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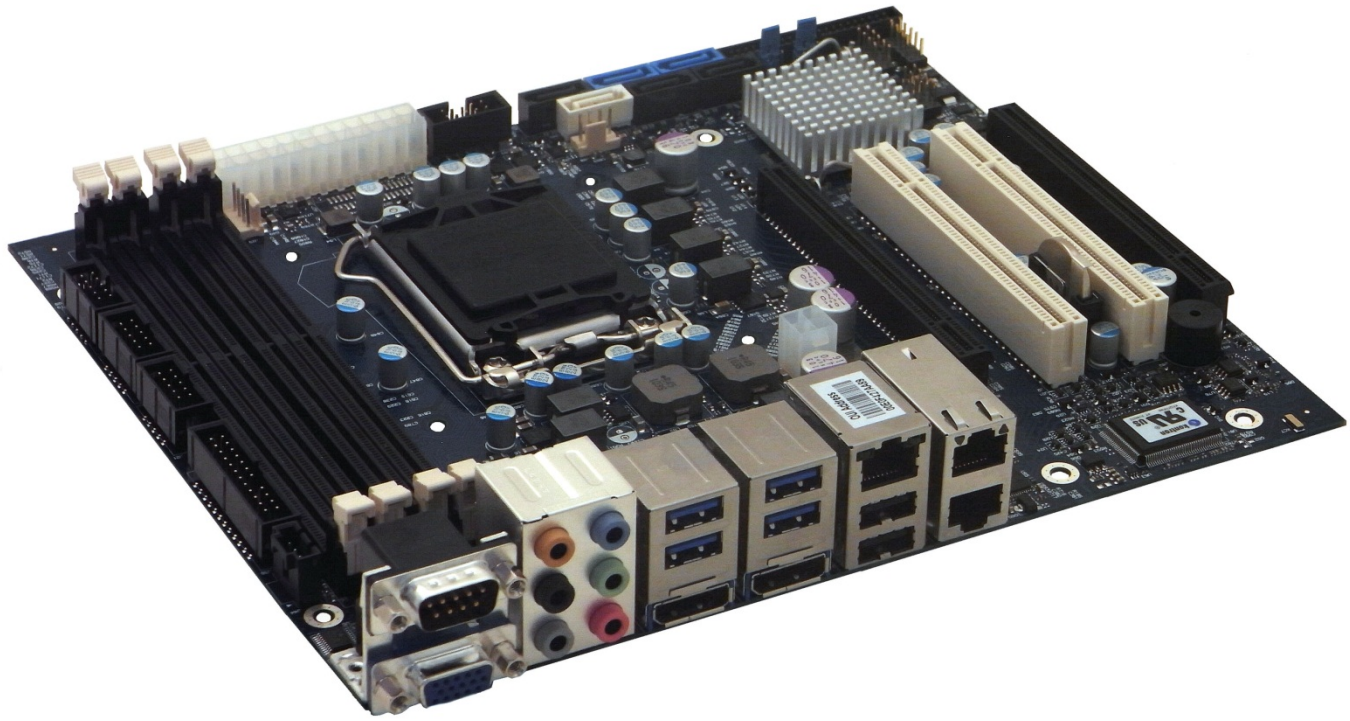
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» Kontron User's Guide «



KTQ77/Flex Users Guide

KTD-N0848-G

If it's embedded, it's Kontron

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Document Revision History.

Revision	Date	By	Comment
G	July 2019	CW	Include new note for the Power Specification
F	April 2019	CW	Include new note for the Power Connector Chapter 7.1
E	Sept. 2017	CW	Note to warn about carefully connecting the power connector
D	April 2016	GSZ	New memory SKU
C	Jan. 19th 2015	MLA	Correction of Mic2 and Line2 location. Note on RAM speed. EXT_BAT max. 3.47 V. Chapter 7.2.2 Riser Card note corrected.
B	Jan. 8th 2014	MLA	Added BIOS features: Force Boot Setup and PC Speaker/Beep.
A	Aug. 22nd 2013	MLA	Minor bugs. Removed 5V tolerance for some GPIO's. J11 and J30 descriptions corrected. 3.3V now 5% tolerance. CPU List updated. BIOS part added. System Resources tables corrected. RAM list updated. Block diagram improved.
0	Jun. 29th 2012	MLA	Preliminary version

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For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

⚠CAUTION



Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching

the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

⚠CAUTION

Danger of explosion if the battery is replaced incorrectly.

- Replace only with same or equivalent battery type recommended by the manufacturer.
- Dispose of used batteries according to the manufacturer's instructions.

KONTRON Technical Support and Services

If you have questions about installing or using your KONTRON Product, then please notice that you will find many answers in this Users Guide. To obtain support please contact your local Distributor or Field Application Engineer (FAE).

Before Contacting Support: Please be prepared to provide as much information as possible:

- CPU Board
  1. Type.
  2. Part Number (find PN on label)
  3. Serial Number if available (find SN on label)
- Configuration
  1. DRAM Type and Size.
  2. BIOS Revision (find the version info in the BIOS Setup).
  3. BIOS Settings different than *Default* Settings (refer to the BIOS Setup section).
- System
  1. O/S Make and Version.
  2. Driver Version numbers (Graphics, Network, and Audio).
  3. Attached Hardware: Harddisks, CD-Rom, LCD Panels etc.

If the Kontron product seems to be defect and you want to return it for repair, please follow the guide lines from the following page:

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit http://www.kontron.com/about-kontron/corporate-responsibility/quality-management.

Disposal and Recycling

Kontron's products are manufactured to satisfy environmental protection requirements where possible. Many of the components used are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- Reduce waste arising from electrical and electronic equipment (EEE)
- Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- Improve the environmental performance of all those involved during the lifecycle of EEE



Environmental protection is a high priority with Kontron.

Kontron follows the WEEE directive

You are encouraged to return our products for proper disposal.

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1 Introduction

This manual describes the KTQ77/Flex board made by KONTRON AG. The board will also be denoted KTQ77 in this manual.

The KTQ77 board is based on the Q77 chipset, support 2nd and 3rd generation Intel® i7 -, i5 -, i3 2Core and 4Core processors and also Pentium and Celeron processors. See “Processor Support Table for more specific details.

Use of this Users Guide implies a basic knowledge of PC-AT hard- and software. This manual is focused on describing the KTQ77 board’s special features and is not intended to be a standard PC-AT textbook.

New users are recommended to study the short installation procedure stated in the following chapter before switching-on the power.

Note. LPT and LVDS are optionally for future variants.

All configuration and setup of the CPU board is either done automatically or manually by the user via the BIOS setup menus. Only exception is the “Load Default BIOS Settings” Jumper.

2 Installation Procedure

2.1 Installing the Board

To get the board running, follow these steps. If the board shipped from KONTRON has already components like DRAM, CPU and cooler mounted, then relevant steps below, can be skipped.

1. **Turn off the PSU (Power Supply Unit)**



Warning: Turn off PSU (Power Supply Unit) completely (no mains power connected to the PSU) or leave the Power Connectors unconnected while configuring the board. Otherwise components (DRAM, LAN cards etc.) might get damaged. Make sure PSU has 3.3V monitoring watchdog (standard ATX PSU feature), running the board without 3.3V will damage the board within minutes.

2. **Insert the DRAM(s) (UDIMM 240pin)**
   Be careful to push it in the slot(s) before locking the tabs. For a list of approved DRAM contact your Distributor or FAE. See also chapter “System Memory Support”.

3. **Install the processor**
   The CPU is keyed and will only mount in the CPU socket in one way. Use finger to open/ close the CPU socket. Refer to supported processor overview for details.

4. **Cooler Installation**
   Use heat paste or adhesive pads between CPU and cooler and connect the Fan electrically to the FAN_CPU connector.

5. **Connecting Interfaces**
   Insert all external cables for hard disk, keyboard etc. A monitor must be connected in order to be able change CMOS settings.

6. **Connect and turn on PSU**
   Connect PSU to the board by the ATX/BTXPWR and the 4-pin ATX+12V connectors.



Warning: When connecting and disconnecting the power connector to the board, handle with care to prevent bending the PCB board. Bending the PCB board may damage components and can result in malfunction or prevent the board from functioning.

7. **Power Button**
   The PWRBTN_IN must be toggled to start the Power supply; this is done by shorting pins 16 (PWRBTN_IN) and pin 18 (GND) on the FRONTPNL connector (see Connector description). A “normally open” switch can be connected via the FRONTPNL connector.

8. **BIOS Setup**
   Enter the BIOS setup by pressing the <Del> key during boot up.
   Enter Exit Menu and Load Optimal Defaults.
   Refer to the “BIOS Configuration / Setup“ section of this manual for details on BIOS setup.

Note: To clear all CMOS settings, including Password protection, move the Clear CMOS jumper in the Clear CMOS position (with or without power) for ~10 sec. This will Load Failsafe Defaults and make sure Secure CMOS is disabled.

9. **Mounting the board to chassis**



Warning: When mounting the board to chassis etc. please notice that the board contains components on both sides of the PCB which can easily be damaged if the board is handled without reasonable care. A damaged component can result in malfunction or prevent the board from functioning.

When fixing the Motherboard on a chassis it is recommended using screws with integrated washer and having diameter of ~7mm.
Note: Do not use washers with teeth, as they can damage the PCB and may cause short circuits.

2.2 Requirement according to IEC60950

Users of KTQ77 family boards should take care when designing chassis interface connectors in order to fulfil the IEC60950 standard:

When an interface/connector has a VCC (or other power) pin, which is directly connected to a power plane like the VCC plane:

To protect the external power lines of the peripheral devices, the customer has to take care about:
- That the wires have suitable rating to withstand the maximum available power.
- That the enclosure of the peripheral device fulfils the fire protecting requirements of IEC60950.

Lithium Battery precautions:

CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.	**VORSICHT!** Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch den selben oder einen vom Hersteller empfohlenen gleichwertigen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.
ADVARSEL! Lithiumbatteri – Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.	**ADVARSEL** Eksplosjonsfare ved feilaktig skifte av batteri. Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten. Brukte batterier kasseres i henhold til fabrikantens instruksjoner.
VARNING Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.	**VAROITUS** Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laltevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

3 System Specification

3.1 Component main data

The table below summarizes the features of the KTQ77/Flex embedded motherboard.

Form factor	KTQ77/Flex: Flex-ATX (190,5 mm by 228,6 mm)
Processor	Support the following Intel® Core™ processors via Socket H2 (LGA1155), ZIF Socket • Intel® Core™ i7, 2nd and 3rd Generation • Intel® Core™ i5, 2nd and 3rd Generation • Intel® Core™ i3, 2nd and 3rd Generation • 1333/1600MHz system bus and 3/6/8MB internal cache. • Up to 95W (Thermal Guideline) • PCIe x16 (PEG) Gen3.0
Memory	• 4x DDR3 UDIMM 240pin socket • Support single and dual ranks DDR3 1066/1333/1600MT/s (PC3-8500/PC3-10600/PC3-12800) • Support system memory from 1GB and up to 4x 8GB Note: Less than 4GB displayed in System Properties using 32bit OS (Shared Video Memory/PCI resources is subtracted) • ECC not supported
Chipset	Intel Q77 PCH (Platform Controller Hub) • Intel ® VT-d (Virtualisation Technology for Directed I/O) • Intel ® TXT (Trusted Execution Technology) • Intel ® vPRO • Intel ® AMT (Active Management Technology) version 8.0 • Intel ® AT (Anti-Theft Technology) • Intel ® HD Audio Technology • Intel ® RST (Rapid Storage Technology) • Intel ® RRT (Rapid Recover Technology) • SATA (Serial ATA) 6Gb/s and 3Gb/s. • USB 4x rev. 3.0/2.0 + 10x rev. 2.0 • PCIe x4 (in x16 slot) Gen2.0 • ACPI 3.0b compliant • Triple Display support (Triple Graphic Pipes) • Blue-ray HD video playback
Security	• Intel® Integrated TPM 1.2 support
Management	• Intel® AMT (Active Management Technology) 8.0
Audio	Audio, 7.1 Channel High Definition Audio Codec using the VIA 1708B codec • Line-out • Line-in • Surround output: SIDE, LFE, CEN, BACK and FRONT • Microphone: MIC1 and MIC2 • CDROM in • SPDIF (electrical Interface only) • On-board speaker (Electromagnetic Sound Generator like Hycom HY-05LF)

Video	Intel ® HD Graphics 4000 or Intel ® HD Graphics 3000 or Intel ® HD Graphics 2500 or Intel ® HD Graphics 2000 or Intel ® HD Graphics, depending on actual CPU. Analogue VGA and digital display ports (2x DP) via the Mobile Intel ® Q77 Chipset. • VGA (analogue panel) • 2x DP (DisplayPort), comply with DisplayPort 1.2 specification. • LVDS panel support (optional) up to 24 bit, 2 pixels/clock and 1920x1200. • HDMI panel support via DP to HDMI Adapter Converter. • Second VGA panel support via DP to VGA Adapter Converter • Second DVI panel support via DP to DVI Adapter Converter • Triple independent pipes for Mirror and/or independent display support
I/O Control	Via ITE IT8516E Embedded Controller and Winbond W83627DHG I/O Controller (both via LPC Bus interface)
Peripheral interfaces	• 2x USB 2.0 ports on I/O area • 4x USB 3.0 ports on I/O area • 8x USB 2.0 ports on internal pinrows • 4x Serial ports (RS232) on internal pinrows • 2x Serial ATA-600 IDE interfaces (blue) • 4x Serial ATA-300 IDE interfaces (black) • 1x Serial ATA-300 IDE interfaces (white), shared with mSATA • RAID 0/1/5/10 support • mSATA via mSATA connector, shared with SATA (white) • PS/2 keyboard and mouse ports via pinrow
LAN Support	• 1x 10/100/1000Mbits/s LAN (ETHER1) using Intel® Lewisville 82579LM Gigabit PHY connected to Q77 supporting AMT 8.0 • 2x 10/100/1000Mbits/s LAN (ETHER2/ETHER3)using Intel® Hartwell 82574L PCI Express controllers • PXE Netboot supported. • Wake On LAN (WOL) supported
Expansion Capabilities	• 2x PCI slot(s) (PCI Local Bus Specification Revision 3.0, 33MHz) • PCI-Express slots: o 1 slot PCIe x16 Gen3.0 o 1 slot PCIe x4 (in a x16 slot) Gen2 (EFT samples support only PCIe x1) o 1 slot miniPCI-Express • SMBus, compatible with ACCES BUS and I2C BUS, (via Feature connector) • SPI bus routed to SPI connector • DDC Bus routed to DP connector when DP Adapters are connected • 5 x digital input, (via Feature connector) • 13 x GPIOs (General Purpose I/Os), (via Feature connector) • DAC, ADC, PWM and TIMER (Multiplexed), (via Feature connector) • WAKE UP / Interrupt Inputs (Multiplexed), (via Feature connector) • 3 Wire Bus for GPIO Expansion (up to 152 GPIOs), (via Feature connector) • 8 bit Timer output, (via Feature connector)

Hardware Monitor Subsystem	• Smart Fan control system, support Thermal® and Speed® cruise for FAN_CPU • CPU die temperature input (Precision +/- 3ºC) • Voltage monitoring • Intrusion (Case Open) detect input, (via Feature connector) • Sleep S4/S5# Indication, (via Feature connector) • System Powergood Signal, (via Feature connector)
Power Supply Unit	ATX/BTX (w. ATX+12V) PSU for full PCI/PCIe load.
Battery	Exchangeable 3.0V Lithium battery for on-board Real Time Clock and CMOS RAM. Manufacturer Panasonic / Part-number CR-2032L/BN, CR2032N/BN or CR-2032L/BE. Approximate 5 years retention. Current draw is 5,7µA when PSU is disconnected and 0 µA in S0 – S5. **CAUTION: Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.**

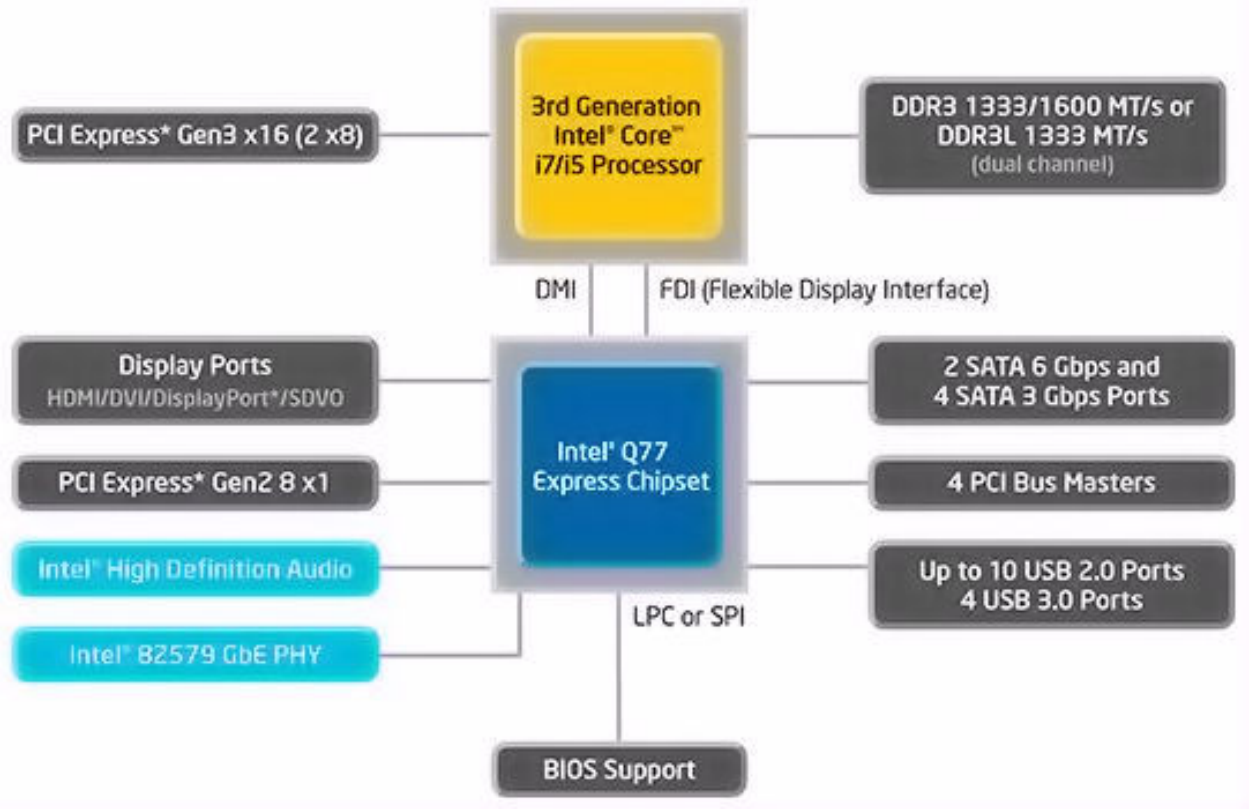
BIOS	• Kontron/ AMI BIOS (EFI core version)
	• Support for ACPI 3.0 (Advanced Configuration and Power Interface), Plug & Play
	  o Suspend (S1 mode)
	  o Suspend To Ram (S3 mode)
	  o Suspend To Disk (S4 mode)
	• "Always On" BIOS power setting
	• RAID Support (RAID modes 0,1, 5 and 10)

Operating Systems Support	• WinXP (32b *) • Windows 7 (32b + 64b *) • WES7 (32b * + 64b *) • Linux Fedora * • Linux Ubuntu * (RAID problem) • VxWorks BSP, WES7 BSP, Kontron Linux BSP (not ready yet) *= Out Of The Box installation test only

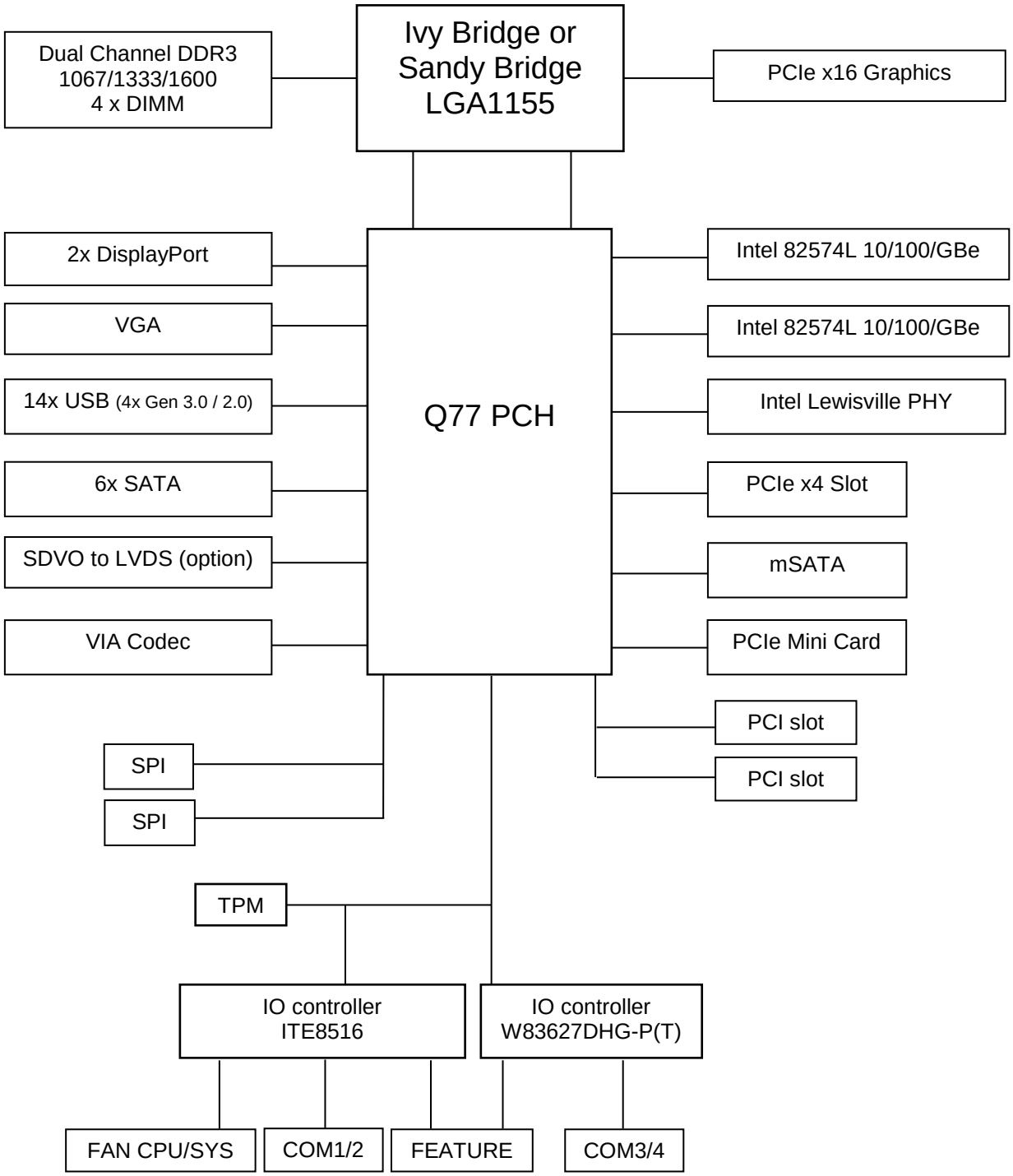
Environmental Conditions	**Operating**: 0°C – 60°C operating temperature (forced cooling). It is the customer's responsibility to provide sufficient airflow around each of the components to keep them within allowed temperature range. 10% - 90% relative humidity (non-condensing) **Storage**: -20°C – 70°C; lower limit of storage temperature is defined by specification restriction of on-board CR2032 battery. Board with battery has been verified for storage temperature down to -40°C by Kontron. 5% - 95% relative humidity (non-condensing) **Electro Static Discharge (ESD) / Radiated Emissions (EMI):** All Peripheral interfaces intended for connection to external equipment are ESD/ EMI protected. EN 61000-4-2:2000 ESD Immunity EN55022:1998 class B Generic Emission Standard. **Safety:** IEC 60950-1: 2005, 2nd Edition UL 60950-1 CSA C22.2 No. 60950-1 Product Category: Information Technology Equipment Including Electrical Business Equipment Product Category CCN: NWGQ2, NWGQ8 File number: E194252 **Theoretical MTBF:** 216227 / 100903 hours @ 40ºC / 60ºC for the KTQ77/Flex **Restriction of Hazardous Substances (RoHS):** All boards in the KTQ77 family are RoHS compliant. **Capacitor utilization:** No Tantalum capacitors on board Only Japanese brand Solid capacitors rated for 100 ºC used on board

3.2 System overview

The block diagram below shows the architecture and main components of the KTQ77. The key component on the board is the Intel® Q77 (Panther Point) Express Chipset.



More detailed block diagram on next page.


Dual Channel DDR3
1067/1333/1600
4 x DIMM
Ivy Bridge or
Sandy Bridge
LGA1155
PCIe x16 Graphics
2x DisplayPort
VGA
14x USB (4x Gen 3.0 / 2.0)
6x SATA
SDVO to LVDS (option)
VIA Codec
Q77 PCH
Intel 82574L 10/100/GBe
Intel 82574L 10/100/GBe
Intel Lewisville PHY
PCIe x4 Slot
mSATA
PCIe Mini Card
PCI slot
PCI slot
SPI
SPI
TPM
IO controller
ITE8516
IO controller
W83627DHG-P(T)
FAN CPU/SYS
COM1/2
FEATURE
COM3/4

3.3 Processor Support Table

The KTQ77 is designed to support the following LGA1155 processors (up to 95W power consumption):

2nd and 3rd generation Intel® Core™ i7 processor

2nd and 3rd generation Intel® Core™ i5 processor

2nd and 3rd generation Intel® Core™ i3 processor

Pentium and Celeron



In the following list you will find all CPU's supported by the chipset in according to Intel.

Embedded CPU's are indicated by green text, successfully tested CPU's are indicated by **highlighted** text, successfully tested embedded CPU's are indicated by **green and highlighted** text and failed CPU's are indicated by red text.

Some processors in the list are distributed from Kontron, those CPU's are marked by an * (asterisk). However please notice that this marking is only guide line and maybe not fully updated.

Processor Brand	Clock [GHz]	Turbo [GHz]	Cores / Threads	Bus [MHz]	Cache [MB]	CPU Number	sSpec no.	Step	TG [W/°C]	Note
I7 3rd Gen. (Ivy Bridge)	3.5	3.9	4 / 8	1333/1600	8	3770K	SR0PL	E1	77/67.4	HDG4000
	3.4	**3.9**	**4 / 8**	**1333/1600**	**8**	**3770**	**SR0PK**	**E1**	**77/67.4**	**HDG4000**
	3.1	3.9	4 / 8	1333/1600	8	3770S	SR0PN	E1	65/69.1	HDG4000
	2.5	3.7	4 / 8	1333/1600	8	3770T	SR0PQ	E1	45/69.8	HDG4000
I7 2nd Gen. (Sandy Bridge)	3.5	3.9	4 / 8	1066/1333	8	2700K	SR0DG	D2	95/72.6	HDG3000
	3.4	**3.8**	**4 / 8**	**1066/1333**	**8**	**2600**	**SR00B**	**D2**	**95/72.6**	HDG2000
	3.4	3.8	4 / 8	1066/1333	8	2600K	SR00C	D2	95/72.6	HDG3000
	2.8	3.8	4 / 8	1066/1333	8	2600S	SR00E	D2	65/69.1	HDG2000
I5 3rd Gen. (Ivy Bridge)	3.4	3.8	4 / 4	1333/1600	6	3570	SR0T7	N0	77/67.4	HDG2500
	3.4	3.8	4 / 4	1333/1600	6	3570K	SR0PM	E1	77/67.4	HDG4000
	3.3	3.7	4 / 4	1333/1600	6	3550	SR0P0	E1	77/67.4	HDG2500
	3.2	3.6	4 / 4	1333/1600	6	3470	SR0T8	N0	77/67.4	HDG2500
	3.1	3.8	4 / 4	1333/1600	6	3570S	SR0T9	N0	65/69.1	HDG2500
	3.1	3.5	4 / 4	1333/1600	6	3450	SR0PF	E1	77/67.4	HDG2500
	3.1	3.3	4 / 4	1333/1600	6	3350P	SR0WS	E1	69/67.4	-
	3.0	**3.7**	**4 / 4**	**1333/1600**	**6**	**3550S**	**SR0P3**	**E1**	**65/69.1**	**HDG2500**
	3.0	3.2	4 / 4	1333/1600	6	3330	SR0RQ	E1	77/67.4	HDG2500
	2.9	3.6	4 / 4	1333/1600	6	3475S	SR0PP	E1	65/69.1	HDG4000
	2.9	3.6	4 / 4	1333/1600	6	3470S	SR0TA	N0	65/69.1	HDG2500
	2.9	3.6	2 / 4	1333/1600	3	3470T	SR0RJ	L1	35/65.0	HDG2500 *
	2.8	3.5	4 / 4	1333/1600	6	3450S	SR0P2	E1	65/69.1	HDG2500
	2.7	3.5	4 / 4	1333/1600	6	3330S	SR0RR	E1	65/	HDG2500
	2.3	3.2	4 / 4	1333/1600	6	3570T	SR0P1	E1	45/69.8	HDG2500
I5 2nd Gen. (Sandy Bridge)	3.3	3.7	4 / 4	1066/1333	6	2550K	SR0QH	D2	95/72.6	-
	3.3	3.7	4 / 4	1066/1333	6	2500K	SR008	D2	95/72.6	HDG3000
	3.3	3.7	4 / 4	1066/1333	6	2500	SR00T	D2	95/72.6	HDG2000
	3.2	3.5	4 / 4	1066/1333	6	2450P	SR0G1	D2	95/72.6	-
	3.1	3.4	4 / 4	1066/1333	6	2380P	SR0G2	D2	95/72.6	-
	3.1	**3.4**	**4 / 4**	**1066/1333**	**6**	**2400**	**SR00Q**	**D2**	**95/72.6**	**HDG2000**
	3.0	3.3	4 / 4	1066/1333	6	2320	SR02L	D2	95/72.6	HDG2000
	2.9	3.2	4 / 4	1066/1333	6	2310	SR02K	D2	95/72.6	HDG2000
	2.8	3.1	4 / 4	1066/1333	6	2300	SR00D	D2	95/72.6	HDG2000
	2.7	3.7	4 / 4	1066/1333	6	2500S	SR009	D2	65/69.1	HDG2000
	2.7	3.5	2 / 4	1066/1333	3	2390T	SR065	Q0	35/65.0	HDG2000
	2.5	3.3	4 / 4	1066/1333	6	2405S	SR0BB	D2	65/69.1	HDG3000
	2.5	3.3	4 / 4	1066/1333	6	2400S	SR00S	D2	65/69.1	HDG2000
	2.3	3.3	4 / 4	1066/1333	6	2500T	SR00A	D2	45/69.8	HDG2000

Processor Brand	Clock [GHz]	Turbo [GHz]	Cores / Threads	Bus [MHz]	Cache [MB]	CPU Number	sSpec no.	Step	TG [W/°C]	Note
I3 3rd Gen. (Ivy Bridge) (No vPRO)	3.5	-	2 / 4	1333/1600	3	3250	SR0YX	P0	55/65.3	HDG2500
	3.4	-	2 / 4	1333/1600	3	3245	SR0YL	L1	55/65.3	HDG4000
	3.4	-	2 / 4	1333/1600	3	3240	SR0RH	L1	55/65.3	HDG2500
	3.3	-	2 / 4	1333/1600	3	3225	SR0RF	L1	55/65.3	HDG4000
	3.3	**-**	**2 / 4**	**1333/1600**	**3**	**3220**	**SR0RG**	**L1**	**55/65.3**	**HDG2500**
	3.2	-	2 / 4	1333/1600	3	3210	SR0YY	P0	55/65.3	HDG2500
	3.0	-	2 / 4	1333/1600	3	3250T	SR0YW	P0	35/65.0	HDG2500
	2.9	-	2 / 4	1333/1600	3	3240T	SR0RK	L1	35/65.0	HDG2500
	2.8	-	2 / 4	1333/1600	3	3220T	SR0RE	L1	35/65.3	HDG2500
I3 2nd Gen. (Sandy Bridge) (No vPRO)	3.4	-	2 / 4	1066/1333	3	2130	SR05W	Q0	65/69.1	HDG2000
	3.3	-	2 / 4	1066/1333	3	2125	SR0AY	J1	65/69.1	HDG3000
	3.3	**-**	**2 / 4**	**1066/1333**	**3**	**2120**	**SR05Y**	**Q0**	**65/69.1**	HDG2000
	3.1	-	2 / 4	1066/1333	3	2105	SR0BA	J1	65/69.1	HDG3000
	3.1	-	2 / 4	1066/1333	3	2100	SR05C	Q0	65/69.1	HDG2000
	3.1	-	2 / 4	1066/1333	3	2102	SR05D	Q0	65/69.1	HDG2000
	2.6	-	2 / 4	1066/1333	3	2120T	SR060	Q0	35/65.0	HDG2000
	2.5	-	2 / 4	1066/1333	3	2100T	SR05Z	Q0	35/65.0	HDG2000
Pentium	3.1	-	2 / 2	1066/1333	3	G870	SR057	Q0	65/69.1	HDG
	3.0	-	2 / 2	1066/1333	3	G860	SR058	Q0	65/69.1	HDG
	2.9	**-**	**2 / 2**	**1066/1333**	**3**	**G850**	**SR05Q**	**Q0**	**65/69.1**	**HDG**
	2.9	-	2 / 2	1066	3	G645	SR0RS	Q0	65/69.1	HDG
	2.8	-	2 / 2	1066/1333	3	G840	SR05P	Q0	65/69.1	HDG
	2.8	-	2 / 2	1066	3	G640	SR059	Q0	65/69.1	HDG
	2.7	-	2 / 2	1066	3	G632	SR05N	Q0	65/69.1	HDG
	2.7	-	2 / 2	1066	3	G630	SR05S	Q0	65/69.1	HDG
	2.8	-	2 / 2	1066/1333	3	G860T	SR0MF	Q0	35/65.0	HDG
	2.6	-	2 / 2	1066	3	G620	SR05R	Q0	65/69.1	HDG
	2.6	-	2 / 2	1066	3	G622	-	-	65/69.1	HDG
	2.5	-	2 / 2	1066	3	G645T	SR0S0	Q0	35/65.0	HDG
	2.4	-	2 / 2	1066	3	G640T	SR066	Q0	35/65.0	HDG
	2.2	-	2 / 2	1066	3	G620T	SR05T	Q0	35/65.0	HDG
	2.3	-	2 / 2	1066	3	G630T	SR05U	Q0	35/65.0	HDG
Celeron	2.7	-	2 / 2	1333	2	G1620	SR10L	P0	55	HDG *
	2.7	-	2 / 2	1066	2	G555	SR0RZ	Q0	65/69.1	HDG
	2.6	-	2 / 2	1333	2	G1610	SR10K	P0	55	HDG *
	2.6	-	2 / 2	1066	2	G550	SR061	Q0	65/69.1	HDG
	2.5	**-**	**2 / 2**	**1066**	**2**	**G540**	**SR05J**	**Q0**	**65/69.1**	**HDG**
	2.4	-	2 / 2	1066	2	G530	SR05H	Q0	65/69.1	HDG
	2.3	-	2 / 2	1333	2	G1610T	SR10M	P0	35/	HDG *
	2.2	-	2 / 2	1066	2	G550T	SR05V	Q0	35/65.0	HDG
	2.1	-	2 / 2	1066	2	G540T	SR05L	Q0	35/65.0	HDG
	2.0	-	2 / 2	1066	2	G530T	SR05K	Q0	35/65.0	HDG
	2.0	-	1 / 2	1066/1333	1.5	G470	SR0S7	Q0	35/65.5	HDG
	1.8	-	1 / 2	1066	1.5	G460	SR0GR	Q0	35/65.5	HDG
	1.6	-	1 / 1	1066	1	G440	SR0BY	Q0	35/65.5	HDG

(*) ECC not supported on KTQ77.

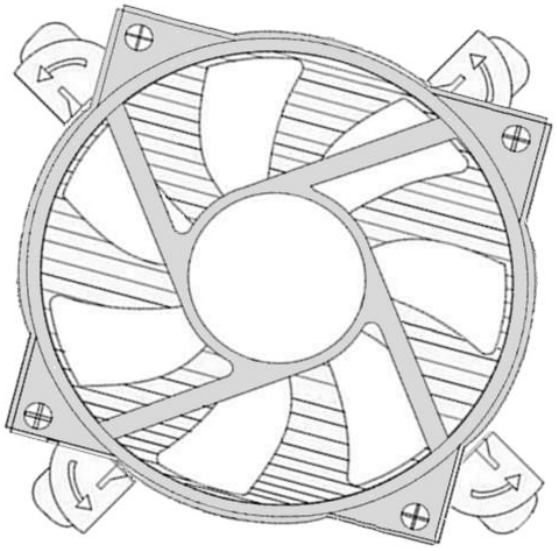
Not all CPUs, even of same type, support all functions ex. i7 3770K, i7 2600K, i5 3570K, 3450, 3450S, 3350P, 3330S, 3330 and i5 2500K, 2300,2310, 2320, 2380P, 2450P, 2550K doesn't support vPro while all other i7 and i5 does.

Intel® Turbo Boost Technology 2.0 is supported by i5 and i7, as indicated in above list of processors, and is enabling overclocking of all cores, when operated within the limits of thermal design power, temperature and current.

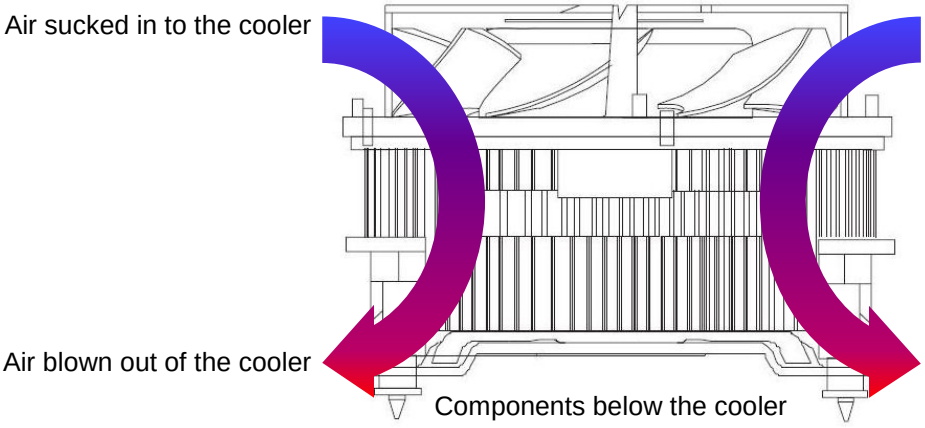
Sufficient cooling must be applied to the CPU in order to remove the effect as listed in above table (Thermal Guideline). The sufficient cooling is also depending on the maximum (worst-case) ambient operating temperature and the actual load of processor.

Warning: Make sure sufficient airflow is always present around the components located below the cooler. Different coolers are available on the market and some is not generating any airflow or is blocking the airflow around these components, causing reduced lifetime.

It is recommended to use a cooler like the Kontron PN 1046-6305 “KTQ77 Cooler”.



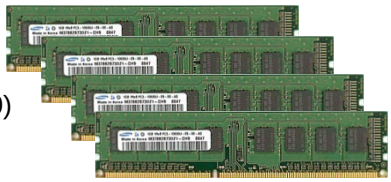
The design of this cooler makes sure airflow is always present around the components below the cooler. Even if Fan is set to be off, it is still running a minimum RPM (Rotation Per Minute).



Note: The temperature of the air blown out of the cooler must be less than 70°C maximum in order not to overheat components near the CPU. However most CPU’s requires maximum 67.4ºC, so in order not to violate the CPU specification the temperature of the air should be maximum ~65ºC.

3.4 System Memory support

The KTQ77/FLEX has four DDR3 UDIMM sockets. The sockets support the following memory features:



- 4x DDR3 1.5V UDIMM 240-pin
- Dual-channel with 2 UDIMM per channel
- Single/dual rank unbuffered 1333/1600MT/s (PC3-10600/PC3-12800)
  The supported 2nd Generation Core i5 support 1066/1333 MT/s
  From 1GB and up to 4x 8GB.
  Note: Less than 4GB displayed in System Properties using 32bit OS
  (Shared Video Memory/PCI resources is subtracted)
- SPD timings supported
- ECC not supported

The installed DDR3 DIMM should support Serial Presence Detect (SPD) data structure. This allows the BIOS to configure the memory controller for optimal performance. If non-SPD memory is used, the BIOS will attempt to configure the memory settings, but performance and reliability may be impacted.

Memory Operating Frequencies
Regardless of the DIMM type used, the memory frequency will either be equal to or less than the processor system bus frequency. For example, if DDR3 1600 memory is used with a 1333 MHz system bus frequency processor, the memory clock will operate at 666 MHz. The table below lists the resulting operating memory frequencies based on the combination of DIMMs and processors.

DIMM Type	Module name	Memory Data transfers [Mill/s]	Processor system bus frequency [MHz]	Resulting memory clock frequency [MHz]	Peak transfer rate [MB/s]
DDR3 1066	PC3-8500	1066	1066 / 1333	533	8533
DDR3 1333	PC3-10600	1333	1333/1600	666	10666
DDR3 1600	PC3-12800	1600	1333	666	10666
DDR3 1600	PC3-12800	1600	1600	800	12800

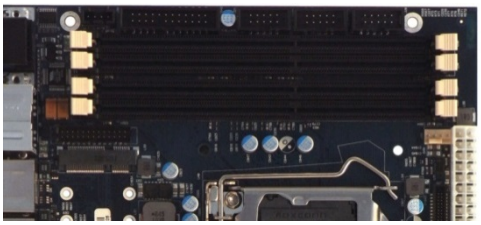
Notes: Kontron offers the following memory modules:
Please notice that not all speeds are supported by all CPU's.

NEW SKU 04/2016*	SKU Name**	OLD SKU before 04/2016
1060-2490	DDR3-1066 DIMM 4GB	1054-3700
1060-2492	DDR3-1333 DIMM 2GB	1054-3702
1060-2494	DDR3-1333 DIMM 4GB	1054-3703
1060-2496	DDR3-1333 DIMM 8GB	1054-3704
1060-2498	DDR3-1600 DIMM 2GB	1054-3707
1060-2500	DDR3-1600 DIMM 4GB	1054-3708
1060-2488	DDR3-1600 DIMM 8GB	1052-5601

*SKU changes were caused by administrative issues only, no hardware changes.
**Named are always the min. requirements, the shipped memory can fulfill a higher performance level

It has not been verified that the combination of CPU supporting Bus Speed 1600 MHz and DDR3 1600 actually runs at 1600 MHz.

In order to support Intel ® AMT (Management Engine) SLOT A0 **must** always be populated. In case of using more than a single DIMM it is recommended to populate A0 + B0 first.



(Example Flex version)

3.5 KTQ77 Graphics Subsystem

The KTQ77 equipped with Intel 3rd generation Core i3, i5 or i7 processor, supports Intel ® HD Graphics 2500/4000 depending on specific processor and KTQ77 equipped with Intel 2nd generation Core i5 processor, supports Intel ® HD Graphics 2000 (only i5-2400 supported). In the following only GFX for 3rd generation core processors are described.

All KTQ77 versions support analogue VGA and digital display ports (2x DP) via the Intel ® Q77 Chipset. Optionally LVDS support.

The DP interface supports the DisplayPort 1.2 specification. The PCH supports High-bandwidth Digital Content Protection for high definition content playback over digital interfaces. The PCH also integrates audio codecs for audio support over DP interfaces.

Up to three displays (any three display outputs) can be activated at the same time and be used to implement dual independent display support and/or mirror display support. PCIe and PCI graphics cards can be used to replace on-board graphics or in combination with on-board graphics.

3.5.1 Intel® HD Graphics 4000/2500

Features of the Intel HD Graphics 4000/2500 build into the i3, i5 and i7 processors, includes:

- High quality graphics engine supporting
  - DirectX11 and OpenGL 4.0 compliant
  - Shader Model 5.0 support
  - Intel ® Clear Video HD Technology
  - Intel ® Quick Sync Video Technology
  - Intel ® Flexible Display Interface (Intel ® FDI)
  - Core frequency of 650 - 1150 (Turbo) MHz
  - Memory Bandwidth up to 21.3 GB/s
  - 6 3D Execution Units (HD Graphics 2500)
  - 16 3D Execution Units(HD Graphics 4000)
  - 1.62 GP/s and 2.7 GP/S pixel rate (DP outputs)
  - Hardware Acceleration CVT HD and QSV
  - Dynamic Video Memory Technology (DVMT) support up to 1720 MB

- LVDS panel Support (optional), 18/24 bit colours in up to WUXGA (1920x1200) @60 Hz and SPWG (VESA) colour coding. OpenLDI (JEIDA) colour coding is 18 bit with or without Dithering.

- DP0 and DP1
  - 24/30 bit colours in WQXGA (2560x1600 pixels) and HDCP.
  - DisplayPort standard 1.2

Use of DP Adapter Converters can implement HDMI support or second VGA or DVI panel support.

The HDMI interface supports the HDMI 1.4a specification and includes audio codecs. However limitations to the resolution apply:
2048x1536 VGA
1920x1200 HDMI and DVI



DP to VGA PN 1045-5779 | DP to HDMI PN 1045-5781 | DP to DVI-D PN 1045-5780

3.6 Power Specification

In order to ensure safe operation of the board, the ATX12V power supply must monitor the supply voltage and shut down if the supplies are out of range – refer to the hardware manual for the actual power supply specification. The KTQ77 board is powered through the ATX/BTX connector and ATX+12V connector. Both connectors must be used in according to the ATX12V PSU standard.

The supply voltage requirements are as follows:

Supply	Min	Max	Note
VCC3.3	3.135V	3.465V	Should be ±5% for compliance with the ATX specification
Vcc	4.75V	5.25V	Should be ±5% for compliance with the ATX specification. Should be minimum 5.00V measured at USB connectors in order to meet the requirements of USB standard.
+12V	11.4V	12.6V	Should be ±5% for compliance with the ATX specification
–12V	–13.2V	–10.8V	Should be ±10% for compliance with the ATX specification
-5V	-5,50V	-4.5V	Not required for the KTQ77 board
5VSB	4.75V	5.25V	Should be ±5% for compliance with the ATX specification

Notice: If there is an unintentional voltage drop in the electrical mains power supply for longer than the specified holdup time (brownout), then all supply voltages should be shut down and remain in the off state long enough to allow internal voltages to discharge sufficiently. Failure to observe this off state time means that parts of the product or attached peripherals may work incorrectly or suffer a reduction of MTBF.
The minimum off state time, to allow internal voltages to discharge, depends on the implemented PSU model and additional electrical factors. To determine the required off state time, each case must be considered individually.
For more information, contact Kontron Support.

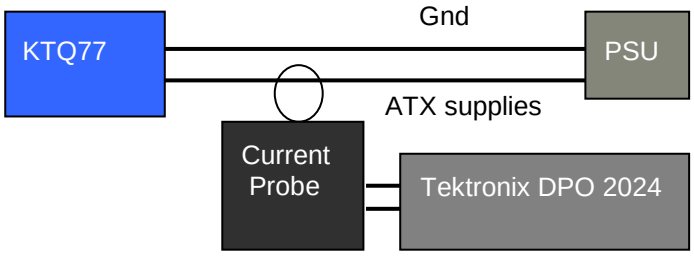
3.6.1 Power Consumption

On the following pages the power consumption of the KTQ77 Board is measured under:

1- DOS, idle, mean
2- Windows7, Running 3DMARK 2005 & BiT 6, mean
3- S1, mean
4- S3, mean
5- S4, mean

The following items were used in the test setup:

Low Power Setup
Standard system configuration equipped with PCI card, Internal graphics, 2x SATA disks, Intel i3 CPU, 2x DIMM 2GB Modules, DP Monitor, Keyboard & Mouse. 1x 1-4GB USB Flash Stick, 1x 1GB LAN
High Power Setup
Standard system configuration equipped with PCI card, PCIex4, PCIex16, miniPCIe WLAN, 4x SATA disks, Intel i7 CPU, 4x DIMM 2GB Modules, DP Monitor, Keyboard & Mouse, 3x 1-4GB USB Flash Stick, 3x 1GB LAN.



Note: The Power consumption of Display and HD are not included.

