Pro WS X299
SAGE II
Copyright © 2020 ASUSTeK COMPUTER INC. All Rights Reserved.

No part of this manual, including the products and software described in it, may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form or by any means, except documentation kept by the purchaser for backup purposes, without the express written permission of ASUSTeK COMPUTER INC. ("ASUS").

Product warranty or service will not be extended if: (1) the product is repaired, modified or altered, unless such repair, modification of alteration is authorized in writing by ASUS; or (2) the serial number of the product is defaced or missing.

ASUS PROVIDES THIS MANUAL “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL ASUS, ITS DIRECTORS, OFFICERS, EMPLOYEES OR AGENTS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING DAMAGES FOR LOSS OF PROFITS, LOSS OF BUSINESS, LOSS OF USE OR DATA, INTERRUPTION OF BUSINESS AND THE LIKE), EVEN IF ASUS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES ARISING FROM ANY DEFECT OR ERROR IN THIS MANUAL OR PRODUCT.

SPECIFICATIONS AND INFORMATION CONTAINED IN THIS MANUAL ARE FURNISHED FOR INFORMATIONAL USE ONLY, AND ARE SUBJECT TO CHANGE AT ANY TIME WITHOUT NOTICE, AND SHOULD NOT BE CONSTRUED AS A COMMITMENT BY ASUS. ASUS ASSUMES NO RESPONSIBILITY OR LIABILITY FOR ANY ERRORS OR INACCURACIES THAT MAY APPEAR IN THIS MANUAL, INCLUDING THE PRODUCTS AND SOFTWARE DESCRIBED IN IT.

Products and corporate names appearing in this manual may or may not be registered trademarks or copyrights of their respective companies, and are used only for identification or explanation and to the owners’ benefit, without intent to infringe.

Offer to Provide Source Code of Certain Software

This product contains copyrighted software that is licensed under the General Public License ("GPL"), under the Lesser General Public License Version ("LGPL") and/or other Free Open Source Software Licenses. Such software in this product is distributed without any warranty to the extent permitted by the applicable law. Copies of these licenses are included in this product.

Where the applicable license entitles you to the source code of such software and/or other additional data, you may obtain it for a period of three years after our last shipment of the product, either

(1) for free by downloading it from https://www.asus.com/support/

or

(2) for the cost of reproduction and shipment, which is dependent on the preferred carrier and the location where you want to have it shipped to, by sending a request to:

ASUSTeK Computer Inc.
Legal Compliance Dept.
15 Li Te Rd.,
Beitou, Taipei 112
Taiwan

In your request please provide the name, model number and version, as stated in the About Box of the product for which you wish to obtain the corresponding source code and your contact details so that we can coordinate the terms and cost of shipment with you.

The source code will be distributed WITHOUT ANY WARRANTY and licensed under the same license as the corresponding binary/object code.

This offer is valid to anyone in receipt of this information.

ASUSTeK is eager to duly provide complete source code as required under various Free Open Source Software licenses. If however you encounter any problems in obtaining the full corresponding source code we would be much obliged if you give us a notification to the email address gpl@asus.com, stating the product and describing the problem (please DO NOT send large attachments such as source code archives, etc. to this email address).
 Contents

Safety information ................................................................. vi
About this guide ........................................................................................................ vii
Pro WS X299 SAGE II specifications summary ............................................................ ix
Package contents ........................................................................................................ xiii
Installation tools and components ............................................................................ xiv

Chapter 1: Product Introduction
1.1 Motherboard overview ......................................................................................... 1-1
   1.1.1 Before you proceed ...................................................................................... 1-1
   1.1.2 Motherboard layout .................................................................................... 1-2
   1.1.3 Central Processing Unit (CPU) ..................................................................... 1-4
   1.1.4 System memory ............................................................................................ 1-5
   1.1.5 Expansion slots ........................................................................................... 1-7
   1.1.6 Onboard buttons .......................................................................................... 1-9
   1.1.7 Onboard jumpers ......................................................................................... 1-11
   1.1.8 Onboard LEDs ............................................................................................ 1-12
   1.1.9 Internal connectors ...................................................................................... 1-14

Chapter 2: Basic Installation
2.1 Building your PC system ....................................................................................... 2-1
   2.1.1 Motherboard installation ............................................................................. 2-1
   2.1.2 CPU installation ......................................................................................... 2-3
   2.1.3 CPU heatsink and fan assembly installation ................................................ 2-5
   2.1.4 DIMM installation ....................................................................................... 2-6
   2.1.5 ATX power connection ............................................................................... 2-7
   2.1.6 SATA device connection ............................................................................. 2-8
   2.1.7 Front I/O connector .................................................................................... 2-9
   2.1.8 Expansion card installation ......................................................................... 2-10
   2.1.9 M.2 installation ........................................................................................... 2-11
   2.1.10 ASUS fan holder installation .................................................................... 2-12

2.2 BIOS update utility .............................................................................................. 2-13

2.3 Motherboard rear and audio connections ............................................................ 2-15
   2.3.1 Rear I/O connection ................................................................................... 2-15
   2.3.2 Audio I/O connections ............................................................................... 2-17

2.4 Starting up for the first time ................................................................................. 2-19

2.5 Turning off the computer ..................................................................................... 2-19
Chapter 3: BIOS Setup

3.1 Knowing BIOS ........................................................................................................ 3-1

3.2 BIOS setup program ............................................................................................. 3-2

3.2.1 EZ Mode........................................................................................................... 3-3
3.2.2 Advanced Mode ............................................................................................... 3-4
3.2.3 Q-Fan Control ................................................................................................. 3-7
3.2.4 AI OC Guide .................................................................................................... 3-9
3.2.5 EZ Tuning Wizard ........................................................................................... 3-10

3.3 My Favorites ......................................................................................................... 3-12

3.4 Main menu ........................................................................................................... 3-14

3.5 Ai Tweaker menu ................................................................................................. 3-14

3.6 Advanced menu .................................................................................................. 3-16

3.6.1 CPU Configuration ........................................................................................ 3-16
3.6.2 Platform Misc Configuration ........................................................................ 3-16
3.6.3 System Agent (SA) Configuration .............................................................. 3-16
3.6.4 PCH Configuration ........................................................................................ 3-17
3.6.5 PCH Storage Configuration ........................................................................... 3-17
3.6.6 CPU Storage Configuration .......................................................................... 3-18
3.6.7 Onboard Devices Configuration ................................................................... 3-18
3.6.8 APM Configuration ......................................................................................... 3-18
3.6.9 USB Configuration ......................................................................................... 3-19
3.6.10 HDD/SSD SMART Information .................................................................. 3-19
3.6.11 NVMe Configuration .................................................................................... 3-19
3.6.12 Thunderbolt(TM) Configuration ............................................................... 3-19
3.6.13 PCH-FW Configuration ............................................................................. 3-19
3.6.14 Network Stack Configuration .................................................................... 3-19

3.7 Monitor menu ....................................................................................................... 3-20

3.8 Boot menu ........................................................................................................... 3-20

3.9 Tool menu ............................................................................................................ 3-22

3.9.1 ASUS EZ Flash 3 Utility ................................................................................ 3-22
3.9.2 Secure Erase .................................................................................................. 3-23
3.9.3 ASUS User Profile ......................................................................................... 3-24
3.9.4 ASUS SPD Information ................................................................................. 3-24
3.9.5 Graphics Card Information .......................................................................... 3-24

3.10 Exit menu ............................................................................................................. 3-25

3.11 Updating BIOS ...................................................................................................... 3-26

3.11.1 EZ Update ..................................................................................................... 3-26
3.11.2 ASUS EZ Flash 3 .......................................................................................... 3-27
3.11.3 ASUS CrashFree BIOS 3 ............................................................................. 3-29
Chapter 4: RAID Support

4.1 RAID configurations ................................................................. 4-1
  4.1.1 RAID definitions ................................................................ 4-1
  4.1.2 Installing storage devices ....................................................... 4-2
  4.1.3 Intel® Rapid Storage Technology in UEFI BIOS ............... 4-2
  4.1.4 Intel® Virtual Raid on CPU in UEFI BIOS ....................... 4-6
  4.1.5 Intel® Rapid Storage Technology Option ROM utility ...... 4-13

4.2 Creating a RAID driver disk ...................................................... 4-17
  4.2.1 Creating a RAID driver disk in Windows® ....................... 4-17

Chapter 5: Multi GPU Support

5.1 AMD CrossFire™ technology ...................................................... 5-1
  5.1.1 Requirements ..................................................................... 5-1
  5.1.2 Before you begin ............................................................... 5-1
  5.1.3 Installing two CrossFire™ graphics cards ....................... 5-2
  5.1.4 Installing three CrossFire™ graphics cards ................. 5-3
  5.1.5 Installing four CrossFire™ graphics cards ................... 5-4
  5.1.6 Installing the device drivers ............................................... 5-5
  5.1.7 Enabling the AMD CrossFire™ technology ................... 5-5

5.2 NVIDIA® SLI® technology ............................................................ 5-7
  5.2.1 Requirements ..................................................................... 5-7
  5.2.2 Installing two SLI-ready graphics cards ....................... 5-7
  5.2.3 Installing three SLI-ready graphics cards ............... 5-8
  5.2.4 Installing four SLI-ready graphics cards ............. 5-9
  5.2.5 Installing the device drivers ............................................ 5-10
  5.2.6 Enabling the NVIDIA® SLI® technology .................. 5-10

Appendix

Pro WS X299 SAGE II block diagram (48-Lane) ............................... A-1
Pro WS X299 SAGE II block diagram (44-Lane) ............................... A-2
Pro WS X299 SAGE II block diagram (28-Lane) ............................... A-2
Q-Code table ................................................................................. A-3
Notices ......................................................................................... A-7
ASUS contact information ................................................................. A-12
Safety information

Electrical safety

• To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
• When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
• Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
• Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
• Ensure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
• If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

Operation safety

• Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
• Before using the product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
• To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
• Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
• Place the product on a stable surface.
• If you encounter technical problems with the product, contact a qualified service technician or your retailer.
About this guide

This user guide contains the information you need when installing and configuring the motherboard.

How this guide is organized

This guide contains the following parts:

1. Chapter 1: Product Introduction
   This chapter describes the features of the motherboard and the new technology it supports. It includes description of the switches, jumpers, and connectors on the motherboard.

2. Chapter 2: Basic Installation
   This chapter lists the hardware setup procedures that you have to perform when installing system components.

3. Chapter 3: BIOS Setup
   This chapter tells how to change system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

4. Chapter 4: RAID Support
   This chapter describes the RAID configurations.

5. Chapter 5: Multi GPU support
   This chapter describes how to install and configure multiple AMD CrossFire™ and NVIDIA® SLI® graphics cards.

Where to find more information

Refer to the following sources for additional information and for product and software updates.

1. ASUS website
   The ASUS website (www.asus.com) provides updated information on ASUS hardware and software products.

2. Optional documentation
   Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.
Conventions used in this guide

To ensure that you perform certain tasks properly, take note of the following symbols used throughout this manual.

**DANGER/WARNING:** Information to prevent injury to yourself when trying to complete a task.

**CAUTION:** Information to prevent damage to the components when trying to complete a task.

**IMPORTANT:** Instructions that you MUST follow to complete a task.

**NOTE:** Tips and additional information to help you complete a task.

Typography

**Bold text**
Indicates a menu or an item to select.

**Italics**
Used to emphasize a word or a phrase.

**<Key>**
Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key.

Example: `<Enter>` means that you must press the Enter or Return key.

**<Key1> + <Key2> + <Key3>**
If you must press two or more keys simultaneously, the key names are linked with a plus sign (+).
## Pro WS X299 SAGE II specifications summary

| **CPU** | LGA2066 Socket for Intel® Core™ X-Series Processors  
| Supports 14nm CPU  
| Supports Intel® Turbo Boost Max Technology 3.0**  
| * Refer to [www.asus.com](http://www.asus.com) for Intel® CPU support list.  
| ** Support of these features depends on the CPU types. |
| **Chipset** | Intel® X299 Chipset |
| **Memory** | Intel® Socket 2066 Core™ X-series Processors (6-core or above)  
| 8 x DIMM, Max. 256GB, DDR4 4266(O.C.) / 4200(O.C.) / 4133(O.C.) / 4000(O.C.) / 3600(O.C.) / 2933 / 2666 / 2400 / 2133* MHz, non-ECC, unbuffered memory  
| Supports Intel® Extreme Memory Profile (XMP)  
| * Hyper DIMM support is subject to the physical characteristics of individual CPUs. Please refer to Memory QVL (Qualified Vendors List) for details.  
| ** Supported memory capacity depends on both CPU installed and memory installed. |
| **Expansion slots** | 7 x PCIe 3.0/2.0 x16 Slots (Single at x16, Dual at x16/x16, Quad at x16/x16/ x16/x16, Seven at x16/x8/x8/x8/x8/x8/x8)*  
| * Please refer to the block diagrams in the Appendix for more details. |
| **Multi-GPU support** | Supports AMD 4-Way CrossFireX™ Technology  
| Supports NVIDIA® 4-Way SLI® Technology*  
| * Actual number of multi-graphic support differs per vendors’ graphic cards. Please check with vendor beforehand. |
| **Storage** | Intel® X299 Chipset with RAID 0, 1, 5, 10 and Intel Rapid Storage Technology 15 support  
| - 1 x M.2_1 (Gen 3 x4) socket3, type 2242/2260/2280/22110 storage devices support (PCle mode & SATA mode)  
| - 1 x M.2_2 (Gen 3 x4) socket3, type 2242/2260/2280 storage devices support (PCle mode)*  
| - 8 x SATA 6.0 Gb/s ports  
| - 3 x U.2 connector (supports U.2 NVMe device)**  
| - Intel® Optane™ Memory Ready  
| - Intel® Virtual RAID (VROC) support for CPU RAID***  
| * M.2 PCle RAID support.  
| ** The U.2 connectors are only supported on 48/44-Lane CPUs. U.2_3 is only supported on 48-Lane CPUs.  
| *** Intel® VROC is supported via RSTe and Intel® VROC_HW_KEY. VROC_HW_KEY is purchased separately. NVMe RAID type and function will depend on the Intel® VROC_HW_KEY installed. |
| **LAN** | 2 x Intel® I225-LM Gigabit LAN controller |

