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User manual ASUS SABERTOOTH Z87
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**SABERTOOTH
Z87**

ASUS

Motherboard



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Manual abstract:

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 <http://support.asus.com/download> 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., 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. This offer is valid to anyone in receipt of this information. Turning off the computer. 2 Installing the RAID driver during Windows OS installation. 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. Vi 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: 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.

This chapter lists the hardware setup procedures that you have to perform when installing system components. This chapter tells how to change system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided. This chapter describes the contents of the support DVD that comes with the motherboard package and the software. This chapter describes the RAID configurations. Chapter 5: RAID support Chapter 4: Software support Chapter 3: BIOS setup Chapter 2: Basic installation Chapter 1: Product introduction Where to find more information Refer to the following sources for additional information and for product and software updates. 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. optional documentation ASUS websites 2. Vii 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. 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 (+).

0 support depends on the CPU types. chipset Memory Intel® Z87 Express Chipset 4 x DIMM, max. 32GB, DDR3 1866 / 1600 / 1333 / 1066 MHz, non-ECC, un-buffered memory Dual channel memory architecture Supports Intel® Extreme Memory Profile (XMP) * Hyper DIMM support is subject to the physical characteristics of individual CPUs. Resolution of 4096 x 2304 @24Hz and 2560 x 1600 @60Hz Supports Intel® InTru 3D, Intel® Quick Sync Video, Intel® Clear Video HD Technology and Intel® Insider Supports up to three displays simultaneously Maximum shared memory 1024MB Multi-GPU support LAN Supports NVIDIA® Quad-GPU SLI Technology Intel® I217-V Gigabit LAN controller Supports AMD® Quad-GPU CrossFireX Technology (continued on the next page) ix SABERTOOTH Z87 specifications summary Storage Intel® Z87 Express Chipset - 6 x SATA 6.0 Gb/s ports (brown) with RAID 0, 1, 5 and 10 support - Supports Intel® Smart Response Technology, Intel® Rapid Start Technology, Intel® Smart Connect Technology* - 2 x SATA 6.

0 Gb/s ports (beige) - 2 x eSATA 6.0 Gb/s ports (red) 2 x ASMedia® SATA 6Gb/s controllers** * These functions will work depending on the CPU installed. - Absolute pitch 192khz/24bit true BD lossless sound - BD audio layer content protection - Supports jack-detection, multi-streaming and front panel jackretasking - Optical S/PDIF out ports at rear I/O USB Intel® Z87 Express Chipset - supports ASUS USB 3.1 ports (4 ports at mid-board, 4 ports at rear panel) - TUF Thermal Armor with Flow Valve - TUF Thermal Radar 2 with Thermistor cables - TUF Fortifier Exclusive TUF Features Ultimate COOL! 1 ports 1 x 4-pin CPU Fan connector (black) supports both 3-pin (DC mode) and 4-pin (PWM mode) CPU coolers control 1 x 4-pin CPU Optional Fan connector (CPU_OPT; black) 4 x 4-pin Chassis Fan connectors (black) 2 x 3-pin Assistant Fan connectors (white) 1 x TPM connector 3 x Thermal Sensor connectors (T_Sensor) 1 x S/PDIF out header 1 x DirectKey button 1 x MemOK! 4 cm Specifications are subject to change without notice.



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Xii Package contents Check your motherboard package for the following items User Manual ASUS SABERTOOTH Z87 motherboard Technical documentations, certification and warranty card Support DVD 4 x Serial ATA 6.0 Gb/s cables 1 x ASUS SLI bridge connector 1 x ASUS Q-Shield 1 x 2-in-1 ASUS Q-Connector kit 2 x 35mm Assistant fans 2 x short fan screws 4 x long fan screws 3 x PCIe x16 slot covers 3 x PCIe x1 slot covers 2 x DRAM slot covers Rear I/O dust filter 1 x 40mm I/O assistant fan lid 1 x Connector cap set (LAN cap, HDMI cap, DVI cap, DP cap, Front USB 3.0 connector caps 6 x Audio connector caps 1 x Adhesive foam for 35mm assistant fan) If any of the above items is damaged or missing, contact your retailer. The illustrated items above are for reference only. Actual product specifications may vary with different models. **Xiii Installation tools and components** 1 bag of screws Philips (cross) screwdriver PC chassis Power supply unit Intel LGA1150 CPU Intel LGA1150 compatible CPU Fan DIMM SATA hard disk drive SATA optical disc drive (optional) Graphics card (optional) The tools and components in the table above are not included in the motherboard package.

I Special features Product highlights 1 LGA1150 socket for 4th generation Intel Core i7/Intel Core i5/Intel Core i3, Pentium and Celeron processors This motherboard supports 4th generation Intel Core i7/Intel Core i5/Intel Core i3, Pentium and Celeron processors in the LGA1150 package. It provides great graphics and system performance with its GPU, dual-channel DDR3 memory slots and PCI Express 2.0. Intel Z87 Express Chipset Intel Z87 Express Chipset is a single chipset that supports the LGA1150 socket for 4th generation Intel Core i7/Intel Core i5/Intel Core i3, Pentium and Celeron processors. It utilizes the serial point-to-point links, which increases bandwidth and enhances the system's performance. It natively supports up to six USB 3.0 ports for up to ten times faster transfer rate than USB 2.0 and enables the iGPU function for Intel integrated graphics performance. 0) is the PCI Express bus standard that provides twice the performance and speed of PCIe 2.0. It provides an optimal graphics performance, unprecedented data speed and seamless transition with its complete backward compatibility to PCIe 1.