Low Power Setup results:

DOS Idle, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	0,37A	3,96W
+12V P4	0,80A	9,60W
+5V	1,22A	6,10W
+3V3	0,25A	0,83W
-12V	< 100mA	
5VSB	< 10 mA	
Total		20,49W

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw**	**Power consumption**
+12V	0,37A	4,44W
+12V P4	1,62A	19,44W
+5V	2,15A	10,75W
+3V3	0,39A	1,29W
-12V	< 100mA	
5VSB	< 10 mA	
Total		35,92W

S1 Mode, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	0,30A	3,60W
+12V P4	0,37A	4,44W
+5V	0,85A	4,25W
+3V3	0,28A	0,92W
-12V	< 100mA	
5VSB	< 100mA	
Total		13,21W

S3 Mode, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	0	0W
+12V P4	0	0W
+5V	0	0W
+3V3	0	0W
-12V	0	0W
5VSB	< 100mA	<0.5W
Total		<0.5W

S4 Mode, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	0	0W
+12V P4	0	0W
+5V	0	0W
+3V3	0	0W
-12V	0	0W
5VSB	< 100mA	<0.5W
Total		<0.5W

High Power Setup results:

DOS Idle, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	1,72A	20,64W
+12V P4	0,98A	11,76W
+5V	1,60A	8,00W
+3V3	1,38A	4,55W
-12V	< 500mA	
5VSB	< 50 mA	
Total		44,55W

Windows 7, mean 3DMARK2005 (first scene) & BiT 6		
Supply	**Current draw**	**Power consumption**
+12V	1,70A	20,40W
+12V P4	3,60A	43,20W
+5V	2,60A	13,00W
+3V3	1,86A	6,138W
-12V	< 100mA	
5VSB	< 10 mA	
Total		82,74W

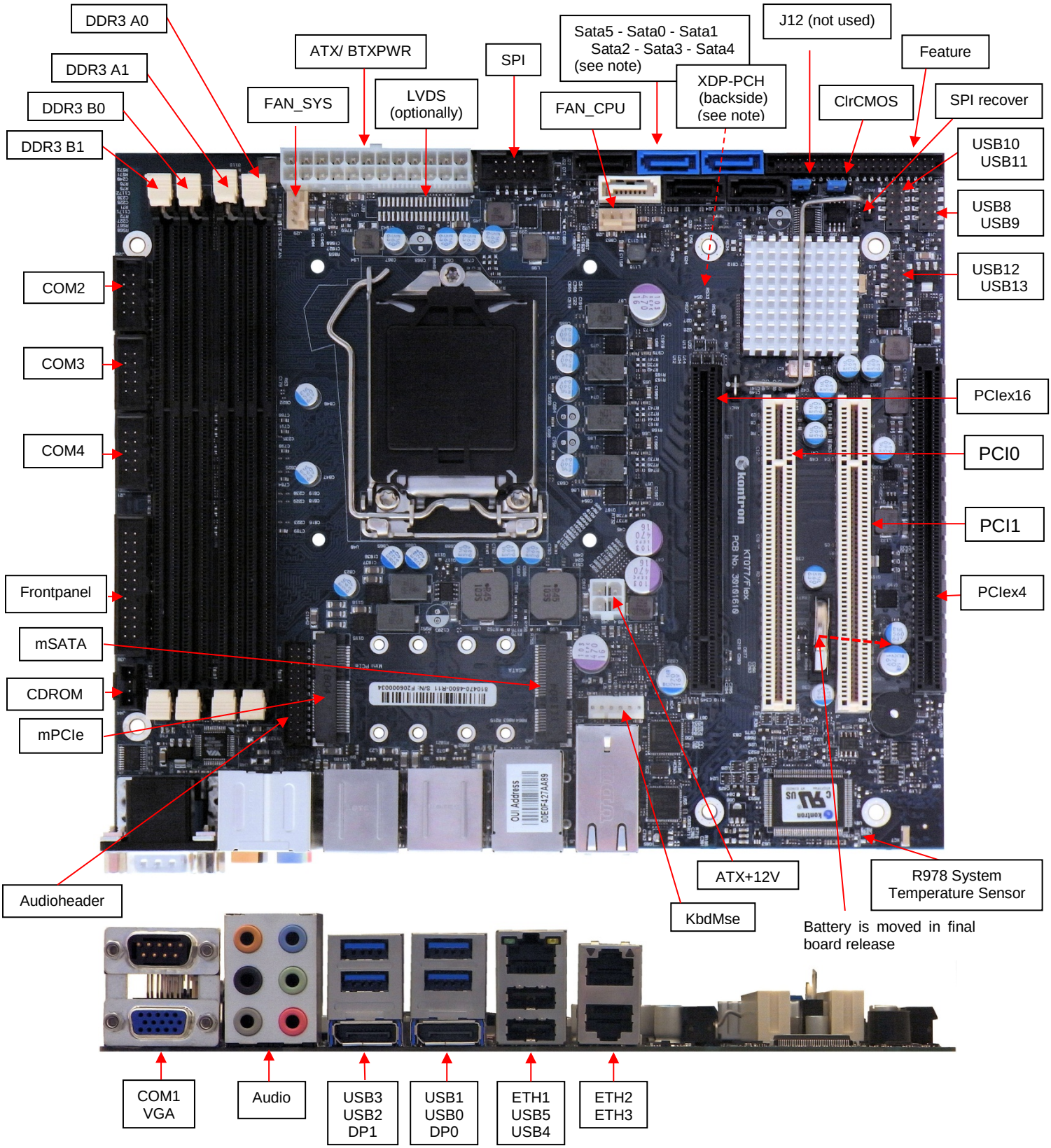
S1 Mode, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	1,40A	16,80W
+12V P4	0,52A	6,24W
+5V	1,10A	5,50W
+3V3	1,26A	4,16W
-12V	< 100mA	
5VSB	< 10 mA	
Total		32,70W

S3 Mode, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	0	0W
+12V P4	0	0W
+5V	0	0W
+3V3	0	0W
-12V	0	0W
5VSB	< 100mA	<0.5W
Total		<0.5W

S4 Mode, Mean, No external load		
Supply	**Current draw**	**Power consumption**
+12V	0	0W
+12V P4	0	0W
+5V	0	0W
+3V3	0	0W
-12V	0	0W
5VSB	< 100mA	<0.5W
Total		<0.5W

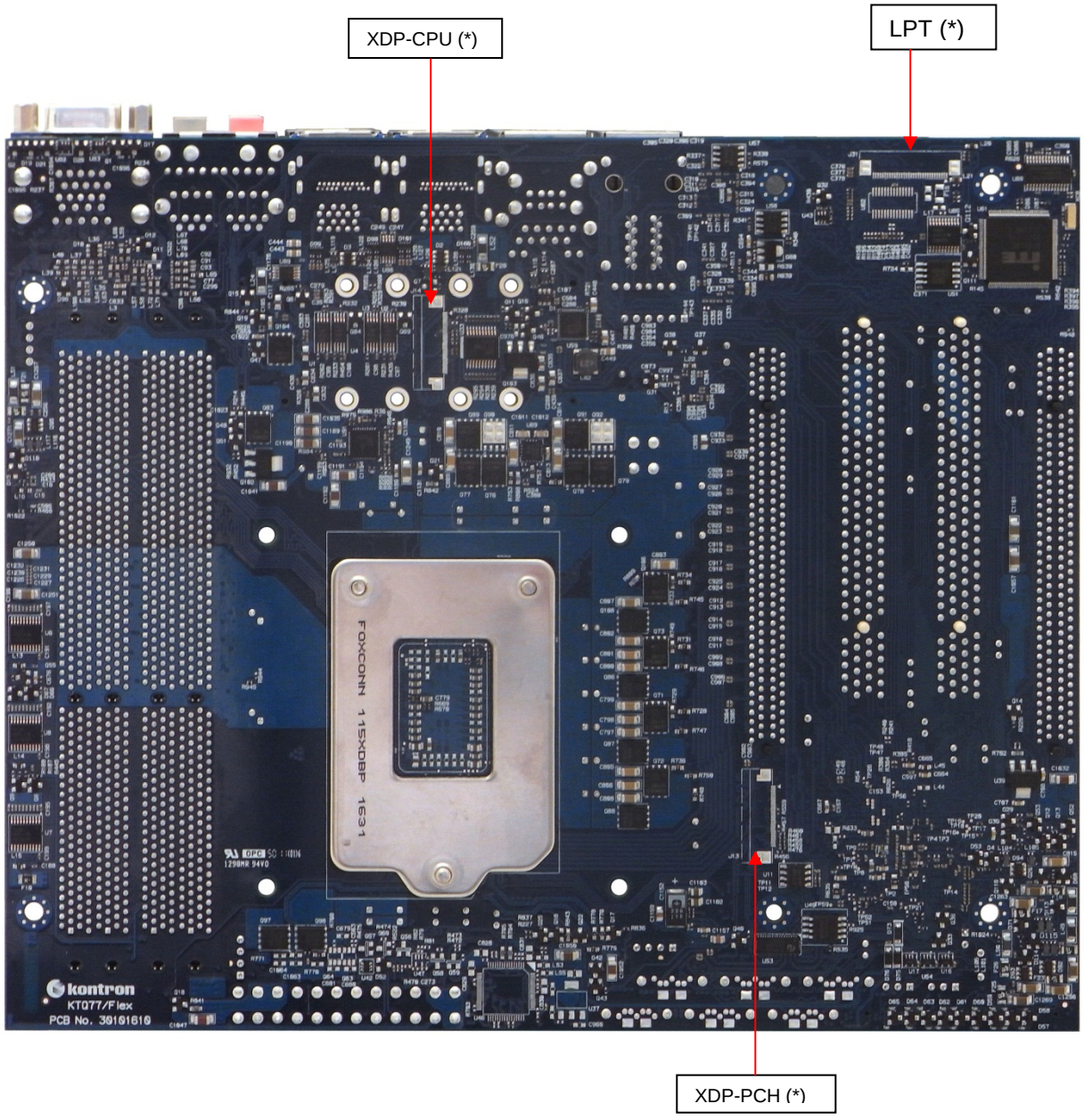
4 Connector Locations

4.1 KTQ77/Flex – frontside



Notes: Sata0/Sata1support up to 6GB/s and Sata2/Sata3/Sata4/Sata5 support up to 3GB/S.
USB0 – USB3 supports USB3.0/USB2.0, USB4 – USB13 supports USB2.0.

4.2 KTQ77/Flex - backside



(*) The LPT connector and the XDP connectors are not mounted in volume production.

5 Connector Definitions

The following sections provide pin definitions and detailed description of all on-board connectors.

The connector definitions follow the following notation:

Column name	Description
Pin	Shows the pin-numbers in the connector. The graphical layout of the connector definition tables is made similar to the physical connectors.
Signal	The mnemonic name of the signal at the current pin. The notation “XX#” states that the signal “XX” is active low.
Type	AI: Analogue Input. AO: Analogue Output. I: Input, TTL compatible if nothing else stated. IO: Input / Output. TTL compatible if nothing else stated. IOT: Bi-directional tristate IO pin. IS: Schmitt-trigger input, TTL compatible. IOC: Input / open-collector Output, TTL compatible. IOD: Input / Output, CMOS level Schmitt-triggered. (Open drain output) NC: Pin not connected. O: Output, TTL compatible. OC: Output, open-collector or open-drain, TTL compatible. OT: Output with tri-state capability, TTL compatible. LVDS: Low Voltage Differential Signal. PWR: Power supply or ground reference pins.
	Ioh: Typical current in mA flowing out of an output pin through a grounded load, while the output voltage is > 2.4 V DC (if nothing else stated). Iol: Typical current in mA flowing into an output pin from a VCC connected load, while the output voltage is < 0.4 V DC (if nothing else stated).
Pull U/D	On-board pull-up or pull-down resistors on input pins or open-collector output pins.
Note	Special remarks concerning the signal.

The abbreviation *TBD* is used for specifications which are not available yet or which are not sufficiently specified by the component vendors.

6 IO-Area Connectors

6.1 Display connectors (IO Area)

The KTQ77 family provides one on-board Analogue VGA port, two on-board DP's (DisplayPort) and optionally one on-board LVDS panel interface. Two graphic pipes are supported; meaning that up to two independent displays can be implemented using any two of the above mentioned graphic ports.
.

6.1.1 Analogue VGA (VGA)

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN		Signal	Type	Ioh/Iol	Pull U/D	Note
						6	GND	PWR	-	-	
	/75R	-	A0	RED	1	11	NC	-	-	-	
						7	GND	PWR	-	-	
	/75R	-	A0	GREEN	2	12	DDCDAT	IO	TBD	2K2	
						8	GND	PWR	-	-	
	/75R	-	A0	BLUE	3	13	HSYNC	O	TBD		
						9	5V	PWR	-	-	1
	-	-	-	NC	4	14	VSYNC	O	TBD		
						10	GND	PWR	-	-	
	-	-	PWR	GND	5	15	DDCCLK	IO	TBD	2K2	

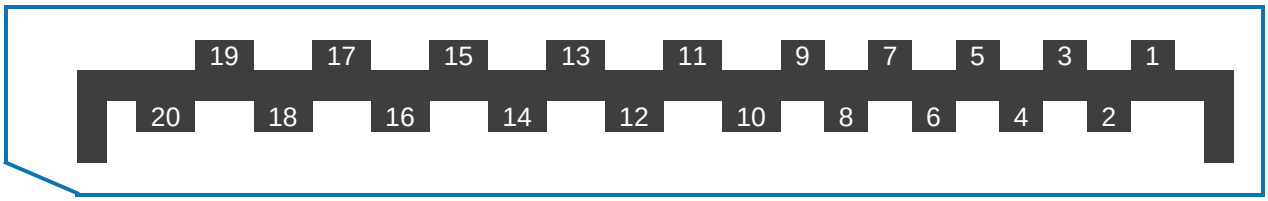
Note 1: The +5V supply is fused by a 1.1A resettable fuse

Signal Description - VGA Connector:

Pin	Signal	Description
1	RED	Analogue output carrying the red colour values. (75 Ohm cable impedance).
2	GREEN	Analogue output carrying the green colour values. (75 Ohm cable impedance).
3	BLUE	Analogue output carrying the blue colour values. (75 Ohm cable impedance).
4	NC	No Connection
5-8	GND	
9	5V	This 5V supply is fused by a 1.1A resettable fuse.
10	GND	
11	NC	No Connection
12	DDCDAT	Display Data Channel Data. Used as data signal to/from monitors with DDC interface.
13	HSYNC	CRT horizontal synchronization output.
14	VSYNC	CRT vertical synchronization output.
15	DDCCLK	Display Data Channel Clock. Used as clock signal to/from monitors with DDC interface.

6.1.2 DP Connectors (DP0/DP1)

The DP (DisplayPort) connectors are based on standard DP type Foxconn 3VD51203-H7JJ-7H or similar.



Pin	Signal	Description	Type	Note
1	Lane 0 (p)		LVDS	
2	GND		PWR	
3	Lane 0 (n)		LVDS	
4	Lane 1 (p)		LVDS	
5	GND		PWR	
6	Lane 1 (n)		LVDS	
7	Lane 2 (p)		LVDS	
8	GND		PWR	
9	Lane 2 (n)		LVDS	
10	Lane 3 (p)		LVDS	
11	GND		PWR	
12	Lane 3 (n)		LVDS	
13	Config1	Aux or DDC selection	I	Internally pull down (1Mohm). Aux channel on pin 15/17 selected as default (when NC) DDC channel on pin 15/17, If HDMI adapter used (3.3V)
14	Config2	(Not used)	O	Internally connected to GND
15	Aux Ch (p)	Aux Channel (+) or DDC Clk		AUX (+) channel used by DP DDC Clk used by HDMI
16	GND		PWR	
17	Aux Ch (n)	Aux Channel (-) or DDC Data		AUX (-) channel used by DP DDC Data used by HDMI
18	Hot Plug		I	Internally pull down (100Kohm).
19	Return		PWR	Same as GND
20	3.3V		PWR	Fused by 1.5A resetable PTC fuse, common for DP0 and DP1

6.2 Ethernet Connectors (IO Area)

The KTQ77 boards supports three channels of 10/100/1000Mb Ethernet, one (ETH1) is based on Intel® Lewisville 82579LM Gigabit PHY with AMT 8.0 support and the two other controllers (ETHER2 & ETHER3) are based on Intel® Hartwell 82574L PCI Express controller.

In order to achieve the specified performance of the Ethernet port, minimum Category 5 twisted pair cables must be used with 10/100MB and minimum Category 5E, 6 or 6E with 1Gb LAN networks.

The signals for the Ethernet ports are as follows:

Signal	Description
MDI[0]+ / MDI[0]-	In MDI mode, this is the first pair in 1000Base-T, i.e. the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX.
MDI[1]+ / MDI[1]-	In MDI mode, this is the second pair in 1000Base-T, i.e. the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX.
MDI[2]+ / MDI[2]-	In MDI mode, this is the third pair in 1000Base-T, i.e. the BI_DC+/- pair. In MDI crossover mode, this pair acts as the BI_DD+/- pair.
MDI[3]+ / MDI[3]-	In MDI mode, this is the fourth pair in 1000Base-T, i.e. the BI_DD+/- pair. In MDI crossover mode, this pair acts as the BI_DC+/- pair.

Note: MDI = Media Dependent Interface.

Ethernet connector 1 (ETH1) is mounted together with USB Ports 4 and 5.
Ethernet connector 2 (ETH2) is mounted together with and above Ethernet connector 3 (ETH3).

The pinout of the RJ45 connectors is as follows:

Signal	PIN	Type	Ioh/Iol	Note
MDI0+				
MDI0-				
MDI1+				
MDI2+				
MDI2-				
MDI1-				
MDI3+				
MDI3-				
	8 7 6 5 4 3 2 1			

6.3 USB Connectors (IO Area)

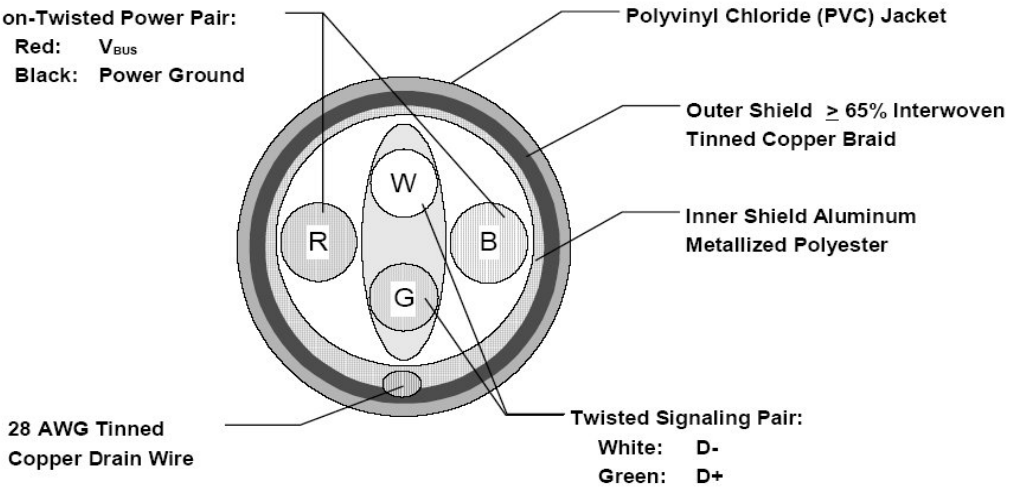
The KTQ77 board contains two EHCI (Enhanced Host Controller Interface) and one XHCI (Extensible Host Controller Interface). The two EHCI controllers, EHCI1 and EHCI2, supports up to fourteen USB 2.0 ports allowing data transfers up to 480Mb/s. The XHCI controller supports four USB 3.0 ports allowing data transfers up to 5Gb/s. The four USB 3.0 ports are shared with four of the USB 2.0 ports (USB0 – USB3) from the EHCI1.

Legacy Keyboard/Mouse and wakeup from sleep states are supported. Over-current detection on all fourteen USB ports is supported. The following USB connectors are available in the IO Area.

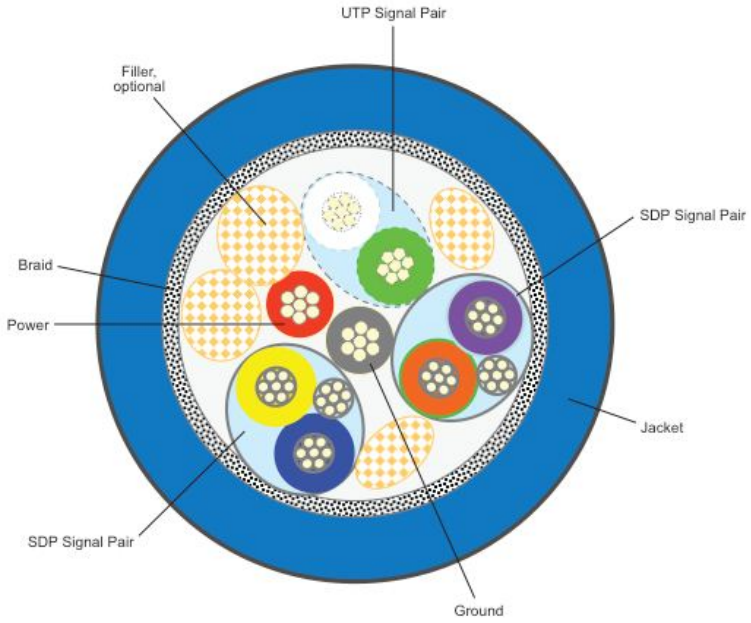
USB Port 0 and 1 (via EHCI1/XHCI) are supplied on the combined USB0, USB1 and DP0 connector.
USB Port 2 and 3 (via EHCI1/XHCI) are supplied on the combined USB2, USB3 and DP1 connector.
USB Port 4 and 5 (via EHCI1) are supplied on the combined ETH1, USB4 and USB5 connector.

Note:

For USB2.0 cabling it is required to use only HiSpeed USB cable, specified in USB2.0 standard:



For USB3.0 cabling it is required to use only HiSpeed USB cable, specified in USB3.0 standard:



6.3.1 USB Connector 0/1 (USB0/1)

USB Ports 0 and 1 are mounted together with DP0 port and supports USB3.0/USB2.0.

Note	Type	Signal	PIN	Signal	Type	Note
	IO	USB1-		USB1+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	RX1-	5 6 7 8 9	TX1+	IO	
	IO	RX1+		TX1-	IO	
	PWR	GND				
	IO	USB0-		USB0+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	RX0-	5 6 7 8 9	TX0+	IO	
	IO	RX0+		TX0-	IO	
	PWR	GND				

Note 1: In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

Signal	Description
USB0+ USB0- RX0+ RX0- TX0+ TX0- USB1+ USB1- RX1+ RX1- TX1+ TX1-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

6.3.2 USB Connector 2/3 (USB2/3)

USB Ports 2 and 3 are mounted together with DP1 port and supports USB3.0/USB2.0.

Note	Type	Signal	PIN	Signal	Type	Note
	IO	USB3-		USB3+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	RX3-	5 6 7 8 9	TX3+	IO	
	IO	RX3+		TX3-	IO	
	PWR	GND				
	IO	USB2-		USB2+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	RX2-	5 6 7 8 9	TX2+	IO	
	IO	RX2+		TX2-	IO	
	PWR	GND				

Note 1: In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

Signal	Description
USB2+ USB2- RX2+ RX2- TX2+ TX2- USB3+ USB3- RX3+ RX3- TX3+ TX3-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

6.3.3 USB Connector 4/5 (USB4/5)

USB Ports 4 and 5 are mounted together with ETH1 port and supports USB2.0.

Note	Type	Signal	PIN	Signal	Type	Note
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB5-		USB5+	IO	
1	PWR	5V/SB5V	1 2 3 4	GND	PWR	
	IO	USB4-		USB4+	IO	

Note 1: In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

Signal	Description
USB4+ USB4- USB5+ USB5-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

6.4 Audio Connector (IO Area)

The on-board Audio circuit implements 7.1+2 Channel High Definition Audio with UAA (Universal Audio Architecture), featuring five 24-bit stereo DACs and three 20-bit stereo ADCs. The Following Audio connector is available in IO Area.

Audio Speakers, Line-in and Microphone are available in the stacked audiojack connector

Note	Type	Signal			Signal	Type	Note
	OA	CEN-OUT	TIP	TIP	LINE1-IN-L	IA	
	OA	LFE-OUT	RING	RING	LINE1-IN-R	IA	
	PWR	GND	SLEEVE	SLEEVE	GND	PWR	
	OA	REAR-OUT-L	TIP	TIP	FRONT-OUT-L	OA	
	OA	REAR-OUT-R	RING	RING	FRONT-OUT-R	OA	
	PWR	GND	SLEEVE	SLEEVE	GND	PWR	
	OA	SIDE-OUT-L	TIP	TIP	MIC1-L	IA	
	OA	SIDE-OUT-R	RING	RING	MIC1-R	IA	
	PWR	GND	SLEEVE	SLEEVE	GND	PWR	

Signal	Description	Note
FRONT-OUT-L	Front Speakers (Speaker Out Left).	Shared with Audio Header
FRONT-OUT-R	Front Speakers (Speaker Out Right).	Shared with Audio Header
REAR-OUT-L	Rear Speakers (Surround Out Left).	Shared with Audio Header
REAR-OUT-R	Rear Speakers (Surround Out Right).	Shared with Audio Header
SIDE-OUT-L	Side speakers (Surround Out Left)	Shared with Audio Header
SIDE-OUT-R	Side speakers (Surround Out Right)	Shared with Audio Header
CEN-OUT	Center Speaker (Center Out channel).	Shared with Audio Header
LFE-OUT	Subwoofer Speaker (Low Freq. Effect Out).	Shared with Audio Header
MIC1	MIC Input 1	Shared with Audio Header
LINE1-IN	Line in 1 signals	Shared with Audio Header

Port	2-channel	4-channel	6-channel	8-channel
Light Blue	Line in	Line in	Line in	Line in
Lime	Line out	Front speaker out	Front speaker out	Front speaker out
Pink	Mic in	Mic in	Mic in	Mic in
Audio header	-	-	-	Side speaker out
Audio header	-	Rear speaker out	Rear speaker out	Rear speaker out
Audio header	-	-	Center/ Subwoofer	Center/ Subwoofer

6.5 COM1 Connector (IO Area)

Four RS232 serial ports are available on the KTQ77, COM1 is available in the IO Area while the other COM ports are available on internal pin header connectors.

The typical definition of the signals in the COM ports is as follows:

Signal	Description
TxD	Transmitted Data, sends data to the communications link. The signal is set to the marking state (-12V) on hardware reset when the transmitter is empty or when loop mode operation is initiated.
RxD	Received Data, receives data from the communications link.
DTR	Data Terminal Ready, indicates to the modem etc. that the on-board UART is ready to establish a communication link.
DSR	Data Set Ready, indicates that the modem etc. is ready to establish a communications link.
RTS	Request To Send, indicates to the modem etc. that the on-board UART is ready to exchange data.
CTS	Clear To Send, indicates that the modem or data set is ready to exchange data.
DCD	Data Carrier Detect, indicates that the modem or data set has detected the data carrier.
RI	Ring Indicator, indicates that the modem has received a ringing signal from the telephone line.

The pinout of Serial ports COM1 is as follows:

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
	-	-	PWR	GND	5					
					9	RI	I	-	/5K	
	-		O	DTR	4					
					8	CTS	I	-	/5K	
	-		O	TxD	3					
					7	RTS	O		-	
	/5K	-	I	RxD	2					
					6	DSR	I	-	/5K	
	/5K	-	I	DCD	1					

7 Internal Connectors

7.1 Power Connector (ATX/BTXPWR)

The KTQ77 boards are designed to be supplied from a standard ATX (or BTX) power supply. Use of BTX supply is not required for operation, but may be required to drive high-power PCIe cards.

ATX/ BTX Power Connector (J45):

Note	Type	Signal	PIN		Signal	Type	Note
	PWR	3V3	12	24	GND	PWR	
	PWR	+12V	11	23	5V	PWR	
	PWR	+12V	10	22	5V	PWR	
	PWR	SB5V	9	21	5V	PWR	
	I	P_OK	8	20	-5V	PWR	1
	PWR	GND	7	19	GND	PWR	
	PWR	5V	6	18	GND	PWR	
	PWR	GND	5	17	GND	PWR	
	PWR	5V	4	16	PSON#	OC	
	PWR	GND	3	15	GND	PWR	
	PWR	3V3	2	14	-12V	PWR	
	PWR	3V3	1	13	3V3	PWR	

Note 1: -5V supply is not used on-board.

See chapter “Power Specificaton” regarding input tolerances on 3.3V, 5V, SB5V, +12 and -12V (also refer to ATX specification version 2.2).



Important: The ATX 12V specification does not clearly state a requirement for the ramp-up of the 5V standby voltage (SB5V) . However, Kontron strongly recommends to use only PSUs where the 5V Standby (SB5V) ramp up follows the same rules as listed for +5VDC.
This should ensure that the board behaves properly, in particular when powering up without or with a weak/empty battery.

ATX+12V-4pin Power Connector (J46):

Note	Type	Signal	PIN		Signal	Type	Note
	PWR	GND	2	4	+12V	PWR	1
	PWR	GND	1	3	+12V	PWR	1

Note 1: Use of the 4-pin ATX+12V Power Connector is required for operation of all KTQ77 board versions.

Signal	Description
P_OK	P_OK is a power good signal and should be asserted high by the power supply to indicate that the +5VDC and +3.3VDC outputs are above the undervoltage thresholds of the power supply. When this signal is asserted high, there should be sufficient energy stored by the converter to guarantee continuous power operation within specification. Conversely, when the output voltages fall below the undervoltage threshold, or when mains power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, P_OK should be de-asserted to a low state. The recommended electrical and timing characteristics of the P_OK (PWR_OK) signal are provided in the *ATX12V Power SupplyDesign Guide*. It is strongly recommended to use an ATX or BTX supply in order to implement the supervision of the 5V and 3V3 supplies. These supplies are not supervised on-board.
PS_ON#	Active low open drain signal from the board to the power supply to turn on the power supply outputs. Signal must be pulled high by the power supply.

7.2 Fan Connectors (FAN_CPU) (J28) and (FAN_SYS) (J29)

The **FAN_CPU** is used for the connection of the FAN for the CPU.
The **FAN_SYS** can be used to power, control and monitor a fan for chassis ventilation etc.

The 4pin header is recommended to be used for driving 4-wire type Fan in order to implement FAN speed control. 3-wire Fan is also possible, but no fan speed control is integrated.

4-pin Mode:

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
1	CONTROL	O	-	-	
2	SENSE	I	-	4K7	
3	+12V	PWR	-	-	
4	GND	PWR	-	-	

Signal	Description
CONTROL	PWM signal for FAN speed control
SENSE	Tacho signal from the fan for supervision. The signals shall be generated by an open collector transistor or similar. On-board is a pull-up resistor 4K7 to +12V. The signal has to be pulsed, typically twice per rotation.
12V	+12V supply for fan. A maximum of 2000mA can be supplied from this pin.
GND	Power Supply GND signal

3-pin Mode:

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
-					
2	SENSE	I	-	4K7	
3	+12V	PWR	-	-	
4	GND	PWR	-	-	

Signal	Description
SENSE	Tacho signal from the fan for supervision. The signals shall be generated by an open collector transistor or similar. On-board is a pull-up resistor 4K7 to +12V. The signal has to be pulsed, typically twice per rotation.
12V	+12V supply for fan. A maximum of 2000mA can be supplied from this pin.
GND	Power Supply GND signal

7.3 PS/2 Keyboard and Mouse connector (KBDMSE) (J15)

Attachment of a PS/2 keyboard/mouse can be done through the pinrow connector KBDMSE (J15). Both interfaces utilize open-drain signalling with on-board pull-up.

The PS/2 mouse and keyboard is supplied from SB5V when in standby mode in order to enable keyboard or mouse activity to bring the system out from power saving states. The supply is provided through a 1.1A resettable fuse.

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
1	KBDCLK	IOD	/14mA	2K7	
2	KBDDAT	IOD	/14mA	2K7	
3	MSCLK	IOD	/14mA	2K7	
4	MSDAT	IOD	/14mA	2K7	
5	5V/SB5V	PWR	-	-	
6	GND	PWR	-	-	

Signal Description – Keyboard & and mouse Connector (KBDMSE).

Signal	Description
MSCLK	Bi-directional clock signal used to strobe data/commands from/to the PS/2 mouse.
MSDAT	Bi-directional serial data line used to transfer data from or commands to the PS/2 mouse.
KDBCLK	Bi-directional clock signal used to strobe data/commands from/to the PC-AT keyboard.
KBDDAT	Bi-directional serial data line used to transfer data from or commands to the PC-AT keyboard.

7.4 Display connectors (Internal)

The KTQ77 family provides optionally internal on-board LVDS panel interface. For IO Area Display Connectors (VGA and two DP's), see earlier section.

Two graphic pipes are supported; meaning that up to two independent displays can be implemented using any two display connectors in IO Area - and Internal (LVDS) connector (optionally).

7.4.1 LVDS Flat Panel Connector (LVDS) (J39) (optionally)

Two graphic pipes are supported; meaning that up to two independent displays can be implemented using any two of display connectors (IO Area - and Internal connectors).

Note	Type	Signal	PIN		Signal	Type	Note
Max. 0.5A	PWR	+12V	1	2	+12V	PWR	Max. 0.5A
Max. 0.5A	PWR	+12V	3	4	+12V	PWR	Max. 0.5A
Max. 0.5A	PWR	+12V	5	6	GND	PWR	Max. 0.5A
Max. 0.5A	PWR	+5V	7	8	GND	PWR	Max. 0.5A
Max. 0.5A	PWR	LCDVCC	9	10	LCDVCC	PWR	Max. 0.5A
2K2Ω, 3.3V	OT	DDC CLK	11	12	DDC DATA	OT	2K2Ω, 3.3V
3.3V level	OT	BKLTCTL	13	14	VDD ENABLE	OT	3.3V level
3.3V level	OT	BKLTEN#	15	16	GND	PWR	Max. 0.5A
	LVDS	LVDS A0-	17	18	LVDS A0+	LVDS	
	LVDS	LVDS A1-	19	20	LVDS A1+	LVDS	
	LVDS	LVDS A2-	21	22	LVDS A2+	LVDS	
	LVDS	LVDS ACLK-	23	24	LVDS ACLK+	LVDS	
	LVDS	LVDS A3-	25	26	LVDS A3+	LVDS	
Max. 0.5A	PWR	GND	27	28	GND	PWR	Max. 0.5A
	LVDS	LVDS B0-	29	30	LVDS B0+	LVDS	
	LVDS	LVDS B1-	31	32	LVDS B1+	LVDS	
	LVDS	LVDS B2-	33	34	LVDS B2+	LVDS	
	LVDS	LVDS BCLK-	35	36	LVDS BCLK+	LVDS	
	LVDS	LVDS B3-	37	38	LVDS B3+	LVDS	
Max. 0.5A	PWR	GND	39	40	GND	PWR	Max. 0.5A

Note: The KTQ77 on-board LVDS connector supports single/dual channel, 18/24bit SPWG panels up to resolution 1600x1200 or 1920x1080 (1920x1200 with limited frame rate is possible).

Signal Description – LVDS Flat Panel Connector:

Signal	Description
LVDS A0..A3	LVDS A Channel data
LVDS ACLK	LVDS A Channel clock
LVDS B0..B3	LVDS B Channel data
LVDS BCLK	LVDS B Channel clock
BKLTCTL	Backlight control (1), PWM signal to implement voltage in the range 0-3.3V
BKLTEN#	Backlight Enable signal (active low) (2)
VDD ENABLE	Output Display Enable.
LCDVCC	VCC supply to the display. Power-on/off sequencing depending on selected (in BIOS setup) display type. 5V or 3.3V selected in BIOS setup. Maximum load is 1A.
DDC CLK	DDC Channel Clock

Notes: Windows API will be available to operate the BKLTCTL signal. Some Inverters have a limited voltage range 0- 2.5V for this signal: If voltage is > 2.5V the Inverter might latch up. Some Inverters generates noise on the BKLTCTL signal, resulting in making the LVDS transmission failing (corrupted picture on the display). By adding a 1Kohm resistor in series with this signal, mounted in the Inverter end of the cable kit, the noise is limited and the picture is stable.
If the Backlight Enable is required to be active high, then check the following BIOS Chipset setting: Backlight Signal Inversion = Enabled.

7.5 SATA (Serial ATA) Disk interface (J22 – J27)

The KTQ77 boards have an integrated SATA Host controller (integrated in the PCH) that supports independent DMA operation on six ports. One device can be installed on each port for a maximum of six SATA devices. A point-to-point interface (SATA cable) is used for host to device connections. Data transfer rates of up to 6.0Gb/s (typically 600MB/s) on SATA0 and SATA1 (blue connectors) and 3.0Gb/s (typically 300MB/s) on SATA2, SATA3, SATA4 and SATA5 (black connectors). In case mSATA is used then the SATA2 is disabled.

The SATA controller supports:

2 to 6-drive RAID 0 (data striping)
2-drive RAID 1 (data mirroring)
3 to 6-drive RAID 5 (block-level striping with parity).
4-drive RAID 10 (data striping and mirroring)
2 to 6-drive matrix RAID (different parts of a single drive can be assigned to different RAID devices).
AHCI (Advanced Host Controller Interface)
NCQ (Native Command Queuing). NCQ is for faster data access.
Hot Swap
Intel® Rapid Recover Technology
2 – 256TB volume (Data volumes only)
Capacity expansion
TRIM in Windows 7 (in AHCI and RAID mode for drives not part of a RAID volume). (TRIM is for SSD data garbage handling).

The RAID (Redundant Array of Independent Drives) functionality is based on a firmware system with support for RAID modes 0 1, 5 and 10.

SATA connector pinning:
The pinout of SATA ports SATA0 (J27), SATA1 (J26), SATA2 (J25), SATA3 (J24), SATA4 (J23) and SATA5 (J22) is as follows:

PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
1	GND	PWR	-	-	
2	SATA* TX+				
3	SATA* TX-				
4	GND	PWR	-	-	
5	SATA* RX-				
6	SATA* RX+				
7	GND	PWR	-	-	

The signals used for the primary SATA hard disk interface are the following:

Signal	Description
SATA* RX+ SATA* RX-	Host transmitter differential signal pair
SATA* TX+ SATA* TX-	Host receiver differential signal pair

"*" specifies 0, 1, 2, 3, 4, 5 depending on SATA port.

7.6 USB Connectors (USB)

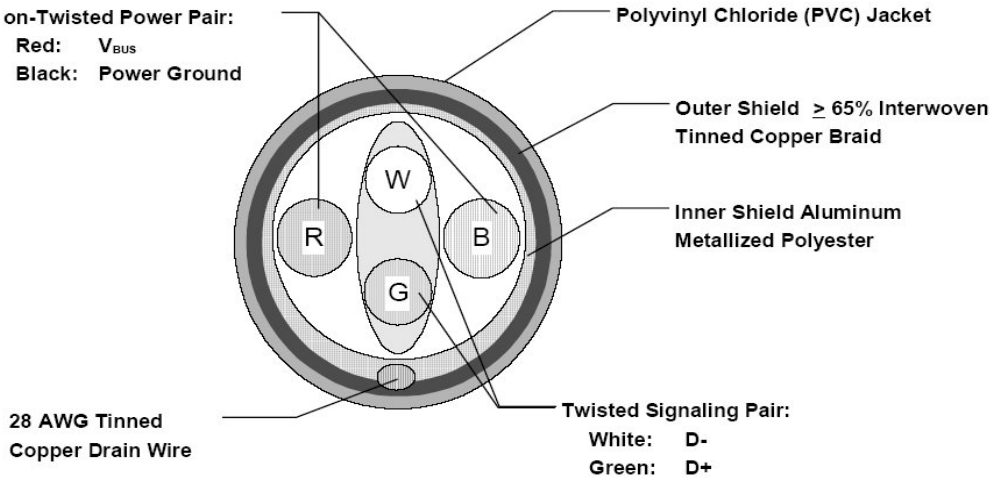
The KTQ77 board contains two EHCI (Enhanced Host Controller Interface) host controllers (EHCI1 and EHCI2) that support up to fourteen USB 2.0 ports allowing data transfers up to 480Mb/s. Legacy Keyboard/Mouse and wakeup from sleep states are supported. Over-current detection on all fourteen USB ports is supported.

Note that four USB 3.0 ports are shared with four of the USB 2.0 ports (USB0 – USB3) from the EHCI1.

The following USB ports are available on Internal Pinrows:

USB Port 6 and 7 (via EHCI1) are supplied on the USB6/7 internal pinrow FRONTPNL connector.
USB Port 8 and 9 (via EHCI2) are supplied on the USB8/9 internal pinrow connector.
USB Port 10 and 11 (via EHCI2) are supplied on the USB10/11 internal pinrow connector.
USB Port 12 and 13 (via EHCI2) are supplied on the USB12/13 internal pinrow connector.

Note: It is required to use only HiSpeed USB cable, specified in USB2.0 standard:



7.6.1 USB Connector 6/7

See Frontpanel Connector (FRONTPNL) description.

7.6.2 USB Connector 8/9 (USB8/9) (J18)

USB Ports 8 and 9 are supplied on the internal USB8/9 pinrow connector J18.

Note	Type	Signal	PIN		Signal	Type	Note
1	PWR	5V/SB5V	1	2	5V/SB5V	PWR	1
	IO	USB8-	3	4	USB9-	IO	
	IO	USB8+	5	6	USB9+	IO	
	PWR	GND	7	8	GND	PWR	
	NC	KEY	9	10	NC	NC	

Signal	Description
USB8+ USB8- USB9+ USB9-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

7.6.3 USB Connector 10/11 (USB10/11) (J17)

USB Ports 10 and 11 are supplied on the internal USB10/11 pinrow connector J17.

Note	Type	Signal	PIN		Signal	Type	Note
1	PWR	5V/SB5V	1	2	5V/SB5V	PWR	1
	IO	USB10-	3	4	USB11-	IO	
	IO	USB10+	5	6	USB11+	IO	
	PWR	GND	7	8	GND	PWR	
	NC	KEY	9	10	NC	NC	

Signal	Description
USB10+ USB10- USB11+ USB11-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

7.6.4 USB Connector 12/13 (USB12/13) (J16)

USB Ports 12 and 13 are supplied on the internal USB12/13 pinrow connector J16.

Note	Type	Signal	PIN		Signal	Type	Note
1	PWR	5V/SB5V	1	2	5V/SB5V	PWR	1
	IO	USB12-	3	4	USB13-	IO	
	IO	USB12+	5	6	USB13+	IO	
	PWR	GND	7	8	GND	PWR	
	NC	KEY	9	10	NC	NC	

Signal	Description
USB12+ USB12- USB13+ USB13-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by resettable 1A fuse covering both USB ports.

Note 1: In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

7.7 Serial COM2 – COM4 Ports (J19, J20, J21)

Three RS232 serial ports are available on the KTQ77 via pin-row connector. (COM 1 is in the IO area and is based on standard DB9 connector, see other section for more info).

The typical definition of the signals in the COM ports is as follows:

Signal	Description
TxD	Transmitted Data, sends data to the communications link. The signal is set to the marking state (-12V) on hardware reset when the transmitter is empty or when loop mode operation is initiated.
RxD	Received Data, receives data from the communications link.
DTR	Data Terminal Ready, indicates to the modem etc. that the on-board UART is ready to establish a communication link.
DSR	Data Set Ready, indicates that the modem etc. is ready to establish a communications link.
RTS	Request To Send, indicates to the modem etc. that the on-board UART is ready to exchange data.
CTS	Clear To Send, indicates that the modem or data set is ready to exchange data.
DCD	Data Carrier Detect, indicates that the modem or data set has detected the data carrier.
RI	Ring Indicator, indicates that the modem has received a ringing signal from the telephone line.

The pinout of Serial ports COM2 (J20), COM3 (J19) and COM4 (J21) is as follows:

Note	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Note
	-	I	DCD	1 2	DSR	I	-	
	-	I	RxD	3 4	RTS	O		
		O	TxD	5 6	CTS	I	-	
		O	DTR	7 8	RI	I	-	
	-	PWR	GND	9 10	5V	PWR	-	1

Note 1: The COM2, COM3 and COM4 5V supply is fused with common 1.1A resettable fuse.

DB9 adapter cables (PN 821016 200mm long and 821017 100mm long) are available for implementing standard COM ports on chassis.

7.8 Audio Connectors

The on-board Audio circuit implements 7.1+2 Channel High Definition Audio with UAA (Universal Audio Architecture), featuring five 24-bit stereo DACs and three 20-bit stereo ADCs.

The following Audio connectors are available as internal connectors.

7.8.1 CDROM Audio Input (CDROM) (J44)

CD-ROM audio input may be connected to this connector or it can be used as secondary line-in signal.

PIN	Signal	Type	Note
1	CD_Left	IA	1
2	CD_GND	IA	
3	CD_GND	IA	
4	CD_Right	IA	1

Note 1: The definition of which pins are used for the Left and Right channels is not a worldwide accepted standard. Some CDROM cable kits expect reverse pin order.

Signal	Description
CD_Left CD_Right	Left and right CD audio input lines or secondary Line-in.
CD_GND	Analogue GND for Left and Right CD. (This analogue GND is **not** shorted to the general digital GND on the board).

7.8.2 Line2 and Mic2

Line2 and Mic2 are accessible via Front Panel Connector, see Front Panel connector description.

7.8.1 Audio Header Connector (AUDIO_HEAD) (J47)

Note	Type	Signal	PIN		Signal	Type	Note
1	AO	LFE-OUT	1	2	CEN-OUT	AO	1
	PWR	AAGND	3	4	AAGND	PWR	
1	AO	FRONT-OUT-L	5	6	FRONT-OUT-R	AO	1
	PWR	AAGND	7	8	AAGND	PWR	
1	AO	REAR-OUT-L	9	10	REAR-OUT-R	AO	1
1	AO	SIDE-OUT-L	11	12	SIDE-OUT-R	AO	1
	PWR	AAGND	13	14	AAGND	PWR	
1	AI	MIC1-L	15	16	MIC1-R	AI	1
	PWR	AAGND	17	18	AAGND	PWR	
1		LINE1-L	19	20	LINE1-R		1
	NC	NC	21	22	AAGND	PWR	
	PWR	GND	23	24	NC	NC	
	O	SPDIF-OUT	25	26	GND	PWR	

Note 1: Shared with Audio Stack connector

Signal	Description
FRONT-OUT-L	Front Speakers (Speaker Out Left).
FRONT-OUT-R	Front Speakers (Speaker Out Right).
REAR-OUT-L	Rear Speakers (Surround Out Left).
REAR-OUT-R	Rear Speakers (Surround Out Right).
SIDE-OUT-L	Side speakers (Surround Out Left)
SIDE-OUT-R	Side speakers (Surround Out Right)
CEN-OUT	Center Speaker (Center Out channel).
LFE-OUT	Subwoofer Speaker (Low Freq. Effect Out).
NC	No connection
MIC1	MIC Input 1
LINE1	Line 1 signals
F-SPDIF-OUT	S/PDIF Output
AAGND	Audio Analogue ground

7.9 Front Panel Connector (FRONTPNL) (J36)

Note	Pull U/D	Ioh/ Iol	Type	Signal	PIN		Signal	Type	Ioh/ Iol	Pull U/D	Note
	-	-	PWR	USB6/7_5V	1	2	USB6/7_5V	PWR	-	-	
	-	-		USB6-	3	4	USB7-		-	-	
	-	-		USB6+	5	6	USB7+		-	-	
	-	-	PWR	GND	7	8	GND	PWR	-	-	
	-	-	NC	NC	9	10	LINE2-L		-	-	
	-	-	PWR	+5V	11	12	+5V	PWR	-	-	
	-	/7mA	O	SATA_LED#	13	14	SUS_LED	O	7mA	-	
	-	-	PWR	GND	15	16	PWRBTN_IN#	I		1K1	
	4K7	-	I	RSTIN#	17	18	GND	PWR	-	-	
	-	-	PWR	SB3V3	19	20	LINE2-R		-	-	
	-	-	PWR	AGND	21	22	AGND	PWR	-	-	
	-	-	AI	MIC2-L	23	24	MIC2-R	AI	-	-	

Signal	Description
USB10/11_5V	5V supply for external devices. SB5V is supplied during power down to allow wakeup on USB device activity. Protected by resettable 1.1A fuse covering both USB ports.
USB1+ USB1-	Universal Serial Bus Port 1 Differentials: Bus Data/Address/Command Bus.
USB3+ USB3-	Universal Serial Bus Port 3 Differentials: Bus Data/Address/Command Bus.
+5V	Maximum load is 1A or 2A per pin if using IDC connector flat cable or crimp terminals respectively.
SATA_LED#	SATA Activity LED, active low signal (via 470Ω). Recommended is using Low Power LED like HLMP4700 with anode connected to +5V (pin 11). When red color LED is used, possible weak glowing could be noticed when the LED supposed to be off. In order to eliminate this problem a resistor 3K3 can be connected in parallel with the LED or a diode can be connected in series with the LED.
SUS_LED	Suspend Mode LED (active high signal). Output 3.3V via 470Ω.
PWRBTN_IN#	Power Button In. Toggle this signal low to start the ATX / BTX PSU and boot the board.
RSTIN#	Reset Input. When pulled low for a minimum 16ms, the reset process will be initiated. The reset process continues even though the Reset Input is kept low.
LINE2	Line2 is second stereo Line signals
MIC2	MIC2 is second stereo microphone input.
SB3V3	Standby 3.3V voltage
AGND	Analogue Ground for Audio

Note: In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

7.10 Feature Connector (FEATURE) (J30)

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN		Signal	Type	Ioh/Iol	Pull U/D	Note
2	2M/	-	I	CASE_OPEN#	1	2	SMBC		/4mA	10K/	1
	-	25/25mA	O	S5#	3	4	SMBD		/4mA	10K/	1
	-	25/25mA	O	PWR_OK	5	6	EXT_BAT	PWR	-	-	
	-		O	FAN3OUT	7	8	FAN3IN	I	-	-	
	-	-	PWR	SB3V3	9	10	SB5V	PWR	-	-	
	-		IOT	GPIO0	11	12	GPIO1	IOT		-	
	-		IOT	GPIO2	13	14	GPIO3	IOT		-	
	-		IOT	GPIO4	15	16	GPIO5	IOT		-	
	-		IOT	GPIO6	17	18	GPIO7	IOT		-	
	-	-	PWR	GND	19	20	GND	PWR	-	-	
	-		I	GPIO8	21	22	GPIO9	I		-	
	-		I	GPIO10	23	24	GPIO11	I		-	
	-		I	GPIO12	25	26	GPIO13	IOT		-	
	-		IOT	GPIO14	27	28	GPIO15	IOT		-	
	-		IOT	GPIO16	29	30	GPIO17	IOT		-	
	-	-	PWR	GND	31	32	GND	PWR	-	-	
	-	8/8mA	O	EGCLK	33	34	EGCS#	O	8/8mA	-	
	-	8/8mA		EGAD	35	36	TMA0	O			
	-		PWR	+12V	37	38	GND	PWR	-	-	
	-		O	FAN4OUT	39	40	FAN4IN	I	-	-	
	-	-	PWR	GND	41	42	GND	PWR	-	-	
	-	-	PWR	GND	43	44	S3#	O	25/25mA	-	

Notes: **1**. Pull-up to +3V3Dual (+3V3 or SB3V3). **2**. Pull-up to on-board Battery.

Signal	Description
CASE_OPEN#	CASE OPEN, used to detect if the system case has been opened. This signal's status is readable, so it may be used like a GPI when the Intruder switch is not required.
SMBC	SMBus Clock signal
SMBD	SMBus Data signal
S3#	S3 sleep mode, active low output, optionally used to deactivate external system.
S5#	S5 sleep mode, active low output, optionally used to deactivate external system.
PWR_OK	PoWeR OK, signal is high if no power failures are detected. (This is not the same as the P_OK signal generated by ATX PSU).
EXT_BAT	(EXTernal BATtery) option for connecting + terminal of an external primary cell battery (2.5 - 3.47 V) (– terminal connected to GND). The external battery is protected against charging and can be used with or without the on-board battery installed.
FAN3OUT	FAN 3 speed control OUTput, 3.3V PWM signal can be used as Fan control voltage.
FAN3IN	FAN3 Input. 0V to +3V3 amplitude Fan 3 tachometer input.
FAN4OUT	FAN 4 speed control OUTput, 3.3V PWM signal can be used as Fan control voltage.
FAN4IN	FAN4 Input. 0V to +3V3 amplitude Fan 3 tachometer input.
SB3V3	Max. load is 0.75A (1.5A < 1 sec.)
SB5V	StandBy +5V supply.
GPIO0..17	General Purpose Inputs / Output. These Signals may be controlled or monitored through the use of the KT-API-V2 (Application Programming Interface).
EGCLK	Extend GPIO Clock signal
EGAD	Extend GPIO Address Data signal
EGCS#	Extend GPIO Chip Select signal, active low
TMA0	Timer Output
+12V	Max. load is 0.75A (1.5A < 1 sec.)

