POWERLEAP™ PL-PROMMX PLUS

Pentium® CPU Upgrade Kit

--for--

- Intel Pentium (P54C) and Pentium w/MMX Technology (P55C)
- AMD K6 and K6-2
- Cyrix/IBM 6X86, 6X86L, 6X86MX, and MII
- IDT C6

July 1998

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Introduction

Your PowerLeap™ PL-ProMMX Plus CPU upgrade board allows Pentium socket 5 and socket 7 systems to take advantage of the latest MMX CPU technology from Intel, AMD, Cyrix, and IDT.

The CPU upgrade board employs patent pending technology *to adapt socket 5 and socket 7 systems* to the voltage and pinout requirements of this new generation of processors. By providing an upgrade solution that would otherwise require the replacement of the motherboard, PowerLeap™ lets you enjoy the most cost-effective MMX CPU upgrade solution.

About MMX™ Technology

Intel's MMX technology extends the performance of Pentium processors with 57 new instructions, a 32K L1 cache, four new 64-bit data types, and more. For multimedia and communications applications, MMX can significantly enhance audio/video playback and image processing. MMX technology is compatible with a wide range of existing operating systems (including MS-DOS, Windows, OS/2, and UNIX) and 16/32-bit applications.

About 3DNow! ™ Technology

AMD's 3DNow! technology is an innovative group of 21 new instructions for the x86 architecture that bring powerful performance enhancements for multimedia and floating-point-intensive applications. With 3DNow! technology, applications can achieve more detailed 3D imaging, faster frame rates for video playback, and dramatic improvements in audio. 3DNow! technology appears in the AMD K6-2 processor and works with all existing operating systems and x86 applications.

Some Commonly Used Abbreviations

This manual uses the following abbreviations and acronyms.

MMX: Multimedia Extension

P54C: Intel Pentium CPU

P55C: Intel Pentium with MMX CPU

Special Features

Your PowerLeap™ PL-ProMMX Plus offers the following advanced features:

- Supports Intel Pentium, Pentium w/MMX, AMD K6, K6-2, Cyrix/IBM 6x86L, 6x86MX, M-II & IDT C6 CPUs.
- Provides MMX-enabled CPU upgrades for both Socket 5 & Socket 7 Pentium systems.
- Employs patented IPS (Independent Power Source) technology, providing pure, abundant, & durable power to the V/Core of split-voltage CPUs.
- Offers a unique *CPU overheating protection* function.
- Includes switching VRM (Voltage Regulating Module) circuitry.
- Provides intelligent overcurrent protect circuitry.
- Supports 1.6V~3.5V (ascending by 0.1V), 20 sets voltage settings for V/Core.
- Offers chip-for-chip replacement, with no software drivers to install.

What You Have

Your PowerLeap™ PL-ProMMX Plus upgrade board includes the following items:

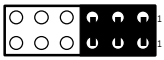
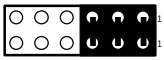
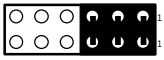
- The PowerLeap™ PL-ProMMX Plus upgrade board
- Power connector cord
- PowerLeap™ Utility Diskette
- CPU cooling fan & heatsink

Configuring the PowerLeap™ PL-ProMMX Plus

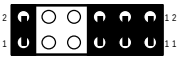
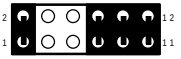
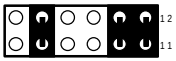
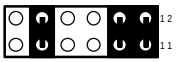
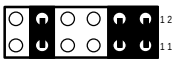
This chapter describes setting the clock multiplier and voltages for your PowerLeap™ PL-ProMMX Plus CPU upgrade board. It also discusses enabling and disabling the *CPU overheating protection* function.

Quick Start: CPU Settings

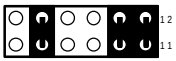
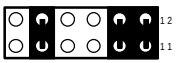
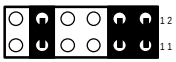
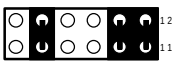
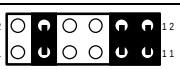
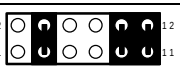
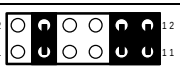
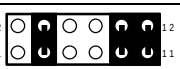
This section shows how to use the JP1 and JP2 jumper switches to choose the correct clock multiplier and voltages for your new Intel, AMD, Cyrix/IBM, or IDT processor. For information about calculating the CPU upgrade board's clock multiplier, refer to the chapter "Technical Reference" later in this manual.

