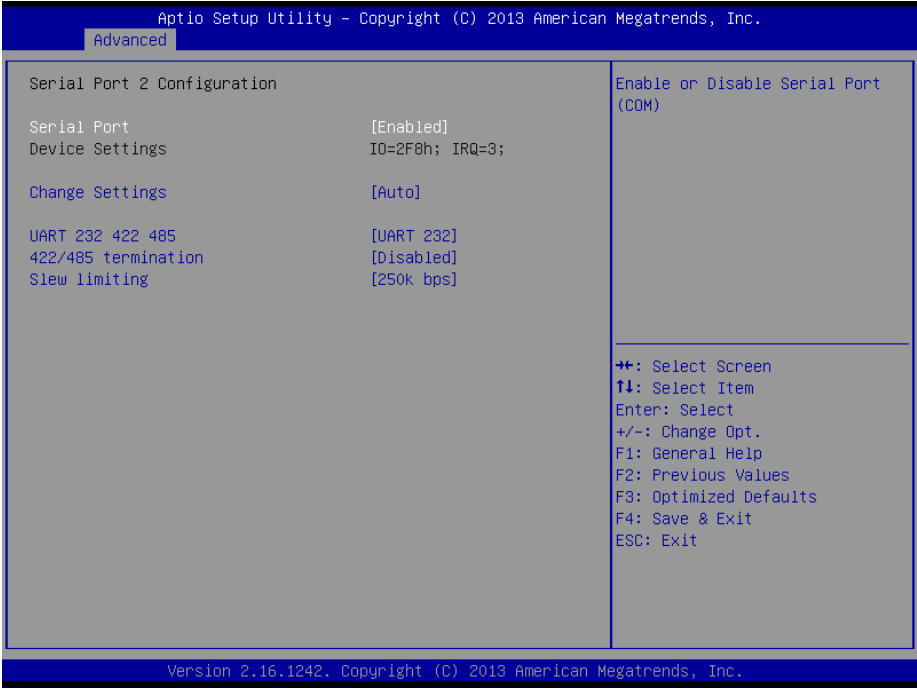
| Item | Description |
|------------------------------------|---|
| Serial Port 1 Configuration | Set Parameters of Serial Port 1 (COMA). |
| Serial Port 2 Configuration | Set Parameters of Serial Port 2 (COMB). |

3.6.2.2.1 Serial Port 1 Configuration



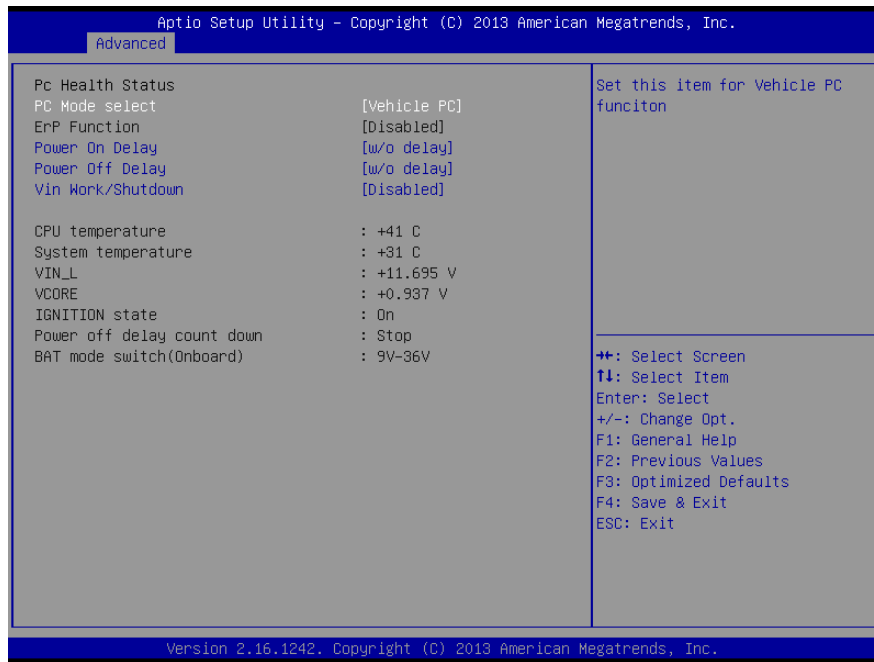
| Item | Option | Description |
|-----------------------------|--|---|
| Serial Port | Enabled [Default] , Disabled | Enable or Disable Serial Port (COM). |
| Change Settings | Auto [Default] IO=3F8h; IRQ=4; IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12; | Select an optimal settings for Super IO Device. |
| UART 232 422 485 | UART 232 (LOOPBACK) UART 232 [Default] UART 485 UART 422 | Change the Serial Port as RS232/ 422/ 485. |
| 422/ 485 termination | Disabled [Default] Enabled | TERM from GPIO. |
| Slew limiting | 10M bps 250k bps [Default] | SLEW from GPIO. |

3.6.2.2.2 Serial Port 2 Configuration



| Item | Option | Description |
|----------------------|--|--|
| Serial Port | Enabled[Default], Disabled | Enable or Disable Serial Port (COM). |
| Change Settings | Auto[Default] IO=2F8h; IRQ=3; IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12; | Select an optimal setting for super IO device. |
| UART 232 422 485 | UART 232 (LOOPBACK) UART 232[Default] UART 485 UART 422 | Change the Serial Port as RS232/ 422/ 485 |
| 422/ 485 termination | Disabled[Default] Enabled | TERM from GPIO. |
| Slew limiting | 10M bps 250k bps[Default] | SLEW from GPIO. |

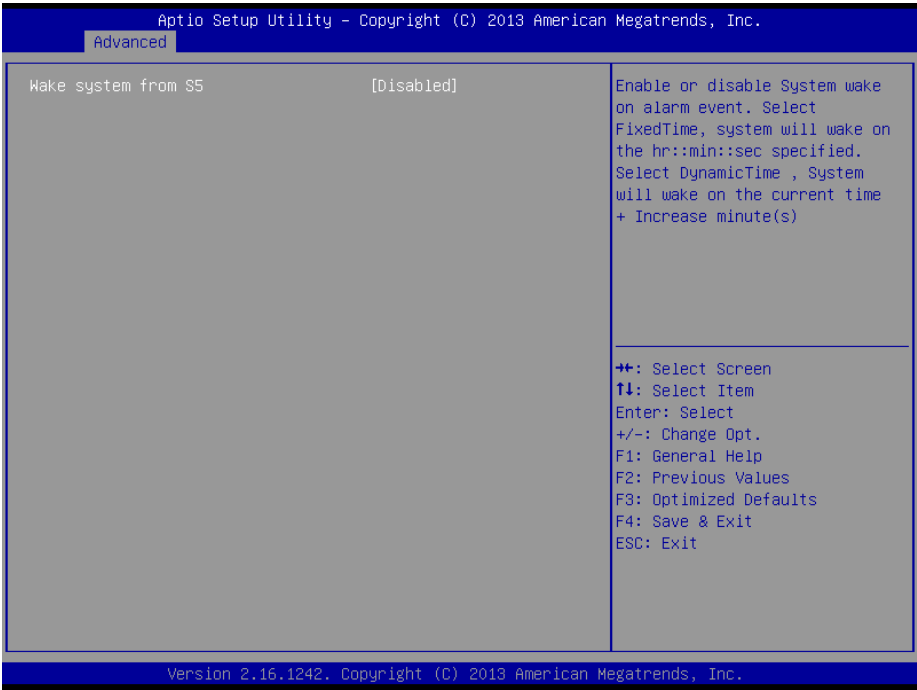
3.6.2.3 EC 8528 H/W Monitor



| Item | Option | Description |
|--------------------|---|---|
| PC Mode select | Industry PC Vehicle PC[Default] | Set this item for Vehicle PC function. Vehicle PC: BIOS will set item “Power on/off delay” & “Vin Work/Shutdown” function as active. Industry PC: Item “Power on/off delay” & “Vin Work/Shutdown” will be gray and has no function. |
| Power On Delay | w/o delay[Default] 10 Sec 30 Sec 1 Min 5 Min 10 Min 15 Min 30 Min 1 Hour | Power On Delay. |
| Power Off Delay | w/o delay[Default] 20 Sec 1 Min 5 Min 10 Min 30 Min 1 Hour 6 Hour 18 Hour | Power Off Delay. |
| Vin Work/ Shutdown | Disabled[Default] (11.5V, 10.5V)/(23V,21V) (12.0V, 11.0V)/(24V,22V) | Vin Work/ Shutdown. |

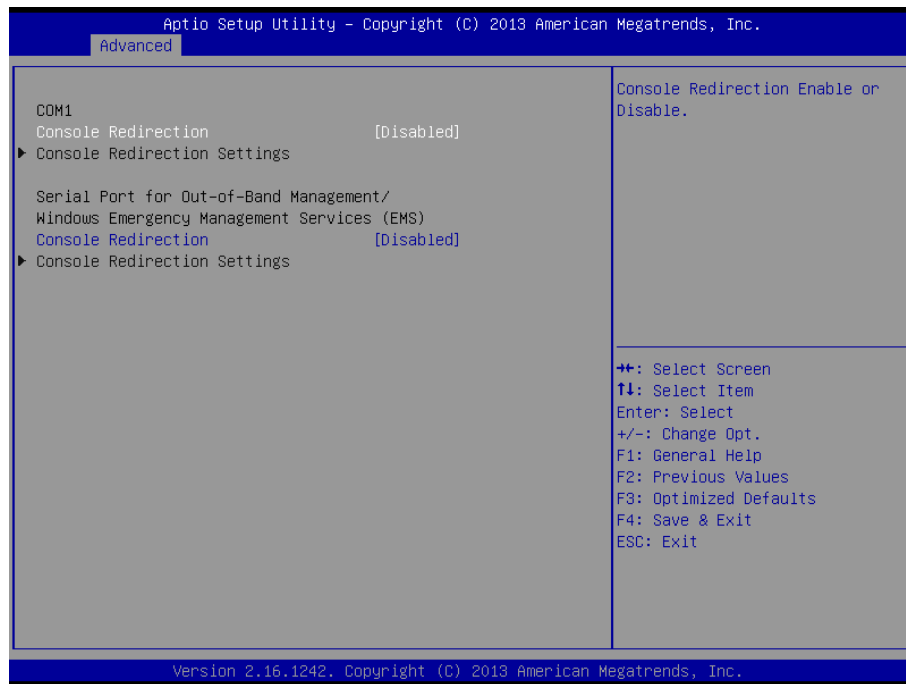
| | | |
|--|--|--|
| | (12.5V, 11.0V)/(25V,22V) (12.5V, 11.5V)/(25V,23V) | |
|--|--|--|

3.6.2.4 S5 RTC Wake Settings



| Item | Options | Description |
|---------------------|--|--|
| Wake system from S5 | Disabled[Default], Fixed Time Dynamic Time | Enable or disable System wake on alarm event. Select Fixed Time, system will wake on the hr::min::sec specified. Select Dynamic Time, System will wake on the current time + Increase minute(s). |

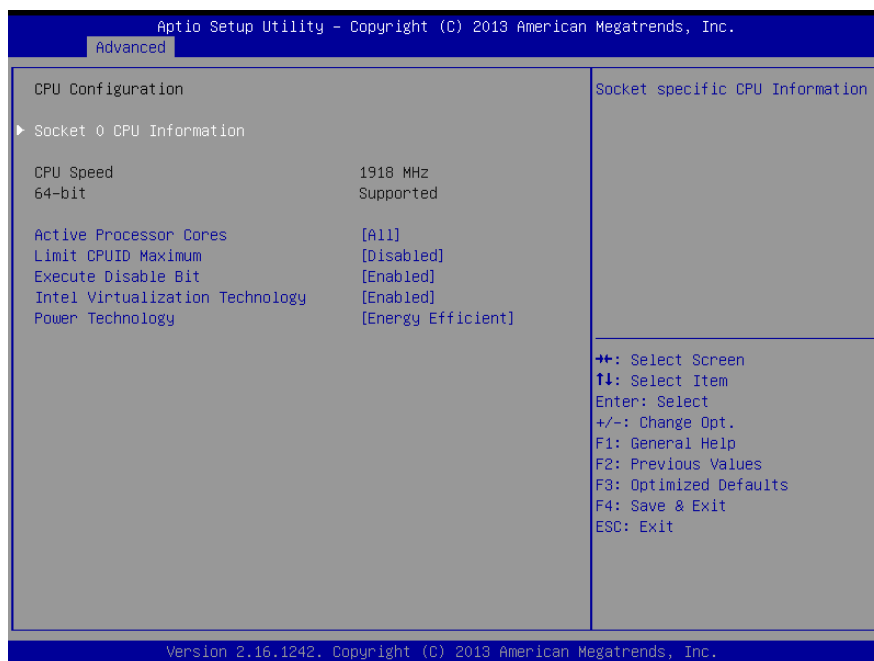
3.6.2.5 Serial Port Console Redirection



| Item | Options | Description |
|---------------------|-------------------------------|--|
| Console Redirection | Disabled[Default], Enabled | Console Redirection Enable or Disable. |

3.6.2.6 CPU Configuration

Use the CPU configuration menu to view detailed CPU specification and configure the CPU.

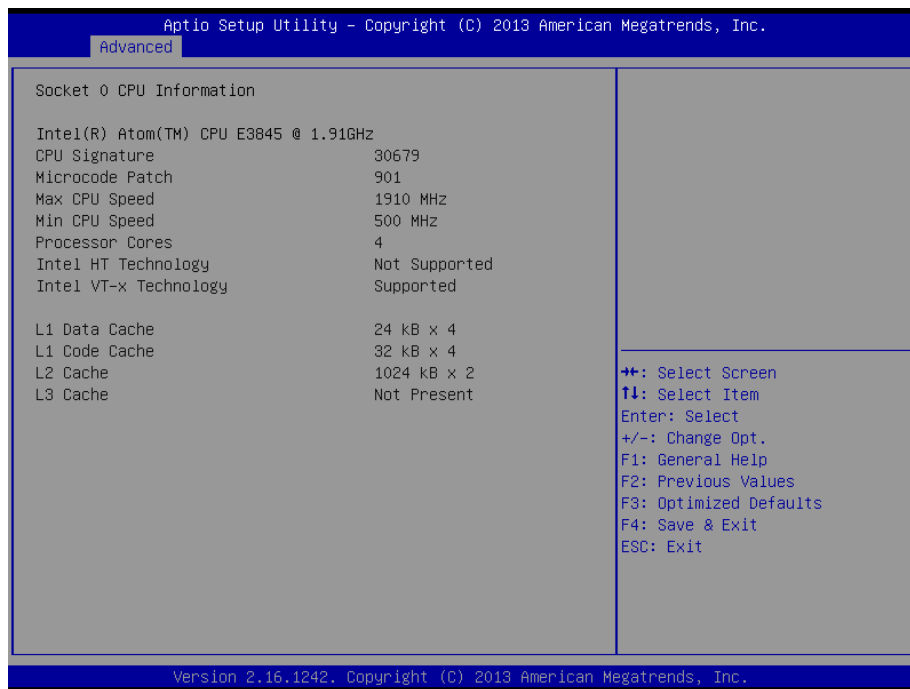


| Item | Options | Description |
|------------------------|---------------|---|
| Active Processor Cores | All[Default], | Number of cores to enable in each processor |

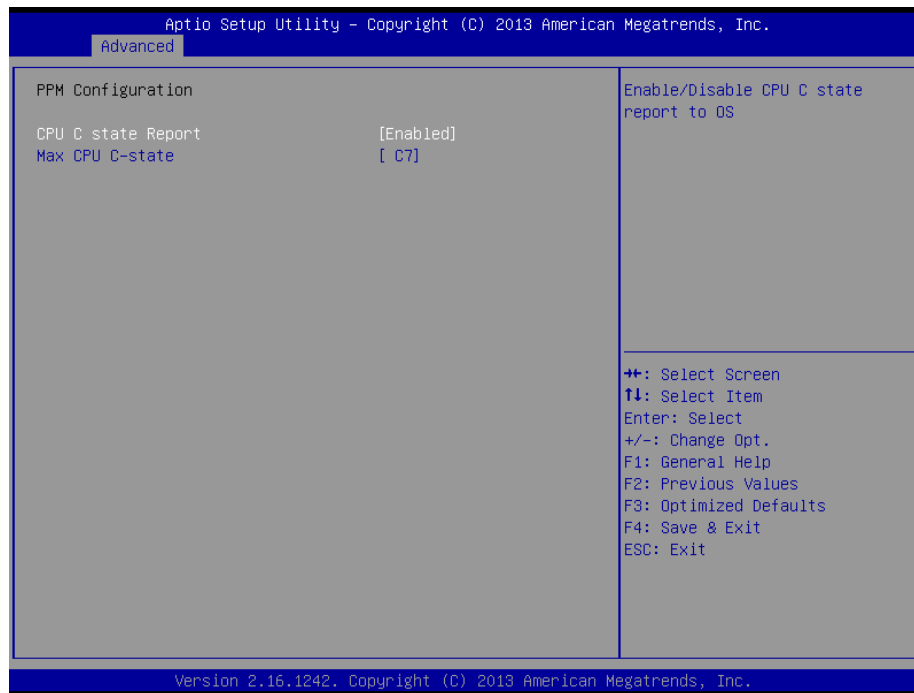
VMS-BYT

| | | |
|--|---|---|
| | 1 | package. |
| Limit CPUID Maximum | Disabled[Default], Enabled | Disabled for Windows XP. |
| Execute Disable Bit | Disabled, Enabled[Default] | XD can prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS (Windows Server 2003 SP1, Windows XP SP2, SuSE Linux 9.2, RedHat Enterprise 3 Update 3.) |
| Intel Virtualization Technology | Disabled, Enabled[Default] | When enabled, a VMM can utilize the additional hardware capabilities provided by Virtualization Technology. |
| Power Technology | Disabled, Energy Efficient[Default] Custom | Enable the power management features. |

3.6.2.6.1 Socket 0 CPU Information

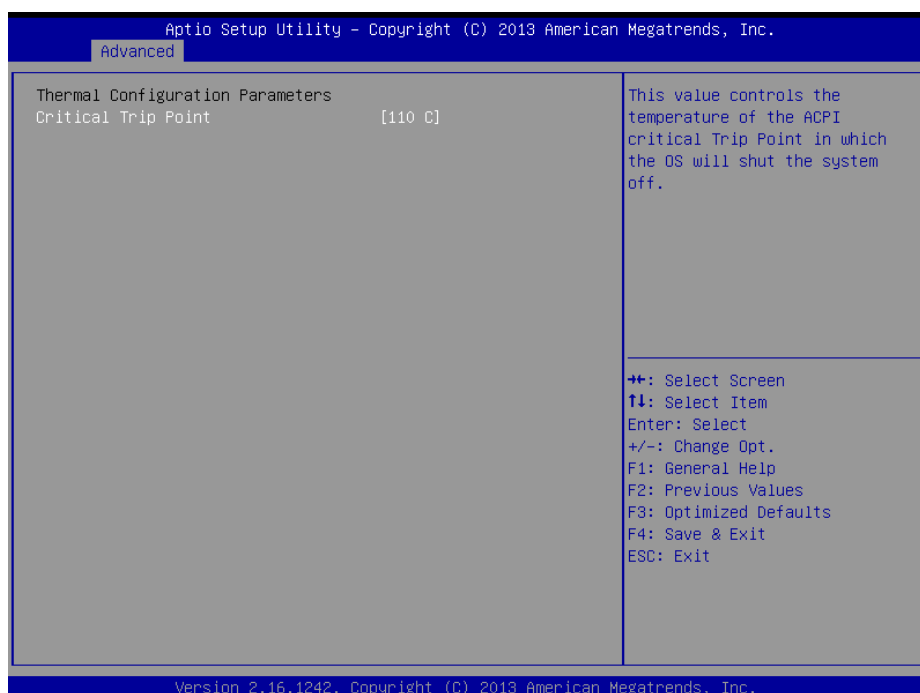


3.6.2.7 PPM Configuration



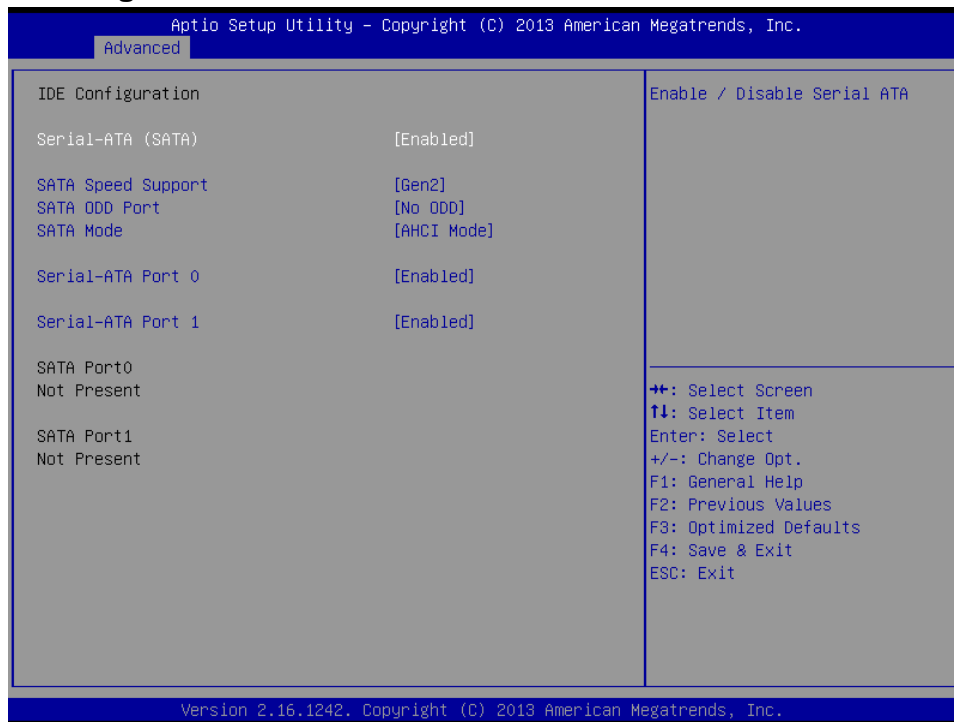
| Item | Options | Description |
|---------------------------|-------------------------------|---|
| CPU C state Report | Disabled, Enabled[Default] | Enable/Disable CPU C state report to OS. |
| Max CPU C-state | C7[Default] C6 C1 | This option controls Max C state that the processor will support. |

