With or Without Case Cover:

Temperature measurements of different computer components with/without case cover were taken for two different types of computers. One was a minitower and the other was a desktop. The CPUs in these two types of computers are different. The minitower is a modern computer with ATX power supply and motherboard. The desktop is an older design with AT power supply and motherboard. In both cases, CPUs have their own cooling fans.

Method: The temperature of the room was lowered to 73EF and then AC was turned off. No external forced cooling of any sort was applied. As the room temperature slowly approached 74EF, the temperature of a computer component was recorded. Time between different temperature measurements was from 30 minutes to 1 hour to allow components to reach steady state temperatures.

Instrument: An electronic indoor/outdoor thermometer with two temperature sensors was used. One of the sensors is available as a probe with 9.5' sensor wire. This was used to measure temperature of different computer components. The second sensor is built into the main body of the electronic thermometer. This was used to keep track of room temperature. The resolution of the thermometer is 0.1EF/0.1EC.

Table I Temperature of Different Computer Components

	Case #1		**Case #2**	
	Minitower, ATX, Athlon 600MHZ, FIC-SD11 Motherboard, HD *Horizontally* Mounted, 74EF Room Temperature		**Desktop, AT, K6-2 350MHZ, ASUS P5A-B Motherboard, HD *Vertically* Mounted, 74EF Room Temperature**	
Component	**Without Cover**	**With Cover**	**Without Cover**	**With Cover**
Hard disk	90.3EF	91.0EF	85.3EF	86.9EF
Processor ***(Temp. via probe)***	88.3EF	95.7EF	N.A.	N.A.
Processor ***(Temp. via CMOS)***	N.A.	N.A.	109.0EF	114.0EF
2" off the MB ***(Temp. via probe)***	79.3EF	84.2EF	79.0EF	85.3EF
2" off the MB ***(Temp. via CMOS)***	N.A.	N.A.	86.0EF	89.0EF
Hard disk ***-outside the case -no heat sink -on insulated surface***	87.4EF	N.A.	82.0EF	N.A.

Hard Disk Mounting and Cooling:

In the case of minitowers, the hard disks are mostly mounted horizontally. In the case of desktops, the hard disks are usually mounted vertically. After corresponding with disk manufacturers, it was confirmed that the hard disks can be mounted vertically or horizontally as long as the mounting is firm. Furthermore, it was confirmed that hard disks do not need heat-sinks or forced cooling if these are in an open environment. Heat-sinks and forced cooling are required if the hard disks are enclosed in a box, such as a computer case.