Dual-Channel DDR3 1866 / 1600 / 1333 / 1066 MHz Support The motherboard supports the dual-channel DDR3 memory that features data transfer rates of DDR3 1866 / 1600 / 1333 / 1033 MHz to boost the system's performance, and to meet the higher bandwidth requirements of 3D graphics, multimedia and Internet applications. **Quad-GPU SLI and Quad GPU CrossFireX** Support This motherboard features the most powerful Intel Z87 platform that optimizes PCIe allocation in multi-GPU SLI and CrossFireX solution, giving you a brand-new gaming enjoyment. **ASUS SABERTOOTH Z87 I-I Chapter I Intel Smart Response Technology** Intel Smart Response Technology, an important part of Green ASUS eco-friendly computing, reduces load and wait time, eliminates unnecessary hard drive spin thus lowering power usage, and uses an installed SSD (requires 18.6 GB available space) as a cache for frequently accessed data or applications. It combines SSD performance and hard drive capacity, operating up to six times faster than a hard-drive-only system to boost the system's overall performance.

**** An operating system must be installed on the HDD to launch Intel Smart Response F12 BIOS snapshot hotkey F3 Shortcut for most accessed information** ASUS DRAM SPD (Serial Presence Detect) information detecting faulty DIMMs, and helping with difficult POST situations. **ASUS Q-Design** ASUS Q-Design enhances your DIY experience. All of Q-Slot and Q-Shield design speed up and simplify the DIY process. **ASUS Q-shield** ASUS Q-Shield's special design makes it convenient and easy to install on your motherboard. With better electric conductivity, it ideally protects your motherboard against static electricity and shields it against EMI (Electronic Magnetic Interference).

ASUS Q-connector ASUS Q-Connector is a unique adapter that allows you to easily connect or disconnect the chassis front panel cables to one module, eliminating the hassle of plugging one cable at a time and making the connection quick and accurate. **DirectKey** DirectKey allows you to conveniently go into the BIOS setup with the press of a button. With this feature, you can enter the BIOS anytime without having to press the key during POST. It also allows you to shut down or turn on your computer and directly enter the 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 Rear I/O connection** for more information about rear panel connectors and internal connectors. **3** The motherboard comes with a surface mount LGA1150 socket designed for the 4th Generation Intel Core i7 / Intel Core i5 / Intel Core i3, Pentium and Celeron processors.

Central Processing Unit (CPU) Ensure that all power cables are unplugged before installing the CPU. Ensure that you install the correct CPU designed for LGA1150 only. **DO NOT** install a CPU designed for LGA1155 and LGA1156 sockets on the LGA1150 socket. 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 LGA1150 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.



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DO NOT install a DDR or DDR2 memory module to the DDR3 slot.

System memory Recommended memory configurations ASUS SABERTOOTH Z87 1-11 Chapter 1 Memory configurations You may install 2GB, 4GB and 8GB unbuffered and non-ECC DDR3 DIMMs into the DIMM sockets. You may install varying memory sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess memory from the higher-sized channel is then mapped for single-channel operation. According to Intel CPU spec, DIMM voltage below 1.

65V is recommended to protect the CPU. Always install DIMMs with the same CAS latency. For optimum compatibility, we recommend that you obtain memory modules from the same vendor. Due to the memory address limitation on 32-bit Windows OS, when you install 4GB or more memory on the motherboard, the actual usable memory for the OS can be about 3GB or less. For effective use of memory, we recommend that you do any of the following: a) Use a maximum of 3GB system memory if you are using a 32-bit Windows OS.

B) Install a 64-bit Windows OS when you want to install 4GB or more on the motherboard. C) For more details, refer to the Microsoft support site at <http://support.microsoft.com>. This motherboard does not support DIMMs made up of 512Mb (64MB) chips or less (Memory chip capacity counts in Megabit, 8 Megabit/Mb = 1 Megabyte/MB). 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. To operate at the vendor-marked or at a higher frequency, refer to section 3.5 Ai Tweaker menu for manual memory frequency adjustment. For system stability, use a more efficient memory cooling system to support a full memory load (4 DIMMs) or overclocking condition. Memory modules with memory frequency higher than 2133MHz and their corresponding timing or the loaded XMP profile is not the JEDEC memory standard. The stability and compatibility of the memory modules depend on the CPU capabilities and other installed devices.

5 - Chapter 1 1-18 Chapter 1: Product introduction Side(s): SS - Single-sided DS - Double-sided DIMM support: (1) Supports one (1) module inserted into any slot as Single-channel memory configuration. We suggest that you install the module into A2 slot. (2) Supports two (2) modules inserted into either the dark brown slots or the beige slots as one pair of Dual-channel memory configuration. We suggest that you install the modules into slots A2 and B2 for better compatibility. (4) Supports four (4) modules inserted into both the dark brown slots and beige slots as two pairs of Dual-channel memory configuration. ASUS exclusively provides hyper DIMM support function. Hyper DIMM support is subject to the physical characteristics of individual CPUs. Settings in the BIOS for the hyper DIMM support. Visit the ASUS website for the latest QVL. 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. 0 x16_3 slot Chapter 1 1-20 Chapter 1: Product introduction PCIe x16_3 Configuration x1 mode x4 mode eSATA mode PCI Express sharing mode PCIe x16_3 x1 x4 x1 PCIe x1_1 x1 Disabled N/A PCIe x1_2 x1 Disabled x1 PCIe x1_3 x1 Disabled x1 eSATA 6Gb/s Disabled Disabled Enabled We recommend that you provide sufficient power when running CrossFireX or SLI mode. Connect a chassis fan to the motherboard connector labeled CHA_FAN1-4 when using multiple graphics cards for better thermal environment. 6 Onboard buttons allow you to fine-tune performance when working on a bare or open case system. This is ideal for overclockers and gamers who continually change settings to enhance system performance.