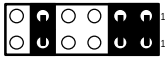
Intel CPU	JP1 Setting	JP2 Setting
Pentium-200 (66/3.0x)		
Pentium w/MMX-166 (66/2.5x)		
Pentium w/MMX-200 (66/3.0x)		
Pentium w/MMX-233 (66/3.5x)		

For Dual CPU system's upgrade, please stick with Intel CPUs; AMD, Cyrix & IDT CPU won't support SMP systems.

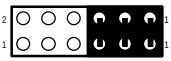
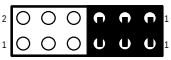
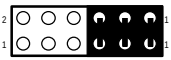
AMD K6 CPU	JP1 Setting	JP2 Setting
K6-166 (66/2.5x)		
K6 -200 (66/3.0x)		
*K6 -233 (66/3.5x) 3.2V		
*K6 -233 (66/3.5x) 2.2V		
K6 -266 (66/4.0x)		
K6 -300 (66/4.5x)		

* Note the actual voltage printed on the CPU label.

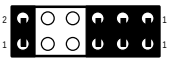
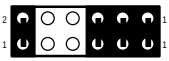
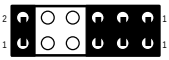
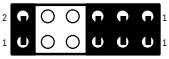
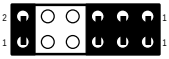
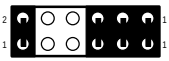
AMD K6-2 CPU	JP1 Setting	JP2 Setting
K6-2/233 (66/3.5x)		
#K6-2/233 (75/3.0x)		
K6-2/266 (66/4.0x)		
#K6-2/266 (75/3.5x)		
K6-2/300 (66/4.5x)		
#K6-2/300 (75/4.0x)		
K6-2/333 (66/5.0x)		
#K6-2/333 (75/4.5x)		

K6-2/366 (66/5.5x)		

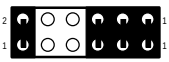
For systems with an external clock speed faster than 66MHz.

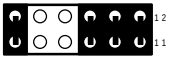
Cyrix/IBM 6x86L CPU	JP1 Setting	JP2 Setting
6x86L-P150+ (60/2.0x)		
6x86L-P166+ (66/2.0x)		
#6x86L-P200+ (75/2.0x)		

For systems with an external clock speed faster than 66MHz.

Cyrix/IBM 6x86MX CPU	JP1 Setting	JP2 Setting
6x86MX-PR166GP (60/2.5x)		
6x86MX-PR200GP (66/2.5x)		
#6x86MX-PR200GP (75/2.0x)		
6x86MX-PR233GP (66/3.0x)		
#6x86MX-PR233GP (75/2.5x)		
#6x86MX-PR266GP (83/2.5x)		

For systems with an external clock speed faster than 66MHz.

Cyrix/IBM M-II CPU	JP1 Setting	JP2 Setting
M-II-300GP (66/3.5x)		

M-II-333GP (75/3.5x)		

IDT CPU	JP1 Setting	JP2 Setting
C6 MMX-180 (60/3.0x)		
C6 MMX-200 (66/3.0x)		
C6 MMX-225 (75/3.0x)		
C6 MMX-240 (60/4.0x)		

JP1 Settings: Clock Multiplier

This section shows the clock multiplier settings for Intel, AMD, Cyrix/IBM, and IDT CPUs.

Clock Multiplier for P55C, K6, K6-2, 6x86L, 6X86MX, M-II (Dual-Voltage) C6, and P54C (Single-Voltage)								
CLKMUL	**5.5x**	**5x**	**4.5x**	**4x**	**3.5x**	**3x**	**2.5x**	**2x**
JP1: Pins 1-2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
JP1: Pins 3-4	OFF	ON	ON	OFF	OFF	ON	ON	OFF
JP1: Pins 5-6	ON	ON	ON	ON	OFF	OFF	OFF	OFF

Clock Multiplier for 6X86 (Single-Voltage) and 6X86L (Dual-Voltage)	
CLKMUL	**2x**
JP1: Pins 1-2	ON
JP1: Pins 3-4	OFF
JP1: Pins 5-6	OFF

For systems with an external clock speed of less than 66MHz (50MHz or 60MHz), there may be a slight performance sacrifice for your new CPU. For example, changing to a K6-166 from a Pentium-75 will result in a system upgrade speed of 150MHz (not 166MHz). In this case, you can get improved performance by adjusting the external clock speed to 66MHz.