3.6.2.8 Thermal Configuration



| Item | Options | Description |
|----------------------------|--|---|
| Critical Trip Point | 120 C 110 C[Default] 100 C 90 C 80 C 70 C 60 C 50 C | This value controls the temperature of the ACPI critical Trip Point in which the OS will shut the system off. |

3.6.2.9 IDE Configuration



| Item | Options | Description |
|----------------------------|---|------------------------------------|
| Serial-ATA (SATA) | Enabled[Default] Disabled, | Enable/Disable Serial ATA. |
| SATA Speed Support | Gen1 Gen2[Default] | SATA Speed Support Gen1 or Gen2. |
| SATA ODD Port | Port0 ODD Port1 ODD No ODD[Default] | SATA ODD is Port0 or Port1. |
| SATA Mode | IDE Mode AHCI Mode[Default] | Select IDE/ AHCI. |
| Serial-ATA Port 0/1 | Enabled[Default] Disabled, | Enable/Disable Serial ATA Port0/1. |

3.6.2.10 Network Stack Configuration



| Item | Options | Description |
|----------------------|--|------------------------------------|
| Network Stack | Enabled Disabled [Default] , | Enable/Disable UEFI Network Stack. |

3.6.2.11 CSM Configuration

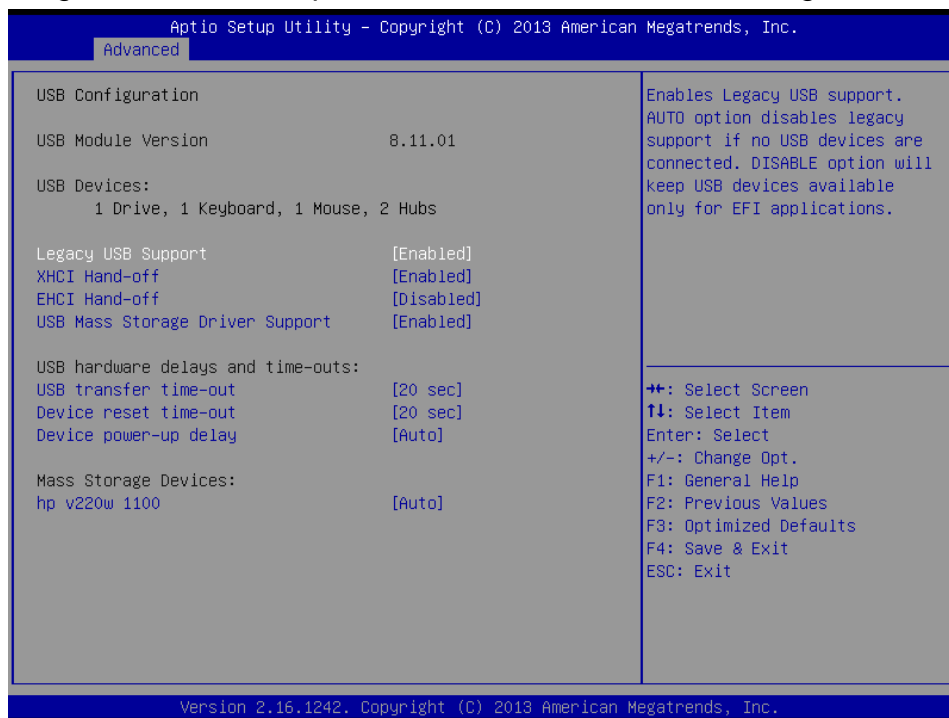


| Item | Options | Description |
|--------------------|---------------------------------------|-----------------------------|
| CSM Support | Enabled [Default] Disabled, | Enable/Disable CSM Support. |

| | | |
|----------------------------|---|--|
| GateA20 Active | Upon Request[Default] Always | UPON REQUEST – GA20 can be disabled using BIOS services. ALWAYS – go not allow disabling GA20; this option is useful when any RT code is executed above 1MB. |
| Option ROM Messages | Force BIOS[Default] Keep Current | Set display mode for Option ROM. |
| INT19 Trap Response | Immediate[Default] Postponed | BIOS reaction on INT19 trapping by Option ROM: IMMEDIATE – execute the trap right away; POSTPONED – execute the traps during legacy boot. |
| Boot option filter | UEFI and Legacy Legacy only[Default] UEFI only | This option controls Legacy/UEFI ROMs priority. |
| Network | Do not launch[Default] UEFI only Legacy only | Controls the execution of UEFI and Legacy PXE OpROM. |
| Storage | Do not launch UEFI only Legacy only[Default] | Controls the execution of UEFI and Legacy Storage OpROM. |
| Video | Do not launch UEFI only Legacy only[Default] | Controls the execution of UEFI and Legacy Video OpROM. |
| Other PCI devices | UEFI only Legacy only[Default], | Determines OpROM execution policy for devices other than Network, Storage, or Video. |

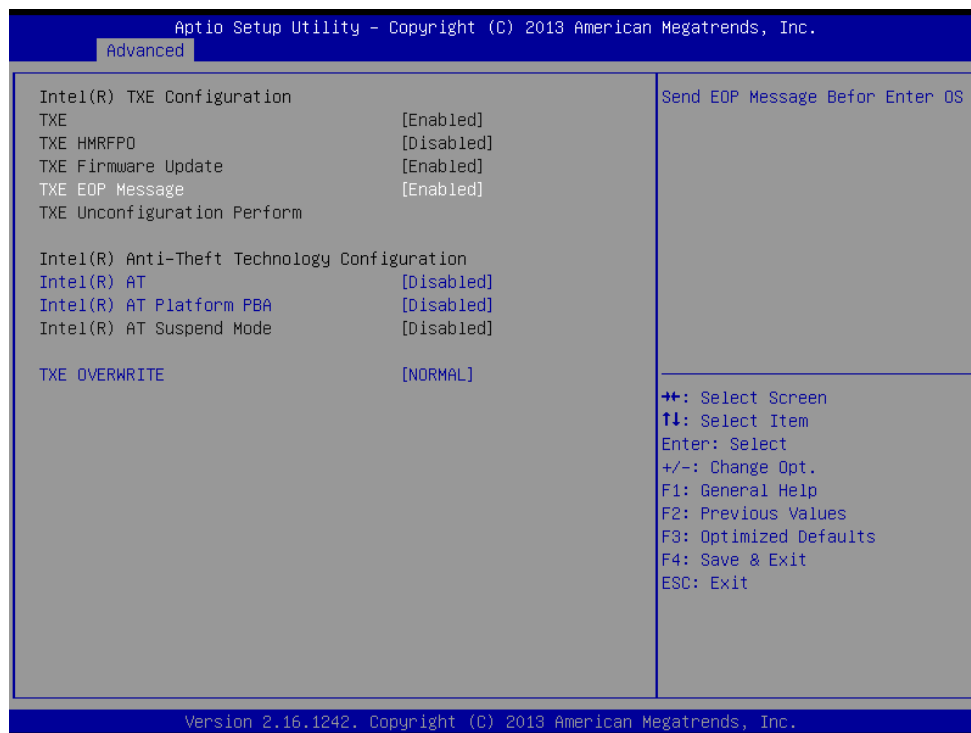
3.6.2.12 USB Configuration

The USB Configuration menu helps read USB information and configures USB settings.



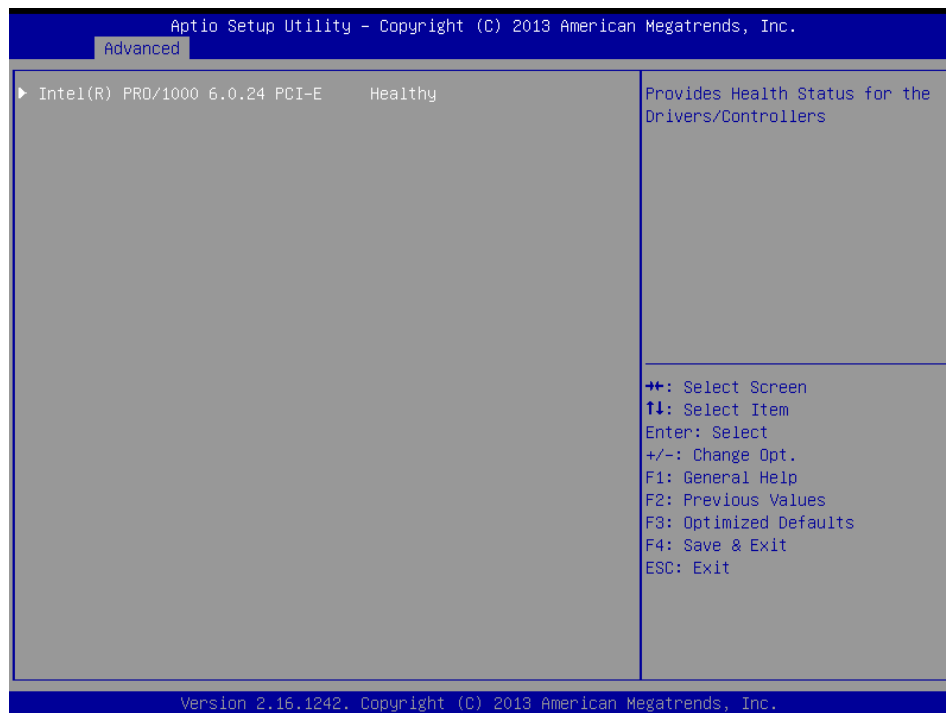
| Item | Options | Description |
|--|---|--|
| Legacy USB Support | Enabled[Default] Disabled Auto | Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE option will keep USB devices available only for EFI applications. |
| XHCI Hand-off | Enabled[Default] Disabled | This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver. |
| EHCI Hand-off | Enabled Disabled[Default] | This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver. |
| USB Mass Storage Driver Support | Enabled[Default] Disabled | Enable/Disable USB Mass Storage Driver Support. |
| USB transfer time-out | 1 sec 5 sec 10 sec 20 sec[Default] | The time-out value for Control, Bulk, and Interrupt transfers. |
| Device reset time-out | 10 sec 20 sec[Default] 30 sec 40 sec | USB mass storage device Start Unit command time-out. |
| Device power-up delay | Auto[Default] Manual | Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken from Hub descriptor. |

3.6.2.13 Security Configuration



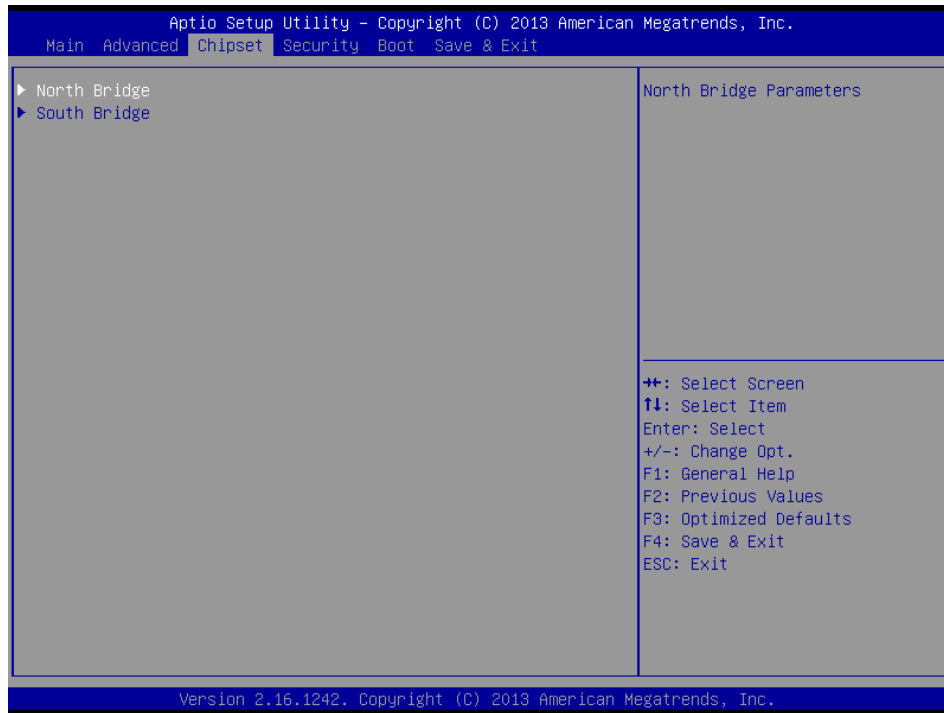
| Item | Options | Description |
|-------------------------------|--|---|
| TXE EOP Message | Disabled Enabled[Default], | Send EOP Message Before Enter OS. |
| Intel® AT | Disabled[Default] Enabled, | Enable/Disable BIOS AT Code from Running. |
| Inter® AT Platform PBA | Disabled[Default], Enabled | Enable/Disable BIOS AT Code from Running. |
| TXE OVERWRITE | OVER WRITE NORMAL[Default] | TXE OVERWRITE. NORMAL: Over Write Pin as high. (TXE enabled) OVERWRITE: Over Write Pin as low. (TXE disabled) |

3.6.2.14 Intel(R) PRO/1000 6.0.24 PCI-E

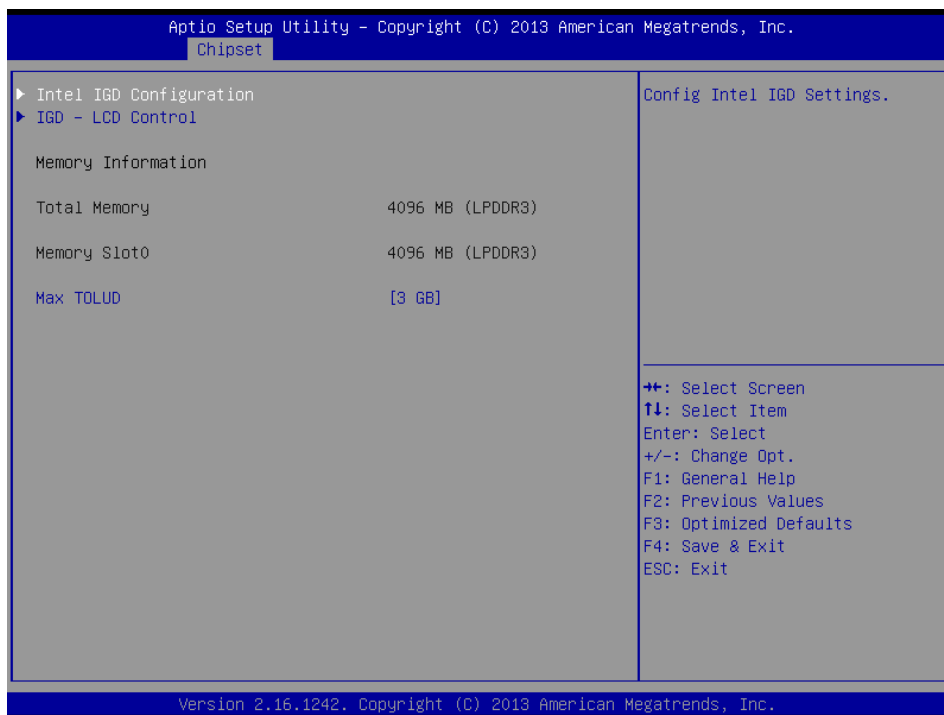


| Item | Description |
|-------------------------------------|---|
| Intel® PRO/1000 6.0.24 PCI-E | Provides Health Status for the Drivers/Controllers. |

3.6.3 Chipset

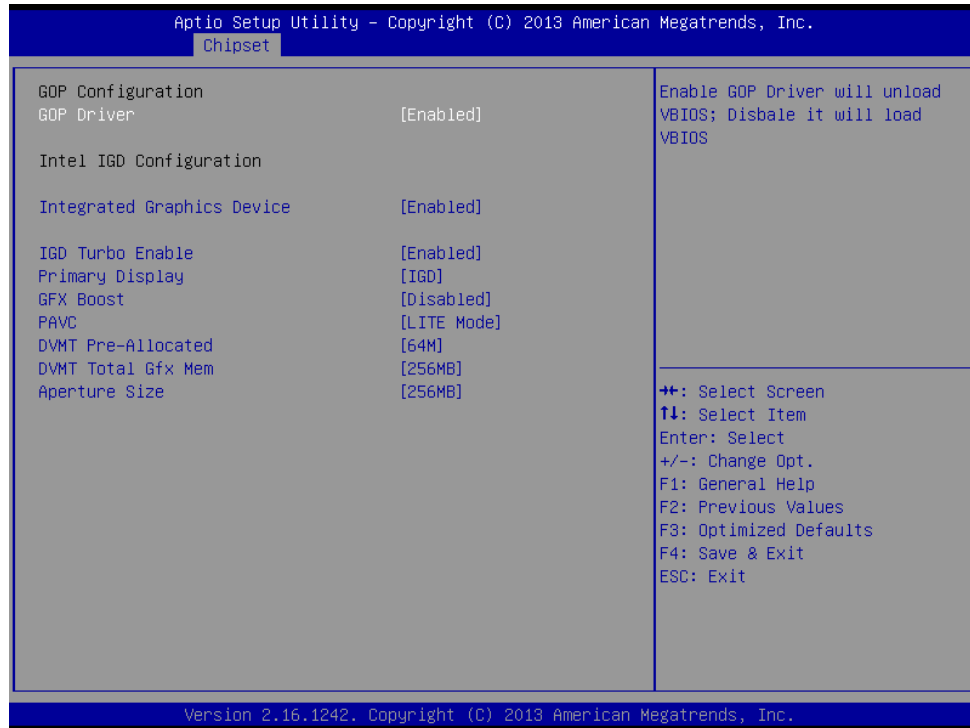


3.6.3.1 North Bridge



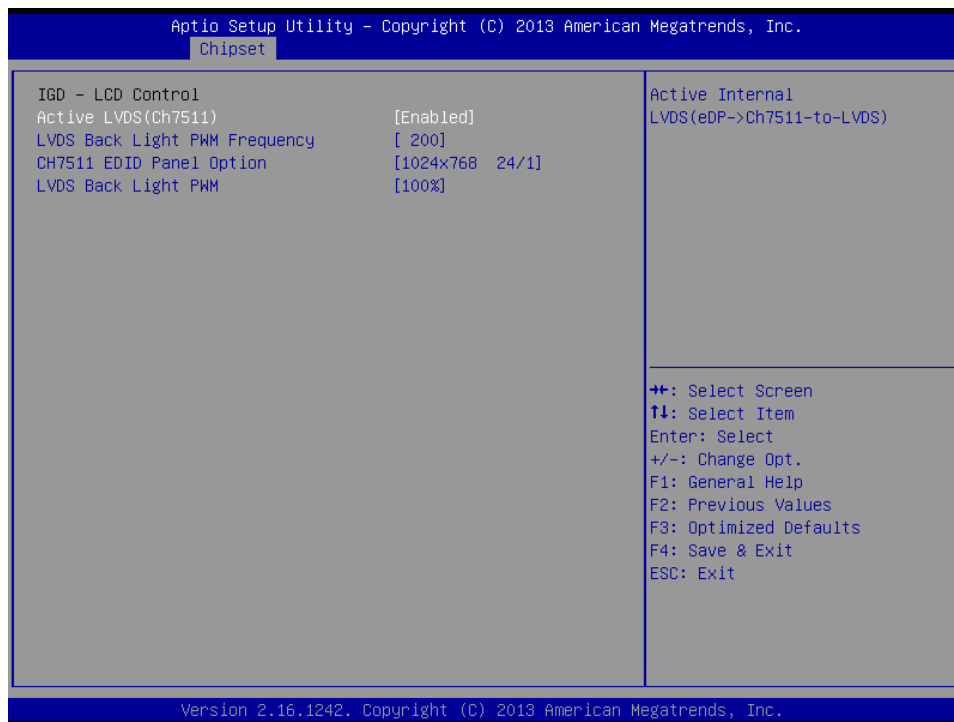
| Item | Options | Description |
|-----------|--|-------------------------|
| Max TOLUD | Dynamic 2 GB 2.25 GB 2.5 GB 2.75 GB 3 GB[Default] | Maximum Value of TOLUD. |

3.6.3.1.1 Intel IGD Configuration



| Item | Option | Description |
|-----------------------------------|---|--|
| GOP Driver | Enabled[Default], Disabled | Enable GOP Driver will unload VBIOS; Disable it will load VBIOS. |
| Integrated Graphics Device | Enabled[Default], Disabled | Enable: Enable Integrated Graphics Device (IGD) when selected as the Primary Video Adaptor. Disable: Always disable IGD. |
| IGD Turbo Enable | Enabled[Default], Disabled | Enable: Enable IGD Turbo Enable. Disable: IGD Turbo Disable. |
| Primary Display | Auto IGD[Default] PCIe | Select which of IGD/PCI Graphics device should be Primary Display. |
| GFX Boost | Enabled, Disabled[Default] | Enable/Disable GFX Boost. |
| PAVC | Disabled LITE Mode[Default] SERPENT Mode | Enable/Disable Protected Audio Video Control. |
| DVMT Pre-Allocated | 64M[Default]/96M/128M/160M/192M/ 224M/256M/288M/320M/352M/ 384M/416M/448M/480M/512M | Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device. |
| DVMT Total Gfx Mem | 128MB 256MB[Default] Max | Select DVMT 5.0 Total Graphics Memory size used by the Internal Graphics Device. |
| Aperture Size | 128MB 256MB[Default] | Select the Aperture Size. |