1. Installing DIMMs that are not compatible with the motherboard may cause system boot failure, and the DRAM_LED near the MemOK! Button until the DRAM_LED starts blinking to begin automatic memory compatibility tuning for successful boot. 8 Onboard LEDs for the exact location of the DRAM_LED. The DRAM_LED also lights up when the DIMM is not properly installed. Turn off the system and reinstall the DIMM before using the MemOK! During the tuning process, the system loads and tests failsafe memory settings.

It takes about 30 seconds for the system to test one set of failsafe settings. If the test fails, the system reboots and test the next set of failsafe settings. The blinking speed of the DRAM_LED increases, indicating different test processes. Due to memory tuning requirement, the system automatically reboots when each timing set is tested. If the installed DIMMs still fail to boot after the whole tuning process, the DRAM_LED lights continuously. Replace the DIMMs with ones recommended in the Memory QVL (Qualified Vendors Lists) in this user manual or on the ASUS website at www.asus.com. If you turn off the computer and replace DIMMs during the tuning process, the system continues memory tuning after turning on the computer. To stop memory tuning, turn off the computer and unplug the power cord for about 5 seconds. If your system fails to boot up due to BIOS overclocking, press the MemOK! button to boot and load the BIOS default settings. A message will appear during POST reminding you that the BIOS has been restored to its default settings.

We recommend that you download and update to the latest BIOS version from the ASUS website at www.asus.com. Com after using the MemOK! This feature allows your system to go to the BIOS Setup program with the press of a button. With DirectKey, you can enter the BIOS anytime without having to press the <Delete> key during POST. It also allows you to turn on or turn off your system and conveniently enter the BIOS during boot-up. DirectKey button Ensure to save your data before using the DirectKey button. When the system is on and you press the DirectKey button, your system will shut down. Press the DirectKey button again or the Power-on button to reboot and enter the BIOS directly. Turn off your system using the power-on button to allow your system to go through POST (without entering the BIOS) when you reboot your system. refer to section 3.

8 Boot Menu for details about setting the DirectKey default function. This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data.



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The onboard button cell battery powers the RAM data in CMOS, which include system setup information such as system passwords. Clear RTC RAM (3-pin CLRTC) Jumpers To erase the RTC RAM: 1.

Turn OFF the computer and unplug the power cord. Move the jumper cap from pins 1-2 (default) to pins 2-3. Keep the cap on pins 2-3 for about 5-10 seconds, then move the cap back to pins 1-2. Plug the power cord and turn ON the computer. Hold down the <Delete> key during the boot process and enter BIOS setup to re-enter data.

Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure! If the steps above do not help, remove the onboard battery and move the jumper again to clear the CMOS RTC RAM data. After the CMOS clearance, reinstall the battery. You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the C. Shut down and reboot the system so the BIOS can automatically reset parameter settings to default values. Due to the chipset behavior, AC power off is required to enable C. You must turn off and on the power supply or unplug and plug the power cord before rebooting the system. 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 drive. If an error is found, the critical component's LED stays lit up until the problem is solved.

POST State LEDs Onboard LEDs 2. The motherboard comes with a standby power LED. The green LED lights up to indicate that the system is ON, in sleep mode, or in soft-off mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The illustration below shows the location of the onboard LED. 0 Gb/s connectors (7-pin SATA6G_1-6 [brown]) Internal connectors If you installed Serial ATA hard disk drives, you can create a RAID 0, 1, 5, and 10 configuration with the Intel® Rapid Storage Technology through the onboard Intel® Z87 chipset. These connectors are set to [AHCI Mode] by default. If you intend to create a Serial ATA RAID set using these connectors, set the SATA Mode item in the BIOS to [RAID Mode]. 1 RAID configurations or the manual bundled in the motherboard support DVD. 0 Gb/s connectors (7-pin SATA6G_E12 [beige]) ASMedia storage controller can only support AHCI mode.

These SATA ports are for data drives only. 3. This connector allows you to connect a USB 3.0 module, you can enjoy all the benefits of USB 3.0 including faster data transfer speeds of up to 5Gbps, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.

These connectors are based on xHCI specification. We recommend you to install the related driver to fully use the USB 3. This connector is for an additional Sony/Philips Digital Interface (S/PDIF) port. Connect the S/PDIF Out module cable to this connector, then install the module to a slot opening at the back of the system chassis. These connectors are for USB 2.