JP2 Settings: CPU Voltage and CPU Overheating Protection

This section shows the CPU core voltage settings for Intel, AMD, Cyrix/IBM, and IDT CPUs. It also discusses enabling and disabling the *CPU overheating protection* function.

Pins 1-10: CPU Core Voltage

To reduce power consumption, dual-voltage CPUs use two separate supply voltages: an I/O interface voltage and a lower core voltage for the processor.

Core Voltage	3.5V	3.3V	3.2V	2.9V	2.8V	2.2V	1.8V
CPU Type	**C6**	**P54C**	**K6-233***	**K6-166 K6-200 6X86MX**	**P55C 6X86L**	**K6-266 K6-300 K6-2**	**K6-3**
JP2: Pins 1-2	Closed	Closed	Open	Closed	Open	Open	Closed
JP2: Pins 3-4	Closed	Open	Open	Open	Open	Closed	Closed
JP2: Pins 5-6	Closed	Closed	Closed	Open	Open	Open	Open
JP2: Pins 7-8	Closed	Closed	Closed	Closed	Closed	Open	Open
JP2: Pins 9-10	Closed	Closed	Closed	Closed	Closed	Closed	Open

For a complete listing of core voltage settings 1.6V~3.5V, refer to the chapter "Technical Reference" P.21.

Pins 11-12: CPU Overheating Protection

The CPU upgrade board offers a unique *CPU overheating protection* function—when enabled, the CPU speed will automatically drop 50% if the CPU temperature reaches 70°C. This prevents the CPU from overheating.

CPU Overheating Protection	
JP2: Pins 11-12	**CPU Overheating Protection**
Closed	Enabled
Open	Disabled

Installing the CPU Upgrade Board

This chapter describes installing your PowerLeap™ PL-ProMMX Plus CPU upgrade board.

Before Installation

Prior to starting installation, take your CPU upgrade board from its packing and remove the protective foam pad, taking care not to damage the pins. If the package includes a CPU cooling fan & heatsink, remove it too.

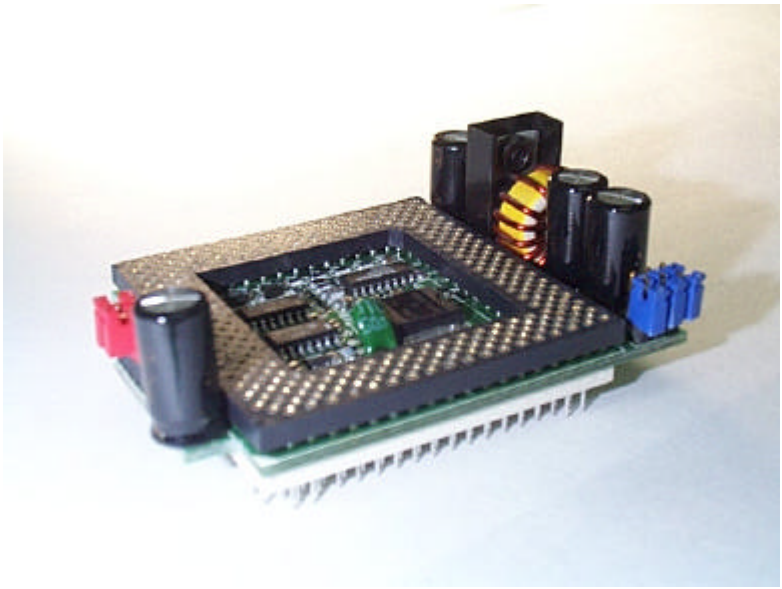


Figure 1. PowerLeap™ PL-ProMMX Plus (SVRM)

To compare the performance increase provided by the PowerLeap™ PL-ProMMX Plus CPU upgrade board, we suggest running the Landmark System Speed Test both before and after installation. If you are uncertain about the speed of your existing CPU, you can determine the speed by running the Landmark System Speed Test. For details, see "Running the Landmark System Speed Test" later in this guide.