GPIO in more details.

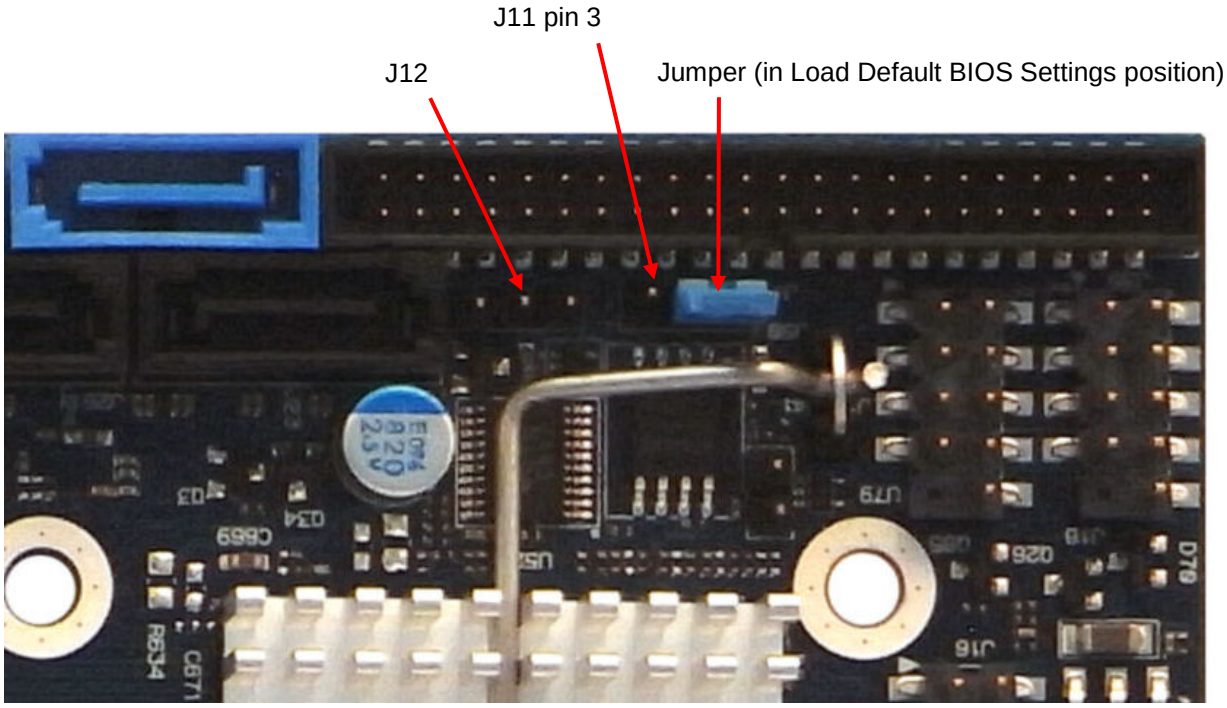
The GPIO's are controlled via the ITE IT8516F Embedded Controller. Each GPIO has 100pF to ground, clamping Diode to 3V3 and has multiplexed functionality. Some pins can be DAC (Digital to Analogue Converter output), PWM (Pulse Width Modulated signal output), ADC (Analogue to Digital Converter input), TMRI (Timer Counter Input), WUI (Wake Up Input), RI (Ring Indicator Input) or some special function.

Signal	IT8516F pin name	Type	Description
GPIO0	DAC0/GPJ0	AO/IOS	
GPIO1	DAC1/GPJ1	AO/IOS	
GPIO2	DAC2/GPJ2	AO/IOS	
GPIO3	DAC3/GPJ3	AO/IOS	
GPIO4	PWM2/GPA2	O8/IOS	
GPIO5	PWM3/GPA3	O8/IOS	
GPIO6	PWM4/GPA4	O8/IOS	
GPIO7	PWM5/GPA5	O8/IOS	
GPIO8	ADC0/GPI0	AI/IS	
GPIO9	ADC1/GPI1	AI/IS	
GPIO10	ADC2/GPI2	AI/IS	
GPIO11	ADC3/GPI3	AI/IS	
GPIO12	ADC4/WUI28/GPI4	AI/IS/IS	
GPIO13	RI1#/WUI0/GPD0	IS/IS/IOS	
GPIO14	RI2#/WUI1/GPD1	IS/IS/IOS	
GPIO15	TMRI0/WUI2/GPC4	IS/IS/IOS	
GPIO16	TMRI1/WUI3/GPC6	IS/IS/IOS	
GPIO17	L80HLAT/BAO/WUI24/GPE0	O4/O4/IS/IOS	

7.11 ”Load Default BIOS Settings” Jumper (J11)

The “Load Default BIOS Settings” Jumper (J11) can be used to recover from incorrect BIOS settings. As an example, incorrect BIOS settings coursing no display to turn on can be erased by the Jumper.

The Jumper has 3 positions: Pin 1-2, Pin2-3 (default position) and not mounted.



Warning: Don’t leave the jumper in position 1-2, otherwise if power is disconnected, the battery will fully deplete within a few weeks.

J11		Description
pin1-2	pin2-3	
X	-	Load Default BIOS Settings
-	X	Default position
-	-	No Function

To **Load Default BIOS Settings**:

1. Turn off power completely (no SB5V).
2. Move the Jumper to pin 1-2 for ~10 seconds.
3. Move the Jumper back to position 2-3 (default position).
4. Turn on power (use the Power On Button if required to boot).
5. Motherboard might automatically reboot a few times. Wait until booting is completed.

7.12 ClrRTC (J12)

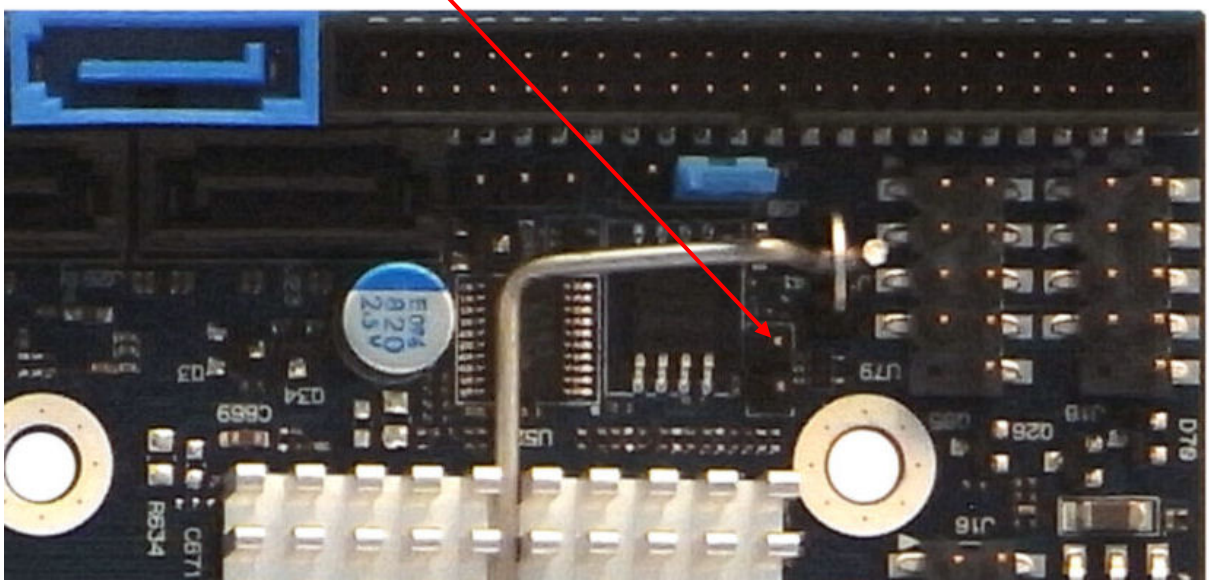
The ClrRTC (J12) connector is not used. Do not install any jumper in case J12 pin row is available.

7.13 SPI Recover Jumper (J41)

The SPI Recover Jumper is used to select BIOS Recovery SPI Flash instead of the BIOS Default SPI Flash.

Normally Jumper is not installed and board boots on the BIOS Default SPI Flash.

Only in case the Default BIOS gets corrupted and board do not boot:
Then turn off power
Install Jumper (J41)
Try rebooting



After rebooting, remove the Jumper before Default BIOS is recovered by reloading BIOS (for instance by using latest BIOS upgrade package from web product page).

Verify that Default BIOS has been recovered by making a successful reboot.

Warning: If the jumper (J41) is mounted and you make BIOS Upgrade etc. then the BIOS Recovery SPI Flash will be Upgraded and not the BIOS Default SPI Flash.
This means that in case something goes wrong (power interruption or incorrect BIOS package used etc.) when Upgrading BIOS, then the BIOS Recovery SPI Flash might get corrupted.

7.14 SPI Connector (SPI) (J40)

The SPI Connector is normally not used. If however a SPI BIOS is connected via the SPI Connector then the board will try to boot on it.

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN		Signal	Type	Ioh/Iol	Pull U/D	Note
	-			CLK	1	2	SB3V3	PWR	-	-	
	-		I	CS0#	3	4	ADDIN	IO		/10K	
	10K/		-	NC	5	6	NC	-	-	-	
	10K/		IO	MOSI	7	8	ISOLATE#	IO		/10K	
	-		IO	MISO	9	10	GND	PWR	-	-	

Signal	Description
CLK	Serial Clock
SB3V3	3.3V Standby Voltage power line. Normally output power, but when Motherboard is turned off then the on-board SPI Flash can be 3.3V power sourced via this pin.
CS0#	CS0# Chip Select 0, active low.
ADDIN	ADDIN input signal must be NC.
MOSI	Master Output, Slave Input
ISOLATE#	The ISOLATE# input, active low, is normally NC, but must be connected to GND when loading SPI flash. Power Supply to the Motherboard must be turned off when loading SPI flash. The pull up resistor is connected via diode to 5VSB.
MISO	Master Input, Slave Output

7.15 XDP-CPU (Debug Port for CPU) (J14)

The XDP-CPU (Intel Debug Port for CPU) connector is not mounted and not supported. XDP connector layout (pads) is located on the backside of PCB and is prepared for the Molex 52435-2671 (or 52435-2672).

Pin	Signal	Description	Type	Pull Up/Down	Note
1	OBSFN_A0				
2	OBSFN_A1				
3	GND		PWR	-	
4	NC		NC	-	
5	NC		NC	-	
6	GND		PWR	-	
7	NC		NC	-	
8	NC		NC	-	
9	GND		PWR	-	
10	HOOK0				
11	HOOK1				
12	HOOK2				
13	HOOK3				
14	HOOK4				
15	HOOK5				
16	+5V		PWR	-	
17	HOOK6				
18	HOOK7			500R	(500R by 2x1K in parallel)
19	GND		PWR	-	
20	TDO			/51R	
21	TRST#			/51R	
22	TDI			/51R	
23	TMS			/51R	
24	NC		NC	-	
25	GND		PWR	-	
26	TCK0			/51R	

7.16 XDP-PCH (Debug Port for Chipset) (J13)

The XDP-PCH (Intel Debug Port for Chipset) connector is not mounted and not supported. XDP-PCH connector layout (pads) is prepared for the Molex 52435-2671 (or 52435-2672).

Pin	Signal	Description	Type	Pull Up/Down	Note
1	NC		NC	-	
2	NC		NC	-	
3	GND		PWR	-	
4	NC		NC	-	
5	NC		NC	-	
6	GND		PWR	-	
7	NC		NC	-	
8	NC		NC	-	
9	GND		PWR	-	
10	HOOK0	RSMRST#			Connected to HOOK6
11	HOOK1	PWRBTN#			
12	HOOK2		NC	-	
13	HOOK3		NC	-	
14	HOOK4		NC	-	
15	HOOK5		NC	-	
16	+5V		PWR	-	
17	HOOK6				Connected to HOOK1
18	HOOK7	RESET#		500R	(500R by 2x1K in parallel)
19	GND		PWR	-	
20	TDO			210R/100R	
21	TRST#				
22	TDI			210R/100R	
23	TMS			210R/100R	
24	NC		NC	-	
25	GND		PWR	-	
26	TCK0			/51R	

8 Slot Connectors (PCIe, mSATA, miniPCIe, PCI)

8.1 PCIe Connectors

All members of the KTQ77 family supports one (x16) (16-lane) PCI Express port, one x4 PCI Express port (in a x16 PCI Express connector) and two miniPCI Express ports.

The **16-lane (x16) PCI Express** (PCIe 2.0 and PCIe 3.0) port can be used for external PCI Express cards inclusive graphics card. It is located nearest the CPU. Maximum theoretical bandwidth using 16 lanes is 16 GB/s.

The two **miniPCIe** (PCIe 2.0) is located on the backside of the board.

The **4-lane (x4) PCI Express** (PCIe 2.0) can be used for any PCIex1, PCIex2 or PCIex4 cards inclusive “Riser PCIex1 to PCI Dual flexible card“. (EFT samples support only PCIe x1).

8.1.1 PCI-Express x16 Connector (PCIe x16)

Note	Type	Signal	PIN		Signal	Type	Note
		+12V	B1	A1	NC		
		+12V	B2	A2	+12V		
		+12V	B3	A3	+12V		
		GND	B4	A4	GND		
		SMB_CLK	B5	A5	NC		
		SMB_DATA	B6	A6	NC		
		GND	B7	A7	NC		
		+3V3	B8	A8	NC		
		NC	B9	A9	+3V3		
		SB3V3	B10	A10	+3V3		
		WAKE#	B11	A11	RST#		
		NC	B12	A12	GND		
		GND	B13	A13	PCIE_x16 CLK		
		PEG_TXP[0]	B14	A14	PCIE_x16 CLK#		
		PEG_TXN[0]	B15	A15	GND		
		GND	B16	A16	PEG_RXP[0]		
		CLKREQ	B17	A17	PEG_RXN[0]		
		GND	B18	A18	GND		
		PEG_TXP[1]	B19	A19	NC		
		PEG_TXN[1]	B20	A20	GND		
		GND	B21	A21	PEG_RXP[1]		
		GND	B22	A22	PEG_RXN[1]		
		PEG_TXP[2]	B23	A23	GND		
		PEG_TXN[2]	B24	A24	GND		
		GND	B25	A25	PEG_RXP[2]		
		GND	B26	A26	PEG_RXN[2]		
		PEG_TXP[3]	B27	A27	GND		
		PEG_TXN[3]	B28	A28	GND		
		GND	B29	A29	PEG_RXP[3]		
		NC	B30	A30	PEG_RXN[3]		
		CLKREQ	B31	A31	GND		
		GND	B32	A32	NC		
		PEG_TXP[4]	B33	A33	NC		
		PEG_TXN[4]	B34	A34	GND		
		GND	B35	A35	PEG_RXP[4]		

		GND	B36	A36	PEG_RXN[4]		
		PEG_TXP[5]	B37	A37	GND		
		PEG_TXN[5]	B38	A38	GND		
		GND	B39	A39	PEG_RXP[5]		
		GND	B40	A40	PEG_RXN[5]		
		PEG_TXP[6]	B41	A41	GND		
		PEG_TXN[6]	B42	A42	GND		
		GND	B43	A43	PEG_RXP[6]		
		GND	B44	A44	PEG_RXN[6]		
		PEG_TXP[7]	B45	A45	GND		
		PEG_TXN[7]	B46	A46	GND		
		GND	B47	A47	PEG_RXP[7]		
		CLKREQ	B48	A48	PEG_RXN[7]		
		GND	B49	A49	GND		
		PEG_TXP[8]	B50	A50	NC		
		PEG_TXN[8]	B51	A51	GND		
		GND	B52	A52	PEG_RXP[8]		
		GND	B53	A53	PEG_RXN[8]		
		PEG_TXP[9]	B54	A54	GND		
		PEG_TXN[9]	B55	A55	GND		
		GND	B56	A56	PEG_RXP[9]		
		GND	B57	A57	PEG_RXN[9]		
		PEG_TXP[10]	B58	A58	GND		
		PEG_TXN[10]	B59	A59	GND		
		GND	B60	A60	PEG_RXP[10]		
		GND	B61	A61	PEG_RXN[10]		
		PEG_TXP[11]	B62	A62	GND		
		PEG_TXN[11]	B63	A63	GND		
		GND	B64	A64	PEG_RXP[11]		
		GND	B65	A65	PEG_RXN[11]		
		PEG_TXP[12]	B66	A66	GND		
		PEG_TXN[12]	B67	A67	GND		
		GND	B68	A68	PEG_RXP[12]		
		GND	B69	A69	PEG_RXN[12]		
		PEG_TXP[13]	B70	A70	GND		
		PEG_TXN[13]	B71	A71	GND		
		GND	B72	A72	PEG_RXP[13]		
		GND	B73	A73	PEG_RXN[13]		
		PEG_TXP[14]	B74	A74	GND		
		PEG_TXN[14]	B75	A75	GND		
		GND	B76	A76	PEG_RXP[14]		
		GND	B77	A77	PEG_RXN[14]		
		PEG_TXP[15]	B78	A78	GND		
		PEG_TXN[15]	B79	A79	GND		
		GND	B80	A80	PEG_RXP[15]		
		CLKREQ	B81	A81	PEG_RXN[15]		
		NC	B82	A82	GND		

8.1.2 mSATA (J43)



The mSATA support mSATA SSD cards (up to full size). mPCI Express is not supported. When mSATA card is installed then SATA2 (J25) (White connector) is disabled.

Note	Type	Signal	PIN		Signal	Type	Note
		WAKE#	1	2	+3V3	PWR	
	NC	NC	3	4	GND	PWR	
	NC	NC	5	6	+1.5V	PWR	
1		CLKREQ#	7	8	NC	NC	
	PWR	GND	9	10	NC	NC	
		PCIE_mini CLK#	11	12	NC	NC	
		PCIE_mini CLK	13	14	NC	NC	
	PWR	GND	15	16	NC	NC	
	NC	NC	17	18	GND	PWR	
	NC	NC	19	20	W_Disable#		2
	PWR	GND	21	22	RST#		
		PCIE_RXN	23	24	+3V3 Dual	PWR	
		PCIE_RXP	25	26	GND	PWR	
	PWR	GND	27	28	+1.5V	PWR	
	PWR	GND	29	30	SMB_CLK		
		PCIE_TXN	31	32	SMB_DATA		
		PCIE_TXP	33	34	GND	PWR	
	PWR	GND	35	36	NC	NC	
	PWR	GND	37	38	NC	NC	
	PWR	+3V3 Dual	39	40	GND	PWR	
	PWR	+3V3 Dual	41	42	NC	NC	
	PWR	GND	43	44	NC	NC	
		CLK_MPCIE	45	46	NC	NC	
		DATA_MPCIE	47	48	+1.5V	PWR	
		RST_MPCIE#	49	50	GND	PWR	
3		SEL_MSATA	51	52	+3V3 Dual	PWR	

Note 1: 10K ohm pull-up to 3V3.

Note 2: 2K2 ohm pull-up to 3V3 Dual.

Note 3: 100K ohm pull-up to 1V8 (S0 mode)

8.1.3 miniPCI-Express mPCIe (J42)

The miniPCI Express port mPCIe supports mPCIe cards only. (mSATA not supported)

Note	Type	Signal	PIN		Signal	Type	Note
		WAKE#	1	2	+3V3	PWR	
	NC	NC	3	4	GND	PWR	
	NC	NC	5	6	+1.5V	PWR	
1		CLKREQ#	7	8	NC	NC	
	PWR	GND	9	10	NC	NC	
		PCIE_mini CLK#	11	12	NC	NC	
		PCIE_mini CLK	13	14	NC	NC	
	PWR	GND	15	16	NC	NC	
	NC	NC	17	18	GND	PWR	
	NC	NC	19	20	W_Disable#		2
	PWR	GND	21	22	RST#		
		PCIE_RXN	23	24	+3V3 Dual	PWR	
		PCIE_RXP	25	26	GND	PWR	
	PWR	GND	27	28	+1.5V	PWR	
	PWR	GND	29	30	SMB_CLK		
		PCIE_TXN	31	32	SMB_DATA		
		PCIE_TXP	33	34	GND	PWR	
	PWR	GND	35	36	NC	NC	
	NC	NC	37	38	NC	NC	
	NC	NC	39	40	GND	PWR	
	NC	NC	41	42	NC	NC	
	NC	NC	43	44	NC	NC	
	NC	NC	45	46	NC	NC	
	NC	NC	47	48	+1.5V	PWR	
	NC	NC	49	50	GND	PWR	
	NC	NC	51	52	+3V3	PWR	

Note 1: 10K ohm pull-up to 3V3 Dual.

Note 2: 2K2 ohm pull-up to 3V3 Dual.

8.1.4 PCI-Express x4 Connector (PCIe x4) (J33)

The KTQ77 supports one PCIex4 in a PCIex16 slot. All GND pins in the PCIEx16 connector are connected to GND, but all signal pins from pin 33 and above are all unconnected.

Note	Type	Signal	PIN		Signal	Type	Note
		+12V	B1	A1	NC		
		+12V	B2	A2	+12V		
		+12V	B3	A3	+12V		
		GND	B4	A4	GND		
		SMB_CLK	B5	A5	NC		
		SMB_DATA	B6	A6	NC		
		GND	B7	A7	NC		
		+3V3	B8	A8	NC		
		NC	B9	A9	+3V3		
		SB3V3	B10	A10	+3V3		
		WAKE#	B11	A11	RST#		
		NC	B12	A12	GND		
		GND	B13	A13	PCIE_x16 CLK		
		PEG_TXP[0]	B14	A14	PCIE_x16 CLK#		
		PEG_TXN[0]	B15	A15	GND		
		GND	B16	A16	PEG_RXP[0]		
1		CLKREQ	B17	A17	PEG_RXN[0]		
		GND	B18	A18	GND		
		PEG_TXP[1]	B19	A19	NC		
		PEG_TXN[1]	B20	A20	GND		
		GND	B21	A21	PEG_RXP[1]		
		GND	B22	A22	PEG_RXN[1]		
		PEG_TXP[2]	B23	A23	GND		
		PEG_TXN[2]	B24	A24	GND		
		GND	B25	A25	PEG_RXP[2]		
		GND	B26	A26	PEG_RXN[2]		
		PEG_TXP[3]	B27	A27	GND		
		PEG_TXN[3]	B28	A28	GND		
		GND	B29	A29	PEG_RXP[3]		
		NC	B30	A30	PEG_RXN[3]		
		NC	B31	A31	GND		
		GND	B32	A32	NC		

Note 1: 10K ohm pull-up to 3V3 Dual.

8.2 PCI Slot Connectors

KTQ77/Flex support 2 PCI slots PCI0 – PCI1 (J1 – J2).

Note	Type	Signal	Terminal S	Terminal C	Signal	Type	Note
	PWR	-12V	F01	E01	TRST#	O	
	O	TCK	F02	E02	+12V	PWR	
	PWR	GND	F03	E03	TMS	O	
NC	I	TDO	F04	E04	TDI	O	
	PWR	+5V	F05	E05	+5V	PWR	
	PWR	+5V	F06	E06	INTA#	I	
	I	INTB#	F07	E07	INTC#	I	
	I	INTD#	F08	E08	+5V	PWR	
NC	-	-	F09	E09	-	-	NC
NC	-	-	F10	E10	+5V (I/O)	PWR	
NC	-	-	F11	E11	-	-	NC
	PWR	GND	F12	E12	GND	PWR	
	PWR	GND	F13	E13	GND	PWR	
NC	-	-	F14	E14	GNT3#	OT	
	PWR	GND	F15	E15	RST#	O	
	O	CLKB	F16	E16	+5V (I/O)	PWR	
	PWR	GND	F17	E17	GNT0#	OT	
	I	REQ0#	F18	E18	GND	PWR	
	PWR	+5V (I/O)	F19	E19	PME#	I	
	IOT	AD31	F20	E20	AD30	IOT	
	IOT	AD29	F21	E21	+3.3V	PWR	
	PWR	GND	F22	E22	AD28	IOT	
	IOT	AD27	F23	E23	AD26	IOT	
	IOT	AD25	F24	E24	GND	PWR	
	PWR	+3.3V	F25	E25	AD24	IOT	
	IOT	C/BE3#	F26	E26	GNT1#	OT	
	IOT	AD23	F27	E27	+3.3V	PWR	
	PWR	GND	F28	E28	AD22	IOT	
	IOT	AD21	F29	E29	AD20	IOT	
	IOT	AD19	F30	E30	GND	PWR	
	PWR	+3.3V	F31	E31	AD18	IOT	
	IOT	AD17	F32	E32	AD16	IOT	
	IOT	C/BE2#	F33	E33	+3.3V	PWR	
	PWR	GND	F34	E34	FRAME#	IOT	
	IOT	IRDY#	F35	E35	GND	PWR	
	PWR	+3.3V	F36	E36	TRDY#	IOT	
	IOT	DEVSEL#	F37	E37	GND	PWR	
	PWR	GND	F38	E38	STOP#	IOT	
	IOT	LOCK#	F39	E39	+3.3V	PWR	
	IOT	PERR#	F40	E40	SDONE	IO	
	PWR	+3.3V	F41	E41	SB0#	IO	
	IOC	SERR#	F42	E42	GND	PWR	
	PWR	+3.3V	F43	E43	PAR	IOT	
	IOT	C/BE1#	F44	E44	AD15	IOT	
	IOT	AD14	F45	E45	+3.3V	PWR	
	PWR	GND	F46	E46	AD13	IOT	
	IOT	AD12	F47	E47	AD11	IOT	
	IOT	AD10	F48	E48	GND	PWR	
	PWR	GND	F49	E49	AD09	IOT	
SOLDER SIDE					**COMPONENT SIDE**		
	IOT	AD08	F52	E52	C/BE0#	IOT	
	IOT	AD07	F53	E53	+3.3V	PWR	
	PWR	+3.3V	F54	E54	AD06	IOT	
	IOT	AD05	F55	E55	AD04	IOT	
	IOT	AD03	F56	F56	GND	PWR	
	PWR	GND	F57	E57	AD02	IOT	
	IOT	AD01	F58	E58	AD00	IOT	
	PWR	+5V (I/O)	F59	E59	+5V (I/O)	PWR	
	IOT	ACK64#	F60	E60	REQ64#	IOT	
	PWR	+5V	F61	E61	+5V	PWR	
	PWR	+5V	F62	E62	+5V	PWR	

8.2.1 Signal Description – PCI Slot Connector

SYSTEM PINS	
CLK	Clock provides timing for all transactions on PCI and is an input to every PCI device. All other PCI signals, except RST#, INTA#, INTB#, INTC#, and INTD#, are sampled on the risingedge of CLK and all other timing parameters are defined with respect to this edge. PCI operates at 33MHz.
PME#	Power Management Event interrupt signal. Wake up signal.
RST#	Reset is used to bring PCI-specific registers, sequencers, and signals to a consistent state. What effect RST# has on a device beyond the PCI sequencer is beyond the scope of this specification, except for reset states of required PCI configuration registers. Anytime RST# is asserted, all PCI output signals must be driven to their benign state. In general, this means they must be asynchronously tri-stated. SERR# (open drain) is floated. REQ# and GNT# must both be tri-stated (they cannot be driven low or high during reset). To prevent AD, C/BE#, and PAR signals from floating during reset, the central resource may drive these lines during reset (bus parking) but only to a logic low level–they may not be driven high. RST# may be asynchronous to CLK when asserted or deasserted. Although asynchronous, deassertion is guaranteed to be a clean, bounce-free edge. Except for configuration accesses, only devices that are required to boot the system will respond after reset.
ADDRESS AND DATA	
AD[31::00]	Address and Data are multiplexed on the same PCI pins. A bus transaction consists of an address phase followed by one or more data phases. PCI supports both read and write bursts. The address phase is the clock cycle in which FRAME# is asserted. During the address phase AD[31::00] contain a physical address (32 bits). For I/O, this is a byte address; for configuration and memory, it is a DWORD address. During data phases AD[07::00] contain the least significant byte (lsb) and AD[31::24] contain the most significant byte (msb). Write data is stable and valid when IRDY# is asserted and read data is stable and valid when TRDY# is asserted. Data is transferred during those clocks where both IRDY# and TRDY# are asserted.
C/BE[3::0]#	Bus Command and Byte Enables are multiplexed on the same PCI pins. During the address phase of a transaction, C/BE[3::0]# define the bus command. During the data phase C/BE[3::0]# are used as Byte Enables. The Byte Enables are valid for the entire data phase and determine which byte lanes carry meaningful data. C/BE[0]# applies to byte 0 (lsb) and C/BE[3]# applies to byte 3 (msb).
PAR	Parity is even parity across AD[31::00] and C/BE[3::0]#. Parity generation is required by all PCI agents. PAR is stable and valid one clock after the address phase. For data phases, PAR is stable and valid one clock after either IRDY# is asserted on a write transaction or TRDY# is asserted on a read transaction. Once PAR is valid, it remains valid until one clock after the completion of the current data phase. (PAR has the same timing as AD[31::00], but it is delayed by one clock.) The master drives PAR for address and write data phases; the target drives PAR for read data phases.
INTERFACE CONTROL PINS	
FRAME#	Cycle Frame is driven by the current master to indicate the beginning and duration of an access. FRAME# is asserted to indicate a bus transaction is beginning. While FRAME# is asserted, data transfers continue. When FRAME# is deasserted, the transaction is in the final data phase or has completed.
IRDY#	Initiator Ready indicates the initiating agent's (bus master's) ability to complete the current data phase of the transaction. IRDY# is used in conjunction with TRDY#. A data phase is completed on any clock both IRDY# and TRDY# are sampled asserted. During a write, IRDY# indicates that valid data is present on AD[31::00]. During a read, it indicates the master is prepared to accept data. Wait cycles are inserted until both IRDY# and TRDY# are asserted together.
TRDY#	Target Ready indicates the target agent's (selected device's) ability to complete the current data phase of the transaction. TRDY# is used in conjunction with IRDY#. A data phase is completed on any clock both TRDY# and IRDY# are sampled asserted. During a read, TRDY# indicates that valid data is present on AD[31::00]. During a write, it indicates the target is prepared to accept data. Wait cycles are inserted until both IRDY# and TRDY# are asserted together.
STOP#	Stop indicates the current target is requesting the master to stop the current transaction.
LOCK#	Lock indicates an atomic operation that may require multiple transactions to complete. When LOCK# is asserted, non-exclusive transactions may proceed to an address that is not currently locked. A grant to start a transaction on PCI does not guarantee control of LOCK#. Control of LOCK# is obtained under its own protocol in conjunction with GNT#. It is possible for different agents to use PCI while a single master retains ownership of LOCK#. If a device implements Executable Memory, it should also implement LOCK# and guarantee complete access exclusion in that memory. A target of an access that supports LOCK# must provide exclusion to a minimum of 16 bytes (aligned). Host bridges that have system memory behind them should implement LOCK# as a target from the PCI bus point of view and optionally as a master.
IDSEL	Initialization Device Select is used as a chip select during configuration read and write transactions.
DEVSEL#	Device Select, when actively driven, indicates the driving device has decoded its address as the target of the current access. As an input, DEVSEL# indicates whether any device on the bus has been selected.

ARBITRATION PINS (BUS MASTERS ONLY)	
REQ#	Request indicates to the arbiter that this agent desires use of the bus. This is a point to point signal. Every master has its own REQ# which must be tri-stated while RST# is asserted.
GNT#	Grant indicates to the agent that access to the bus has been granted. This is a point to point signal. Every master has its own GNT# which must be ignored while RST# is asserted. While RST# is asserted, the arbiter must ignore all REQ# lines since they are tri-stated and do not contain a valid request. The arbiter can only perform arbitration after RST# is deasserted. A master must ignore its GNT# while RST# is asserted. REQ# and GNT# are tri-state signals due to power sequencing requirements when 3.3V or 5.0V only add-in boards are used with add-in boards that use a universal I/O buffer.
ERROR REPORTING PINS. The error reporting pins are required by all devices and maybe asserted when enabled	
PERR#	Parity Error is only for the reporting of data parity errors during all PCI transactions except a Special Cycle. The PERR# pin is sustained tri-state and must be driven active by the agent receiving data two clocks following the data when a data parity error is detected. The minimum duration of PERR# is one clock for each data phase that a data parity error is detected. (If sequential data phases each have a data parity error, the PERR# signal will be asserted for more than a single clock.) PERR# must be driven high for one clock before being tri-stated as with all sustained tri-state signals. There are no special conditions when a data parity error may be lost or when reporting of an error may be delayed. An agent cannot report a PERR# until it has claimed the access by asserting DEVSEL# (for a target) and completed a data phase or is the master of the current transaction.
SERR#	System Error is for reporting address parity errors, data parity errors on the Special Cycle command, or any other system error where the result will be catastrophic. If an agent does not want a non-maskable interrupt (NMI) to be generated, a different reporting mechanism is required. SERR# is pure open drain and is actively driven for a single PCI clock by the agent reporting the error. The assertion of SERR# is synchronous to the clock and meets the setup and hold times of all bused signals. However, the restoring of SERR# to the deasserted state is accomplished by a weak pullup (same value as used for s/t/s) which is provided by the system designer and not by the 65signaling agent or central resource. This pull-up may take two to three clock periods to fully restore SERR#. The agent that reports SERR#s to the operating system does so anytime SERR# is sampled asserted.
INTERRUPT PINS (OPTIONAL). Interrupts on PCI are optional and defined as “level sensitive,” asserted low (negative true), using open drain output drivers. The assertion and deassertion of INTx# is asynchronous to CLK. A device asserts its INTx# line when requesting attention from its device driver. Once the INTx# signal is asserted, it remains asserted until the device driver clears the pending request. When the request is cleared, the device deasserts its INTx# signal. PCI defines one interrupt line for a single function device and up to four interrupt lines for a multi-function device or connector. For a single function device, only INTA# may be used while the other three interrupt lines have no meaning.	
INTA#	Interrupt A is used to request an interrupt.
INTB#	Interrupt B is used to request an interrupt and only has meaning on a multi-function device.
INTC#	Interrupt C is used to request an interrupt and only has meaning on a multi-function device.
INTD#	Interrupt D is used to request an interrupt and only has meaning on a multi-function device.

8.2.2 KTQ77 PCI IRQ & INT routing

Board type	Slot	REQ	GNT	IDSEL	INTA	INTB	INTC	INTD
KTQ77/Flex	0	REQ0	GNT0	17	INTA	INTB	INTC	INTD
	1	REQ1	GNT1	18	INTF	INTG	INTH	INTE

When using the 820982 “PCI Riser - Flex - 2slot w. arbiter” the lower slot has IDSEL / IRQs routed straight through and the top slot has the routing: IDSEL=AD22, INT_PIRQ#D, INT_PIRQ#A, INT_PIRQ#B, INT_PIRQ#C. 820982 PCI Riser shall be plugged into Slot 0 and jumper in AD30.

9 On-board - & mating connector types

The Mating connectors / Cables are connectors or cable kits which are fitting the On-board connector. The highlighted cable kits are included in the “KTQ77 Cable & Driver Kit” PN 826599, in different quantities depending on type of connector. For example there are 4x 821017 COM cables and 6x 821035 SATA cables.

Connector	On-board Connectors		Mating Connectors / Cables	
	Manufacturer	Type no.	Manufacturer	Type no.
FAN_CPU	Foxconn	HF2704E-M1	AMP	1375820-4 (4-pole)
FAN_SYS	AMP	1470947-1	AMP	1375820-3 (3-pole)
KBDMSE	Molex	22-23-2061	Molex	22-01-2065
			Kontron	**KT 1046-3381**
CDROM	Foxconn	HF1104E	Molex	50-57-9404
	Molex	70543-0038		
SATA	Hon Hai	LD1807V-S52T	Molex	67489-8005
			Kontron	**KT 821035** (cable kit)
ATXEWR	Molex	44206-0002	Molex	5557-24R
ATX+12V-4pin	Lotes	ABA-POW-003-K02	Molex	39-01-2045
EDP	Tyco	5-2069716-3	Tyco	2023344-3
LVDS	Don Connex	C44-40BSB1-G	Don Connex	A32-40-C-G-B-1
			Kontron	KT 910000005
			Kontron	**KT 821515** (cable kit)
			Kontron	KT 821155 (cable kit)
COM1,2, 3, 4	Wuerth	61201020621	Molex	90635-1103
			Kontron	KT 821016 (cable kit)
			Kontron	**KT 821017** (cable kit)
USB68/9, 10/11, 12/13	Pinrex	512-90-10GBB2	Kontron	**KT 821401** (cable kit)
USB6/7 (*)	(FRONTPNL)	-	Kontron	**KT 821401** (cable kit)
AUDIO_HEAD	Molex	87831-2620	Molex	51110-2651
			Kontron	**KT 821043** (cable kit)
FRONTPNL	Pinrex	512-90-24GBB3	Molex	90635-1243
			Kontron	**KT 821042** (cable kit)
FEATURE	Foxconn	HS5422F	Don Connex	A05c-44-B-G-A-1-G

* USB6/USB7 is located in FRONTPNL connector. Depending on application KT 821401 can be used.

Note: Only one connector will be mentioned for each type of on-board connector even though several types with same fit, form and function are approved and could be used as alternative. Please also notice that standard connectors like DVI, DP, PCIe, miniPCIe, PCI, Audio Jack, Ethernet and USB is not included in the list.

10 System Resources

10.1 Memory Map

Address (hex)		Size (hex)	Description
0xFF000000	0xFFFFFFFF	1000000	Intel 82802 Firmware Hub Motherboard resources
0xFEE00000	0xFEEFFFFF	100000	Motherboard resources
0xFED10000	0xFED93FFF	84000	Motherboard resources
0xFED00000	0xFED003FF	400	High Precision Event Timer
0xF8000000	0xFBFFFFFF	400000	Motherboard resources
0xF7E3B000	0xF7E3B00F	10	Intel® Management Engine Interface
0xF7E39000	0xF7E39FFF	1000	Intel® 82579LM Gigabit #1
0xF7E38000	0xF7E383FF	400	Intel® Chipset USB EHCI – 1E2D
0xF7E37000	0xF7E373FF	400	Intel® Chipset USB EHCI – 1E26
0xF7E36000	0xF7E367FF	800	Intel® Chipset 7 port SATA ACHI – 1E02
0xF7E35000	0xF7E350FF	100	Intel® Chipset SMBus Controller – 1E22
0xF7E30000	0xF7E33FFF	4000	High Definition Audio Controller
0xF7E20000	0xF7E2FFFF	10000	Intel USB 3.0 XHCI
0xF7E00000	0xF7E1FFFF	20000	Intel® 82579LM Gigabit #1
0xF7D20000	0xF7D23FFF	4000	Intel 82574L Gigabit #3
0xF7D00000	0xF7DFFFFF	100000	Intel® Chipset PCIe Root port – 1E10
0xF7D00000	0xF7D1FFFF	20000	Intel 82574L Gigabit #3
0xF7C20000	0xF7C23FFF	4000	Intel 82574L Gigabit #2
0xF7C00000	0xF7CFFFFF	100000	Intel® Chipset PCIe Root port – 1E12
0xF7C00000	0xF7C1FFFF	20000	Intel 82574L Gigabit #2
0xF7800000	0xF7BFFFFF	400000	Intel HD Graphics
0xE0000000	0xEFFFFFFF	10000000	Intel HD Graphics
0xDFA00000	0xFEAFFFFF	1F100000	PCI bus
0xDFA00000	0xDFA00FFF	1000	Motherboard resources
0x40004000	0x40004FFF	1000	System board
0x20000000	0x201FFFFF	200000	System board
0xD0000	0xE7FFF	18000	PCI bus
0xA0000	0xBFFFF	20000	Intel HD Graphics PCI bus

10.2 PCI Devices

Bus #	Device #	Function #	Vendor ID	Device ID	Chip	Device Function
0	0	0	8086	0150	CPU	Intel – DRAM Controller
0	2	0	8086	0152	CPU	Intel – HD Graphics
0	20	0	8086	1E31	Q77 Chipset	Intel - USB 3.0
0	22	0	8086	1E3A	Q77 Chipset	Intel – Management Engine
0	25	0	8086	1502	82579LM LAN	Intel - Ethernet Controller
0	26	0	8086	1E2D	Q77 Chipset	Intel - USB
0	27	0	8086	1E20	Q77 Chipset	Intel - HD Audio
0	28	0	8086	1E10	Q77 Chipset	Intel – PCIe Root Port 1
0	28	1	8086	1E12	Q77 Chipset	Intel – PCIe Root Port 2
0	29	0	8086	1E26	Q77 Chipset	Intel - USB
0	30	0	8086	244E	82801 PCI Bridge	Intel – PCI Bridge
0	31	0	8086	1E47	Q77 Chipset	Intel - LPC
0	31	2	8086	1E02	Q77 Chipset	Intel - SATA AHCI Controller
0	31	3	8086	1E22	Q77 Chipset	Intel - SMBus
1	0	0	8086	10D3	82574L LAN	Intel - Ethernet Controller
2	0	0	8086	10D3	82574L LAN	Intel - Ethernet Controller

10.3 Interrupt Usage

IRQ	System timer	PS/2 Keyboard	COM2 Selection in BIOS	COM1 Selection in BIOS	SMBus Chipset 7 – 1E22	COM3 Selection in BIOS	System CMOS/real-time watch	COM4 Selection in BIOS	PS2 Mouse	Numerical Data Processor	Intel(R) USB EHCI – 1E2D	PCIe Root port 1 – 1E10	Intel(R) Management Engine Interface	PCIe Root port 2 – 1E12	Intel(R) SATA ACHI – 1E02	High Definition Audio	Intel(R) USB EHCI – 1E26						Notes
NMI																							
IRQ0	X																						
IRQ1		X																					
IRQ2																							
IRQ3			X																				
IRQ4				X																			
IRQ5					X																		
IRQ6																							
IRQ7						X																	
IRQ8							X																
IRQ9																							
IRQ10								X															
IRQ11																							
IRQ12									X														
IRQ13										X													
IRQ14																							
IRQ15																							
IRQ16											X	X	X										
IRQ17														X									
IRQ18																							
IRQ19															X								
IRQ20																							
IRQ21																							
IRQ22																							
IRQ23																X	X						
IRQ24																							
IRQ25																							
IRQ26																							

10.4 IO Map

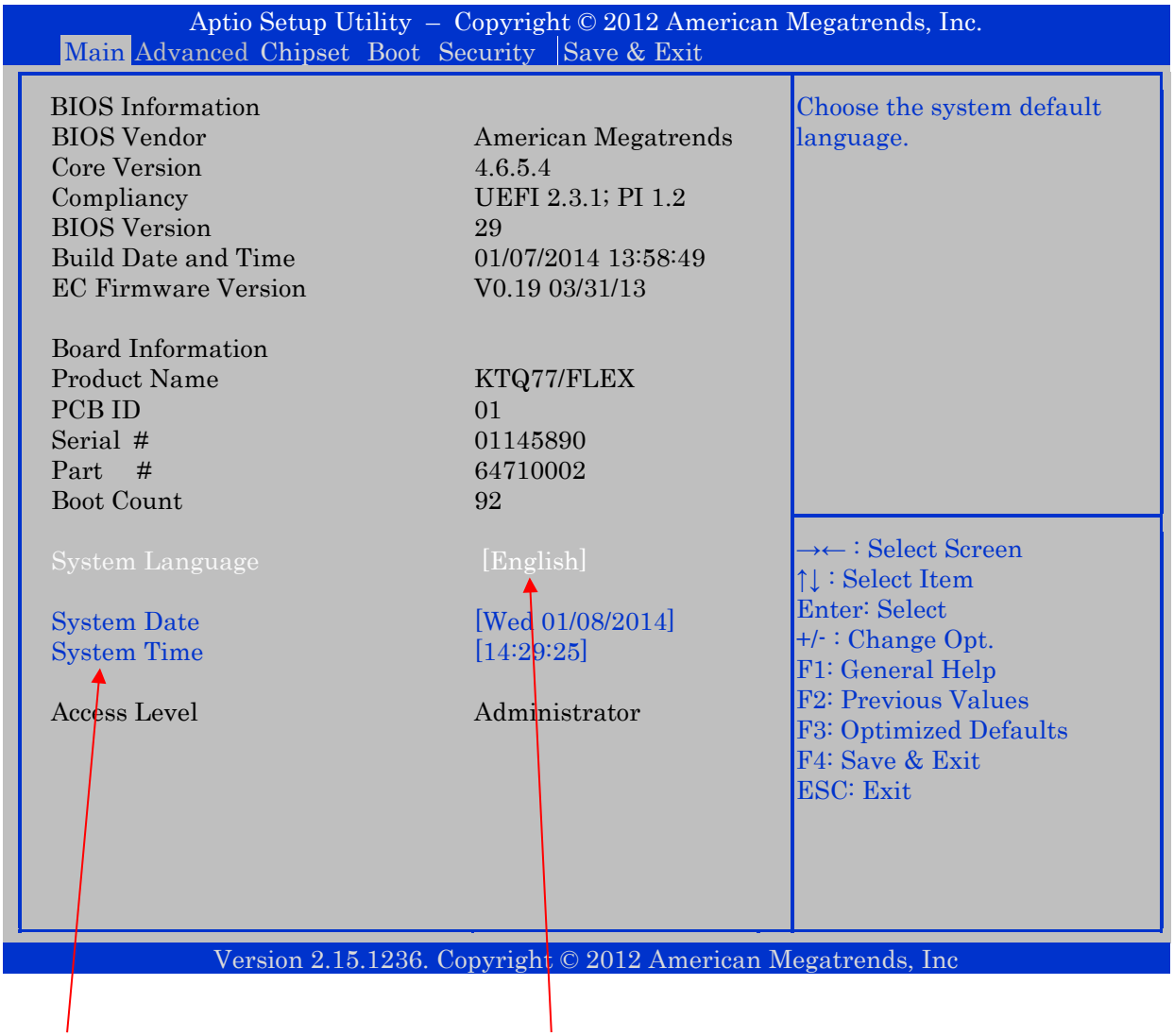
Address range (hex)		Size (hex)	Description
0x0000FFFF	0x0000FFFF	1	Motherboard resources
0x0000F0D0	0x0000F0D7	8	Intel® 7 port SATA AHCI – 1E02
0x0000F0C0	0x0000F0C3	4	Intel® 7 port SATA AHCI – 1E02
0x0000F0B0	0x0000F0B7	8	Intel® 7 port SATA AHCI – 1E02
0x0000F0A0	0x0000F0A3	4	Intel® 7 port SATA AHCI – 1E02
0x0000F060	0x0000F07F	20	Intel® 7 port SATA AHCI – 1E02
0x0000F040	0x0000F05F	20	Intel® SMBus – 1E22
0x0000F000	0x0000F03F	40	Intel® HD Graphics family
0x0000E000	0x0000EFFF	1000	PCIe Root port 1 – 1E10
0x0000D000	0x0000DFFF	1000	PCIe Root port 2 – 1E12
0x0000164E	0x0000164F	2	PCI bus Motherboard resources
0x00001000	0x0000100F	10	PCI bus Motherboard resources
0x00000A00	0x00000A2F	30	Motherboard resources
0x00000680	0x0000069F	20	Motherboard resources
0x00000500	0x0000057F	80	Motherboard resources
0x000004D0	0x000004D1	2	Programmable interrupt controller
0x00000400	0x0000047F	80	Motherboard resources
0x000003F8	0x000003FF	8	COM1
0x000003E8	0x000003EF	8	COM3
0x000003C0	0x000003DF	20	Intel® HD Graphics family
0x000003B0	0x000003BB	C	Intel® HD Graphics family
0x000002F8	0x000002FF	8	COM2
0x000002E8	0x000002EF	8	COM4
0x00000290	0x0000029F	10	Motherboard resources
0x0000020E	0x0000020F	2	Motherboard resources
0x000000F0	0x000000FF	10	Numeric data processor
0x000000E0	0x000000EF	10	Motherboard resources
0x000000C0	0x000000DF	20	Direct memory access controller
0x000000A2	0x000000BF	1E	Motherboard resources
0x000000A0	0x000000A1	2	Programmable interrupt controller
0x00000090	0x0000009F	10	Motherboard resources
0x00000081	0x00000091	11	Direct memory access controller
0x00000072	0x00000080	F	Motherboard resources
0x00000070	0x00000077	8	System CMOS/real time clock
0x00000065	0x0000006F	B	Motherboard resources
0x00000064	0x00000064	1	Standard PS/2 Keyboard
0x00000062	0x00000063	2	Motherboard resources
0x00000061	0x00000061	1	System Speaker
0x00000060	0x00000060	1	Standard PS/2 Keyboard
0x00000044	0x0000005F	1C	Motherboard resources
0x00000040	0x00000043	4	System Timer
0x00000022	0x0000003F	1E	Motherboard resources
0x00000020	0x00000021	2	Programmable interrupt controller
0x00000000	0x0000001F	20	Direct memory access controller

11 BIOS

The BIOS Setup is used to view and configure BIOS settings for the board. The BIOS Setup is accessed by pressing the <Del> -key after the Power-On Self-Test (POST) memory test begins and before the operating system boot begins.

The BIOS settings will be loaded automatically when loading “Restore Default” see “Save & Exit” menu. In this Users Guide the default settings are indicated by **bold**. Please notice that “Restore User Defaults” might have different set of default values.