3.6.3.1.2 IGD - LCD Control

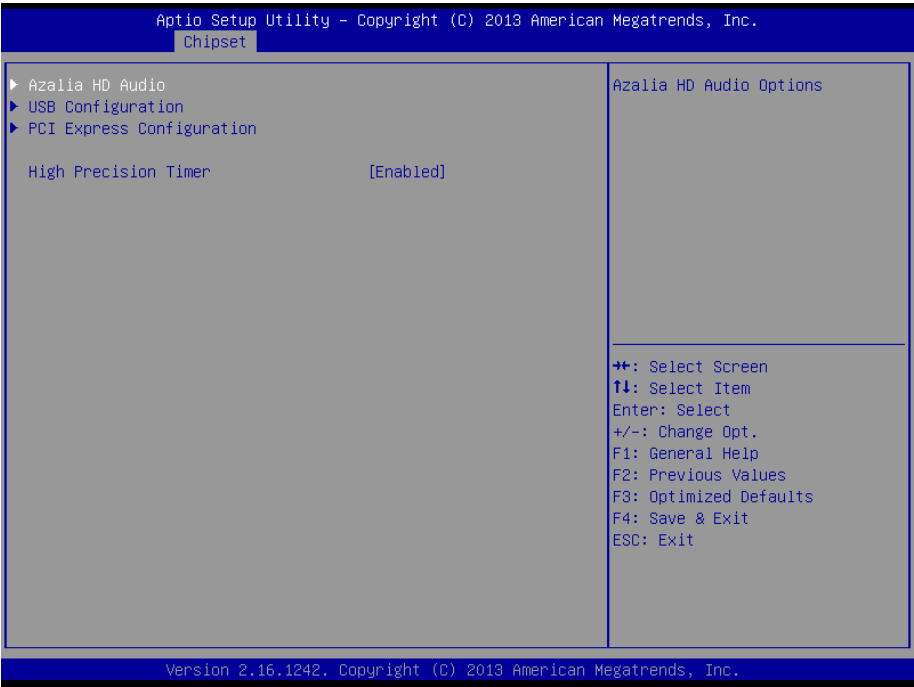


| Item | Option | Description |
|-------------------------------|--|---|
| Active LVDS (Ch7511) | Enabled[Default] Disabled | Active Internal LVDS (eDP->Ch7511-to -LVDS). |
| LVDS Back Light PWM Frequency | 200[Default] 300 400 500 700 1k 2k 3k 5k 10k 20k | Select LVDS back light PWM Frequency. |
| CH7511 EDID Panel Option | 1024x768 24/1[Default] 800x600 18/1 1024x768 18/1 1366x768 18/1 1024x600 18/1 1280x800 18/1 1920x1200 24/2 640x480 18/1 800x480 18/1 1920x1080 18/2 1280x1024 24/2 1440x900 18/2 1600x1200 24/2 1366x768 24/1 | Port1-EDP to LVDS (Chrotel 7511) Panel EDID Option. |

VMS-BYT

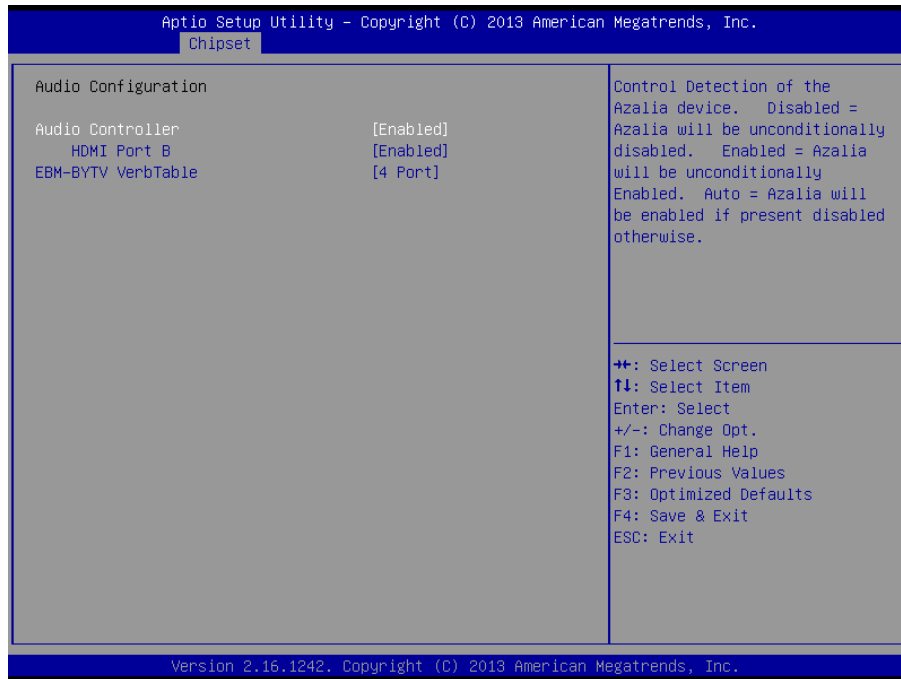
| | | |
|---------------------|---|----------------------------------|
| | 1920x1080 24/2 1680x1050 24/2 | |
| LVDS Back Light PWM | 00% 25% 50% 75% 100% [Default] | Select LVDS back light PWM duty. |

3.6.3.2 South Bridge



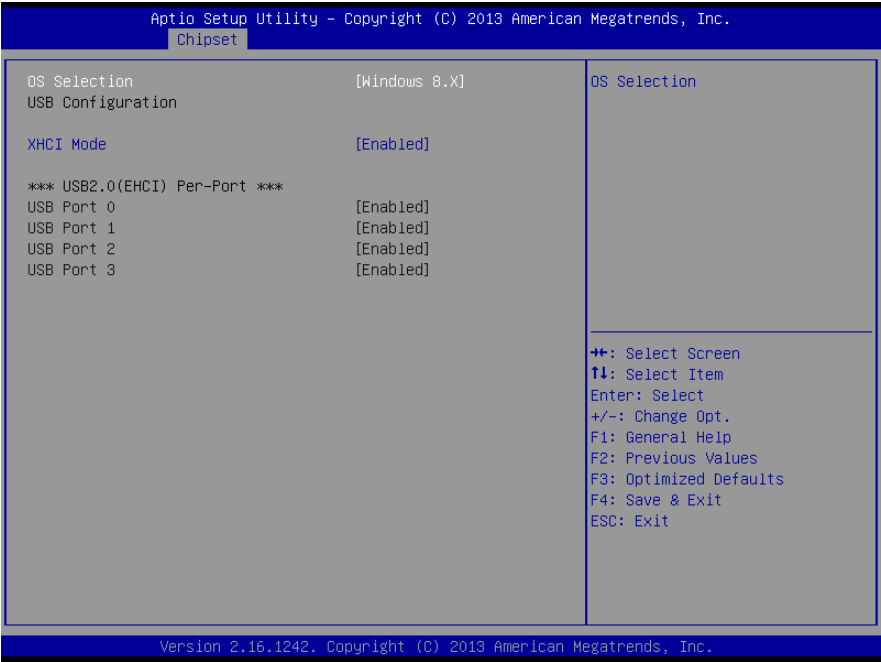
| Item | Option | Description |
|----------------------|--------------------------------------|---|
| High Precision Timer | Disabled Enabled [Default] | Enable or Disable the High Precision Event Timer. |

3.6.3.2.1 Azalia HD Audio



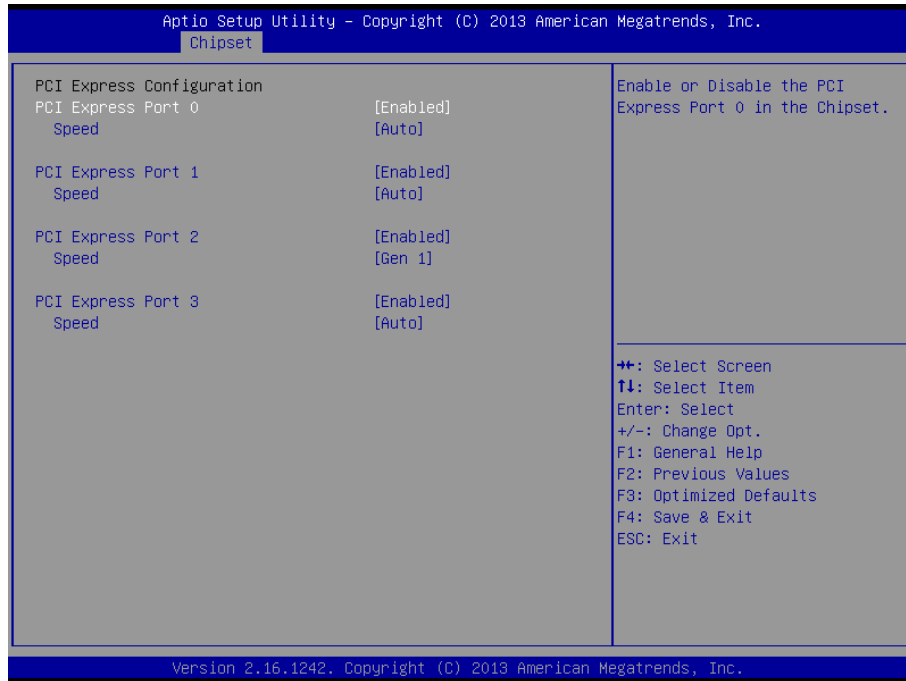
| Item | Option | Description |
|---------------------------|--|--|
| Audio Controller | Enabled[Default], Disabled | Control Detection of the Azalia device. Disabled = Azalia will be unconditionally disabled. Enabled = Azalia will be unconditionally Enabled. Auto = Azalia will be enabled if present disabled otherwise. |
| HDMI Port B | Enabled[Default], Disabled | Enable/Disable HDMI Port B. |
| EBM-BYTV VerbTable | 4 Port[Default], 5 Port | EBM-BYTV VerbTable. |

3.6.3.2.2 USB Configuration



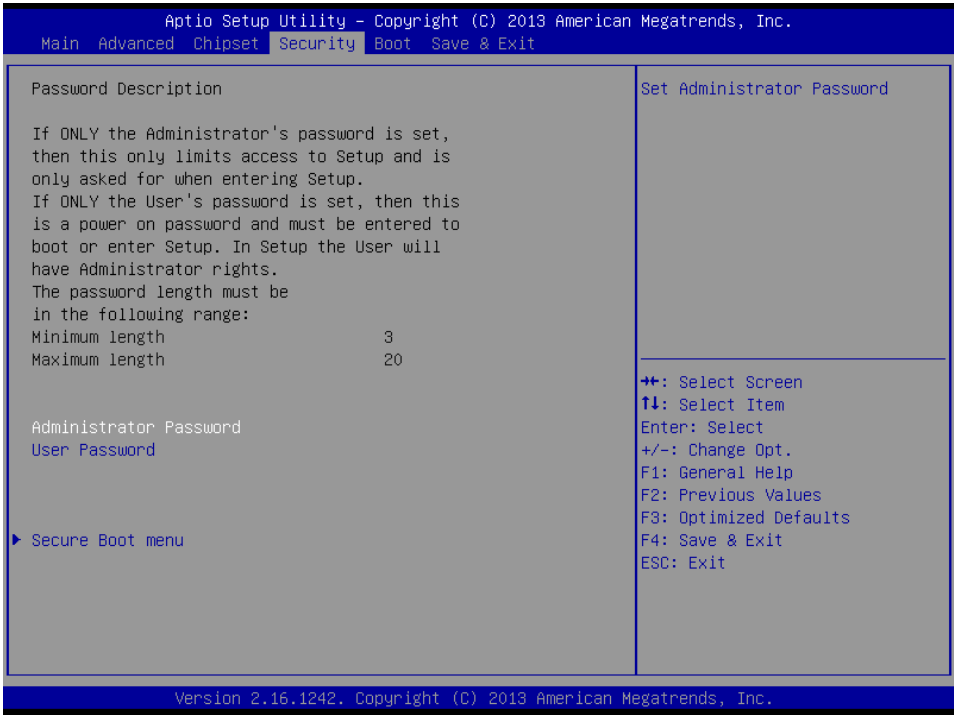
| Item | Option | Description |
|--------------|---|--|
| OS Selection | Windows 8.X[Default] Android Windows 7 | Please select the corresponding type of Windows for OS installation. Please change the item of OS selection to Windows 7 if you intend to install Windows 7 OS; Please change the item of OS selection to Windows 8.X if you intend to install Windows 8 OS. |
| XHCI Mode | Enabled[Default], Disabled Auto Smart Auto | Mode of operation of xHCI controller. |

3.6.3.2.3 PCI Express Configuration



| Item | Option | Description |
|--------------------|---------------------------------|--|
| PCI Express Port 0 | Enabled[Default], Disabled | Enable or Disable the PCI Express Port 0 in the Chipset. |
| Speed | Auto[Default] Gen 2 Gen 1 | Configure PCIe Port Speed. |
| PCI Express Port 1 | Enabled[Default], Disabled | Enable or Disable the PCI Express Port 1 in the Chipset. |
| Speed | Auto[Default] Gen 2 Gen 1 | Configure PCIe Port Speed. |
| PCI Express Port 2 | Enabled[Default], Disabled | Enable or Disable the PCI Express Port 2 in the Chipset. |
| Speed | Auto Gen 2 Gen 1[Default] | Configure PCIe Port Speed. |
| PCI Express Port 3 | Enabled[Default], Disabled | Enable or Disable the PCI Express Port 3 in the Chipset. |
| Speed | Auto[Default] Gen 2 Gen 1 | Configure PCIe Port Speed. |

3.6.4 Security



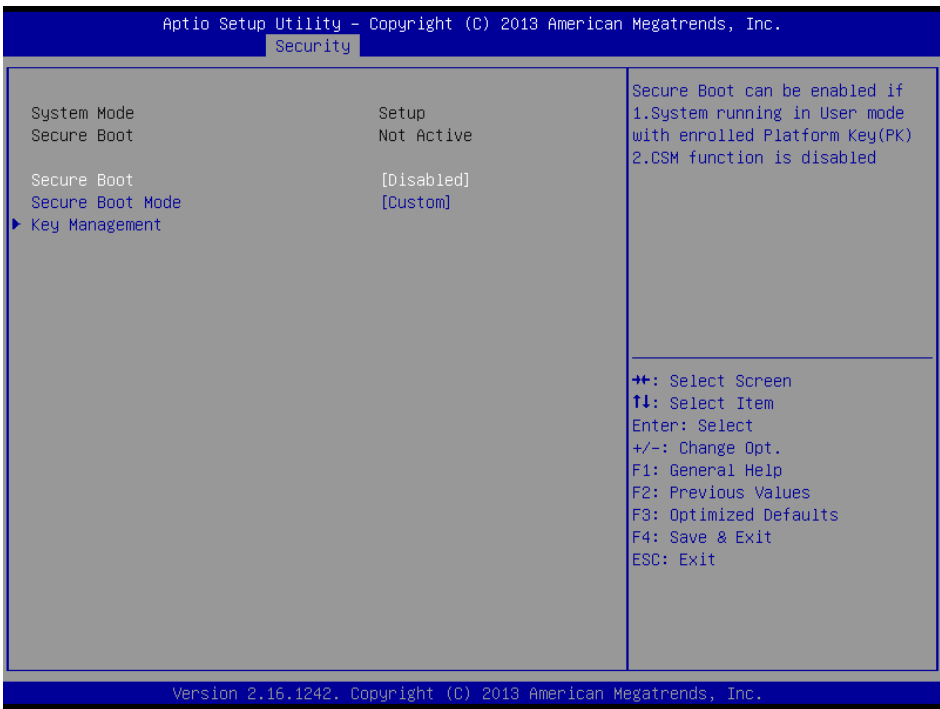
● Administrator Password

Set setup Administrator Password

● User Password

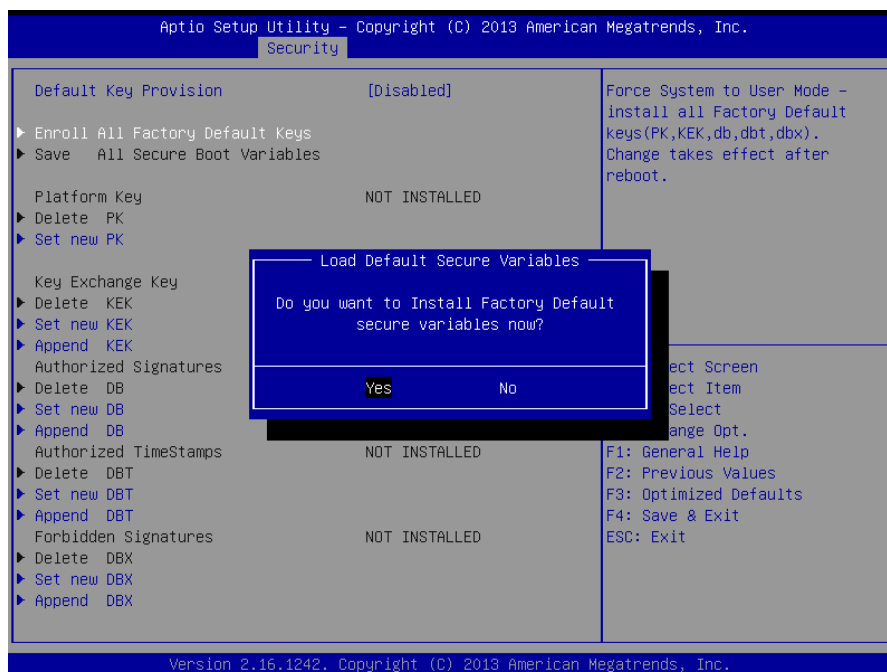
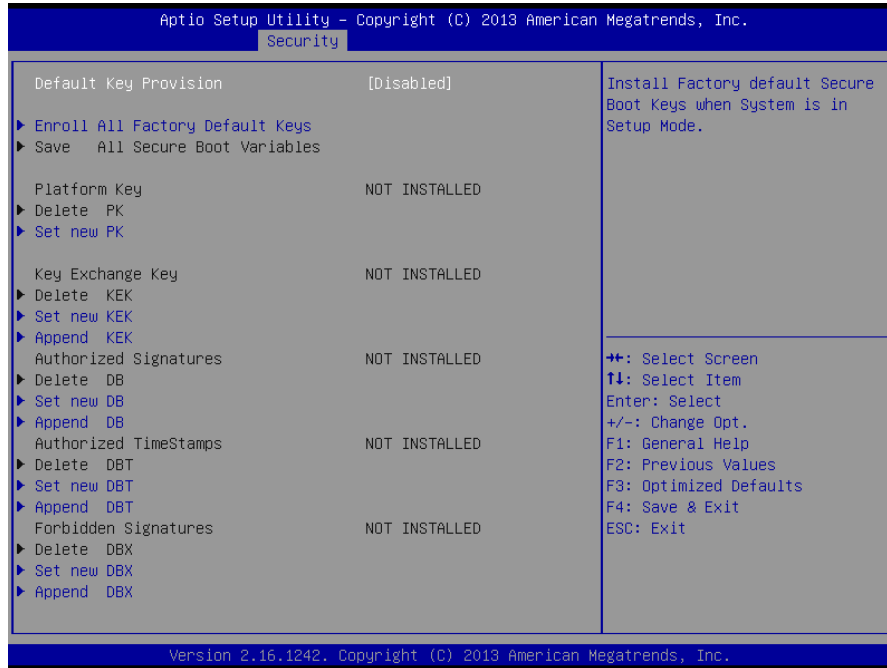
Set User Password

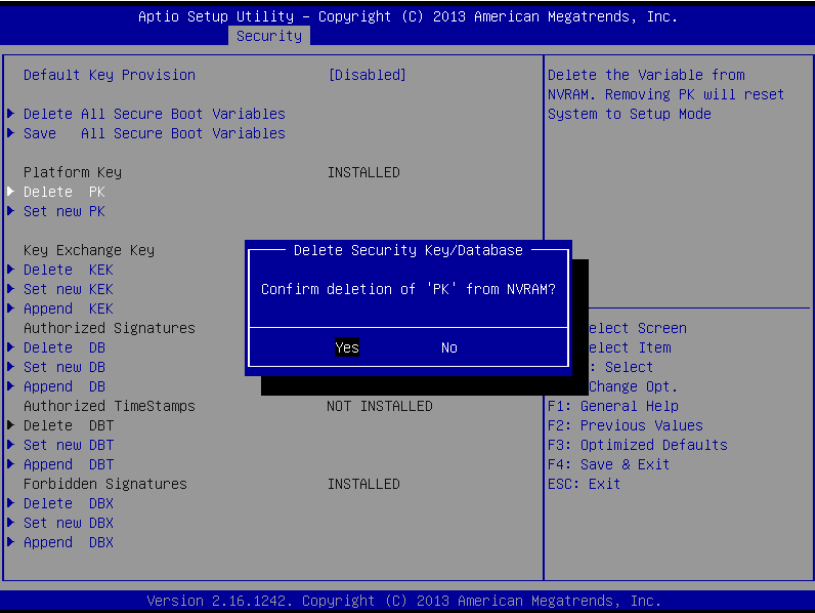
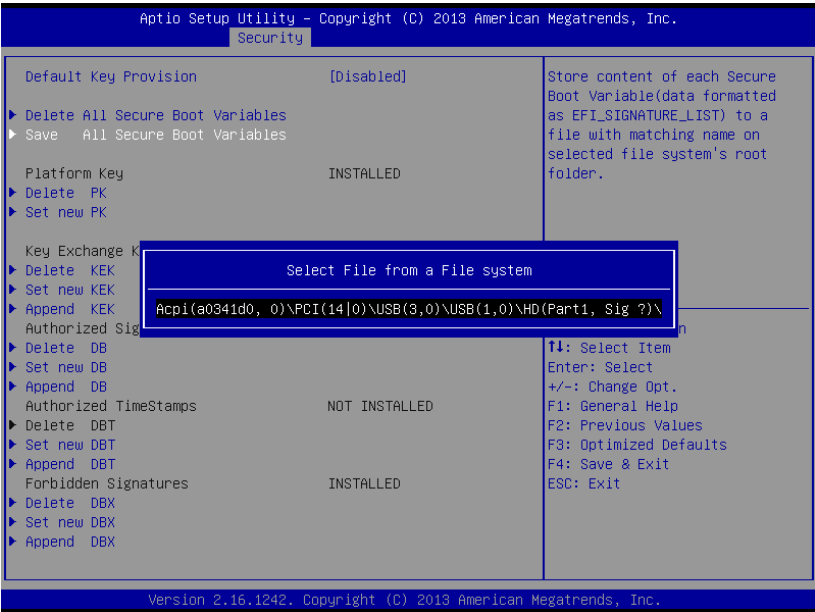
3.6.4.1 Secure Boot menu