Installation

If your package came with a CPU cooling fan & heatsink, install the CPU upgrade board as follows.

➲ To install the CPU upgrade board:

1. Place your computer where you will have plenty of space to work.
2. **Turn the computer off and disconnect all power cords and cables from the rear of the computer.**
3. Remove the cover from the computer (as described in the computer documentation).
4. Locate your existing CPU on the computer's motherboard. The CPU will be clearly labeled with the manufacturer's name (such as "Intel"), and markings identifying the CPU model and speed (such as Pentium-75).
5. Remove the existing CPU cooling fan.
6. Remove the existing CPU from the ZIF socket.

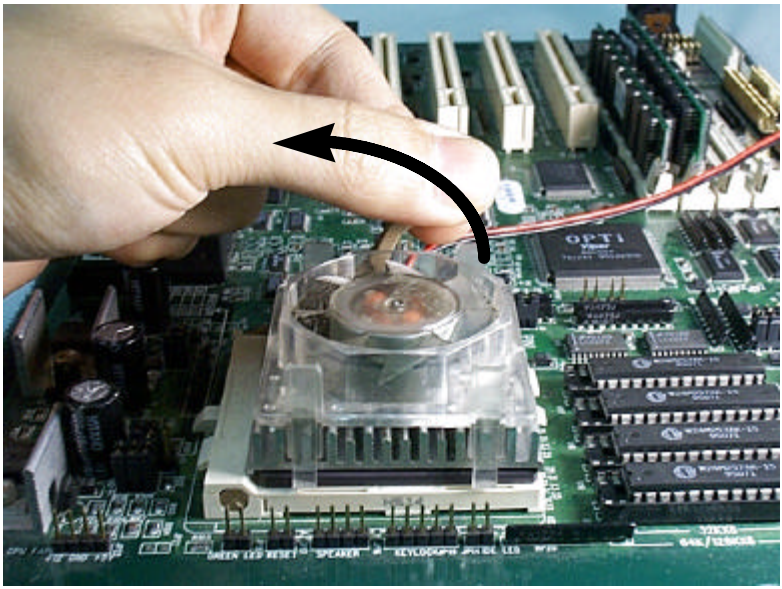


Figure 2. Removing the existing CPU and CPU cooling fan

7. Hold the provided CPU cooling fan & heatsink so that the CPU plate faces upward.
8. Loosen the hex nuts at each corner of the CPU cooling fan. You should be able to freely move the CPU plate up and down.

9. Turn your new CPU over (so that the pins are facing upward) and slide it under the grooves at the sides of the CPU plate.

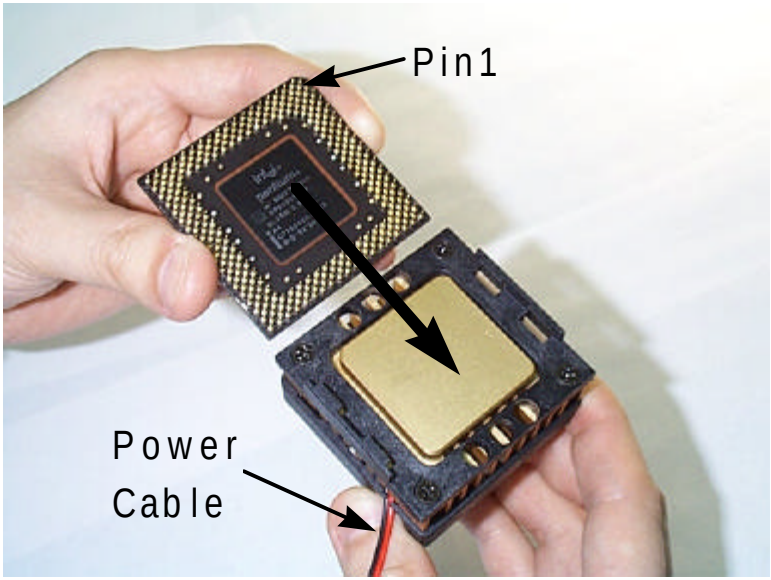


Figure 3. Sliding the CPU onto the CPU plate

Pin 1 of the CPU must occupy the corner diagonally opposite the fan's power cable. If necessary, remove the CPU from the CPU plate and insert it again, with pin 1 in the correct position.