11.1 Main

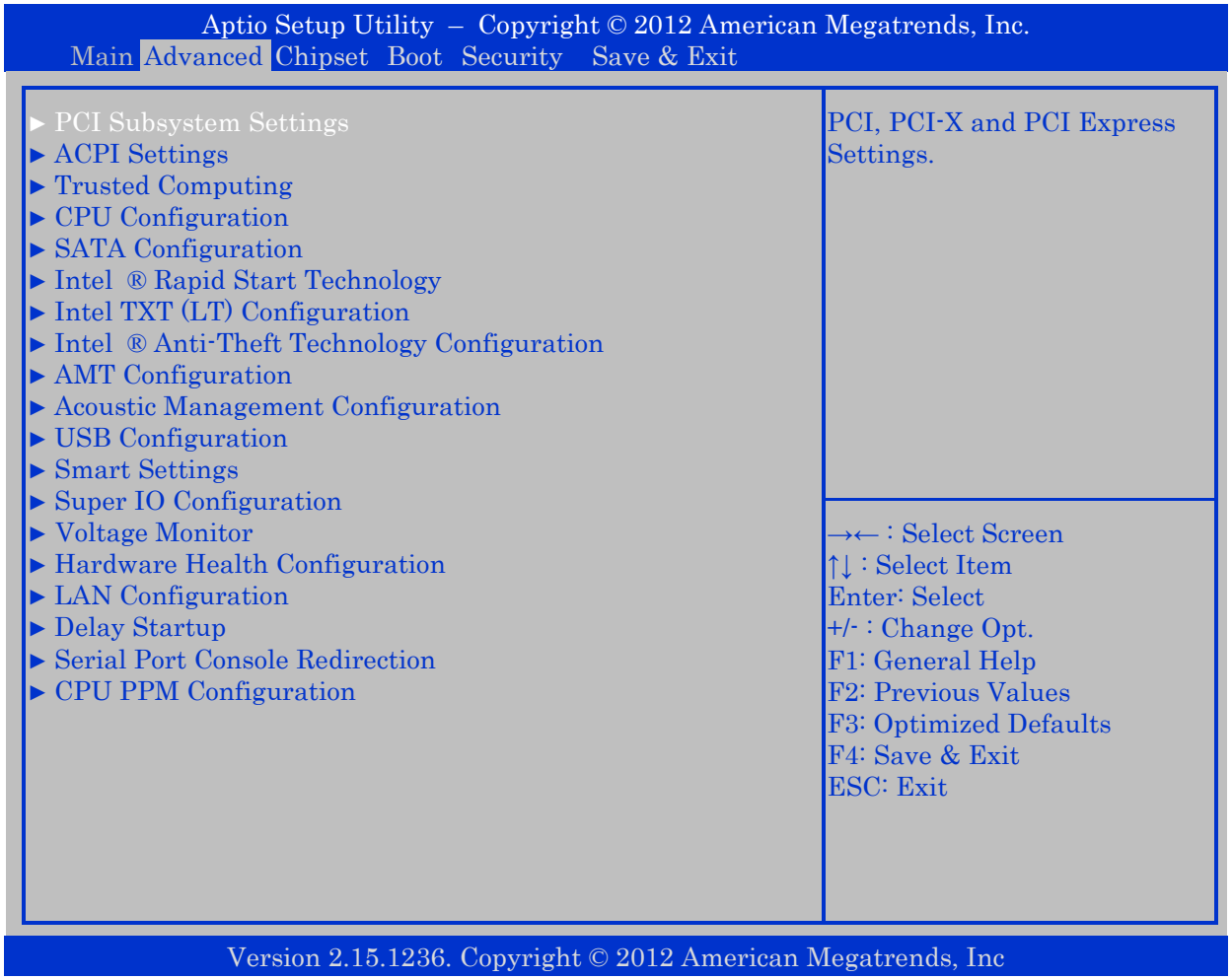


Blue text for settings that can be changed. White text for actual setting to be changed via the control keys (Black text for settings that cannot be changed via control keys)

The following table describes the changeable settings:

Feature	Options	Description
System Date	MM/DD/YYYY	Set the system date.
System Time	HH:MM:SS	Set the system time.

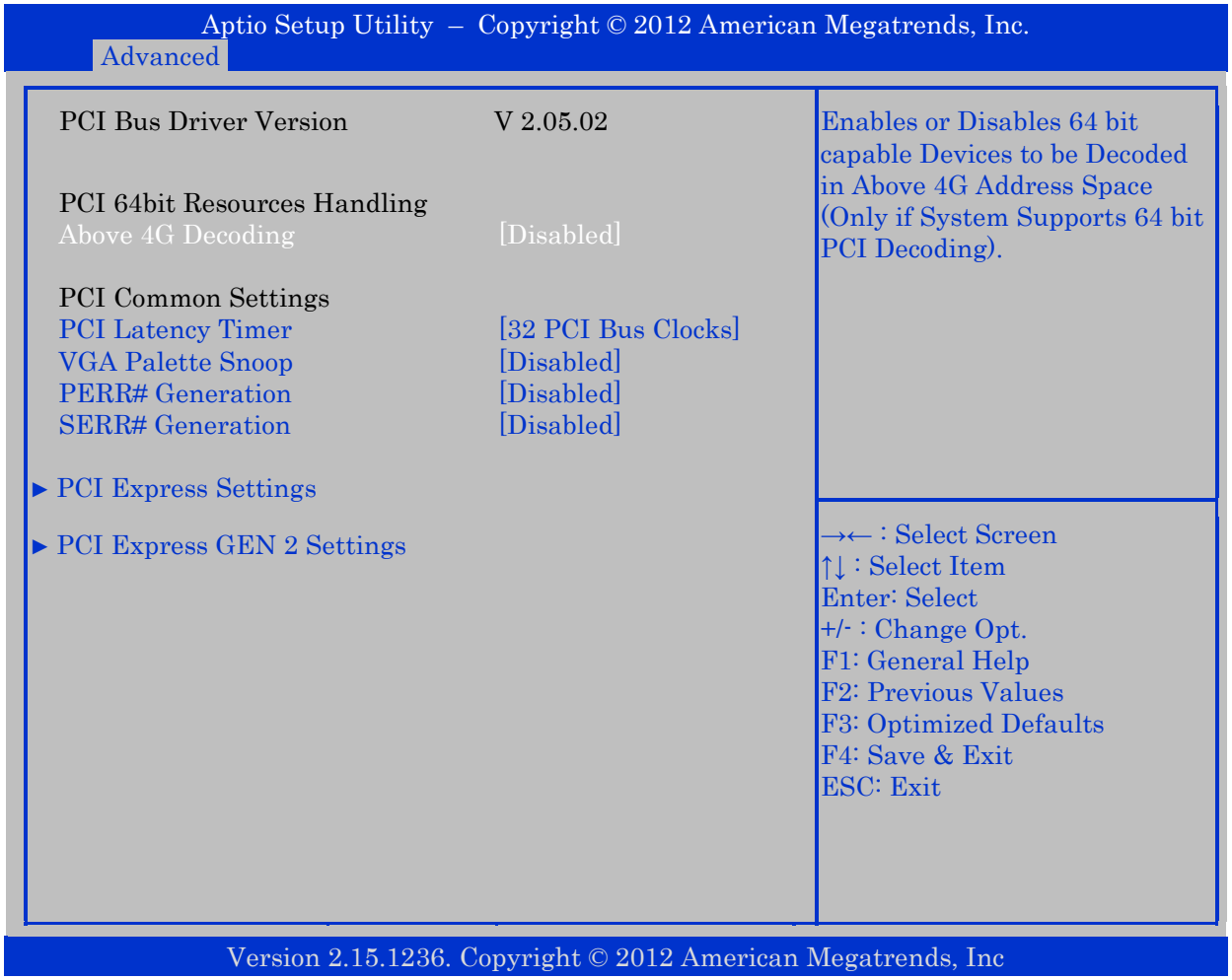
11.2 Advanced



The Advanced (main) menu contains submenu selections which will be described in more details on the following pages.

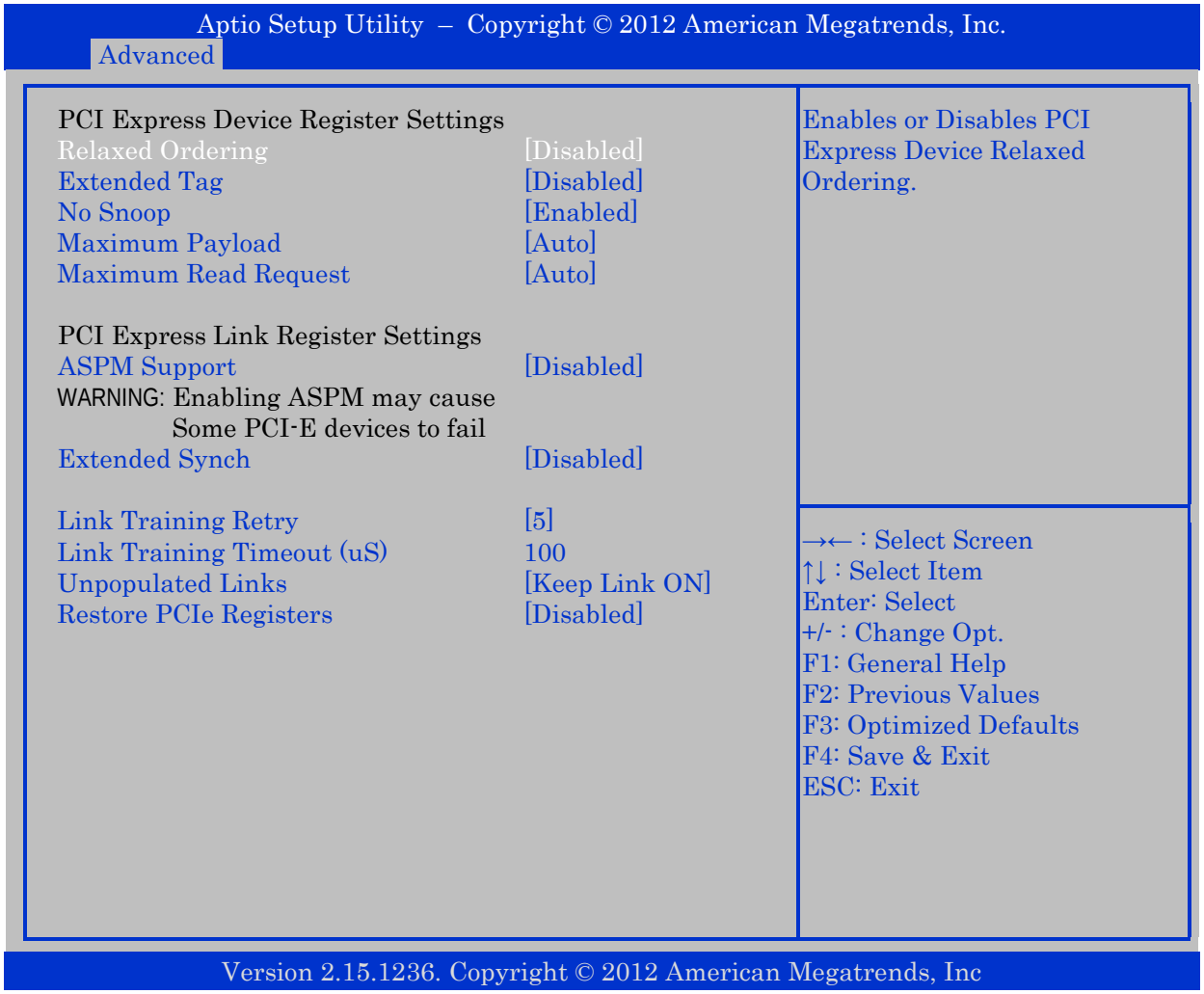
In order to make a selection of a submenu activated the ↑↓ keys until the requested submenu becomes white color, then activate the <Enter>.

11.2.1 Advanced - PCI Subsystem Settings



Function	Selection	Description
Above 4G Decoding	**Disabled** Enabled	Enables or Disables 64 bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).
PCI Latency Timer	**32 PCI Bus Clocks** 64 PCI Bus Clocks 96 PCI Bus Clocks 128 PCI Bus Clocks 160 PCI Bus Clocks 192 PCI Bus Clocks 224 PCI Bus Clocks 248 PCI Bus Clocks	Value to be programmed into PCI Latency Timer Register.
VGA Palette Snoop	**Disabled** Enabled	Enables or Disables VGA Palette Registers Snooping.
PERR# Generation	**Disabled** Enabled	Enables or Disables PCI Device to Generate PERR#.
SERR# Generation	**Disabled** Enabled	Enables or Disables PCI Device to Generate SERR#.

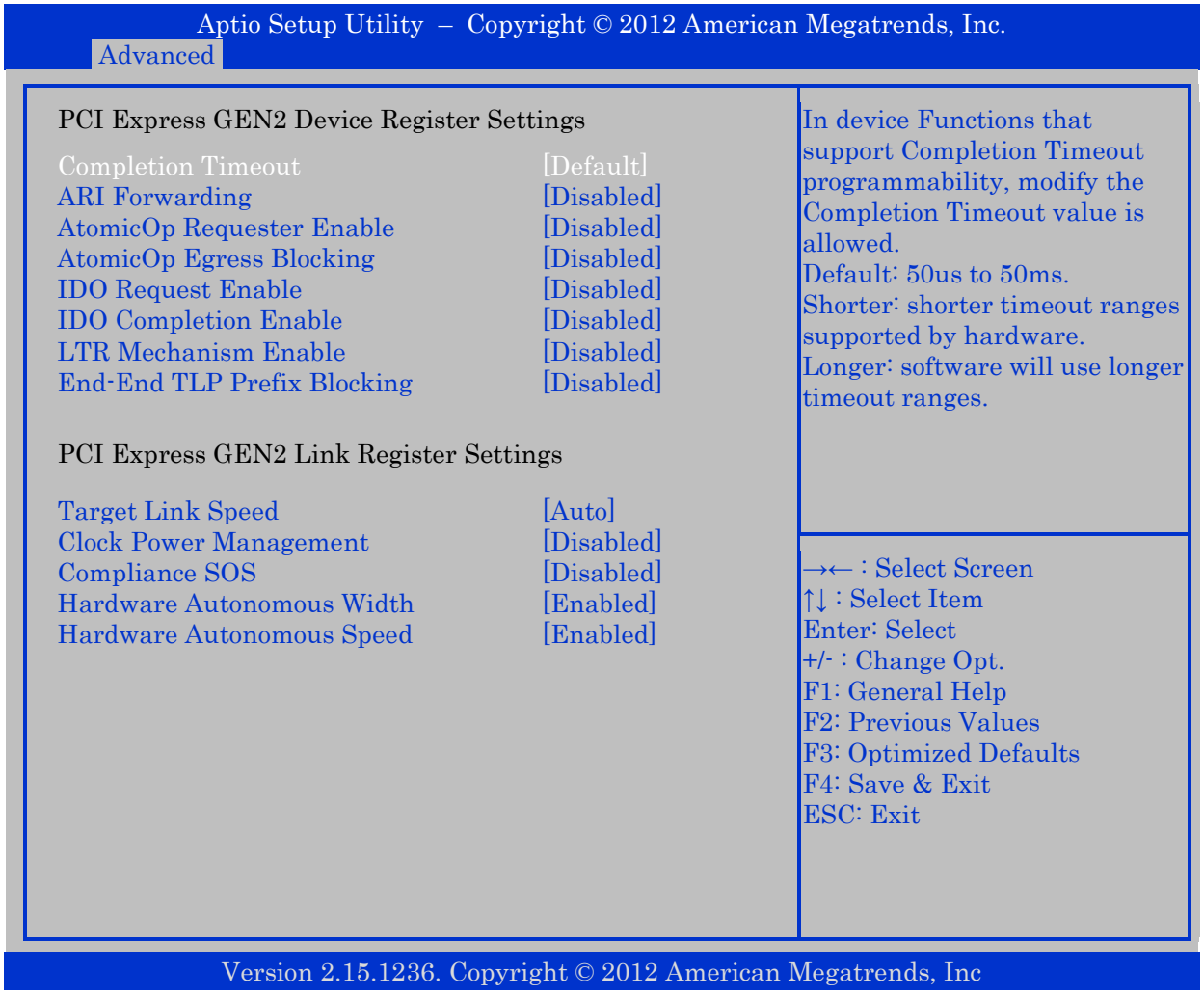
11.2.1.1 PCI Express Settings



Function	Selection	Description
Relaxed Ordering	**Disabled** Enabled	Enables or Disables PCI Express Device Relaxed Ordering.
Extended Tag	**Disabled** Enabled	If ENABLED allows Device to use 8-bit Tag field as a requester.
No Snoop	**Disabled** Enabled	Enables or Disables PCI Express Device No Snoop option.
Maximum Payload	**Auto** 128 Bytes 256 Bytes 512 Bytes 1024 Bytes 2048 Bytes 4096 Bytes	Set Maximum Payload of PCI Express Device or allow System BIOS to select the value.
Maximum Read Request	**Auto** 128 Bytes 256 Bytes 512 Bytes 1024 Bytes 2048 Bytes 4096 Bytes	Set Maximum Read Request Size of PCI Express Device or allow System BIOS to select the value.
ASPM Support	**Disabled** Auto Force L0s	Set the ASPM Level: Force L0s - Force all links to L0s State: Auto – BIOS auto configure: Disable – Disabled ASPM
Extended Synch	**Disabled** Enabled	If ENABLED allows generation of Extended Synchronization patterns.
Link Training Retry	Disabled 2 3 **5**	Defines number of Retry Attempts software will take to retrain the link if previous training attempt was unsuccessful.
Link Training Timeout (uS)	**100** (note1)	Defines number of Microseconds software will wait before polling ´Link Training´ bit in Link Status register. Value range from 1 to 100uS.
Unpopulated Links	**Keep Link ON** Disable Link	In order to save power, software will disable unpopulated PCI Express links, if this option set to ´Disabled Link´.
Restore PCIe Registers	Enabled **Disabled**	On non-PCI Express aware OS's (Pre Windows Vista) some devices may not be correctly reinitialized after S3. Enabling this restores PCI Express device configurations on S3 resume. Warning: Enabling this may cause issues with other hardware after S3 resume.

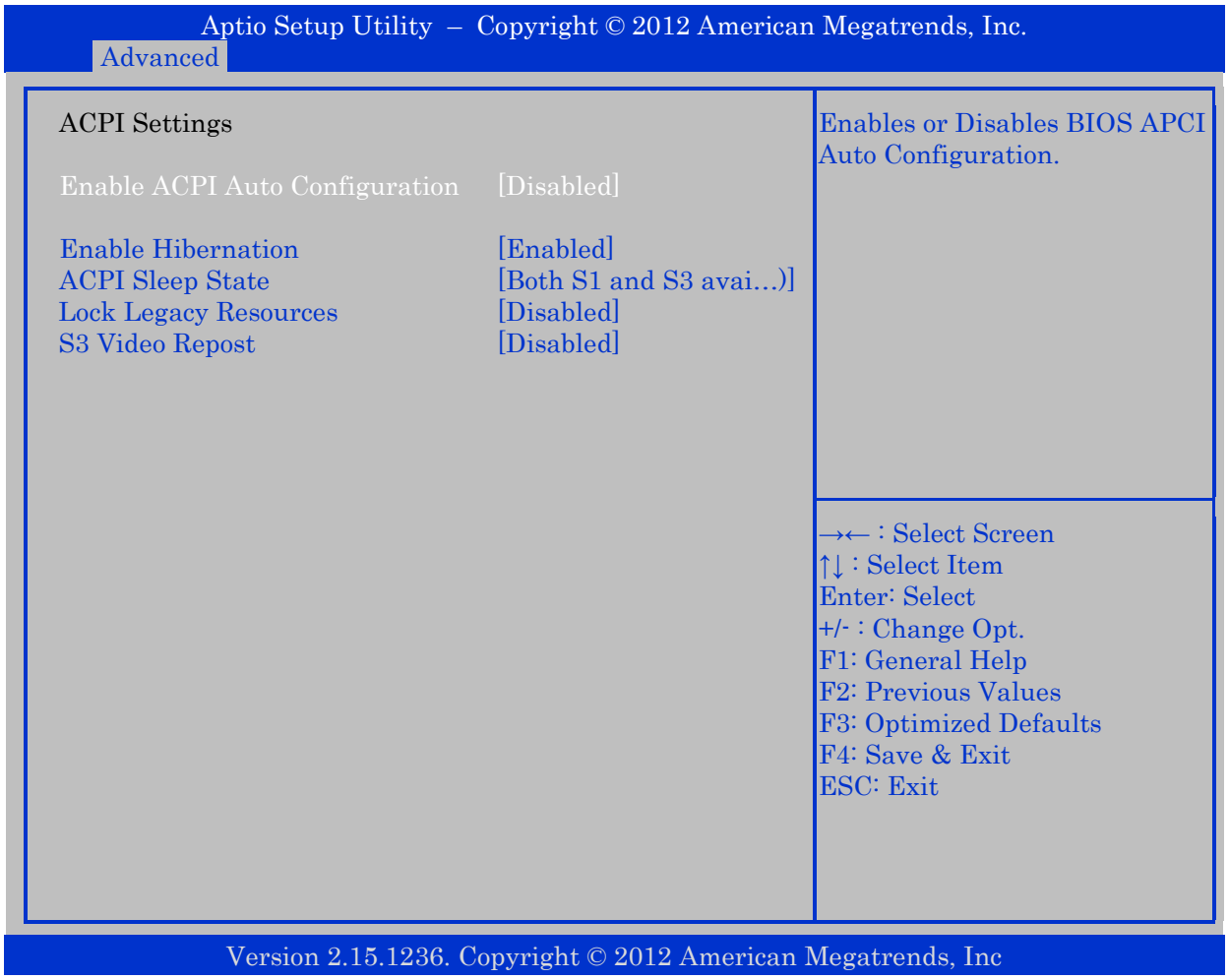
Note1: Use either digit keys to enter value or +/- keys to increase/decrease value. Don't use mix of digit keys and +/- keys.

11.2.1.2 PCI Express GEN 2 Settings



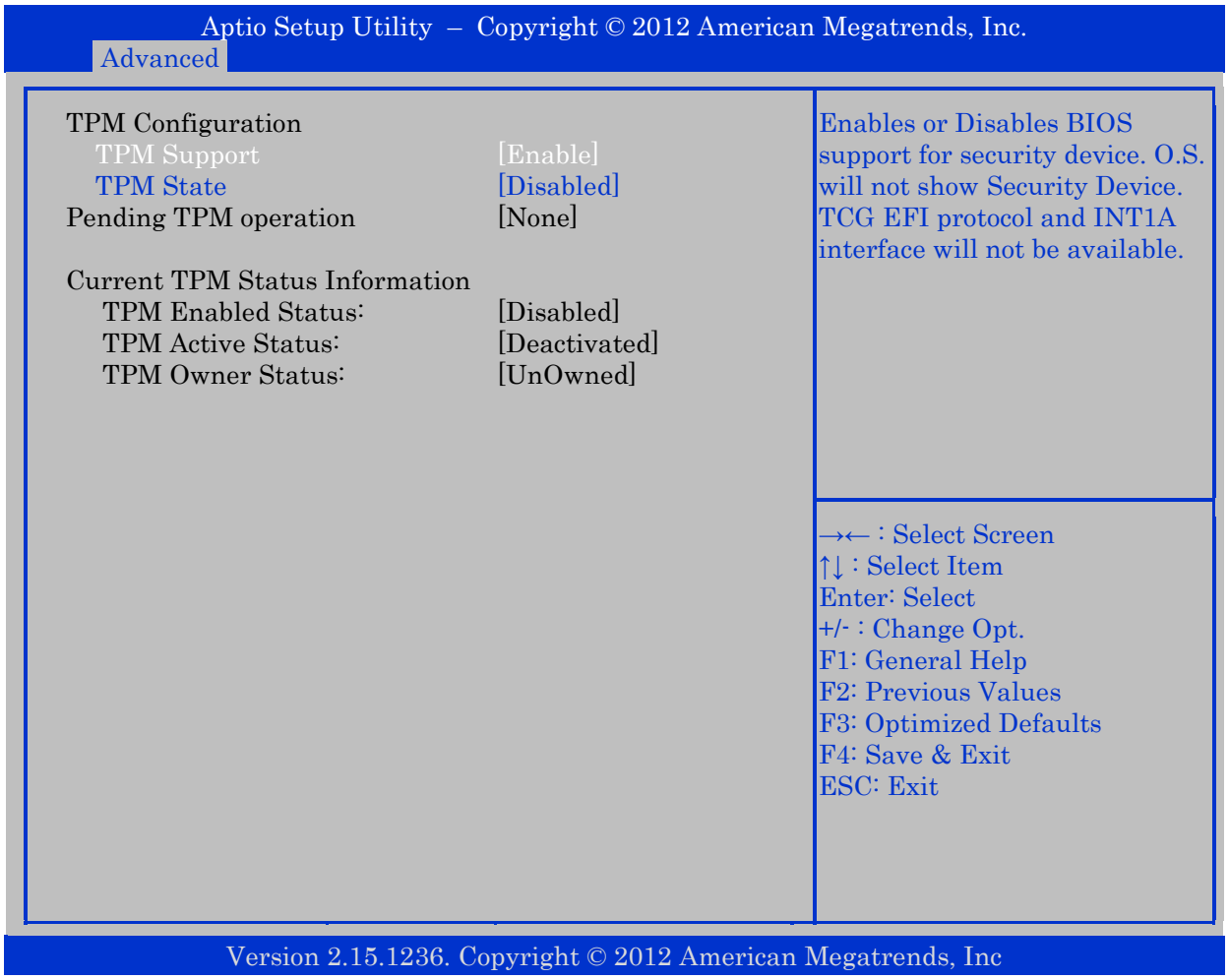
Function	Selection	Description
Completion Timeout	**Default** Shorter Longer Disabled	In device Functions that support Completion Timeout programmability, modify the Completion Timeout range value is allowed. Default: 50us to 50ms. Shorter: shorter ranges supported by HW. Longer: longer ranges implemented by SW.
ARI Forwarding	**Disabled** Enabled	If supported by HW and Enabled, the Downstream Port disables its traditional Device Number field being 0 enforcement when turning a Type1 Configuration Request into a Type0 Configuration Request, permitting access to Extended Functions in an ARI Device immediately below the port.
AtomicOp Requester Enable	**Disabled** Enabled	If supported by HW and Enabled, initiate AtomicOp Requests only if Bus Master Enable bit is in the Command Register Set.
AtomicOp Egress Blocking	**Disabled** Enabled	If supported by HW and Enabled, outbound AtomicOp Requests via Egress Ports will be blocked.
IDO Request Enable	**Disabled** Enabled	If supported by HW and Enabled, permit setting the number of ID-Based Ordering (IDO) bit (Attribute[2]) requests to be initiated.
IDO Completion Enable	**Disabled** Enabled	If supported by HW and Enabled, permit setting the number of ID-Based Ordering (IDO) bit (Attribute[2]) requests to be initiated.
LTR Mechanism Enable	**Disabled** Enabled	If supported by HW and Enabled, enable the Latency Tolerance Reporting (LTR) Mechanism.
End-End TLP Prefix Blocking	**Disabled** Enabled	If supported by HW and Enabled, block forwarding of TLPs containing End-End TLP Prefixes.
Target Link Speed	**Auto** Force to 2.5 GT/s Force to 5.0 GT/s	If supported by HW and set to ´Force to 2.5 GT/s´ for Downstream Ports, this sets an upper limit on link operational speed by restricting the values advertised by the Upstream component in its training sequences. When ´Auto´ is selected HW initialized data will be used.
Clock Power Management	**Disabled** Enabled	If supported by HW and Enabled, device is permitted to use CLKREQ# signal for power management of Link clock in accordance to protocol defined in appropriate form factor specification.
Compliance SOS	**Disabled** Enabled	If supported by HW and Enabled, force LTSSM to send SKP Ordered Sets between sequences when sending Compliance Pattern or Modified Compliance Pattern.
Hardware Autonomous Width	**Enabled** Disabled	If supported by HW and Disabled, disable the HW ability to change link width except width size reduction for the purpose of correcting unstable link operation.
Hardware Autonomous Speed	**Enabled** Disabled	If supported by HW and Disabled, disable the HW ability to change link speed except speed rate reduction for the purpose of correcting unstable link operation.

11.2.2 Advanced - APCI Settings



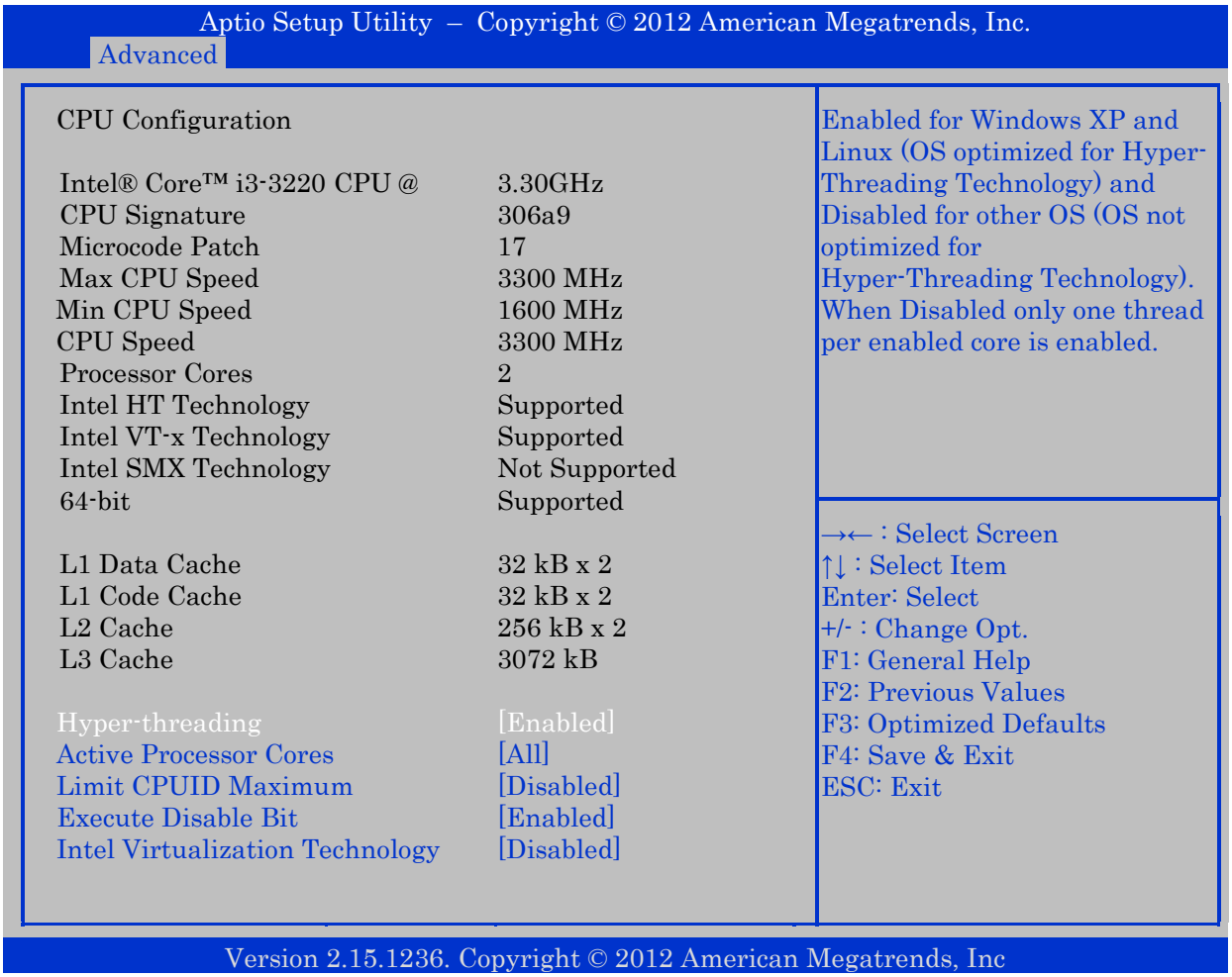
Function	Selection	Description
Enable ACPI Auto Configuration	**Disabled** Enabled	Enables or Disables BIOS APCI Auto Configuration.
Enable Hibernation	Disabled **Enabled**	Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.
ACPI Sleep State	Suspend Disabled S1 only(CPU Stop Clock) S3 only (Suspend to RAM) **Both S1 and S3 available…**	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.
Lock Legacy Resources	**Disabled** Enabled	Enables or Disables Lock of Legacy Resources.
S3 Video Repost	**Disabled** Enabled	Enables or Disables S3 Video Repost.

11.2.3 Advanced - Trusted Computing



Function	Selection	Description
TPM Support	**Disabled** Enabled	Enables or Disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
TPM State	**Disabled** Enabled	Turn TPM Enable/Disable. NOTE: Your Computer will reboot during restart in order to change State of TPM.
Pending operation	**None** Enable Take Ownership Disable Take Ownership TPM Clear	Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of the Device.

11.2.4 Advanced - CPU Configuration



Function	Selection	Description
Hyper-threading (Note1)	Disabled **Enabled**	Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only one thread per enabled core is enabled.
Active Processor Cores	**All** 1	Number of cores to enable in each processor package.
Limit CPUID Maximum	Disabled **Enabled**	Disabled for Windows XP
Execute Disable Bit	Disabled **Enabled**	XD can prevent certain classes of malicious buffer overflow attacks when combined with supporting OS (Windows Server 2003 SP1, Windows XP SP2, SuSE Linux 9.2, RedHat Enterprise 3 Update 3.)
Intel Virtualization Technology	**Disabled** Enabled	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Note1: Not present if using CPU not supporting this feature.

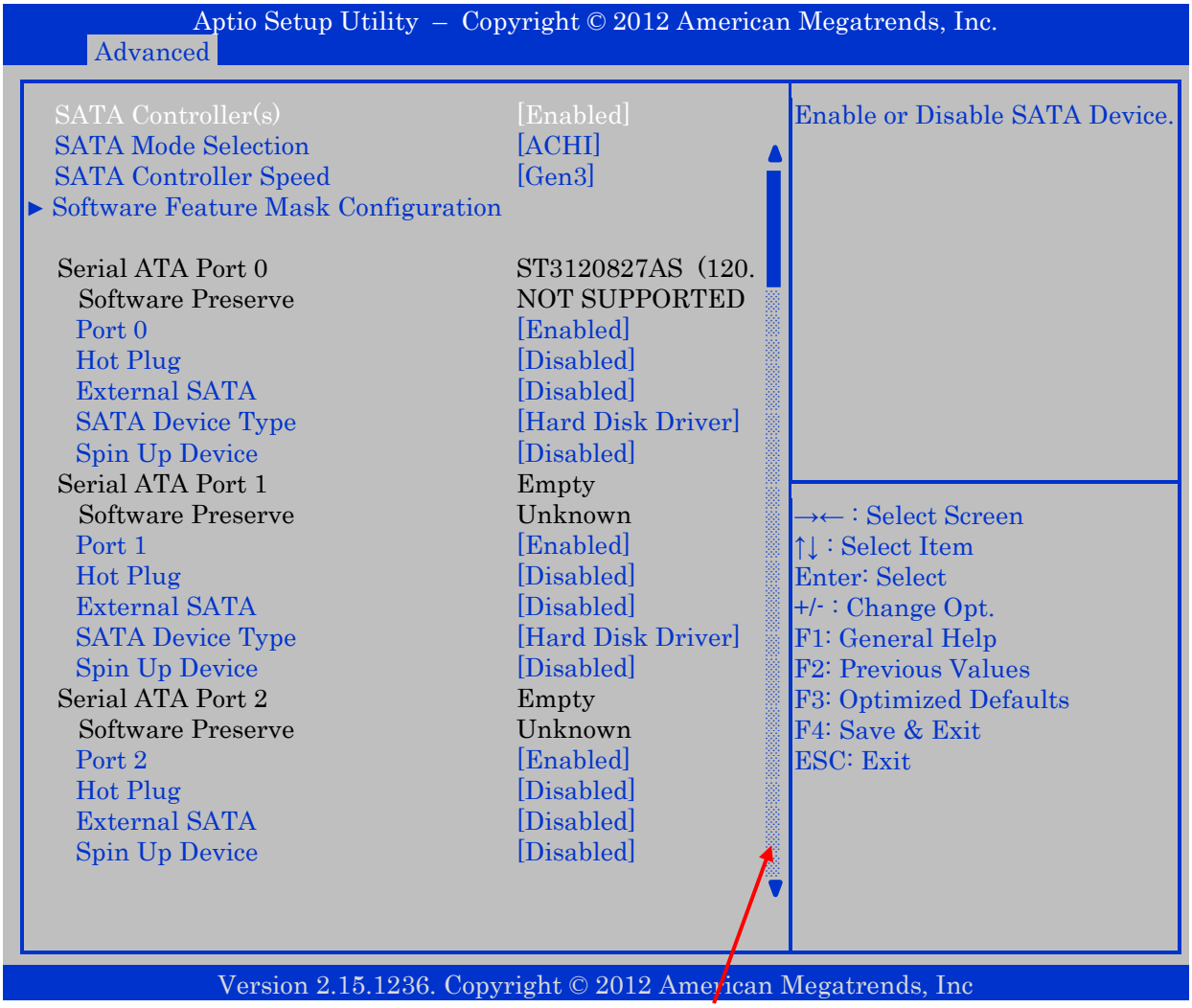
Notes:

Intel HT Technology (Hyper Threading Technology) is a performance feature which allows one core on the processor to appear like 2 cores to the operating system. This doubles the execution resources available to the O/S, which potentially increases the performance of your overall system.

Intel VT-x Technology (Virtualization Technology) Previously codenamed "Vanderpool", VT-x represents Intel's technology for virtualization on the x86 platform. In order to support “Virtualization Technology” the CPU must support VT-x and the BIOS setting “Intel Virtualization Technology” must be enabled.

Intel SMX Technology (Safer Mode Extensions Technology) is a part of the Trusted Execution Technology.

11.2.5 Advanced - SATA Configuration



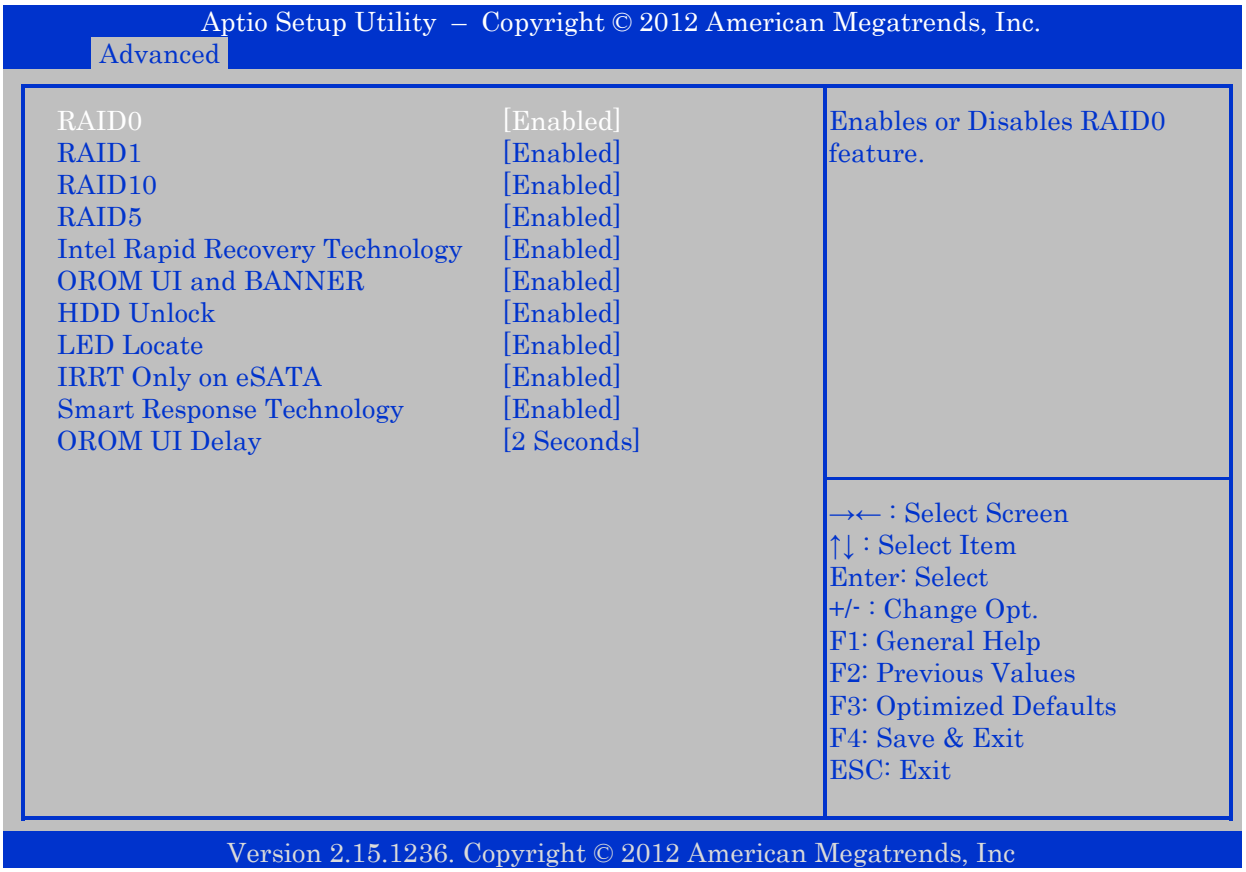
(Scroll indicator bar)

Note: By scrolling down (or up) also settings for Serial ATA Port 3 - 5 can be accessed.

Function	Selection	Description
SATA Controller(s)	Disabled **Enabled**	Enable or Disable SATA Device.
SATA Mode Selection	IDE **ACHI** RAID	Determines how SATA controller(s) operate.
SATA Controller Speed	Gen1 Gen2 **Gen3**	Indicates the maximum speed the SATA controller can support.

Note: in the above BIOS menu the functions below the submenu *Software Feature Mask Configuration* will be described after the submenu description.

11.2.5.1 Software Feature Mask Configuration



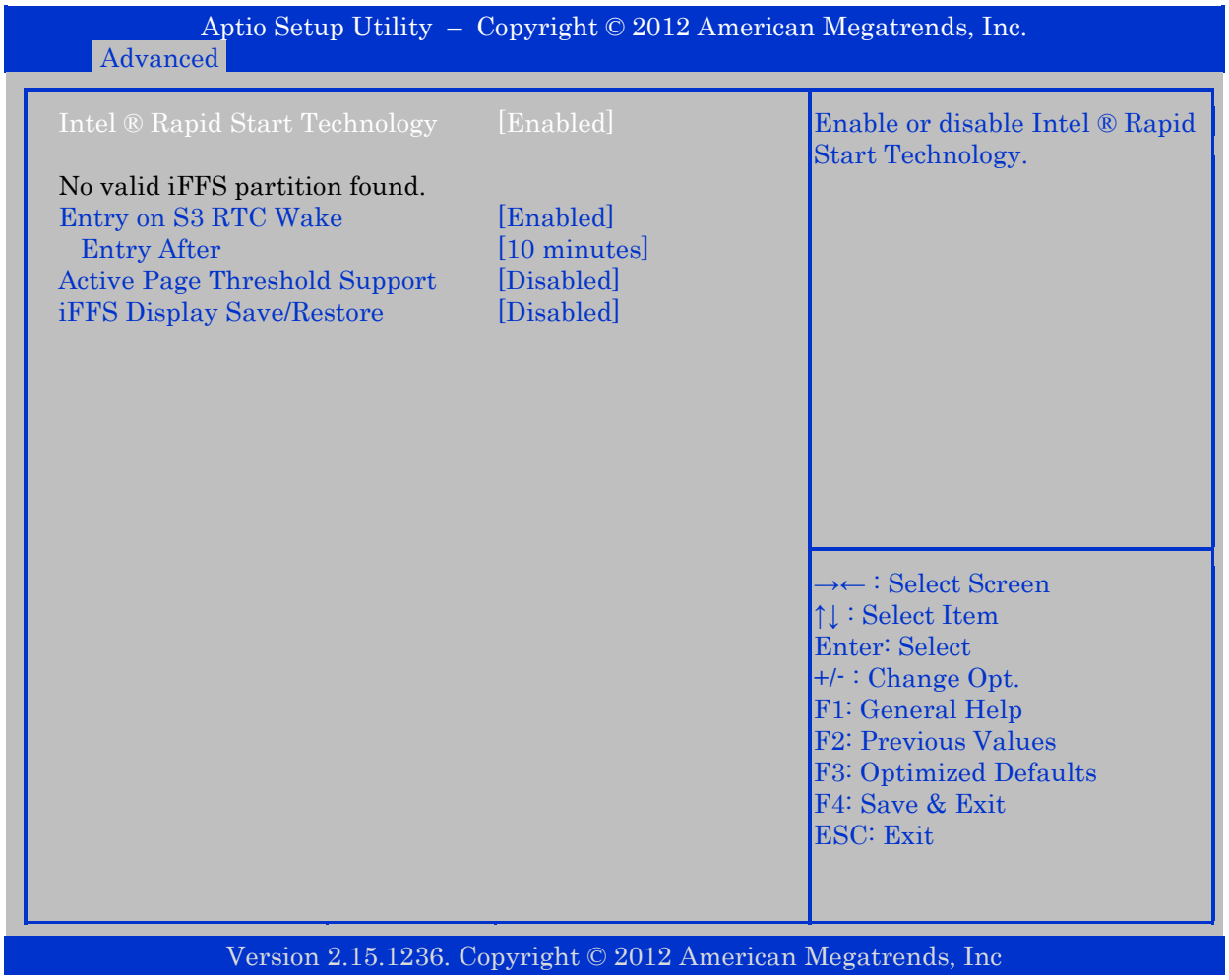
Submenu *Software Feature Mask Configuration* description:

Function	Selection	Description
RAID0	Disabled **Enabled**	Enable or disable RAID0 feature.
RAID1	Disabled **Enabled**	Enable or disable RAID1 feature.
RAID10	Disabled **Enabled**	Enable or disable RAID10 feature.
RAID5	Disabled **Enabled**	Enable or disable RAID5 feature.
Intel Rapid Recovery Technology	Disabled **Enabled**	Enable or disable Intel Rapid Recovery Technology.
OROM UI and BANNER	Disabled **Enabled**	If enabled, then the OROM UI is shown. Otherwise, no OROM banner or information will be displayed if all disks and RAID volumes are Normal.
HDD Unlock	Disabled **Enabled**	If enabled, indicates that the HDD password unlock in the OS is enabled.
LED Locate	Disabled **Enabled**	If enabled, indicates that the LED/SGPIO hardware is attached and ping to locate feature is enabled on the OS.
IRRT Only on eSATA	Disabled **Enabled**	If enabled, then only IRRT volumes can span internal and eSATA drives. If disabled, then any RAID volume can span internal and eSATA drives.
Smart Response Technology	Disabled **Enabled**	Enable or disable Smart Response Technology
OROM UI Delay	**2 Seconds** 4 Seconds 6 Seconds 8 Seconds	If enabled, indicates the delay of the OROM UI Splash Screen in normal status.

Remaining *SATA Configuration* menu description:

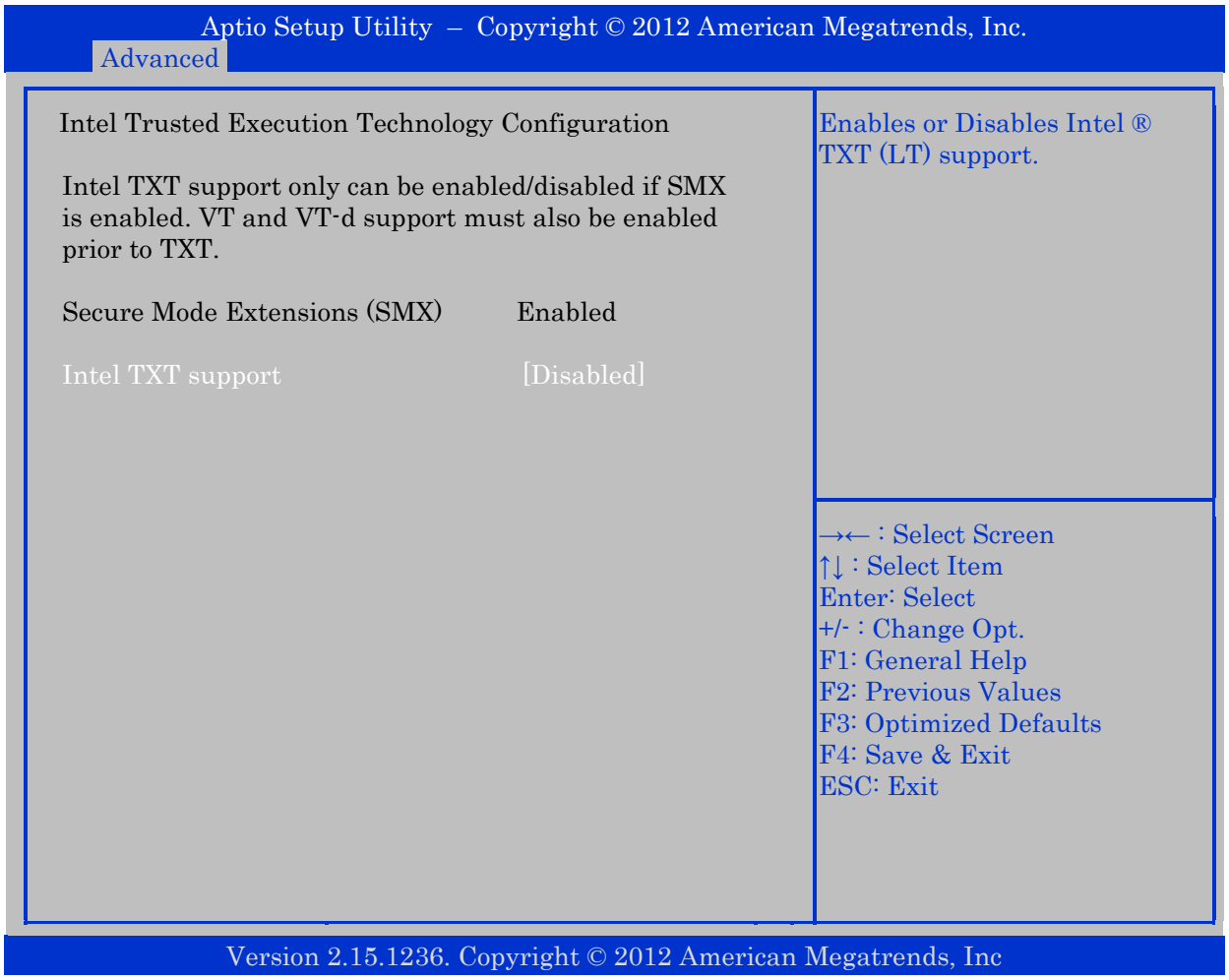
Function	Selection	Description
Port 0	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	**Disabled** Enabled	Designates this port as Hot Pluggable.
External SATA	**Disabled** Enabled	External SATA Support.
SATA Device Type	**Hard Disk Drive** Solid State Drive	Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.
Spin Up Device	**Disabled** Enabled	On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to the device.
Port 1	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
SATA Device Type	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port 2	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port 3	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port4	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)
Port5	Disabled **Enabled**	Enable or Disable SATA Port.
Hot Plug	(see same function above)	(see same function above)
External SATA	(see same function above)	(see same function above)
Spin Up Device	(see same function above)	(see same function above)

11.2.6 Advanced - Intel ® Rapid Start Technology



Function	Selection	Description
Intel ® Rapid Start Technology	**Disabled** Enabled	Enable or disable Intel ® Rapid Start Technology.
Entry on S3 RTC Wake	**Enabled** Disabled	iFFS invocation upon S3 RTC wake.
Entry After	Immediately 1 minute 2 minutes 5 minutes **10 minutes** 15 minutes 30 minutes 1 hour 2 hours	Enable RTC wake timer at S3 entry.
Active Page Threshold Support	**Disabled** Enabled	Support RST with small partition.
iFFS Display Save/Restore	**Disabled** Enabled	iFFS Display Save/Restore.