(continued on the next page)
# Pro WS X299 SAGE II specifications summary

<table>
<thead>
<tr>
<th>Audio</th>
<th>Realtek ALC S1220A 8-Channel High Definition Audio CODEC featuring Crystal sound 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Power pre-regulator reduces power input noise to ensure consistent performance.</td>
</tr>
<tr>
<td></td>
<td>- Separate layer for left and right track, ensuring both sound deliver equal quality</td>
</tr>
<tr>
<td></td>
<td>- Impedance sense for front and rear headphone outputs</td>
</tr>
<tr>
<td></td>
<td>- Audio Shielding: Ensures precision analog/digital separation and greatly reduced multi-lateral interference</td>
</tr>
<tr>
<td></td>
<td>- Internal audio Amplifier to enhance the highest quality sound for headphone and speakers</td>
</tr>
<tr>
<td></td>
<td>- Unique de-pop circuit: Reduces start-up popping noise to audio outputs</td>
</tr>
<tr>
<td></td>
<td>- Premium Japanese-made audio capacitors provides warm, natural and immersive sound with exceptional clarity and fidelity</td>
</tr>
<tr>
<td></td>
<td>- High quality 120dB SNR stereo playback output (Line-out@back) &amp; 113dB SNR input (Line-in) support</td>
</tr>
<tr>
<td></td>
<td>- Supports up to 32-Bit/192kHz playback*</td>
</tr>
<tr>
<td></td>
<td>- DTS Connect</td>
</tr>
<tr>
<td></td>
<td>- DTS:X® Ultra</td>
</tr>
<tr>
<td></td>
<td>- DTS Headphone:X</td>
</tr>
<tr>
<td></td>
<td>- Supports: Jack-detection, Multi-streaming, Front Panel Jack-retasking(MIC)</td>
</tr>
<tr>
<td></td>
<td>- Optical S/PDIF out port(s) at back panel</td>
</tr>
<tr>
<td></td>
<td>* Due to limitations in HDA bandwidth, 32-Bit/192kHz is not supported for 8-channel audio. 32-Bit/192kHz is only available under Windows® 10.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Back Panel I/O Ports</th>
<th>1 x BIOS FlashBack™ Button</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 x USB 3.2 Gen 2 ports (USB Type-C® &amp; Type A)</td>
</tr>
<tr>
<td></td>
<td>6 x USB 3.2 Gen 1 ports (Blue)</td>
</tr>
<tr>
<td></td>
<td>4 x USB 2.0 ports (1 Supports BIOS FlashBack™)</td>
</tr>
<tr>
<td></td>
<td>1 x Optical S/PDIF Out port</td>
</tr>
<tr>
<td></td>
<td>2 x Intel® LAN (RJ45) ports</td>
</tr>
<tr>
<td></td>
<td>8-channel Audio I/O ports</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Features</th>
<th>Supporting ASUS Control Center (ACC) Management IT software</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC Design - ASUS PRO Clock Technology</td>
<td>Full BCLK range for extreme overclocking performance.</td>
</tr>
<tr>
<td>5-Way Optimization by Dual Intelligent Processors 5</td>
<td>Whole system optimization with a single click! Perfectly consolidates better CPU performance, power saving, digital power control, system cooling and app usages.</td>
</tr>
<tr>
<td>DIGI+ Power Control</td>
<td>- CPU Power: Digital 8-phase power design</td>
</tr>
<tr>
<td></td>
<td>- DRAM Power: Digital 2-phase power design</td>
</tr>
<tr>
<td>TPU</td>
<td>- Auto Tuning, TPU</td>
</tr>
<tr>
<td>EPU</td>
<td>Fan Xpert 4</td>
</tr>
<tr>
<td>Turbo Core App</td>
<td>(continued on the next page)</td>
</tr>
</tbody>
</table>
# Pro WS X299 SAGE II specifications summary

<table>
<thead>
<tr>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel Virtual RAID on CPU (VROC) ready</td>
</tr>
<tr>
<td>ASMedia USB 3.2 Gen 2 Controller supports Multiple-Ins function</td>
</tr>
<tr>
<td>Thunderbolt 3 support</td>
</tr>
<tr>
<td>Blistering-fast 40 Gb/s data transfers upgrades with ThunderboltEX 3 cards</td>
</tr>
<tr>
<td>M.2 and U.2 Onboard (The Latest Transfer Technology with up to 32Gb/s Data-transfer Speeds for M.2 and U.2)</td>
</tr>
<tr>
<td>Vertical M.2 design with bracket set, up to 22110</td>
</tr>
<tr>
<td>ASUS SafeSlot and SafeSlot Core: Fortified PCIe Slot preventing damages</td>
</tr>
<tr>
<td>ASUS Overvoltage Protection: World-class circuit-protecting power design</td>
</tr>
<tr>
<td>ASUS Enhanced DRAM Overcurrent Protection Short circuit damage prevention</td>
</tr>
<tr>
<td>ASUS Stainless-Steel Back I/O: 3X corrosion-resistance for greater durability!</td>
</tr>
<tr>
<td>ASUS ESD Guards - Enhanced ESD protection AURA Sync</td>
</tr>
<tr>
<td>- Aura RGB Strip Headers</td>
</tr>
<tr>
<td>- Aura Addressable Strip Header</td>
</tr>
<tr>
<td>Ai Charger +</td>
</tr>
<tr>
<td>ASUS Q-Design:</td>
</tr>
<tr>
<td>- ASUS Q-Shield</td>
</tr>
<tr>
<td>- ASUS Q-Code</td>
</tr>
<tr>
<td>- ASUS Q-LED (CPU, DRAM, VGA, Boot Device LED)</td>
</tr>
<tr>
<td>- ASUS Q-Slot</td>
</tr>
<tr>
<td>- ASUS Q-DIMM</td>
</tr>
<tr>
<td>- ASUS Q-Connector</td>
</tr>
<tr>
<td>ASUS BIOS FlashBack™ Onboard Button: Power/Reset</td>
</tr>
<tr>
<td>UEFI BIOS</td>
</tr>
<tr>
<td>- CrashFree BIOS 3</td>
</tr>
<tr>
<td>- EZ Flash3</td>
</tr>
<tr>
<td>- EZ Tuning Wizard</td>
</tr>
<tr>
<td>- ASUS UEFI BIOS EZ Mode</td>
</tr>
<tr>
<td>- Multi-language BIOS</td>
</tr>
<tr>
<td>AI overclocking</td>
</tr>
<tr>
<td>AI Suite 3</td>
</tr>
</tbody>
</table>

(continued on the next page)
## Pro WS X299 SAGE II specifications summary

<table>
<thead>
<tr>
<th>USB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intel® X299 Chipset</strong></td>
</tr>
<tr>
<td>- 8 x USB 3.2 Gen 1 ports (6 ports @ rear, 2 ports @ front)</td>
</tr>
<tr>
<td>- 4 x USB 2.0 ports (4 ports @ rear)</td>
</tr>
<tr>
<td><strong>ASMedia USB 3.1 Controller</strong></td>
</tr>
<tr>
<td>- 2 x USB 3.2 Gen 2 ports @ rear (1 x Type A; 1 x USB Type-C®)</td>
</tr>
<tr>
<td>- 1 x USB 3.2 Gen 2 @ front (optional Type A or USB Type-C®)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal I/O connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x Aura Addressable Strip Header</td>
</tr>
<tr>
<td>1 x AAFP connector</td>
</tr>
<tr>
<td>2 x Aura RGB Strip Header</td>
</tr>
<tr>
<td>1 x USB 3.2 Gen 1 connector(s) support(s) additional 2 USB 3.2 Gen 1 port(s)</td>
</tr>
<tr>
<td>1 x USB 3.2 Gen 2 front panel connector</td>
</tr>
<tr>
<td>1 x M.2 Socket 3 with M key, type 2242/2260/2280/22110 storage devices support (PCIe 3.0 x 4 &amp; SATA mode)</td>
</tr>
<tr>
<td>1 x M.2 Socket 3 with M key, type 2242/2260/2280 storage devices support (PCIe 3.0 x 4 mode)</td>
</tr>
<tr>
<td>8 x SATA 6Gb/s connectors</td>
</tr>
<tr>
<td>1 x VROC_HW_Key</td>
</tr>
<tr>
<td>2 x CPU Fan connectors</td>
</tr>
<tr>
<td>2 x Chassis Fan connectors</td>
</tr>
<tr>
<td>1 x 4-pin Water Pump header</td>
</tr>
<tr>
<td>1 x AIO_PUMP connector</td>
</tr>
<tr>
<td>1 x Thunderbolt header</td>
</tr>
<tr>
<td>1 x 24-pin EATX Power connector</td>
</tr>
<tr>
<td>2 x 8-pin ATX 12V Power connectors</td>
</tr>
<tr>
<td>1 x 6-pin ATX 12V Power connector</td>
</tr>
<tr>
<td>1 x System panel connector</td>
</tr>
<tr>
<td>1 x Thermal sensor connector</td>
</tr>
<tr>
<td>1 x Power-on button</td>
</tr>
<tr>
<td>1 x FlexKey button (Reset)</td>
</tr>
<tr>
<td>1 x Clear CMOS button</td>
</tr>
<tr>
<td>3 x U.2 connectors</td>
</tr>
<tr>
<td>1 x CPU_OV jumper</td>
</tr>
<tr>
<td>1 x COM port header</td>
</tr>
<tr>
<td>1 x TPM header</td>
</tr>
<tr>
<td>1 x M.2 Fan connector</td>
</tr>
<tr>
<td>3 x U.2 LED switch header</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating system support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows® 10 64-bit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Form factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEB Form Factor, 12&quot; x 10.5&quot; (30.5cm x 26.7cm)</td>
</tr>
</tbody>
</table>

- Specifications are subject to change without notice.
- Visit the ASUS website for the software manual.
## Package contents

Check your motherboard package for the following items.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motherboard</td>
<td>1 x Pro WS X299 SAGE II motherboard</td>
</tr>
<tr>
<td>Cables</td>
<td>8 x SATA 6Gb/s cables</td>
</tr>
<tr>
<td></td>
<td>2 x Extension cable for Addressable LED</td>
</tr>
<tr>
<td></td>
<td>1 x M.2 screws kit</td>
</tr>
<tr>
<td></td>
<td>1 x Vertical M.2 bracket set</td>
</tr>
<tr>
<td></td>
<td>1 x ASUS 3-Way SLI® bridge</td>
</tr>
<tr>
<td></td>
<td>1 x ASUS 4-Way SLI® bridge</td>
</tr>
<tr>
<td></td>
<td>1 x ASUS HB SLI® bridge</td>
</tr>
<tr>
<td>Accessories</td>
<td>1 x COM port bracket</td>
</tr>
<tr>
<td></td>
<td>1 x I/O shield</td>
</tr>
<tr>
<td></td>
<td>1 x ASUS fan holder</td>
</tr>
<tr>
<td></td>
<td>2 x Fan screws</td>
</tr>
<tr>
<td></td>
<td>1 x Fan kit</td>
</tr>
<tr>
<td></td>
<td>1 x Q-Connector</td>
</tr>
<tr>
<td>Application DVD</td>
<td>1 x Motherboard support DVD</td>
</tr>
<tr>
<td>Documentation</td>
<td>1 x User guide</td>
</tr>
<tr>
<td></td>
<td>1 x ASUS CONTROL CENTER QSG</td>
</tr>
</tbody>
</table>

If any of the above items is damaged or missing, contact your retailer.
Installation tools and components

PC chassis

SATA hard disk drive

Phillips (cross) screwdriver

Power supply unit

1 bag of screws

DIMM

SATA optical disc drive (optional)

Graphics card

M.2 SSD module (optional)

The tools and components in the table above are not included in the motherboard package.
Product Introduction

1.1 Motherboard overview

1.1.1 Before you proceed

Take note of the following precautions before you install motherboard components or change any motherboard settings.

- Unplug the power cord from the wall socket before touching any component.
- Before handling components, use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, to avoid damaging them due to static electricity.
- Hold components by the edges to avoid touching the ICs on them.
- Whenever you uninstall any component, place it on a grounded antistatic pad or in the bag that came with the component.
- Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.
1.1.2 Motherboard layout

Refer to **Internal connectors** and **Rear I/O connection** for more information about rear panel connectors and internal connectors.
<table>
<thead>
<tr>
<th>Layout contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DDR4 DIMM slots</td>
<td>1-5</td>
</tr>
<tr>
<td>2. Power connectors</td>
<td>1-18</td>
</tr>
<tr>
<td>3. CPU socket</td>
<td>1-4</td>
</tr>
<tr>
<td>4. Fan and pump connectors</td>
<td>1-17</td>
</tr>
<tr>
<td>5. U.2 connectors</td>
<td>1-20</td>
</tr>
<tr>
<td>6. M.2 slot</td>
<td>1-21</td>
</tr>
<tr>
<td>7. SATA 6 Gb/s connectors</td>
<td>1-14</td>
</tr>
<tr>
<td>8. USB 3.2 Gen 1 connector</td>
<td>1-16</td>
</tr>
<tr>
<td>9. USB 3.2 Gen 2 connector</td>
<td>1-15</td>
</tr>
<tr>
<td>10. System panel connector</td>
<td>1-19</td>
</tr>
<tr>
<td>11. Thermal sensor connector</td>
<td>1-22</td>
</tr>
<tr>
<td>12. VROC Key connector</td>
<td>1-25</td>
</tr>
<tr>
<td>13. U.2 LED SW jumper</td>
<td>1-11</td>
</tr>
<tr>
<td>14. TPM connector</td>
<td>1-25</td>
</tr>
<tr>
<td>15. CPU Over Voltage jumper</td>
<td>1-11</td>
</tr>
<tr>
<td>16. Addressable RGB LED connectors</td>
<td>1-24</td>
</tr>
<tr>
<td>17. AURA RGB LED connectors</td>
<td>1-23</td>
</tr>
<tr>
<td>18. Serial port connector</td>
<td>1-22</td>
</tr>
<tr>
<td>19. Clear CMOS button</td>
<td>1-10</td>
</tr>
<tr>
<td>20. Q-Code LED</td>
<td>1-9</td>
</tr>
<tr>
<td>21. FlexKey button (Reset)</td>
<td>1-9</td>
</tr>
<tr>
<td>22. Power-on button</td>
<td>1-9</td>
</tr>
<tr>
<td>23. Front panel audio connector</td>
<td>1-15</td>
</tr>
<tr>
<td>24. Thunderbolt header</td>
<td>1-20</td>
</tr>
</tbody>
</table>
1.1.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA2066 socket designed for the Intel® Core™ X-series Processors.

Ensure that you install the correct CPU designed for LGA2066 socket only. DO NOT install a CPU designed for other sockets on the LGA2066 socket.

Ensure that all power cables are unplugged before installing the CPU.

Upon purchase of the motherboard, ensure that the PnP cap is on the socket and the socket contacts are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket contacts/motherboard components. ASUS will shoulder the cost of repair only if the damage is shipment/transit-related.

Keep the cap after installing the motherboard. ASUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA2066 socket.

The product warranty does not cover damage to the socket contacts resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.
1.1.4 System memory

The motherboard comes with eight DDR4 (Double Data Rate 4) Dual Inline Memory Modules (DIMM) slots.

A DDR4 module is notched differently from a DDR, DDR2, or DDR3 module. DO NOT install a DDR, DDR2, or DDR3 memory module to the DDR4 slot.

Recommended memory configurations

Intel® Core™ X-series Processors (6-core or above)
Memory configurations
You may install 2 GB, 4 GB, 8 GB, 16 GB and 32 GB unbuffered and non-ECC DDR4
DIMMs into the DIMM sockets.

For Intel® Core™ X-Series Processors (6-core or above), you may install varying memory
sizes in Channel A, Channel B, Channel C, and Channel D. The system maps the total
size of the lower-sized channel for the quad-channel configuration. Any excess memory
from the higher-sized channel is then mapped for single-channel operation.