10. Tighten the hex nuts. The CPU should be firmly attached to the CPU plate.

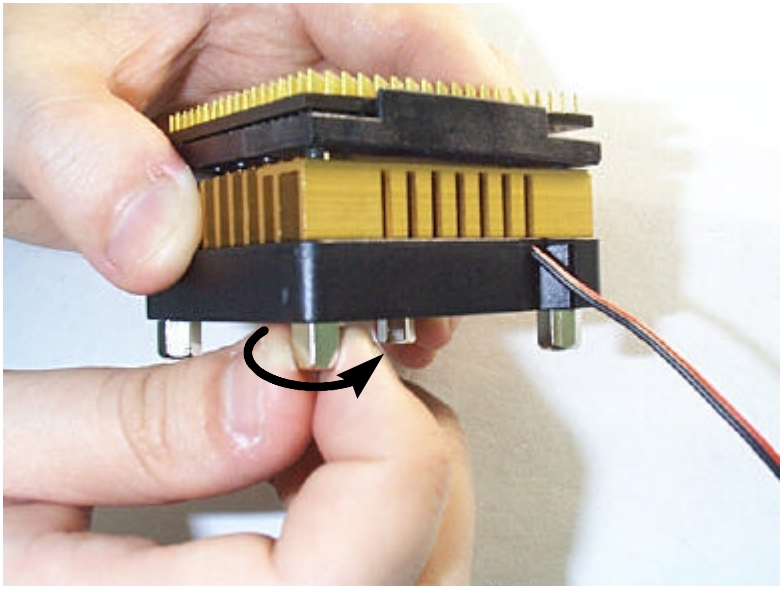


Figure 4. Tightening the hex nuts

11. Make sure that the upgrade board's JP1 and JP2 jumper settings are correct (refer to the previous chapter). These jumper switches let you set the correct external clock frequency, clock multiplier, and voltage for the upgrade board.

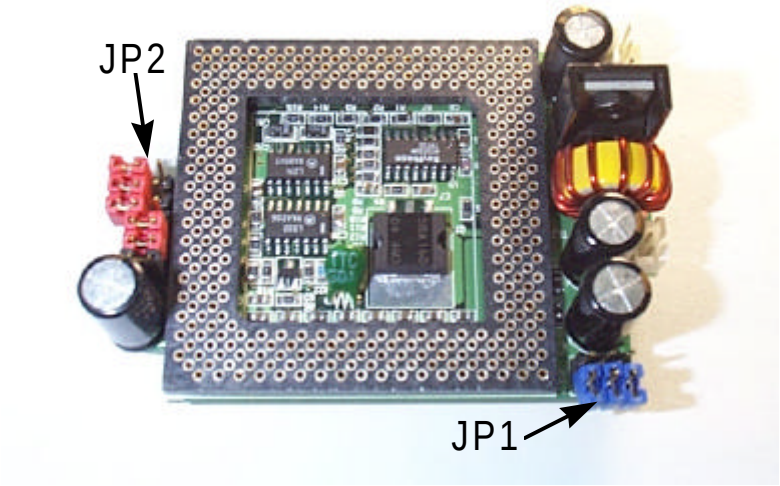


Figure 5. JP1 and JP2 jumper switches

12. Turn the CPU cooling fan & heatsink over and insert the CPU into the upgrade board, **making sure that pin 1 of the CPU corresponds to pin 1 of the upgrade board**. Be sure the CPU is firmly seated in the board.