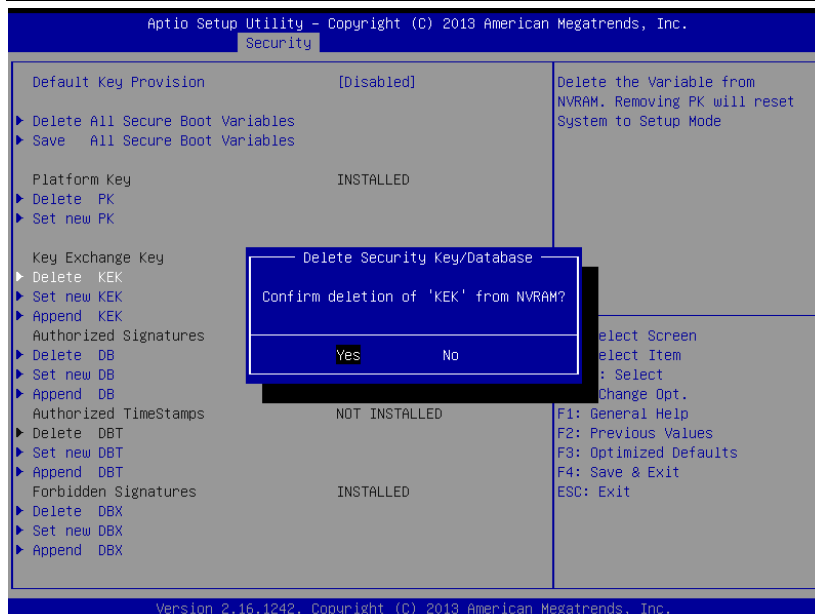
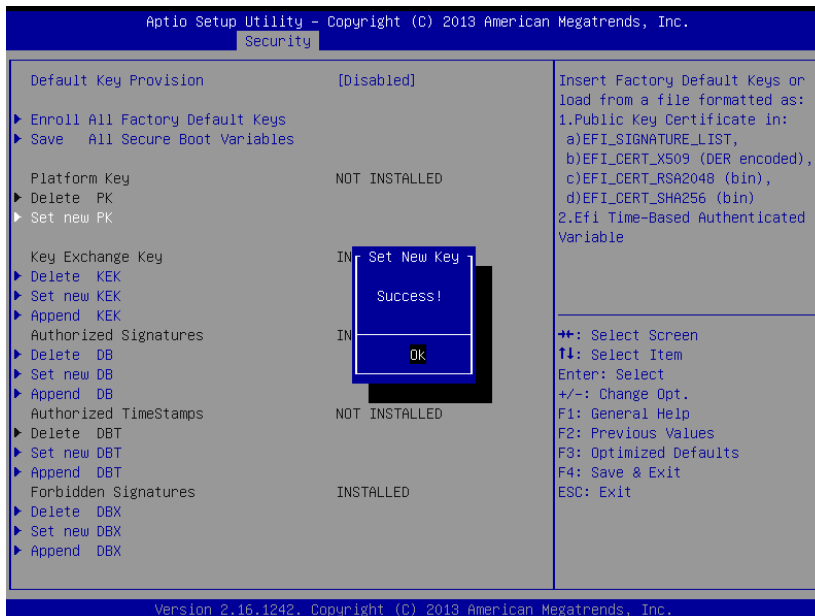
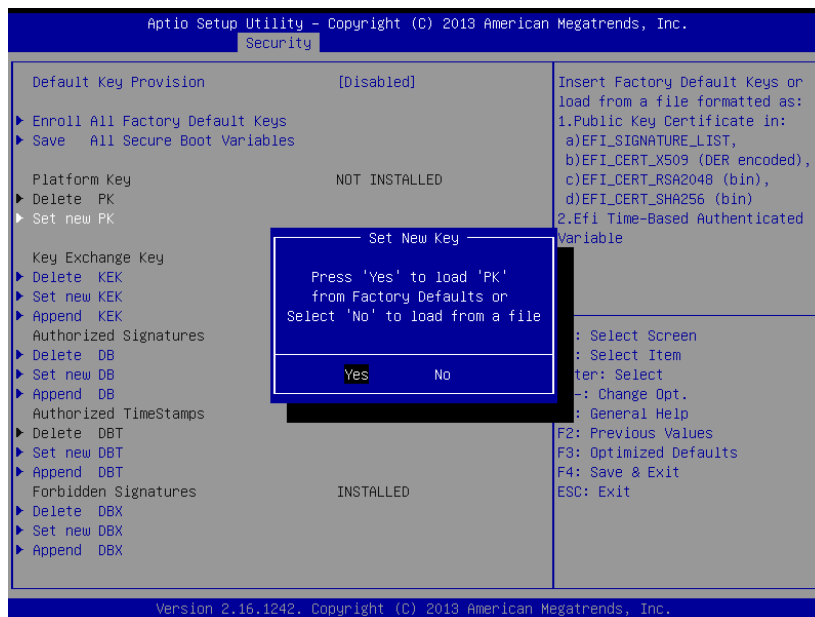


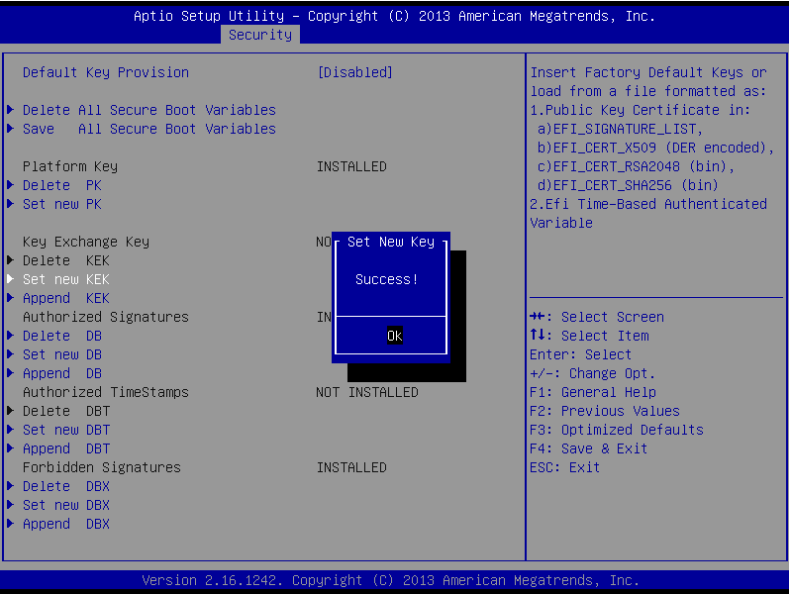
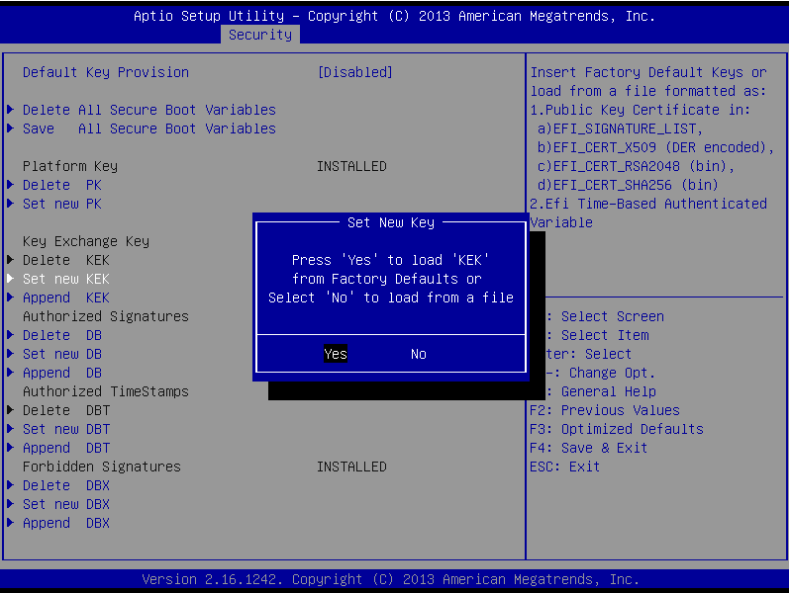
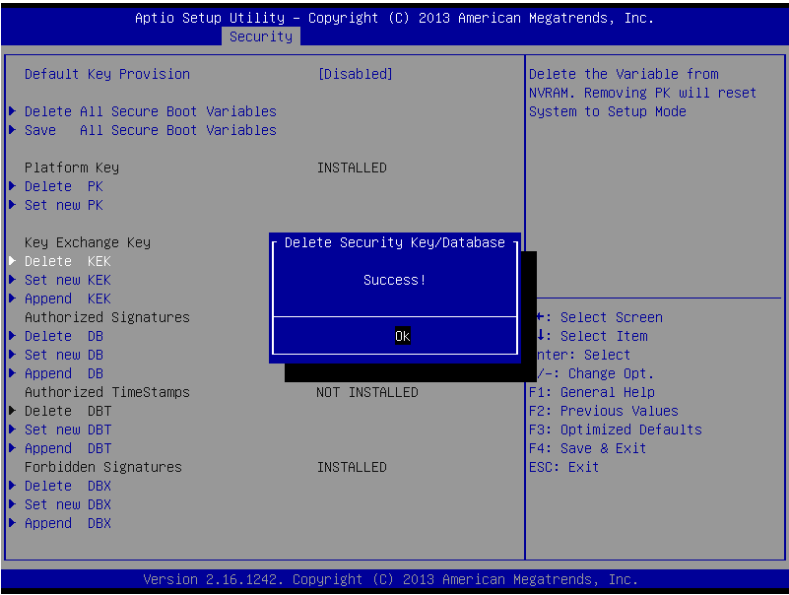
| Item | Option | Description |
|------------------|------------------------------|--|
| Secure Boot | Disabled[Default] Enabled | Secure Boot can be enabled if 1.System running in User mode with enrolled Platform Key(PK) 2.CSM function is disabled. |
| Secure Boot Mode | Standard Custom[Default] | Secure Boot mode selector. 'Custom' Mode enables users to change Image Execution policy and manage Secure Boot Keys. |

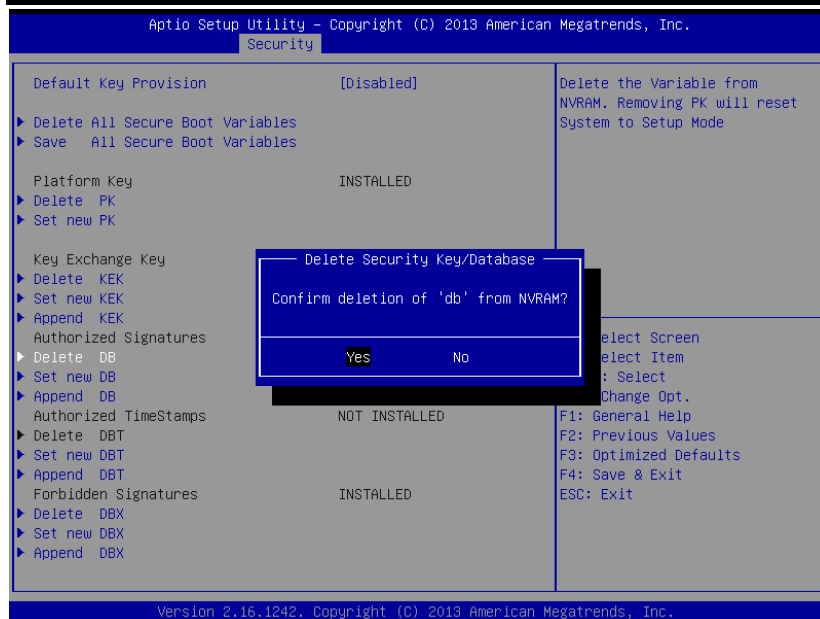
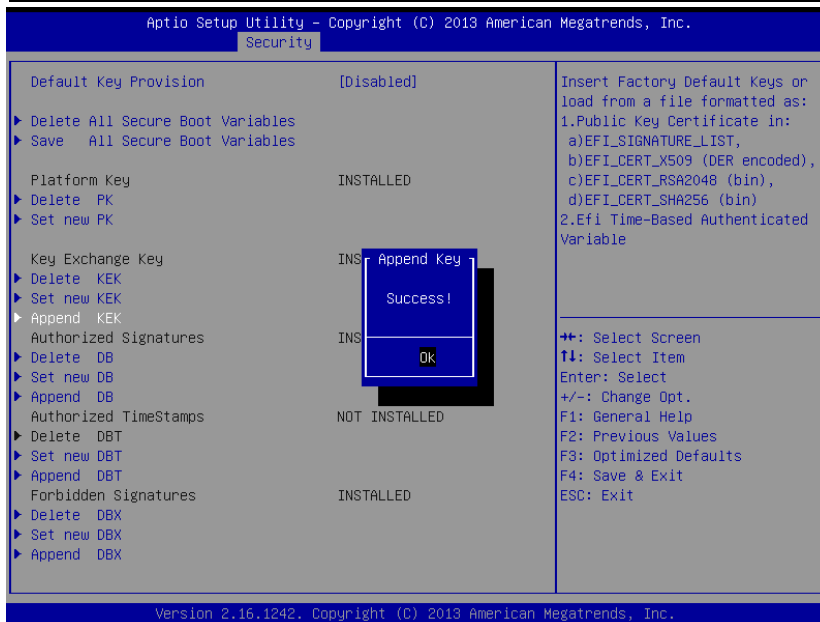
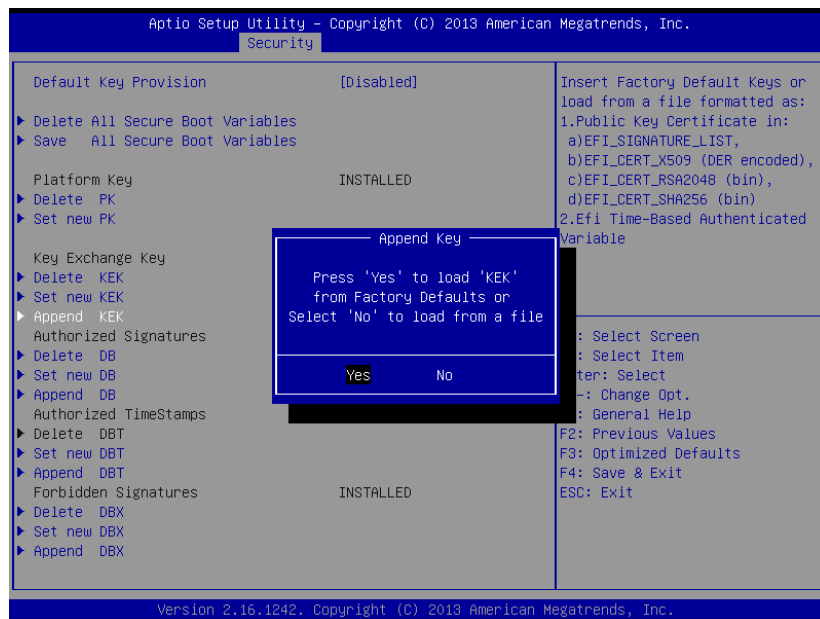
3.6.4.1.1 Key Management

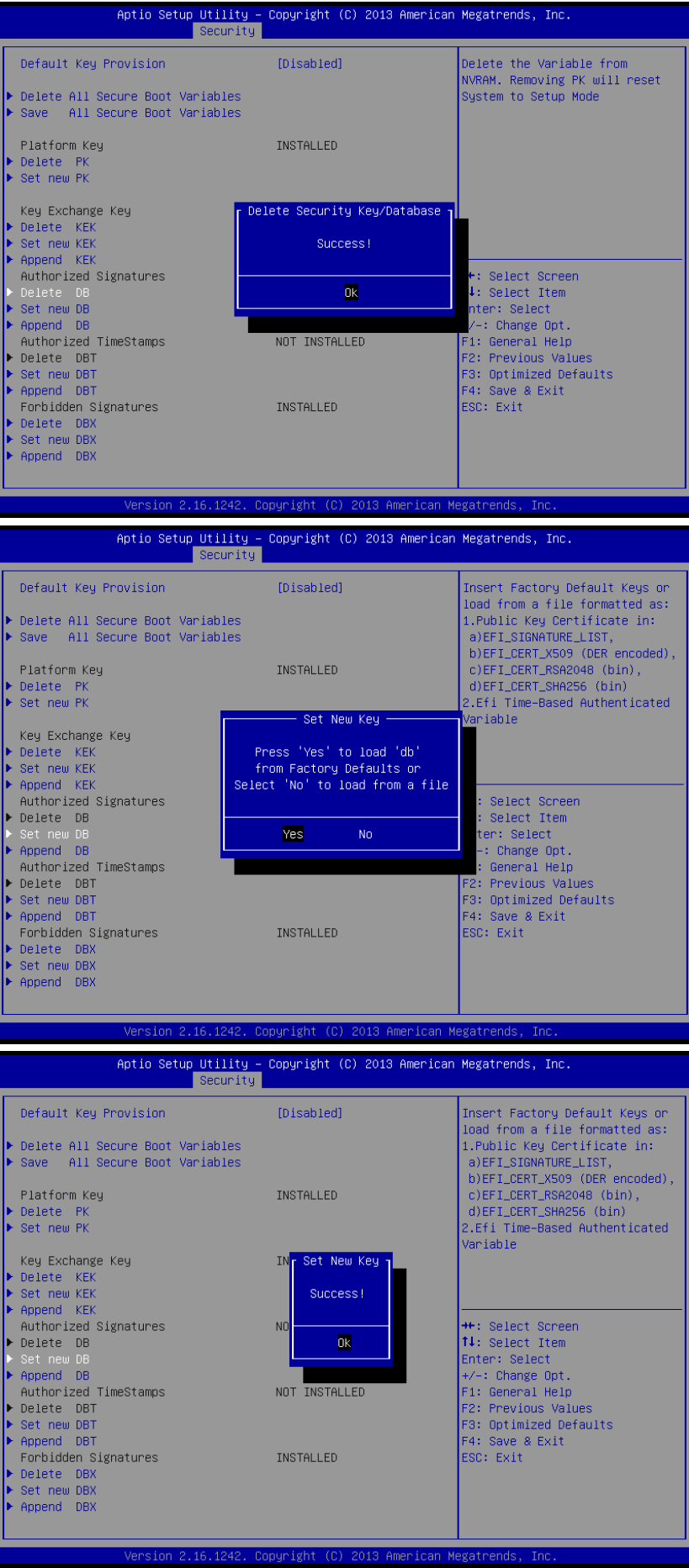


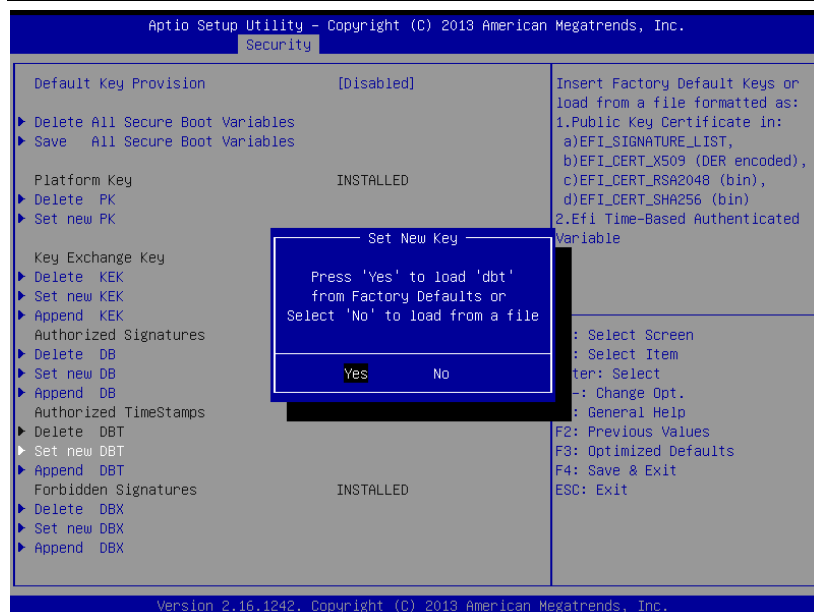
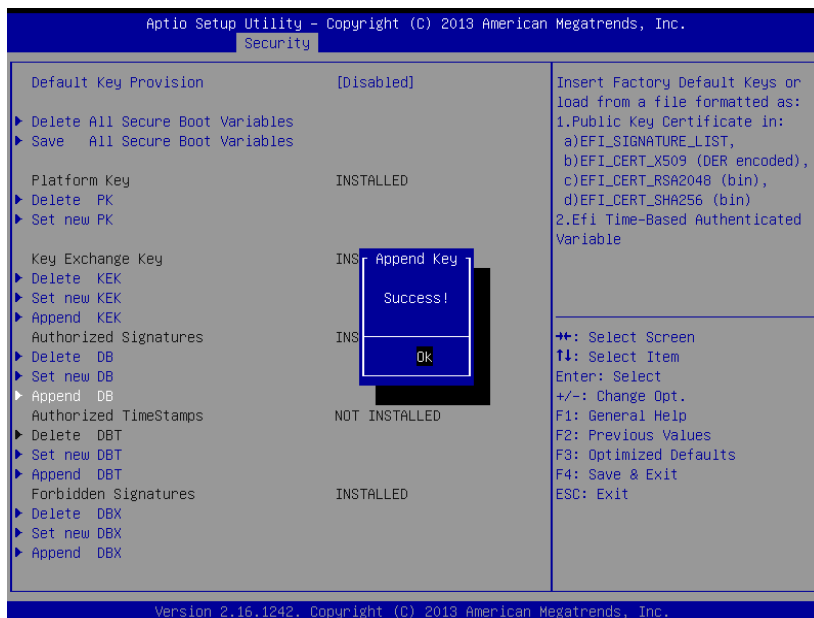
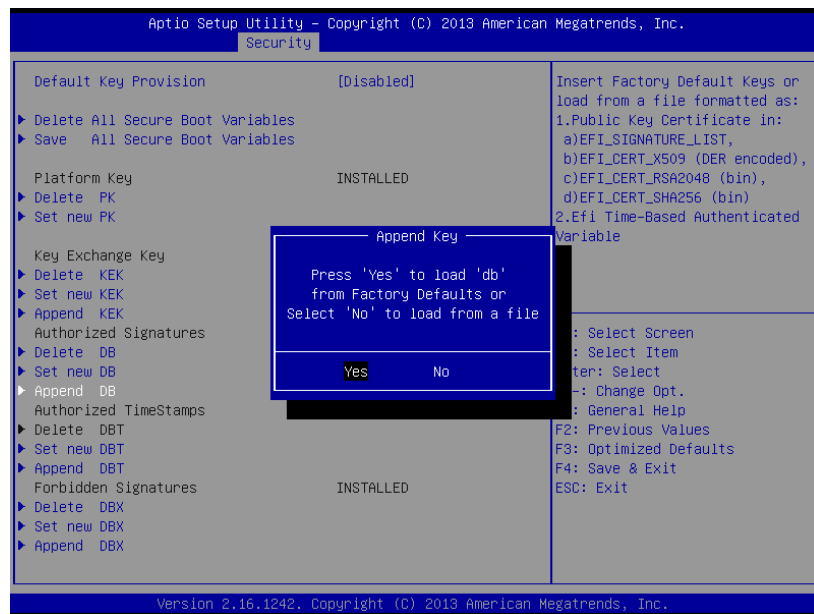