• The default memory operation frequency is dependent on its Serial Presence Detect
(SPD), which is the standard way of accessing information from a memory module.
Under the default state, some memory modules for overclocking may operate at a
lower frequency than the vendor-marked value.

• For system stability, use a more efficient memory cooling system to support a full
memory load (8 DIMMs) or overclocking condition.

• Always install the DIMMs with the same CAS Latency. For an optimum compatibility,
we recommend that you install memory modules of the same version or data code
(D/C) from the same vendor. Check with the vendor to get the correct memory
modules.

• Visit the ASUS website for the latest QVL.
1.1.5 Expansion slots

Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.
Chapter 1: Product Introduction

- We recommend that you provide sufficient power when running CrossFireX™ or SLI® mode.

- Connect a chassis fan to the chassis fan connectors when using multiple graphics cards for better thermal environment.

- We recommend that install the graphics cards into the PCIe 3.0/2.0 x16_1 and PCIe 3.0/2.0 x16_3 slots when running 2-Way SLI® bridge.

<table>
<thead>
<tr>
<th>Slot Description</th>
<th>Single VGA</th>
<th>Dual VGA</th>
<th>Triple VGA</th>
<th>Quad VGA</th>
<th>Septuple VGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PCIEX16_1</td>
<td>X16</td>
<td>X16</td>
<td>X16</td>
<td>X16</td>
<td>X16</td>
</tr>
<tr>
<td>2. PCIEX16_2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X8</td>
</tr>
<tr>
<td>3. PCIEX16_3</td>
<td>-</td>
<td>X16</td>
<td>-</td>
<td>X16</td>
<td>X8</td>
</tr>
<tr>
<td>4. PCIEX16_4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X8</td>
</tr>
<tr>
<td>5. PCIEX16_5</td>
<td>-</td>
<td>-</td>
<td>X16</td>
<td>X16</td>
<td>X8</td>
</tr>
<tr>
<td>6. PCIEX16_6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X8</td>
</tr>
<tr>
<td>7. PCIEX16_7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X16</td>
</tr>
</tbody>
</table>
1.1.6 Onboard buttons

1. **Power-on button**
   The motherboard comes with a power-on button that allows you to power up or wake up the system. The button also lights up when the system is plugged to a power source indicating that you should shut down the system and unplug the power cable before removing or installing any motherboard component.

![Pro WS X299 SAGE II Power on button](image)

2. **FlexKey button (Reset)**
   Press the FlexKey button to reboot the system. You may also configure the button and assign a quick access feature such as activating Safe Boot or turning Aura lighting on or off to the button.

![Pro WS X299 SAGE II Reset button](image)

This button is set to [Reset] by default. You can assign a different function to this button in the BIOS settings.
3. **Clear CMOS button**

Press this button to clear the BIOS setup information only when the system hangs due to overclocking.

![Clear CMOS button](image)

Pro WS X299 SAGE II Clear CMOS button
1.1.7 Onboard jumpers

1. CPU Over Voltage jumper

The CPU Over Voltage jumper allows you to set a higher CPU voltage for a flexible overclocking system, depending on the type of the installed CPU. To gain more CPU voltage setting, insert the jumper to pins 2-3. To go back to its default CPU voltage setting, insert the jumper to pins 1-2.

2. U.2 LED SW jumper

The U.2 LED SW jumper allows you to select the LED mode for storage devices. Set to pins 1-2 for NVMe device LED mode. Set to pins 2-3 for normal storage device LED mode.
1.1.8 Onboard LEDs

1. M.2 LEDs
   The M.2 LED near the M.2 socket will light up when an SATA SSD device is detected.

2. Q-Code LEDs
   The Q-Code LED design provides you with a 2-digit error code that displays the system status.

- The Q-Code LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
- Please refer to the Q-Code table in the Appendix section for more details.
3. **POST State LEDs**

The POST State LEDs provide the status of these key components during POST (Power-On Self-Test): CPU, memory modules, VGA card, and hard disk drives. If an error is found, the critical component's LED stays lit up until the problem is solved.

The POST State LEDs provide the most probable cause of an error code as a starting point for troubleshooting. The actual cause may vary from case to case.
1.1.9 Internal connectors

1. SATA 6 Gb/s connectors

These connectors connect to SATA 6 Gb/s hard disk drives via SATA 6 Gb/s signal cables.

If you installed SATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® X299 chipset.

NOTE: Connect the right-angle side of SATA signal cable to SATA device. You may also connect the right-angle side of SATA cable to the onboard SATA port to avoid mechanical conflict with huge graphics cards.

These connectors are set to [Intel RST Premium (RAID)] by default.
2. **Front panel audio connector**
   This connector is for a chassis-mounted front panel audio I/O module that supports HD Audio. Connect one end of the front panel audio I/O module cable to this connector.

![Pro WS X299 SAGE II Front Panel Audio connector](image)

We recommend that you connect a high-definition front panel audio module to this connector to avail of the motherboard's high-definition audio capability.

3. **USB 3.2 Gen 2 connector**
   This connector allows you to connect a USB 3.2 Gen 2 module for additional USB 3.2 Gen 2 ports. The latest USB 3.2 Gen 2 connectivity provides data transfer speeds of up to 10 Gbps.

![Pro WS X299 SAGE II USB 3.2 Gen 2 connector](image)
4. **USB 3.2 Gen 1 connectors**

This connector allows you to connect a USB 3.2 Gen 1 module for additional USB 3.2 Gen 1 front or rear panel ports. With an installed USB 3.2 Gen 1 module, you can enjoy all the benefits of USB 3.2 Gen 1 including faster data transfer speeds of up to 5 Gb/s, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.0.

The USB 3.2 Gen 1 module is purchased separately.

The plugged USB 3.2 Gen 1 device may run on xHCI or EHCI mode depending on the operating system's setting.
5. Fan and Pump connectors

The Fan and Pump connectors allow you to connect fans or pumps to cool the system.

- DO NOT forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!
- Ensure the cable is fully installed into the connector.
- The CPU_FAN connector supports the CPU fan of maximum 1A (12 W) fan power.
- W_PUMP+ function support depends on water cooling device.
- Connect the fan of your water cooling kit to the AIO_PUMP connector.

### Header | Max. Current | Max. Power | Default Speed | Shared Control
--- | --- | --- | --- | ---
CPU_FAN | 1A | 12W | Q-Fan Controlled | A
CPU_OPT | 1A | 12W | Q-Fan Controlled | A
CHA_FAN1 | 1A | 12W | Q-Fan Controlled | -
CHA_FAN2 | 1A | 12W | Q-Fan Controlled | -
AIO_PUMP | 1A | 12W | Full-Speed | -
W_PUMP+ | 3A | 36W | Full-Speed | -
M.2_FAN | 1A | 12W | Q-Fan Controlled | -
6. Power connectors

These connectors are for ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.

- DO NOT connect the 6-pin power plug only, the motherboard may overheat under heavy usage.
- Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.

For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12V Specification 2.0 (or later version) and provides a minimum power of 350 W.

- We recommend that you use a PSU with a higher power output when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- If you want to use two or more high-end PCIe x16 cards, use a PSU with 1000W power or above to ensure the system stability.
7. **System panel connector**

This connector supports several chassis-mounted functions.

- **System Power LED connector (PLED)**
  The 2-pin and/or 3-1 pin connectors allow you to connect the System Power LED. The System Power LED lights up when the system is connected to a power source, or when you turn on the system power, and blinks when the system is in sleep mode.

- **Storage Device Activity LED connector (HDD_LED)**
  The 2-pin connector allows you to connect the Storage Device Activity LED. The Storage Device Activity LED lights up or blinks when data is read from or written to the storage device or storage device add-on card.

- **System Warning Speaker connector (SPEAKER)**
  The 4-pin connector allows you to connect the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings.

- **Power Button/Soft-off Button connector (PWRSW)**
  The 3-1 pin connector allows you to connect the system power button. Press the power button to power up the system, or put the system into sleep or soft-off mode (depending on the operating system settings).

- **Reset button connector (RESET)**
  The 2-pin connector allows you to connect the chassis-mounted reset button. Press the reset button to reboot the system.

- **Chassis intrusion connector (CHASSIS)**
  The 2-pin connector allows you to connect the chassis-mounted intrusion detection sensor or switch. The chassis intrusion sensor or switch sends a high-level signal to the connector when a chassis component is removed or replaced, the signal is then generated as a chassis intrusion event.
8. **Thunderbolt header**

This header is for the add-on Thunderbolt I/O card that supports Intel’s Thunderbolt Technology, allowing you to connect up to six Thunderbolt-enabled devices and a DisplayPort-enabled display in a daisy-chain configuration.

![Pro WS X299 SAGE II Thunderbolt header](image)

9. **U.2 connector**

This motherboard comes with U.2 connectors which support PCIe 3.0 x4 NVM Express storage.

- The U.2 module is purchased separately.
- The U.2 connectors are only supported on 48/44-Lane CPUs.
- U.2_3 is only supported on 48-Lane CPUs.
- Visit the ASUS website for the latest AVL.

![Pro WS X299 SAGE II U.2 connector](image)
10. **M.2 slot**

These sockets allow you to install M.2 SSD modules.

- **M.2_1 socket** supports PCIe 3.0 x4 and SATA mode M Key design and type 2242 / 2260 / 2280 / 22110 PCIe and SATA storage devices.
- **M.2_2 socket** supports PCIe 3.0 x4 mode M Key design and type 2242 / 2260 / 2280 PCIe storage devices.
- **M.2_1 socket** shares bandwidth with SATA6G_1 port. When M.2_1 socket runs in SATA mode, SATA6G_1 port will be disabled.
- **M.2_1 & M.2_2 sockets** support IRST (Intel® Rapid Storage Technology).

- The M.2 SSD module is purchased separately.
- The M.2 LED near the M.2_2 socket will light up when an SATA SSD device is detected. Refer to section **Onboard LEDs** for the exact location of the M.2 LED.
11. **Thermal sensor connector**

This connector is for the thermistor cable that monitors the temperature of the devices and the critical components inside the motherboard. Connect the thermistor cable and place the sensor on the device or the motherboard’s component to detect its temperature.

![Pro WS X299 SAGE II Thermal Sensor connector](image)

The thermal sensor is purchased separately.

12. **Serial port connector**

This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.

![Pro WS X299 SAGE II Serial port connector](image)
13. **AURA RGB LED connector**

The AURA RGB LED connector allows you to connect RGB LED strips.

The AURA RGB LED connector supports 5050 RGB multi-color LED strips (12V/G/R/B), with a maximum power rating of 2A (12V), and no longer than 2 m.

Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the RGB LED extension cable and the RGB LED strip is connected in the correct orientation, and the 12V connector is aligned with the 12V header on the motherboard.
- The LED strip will only light up when the system is powered on.
- The LED strip is purchased separately.
14. **Addressable RGB LED connector**

This connector is for individually addressable RGB WS2812B LED strips or WS2812B based LED strips.

![Pro WS X299 SAGE II Addressable RGB LED connector](image)

The addressable RGB LED connector supports WS2812B addressable RGB LED strips (5V/Data/Ground), with a maximum power rating of 3A (5V) and a maximum of 60 LEDs.

Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, or components.

- Actual lighting and color will vary with LED strip.
- If your LED strip does not light up, check if the addressable RGB LED strip is connected in the correct orientation, and the 5V connector is aligned with the 5V header on the motherboard.
- The addressable RGB LED strip will only light up under the operating system.
- The addressable RGB LED strip is purchased separately.
15. VROC Key connector

This connector allows you to connect a KEY module to enable additional CPU RAID functions with Intel® CPU RSTe.

- The KEY module is purchased separately.
- Due to CPU behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® Core™ X-series Processors (6-core or above) and Intel® SSD modules.

16. TPM connector

This connector supports a Trusted Platform Module (TPM) system, which securely store keys, digital certificates, passwords and data. A TPM system also helps enhance network security, protect digital identities, and ensures platform integrity.

The TPM module is purchased separately.
2.1 Building your PC system

The diagrams in this section are for reference only. The motherboard layout may vary with models, but the installation steps are the same for all models.

2.1.1 Motherboard installation

1. Install the ASUS Q-Shield to the chassis rear I/O panel.

2. Place the motherboard into the chassis, ensuring that its rear I/O ports are aligned to the chassis' rear I/O panel.
3. Place nine screws into the holes indicated by circles to secure the motherboard to the chassis.  

![Diagram of nine screws being placed into the motherboard]

**DO NOT overtighten the screws! Doing so can damage the motherboard.**
2.1.2 **CPU installation**

Please note the order in opening/closing the double latch. Follow the instructions printed on the metal sealing hatch or the illustrations shown below in this manual. The plastic cap will pop up automatically once the CPU is in place and the hatch properly sealed down.

1. **A**
2. **B**
3. **C**
4. **A**

---

ASUS Pro WS X299 SAGE II

Chapter 2
2.1.3 CPU heatsink and fan assembly installation

Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan, if necessary.

To install the CPU heatsink and fan assembly

1

2
2.1.4 DIMM installation

1. [Illustration of DIMM installation process]

2. [Illustration of DIMM installation process]

3. [Illustration of DIMM installation process]

To remove a DIMM

B. [Illustration of DIMM removal process]

A. [Illustration of DIMM removal process]
2.1.5 ATX power connection

1

2

• DO NOT connect the 6-pin power plug only, the motherboard may overheat under heavy usage.
• Ensure to connect the 8-pin power plug, or connect both the 8-pin and 6-pin power plugs.
2.1.6 SATA device connection

1

2
2.1.7 Front I/O connector

To install ASUS Q-Connector

To install USB 3.2 Gen 2 connector

This connector will only fit in one orientation. Push the connector until it clicks into place.

To install USB 3.2 Gen 1 connector

To install front panel audio connector
2.1.8 Expansion card installation

To install PCIe x16 cards
2.1.9 M.2 installation

OR

Supported M.2 type varies per motherboard.
2.1.10 ASUS fan holder installation

To install the ASUS fan holder and fan

When using high performance settings whilst overclocking, ensure to install the fan holder for additional fan(s).

- You may install 12V (1A, 12W), 40mm x 40mm fans or 50mm x 50mm fans.
- Ensure to use the bundled screws that came with your fans.
2.2 BIOS update utility

BIOS FlashBack™

BIOS FlashBack™ allows you to easily update the BIOS without entering the existing BIOS or operating system. Simply insert a USB storage device to the USB port (the USB port hole marked in green on the I/O shield) then press the BIOS FlashBack™ button for three seconds to automatically update the BIOS.

To use BIOS FlashBack™:

1. Insert a USB storage device to the BIOS FlashBack™ port.

   • We recommend you to use a USB 2.0 storage device to save the latest BIOS version for better compatibility and stability.
   • Refer to section Rear I/O connection for the location of the USB port that supports BIOS FlashBack™.

2. Visit https://www.asus.com/support/ and download the latest BIOS version for this motherboard.

3. Manually rename the file as WSXSG2.CAP, or launch the BIOSRenamer.exe application to automatically rename the file, then copy it to your USB storage device.

