WHAT IS OVERCLOCKING?¹
Push the tuning of your boxed processor to a new level

Overclocking¹ is the process and techniques used to increase the processor's frequencies above or below the processor specification.

OVERCLOCKING¹ UNLOCKED
Now, overclocking¹ isn't only for the professionals.

Everyday overclockers are looking for stability: they want to be able to use the overclocked¹ system on a daily basis without worrying about stability and/or failures.

WHY OVERCLOCK?¹
Increased performance for compute intensive tasks.

• Can decrease time for compute workloads like rendering and transcoding media.
• Can increase general system performance including gaming and applications

¹ Altering clock frequency or voltage may damage or reduce the useful life of the processor and other system components, and may reduce system stability and performance. Product warranties may not apply if the processor is operated beyond its specifications. Check with the manufacturers of system and components for additional details.
HOW TO OVERCLOCK

WHAT DO YOU NEED?
The right thermal solution, processor and chipset combination is required.

WHAT ARE YOU CHANGING?
There are a few basic “knobs” that you can use to adjust the system:

- **Base Clock (BCLK) Frequency:** Base frequency clock that the motherboard functions at.
- **CPU Core Multiplier:** Uses the BCLK frequency and "multiplies" it to achieve CPU base frequency.
- **Turbo Multiplier.**

HOW DO YOU DO IT?
Overclock, monitor, and stress a system with Intel® Extreme Tuning Utility (Intel® XTU), a simple Windows performance tuning application.

Using Intel® XTU’s Modifying Core Multiplier, you can allow the system to run at stock speed with all power states for normal loads but increase the max frequency that Turbo mode will use when needed.

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2 There are multiple 3rd party solutions in the market that support overclocking requirements.
UNLOCKED INTEL® CORE™ PROCESSOR

Intel® Core™ i9 Extreme Edition
Up to 18 Cores/36-way Multitasking
Ultimate content creation and most immersive VR
Extreme performance and mega-tasking

Unlocked Intel® Core™ i7 Processor
Up to 6 Cores/12-way Multitasking
Amazing VR, gaming and content creation
Seamless multitasking and streaming

Unlocked Intel® Core™ i5 Processor
6 Cores/6-way Multitasking
Great for VR and gaming

Unlocked Intel® Core™ i3 Processor
4 Cores/4-way Multitasking
Entry overclocking and casual gaming processor

THERMAL SOLUTION
Increased cooling capabilities are critical for overclocking: High-end Air Heat sinks, All in one liquid coolers; Custom liquid coolers

MOTHERBOARD
Motherboard with Intel® “Z/X” chipset

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² There are multiple 3rd party solutions in the market that support overclocking requirements.
RISKS AND PROTECTION

UNDERSTANDING THE RISKS OF OVERCLOCKING¹

Altering PC clock or memory frequency and/or voltage may:
• Reduce system stability and use life of the system, memory and processor
• Cause the processor and other system components to fail
• Cause reductions in system performance
• Cause additional heat or other damage
• Affect system data integrity

PERFORMANCE TUNING PROTECTION PLAN

Overclocking¹ is not covered under the Standard Intel Warranty. With the Performance Tuning Protection Plan, Intel allows a single replacement for a qualified processor, in addition to the standard 3 year warranty

Covers processor failure due to running outside of Intel® specifications, hassle-free. Plans may be purchased for all unlocked boxed processors

Learn more: http://click.intel.com/tuningplan

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## Choosing a Motherboard for Overclocking

<table>
<thead>
<tr>
<th>Feature</th>
<th>Potential Z/X Configuration</th>
<th>Potential B/H Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel® Enabled for Overclocking</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Overclock Auto-Tuning</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Power Delivery</td>
<td>Multi-Phase / Digital</td>
<td>Analog / Single Phase</td>
</tr>
<tr>
<td>Multi-GPU Enabled</td>
<td>SLI* / Crossfire*</td>
<td>No</td>
</tr>
<tr>
<td>I/O Enablement</td>
<td>Additional Ports / 3rd Party Controllers</td>
<td>Basic Chipset</td>
</tr>
<tr>
<td>Cooling Feature</td>
<td>Enhanced Chipset Cooling / Extra Fan Headers</td>
<td>Basic Chipset Cooling / Minimal Fan Headers</td>
</tr>
<tr>
<td>PCIe Configuration</td>
<td>Maximum PCIe lane usage / Flexible Physical Slots</td>
<td>Basic PCIe usage / Minimal Physical Slots</td>
</tr>
</tbody>
</table>

Intel recommends enthusiasts select motherboards with Z or X chipsets that are designed to support tunability features of Intel K and X/E SKUs.

## Intel® Extreme Tuning Utility


ODMs who build motherboards that overclock and can make settings available through BIOS.

## Overclocking¹ Using Core Multiplier in Intel® XTU

Modifying Core Multiplier, you allow the system to run at stock speed with all power states for normal loads but increase the max frequency that Turbo mode will use when needed.

<table>
<thead>
<tr>
<th>Multipliers</th>
<th>BCLK: 100 MHz</th>
<th>Turbo Multiplier: 24</th>
<th>Turbo Frequency: 4.2 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Active Core</td>
<td>35 x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Active Cores</td>
<td>34 x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Active Cores</td>
<td>33 x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Active Cores</td>
<td>33 x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multipliers</th>
<th>BCLK: 100 MHz</th>
<th>Turbo Multiplier: 50</th>
<th>Turbo Frequency: 5.0 GHz</th>
</tr>
</thead>
</table>

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