\overleftrightarrow Quick XMP Overclocking Settings

Intel XMP (Extreme Memory Profile) allows users to easily overclock XPG memory by modifying settings in the BIOS, by that achieving even better performance than factory defaults without complex and often risky changes to memory voltages or frequencies. However, to use easy XMP settings, PCs need to have the following:

- 1. Intel CPU
- 2. XMP-supporting chipset and motherboard
- 3. XMP-compatible memory we recommend high performance XPG modules

Every motherboard manufacturer employs their own way of accessing XMP, though these are generally similar and consistent across brands. We're using an ASUS Z97 PRO in our example.

Enter the BIOS (usually by holding or repeatedly tapping DEL after powering on your PC). Prior to loading XMP the default frequency for our 16GB of installed DDR3 memory is 1600MHz, as shown in the red box.

VISLIS UEFI BIOS Utility – EZ Mode			
07/03/2015 17:29[☆] ⊕ English ♀ EZ Tu	ning Wizard(F11)		
Information CPU Tempera 297-PRO(Wi-Fi ac) BIOS Ver. 2205 Intel(R) Core(TM) 17-4790K CPU @ 4.00GHz Speed: 4000 MHz Memory: 16384 MB (DDR3 1600MHz)	ture 43°C	CPU Voltage 1.040 V Motherboard Temperature 28°C	EZ System Tuning Click the icon to specify your preferred system settings for an improved system performance or a power-saving system environment Quiet Performance
DRAM Status DIMM_A1: A-DATA 8192MB 1600MHz DIMM_A2: N/A DIMM_B1: A-DATA 8192MB 1600MHz DIMM_B2: N/A	SATA Informatio P1: WDC WD1600A45 P2: N/A P3: N/A P4: N/A P5: N/A P6: N/A	n 5-00L7A0 (160.0GB) ge tychnology Off	Energy-saving Customized > Customized > Boot Priority Choose one and drag the items. Switch all P1: WDC WD1600AAJS-00L7A0 (152627MB)
FAN Profile CPU FAN 1273 RPM Image: CHA2 FAN CHA2 FAN Image: CHA2 FAN	CPU FAN 300 90 90 Manual Fan Tur	70 100 °C	UEFI: (FAT) ADATA USB Flash Drive (14892MB) .::
		Default(F5) Save & Exit(F10) Advanced Mode(F7)

Loading XMP: Method A

The red box in the screenshot below shows the XMP enable/disable drop menu. This will only show or be active on XMP compatible motherboards coupled with XMP-supporting memory.

ASLIS UEFI BIOS Uti	ility – EZ Mode			-
07/03/2015 17:29[‡]	🌐 English 🛛 👳 EZ Tun	ing Wizard(F11)		
Information 297-PRO(WI-Fi ac) BIOS Ver. 2205 Intel(R) Core(TM) 17-4790K CPU @ 4. Speed: 4000 MHz Memory: 16384 MB (DDR3 1600MHz	CPU Temperati 00GHz z)	ure 43°C	CPU Voltage 1.040 V Motherboard Temperature 28°C	EZ System Tuning Click the icon to specify your preferred system settings for an improved system performance or a power-saving system environment Quiet Performance
DRAM Status DIMM_A1: A:DATA 8192MB 1600MHz DIMM_A2: N/A DIMM_B1: A:DATA 8192MB 1600MHz DIMM_B2: N/A	2	SATA Informatio P1: WDC WD1600A45 P2: N/A P3: N/A P4: N/A P5: N/A P6: N/A Intel Rapid Stora On	n 500L7A0 (160.0GB) ge &chnology Off	Customized > Boot Priority Choose one and drag the items. Switch all P1: WDC WD1600AAJS-00L7A0 (152627MB) .::
FAN Profile CPU FAN 1273 RPM CHA2 FAN N/A CHA4 FAN N/A	CHAI FAN N/A CHA3 FAN N/A CPU OPT FAN N/A	CPU FAN 50 50 Manual Fan Tur	70 100 C	● UEFE: (FAT) ADATA USB Flash Drive (14892MB) …: #Boot Menu(F8)
-			Default(F	5) Save & Exit(F10) Advanced Mode(F7)

Based on the XMP parameters supported by the installed memory, you can load available XMP pre-sets such as Profile 1 as shown, using the drop menu.