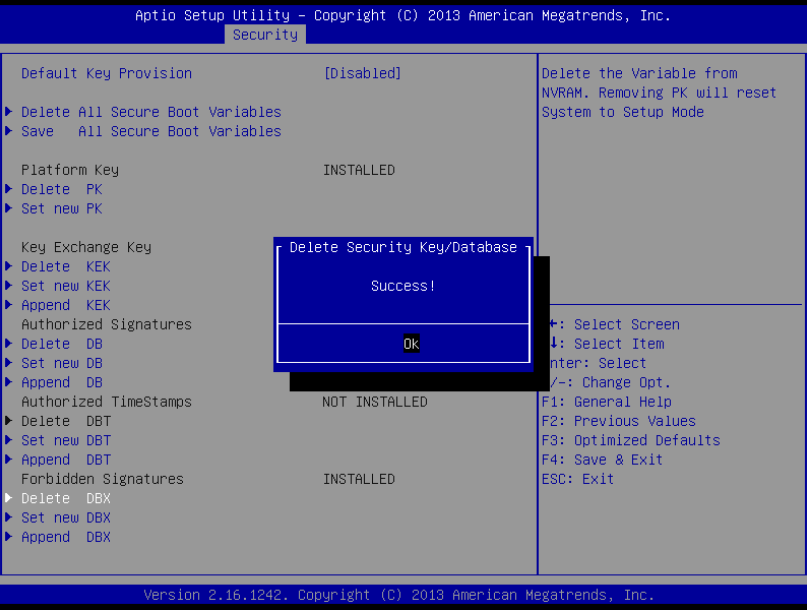
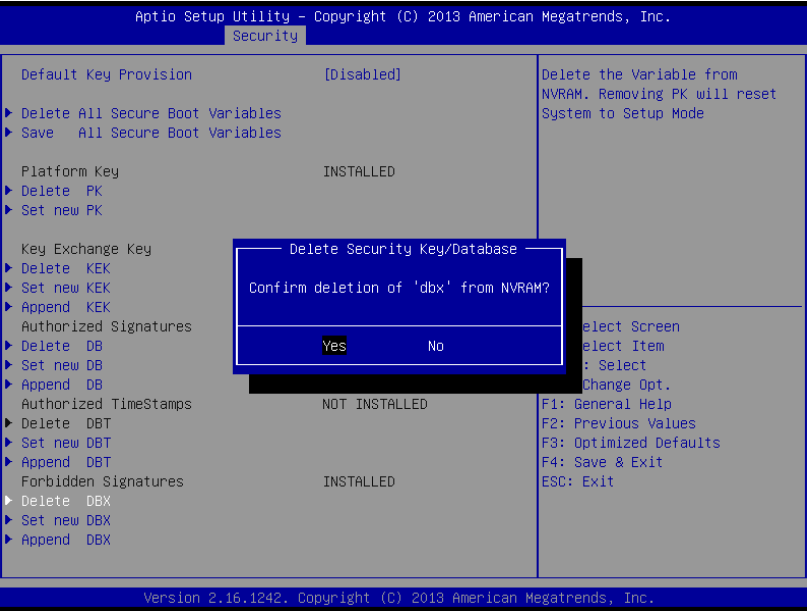
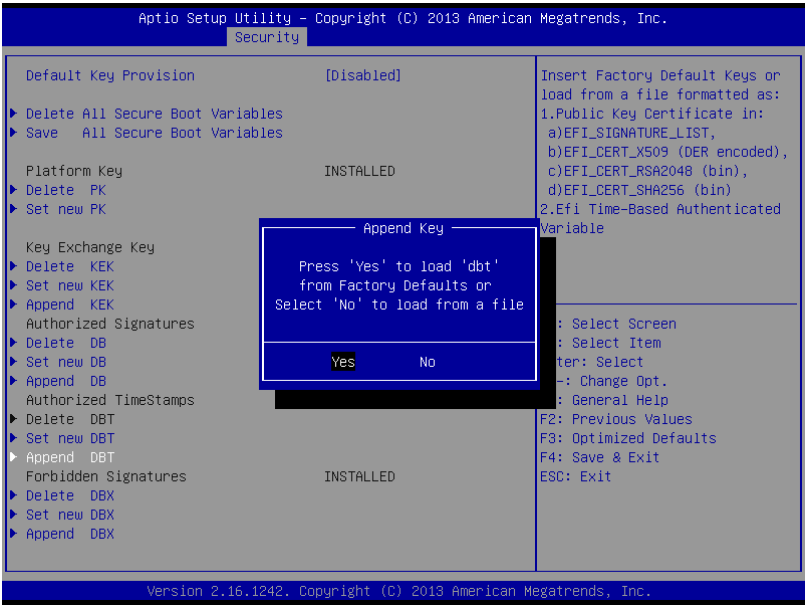


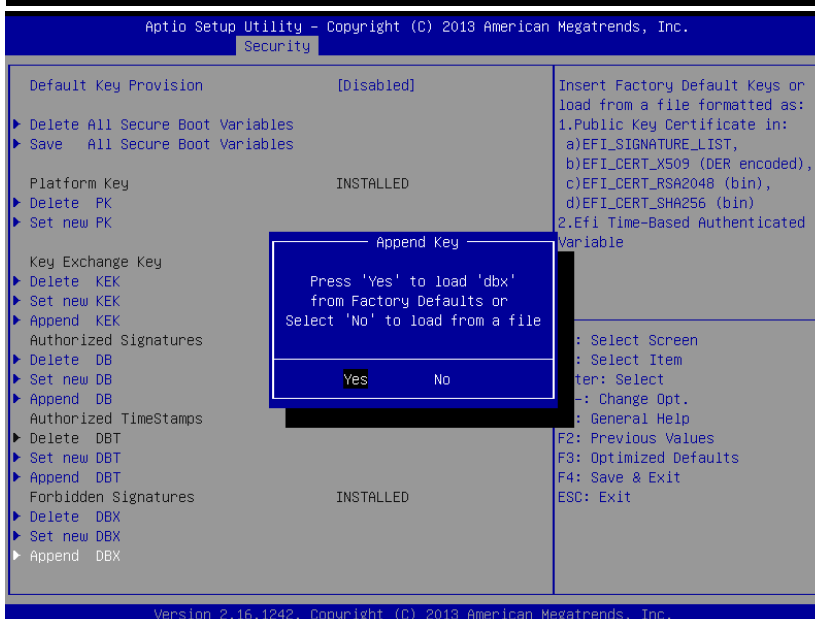
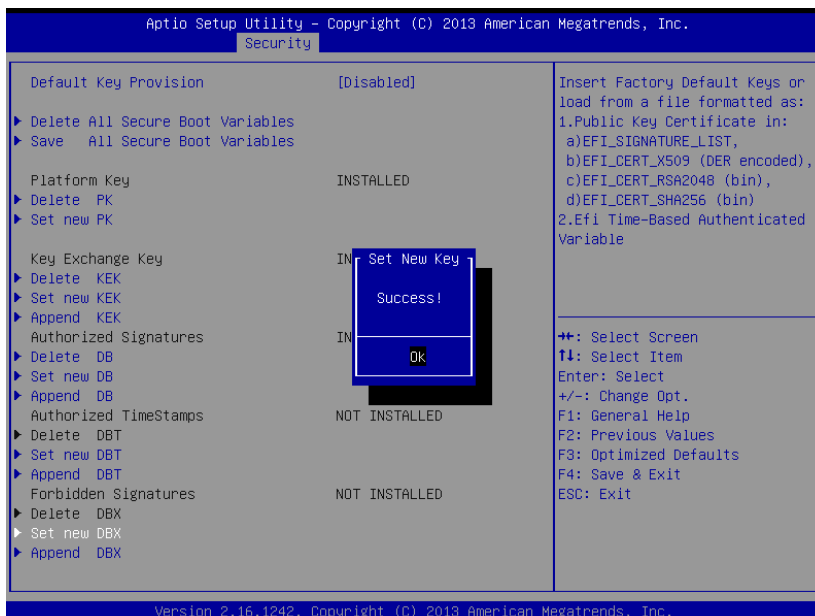
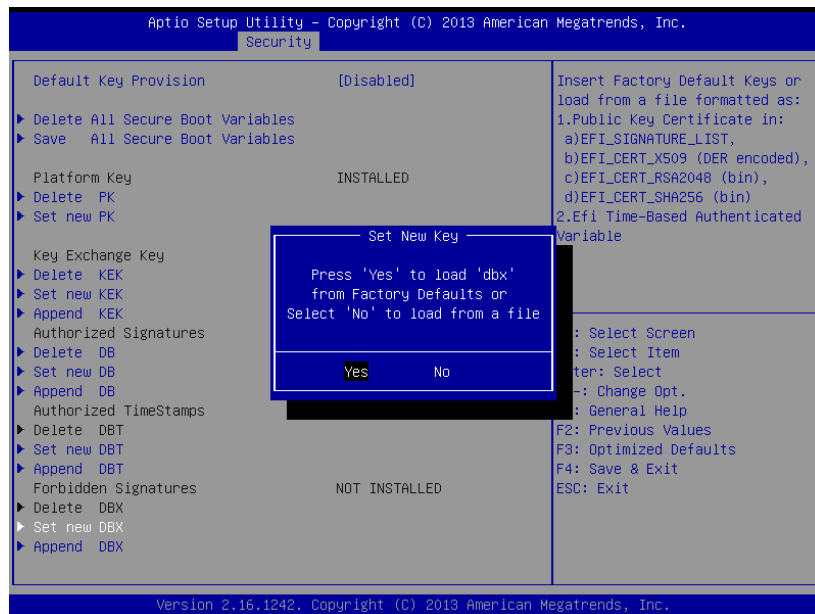




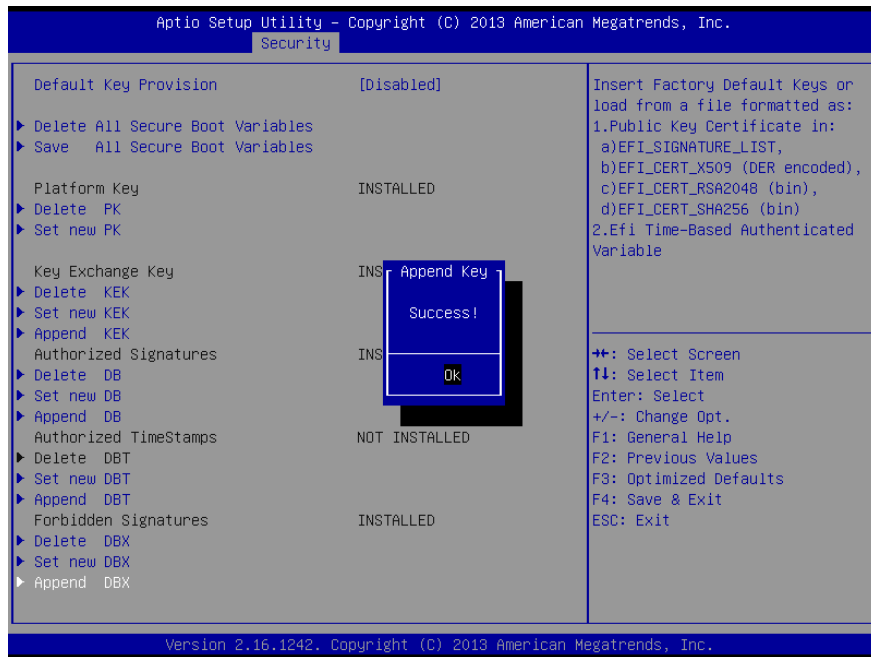






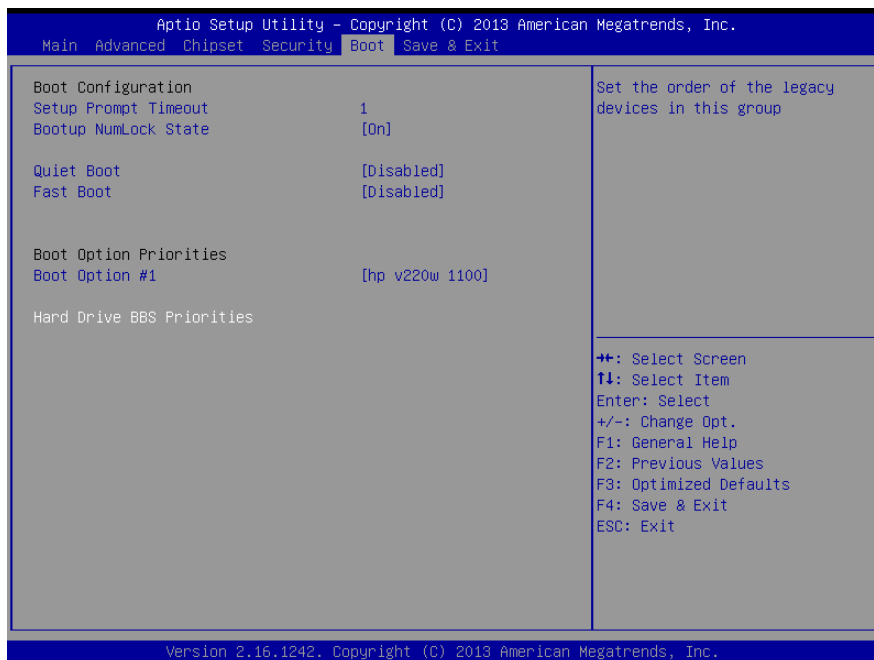


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| Item | Option | Description |
|-----------------------|-------------------------------|--|
| Default Key Provision | Enabled, Disabled[Default] | Install Factory default Secure Boot Keys when System is in Setup Mode. |

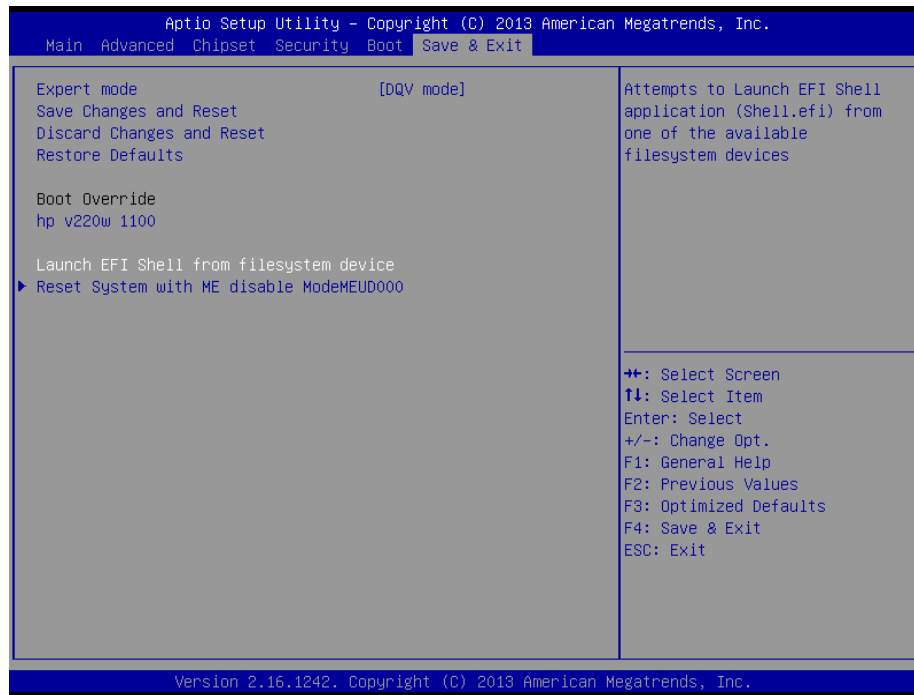
3.6.5 Boot



| Item | Option | Description |
|----------------------|--------------------|---|
| Setup Prompt Timeout | 1~ 65535 | Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting. |
| Bootup NumLock State | On[Default] Off | Select the Keyboard NumLock state |
| Quiet Boot | Disabled[Default] | Enables or disables Quiet Boot option |

| | | |
|-------------------------|------------------------------|---|
| | Enabled | |
| Fast Boot | Disabled[Default] Enabled | Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options. |
| Boot Option #1/2 | Set the system boot order. | |

3.6.6 Save and exit



3.6.6.1 Save Changes and Reset

Reset the system after saving the changes.

3.6.6.2 Discard Changes and Reset

Any changes made to BIOS settings during this session of the BIOS setup program are discarded. The setup program then exits and reboots the controller.

3.6.6.3 Restore Defaults

This option restores all BIOS settings to the factory default. This option is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting.

3.6.6.4 Launch EFI Shell from filesystem device

Attempts to Launch EFI Shell application (Shellx64.efi) from one of the available filesystem devices.

4. Drivers Installation



Note: Installation procedures and screen shots in this section are for your reference and may not be exactly the same as shown on your screen.

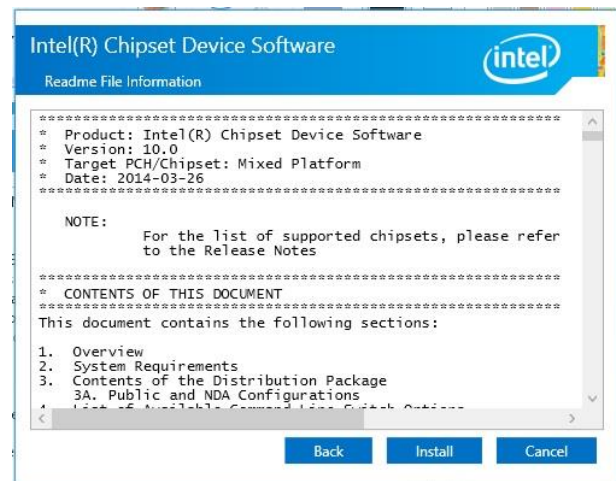
4.1 Install Chipset Driver

All drivers can be found on the Avalue Official Website:

<http://www.avalue.com.tw>.



Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



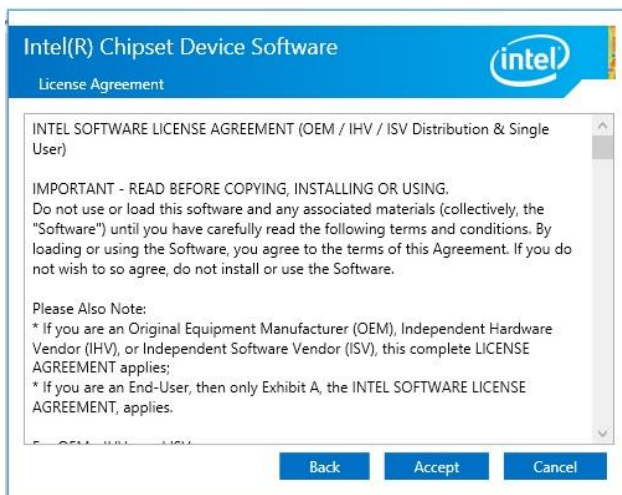
Step 3. Click Install.



Step1. Click Next.



Step 4. Click Finish to complete setup.



Step 2. Click Accept.

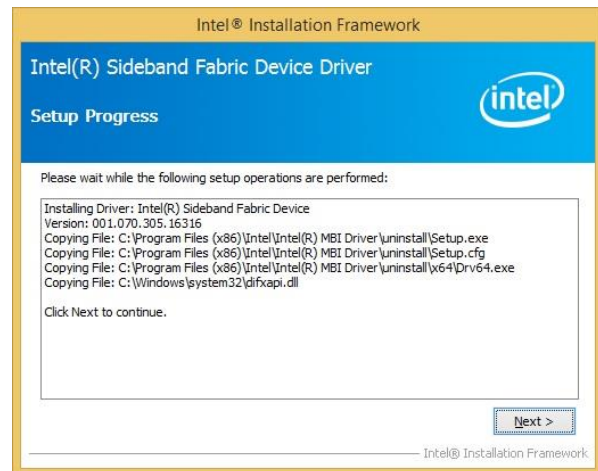
4.2 Install MBI Driver

All drivers can be found on the Avalue Official Website:

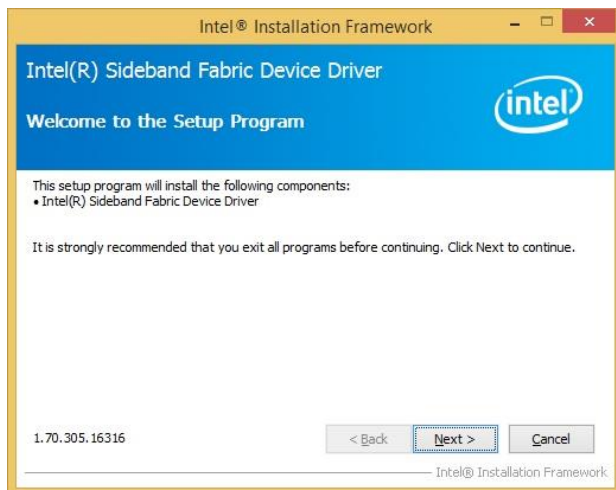
<http://www.avalue.com.tw>.