   The BIOSRenamer.exe application is zipped together with your BIOS file when you download a BIOS file for a BIOS FlashBack™ compatible motherboard.

4. Shut down your computer.

5. Press the BIOS FlashBack™ button for three seconds until the FlashBack™ LED blinks three times, indicating that the BIOS FlashBack™ function is enabled.

6. Wait until the light goes out, indicating that the BIOS updating process is completed.
For more BIOS update utilities in BIOS setup, refer to the section **Updating BIOS** in Chapter 3.

- Do not unplug portable disk, power system, or press the CLR_CMOS button while BIOS update is ongoing, otherwise update will be interrupted. In case of interruption, please follow the steps again.

- If the light flashes for five seconds and turns into a solid light, this means that the BIOS FlashBack™ is not operating properly. This may be caused by improper installation of the USB storage device and filename/file format error. If this scenario happens, please restart the system to turn off the light.

- Updating BIOS may have risks. If the BIOS program is damaged during the process and results to the system’s failure to boot up, please contact your local ASUS Service Center.
2.3 Motherboard rear and audio connections

2.3.1 Rear I/O connection

Rear panel connectors

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIOS FlashBack™ button</td>
</tr>
<tr>
<td>2</td>
<td>USB 2.0 ports 9-12 (bottom port supports BIOS FlashBack™)</td>
</tr>
<tr>
<td>3</td>
<td>Intel® LAN port (LAN2)*</td>
</tr>
<tr>
<td>4</td>
<td>Intel® LAN port (LAN1)*</td>
</tr>
<tr>
<td>5</td>
<td>USB 3.2 Gen 2 port E2</td>
</tr>
<tr>
<td>6</td>
<td>USB 3.2 Gen 1 ports 7 and 8</td>
</tr>
<tr>
<td>7</td>
<td>USB 3.2 Gen 1 ports 5 and 6</td>
</tr>
<tr>
<td>8</td>
<td>USB 3.2 Gen 1 ports 3 and 4</td>
</tr>
<tr>
<td>9</td>
<td>USB 3.2 Gen 2 Type-C® port EC1</td>
</tr>
<tr>
<td>10</td>
<td>Optical S/PDIF Out port</td>
</tr>
<tr>
<td>11</td>
<td>Audio I/O ports**</td>
</tr>
</tbody>
</table>

* and ** : Refer to the tables on the next page for LAN port LEDs and audio port definitions.

- USB 3.2 Gen 1/Gen 2 devices can only be used as data storage only.
- We strongly recommend that you connect your devices to ports with matching data transfer rate. Please connect your USB 3.2 Gen 1 devices to USB 3.2 Gen 1 ports and your USB 3.2 Gen 2 devices to USB 3.2 Gen 2 ports for faster and better performance for your devices.
* LAN ports LED indications*

<table>
<thead>
<tr>
<th>Activity Link LED</th>
<th>Speed LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Description</td>
</tr>
<tr>
<td>Off</td>
<td>No link</td>
</tr>
<tr>
<td>Solid Green</td>
<td>Linked</td>
</tr>
<tr>
<td>Green (Blinking)</td>
<td>Data activity</td>
</tr>
</tbody>
</table>

You can disable the LAN controllers in BIOS. Due to hardware design, the LAN1 port’s LEDs may continue to blink even when disabled.

** Audio 2, 4, 5.1 or 7.1-channel configuration**

<table>
<thead>
<tr>
<th>Port</th>
<th>Headset 2-channel</th>
<th>4-channel</th>
<th>5.1-channel</th>
<th>7.1-channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Blue</td>
<td>Line In</td>
<td>Line In</td>
<td>Line In</td>
<td>Side Speaker Out</td>
</tr>
<tr>
<td>Lime</td>
<td>Line Out</td>
<td>Front Speaker Out</td>
<td>Front Speaker Out</td>
<td>Front Speaker Out</td>
</tr>
<tr>
<td>Pink</td>
<td>Mic In</td>
<td>Mic In</td>
<td>Mic In</td>
<td>Mic In</td>
</tr>
<tr>
<td>Orange</td>
<td>–</td>
<td>–</td>
<td>Center/Sub wofer</td>
<td>Center/Sub wofer</td>
</tr>
<tr>
<td>Black</td>
<td>–</td>
<td>Rear Speaker Out</td>
<td>Rear Speaker Out</td>
<td>Rear Speaker Out</td>
</tr>
</tbody>
</table>
2.3.2 Audio I/O connections

Audio I/O ports

Connect to Headphone and Mic

Connect to Stereo Speakers

Connect to 2-channel Speakers
Chapter 2: Basic Installation

Connect to 4-channel Speakers

Connect to 5.1-channel Speakers

Connect to 7.1-channel Speakers
### 2.4 Starting up for the first time

1. After making all the connections, replace the system case cover.
2. Ensure that all switches are off.
3. Connect the power cord to the power connector at the back of the system chassis.
4. Connect the power cord to a power outlet that is equipped with a surge protector.
5. Turn on the devices in the following order:
   a. Monitor
   b. External SCSI devices (starting with the last device on the chain)
   c. System power
6. After applying power, the system power LED on the system front panel case lights up. For systems with ATX power supplies, the system LED lights up when you press the ATX power button. If your monitor complies with the “green” standards or if it has a “power standby” feature, the monitor LED may light up or change from orange to green after the system LED turns on.

   The system then runs the power-on self tests (POST). While the tests are running, the BIOS beeps (refer to the BIOS beep codes table) or additional messages appear on the screen. If you do not see anything within 30 seconds from the time you turned on the power, the system may have failed a power-on test. Check the jumper settings and connections or call your retailer for assistance.

<table>
<thead>
<tr>
<th>BIOS Beep</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>One short beep</td>
<td>VGA detected</td>
</tr>
<tr>
<td></td>
<td>Quick boot set to disabled</td>
</tr>
<tr>
<td></td>
<td>No keyboard detected</td>
</tr>
<tr>
<td>One continuous beep followed by two short beeps then a pause (repeated)</td>
<td>No memory detected</td>
</tr>
<tr>
<td>One continuous beep followed by three short beeps</td>
<td>No VGA detected</td>
</tr>
<tr>
<td>One continuous beep followed by four short beeps</td>
<td>Hardware component failure</td>
</tr>
</tbody>
</table>

7. At power on, hold down the <Delete> key to enter the BIOS Setup. Follow the instructions in Chapter 3.

### 2.5 Turning off the computer

While the system is ON, press the power button for less than four seconds to put the system on sleep mode or soft-off mode, depending on the BIOS setting. Press the power switch for more than four seconds to let the system enter the soft-off mode regardless of the BIOS setting.
BIOS Setup

3.1 Knowing BIOS

The new ASUS UEFI BIOS is a Unified Extensible Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond the traditional keyboard-only BIOS controls to enable a more flexible and convenient mouse input. You can easily navigate the new UEFI BIOS with the same smoothness as your operating system. The term “BIOS” in this user manual refers to “UEFI BIOS” unless otherwise specified.

BIOS (Basic Input and Output System) stores system hardware settings such as storage device configuration, overclocking settings, advanced power management, and boot device configuration that are needed for system startup in the motherboard CMOS. In normal circumstances, the default BIOS settings apply to most conditions to ensure optimal performance. **DO NOT change the default BIOS settings** except in the following circumstances:

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.
- You have installed a new system component that requires further BIOS settings or update.

Inappropriate BIOS settings may result to instability or boot failure. **We strongly recommend that you change the BIOS settings only with the help of a trained service personnel.**

- When downloading or updating the BIOS file, rename it as **WSXSG2.CAP** for this motherboard.
- BIOS settings and options may vary due to different BIOS release versions. Please refer to the latest BIOS version for settings and options.
3.2 BIOS setup program

Use the BIOS Setup to update the BIOS or configure its parameters. The BIOS screen include navigation keys and brief onscreen help to guide you in using the BIOS Setup program.

Entering BIOS at startup
To enter BIOS Setup at startup, press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

Entering BIOS Setup after POST
To enter BIOS Setup after POST:

• Press <Ctrl>+<Alt>+<Delete> simultaneously.
• Press the reset button on the system chassis.
• Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.

After doing either of the three options, press <Delete> key to enter BIOS.

- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.
- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu or press hotkey <F5>. See section Exit menu for details.
- If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. See section Onboard buttons for information on how to erase the RTC RAM via the Clear CMOS button.
- The BIOS setup program does not support the Bluetooth devices.

Please visit ASUS website for the detailed BIOS content manual.

BIOS menu screen

The BIOS Setup program can be used under two modes: EZ Mode and Advanced Mode. You can change modes from Setup Mode in Boot menu or by pressing the <F7> hotkey.
3.2.1 EZ Mode

By default, the EZ Mode screen appears when you enter the BIOS setup program. The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance, mode and boot device priority. To access the Advanced Mode, select **Advanced Mode** or press the <F7> hotkey for the advanced BIOS settings.

The default screen for entering the BIOS setup program can be changed. Refer to the **Setup Mode** item in section **Boot menu** for details.
3.2.2 Advanced Mode

The Advanced Mode provides advanced options for experienced end-users to configure the BIOS settings. The figure below shows an example of the Advanced Mode. Refer to the following sections for the detailed configurations.

To switch from EZ Mode to Advanced Mode, click Advanced Mode (F7) or press the <F7> hotkey.
Menu bar

The menu bar on top of the screen has the following main items:

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Favorites</td>
<td>For saving the frequently-used system settings and configuration</td>
</tr>
<tr>
<td>Main</td>
<td>For changing the basic system configuration</td>
</tr>
<tr>
<td>Ai Tweaker</td>
<td>For changing the overclocking settings</td>
</tr>
<tr>
<td>Advanced</td>
<td>For changing the advanced system settings</td>
</tr>
<tr>
<td>Monitor</td>
<td>For displaying the system temperature, power status, and changing the fan settings</td>
</tr>
<tr>
<td>Boot</td>
<td>For changing the system boot configuration</td>
</tr>
<tr>
<td>Tool</td>
<td>For configuring options for special functions</td>
</tr>
<tr>
<td>Exit</td>
<td>For selecting the exit options and loading default settings</td>
</tr>
</tbody>
</table>

Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting Main shows the Main menu items.

The other items (My Favorites, Ai Tweaker, Advanced, Monitor, Boot, Tool, and Exit) on the menu bar have their respective menu items.

Submenu items

A greater than sign (>) before each item on any menu screen means that the item has a submenu. To display the submenu, select the item and press <Enter>.

Language

This button above the menu bar contains the languages that you can select for your BIOS. Click this button to select the language that you want to display in your BIOS screen.

My Favorites (F3)

This button above the menu bar shows all BIOS items in a Tree Map setup. Select frequently-used BIOS settings and save it to MyFavorites menu.

Refer to section My Favorites for more information.

Q-Fan Control (F6)

This button above the menu bar displays the current settings of your fans. Use this button to manually tweak the fans to your desired settings.

Refer to section Q-Fan Control for more information.

AI OC Guide (F11)

This button above the menu bar allows you to view the descriptions of AI overclocking and enable it.

- Refer to section AI OC Guide for more information.
- This function is only enabled when using an unlocked CPU.
Search(F9)
This button allows you to search for BIOS items by entering its name, enter the item name to find the related item listing.

AURA ON/OFF(F4)
This button allows you to turn the RGB LED lighting or functional LED on or off.
[All On]: All LEDs (Aura or Functional) will be enabled.
[Aura Only]: Aura LEDs will be enabled and functional LEDs will be disabled.
[Aura Off]: Aura LEDs will be disabled, however functional LEDs will still be enabled.
[Stealth Mode]: All LEDs (Aura and Functional) will be disabled.

Search on FAQ
Move your mouse over this button to show a QR code, scan this QR code on your mobile device to connect to the BIOS FAQ web page of the ASUS support website. You can also scan the following QR code:

Scroll bar
A scroll bar appears on the right side of a menu screen when there are items that do not fit on the screen. Press the Up/Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen.

General help
At the bottom of the menu screen is a brief description of the selected item. Use <F12> key to capture the BIOS screen and save it to the removable storage device.

Configuration fields
These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable.
A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

EZ Tuning Wizard
This button allows you to view and configure the RAID settings of your system.

Refer to section EZ Tuning Wizard for more information.

Last Modified button
This button shows the items that you last modified and saved in BIOS Setup.
3.2.3 **Q-Fan Control**

The Q-Fan Control allows you to set a fan profile or manually configure the operating speed of your CPU and chassis fans.
Configuring fans manually
Select Manual from the list of profiles to manually configure your fans’ operating speed.

To configure your fans:
1. Select the fan that you want to configure and to view its current status.
2. Click and drag the speed points to adjust the fans’ operating speed.
3. Click **Apply** to save the changes then click **Exit (ESC)**.
3.2.4 AI OC Guide

- The screenshot shown in this section is for reference purposes only, and may not exactly match what you see on your screen.
- This function is only enabled when using an unlocked CPU.

The AI OC Guide allows you to enable the AI Overclocking feature, or view a quick guide of the AI Overclocking feature which highlights the recommended setup procedure and descriptions of the AI Overclocking.

Clicking on Enable AI will enable AI Overclocking.
3.2.5 EZ Tuning Wizard

EZ Tuning Wizard allows you to easily set RAID in your system using this feature.

Creating RAID

To create RAID:

1. Click **EZ Tuning Wizard** from the BIOS screen to open EZ Tuning Wizard screen.
2. Click **RAID** then select the port that you want to set to [RAID] mode, **CPU**, **PCH** or **SATA**, then click **Next**.

   - Ensure that your HDDs have no existing RAID volumes.
   - Ensure to connect your HDDs to Intel® SATA connectors.

3. Select **Yes** to enable RAID.
4. Select the type of storage for your RAID, **Easy Backup** or **Super Speed**, then click **Next**.

5. After selecting the type of RAID, click **Next** then click **Yes** to continue the RAID setup.

6. After the RAID setup is done, click **Yes** to exit the setup then click **OK** to reset your system.

---

You can only select Easy Backup (RAID 10) if you connect four (4) HDDs.

b. For Super Speed, click **Next** then select from **Super Speed (RAID 0)** or **Super Speed (RAID 5)**.
3.3 **My Favorites**

My Favorites is your personal space where you can easily save and access your favorite BIOS items. My Favorites comes with several performance, power saving, and fast boot related items by default. You can personalize this screen by adding or removing items.

![UEFI BIOS Utility - Advanced Mode](image)

- **CPU Core Ratio**: By Core Usage
- **DRAM Frequency**: Auto
- **CPU Core Voltage**: Auto
- **CPU Cache Voltage**: Auto
- **DRAM Voltage (CHA, CHB)**: 0.656V
- **DRAM Voltage (CHC, CHD)**: 1.184V
- **PCH Storage Configuration**
- **Onboard Devices Configuration**
  - Autonomous Core C-State
  - Fast Boot
  - Next Boot after AC Power Loss

**NOTE**: The system will adjust all core ratios automatically. (Sync All Core): Configure a core ratio limit to synchronize all cores. (By Core Usage): Configure the ratio limits for active cores depending on how many cores are being utilized. (By Spec Core): Configure each physical core's ratio individually.