0 ports. Connect the USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 2. Doing so will damage the motherboard! You can connect the front panel USB cable to the ASUS Q-Connector (USB, dark brown) first, and then install the Q-Connector (USB) to the USB connector onboard if your chassis supports front panel USB ports. CPU, optional, chassis, and assistant fan connectors Connect the fan cables to the fan connectors on the motherboard, ensuring that the black wire of each cable matches the ground pin of the connector. (4-pin CPU_FAN; 4-pin CPU_OPT; 4-pin CHA_FAN1-4; 3-pin ASST_FAN1-2) 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 that the CPU FAN cable is securely installed to the CPU fan connector. The CPU_FAN connector supports the CPU fan of maximum 1A (12 W) fan power. The CPU_FAN, CHA_FAN and ASST_FAN connectors support the TUF Thermal Radar 2 feature.

To fully use the fan control function, ensure that you connect only an assistant fan to the ASST_FAN connectors. Chapter 1 1-30 Chapter 1: Product introduction 7. This connector is for a chassis-mounted front panel audio I/O module that supports either HD Audio or legacy AC 97 audio standard. Connect one end of the front panel audio I/O module cable to this connector. Front panel audio connector (10-1 pin AAFP) 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. If you want to connect a high-definition or an AC97 front panel audio module to this connector, set the Front Panel Type item in the BIOS setup to [HD] or [AC97]. 8. These connectors are for the thermistor cables that monitor 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 component to detect its temperature. thermal Sensor connectors

(2-pin T_SENSOR1; T_SENSOR2; T_SENSOR3) ASUS SABERTOOTH Z87 1-31 Chapter 1 9.

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. ATX power connectors (24-pin EATXPWR; 8-pin EATX12V) For a fully configured system, we recommend that you use a power supply unit (PSU) that complies with ATX 12 V Specification 2.0 (or later version) and provides a minimum power of 350 W.

DO NOT forget to connect the 4-pin/8-pin EATX12 V power plug. Otherwise, the system will not boot. 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 PCI Express x16 cards, use a PSU with 1000W power or above to ensure the system stability.

If you are uncertain about the minimum power supply requirement for your system, refer to the Recommended Power Supply Wattage Calculator at <http://support.asus.com/power>. This 2-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode. This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector.



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The IDE LED lights up or flashes when data is read from or written to the HDD. This 4-pin connector is for the chassis-mounted system warning speaker. The speaker allows you to hear system beeps and warnings. This connector is for the system power button.

Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the operating system settings. Pressing the power switch for more than four seconds while the system is ON turns the system OFF. This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power. Reset button (2-pin RESET) ATX power button/soft-off button (2-pin PWRSW) System warning speaker (4-pin SPEAKER) Hard disk drive activity LED (2-pin IDE_LED) System power LED (2-pin PLED) ASUS SABERTOOTH Z87 1-33 Chapter 1 11. This connector supports a Trusted Platform Module (TPM) system, which securely store keys, digital certificates, passwords and data. A TPM system also helps enhance the network security, protects digital identities, and ensures platform integrity. TPM connector (20-1 pin TPM) 12. DirectKey connector (2-pin DRCT) This connector is for the chassis-mounted button that supports the DirectKey function. Connect the button cable that supports DirectKey, from the chassis to this connector on the motherboard. Chapter 1 1-34 Ensure that your chassis comes with the extra button cable that supports the DirectKey feature.

Refer to the technical documentation that came with the chassis for details. 1 Building your PC system Motherboard installation 2 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. 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. ASUS SABERTOOTH Z87 2-1 Chapter 2 3. Place nine screws into the holes indicated by circles to secure the motherboard to the chassis. chapter 2 2-2 DO NOT overtighten the screws! Doing so can damage the motherboard.

2 CPU installation Ensure that you install the correct CPU designed for LGA1150 socket only. DO NOT install a CPU designed for LGA155 and LGA1156 socket on the LGA1150 socket. 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 Chapter 2 2-4 Chapter 2: Basic installation To uninstall the CPU heatsink and fan assembly ASUS SABERTOOTH Z87 2-5 Chapter 2 2. 2 USB BIOS Flashback BIOS update utility USB 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, press the USB BIOS Flashback button for three seconds, and the BIOS is updated automatically. Place the bundled support DVD to the optical drive and install the USB BIOS Flashback Wizard. Follow the onscreen instructions to complete the installation. Insert the USB storage device to the USB Flashback port. We recommend you to use a USB 2.

0 storage device to save the latest BIOS version for better compatibility and stability. Launch the USB BIOS Flashback Wizard to automatically download the latest BIOS version. Press the BIOS Flashback button for three seconds until a flashing light appears, which indicates that the BIOS Flashback function is enabled. Wait until the light goes out, indicating that the BIOS updating process is completed. USB BIOS Flashback button USB BIOS Flashback port For more BIOS update utilities in BIOS setup, refer to the section 3. 11 Updating BIOS in Chapter 3. Do not unplug portable disk, power system, or use the CLR_CMOS jumper while BIOS update is ongoing, otherwise update will be interrupted. 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. ASUS SABERTOOTH Z87 2-11 Chapter 2 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. Chapter 2 2-12 * and **: Refer to the tables on the next page for LAN port LEDs, and audio port definitions. chapter 2: Basic installation USB 3. 0 devices can only be used as data storage only. 0 ports for faster and better performance for your USB 3.

0 devices. Due to the design of the Intel® 8 series chipset, all USB devices connected to the USB 2. 0 and USB 3. 0 ports are controlled by the xHCI controller. Some legacy USB devices must update their firmware for better compatibility.