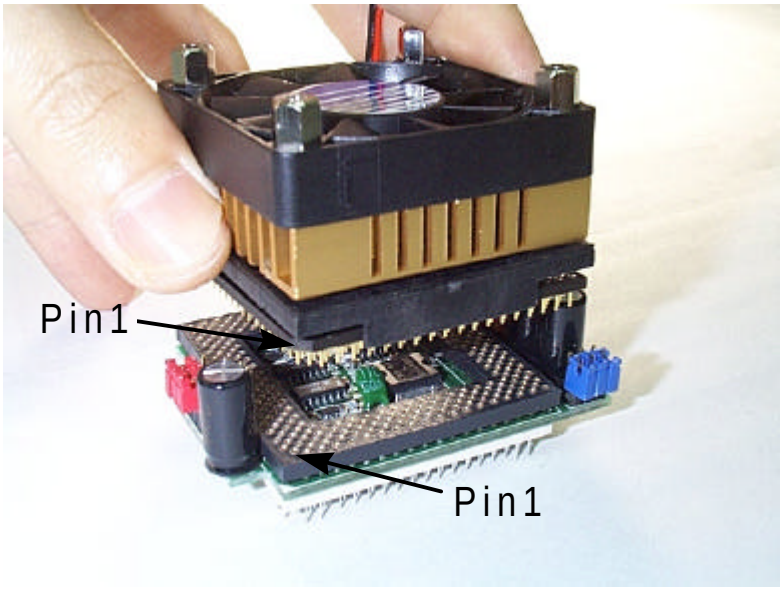


Figure 6. Inserting the CPU into the upgrade board

13. Install the CPU upgrade board into your computer's ZIF socket, **making sure that pin 1 of the upgrade board is installed in pin 1 of the ZIF socket.**

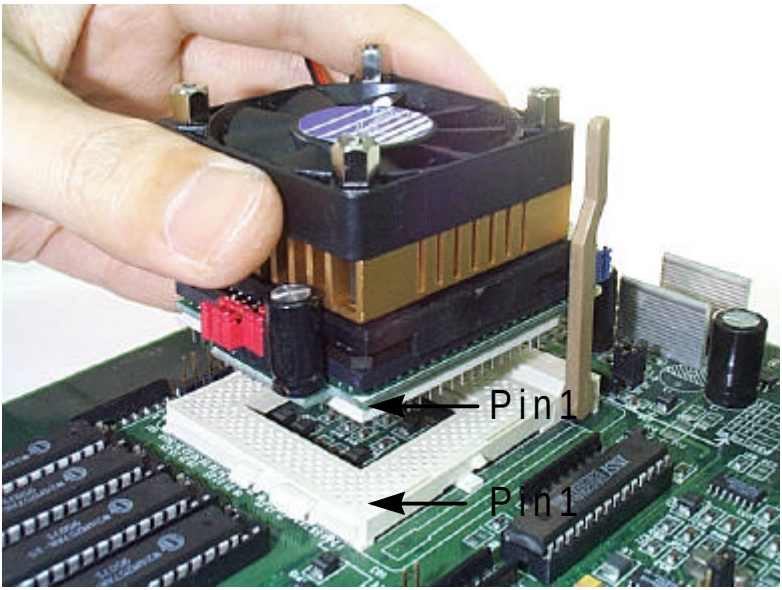


Figure 7. Installing the CPU upgrade board into the ZIF socket

Pin 1 of the CPU upgrade board must match the pin 1 hole of the ZIF socket. If the upgrade board is installed incorrectly, it may be damaged.