**Hardware Monitor**

- **CPU/Memory**
  - Frequency: 3000 MHz
  - Temperature: 62°C
  - BCLK: Core Voltage
  - 100.0 MHz: 0.841 V
  - Ratio: DRAM Freq
  - 38x: 2133 MHz
  - Vol_C0/C1/C0/C1: Capacity
  - 0.656 V: 4096 MB
  - 1.184 V:

**Pflow**

- CPU: 74
- Cooler: 125 kHz
- V_freq:f for 450MHz
  - 1.213 V: 4532 MHz
  - 3.29 MHz
  - 4114 MHz: 4233 MHz
Adding items to My Favorites

To add BIOS items:

1. Press <F3> on your keyboard or click **MyFavorite (F3)** from the BIOS screen to open Setup Tree Map screen.

2. On the Setup Tree Map screen, select the BIOS items that you want to save in My Favorites screen.

3. Select an item from main menu panel, then click the submenu that you want to save as favorite from the submenu panel and click **+** or press <Enter> on your keyboard.

   You cannot add the following items to My Favorite items:
   - Items with submenu options
   - User-managed items such as language and boot order
   - Configuration items such as Memory SPD Information, system time and date.

4. Click **Exit (ESC)** or press <Esc> key to close Setup Tree Map screen.

5. Go to My Favorites menu to view the saved BIOS items.
Chapter 3: BIOS Setup

3.4 Main menu
The Main menu screen appears when you enter the Advanced Mode of the BIOS Setup program. The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, language, and security settings.

Security
The Security menu items allow you to change the system security settings.

- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See section Onboard buttons for information on how to erase the RTC RAM via the Clear CMOS button.
- The Administrator or User Password items on top of the screen show the default [Not Installed]. After you set a password, these items show [Installed].

3.5 Ai Tweaker menu
The Ai Tweaker menu items allow you to configure overclocking-related items.

Be cautious when changing the settings of the Ai Tweaker menu items. Incorrect field values can cause the system to malfunction!

The configuration options for this section vary depending on the CPU and DIMM model you installed on the motherboard.

Ai Overclock Tuner
Allows you to select the CPU overclocking options to achieve the desired CPU internal frequency.

- [Auto] Loads the optimal settings for the system.
- [X.M.P.] If you install memory modules supporting the eXtreme Memory Profile (X.M.P.) Technology, choose this item to set the profiles supported by your memory modules for optimizing the system performance.

The [X.M.P.] configuration option appears only when you install memory modules supporting the eXtreme Memory Profile (X.M.P.) Technology.

The following item appears only when you set the Ai Overclocking Tuner to [Manual].

BCLK Frequency
This item allows you to set the BCLK (base clock) frequency to enhance the system performance. Use the <+> or <-> to adjust the value.

We recommend you to set the value based on the CPU specification, as high BCLK frequencies may damage the CPU permanently.
ASUS MultiCore Enhancement

[Auto] This item allows you to maximize the overclocking performance optimized by ASUS core ratio settings.

[Disabled] This item allows you to set to default core ratio settings.

CPU Core Ratio

This item allows you to set the CPU core ratios.
Configuration options: [Auto] [Sync All Cores] [By Core Usage] [By Specific Core] [AI Optimized]

BCLK Frequency : DRAM Frequency Ratio

[Auto] The BCLK frequency to DRAM frequency ratio will be set to the optimized setting.

[100:133] The BCLK frequency to DRAM frequency ratio will be set to 100:133.

[100:100] The BCLK frequency to DRAM frequency ratio will be set to 100:100.

DRAM Frequency

This item allows you to set the memory operating frequency. The configurable options vary with the BCLK (base clock) frequency setting. Select the auto mode to apply the optimized setting.
Configuration options: [Auto] [DDR4-800MHz] - [DDR4-4400MHz]

Internal CPU Power Management

The subitems in this menu allow you to set the CPU ratio and features.

Enhanced Intel SpeedStep Technology
Allows the operating system to dynamically adjust the processor voltage and cores frequency to decrease the average power consumption and decrease average heat production.
Configuration options: [Disabled] [Enabled]

Turbo Mode
Allows you to enable your processor cores to run faster than the base operating frequency when it is below power, current and specification limit.
Configuration options: [Disabled] [Enabled]
3.6 Advanced menu

The Advanced menu items allow you to change the settings for the CPU and other system devices.

Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.

3.6.1 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects.

The items in this menu may vary based on the CPU installed.

Hyper-Threading [ALL]

This item allows a hyper-threading processor to appear as two logical processors, allowing the operating system to schedule two threads or processors simultaneously.

Configuration options: [Disabled] [Enabled]

CPU Power Management Configuration

This item allows you to manage and configure the CPU’s power.

Enhanced Intel SpeedStep Technology

Allows the operating system to dynamically adjust the processor voltage and cores frequency to decrease the average power consumption and decrease average heat production.

Configuration options: [Disabled] [Enabled]

Turbo Mode

This item allows you to automatically set the CPU cores to run faster than the base operating frequency when it is below the operating power, current and temperature specification limit.

Configuration options: [Disabled] [Enabled]

Autonomous Core C-State

Allows you to enable or disable Autonomous Core C-State Report.

Configuration options: [Auto] [Disabled] [Enabled]

3.6.2 Platform Misc Configuration

The items in this menu allow you to change the ASPM for PCH and SA PCIe.

3.6.3 System Agent (SA) Configuration

The items in this menu allow you to adjust the Link Speed for PEG Port and Multi-Monitor.
3.6.4 PCH Configuration
The items in this menu allow you to adjust the PCH PCIe speed.

PCI Express Configuration
This item allows you to configure the PCIe slots.

PCIe Speed
This item allows your system to automatically select the PCIe port speed.
Configuration options: [Auto] [Gen1 (2.5 GT/s)] [Gen2 (5 GT/s)] [Gen3 (8 GT/s)]

3.6.5 PCH Storage Configuration
While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show Empty if no SATA device is installed to the corresponding SATA port.

SATA Controller(s)
This item allows you to enable or disable the SATA Device.
Configuration options: [Enabled] [Disabled]

SATA Mode Selection
This item allows you to set the SATA configuration.

[AHCI] Set to [AHCI] when you want the SATA hard disk drives to use the AHCI (Advanced Host Controller Interface). The AHCI allows the onboard storage driver to enable advanced SATA features that increases storage performance on random workloads by allowing the drive to internally optimize the order of commands.

[Intel RST Premium (RAID)] Set to [Intel RST Premium (RAID)] when you want to create a RAID configuration from the SATA hard disk drives.

SMART Status Check
SMART (Self-Monitoring, Analysis and Reporting Technology) is a monitoring system that shows a warning message during POST (Power-on Self Test) when an error occurs in the hard disks.
Configuration options: [On] [Off]

SATA6G_1 - SATA6G_8
This item allows you to enable or disable the selected SATA port.
Configuration options: [Disabled] [Enabled]

Hot Plug
These items appears only when the SATA Mode Selection is set to [AHCI] and allows you to enable or disable SATA Hot Plug Support.
Configuration options: [Disabled] [Enabled]
3.6.6 CPU Storage Configuration
The items in this menu allow you to configure CPU storage configurations.

- This menu will appear only when an Intel® Core™ X-series Processors (6-core or above) is installed.
- Due to CPU behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® Core™ X-series Processors (6-core or above) and Intel® SSD modules.

3.6.7 Onboard Devices Configuration
The items in this menu allow you to switch between PCIe Lanes and configure onboard devices.

HD Audio Controller
This item allows you to use the Azalia High Definition Audio Controller.
Configuration options: [Disabled] [Enabled]

USB Type C Power Switch
[Auto] The system will automatically detect your USB Type-C® devices and provide suitable power if needed.
[Enabled] The USB Type-C® port will always provide power to your devices.

RGB LED lighting
When system is in working state
This item allows you to turn the RGB LED lighting on or off when the system is in the working state.
Configuration options: [All On] [Stealth Mode]

Q-Code LED Function
[Disabled] Turn off Q-Code LED.
[POST Code Only] Show POST (Power-On Self-Test) code on Q-Code LED.
[Auto] Automatically display POST (Power-On Self-Test) code and CPU temperature on Q-Code LED.

Intel LAN / LAN2 Controller
This item allows you to enable or disable the Intel LAN / LAN2 controllers.
Configuration options: [Enabled] [Disabled]

3.6.8 APM Configuration
The items in this menu allow you to set system wake and sleep settings.

ErP Ready
This item allows you to switch off some power at S4+S5 or S5 to get the system ready for ErP requirement. When set to [Enabled], all other PME options are switched off.
Configuration options: [Disabled] [Enable(S4+S5)] [Enable(S5)]
3.6.9 **USB Configuration**
The items in this menu allow you to change the USB-related features.

The Mass Storage Devices item shows the auto-detected values. If no USB device is detected, the item shows **None**.

**USB Single Port Control**
This item allows you to enable or disable the individual USB ports.

Refer to section **Motherboard layout** for the location of the USB ports.

3.6.10 **HDD/SSD SMART Information**
This menu displays the SMART information of the connected devices.

NVM Express devices do not support SMART information.

3.6.11 **NVMe Configuration**
This menu displays the NVMe controller and Drive information of the connected devices.

3.6.12 **Thunderbolt(TM) Configuration**
The items in this menu allow you to configure Thunderbolt settings.

**TBT Root port Selector**
This item allows you to select the thunder root port.
Configuration options: [Thunderbolt Disabled] [PCIEX16_2]

3.6.13 **PCH-FW Configuration**
This item allows you to configure the firmware TPM.

3.6.14 **Network Stack Configuration**
The items in this menu allow you to configure Ipv4 / Ipv6 PXE support.
3.7 Monitor menu

The Monitor menu displays the system temperature/power status, and allows you to change the fan settings.

Q-Fan Configuration

Q-Fan Tuning
Click this item to automatically detect the lowest speed and configure the minimum duty cycle for each fan.

CPU Q-Fan Control
[Disabled] Disable the Q-Fan control feature.
[Auto] Detects the type of CPU fan installed and automatically switches the control modes.
[DC mode] Enable the CPU Q-Fan control in DC mode for 3-pin CPU fan.
[PWM mode] Enable the CPU Q-Fan control in PWM mode for 4-pin CPU fan.

Chassis Fan(s) Configuration

Chassis Fan 1/Fan 2 Q-Fan Control
[Disabled] Disable the chassis Q-Fan control feature.
[Auto] Detects the type of chassis fan installed and automatically switches the control modes.
[DC mode] Enable the chassis Q-Fan control in DC mode for 3-pin chassis fan.
[PWM mode] Enable the chassis Q-Fan control in PWM mode for 4-pin chassis fan.

Water Pump+/AIO PUMP Control
[Disabled] Disable the Water Pump control feature.
[Auto] Detects the type of water pump installed and automatically switches the control modes.
[DC mode] Enable the Water Pump control in DC mode for 3-pin chassis fan.
[PWM mode] Enable the Water Pump control in PWM mode for 4-pin chassis fan.

3.8 Boot menu

The Boot menu items allow you to change the system boot options.

Fast Boot
[Disabled] Allows your system to go back to its normal boot speed.
[Enabled] Allows your system to accelerate the boot speed.

The following items appear only when you set the Fast Boot to [Enabled].

Next Boot after AC Power Loss
[Normal Boot] Returns to normal boot on the next boot after an AC power loss.
[Fast Boot] Accelerates the boot speed on the next boot after an AC power loss.
### Boot Configuration

**Setup Mode**
- [Advanced Mode] This item allows you to go to Advanced Mode of the BIOS after POST.
- [EZ Mode] This item allows you to go to EZ Mode of the BIOS after POST.

### CSM (Compatibility Support Module)

This item allows you to configure the CSM (Compatibility Support Module) items to fully support the various VGA, bootable devices and add-on devices for better compatibility.

**Launch CSM**
- [Auto] The system automatically detects the bootable devices and the add-on devices.
- [Enabled] For better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.
- [Disabled] Disable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.

The following items appear only when you set the Launch CSM to [Enabled].

<table>
<thead>
<tr>
<th>Boot Devices Control</th>
<th>Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boot from Network Devices</strong></td>
<td>This item allows you to select the type of network devices that you want to launch.</td>
</tr>
<tr>
<td>Configuration options: [Ignore] [Legacy only] [UEFI driver first]</td>
<td></td>
</tr>
<tr>
<td><strong>Boot from Storage Devices</strong></td>
<td>This item allows you to select the type of storage devices that you want to launch.</td>
</tr>
<tr>
<td>Configuration options: [Ignore] [Legacy only] [UEFI driver first]</td>
<td></td>
</tr>
<tr>
<td><strong>Boot from PCI-E/PCI Expansion Devices</strong></td>
<td>This item allows you to select the type of PCIe/PCI expansion devices that you want to launch.</td>
</tr>
<tr>
<td>Configuration options: [Legacy only] [UEFI driver first]</td>
<td></td>
</tr>
</tbody>
</table>

### Secure Boot

This item allows you to configure the Windows® Secure Boot settings and manage its keys to protect the system from unauthorized access and malwares during POST.
Boot Option Priorities
These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.

- To access Windows® OS in Safe Mode, press <F8> after POST (Windows® 8 not supported).
- To select the boot device during system startup, press <F8> when the ASUS Logo appears.

Boot Override
These items display the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

3.9 Tool menu
The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.

Setup Animator
This item allows you to enable or disable the Setup animator.
Configuration options: [Enabled] [Disabled]

3.9.1 ASUS EZ Flash 3 Utility
This item allows you to run ASUS EZ Flash 3. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.

For more details, refer to section ASUS EZ Flash 3.
3.9.2 Secure Erase

SSD speeds may lower over time as with any storage medium due to data processing. Secure Erase completely and safely cleans your SSD, restoring it to factory performance levels.

Secure Erase is only available in AHCI mode. Ensure to set the SATA mode to AHCI. Click Advanced > PCH Storage Configuration > SATA Mode Selection > AHCI.

To launch Secure Erase, click Tool > Secure Erase on the Advanced mode menu.

Check the ASUS support site for a full list of SSDs tested with Secure Erase. The drive may become unstable if you run Secure Erase on an incompatible SSD.

- The time to erase the contents of your SSD may take a while depending on its size. Do not turn off the system during the process.
- Secure Erase is only supported on Intel SATA port. For more information about Intel SATA ports, refer to section Motherboard layout of this manual.

Status definition:

- **Frozen.** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure Erase.

- **Locked.** SSDs might be locked if the Secure Erase process is either incomplete or was stopped. This may be due to a third party software that uses a different password defined by ASUS. You have to unlock the SSD in the software before proceeding with Secure Erase.
3.9.3  **ASUS User Profile**
This item allows you to save and load BIOS settings profiles.

**Load from Profile**
This item allows you to load the previous BIOS settings saved in the BIOS Flash. Key in the profile number that saved your BIOS settings, press <Enter>, and then select **Yes**.