* LAN ports LED indications Activity Link LED Off Status Description No link Linked Speed LED Status Description Off Green 10 Mbps connection 1 Gbps connection LAN port ACT/LINK LED SPEED LED Orange Orange (Blinking then steady) Orange (Blinking) Data activity Ready to wake up from S5 mode Orange 100 Mbps connection ** Audio 2, 4, 6, or 8-channel configuration Port Light Blue Lime Pink Orange Black Gray Headset 2-channel Line In Line Out Mic In 4-channel 4-channel Line In Front Speaker Out Mic In Rear Speaker Out 6-channel Line In Front Speaker Out Mic In Center/Subwoofer Rear Speaker Out 8-channel Line In Front Speaker Out Mic In Center/Subwoofer Rear Speaker Out Side Speaker Out ASUS SABERTOOTH Z87 2-13 Chapter 2 2. Starting up for the first time After making all the connections, replace the system case cover. Ensure that all switches are off. Connect the power cord to the power connector at the back of the system chassis. Connect the power cord to a power outlet that is equipped with a surge protector. Turn on the devices in the following order: a. Monitor External SCSI devices (starting with the last device on the chain) System power 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.



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Chapter 2 2-16 Chapter 2: Basic installation BIOS Beep One short beep Description VGA detected Quick boot set to disabled No keyboard detected One continuous beep followed by two short beeps then a pause (repeated) One continuous beep followed by three short beeps One continuous beep followed by four short beeps 7. No memory detected No VGA detected Hardware component failure At power on, hold down the <Delete> key to enter the BIOS Setup. 5 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. Turning off the computer ASUS SABERTOOTH Z87 2-17 Chapter 2 Chapter 2 2-18 Chapter 2: Basic installation Chapter 3: BIOS setup BIOS setup 3. 1 Knowing BIOS 3 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: q q 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 in 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 Z87ST. 2 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.

BIOS setup program Entering BIOS at startup To enter BIOS Setup at startup, press <Delete> during the Power-On Self Test (POST). If you do not press <Delete>, POST continues with its routines. Entering BIOS Setup after POST To enter BIOS Setup after POST: q q q 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. ¶ ¶ ¶ 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>.

If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. 7 Jumpers for information on how to erase the RTC RAM via the Clear CMOS jumper. The BIOS setup program does not support the bluetooth devices. ¶ ¶ ¶ BIOS menu screen The BIOS Setup program can be used under two modes: EZ Mode and Advanced Mode. You can change modes from the Exit menu or from the Exit/Advanced Mode screen. 1 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, click Exit/Advanced Mode, then select Advanced Mode or press <F7> hot key for the advanced BIOS settings. The default screen for entering the BIOS setup program can be changed. Exits the BIOS setup program without saving the changes, saves the changes and resets the system, or enters the Advanced Mode EZ Mode Displays the CPU/motherboard temperature, CPU/5V3.

3V/12V voltage output, CPU/chassis/power fan speed Selects the display language of the BIOS setup program Selects the Advanced mode functions Selects the boot device priority Displays the Advanced mode menus Selects the boot device priority Displays the system properties of the selected mode on the right hand side Loads optimized default settings ¶ ¶ ¶ The boot device options vary depending on the devices you installed to the system. The Boot Menu (F8) button is available only when the boot device is installed to the system. 2 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 access the Advanced Mode, click Exit, then select Advanced Mode or press F7 hotkey. Back button Menu bar General help Advanced Mode Menu items Submenu item Pop-up window Configuration fields Scroll bar Navigation keys Last modified settings Quick note Menu bar The menu bar on top of the screen has the following main items: My Favorites For saving the frequently-used system settings and configuration. Main For changing the basic system configuration Ai Tweaker Advanced Monitor Boot Tool Exit For changing the overclocking settings Chapter 3 3-4 For changing the advanced system settings For displaying the system temperature, power status, and changing the fan settings. For changing the system boot configuration For configuring options for special functions For selecting the exit options and loading default settings Chapter 3: BIOS setup 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. Back button This button appears when entering a submenu. Press <Esc> or use the USB mouse to click this button to return to the previous menu screen. 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>. Pop-up window Select a menu item and press <Enter> to display a pop-up window with the configuration options for that item. 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.



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Press the Up/Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen. Navigation keys At the bottom right corner of the menu screen are the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings.

If you delete all shortcut items from the F3: Shortcut list, the default shortcut items will reappear after your next startup. General help At the top right corner 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. This button allows you to enter notes of the activities that you have done in BIOS. The Quick Note function does not support the following keyboard functions: delete, cut, copy and paste.

You can only use the alphanumeric characters to enter your notes. ASUS SABERTOOTH Z87 3-5 Chapter 3 Quick Note button Last Modified button This button shows the items that you last modified and saved in BIOS Setup. 3. 3 MyFavorites is your personal space where you can easily save and access your favorite BIOS items. To add frequently-used BIOS items to My Favorites: Use the arrow keys to select an item that you want to add.

When using a mouse, hover the pointer to the item. Press <F4> on your keyboard or right-click on your mouse to add the item to My Favorites page. You cannot add the following items to My Favorites: Items with submenu options User-configurable items such as language and boot device order Configuration items such as Memory SPD Information, system time and date Chapter 3 3-6 Chapter 3: BIOS setup 3. 4 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.