14. Lock the CPU upgrade board into the ZIF socket by pressing the socket arm down.

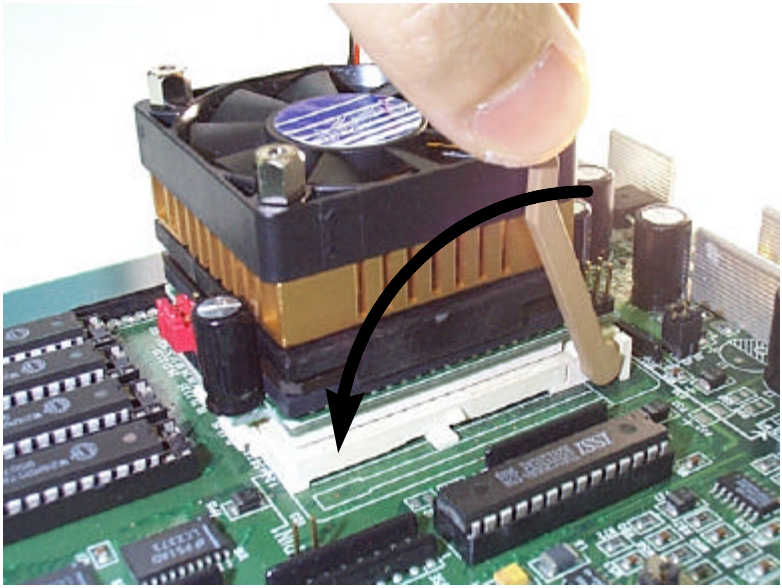


Figure 8. Locking the CPU upgrade board into the ZIF socket

15. Plug the PL-ProMMX Plus's power cable and fan' s power cable into the power connector and fan connector on the CPU upgrade board.

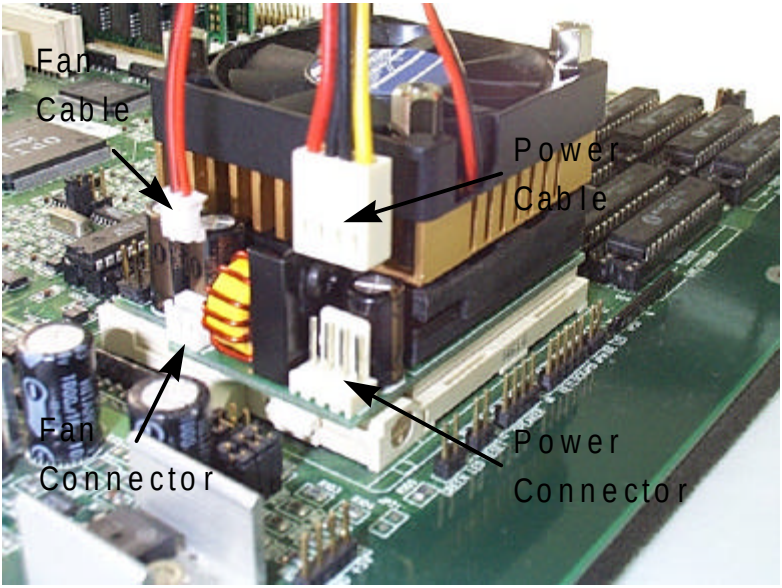


Figure 9. Connecting the power cable and fan cable

The upgrade board must have an independent (external) power supply in order to operate. Without a connection to an external power supply, the CPU upgrade will not work.

For maximum reliability, do not use the unused connector on the power connector cord to supply power to a hard disk drive or other device. In other words, use the power connector cord to connect only the upgrade board to the power supply.

Technical Reference

This chapter presents information for calculating the system upgrade speed. It also lists all CPU core voltage settings.

Calculating the System Upgrade Speed

You can achieve the best CPU performance by adjusting the system board's external clock speed according to the tables below. Or use the formula below to calculate the CPU upgrade board's clock multiplier.

System Upgrade Speed = External Clock Speed x Upgrade Board Clock Multiplier

Intel CPU	External Clock Speed	Upgrade Board Clock Multiplier	Internal Clock Speed
Pentium - 75	50 MHz	1.5x	75 MHz
Pentium - 90	60 MHz	1.5x	90 MHz
Pentium - 100	66 MHz	1.5x	100 MHz
Pentium - 120	60 MHz	2x	120 MHz
Pentium - 133	66 MHz	2x	133 MHz
Pentium - 150	60 MHz	2.5x	150 MHz
Pentium -166	66 MHz	2.5x	166 MHz
Pentium - 200	66 MHz	3x	200 MHz
P55C MMX - 166	66 MHz	2.5x	166 MHz
P55C MMX - 200	66 MHz	3x	200 MHz
P55C MMX - 233	66 MHz	3.5x	233 MHz