11.2.7 Advanced - Intel TXT (LT) Configuration



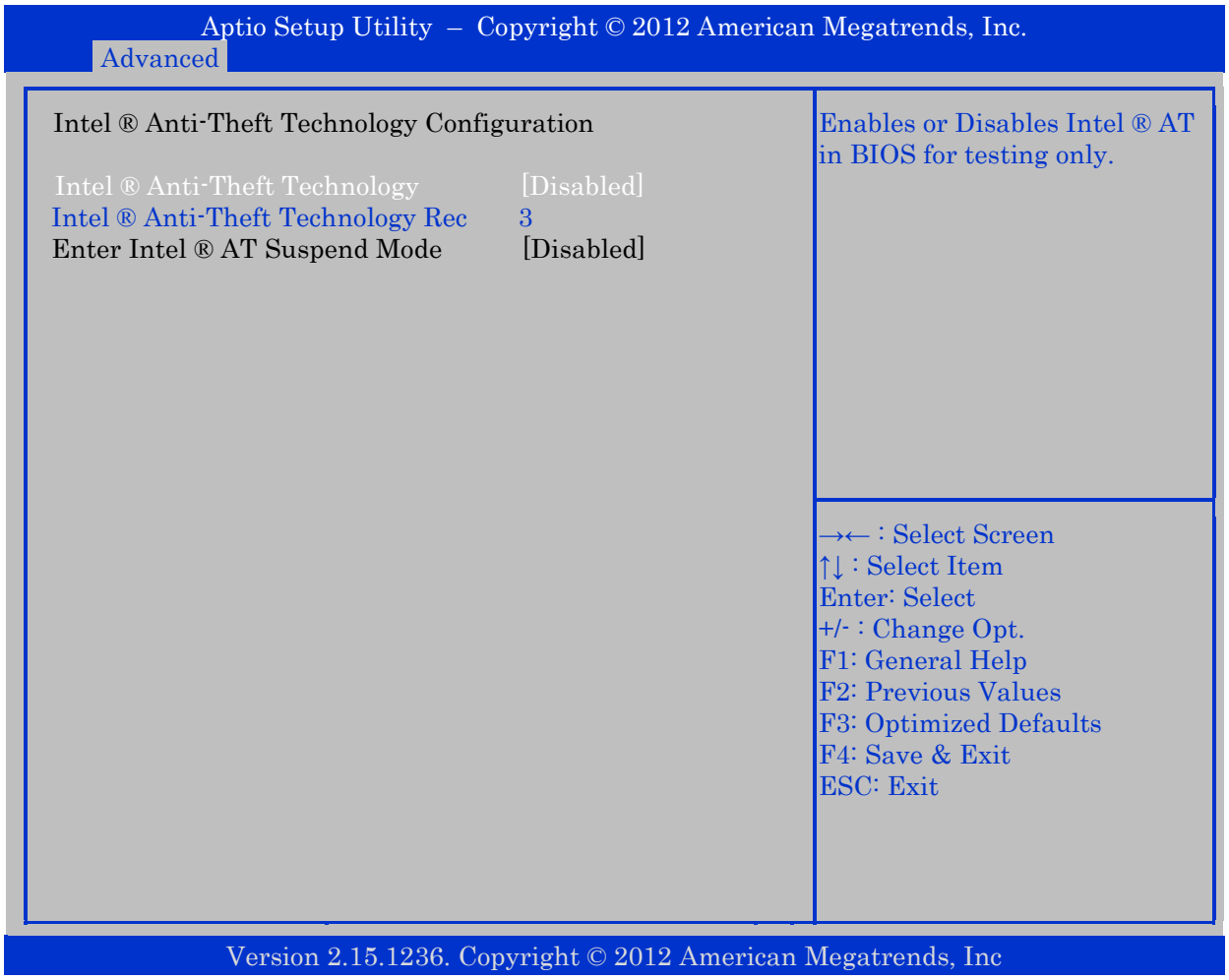
SMX (Intel Secure Mode Extension) instructions are enabled if supported by the CPU, so no BIOS settings are present.

VT (Intel Virtualization Technology) is enabled/disabled in the menu: *Advanced* > *CPU Configuration*.

VT-d can be enabled/disabled in the menu: *Chipset* > *System Agent (SA) Configuration.*

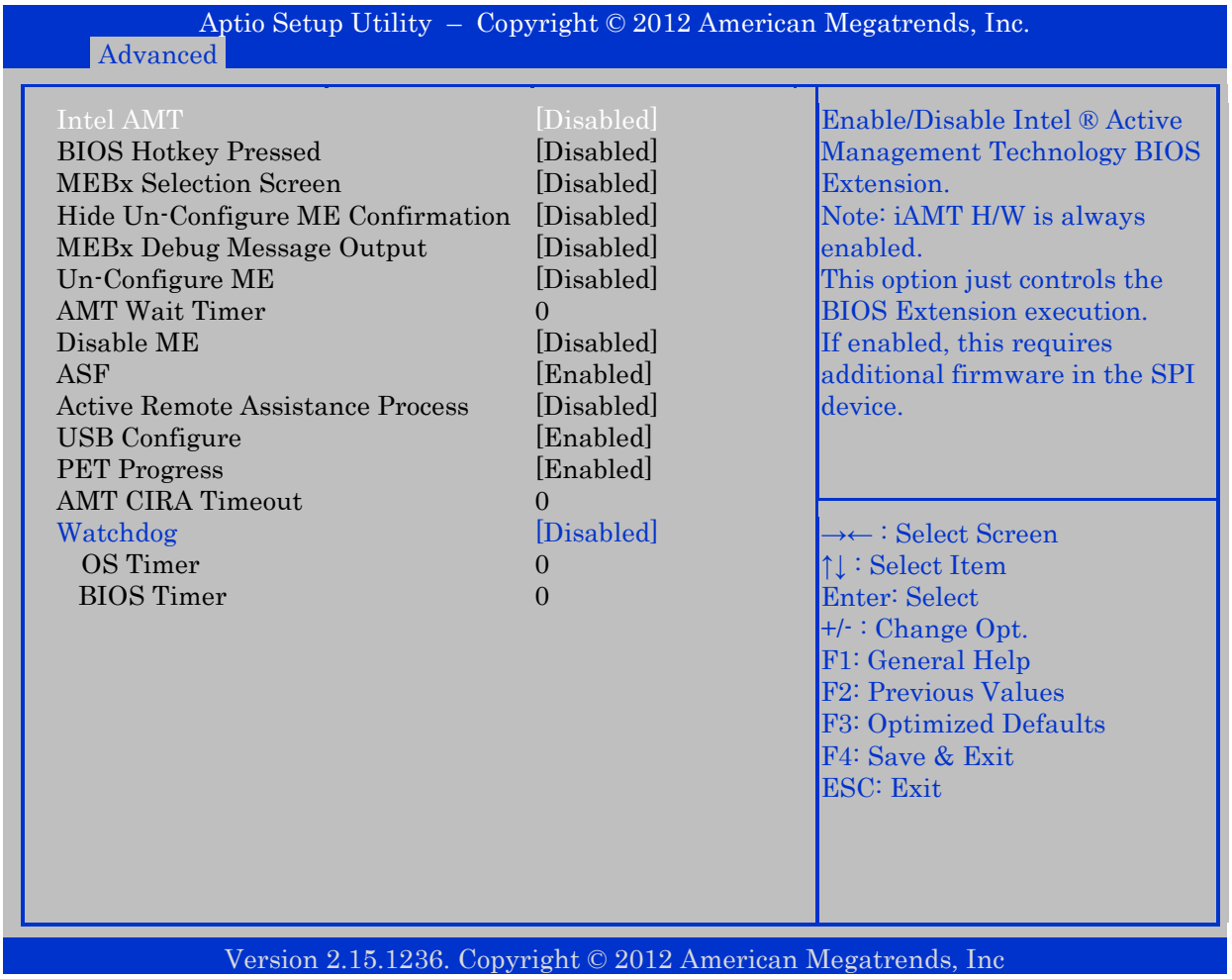
Function	Selection	Description
Intel TXT support	**Disabled** Enabled	Enables or Disables Intel ® TXT (LT) support.

11.2.8 Advanced - Intel ® Anti-Theft Technology Configuration



Function	Selection	Description
Intel ® Anti-Theft Technology	**Disabled** Enabled	Enables or Disables Intel ® AT in BIOS for testing only.
Intel ® Anti-Theft Technology Rec	**3** (allowed 1 – 64)	Set the number of times Recovery attempt will be allowed.

11.2.9 Advanced - AMT Configuration



Function	Selection	Description
Intel AMT	**Disabled** Enabled	Enable/Disable Intel ® Active Management Technology BIOS Extension. Note: iAMT H/W is always enabled. This option just controls the BIOS Extension execution. If enabled, this requires additional firmware in the SPI device.
BIOS Hotkey Pressed (Note1)	**Disabled** Enabled	OEMFlag Bit 1: Enable/Disabled BIOS hotkey press.
MEBx Selection Screen (Note1)	**Disabled** Enabled	OEMFlag Bit 2: Enable/Disabled BIOS MEBx Selection Screen.
Hide Un-Configure ME Confirmation (Note1)	**Disabled** Enabled	OEMFlag Bit 6: Hide Un-Configure ME without password Confirmation Prompt
MEBx Debug Message Output (Note1)	**Disabled** Enabled	OEMFlag Bit 14: Enable MEBx Debug Message Output.
Un-Configure ME (Note1)	**Disabled** Enabled	OEMFlag Bit 15: Un-Configure ME without password.

Function	Selection	Description
AMT Wait Timer (Note1)	0 - 65535 (Note4)	Set timer to wait before sending ASF_GET_BOOT_OPTIONS.
Disable ME (Note1)	**Disabled** Enabled	Set ME to Soft Temporary Disabled.
ASF (Note1)	Disabled **Enabled**	Enable/Disabled Alert Specification Format.
Active Remote Assistance Process (Note1)	**Disabled** Enabled	Trigger CIRA boot.
USB Configure (Note1)	Disabled **Enabled**	Enable/Disable USB Configure function.
PET Progress (Note1)	Disabled **Enabled**	Users can Enable/Disable PET Events progress to receive PET events or not.
AMT CIRA Timeout (Note1) (Note5)	0 – 255 (Note4)	OEM defined timeout for MPS connection to be established. 0 – use the default timeout value of 60 seconds. 255 – MEBX waits until the connection succeeds.
Watchdog (Note2)	**Disabled** Enabled	Enable/Disable Watchdog Timer.
OS Timer (Note3)	0 - 65535 (Note4)	Set OS watchdog timer.
BIOS Timer (Note3)	0 - 65535 (Note4)	Set BIOS Watchdog Timer.

Note1: Only if Intel AMT = Enabled.

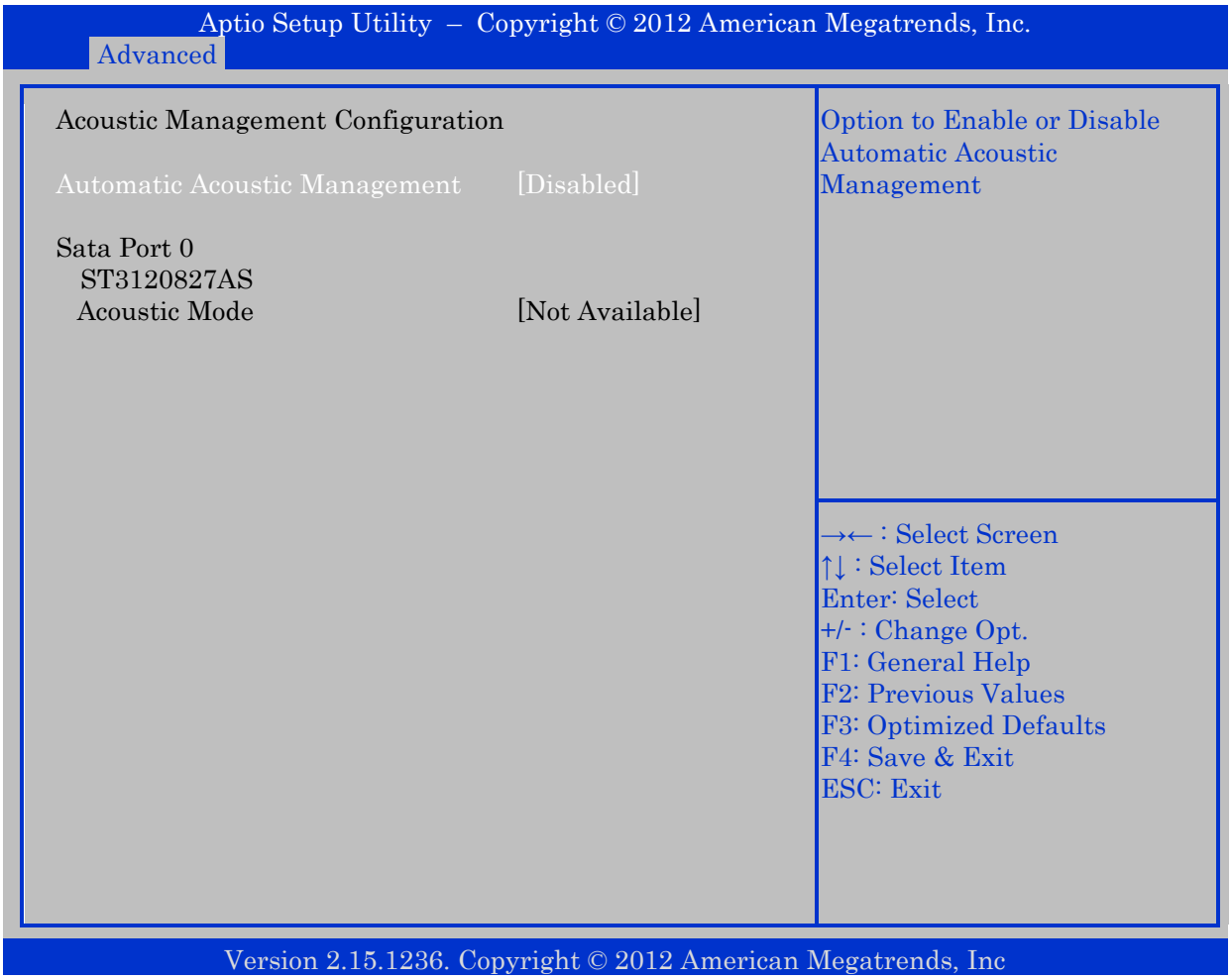
Note2: This Watchdog function is unsupported.
Recommendation, use Watchdog function present in *Hardware Health Configuration* menu.

Note3: Only if Watchdog = Enabled.

Note4: To enter number use digit keys and/or +/- keys.

Note5: Only if Active Remote Assistance Process = Enabled.

11.2.10 Advanced - Acoustic Management Configuration



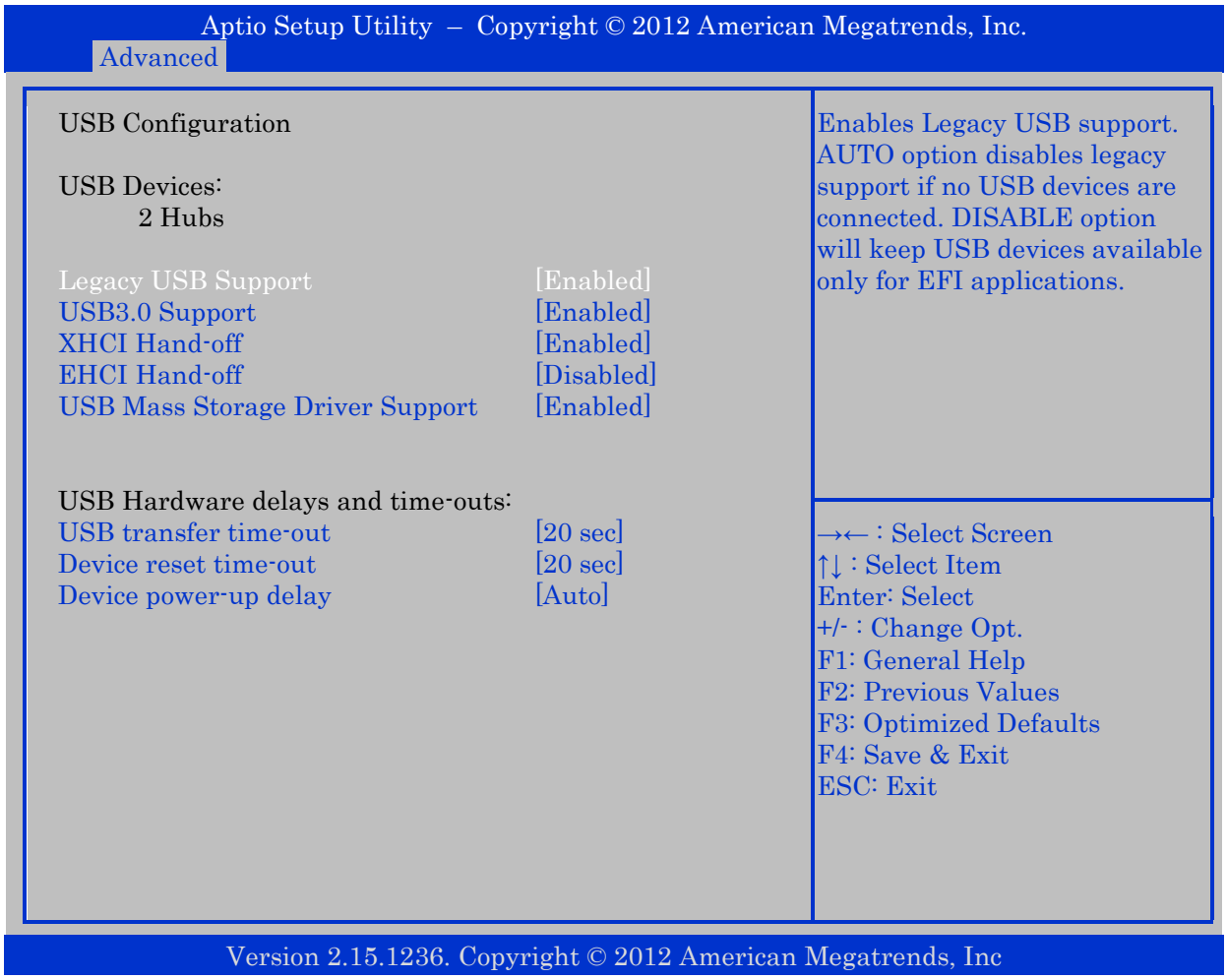
Function	Selection	Description
Automatic Acoustic Management	Enabled **Disabled**	Option to Enable or Disable Automatic Acoustic Management.

Note:

Automatic acoustic management (AAM) is a method for reducing acoustic emanations in AT Attachment (ATA) mass storage devices, such as ATA hard disk drives and ATAPI optical disc drives. AAM is an optional feature set for ATA/ATAPI devices; when a device supports AAM, the acoustic management parameters are adjustable through a software or firmware user interface.

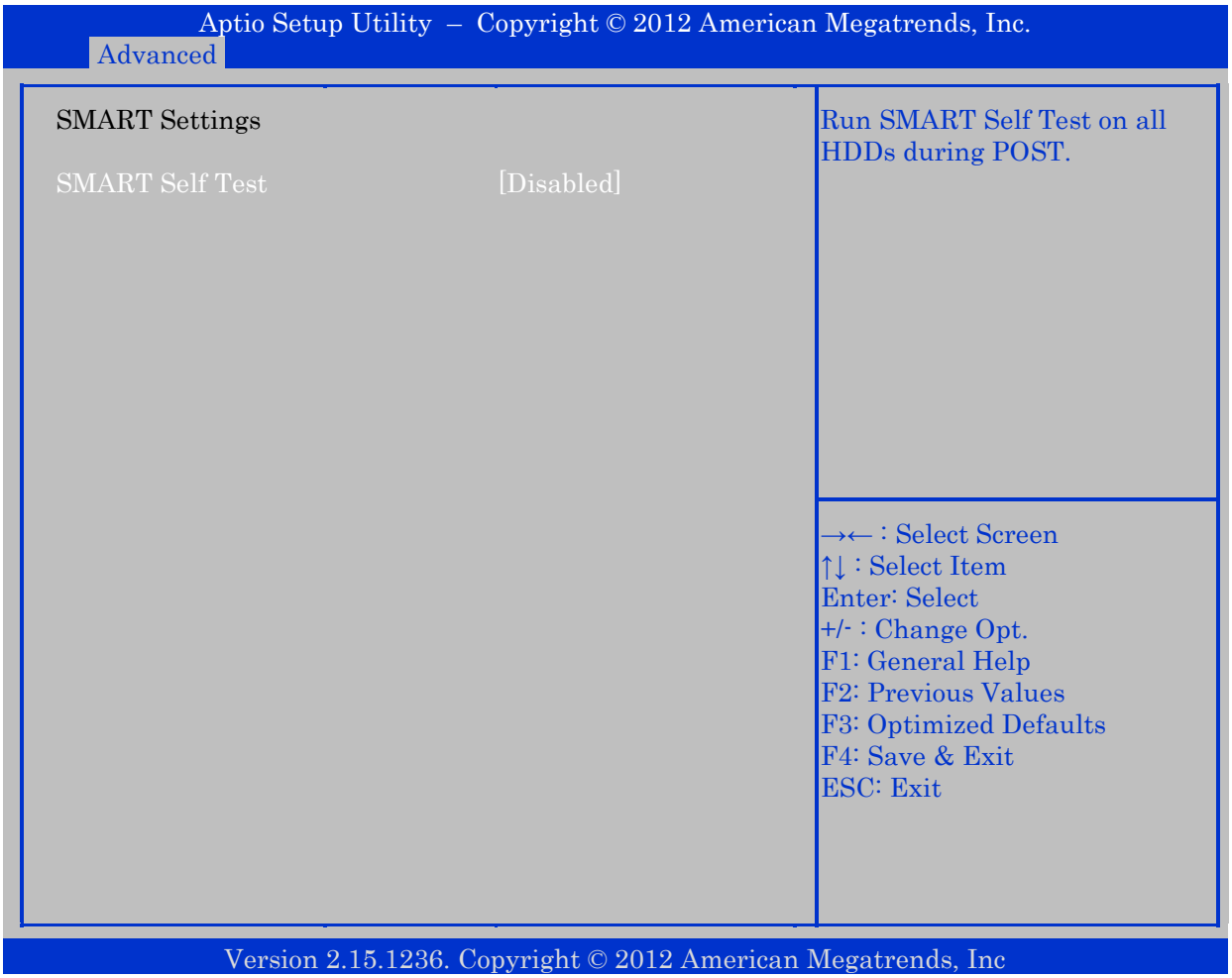
The ATA/ATAPI sub-command for setting the level of AAM operation is an 8-bit value from 0 to 255. Most modern drives ship with the vendor-defined value of 0x00 in the acoustic management setting. This often translates to the max-performance value of 254 stated in the standard. Values between 128 and 254 (0x80 - 0xFE) enable the feature and select most-quiet to most-performance settings along that range. Though hard drive manufacturers may support the whole range of values, the settings are allowed to be banded so many values could provide the same acoustic performance.

11.2.11 Advanced - USB Configuration



Function	Selection	Description
Legacy USB Support	**Enabled** 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.
USB3.0 Support	Enabled **Disabled**	Enable/Disable USB3.0 (XHCI) Controller support.
XHCI Hand-off	**Enabled** 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	**Disabled** Enabled	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** Disabled	Enable/disable USB Mass Storage Driver Support.
USB transfer time-out	1 sec 5 sec 10 sec 20 sec	The time-out value for Control, Bulk, and Interrupt transfers.
Device reset time-out	10 sec 20 sec 30 sec 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	**Auto** 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 100 ms, for a Hub port the delay is taken from Hub descriptor.

11.2.12 Advanced - SMART Settings

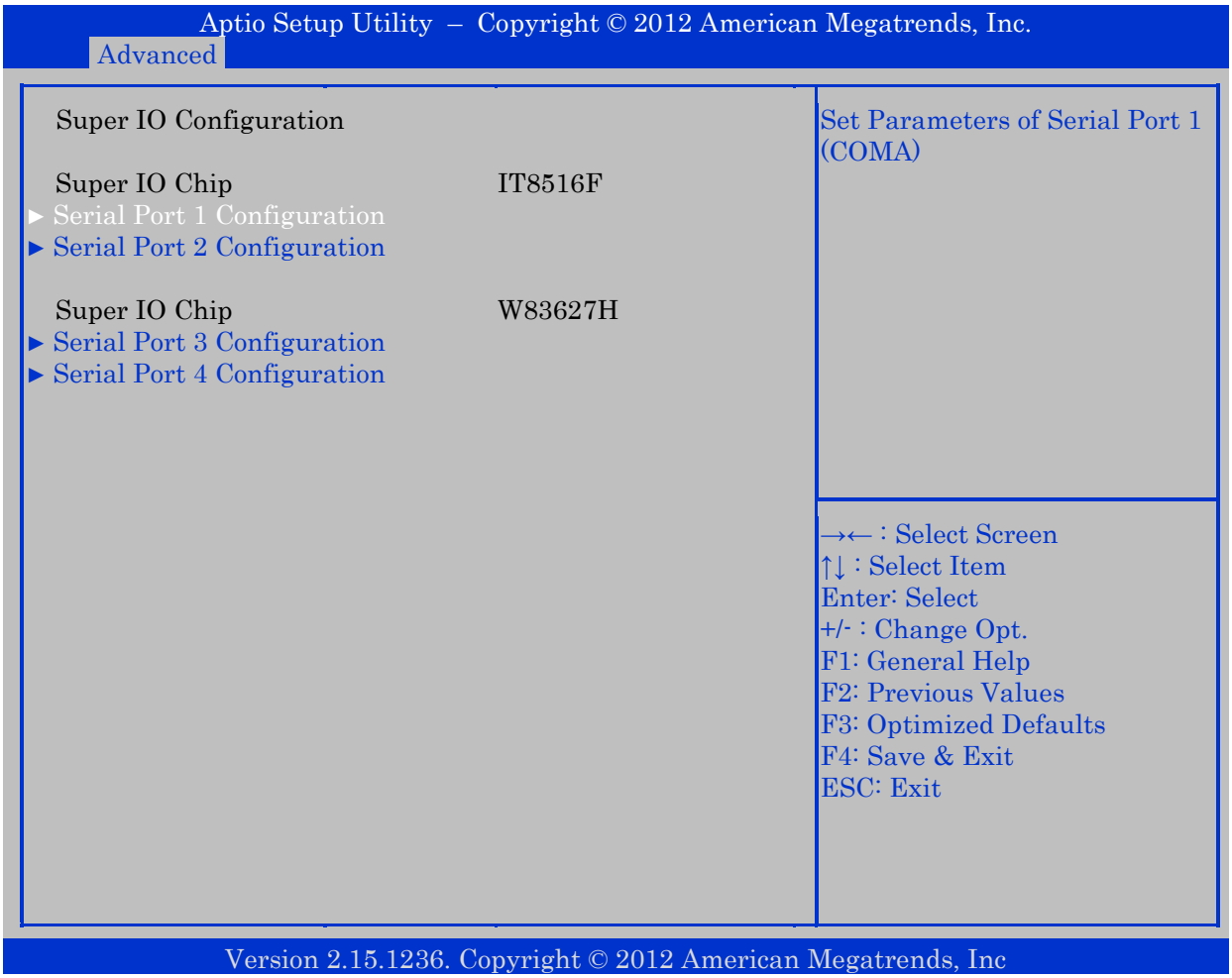


Function	Selection	Description
SMART Self Test	**Disabled** Enabled	Run SMART Self-Test on all HDDs during POST.

Note:

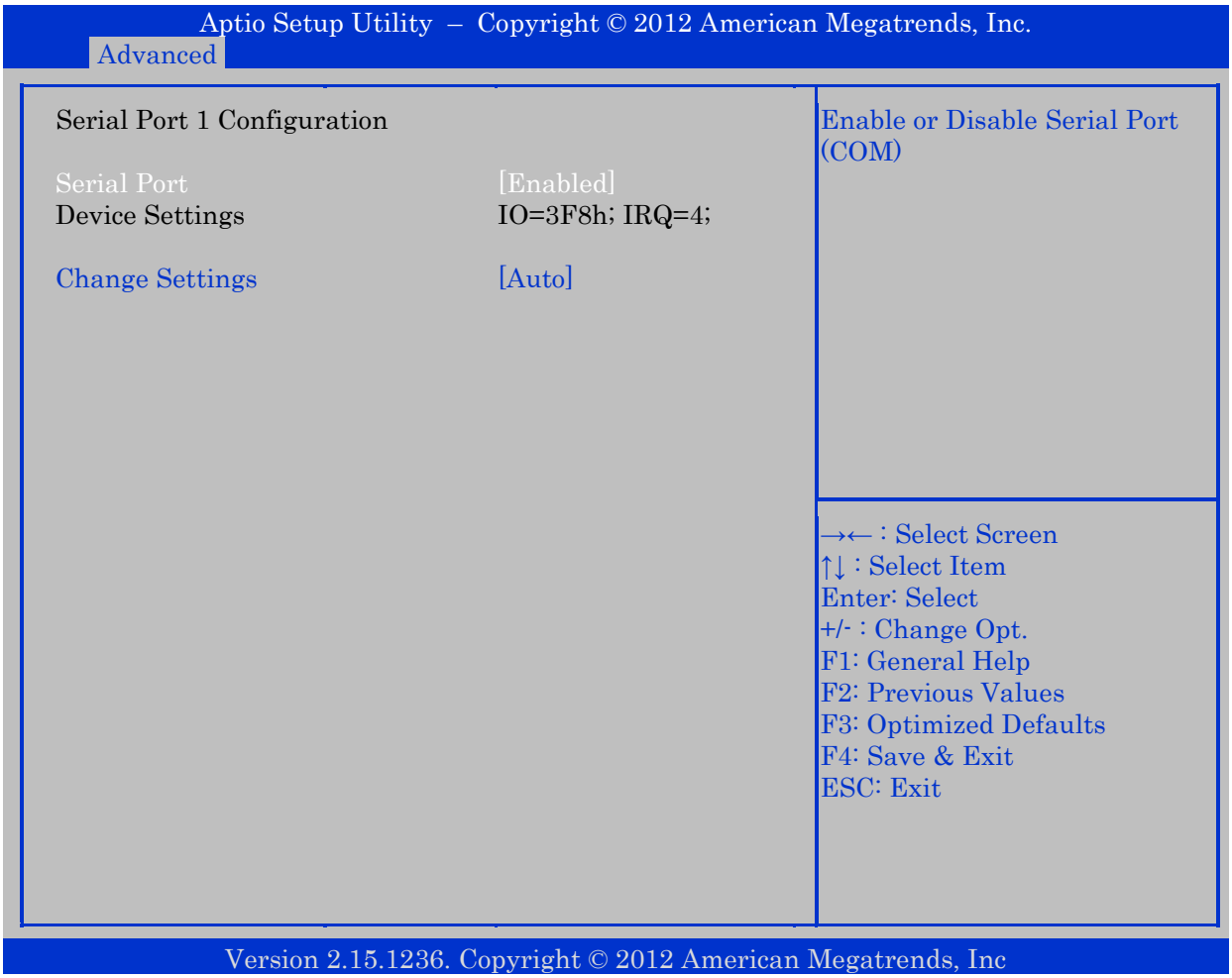
S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology; often written as SMART) is a monitoring system for computer hard disk drives to detect and report on various indicators of reliability, in the hope of anticipating failures.

11.2.13 Advanced - Super IO Configuration



The 5 submenus are shown and described on the following pages.

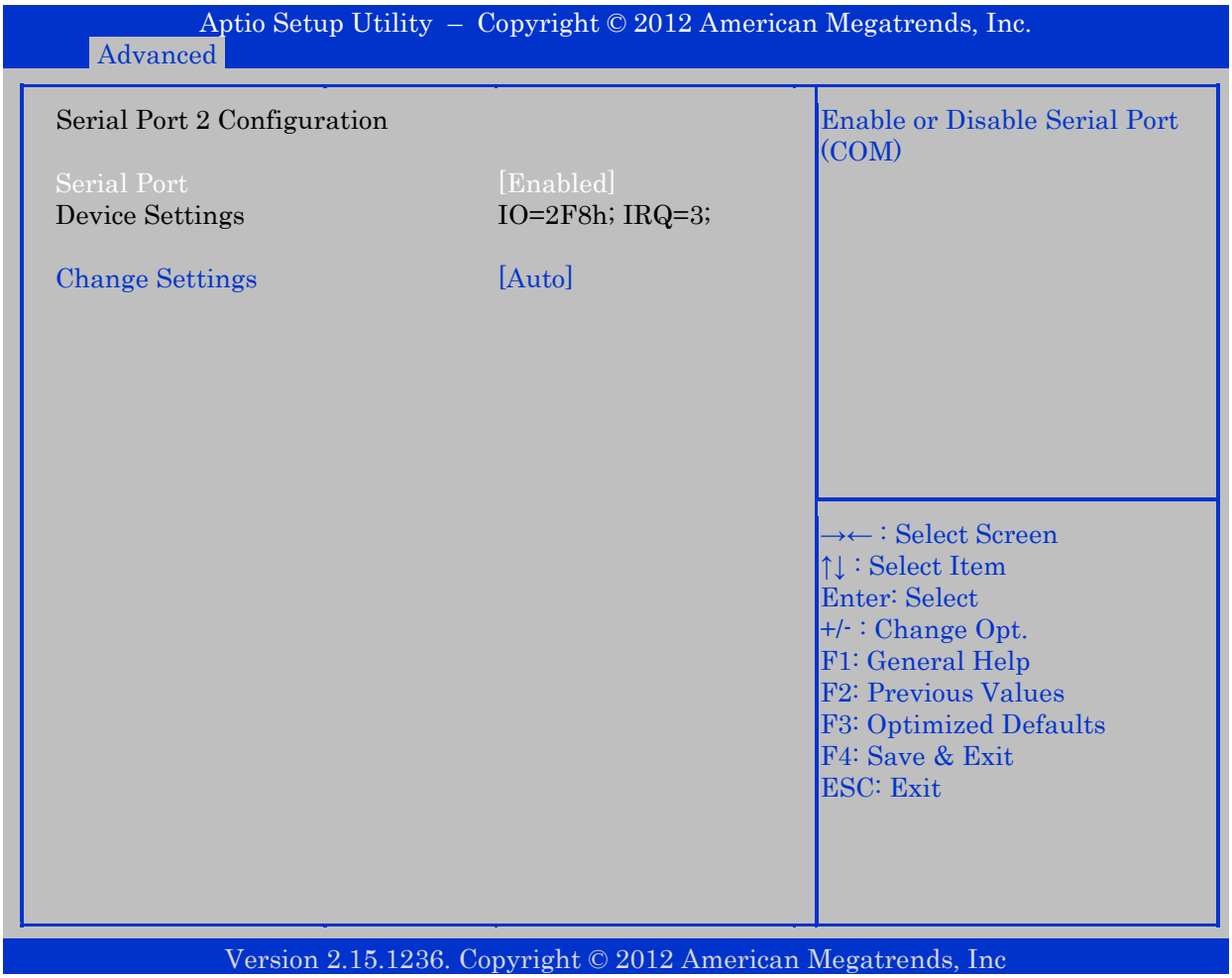
11.2.13.1 Serial Port 1 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings (Note1)	**Auto** IO=3F8h; IRQ=4; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.

Note1: only if Serial Port = Enabled

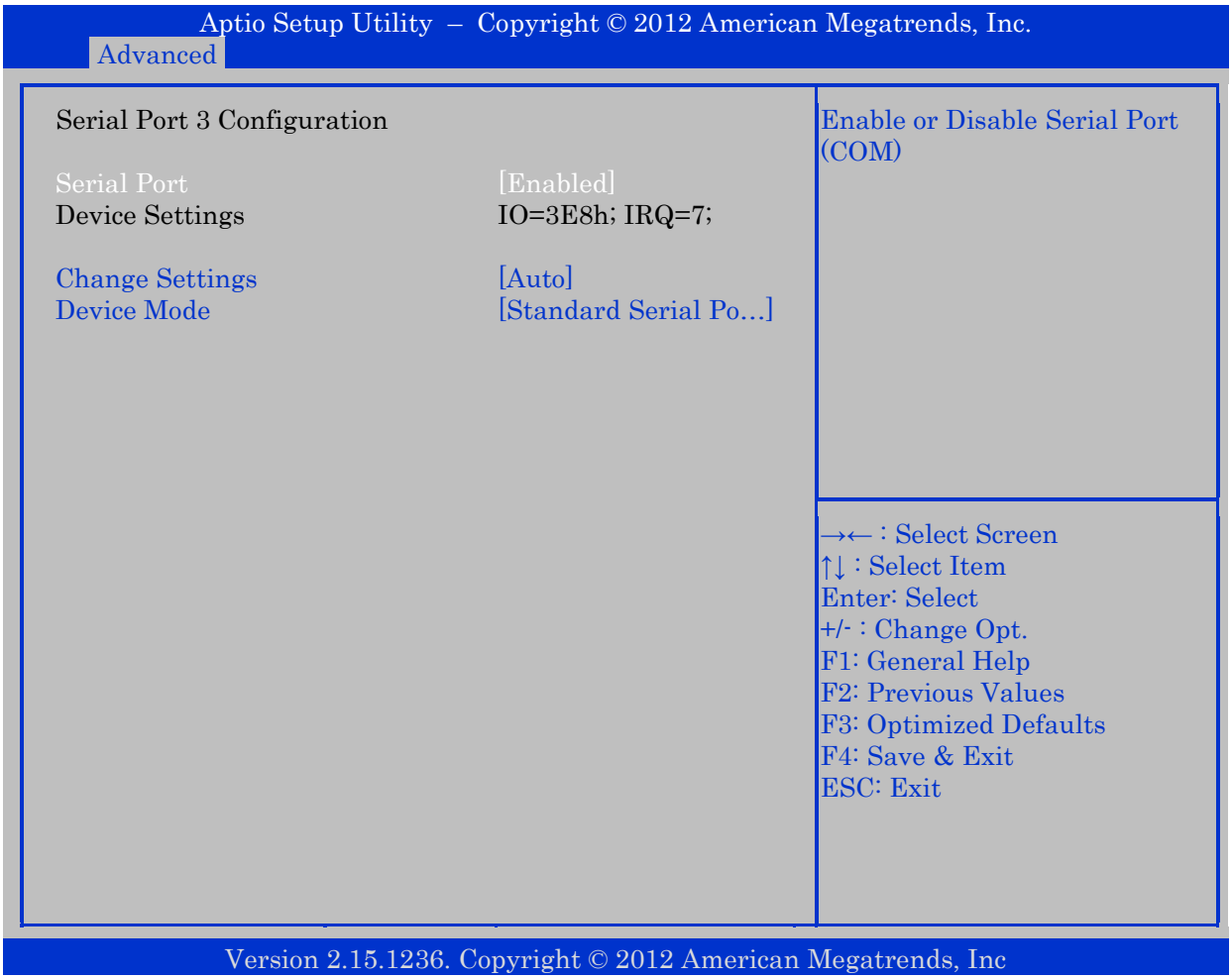
11.2.13.2 Serial Port 2 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings (Note1)	**Auto** IO=2F8h; IRQ=3; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.

Note1: only if Serial Port = Enabled

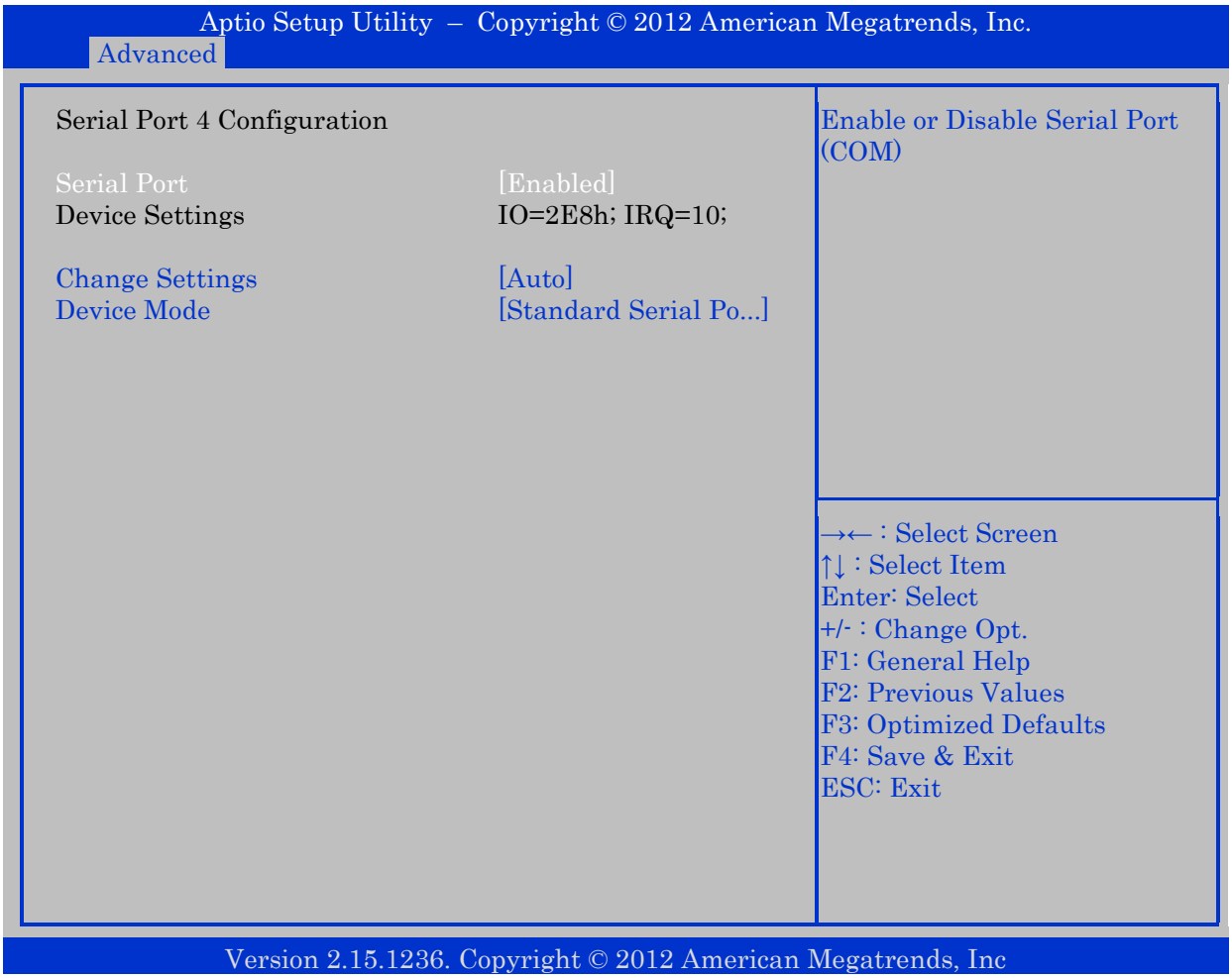
11.2.13.3 Serial Port 3 Configuration



Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings (Note1)	**Auto** IO=3E8h; IRQ=7; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.
Device Mode (Note1)	**Standard Serial Port Mode** IrDA 1.0 (HP SIR) Mode ASKIR Mode	Change the Serial Port mode. Select <High Speed> or <Normal mode> mode.

Note1: only if Serial Port = Enabled

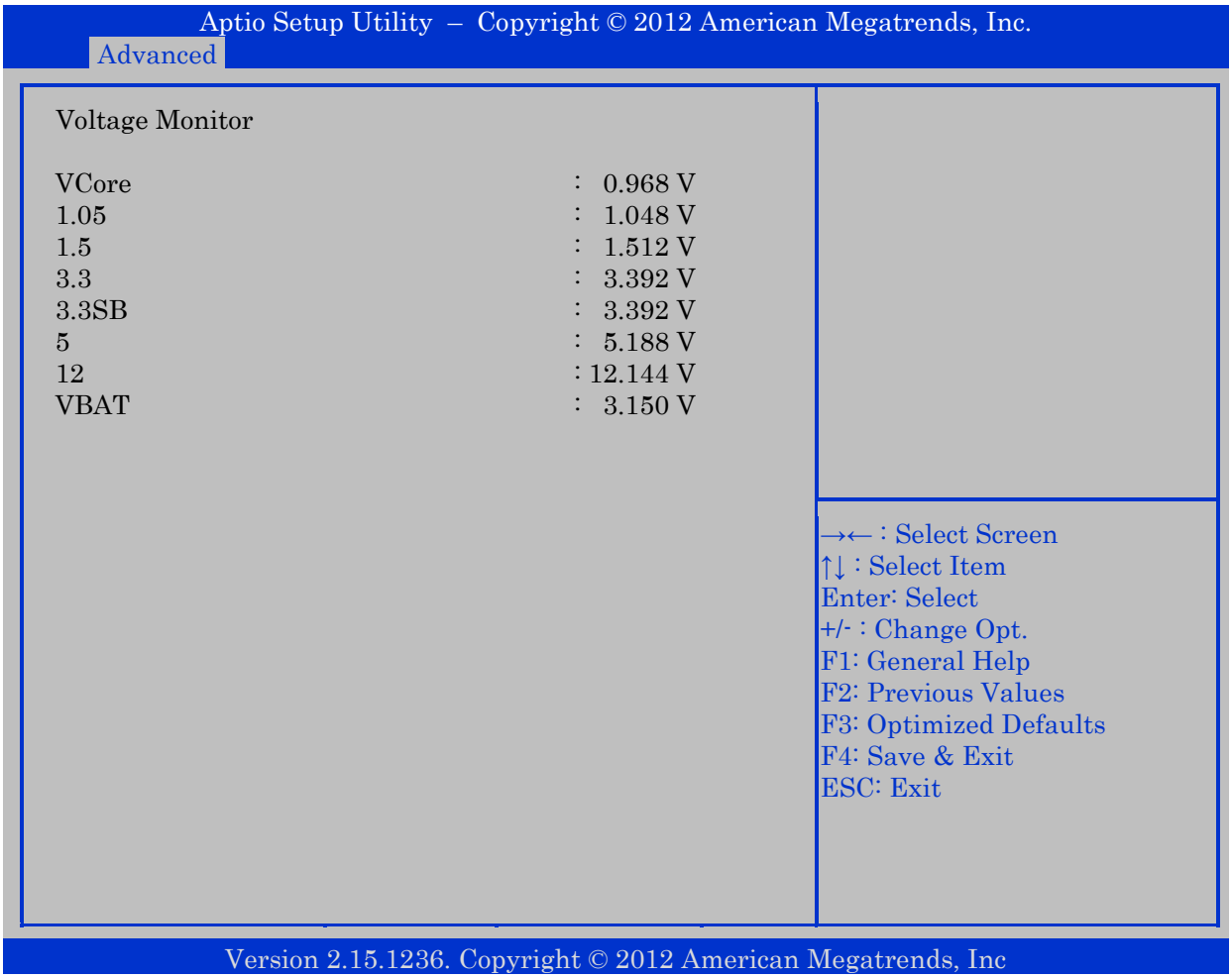
11.2.13.4 Serial Port 4 Configuration



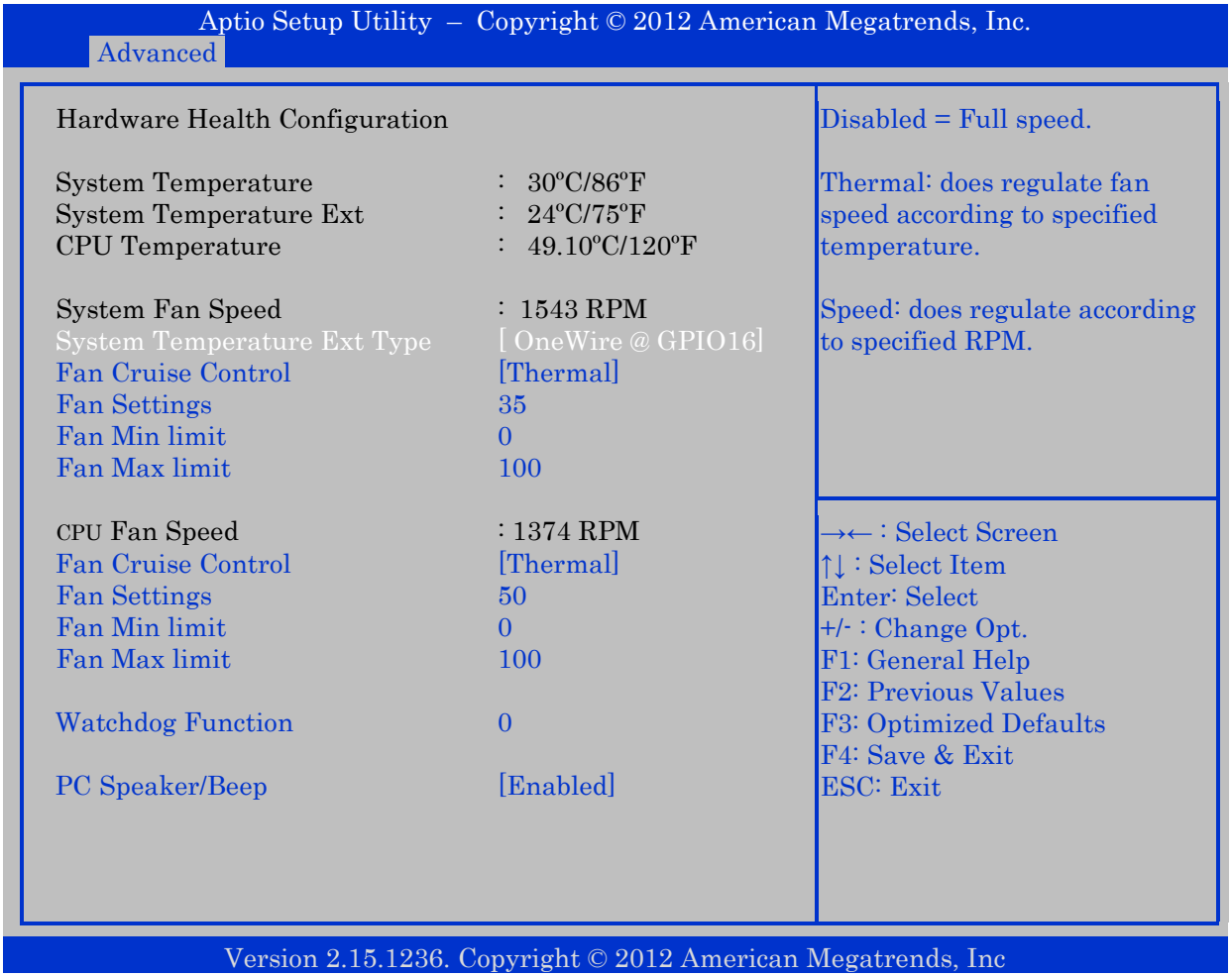
Function	Selection	Description
Serial Port	Disabled **Enabled**	Enable or Disable Serial Port (COM)
Change Settings (Note1)	**Auto** IO=2E8h; IRQ=10; IO=3F8h; IRQ=3,4,5,6,7,10,11,12; IO=2F8h; IRQ=3,4,5,6,7,10,11,12; IO=3E8h; IRQ=3,4,5,6,7,10,11,12; IO=2E8h; IRQ=3,4,5,6,7,10,11,12;	Select an optimal setting for Super IO device.
Device Mode (Note1)	**Standard Serial Port Mode** IrDA 1.0 (HP SIR) Mode ASKIR Mode	Change the Serial Port mode. Select <High Speed> or <Normal mode> mode.