ASUS UEFI BIOS Utility – EZ Mode		
07/03/2015 17:29[¢] ⊕ English ♀ EZ Tu Friday	ning Wizard(F11)	
Information CPU Tempera 297-PRO(Wi-Fi ac) BIOS Ver. 2205 Intel(R) Core(TM) 17-4790K CPU @ 4.00GHz Speed: 4000 MHz Memory: 16384 MB (DDR3 1600MHz)	ture CPU Voltage 1.040 V Motherboard Temperature 43°C 28°C	EZ System Tuning Click the icon to specify your preferred system settings for an improved system performance or a power-saving system environment Quiet Performance
DRAM Status DIMM_A1: A-DATA 8192MB 1600MHz DIMM_A2: N/A DIMM_B1: A-DATA 8192MB 1600MHz DIMM_B2: N/A Profile#1 Disabled X.M.P Usabled	SATA Information P1: WDC WD1600A4JS-0017A0 (160.0GB) P2: N/A P3: N/A P4: N/A P5: N/A P6: N/A P6: N/A Intel Rapid Storage On Off	Customized > Boot Priority Choose one and drag the items. Switch all P1: WDC WD1600AAJS-00L7A0 (152627MB)
FAN Profile CPU FAN 1277 RPM CHA2 FAN CHA2 FAN CHA3 FAN CHA4 FAN CHA4 FAN CHA4 FAN N/A	CPU FAN	UEFL: (FAT) ADATA USB Flash Drive (14892MB) .::
	Default(F	5) Save & Exit(F10) Advanced Mode(F7)

After choosing Profile 1, you will see its specifics: in our example those are 2999MHz frequency, 12-14-14-36 timings, and so on.

UEFI BIOS Utility - EZ I	Mode		
07/03/2015 17:29 Cm English			
Information CPU 297-PRO(Wi-Fi ac) BIOS Ver. 2205 Intel(R) Core(TM) 17-4790K CPU @ 4.00GHz Speed: 4000 MHz Memory: 16384 MB (DDR3 1600MHz)	Temperature 45°C	CPU Voltage 1.040 V Motherboard Temper 29°C	EZ System Tuning Click the icon to specify your preferred system settings for an improved system performance or a power-saving system environment Quiet Performance
DRAM Status DIMM_A1: A: DATA 8192MB 1600MHz DIMM_A2: NA DIMM_B1: A: DATA 8192MB 1600MHz DIMM_B2: NA	SATA Informati P1: WDC WD1600AV P2: N/A P3: N/A P4: N/A P5: N/A P5: N/A P6: N/A Intel Rapid Stor 2N-1.65V-1.207 On	on ys-ool7A0 (160.0GB) age &chnology Off	Customized > Boot Priority Choose one and drag the Rems. Switch all P1: WDC WD1600A4JS-00L7A0 (152627MB) .::
FAN Profile CPU FAN 1303 RPM CHA1 FAN CHA2 FAN N/A M/A CHA4 FAN N/A CPU OPT FANN N/A CPU OPT FANNNA	CPU FAN ³⁰ ⁵⁰ ⁶ ⁹ ⁹⁰	n 100 <	UEFL (FAT) ADATA USB Flash Drive (14892MB) .::
		D	efault(F5) Save & Exit(F10) Advanced Mode(F7)

If you are satisfied with these specifications and settings and want to apply them, press F10 to save and restart your PC for XMP settings to take effect.

Enter the BIOS again to double check whether the changes have been applied, primarily the frequency overclock from 1600MHz to 3000MHz (or 2999MHz).