AMD CPU	External Clock Speed	Upgrade Board Clock Multiplier	Internal Clock Speed
K6-166	66 MHz	2.5x	166 MHz
K6-200	66 MHz	3x	200 MHz
K6-233	66 MHz	3.5x	233 MHz
K6-266	66 MHz	4x	266 MHz
K6-300	66 MHz	4.5x	300 MHz
K6-2 /233	66 MHz	3.5x	233 MHz
K6-2 /233	75 MHz	3x	225 MHz
K6-2 /266	66 MHz	4x	266 MHz
K6-2 /266	75 MHz	3.5x	266 MHz
K6-2 /300	66 MHz	4.5x	300 MHz
K6-2 /300	75 MHz	4x	300 MHz
K6-2 /333	66 MHz	5x	333 MHz
K6-2 /333	75 MHz	4.5x	337 MHz
K6-2 /366	66 MHz	5.5x	366 MHz

IDT CPU	External Clock Speed	Upgrade Board Clock Multiplier	Internal Clock Speed
C6-180	60 MHz	3x	180 MHz
C6-200	66 MHz	3x	200 MHz
C6-225	75 MHz	3.5x	225 MHz
C6-240	60 MHz	4x	240 MHz

Cyrix/IBM CPU	External Clock Speed	Upgrade Board Clock Multiplier	Internal Clock Speed
6x86 - P120+	50 MHz	2x	100 MHz
6x86 - P133+	55 MHz	2x	110 MHz
6x86 - P150+	60 MHz	2x	120 MHz
6x86 - P166+	66 MHz	2x	133 MHz
6x86 - P200+	75 MHz	2x	150 MHz
6x86L - P120+	50 MHz	2x	100 MHz
6x86L - P133+	55 MHz	2x	110 MHz
6x86L - P150+	60 MHz	2x	120 MHz
6x86L - P166+	66 MHz	2x	133 MHz
6x86L - P200+	75 MHz	2x	150 MHz
6x86MX - PR166	60 MHz	2.5x	150 MHz
6x86MX - PR200	66 MHz	2.5x	166 MHz
6x86MX - PR200	75 MHz	2.5x	150 MHz
6x86MX - PR233	66 MHz	2 x	200 MHz
6x86MX - PR233	75 MHz	3x	188 MHz
6x86MX - PR266	83 MHz	2.5x	207 MHz
MII-300GP	66 MHz	3.5x	233 MHz
MII-333GP	75 MHz	3.5x	263 MHz

For systems with an external clock speed slower than 50MHz, there may be a slight performance sacrifice for your new CPU. For example, changing to a K6-166 from a Pentium-75 will result in a system upgrade speed of 150MHz (not 166MHz).

JP2: Core Voltage Settings

Core Voltage	Pins 1-2	Pins 3-4	Pins 5-6	Pins 7-8	Pins 9-10
3.5V	Closed	Closed	Closed	Closed	Closed
3.4V	Open	Closed	Closed	Closed	Closed
3.3V	Closed	Open	Closed	Closed	Closed
3.2V	Open	Open	Closed	Closed	Closed
3.1V	Closed	Closed	Open	Closed	Closed
3.0V	Open	Closed	Open	Closed	Closed
2.9V	Closed	Open	Open	Closed	Closed
2.8V	Open	Open	Open	Closed	Closed
2.7V	Closed	Closed	Closed	Open	Closed
2.6V	Open	Closed	Closed	Open	Closed
2.5V	Closed	Open	Closed	Open	Closed
2.4V	Open	Open	Closed	Open	Closed
2.3V	Closed	Closed	Open	Open	Closed
2.2V	Open	Closed	Open	Open	Closed
2.1V	Closed	Open	Open	Open	Closed
2.0V	Open	Open	Open	Open	Closed
1.9V	Open	Open	Closed	Open	Open
1.8V	Closed	Closed	Open	Open	Open
1.7V	Open	Closed	Open	Open	Open
1.6V	Closed	Open	Open	Open	Open

Downloading PowerLeap Software

The PowerLeap web site (http://www.powerleap.com/download.htm) contains links to files available for FTP download, including:

- PowerLeap CPU Control Panel and the PL/586 Write-back Cache Driver for Windows 95. This is the contents of the distribution diskette that is include with the PL/586-133, PL/54C, PL/OD54C, and PL/ProMMX products.
- PL/586 Installation Software for DOS/Windows 3.x.
- PL/386 Installation Software for DOS/Windows 3.x.
- WinTune 97 Benchmark. *Windows Magazine's* latest version of the WinTune benchmark, which is handy for before-after comparisons. Requires Windows 95.