Note1: only if Serial Port = Enabled

11.2.14 Advanced - Voltage Monitor



11.2.15 Advanced - Hardware Health Configuration



Function	Selection	Description
System Temperature Ext Type (note1)	**Disabled** LM75 @ 0x90 OneWire @ GPIO16	Use external connected sensor instead of onboard.
Fan Cruise Control (System Fan)	**Disabled** Thermal (note2) Speed	Disabled = Full speed. Thermal: Regulate according to specified ºC. Speed: Regulate according to specified RPM.
Fan Settings (System Fan)	30 – 90 (note2,note3) 1000 – 9999 (note4)	Specify limit temperature in ºC or limit RPM (depending on Thermal or Speed selection)
Fan Min limit (System Fan) (note5)	**0** (note6)	Minimum PWM %, can be used to make sure fan is always active. Make sure Min limit < Max limit.
Fan Max limit (System Fan) (note5)	**100** (note6)	Maximum PWM %, can be used to limit the fan noise. Make sure Min limit < Max limit.
Fan Cruise Control (CPU Fan)	**Disabled** Thermal Speed	Disabled = Full speed. Thermal: Regulate according to specified ºC. Speed: Regulate according to specified RPM.
Fan Settings (CPU Fan)	30 – 90 (note3) 1000 – 9999 (note4)	Specify limit temperature in ºC or limit RPM (depending on Thermal or Speed selection)
Fan Min limit (CPU Fan) (note7)	**0** (note6)	Minimum PWM %, can be used to make sure fan is always active. Make sure Min limit < Max limit.
Fan Max limit (CPU Fan) (note7)	**100** (note6)	Maximum PWM %, can be used to limit the fan noise. Make sure Min limit < Max limit.
Watchdog Function	0 - 255 (note8)	0 = Disabled. Enter the service interval in seconds before system will reset. Refer to manual how to reload the timer.
PC Speaker/Beep	Disabled **Enabled**	Control the default beeps during boot of the system. This setting will also control the beep during enumeration and (un)plug of USB.

Note1: Only visible if external temperature sensor like PN1053-4925 “Cable Temperature Sensor - 44P, 400 mm” is connected.

Note2: Only visible if external temperature sensor is connected and if System Temperature Ext Type is not Disabled.

Note3: ºC (if Fan Cruise Control = Thermal) use either digit keys to enter value or +/- keys to increase/decrease value. Don’t use mix of digit keys and +/- keys.

Note4: RPM (if Fan Cruise Control = Speed) use either digit keys to enter value or +/- keys to increase/decrease value by 100. Don’t use mix of digit keys and +/- keys.

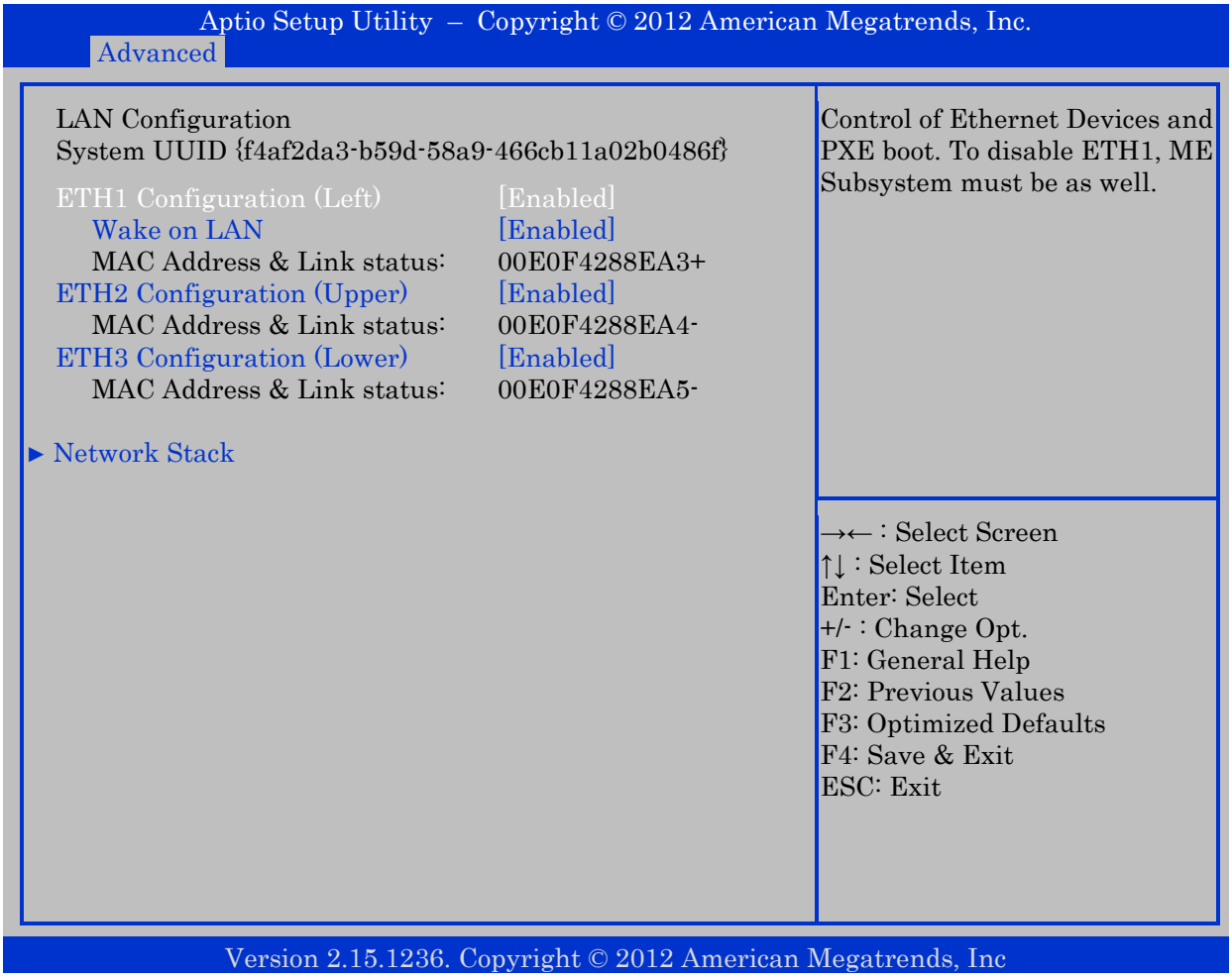
Note5: Only visible if external temperature sensor is connected and if System Fan Cruise Control is Thermal.

Note6: Use number keys to enter value.

Note7: Only visible if CPU Fan Cruise Control is Thermal.

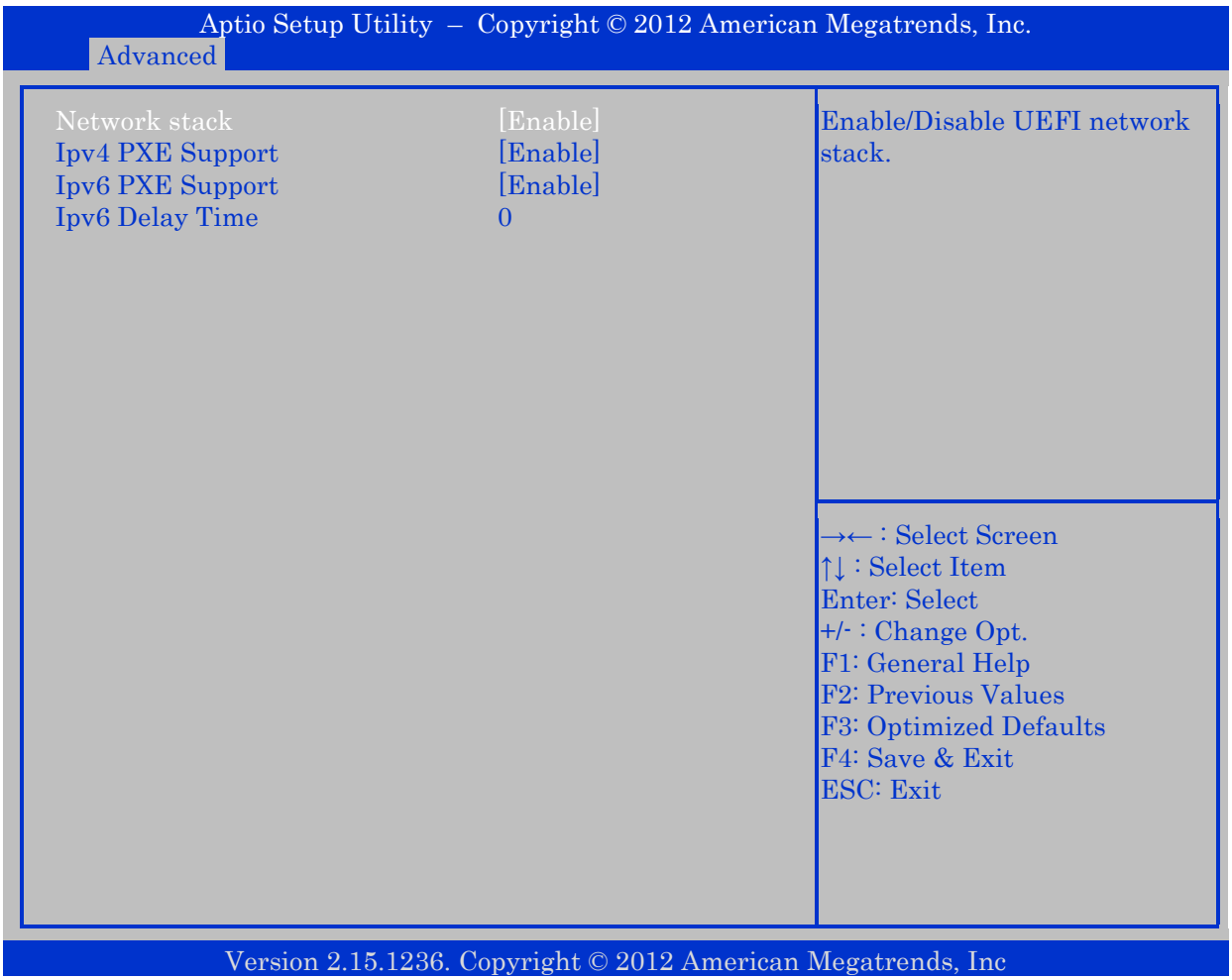
Note8: Seconds, use digit keys to enter value. Value 0 means Watchdog is disabled. Refer to “KT-API-V2 User Manual” to control the Watchdog via API or refer to “KT-API-V2 User Manual DLL” how to control Watchdog via Windows DLL.

11.2.16 Advanced - LAN Configuration



Function	Selection	Description
ETH1 Configuration (Left)	Disabled **Enabled** With PXE boot	Control of Ethernet Devices and PXE boot. To disable ETH1, ME Subsystem must be as well.
Wake on LAN	**Enabled** Disabled	Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)
ETH2 Configuration (Upper)	Disabled **Enabled** With PXE boot	Control of Ethernet Devices and PXE boot. To disable ETH2, ME Subsystem must be as well.
ETH3 Configuration (Lower)	Disabled **Enabled** With PXE boot	Control of Ethernet Devices and PXE boot. To disable ETH3, ME Subsystem must be as well.

Network Stack

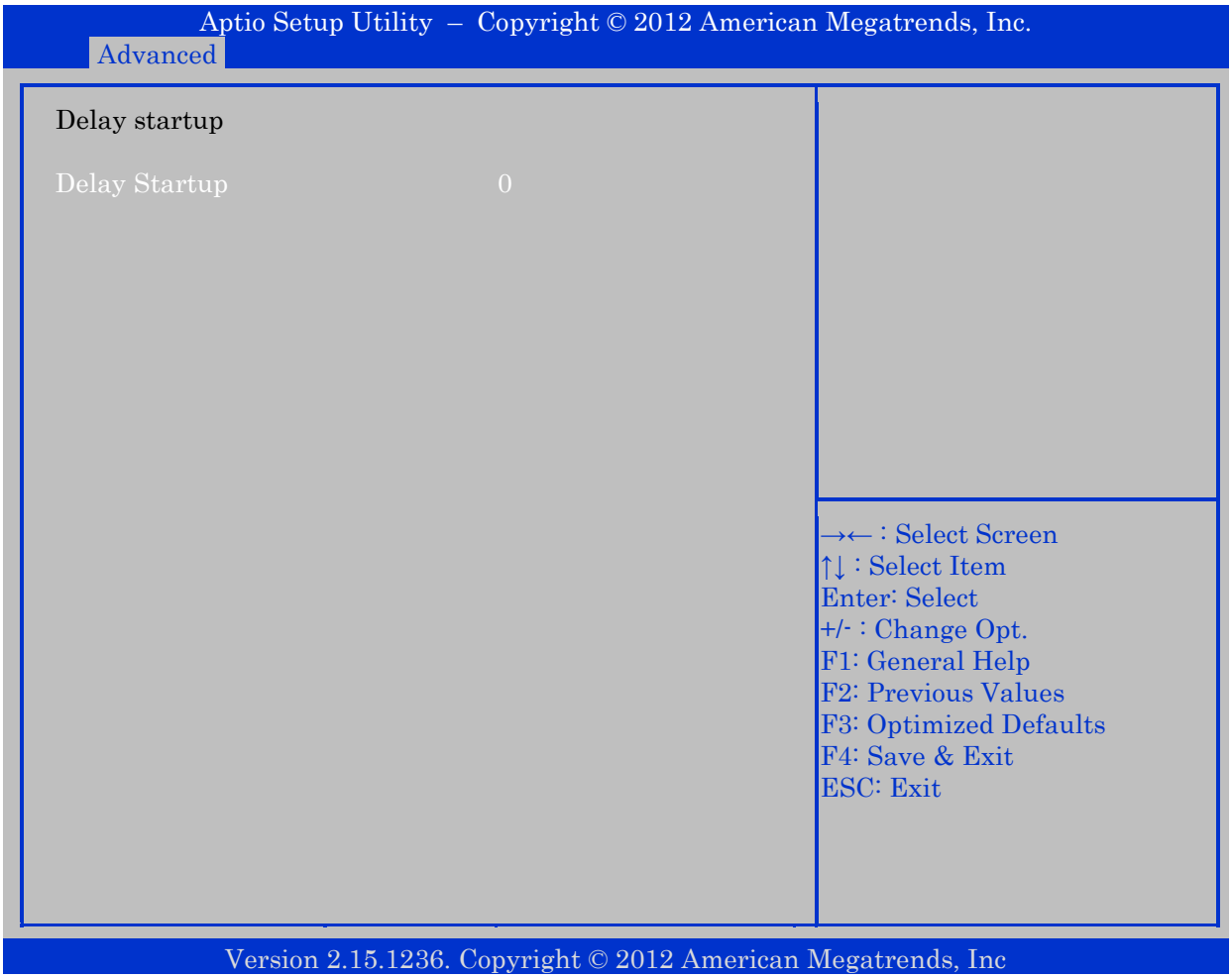


Function	Selection	Description
Network stack	**Disable Link** Enabled	Enable/Disable UEFI network stack.
Ipv4 PXE Support (Note1)	**Enabled** Disabled	Enable Ipv4 PXE Boot Support. If disabled IPV4 PXE boot option will not be created.
Ipv6 PXE Support (Note1)	**Enabled** Disabled	Enable Ipv6 PXE Boot Support. If disabled IPV6 PXE boot option will not be created.
IPv6 Delay Time (Note1)	**0** – 15 (Note2)	Set Seconds of Delay Before IPv6 PXE Boot. Default 0 Seconds.

Note1: Only if Network stack = Enabled.

Note2: To enter number use digit keys and/or +/- keys.

11.2.17 Advanced - Delay Startup

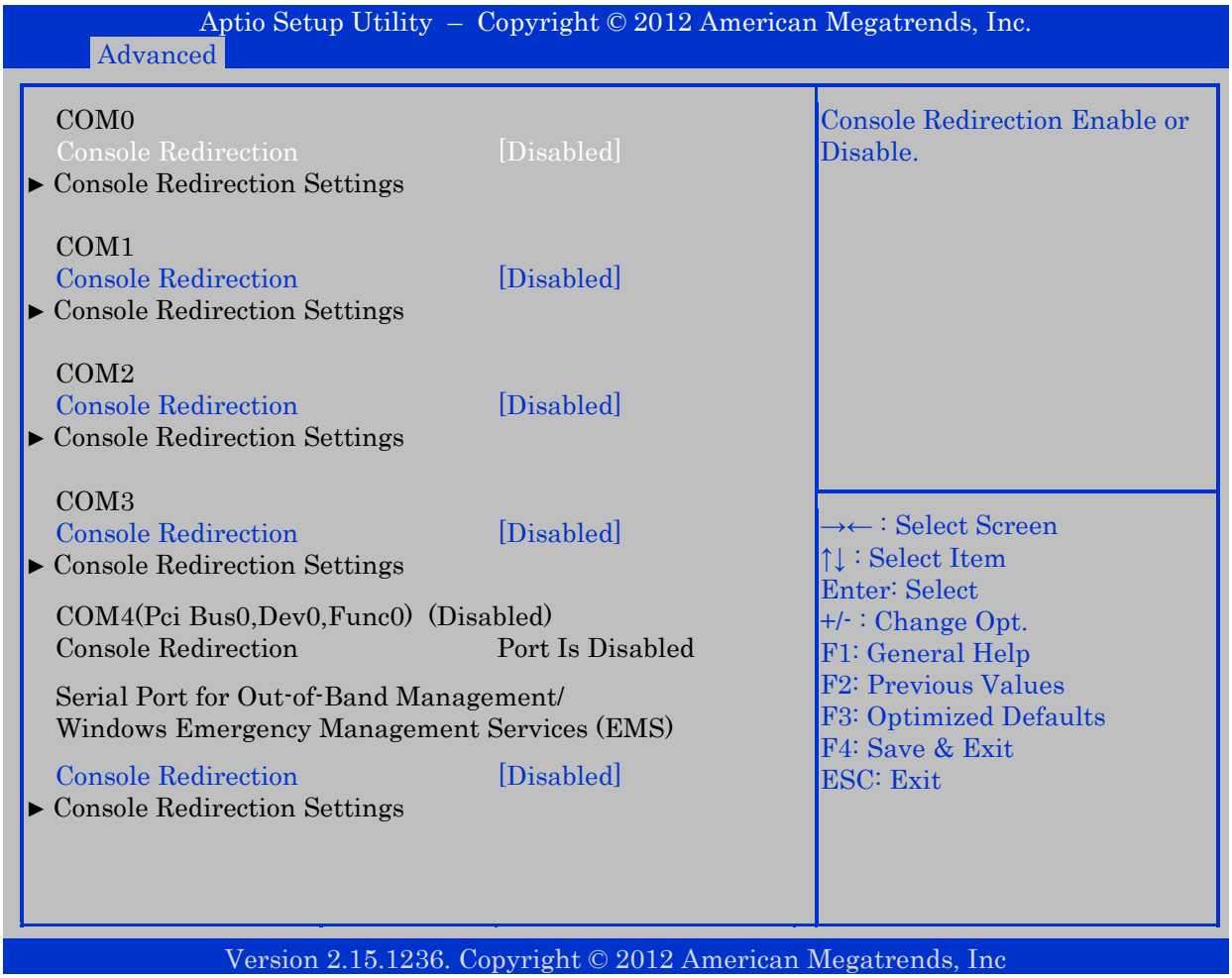


Function	Selection	Description
Delay Startup	**0** – 9999 Note1)	Delay startup value is in ms.

Note1: To enter number use digit keys and/or +/- keys.

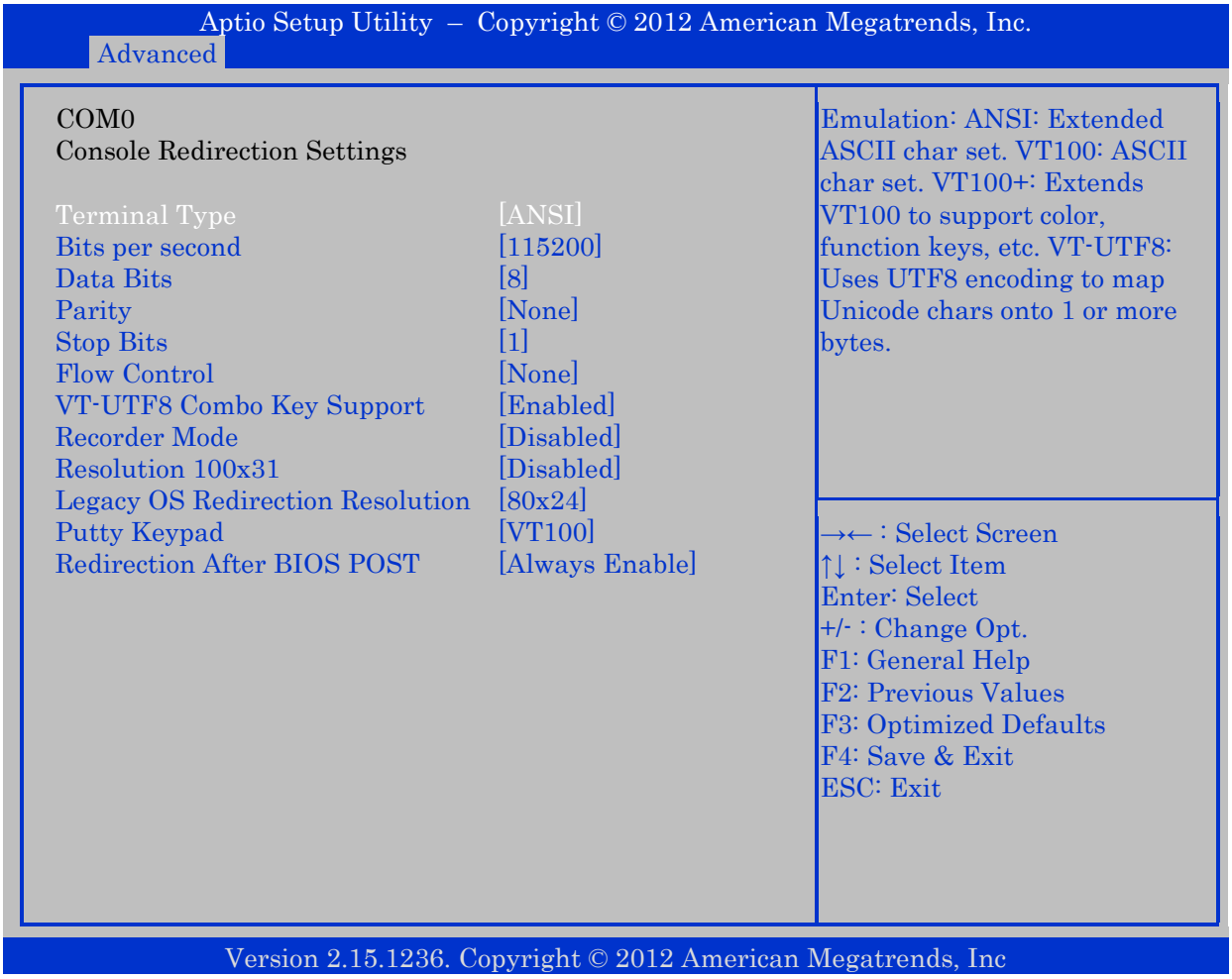
The delay initiates if the value is different from 0, starts at the earliest possible point of the BIOS boot. For some add-on devices the BIOS boot is too fast for proper detection. In other words, the setting is meant as a possible fix to Add-on device detection problems.

11.2.18 Advanced - Serial Port Console Redirection



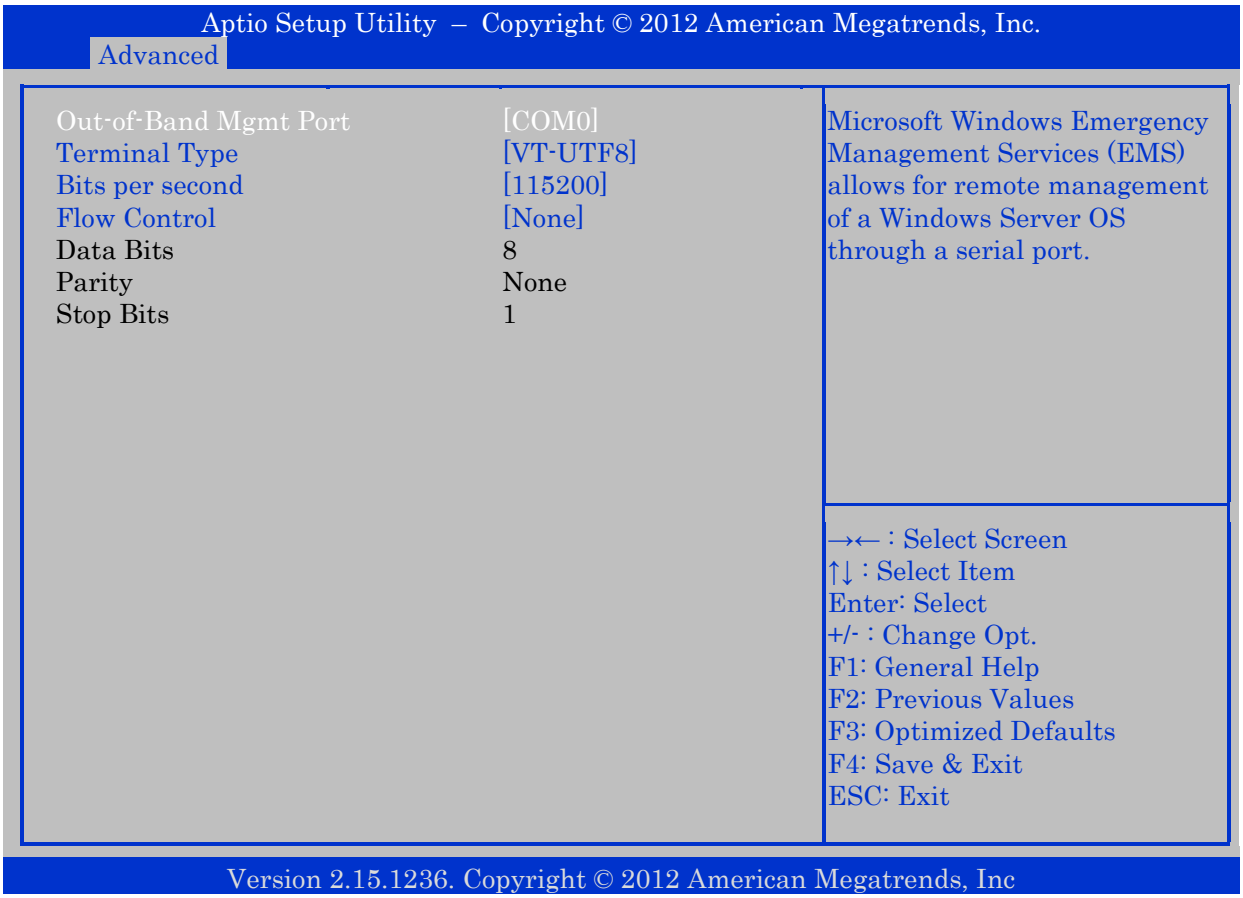
Console Redirection Settings

The “Console Redirection Settings” Menus are only available if related “Console Redirection” is Enabled. A different menu is available for Serial Port for Out-of-Band Management, see next page.



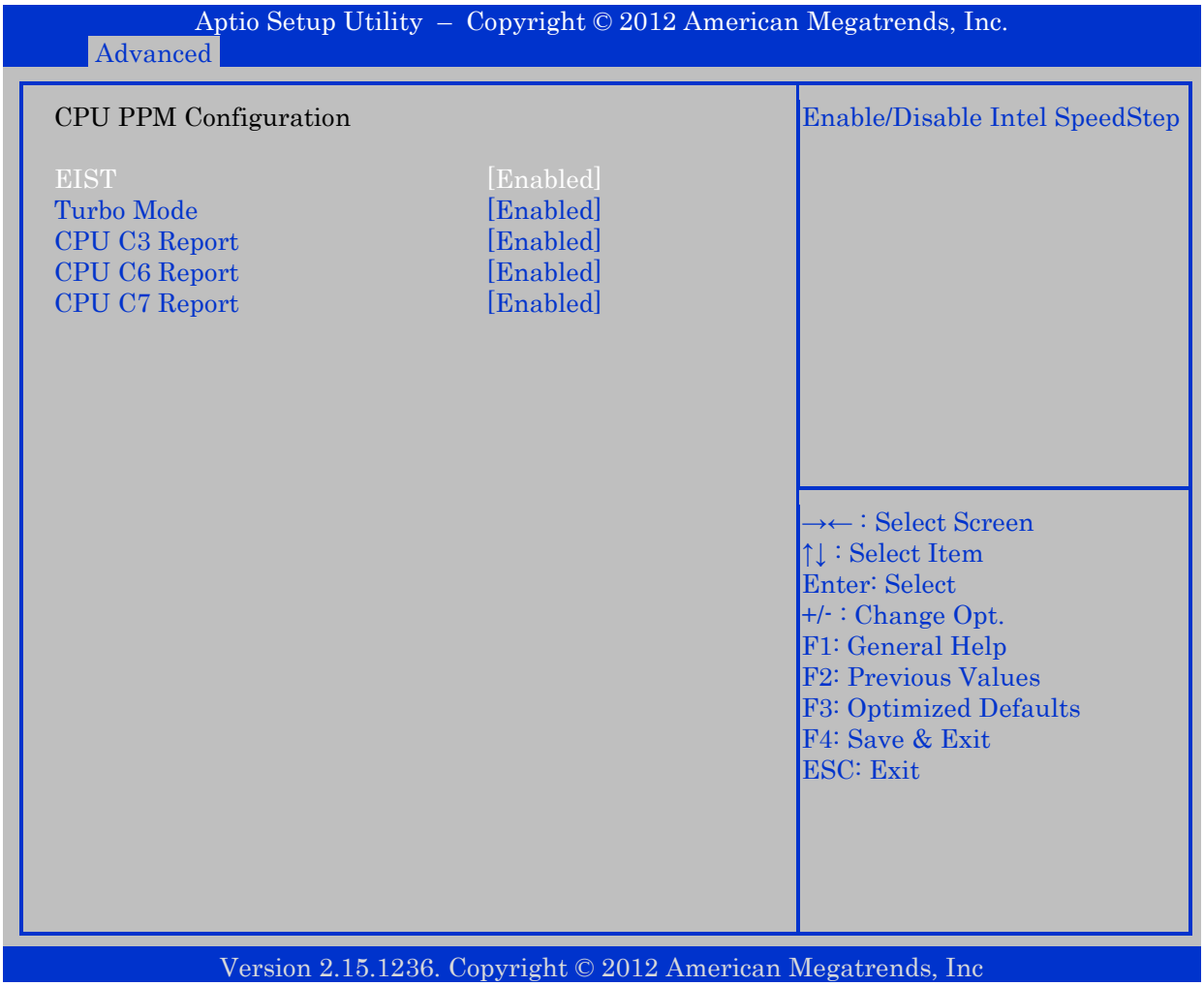
Function	Selection	Description
Terminal Type	VT100 VT100+ VT-UTF8 **ANSI**	Emulation: ANSI: Extended ASCII char set. VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
Bits per second	9600 19200 38400 57600 **115200**	Select serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Data Bits	7, **8**	Data Bits
Parity	**None** Even Odd Mark Space	A parity bit can be sent with the data bits to detect some transmission errors. Even: parity bit is 0 if the num of 1's in the data bits is even. Odd: parity bit is 0 if the num of 1's in the data bits is odd. Mark: parity bit is always 1. Space: parity bit is always 0. Mark/Space do not allow error detection.
Stop Bits	**1** 2	Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.
Flow Control	**None** Hardware RTS/CTS	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a ´stop´ signal can be sent to stop the data flow. Once the buffers are empty, a ´start 'signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.
VT-UTF8 Combo Key Support	Disabled **Enabled**	Enable VT-UTF8 Combination Key Support for ANSI/VT100 terminals.
Recorder Mode	**Disabled** Enabled	On this mode enabled only text will be send. This is to capture Terminal data.
Resolution 100x31	**Disabled** Enabled	Enables or disables extended terminal resolution.
Legacy OS Redirection Resolution	**80x24** 80x25	On Legacy OS, the Number of Rows and Columns supported redirection.
Putty Keypad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select FunctionKey and KeyPad on Putty.
Redirection After BIOS POST	**Always Enable** BootLoader	The settings specify if BootLoader is selected than Legacy console redirection is disabled before booting to Legacy OS. Default value is Always Enable which means Legacy console Redirection is enabled for Legacy OS.

When “Serial Port for Out-of-Band Management/Windows Emergency Management Services (EMS)” > “Console Redirection” is enabled:



Function	Selection	Description
Out-of-Band Mgmt Port	**COM0** COM1 COM2 COM3 COM4	Microsoft Windows Emergency Management Services (EMS) allows for remote management of a Windows Server OS through a serial port.
Terminal Type	VT100 VT100+ **VT-UTF8** ANSI	VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. See above, in Console Redirection Settings page, for more Help with Terminal Type/Emulation.
Bits per second	9600 19200 57600 **115200**	Select serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Flow Control	**None** Hardware RTS/CTS Software Xon/Xoff	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a ´stop´ signal can be sent to stop the data flow. Once the buffers are empty, a ´start ‘signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.

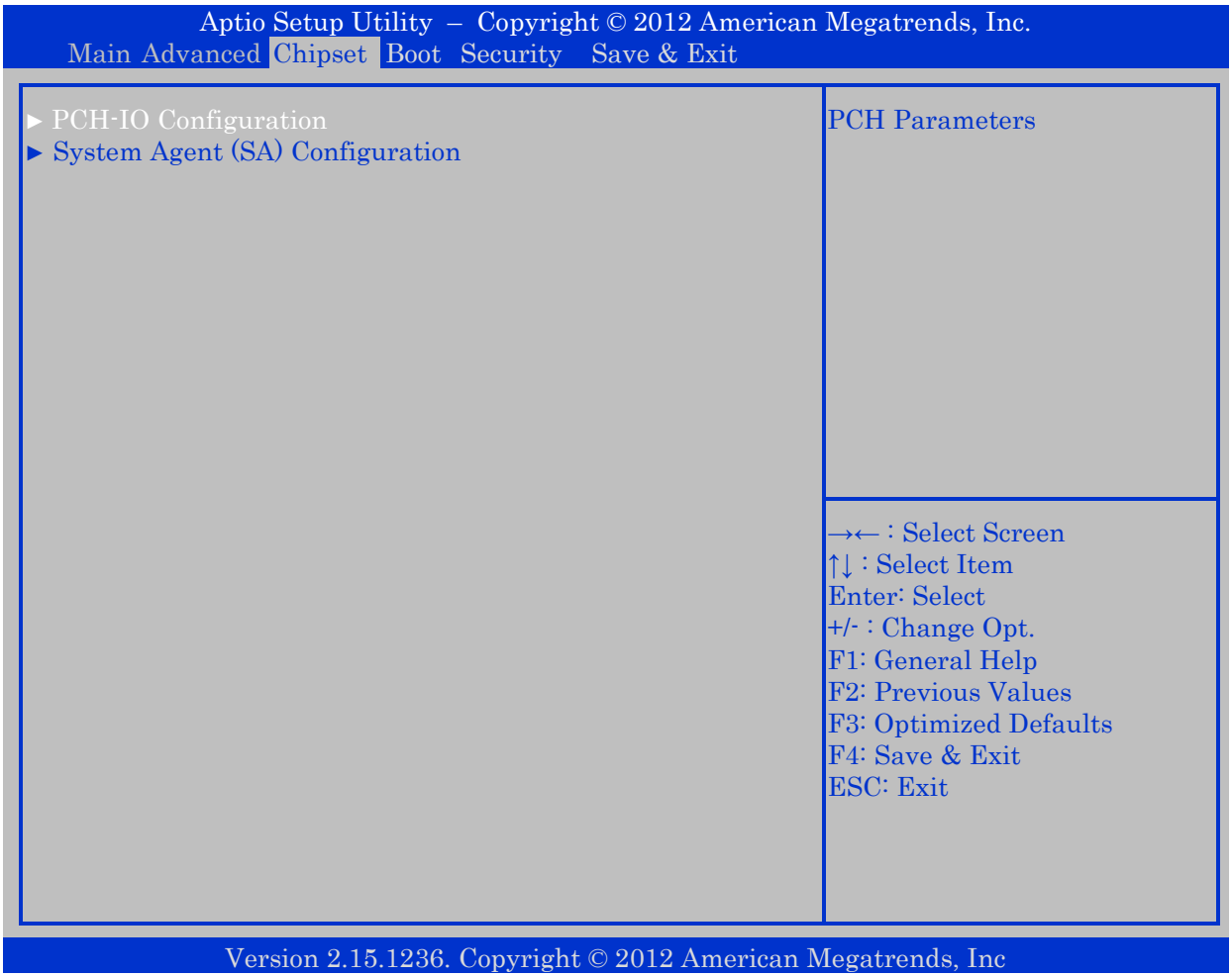
11.2.19 Advanced - CPU PPM Configuration



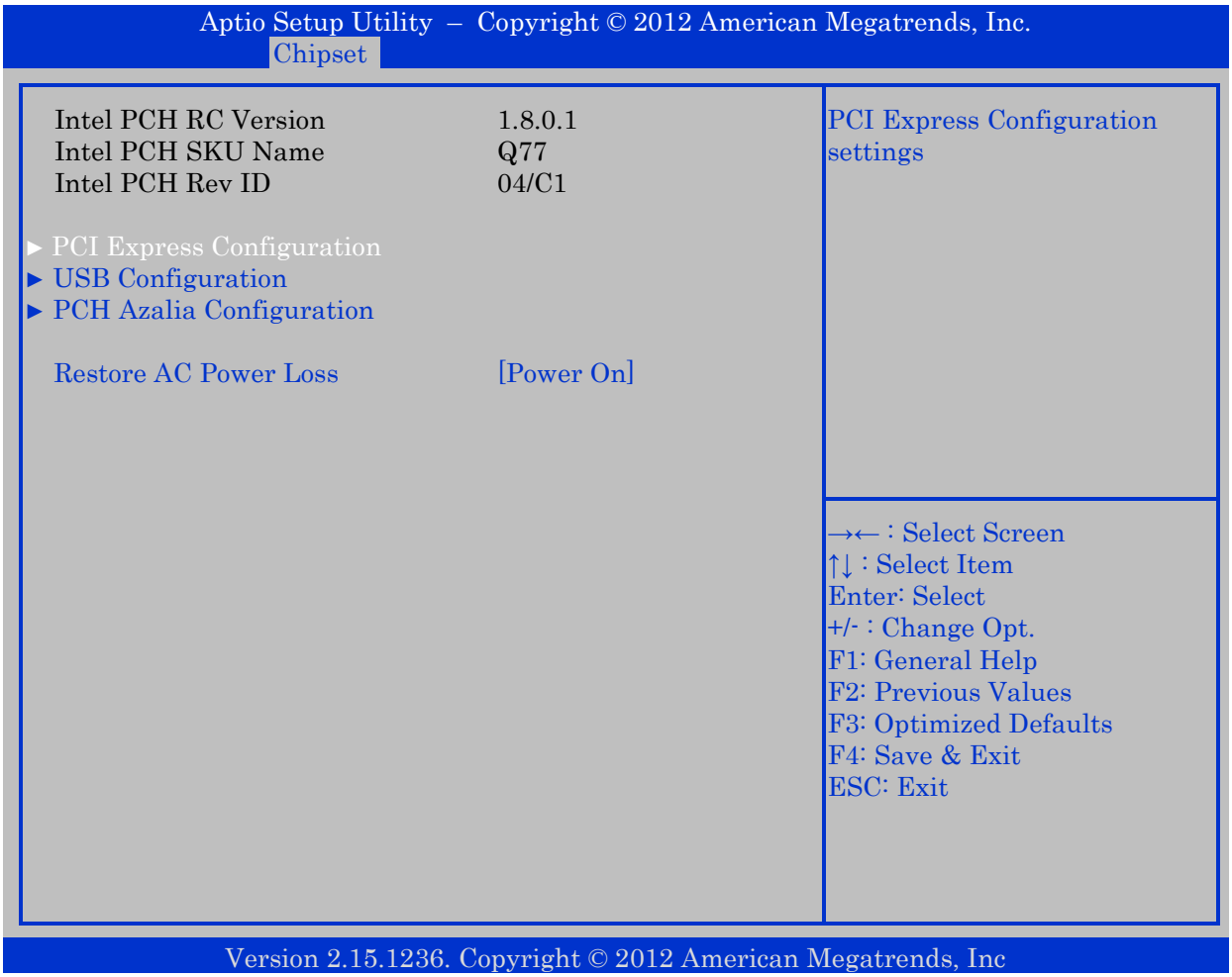
Function	Selection	Description
EIST	Disabled **Enabled**	Enable/Disable Intel SpeedStep.
Turbo Mode (Note1)	Disabled **Enabled**	Turbo Mode
CPU C3 Report	Disabled **Enabled**	Enable/Disable CPU C3 (ACPI C2) report to OS
CPU C6 Report	Disabled **Enabled**	Enable/Disable CPU C6 (ACPI C3) report to OS
CPU C7 Report	Disabled **Enabled**	Enable/Disable CPU C7 (ACPI C3) report to OS

Note1: Not present if CPU do not support Turbo Mode..

11.3 Chipset


Aptio Setup Utility – Copyright © 2012 American Megatrends, Inc.
Main Advanced Chipset Boot Security Save & Exit
► PCH-IO Configuration
► System Agent (SA) Configuration
PCH Parameters
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
Version 2.15.1236. Copyright © 2012 American Megatrends, Inc

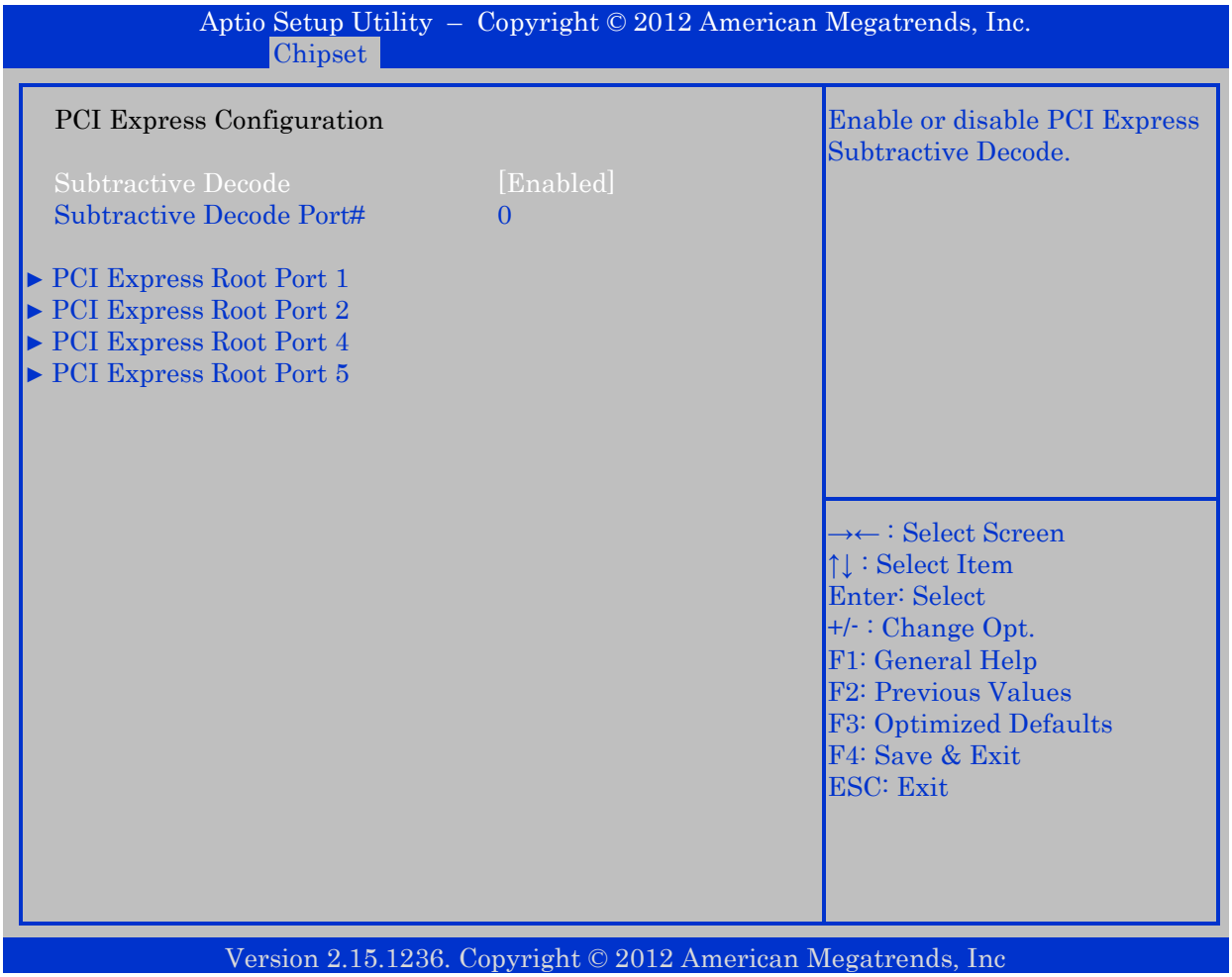
11.3.1 PCH-IO Configuration



Please fid description of the “PCI Express Configuration”, “USB Configuration” and “PCH Azalia Configuration” on the following pages.

Function	Selection	Description
Restore AC Power Loss	Power Off **Power On** Last State	Select AC Power state when power is re-applied after a power failure.

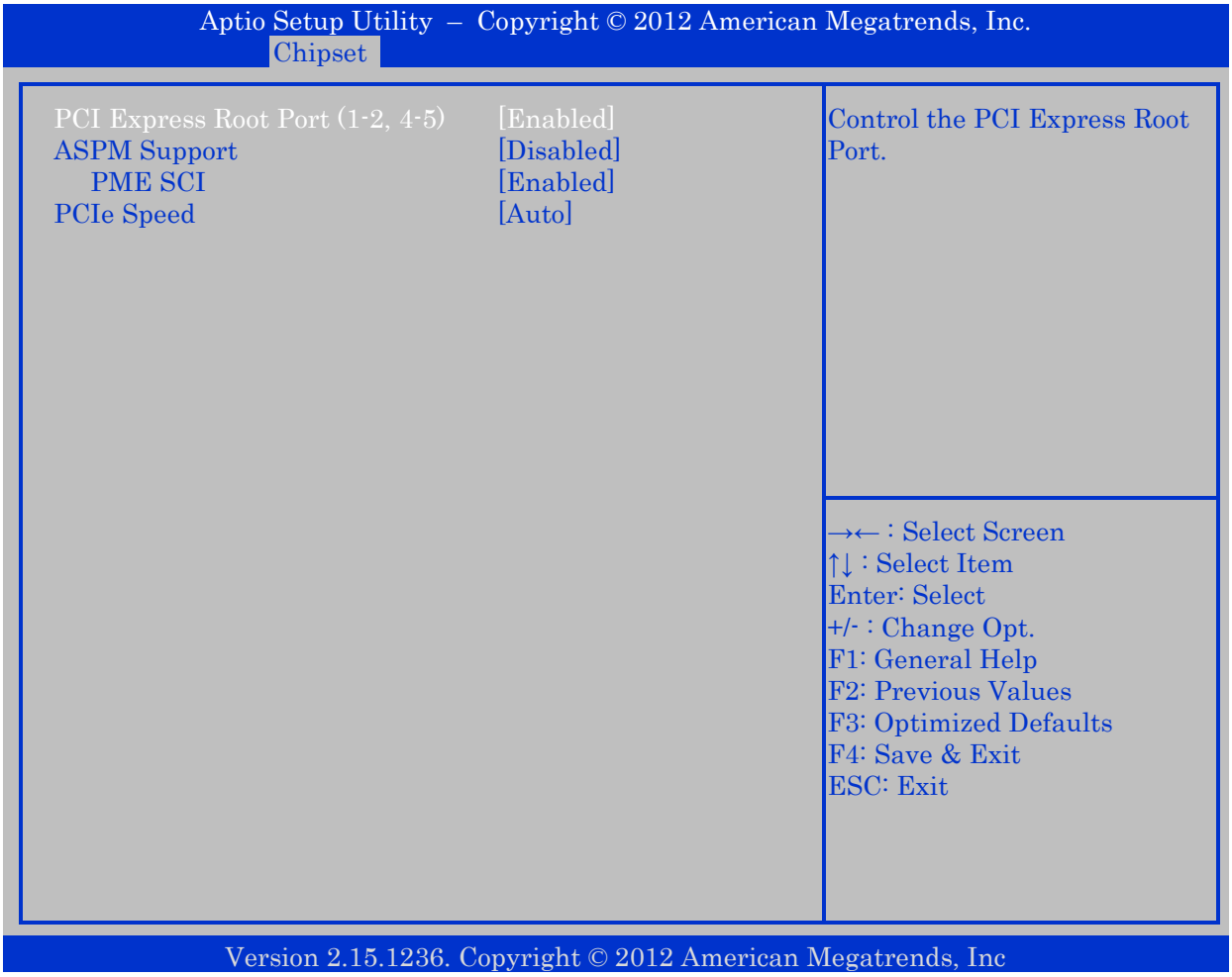
PCI Express Configuration



Function	Selection	Description
Subtractive Decode	**Disabled** Enabled	Enable or disable PCI Express Subtractive Decode.
Subtractive Decode Port# (Note1)	**0** (Note2)	Select PCI Express Subtractive Decode Root Port. User to ensure port availability.