Main menu Security The Security menu items allow you to change the system security settings. 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]. ASUS SABERTOOTH Z87 3-7 Chapter 3 If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. 7 Jumpers for information on how to erase the RTC RAM via the Clear CMOS jumper. Administrator Password If you have set an administrator password, we recommend that you enter the administrator password for accessing the system. Otherwise, you might be able to see or change only selected fields in the BIOS setup program. From the Create New Password box, key in a password, then press <Enter>. Confirm the password when prompted. From the Enter Current Password box, key in the current password, then press <Enter>.

From the Create New Password box, key in a new password, then press <Enter>. Confirm the password when prompted. To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the Administrator Password item on top of the screen shows Not Installed. User Password If you have set a user password, you must enter the user password for accessing the system. The User Password item on top of the screen shows the default Not Installed. After you set a password, this item shows Installed. From the Create New Password box, key in a password, then press <Enter>. Confirm the password when prompted. From the Enter Current Password box, key in the current password, then press <Enter>.

From the Create New Password box, key in a new password, then press <Enter>. Confirm the password when prompted. To clear the user password, follow the same steps as in changing a user password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the User Password item on top of the screen shows Not Installed. 3.

5 The Ai Tweaker menu items allow you to configure the 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 Tweaker menu Scroll down to display other BIOS items.

ASUS SABERTOOTH Z87 3-9 Chapter 3 Ai Overclock Tuner [Auto] [Auto] Allows you to select the CPU overclocking options to achieve the desired CPU internal frequency. Select any of these preset overclocking configuration options: [Manual] [X.] Loads the optimal settings for the system. Allows you to automatically optimize the CPU ratio and BCLK frequency. Allows your system to automatically optimize the CPU ratio, BCLK frequency, and memory parameters. If you install memory modules supporting the eXtreme Memory Profile (X.) Technology, select this item to set the profiles supported by your memory modules for optimizing the system performance. The following item appears only when you set the Ai Overclocking Tuner to [Manual]. filter PLL [Auto] BCLK Frequency [100. 0] Allows you to select a BCLK (base clock) mode when running in a high or low BCLK.

Configuration options: [Auto] [Low BCLK Mode] [High BCLK Mode] Allows you to set the BCLK frequency to enhance the system performance. Use the <+> or <-> keys to adjust the value. The values range from 80. The following item appears only when you set the Ai Overclocking Tuner to [X. EXtreme Memory Profile] ASUS MultiCore Enhancement [Enabled] [Enabled] [Disabled] Allows you to select the X. Configuration options: [Profile #1] [Profile #2]

Default set to [Enabled] for maximum performance under XMP/Manual/ User-defined memory frequency mode. allows you to set to default core ratio settings. CPU Core Ratio [Sync All Cores] [Per Core] Allows you to set the CPU ratio and synchronize automatically either per core or all cores. Configuration options: [Auto] [Sync All Cores] [Per Core] When the CPU Core Ratio is set to [Sync All Cores], the following item appears: 1-Core Ratio Limit [Auto] Select [Auto] to apply the CPU default Turbo Ratio setting or manually assign a 1-Core Limit value that must be higher than or equal to the 2-Core Ratio Limit. 2-Core Ratio Limit [Auto] Select [Auto] to apply the CPU default Turbo Ratio setting or manually assign a 2-Core Limit value that must be higher than or equal to the 3-Core Ratio Limit.

Chapter 3 3-10 Chapter 3: BIOS setup If you assign a value for 2-Core Ratio Limit, do not set the 1-Core Ratio Limit to [Auto].



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3-Core Ratio Limit [Auto] Select [Auto] to apply the CPU default Turbo Ratio setting or manually assign a 3-Core Limit value that must be higher than or equal to the 4-Core Ratio Limit. If you assign a value for 3-Core Ratio Limit, do not set the 1-Core Ratio Limit and 2-Core Ratio Limit to [Auto]. 4-Core Ratio Limit [Auto] Select [Auto] to apply the CPU default Turbo Ratio setting or manually assign a 4-Core Limit value that must be higher than or equal to the 3-Core Ratio Limit. If you assign a value for 4-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, and 3-Core Ratio to [Auto].
Min CPU Cache Ratio [Auto] Allows you to set the minimum possible ratio on the Uncore part of the processor. Use the <+> or <-> keys to adjust the value. The values depend on the CPU installed. Max CPU Cache Ratio [Auto] Allows you to set the maximum possible ratio on the Uncore part of the processor. Use the <+> or <-> keys to adjust the value.

The values depend on the CPU installed. Internal PLL Overvoltage [Auto] Allows you to enable the internal PLL Overvoltage for K-SKU CPUs to get the extreme overclocking capability. Configuration options: [Auto] [Enabled] [Disabled] CPU bus speed : DRAM speed ratio mode [Auto] [Auto] Allows you to set the CPU bus speed to DRAM speed ratio mode. [100:133] [100:100] DRAM speed is set to the optimized settings. The CPU bus speed to DRAM speed ratio is set to 100:133. The CPU bus speed to DRAM speed ratio is set to 100:100. memory Frequency [Auto] CPU Graphics Max. Ratio [Auto] [Auto] [Manual] Allows you to automatically optimize the CPU Graphics Ratio depending on the system loading. Allows you to set a value for an optimal CPU Graphics Ratio. Use the <+> or <-> keys to adjust the CPU graphics ratio.

