

## THE EDITOR'S VIEW

# No Guarantees for Microprocessors

## Customers Want Perfection, But the Real World Can't Deliver

The recent whirlwind of controversy surrounding Intel's Pentium bug has raised difficult questions for microprocessor vendors. What level of perfection can a processor buyer expect? How should the chip vendor react when there are flaws in its products? Is it possible to guarantee a microprocessor?

Intel's touted "guarantee" for its Pentium processor covers only the single, known floating-point divide problem. Essentially, users with the flawed Pentium can, for any reason, get a new chip as long as they claim it is for the FDIV bug. Users with corrected Pentiums, however, have no recourse under Intel's current guarantee.

Once Intel reveals its Pentium bug list (see page 4), the public will see that every Pentium chip has minor problems; even though the newest chips eliminate the FDIV bug, they have their own share of flaws. Most will be seen by hardware vendors but not end users. A few, however, may impact users, perhaps with a lower probability than the FDIV bug, but with a finite chance nonetheless. No matter the odds, some customers will be so worried about one or more of these problems that they will demand a replacement. After all, there are millions of Pentium users; surely at least a few of them are intolerant for one reason or another.

Who is to say which bugs make it worth replacing the part? Ultimately, the processor vendor must make this call. In Intel's case, the last round of replacements cost \$475 million; the next round, if it happens, will be even more expensive. If a processor vendor were so foolish as to offer an unconditional guarantee on its products, it would quickly go bankrupt replacing parts. If all processor vendors were somehow forced to guarantee their parts, CPU prices would skyrocket.

As consumers, we like unconditional guarantees. For certain types of products, we have come to expect them. But a microprocessor is one of the most complex artifacts manufactured by man. Every one of them, particularly the high-performance leading-edge parts that users crave, has flaws. It is unrealistic to expect these chips to be perfect.

Yet somehow, PC buyers expected exactly that. When news of the Pentium bug escaped the trade press and landed on national television, many ordinary people were shocked to find that a computer could possibly make an error. Their faith in technology is flattering but, as we insiders know, sadly misplaced.

To address this problem, the microprocessor industry must begin a campaign to educate the public about

the blemishes as well as the blessings of their products. Yes, computers can change the way you look at the world, but they also can stop working, misplace data, or even give you an occasional wrong answer without notice. Intel plans to devote some of its considerable resources to communicating this message.

Even if expectations are lowered, the question remains: how to respond to a flaw? The first step is to make the problem public as quickly as possible. The more severe the flaw, the more important this is, even if the solution is incomplete. This policy would have minimized the amount of work performed on flawed Pentiums and made Intel appear more sympathetic than dictatorial.

Once the problem is characterized and well understood, the company can make a determination as to whether to initiate a recall or replacement program. In this way, a microprocessor is similar to an automobile. Car buyers will not receive a new car, or even free repairs, if their automobile has a scratch in the paint, a window that sticks, or some other minor flaw. Often, the car maker is aware of manufacturing defects that cause these flaws but chooses not to recall the affected vehicles. Only if the flaw could jeopardize the safe operation of the car will the company typically repair or replace it.

Similarly, microprocessor vendors will be forced to evaluate each bug and decide whether it warrants a recall. Hopefully, few bugs will. When less severe problems occur, users must accept that purchasing a computer is a risk. Risk-adverse users should wait before trying a new type of processor (or automobile) until it has been available for a year or two.

One mistake that Intel made was attempting to distinguish among its customers. True, some needed a new chip more than others. But the bottom line is that Ms. Anybody paid for her Pentium PC just as Professor Nicely did, and she deserves to be treated the same way. Until some vendor offers "upgrade insurance" as an option, companies should treat all their customers equally in the event of a problem.

These customers will judge the chip vendor on its response to bugs. Smart consumers will think about the CPU vendor's reputation before buying a system. Intel has made a substantial down payment to establish a good reputation. We will have to see how expensive it is