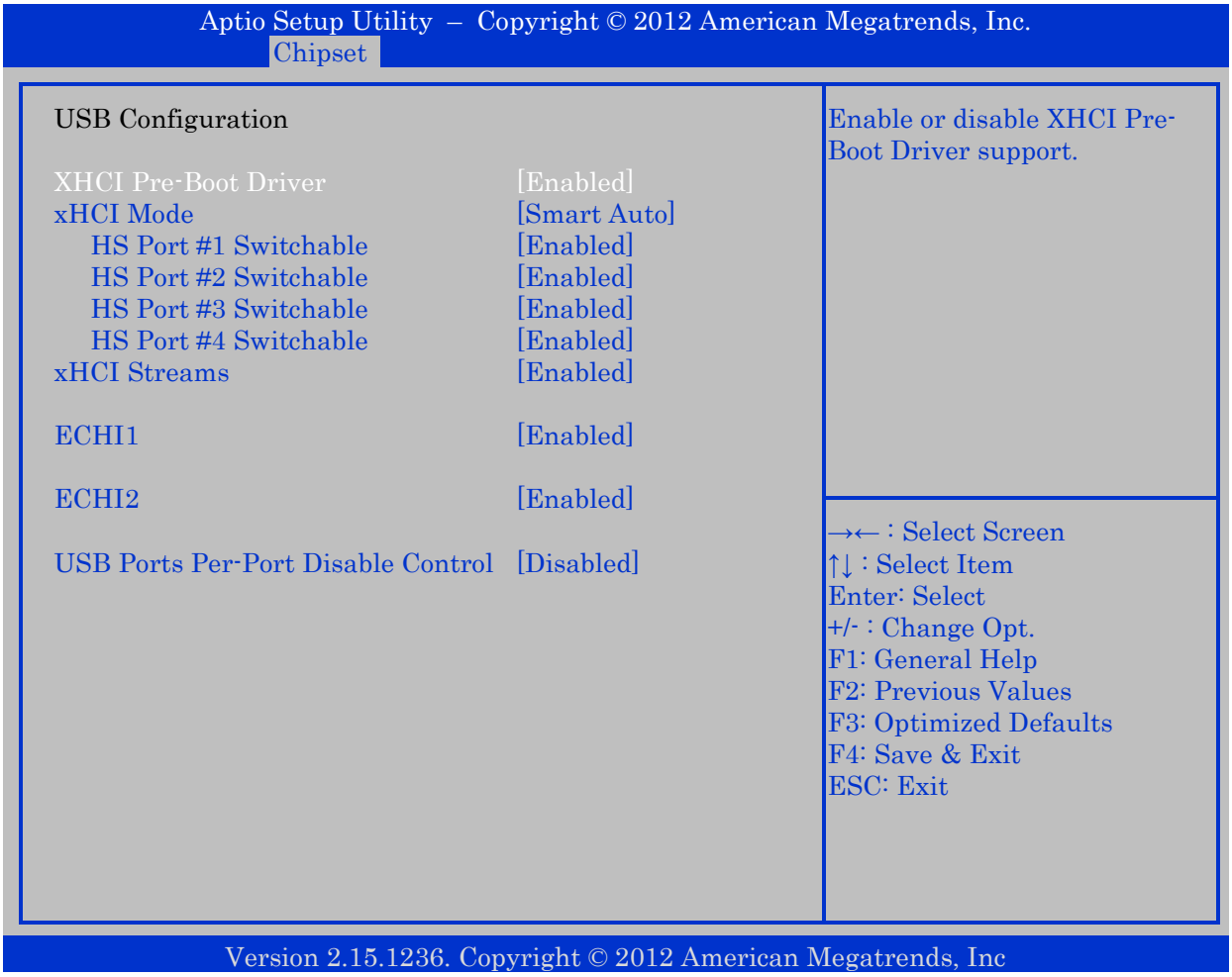
Note1: Only visible if “Subtractive Decode” is Enabled.
Note2: To enter number use digit keys and/or +/- keys.

PCI Express Root Port (1-2, 4-5)



Function	Selection	Description
PCI Express Root Port (1-2, 4-5)	Disabled **Enabled**	Control the PCI Express Root Port.
ASPM Support	**Disabled** L0s L1 L0sL1 Auto	Set the ASPM Level. Disabled: Disabled ASPM L0s: Force all links to L0s State Auto: BIOS auto configure
PME SCI	Disabled **Enabled**	Enable or disable PCI Express PME SCI.
PCIe Speed	**Auto** Gen1 Gen2	Select PCI Express port speed.

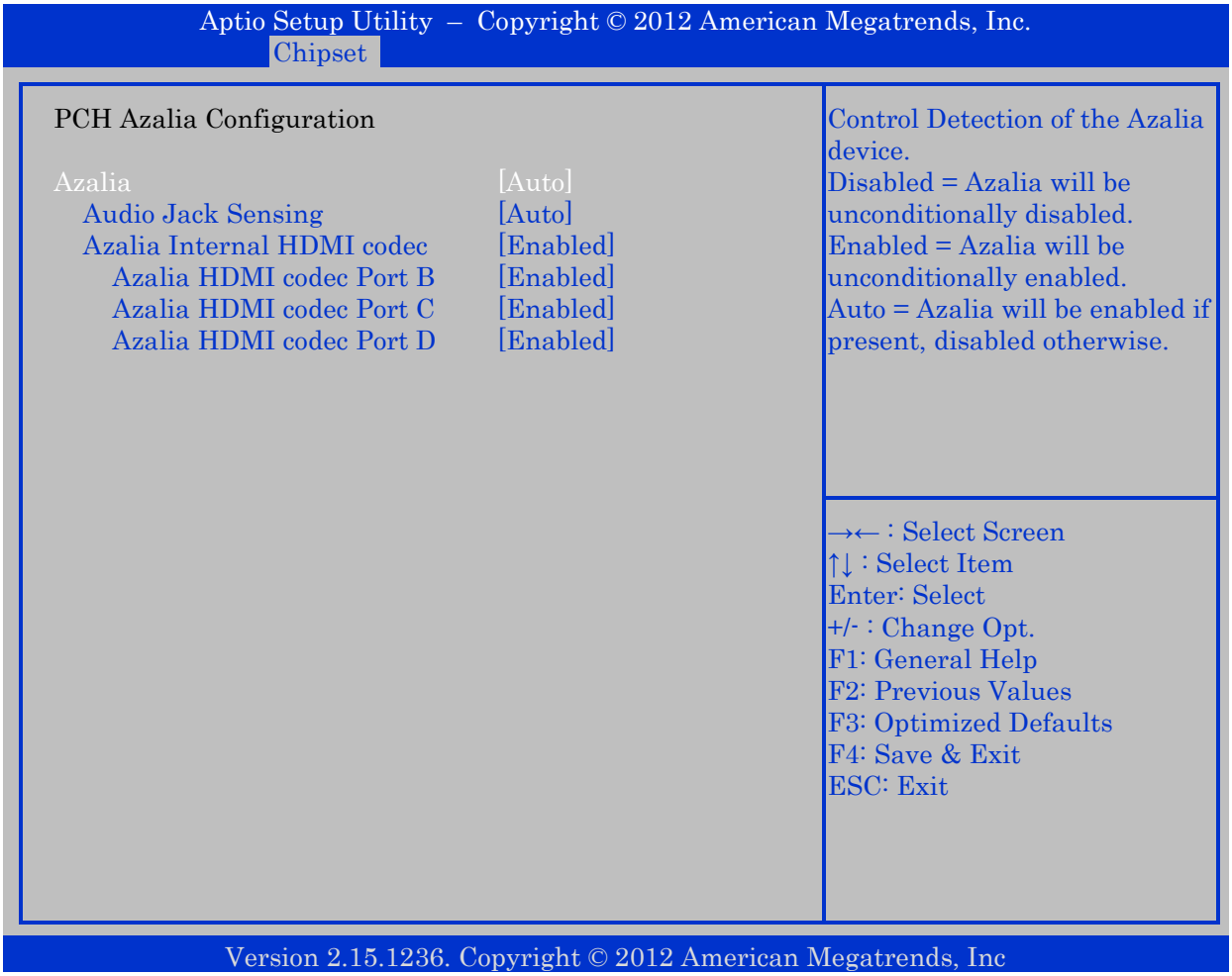
USB Configuration



Function	Selection	Description
XHCI Pre-Boot Driver	**Enabled** Disabled	Enable or disable XHCI Pre-Boot Driver support.
xHCI Mode	**Smart Auto** Auto Enabled Disabled	Mode of operation of xHCI controller.
HS Port #1 Switchable HS Port #2 Switchable HS Port #3 Switchable HS Port #4 Switchable (Note1)	Disabled **Enabled**	Allows for HS port switching between xHCI and EHCI. If disabled, port is routed to EHCI. If HS port is routed to xHCI, the corresponfing SS port is enabled.
xHCI Streams	Disabled **Enabled**	Enable xHCI Maximum Primary Stream Array Size.
ECHI1	Disabled **Enabled**	Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled.
ECHI2	Disabled **Enabled**	Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled.
USB Ports Per-Port Disable Control	**Disabled** Enabled	Control each of the USB ports (0 – 13) disabling.
USB Port #(0-13) Disabled (Note2)	Disabled **Enabled**	Disabled USB port.

Note1: Not visible if “xHCI Mode” is Disabled.
Note2: Only visible if “USB Ports Per-Port Disable Control” is Enabled.

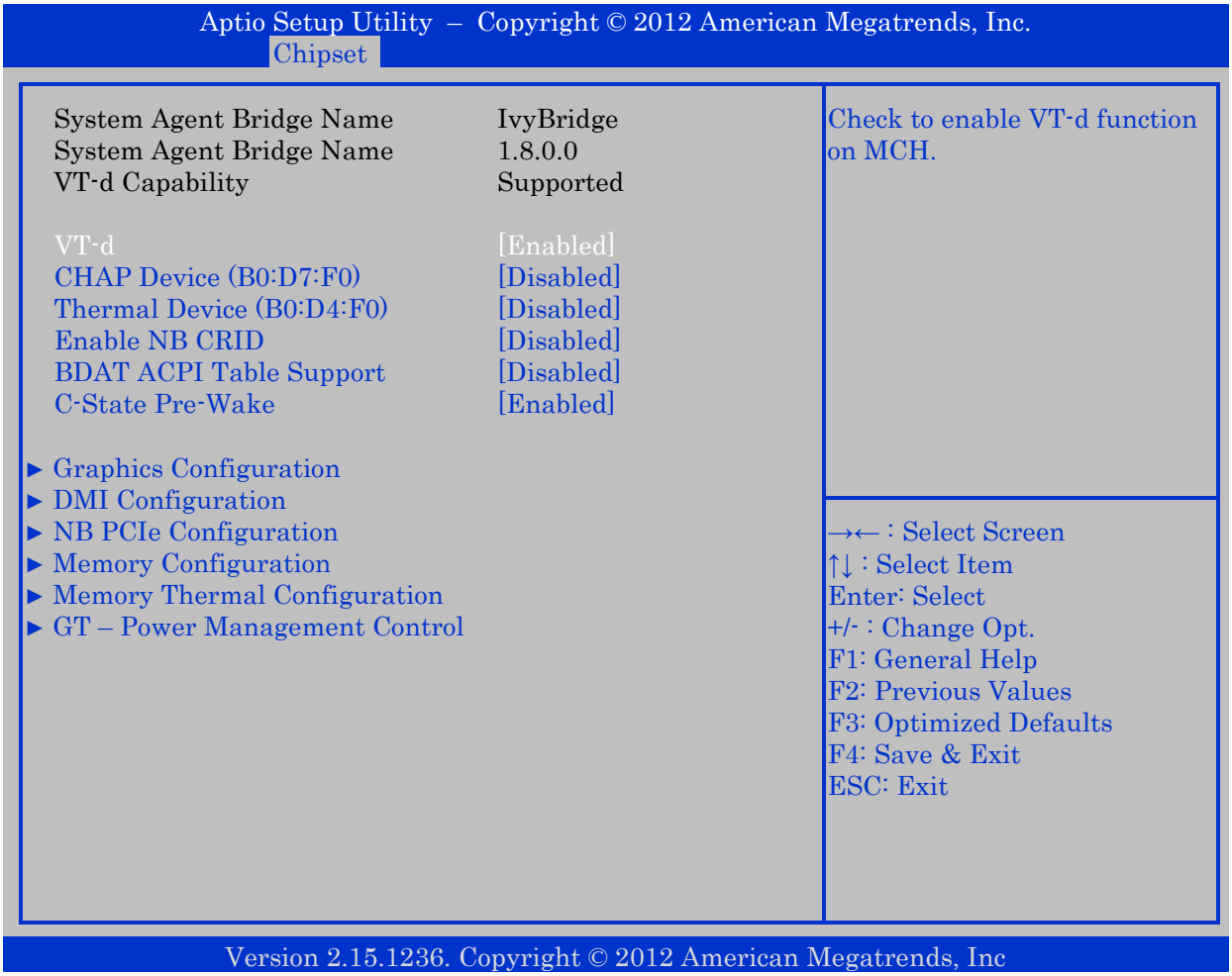
PCH Azalia Configuration



Function	Selection	Description
Azalia	Disabled Enabled **Auto**	Control Detection of the Azalia device. Disabled = Azalia unconditionally disabled. Enabled = Azalia unconditionally enabled. Auto = Azalia enabled if present, disabled otherwise.
Audio Jack Sensing (Note1)	Disabled **Auto**	Auto: The insertions of audio jacks are auto determined. Disabled: Driver assumes that all jacks are inserted (useful when using the Audio pinrow)
Azalia Internal HDMI codec (Note1)	Disabled **Enabled**	Enable or disable internal HDMI codec for Azalia.
Azalia HDMI codec PortB Azalia HDMI codec PortC Azalia HDMI codec PortD (Note2)	Disabled **Enabled**	Enable or disable internal HDMI codec for Azalia.

Note1: Only visible if “Azalia is not Disabled.
Note2: Only visible if “Azalia is not Disabled and “Azalia Internal HDMI codec” is Enabled.

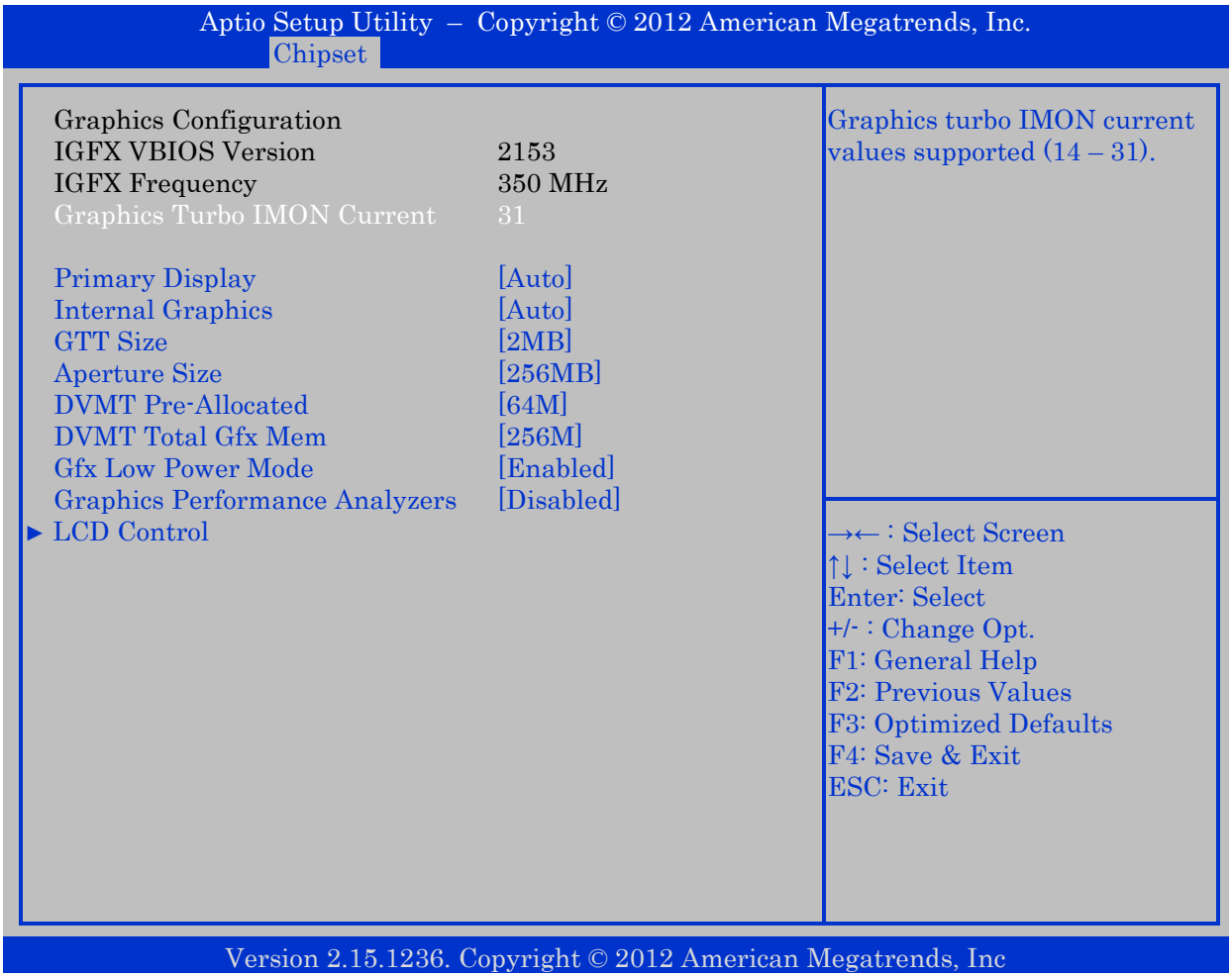
11.3.2 System Agent (SA) Configuration



Function	Selection	Description
VT-d (Note1)	Disabled **Enabled**	Check to enable VT-d function on MCH.
CHAP Device (B0:D7:F0)	Enabled **Disabled**	Enable or disable SA CHAP Device.
Thermal Device (B0:D4:F0)	Enabled **Disabled**	Enable or disable SA Thermal Device.
Enable NB CRID	Enabled **Disabled**	Enable or disable NB CRID Workaround.
BDAT ACPI Table Support	Enabled **Disabled**	Enables support for the BDAT ACPI Table.
C-State Pre-Wake (Note2)	**Enabled** Disabled	Controls C-State Pre-Wake feature for ARAT, in SSKPD[57]

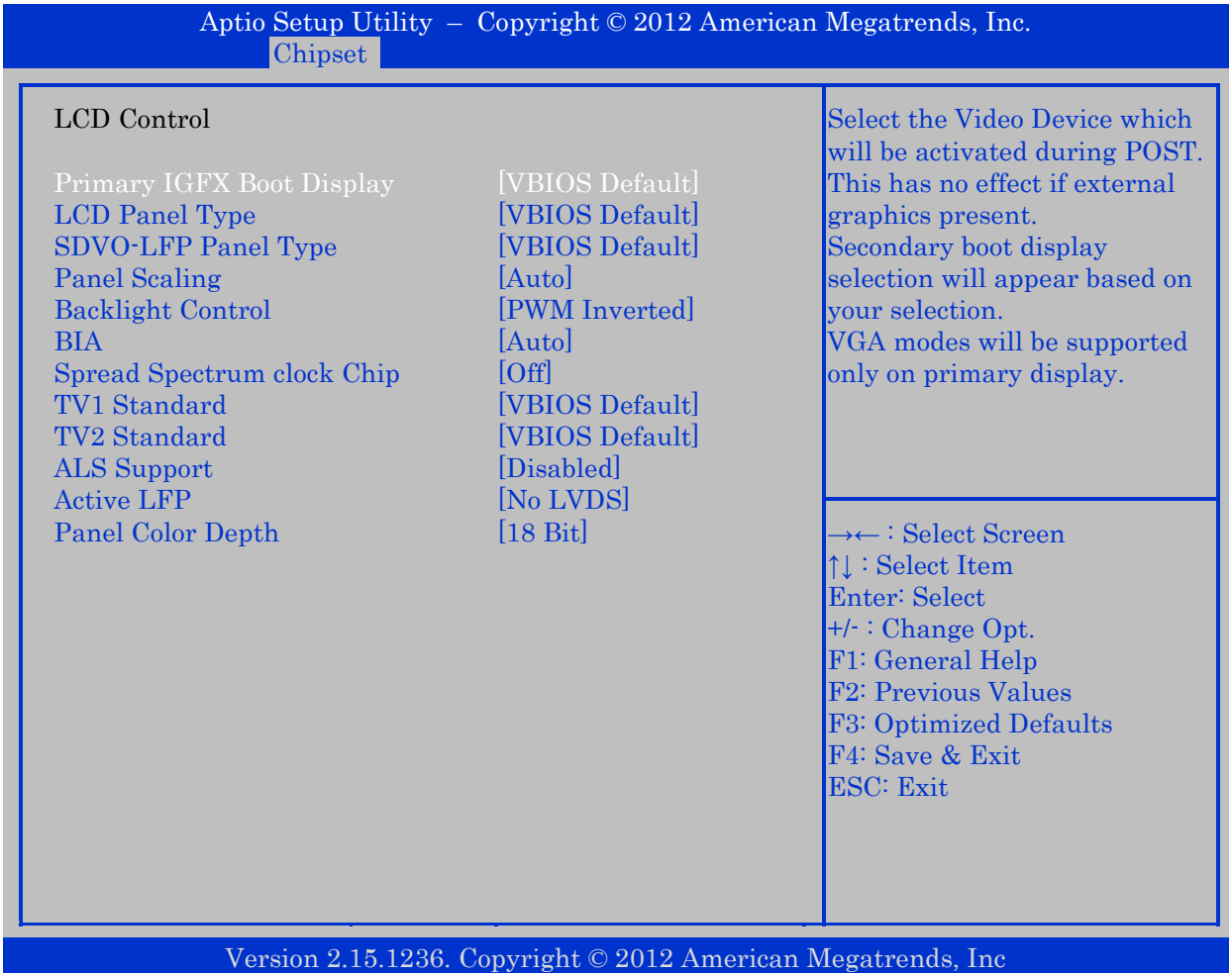
Note 1: Only present if supported by CPU.
Note 2: Only present if Ivy Bridge CPU is used.

Graphics Configuration



Function	Selection	Description
Graphics Turbo IMON Current	**31**	Graphics turbo IMON current values supported (14 – 31).
Primary Display	**Auto** IGFX PEG PCI	Select which of IGFX/PEG/PCI Graphics device should be Primary Display Or select SG for Switchable Gfx.
Internal Graphics	**Auto** Disabled Enabled	Keep IGD enabled based on the setup options.
GTT Size	1MB **2MB**	Select the GTT Size.
Aperture Size	128MB **256MB** 512MB	Select the Aperture Size.
DVMT Pre-Allocated	32M, **64M**, 96M,128M, 160M, 192M, 224M, 256M, 288M, 320M, 352M, 384M, 416M, 448M, 480M, 512M, 1024M	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx Mem	128M **256M** MAX	Select DVMT 5.0 Total Graphics Memory size used by the Internal Graphics Device.
Gfx Low Power Mode	**Enabled** Disabled	This option is applicable for SSF only.
Graphics Performance Analyzers	Enabled **Disabled**	Enable or disable Intel Graphics Performance Analyzers Counters.

LCD Control

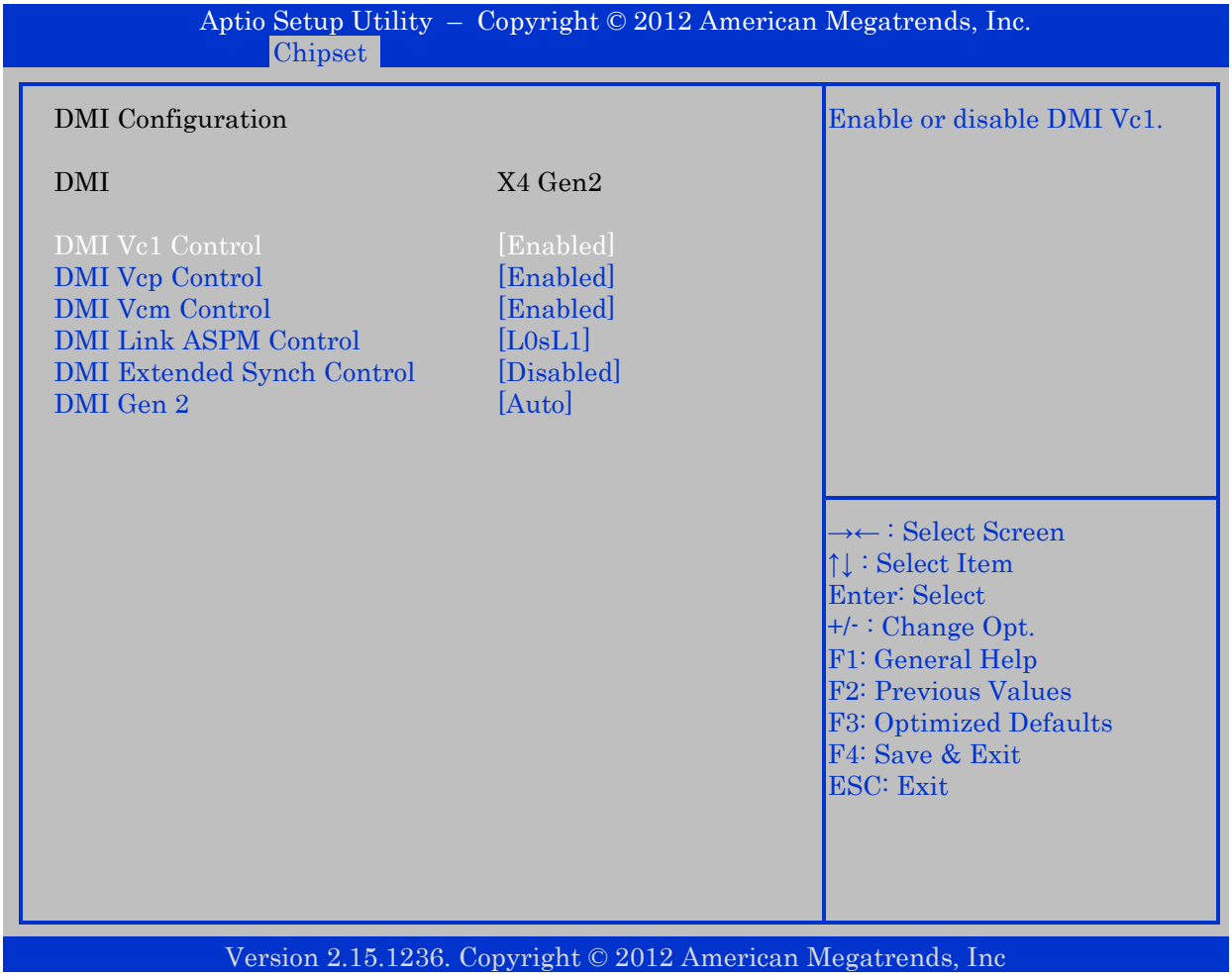

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Chipset
LCD Control
Primary IGFX Boot Display [VBIOS Default]
LCD Panel Type [VBIOS Default]
SDVO-LFP Panel Type [VBIOS Default]
Panel Scaling [Auto]
Backlight Control [PWM Inverted]
BIA [Auto]
Spread Spectrum clock Chip [Off]
TV1 Standard [VBIOS Default]
TV2 Standard [VBIOS Default]
ALS Support [Disabled]
Active LFP [No LVDS]
Panel Color Depth [18 Bit]
Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
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Function	Selection	Description
Primary IGFX Boot Display	**VBIOS Default** CRT (DVI-A, default 1) EFP (DVI-D, default 1) LFP (LVDS display) EFP3 (DP2 display) EFP2 (DP1, default 2) LFP2	Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.
LCD Panel Type	**VBIOS Default** 640x480 LVDS 800x600 LVDS 1024x768 LVDS1 1280x1024 LVDS 1400x1050(RB) LVDS1 1400x1050 LVDS2 1600x1200 LVDS 1366x768 LVDS 1680x1050 LVDS 1920x1200 LVDS 1440x900 LVDS 1600x900 LVDS 1024x768 LVDS2 1280x800 LVDS 1920x1080 LVDS 2048x1536 LVDS	Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item.
SDVO-LFP Panel Type	**VBIOS Default** 1024x768 SDVO-LFP 1280x1024 SDVO-LFP 1400x1050 SDVO-LFP 1600x1200 SDVO-LFP	Select SDVO panel used by Internal Graphics Device by selecting the appropriate setup item.
Panel Scaling	**Auto** Off Force Scaling	Select the LCD panel scaling option used by Internal Graphics Device.
Backlight Control	**PWM Inverted** PWM Normal GMBus Inverted GMBus Normal	Backlight Control Setting
BIA	**Auto** Disabled Level 1 Level 2 Level 3 Level 4 Level 5	Auto: GMCH use VBT defaults. Level n: Enabled with selected Aggressiveness Level.
Spread Spectrum clock Chip	**Off** Hardware Software	Hardware: Spread is controlled by chip. Software: Spread is controlled by BIOS.

Function	Selection	Description
TV1 Standard	**VBIOS Default** NTSC_M NTSC_M_J NTSC_433 PAL_B PAL_G PAL_D PAL_H PAL_I PAL_M PAL_N SECAM_L SECAM_B SECAM_D SECAM_G SECAM_H SECAM_K HDTV_STD_SMPTE_240M_1080i59 HDTV_STD_SMPTE_240M_1080i60 HDTV_STD_SMPTE_295M_1080i50 HDTV_STD_SMPTE_295M_1080p50 HDTV_STD_SMPTE_296M_720p50 HDTV_STD_SMPTE_296M_720p60 HDTV_STD_CEAEIA_7702A_480p60 HDTV_STD_CEAEIA_7702A_480i60	Select the ability to configure a TV Format.
TV2 Standard	**VBIOS Default** NTSC_M NTSC_M_J NTSC_433 PAL_B PAL_G PAL_D PAL_H PAL_I PAL_M PAL_N SECAM_L SECAM_B SECAM_D SECAM_G SECAM_H SECAM_K HDTV_STD_SMPTE_240M_1080i59 HDTV_STD_SMPTE_240M_1080i60 HDTV_STD_SMPTE_295M_1080i50 HDTV_STD_SMPTE_295M_1080p50 HDTV_STD_SMPTE_296M_720p50 HDTV_STD_SMPTE_296M_720p60 HDTV_STD_CEAEIA_7702A_480p60 HDTV_STD_CEAEIA_7702A_480i60	Select the ability to configure a TV Minor Format.

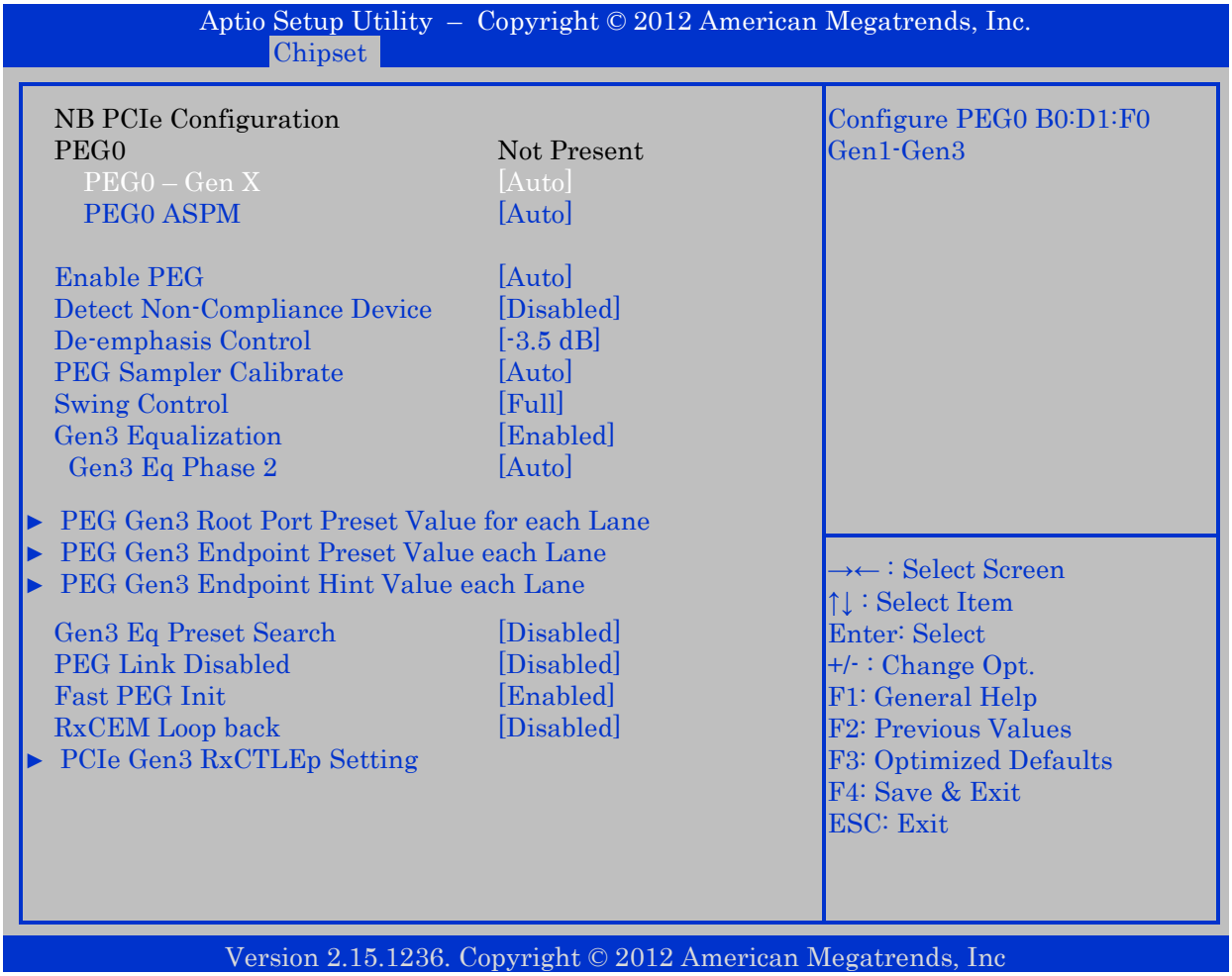
Function	Selection	Description
ALS Support	Enabled **Disabled**	Valid only for ACPI. Legacy = ALS Support through the IGD INT10 function. SCPI = ALS support through an ACPI ALS driver.
Active LFP	**No LVDS** Int-LVDS SDVO LVDS eDP Port-A eDP Port-D	Select the Active LFP Configuration. No LVDS: VBIOS does not enable LVDS. Int-LVDS: VBIOS enables LVDS driver by SDVO encoder. SDVO LVDS: VBIOS enables LVDS driver by SDVO encoder. eDP Port-A: LFP driven by Internal DisplayPort encoder from Port-A.
Panel Color Depth	**18 Bit** 24 Bit	Select the LFP Panel Color Depth.

DMI Configuration



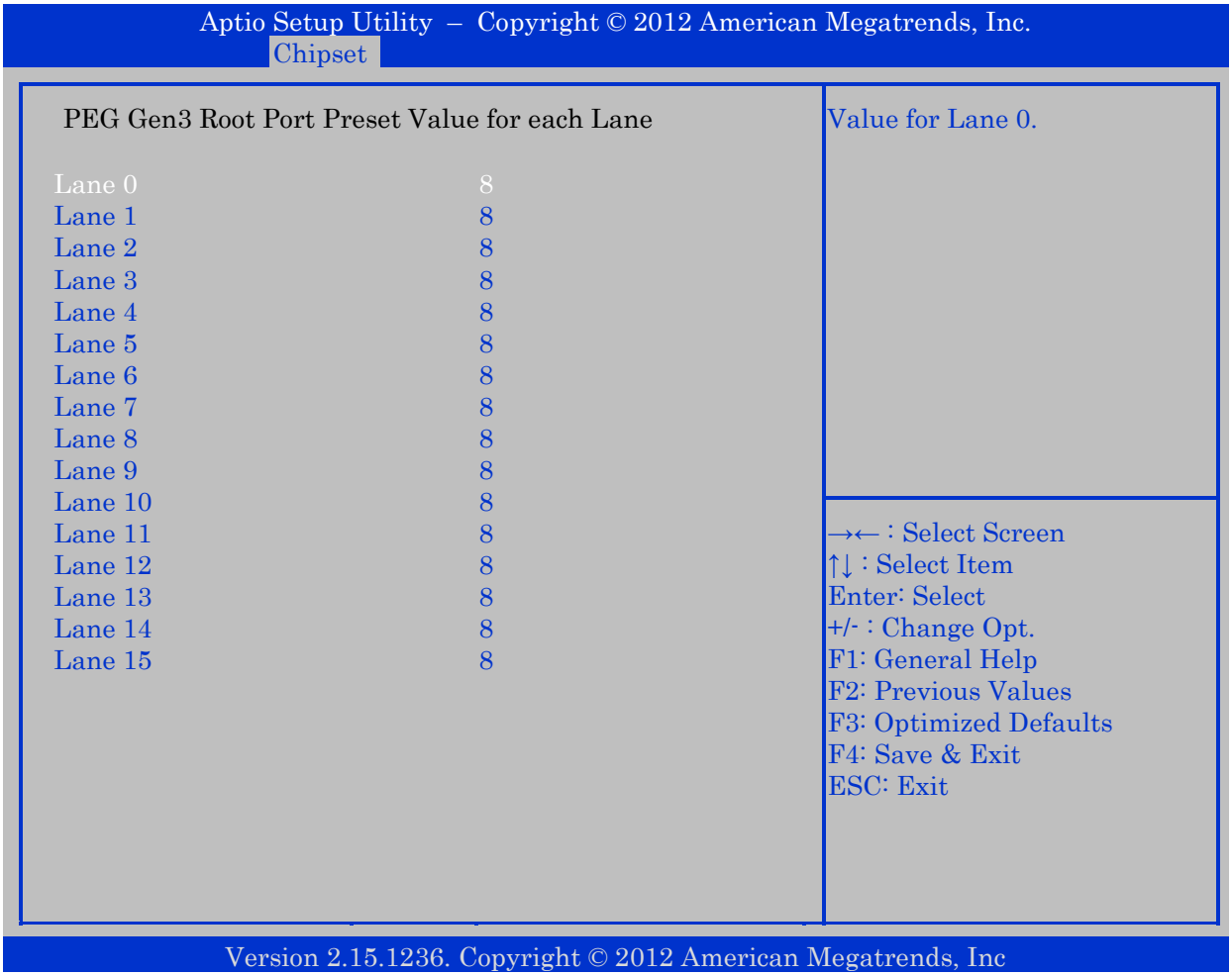
Function	Selection	Description
DMI Vc1 Control	**Enabled** Disabled	Enable or disable DMI Vc1
DMI Vcp Control	**Enabled** Disabled	Enable or disable DMI Vcp
DMI Vcm Control	**Enabled** Disabled	Enable or disable DMI Vcm
DMI Link ASPM Control	Disabled L0s L1 **L0sL1**	Enable or disable the control of Active State Power Management on SA side of the DMI Link.
DMI Extended Synch Control	Enabled **Disabled**	Enable DMI Extended Synchronization.
DMI Gen 2	**Auto** Enabled Disabled	Enable or disable DMI Gen 2. Auto means Disabled for IVB A0 MB/DT and IVB B0 MB, Enabled for other CPUs.

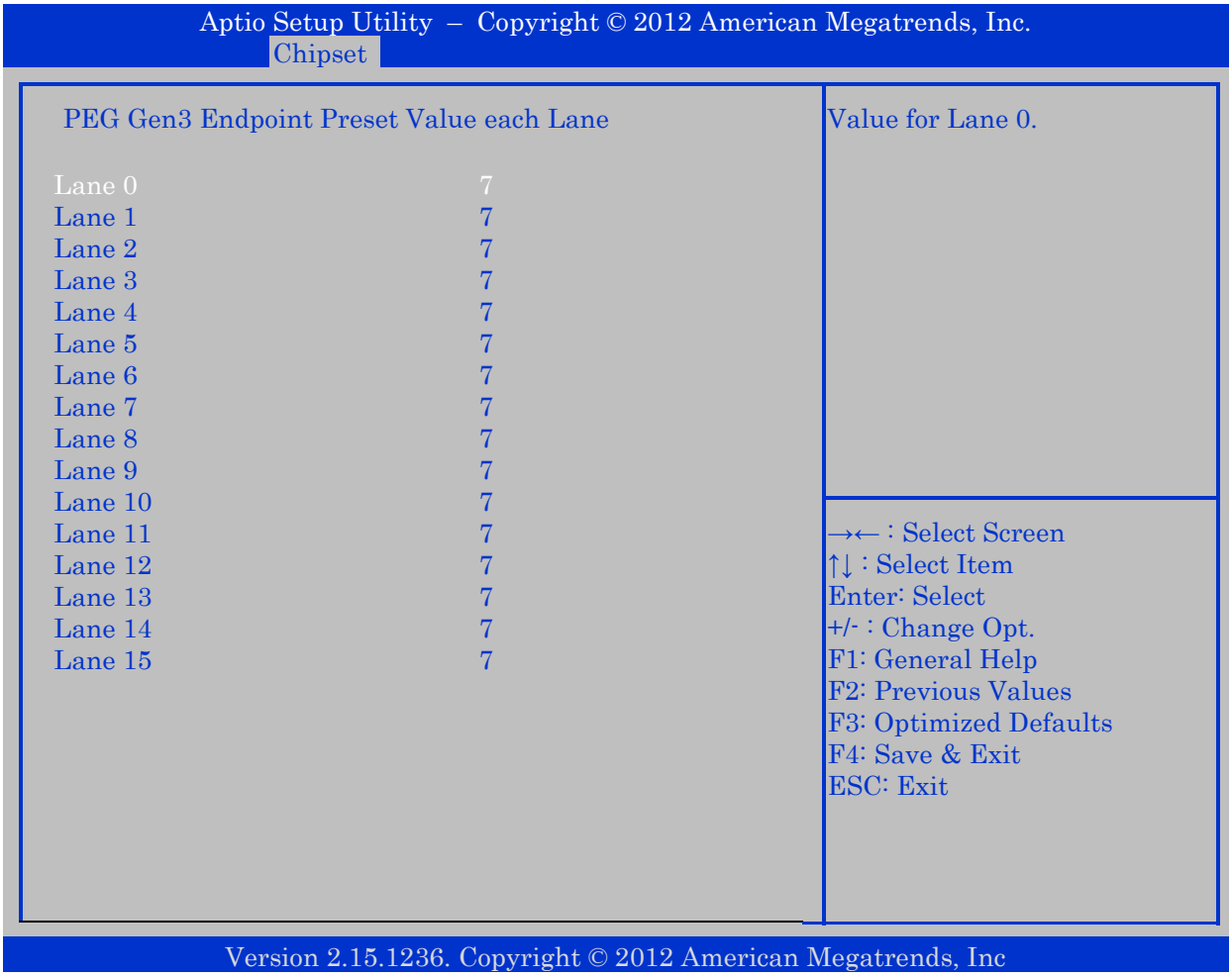
NB PCIe Configuration

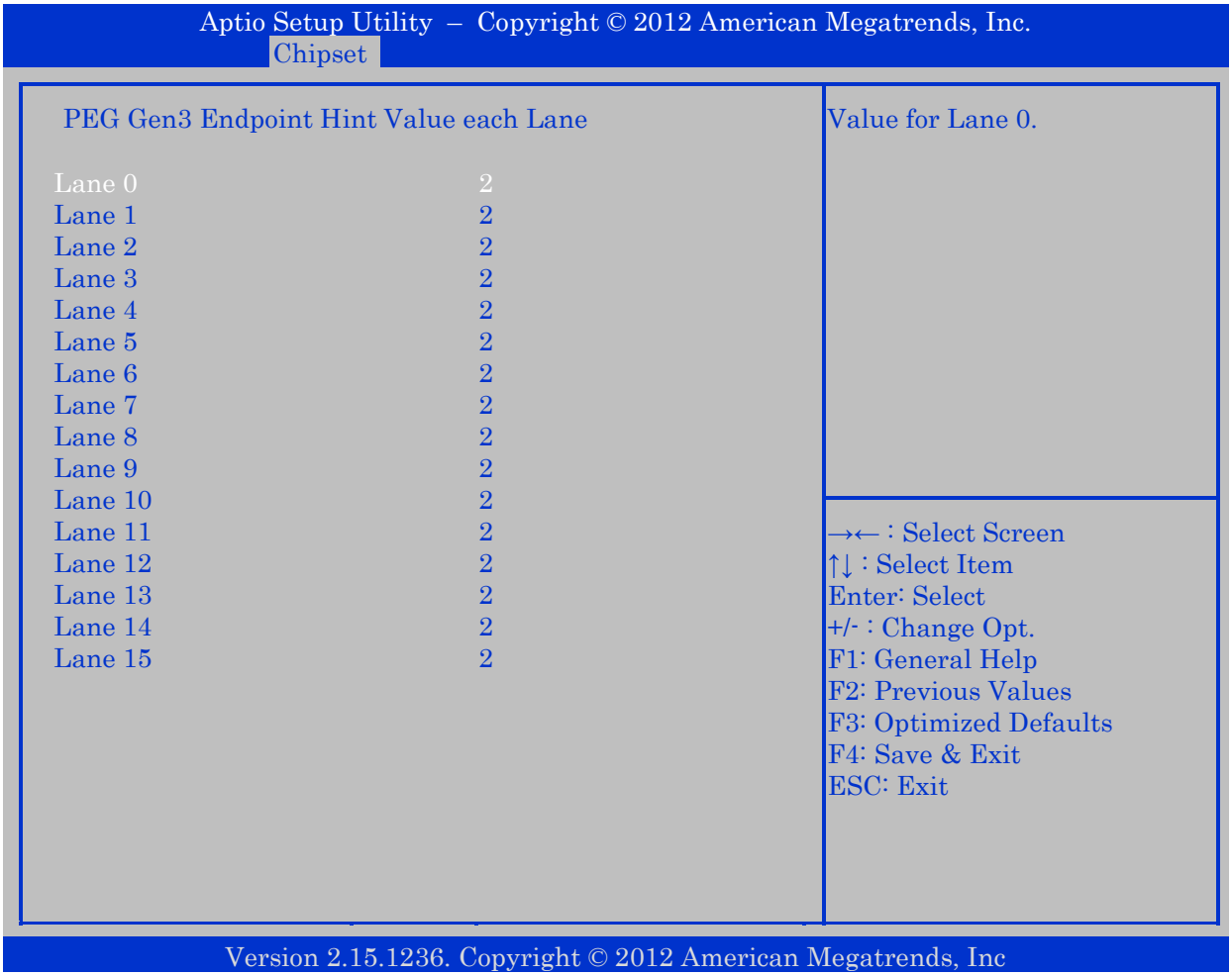


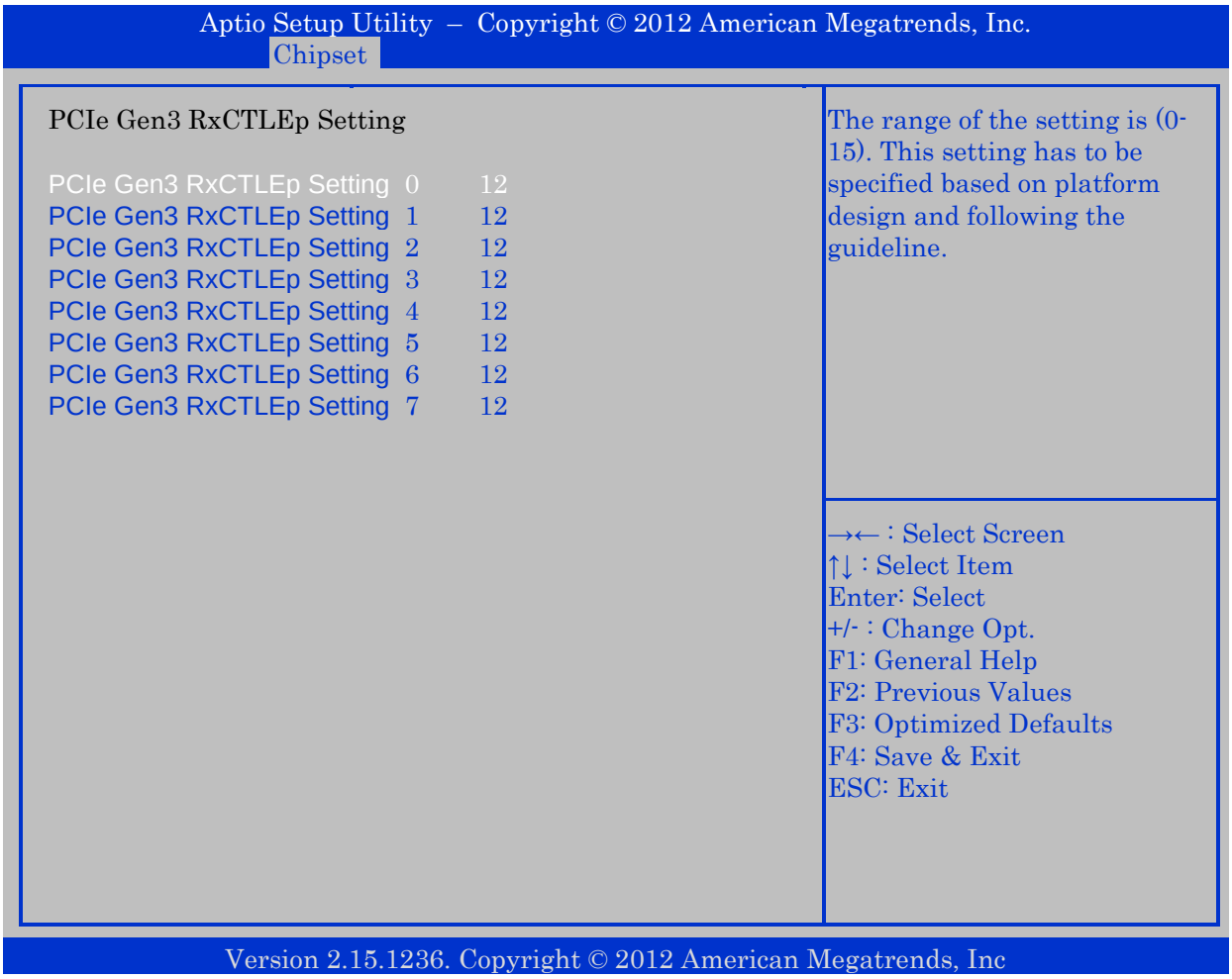
Function	Selection	Description
PEG0 – Gen X	**Auto** GEN1 Gen2	Configure PEG0 B0:D1:F0 Gen1-Gen3
PEG0 ASPM	Disabled **Auto** ASPM L0s ASPM L1 ASPM L0sL1	Control ASPM support for the PEG: Device 1 Function 0. This has no effect if PEG is not the currently active device.
Enable PEG	Disabled Enabled **Auto**	To enable or disable the PEG.
Detect Non-Compliance Device	**Disabled** Enabled	Detect Non-Compliance PCI Express Device in PEG.
De-emphasis Control	-6 dB **-3.5 dB**	Configuring the De-emphasis Control on PEG.
PEG Sampler Calibrate	**Auto** Enabled Disabled	Enable or disable PEG Sampler Calibrate. Auto means Disabled for SNB MB/DT, Enabled for IVB A0 B0.
Swing Control	Reduced Half **Full**	Perform PEG Swing Control, on IVB C0 and Later.
Gen3 Equalization (Note1)	**Enabled** Disabled	Perform PEG Gen3 Equalization steps.
Gen3 Eq Phase 2 (Note1)	**Auto** Enabled Disabled	Perform PEG Gen3 Equalization phase 2.
Gen3 Eq Preset Search (Note1)	Enabled **Disabled**	Perform PEG Gen3 Preset Search algorithm, on IVB Co or Later.
PEG Link Disabled	Enabled **Disabled**	Enable or disable PCIe link disable mechanism for additional power saving.
Fast PEG Init	**Enabled** Disabled	Enable or disable Fast PEG Init, Some optimization if not PEG devices present in cold boot.
RxCEM Loop back	**Enabled** Disabled	Enable or disable RxCEM Loop back.