- DO NOT shut down or reset the system while updating the BIOS to prevent the system boot failure!
- We recommend that you update the BIOS file only coming from the same memory/CPU configuration and BIOS version.

**Profile Name**
This item allows you to key in a profile name.

**Save to Profile**
This item allows you to save the current BIOS settings to the BIOS Flash, and create a profile. Key in a profile number from one to eight, press <Enter>, and then select **Yes**.

**Load/Save Profile from/to USB Drive**
This item allows you to load or save profile from your USB drive, load and save profile to your USB drive.

3.9.4  **ASUS SPD Information**
This item allows you to view the DRAM SPD information.

3.9.5  **Graphics Card Information**
This item displays the information about the graphics card installed in your system.

**GPU Post**
This item displays the information and recommended configuration for the PCIe slots that the graphics card is installed in your system.

- This feature is only supported on selected ASUS graphics cards.

**Bus Interface**
This item allows you to select the bus interface.

Configuration options: [PCIEX16_1]
3.10 Exit menu

The Exit menu items allow you to load the optimal default values for the BIOS items, and save or discard your changes to the BIOS items. You can access the EZ Mode from the Exit menu.

Load Optimized Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F5>, a confirmation window appears. Select Ok to load the default values.

Save Changes & Reset

Once you are finished making your selections, choose this option from the Exit menu to ensure the values you selected are saved. When you select this option or if you press <F10>, a confirmation window appears. Select Ok to save changes and exit.

Discard Changes & Exit

This option allows you to exit the Setup program without saving your changes. When you select this option or if you press <Esc>, a confirmation window appears. Select Ok to discard changes and exit.

Launch EFI Shell from filesystem device

This item allows you to attempt to launch the EFI Shell application (shellx64.efi) from one of the available filesystem devices.
3.11 Updating BIOS

The ASUS website publishes the latest BIOS versions to provide enhancements on system stability, compatibility, and performance. However, BIOS updating is potentially risky. If there is no problem using the current version of BIOS, DO NOT manually update the BIOS. Inappropriate BIOS updating may result to system’s failure to boot. Carefully follow the instructions in this chapter to update your BIOS when necessary.

Visit [http://www.asus.com](http://www.asus.com) to download the latest BIOS file for this motherboard.

The following utilities allow you to manage and update the motherboard BIOS setup program.

1. EZ Update: Updates the BIOS in Windows® environment.
2. ASUS EZ Flash 3: Updates the BIOS using a USB flash drive.
3. ASUS CrashFree BIOS 3: Restores the BIOS using the motherboard support DVD or a USB flash drive when the BIOS file fails or gets corrupted.

3.11.1 EZ Update

The EZ Update is a utility that allows you to update the motherboard BIOS in Windows® environment.

- EZ Update requires an Internet connection either through a network or an ISP (Internet Service Provider).
- This utility is available in the support DVD that comes with the motherboard package.
3.11.2 ASUS EZ Flash 3

ASUS EZ Flash 3 allows you to download and update to the latest BIOS through the Internet without having to use a bootable floppy disk or an OS-based utility.

Updating through the Internet varies per region and Internet conditions. Check your local Internet connection before updating through the Internet.

To update the BIOS by USB:

1. Insert the USB flash disk that contains the latest BIOS file to the USB port.
2. Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select ASUS EZ Flash 3 Utility and press <Enter>.
3. Select via Storage Devices(s).
4. Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, and then press <Enter>.
5. Press the Left/Right arrow keys to switch to the Folder Info field.
6. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.
• This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.
• DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section Exit menu for details.

To update the BIOS by Internet:

1. Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select ASUS EZ Flash 3 Utility and press <Enter>.
2. Select via Internet.

3. Press the Left/Right arrow keys to select an Internet connection method, and then press <Enter>.

4. Follow the onscreen instructions to complete the update.
5. Reboot the system when the update process is done.

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section Exit menu for details.
### 3.11.3 ASUS CrashFree BIOS 3

The ASUS CrashFree BIOS 3 utility is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using the motherboard support DVD or a USB flash drive that contains the BIOS file.

The BIOS file in the motherboard support DVD may be older than the BIOS file published on the ASUS official website. If you want to use the newer BIOS file, download the file at [https://www.asus.com/support/](https://www.asus.com/support/) and save it to a USB flash drive.

#### Recovering the BIOS

**To recover the BIOS:**

1. Turn on the system.
2. Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.
3. The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.
4. The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

**DO NOT** shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!
RAID Support

4.1 RAID configurations

The motherboard supports Intel® Rapid Storage Technology with RAID 0, RAID 1, RAID 5, and RAID 10 solution.

If you want to install a Windows® operating system to a hard disk drive included in a RAID set, you have to create a RAID driver disk and load the RAID driver during OS installation. Refer to section Creating a RAID driver disk for details.

4.1.1 RAID definitions

RAID 0 (Data striping) optimizes two identical hard disk drives to read and write data in parallel, interleaved stacks. Two hard disks perform the same work as a single drive but at a sustained data transfer rate, double that of a single disk alone, thus improving data access and storage. Use of two new identical hard disk drives is required for this setup.

RAID 1 (Data mirroring) copies and maintains an identical image of data from one drive to a second drive. If one drive fails, the disk array management software directs all applications to the surviving drive as it contains a complete copy of the data in the other drive. This RAID configuration provides data protection and increases fault tolerance to the entire system. Use two new drives or use an existing drive and a new drive for this setup. The new drive must be of the same size or larger than the existing drive.

RAID 5 strips both data and parity information across three or more hard disk drives. Among the advantages of RAID 5 configuration include better HDD performance, fault tolerance, and higher storage capacity. The RAID 5 configuration is best suited for transaction processing, relational database applications, enterprise resource planning, and other business systems. Use a minimum of three identical hard disk drives for this setup.

RAID 10 is data striping and data mirroring combined without parity (redundancy data) having to be calculated and written. With the RAID 10 configuration you get all the benefits of both RAID 0 and RAID 1 configurations. Use four new hard disk drives or use an existing drive and three new drives for this setup.
4.1.2 Installing storage devices
The motherboard supports SATA hard disk drives and PCIe SSD storage devices. For optimal performance, install identical drives of the same model and capacity when creating a disk array.

Refer to Chapter 2 for details on installing storage devices to your motherboard.

4.1.3 Intel® Rapid Storage Technology in UEFI BIOS
To enter the Intel® Rapid Storage Technology in UEFI BIOS:

1. Enter the BIOS Setup during POST.
2. Go to the Advanced menu > PCH Storage Configuration, then press <Enter>.
3. Set the SATA Mode Selection item to [Intel RST Premium (RAID)].

If you are using PCIe storage devices, ensure to enable all the PCIE Storage RAID Support items.

4. Go to the Boot menu > CSM (Compatibility Support Module) > Launch CSM, then set the item to [Disabled].
5. Save your changes and exit the BIOS Setup, then enter the BIOS Setup again.
6. Go to the Advanced menu > Intel(R) Rapid Storage Technology, then press <Enter> to display the Intel® Rapid Storage Technology menu.

Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.

Due to chipset limitation, when SATA ports are set to RAID mode, all SATA ports run at RAID mode together.
Creating a RAID set

To create a RAID set:

1. From the Intel® Rapid Storage Technology menu, select **Create RAID Volume** and press <Enter>. The following screen appears:

   ![Screen capture of Intel Rapid Storage Technology menu showing Create RAID Volume options]

   - **Name**: Enter a name for the RAID set and press <Enter>.
   - **RAID Level**: Press <Enter> to select the RAID level to create, and then press <Enter>.
   - **Select Disks**: Press <Enter> and select X for the disks you want to include in the RAID set.

2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.

3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.

4. Under **Select Disks**, press <Enter> and select X for the disks you want to include in the RAID set.
5. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

- RAID 0: 128 KB
- RAID 10: 64 KB
- RAID 5: 64 KB

We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.

6. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

7. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.
Deleting a RAID set

Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Rapid Storage Technology menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:

![Delete RAID volume screen]

2. When the Delete item is selected, press <Enter>, then select Yes to delete the RAID volume and return to the Intel® Rapid Storage Technology menu, or select No to cancel.

![Confirm deletion screen]
4.1.4 **Intel® Virtual Raid on CPU in UEFI BIOS**

This feature requires a KEY module to enable CPU RAID functions with Intel® CPU RSTe.

- The KEY module is purchased separately.
- Due to CPU behavior, CPU RAID functions with Intel® CPU RSTe only supports Intel® Core™ X-series Processors (6-core or above) and Intel® SSD modules.
- Refer to section *Internal connectors* for the location of the VROC_HW_KEY connector.

- Due to hardware design, CPU RAID configuration as OS drives is only supported in the following configuration sets and cannot be created across different sets:
  - **[Set 1]** U.2_1, U.2_2, and U.2_3.
  - **[Set 2]** PCIEX16_1 to PCIEX16_3 with Intel® SSD installed.
  - **[Set 3]** PCIEX16_4 to PCIEX16_7 with Intel® SSD installed.
- Due to hardware design, RAID Volume between M.2_1 and M.2_2 is not supported.

To enter the Intel® Virtual Raid on CPU in UEFI BIOS:

1. Enter the BIOS Setup during POST.
2. Go to the **Boot menu > CSM (Compatibility Support Module) > Launch CSM**, then set the item to **[Disabled]**.
3. Go to the **Advanced menu > CPU Storage Configuration**, then set the PCIe slot(s) that you have installed the storage devices to **[Enabled]**.
4. Save your changes and exit the BIOS Setup, then enter the BIOS Setup again.
5. Go to the **Advanced** menu > **Intel(R) Virtual Raid on CPU > All Intel VMD Controllers**, then press <Enter> to display the Intel® Virtual Raid on CPU menu.

Refer to Chapter 3 for details on entering and navigating through the BIOS Setup.
Creating a RAID set

To create a RAID set:

1. From the Intel® Virtual Raid on CPU menu, select **Create RAID Volume** and press <Enter>. The following screen appears:

   ![Create RAID Volume Screen](image)

   **Name:** Volume0
   **RAID Level:** RAID(0,striped)
   **Enable RAID spanned over VMD Controllers:**
   **Select Disks:**
   - Port 0, VMID, INTEL SSDPEKKX512G7 SN:ET8P135208X512F, 476.9GB
   - Port 1, VMID, INTEL SSDPEKKX512G7 SN:ET8P135208X512F, 476.9GB
   - Port 2, VMID, INTEL SSDPEKKX512G7 SN:ET8P135208X512F, 476.9GB
   - Port 3, VMID, INTEL SSDPEKKX512G7 SN:ET8P135208X512F, 476.9GB

2. When the **Name** item is selected, enter a name for the RAID set and press <Enter>.
3. When the **RAID Level** item is selected, press <Enter> to select the RAID level to create, and then press <Enter>.
4. When the **Enable RAID spanned over VMD Controllers** item is selected, press <Enter> and select X to enable this function.
5. Under **Select Disks**, press <Enter> and select X for the disks you want to include in the RAID set.
6. When the **Strip Size** item is selected, press <Enter> to select strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

- RAID 0: 128 KB
- RAID 10: 64 KB
- RAID 5: 64 KB

We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.

7. When the **Capacity (MB)** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

8. When the **Create Volume** item is selected, press <Enter> to create the RAID volume and return to the Intel® Rapid Storage Technology menu.
Deleting a RAID set

Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the Intel® Virtual Raid on CPU menu, select the RAID volume you want to delete and press <Enter>. The following screen appears:

2. When the Delete item is selected, press <Enter>, then select Yes to delete the RAID volume and return to the Intel® Virtual Raid on CPU menu, or select No to cancel.
Installing the RAID controller driver during Windows® 10 OS installation
This part provides the instructions on how to install the RAID controller drivers during OS installation.

To install the RAID controller driver when installing Windows® 10 OS:

1. Boot the computer using the Windows® 10 OS installation disc. Follow the screen instructions to start installing Windows® 10.

2. When prompted to choose a type of installation, click **Custom: Install Windows only (advanced)**.

3. Click **Load Driver**.
4. A message appears, reminding you to insert the installation media containing the driver of the RAID controller driver. If you have only one optical drive installed in your system, eject the Windows OS installation disc and replace with the motherboard Support DVD into the optical drive. Click **Browse** to continue.

![Browse Driver](image1.png)

5. Locate the driver in the corresponding folder of the Support DVD then click **OK** to continue.

6. Select the RAID controller driver you need from the list and click **Next**.

7. When the system finishes loading the RAID driver, replace the motherboard Support DVD with the Windows Server installation disc. Select the drive to install Windows and click **Next**.

![Select Drive](image2.png)

8. Setup then proceeds with the OS installation. Follow screen instructions to continue.
4.1.5 Intel® Rapid Storage Technology Option ROM utility

To enter the Intel® Rapid Storage Technology Option ROM utility:

1. Turn on the system.
2. During POST, press <Ctrl> + <I> to display the utility main menu.

![Intel® Rapid Storage Technology Option ROM utility interface]

RAID Volumes:
None defined.

Physical Devices:
<table>
<thead>
<tr>
<th>Port</th>
<th>Device Model</th>
<th>Serial #</th>
<th>Size</th>
<th>Type/Status (Vol ID)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ST3160812AS</td>
<td>9LS0HJA4</td>
<td>149.0GB</td>
<td>Non-RAID Disk</td>
</tr>
<tr>
<td>1</td>
<td>ST3160812AS</td>
<td>9LS0F4HL</td>
<td>149.0GB</td>
<td>Non-RAID Disk</td>
</tr>
<tr>
<td>2</td>
<td>ST3160812AS</td>
<td>3LS0JYL8</td>
<td>149.0GB</td>
<td>Non-RAID Disk</td>
</tr>
<tr>
<td>3</td>
<td>ST3160812AS</td>
<td>9LS0BJ5H</td>
<td>149.0GB</td>
<td>Non-RAID Disk</td>
</tr>
</tbody>
</table>

The navigation keys at the bottom of the screen allow you to move through the menus and select the menu options.

- The RAID BIOS setup screens shown in this section are for reference only and may not exactly match the items on your screen.
- The utility supports maximum four hard disk drives for RAID configuration.
Creating a RAID set

To create a RAID set:

1. From the utility main menu, select 1. Create RAID Volume and press <Enter>. The following screen appears:

2. Enter a name for the RAID set and press <Enter>.
3. When the RAID Level item is selected, press the up/down arrow key to select a RAID level to create, and then press <Enter>.
4. When the Disks item is selected, press <Enter> to select the hard disk drives you want to include in the RAID set. The SELECT DISKS screen appears:

   Enter a unique volume name that has no special characters and is 16 characters or less.

   Select 2 to 6 to use in creating the volume.
5. Use the up/down arrow key to select a drive, and then press <Space> to select. A small triangle marks the selected drive. Press <Enter> after completing your selection.

6. Use the up/down arrow key to select the strip size for the RAID array (for RAID 0, 10 and 5 only), and then press <Enter>. The available strip size values range from 4 KB to 128 KB. The following are typical values:

- RAID 0: 128 KB
- RAID 10: 64 KB
- RAID 5: 64 KB

WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST. Are you sure you want to create this volume? (Y/N)

We recommend a lower strip size for server systems, and a higher strip size for multimedia computer systems used mainly for audio and video editing.

