



Invisible Computers for Industry:

What to look for in an Embedded Computer

Embedded computers are invisible computers. When you look at an embedded system, you don't **SEE** a computer. What you see is a thermostat, or an exercise machine, or a piece of industrial machinery. You see what the computer **DOES**, but not the computer itself.

Your job of specifying the best embedded computer for your application can be made easier with a little extra knowledge. It is our intent to provide you, through this white paper, enough information to make finding the right embedded computer or the best vendor or supplier for your application. There are a number of considerations to take into account and questions that need answers as you are deciding on an embedded computer. Some directly relate to how well the computer can function in your application, and others relate to how easy it will be to use. Your source for embedded controllers and peripherals should have the right skills, expertise and answers to the following questions to make your job of selecting the best options for your application easier.

- 1. Functionality:** With respect to functionality, the first question to ask is how much processing power the computer has relative to your needs? A computer with a 32-bit processor and several megabytes of memory is massively overpowered for use as a thermostat controller, but an 8-bit processor with a few hundred bytes of total memory will be underpowered for many uses. You must weigh the needs of your application against the capabilities of the computer(s) you're thinking of using. Having more power available than you currently require can insulate you somewhat if your requirements increase in future, however.

How much input and output, and what kind, must the system handle? How quickly must data be processed, and how sophisticated is the necessary processing? Does the embedded computer you're looking at have sufficient capability by itself, or will it need to be supplemented with one or more additional boards? If the computer requires supplementary I/O boards, how easily does it accommodate them?

- 2. Cost:** How expensive is the computer? If you're aiming at the consumer market, a thermostat that costs \$3500 won't do well. Another factor that influences cost is if the computer does more than your application requires - a custom variant of the computer would save money if the quantity you need makes up for the extra development cost. If the computer does less than your application requires, a custom variant could save money over a multiple-board system.
- 3. Size:** How large is the computer, physically? The smaller the board, the more places it can fit. Again, a desktop PC would not be appropriate as a thermostat. Does the vendor offer custom

variants of the computer? A custom board may be a cost effective option if the computer does what you need, but doesn't physically fit where you need it.

- 4. Software:** Will you be developing the application software yourself? If not, does the computer vendor offer software development services? If so, they're likely to be the most familiar with their own computer and the most efficient at producing software for it. On the other hand, they're not likely to be as familiar with your field as your own engineers or a software consultant who works in your specific field or industry will be.
- 5. Vendor Documentation:** If you or a consultant you hire will be developing the application, be sure to consider available documentation. Good documentation makes your job easier. Be sure to ask what documentation is provided by the vendor, and how complete and understandable is it?
- 6. Proprietary versus Industry-standard Software:** What language(s) can you write your software in? Are they proprietary or industry-standard? It may be difficult to find expertise or support for working with a proprietary language, but it can offer capabilities that may be hard to come by otherwise. Does the vendor provide a complete set of development tools? Are you limited to that set, or can other toolsets be used?
- 7. Additional Support:** What other support is available? Does the vendor provide a library of routines to control their hardware? Which operating systems, if any, are available for the board?

There may be other factors to consider that are specific to your application. The task of selecting a vendor or consultant will be made easier if you create a list of questions and information specific to your application prior to your first phone call or meeting with a prospective vendor or consultant. If you have a reasonable understanding about how the above listed considerations relate to your need to an embedded controller, be sure to add the facts to your list for evaluating any vendor's products and services.