Note 1: Only present if Ivy Bridge CPU is used.


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Chipset
PEG Gen3 Root Port Preset Value for each Lane
Lane 0 8
Lane 1 8
Lane 2 8
Lane 3 8
Lane 4 8
Lane 5 8
Lane 6 8
Lane 7 8
Lane 8 8
Lane 9 8
Lane 10 8
Lane 11 8
Lane 12 8
Lane 13 8
Lane 14 8
Lane 15 8
Value for Lane 0.
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
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Chipset
PEG Gen3 Endpoint Preset Value each Lane
Lane 0 7
Lane 1 7
Lane 2 7
Lane 3 7
Lane 4 7
Lane 5 7
Lane 6 7
Lane 7 7
Lane 8 7
Lane 9 7
Lane 10 7
Lane 11 7
Lane 12 7
Lane 13 7
Lane 14 7
Lane 15 7
Value for Lane 0.
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
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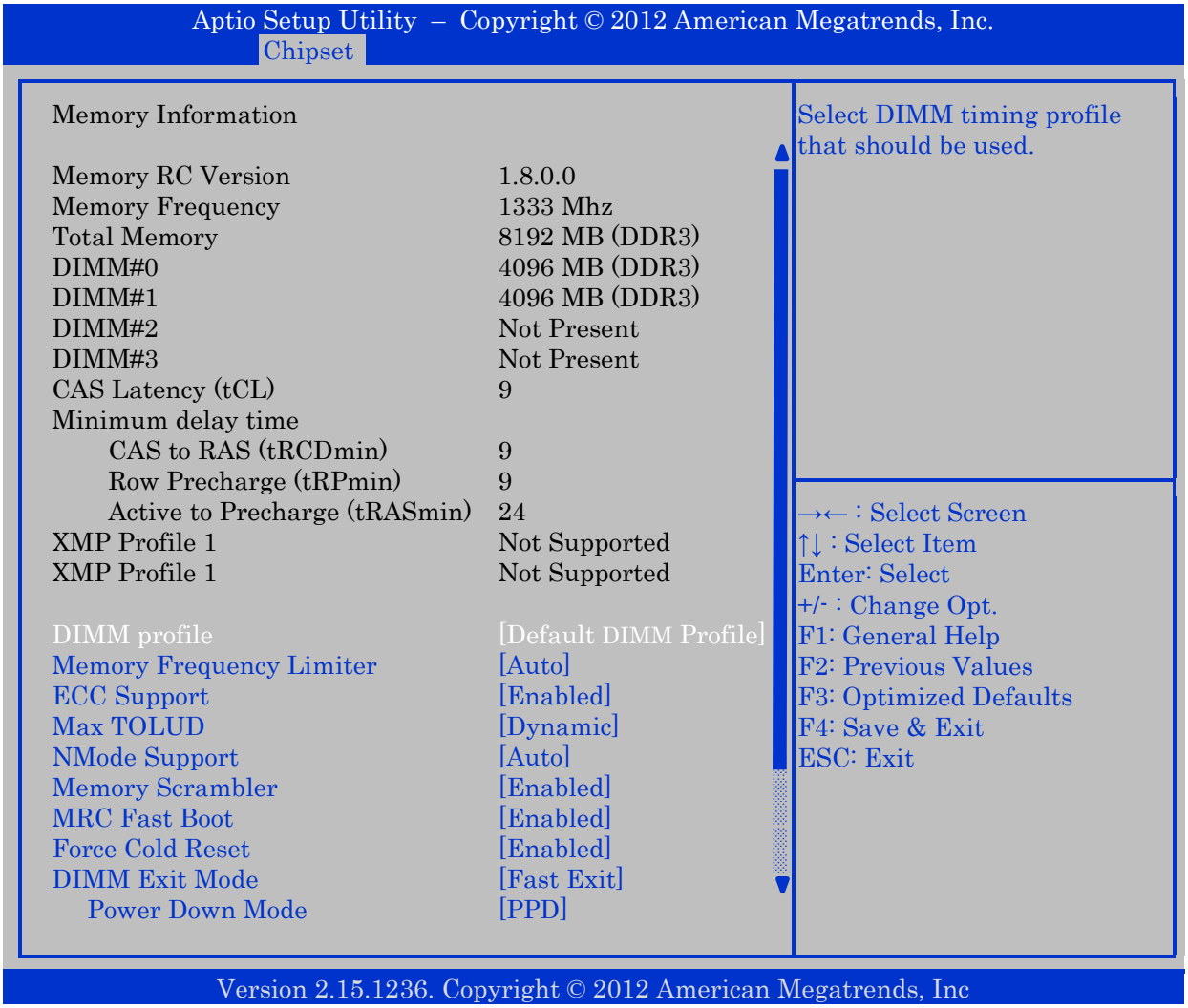

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Chipset
PEG Gen3 Endpoint Hint Value each Lane
Lane 0 2
Lane 1 2
Lane 2 2
Lane 3 2
Lane 4 2
Lane 5 2
Lane 6 2
Lane 7 2
Lane 8 2
Lane 9 2
Lane 10 2
Lane 11 2
Lane 12 2
Lane 13 2
Lane 14 2
Lane 15 2
Value for Lane 0.
→← : Select Screen
↑↓ : Select Item
Enter: Select
+/- : Change Opt.
F1: General Help
F2: Previous Values
F3: Optimized Defaults
F4: Save & Exit
ESC: Exit
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Function	Selection	Description
PCIe Gen3 RxCTLEp Setting (Note1)	0-11, **12**, 13-15	The range of the setting is (0-15). This setting has to be specified based on platform design and following the guideline.

Note 1: Only present if Ivy Bridge CPU is used.

Memory Configuration

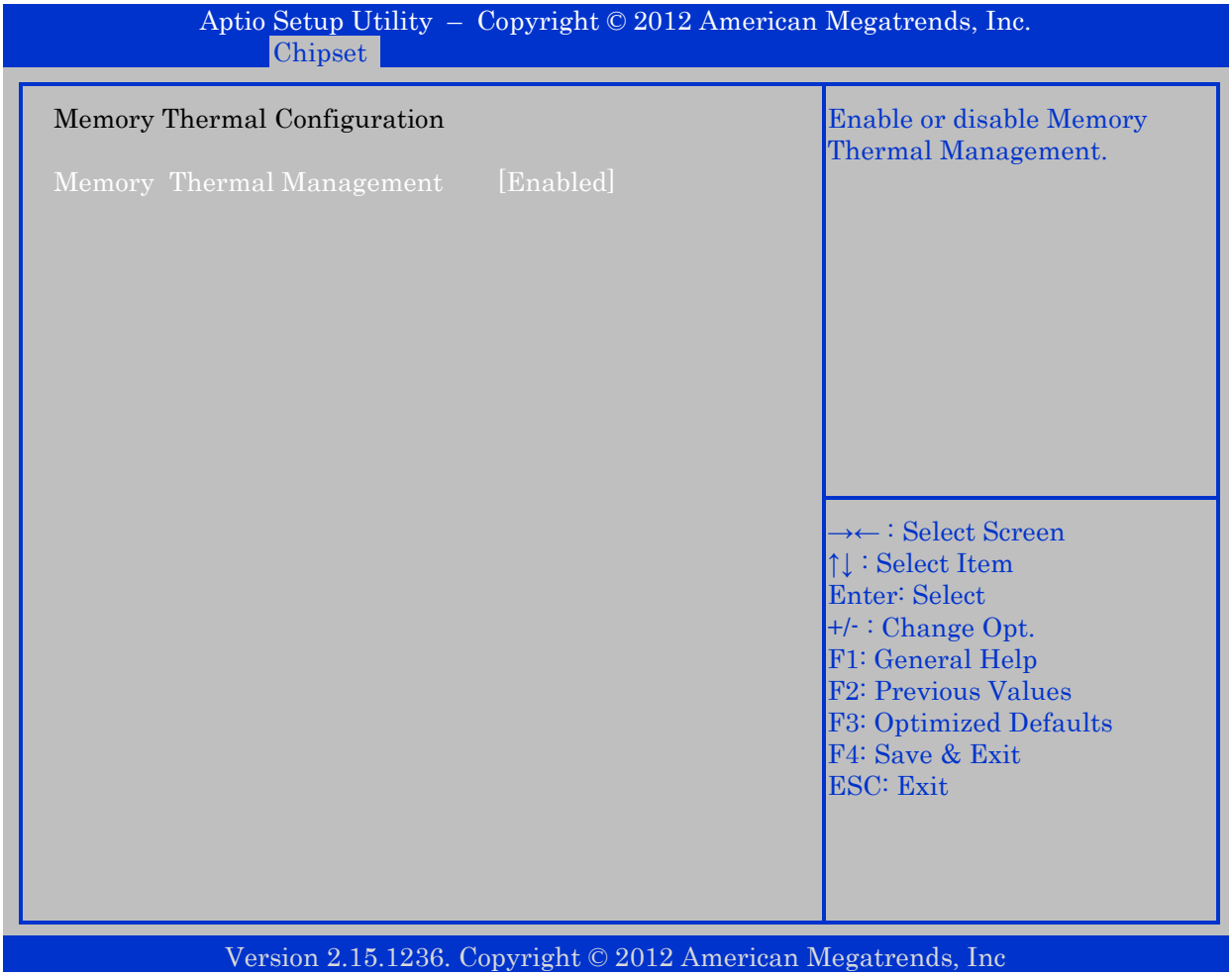


Function	Selection	Description
DIMM profile	**Default DIMM profile** Custom Profile XMP Profile 1 XMP Profile 2	Select DIMM timing profile that should be used.
Memory Frequency Limiter	**Auto** 1067 1333 1600 1867 2133 2400 2667	Maximum Memory Frequency Selections in Mhz.
ECC Support	Disabled **Enabled**	Enable or disable DDR Ecc Support.

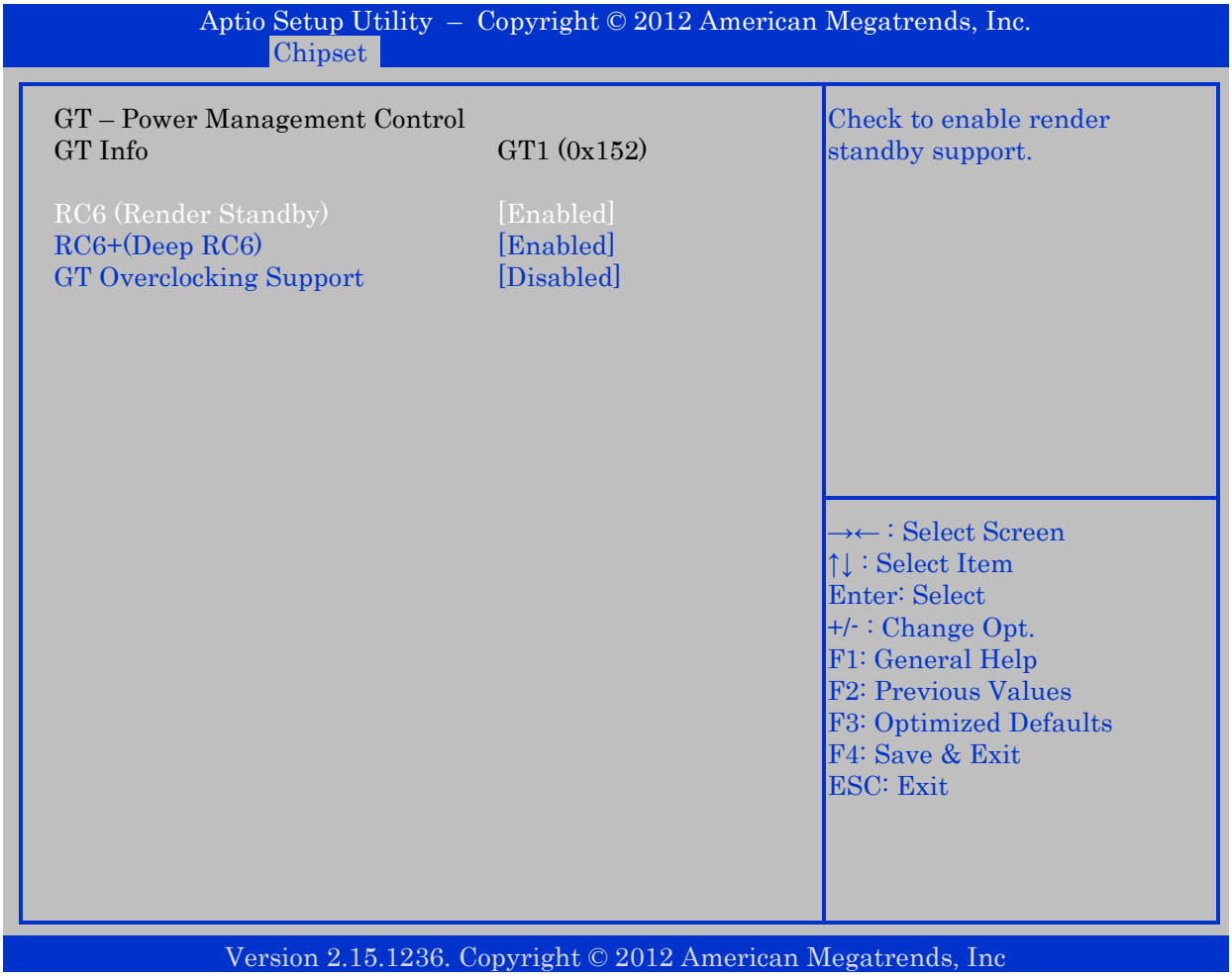
Table continued:

Function	Selection	Description
Max TOLUD	**Dynamic** 1 GB 1.25 GB 1.5 GB 1.75 GB 2 GB 1. GB 2.5 GB 2.75 GB 3 GB 3.25 GB	Maximum Value of TOLUD. Dynamic assignment would adjust TOLUD automatically based on largest MMIO length of installed graphic controller.
NMode Support	**Auto** 1N Mode 2N Mode	Nmode Support Option
Memory Scrambler	**Enabled** Disabled	Enable or disable memory scrambler.
MRC Fast Boot	**Enabled** Disabled	Enable or disable MRC Fast Boot
Force Cold Reset	**Enabled** Disabled	Force cold reset or choose MRC cold reset mode, when cold boot is required during MRC execution. Note: If ME 5.0MB is present, Force cold reset is required!
DIMM Exit Mode	Auto Slow Exit **Fast Exit**	DIMM Exit Mode control.
Power Down Mode	No Power Down APD **PPD** APD-PPD	Power Down Mode control.
Scrambler Seed Generation Off	Enabled **Disabled**	Control Memory Scrambler Seed Generation. Enable – do not generate scrambler seed. Disable – Generate scrambler seed always.
Memory Remap	**Enabled** Disabled	Enable or disable Memory Remap above 4G.
Memory Alias Check	Enabled **Disabled**	Enable or disable Memory Alias Check.
Channel A DIMM Control	**Enable Both DIMMS** Disable DIMM0 Disable DIMM1 Disable Both DIMMS	Enable or disable dims on channel A.
Channel B DIMM Control	**Enable Both DIMMS** Disable DIMM0 Disable DIMM1 Disable Both DIMMS	Enable or disable dims on channel B.

Memory Thermal Configuration

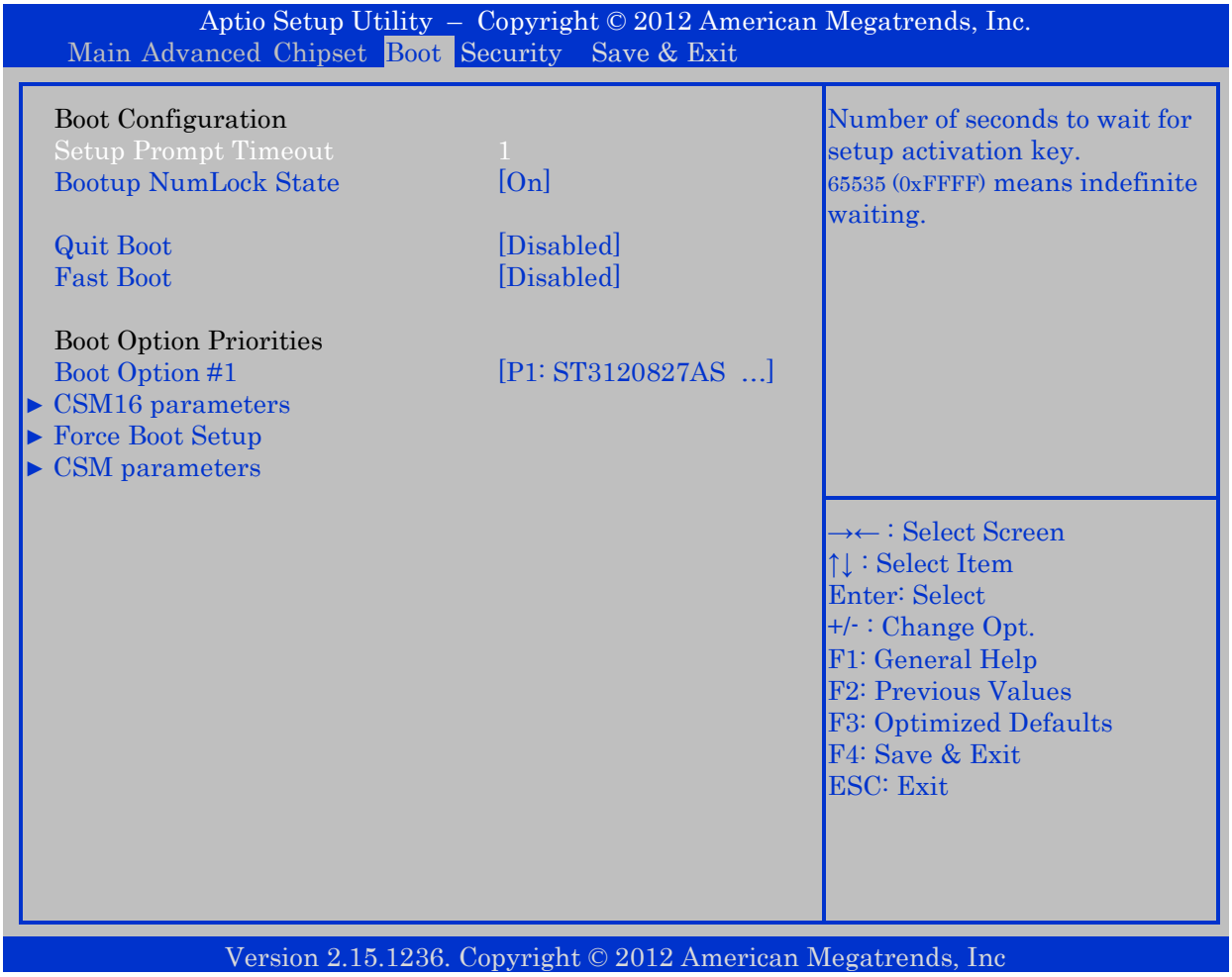


GT – Power Management Control



Function	Selection	Description
RC6 (Render Standby)	**Enabled** Disabled	Check to enable render standby support.
RC6+(Deep RC6)	**Enabled** Disabled	Check to enable Deep RC6 (RC6+) support.
GT Overclocking Support	Enabled **Disabled**	Enable or disable GT Overclocking Support.

11.4 Boot

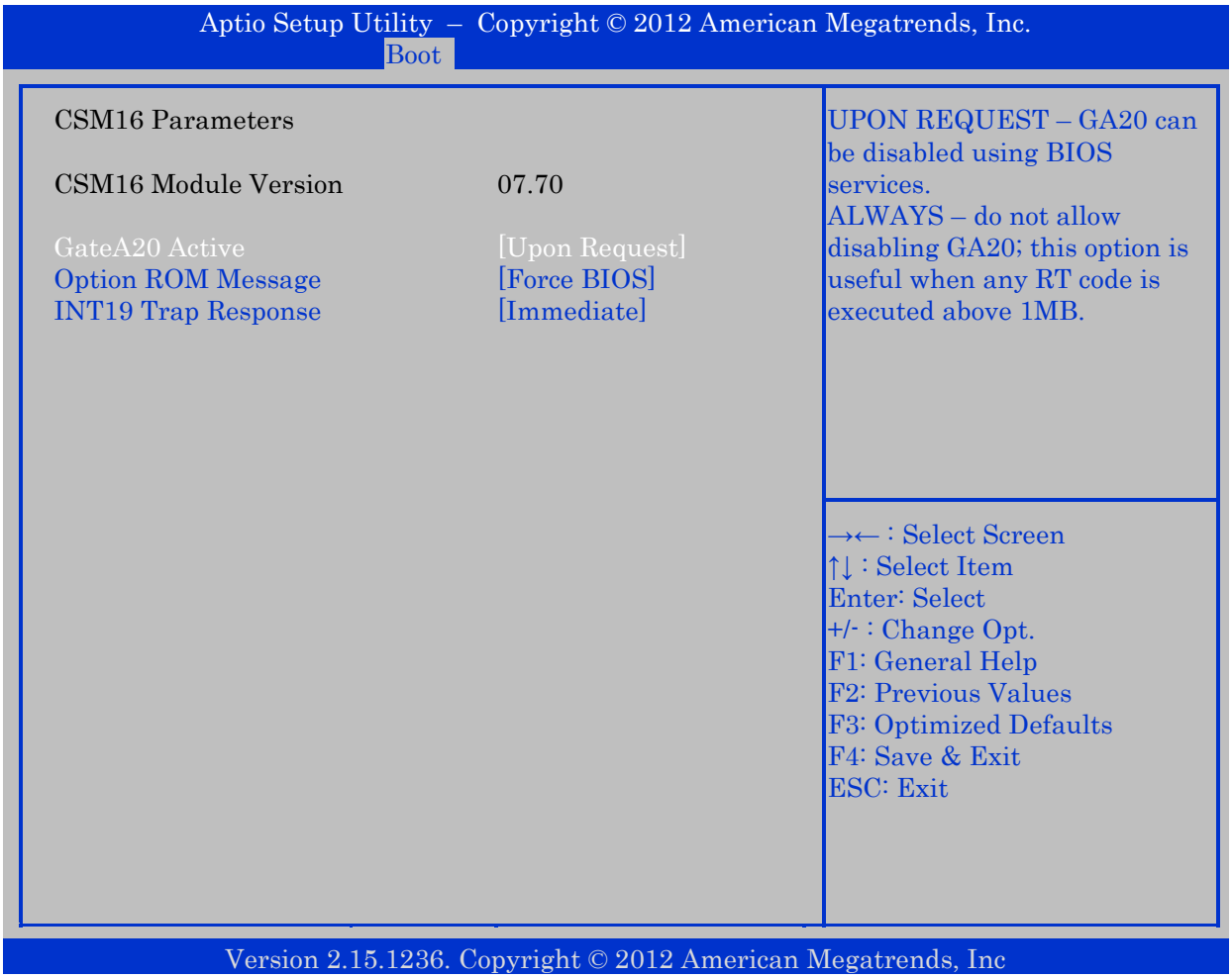


Note: When pressing <F7> while booting it is possible manually to select boot device.

Function	Selection	Description
Setup Prompt Timeout	**1**, 2 - 65535 (Note)	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	**On** Off	Select the Keyboard Numlock state.
Quit Boot	**Disabled** Enabled	Enables or disables Quiet Boot option.
Fast Boot	**Disabled** 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.
GateA20 Active	**Upon Request** Always	Upon Request: GA20 can be disabled using BIOS services. Always: do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
Option ROM Message	**Force BIOS** Keep Current	Set display mode for Option ROM.
INT19 Trap Response	**Immediate** Postponed	BIOS reaction on INT19 trapping by Option ROM. Immediate: execute the trap right away. Postponed: execute the trap during legacy boot.
Boot Option #1	(list of bootable devices)	Sets the system boot order.

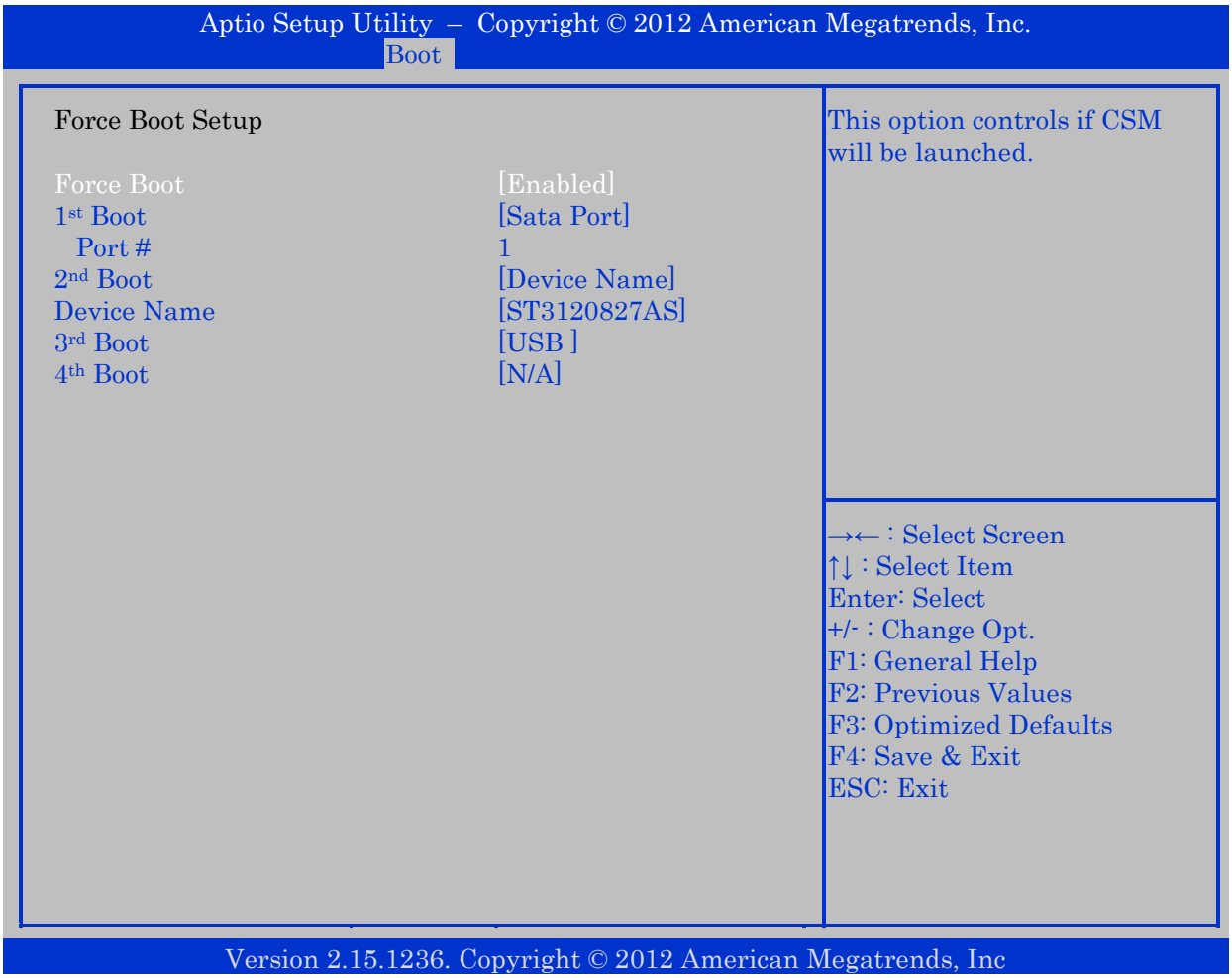
Note: To enter number use digit keys and/or +/- keys.

11.4.1 CSM16 parameters



Function	Selection	Description
GateA20 Active	Upon Request **Always**	Upon Request: GA20 can be disabled using BIOS services. Always: do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.
Option ROM Message	**Force BIOS** Keep Current	Set display mode for Option ROM.
INT19 Trap Response	**Immediate** Postponed	BIOS reaction on INT19 trapping by Option ROM: Immediate: execute the trap right away. Postponed: execute the trap during legacy boot.

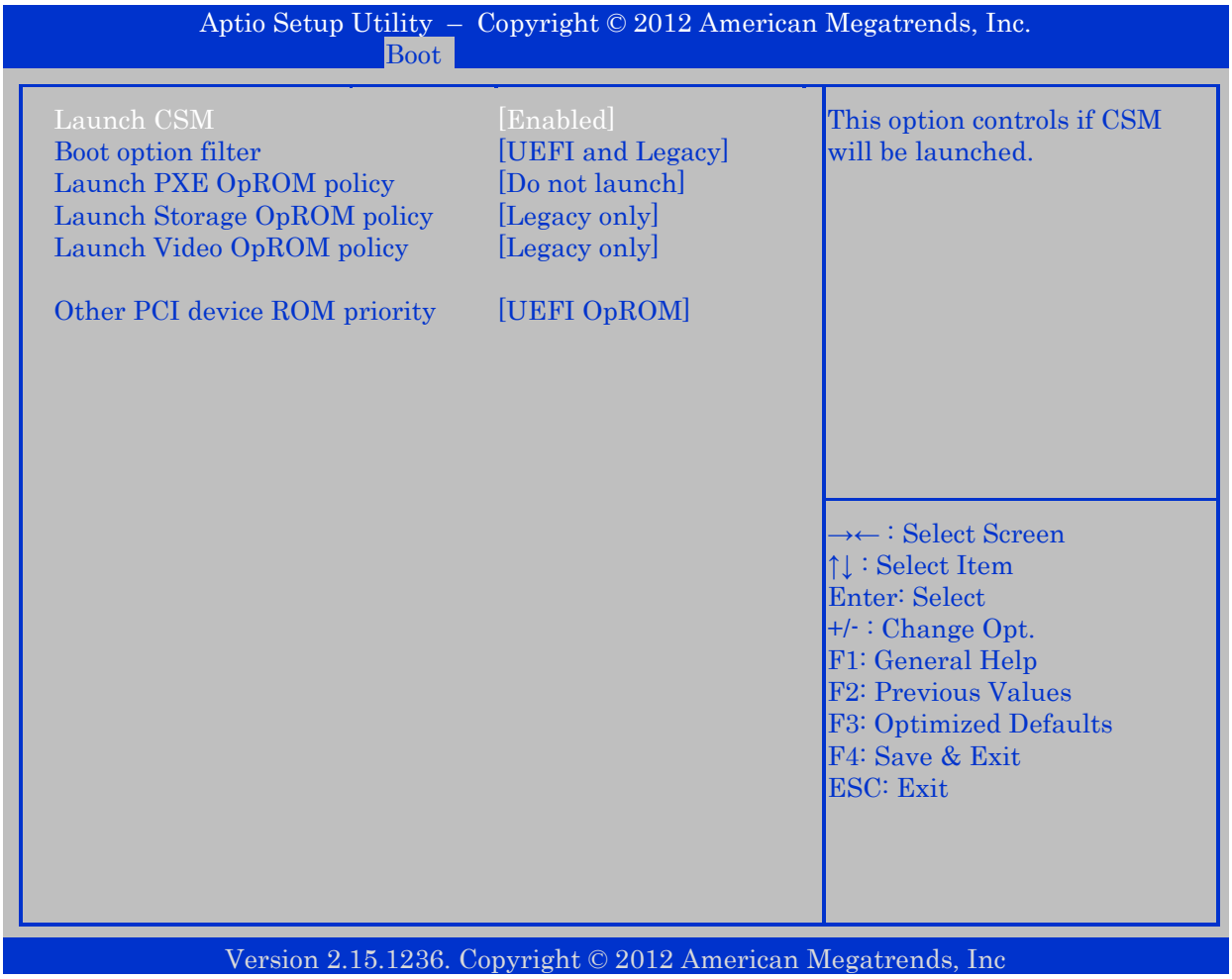
11.4.2 Force Boot Setup



Function	Selection	Description
Force Boot	**Disabled** Enabled	
1st Boot (2nd Boot) (3rd Boot) (4th Boot) Note1	**N/A** USB SATA SATA Port Device Name	
Port # Note2	0 - 5 Note4	
Device Name Note3	None ST3120827AS *N/A * *N/A * *N/A *	

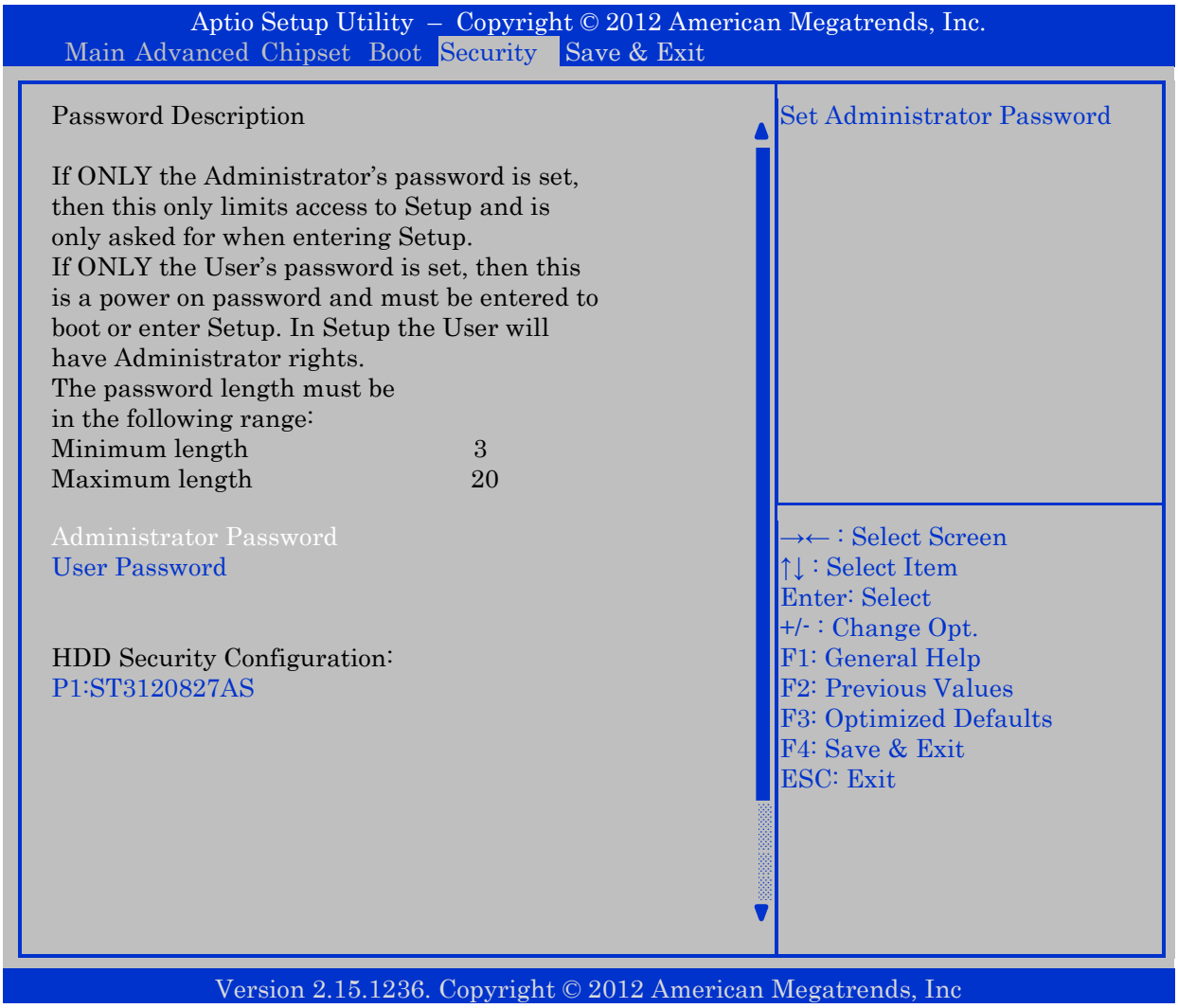
Note 1: 1st Boot, 2nd Boot, 3rd Boot and 4th Boot have the same set of selections.
Note 2: Only shown if SATA Port is selected.
Note 3: Only shown if Device Name is selected.
Note 4: By +/- key select requested port number. Make sure only valid number (0 – 5) is selected.

11.4.3 CSM parameters



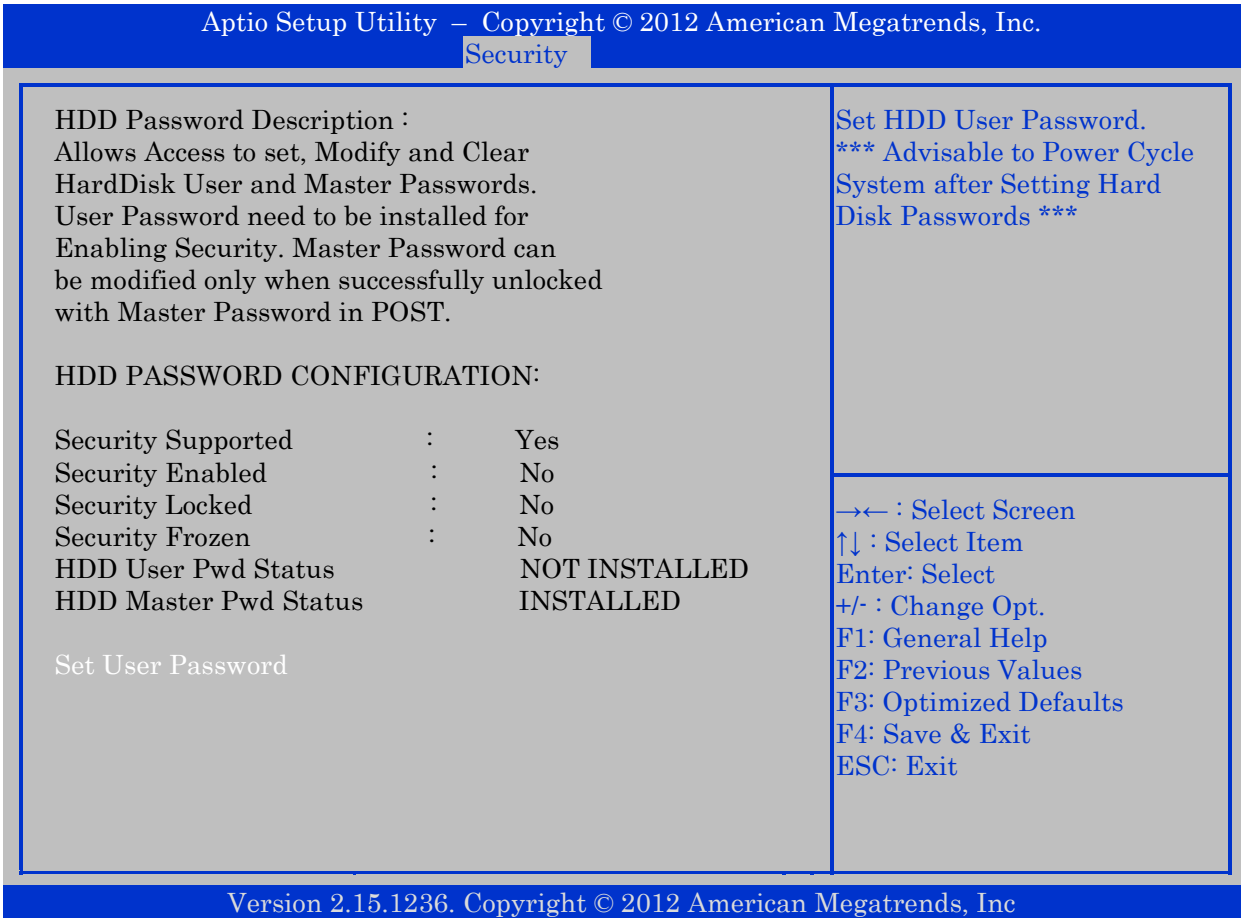
Function	Selection	Description
Launch CSM	**Enabled** Disabled	This option controls if CSM will be launched.
Boot option filter	**UEFI and Legacy** Legacy only UEFI only	This option controls what devices system can boot to.
Launch PXE OpROM policy	**Do not launch** UEFI only Legacy only	Controls the execution of UEFI and Legacy PXE OpROM.
Launch Storage OpROM policy	Do not launch UEFI only **Legacy only**	Controls the execution of UEFI and Legacy Storage OpROM.
Launch Video OpROM policy	Do not launch UEFI only **Legacy only**	Controls the execution of UEFI and Legacy Video OpROM.
Other PCI device ROM priority	**UEFI OpROM** Legacy OpROM	For PCI devices other than Network, Mass storage or Video defines which OpROM to launch.

11.5 Security



Function	Selection	Description
Administrator Password	(See Password description above)	Set Administrator Password
User Password	(See Password description above)	Set User Password

11.5.1 HDD Security Configuration

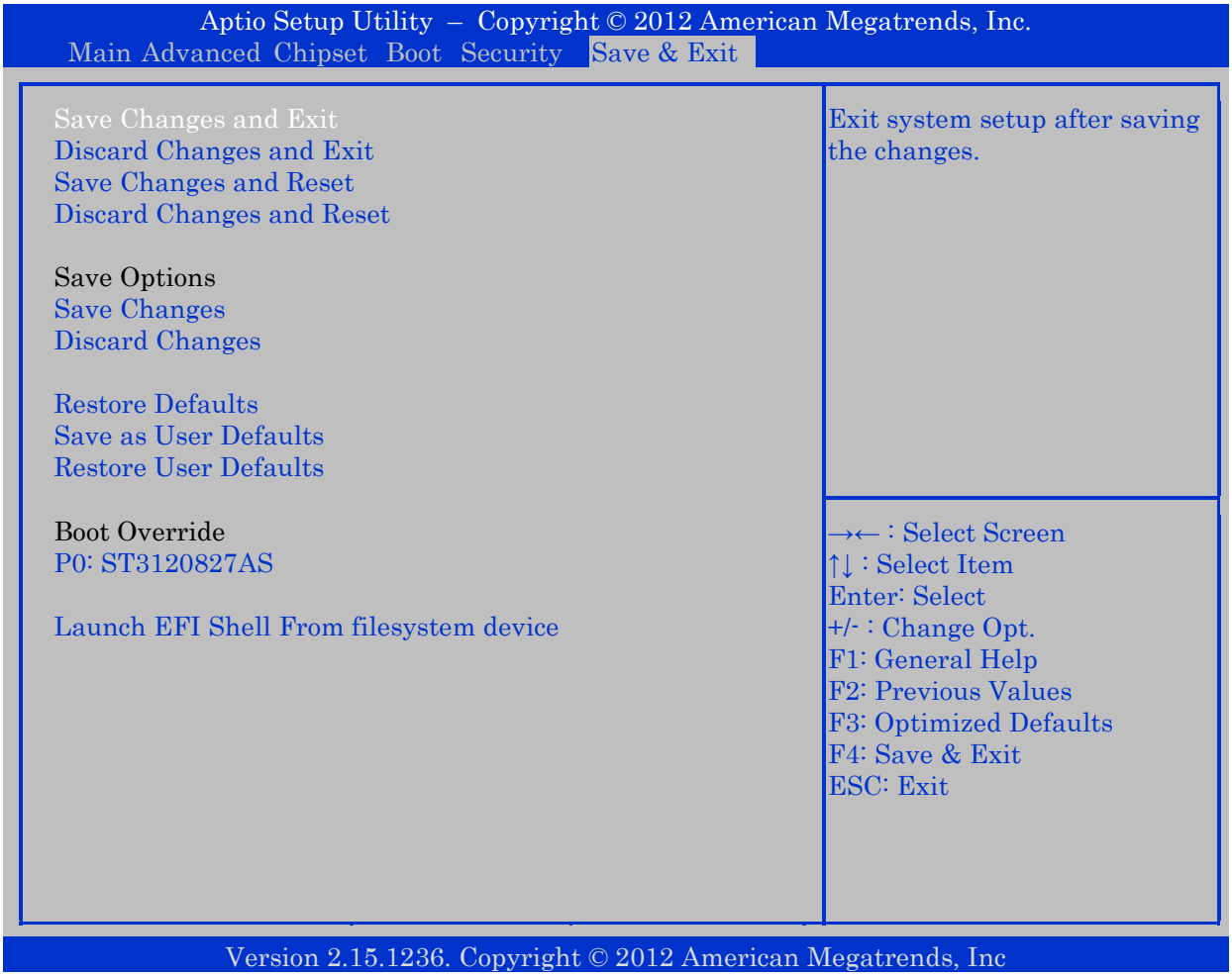


Only visible if entering a device listed below HDD Security Configuration.

Function	Selection	Description
Set User Password	**Create New Password**	Set HDD User Password. *** Advisable to Power Cycle System after Setting Hard Disk Passwords ***

11.6 Save & Exit

This Menu is special; having no “selections” for each function, or in other words, the function is the same as the selection.



Function	Description
Save Changes and Exit	Exit system setup after saving the changes.
Discard Changes and Exit	Exit system setup without saving any changes.
Save Changes and Reset	Reset the system after saving the changes.
Discard Changes and Reset	Reset the system without saving any changes.
Save Changes	Save Changes done so far to any of the setup options.
Discard Changes	Discard Changes done so far to any of the setup options.
Restore Defaults	Restore/Load Default values for all the setup options.
Save as User Defaults	Save the Changes done so far as User Defaults.
Restore User Defaults	Restore the User Defaults to all the setup options.
(possible list of boot devices)	Selection table of bootable devices. When selected system will boot on selected device. (See note below)
Launch EFI Shell From filesystem device	Attempts to Launch EFI Shell application (Shellx64.efi) from one of the available filesystem devices.

Note: When pressing <F7> while booting it is possible manually to select boot device.

12 AMI BIOS Beep Codes

It is normal for Kontron AMI UEFI BIOS to generate some beeps after POST has passed successfully:
The first beep indicates that POST has successfully passed.
Then a number of beeps indicate the number of attached USB devices.
And finally a special long beep indicates that AMI boot is completed.
Note: The long beep starting as a normal beep but is changing to higher frequency.

If POST has found a problem, then the normal behaviour (described above) is changed:

Boot Block Beep Codes:

Number of Beeps	Description
1	Insert diskette in floppy drive A:
2	'AMIBOOT.ROM' file not found in root directory of diskette in A:
3	Base Memory error
4	Flash Programming successful
5	Floppy read error
6	Keyboard controller BAT command failed
7	No Flash EPROM detected
8	Floppy controller failure
9	Boot Block BIOS checksum error
10	Flash Erase error
11	Flash Program error
12	'AMIBOOT.ROM' file size error
13	BIOS ROM image mismatch (file layout does not match image present in flash device)

POST BIOS Beep Codes:

Number of Beeps	Description
1	Memory refresh timer error.
2	Parity error in base memory (first 64KB block)
3	Base memory read/write test error
4	Motherboard timer not operational
5	Processor error
6	8042 Gate A20 test error (cannot switch to protected mode)
7	General exception error (processor exception interrupt error)
8	Display memory error (system video adapter)
9	AMIBIOS ROM checksum error
10	CMOS shutdown register read/write error
11	Cache memory test failed

Troubleshooting POST BIOS Beep Codes:

Number of Beeps	Troubleshooting Action
1, 2 or 3	Reset the memory, or replace with known good modules.
4-7, 9-11	Fatal error indicating a serious problem with the system. Consult your system manufacturer. Before declaring the motherboard beyond "all hope", eliminate the possibility of interference due to a malfunctioning add-in card. Remove all expansion cards, except the video adapter. • If beep codes are generated when all other expansion cards are absent, consult your system manufacturer's technical support. • If beep codes are not generated when all other expansion cards are absent, one of the add-in cards is causing the malfunction. Insert the cards back into the system one at a time until the problem happens again. This will reveal the malfunctioning card.
8	If the system video adapter is an add-in card, replace or reset the video adapter. If the video adapter is an integrated part of the system board, the board may be faulty.

13 OS Setup

Use the Setup.exe files for all relevant drivers. The drivers can be found on KTQ77 Driver CD or they can be downloaded from the homepage http://www.kontron.com/

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