The minimum value depends on the installed CPU. ASUS SABERTOOTH Z87 3-11 Chapter 3 Allows you to set the memory operating frequency. The configuration options vary with the BCLK/PCIE Frequency item settings. OC Tuner [As Is] OC Tuner automatically overclocks the frequency and voltage of CPU and DRAM for enhancing the system performance and accelerates the iGPU performance to the extreme according to the integrated graphics loading. Configuration options: [As Is] [Ratio Only] [BCLK First] EPU Power Saving Mode [Disabled] Configuration options: [Disabled] [Enabled] Allows you to enable or disable the EPU power saving function. DRAM Timing Control The subitems in this menu allow you to set the DRAM timing control features. Use the <+> or <-> keys to adjust the value. To restore the default setting, type [auto] using the keyboard and press the <Enter> key. Changing the values in this menu may cause the system to become unstable! If this happens, revert to the default settings. Primary Timings DRAM CAS# Latency [Auto] Configuration options: [Auto] [1] [1] [31] Configuration options: [Auto] [1] [1] [31] Configuration options: [Auto] [1] [1] [31] Configuration options: [Auto] [1] [1] [63] Configuration options: [Auto] [1] [1] [3] DRAM RAS# to CAS# Delay [Auto] DRAM RAS# PRE Time [Auto] DRAM RAS# ACT Time [Auto] DRAM COMMAND Mode [Auto] Secondary Timings DRAM RAS# to RAS# Delay [Auto] DRAM REF Cycle Time [Auto] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [511] Configuration options: [Auto] [1] [1] [65535] Configuration options: [Auto] [1] [1] [16] Configuration options: [Auto] [1] [1] [15] DRAM Refresh Interval [Auto] Chapter 3 3-12 DRAM WRITE Recovery Time [Auto] DRAM READ to PRE Time [Auto] Chapter 3: BIOS setup DRAM FOUR ACT WIN Time [Auto] DRAM WRITE to READ Delay [Auto] Configuration options: [Auto] [1] [1] [255] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [31] DRAM CKE Minimum pulse width [Auto] DRAM CAS# Write Latency [Auto] RTL IOL control DRAM RTL (CHA_R0D0) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHA_R0D1) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHA_R1D0) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHA_R1D1) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHB_R0D0) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHB_R0D1) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHB_R1D0) [Auto] Configuration options: [Auto] [1] - [63] DRAM RTL (CHB_R1D1) [Auto] Configuration options: [Auto] [1] - [63] DRAM IO-L (CHA_R0D0) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHA_R0D1) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHA_R1D0) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHA_R1D1) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHA_R1D0) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHA_R1D1) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHB_R0D0) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHB_R0D1) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHB_R1D0) [Auto] Configuration options: [Auto] [1] - [15] DRAM IO-L (CHB_R1D1) [Auto] Configuration options: [Auto] [1] - [15] Third Timings tRDRD [Auto] Configuration options: [Auto] [1] [1] [7] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [63] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [7] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [1] [1] [15] Configuration options: [Auto] [0] [1] [1] Configuration options: [Auto] [1] [1] [31] tRDRD_dr [Auto] tRDRD_dd [Auto] tWRRD [Auto] tWRRD_dr [Auto] tWRRD_dd [Auto] tWRWR [Auto] tWRWR_dr [Auto] tWRWR_dd [Auto] Dec_WRD tRDWR [Auto] tRDWR_dr [Auto] tRDWR_dd [Auto] Chapter 3 3-14 Chapter 3: BIOS setup MISC MRC Fast Boot [Auto] Allows you to enable, disable or automatically set the MRC fast boot.
] Configuration options: [Enable Both DIMMS] [Disable DIMM0] [Disable DIMM1] [Disable Both DIMMS] Allows you to set the optimized scrambler setting for stability. configuration options: [Optimized (ASUS)] [Default (MRC)] DIGI+ Power Control CPU Load-Line Calibration [Auto] Load-line is defined by Intel® VRM specification and affects CPU power voltage. The CPU working voltage will decrease proportionally to CPU loading. Higher load-line calibration could get higher voltage and good overclocking performance, but increases the CPU and VRM thermal conditions. Select from Level 1 to Level 8 to adjust CPU power voltage from 0% to 100%.



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The actual performance boost may vary depending on your CPU specification. **DO NOT** remove the thermal module. The thermal conditions should be monitored. CPU Voltage Frequency [Auto] Frequency switching affects the VRM transient response and the thermal component conditions. Higher frequency gets quicker transient response.

Configuration options: [Auto] [Manual] **DO NOT** remove the thermal module when setting this item to [Manual Mode]. The thermal conditions should be monitored. The following item appears only when you set the CPU Voltage Frequency to [Manual]. ASUS SABERTOOTH Z87 3-15 Chapter 3 CPU Fixed Frequency [300] This item allows you to set a fixed CPU Voltage frequency. Use the <+> or <-> keys to adjust the value. The values range from 300kHz to 500kHz with a 50kHz interval. The following items appear only when you set the CPU Voltage Frequency to [Auto]. vRM Spread Spectrum [Disabled] Enable the VRM Spread Spectrum to enhance system stability. Configuration options: [Disabled] [Enabled] Active Frequency Mode [Disabled] Set this item to [Enabled] to help enhance the power saving condition while switching frequencies. While a higher frequency makes the VRM transient response much faster, switching frequencies affect the VRM thermal components.

