

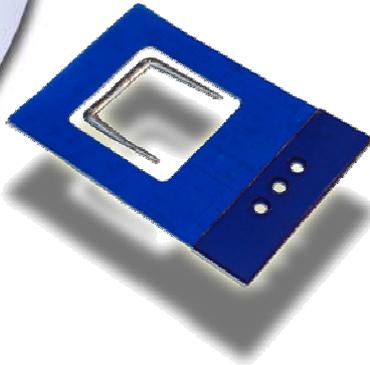


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Installation  
Guide for  
P/N: I775-X1



**Indigo2™**  
**Engineered Thermal Interface**  
for  
**Intel Core™ 2 Quad, Core™ 2 Extreme, Core™ 2 Duo and Xeon™ processors**

Indigo2™ is an Engineered Thermal Interface (ETI) that fits neatly between a CPU lid and heat sink or waterblock to keep CPUs cooler. Unlike greases, metallic thermal interface pads or liquid metal alloys, Indigo2 is a self-contained and sealed structure, deploying a Phase Change Metallic Alloy (PCMA) which reflows and fills surface asperities on the CPU lid and heat sink. The resultant interfacial layer is void-free and robust, with low thermal contact and bulk resistance.



Important: Unlike most thermal interface products, the Indigo2 form-factor is optimized for each application.



Attempting to use Indigo2 with CPUs or heat sinks other than those specified below may result in improper reflow, material migration, degraded performance or failure of the interface.

**Supported Hardware:**

Supported CPUs:

- Intel Core™ 2 Quad
- Core™ 2 Extreme
- Core™ 2 Duo
- Xeon™



Supported heat sink types:



Heat sink contacts entire surface of CPU lid. Compatible with Indigo2.

Unsupported heat sink types:



Heat sink does not contact entire surface of CPU lid. Incompatible with Indigo2.



Heat sink surface has channels between mounting base and heat pipes. Incompatible with Indigo2.

## **ETI Evaluation Kit Contents:**

The Indigo2 ETI is offered as part of an Engineered Thermal Interface Kit. This kit includes several cleanroom-grade surface cleaning products along with temperature indicating labels for two complete installations. The ETI kit includes:

- (2) Indigo2 ETIs
- (2) Temperature indicating labels
- (2) Pre-saturated solvent wiper pouches
- (2) Cleanroom-grade dry wipers
- (2) Pairs of powder-free nitrile gloves
- (1) Detailed Installation Guide



Check the condition of the ETI kit before installation; if any problem is found, contact Enerdyne Solutions for a replacement.

## **Installation Steps:**

1. **Motherboard Removal:**  
As many of the larger CPU heat sinks may include a backplate with multiple clip supports, removal of the motherboard from the PC case is recommended.



Motherboard removal will also facilitate proper alignment of the ETI to the CPU lid and heat sink. It is recommended that all heat sink mounting hardware be installed during Step #9.

2. **CPU Installation:**  
Install the CPU in the motherboard. Refer to motherboard or CPU installation instructions.



The ETI can only be applied after correct installation of the CPU.

3. **Thermal Interface Material (TIM) Removal (if applicable):**  
Using the supplied dry wiper cloth, thoroughly remove all existing interface grease from the CPU lid and heat sink.



Use fresh areas of the wiper until no visible grease residue is detected on the wiper.

4. **Put on Gloves:**  
Prior to the final degreasing step, the powder-free nitrile gloves must be worn to prevent any finger oils or contaminants from contacting the CPU lid, heat sink and ETI surfaces.



Stray interface compound can be mitigated as gloves are applied immediately following the TIM Removal step.

5. **Degrease CPU lid and Heat Sink Surfaces:**  
Remove the pre-saturated solvent wiper from the foil pouch and carefully wipe the CPU lid and heat sink interfacial surfaces. Continue to wipe each surface with fresh areas of the wiper until no visible residue is detected on the wiper.



Be prepared to wipe the CPU lid and heat sink surfaces immediately upon opening the foil pouch as the solvent will quickly evaporate.



New CPUs or heat sinks must be degreased as well.