ASLIS UEFI BIOS Utility - EZ Mod	e		
07/03/2015 17:31[☆] ⊕ English ♀	EZ Tuning Wizard(F11)		
Information CPU Tem 237-PRO(Wi-Fi ac) BIOS Ver. 2205 Intel(R) Core(TM) 17-4790K CPU @ 4.00GHz Speed: 4092 MHz Memory: 16384 MB (DDR3 3000MHz)	nperature 48°C	CPU Voltage 1.056 V Motherboard Temperature 29°C	EZ System Tuning Click the icon to specify your preferred system settings for an improved system performance or a power-saving system environment Quiet Performance
DRAM Status DIMM_A1: N/A DIMM_A2: A-DATA 8192MB 1600MHz DIMM_B1: N/A DIMM_B2: A-DATA 8192MB 1600MHz XIM.P	SATA Informatic P1: WDC WD1600AA P2: N/A P3: N/A P4: N/A P5: N/A P6: N/A Intel Rapid Stor. 55V-1.20V On	on js-ool7A0 (160.0GB) age Cychnology Off	Customized > Boot Priority Choose one and drag the items. Switch all P1: WDC WD1600AAJS-00L7A0 (152627MB)
FAN Profile Image: CPU FAN Image: CHA1 FAN Image: Table 2 RPM Image: CHA2 FAN Image: CHA2 FAN Image: CHA3 FAN Image: N/A Image: CHA3 FAN Image: CHA4 FAN Image: CHA4 FAN Image: N/A Image: CPU OPT FAN Image: N/A Image: CPU OPT FAN Image: N/A Image: CPU OPT FAN	CPU FAN	ning	E UEFI: (FAT) ADATA USB Flash Drive (14892MB)
		Default(F5	5) Save & Exit(F10) Advanced Mode(F7)

Loading XMP: Method B

On our example motherboard, we can use the ASUS Ai Tweaker utility to enable XMP. Enter the BIOS and navigate to the Ai Tweaker section (or press F7 for a shortcut). Under Ai Overclock Tuner, find the XMP option and choose a profile to enable.

07/03/2015 17:29* Benglish MyFavorite(F3) & Qfan Control(F6) @ EZ Tuning Wizard(F11) & Quick Note	(F9) ? Hot Keys
My Favorites Main <u>Al Iweaker</u> Advanced Monitor Boot Tool Exit Target CPU Turbo-Mode Frequency: 4501MHz Target DRAM Frequency: 3000MHz Target Cache Frequency: 3989MHz Target DMI/PEG Frequency: 100MHz Target CPU Graphics Frequency: 1278MHz Ai Overclock Tuner	CPU Frequency Temperature 4000 MHz 46°C BCLK Vcore 100.0 MHz 1.040 V Ratio 40X
XMP DDR3-2999 12-14-14-36-2N-1.65V-1.20V Profile #1 CPU Strap Auto PLL Selection Auto Filter PLL Auto	Memory Frequency Voltage 1600 MHz 1.674 V Capacity 16384 MB
ASUS MultiCore Enhancement Auto	Voltage +12V +5V 12.096 V 5.120 V
[Manual]: When the manual mode is selected, the BCLK(base clock) frequency can be assigned manually. [XMP]: When the XMP(extreme memory profile) mode is selected, the BCLK frequency and memory parameters will be optimized automatically.	+3.3∨ 3.264 V
Last Version 2.16.1240. Copyright (C) 2014 American Megatrends, Inc.	Modified EzMode(F7) (

After confirming that these are the settings you want, press F7 to exit Ai Tweaker and F10 to save and restart your PC for XMP settings to take effect. As before, on restarting re-enter the BIOS to make sure overclocking has been applied.

VISUS UEFI BIOS Utility – EZ Mode		
07/03/2015 17:31[¢] ⊕ English ♀ EZ Friday	Tuning Wizard(F11)	
Information CPU Tempe 297-PRO(Wi-Fiac) BIOS Ver. 2205 Intel(R) Core(TM) 17-4790K CPU @ 4.00GHz Speed: 4092 MHz Memory: 16384 MB (DDR3 3000MHz)	erature CPU Voltage 1.056 V Motherboard Temperature 48°C 29°C	EZ System Tuning Click the icon to specify your preferred system settings for an improved system performance or a power-saving system environment Quiet Performance
DRAM Status DIMM_A1: N/A DIMM_B1: N/A DIMM_B1: N/A DIMM_B2: A-DATA 8192MB 1600MHz DIMM_B2: A-DATA 8192MB 1600MHz XM.P	SATA Information P1: WDC WD1600AAJS-00L7A0 (160.0GB) P2: N/A P3: N/A P4: N/A P5: N/A P6: N/A Intel Rapid Storage -1.20v On	Customized Customized Choose one and drag the items. Switch all P1: WDC WD1600AAJS-00L7A0 (152627MB)
FAN Profile CPU FAN CHA1 FAN 1362 RPM N/A N/A CHA2 FAN CHA3 FAN N/A N/A CHA4 FAN N/A	CPU FAN 100 50 50 50 50 70 100 50 50 50 50 50 50 50 50 50	UEFI: (FAT) ADATA USB Flash Drive (14892MB)
	Default(f	5) Save & Exit(F10) Advanced Mode(F7)