7. When the **Capacity** item is selected, enter the RAID volume capacity that you want and press <Enter>. The default value indicates the maximum allowed capacity.

8. When the **Create Volume** item is selected, press <Enter>. The following warning message appears:

```
WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.
Are you sure you want to create this volume? (Y/N)
```

9. Press <Y> to create the RAID volume and return to the main menu, or <N> to go back to the CREATE VOLUME menu.
Deleting a RAID set

Be cautious when deleting a RAID set. You will lose all data on the hard disk drives when you delete a RAID set.

To delete a RAID set:

1. From the utility main menu, select 2. Delete RAID Volume and press <Enter>. The following screen appears:

   ![DELETE VOLUME MENU]

<table>
<thead>
<tr>
<th>Name</th>
<th>Level</th>
<th>Drives</th>
<th>Capacity</th>
<th>Status</th>
<th>Bootable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume0</td>
<td>RAID0 (Stripe)</td>
<td>2</td>
<td>298.0GB</td>
<td>Normal</td>
<td>Yes</td>
</tr>
</tbody>
</table>

   ![HELP]

   Deleting a volume will reset the disks to non-RAID.

   **WARNING:** ALL DISK DATA WILL BE DELETED.
   (This does not apply to Recovery volumes)

   ![DELETE VOLUME VERIFICATION]

   ALL DATA IN THE VOLUME WILL BE LOST!
   (This does not apply to Recovery volumes)

   Are you sure you want to delete “Volume0”? (Y/N):

2. Use the up/down arrow key to select the RAID set you want to delete, and then press <Delete>. The following warning message appears:

3. Press <Y> to delete the RAID set and return to the utility main menu, or press <N> to return to the DELETE VOLUME menu.
Exiting the Intel® Rapid Storage Technology Option ROM utility

To exit the utility:

1. From the utility main menu, select 6. Exit, then press <Enter>. The following warning message appears:

   ![CONFIRM EXIT]

   Are you sure you want to exit? (Y/N):

2. Press <Y> to exit or press <N> to return to the utility main menu.

4.2 Creating a RAID driver disk

4.2.1 Creating a RAID driver disk in Windows®

To install the RAID driver for Windows® OS:

1. During the OS installation, click Load Driver to allow you to select the installation media containing the RAID driver.

2. Insert the USB flash drive with RAID driver into the USB port or the support DVD into the optical drive, and then click Browse.

3. Click the name of the device you’ve inserted, go to Drivers > RAID, and then select the RAID driver for the corresponding OS version. Click OK.

4. Follow the succeeding screen instructions to complete the installation.

   Before loading the RAID driver from a USB flash drive, you have to use another computer to copy the RAID driver from the support DVD to the USB flash drive.

   To set up a Windows® UEFI operating system under RAID mode, ensure to load the UEFI driver for your optical drive.
Multiple GPU Support

5.1 AMD CrossFireX™ technology
The motherboard supports the AMD CrossFireX™ technology that allows you to install multi-graphics processing units (GPU) graphics cards. Follow the installation procedures in this section.

5.1.1 Requirements
• In Dual CrossFireX™ mode, you should have two identical CrossFireX™-ready graphics cards or one CrossFireX™-ready dual-GPU graphics card that are AMD certified.
• Ensure that your graphics card driver supports the AMD CrossFireX™ technology. Download the latest driver from the AMD website at www.AMD.com.
• Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system. See Chapter 1 for details.

  • We recommend that you install additional chassis fans for better thermal environment.
  • Visit the AMD Game website at http://game.AMD.com for the latest certified graphics card and the supported 3D application list.

5.1.2 Before you begin
For AMD CrossFireX™ to work properly, you have to uninstall all existing graphics card drivers before installing AMD CrossFireX™ graphics cards to your system.

To uninstall existing graphics card drivers:
1. Close all current applications.
2. Go to Control Panel > Programs and Features.
3. Select your current graphics card driver/s.
4. Select Uninstall.
5. Turn off your computer.
5.1.3 Installing two CrossFireX™ graphics cards

The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

To install two CrossFireX™ graphics cards:

1. Prepare two CrossFireX™-ready graphics cards.

2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.

4. Align and firmly insert the CrossFireX™ bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

The CrossFireX™ bridge is only required for selected graphics cards.
5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.

5.1.4 Installing three CrossFireX™ graphics cards

To install three CrossFireX™ graphics cards:

1. Prepare three CrossFireX™-ready graphics cards.

2. Insert the three graphics card into the PCIEX16 slots. If your motherboard has more than three PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.

4. Align and firmly insert the two CrossFireX™ bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.

5. Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.
5.1.5 Installing four CrossFireX™ graphics cards

To install four CrossFireX™ graphics cards:

1. Prepare four CrossFireX™-ready graphics cards.

2. Insert the four graphics cards into the PCIEX16 slots. Refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.

4. Align and firmly insert the three CrossFireX™ bridge connectors to the goldfingers on each graphics card. Ensure that the connectors are firmly in place.

5. Connect four independent auxiliary power sources from the power supply to the four graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.
5.1.6 Installing the device drivers

Refer to the documentation that came with your graphics card package to install the device drivers.

Ensure that your PCIe graphics card driver supports the AMD CrossFireX™ technology. Download the latest driver from the AMD website at www.AMD.com.

5.1.7 Enabling the AMD CrossFireX™ technology

After installing your graphics cards and the device drivers, enable the CrossFireX™ feature through the AMD Vision Engine Control Center in Windows environment.

Launching the AMD VISION Engine Control Center

To launch the AMD VISION Engine Control Center:

1. Right-click on the Windows® desktop and select AMD VISION Engine Control Center.
Enabling Dual CrossFireX™ technology

To enable Dual CrossFireX™ technology:

1. In the AMD Vision Engine Control Center window, click **Performance > AMD CrossFireX™**.
2. Select **Enable AMD CrossFireX™**.
3. Select a GPU combination from the drop-down list.
4. Click **Apply** to save and activate the GPU settings made.
5.2 NVIDIA® SLI® technology

The motherboard supports the NVIDIA® SLI® (Scalable Link Interface) technology that allows you to install multi-graphics processing units (GPU) graphics cards. Follow the installation procedures in this section.

5.2.1 Requirements

- In SLI® mode, you should have two identical SLI-ready graphics cards that are NVIDIA® certified.
- Ensure that your graphics card driver supports the NVIDIA® SLI® technology. Download the latest driver from the NVIDIA® website at www.NVIDIA.com.
- Ensure that your power supply unit (PSU) can provide at least the minimum power required by your system.

  - We recommend that you install additional chassis fans for better thermal environment.
  - Visit the NVIDIA® zone website at http://www.nzzone.com for the latest certified graphics card and supported 3D application list.

5.2.2 Installing two SLI-ready graphics cards

The following pictures are for reference only. The graphics cards and the motherboard layout may vary with models, but the installation steps remain the same.

To install two SLI-ready graphics cards:

1. Prepare two SLI-ready graphics cards.
2. Insert the two graphics card into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.
3. Ensure that the cards are properly seated on the slots.
4. Align and firmly insert the SLI® bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

5. Connect two independent auxiliary power sources from the power supply to the two graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.

5.2.3 Installing three SLI-ready graphics cards

Refer to the documentation that came with your graphics card package to install the device drivers.

To install three SLI-ready graphics cards:

1. Prepare three SLI-ready graphics cards.

2. Insert the three graphics cards into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.
4. Align and firmly insert the 3-way SLI® bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

5. Connect three independent auxiliary power sources from the power supply to the three graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.

5.2.4 Installing four SLI-ready graphics cards

To install four SLI-ready graphics cards:

1. Prepare four SLI-ready graphics cards.

2. Insert the four graphics cards into the PCIEX16 slots. If your motherboard has more than two PCIEX16 slots, refer to Chapter 1 in this user manual for the locations of the PCIEX16 slots recommended for multi-graphics card installation.

3. Ensure that the cards are properly seated on the slots.

4. Align and firmly insert the 4-way SLI® bridge connector to the goldfingers on each graphics card. Ensure that the connector is firmly in place.

5. Connect four independent auxiliary power sources from the power supply to the four graphics cards separately.

6. Connect a VGA or a DVI cable to the graphics card.
5.2.5 Installing the device drivers

Refer to the documentation that came with your graphics card package to install the device drivers.

Ensure that your PCIe graphics card driver supports the NVIDIA® SLI® technology. Download the latest driver from the NVIDIA® website at www.NVIDIA.com.

5.2.6 Enabling the NVIDIA® SLI® technology

After installing your graphics cards and the device drivers, enable the SLI® feature in NVIDIA® Control Panel under the Windows® 10 operating system.

Launching the NVIDIA® Control Panel

You can launch the NVIDIA® Control Panel by the following two methods:

A. Right click on the empty space of the Windows® desktop and select NVIDIA® Control Panel.

The NVIDIA® Control Panel window appears (See Step B3).

B1. If you cannot see the NVIDIA® Control Panel item in step (A), select Screen Resolution.

View
Sort by
Refresh
Paste
Paste shortcut

NVIDIA Control Panel

New

Screen resolution
Gadgets
Personalize

View
Sort by
Refresh
Paste
Paste shortcut

Screen resolution
Gadgets
Personalize

Undo Rename Ctrl+Z

New
B2. From the Screen Resolution window, click **Advanced settings**.

B3. The NVIDIA® Control Panel window appears.

**Enabling SLI® settings**

From the NVIDIA® Control Panel window, select **Configure SLI, Surround, PhysX**. In the **Quad-SLI enabled**, click **Maximize 3D Performance SLI** to set the display for viewing SLI® rendered content. When done, click **Apply**.
Appendix

Pro WS X299 SAGE II block diagram (48-Lane)
## Q-Code table

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Not used</td>
</tr>
<tr>
<td>02</td>
<td>microcode</td>
</tr>
<tr>
<td>03</td>
<td>CACHE_ENABLED</td>
</tr>
<tr>
<td>04</td>
<td>PCH initialization</td>
</tr>
<tr>
<td>06</td>
<td>CPU_EARLY_INIT</td>
</tr>
<tr>
<td>10</td>
<td>PEI Core is started</td>
</tr>
<tr>
<td>11 – 14</td>
<td>Pre-memory CPU initialization is started</td>
</tr>
<tr>
<td>15 – 18</td>
<td>Pre-memory System Agent initialization is started</td>
</tr>
<tr>
<td>19 – 1C</td>
<td>Pre-memory PCH initialization is started</td>
</tr>
<tr>
<td>2B – 2F</td>
<td>Memory initialization</td>
</tr>
<tr>
<td>30</td>
<td>Reserved for ASL (see ASL Status Codes section below)</td>
</tr>
<tr>
<td>31</td>
<td>Memory Installed</td>
</tr>
<tr>
<td>32 – 36</td>
<td>CPU post-memory initialization</td>
</tr>
<tr>
<td>37 – 3A</td>
<td>Post-Memory System Agent initialization is started</td>
</tr>
<tr>
<td>3B – 3E</td>
<td>Post-Memory PCH initialization is started</td>
</tr>
<tr>
<td>4F</td>
<td>DXE IPL is started</td>
</tr>
<tr>
<td>50 – 53</td>
<td>Memory initialization error. Invalid memory type or incompatible memory speed</td>
</tr>
<tr>
<td>4F</td>
<td>DXE IPL is started</td>
</tr>
<tr>
<td>54</td>
<td>Unspecified memory initialization error</td>
</tr>
<tr>
<td>55</td>
<td>Memory not installed</td>
</tr>
<tr>
<td>56</td>
<td>Invalid CPU type or Speed</td>
</tr>
<tr>
<td>57</td>
<td>CPU mismatch</td>
</tr>
<tr>
<td>58</td>
<td>CPU self test failed or possible CPU cache error</td>
</tr>
<tr>
<td>59</td>
<td>CPU micro-code is not found or micro-code update is failed</td>
</tr>
<tr>
<td>5A</td>
<td>Internal CPU error</td>
</tr>
<tr>
<td>5B</td>
<td>Reset PPI is not available</td>
</tr>
<tr>
<td>5C – 5F</td>
<td>Reserved for future AMI error codes</td>
</tr>
<tr>
<td>E0</td>
<td>S3 Resume is stared (S3 Resume PPI is called by the DXE IPL)</td>
</tr>
<tr>
<td>E1</td>
<td>S3 Boot Script execution</td>
</tr>
<tr>
<td>E2</td>
<td>Video repost</td>
</tr>
<tr>
<td>E3</td>
<td>OS S3 wake vector call</td>
</tr>
<tr>
<td>E4 – E7</td>
<td>Reserved for future AMI progress codes</td>
</tr>
<tr>
<td>E8</td>
<td>S3 Resume Failed</td>
</tr>
<tr>
<td>E9</td>
<td>S3 Resume PPI not Found</td>
</tr>
<tr>
<td>EA</td>
<td>S3 Resume Boot Script Error</td>
</tr>
<tr>
<td>EB</td>
<td>S3 OS Wake Error</td>
</tr>
<tr>
<td>EC – EF</td>
<td>Reserved for future AMI error codes</td>
</tr>
</tbody>
</table>

(continued on the next page)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>Recovery condition triggered by firmware (Auto recovery)</td>
</tr>
<tr>
<td>F1</td>
<td>Recovery condition triggered by user (Forced recovery)</td>
</tr>
<tr>
<td>F2</td>
<td>Recovery process started</td>
</tr>
<tr>
<td>F3</td>
<td>Recovery firmware image is found</td>
</tr>
<tr>
<td>F4</td>
<td>Recovery firmware image is loaded</td>
</tr>
<tr>
<td>F5 – F7</td>
<td>Reserved for future AMI progress codes</td>
</tr>
<tr>
<td>F8</td>
<td>Recovery PPI is not available</td>
</tr>
<tr>
<td>F9</td>
<td>Recovery capsule is not found</td>
</tr>
<tr>
<td>FA</td>
<td>Invalid recovery capsule</td>
</tr>
<tr>
<td>FB – FF</td>
<td>Reserved for future AMI error codes</td>
</tr>
<tr>
<td>60</td>
<td>DXE Core is started</td>
</tr>
<tr>
<td>61</td>
<td>NVRAM initialization</td>
</tr>
<tr>
<td>62</td>
<td>Installation of the PCH Runtime Services</td>
</tr>
<tr>
<td>63 – 67</td>
<td>CPU DXE initialization is started</td>
</tr>
<tr>
<td>68</td>
<td>PCI host bridge initialization</td>
</tr>
<tr>
<td>69</td>
<td>System Agent DXE initialization is started</td>
</tr>
<tr>
<td>6A</td>
<td>System Agent DXE SMM initialization is started</td>
</tr>
<tr>
<td>6B – 6F</td>
<td>System Agent DXE initialization (System Agent module specific)</td>
</tr>
<tr>
<td>70</td>
<td>PCH DXE initialization is started</td>
</tr>
<tr>
<td>71</td>
<td>PCH DXE SMM initialization is started</td>
</tr>
<tr>
<td>72</td>
<td>PCH devices initialization</td>
</tr>
<tr>
<td>73 – 77</td>
<td>PCH DXE Initialization (PCH module specific)</td>
</tr>
<tr>
<td>78</td>
<td>ACPI module initialization</td>
</tr>
<tr>
<td>79</td>
<td>CSM initialization</td>
</tr>
<tr>
<td>7A – 7F</td>
<td>Reserved for future AMI DXE codes</td>
</tr>
</tbody>
</table>

