# POWERLEAP™ NEO S370

## An FC-PGA to PPGA Converter

*--for use with--*

- Intel Pentium III "Coppermine" CPUs

***Installation Guide***

Manual edition 1.1, April 2000

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# Contents

# Warning: Read Me First!

There are many issues you need to be aware of before and during installation of your FC-PGA ("Flip Chip" Pin Grid Array) CPU and Neo S370. We strongly recommend you completely read this section before proceeding with your CPU upgrade.

- **Take extreme care when inserting the FC-PGA CPU into the Neo S370**. The FC-PGA CPU (Intel Pentium III "Coppermine") is a LOT more fragile than PPGA CPUs (Celeron).
- **Avoid touching the FC-PGA silicon die**. Always handle the FC-PGA CPU by the edges.
- **BEFORE inserting the FC-PGA CPU into the Neo S370 converter, set the correct S1 DIP switch settings**. Refer to the section, "Specifying the CPU Bus Settings".
- **DO NOT try to remove your FC-PGA CPU from your Neo S370**. If you have wrongly inserted your FC-PGA CPU in the Neo S370 seek the help of an experienced technician to help you remove it. Trying to remove it yourself is very risky and an easy way to damage your new and expensive FC-PGA CPU.
- **DO NOT remove the Neo S370 if the power is still on**. The Neo S370 LED emits a light if system power is still running through the motherboard.
- **DO NOT use the fan that came included with your FC-PGA CPU**. Instead, use the custom PowerLeap Neo S370 CPU heatsink/fan. The added height of the Neo S370 could cause problems if you try to use a different CPU heatsink/fan. In addition, the thermal pad protects the silicon die and increases thermal dissipation rate.

# Introduction

The PowerLeap Neo S370 is a unique, cost-effective FC-PGA to PPGA converter that allows you to install an Intel Pentium III "Coppermine" into a Socket 370 computer designed for an Intel Celeron CPU. With the Neo S370's unique technology, you can upgrade your Celeron CPU to a Pentium III while still keeping your existing Socket 370 motherboard.

Although the FC-PGA and Celeron CPUs are designed for Socket 370, there are differences in the pin definitions and voltage requirements for these CPUs. For this reason, an FC-PGA CPU will not run when directly inserted in the processor socket of a motherboard designed for the Celeron. The Neo S370 adapts the pin signals of FC-PGA CPUs so that they can run on motherboards with the PPGA form factor.

## Special Features

The PowerLeap Neo S370 provides the following advanced features:

- Supports Intel Pentium III (100/133MHz) CPUs in the FC-PGA package. (Note: In order to use the Pentium III at 100MHz or 133MHz, your motherboard must support the 100MHz or 133MHz frontside bus, respectively.)
- When used with * *SMP-compliant CPUs*, supports SMP (Symmetric Multi-Processing) on dual-Socket 370 motherboards.

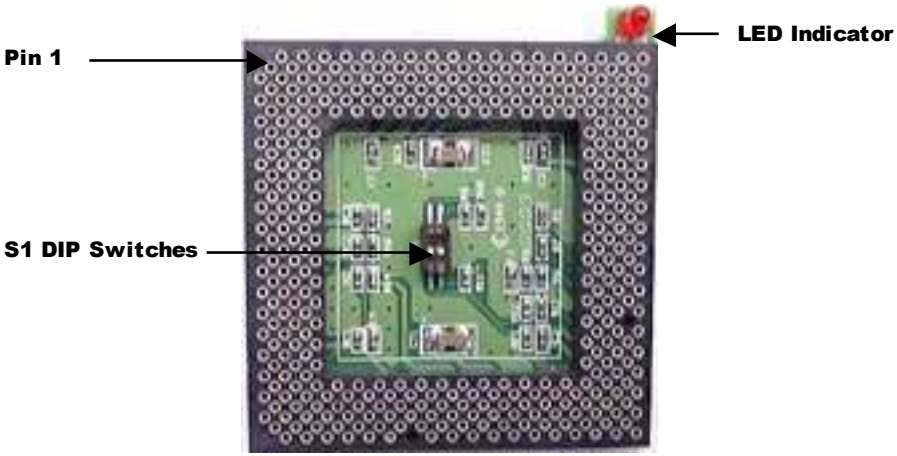
* *It is important to note that not all Pentium III (FC-PGA) CPUs are SMP compliant. To see if Pentium III CPU supports dual-processor operation, you need to know the version of the CPU (called "stepping"). Check the Intel web site to see an updated list of the Pentium III CPUs and whether they support dual-processor operation.*

- Includes a LED safety feature that signals whether there is still power running through the motherboard. **If the LED is emitting a light, do not remove the Neo S370**.
- Allows drop-in CPU replacement, with no software drivers to install.
- Compatible with the PowerLeap PL-PII and other slotkets.