Use only the supplied solvent wipers, acetone or xylene for the degreasing step. **Do not use** isopropyl alcohol (IPA) for the final wipe.

6. **Indigo2 Handling:**  
The Indigo2 ETI must be handled on the blue surfaces, preferably with powder-free gloves.



ETI installation requires a lint-free environment.



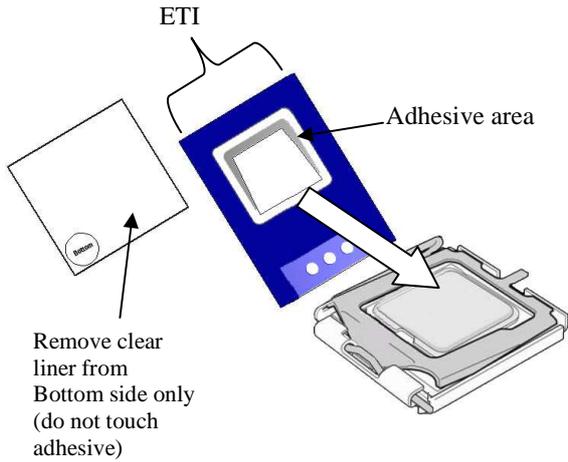
Do not bend, flex or puncture any portion of the ETI. Keep all chemical agents (solvents, wipers, etc.) away from the ETI. Do not remove the liners prior to the specific installation step.

**7. Bottom Side Liner Removal:**

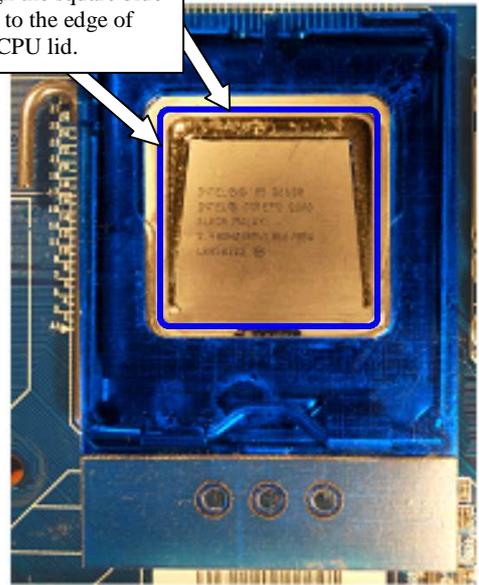
Remove the “Bottom” side square clear liner by slowly peeling the liner, beginning from the corner with the white label.



Do not touch the exposed adhesive area after removal of the clear liner. Once the liner has been removed, proceed immediately to Step #8: Alignment and Placement.



Align the square blue ring to the edge of the CPU lid.



ETI on CPU lid with correct alignment and placement



It is critical that the square blue alignment ring is completely on the CPU lid.

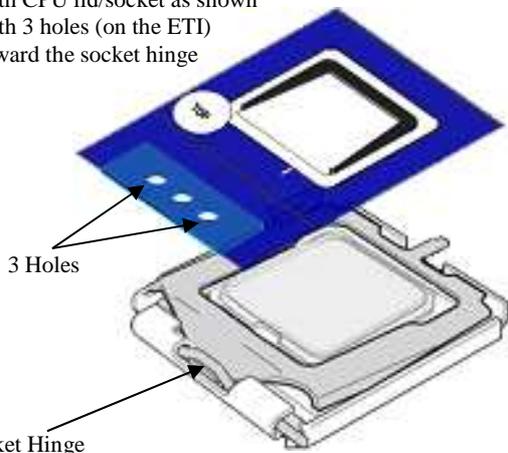
**8. Alignment and Placement:**

Orient the ETI such that the Bottom side is facing the CPU lid. (Refer to the figures below for correct placement).



Orientation and alignment of the ETI to the CPU lid and socket is critical. Refer to the figures below for correct placement.

Ensure that the ETI is oriented with CPU lid/socket as shown with 3 holes (on the ETI) toward the socket hinge



Carefully lower the ETI onto the CPU lid surface and apply a light, downward finger pressure onto the square blue alignment ring surfaces.