(continued on the next page)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>Boot Device Selection (BDS) phase is started</td>
</tr>
<tr>
<td>91</td>
<td>Driver connecting is started</td>
</tr>
<tr>
<td>92</td>
<td>PCI Bus initialization is started</td>
</tr>
<tr>
<td>93</td>
<td>PCI Bus Hot Plug Controller Initialization</td>
</tr>
<tr>
<td>94</td>
<td>PCI Bus Enumeration</td>
</tr>
<tr>
<td>95</td>
<td>PCI Bus Request Resources</td>
</tr>
<tr>
<td>96</td>
<td>PCI Bus Assign Resources</td>
</tr>
<tr>
<td>97</td>
<td>Console Output devices connect</td>
</tr>
<tr>
<td>98</td>
<td>Console input devices connect</td>
</tr>
<tr>
<td>99</td>
<td>Super IO Initialization</td>
</tr>
<tr>
<td>9A</td>
<td>USB initialization is started</td>
</tr>
<tr>
<td>9B</td>
<td>USB Reset</td>
</tr>
<tr>
<td>9C</td>
<td>USB Detect</td>
</tr>
<tr>
<td>9D</td>
<td>USB Enable</td>
</tr>
<tr>
<td>9E – 9F</td>
<td>Reserved for future AMI codes</td>
</tr>
<tr>
<td>A0</td>
<td>IDE initialization is started</td>
</tr>
<tr>
<td>A1</td>
<td>IDE Reset</td>
</tr>
<tr>
<td>A2</td>
<td>IDE Detect</td>
</tr>
<tr>
<td>A3</td>
<td>IDE Enable</td>
</tr>
<tr>
<td>A4</td>
<td>SCSI initialization is started</td>
</tr>
<tr>
<td>A5</td>
<td>SCSI Reset</td>
</tr>
<tr>
<td>A6</td>
<td>SCSI Detect</td>
</tr>
<tr>
<td>A7</td>
<td>SCSI Enable</td>
</tr>
<tr>
<td>A8</td>
<td>Setup Verifying Password</td>
</tr>
<tr>
<td>A9</td>
<td>Start of Setup</td>
</tr>
<tr>
<td>AA</td>
<td>Reserved for ASL (see ASL Status Codes section below)</td>
</tr>
<tr>
<td>AB</td>
<td>Setup Input Wait</td>
</tr>
</tbody>
</table>

(continued on the next page)
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Reserved for ASL (see ASL Status Codes section below)</td>
</tr>
<tr>
<td>AD</td>
<td>Ready To Boot event</td>
</tr>
<tr>
<td>AE</td>
<td>Legacy Boot event</td>
</tr>
<tr>
<td>AF</td>
<td>Exit Boot Services event</td>
</tr>
<tr>
<td>B0</td>
<td>Runtime Set Virtual Address MAP Begin</td>
</tr>
<tr>
<td>B1</td>
<td>Runtime Set Virtual Address MAP End</td>
</tr>
<tr>
<td>B2</td>
<td>Legacy Option ROM Initialization</td>
</tr>
<tr>
<td>B3</td>
<td>System Reset</td>
</tr>
<tr>
<td>B4</td>
<td>USB hot plug</td>
</tr>
<tr>
<td>B5</td>
<td>PCI bus hot plug</td>
</tr>
<tr>
<td>B6</td>
<td>Clean-up of NVRAM</td>
</tr>
<tr>
<td>B7</td>
<td>Configuration Reset (reset of NVRAM settings)</td>
</tr>
<tr>
<td>B8–BF</td>
<td>Reserved for future AMI codes</td>
</tr>
<tr>
<td>D0</td>
<td>CPU initialization error</td>
</tr>
<tr>
<td>D1</td>
<td>System Agent initialization error</td>
</tr>
<tr>
<td>D2</td>
<td>PCH initialization error</td>
</tr>
<tr>
<td>D3</td>
<td>Some of the Architectural Protocols are not available</td>
</tr>
<tr>
<td>D4</td>
<td>PCI resource allocation error. Out of Resources</td>
</tr>
<tr>
<td>D5</td>
<td>No Space for Legacy Option ROM</td>
</tr>
<tr>
<td>D6</td>
<td>No Console Output Devices are found</td>
</tr>
<tr>
<td>D7</td>
<td>No Console Input Devices are found</td>
</tr>
<tr>
<td>D8</td>
<td>Invalid password</td>
</tr>
<tr>
<td>D9</td>
<td>Error loading Boot Option (LoadImage returned error)</td>
</tr>
<tr>
<td>DA</td>
<td>Boot Option is failed (StartImage returned error)</td>
</tr>
<tr>
<td>DB</td>
<td>Flash update is failed</td>
</tr>
<tr>
<td>DC</td>
<td>Reset protocol is not available</td>
</tr>
</tbody>
</table>

**ACPI/ASL Checkpoints (under OS)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>System is entering S3 sleep state</td>
</tr>
<tr>
<td>04</td>
<td>System is entering S4 sleep state</td>
</tr>
<tr>
<td>05</td>
<td>System is entering S5 sleep state</td>
</tr>
<tr>
<td>30</td>
<td>System is waking up from the S3 sleep state</td>
</tr>
<tr>
<td>40</td>
<td>System is waking up from the S4 sleep state</td>
</tr>
<tr>
<td>AC</td>
<td>System has transitioned into ACPI mode. Interrupt controller is in PIC mode.</td>
</tr>
<tr>
<td>AA</td>
<td>System has transitioned into ACPI mode. Interrupt controller is in APIC mode.</td>
</tr>
</tbody>
</table>
Notices

Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer’s instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.
Compliance Statement of Innovation, Science and Economic Development Canada (ISED)

This Class B digital apparatus complies with Canadian ICES-003, RSS-210, and CAN ICES-3(B)/NMB-3(B).

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Déclaration de conformité de Innovation, Sciences et Développement économique Canada (ISED)

Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003, RSS-210 et CAN ICES-3(B)/NMB-3(B).

Cet appareil est conforme aux normes CNR exemptes de licence d’Industrie Canada. Le fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d’interférences et (2) cet appareil doit accepter toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité de l’appareil.

VCCI: Japan Compliance Statement

Class B ITE

KC: Korea Warning Statement

이 기기는 가정용 (B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.
Declaration of compliance for product environmental regulation

ASUS follows the green design concept to design and manufacture our products, and makes sure that each stage of the product life cycle of ASUS product is in line with global environmental regulations. In addition, ASUS disclose the relevant information based on regulation requirements.

Please refer to [http://csr.asus.com/Compliance.htm](http://csr.asus.com/Compliance.htm) for information disclosure based on regulation requirements ASUS is complied with:

**EU REACH and Article 33**

Complying with the REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals) regulatory framework, we published the chemical substances in our products at ASUS REACH website at [http://csr.asus.com/english/REACH.htm](http://csr.asus.com/english/REACH.htm).

**EU RoHS**

This product complies with the EU RoHS Directive. For more details, see [http://csr.asus.com/english/article.aspx?id=35](http://csr.asus.com/english/article.aspx?id=35)

**India RoHS**

This product complies with the “India E-Waste (Management) Rules, 2016” and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in concentrations exceeding 0.1% by weight in homogenous materials and 0.01% by weight in homogenous materials for cadmium, except for the exemptions listed in Schedule II of the Rule.

**Vietnam RoHS**

ASUS products sold in Vietnam, on or after September 23, 2011, meet the requirements of the Vietnam Circular 30/2011/TT-BCT.

Các sản phẩm ASUS bán tại Việt Nam, vào ngày 23 tháng 9 năm 2011 trở về sau, đều phải đáp ứng các yêu cầu của Thông tư 30/2011/TT-BCT của Việt Nam.

**Turkey RoHS**

AEEE Yönetmeliğine Uygundur

**ASUS Recycling/Takeback Services**

ASUS recycling and takeback programs come from our commitment to the highest standards for protecting our environment. We believe in providing solutions for you to be able to responsibly recycle our products, batteries, other components as well as the packaging materials. Please go to [http://csr.asus.com/english/Takeback.htm](http://csr.asus.com/english/Takeback.htm) for detailed recycling information in different regions.
DO NOT throw the motherboard in municipal waste. This product has been designed to enable proper reuse of parts and recycling. This symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

DO NOT throw the mercury-containing button cell battery in municipal waste. This symbol of the crossed out wheeled bin indicates that the battery should not be placed in municipal waste.

Regional notice for California

WARNING

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Google™ License Terms

Copyright© 2020 Google Inc. All Rights Reserved.

Licensed under the Apache License, Version 2.0 (the “License”); you may not use this file except in compliance with the License. You may obtain a copy of the License at:
http://www.apache.org/licenses/LICENSE-2.0

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an “AS IS” BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.

See the License for the specific language governing permissions and limitations under the License.
French: AsusTek Computer Inc. déclare par la présente que cet appareil est conforme aux critères essentiels et autres clauses pertinentes des directives concernées. La déclaration de conformité de l’UE peut être téléchargée à partir du site Internet suivant: www.asus.com/support

Deutsch: ASUS Computer Inc. erklärt hiermit, dass dieses Gerät mit den wesentlichen Anforderungen und anderen relevanten Bestimmungen der zugehörigen Richtlinien übereinstimmt. Der gesamte Text der EU-Konformitätserklärung ist verfügbar unter: www.asus.com/support

Italiano: ASUS Computer Inc. con la presente dichiara che questo dispositivo è conforme ai requisiti essenziali e alle altre disposizioni pertinenti con le direttive correlate. Il testo completo della dichiarazione di conformità UE è disponibile all’indirizzo: www.asus.com/support

Русский: Компания ASUS заявляет, что это устройство соответствует основным требованиям и другим соответствующим условиям действующих директив. Полный текст декларации соответствия ЕС доступен на адресе: www.asus.com/support

Български: С настоящото ASUS ТeK Computer Inc. декларира, че това устройство е в съответствие със съществените изисквания и другите приложими постановления на свързаните директиви. Пълният текст на декларацията за съответствие на ЕС е достъпен на адрес: www.asus.com/support

Hrvatski: ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj u sbitim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o usklađenosti dostupan je na: www.asus.com/support

Čeština: Společnost ASUSTeK Computer Inc. tímto prohlašuje, že toto zařízení splňuje základní podmínky a další příslušné ustanovení souvisejících směrnic. Plné znění prohlášení o shodě EU je k dispozici na adrese: www.asus.com/support

Dansk: ASUS Computer Inc. erklærer herved, at dette enhed er i overensstemmelse med hævdede krav og andre relevante bestemmelser i de relaterede direktiver. Hele EU-overensstemmelseserklæringen kan findes på: www.asus.com/support

Nederlands: ASUSTeK Computer Inc. verklaart hierbij dat dit apparaat voldoet aan de essentiële eisen en andere relevante bepalingen van de verwante richtlijnen. De volledige tekst van de EU-verklaring van overeenstemming is beschikbaar op: www.asus.com/support

Suomi: ASUSTeK Computer Inc. ilmoittaa tätä, että tämä laite on asiainkuuluvien direktiivien olemaan vaatimusten ja muiden tätä koskevien säädösten mukainen. Yhdemmukainsaamimuutmukseen koko teksti on luettavissa osoitteessa: www.asus.com/support

Ελληνικά: Με το παρόν, η ASUSTeK Computer Inc. δηλώνει ότι αυτή η συσκευή συμπληρώνεται με τις θεμελιώδεις απαιτήσεις και άλλες σχετικές διατάξεις των Οδηγιών της ΕΕ. Το πλήρες κείμενο της δηλώσεως συμμόρφωσης είναι διαθέσιμο στη διεύθυνση: www.asus.com/support

Українська: ASUSTeK Computer Inc. заявлю, що цей пристрій відповідає основним вимогам та іншим відповідним положенням відповідних Директив. Повний текст декларації відповідності стандартам ЕС доступний на: www.asus.com/support

Турецки: ASUSTeK Computer Inc. bu sayet temel gereksinimlerine ve ilişkili Yönetmelere uygun olduğunu beyan eder. AB uyguluk bildirimim tam metni şu adreste bulabilirsiniz: www.asus.com/support

Bosanski: ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj usklađen sa bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o usklađenosti dostupan je na: www.asus.com/support

Português: A ASUSTeK Computer Inc. declara que este dispositivo está em conformidade com os requisitos essenciais e outras disposições relevantes das Diretivas relacionadas. Texto integral da declaração da UE disponível em: www.asus.com/support

Русский: ASUS Computer Inc. заявляет, что это устройство соответствует основным требованиям и другим соответствующим условиям действующих директив. Полный текст декларации соответствия ЕС доступен на адресе: www.asus.com/support

Español: Por la presente, ASUSTeK Computer Inc. declara que este dispositivo cumple los requisitos básicos y otras disposiciones pertinentes de las directivas relacionadas. El texto completo de la declaración de la UE de conformidad está disponible en: www.asus.com/support

Bosanski: ASUSTeK Computer Inc. ovim izjavljuje da je ovaj uređaj usklađen sa bitnim zahtjevima i ostalim odgovarajućim odredbama vezanih direktiva. Cijeli tekst EU izjave o usklađenosti dostupan je na: www.asus.com/support

Appendix

ASUS Pro WS X299 SAGE II
ASUS contact information

ASUSTeK COMPUTER INC.
Address 1F, No. 15, Lide Rd., Beitou Dist., Taipei City 112, Taiwan
Telephone +886-2-2894-3447
Fax +886-2-2890-7798
Web site https://www.asus.com

Technical Support
Telephone +86-21-38429911
Online Support https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=en

ASUS COMPUTER INTERNATIONAL (America)
Address 48720 Kato Rd., Fremont, CA 94538, USA
Fax +1-510-608-4555
Web site https://www.asus.com/us/

Technical Support
Support fax +1-812-284-0883
Telephone +1-812-282-2787
Online support https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=en-us

ASUS COMPUTER GmbH (Germany and Austria)
Address Harkortstrasse 21-23, 40880 Ratingen, Germany
Web site https://www.asus.com/de/
Online contact https://www.asus.com/support/Product/ContactUs/Services/questionform/?lang=de-de

Technical Support
Telephone (DE) +49-2102-5789557
Telephone (AT) +43-1360-2775461
Online support https://www.asus.com/de/support
FCC COMPLIANCE INFORMATION
Per FCC Part 2 Section 2.1077

Responsible Party: Asus Computer International
Address: 48720 Kato Rd., Fremont, CA 94538
Phone/Fax No: (510)739-3777/(510)608-4555

hereby declares that the product

Product Name : PRO WS X299 SAGE II
Model Number : PRO WS X299 SAGE II

compliance statement:
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Ver. 180125