Configuration options: [Disabled] [Enabled] CPU Power Phase Control [Auto] Allows you to set the power phase control of the CPU. Configuration options: [Auto] [Standard] [Optimized] [Extreme] [Manual Adjustment] **DO NOT** remove the thermal module when setting this item to [Extreme] and [Manual Adjustment]. The thermal conditions should be monitored. The following item appears only when you set the CPU Power Phase Control to [Manual Adjustment]. Manual Adjustment [Fast] Allows you to set a faster phase response for the CPU to increase system performance or to slower phase response to decrease DRAM power efficiency. configuration options: [Ultra Fast] [Fast] [Medium] [Regular] CPU Power Duty Control [T. Probe] DIGI + VRM Duty Control adjusts the current of every VRM phase and the thermal conditions of every phase component. The thermal conditions should be monitored. CPU Current Capability [Auto] DIGI+ VRM CPU Current Capability provides wider total power range for overclocking. A higher value setting gets higher VRM power consumption delivery and extends the overclocking frequency range simultaneously.

Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%] Choose a higher value when overclocking, or under a high CPU loading for extra power support. Chapter 3 3-16 Chapter 3: BIOS setup CPU Power Thermal Control [130] A higher temperature brings a wider CPU power thermal range and extends the overclocking tolerance to enlarge the O. Use the <+> or <-> keys to adjust the value. The values depend on the CPU installed. **DO NOT** remove the thermal module.

The thermal conditions should be monitored. DRAM Current Capability [100%] DRAM Voltage Frequency [Auto] A higher value brings a wider total power range, and extends the overclocking range simultaneously. Configuration options: [100%] [110%] [120%] [130%] Allows you to adjust the DRAM switching frequency. Assign a fixed high DRAM frequency to increase the O. c.

Range, or a low DRAM frequency for a better system stability. Configuration options: [Auto] [Manual] The following item appears only when you set the DRAM Frequency Mode item to [Manual]. DRAM Fixed Frequency Mode [300] Allows you to set a fixed DRAM frequency to increase the overclocking range or a low DRAM frequency for better system stability. Use the <+> or <-> keys to adjust the value. The values range from 300kHz to 500kHz with a 50kHz interval. DRAM Power Phase Control [Auto] [Auto] [Optimized] [Extreme] Allows you to set the Auto mode. Allows you to set the ASUS optimized phase tuning profile. Allows you to set the full phase mode. CPU Power Management The subitems in this menu allow you to set the CPU ratio and their features. Enhanced Intel SpeedStep Technology [Enabled] Allows the operating system to dynamically adjust the processor voltage and cores frequency, resulting to a decreased average power consumption and decreased average heat production.

Configuration options: [Disabled] [Enabled] Allows you to enable your core processor's speed to run faster than the base operating frequency when it is below operating power, current and temperature specification limit. Configuration options: [Disabled] [Enabled] The following items appear only when you set the Turbo Mode to [Enabled]. ASUS SABERTOOTH Z87 3-17 Chapter 3 Turbo Mode [Enabled] Turbo Mode Parameters Long Duration Package Power Limit [Auto] Allows you to limit the Turbo Ratio's time duration that exceeds the TDP (Thermal Design Power) for maximum performance. Use the <+> or <-> keys to adjust the value. The values range from 1W to 4096W. Package Power Time Window [Auto] Also known as Power Limit 1, and allows you to maintain the time window for Turbo Ratio over TDP (Thermal Design Power). Use the <+> or <-> keys to adjust the value. The values range from 1 to 127 in seconds. Short Duration Package Power Limit [Auto] Also known as Power Limit 2, and allows you to provide rapid protection when the package power exceeds the Power Limit 1. Use the <+> or <-> keys to adjust the value.

The values range from 1W to 4096W. CPU Integrated VR Current Limit [Auto] Allows you to set a higher current limit to prevent frequency and power throttling when overclocking. Use the <+> or <-> keys to adjust the value. The values range from 0. CPU Internal Power Switching Frequency Frequency Tuning Mode [Auto] Allows you to increase or decrease the switching frequency of the internal regulator.

decrease to help consume less power or increase to help voltage stability. When this item is set to [+] or [-], the Frequency Tuning Offset appears and allows you to set its value from 0% to 6%. CPU Internal Power Fault Control Thermal Feedback [Auto] Allows your system to take precautionary actions to be taken by the CPU when the thermal conditions of the external regulator exceeds the threshold. Configuration options: [Auto] [Disabled] [Enabled] Disable this item to prevent tripping the Fully Integrated Voltage Regulator when doing over-voltage. We recommend you to disable this item when overclocking.

Configuration options: [Auto] [Enabled] [Disabled] CPU Integrated VR Fault Management [Auto] CPU Internal Power Configuration CPU Integrated VR Efficiency Management [Auto] Allows you to improve power saving when the processor is in low power state. Disable to make the Fully Integrated Voltage Regulator work in high performance at all times. Configuration options: [Auto] [High Performance] [Balanced] Chapter 3 3-18 Chapter 3: BIOS setup Power Decay Mode [Auto] Idle Power-in Response [Auto] Allows your system to improve the power saving mode on the Fully Integrated Voltage Regulator as the processor goes into low current state.



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