**9. Heat Sink Mounting Hardware Installation:**

Any heat sink clip supports and backplates may now be mounted over the installed ETI.



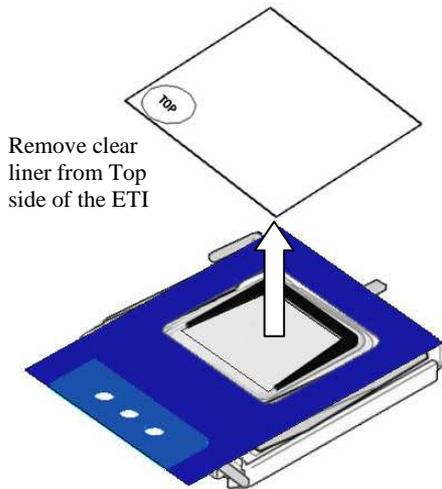
The ETI must extend beneath any heat sink clip support/frame and must not be bent by the frame.

**10. Top Side Liner Removal:**

Remove the “Top” side square clear liner by slowly peeling the liner, beginning from the corner with the white label.



Do not touch the adhesive area after removal of the clear liners. Once the liner has been removed, proceed immediately to Step #11: Heat Sink Mounting.



Remove clear liner from Top side of the ETI

### 11. Heat Sink Mounting:



It is imperative that the heat sink is aligned correctly before it makes contact with the ETI. Once the adhesive makes contact with the surface of the heat sink it cannot be removed or repositioned without damaging the ETI.

Mount the heat sink and apply a uniform pressure to the assembly. Use even torque on all of the bolts (by alternating the tightening of bolts) to ensure the force is centered over the CPU lid area.

The heat sink clip support may be temporarily taped to the heat sink base to keep in place during heat sink mounting.



Avoid any twisting or peeling on the interface as the heat sink is bolted down.

### 12. ETI Reflow:

As part of the initial installation, the Indigo2 ETI must be heated to a minimum of 70 °C (158 °F) to reflow (melt) the PCMA. Reflow may be accomplished through the use of either:

**Method 1:** Oven Reflow

**Method 2:** CPU Reflow



Oven reflow is the easiest and preferred method for achieving the highest thermal performance interface.



The interface is highly thermally resistive without a complete reflow. Failure to perform the exact reflow procedure may result in failure of the thermal interface.

### Method 1: Oven Reflow:

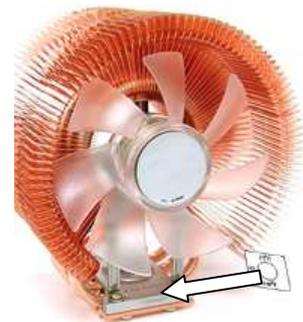
Remove memory modules, boards and cables from the motherboard before inserting into the oven for reflow.



Most motherboards, CPUs and heat sink fans possess a non-operating/storage temperature limit well above reflow temperature (consult your specific hardware manufacturer's specifications).

The Indigo2 ETI is shipped with a one-time-use temperature indicating label that, if placed correctly, will indicate a proper oven reflow.

1. Place the temperature indicating label firmly on the heat sink baseplate or waterblock. The label must be firmly attached to correctly measure heat sink temperature.



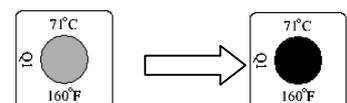
**Temperature indicator on the heat sink baseplate adjacent the thermal interface**



If the baseplate is not visible or accessible, you must measure the interface temperature to verify a minimum of 70 °C has been reached.

2. Place the entire motherboard assembly (motherboard, CPU with the ETI and heat sink installed) in an oven set between 70-75 °C. Reflow may take 25-30 minutes in a convection-type oven.

When the heat sink baseplate has reached proper temperature, the indicator will turn from silver to black indicating a complete reflow.



- Turn off the oven, open the oven door and allow cooling for 10-15 minutes. Leave the entire motherboard assembly in the oven.



Do not move or bump the motherboard and heat sink until it is cool to the touch.