## What You Have

In addition to this *Installation Guide*, the PowerLeap Neo S370 converter upgrade kit includes:

- The PowerLeap Neo S370 converter




**PowerLeap Neo S370**

- PowerLeap CPU heatsink/cooling fan
- Thermal conductive pad

# Inserting an FC-PGA CPU into the Neo S370

This section describes inserting an Intel FC-PGA Pentium III (100/133MHz) CPU into your Neo S370 converter.

*WARNING:* *When inserting the CPU into the Neo S370, do not touch the FC-PGA CPU Die.*

## About the FC-PGA Form Factor

The FC-PGA ("Flip Chip" Pin Grid Array) form factor is a new chip packaging designed for Intel Pentium III "Coppermine" processors. On the FC-PGA package, the processor's silicon core faces up and is exposed. In contrast, the silicon core of a PPGA (Plastic Pin Grid Array) form factor faces down toward the socket.

The FC-PGA allows the core to have direct contact with a heatsink. However, this also makes the CPU much more fragile than a PPGA form factor CPU.

## Before Insertion

Prior to installation, take your Neo S370 from its packing and remove the protective wrapping, taking care not to damage the pins. Next remove the included CPU heatsink/cooling fan.

Always handle the Neo S370 and your new FC-PGA CPU by the edges and avoid touching its pins.

Before installing the Neo S370 or handling your new FC-PGA CPU, we strongly recommend the following:

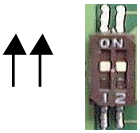
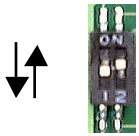
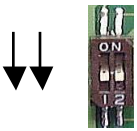
- Use a grounding strap or touching the power supply of the computer before installation to release any static electricity build-up. If possible work in a clean and static-free area. For example, carpeted areas are very susceptible to static electricity build-up. Concrete or other non-carpeted surfaces are less likely to create static electricity build-up.
- Do not touch the silicon die on the CPU. The silicon die is the blue or silver square on the surface of the FC-PGA CPU.

*CAUTION:* *Your PowerLeap Neo S370 converter is a static-sensitive device. It is susceptible to damage if not protected during installation.*

## Specifying the CPU Bus Settings

This section shows you the correct S1 DIP switch settings to choose depending on your CPU bus speed.

*CAUTION: You must apply the correct S1 DIP switch settings before you insert your new CPU into the Neo S370.*

| CPU Bus Speed | S1 Settings | | S1 Settings Diagram |
|---|---|---|---|
| | 1 | 2 | |
| 66MHz | ON | ON |  |
| 100MHz **(Default)** | OFF | ON |  |
| 133MHz | OFF | OFF |  |

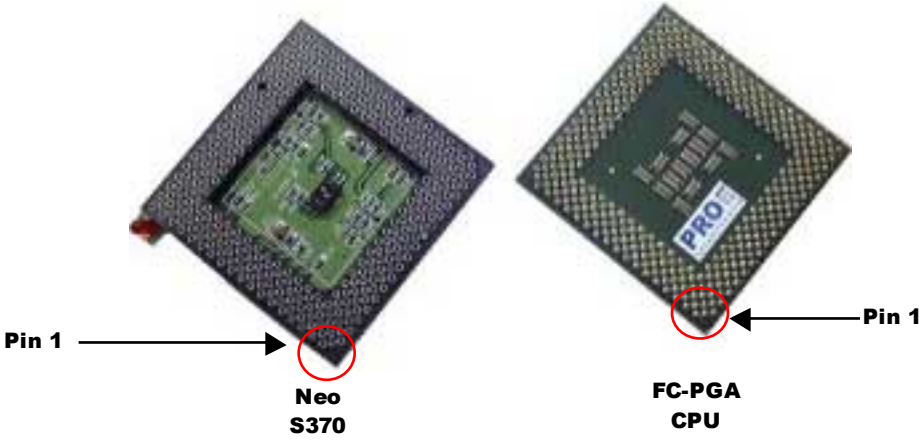
## Inserting an FC-PGA CPU into the Neo S370

This section describes inserting an FC-PGA CPU into the Neo S370.