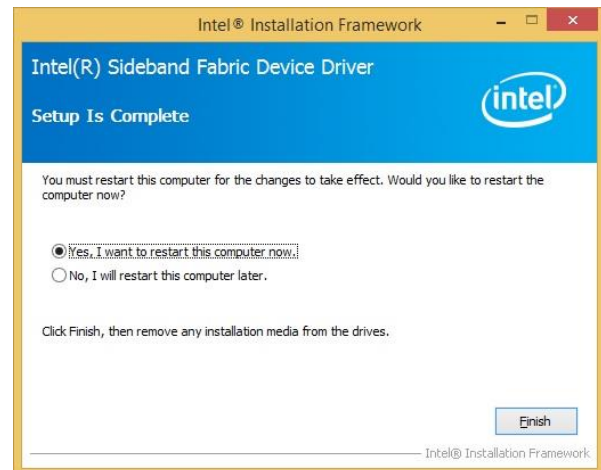
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



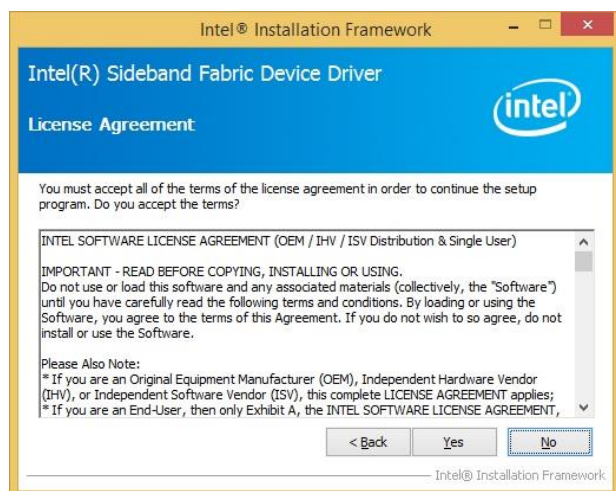
Step 3. Click **Next** to proceed setup.



Step1. Click **Next** to start installation.



Step 4. Click **Finish** to complete setup.



Step 2. Click **Yes** to accept license agreement.

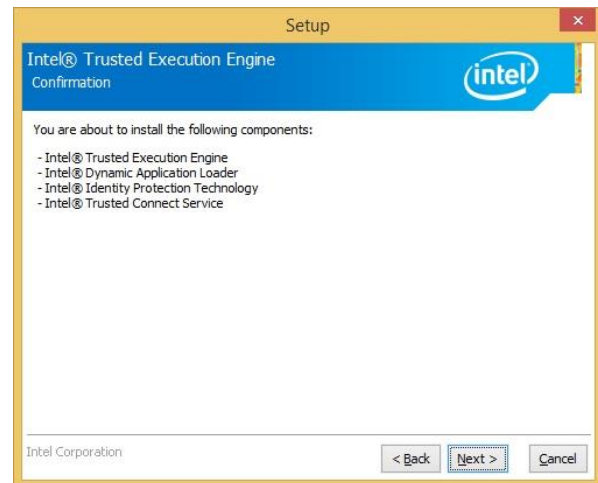
4.3 Install TXEI Driver

All drivers can be found on the Avalue Official Website:

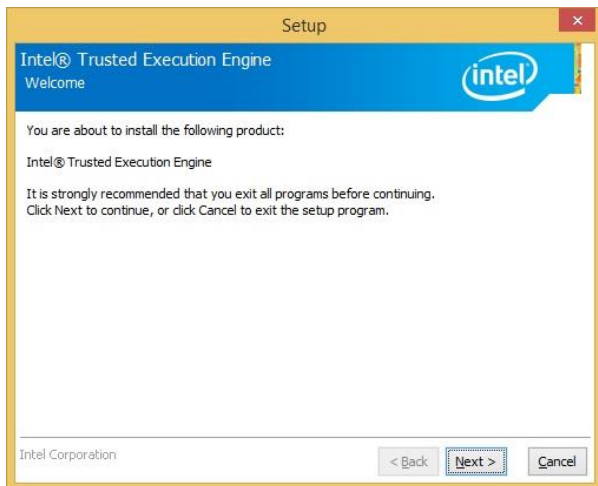
<http://www.avalue.com.tw>.



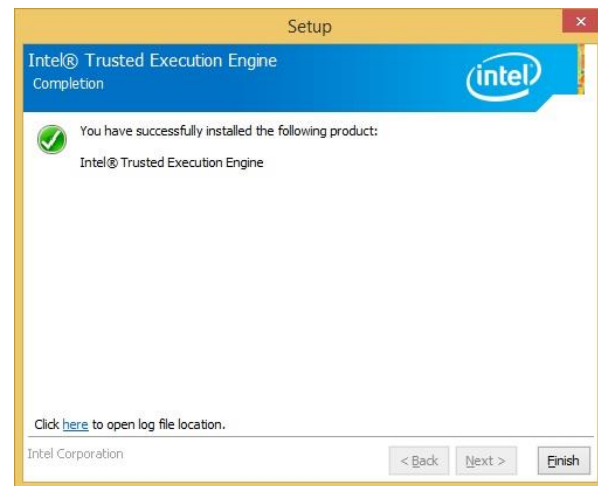
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



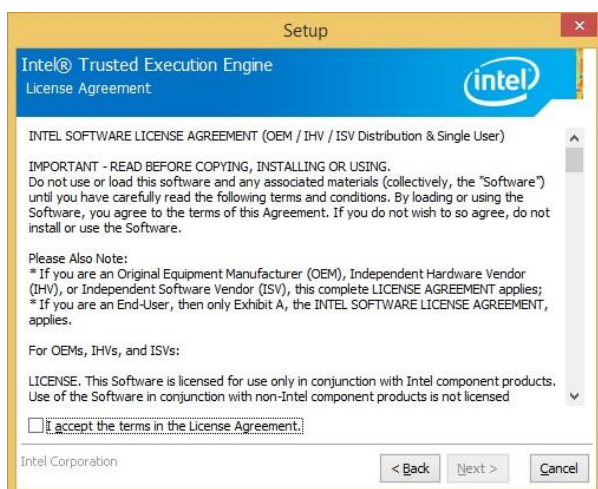
Step 3. Click **Next** to continue installation.



Step1. Click **Next** to start installation.



Step 4. Click **Finish** to complete setup.



Step 2. Click **Next**.

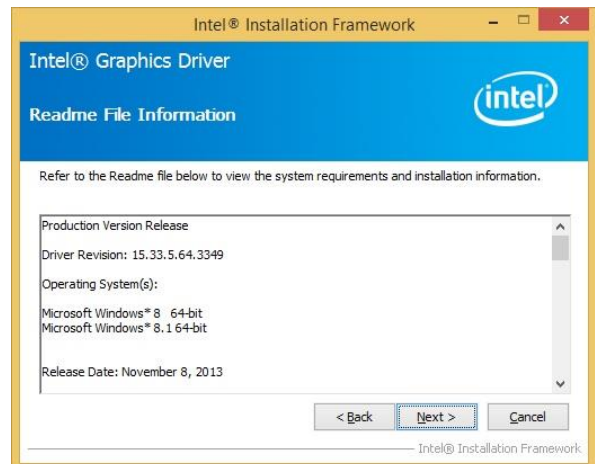
4.4 Install VGA Driver

All drivers can be found on the Avalue Official Website:

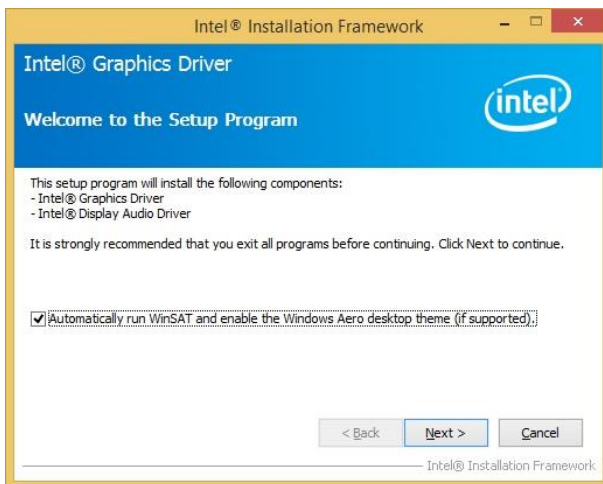
<http://www.avalue.com.tw>.



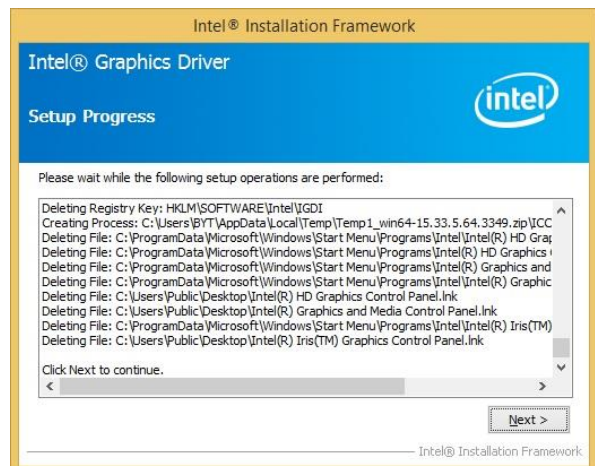
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



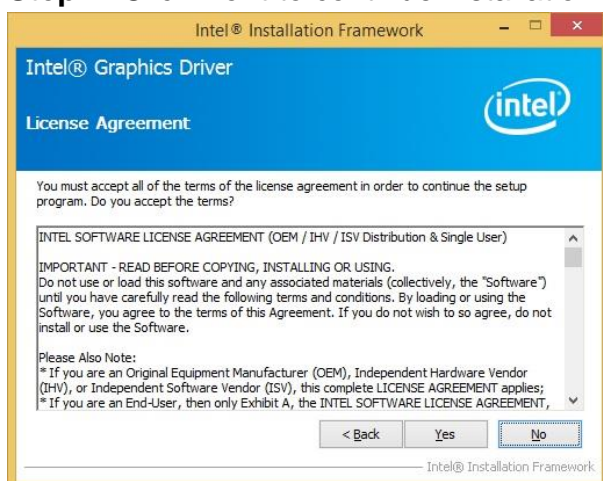
Step 3. Click Next.



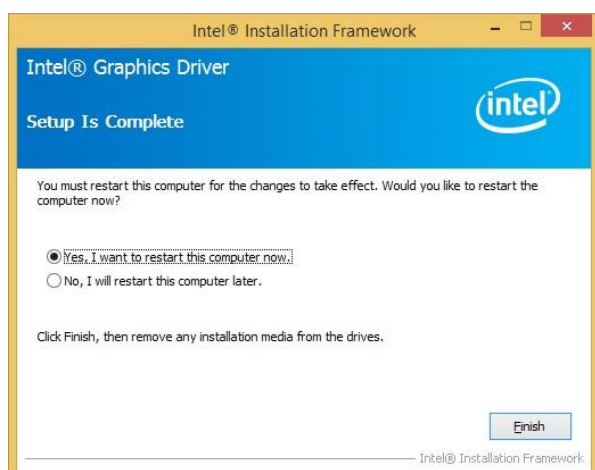
Step 1. Click Next to continue installation.



Step 4. Click Next.



Step 2.
Click **Yes** to accept license agreement.



Step 5. Click Finish to complete setup.

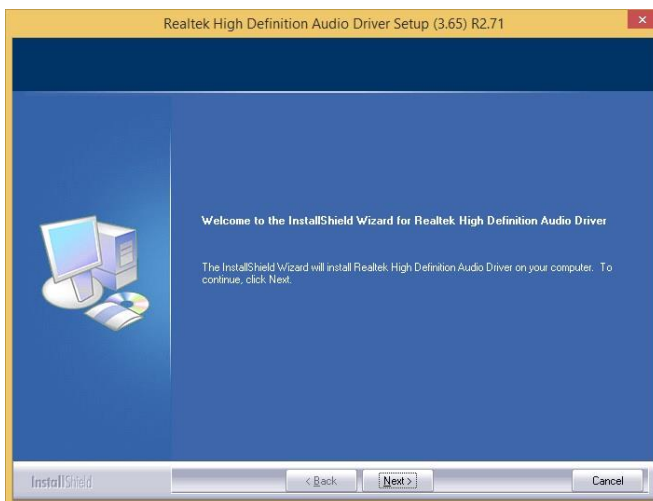
4.5 Install Audio Driver (For Realtek ALC888S)

All drivers can be found on the Avalue Official Website:

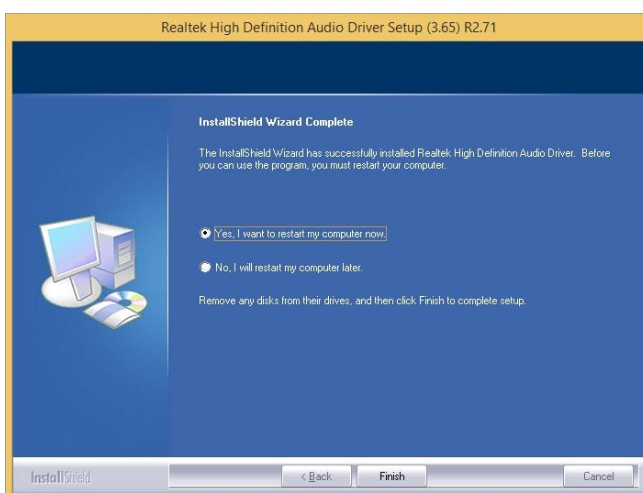
<http://www.avalue.com.tw>.



Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



Step 1. Click **Next** to continue setup.



Step 2. Click **Finish** to complete the setup.

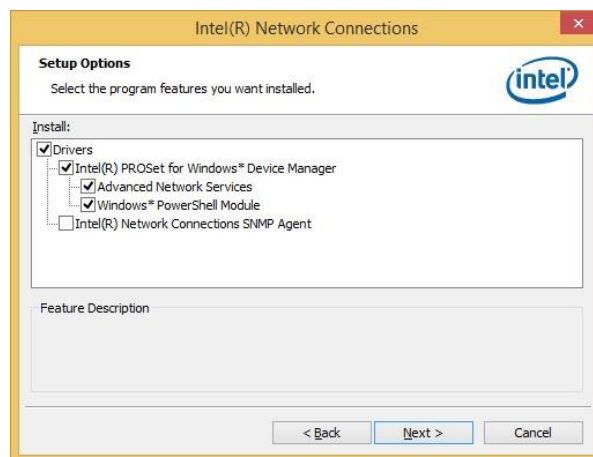
4.6 Install Gigabit Driver

All drivers can be found on the Avalue Official Website:

<http://www.avalue.com.tw>.



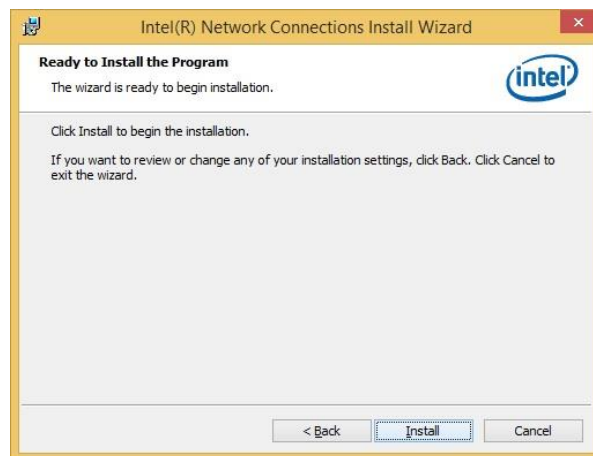
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



Step 3. Click Next.



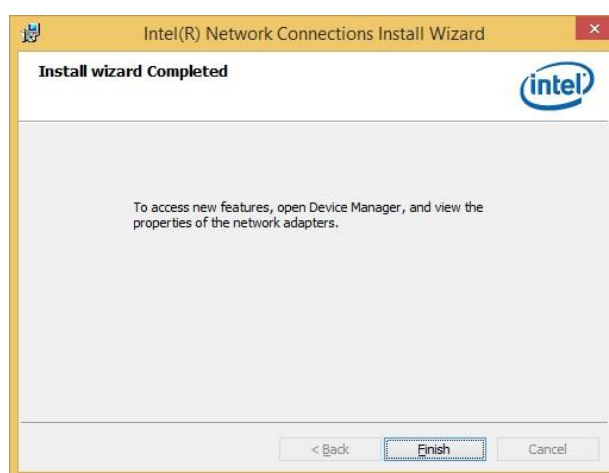
Step 1. Click Next.



Step 4. Click Install to proceed.



Step 2. Click Next to accept license agreement.



Step 5. Click Finish to complete the setup

4.7 Install USB3.0 Driver

All drivers can be found on the Avalue Official Website:

<http://www.avalue.com.tw>.



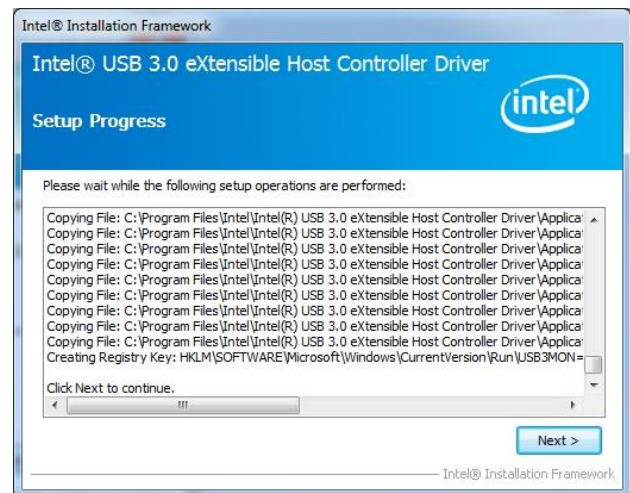
Note: The installation procedures and screen shots in this section are based on Windows 10 operation system.



Step 3. Click Next.



Step 1. Click Next.



Step 4. Click Next to proceed.



Step 2. Click Yes to accept license agreement.



Step 5. Click Finish to complete the setup

5. Command Summary



Note: Please contact our AE if you have further questions.

| | |
|------|---|
| @1 | AT@1: Display version information ATBS MT3647S VXX.X.XXXXXX> |
| BRxy | Setting RS232 baud rate. xy is baud rate parameter. ATBR09: 9600 ATBR19: 19200 ATBR38: 38400 ATBR57: 57600 ATBR99: 115200 |
| Eh | ATE0: echo off(Default) ATE1; echo on |
| T | ATT (HEX: 41 54 54 0D): Terminate sending. To use ATS will continue it. |
| I | ATI: Request vehicle ID, the length is variable. 1.) J1708: Output format: ASCII code Byte 0:0x2A Byte 1: Vehicle ID byte 1 Byte 2: Vehicle ID byte 2 Byte N:Vehicle ID byte N Byte N+1: Check Sum=Byte 1+Byte2+.....+Byte N Byte N+2:0x0D Byte N+3:0x0A N: Max 20 2.)J1939 Byte 0:0x2A Byte 1: Vehicle ID byte 1 Byte 2: Vehicle ID byte 2 Byte N:Vehicle ID byte N Byte N+1: Check Sun= Byte1+Byte2 +.....Byte N Byte N+2:0x0D Byte N+3:0x0A N: Max 35 |
| PA | ATPA: Print data by ASCII CODE format |
| PH | ATPH: Print data by HEX CODE format |
| R | ATR: Clear protocol and distance (D1, D2) memory, the ATR command clear current protocol then continue learning next new protocol. |
| RJ | ATRJ: Request J1939 FMS High Resolution Total Vehicle Distance (#33~#36) |
| RH | ATRH: Request Hino Truck Total vehicle distance (#33~#36) |
| S | ATS(HEX:41 54 53 0D): Continue auto-send data every |
| SS | ATSS: Auto- send Simple Data every 100~200 ms. |
| SP | ATSP: Auto-send Packaging Messages every 100~200 ms. |

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| | |
|-----|--|
| SR | ATSR: Auto-send J1939/J1708 Raw Data, Refer to Raw Data Protocol. |
| X | <p>ATX: Request to send data of alternate, data format as ATS/ATSP command.</p> <p>For J1939 protocol:</p> <p>Packing1 Packing2 Packing 3</p> <p>Packing4 Packing5 Packing6 Packing1</p> <p>For J1708 protocol:</p> <p>Packing1 Packing2 Packing 3</p> <p>Packing4 Packing5 Packing1</p> |
| #xy | <p>AT#xy: The command will print designated data by ASCII code. —xyll is data address, it is decimal.</p> <p>J1708: 00~83</p> <p>J1939: 00~105.</p> <p>EX: AT#01, to get speed high byte.</p> |

- **Simple Data Protocol: (ASCII CODE)**

| Data | Description |
|---------|--|
| HEAD | @ |
| Byte 0 | , |
| Byte 1 | Speed , (0~255) km/h |
| Byte 2 | , |
| Byte 3 | RPM High Byte (RPMHB) |
| Byte 4 | , |
| Byte 5 | RPM Low Byte(RPMLB) |
| Byte 6 | , |
| Byte 7 | Engine Loading, (0~100%) |
| Byte 8 | , |
| Byte 9 | Battery Voltage (BV), |
| Byte 10 | , |
| Byte 11 | Engine Temperature(ET), =ET-40 (°C) |
| Byte 12 | , |
| Byte 13 | Throttle position 0~100 % |
| Byte 14 | , |
| Byte 15 | Status , Note 2 |
| Byte 16 | , |
| Byte 17 | MAF (0~255), MAF RATE= MAF * 300 (g/s) |
| Byte 18 | , |
| Byte 19 | Distance : D1 |
| Byte 20 | , |
| Byte 21 | Distance: D2 , Distance = D1*256+D2 (KM) |
| Byte 22 | , |
| Byte 23 | FU, Average Fuel Economy (km/L) =Fu /10 |
| Byte 24 | , |
| Byte 25 | Check sum (add numbers)= Byte1+ Byte3+Byte5+ Byte7+ Byte9+Byte11+ Byte13+ Byte15+Byte17+ Byte19+ Byte21+Byte23 |
| Byte 26 | Carry return (0x0D) |
| Byte 27 | Line feed (0x0A) |