☆ CPU-Z Memory Spec Verification

You can use the free CPU-Z utility to check on numerous PC parameters, including memory frequency. This will show you what memory speed is actually being detected by your operating system outside of the BIOS. Keep in mind the number reported by CPU-Z needs to be multiplied by two in the case of DDR3 to calculate actual speed (1500MHz x 2 = 3000MHz in our example).

CPU-Z can be downloaded from www.cpuid.com/softwares/cpu-z.html

Type	DDR3	Channel #	Dual
Size	16 GBytes	DC Mode	
	NE	B Frequency	3989.8 MHz
mings —			-
	DRAM Frequency	1500.5 MHz	X2=3000 Mhz
	FSB:DRAM	1:11	
	CAS# Latency (CL)	12.0 clocks	
RAS	# to CAS# Delay (tRCD)	14 clocks	
	RAS# Precharge (tRP)	14 clocks	
Cycle Time (tRAS)		36 clocks	
Row Re	fresh Cycle Time (tRFC)	391 clocks	
	Command Rate (CR)	2T	
	DRAM Idle Timer		
Total CAS# (tRDRAM)			
	Row To Column (tRCD)		

$\stackrel{}_{\propto}$ Verify XMP Version and Memory SPD (Serial Presence Detect)

The SPD tab in CPU-Z shows whether installed memory supports XMP and SPD, and which version of these is supported: for example XMP 1.3, XMP 2.0, and so on. Depending on the supported XMP version, different overclocking options will become available in the BIOS.

- <u>@</u> :		CPU-Z		>	ĸ		
CPU Caches Mainboard Memory SPD Graphics About							
Slot #2 DDR3							
Module Size	8192 N	IBytes	Correction		-		
Max Bandwidth	PC3-12800	(800 MHz)	Registered				
Manufacturer	A-Data Te	chnology	Buffered				
Part Number	DDR3 300	0 20Z	SPD Ext.	XMP 1.3			
Serial Number	00000	A000	Week/Year	49 / 13			
Timings Table	JEDEC #5	JEDEC #6	JEDEC #7	XMP-3000			
Frequency	685 MHz	761 MHz	800 MHz	1500 MHz			
CAS# Latency	9.0	10.0	11.0	12.0			
RAS# to CAS#	9	10	11	15			
RAS# Precharge	9	10	11	15			
tRAS	24	27	28	37			
tRC	33	37	39	51			
Command Rate				2T			
Voltage	1.50 V	1.50 V	1.50 V	1.650 V			
CPU-Z Ver. 1	.72.0.x64	Tools 🔻	Validate	ОК			

$\stackrel{\wedge}{\curvearrowright}$ XMP Overview

Intel Extreme Memory Profile (Intel XMP) allows compatible DDR3/DDR4 memory to operate in overclocked mode, unlocking operating frequencies that exceed default settings. This caters to the needs of performance enthusiasts and gamers who want to enhance their Intel-based PCs. For power users who enjoy overclocking whether competitively or for better performance in games, Intel XMP compatibility is highly recommended, and therefore users are advised to install XMP-compatible memory and motherboards to easily modify XMP settings and overclock with minimal effort and optimal stability. Making sure your memory and motherboard are XMP-compatible is the only way to access the advantages of this technology.

☆ Additional Thoughts

Intel XMP settings that are pre-defined and pre-tested by hardware makers can be loaded through the BIOS or special tuning programs via your PC's operating system. Usually, the easiest method to load Intel XMP settings is to use a tuning utility, which may be provided by the motherboard producer – as with Ai Tweaker in our example. For additional information on your specific motherboard, please consult the manufacturer website.