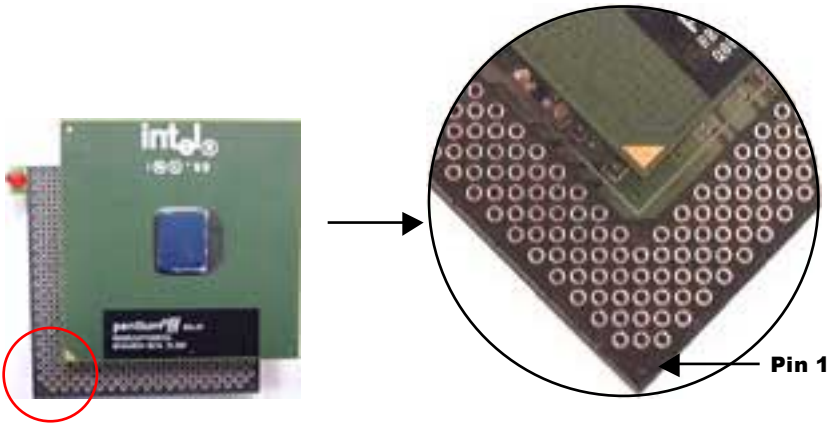
### ➲ To insert an FC-PGA CPU into the Neo S370:

1. Place the Neo S370 on a flat surface.
2. **Set the S1 DIP switch settings to correspond to your CPU bus speed**. Refer to "Specifying the CPU Bus Settings".

3. **Locate pin 1 on the CPU and the Neo S370**. A triangular tab indicates the pin 1 corner of a Pentium III CPU.




4. Align both pin 1 corners and place the FC-PGA CPU on the Neo S370.




*Note:* *Make sure the CPU is properly inserted in the Neo S370 before applying pressure.*

5. Pick up the combined unit by the edges with both hands and verify pin 1 alignment is correct.

6. Squeeze the unit together using evenly applied pressure.

*CAUTION: If the FC-PGA CPU does not easily fit, do not force it. Verify pin 1 alignment is correct.*

7. Make sure the new CPU is firmly seated in the Neo S370.


**INCORRECT**

**CORRECT**

*CAUTION: DO NOT try to remove the FC-PGA CPU yourself if you have incorrectly inserted it into the Neo S370.*

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# Installing the Neo S370 in a ZIF Socket

This section describes placing the Neo S370 into a ZIF socket on your motherboard. In addition, it shows you how to place the thermal conductive pad on the FC-PGA silicon die.

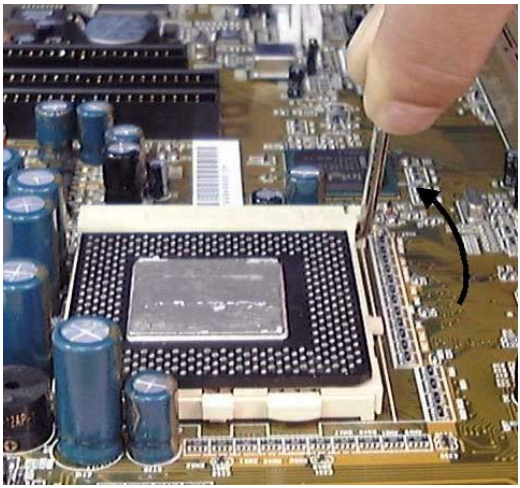
**You must correctly apply the conductive thermal pad**. The silicon die of a FC-PGA form factor CPU is mounted directly on the topside of the CPU. The thermal pad not only acts as a cushion to protect the exposed silicon die, but also helps dissipate heat evenly.