● **Simple Data Protocol: (HEX CODE)**

| Data | Description |
|---------|--|
| HEAD | @ (=0x40) |
| Byte 1 | Speed , (0~255) km/h |
| Byte 2 | RPM High Byte (RPMHB) |
| Byte 3 | RPM Low Byte(RPMLB), $RPM = RPMHB * 256 + RPMLB$ |
| Byte 4 | Engine Loading, (0~100%) |
| Byte 5 | Battery Voltage (BV), $= (BV + 100) / 10$ (V) |
| Byte 6 | Engine Temperature(ET), $= ET - 40$ (°C) |
| Byte 7 | Throttle position 0~100 % |
| Byte 8 | Status, Note 2 |
| Byte 9 | MAF (0~255), $MAF\ RATE = MAF * 300$ (g/s) |
| Byte 10 | Distance: D1 |
| Byte 11 | Distance: D2, $Distance = D1 * 256 + D2$ (KM) |
| Byte 12 | FU, Average Fuel Economy (km/L) $= Fu / 10$ |
| Byte 13 | Check sum (add numbers)= Byte1+ Byte2+Byte3+ Byte4+ Byte5+Byte6+ Byte7+ Byte8+Byte9+ Byte10+ Byte11+Byte12 |
| Byte 14 | Carry return (0x0D) |
| Byte 15 | Line feed (0x0A) |

NOTE:

1.) Data format : ASCII CODE

@ , 7 8 , 0 E , 7 0 , 0 0 , 0 3 , 9 8 , 2 8 , Status ,MAF,D1,D2,Fu,CS

Speed=120 km/hr ($78_{Hex} = 120_{Dec}$)

Rpm=0x0E70= 3696 ($0E70_{Hex} = 3696_{Dec}$)

2.) status:

Bit 7:

0: Normal

1: Emergency Braking (Acceleration < -6 m/ s²)

Bit 6:

0: Brake OFF

1: Brake ON

1: Brake

Bit 5:

0: Clutch OFF

1: Clutch ON

Bit 4:

0: Cruise Control OFF

1: Cruise Control ON

Bit 3:

0: Brake (ON/OFF) unavailable

1: Brake (ON/OFF) available

Bit 2:

0: Clutch (ON/OFF) unavailable

1: Clutch (ON/OFF) available

Bit 1:

0: Cruise Control (ON/OFF) unavailable

1: Cruise Control (ON/OFF) available

Bit 0:

0: NORMAL

1: DTC ON

2.) Distance = $D1 \times 256 + D2$ (KM)

3.) Average Fuel Economy = $Fu/10$

● J1939 Raw Data Protocol (HEX CODE)

Support for J1939 PGN / SPN access as defined in the J1939 standards. This function will report all PGNs and their source node on the J1939 network. Each SPN under this function should be set to a size of 32 bits.

| J1939 | Format | |
|---------|--|-----|
| Byte 0 | @ (=0x40) | |
| Byte 1 | Bit4,3,2: Priority Bit0: Data Page Bit1,5,6,7:Reversed | |
| Byte 2 | PDU Format (PF) | PGN |
| Byte 3 | PDU Specific (PS) | |
| Byte 4 | Source Address | |
| Byte 5 | Data1 | |
| Byte 6 | Data2 | |
| Byte 7 | Data3 | |
| Byte 8 | Data4 | |
| Byte 9 | Data5 | |
| Byte 10 | Data6 | |
| Byte 11 | Data7 | |
| Byte 12 | Data8 | |
| Byte 13 | Check sum | |
| Byte 14 | 0x0D | |
| Byte 15 | 0x0A | |

● J1708 Raw Data Protocol (HEX CODE)

This function will report all MID and PID that broadcasting on the J1708 network. Its data length is not fixed, please refer to SAEJ1708.

| Format | PIDs 192-253 | PIDs 128-191 | PIDs 0-127 |
|---------|---------------------------------------|--------------|-------------------|
| Byte 0 | @ (= 0x40) | @ (= 0x40) | @ (= 0x40) |
| Byte 1 | Message identification (MID) | MID | MID |
| Byte 4 | Parameter identification (PID) | PID | PID |
| Byte 3 | Number of data bytes | Data1 | Data1 |
| Byte 4 | Data1 | Data2 | Check Sum |
| Byte 5 | Data2 | Check Sum | 0x0D |
| Byte 6 | | 0x0D | 0x0A |
| Byte 7 | Data N | 0x0A | |
| Byte 8 | Check Sum | | |
| Byte 9 | 0x0D | | |
| Byte 10 | 0x0A | | |

PIDs 0-127 describe data parameters that are one byte long.

PIDs 128-191 describe data parameters that consist of two bytes.

PIDs 192-253 The first byte following these PIDs will contain the number of data parameter bytes.

| | | | | | | | |
|------|------|------|------|------|------|------|------|
| 0x40 | 0x80 | 0x15 | 0x01 | 0x32 | 0xC8 | 0x0D | 0x0A |
| 64 | 128 | 21 | 1 | 50 | 200 | 13 | 10 |

EX:

MID=128

PID=21 (Engine ECU temperature)

Data=50

● 1939 Packaged Messages Protocol

| | | | |
|--|--|---|--|
| ATSP: send packaged messages by turns. | | | |
| Response HEX CODE (default) after ATPH command | | | |
| Packing 1(#00~#17) Byte 0:" @", (0x40) Byte 1:"1", (0x31) Byte 2: #00 Byte 3: #01..... Byte 19:#17 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | Packing 2 (#18~35) Byte 0:" @", (0x40) Byte 1: "2", (0x32) Byte 2: #18 Byte 3: #19..... Byte 19:#35 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | Packing 3 (#36~53) Byte 0:" @", (0x40) Byte 1: "3", (0x33) Byte 2: #36 Byte 3: #37..... Byte 19:#53 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | |
| Packing 4 (#54~71) Byte 0:"@", (0x40) Byte 1: "a", (0x61) Byte 2: #54 Byte 3: #55..... Byte 19:#71 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | Packing 5 (#72~89) Byte 0:"@", (0x40) Byte 1: "b", (0x62) Byte 2: #72 Byte 3: #73..... Byte 19:#89 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | Packing 6 (#90~105) Byte 0: "@", (0x40) Byte 1: "c", (0x63) Byte 2: #90 Byte 3: #91..... Byte 17:#105 Byte 19:0 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | |
| NOTE : 1.) After ATPA command, AT#00 ~ AT#105 respond ASCII CODE format data. Byte 21 & 22 were ignored. 2.) Packing 6, Byte18~Byte19 not defined (set to 0) 3.) This is the common J1939 measurement overview showing which measurements are available. Note that not all measurements are supported by the individual engines. | | | |

Packing 7 will display only there is trouble code occurrence.

| | | |
|---|--|--|
| Packing7 Byte 0:"@",(0x40) Byte 1: "!",(0x21) Byte 2: C1 (Low) Byte 3: C1 (Hi) Byte 4: C2 (Low) Byte 5: C2 (Hi) Byte 6: C3 (Low) Byte 7: C3 (Hi) Byte 8: C4 (Low) Byte 9: C4 (Hi) Byte 10: C5 (Low) Byte 11: C5 (Hi) Byte 12: 0 Byte 19: 0 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | | |
|---|--|--|

NOTE :

1.) Taking the example trouble code.

EX:

40 21 94 04 12 15 23 0D 20 0D 00 00 00 00 00 00 00 00 00 00 1C
0D 0A Trouble code :

0494, 1512, 0D23, 0D20 (HEX)

2.) Packing 7, Byte12~Byte19 not defined (set to ||0||)

VMS-BYT

| | | | | | | | | |
|-----|--|----|---|---|----------|-----------------------|---------------------------------------|----|
| #00 | Speed Low Byte (SLB) | | | | | | | |
| #01 | Speed High Byte (SHB) speed=(SHB*256+SLB)/256 (km/h) | | | | | | | |
| #02 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Clutch switch | | Brake switch | | NOT USED | MIL ON (Engine Fault) | Cruise control active | |
| | 00 = pedal released 01 = pedal depressed | | 00 = pedal released 01 = pedal depressed | | | 0 = off 1 = on | 00 = switched off 01 = switched on | |
| #03 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | B7: Emergency Brake(-6m/ s ²) B6:speed Up (6m/ s ²) B5: Double Emergency brake (over -12m/ s ²) 1: Enable, 0:Disable | | | PTO state 00000 = off/disabled 00101 = Set 11111 = not available | | | | |
| #04 | 0.4 % / Bit gain, Accelerator Pedal Position(APP) , 0 to 100 % APP= Data* 0.4 | | | | | | | |
| #05 | Engine Total Fuel used 0,5 L / Bit gain , ETF1 | | | | | | | |
| #06 | Engine Total Fuel used 0,5 L / Bit gain , ETF2 | | | | | | | |
| #07 | Engine Total Fuel used 0,5 L / Bit gain , ETF3 | | | | | | | |
| #08 | Engine Total Fuel used 0,5 L / Bit gain , ETF4 Engine Total Fuel used =((ETF4*256*256*256)+(ETF3*256*256)+(ETF2*256)+ETF1)*0.5 | | | | | | | |
| #09 | Fuel Level (FL) , 0 to 100 %, 0.4 %/bit Fuel Level=FL*0.4 | | | | | | | |
| #10 | RPM Low byte, RL | | | | | | | |
| #11 | RPM High byte, RH RPM= (RH*256+ RL)* 0.125 | | | | | | | |

| | | | | | | | | |
|-----|---|----|----|----|---|----|----|----|
| #12 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | NOT USED | | | | Engine Starter Mode | | | |
| | B7: 1, Total Vehicle Distance is provided by vehicle ECU 0, Total Vehicle Distance is calculation value B3~B0: 0000 start not requested 0001 starter active, gear not engaged 0010 starter active, gear engaged 0011 start finished; starter not active after having been actively engaged ? (after 50ms mode goes to 0000)? 0100 starter inhibited due to engine already running 0101 starter inhibited due to engine not ready for start (preheating) 0110 starter inhibited due to driveline engaged 0111 starter inhibited due to active immobilizer 1000 starter inhibited due to starter over-temp 1001-1011 Reserved 1100 starter inhibited - reason unknown 1101 error 1111 not available | | | | | | | |
| #13 | Axle location The value 0xFF indicates not available. | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Axle location Bit-mapped position number counting front to back facing forward F = not available position number, counting front to back on the vehicle. B7,B6,B5,B4 Axle location Bit-mapped position number counting front to back facing forward. | | | | Tire location Bit-mapped counting left to right facing forward F = not available The low order 4 bits represent a position number, counting left to right when facing in the direction of normal vehicle travel | | | |
| #14 | Axle weight 0.5 kg / Bit gain (Low Byte),AWL | | | | | | | |
| #15 | Axle weight 0.5 kg / Bit gain (High Byte), AWH Weight=(AWH*256+AWL)*0.5 | | | | | | | |
| #16 | Engine total hours of Operation, EH1 | | | | | | | |
| #17 | Engine total hours of Operation, EH2 | | | | | | | |
| #18 | Engine total hours of Operation, EH3 | | | | | | | |

VMS-BYT

| | |
|-------------|---|
| #19 | Engine total hours of Operation, EH4 Accumulated $\text{time} = ((\text{EH4} * 256 * 256 * 256) + (\text{EH3} * 256 * 256) + (\text{EH2} * 256) + \text{EH1}) * 0.05$ |
| #20~ #27 | Vehicle identification number, aabbccddeeffgghh (If the Vehicle ID contains more than 8 Bytes then #20~#27 are "00", please use ATI command to request. |
| #20 | aa |
| #21 | bb |
| #22 | cc |
| #23 | dd |
| #24 | ee |
| #25 | ff |
| #26 | gg |
| #27 | hh |
| #28 | Engine Percent Load At Current Speed (0~125 %) |
| #29~ #32 | SW-version supported for trucks, Version number in the format ab.cd where this byte represents ASCII code #29 : "a", #30: "b", #31:"c", #32:"d" |
| #33~ #36 | High Resolution Total Vehicle Distance, 5 m/bit, 0 to 21,055,406 km $= ((\text{D4} * 256 * 256 * 256) + (\text{D3} * 256 * 256) + (\text{D2} * 256) + \text{D1}) * 0.005 \text{ (KM)}$ |
| #33 | D1 |
| #34 | D2 |
| #35 | D3 |
| #36 | D4 |
| #37~ #38 | The distance which can be traveled by the vehicle before the next service inspection is required $\text{SERV} = (\text{V2} * 256 + \text{V1}) * 5 - 160635 \text{ (KM)}$ |
| #37 | V1 |
| #38 | V2 |

#39

| B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|--|----|---|----|----|---|----|----|
| Vehicle motion(B7,B6): 00 = Vehicle motion not detected 01 = vehicle motion detected | | Driv. 2 working stat state (B5,B4,B3) 000 = Rest 001 = Driver available 010 = Work 011 = Drive 110 = Error 111 = not available | | | Driv. 1 working state (B2,B1,B0): 000 = Rest 001 = Driver available 010 = Work 011 = Drive 110 = Error 111 = not available | | |

#40

| B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
|--------------------|----|---------------|----|-----------------------------|----|----|----|
| Vehicle Over speed | | Driver 1 card | | Driver 1 time related state | | | |

Vehicle Over speed (B7,B6)◦ Indicates whether the vehicle is exceeding the legal speed limit set in the tachograph.

00 = No over speed
01 = Over speed

Driver 1 card (B5,B4)

00 = Card not present
01= Card present

Driver 1 time related state (B3,B2,B1,B0)◦ Indicates if the driver approaches or exceeds working time limits (or other limits).

0000 = normal
0001 = 15 min bef. 4.5 h
0010 = 4.5 h reached
0011 = 15 min bef. 9 h
0100 = 9 h reached
0101 = 15 min bef. 16 h
0110 = 16h reached
1110 = Error
1111 = not available

| | | | | | | | | |
|-------------|---|----|--|----|--|----|--------------|----|
| #41 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | NOT USED | | Driver 2 card (B5,B4) 00 = Card not present 01= Card present | | Driver 2 time related state (B3,B2,B1,B0)。Indicates if the driver approaches or exceeds working time limits (or other limits). 0000 = normal 0001 = 15 min bef. 4.5 h 0010 = 4.5 h reached 0011 = 15 min bef. 9 h 0100 = 9 h reached 0101 = 15 min bef. 16 h 0110 = 16h reached 1110 = Error 1111 = not available | | | |
| #40 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Direction indicator | | Tachograph performance | | Handling information | | System event | |
| | Direction indicator (B7,B6)。G 00 = Forward 01 = Reverse Tachograph performance (B5,B4) 00 = Normal performance 01 = Performance analysis Handling information (B3,B2) 00 = no handling information 01 = handling information System event (B1,B0) 00 = no tachogr. Event 01 = tachogr. Event | | | | | | | |
| #43~ #44 | Tachogr. vehicle speed 1/256 km/h Bit gain Speed= ((VS2*256)+VS1)/256 | | | | | | | |
| #43 | VS1 | | | | | | | |
| #44 | VS2 | | | | | | | |
| #45 | Engine Coolant Temperature(ECT) , -40 to 210 deg C ECT=data-40 °C | | | | | | | |

| | |
|-------------|--|
| #46 | Engine Turbocharger Boost Pressure(ETBP), 2 kPa/bit, 0~500 kPa ETPB=data *2 (kPa) |
| #47 | Engine Intake Manifold 1 Temperature(EIMT), -40 to 210 deg C EIMT=data-40 °C |
| #48 | Bit7,6 Anti-Lock Braking (ABS) Active。 00 - ABS passive but installed 01 - ABS active 10 – Reserved 11 - Not available Bit5~Bit0: Reserved. |
| #49 | Brake Pedal Position (BPP), 0.4 %/bit, 0~100% BPP=data*0.4 (%) |
| #50 | Parking and/or Trailer Air Pressure(PTAP), 8 kPa/bit PTAP=data *8 (kPa) |
| #51 | Gas Mass Flow High Byte (GMFHB) , 0.055(g/s) /bit Gas Mass Flow= (GMFHB*256+ GMFLB)*0.055 (g/s) |
| #52 | Gas Mass Flow Low Byte (GMFLB) , 0.055(g/s) /bit |
| #53 | Parking Brake Switch 00 = Parking brake not set 01 = Parking brake set |
| #54 | Bit 1 ,Bit 0: Diagnostics supported 00 = diagnostics is not supported 01 = diagnostics is supported 10 = reserved 11 = don't care Bit 3 ,Bit 2: Requests supported 00 = request is not supported 01= request is supported 10 = reserved 11 = don't care Bit4~Bit7:Reserved |
| #55~ #56 | Ambient Air Temperature: Temperature of air surrounding vehicle. AAT=(AATH* 256+AATL)*0.03125 -273 (deg C) #55: AATL #56: AATH |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|------------------------------------|----|----------------------------------|----|----------------------------------|----|--|----|----|----|----|----|----|----|----|----------------------------------|--|------------------------------------|--|----------------------------------|--|----------------------------------|--|---------------|--|---------------|--|-------------|--|---------------|--|-------------|--|--------------|--|-----------|--|-------------|--|------------|--|------------|--|------------|--|------------|--|--------------------|--|--------------------|--|--------------------|--|--------------------|--|
| #57 | <p>Door Control 1:</p> <p>Bit 7, Bit6: Status 2 of doors</p> <p>00 = all bus doors disabled</p> <p>01 = at least 1 bus door enabled</p> <p>10 = error</p> <p>11 = not available</p> <p>Bit 5, Bit4: Ramp/Wheel chairlift</p> <p>00 = inside bus</p> <p>01 = outside bus</p> <p>10 = Error</p> <p>11 = not available</p> <p>Bit 3,2,1,0 : Position of doors</p> <p>0000 = at least 1 door is open</p> <p>0001 = closing last door</p> <p>0010 = all doors closed</p> <p>1110 = Error</p> <p>1111 = not available</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| #58~ #65 | <p>Door Control 2, #58~#65</p> <p>Lock Status:</p> <p>locked → doors cannot be operated by the driver or a passenger</p> <p>unlocked → door may be operated by the driver or a passenger</p> <p>Open Status:</p> <p>closed → door is completely closed</p> <p>open → door is not completely closed</p> <p>Enable Status:</p> <p>disabled → door cannot be opened by a passenger</p> <p>enabled →→ door can be opened by a passenger</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| #58 | <table><tr><td>B7</td><td>B6</td><td>B5</td><td>B4</td><td>B3</td><td>B2</td><td>B1</td><td>B0</td></tr><tr><td colspan="2">Bit 7, Bit 6: Lock Status Door 2</td><td colspan="2">Bit 5, Bit 4: Enable Status Door 1</td><td colspan="2">Bit 3, Bit 2: Open Status Door 1</td><td colspan="2">Bit 1, Bit 0: Lock Status Door 1</td></tr><tr><td colspan="2">00 = Unlocked</td><td colspan="2">00 = Disabled</td><td colspan="2">00 = Closed</td><td colspan="2">00 = Unlocked</td></tr><tr><td colspan="2">01 = Locked</td><td colspan="2">01 = Enabled</td><td colspan="2">01 = Open</td><td colspan="2">01 = Locked</td></tr><tr><td colspan="2">10 = Error</td><td colspan="2">10 = Error</td><td colspan="2">10 = Error</td><td colspan="2">10 = Error</td></tr><tr><td colspan="2">11 = Not available</td><td colspan="2">11 = Not available</td><td colspan="2">11 = Not available</td><td colspan="2">11 = Not available</td></tr></table> | | | | | | | | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | Bit 7, Bit 6: Lock Status Door 2 | | Bit 5, Bit 4: Enable Status Door 1 | | Bit 3, Bit 2: Open Status Door 1 | | Bit 1, Bit 0: Lock Status Door 1 | | 00 = Unlocked | | 00 = Disabled | | 00 = Closed | | 00 = Unlocked | | 01 = Locked | | 01 = Enabled | | 01 = Open | | 01 = Locked | | 10 = Error | | 10 = Error | | 10 = Error | | 10 = Error | | 11 = Not available | | 11 = Not available | | 11 = Not available | | 11 = Not available | |
| B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bit 7, Bit 6: Lock Status Door 2 | | Bit 5, Bit 4: Enable Status Door 1 | | Bit 3, Bit 2: Open Status Door 1 | | Bit 1, Bit 0: Lock Status Door 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 00 = Unlocked | | 00 = Disabled | | 00 = Closed | | 00 = Unlocked | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 = Locked | | 01 = Enabled | | 01 = Open | | 01 = Locked | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 = Error | | 10 = Error | | 10 = Error | | 10 = Error | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 = Not available | | 11 = Not available | | 11 = Not available | | 11 = Not available | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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|-----|--|----|--|----|--|----|--|----|
| #59 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit 6: Open Status Door 3 00 = Closed 01 = Open 10 = Error 11 = Not available | | Bit 5, Bit 4: Lock Status Door 3 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | | Bit 3, Bit 2: Enable Status Door 2 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit 1, Bit 0: Open Status Door 2 00 = Closed 01 = Open 10 = Error 11 = Not available | |
| #60 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit 6: Enable Status Door 4 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit 5, Bit 4: Open Status Door 4 00 = Closed 01 = Open 10 = Error 11 = Not available | | Bit 3, Bit 2: Lock Status Door 4 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | | Bit 1, Bit 0: Enable Status Door 3 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | |
| #61 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit 6: Lock Status Door 6 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | | Bit 5, Bit 4: Enable Status Door 5 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit 3, Bit 2: Open Status Door 5 00 = Closed 01 = Open 10 = Error 11 = Not available | | Bit 1, Bit 0: Lock Status Door 5 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | |

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|-----|--|----|--|----|--|----|---|----|
| #62 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit 6: Open Status Door 7 00 = Closed 01 = Open 10 = Error 11 = Not available | | Bit 5, Bit 4: Lock Status Door 7 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | | Bit 3, Bit 2: Enable Status Door 6 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit1, Bit 0: Open Status Door 6 00 = Closed 01 = Open 10 = Error 11 = Not available | |
| #63 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit 6: Enable Status Door 8 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit 5, Bit 4: Open Status Door 8 00 = Closed 01 = Open 10 = Error 11 = Not available | | Bit 3, Bit 2: Lock Status Door 8 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | | Bit1, Bit 0: Enable Status Door 7 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | |
| #64 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit 6: Lock Status Door 10 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | | Bit 5, Bit 4: Enable Status Door 9 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit 3, Bit 2: Open Status Door 9 00 = Closed 01 = Open 10 = Error 11 = Not available | | Bit 1, Bit 0: Lock Status Door 9 00 = Unlocked 01 = Locked 10 = Error 11 = Not available | |

| | | | | | | | | |
|-------------|--|----|--|----|---|----|---|----|
| #65 | | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | | | | | Bit 3, Bit 2: Enable Status Door 10 00 = Disabled 01 = Enabled 10 = Error 11 = Not available | | Bit1, Bit 0: Open Status Door 10 00 = Closed 01 = Open 10 = Error 11 = Not available | |
| #66~ #71 | Time / Date: #66 : Second=data * 0.25 #67 : Minutes=data #68 : Hours=data #69 : Month=data #70 : Day=data * 0.25 #71 : Year=data-1985 (1985 to 2235 years) | | | | | | | |
| #72 | Alternator Status | | | | | | | |
| | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Bit 7, Bit6: Alternator Status 4 00 = not charging 01 = charging 10 = error 11 = not available | | Bit 5, Bit4: Alternator Status 3 00 = not charging 01 = charging 10 = error 11 = not available | | Bit 3, Bit 2: Alternator Status 2 00 = not charging 01 = charging 10 = error 11 = not available | | Bit 1, Bit 0: Alternator Status 1 00 = not charging 01 = charging 10 = error 11 = not available | |
| #73 | Selected Gear = data -125negative gear are reverse gears 00000000 = neutral 11111011 = park | | | | | | | |

| | | | | | | | | | | | | | | | |
|-------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| #74 | Current Gear=data-125 negative gear are reverse gears 00000000 = neutral 11111011 = park | | | | | | | | | | | | | | |
| #75~ #76 | Bellow Pressure Front Axle Left Information of the pressure of the air suspension bellow at the left side of the front axle $\text{Pressure} = ((\text{BPFAL2} * 256) + \text{BPFAL1}) * 0.1, \text{kPa}$ | | | | | | | | | | | | | | |
| #75 | BPFAL1 | | | | | | | | | | | | | | |
| #76 | BPFAL2 | | | | | | | | | | | | | | |
| #77~ #78 | Bellow Pressure Front Axle Right Information of the pressure of the air suspension bellow at the left side of the front axle $\text{Pressure} = ((\text{BPFAR2} * 256) + \text{BPFAR1}) * 0.1, \text{kPa}$ | | | | | | | | | | | | | | |
| #77 | BPFAR1 | | | | | | | | | | | | | | |
| #78 | BPFAR2 | | | | | | | | | | | | | | |
| #79~ #80 | Bellow Pressure Rear Axle Left Information of the pressure of the air suspension bellow at the left side of the front axle $\text{Pressure} = ((\text{BPRAL2} * 256) + \text{BPRAL1}) * 0.1, \text{kPa}$ | | | | | | | | | | | | | | |
| #79 | BPRAL1 | | | | | | | | | | | | | | |
| #80 | BPRAL2 | | | | | | | | | | | | | | |
| #81~ #82 | Bellow Pressure Rear Axle Right Information of the pressure of the air suspension bellow at the left side of the front axle $\text{Pressure} = ((\text{BPRAR2} * 256) + \text{BPRAR1}) * 0.1, \text{kPa}$ | | | | | | | | | | | | | | |
| #81 | BPRAR1 | | | | | | | | | | | | | | |
| #82 | BPRAR2 | | | | | | | | | | | | | | |
| #83~ #90 | Driver's Identification (Driver 1 & Driver 2 identification) <table border="1" data-bbox="354 1617 1422 1666"> <tr> <td>#83</td><td>#84</td><td>#85</td><td>#86</td><td>#87</td><td>#88</td><td>#89</td><td>#90</td></tr> </table> The driver ID is only available if a digital tachograph is present | | | | | | | #83 | #84 | #85 | #86 | #87 | #88 | #89 | #90 |
| #83 | #84 | #85 | #86 | #87 | #88 | #89 | #90 | | | | | | | | |
| #91~ #92 | Engine Fuel Rate (EFR). Amount of fuel consumed by engine per liter of hour. $\text{EFR} = (\text{EFR2} * 256 + \text{EFR1}) * 0.05, \text{L/h}$ Data Range: 0 to 3,212.75 L/h | | | | | | | | | | | | | | |
| #91 | EFR1 | | | | | | | | | | | | | | |
| #92 | EFR2 | | | | | | | | | | | | | | |

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|--------------|--|-----|-----|-----|------|------|------|--|-----|-----|-----|-----|-----|------|------|------|
| #93~ #94 | Engine Instantaneous Fuel Economy (EIFE). Current fuel economy at current vehicle velocity. EIFE=(EIFE2*256+EIFE1) / 512 , km/L Data Range: 0 to 125.5 km/L | | | | | | | | | | | | | | | |
| #93 | EIFE1 | | | | | | | | | | | | | | | |
| #94 | EIFE2 | | | | | | | | | | | | | | | |
| #95~ #102 | FMS Tell Tale Status <table><tr><td>#95</td><td>#96</td><td>#97</td><td>#98</td><td>#99</td><td>#100</td><td>#101</td><td>#102</td></tr></table> The Tell Tale Status information is derived from information displayed to the driver's dashboard. | | | | | | | | #95 | #96 | #97 | #98 | #99 | #100 | #101 | #102 |
| #95 | #96 | #97 | #98 | #99 | #100 | #101 | #102 | | | | | | | | | |
| #95 | Bit 3,2,1,0: Telltale Block ID Bit 7,6,5,4: Telltale Status 1 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available | | | | | | | | | | | | | | | |
| #96 | Bit 3,2,1,0: Telltale Status 2 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available Bit 7,6,5,4: Telltale Status 3 1000 = off 1001 = Cond. Red 1010 = Cond. Yellow 1011 = Cond. Info 1100–1110 = Reserved 1111 = not available | | | | | | | | | | | | | | | |

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| #97 | <p>Bit 3,2,1,0: Teletale Status 4</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> <p>Bit 7,6,5,4: Teletale Status 5</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> |
| #98 | <p>Bit 3,2,1,0: Teletale Status 6</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> <p>Bit 7,6,5,4: Teletale Status 7</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> |

| | |
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| #99 | <p>Bit 3,2,1,0: Teletale Status 8</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> <p>Bit 7,6,5,4: Teletale Status 5</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> |
| #100 | <p>Bit 3,2,1,0: Teletale Status 10</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> <p>Bit 7,6,5,4: Teletale Status 11</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> |

| | |
|------|---|
| #101 | <p>Bit 3,2,1,0: Telltale Status 12</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> <p>Bit 7,6,5,4: Telltale Status 13</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> |
| #102 | <p>Bit 3,2,1,0: Telltale Status 14</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> <p>Bit 7,6,5,4: Telltale Status 15</p> <p>1000 = off</p> <p>1001 = Cond. Red</p> <p>1010 = Cond. Yellow</p> <p>1011 = Cond. Info</p> <p>1100–1110 = Reserved</p> <p>1111 = not available</p> |
| #103 | Battery Voltage (BV), = (data+100)/10 (V) |
| #104 | <p>Engine Oil Filter Differential Pressure</p> <p>EODP= data*0.5 (kPa)</p> |
| #105 | YUTONG Bus, speed: 0~255 km/h |

● **J1708 Packaged Messages Protocol**

| | | | |
|--|---|--|--|
| ATSP | Once AT1708 SLEEP, it can wake it up. Start to send data by 3 packing, response HEX CODE | | |
| | Packing 1: Byte 0: "@" , 0x40; Byte 1: 4 Byte 2: #00 Byte 3: #01 Byte 4: #02 Byte 5: #03 Byte 6: #04 Byte 7: #05 Byte 8: #06 Byte 9: #07 Byte 10: #08 Byte 11: #09 Byte 12: #10 Byte 13: #11 Byte 14: #12 Byte 15: #13 Byte 16: #14 Byte 17: #15 Byte 18: #16 Byte 19: #17 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | Packing 2: Byte 0: "@" , 0x40; Byte 1: 5 Byte 2: #18 Byte 3: #19 Byte 4: #20 Byte 5: #21 Byte 6: #22 Byte 7: #23 Byte 8: #24 Byte 9: #25 Byte 10: #26 Byte 11: #27 Byte 12: #28 Byte 13: #29 Byte 14: #30 Byte 15: #31 Byte 16: #32 Byte 17: #33 Byte 18: #34 Byte 19: #35 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A | Packing 3: Byte 0: "@" , 0x40; Byte 1: 6 Byte 2: #36 Byte 3: #37 Byte 4: #38 Byte 5: #39 Byte 6: #40 Byte 7: #41 Byte 8: #42 Byte 9: #43 Byte 10: #44 Byte 11: #45 Byte 12: #46 Byte 13: #47 Byte 14: #48 Byte 15: #49 Byte 16: #50 Byte 17: #51 Byte 18: #52 Byte 19: #53 Byte 20: Check sum = Byte2 + ..+Byte 19 Byte 21: 0x0D Byte 22: 0x0A |
| NOTE : 1.) After ATPA command, AT#00 ~ AT#83 respond ASCII CODE format data. Byte 21 & 22 were ignored. 2.) This is the common J1708 measurement overview showing which measurements are available. Note that not all measurements are supported by the individual engines. Packing 4 & 5 will display only there is trouble code occurrence. | | | |

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| | | | |
| | Packing 4: Byte 0: "@" Byte 1: 7 Byte 2:a , #54 Byte 3:b , #55 Byte 4:c , #56 Byte 5:a , #57 Byte 6:b , #58 Byte 7:c , #59 Byte 8:a , #60 Byte 9:b , #61 Byte 10:c , #62 Byte 11:a , #63 Byte 12:b , #64 Byte 13:c , #65 Byte 14:a , #66 Byte 15:b , #67 Byte 16:c , #68 Byte 17: Check sum = Byte2 + ..+Byte 16 Byte 18: 0x0D Byte 19: 0x0A | Packing 5: Byte 0: "@" Byte 1: 8 Byte 2:a , #69 Byte 3:b , #70 Byte 4:c , #71 Byte 5:a , #72 Byte 6:b , #73 Byte 7:c , #74 Byte 8:a , #75 Byte 9:b , #76 Byte 10:c , #77 Byte 11:a , #78 Byte 12:b , #79 Byte 13:c , #80 Byte 14:a , #81 Byte 15:b , #82 Byte 16:c , #83 Byte 17: Check sum = Byte2 + ..+Byte 16 Byte 18: 0x0D Byte 19: 0x0A | |
| | a — MID b — SID or PID of a standard diagnostic code. C — Diagnostic code character. Bits 4-1: Failure mode identifier (FMI) | | |
| #00~ #01 | Road Speed —Indicated vehicle velocity Maximum Range: 0.0 to 205.2 km/h (0.0 to 127.5 mph) $\text{speed} = (\text{SHB} \times 256 + \text{SLB}) / 256$ | | |
| #00 | Speed Low Byte (SLB) | | |

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| #01 | Speed High Byte (SHB) |
| #02 | <p>Cruise Control Status—State of the vehicle velocity control system (active, not active), and system switch (on, off), for various system operating modes.</p> <p>Bit 7: cruise mode 1=active/0=not active</p> <p>Bit 6: clutch switch 1=on/0=off</p> <p>Bit 5: brake switch 1=on/0=off</p> <p>Bit 4: accel switch 1=on/0=off</p> <p>Bit 3: resume switch 1=on/0=off</p> <p>Bit 2: coast switch 1=on/0=off</p> <p>Bit 1: set switch 1=on/0=off</p> <p>Bit 0: cruise control switch 1=on/0=off</p> |
| #03 | <p>Brake Stroke Status—Identifies the current state of the vehicle foundation brakes.</p> <p>Bit 7-4: Axle number 1 to 16 (represented as 0 to 15)</p> <p>Bit 3-1: Brake status/Stroke adjustment</p> <p>000 = OK</p> <p>001 = Out of adjustment</p> <p>010 = Delay brake return</p> <p>011 = Brake pads worn</p> <p>100 = Delayed brake application</p> <p>101 = Reserved</p> <p>110 = Error</p> <p>111 = Not available</p> <p>Bit 0: 1 = Left wheel, 0 = Right wheel</p> |
| #04 | <p>Percent Accelerator Pedal Position(PAPP)—Ratio of actual accelerator pedal position to maximum pedal position.</p> <p>Maximum Range: 0.0 to 102.0%</p> <p>PAPP= Data* 0.4</p> |
| #05~ #08 | <p>Total Fuel Used (Natural Gas)—Accumulated amount of fuel used during vehicle operation.</p> <p>Maximum Range: 0.0 to 2 147 483 648 L (0.0 to 4 724 464 025 lb)</p> <p>$TFU=((ETF4*256*256*256)+(ETF3*256*256)+(ETF2*256)+ETF1)*0.473$</p> |
| #05 | Engine Total Fuel used 0473 L / Bit gain , ETF1 |
| #06 | Engine Total Fuel used 0,473 L / Bit gain , ETF2 |
| #07 | Engine Total Fuel used 0,5 L / Bit gain , ETF3 |
| #08 | Engine Total Fuel used 0,473 L / Bit gain , ETF4 |
| #09 | Fuel Level —Ratio of volume of fuel to the total volume of the primary fuel |

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| | storage container. Maximum Range: 0.0 to 127.5(%) Fuel Level=FL * 0.5 (%) |
| #10~ #11 | Engine Speed (RPM) —Rotational velocity of crankshaft. Maximum Range: 0.0 to 16383.75 rpm RPM= (RH*256+ RL)* 0.25 |
| #10 | RPM Low byte, RL |
| #11 | RPM High byte, RH |
| #12 | Engine Oil Pressure(EOP) —Gage pressure of oil in engine lubrication system as provided by oil pump. Maximum Range: 0.0 to 879.0 kPa (0.0 to 127.5 lbf/in2) EOP=data * 3.45 (kPa) |
| #13 | Throttle Position(TP) —The position of the valve used to regulate the supply of a fluid, usually air or fuel/air mixture, to an engine. 0% represents no supply and 100% is full supply. Maximum Range: 0.0 to 102.0% TP= data * 0.4(%) |
| #14 | Cargo Weight —The force of gravity of freight carried. Maximum Range: 0.0 to 1 166 056.9 N (0.0 to 262 140.0 lbf) (Low Byte),AWL |
| #15 | (High Byte), AWH Weight=(AWH*256+AWL)* 17.792 N |
| #16 | Total Engine Hours(TEH) —Accumulated time of operation of engine. Maximum Range: 0.0 to 214 748 364.8 h TEH=((EH4*256*256*256)+(EH3*256*256)+(EH2*256)+EH1)*0.05 |
| #16 | Engine total hours of Operation, EH1 |
| #17 | Engine total hours of Operation, EH2 |
| #18 | Engine total hours of Operation, EH3 |
| #19 | Engine total hours of Operation, EH4 |
| #20~ #27 | Vehicle Identification Number —Vehicle Identification Number (VIN) as assigned by the vehicle manufacturer. Vehicle identification number, aabbccddeeffgghh “ATI” command can show max 20 character VIN |
| #20 | aa |
| #21 | bb |
| #22 | cc |
| #23 | dd |
| #24 | ee |
| #25 | ff |

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|-------------|--|
| #26 | gg |
| #27 | hh |
| #28 | <p>PTO Engagement Control Status</p> <p>PTO output status:</p> <p>Bits 7-3:</p> <p> B7:no used</p> <p> B6: Emergency brake(-6m/s²)</p> <p> B5: speed up (6m/s²)</p> <p> B4: Double Emergency brake (over -12m/s²)</p> <p> 1: Enable, 0:Disable</p> <p>Bits 3-2: PTO #2 engagement actuator status</p> <p>Bits 1-0: PTO #1 engagement actuator status</p> <p>NOTE—Each status will be described using the following nomenclature:</p> <p>00 Off/Not active</p> <p>01 On/Active</p> <p>10 Error condition</p> <p>11 Not available</p> |
| #29 | <p>Average Fuel Economy</p> <p>$AFE=((AFE2*256)+AFE1) * 1.660\ 72 \times 10^{-3} \text{ km/L}$</p> |
| #29 | AFE1 |
| #30 | AFE2 |
| #31~ #32 | <p>Mass Air Flow—Mass air flow measured at the fresh air intake</p> <p>$MAF=((MAF2*256)+MF1) * 0.125 \text{ kg/min}$</p> |
| #31 | MAF1 |
| #32 | MAF2 |
| #33~ #36 | <p>Total Vehicle Distance(TVD)—Accumulated distance travelled by vehicle during its operation.</p> <p>Maximum Range: 0.0 to 691489743 km (0.0 to 429 496 729.5 mi)</p> <p>Bit Resolution: 0.161 km (0.1 mi)</p> <p>$TVD=((D4*256*256*256)+(D3*256*256)+(D2*256)+D1)*0.161 \text{ (KM)}$</p> <p>If vehicle does not provide TVD, AT1708 replace the information with the calculated distance, deviation is 0.5%, The first time connection AT1708 please command ATR to clear distance memory.</p> |
| #33 | D1 |
| #34 | D2 |
| #35 | D3 |
| #36 | D4 |
| #37~ | Fuel Rate (Instantaneous) —Amount of fuel consumed by engine per unit |

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| #38 | of time. Maximum Range: 0.0 to 1.076 65 L/s $FR=(V2*256+V1) * 16.428 \times 10^{-6} \text{ L/s}$ |
| #37 | V1 |
| #38 | V2 |
| #39~ #42 | Total Vehicle Hours(TVH) —Accumulated time of operation of vehicle. Maximum Range: 0.0 to 214 748 364.8 h $TVH=((H4*256*256*256)+(H3*256*256)+(H2*256)+H1)*0.05 \text{ (H)}$ |
| #39 | H1 |
| #40 | H2 |
| #41 | H3 |
| #42 | H4 |
| #43 | Reserved |
| #44 | Percent Engine Load(PEL) —Ratio of current output torque to maximum torque available at the current engine speed. Maximum Range: 0.0 to 127.5% $PEL=data * 0.5(\%)$ |
| #45 | Engine Coolant Temperature(ECT) , Maximum Range: 0.0 to 255.0°F $ECT= data \text{ } ^\circ\text{F}$ |
| #46 | Boost Pressure (BP) —Gage pressure of air measured downstream on the compressor discharge side of the turbocharger. Maximum Range: 0.0 to 219.8 kPa (0.0 to 31.875 lbf/in2) $PB=data * 0.862 \text{ (kPa)}$ |
| #47 | Intake Manifold Temperature (IMT) —Temperature of pre-combustion air found in intake manifold of engine air supply system. Maximum Range: 0.0 to 255.0 °F $IMT=data \text{ } ^\circ\text{F}$ |
| #48 | ABS Control Status Bits 7-6: ABS off-road function switch Bits 5-4: ABS retarder control Bits 3-2: ABS brake control Bits 1-0: ABS warning lamp 00 Off/Not active 01 On/Active 10 Error condition 11 Not available |
| #49 | Parking Brake Switch Status —Identifies the state (active/inactive) of the parking brake switch Bit 7: 1=active/0=inactive |

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| | Bits 6-1: Undefined MIL ON / OFF —Engine Fault warning lamp. Bit 0: 1=ON / 0=OFF |
| #50 | Brake Application Pressure (BAP) Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in ²) BAP=data *4.14 (kPa) |
| #51 | Brake Primary Pressure (BPP) —Gage pressure of air in the primary, or supply side, of the air brake system. Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in ²) BPP=data* 4.14 (kPa) |
| #52 | Brake Secondary Pressure —Gage pressure of air in the secondary, or service side, of the air brake system. Maximum Range: 0.0 to 1055 kPa (0.0 to 153.0 lbf/in ²) BPP=data* 4.14 (kPa) |
| #53 | Road Speed Limit Status: State (active or not active) of the system used to limit maximum vehicle velocity. Bit 7: 1=active/0=not active Bits 6-0: Undefined |
| #54~ #83 | Trouble Code (DTC) —Diagnostic Trouble Code. a — MID b — SID or PID of a standard diagnostic code. C — Diagnostic code character. Bits 4-1: Failure mode identifier (FMI) |
| #54 #55 #56 | DTC #1 #54: a #55: b #56: c |
| #57 #58 #59 | DTC #2 #57: a #58: b #59: c |
| #60 #61 #62 | DTC #3 #60: a #61: b #62: c |
| #63 #64 #65 | DTC #4 #63: a #64: b #65: c |
| #66 #67 | DTC #5 #66: a #67: b |

| | |
|-----|---------------|
| #68 | #68: c |
| #69 | DTC #6 #69: a |
| #70 | #70: b |
| #71 | #71: c |
| #72 | DTC #7 #72: a |
| #73 | #73: b |
| #74 | #74: c |
| #75 | DTC #8 #75: a |
| #76 | #76: b |
| #77 | #77: c |
| #78 | DTC #9 #78: a |
| #79 | #79: b |
| #80 | #80: c |
| #81 | DTC #10#81: a |
| #83 | #82: b |
| #83 | #83: c |

● J1708 Packaged Messages Protocol

1.) >AT#h,

Response: "Data1" "Data2" "H0D" "H3E" by ASCII CODE.

EX1:

AT#1, to get vehicle speed, if speed is 255,

Display,

FF> (H46, H46, H0D, H3E).

2.) Trouble code:

40 37 **80 8 CA** 80 A AA 80 B AA 80 C AA 80 1 AA FC D A

Trouble code:

MID 128 (H80)

PID 8(H8)

Diagnostic code character (CA), FMI= A, bit4~bit1

| | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|----|----|----|
| 2A | 31 | 47 | 31 | 4A | 46 | 32 | 37 | 57 | 38 | 47 | 4A | 31 | 37 | 38 | 32 | 32 | 37 | 0 | 0 | 0 | 27 | 0D | 0A |
| | 1 | G | 1 | J | F | 2 | 7 | W | 8 | G | J | 1 | 7 | 8 | 2 | 2 | 7 | | | | CS | | |

Quick Reference Guide

| | | |
|----------------------|--------|---|
| Country Manufactured | 1 | U.S.A.(1 or 4), Canada (2), Mexico (3), Japan (J), Korea (K), England (S), Germany (W), Italy (Z) |
| Manufacturer | G | |
| Vehicle Type | 1 | |
| Vehicle Features | JF27W | |
| Accuracy Check Digit | 8 | |
| Model Year | G | 1988 (J), 1989 (K), 1990 (L), 1991 (M), 1992 (N), 1993 (P), 1994 (R), 1995 (S), 1996 (T), 1997 (V), 1998 (W), 1999 (X), 2000 (Y), 2001 (1), 2002 (2), 2003 (3)..... |
| Production Plant | J | |
| Sequential Number | 178227 | The sequence of the vehicle for production as it rolled off the manufacturers assembly line. |