### Method 2: CPU Reflow:

By exercising the CPU, an adequate quantity of processor thermal energy can facilitate reflow.

- Turn off computer and unplug the power cord.
- Unplug CPU (heat sink) fan and case fan(s). For water cooled systems, disconnect the water lines.
- Place a towel or other cloth completely around all surfaces of the heat sink in order to ensure that the thermal interface reaches the proper temperature.
- Plug in power cord and boot the computer.
- Exercise the CPU with a “burn-in” program to maximize heat generated at the junction. Multi-core CPUs may require multiple copies of a burn-in program to be run simultaneously (one for each core). Refer to References below for links to burn-in utilities.
- Use a CPU monitoring program (TaskManager in Windows) to ensure that all CPU cores are running at 100%.

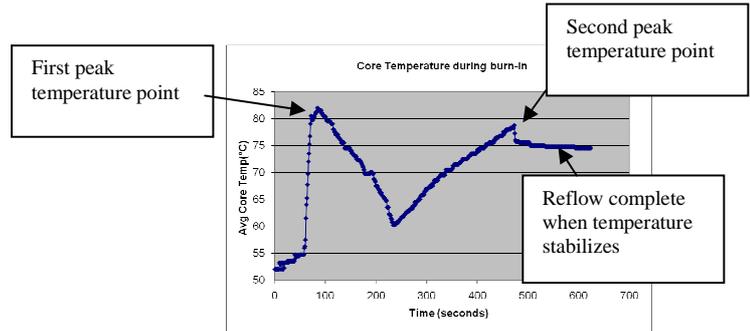


The Indigo2 interface is highly thermally resistive without a complete reflow.



Intel Multi-core processors have built in protection that prevents the processor from exceeding maximum junction temperatures.

During an optimal processor burn-in, the CPU core temperatures will rise to a first peak temperature (80-90 °C), fall rapidly and then rise to a second peak temperature point before dropping to the final stable temperature.



**Graph of Core Temperature during Processor Burn-in Reflow**

After the core temperature reaches the second peak temperature point, ~75-80 °C, shut down the computer, remove any cloth from around the heat sink and reconnect the CPU fan and case fan(s) or water lines.



If the core temperature does not achieve a first peak temperature of 80-90 °C and a second peak temperature point of ~75-80 °C, then improper reflow may have occurred. Proceed to “Removal” and re-install Indigo2 using **Method 1: Oven Reflow** (See Step #12).



The CPU core temperature is not to be confused with the case temperature (expressed as Maximum Tc). The maximum core temperature will always display 10-20 °C higher than the Maximum Tc specification (depending on the specific CPU).

### Rework:

To disassemble, release the clamping force and apply a side bending force to the top of the heat sink to break the bond from one edge of the ETI. The ETI may then be peeled off. Any residual adhesive or alloy on the CPU or heat sink/exchanger may be removed with a flat blade along with a solvent such as acetone or xylene.

Indigo is a single-use interface product and any rework (pre/post-reflow) will require a new ETI. All interface material and adhesive residue must be removed and the CPU and heat sink re-cleaned (see the installation guide) prior to the re-installation of a new ETI.

### Storage:

Store Indigo2 at room temperature conditions of 22° C (72° F) and 50% R.H., preferably in the original sealed plastic bag.

## **References:**

### Burn in Program:

<http://users.bigpond.net.au/cpuburn/>

### Temperature monitors:

Motherboard manufacturers usually supply a hardware monitor utility for their boards. SpeedFan is the most popular temperature monitoring tool. It includes a real-time graphing mode that will aid in the processor burn-in:

<http://www.almico.com/speedfan.php>

The Material Safety Data Sheet (MSDS) for the pre-saturated solvent wiper can be found at:

<http://www.polywater.com/downloads/TR1msds.pdf>

Contact us for more information about this or other Indigo2 applications at our website:

<http://www.EnerdyneSolutions.com>

## **Disclaimer:**

Enerdyne Solutions is not responsible for any damages due to external causes, including but not limited to, improper use, accident, neglect, alteration, repair, improper installation, improper testing, or damages.

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