*CAUTION: Before continuing with this section, make sure you have properly inserted your new FC-PGA CPU into the Neo S370. Refer to the Correct and Incorrect pictures in the previous chapter to verify correct position.*

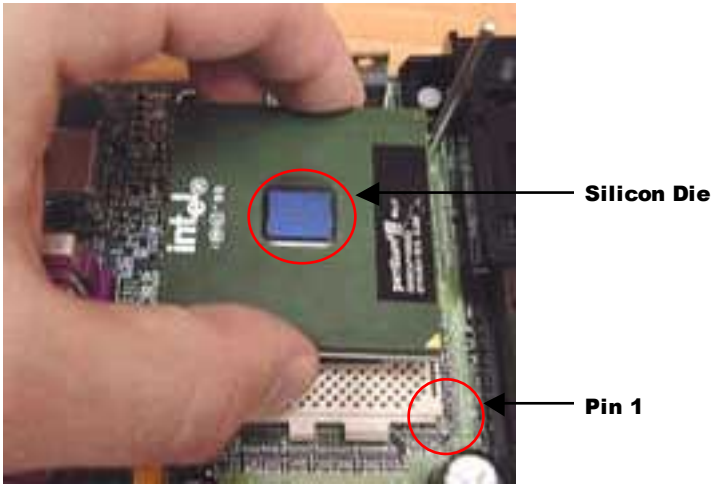
➲ **To install the Neo S370 in a ZIF socket:**

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.
5. Remove the existing CPU cooling fan.

6. Remove the existing CPU from the ZIF socket.



7. Make sure that pin 1 of the Neo S370 is properly aligned with pin 1 of the ZIF socket.
8. Install the new Neo S370 into your computer's ZIF socket. If the Neo S370 does not easily fit, do not force it. Verify pin 1 alignment is correct.



*CAUTION: Pin 1 of the Neo S370 must match the pin 1 hole of the ZIF socket.*

9. Lock the Neo S370 into the ZIF socket by pressing the socket arm down.

10. Place the thermal pad squarely on the FC-PGA silicon die.

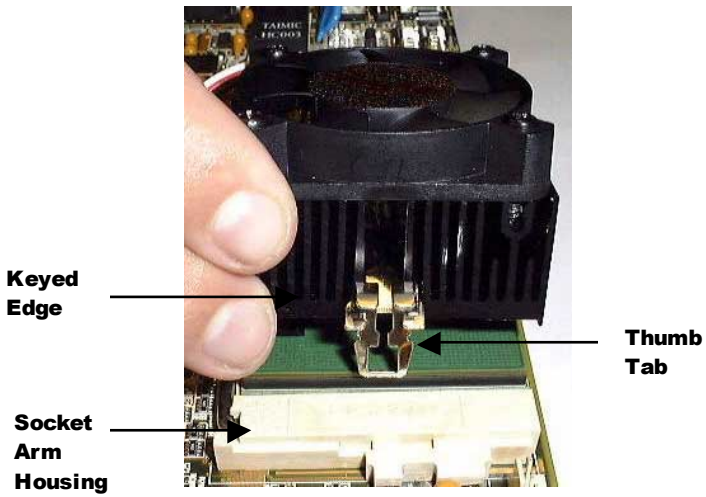
# Installing the CPU Heatsink/Fan

This section describes installing your new CPU heatsink/fan. **Do not use your old CPU heatsink/fan with your CPU upgrade**.

In addition to the added height of the Neo S370 converter, a heatsink designed for use with a PPGA CPU (Celeron) does not work with a FC-PGA CPU because it applies load to the center of the socket body. This places uneven force on the exposed silicon die and results in a tilted heatsink reducing thermal transfer rate.

➲ **To install the CPU heatsink/fan:**

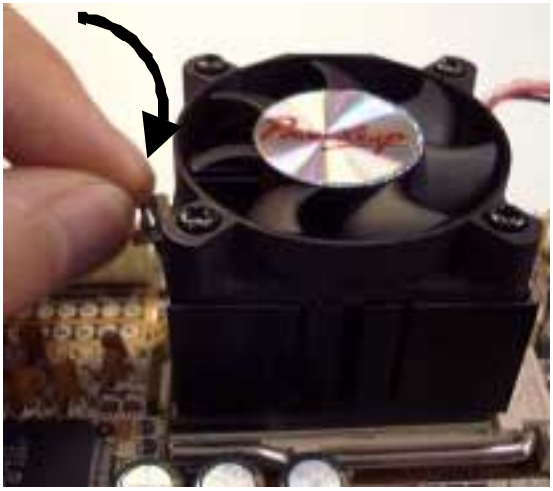
1. Make sure the area around the heatsink clip hooks is clear and tall components do not interfere with the CPU heatsink/fan.
2. Place the CPU heatsink/fan on the FC-PGA CPU. The thumb tab of the clip should face the housing of the socket arm.




3. Make sure the CPU heatsink/fan's thermal pad rests squarely on the silicon die. The die will be a blue or silver color.

4. Attach the clip on the opposite side of the socket arm housing to its socket tab.


5. Fasten the thumb tab side of the clip to its socket tab.



6. Connect the fan cable to the appropriate header on the motherboard.

# Frequently Asked Questions

- **Will I be able to use my current heatsink/fan when the Neo S370 is installed? I have read that because the FC-PGA core is so close to the top of the CPU package, the CPU is incompatible with current Socket 370 heatsinks.**

  We've designed the Neo S370 with a thin 2-layer PCB, but to eliminate any potential problems that could arise with incompatible heatsinks/fans, we will bundle a custom heatsink/fan with the Neo S370. We strongly recommend that you not use your original CPU heatsink/fan with the Neo S370. In addition, each Neo S370 will be bundled with a conductive thermal pad to protect the FC-PGA die (the pad will act as a cushion for the heatsink/fan).

- **Does the Neo S370 support SMP (Symmetric Multi-Processing)?**

  The Neo S370 supports dual-CPU operation with SMP-enabled CPUs. However, at the time of this writing Intel had not made SMP-enabled FC-PGA Pentium III CPUs available.

- **For dual processor systems, is it possible to mix processors of different steppings or types (for example, a 466MHz Celeron and a Pentium III 550)?**

  Intel supports mixed steppings for the Pentium III, but only with processors that have identical family and model number as indicated by the CPUID instruction (for more information, refer to "Intel Pentium III Processor Specification Update, March 2000"). Intel does not support dual processors running at different frequencies--"uncharacterized errata" may result. In dual processor systems, the processor with the lowest feature set (as determined by the CPUID Feature Bytes) must be the Bootstrap Processor (BSP). Using the Neo S370, your system may function with dual processors of different types--but the performance will not be significantly better than using the Bootstrap Processor alone. For example, with a Celeron 466 and Pentium III 550 running on a 66MHz frontside bus, the Celeron must be the Bootstrap

Processor and the Pentium III would operate at only 333MHz (66MHz x 5.5). In addition, only 128KB of the Pentium III's L2 cache will be used.

- **Why does the Neo S370 use a LIF (Low Insertion Force) socket instead of a ZIF socket?**

  The Neo S370 employs a customized 370-pin PGA socket. Using a ZIF socket for the FC-PGA will cause mechanical problems.

- **Won't there be a problem with the FC-PGA CPU's operation if the motherboard doesn't support a voltage as low as 1.6V?**

  This depends on your motherboard's VRM version. Motherboards released prior to VRM v8.2 (including Slot 1 motherboards in the Pentium II 233/266/300 'Klamath' era) won't support a core voltage of less than 2.0V. These boards can't take the 1.6V Pentium III even with the current Neo S370. (We're considering designing a version of the Neo S370 that employs a stepping VRM.) By the way, the Abit BP6 motherboard supports as low as 1.3V.

- **My motherboard will only go down to a CPU core voltage of 1.8V. Will the Neo S370 lower the voltage to the 1.6V that is necessary for the Pentium III CPU?**

  We've decided not to offer this feature in the current version. All recent Socket 370 PGA motherboards support 1.6V. However, for the old Slot 1 motherboards, we'll add the step-down voltage support to the forthcoming PL-PIII adapter (our latest Slot 1 upgrade). It'll use PowerLeap's patented IPS (Independent Power Source) technology and give you as low as 1.3V VCore.

- **Can I use the Neo S370 with a slotket?**

  Yes. You can install the Neo S370 on PowerLeap's PL-PII and other slot-to-socket adapters (slotkets).

- **I inserted my FC-PGA CPU into the Neo S370 incorrectly. How can I remove it?**

  The pins on an FC-PGA CPU are more fragile than those on a Celeron CPU, and are easily broken. If you insert the FC-PGA CPU in the Neo S370 incorrectly, do not attempt to remove it by yourself. Instead, seek the help of an experienced technician to help remove it. This precaution may prevent damage to your CPU.

- **Since the Pentium III CPU needs 1.6 volts, will my motherboard adjust itself accordingly (assuming that the board supports that voltage) or will I need to manually select a voltage of 1.6V?**

  Your motherboard will automatically adjust to the CPU voltage requirements (assuming that the board supports under 2.0V).